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Managing Non-Point Source Pollution in Massachusetts Watersheds

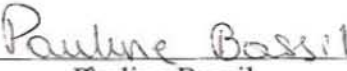
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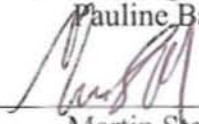
WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the degree requirements for the
Degree of Bachelor of Science

by


Joseph Basile

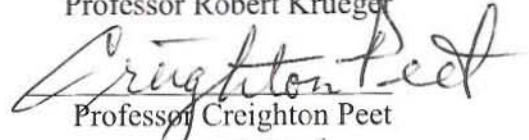

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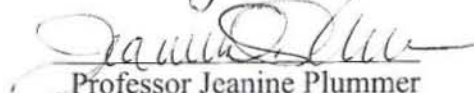

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Abstract

Non-point source (NPS) pollution is water pollution that originates from diffuse sources. The goal of this project was to develop recommendations for improvement of the management of NPS pollution in Massachusetts. Through nationwide case studies, informant interviews, and archival research we identified problems in current management strategies. Based on our findings, we recommended multiple policy changes, including coordination of statewide NPS pollution data collection efforts, research into distribution of grant funding, and research into effective public education programs.

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Authorship

All members of the research team collaborated on the following tasks:

1. Writing the Abstract, Introduction, Background, Methodology, Results, and Analysis, Conclusions and Recommendations.
2. Conducting interviews with informants.
3. Transcribing the interview recordings (Appendices A, sections 1-9)

Joseph Basile was responsible for the formatting of the report.

Pauline Bassil was responsible for creating the matrices from interviews and case studies.

Martin Stowell was responsible for writing the executive summary.

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Executive Summary

Non-point source (NPS) pollution is the largest threat to United States watersheds. The U.S. Environmental Protection Agency (EPA) estimates that NPS pollution comprises 60 percent of all water pollution problems within the United States (EPA, 2006f). The physical characteristics of NPS pollution, such as its diffuse origin and the lack of individual ownership, have made it a complex water management issue.

The goal of this project was to provide recommendations for improving management of NPS pollution in Massachusetts watersheds. First, we created a set of best management practices (BMPs) for effective NPS pollution management in the U.S. based on case studies and interviews. Second, we conducted interviews to identify current management practices implemented in three Massachusetts watersheds, and their shortcomings. Lastly, we completed our goal by comparing the identified shortcomings in Massachusetts to our set of BMPs.

The identified BMPs included both structural and non-structural solutions. Structural BMPs included erosion prevention and sediment control methods, such as streambank fencing, sediment forebays, stormwater management techniques, and low impact development (LID) strategies. We also identified non-structural BMPs including different public outreach techniques. Examples of public outreach BMPs are community involvement, cooperation with local media, and public education programs.

We then identified issues in the management of NPS in three watersheds in Massachusetts: the Blackstone River, the Charles River, and the Sudbury, Assabet, Concord River watersheds. The distribution of 319 grant funding by the Massachusetts Department of Environmental Protection (MassDEP) tends to favor affluent communities.

The requirement for Quality Assurance Project Plans (QAPPs) also prevents smaller organizations from receiving or keeping 319 grant funding. We also found that most organizations throughout the Commonwealth do not have sufficient resources to collect water quality data and there are few partnerships for sharing of available data.

Stormwater management has also been difficult in Massachusetts because state and local regulations often hinder the implementation of LID strategies and other stormwater solutions. Finally, we found that most grassroots organizations and the MassDEP do not have sufficient resources to implement and evaluate community outreach programs that would help raise awareness of NPS pollution issues.

To solve these problems, we created the following set of suggested improvements for NPS pollution management in Massachusetts. First, we recommend that the MassDEP evaluate the potential impact of a varied match requirement for 319 grant applicants based on community income level. Second, we suggest that the MassDEP provide 319 grant recipients with assistance in completing QAPPs. To improve water quality data collection, we recommended that the MassDEP create an umbrella organization to coordinate all such efforts throughout the state. We further suggest that grassroots organizations cooperate to change regulations that may restrict the implementation of stormwater and LID solutions. Finally, we recommended that management organizations conduct research into what types of outreach programs are most effective.

There are many difficulties associated with the management of NPS pollution. Our research has shown what NPS management strategies have been successful in the past, and what problems currently exist in the management framework in Massachusetts.

By implementing our recommendations, management organizations throughout the Commonwealth will improve their efforts to effectively manage NPS pollution.

1 Introduction

Non-point source (NPS) pollution is threatening the overall quality of surface and ground waters in the United States. The U.S Environmental Protection Agency (EPA) estimates that NPS pollution comprises 60 percent of all water pollution problems within the United States (EPA 2006f). The physical characteristics of NPS pollution, such as its diffuse origin and the lack of individual ownership, have made it a complex issue. By definition, NPS pollution does not enter a water body at any specific point. Because of this, it is difficult to quantify flows and concentrations and thus to establish effluent based regulations. Another difficulty is the potential for stakeholders to use the water resources to maximize their individual benefits without concern for the resource. Stakeholders may not know enough about the impact they have on a water body. However, there are also people who are aware of their impact on the health of the resource but they choose to continue their actions (Dolsak and Ostrom, pp. 7-8).

According to the United States Census Bureau (2007), there are approximately 6.4 million people living in the Commonwealth of Massachusetts. All of these people rely on water resources for their daily needs and activities. They are all affected by pollution that impairs water quality. There are two categories of water pollution sources: point source and non-point source. Point source pollution originates from a single geographical point, such as an effluent discharge from an industry. NPS pollution is defined by the Massachusetts Department of Environmental Protection (MassDEP) as “pollution of surface or groundwater supplies originating from land-use activities and/or the atmosphere, having no well-defined source” (MassDEP, 2006d). Examples of NPS

pollutants are fertilizers (nitrates and phosphorus), sediments, bacteria, and toxic chemicals (MassDEP 2006d).

Within Massachusetts, the current problems facing NPS pollution management generally fall into two categories. They either are financial issues, or are concerned with collaborative efforts of organizations and local stakeholders. To understand these problems, we must explore what management techniques have proven effective and what techniques Massachusetts is currently implementing.

Previous research has identified NPS pollution as the leading concern within Massachusetts watersheds (MassDEP 2006d). Historically, water has been managed by laws and policies regarding how stakeholders can use and ultimately impact the resource. However, this regulatory framework has not successfully controlled all NPS pollution issues. Therefore, there is a need for improved strategies, such as approaching water management in a collaborative manner. Collaboration involves negotiations and problem solving among governmental and non-governmental stakeholders (Sabatier, 2005). However, management organizations need more research to further improve NPS pollution management strategies in Massachusetts.

The goal of this project was to provide recommendations for improving management of NPS pollution in Massachusetts watersheds. To accomplish this we studied aspects of the regulatory framework in Massachusetts such as government legislation, public outreach, and engineering solutions. We obtained data from interviews, case studies from other states and Massachusetts state databases. We focused our interviews on informants of three different watersheds in Massachusetts: the Charles River Watershed, the Blackstone River Watershed, and the Sudbury, Assabet, and

Concord (SuAsCo) Watershed. We qualitatively analyzed the data and used them to develop recommendations for improving the management of NPS pollution in Massachusetts watersheds. If watershed management organizations implement these recommendations, they will improve the management of NPS pollution, and this will lead to healthier water bodies throughout the 27 watersheds in the Commonwealth.

2 Background Research and Literature Review

To understand the challenges faced by water management institutions concerned with non-point source (NPS) pollution control, we conducted extensive background research. This chapter provides details on the ecological processes affected by NPS pollution and the social effects of the widespread use of water. In addition, we discuss watershed management practices at the federal, state, and local levels.

2.1 Non-Point Source Pollution within Ecological Systems

There are many potential hazards that threaten the quality of water resources. One of the most harmful and hardest to manage is NPS pollution. NPS pollution comes from many different sources, which may not produce significant pollution individually, but when pooled together can degrade the quality of the receiving water. The pollutants merge by precipitation and snowmelt moving over and through land surfaces, picking up natural and anthropogenic pollutants. This process is called run-off, and eventually the run-off collects in a common receiving water body (EPA, 2006e).

2.1.1 NPS Pollution within the Water Cycle

The difficulty associated with managing NPS pollution stems from the structure and dynamics of the hydrological cycle, commonly called the water cycle. The movement of NPS pollutants directly correlates with the movement of water through a watershed. A watershed is the area of land that drains into such common holding areas as rivers, lakes, and oceans (EPA, 2006m). The topography of the region defines the boundaries of a watershed. A divide is a ridgeline in the topography; it is the highest elevation in an area of land. The precipitation that falls on the inside of the divide will

flow into one watershed while precipitation falling on the outside will flow into a different watershed (Davis & Masten, 2004, p.193).

The precipitation that falls in a watershed follows the contours of the region. As it moves through the watershed, it picks up and transports natural and anthropogenic pollutants. Soils and other natural media act as filters for NPS pollution. Infiltration is this natural process of filtering. However, as human impacts spread, infiltration is greatly reduced because of impervious surfaces. These surfaces are usually made out of concrete, asphalt, and stone. They allow less water to filter through them so they collect many different NPS pollutants. Precipitation sweeps these pollutants directly into water bodies because the soil does not filter them. The main cause of the increasing amount of impervious surfaces is transportation. Washington State estimates that between 63 and 70 percent of the impervious surfaces in Olympia are roads and parking lots (Barnes, Morgan III & Roberge, 2001-2000). Because the impervious surfaces do not allow significant amounts of water and pollutants to pass through them, the amount of storm water runoff increases during precipitation events and can cause downstream flooding. This flooding can damage ecosystems and drinking water by stirring up sediment.

These two processes of infiltration and run-off are the result of water moving through a watershed. Two major processes are responsible for the large-scale movement of water through the hydrological cycle. The first process is evaporation, which is the vaporization of water from surface waters, such as rivers, lakes, or oceans. The second process, transpiration, is described as, “the process by which water is emitted (to the atmosphere) from plants through the stomata, small openings on the underside of leaves”

(Davis & Masten, 2004, p.190). These processes are referred to collectively as evapotranspiration.

Evapotranspiration is the first step in the movement of large volumes of water to different geographical regions. Water evaporated out of bodies of water or transpired from plants does not necessarily precipitate back where its source, but rather is transported through the lower atmosphere to other areas. Hunt (2004) states that, “Roughly 10 percent (of water moving into the atmosphere by evapotranspiration) falls as precipitation over land and the rest falls directly back into the ocean” (p.6). This means that there is always a constant flow of freshwater delivered to the continents. However, this movement of water does not move NPS pollutants; it exacerbates the situation by producing more run-off, which concentrates the pollutants that are present in the water body. The complexities of the water cycle and the difficulty of managing NPS pollution are intimately related.

2.1.2 Effects of NPS Pollution on Ecological Systems

NPS pollution comes in many forms, and can affect the health of a watershed in various ways. Fertilizers are one of the main contributors to NPS pollution. Many people in Massachusetts appreciate a green, healthy looking lawn. However, if the homeowners care for their lawns improperly, they might unknowingly contaminate their local watershed. If homeowners use fertilizer in excess or at the wrong time, stormwater may wash much of it away as run-off and the fertilizer finds its way into receiving waters. According to the Massachusetts Department of Environmental Protection (MassDEP), fertilizer acts the same way in water as it does in the soil, promoting plant and algal growth by providing phosphorus and nitrogen (MassDEP, 2006c). If people introduce

too much phosphorus and nitrogen into a watershed, it can cause eutrophication (Carpenter et al., 1998). Eutrophication is the natural aging process of a water body. Aging of a lake is the process of organic sediments accumulating in a lake. These sediments fill the lake and eventually turn it into a marsh and then over time into a forest. Naturally, this process takes thousands of years, but pollutants like fertilizers can accelerate it dramatically.

The problem with eutrophication is that it increases the growth of algae, which can be harmful to humans, livestock, and other wildlife in the ecosystem (Carpenter et al., 1998). When the algae die, their decomposition by bacteria consumes oxygen. This creates a shortage of oxygen in the water, which other plant and animal life require to survive. This depletion in turn reduces the biodiversity of an ecosystem because there is not enough oxygen to support other species. Along with creating oxygen scarcity when the algae blooms die, certain algal species release toxins into the water. Yet another issue is dinoflagellates, or one-cell marine microorganisms, which are associated with algal blooms (Carpenter et al., 1998). They can cause long-term neurological damage to animals and humans if ingested.

Certain NPS pollutants can pose a public health risk. For instance, pet waste is a major pollutant in Massachusetts. Approximately three tons of pet waste from dogs and cats ends up in the Charles River Watershed every day because of stormwater run-off (MassDEP, 2006f). Pet waste is a health risk for humans because it contains pathogenic bacteria, such as *Salmonella*, *E. coli*, and parasites like *Cryptosporidium* and *Giardia lamblia*, which cause a variety of illnesses (EPA, 2006j). Once these pathogens enter a lake or river, they may infect local users of the water resources. Household pets carry

these microorganisms, as well as many other forms of wildlife, from birds to beavers, that inhabit the watershed. Thus, the management of water resources can be difficult in part because so many different domestic and wild animal species carry microorganisms that are damaging.

2.1.3 Pollutant Management Terminology

Best Management Practices

It is important to understand the concept of best management practices (BMP's) because we will use this concept when we are examining management cases during our research. BMP's are methods, activities, and procedures designed to prevent or reduce NPS water pollution. Usually, management organizations apply BMP's as a system of practices rather than a single practice. When dealing with NPS pollution, which has multiple sources, and contains multiple pollutants, several BMP's may be necessary for effective control (MassDEP, 2006a).

BMP's are either structural or non-structural, or some combination of both. Structural practices include, but are not limited to, conveyances, water filtration devices, water storage devices, and filters. Non-structural practices include town planning, pollution prevention procedures, and programs that increase public awareness to prevent pollution. In other words, structural BMP's control NPS pollution by reducing runoff and providing facilities to remove pollutants from storm water, while non-structural BMP's prevent or limit the entry of pollutants into storm water at their sources (MassDEP, 2006a).

Total Maximum Daily Loads

An important concept put forth by the EPA (2006c) which seeks to quantify the rate at which pollutants can enter a watershed while still allowing water quality standards to be met is called the total maximum daily load (TMDL). Should the rate of pollutants entering a watershed increase beyond the TMDL capacity, the water quality will begin to degrade below current standards.

The purpose of TMDL's is to determine sustainable levels of pollutant loads for different bodies of water with different uses. Therefore, the calculations used to determine TMDL's must take into account the usage, such as contact recreation or drinking water. Researchers calculate different TMDL's for each water body and each pollutant.

Quality Assurance Project Plans (QAPPs)

QAPPs are reports on the planning, implementation, and assessment procedures for projects given funding by the EPA. Organizations receiving funding use QAPPs to report the outcomes of their efforts back to the EPA. Those outcomes usually involve large amounts of scientific data on changes in water quality and require scientific competence to complete. Grants given by the EPA under section 319 of the Clean Water Act (CWA) often require QAPPs (EPA, 2006i).

2.2 History of Regulatory Strategies within the U.S.

To reduce the danger that NPS pollution can pose not only to the environment but also to human health, effective management plans have become necessary. The control of pollution to receiving water bodies became particularly important in the period after the

Civil War, which was a time of exceptional growth and development in the United States. This period witnessed a substantial increase in both the population and industrial activity. The United States used water for drinking, human and industrial waste disposal, power, and transportation. These uses began to put water resources in jeopardy because economic and industrial growth were the nation's main concern, and natural resources were perceived as bountiful and not in need of conservation (Petulla, 1997). As waterways became a primary means of waste disposal during the industrial revolution, the expression, "The solution to pollution is dilution," (Sabatier et al., 2005) became a reflection of the American perception of a limitless and invincible environment. Americans exploited different areas for their natural resources, so they moved factories from one location to another without worrying about the depleted soils and pollution left behind.

The misuse of natural resources led to the creation of several movements, such as the progressive movement, that focused mainly on protecting natural resources. According to Sabatier et al. (2005), the progressive movement emerged in the beginning of the twentieth century and consisted mostly of private individuals and organizations. The progressives addressed economic and social reforms. In the domain of natural resources, the group recommended a set of conservation principles that concentrated mostly on creating, "the greatest good for the greatest number in the long run, rather than the greatest wealth for entrepreneurs in the short run" (Sabatier et al., 2005 pp 28). To achieve this objective, the group called for federal supervision of the nation's resources and the preservation of those resources for future generations. Another aim was to reduce the power of the monopolistic corporations that had grown by the late 1800s to gigantic

proportions. The progressive movement argued for the right of regular citizens to initiate legislation by suggesting changes in policies at all levels of society, economy, and government. They wanted to give authority to manage programs related to conserving the environment to well trained and qualified groups instead of local supporters of the dominant political parties. These principles also illustrate the main goals of most of the movements that emerged in that period. However, since the federal government was more concerned with the industrial and economical growth than with resources and environmental protection, most of the movements that emerged in that period were not very successful in controlling and reducing NPS pollution (Sabatier et al., 2005).

It was not until the beginning of 1970 that the focus in the U.S. government shifted from economic development to enhancing environmental values. According to Sabatier et al. (2005), the new focus on the environment was due to both economic and scientific innovation. For instance, the scientific perspectives on ecosystems provided evidence that different ecological systems are interrelated. This led to an enhanced capacity to detect minute concentrations of chemical residue that proved that even chemicals with low concentrations could be harmful to the environment. Economic growth played an important role in raising public awareness on the importance of a clean environment because it helped to increase average income and educational levels during the 1950s and 1960s, which intensified the demand for outdoor recreation and gave people greater awareness of environmental problems.

As environmental problems became more evident, people were concerned for the ability of governmental agencies to address these issues. In particular, state and local pollution control agencies had neither the financial capability nor the legal authority to

deal with many water quality problems, mainly because they were under political pressure not to impose damaging costs on industry (Sabatier et al., 2005). This in turn raised the need for a new federal pollution control agency that would integrate pollution control programs and help improve the financial and technical capabilities of state and local organizations to address pollution issues.

2.2.1 Federal Regulations

The U.S. Environmental Protection Agency (EPA) was established in 1970 in response to the growing public demand for cleaner water as well as a cleaner environment. EPA's mission is to protect human health and the environment. The agency works toward this goal by establishing and enforcing environmental protection standards and laws, endorsed by Congress. The EPA also conducts environmental research and provides assistance to other agencies combating environmental pollution. The agency works to evaluate, understand, and solve current as well as future problems by conducting research and providing leadership in addressing emerging environmental issues (EPA, 2006a).

The Clean Water Act (CWA) is one of the most important water quality regulations established in the U.S. The U.S. Congress first enacted the CWA in 1942 and then revised it in 1972 to include a system involving federal mandates to the EPA to set water quality standards and mandates to states to adopt implementation plans subject to EPA review (Sabatier et al. 2005). The CWA gave EPA the authority to implement water pollution programs and set water standards and regulations to control discharges of pollutants into U.S waterways (EPA, 2006d). During most of the 1970s and 1980s, the EPA focused mainly on developing technology-based standards for almost every industry

and pollutant. By the mid 1980s, it was apparent that the strategies they developed were useful for controlling point sources of pollution. Discharges from point sources such as factories had declined, and water quality in affected areas has improved. However, the U.S. needed a different strategy to deal with NPS pollution. At the time, the EPA estimated that NPS pollution represented over 60 percent of the nations' remaining water pollution problems (EPA 2006h). The U.S. still needed to make progress in reducing pollution caused by sediments, fertilizers, and oil from non-point sources (Sabatier et al., 2005). The EPA anticipated that technology based standards might not result in desired water quality in all receiving waters. Therefore, it established section 303(d) of the CWA. This section required states to identify water bodies for which technology based effluent limits or other pollution control measures required by federal or local regulations were not strict enough to achieve water quality goals. Until the mid 1980s, implementation of section 303(d) was limited, mostly because of the lack of financial and advanced technical help provided by the EPA (Sabatier et al., 2005).

The U.S. considered NPS pollution sufficiently serious that section 101 of the Clean Water Amendments made the control of non-point sources a specific national goal. Under Section 305(b) of the Clean Water Act, each state Department of Environmental Protection (DEP) must submit a statewide report every two years to the EPA. This report includes a description of the status of water quality in the state, an analysis of the programs undertaken to reduce the discharge of pollutants and an estimate of costs necessary to implement any programs that would help in detecting and reducing the sources of discharges (EPA, 1973).

Section 319 of the Clean Water Act, added in 1987, authorized the EPA to provide grants to states for implementation of approved NPS pollution control programs and projects to help protect and improve water quality. This established a national program to control NPS pollution which includes a framework to determine which projects are eligible for funding under section 319 (h) and to establish a set of federal regulations and requirements that all grants recipients should fulfill. To receive help, each state should submit a work plan and project costs at least 60 days prior to the beginning of the proposed funding period. Once the state receives the funding, it may provide grants to both public and private entities that can help implement the approved management program. However, it is the state agencies responsibility to ensure that all recipients of the grants are well aware of the grant requirements and guidelines and that their projects comply with them (EPA, 2006h). Table 2.1 shows a general timeline of the application process, noting that the exact dates for 319 grant applications vary from state to state.

Table 2.1 General Schedule for 319 Grant Applicants
(Source: The U.S Environmental Protection Agency, 2006)

EPA provides funding targets for the following fiscal year and may issue non-point source guidance.	Spring
States submit draft work plans to EPA regions.	April–May
EPA regions conduct their reviews of state and provide written comments agencies.	Within 6 weeks of applications receipt from state to state.
States submit their final work plans and grant applications to EPA regions.	At least 60 days prior to proposed funding period.
Final work plans are reviewed; if all requirements are met, EPA region awards grant as quickly as possible.	Within 60 days of receipt from state.
States obligate funds. States are expected to obligate section 319(h) grant funds as quickly as possible and begin to implement the activities described in the approved work plan. The state should obligate the funds within 1 year of grant award.	As quickly as possible, within first year.

The EPA announced the Clean Water Action Plan in 1999 to accelerate the progress the nation had made on improving the quality of water and protecting the natural resources since Congress enacted the Clean Water Act in 1972. The new plan called for a new cooperative approach to watershed protection in which federal, state, and local governments work together with the public to implement effective strategies and develop useful plans to solve pollution related problems (Sabatier et al., 2005). In April of 2000, individual states and the EPA joined to form a new non-point source partnership, which provides a framework for the states and the EPA to work together cooperatively to identify, prioritize, and solve NPS problems (EPA, 2006k).

2.2.2 Massachusetts Regulatory Framework

The MassDEP is the state agency responsible for ensuring a clean environment in Massachusetts. Using a set of management processes and procedures, in association with the EPA, they help to control and reduce pollution. Each year the state receives funds from the EPA under the section 319 grant program, to implement their approved non-point source plans. These include regulatory enforcement, technical assistance, education, and training (EPA, 2006h).

Massachusetts is one of the several states that have established collaborative programs to encourage watershed management. For example, the “Massachusetts Non-Point Source Program” is a dynamic program that focuses on strong working partnerships to protect the state watersheds. The “Massachusetts Watershed Initiative” is another collaborative program in which the Executive Office of Environmental Affairs (EOEA) has set up watershed teams for each watershed in Massachusetts. Each team includes

state and federal agencies as well as local community partners. These teams assess environmental quality, identify local problems, and recommend solutions.

The most recent strategy employed by the MassDEP to protect and maintain water quality is the “Watershed Approach”. The watershed approach is a process that focuses on improving water quality conditions and providing a framework under which the management organizations can achieve restoration and protection of the basin’s natural resources in a collaborative effort. The approach requires cooperation between state and federal environmental agencies, citizens, non-profit groups, and businesses. This approach consists of a five year cycle, as shown in Table 2.2. Specific activities are required to take place during each year of the cycle (MassDEP, 2006e).

Table 2.2 The Massachusetts Five Year Cycle

Year	Activities
1	Gather information about existing water resources to agree on goals and objectives for each watershed.
2	The DEP works with volunteer groups that have the ability to help in data collection activities
3	The data collected in year 2 are analyzed as a prerequisite to issuing permits in the following year.
4	The DEP develops an action plan for each watershed, and the best management practices (BMPs) are implemented by the organizations to reduce the discharges of non-point source pollution.
5	An evaluation is taken to determine how successful the Watershed Approach has been in addressing the water resource issue.

Government agencies and local watershed advocacy groups developed regulations and strategies collaboratively. This management system has good sources of funding and scientific expertise (through the involvement of state government), as well as good community outreach (through the actions and visibility of community organizations). The DEP has implemented this approach as a strategy to protect water supplies in Massachusetts and to provide safe drinking water (MassDEP, 2006b).

2.2.3 Local Regulatory Frameworks

Towns and cities generally follow the state regulations. Because of the physical characteristics of NPS pollution, make the effectiveness of local regulations that relate to each town and city difficult to achieve. However, federal and state perspectives have recognized the importance of local control and the effectiveness of community based environmental protection. The watershed initiative gives each community a meaningful role in the decision making process. It protects limited resources and addresses the highest priority water-related problems within sub-watersheds, considering both surface and ground water flow. According to the Massachusetts Department of Environmental Protection, this process is very significant in today's environment of heightened awareness because people can personally relate to their own watershed and participate in the watershed management process (MassDEP, 2006e).

In accordance with the collaborative approach to watershed management, towns and cities have been trying to get their communities more involved in cleaning up wastewater and protecting water resources. One of the main advantages of getting the community involved is to help the public understand how water quality is affected by

land use. Another advantage of public participation is assistance in collecting data (MassDEP, 2006e). These data can help the EPA categorize watersheds according to their contamination levels so that communities can get the technical help and the grants they need to reduce watershed pollution problems.

The communities located in the watershed realized that the increasing amount of pollutants found in the watersheds was compromising the integrity of their rivers. They organized volunteer associations as a grassroots effort to address this issue. These groups acquired state and federal funding to provide technical aid in the identification of problems found throughout the watershed. Data collected by volunteers in 1988 allowed the MassDEP to assess and determine the total amount of pollutants the Assabet River could receive and still meet state water quality standards. The data collected also led to community-run workshops to educate the public about the hazards and implications of phosphorus, to provide information about phosphorus reduction technologies, and to involve communities that are affected by the phosphorus problem. This collaborative approach helped in improving the water quality in the Sudbury-Assabet-Concord Watershed (SuAsCo).

2.2.4 Summary of Section 2.2

Through the decades, the United States has formed complex social and legal systems to deal with water pollution problems. In particular, the past 40 years have seen an increase in the participation of all levels of government, including federal and state agencies, local organizations, and even individuals. These all contribute to the reduction of both point source and NPS pollution. As grassroots organizations have gained

importance in recent years, so has an understanding of the complex social issues surrounding NPS pollution and water resource management.

2.3 Sociological Issues Concerning NPS Pollution Management

Throughout the process of creating systems and agencies for the management of water resources, outstanding issues emerged, such as those mentioned in, “The Tragedy of the Commons,” (Hardin, 1968). While some of these issues were undoubtedly technical, such as the creation of new reservoirs and canals, others were sociological, and thus required sociological perspectives to manage. This is also true today. The effect of sociological issues on watershed management has since become clearer, and realizing the significance of the concept of a common pool resource is paramount to achieving an understanding of such effects.

2.3.1 Common-Pool Resources

A key concept in understanding the management of water resources in Massachusetts is the idea of a common pool resource. Common pool resources are resources to which many users have direct access. Along with water, some examples of common pool resources include air, wildlife and game, and, to some extent, the internet (Dolsak & Ostrom, 2003, p. 4).

Common-pool resources share certain characteristics. Dolsak and Ostrom (2003) describe two such characteristics as subtractability and susceptibility to “free-riders” (pp.6-7).

Subtractability describes the effect each user has on the ability of other users to benefit from the resource. Dolsak and Ostrom (2003) state that, “The tons of fish or acre-feet of water withdrawn from a particular water resource by one user are no longer available to others using the same resource. The absorptive capacity of an airshed or watershed is reduced each time a user emits pollutants into the air or water,” (p.6). This characteristic highlights some of the difficulty in managing common-pool resources because users may not be aware of the effect that their use or misuse of a resource is having on the resource as a whole.

However, Tietenberg (2002) states that the vulnerability of a resource to this type of misuse is dependant on the scarcity of that resource. He illustrates this point with the example of bison in the American West. Before there was a shortage, hunters could hunt as many bison as they needed because their actions had a negligible effect on the total resource. Overexploitation was not possible. As human populations continued to rise, however, bison populations began to decline. Scarcity became a factor and the government could no longer leave hunting practices unrestricted (pp. 64,65A). This has been a recurring theme throughout American history, as mentioned in section 2.2. America was initially an immense region of seemingly limitless resources, and has since become a nation of clearly finite resources. Thus, phrases such as, “The solution to pollution is dilution,” have fallen out of common usage.

Another characteristic of common-pool resources is the susceptibility of the resource to free riders. This describes the ability of a user of a resource to benefit from and use a common pool resource while failing to contribute to its management. This is related to the concept of subtractability, in which certain users may draw far more from

the resource than is appropriate (even if they contribute to its management), thus reducing the ability of other users to draw from that resource (Dolsak & Ostrom, 2003, p. 7). For instance, users who falsify their water usage records would be free riders, because they are not paying for their water. However, a corporation that pays for its water but draws a vast majority of the resource is damaging the subtractability of that resource by depleting it.

Dolsak and Ostrom (2003) have proposed a list of general principles that can be used for the effective management of common-pool resources.

