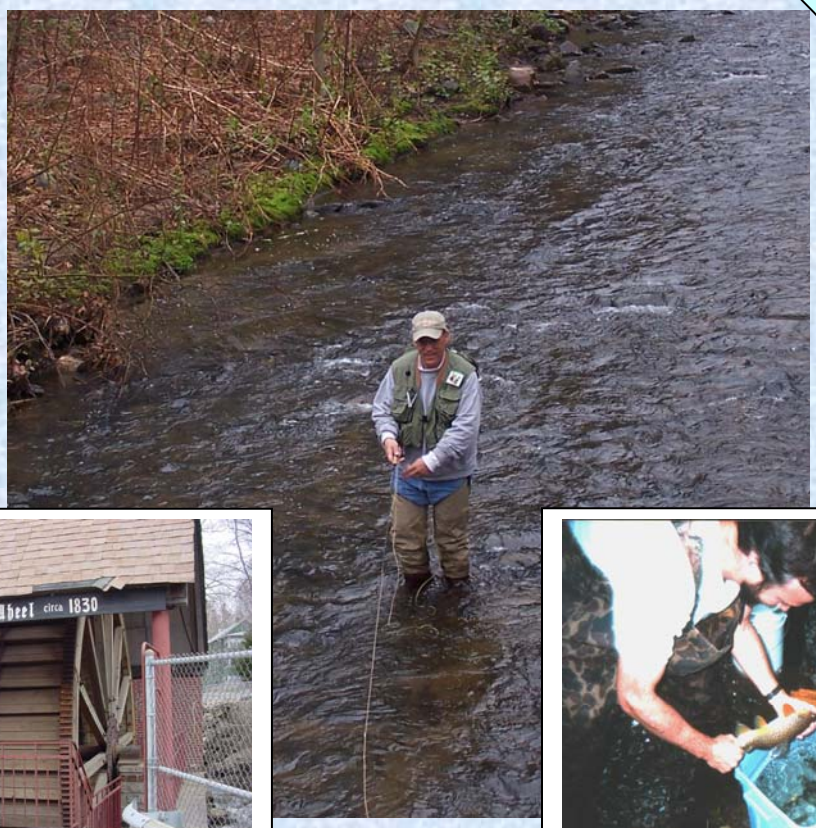
The Pequabuck River Watershed Management Plan

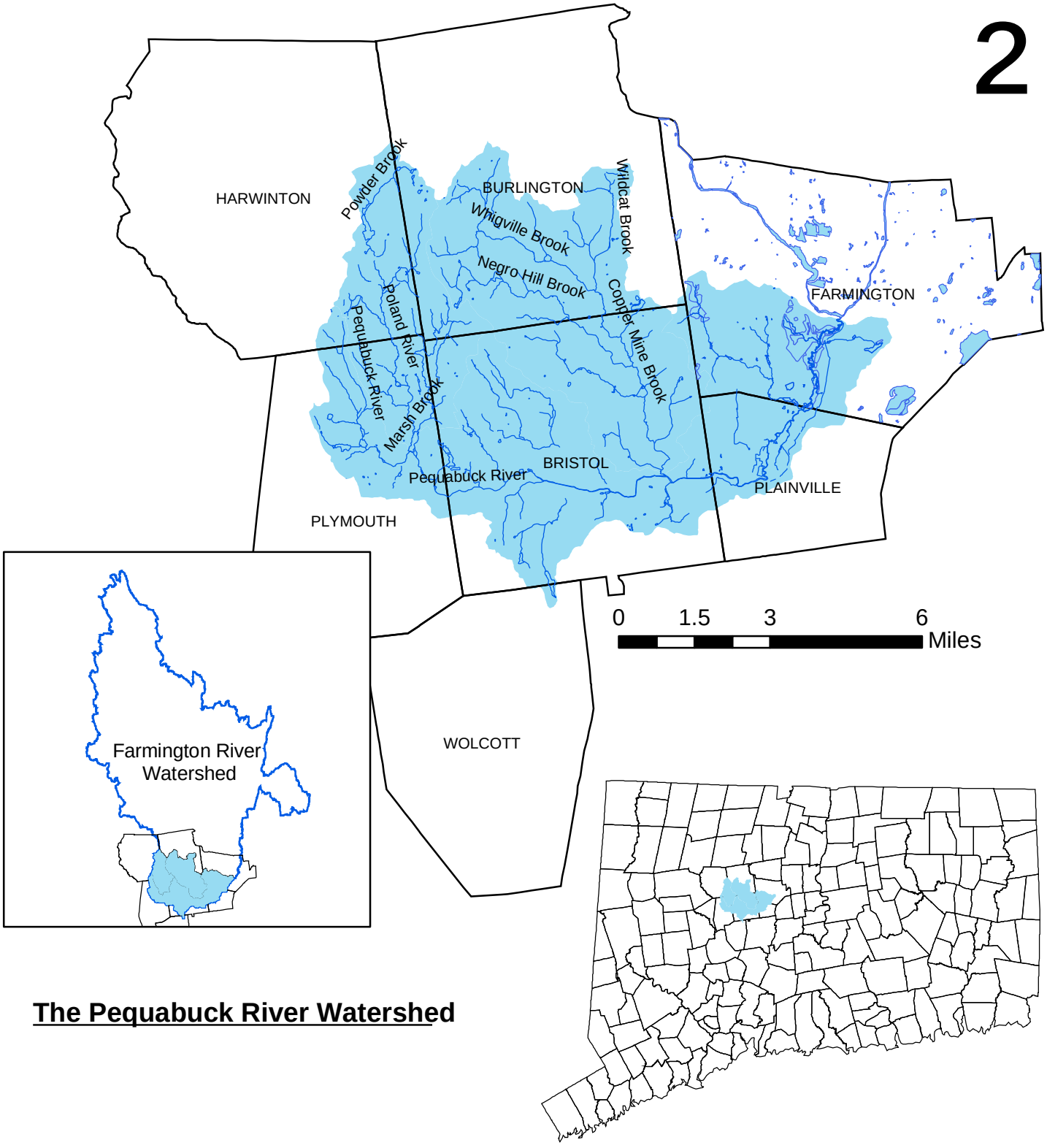
June 2005



Prepared by: The Central Connecticut Regional Planning Agency, the Pequabuck River Watershed Association & the Farmington River Watershed Association, in co-operation with the Management Plan Stakeholder Committee.

CCRPA

This study is funded in part by the CT DEP through a US EPA Clean Water Act Section319 nonpoint source grant.



The Pequabuck River Watershed

PARTICIPANTS LIST

Name	Affiliation
Bill Allread	Plymouth Inland/Wetlands and Conservation Commission
Mark Austin	City of Bristol, Public Works
Tom Beland	Burlington
Jim Benway	Plymouth
Beverly Bobroske	Bristol
Robyn Bugbee	City of Bristol, Economic Development
Tina Delaney	Farmington Land Trust
James Desmarais	Burlington Inland Wetland and Watercourses Commission
Elizabeth Dolphin	Town of Farmington
Cindy Donovan	Bristol Garden Club
Tom Doyle	Bristol
Zachary Fisk	Bristol Conservation Commission
Timothy Furey	Chair, Central Connecticut Regional Planning Agency
Eric Hammerling	Farmington River Watershed Association
Jennifer Heintz	Farmington River Watershed Association
John Hickey	Farmington Conservation Commission, Chair
Rebecca Hurley	Bristol
Dr. Mark Johnson	St. Joseph's College
Ann Jurkiewicz	Burlington Land Trust
Jewel McKenzie	USDA – Natural Resources Conservation Service
Mary Moulton	Pequabuck River Watershed Association
Donald Muller	Bristol
Vin Mullin	Plainville Conservation Commission
David Niedzwiecki	Plainville Conservation Commission
Pramod Pandey	Central Connecticut Regional Planning Agency
Chet Reed	Pequabuck River Watershed Association
Christopher Ried	Harwinton
Paul Rochford	Burlington Land Trust
Jason Rupaka	Plainville Conservation Commission
Sebastian Saraceno	Bristol
Hildegarde Siemiatkoski	Terryville-Plymouth Day Care Center, Inc.
Linda Simeone	Plainville Conservation Commission
Jim Stuart	Plainville
Ken Shooshan-Stoller	Central Connecticut Regional Planning Agency
Mary Suchopar	United Way of West Central Connecticut
Carl Swanson	Pequabuck River Watershed Association
Joe Treggor	Farmington Conservation Commission
Barbara Walker	Bristol
Alan Weiner	City of Bristol, Land Use
Earl Weingart	Harwinton Planning & Zoning Commission
Guy Wolf	Farmington Planning & Zoning Commission
Pamela Wolf	Farmington

TABLE OF CONTENTS

STAKEHOLDERS' AGREEMENT

<u>Management Plan Overall Goal</u> - Develop an affordable and effective watershed management plan that can be implemented by the watershed towns.

Focus Areas and Goals

<u>Habitat</u>: **Maintain and improve fish and wildlife habitat and biodiversity of the watershed and promote habitat connectivity by protecting wildlife and riparian corridors**
<u>Land Use</u>: **Promote land uses compatible with protecting and improving water quality, and enhancing the river as an asset to the communities**
<u>Protected Open Space</u>: **Identify existing protected land and protect more land.**
<u>Water Quality</u>: **Improve and protect water quality in the watershed**

We, the undersigned, pledge, as Stakeholders in the process to improve the Pequabuck River Watershed, to support the goals and actions of this Management Plan:

----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------
----------	----------

ACKNOWLEDGEMENTS

The preparation of this Plan would not have been possible without the support and valuable contribution of a large number of individuals and organizations. We would like to credit Connecticut Department of Environmental Protection (CT DEP) and United States Environmental Protection Agency (US EPA) for funding this project making this happen. The Central Connecticut Regional Planning Agency, the Farmington River Watershed Association and the Pequabuck River Watershed Association created a strong partnership to coordinate the meetings and finalize this Plan.

Management Plan Stakeholders Group

After the completion of the State of the Watershed Report, it was presented to the Management Plan stakeholders group to review the Report and then use it in developing the Management Plan. Several rounds of discussion were held with the members of the group to define the overall management goal, objectives and actions. Members of this group included Bill Allread, Mark Austin, Tom Beland, Jim Benway, Beverly Bobroske, Robyn Bugbee, Tina Delaney, James Desmarais, Liz Dolphin, Cindy Donovan, Tom Doyle, Zachary Fisk, Timothy Furey, Eric Hammerling, Jennifer Heintz, John Hickey, Rebecca Hurley, Dr. Mark Johnson, Ann Jurkiewicz, Jewel McKenzie, Mary Moulton, Donald Muller, Vin Mullin, David Niedzwiecki, Pramod Pandey, Chet Reed, Christopher Ried, Paul Rochford, Jason Rupaka, Sebastian Saraceno, Hildegarde Siemiatkoski, Ken Shooshan-Stoller, Jim Stuart, Mary Suchopar, Carl Swanson, Joe Treggor, Barbara Walker, Alan Weiner, Earl Weingart, Guy Wolf, Pamela Wolf.

Special thanks to the stakeholder meeting hosts: State Representative Betty Boukus; Hon. Gerard Couture, Mayor of Bristol; First Selectman Theodore C. Scheidel, Jr., Town of Burlington; Hon. Richard Covello, Mayor of Plymouth; Bruce Chudwick, Chair of the Farmington Town Council; and John Leone, Executive Director of the Central Connecticut Chambers of Commerce.

