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Community Science: Process, Procedure and Analysis of a Community Environmental Education Outreach Initiative

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FLORIDA STATE UNIVERSITY
COLLEGE OF EDUCATION

**COMMUNITY SCIENCE:
PROCESS, PROCEDURE AND ANALYSIS OF A
COMMUNITY ENVIRONMENTAL EDUCATION OUTREACH INITIATIVE**

By

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ABSTRACT

This dissertation research consisted of the development, implementation and assessment of a community environmental education outreach initiative in support of a lake restoration project in Tallahassee, Florida, U.S.A. This study focused on a community of 4,600 residential homes, where specific environmental concerns had resulted from the eutrophication of lakes within their neighborhood caused by nonpoint source pollution. The significance of this research was that it demonstrated that environmental educators can effectively provide accurate, timely, and relevant information on specific community projects. This is a challenge facing educators and project managers across the country on a project-by-project basis. This research implemented and examined various educational outreach techniques and assessed their effectiveness in informing and motivating community members.

The educational component of this project consisted of a multi-faceted approach to reach residents of the Killearn Lakes community. Components included; an educational web site (<http://www.killearnlakes.org/>); bimonthly newsletters to residents; educational outreach booths at community events; neighborhood school outreach initiatives and coordination with other education/information providers in the region. The purpose of the educational component was to inform residents how individuals make a difference in sustaining acceptable water quality of their lakes. The research was situated in the assertion that providing relevant educational material to the target community will translate into ecologically beneficial behaviors leading to the improvement of water quality in Lake Iamonia, the ultimate receiving water body of this neighborhood's stormwater runoff. The assessment phase was performed through administering, analyzing and interpreting results from a detailed survey.

The analysis demonstrated that the use of an interdisciplinary approach of environmental education can make a sustainable positive impact in a community and its environmental management efforts. The underlying message was that individuals can understand the relevance of scientific issues in their lives, which in turns enhances the willingness of individuals to participate in efforts toward betterment of their community.

This project demonstrated that community-gain can be achieved from presenting

quality comprehensive environmental education outreach. Survey results demonstrated that concerted outreach techniques can see gains in the target population's understanding of environmental best management practices and that, at least for some, this understanding translates into increased implementation of these practices on a personal level.

CHAPTER 1

OVERVIEW OF STUDY

Introduction

This dissertation research consists of the implementation and analysis of a community environmental educational outreach initiative. This outreach initiative focuses on a discrete community with specific environmental concerns. This research has broader applications beyond the effort of informing and motivating change for a specific community. The ability to provide accurate, timely, and relevant information on specific community projects is a challenge facing educators and project managers across the country. In addition to the challenge of educational outreach informing an affected community, there is also the consideration of how effective has the various educational techniques actually been in communicating to the target population. With limited funding related to educational outreach efforts that focus on community environmental and health issues, it is imperative to employ the most effective outreach techniques available. The goal being to both inform and motivate community members on the environmental issues facing their community while improving the long-term health of their community.

The scope of environmental damage that exists in our country and communities is extensive. In Florida, there are fifty listed sites on the National Priority List; these are commonly referred to as ‘Super Fund’ sites (Environmental Protection Agency, 2007). The National Priority List is the list of known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories that are of national priority. This listing is intended primarily to guide the Environmental Protection Agency (EPA), (2007) in determining which sites require further investigation, currently there are 1,243 sites on the National Priority List. To obtain a ranking on the National Priority List, the site of concern is scored based on the potential of a site to pose a threat to human health or the environment. This priority list does not guarantee funding for remediation; it only serves as a mechanism for the EPA to determine which sites warrant further investigation at the national level. This process identifies if federal money can be used for remedial action; notifies the communities affected by the

contaminated sites; and serves notice to potentially responsible parties of pending legal action for remediation cost for which their mandatory participation is sought.

The National Priority List only represents a small percentage of the contaminated sites in this country that have the potential to impact the health of families and the environment within communities across this country. To once again focus on Florida, the Department of Environmental Protection (DEP) has identified over 23,102 petroleum contaminated sites, 1,563 dry cleaner solvent contaminated sites and over 600 sites identified where extensive contamination of groundwater is involved (Florida Department of Environmental Protection, 2007; 2006). Petroleum and dry cleaner solvents are not the only sources of contamination in Florida, sites ranging from landfill, printers, electric power plants, mining operations and agricultural applications of pesticides and fertilizers all have the potential of creating contamination within our communities. These contaminated sites are not isolated islands, but businesses within communities affecting individuals in every county across Florida.

Sites such as those listed on the National Priority list or those being handled at the State level for hazardous waste represents the most severely contaminated sites. Another land classification known as Brownfields represents contamination of low-level pollutants. Brownfields are abandoned industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination (EPA, 2007a). Federal, State and local agencies recognize that the reuse of urban properties is an important land use policy. The reuse of these properties prevents the development of open spaces and natural areas. In Florida, there are 154 sites across the State designated as Brownfields this represents over 148,000 acres of land (Florida Department of Environmental Protection, 2007a).

Highlighting only public and private contaminated sites does not fully demonstrate the value of effective and relevant community science education. The need for safe drinking water is of primary importance. In Florida there are over 1,700 rivers and streams, 7,800 lakes, and 320 springs of those 27 are first magnitude springs (discharge greater than 100 cubic feet per second) (Hammett, Katz, McPherson, Patino, Schiffer, Wedderburn & Yobbi, 2001). The extensive freshwater system is underlain virtually everywhere with aquifers providing drinking water for individual homeowners

and municipalities across the State. Although Florida does have extensive water resources, these resources are finite. The demand that population growth and agriculture usage has on our water resources is one of Florida's greatest resource challenges (Hammett et al, 2001). Groundwater contamination, water level drawdowns, saltwater intrusion and nutrient loading from point and non-point sources are all affecting the quantity and quality of this limited natural resource.

Florida is not unique in this challenge. Across the country, private and public organizations are recognizing the critical roll that educating stakeholders has in the success for community redevelopment and resource conservation. Every site and every community has unique characteristics. There are components of educational outreach that are applicable in every community. Community educational outreach efforts have historically worked as isolated events; and unfortunately the knowledge and lessons learned are not transferred to the larger audience. This research develops, implements and assesses the specific components in the educational outreach to inform and motivate residents in an affected community. By sharing the tools and techniques employed along with assessing the effectiveness of these tools, the larger audiences of environmental and community outreach educators can learn and improve upon this research. This research will serve to improve the quality and effectiveness of community educational outreach initiatives across the nation.

Project Overview

This research project develops, implements and assesses an educational outreach effort targeted to inform, provide relevant educational material from a variety of sources. The end-point is to motivate change from individual homeowners within a large suburban community as it relates to practices that impact the surface water quality of their community lakes. The focus of the educational outreach effort is based on the negative environmental impact the community has had on the lakes in their area. Accordingly, there is need for individual homeowners to modify behavior; this is critical to the overall long-term improvement of the surface water quality. Excessive nutrients, sediments and chemicals entering the community lakes have caused eutrophication of the lakes. This overall deterioration has been recognized by state and local agencies as an issue of

concern for the health of the watershed of the region (Florida Department of Environmental Protection, 2003; Northwest Florida Water Management District, 2006).

This research project will encompass the efforts of the educational component of the Killearn Lake Plantation Clean Lakes Project (KLPCL). The KLPCL Project is funded through a grant from the Northwest Florida Water Management District (NFWFMD) Florida Forever Competitive Grants Program. According to the NFWFMD and grant recipients this grant is a first for a homeowners' association to receive from the Florida Forever project. The NFWFMD recognizes that Killearn Lakes Plantation lakes/stormwater ponds are degrading the southern portion of Lake Iamonia. The nutrient and sediment loading from these lakes/stormwater ponds is causing eutrophication of Lake Iamonia (Florida Department of Environmental Protection, 2003; McGlynn, 2006, 2006a; Northwest Florida Water Management District, 2006). Thus, improving the water quality of the Killearn Lakes Plantation lakes/stormwater ponds can have a dramatic effect on Lake Iamonia. The grant awarded to the Killearn Lakes Homeowners Association demonstrates a willingness by the NFWFMD to allow a community to work towards a system wide solution to the overall water quality of the local watershed. The Killearn Lakes Homeowners Association is overseeing all the work outlined in the grant application. Work on the different components of the grant is being sub-contracted out to a variety of contractors to perform specific task. Leon County is the grant manager, distributing the funding as phases are completed.

As a result of this research effort, a community educational outreach initiative was developed and implemented to inform residents of the effected area and to assist residents in recognizing the impact their life styles have on the surrounding surface waters. This research provided educational material to improve the quality of, and assess the effectiveness of, the outreach effort. It has long been recognized that by simply informing residents of facts on environmental impacts from human behavior that this is not enough of an impact to affect lasting and meaningful change that will have long-term benefits (Coyle, 2005; Haluza-Delay, 2001; Hungerford & Volk, 1990). This project incorporates a sense of community to the educational outreach initiative. This sense of community attempts to provide a level of ownership for the residents to their lakes (Chi, 2000; Roth, 2004). The educational outreach effort utilized a variety of methods to

develop this level of ownership for the residents and thus a relevancy. The outreach effort was assessed utilizing a survey and results and recommendations for improvements of community educational outreach approaches were developed and presented.

History of the Site

Killearn Lakes Plantation (KLP) is a rural residential development that was initiated in the early 1970's. The Killearn Lake Homeowners Association (KLHOA) owns the KLP lakes and greenway areas. When fully developed, KLP will include more than 4,600 homes scattered throughout the rolling hills of northeast Leon County. In order for developers to acquire building permits, a chain of large holding ponds or lakes were designed and created to capture stormwater runoff before it entered Lake Iamonia, a natural marsh/lake approximately 6,000 acres in surface area. These six man-made lakes serve as holding/treatment ponds as well as recreational waters for home sites. The estimated area of these six holding ponds/lakes is approximately 205 acres.

Because of the remote location of the KLP development, sheet flow drainage and septic systems were utilized to handle stormwater and sewer during phases I & II of development in the 1970's. Although residential construction started in the late 1970's development was slow due to poor economic conditions and high interest rates. During the first 10 years, stormwater and sewage problems were minimal when large undeveloped green areas with vegetation or drainage pathways dominated the KLP subdivision.

After the construction boom in the mid to late 1980's, flooding problems and aging and failing septic systems began to occur. This was at a point that approximately 25 percent of the project was developed with residential homes. Much of the land has clay type soils. These conditions do not allow for adequate percolation, and consequently enhance surficial sheet water flow and nutrient loading to the lakes. These conditions became more apparent as more people flocked to this rural northeast development. Modifications to the original stormwater drainage system and a new sewer system were implemented to address septic and flooding issues in the newest developments in KLP. Flooding and septic problems were exacerbated by the commercial development in the Bradfordville area from the late 1990s through 2004. Deficit rainfall conditions from

2000 through 2004 allowed continued commercial and residential development in low areas with a limited number of flooding and septic failures.

Today KLP is approaching complete “build-out” of residential lots in all phases of the subdivision. The remaining green areas and small local holding ponds are not sufficient to efficiently handle the amount of untreated stormwater and septic runoff without significantly impacting the water quality of the lakes in KPL. This increased stormwater runoff provides sedimentation and excessive nutrients (nitrogen and phosphorous) that grow extensive communities of aquatic macrophytes, microscopic and/or filamentous algae which are causative components of the eutrophication process. Other hydrocarbon pollutants also enter KLP lakes via stormwater/septic runoff waters. Sediments have accumulated in the KLP chain of lake during the past 15 years. Water quality has continued to degrade through out the KLP chain since 1985. Future surrounding development will continue to degrade water quality in all KLP lakes.

The Clean Lakes Project

The objectives of the Clean Lake Projects are:

- Improve the stormwater treatment capabilities of Killearn Lake Plantation lakes that flow into Lake Iamonia;
- Assess the results of lake restoration activities;
- Determine the need, feasibility (economic and aesthetic) for additional restoration activities in adjoining areas. Implement nonpoint source pollution best management practices;
- Prepare documentation of the restoration efforts to be used to assess the applicability of these techniques in associated watersheds;
- Inform and educate residents of the affected community of best management practices to improve the overall water quality of their surface water.

The educational component of the project is considered the most significant long-term goal of the Clean Lakes Project. Without significant behavior change from the residents of KLP, the restoration efforts will be of little long-term value. If behavior changes of the community do not occur then the health of the lakes in the community will

return to pre-restoration conditions; excessive loading of nutrients, sediment and chemicals from stormwater runoff will continue and thus eutrophication will return.

An example of this can be found in the hypereutrophic condition of Lake Munson in southern Leon County Florida. Hypereutrophication is the accelerated eutrophication process from excessive nutrient loading of the surface water body. Leon County has spent nearly 18 million dollars on restoration efforts for this lake (McGlynn, 2006). However, the polluted stormwater entering the lake is continuing this accelerated eutrophication process. Without identifying, addressing and curbing the pollutants entering the stormwater the lake has no way to support a healthy ecosystem (McGlynn, 2006). A critical component of this identification and addressing the pollutant loading of the stormwater is educating the community on sound environmental practices that can reduce the quantity and variety of pollutants that have an adverse impact on the health of the lake.

Components of the Clean Lakes Project

The major components of the Clean Lakes Project consist of:

- *Control Structure Retrofit;* The control structures that allow transfer of water between the lakes will be upgraded and optimized for sediment and nutrient removal.
- *Sediment Removal;* Sediments will be removed from Lake Blue Heron, draining will occur prior to sediment removal. It is planned that the sediments will be used to create an island wildlife sanctuary within Lake Blue Heron and for berm construction. The remainder of sediments or "muck" will be disposed of in a proximal and suitable site. Subsequent to the sediment removal, these lakes will be replanted and maintained as naturally vegetated Florida lakes. Beneficial aquatic plants and shoreline buffers will be planted in and around the lake.
- *Artificial Marsh and Buffer Zones;* Artificial marshes will be constructed to remove nutrients and sediment as the water flows from lake to lake and ultimately into Lake Iamonia. Shoreline buffers will be planted around Lake Blue Heron. The first phase of aquatic plantings will focus on continuous blooming emergent aquatic plants. Homeowner acceptability of aquatic plants around and in their lakes is a component of the educational outreach effort.

- *Berm and Swale Construction;* Sediments removed from Lake Blue Heron will be used to construct berms parallel to the direction of stormwater flow and will be placed in grassy swales which drains sheet flow into the Killearn Lakes Plantation water bodies. The exact locations of berms will be determined, and will involve a combination of private property and KLHOA “greenways” areas. Berms will be gently sloping grassy areas to slow stormwater and capture sediment before entering the lake.
- *Establishing Grassy Pathways to Lakes;* Many roads and pathways leading to the lakes do not have adequate grassy vegetation to filter stormwater flowing into the lakes, which thus transport sediment into the lakes. These pathways need to be sodded to slow the stormwater and help filter the larger sized particulate materials before entering the Killearn Lakes Plantation waters.
- *Rain Gardens;* Areas immediately upstream from the berms and along lakefront residential properties are planned to be planted with vegetation that will help filter the stormwater. These rain gardens will be incorporated and managed as part of the shoreline buffer zone system.
- *Monitoring;* Over a one-year period, monitoring will be performed to monitor the effectiveness of nonpoint source pollution reduction.

Within each of these project components is the need to educate the stakeholders on a variety of levels. The ultimate success of the grant will lie in the willingness of individuals within the community to make similar changes that will improve the water quality that leaves each separate (4,600) homeowners’ properties.

Educational Outreach Summary

The educational component of this project consisted of a multi-faceted approach to reach the residents of the Killearn Lakes community. Components of the outreach effort included the development of an educational web site, bimonthly newsletters to residents, educational outreach booths at community events, school outreach initiative and coordination with other education providers in the region to provide relevant material to residents of the target area. The purpose of the educational program is to inform and empower the Killearn Lakes residents to understand how individuals make a difference in

sustaining acceptable water quality of their lakes. In turn, this will improve the overall water quality of Lake Iamonia, which lies within the Ochlocknee River watershed. The research design and implementation is a directed effort to incorporate the components of environmental education to: develop awareness of the existing environmental problems within the community; build upon the pre-existing knowledge of the community related to the issues of concern; foster a sense of concern about those issues; provide the necessary skills for the community members to be part of the solution and finally to involve the community in solving the environmental problems within their neighborhood (UNESCO, 1975). All of these following specific references: (Anderson, Sharma, Lockhart, 2004, Coyle, 2005; Disinger, 2001; Hungerford & Volk, 1990; Meredith, Cantrell, Conner, Hunn, & Spector, 2000; NEEAC, 2005; NEETF, 2000) have promoted these components of environmental education as critical elements in order to achieve a populace that can critically assess policy, public and government actions, make informed decisions and be productive community members for our social well-being.

The ability to promote these critical components of environmental education through the use of community outreach involves the incorporation of the concept of citizen science. Citizen science has come to have several meanings and each of these meanings are included in this research. First, citizens science can represent hard-core professional scientist trained and practicing in their chosen field of study being active members of social problem solving and policy making process (Miller, 2004; Schneider, 2001). Through this research this concept of citizen science includes the active participation of professional scientist within the outreach effort. This participation includes technical support on sample data, ecological study interpretations, support through providing explanations to community members on the environmental impact of pollution sources and hydrogeological analysis of the site.

Citizen science has also come to mean the active participation of volunteers that have no technical or scientific background working on research related task for a scientific study (Phillips, Lewenstein & Bonney, 2005). This research promotes this concept of citizen science by encouraging the community to be active members of the Clean Lakes Project. Activities have been specifically designed to promote the

participation of the community and encourage the community to be part of the solution of the environmental issues facing the community.

The final concept of citizen science incorporated in this research and promoted by Roth (2004) recognizes that it is crucial to develop citizens that are critical consumers; consumers that recognize the lifestyles that we choose to live have larger impacts on our community, society and environment in which we live. This project, through the multifaceted outreach approach being employed, is attempting to nurture the target community to be critical consumers on a variety of levels who recognize the importance of making informed decisions, realizing that actions have consequences and in order to improve the health of our communities, community members need to be part of the solution not part of the problem.

Research objectives of this study

- Present a proactive educational outreach effort allowing for informative and relevant material to be readily accessible to homeowners;
- Assess the level of awareness in homeowners' achieved through the educational outreach efforts of this project;
- Determine if through this awareness, will homeowners' modify their practices at home? Specifically those activities that have an adverse affect on the surface water quality in their neighborhood and the associated receiving lakes;
- Determine the barriers to modifying behavior of people within the neighborhoods.

Research questions addressed in this study

- From the educational outreach effort have residents' level of awareness been heightened to promote consideration as it relates to the water quality of the lakes in their community? Specifically:
 - Do residents within the affected area recognize the issues of concern that the educational outreach initiative addresses?
 - Do residents within the affected area consider their homes a potential point source of the pollution within their community lakes?

- Has the educational outreach effort promoted any effective change in home/lawn practices?
- Of the educational outreach approaches employed which are most effective in reaching a large suburban community?

Conclusion

The use of an interdisciplinary approach in this research that utilizes local resources, technical resources, and community relevance is a low hanging fruit that can easily be achieved in community educational outreach efforts. What is required is sound initial research, a building of a support net, the cooperation of key leaders in the educational and local community and most importantly the desire and willingness to make a difference in how individuals are taught, perceive and understand science in their lives. What we can gain from presenting quality comprehensive environmental education outreach is significant, a chance to impact how individuals assess, evaluate, understand and ultimately decide to handle environmental, social, and political problems at the local, national and global level.

CHAPTER 2

LITERATURE REVIEW

Introduction

The literature review presents an overview of the current state of environmental education, addressing the historical foundations to current environmental education trends and efforts. We will explore the need for such education by briefly discussing the current state of our environment in this country. An understanding of environmental literacy and understanding of environmental learning will be explored. Next, the case will be made on the importance of recognizing that environmental education has both political and social agendas. Finally, the issues of community connection, use of technology and issues of science education reform and funding will be addressed.

Environmental Education

An environmental education approach to teaching and learning utilizes the environment to integrate into the overall curriculum. Science, math social studies, language arts are integrated into the local community at a variety of levels. The multidisciplinary, hands-on and minds-on approach to teaching and learning has come to be inclusive in environmental education. It is unfortunate that environmental education is currently perceived in a narrow sense, often competing with traditional science curricula and considered as add on to subjects (Chin, 2001, 2004; Disinger 2001). Environmental education is much more practical than most people superficially understand. The many hands-on learning experiences that environmental education offers ultimately translates into job, career, and people skills. On a broader scale, environmentally literate community leaders have a deep understanding of environmental issues – with often complex causes and effects – enabling them to make sound decisions in stewarding our air, land, and water (Coyle, 2005).

The Tbilisi Conference produced one of the founding documents for environmental education and was convened in October, 1977. This intergovernmental conference provided the groundwork of goals and recommendations for environmental education (NEEAC, 2005; UNESCO, 1978). The Tbilisi Declaration from the

Intergovernmental Conference on Environmental Education (1978) endorsed the following:

1. The goals of environmental education are:

- To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
- To create new patterns of behavior of individuals, groups and society as a whole towards the environment.

2. The objectives of environmental education are:

- **Awareness:** to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems;
- **Knowledge:** to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems;
- **Attitudes:** to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection;
- **Skills:** to help social groups and individuals acquire the skills for identifying and solving environmental problems;
- **Participation:** to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems (pp. 25, 26).

The International Workshop on Environmental Education held in Belgrade, Yugoslavia, 13-22 October 1975, established the groundwork for the Tbilisi Conference. It has come to be known as the Belgrade Charter, this group of 60 countries proposed the goal of environmental education is to develop a world population aware of, and concerned about, the environment and its associated problems, with the knowledge, skills, attitudes, motivations and commitments to work individually and collectively toward solutions of current problems and prevention of new ones (UNESCO, 1975).

These goals and objectives proposed over thirty years ago by a conference of nations are as relevant today as when the Tbilisi Declaration was initially made. We, as nations still struggle with obtaining these primary objectives in our classrooms. In this country, the National Environmental Education Advisory Council (NEEAC), (2005) sees the primary challenge facing our society is raising the level of environmental literacy. “If the nation can meet this challenge, individuals will be more capable of analyzing environmental issues and making informed decisions as consumers, employees, parents, youths, students, and voters” (NEEAC, 2005, p. 3). It has long been recognized that humans have had the ability to alter and rapidly change their surroundings, often at the detriment of other species, resources and ecosystems. Rachel Carson, one of the true heroines in awakening society’s consciousness to our impact on the greater biosphere said, “We still haven’t become mature enough to think of ourselves as only a tiny part of a vast and incredible universe. Man’s attitude toward nature is today critically important simply because we have now acquired a fateful power to alter and destroy nature. But man is a part of nature, and his war against nature is inevitably a war against himself” (Leonard, 1964, para 1). The result of this altering of the balance of the ecosystem is the irreversible loss by some estimates, as much as 30 percent of the world's animals and plants as direct results of human impacts (Brown, 2001).

The need to have environmental education reach not an elite few of society but the larger society as a whole has been identified as a critical issues by many national and international organizations representing a large cross section of society (NEETF, 2000; NSTA, 2006; NAAEE, 2006; UNESCO, 1978, 1975). The general public must come to appreciate, understand and be empowered to make a difference in their lives as part of the greater biosphere. Through formal and informal educational settings environmental education should be provided for all ages and should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world in which we live (UNESCO, 1978).

Citizen Science

This notion of life-long learning in environmental education segues nicely into the concepts of citizen science. Citizen science has come to represent the inclusion of science within the larger social structure on a variety of levels. Citizen science can be explained through three strands of thought. Each strand represents distinctive differences of citizen science; however all have the same underlining theme; science being part of the social fabric of our communities from the local through to the global level.

First the term citizen science has been considered the inclusion of scientist in the public policy making arena. Schneider (2001) presents that scientist must be part of the process when policy decisions involve complicated scientific concepts and technical expertise. Examples include issues associated with the Nuclear Regulatory Commission, policy decisions on climate change, regulations of genetic engineering, and pollution discharge standards for air and water emissions, to name a few. It is apparent that policy makers take scientific data presented to them at face value, not questioning the underling assertions, methods or context of that data (Miller, 2004; Schneider, 2001). Scientists not only need to be on the technical end of these issues but also on the policy end. If policy makers are unable to understand the complex cause and effect issues associated with policy decisions, then unwanted and unanticipated social, economic and environmental consequences can, have and will continue to occur.

Moving away from the above concept of citizen science and exploring what is considered the traditional view of citizen science is the notion of volunteers participating in scientific research. This scientific research is a coordinated network and usually overseen by a formally trained scientist. Examples of citizen science projects include the Audubon Society's annual Christmas Bird Count that has been collecting data from around the country since 1900. Another example of volunteer participation in hands on citizen science is the Florida Lakewatch program coordinated through the University of Florida's Institute of Food and Agricultural Science/Department of Fisheries and Aquatic Science. This program has been in existence since 1986 and is considered one the largest lake monitoring programs in the nation with over 1,800 trained citizens monitoring over 600 lakes throughout Florida (UF IFAS, 2008).

The final concept of citizen science is the form of science that individuals are concerned with as they go about their day-to-day lives (Roth, 2004). This citizen science can be taken in a variety of contextual manners, ranging from personal matters (e.g., accessibility to safe drinking water), livelihood (e.g., best farming practices), leisure (e.g., gardening in sustainable, organic ways), to activism or organized protest (Roth, 2004). Citizen science should be used to create a shift away from citizens as uncritical consumers: consumers that are often unaware that their vegetables have been genetically modified; the meat they consume has been raised in part with animal meal and antibiotics; the final destination of the garbage they put out causing ground water pollution; elevated mercury levels of mercury and organic pollutants in our fish; or the source of power that runs their homes creating air pollution and contributing to global warming (Roth, 2004). These behaviors are fundamentally inconsistent with environmentally sustainable lifestyles. Derek Hodson, (1999) suggests that the ultimate purpose of education for scientific literacy is “to produce activists: people who will fight for what is right, good, and just; people who will work to refashion society along more socially-just lines; people who will work vigorously in the best interests of the biosphere (p 789).” This definition of scientific literacy is the basis for environmental literacy.

The State of the Environment

We have witnessed unprecedented growth on economic and technological fronts that has benefited many but has reaped severe environmental and social cost for others. Inequality between poor and rich nations is growing and there is evidence around the globe of deterioration, not in isolated regions, but on a worldwide scale (UNESCO, 1975; UNESCO, 1978). Al Gore’s movie *An Inconvenient Truth* speaks to these cataclysmic effects. Social strife, war, poverty, starvation and increased child mortality and decreased life expectancies are all symptoms of a system that is unbalanced and in dire needs. By some conservative estimates, over 15,000 species are in danger of extinction (Baillie, Hilton-Taylor, & Stuart, 2006). Closer to home, the USGS released a study in 1995 documenting that 30 ecosystems are critically endangered, 58 are endangered and more than 38 are threatened in the United States (EPA, 2006c). According to the latest data from the Center for Disease Control and Prevention (CDC) (2006), in 2005 nearly 9

percent of children - 6.5 million children under age 18 - were reported to currently have asthma (CDC, 2006). The percentage of children who have asthma more than doubled between 1980 and 1995. We, as a nation, are facing: air, water and soil pollution that carries personal, social and ecological cost that are uncounted and unchecked and insidiously sprawls into urban areas that continue to drain and tax available infrastructure and eliminate limited natural resources. Over forty-four years ago Rachel Carson stated, “We in this generation, must come to terms with nature, and I think we’re challenged as mankind has never been challenged before to prove our maturity and our mastery, not of nature, but of ourselves” (Leonard, 1964, para 1).

As we are in the first decade of the 21st century, there is continued and growing support from the public for environmental education in our schools. A whopping 95% of Americans surveyed recognize the need to support continued environmental education in our schools (Coyle, 2005). Unfortunately, this positive indication of support for quality environmental education is overshadowed by the same Coyle (2005) report that indicates that *80% of Americans are heavily influenced by incorrect or outdated environmental myths*; this is a conundrum of epic proportion. A difficult concept for environmental educators to accept is the fact that we seem to be losing the battle for the environment in our schools and communities. We have too few successes that can be cited that outweigh the severity of environmental degradation and the serious problems associated with human activities (Hungerford & Volk, 1990).

The American Association for the Advancement of Science (AAAS) sums up the global situation writing, “The most serious problems that humans now face are global: unchecked population growth in many parts of the world, acid rain, the shrinking of tropical rain forests and other great sources of species diversity, the pollution of the environment, disease, social strife, the extreme inequities in the distribution of the earth's wealth, the huge investment of human intellect and scarce resources in preparing for and conducting war, the ominous shadow of nuclear holocaust—the list is long, and it is alarming.” (Rutherford & Ahlgren, 1990, para. 3). The National Research Council advocates the belief that at no time in history has improving science education been more important than it is today (Duschl, Schweingruber, & Shouse, 2007).

Understanding of Environmental Literacy

Environmental literacy is the capacity to understand evidence-based arguments concerning the interactions among human populations, technologies and environmental systems and to participate knowledgeably in decisions based on those arguments (Anderson, Sharma, Lockhart, 2004). Anderson et al. (2004) present that this working definition of environmental literacy focuses on informed action: advocating that schools should prepare citizens to participate in evidence-based reasoning about human actions and their environmental effects, encouraging the need for environmental literacy to be central rather than peripheral to the school curriculum.

The need for an environmentally literate citizenry is becoming increasingly apparent in our rapidly changing technical world where global issues are no longer distantly removed from the communities in which we live. Only a small number of our citizens are environmentally literate enough to understand the complex environmental issues and decisions of this country (Coyle, 2005). For nearly four decades, polls have consistently shown that the majority of Americans care about a healthy environment. Most of these individuals, however, lack a basic understanding of environmental issues (NEEAC, 2005). Since 1997, the National Environmental Education and Training Foundation (NEETF) has conducted a yearly survey on environmental awareness. In a typical year, Americans can correctly answer fewer than 25 percent of the basic environmental literacy questions presented (Coyle, 2005; EPA, 2006; NEEAC, 2005). The question is raised: *how can individuals make sound decisions about the environment as well as be stewards of that environment without being environmentally literate?* Environmental literacy promotes the respect for and understands the limitations of scientific evidence. Environmental literacy assist in developing our set of scruples to understand our impacts on the environment and provides citizens knowledge, skills and strength to participate in the decision making process on environmental issues (Anderson, et al., 2004). Through this route of literacy, it is possible to empower citizens to want to: understand; promote awareness and take action in the realm of environmental issues that affect the local, regional and global community.

Environmental education goals in the K-12 experience are designed to provide students with the knowledge, skills and awareness to be socially conscious of

environmental problems. Effective environmental education can provide students with the necessary understanding, skills, knowledge and tools to address concerns about societal health and the associated environment. The objective of environmental education is to enable individuals to integrate this knowledge into sustainable social and economic planning for their communities (EPA, 2006a; NEEAC, 2005). In essence, environmental education helps people learn how to evaluate information and points of view for themselves in order to make informed decisions (Meredith, et al., 2000).

The question as to how to achieve an environmentally literate populace remains a challenge for educators. NEEAC (2005) recommends that steps be taken to improve the quality, accessibility, and dissemination of environmental education materials and programs. Environmental education enhances lifelong learning skills, including critical thinking, problem solving, collaboration, and decision-making. As a result, individuals are more capable of understanding and weighing various sides of an environmental issue to make informed and responsible decisions (Coyle, 2005; Environmental Protection Agency, 2006a; NAAEE, 2006; NEEAC, 2005; NEETF, 2000 Tompkins, 2005).

Meredith et al., (2000) outlined key characteristics of environmental education:

- Relates to an environmental topic or issue;
- Makes use of the outdoors as a learning environment whenever possible and appropriate;
- Is a lifelong learning process;
- Is interdisciplinary and draws upon many fields of study and learning;
- Is relevant to the needs, interests, and motivations of the learner;
- Is based on accurate and factual information;
- Presents information in a balanced and unbiased manner;
- Inspires critical thinking and decision-making;
- Motivates people to take responsible action;
- Improves learner achievement and outcomes (p. 5).

Environmental literacy can be thought of as the desired outcome of the process of environmental education (NEEAC, 2005). The intent of environmental education is to create citizens that are critical thinking, informed and responsible decision-makers for the challenges that will confront them as members of our society (Coyle, 2005; Disinger,

2001; NEEAC, 2005; NEETF, 2000). The need to instill environmental literacy in our students is a *critical and complicated* process. Scientific knowledge and the skills to effectively use rational inquiry and make decisions on evidence-based arguments as it relates to policy and government actions can only improve our societal well being (C.W. Anderson et al., 2004).

How we know what we know about Environmental Learning

Education serves many purposes: it propagates society, raises children to follow in their parents' traditions, develops and discovers strengths in the individual, assists in the acquisition of knowledge through the reading of books, and the learning of facts and ultimately strives to produce responsible and productive citizens (Darling-Hammond, 1998; Rice, 1999; Roosevelt, 1930). In essence, the ultimate goal of education is to shape human behavior. Societies throughout the world establish educational systems to develop citizens who will behave in an economic and socially desirable manner (Hungerford & Volk, 1990). The traditional thought in environmental education has been that if we can make people knowledgeable and provide information then, in turn, it will result in heightened awareness and ultimately lead to responsible action (Hungerford & Volk, 1990). However, this traditional view of environmental education has failed to make a difference in the behavior of Americans towards the greater biosphere (Coyle, 2005; Hungerford & Volk, 1990).

As a result, of any measurable difference in environmental education, it is critical to establish the understanding of how individuals come to know and use scientific knowledge in their lives. The National Research Council (NRC) (1999) recognizes that a key aspect of teaching science is to focus on helping students overcome deeply rooted misconceptions that interfere with learning. During the course of our personal and social lives, all of us construct a body of practical working knowledge, tested and validated against individual and collective experiences (Jenkins, 1999). When one is making a decision on how to act or respond to a situation, scientific knowledge is considered alongside other experiences and personal knowledge. It is important to recognize that many individuals hold misconceptions of the scientific knowledge they have come to know. In our day-to-day interactions, these misconceptions may carry little to any

consequences for the individual. However, in other circumstances such misconstrued or unconstructed knowledge can be misleading or even dangerous. Here we can see the consequences of misconstrued or unconstructed knowledge with the concept of the uncritical consumers; ones who make decisions that have consequences and impacts far reaching from their immediate choice (Roth, 2004).

Environmental education should play a key role in developing and constructing accurate scientific knowledge for individuals. The social ramifications of environmental education are significant to our society as a whole. Environmental problems are a result of environmental practices due to our social and cultural development (Saul, 2000). To create lasting impressions on our students, which are our citizens, environmental education needs to include components of nature, culture and ecological consequences of human practices on the biosphere that is relevant to the individual learner.

Bruce Munson (1994) has explored the cultural process in environmental knowledge. Munson surveyed students on several ecological concepts and found that widespread misconceptions existed. He found that:

- Misconceptions can represent elements of a coherent framework constructed by the individual;
- Misconceptions are constructed by individuals in response to their verbal and empirical experiences;
- Misconceptions are stable elements of an individual's conceptual framework and highly resistant to change; traditional teaching is unlikely to change a student's conceptual understanding;
- Misconceptions are useful to the individual;
- Misconceptions are believed by the individual - they make sense;
- Common types of misconceptions exist within cultures and across a range of ages (p. 33).

Students' existing conceptions affect their interpretation of their world and the assimilation and development of additional knowledge (Driver & Erickson, 1983; Munson, 1994; Posner, Strike, Hewson, & Gertzog, 1982). Individual learning does not occur in a social, political or historical vacuum (Roberts, 1996). Munson (1994) concluded that educators cannot simply fill in voids of ecological knowledge with

students, since there are very few voids, *but many misconceptions*. He presents that educators must understand that students are not lacking knowledge; they have developed understandings that structure their learning so they maintain misconceptions, despite learning new content knowledge. The American Association for the Advancement of Science (AAAS), in *Science for all Americans*, understands that people have to construct their own meaning regardless of how clearly teachers or books present the information (Rutherford & Ahlgren, 1990). Mostly, a person does this by connecting new information and concepts to what he or she already knows. It is evident that students need to be given a reason to discard their long-standing misconceptions to adopt and construct accurate conceptions they will carry with them through their entire lives.

Munson acknowledged in his work the role of culture in shaping individual and group knowledge; recognizing that knowledge is culturally situated within the context of families, communities and the larger culture (Munson, 1994; Saul, 2000). Environmental problems are socially constructed in terms of their conceptualized effects on individuals, groups, other living organisms and systems (Robertson, 1994). In environmental education, this cultural and community component of understanding needs to be an integral factor of any successful reform effort for curriculum.

Elizabeth Klein and Eileen Merritt (1994) argued that it is important to develop the thinking skills in students to investigate issues, evaluate alternative and clarify values. Students need to develop an awareness of how individuals and collective actions influence quality of life and the environment. A traditional educational view of students being made aware of issues and that awareness translating into changed behavior has failed to have lasting impact on human behavior (Hungerford & Volk, 1990). Klein and Merritt (1994) realized that the learning process is far more complicated and view the goals of environmental education in line with the vision of constructivism.

The central constructivist paradigm in learning stresses that *learners actively construct knowledge and do not just passively receive information* (Saul, 2000). Basically, constructivism views that knowledge is not 'about' the world, but rather 'constitutive' of the world (Driver, Asoko, Leach, Mortimer, & Scott, 1994; Steffe & Gale, 1995). Knowledge is not a fixed object; it is constructed by an individual through his/her own experience of that object. Learning approaches mindful of constructivist

theory emphasizes authentic, challenging projects that include students, teachers and experts in a learning community. Its goal is to create learning communities that are more closely related to the collaborative practice of the real world (Steffe & Gale, 1995). Effective learning requires the individual to more than just make multiple connections of new ideas to old ones; it sometimes requires that people restructure their thinking radically (Rutherford & Ahlgren, 1990). In order for an individual to incorporate a new concept, they must change the connections among the knowledge they already know, or even discard some long-held beliefs about the world.

Klein and Merritt (1994) view of learning mindful of constructivist theory involves:

- Introduction of a real-life problem by the students or teacher for the students to resolve;
- Student centered instruction facilitated by the teacher;
- Productive group interactions during the learning process;
- Authentic assessment and demonstration of student progress (p. 15).

The objective is to simulate real-world challenges that require students to master the central concepts to solve and resolve the challenge (NRC, 2000; Saul, 2000).

