

**DECISION MAKING FOR NATURAL
RESOURCES AND WATERSHED
MANAGEMENT: CURRENT THINKING
AND APPROACHES**

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EXECUTIVE SUMMARY

The watershed approach, emphasizing all aspects and elements of a watershed as a unit of measure, including those social in nature, has become commonplace in watershed management in the United States and other parts of the world. Likewise, it is increasingly commonplace that an integrative, holistic, multidisciplinary, and multi-party approach is taken with natural resources management in other settings.

In the area of decision making, recent research challenges traditional collaborative approaches and contends that alternative approaches may be necessary. These alternatives may include decision-aiding processes rather than conflict resolution or consensus models. The research also suggests that it is advisable to contextualize decision making in relation to social concepts of and relationships to land and resources. That is, different groups may have different images of and relationships to land and natural resources, and these must be factored into both decision making processes and decision making itself.

Social factors to be considered include orientation to the environment, attachment to and sense of place, social class, education, land/property ownership, concepts of property rights, and proximity to any particular site or environmental system under consideration. Other issues to be taken into consideration specifically with collaborative/participatory efforts include what resources are available, effective governance, strategies of inclusion, and management styles. Collaborative efforts are most effective if participants are brought into the process early on, information is shared in a collegial (rather than “top-down”) fashion, there is true collaboration between scientists, technicians, managers and participants, information is presented in lay terms, and appropriate technologies (including communication technologies) are employed. Increasingly, co-management and adaptive (“learn as you go”) styles are being embraced as both effective and efficient. Technocratic approaches are seen as ineffective and, in some contexts, counterproductive. If trust does not already exist between citizens and leaders/officials, then efforts must be made to earn that trust.

GIS and simulation models long have been used in decision making in watershed and natural resources management. This sometimes is questioned for small areas such as riparian buffers, since the scale, data, equipment, time, and money may not be reasonable or practical with buffers and other small-scale environs. Newer to the technological approaches in natural resources and watershed management is the use of DNA traces to identify sources of fecal contamination of water and soil.

With both the more technical approaches and the inclusive, decision making approaches, there is increasingly the call for eclecticism in approaches, models, and tools used. With the participatory models, there is the call for more cultural sensitivity and adaptive, cooperative learning as opposed to more technocratic approaches. There also is, in essence, a recognition that those organizing and running participatory sessions need to be

culturally competent, able to recognize and tailor efforts to the culture of those who are participating.

Overlaying all of these developments, of course, is the fact that environmental and stewardship issues and concerns are now “global” in the richest sense of the word. Thus, while efforts are made to attain sustainability in specified patches, niches, ecosystems, and regions, at the same time these efforts are now couched in a much larger context. Research shows that in much of the rest of the world, as in the United States, collaborative endeavors, versus those that are solely scientific or technical, are being embraced as necessary for reaching immediate and larger-scale goals.

The wealth of information related to natural resources and watershed management – including books, manuscripts, journal articles, and websites – continues to grow at a rapid rate. This document provides good solid direction for readers, but humbly submits that the resources listed herein constitute a good beginning, but not a full-service stop.

This document overviews representative research related to natural resources and watershed management, and gives directions to readers regarding publicly available free publications, web sites, and scholarly journals. Not all scholarly journals are free or available via the Internet, but most can be accessed through services available at public libraries.

This document is divided into three parts. The first part is an essay. There are two purposes to this essay. The first purpose is to capture the key issues and findings of the many studies reviewed in the second part of the document (the annotated bibliography). The second purpose is to go a little beyond the annotated bibliography. The essay begins with the big picture and then contextualizes major issues such as human impacts on the environment, population increases, growth and sprawl, as they relate to South Carolina.

The second part is an annotated bibliography that is intended to give readers more resources at hand for their own personal, professional, and community uses. Appended to the bibliography is a brief list of free publications and websites that may be of interest to readers.

The third part is a report on a content analysis of county council and municipal governments’ decisions in the area of natural resources, with a focus on the Saluda and Reedy Rivers and the Saluda-Reedy Watershed. Generally, it was found that city and county governmental bodies tended to focus on local issues, often without reference to larger social, economic, or environmental arenas. Zoning, land use, and water infrastructure had precedence among some entities. The entities with a sustained and concentrated focus on the Saluda and Reedy Rivers and the Saluda-Reedy Watershed were Greenville City Council and Greenville County Council.

The interpretations, views and conclusions contained in this document are those of the authors and do not necessarily represent the views of Upstate Forever.

PART I:

**ESSAY: WATERSHED AND NATURAL RESOURCES
DECISION MAKING AND MANAGEMENT: KEY ISSUES
AND THEIR RELEVANCE TO SOUTH CAROLINA**

by

**Brenda J. Vander Mey
June 2006**

PART I: ESSAY: WATERSHED AND NATURAL RESOURCES DECISION MAKING AND MANAGEMENT: KEY ISSUES AND THEIR RELEVANCE TO SOUTH CAROLINA

by **Brenda J. Vander Mey, June 2006**

INTRODUCTION

The companion piece to this essay is an annotated bibliography that surveys an array of information for natural scientists, social scientists, planners and developers, teachers, and all the rest of us with an interest in understanding both the big and small pictures related to environmental issues. It is hoped that the bibliography helps readers have more resources at hand for their own personal, professional, and community uses. After the annotated bibliography, readers will find a brief listing of free publications and websites that may be of interest or use to them. Many of the websites have links to other organizations and publications.

One purpose of this essay is to capture the key issues and findings of the many studies reviewed in the annotated bibliography. The other purpose of this essay is to go a bit beyond the annotated bibliography to locate South Carolina and, especially, the Saluda-Reedy Watershed,¹ in the mix.

THE BIG PICTURE

The big picture is really big. It is global. It is international. It is national. It also can be overwhelming. However, the good news is that in many places in the world, in watersheds large and small, efforts are being made to ensure sustainable futures. All the same, data available to date would indicate that complacency is ill-advised at best.

Human Impacts on the Environment

Sandra Postel (2005), director of the Global Water Policy Project in Amherst, Massachusetts, continues to document the impacts that humans have on their environments, and especially on water. A few of the human activities affecting ecosystems on a large-scale world wide include:

- Land conversion² and degradation – altering runoff, groundwater recharge and affecting quantity, quality, and timing of water flows, destroying fish and wildlife habitats;

¹ The Saluda-Reedy Watershed includes nearly 1,400 miles of streams, and is 80 miles long. It begins at the North Carolina-South Carolina border and flows to the Buzzard's Roost dam that forms Lake Greenwood. It includes seven counties and parts of 18 towns and communities (Saluda-Reedy Watershed Consortium, 2005).

² "Land conversion" in the United States typically is associated with "development" and "sprawl."

- Dam construction – fragments and alters rivers and natural flow, alters water temperature and transport of nutrients and sedimentation, can degrade habitats and cause loss of species;
- Uncontrolled pollution – diminishes water quality, can make water unsafe to drink, increases the costs of water treatment, can kill off species and cause “dead zones;” and,
- Population and consumption growth – associated with increased damming and diversion of water, more land conversion, more food and water consumption, and the potential to change climate (Poster, 2005, p. 10, paraphrased).

Expected Population Increases

The world’s population will probably increase by about 50% in the next fifty years, with the bulk of that increase occurring in the developing countries. It is expected that the population in the United States will grow by about 27% from the year 2000 to 2030 (Naiman and Turner, 2000). South Carolina’s population is estimated to grow from 4,012,012 people in 2000 to 5,371,150 people in 2030 (South Carolina Community Profiles, <http://www.sccommunityprofiles.org/census/projection.asp>). By my calculation, that is an increase of 33.87%, or 33.9%.

Factors Affects Freshwater Systems and the “Water for Life” Decade

In terms of freshwater systems, it is argued that five major factors affect these ecosystems. These factors are:

- *Human demography;*
- *Resource use;*
- *Patterns of water consumption;*
- *Technology development; and,*
- *Social organization* (Naiman and Turner, 2000, p. 958, verbatim).

Recognizing the global importance of freshwater management, the United Nations has declared 2005-2015 to be the *International Decade for Action, “Water for Life”*³ (Parris, 2005). Long before this declaration, nations had been hosting and attending international conferences regarding globalization, growth, and the environment. They also had been enacting treaties related to these forces and issues (see, for instance, French, 2000; McNeely and Scherr, 2003).

The Environmental Sustainability Index

The Environmental Sustainability Index work, which includes 146 nations in its analysis, has provided the baseline information needed to move forward, but yet also reveals that much needs to be done now (Esty et al., 2005). It should be noted that by the measures used for this Index, North Korea had the lowest ranking of the 146 countries studied,

³ <http://www.un.org/waterforlifedecade/>

Finland and Norway had the highest rankings, and the United States was ranked forty-fifth.

Whither the Forests and Water?

At the national level, it is estimated that less than five percent of the original forests remain in the lower 48 states. In addition, nearly half of the wetlands and around 70% of the riparian forests have been converted to other uses (Naiman and Turner, 2000).

In terms of forested area in South Carolina, one study estimates that 230,000 acres of the state's estimated 12 million acres of timberland were lost between 1993 and 2001 (Associated Press, May 4, 2003). *The National Woodland Owner Survey for South Carolina* found that 57% of all woodland acres in the state are privately owned (Adams, 2004).

In addition, water consumption in the United States has doubled since 1960, and is expected to increase dramatically in the near future (Naiman and Turner, 2000). A study conducted by South Carolina's Department of Natural Resources found that from 1955 to 1980, there was a 500% increase in water consumption in the state. The study predicted that by the year 2000, water consumption in the state would be at about 400 million gallons a day. However, another study indicates that by 2000, the state's water consumption rate exceeded 540 million gallons daily (Hammond, 2002).

It should be noted that historically water was so abundant in the South -especially in the Southeast- that neither water rights nor availability were issues. However, due to factors such as increased population, increased personal and other uses of water, and increased urbanization, the South faces a number of water quality and water quantity issues. These issues include water availability, water rights, water quality, the finite nature of water as a resource, water contamination due to agricultural, industrial, and personal practices, and the pressure of greater volumes of use (Smith, 2000).

South Carolina's Water Plan

South Carolina continues to enjoy an abundance of water. However, its population continues to expand. Land conversion rates are relatively high. Not only is there increasing intrastate competition for water, but with three of its four major river basins shared with neighboring states, there is interstate competition as well. Water *has* (my emphasis) become an issue for the state (Badr, Wachob, and Gellici, 2004; Shannon, 2002).

Water runoff is considered to be the major problem, though other issues also are present in relation to water. South Carolina's *Water Plan* (Badr, Wachob, and Gellici, 2004) outlines procedures for assuring that the state's future needs for water can be met. Management goals for water resources in South Carolina include:

- *Allocation of surface and ground water to ensure long-term availability of water as a resource;*
- *Protection of freshwater and estuarine ecological functions and habitats;*
- *The development of a water-conservation ethic by providing education opportunities and information to the citizenry;*
- *Management of shortages so that all users share the burden;*
- *Drought management and mitigation plans to minimize drought impacts;*
- *Management of the quantity and quality of both surface and ground water in an integrated manner to protect, maintain, and enhance water as a resource;*
- *The development of interstate agreements with North Carolina and Georgia to protect water quality and quantity and provide equitable allocation of surface and groundwater;*
- *Regulation of interstate transfers in a way that reflects the variability in water availability, respects the natural systems, and protects the source basin's present and future water demands; and,*
- *Having a flood plan management and mitigation plan that establishes actions and procedures to minimize flood hazards and protect life and property (Badr, Wachob, and Gellici, 2004, p. 3).*

IT'S SPRAWL – AND WE ARE DEFINITELY IN THE MIX

WHAT IS SPRAWL?

Sprawl is defined as “*the process in which the spread of development across the landscape far outpaces population growth*” (Ewing et al., 2002, p. 3). It is contended that sprawl has four dimensions. These are:

- *A population that is widely dispersed in low-density development;*
- *Rigidly separated homes, shops, and workplaces;*
- *A network of roads marked by huge blocks and poor access; and,*
- *A lack of a well-defined, thriving activity centers, such downtowns and town centers (Ewing et al., p. 3, verbatim).*

What are the Effects of Sprawl?

The effects of sprawl include:

- Increased impervious surfaces;
- Greater water runoff;
- The loss of forests, small streams, meadows and wetlands;
- Decreased groundwater flow into streams:
- Stream contamination;
- Increased flooding, erosion and sedimentation;
- Compromised water quality;
- Higher rates of driving and vehicle ownership; and,

- Increased levels of ozone pollution (Otto et al., 2002; Ewing et al., 2002; Platt, 2006).

Is all Growth “Sprawl?”

Urban growth and sprawl are not always the same things. As noted by Garkovich (2000), urban growth simply refers to “*the geographic expansion of urban areas*” (p. 1). Sprawl refers to “*dispersed development outside of compact urban and village centers along highways and in the rural countryside*” (Garkovich, 2000, p. 1, as taken from the Vermont Forum on Sprawl).

South Carolina Ranks High in Sprawl

Using the four dimensions of sprawl identified by Ewing and associates, the Greenville-Spartanburg metropolitan area ranks fifth in sprawl among metropolitan areas in the United States (Ewing et al., 2002). Another study reported that between 1970 and 1990, about 20 million acres of rural land were converted to urban use in the United States (Garkovich, 2000). This study also found that from 1987 to 1992, the South had the highest number of acres converted to developed use. Moreover, of the 16 southern states included in the study, seven – including South Carolina – saw more than a 30% conversion of land use. That same study provides a quote from Burchell and Shad’s 1998 presentation on “*Land Use Conflicts at the Rural-Urban Interface*” (the proceedings of which were published by the American Farmland Trust) as follows:

“In South Carolina, if sprawl continues unchecked, statewide infrastructure costs for the period 1995 to 2015 are projected to be more than \$56 billion, or \$750.00 per citizen every year for the next 20 years”
(Burchell and Shad, in Garkovich, 2000, p. 7).

Using census data to measure sprawl, another study listed the “*Most Sprawled Metropolitan Areas, 2000.*” Myrtle Beach, Florence, and Sumter, South Carolina received perfect scores on sprawl (i.e., 100.00).⁴ The only other South Carolina metropolitan area making this list was Greenville-Spartanburg-Anderson, with a score of 98.76 (Lopez and Hynes, 2003, p. 343).

Finally, an analysis conducted by London and Hill (2000) of Clemson University found that from 1992 to 1997, in South Carolina the conversion to developed land increased by 30.2%. This put the state at sixth in the nation for increases in developed land during that time period. It also is noted that this degree of land conversion sharply contrasts to the rate of population growth during the same time period, which was 5.3% (London and Hill, 2000).

Regardless of which report used, sprawl and growth are quite pronounced in South Carolina. On the other hand, surveys of South Carolinians show that they are concerned about growth, sprawl, and problems with zoning (Vander Mey, 2002, 2004). In addition,

⁴ A score of 100 in this study could be interpreted as being completely sprawled.

management of the state's watersheds and natural resources can go a long way toward countering some of the effects of sprawl, while at the same time contributing to sustainable ecosystems in the state's future. Numerous efforts are underway in the state, with an incredible array of individuals, organizations, and agencies collaborating on this shared goal (see, for example, South Carolina Design Arts Partnership, 2000; South Carolina Department of Natural Resources, 2001; Saluda-Reedy Watershed Consortium, 2005).

There is no doubt that more collaboration and more participation are warranted. It is hoped that the brief overview of key issues surrounding watershed and natural resources management, combined with the information contained in the annotated bibliography, can help inform and expand these efforts.

KEY ISSUES IN WATERSHED AND NATURAL RESOURCES MANAGEMENT

A watershed represents a topographically defined area that is drained by a stream system – representing a smaller upstream catchment – that is a constituent of a larger river basin. This landscape encompasses both surface and groundwater supplies, in addition to terrestrial and community resources. Increasingly, the watershed has come to be viewed as a place-based and ecological entity, as well as a socioeconomic and political unit to be utilized for management planning, conservation strategies, and implementation purposes (Clark, Burkhardt and King, 2005, p. 297)

A watershed is “*the drainage area of a stream and its tributaries*” (South Carolina Department of Natural Resources, 2001, p. 86).

Management Paradigm Shift

Over the past several decades, the approach to managing watersheds and natural resources has taken a stark shift in paradigm. The movement has been away from top-down, autocratic and technocratic, solely technological and science approaches, to integrated environmental management (IEM). IEM is seen as conducive to more sustainable management of ecosystems, as opposed to past efforts that focused only on engineering aspects, individual plots of property, or biological or technological management approaches (Rhoads, et al., 1999; Smith, 2000; United States Environmental Protection Agency, 2005).

Ecosystem management can take several forms (Yaffee, 1998; Blumenthal and Jannink, 2000; Moore and Koontz, 2003), but, essentially, ecosystem management is holistic, integrates a broad range of goals and participants, is inter- and multi-disciplinary, is place- and community-based, and includes the general citizenry in issue identification and management planning. It is bottom-up rather than top-down (Johnson, 2000; Ewel, 2001; Platt, 2006). Furthermore, it is the essential element in the Watershed Protection Approach (i.e., using the whole watershed as the “place” and focus of management)

advanced by the US Environmental Protection Agency (Rhoads, et al., 1999; Smith, 2000; United States Environmental Protection Agency, 2005).

There are a number of issues and challenges that have been identified as associated with taking a watershed or ecosystems approach to the management of watersheds and natural resources. Several of these are listed below. Elaborations on these issues can be found in the attached annotated bibliography.

Environmental Knowledge, Environmental Concern, and Action on Behalf of the Environment

Nationwide surveys conducted from 1997 to 2001 indicate that education is the single most important factor in environmental knowledge. Environmental knowledge tends to increase with level of education. In the United States, people in the West tend to score highest on environmental knowledge, and people in the South tend to score the lowest. Generally speaking, people who actively seek out environmental information are more likely than the general public to engage in pro-environmental behaviors (Coyle, 2005).

This same series of nationwide surveys also found that 41% of the US adult population could correctly identify a watershed (Coyle, 2005). A study of South Carolina residents in the Upstate of South Carolina, conducted by Clemson University researchers, found that only 27.3% of the adults participating in that study could do the same (Mobley and Witte, 2005). The study also found that roughly the same percentage of respondents had engaged in pro-environmental behaviors such as planting a tree or creating a wildlife habitat.

That is not to say, however, that South Carolinians do not care about the plight of the environment in their state. Three different surveys of adult South Carolinians have revealed that they are indeed concerned (Vander Mey, 2002). What is needed, therefore, is more work focused on connecting concern with increased knowledge in order to foster constructive action. It has been found that when people are informed, for instance, of the value of conserving water, they are more likely to be committed to conserving water (Trumbo and O'Keefe, 2005).

Perceptions, of course, do not always align with fact. For instance, one study found that regardless of the objective measures of water quality of particular bodies of water, there is a tendency for people evaluating lakes to perceive those with more shoreline development as more polluted (Stedman and Hammer, 2006). In the telephone survey conducted among Upstate residents in South Carolina, it was found that respondents were inclined to agree that selected water bodies in the Saluda-Reedy Watershed had become more polluted over the last 10 years (Mobley and Witte, 2005). However, while this watershed can potentially be compromised by development, the water quality in the watershed actually has improved over the past several decades (Saluda-Reedy Watershed Consortium, 2005).

Perceptions of and Relationship with the Environment

Greider and Garkovich's (1994) work on the social construction of the environment (i.e., "sense of place") richly illustrated that the environment does not have meaning to people in and of itself. Rather, personal and cultural factors contribute to the meanings that people attribute to the environment. These factors include age, race, gender, social class, and ethnicity, and rural or urban residence (Karp, 1996; Burger, 1998; Cordell and Green, 2002; Cottrell, 2003; Adeola, 2004; Hunter and Rinner, 2004; Johnson et al., 2004; Payton et al., 2005).

Findings from these studies include:

- Blacks more than whites tend to value preserving natural areas, whereas whites tend to prefer natural areas as recreational areas;
- Blacks more than other ethnic groups tend to agree that humans have a right to control, modify, or rule over nature;
- Except for outdoor team sports, Blacks are underrepresented in all outdoor activities;
- Rural residents are more likely than urban residents to agree that human skills can insure the future of the earth, that the environmental crisis is exaggerated, and that humans are meant to control nature;
- Foreign-born citizens are more likely than native born citizens to agree that humans should control nature;
- Older people are more inclined than younger people to believe that humans are meant to control the environment;
- Whites tend to believe, more than other groups, that the balance of nature is delicate and that humans do not have the right to rule over nature;
- People who are more ecocentric in their orientation to the environment, regardless of other characteristics and environmental knowledge, tend to place a higher priority on preserving species; and,
- Blacks and other minorities tend to suspect that they are disproportionately exposed to environmental risks (e.g., industrial pollution, nuclear waste, pesticides);
- Overall, minorities are less likely to be active users of wilderness areas, but nonetheless tend to value wilderness in more passive ways.

What about the Farmers?

A number of studies have explored the relationships between being an agricultural producer (i.e., "farmer") and orientations toward and actions on behalf of the environment. While there is some variation, American agricultural producers see themselves as environmental stewards. Farmers value conserving and preserving natural resources. For farmers, specific actions in the context of watershed and natural resources management often are a function of degree of economic risk entailed, scale of the operation, perceived reciprocity from neighbors, government incentives, and community

characteristics (Camboni and Napier, 1993; Ryan et al., 2003; East Tennessee Technical Support Center, 2004; Lubell, 2004; Gan et al., 2005; Page and Daugherty, 2006).