Contributors

The group would like to specially recognize the contribution of Charles Fredette, Lisa Wahle, Robert Hust, and Sally Snyder of the Connecticut Department of Environmental Protection for their suggestions and help. Kevin Case, Jane Brawerman, Bruce Williams, Arthur Mauger, Doug Glowacki, Joseph Gerstner, Peter Spangenberg, Jon Guglietta, Elizabeth Dolphin, Terry Obey, Sandy Prisloe also contributed their knowledge, ideas, and data required to finish the State of the Watershed Report. We also thank public works departments of the watershed towns for their help in providing water and sewer statistics. Finally, our special thanks go to all those individuals and organizations who gave their time, efforts and resources in completing the State of the Watershed Report and the Management Plan.

PREFACE

Conservation and preservation of nature has become a global issue since the 1970s. Heavy industrialization during the first half of the 20th century highly affected the environment of the whole nation. In response to the negative impacts of industrialization, the United States enacted and implemented several environmental protection programs in the 1970s. The first US department created to address these issues was the Environmental Protection Agency (EPA), created in July of 1970. The Connecticut Department of Environmental Protection (CT DEP) was established in 1971. The mission of the CT DEP is "to conserve and improve natural resources and the environment in order to protect public health, safety, and welfare while preserving and enhancing the quality of life for present and future generations." One way EPA does this is by granting funds to regional or local agencies to complete studies such as this.

This plan presents the steps to be taken by various public and private entities to improve the state of one of Connecticut's important watershed regions, the Pequabuck River Watershed. The Pequabuck River Watershed is a tributary to the Farmington Regional Basin which drains to the Connecticut Major Basin. This plan provides a summary of the State of Watershed Report and the management goals, actions and strategies required to preserve and improve water quality and quantity, fish and habitat, and land use in the watershed. The Management Plan is based on the critical data and analyses of the State of the Watershed Report. This study is funded in part by the CT DEP through a US EPA Clean Water Act §319 grant.

ORGANIZATION ACRONYMS

BOEs - Municipal Boards of Education
CCD – Connecticut Conservation Districts
CCRPA - Central Connecticut Regional Planning Agency
ConnDOT - Connecticut Department of Transportation
DEP - Connecticut Department of Environmental Protection
DPW - Municipal Departments of Public Works
ELCC - Environmental Learning Centers of Connecticut
FRWA - Farmington River Watershed Association
NEMO - Nonpoint Education for Municipal Officials (UConn Extension System)
PRWA - Pequabuck River Watershed Association
PZCs - Municipal Planning & Zoning Commissions
SHPO – State Historic Preservation Office
SWCD- Soil & Water Conservation District
EPA- Environmental Protection Agency
USDA/NRCS – United States Department of Agriculture/Natural Resources Conservation Service
USGS- United States Geological Survey

EXECUTIVE SUMMARY

The Pequabuck River Watershed Coalition (comprised of representatives from over a dozen organizations as well as numerous citizen volunteers from Bristol, Burlington, Farmington, Harwinton, Plainville and Plymouth) is very pleased to present this Management Plan which outlines the management goals, actions and strategies to be taken to help preserve and improve the various environmental aspects of the watershed.

In terms of background, The Pequabuck River Watershed, State of the Watershed Report (December 2004) is the descriptive database of findings from which the Management Plan draws its recommendations.

The Pequabuck River Watershed, a 57.9 square mile area which lies in the Central Valley of Connecticut, is the upland area or subregional basin of the Farmington Regional Basin that drains to the Connecticut Major Basin. The Pequabuck River Watershed is rich with various natural habitats supportive of fish and wildlife. The variety of habitats include lakes with shallow and deep water, wetlands, marshes, fields and wooded areas of hardwoods, mixed conifers and shrubs.

The Pequabuck River Watershed experienced rapid human settlement during the early colonist period. Then, between 1860 and 1945, this area experienced an increase in industrialization and a decrease in agriculture. The Pequabuck River became one of the most polluted rivers in Connecticut since the early 1900's. The main reason for water quality degradation was the discharge of large quantities of poorly treated municipal sewage and industrial wastes. Moves to improve water quality in the Pequabuck River were made in the late 1970's, as treatment procedures improved for both industrial discharges and wastewater treatment at municipal facilities. Three Water Pollution Control Facilities (WPCF) for the Towns of Plymouth and Plainville, and the City of Bristol are currently discharging their effluent into the Pequabuck River.

The mean daily streamflow averages about 81 cubic feet per second (cfs) with precipitation being the dominant contributor to the River flow. The surface waters of the Pequabuck River Watershed, including Poland River and Coppermine Brook, are classified from Class AA to C/B, with the majority of the river falling in Class B or C/B water. Although there has been a drastic reduction in bacteria such as E-coli and nutrients such as phosphorous and nitrogen concentration in the Pequabuck River since the late 1980s, much work still needs to be done to preserve and improve the water quality of the river and its surrounding environment. E-coli levels in the Pequabuck River still exceed the permissible limit for non-contact recreation. Nitrogen, which is identified along with phosphorus as the nutrient responsible for the growth of algae and eutrophication of fresh waterbodies, is present in the Pequabuck River in a significant amount.

The Watershed includes a total of 9,339 acres (almost 15 square miles) of Level B aquifer protection area. Almost half of the aquifer area in the region is already covered by residential, commercial or impervious surfaces. Three major water utilities (Bristol Water Dept., New Britain Water Dept., and Connecticut Water Company) are currently withdrawing surface water for public water supply as well as groundwater from the watershed area. The Pequabuck River serves as a water source for various industrial and recreational purposes, as well.

The Pequabuck River Watershed is an important natural habitat for many different species of birds, plants and animals. More than 70% of the total Watershed land is still covered by forest and open space. The Watershed provides habitat to at least three species of special concern mammals, eight different species of birds that are either listed as state endangered, threatened, or species of special concern, and at least three species of special concern reptiles.

Land development is on the rise in the Watershed. The number of species of animals, reptiles, and birds is declining as the land development causes habitat destruction and other environmental problems.

The Pequabuck River Watershed Management Plan includes strategies to improve the problems identified in the State of the Watershed Report. A Stakeholders Committee was formed in September 2004, composed of volunteers from the six Watershed communities: Bristol, Burlington, Farmington, Harwinton, Plainville and Plymouth. The Committee developed the goals, actions and strategies included in the Plan, as well as an overarching goal of the Plan. The Committee established goals in the four focus areas of Habitat, Land Use, Water Quality and Protected Open Space. Two work groups developed and refined the goals, actions and strategies. To support each goal, twenty actions were formulated as recommendations. The Committee also selected appropriate implementing parties for those actions.

Actions Matrix

Action	Goals that the Action Supports				Implementing Parties																							
P= Primary Support, S= Secondary Support	Land Use	Habitat	Water Quality	Protected Open Space	PRWA	FRWA	CCRPA	DEP	CONSERVATION COMMISSIONS	PZCs	DPWs	TOWN COUNCILS	UCONN	BOEs	GARDEN CLUBS	LAND TRUSTS	HISTORIC AL SOCIETIES	CHC	NEMO	ConnDOT	SWCD	WATER COS.	PARKS & REC.	ELCC	TROUT UNLIMITED	WPCF	PUBLIC HEALTH DEPTS. & DISTS.
1) Create and promote awareness of Pequabuck River Watershed resources through education efforts designed for the public.	P	P	P	P	☺	☺	☺	☺					☺	☺	☺				☺		☺	☺		☺			
2) Use Best Management Practices (BMPs).	P	P	P	P							☺									☺				☺				
3) Encourage Watershed towns to incorporate policies and strategies in their plans of conservation and development and zoning and subdivision regulations to preserve water quality and protect open space and habitats when considering land development in the Watershed.	P	P	P	P	☺	☺	☺		☺							☺								☺			
4) Reach out and create partnerships with other groups to disseminate information on water quality, protected open space, fish and wildlife habitat and resource impacts of land use.	P	P	P	P	*	*								☺	☺							☺		☺			☺
5) Work with towns to create or protect vegetated, riparian buffers alongside the Pequabuck River and its key tributaries to enhance wildlife habitat, improve water quality and encourage groundwater recharge and recreational opportunity.	P	P	P	P					☺	☺	☺	☺										☺					
6) Encourage the use of the river corridor as recreation areas, where appropriate.	P	S	S	S					☺	☺													☺				
7) Ensure protection and enhancement of historical and cultural sites in the Watershed.	P	S	S	S			☺			☺							☺	☺									
8) Publicize recreational uses of the Pequabuck River and economic benefits associated with protecting and improving them, with environmentally sensitive land-use practices.	P	S	S	S	☺	☺			☺														☺				
9) Document existing fish and wildlife habitats and compile biodiversity database for the Watershed.	S	P	S	S	☺	☺	☺	☺																			
10) Foster local appreciation of native, fish and wildlife species and habitats; and increase knowledge of problems associated with exotic, invasive plants, animals and insects.	S	P	S	S				☺					☺	☺	☺												
11) Encourage, promote, and advocate for remediation of fish habitat.	S	P	S	S	☺			☺																	☺		
12) Isolate and identify sources of water pollution.	P	P	P	S		☺		☺			☺										☺						☺
13) Educate private and business landowners along the Pequabuck on “Good Housekeeping” practices that help protect water quality.	S	S	P	S	☺	☺					☺	☺										☺					
14) Address issues of deficient groundwater recharge.	P	S	P	S					☺	☺	☺											☺					
15) Encourage cooperation in management efforts among water pollution control authorities.	S	S	P	S				☺				☺															
16) Work with towns to ensure that proper enforcement of wetlands, aquifer protection, and other environmental regulations is occurring.	P	S	P	S	☺	☺		☺																			
17) Create a watershed-wide database of existing protected open space and identify potential land for protection.	S	S	S	P			*		☺	☺						☺											
18) Encourage and support development of a water quantity plan that analyzes the impacts of water diversions, impoundments and discharges on water quality and fisheries habitat.	S	P	P	S	*	*		☺			☺											☺				☺	

*= Initiates ☺= Implements

Acronyms: PRWA, Pequabuck River Watershed Association; FRWA, Farmington River Watershed Association; CCRPA, Central Connecticut Regional Planning Agency; DEP, Department of Environmental Protection; PZCs, Municipal Planning & Zoning Commissions; DPW, Municipal Departments of Public Works; BOEs, Municipal Boards of Education; SHPO, State Historic Preservation Office; NEMO, Nonpoint Education for Municipal Officials (UConn Extension System); ConnDOT, Connecticut Department of Transportation; CCD, Connecticut Conservation Districts; ELCC, Environmental Learning Centers of Connecticut; WPCF, Water Pollution Control Facilities.

INTRODUCTION

The River - It all starts and ends with water. This is an elemental component of life on Earth. Humans are composed of almost 70% water. We could not live beyond a few days without water. Water serves us in every facet of our lives every day, and we love water. The Northeastern United States has an abundance of water which is probably one of the reasons why we take it for granted.

Our attachment to water has had a powerful influence on the pattern of civilization since the dawn of time. Rivers, as key sources of fresh water, had particular attraction. Ancient Babylon had the Tigris and Euphrates Rivers, Rome has the Tiber River, London has the Thames River, New York has the Hudson River, and so on.

The Pequabuck River, diminutive and less famous than its larger cousins listed above, influenced human activity locally long before the arrival of Europeans. Archaeological study has shown that the Tunxis Indians made temporary camps close to the River. The River served as a rich resource of food and water.

European settlers found a number of uses for the River, especially important with the advent of waterpower, and established growing communities along its banks.

Today, the Pequabuck River remains an important resource for the region for different reasons than those that were historically vital. Although waterpower is gone, industry still uses the river water for processing and discharges. However, the River's importance as a resource is not as obvious or prominent today as it was in the past.

