

## **2.0 INTRODUCTION**

This document was written with the intention of guiding the decisions of people working in government and business, as well as those property owners within in the watershed whose activities impact the quality of the Niantic River and its tributaries. It is meant to inform this general audience about known and suspected water quality issues and to recommend actions to address them. The most current and available science describes what we know about these issues and why they are important to all of us. Standard and innovative land use and water resource management practices provide techniques that equate to the best approaches for dealing with these issues.

To better under the genesis of this planning document, several key questions are addressed below.

### **2.1 Why is this plan needed?**

The Niantic River does not meet State of Connecticut water quality standards. From the Golden Spur to the Amtrak Bridge, the use of the river for swimming, shellfish and other recreation is impaired because of excessive bacteria levels. Also, the river does not support the diversity and abundance of aquatic life expected to be found in the river. The cause of this impairment to aquatic life is not completely understood; however, there is a building body of scientific evidence that states that the river is overloaded with nutrients, primarily nitrogen. Nitrogen enriches the brackish Niantic River water, like fertilizer on a lawn, increasing algal and plant growth. Like bacteria, nutrients flow to the river with stormwater and are considered a problem of nonpoint source pollution.

Uses and enjoyment of the Niantic River are impacted by poor water quality and nonpoint source pollution. The water quality of the Niantic River is poor enough so that shellfishing and swimming are limited. Following one inch of rainfall, the State of Connecticut is required to close the shellfish beds of the Niantic River. Rain carries bacteria into the river where it is filtered by shellfish rendering them unsafe for consumption. Normally it would take 14 to 28 days for shellfish to cleanse themselves

(depurate) so that potentially harmful bacteria are no longer a concern (until the next 1” rainstorm).

Changes in how we use and enjoy the Niantic River are linked to the overall health of the Niantic River ecosystem, which is also changing and maybe not for the better. Populations of marine plants and animals commonly found in the Niantic River have decreased over the past 4 decades (Millstone Environmental Laboratory (MEL), 2005). Beginning in the 1980s, a sharp decline in eelgrass (*Zostera marina*) was documented (Marshall, 1994) and in more recent years, eelgrass in the Niantic has shown annual variation (MEL, 2005). Scallops and winter flounder rely on eelgrass as nursery habitat and are practically missing from the Niantic River (Heck, *et al.*, 1995; MEL, 2005). Meanwhile, new species like green crabs and grubby, appear to be on the rise in the River (MEL, 2005).

Degraded water quality is thought to be an important driving force in these ecological changes. In particular, excessive nitrogen loading from nonpoint sources, predation, increased water temperatures and disease are all implicated as causes of this ecological situation (Marshall, 1994; CTDEP, 2002b; MEL, 2005). So, what can be driving these changes?

As time progresses, we become more certain of the causes of these *water quality impairments* and their relationship to ecosystem changes. Bacteria and nitrogen are the two greatest concerns for the quality of the Niantic River. Polluted runoff, illegal marine discharges and sewer line accidents are the most probable sources of bacteria to the Niantic (CT DA/BA, 2005). Nitrogen, polluted runoff, atmospheric deposition and groundwater inputs are critical water quality concerns for the Niantic River (Marshall, 1994; Mullaney, 2006; Stacey, 2004). For instance, we know that polluted runoff accounts for approximately half (50%) of the nitrogen inputs into the Niantic River. These inputs are the focus of this study. Atmospheric deposition of nitrogen accounts for approximately 10% of the nitrogen making its way to the river (Marine Biological Laboratory, 2006). The remaining nitrogen is most likely coming from septic systems through groundwater (Mullaney, 2006).

Significant investments have been made to control pollution to the Niantic River. East Lyme and Waterford have sewered many of the neighborhoods along the shores of the river to eliminate the risk of bacterial and nutrient pollution from septic systems. The Niantic boating community is being encouraged to observe the No Discharge Zone on river to control sewage from marine vessels. These efforts, combined with advances in stormwater management, offer hope that impacts from historic activities can be turned around. However, the impacts and management of nonpoint source pollution (*i.e.* polluted runoff and stormwater) remain.

The nature of nonpoint source pollution makes it extremely challenging to manage. It is decentralized (sources vary and are scattered), cumulative (pollution results not from one, voluminous event; rather, it occurs over time in regular, periodic rain/runoff events), and systematic (an entire hydrologic unit [watershed] is both the scope and scale of the problem). In the case of the Niantic River, pollution is transported to the mainstem via several smaller streams, each carrying pollutant loads emanating from sources somewhere else in the watershed. Hence, effectively managing nonpoint source pollution issues relies on an approach that is comprehensive and watershed-based, *i.e.* scaled according to the natural system to be managed.