Environmental Education with a Political and Social Agenda

The concept of real-world challenges is relevant to environmental issues, which encompass social, physical, economic and ecological in an inclusive package (Lewis & Jelinek, 1995). Environmental education should be designed to improve the lives of everyone. Lewis and James (1995) concern with current environmental curricula is the lack of inclusion of multicultural issues. People of color and diverse backgrounds are often not a part of the curricula discussion. This limitation ignores the fact that environmental issues have an impact on all races, and social economic groups (Lewis & James, 1995). The NRC (1996) recognizes the importance of science for all students; “all students regardless of age, sex, culture, ethnic background, disabilities aspirations or interest and motivations in science, should have the opportunity to attain high levels of scientific literacy” (p 20). The AAAS reinforces this belief writing, “To neglect the science education of any (as has happened too often to girls and minority students) is to

deprive them of a basic education, handicap them for life, and deprive the nation of talented workers and informed citizens—a loss the nation can ill afford” (Rutherford & Ahlgren, 1990).

Roth (2004) recognizes that the needs of diverse groups of people - except, white middle class males - have not been met, leading to largely their exclusion from the scientific discussion. Brickhouse and Kittleson (2006) advocate that science education can make a very important contribution to efforts of preserving natural resources and organizing communities by teaching students how scientific practices can be linked to a variety of different cultural resources and values. This reconceptualizing of science as a means of destruction and stripping the earth to one that serves to provide constructive and progressive solutions to environmental issues can serve the diverse school population (Brickhouse & Kittleson, 2006). Science and science education can serve the purpose of social justice and environmental justice. The notion of social justice is considered the condition in society where all members have the same basic rights, security and opportunities, obligations and social benefits (Barr Foundation, 2006; Brickhouse & Kittleson, 2006). Environmental justice has come to represent the fair treatment, meaning that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local and tribal programs and policies (Environmental Literacy Council, 2005). This is environmental education. Education that recognizes that teaching science is a political act and we must teach all of our students to be aware of the social, political and economic forces that shape the way we know and live (Roth, 2004). “Teaching is a political act when it promotes active participation in citizen science and engagement for social justice” (Roth, 2004, p. 214).

Hodson (1999) states that the politicization of science education can be achieved by providing opportunities to our students to deal with a wide range of socioeconomic issues that have a scientific, technological or environmental dimension. By situating curricula in socially and personally relevant context, an issues-based approach can provide the motivation that is currently absent in science education (Hodson, 1999). Hodson, (1994) has outlined how an issues-based approach can achieve critical scientific

and technological literacy in our students. He presents an approach that consists of four levels of sophistication:

Level 1: Appreciating the societal impact of scientific and technological change, and recognizing that science and technology are, to some extent, culturally determined;

Level 2: Recognizing that decisions about scientific and technological development are taken in pursuit of particular interests, and that benefits accruing to some may be at the expense of others; Recognizing that scientific and technological development are inextricably linked with the distribution of wealth and power;

Level 3: Developing one's own views and establishing one's own underlying value positions;

Level 4: Preparing for and taking action (pp. 787-788).

Hungerford and Volk (1990) understand the significance of the social impact of environmental education placing the ability to take positive environmental action as the most significant achievement of the educational process. Students must be given the opportunity to develop a sense of ownership and empowerment so they are fully invested in an environmental sense and encouraged to become responsible active citizens (Hungerford & Volk, 1990).

The arguments put forth by (Brickhouse & Kittleson, 2006; Hodson, 1994, 1999; Hungerford & Volk, 1990; Jenkins, 1999; Lemke, 2001; Roth, 2004) and many others advocate the need to push school science into the social and political world. Students need to be made aware of the social, political and economic forces that shape the way we know and live (Roth, 2004). *Science for all*, has a global resonance to have citizens that are scientifically literate and able to contribute to decision making about issues, whether personal or broadly political (Jenkins, 1999).

Science education needs to develop several complementary approaches to assist students in learning. Lemke (2001) tells us that our curricula and teaching methods are closely adapted to the needs of middle and upper-middle class culturally North American, fluent speakers of English. It is critical for educators to expand the depth and scope of the curricula to reach the larger diverse population. Science education needs to develop several complementary approaches to assisting learning suited to the heterogeneous classroom (Lemke, 2001).

Lemke (2001) writes: “We will need interdisciplinary curricula and instructional materials support for the science based components of thematic projects studies, and for individual and for small group learning in both face-to-face and network mediated investigations” (p. 307). Science education has no excuse with the advancements in technology not to include the social, cultural and linguistically differences and their importance to our students (Lemke, 2001).

Conservative Organizations use of Environmental Education

Political and social organizations recognize the importance of utilizing environmental education to promote key organizational ideas and concepts. A component of the political agenda of environmental education of which this research also has applicability is the efforts of organizations to influence the health of ecosystems and educate members, policy makers and the general public on what the organization would consider as hot-button topics. Organizations on both the conservative and liberal side of the political spectrum push forward agendas that are in the best interest of their group members. The National Rifle Association, (NRA) through their ECHO (Environmental Conservation Hunting Outreach) Program works to advance conservation efforts, encourage hunter safety and ethics, and promotes hunting as a beneficial and responsible use of wildlife resources (NRA, 2007). This is accomplished through educational programs, restoration efforts and improving hunting access and shooting range projects.

The NRA is not alone in its efforts; the American Sportsfishing Association’s FishAmerica Foundation is this organizations effort to invest in fish and habitat conservation and research across the country. The FishAmerica Foundation provides grant opportunities that fund conservation efforts in communities. A few examples of some funded projects include the FishAmerica Family Fishing Waters program that creates local community fishing opportunities; and a community based NOAA partnership to restore fisheries habitat (FishAmerica, 2007).

One of the most influential hunting organizations on the conservation front is Ducks Unlimited. This organization has become a leading voice in the effort to conserve wetlands across the country. Through educational initiatives, fundraising, lobbying efforts and scientific studies Ducks Unlimited has been leading the effort in habitat protection

and restoration. Through a network of federal, state, private and nonprofit conservation organizations Ducks Unlimited continues to support both hunter and conservationist interest across North America (Ducks Unlimited, 2007).

Connections to our Communities

An effective method to develop an environmentally educated citizenry is to use instructional techniques that expound on the relationship of the family-school-community ecosystem and this interconnection with the greater societal culture and environment (Bennett & Bennett, 2004). Hillary Clinton (1995) presents this concept at length in her book: *It Takes a Village*; her current political presence and the possibility of her continuing to expand this momentum with presidential aspirations ([Democratic Convention Guide 2008](#)) will further enhance this presented commitment to focusing on community involvement. The concept of the connection of schools to our communities in an integral manner within curriculum development and implementation is not a new idea. John Dewey recognized the importance of learning outside the classroom, “Experience has its geographic aspects, its artistic and its literary, its scientific and its historical sides. All studies arises from aspects of the one earth and one life lived upon it” (Dewey, 1910, p. 125). Undoubtedly, this conception has evolved into what modern reform efforts have come to associate with the place-based education. This is often interchangeable with a number of similar terms such as community-based learning, service-learning, environment as an integrating concept (EIC), sustainable education and project-based learning (Powers, 2004).

The promoters of place-based education present that the core concepts of this educational approach as:

- Emerging from the particular attributes of a place. The content is specific to the geography, ecology, sociology, politics and other unique dynamics of that place.
- Inherently multidisciplinary and often promotes team teaching among educators and community resources personnel.
- Experimental: in many programs, this includes a participatory action or service-learning component.

- Reflective of an educational philosophy that is broader than “learn to earn”.
Curricula and programs are designed for broader, life-long learning objectives.
- Connecting place with self and community. These connections are pervasive because of the ecological lens place-based curricula situates itself within (Chin, 2001).

There is growing evidence that place-based learning is having a positive impact on students across the spectrum of content material achievement and student behavior (Lieberman & Hoody, 1998). A study conducted by the State Education and Environment Roundtable (SEER) found that students learn more effectively within an environment-based context that is not primarily focused on learning about the environment but uses a school and the surrounding community as a framework within which *students can construct their own learning* (Coyle, 2005; Lieberman & Hoody, 1998; NEETF, 2000; NEEAC, 2005). In the SEER study, students performed better on traditional measures of competence in reading, math and writing and their interest and motivations also improved (Coyle, 2005; NEETF, 2000; NEEAC, 2005). Meredith et al. (2000) found that nonformal education activities such as events at parks, museums, zoos, nature centers or through the media serve as intrinsic motivation for individuals. Finally, several studies point to the powerful link between learning in the local context and the enhancement of student participation in community concerns and increased engagement in their academic studies (Chi, 2000; Henness, 2001; Powers, 2004). The AAAS encourages science teachers to take advantage of the rich resources of the larger community and involve parents and other concerned adults in ways that can enhance the learning experience for their students (Rutherford & Ahlgren, 1990). “Classroom environments are positively influenced by opportunities to interact with parents and community members who take interest in what they are doing” (NRC, 1999 pp. 233-234).

The Environment as an Integrating Context (EIC) approach promoted by SEER to environmental education prompts a multidisciplinary teaching and learning technique that crosses the boundaries of content. This integration of disciplines can be used to emphasize a single thematic idea and explore how concepts, principles and topics from various disciplines exemplify a particular theme (Lieberman & Hoody, 1998; Meredith et al., 2000). EIC instructional approach can take on many different forms meeting the

needs of the school and community it is utilized in. However regardless of the school or community, there are certain characteristics that emerge in these locations: interdisciplinary integration of subject matter; collaborative instruction; emphasis on problem solving and projects; combination of independent and cooperative learning; and learner-centered and constructivist approaches (Lieberman & Hoody, 1998; Meredith et al., 2000).

There have been a growing number of district and regional initiatives to bring place-based education into the mainstream curriculum. Efforts of the National Science Foundation's Urban Systemic Program recently published their assessment of a five-year funding cycle that provided 30 districts across the Nation financial support to improve science and mathematics education (NSTA, 2006). Part of the systemic reform effort the NSF accomplished was the development of partnerships between school districts with colleges and universities, businesses, community groups and informal science education sites (NSTA 2006). In order to accomplish the systemic reform that needs to be accomplished in science education, it is critical to develop partnerships between all community stakeholders' involved in the process. The NSF recognizes the need for serious reform in these content areas (NSTA, 2006). This recognition is reinforced by the result of mathematics and science test administered by the National Assessment of Education Progress showing that less than 20% of 12th graders and only one-third of 4th and 8th grade students reached proficiency in mathematics and science. Scores for minority students were found to be significantly lower (U.S. Department of Education, National Center for Educational Statistics, 2006).

The Place-Based Education Evaluation Collaborative (PEEC), established in 2002, is a partnership between organizations and projects that work collaboratively to promote and support place-based educational models in the New England region. Current projects that PEEC is overseeing, evaluating and assessing include the CO-SEED, Sustainable School Project, Community Mapping Program and a Forest for Every Classroom (Duffin, 2004). The goals in each of these programs varies but do have these common themes: enhancing community and school connections; increasing understanding of and connection to the local area; increasing understanding of ecological concepts; enhancing environmental stewardship; increasing academic performance;

improving the local environment; improving of school grounds habitat and use as a teaching space; and increasing civic participation (Powers, 2004).

In the San Francisco Bay area a group of 25 environmental education program providers gathered to form a learning community with the goal to develop a regional framework that outlines how environmentally responsible behavior can be promoted through environmental education (Chin, 2004). This regional learning community assessed the current status of environmental education in the region; developed a framework to understand how environmental education can contribute to the goal of responsible behavior; identified how the groups can better serve their community and ultimately how to better inform and educate the region's citizens.

Beyond the regional efforts to bring environmental education to our schools and communities there exists a network of organizations who attempt to reach educators across the country including, Project Food, Land and People; Project Learning Tree; Project WILD and Project WET. Project Food, Land and People develops and disseminate curriculum, and sponsors symposiums across the country, this organization was established in 1988, has developed over 55 hands on lessons and estimates it has trained over 30,000 educators to utilize their lessons in 27 states reaching millions of our youth (Food, Land & People, 2006).

Project WILD has been around since 1983, it is considered the largest wildlife education program in the world, estimating that over one million educators has been trained and provide lessons who in turn have reached over 53 million students. The program has coordinators in all states responsible for distributing and training educators in their state (Council for Environmental Education, 2006). Project WET is a network of state coordinators that provides material and training for educators to teach about water and water resources. The program has coordinators in all states providing workshops and curriculum for local educators (Project Wet International Foundation, 2006). Even with what could be considered as a significant amount of relevant resources available, there is still the issue of making educators aware of these sites, identifying relevancy to their lesson plans, and then integration of them at a community level.

Outside of formal school settings, children participate in many institutions that foster their learning. For some of these institutions, promoting learning is part of their

goals, including: after-school programs, Boy and Girl Scout Associations, 4-H Clubs, museums, and religious education. In other institutions or activities, learning is more incidental, but learning takes place nevertheless such as in sports activities, fishing, hunting, farming/gardening and hobbies of the family and community. These learning experiences are fundamental to children and adults' lives since they are embedded in the culture and the social structures that organize their daily activities (NRC, 1999).

Learning occurs all around us, individuals interacting and sharing their experiences and time are all separate learning opportunities. Connecting these opportunities through the demonstration of relevance is key to improving students' interactive conceptualization of meaning.

There has been concern among researchers that by taking students to natural settings in pristine wilderness locations, away from their local home setting can have a negative effect on students' attitudes of their direct community's environmental issues (Fisman, 2005; Haluza-Delay, 2001). Such concerns reinforce the need to teach students within their communities and build a connection between their environmental concerns and their community (Fisman, 2005). All communities are rich in educational resources. There are outdoor settings that can be utilized to effectively unlock our natural curiosity and develop an appreciation for the environment (Meredith et al., 2000). In addition, beyond the natural world, man-made structures such as parks, parking lots, water treatment plants, landfills, industrial sites and schoolyards can successfully reveal the relationships between human society and the greater environment (Meredith et al., 2000). Knowledge about these resources can be used when learning relevant scientific concepts, by focusing on local issues and the social context in which it is situated; students' can build on prior scientific understandings and have legitimate conceptual resources to reference (Chin, 2004).

There needs to be more effective familiarity of students with off-site centers and of the people and places in our community: including zoos, aquariums, museums, arboreta, botanical gardens, nature centers and natural parks, refuges and field study areas; school yard habitats and gardens; and green campuses (Coyle, 2005). These locations serve to strengthen the critical connection that students need to make to

establish relevance for need to appreciate, learn and apply their total scientific knowledge.

Tools of Technology

Traditionally in the k-12 classroom, environmental education has been piggybacked on other established subjects (Disinger, 2001). An advantage of this trend has been that environmental educators have had access to the tools of formal education plus the added resource of the natural world (Heimlich, 2003). Resources such as schoolyards, parks, nature centers, zoos, museums and camps, are used to learn about the environment in an integrated discipline approach (Heimlich, 2003). This feature of hands-on learning and direct student contact with the environment has been a dominant feature in the environmental education field of study (Barney, Mintzes, & Yen, 2005; Dori & Tal, 2000; Heimlich, 2003; Lucas, 2000; Sedlacek et al., 2005; Simmons, 1998). With this historical grounding in the “hands-on” approach to education, environmental educators have approached the use of the Internet with reservation, concerned about the contrast between the virtual and real world (Heimlich, 2003). The issue to be conscious and concerned about is the ability to strike a balance between the tools that represent the world and direct experience within that world.

Historically, scientific knowledge has lead to technological and social advances. Thus, in order for environmental education to remain socially relevant, it must adapt to technological changes (Heimlich, 2003). The adaptation to computer and distance learning technologies in environmental education has occurred in a gradual, slow process. Heimlich (2003) performed a review of 10 years of three of the journals dominant in the environmental education; only 15 articles appeared that addressed computers or distance learning technologies. The majority of those articles provided case studies of an applied use of technology rather than the appropriateness to the context or setting. Lemke, (2001) recognizes the need for standalone computer-aided instruction curricula, with topic modules and multiple pathways for linking ideas and developing conceptual relationships creating rich information-access.

We cannot ignore that technology has become an important instrument in education. Computer-based technologies hold great promise both for increasing access to

knowledge and as a means of promoting learning. The public imagination has been captured by the capacity of information technologies to centralize and organize large bodies of knowledge; people are excited by the prospect of information networks, such as the Internet for linking students around the globe into communities of learners (NRC, 1999). There is great potential in the use of technology to serve as a powerful learning tool to enhance students learning of scientific concepts (Reid-Griffin & Carter, 2004; Rutherford & Ahlgren, 1990). Technology can be used to help meet the challenges of establishing effective learning environments by:

- Bringing real-world problems into classrooms through the use of videos, demonstrations, simulations, and Internet connections to concrete data and working scientists.
- Providing "scaffolding" support to augment what learners can do and reason about their path to understanding. Scaffolding allows learners to participate in complex cognitive performances, such as scientific visualization and model-based learning that is more difficult or impossible without technical support. Increasing opportunities for learners to receive feedback from software tutors, teachers, and peers; to engage in reflection on their own learning processes; and to receive guidance toward progressive revisions that improve their learning and reasoning.
- Building local and global communities of teachers, administrators, students, parents, businesses, civic organization and other interested learners.
- Expanding opportunities for teachers' learning (NRC, 1999 p. 231).

It is critical to recognize that yesterday's education is not sufficient for today's learner; academic excellence must be acquired within the context of today's technological environment in order to properly prepare students to meet the challenges of today's world (Lemke, 2003). Environmental educators need to utilize Internet technology not to replace the connections to real world environmental concerns but to enhance that experience (Gunderson, 2006; Mann & Coble, 2006). There are many high quality educational materials available through the Internet; a real problem though is finding relevant curricula. The Environmental Protection Agency (EPA) has recognized this concern and through the Office of Environmental Education has improved the access to educational information and resources through their main web site at

<http://www.epa.gov/enviroed/> (EPA, 2006b; NEEAC, 2005). At this site there is a portal to educational resources including pre-kindergarten -4th grade Environmental Kids Club; the Student Center (5th-8th grade); the High School Center; and the Teachers page. These sites contain projects, basic environmental concepts, local and global issues pages, and teaching aids and concepts to enhance the classroom learning of scientific concepts (EPA, 2006b).

There are numerous other Internet based science curricula resources available that can be utilized to enhance environmental education, many are free; others require registration while others require a fee to access the material. A few of the outstanding curricula sites that promote inquiry learning and enhance the principles of environmental education include; GEMS, EE-Link and WISE, each is described below. Gateway to 21st Century (GEMS) learning at <http://www.thegateway.org/> is a Consortium effort to provide educators access to thousands of educational resources found on various federal, state, university, non-profit and commercial Internet sites (GEMS, 2006). The North American Association for Environmental Education (NAAEE) environmental education on the Internet (EE-Link) at <http://eelink.net/pages/EE-Link+Introduction>, which is designed to provide support for teachers, professionals and students in environmental education (NAAEE, 2006). Finally there is the University of California, Berkley web based inquiry science environment (WISE) at <http://wise.berkeley.edu/>. On this site, students explore real world issues, investigate and assess evidence and come to conclusions by utilizing resources available through the Internet (University of California, Berkley, 2006).

Online science education material is also available through many federal agencies such as NASA at <http://education.nasa.gov/home/index.html>, the United States Geological Survey (USGS) at <http://education.usgs.gov/>, the United States Department of Agriculture (USDA) Forest Service at <http://www.na.fs.fed.us/spfo/ce/index.cfm>, and the Department of Energy at <http://www1.eere.energy.gov/education/>. All these sources are open to any educator, parent and student with access to the Internet. In addition, to federal agencies, State and Local governments, informal learning site (museums, zoos, aquariums, libraries, science centers), and Universities all have links to educational material available through the Internet.

All of these resources can enhance the teaching and learning of scientific concepts in the classroom and community; *the key is relevancy, quality and connection to the lesson plan*. With this plethora of online resources, why are we not seeing them used more in the classroom to enhance the teaching and learning of science? Many reasons can be sighted, least of which is the factor of time, even experienced teachers do not have the time to search through the multitude of web sites, identify exemplary, grade-level appropriate material which support content standards and can easily be integrated into the existing curriculum (Kahn, Rockman, Kelley, & Commissio, 2006).

In addition to the factor of time for locating quality Internet resources there is the learning curve teachers experience when integrating new technology into the classroom. Teachers and students can experience frustration and even failure when first integrating new technology into the classroom (Reid-Griffin & Carter, 2004; Williams, Linn, Ammon, & Gearhart, 2004). Often these exasperating first experiences turn teachers off to further attempts at technology integration into the classroom. Regardless of these perceived barriers, it is critical that educators accept that children are much more comfortable with today's computer technology and cyberspace than adults. A 2003 US census survey found that over 66% of people from age 3-17 had a computer with Internet at home (US Census Bureau, 2003). This demonstrated that digital technology is increasingly becoming a part of students' everyday lives. The use of computers and the Internet are no longer restricted to a privileged few, but available and utilized by a majority of students.

Technological Issues of Concern

Environmental education has promoted itself as place-based and outdoor centered. These features of hands-on learning and direct student contact with the environment have been a dominant feature in the presentation of environmental education (Barney, Mintzes, & Yen, 2005; Dori & Tal, 2000; Heimlich, 2003; Lucas, 2000; Sedlacek et al., 2005; Simmons, 1998). With this historical hands-on method to instruction, environmental education has approached the use of the Internet with reservation, concerned about the contrast between the virtual and real world (Heimlich, 2003). However in a recent study comparing a traditional and an Internet based version of an environmental education

program it was found that the Internet based curriculum students out-performed their counterparts in content knowledge and improved attitudes related to environmental issues (Aivazidis, Lazaridou, & Hellden, 2006). We cannot deny that in order for environmental education to remain socially relevant, it must adapt to technological changes (Heimlick, 2003).

There is a learning curve associated with the implementation of any new tool into the classroom. In a two-year case study of integrating Internet based inquiry curriculum, Williams, et al. (2004) found that in the first year the teacher had to master the logistical ropes of the technology. In the process, the teacher gained a deeper understanding of the science content and curriculum goals for the students. In the second year, the teacher was comfortable with the technology and was able to focus efforts on supporting students' learning through making their scientific thinking visible. This coincides with other reports by teachers experiencing frustrations and failures in attempting to teach students to use new technology at the same time expecting students to learn scientific content (Reid-Griffin & Carter, 2004).

Another issue of concern is the *lack of collaboration between resource providers*. Typically, online resources are fragmented and piecemealed together, there are very few common trusted portals to utilize. As a result, teachers often do not know about what resources are available nor do they make good use of the resources that are available in the virtual world (Chin, 2004; Kahn et al., 2006). It is critical to maximize the use of information technology for the delivery of environmental education. There exists a real lack of collaboration; there currently is not enough connection across organizations/programs to provide a continuum of experiences (Chin, 2004). To improve in this delivery there must be a central presence on the Internet of environmental education, a presence that will serve the greater learning community and enhance the teaching and learning in the classroom (Coyle, 2005). By weaving together a collaborative local effort two additional benefits occur:

All educators need to accept that children are much more comfortable with today's computer technology and cyberspace than adults. As previously presented a 2003 US census survey found that over 66% of people from age 3-17 had the presence of a computer and the Internet at home (United States Census Bureau, 2003). The use of

computers and the Internet are no longer restricted to a privileged few, but available and utilized by a majority of our students. It is critical that environmental education utilizes this technology to enhance the integration of the core curriculum and principles into the classroom, making environmental literacy an attainable outcome for all students. The AAAS recognizes that without the continuous development and creative use of new technology, society runs the risk of limiting its capacity for survival and for working towards a world in which we are able to sustainably exist within our environment (Rutherford & Ahlgren, 1990).

Science Education Reform

As science educators, we are hearing from a multitude of sources the desire and need for science education reform at a wide variety of levels (Coyle, 2005; Duschl, et al., 2007; Lieberman & Hoody, 1998; Meridith et al., 2000; NEEAC, 2005; NRC, 1996; Rutherford & Ahlgren, 1990). The emphasis in this reform is the belief that science, energetically pursued, can provide humanity with the knowledge of the biophysical environment and of social behavior needed to develop effective solutions to our global and local problems; without that knowledge, progress toward a safe world will be unnecessarily handicapped (Rutherford & Ahlgren, 1990). The need for the concept of citizen science is now; science that can enhance public understanding, awareness and motivation for productive action for our communities and ourselves (Hodson, 1999; Roth, 2004). A scientifically informed citizenry is needed as never before to actively participate in major political debates facing our local, state, federal and international constituencies (Duschl et al., 2007).

To improve science education in the United States changes are urgently needed throughout the system, changes in the teaching of students and in the education of teachers can and should begin now (Duschl, et al., 2007). Through the promotion of science education reform, schools and communities can emphasize and explain the dependency of living things on each other and on the physical environment. The AAAS in Project 2061 believes science fosters the kind of intelligent respect for nature that should inform personal and public decisions on the uses of technology (Rutherford & Ahlgren, 1990). Even with the appearance of support from organizations that promote

and foster the belief of environmental (scientific) literacy there is very little hard evidence of sincere integration in print. For example, the national science education standards has a smattering of environmental topics through the standards, these topics in Table 1 demonstrate that there is no coherent approach to environmental science education nor any real attempt at integration of an overlapping theme of environmental literacy in the science standards (McComas, 2002; NRC, 1996).

Table 1: Environmental Science Content in the National Science Education Standards

Content Topic	Grade Level
Biotic and abiotic factors/issues	K-4; 5-8
Cycles, (water, geochemical, nitrogen, ect)	5-8; 9-12
Ecosystem defined	5-8;
Energy flow (sun)	5-8; 9-12
Environmental decisions should be based on science and technology	5-8; 9-12
Food chain issues	K-4
Humans impact on the environment, its cycles and other organisms	9-12;
Humans use of natural resources	9-12;
Limits on growth and carrying capacity	5-8; 9-12
Organisms impact on the environment and each other for good and bad	K-4; 9-12
Organisms interact	9-12;
Overpopulation, population density and consequences	K-4; 5-8
Pollution, causes, risk and consequences	K-4; 5-8; 9-12
Population change, growth (types and reasons)	K-4; 9-12
Population defined	5-8;
Predator, producer, consumer	K-4; 5-8
Resources are limited	K-4

The call for science education reform has reached all parts of the teaching and learning process: from how science is presented in our classrooms and communities, to

science teacher preparation and continuing to what should be taught as science. Science curriculum is often fragmented into discreet parts that mask the important concepts and connections critical to the larger objective of creating literate students (Anderson et al., 2006). Roth (2004) recognizes the need to shift and redirect science content, he writes, “Teaching a small set of key scientific concepts and theories often incompatible with everyday knowing and common sense in better ways does not significantly change the situation. When students begin to participate in ‘citizen science’, they enter multiple relations, situations through which science is enacted in the community” (p. 177). Anderson et al. (2006) believe that our students learn science in context that is disconnected to current political issues and they are not being prepared in their future societal roles. Hungerford and Volk (1990) recognize the need for moving content reform in a direction so that students can develop a sense of empowerment and ownership in the environmental issues facing our society.

Environmental issues need to become an integral part of the instructional design in order to change behavior; environmental education must be central in science education, moving beyond an awareness or knowledge of the issues (Disinger, 2001; Hungerford & Volk, 1990). By moving beyond basic awareness in our classrooms and communities, we may be able to obtain real control of environmental problems in the U.S. and abroad. Only a public with a sound base of environmental education will be able to understand these problems and address them at their source (Coyle, 2005).

Arguably one of the most apparent reasons to consider and pursue reform in science education can be found in the performance of our students across the nation in science proficiency. By all measurable standards and even with the most optimistic of readings we put on the scores, our students are suffering and there is a great need to improve on all fronts of science education (Coyle, 2005; NEEAC, 2005; NEETF, 2000; NSTA, 2006; U.S. Department of Education, National Center for Educational Statistics, 2006). Environmental education can and should serve to improve the state of science for our students. Environmental education has the potential to link and integrate curriculum in the classroom, create relevance to the community, cut across the spectrum of disciplines and improve overall student performance in those same academic disciplines (Barr Foundation, 2006; Disinger, 2001; Duffin, 2004; Lieberman & Hoody, 1998; Mann

& Coble, 2006; NEEAC 2005; NEETF, 2000; Powers, 2004; Sedlacek, Young, Acharya, Botta, & Burbacher, 2005; Simmons, 1998). Environmental education is essential education (Simmons, 1998). Through this essential education not only will performance indicators improve but more importantly we will teach our students to be aware of the forces that shape the way we process data and knowledge and understanding to make sound, informed and intelligent decisions at a wide variety of levels.

Funding

Our nation spent in excess of \$500 billion on our children's elementary and secondary education in 2004-05 fiscal year (U.S. Department of Education, 2006). While billions are spent in our nation's schools, our children continue to be outpaced in science and mathematical achievements in the world arena. This is reflected by science performance of students, the 2006 National Center for Educational Statistics reports that only 29% of 4th and 8th graders and 18% of 12th graders were at or above the level of proficient (solid academic achievement) in science performance (U.S. Department of Education, National Center for Educational Statistics, 2006). Figures 1 and 2 illustrate the challenge facing our country, even with increased funding going towards k-12 education; student competency in science remains stagnant showing no to little gains in proficiency in content areas.

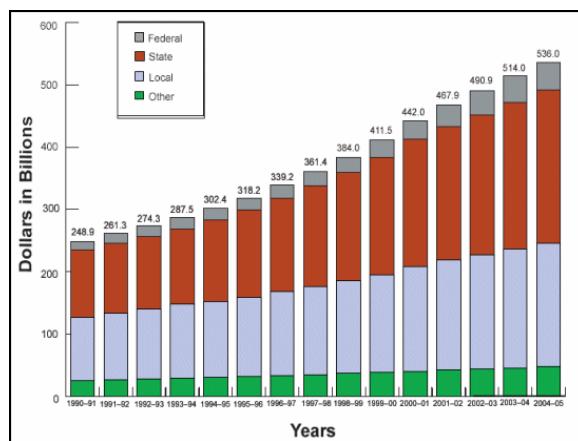


Figure 1: Total U.S. Expenditures for Elementary and Secondary Education

Source: U.S. Department of Education (2006)

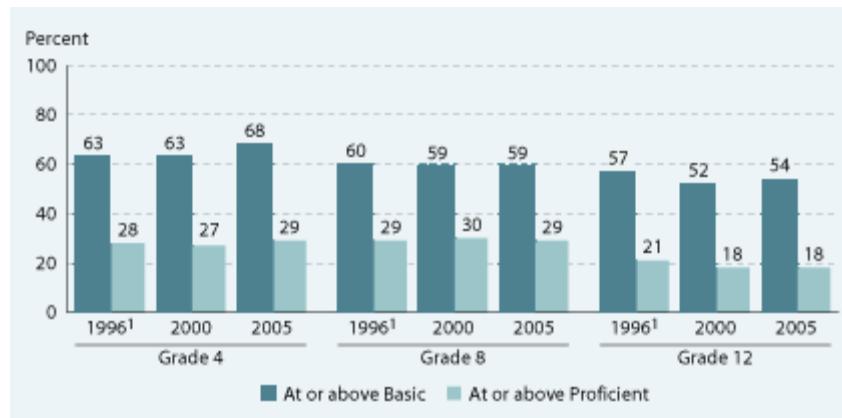


Figure 2: Science Performance of Students at or above Basic and at or above Proficient in Science in 1996, 2000, and 2005

Source U.S. Department of Education, National Center for Educational Statistics, 2006

The National Environmental Educational Act is one of the largest federal sources of funding for environmental education. Since 1990 Congress has appropriated \$80 million for the implementation of the act, of that \$14 million is authorized for funding for the Office of Environmental Education. Unfortunately, the largest amount that has ever been appropriated is 7.8 million. The Office of Environmental Education is responsible for implementing educational programs and provide funding for grants, activities, educator training and supports the National Environmental Education and Training Foundation, National Environmental Education Advisory Council, and the Council of Environmental Quality (NEEA, 2005).

Funding at the national, regional, state and local level is a real concern for those seeking to implement educational reform. The lack of available resources from public and private sources has a direct impact on the research and innovation development in science education. Active promotion of the need for educational reform and the concerted effort from science educators at all levels is critical to motivate and solicit funding opportunities. This proposed research will be a visible and tangible presentation of reform; focused at a local resource area, with potential gains across the educational spectrum.

CHAPTER 3

METHODS

Introduction

The research objectives of this project included the development, implementation and assessment of an environmental education community outreach initiative. Each phase of this research has required a thorough understanding of the issues facing the target community, understanding the challenges of presenting relevant educational material to a diverse population and the ability to assess the effectiveness of the outreach campaign. The methods employed to accomplish this task have encompassed the fundamental assertions of environmental education promoted by a variety of programs and researchers (Anderson et al., 2004; Bennett & Bennett, 2004; Coyle, 2005; Disinger, 2001; EPA, 2006a; EPA, 2006b; Hodson, 1999; Hungerford & Volk, 1990; Meredith et al., 2000; NEEAC, 2005; NEETF, 2000; Roth, 2004; UNESCO, 1975). The assessment of the effectiveness of the outreach effort has utilized sound survey design methods and assessment tools (Cochran, 1977; Cohen, 1988; Dillman, 2000; Foreman, 1991).

Components of the Educational Outreach Effort

The objectives of the outreach effort development and delivery mechanism was designed to inform residents on the lake restoration efforts, provide information on environmental issues of concern for the community and provide best management practice techniques to aid in the overall improvement of surface water quality for the community lakes. A multi-component outreach effort was designed, implemented and then fine-tuned throughout the project duration. This effort informed, provided educational material and allowed for community input on the environmental issues of concern. The variety of outreach approaches was designed to maximize the number of individuals that were reached, thus improving the chances to inform and provide knowledge for the community.

The components of the educational outreach effort include;

- Internet educational web site;
- Bimonthly community newsletters;

- Delivering Site Specific Information to Water Front Property Owners;
- Educational booth at appropriate residential events;
- Initiatives to convey knowledge and include community schools in the Clean Lakes Project.

All of these educational outreach components were coordinated with State and local agencies. This enabled the project to maximize the distribution of educational material and insure that a united and supportive message of the importance of best management practices to be incorporated by individuals which is the critical link to the health and wellbeing of the water bodies and the environment within the targeted neighborhood.

Internet Educational Site

The goal of the Internet site was to provide a variety of information and educational material to the affected community. The site's objectives were to: inform residents on the scope and scheduling of the project objectives and progress of the lake restoration efforts and provide educational information on best management practices for residents. The overall goal of the project was for residents to incorporate actions in their day-to-day activities that can improve the water quality and reduce the volume of storm water that leaves their property. Homeowner property concerns related to landscaping, lawn care, gardening, stormwater and erosion control and septic tank issues were all addressed through the web site. The web site was designed to be informative, well planned and updated to include the community as an integral part of their web site. This inclusiveness was designed to create a virtual community where residents could learn about their community efforts, share best management practices and learn how to improve their homes to the benefit of the environment. Figure 3 provides an outline of the web site features and the framework the site was structured around. The web site served as a project explanation and updating source, resource center, education portal, community events resource, and informational tool that targeted residents. In addition, being on the Internet, the information presented is available to a wide variety of communities across the nation to assist in best management practices as it pertains to stormwater control and management in comparable communities.

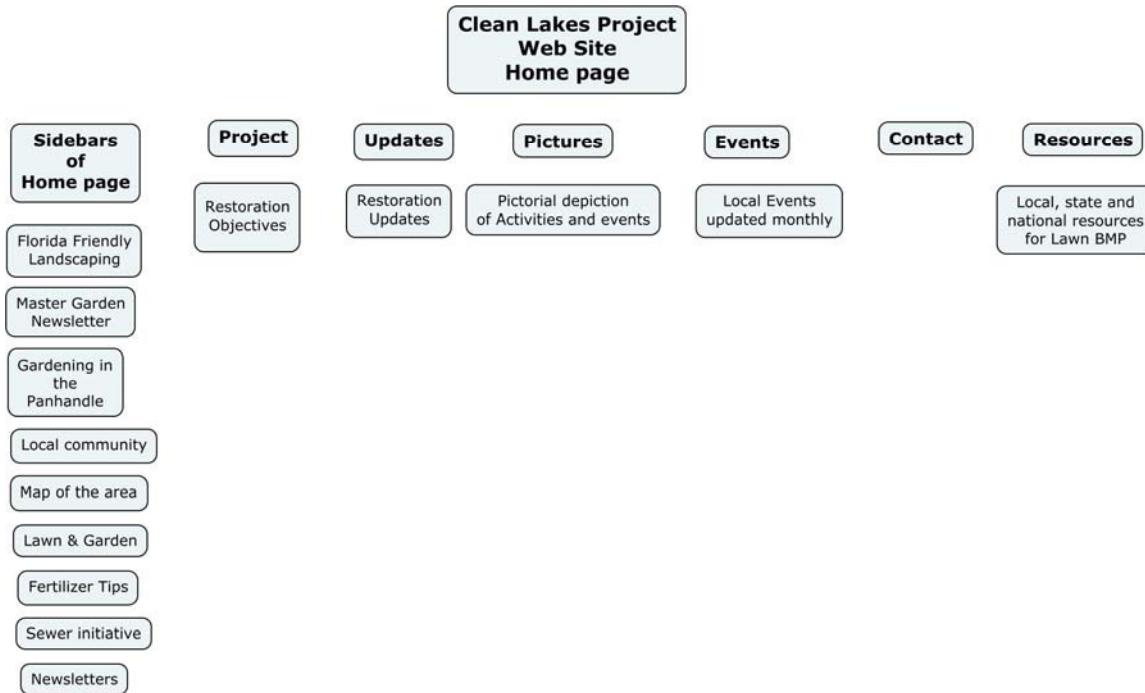


Figure 3 Conceptual Design Clean Lakes Project Web Site

The Project page was designed to serve as a tool to inform residents of the Clean Lakes grant and grant expectations and applications. It was critical that the residents of Killearn Lakes understood the scope, purpose and timeframe of the Clean Lakes Grant. This understanding of the project's scope, purpose and timeframe allowed for homeowners to feel ownership and part of the process. This restoration effort took place within their neighborhood, to their lake and for the improvement of their environment. By informing the residents of the critical elements of the project, they would feel as if they were directly linked to the project. This ownership assisted in developing that critical link of relevance for the homeowner and in turn improved their desire to understand ways they can improve the surface water quality in day-to-day activities on their properties. The Project page included a description of the grant and the various components within the grant activities.

The Updates page was specifically designed to provide relevant and current updates of specific grant goals and tasks. This page focused on moving beyond the intent of the grant by providing precise information on restoration efforts, submittal deadlines to

local agencies, community participation in grant funded projects and other related material. This page was updated as needed to stay current with ongoing activities and events.