Every generation has rediscovered new reasons to preserve rivers so their value to the community is fully realized. The Pequabuck River is a singular asset to the region and holds great potential value in several areas for the communities of the Watershed:

- ✓ Environmental – The physical, chemical and biological functions of the River are critical to the availability of clean water. The River interacts with groundwater, to absorb its excess, and replenish its deficiencies. The waters of the Pequabuck River act to dilute several types of pollutants. The Pequabuck River provides a unique and rich habitat for plants, fish, birds, amphibians, reptiles and mammals.
- ✓ Historical – The Pequabuck River Valley is rich in prehistoric and Native American artifacts. Several archaeological sites have been discovered, and probably many more are hidden. The Lewis Walpole Library in Farmington contains many arrowheads and other artifacts discovered in areas in close proximity to the Pequabuck River. There are also examples of early American mill development along the banks of the Pequabuck River, the finest of which is the Terry Waterwheel in Plymouth.
- ✓ Recreational – The presence of the Pequabuck River, its two main tributaries, and other associated water bodies in the Watershed, offer communities opportunities to expand the range of recreational activities for their citizens. The Pequabuck River alone offers chances for fishing, canoeing on certain segments, birdwatching, hiking and general relaxation. The value of the visual relief of the riffles and cascades of the Pequabuck River should not be underestimated. The potential to create more and varied recreational possibilities is waiting to be realized.

  Fishing the Pequabuck River and its tributaries provides many hours of outdoor recreation for residents in the watershed. Improved water quality has allowed the stocking of trout and salmon fry in the main stem of the river. The river and some of its tributaries also have populations of native brown trout. Trout and salmon will not survive poor water quality. Their year-round presence tells us that the river has come a long way back from its polluted past. DEP Fisheries Division conducts surveys, and

fish survival has declined the last two years, which is cause for concern. Fish are our "canaries in the coal mine" for water quality.

- ✓ Educational – The value of a "living laboratory" to observe natural processes has been recognized locally and statewide, as local schools, nature centers and colleges have utilized the Pequabuck River as an aid to reinforce classroom learning. Often, the data obtained in the learning activities adds valuable information to the database of Watershed conditions.
- ✓ Economic – As communities evaluate their assets to maximize economic returns and enhance quality of life for residents, the Pequabuck River should not be forgotten. The River's potential value in this regard has been unrealized. Commercial centers along the length of the Pequabuck River should turn sustained attention to incorporating the River into economic development planning, especially in locations where current development makes buffer zones unworkable. The Pequabuck River is a unique amenity to downtown Bristol and the town centers of Plainville and Terryville.

The Watershed – The Pequabuck River Watershed contains all the land area that drains to the Pequabuck River. This area of 58 square miles includes significant parts of six communities: Bristol, Burlington, Farmington, Harwinton, Plainville and Plymouth. The Watershed is 70% forested, yet at the same time, areas along the Pequabuck River are densely populated, paved and developed. Indeed, 80% of the land within a 100-foot buffer of the Pequabuck River in Downtown Bristol is impervious.

While the Pequabuck River is a visible and tangible thing, its watershed is essentially invisible. There are no signs along the road that alert motorists that they are entering the Pequabuck River Watershed. Some water companies announce entrances to watershed lands associated with reservoirs or well fields, but no such awareness of the Pequabuck River Watershed has been raised. Most maps in common usage do not demarcate watershed boundaries. The anonymous nature of watersheds, and their dynamics, contributes strongly to their problems.

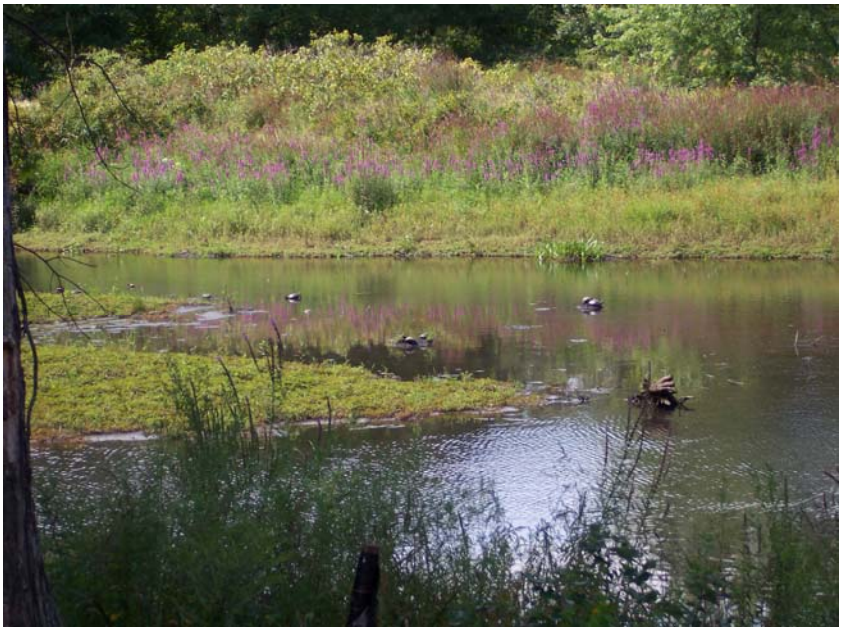
The Problems – Due to the fact that early American industry flourished along the banks of the Pequabuck River, the River became the site of direct waste discharges for well over 100 years. Without regulation, any and all industrial and residential waste easily found its way into the River. Many residents of the watershed recall a foul-smelling river, with a surface that revealed every color of the rainbow. Thus, the Pequabuck River's notorious reputation as a waterway on the precipice of death was firmly established.

However, since enactment of the Clean Water Act of 1977, the direct discharges of pollutants, referred to as point sources, have been significantly reduced through voluntary and enforcement actions of governmental regulation. Upgrades of sewage treatment plants along the Pequabuck River in the late 1980s drastically reduced contaminants such as ammonia. Such improvements have led to rejuvenated fish habitat, clearing the way toward designation of the River as a Trout Management Area (TMA) and regular trout and salmon stocking programs.

Although the virtual elimination of point sources has resulted in dramatic reductions of pollutants and improvements in water quality, the problem of nonpoint sources of pollution remains. These nonpoint sources generate pollutants that are conveyed to the river by surface runoff, a phenomenon which requires some explanation.

The River is where most of the surface water that flows across the watershed ends up. If the watershed were a heart, the Pequabuck River would be the aorta. Water is constantly being poured upon the surface of the land in form of rainfall, snowmelt, lawn watering, car washing, etc. Where there is soil, a certain amount of water infiltrates down from the surface; however, there is no such thing as 100% infiltration. Where it is

paved, there is not groundwater infiltration. Water that does not percolate down through soil becomes runoff. The runoff "runs off" in search of the lowest sections of the topography – the waterways. Runoff, in and of itself, isn't all that bad. It is the stuff that runoff picks up on its way (oil, sand, salt, etc.) to the streams, ponds and rivers that is the problem.



Turtles in the Pequabuck River - Photo courtesty of Vin Mullin

The problem is insidious. The oil change spill on John and Jane Doe's driveway pavement is carried into the street by the torrential thunderstorm that evening (along with the fertilizer that Jane overapplied on the dwarf alpine spruce). As Jane and John sleep contentedly overnight, the storm's runoff, containing oil and chemicals, races pell mell, unchallenged into the storm drain at the end of the street. Underground pipes connected to the storm drain convey the runoff swiftly and discharge it into a no-name stream, which empties into Copper Mine Brook, which empties into the Pequabuck River, as John and Jane awaken the next day. Although some of the pollutants are diluted and dissolved, many of them are actively degrading the water and harming its inhabitants. That morning, over a cup of steaming coffee, John Doe reads a story in the newspaper about nonpoint pollution in the Pequabuck River. "Jane, how does stuff like this happen? What can we do about it? And where did you hide my socks?"

The Solutions - This management plan is designed to help answer John's first two questions only. As the State of the Watershed Report mentions, much of the point source of water pollution has been identified, and efforts at the State level are underway to deal with "end of pipe" sources. Nonetheless, the nonpoint source pollution, such as the kind produced by John and Jane Doe, has kept the Pequabuck River classified as an impaired waterway by the Connecticut Department of Environmental Protection (DEP). Although the DEP lists municipal and industrial point sources as potential origins, urban runoff is suspected as a major contributing cause of impairment for over half the River's length.

The Stakeholders Committee, composed of people who live and/or work in the Pequabuck River Watershed, has worked diligently to create a plan to help the Watershed communities realize the full potential of the region's water resources.

The Committee recognized four focus areas of concern (*land use, water quality, habitat, and protected open space*), and created goals for each focus area. Specific actions were identified that would support the goals. The actions recognize the twin imperatives of education (for example, How does a watershed work? How does nonpoint source pollution work? Why are invasive species a problem?) and practice (for example, How can pollution be prevented? what land use techniques can preserve water quality? How

can residential day-to-day activities be altered to conserve water and improve quality?). Strategies were then developed to address those twin imperatives.

The aim of the Management Plan is to present a guide for the people who live and work in the Watershed, to help improve, preserve and conserve a valuable resource. The Pequabuck River Watershed, its lands and its waters, hold great potential. Certain choices made at home and at work can make a difference in the quality of our water resources and the quality of our lives.

THE MANAGEMENT PLAN

Focus Area: Habitat

Habitat Goal: **Improve and maintain fish and wildlife habitat and the biodiversity of the Watershed and promote habitat connectivity by protecting wildlife and riparian corridors.**

"Participate in the development and implementation of the Pequabuck River Watershed Management Plan." Plymouth Plan of Conservation and Development, 2005

Opportunities and Benefits: The Watershed includes many habitats including rural forests, fields, farms, reservoirs, suburban lawns, gardens, shopping centers and golf courses, urban buildings, parking lots and parks, as well as the River itself. From rare and endangered to common and sometimes invasive, many plants and animals live here. This diversity of life adds to our enjoyment and quality of life.

The Pequabuck River is now clean enough to support a trout fishery with a section designated by DEP as a Trout Management Area (TMA) that provides quality catch and release fishing for sporting enthusiasts, and excellent growth rates for the trout! Whether you fish or not, the presence of trout in the river is important. The fish themselves are excellent indicators of water quality. The River is included as part of the Atlantic Salmon Restoration Program. Annual releases of salmon fry into the Pequabuck River are promising for establishing that species in the Watershed. The presence of healthy fisheries in the Watershed is good news for other predatory species that seek fish for food, such as bald eagles.

Young bald eagle near the mouth of the Pequabuck River - Photo courtesy of Tina Delaney

The watercourses of the Watershed provide homes and food for other creatures such as otters, beavers and fishers. The land adjacent to the Watershed's waterways attracts animal visitors looking for fresh water and food. A wide variety of animals routinely patrol these lands, called riparian corridors, as part of their range, such as turkeys, deer and foxes.

Rich and diverse habitats can have secondary effects of creating recreational opportunities for hiking, birdwatching, fishing, and hunting. These secondary effects can have

positive impacts upon the economy of the Watershed towns.

Problems and Threats: The introduction of non-native plant species, such as Japanese knotweed and Eurasian watermilfoil, to the riparian environment has upset the ecological balance of the Watershed's ponds and streams. Native species suffer when invasive species proliferate and spread throughout the habitat.

Human activity and development have negatively impacted riparian habitat. Culverts, diversions, clear-cutting and other activities have altered the natural habitat of certain species of fish, animals and plants. The result of degraded habitats is loss of species diversity and abundance in the ecosystem.