1. Rules are devised and managed by resource users.
 2. Compliance with rules is easy to monitor.
 3. Rules are enforceable.
 4. Sanctions are graduated.
 5. Adjudication is available at low cost.
 6. Monitors and other officials are accountable to users
 7. Institutions to regulate a given common-pool resource may need to be devised at multiple levels.
 8. Procedures exist for revising rules.
- (p. 22).

Dolsak and Ostrom (2003) back up each of these principles with a brief explanation. For instance, they explain that by having the users of a resource devise and manage the rules regarding a resource, the rules more accurately reflect their use and the users will be more likely to comply with such rules (p. 22). The second, third, and fourth principles involve the practicality of such rules. If rules are easy to monitor, enforce, and sanction, the environmental effectiveness of the management will increase. Linking institutions at multiple levels helps to ease tensions in the management process (p. 23).

Apart from this list, Sabatier et al. (2005) notes that partnership is important in the management of resources commonly held by groups of stakeholders. As an example, he

uses watershed management to highlight several aspects of a theory developed to explain the formation and dynamics of such partnerships. For instance, he notes that the benefits of partnerships are higher when sources of pollution in watersheds are non-point source in nature, since the command and control regulations employed for the management of point sources would be expensive and complicated if attempted on non-point sources. He also notes that any cost incurred by these partnerships will be unsustainable unless the general population perceives the threat of pollution to be severe (pp. 180-181).

Sabatier et al. (2005) bases the dynamics and likelihood of formation of these partnerships in watershed management on a body of theory concerned with several factors, including the attributes of the water resources, the management institutions in place, and the communities involved. He points out that if stakeholders see threats to water resources as severe and scientific knowledge is extensive, partnerships are more likely to form. Management institutions must also be able to bear the initial costs when beginning a partnership and higher-level institutions must be willing to allow for local autonomy. The U.S. addresses both of these issues by providing grants based on local and state regulations. Sabastier et al.(2005) also notes that communities with high levels of social and human capital, as well as communities that are similar to those with whom a potential for partnership exists (low cultural or belief heterogeneity), are more likely to seek out partnerships with neighboring communities (p. 182).

2.3.2 Bridging Scales in Institutional Management

Another important concept in the management of water resources is the bridging of different levels of institutions. A prime example of this in the U.S. is active partnerships between the EPA and state and local regulatory institutions. These

partnerships are important because localized management efforts may not have the resources of a federal institution such as the EPA. This also implies that states that may organize collaborative efforts with other management groups, such as grassroots organizations, must consider the resources available. Bidwell and Ryan state that, “Regardless of the affiliation decision, states would do well to explicitly recognize the implications of organizational affiliation when designing policies that foster collaboration. Without ample resources to enhance capacity, collaboration should be expected to reinforce rather than replace institutional norms,” (p. 841).

Some experts believe that centralized control can jeopardize the welfare of local resources, and thus the only solution is a partnership between the different institutional levels. Berkes (2002) explains how centralization of management efforts often undermines local practices. “Local institutions tend to use their own folk knowledge, often referred to as local knowledge, indigenous knowledge, or traditional ecological knowledge, whereas centralized management agencies tend to use internationally accepted scientific practice and often assume away local knowledge and practice” (p 297).

We can more clearly define the effects of such centralization. Berkes (2002, p. 298) makes a distinction between *processes* and *outcomes*. He notes that while an observer can see a process such as commercialization of subsistence resources, like water as either positive or negative, it is the process that often defines the effect this has on the resource management. He draws on one particular aspect of this type of change: speed. If commercialization is rapid, local institutions are not likely to adapt efficiently, and negative consequences will result. Alternately, if the process takes a longer period of time, local institutions will be more likely to adapt and have a positive effect on outcomes.

2.3.3 *Sociopolitical and Ecological Boundaries: A Case Study Approach*

One particular difficulty in managing resources such as water is the difference between socio-political boundaries, and the boundaries of that resource. Different management practices in different sections of a single resource can adversely affect the use of a resource in surrounding areas. Within the United States, state boundaries offer slightly less of an obstacle because the EPA has influence over the actions of individual states. When national borders intersect the boundaries of resources, however, there may be little or no organizational control over the action of each independent nation. The purpose of this section is to examine how disputes over resources can be detrimental to resource management, and how different levels of management can mediate such disputes. We do this through an examination of case studies, beginning with a very broad view and narrowing this down to an example of an interstate dispute within the U.S.

One example of an international water resource dispute draws on Iraq to highlight some of these political difficulties. The headwaters of the Tigris and Euphrates rivers originate mostly in Turkey and Syria. Although Iraq's main source of water for consumption and irrigation is these two rivers, Turkey has built a series of dams along the Euphrates that has significantly reduced the volume of water flowing into Iraq from this river (Hammond, 1994, p. 183).

In North America, the U.S. and Mexico have had many disputes over rivers and groundwater, which flow into Mexico from its northern border. One such dispute resulted when Mexico increased the amount of groundwater it withdrew near the U.S. border. The U.S. took strong measures to curb the amount of groundwater seeping across the border. The source of this seepage was an 82-mile canal that was earthen. U.S. management had

the earthen sections lined with impermeable surfaces. Garcia-Acevedo and Ingram (2004) have described the result of these actions as, "...Mexico pleaded a case for its ownership of the water in question under the provisions of Minute 242, which required mutual consultation over any future groundwater development. The U.S. countered that Mexico's argument lacked legal merit since it was not groundwater at issue, but surface water belonging to the United States. The dispute, however, has never been part of the U.S.-Mexico diplomatic agenda. It has never been the subject of formal negotiations between the two countries," (Garcia-Acevedo & Ingram, 2004). This is a highly transparent example concerning the need for management on a higher level than the individual territories involved.

Even within the United States, where the EPA has much influence over the management of water resources throughout various states, major conflicts can emerge. A current, and very transparent, example concerns the Apalachicola-Chattahoochee-Flint (AFC) river Basin in the Southeastern United States. Lipford (2004) explains that the use of water resources in this area was once of no concern. In the latter, half of the twentieth century, population growth increased and the ultimate result was a drawn out dispute spanning three decades. This dispute involves the U.S. Army Corps of Engineers and the city of Atlanta, Georgia. Atlanta attempted to increase water consumption from the Chattahoochee River and Lake Sidney Lanier, raising very serious concerns from Alabama and Florida, two downstream states that had stakes in the continued use of the river. Figure 2.1 shows the basin where this dispute took place.

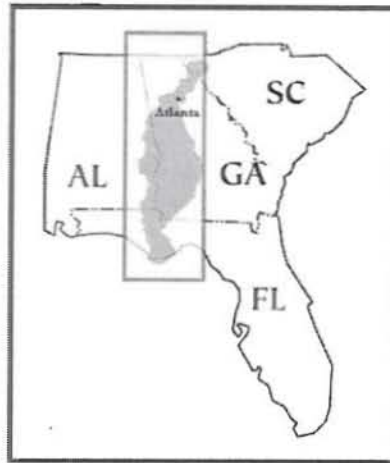


Figure 2.1 The AFC River Basin
(Source: Lipford, 2004, p. 3)

As noted by Tietenberg (2004), the absence of scarcity of common-pool resources, water included, eliminates the need for strict management and regulation and reduces the possibility of conflicts (pp. 64-65). Until 1989, this appeared to be the case for water resources in the AFC basin. It was then that the Army Corps of Engineers and Atlanta, Georgia, proposed a dramatic increase in the amount of water the city would draw from the Chattahoochee River to supplement their growing city and economy. Alabama became alarmed at the possibility of significantly decreased water flow in the basin, and so pursued a lawsuit against the Army Corps of Engineers. Florida soon followed, as the Apalachicola Bay oyster industry was very important to the state and relied on flow from the AFC basin (Lipford, 2004 pp. 6-8).

Even through years of disputes brought to the Supreme Court, attempts to resolve the conflicts failed in 2003, after which Alabama and Florida reinstated their lawsuits against the Army Corps of Engineers. Lipford (2004) states that this is at least in part due to the fact that neither the U.S. Congress nor the U.S. Supreme Court are fond of settling interstate water disputes. As a result, the Supreme Court often leaves the bulk of the negotiations up to the states themselves (p.8). According to Sabatier et al. (2005) the

theory on resource management partnerships states that the costs of failing to increase water consumption by Atlanta and the costs of decreased water flow in Alabama and Florida are too great and eliminated the chances for effective partnerships (p.182). In short, the effect of the increasingly scarce water resources has been too great an issue to solve and as of 2004 no definitive solution had been reached (Lipford 2004, pp 8-10).

Through these examples, it is clear that governing bodies with authority over socio-political jurisdictions are important for the effective management of resources that span such borders. It is also clear that past management has addressed these topics, and must continue to do so in the future.

2.3.4 Summary of Section 2.3

This section examined sociological issues surrounding the management of resources such as water. The concepts addressed were common pool resources, interactions between institutional scales, and the intersections of socio-political boundaries with the boundaries of a given resource. These issues highlight the need for open communication between different divisions of management and a complete understanding by institutional bodies concerning the effects of water as a common pool resource.

2.4 Summary of Background Research and Literature Review

This chapter has sought to explain the challenges faced by national and state water management institutions and what they have done thus far to address these challenges. The challenges addressed were the ecological effects of NPS pollution within watersheds and the social challenges of watershed management. We also outlined the way federal,

state, and local institutions have managed water resources both historically and at present.

This discussion relates directly to the challenges faced by the federal EPA and the

Massachusetts DEP.

3 Research Methodology

The purpose of this research project was to make recommendations for the improvement of current regulatory practices concerning non-point source (NPS) pollution within Massachusetts watersheds. We accomplished this goal by completing the following objectives.

1. Identify a set of Best Management Practices (BMP's) for effective NPS pollution management.
2. Identify a sample of existing management practices in Massachusetts by collecting information on watershed management practices in three watersheds within Massachusetts: The SuAsCo, Blackstone River, and Charles River Watersheds.
3. Identify shortcomings in the management practices in Massachusetts by analyzing and comparing the data collected while completing objectives one and two. Use these shortcomings to complete the project goal.

3.1 Identification of BMP's

The research team used three primary techniques when creating a set of BMP's in fulfillment of Objective 1. These techniques included (a) researching case studies identified and published by the United States Environmental Protection Agency (EPA) as, "319 Success Stories," (b) researching past studies done on specific issues and techniques relevant to NPS pollution management, and (c) interviews with experts and officials throughout the state.

3.1.1 Case Studies Research

When creating a list of BMP's, we relied heavily on information provided by the EPA on watersheds throughout the U.S. that demonstrated successful use of grant money supplied under section 319 of the Clean Water Act (CWA) for the resolution of NPS

pollution issues. When selecting case studies from throughout the country, we chose examples that have similar ecological and geographic properties as Massachusetts, and watersheds that have similar pollutants as the selected watersheds in Massachusetts. From these studies, we compiled tables containing important features and BMP's from each study that appeared to lead to success.

For each of the three watersheds in Massachusetts that we chose to study, we selected three case studies from the EPA. We chose this number to ensure that the data collected would represent BMP's that were common in successful efforts to control NPS pollution, while not exceeding the scope of our research. Table 3.1 shows the chosen case studies.

Table 3.1 Case Studies

Massachusetts Watershed:	Ecologically and Geographically Similar Case Studies:
The SuAsCo Watershed	Connecticut: Edgewood Park Pond North Carolina: Mills River Virginia: Middle Fork Holston River
The Blackstone River Watershed	Connecticut: Center Springs Pond Restoration Project Rhode Island: Curran Brook Sedimentation Pond Pennsylvania: Villanova's Storm Water Wetland Retrofit
The Charles River Watershed	Florida: Blackwater River Restoration Nevada: The Upper Carson River Basin New Hampshire: Lake Opechee

Once we had compiled the data into tables, we were able to identify practices common to at least two of the case studies. In selecting BMP's, the research team focused

on both social aspects, such as the participation of local residents in the management process, and the installation of structural BMP's such as erosion prevention.

3.1.2 Research of Past Studies

The research team used past research reports to gather information on several management BMP's. We used reports to study how water quality data is collected and organized, and also to understand financial cooperation between watershed management organizations throughout the state. The primary report used was, "*WATERSHED MANAGEMENT – Better Coordination of Data Collection Efforts Needed to Support Key Decisions,*" by the United States General Accounting Office (2004). The research team reviewed the report and cited key points therein as organizational BMP's that could be applied in Massachusetts.

3.1.3 Expert Interviews

The research team also conducted interviews with expert informants. We conducted three interviews in person at the office of the interviewee for this purpose, and recorded audio from each for later review. We then gathered the data from these interviews in matrices. From these matrices, we identified BMP's. The interviews that we conducted are shown in Table 3.2.

Table 3.2 Information Regarding Interviewees

Interview	Position	Purpose of Interview
Seth Tuler	Social Scientist - WPI	General research strategies; examples of BMP's
Kathleen Baskin	Director of Water Policy - Massachusetts Executive Office of Environmental Affairs	State strategies; pending strategies; grassroots organizations; comm. Involvement
Emile Tayeh	Vice President; Construction Chief of Environmental Affairs – Cumberland Farms	Managements techniques in place, effective strategies

3.2 Identification of Massachusetts Management Strategies

To complete objective two, the research team first selected three watersheds in Massachusetts (out of Massachusetts 27) and then identified leading management organizations within them. The team also identified organizations that manage watersheds at a regional level. Once we identified the organizations, the team conducted on-site interviews with the officials in charge of each organization.

3.2.1 Selection of Watersheds

It would have been beyond the scope of this project to examine every watershed in Massachusetts. Because of this, we narrowed our focus to three unique watersheds in Massachusetts. We selected the watersheds to most inclusively represent the various features of watersheds and social conditions throughout the state of Massachusetts. Detailed descriptions of our chosen watersheds (the SuAsCo, Blackstone River, and Charles River) are in chapter 4.

3.2.2 Informant Interviews

After we conducted archival research into possible BMP's and selected our set of watersheds for study, we compiled a list of questions we had on each watershed. We then conducted interviews with key informants at the Massachusetts Department of Environmental Protection (MassDEP) and at grassroots organizations within each watershed. The interview questions were tailored to the position and experience of the interviewee (refer to Appendix A for outlines used during each interview).

The interviewees are listed in table 3.3. We conducted each interview at the office of the interviewee, and recorded audio of each interview to be transcribed for later use. The data in the transcripts were then compiled into matrices to highlight what practices are currently in place in Massachusetts.

Table 3.3 Massachusetts Policy Informants

Interview	Position	Purpose
Kathleen Baskin	Director of Water Policy - Massachusetts Executive Office of Environmental Affairs	State strategies; pending strategies; grassroots organizations; comm. Involvement
Therese Beaudoin	Blackstone River Watershed Coordinator – MassDEP	MassDEP management; information on pollutants and solutions
Jane Peirce	Director – NPS grants program	Grants Program
Donna Williams	Blackstone watershed association	Management Practices used in the BWS
Robert Zimmerman	Executive Director - Charles River Watershed Association	Management Practices used in the CWR
Peter Coffin	Blackstone watershed association	Management Practices used in the BWR
Alison Field-Juma	Director – Organization for the Assabet River	Management practices of OAR in relation to the entire SuAsCo watershed.

3.2.3 Funding Distribution in Massachusetts

To analyze the distribution of funding throughout the Commonwealth, we compiled data from the MassDEP into a map showing approximately where NPS pollution BMP's were implemented using section 319 grant funding from FY2002 to FY2006. The map was also color coded to show the distribution of wealth throughout the state. This overlay of data, taken from Massachusetts archives and Census 2000 data, shows what regions are most likely to receive federal funding. The data collected during the interview process supported this understanding.

3.3 Identification of Shortcomings and Creation of Recommendations

To identify shortcomings in Massachusetts management practices, we compared the data collected during our completion of objective 1 and compared it to the data collected while completing objective 2. We identified shortcomings in the following areas: availability of financial resources throughout the state, collection of water quality data, stormwater management, and community outreach. For each, of these areas we considered social aspects such as community involvement and the outcomes the state was producing.

We were then able to create a set of recommendations that could fill those gaps. We designed the recommendations to bring the management practices of Massachusetts agencies closer to coinciding with our identified BMP's. If our research identified problems within Massachusetts for which our set of BMP's could not provide a precedent for improvement, we created recommendations for further research or trial programs designed to lead the state toward eventual improvement.

4 Results and Analysis

The purpose of this project was to develop recommendations to reduce non-point source (NPS) pollution in Massachusetts. We first outline our preferred set of Best Management Practices (BMPs) based on our research of case studies and interviews with local experts in the field. We then present the practices for the control of NPS pollution in Massachusetts watersheds and some of the factors that influence the effectiveness of these measures. Lastly, we identify potential improvements that governmental and non-governmental organizations throughout the Commonwealth of Massachusetts could implement to improve the management of NPS water pollution.

To understand the current management of NPS pollution within Massachusetts, we chose a sample of three watersheds out of 27. In choosing watersheds to study, we attempted to select watersheds that could be representative of the different ecologic and man-made features found throughout the state. The selected watersheds are described below.

- *The SuAsCo Watershed*

As shown in Figure 4.1, the SuAsCo Watershed is a large watershed in central Massachusetts. We examined this watershed because it represents a clear example of a watershed that is being affected by NPS pollution in a region that consists mostly of suburban developments and agricultural land. The primary uses of water resources in this watershed are recreational. Many of its major rivers (Concord, Assabet, and Sudbury) are used for boating, fishing, and bird watching. By analyzing the management practices of the SuAsCo watershed, we gained an understanding of how Massachusetts is managing suburban and agricultural watersheds.



Figure 4.1 The SuAsCo Watershed
 (Adapted from: Sudbury Valley Trustees, *Greenways Plan*, 2000)

- *The Blackstone River Watershed*

Figure 4.2 shows that the Blackstone River Watershed is located in south central Massachusetts and Rhode Island. Therefore, it includes the cities of Providence and Worcester, the second and third largest population centers in New England, respectively. The majority of the watershed is urban. By studying an urban watershed, we examined problems that do not necessarily occur in a suburban or rural watershed. One such issue studied is the effect of impervious surfaces on water drainage and NPS pollution.



Figure 4.2 The Blackstone River Watershed

(Adapted from: U.S. Department of the Interior, U.S. Geological Survey, *Blackstone River Drainage Basin, 2007a*)

- *The Charles River Watershed*

The Charles River is the longest river in Massachusetts. As shown in Figure 4.3, it runs from rural areas in central Massachusetts into Boston Bay. We decided to include this watershed in our study because it has problems with several different NPS pollutants. The basin transitions from rural land at the headwaters of the river, to suburban land in the middle basin, and urban areas in the lower basin. By studying this watershed, we gained knowledge on how Massachusetts is managing a watershed with multiple NPS pollutant problems.



Figure 4.3 The Charles River Watershed

(Adapted from: U.S. Department of the Interior, U.S. Geological Survey, *Charles River Drainage Basin, 2007b*)

4.1 Identified BMPs

To identify a set of BMP's, we accumulated data on nine case studies, researched past studies done on specific issues and techniques relevant to NPS pollution management, and interviewed experts in the field. The identified BMP's were either structural or non-structural.

4.1.1 Case Study Research

We based the selection of the individual case studies on the geographic and ecological similarities between the watersheds in the case studies and those we investigated in Massachusetts. We also took into consideration the type of pollutants that

threatened each watershed. A summary of significant BMPs used in the nine case studies is shown in Table 4.1.

Table 4.1 Case Study BMP

BMP	Technique	Advantages	Disadvantages
Erosion Prevention (structural)	Planting vegetation on riverbanks	Inexpensive Aesthetic	Not permanent
	Building fences	More permanent	Require maintenance
Sediment Control (structural)	Forebays	Effective control	Expensive to install Require maintenance
	Street sweeping	Simple	Only effective for road sand
Stormwater Management (structural)	Redirecting storm pipes	Easy Effective	
	Monitoring program	Data useful	Expensive Requires expertise
Public Outreach (non-structural)	Community involvement	Expenses covered by 319 grants	Results delayed Difficult to assess
	Education programs	Raises public awareness	

Each BMP listed in Table 4.1 targets different problems that arise from NPS pollution. One of the problems that recurred throughout the different case studies was that of erosion control. Many of the case studies cited the use of two techniques: planting vegetation on stream banks and building stream bank fencing. Planting vegetation along a stream bank is a natural way to control erosion. While planting vegetation is aesthetically pleasing, stream bank fencing may be a more permanent solution even though it requires periodic maintenance. Stream bank fencing can help to hold sediments back that would otherwise wash directly into the water bodies. Both solutions have proven to be effective in the control of erosion (EPA, 2006b; EPA, 2006g; EPA, 2006l; EPA, 2002b).

While vegetation and streambank fencing can prevent sediment from entering waterways, another structural technique to improve water quality is to remove sediment already in the water. Organizations frequently used two techniques to control the amount

of sediments traveling through a water body. One technique that was implemented by four of our nine case studies is the construction of sediment forebays (EPA, 2004a; EPA, 2004c; EPA, 2002b; EPA, 2002c). A forebay is a type of stormwater holding area that allows heavy particles to settle from the water before it enters a lake, river, or pond (Therese Beaudoin, personal communication, 2006). They have been cited as an effective way to control sedimentation, but they are expensive to build and costly to maintain (Therese Beaudoin, personal communication, 2006). Another BMP for sediment control is to increase the frequency of street sweeping. Street sweeping was increased and successfully controlled sedimentation around Center Springs Pond in Connecticut (EPA 2004a). In Massachusetts, sand and salt are used to improve road traction during winter snow and ice storms. In the spring, rainstorms wash the sand and salt off into nearby water bodies. Increased street sweeping is an effective BMP to control the entry of sediments into the watershed. However, street sweeping only controls road sand and does not affect sediments from erosion or other non-point sources.

Perhaps the most important technique for mitigating the problems caused by stormwater is to raise public awareness. Public outreach is the only BMP cited by every case study reviewed. Some of the techniques used to educate the public on NPS pollution are conferences, lectures and classroom education. Raising awareness of the problems caused by NPS pollution may make the public more willing to support engineering or other expensive solutions and educate them on how to decrease their own contributions to NPS pollution. However, a problem with public outreach campaigns is that the results may be delayed and cannot be measured easily, leaving questions on their effectiveness (Peter Coffin, personal communication, December 6, 2006).

4.1.2 Past Study Research

The main topic covered by our research into past studies is the collection of water quality data. Coordination of pollutant data collection is one of the most important components of any water resource management plan. The U.S. General Accounting Office (USGAO, 2004) reported that state governments often cite shortages of funding as the main reason for shortfalls in data collection. To help combat funding shortages and improve statewide monitoring, the USGAO report recommends that states establish umbrella organizations to coordinate data collection among state and local agencies. Such coordination would allow agencies across the state to make the best use of available resources and decide which watersheds are in the most need of cleanup (p 46).

4.1.3 Expert Interviews

The interviews of local area experts were important tools in gathering BMP's concerning NPS pollution management. Transcripts of the interviews are provided in Appendix A. Most of the BMPs discussed by the experts were non-structural. A summary of them is in Table 4.2.

Table 4.2 Interview BMP's

BMP	Techniques	Advantages	Disadvantages
Public Outreach (Non-Structural)	Involvement of local media. Education Programs	Raises awareness of NPS issues	Effects difficult to measure
Low Impact Development (Structural)	Raingardens, Rainwater storage systems	Reduces effects of impervious surfaces	Legislation and regulations often need to be altered

Perhaps the most important technique for mitigating the problems caused by stormwater is to raise public awareness so that engineering solutions will be more acceptable to the public and more likely to be implemented. In addition, people may become motivated to work toward decreasing their own contributions to the problems. Some of the techniques used to educate the public are conferences and lectures that not only introduce them to the problems, but to the people working to solve them. Organizations such as the DEP would benefit from a public who knows that they can always rely on them and feel comfortable communicating with them. Conveying a friendly image to the public could be an effective method of gaining support and increasing state supplied funding.

Two of the three experts interviewed cited the need for increased attention to Low Impact Development (LID). LID techniques have shown promise in mitigating the problems caused by impervious surfaces in developed areas. This was voiced by Robert Zimmerman of the CRWA, “We can engineer things to make what we build behave as if we’d never build it, in terms of rainwater to land to groundwater connections,” (Zimmerman, personal communication, December 6, 2006). Alison Field-Juma of OAR further supported the need for increased LID solutions. She recommends pushing for the development and implementations of solutions such as greenroofs to absorb runoff (Field-Juma, personal communication, December 14, 2006).

4.2 Current Massachusetts Watersheds Management Issues

The three watersheds selected for study in Massachusetts were the SuAsCo Watershed, the Blackstone River Watershed, and the Charles River Watershed. We gathered information regarding management techniques used in these watersheds from

nine interviews of persons familiar with the subject. Transcripts of the interviews as well as a set of matrices that summarize the main findings are in Appendix A. A list of the interviews we conducted is in Tables 3.2 and 3.3. Several key issues emerged in the course of these interviews.

4.2.1 Issues with Financial Resources

Financial resources are the main limiting factor for the implementation of all watershed management practices. Without adequate funding, management organizations cannot keep a full staff, run outreach campaigns, or even apply for grant money from the DEP and U.S. Environmental Protection Agency (EPA). Section 319 funding is the main source of governmental grants provided by the EPA through the DEP. Non-governmental sources can be used to obtain the matching funds required by the DEP to obtain the 319 grant.

Understanding the distribution of funding from government sources, such as the EPA's section 319 funding, and private contributions is essential for understanding how Massachusetts manages NPS pollution. Once this distribution is fully understood, it is likely that state and local organizations will have more control over what organizations receive funding and why.

Within the Commonwealth of Massachusetts, the Massachusetts Department of Environmental Protection (MassDEP) is in control of all grant funding provided by the EPA under section 319 of the Clean Water Act (CWA). According to Jane Peirce (Peirce, personal communication, November 27, 2006), local organizations working within specific watersheds solicit grant money from the MassDEP through a project application process. To qualify for funds, the application must include specific engineering based

solutions for a given water body, and an outreach program concerning the project itself or NPS pollution in general. In addition, the applicant must secure funding for at least 40% of the total cost of the project from outside sources, either in-cash or in-kind.

Peter Coffin of the Blackstone Headwaters Coalition stated that many grassroots organizations experience difficulties when completing 319 grant proposals. The 40% match requirement can present difficulties for smaller organizations, especially those who operate in the less affluent communities of central Massachusetts (Coffin, personal communication, December 7, 2006). These communities have fewer financial resources and less access to expensive expertise. Figure 4.4 shows the distribution of wealth in Massachusetts compared to the distribution of 319 funding over the past decade. Organizations that are in the most affluent areas, particularly in eastern Massachusetts, have been the most likely to receive 319 funding. 319 grant funding is pursued on a competitive basis, so that organizations that are already most able at obtaining funding are the most likely to receive even more funding from the state. Organizations that operate within less affluent watersheds are less likely to be able to raise the required matching funds. As a result, funding may not always go to the watersheds with the most severe problems.

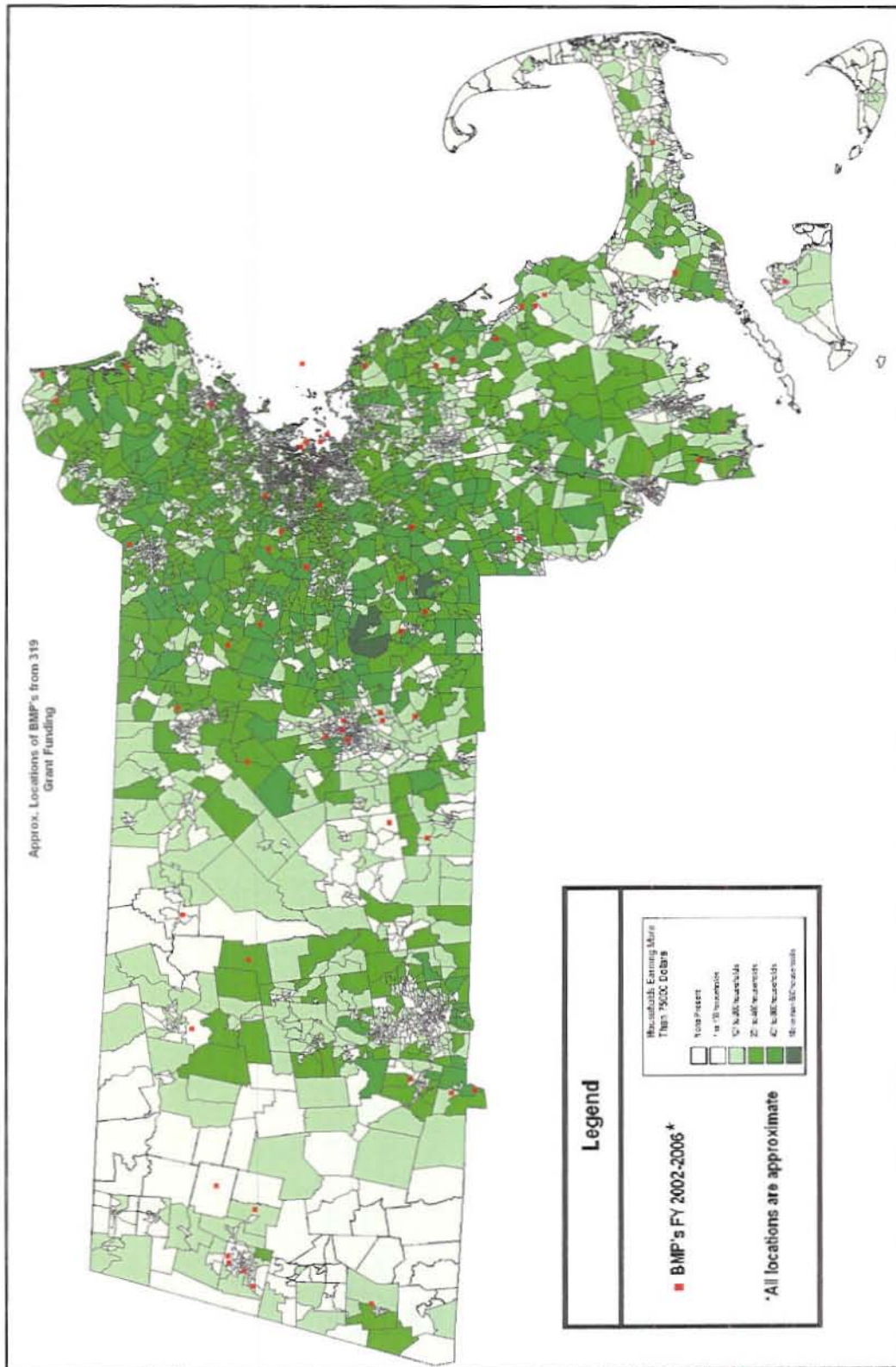


Figure 4.4 Approximate Locations of 319 Grant Funding Projects
 (Adapted from: Commonwealth of Massachusetts Executive Office of Environmental Affairs, *MassGIS Data Viewer*, 2007; MassDEP, *Indicative Project Summaries*, 2006f)

Another challenge with 319 funding is the requirement for Quality Assurance Project Plans (QAPPs). Donna Williams (personal communication, November 30, 2006) mentioned that organizations have given 319 grant funding back to the MassDEP because they were unable to complete the QAPP correctly. The difficulties in completing QAPPs result from a lack of funding and quality assurance expertise among many smaller management organizations. Because of these difficulties, the MassDEP has eased the requirements for QAPPs in recent years (Appendix A). As shown in Table 4.3, two of the three representatives of the watershed organizations interviewed about QAPPs seemed to have a negative view although they allacknowledged the need for proper evaluation o f the success of 319 projects.

