

Clemson University Center for Watershed Excellence

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ABSTRACT. Our nation's watersheds are at risk. There is a disconnect between the watershed and its stakeholders. As each citizen plays an individual and collective role as both a consumer of natural capital and a steward of the environment, capacity building must be designed to welcome the input of the general stakeholder. Community-based stakeholder groups are attempting to reduce this risk with 'grassroots-level' environmental education and water quality monitoring programs. Many groups have done a commendable job in providing environmental education programs and protecting their watersheds by identifying key issues to be addressed. Other groups unintentionally create misinformation due to a lack of scientific skills, training, and technology to meet the rigors of 'good science'. Invalid data negatively impacts the value and acceptance of stakeholder datasets and may misdirect limited public funding. In 2008, the EPA-designated Clemson University Center for Watershed Excellence was established with a mission to promote local stakeholder involvement in protecting and improving the natural and economic resources of their watershed. The center adopted a vision to involve Clemson University faculty and students in state-wide watershed research and education programs that support the development and implementation of community-based, cost-effective watershed management programs.

INTRODUCTION

Our nation's watersheds are at risk. Throughout this nation, many watersheds are being impacted by uncontrolled development, rapid economic growth, and a swelling coastal population. There is reduced local, state, and federal funding for water resources monitoring and research and watershed-scale planning. Of great concern, there is a disconnection between the watershed and its stakeholders. The public at large, based on a decade of community-based programming, is disengaged with local and regional environmental issues due to the

- lack of community vision and spirit;
- lack of readily accessible and understandable information;

- complexity of watershed issues; and
- perceived lack of value of stakeholder input by regulatory agencies.

The historic 'top-down' model for addressing environmental problems is beginning to show weakness, particularly in our current political climate. For agencies to share the responsibility for formulating policy, there must be a paradigm shift from centralized command-and-control regulation to a partnership approach. A key step in developing this partnership approach to addressing watershed-scale issues is improving community awareness of local and regional natural resources issues. This awareness is critical as each citizen plays an individual and collective role as both a consumer of natural capital and a steward of the environment.

As noted by G. Evelyn Hutchinson, the natural world is "the ecological play in the evolutionary theater" (Alpert and Keller, 2003), with many players where humanity has assumed the position of director and manager. With busy lifestyles, society to a great extent has transferred the responsibility of solving environmental problems to scientists and [regulatory] agencies (Rogers, 2006). Even with high levels of scientific and policy expertise, there remain shades of "The Tragedy of the Commons" (Hardin, 1968) in managing our watersheds - as society continues to assume our growing natural resource limitations will always have technological solutions. In this age of global warming, the challenge of creating technological solutions for sustainable natural resources and economies is being questioned frequently by many sectors of society.

NEED

Watersheds are complex entities at the landscape-level that display structures and processes that reflect natural and human-driven variables at a range of scales (Thoms, 2006). There is a need to manage water resources at the watershed level due to multiple impacts with complex interactions. Characterizing water quality impacts to our nation's streams and rivers remains a challenge (Hirsch, 2001). Interpreting water quality data

requires extensive knowledge in hydrology, biogeochemistry, sampling strategies, sediment transport, statistical analyses, etc. Due to complexity and the academic nature of research, it is difficult to transfer research to an audience capable of influencing public policy (Arame, 2003). EPA notes in their 2003 – 2008 Strategic Plan that “Water quality monitoring and assessment programs - the essential underpinning of all aspects of the watershed approach - must be strengthened and upgraded across the country”. Rogers (2006) summarized the real challenge in managing water resources as ‘developing collective understanding and integrations of knowledge, within and between scientists, citizens, and [regulatory] agencies’.

EPA noted the need to emphasize partnerships and stakeholder collaborations in *Innovating for Better Environmental Results: A Strategy to Guide the Next Generation of Innovation at EPA (2002)*. EPA management recognizes the need to be viewed by the general public as more than a generator and repository of information – the agency must incubate the partnership role among the American public. In the *2003-2008 EPA Strategic Plan: Direction for the Future*, it is noted under Healthy Communities and Ecosystems that the national water program’s watershed strategy will enable a more comprehensive, stakeholder-driven approach to achieving water quality goals.

For stakeholders to become engaged as functional partners, it is vital for communities to develop an appreciation of the economic value and ecological services provided by their natural resources and the scientific issues related to sustainability. There are substantial quantitative and qualitative data indicating a widespread lack of public understanding of science (Jenkins, 2003). To become informed, stakeholders need access to understandable scientific and policy expertise. Multi-level environmental education programs, watershed roundtables, and peer review councils designed to support community group sponsored research will play key roles in providing this access.

Recognizing the disconnection between the watershed and its stakeholders, the U.S. EPA has proposed various capacity building initiatives to stimulate community awareness and engage stakeholders. EPA’s capacity building program provides a framework to foster collaboration as it encourages scientists, agencies, and the public to work together in a watershed-scale learning program centered on environmental stewardship. Rogers (2006) notes the importance of scientists being co-learners, shedding the mantle of ‘expert’ and fully participating with stakeholders and agencies as partners. As scientists become engaged as active partners, however, it is important that they not to blur the role of scientist with environmental advocate (Lauenroth, 2003) in order to maintain their objective credibility.