Data from the State of the Watershed Report explains the repercussions of invasive species within the Watershed. Much more data on individual species impacts needs to be documented.

Actions that form primary support for this goal are as follows:

- ✓ **Action**: Create and promote awareness of Pequabuck River Watershed resources through education efforts designed for the public.

Strategies:

- Consider publishing educational materials for the public on "The Critters in your Backyard," the "Birds of Bristol," the "Wildlife of your Watershed," etc.
- Sponsor events, such as fishing derbies, Master Gardening programs, and nature hikes, to promote understanding of threats and appreciation of benefits regarding riparian habitat.

Brown Trout – Bi-annual fish survey by DEP in the Pequabuck River

- ✓ **Action**: Use Best Management Practices (BMPs) for preserving viable habitat.

Strategies:

- Create undisturbed buffer zones at river edges.
- Prevent clear-cutting activities in environmentally sensitive areas.

- ✓ **Action**: Encourage Watershed towns to incorporate policies and strategies in their plans of conservation and development and zoning and subdivision regulations to preserve water quality and protect open space and habitats when considering land development in the Watershed.

Strategies:

- Work with municipal planners and engineers, DEP, etc., to incorporate BMPs into plans of conservation & development, and zoning and subdivision regulations to ensure that future land uses are compatible with protecting and improving riparian habitat.
- Identify potential open space parcels that would enhance wildlife corridors through connections, and document in plans of conservation and development.
- Assist municipalities in enforcement of regulations by reporting infractions.

- ✓ **Action**: Reach out and create partnerships with other groups to disseminate information on water quality, protected open space, fish and wildlife habitat and the resource impacts of land use.

Strategies:

- Develop a pamphlet to distribute with water bills on fish and wildlife habitat preservation procedures.
- Recruit volunteers to survey, remove, and monitor invasive plant populations through partnership with UConn-IPANE, DEP, watershed organizations, local garden clubs, and/or other partners.
- Create pages on appropriate web sites for Watershed information and recommendations.

✓ **Action**: Work with towns to create or protect vegetated, riparian buffers alongside the Pequabuck River and its key tributaries to enhance fish and wildlife habitat, improve water quality and encourage groundwater recharge and recreational opportunities.

Strategies:

- Advocate for open space acquisitions or conservation easements in areas that are critically sensitive to water resources.
- Assist towns with documentation of critically sensitive areas.

""Consider adopting stream buffer regulations."
"Support the Connecticut Atlantic Salmon Restoration Program."
Farmington Plan of Conservation and Development. 1995

Habitat

✓ **Action**: Document existing fish and wildlife habitats and compile biodiversity database for the Watershed.

Strategies:

- Develop a Biodiversity Database for the Watershed.
- Develop a Natural Resources Inventory for the Watershed.
- Incorporate this new data into a reissued State of the Watershed Report.

✓ **Action**: Foster local appreciation of native fish and wildlife species diversity and habitats; and increase knowledge of problems associated with exotic, invasive plants, animals and insects.

Strategies:

- Develop a field guide to native and non-native flora, fish and fauna in the watershed.
- Sponsor programs to educate waterside landowners about the subject.
- Partner with Garden Clubs to create restoration pilot programs to identify and remediate affected areas.
- Encourage nurseries to sell only non-invasive plant species.

Invasive Japanese Knotweed – Photo courtesy of Barbara Walker

✓ **Action**: Encourage, promote and advocate for remediation of fish habitat.

Strategies:

- Urge DEP to initiate a fisheries evaluation to optimize fish habitat and to identify sites for restoration activities, in coordination with PRWA.
- Encourage towns to view fisheries habitat restoration and preservation as strategic priorities in economic and community development.

- ✓ **Action**: Isolate and identify sources of water pollution.
  Strategies:
  - Maintain and update the State of the Watershed Report database with regular water sampling and fish surveys.
  - Ensure that towns follow procedures outlined in their Stormwater Manuals.

- ✓ **Action**: Encourage and support development of a water quantity plan that analyzes impacts of water diversions, impoundments and discharges on water quality and fisheries habitat.

  Strategies:
  - Distribute fact sheets which document effects of flow deviations on fisheries.
  - Work with DEP to initiate a water quantity plan for the Watershed.

Focus Area: Land Use

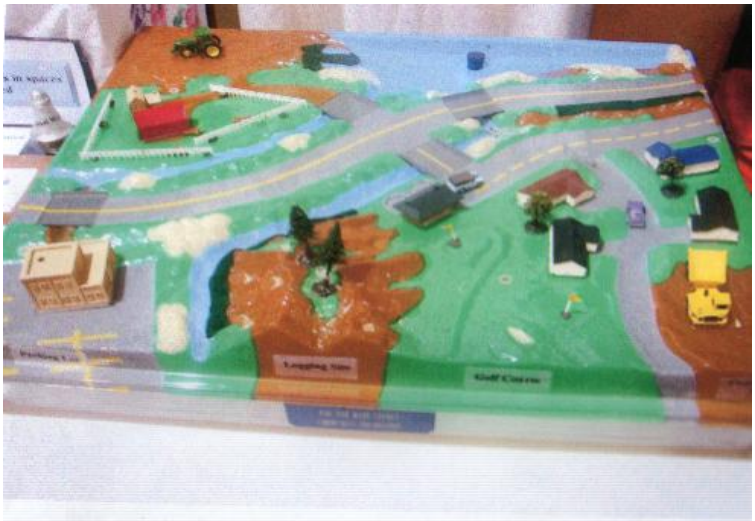
Land Use Goal: Promote land uses compatible with protecting and improving water quality, and enhancing the River as an asset to the communities.

"Enhance protection of surface water and groundwater quality in Burlington, especially in public water supply watershed, by drafting appropriate regulations." Burlington Plan of Conservation and Development, 1997

Opportunities and Benefits: The Pequabuck River Action Plan of 2000 recognized the underutilization of the Pequabuck River as a community asset. The realization of the potential benefits of forging a new relationship with the Pequabuck River and its tributaries and other waterways is still in its infancy.

The Pequabuck River flows through Downtown Bristol and the town centers of Plymouth and Plainville. Each of these communities is seeking unique features to revitalize their traditional, core centers of commerce. Creating a developmental focus on the River's proximity that simultaneously exploits and protects that opportunity is essential. Land-use policy and implementation is the key first step in creating that focus.

Land-use policy and implementation can provide additional, enhanced public access for recreational pursuits such as fishing, hiking, and birdwatching. Development with access or viewsheds of waterways can be reoriented toward the rivers, streams and ponds. Certain land uses, such as cafes, restaurants and other retail will see benefits. With the emphasis of this amenity built into development plans,



Enviroscape kinetic display of stormwater runoff - photo courtesy of Cindy Donovan

the importance of resource preservation will also be stronger.

Special features of the Watershed, historic and natural, have the potential to enhance and expand economic and recreational opportunities.

Problems and Threats: While human population in the Watershed is rising modestly, land use is exploding. Sprawl conditions increase the likelihood that new developments will add to the Watershed's acreage of impervious surface. Precipitation on impervious surfaces picks up pollutants, heats the runoff and increases the velocity of the discharges entering the Watershed's waterbodies.

The transported pollutants degrade water quality, the heated runoff raises river water temperatures which stress fish populations, and high velocity runoff causes erosion and turbidity that damage quality and habitat. Impervious surfaces also impede groundwater recharge by conveying runoff to waterbodies, not to the ground, which helps support stream base flows during seasonal low flow events.

Data from the State of the Watershed Report cite extreme fluctuation in flows that indicate a dependence on precipitation and runoff for source water for the streams and rivers of the Watershed.

Actions that form primary support for this goal are as follows:

- ✓ **Action:** Create and promote awareness of Pequabuck River Watershed resources through education efforts designed for the public.
  Strategies:
  - Make presentations with partners to land-use commissions in Pequabuck River Watershed communities on best management practices to reduce stormwater and protect the Watershed's rivers, streams and ponds.
  - Provide pollution prevention workshops intended for specific audiences, sponsored by interest groups representing that audience.
  - Sponsor contests to name "unnamed" streams in the Watershed.

"The key to the maintenance of Harwinton as a rural community is the protection of the natural environment." Harwinton Plan of Conservation and Development, 1995

- ✓ **Action:** Use Best Management Practices (BMPs).
  Strategies:
  - Create undisturbed buffer zones at river edges.
  - Promote more natural solutions to stormwater controls that increase groundwater infiltration and decrease the velocity of runoff and the extreme fluctuations in flow.

Horseshoe Falls, Plymouth – photo courtesy of Hildie Siemiatkoski

- ✓ **Action:** Work with towns to create or protect vegetated, riparian buffers alongside the Pequabuck River and its key tributaries to enhance fish and wildlife habitat,

improve water quality and encourage groundwater recharge and recreational opportunity.

Strategies:

- Develop an inventory of public access areas and their current and potential recreational uses.
- Identify future appropriate areas for recreational uses along rivers and streams.
- Consider working on a map of cultural/historic assets with local historical societies, garden clubs, and other interested groups.

✓ **Action:** Encourage Watershed towns to incorporate policies and strategies in their plans of conservation and development and zoning and subdivision regulations to preserve water quality and protect open space and habitats when considering land development in the Watershed.

Strategies:

- Allow for and encourage alternative methods for groundwater infiltration such as semi-pervious pavements in development proposals.
- Consider maximum parking allowance, rather than minimum parking requirements, in zoning regulations to provide a cap for parking lot size.

✓ **Action:** Reach out and create partnerships with other groups to disseminate information on water quality, protected open space, fish and wildlife habitat and resource impacts of land use.

"Evaluate and mitigate the potential impacts of development, construction and stormwater discharge, to prevent deterioration of the quality of the Town's surface waters, especially Hamlin Pond, the Quinnipiac River and the Pequabuck River." Plainville Plan of Conservation and Development, 1997

Strategies:

- Make presentations with partners to land-use commissions in Pequabuck River Watershed communities on best management practices to reduce stormwater and protect the River.
- Work with DEP to expand the provision of pollution prevention programs through public schools.

✓ **Action:** Encourage the use of the river corridor as recreation areas, where appropriate.

Strategies:

- Develop criteria for siting riverside recreation areas.
- Coordinate open space acquisition activities between land trusts, water companies and municipalities.

✓ **Action:** Ensure protection and enhancement of historical and cultural sites in the Watershed.

Strategies:

- Work with the State Historic Preservation Office and local historical societies to identify threats to historical river sites.
- Seek funds for preservation and enhancement of sites.

✓ **Action:** Work with towns to ensure that proper enforcement of wetlands, aquifer protection and other environmental regulations is occurring**.**

Strategies:

- Establish good working relationships with town level enforcement personnel.
- Create informational material related to existing regulations and their rationale**.**

- ✓ **Action:** Isolate and identify sources of water pollution**.**
  Strategies:
  - Encourage enforcement of proper erosion and sediment controls on construction sites.

- ✓ **Action:** Address issues of deficient groundwater recharge**.**
  Strategies:
  - Review town standards to encourage groundwater recharge.
  - Encourage zero increase in surface runoff during and after construction projects.

- ✓ **Action:** Publicize recreational uses of the Pequabuck River and economic benefits associated with protecting and improving them, with environmentally sensitive land-use practices.
  Strategies:
  - Promote walking tours of natural and historic features of the Pequabuck River.
  - Sponsor fishing and canoeing events in appropriate river settings.
  - Involve chambers of commerce and tourist bureaus in publicity.

Focus Area: Protected Open Space

<u>Protected Open Space Goal</u>: Identify existing protected land and protect more land.