The Pictures and Events pages were designed to build a sense of community in the virtual world. The Pictures page included current photographs of the restoration effort, examples of community members involved in best management practices and the Clean Lakes Project working with community members on grant initiatives. The Events page continues to be a service to community members, informing them of local events that may be of interest. Events are selected based on the relevance to lawn best management practice, outdoors oriented, educational and family oriented. Dates, time, location, cost and contact information are provided.

The educational component of the web site comprises of a variety of constituents. The site includes a Resource page that allows a visitor to the site to explore external educational links. The links were arranged by subject category type with a brief description of what the site has to offer. These resource links allow residents to explore external links that provide information ranging from lawn and garden care, local resources, environmental educational publication, and sites that address lake quality, nonpoint source pollution concerns addressed by local, state and nonprofit agencies.

The website also contains educational resource pages that address lawn and garden maintenance matters. Issues of how to maintain a lawn that minimizes the risk of off site migration of fertilizers, pesticides and other household chemicals are addressed. The web site visitors are encouraged to explore the local site and visit external sites that provide useful material to assist in the environmentally responsible manner of home and lawn maintenance.

In addition to the informative and educational nature of the website, there is a component of a “home town” feel to the site. This was done to let visitors to the site know that the concepts and components of the web site not only resided in the virtual world but also was part of the community in which they lived. This was accomplished through a variety of techniques. First, a page was provided to promote neighbors and local businesses that endorse and practice environmentally responsible behavior. As mentioned, a picture page is presented to show restoration efforts and local events. The

site also provides sidebar links to the monthly Master Gardener Newsletter, Gardening in the Panhandle and the Leon County link to the Killearn Lakes sanitary sewer website. A web counter was included to monitor the number of visits to the site. Visitors to the site have been encouraged to contact the Clean Lakes Project to provide comments, suggestions and pictures for the web site.

The site provides an update on a bi-weekly basis through the duration of the project. These updates included pictures of the lake restoration project to assist residents in recognizing the efforts being made on the lake and to demonstrate the scope of work that text descriptions cannot completely convey.

Newsletters

An outreach method of direct mailing was utilized to provide education material for the residents in the affected area. A bimonthly newsletter for the residents of Killearn Lakes was developed. This newsletter was sent to the 4,600 homeowners in the neighborhood approximately four times during the work phase of the project. Distribution was accomplished through the homeowners association's *Lakeview* newsletter. The newsletter was titled the *Clean Lakes Project* and consisted of one page, front and back. The purpose of the newsletter was to inform the residents of the restoration project and address directly the issues facing the neighborhood as it relates to the surface water quality of the lakes in their community. The newsletter provided information in a concise and clear manner specifically on why the surface water had deteriorated and what measures are needed to accomplish lasting improvement on the surface water quality of the lakes. For the project, it was estimated that there would be four newsletters sent to the residents. Additional newsletters have been requested to be continued.

Topics explored included:

- Introductory discussion of the Clean Lakes Project;
- Florida Friendly Yard concepts
- Fertilizer Tips;
- Stormwater management techniques;
- Sanitary Sewer installation update;

- Science behind best management practice of rain gardens;
- Backyard wildlife habitat enhancement;
- Lake front best management practices.

Presence at Residential Social Events

The project arranged for a physical presence of informed environmental professionals at local social events where residents can obtain educational literature, discuss issues of concern and exchange ideas on methods to improve the overall lake quality within their community. This direct access and availability was accomplished by arranging for manned booths with educational literature from Local, State, Federal and University entities that address the issues as it relates to environmental concerns and methods to improve overall land and water quality. Individuals familiar with the grant's objectives and the current status were available to residents to discuss issues of concern. In addition, efforts were made to provide educational material that served to enhance lawn best management techniques.

The project worked in cooperation and coordination with a variety of agencies to obtain educational material pertinent to the Clean Lakes Project. Organizations such as Florida Department of Environmental Protection, Northwest Florida Water Management District, City of Tallahassee, Leon County, and University of Florida Institute of Food and Agricultural Sciences Leon County Extension all contributed and were available to be contacted and all asked to participate in the educational outreach effort at some level of involvement.

School Outreach Effort

Within the Killearn Lakes community there is an elementary, middle and secondary school. These schools two elementary schools, one middle school and one high school were contacted to educate and inform the schools of the grant's efforts and accomplishments. Teachers in the forth and fifth grade classes of the two elementary schools were directly contacted to solicit their support to include discussion about the project utilizing the actual restoration site and the web site in their classroom. The elementary schools were asked to participate in the development of stormwater drainage

placards that were placed throughout the community to inform/remind the residents that the local water bodies receive their stormwater. This stormwater placard initiative informed and created a sense of ownership within the participating students that they took home to their residence and to their direct neighborhood community.

The secondary school was solicited for student volunteers to distribute educational literature to the surrounding property owners around the Killearn chain of lakes and were asked to assist with the installation of storm water placards in the community. The use of secondary students for educational literature served to further involve the homeowners while including the students in a community project providing that necessary link to relevancy. This relevancy provided the critical link necessary for participating students to learn about the Clean Lakes Project efforts and specific ways that they can improve the surface water quality of their community lakes. The schools within the neighborhood were also approached about incorporating best management practices on the school grounds. These best management practices were also included as educational components in key subject areas within the curriculum.

Assessing Educational Outreach

This component of the project research addresses several components of the educational outreach effort. In this aspect of the study, assessment of the overall success of the educational outreach effort was accomplished through the administering of a survey. This survey was used to assess the level of awareness of residents of the Clean Lakes Project; assess the willingness of residents to modify their practices at home that impact the quality of their community lakes; and inquire about barriers that exist for homeowners to modify potentially environmentally destructive behaviors.

Through the survey, the research questions addressed included:

- What educational outreach approaches are most effective in reaching a large suburban community?
- Do residents within the affected area recognize the issues of concern that the educational outreach initiative addressed?
- Do residents within the affected area consider their homes a potential point source of the pollution within their community lakes?

- Has the education outreach effort promoted any change in home/lawn practices?

Survey Design

The survey consisted of a questionnaire that was constructed to elicit information from the residents of the community. This questionnaire was organized in such a manner to present a logical flow of the questions. The questions were developed to present a theme or story as the survey is taken (Cohen, 1988). The theme approach to the questionnaire was designed to assist the respondents' ability to recall their past behaviors and attitudes accurately (Cohen, 1988). This approach also assisted the respondents to feel that their input was important and that a sense of trust and understanding between the surveyor and respondents was developed (Dillman, 2000).

The survey questions were arranged to take the respondents through a situation step by step. The questions were classified and sequenced as:

- **Demographic questions** - Facts, such as age, sex, proximity to the lakes, length of time in neighborhood;
- **Past and current behavior questions** - Actions (past and present) that respondents perform that potentially affect lake water quality both positively and negatively;
- **Awareness and level of knowledge questions** - Here information was requested about the level of awareness residents have concerning the Clean Lake Project. In addition, the level of knowledge concerning the environmental condition of the community lakes and practices that can improve the health of the lakes were addressed;
- **Attitudes, opinion and motivation questions** - Quantifying these feelings is often difficult; it was critical to compile questions that elicited and drew out respondents' attitudes and opinions as they relate to the Clean Lakes Project and environmental stewardship in their neighborhood. In addition to understanding the attitudes and opinions, questions were compiled that extract residents motivations as it relates to changing practices at home that impact environmental health of the residential lakes;

- **Future intentions and behavior questions** - These questions elicited responses from respondents of hypothetical situation of future intentions from the educational outreach efforts of the Clean Lakes Project (Cohen, 1988).

The design and presentation of the survey held important consideration when developing the questionnaire. The importance of this design was two-fold. First, respondent-friendly designs improve response rates (Dillman, 2000). Next the respondent-friendly design improved response from people least likely to respond to the survey, this reduced the non-response error (Dillman, 2000). It was important to collect as many reliable responses from the survey as possible. This included respondents whose response rate may be low, but whose opinions and perceptions are valuable to the study.

In the design and construction of the questionnaire, the question wording and structure utilized Dillman's (2000) recommendations in tailored designed methods. This design included choosing simple over specialized words. The purpose of this design was to select wording that was well understood by the most number of people. Tailored design methods such as avoiding vague quantifiers and the use of complete sentences were incorporated to decrease sample response errors. The questionnaire answers used equal numbers of positive and negative categories for scalar questions. In addition, response categories that were mutually exclusive from one another were developed. The questions were technically accurate. Questions that elicited objections, to reduce the non-response rate of these questions, were constructed in such a manner as to seem less objectionable to respondents. Well-designed questions and layout utilizing these techniques were employed to reduce the non-response and measurement errors (Dillman, 2000).

The questions consisted of closed-ended and open-ended structure. The closed-ended questions consisted of dichotomous and multichotomous questions. The open-ended questions provided respondents a chance to express in their own words and thoughts on the project and the educational outreach effort and attitudes towards environmental stewardship within their community.

Survey Validation

The objectives of the validation process were designed to insure that the final survey met the objectives of the researcher and was presented in such a manner that respondents understood the questions and were willing to complete and return the survey. To this end, a testing and re-evaluation of all components of the survey was conducted for this research prior to final survey distribution to the selected sample population.

The major professor and survey content expert approved survey development, design and questionnaire selection. These individuals provided critical review and recommendation to the survey. After completion of this internal evaluation process the survey was distributed to a select group of independent respondents to provide comment on survey design and question wording, clarity and understanding. These comments were used to refine the survey and additional rounds of internal evaluations were conducted prior to finalization of the survey. The University Human Subject Committee review and approval was required prior to the final distribution of the survey.

Sample Selection

The Killearn Lakes community consists of 4,600 residential lots. The neighborhood has three public schools and one private school. The neighborhood mainly consists of single-family residential structures that vary from large suburban lots to zero lot line developments and a gated community. The objective of the environmental educational outreach effort was to inform and empower the Killearn Lakes residents to understand how individuals make a difference in the water quality of their lakes. This outreach effort was not limited to lake front homeowners or a certain social or economic class. The age, race and religious beliefs are not a factor as it relates to the outreach effort. The purpose of the educational component of this project was to try to reach as many individuals as possible in order to promote awareness and environmental stewardship.

As a result of this challenge, a sampling strategy was utilized to capture a representative population from the community. This study had funding limitations so it was critical to utilize a sampling approach to discern the effectiveness of the environmental education outreach effort. For these objectives, a specific target

population from the Killearn Lakes community was utilized. This sample population was considered the cluster population for the community (Cohen, 1988; Foreman, 1991).

The discrete location utilized for the sampling event was a community social event held at a community park. The social event was open to all residents of the neighborhood and was free. It was a day-long event and consisted of a carnival atmosphere with free entertainment and food. This event allowed for a diverse group of residents to be available to participate in the survey and allowed for a unique opportunity to capture the diverse range of residents living within the Killearn Lakes subdivision in a cost effect manner. This sample location allowed for the survey to capture a cross section of residential lots. Within the neighborhood there are residential lots located adjacent or near community lakes, lots that were in the earlier development phase of the community and those residential lots that were built in the later phases of the subdivision. The significance of this diverse residential development expansion is that it illustrates the variety of residential lot construction techniques capturing examples of individual septic systems, community sanitary sewer systems, infrastructure control of stormwater to no stormwater control allowing for sheet flow of water to the local surface water bodies. By conducting the survey at a community social event it was possible to sample the assortment of residents with homes in locations within the different construction phases of this development.

Survey Distribution

Given the large residential population of this community the use of a cluster of the total population was utilized. This cluster consisted of selected residents attending a free community social event open to all residents of the neighborhood and held at a community park.

The questionnaire was a voluntary participation survey. Distribution was accomplished by requesting participation by residents attending the community social event. Surveys were on clipboards and residents who agree to fill out the survey were asked to return them to the Clean Lakes Project both. There was no prompting or active participation by the researcher when handing out the survey. If residents had questions

about the Clean Lakes Project, they were requested to complete the survey to the best of their abilities and all questions were addressed at the end of the survey.

Sample Size

The ideal cluster population sample size was determined through the use of Cochran's (1977) sample size formula for continuous data. For this study the level of acceptable risk of error, the alpha level is 0.05, which is acceptable value for educational research studies (Bartlett, Kotrlik & Higgins, 2001). The acceptable margin of error was initially set at 3%; this is considered acceptable for educational research studies (Bartlett et al., 2001).

Below is Cochran's (1977) sample size formula for continuous data that will be used to determine the appropriate sample size for this study (Bartlett et al., 2001).

$$n_0 = \frac{(t)^2}{(d)^2} \frac{(s)^2}{(s)^2}$$

Where t = value for selected alpha level of .050 in each tail = 1.65

(the alpha level of .10 indicates the level of risk the researcher is willing to take that true margin of error may exceed the acceptable margin of error.)

Where s = estimate of standard deviation in the population = 1.167.

Where d = acceptable margin of error for mean being estimated = .21.

The target sample size for this research was calculated to be 84. Upon administration of the survey 65 completed responses were received. Based on the calculation for response rate:

Response rate = (number of completed surveys/number of expected survey)100

The response rate for this survey was 77%.

The strengths and limitations to this survey design and sampling strategy are discussed below.

Strengths and Limitations

Surveys by design have certain strengths and limitations associated with them. It is critical to be aware of these issues in the design, implementation and analysis of surveys and the results that come out from survey data. Surveys are effective tools when

assessing attitudes and opinions along with behaviors that are difficult to observe (Burchinal, 2005; Dillman, 2000; Hill, 1998). The survey administered for this research project objective was to assess respondents' attitudes and opinions related to the Clean Lakes Project and the associated educational components. In addition, this survey assessed the home and lawn practices that respondents practice and determined if the educational outreach effort had brought any effective change to those practices.

The greatest challenge in developing and assessing surveys is the self-reporting nature of the data collected (Burchinal, 2005; Cochran, 1977; Dillman, 2000). Self-reporting data responses pose many challenges for researchers. Respondents often interpret survey questions differently than the designer intended. Since surveys only provide a written description of what respondents say, they often cannot convey a true representation of how respondents feel about a particular subject. Responses to surveys cannot always be taken as accurate representations of how respondents behave. This is particularly true with behavior that may not be socially acceptable (Dillman, 2000). Respondents may not be truthful when taking a survey for a variety of reasons. Since the data is self-reporting there is no mechanism to confirm the respondents' answers to the survey and such limitations must be considered when analyzing the data generated from the survey.

The cluster sampling technique has limitations that need to be addressed. By the nature of the cluster, it is possible that the entire neighborhood population was not represented within the cluster. Since the cluster is limited to attendees of a community fall festival, then individuals that would not attend such events are not captured by the cluster. In addition, competing seasonal events such as football games, soccer games and other Saturday events may have prevented a select number of residents from attending this community event, as such they are not represented by the cluster. A final issue associated with the cluster sample is the population of potential respondents that attended the day long event; this population was predisposed to wanting to enjoy a festival atmosphere on a beautiful fall Saturday. The researcher recognized these challenges and accepted these minimal limitations understanding that this population may not represent fully the views of the entire neighborhood.

There are limitations also associated with the sample size. This sample size is a target size for the survey. The actual sample response rate was limited to the number of respondents willing and available to participate in the survey on the day of the community event. For this survey a response rate of 77 percent was achieved, although not an ideal return, the response rate for this survey falls within acceptable statistical parameters (Burchinal, 2005). The researcher is aware of the challenges such as funding, time expenditure and ability to solicit willing participants are part of the challenge of implementing a survey and understands that the ideal sample population is a baseline from which to work (Alreck & Settle, 1985; Hill, 1998).

Data Analysis

The SPSS v 15 statistics software was used to collate, organize, summarize and describe the collected survey data. Summary measurements such as mean, frequencies, standard deviations and correlations were processed. Inferential statistics were employed to determine the degree of confidence in the results. This method was used to determine how much confidence to place on the sample estimates.

Open-ended responses in the survey were coded and evaluated to add richness of the data analysis. In addition to the survey results, a web counter was placed on the educational web site to monitor visitors to the site and a unique Clean Lakes Project email for visitors to send inquiries was set up. The number of web site visits and email inquiries were recorded once a week for the duration of the study. The combination of quantitative close-ended survey questions, qualitative open-ended survey questions and the monitoring of the web site served to provide a data set that effectively assesses the educational initiative and address the research objectives. Completion of the fieldwork for this project was October of 2007. Data analysis and report of findings was completed in mid December 2007.

CHAPTER 4

IMPLEMENTATION OF THE

Environmental Educational Outreach Effort

The Initial Planning Process

The Clean Lakes Project was initially proposed to the Northwest Florida Water Management District (NFWFMD) as a cost sharing Florida Forever project by the homeowners association. Funding would be shared between Leon County and the NFWFMD to assist the Killearn Lakes Homeowner's Association to improve the water quality of the lakes within their neighborhood. Proposed activities included infrastructure repairs to the Lakes, reinstating of buffer zones, establishing stormwater controls such as berms, swales and implementing rain gardens in strategic locations in the neighborhood. In addition to the physical and structural work suggested, there was a public educational initiative built into the project. This public education initiative was initially proposed to extend for two years and to have included:

- Town meetings and workshops – Public workshops were proposed to be held to educate the residents of the watershed about personal Best Management Practices (BMPS) for pollution reduction and habitat improvement, as well as techniques and technical assistance for development and maintenance of personal shoreline buffer zones and rain gardens. The Leon County Extension Service and the City of Tallahassee's Think About Personal Pollution (tappwater.org) had indicated that they would assist in facilitating the public outreach workshops.
- Evaluation of the potential for improvement of community access to information of the project. The potential for improved public access to information was hoped to serve as a means of enhancing a community sense of shared ownership and stewardship.
- Educational materials including brochures, newsletters and CDs, neighborhood postings, communication on radio and television were to be disseminated to educate the residents of the watershed on BMPs for residential communities. The KHOA volunteers were to be responsible for the newsletter and brochures and the

volunteer recruitment effort for the shoreline buffer zone program. (Harrington, 2004)

The Killearn Lakes Homeowners association was awarded the Florida Forever Grant; infrastructure work was initiated however the proposed educational outreach effort was not implemented due to numerous bureaucratic hurdles at local (city and county) and state levels. The parties that agreed to perform the associated work failed to follow through on their agreements leaving the Killearn Homeowners Association being responsible for this component of the grant without a coordinating mechanism in which to execute any public educational outreach.

Designing and Implementing a Successful Initiative

In March 2007, the Killearn Lakes Homeowner's Association and McGlynn Labs requested assistance in developing a public education and community outreach effort. Numerous conceptual plans were proposed and formulated. The intricacies of this project not only necessitated passively informing the homeowners of the methodologies to be employed in addressing the pond restoration project but also a much more complicated, integrated and integral approach for the overall success of this project was required to be presented. A management team consisting of a homeowner' representative, the project manager and an environmental consultant, all involved recognized that the success of the educational effort would be the key component in successfully addressing the grant commitment which would ultimately determine the long-term success of this project. Most notably, the recognition by individual homeowners that they hold some responsibility for the welfare of their lakes and providing these residents knowledge, resources and skills to improve the quality of their lakes by controlling stormwater and individual pollution sources on their own property. Community involvement through individual homeowners was required to increase their environmental awareness and most importantly, the taking of proactive steps to decrease their contribution to impacting their local environment.

This discussion with the management team of this project involved concepts of environmental teaching and learning relevancy techniques that would be used in a cost effective manner to reach the owners of the 4,600 residential lots. These techniques

would need to be incorporated into this project at various key points throughout the project implementation. These required points were to:

- Inform the residents of the work being performed;
- Supply the residents with access to information on environmental stewardship relevant to their individual homes and this project;
- Present a foundation for supplying additional relevant environmental information at a wide variety of level to base future independent sound environmental decisions within the residents;
- Offer every available opportunity for access to information in order to decrease individual resident's contribution to stormwater run-off which could effect the local lakes and overall environmental quality.

The management team endorsed the presented model and requested a refinement of the project management scope, level of effort and sequential and concurrent course of events to address the project requirements. Upon refining the goals and defining the duration of the project, the following community outreach and educational initiative was presented and accepted:

- A bimonthly newsletters to all 4,600 residents would be distributed for 4 cycles;
- A website would be initiate and kept current with community information presented through the duration of the project;
- Community involvement via the Environmental Education Initiative at homeowner events would actively be present, have pertinent information and contribute as requested;
- Employment of the use of the media would be utilized when deemed useful;
- Environmental packets would individually be delivered to waterfront property owners;
- Involvement of the local schools with a stormwater drain marker project would be considered to be initiated.

The management team of this project accepted and endorsed this presented model approach and all involved voiced a wide level of support. Team buy-in at all levels during the foundation of this effort was critical. The initial levels of the Community Outreach and Environmental Initiative level were then fully organized and preparations

were initiated for this planned approach. Figure 4 provides an outline of the concepts that were presented as the initiatives to be implemented as components of this educational effort.

It is critical to point out at the beginning phases of the outreach effort the participants all came to the negotiation and exploratory table with a common goal to: improving the overall environmental quality of the neighborhood. This allowed for the group to focus on a single resource/situation and outcome. Competing interest and internal organizational strife did not become barriers to success. The group realized that education, which in fact was all environmentally based education, must reach all that are affected. The health of the local community surface water quality became a common objective for all involved in the process. This belief within the management team, which is also held and promoted by many national organizations, was put into action with the Environmental Educational Outreach initiative for this Killearn Lakes Restoration Project (Coyle, 2005; Duschl et al., 2007; EPA, 2006a; Rutherford & Ahlgren, 1990).

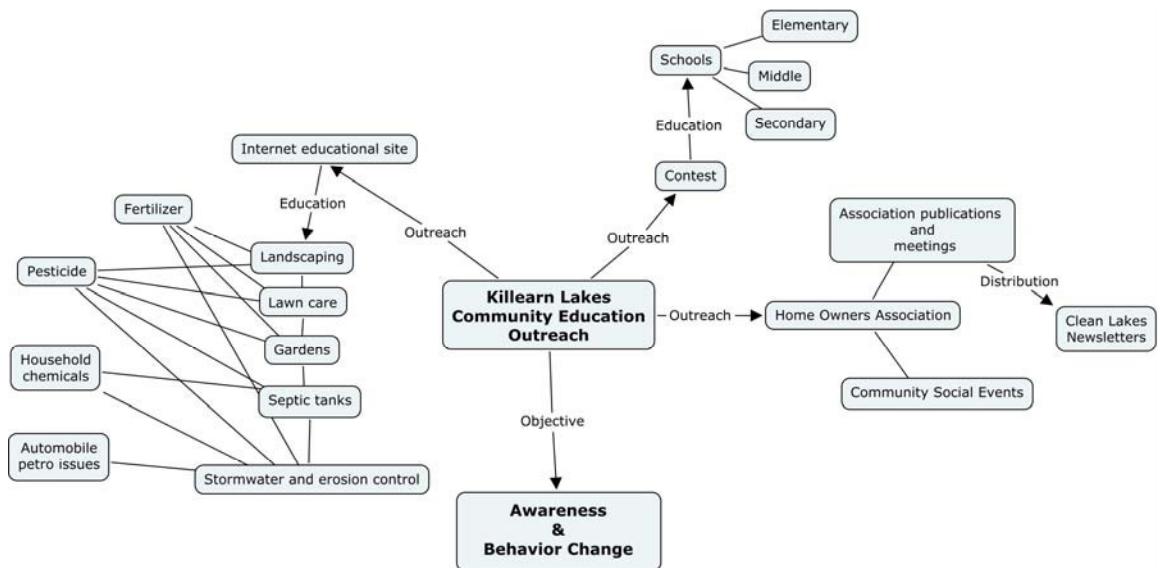


Figure 4 Educational Initiative Conceptual Plan

Review of Efficacy and Navigating Barriers to Success

The logistical and organizational efforts with the project management team were performed through email and discussed via telephone calls. The initial plan, with the multifaceted approach that I presented to the management team was adopted for the project. As the educational coordinator, the design and implementation became my full responsibility; the project manager was kept apprised of developments and implementation as the process moved forward.

In working with project manager, and the homeowners association on the initial design, challenges and expectations during the organizational meeting there was a free and often diverse exchange of opinions. Within this core group of the management team, their level and breadth of knowledge facilitated the open exchange of ideas. As both an active member of this process and researcher reviewing the process, the level of efficacy of the core organizational group was professional, competent and as such operated at a high degree of targeted efficiency.

Barriers to the organizational success included working through the wide variety of involved groups in this project. Issues between the homeowner's association and project manager developed because of the documentation requirements of the County. This caused for barriers on many fronts as the project moved from organizational to implementation. The 'owners' of the project were the Killearn Lakes Homeowner's Association that was run by a governing board and this group represented 4,600 residential homes; McGlynn Labs was the project manager for the work performed. The intricacies of the interactions between this highly varied team were challenging and at times a barrier to smooth operational issues.

Building of a Web Site

Once the management team all agreed on the proposed plan for the environmental educational initiative, my work began in earnest. The initial step was the designing of the web site. The initial conceptual idea, to development of content and development of the web site look and feel to the final product requires numerous integral steps. The first step was to identify a competent web designer. The project secured the services of Five22.com Web Site design and a locally owned company. Upon meeting and

discussing the conceptual design, the initial concepts, graphical options, web site objectives and design criteria were explored. Five22.com was extremely cooperative and professional and in fact a wonderful teacher of web site designs; explaining what a web site can and cannot accomplish and the challenges of initial setup and implementation.

The initial site design was agreed upon after the review of six design mock-ups for the overall look of the site were presented. These mock-ups were variations on a theme. In the end, given the goals and objectives of the target audience a chosen layout offered a soft earth tones color scheme and allowed for the use of left and right side bar schemes that would carry thematically throughout the entire site. The layout allowed for the use of the middle of the screen to provide relevant information to visitors. It was agreed that we would use a minimum of clip art.

The agreement between Five22.com and myself was required for them to provide the web presence and secure hosting and domain name (KillearnLakes.org). My duties required that I provide the material content of the site as the content expert and I held the responsibility of providing relevant, accurate and timely information. In essence, Five22.com provided the canvas and I was to provide the theme, feel and color for the work.

Developing Content

The web site's objectives were to inform residents on the scope, scheduling, project objectives and progress of the lake restoration efforts and provide educational information on Best Management Practices (BMPs) for residents. With the overall goal of the web site identified, each section began to take direction and shape. Material for content was developed, refined and then sent to Five22.com for incorporation into the separate and various web pages of the site.

Front Page

The objective of the front page of the site is to welcome visitors to the site and with a glance being able to discern the intent of the web site. With that concept in mind, the title was developed explicitly stating the purpose of the site and placed on the header of the page. At that point, the Killearn Lakes Plantation Restoration Clean Lakes Project web site logo was designed created by me. The backdrop of the logo design is that of

Lake Blue Heron, the targeted water body of the restoration effort. The front page of the site also needed to provide a brief description of the objectives allowing the visitor to explore to depth with a click of a button.

Below the header are buttons that lead to further page options available for the visitor to explore. Sidebars are utilized to allow for external links on Best Management Practices (BMPs) for lawn and gardens, regional newsletters, sanitary sewer initiative and internal topographic maps, Clean Lake newsletter and lawn and garden tips to reduce stormwater migration off residential sites. Figure 5 illustrates the Front Page look and the layout design for the site.

The screenshot shows the homepage of the Killearn Lakes Plantation Restoration Clean Lakes Project. At the top is a banner featuring a photograph of a lake surrounded by houses and trees. Below the banner, the title "KILLEARN LAKES PLANTATION RESTORATION" is displayed in large, bold, yellow letters, with "Clean Lakes Project" in smaller green letters underneath. A navigation menu at the top includes buttons for HOME, PROJECT, UPDATES, PICTURES, EVENTS, CONTACT, and RESOURCES. To the left, a sidebar displays several news items with small thumbnail images and titles: "Florida-Friendly Landscapes: The Smart Way To Grow", "Master Garden Newsletter Nov / Dec 2007 Edition", "Gardening In the Panhandle Free Download", and "Your Local Community - Supporting the Clean Lakes Concept". The main content area features a section titled "The Killearn Lakes Plantation Restoration: Clean Lakes Project" with a detailed description of the project's goals and activities. To the right, there are links to "Download Our Newsletters in PDF format", "View The Student Drawing Contest", "View Maps of Where Your Water Flows Google GIS", "Lawn & Garden Tips", "Fertilizer Tips", and "Killearn Lakes Plantation Sanitary Sewer website". A circular graphic on the right side says "NO DUMPING IN LAKES WATER DRAINS INTO LAKES". At the bottom, a footer note states: "Funding for this restoration project made possible by Leon County with partial funding provided through a Florida Forever Grant from the Northwest Florida Water Management District".

Figure 5 Front Page of Killearn Lakes Plantation Restoration Clean Lakes Project

Project Page

The Project page's purpose is to provide the scope and intent of the restoration work in a clear and concise manner for visitors to the site. Objectives such as sediment removal, establishment of vegetative buffer zones, establishment of berms, swales and rain gardens are presented. Maps of the lake area provides a graphic depiction of the restoration area, figure 6 provides the content of the Project page a visitor would find if visiting the site.

The screenshot shows the homepage of the Killearn Lakes Plantation Clean Lakes Project. At the top, there is a banner with a photo of a lake and the text "KILLEARN LAKES PLANTATION RESTORATION" and "Clean Lakes Project". Below the banner is a navigation menu with links: HOME, PROJECT (highlighted), UPDATES, PICTURES, EVENTS, CONTACT, and RESOURCES. To the left, there are several sidebar boxes: "Florida-Friendly Landscapes", "Master Garden Newsletter", "Now / Dec 2007 Edition" (with a thumbnail of a newsletter), and "Your Local Community - Supporting the Clean Lakes Concept". The main content area includes a section titled "The Killearn Lakes Plantation Restoration: Clean Lakes Project" which discusses the grant from the Northwest Florida Water Management District and outlines project objectives. It also features a photo of a lake and a list of objectives. Another section, "Clean Lakes Project Objectives:", lists four goals for improving stormwater treatment, assessing results, determining feasibility, and preparing documentation. A "Major Components of Project:" section describes a "Control Structure Retrofit" where control structures between lakes will be upgraded for sediment and nutrient removal. A "Sediment Removal" section explains that sediments will be removed from Lake Blue Heron to create an island wildlife sanctuary and for berm construction. A map of the lake area is shown with a "Click For Large Image" link. To the right, there are additional sidebar boxes: "View Maps of Where Your Water Flows" (with a Google GIS logo), "Lawn & Garden Tips", "Fertilizer Tips", and "Killearn Lakes Plantation Sanitary Sewer website".

Figure 6 The Killearn Lakes Plantation Clean Lakes Project Page

Artificial Marsh and Buffer Zones

Artificial Marshes will be constructed to remove nutrients and sediment as the water flows from lake to lake to Lake Iamonia. Shoreline buffers will be planted around Lake Blue Heron. The first phase of aquatic plantings will focus on continuous blooming emergent aquatic plants as a means of easing homeowner acceptability of aquatic plants around and in their lake



[Click For Large Image](#)

Berm and Swale Construction

Sediments removed from Lake Blue Heron will be used to construct berms parallel to the direction of stormwater flow will be placed in the grassy swales draining sheet flow into the Killearn Lakes Plantation Lakes. The exact locations of berms will be determined, and will involve a combination of private property and KLHOA "greenways" areas. Berms will be gently sloping grassy areas to slow stormwater and capture sediment prior to entering the lake.

Establishing Grassy Pathways to Lakes

Many roads and pathways leading to our lakes do not have adequate grassy vegetation to filter stormwater heading into the lakes. These pathways need sod to slow the stormwater and help filter the larger sized particulate materials before they enter the Killearn Lakes Plantation lakes.

Rain Gardens

Areas immediately upstream from the berms and along lakefront residential properties will potentially be planted with vegetation that can help filter the stormwater. These will be incorporated and managed as part of the shoreline buffer zone system.

Monitoring

Over the one-year period, monitoring will be performed to monitor the effectiveness of nonpoint source pollution reduction.

Your Yard: Make it a Florida Friendly Yard!

Our yards and neighborhoods are channels to our waterways and aquifers. Your yard is the first line of defense for preserving Florida's fragile environment. The health of Florida's estuaries, rivers, lakes, springs and aquifers depends partly on how you landscape, fertilize and maintain your yard. You don't even have to live on the water to make a big difference. Rain that falls on yards, roads and parking lots wash into waterways or leach into ground water, carrying pollutants -- including fertilizers, pesticides, animal waste, and petroleum products. Improperly applied fertilizers and pesticides from residential areas pose a serious threat to the health of Florida's waters.

Follow an integrated approach to landscaping and make your yard a Florida Friendly Yard!

1. Right plant, right place
2. Water efficiently
3. Fertilize appropriately
4. Mulch
5. Attract wildlife
6. Manage yard pest responsibly
7. Recycle yard waste
8. Reduce stormwater runoff
9. Protect the waterfront



From Florida Yards & Neighborhoods University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS), 2006 @
<http://hort.ifas.ufl.edu/fyn/handbook.pdf>

Funding for this restoration project made possible by Leon County with partial funding provided through a Florida Forever Grant from the Northwest Florida Water Management District

Web Design By www.Five22.com

Figure 6 continued The Killearn Lakes Plantation Clean Lakes Project Page

Updates Page

The Updates pages purpose is to provide visitors to the site current information on the Clean Lakes initiatives and objectives through the course of the restoration effort and

was updated as needed through the course of the project. With this page, specific restoration work was featured offering visitors the insight of best management lake practices and allowing further in-depth understanding of the restoration process. In addition to the lake specific restoration work, this page featured student volunteers working with grant funded activities and the popular stormwater drain marker outreach effort. Figure 7 provides the content a visitor to the site would find.

KILLEARN LAKES PLANTATION RESTORATION
Clean Lakes Project

[HOME](#) [PROJECT](#) [UPDATES](#) [PICTURES](#) [EVENTS](#) [CONTACT](#) [RESOURCES](#)

Project Update:
March 19 2008

The second round of storm drain marker installations was successfully completed Saturday, March 8th. Once again, with the wonderful assistance of the Chiles Marine Biology Club the message of best management as it applies to stormwater is being delivered to our neighborhood. Please, if you have a chance to thank these wonderful young people, do take the time to do so, they have donated their time to assist the Clean Lakes Project and our neighborhood should acknowledge these young adults efforts!

The aquatic vegetation planting around Lake Blue Heron is scheduled for the last weekend in March. Take a moment to walk down to the lake and enjoy the fruits of this restoration effort.

One final note is that with the return of the rains, there has been an increase of yard debris, trash and other non-point source pollution sources being swept to our neighborhood lakes. It is critical that each of us takes the responsibility to implement best management practices for our lawns and gardens for the health of our lakes. Take the effort to be environmental stewards for the good of the entire community.

March 2008

The planned winter planting for Lake Blue Heron have been a resounding success. The establishment of vegetative buffers has begun with the planting of several species of trees around the lake area. These trees represent native wetland species that will serve to reestablish a natural wetland ecosystem. 150 Bald Cypress, 50 Water Tupelo, 30 Chestnut Oaks, 50 Eastern Red Cedar, 45 flowering Dog Wood and 45 Eastern Red Bud Trees have been planted in and around the lake area. All these trees

View Maps of Where Your Water Flows
Google Map GIS

Lawn & Garden Tips

Fertilizer Tips

Killearn Lakes Plantation Sanitary Sewer website

Figure 7 Killearn Lakes Plantation Restoration Clean Lakes Project Updates Page

associated beavers. These guards allow for the establishment of these wetland trees without harming the beavers and the wetland ecosystem. Spring will bring in the planned planting of the aquatic vegetation.



Fish stocking will also commence in the spring. Even with the extended drought conditions and the lake draw down for restoration work, many fish fry survived and have reemerged. This is apparent when one strolls down to the lake and observes all the shoreline actives. The migratory water fowl have also been enjoying the life returning to the lake.



Additional work will be completed upland and downstream of Lake Blue Heron for stormwater management. However, it should be noted that at this point in the project, Lake Blue Heron can now be considered a successful model of sustainability for an urban lake for the foreseeable future.



On a final note, the rain events that the area has received during the past few weeks have replenished the Killearn Lakes chain. Lake Blue Heron is now full. In addition the Ochlockonee River has crested and the flood waters are replenishing the long dry Lake Iamona.

Stormwater Drain Markers Hit the Street!

Upon a review of over 300 art entries from the children; 6 were ultimately chosen to be manufactured into a plasticated and UV stabilized 4" marker with the children's design on them. The requested message to communicate via these markers was to make sure only rainwater will enter these drains to protect our water resources. Of course, the varied and wild interpretations of the children's art form spanned the horizons from entertaining to thoughtful to ridiculous to hilarious and each one was unique and thoughtful. Because of the production process, a minimum of 50 of each design was required to initiate manufacturing. With 300 markers slated for production, this allowed for only 6 students to be chosen for this project, however as the educational coordinator for the project, I wish I could put one marker from every child on our City and County's stormwater drains.



These colorful stormwater drain markers are advertised to last over 30 years. That means these children could be walking by these markers with their children in upcoming years. The installation of these markers is with a rock hard adhesive. The Clean Lakes Project is fortunate to have had a wonderful partner for this effort; the Chiles High School Marine Biology Club volunteered to assist with the installation of



these markers in the neighborhood. Through the generous support of these students the installation of the markers has been completed through a large portion of the neighborhood. As you walk, bike or drive through the Killearn Lakes community take notice of the stormwater drain systems, you just might see one of the markers designed by our children and installed through the efforts of our young adults, all members of our community doing their part to bring environmental stewardship to our neighborhood.



Figure 7 continued Killearn Lakes Plantation Restoration Clean Lakes Project Updates Page

Stormwater Drain Markers: Made By
OUR Children For OUR Neighborhood!

The Clean Lakes Team wants to thank the students of Killearn Lakes Elementary School, Hawks Rise Elementary School and Chiles High School for their contributions in designing and installing **Stormwater Drain Markers** within your neighborhood.

This forthcoming initiative will effectively place - 300 **Stormwater Drain Markers** throughout the Killearn Lakes subdivision. These markers were designed by children from the elementary schools and installed by the volunteer efforts of the High school students. What a fun and enjoyable project this has been. We have had over 300 art submissions for this project; our only regret is that we can choose only 6 separate art submission to have manufactured. The success of this project is directly related to the efforts of our community's students and the Leon County Schools who have taken the time and initiative to be part of this effort. It could be your child's art design that will serve to reminding us of where your stormwater drains. We want to thank everyone for their enthusiastic contributions and support of this project.

The **Stormwater Drain Markers** are intended to remind all of us to help protect our lakes from nonpoint source pollution. Remember, rainwater picks up trash, yard waste, petroleum waste, and many other harmful substances that flow through our storms drain and into our lakes causing our waters to become polluted.

Enjoy these designs, thank our students and do your part in keeping only rainwater going down our stormwater drains! The health of our lakes are reflected in this commitment.