Table 4.3 Informant Comments on QAPP's

Interview	Organization	Comment on Qapp's	Positive or Negative statement regarding Qapp's
Donna Williams	Blackstone watershed association	Can be difficult for Organizations to complete, led to several instances of orgs. returning 319 money	Negative
Robert Zimmerman	Charles River Watershed Association	Essential for proving that work is valid and useful.	Positive
Peter Coffin	Blackstone watershed association	Can be difficult for Organizations to complete	Negative

4.2.2 *Insufficient Water Quality Data Collection Methods*

Collecting water quality data is an important step in identifying the sources and distribution of pollutants in Massachusetts. It provides help in determining how Massachusetts should manage specific areas based on their main NPS pollutants. However, the MassDEP, as well as many watershed associations, does not have the ability to create and maintain an adequate monitoring program.

The main contributors to NPS pollution in Massachusetts watersheds are nutrients such as phosphates and nitrates, and fecal coliforms from animal waste. Management organizations know the sources of these pollutants in a general sense, but their ability to collect specific data on them is still inadequate in some areas.

For example, the Blackstone Headwaters Coalition is able to test for certain pollutants but it is not able to look at them all. “We have equipment for testing for phosphates and nitrates but we don’t have the testing capacity to test for heavy metals or suspended solids which are made from fats and greases,” (Coffin, personal communication, December 7, 2006). The inability to test for suspended solids and heavy metals leaves a gap in their data. Other organizations are also limited in the data that they can collect.

According to Therese Beaudoin, and as mentioned in section 4.1.1, the main reason for the general insufficiency of data collection comes from financial issues. When agencies and organizations have an adequate budget, they can carry out all of the tests they need. However, the MassDEP has had budget cuts in recent years and non-governmental organizations (NGO) often lack the financial ability to fund major monitoring programs (Beaudoin, personal communication, November 20, 2006). Donna Williams commented on the MassDEP’s monitoring program, saying, “It is hard to criticize DEP because their funding has been reduced and reduced [*sic*] and they have fewer and fewer people,” (Williams, personal communication, November 30, 2006). The budget difficulties faced by the MassDEP also lead to difficulties for the NGOs, who rely heavily on MassDEP supplied 319 grant funding for Best Management Practice (BMP) implementation projects.

4.2.3 Inadequate State and Local Regulations of Stormwater Management

One major type of project which receives 319 grant funding involves stormwater management. Stormwater runoff enables NPS pollution to spread throughout a watershed. Proper management of stormwater can reduce many pollutants that rely on those waters as a mechanism of transport.

Many organizations, such as the Massachusetts Audubon Society (Mass Audubon) actively seek to improve control mechanisms for the management of stormwater. Donna Williams (Williams, personal communication, November 30, 2006) has stated that a conference of local organizations in the spring of 2007 will seek to address many issues related to this topic. The management of stormwater is often facilitated by such organizations with the help of town and state officials. As shown in Table 4.4, many of those interviewed cited the difficulties in changing local by-laws and regulations in order to allow for stormwater management solutions like narrower roads, rain gardens, green roofs, and many low impact development techniques. Local governments may also be reluctant to enact changes which might affect local businesses such as farming and real estate development.

Table 4.4 Informant Comments on Stormwater

Interview	Comment on Stormwater BMP Implementation	Cited Changing of Laws/Regulations?
Kathleen Baskin	State needs to insure there is adequate flow in river systems for fisheries.	No
Emile Tayeh	Have less salt on the roads, trying to use more natural products instead of chemical	No
Donna Williams	Better management of parking lots, dumpsters, landscaping, pet waste, fertilizers, etc.	Yes
Jane Peirce	If developers agree, they still have to deal with many legal barriers.	Yes
Robert Zimmerman	Many developers are unwilling to change practices. The CRWA has a conflict of interest in regard to selling Smartstorm technology.	Yes
Peter Coffin	Feds pushing on the state to do something about NPS, and the state pushed on the cities and towns, however that is not enough funding to implement any projects	Yes
Alison Field-Juma	By laws and regulations may need to be altered, town by town, to allow for such solutions	Yes

Another challenge that several interviewees cited is convincing developers to implement LID solutions. Many developers wish to continue building with the same techniques that they have been using for years, and many regulations are in place that prevent developers from changing those techniques. Allison Field-Juma of the Organization for the Assabet River (OAR), cites this as one of the largest obstacles facing implementation of LID solutions, (personal communication, December 14, 2006).

4.2.4 Difficulties in Implementing and Measuring Community Outreach

One strategy for changing the minds of developers, legislators, policy makers, and stakeholders with regard to LID and an array of other issues is the use of public awareness campaigns. For this reason, many grassroots watershed organizations focus primarily on outreach. When we asked Donna Williams what she did for Mass Audubon

and BRC, she replied, “The whole deal is education and outreach...” (Williams, personal communication, November 30, 2006). Organizations, such as the CRWA, Mass Audubon, and OAR, have been doing their part in educating Massachusetts citizens, but it is not an easy task. There are obstacles that prevent these organizations from effectively educating and influencing the general public. Some of the hurdles are issues with funding, measuring effectiveness, and the problems inherent in changing human behavior.

Non-profit organizations (NPOs) like the CRWA, OAR, and the Mass Audubon focus their time and resources towards public outreach. Donna Williams believes that NPS pollution is a community and grassroots issue (Williams, personal communication, November 30, 2006). Grassroots organizations have taken responsibility for informing the public of the impact their actions have on the environment. However, these organizations do not have adequate funding or staffing to reach everyone. As stated by Donna Williams, “If the state could create more funding opportunities for the grassroots organizations, then they could help get the word out” (Williams, personal communication, November 30, 2006). The scarcity of funding and human resources does not only pertain to the Mass Audubon. Alison Field-Juma of OAR comments, “We don’t have many staff and we’re not full time. We would like to do more. We always like to try to increase people’s knowledge” (Field-Juma, personal communication, December 14, 2006). Financial limitations have been a limiting factor in the ability of organizations to perform sufficient outreach. With more funding and resources, these NPOs could be more effective in communicating the NPS issue.

Like other programs, outreach campaigns require funding and also have to prove their effectiveness. Measuring public outreach effectiveness is a difficult task, as

explained by Peter Coffin, “‘Education is a black hole.’ It’s a need, but you put in the time and energy now and you’re not going to see the results until that child is a homeowner, or a technical person, or doing something in the world,” (Coffin, personal communication, December 7, 2006). In addition, the goal of such outreach programs is to change people’s behavior and habits, which is notoriously difficult and slow. The ability to demonstrate an impact becomes a problem when NPOs rely on funding from an outside source to drive their outreach programs. Donna Williams suggested that the state is hesitant to fund grassroots outreach campaigns because of the difficulties in measuring their success (Williams, personal communication, November 30, 2006). These NPOs need funding to implement their programs but they need to prove that their programs are effective.

While grassroots organizations are having difficulties measuring the effectiveness of their outreach programs, the MassDEP is struggling against a poor public image. The image of the MassDEP has suffered because it has a substantial regulatory and enforcement component and much of the public consider it a regulation maker. According to Therese Beaudoin, the budget of the MassDEP, as well as the size of their staff, has shrunk over the past six years. Their staff is insufficient for open communication with the grassroots organizations and stakeholders (Beaudoin, personal communication, November 20, 2006). Jane Peirce described the MassDEP’s communication with the agricultural community, who produce pollutants in the form of sedimentation, nutrients, and fecal coliform from livestock waste, as particularly difficult. Local farmers tend to dislike the MassDEP and can be hesitant to allow officers on their lands because they see the MassDEP as regulators who are likely to impose restrictions

on their land use. This lack of communication and the misunderstanding of the MassDEP's responsibilities are creating difficulties for implementing agricultural BMPs that could reduce the effects of stormwater runoff and fertilizer use (Peirce, personal communication, November 27, 2006).

All of these issues (including the pollutants present; communication between governmental organizations, non-governmental organizations, and stakeholders; and the allocation of funding) represent hurdles on the way to an improved NPS pollution management framework in the Commonwealth of Massachusetts. The next task we undertook was creating a model for NPS pollution management to help highlight the areas where Massachusetts should make improvements.

4.3 Recommendations for Improvement

The BMP's identified in section 4.1 are techniques Massachusetts can use to improve their NPS pollution management system. Those BMP's ranged from structural to non-structural practices, and short term corrections to long term solutions. We cited each of the BMP's as being effective practices elsewhere in the country. Massachusetts faces many of the same problems that we highlighted in the case studies. The major deficiencies found in Massachusetts are its financial resources, data collection, stormwater management, and public outreach. To address these deficiencies in NPS pollution management, Massachusetts needs to implement proper BMP's.

4.3.1 Financial Resources

One financial resource issue is the reassessment of the current distribution of 319 grant funding statewide. Because the state has a vested interest in ensuring the health of

its water supplies, agencies such as the MassDEP should be willing to assist organizations when they apply for grant funding and when they look to complete their QAPPs. A competitive application process is certainly necessary, but the MassDEP can take certain steps to ensure that smaller organizations have similar opportunities to receive 319 funds.

The MassDEP should conduct research into implementing a sliding scale requirement for matching funds in the application process based on the financial resources of the applicant and the severity of the NPS problem. Such variations in the application requirements are likely to help normalize the distribution of funding so that they allocate money where it is needed most, instead of where it is otherwise most available.

The DEP should also begin exploratory studies into the effect of providing assistance for the completion of QAPPs. The QAPP is undoubtedly an essential part of the management process, but many organizations do not have the resources or the expertise to complete them in full. Providing assistance for their completion will only help organizations provide the MassDEP with the information they are seeking. It will also provide a way for the DEP to get the in-depth data they were seeking when QAPPs were first required.

4.3.2 Water Quality Data Collection

Like funding, data collection acts as a base upon which many other components of a NPS management plan must rest. The first priority for the organizations and agencies responsible for the management of NPS pollution in Massachusetts should be the coordination of data collection throughout the state. The MassDEP, after reviewing the

report entitled, "Better Coordination of Data Collection Efforts Needed to Support Key Decisions," (U.S. GAO 2004) should immediately seek the formation of a new umbrella organization within the DEP to coordinate data collection throughout the state. This office should be capable of:

1. Communicating with all grassroots organization that actively collect water quality data.
2. Facilitating communication and sharing of data between such organizations.
3. Setting priorities for which pollutant data are most essential for management efforts in different areas.
4. Organizing and presenting data collected throughout the state on an annual basis.

To create this office, the MassDEP will likely need to appeal to state legislators for funding and support. The first step in this process should be to enlist the support of as many watershed organizations as possible. Such a coordinated effort may also have the benefit of leading to subsequent coordination among the different groups and help to improve statewide data collection (with or without state funding). The MassDEP and grassroots agencies should then make it a priority to push for funding for the creation of this state office.

This new office will aid the DEP by channeling all of the data collected by grassroots organizations directly to them. Grassroots organizations will benefit from access to these data from across the Commonwealth allowing them to gauge their progress and the effectiveness of their efforts. This open communication will also prevent organizations from doing research that has already been done.

4.3.3 Stormwater Management

A BMP cited for stormwater management is LID technology. With LID technology being more widely accepted, areas with a significant amounts of impervious

surfaces can decrease the impact they have on water quality. However, one of the major obstacles with the implementation of LID technology in Massachusetts has been local by-laws and regulations.

Watershed organizations in Massachusetts should work together to change state and local regulations surrounding the implementation of LID technology. This can be in the form of free sharing of information on how organizations can work to change such regulations or actual cooperation on pushing for change at the state level. This cooperation will give individual watershed organizations a stronger voice when pursuing these changes. As by-laws and regulations are changed, developers will have more options when considering their construction techniques with regard to LID solutions.

4.3.4 Public Outreach

While we have found no precedent for an effective public outreach program, outreach is essential to organizations who seek to manage NPS through water quality monitoring, engineering BMPs, and LID solutions. Groups conducting outreach must do more research to find the most effective type of outreach campaign. There are many considerations when organizing an outreach program. Further research must answer questions like, 'What medium is the most effective to get the information across?' and, 'Who is the target audience?' Even though there is no clear answer to any of these questions, through 319 grants the EPA is helping to build an effective public outreach program. In every 319 grant, a certain amount of the money is allocated specifically for implementing a public awareness campaign. The organizations receiving 319 grants can use the funds they receive for public outreach more effectively if they know the best

outreach strategies. Watershed organizations should do research to create more effective educational tools.

Outreach programs organized by the MassDEP would be more effective if the public, particularly the agricultural community, saw them in a more positive way. One of the recommendations given by Jane Peirce (Peirce, personal communication, November 27, 2006) was to find other organizations that the DEP can collaborate with to bridge communication gaps with local farmers. The MassDEP should also seek to improve its image in the eyes of the public. According to Therese Beaudoin, the Worcester Telegram and Gazette offered the MassDEP an opportunity to publish articles in their newspaper (Beaudoin, personal communication, November 20, 2006). Unfortunately, the MassDEP only took advantage of this opportunity twice. In our opinion, publishing articles in newspapers such as the Worcester Telegram and Gazette could be an effective way to communicate with the public and may greatly improve the image of the MassDEP in the eyes of the public.

5 Conclusions and Recommendations

Non-point source (NPS) pollution is jeopardizing the health of watersheds throughout Massachusetts. Substances such as phosphorous, nitrogen, pet waste, and household chemicals can damage freshwater and marine ecosystems, as well as drinking water supplies. Throughout this chapter, we discuss our conclusions on best management practices (BMP's), current issues in Massachusetts, and our set of recommendations for improved management of NPS pollution in Massachusetts watersheds. We then present recommendations for further research.

5.1 Conclusions

From our research, we have shown that certain structural and non-structural BMP's can be effective in solving NPS pollution problems similar to those faced by Massachusetts. We then uncovered what challenges NPS pollution is presenting to watershed management groups throughout the state, and, finally, we made recommendations on how to improve the management of NPS pollution based on our BMP research.

5.1.1 Best Management Practices

The research team uncovered a set of effective BMP's that we used as a precedent for the improvement of NPS pollution management. Our research of case studies cited by the United States Environmental Protection Agency as successful uses of 319 grant money provided structural BMP's such as erosion prevention using stream bank fencing or new vegetation, sediment and stormwater control through sediment forebays, street sweeping, and stormwater monitoring programs. The case studies also revealed that the

non-structural BMP's of community involvement and education programs could be an effective tool.

We then looked at a research report by the United States General Accounting Office (GAO) recommending better coordination of data collection efforts throughout the nation. The report cites the creation of umbrella organizations as a non-structural BMP aimed at improving NPS pollution monitoring coordination.

Finally, we consulted several experts in the management of watersheds and found that the general category of Low Impact Development (LID), which encompasses many aspects of stormwater management, as well as effective community involvement are import BMP's to employ in Massachusetts.

5.1.2 Current Issues in Massachusetts Watersheds

As shown in the results section, the current watershed management practices in Massachusetts are insufficient. A major obstacle faced by many watershed management organizations is a lack of funding. This lack of funding has also led to other problems, including insufficient data collection capabilities and coordination, and a lack of widespread, effective public outreach campaigns.

Our findings have shown that the method the Massachusetts Department of Environmental Protection (MassDEP) uses to distribute funds received under Section 319 of the Clean Water Act (CWA) can make it difficult for smaller watershed management organizations to successfully receive funds, while others can do so regularly. The distribution of wealth in Massachusetts, when compared to the distribution of 319 funding over the past decade shows that organizations that are in the most affluent areas,

particularly in eastern Massachusetts, are most likely to receive 319 funding (Appendix D).

5.1.3 Recommendations for Improvement

We then examined the current state of NPS pollution management in Massachusetts and compared it to our BMP's to create a set of recommendations that would help to improve the efforts of organizations throughout the state. These recommendations included increased coordination of statewide NPS pollution data collection efforts, research into new methods of distributing 319 grant funding, increased assistance for the completion of Quality Assurance Project Plans, research into effective methods of reaching the public, and work to enable LID techniques to spread throughout the state. By implementing these recommendations, governmental and non-governmental watershed management groups throughout the state will improve their efforts to control NPS pollution.

5.2 Recommendations for Further Research

Perhaps the most outstanding issues that appeared in our research were storm water and wastewater management, and the implementation of Low Impact Development (LID). Improvements in these two areas would greatly improve the management of NPS pollution throughout the watersheds of Massachusetts. The research team has decided on the following recommendations for further research:

- ***Research possible improvements for wastewater management systems:*** Topics that could be included in this area of research are banning phosphorus from all detergents, as was done by the State of Washington. Limiting pollutant discharges from wastewater treatment plants seems to be a priority for many management agencies.

- ***Research the political and regulatory structure surrounding storm water management and LID implementation and find ways to improve it.*** While the engineering concerning LID and storm water management are developed and improving, a major area of concern is the regulatory structure that governs when organizations or individuals can implement such solutions. Determining what state and local regulations need to be changed, and how organizations can work to change them, will greatly aid the efforts of organizations attempting to implement these solutions to the NPS Pollution problem.

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Appendices

Appendix A: Interview Transcripts

Section 1: *Professor Seth Tuler:* Worcester Polytechnic Institute
Adjunct Assistant Professor for the IGSD 11/6/2006
Joseph Basile, Pauline Bassil, Martin Stowell

Protocols:

1. What research have you done in the past concerning watershed management, specifically in regard to the management of non-point source pollution?
2. In your opinion, can you suggest any characteristics which you have found to be common to effective management of NPSP?
3. Can you suggest any methods for determining other common characteristics?
4. (After explaining which watersheds are being studied) Can you suggest any other local watersheds which would be useful in our project?
5. What techniques do you feel would help us in the interview process, so that we can get the most of each interview we conduct?
6. Are there any contacts or sources of contacts that you can suggest for our project?

Interview:

[PB] What research have you done in the past concerning watershed management, specifically in regard to NPSP management?

[ST] My work has mainly been around the planning process. So, for instance, how is the planning process for watershed management designed? So one of the main ideas is community involvement, which is an issue. So its been, what's the role of people who live in the watershed in the planning process and decision making, as distinct from the local officials. And I've asked people what they think (about) how it should happen and,

in terms of non-point source pollution I haven't focused specifically on (it). Just about pollution in general.

[PB] Well talking about people's involvement it has to be the same for every problem, whether it's Non-point of point source pollution.

[JB] Right, so the validity of your work holds.

[ST] Right.

[JB] So, what did you find out?

[ST] Actually, can we just back up one second. The other project, we studied coastal abatement in southeastern Massachusetts where there's a lot of nitrogen runoff. The question was what information people needed to know to make decisions about how to control and mitigate the nitrogen runoff in these coastal areas. For instance, we studied what information scientists needed, and what information officials needed. Because a lot of the decisions are made at the board of health, or a level of the conservation commission, like where can you build a house, does it need a septic system or something. So the scientists wanted to build these big models, really sophisticated models, but they could only do them on high scales, and the people of the town wanted to know whether it was safe, or ok to build a house, "here," as opposed to, "here," (gestures) and what the impact would be on the bay, and scientists cant build models on that scale. So there was this kind of mismanagement between the information that the scientists were trying to provide and the goals of the decision makers.

[JB] Right, so in effect the information that the scientists were trying to provide wasn't all the useful.

[ST] It wasn't. They were trying to provide all these really complex models of these higher scale levels, big areas, and they didn't want to tell anyone about uncertainties because they thought if they told them about uncertainties they'd just get confused. And the local people said, "We want to know at the micro-scale level and we want to know all about the uncertainties so that we can make informed decisions."

[JB] What did you pull from (the other project)?

[ST] We studied watershed sin a few different areas, like New Jersey and Washington State, on the Olympic peninsula, and in Massachusetts and another in California. And we asked people what they thought would be most appropriate in the planning process. You know, should it involve local residents and what kinds of messages should be involved. Basically, the main message is that different people have different opinions about what would be fair. Some people wanted to adjust it to be based only on science, like hydrology, while others wanted the decisions to be based on local values. So there was this conflict. And fairness had to do with who should be involved. And should it be the people that live in that community, or should it be the officials like from the state? So,

what we took away from that was, when you do watershed planning, you also have to pay attention to how it happens not just why decisions are made: how you get to the outcomes, because if people don't like how you got there, they won't agree with the outcomes. So, how decisions get made is the big lesson in this.

[JB] In your opinion, can you suggest any characteristics which you have found to be common to effective management of NPSP?

[ST] In my experience, the more planners think about these questions of process up front, the more smoothly the decision making process will move forward more smoothly. I mean there can still be conflict, really intense conflict, like whether they should shut down a particular industry. Some of the rivers around this area, for instance, such as whether they should dredge or not dredge; the conflicts can become really intense, but by paying attention to who's involved and all these other process things right at the beginning.

[JB] Oh, as opposed to looking right at the outcomes and saying, "oh well you're kind of involved in this?"

[ST] We call it something, "decide announce defend," which is the way the EPA used to work. The idea is that they figure out what the decision ought to be, and then announce it, and then people would get mad, and disagree with it. They might even have really legitimate reasons, and then they'd be in a position of having to defend it. And this idea was that maybe they shouldn't decide everything before you talk to the people involved; maybe they should talk to people so they can decide.

[PB] So, basically, people's involvement is very important in the decision making process.

[ST] Yes, absolutely.

[JB] Can you suggest any methods for determining common characteristics of good NPSP management? (From EPA success stories)

Database was explained to Seth Tuler so that he understood the question.

[ST] I guess how I would start, is trying to figure out how they are defining success. That will help you think about, do you agree with how they are defining success? Because they might just do it by outcome, and are there other measures of success? And they might not have the information available for you to assess it. But you can begin to say is, "is this enough to know if it was successful? To really understand something about successful outcomes you have to know something about successful outcomes you have to know something about how they got there. So what I would look at is important questions like, were all the important parties involved? Because otherwise how would you know that the solutions meet everybody's needs? Are there other issues that were important to people that weren't about achieving a standard. Maybe they really cared about access to the

water, but the standard were only concern with contaminates. So maybe the process was successful in dealing with contamination, but it might not have been successful in addressing these other needs.

[JB] Well one of the case studies we looked at today, which had to do with dairy farmers, and how they started building roofs over their feedlots and fences near the rivers to reduce the flow of nutrients in the watershed. But it doesn't seem to say where the funding came from to build that stuff. I mean, were the farmers forced to pay for it themselves? It doesn't really say.

[ST] Yea, there's a book by a guy named Bierly. He looked at a lot of different case studies and tried to figure out what made them successful. He used five different kinds of outcomes. For instance, he used improving social capacity, so like improving the ability of people locally to control pollution and make decisions. So they were more informed, so that they didn't always have to rely on some official. And another one had to do with public health. So there were like four or five outcomes that I thought, well that generally people care about. So we looked at all of those. [Inaudible] So if this database doesn't have information for you to assess things but you can still try to see different things. Who has this database?

[JB] Oh it's the EPA.

[PB] The EPA website. It's under section 319. It's actually called success stories.

[ST] Ok so they're success stories so they tell you a lot about how they got there and why it was successful. You know, there's a... well I guess my advice is to look at what procedural things they identify as being important, and how do they measure them in terms of the outcomes they see. [Inaudible] In terms of success. Like I could sit here and tell you a bunch of events and think of lots of different procedural issues there, but actually you should look at the more intriguing stories. And then you might say that in every case study you read, they mentioned one characteristic which had to do with, early on having invited everybody from the community who cared, I'm just making this up, and that seemed to really matter in a lot of them, like 10 out of 20 of these cases. But I wouldn't be able to know that ahead of time. And then I would take those ones you were able to extract and list them. Does that kind of answer your question? I feel like I may have forgotten what the question is.

[JB] Yea that was perfect.

[PB] How many case studies do you think we should look at? I mean, I know like the more the better, but how many case studies should we look at to come up with a decent conclusion about what's important?

[JB] Right, to make it valid?

[ST] How big is the database?

[PB] Huge, It lists since the year 1997 to 2002.

[JB] Yea, there's dozens of them, the most recent year is 2002.

[ST] And so they're all about Non-point source pollution? And they're all over the country?

[PB] Yes

[ST] Well last term you were really talking just about Massachusetts, or New England.

[PB] Well we're trying to come up with a best management practices, and we think it can be anywhere in the US, so we can't really look into Massachusetts only so we have to check other states so we can come up with Best Management Practices for Massachusetts.

[JB] Right, because we're trying to figure out these common characteristics, and we're going to find the common characteristics and then we're going to figure out what Massachusetts is doing, and we're going to compare them. So if we took the common characteristics and then compared them to Massachusetts it wouldn't really make sense.

[ST] Gotcha [*sic*]. Well that's a good question, because you have to... well you can just randomly sample from it, but if you want to get a statistically valid result you'd have to analyze at least like 30. Because if you wanted to do statistical tests on these 30 cases. Right. So maybe you don't want to run these statistical tests.

[JB] Right, we are looking more into a qualitative analysis.

[ST] Ok, so you could just randomly choose, but if you could think of a way to like carve up the sample than it might be better. Like do you want to do just inland water bodies? Or coastal areas? Because you might be able to use more of the coastal ones if you wanted to.

[JB] Well because we were going to try to keep it valid for Massachusetts, but the studies would not actually be in Massachusetts, so we were going to look for similar types of watersheds to the ones in Massachusetts.

[ST] Well then I would look at ones that are of comparable size. And in terms of cities, towns, population. I know there's a distribution in Massachusetts. But then the Connecticut River is really an exception in Massachusetts. I mean it starts in New Hampshire and flows through New Hampshire to Vermont. So it's like four states. Most rivers in Massachusetts don't flow through four states. And like if you go out west, like if you look at the Mississippi River. So there's a lot of states. The way that that is managed would be, with all these different states around, would be different than if it were just in the state. So you might want to look at how they're managed between two states. Just look at those, to help you weed out some. And maybe in terms of population, especially

within local jurisdictions. And I don't know... are these all federal laws the govern non-point source pollution, or are they state?

[JB] They seem to be mostly state.

[PB] You go by state, yes. It's kind of a combination between federal and state but it really depends on the state.

[ST] So are there other states that, well there might be states that the regulations may be really different than in Massachusetts, just in terms of [Inaudible] They may be different because they way that decisions are made differently and might require different tests to be done. And if you find ones that are more like Massachusetts that would also be good.

[PB] I know that all states have to submit, every two years, a report to the EPA. So they all have to do this.

[ST] Right, but the way they do it might be different. Like in Oregon and Washington, they had a program and it's still going on where they created all these watershed councils. And so they had a really unique way of watershed management that was all about these different stakeholders being a part of this council. And if Massachusetts doesn't use this approach and they can't because the regulations are different, then you can't compare them, unless of your you're going to tell them to change the regulations. So maybe if you looked at states where the regulatory framework is more similar to Massachusetts. What I'm saying is if you can think of ways to help you reduce that database down to fewer and fewer types, then you could select the types that more strongly relate to Massachusetts. So regulatory framework, maybe the geography of the watershed, the population size, because the determines the type of stakeholders. And I think that you're truly trying to bite off something huge.

[JB] Right, that's what we're trying not to do.

[ST] Because, if you just think about, you know, like, is it appropriate that what you do for the Blackstone is the same as what you do for the Ipswich River? Would you use the same management techniques?

[JB] That's one of the things we're trying to do in selecting watersheds is that the Blackstone's representing urban, for instance.

[ST] So which watersheds are you studying?

[JB] Well we've actually had a little bit of friction with that. We're definitely doing the Blackstone...

[PB] The SuAsCo watershed.