It should be noted that while conventional wisdom or popular mythology might suggest that farmers will engage in conservation and preservation only when provided economic incentives, research reveals that farmers are intrinsically motivated to protect the environment (Thompson, 1995, 1997; Ryan et al., 2003).

It also might be the case that agricultural producers' perspectives can not be neatly split into "either/or" categories. A case study project among farmers in South Carolina, for instance, found that farmers had more than one definition or view of their farms. They tended to agree that their farmland was personal property, that it constituted a business, and that it was an agroecosystem (Klumas, 1996).

Challenges to Collaborative Management of Watersheds and Natural Resources

In their analysis of 1,500 online media stories about ecosystem management from 1992 through 1998, Bengston et al. (2001) found that favorable attitudes (78%) predominated. This led them to conclude that "ecosystem management no longer is a new or controversial topic" (Bengston et al., p. 481). However, even if ecosystem management itself may not be controversial, the literature reviewed for the annotated bibliography revealed a number of challenges to successful collaborative management of watersheds and natural resources.

These challenges include trust or distrust, respect for property rights and the views and experiences of everyday people, early inclusion into the process, and genuine inclusion of citizen participants as decision makers, and not merely as another source of data.

It has been found that successful formation and operation of collaborative watershed and natural resources decision making groups can be hampered when a community has experienced events that have led citizens to be distrustful of leaders and agency officials (Singleton, 2002; O'Neill, 2005). On the other hand, research demonstrates that collaborative ventures are successful when there already is trust of leaders and officials on behalf of citizen participants, or trust is established and maintained as the collaboration is created and begins operation (Lubell, 2004).

Collaborative efforts also are more successful if the property rights of the citizen participants are acknowledged and respected (Rickenbach and Reed, 2002). Further, respect for the knowledge and experience that citizen participants bring to the table is critical to success of the collaboration. Collaborative efforts can be impeded if not rendered impossible if the approaches taken by the leaders are too technocratic or heavily reliant on "expert" assessments rather than giving credence to "regular" peoples' observations and suggestions (Steele, 2004; LaChapelle and McCool, 2005).

Lubell and associates (Lubell et al., 2002) studied 928 watershed partnerships in the United States in an effort to understand the benefits and transaction costs of participating

in these partnerships. They found that while state environmental policies do not have a significant impact on watershed partnership formation, opposition from agricultural interests tends to inhibit partnership formation and activity. While percent of natives in a state's population had no bearing on watershed partnership rates, areas with higher median educational attainment and occupation statuses among residents had higher watershed participation rates while areas with higher Black and Hispanic populations had lower rates of partnership. Their analysis led them to caution that watershed partnerships are not "magic bullets" for solving all environmental collective action problems (Lubell et al., 2002).

Leaders' and facilitators' respect for participants' attachment to land and place also has been associated with success in collaborative watershed and natural resources management (Lubell, 2004; Payton et al., 2005).

Another real challenge to participation in watershed management groups or organizations is that many people do not think in terms of a "watershed." This is hard for them to visualize, or else hard for them to place their own place of residence in this broader context (O'Neill, 2005). The report by Harris et al., (2004; contained in this larger document) on decision making in the Saluda-Reedy Watershed of South Carolina illustrates that sometimes key decision makers make land use, zoning, and other decisions that might have bearing on the watershed in which they are located without reference to the Watershed or the bodies of water found in the watershed. Certainly then, the various efforts being made all over the country to help people know their watersheds are worth the time and effort.

Other factors that apparently are key to successful collaborative management of watersheds and natural resources include bringing citizen participants in *early* in the process, making sure that the whole watershed (and not just certain segments) are included, using culturally appropriate approaches to communication and decision making, and ensuring that citizen participation is integral to the processes involved, as opposed to using citizen input as just another set of data or not fully engaging citizens in the processes (Duram and Brown, 1999; Korfmacher, 2001; LaChapelle and McCool, 2005).

Finally, I would like to add my own suggestion for improving citizen participation in watershed and natural resources decision making. This is based on this current review of research, others readings that I have done over the years, a little bit of my own research (Vander Mey et al, 1998 – which found, among other things, that South Carolinians tend to agree that environmentalists exaggerate the effects that animal agriculture has on the environment), and practical experience in teaching about the environment and interacting with people across the state of South Carolina. This has to do with defining the underlying purpose of these collaborations.

It is my guess that the more *stewardship*, rather than *environmentalism*, is stressed in these collaborative endeavors, the more readily people will want to participate. My guess

is that this would be the case especially in parts of the country where “environmentalist” and “environmentalism” conjure up negative images and stereotypes.

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PART II:

**DECISION MAKING FOR NATURAL RESOURCES AND
WATERSHED MANAGEMENT: CURRENT THINKING
AND APPROACHES**

AN ANNOTATED BIBLIOGRAPHY

by

**Brenda J. Vander Mey and W. Paul Pitts
June 2006**

PART II: AN ANNOTATED BIBLIOGRAPHY

by Brenda J. Vander Mey and W. Paul Pitts, June 2006

I. BACKGROUND, GENERAL, AND TEXTBOOK PUBLICATIONS RELATED TO THE ENVIRONMENT, AND NATURAL RESOURCES AND WATERSHED MANAGEMENT ISSUES AND APPROACHES

Baker, M. B., Jr., P. F. Ffolliott, C. B. Edminster, K. L. Mora, and M. C. Dillon. 2000. *Watershed Management Contributions to Land Stewardship: A Literature Review*. General Technical Report No. RMRS-GTR-71WWW. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. Fort Collins, CO.
<http://www.fs.fed.us/rm/pubs/stewardship.html>

The title of this publication may be misleading in that the publication is composed of a series of bibliographies that are topically organized; no literature reviews are included. However, extensive bibliographies are available. Topic areas include:

- Watershed Management Perspectives;
- Issues in the 21st Century;
- Watershed Management Contributions to Future Land Stewardship;
- Watershed-Related Research projects;
- Applied Watershed Management Activities;
- Technology Transfer Mechanisms; and,
- Case Studies.

Bengston, D. N., G. Xu, and D. P. Fan. 2001. Attitudes toward ecosystem management in the United States, 1992-1998. *Society and Natural Resources*, 14: 471-487.

The authors analyzed favorable and unfavorable attitudes toward ecosystem management as expressed in 1,500 online media stories from 1992 through 1998. Thirty-three different news sources were used.

It was found that media discussion about ecosystem management has declined and leveled off, which may mean that “*ecosystem management no longer is a new or controversial topic*” (p. 481). For the entire study period, favorable attitudes toward ecosystem management predominated (78%). In addition, it was found that discussion of ecosystem management shifted from what it is and should it be done to what are the best practices for specific geographic areas (p. 483). All the same, the authors caution that “*the public points to the ends and does not think about the means*” (p. 484). Thus, those

engaged in ecosystem management must continue identifying and meeting challenges associated with ecosystem management.

Campbell, C. S. and M. H. Ogden. 1999. *Constructed Wetlands in the Sustainable Landscape*. New York: John Wiley & Sons.

This slim volume, replete with drawings, case studies, data charts, and photographs, takes an integrated, holistic approach to sustainable constructed wetlands. Chapters include:

- The Concept of Sustainable Development;
- The Nature of Wetland Processes;
- Constructed Wetlands and Wastewater Treatment Designs;
- Design, Operation, and Maintenance of Constructed Wetlands;
- Stormwater Renovation with Constructed Wetlands;
- Single-Family Residential Systems;
- The Pond;
- Wildlife Considerations and Management;
- Art, Engineering, and the Landscape; and,
- Examples of Multiple-Use Constructed Wetlands.

This book brings together issues of policy and regulation, the technicalities of design and construction, and the social and natural sciences' contributions to collaborative and interdisciplinary efforts to construct sustainable wetlands. In some cases, the projects used to illustrate policies, environmental problems, and social concerns are ones that are actually reconstruction projects. That is, the projects were put in place to correct past mistakes made in constructed wetlands – ones usually undertaken originally as narrowly conceived engineering projects or economic development endeavors. Reconstruction efforts showcased in this volume focused on correcting engineering mistakes and creating environmental niches that attract and retain wildlife, are plant habitats, enhance the physical and aesthetic quality of an area, and, often, are enjoyed by human users as well.

Examples of successful wetlands construction and restoration projects showcased in this book include:

- The Arcata, California Wastewater Marsh and Wildlife Sanctuary;
- Columbia, Missouri Wetlands Wastewater Treatment Project;
- Orlando, Florida Easterly Wetlands Reclamation and Park Project;
- The Outdoor Classroom and Constructed Wetlands Project for Los Padillas Elementary School, Albuquerque, New Mexico;
- Binford Lake/Butler Creek Greenway, Gresham, Oregon; and,
- Mitchell Lake Wetlands and Chavaneaux Gardens, San Antonio, Texas.

**Coyle, K. J. 2005. *Environmental Literacy in America: What Ten Years of NEETF/Roper Research and Related Studies Say about Environmental Literacy in the U.S.* NEETF/Roper Report – Draft. May. Washington, DC: National Environmental Education & Training Foundation.
www.neetf.org/pubs/ERL2005.pdf**

Relying on the annual NEETF/Roper environmental knowledge quizzes conducted by telephone nationally each year from 1997 to 2001, and incorporating findings from other studies, it was found that environmental illiteracy remains a significant feature of American life. Some of the specific findings include:

- Level of education is the single most significant factor in relation to environmental knowledge, with environmental knowledge scores increasing with level of education;
- People in the West scored highest on environmental knowledge, and people in the South scored lowest;
- Overall, 41% of adult respondents could correctly define a watershed;
- People who actively seek out environmental information were more likely than the general public to engage in pro-environmental behaviors and are more willing to pay for pro-environmental versions of products; and,
- Most Americans believe that environmental protection and economic development can go hand in hand

Edwards, C. A., R. Lal, P. Madden, R. H. Miller and G. House, Eds. 1990. *Sustainable Agricultural Systems*. Delray Beach, FL: St. Lucie Press.

This massive tome covers the gamut of issues and research related to sustainable agriculture – in the United States and internationally. Articles range from providing a history of sustainable agriculture, policy development for sustainable agriculture, and the ecological considerations for food security in developing countries, to specific technologies associated with sustainable agriculture (e.g., Integrated Pest Management, alternative tillage methods, weed and pasture management).

T. L. Logan’s chapter “Sustainable agriculture and water quality” (pp. 582-613) provides an array of analyses related to agricultural practices and soil erosion, runoff, and impacts on ground water and surface water. It is noted that specific water quality regulations are necessary to foster adoption of practices that decrease agriculture’s impact on water quality.

Esty, D. C., M. Levy, T. Srebotnjak, and A. de Sherbinin. 2005. 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. Main Report. New Haven: Yale Center for Environmental Law and Policy. www.yale.edu/envirocenter. Also available at: www.ciesin.columbia.edu.

This publication is the result of collaboration between the Yale Center for Environmental Law and Policy, Yale University, the Center for International Earth Science Information Network (CIESIN), Columbia University, the Joint Research Centre (JRC) of the European Commission, and the World Economic Forum. The websites listed above also provide, free of charge, the full report and various break out reports.

The purpose of this work is to provide benchmarks that can be used to track national-level efforts at environmental sustainability. Seventy-six data sets were used. The data sets variously contained information about past, present, and intended efforts toward environmental sustainability, nation-level capacities to improve environmental conditions, 21 different environmental sustainability indicators, environmental management efforts, and present pollution levels. In all, the Environmental Sustainability Index (ESI) Score is a function of five components, derived for 21 indicators, which were themselves based on 76 variables.

The five components are:

- *“Environmental Systems;*
- *Reducing Environmental Stresses;*
- *Reducing Human Vulnerability to Environmental Stresses;*
- *Societal and Institutional Capacity to Respond to Environmental Challenges; and,*
- *Global Stewardship” (p. 1).*

It is noted that ESI does not rely on the standard indicators of environmental sustainability, i.e., ecological soundness, economic feasibility, and social acceptance. Instead, it is argued that *“sustainability... is the dynamic condition of society that depends on more than the protection and management of environmental resources and stresses as measured by ESP” (p. 12).* It is further argued that sustainability measures must include social dimensions (e.g., social justice and effective governance) and education. The authors concede that currently, ESI is somewhat compromised by data gaps and by the fact that it does not cover certain important issues such as waste management, exposure to heavy metals, and wetlands destruction. This is due to the fact that either these data are not being collected, or are not being collected in a way that makes it possible *“to make cross-county comparisons” (p. 2).*

One hundred and forty-six countries were included in the analysis. Generally speaking, the Nordic or Scandinavian countries had the highest ESI scores (Finland and Norway were ranked numbers one and two, respectively). North Korea had the lowest ranking. The United States was ranked forty-fifth. The United States scored relatively high on

social and institutional capacity and on reducing human vulnerability, but scored relatively low on reducing stresses and global stewardship.

Ffolliott, P. F., M. B. Baker, Jr., C. B. Edminster, M. C. Dillon and K. L. Mora. 2002. *Land Stewardship through Watershed Management: Perspectives for the 21st Century*. New York: Kluwer Academic/Plenum Publishers.

This book represents a synthesis of papers presented at the international conference *Land Stewardship in the 21st Century: The Contributions of Watershed Management*, Tucson, March 2000. This book is very interdisciplinary, and reflects an holistic perspective on watershed management and on watershed management as land stewardship. Case analyses are provided for technological approaches to watershed management, social scientific and policy issues, and processes related to watershed management. U.S. and international case examples are used. Extensive bibliographies are located at the conclusion of each chapter.

The chapters are arranged as follows:

- Introduction;
- Perspectives, Problems, Programs;
- A Retrospective View;
- Issues to be Confronted;
- Watershed Management Contributions to Land Stewardship; and,
- Future Protocols.

Note: Earlier versions of some of the chapters in this book are available online as: Ffolliott, P. F., M. B. Baker, Jr., C. B. Edminster, M. C. Dillon and K. L. Mora. [Technical Coordinators] 2000. *Land Stewardship in the 21st Century: The Contributions of Watershed Management; 2000 March 13-16; Tucson, AZ*. Conference Proceedings. RMRS-P-13. United States Department of Agriculture Forest Service. Fort Collins, CO. http://www.fs.fed.us/rm/pubs/rmrs_p013.html. Other papers and monographs presented at the conference but not included in this book can be accessed at this site.

Garkovich, L. 2000. *Land Use at the Edge: The Challenges of Urban Growth for the South*. Southern Rural Development Center, 21st Century Series. No. 13. August. <http://srdc.msstate.edu/>

Overviews national and regional trends in urban land use, with a special focus on the South. Lists consequences of growth and sprawl, including threats to wetlands and watersheds. Explores the costs of growth to humans and environments, and discusses strategies for managing growth and land use.

Goudie, A. 2001. *The Human Impact on the Natural Environment*. Fifth Edition. Cambridge, MA: The MIT Press.

This is a data-driven, statistics-packed textbook that systematically inventories human impacts on the environment. Numerous drawings, charts, illustrations, and photographs are included, as is an extensive bibliography. The discussions begin with what is known about the earliest humans and their use of and impact on the environment, and proceeds through all historical epochs around the world. The book concludes with a discussion of future uncertainty and future responses.

The chapters in the book are arranged as follows:

- Introduction;
- The Human Impact on Vegetation;
- Human Influence on Animals;
- The Human Impact on Soil;
- The Human Impact on the Waters;
- Human Agency in Geomorphology;
- The Human Impact on Climate and the Atmosphere;
- The Future; and,
- Conclusion.

This is not a “doom and gloom” text. Furthermore, while the book focuses throughout on humans’ impacts on the environment, it is acknowledged that even without human influence, the environment would be both complex and in a state of flux. It also is acknowledged that humans can have positive (i.e., regenerative, restorative, enhancing) influences on the environment.

The author attempts to be as factual and as scientific as possible. The conclusion chapter includes a discussion on how and why negative impacts on the environment are reversible.

Greider, T. and L. Garkovich. 1994. Landscapes: The social construction of nature and the environment. *Rural Sociology*, 59(1):1-24.

This article provides an approach to understanding the meanings of place and environment for social groups. The approach combines social constructionism with phenomenology and symbolic interaction to identify the links between people, places, and nature. Case studies from sociology and anthropology are used to illustrate the use of this approach. Emphasized is the fact that humans confer meanings to nature and the environment. It is contended that people define these through their values and beliefs, which are grounded in culture.

This framework gives insight into why different groups sometimes have conflict over changes in the natural environment and potential consequences of these changes. In a

practical and applied sense, this approach can be used to more effectively manage environmental projects, environmental policies, and community responses to them.

Harper, C. L. 2004. *Environment and Society: Human Perspectives on Environmental Issues*. Third Edition. Upper Saddle River, NJ: Prentice-Hall, Inc.

A widely used textbook for sociology of the environment courses, this compactly written text provides an overview of the key research and points of contention related to humans and the environment. It is current on U.S. and international laws, policies, and treaties. It takes a very global perspective, and also challenges the reader to identify what s/he can do to make their world more sustainable.

The book contains the following chapters:

- Environmental Problems and Ecosystems;
- Human Systems, Environment, and the Social Sciences;
- The Resources of the Earth: Sources and Sinks;
- Global Climate Change, Scientific Uncertainty, and Risk;
- Population, Environment, and Food;
- Energy and Society;
- Alternative Futures: Sustainability, Inequality, and Social Change;
- Transforming Structures: Markets, Politics, and Policy;
- Environmentalism: Ideology, Action, and Movements; and,
- Globalization: Trade, Environment and the Third Revolution.

Hunsaker, C. T., P. M. Swartz, and B. L. Jackson. 1996. *Landscape Characterization for Watershed Management*. 1996. Conference paper No. 96060227—1. Available from the U.S. Department of Energy's Information Bridge, Office of Science and Technology Information, <http://www.osti.gov/>.

This is a very brief document that shows how landscape pattern metrics were applied to the monitoring and assessment of water quality for the Mid-Atlantic Region, as a demonstration of the EPA's Environmental Monitoring and Assessment Program (EMAP). It was found that the proportion of nitrogen and sediments increased in conjunction with proportionate uses of agriculture; and that areas with contiguous land cover or forests had "better water quality" (p.5).

Mallin, M. A., K. E. Williams, E. C. Esham, and R. P. Lowe. 2000. Effect of human development on bacteriological water quality in coastal waters. *Ecological Applications*, 19(4): 1047-1056.

Analysis was focused on five estuarine creeks in southeastern North Carolina over a four-year period. These areas are rapidly developing. It is proposed that under certain conditions, rapid development in coastal areas can pose environmentally-based health

risks to humans. The study tracked the rates and distributions of *Escherichia coli* and fecal coliform.

Significant correlations were found between fecal coliform abundance and human populations in watersheds and between percent developed land and fecal coliform. The strongest finding was found between fecal coliform abundance and percent watershed-impervious coverage (e.g., roofs, parking lots, roads). Water runs off these impervious surfaces and into stormwater and other water systems.

The authors suggest that health risks to humans created by development of coastal areas could be reduced if planning incorporated limited use of impervious surfaces, and maximum use of grassy swales, constructed wetlands, and other “green” areas.

McHarg, I. L. 1969. *Design with Nature*. Garden City, NY: Doubleday & Company, Inc.

“Clearly, the problem of man and nature is not one of providing a decorative background for the human play, or even ameliorating the grim city: it is the necessity of sustaining nature as source of life, milieu, teacher, sanctum, challenge, and, most of all, of rediscovering nature’s corollary of the unknown in the self, the source of meaning.” (McHarg, 1969, p. 19)

McHarg’s work is widely recognized as seminal to an ecological approach to planning. His use of the term “*design with nature*” is intentional. It underscores his contention that there is an ethic to planning. That is, in his view, there should be a real and sustained, respectful and thoughtful, linkage between humans and their use and manipulation of nature.

Among his propositions are the following:

*Uncontrolled growth is inevitably destructive (p. 83);
Development is inevitable and must be accommodated (p. 83); and,
Interstate highways should maximize public and private benefits (p. 22).*

The chapters in the book are as follows:

- Introduction;
- City and Countryside;
- The Plight;
- A Step Forward;
- The Cast and the Capsule;
- Nature in the Metropolis;
- On Values;
- A Response to Values;
- The World is a Capsule;
- Processes as Values;

- The Naturalists;
- The River Basin;
- The Metropolitan Region;
- Process and Form;
- The City: Process and Form;
- The City: Health and Pathology; and,
- Prospect.

There are numerous site analyses, zone analyses, maps, drawings, and photographs included in this book.

McNeely, J. A. and S. J. Scherr. 2003. *Ecoagriculture: Strategies to Feed the World and Save Wild Biodiversity*. Washington: Island Press.

This book brings together the myriad issues surrounding the interface between the need to feed people and the need to produce foods in ways that are healthful to people and not harmful to the environment, yet protect if not enhance wild biodiversity in plants and animals.

The chapters are arranged as follows:

- Introduction;
- Wild Biodiversity under Threat;
- Agriculture and Human Welfare;
- Agriculture and Wild biodiversity;
- Ecoagriculture: Genesis of the Approach;
- Making Space for Wildlife in Agricultural Landscapes;
- Enhancing the Habitat Value of Productive Farmlands;
- Coexisting with Wild Biodiversity in Ecoagriculture Systems;
- Policies to Promote Ecoagriculture;
- Market Incentives for Ecoagriculture;
- Institutions to Support Ecoagriculture; and
- Bringing Ecoagriculture into the Mainstream.