Watershed-scale capacity building encompasses more than science and education, it involves socioeconomic, political, cultural, and historical issues (Roth and Desautels, 2002). Capacity building requires that relevant scientific advances be transferred to both regulatory agencies and the stakeholder community (Roux, 2001). Using capacity building concepts, science-based nonprofit environmental organizations have the opportunity to provide meaningful natural resources education and local watershed monitoring programs to encourage stewardship. Successful local and regional watershed-scale organizations have demonstrated that effective community spirit originates at the grass-roots level and depends on community-level visionaries and leaders. As example, this author has been actively engaged in a dynamic capacity building program based in Augusta, Georgia which exemplifies the power of community based stewardship and the value of philanthropy through doing. For the past decade, Southeastern Natural Sciences Academy, through natural resources research and education, has been instrumental in the transition of Augusta, Georgia from an environmentally challenged city to one of the most environmentally progressive cities in Georgia. The Academy has taken the leadership role in developing the critical long-term continuous monitoring database for the Savannah River that is being used in decision making by state and federal agencies. This research program, Savannah River at Risk™, has been funded by a \$2 Million investment by public and private stakeholders. Such stakeholder investments are expanding the role of stakeholders in managing their watersheds. Today, stakeholders not only influence the political process driving environmental legislation, stakeholders also fund and conduct regional research programs designed to advance science-based management policy.

CENTERS OF EXCELLENCE

In 2007, Region 4 EPA evaluated the development of regional watershed centers as a tool for building capacity. The following need statement was developed: *Watershed-based stakeholder groups and local governments need cost effective technical tools for scientific support, engineering support, and information technology, as well as assistance with legal issues, project management, outreach and education, and planning support. They also need assistance in developing legal authorities for activities such as permitting, enforcement, contracting, fund raising, land use planning and resource management* (William Cox, Region 4 EPA, personal communication).

To become designated as an EPA Center of Excellence for Watershed Management, a proposed center must demonstrate that it:

1. has the capacity to identify and address the needs of local watershed stakeholders;
2. has support at the highest levels of the university;
3. is willing to partner with other institutions;
4. will involve students, staff and faculty in applying research and conducting activities that solve issues associated with watershed management at the watershed scale;
5. can become self-sustaining after a period of time;
6. has the capacity to involve the full suite of disciplines needed for all aspects of watershed management; and
7. can deliver and account for results related to watershed improvement and sustainability.

CLEMSON CENTER OF EXCELLENCE

In 2007, the Clemson University Center for Watershed Excellence was established with a mission to promote local stakeholder involvement in protecting and improving the natural and economic resources of their watershed. The center adopted a vision to involve Clemson University faculty and students in state-wide watershed research and education programs that support the development and implementation of community-based, cost-effective watershed management programs. The primary outcome will be strengthening environmental stewardship by establishing strong, effective and sustainable stakeholder communities dedicated to the long-term management and conservation of watershed resources.

On June 8, 2008, the Clemson Center for Watershed Excellence was officially designated by EPA Region 4 as a Center of Excellence in Watershed Management. Clemson University, Region 4 EPA, and the South Carolina Department of Health and Environmental Control's Water Bureau signed a three-party Memorandum of Understanding in support of the center. Objectives for Clemson University's Center of Excellence in Watershed Management are:

1. work with local communities to enhance community understanding of sustainability, identify watershed issues, develop site-based solutions towards economic and environmental sustainability, and procure funding sources;
2. provide cost effective technical tools, hands-on support, and practical products and services to watershed-based stakeholder groups and local governments that include scientific, engineering, information technology, project management,

peer review, outreach & education, and planning support;

3. provide faculty expertise in the areas of environmental and ecological sciences, engineering, community planning, marketing, behavioral sciences, economics, and computer sciences;
4. provide a multi-level environmental education road-map to community stakeholder groups through development of targeted education programs incorporating a watershed teaching module;
5. develop a dedicated website offering water quality research information and monitoring tools, capacity-building information for nonprofit groups and the public-at-large, regional events calendar, and links to appropriate state and federal agencies and resources;
6. foster stakeholder participation through a small-grants program; and
7. influence the design and implementation of public policies to advance the conservation of natural resources through site-based conservation activities.

The primary EPA regional network initiative of the Clemson University Center for Watershed Management is developing the Intelligent River™/ digital watershed cyberinfrastructure program. This cyberinfrastructure initiative will provide the platform to link statewide monitoring programs. Four demonstration projects are being developed by Clemson University to showcase the digital watershed concept. A shift towards sustainable watersheds will require an innovative approach to employing a cost-effective remote data acquisition system to provide near real-time water quality and water quantity data in major streams, rivers, and estuaries within the next decade. Such a system is essential to link land, water, and energy which are being impacted by unsustainable human demands, establish long-term water quality trends, monitor flow in critical areas, track land-use changes, document pollution impacts, and effectively manage water resources on a watershed scale.

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