Opportunities and Benefits: Water resources in developed areas derive significant benefits for the Watershed and its communities from protected open space. It stands to reason that more pervious surfaces allow greater soil infiltration from precipitation. This helps replenish groundwater supplies and is a first defense against polluted stormwater runoff reaching a waterbody. Overland flow and infiltration helps trap sediments and pollutants. The closer the protected open space is to the water body, the greater the benefit. Streamside corridors are vital to preserving habitats for many species of animals, plants and amphibians. Shade Swamp Sanctuary, Sessions Woods, Barnes Nature Center, and purchases of open space with surface water bodies all contribute to elevating the quality of habitats in the Watershed.

Protected open space lands that form streamside corridors also add an opportunity for a richer recreational experience. This potential of river access provides possibilities for fishing, hiking, birdwatching, boating, bicycling and urban relief.

Pequabuck Lane - Photo courtesy of Tina Delaney

Streamside corridors with public access also allow opportunities for greater appreciation of water resources as a community asset. Try to picture Rockwell Park and Memorial Boulevard without the Pequabuck River.

From an economic standpoint, protected open space saves money for municipalities by requiring little or no infrastructure expenses, unlike residential, commercial or industrial land. Protected open space can actually increase the value of residential properties nearby.

Problems and Threats: Undeveloped land may not be open space for long. The pressure to develop vacant land increases annually. Future development may imply increases in incompatible land uses and impervious surfaces that could threaten surface water and groundwater.

Although 70% of the Watershed is forested or open space, data from the State of the Watershed Report calculates the dedicated open space in the Watershed; that is, open space in which development is prohibited, to only 3.4% of the total land in the Watershed.

As vacant land is developed, more pressures are applied to the Watershed's ability to naturally process runoff.

"Recognize the importance of the Pequabuck River as a significant natural asset to the community. Identify and support opportunities to enhance the use of the river corridor for both open space and recreational purposes."
Bristol Plan of Conservation and Development, 2000

Actions that form primary support for this goal are as follows:

- ✓ **Action**: Create and promote awareness of Pequabuck River Watershed resources through education efforts designed for the public.
  Strategies:
  - Support development of a Watershed-based open space plan.
  - Encourage regularly scheduled NEMO Open Space Workshops at the local level.

- ✓ **Action**: Use Best Management Practices (BMPs).
  Strategies:
  - Encourage development and use of conservation subdivisions in the Watershed towns, especially in sensitive environmental areas

- ✓ **Action**: Encourage Watershed towns to incorporate policies and strategies in their plans of conservation and development and zoning and subdivision regulations to preserve water quality and protect open space and fish and wildlife habitats when considering land development in the Watershed.
  Strategies:
  - Encourage communities to develop open space plans.
  - Encourage open space buffers in subdivision plans.

- ✓ **Action**: Reach out and create partnerships with other groups to disseminate information on water quality, protected open space, fish and wildlife habitats and resource impacts of land use.
  Strategies:
  - In coordination with towns and land trusts, identify and utilize existing funding mechanisms for open space acquisition such as the State Open Space Grant Program.

- ✓ **Action**: Work with towns to create or protect vegetated, riparian buffers alongside the Pequabuck River and its key tributaries to enhance fish and wildlife habitat, improve water quality and encourage groundwater recharge and recreational opportunity.
  Strategies:
  - Support creation of river corridor protection districts as overlay zones.

- ✓ **Action**: Create a Watershed-wide database of existing protected open space and identify potential land for protection.
  Strategies:
  - Adopt land selection criteria for open space acquisition that recognizes priority for headwaters, high biodiversity and critical fish and wildlife habitats.
  - Encourage development of a GIS-based regional database of open space parcels.

Focus Area: Water Quality

Water Quality Goal: Improve and protect water quality in the Watershed.

Prohibit clearing of wetland and watercourse vegetation that serves a variety of ecological functions and revegetate scenic areas that are denuded;" State Plan of Conservation and Development , Policies Plan for Connecticut 2004-2009 (Recommended)

Opportunities and Benefits: Clean water is fundamental to our lives. It is fortunate that the Pequabuck River Watershed has sources of clean water, including one of the state's major aquifers. Clean water has allowed the establishment of communities and the growth of economies.

In the past the Pequabuck River has not always had the best quality of water but with conservation methods and sound environmental practices, the quality of the river water has greatly improved since the 1970's. The water quality has improved so much that trout and salmon have been successfully reintroduced to the River.

Even with all of our advances in water quality, more work needs to be done.

With the upgrades to the treatment of sewage by the water pollution control facilities, dramatic decreases in certain pollutants have been realized, proving that efforts to improve water quality are goals that can be achieved.

Problems and Threats: Degraded water quality has real potential to permanently damage the major water supply aquifer, severely limit human recreational activity, destroy fish and wildlife, and diminish the Watershed as an asset to its communities. The pollution history of the Pequabuck River should punctuate the fragility of this resource.

Data from the State of the Watershed Report lists several indicator materials at unhealthy levels, including metals, harmful bacteria and other pathogens which are found in segments of the Pequabuck River.

Actions that form primary support for this goal are as follows:

- ✓ **Action:** Create and promote awareness of Pequabuck River Watershed resources through education efforts designed for the public.

Strategies:

- Continue to support the educational programs and outreach of the Pequabuck River Watershed Association and the Environmental Learning Centers of Connecticut that reach our schools.
- Continue to provide the Enviroscape Program as outreach to garden clubs, home shows and other public events to publicize the effects of everyday activities on the Watershed.
- Utilize the "After the Storm" program published by the Weather Channel and the EPA.
- Distribute flyers to residents of the Watershed.

- ✓ **Action:** Use Best Management Practices (BMPs).

Strategies:

- Require and enforce the use of erosion and sediment controls as per the current edition of the Connecticut Guidelines for Soil Erosion and Sediment Control.
- Follow the guidelines as established by the 2004 Connecticut Stormwater Quality Manual, as revised.
- Use the Best Management Practices as outlined in the Appendix. While not all of the BMPs will be appropriate for or accepted by every municipality, the list is meant to be a guideline of some of the technologies available at the time of publication.

- ✓ **Action:** Encourage Watershed towns to incorporate policies and strategies in their plans of conservation and development, zoning and subdivision regulations to preserve or improve water quality and protect open space and habitats when considering land development in the Watershed.

Strategies:

- Work with DEP, town engineering depts., etc., to incorporate BMPs into plans of conservation and development, and zoning and subdivision regulations to ensure that future land uses are compatible with protecting and improving water quality.
- Work to help enforce the current laws to prevent pollution.
- Reinforce or create pet waste ordinances (pooper scooper laws) and restrictions on illegal dumping.

"To promote the development of green belt areas along the major rivers…" Central Connecticut Regional Development Plan: Future Land Use – 2010, 1993

- ✓ **Action:** Reach out and create partnerships with other groups to disseminate information on water quality, protected open space, fish and wildlife habitat and resource impacts of land use.

Strategies:

- Continue to support the educational programs and outreach of the Pequabuck River Watershed Association and the Environmental Learning Centers of Connecticut that reach our schools.
- Contact the Farmington River Watershed Association to assist with their current outreach activities.
- Contact the local lake associations and encourage educational programs with their members.
- Encourage the use of publicly available flyers and programs. Sponsor a group at the local garden club or home show.

- Continue regular water quality monitoring and compilation of trend data.
- Coordinate and support an "adopt-a-segment" program to encourage visual monitoring on a regular basis.

✓ **Action:** Work with towns to create or protect vegetated, riparian buffers alongside the Pequabuck River and its key tributaries to enhance fish and wildlife habitat, improve water quality and encourage groundwater recharge and recreational opportunity.

Strategies:

- Encourage the use of publicly available flyers and programs.
- Educate homeowners on the importance of the buffers along the rivers and streams.
- Consider adding requirements to the local inland wetlands regulations.
- Strongly encourage the planting of native species and removal of non-native invasive plants.
- Provide towns with data and mapping of areas with adequate buffers and areas in need of buffers.

✓ **Action:** Isolate and identify sources of water pollution.

Strategies:

- Establish a septic systems database to track aging system including mapping.
- Identify and map all direct discharge points along the River.
- Ensure that towns follow procedures outlined in their Stormwater Manuals.
- Work with the Farmington River Watershed Association to participate in the river walk program to help identify and locate discharges to the rivers and streams.
- Promote upgrades to the maximum extent practicable of the Watershed's water pollution control facilities.

"Prohibit new development which would contribute additional pollution to the Pequabuck River." Farmington Plan of Conservation and Development, 1995

✓ **Action:** Educate private and business landowners in the Watershed on "Good Housekeeping" practices that help protect water quality.

Strategies:

- Coordinate with water companies and local chambers of commerce to disseminate information for landowners.
- Ensure that towns follow procedures outlined in their Stormwater Manuals.
- Publicize the BMPs outlined in the Appendix.
- Encourage the use of publicly available flyers and programs.
- Sponsor a group at the local garden club or home show.
- Send out flyers in water or sewer bills.

- ✓ **Action:** Address issues of deficient groundwater recharge.
  Strategies:
  - Seek funds for a pilot program that illustrates methods to optimize groundwater recharge.
  - Encourage Watershed towns to consider strategies for groundwater recharge in aquifer protection regulations.
  - Work with DEP, town engineering depts., etc., to incorporate BMPs into plans of conservation and development, inland wetlands, and zoning and subdivision regulations to ensure that future land uses are compatible with protecting and improving groundwater recharge.
  - Encourage the use of infiltration methods for roof leaders from houses and most businesses.
  - Use "rain gardens" where soil types can support such plantings.
  - Encourage the use of non-impervious materials and methods such as stabilized gravel driveways and reinforced grass parking lots for overflow traffic.
  - Use swales rather than pipes to encourage infiltration for low flows and photo-treatment of some pollutants

- ✓ **Action:** Encourage cooperation in management efforts among water pollution control authorities.
  Strategies:
  - Establish regular meetings with water pollution control authorities in the Watershed and interested groups to coordinate water quality efforts.

- ✓ **Action:** Work with towns to ensure that proper enforcement of wetlands, aquifer protection and other environmental regulations is occurring.
  Strategies:
  - Work with DEP, town engineering depts., private and public water companies, etc., to incorporate stronger enforcement of the existing ordinances and laws.
  - Work with local officials to allow zoning and wetlands enforcement officers the ability to fine violators.
  - Encourage reporting of illegal dumping.
  - Start a stenciling program on all catch basins. The ConnDOT and some municipalities may have stencils available for use by volunteer groups
  - Encourage citizen involvement by establishing and publicizing where and who to report possible violations.
  - Require enforcement entities to follow up on the results of violation investigations.

- ✓ **Action:** Encourage and support development of a water quantity plan that analyzes the impacts of water diversions, impoundments and discharges on water quality and fisheries habitat.
  Strategies:
  - Work with DEP, town engineering depts., private and public water companies etc., to incorporate BMPs into plans of conservation and development, and zoning and subdivision regulations to ensure that future land uses are compatible with protecting and improving water quality.
  - Encourage public programs similar to the Storm Water Trust that the City of Bristol has established to provide for the perpetual maintenance of water control structures.

- Initiate requests that DEP engage interested groups in the Watershed and that DEP lead a comprehensive analysis of quantity issues in the Watershed, especially in terms of the impacts of water diversions, and draft recommendations for remediation.

Summary of the State of the Watershed Report

The state of one of Connecticut's important watershed regions, the Pequabuck River Watershed, has been presented in this report. The State of the Watershed Report has been prepared based on research of water quality and flow information, watershed history, along with other watershed related issues such as land use practices and regulations, and habitat of the region.