Numerous case studies from projects around the world are presented.

Odum, H. T. 1983. *Systems Ecology: An Introduction*. New York: A Wiley-Interscience Publication.

This is a standard-bearing text for ecological analysis and ecological approaches. The book overviews systems ecological analysis, emphasizing that this approach studies whole ecosystems – including overall performance and system design detail. The book, with graphic illustrations and extensive bibliographies, is divided into four parts:

- Energy, Systems, and Simulation;
- Design Elements;

- Organization and Pattern; and,
- Systems of Nature and Humanity.

The last portion of the book provides analyses of regional systems of landscape and human settlement and discusses water and water issues in relation to regional models and competition for use of natural resources.

Odum H. W. 1936. *Southern Regions of the United States*. Chapel Hill, NC: The University of North Carolina Press.

A seminal work in what was then the emerging ecological approach to human systems, also known as human ecology. Employing a very interdisciplinary framework, Odum used over 700 social indicators from a variety of data sources to explain the South (and compare it with other regions of the country) in terms of its status in relation to industry and wealth, the people of the region, their customs and institutions, the South's natural resources and agrarian culture, and the region's technological deficiencies. Ultimately, Odum relied on the ecological perspective and masses of data to identify the region's potential and to guide future planning based on socioeconomic factors that affect the use of natural resources and influence decision making.

Platt, R. H. 2006. Urban watershed management: Sustainability, one stream at a time. *Environment*, 48(4): 26-42.

Platt notes that previous research has identified several negative human impacts on urban watersheds. These include: increased impervious cover; increased flashiness due to increased deliberate interventions such as river rafting which increases bank erosion and downstream siltation; contamination by point sources such as sewer overflows and industrial discharges; and, contamination by nonpoint sources such as storm runoff, failing septic systems, and farm and landscape fertilizers; and, increased flood hazards.

It also is documented that public use and enjoyment of urban surface waters can be impeded by private ownership of stream banks, flood walls, and large junk objects such as cars (p.30).

Ecosystem management, which increasingly involves complex partnerships comprised of an array of stakeholders and interest groups, has become the dominant paradigm for urban watershed management. This paradigm is a stark departure from past approaches that were centered on engineering approaches. This paradigm is more holistic and inclusive, and speaks to the goal of sustainability. According to Platt, "*holistic watershed management today seeks to integrate a broad range of goals, means, and participants through ad hoc watershed partnerships... Ideally, such efforts may enhance both the physical/biological health of urban streams and the attachment of watershed residents to their local streams*" (p. 31).

Platt draws from findings from a study conducted by the University of Massachusetts Amherst to illustrate how the ecosystem management paradigm can be tailored and

applied in different watersheds. The watersheds reported on in this article are Boston's Charles River, Huston's Buffalo Bayou, and Portland's Johnson Creek. It was found that while in each case the effects of long-term abuse needed to be addressed, each watershed also had to be studied in terms of its own unique characteristics (such as history, physical setting, state and local laws, political culture and leadership). At the same time, several broad factors were found to be held in common to these three watersheds. These common factors included:

- One or more issues that forced attention and local concern;
- Community catalysts (e.g., local residents, NGOs, scientists);
- The creation of alliances of watershed partnerships that bridged conflicts among stakeholders;
- Creative, multi-source and multi-party funding strategies; and,
- A focus on specific sites (due to complexity and other factors) that fostered the ability produce showcases or models (Platt, 2006, p. 41).

Postel, S. 2005. From the headwaters to the sea: The critical need to protect freshwater ecosystems. *Environment*, 47(10): 8-21.

This article systematically identifies an array of life-support services provided by freshwater ecosystems. These include flood and drought mitigation, wildlife habitat, recreational opportunities, ecosystems and food security, water for industries, homes and cities, and aesthetic, cultural and spiritual values.

Written from an international perspective, the article illustrates how water strategies of the 20th century largely worked against nature (e.g., dam construction, large-scale river diversions, various engineering projects). During this time frame, human impacts on freshwater ecosystems also have tended to be negative (e.g., pollution, water consumption, introduction of exotic species, habitat loss). Postel notes, for instance, that part of the devastation of Hurricane Katrina was a function of the fact that numerous dams and levees that have been built upstream along the Mississippi River have contributed to the loss of coastal wetlands that could have served as a buffer against the storm's powerful surges.

At the same time, Postel presents strategies that are now being used in an effort to protect freshwater ecosystems and learn from past mistakes. For instance, in a departure from its engineering tradition, the U.S. Army Corps of Engineers has been engaging in projects that demonstrate the positive effects of wetlands and natural flood plains in controlling floods. Work currently is underway to restore dried out floodplains and delta wetlands along the Danube. Several large cities in the United States (including New York City, Boston, Massachusetts, and Seattle, Washington) have been investing in watershed protection rather than additional construction of water filtration plants in an effort to maintain drinking water purity.

Reimold, R. J. Ed. 1998. *Watershed Management*. New York, NY: McGraw-Hill, A Division of the McGraw-Hill Companies.

Overviews a watershed as a unit of measure, watershed management concepts, key factors in regional assessments for watershed management in the United States, groundwater aspects of watershed management, the role of highways in watershed management, watershed management in urban areas of the United States, and issues in successful multiparty watershed management.

Roth, L. [Ed.]. 2004. *Life at the Water's Edge: A Shoreline Resident's Guide to Natural Lakeshore and Streamside Buffers for Water Quality Protection in South Carolina*. Clemson, SC: Clemson University Public Service Publishing, Clemson University.

This science-based, practical guide is well illustrated with photographs, drawings and summary charts to deliver what the title implies: a guide for people living along water bodies in South Carolina.

The chapters in this guide are as follows:

- Introduction: Protecting Palmetto Waters: The Shoreline Resident's Special Stake;
- It Begins on the Land: A Watershed Perspective;
- Beyond the Water's Edge: Aquatic Life, Healthy versus Harmed;
- Growing it Back to Health: Shoreline Buffer Vegetation for Water Quality Protection;
- Designing a Shoreline Buffer; and,
- Establishing and Maintaining Shoreline Buffer Vegetation.

The appendices include a list of suggested readings, a text glossary, the botanical names of plants mentioned in the guide, and plant lists for South Carolina shoreline and streamside buffers.

Smith, G. E. 2000. *Water Quality and Quantity Issues for the South*. Southern Rural Development Center, 21st Century Series. No. 7. May. <http://srdc.msstate.edu/>

Provides a brief history of water policy in the South, assesses the current water quality and quantity situation for the South, identifies and discusses issues regarding water quality and quantity that must be addresses in the South. These challenges include:

- Increased demand;
- The watershed approach;
- Interbasin transfers;
- Equity; and,
- Property rights.

Smith notes that the watershed-level planning approach (i.e., the watershed approach) was identified by the Clean Water Action Plan (U.S. Environmental Protection Agency, 1998) as pivotal to clean water.

An array of “policy tools” is at the disposal of state, federal, and local policymakers to address the challenges listed above.

These tools include

- Taxes;
- Incentives (monetary and market-based);
- Litigation;
- Education;
- Acquisition; and
- Regulation.

All told, Smith contends that given the encompassing nature of the watershed approach and the complexity and diversity of entities and interests involved, success will depend on *informed participation* (our emphasis) of all parties.

United States Environmental Protection Agency. 2003. *2003-2008 EPA Strategic Plan: Direction for the Future*. EPA-190-R-03-003, September 2003. Washington, DC: Office of the Chief Financial Officer, Office of Planning, Analysis, and Accountability (2723A). www.epa.gov/ocfopage.

After extensive collaboration with myriad colleges and universities, agencies and organizations, the EPA released its new five-year plan in September of 2003. The five goals areas to be focused on are:

- Clean Air and Global Climate Change;
- Clean and Safe Water;
- Land Preservation and Restoration;
- Healthy Communities and Ecosystems; and,
- Compliance and Environmental Stewardship.

Each goal has several objectives, with sub-objectives associated with these objectives. For instance, Land Preservation and Restoration has the objectives of land preservation, land restoration, and enhancement of science and research. The objective of land restoration includes the sub-objective of preparing for and responding to accidental and intentional releases. Strategies and means for achieving objectives are clearly stated. Extensive bibliographies are included in this large document.

United States Environmental Protection Agency. 2005. *Community-Based Watershed Management: Lessons from the National Estuary Program*. EPA-842-B-05-003. February. Washington, DC: EPA Office of Wetlands, Oceans, and Watershed. www.epa.gov/owow/estuaries

Based on roughly 20 years of experience in the 28 National Estuary Programs (NEPs), the document systematically identifies principles, key issue areas, and strategies for successful management of watershed management. Sidebars provide examples from the NEPs related to problems such as reducing pollution and increasing habitat. Chapter 1 presents the four cornerstones of NEP. These are:

- Focus on the watershed;
- Integrate science into the decision-making process;
- Foster collaborative problem solving; and,
- Include the public. (p. 1)

The chapters in this document are:

- Chapter 1. The National Estuary Program (NEP)
- Chapter 2. Establishing a Governance Structure
- Chapter 3. Identifying Problems and Solutions
- Chapter 4. Developing the Management Plan – A Blueprint for Action
- Chapter 5. Implementing the Management Plan
- Chapter 6. Conclusion

Appendices include a copy of the Clean Water Act, Section 320, as Amended, Pros and Cons of Becoming a Tax-Exempt Nonprofit, and Excerpt from an NEP Finance Plan.

This document is an excellent “how to” guide for watershed decision-making and management.

Warner, M. L., H. Harris, B. J. Vander Mey, J. Allen, C. M. Sieverdes, C. Mobley, and P. Skewes. 1998. *Animal Agriculture in South Carolina: A Fact Book*. Publication Number EER. Funded by PSA Agrisystems Productivity and Profitability Competitive Grants. Public Service and Agriculture. Clemson University. Clemson, South Carolina. <http://cherokee.agecon.clemson.edu/eer172.htm>

In the Introduction to this collection of original research and articles, Hal Harris notes that after much heated debate over the so-called “Hog Bill,” new regulations regarding animal agriculture went into effect in South Carolina in June of 1998. The state’s Department of Health and Environmental Control (DHEC) then incorporated the law into its regulatory framework.

Given the continued controversy over animal agriculture in South Carolina, a team of researchers at Clemson University proposed a multi-disciplinary, integrated study of

animal agriculture in the state. There were three stated purposes of the project. These were:

- To improve the knowledge base of both interest groups and the general public about animal agriculture issues;
- To ascertain South Carolinians' attitudes and opinions about animal agriculture; and,
- To create the environment for an improved dialogue between the industry, concerned citizens, and government on animal agriculture (Harris, 1998, p. 1).

One of the products from the team's efforts was the Factbook cited above. The publication is organized as follows:

- Introduction (H. Harris)
- Current Status of Animal Agriculture in South Carolina: Comparison with Adjacent States (H. Harris)
- Adult South Carolinians' Opinions about Animal Agriculture (B. J. Vander Mey, C. Mobley, and J. E. Hawdon)
- Depicting Trends in South Carolina Animal Agriculture (C. M. Sieverdes)
- Spatial Relations of Polluted Streams, Animal Agriculture, and Human Populations in South Carolina Watershed (J. Allen, K. S. Lu, and S. Blacklocke)
- Economics of Regulating Animal Agriculture (M. L. Warner)
- How Governments are Responding (M. L. Warner)
- The Changing Structure of Animal Agriculture (M. L. Warner)
- Problems and Solutions (M. L. Warner)
- Other Sources of Nonpoint Pollution (M. L. Warner)
- Sources of Funding for Farmers
- Websites of Interest for Agriculture and the Environment

It should be noted that the analysis of spatial relations of polluted streams (Allen, Lu and Blacklocke) revealed that *"the spatial relationship between impaired streams for dissolved oxygen and concentrations of hogs, cattle, chicken farms is not strong, whereas the spatial relationship between the human population and impairment for dissolved oxygen appears to be significant"* (p. 30). In addition, the telephone survey of 700 adult South Carolina residents (Vander Mey, Mobley and Hawdon) revealed the following:

- 73% of respondents were supportive of additional animal agriculture in their counties;
- Respondents were inclined to support animal agriculture because, from their views, the industry supports family farms, employs others, and brings in other businesses;
- Respondents were concerned about the possibility of odors, environmental problems, and flies;
- Respondents would support tougher environmental regulations for animal agriculture (57.7%), though 71.6% indicated that they believed people already were working to reduce the environmental impacts of animal agriculture;

- Very few respondents (12%) believed that animal agriculture had reduced their quality of life;
- Most respondents (97.3%) indicated that it is important to preserve family farms;
- 89.4% indicated that the preservation of open spaces is important to them;
- 54.9% of the respondents agreed that better zoning is needed to separate animal operations from residential areas;
- Two-thirds of the respondents (65.7%) supported property owners' rights to use their property as they wish;
- 63.7% agreed that environmentalists exaggerate problems associated with animal agriculture;
- 32.1% agreed that animal agriculture causes environmental harm, and,
- 15.1% of the respondents agreed that land currently being used for animal agriculture could be put to better use (pp. 10, 14).

Wohl, E. 2004. *Disconnected Rivers: Linking Rivers to Landscapes*. New Haven, Conn: Yale University Press.

This book describes American river systems, with an emphasis on ecological impacts of industrial, agricultural, municipal, and personal human use. Empirical data on specific pollutants and erosion rates are provided. Regional analyses of river basins, as well as analyses of selected individual rivers, are included. A critical appraisal of past restoration projects is presented.

The ecological approach taken appears to be one that relies solely or nearly completely on the natural sciences' disciplines. In lieu of incorporating research and insight from the social sciences, the book provides individual readers with what they personally and collectively can do to improve the health of U.S. rivers.

Yandle, B. [Ed.]. 1995. *Land Rights: The 1990s Property Rights Rebellion*. Lanham, MD: Rowman & Littlefield Publishers, Inc.

As noted in Yandle's introductory essay, individuals, corporations, and groups across the United States are focusing attention on the Constitutional issue of property rights. There has evolved a number of grassroots efforts in this context. These efforts are tantamount to a rebellion. People are challenging the state's authority over their lives in the context of their property and their uses of their property. The takings clause of the Fifth Amendment is now the stuff of everyday discourse across the country. As noted by Yandle, "*the legal status of major categories of resources has moved from private to politically vulnerable public property, closer yet to becoming a commons where conservation incentives are weakest*" (pp. xiii-xiv).

The book contains the following original articles:

- The Property Rights Movement: How it Began and Where it is Headed (N. G. Marzulla);
- Property Rights and the Police Powers of the State: Regulatory Takings: An Oxymoron? (E. O'Hara);
- The Lucas Case and the Conflict over Property Rights (J. R. Rinehart and J. J. Pompe);
- Land-Rights Conflicts in the Regulation of Wetlands (K. J. Ceplo);
- Property Rights Conflicts Under the Endangered Species Act: Protection of the Red-Cockaded Woodpecker (L. A. Welch);
- The Property Rights Movement and State Legislation (H. L. Lund);
- The Political Economy of State Takings Legislation (J. Lipford and D. J. Boudreaux);
- Elements of Property Rights: The Common Law Alternative (R. E. Meiners); and,
- Federal Zoning: The New Era in Environmental Policy (R. H. Nelson).

Each original article is well-researched and contains a lengthy bibliography. The volume provides an understanding of the historical, social, and legal antecedents for the continued debates about property rights, and provides clear insight into linkages between natural resource management and property rights.

II. SOCIAL AND CULTURAL FACTORS IN NATURAL RESOURCES AND WATERSHED MANAGEMENT

A number of social and cultural factors are relevant in trying to understand peoples' environmental beliefs, attitudes, and practices. These include home/property ownership, education, financial status, past experience with environmental issues and projects, community characteristics, and information about issues or situations.

Burger, J. 1998. Environmental attitudes and perceptions of future land use at the Savannah River Site: Are there racial differences? *Journal of Toxicology and Environmental Health, Part A*, 53: 255-262.

This study was based on interviews conducted with 399 people attending a Mayfest celebration in Columbia, South Carolina. These interviews were conducted over a three-day period in May of 1996. The focus was on perceptions of environmental problems at the Savannah River Site (SRS) and potential future uses of the site.

No differences by race of study participant was found in the ranking of the severity of selected environmental problems at the SRS, though blacks were more likely to support using federal funds to solve these environmental problems.

However, racial differences among study participants were found in relation to preferences for future uses of the SRS by the public. Blacks were more likely to favor using the SRS as a preserve, while whites were more likely to favor using the SRS for recreational activities such as hiking, fishing, and hunting. At the same time, however, blacks and whites were equally likely to give low priority to using the SRS in the future for things such as additional nuclear waste storage, nuclear production, and housing.

Burger, J. 2003. Perceptions about environmental use and future restoration of an urban estuary. *Journal of Environmental Planning and Management*, 46(3): 399-416.

This study was based on 281 interviews with people in the Newark Bay Complex of the New York/New Jersey Harbour. The interviews were conducted from May through September in 2000. The study sought to determine how people value or rate environmental problems, land and resources, and what the participants thought was important in terms of improving the remaining habitat in the area. More specifically, the study sought to see if factors such as ethnicity, income, education, or age had any bearing on perceptions and preferences.

Most of the respondents indicated that pollution was the most pressing environmental problem in New Jersey. Most also indicated that the habitat could be improved by removing pollution and cleaning up garbage, with fewer indicating that doing such things as adding facilities, removing trash, or providing more boat access would improve the habitat.

Most respondents also indicated that they use the habitat as their own wild area. Respondents tended to agree that the habitat was important as a walking area, as a green

or open space, as a place to “commune with nature,” and as a place to go to be away from other people.

Whites and Asians were more likely to use the habitat for walking, enjoying it as an open space, and for birdwatching, while Blacks and Hispanics were more likely to use the habitat for fishing and crabbing.

For all uses of the area, younger people gave higher ratings than did older people. People with lower incomes and less education rated consumptive activities such as fishing and crabbing as more important than did people with higher incomes. Older people gave higher ratings to improvements such as cleaning up rubbish, increasing the number of native plant species, and providing an improved habitat for birds than did younger people.

In terms of importance of possible improvement to the site, Whites and Asians rated improving the habitat for birds and butterflies, while Blacks and Hispanics gave higher ratings to building promenades and providing more informational brochures on the habitat.

Camboni, S. M. and T. L. Napier. 1993. Factors affecting use of conservation farming practices in east central Ohio. *Agriculture, Ecosystems and Environment*. 45: 79-94.

Surveys with 371 farm owner-operators in Ohio were conducted to examine how factors such as attitudes, personal characteristics, and farm structure were related to soil conservation practices.

Generally, the authors found that the farmers believe that farmers should have to use conservation practices on highly erodible soil and that farmers should not be permitted to engage in farming practices that could damage soil as a resource. However, the authors found that farm structure factors had the most significant relationship to actual soil conservation practices, though some personal (sociodemographic) characteristics of the farmers also had a role. For instance, farmers opting for no till tended to be younger, less experienced at farming, more aware of the environmental damage caused by agricultural pollution, and had fewer acres under cultivation. Those who used deep plowing tended to be older, had a higher percentage of farm income derived from animal operations, and had more years of farming experience.

Cordell, H. K., C. J. Betz, and G. T. Green. 2002. Recreation and the environment as cultural dimensions in contemporary American society. *Leisure Sciences*, 24: 13-41.

Data from the National Survey on Recreation and the Environment (NSRE; n=22,847 respondents) are used to try to broadly identify recreational trends, opinions about the environment, and demographic changes in the United States. This study responds to the fact that the US population is increasing and is expected to double by 2099, a projection

that justifies understanding these trends in hopes of improved management of the environment and increased opportunities for outdoor recreation.

Key findings include:

- Birding, hiking, and swimming in natural waters have greatly increased in popularity in the United States from 1983 to 2001;
- Walking is popular among all ethnic groups;
- Except for outdoor team sports, Blacks are underrepresented in all outdoor activities;
- Rural residents are overrepresented among respondents who participate in motor boating, off-road driving, and big game hunting;
- Whites tend to feel that the balance of nature is delicate and that humans do not have a right to rule over nature, while tending to disagree that humans can control the environment and have a right to modify it;
- Blacks more than other ethnic groups tend to agree that humans have a right to control, modify, and rule over nature;
- Blacks are more likely than other groups to disagree that limits to the number of people who can inhabit the earth are approaching;
- American Indians tend to far more strongly agree than all other groups surveyed that we are abusing the environment and that humans are not meant to rule over nature;
- Rural residents are more likely to agree that human skills can insure the future of the earth, that the environmental crisis is exaggerated, and that humans are meant to control nature;
- Older people tended to agree more with statements to the effect that humans were meant to control nature than were younger respondents;
- Respondents with lower incomes (\$15,000-\$25,000 per year) were more likely to agree that the environmental crisis is exaggerated and that humans have the right to modify and control nature;
- Foreign born and Hispanic respondents were very similar in that for both groups, in comparison to other groups represented in the study, they showed greater agreement with the idea that humans have the right to modify the natural environment, that the environmental crisis is exaggerated, and that the balance of nature actually is not all that delicate;
- Generally, Americans are concerned about the environment, believe that the environment is fragile, and believe that humans are upsetting the balance of nature; and,
- Generally, Americans do not believe that science and ingenuity will overcome human impacts on the environment or that humans were meant to rule over nature.