[ST] SuAsCo? That's what they call it? Sudbury Assabet Concord?

[JB] Yea, there's an organization that calls themselves by that combination of names. So we were planning on doing that one and we're talking about looking at the Connecticut River and our advisors advised us that that would be a little too much for the project because it's such a big, diverse watershed. They suggested either taking a piece of it, like a sub watershed, or selecting a different one, maybe one closer to our location. And that was actually our next question.

[ST] Ok, well before I answer that question. So if you defined that the Blackstone counts as one river, so if you could find other examples of rivers like that in the US, maybe you could get two or three of them. Or a handful of examples. And then if you look at the SuAsCo, which might be more of a suburban, or rural kind of place, then find another few examples like that. Because that goes through some pretty pricey kinds of developments, in Concord or Lexington. There's also probably some industrial areas too. I think there's a lot of farming. So you know, how does that set of land uses, try to characterize it, and pick examples like that. A third one? So the friction was around the Connecticut?

[JB] Yes, I think just in general it seemed like we were taking a lot.

[PB] Right, they wanted us to find something more local, and easy for us to get to. And they wanted to make sure we are able to interview people. Time wise, we're only going to be working on it for about five more weeks before we start the final write up. So we want something local. And I commute anyway so I don't mind some driving.

[ST] Where do you commute from?

[PB] Uxbridge.

[ST] Uxbridge? I'm trying to think of what a good watershed is in the area, but I don't know. There something further west called the Farmington River. Well, one reason it may be interesting is because it's got a big lake. What's interesting about it is that it's been designated a national scenic river. So there's been a lot of work done on it to preserve the water quality. And so that's a Farmington river. And so that would be like an hour and a half. And there's also, see I live out west. So there's the Westfield River. But I'm also thinking of, well then there's also like the Merrimac, and that's like a big industrial thing. [Inaudible]

[MS] What about the Swift River?

[ST] Oh yes, the Swift River. That's an interesting one. And you'd have to decide whether you want to do it north of the Quabbin or south of the Quabbin. Because it won't make sense to do both. It might be managed quite differently because you have that big thing in the middle. But it's also supposed to be really heavily fished. Do you fish?

[MS] Yes, that's why I mentioned it.

[ST] Yea, so that raises a lot of questions about, well how do you manage a river like that for water quality and recreational uses? So it depends. I don't know much about it but that would be interesting. Yea try to do a smaller one. The Blackstone's big. The Concord's well, it's big but it's also got a lot of farming, you know? And it's really well connected. So there's not a lot of development.

I had this book, I was actually thinking about this. It's an atlas of all the watersheds in Massachusetts. I have no idea where I had it.

[JB] Oh we actually have something like that from online. It's called the MassGIS server. It's just like an interactive map and you can pull up different watersheds and see different properties of each one.

[ST] Yea, well the Swift sounds interesting. I guess you could work it out. Are there any other ones that you've come up with that seem interesting.

[JB] Well it's tough because we had been, just until last Tuesday, planning on studying the Connecticut. And yea, we were pretty set on it, and now we have to find another.

[ST] Yea I would pick something somewhat closer.

[JB] Ok well the next part is... we were actually going to set up our next interview with Kathleen Baskin. She's the director of water policy for the state. But I guess we're just a bit nervous, being the first off campus interview. So the question we have written down is, what techniques do you feel would help us in the interview process so that we can get the most out of each interview?

[ST] That's a good question. So reflecting on this one, I thought your question were good questions. And I think it's OK that you don't ask them exactly as they're written down. If you use them more as a conversation, then that's fine. And I think it's good that you follow up on each question. I think where you could've started more, which would have been helpful for me is if you actually talked a little more about what the project was about. Like, this is what we're trying to do therefore we're trying to find out about these characteristics we put together. So then there's a context. Are you going to ask her these same questions?

[PB]No

[ST] Yea, they'd be kinda *[sic]* different.

[JB] We still have to come up with our protocols. Professor Peet was talking about protocols and questions. And I know, well questions, that are obvious, but I'm not sure exactly what protocols refer to.

End of Recording

**Section 2: Kathleen Baskin: Executive Office of Environmental Affairs, CRWA
Massachusetts Director of Water Policy 11/13/2006
Joseph Basile, Martin Stowell, Pauline Bassil (Absent)**

Protocols:

Purpose:

The purpose of the interview with Mrs. Baskin is to establish the relationship the state of Massachusetts has with both local management agencies (be they official or grassroots) and federal agencies (the EPA).

Protocols:

An audio recording of the interview will be made. This will be confirmed with Director Baskin before the interview begins (consent has already been obtained). We will then reintroduce ourselves and our project (a brief description of the project will be sent via email on 11/7/2006). The interview will last approximately one hour. Topics which will be covered include:

- An overview of Director Baskin's position and Experience regarding her time with the Charles River Watershed Coalition and the Commonwealth of Massachusetts.
- Specific aspects of the regulatory structure in Massachusetts, and what the state is currently doing about NPSP.
- How Director Baskin's office cooperates and corresponds with the management agencies responsible for each of our watersheds.

Position and Experience

7. As Director of Water Policy for Massachusetts, what are the people of the state relying on you for?
8. What are the challenges faced by Massachusetts, specifically in regard to NPSP?
9. We understand that you have experience working with the Charles River Watershed Coalition. What has your experience with that organization taught you about the importance of interaction between the grassroots campaigns and state and federal agencies?

Regulatory Structure of Massachusetts

1. We understand that watershed organizations receive funds for implementation of NPSP strategies under section 304 of the Clean Water Act. After a watershed assessment of NPSP is complete, how long of a waiting period can be expected before the watershed can qualify for funds under section 304?
2. Would it be helpful to expedite this process?
3. What kinds of activities have been funded so far, and how effective have they been?
4. What regulations have been most effective in controlling NPSP?
5. Are there any regulations on the drawing board or waiting to be passed which could help improve NPSP management?

Cooperation with local officials

1. In your opinion, what kinds of communication are needed between your office and local stakeholders, both before and after decisions are made by your staff?
2. Does your agency organize any NPSP awareness campaigns, or is your focus more on assisting the efforts of local organizations?

Interview:

[JB] As the director of water policy in Massachusetts what are the people relying on you for?

[KB] Well they are relying on me to develop policies and insure that they are implemented that protect water quantity and water quality. For both water supply and natural systems. So it is pretty broad, I get involved with drinking water and who should have how much from what source, I am involved with storm water management, combined sewer overflows, insuring there is adequate flow in river systems for fisheries. Any thing water, a public health and public safety, and aquatic protection or natural resource protection emphasis.

[JB] Now do you focus down to specific watersheds? Do you focus on one watershed for a while and have interaction with one group of people at one time then move onto the next?

[KB] As an issue comes up I would do that, but not in a formalized manner, at this agency we don't have a rotating schedule for looking at watersheds. Other agencies under the EOEA, department of agriculture and resources, department of fish and game, department of conservation and recreation, and department of environmental protection, have rotating schedule (DEP). For a number of years eoeda did have a watershed initiative, and that assigned agency people to one program and assigned them to one watershed. So for example the blackstone river watershed had it's own agency person who would get coalitions together and develop solutions to problem they identified. But that initiative ended in 2003, since then its been where we see a need. Who ever is looking for attention or special assistance, there might be a particular permit we are helping them with or funding. It also could be a topic that affects only one certain area, like extreme low flow affects the eastern side of the state more than the western part.

[JB] Tell us about the Charles River Watershed Association, and your work with them.

[KB] I work for them for 10 years, what I did with them was help develop their technical place so they would have more informed advocacy, so for example instead of going out and saying this river is polluted, we went out and took water samples took them under different conditions, rain vs dry weather, summer, winter, looked at different sources pipes vs in river. We could actually characterize how dirty is it what is causing the problem. We looked at flow, land use, changing land use, and what the watershed association did with that technical information, it evolved into something that was more than just an education and advocacy group. It moved over to a more informed advocacy, I think the watershed association has benefited from a few things, being situated in a nice location in the commonwealth and being able to attract money and attention. They've

become the biggest watershed association in the state. Their technical aspect of their work has helped them a lot, they've become the voice for watershed associations throughout the state. So there I a task force that the state has agreed on something stormwater, combined sewer overflows, they (CRWA) will often be the ones to sit at the table to represent all other watershed associations. They have helped develop policy, regulations, and relationships with communities, citizens, businesses, state and federal agencies. I worked with a lot of people from outside the organization to help figure out solutions.

[JB] Does your agency here do any public outreach, or do you leave it up to more local organizations?

[KB] I would say on a particular project we may do some local outreach, but not on a consistent basis.

[JB] So it is not your focus?

[KB] Not as much, we would like it to be but we only have a few people here working on water policy, So when we catch wind of something a disagreement between a town and one of our agencies we might call and say 'tell us whats going on here'. There are also these things called ear marks which is basically a way for the legislature to have a say in the executive branches budget. We work under the governor but the legislature gives us the money. For example say there was a 10 million dollar budget, they would say 'ok here is 10 million dollar but we want you to do 3 million in specific work, the other 7 million do whatever you were going to do anyway.' So sometimes we pick up that money and work on project, or we just let it sit on the table and reduce our budget by that much. There is obviously a little tension back and forth, I don't know if you heard but the governor stripped out 425 million dollars from the budget, so the state agencies are saying well we will give back our ear marks. There are projects we think are worthy and we will pick them up and those will have a local focus, for example the Plymouth carver aquifer we were helping develop and action plan for aquifer and we were hosting monthly meetings at night with local officials. So there is some local outreach like that where we can do it, but we cant do it for every area in the state.

[JB] For instance if you have a water body under study like and aquifer or a lake, and you run a study on it, what Is the lag time between the study is done and implementation of clean it up?

[KB] I'd say it is a minimum of a year, because depending on how you are going to get that funded, it could even take longer, could be 5 years or never. Because it is going to rely on a local source of money, like you have to go to the town meeting and people have to vote on expanding a budget in order for the DPW director or somebody do this work. And town meetings only happen in the fall and spring, so it could take a few cycles to get the funding. On the other hand if they were able to get any government moneys it can take 6-12 months from when you send an application for a grant till you get a contract to do the work. You do the study, wait for the grant cycle which can be up to a year, then another 6-8 months before they realistically can work on the project. On the other hand if it was a developer who wanted to get the project in, and a conservation commissioner said "this thing over here is really causing a problem to our wetland a lot of non-point source run-off", and a developer who wants to build over here might say "I know I am going to cause some impact over here but I can help fix the other part to offset my

impact” and he can get it done much quicker. So it really depends on two things, one the source of the funding, and the types of permits you need to get to get the project done.

[JB] Does it take too long sometimes? Would it be helpful to speed things up?

[KB] I think in some cases yes, but I think it depends on the problem. The funding and the waiting for the funding cycle, and waiting for grants and such, takes a long time. So if there was a way to get a quicker approval or different funding mechanism that would be something that would speed things up. Some environmental review is redundant some of the permitting part, there might be some redundancies. We are looking at that in our dam removal permit streamlining effort. We have a whole bunch of different permits to remove a dam. Processes for acquiring complicated permits could be streamlined because they ask a bunch of the same questions. But jumping over steps of environmental review is a bad idea.

[JB] In terms of any regulations that your office has come up with recently, what has been the most effective?

[KB] The regulations address a particular law, so you have a law and the regulations tell somebody how they are going to comply to the law. What we do here at EOE is more of the policy stuff which is sort of the more bossiness to push agencies and others into certain areas like dam removal and other priorities. What this office does it develop directions to move in, in terms of water policy. I'd say the most effective policy to come out of here is the Massachusetts water policy which you can find on the website. It describes how to use each drop of water the most efficiently, so recognizing that some parts of the state are running out of water to drink and for fisheries. It has a statement about wastewater and storm water recharged into the ground. It looks at each sector to try and get the most use out of each drop of water. Out of that has come a lot of other work, it laid the roadwork for many initiatives in the agencies. Out of that the DEP is almost done revising its storm water management policy, to encourage and give guidance on recharging storm water. Some regulations and some policies have come out of that policy (Massachusetts Water Policy).

[JB] No that's good its almost a trickle down affect.

[KB] Yeah, right I am not the boss of anyone in any agency but our office does oversee other agencies and we can say that we should be working on something and we can help them find the funding in the budget for the work.

[JB] What is on the drawing board for policy?

[KB] Well the biggest thing right now is the administrative change, they will have their own priorities. But we want to share with them our concern for sustainable water resources, making sure everyone has enough. The state did this about 100 years ago looking at the Quabbin reservoir. We want some kind of understanding of how much water is there how much water do environmental systems need. In the science world, we do not have a good understanding of that at what point do certain population's crash. How do we best use the water available, how do the laws and policies work together, some times they do not work well together because they have competing needs. That would be a part of our sustainable water resources planning.

[JB] What kinds of communication are needed between your office and local stakeholders before and after decisions are made?

[KB] Well before hand its really good to have an idea of whats going on. And often time no one has a better idea than the ones living in the area. So its very good to go out and

understand what the issues are, what the capacity of say a town is to address a problem, what they need, and help develop a solution they will buy into. If you bring a stakeholder long through the process it cuts down on backfiring in the end, because we have had some situations where we have not done that and have had a big backlash. For example there is the water management act, which is the water withdrawal and permitting, which tells you how much water you can take and under what conditions, and there was a policy that was issued a few years ago without stakeholder involvement by the DEP and the water suppliers were really angry and that was in April of 2004 there has been a lot of back and forth disagreement. And currently the water suppliers the state and NPO's are participating on a blue ribbon panel which was set up by the legislature to help them work out their differences, two and a half years later they are still trying to fix it. So another option would be to work it out before hand. Its not always the case, maybe there are not enough state resources to go through a lengthy process to get everybody on board, there is no guarantee the outcome would be any different in this situation. Then after decisions are made, it is good because you get some feed back on how well you made your decisions is it working out? How can you apply what you learned to a future case. I think that is really important too. Especially in a permitting issuing world like DEP or department of fish and game, more than the eoia would in a state wide over arching office. If you have more process up front with stakeholders it might take longer to get to implementations but it might make the implementation process easier because everybody is on board. That could be a less painful process than just deciding a way to do it without stakeholder involvement.

End of Recording

Section 3: Emile Tayeh: Cumberland Farms

Vice President, Construction Chief of Environmental Affairs, Cumberland Farms

Cumberland Farms, Inc, 777 Dedham St., Canton, Ma 02021 11/16/2006

Pauline Bassil, Martin Stowell (Absent), Joseph Basile (Absent)

[PB] What type of responsibilities do you have and what is Cumberland Farms relying on you for?

[ET] I am in charge of all Cumberland farms environmental affairs nation wide. I am chief environmental affairs officer as well as vice president of construction and maintenance. I handle maintenance for store and station and I handle any environmental affair for the company from compliance to investigation to imitation to clean ups to mitigated measures, training ...

[PB] talking of clean- ups, we know that in your job you mostly concentrate on point – source pollution such as gas leaks .but in general did you have any problems or experience with non point source pollution (NPSP)?

[ET] Just so you understand it is hard to distinguish between point and non- point releases. Overall the non-point release is basically the day to day operation of the gas station with respect to air pollution. So, from time to time you have vapors released into the atmosphere by customers or by equipments or perhaps sometimes you have house cleanings and dealer's location where there will be drippers of gasoline and eventually it will be collected, and overtime that will be NPSP. But majority of my responsibilities deal with direct releases but we take into consideration when we design gas stations what we can do to prevent NPS from happening, for example making sure that we install positive limiting barriers around the pump island to catch any residue of contamination making sure we have the vapor assist system to make sure that we sock every vapors back as a customer is pumping gas to remove those small element of vapors making sure our delivery trucks are equipped with stage 1 vapor equipments which basically sock the vapor back from the tank instead of releasing it back to the atmosphere and become NPSP. So we do keep an eye on it when we are constructing new Gas stations through our awareness and training.

[PB] Personally have you had any experience- doesn't have to be through Cumberland farms- with managing NPSP?

[ET] When you try to talk about NPSP, in my experience being a civil engineer, civil cite engineer. I have the experience with respect to NPS such as when we design any large development we have to make sure that we don't have any salt on the roads, trying to use more natural products instead of chemical so we can protect the watershed district. In high watershed district we try to come up with a design that helps protect the watershed. Watershed areas have been designated by the state of Massachusetts (MA) and they have been very firm in trying to protect these watersheds from NPS i.e. salt, chemicals perchloroethylene, trichloethylene and components from dry cleaners and

home usages. In my experience I was working with Dr. Pete Fletcher of the MA soil and ground water committee, trying to give awareness to home owners and households, since in NPS you get to attack all areas of possibilities i.e. households, businesses, stations... you want to make a combination efforts to make sure that everybody do their part so we can eliminate or at least minimize any impact on the watershed areas, i.e. in household you have to make sure they don't dump for example cooking oil into the sink which eventually go in the septic system which reach to the ground and overtime will become NPSP.

[PB] So, you are saying raising public awareness is very important in reducing NPSP.

[ET] It is a combination of several efforts every section of the society need to do there part. Regulators need to come up with the proper and practical regulations and cost effective regulations. For say if they came up with tougher regulations and very costly then you won't have compliance from the public. So, the regulators have to be creative in coming up with proper regulations that helps home owners or customers or business or the public to comply. The second part will be consumers, who need to have proper awareness and tools to do the job. So if every segment of the society does their part then we will be helping in minimizing if not eliminating NPS. For examples, on customers at gas station we felt that the most NPS is by the customers dripping gasoline to the side of the car and drippers can come in right on the pavement or concrete near the pump island and when the rain comes in it washes it away and accumulate run offs over time . So we designed an easy customer friendly nuzzle, which have a vapor assist that is easier to deal with and customers are more comfortable using it and it still collect vapors and minimize pollution. We also built proper concrete pad we put limiting barriers on the edge of the concrete so if drippers occur an run off has to come in it will be collected in that grooves at the edge of the concrete pad. And from time to time we clean that and remove it. So it has to be a combination of several efforts awareness for the public, businesses, operators, regulators, industry itself and it is a combination of all these segments.

[PB] Just to summarize what you just said, in you opinion the collaborative approach is the best technique to reduce NPS. In another word everybody has to work with each other in order to reduce NPS.

[ET] Right, you get the regulators, who institute the regulations and you have the operators, who implement the regulations and then you have the customers (recipients) who are using the equipments and services, and then you get the industry that is manufacturing the equipments. All of them have to do a collaborative effort to achieve this objective. It can't be done with one without the others.

[ET] Some businesses think that the best approach is to do the minimum and unless they got caught, they will do the work and that is wrong. We actually have been taken the initiative to invest upfront. People say why do you invest upfront you don't have to do it. However we do it because it become like insurance for us for the future. It will minimize our liability for the future. So, we have implemented best management practices (BMPs) whether at our terminal, station and even our plant here. For example, I handle all

environmental affairs at Cumberland farms and that doesn't mean I only handle gas stations and hydrocarbon issues only at the station level we have terminals which needs to have BMPs, we also need BMPs at our plants where we use acids. So we found a way to recycle acids back and we do cleaning for the equipments ... being in the milk or ice cream business we get to have the proper equipments and the proper BMPs to eliminate and if not to minimize pollution.

[PB] Do you have any personal suggestions for the improvements of NPSP management techniques?

[ET] I think what is mostly likely to work in our society is setting up conferences. I know we rely on each other to come up with the idea instead of focusing on having a corporative meeting to come up with a solution. So one of my recommendations will be that government and businesses as well as industries and consultants and experts need to get together and come up with lists of pros and cons and see what works and what doesn't. At the end we don't have a perfect system right now and everybody is looking for the perfect system which is perfect regulations, perfect equipments so we have to make sure that we do all of that in conjunction with all factors of life such as economy, because at the end of the day cost of certain compliance is important. We need to do more discussions, studies and conferences so we can come up with the proper requirements and we aren't not doing as much of that right now. My group and I are working with the state of New Hampshire trying to do studies on the impact of MTBE from vapors condensing back into the ground and becoming NPSP. So we have done studies to work with the state of New Hampshire and other industries trying to prove that vapor MTBE condensed in its recycling back and polluting back our ground water. So we put a study together and we found that yes it does and now we have enough data to give to the industry to come up with better equipments so if vapors needs to be condensed back and released back into the ground water we can eliminate that. So this is a good example how businesses, industry, customers and regulators get together to do a study and the result of that study is going to help us minimize non- point source pollution. So that is one of my suggestions more corporative efforts like the program we have with the state of New Hampshire. More conferences and bringing everybody together not just the regulators making decisions without the others it has to be a combination of all aspects of society.

[PB] we already talked about New Hampshire, but what about Massachusetts? Do you have any type of interactions with local or state officials?

[ET] In Massachusetts, I believe the only time we worked with the state of MA was about the simple cause of on site septic system to come up with better requirements for title 5, meaning the state of MA has homes. And homes need to have a source of waste water disposals so either are on sewer which is basically a collective system that collects waste water from homes and sends it to waste water treatments. And the waste water treatment plants will clean the water and recycle it back. But there is a lot of community that do not have waste treatments and have simply the old common system called the on site septic

system meaning all the human disposal waste are discharged into the septic system and then reach back into the ground water.

[PB] can you give us some examples of some of the communities that have this problem?

[ET] Many communities especially in the suburb, south east MA, Cape Cod have on site septic system. Some of those septic systems may have failed, the state of MA in conjunction with the public have come up with what we call title 5 inspection and they provide a lot of programs on how to upgrade the septic programs by providing funds and assistance. In the past, the problem that was impacting watersheds in MA use to be all the nitrate and chlorinated substances coming from homes. Now by having this title 5 that is almost getting revised every year, title 5 is one classic example of mitigated measures that the state along with the communities and public worked together to come up with rules to eliminate the NPS coming from homes, and that helped tremendously by encouraging home owners to upgrade their septic systems. For example, right now no home owners can sell their houses without having their septic system checked. So little by little we are going to come to the point where we don't have failed septic systems anymore near rivers, ponds or watersheds districts. So that was one example in Massachusetts that worked and I hope we have more of that.

[PB] you already said that it is very important to work together as public, engineers, and officials to come up with a solution, but what kind of communications are needed between engineering teams and stakeholders and how important is the participation of the local residents in the decision making process?

[ET] Let me give you a couple of examples on that, going back to the issue of septic systems since it is an easy NPS issue that we can use as an example. Septic systems depend on the soil, you have to make sure that the type of soil you have on the ground is going to lead to whether you have the proper design or not. We use to believe that having well sand will allow the water to move faster in the course of materials. Now engineers told regulators that they shouldn't want the water to go faster because sometimes going too fast doesn't purify the water before it gets to the ground water. So engineering community have come up to the regulators and told them that yes you want some good courses of sand but we have to make sure that we have a good layer that eventually prevents the water from arriving their faster. So we came up with a design to keep the separation between ground water elevation and true bottom of septic systems. So if you have a course of sand you want a bigger separation, if you have a medium course of sand you don't need as much separation between the bottom of the septic system and the ground water. Every aspect of society whether it is the professionals, the community, the public, the regulators you can't have one without the others, it has to be a complete puzzle, because if you brought in the regulators, the public, the community and did not bring any industry that designs and builds, then these folks may design something, come up with an argument for a better design without understanding the cost of it, and if the cost became so huge then the public can't comply. So what we want is the best solution, in the most efficient costly solution to fix. So I can come up a solution, don't build but that is not a solution because now you are preventing developers from building their

homes. So you need to make sure that every aspect of society is involved including the professionals and the scholars.

[PB] do you think that the state of Massachusetts is providing enough grants and funds to reduce NPSP? Because in our opinion the more funding you have the faster and easier it is to reduce NPSP.

[ET] We tried with gas stations, and we should now expand on that in different areas. For example the state of MA was one of the leaders among many states to give incentives for operators and owners of gas stations to clean their properties and to mitigate their measures. So they said ok we are going to let the public share your cost if you are in compliance. You build the proper stations, you remain in compliance, you train your staff, and you make sure that the staff is aware that the environment is important; you make sure that the equipments are inspected daily and weekly. By doing all that then you helped with NPS, in return we will give you incentive if you had this big release and you have done everything by the book, and you just happen to have an accident we will pay for you and we will reimburse you all your cost even if it is hundreds of thousands of dollars. So the state MA created the 21J program. The chapter 21J is a fully reimbursement program, meaning if I am an operator and owner of underground tanks that have been in compliance and I have a certificate of compliance (COC) and if I do everything by the book and God forbid I have an incident, the cost of that incident once I spend it in compliance with the laws I can submit that cost to the state and the state will reimburse me. So that gave me incentive to remain in compliance and minimize NPS. So that helped, and help everybody not just Cumberland farms to take advantage of that program and actually helped mitigate against NPSP from gas stations. I think that the state of Florida has done that for dry cleaners and Massachusetts hasn't done that yet. So in Massachusetts they can do it now, they can go from gas stations because that was the biggest NPS, so now they should expand that to dry cleaners, and to home owners with fuel oil tanks as they did in Connecticut. So yes the state of Massachusetts can do more, I think they are on their way but they haven't yet achieved. They should implement a program for home owners on heating oil tanks and that is another area that may impact the watershed protection areas and the water supplies, they should have programs for dry cleaners and on site septic systems by giving grants for home owners. They have done some for on site septic systems but not as much as I like it to be.

[PB] what do they do in the state of Florida to prevent NPSP from dry cleaners?

[ET] In Florida they have a similar program like the one for gas stations. For example, if you have a dry cleaner and you have contained your waste perchlorate ethylene and trichloroethylene and you are doing everything by the book. Somehow you have a release of perchlorate ethylene contamination, and then the state of Florida will allow that owner or that responsible part to be covered by the remediation so the state will pay them what they spend on cleaning ups. So that gives dry cleaner owners incentives to be in compliance with the law, and therefore minimize cost eventually. So that program in Florida is working and we should do it in Massachusetts. The program in Connecticut with respect to home heating oil is working too; we should have it in Massachusetts, the

on site septic system is working in California we should have more of it in Massachusetts by providing grants or at least some incentive so home owners will feel that they should clean and upgrade their septic system since the state is giving them grants to do so.

[PB] since there is 27 watersheds in Massachusetts and because we don't have enough time to study all of them we decided to study only 3 of them and compare them to a set of BMPs. The watersheds we chose are the Blackstone River, the Concord River, and the Charles River. Do you have any idea on how these watersheds are being managed?

[ET] You chose very tough and complicated watershed areas. For example, the Charles River is a very complicated watershed. The bigger the watershed is the more complex the NPS becomes. We can be talking about homes, on site septic systems, dry cleaners, industrial projects discharges. Your best bet is to try to first analyze what is within that watershed district from industries, businesses, operator... try to break it down, in order to understand what you are dealing with. And then you have to find out in those industries what the regulators have implemented from rules and mitigated measures to prevent those industries from polluting these watersheds. And then you can go back and figure out what is the current status of the Charles River watershed right now, at the end of the day what do we have for concentration? What is the biggest pollutant in the river? So that way you can figure out which industry is complying and which isn't. For example if you find out that in the river you have hydro- carbon that means that gas station industry isn't complying ...and this way you can pin point which industry isn't complying and where do you need more work to be done.

[PB] I think that is a great idea.

End of Recording

Section 4: *Therese Beaudoin*: MassDEP

Watershed Coordinator

Department of Environmental Protection, Central Regional Office

627 Main St., Worcester, Ma 01608 11/20/2007

Joseph Basile, Pauline Bassil, Martin Stowell

Protocols:

Purpose:

The purpose of this interview is to establish what the MassDEP office in Worcester does for the state, how they interact with different levels of management, and what challenges are being faced by the state in regard to NPSP.

Position and Experience

1. What types of responsibilities do you have and what is the DEP relying on your office for?
2. In general, what experience have you had with watershed management, particularly in regard to NPSP?
3. What pollutants do you see as most damaging and in the most need of control, specifically within Massachusetts?
4. Which management strategies which have been implemented do you feel have been most effective in controlling NPSP and why?

Management Structure of Massachusetts

1. Do you feel that it is more effective to prevent problems from NPSP than to treat problems which have come up?
2. What does the MassDEP do to encourage stakeholders to prevent problems from NPSP and how effective are those efforts?
3. How does your office interact with national organizations, namely the EPA?
4. We understand that watershed management organizations can qualify for funding under section 319 of the clean water act. After an assessment of water bodies are completed, how long of a waiting period can be expected before funds are received under section 319?
5. Would it be helpful to expedite this process?
6. Are there any regulations waiting to be passed which could help improve the management of NPSP?

Cooperation with Grassroots Organizations

1. In your opinion, what kinds of communication are needed between your office and local stakeholders, both before and after decisions are made by your staff?
2. Does your agency organize any NPSP awareness campaigns, or is your focus more on assisting the efforts of local organizations?

3. How frequently does your office cooperate with the grassroots organizations in the watersheds that we have selected for study?