[Click Here to See All of the Drawings](#)



September 10, 2007

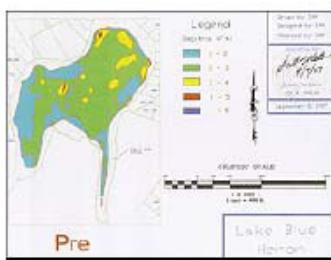
Below are the bathymetric survey results of Lake Blue Herons pre and post sediment removal conditions. From the survey it was found that over 50,000 cubic yards of material were removed from Lake Blue Heron.



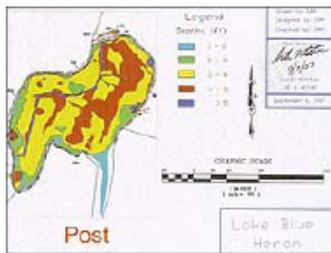
Engineering Survey Comparison - [Click to view PDF](#)

Lake Blue Heron Pre-dredge Bathymetry
(LBH Pre Dredge) [Click to Enlarge](#)

Figure 7 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Updates Page



Lake Blue Heron Post Dredge Bathymetry
(LBH Pst Dredge) [Click to Enlarge](#)



August 27, 2007

Work steadily continues on Lake Blue Heron. The sediment that was removed from the lake bottom was relocated at the spoil pile. The spoil pile is being hauled away and is steadily decreasing.

The refilling of the lake is directly linked to our rainfall. According to the National Weather Service, since January Tallahassee is 35% below normal rainfall. Although some parts of Leon County have been seeing the return of summer rainfall patterns, other parts of the county remain very dry. Everyone involved in this project are concerned about the lack of rainfall as we are anticipating the return of our normal weather patterns.

Leon County has approved the tree removal permit. As a result the removal of trees along the lake has been progressing. The tree removal portion of the restoration effort is in an effort to restore appropriate plants around the lake. This process first requires the removal of dead, diseased and inappropriate species of trees from the area. This removal process will be followed by the replacement and planting of tree species that are appropriate for locations around the lake.

July 12, 2007

The major sediment removal and lake sculpturing work for Lake Blue Heron has been completed. Significant rainfall to speed the refilling of the lake will complete this effort. Weeds within the lake have not yet become an issue. The alligator weeds (the tall weeds that took over the lake last summer) have not yet come back but are

Figure 7 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Updates Page

being monitored. As long as the lake refills adequately, the alligator weed should not come back to pose any significant problem, the situation is being monitored and will be addressed accordingly.

The planting phase of the restoration effort involving the native aquatic plants that will be placed strategically in the lake will begin once the water in the lake reaches satisfactory levels. This task is anticipated to take place in the Fall.

Although the major construction work for the lake is completed, you should expect to see activity around the lake. For instance, the inflow areas that lead to the sump holes still needs to be cleaned and lime rocks placed within these areas. In addition to these, other best management practices such as construction of berms, swales and marshes will begin. All of this work will be performed on the easements or upland areas from the lake. None of this work will take place on private property with the exception of where the golf course has agreed to cooperatively accommodate this restoration effort. This work is not time critical, so it will be accomplished over the next few months and anticipated to be completed by October.

Finally, the Leon County Growth Management Office has signed off on the projects tree removal plan and issued the associated permit. Once the identified trees are removed, due to their poor health or inappropriate location (upland trees in wetland locations) then replanting of suitable trees will occur.

June 6, 2007

Lake Blue Heron is ready for refilling. The contractor performing the lake bed work has done a wonderful job. During sediment removal and lake bed restoration a large amount of sediment was able to be removed from the center areas of the lake and the planned catch basins were able to be expanded. The edges have been contoured and sloped along with the weeds being plowed over and through. There will still be additional tree removal and road work leading to the lake, however at this point Lake Blue Heron is ready to be refilled.

If you have been by the restoration site you might have noticed some brush piles in the lake bed. These piles are being placed in the lake to provide habitat and cover for the fish population. These brush piles provide structure and cover around which fish orient themselves. These fish attractors concentrate fish by providing cover, structure, spawning habitat and serve as attachment surfaces for many organisms that fish feed on.

At this point, our lake is ready for the long awaited rainy season to begin.

**Figure 7 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Updates Page**

May 22, 2007

First we at the Clean Lakes Project want to congratulate those luck homeowners that won raffle prizes that were drawn at the Quarterly Homeowners open meeting held on May 8. Our Grand Prize winner was the Pursell Family! Congratulations.

The lake sediment removal continues. The contractor moving the soil anticipates that digging of the lake bottoms should be completed by the end of May. Following this will be detail work around the lake edge and removal of trees. It is anticipated that lake vegetative planting will follow.

May 5, 2007

Sediment and soil removal has begun at Lake Blue Heron. The Project manager anticipates it will take between 2 to 3 weeks of heavy equipment work on the lake for this to occur.

May 2007

Administrative issues of concern: The Killearn Lakes Home Owners Association (KLHOA), Leon County, Northwest Florida Water Management District (NFWFMD) and Department of Environmental Protection (DEP) are all committed to the success of the Clean Lakes Project. Logistical issues related to lake restoration have been successfully negotiated with all interested parties.

Issues related to the lake drawdown have been addressed by the Project Manager working in conjunction with KLHOA and DEP officials. Concerns related to sediment removal and disposal from the dredging project were raised by a lake resident. These issues have been resolved.

Lake Blue Heron drawdown began March 13th, when completed dredging of the lake will begin.

The Project Manager is working on identifying areas around Lake Blue Heron where plant remediation can occur. It is critical to identify areas where upland, wetland and aquatic plants can be placed to improve water quality entering and retained in the lake. Homeowners around the lake are encouraged to participate in the vegetative restoration portion of the grant.

A preconstruction meeting at the job site is being held the first week in May. County, Project and KLHOA representative will be present. Work at Lake Blue Heron is to commence immediately following the meeting!

Please remember: For all in the *Killearn Lakes Community*, it is critical to take responsibility of past, present and future water quality of our neighborhood.

Environmental Stewardship is for ALL in our Community

Figure 7 continued Killearn Lakes Plantation Restoration Clean Lakes Project Updates Page

Web Site Educational Components

A major component of the web site was to provide educational material for visitors. This element of the web site provided an asynchronous environment where visitors could explore a variety of resources based on their individual needs. The e-learning environment that was developed employed both external site and internal resources.

During the selection phase of this project for the external links, specific criteria were utilized to determine the value to the intent of the project and relevancy to homeowners and their site specific needs. Criteria that were utilized included:

- Web site content, this included accuracy of presented information;
- Web site availability, this included issues of ease of site navigation and content straightforward design layout, speed of download and;
- Relevance to homeowners, here it was important to determine if the information presented was applicable to our specific geographic and planting region.

During the selection of external links, it was critical to consider how and why a homeowner would want to visit the site and how it could improve best management practices for their property. In addition, if a visitor wanted resources to explore in greater depth the issues of stormwater management or sewer versus septic tank management of their waste, resources needed to be made readily available. For each external link that was selected, a synopsis of the site was provided along with a direct hot link. Figure 8 illustrates the external links; this page was called the Resources page and was organized based on subject and regional relevancy to the project.

KILLEARN LAKES PLANTATION RESTORATION

Clean Lakes Project

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For Further Information for your Lawn & Garden Needs:

Florida-Friendly Landscapes
The Smart Way To Grow

Master Garden Newsletter
Nov / Dec 2007 Edition

Gardening in the Panhandle
Free Download

Your Local Community - Supporting the Clean Lakes Concept

Rain Gardens; Gardening with Water Quality in Mind, this site provides a nice overview of rain garden with wonderful external links to resources available from the Internet <http://www.infinitivity.com/~stack/rain/>

Rain Gardens Design for Home Owners this booklet provides a basic how to guide for rain garden installation for home owners, a wonderful resource when designing and caring for your rain garden http://www.aces.edu/waterquality/nemo/Fact%20Sheets/rain20garden_20mg_20final.pdf

TAPP think about Personnel Pollution educates individuals on ways that small personal changes in home and yard practice can help keep local lakes, sinks and streams cleaner. <http://www.tappwater.org>

The Florida Yard & Neighborhoods Program main site provides special educational and outreach activities directed to communities to help residents reduce pollution and enhance their environment by improving home and landscape management. <http://hort.ifas.ufl.edu/fyn/>

Florida-Friendly Landscaping web site proved great information to create your Florida-Friendly yard. All it takes is a willingness to learn and a desire to build a yard that is both beautiful and protects our precious Florida environment. <http://www.floridayards.org/index.php>

IFAS, A Guide to Environmentally Friendly Landscaping, A guide for Florida homeowners who seek to redefine the image of home and landscape. The idea is to cooperate with local, natural conditions, rather than to battle the elements. http://edis.ifas.ufl.edu/BODY_EP079

A Guide to Florida-Friendly Landscaping Florida Yard & Neighborhoods Handbook
This FYN handbook provides helpful concepts, tools and techniques for creating your own Florida Friendly Yard. A yard that is beautiful and environmentally friendly! <http://hort.ifas.ufl.edu/fyn/handbook.pdf>

Central Florida Yard & Neighborhood web site is full of useful links and tips to maintaining your Florida-Friendly Yard. <http://cfyn.ifas.ufl.edu/>

Leon County's IFAS Extension Resources:

Leon County Extension Office Solutions for your Life
http://leon.ifas.ufl.edu/lawn_and_garden/MG/GardeningInThePanhandle/index.shtml

UF/IFAS Leon County Extension is part of a statewide network of extension facilities.
The Leon County extension is here to service the needs of our community. <http://leon.ifas.ufl.edu/>

Leon County Extensions Timely gardening articles can be found at
http://leon.ifas.ufl.edu/News_Columns/index.shtml

Leon County Master Gardener's newsletters
http://leon.ifas.ufl.edu/lawn_and_garden/MG/newsletters/index.shtml

Local Links:

Killearn Lakes Homeowner's Association helps to keep residents of the Killearn Lakes Plantation connected. <http://www.killearnlakeshoa.org/>

Killearn Lakes Plantation Sanitary Sewer System provides residents of Units I and II with affordable solutions and timely information for connecting to the neighborhood's low-pressure sanitary sewer system. <http://www.klpssewer.com/>

Killearn Lakes water quality from McGlynn Laboratories
<http://www.mcglynnlabs.com/KillearnLakesProjectPage.html>

The City of Tallahassee's Go Green Tallahassee
Initiative to promote and encourage environmental responsibility in our community
<http://talgov.com:80/communications/green.cfm>

Tallahassee Public Works is responsible for traffic control, road maintenance, drainage, and stormwater management for the city. <http://www.talgov.com/pubworks/index.cfm>

Figure 8 Killearn Lakes Plantation Restoration Clean Lakes Project Resources Page

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GREEN MINDER, before you print - THINK

Florida's Department of Environmental Protection Nonpoint Sources Pollution:

Nonpoint Source Management Program's goal is to minimize nonpoint sources pollution (Pointless Personal Pollution) from new and end existing land use activities.
<http://www.dep.state.fl.us/water/nonpoint/>

Nonpoint sources management best management practices, public information and educational resources.
<http://www.dep.state.fl.us/water/nonpoint/pubs.htm>

Waterfront Property Owner's Guide, A guide directed towards waterfront property owners to broaden the awareness on the cause, effects and prevention of water pollution.
<http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/wpog.pdf>

Florida Green Industries Best Management Practices for Protection of Water Resources in Florida, A manual that provides information and guidance on turfgrass and landscape management practices to conserve and protect Florida's water resources. This manual serves as an educational guide for professional service providers and other interested parties.
http://www.dep.state.fl.us/central/Home/MeetingsTraining/FLGreen/BMP_Book_final.pdf

Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses, A manual on best management practices covering many of the aspects of operating a golf course in environmentally sound manner written in conjunction with FDEP, Florida golf Course Superintendents Association, Audubon International and the University of Florida.
<http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/glfbmp07.pdf>

Additional Sources of Information:

University of Florida's IFAS main site
The University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) is a federal-state-county partnership dedicated to developing knowledge in agriculture, human and natural resources, and the life sciences, and enhancing and sustaining the quality of human life by making that information accessible.
<http://www.ifas.ufl.edu/index.html>

The Center for Aquatic and Invasive Plants has information on the ecological problems associated with exotic and introduced plant species in Florida. The site also identifies ways that you can help combat these invaders.
<http://plants.ifas.ufl.edu/guide/invplant.html>

Florida Lakewatch is a volunteer citizen monitoring the quality of water resources throughout the state.
<http://lakewatch.ifas.ufl.edu/>

Florida Forever Program Originally called Preservation 2000, this recently transformed program has been responsible for the acquisition and restoration of over 1.5 million acres of land in our state. Florida Forever also provided the grant for the Killearn Lakes Restoration Project.
<http://www.dep.state.fl.us/lands/acquisition/p2000/>

Florida Lake Management Society provides information for preserving and enhancing water resources, as well as the Love Your lake Program, which provides funding for lakefront improvement projects. <http://www.flms.net/>

Florida Native Plant Society is dedicated to promoting the benefits of native plants in the wild and in our yards. This site has resources for landscaping, policy, and links to identification resources. <http://www.fnps.org/>

National Academies' Water Information Center provides scientific resources for the many challenges of maintaining and improving water resources nationwide. <http://water.nationalacademies.org/>

Northwest Florida Water Management District is responsible for protecting and managing the water resources in our 16-county region. <http://www.nwfwm.state.fl.us/>

University of Wisconsin Lakes Program has a large selection of information on the impact of human activities on our lakes. <http://www.uwsp.edu/cnr/uwxlakes/humanimpact/>

University of Wisconsin's Cooperative Extensions web site on Water Resources Education
<http://clean-water.uwex.edu/index.html>

Figure 8 continued Killearn Lakes Plantation Restoration Clean Lakes Project Resources Page

The internally developed educational components of the site were designed to provide greater insight and resources for visitors to develop best management techniques specific for their lawn and garden needs. A page was built to present to visitors the principles of prudent lawn management such that a minimal to negligent effects on the

surrounding environment would occur. Concepts such as efficient use of water and smart planting schemes, minimization of fertilizer and pesticide usage, lawn refuge recycling and considerations for lake front properties were presented to aid visitors to develop environmentally responsible property management. Figure 9 presents the internal lawn and garden page.

KILLEARN LAKES PLANTATION RESTORATION
Clean Lakes Project

HOME **PROJECT** **UPDATES** **PICTURES** **EVENTS** **CONTACT** **RESOURCES**

Lawn & Garden Tips using the Principles of Florida-friendly Landscaping

Right Plant, Right Place
Almost any plant will survive in your landscape if you plant it in the right place. You can drastically reduce the need for water, fertilizer, pesticides and pruning if you follow these tips:

1. Make a note of the type of soil, sunlight exposure and water conditions of the planting site before you shop. Choose plants that thrive under the conditions you noted.
2. Limit the number of plants that need a lot of water or care.
3. Keep only as much grass as you directly use for recreation and other purposes. Plant beds and mulched areas use less water than grass.
4. Remove invasive exotic plants so they don't steal water and nutrition from Florida-friendly plants.

Native Nurseries
The Store for Nature Lovers

Water Efficiently
Typically, at least 50% of water used by households is used outdoors. Efficient watering will not only help you save money and conserve water, but can also create a healthier landscape. Follow these tips to save water and money:

1. Water your lawn and plants only when you know they need it or show signs of stress.
2. Use a rain gauge or moisture sensor so you will know if rainfall has done the job.
3. Install a drip or micro-spray system in your plant beds. They use water more efficiently than traditional spray heads.
4. Install an automatic rain shutoff device to avoid watering when it's raining.
5. Stop overwatering! Overwatered grass has short roots that make it harder to survive pest attacks, disease and drought.
6. Collect water in a rain barrel to use to water your plants.

Fertilize Appropriately
When too much fertilizer is applied to landscapes, it seeps past the root zone of the grass, plants or trees and into the aquifer or runs off into water bodies. Plants, animals and people depend on clean water for survival. Follow these tips to help prevent water pollution:

1. Fertilize lawns, trees and plants only to maintain health. Don't exceed recommended amounts. Fertilizer will not help poor growth caused by too much shade, disease or pests.
2. Use slow-release fertilizers that make nutrients available to plants for a longer time.
3. They are kinder to the environment and are usually more cost-effective.
4. Use iron instead of nitrogen if you want to "green-up" your lawn.
5. Hold off on fertilizing if a heavy rain is expected, and don't overirrigate after applying.
6. Follow the directions on the fertilizer package and use a drop spreader instead of a rotary spreader to apply it.
7. Avoid weed and seed products.

View Maps of Where Your Water Flows
Google GIS

Lawn & Garden Tips

Fertilizer Tips

Killearn Lakes Plantation Sanitary Sewer website

Figure 9 Killearn Lakes Plantation Restoration Clean Lakes Project Lawn & Garden Page

Mulch

Who likes to weed? Keeping mulch on your plant beds helps control weeds, retain soil moisture and reduce erosion and stormwater runoff. Follow these tips when mulching:

1. Cut down on mowing by replacing grass with mulch in areas that are shaded or difficult to mow.
2. Keep the level of mulch up to 2-3 inches by applying it once or twice a year.
3. Keep mulch 2 inches from the base of plants to avoid disease.
4. Let fallen tree leaves stay under a tree to create self-mulching areas.
5. Look for cypress mulch that is not harvested from Florida's wetlands.
6. Choose recycled mulch or alternatives like elaeuca, leaves, pine needles or bark.

Attract Wildlife

Friendly visitors, like butterflies and beneficial insects, will enjoy your landscape if you provide food, water and cover. Attract wildlife by following these tips:

1. Plant vines, shrubs and trees to create cover, nesting areas and food.
2. Provide a water source such as a birdbath or a small pond.
3. Provide wildlife shelters such as a bat house, birdhouse or brush pile.
4. Protect the health of wildlife visitors. Limit pesticide use by spot-treating only the areas that need attention.



Manage Yard Pests Responsibly

When it comes to pest management, nature takes care of itself! Misused pesticides in your yard can run off into waterways and harm beneficial insects. Follow these tips when managing yard pests:

1. Learn to identify beneficial insects and let them do the work for you.
2. Be tolerant! Low levels of pests will do minimal damage.
3. Check plants regularly and prune off a plant's infected areas or pick off insects when possible.
4. Use pesticides only to spot-treat affected plants and lawn areas. Avoid blanket applications.
5. Choose the least-toxic pesticides such as horticultural oils, insecticidal soaps and *Bacillus thuringiensis* (BT).
6. Read and follow pesticide labels carefully for safe use and disposal.



Recycle

Recycling your yard waste back onto your lawn and landscape can improve the fertility and water-holding ability of the soil and help aerate soil that has become compacted.

1. There's no need to bag or rake lawn clippings. Leave grass clippings on the lawn to recycle nitrogen.
2. Use fallen leaves and pine needles as mulch under trees and shrubs.
3. Create and maintain a compost pile with yard waste and kitchen scraps (no animal products). Compost is a great natural fertilizer and mulch.



Reduce Stormwater Runoff

Stormwater runoff can carry pollutants, pesticides and excess fertilizers into bays, rivers and lakes. Remember that what goes in your storm drain can find its way into our water sources. Follow these tips to help reduce stormwater runoff from your yard:

1. Direct downspouts and gutters into your lawn, plant beds, rain barrels, cisterns or containment areas.
2. Use mulch, bricks, gravel or other porous surfaces for walkways, patios and driveways.
3. Sweep grass clippings, fertilizer and soil onto the lawn so they don't get washed into storm drains.
4. Clean up oil spills and leaks on the driveway. Use cat litter to absorb oil.
5. Pick up pet waste to help reduce bacterial and nutrient pollution.
6. Remove trash from street gutters before it gets washed into storm drains.
7. Use swales (low areas) to hold and filter water.



Protect the Waterfront

Bays and waterways contribute to the quality of life in Florida. Waterfront owners can help protect these fragile natural treasures by following these tips:

1. Never prune mangroves or remove any vegetation without first seeking proper permits and guidelines.
2. Establish a 10-30 foot "no fertilizer, no pesticide" zone along your shoreline.
3. Remove invasive exotic aquatic plants by cutting, pulling or raking. Plant a buffer zone of low-maintenance plants between your lawn and shoreline to absorb nutrients and to provide wildlife habitat.

The University of Florida established these nine Florida-friendly landscaping principles to guide Florida Yards & Neighborhoods programs offered through county Extension Service offices. For additional information visit <http://www.floridayards.org/index.php>.

Funding for this restoration project made possible by Leon County with partial funding provided through a Florida Forever Grant from the Northwest Florida Water Management District

Figure 9 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Lawn & Garden Page

In addition to the lawn and garden internal educational page, a page was developed to assist visitors by providing a visual aid in understanding the significance of topography in surfacial water flow patterns. In this neighborhood, the predominate receiving water body is Lake Iamonia. Prior to water entering this major lake, there are a series of lakes that receive the stormwater from throughout the neighborhood. The topographic maps provided on this page are to a fine enough resolution that individual property owners can make informed decisions on where to install control measures to mitigate the off site migration of stormwater from their own property. These maps provide a useful tool in understanding the significance of topography from an individual property to an entire neighborhood level. Figure 10 illustrates the Where Your Water flows maps page.

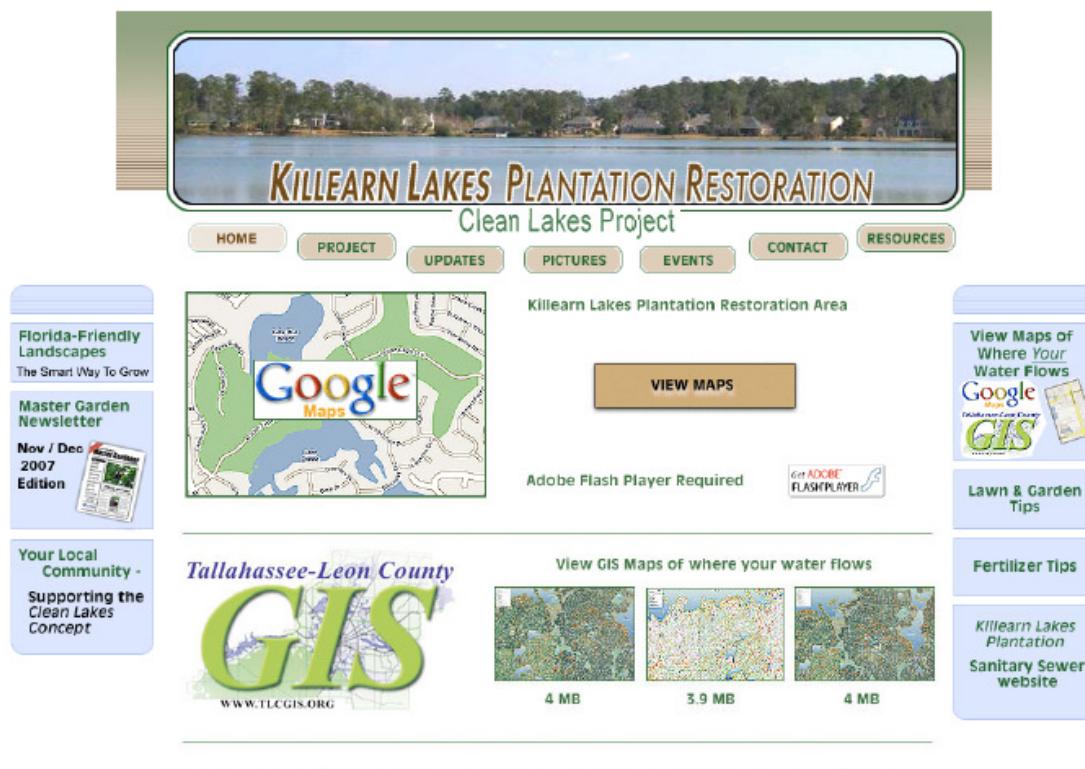


Figure 10 Killearn Lakes Plantation Restoration Clean Lakes Project
Where Your Water Flows Map Page

Contour lines explained:

When you look at the map you will see a series of contour lines. Contour lines are used to determine elevations and are lines on a map that are produced from connecting points of equal elevation (elevation refers to height in feet, or meters, above sea level). Just remember these points when studying the map of your area as it relates to contour lines:

- Every point on a contour line represents the exact same elevation.
- Contour lines can never cross one another; each line represents a separate elevation.
- Moving from one contour line to another always indicates a change in elevation. To determine if it is a positive (uphill) or negative (downhill) change you must look at the elevation on either side.
- The closer contour lines are to one another, the steeper the slope is in the real world. If the contour lines are evenly spaced it is a constant slope, if they are not evenly spaced the slope changes.
- A series of closed contours (the contours make a circle) represents a hill. If the closed contours are hachured it indicates a closed depression.
- Contour lines crossing a stream valley will form a "V" shape pointing in the uphill (and upstream) direction

Figure 10 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Where Your Water Flows Map Page

Development of a Web Site with that ‘Home Town Feel’

For the site to be considered part of the community, it was critical to bring elements of the community into the web site. Local ownership of the site was developed with both the context and content. The site incorporated a Pictures page; this page was utilized to both provide visual aids to visitors on the restoration effort and also to demonstrate the involvement of community members in these grant sponsored activities. These pictures were updated as new and relevant material was made available. In addition to the Pictures page an Events page was developed that was updated on a monthly basis. This page proved information to visitors about local events. I went to a variety of resources to identify local events that were both educational, outdoor oriented and promoted ideas associated with the grant’s objectives. Special effort was made to select non-profit or public service sponsored events. The site also provided a page that highlighted local businesses and individuals that supported and practiced best management practices for lawn and garden maintenance. The objective with this page was to demonstrate to visitors that there were individuals within their community putting into practice and supporting many of the best management concepts emphasized throughout the web site. Figures 11, 12 and 13 provide illustrations of the community inclusion into the web site.



Figure 11 Killearn Lakes Plantation Restoration Clean Lakes Project Pictures Page



Restoration of Lake Blue Heron September 23, 2007th
Click Images for larger versions



Restoration of Lake Blue Heron August 27, 2007th
Click Images for larger versions



Restoration of Lake Blue Heron August 18, 2007th
Click Images for larger versions



Restoration of Lake Blue Heron August 6, 2007th
Click Images for larger versions



Restoration of Lake Blue Heron July 12th
Click Images for larger versions



Lake Petty Gulf July 2007
Click Images for larger versions

Figure 11 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Pictures Page



Restoration of Lake Blue Heron June 2nd
Click Images for larger versions



Restoration of Lake Blue Heron May 19th
Click Images for larger versions



Restoration of Lake Blue Heron May 12th
Click Images for larger versions



Restoration of Lake Blue Heron
Click Images for larger versions



Your Clean Lakes Project at the Killearn Lakes Kids Fishing Contest 2007
Click Images for larger versions



Figure 11 continued Killearn Lakes Plantation Restoration Clean Lakes Project Pictures Page



Lake Blue Heron Past
Click Images for larger versions

Wildlife of our Lakes
Click Images for larger versions



2006 Killearn Lakes Plantation Lake Cleanup and Planting
Click Images for larger versions



Lake Drawdown and Fish Relocation
Click Images for larger versions



Figure 11 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Pictures Page

KILLEARN LAKES PLANTATION RESTORATION
Clean Lakes Project

HOME **PROJECT** **UPDATES** **PICTURES** **EVENTS** **CONTACT** **RESOURCES**

Events

Wednesday January 16, 2008

Forging the Future of Space Science - The Next 50 Years
Panel session featuring professors from FSU and FAMU, 2:30-5 p.m. in the Dome Theatre & Planetarium. Lecture by NASA Astronaut Carl Walz, "Leaving the Planet - Science and Technology Development Results on the International Space Station," 7 p.m. in the IMAX Theatre. Free. Registration requested. Details: 644-IMAX or [Click Here](#)

Challenger Learning Center IMAX
200 S. Duval St.
Tallahassee, FL 32301
Phone: (850) 644-IMAX

Thursday January 17, 2008

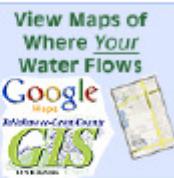
Herbert Stoddard Natural History Seminar - "The Search for the Ivory-billed Woodpecker in Northwest Florida"
Dr. Geoff Hill, professor of ornithology at Auburn University, presents some of the evidence for the Ivory-billed Woodpecker's existence in northwest Florida and discusses future prospects for conservation. 7:30-9 p.m. in E.V. Komarek Science Education Center. Free, RSVP requested.
Details: lisa@ttrs.org or 893-4153 ext. 241.

Tall Timbers Research Station and Land Conservancy
13093 Henry Beadel Drive
Tallahassee, FL 32312 Phone: (850) 893-4153

Saturday January 19, 2008

Birdseed Benefit for Tallahassee Museum and Wildlife Encounter
Sandy Beck will introduce you to live owls, hawks, a vulture and other wildlife. Children can also make pinecone/suet feeders. 10 a.m.-noon. 386-8882.

Native Nurseries
1661 Centerville Road
Tallahassee, FL 32308
Phone: (850) 386-8882



Lawn & Garden Tips

Fertilizer Tips

Killearn Lakes Plantation
Sanitary Sewer website

Figure 12 Killearn Lakes Plantation Restoration Clean Lakes Project Events Page

Jody Walthall will show slides and discuss how to attract more and varied birds, how to squirrel-proof your feeder and more.
10 a.m. Free. 386-8882.

Native Nurseries
1661 Centerville Road
Tallahassee, FL 32308
Phone: (850) 386-8882

Saturday January 19, 2008

Birding with Jim Cavanagh

Enjoy winter birding with volunteer Jim Cavanagh. Visit ponds and the lighthouse area, including the dike marsh, and expect to see shorebirds, ducks, sparrows and raptors. Walk an additional four miles around Stoney Bayou 2. Participants may depart the group at any point. Meet at Wachovia Bank on South Monroe Street at 7:30 a.m. to carpool or meet at 8 a.m. at St. Marks National Wildlife Refuge between Stoney Bayou 1 and East River Pool. Bring binoculars, field guide, insect repellent, water, comfortable walking shoes and light lunch if desired. Expect to be done by 11 a.m. or 1 p.m. for extended walk. \$5 per vehicle. No extra cost for passengers.

Details: Melissa Forehand, birdingtreetfrog@gmail.com about carpooling or Jim Cavanagh, jim.cavanagh@med.fsu.edu or (850) 562-1533.

St. Marks National Wildlife Refuge
1255 Lighthouse Road
St. Marks, FL 32355
Phone: (850) 925-6121

Wednesday January 23, 2008

Apalachee Audubon Society Program Meeting

Rob Heath will share information about Roseate Spoonbill behavior, biology and conservation. The purpose of Audubon's banding and resighting project is to explore the natural history of this species and compare breeding populations from Miami's Florida Bay and Tampa Bay. Rob will describe details of this project and outline some preliminary results. 7 p.m. social, 7:30 program.

United Church in Tallahassee
1834 Mahan Drive
Tallahassee, FL 32308
Phone: (850) 878-7385

Saturday January 26, 2008

Horticulture and Flower Show - District III

This is a sanctioned horticulture and flower show that will be hosted at four Tallahassee homes and at the Historic Bradfordville School House. Flower arrangement designs will be featured in home settings. Horticulture exhibits will be at the Historic Bradfordville School House.

Historic Bradfordville School House
3439 Bannerman Road
Tallahassee, FL
PRICE: Free at Historic Bradfordville School House. Admission to homes - \$15
PHONE: 850-422-7758

Saturday January 26, 2008

Figure 12 continued Killearn Lakes Plantation Restoration Clean Lakes Project Events Page

Animal Track Detectives

Learn where to look and how to observe animal signs and determine what animal left the clues. Talk about what animals might be in your yard, and learn how to identify animal tracks. Participants can make their own track notebook to take home and to use. 11 a.m.-1 p.m. \$4 for members, \$8 for nonmembers, children half price. Reservations required. Details: (229) 377-4408.

Birdsong Nature Center

2106 Meridian Road
Thomasville, Ga. 31792
Phone: (229) 377-4408

Saturday February 2, 2008**Wildlife Heritage and Outdoors Festival**

Exhibits and demonstrations to reconnect visitors to hiking, fishing, hunting, bird watching, canoeing, photography and more. Held at the Education Cabin and other locations in the St. Marks National Wildlife Refuge. Especially popular with families and children of all ages.
10:00 am to 3:00 pm

St. Marks National Wildlife Refuge

1255 Lighthouse Rd
St. Marks, FL 32355
Education and Visitor Center
Phone: 850-925-6121

Saturday February 2, 2008**Cavity Nesters: Bluebirds, Purple Martins and Woodpeckers**

Learn about the local cavity nesters. There will be a short presentation on their life histories and on ways to attract them. Afterward the presentation, take a short walk along part of Birdsong's Bluebird Trail and look for these birds. Those who wish can stay and make a bluebird house from a pre-cut kit. 1-3:30 p.m. \$4 for members, \$8 for nonmembers, children half price. \$12 for a bluebird house kit. Reservations required. Details: (229) 377-4408.

Birdsong Nature Center

2106 Meridian Road
Thomasville, Ga. 31792
Phone: (229) 377-4408

Thursday February 7, 2008**Butterfly Garden Work Days**

Create a garden. Bring gardening gloves, knee pads, picnic lunch and field guides. Details: (229) 377-4408.
If you are unable to attend a garden work day but would like to contribute to the garden in some way, consider bringing needed items such as bags of leaves for mulch, pine straw, gardening gloves and garden tools.
9:00 am to 12:00 pm

Birdsong Nature Center

2106 Meridian Road
Thomasville, Ga. 31792
Phone: (229) 377-4408

Friday February 8, 2008**Inaugural Stone Age and Primitive Art Festival**

See projectile point fashioning, also known as flint-knapping, bow and arrow

Figure 12 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Events Page

construction, basket weaving, early pottery methods and more. \$3 per carload of up to eight people, \$1 per pedestrian or bicyclist; admission fee includes access to all events. (850)962-2771 or www.floridastateparks.org

Friday February 8, 9:00 am to 5:00 pm
Saturday February 9, 9:00 am to 5:00 pm
Sunday February 10, 9:00 am to 5:00 pm

Ochlockonee River State Park
429 State Park Road
Sopchoppy, FL 32358

Saturday February 9, 2008

Owl Prowl

Take a walk with volunteer Christopher Borg of Tall Timbers Research Station to search for the owls of Birdsong. Chris will help identify various owl species by their unique vocalizations. Possible species include Barred, Great-horned and Eastern Screech Owls. Bring binoculars, field guide, water and appropriate clothing for the weather. \$4 for friends, \$8 for nonmembers, children half price. Reservations required. Details: (229) 377-4408 time 6:00 pm.

Birdsong Nature Center
2106 Meridian Road
Thomasville, Ga, 31792
Phone: (229) 377-4408

Saturday February 9, 2008

Darwin Day 2008

Free day of presentations for high school and college students and the public on Charles Darwin, his theory and its impact on science and culture. 644-1855. 9:00 am to 4:00 pm

FSU College of Medicine
1115 W. Call St.
Tallahassee, FL 32306
Phone: (850) 644-1855

Saturday February 16, 2008

Arbor Day Tree Art

Celebrate Georgia's Arbor Day. First learn about the characteristics of trees, how to determine the age of a tree and how to plant and care for a tree. Collect cones, nuts and leaves to create animals and other nature-related art and craft objects. A tree seedling from Birdsong will be provided to plant at home. 11 a.m.-1 p.m. \$4 for members, \$8 for nonmembers, children half price. Reservations required. Details: (229) 277-4408.

Birdsong Nature Center
2106 Meridian Road
Thomasville, Ga, 31792
Phone: (229) 377-4408

Saturday February 23, 2008

Ochlockonee River Kennel Club Dog Show

Conformation, agility, and obedience event.
Saturday February 23, 8:00 am-5:00 pm
Sunday February 24, 8:00 am-5:00 pm

North Florida Fairgrounds
441 Paul Russell Road

Figure 12 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Events Page

Tallahassee, FL 32301
Phone: (850) 878-3247

Saturday February 23, 2008

Mag Lab Open House

Hands-on demonstrations geared toward children of all ages, self-guided tours of the lab's 330,000-square-foot facility, games, giveaways and the chance to meet and chat with research scientists and other Mag Lab staff. Details: 644-0311.
10:00 am to 3:00 pm

National High Magnetic Field Laboratory Auditorium

1800 E. Paul Dirac Drive
Tallahassee, 32310
Phone: (850) 645-0034

Figure 12 continued Killearn Lakes Plantation Restoration Clean Lakes Project Events Page

The screenshot shows the website for the Killearn Lakes Plantation Restoration Clean Lakes Project. At the top, there is a large banner image of a lake with houses in the background. Below the banner, the title "KILLEARN LAKES PLANTATION RESTORATION" is displayed in large, bold letters, followed by "Clean Lakes Project". A navigation menu below the title includes links for HOME, PROJECT, UPDATES, PICTURES, EVENTS, CONTACT, and RESOURCES.

Your Local Community Supporting the Clean Lakes Concept

Student Volunteers Make Difference

Lake Blue Heron is waiting and hoping for the much needed and anticipated rain to come. As everyone waits for the lake to refill, the concern of weed growth has been an ongoing issue. Some hard working high school students have taken up the challenge to assist in the control of these invasive weeds. The Clean Lakes Project wants to take a moment and thank these students for their efforts! With the use of machetes and sweat, these students have successfully knocked down invasive shore line weeds such as sesbania that was such a problem last years around the lake shore.

This work by hand is the only way to address this due to the soft muck in the area; and with the avoidance of using herbicides which can have additional off-target affects. The work the students are doing takes effort but is a much more environmentally sound method of weed control. Sesbania can rapidly form thick dense stands around the lake displacing native plants, preventing the needed shore line buffers that provide essential food and shelter for native wildlife. These students have provided a wonderful service for our lake and neighborhood, if you see them out there working, take a minute and thanks these wonderful young adults for their efforts!

Click For Here More Pictures

View Maps of Where Your Water Flows

Google Maps
Folioscenes Leon County GIS

Lawn & Garden Tips

Fertilizer Tips

Killearn Lakes Plantation Sanitary Sewer website

Florida-Friendly Landscapes
The Smart Way To Grow

Master Garden Newsletter
Nov / Dec 2007 Edition

Gardening in the Panhandle
Free Download

Your Local Community - Supporting the Clean Lakes Concept

Figure 13 Killearn Lakes Plantation Restoration Clean Lakes Project Your Local Community Page

The efforts of a few can make a big difference for an entire community!

Joe Barnett took the initiative to inform, arrange and participate in a clean-up of Lake Petty Gulf within Killearn Lakes Plantation on July 7, 2007. You might have seen his article in the Northeast Chronicles discussing the clean-up entitled,

Killearn Lakes to Clean Lake and Enjoy Cookout or you might have received an invitation to join in the clean-up effort.