Given the changes in ethnic composition of the US population, it is expected that these results can be used to help guide the development of future outdoor recreation opportunities. Likewise, it is expected that with increases in proportions of the population living in urban areas, patterns of recreation participation will change. In

addition, based on these data, it is expected that as incomes increase in the country, recreation participation rates will increase, and there will be generally a “greener” environmental attitude (pp.37-39).

Cottrell, S. P. 2003. Influence of sociodemographics and environmental attitudes on general responsible environmental behavior among recreational boaters. *Environment and Behavior*, 35(3): 347-375.

This study is based on a secondary analysis of a mail survey of registered boat owners with boats on the Chesapeake Bay. The analysis is based on 230 usable surveys returned. The respondents were asked about their general responsible environmental behavior (GREB) while boating in Maryland during 1992. The study sought to discover if there was a relationship between GREB and sociodemographic variables such as age, income, education, and stand on political issues. In addition, the study sought to find out if GREB was related to environmental concern, knowledge of environmental issues, and sociodemographic variables.

The sample was predominantly male, white, and relatively affluent.

Income and age were significant, negative predictors of environmental concern. That is, older and more wealthy respondents were less concerned about the environment than were younger and less affluent respondents. Verbal commitment to the environment was predictive of environmental behavior.

Dunlap, R. E. and A. G. Mertig. 1995. Global concern for the environment: Is affluence a prerequisite? *Journal of Social Issues*, 51(4): 121-137.

Relying on a survey administered by the George H. Gallup International Institute in 1992 (24 nations, with sample sizes ranging from 700 in Finland to nearly 5,000 in India), the authors tested the conventional wisdom that affluence of a nation is positively related to its citizens' concerns for environmental quality. The results did not support conventional wisdom. Rather, it was found that citizens in poorer nations do harbor concerns about environmental quality and are supportive of measures that would protect the environment. It is speculated that, among other things, media coverage of environmental issues, along with activism in nations and personal observations, may partially account for this counterintuitive finding.

Duroy, Q. M. 2005. *The Determinants of Environmental Awareness and Behavior. Rensselaer Working Papers in Economics*. Number 0501, January. Troy,

NY: Department of Economics, Rensselaer Polytechnic.
<http://www.rpi.edu/economics/www/workingpapers>.

Relying on data from the World Values Survey (1995-1997), the author analyzed the relationship between the level of economic affluence of 40 different nations and peoples' levels of environmental concern. It was hypothesized that, contrary to conventional wisdom, environmental awareness and individual-level involvement in environmental protection can operate independently of economic affluence. It was found that environmental awareness was a function of income equality, subjective well-being, and urbanization, while population pressures, happiness, and education were correlated with environmental behavior.

These findings support other research indicating that it is neither always nor automatically the case that people in poorer countries are neither environmentally aware nor engaged in environmentally protective behaviors. Other sociocultural and social psychological factors have bearing on environmental awareness and environmental behaviors regardless of the level of economic affluence of the nation in which individuals reside.

East National Technical Support Center. 2004. *Guide for Estimating Participation in Conservation Programs and Projects*. Series Number: 1801 (Second Revision), Publication Code T027. United States Department of Agriculture, Natural Resources Conservation Services, Science & Technology, Social Sciences Discipline. Greensboro, NC.
<http://www.ssi.nrcs.usda.gov/publications/>

This guide was developed to provide estimations of likely participation rates in NRCS conservation programs and to provide sociological information that can be used to increase participation in these programs.

Factors related to participation in NRCS programs include:

- **Characteristics of Farmers and Ranchers**
Factors include: desire to pass farm to children; full time farming; high number of contacts with USDA agencies; stewardship attitude; high income; high education; high awareness of resource problems; high use of mass media; history of early adoption of innovations; has a conservation plan; aware of relevance of conservation to the operation; willingness to take risks; and, high number of contacts with private organizations.
- **Farm or Ranch Structural Characteristics**
Factors include: low debt level; full ownership; large-scale operation; corporate operations; and, high gross sales.
- **Perceived Characteristics of Conservation Practices and Resource Management Systems**

Perceived characteristics associated with adoption of conservation practices or technologies include: inexpensive; time and labor saving; easily observable results; simplicity; flexibility; relies on existing knowledge and equipment; compatible with operator's beliefs, values, current management style or system, and with the producer's need for the innovation; and, initially can be tried on a small scale.

- **Social Capital**

Though inconclusive at this time, the research on the links between social capital of a group or community and the probability of adoption of agricultural conservation practices appear positively related to: highly effective local leadership; past participation in collaborative endeavors; and, a high degree of community participation in conservation organizations, as well as social, civic, religious, and agricultural organizations.

- **Community Characteristics**

Community characteristics related to an increased probability of adopting conservation practices and systems include: a community that has a healthy farm economy; a track record of effective conservation partnership outreach activities; ready availability of technical assistance in the community; a recent history of successful private and public co-sponsored conservation activities; and minimal commercial and residential development pressures on agricultural lands.

The guide concludes with suggestions for having in place needed educational, informational, and technical assistance, and, when needed, financial assistance. In addition, the guide gives suggestions on how to effectively communicate with potential adopters, and factors to consider in timing participation in adoption of conservation techniques, systems, or programs.

Forsyth, D. R., M. Garcia, L. E. Zyzniowski, P. A. Story and N. A. Kerr. 2004. Watershed pollution and preservation: The awareness-appraisal model of environmentally positive intentions and behaviors. *Analysis of Social Issues and Public Policy*, 4(1): 115-128

Based on a survey of 1,128 residents in two urban watersheds, this study found support for the awareness-appraisal model. This model posits that peoples' reactions to threatening situations are influenced by their appraisal of the degree of threat that the situations pose. In this study, it was found that respondents who were aware of their watershed - based on a watershed knowledge test - and knew that it was polluted, had the strongest pro-conservation behavioral intentions.

Gan, J., O. Onianwa, J. Schellas, G. Wheelock, and M. Dubois. 2005. Does race matter in landowners' participation in conservation incentive programs? *Society and Natural Resources*, 18: 431-445.

This study compared participation rates and behaviors of black and white small landowners in eight conservation incentive programs in Alabama. It was found that blacks and whites alike tended not to participate in specific incentive programs, but were equally likely to participate in umbrella programs such as the Forestry Incentives Program, Stewardship Incentives Program, and the Conservation Reserve Program. However, whites tended to enroll more acreage and to have been involved in these programs for longer periods of time. Blacks scored lower on satisfaction with the programs, and tended to have greater difficulty in meeting cost share requirements of the programs.

Geisler, C. C. 2000. Estates of mind: Culture's many paths to land. *Society and Natural Resources*, 13: 51-60.

Geisler contends that land conservation is a product of two different, and oftentimes sharply contrasting, subcultures: the subculture of private property and that of public property. These subcultures reflect different historical and cultural conceptions of land, which have culminated in competing land conservation ethics, policies, and abiding cultural conflicts. It is posited that rather than “the American Dream” (i.e., owning one’s own piece of the U.S.), conservation policies and efforts might benefit from acknowledging *two* (our emphasis) American Dreams. The significance of understanding how culture is hidden but embedded in land use planning and policy is underscored.

It is contended that reconciliation between private and public property cultures is possible. This is possible because both of these property systems have their own flaws. Private land ownership, for instance, often is compromised by problems such as absentee ownership, inappropriate land development, and cultural inappropriateness. In addition, sentiments and practices have changed, rendering this land ethic of the eighteenth and nineteenth centuries a questionable ethic for future generations. Public land ownership systems may not be the ideal or only mechanism for conservation, either. This system also has been plagued by absentee management. Further, public ownership in the United States and elsewhere has not proven to guarantee conservation.

Geisler suggests a convergence of systems that he calls “*social utility property*,” an approach yet to be fully understood but one with clear implications for public policy and decision making. In short, he sees a system emerging that conceptualizes land as more than a commodity, one that is “*affected by the public interest*” (p. 58).

Hunter, L. M. and L. Rinner. 2004. The association between environmental perspective and knowledge and concern with species diversity. *Society and Natural Resources*, 17: 517-532.

Based on 398 mail surveys completed by residents in Boulder, Colorado, the study sought to discern whether environmental perspective (measured using the NEP – New Ecological Paradigm) was related to knowledge/concern with species diversity. Species included in the survey were Preble’s meadow-jumping mouse, Townsend’s big-eared rabbit, the black-tailed prairie dog, Ute Ladies’-tresses orchid, the Peregrine falcon, and the sharp-tailed grouse.

No differences were found among the respondents in relation to knowledge about local species and environmental perspective. However, it was found that respondents with more ecocentric environmental perspectives were statistically more likely to positively prioritize local species in local open-space land management decisions. However, very little support was given to the hypothesis that respondents with more ecocentric perspectives and prior knowledge of species were more likely to give the species higher priority in management decision making. Said another way, regardless of their knowledge, people with more ecocentric orientations placed a higher priority on including the species in management decisions than did those with more anthropomorphic perspectives.

Being older was related to prior knowledge of three of the species. Gender and income as factors in species priority were mixed and variable.

Johnson, C. Y., J. M. Bowler, J. C. Bergstrom, and H. K. Cordell. 2004. Wilderness values in America: Does immigrant status or ethnicity matter? *Society and Natural Resources*, 17: 611-628.

Relying on data from the 2000 National Survey on Recreation and Environment, the authors tested the thesis that “wilderness” is a social construction primarily valued by US-born whites. Black respondents had lower rates of visitation to and projected future visitation to wilderness areas, but scored similarly to whites in placing a positive value on protecting wilderness areas for reasons such as their role in the protection of air and water quality. Blacks, women, and urbanites were far more likely to positively respond to the idea of preserving wilderness areas because of their role in serving as habitats for plants and animals than were older people and those with advanced degrees. Asians gave higher scores to the intrinsic value of wilderness areas than did whites or Blacks. US-born Latinos were similar to whites in their support for wilderness areas. Overall, minorities were less likely than whites to be active users of wilderness areas, but tended to value wilderness areas in more passive ways.

Karp, D. G. 1996. Values and their effect on pro-environmental behavior. *Environment and Behavior*, 28(1): 111-133.

Using Swartz's measures of values, the author surveyed 302 undergraduate students to explore the linkages between values and environmental behaviors (16 items inventoried). Positive relationships were found between environmental behavior and openness to change and valuing universalism and action on behalf of the environment. Having an orientation toward self-enhancement was negatively related to environmental values and environmental action.

Mobley, C. and J. Witte. 2005. *Public Opinion on the Saluda-Reedy Watershed: Knowledge, Attitudes and Behaviors*. Prepared for The Saluda-Reedy Watershed Consortium. Clemson, South Carolina: Department of Sociology, Clemson University.

http://www.saludareedy.org/research/indepth_reports/publication.pdf

Using a combination of web and telephone surveys, 855 South Carolina residents were interviewed. Telephone surveys were conducted with residents of the Upstate of South Carolina, which is where the Saluda-Reedy Watershed Web surveys were conducted with the general public, environmental professionals, developers, and municipal officials.

The survey queried respondents in the following categories of concern:

- *Environmental concern and perceptions of change in water quality;*
- *Environmental knowledge about watershed basics and the causes and impacts of pollution;*
- *Participation in recreational activities;*
- *Participation in environmentally positive or negative behaviors; and,*
- *Willingness to get involved in efforts to improve water quality (p. 1, verbatim).*

It was found that residents in the Saluda-Reedy Watershed held a high level of concern about the quality of water in their local rivers and streams. While about one-third (30.8%) believed that local water quality had remained the same over the past 10 years, over half (55.2%) believed that the water quality had gotten worse in this time period (p. 9).

It also was found that only 27.3% of the respondents gave the correct answer regarding the definition of a watershed (p. 6).

Other key findings:

- Among all respondents, fishing, hiking, swimming and motor boating were the most frequently reported popular outdoor activities;
- Very few respondents indicated that they had changed their own behaviors (e.g., stopped using a product containing a harmful chemical) due to concern over the environment;
- A little over one-fourth (26.5%) of the respondents had created a wildlife habitat;
- Younger respondents had the highest rates of participating in river or lake clean-up events, but the lowest rates of water use reduction;

- Consistent with national trends, respondents in this study had very low rates of dumping old *oil down storm drains* (1.8%); *dumping grass clippings down storm drains or creeks* (2.1%), or *storing pesticides in leaking containers* (2.1%; see p. 18)

O'Neill, K. M. 2005. Can watershed management unite town and country? *Society and Natural Resources*, 18: 241-253.

Relying on previous empirical research, this article illustrates how Henri Lefebvre's concepts of social space can be used to organize watershed partnerships. As opposed to much of the research that focuses on the *processes* of watershed partnerships, this article focuses on the *contexts* of them.

According to Lefebvre, there are three social dimensions to space in advanced capitalist countries. These dimensions are:

- **Conceived Space**
The space envisioned by actors such as planners, policy makers, and architects.
- **Perceived Space**
Peoples' sense of a place; their perceptions of its social and cultural definition and significance.
- **Lived Space**
How people actually use a space and experience it. The images that people have of a space, often in the context of emotions that they have about the space.

Space as conceived by planners, designers, and policy makers often is out of sync with the space as perceived and lived among those affected by the decisions and designs made. It is argued that successful watershed partnerships must be location specific, and organized and operated with an understanding of these perceived and lived spaces. That is, the watershed approach must incorporate the concept of social space.

Based on previous research, the article identifies several convergent findings that can have instructional value in successful watershed partnerships. These include:

- **Watershed Partnerships in Rural Areas**

These areas often include federal, public land as well as privately held land. Thus, there sometimes are partnership challenges due to different regulations that pertain to the different lands. Not uncommonly, private property owners raise concerns about violations or usurption of their property rights. Other challenges often include bringing in partners with little scientific or technical knowledge needed for watershed management. Distrust of certain agencies due to past experiences and distrust of expert knowledge and advice due to owners' levels of

knowledge and understanding are not unusual. Distrust can be compounded when property owners' sense of place and lived experiences on their lands are ignored by watershed organizers.

- **Watershed Partnerships in Suburban and Urban Areas**

Suburban and urban land use is typically somewhat predefined by zoning ordinances, policies, and stormwater drain systems – which usually are not in accord with conservation goals that are focused on a watershed's boundaries. Watersheds themselves are visually “out of mind” (not seen, not experienced, not envisioned) by many suburban and urban dwellers. This is often overlaid with residents' tendencies to see cities as separate from nature – thus decreasing the likelihood that they will participate in watershed partnerships.

While expertise often abounds in these areas, it is sometimes a challenge to identify which local agency and officials should be put at the helm of responsibility for the area's watershed management. This can be compounded by the fact that while ordinary citizens might be willing to participate in the watershed partnership, developers and others with vested financial interests tend not to participate, but, rather, to wait until decisions are made to take action. Often, if the decisions are counter to their interests, they will seek legal redress of the situation.

- **Coordination Problems in Diverse Watersheds**

Due to lived experiences, dwellers' issues in their respective watersheds may have a great deal to do with whether they are more rural or more urban in their residential settings. Thus, their priorities will be different. Consequently, they may pit themselves against one another, or against the agencies and planners bringing them to the table. Likewise, given their diverse experiences and perceptions, they may be reluctant to participate in watershed management due to their own perceptions of the high transaction costs involved in such participation.

The following suggestions for watershed partnerships that incorporate the concept of social space have been culled from this article:

- Identify and work through the institutional barriers created by differences in settlement type, perceived and lived spaces;
- Make the watershed visible to potential collaborators and dwellers;
- Identify local needs and approaches culturally appropriate to addressing these needs – including processes of participation;
- Bring in potential collaborators early in the process, and tool them with the information and skills they need to comfortably and adequately participate; and,
- Head off potential conflict between rural and urban dwellers by focusing on the whole watershed, and not just portions or parcels therein.

Smith, M. D. and R. S. Krannich. 2000. "Culture clash" revisited: Newcomer versus longer-term residents' attitudes toward land use, development, and environmental issues in rural communities in the Rocky Mountain West. *Rural Sociology*, 65(3): 396-421.

The authors attempted to empirically test the validity of popular media accounts of newcomer-old timer culture clashes in high amenity rural areas in the Rocky Mountain West that had experienced a great deal of urban-to-rural migration during the 1970s and 1980s. Newcomers tended to be younger and more educated than old-timers (i.e., long term residents). Media accounts portrayed these changing rural areas as rife with tension and conflict due to the new arrivals' more liberal environmental values and urban orientations.

The authors' analysis of surveys administered to residents in three communities revealed that while the newcomers and old timers tended to differ sociodemographically, they tended not to differ on environmental issues, or else to differ on these issues in ways that were contrary to popular media portrayals. The groups were similar in their concerns for the environment. However, the old timers, rather than the newcomers, were more likely to be concerned about population growth, tourism development, and economic development. Specifically, they were more likely than the younger, better educated newcomers to want to see limitations put on these processes.

Stedman, R. C. 2003. Is it really just a social construction?: The contributions of the physical environment to sense of place. *Society and Natural Resources*, 16: 671-685.

Using an analysis of surveys mailed to property owners in Vilas County, Wisconsin (1000 mailed; 721 usable surveys returned), and interpolating these findings with information from lake data bases in the county (e.g., lake size, shoreline development density), this study sought to test whether sense of place is solely a matter of a social construction of meaning, or if lake characteristics also had bearing on sense of place.

It was found that some characteristics of the lakes in the study area were related to place satisfaction. These characteristics included the lake being clear, large, blue/green in color, and less developed with no public access. Attachment to place, however, was not related to lake characteristics, though seeing the lake as a "social place" (as opposed to an escape place) was related to higher levels of development along the lake.

There are at least two implications to these findings. The first is that sense of place may be influenced by actual physical characteristics and not just socially constructed meanings of a given area. Second, if the characteristics of a lake have no bearing on attachment to place, it is possible that even in the face of environmental degradation attachment to place may not change.

Stedman, R. C. and R. B. Hammer. 2006. Environmental perception in a rapidly growing amenity-rich region: The effects of lakeshore development on

perceived water quality in Vilas County, Wisconsin. *Society and Natural Resources*, 19: 137-151.

This study represents an elaboration of the analysis (using the same survey data) discussed above. It is found that while increased shoreline development is associated with perceptions of decreased water quality, shoreline development was not associated with actual water quality as measured by variables included in limnological databases on Vilas County lake attributes and data from the Long Term Ecological Research program. Specifically, using these databases in conjunction with the survey of residents, it was found that there was little relationship between perceived water quality and indicators used to measure biogeochemical water quality.

Stephan, M. 2005. Democracy in our backyards: A study of community involvement in administrative decision making. *Environment and Behavior*, 37(5): 662-682.

The author relied on a subset of Superfund sites, and employed a number of data bases and data sources to conduct the analysis. Mobilization was highest in areas that had the highest levels of wealth and poverty together. It was found that as the level of poverty rose in a site area, so did the level of community mobilization around the Superfund site issues. Home ownership, but not proximity to the site, also increased mobilization and participation.

It is speculated that poorer residents have higher levels of connectedness with their neighbors, thus are better and more easily able to mobilize on behalf of their communities. Or, it may be that poorer residents fear that other residents will not become active, so they are motivated to act and to enlist others.

Trumbo, C. W. and G. J. O’Keefe. 2005. Intention to conserve water: Environmental values, reasoned action, and information effects across time. *Society and Natural Resources*, 18: 573-585.

The authors conducted two telephone surveys in the Reno-Sparks, Nevada area in 1998 (n=405) and 2000 (n=463), and complemented these data with a panel of 249. It was found that information about issues influenced attitudes and norms. That is, those most informed about the value of conserving water tended to hold the more positive values toward water conservation, and tended to be more likely to have the intention of conserving water.

III. SCIENCE- AND TECHNOLOGY-DRIVEN MANAGEMENT OF NATURAL RESOURCES AND WATERSHEDS

Burian, S. J., M. J. Brown, and T. N. McPherson. 2002. Evaluation of land use/land cover datasets for urban watershed modeling. *Water Science and Technology*, 45(9): 269-276.

Land use and land cover (LULC) data increasingly are being used for modeling nonpoint source pollution. LULC datasets are important in modeling total maximum daily load (TDML), and, as noted by the authors, are central “to the US EPA’s BASINS modeling system” (p. 270). Use of the data has become easier because of improvements in technology (especially, GIS), and greater access to databases. The authors argue that reliable predictions are a function of accurate LULC databases, appropriate spatial resolution, and, the level of detail.

The authors contend that the USGS LULC data, which are commonly used, have lower levels of classification and more coarse resolution than do other available LULC data. The authors point out that USGS data sets can not usually provide the high resolution and current land use information needed to “evaluate land-use specific BMP implementation in alternative stormwater management plans” (p. 275).

The authors used the United States Geological Service’s LULC and a LULC dataset received from the Southern California Association of Governments (SCAG) to analyze predicted average annual stormwater runoff and TSS loads (total solid loads) in three catchments in Los Angeles. It was found that in each catchment, the USGS LULC dataset yielded higher predictions for runoff and TSS than did the dataset provided by the SCAG.

Erbe, V., T. Frehmann, W. F. Geiger, P. Krebs, J. Londong, K-H Rosenwinkel, and K. Seggelke. 2002. *Integrated modeling as an analytical and optimisation tool for urban watershed management*. [2nd World Water Congress: Integrated Water Resources Management, 15-19 October 2001, Berlin, Selected Proceedings.] *Water Science and Technology*, 46(6): 141-150.