Interview:

[TB] Well I'll jump right in, I am a watershed coordinator, which is a position that's created for the regional offices, Worcester is one of our four regional offices and between them we cover the state. I have a variety of responsibilities including a water quality monitoring program and we sample 29 stations located at strategic places on 6 of our watersheds in central Massachusetts. So specifically that will hit the Blackstone, which I understand you guys are interested in, we don't sample the Connecticut, or I don't personally sample the Connecticut, someone else in the department has. The Nashua, Suasco, Millers, Chicopee, and the French and Quinebaug watersheds. We sample these basins every other month, and incidentally we collect both wet and dry weather conditions. So we do have stormwater quality data from all these places. We started sampling some in '98 the French and Quinebaug in '99 and the remaining three in 2000. So at this point we have anywhere between eight to nine years of data. We are in the process of generating reports for our data. We do not have a lot of the data available but that is an internal issue. In addition to the monitoring responsibilities I also work with our monitoring arm of the department which is the division of Watershed Management, they are responsible for the more typical monitoring that the state does, on a rotating five year basis they look at the 27 watersheds in Massachusetts in a more concentrated format. They sample more stations once every five years. That's a little misleading, they sample four to five watersheds every five years. So this year I think we are in the purple basins, which for us includes the Charles River basin. What they do is, they sample from typically April through October for water quality, they'll go out once a month and collect bacteria data, nutrient quality data, temperature, pH, as well as your conventional pollutants, total alkalinity, chlorides, hardness, turbidity. They will do that once a month for five or six months. And they sample at anywhere say from 20 to 40 for example. What they will do is look at impacted areas on these rivers. Specifically they will try to bracket known point sources of discharge so they will be able to say what the water quality is above and below any given waste treatment plant. As well as a number of other stations, but the treatment plants are integral to their monitoring program because that data I used to determine if the waste water treatment plant effluent discharge permit need to be upgraded and become more strict. Then use the data to also evaluate how the existing limits are. So the program of the central regional office that I do is unique amongst the rest of the regional offices, the other regional offices recently hired people such as myself but they particularly look at bacteria force tracking, which is quite a bit different, we do not sample bacteria at all. So they're looking for places of discharges of fecal coliform bacteria during dry weather for the most part to pinpoint sources that shouldn't be there.

[PB] How come it is different? Why is it different?

[TB] Back in 1995 I believe before I started, the state adopted the watershed initiative and that was to have teams of people that would look at individual watersheds, and we had 20 of these groups. What they would do is gather expertise from federal, state, and

local agencies, non profit organizations, citizens. Gather all of the expertise and resources on the table and try to determine what problems are and solutions to solve them, and at that point the department thought it would be great to have a pilot program within DEP setup on a watershed level. So what they did was they took the Worcester regional office and split it up into the basin east, which was for us part of the Merrimac, part of the Charles, and our part of the Assabet watershed. Basin central was the Blackstone and the Nashua, Basin west was the French/Quinebaug, Millers, Chicopee. My position and my colleague position Warren Kimball were created specifically to coordinate things better within the department. But it was purely setup as a pilot program for the central office to see how it would work. There was some resource issues, and eventually that approach was disbanded shall we say. We no longer really function in that way. Work is dealt out on a different level now instead of a watershed level. Mostly due to resource shortages. Warren and I are still in place from those days, but it is working well we still have contact with the remaining team people even though the teams are not together. As well as internally, there can be issues where one hand doesn't know what the other hand is doing, and its not specific to here it happens every where, there are so many people so many programs no one really has a good idea of what everyone else is really doing, there is need to have a person to cross over these hidden boundaries. So Warren and myself have come from DWM the typical monitoring arm, they have very different programs down there. Their focus is the entire state where as the regional office just focuses on just the central region of Massachusetts. But Warren and I have worked in DWM in the past so we know people individually we know what the programs are, so it is a good interface. We have a much better utilization of DWM resources.

[JB] To fill you in a bit the final set of watersheds we are going to be studying, the Blackstone, SUASCO, and the Charles. How does non point source pollution fit into all of this, what do you deal with specifically concerning that?

[TB] In the Blackstone which is the one I am the most familiar with, out of these three. Storm water run-off from the city of Worcester has a huge impact on water quality of the river. Bear in mind that the Blackstone is impaired at its headwater, regardless of the city there is the huge municipal discharge from the upper Blackstone water pollution abatement district, which is a huge waste water treatment plant for Worcester and some smaller towns like Millbury. And what you find is that in a good day the water in the Blackstone is anywhere from 40-90 percent waste water treatment plant effluent. Son on a good day when the river is running high it is 40 percent, but in the summer when it hasn't rained in a couple of weeks it is 90 percent. So it is what you call an effluent dominated river. Having said that and bearing in mind the implications of its being an effluent. The water quality in the Blackstone is an order of magnitude worse after its been raining, which means the non point sources are much more impacting the water than the point sources by an order of magnitude. So that is pretty significant. What is going on right now? Unique to the city of Worcester is a CSO abatement project. CSO being combined sewer overflows. What happens in the CSO area is that it is brought to a CSO treatment facility in the southern part of the city and it is treated to get gross pollution out, debris, leaves, trash whatever else is in there. Then it goes into settling chambers and whatever is in there settles to the bottom, it goes through a chlorination process to kill off

whatever bacteria is in there. Then it is released back to Mill brook with a level of treatment that you would not find in other areas. In a small storm or a longer storm with a smaller amount of rain water, the excess now goes to the upper Blackstone so the stormwater is treated as sewer water, which isn't really effective it is overkill. The CSO facility bridges the gap between releasing raw sewage and treating it all. Which is unique Worcester I one of the only cities to have a facility like this. They have a discharge permit and they regulate it and etc. Where was I going with that? Ok, so the city has the CSO treatment plant, we have a sampling station that is located in Worcester above where the upper blackstone discharge comes in, so its above and municipal waste water treatment discharges so what you see there is basically whatever run-off comes out of the city and whatever discharge you get from the CSO treatment plant, which isn't all that much. And the bottom there is full of algae, nasty brown disgusting algae, it doesn't look pretty it doesn't smell pretty. There are obvious problems with flow there because when the run-off comes off the city streets, it comes off so quickly that it just shoots right through the stream beds and does a lot of scouring. It's not necessarily the best habitat.

[JB] Pulls up sediment instantly right?

[TB] Right, and it washes off all the sand from city streets, like right across the street from you guys, Salisbury pond. We were out there in '99, because there is a group in the city, the Mill Brook task force, that was looking at Salisbury pond. Which is the only above ground part of Mill Brook, the rest of it is underground and culverted. We went out there, right in the middle of the pond, we were up there to canoe, there was so much road sand built up I could get out of the canoe and walk around in my knee boots and not have the water go over the top of the foot part of the boot. So we predicted that in another five years or so it would be above the water level. An island of sand.

[JB] I have actually noticed that all the storm drains on the street have the signs on them that it drains to Salisbury pond.

[TB] That was a effort on part of the city to enlighten people to not just dump there. Yup and the city is doing an increased amount of street sweeping to get the sand up off of the roads before the major storms come in the spring. So they wait basically for the snowy season to be over and then they go out and sweep up as much sand as they can retrieve.

[JB] Has dredging been considered for that pond?

[TB] Not yet. The problem with Salisbury is that there is still a lot of inputs coming in from the upstream watersheds. So until you put a stop to that it is just going to keep on washing in. So no one would fund a dredging project knowing that there are inputs still coming in. So what has happened is that the city got a grant to, they were originally build a sediment forebay. The bulk of the sand that comes into the pond from where you guys can see it standing on shore comes from 290 and 190 and the state roads in the north of the city, it washes down through these underground pipes. It hits Salisbury pond and slows down, all of the sand falls right there. So what the city was going to do was build a sediment forebay, so during stormwater events the water would be channeled through the

forebay. The water would slow down and the sediments would fall out, in this container as it were, and when it fills up the city can go in with a clam shell dredge and take all that road sand out. What they did was, it took them so much money to design the structure they did not have enough money leftover to build it. So that is going to another phase, but what they did have the money to do was, there are these engineering units called vortex separators, you guys familiar with those? You will hear it a lot with stormwater. What they do is, when it starts to rain, they are in a pipe underground, water flows into it and they spin and centrifuge out all of the sand and heavier particles to other chambers, and the cleaner water flows straight through to the pond to where it was going to go anyway. They were able to put in two of these units across from WPI on Salisbury street. You wont notice anything there except they just reseeded the lawn and there are six man hole covers there so they can access the separators and dredge out the sand. So that's what they were able to do, to address the stormwater coming in from the park ave Salisbury street side of the pond. Where as the bulk of the sand is coming from the northern part. So that's yet to be determined with what they are going to do with that.

[JB] That's actually interesting a lot of our background research had a lot to do with the forebays, especially when we were trying to relate it to this watershed. You see them used in a lot of successful stories around.

[TB] Have you talked to anyone at the city yet?

[Group] no

[TB] I'll give you the name of someone over there to contact, Joe Buckley. He's in the sewer operations group. But Joe is very instrumental in getting the city to address their stormwater discharge permit. He knows the city underground like the back of his hand, he is amazing. But he knows everything about what the city is doing in terms of managing stormwater and how well they are doing and what problem areas there are. He was very instrumental in helping the mill brook taskforce get a handle on how things are and where things are.

[JB] What actual pollutants are there in this watershed?

[TB] Besides the gross particles, phosphorus is a big problem. Phosphorus will attach itself to smaller particles it'll attach itself to sand. It comes from fecal material, animal waste, people waste, people fertilizing their lawns. Phosphorus is the limiting nutrient in surface waters. Which means that any additional source will tip the balance to over fertilization. Where as nitrogen is not a problem there is plenty of nitrogen in the air, it is kept in equilibrium. Phosphorus that's the problem in freshwater, it is the opposite in saltwater. Phosphorus is our big problem, so what you find where there is over eutrophication. Have you heard that term?

[MS] Yes.

[TB] Where there is an over abundance of nutrients in freshwaters, the nutrient is phosphorus. So controlling the phosphorus input is a real problem, there is some amount of outreach that could be effective because to some extent it comes from peoples activities. There are some very graphic EPA fliers for example, 'your not just fertilizing your lawn' there is a picture of a guy with a lawn mower stand on a lake. They are very graphic but very true. So one of the things that the department does, the division of watershed management, they take all the science that we have and put it in various reports. Some of them are status reports, water quality assessments we have those. We have those for all of the watersheds you are looking for, I think we have extra copies and if not they are on the web. We are also writing things call TMDL's reports, what they are meant to do is to take a water body, we'll use Salisbury pond to continue with that [inaudible], there is a TMDL written for Salisbury pond, and it addresses the problems we know are there, and how we can minimize those problems. Work with what we have and, identify what needs to be reduced. From the basis on how much water is in there and how much pollution the water body can take. What happens is the department will write a TMDL for any given pollutant, I do believe there is one for phosphorus as well as bacteria for Salisbury pond. It will say here is the water, here is the water body, here are the characteristics of the upstream watershed, here is what can be done to minimize what problems we have. So for example with Salisbury pond one of the problems identified was all of the sand getting in and all of the nutrients getting in with it. Here is what needs to be done to minimize the sand coming out, and one of those was the increased street sweeping, another one was the forebay, things like that. So the phosphorus is going to be the key one to find in surface waters. What else do we have? Chlorides you know with road salts, we get a pulse of that in the spring. That can be problematic as well.

[JB] Oh right once all of the spring rains come and wash it off the roads.

[TB] Right, it changes the characteristics of the water body, and it can really throw off fish and invertebrates.

[PB] Going back to the public outreach, do you think that if you did more activities with the public, like you were talking about the pictures on the website, but to be honest, I had never been to the EPA website until this project.

[TB] Im sure that is true for your average person as well.

[PB] Exactly, so do you think if the DEP did more with public outreach, this will well? Because I think people are getting more concerned with the environment, especially with global warming. If they put those pictures from the EPA website in a newspaper do you think this would help?

[TB] What we found is that the Worcester paper, the Telegram and Gazette, told us they would publish whatever articles people wanted to write on the environment. But I think only two articles were written. I don't know if the department does much outreach, there used to be outreach associated with the watershed teams. The local groups are great with watershed outreach, in the Blackstone there is, Blackstone Headwaters Coalition,

Blackstone Watershed Association, and in Rhode Island there is the Blackstone Watershed Council. They're gearing up to do more outreach, because when the water quality is ten times worse under stormwater conditions that's where we guide them to work on that. But to answer your question, one of the outreaches was for the city to paint those 'do not dump' signs on the storm drains. That was a big project, but there is more effort to educate children in school systems so we are bringing up a generation of children who know a lot more than I did in my youth. So that's where people are going now. But as far as reaching Joe Q public, I have no idea what's being done to address your average citizen. The information is available its just a matter of trying to reach someone when they are confronted with 100 channels of television, and so many books to read, how do you grab peoples attention, its definitely not my area of expertise.

[JB] Which management strategies that have been implemented are the most effective?

[TB] Well as I mentioned before we have the TMDL studies, what they do is they identify the sources of pollution and what entities are best suited to deal with that particular problem. So back to our Salisbury pond problem, we have Mass highway is responsible for 190 and 290, rt 9, rt 70 etc. They have agreed to step up their street sweeping program, we've had limited results with that. The city on the other hand has gone the other direction, and they are fabulous. If you go out in April the city has done a great job in their street sweeping. They have done a bang up job on keeping up with their end of things. I've been really impressed with them. Some times its parking lot management for larger companies, something like that we also need to do their storm drain catch basin clean out. What you will notice if you look in the catch basins you can see if the sand is up to the top or not. It will tell you how well the city or whoever is responsible for cleaning out the basins, because if it is full it will just over flow and go to the next one, so its not doing any good.

[JB] So as far as private companies taking care of they drain

[TB] Norton Company, for example is in the upper watershed. They are a huge property owner in the area above Salisbury pond. So they have been instrumental in working with the Mill Brook Task Force to address what is going on in their property as well.

[JB] Would you consider any sort of incentive program for companies to keep their catch basin clear?

[TB] Does the department consider incentive programs?

[JB] I don't know, I know we have decentive programs. I think we excel at the decentive programs, the regulatory community. Where we regulate non-point source is mostly from site run-off from site development, construction activities. If they are potentially going have run-off going to a water body usually adjacent, then they have to get a permit to do it, and part of the permit they have very specific conditions that have to be met to minimize and eliminate run-off coming from their property. Where that falls apart is for example, there is a place over in Hopedale, where someone was building a house on a

steep hill side. But they weren't on the water body they were on the other side of the street. But they lost control of their site, and the run-off pulled a lot of sand and silt off that property across the road, over some ones lawn, and into the river behind that persons lawn. So that is a little tougher to regulate. But that is our program that most regulates stormwater, stormwater run-off on a department level. The EPA has their own programs as well.

[JB] Is it more effective to prevent it (non-point source pollution) than to deal with it after it is a problem? That's what you were getting at, to prevent it in the construction phase as opposed to waiting for it to already be a problem

[TB] That's specific to construction activities where you have opened up a site, that's great when you have the site open because it's only going to open for a specific amount of time. There are specific things you can do to keep the run-off on the site. Once the site is under control, you planted your seeds and put the stone wall in. Then you're all set. But then you come up to the city of Worcester, we have all together different non-point source problem here. There is still some construction related activities that result in stormwater problems here in the city with run-off of sediments and silt in particular. You can tell when there is a silt problem because the water looks like café latte, wrong color, you can't see below the surface. But with the city there are all together different problems, you have run-off from all the impervious surfaces. From the roof tops where birds were pooping, from the parking lots and the trash people throw out on the ground. I was out on Salisbury pond in November I think in '99 or 2000 working with WPI students, and they were doing a project looking at the nature of the sediments in the pond. This is when they confirmed that it actually is road sand that is in there. What we found is that we had run up against the gun, we had to go out and get our samples but the pond was partially frozen, but what had happened is. Salisbury pond looks like this, kinda shaped like a kidney. [draws a map]. And it goes like this. Where is the northern inlet, comes down like this, there is an island right here, and there is a marsh right here, this is where wanted to put in the forebay, they had to put up some sort of [inaudible]. But to get back to my example, here is where the huge road sand pile is. The water flows down here and down here. What we found is that there is a big area that was frozen like right there. All of the trash and debris that got flushed out of the storm drains from the upper apart of the city ended up dammed up against this ice wedge, and it was full of cigarette butts, dunkin donuts cups, and mostly that's what it was, a few candy bar wrappers. But that's in there as well, a more aggressive liter campaign could only help. If we could get people to stop smoking and throwing their cigarette butts out the window and put them in their ash tray. Cigarette butts do not biodegrade very quickly. But that was just incredible to see that because we had just happened to be out there right after the first flush of a rain storm. I couldn't believe it.

[JB] There was one of the case studies we looked at that actually used a trash rack on the inlet to the water body.

[TB] Oh that's sad.

[JB] It seemed like a last resort type option, if it got that bad would you consider that an option.

[TB] Yes, but that the department would not do it, it would be the city of Worcester in this case. But I do believe that they do have a trash rack built in at the head of the forebay. They already have a forebay designed it is just a matter of coming up with the funding to build it and maintain. So once they do that we can try to raise the millions of dollars to dredge the pond. The case with Salisbury pond is that it has a deep peat bottom. The Navy tried to dredge it in the 70's and they sunk a bulldozer in the peat bottom. So then they tried to send a second bulldozer to drag the first one out but that one sunk as well. Finally they got really heavy equipment bigger than bulldozers and dragged both the bulldozers out. It is not going to be easy to dredge.

[JB] How do you interact with the state and the federal level?

[TB] We are the state, and the DEP is the main regulatory arm for the state. Massachusetts is not a delegated state which means that we administer EPA programs jointly with the EPA. Down to our south Rhode Island is a delegated state, at some point they demonstrated to the EPA that they can enforce EPA rules on their own. Massachusetts chose not to do that, having said that we work hand in hand with the EPA on EPA programs, for example the clean water act. The EPA administers that, we work with them, they fund us to do that. So what happens is we have people who are paid by federal funds to administer the NPDES program, national pollution discharge elimination system, are you guys familiar with that?

[PB] Kind of.

[TB] Its one of our biggest regulatory tools to address discharges to surface waters. The point of it is to eliminate pollutant discharges and you can run into problems with that, which is a very new thing. Im sure no body fore saw it when they wrote the regulations. For example there is a large power plant just over the boarder in Rhode Island, that's uses water in its cooling towers to cool down the power plant, in a heat exchange process.

[JB] Ocean State Power?

[TB] Yes.

[JB] That's in my town.

[TB] You can either use water or air to cool off your processes. But air is less efficient from a power loss stand point, so it robs your bottom line. So people who build power plants would prefer to go with the water route because its cheaper and it cuts into their profits a lot less, but you have to have a large supply of water. Several summers Ocean State Power did not have enough water in the Blackstone river, they have a permit to withdraw water from the river and pipe it ten miles west to cool their power plants. But there are certain caveats when the Blackstone river gets to a certain points they do not

have that right anymore. What they were doing was going upstream, buying water from water companies who had extra water under their permits that they were not using, and trucking it down to Ocean State Power. So they were able to keep doing business. In the Charles River I worked in a program when I worked in environmental consulting and there is a loop hole in the water management act, which allows this use specifically. The water management act regulates those who use more than 100,000 gallons a day. These power plants with wet cooling towers use more than 100,000 gallons a day, so they would fall into the act. What the loop hole allows them to do is if there is a near by waste water discharge they can use the effluent from that in their cooling towers. Which sounds good from the pollution discharge elimination point of view, but what happens in this case the water from the effluent went through a highly technical treatment, and the water in the effluent, particularly in wet weather conditions was cleaner than the water in the river. So the Charles River watershed environmental groups went up in arms, because they wanted the effluent in the water because it diluted the polluted water in the river. It can be seen as a creative reuse of effluent or it can be seen as robbing the waters kind of thing.

[PB] How did they solve this problem with the Charles River?

[TB] Well at the time the power plant was allowed to be built, they had to put a sensor in the river and when the river got below a certain point they no longer were able to take water out of the river. They had to instead buy water from the local water company. In that particular case of the effluent they took from the river, they run it through their processors and they discharge 20% of it back, which just means it's a lot more concentrated. So the treatment plant would treat it again. Part of the permit that the power plant got required them to collect monitoring data on the aquatic communities in the Charles River.

[PB] Do they pay the state to take the water?

[TB] No, I do not believe there is a payment involved. They have to pay the state for a permit, but they do not pay for the water per say. They would be paying the owner for the effluent so in this case it was the Milford waster water treatment plant.

End of Recording

Section 5: Jane Peirce: MassDEP

S. 319 Program Coordinator

Department of Environmental Protection, Central Regional Office

627 Main St., Worcester, Ma 01608 11/28/2006

Joseph Basile, Pauline Bassil, Martin Stowell (Absent)

Protocols:

Purpose:

The purpose of this interview is to elaborate on our previous interview with Therese Beaudoin and find out what the MassDEP office in Worcester does for the state, specifically in regard to the grants program. It is hoped that this interview will shed light on each of the three watersheds under study.

Position and Experience

5. What types of responsibilities do you have and what is the DEP relying on your office for?
6. In general, what experience have you had with watershed management, particularly in regard to NPSP?
7. What pollutants do you see as most damaging and in the most need of control, specifically within Massachusetts?

Management Structure of Massachusetts

7. Do you feel that it is more effective to prevent problems from NPSP than to treat problems which have come up?
8. Does the MassDEP ever supply grant money for public outreach to encourage stakeholders to prevent problems from NPSP and, if so, how effective are those efforts? If not, do you feel that it would be a feasible option?
9. How does your office interact with national organizations, namely the EPA?
10. We understand that watershed management organizations can qualify for funding under section 319 of the clean water act. After an assessment of water bodies are completed, how long of a waiting period can be expected before funds are received under section 319?
11. Would it be helpful to expedite this process?

Cooperation with Grassroots Organizations

4. In your opinion, what kinds of communication are needed between your office and local stakeholders, both before and after decisions are made by your staff?
5. How frequently does your office cooperate with the grassroots organizations in the watersheds that we have selected for study?

Interview:

[JB] What responsibilities do you have? And what is the DEP relying on you for?

[JP] This office is the central region office for Massachusetts Department of the Environmental Protection. Also within this building is the division of the watershed management. The state wide division of watershed management does water quality monitoring and assessment work they maintain the 303 d list of impaired water, basically they report on the status of water quality state wide, so that is the state wide function. I actually work for the division of municipal services. The state revolving fund comes out of the office located in Boston and that is megabucks for infrastructure for water and sewer projects, but here we have the watershed project program, my section. I have colleagues who also manage grants programs that sometimes intersect with non point source (NPS) work. We do water loss prevention grants. There is another program called 604 b, competitive grant program, that is for monitoring assessment work also related to NPS, but the biggest source of money in the state, aside from the state revolving fund, that focus on implementing NPS projects is the 319 NPS program and that is one that I am a coordinator for. So within this office in Worcester we have a section chief for watershed projects, I report to him the 604 b. So I don't do things with autonomy, no state employee ever does things autonomously. So a lot of the stuff I do, I work with my section chief. So I run this big grant program. So what DEP is relying on my office to do is a variety of things, but my core function is to solicit proposals for implementation work that will improve water quality and to facilitate selection of good proposals, and then write the contract and act as a project officer for that work as it goes on and then see that the project is wrapped up and that we got the product we were looking for, but then I generate the report and then I send it to the EPA, so a lot of interaction due relates to EPA because they are also interested in seeing that we clean up impaired water.

[JB] so the 319 money actually comes from the EPA?

[JP] Yes, the 319 are a section of the clean water act. So EPA, headquarters gets a huge chunk of money every year and they divide it up among the states, the states take their piece of it. We keep some for our internal operations related to NPS always, and we award the rest of it as competitive grants.

[PB] how do you exactly use the amount of money that the DEP keeps from the 319 program, do you use it for example to increase public awareness and do more activities?

[JP] I have to write a work plan every year that tells them exactly that. I think we fund 10 and a half full time positions for people who do NPS related work, we use some for buying equipments to support the monitoring and assessment program like lab equipments and vehicles for the field staff, we do keep some aside for publication of brochures and materials that we do, not a big chunk but some.

[PB] you said that you use some of the money they you keep for brochures, do you think it will be more helpful in reducing NPS if you use a bigger chunk of the money to do more public outreach?

[JP] Let me give you an example, we probably have about 20 thousands dollars that I accumulate over the past year, we don't do a lot of developing brochures, or publications I told you about this website, and I have to reproduce some more of those, and that what I will use that money for, to make more of these CDs to hand out. But mostly the way we do our outreach education is through the competitive grants programs. We get about 2 million dollars a year from the EPA and we keep about less than half of that for ourselves the rest of it gets awarded out as projects. So I create a category for projects that are fundamentally outreaching education and even when we do an implementation project I put a task in there that says what are you going to do for outreaching education, so if somebody do a big project to clean up their lake, we also ask them to do some work to inform the lake residents about the clean up work they have done, and what they can do help clean it up themselves such as maintaining their loans and all that stuff. So in that way a whole lot of the outreaching education money is distributed, and then once in a while we do a big project that we fund competitively that is a big outreach thing. This CD was funded as a competitively funded project.

[JB] when EPA divides up the money for the states, how does it decide to do that? What are some of the qualifications?

[JP] They have some arcane formula that they follow.

[JB] there is no way to influence it, like if the state start performing better it will get more money?

[JP] It would be nice to say that, but in the 5 or 6 years that I have been doing this job the money never changed, the amount never changed and they are always threatening us. EPA is always threatening us; we have to demonstrate success. That kind of stuff comes from Washington, it is politics. We are currently facing the situation where the EPA administration has agreed to some milestones by which they will evaluate the success that can't be attained. Essentially, EPA said to the office of management and budget, ok we will clean up 2500 impaired water bodies by the year of 2012 or something, without regard for the fact that we are talking about the ecosystem, and talking about that we only get about 1.5 million a year that we can award out and I can do a big project and clean up a little watershed with that much of money. We can't really meet the kind of milestones that we are faced with, so I have no idea how much money will be in the future for us, but apparently we are doing what we can to make as much progress as we can.

[JB] in your opinion, what are the most damaging pollutants in Massachusetts, or the ones that are the biggest problems?

[JP] The most pervasive pollutant is bacteria if you are talking about the cause. I think probably the most damaging pollutant is nutrients combining both nitrogen and phosphors. Universally, it is stormwater which carries all that stuff everywhere. If you can treat stormwater you can catch all that bad stuff.

[JB] as far as some managing techniques, in your opinion do you think it will be more helpful to prevent problems from happening then to clean it up after or is it maybe to difficult to see where the problems may come out?

[JP] I think you need a combination, but I think the easiest thing to do is always to fix the problem rather than change behavior. Are you familiar with Community Based Social Marketing? It is a very interesting concept and there is a website you can check out. It is sort of some burgeoning field of psychology where you don't just say I want to do a brochure or a website. You kind of do a focus group upfront and say why aren't you recycling? Why are you over fertilizing your lawn? What would make you change that behavior? How can we help you change that behavior? May go back later and see if your effort did really change the behavior. So it's much more of a comprehensive approach to try and implement behavior change in people instead of just saying you will stop fertilizing your lawn. So well how and what will change your mind about it? I think that the more we do of that kind thoughtful outreaching education work the better off we are, because I think that really is going to make a change instead of just lecturing people. So yes, I think preventing is always great, but sometimes it is not something people can avoid. I mean I can't avoid driving my car to work.

[JB] what kind of communications are needed between your staff and local stakeholders before and after decisions are made? (Funding decisions)

[JP] There are some places that I identified as weak spots and that I always need help with. One of the stigmas that I deal with is that I work for the DEP. And because DEP has such a substantial regulatory and enforcement component a lot of people think that well the DEP is creepy, they don't want to deal with us, they don't want to work with us and because the 319 program comes from the fed, it is pretty heavily burdened with the administrating and reporting stuff and just the request for proposals I put out is pretty big. So a lot of the challenge I personally face is to have people feel comfortable calling me saying that is a good project, a good proposal. When I do an outreach session in meetings, I want people to say: "hey I saw her talk she didn't look mean to me, I still can call her up and it will be OK." And I am the only person doing that, I get other people who sometime say: "yes there is a 319 program, call Jane." But I am the only person sort of carrying the fire for this program at the moment. We used to have whole other people that we funded them for 3 or 4 years and their job was to do outreach planning in each region, and that helped a lot. We also had Massachusetts watersheds initiative in place where there was a team, and actually a team leader for every major basin. They were really great in sort of beaten the bushes, and getting projects and people going. We don't have that anymore, Governor Romney eliminated that program. So, the kind of communication I need to make before decisions are made is what I am looking for and what will make me fund a project that somebody wants to do. It really distresses me when people put a lot of time and effort in developing a proposal and we don't fund it, because they did just as much work as somebody who did fund a proposal, and it is just a matter of me failing to get to them a head of time and give them enough clear guidance so they can put their energy into writing something we will fund. I mean there is no point of keeping the money, it is there to use and I love to hand it out to people. So, one of my communication challenges

is how do I get to everybody who wants the money ahead of time and tell them how to get it . We can't help people develop proposals anymore, when something gets issued because the Massachusetts Bid laws won't let us have our own conversation about what if you say, you know if you put this task in it is more competitive. So, I am always saying to people if you have an idea talk to me and I can work with you to help develop it into a proposal that we fund. And after the fact, I really try to get to people who submit proposals that we don't fund and tell them why not. Because if there is a way to take that proposal and just spin it a little differently and put something else in and submit it in the next year, why not, if you have people who have the energy and they are willing to do some work we want to encourage that . So, that is my following challenge to the process; keeping people engaged and interested and not being discouraged by the fact that we didn't find them once.

[PB] so does it have to do with how the proposal is written more than how contaminated the watershed is?

[JP] Both, the first priority of a good proposal is to be addressing an impaired water. So, proposals need to address those priority waters, they need to address the contaminants that we have identified. So if it is a listed water body for nutrient and they tell me with the proposal that want to treat bacteria then it is a problem unless they are going to get at both. So, that all has to do with how you write the proposal, how you make sure the proposal is competitive and addresses the problem

[JB] this question is about the process of funding through 319, we understand that an organization will do an assessment of a water body, and after it is assessed somebody in the grass root organization will come up with the proposal to implement some solutions to the problem, and then it goes through your office and you provide funding to it and it gets implemented. What is the time scale on that whole entire process, beginning to end?