Although watershed-based management plans have been recognized as the approach to dealing with nonpoint source pollution, they are not without their own set of challenges. For instance, watershed boundaries are not political boundaries, therefore several jurisdictions often have a stake in watershed management. The Niantic River Watershed includes portions of four towns – East Lyme, Montville, Salem, and Waterford. Therefore, watershed management relies on participation and execution from all four communities.

Watershed management boils down to *land use* management. By and large, land use planning and regulation, including the management of runoff (*i.e.* stormwater), lies with the municipalities. Current nonpoint source pollution problems are linked to historic development and stormwater management in these four communities. Like all coastal watershed communities in Connecticut, population and development pressure will

continue to yield more full-time residents, housing and other developments, thereby increasing the potential for nonpoint source pollution problems. (NOAA, Spatial Trends in Coastal Socioeconomics (STICS), 2006).<sup>1</sup>

As the last remaining parcels of developable land are converted to commercial, industrial, and residential uses, the quantity and quality of stormwater runoff can be expected to change. Therefore, it is central to this plan that polluted runoff be considered the greatest water quality management challenge for the Niantic River, primarily because it is considered the most *manageable* of all potential sources of pollution to the river. That is to say there is *real hope and possibility to prevent further degradation of the Niantic River and to restore it to an improved condition*. This plan is needed to establish a coherent and practical approach to dealing with nonpoint source pollution in the Niantic River Watershed.

The plan and the lessons learned from the planning process will assist the State of Connecticut to manage many of its coastal watersheds. The State of Connecticut's Coastal Nonpoint Source Pollution Control Program, developed in accordance with Section 6217 of the federal Coastal Zone Act Reauthorization Amendments of 1990, instigated this project with the hope that it will serve as a pilot study for other watersheds. The Niantic River Watershed was chosen because of its relatively manageable size; presence of known water quality issues; development pressure; active and participatory municipalities; and rich natural resources.

## 2.2 How was the plan developed?

The Niantic River Watershed Protection Plan was developed as a result of a research and planning project funded by the CTDEP's OLISP. The CTDEP OLISP and the BWPLR have received a one-time grant from NOAA's OCRM to develop a watershed protection plan for a small coastal watershed located within Connecticut's coastal nonpoint source pollution management area. The project was directed by a

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<sup>1</sup> According to population statistics provided by NOAA, the coastal watersheds of New London County experienced population growth as follows: 230,348 (1970), 238,409 (1980), 254,957 (1990), 259,080 (2000), 266,466 (2004).

Steering Committee composed of representatives from the Towns of East Lyme, Montville, Salem, and Waterford; CTDEP (several offices); U.S. Geological Survey (USGS); UCONN; and Save the River, Save the Hills. A consulting team, led by Kleinschmidt Associates of Essex, Connecticut, was responsible for completing the project and drafting the plan. Figure 2.2-1 shows the project team organization.

The plan follows federal guidelines for a watershed management plan. Two documents, in particular, were consulted throughout the plan development process. The US Environmental Protection Agency (USEPA) issued in 2005 the *Draft Handbook for Developing Watershed Plans to Restore and Protect our Waters*,<sup>2</sup> which guides plan development according the nine key elements of a nonpoint source/watershed management plan (Table 2.2-1).

**Table 2.2-1. The Nine Key Elements of a Watershed Plan**

<u>Key Element of a Watershed Plan</u>	<u>Plan Section</u>
Identify causes and sources of pollution that need to be controlled	4.2 through 4.4
Determine load reductions needed	4.5.3
Develop management measures to achieve goals	6.1
Develop implementation schedule	7.3
Develop interim milestones to track implementation of management measures	6.2
Develop criteria to measure progress toward meeting watershed goals	6.2
Develop monitoring component	7.5
Develop information/education component	7.2
Identify technical and financial assistance needed to implement plan	7.1 and 7.4

Also from USEPA, *Getting in Step: A Guide for Conducting Watershed Outreach Campaigns*,<sup>3</sup> was used as a reference to develop information and education (I/E) strategies for the Niantic River Watershed Protection Plan.