Research shows that the Pequabuck River has been one of the most polluted rivers in Connecticut since the beginning of the 20th century. The DEP has listed (Section 303(d) reporting) many segments within the Pequabuck River Watershed as impaired waterbodies due to high turbidity, high levels of bacteria, habitat alteration, and unknown stressors in the water.

Historically the main reason for water quality degradation was the discharge of large quantities of poorly treated municipal sewage and industrial waste from different industries in the early 1800's and, later, the discharges from the automotive, high-tech and recycling businesses of the 20th and 21st centuries. Various non-point sources also contribute to the contamination of already poor quality water. Moves to improve water quality in the Pequabuck River were made in the late 1970's as treatment procedures improved for both industrial discharges and wastewater treatment at municipal facilities. Similarly, watershed organizations also started monitoring programs to evaluate water quality and determine potential sources of pollution.

In the 1980s, as water quality improved, DEP Fisheries Division started to stock trout, and in 1994, Atlantic salmon fry in the Pequabuck River Watershed. There is now a catch and release Trout Management Area from King Street (Routes 229 and 72) in Bristol to Route 177 in Plainville, including part of Copper Mine Brook. The Pequabuck River Watershed Association has supplemented the DEP trout stocking each fall since 1995.

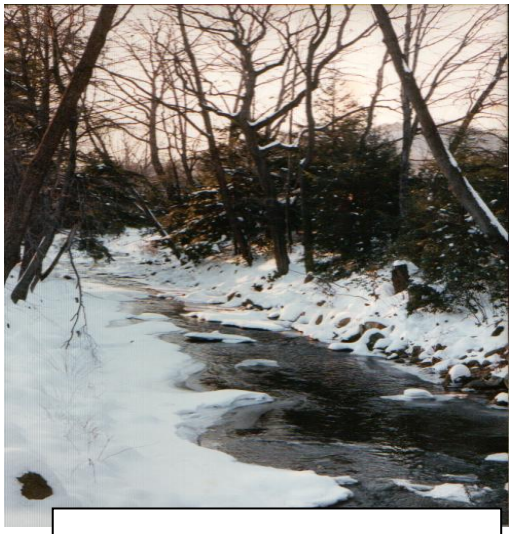
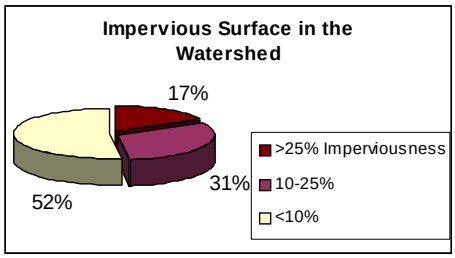


Photo courtesy of Barbara Walker

Although the water quality has improved, many challenges remain ahead:

- The Watershed still falls short of DEP water quality designated usage goals;
- Non-point source pollution is a major concern in the Watershed. Wastewater and discharge regulations are limited mostly to point sources. Non-point sources, which are hard to pinpoint, are polluting the River. The newly introduced General Permit for the Discharge of Stormwater from Small MS4s (Municipal Separate Storm Sewer System) may be helpful to curb illicit discharges to the River and also control non-point source pollution to some extent;

- Population growth trends indicate a possible 11% increase between 2000 and 2010, which will only add to the problems mentioned above, as well as increase demands on the water supply. The water supply is already heavily taxed by demands for drinking water, industrial uses, recreational uses, and waste water assimilation needs;
- Land use patterns have a direct impact on the quality of water. Towns in the Watershed have implemented various land use regulations to protect their watercourses and wetlands. Although these regulations have helped to protect the watercourses and wetlands from direct encroachment, they have not succeeded in protecting the River from various non-point sources of pollution;
- Parts of the Watershed have high percentages of impervious surfaces, which pose a threat to water quality via non-point source pollution as well as negatively affecting water quantity. Having more than 25% of impervious surface indicates degraded water quality, and between 10-25% of impervious surface indicates impacted water quality (Schueler 1994);



- The Pequabuck River Watershed includes important habitat areas including Shade Swamp Sanctuary in Farmington, Indian Rock Nature Preserve and Barnes Nature Center in Bristol, and Sessions Woods Wildlife Management Area in Burlington. The Watershed provides habitat for many endangered species and species of special concerns such as the silver-haired bat, Hoary bat, Indiana bat, Cooper's hawk, and eastern ribbon snake, but the number of these animals, reptiles, and birds is declining because of habitat destruction and land development; and
- The Pequabuck River lacks macroinvertebrate diversity, which indicates low water quality. Macroinvertebrates are visible to the naked eye but smaller than 50mm (megainvertebrates are larger than 50mm). Macroinvertebrates form an important link in stream food-chains providing a major source of food for freshwater fish including trout.

ONGOING AND POTENTIAL FUTURE PROJECTS

Even though this document is a "management plan" and not an "implementation plan", many readers will now be wondering "ok, what do we do now?" Fortunately, there are several potential and ongoing projects that complement this management plans goals and actions in the categories of habitat, land use, protected open space, and water quality. A few of these efforts are highlighted below:

Route 229 Dam Removal Project – This dam represents the first obstacle to upstream fish migration all the way from the Connecticut River and is a remnant of our past use of the River for industry. The current configuration of the dam is due to stabilization of the old structure when it was acquired by the CT DOT. It provides no flood control or protection. PRWA is working to secure funding for the removal of this dam and bank improvements in the area. Sediment core samples have been tested. Removal will allow fish to travel upstream and find more cool water refuges during the low flow and warm water summer months. This project will also improve access to the River.

Other improvements in the Route 72 and Downs Street area include creation of a trout park and handicapped fishing area associated with the former Trudon property, and modification or removal of the retention wall alongside the road.

Daylighting the Pequabuck – There are stretches of the Pequabuck River and North Brook that are piped through underground culverts. In some areas there is the potential to "daylight" sections of the river, i.e., allowing the public to enjoy the beauty of a flowing, aboveground river once again. Daylighting can be expensive, but in places such as Brackett Park in Bristol, it makes great sense to celebrate the natural attributes of the river rather than have them hidden from view.

Improving Fish Survival By Improving Habitat – As demonstrated by the recent successful installation of rock weirs by FRWA, PRWA and Trout Unlimited in Rockwell Park, fish habitat can be enhanced to improve stream depth and provide cool water refuges from the summer heat for our cold water fish species. Identifying locations for additional weirs should help improve fish survival.

Promotion of the Pequabuck River as an Asset – our society tends to value things that have a demonstrated economic value and benefit. A recent study by North Carolina State University on a 14-mile stretch of the Farmington River, documented the benefits of a clean, protected river as follows: $9.5 million total economic benefit to five towns; $120,000/acre increase in land value within one mile of the protected river; and numerous benefits to local businesses stemming from recreational use of the river.

Open Space Protection – the Town of Farmington is a leader in the Pequabuck River watershed (indeed in the entire state of Connecticut) in prioritizing and protecting important open space areas for wildlife habitat, recreational use, aquifer protection, and other purposes. The Town of Burlington currently has large blocks of open space that are class III water company lands (~360 acres), which are water company lands that are currently undeveloped but vulnerable to future sale and development. Although Burlington also has over 5,000 acres of class I & II lands (water company lands that are of vital importance to protection of source water) that are protected open space, there is a need to look at open space in Burlington – as in all of the Pequabuck River watershed towns – in the context of the many values of open space and the recreational needs of the public.

Support Future Upgrades of Sewage Treatment Facilities along the Pequabuck River – As has been highlighted in this report and the State of the Watershed Report, one of the leading contributors of nitrogen, phosphorus, and likely other contaminants are the sewage treatment facilities in Bristol, Plainville, and Plymouth whose effluent makes up a majority of the river's baseflow at certain times of the year. These facilities have made tremendous strides over the past decade to treat wastewater to even higher standards, but there is room for improvement. We encourage these towns to invest in upgrading the facilities as appropriate and as funding is made available, to continue the benefits to water quality in the Pequabuck River, which would also benefit downstream watersheds.

APPENDICES

Glossary

Aesthetics: Characteristics of surface water such as appearance, and odor which may impact its uses.

Algae: One-or multi-celled, mostly aquatic plants that lack true stems, roots, and leaves, but usually contain chlorophyll. Algae convert carbon dioxide and inorganic nutrients such as nitrogen and phosphorus into organic matter through photosynthesis.

Alkalinity: Refers to the presence of bicarbonates, carbonates, and hydroxides that shift the pH below 7.

Anadromous: Migrating upstream to fresh water streams to spawn.

Aquifer: An underground layer of rock or soil containing groundwater.

Arithmetic Mean: The number, calculated by dividing the sum of all values by the number of values to be averaged.

Benthic Macroinvertebrates: Organisms and/or animals which can be seen by the unaided eye, and which live at least part of their life cycle within or upon submerged substrates in a body of water. These animals usually consist of the aquatic life stages of various insects and arthropods, mollusks, leeches and worms.

Best Management Practices (BMPs): Management practices such as nutrient management or structural practices such as vegetated drainage swales or buffers designed to reduce the quantities of pollutants such as sediment, nitrogen, phosphorus, and animal wastes in the waterbodies, such as lakes, creeks, streams, rivers, estuaries, and ground water.

Biochemical Oxygen Demand (BOD): The quantity of largely organic, materials present in a water sample as measured by a specific test.

Designated Use: Those uses specified in the CT Water Quality Standards for each surface water (or groundwater) classification, whether or not they are being attained.

Detention: The process of collecting and holding back stormwater for delayed release to receiving waters.

Discharge Permit: Legal contract negotiated between federal and state regulators and an industry or sewage treatment plant that sets limits on many water pollutants or polluting effects from the discharges of its pipes to public waterbodies.

Discharge: The volume of flow of solution.

Dissolved Oxygen: The amount of oxygen present in the water column. More than 5 parts oxygen per million (ppm) is considered healthy; below 3 is generally stressful to aquatic organisms.

Domestic Sewage: Wastewater which consists of water and human excretions or other waterborne wastes incidental to the occupancy of a residential building or a non-residential building.

Drainage Area: An area of land that drains to certain waterbody; watershed.

Effluent: Treated or untreated liquid waste material from a point source, such as a wastewater treatment plant or an industrial facility that is discharged into the waterbody or land.

Endangered Species: Any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an "endangered species" pursuant to the federal Endangered Species Act.

Erosion: Wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical, chemical, or biological forces.

Eutrophic: Condition refers to a nutrient-enriched, highly productive waterbody.

Eutrophication: A process by which a waterbody becomes rich in dissolved nutrients, often leading to algal blooms, low dissolved oxygen, and changes in community composition. Eutrophication occurs naturally, but can be accelerated by human activities that increase nutrient inputs to the waterbody.

Fecal Coliform: Bacteria from the colons of warm-blooded animals which are released in fecal material. Specifically, this group comprises all of the aerobic and facultative anaerobic, and rod-shaped bacteria.

Geometric Mean: A measure of central tendency calculated by determining the anti-log of the mean of the logarithms of the values to be averaged.

Groundwater: The water that occurs beneath the earth's surface between saturated soil and rock and that supplies wells and springs.

Habitat: A specific area in which a particular type of plant or animal lives.

Hazardous Waste: Any solid, liquid, or gaseous substance which, because of its source or measurable characteristics, is classified under state or federal law as hazardous and is subject to special handling, shipping, storage, and disposal requirements.

High Quality Waters: Surface waters where the water quality is better than necessary to meet the criteria established in these Water Quality Standards for the applicable classification or which may sustain a sensitive use designated for a higher classification.