[JP] The upfront assessment work depends on what they have for resources, depends on how much assessment you have already done, how much other will get done, if they have a sampling program. But from the time we look for proposals, and we ask for proposals on annual basis and it is always state wide meaning it isn't like the Suasco can only ask for money once every five years. Every single year, every stakeholder group in the state can ask for money from us. Proposals are due to us on June 1st which is pretty typical, we receive them on June 1st we take about 2 months to evaluate them, there is an internal review community that reads them, and makes recommendations, and our commissioner in the DEP approves the recommendations, then we send them to EPA, and EPA has to approve them. So that can eat up the whole summer, usually by October 1st we are clear on everybody's approval and we can start writing contracts. Contracts should all be in place by the end of February.

[PB] so most of the implementation work will start in the spring?

[JB] Yes, the contract we write is for 3 years, and I like people to ask for money, frankly. And we have a lot of money, if it is a good project, I am happy to give it to them for good

work. So a lot of times projects will go sequentially, but mostly people don't try and do 2 projects at once.

[JB] will it be helpful to speed up the process of implementation of both getting the money in their hands and getting the stuff in the ground?

Probably, but I can't say that I think that is the major problem. Sometimes you can only do stuff as fast as you can do it, especially when we have seasonal considerations. The price of materials have been going up, you know there is a lot of things that happen and keep people from getting stuff slammed in the ground right a way. But things that are most important for effective remediation of impaired water once we fund these things and get them going is the guy operating should maintain what you put in the ground correctly, we can fund the entire cash basis but if they don't get maintained they are only good until they fill up. So I think that is probably another real major educational effort that you need to keep an eye on.

[JB] do you know how the grass roots organizations solicit funds for projects? And do you take that into account when you divide money up?

[JP] In a positive way, sure. One of the things I haven't told you about is that the 319 program requires a match. We give 60% of the money but then we need a 40% of local non-federal match cash or in-kind. So I would image for instance, that at the proposal stage the stakeholder group, who I would say they are responsible in constructing the proposal, would go out and ask for some time, cash or expertise.

[JB] so the match is required in the proposal?

[JP] Right

[JP] What I got from the primary information I have that you are interested in finding ways to enhance the way we deal with NPSP in the state of Massachusetts. Let me give you 1 recommendation. One of the things we need to be doing more of is infiltration as a treatment rather than the devices that go in the ground and suck up the sediment. Infiltration gets out everything, because it will treat the bacteria assuming that it a correctly designed infiltration. It will also attenuate much but not all of the nutrients, at least it may grab some nitrogen instead of send it right in the water body, for instance. One more think we should pay close attention to is the Low Impact Development (LID) because conceptually that is not only mostly the kind of infiltration treatment I am talking about but also it is a sort of a shift in terms of keep the stormwater on the lot try to limit the predevelopment hydrology, as much as you can, so you don't end up with big pipes full of water shouting out somewhere, you have little things everywhere and you also get appropriate recharge in the areas where the rainfall ends. I think whatever we do to push for treatment for NPSP needs to emphasize the use of the LID. I think those are sustainable, attractive, not necessarily so expensive, and they provide a much more comprehensive treatment in recharge than anything else.

[JB] How would you go about that? Would you speak with developers and recommend that they build them?

[JP] It is an interesting effort because even if we convince the developers they get this whole other army of people they have to deal with. Frankly, a rare developer on its own would say this is a better way, and even though it is harder I want to push it; I mean they are trying to make money like everybody else. It doesn't come from the DEP, but from the executive office of environmental affairs, they did that big initiative associated with the whole smart growth program to push for the LID, and they do a lot of marketing and outreach to developers and realtors and that is a pure way educational effort. You just got to get people to start thinking in that direction and then from our side we make sure to ask for LID as BMPs wherever they are possible, and if somebody gives us a proposal that wants to put something where we think that LID solution could also be used we make sure when we negotiate the contract with them that we have that discussion and try to get them to think about it differently if we can. We can tell them that we favor solutions that use this approach.

The danger is that rain gardens are constructed from infiltrating layer below and under drain pipe, some crushed stones, some kind of filtration materials, and they planted and it looks like a little garden, but it is a little bit indented and it is constructed so that the basin itself fills up the overflow goes into a catch basin that also feeds into the under drain. But when you see one, they are very unobtrusive, so it just looks like a depression in the road. So, the problem is you get a new highway superintendent and goes Jesus that gets a low spot, we have to fill it in, or a developer builds a subdivision where instead of running the water off to the drive ways, does some nice rain gardens on the side or whatever. If the buyer is unaware of the treatment and they fill in the swain, swale, because they think it is a wet spot in the ground and they don't like the way it looks, then you lost all the values of these BMPs, and you don't have any stormwater treatment in there at all. That is another challenge with that approach you have to make sure that people know what it is.

[PB] earlier you were talking about the image of the DEP, and how it is kind of tough to get people to warm up to you, Theresa said something about the local newspaper letting people in the DEP publish articles about awareness in the area, and only 2 were published. Do you think that really help if the DEP published an article every once in the while?

[JP] Oh sure, when we give out our rewards I do a good press release every year, sometimes the paper picks it up and sometimes they don't. It will be very useful if the DEP had somebody on board who writes articles and send them out.

[JP] Let me just plant an idea in your head because here is the place where something is broken, talking about places where DEP is intimidated and people don't want to deal with us. One of the places will really be the agriculture community, because the wetland regulations so often run against agriculture practices and in this state we have a culture very protective of all the farmers and various type of farming operations. The only way I been able to put any 319 money toward agricultural BMPs by giving money to Umass extension that then will do a project to do nutrient management plans to people, or outreach and education plans, But I have to give money to Umass because none of the

farmers will step forward and say yes I want some of this money because they can't get over their suspicion of allowing DEP on their properties. So, we could use more partners who would facilitate us getting the money to the farmers. There are a lot of projects that are absolutely eligible for 319 that we don't fund just because it comes from DEP. I think the easiest way to solve this problem is to partner with the people who aren't so scared of us.

[PB] that may not make sense, but I think they should be some laws that force the farmers to work with the DEP because they are contributing to NPSP?

[JP] They are like an endangered species in the state, they get handle with great amount of care. It will be nice to drag them down to the table, and maybe that is why it works in other states because there is too many of them. But we just have cranberry outrageous that we protect, we have vegetable growers and few dairy farms but we all like to support them but it is tough.

End of Recording

Section 6: *Donna Williams: Mass Audubon, Blackstone Headwaters Coalition
Conservation Advocacy Coordinator: Central Massachusetts Advocacy Office
Massachusetts Audubon Society*
Mass Audubon, 414 Massasoit Rd., Worcester, MA 01604 11/30/2006
Joseph Basile, Pauline Bassil, Martin Stowell

Protocols:

Purpose:

The purpose of this interview is to gain knowledge of the involvement of grassroots organizations in the effort to manage Massachusetts watersheds. More specifically this interview hopes to give us more knowledge about what types of management strategies have been implemented in the watersheds we are studying. We are studying the Blackstone River Watershed, the SuAsCo Watershed, and the Charles River Watershed.

Position and Experience:

1. What types of responsibilities do you have to the Massachusetts Audubon society, and what are they relying on you to do?
2. In general, what experience have you had with watershed management, particularly in regard to non-point source pollution?
3. What pollutants do you see as the most damaging and in the most need of control in Massachusetts?

NGO's Roles in Management:

1. Do you feel that it is more effective to prevent problems from NPSP than to treat problems which have become apparent?
2. How does the Mass. Audubon Society interact with government run agencies such as the MassDEP and the EPA?
3. What is the Massachusetts Audubon Society's main role in managing Massachusetts watersheds?
4. In your opinion, how important is communication between your organization and local stakeholders, both before and after any decisions are made?
5. Does the Mass. Audubon Society ever have difficulty raising sufficient funds to attain matching grants from the state?
6. What do you believe are the main limiting factors for the effective management of Massachusetts Watersheds?
7. How are these factors being addressed?

Interview:

[JB] we want to know how organizations like yours and your organization specifically interacts with the state and the communities, and what do you do to improve the situation as far as NPS?

[DW] I am involved in several Blackstone organizations. They are 3 watershed organizations in the Blackstone river watershed. There is the Blackstone Headwater Coalition and I am the president of that. There is the Blackstone River Watershed Association and I am secretary of that, and then there is the Blackstone River watershed council which works in Rhode Island. We have created an umbrella organization called the Blackstone River Coalition that works to help these 3 groups and others to work together. And we have launched the campaign for fishable swimmable Blackstone River by 2015. So stormwater and NPSP are a major issue in our campaign and all the work that we do. You must be familiar with EPA's phase 2 stormwater management program. We are working with communities in the watershed to implement their phase 2 plans. So we are first working with municipal officials to help them implement an open space residential design, stormwater by law that includes low impact development (LID). Then, we are working with businesses to help them do better house keeping practices to reduce polluted run offs from their sites, better dumpster management, better parking lot management, better landscaping practices, all that kind of things and we are also working with homeowners, fertilizers, picking up after their dogs and all that. Next April we are collaborating with others for a conference with developers and engineers so they can start doing LID best management practices (BMPs) in there designs. But you have to get the regulatory infrastructure in line first for those things to be allowed. So if you can encourage them through your regulatory piece then the builders and engineers will use them because they know they won't have to get waivers and have all these delays in the permitting process.

[PB] is it true that some LID have already been implemented even though there is not any law to enforce it?

[DW] Some can be done, but as far as narrower roads in some cases it takes a waiver and making houses be close together requires special zoning, open space residential design. Something can be done; we are working to help people do things as simple as rain gardens, even we are directing the down spout on houses so they don't drain to the driveway but to vegetated area. So, some of them are very simple and can be done without regulatory.

[JB] personally, what do you do for the Audubon, and for these organizations?

[DW] The whole deal is education and outreach. So we do watershed programming for adults and kids. We have a dog and ponyshow, a PowerPoint presentation, we go to communities and we ask someone within the stuff of the community to bring together the members of the selectman planning board conservation commission all the local decision makers and then we do a presentation about stormwater management. We are focusing on stormwater but that obviously incorporates non point source pollution (NPSP)). The goal is to work with the local decision makers to make them aware of the impact of the stormwater on the waterways and we are talking volume, quantity as well as quality. So, our streams are getting flashier, because we are going more water faster, and we aren't getting the right infiltration. We can't point to any specific project that we have been responsible for in that regard, all what we are doing is talking to people. We have some

stream bank stabilization project that we helped make happen. We have worked with the town of Grafton to do 2 bioengineering projects one of them on the Quinsigamond River.

[PB] have the presentations you've been doing showed any improvement in raising public awareness?

[DW] Well, it is very slow to get people to understand what the issue is, and to get them to in fact incorporate these BMPs. We have worked with the 319 grant on Salisbury pond. So that is one in the ground example of what we have done I helped craft this application

[JB] So along that line, we understand that you have to have the 40% matching before you get the grant, is getting that 40% funding before hand pretty difficult?

[DW] It doesn't seem to be too hard because most of these projects are done in partnership, and some of these matches can be in-kind match. And all of our works are done in partnership; partners are willing to help not necessarily with money but with services. So the match isn't a problem, but getting a successful application to the state is, and doing the work, and actually implementing it. We had a situation in Shruberry, MA, where we had to get back at the 319 grant, because the sticking point was that it requires quality insurance project plans (QAPP), and it was extremely difficult to put that together the way the state was requiring. So people couldn't do it and they had to give the state their money back, but then the QAPP was changed because the state understood that it was pretty difficult to achieve it

[PB] when you say it isn't hard to come with the 40% match does that only implies to the Blackstone Watershed or overall? In general, do you think it will be better to have a sliding scale that range for example between 20 to 40%, instead of a fix 40% match?

[DW] It will be easier to come up with the 20%, I think it is a good idea. That does become interesting because in Massachusetts the school reimbursement program for new schools. In Worcester, which is an old industrial city, gets 90% reimbursement rate for building new schools, although the other towns around get 60%. Worcester schools are like palaces, they overbuild them because they don't have to pay too much, however the towns around their schools are utilitarian because they have to come up with 32%. But that might be one way certainly, urban cities have old failing infrastructure. But what we are finding is that other states are much more progressives than Massachusetts on LID and other methods and in instituting stormwater utilities so collecting a fee to maintain stormwater infrastructure. So they generate fees that will pay for the maintenance of infrastructure and cleaning catch basis which are BMPs for NPS.

[JB] if you were to implement something like that or any other regulation that will affect the community, how important is it to talk to the actually people in the community before hand?

[DW] It is important, because they will be resistance and all you can do is educate people for the need of that. The city of Worcester is under a lot of stresses right now looking at a lot of environmental mandates that are under unfunded mandates, so they are crying

about not raising water and sewer rates, for instance to help fund the improvement of the waste and treatment plan. So again that isn't a NPS problem but an example about the crying over increasing rates. So, yes you do have to educate the public, they won't like it because this is money coming out of their pockets.

[JB] What do you believe are the main limiting factors for how your organization manages NPSP?

[DW] We are relying on other people to do it, because we don't own properties, again it is an educational thing, we can help people get grants and funding, but we are working in partnership. One project we are going to do in here, the plan is to create rain gardens there and have an appropriate use of the rain barrel. So we need to get more model projects to show people and interpret them. For instance, about the one in Salisbury pond they are going to be a kiosk that says what it is about.

[PB] we know that the DEP had the opportunity to publish articles in the local newspaper about different themes such as educational articles that may raise public awareness, but they have only done it twice in the past 3 years. Do you think if the DEP did more work and helped you in reducing NPSP would this lead to better results?

[DW] Yes it would, because people have to know something to go to the website. This is not a topic that is high on most people's list. There has to be a wide spread education and outreach through many different media to reach the biggest number of people. I agree with you absolutely. What would be helpful will be more funding going to watershed groups for just that kind of outreach because it is expensive to produce these brochures, but it is something you can give to a person, who may read it or not, but you need to have hard copies of things to distribute. And we do need to have a much better outreach as far as getting information into the media and then we are depending on the media to print it. But a part of the phase 2, one of the 6 standards to BMPs is education and outreach, so again the phase 2 is EPA and come through the DEP here in Massachusetts. But it is up to the local community to do education and outreach. NPSP really is a grass root issue because it is up to organizations like ours and municipalities to educate people about it, and so much of it is changing people's habits and that what education is all about. The responsibility now is at the community level and the grass roots level. If the state could create more funding opportunities for the grassroots organizations, then they could help get the word out. The state seems to be hesitating in putting too much faith or reliance in the grassroots people.

[DW] It is hard to evaluate your success when it comes to educating people.

[JB] what is the relationship of the organization with the DEP like? How often do you actually cooperate with the DEP in getting things done?

[DW] We have a great relationship with them; the central regional office is in Worcester. They are wonderful people, they are much unfunded. The republican governor and administration in Massachusetts, the word environment has been missing from their lexicon for all the while they been here so we have a great hope for January when things

switch. It is hard to criticize DEP because their funding has reduced and reduced [sic] and they have fewer and fewer people.

[JB] we also got the impression from some of them that they aren't satisfied with the image that they have in the eyes of the public, that they are being viewed especially by the farming community as being someone who is telling them what to do. Do you see any of that with them?

[DW] Well they are regulators; people don't like to be regulated. And some people think that it is their land and they can do whatever they want with it. So they resent any kind of control. I can see where DEP people feel they can't be perceived that way, that is understandable but they are doing there job.

[JB] beside public education and outreach, what are some of the BMPs that you already or have been implementing?

[DW] We have influenced the design of the route 146, Mass turnpike interchange. It is all been redone. 10 to 12 years ago the original Mass highway design for that had all the stormwater going directly into the river with no treatment it was a perfect 1950's highway design. So many of us went and talk with them and said you cant do this and you really need to redirect the stormwater to some sort of treatment before it goes to the river. So they listened and they were able to redesign to put the stormwater into some kind of treatment, so they either went into detention basins or something. So the impact of the river with this new design is much less than the original design. Protecting cold water fishery streams is one of our major issues as well. So when projects are proposed that will drain to a cold water stream, we have been working through the Mass environmental policy act (MEPA). Commenting on projects to help reshape the project to reduce NSP impacts to these cold water streams, so we been successful in getting some of the projects redesigned to make sure that runoff is not supper heated, that buffers are maintained, they are several rain gardens that have been built as model projects. We are hoping that people are using fewer fertilizers but I don't, it is hard to tell. We ourselves have not been responsible for a lot of individual problems. Another one is the_Dorothee pond; we worked with them to do a 319 grant.

[JB] What pollutants do you see as the most damaging and in the most need of control in the Blackstone Watershed?

[DW] Nutrients, Phosphate and Nitrates. We have a water modeling program, highly successful, we have 74 monitors that work at 76 sites through out the watershed. They monitor every 2nd Saturday of the month and they work from April to November. So we have a lot of data and Phosphate and Nitrate are 2 of the perimeters that they monitor. So we have just finished our third year of monitoring with great equipments. So it is very reliable data.

[PB] we know that phosphate can come from different sources; do you know what the main contributors of phosphate in the watershed are?

It is the waste water treatment plant. They have their limits, they have no limits for nitrogen, and phosphate they do have a limit of .75 ml and it has to be down to .7 ml. a lot of it comes out of the waste water plant, they are very good at taking the bacteria out, but they need to be much more work done on the nutrients. But that is not the only source; it is fertilizers, agriculture and sedimentation (Phosphate bonding to sediments). Fail septic systems, dog poop..... Phosphate is the limiting factor for aquatic plant growth in fresh water, and nitrate the limiting factor in the salt water. We have to be concerned about phosphate in waterways, but our river flows to Narragansett bay and there it is just the opposite. So the waste water treatment plan is going to have strict limits on nitrogen even though we are 46 miles away from the bay, and it all gets there.

[JB] as far as education goes, do you ever do presentations at elementary schools, for younger individuals?

[DW] Not really young, 4th and 5th grades are really the youngest, we do do a lot of that, and we have a watershed model that is fabulous. It is a 3 dimensional desktop model that we carry around, it has all different land uses on it, it get a construction site, a golf course, a factory, a farm waterways and then you use it to talk to kids about the different land uses, what kind of pollutants the land uses generate and then we use cool laid and coco as pollutants, you sprinkle them and then we have spray bottles, we make it rain and see where the pollutants will go. And then we talk about the impacts of all those pollutants on fish, waterways, drinking water and then you talk about what you can do to prevent it all. The kids love it, it is just fabulous and we even use it with adults also. The one thing that is most effective, the one little piece of knowledge that people need to understand is to know how stormwater works, they don't understand that storm drainers go to the nearest waterway; they think they go to the waste water treatment plan.

[PB] I think the hardest thing to do is to come up with a way to educate people our age, because you can't really get in hold with them, I mean for people who are still in high school; you can just go there and give them a presentation.

[DW] That is a very good point, how to reach your generation. Colleges and universities can do a much better job of what they do on their own campus. So it could start there it could be institutional. We were at Holy Cross last winter; all those stairs have to be kept clear of snow and ice. When we were there, there was just a lot of mud salts on all the stairs and all these salts get into the storm drain system.

[PB] I think here is where the media and the newspapers start to play a role because people our age at work, of course they are going to watch T.V and read the newspaper at least the Sunday paper, so if there is an article in the newspaper about NPSP with an attractant title they are going to read it.

[JB] And that is another thing we brought up when we were talking about the image of the DEP, if they have a staff writer for the DEP, so they can have that contact with the community.

[DW] Right, so the people can understand the reason for the regulations, that is a good point. The DEP have an outreach person, but I don't know what his focuses are. But then again you guys are always on the internet; do you even read the newspaper? How can we reach you?

[JB] we do read it sometimes online

[PB] probably college students don't read the newspaper, but people at work do read at least the Sunday paper.

[DW] That is a good idea.

End of Recording

Section 7: Robert Zimmerman: CRWA
Executive Director - Charles River Watershed Association
190 Park Rd. Weston Ma, 02493 12/6/2006
Joseph Basile, Martin Stowell (Absent), Pauline Bassil (Absent)

Protocols:

Position and Experience

1. What types of responsibilities do you have and what is CRWA relying on you for?
 - a. In general, what experience have you had with the management of NPSP?
2. What pollutants do you see as most damaging and in need of control, specifically within Massachusetts and the Charles River Watershed?
3. What management strategies have you seen or implemented throughout your career?
 - a. Which of these has been most effective and why?

Regulatory Structure of Massachusetts

1. What types of interactions do you have with local and state officials when it comes to the management of NPSP?
2. In your opinion, what kinds of communication are needed between engineering teams and local stakeholders, both before and after the implementation of solutions for the control of NPSP?
3. What has your experience been like dealing with section 319 grant-funding?
 - a. Has the requirement for 40% matching funds ever stopped a proposal (in your watershed) from being approved?
 - b. Are there any other obstacles which have prevented proposals from being approved?
4. What is your opinion on Quality Assurance Project Plans (QAPP)?
5. Does your organization interact and cooperate with other environmental management groups?

Education and Outreach in Managing NPSP

1. What types of outreach programs does your organization sponsor, specifically concerning NPSP?
2. How effective have they been? What age group do you see as the most important to target?
3. How effectively do you feel you are reaching the public through your website?

Low Impact Development

1. How many homes currently have your Smartstorm technology installed?
2. Besides reading your website how does CRWA advertise the Smartstorm technology?

Interview:

[JB] To get started, just some general questions. What do you do here? What are your responsibilities?

[RZ] I'm, in fact, the director of policy here. I guess I ultimately have responsibility for whatever happens here, whatever we do.

[JB] Ok, and what's your experience with non-point source pollution?

[RZ] Well, let's see. I've been working here for sixteen years, so I've been dealing with non-point source pollution of one form or another for that sixteen years. Since it's a source of pollution to the waters of the United States and probably the number one source of pollution to the waters of the United States.

[JB] Alright. Well what pollutants are the worst?

[RZ] Well, probably nutrients. Ok, phosphates and nitrates. But you also get animal waste, bacteria, suspended solids, oil and grease, ethanol, glychene, glycol... and trash.

[JB] Is there a lot of work being done for (management of) nitrogen? I know that's more of a problem for the bay because it's the limiting factor in saltwater. Is there a lot of work being done on nitrogen specifically in the watershed?

[RZ] No, most of the work we're doing is on phosphorus but it turns out that if you take care of phosphorus you also generally take care of nitrogen.

[JB] Yea, I understand you guys recently got a 319 grant for sediment control. Is that correct?

[RZ] I don't know. I know we have a 319 grant to finish a TMDL on phosphorus. Is this a coastal zone management grant?

[JB] I don't know, I don't have a lot of information on it.

[RZ] Alright, well it could well be that we do.

[JB] So, what's most effective as a management strategy? Is there anything that stands out?

[RZ] Yea, lawsuits.

[JB] Really? Lawsuits against certain towns? Specific industries?

[RZ] No, EPA or DEP go after the organizations that are responsible for regulating pollution and make them do their jobs. So that's one strategy. Generally those are friendly lawsuits. There are good regulators in any agency, and they want to do their jobs. And they are often prevented from doing their jobs by the politics of the day. Over the last six years at the state level and the federal lever there have been a lot of people that have been interested in preventing regulators from doing their jobs. So lawsuits use federal district courts and state courts to achieve what the regulators might not be able to do on their own. So let's see. We threaten to sue the department of conservation and recreation unless they get a consent form. We're partnered with the conservation and loan commission. So it's kind of a nice mixture of our science and engineering and legal staff with their legal staff, although they do have a very strong legal staff and science and engineering capability. We are currently suing the Massachusetts Highway Department for discharges to the waters of the United States. And there may be some other suits about to come down on the pike.

[JB] So the lawsuits aren't meant so much as punitive so much as, "get your act together, get moving now." Like kind of like a wake up call to these organizations that are supposed to be managing their discharges?

[RZ] Well a lawsuit is more than a wakeup call. I mean, a judge orders you to do something, you've got to go do it. The Boston harbor case is a good case in point. CLF sued EPA and the state of Massachusetts for violations of the clean water act because the harbor did not meet the requirements of the act. EPA turned around and joined with CLF and sued the state, which resulted in the formation of the Massachusetts Water Resources Authority expenditure of 4.5 billion dollars. So it's not, "get your act together," its, "this is the law, take care of business."

[JB] What other watershed groups in the state do you typically have partnerships with, governmental or non-governmental?

[RZ] Well we work a lot with EPA and DEP since they're the two agencies that oversee things. But then, like I said, that can be either adversarial or friendly. We know lots of

people there and are friendly with them, but occasionally the nature of the relationship is adversarial, in the sort of Tip O'Neil sort of sense. You argue with them all day then go out and have a beer with them at night. The only organization we're currently partnered with is CLF.

[JB] What about local communities? How much contact do you have with the actual people in the local communities? This is kind of an outreach question.

[RZ] So this is the education? Or how much do we work with municipal officials, or both?

[JB] Both, but I was aiming more toward education.

[RZ] We speak a lot, you know, on any given week two or three of us will go out and speak at rotary clubs, land trust annual meetings, you know, schools, universities, that sort of thing. Beyond that, besides our newsletter and our online newsletter, that is not the emphasis of the organization right now.

[JB] So what is the emphasis?

[RZ] Science and engineering, fixing, changing regulation, forcing outcomes.

[JB] So, implementation, boots in the ground type projects?

[RZ] Exactly. And we like to deploy enough forces to actually get the job done. Unlike some.

[JB] Are there any other organizations which focus on outreach?

[RZ] Most organizations focus on outreach. They do outreach in... a lot of whining, which [Inaudible]. I guess I don't really mean that as a criticism, well it is a criticism, lets face facts. But one of things that I learned when I first got here, well I made the assumption that everybody already knew what was wrong with the environment so all you've got to do is go out and find the funding and the will to get it fixed. That's actually not true. There's not a lot of environmental science out there. A lot of environmental organizations don't employ scientists, they employ lawyers. Or if they don't employ lawyers they employ people who are concerned about the environment but have no real training in understanding it systematically and that sort of thing. So in that context there's a lot of assumptions made about what we need to do to fix the problems. And as a consequence of that, because people think the problems are obvious, we end up attempting to fix symptoms, which is not a good way to eradicate disease, the last I looked. You know, it's palliative; it makes the patient feel a little better, but doesn't fundamentally fix the problem. So in my estimation, lots of environmental groups spin their wheels trying to fix things that really don't need fixing. They're not root causes. If you'd fix the root cause the symptom would go away.

[JB] Do you feel that you've making a lot of progress in this watershed? Especially with the focus on science and engineering, is that other watershed organizations would be well advised to put more emphasis on the science and engineering end?

[RZ] Yea, I do. And yea, I think we've made a lot of progress. It's frustrating work, it's hard. You're taking on what turn out to be long held opinions about the way things should work. But yea, we're changing the nature of the way state and federal agencies look at water and water infrastructure and resolution of the problems that we face.

[JB] Do you deal a lot with 319 grants?

[RZ] Yea, we apply probably every couple years.

[JB] That requires a forty percent match. Has that ever been an issue, obtaining those funds?

[RZ] I think it's always an issue. Funding is an un-winnable war for a non-profit organization. So yea, because there are a lot of restrictions. It can't be federal match, its got to be local organization that's not federally oriented. A lot of the state environmental monies actually block grants from the federal government. It's an issue, but sixty percent is better than no percent.

[JB] What other issues are there concerning 319 or other EPA funded grants?

[RZ] Well there are always more applications than there is money to respond to all of them. So its competitive grant process, so you've got to get good at it, and you also have to demonstrate that you do what you say you're going to do.

[JB] Are you familiar with Quality Assurance Project Plans? What is your opinion of them?

[RZ] Well we have a number of them. I think we got our first QAPP in 95' maybe? (It) took us along time to get it. I think we were, if not the first, certainly one of the first nonprofits in New England to get one for water quality monitoring and that sort of thing. I think they're essential. Expecting now to get treated by court authorities or regulatory agencies as valid and useful. Otherwise it's a waste of time.

[JB] Do you think any smaller organizations would benefit from assistance in completing them?

[RZ] Sure.

[JB] To get back to education a little bit. A lot of age groups focus on middle to high school education, with some, "second hand education" for their parents. Is it difficult to reach people in the 18 to 25 age range?

[RZ] Well we don't set out to reach them, I suppose. Well sort of the general insight, when you start out in college your immediate focus is not the environment. You're graduating from focusing almost entirely on yourself to focusing on things outside yourself. It's the nature of the transition between being a teenager and being twenty five years old and having to support yourself. And over the course of four or five years in college I think most students start to make that transition. I don't know a lot of 17, 18, 19 year old adults who are not mostly focused on themselves. Videogames, concerts, hormones, grades, conflicts with parents, etc. And I don't know too many adults who are 21, 22, 23 who aren't becoming aware that it isn't as easy as it looks. The issues of being an adult are unknown and unknowable in high school. I mean, how could you know about it already? There's no experience with it. A parent could sit and tell you all day long that it isn't as easy as it looks but all of the kids I've had experience with think it's going to be pretty easy to be a bazillionaire [*sic*] when they graduate from college because that's what they want to do, they want to make money. And then they get there and their first jobs are twenty or thirty thousand a year and that's a long way from being a bazillionaire [*sic*] and it's hard. I think it's at that point that you get a sense of consequence, responsibility, attention to the issues. I think there's also the beginnings of awareness of the irresponsibility of other generations. A little anger isn't a bad thing, as long as it leads to action. That's along explanation.