The authors ran SIMBA® software for sewer on MATLAB®SIMULINK® to create numerical modeling to optimize the wastewater system of Odenthal (Germany) and two other sites in Germany. It was found that integrated numerical modeling can be used to predict water quality under different loading conditions.

Havens, K. E. & N. G. Aumen. 2000. Hypothesis-driven experimental research is necessary for natural resource management. *Environmental Management*, 25(1): 1-7.

The authors argue that in order to effectively manage natural resources, scientists must understand ecosystems and how they respond to human- and naturally-induced stressors. Cause-effect relationships are best understood and documented by experimental research rather than by relying solely on observations or models, according to the authors.

The authors show two models: one focused on research and monitoring of ecosystems and the other on actual resource management.

The first model has a feedback loop between conceptual and predictive models and revisions of these, with the factors of hypotheses, further observational research, and controlled experiments intervening. The second model shows the loops between public concerns, ecosystem responses to stressors, resource management issues, and recommendations and actions. These two models are shown as feeding and informing one another.

Three brief case studies from South Florida are presented: cattail expansion in the Everglades; Everglades threshold phosphorous concentrations; and, salinity criteria for Florida estuaries.

Fundamentally, the article is focused on dispensing with debates about applied versus basic research for ecosystem management. It is argued that since ecosystems are complex and constantly changing, relying solely on past research to manage and restore ecosystems may be insufficient.

Kelsey, R. H., G. I. Scott, D. E. Porter, B. Thompson, and L. Webster. 2003. Using multiple antibiotic resistance and land use characteristics to determine sources of fecal coliform bacterial pollution. *Environmental Monitoring and Assessment*, 81: 337-348.

Multiple Antibiotic Resistance (MAR) analysis was used to examine *E. coli* from surface water and sewage sources in Murrells Inlet, South Carolina. These then were tested for antibiotic resistance. In addition, land use were derived from GIS and included in the regression analysis. Pattern analysis was conducted using the PROC CLUSTER procedure in SAS.

The analysis revealed that fecal pollution found in Murrells Inlet was not from human sources. The authors state that the major source of fecal pollution appears to have come from stormwater runoff. In addition, it was found that, by engaging in very site-specific analysis, fecal pollution of a human origin that was found most likely came either from boats or else from sewage collection systems that had malfunctioned. At the same time, the research illustrated the feasibility and utility of using MAR to examine areas that are affected by fecal contamination from human sources.

Lovejoy, S. B. 1997. Watershed management for water quality protection: Are GIS and simulation models the answer? *Journal of Soil and Water Conservation*, 52(2): 103.

The author acknowledges that many natural resource agencies advocate GIS as “*the answer*” to nonpoint pollution problems. However, Lovejoy questions whether GIS or simulation models are practical or feasible in all situations. The models require massive amounts of data and can be very expensive. It might be that in some cases, a low technology alternative is reasonable. The money saved can go into conservation efforts. It is suggested that under some circumstances (e.g., the riparian buffer strip program), GIS and models may not be necessary.

Martellini, A., P. Payment, and R. Villemur. 2004. Use of eukaryotic mitochondrial DNA to differentiate human, bovine, porcine and ovine sources in fecally contaminated surface water. *Water Research*, 39: 541-548.

A molecular model was used to analyze the sources of fecal contamination from two bodies of water, untreated sewerage, agricultural soil run-offs, and swine farm effluents. This was the first published study on the use of genetic markers to track fecal pollution sources. This method is seen as superior to bacteriological analyses because it provides more information, and can save time and money.

McQuaid, B. F., and L. Norfleet. 1999. Assessment of two Carolina watersheds using land and stream habitat quality indices. *Journal of Soil and Water Conservation*, 54(4): 657-668.

The authors used a variety of watershed assessment tools to document conditions in the Saluda River Watershed in South Carolina and the Rocky River Watershed in North Carolina. The tools included:

- The NRCS (Natural Resources Conservation Service; USDA) Visual Stream Assessment (VSA);
- Stream Habitat Assessment (SHA);
- Riparian Vegetation Index (RVI);
- Index of Biotic Integrity (IBI); and,
- Land Quality Index.

This was a pilot study and one of the contributions that NRCS makes in terms of helping local groups and private landowners assess their watersheds.

The measurements, scoring, and thresholds were based on the US EPA’s Rapid Bioassessment Protocol (p. 657). It was tailored to the nature of southern piedmont streams.

The results indicated that using these multiple methods as one bundle of assessment tools was valuable and yielded useful information.

Trauth, K. M., and D. S. Adams. 2004. Watershed-based modeling with AGNPS for storm water management. *Journal of Water Resources Planning and Management*, May/June: 206-214.

The authors used the Agricultural Non-Point Source (AGNPS) modeling system, created by the United States Department of Agriculture, to develop sediment transport information in conjunction with a storm water planning and management project in Missouri. The resulting information is designed to be shared with decision makers. This approach is consistent with the EPA's Phase II storm water requirements.

It was found that by using this system, impact on sediment loading could be determined.

Van Dolah, R. F., D. E. Chestnut, J. D. Jones, P. C. Jutte, G. Riekerk, M. Levisen, and W. McDermott. 2003. The importance of considering spatial attributes in evaluating estuarine habitat condition: The South Carolina Experience. *Environmental Monitoring and Assessment*, 81: 85-95.

Over a two-year period (1999 and 2000), the authors sampled water at 57 tidal creek sites and 50 open water sites throughout the coastal regions of South Carolina. While historically, estuarine monitoring programs have tended to study large regional areas or large-scale bodies of water, given small creeks' vital roles in serving as nursery habitats for finfish species and wading birds, and the fact that these small creeks are the initial entry sites for nonpoint pollution from upland waters, it is reasonable to assume that monitoring of these creeks can help identify early signs of anthropogenic stress (p. 85, paraphrased).

Of the 11 water quality measures used in this study, tidal creeks had significantly higher values for six of these measures than did the open water habitats. These measures included higher turbidity, mean salinity, mean fecal coliform, and, mean total nitrogen. The tidal creeks also had higher abundance and biomass of finfish and crustaceans (p. 92), while abundance and biomass measures for benthic infauna were lower in the tidal creeks than in the open waters (p. 92).

The results of this study reinforce the idea that for more comprehensive and encompassing monitoring of water bodies and systems, it is important to include the small watersheds.

IV. PARTICIPATORY AND INTEGRATED MODELS OF NATURAL RESOURCES AND WATERSHED MANAGEMENT

.With the participatory models, there is the call for more cultural sensitivity and adaptive, cooperative learning as opposed to more technocratic approaches. There also is, in essence, a recognition that those organizing and running participatory sessions need to be culturally competent, able to recognize and tailor efforts to the culture of those who are participating.

Beck, M. B., B. D. Fath, A. K. Parker, O. O. Osidele, G. M. Cowie, T. C. Rasmussen, B. C. Patten, B. G. Norton, A. Steinemann, S. R. Borrett, D. Cox, M. C. Mayhew, X-Q Zeng, and W. Zeng. 2002. Developing a concept of adaptive community learning: Case study of a rapidly urbanizing watershed. *Integrated Assessment*, 3(4): 299-307.

The authors (who represent a wide array of disciplines) argue that just as adaptive management “*celebrates a prudent measure of experimentation, so does adaptive community learning*” (p. 301). According to the authors, adaptive learning involves identifying stakeholder concerns, developing maps and mathematical models of the natural area under consideration, conducting a computational assessment of information generated from stakeholder input, communicating with stakeholders about the outcomes of this analysis, identifying the scientific unknowns, and identifying what tests and analyses need to be conducted in the future.

The authors use as their case study Lake Lanier, Georgia, an area near Atlanta that is an important impoundment area that is receiving a great deal of public scrutiny and policy consideration in the face of increasing demands for water for the rapidly growing service areas. A great deal of the scientific information already was available. The authors found that the Lake Lanier group had become fully participatory through the iterative process that they delineated. They also found that their (the authors’) involvement in the process underscored “*the fact that the previously imagined neutrality (objectivity) of clinical detachment may be neither possible nor helpful to progress*” (p. 306).

Blumenthal, D. and J. L. Jannink. 2000. A classification of collaborative management models. *Conservation Ecology*, 4(2): Article 13. Online: <http://www.ecologyandsociety.org/vol14/iss2/art13/>

The authors acknowledge that the management of natural resources involves “*understanding and manipulating complex systems containing both human and natural components*” (p. 1). Past research has evaluated various collaborative methods in relation to their strengths and weaknesses, the degree to which systems methods are used, and how participation is used. The authors contend that such research does not create mechanisms by which the various methods can be cross-referenced. They argue that a more efficacious approach would be to describe “*the characteristics a method should have in order to successfully guide collaborative management*” (p.1). This, they contend, would yield a consistent framework to compare the various methods, provide an impetus for dialogue among the disciplines involved in the various approaches to collaborative management, and help introduce the practical and theoretical literature in the area. To

that end, they develop five criteria to evaluate six different commonly used collaborative methods.

The five criteria were:

- Participation;
- Institutional Analysis;
- Simplification of Natural Resources;
- Scale of Application; and,
- Stage of Application

The six collaborative methods evaluated using these criteria were:

- Soft Systems Analysis;
- Adaptive Environmental Assessment and Management/Adaptive Management;
- Ecosystem Management;
- Agroecosystem Analysis;
- Rapid Rural Appraisal; and,
- Participatory Rural Appraisal.

The authors found that there was a great deal of similarity among and between the methods evaluated. All were flexible enough to allow for adaptation over time. Most had as central tenets experimentation and monitoring. Most also can be used at the scale of a watershed, although the authors found that those focused on agricultural management tended to operate at smaller scales. Adaptive Environmental Assessment and Management had the most sophisticated approaches “*for making sense out of complex systems*” (p. 10). The authors suggest that it is now time to go from implementing collaborative management in projects to learning about collaborative management across the disciplines.

Ewel, K. C. 2001. Natural resources management: The need for interdisciplinary collaboration. *Ecosystems*, 4: 716-722.

As natural resource management has become more and more complex, problems have arisen with managing this complexity. The author contends that understanding how a particular ecosystem works is not sufficient for actually managing it. Scientists, managers, and stakeholders increasingly realize the need to learn from each other and work together. The author contends that using a concept of ecosystem service that is effected through adaptive management may address the complexities of both ecosystem management and management of the parties involved in the management. To this end, experts from an array of natural and social scientists, working collaboratively with managers, stakeholders (community members) and others (graduate and undergraduate students, policy makers, and church leaders, for instance) may be what is needed. This is illustrated with the case of the mud crabs on the island of Kosrae, Federated States of Micronesia.

Heart, B., E. Humstone, T. F. Irwin, S. Levine, and D. Weisbord. 2002. *Community Rules: A New England Guide to Smart Growth Strategies*. Copyrighted by The Conservation Law Foundation and the Vermont Forum on Sprawl. <http://www.clf.org/general/index.asp?id=347>

This guidebook was developed to help citizens know how to use their local regulations to protect natural resources and open spaces, promote transportation options, encourage multiple use of natural areas, manage land along highways, encourage land use that mitigates sprawl, and encourage growth with minimal environmental impact. The financial, environmental, and social costs of sprawl are analyzed. Models of smart growth are presented, with examples from several towns and cities in northeastern states. Zoning and participatory processes are emphasized.

Johnson, M. D. 2000. A sociocultural perspective on the development of U.S. natural research partnerships in the 20th century. Pp. 205-212 in Ffolliott, P. F., M. B. Baker, Jr., C. B. Edminster, M. C. Dillon and K. L. Mora. [Technical Coordinators]. *Land Stewardship in the 21st Century: The Contributions of Watershed Management; 2000 March 13-16; Tucson, AZ. Conference Proceedings. RMRS-P-13. United States Department of Agriculture Forest Service. Fort Collins, CO. http://www.fs.fed.us/rm/pubs/rmrs_p013.html*

U.S. natural research management approaches during the 20th century are broken down into three periods: The Early Period, 1900-1960; The NEPA period, 1961-1980; and, The Modern Period, 1981-Present. The Early Period was characterized by a governmentally driven “top down” approach, one that often focused narrowly on economic pressures. When NEPA (National Environmental Policy Act) passed in 1969, the U.S. entered its second phase. While still a “top down” era, NEPA called for impact statements and public participation. However, “public participation” increasingly was seen by many citizens and activists to be lip service at best. As individuals and activist organization demanded more information and accountability from federal agencies, the U.S. went into its post-NEPA or Modern Period. This is its current phase. This phase has been fostered, according to Johnson, by the following:

- A loss of trust in the federal government;
- Increased public access to print, digital, and broadcast information;
- An increased focus on the “non-commodity” dimensions of natural resources and environments, such as aesthetic and recreational value; and,
- Increasing public demand for the incorporation of multiple uses in natural resource planning.

Johnson splits current approaches to natural resource management in the U.S. into the following categories:

- **Ecosystem Management**
A rather broad, holistic approach incorporating multiple concerns, and focusing on areas that are defined by ecological rather than geopolitical factors;
There still is a tendency to emphasize the biophysical and economic over multiple use and other social concerns.
- **Community-Based Planning**
Locally led planning and decision making to take a more holistic approach to natural resources planning and decision making, incorporating local social, economic and use concerns;
Sometimes referred to as a “bottoms up” approach, and usually issue- or concern-driven.

Lubell, M., M. Schneider, J. T. Scholtz, and M. Mete. 2002. Watershed partnerships and the emergence of collective action institutions. *American Journal of Political Science*, 46(1): 148-163.

Analyzed the myriad social, ecological, political, and economic factors that affect watershed partnerships, focusing on benefits and transaction costs. N=928 watersheds in the United States.

Key findings include:

- State environmental policies do not have a significant impact on watershed partnership formation;
- Opposition from agricultural interests tends to inhibit watershed partnership formation and activity;
- Areas with higher median educational attainment and occupational statuses among residents have higher watershed partnership participation rates;
- Areas with higher Black and Hispanic populations have lower rates of partnership incidences;
- Percent of state natives in the populations has no bearing on watershed partnership rates; and,
- Watershed partnerships, while compatible with a cooperative governing style, are not “magic bullets” for solving all environmental collective action problems.

Moore, E. A. and T. M. Koontz. 2003. A typology of collaborative watershed groups: Citizen-based, agency-based, and mixed partnership. *Society and Natural Resources*, 16: 451-460.

Based on an analysis of 64 watershed groups in Ohio, the authors classified the groups as citizen-based, agency-based, and mixed. Mixed groups seemed especially able to complete a collaborative watershed plan based on input from people with differing skills, knowledge, and expertise. Mixed and agency-based groups, which tend to be newer than citizen-based groups, tended to see group development and sustainability as an indicator of success. Citizen-based groups tended more often to list as an accomplishment their influence on changing policy and regulations. The type of group tends to determine what will be accomplished. It is suggested that when planning for collaborative decision making, responsible parties might consider what types of groups are needed, given that different groups tend to assume different roles in these collaborations.

Page, A. P., Y-S Kim, and P. J. Daugherty. 2006. What makes community forest management successful: A meta-study from community forests throughout the world. *Society and Natural Resources*, 19: 33-52.

The authors conducted a meta-study of 31 articles (69 case studies) focused on community forest management (CFM). Measures of success included: ecological sustainability; equity; efficiency; property rights regimes; institutions; incentives and interests; financial and human resource support; physical features; community features; level of participation; degree of decentralization; and technology and market influence (see pages 40-42 for variables used in each measure).

In all articles reviewed, the authors found that property rights regimes (especially those with tenure security and clear ownership systems), community incentives and interests, and institutional arrangements (e.g., enforcement of rules, sanctions and penalties) were associated with success of CFM projects. The authors conclude that the success of CFM involves “*the creation of a complex relationship between the community and the ecosystem that provides appropriate feedback to the community and creates the ability to respond to ecological, social, and economic changes over time*” (p. 52).

Pickett, S. T. A., M. L. Cadenasso, and J. M. Grove. 2005. Biocomplexity in coupled natural-human systems: A multidimensional framework. *Ecosystems*, 8: 225-232.

Provides a framework and clarification of biocomplexity (systems theory) and limitations of the concept of biodiversity. A model graphically displays the spatial, organization, and temporal dimensions of complexity. The authors acknowledge that without application to “specific realms, biocomplexity remains abstract and non-operational” (p. 231).

Schusler, T. M., D. J. Decker, and M. J. Pfeffer. 2003. Social learning for collaborative natural resource management. *Society and Natural Resources*, 15: 309-326.

Recognizing the call for natural resource management to be collaborative (co-managed), and the role that social learning could play in collaborative resource management, the authors surveyed 29 individuals who had participated in a search conference in New York. [Search conferences are used to help participants collectively make a plan and then implement it.]

Social learning involves “*open communication, diverse participation, unrestrained thinking, constructive conflict, democratic structure, multiple sources of knowledge, extended agreement, and facilitation*” (p. 309).

The authors found that all participants learned about the concerns of other participants, 90% learned new factual information, 86% observed that actions were identified to address problems or take advantage of opportunities, 52% found that their own concerns related to managing the resources of the site under discussion had changed as a result of their participation, and 41% became aware of the presence or lack of resources in their community to address the problems identified (p. 315).

The authors conclude that social learning is a necessary but not sufficient condition for collaborative management of natural resources. Other things, such as capacity, supportive policies, and appropriate structures, also must be in place.

V. ISSUES IN DECISION MAKING IN NATURAL RESOURCES AND WATERSHED MANAGEMENT

Blomquist, W. and E. Schlager. 2005. Political pitfalls of integrated watershed management. *Society and Natural Resources*, 18: 101-117.

The authors used the San Juan Creek, California watershed to investigate promises and pitfalls of watershed management. Inside this watershed are five water districts. The watershed itself is characterized by rapid population growth and development.

Challenges that arose included accountability, inclusion of communities, and watershed-scale decision structures. The authors contend that a polycentric approach, common in many U.S. watersheds, can help avert or minimize these pitfalls.

Chess, C. and K. Purcell. 1999. Public participation and the environment: Do we know what works? *Environmental Science & Technology*, 33(16): 2685-2692.

This report contains an analysis of existing empirical research on the success of different forms of environmental public participation. It was found that the particular form (e.g., workshop, public meeting) may not always determine process or outcome success. Other factors, such as the history of the particular issue at hand, agency commitment, and expertise, may be more important than the work of the participants. Agencies' handling of issues and participants can have significant impact on both process and outcomes. Process and outcomes are limited, for instance, when agencies are condescending to participants or fail to adequately publicize public forums. On the other hand, outcomes tend to be positive when agencies provide neutral facilitation and work to improve relationships with indigenous peoples.

“Rules of thumb” for public participation, as identified in this study, are:

- Clarify and clearly state goals;
- Invest in advance planning and begin outreach early;
- Modify, or veer from, traditional participatory forums to meet outcome goals;
- Implement a program that relies on several forms of public participation; and,
- Get feedback on the public participation efforts.

Clark, B. T., N. Burkhardt, and M. D. King. 2005. Environmental assessment: Watershed management and organizational dynamics: Nationwide findings and regional variation. *Environmental Management*, 36(2): 297-310.

Responding to growing concerns about resource management efforts on the watershed scale, the authors conducted a nationwide survey of watershed organizations in the United States in an effort to create a national portrait of such efforts. An e-mail survey was sent to 574 contacts. The response rate was 37%.

The organizations represented in this survey were organized as early as 1904 and as late as 2002, with the mean year of formation being 1991. This appears consistent with the shift toward more collaborative approaches to watershed management. Almost half of the watershed organizations were created in response to concerns about conditions giving rise to ecological damage within the watershed.

About two-thirds of the organizations had paid staff and therefore did not rely entirely on volunteers. Organizations in the western states tended to have more state and federal employees in their organizations. About one-third indicated that their funding had decreased, another third believed that their funding was stable, and 36% reported that their funding base was increasing. Organizations in the more western states tended to have larger operating budgets than those in the more eastern parts of the country.

In terms of the primary mechanism for decision-making, about half of the organizations rely on voting among their respective boards of directors only. About one-fifth relied on simple majority voting among all members, while almost one-fifth (19.5%) used total consensus or unanimous voting among all members. Very few (1.5%) relied on the vote of only one designated member in decision making.

The authors suggest that data such as these can help lead to regional assessments of organizational patterns, and may help foster linkages among organizations with similar characteristics.

Duram, L. A. and K. G. Brown. 1999. Assessing public participation in U.S. watershed planning initiatives. *Society and Natural Resources*, 12: 455-467.

The authors conducted a survey of federally funded watershed planning initiatives. They sent out 126 mail surveys, and received valid responses from 64 contracts. They found wide variation in the initiatives in terms of population size, land area encompassed, watershed organization, and participation characteristics such as the types of agencies involved, frequency of meetings, and numbers of active participants.

Key findings included:

- The plans may have success in the long term if a collaborative approach is attained, even if participation initially begins with a bureaucratic, legally mandated approach.
- Participation is most helpful in outreach and in identifying and prioritizing issues.
- Participation should start early in the process. Participation that is begun late in the process can be divisive and counter-productive.
- Two-way rather than one-way communication was the most effective.
- Participation is beneficial to watershed planning.
- Public participation increases awareness of watershed issues. This helped foster cooperation among agricultural and nonagricultural land owners.
- Interagency coordination was improved through the watershed planning participation efforts.