Hydrocarbons: Any of a vast family of compounds originating in materials containing carbon and hydrogen in various combinations. Some may be carcinogenic; others are active participants in photochemical processes in combination with oxides of nitrogen.

Impaired Water: Surface and ground waters that are negatively impacted by pollution, or physical alteration, or modification resulting in decreased water quality.

Impervious Surface: A surface such as pavement that cannot be easily infiltrated by water.

Indicator Bacteria: A species or group of microbes which are used to conduct microbiological examinations of water in order to determine its sanitary quality. The primary function of these indicators is to provide evidence of recent fecal contamination from warm blooded animals. They serve as surrogates for pathogens which may be present in sewage.

Invasive Species: Any vertebrate, invertebrate, weed, fungi, plant disease, livestock disease or other organism that is non-native, alien, or exotic to the ecosystem where it exists or potentially could be introduced – including agricultural, range, and forest ecosystems; and when introduced causes, or is likely to cause, economic or environmental harm.

Land Use: Development and uses of land for various activities such as agriculture, residences, industries, etc. Certain types of pollution problems are often associated with particular land uses, such as sedimentation from construction activities and pesticides and fertilizers from agriculture.

Level B Aquifer Protection Area: Preliminary critical area around well fields in stratified drift used by water systems serving over 1000 people. The protected area encompasses the area of contribution and recharge area of the well field. This preliminary mapping will be refined by the water companies using extensive, site-specific data and ground water modeling to determine the final (or Level A) mapping area. The final mapping will define the regulatory boundaries for land use regulations. The Aquifer Protection Land Use Regulation applies only to regulated activities located within the Level A mapping boundary of a protected aquifer.

Macroinvertebrate: Invertebrates visible to the naked eye, such as snail and mayfly.

Natural Community: A distinct and reoccurring assemblage of populations of plants, and/or animals naturally associated with each other and their physical environment.

Nitrate: A form of nitrogen which is readily available to plants as a nutrient. Generally, nitrate is the primary inorganic form of nitrogen in aquatic systems.

Nitrogen: An element which in living organisms is a component of protein structures.

Nonpoint Source Pollution (NPS): Pollution originating from stormwater runoff from areas having no well-defined source such as land surfaces and roadways.

Nutrients: Chemicals that are needed by plants and animals for growth (e.g., nitrogen, phosphorus). In water resources, if other physical and chemical conditions are optimal, excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae, creating eutrophic condition.

Pathogen: Organisms such as a virus, bacteria, or fungus that can cause diseases in humans.

Pesticides: Chemical materials that are used for the control of undesirable insects, diseases, vegetation, animals or other forms of life.

pH: A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. The scale is 0-14. Technically it is the negative log of the hydrogen ion concentration (-log10 [H+]).

Phosphorus: An element essential to the growth and development of plants, but which, in excess, can be the limiting nutrient to problematic blue-green algal blooms.

Point Source: Any confined and discrete conveyance from which pollutants are or may be discharged. These include pipes, ditches, channels, tunnels, conduits, wells, containers, and concentrated animal feeding operations.

Pollutant: A contaminant that adversely alters the physical, chemical, or biological properties of the water and environment. The term includes nutrients, sediment, pathogens, toxic metals, carcinogens, oxygen-demanding materials, and all other harmful substances.

Recreational use: Active or passive water-related leisure activities such as fishing, swimming, boating, and aesthetic appreciation.

Riffle: Area of a stream or river characterized by a rocky substrate and turbulent, fast-moving, shallow water.

Riparian: Pertaining to the banks of a river, stream, waterway or other typically flowing body of water as well as plant and animal communities along such bodies of water. This term is also commonly used for other bodies of water, e.g., ponds, lakes, etc., although littoral is the more precise term for such stationary bodies of water.

Runoff: Water that is not absorbed by soil and drains off the land into waterbodies.

Sanitary Survey: An investigation of a particular geographic area to determine if unlawful or inadequately treated discharges of sewage or other sources of indicator bacteria are present.

Saturated zone: Underground area of the earth where void spaces in the soil or rock are filled completely with water.

Sediment: Particles of sand, clay, silt, and plant or animal matter present in water.

Sewage: Defined in Sec. 22a-423 of the General Statutes and means "human and animal excretions and all domestic and such manufacturing wastes as may tend to be detrimental to the public health."

Significant Natural Communities: Plants representative of common as well as rare, and uncommon vegetation (plant) communities.

Species of Special Concern: Any native plant species or any native non-harvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population or has been extirpated from the state.

Stakeholders: Concerned individuals or groups who live in the watershed or have land management responsibilities in it. It includes government agencies, businesses, private individuals and special interest groups.

Stormwater: Rainwater that runs off the land, usually paved or compacted surfaces in urban or suburban areas, and drained into nearby waterbodies.

Subbasins: One of several basins that form a watershed.

Suspended Solids: Organic and inorganic particles, such as solids from wastewater, sand, clay, and silt, that are suspended and carried in water.

Threatened Species: Any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the federal Endangered Species Act, except for such species determined to be endangered by the Commissioner in accordance with section 4 of this act.

Total Kjeldahl Nitrogen (TKN): An oxidative procedure that converts organic nitrogen forms to ammonia by digestion with an acid, catalyst, and heat. Total Kjeldahl nitrogen is a measure of the concentration of reduced forms of nitrogen in surface water, principally, ammonium and amino forms of organic nitrogen.

Total Suspended Solids (TSS): The measurement by weight of particles that are suspended in water. Suspended solids in water reduce light penetration in the water column, can clog the gills of fish and invertebrates. Suspended solids can result from

erosion from urban runoff and agricultural land, industrial wastes, bank erosion, bottom feeders (such as carp), algae growth or wastewater discharges.

Turbidity: A measure of the amount of light intercepted by a given volume of water due to the presence of suspended and dissolved matter and microscopic organisms. Increasing the turbidity of the water decreases the amount of light that penetrates the water column. High levels of turbidity are harmful to aquatic life.

Urbanized Area: For Census 2000, the Census Bureau classifies as "urban" all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). It delineates UA and UC boundaries to encompass densely settled territory, which consists of core census block groups or blocks that have a population density of at least 1,000 people per square mile, and surrounding census blocks that have an overall density of at least 500 people per square mile. In addition, under certain conditions, less densely settled territory may be part of each UA or UC.

Water Quality: The physical, chemical and biological characteristics of surface or ground waters.

Water Quality Classification: The designation of the proposed uses of surface and ground waters with alphabetic characters. Where classifications appear as alphabetic characters separated by a diagonal line, the first classification indicates known or presumed existing water quality and the second classification indicates the goal for the subject water.

Water Quality Standards: Established limits of certain chemical, physical, and biological parameters in a water body; water quality standards are established for the different designated uses of a waterbody.

Water Table: The depth or level below which the area is saturated with water.

Watershed: The area of land from which rainfall (and/or snowmelt) drains into a certain waterbody such as lake, stream or a river. Watersheds are also sometimes referred to as drainage basins or drainage areas.

Wetlands: Defined in Sec. 22a-38(15) of the General Statutes and means Land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soils Survey.

Zoning: Designating by ordinance areas of land reserved and regulated for different land uses.

Bibliography

Arnold, C. L., Jr. and C. J. Gibbons. 1996. Impervious Surface Coverage: The Emergence of a Key Environmental Indicator. Journal of the American Planning Association 62(2): 243-258.

Bell, Michael. 1985. The Face of Connecticut. People, Geology, and the Land. State Geological and National History Survey of Connecticut, Bulletin No. 10.

Central Connecticut Regional Planning Agency. 2000. The Pequabuck River Watershed Action Plan.

City of Bristol. 2002/03. Departments of Public Works, Planning, & Water Supply.

City of Bristol. 2003. Water Pollution Control Facility.

Connecticut Department of Environmental Protection, Wildlife Division.1999. Wildlife in Connecticut, Informational Series: Mute Swan.

Connecticut Department of Environmental Protection. 2002. 2002 Water Quality Report to Congress; Prepared Pursuant to Clean Water Act Section 305(b).

Connecticut Department of Environmental Protection, Bureau of Water Management, Ambient Monitoring Program. Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors Year 2000 Summary Report. http://www.dep.state.ct.us/wtr/volunmon/2000rbvsummary.pdf.

Connecticut Department of Environmental Protection, Bureau of Water Management, Wetlands Management Section. 1997. Guidelines: Upland Review Area Regulations, Connecticut's Inland Wetlands & Watercourses Act.

Connecticut Department of Environmental Protection. 2002. Connecticut Consolidated Assessment & Listing Methodology for 305(b) and 303(d) Reporting.

Connecticut Department of Environmental Protection. 2002. 2002 List of Connecticut Waterbodies Not Meeting Water Quality Standards.

Connecticut Department of Environmental Protection. 1997.The Pequabuck River- 30 Years of Connecticut's Clean Water Facts.

Connecticut Department of Environmental Protection. 2002. Water Quality Standards.

Connecticut Department of Transportation (ConnDOT), Bureau of Planning. 2002. Office of Inventory & Forecasts.

Connecticut Economic Resource Center (CERC). 2002. Connecticut Town Profiles. http://www.cerc.com/detpages/resources373.html

Connecticut River Watch Program. 2002. Water Quality Sampling.

DeGraff, R. M. & Mariko Yamasaki.2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England. Hanover.

Earthscape. 2003. Hydrologic Cycle. http://www.und.edu/instruct/eng/fkarner/pages/cycle.htm

Emery, J. L. 1972. Shade Swamp Sanctuary. The Farmington River Watershed Association.

Hagstoem, N. T., Gerrish, W. B., Machowski, E. A. and Hyatt, W. A. 1989. A Survey of Connecticut Streams and Rivers- Farmington River, Park River and Stony Brook Drainages, F-66-R-1: Annual Performance Report. Connecticut Department of Environmental Protection. Hartford, CT.

Klein, R. D. 1979. Urbanization And Stream Quality Impairment. Water Resources Bulletin15(4): 948-963.

La Sala, Jr., A. M. 1964. Geology and Ground-Water Resources of the Bristol-Plainville-Southington Area, Connecticut. U.S. Government Printing Office, Washington.

Bevier, L. R. 1994. The Atlas of Breeding Birds of Connecticut. . Connecticut Department of Environmental Protection; State Geological and Natural History Survey of Connecticut. Management Plan for the Mattabesset River Watershed. 2000. Middlesex County Soil and Water Conservation District.

National Climatic Data Center. 2003. Connecticut Climate Summary. http://www.ncdc.noaa.gov/oa/climate/research/cag3/CT.html

National Geographic Society.1987. Field Guide to the Birds of North America. 2nd Edition. The National Geographic Society.

Rosen, D. & Gene Billings. 1996. Finding Birds in Connecticut. A Habitat-based Guide to 450 Sites. Connecticut.

Schueler, T. R. 1994. The Importance of Imperviousness. Watershed Protection Techniques 1(3): 100-111.

State of Connecticut. General Statutes of Connecticut.1997.Volume 2, Section 8-23.

The Pomperaug River Watershed Coalition, Inc. 2001. Pomperaug River State of the Watershed Report Preliminary Assessment.

Town of Farmington. 2003. Departments of Planning.

Town of Burlington. 2003. Departments of Public Works.

Town of Plainville. 2003. Departments of Public Works.

Town of Plymouth. 2003. Departments of Public Works.

Town of Plymouth. 2003. Water Pollution Control Facility.

U.S. Department of Commerce. U.S.Census Bureau. U.S. Census, 2000.