[JB] How well does your website perform?

[RZ] Not very well, we need to redo it. It's seven or eight years old now. It needs to be completely redone. We've got too much data on there. It's slow. Some of the keys don't function any more.

[JB] Does it get a lot of traffic?

[RZ] It gets a lot of traffic.

[JB] I've heard about smartstorm technology, this low impact development technology. My colleague Martin knows more about it than I do. How popular is it?

[RZ] Well we don't actually go out and promote because there's a conflict of interest. We're a non-profit 501c3 organization. So there is the obvious problem. If we start manufacturing and selling products we get into tax issues. And those are easily addressed, but we're also the organization that's going out and beating on regulations to control water more and make it more difficult to water your lawn with irrigation systems that go off in the middle of a rainstorm. And if you do that, then at the same time you're out selling a system that captures rainwater and allows you to water your lawn with impunity regardless of a drought that's a clear conflict. So although we got into smartstorm in 98 or 99 because nobody else was doing anything with it, we thought it was something worth pursuing. We're now in the process of getting out; selling the technologies we've created and simply backing away. We're not currently really marketing systems.

[JB] So you're trying to do is pass the technology onto other engineering firms?

[RZ] No, well people that are in the business of irrigation supply and that sort of thing.

[JB] Do they do an effective job of implementing all of these low impact development strategies?

[RZ] (Gesture) *Shakes Head*

[JB] Not at all?

[RZ] No.

[JB] Is it more cost in the development process?

[RZ] Well yes, but not much. If you have a bulldozer on a site, having it stay an extra day to put in a rain garden and drop gravel and do stuff like that is pretty cheap.

[JB] So what do you think is the main obstacle to getting low impact development more widespread?

[RZ] Profits. There is a natural resistance among the shill groups. National Association of Industrial and Office Parks, the Home Builder's Associations, and by shill I mean they're front organizations for all of the corporations that actually make money behind the scenes. So they send some dues in and expect these organizations to fight these fights. To fight environmentalists is always the same. It's always those groups versus us. Mass Municipal Association, Mass Waterworks Association, you get the idea. And, incorporating low impact development techniques using the science of groundwater hydrology and asking these organization when they develop or redevelop to pay attention and get it right is always a battle. "That can't be done." "Site's already hammered." "It's a green field. If you want us to redevelop green fields you can't ask us to bring the site back to some sort of historic function." "Too costly, too much time cuts into our profits, so we won't do that." You get into all this stuff. So it's always leverage. We don't sit down and hold hands and everybody says, "Oh yea, we have to do that because it's good for the environment and will actually make things function properly." They go home and do exactly what they've always done. And that's why you get lawsuits. We've got relationships with regulators and that sort of things. You've got to force outcomes; it's the only way to do it. If there weren't such a thing as the clean water act, Boston harbor would be as dirty today as it was in 1965. Absolutely, I guarantee you.

[JB] Are there any organizations in the state that you can think of the focus on creating new legislation and governmental acts?

[RZ] There are a few. There's the Massachusetts Smartgrowth Alliance, there's us, there's the Conservation Law Foundation, Environmental League of Massachusetts, but there aren't very many of us. And we're pretty weak too. We're not lobbyists that send

thousands of dollars to legislators so that they can get re-elected. I think we could be stronger voices, but we're not.

[JB] Do you have adequate field data, specifically on phosphorus, to come up with specific sites that have the highest priority?

[RZ] Well let's think about that for a minute. Is the issue a particular site or is it the way we engineering things? And it turns out that the issue is the way we engineer things. We can engineering things to make what we build behave as if we'd never build it in terms of rainwater to land to groundwater connections. The question is, do we have the will to do that? So, number one, the symptom, which is surface water runoff that pollutes the waters of the United States, we can treat on individual sites. But the root cause is the way we go about designing and building things. And one of the things we've done for the past couple hundred years is throw as much water away as we possibly can. We centralize it, we get it into pipes and out to the ocean as quickly as we can. You could get the water right. You could get it into wetlands constructing wetlands, you could get it reconnected to the ground, clean it up, you could slow it down, all of which has great benefit. So I guess our focus has been on fundamental engineering. How do you change the nature of the regulations that favor large centralized systems and get them to favor centrally managed decentralized systems who's focus is to reestablish the rainwater to land connections that existed five hundred years ago? Which we certainly possess the technology to do. And if we did that than virtually all of the problems that we face go away. Not only that, but we restore water quality and protect our own potable drinking water sources. Going around and fighting this on a site by site basis, although we comment on big sites, and suggest things, why would you do that? Nobody has the time to do that. We do demonstration projects. We worked with Harvard, and showed them how to [inaudible] a stream in their new campus. So that I suppose is site by site but the idea is to push the edge of what's normal.

End of Recording

Section 8: *Peter Coffin: Blackstone Headwaters Coalition
Coordinator, Blackstone Headwaters Coalition* 12/6/2006
Joseph Basile, Pauline Bassil, Martin Stowell (Absent)

Protocols:

Position and Experience

4. What types of responsibilities do you have and what is Blackstone Headwaters Coalition relying on you for?
 - a. In general, what experience have you had with the management of NPSP?
5. How important is stormwater management in urban areas, and what is being done about it?
6. What management strategies have you seen or implemented throughout your career?
 - a. Which of these has been most effective and why?

Regulatory Structure of Massachusetts

6. What types of interactions do you have with local and state officials when it comes to the management of NPSP?
7. In your opinion, what kinds of communication are needed between engineering teams and local stakeholders, both before and after the implementation of solutions for the control of NPSP?
8. What has your experience been like dealing with section 319 grant-funding?
 - a. Has the requirement for 40% matching funds ever stopped a proposal (in your watershed) from being approved?
 - b. Are there any other obstacles which have prevented proposals from being approved?
9. What is your opinion on Quality Assurance Project Plans (QAPP)?
10. Does your organization interact and cooperate with other environmental management groups?

Education and Outreach in Managing NPSP

4. What types of outreach programs does your organization sponsor, specifically concerning NPSP?
5. How effective have they been? What age group do you see as the most important to target?

Interview:

[JB] So just to get a little background, why don't you tell us a little about yourself?

[PC] OK. My name is Peter Coffin. I'm the coordinator for the Blackstone Headwaters coalition. It's a part time position, and, well do you want to know about the organization, or myself, or a little bit of both?

[PB] Sure, both.

[PC] I'm a history major, and I've got a masters (degree) in regional planning. I got interested in land use issues, basically from Nantucket. I have an interest in water, went back to school, got a masters (degree) in regional planning. My first job was in the Blackstone valley in 1985, working on retaining rural character and providing affordable housing. I've lived in the Blackstone since the 80s and I've worked as a park ranger at the nation heritage corridor: John H Chafee Blackstone River. I'm still a part time ranger, occasionally. In the 1990, I got employment with UMASS extension, which is out of UMASS Amherst, and it was to focus on Non-point source pollution as it affected the Narragansett Bay estuary, so there was some USDA funding to look at what upstream watersheds, what potential impacts they might have on the Narragansett. There's not much agriculture in the Blackstone anymore, so we focused more on development residential, and did some modeling to show how land use changes over time might have various impacts. I worked for UMASS extension on a 3 year grant. I stretched it to about 7 years. At the end of that, a group had formed in Worcester, focusing on the stormwater permit. Worcester is a city: a phase 1 permit is required. Some people wanted to make sure that was as good as it could be. And they basically established a watchdog committee to try to work with the city to enhance that, and that movement pulled together an organization which became the Blackstone headwaters coalition because the state had studied the river a great deal, but they began the Blackstone at Quinsig [sic] village and that's where, in their heads, the Blackstone River begins. So there was very little testing done of all the significant rivers and streams in Worcester and the upper headwaters. So the Headwaters coalition has always focused on that geography. But as the watershed works, the city of Worcester also has Lake Quinsigamond and then that involves the Quinsigamond River. And so we've taken that as our territorial jurisdiction really, everything upstream of where the Quinsigamond River joins the Blackstone in South Blackstone or Fishersville. Over time our group got 501C3 status, we've been in existence for about five years. We've gotten a lot of support from Mass Audubon: they provide us housing, and phones and Xerox, and what it takes to run an organization. Much less Donna Williams whom I guess you've talked with. So I live in Mendon and

I'm on the conservation commission and this is exciting stuff, there's a lot going on in the Blackstone (watershed).

[JB] How important is stormwater management in urban areas, and what is being done about it?

[PC] Stormwater, well its very complex, and of course in an urban environment its even more important because it has more an impact on an environment where you're disturbing the natural way of handling the water. Based on a lot of work that's been done from Schuler, I don't know if you know the Council of the Watershed down in Maryland, they've done a lot of work, as you increase impervious area you get flashier streams, the hydrology changes, it leads to a lot of problems. Nature's way of handling that energy change is to make it wider and deeper. But you can't do that in an urban environment because people's houses are there. So you can put up rip-rap [*sic*] and try to control it, so its very complex, and that's the hydrology, much less the loading. And with water quality Dr. Ray Wright out of URI, they did the Blackstone Initiative. It was a major EPA funding for the two states to work together on water quality. The basic finding of that was, Worcester, being a city on a small stream or river, w it's usually the other way around you have big cities at the end of the rivers. So it's a problem, you've got this big urbanized area much less the sewage treatment, while that's not NPS its point source. But there's only so much river for so much dilution. What is impacting the Blackstone? Is it historic sediments behind all these dams? Yes. Is it these treatment plants? Yes. Is it NPS? Yes. How much of it? The science isn't quite there so it's very complex. Then you've got the Feds pushing on the state to do something about NPS, and the state pushed on the cities and towns, but there's no money to pay for anything, its more, what they call, and unfunded mandate, and higher regulations, and, "who's going to do it?" If it's DPW in a city, that's clear, in a town, is it the conservation commition, is it the DPW? Is it the board of health? What are your concerns? It's a function of what your water resources are. It is very complex. But it's exciting too because there are opportunities to work with something that hasn't been done before and it gets at this watershed, what you do on the land affects the water. So that's the general principle about non-point, and I think across the nation and everywhere they're realizing its not coming from pipes, its washing off of our yards and our streets and how do you discourage those pollutants from getting there? There's no cost to it, and it's a function of how many cars you have and how many yards you have, each street is different as to what is the limiting factors. I think we're seeing it all across embayments. There too much nutrients in all of our river bodies. And so that leads to anoxia in the Mississippi but then who's job is it to go upstream and say, "No, you can't put fertilizer on your lawn." They're able to do that in the Chesapeake: go upstream to these agricultural users, because the science is there: they know there's x amount of pounds per year coming off of that field. We don't know how many pounds of phosphorus are coming off of the yards of Worcester, that's still a mystery to me. Where is all this phosphorus coming from? Is it historic sediment that just gets washed up because its been sitting there for hundreds of years? Is it fresh stuff that's washing off the streets? Is it erosion of fine silts from developments on steep slopes? Or all of the above?

[PB] I know if you knew this, it would make it easier to solve the problem. Who's responsibility is it to know this? Is it the DEP? Is it the EPA?

[PC] The way the United States works, it's, you've got to take them to court. So who's job is it? It's the EPA's ultimately responsible for the quality of the water, but they like to see the states do it. Massachusetts said, "No thanks, we don't want the authority for NPS. We're not going to take that responsibility." So you've got an EPA person in charge of the state. One person for the whole state. That's to write the permit much less what's required: what they call a TMDL. So the legality of it is it's the state's job, where the EPA funds the state, to test the waters. Waters or resources are put on the 303d list, that should, the clean water act requires, some plan to get that water off that list. A lot of that, the science would say, is a TMDL. Who's job is it to say, "What is the amount of phosphorous, in this case, that that stream or that pond can take without getting eutrophication. So, whose job is it to write the standards? There were no standards for nutrients. They're just begging to impose it. Then higher standards. And then over what time periods. So that's with treatment plants, much less NPS. So if you have this pond that eutrophying [*sic*], and you need to do a TMDL that state has done some TMDL's, but very broad cursory, But enough to satisfy their feeling that they've done what they need to do. No who's to enforce the TMDL? Because really what they TMDL says, "Ok, it can only accept 50 lbs per year." You've got to go to every person in that watershed, and make some assumptions. Where's the waste load allocation? Is it x amount from this yard? No one has done that science, to say, "This is where the phosphorous is coming from." "Ok, everyone has to reduce by 10%." And it won't happen until somebody sues and the courts mandate somebody to do that scientific analysis. I guess they're begging to experiment with a tax, like in emissions. You're only allowed to cap so much, so they have to buy existing users get grandfathered at so many pounds and then if they can't reduce that they buy it from somebody else. Theoretically that's the way it could evolve. But that's going to take 50 years and lawsuits.

[PB] If the DEP had already started a while ago I think we would've been like halfway through, but why did they DEP refuse to do it?

[PC] Because they're getting cut back. They don't have the science to do the analysis. No one has the money to do the testing to show that it's a problem. So that was our first thing, was, get the city, or somebody, to test the waters, so it can be put on this list. They already have so many waters on this list they've got enough to do just handling the main stems. They don't have the staff and time to work on the streams. Which is where we're seeing. More fo the impact might be seen on these smaller streams.

[JB] If the grassroots movement could get the resources to do that study, would you? Would you take it into your own hands if you could?

[PC] It's complex to define what that study is. I guess you're saying a waste load allocation, and then for watershed wide that's intense. So normally there is a small subset or a sub basin or a lake and pond, and they've been done. Has anyone done a TMDL for the whole watershed? I guess that's the upper Narragansett is saying that there's a major

problem, and they're of course pointing the finger at Massachusetts for all the nitrates. Massachusetts is saying, "no. the nitrates get attenuated over time, so you shouldn't have the same standards, so the scientists can't agree on the interpretation of all of it. So we would love good science, that we could then make sense to justify advocating for monies to either install BMP's, to crank up the treatment plants. Or what we're seeing more is the education so people won't do, not what's not regulated.. I don't think we're ever going to get to regulate what people can do on their own property. Can you get regulations for slow release fertilizers? Yea maybe. But you're only going to get the regulation if you get the groundswell, the political support that that's important. And so, then you've got to educate people as to the problem, or the extent of the problem now vs if you don't do something in ten years. And its hard because any water quality improvements you want now, even if you took all the phosphorous out of the systems, there's enough in the system to keep it bad for another 20 or 30 years. Now over time that would get flushed out and if you limit what's coming in nature will clean itself up. But there's more and more demands being put on that. There's more and more development, less recharge, etc. It's a little frustrating because you can't necessarily say; the city has installed a lot of vortex separators, to get out the particles. Is that really going to have an improvement in water quality? Maybe immediately downstream, but there's so much sediment coming in from elsewhere that, why are you spending \$300,000 for a twin vortex separators? There's this big slug coming in from the twin culvert that probably has ten times as much sediment. That's where it would be interesting to do a cost-benefit analysis. It's hard to define the benefits when it's not just one limiting factor. There's a lot of things that are causing those impairments to the water resource. So in some ways in frustrating because you don't have the hard science to say, if you do this, this will result.

[JB] How difficult is it to get a proposal approved through the 319 grant program?

[PC] Well if you have a good idea... with 319 it's got to be in the ground. They're getting away from end of the pipe solutions. For a few years, if it was required in the permit, there can't be grant funding to pay for it. The city of Worcester had a permit. All the other towns didn't have the permit. You couldn't necessarily go for a vortex separator in Worcester if it wasn't written in the program. We've gotten away from that a little bit, but now they've also gotten away from end of the pipe. They want reductions upstream in the watershed. 319 would not fund education; they want something in the ground. And then, what was required for the longest time was that you had to do water quality testing to demonstrate the efficiencies. So now you're looking for volunteer organizations who are struggling to write the grant. There's got to be a significant cash match or in kind match. The towns have to want to do it, and then the big question is maintenance and liability. And when it was first starting out, why should the towns do it? They didn't see it as a problem. It was only going to be headaches. So, if you could pull together a project, it was a great way to get funding. If you had some monies that you could leverage, the town wanted to see it happen.

[JB] For the matching funds for these grants, would it be better to, "even the playing field," by actually going out and seeing which communities had more money to put toward a match or more expertise to put towards it in kind, and actually made a sliding

scale so that the lower class communities only had to raise 30% match while some of the more affluent communities would be a bit higher, about 50%.

[PC] Well yea, the you get into the whole social justice, and that's why they wanted just one rule for everyone. That makes a lot of sense, although I think what they're also saying, is that is there as big an impact from NPS in a rural setting as there is in an urban setting? And depending on what funding you're going for there's different years and watersheds are given priority depending on where they are in the watershed cycle. There's also, for other fundings [*sic*], urban areas are given preference. The other problem is, even if a town is wealthier, if its not part of their plan, or who's job is it to say that (for instance) the city of Worcester is going to take case of Lake Quinsigamond? So the only people who really speak to that are people who *might* belong to a watershed association. But they're for around a pond. It's harder to get a watershed association for a river that's not necessarily in their back yard. Unfortunately, there's very little money anywhere, even in affluent communities to pay for innovative water quality treatment. There always has been the rate payers, but then that's permitted discharge, and your question was on 319 which is non-point source. So it's been this transition of the original city of Worcester, and Boston urban areas were responsible for non-point source. That was 10 or 15 years ago. They're going into their second or third round of 5 year permits. It's new to the suburban areas, phase 2. They have 5 years in which to come up with a plan. It was a major challenge just to get the towns to understand that they own the pipes, therefore they're responsible for the quality of the water in the pipes. That is major. That has kind of scared the towns, and they didn't want to do it. But I think they've all come around to say, "ok, but we're only going to do X,Y, and Z and we have no monies to do what might be needed to handle to problem. So it's kind of an interesting time as to... would 319 pay for it? Well not if it's in the plans. There you get... if the town did a great job creating their plan, said exactly what they're going to do, they wouldn't get 319 funding because it's in the plan and they're supposed to be doing it anyway. So the incentive for the towns was to low-ball the projects. Just do a bare minimum, map your outfalls, say you'll do a little public education, be able to check off the six items that they're supposed to do, and try to do as little as possible. And there's nobody at the state, necessarily, to review them all, or say how they're doing. As long as they sent them in and could pass those checkmarks. So the opportunity now is well, those checkmarks could be a lot of things. And so I think that's where the grassroots are trying to say, well lets work with the towns and try to do something better in this regard. Where is there money that might pay for it? And so that gets at your question, could you encourage it if you reduced the amounts. Or rather than reducing.... You either reduce the amount required for a match or I think it would be better if you could increase the funding for the projects as well. A lot of the ways around that is if the town is willing to do it, and they have a project, they often have the land that the BMP gets installed on, so that's kind of an easy way to get the match because that land is worth a fair amount. And that's where grassroots can help, with water quality testing or with outreach, and someone might get \$17/ hour. But still, a big project is often beyond the capacities of a volunteer group.

[PB] Going back to the 319 funding, you said that those won't fund any education program. Doesn't the state think that education is an important part in helping to reduce non-point source pollution? And why won't they fund any education?

[PC] Well I guess I missed a bit; it's not that they won't fund any education program. My experience is, if it's just education, they're not going to fund it. And you know, ten percent to education, no they like that. But the problem with 319, you first have to have something in the ground then that would be secondary. So, if you're struggling to come up with the money and the BMP's going to cost 30 or 40 thousand, you've got to come up with another two thousand to match for a five thousand education and outreach program. The other, it's kind of unfair, is they also want to see results. The results you get for education are ten, twenty years down the line. So, to get evaluated... I once had a boss who said, "Education is a black hole." It's a need, but you put in the time and energy now and you're not going to see the results until that child is a homeowner, or a technical person, or doing something in the world. So still do education, because that's really critical in the long run, but you have to show results. So focus your education on actors who are making decisions now. That's why a lot of the focus has been on local officials. I'm a real supporter of education while the real answer has got to be changing people's lifestyles and getting the political will that people know that these are problems and there are things that they can do. So you real have to try to, and maybe that's why I'm not successful. You have to try to reach out to all different audiences.

[JB] Right, that's actually where we were going with this next. I dunno [*sic*], it seems like a lot of outreach is either, like you said, focused on officials and, you know, that sort of group, and then there's also a lot of outreach done in elementary and high schools. But we're starting to get somewhat of a picture of a gap between high school and, you know, being a homeowner in a community. Instead there's this who college aged to like 25 or 26 when it's actually more difficult to reach them. Do you think that it would be a good idea to work with college campuses to actually fund events that could do outreach to this age group?

[PB] The point is, once you address elementary school students, by the time they reach high school or college, all the education about non-point source pollution you've already given them by then, if they're not really going over it and talking about it, they're going to forget it. So once they reach college and go out and find a job in real life, this is the part of life that's most important and this age are the people who are contributing the most to non-point source pollution.

[PC] Yea, I'm not sure they contribute the most, but they're significant. Well there's really two ways I'd go with that. One is as an audience, and I guess that's your point, that there's a gap. If you've gotten them at the elementary and high school level, and you're getting them as the homeowner or citizen, what about the college age and late high school? And you're right. But you have to make it interesting for the audience. At school they don't have a choice. They're in the classroom and you try to make it fun and entertaining. The challenge is ok; we could do that at the college level, because this is pretty complicated science. You know, and that's probably to engage college students in

research topics or have it in their classroom that there's real world applications to their chemistry, to their biology, to their politics, whatever it might be. So that would be one way, as an audience. I guess the other way, I was tempted to (mention), does it make sense to try to reach out to the college, because they could really have a change in. They don't own lawns. So exactly what are their practices that you're trying to change? One would be the college as an institution. WPI owns some property and to me there's this great case study, that WPI had this tradition, I guess the frats, of this tug-of-war over lake Salisbury. They had to abandon that century old tradition because the water quality was so bad. People couldn't get pulled into the lake. Well to me that says, "wait a moment." That's an object lesson. It shall not stand. You know? That water quality in that lake better be able to sustain minimal physical contact. And if it's not, it's the job of WPI and the people in that area to complain to the state to say (something). So you look to the state and the state says, "Well we don't have any money." So there was a Mill Brook Task Force, to look at that. Well the pond has been dredged. Does it need to be dredged again? Well there's continual stuff coming in so once you dredge is it just going to fill up again? Well ok, so let's go for a 319 grant. And a lot of time was spent pulling together the, I forget what it was- five hundred thousand or two hundred fifty thousand. Pulling together the match and that was one guy's long term effort. He was actually my predecessor at my position when he started. And they got the money to design the sediment forebay but there's not enough money to pay for construction. Ok, so let's take the money that's available and put it into these vortex separators and at least get a handle on that. There's this design for this forebay which would go a great distance towards handling the sediment which is going into Salisbury, who's going to pay for it? Well, it may be the city. They're ultimately responsible kind of. Maybe a grant from the state, but you need that match. And, you know, you really need the institutional support from WPI, and then you need some neighborhood groups. So you know all the elements are there, but it takes a lot of local power, or someone's commitment to wanting it to happen. It could be my job. Ok so it's my job to make the Mill Brook Task Force a success and try to get the city to spend more money. But I don't necessarily have the political connections or the chutzpah to, I don't know, talk to someone at WPI. So if you guys come up with a great idea, because I think there's a resource there that's impounded. This is WPI's mandate kind of to engineer in their own back yard. Of course it all boils down to money. A lot of money has already been spent on it, and a lot of study from WQP's [sic] you know, for how many years going back? So I think now is the time to begin or continue trying to pull together a... coalition or something temporary. Call it a task force or something. And then what is the end goal? Dredging it? And/or this forebay? I guess maybe, if you had this forebay could you dredge it once and not have to do it again? I don't know. And I'm not sure who would know the answer to that.

[JB] It's a pretty complicated topic all in all. I think those were all of the general topics we intended to cover. I don't know how we're doing on time.

[PB] We need to ask you about Quality Assurance Project Plans.

[JB] Oh yes, the QAPP.

[PC] Oh yea I wanted to talk about that with the 319, because for a long time that was a big hurdle that you had to test for the effectiveness of the BMP so you had to have a QAPP. Local nonprofits didn't have that scientific capacity so we spent all of our time trying to develop that. With our monthly work testing, we could help save time. We helped get a QAPP approved, so that was a significant milestone for that program, that volunteer monitoring program. But that's really for just monthly testing. Each QAPP, or each project should have its own QAPP, and even though it uses some of the same parameters we have equipment for testing for phosphates and nitrates but we don't have the testing capacity to test for heavy metals or suspended solids which are made from fats and greases. Which might be more the parameters of interest for what BMP you're trying to install. And that was always the challenge: finding money to do the testing required but I think they're getting away from that and if you're using something that's already been used - I mean why should we have to analyze how efficient a vortex separator is? My concern is that we still need to evaluate, does it make sense for the vortex separator to insert into all these sites? And a QAPP is a significant hurdle, its almost, college level chemistry required.

[JB] Do you think that the state should be doing more to assist groups in completing them?

[PC] Well I think they've gotten away from requiring the QAPP's for the 319 because they probably heard loud and strong that that was too much to ask. But I think that there's a fine line between... you should give some serious thought as to how you evaluate the success of whatever you're doing. And that maybe doesn't need to be detailed chemistry but you need to give some thought as to why are you doing what you're doing, and how will you know if you're having success? So it's relatively easier with structural things. And that's, I guess what I was saying with the state: they want something in the ground, structural, solid, that they could kick, as opposed to softer outreach. How do you know that you've gotten people to change their behavior? That's the hard one to do. When you're talking about the success of education and outreach, it's always a challenge.

End of Recording

Section 9: *Alison Field-Juma: Organization for the Assabet River Policy Director, Organization for the Assabet River*
9 Damon Mill Square Suite 1E Concord, Ma 01742 12/14/2006
Joseph Basile, Martin Stowell (Absent), Pauline Bassil (Absent)

Protocols:

Position and Experience

7. What types of responsibilities do you have and what is OAR relying on you for?
8. What pollutants do you see as most damaging and in need of control, specifically within Massachusetts and the SuAsCo Watershed?
9. What NPSP management strategies have you seen or implemented throughout your career?
 - a. Which of these has been most effective and why?

Regulatory Structure of Massachusetts

11. What types of interactions do you have with local and state officials when it comes to the management of NPSP?
12. In your opinion, what kinds of communication are needed between engineering teams and local stakeholders, both before and after the implementation of solutions for the control of NPSP?
13. What has your experience been like dealing with section 319 grant-funding?
 - a. Has the requirement for 40% matching funds ever stopped a proposal (in your watershed) from being approved?
 - b. Are there any other obstacles which have prevented proposals from being approved?
14. What is your opinion on Quality Assurance Project Plans (QAPP)?
15. Does your organization interact and cooperate with other environmental management groups?
 - a. Can you suggest any other contacts within the SuAsCo Watershed?

Education and Outreach in Managing NPSP

6. What types of outreach programs does your organization sponsor, specifically concerning NPSP?

- a. How effective have they been and what age group do you see as the most important to target?
7. How effectively do you feel you are reaching the public through your website?

Interview:

[JB] What are your responsibilities and what is the organization relying on you for?

[AFJ] Ok, well I'm the policy director, and that means that I'm responsible for knowing the implementation of policies and laws so that they benefit the river. So that has to do with compliance and enforcement. Not that we do the enforcement, but we do see whether projects or activities are complying with what the relevant laws are and if not, we will comment through whatever the established process is on those projects. And then, also, I'm responsible here for some research on education and outreach and the website, talking to school students or communities or whoever might be interested in learning about stewardship of the river essentially.

[JB] We're trying to get a perspective on the entire SuAsCo watershed. What pollutants are most damaging and in need of control, either within the entire SuAsCo watershed or specifically within the Assabet?

[AFJ] The main pollutant that we're dealing with is phosphorus. And that is because there was a study done called a TMDL, which is a total maximum daily load, which recently looks at what is the capacity of a river to handle any pollutants and it looks at which pollutants are having a negative impact and determines what level of those pollutants the river could live with without having a negative impact. And that study determined that phosphorus was the main one, but it doesn't mean that there aren't a lot of other things in the water that shouldn't be there. But the issue with phosphorus is that it stimulates growth of aquatic plants (algal blooms) and so when there's too much biomass growing in the river it rots and smells and uses up the oxygen which makes it so the fish can't live and you know, the other wildlife in the water and so some biomass is good, but this is sort of too much of it, and not the right balance of species. So that's the main one but there are sort of talks of waste sites around here, there are... who knows what is in the wastewater which is being discharged to the river. Some things we know, like how much phosphorus there is or how much nitrogen or things which are regulated by the state. What pharmaceuticals are in the water, or there are industries that discharge to municipal systems and they may not be saying, and in some cases they may not need to say, what is in there. So, there's sort of a historical load for past industries, activities, there's quite a bit of contamination and sediments and there's the current load of pollutants, which is currently being discharged to the waters.

[JB] How big of a problem is sedimentation?

[AFJ] Well actually that's a really good question. There's a study being done right now, being done by the Army Corps of Engineers, to look at the effect of sediments on the water quality. So, the reason for it was that under the clean water act, the wastewater treatment plants along the river have to get permits, which is the national discharge elimination system, and we worked really hard to make sure that the limit for phosphorus was brought much lower than it had been because of what the TMDL had shown. But there was a question that remained that well, that's a point source, but maybe there are other sources and the TMDL said well, it looks like there could be phosphorus that's cycling from the sediments that's there. Maybe rotted plant material, then it gets taken up again, and it'll grow so that it's actually cycling, so if you reduce what's actually going in you know, you won't really eliminate the problem because it's still all still there. Well, this study was to determine how much phosphorus cycling there is, what's in the sediments so if it would make sense to remove them from the phosphorus, well what other contaminants are in there that would effect whether you could dredge them or land fill them. And it also looks at what would happen if you removed the dams, because the dams hold back the water and they hold back a lot of the biomass and plant growth. And so they are preventing the river from flushing itself so that if you start putting less pollution in, but it can't clear out what is there, you've still got a problem. So that study is looking at that, and we don't have the results yet. But things we do know is yes there is contamination chronically, especially heavy metals and things like that and so that's the process that we're in right now.