The efforts of Joe and his neighbors resulted in the collection of 5 canoe loads of plastic bags, fast food trash, a road sign, a tackle box, a chair, a table, shoes, toys, balls, assorted wood and LOTS of water bottles and cans. Material such as the plastic bottles and cans were recycled. Most of this material appeared



to be transported from the streets and into the stormwater drains that eventually flow into the lake.

[Click For Here More Pictures](#)

As the team of neighbors collected this trash from the lake, it was noted that the water clarity was poor due to suspended particulates from surficial runoff. There appeared to be sediment runoff from newer homes and an obvious lack of adequate vegetation to slow and filter this runoff. Visibility within this water was only 2 feet while it should be substantially more. It is imperative that each resident continues to make the efforts to control the stormwater leaving their property through best management practices. Many easy steps can be taken to aid in this cleaning and filtration process. In addition, it is important to take the effort to dispose of trash and recyclable items in an appropriate manner, this supports the reduction of trash/garbage pick up days. These practices are good for everyone in our community! Thank you Dr. Barnett, for your efforts and dedication.

The Florida Yard and Neighborhoods (FYN) program has evaluated the Graves family home in our neighborhood and found environmentally responsible landscape practices throughout the property.

The Leon County Extension yard advisors found the Grave's yard met the required practices for all landscapes related to the FYN scale. There were no invasive species on the property, it was apparent recycle of all organic refuse back into the landscape, use of mulch is extensive and properly applied, and very rare, if ever, use of any pesticides.

The plant selection and placement were found to be excellent for the shaded conditions. Not having an irrigation system allowed for maximum points for a landscape designed to mostly exist on rainfall. Only recommended fertilizer for our area is used and any such applications are done sparingly.



The advisors were most impressed in the way the Grave family created natural areas that are self-mulching and permit indigenous ground covers, such as the partridge berry in your back yard. They likewise took notice of the accommodations made to attract and service wildlife, in so limited a footprint.

There was no evidence of pests or plantings prone to pests. The sloping nature of the lot does create a storm water runoff problem, but the lawn advisors feel the use of plantings and bedding in wash-prone areas minimizes the erosive effects of run-off.

Figure 13 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Your Local Community Page

Joe Barnett is one of our neighbors taking the responsibility of keeping our local lakes as clean as possible through his personal gardening and home maintenance activities.

In doing so, he and his family have recognized that there are fundamental practices they can do at home to improve the storm water quality that leaves their property. In addition, he has created a beautiful landscape that enhances the value and level of enjoyment of his property for all.

A few of the initiatives that Joe and his family have undertaken include:

- Establishment of a mixture of plants including wax myrtle, cherry laurel, cypress, holly, button bush and ferns that together increase the amount of water filtered before entering surface waters or returning to the recharge ground water. The planting and nurturing

Click Photos
to See Full Size



of native trees to our area ensure that they will thrive.

- Thoughtful planting schemes such as rain gardens and leaving a natural buffer by the lake protect our lakes and streams from excessive sheet flow and reduce the amount of erosion and sediment deposits that enter our lakes.
- These areas also serve for valuable wildlife habitat providing food and shelter for our diverse Florida wildlife.
- Composting yard waste such as grass clippings and leaves that can be recycled on site to provide nutrients to the soil and reduce your cost of waste disposal.
- Being conscious of fertilization and assuring that it stays where it will do the most good, around the plants not depositing in the down-gradient lake.



Thank you Joe and your family for sharing your efforts, and showing all of us how easy it can be to take steps in our own backyard to make a personal difference and to be ***Stewards of our Environment.***

Native Nurseries

Location:
1661 Centerville Rd
Tallahassee, FL 32308

Nursery Hours:
Monday through Saturday
8:00 am to 6:00 pm, closed on
Sunday



They can be reached at **(850)386-8882**

Join their online newsletter by going to <http://www.nativenuiseries.com>

Our mission at Native Nurseries is to educate, inspire and assist people in our community to preserve, manage and develop their lands, gardens and yards to benefit native wildlife and to promote awareness of the interrelationships of all living things.

The Clean Lakes Project wants to thank Native Nurseries for their support of this project by their kind donation to the **Clean Lakes Raffle being held on April 28 th** at Lake Monkey Business, Killearn Lakes Kids Fishing Contest!

If you know of a local business or neighbor that promotes the concepts of The Clean Lake Project, and could be highlighted on this page, please email us at: cleanlakesproject@gmail.com

Figure 13 continued Killearn Lakes Plantation Restoration Clean Lakes Project
Your Local Community Page

Tracking Web Site Usage

In order to effectively track the usage of the Clean Lakes educational web site, a site counter was added. This counter helped establish that the site was being visited at a steady rate. In addition to the site counter, the establishment of a web site profiler, Google Analytic, was used during the later usage phase of this project and this database captured a variety of visitor trends and usage analysis from the web site. The data captured with this program is discussed in the assessment phase found in chapter five of this document.

Newsletter Implementation

Being a multidimensional environmental educational outreach effort, a direct mail out of the restoration effort was utilized. This direct mailing was accomplished in cooperation with the KLHOA. The homeowners' organization provides a neighborhood magazine on a bimonthly basis and is directly received by the 4,600 residents via direct mail in this community. By utilizing this mechanism for delivery, I published four separate grant funded educational newsletters directly targeting the residents of the community. As the educational coordinator, I produced and published the newsletters and the homeowners' association inserted the newsletters into their publication for delivery to their residents.

It was important from the conception of these newsletters to have a professional looking publication that residents would take the time to review and read. With that concept, I developed an initial logo to be used on each of the newsletters published. It was important to create a look that residents would recognize and associate with their restoration effort. Considerations for the logo included a simple clean design, catchy phrase, and a single color that could be mass-produced for publication, with that the Clean Lakes logo was created and was adopted for all restoration reports.

The newsletter was designed to provide residents with information on a variety of issues related to the grant's intent. The subject matters were selected based on relevancy to the grant and the applicability to the targeted community. Each article was researched, reviewed and sent out to the management team for critical review and incorporation of their comments. The challenge of providing material in a limited publication space was

difficult; however the finished consecutive publications consistently had the same look and feel. In each newsletter, the website was referenced and additional the newsletters were electronically emplaced on the website.

April 2007 Newsletter

Each newsletter's content was developed with a specific theme in mind. The first Clean Lakes Project newsletter was received by residents in April, 2007. The content of this newsletter was developed around an introductory theme to introduce the residents to the project to both inform and promote the idea this project. This project newsletter presented the project as more than just a lake restoration job but a community project that each homeowner could and needed to become actively involved with. With this concept, a Florida Friendly Yard was introduced in the newsletter. This notion of developing landscaping that takes advantage of local native plant species while recognizing the conservation concerns of living in a State that has easily impacted aquifers. The Florida Friendly Yard concept is a property plan developed by the University of Florida, Institute of Food and Agriculture Sciences and is promoted through their Florida Yard & Neighborhoods program.

This first newsletter also expounded on the importance of proper fertilizer application for homeowners. Many residents do not understand that fertilizers come in different formulations. Nor is there a clear understanding that fertilizers now come in slow release formulation. This allows for the nitrogen to be utilized by the plants over a longer period of time as opposed to leaching into the aquifer or being washed into surface waters in rain events. Although there were many credible sources available for the fertilizer article presented, I deliberately cited the TAPP (Think About Personal Pollution) program as a resource to inform residents of this program. The TAPP program is a local initiative funded from EPA through and agreement with FDEP and awarded and implemented through the City of Tallahassee. This grant initiative is a reminder to residents of the importance of their personal impact on the quality of their drinking water.

The final article presented in the first newsletter was on the importance of controlling stormwater runoff at the individual property level. The basic concept is that by implementing lawn best management practices it is possible to slow the flow of

stormwater which reduces the amount of pollutants that enter the surrounding surface water bodies. Simple techniques were presented that homeowners could implement on their property and references sited for further reading.

June 2007 Newsletter

The June newsletter addressed two main topics, the first article re-introduced the Florida Friendly Yard & Neighborhood program and informed the readers that the Leon County Cooperative Extension was implementing a Certified Florida Yard program. This certification program provides a ranking and grading of home sites on the principles of the Florida Friendly Yard & Neighborhood concepts. The main emphasis of this program is the implementation in nine best management techniques including; proper plant selection and placement, fertilizing, integrated pest management, mulch, water conservation, recycling, attracting wildlife, stormwater runoff and shoreline stabilization. The objective of publicizing this concept in the newsletter was to both promote this new initiative by the Extension office and demonstrate to the readers that there are many individual techniques that can be implemented by homeowners to improve their yards while at the same time improving the surrounding environment.

The second article in the newsletter addressed the contentious subject of the sanitary sewer lines that were installed within the first two construction phases of the neighborhood. The installation of this sanitary sewer system was prompted due to the increasing levels of nutrients and fecal coliform counts in the surrounding surface water. In addition, the homes in units I and II within the Killearn Lakes Subdivision (approximately 1,400 residences) were increasingly having septic tank failures and untreated effluent was draining across lawns, streets and pedestrian paths. The cost of the system installation was through public funds and Leon County and the City of Tallahassee worked jointly to implement and install the system.

The sanitary sewer system installation would greatly reduce the nutrient loading of the surface water of the impacted area, and increase the overall property value of the homes. This seemed very positive for all involved in the project, the homeowners would be better off being on a municipal sewer system and the quality of the environment would benefit because of the decreased nutrient loading. Although the installation of the system

was being paid by tax dollars, the cost of existing homes to hook into the system would need to be absorbed by the individual property owners, this cost averages approximately \$10,000. The article's intention was to provide the economic and environmental facts to the homeowners in an unbiased manner about the overall environmental advantages for individual homeowners to have their homes hooked up to the sanitary sewer system.

August 2007 Newsletter

The August newsletter focused on two concepts, the science behind rain gardens and the backyard bird population report. The purpose of the science behind rain gardens article was to provide a technical discussion behind the installation with the principles behind and the purposes of rain gardens in the control of stormwater. Information was provided to the reader for a clear understanding of this methods employed could be developed. It is much more helpful to have a foundation of understanding of the technical aspects of a process prior to attempting an installation of a rain garden, this article provide that necessary background information.

The second article provided the latest data from Audubon Society's *A State of the Birds Report, Summer 2007*. In conjunction with the report which noted the alarming rate of habitat loss attributed to urban growth and the decline in common bird populations, the article presented steps homeowners can take to re-introduce wildlife habitat in their backyards. The creating of backyard wildlife habitat serves many purposes, not only is necessary cover and food for local wildlife provided but in this process there is a markedly reduced use of pesticides, fertilizer and the increased utilization of native plant species. The creation of a backyard habitat also aids in the overall surface water quality by reducing nutrient runoff and aids in the management of stormwater drainage.

October 2007 Newsletter

The October newsletter was the last newsletter published. In this newsletter the first article presented a discussion on concepts to maintain the water quality of urban lakes. The lake restoration effort includes the establishment of vegetative buffer zones including the planting of over 200 wetland trees around the lake's shore. The article

provided the rational for this planting scheme; to educate the readers on how vegetative buffer zones maintain the health of the water body.

The next article was a discussion about the importance of individual responsibility to the continued quality of our water. The article reiterates and reminds the reader of the past newsletter discussions and the positive efforts accomplished by the Clean Lakes Project. In the end, it was pointed out that it is the duty of each stakeholder to act in a manner that improves the quality of their water bodies. The final article promoted the educational initiative of the stormwater drain contest. This article both informed the readers of this project and thanked all who participated in the effort. Figures 14, 15, 16 and 17 presents the published newsletters.

Killearn Lakes Plantation Restoration: Clean Lakes Project



The Killearn Lakes Plantation Restoration: Clean Lakes Project

The residents of Killearn Lakes Plantation are fortunate to have their lakes selected as recipients of a grant from the Northwest Florida Water Management District Florida Forever Grant. This grant supports management efforts to improve water quality by implementing stormwater improvements, restore natural systems and demonstrate best management practices (BMP). Within the Killearn Chain of Lakes, Lake Blue Heron has been selected as a pilot project where a variety of BMPs will be utilized to improve the water quality for all to enjoy. In addition to the activities at Lake Blue Heron, the Clean Lakes Project plans on:

1. Demonstration Rain Gardens;
2. Opportunities for Residents to participate and benefit from *Florida Friendly Yard* BMPs;
3. Raise the level of awareness of how each individual can make a difference in the overall water quality of their waterways.

This is a wonderful opportunity for all of us to learn, enjoy, participate and improve our neighborhood, local lakes and watershed. Let's take advantage of this and have some fun! Coming soon is our web site to keep you up to date on project activities, Lake Heron's progress and links to pertinent educational material at <http://killearnlakes.org/>.

Your Yard:

Make it a Florida Friendly Yard!

Our yards and neighborhoods are channels to our waterways and aquifers. Your yard is the first line of defense for preserving Florida's fragile environment. The health of Florida's estuaries, rivers, lakes, springs and aquifers depends partly on how you landscape, fertilize and maintain your yard. You don't even have to live on the water to make a big difference. Rain that falls on yards, roads and parking lots wash into waterways or leach into ground water, carrying pollutants — including fertilizers, pesticides, animal waste, and petroleum products. Improperly applied fertilizers and pesticides from residential areas pose a *serious threat* to the health of Florida's waters.

Follow an integrated approach to landscaping and make your yard a Florida Friendly Yard!

1. Right plant, right place
2. Water efficiently
3. Fertilize appropriately
4. Mulch
5. Attract wildlife
6. Manage yard pest responsibly
7. Recycle yard waste
8. Reduce stormwater runoff
9. Protect the waterfront

From Florida Yards & Neighborhoods University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS), 2006 @ <http://hort.ifas.ufl.edu/fyn/handbook.pdf>

Figure 14 April 2007 Clean Lakes Project Newsletter

Fertilizer Tips

Did you know that lawns generally need only one or two fertilizer applications per year?

Remember these points to keep your lawn health and your lakes clean:

Less is Best

Fertilize only as needed to maintain the health and quality of lawns and landscape plants and reduce nitrate levels. If your lawn and landscape plants are established or look healthy enough already, there's no rule that says you must fertilize them. Fertilize with a purpose, such as to increase growth, flowering or fruiting or to correct an observed nutrient deficiency (as confirmed by a soil test).

Choosing a Fertilizer

If you decide you need to fertilize occasionally, use fertilizers with a label that specifies at least 50 percent of the nitrogen is in a *slow-release* or *water-insoluble* form. Nitrates from slow-release sources are more likely to be used by plants and less likely to leach out or wash away when it rains.

Phosphorus

Phosphorus is a major contributor to water quality problems. It is extremely difficult and expensive to remove once it gets into the water. Most North Florida soils are already high in phosphorus.

Water

It's very important to apply the proper quantity of water after fertilizing if rainfall is not expected within 8-12 hours. You should never apply fertilizer when heavy rains are coming. Your work and your investment will wash away with the rain and adversely impact the water down gradient.

From TAPP campaign (Think about Personal Pollution) learn more at <http://www.tappwater.org/default.aspx>

Lawn and Garden:

Stormwater Runoff: Slow The Flow To Clean The Water

The overall goal of a water-friendly yard is to slow the flow of water running off of every yard, helping to assure that the water reaching streams and lakes is clean. Slowing the flow helps prevent pollutants such as silt, fertilizers and pesticides from washing off your yard into storm drains and eventually into local water resources. Keep in mind that many storm drains lead directly to waterbodies without treatment. So, take steps to hold rainwater in areas of your yard where it can filter slowly through the soil. This can be done by adopting some of the following practices on your property:

1. Examine the Lay of Your Land: Where does your water flow?
2. Minimize Soil Erosion: Do you have bare ground that can use ground covers?
3. Create Mulched Beds: Reduce fertilizing, watering, mowing, pesticide use.
4. Plant a Rain Garden: Compared to a lawn it absorbs about 30% more water!
5. Build Berms and Swales: This allows water to percolate in place, not wash to the lake.
6. Terrace a Slope: Convert an area that is too steep for a berm or garden to slow and hold water.
7. Consider Rain Barrels and Cisterns: These can save roof water for future watering needs.

By slowing the flow of water from yards and neighborhoods, water will have more time to soak into the soil and filter contaminants.

From TAPP campaign (Think about Personal Pollution) learn more at <http://www.tappwater.org/default.aspx>

This publication funded through the NWFWM Florida Forever Act FS 259.105
A partnership project between NWFWM, Leon County and KLHOA

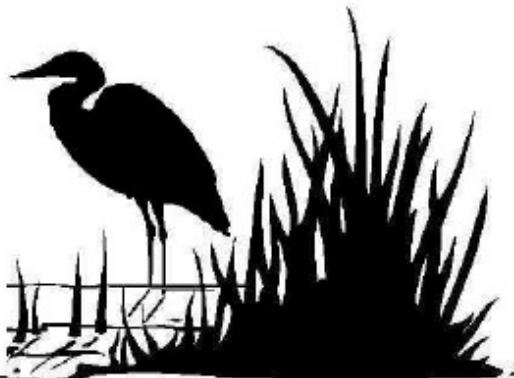


Figure 14 continued April 2007 Clean Lakes Project Newsletter

Killearn Lakes

Plantation Restoration:

Clean Lakes Project



June 2007

Florida Friendly Neighborhoods, Our Neighborhood

Leon County is establishing our own *Florida Yard & Neighborhood* (FY&N) through the Leon County Cooperative Extension efforts. The FY&N program provides information on the best ways to design and maintain yards and gardens. These recommended methods will provide a quality landscape while reducing the use of fertilizers and pesticides, conserving water supplies and increasing native habitats. Benefits for property owners include enjoying an attractive, well-kept landscape at reduced cost and reduced effort, while also minimizing pollution and stormwater runoff problems; a win-win situation. FY&N emphasis is in nine areas: proper plant selection and placement, fertilizing, integrated pest management, mulch, water conservation, recycling, attracting wildlife, stormwater runoff and shoreline stabilization.

The Leon County Cooperative Extension is training volunteers that can serve as yard advisors to assist homeowners in assessing their lawns based on the FY&N principles. We soon will be able to have yard advisors assess lawns for Certified Florida Yards status based on these principles.

There is no need to wait for Certification status to make proactive steps in your own

backyard. If you have taken steps to promote a Florida Friendly Yard we want to hear from you contact us at cleanlakesproject@gmail.com. You may be highlighted at our Local Community Supporting the Clean Lakes Concept on our web site at <http://www.killearnlakes.org/>, where additional information on environmental stewardship is available

Our Sanitary Sewer System Just the Facts\$\$

The Leon County Board of Commissioners approved using \$5 million in tax dollars from the Blueprint 2000 program to address the septic tank problems in Killearn Lakes Units I & II. This money covered the cost of installing the infrastructure for the low-pressure system. Leon County Public works and PBS&J engineers oversaw this project. The City of Tallahassee is providing the service for the sanitary sewer system.

Existing homeowners in Units I & II have an estimated cost in the range of \$8,000 to \$10,000 per household to connect to the sanitary sewer system. This cost covers the expense incurred for installation of plumbing, grinder package, and proper abandonment of the existing septic tank.

OUCH! I can hear you wince at the mere mention of these cost. The City is offering a financial incentive for those residents willing

Figure 15 June 2007 Clean Lakes Project Newsletter

- to move forward with sanitary sewer hookup:
- Waiver of \$450 City tap fee until September 30, 2008.
 - Free final pump-out of septic tank by calling 891-4YOU (4968).
 - Low-interest sewer connection loans, currently at 5.15%.
 - Sewer system connection charge fixed at \$3,780 until September 30, 2007.

You can finance the cost for up to 10 years and make automatic monthly payments on your City utility bill. The loan is secured by a lien on the property in the amount of the loan outstanding. Use the City loan for **all or part of the cost**, including the sewer tap fee, system charge, package grinder pump, sewer line construction, electrical enhancements and septic tank abandonment. The City will issue checks directly to the contractor(s).

The Economics

- Your money has the most purchasing power now. These costs will only increase. The incentives in place by the City are *in place for you*.
- The incentive packages are time limited.
- Financing on your monthly utility bill for \$10,000 for 10 years will be \$100.
- Lake water quality over those ten years will reflect your investment.
- Your resale value will increase by hooking up.
- You will no longer have maintenance costs for your septic. Have you considered the age and these maintenance cost of your septic?

It is the Environmentally Responsible course to take; your investment now is financially balanced, economically justified and environmentally warranted.

Why Bother?

We at the Clean Lakes Project want all residents of Killearn Lakes to realize the impact that impaired and failed septic systems have on our community. It is well documented that failing home septic systems allow for untreated human waste containing fecal coliform, excessive nutrients and other chemical waste products put down the drain by homeowners to enter our surface water. This *nonpoint sources pollution* is a MAJOR contributing factor to the continual decline in surface water quality in our neighborhood.

The lakes in our neighborhood are in varying states of eutrophication, a process whereby water bodies, such as lakes receive excess nutrients that stimulate excessive plant growth such as algae and nuisance plants and weeds. This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water. The dead plant material decomposes causing other organisms to die, including fish, leading to deterioration of our watershed, the water in which we all depend. The NWFWM award a grant to the Killearn Lakes Homeowners Association so our community can move toward better stewardship of our land and water.

Remember

Environmental Stewardship is for **ALL** in
our **Community**
Make the Effort to Get Hooked Up

This publication funded in cooperation with Leon County and NWFWM Florida Forever Grant



Figure 15 continued June 2007 Clean Lakes Project Newsletter

Killearn Lakes Plantation Restoration: Clean Lakes Project

August 2007

The Science Behind Rain Gardens

By now, you have heard of the term rain garden. In this issue we will be discussing the science behind the rain garden, how it is used and the reason why this landscape technique can improve the overall quality of the water leaving your property? A rain garden is a slightly sunken native plant garden receiving water from a source such as your roof, driveway or the natural slope of your property. Properly designed rain gardens can trap and retain up to 99 percent of common pollutants in urban storm runoff. Affordable and easy-to-design gardens can improve water quality and promote the conversion of some common pollutants into less harmful compounds. In order to assure that the renovation work performed on the lakes within Killearn Lakes will have a sustainable and healthy future, the quality of the surface and shallow groundwater leaving every home within our neighborhood should be as clean and nutrient free as possible. This effort has to be a collective endeavor within our community to be successful.

Have you asked yourself if you need a rain garden and perhaps what type of a rain garden would you want? Maybe you have further thought of the location, size, design, cost and maintenance concerns on your property. A quick internet search releases a flood of information on the factors and design to considerations for your rain garden. We have conveniently placed pertinent information at your own web site on this subject at killearnlakes.org.

The overall concept is quite simple. By capturing or significantly slowing down the water as it leaves our roofs and paved areas, this helps to drop out silt, suspended matter and dissolved nutrients. This impeding allows the water to soak into an area that will pass by soils and roots which serve to absorb nutrients and breakdown complex fertilizers and allow for enhanced degradation of such pollutants as petroleum products.

Here are some interesting scientific considerations:

- ♦ If the water is unrestrained in a large storm event more than half



of the rainwater that falls on a typical city block will leave as runoff that includes metals, oils, fertilizers and other particulate matter.

- ♦ The size of the rain garden can be any size you want or if you want 100% runoff control, you need to make calculations. However, any size garden will help.
- ♦ The type of vegetation used in a rain garden makes little or no difference in the effectiveness of the rain garden. The presence of a berm around a rain garden is a more significant factor in the success of cleaning the water. The effectiveness of a rain garden is based on the ability to trap storm water runoff and allow it time to soak into the ground.
- ♦ By diversifying your vegetation and flow paths through your lawn, benefits to enhancing wildlife habitats and diversity will follow.
- ♦ Denser plant growth prevents soil crusting that occurs when rain drops strike bare ground and small soil particles are dispersed which then clog pores in the soil and reduce the amount of water that penetrates the surface.
- ♦ Modifying the garden to allow water to pool in the bottom reduces oxygen levels in the soils creating anaerobic conditions which are favorable to the denitrification process. This encourages bacteria in the soil to convert the nitrates in surface water into nitrogen gas via the denitrification process which makes for cleaner water.
- ♦ Shallow depressions in the earth landscaped with hardy shrubs and plants and surrounded by bark mulch can offer a simple remedy to vastly increasing water quality.
- ♦ Numerous schools and educators are using rain garden design and implementation for teaching children (through college level classes) aspects of water quality, botany, engineering and community service.

Figure 16 August 2007 Clean Lakes Project Newsletter

Make Your Yard a Backyard Habitat

Florida has the third most diverse wildlife population of any state in this country. Amazingly, Florida is home to more than 500 species of birds, including breeding, winter visitors and migratory species. Rapid expansion of human populations and urban growth is destroying native wildlife habitats at alarming rates. The Audubon Society issued *A State of the Birds Report Summer 2007* that details distressing declines in population of our most common birds. Audubon has highlighted 20 birds of special concern noting that they have lost at least 50 percent of their population in just four decades. As you can guess, Florida is home to many of these beloved birds. Here are highlighted just a few that could be found in your back yard or near by wetlands or further helped by habitat enhancements such as rain gardens and natural habitat buffers. When was the last time you saw or heard any of these birds in your neighborhood?

Bobwhite (Quail): A chubby, robin-sized bird that runs along the ground in groups and is found in grasslands mixed with shrubs or widely spaced trees throughout much of the Eastern United States. Population has declined 82 % in the 40 years since recording statistics.

Eastern Meadowlark: Also a robin-sized bird with a light brown back and brilliant yellow breast with a big, black "V", found in grasslands and open savannas in throughout much of the Eastern United States. Population decline 72%.

Common Grackle: A dark bird longer than most blackbirds, slimmer than most crows, and very iridescent with long center-creased tail, found in a variety of open habitats with trees, including urban areas, parks, riparian areas, and a variety of woody wetlands in the United States and Canada. Population decline 61%.

American Bittern: A two-foot tall brown and tan striped wading bird found in freshwater wetlands with tall, emergent vegetation in most of the Canadian provinces and the northern half of the contiguous United States and a common Florida winter resident. Population decline 59%.

Whip-poor-will: A bird only active at night with mottled brown plumage, found in dry, open woodlands with little underbrush in most of the eastern United States, and parts of southeastern and south-central Canada. Population decline 57%.

Why should the decline of these birds concern us? The presence and health of these birds should be viewed as the canaries that once alerted the miners of imminent danger in the coalmines of old. So

too, should we view the lack of the bobwhite or the absence of the summer night call of the *Whip-poor-will* as a signal of the declining health of our environment.

We can take steps in our community green spaces and our own backyards to provide habitat for our native wildlife. By incorporating some best management practices, it is possible to create a landscape that will bring your yard to life with birds, small animals, butterflies and other beneficial insects. A yard that is a diverse habitat for wildlife is attractive, enjoyable to create and watch and is a peaceful place to relax and unwind. Landscape practices that help wildlife like: reduced lawn chemicals, conservation of water, elimination of exotic plants and the planting of native species all serve to benefit the environment and improve the quality of life for all including the lakes and ponds that make up our watersheds.

Some key environmentally sound techniques to consider include:

Choose Native Plants: Select native species that belong in the area focusing on plants that are sustainable and not requiring constant watering and maintenance.

Provide structural diversity: Structural diverse landscapes are ones that have plants growing at different heights and groupings. Consider planting arrangements that mimic natural configurations. This type of scheme allows for more choices for shelter, food and nesting choices for birds and other wildlife.

Leave natural ground debris: Leave dead trees and fallen limbs in place if they do not create a hazard. Such areas allow for perching, nesting and feeding areas for birds. If you are removing a tree, consider leaving a sizeable stump even 10 – 15 feet high; numerous birds are attracted to a stump like this for food and habitat.

Reduce the size of mowed lawn area: Reduce the amount of mowed areas around your yard, especially around low traffic areas. Consider replacing turf with native plant species in parts of your lawn. Plant diversity attracts more wildlife species.

For addition information please visit our web site at killearmlakes.org for information on lawn and garden practices that will improve the health of the soil, air and water for all and create much needed habitat for our wild neighbors.

Remember
***Environmental Stewardship* is for ALL in our
Community**

This publication funded in cooperation with Leon County and NWFWM
Florida Forever Grant



Figure 16 continued August 2007 Clean Lakes Project Newsletter

Killearn Lakes

Plantation Restoration:

Clean Lakes Project

October 2007

Our Lake Fronts

As the Clean Lakes Project moves into the restoration phase of work around Lake Blue Heron, it is time to discuss the concept of Right Plant, Right Place from the Florida Yard & Neighborhoods program and how this applies to our lakes. First, let's take a look at the characteristics of lakes and their shores in their natural state.

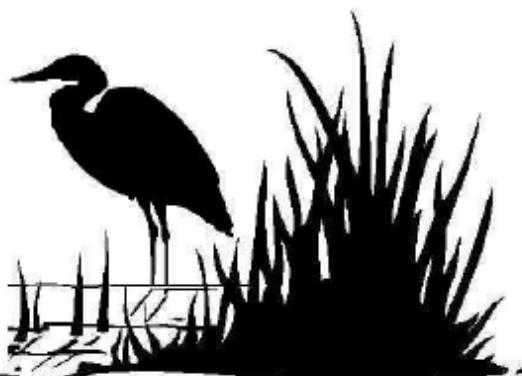
In its natural state, a lakeshore supports a variety of annual and perennial vegetation. There are emergent and submergent shoreline plants, and the water body experiences cycles of increases and decreases in algae populations. Lakes and ponds have several distinct defining characteristics and every lake has its own unique features. The size, shape, and depth of the lake all affect how it responds to various environmental inputs. Many manmade lakes in urban areas are designed to serve as stormwater retention bodies. In addition, most lakes in neighborhoods are relatively small and somewhat shallow. No matter what their purpose, neighborhood lakes can provide sustainable aquatic ecosystems for aquatic insects, fish, frogs, turtles, birds, and other wildlife.

Neighborhood Lakes

Lakes in neighborhoods, regardless if they are natural or manmade, serve as receivers of stormwater. This stormwater is the major carrier of nonpoint source pollution. This nonpoint sources pollution in stormwater consists of a variety of materials; petroleum products, microscopic particles from the wear of brakes and tires on our cars, shingle particles washed off roofs, soap, paint, sediment, leaves and grass clippings, wildlife and human/pet waste, lawn and agricultural fertilizers and pesticides. All these chemicals are either dissolved in the water or carried in fine particles called suspended solids. All of these nonpoint source pollutants are carried by stormwater into our lakes and all have an effect on the water quality and the sediments of the lakes.

Water Quality Buffers

Plant buffers around the shore of our lakes serve to purify runoff as it passes across the buffer. These buffer zones serve to slow the flow of stormwater allowing sediment and suspended solids to fall out, effectively filtering the water prior to flowing into the lake. The organic based compounds can then be effectively broken down and recycled within this microcosm. Ideally, plant buffers with native species can serve multiple purposes, improving water quality, be



pleasing aesthetically, and enhance the habitat and food sources for wildlife. Remember, it is important to continue these buffer zones plantings into the water. This will provide emergent vegetation for aquatic life and also serves to uptake suspended nutrients in the water even if the pond is not part of a stormwater treatment area.

Lake Blue Heron

The Clean Lakes Project is working toward creating these buffer zones around Lake Blue Heron. This process has several components. First, it was necessary to take an inventory of plant species that were present around the lake's shore. Once the inventory was complete, diseased upland trees and exotic species were identified for removal. These trees were removed to make way for the appropriate species along the shoreline of the lake specifically re-creating the vegetative buffer zones that has been absent around the lakeshore. Exotics invasive species such as Chinese Tallow and Mimosa tree are invasive aggressive exotics species out-competing native species. Upland pines and oaks that do not thrive and become diseased are being removed to make way for wetland trees that are appropriate for that ecological niche along the shoreline. Examples of appropriate wetland trees for shore buffer zones include ash, red maple, cypress and tupelo or black gum trees. Wetland species like the willow and the sweet gum are discouraged because they are less desirable and can be naturally invasive. Cypress hammocks will serve as shoreline buffers which make wonderful wildlife habitat, provide pleasing fall colors and welcome shade in the heat of summer. Wetland trees are best planted in the winter when they are dormant. In the spring, they come alive first extending their roots down for water and then they leaf out. Wetland trees will be planted along the shoreline this winter.

The buffer zone planting will extend into the water body serving to enhance the natural filtration and necessary aquatic animal shelters and nurseries. The shoreline specie being used for Lake Blue Heron will be the Blue Flag Iris. While trees are best planted in the dead of winter, the smaller herbaceous wetland plants will be planted in early spring. The lake will need to be full or the herbaceous wetland plants will not survive with their shallow root systems.

As the planting of the shoreline buffers is implemented the timing and placement of planting will be critical in the establishment of the vegetative buffer. As the planting season approaches, be aware that it will take a few seasons for plants to become established. The

Figure 17 October 2007 Clean Lakes Project Newsletter

Florida Forever Grant, funded by the NWFWM, will provide trees to replace the upland species that were removed (approximately 250). Remember the canopy of a full cypress tree will extend 30' and these trees will take years to establish their presence. The grant will also supply us with smaller herbaceous wetland plants, like the Blue Flag Iris (1000s). The success of this critical component of the project will depend on your patience and understanding that establishing the vegetative buffer zone is dependent on the concept of Right Plant, Right Place & Right Time!

Looking Into Our Water Future

As we look into our water resource future, the demand for water is continually increasing and as such, sustainability, protection and conservation are key concepts we all should understand and practice. Although an adequate supply of water is currently available in our northwest Florida area, careful planning and implementation of best water management practices are critical for our lakes, recharge-areas and the intermediate and Floridan aquifer. Most directly visible and achievable to all within the Killearn Lakes subdivision is sustaining acceptable lake water quality within your neighborhood. Recognize that the future of this lake restoration project is in the hands of all the residents within these recharge areas. The future of these water bodies is you and your neighbor's responsibility. You are the stakeholders and you are the most directly influencing factor on this and adjoining water bodies.

Reflecting on Our Lakes

The Clean Lakes Project at Killearn Lakes has included many facets and opportunities to present a wide variety of topics relating to water quality. Our goal has been to specifically increase the awareness level of residents on factors affecting water quality within this beautiful area. As this project winds down, let us reflect upon the materials that we have had the opportunity to present in these newsletters:

- ◆ Rain Gardens and the Science Behind them
- ◆ Residents' participation in the Florida Friendly Yard Best Management Practices
- ◆ Raising the awareness of how we can protect our water quality
- ◆ Assessing Stormwater Run-off
- ◆ Fertilizer Tips & Minimizing Soil Erosion
- ◆ Making your Yard a Backyard Habitat
- ◆ Sanitary Sewer System program

Concurrently, we also enjoyed the opportunities to support these efforts in a wide variety of ways by:

- ◆ Establishing the <http://www.killearnlakes.org/> web site and providing pictures and updates for all residents to have readily available
- ◆ Presenting this information at the Neighborhood Fishing Day
- ◆ Giving away \$500 in plants from Native Nursery for Rain Gardens
- ◆ Presented information at a Home Owner's Meeting
- ◆ Delivering Site Specific Information to Water Front Property

- ◆ Owners in specifically tailored information packets
- ◆ Obtaining Community Assistance from students at local schools in conjunction with their community service volunteer hours
- ◆ Sponsoring a Storm Water Placard Design contest performed by students of Killearn Lakes Elementary and Hawk's Rise Elementary and the winning placards will be emplaced on stormwater drains by the end of the year by local high school student volunteers.

As you reflect on the material presented and implement some best management practices for your home and lawn; please reflect on the future of our children and the resources and heritage that we will leave them. Take Pride and Ownership in your Home, Neighborhood and Watershed, now and into the future.

Stormwater Drain Markers: Made By OUR Children For OUR Neighborhood!

The Clean Lakes Team wants to thank the students of Killearn Lakes Elementary School, Hawks Rise Elementary School and Chiles High School for their contributions in designing and installing Stormwater Drain Markers within your neighborhood.

This forthcoming initiative will effectively place ~300 Stormwater Drain Markers throughout the Killearn Lakes subdivision. These markers were designed by children from the elementary schools and installed by the volunteer efforts of the High school students. What a fun and enjoyable project this has been. We have had over 300 art submissions for this project; our only regret is that we can choose only 6 separate art submission to have manufactured. The success of this project is directly related to the efforts of our community's students and the Leon County Schools who have taken the time and initiative to be part of this effort. It could be your child's art design that will serve to reminding us of where your stormwater drains. We want to thank everyone for their enthusiastic contributions and support of this project.

The Stormwater Drain Markers are intended to remind all of us to help protect our lakes from nonpoint source pollution. Remember, rainwater picks up trash, yard waste, petroleum waste, and many other harmful substances that flow through our storms drain and into our lakes causing our waters to become polluted.

Enjoy these designs, thank our students and do your part in keeping only rainwater going down our stormwater drains! The health of our lakes are reflected in this commitment.

Remember
Environmental Stewardship is for **ALL** in our
Community

This publication funded in cooperation with Leon County and NWFWM, Florida Forever Grant



Figure 17 continued October 2007 Clean Lakes Project Newsletter

Educational Outreach through Public Events and Delivery of Site Specific Information

A traditional outreach effort such as the publication of informative pamphlets and booklets is a method of informing consumers utilized by many public agencies. Many of these publications are developed and assembled by knowledgeable staff within the particular agency. Throughout the Clean Lakes Project environmental outreach effort, I utilized many of these public agencies' publications to provide relevant information to the residents in the target community.

The volume of publications available to a homeowner is remarkable. Many of these traditional publications are now readily available on the Internet as well. However, public agencies still utilize printed material to provide their customers specific information deemed relevant. I was able to amass literature from a variety of Local, State, Federal and University entities that addressed the environmental concerns being addressed by the Clean Lakes Project and methods to improve the overall water quality for the targeted neighborhood. Below in figure 18 is a list of the literature and the agency that developed and published the information.

All the organizations that published the literature that was utilized by the project were very cooperative with providing these materials. Through email and phone conversations meeting times were arranged and all the material was gathered for further distribution.