- Public participation contributed to stakeholders ability to reach a consensus on the plan goals, which had a positive effect on the legitimacy of the final plans.

Gorder, J. S. 2001. *Statewide Watershed Management Effects on Local Watershed Groups: A Comparison of Wisconsin, Kentucky and Virginia*. Master Paper. Blacksburg, VA: Urban and Regional Planning, Virginia Polytechnic Institute and State University. On-line through etds@vt: <http://scholar.lib.vt.edu/theses/available/etd-04222002-170513/>

Based on a review of previous literature, Gorder contends that local watershed groups are often not fully informed of exactly what their role is, and how much financial, technical, and educational support can or will be provided to them. Obstacles that keep watershed groups from reaching their fullest potential include “*insufficient leadership capacity at the local level, insufficient coordination of responsibilities and priority setting across watershed, and insufficient funds and resources at the local level*” (p. 10).

Gorder lists the following factors as associated with having effective statewide watershed management programs. These factors are:

- Having one central agency in charge of initiating, coordinating, and acknowledging successful watershed management activities;
- Adequate state funding support for local watershed groups;
- Support from the state to initiate research, experimentation, and pilot projects;
- State provision of technical assistance and support;
- State support for public education on water quality issues; and
- Having local and statewide open forums where all stakeholders can voice their concerns and opinions (Gorder, 2001, pp. 11-13).

Gorder found it difficult to neatly compare the three states’ watershed plans and processes based on the factors listed above because the states had different goals and were in different stages of planning. However, it was found that Wisconsin had been successful in having a central agency in charge of the planning activities, and in creating effective and collaborative relationships among watershed groups. However, the state had not realized forums for public participation, as Virginia had. Kentucky had studied other watershed management techniques and outcomes before embarking on its own. This is seen as having contributed to its own watershed management framework, which Gorder rated as “efficient and well-organized” (p. 50).

Gregory, R., T. McDaniels, and D. Fields. 2001. *Decision aiding, not dispute resolution: Creating insights through structured environmental decisions*. *Journal of Policy Analysis and Management*, 20(3): 415-432.

The authors overview key problems with dispute resolution involving natural resources. These include the tendency to delegate policy responsibilities to groups of people who have vested interests, the tendency for people rely on heuristic rather than rational reasoning, and the emphasis on process issues rather than the overall quality of the

decision making. The authors propose using decision-aiding for making decisions about public policy related to environmental decisions. Decision-aiding as delineated by the authors entails the following:

- The use of objectives to clearly identify what matters to stakeholders;
- A set of attractive alternatives;
- Reliance on technical information to characterize the effects of alternatives;
- Identification of tradeoffs; and,
- A summary of agreements and disagreements, and reasons for those, among the stakeholders.

The authors identify what elements typically are present in well-structured decision processes (e.g., clear definition of the problem to be addressed, identification of key objectives, paying attention to cognitive and emotional traps). They contend that effective decision making involves adaptive learning and some system of monitoring and adjustment.

Howell, J. L. and G. B. Habron. 2004. Agricultural landowners' lack of preference for internet Extension. *Journal of Extension*, 42: 6. www.ioe.org

Surveys were sent to agricultural landowners in four watersheds in Michigan. It was found that the majority of respondents preferred receiving watershed information through written materials such as newsletters, bulletins and fact sheets. Very few respondents wanted to receive watershed information from the Internet, e-mail, computer software or the Web.

Imperial, M. 2005. Using collaboration as a governance strategy: Lessons from six watershed management programs. *Administration & Society*, 37(3): 281-320.

This study focused on how collaboration is used as a strategy for improving watershed governance. The study areas were six watersheds: Inland Bays in Delaware, Narragansett Bay in Rhode Island and Massachusetts, Salts Pond in Rhode Island, Lake Tahoe in California and Nevada, Tampa Bay in Florida, and Tillamook Bay in Oregon. Field interviews were conducted with over 200 persons involved in decision making across these six watersheds. Findings included:

- Resource sharing can help overcome the problems associated with limited resources;
- Articulating shared policies, regulations, and norms are important for encouraging collaboration;
- Formalizing shared policies, rules, norms, practices, procedures, and processes (e.g., by entering into an MOU) helps ensure that policies are implemented and minimizes problems caused by staff turnover or loss of institutional memory;
- Once developed, watershed managers must work to maintain trust and inter-organizational relationships;

- Conflict avoidance is not always the best strategy to use since conflict can result in more ideas and approaches to problem identification and solving; and,
- The collaborative approach is not a magic bullet. Sometimes, other strategies such as legislative intervention or unilateral action may be called for.

Korfmacher, K. S. 2001. The politics of participation in watershed modeling. *Environmental Management*, 27(2): 161-176.

Using data about participatory modeling in four watersheds, the author identifies some possible pitfalls in the process, while recognizing that public participation can increase support for the watershed management decisions that are made.

The possible pitfalls include:

- Some groups may be underrepresented, thus undermining the credibility of the efforts;
- Stakeholders can become disillusioned if it is unclear how and if modeling results have been or will be used in decision-making; and,
- Managers might be inclined to assume that because some members of the public participated in the process there has been adequate public participation. It might be – and often is – the case that public participation is highly selective.

LaChapelle, P. R. and S. F. McCool. 2005. Exploring the concept of “ownership” in natural resource planning. *Society and Natural Resources*, 18: 279-285.

The authors contend that today’s natural resource issues are “wicked,” that is, they are characterized by “*multiple and competing values and goals, little scientific agreement on cause-effect relationships, limited time and resources, incomplete information, and structural inequities in access to information and the distribution of political power*” (p. 279). One of the key problems with current natural resource planning processes, according to the authors, is the “technocentric utilitarianism” approach, developed during the Progressive Era, which tends to characterize the methods employed. [This approach also is known as rational-comprehensive, and tends to rely on experts – scientists and technicians – to identify public interest.]

The authors contend that while agencies such as the EPA stress public participation in natural resource issues and management, the public participation often is treated as just another source of data. In the process, the public participants do not garner any ownership of the issues or solutions to any problems.

According to the authors (pp. 281-282, paraphrased), ownership entails:

- “*The processes by which voices are heard and considered legitimate or valid;*
- *The right of individuals to have their thoughts seen as authoritative and correct;*
- *Challenging the “culture of technical control;”*”

- *Contributing to both the definition of the problem and the outcomes or solutions; and,*
- *Distribution across myriad social, ecological, and political scales.”*

The authors contend that ownership is both horizontal and vertical in nature. Horizontal ownership refers to the interaction between the citizens and agencies in reference to whatever is the subject of the plan. Ownership is vertical in that it can extend from the local level to the regional, national, and international scale. The authors emphasize that when ownership is shared widely, “the likelihood of broad social acceptability and political implementation increases” (p. 282).

The authors provided numerous real examples to illustrate their points regarding the positive impacts of joint and genuine ownership of processes and outcomes. These included conflicts between off-road vehicle use and endangered species on Cape Cod and in the Inimin Forest in California.

Leach, W. D. and N. W. Pelkey. 2001. Making watershed partnerships work: A review of the empirical literature. *Journal of Water Resources Planning and Management*, Nov/Dec: 378-385.

An analysis of 37 studies revealed a total of 210 “lessons learned” about watershed partnerships and conflict resolution. These lessons were grouped into 28 thematic categories.

Factor analysis revealed that these themes could be grouped as follows:

- Resources and scope of the partnership activities;
- Flexibility and informality;
- Alternative dispute resolution; and,
- Institutional analysis and development.

Funding and effective leadership were mentioned in 60% of the studies. Interpersonal trust also was found to be important to successful partnerships. Integral to trust are neutral facilitators, clear process rules, and “*unimpaired sharing of data and information*” (p. 383).

Lubell, M. 2004. Collaborative watershed management: A view from the grassroots. *The Policy Studies Journal*, 32(3): 341-361.

This study is based on a survey of farmers who participated in the Suwanee River Partnership in Florida. Formally chartered through a Memorandum of Understanding in 1999, the Partnership is composed of “*42 different local, state, and federal agencies plus agricultural interest groups*” (p. 342). While much watershed management research is focused on why and how elites participate in collaborative watershed groups, the author was interested to find out why farmers participate. Some farmers participate as representatives of agricultural interest groups and others participate through actual

activities such as having and executing their own conservation plans. It was this second group of participants that were focused on for this study.

Surveys were mailed to all farmers in the Suwanee Basin. A total of 83 usable surveys were collected and were the basis for this analysis.

Key findings of this study include:

- Trust in local government had a positive relationship with participation;
- Stewardship and inclusiveness were positively related to farmers' assessment of the effectiveness of the collaboration;
- Farmers' expectations of reciprocity from other farmers was a strong factor in farmer participation; and,
- Cost-sharing was an important factor in farmer participation in the collaborative.

Payton, M. A., D. C. Fulton, and D. H. Anderson. 2005. Influence of place attachment and trust on civic action: A study at Sherburne National Wildlife Refuge. *Society and Natural Resources*, 18: 511-528.

While natural resource management agencies now favor collaborating with the public in deciding their actions and decisions, this management model faces challenges due to declining citizen involvement. This study sought to explore the relationship between place attachment and citizen's volunteer behaviors in the Sherburne National Wildlife Refuge in Minnesota. A positive relationship was found between emotional place attachment and civic action. Emotional place attachment also was related to trust. The findings suggest that managers can take action to enhance trust among the public to increase volunteer activity in their respective areas.

Reza, G., K. W. Hipel, and K. C. Abbaspour. 2005. Prioritizing long-term watershed management strategies using group decision analysis. *International Journal of Water Resources Development*, 21(2): 297-309.

Locally based water resources management is now common place. Given the fact that stakeholders often have different perspectives and objectives, managing inter-group conflict is seen as crucial to the success of watershed management. This study found that water resources development, followed by agricultural and range management, are preferred approaches among decision makers.

Rickenbach, M. G., and A. S. Reed. 2002. Cross-boundary cooperation in a watershed context: The sentiments of private forest landowners. *Environmental Management*, 30(4): 584-594.

Based on fifty in-depth interviews with 50 nonindustrial private forest landowners, watershed council members, and agency employees, it was found that stewardship ethic, property rights amid uncertainty, and action orientation were three factors that contributed to landowners' decisions to participate in local watershed councils.

Cooperation was a function of perceived consensus, legitimacy of authority, and group identity.

Ryan, R. L., D. L. Erickson, and R. DeYoung. 2003. Farmers' motivations for adopting conservation practices along riparian zones in a Mid-Western agricultural watershed. 2003. *Journal of Environmental Planning and Management*, 46(1): 19-37.

This study is based on a mail survey of 268 farmers in the River Raisin watershed, which is located in southeastern Michigan near Detroit and Toledo.

The survey inventoried current conservation practices, motivations for adopting conservation practices, likelihood of adopting management practices along streams in the future, and effects of motivation on likelihood of adopting management practices.

It was found that farmers in this study were concerned about the aesthetic quality of conservation practices. However, farmers also were positively motivated to adopt conservation practices that would have positive impacts on their downstream neighbors' land and water. Soil conservation was embraced for both economic and stewardship reasons. For a few measures, farmers were reluctant to take the risk because while a particular practice (e.g., no-till, grass buffer strips along streams) may currently be required by farmers who receive government subsidies, whether the program would be required in the long-term, or would be tied to subsidies, was not always clear.

As has been found in other studies, the smaller scale and part-time farmers were more likely to adopt the riparian management strategies than were the larger scale and full-time farmers. A logical and valid implication of this finding is that it might be a wise investment for government conservation programs to target (and reward) smaller scale and part-time farmers for what may be very long-term positive impacts on riparian zones.

Serveiss, V. B. 2002. Applying ecological risk principles to watershed assessment and management. *Environmental Management*, 29(2): 145-154.

A watershed approach was used to conduct ecological risk assessment in three watersheds. It was found that the most important watershed ecological risk assessment principles were "*holding regular meetings between scientists and managers, using assessment endpoints and conceptual models, and developing a focus for the multiple stressor analysis*" (p. 148). It was found that this approach encourages more interaction between managers and scientists, and helps scientists understand more clearly the technical needs of managers and decision makers. Managers are able to incorporate more scientific information in their decision making.

Steele, J. C. 2004. An Examination of Public Participation Used in the Development of Watershed management Plans in Ohio. Masters Thesis. Athens, Ohio: University of Ohio, Environmental Studies (Arts and Sciences). Online at OhioLINK ETD: <http://www.ohiolink.edu/ed/>

According to the author, watershed coordinators in Ohio are to follow *A Guide to Developing Local Watershed Action Plans in Ohio*, created by the Ohio EPA. This guide takes a watershed approach to planning and management, which necessarily entails public participation. The focus of the research for this thesis was how the public was being included in the decision-making in Ohio's watershed planning, how watershed coordinators develop their participatory techniques, and watershed coordinators' perceptions of the resources available to them. Interviews were conducted with six watershed coordinators in the state. Qualitative methods were used for the analysis.

It was found that in Ohio, watershed groups typically are comprised of interested citizens; rarely are there technical experts in the groups. Occasionally, there might be a locally elected official in the group. Thus, watershed groups in Ohio are not comprised in ways typically thought of for watershed partnerships. Coordinators often found themselves worried about the consequences of trying to assemble a watershed group, rather than allowing one to come from the grassroots, or use one that already was in place. The crux of the concern mainly came down to trust. Citizens may not know the coordinator and/or have no previous relationship with the coordinator' therefore they do not have the trust that usually characterizes relationships with the other types of citizen groups.

Coordinators, driven by deadlines, may hastily put together the group, and more time must be spent on developing trust that could be applied to other tasks. Coordinators also must establish advisory boards, in keeping with their guidelines.

Public participation at meetings was advertised in all of the standard ways (radio announcements, flyers, postcards, etc.). The public meetings typically had a presentation, followed by a discussion period, and then snacks. Information also was solicited through the use of comment and suggestion cards. Coordinators also sometimes relied on surveys and informal conversations to garner insight from the public.

The author concluded that watershed coordinators tended to rely on a more technocratic model in relation to public participation. Coordinators tended to be dissatisfied with the level of public participation.

While the author conceded that watershed management is not easy, he contends that balance is the key. To that end, he suggests that a collaborative learning ("learn as you go") approach be used rather than the more technocratic approach revealed through his study.

Singleton, S. 2002. Collaborative environmental planning in the American West: The good, the bad, and the ugly. *Environmental Politics*, 11(3): 54-75.

This study is based on primary and secondary source materials, and interviews with 18 individuals who participated in one of three watershed planning collaboratives. The watershed collaboratives were focused on the Dungeness River watershed in northwestern Washington, the Yakima River watershed in Washington, and the Methow River watershed in north central Washington.

The authors' analysis led her to conclude that one watershed collaborative has been a success, another started off with promise of success but got derailed by conflict, and the third watershed's progress has been effectively nullified by the implementation of a new process that stimulates more conflict than progress.

The author found that failed watershed efforts (Yakima and Methow) tended to be derailed by problems of scale, linkage and asymmetries between the stakeholders. There were problems in articulating shared goals. When federal officials were on the teams, they sometimes did not fully appreciate the local perspective or culture. On the other hand, the Dungeness River watershed was smaller, and fairly self-contained.

Other factors contributing to the success of the Dungeness watershed planning group was that the group was characterized by openness and trust among and between all parties. In addition, science-based information was presented and shared in ways such that non-scientists trusted the information and those distributing it. The failed efforts did not enjoy this trust. In fact, some participants in the failed efforts became suspicious of the information they were being given.

Fundamentally, another factor contributing to lack of success for the two large watersheds is alluded to by the author. Simply put, watershed collaborative planning is supposed to be local and place-based. With large watersheds, neither of these may be possible. And, given large scale planning, and therefore diversity of actors and life circumstances, additional hurdles may have to be addressed in order to realize the goals of the group.

Wilson, R. K. 2006. Collaboration in context: Rural change and community forestry in the Four Corners. *Society and Natural Resources*, 19: 53-70.

This study is the result of an evaluation of the Four Corners Sustainable Forestry Partnership (where Arizona, Utah, Colorado, and New Mexico meet and have a common border). This partnership was created so that foresters in the area could pool resources in an effort to more effectively address shared regional issues. Issues include ways for the rural communities, once dependent on the extractive industries, to cope with rapid socioeconomic changes. The study relies on intense case studies with 12 foresters in each of the four regions.

It was found that the place-based contexts of the forestry programs were reflected in the goals, structure, and composition found in the collaborative efforts in each community. It appears that three categories of community forestry projects are emerging as a result. These are: “*ecological restoration/wildfire risk reduction; local economic development; and, building community cohesion*” (p. 65).

The framework that is emerging from this collaboration and an evaluation of it may be useful when applied to other collaborative natural resources management and decision making efforts in terms of understanding more fully how social, economic, and ecological elements have bearing in local contexts, and in relation to specific goals shared by a collaborative.

VI. NATURAL RESOURCES AND WATERSHED MANAGEMENT OUTSIDE THE UNITED STATES: A BRIEF LISTING OF PERTINENT LITERATURE

- Becker, M. and U. Raasch. 2003. Sustainable stormwater concepts as an essential instrument for river basin management. *Water Science and Technology*, 48(10): 25-32.**
- Berger, M., A. R. Harborne, T. P. Dacles, J-L Solant, and G. L. Ledesma. 2005. A framework of lessons learned from community-based marine reserves and its effectiveness in guiding a new coastal management initiative in the Philippines. *Environmental Management*, 34(6): 786-801.**
- Brown, G. 2005. Mapping spatial attributes in survey research for natural resource management: Methods and applications. *Society and Natural Resources*, 18: 17-39.**
- Byron, I. and A. Curtis. 2002. Maintaining volunteer commitment to local watershed initiatives. *Environmental Management*, 30(1): 59-67.**
- Chocat, B., P. Krebs, J. Marsalek, W. Rauch, and W. Shilling. 2001. Urban drainage redefined: From stormwater removal to integrated management. *Water Science and Technology*, 43(5): 61-68.**
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- Garin, P., J-D Rinaudo, and J. Ruhlmann. 2002. Linking expert evaluations with public consultation to design water policy at the watershed level. *Water Science and Technology*, 46(7): 263-271.**
- Jacobs, K. 2004. Waterfront redevelopment: A critical discourse analysis of the policy-making process within the Chatham Maritime Project. *Urban Studies*, 41(4): 817-832.**
- Kontogianni, A., I. H. Langford, A. Papandreou, and J. H. Skourtos. 2003. Social preferences for improving water quality: An economic analysis of benefits from wastewater treatment. *Water Resources Management*, 17: 317-336.**
- Menses, G. D. and A. B. Palacio. 2005. Recycling behavior: A multidimensional Approach. *Environment and Behavior*, 37(6): 837-860.**

- Nelson, A. and C. Pettit. 2004. Effective community engagement for sustainability: Wombat Community Forest Management case study. *Australian Geographer*, 35(3): 301-315.
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- Yeh, C-H and J. W. Labadie. 1997. Multiobjective watershed-level planning of storm water detention systems. *Journal of Watershed Resources Planning and Management*, 123(6): 336-343.
- Yu, Y-B., B-D. Wang, G-L Wang, and W. Li. 2004. Multi-person fuzzy decision-making model for reservoir flood control operation. *Water Resources Management*, 18: 111-124.

APPENDIX

ELECTRONICALLY AVAILABLE FREE PUBLICATIONS: A BRIEF SELECTION

- Center for Community Growth and Change.** 2002. *The Reedy River Master Plan*. Clemson, SC: Clemson University, Center for Community Growth and Change. <http://www.clemson.edu/caah/ccgc>.
- Colorado Department of Local Affairs, Office of Smart Growth.** 2004. *Water-Efficient Landscape Design: A Model Landscape Ordinance for Colorado's Communities Utilizing a Water Conservation-Oriented Planning Approach*. Denver, CO: Colorado Department of Local Affairs. www.dola.state.co.us
- Coyle, K. J.** 2005. *Environmental Literacy in America: What Ten Years of NEETF/Roper Research and Related Studies Say about Environmental Literacy in the U.S.*. Washington, DC: National Environmental Education & Training Foundation. www.neetf.org/pubs/ELR2005.pdf
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- Duroy, Q. M.** 2005. *The Determinants of Environmental Awareness and Behavior*. *Rensselaer Working Papers in Economics*. Number 0501, January. Troy, NY: Department of Economics, Rensselaer Polytechnic. <http://www.rpi.edu/economics/www/workingpapers>.
- Environmental Modeling Research Laboratory, BYU.** ND. *WMS 7.0 Overview of the Watershed Modeling System*. A step-by-step PowerPoint presentation, created by the Environmental Modeling Research Laboratory of Brigham Young University, found through a search of the US Department of Transportation website, www.cflhd.gov/hyd/presentation19-nelson.pdf. [This same presentation was not found when searching the EMRL site.]
- Esty, D. C., M. Levy, T. Srebotnjak, and A. de Sherbinin.** 2005. *2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship*. Main Report. New Haven: Yale Center for Environmental Law and Policy. www.yale.edu/envirocenter. Also available at: www.ciesin.columbia.edu.
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- Michigan Department of Environmental Quality and Institute of Water Research, Michigan State University.** 2000. *Developing a Watershed Management Plan for Water Quality: An Introductory Guide*. Michigan Department of Environmental Quality, Surface Water Quality Division, Nonpoint Source Program Staff, <http://www.deq.state.mi.us/swq> and Institute of Water Research, Michigan State University, <http://www.iwr.msu.edu>
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WEBSITES

I. UNITED STATES – NATIONAL

AMERICAN WATER RESOURCES ASSOCIATION. A professional association. Publishes several journals, holds annual conferences, and provides information about related organizations and professional meetings. <http://www.awra.org/>

Conservation Technology Information Center. A nonprofit organization that coordinates the National Watershed Network. Maintains calendars of pertinent meetings and events, provides information about watersheds across the United States; helps support local watershed collaborative efforts. Has several free publications available on line. <http://www.ctic.purdue.edu/CTIC/CTIC.html>

Decision Research. An independent, nonprofit research corporation focused on human judgment, information processing, and risk perception as they relate to larger social questions such as how decisions about the management of natural resources should be made, what are the roles of experts versus citizens in decision making that affects everyone, and communication can help people understand and cope with risk. <http://www.decisionresearch.org/>

National Oceanic and Atmospheric Administration (NOAA). Is the part of the United States Department of Commerce that studies and helps to protect oceans and regulate atmospheric omissions. The NOAA also houses the National Weather Service and helps to prepare when flooding and other natural disasters occur. <http://www.noaa.gov>.