U.S. Department of the Interior. USGS, National Water Quality Assessment Fact Sheet 001-97, Trends in Nitrogen and Phosphorus Concentrations in Southern New England Streams, 1974-92.

U.S. EPA. 1996. Watershed Approach Framework. http://www.epa.gov/owow/watershed/framework

U.S. EPA. 2003. Superfund in New England. http://www.epa.gov/ne/superfund/

U.S. Geological Survey; Water Resources Division. East Hartford, CT. http://ct.water.usgs.gov/

United States Environmental Protection Agency. 2000. Office of Water, EPA 833-00-002, StormWater Phase II Final Rule.

United States Geological Survey. 1998. Water Quality in the Connecticut, Housatonic, and Thames River Basins, 1992-95.

United States Geological Survey. 2002. Peak Streamflow for Connecticut. http://nwis.waterdata.usgs.gov/ct/nwis/peak/?site_no=01189000&agency_cd=USGS

United States Geological Survey. 2003. Groundwater Well Data, Well BU2. http://nwis.waterdata.usgs.gov/ct/nwis/gwlevels.

University of Connecticut. The Map & Geographic Information Center (MAGIC). http://magic.lib.uconn.edu/

Links

Pequabuck River Watershed State of the Watershed Report, http://www.ccrpa.org/environmental planning

Selected Best Management Practices

River water quality is directly affected by nutrients, pesticides, and sediment present in the runoff. Management strategies need to address both quantity and quality. All types of land uses within the watershed contribute surface water runoff and pollutant loads to the river. The following are some of the suggested Best Management Practices (BMPs) that can improve overall quality of the river and the watershed. This list claims to be neither all-inclusive nor limited to this document. These are some strategies that can be applied where appropriate.

Water Quantity

Purpose: Many activities in the watershed can affect the water resources of the watershed. Wherever feasible, water users should consider implementing surface water management strategies that can reduce the impacts associated with excessive runoff and/or very low flow.

Practices: Surface water management strategies ranging from improved ditch maintenance and water table management to additional on-site canal storage or the construction of detention reservoirs for holding excess rainfall can prevent the river being overloaded with rapid runoff and pollutants/contaminants that are carried by the runoff.

Where possible, on-site detention should be provided to reduce both the rate and volume of discharges to the river/stream following heavy rains. Detention areas allow all or a portion of the drainage water to be temporarily stored on-site. The excess water can be stored for use or released later at low flow rates.

Sediment Transport

Purpose: Suspended solids or sediments are recognized forms of water pollution. Sediment losses may also be associated with reductions in water clarity.

Practices: Create and maintain localized settling basins to trap sediments at catch basin connections to drainage.

Stabilize bare soils and river/stream banks by encouraging coverage by vegetation. Vegetation types selected should provide maximum stabilization by roots and foliage. Vegetative buffer strips could also serve to reduce the erosion of soil particles.

When removing vegetation from river banks, avoid disrupting grass slopes.

Develop and implement a systematic management plan for removing sediments from catch basin on a regular basis.

Protect river/stream banks from erosion in areas subject to high water velocities. This may be accomplished using rip-rap, concrete, headwalls, or other materials that buffer turbulence associated with high flow velocity.

Plant vegetation or maintain desirable vegetation on river corridor to prevent erosion and trap sediments that may result from stormwater runoff or irrigation drainage.

Special measures should be used to reduce sediment transport during construction and other land-altering events.

Erosion Control

Purpose: Erosion-control practices should be considered to minimize soil loss and runoff that can carry dissolved and attached nutrients on soil particles to surface waters. Vegetative filter strips are effective in reducing the levels of suspended solids and nutrients. Existing vegetation is frequently the best preventive measure for erosion. Because native or existing vegetation is already established, it is usually better cover species than introduced species**.**

Practices: Where possible, establish "do not disturb" zones on your site. Vegetative and soil protection practices for soil that is already exposed reduce erosion in several ways:
• Shield the soil from the direct impact of rainfall or runoff
• Increase soil porosity and water storage capacity
• Reduce the energy of the runoff
• Physically hold the soil in place with the root system of vegetation
Vegetative erosion controls (not well suited to heavy traffic areas) include:
• Vegetative cover, either as a permanent cover or as a temporary measure prior to permanently stabilizing the area. This can be accomplished by seeding, seeding and mulching, seeding and matting, or sodding.
• Create a buffer zone between activities and receiving streams.
• Mulching or erosion control mats or netting to physically protect exposed soils.

Pesticides/Herbicides

Purpose: Pesticide can be highly dangerous to the river water, fish and organisms that survive in the river. Excessive and inappropriate application of pesticides/herbicides can contaminate river and groundwater, which can be potentially dangerous to human and other living organism.

Practices: Time pesticide applications in relation to current soil moisture, anticipated weather conditions, and irrigation schedule to achieve greatest efficiency and reduce potential for offsite transport. Do not apply pesticides when rain and high-velocity winds are expected.

Proper training/education of field operators responsible for handling, loading, and operating spray machinery can minimize the potential for misapplication of agricultural chemicals. Public education through radio/TV broadcasting, pamphlets and brochures can enable individuals to understand about application of pesticides. Special efforts should be taken to ensure the continuity of such education programs.

Since certain chemicals may be inappropriate for some soil types or application areas, the permittee should check with the municipality and the State Department of Environmental Protection (DEP) prior to the application of chemical treatments. Vehicles

should not be driven over the treated area to avoid the tracking of the chemicals to other areas on or off the site. In addition, irrigation is a temporary measure involving a light application of water to moisten the soil surface. The minimum amount of water should be applied because an excess of water can cause erosion.

Nutrients

Purpose: If not handled properly, fertilizers can be a significant source of water pollution. Nitrogen and phosphorus are of particular concern within the Pequabuck River Watershed. These nutrients originate from a variety of land uses, including: agricultural, urban, suburban, and natural areas. Excess nutrients stimulate algal blooms and growth of noxious plants in receiving water bodies.

Practices: Proper training of the field operators responsible for handling, loading, and operating fertilizer spreading equipment, and for correct maintenance of field equipment can help achieve desired placement of fertilizers, avoid waste, and prevent contamination of open waters. Re-enforce training with checklists of critical operating points before application of materials.

Develop a nutrient management plan based on soil, water, plant and organic material sample analyses and expected crop yields. USDA-NRCS develops nutrient management plans.

Do not apply materials under "high risk" situations, such as before forecasted rainfall. Avoid applications of nutrients during intense rainfall, on bare soils with extreme erosion potential, or when water tables are near the surface.

Take precautions when storing fertilizer to prevent contamination of nearby ground and surface water. Always store fertilizer in an area that is protected from rainfall.

Septic Systems

Purpose: If not handled properly, septic systems can fail and contaminate nearby water sources creating public health problems. Inadequately treated sewage from septic systems can be a cause of groundwater contamination. It poses a significant threat to drinking water and human health because it can contaminate drinking water wells and cause diseases and infections in people and animals. If a septic system is working properly, it will effectively remove most of the pollutants.

Practices:
Inspect septic system (every 3 years) and pump tank as necessary (generally every 3 to 5 years).

Use water efficiently.

Don't dispose of household hazardous wastes in sinks or toilets.

Care for leach fields.

Animal and Pets Waste

Purpose: Animal waste is one of the many little sources of pollution that can add up to big problems for water quality and may cause human health problems as well. Unless

disposed properly, pets, waterfowl and other urban wildlife waste can cause significant water pollution problems. Animal waste contains several types of pollutants that contribute to water quality problems such as nutrients, pathogens and a naturally toxic material, ammonia.

Practices: Some simple practices can help prevent pollution by keeping animal waste out of the water. While it may seem easier to ignore the problem of animal waste, it is not protecting not only the environment but also ones own health.

Pick up after your pet. Preventing water pollution can be as simple as remembering to take along a plastic bag or pooper scooper when you walk your dog. For both "quality of life" and public health reasons, many communities actually have laws requiring anyone taking their animal off of their property to immediately clean up the waste after the pet relieves itself. Your choices once you have picked up the waste include:

- Flush it down the toilet so the septic system or sewage treatment plant will treat it in the same manner as human waste.
- Put it in the trash. This is less effective, as waste that ends up in a landfill may still cause pollution problems. Putting animal waste in the trash is actually against the law in some communities.
- Bury it in your yard. The microorganisms in the soil will break down the waste and release the nutrients to nearby plants. Make sure the hole is at least five inches deep and located away from vegetable gardens, children's play areas, or any lake, stream, wetland, well or ditch. (CAUTION: Don't bury waste in your compost pile. The pile does not get hot enough to kill the pathogens and using the compost could cause illness.)
- Install an underground pet waste digester. These function like small septic tanks. Before buying one, check for local laws that may restrict their use or location.

Keep your yard clean. While there are no laws requiring you to clean up animal waste on your own property, there are good reasons to be careful where you leave it to decay. Some diseases can be transmitted from pet waste to humans through soil contact. Children who play outside and adults that garden are most at risk for infection, so cleaning up waste from play and garden areas is especially important. Washing hands with anti-bacterial soap and water after working or playing in the dirt is the best protection from disease.

Don't feed waterfowl. While one of the pleasures of a trip to the park has always been taking stale bread to feed the ducks, the environmental and health impacts of this activity for both humans and birds can be serious. Feeding waterfowl also tends to cause the birds to concentrate in numbers higher than can be supported by the natural food supplies. This can cause problems in the winter months when fewer people come to the park or shore with food. These large flocks of birds also create large quantities of waste and serious water pollution problems.

Dispose of kitty litter properly. When cleaning out the litter box, a two-step approach is most effective. Cat waste may be scooped out and flushed down the toilet, and the used litter should be bagged, sealed and placed in the trash. Dumping the entire contents of the litter box down your toilet will cause plumbing problems and prematurely fill up your septic tank or sewer system with indigestible material, but sending untreated cat waste to the landfill can cause pollution problems. While it may not seem like a big deal if one more dog, cat or bird "contributes" some waste to the neighborhood environment, think about how many animals there are out there. Animal waste may not be the biggest or most toxic pollutant going into your local waters, but it is one of those

little problems that, when all the pieces are added together, lead to serious environmental and health problems. So please think twice about your pet's bathroom habits and do your part to help keep our waters and environment clean.

References:

Water Quality/Quantity BMPs for Indian River Area Citrus Groves (http://ircitrusbmp.ifas.ufl.edu/Web%20Documents/BMP%20Manual/BMP%20Manual.htm)

Environmentally Responsible Best Management Practices. Environmental Services, City of Portland.

A Homeowner's Guide to Septic Systems. EPA-832-B-02-005. December 2002.

Fact Sheet: Starting in Your Home and Yard. Animal Waste and Water Quality. Heather M. Crawford, Coastal Resources Educator. CT Sea Grant Extension Program. December 1999.

WebLinks for Best Management Practices:

State of Hawaii, Dept of Land & Natural Resources
http://www.state.hi.us/dlnr/dofaw/wmp/bmps.htm

Metropolitan Council. Urban Small Sites Best Management Practice Manual
http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm

Ohio State University Extension Fact Sheet. Agricultural Best Management Practices
http://ohioline.osu.edu/aex-fact/0464.html

http://www.co.broward.fl.us/ppi00400.htm

Agricultural best management practices. Agriculture & Agri-Food Canada
http://www.agr.gc.ca/pfra/water/agribtm_e.htm

Best Management Practices Series. Ministry of Agriculture and Food, Canada.
http://www.gov.on.ca/OMAFRA/english/environment/bmp/series.htm

Protecting Water Quality in Urban Areas — A Manual. Minnesota Pollution Control Agency
http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html