Publication	Organization
TAPP Rain Garden Manuals	City of Tallahassee
TAPP Rain Gardens: A Household Way to Improve Water	City of Tallahassee
TAPP Guide to Water Friendly Yards	City of Tallahassee
TAPP 2008 Rain Garden Calendar	City of Tallahassee
Save the Swales (color)	Environmental Protection Agency

Figure 18 Environmental Educational Publications distributed through the Clean Lakes Initiative

Publication	Organization
Pointless Personal Pollution	Environmental Protection Agency
After the Storm: A Citizen's Guide to Stormwater	Environmental Protection Agency
Homeowner's Guide to Septic Systems	Department of Environmental Protection
Septic Systems Folder	Department of Environmental Protection
Septic Magnets	Department of Environmental Protection
Make Your Home the Solution to Stormwater Pollution	Department of Environmental Protection
A Citizen's Guide to Stormwater Ponds	Department of Environmental Protection
Waterfront Property Guide	Department of Environmental Protection
Clean Water: Everybody's Business	Department of Environmental Protection
Children's Environmental Stickers	Department of Environmental Protection
Florida Friendly Landscaping	University of Florida

Figure 18 continued Environmental Educational Publications distributed through the
Clean Lakes Initiative

Public Events

Through the course of the project literature was made available through three neighborhood public events. For two of the events a pavilion tent and tables were set up within the festival area. For the third event, a homeowner's association meeting, a table was utilized to display the material. All the literature was displayed in a manner that allowed for easy reviewing of this literature and for passive browsing by residents that were walking through this display. All materials were free, and there was always a knowledgeable person available to answer any questions related to residential lawn and garden best management practices and address the status of the restoration work in their neighborhood.

The first event was considered the Clean Lakes Environmental Educational outreach efforts kick-off event. It was held at the Spring Kid's Fishing Day in April, 2007. For this event, to draw attention to the project, extra effort was made to bring residents attending the event to the pavilion. In order to accomplish this, a children's hand on display provided by FDEP know as the EnviroScape, a portable model with

landscape was set up at the booth. This model allowed for hands-on demonstrations of nonpoint and point sources of water pollution and ways to prevent pollution problems. In addition to this hands-on learning activity for the children, there was a special opportunity for the adults to register for a chance to win prizes sponsored through the Clean Lakes Project. This was accomplished through the Clean Lakes Raffle. The raffle was free and open to all residents in the community; the only requirement was to be present at the Kids' Fishing Event in order to register for a chance to win the prizes. The prize schedule was: Grand Prize of a \$400 gift certificate toward consultation and plant purchase and the IFAS Florida Friendly Yard Manual; First prize \$50 gift certificate toward plant purchase and the IFAS Florida Friendly Yard Manual; 2nd Runner ups \$25 gift certificate toward plant purchase and the IFAS Florida Friendly Yard Manual. The gift certificates were to a local garden nursery that donated an additional \$25 gift certificate. The Florida Friendly Yard Manuals produced by University of Florida's IFAS were provided by the local extension office. The promotional concept was to interest residents in best management practices for their lawn and gardens and provide financial incentives to a few to implement these practices. In addition to the hands on module and the raffle, educational literature was available for residents along with content experts to discuss with residents any questions that they might have concerning the Clean Lakes Project and environmental concerns related to their neighborhood.

The next event that I attended on behalf of the project was the quarterly Homeowner's Association meeting. This meeting was open to all residents within the neighborhood. These meetings are conducted by the homeowner's association's board and all business is brought up and ratified by a quorum of the board. During this meeting, the major topics that were addressed included the financial state of the association and spending priorities. After the internal business, a County Commission representative fielded questions concerning the cost to homeowners of hooking up to the new sanitary sewer system. Finally, I presented to the gathered residents an introduction to the Clean Lakes Project and the scope of work that was planned. I emphasized the importance of individual responsibility to the long-term success this project. Educational literature was made available in the back of the meeting room through a display on a

table. Finally, from the Kid's Fishing day raffle event, I held the winning drawing for the prizes and these were awarded shortly thereafter.

The final public event was held at the Neighborhood Fall Festival. This event, as with the spring event, was open to all residents of the community. There was food and entertainment provided for participants. As with the spring event, the Clean Lakes Project was set up under a pavilion with tables to display all available literature. The attraction for participants to the pavilion for this event was a display of children's' art work. I displayed an assembly of design submissions from the stormwater drain art contest that was conducted at two elementary schools. This display served to draw in residents to see their neighborhood's children's art and served as a nexus into discussions about the project and individual responsibilities concerning the health of the community lakes. At all of these public events, reference to the KillearnLakes.org website was presented and reinforced.

Lake Front Educational Packets

The lake front educational packets were designed to specifically address the heightened responsibility that lake front property owners have in surface water quality. Lake front owners are the final guardians of the sheet flow of water through their yards. They also can be a single major contributing source. These packets of information were designed to provide educational material that would aid in implementing and improving best management practices for lawn and gardens for these property owners of lake front lots. The packets also provided scientific supporting background literature on the rational for environmentally sustainable practices for property owners. Student volunteers prepared 200 packets for distribution. Then a second set of volunteers delivered these packets along lake front and adjacent properties throughout the neighborhood.

It should be pointed out that opportunities for learning during educational initiatives need to be identified at all levels and all junctures. Upon obtaining student assistance to compile this information, these children learned about the information from all of the separate packets that they were placing together in these packets. Upon obtaining older students to assist in delivering this information to the lake front owners,

this also presented an opportunity to review the literature with these students so that they were functionally conversant on the subject matter.

Community Schools in the Clean Lakes Project

The educational outreach efforts also targeted involvement of the local public schools in the restoration efforts and providing information on the benefits of environmental stewardship for their neighborhoods. This inclusion of students and their schools was considered a significant component of the long-term success of the health of the environment. By investing in the establishment of environmental knowledge with school age children, then that knowledge can translate into action by the children's families day-to-day practices and more significantly into the adult lives of the students. This bonus and exponential return as it relates to time can have a significant impact on social and environmental health of a community.

Providing information to the schools of the Clean Lakes Project and the timing related to request for participation needed to be laid out for smooth inclusion into the project. Since the outreach effort began in late April of 2007, the ability to involve the local school during the spring and summer was not a feasible option. An initial informative letter (appendix A) was sent out in May to let teachers know of the Project and the anticipated autumn activates that could involve school participation.

Stormwater Drain Design Initiative

In the Fall of 2007, a second email was sent out to the local elementary school to solicit support for the stormwater drain contest. In the letter (appendix B) it was explained that the Clean Lakes outreach effort had reached a point in the project where I wanted to actively encourage participation of the school in the stormwater drain design effort. It was explained that these drain markers would be utilized as a visual presence and act as a reminder of the existence and the impact on the lakes due to stormwater runoff through these drains. In this letter I explained that in an effort to extend this environmental educational outreach opportunity, I would appreciate if the instructors would encourage some of their students in their school to design the drain markers that I would then have manufactured. Part of the interest in wanting the students to participate

in this process was to raise their level of awareness of stormwater drains and the affects on local water bodies and to stress the concerns of nonpoint source pollution. This educational effort would allow the students to take interest and ownership in the well-being of the environment of their own community.

The objective of the Clean Lakes Project is to have a strong and lasting positive affect on the surface water quality in the community. This lasting impact can only take place if all in the community become informed of the issues and make efforts to change behavior that can have an adverse impact on our environment. This project was a great way to involve children in the community and raise their level of awareness of issues affecting their community.

With this initiative of an art contest, I was able to gain the support of the Art instructor in one elementary school and two fifth grade science instructors and the director of the after school enrichment program at a second elementary school. I was able to present to the students the purpose of the stormwater drain markers and lead the classes in a discussion on nonpoint source pollution and how they specifically along with their families can make a difference in reducing this type of pollution.

The storm drain contest brought in over 300 entries from the participating elementary age students. Selection of the entries that would be produced was made through a committee of volunteers. Having been directly involved with the students and teachers from the different classes, I recused myself from the selection committee for the art project. The selection committee had no contact with the students and worked independently. Next, it was necessary to solicit support from the local high school for installation of the drain markers throughout the neighborhoods. Successful contact was made with the faculty advisor of the Marine Biology Interest Club. The faculty advisor informed the club members of the installation activity and the students enthusiastically volunteered to take part when the drain markers were ready for installation.

Prior to the installation of the markers, I made a presentation to the club members of which there were 25 students in attendance. The presentation was a detailed discussion of nonpoint source pollution and how they and their families can impact the water quality of their neighborhoods. During the presentation, there was discussion from

the students of the importance of taking responsibility for their waste products and methods to reduce the volume of such products.

Storm Drain Marker Installation Day

The marker installation process involved twenty volunteers; seventeen of these volunteers were the students from the local high school Marine Biology Club. It was predetermined that the students would work for 2 hours on the installation. I arranged for the logistical aspects of the project and provided all materials and maps for the installation. In addition, there were drinks and snacks provided for the students from the Killearn Lakes Homeowner's Association. Prior to the installation day, the faculty advisor sent informative permission slips home for parental signature. This added bonus served to reinforce to the parents the purpose of the Clean Lakes Project and demonstrated a level of commitment by their children to the concepts of environmental stewardship.

Before the student teams were sent out I held a briefing that covered the purpose of the morning's activities, the proper installation technique, issues associated with safety of the team and a reminder that they were representing not only themselves and their school but also representing the Clean Lakes Project. Within the two-hour window the students successfully installed over 250 drain markers in the target neighborhood and the three local schools, Appendix C provided the maps of the area covered by the student teams. All the teams reported back to the rendezvous location on time and without incident and then each team debriefed about their experience during the installation process.

Promotion within the Schools

The stormwater drain design contest drew a large amount of attention to the Clean Lakes Project. I decided that it would be advantageous to capitalize on this attention at the two elementary schools where the contest was conducted. Since there were such an overwhelming number of design entries submitted by the elementary school students I negotiated with the drain marker manufacturer a change to our original agreement. Instead of the agreed upon three unique designs, I request the manufacture to produce six

unique designs. With that agreement in place at the production level, I was able to select three unique designs from each school. This allowed for promotion and recognition of each schools contribution in a manner that was much more inclusive and in the spirit of the outreach effort.

The recognition at the school level was accomplished via three initiatives. First, I arranged for each student in the participating classes in the design contest to receive a certificate of appreciation for their effort and contribution to environmental stewardship from the Clean Lakes Project. The certificate, (appendix D) was printed on a full 8.5 x 11 sheet of 24 lb. thyme linen paper. Volunteers from the schools placed each child's name on the certificate in the space provided. Upon the teachers giving these certificates of recognition to the students, it allowed for reinforcement of the project objectives. Second, I created a plaque for each selected design that was manufactured. These six plaques were inscribed with each specific single child's name and read: 'In special recognition of your contribution to environmental stewardship, the Clean Lakes Project thanks you for your artistic design in the storm drain marker design project 2007.' Third, there was a presentation at each school on the School specific morning news broadcast presenting the plaques to the children. In addition, a plaque with all three unique designs was presented to the principal of each school which thanked the school for their participation in this project. Fourth and finally, the weekend prior to the presentation, six storm drain markers were installed at each school. A challenge was presented to the children of the school to find and identify their storm drains at their school during the morning presentation. At the completion of the installation of the storm drain project, markers were installed at two separate elementary schools, one middle school and at the High School, all of which are directly located within this project area.

Usage of the Media

In order to promote the restoration effort and reach larger audiences to provide information on best management practices and advance environmental stewardship within the larger community the local media was contacted. Through the newspaper, three articles were published related to the efforts of the Clean Lakes Project. In

addition, two local television networks provided coverage on Clean Lakes Promotional presentation at the County Commission meeting.

The first article I wrote (appendix E) informed the readers of the purpose of the restoration effort and how the Clean Lakes Project would implement the restoration effort and promote environmental stewardship within the affected community. The second article (appendix F) had a more local flavor to it. This article reiterated the restoration objectives and promoted the need for community involvement for the long-term success of this improvement plan. The third article (appendix G) promoted the stormwater drain marker initiative. This article sighted the efforts of the local schools in this effort to inform and remind residents of the purpose of stormwater drains. Each article also served to promote the educational web site, asking readers to visit the site for additional information related to the topics of environmental stewardship at the residential level.

The last use of the media happened out of the success of the stormwater drain marker initiative and recognition received from the Florida Section of American Water Works Association (FSAWWA). The American Water Works Association is an *international*, nonprofit, scientific, and educational association dedicated to improving drinking water for people everywhere. The Florida Section includes 130 utility members that collectively supply potable water to more than 80 percent of Florida's population. Utilities, scientists, educators, engineers, water plant operators, regulators, public officials, consultants, manufacturers, and consumers can be found among the active participants in the FSAWWA.

The Clean Lakes Project received second place for the 2007 Water Conservation Award for Excellence in Public Education/Community Relations. The Project received this award in recognition for the broadly integrated and extremely well coordinated environmental educational outreach approach that was utilized for the Killearn Lakes Restoration Project. By receiving this award, the initiatives utilized in this outreach effort successfully connected with a much larger audience of concerned professionals to be able to incorporate our educational approach into their programs. The recognition received by the award and the promotional success of the storm drain markers attracted the attention of the Leon County Commission to the project. The Commission then requested that the Clean Lakes Project make an award presentation to the Commission at

one of their scheduled meetings. This presentation acknowledged the financial contributions and support of Leon County in addition to reminding the Commissioners of the broad success of the Clean Lakes Project. I designed a plaque that was presented to the Commission which included the six storm drain markers from the elementary school children and a dedication inscription.

After this presentation to the County Commission, the local television news channels interviewed me on the Clean Lakes Project. Through both interviews, I stressed the importance of local environmental stewardship and the significance of bringing funding opportunities to the communities impacted by degradation of their environment. I reiterated the importance of citizens taking responsibility at their homes and within their community to improve the health of their land and water bodies.

Through the FSAWWA's recognition of the innovativeness and uniqueness of this project, coupled with the request from the County Commission, the Clean Lakes Project was able to utilize this exposure received and to further promote its mission to a broader audience. It was extremely important to be able to identify opportunities and successfully manage these unplanned events. The core message of the importance of best management practices at individual homeowners' level was successfully presented and reinforced at a wide variety of levels.

CHAPTER 5

The Tools of Assessment

The environmental educational outreach effort was a concerted effort to identify, contact and inform resident of Best Management Practices (BMPs) that can improve the surface water quality of their neighborhood lakes. One objective of the research was to perform an assessment of the efficacy of the success, or failure, of the outreach effort. The tools utilized for the assessment included a resident survey on the Clean Lakes Project and analyses of the educational web site. Through these assessment tools it was possible to examine from a variety of perspectives the outreach efforts extent and depth of interaction and education of the target population that it reached.

Survey Design

The intent and basis of the design of this survey was to assess the views of the overall success of educational outreach effort through the Clean Lakes Project as seen from the homeowners of the target community. This intent was the dominant factor in the design layout and tailored the question selections of the survey. The survey scope included identifying homeowners in the target neighborhood and providing these individual homeowners with a survey that was simply presented and that they would be willing to complete. This required easy-to-follow design layout and language was required so that the survey could be easily understood by a large sector of the population.

The survey design was modeled after both Cohen's, 1988 and Dillman's 2000 recommendations of arranging the questions in a thematic approach, avoiding ambiguity with the questions and demonstrating a sense of trust and understanding with the respondents. There were eighteen questions that required either a single or multiple responses. There was also space available for comments that respondents could provide additional details. The survey was printed on one sheet of paper utilizing the front and back of the paper. Figure 19 provides the final survey design that was used and distributed to the residents of the target neighborhood.

Assessment of Killearn Lakes Plantation Restoration Clean Lakes Project Educational Outreach Efforts

Please take a moment to answer these questions to assist in future environmental outreach efforts.

Your opinion will make a difference!

What is your age?

- 18-30
- 31-54
- 55 and over

Do you rent or own?

- Rent
- Own

How would you rate your household's level of environmental awareness?

- Low
- Medium
- High

Identify what routine environmental practices are applied in your household? (Check all that apply)

- Recycling
- Mulching & composting
- Fertilizer runoff control
- Water usage conservation
- Energy conserving lighting
- Wildlife friendly lawns

How many individuals live in your home?

- 2 or less
- 3 to 4
- 5 to 6
- 7 or more

Is your home on sewer system or septic tank?

- Sewer system
- Septic tank
- Do not know

Do you feel that your house and property adversely affect the water quality of your lakes?

- Yes
- No

Are you aware of the lake restoration efforts in your neighborhood?

- Yes
- No

If you are aware of the restoration work, how did you stay informed of the progress? (Check all that apply)

- *Lakes View* homeowners' association magazine
- Project bimonthly newsletter inserts in *Lakes View*
- Project web site
- Newspapers
- Other _____

Of the Clean Lakes Restoration community outreach efforts, which were you aware of?
(Check all that apply)?

- Project bimonthly newsletter inserts in *Lakes View*
- Project web site
- Newspaper articles
- Community social gatherings
- Homeowner Association meetings
- Lakefront property owners educational packets
- Storm water drain markers

Has the Clean Lakes outreach effort increased your awareness of home and lawn best management methods to improve your lakes' water quality?

- Yes
- No

Figure 19 Survey used for the Assessment of Educational Outreach Effort

In what areas of **home** best management methods has your awareness increased due to the Clean Lakes outreach effort? (Check all that apply)

- Proper disposal of used oil, paint, hazardous household materials and similar products
- Recycling
- Water usage conservation
- Septic tank

In what areas of **home** and best management has your increased awareness translated into direct day-to-day practice due to the Clean Lakes outreach effort? (Check all that apply)

- Proper disposal of used oil, paint, hazardous household materials and similar products
- Recycling
- Water usage conservation
- Septic tank
- None

What do you consider to be the best method to improve long-term water quality in your lakes? (Check all that apply)

- Lake bottom dredging
- Decrease nutrient loading
- Require sewer system hookup
- Re-planting of appropriate wetland and upland species along water bodies
- Individual homeowners implement environmentally sustainable best practices

In what areas of **lawn** best management has your awareness increased due to the Clean Lakes outreach effort? (Check all that apply)

- Erosion control
- Storm water control
- Storm water treatment
- Mulching & composting
- Fertilizer and pesticide usage
- Wildlife enhancement
- Pond and lake natural buffers

In what areas of **lawn** best management has your increased awareness translated into direct day-to-day practice due to the Clean Lakes outreach effort? (Check all that apply)

- Erosion control
- Storm water control
- Storm water treatment
- Mulching & composting
- Fertilizer and pesticide usage
- Wildlife enhancement
- Pond and lake natural buffers
- None

In ten years what level of success would you give the Killearn Lakes Plantation Restoration Clean Lakes Project on sustaining local lake water quality?

- Low
- Medium
- High

Additional Comments

Thank you for your participation!

Figure 19 continued Survey used for the Assessment of Educational Outreach Effort

Based on the thematic design and approach that was utilized for this survey, the first set of questions elicited demographic data from the respondents. The survey questions asked respondents their age based on a scalar range; the number of individuals that lived in their home; if they owned or rented their home and if their house was hooked to the municipal sewer system or a septic tank. With this demographic data, a conceptual sketch of the respondent would begin to take shape.

The questions that focused on past and current behaviors were intended to bring out from respondents actions that potentially affect lake water quality both positively and negatively. The question that addressed current environmental practices provided the respondent with a host of home and garden best management methods that are considered steps individuals can implement at the home level to practice environmental stewardship. This question was framed broadly enough to capture a variety of practices emphasized by the Clean Lakes Project, as well as practices that are promoted by utility providers and the local TAPP program. Two of the survey questions focused specifically on issues either directly addressed in the outreach effort or by external resources sited by the outreach effort. With these questions, the respondents were asked to cite what practices they utilized in their home and lawn based on information provided from the outreach effort.

Questions that focused on the respondents' awareness and level of knowledge were intended to determine the level of awareness residents have concerning the Clean Lake Project. In addition, these questions probed the level of knowledge concerning the environmental condition of the community lakes and practices that can improve the health of the lakes. The survey questions that were used to determine if residents were aware of the Clean Lakes Project included monochromatic responses as well as questions that allowed the respondents to identify the source of information that most effectively reached them. One question was crafted explicitly to address the issue of lake restoration and long-term water quality improvement methods. With this question, respondents were able to select multiple responses and as such, the survey explored the homeowners' perceived and explicit knowledge of the subject.

Survey questions investigating the attitudes, opinion and motivations of respondents associated with environmental stewardship and the Clean Lakes Project were

carefully constructed. These questions allowed respondents to rank their level of environmental awareness as well as if they considered their homes point sources of pollution for the neighborhood lakes. In addition, respondents were asked to rank the overall long-term success of the Clean Lakes Project on sustaining local lake water quality. This question provided insight into the opinions of respondents to local restoration projects and the level of success that they perceive such efforts have for a community.

Survey Assessment

The survey was administered at the neighborhood Fall 2007 festival. This festival was open to all residents within the community. The overall community ambiance for the festival simply could not have been better. One of the community parks served as the location and the mood of the festival was festive. The party ran from eleven in the morning till four in the afternoon. The day was a picture perfect Florida fall day with bright blue skies and a light breeze. The residents and their guest came by choice and all activities were open and free.

The setting included a variety of carnival activities including moonwalks, a mechanical bull ride, a parachute ride and pony rides. In addition, there was an area set up for remote control airplanes and casting contest with rods and reels. Finally there was an assortment of food and drinks available including kegs of beer, sodas and waters, food included hamburgers, chicken, hotdogs and assortment of sides and desserts. Throughout the day, a DJ provided music for the festival attendees and line and group dancing continued through the day.

The homeowner's association sponsored the day's events and all the board members worked the food preparation area and wore their association's shirts to identify them as homeowner representatives. This continual reminder along with the entire event sponsored by the homeowner's association created a level of acceptance and expectation that property related issues and projects would be a component of the day's activities. One of the educational aspects of the project was to have a continual availability of information at events such as this one. A physical presence and interactive display of information for the homeowners to obtain information on the project at their chosen level

was available. As such, the opportunity to interact with residents and request their participation in the survey was performed at that time.

Sixty-six surveys were completed by residents at the event over the 5-hour period. One of the most surprising observations made during the administration of the survey was the extended length of time that residents took to respond to the questions of the survey. It was estimated that the survey would take approximately five minutes to complete. However, the average length of time for survey completion was twice that, part of the reason for this longer time is attributed to the setting of the park. Individuals were able to be more contemplative on their responses and reflective on their home and garden practices in this setting. Another bonus to having the survey administered at the festival was the ability to listen to respondents interpretations of the questions. When a survey is mailed to a resident for completion, it is highly probable that that survey will be unopened and never completed and returned to the researcher. In addition, the wording, regardless of the care in the design and intentional effort to be direct and straightforward, has different meanings and interpretations by the survey respondents.

One example of an interpretation of a question can be found in the question: *How would you rate your household's level of environmental awareness?* As the researcher, this question was intended to probe the respondents' prior and current knowledge of environmental stewardship practices such as BMP for lawns and gardens along with local, state and federal environmental issues of concern. An interpretation from a respondent was to consider the positive use of a commercial pest control service as environmental awareness. Yet another respondent considered themselves environmentally aware because they spotted a white tail deer in their back lawn. These observations demonstrate some of the challenges that survey data presents.

The demographic data from the survey provided an image of the neighborhood's residents. A majority of the respondents were between the ages of thirty-one and fifty-four (84.6%). The average household had three to four individuals living in the house. In addition, the respondents owned over ninety percent of the homes. Finally, of the homes taking the survey, almost two thirds of the respondents reported that they were hooked to the municipal sewers system. The demographic data results are summarized in table 2.

Table 2 Demographic Survey Results

Age range	Frequency	Valid	
		Percent	Percent
18-30	4	6.1	6.2
31-54	55	83.3	84.6
55 and over	6	9.1	9.2
Total	65	98.5	100

Individuals			
living in house	Frequency	Valid	
		Percent	Percent
2 or less	13	19.7	21.3
3 to 4	33	50	54.1
5 to 6	15	22.7	24.6
Total	61	92.4	100

Sewer or Septic	Frequency	Valid	
		Percent	Percent
Sewer			
System	36	54.5	62.1
Septic			
System	21	31.8	36.2
Do not know	1	1.5	1.7
Total	58	87.9	100

From the question, *Identify what routine environmental practice are applied in your household? (Check all that apply)*; it is possible to discern from the residents those environmental practices that have been encouraged and promoted through a variety of sources. Interestingly, these practices that are promoted most fervently from a variety of sources, are the practices most readily incorporated into day-to-day routines. Recycling, energy conservation and disposal of hazardous household products all were the most popular routines incorporated in the household. On the issues of lawn BMPs, practices that would have the greatest impact on improving water quality such as fertilizer runoff control along with erosion and stormwater control less than half of the residents responded that they practiced these techniques on their properties. From this you see that

the routine environmental practices used by individual homeowners is much more focused on energy conservation and recycling of household trash within the home compared to the lawn and garden practices that impact the health of the community's surface water. Table 3 provides a summary of the respondents' answers.

Table 3 Summary of Percent of Environmental Practice Applied in Households

Response	Fertilizer		Energy		Wildlife
	Recycling	Runoff Control	Water Usage Conservation	Conservation	Friendly
				Lighting	Lawns
Yes	93%	23%	62%	70%	41%
No	6%	76%	37%	29%	58%
Response	Proper				
	Stormwater		Restrictive	Disposal of	
	Control	Erosion Control	Pesticide Usage	Hazardous Materials	Septic Tank Maintenance
Yes	32%	41%	41%	80%	32%
No	67%	58%	58%	19%	67%

Respondents were asked: *In what areas of home best management has your increased awareness translated into direct day-to day practices due to the Clean Lakes outreach efforts? (Check all that apply)*. This question was presented to probe the impact the educational outreach effort had on residents with their routine home activities. The outreach effort addressed these home BMPs either directly or through the literature and web site links provided by outside agencies. It was found that just as with the earlier response, recycling and waste management had the most gains. Table 4 provides a summary of the responses received.

Table 4 Summary of Percent of Home BMP Influenced by the Outreach Effort

Disposal of Hazardous Materials		Water		
Recycling	Conservation	Septic Tank	None	
30%	36%	26%	11%	9%

A similar question was posed to the respondents that focused on lawn BMP: *In what areas of lawn best management has your increased awareness translated into direct day-to-day practices due to the Clean Lakes outreach efforts? (Check all that apply).* This question was designed to investigate how the outreach effort had influenced the behavior of residents in their lawn and garden practices. The gains in lawn and garden BMPs were not as great as with the home BMPs. This once again demonstrated a disconnect between home versus lawn and garden practices as it related to environmental stewardship. Table 5 provides a summary of the responses received.

Table 5 Summary of Percent of Lawn BMP influenced by the Outreach Effort

Erosion Control	Stormwater Control	Stormwater Treatment	Mulching & Composting
21%	14%	3%	18%
Pond &			
Fertilizer & Pesticide	Wildlife Enhancement	Lake Buffers	None
12%	11%	11%	15%

Questions that focused on the respondents' awareness and level of knowledge were designed to discern the level of awareness residents had concerning the Clean Lake Project along with the outreach efforts methods providing educational materials to the

neighborhood. First it was important to establish if the respondents were simply aware of the project in their neighborhood. The monochromatic question was posed: *Are you aware of the lake restoration efforts in your neighborhood?* Almost half of the respondents said they were aware of this project. Table 6 provides a summary of results.

Table 6 Summary of Respondents Awareness of the Restoration Effort

Response	Frequency	Valid	
		Percent	Percent
Yes	31	47%	47.7%
No	34	51.5%	52.3%
Missing	1	1.5%	
Total	66	100%	100%

Next it was important to determine how the respondents were able to stay informed of the project. With that, the question was presented: *If you were aware of the restoration work, how did you stay informed of the progress? (Check all that apply).* From the choices, residents found the most convenient sources to stay informed was from their associations bimonthly magazine, followed by the projects newsletters and newspaper articles. Table 7 Provides the results of how respondents responses to this.

Table 7 Summary How Respondents Stayed Informed of the Restoration Progress

Response	Project				
	Lake View Magazine	Bimonthly Newsletter	Project Web Site	Newspapers	Other
Yes	49%	19%	8%	19%	13%
No	51%	81%	92%	81%	87%

The survey also provided a question that allowed for a separation between residents being aware of the physical restoration work of the project with the educational outreach component of the project. The question: *Of the Clean Lakes Restoration community outreach efforts, which were you aware of? (Check all that apply)*; this question was aimed at teasing apart that difference. The respondents were asked to differentiate the educational components geared toward informing residents of BMPs at the home level compared to simply being aware of a lake restoration effort. Here it was found the most effective method was the projects bimonthly newsletter inserts, over a third of the respondents said they at least saw these inserts. Table 8 provides a summary of these results.

Table 8 Summary of Respondents' Awareness of Clean Lakes Project Outreach Efforts

Outreach Effort	Yes	No
Project Bimonthly Newsletter	38%	62%
Project Web site	14%	86%
Newspaper Articles	29%	71%
Social Gatherings	7%	93%
Homeowner's Association		
Meetings	32%	68%
Lakefront Educational Packets	9%	91%
Stormwater Drain Markers	10%	90%

Through the survey, a question was designed to explore the understanding respondents had of the mitigation methods employed to improve the lake water quality and what would have the greatest sustainable impact for the lake. The question: *What do you consider to be the best method to improve long-term water quality in your lakes? (Check all that apply)*; allowed respondents to explicitly demonstrate their knowledge of surface water environmental sustainability. It was found that a majority of residents understood that the impact of non-point source pollution was a contributing factor in the

degradation of surface water quality. Table 9 provides a summary of the responses received.

Table 9 Summary Best Methods to Improve Long-term Water Quality

Long-Term lake water quality	improvement method	Yes	No
Lake bottom dredging		21%	79%
Decrease nutrient loading		36%	64%
Require sewer system hookup		40%	60%
Replanting of appropriate wetland and upland species along water bodies		55%	45%
Individual homeowners implement environmentally sustainable best practices		62%	38%

The most challenging areas to examine through a survey are the attitudes, opinions and motivations of respondents. Within the confines of this survey, the internal issues of environmental stewardship was probed attempting to create a deeper understanding of the respondents views of themselves as environmental stewards and their roles in affecting the health of their surface water. To obtain this insight, two questions were posed to the respondents. First the survey asked: *How do you rate your household's level of environmental awareness?* Here respondents could rank their opinions of how environmentally conscious they consider their households. It was found that an overwhelming number of respondents considered their families aware of environmental issues. The next question was: *Do you feel that your house and property adversely affect the water quality of your lakes?* With this question respondents were specifically challenged to consider their property as a point source for pollution. The responses were evenly split on the individual attitudes related to their personal property and practices. Table 10 provides a summary of the responses received

Table 10 Summary of Environmental Awareness and Home Impact on Water Quality

	Low	Medium	High
Household's level of environmental awareness	3	50	47
	Yes	No	
Does your home adversely affect the water quality of your lakes	48	52	

The final question on the survey was offered to gain understanding into respondent's attitudes about the restoration projects and this project's impact on improving water quality: *In ten years what level of success would you give the Killearn Lakes Plantation Restoration Clean Lakes Project on sustaining local lake water quality?* Here it was found that the respondents reacted favorably to the restoration efforts. There was a genuine belief that this project would have a lasting impact on the water quality of their neighborhood lakes. Table 11 provides a summary of the findings to this response.

Table 11 Summary of Long Term Success of Clean Lakes Project

	Low	Medium	High
Level of success of the Clean Lakes Project on water quality after ten years	9%	50%	41%

Assessment from the Web Site

The educational web site was designed for two major purposes. First, the site was designed to provide direct and current information about the restoration project efforts. Next, it was intended to be a resource for visitors to provide useful information on practices that would aid in home and lawn environmental stewardship. The site was specifically designed to attract the residents of the target neighborhood. The ability to

utilize the web site as a method to assess its effectiveness as an educational component of the project developed after the web site had been developed and the project was well underway.

Initially, the site was installed with a simple external web site counter. This counter recorded the number of visits the site received. The visits or hits, recorded the traffic that visited the main front page of the web site. The web counter was started at 500, in April of 2007 and remains active on the site. Figure 20 provides the trending of the number of hits the site has received.

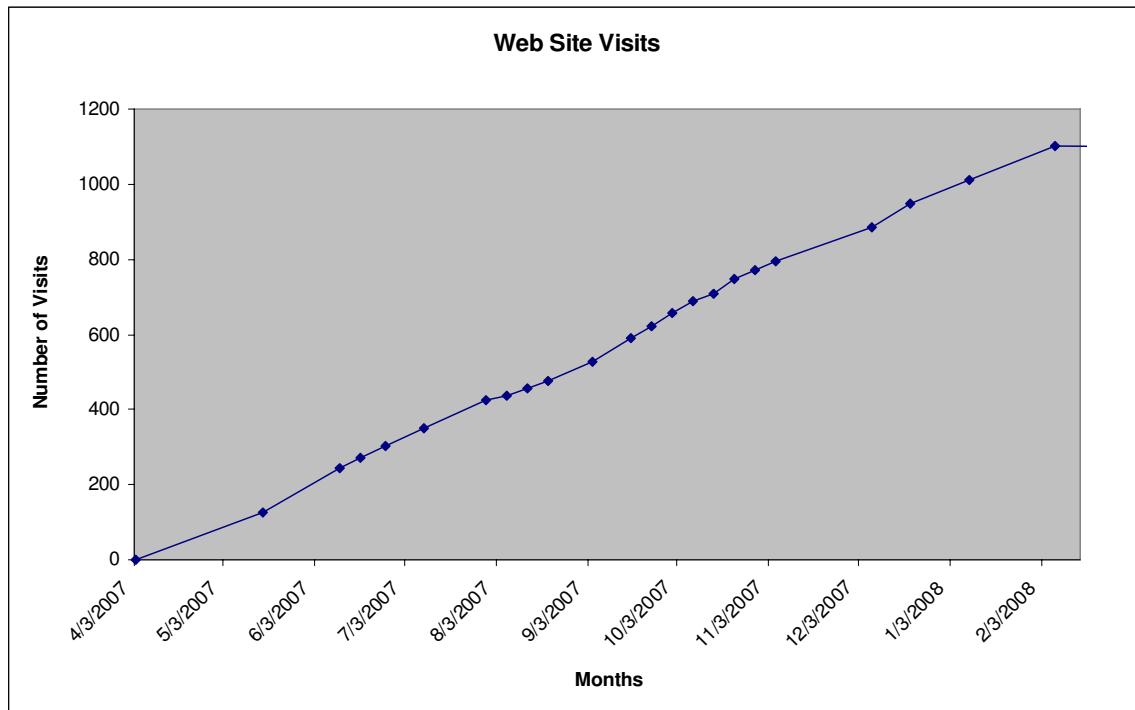


Figure 20 Number of Visits to Killearnlakes.org

From this data it is seen that the number of visitors to the site is steadily increasing at a modest rate. However, what one does not see is any trending data; nor is there the ability to discern: from where these visits are coming from; how long the visits last; or any other trending data that could assess the effectiveness of the web site. In fact,

the web counter serves only to establish that the site is receiving visit and provides no clear notion for what purpose the site was visited

In late December of 2007, I became aware of a web site analytical service that could easily be incorporated into the web site to garnish data that would provide a better understanding of who and how the site is being utilized. In January 2008, Google Analytics was added to Killearnlakes.org. Google Analytics is a free web site analysis tool that provides in depth reports about the traffic that visits a web site. This web tool addition allowed for a broader and better defined view of Killearnlakes.org and how the visitors reached and interacted with the sites content.

Data were collected for one month from this new tool and a clearer image emerged of the visitors to Killearnlakes.org and how they interact with the site. First, for the one month of data collected, there were 125 visits to the web site of that 101 were absolutely unique visitors to the site. Figure 21 provides summary of visitor information for the site. It is seen from the figure that an average of three pages were visited and that visitors spent an average of two minutes on the site during their visits. In general, high speed Internet connections were used and Microsoft's Internet Explorer was the dominant browser utilized.



101 people visited this site

125 Visits

101 Absolute Unique Visitors

376 Pageviews

3.01 Average Pageviews

00:02:11 Time on Site

52.00% Bounce Rate

80.80% New Visits

Technical Profile

Browser	Visits	% visits	Connection Speed	Visits	% visits
Internet Explorer	101	80.80%	Cable	45	36.00%
Firefox	22	17.60%	DSL	36	28.80%
Safari	1	0.80%	Unknown	27	21.60%
Mozilla	1	0.80%	T1	13	10.40%
			Dialup	2	1.60%

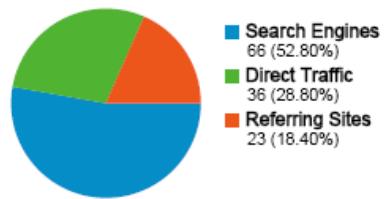
Figure 21 Summary of Visitor Profile to Killearnlakes.org

This analytical tool also allowed for the separation of how the visitors came to Killearnlakes.org. This traffic source differentiated between direct traffic to the site where a visitor would go directly to the web site; referring site traffic which is when a hyperlink is clicked on the referral site and the visitor is taken to Killearnlakes.org; and search engine traffic. The keywords used to find the web site by the search engine are also provided. Figure 22 provides a summary of the traffic sources for Killearnlakes.org.



All traffic sources sent a total of 125 visits

- 28.80% Direct Traffic
- 18.40% Referring Sites
- 52.80% Search Engines



Top Traffic Sources

Sources	Visits	% visits	Keywords	Visits	% visits
google (organic)	50	40.00%	killearn lakes	3	4.55%
(direct) ((none))	36	28.80%	killearn	2	3.03%
killearnlakeshoa.org (referral)	12	9.60%	killearn lakes neighborhood	2	3.03%
yahoo (organic)	7	5.60%	"bathymetric survey * lake "	1	1.52%
internal.moorebass.com	5	4.00%	best project, tallahassee	1	1.52%

Figure 22 Traffic Sources for Killearnlakes.org

Killearnlakes.org was designed to be a local web site geared specially for the residents of the target neighborhood. With Google Analytics a visitor profile emerged, it was now possible to determine where the visitors were geographically located in a much more detail approach. This tool allowed for a location map to emerge of the visitors. As of February 7, 2008 the site has received visitors from three countries. The United State brought in the most traffic, with visitors from twelve States. Of the States, Florida leads with the most visitors to the site. Figure 23 provides a map of the States that have visited Killearnlakes.org.