National Wildlife Federation. A nonprofit organization making efforts to unite Americans in the interest of protecting the country's wildlife. The organization publishes several e-newsletters and updates wildlife news on its website. <http://www.nwf.org/>

Smart Growth America. Is a coalition of national, state and local organizations. The aim is to improve the way homes, towns, cities and metro places and planned and built. The organization also sponsors research projects that are available from the website. <http://www.smartgrowthamerica.org/>

Trust for Public Land. A national nonprofit land conservation organization. Initiatives: Parks for People; Working Lands; Heritage Lands, and Land and Water. Provides conservation services, research and education, and assistance with securing funding for projects. In South Carolina, TPL's projects include the Beaufort Riverwalk, Chattooga National Wild and Scenic River, Waccamaw National Wildlife Refuge, Fort Moultrie National Monument, and Beaufort's Greenprint – a landmark greenspace program in South Carolina. <http://tpl.org/>

United States Army Corps of Engineers. Is a government agency charged with the protection and restoration of much of much of natural resources such as lakes, streams, and forests. The Corps of Engineers' biologists, engineers, and other environmental managers and scientist are responsible for building bridges, damns, and flood control of thousands of watersheds around the country. <http://www.usace.army.mil>.

United States Department of Agriculture, Cooperative Extension Service. Has one hundred Land Grant Colleges and Universities serving residents of each state in an effort to enhance public life. <http://www.csrees.usda.gov/qlinks/extension.html>

United States Department of Agriculture Forest Service. Has publications related to regulation and management of forests, the evolution of the U.S. Water Policy with an emphasis on the West, Water Quality Protection Measures, and Changing Social and Legal Forces Affecting the Management of National Forests.
<http://www.fs.usda.gov/publications>

United States Department of Agriculture Natural Resources Conservation Services. Has watershed projects in every state of the United States. Implements the Watershed Protection and Flood Prevention Act through: watershed surveys and planning; watershed protection and flood prevention operations; and, watershed rehabilitation. Is responsible for, among other programs, the Wetlands Reserve Program. NRCS has an array of publications about natural resources conservation that are free of charge.
<http://www.nrcs.usda.gov/>

United States Department of Agriculture, Natural Resources and Environment. Helps to bridge the gap between the public and government through forums such as Farm Bill Forums and Conservation and Environmental Policies. Its publications include Regional Water Quality Programs investigating the water quality of each state.
http://www.usda.gov/wps/portal/!ut/p/_s.7_0_A/7_0_1OB?navtype=SU&navid=NATURAL_RESOURCES

United States Department of Agriculture, National Agricultural Library. The nation's primary source of agricultural information. This national library is in Beltsville, Maryland; it offers most of its services via the World Wide Web. Since 1862, the library has provided a repository of agricultural information for public and government use.
http://www.nal.usda.gov/general_info/intro_nal.htm

United States Department of Defense (USDOD). The United States department of defense is charged with defending liberty, cultural and environmental heritage, as assisting with homeland security. The US Department of Defense has a role in natural resource management. <http://www.dod.gov/>.

United States Department of Energy, Office of Science and Technical Information. Provides full text access to DOE sponsored research.
<http://www.osti.gov/energycitations/availability.asp>.

United States Department of the Interior (USDOI). Is the United State's chief conservation agency. The USDOI is responsible for protecting the country's treasures. This includes natural and cultural resources. Land and water resources are part of the conservation efforts of the Department of the Interior. <http://www.doi.gov>. Included in the Department of the Interior is the **National Park Service**, which has several projects and publications pertinent to watershed and natural resource management. The Park Service also provides a state by state inventory of rivers in the United States through its Nationwide River Inventory, <http://www.ncrc.nps.gov/rtca/nri>

United States Department of Transportation, Federal Highway Administration. Has a number of research programs and information/reports available.

<http://www.fhwa.dot.gov/>

United States Government Printing Office. Offers numerous studies and other documents, most of the them free and available from the Web. Searchable site.

<http://frwebgate.access.gpo.gov/>.

United States Environmental Protection Agency. In response to public demand for cleaner water, air, and land. The EPA is charged with being the nation's leader in environmental research and education. Its strategic plan for 2003-2008 is among the many documents available free of charge to the public. <http://www.epa.gov>

II. UNITED STATES – AEGIONAL

Conservation Law Foundation. A non-profit organization dedicated to protecting the natural resources and environmental treasures of New England. The Conservation Law Foundation promotes renewable energy, reduction of environmental pollution, and alternatives to sprawl. <http://www.clf.org>.

Southern Environmental Law Center. Serves six southern states: Alabama, Georgia, North Carolina, South Carolina, Tennessee, and Virginia. Works to promote alternatives to poor [or no] planned developments. Helps educate the public, planners, and lawmakers about environmental law. Provides free research documents on line.

<http://www.southernenvironment.org/>

Southern Rural Development Center. Mississippi State University. A nonprofit federally funded (USDA) education, research, and outreach entity. Its mission is to *“strengthen the capacity of the region's 29 land-grant institutions to address critical contemporary rural development issues impacting the well-being of people and communities in the South.”* Has policy, research, and newsletter publications, provides training, sponsors conferences, and provides grant funding for specific endeavors.

<http://www.msstate.edu/srdc>.

Tennessee Valley Authority (TVA). Has been providing power to and engaging in environmental protection in the Tennessee Valley for over seventy years. TVA's web site

announces environmental news, new environmental legislation, and maps of local watersheds. This website also is a repository of information for environmental reports and data gathered on watershed restoration and protection techniques.

<http://www.tva.gov>.

III. SOUTH CAROLINA

Clemson University. Clemson, South Carolina. A land-grant institution. Has numerous publications free of charge available via the Web, and other publications that can be ordered using the web. These publications often are free or are available at a nominal cost. www.clemson.edu. See especially the pages for Public Service and Extension.

Palmetto Conservation Foundation. Is a state-wide nonprofit organization that strives to preserve South Carolina's natural and cultural resources. The organization has six programs designed to preserve South Carolina's cultural and historic resources and greenspaces. <http://www.palmettoconservation.org/index.php>

Saluda-Reedy Watershed Consortium. Includes an array of partners from the public, private, and nonprofit sectors. United by their concern about changing land use on the purity and abundance of the Saluda-Reedy basin, members work cooperatively among themselves and with other entities to address three goals. These goals are: promoting increased knowledge and changing perspectives about the watershed and its value; improving water quality policies and land development regulations throughout the watershed; and, building local capacity for engaging in integrated watershed conservation. Programs include education and advocacy and land trust. www.saludareedy.org

South Carolina Department of Health and Environmental Control (SCDHEC). Is the state agency in charge of protecting the health and welfare of the residents of South Carolina. DHEC operates regional offices in each county in South Carolina to provide health and environmental services to all South Carolinians. Its services vary in different areas providing medical clinics and environmental training testing throughout the state. <http://www.scdhec.net>

South Carolina Department of Natural Resources (SCDNR). Is a South Carolina state agency committed to the conservation of South Carolina's natural resources. SCDNR is a division of the United States Department of Natural Resources. Has a number of reports available at its web site. <http://www.dnr.state.sc.us/>

South Carolina Water Resources Center. The Strom Thurmond Institute at Clemson University, Clemson, South Carolina. Fosters applied water resources research in South Carolina, and links citizens to scientific information and experts. Has several research reports available on line, and publishes the newsletter *SC Water News*. http://www.strom.clemson.edu/teams/water_resources/

Upstate Forever. A nonprofit organization dedicated to promoting sensible growth and the preservation of special places in the Upstate of South Carolina. Upstate Forever produces a periodic newsletter as well as updates on growth in the Upstate. Funds some research/action projects. A ten point plan outlines the objectives of Upstate Forever and its mission of preserving the Upstate.

http://www.upstateforever.org/10_point_plan.htm

JOURNALS: A BRIEF LISTING

Advances in Environmental Research

Advances in Water Resources

Agricultural Water Management

Agriculture & Human Values

Agriculture, Ecosystems & Environment

American Journal of Political Science

American Sociological Review

Aquaculture Research

Business and the Environment

Conservation Ecology (<http://www.ecologyandsociety.org/>)

Coastal Management

Earth Island Journal

Ecological Applications

Ecological Economics

Ecological Modeling

Ecology (Durham)

Ecology Law Quarterly

Ecos

Ecosystem Health

Environment (St. Louis)

Environment and Behavior

Environmental and Ecological Statistics

Environmental & Resource Economics

Environmental Conservation

Environmental International

Environmental Management

Environmental Modeling and Assessment

Environmental Politics

Environmental Values (<http://www.ericademon.co.uk/>)

Environmental Science & Technology

Environmental Toxicology

Ethics and the Environment

Groundwater Monitor

Human Dimensions of Wildlife

Impact

International Journal of Water Resources Development
Journal of Agricultural and Environmental Ethics
Journal of the American Water Resources Association
Journal of Business Ethics
Journal of Environmental Planning & Management
Journal of Extension (online only) www.joe.org
Journal of Forestry
Journal of Policy Analysis and Management
Journal of Soil and Water Conservation
Journal of Sustainable Agriculture
Journal of Water Resources
Journal of Water Resources Planning and Management
Lakes & Reservoirs: Research and Management
Landscape and Urban Planning
Landscape Ecology
Natural Resources Forum
Natural Resources Journal
Restoration Ecology
Rural Sociology
Society and Natural Resources
Water Policy
Water Research
Water Science and Technology
Wetlands
Wetlands Ecology & Management

PART III:

**Water-Based Decision Making among Public Officials:
Findings from Meeting Minutes**

by

Ashley W. Harris, Amy Kracker, and Brenda J. Vander Mey

**Report prepared for the Saluda-Reedy Watershed Consortium,
Greenville, South Carolina**

June 2004

**WATER-BASED DECISION MAKING AMONG
PUBLIC OFFICIALS: FINDINGS FROM MEETING MINUTES
June 2004**

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Clemson Environmental Institute
Clemson University's Jim Self Center on the Future
South Carolina Water Resources Center
South Carolina Department of Natural Resources
Pinnacle Consulting Group, Inc.

Other Partners

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EXECUTIVE SUMMARY

The current study was a content analysis of county council and municipal governments' decisions in the area of natural resources, with a focus on the Saluda and Reedy Rivers, and the Saluda-Reedy Watershed (herein called "the Watershed"). Originally, it was planned that minutes from meetings would be accessed via the Internet. However, some entities did not have minutes on-line; these minutes had to be retrieved manually. It also was decided to add some entities comprised of appointed officials when these entities had decision-making responsibility in the areas of concern.

Minutes from meetings were retrieved for the following: Anderson County Council; Greenville County Council; Greenwood County Council; Laurens County Council; Pickens County Council; Greenville City Council; Anderson County Land Use and Zoning Board of Appeals; Anderson County Planning Commission; Greenville City Public Services Administration; The Greenville County Committee on Public Service, Planning, and Development; Greenville Soil and Water Conservation District; Pickens County Stormwater Committee; Pickens County Soil and Water Conservation District; and, The Appalachian Council of Governments.

Generally, with some exception, it was found that city and county governmental bodies tended to focus on local issues, often without reference to larger social, economic, or environmental arenas. Zoning, land use, and water infrastructure had precedence among some entities. The entities with a sustained and concentrated focus on the Saluda and Reedy Rivers and the Watershed were Greenville City Council and Greenville County Council.

This report details the findings for each entity studied, followed by conclusions and recommendations.

PURPOSE OF THE CURRENT STUDY

The purpose of the current study was to identify the frequency and extent to which issues related to the Saluda and Reedy Rivers, the Saluda-Reedy Watershed, and natural resources were discussed in public meetings in areas affected by or associated with the Watershed. The resulting report is to serve as a baseline for future analyses in this area of concern.

METHODOLOGY

A content analysis form was created by Dr. Ronald C. Wimberley of North Carolina State. This form identified the governing body being analyzed, the type of record(s) examined, the date of the meeting being reported, the source, whether watershed issues were mentioned for the Saluda River, the Reedy River, and/or the Watershed, how many separate issues were discussed for each River and the Watershed, the topic(s), the discussant(s), and proportion of the meeting time devoted to the topic(s). The original plan was to access the meeting minutes of elected governing bodies operating in key

areas of the Watershed, and fill out the forms accordingly. Records were to be retrieved from January 2001 through December 2003.

Variations on Original Methodology

Not all elected bodies originally identified had minutes of meetings posted on websites. A few had some but not all minutes posted. A few had no minutes posted, and one had agendas and actions taken, but not minutes, posted. Thus, mixed methods (on-line retrieval when possible, actual manual retrieval when not) was employed. In addition, at the behest of Dr. Beasley, a few committees, boards, and other entities with relationships to the decision making in the Watershed were added. Finally, committee minutes were tracked through to May 2004, as were minutes for Anderson County Council.

Some websites had searchable databases for archived minutes, others did not. For those that were searchable, key words included “Saluda River,” “Reedy River,” “Saluda-Reedy,” “Saluda-Reedy Watershed,” “watershed,” and “water.” These minutes then were retrieved and read in their entirety. For minutes secured off-line and for minutes secured on-line from non-searchable files, each set of minutes had to be read for both keywords and context.

FINDINGS

The findings for this study begin below. Findings are summarized in Table A.1, Appendix A. Comments and observations are summarized in Table A.2, Appendix A. A list of contact persons is found in Table B.1, Appendix B.

MINUTES FROM COUNTY COUNCIL MEETINGS

Anderson County Council

The most recent Anderson County Council minutes and agendas are on-line at the county’s website, <http://www.andersoncountysc.org/web/Council/>. Older minutes are archived by a third party, accessible from the Council’s website.

Sixty-six sets of minutes from the Anderson County Council meetings were electronically retrieved.

Of these 66 sets of minutes, one set focused specifically on water infrastructure. This occurred during the Council’s retreat on February 10, 2001. Mr. Greer stated that action is needed in Anderson County for the following infrastructure issues: a study to implement and develop a plan regarding water; start a water quality assessment plan; extension of the water loop in phases; an inventory of available water technology; assessment and expansion of the county’s water supply; and, implementation of a plan to fund water system improvements in the county so that all residents’ water needs are met.

This discussion used less than one-fourth of the meeting's minutes.

On September 3, 2002, a representative from the Palmetto Conservation Foundation presented its plans for the 20-mile corridor along the Saluda River that is part of the larger Palmetto Trail project. The Council saw the recreational and eco-tourism value of this, but wanted more information before acting.

Both the city and county of Anderson, South Carolina are growing rapidly. Zoning and land use frequently were discussed and voted on during the County Council meetings. However, during this study period, no discussions regarding growth and expansion, zoning and so on mentioned the Saluda and Reedy Rivers or the Watershed. Water supply and quality, as previously noted, have been the subjects of one county council retreat. On numerous occasions, private citizens have come before the Council with concerns about unsafe drinking water and stormwater runoff. Some residents still rely on well water, and at least one resident's well was tested and found to have e-coli and other bacteria. Residents using well water want to be connected to the County's water, for safety reasons. The Council has been responding to these citizen concerns.

A constantly recurring discussion/action item for the Council revolved around extending the municipal water lines out to all county residents to ensure safe drinking water. At the same time, the Council continues to oversee the allocation of water from Lake Hartwell to Anderson County, and remains watchful regarding allocation of this water to other states.

Other recurring issues taken up by the Council included the paving of dirt roads, expansion of roads, and stormwater runoff from roads.

Greenville County Council

Seventy-two sets of minutes were downloaded from the web pages of the Greenville County Council minutes for this study period ([http://greenvillecounty.org/Ordinance & Minutes.asp](http://greenvillecounty.org/Ordinance%20Minutes.asp)).

Six sets of minutes had material specifically related to the Reedy River (February 6, 2001; February 20, 2001; March 20, 2001; September 4, 2001; November 6, 2001; November 20, 2001). One set of minutes contained material related to the Saluda River (March 6, 2001).

On February 6, 2001, it was announced that the Reedy River Project was underway. The Council indicated its willingness to join this collaborative agreement with the City of Greenville and Clemson University. Ms. Henderson moved to express intent to join in a cooperative and collaborative effort with the City of Greenville and Clemson University to create a Reedy River Master Plan. Mr. Cook moved to amend the item to return to Council for approval after negotiations. This motion carried with one written abstention (Case). The discussion took up less than one-fourth of the meeting's duration.

The Reedy River Master Plan was approved on February 20, 2001. This approval took less than one-fourth of the meeting's time. The Council also discussed amending their financial commitment. The motion failed with one written abstention (Case).

During the March 6, 2001 meeting of the Greenville County Council, less than one-fourth of the meeting was devoted to the a public hearing regarding the annexation by the Glassy Mountain Fire District. This would extend the Saluda Watershed to the state line with North Carolina.

On March 20, 2001, the Council approved the Reedy River Corridor Intergovernmental Agreement for the study of the Reedy River Corridor. The discussant was Mr. Kingsbury. The motion carried with one written abstention (Case). Then, Mr. Kingsbury moved to approve the Reedy River Master Plan as proposed by the Center for Community Growth and Change. The motion carried with one written abstention (Case). These two motions together took up less than one-fourth of the total meeting time.

On September 4, 2001 Ms. Henderson invited her colleagues to the Reedy River Ad Hoc Committee meeting to be held on September 6, 2001. This took very little time at all, far under one-fourth of the total meeting time. On October 30, 2003, the committee was renamed Reedy River Parks and Recreation Committee. The composition of the committee was not changed.

On November 6, 2001, the Council held a public meeting to receive public comment regarding an ordinance authorizing an agreement between the County and Project Garnet, the code name for Orion Power Holdings, locally known as Fork Shoals Energy. One-fourth to one-half of the meeting focused on this issue. Several citizens spoke against this agreement. They were: John Crabtree, Bill Curl, and Ed Paxon, Tammy Crane, Leona Crouch, and Tom Judd. Mr. Flint moved to amend the ordinance related to Fork Shoals Energy to request that the Public Service Commission and DHEC be held responsible for an impact study. This study was to take into consideration the Reedy River Corridor Study. This amendment was supported by Mr. Cook. The motion to amend carried.

Other issues that came before the Greenville County Council during this study period included requests to change zoning ordinances, conservation easements, and appointing individuals from the community to the Planning Commission.

Greenwood County Council

Eighty-eight sets of minutes from the Greenwood County Council minutes were drawn for this study period. Of these, seven contained items relevant to the current study. Three sets of minutes pertained to the Reedy River. Discussions consumed less than one-fourth of the affected meetings.

The minutes were downloaded from the Council's web pages (www.co.greenwood.sc.us). On October 16, 2001 Mr. Kier reported that he would be meeting with the Corps of

Engineers regarding the assessment of the Reedy River. On November 6, 2001, Mr. Moody reported a request to continue a professional services agreement with the Pinnacle Consulting Group to assess the impact of growth on the Reedy River and Lake Greenwood. Council unanimously approved this motion.

On December 18, 2001, the Council discussed the impact of manufacturing plants on the flow of the Reedy River, FERC approved extension of Buzzards Roost Shoreline Management Plan, and an application to the EPA for a grant to study groundwater quality. The discussants were Mr. Kier, Mr. Bryant, Mr. Moody and Ms. Child.

Other items that came before the Council were numerous requests for changes in zoning, citizen complaints about violations to the zoning ordinances, flooding, and a buffer and fence around a storm drainage basin. Guidelines Governing Encroachments of Lake Greenwood were tabled at the August 5, 2003 meeting. At this same meeting, the Council approved a land sale and easement of Buzzards Roost to Duke Power. On November 4, 2003, an invoice from South Carolina's Department of Natural Resources for spraying 25 acres of hydrilla around Lake Greenwood was discussed. The County Engineer, Mr. Larry Smith, introduced this topic.

Greenwood City and County Councils work closely together. They share a Comprehensive Plan. This plan covers areas such as land use, farmland protection, and waterfront development.

Laurens County Council

The minutes of meetings for the Laurens County Council meetings were manually retrieved at the Laurens County Courthouse in Laurens, South Carolina.

Seventy-nine sets of minutes were retrieved for the study time period. Of these, 11 reports had some bearing on the project at hand, three sets of minutes specifically mentioned the Saluda River, and one set mentioned the Reedy River.