[JB] What management strategies have you implemented for NPSP in the past?

[AFJ] Well first of all, sort of a basic foundation for all the strategies, is that we have a monitoring program. And without knowing what's in the water, and the water quality itself, its very hard to pinpoint where the problem is, its hard to see whether strategies that you implement are working, we have a major monitoring program and if you look at our website, you can learn all you wanted to know about it. And we've got a lot of site all throughout the watershed where volunteers go out and measure phosphorus, dissolved oxygen, nitrogen, PH, and we have a new monitoring program that also measures biomass. We will see when the new permits are in effect for the wastewater treatment plants, whether that has an effect on reducing the biomass growth. So that's sort of the foundation for any action that any of us take knows what the problems are.

[JB] Is it (the field data) detailed enough that you would be able to get an idea of specific neighborhoods or developments that are causing more of a problem than others?

[AFJ] To some degree you would be able to generally get an idea. And we could establish new sampling sites to try to zero in on it. The main problem we've been dealing with has been the municipal wastewater plants and we know exactly where they are, that's pretty obvious, and they're on the main stem of the river. But as we start to look more at what's happening in the tributaries, we may want to have more sampling sites in different places to try to pinpoint things. But we can certainly do that. So that's the monitoring. And then we've had, on our website you can see information about phosphorus containing detergents, which are still legal in the state, and also supporting

legislation to ban phosphorus in dishwashing detergents which is a major source. It's already been banned in clothes-washing detergent but not in dishwashing detergent. Another thing we've worked on is lawn care. People apply fertilizers to their lawns and then that washed off into the river which is a problem. And we also, when we look at projects that are happening, for example, there's a new development going in, it's going to have a lot of impervious surface, so it that water going to be recharged? And basically how do they manage their stormwater? Could there be runoff from it which could contain pollutants? So we do quite a bit of commenting on projects that are being proposed in the watershed and a lot of that is through MEPA (Massachusetts Environmental Policy Act). And so a lot of projects, if they're big enough or bad enough will be required to go through that process which is sort of an information gathering process. So we get involved in that and there may be projects that come to conservation commissions and we get involved with that. So that's looking at basically trying to make it so that when there is a new development or a redevelopment of a site that it is as good as it can be. Usually we better hope it weren't there at all. At least if it's going to happen, get in place the most effective stormwater management systems that you can and that's what I sent to you is the state is actually revising their stormwater management policy to try to include much more up to date approaches like low impact development.

[JB] Right, that was one thing I was getting ready to ask you about. How is the process for (the implementation of) low impact development going?

[AFJ] I would say it's moving along in terms of that there's much more acceptance, more interest in it, I think generally people who are involved in development know what it is, and they didn't a few years ago. There's more research results, there's more knowledge about how it works, how to design different techniques, how they work in different climates. There's still a lot of research to be done, there's some great places doing research too, up in New Hampshire, UNH has a whole stormwater research center that's doing really good work. You know, because people wonder when it snows or there's ice or something, is this thing still going to work? So, I think there's more knowledge about it, some projects are taking it on, and they try to do it to some degree and some still try to do it the old traditional way and avoid the whole idea. And that's why the state is getting involved in saying, you know, this is a really good thing to do, we really should try to do it, as opposed to just being silent.

[JB] It sounds like it would be beneficial to someone buying the property too. From my point of view, one of the biggest points I hear was reusing stormwater to water your lawn during droughts. What would the effect be if you got a photograph of everyone's lawn all brown and dead, and then this one house green lawn? It seems very marketable.

[AFJ] Right, well unfortunately most communities don't regulate lawn watering enough to have a lot of brown and dead lawns. But if they did, which they will probably have to, in the near term, yea, I mean, its makes total sense. It's marketable, it costs less, and then also the idea is disconnecting drainage systems. The old is idea is, you get a drop of water and you want to make sure it gets into a pipe as quickly as possible and it stays in that pipe all the way to a river. And you just keep it there. You don't let it out. And this is to

say, get rid of the pipe. Let the water fall, let it go somewhere where it can just soak back into the ground. And there are some places where it doesn't work, with the groundwater too high, or whatever. But in most places it will work. And also there are things like green roofs, which we like in some situations, and white roofs, because they reduce the temperature of the water. And in the summer you can get really hot water pouring off of buildings and parking lots, and white parking lots are good too but people don't seem to talk about those, and when it enters the river it's a temperature pollutant. And it can really destroy cold water fisheries and really alter cold water habitats. So it's really an invisible pollutant. People don't really think of it, and it's something that we really try to pay attention to. Because a lot of these things are really easily done. I mean a white roof doesn't cost more than a black roof. And yet, the water running off it is going to be a lot cooler. So there are things like that that we try to get in wherever we can. And then the last thing I wanted to mention was that there's a fund that was established by Intel corporation to find recharge of stormwater. And it was really as a mitigation because they wanted to withdraw groundwater to use it in processing and we basically said, if you're going to take out that much, you need to find a way to put some back in. So they agreed to establish this fund, it's a million and a half dollars, and so jointly intel and us and the state solicit proposals from nonprofits, from towns, for projects that will recharge groundwater. And so that's trying to reduce stormwater as a nonpoint source pollutant.

[JB] Where are they (Intel) based out of?

[AFJ] They're in Hudson. It's a good program.

[JB] Can you tell me a little bit more about greenroofs?

[AFJ] Yes, do you know what one is?

[JB] Yes, it's a garden on top of a roof right?

[AFJ] Yes, basically. Again its one of these techniques they're refining and getting better and better at. They can build it where it's just a few inches at most of some sort of growing medium and some little plants like sedum which are tough and after they die they regenerate and come back. So it can be very low maintenance, it doesn't weigh a lot, it's probably the most cost effective way you can do it now. And you can make it more elaborate, you know with bushes and trees - you can put whatever you want up there. But there are ways of doing it which are - even on existing buildings because they're not that heavy. And what they do is they trap some of the stormwater. In a small storm they trap all of the stormwater, and the plants act through evapotranspiration and it'll go back up into the air. If there's more water than it can hold, some of it will drain off, but it will have gone through the planting medium and the plants and it will be cooler because of that, because there's no way the plants are going to get as hot as a black tar roof. So now in some cases we may say, we'd rather have that water go into the river and be recharged than just evaporated into the air. That's also a point, so it kinda [sic] depends on the site. So in some sites we'd rather have it go into drywells or something, and be recharged. But we're not going to argue forcefully with a greenroof because it's not going to make that

much of a difference. And in other places it would, and there are other benefits to greenroofs – they use less energy...

[JB] And temperature within cities, right?

[AFJ] Yes, the heat island effect. Right. So that's something that is important and definitely growing in terms of acceptance. Municipalities often have to change their by laws or regulations or whatever to allow that. But that's not a big deal.

[JB] What interactions do you have with local and state officials when it comes to managing NPSP?

[AFJ] Well one is, sort of working out from the bottom. The most local level is the Conservation Commission. And so they are often, they'll have plans submitted to them and they'll review them. So we may talk with them, make suggestions. Also same with the planning board. There could be if there are any wells nearby there could be the committee in each town which makes decisions about whether they have a well protection district or whatever. It's often through the planning board. Town engineers we often work with, because they're the ones who are dealing with a lot of stormwater management and so we're trying, especially through the Intel fund, they're applying to put in projects which deal with stormwater. Like in Hudson there was one where they took the stormwater from a whole section of downtown and routed it through infiltration chambers under their playing fields. And that involved the town engineers and them submitting proposals and stuff. So at the local level there are a lot of different local offices that we would deal with. And then at the state level, there's the MEPA office. So we submit our comments but we also may talk with the MEPA analysts, go onsite visits. We consult quite a lot with Mass Wildlife Division of Fisheries and Wildlife. Basically, getting information from them. This stream, have you ever found of this kind of fish there? What do you think the impact might be of such and such an activity? Also USGS. There are all sorts of the technical agencies in state and federal government who we just have a working relationship with. We call them up and ask them for help or information or whatever. We may ask them to weigh in on something. You know, we have this activity that's being planned here, we think it may have a bad impact. Can you look at it and send in your opinion. It brings to their attention things they would be interested in because it affects the resource that they're responsible for. Things they might not otherwise know about. And it also brings in their expertise into the whole discussion so that they can bring in information and answer people's questions and stuff like that. It's really beneficial.

[JB] In reference to you example of the engineering project the routed excess stormwater under playing fields, what kinds of communication were needed between the engineering team and the local stakeholders of the community?

[AFJ] They handled it all. So I don't actually know what kind of consultation they did. It was a town owned field, it was behind a factory. There may not have been a lot of residents nearby who would have cared one way or another. I think that project, maybe

they tried to tear up streets and put in pipes or something. So, whatever process they would go through, but there are other things which... well one thing is we really try to keep our members informed of what we're doing. And they are stakeholders in this watershed. A lot of them river along the river or the tributaries so they're stakeholders in a lot of the activities that we do. So keeping them informed. We try to have public meetings, you know keeping them educational for people. We ourselves don't have very many projects. So it's more like encouraging others to involve stakeholders. Where if there's maybe a trail going through and people may say, hey we don't like this. So maybe there needs to be more consultation around this whole area. Because we don't actually take on building projects or anything like that, we probably, well have less that's required by law. We really try to communicate a lot. So we do it informally.

[JB] I'm getting a picture that you're very outreach focused and that you try to open communication with everyone.

[AFJ] We try to, but it's difficult because we don't have many staff and we're not full time. We would like to do more. We always like to try to increase people's knowledge. We also try to do a lot of recreational activities on the river to help people experience it and enjoy it and have a stake in it, and want to be involved. Like the big cleanup, an annual cleanup. One year we had like a thousand people. A lot of companies will have their employees form a team and go and that really helps people see. You know, they get in the river, they see what's there, they can see the problems, they can see the beauty of it. So it really increases people's involvement and awareness of the issues.

[JB] The next place I was going to go, it might not even be applicable. That's why I was wondering. Do you ever apply for funds under section 319 of the Clean Water Act; 319 funds from the DEP?

[AFJ] We actually don't because it's more municipalities. I had actually wanted to find out, in response to that note, if we had ever been involved with something where there were 319 funds involved. You know, where somebody else might have gotten them and we were involved, and I don't know. So I don't know that we've ever been involved with that.

[JB] Do you know if any other organizations in the watershed ever get funds?

[AFJ] I don't know. Have you talked with the SuAsCo Watershed community council?

[JB] I emailed them, in part trying to get your information, but I wasn't able to reach them.

[AFJ] I know they have funding to do outreach, education, to communities in the whole Suasco watershed that's specific to those communities' compliance to the Nipdees phase two stormwater requirements. So basically, communities that have to clean up their stormwater. And they're having a hard time doing that. So, I think its state money; I'm not entirely sure where their money come from. But there funds are preparing educational

materials. We did an outreach program like that too. I think it was the DPW in Billerica, talking to them about the river, the issues were, what things they could try to clean up and things like that. Nancy's involved in that, so that's certainly a good non-point source issue that they're working on. And each year they produce a packet for what they're doing. It might be sign boards for the library it might be, like each year they prepare something and the communities actually pay up to receive that material.

[JB] Do you ever target outreach toward specific age groups?

[AFJ] Well, there's one project which is done in Westborough for children, and it's done at a beach there on the lake and they look at how watersheds work. We give talks at Hudson High School, (other) local high schools, and otherwise it's more generally for the membership which is generally adults. And another thing that was funded under the Intel recharge fund was an installation of low impact development techniques at the Acton Discovery Museums and so they've used that a lot for education to kids and their parents. And so it's kind of like a second order impact but that's definitely and ongoing educational activity that they're involved in. Part of it is like with the high schools, kids may have a community service project that they could do and we're actually working with Hudson on that now. And also I forgot to mention that we like some of our recreational activities are geared to families. And we have a thing called Riverquest and its kind of like seeking clues all the way down the river and so people go in their canoes and kayaks and it's really fun. Summer solstice paddles and things like that and they're really family oriented so you get the kids involved as well as their parents getting more educated and more involved with the river.

[JB] How effect is your website? Have you been able to gauge its effectiveness?

[AFJ] I'm not the person who would be able to answer that the best. It's got a lot of information on it. It's got all of our monitoring data and our events. We have now a new thing which is an interactive map so that you can click on the map and it'll open up and you can put together a canoe trip and it'll tell you where you can put the canoe in the water, where you can park, what you'll see along the way, all kinds of stuff like that. So it's really cool new interactive thing. And we actually want to re-have our website and like any website it starts to get disorganized and needs updating. And I think people really do use it. I don't think we have a counter or anything like that. We've also got it so that they can join through the website, they can pay through the website. The kind of thing so that people can use it, it's a tool to do these sorts of things.

End of Recording

Appendix B: Interview Data Matrices

Section 1: Professor Seth Tuler

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
community involvement	People's involvement in the planning process and decision making.	In place	
Communication between scientists and stakeholders	Come up with the right management plan that comply between the scientists design and the goal of the decision makers	In place	The information and design that the scientists are trying to provide are not all the time useful.
Consider both outcome and process when reducing NPSP	Success should be measured according to both outcome and process to make sure that it satisfies everybody's needs		EPA may not provide enough information about the progress used to reduce NPSP

Section 2: Kathleen Baskin

Executive Office of Environmental Affairs, Massachusetts

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
Stormwater management	State needs to insure there is adequate flow in river systems for fisheries.	In place	Don't have a rotating schedule for looking at watersheds.
Watershed initiative	Agencies assigned people to look at each watershed	Initiative ended in 2003	
Develop technical places	Take samples under different weather condition to do monitoring		
Location of the watershed	Help attract money and help		
ear marks	way for the legislature to have a say in the executive branches budge	In progress	
Funding	The money is used to implement projects that will help reduce NPS pollution		The process of approving the funding takes a while
Should involve stakeholders	Stakeholders should be included in decision making just avoid any		

**Section 3: Emile Tayeh
Cumberland farms**

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
positive limiting barriers around the pump island	catch any residue of contamination	In place	
delivery trucks are equipped with stage I vapor equipments	sock the vapor back from the tank instead of releasing it back to the atmosphere	In place	
Stormwater management	Have less salt on the roads, trying to use more natural products instead of chemical	In place	
Raising public awareness	In order to get everybody involved in helping to reduce NPS	explain to different segment of the society, households, businesses, stations ... about NPS	
Collaborative effort	a combination of several efforts where every section of the society need to do there part		
Setting up conferences	People should work together to come up with a solution	Not in place	People rely on each other to come up with the idea
Come up with reimbursement programs	Help people remain in compliance	Only in place for gas station, however it should be expanded to dry cleaners and home owners with oil tanks	

**Section 4: Theresa Beaudoin
MassDEP**

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
Water quality monitor		sample 29 stations located at strategic places on 6 of our watersheds in central Massachusetts	
Monitoring the 27 watershed on a 5 year basis	Collect data to study	sample four to five watersheds every five years	
Watershed initiative	Gather all of the expertise and resources on the table and try to determine what problems are and solutions to solve them,	Approach disbanded	Not enough resources
Combined sewer over flow (CSO) abatement project	Water treatment process	Only in the city of Worcester	
Street sweeping	Get the sand of the roads	City of Worcester is doing an increased amount of street sweeping	
Dredging	Clean up ponds	In place depending on the condition of the watershed	No one will fund a dredging project knowing that they are still pollutants coming in
Vortex separators	centrifuge out all of the sand and heavier particles to other chambers, and the cleaner water flow through	Used a lot in stormwater management	

Outreach activities	Effective in controlling the input of phosphorus	EPA flyers	
TMDL	Identify the amount phosphorus that the waterbody can take	City of Worcester has increased street sweeping and other programs in response to TMDLs	Other organizations (Such as MassHighway) and regions have had more trouble following TMDL's. MassHighway said they would increase effort, but haven't.
Educate children in school systems	Raise generation who knows about the environment	Educating children. Funding big projects.	Hard to get people attention especially when they are busy with other things
Parking lot management for big companies	Clean out drain catch basin		

Section 5: Jane M Peirce
S. 319 Program Coordinator, MassDEP

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
Low Impact Development (LID)	Emphasized importance in control of hydrology	Smartgrowth Program Pushes for LID, BMP's are sustainable, inexpensive, and attractive	S ystem may be unintentionally destroyed during redevelopment. Raingardens and catch basins may be mistaken for sunken sections of road and filled in. If developers agree, they still have to deal with many legal barriers.
Stormwater Solutions	Infiltration vs. sediment removal	Infiltration systems remove (virtually) all nutrients and bacteria before stormwater enters water bodies	
Creating a website	Public awareness: People can learn about NPS pollutions and ways to reduce it		Not to many people will check the website unless they already know about NPS pollution
Adding a task to implementation projects that include public outreach	Increasing public awareness will help reduce NPS pollution	All watershed associations use public awareness as a BMP	
implementing a big outreach project funded competitively once in a while	Help raising public awareness	Creating a website about NPS pollution	Outreach activities should include more than creating websites and brochures. Not enough money to implement more activities
Community based social marketing	Psychological and comprehensive approach to try and implement behavior change in people instead of just lecturing them	Not in progress	
Hire people to do outreach work in different region which will help improve the relationship between the DEP and the public	Improve the image of the DEP so people will stop looking at them as regulators and feel comfortable communicate with them	Not in progress	Not enough funding provided by the EPA
Help organization write the proposal	Organization will have a better chance getting funds	Not in place.	Stopped by the Massachusetts Bid Law

Section 6: Donna Williams
Blackstone watershed association

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
319 Grant Matching Funds, Sliding Scale?	May assist some organizations in receiving funds	Many projects get in-kind matching funds	May be difficult to implement in a fair way. Cites example of giving Worcester a 90% reimbursement on school costs while other towns get 32%
QAPP's	Can be difficult for Organizations to complete, led to several instances of orgs. returning 319 money	Difficulties have led to some easing of requirements	Still must evaluate success of projects.
LID Progress	Can eliminate many stormwater issues	Phase two stormwater management may include LID Solutions. Spring 2007 Conference on LID implementation	Legal system isn't highly supportive of LID. Waivers needed for narrower roads, etc.
Other Stormwater Solutions	Better management of parking lots, dumpsters, landscaping, pet waste, fertilizers, etc.	Mass. Audubon working with businesses and residents	Not enough money to implement more activities
education and outreach	Raising public awareness for both kids and adults(local decision makers)	Using dog and pony show, power point presentations	Don't know how to reach people in the 20 to 25 year range
work with the local decision makers	make them aware of the impact of the stormwater on the waterways,		It takes a while to get people to understand the danger of NPS pollution and start incorporating BMPs to reduce it
collecting a fee to maintain stormwater infrastructure	Provide more funding that will help manage stormwater	Not in progress in Massachusetts, however it showed sufficiency in other states	People will refuse to pay any extra fees to do any clean up work

Use model project	It will be easier to show people examples on how to reduce NPS	create rain gardens there and have an appropriate use of the rain barrel at the Mass Audobon	Don't have enough models
Education outreach through many different media	Reach the biggest number of people from different age range	Only websites and brochures are used	Not enough funding provided. Websites aren't an efficient source of education in this case since people need to know about NPS to check the website
More funding provided to the watershed associations	This funding will be used to raise public awareness	Not in progress	Not enough funding provided by the DEP
Have influenced the design of the route 146, Mass turnpike interchange	Stormwater use to go directly into the river without treatment	Done	
Protecting cold water fishery	Make sure that hot water wont drain straight in cold water stream	getting some of the projects redesigned to make sure that runoff is not supper heated and that buffers are maintained	
water modeling program	Used to monitor and collect data about Phosphate and nitrates	Successfully used for the last 3 years	
Limit to the amount of phosphorus and nitrogen that can be drained in the water ways from the waste water treatment	Will help in reducing the amount of nutrients in the watersheds	Not in progress	No limits have been set for nitrogen and the amount of phosphorus allowed in the watershed should be decreased

**Section 7: Robert Zimmerman
Charles River Watershed Association**

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
319 Grant Matching Funds	40% Match can be very difficult	60% from 319 Funding is better than, "no percent"	Some state funding can block proposals from receiving 319 funding
QAPP's	Can be difficult for Organizations to complete	Acknowledged that orgs. Would benefit from assistance on QAPP's	Essential for proving that work is valid and useful.
LID Progress	LID can eliminate problems associated with stormwater.	The technology is developed and relatively cheap to install (rain gardens can be put in with bulldozers already on site).	Many developers are unwilling to change practices. The CRWA has a conflict of interest in regard to selling LID technology.
Lawsuits	EPA or DEP go after the organizations that are responsible for regulating pollution and make them do their jobs.	Currently suing the Massachusetts Highway Department for discharges to the waters of the United States. And there may be some other suits about to come down on the pike.	Politics that prevent agents from doing their job
Science and engineering, fixing, changing regulation, forcing outcomes.	In ground implementation to reduce NPS pollution		
Public outreach		Speak at rotary clubs, land trust annual meetings, you know, schools, universities	Not the main focus of the organization
Try to fix the problem that symptoms	Should define what the problem is in order to solve it		Not to many environmental engineers employed in the organizations. Most of the people in the organizations are either lawyers or people who are concerned about the environment.

<p>Assist other organizations in writing the proposals</p>	<p>Help smaller organizations to receive 319 grant funding</p>		
<p>Colleges and universities should help in educating people about NPS pollution</p>	<p>Help educate college students that also contributes to NPS and is hard for the watershed organization to reach them</p>	<p>Not sufficient work is being implemented.</p>	

Section 8: Peter Coffin
Blackstone watershed association

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
319 Grant Matching Funds, Sliding Scale?	May assist some organizations in receiving funds	None	May create "Social Justice" issues
QAPP's	Can be difficult for Organizations to complete	Difficulties have led to some easing of requirements	Still must evaluate success of projects.
Stormwater management	It is very important to manage stormwater especially in urban areas because you increase impervious area you get flashier streams, the hydrology changes, it leads to a lot of problems	It was a major EPA funding for the two states to work together on water quality.	Feds pushing on the state to do something about NPS, and the state pushed on the cities and towns, however that is not enough funding to implement any projects
TMDL	Specify the amount of phosphate that can be drained in the river	The state have done some TMDL but not enough	No one is enforcing the TMDL. No one has done the science to know exactly where the phosphate is coming from
Ability to buy	If producers of phosphate can remain within the limits allowed to them they can by some from other people	Not in progress	Needs for lawsuits and time
Sufficient studies and science on the origin of nutrients	To define the origin of the pollutants and know how they can damage the water ways		Not enough money
Installing vortex separators	Get out the phosphate particles	Only improve water quality in the immediate downstream	Won't improve water quality

Raising public awareness	People's activities are the main contributors to NPS pollution	Activities and conference have been implemented. Watershed organizations believes that that raising public awareness is the best management practice they can implement	319 would not fund education; they want something in the ground.
Provide extra money to use toward public outreach	changing people's lifestyles and make them realize that NPS pollution is problem	Most of the focus is on decision makers	Hard to evaluate education
engage college students in research topics or have it in their classroom that there's real world applications to their chemistry, to their biology, to their politics,	Fill up the GAP between educating people in elementary schools and adults	None	May does not make sense to reach college students since they don't own any lawns
Forebays	Reduce sediments that is going toward the waterways		it takes a lot of local power, or someone's commitment to wanting it to happen

Section 9: Alison Field-Juma
Organization for the Assabet River

BMP's Cited and Issues:	Significance:	Progress:	Barriers:
Stormwater Management	Fertilizers, other chemicals runoff lawns into rivers.	Work is done with developers on groundwater recharge, large projects may have to go through information gathering process	State stormwater policy should include up to date techniques
LID	Could improve stormwater management	Good research done, more to be done. UNH has research facility. Intel Corp has stormwater recharge funding	Many developers still prefer the "traditional way." State laws don't necessarily support LID
Other stormwater solutions:	Green-roofs, whiteroofs, white parking lots, etc. can reduce the temperature of runoff, which can damage coldwater habitats. Green-roofs reduce peak runoff events	More general acceptance as time goes on	By laws and regulations may need to be altered, town by town, to allow for such solutions
Permits for phosphorus discharges in the river	Reduce the amount of phosphorus discharged in the river	limit for phosphorus was brought much lower than it had been	Will reduce the problem but won't eliminate it since phosphorus still exist
Study about the effect of sediments on the water quality	Determine how much Phosphorus and other pollutants cycling with the sediment	Found some heavy metal but no final results provided yet	
Water monitoring program	Monitor what is in the water and the water quality	In place	
Support legalization to prohibit phosphorus in dish washing detergent.	Reduce the amount of phosphorus used		

commenting on projects that are being proposed in the watershed	Reduce run offs from sites especially new development	Commenting on projects with the help of MEPA	
revising their stormwater management policy	Include more up to date approach such as LID	Much more acceptance	
Involving the community in decision making	Encouraging others to involve stakeholders	Have educational program for people	Not to many staff working for the organization
recreational activities on the river	increases people's involvement and awareness of the issues	In progress, annual clean ups activities ...	
Education and outreach	Raise public awareness	Activities done with kids and adults	

Appendix C: Case Study Matrices

Section 1: Outside Cases Ecologically Similar to the SuAsCo Watershed

Water Body	Pollutants and sources	BMPs
<p>Connecticut: Edgewood Park Pond (EPA 2006b)</p>	<p>“Nutrients” and sedimentation</p>	<p>Dredging: Brought Maximum Depth to 10 ft; Cleared 12,500 Cu.Yd’s of nutrient rich sediments.</p> <p>Erosion Prevention Vegetative Planting to stabilize land near the pond.</p> <p>Fish habitat restoration Installing fish structures, felled trees, and littoral zone plants.</p> <p>Redirecting the storm pipe for a better infiltration: away from the pond and into a nearby wetland to facilitate the removal of nutrients, sediments, and others.</p>
<p>North Carolina: Mills River (EPA 2006g)</p>	<p>“Agricultural Runoff”, sediments and pesticides</p>	<p>Collaborative effort of different segment of the society such a s state, water quality experts and other organizations</p> <p>Public outreach: Workshops educated local agriculture producers about the dangers of pesticides in the river. Local residents received general watershed education.</p> <p>Restoration of streambeds, construction of infrastructure (i.e. fences)</p> <p>stormwater monitoring program</p>
<p>Virginia: Middle Fork Holston River (EPA 2006l)</p>	<p>Fecal Coliform, nutrient (nitrogen and phosphorus) and sediment loadings.</p>	<p>alternate watering systems for cattle (beef and dairies)</p> <p>streambank fencing,</p> <p>Pasture management improvements.</p> <p>Farmers participations implementing alternative watering systems for cattle. And install fences to protect streambanks</p>

Section 2: Outside Cases Ecologically Similar to the Blackstone Watershed

Water Body	Pollutants and sources	BMPs
<p>Connecticut: Center Springs Pond Restoration Project (EPA 2004a)</p>	<p>urban storm water runoff (Sedimentation, nutrients and trash)</p>	<p>Forebays Accumulates sediment in a confined area for easy removal.</p> <p>Install Trash Rack: To collect large debris before items enter the pond.</p> <p>Dredging of the pond</p> <p>street sweeping programs</p> <p>public education program</p>
<p>Rhode Island: Curran Brook Sedimentation Pond (EPA 2002c)</p>	<p>urban storm water runoff (Nutrients, bacterial contaminants, situation, and organic compounds)</p>	<p>Storm water control system</p> <p>Install sediment forebay</p> <p>artificially created wetland to treat the storm water during wet weather events</p> <p>Public Outreach Campaign</p>
<p>Pennsylvania: Villanova's Storm Water Wetland Retrofit (EPA 2004c)</p>	<p>Urban runoffs (nutrients, metals and suspended solids)</p>	<p>creating a water quality treatment facility</p> <p>storm water detention basin reduce the increased peak flows</p> <p>install sediment forebay</p> <p>conduct Wetland plantings</p>

Section 3: Outside Cases Ecologically Similar to the Charles River Watershed

Water Body	Pollutants	BMPs
<p>Florida: Blackwater River Restoration (EPA 2004b)</p>	<p>Sediments</p>	<p>redirect the source of water flow causing NPS and stabilize the soil</p> <p>closing and repairing roads depending on the slope, traffic, and natural stabilization mechanisms in place</p>
<p>Nevada: The Upper Carson River Basin (EPA 2002a)</p>	<p>Urbanization and agriculture</p>	<p>constructed wetland ponds used for water treatment and sediment capture install a trash can</p> <p>Planting of native trees and shrubs to provide cooler water temperatures and enhance wildlife habitat.</p>
<p>New Hampshire: Lake Opechee (EPA 2002b)</p>	<p>urban storm water runoff (sediments, phosphorus, nitrogen, salt, oil and grease, heavy metals, and bacteria)</p>	<p>Create a wetland: provide overland treatment before storm water entered the lake</p> <p>redesigned boat-launch ramps Prevent run off and sediment from discharging into the lake.</p> <p>Vegetated buffers prevent runoff from discharging directly into the lake.</p> <p>Construct sediment basins (forebays) trap any sediment before it gets discharged into the lake</p>