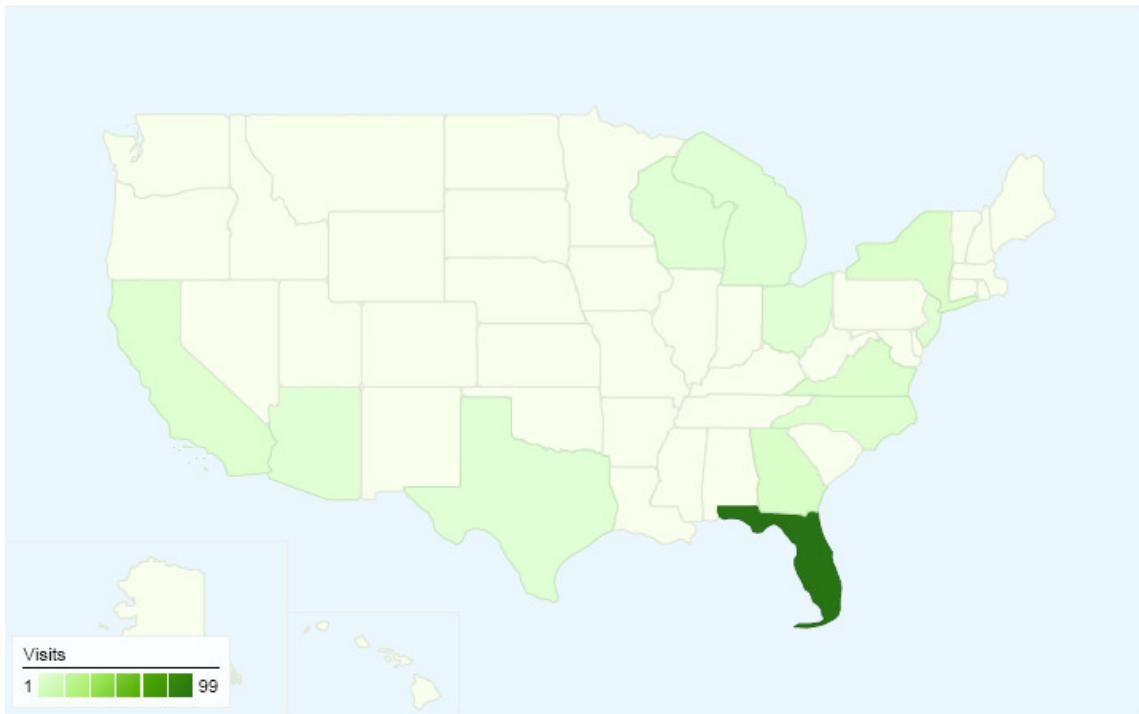


Figure 23 Map of Distribution of Site Visitors from United States

The analytical tools allow for an even finer level of detail to the location profile of the site visitors. At the State detail level, it was discerned that of the 125 visit for the recorded month, 99 came from Florida. Of those Florida visits, seventy-five percent came from Tallahassee. This information provides supporting evidence that a majority of visitors to Killearnlakes.org are from the geographic region where the project was conducted. Figure 24 illustrates the geographic distribution of the Florida visitors to the web site.



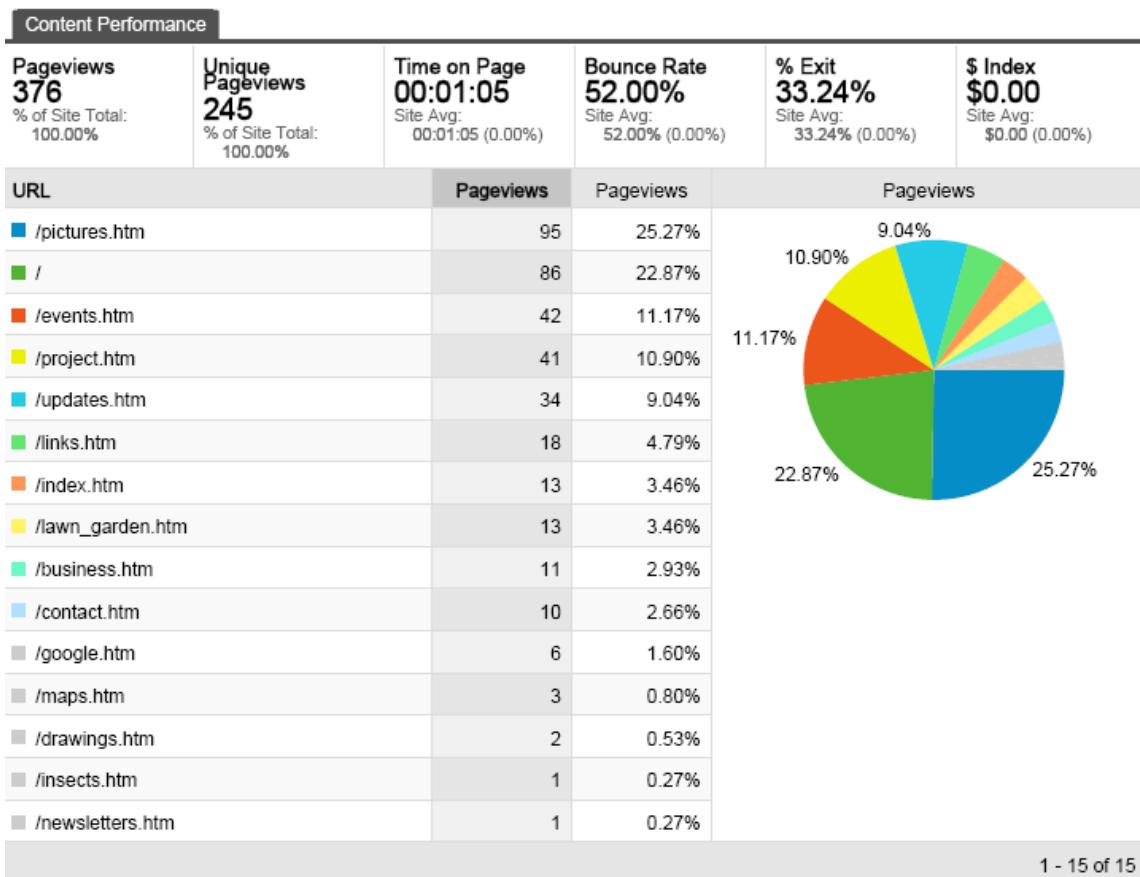
This state sent 99 visits via 18 cities

Figure 24 Map of Distribution of Site Visitors from Florida

Through the use of Google Analytics the multiple layers of the visitors emerged. Their geographic locations, browser profiles, network locations, connection speeds and even more significant what became known was their time spent on the site and where they would specifically go when visiting Killearnlakes.org. From the one months worth of data collected, it is possible to see where in the web site visitors went, what was the most popular area of the site, on average how long visitors stayed at the individual pages of the site and when those specific pages were visited. As the data unfolded it became evident which page was the most popular on the web site. The most visited page on the web site was the pictures page followed closely by the front page of the site. Figure 25 provides a summary of the pages viewed by the visitors to Killearnlakes.org.



15 URLs were viewed a total of 376 times



1 - 15 of 15

Figure 25 Summary of Pages Viewed by Visitors

Conclusion

The ability to determine the efficacy of the environmental educational outreach effort involved various techniques. The survey data provided a demographic portrait of the neighborhood as well as insight into the respondents' home and lawn practices, knowledge of the Clean Lakes Projects and ideas on environmental stewardship. The

educational web site not only served as a component of the outreach effort but also as a separate tool in assessing usage patterns and providing a comprehensive profile of the users of the web site. With this information, the research assessment and addressing the core questions of this study in deeper and richer detail have been made possible.

CHAPTER 6

EXPLORING THE RESEARCH QUESTIONS

The analysis of this educational outreach effort assesses the overall effectiveness of the outreach effort as it relates to the residents of the target neighborhood. There were a variety of initiatives undertaken during the course of this educational outreach effort and the ability to capture the specific components that effectively reached the residents was a critical element of this research. In addition to this aspect of the assessment, it was also significant to understand not only if the information was reaching the residents but also to what level and how that information was translated into the practices of homeowners as it specifically relates to environmental stewardship. Here the research explored the connectivity between the knowledge and the behavior of the residents within the target neighborhood.

Research Questions Addressed in This Study

The focal point of this research was guided and directed by investigating these key fundamental inquiries:

- From the educational outreach effort, have residents level of awareness been heightened to promote consideration as it relates to the water quality of the lakes in their community? Specifically:
 - Do residents within the affected area recognize the issues of concern that the educational outreach initiative addresses?
 - Do residents within the affected area consider their homes a potential point source of the pollution within their community lakes?
 - Has the educational outreach effort promoted any effective change in home/lawn practices?
- Of the educational outreach approaches employed, which are most effective in reaching a large suburban community?

One of the greatest obstacles in environmental education is that chasm that exists between knowing and action (Coyle, 2005; Hungerford & Volk, 1990; Meredith et al., 2000; Tompkins, 2005). The ability to impart knowledge that moves beyond the level of

information and translates into tangible action on the part of the receiver of that knowledge is a formidable challenge (Anderson, et al, 2006; Disinger, 2001; Hungerford & Volt, 1990; Roth, 2004). With this difficult challenge, the major research question emerged; this broad question became; *From the educational outreach effort have residents level of awareness been heightened to promote consideration as it relates to the water quality of the lakes in their community?* In order to address this topic, it was necessary to tease apart this question and explore individual components.

Research Question One

From this above question, further refinement was required to establish a baseline for this project. This question addressed this requirement: *Do residents within the affected area recognize the issues of concern that the educational outreach initiative addressed?* In the most basic of terms, the research question was intended to ascertain if there was a level of understanding that exists of the concerns facing the community related to the environmental health of their neighborhood. At this level, it was not significant if the residents were specifically aware of the Clean Lakes Project, only to establish their content knowledge related to environmental awareness. As such, the most fundamental issue was to establish how residents rated their individual level of environmental awareness. From the survey data, very few felt ill-informed on environmental issues. In fact, 97% considered their household's awareness level as medium to high related specifically to environmental awareness. Table 12 provides a summary of these findings.

Table 12 Households Level of Environmental Awareness

Households level of awareness	Percent
Low	3%
Medium	50%
High	47%

Moving beyond this straightforward response received from the rating of environmental awareness, I next inquired from residents their routine environmental practices applied in their households. By inquiring about practices utilized in the home as related to environmental stewardship, it is then possible to expand upon that foundation knowledge to understand the level of awareness residents have related to environmental issues within their neighborhood. Essentially, through the act of performing routine environmental practices, there is an assumed level of understanding associated with that act. For example, it is a safe conjecture to make that an individual that collects paper for recycling understands that that paper will not end up in the landfill, but be re-utilized and put back into production. There is an assumed level of knowledge related to the issue of recycling that is made with the act of recycling, that knowledge implies understanding and the fuller purpose of the effort of recycling the paper.

This same assertion can be made with other routine environmental practices applied to the home. In the survey, the question was posed: *Identify what routine environmental practices are applied in your household? (Check all that apply)*. With this question, residents were able to identify those practices that they performed at home. As with the example with recycling of paper, there is an assumed level of understanding that exists with the specific employed practice that is sited on the survey. Therefore, if a resident responded that they applied *water usage conservation or properly disposed of their used oil, paint, hazardous household materials or similar products* then there is a level of expected understanding in the performing of those specific acts. With water usage conservation inquiries, this understanding could be linked to the understanding of the cost of the residential utility bill and have very little to do with environmental stewardship. However the same cannot be said for hazardous materials disposal, with this practice there is a much stronger link to the concept of environmental stewardship and the outcome of contaminating land or water if that material is not handled in a responsible manner by the resident.

Of the practices sited on the survey for residents to respond to, only one practice was not part of the Clean Lakes outreach effort. Energy conservation lighting was not an issue specifically addressed as an educational component of the project. The remaining nine practices were issues addressed through the Clean Lakes Project either through

direct contact with residents, newsletters, school outreach, educational web site, or newspaper articles. Figure 26 provides a summary of the responses received and their percentage breakdown of the baseline routine environmental practices employed by residents.

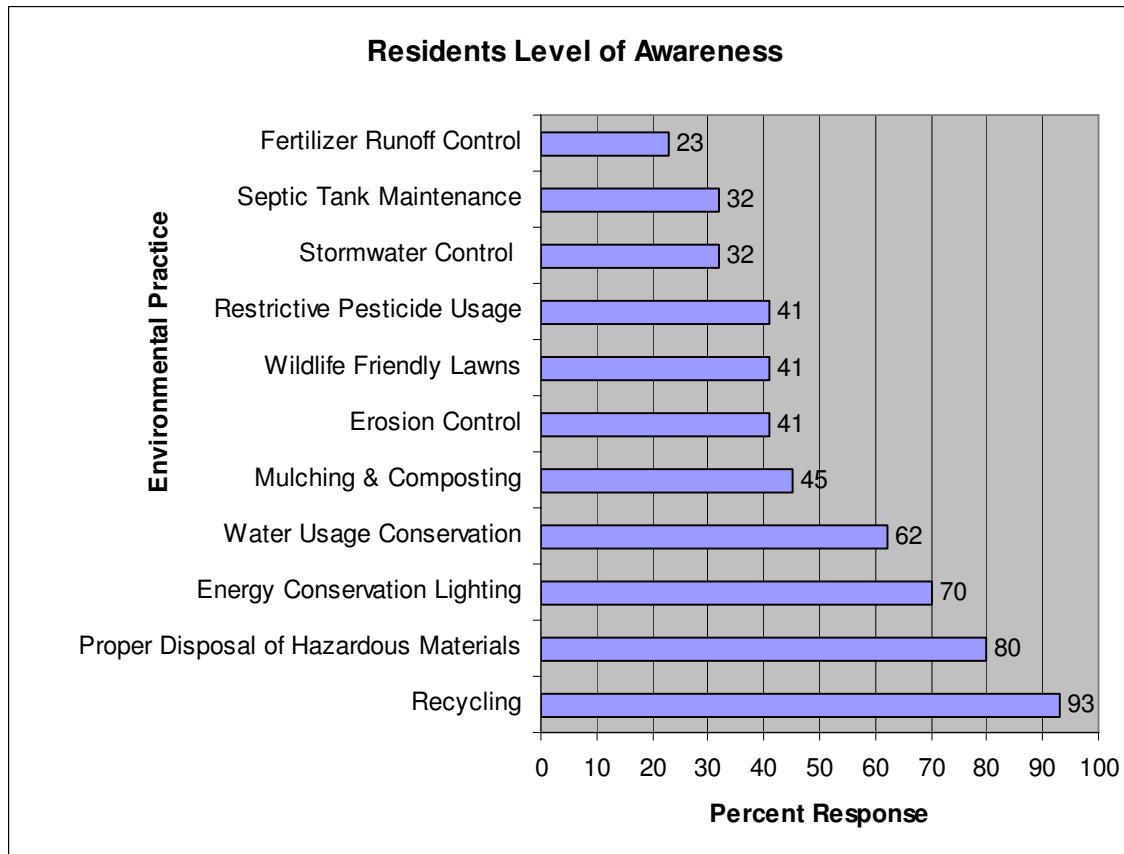


Figure 26 Summary of Residents Responses to Environmental Practices and Awareness

From the above chart, less than half of the residents practiced lawn Best Management Practices (BMP) on a routine bases. Issues and practices associated with surface water quality where individual homeowners can make a difference in the quality and quantity of the stormwater leaving their property are not routine in over half of the residents. Only twenty-three percent of the residents made an effort to control their

fertilizer applications in an environmentally responsible manner, even while one of the most offensive practices of nutrient loading is associated with fertilizer runoff.

A component of the Clean Lakes outreach effort included a homeowner's tutorial about lake restoration components. These lessons were presented in a variety of manners and included a diverse source of informational material. Irrespective of how homeowners came to know about lake restoration methods, a question was presented in the survey to discern their level of understanding about how best to maintain the water quality of a lake. This question allowed for a window of understanding to open about: the issue of surface water quality; the long-term effects certain restoration practices have on the health of a water body; and how these practices are perceived by the homeowners of the target neighborhood. From the survey, it was found that over sixty percent of the residents recognized that to maintain a healthy urban lake, individual homeowners needed to be prudent in the home and lawn Best Management Practices (BMPs). It is also apparent that proper stormwater control through planting schemes to create buffer zones is recognized as a key to the success of a restoration project. Interestingly, it was found that forty percent of the residents realized that the use of a municipal sewer system can play an important role in the long-term health of a lake. Figure 27 provides a summary of the results of these findings.

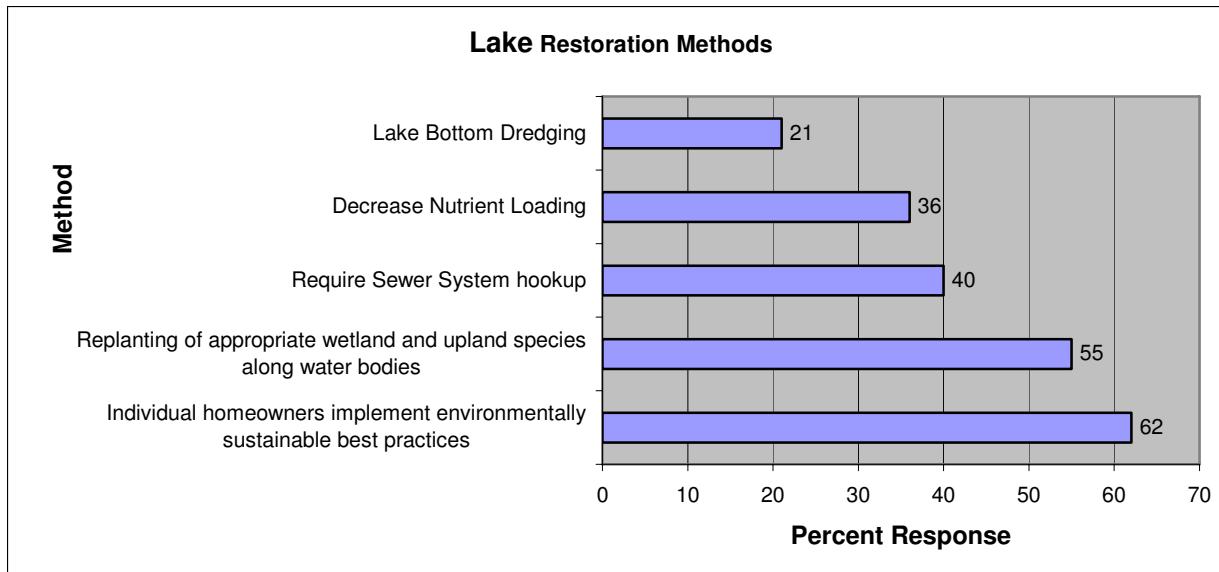


Figure 27 Summary of Response to Best Long-term Lake Restoration Methods

From the interpretation of the survey data, residents of the target neighborhood held a moderate level of understanding associated with the environmental issues and concerns addressed through the Clean Lakes outreach effort. This level of understanding is tempered by the fact that many of the residents apparently did not appreciate the significance of lawn and garden Best Management Practices (BMPs) at the home level yet recognized the importance of individual homeowners implementing Best Management Practices (BMPs) for long-term lake water quality. This represents a concerning discontinuity in knowledge versus practices.

Research Question Two

The term non-point pollution source in actuality is a misnomer; it is well documented where these sources of pollution come from. In the target neighborhood, every home is a potential source for pollution. Every street, lawn, garden, septic tank and garage all have the potential for being a sources of pollution to the lakes of the neighborhood. The challenge from an educational point of view is getting residents to recognize, that they have the potential to be a source that can impact the environmental health of their neighborhoods. From this challenge, the next research question emerged:

Do the residents within the affected area consider their homes a potential point source of the pollution within their community lakes?

It was possible from the survey to directly query the residents with this question of: *Do you feel that your house and property adversely affect the water quality of your lakes?* This question allowed residents to reflect and honestly evaluate their home as a potential point source of pollution of the neighborhood lakes. This inquiry also established if residents felt their homes were part of the problem associated with the deteriorating water quality of their local lakes. From the survey, it was found that the responses to this question were for the most part evenly split with forty-eight percent responding they did adversely affect the water quality and 52 percent saying they did not have an affect on the water quality of their lakes.

The survey data allowed for a deeper analysis of the question of if residents considered their homes as potential point sources of pollution. It was possible to perform a cross-tabulation of the responses to determine if there were any trends developing. This examination was accomplished by comparing the survey responses to the question: *Does your home adversely affect the water quality of your lakes;* compared to the question of: *How would you rate your household's level of environmental awareness?* From this comparison, it is apparent that the level of environmental awareness has very little impact on the respondents' assessment of their home being a potential point source of pollution. One would like to see a higher correlation with residents who consider themselves well informed on environmental issues with an awareness of the impact their property has on the lake quality, however the data did not bear this out. Instead, what was seen was an overall similar response with the cross-tabulation data. Table 13 provides a summary of the cross-tabulation comparison.

Table 13 Cross-tabulation of Household's level of environmental awareness versus Does your home adversely affect the water quality of your lakes

		Does your home adversely affect the water quality of your lakes	
		Yes	No
Household's level of environmental awareness	Low	2%	2%
	Medium	24%	28%
	High	22%	22%

To delve deeper into if residents consider their homes a potential point source for pollution it was possible to review the survey data for the routine environmental practices used by residents at their homes. Although residents perhaps did not consciously consider their homes a potential source for pollution, if they follow Best Management Practices then in affect, they realize the potential does exists and there is some level of accountability associated with environmental stewardship practices. A cross-tabulation comparison was run between the response residents provided to: *Does your home adversely affect the water quality of your lakes*; to the responses of: *Identity what routine environmental practices are applied in your household*. Table 14 summarizes the findings; this comparison revealed that, on the whole, there was very little difference in the environmental practices between residents that considered their home a potential point source and those that did not consider their home a potential point source.

Table 14 Cross-tabulation of Household's level of environmental awareness versus Routine environmental practices applied at home

Routine Environmental Practices applied at home	Does your home adversely affect the water quality of your lakes	
	Yes	No
Recycling	46%	20%
Proper Disposal of Hazardous Materials	38%	40%
Water Usage Conservation	38%	29%
Energy Conservation Lighting	35%	33%
Restrictive Pesticide Usage	23%	12%
Mulching & Composting	19%	25%
Wildlife Friendly Lawns	17%	19%
Erosion Control	17%	15%
Septic Tank Maintenance	17%	12%
Fertilizer Runoff Control	12%	8%
Stormwater Control	10%	15%

Anecdotal information obtained via residents at the Kids Fishing Day in the spring of 2007 and the Fall Festival also revealed insight into the BMPs implementation process of homeowners. From the conversations that were held with residents that attended to the Clean Lakes Project booth, it was possible to actively engage residents in the discussion of BMPs. Here, although individual home sites were not singled out as potential sources of pollution, there was active engagement on the part of residents on the effect of stormwater on their properties and methods employed to control the ensuing sheet flow of water. Through these discussions, there was an active exchange of knowledge and the significance of certain BMPs were explained. It can be assumed that residents that engaged in these interactions became better informed neighbors for all in the community.

Research Question Three

The process of shifting information into knowledge and then into action is a process that varies from individual to individual. There is constant effort made from multiple fields of research to understand how and why this process occurs. The environmental educational efforts have been in this fight to motivate change even before Tbilisi Declaration in 1977. From that 1977 declaration came the objectives of: awareness; knowledge; attitudes; skills; and finally and most critical in all the steps of environmental education was the objective of participation (UNESCO, 1978). The Clean Lakes educational outreach effort made a concerted multifaceted attempt to meet the fundamental objectives outlined by the Tbilisi Declaration. This research project has attempted to ascertain the effectiveness of this rigorous outreach effort.

From the desire to discover the efficacy of the outreach effort the third research question emerged: *Has the educational outreach effort promoted any effective change in home/lawn practices?* This question explored how the Clean Lakes Project affected the residents within the target neighborhood and their practices of environmental stewardship towards their community. It was possible, with the administered survey, to investigate the relative level of success of the Clean Lakes Project from the perspective of the homeowners of the neighborhood. The survey probed the residents on how or if the Clean Lakes Project increased their understanding of BMPs for their home and lawn.

To measure the increase of awareness of BMPs related to environmental stewardship, two questions were presented on the survey. These questions explicitly queried the respondents on BMPs. The first question: *In what areas of home best management methods has your awareness increased due to the Clean Lakes outreach effort? (Check all that apply)* was designed to allow respondents to select those practices associated with their home where their knowledge increased due to some component of the outreach effort. Issues of proper disposal of household hazardous materials, recycling, water conservation and septic tank care were all addressed through the outreach effort and were offered as selections to choose from. The second question: *In what areas of lawn best management has your awareness increased due to the Clean Lakes outreach effort? (Check all that apply)* applied to those practices pertaining to lawn and garden BMPs that would most enhance the water quality of the community

lakes. Issues of: erosion control, stormwater, landscaping and planting schemes were presented. All these issues were addressed through the Clean Lakes outreach effort and reflect prudent methods for practicing environmental stewardship at the homeowner's level.

The survey results indicated that there were gains made in increased awareness with some of the respondents. The data indicated that issues associated with home BMPs faired better than lawn BMPs. Practices associated with recycling and water conservation had the greatest impacts with residents. However, the message of prudent lawn practices associated with fertilizer and pesticide usage and erosion control did reach and increase the knowledge of the residents in the target neighborhood. Table 15 provides a summary of the results collected from the survey of the increased awareness due to the Clean Lakes outreach effort. Table 15 shows that that respondents had increased awareness with all the major topics addressed through the Clean Lakes outreach effort. An essential point that should be made is that for every BMP that was addressed, there was some level of increased awareness that occurred in the target neighborhood. This increase awareness varied from fifty-one percent with recycling to nine percent with stormwater treatment.

Table 15 Percent of Respondents who increased their level of awareness due to the Clean Lakes outreach effort

Awareness increase of home and lawn BMPs	Yes	No
Recycling	51%	49%
Water Usage Conservation	43%	57%
Disposal of hazardous household materials	38%	62%
Fertilizer and pesticide usage	35%	65%
Erosion Control	32%	68%
Mulching and Composting	26%	74%
Septic Tank	25%	75%
Stormwater control	19%	81%
Wildlife enhancement	19%	81%
Pond and lake natural buffers	17%	83%
Stormwater treatment	9%	91%

The awareness level of respondents is one component in ascertaining the effectiveness of the outreach effort. Another useful tool is to determine if that increased level of awareness of BMPs translated into increased participation in those practices. Through the survey, two questions were presented to establish if there were any gains in BMPs from residents associated with their gains in awareness. Two questions were posed and analyzed: *In what areas of home best management has your increased awareness translated into direct day-to-day practice due to the Clean Lakes outreach effort? (Check all that apply)* and; *In what areas of lawn best management has your increased awareness translated into direct day-to-day practice due to the Clean Lakes outreach effort? (Check all that apply)*. Through a cross-tabulation analysis the increased awareness of residents was compared to the increased practice of residents. The results indicated that the greatest gains in increased practices were associated with home BMPs. However with lawn BMPs, reasonable gains in day-to-day practice were recorded. Table 16 provides a summary of these results.

Table 16 Cross-tabulation results of Increased Awareness versus Increased Practice of BMPs

Increased Practice of BMPs due to the Clean Lakes Project	Increased Awareness of BMPs due to the Clean Lakes Project
	Yes
Recycling	29%
Water Usage Conservation	23%
Disposal of hazardous household materials	23%
Erosion Control	23%
Mulching and Composting	17%
Fertilizer and pesticide usage	15%
Pond and lake natural buffers	11%
Septic Tank	10%
Stormwater control	9%
Wildlife enhancement	8%
Stormwater treatment	2%

If one were to take the survey results provided and make a determination based only on the interpretation of these results then the conclusion as to if the Clean Lakes outreach effectiveness of promoting change in home-lawn practices would be considered a modest success. However, a separate component of the outreach effort where quantitative data was not obtained was the school outreach component of the project.

Two elementary schools and one high school assisted with aspects of the Clean Lakes project. From these students, information was imparted and intrinsic educational project goals were brought home to the parents of these children. One example is presented from the Fall Festival event. It was at this event that the following interaction ensued. A mother and her elementary age daughter came by the Clean Lakes Project pavilion. At the pavilion I had arranged for a majority of the students art submissions for the storm drain marker art contest to be displayed for public viewing. These displays were very popular with the crowds at the Fall Festival. In front of the displays was a table with educational literature for residents to browse and take if they wished. I asked the mother if she was familiar with the work of the Clean Lakes Project in her neighborhood, as this question was being presented to the parent, her daughter was looking though the art on display.

The mother responded that she had not heard of the project so she was not familiar with these efforts and presented a tone of indifference. At that moment, her daughter returned very excitedly saying, "Mommy, I found it, I found it!" She had found her submission to the storm drain marker art contest that was held at her school. She wanted to share her work with her mother. The mother immediately had her attention drawn to the art and admired her daughter's work and many of the other works on display. She then returned to our conversation with renewed interest and we discussed the project: how it came about; what the goals were and how she could make a difference with environmental stewardship at the household level. Based on the behavior demonstrated by this individual, this parent went from indifference towards the Clean Lakes Project to a sincere desire to inform herself of the objectives of the project. Her motivation stemmed from the connection she had with her child. It was through that child that awareness for this one homeowner occurred.

The transition of effective change towards environmental stewardship cannot be sought or determined in an example such as this. In addition, it cannot be ascertained how many more parents have been affected through the actions and enthusiasms of their children who were touched by the outreach efforts at the schools. However, this one encounter that was observed provides insight of the outreach efforts affect on families of the target neighborhood through the children of the neighborhood.

To return to the original question: *Has the outreach effort promoted any effective change in home and lawn practices?*, the survey responses indicate that some of the residents present that this is the case. It is also evident that the project through the schools has touched the lives of some of the students in a very positive manner. However, it is difficult to know for certain if this effort will provide lasting improvement in lawn and home environmental stewardship. Water quality can and will be monitored into the future and the storm drain markers will be a permanent part of the neighborhood to serve as a reminder to residents. However, it will take a conscious effort of each individual to take the time to implement the changes and be willing to make the health of their lakes, groundwater, land and community an active part of their day-to-day home and lawn practices.

Research Question Four

The final question investigated the methods utilized in the outreach effort and the effectiveness in reaching the target population of the neighborhood. This question: *Of the educational outreach approaches employed, which are most effective in reaching a large suburban community?* was explored. By discovering which specific tools of the outreach effort were most effective, then it will be possible to improve the overall success of future educational outreach efforts in other locations and in other comparable circumstances.

The components of the Clean Lakes outreach effort consisted of a multifaceted effort that informed, educated and encouraged adoption of home and lawn BMPs by providing:

- A bimonthly newsletters to all 4,600 residents with distribution for 4 cycles;

- A website with community information presented through the duration of the project;
- Community involvement via the Environmental Education Initiative at homeowner events was presented and contained pertinent information and was available to contribute as requested;
- Use of the media as opportunities presented themselves and news releases and articles as pertinent information became available;
- Involvement of the local schools with a stormwater drain marker project was initiated.
- Environmental packets were delivered to waterfront property owners;

This intensive outreach initiative took place over a twelve-month period targeting the residents of the neighborhood.

To determine what components of the outreach effort successfully reached the residents of the neighborhood, the survey explicitly asked respondents to cite which components of the outreach effort they were most familiar. The question: *Of the Clean Lakes Restoration community outreach efforts, which were you aware of? (Check all that apply)?*; was presented to the respondents. With this question, residents were able to cite which of the outreach effort components they were familiar with and which they were not. From the data provided, the component most residents were aware of was the bimonthly newsletter. Table 17 provides a summary of the survey results of the awareness level of the various outreach effort components.

Table 17 Summary of Response to Awareness of Clean Lakes Outreach Components

Community Outreach Effort	Yes
Bimonthly Newsletter	38%
Homeowner Association meetings	32%
Newspaper Articles	29%
Educational Web site	14%

Table 17 continued Summary of Response to Awareness of Clean Lakes Outreach Components

Community Outreach Effort	Yes
Stormwater Drain Markers	10%
Lake front Property packets	9%
Community Social Gathering	7%

This response of thirty-eight percent of awareness of the Clean Lakes outreach effort through the Bimonthly newsletter is not unexpected since the bimonthly newsletter was delivered directly to the homes through the residents' *Lake View* magazine and presented current and accurate information relevant to the homeowners. This direct mailing insured that the newsletter would reach each residential site within the neighborhood in an information packet that was targeted towards community interest. The survey results also indicated that the homeowner association meetings and the local newspaper articles served as an effective method of reaching residents. Although resident attendance to these meeting was low compared to the overall population of the neighborhood, the minutes of the meeting are also posted in the *Lake View* magazine and serve to inform residents of the meeting events.

The educational web site received a fourteen percent response. From the analytical tools used to evaluate the web site it is possible to view trending data that shed some understanding of how the web site was used by the visitors. The data indicated, of the traffic that visited the web site, seventy-five percent was from the Tallahassee area. This supports the survey results. The analytical tools used to evaluate the web site also allowed for a snapshot-average into where, when and how long the website was visited. On the average, visitors spent two minute on the web site and visited three of the pages of the site. The top page visited was the Pictures page, receiving twenty-five percent of the visits followed closely by the Front page. The more informative Project and Updates pages received an average of ten percent of the visits followed by the Resources page received five percent of the visits.

An assessment of this data indicates that the site was visited for local interest. It also points out that when a visitor comes to the web site, there is a limited amount of time available to capture that visitor's attention to explore the site farther. Upon a passive visitor's entrance into this web site through either chance or a search engine query, the web site only has a small window of opportunity to interest that visitor or to loose that opportunity to actively engage them. The web site's intent was to create an asynchronous learning environment allowing the visitor to increase their knowledge through a self-paced and self-directed means of exploring.

Refinement of Research Issues

This research has addressed the questions of the modes, mechanisms and efficacies of presenting relevant environmental issue in a large suburban community. From the work performed through the Clean Lakes Project, there is no single prescriptive method that can be extrapolated to work best in targeting the dissemination of pertinent information and translating it into actions and revised behaviors within a community. In order to design a successful educational outreach initiative, based on the quantitative findings coupled with the experiences and observations of the researcher: a multifaceted approach specifically designed and tailored to the target community based on the available diversity of resources should be employed. If there is a limitation on the techniques to be employed, resources should be carefully examined and allocated towards targeting relevant, accurate and timely information to the targeted community.

CHAPTER 7

CONCLUSIONS

The Anatomy of a Successful Environmental Education Initiative

Through the course of this research, a framework emerged on how to implement and deliver a successful educational outreach effort for a target community. The key components included practical considerations, logistical challenges and a willingness to stay flexible and adapt to the challenges that surfaced through the course of the project. A successful educational process begins with a well thought through initial approach with a roadmap of key components of the project. For the Clean Lakes Project these components consisted of:

- A bimonthly newsletters to all 4,600 residents with distribution for 4 cycles to inform residents of Best Management Practices associated with the project;
- A website with community information presented through the duration of the project. This web site served multiple functions throughout the project.
- Community involvement via the Environmental Education Initiative at homeowner events was presented and contained pertinent information and was available to contribute to the needs of the residents as requested;
- Use of the media as opportunities presented themselves and news releases and articles as pertinent information became available to inform the larger local community;
- Involvement of the local schools with a stormwater drain marker project. This effort allowed the students of the community to be involved in this local issue while providing information related to environmental stewardship.

From this roadmap, a wide foundation of educational opportunities needed to be identified. These opportunities serve as specific entry points to discuss and present information and educational materials. Promoters of utilizing the community science content related to relevant social, economic and ecological issues facing the learners have long suggested that incorporating a variety of content embedded in relevant context will aid students to be productive and thoughtful members of society (Anderson et al., 2006;

Bennett & Bennett, 2004; Chi, 2000; Disinger, 2001; Duffin, 2004; Hodson, 1999; Hungerford & Volk, 1990; Jenkins, 1999; Roth, 2004; Saul, 2000; Tompkins, 2005).

As educational material was developed or collected, it was critical to consider the audiences that this material was being directed towards. With the Clean Lakes Project, information was presented in a wide variety of educational levels. Examples include the storm drain marker contest where I present to students information on nonpoint source pollution at a level they can understand. From this entry point, discussions ensued with the students about potential sources and solutions. Students then took their ideas and expressed these ideas through their art submissions for the storm drain marker contest. In comparison, the newsletters presented to the homeowners provided useful information on a variety of Best Management Practices in a professional and concise manner.

With the development and delivery of these outreach materials, a fundamental principle was universally applied across the spectrum; the principle of presenting accurate and technically sound information in a consistent approach. This principle coupled with providing scientifically credible relevant information to the residents is layered throughout the outreach effort. The success of this project was specifically built through the development of a sound foundation of knowledge that was pertinent and accessible through a wide variety of avenues. When it came to core environmental issues of concern, the Clean Lakes Project did not ‘candy coat’ scientific unpleasant realities. A good example of this is the information provided to residents with the septic tank concerns within the neighborhood. The outreach effort directly addressed the cost monetarily incurred by the homeowners to hook up to the municipal sewer and the environmental issues associated if these same homeowners did not connect the municipal sewer system. It gave them sound information for homeowners’ to base knowledgeable and sound decisions.

Another critical component of a successful environmental educational outreach effort is the ability to adapt. Within the structure of a project, there must be a willingness to not only identify an opportunity for learning but also be willing to modify the delivery of information and adapt to that opportunity. An example of this adaptation can be seen with the Stormwater Drain Marker contest. This initiative turned into a huge success for informing not only the target neighborhood but also the larger local community. It was

because of this effort that larger audiences were informed of environmental stewardship principles of the Clean Lakes initiative. It was from this school outreach effort that a presentation was made at the Leon County Commission, local news coverage ensued and the award for Water Conservation from the FSAWWA was received.

The final, and singly most important, key to a successful outreach effort is to involve the children. School outreach, if done in a thoughtful manner can reach at least two generations of the target population; the children and their parents. By directing resources towards the schools and creating an environment that nurtures and promotes community involvement through the students, then the ultimate goal of environmental education is achieved: the goal of participation. When considering the goal of the Clean Lakes Project of establishing lasting change in behaviors and nurturing the concept of environmental stewardship, it was important to focus the limited resources of this project towards the schools. It will be through the actions and choices of our next generations that will determine the fate of many of our forthcoming environmental challenges. By encouraging and endorsing environmental stewardship at the local level and promoting the concept of a shared earth community will the true value and worth of clean soil, air and water be promoted and prosper into the future.

Based on the quantitative findings of this study along with the experience of the researcher, the success of a community educational outreach effort is a well-designed multifaceted approach. It is critical to identify what makes the information you are providing relevant to the community and to tailor that information specifically to the community in order to keep it relevant to the target audience.

Pertinent Observations via Outreach Efforts

It was through the implementation, delivery and assessment of this outreach effort that additional noteworthy observations were identified. I would be remiss to not bring forth this information for consideration and to aid in future educational outreach efforts. During the Clean Lakes outreach effort there was a concerted attempt to find, evaluate and make available a wide variety of sources material for residents within the target neighborhood.

Several agencies and organizations provided a wealth of educational material for distribution through the outreach effort. Printed publication provided information ranging from Best Management Practices for lawn and gardens to an inclusive manual for water front property owners providing information on potential pollution sources to the mechanisms of addressing mitigation techniques to improve surface water quality. These quality publications were developed to provide useful educational material for property owners. Both from the quantitative data from the survey and the observations made, these educational material hold very little interest, and thus very little educational value, with the residents of the target neighborhood.