Two sets of minutes contained coverage of the Lake Greenwood County Advisory Committee. On October 28, 2003, Administrator Segars introduced the need to nominate three citizens to serve on this board. On November 11, 2003 the Council voted for the following to serve: Dr. Ray L. Wilson, Mr. William Tumblin, and Mr. J. W. Coates.

Funding for the abatement of algae growth in Lake Greenwood was requested on June 12, 2001. This took up about one-fourth to one-half the meeting's time. Vice Chairman Pitts requested information about the findings of the Lake Greenwood studies on September 25, 2001. Rick Green provided this information on October 9, 2001. These took one-fourth to one-half the meetings' times.

On October 22, 2002, Vice Chairman Pitts nominated Mr. Bill Abercrombie, Mr. Bruce Chapman, Mr. Jim Waller, and Mr. John Henley to serve on the Rivers and Lakes Oversight Committee. This body was charged with monitoring the study being

conducted for the Reedy River and to monitor the Colonial Pipeline monies with Laurens County in mind. This discussion consumed less than one-fourth of the total meeting's time.

Natural resources-related issues that came before the Council during this study period were planning and zoning ordinances, land use and district zoning, and the Southern Pine Beetle. In addition, on April 23, 2002, Dr. Byron H. Brown went before the Council with his letter of concern regarding solvent waste residue in the groundwater at the Laurens County Landfill. According to the letter, citizens first brought their concerns to the Council in 1988, but they were rebuked and ridiculed. Subsequently, analyses from DHEC and the South Carolina Department of Public Works have provided data indicating that carcinogenic toxins are in the groundwater in the area under discussion.

The Council's main interest in the Saluda-Reedy Watershed during this study period was oversight of the Colonial Pipeline. Other than that, the minutes of the Council meetings do not reflect a sustained focus on the Watershed.

Pickens County Council

Recent copies of the agenda and actions taken by the Pickens County Council were available at the Council's website (<http://www.co-pickens.sc.us/council>). Minutes per se were not available on line.

The minutes of meetings for Pickens County Council had to be manually searched and copied. Fifty-five sets of minutes from Pickens County Council meetings were drawn for use in this study. Of those records, seven had items that related to this study. One set had an item pertaining solely to the Saluda River.

On February 3, 2003, Holland Leger presented a river access plan for the Saluda River. This was in relation to the Saluda River being further utilized as a primary recreational resource for canoe and kayak use. The Council took no action.

Mr. James London, Ron Harrison and James Potter discussed a resolution opposing water transfers out of the Savannah River basin into the Chattahoochee River (July 23, 2001). This passed unanimously.

On January 7, 2002, the Council heard arguments for and against different sizes of setbacks on Lake Keowee. Mr. Walker Miller, representing Friends of Lake Keowee (F.O.L.K.S.) argued for prohibiting setbacks of less than 100 feet. Tony Niemeyer and Dr. Hargett favored setbacks of 50 feet.

During the Council's public forum of February 4, 2002, Al Babinicz, Executive Director of F.O.L.K.S. spoke in favor of 100-foot setbacks for lake front property. Mr. Hammaker expressed his concern with the Development Standard Ordinance that requires a 190-foot setback for mobile homes. And, Mr. Dan Winchester, President of the Property Owners

Association, cautioned Council regarding septic tank setbacks and the price of septic tank inspections.

On March 4, 2002, the Pickens County Council had its first reading of Ordinance No. 305, which would establish the Pickens County Stormwater Management Office. The motion was made by Ron Harrison, seconded by James Patten and unanimously passed.

During the April 15, 2002 Pickens County Council meeting, the Council presented a budget needed in order to comply with Phase II of the Clean Water act.

On May 6, 2002, the Council held its public forum to establish the Stormwater Management Office. Ben Trotter, Chairman of the Planning Commission, stated that Pickens County is in violation of the law. Mr. Winchester cautioned the Council concerning the Stormwater Office and asked Council to be careful about adding another layer of government.

DHEC representative Arto Ovalles presented to Council regarding issues related to the Stormwater Management Office. He identified the purpose of the office, indicating that it largely was educational in nature.

Other relevant issues that came before the Pickens County Council during the study period were updates from the Soil & Water Conservation office, a proposed mining permit, development standards ordinances, and zoning.

CITY COUNCIL MEETING MINUTES

Greenville City Council

Seventy-four sets of minutes from meetings of the Greenville City Council were retrieved for this study. Minutes from 2001 had to be retrieved manually at Greenville City Hall in Greenville, SC. Minutes for 2002-2004 were available on line at <http://councilminutes.greenergreenville.com/>. Of these, two sets specifically related to the topics of this study.

On May 19, 2003, the Council heard public discussion regarding, and then voted on, an ordinance to amend the conservation easement with the Commissioners of Public Works and the Nature Conservancy for the North Saluda and Table Rock Reservoir areas.

Those in favor of the easement argued that the easement would allow the public an opportunity to use the property for recreational purposes, that there would be no threat to the Watershed. Those opposed contended that the easement would endanger the Watershed and bring harm to the natural state of the area. In addition, those in opposition to the easement voiced concerns that the property would be used for illegal activities and would be detrimental to surrounding residential property. Eleven persons spoke in support of the easement; three spoke in opposition to it. This was the first reading of this ordinance, and the motion to approve it carried.

The discussion took less than one-fourth of the meeting's time.

On June 9, 2003, the Council heard the second and final reading for the easement discussed above. This discussion used less than one-fourth of the total meeting time. The ordinance passed unanimously.

It should be noted that the Reedy River area of Greenville is a major development area (http://www.greatergreenville.com/development/comm_corridors.asp). Reports focusing on the Reedy River Project are available at the city's website.

SELECTED COMMISSIONS, BOARDS, AND OTHER RELEVANT ENTITIES

Anderson County Land Use and Zoning Board of Appeals

Thirty-seven sets of minutes from the meetings of the Anderson County Land Use and Zoning Board of Appeals were manually retrieved at The Zoning Board of Appeals, 111 South Main Street, Anderson, SC. The meeting minutes did not reflect any mention of watershed issues for either the Saluda or Reedy River.

Anderson County Planning Commission

Twenty-seven sets of meeting minutes were manually retrieved for the Anderson County Planning Commission. These were retrieved at the Anderson County Courthouse, 101 South Main Street, Anderson, SC.

For this collection of minutes, watershed issues related to either or both the Saluda and Reedy Rivers were not mentioned.

Greenville City Public Services Administration

Sixty-six sets of meeting minutes for the Greenville City Public Services Administration were manually accessed at Greenville City Hall, Greenville, SC. Of these, two sets of minutes specifically focused on the Reedy River, one set spoke to stormwater projects, and another spoke to the protection of water quality.

On July 9, 2002, about one-fourth to one-half of the meeting was devoted to a presentation on the Reedy River Corridor Master Plan, and commentary following the presentation. Barry Nocks, of Clemson University, made the presentation. He identified the core concepts used to guide the Master Plan, the key elements of the Plan, and the fact that public input was continually sought in the process. An update on the Plan was presented on November 12, 2002. This took less than one-fourth of the entire meeting time.

The NEMO (Nonpoint Education for Municipal Officials) was overviewed for the Committee during its November 18, 2002 meeting. This took less than one-fourth of the

meeting's time. The presenter was Ms. Heather Landry of the Center for Environmental Policy at University of South Carolina. During this meeting, Dan Durig discussed small stormwater projects.

The Greenville County Committee on Public Service, Planning and Development

Thirty-seven sets of minutes were retrieved for the Greenville County Committee on Public Service, Planning and Development. These were retrieved manually from archives at the Greenville County Square, Greenville, SC.

Of these sets of minutes, none specifically mentioned the Saluda or Reedy Rivers or the Watershed, but seven sets of minutes had items relevant to this study. On August 23, 2001, Mr. Jason Gillespie, of the Greenville Soil & Water Conservation District, provided the group with an update on activities of the Stormwater Management Taskforce. On October 3, 2001, there was a first reading of the fee ordinances for stormwater management. These items took less than one-fourth of each meeting's time.

The meeting of November 25, 2002 was lengthy, and at least half of the meeting time was devoted to a discussion of Stormwater Management Fees and the challenges of financially covering a federally mandated but unfunded program.

About one-half of the meeting of February 3, 2003 was devoted to a presentation by Mr. Keith Drummond, who brought the Committee up to date on proposed amendments to the Flood Plain Ordinance. In addition to overviewing the proposed changes, he noted that 350 hours had been spent on training six individuals to become Certified Flood Plain Managers. The Flood Plain Ordinance then went to the Committee for its first reading. The motion carried.

Mr. Jason Gillespie provided the Committee with an overview of Flood Improvement Funding Options during the May 19, 2003 meeting. He noted that under some circumstances, USDA money can be made available for stream bank stabilization. FEMA funds can be used for mitigation programs, for making improvements or buying out houses, whichever is the best option. Requirements for funding include detailed data to identify problems and potential solutions with cost estimates.

He noted that emergency watershed money comes with a 75%-25% cost share. During the flood of 1995, Greenville County's 25% share was primarily made up of in-kind services.

About one-fourth of the meeting of August 4, 2003 was devoted to Mr. Drummond's presentation regarding the Mitigation Program for Dwelling Units Located in the Floodplain, and another one-fourth of the meeting was used to hear Ms. Marcia Papin's presentation of the 2003 Solid Waste Management Plan. She noted that each county is required to submit revised plans to the Department of Health and Environmental Control on an annual basis, based on statistical information regarding population, waste generation, program updates, and fiscal impact.

Greenville Soil and Water Conservation District

Thirty sets of minutes were manually retrieved from the offices of the Greenville Soil and Water Conservation District, Greenville, SC.

Of these sets of minutes, three sets specifically mentioned the Reedy River once each. On March 12, 2002, The Reedy River Restoration Plan was presented in its entirety by Dr. Barry Beasley of the state's Department of Natural Resources. The presentation took up over three-fourths of the entire meeting time.

On February 10, 2003, Ken Foster reported that the problem of lots being sold and homes being erected within the boundaries of the Saluda-Reedy Watershed had resurfaced. Chairman Cothran suggested that a letter be sent out to all persons buying property in the Watershed, and that this correspondence be documented.

During the June 11, 2002 meeting, Jason Gillespie briefly mentioned that he had attended a meeting of Greenville City Council and the Corps of Engineers, during which it was mentioned that Congressman Jim DeMint has secured the money to do a basin-wide Corps study of the Reedy River.

Pickens County Stormwater Committee

The first meeting of the Pickens County Stormwater Committee was held on November 18, 2002. For this study, eleven sets of minutes were manually extracted and copied. There also was a work session held on April 12, 2003. However, a quorum was not present and minutes were not taken.

These minutes were retrieved from the Pickens County Environmental Services, Environmental Services Department, 151 Clearwater Drive, Liberty, SC 29657.

This Stormwater Committee is charged with reviewing the Pickens County Stormwater Management Plan, presenting it to Pickens County Council for approval, recording and tracking complaints about stormwater and stormwater management, work on the County Stormwater Ordinance, partnering with cities in the county regarding co-permitting or co-participation on Stormwater Management, and assisting with public education.

Of the 11 sets of minutes, no specific mention was made of the Saluda or Reedy Rivers, or of the Saluda-Reedy Watershed.

Pickens County Soil and Water Conservation District

Records were available for meetings of this District for 2002-2004, but not for 2001. For the time period of availability, 25 sets of minutes were manually accessed and reviewed at the Pickens County Administration Building, Pickens, SC. Of these 25 sets of minutes, none mentioned the Saluda River, the Reedy River, or the Saluda-Reedy Watershed.

The Appalachian Council of Governments

Minutes for the Appalachian Council of Governments were manually retrieved at the agency's office, 30 Century Circle, Greenville, SC. It should be noted that while newsletters and other information about this agency are available at its website (<http://www.scacog.org/main.html>), minutes were not available on line.

Thirty-four sets of minutes were retrieved from this agency. Of these, seven pertained to the current study. Only one, however, dealt specifically with the Reedy River. At the June 28, 2002 meeting, it was reported that a request had been received from a power generation facility for a temporary discharge to the Reedy River. This was granted, with the stipulation that the discharge would be transferred to a regional facility when it comes on line. This request reflects some of the water quality issues with which this Council is charged responsibility. This took up less than one-fourth of the meeting's time.

Relevant to this current study, though not always mentioning the Saluda or Reedy Rivers or Watershed, were the Water Quality Advisory Plan Amendment (January 26, 2001), Saluda River Basin Water Quality Limits (September 28, 2001 and August 23, 2002), Regional Water Quality Planning and Stormwater Phase II Regulations Update (March 28, 2003), and a sewer request from and interim plan for Woodmont High School (March 28, 2003; March 26, 2004; April 23, 2004).

CONCLUSIONS

The current study was a content analysis of county council and municipal governments' decisions in the area of natural resources, with a focus on the Saluda and Reedy Rivers, and the Saluda-Reedy Watershed. To that end, minutes were retrieved from entities affected by or associated with the Watershed area.

Generally, with some exception, it was found that city and county governmental bodies tended to focus on local issues, often without reference to larger social, economic, or environmental arenas. Zoning, land use, and water infrastructure had precedence among some entities. The entities with a sustained and concentrated focus on the Saluda and Reedy Rivers and the Watershed were Greenville City Council and Greenville County Council.

At the same time, there are indicators that interest in water-based decision making is emerging in several areas. This is reflected in the creation of stormwater management taskforces and offices. It also is reflected in the attention that some entities pay to Flood Plain Ordinances.

However, it would appear that greater, more cohesive and collaborative discourse regarding the Saluda and Reedy Rivers and the Saluda-Reedy Watershed would be of benefit to all areas concerned.

Limitations of the Current Study

Results of this study must be contextualized within the limitations of the study itself. First, estimates of how much time discussion of pertinent items took are best guesses based on the entire set of minutes in which the item or issue was reported. Second, it is possible that the record of the meeting minutes are not reflective of the amount of time or depth associated with any particular discussion or decision.

RECOMMENDATIONS

It is suggested that the Saluda-Reedy Watershed Consortium carefully review these findings, and identify strategies of public outreach that will heighten public decision makers' awareness of their entity's relationships to the Watershed - beyond their own jurisdictional lines.

Appendix A

Table A.1. Summary of Public Meetings on Matters Related to the Saluda-Reedy Watershed.

Table A.2. Summary of Comments and Observations.

Table A1. Summary of Public Meetings on Matters Related to the Saluda-Reedy Watershed.

Governing Body, Entity	Location	Type Record	Manner of Acquisition	Access Information	Issue(s) Pertinent to Watershed
Anderson County Council	Anderson, SC	Minutes (n=66 sets)	Internet	http://www.andersoncountysc.org/web/Council/	The Watershed was never specifically mentioned.
Greenville County Council	Greenville, SC	Minutes (n=72 sets)	Internet	http://greenvillecounty.org/Ordinance & Minutes.asp	6 sets mentioned the Reedy River; 1 set mentioned the Saluda River.
Greenwood County Council	Greenwood SC	Minutes (n=88 sets)	Internet	http://www.co.greenwood.sc.us/	3 sets mentioned the Reedy River.
Laurens County Council	Laurens, SC	Minutes (n=79 sets)	Manual inspection and retrieval	Laurens County Courthouse, Laurens, SC	11 sets related to this study; 3 sets mentioned Saluda River; 1 set mentioned Reedy River.
Pickens County Council	Pickens, SC	Minutes (n=55 sets)	Internet	http://www.co-pickens.sc.us/council	7 sets had items relating to this study; 1 set had an item relating to the Saluda River.
Greenville City Council	Greenville, SC	Minutes (n=74 sets)	2001 minutes retrieved manually; Minutes for 2002-2004 on-line	Greenville City Hall http://councilminutes.greenvillesc.gov/	2 sets specifically dealt with the Saluda-Reedy Watershed.
Anderson County Land Use and Zoning Board of Appeals	Anderson, SC	Minutes (n=37 sets)	Manually retrieved	The Zoning Board of Appeals, Anderson, SC	No mention of any items pertaining to this study.
Greenville City Public Services Administration	Greenville, SC	Minutes (n=66 sets)	Manually retrieved	Greenville City Hall, Greenville, SC	2 sets focused on the Reedy River; 1 set spoke to stormwater projects; 1 spoke to protection of water quality.
Greenville County Committee on Public Service, Planning and Development	Greenville, SC	Minutes (n=37 sets)	Manually retrieved	Greenville County Square, Greenville, SC	No sets specifically mentioned the Saluda or Reedy Rivers or the Watershed, but 7 sets had items relevant to this study.
Greenville Soil & Water Conservation District	Greenville, SC	Minutes (n=30 sets)	Manually retrieved	District Office, Greenville, SC	3 sets mention the Reedy River.
Pickens County Stormwater Committee	Pickens, SC	Minutes (n=11 sets)	Manually retrieved	Pickens County Environmental Services, Liberty, SC	No specific mention of the Saluda or Reedy Rivers or the Watershed.
Pickens County Soil & Water Conservation District	Pickens, SC	Minutes (n=25 sets)	Manually retrieved	Pickens County Administration Building, Pickens, SC	No specific mention of the Saluda or Reedy Rivers or the Watershed.
Appalachian Council of Governments	Greenville, SC	Minutes (n=34 sets)	Manually retrieved	ACG Office, Greenville, SC	1 set dealt with the Reedy River; 7 others had single items relevant to this study.

Table A2. Summary of Comments and Observations.

Governing Body, Entity	Observations/Comments
Anderson County Council	The Saluda-Reedy Watershed is not really a focus for this entity. However, there are recurring votes on/attention to land use, storm water management, and water infrastructure. In addition, expansion of the county water system continues as both a function of growth and as a way to get safe water to more residents. The Council also monitors the allocation of water from Lake Hartwell to Anderson County. Other recurring issues included the paving of roads, expansion of roads, and storm water runoff from roads.
Greenville County Council	The Council entered into a collaborative agreement with the City of Greenville and Clemson University to be part of the Reedy River Project and create a Master Plan. Other issues included Fork Shoals Energy, zoning ordinances, conservation, and easements.
Greenwood County Council	The Council continued service agreements with the Pinnacle Consulting Group to assess the growth on the Reedy River and Lake Greenwood. The Council responded to numerous complaints about changes in zoning ordinances, flooding, and a buffer and fence around a storm basin. Greenwood County and Greenwood City Councils work very closely together, and share a comprehensive plan. This Plan covers issues such as land use, farmland protection, and waterfront development.
Laurens County Council	The Rivers and Lakes Oversight Committee was constituted on October 22, 2002. The County Council apparently is not actively involved in Watershed issues.
Pickens County Council	No action was taken on an access plan for the Saluda River. A resolution was passed opposing water transfers out of the Savannah River basin. Two meetings had discussions of setbacks. Ordinance No. 305 (establishing the Pickens County Stormwater Management Office) was passed. Two more meetings dealt with this office. Other issues were a mining permit, development standards ordinances, and zoning.
Greenville City Council	Heard public discussion on and then voted on an ordinance to amend the conservation easement for the North Saluda and Table Rock Reservoir areas. This passed unanimously at a subsequent meeting. Documents on the Reedy River area as a major development area are available on the city's website (http://www.greatergreenville.com)
Anderson County Land Use and Zoning Board of Appeals	Minutes did not pertain to the Saluda River, the Reedy River, or the Watershed.
Greenville City Public Services Administration	The Reedy River Corridor Master Plan was presented and an update was presented at a later meeting. NEMO was overviewed for the Commission. Small storm water projects were discussed.
Greenville County Committee on Public Service, Planning and Development	An update of the Storm Water Management Taskforce was presented. Storm water Management fees were discussed. The group was updated on proposed amendments to the Flood Plain Ordinance. The Flood Improvement Funding Options was overviewed, the Mitigation Program for Dwelling Units Located in the Floodplain, and the 2003 solid Waste Management Plan were presented and discussed.
Greenville Soil & Water Conservation District	The Reedy River Restoration Plan was presented. The problem of lots being sold and homes being built within the boundaries of the Watershed was discussed. The basin-wide study of the Reedy River was mentioned.
Pickens County Storm water Committee	No specific mention was made of the Saluda River, the Reedy River, or the Watershed.
Pickens County Soil & Water Conservation District	No specific mention was made of the Saluda River, the Reedy River, or the Watershed.
Appalachian Council of Governments	A request for a temporary discharge into the Reedy River was received. This was granted with the stipulation that the discharge would be transferred to a regional facility when it comes on line.

Appendix B

Table B.1. List of Contacts

Table B1. List of Contacts.

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Tel: 864.260.1048

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Ms. Debora LaGroome
Anderson County Land Use and Zoning
Board of Appeals
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Fax: 864.260.4360

Mr. Robert Strother, Executive Director
Appalachian Council of Governments
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Fax: 864.242.6957

Ms. Phyllis Henderson, Chair
Greenville County Council
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Greenville, SC 29601
Tel: 864.467.7358

Mr. Jason Gillespie
Greenville County Soil and Water
301 University Ridge, Suite 3900
Greenville, SC 29601
Tel: 864.467.2756
Fax: 864.467.7518

Mr. Mark Kingsbury, Chair
Greenville County Committee on Public
Service Planning and Development
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Fax: 864.467.7358

Ms. Cheryle R Ratliff, Clerk to Council
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Mr. Robbie Templeton, Chair
Greenwood County Council
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Greenwood, SC 29649
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Mr. Joe V. Edwards, Chair
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