An observation from the Fall Festival revealed that less than four brochures were obtained by residents at the Clean Lakes Pavilion. These few documents were obtained despite the fact that the material was readily available and there were ample opportunities for residents to select from the tables of publications. This scenario should be contrasted to the amount of activity and interest that surrounded the pavilion's other table that contained the Storm Drain marker art displays. This lack of interest in the publications is supported and reflected in the survey results that found that seven percent of the residents were aware of the Clean Lakes efforts at community social events. The painful truth with these publications is that people are simply not interested; the Clean Lakes Project could not give these publications away. These residents were uninterested and found no relevancy to this material. The observation made with the printed publications can be compared to a similar informational issue associated with electronic brochures available on the Internet. Once again, if there is no need to search specifically for that information and read the material, it will not be sought.

A final observation with the Clean Lakes project focused on the issue of the municipal sewer system that was installed in sections within the target neighborhood. The cost of this sewer system was over five million dollars. This work was implemented because the older developmental units within the neighborhood were experiencing a high level of septic tank failures. The sewer system has been completed since January 2007; according to the latest Leon County figures there are 1,200 residential lots that the sewer system could accommodate, of those, four-hundred of the septic systems are failing

(Leon County, 2008). Currently, there are eighty-one homes that have taken the initiative to hook up to the municipal sewer system.

Seven percent of the homes that could hook to the municipal sewer system have done so one year later. The potential of septic tank failure during rain events can have negative impacts on the surface water in these areas. The survey data established that residents are aware of the responsibility individual homeowners have in implementing environmentally sustainable practices and that forty percent did recognize the importance of requiring sewer system hookups. However, to date this recognition has not translated into action for those 1,200 residents. The specific causative reasons for this was not specifically addressed however, the most apparent reason is the cost estimates of ten thousand dollars per resident for this service. Most likely an expense not previously planned or budgeted within their immediate homeownership goals. The City is offering long-term low-interest loans for residents to assist in offsetting some of the cost for residents. The City, County, Clean Lakes Project and Homeowner's association have not been successful to date in identifying the motivational tools to increase participation in this very important aspect for the sustained environmental health of this area.

The Environmental Education Community

This research project has shed light on the way community and environmental educational material should be developed and implemented. Due to the work performed through the Clean Lakes Project I have been able to ascertain the importance of identifying specific sources of relevancy that have been virtually void in the environmental research literature and research community. This study not only identified these sources but developed a program directly addressing and incorporating this relevancy as required. It was then through a multifaceted educational approach that successful implementation of environmental education outreach components to the neighborhood was addressed. The identification and incorporation of the specific level of relevancy tailored to the target population is specifically what this project has successfully highlighted. In order to promulgate this approach to environmental teaching and learning, this relevancy has to be identified, dissected and inserted into the outreach effort. Such an effort can only be accomplished through a thorough understanding of the

project design from the onset, due diligence during the project and at all aspects of design and implementation of the educational initiative.

It is critical that the environmental educational community understand that it is possible to effectively present relevant information to a community and slowly expect attitudes, behavior and actions to positively reflect new awareness, knowledge, and skills through personal actions. In order to accomplish effective change, this requires a highly focused, directed and thought-through specific approach focusing on relevancy towards the target population to keep a project on task. Keystone visible issues need to be reinforced at a variety of levels throughout the duration of the outreach effort. The use of children's education programs can be pivotal to the acceptance and incorporation of a project design and message. Environmental educational outreach efforts must remain flexible and responsive to the community they serve. Environmental educational outreach efforts must be relevant to all levels of education, when presenting to such a wide audience. A project manager has to be a subject matter expert and thoroughly understand the issues facing the community along with the best methods of providing information, knowledge and skills to aid the community to solve the environmental challenges facing them. Most significantly, it is important to identify potential pathways that lead to relevancy for the community members and delve into all nuances with this relevancy opportunity in implementing a successful environmental educational program.

This research furthers and extends the current environmental educational research through the demonstration of a successfully implemented environmental education outreach effort along with an assessment of the effectiveness of that effort. The methodology is not cookbook; however that does not mean that this site-specific success is limited to this one community. The FSAWWA award for excellence in Public Outreach/Community Education for this project is an indicator of the innovative, timely and elevated level of success that the larger public-policy community attributes to this project.

The Path Forward

Environmental Education spans an extremely wide diversity of topics. The efforts of the Clean Lakes Project demonstrate that it is possible to bring together issues

associated with: surface and ground water; stormwater management; concepts associated with native plants and their usages; animal habitat sensitivity; contamination fate and transport mechanisms; home and lawn best management practices; septic tank maintenance and nutrient loading. This interdisciplinary approach that pulls from a broad base of disciplines and highlights the intermingling of these disciplines is best utilized for promoting and establishing lifelong learners. Learners that are: critical of the issues facing them; and critical in the assessment and evaluation of the challenges facing society. Learners who recognize that only through thoughtful consideration and taking action can individuals make a difference, not just in their home or for their families but for their community. Here we return to the concept of our *citizen scientist*, an individual that is willing to take a critical look at the total situation and then make an informed decision for the good of the *whole* community.

Future implications of the concepts explored in this study carry over to numerous additional applications. Ample opportunities exist for integrations of these methods utilized in the Clean Lakes project to be applied to future community education efforts. Examples include: existing and future environmentally impacted communities; areas where public health concerns may be present and also within communities and public projects associated with diverse community redevelopment projects. The challenge of translating knowledge into action needs to be further researched and investigated; future research needs to explore this issue and the influences that affect this translation. A broad and critical examination of the efficacy of an educational project should always be continually performed, adapted and retooled throughout the project's duration.

It is vital to work *within* a community to explore how and why motivation on social and environmental issues occurs. These concepts cannot remain sequestered in the halls of higher education but must be actively explored and challenged within the heart and sole of the community. It is my belief that only through community and school inclusion can the nurturing of a critical *citizen science* populace be achieved. Our educational resources require that our focus be on our students, our future. The hope for citizen scientific clarity lies within environmental clarity. This clarity can only be achieved as we nurture the desires and appreciations of our children so that they can understand these vastly interwoven and complex relevancies of our world.

APPENDIX A SPRING 2007 INITIAL TEACHER CONTACT



5/2/2007

Over the next year, the Killearn Lakes Plantation Restoration: Clean Lakes Project will be conducting a number of initiatives to support management efforts to improve local water quality. By implementing stormwater improvements, restore natural systems and demonstrate best management practices (BMP), the value of wetlands within the community will be enhanced. This initiative is being supported by the Northwest Florida Water Management District (NFWFMD) Florida Forever Grant, and Leon County.

As you may be aware, the Killearn Lakes Plantation community has had historical concerns related to nonpoint source pollution. Sources of concern include septic tanks, lawn chemicals (fertilizers & pesticides), road runoff and unimpeded stormwater flows directly to surface water bodies. The Clean Lakes Project seeks to inform and provide reliable educational material for the community; ultimately encouraging behavior that will improve the overall community watershed.

We are fortunate to have a portion of the grant to use to increase public awareness of the impact the community has on the quality of the Ochlocknee River Watershed. One of the ways we intend to achieve this goal is by inserting placards over stormwater drains throughout the community, educating the public about where their stormwater drains to. Our idea is to have the design of these placards be created by children who live in the community to help create ownership and enthusiasm for the importance of keeping our local water bodies healthy.

The initial time frame for the placard design and placement will be for early fall 2007. The Clean Lakes Project would like to have all of the placards in place by early October. In conjunction with having your students create art for these placards, an educator from the Clean Lakes Project may be coordinated to be available speak and do an activity with your class regarding water quality issues. Please let me know any way that we can help to make this undertaking a positive cooperative effort for the Clean Lakes Project, the students, and the community.

Thank you for your time and we look forward to hearing from you soon.

Renee Murray

APPENDIX B FALL 2007 STORM DRAIN INFORMATIVE EMAIL

All,

I am Renee Murray, Education Coordinator for the Clean Lakes Project. You may be aware of the efforts in restoring the Lakes associated with this project in the Killearn Lakes Community. As a reminder, the Project is doing a restoration project at Lake Blue Heron which has included: lake bottom dredging, infrastructure repairs, inappropriate tree removal, planting of aquatic and terrestrial wetland plants, and outreach efforts including Project website found at <http://www.killearnlakes.org/>, community newsletters and having a presence at a variety of local events with educational materials.

We have reached a point in the project where we are actively encouraging the participation of your school in a storm water drain design effort. These markers will be utilized to be a visual presence and act as a reminder of the existence and the impact on the lakes due to storm water run-off through these drains.

I could easily order pre-made drain markers. However, as a professional educator and in an effort to extend this educational outreach opportunity, I would prefer if we could get some students in your school to design the drain markers and then I will have these manufactured. Part of my interest in wanting the students to participate in this process is to raise their level of awareness of stormwater drains and the affects on local water bodies and to stress the concerns of nonpoint source pollution. This educational effort will allow the students to take interest and ownership in the well being of the environment of their community.

The objective of the Clean Lakes Project is to have a lasting positive affect on the surface water quality in our community. This lasting impact can only take place if all of us become informed of the issues and make efforts to change behavior that have adverse impact on our environment. This project is a great way to involve children in the community and raise the level of awareness of issues affecting their community.

This project can complement and enhance a wide variety of curriculum such as discussions of the water cycle, environmental and pollution issues. Think of the look on your students face, who's design has been chosen and this art work will be in place on every storm water drain (over 300 of them) within their community. These markers are rated for 20 years! We will only be able to choose 2 or possibly 3 designs to implement in this program and the simplicity of the design will be the key!

Please find attached a flier with the pertinent information on the design requirements. I would like to request your assistance, if this will fit into any of your teaching modules to have your students use the provided flier to design their drain using the circle provided (this is the size of the drain markers). Also, there are attached a few examples of drain markers that other children have completed. If you wish you can visit the web site of the company that produces these markers at <http://www.dasmanufacturing.com/storm/index.html>. In addition, please visit <http://www.killearnlakes.org/> for other ideas. I would like to have the marker design

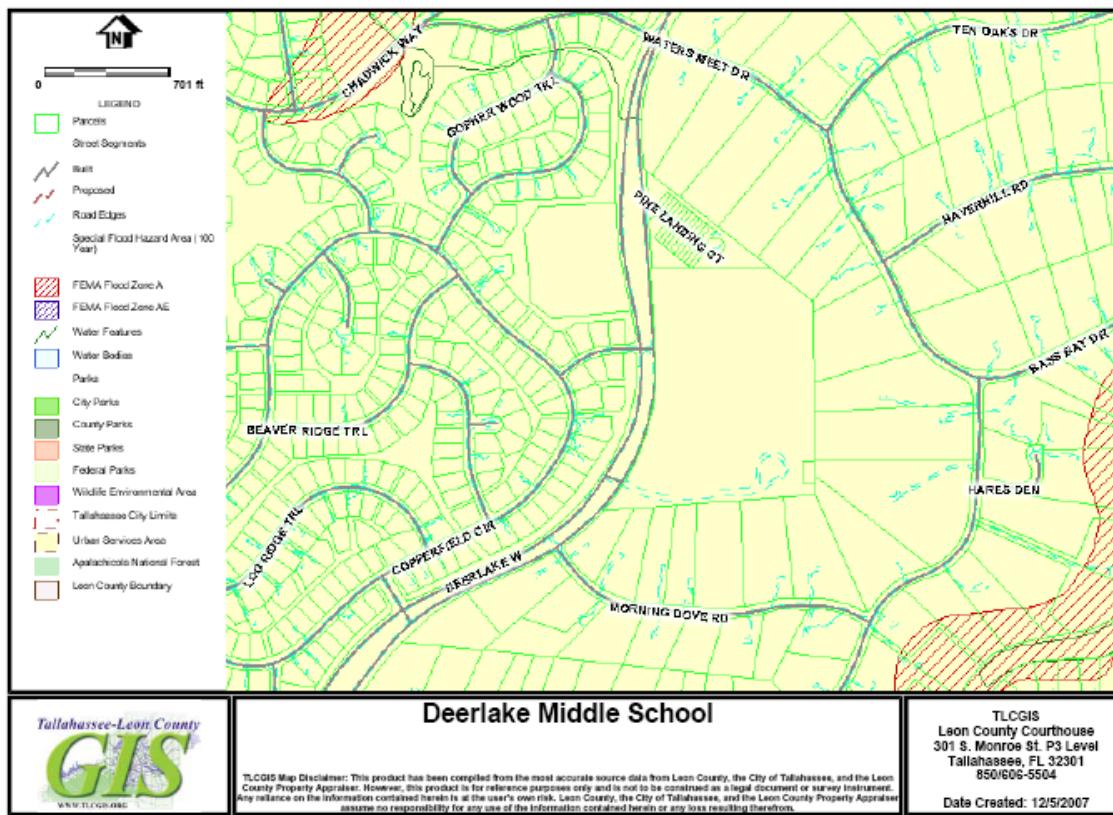
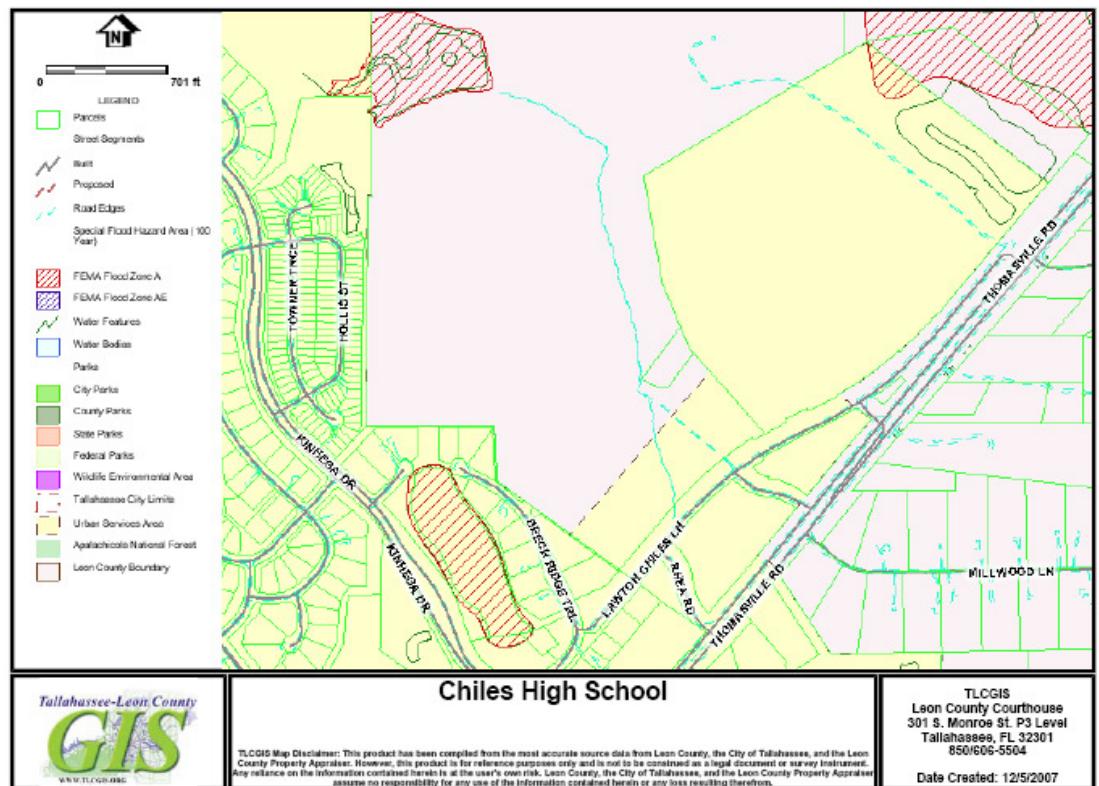
component completed in 2 weeks so we can get them manufactured and installed during the fall.

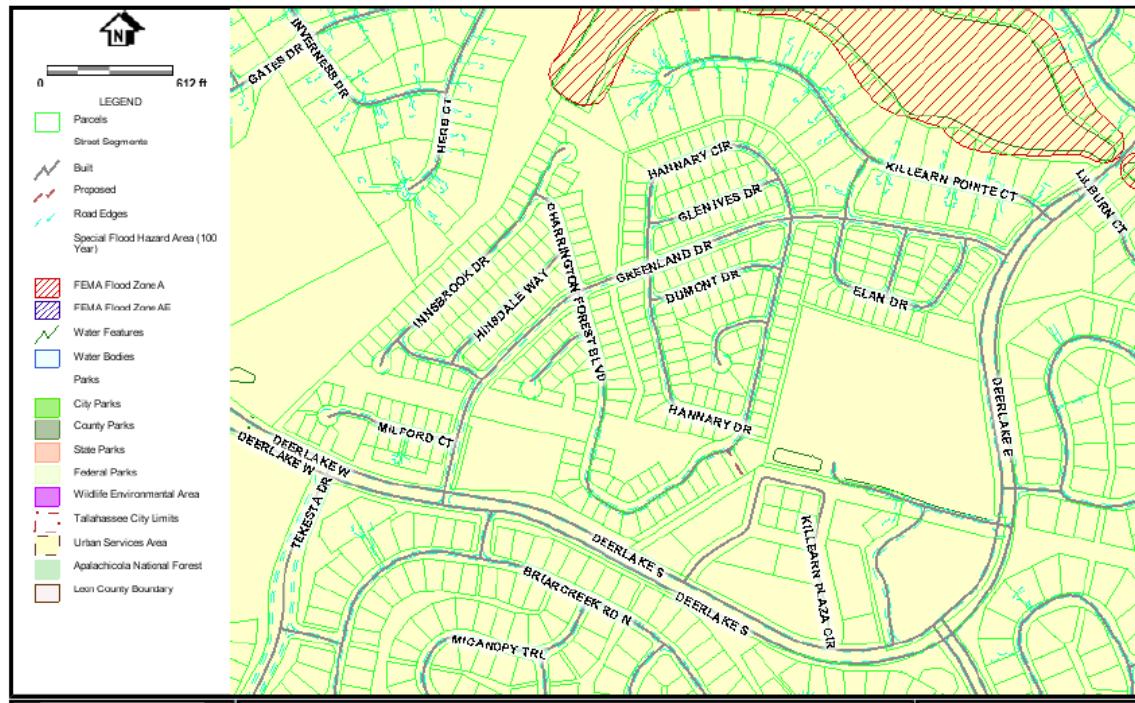
I am limiting this email to the 4th and 5th grade classes of the school, however if you would want to expand the involvement to the larger school community that would be great. In addition, if any teacher would like to include any component of the restoration project in their lessons, please contact me. I have wonderful lesson ideas that would enhance the teaching and learning in your classroom and school community.

Thank you

Renee Murray
cleanlakeproject@gmail.com
893-8939

APPENDIX C MAPS OF INSTALLATION LOCATIONS FOR STORM DRAIN MARKERS

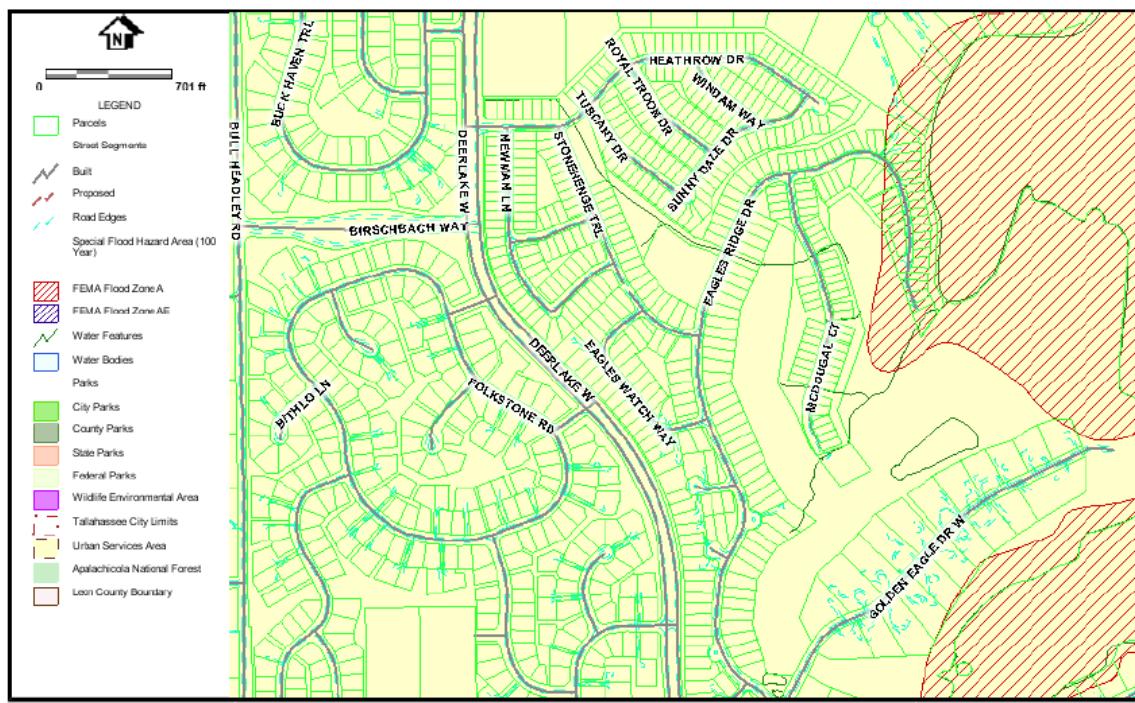




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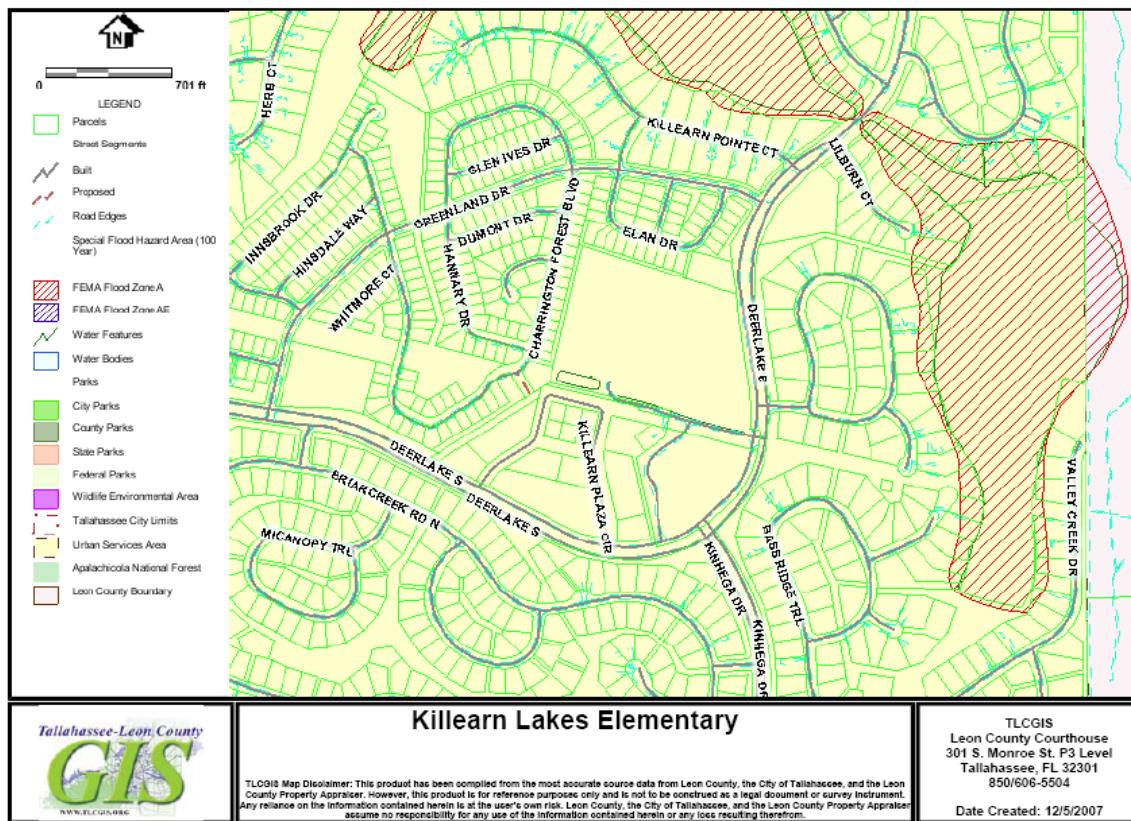
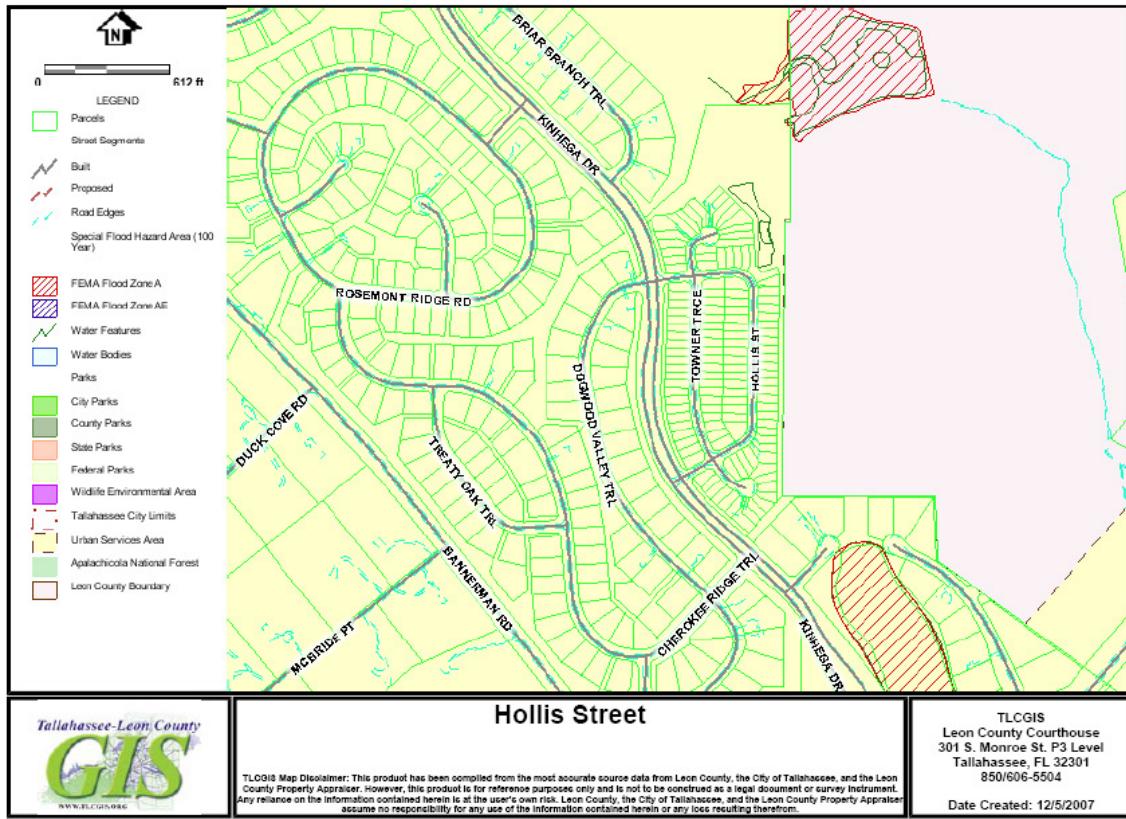
Date Created: 12/5/2007



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APPENDIX D CERTIFICATE OF APPRECIATION



Grant will help restore lakes in Killearn

By Renee Murray

SPECIAL TO THE DEMOCRAT

The Killearn Lakes Plantation Homeowners Association has received a \$570,000 grant for water-quality improvements for the neighborhood's chain of lakes, and the project is in full swing.

The association applied for this competitive grant, which was awarded by Leon County and the Northwest Florida Water Management District.

Lake Blue Heron, which is 82 acres, was selected for restoration efforts. The lake's water quality had deteriorated substantially more than surrounding interconnected lakes, which drain to Lake Iamonia. Lake Blue Heron was completely drained in March so restoration activities could begin. Sediment removal began in May. The lack of rain has actually benefited this portion of the project.

The project will remove years of accumulated sediment, establish marsh and buffer zones, build berms and swales to redirect stormwater, establish rain gardens, and educate the community on how everyone can make a difference in the water quality in their neighborhood and, ultimately, in the lakes.

The long-term success of this restoration effort will depend on homeowners and how they care for their lawns and gardens. Best-management practices and more information about the restoration project can be found at the Web site killearnlakes.org.

To promote the practices, four raffles for \$500 in plants from Native Nurseries were held during the Killearn Lakes Kids Fishing Contest on April 28. Also, educational literature and a hands-on demonstration of "Where Does Your Rainwater Go?" was available and was greeted enthusiastically by children and parents alike.

■ Renee Murray is chemical-safety officer for the Department of Environmental Health & Safety at Florida State University.

APPENDIX F JUNE 6, 2007 ARTICLE

Originally published June 6, 2007

Killearn Lakes restoration project for Lake Blue Heron is under way

By Renee Murray [Print](#) [Email to a friend](#) [Subscribe](#)

Killearn Lakes Plantation Homeowners Association has obtained a grant of \$570,000 for water-quality improvements for the Killearn Lakes Plantation chain of lakes, and this project is in full swing. The association applied for this competitive grant and was awarded funding jointly supported by Leon County and the Northwest Florida Water Management District.

Lake Blue Heron, an 82-acre lake within the network, was selected for restoration efforts. Lake Blue Heron's water quality had deteriorated substantially more than the surrounding interconnected series of lakes, which ultimately drains to Lake Iamonia. The lake was completely drained in March of 2007 so that restoration activities could begin. Sediment removal began in May; our present lack of rain to date has at least been to some benefit for this portion of this project.



This multifaceted project encompasses:

The removal of the years of accumulation of sediments;

Establishment of marsh and buffer zones;

Building berms and swales to redirect storm water;

Establishing rain gardens and

Most importantly, educating the community on how each individual can make a difference in the water quality in his or her neighborhood and ultimately in our lakes.

The long-term success of this restoration effort will depend on the incorporation of Best Management Practices (BMPs) by individual homeowners of their lawns and gardens. To promote these BMPs, four raffles for \$500 in plants from Native Nurseries were held to help winning homeowners establish rain gardens for their homes during the Killearn Lakes Kid's Fishing Contest on April 28. In addition, educational literature and a hands-on demonstration of "Where Does Your Rainwater Go?" was available and greeted enthusiastically by children and parents alike.

These Best Management Practices by individual homeowners are an important and potentially pivotal part of the overall success for the long-term sustained accomplishment of this project. These BMPs are applicable to all of our surrounding communities.

To learn more about this project and BMPs for your area, visit the killearnlakes.org Web site established for this project. This project is a keystone demonstration actively reviewed by both Leon County and the Water Management District for its success. Let's all assist in making the Clean Lakes Project a success. Remember: Good environmental stewardship begins with you.

Renee Murray is a chemical-safety officer with the Department of Environmental Safety at Florida State University.

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APPENDIX G JANUARY 2, 2008 ARTICLE

Originally published January 2, 2008

Students' art reminds us to keep drains clean

By Renee Murray and Amanda Nalley
CHRONICLE STAFF AND SPECIAL TO THE CHRONICLE

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Stormwater drains. We all see them while walking or driving through our community. We probably see them so often that we don't actually notice them anymore.

The Killearn Lakes Plantation Clean Lakes Project has found a way to remind the public and students that keeping storm drains free of litter is important. The project sponsored a Stormwater Drain Marker Contest in which 300 students from Killearn Lakes Elementary and Hawks Rise Elementary entered their art work.

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Six students' works were chosen to be manufactured into four-inch markers and were then attached with a special adhesive onto storm drains within Killearn Lakes, Hawks Rise Elementary, Killearn Lakes Elementary, Deer Lake Middle School and Chiles High School.

"People see that drain marker and think, we need to keep that clean," said Hawks Rise student Michael

Dayton, 10. Dayton's marker, a stork and a turtle in clean water, was inspired by a recent trip to the Florida Keys.

The students selected from Hawks Rise were Dayton; Victoria Cunningham, 9; and Bennett Baker, 11. Killearn Lakes Elementary winners were Tony Cappelino, 9; Claudia Parisi, 10; and Riley O'Bryant, who turns 11 on Jan. 4.

The winners were awarded a personalized plaque with one of their stormwater markers on it, and each school's principal was given a plaque commemorating all three of their students' contributions.

"I was really surprised and excited," said Cunningham.

O'Bryant, who loves to fish, was excited about protecting his hobby.

"If all of our lakes get polluted, it could cause a chain of events, and we couldn't go fishing," he said.

Because these colorful stormwater drain markers are advertised to last more than 30 years, these children could be walking by these markers with their own children in upcoming years.

The Chiles High School Marine Biology Club, which volunteered to assist with the installation of the markers, has completed the installation through much of the neighborhood.

"It's neat for the kids to connect art with a purpose," said Killearn Lakes art teacher Kimberly Brock.

This grassroots initiative of educating children and homeowners was paid for through a grant from the Northwest Florida Water Management District and Leon County. To learn more about the project and to see some of the other

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AMANDA NALLEY /Chronicle
Killearn Lakes Elementary students Riley O'Bryant, left, Tony Cappelino and Claudia Parisi with their winning storm-drain designs. The logos were posted on storm drains in Killearn Lakes Plantation and select schools as a reminder to keep lakes clean by not littering.

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innovative storm drain marker designs, visit the Clean Lakes Project at www.kilearnlakes.org.

So as you are walking around and you see these markers, think about the goal students like Claudia Parisi had in mind.

"If we help the Earth, the future will be better," she said.

- *Renee Murray is the educational coordinator of the Clean Lakes Project. Contact reporter Amanda Nalley at (850) 599-2299 or abnalley@tallahassee.com.*

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APPENDIX H HUMAN SUBJECT COMMITTEE APPROVAL MEMORANDUM

Subject Use of Human Subjects in Research - Approval Memorandum
From Human Subjects <humansubjects@magnet.fsu.edu>
Date Tuesday, November 6, 2007 12:57 pm
To rrmurray@fsu.edu
Cc agallard@fsu.edu



Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 . FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 11/6/2007

To: Renee Murray

Address: PO box 12702 Tallahassee FL 32317
Dept.: MIDDLE AND SECONDARY EDUCATION

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Assessment of Killearn Lakes Plantation Restoration Clean Lakes Project Educational Outreach Efforts

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Exempt per 45 CFR § 46.101(b)2 and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 11/3/2008 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Alejandro Gallard, Advisor
HSC No. 2007.756

APPENDIX I CONSENT TO PARTICIPATE IN VOLUNTARY SURVEY

Cover Letter

Consent to Participate in Voluntary Survey for the Assessment of Killearn Lakes Plantation Restoration Clean Lakes Project Educational Outreach Efforts

Dear Killearn Lakes Resident,

I am a graduate student under the direction of Professor Gallard in the Department of Middle and Secondary Education in the College of Education at Florida State University. I am conducting a research study to assess the effectiveness of the Killearn Lakes Plantation Restoration Clean Lakes project educational outreach effort in your neighborhood.

I am requesting your participation, which will involve completion of the attached one page survey that should only require 10 to 15 minutes of your time and return the survey in the self-addressed envelope provided. Your participation in this study is voluntary however; your input is important not only for this project but may assist in the effectiveness of future community outreach efforts. If you choose not to participate or to withdraw from the study at any time, there will be no penalty, as previously stated your cooperation in completing this survey voluntary on your part. The results of the research study may be published, but your name will not be used or known. The survey is anonymous. The records of this survey will be kept private and confidential to the extent permitted by law. In any sort of report we might publish, we will not include any information that will make it possible to identify participants in this survey. Survey records will be stored securely and only researchers will have access to the records

If you have any questions concerning the research study, please call or email me at 644-7682 or rrmurray@fsu.edu or Dr. Gallard at 644-7806 or agallard@fsu.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you may contact the FSU IRB at 2010 Levy Street, Research Building B, Suite 276, Tallahassee, FL 32306-2742, or 850-644-8633, or by email at jjccoper@fsu.edu.

Return of the survey will be considered your consent to participate. Thank you.

Sincerely,

Renee Murray

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BIOGRAPHICAL SKETCH

Renee R. Murray moved to Tallahassee, Florida in 1976 from Michigan. As a resident of the Tallahassee community for over 30 years, she is a life-long learner and educator with her foundation well rooted within the sciences at an extensive array of levels. Renee received her Bachelor of Science degree in Biochemistry and then Masters in Public Administration (2002) from FSU. Renee's Master Report, entitled 'Alternative Solutions to Mosquito Control at the District Level' examined the feasibility of non-pesticide, ecologically-sound based alternatives for mosquito control solutions. While an undergraduate, Renee authored a paper on *Phytoremediation* (the use of plants in cleaning up hazardous waste) that was awarded as the Best Student paper at a Tampa National Plant Conference. She had previously published an article in a National Aquarium Magazine on Diagnosis and Treatment of Angelfish Disease while owning/operating her own aquaculture facility. Her doctoral GPA is 3.93.

Throughout Renee's academic career, she has always been concurrently employed full time directly within the sciences: serving as a chemist in analytical laboratories, an educational teaching assistant, and a chemical safety officer with FSU. Renee's Doctoral project emphasizes community education and community science which she presents as *Citizen Science*. Renee carries this *Citizen Science* initiative through to a variety of levels. Renee's environmental initiatives have presented her the opportunity to have articles published in the local newspapers, to be interviewed on the local television stations and to have obtained, on behalf of her project, the prestigious *Florida Section of the American Water Works Association Award for Community Education* (October 2007).

Renee's initiative of having children design and install storm drain markers has been a noted visible reminder that a single person's determined efforts can dramatically touch numerous peoples' lives. Special Awards were presented to the County Commissioners; awards that were decorated with these drain markers that were designed by children, in recognition of the Commission's support and assistance. Renee's extensive Environmental Educational efforts were recognized through the nomination and selection as a *Featured Student for the FSU Student Web pages* in April 2008, as

nominated by the Department Chair of Middle and Secondary Education. The website designed and implemented by Renee remains an active educational resource to the community and throughout the United.

Renee's environmental educational initiatives hold direct relevancy and carry-over knowledge to outreach efforts throughout communities through: 1) conservation efforts; 2) design/construction/reconstruction efforts such as in community improvement efforts such as Brownfield redevelopment and also in natural disaster recovery efforts; 3) hazardous waste/health concern impacted areas; 4) go-green/energy/greenhouse awareness conservation initiatives and 5) environmental justice for all. Renee's commitment to Environmental Education comes from a deeply rooted desire to expand the knowledge and understanding of all the people within our communities for the benefit of our future generations.