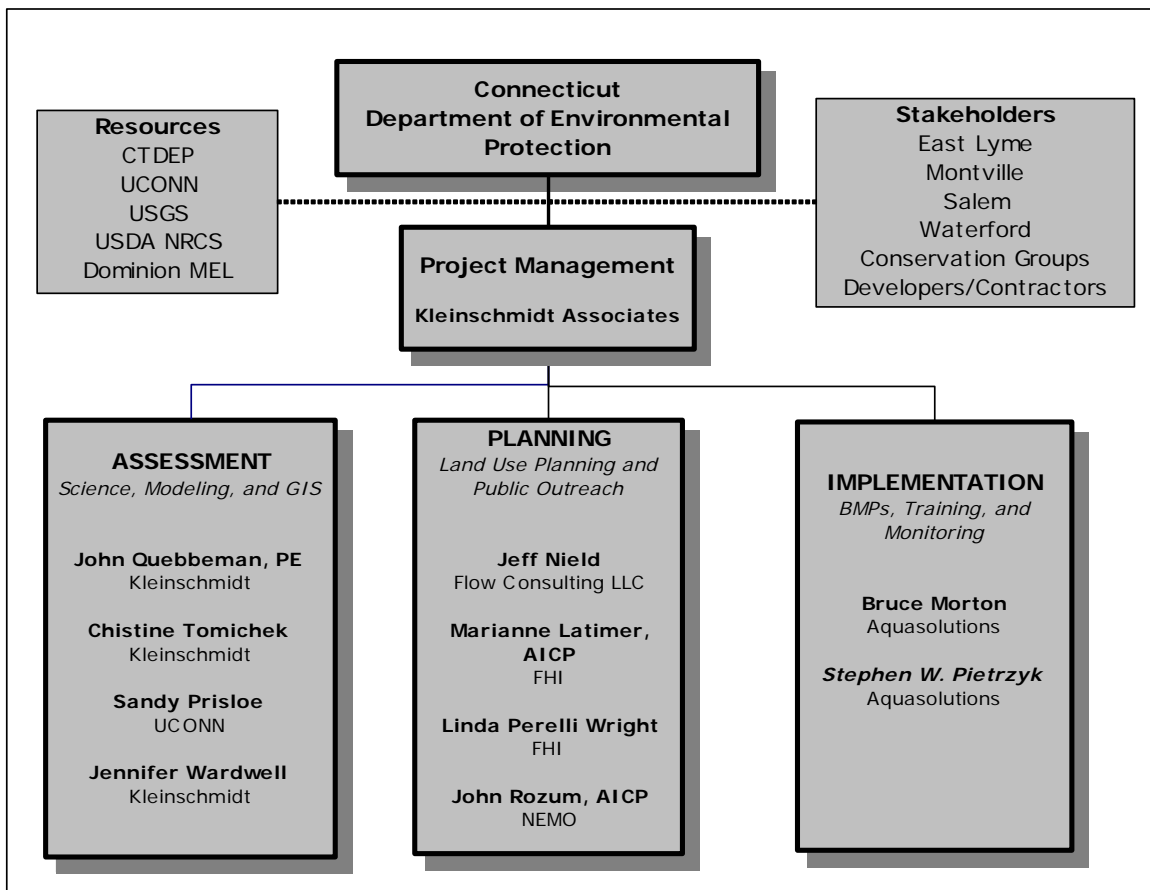
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<sup>2</sup> [http://www.epa.gov/owow/nps/watershed\\_handbook/pdf/handbook.pdf](http://www.epa.gov/owow/nps/watershed_handbook/pdf/handbook.pdf)

<sup>3</sup> <http://www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf>

The project consisted of several key components that led to the development of the plan. Part research project and part planning exercise, the Niantic River project relied on the input of scientists specializing in water quality and marine ecology, concerned citizens dedicated to preserving the Niantic River for future generations, and watershed managers tasked with managing governmental programs and policies dealing with the Niantic. The key steps take to develop the Niantic River Watershed Protection Plan are summarized below:

**Figure 2.2-1. Project Team Organization**



**Step 1: Describe the watershed** – This step was accomplished by gathering available physiographic, biological, and socioeconomic data about the Niantic River Watershed.

Step 2: **Identify existing water quality issues of concern** – Issues were identified by reviewing scientific literature and government documents, as well as talking with a wide range of watershed stakeholders.

Step 3: **Assess potential threats to the watershed and water quality** – The assessment of watershed threats consisted of several parts:

- Development of a 2004 land cover dataset
- Projection of future development/watershed land conversion by completing a future built-out analysis
- Estimation of current and future impervious surface coverage
- Analysis of the vulnerability of watershed lands to nonpoint source pollution

Step 4: **Identify watershed management priorities**, *i.e.* greatest potential and manageable threats.

Step 5: **Identify watershed management measures to minimize pollution**  
Implementation of land use regulations along with the corresponding Best Management Practices (BMPs), which address nonpoint source runoff and most importantly control nutrient levels reaching the Niantic River.

Step 6: **Estimate potential nonpoint source pollution reductions** from selected management measures, where applicable.

Step 7: **Develop monitoring, financial, and I/E recommendations** to implement the watershed plan.

### 2.3 How does this plan interact with other water quality protection and watershed management efforts?

This plan strives for a **consensus-driven, voluntary** and **regional** approach to improving the water quality of the Niantic River and its tributaries by managing nonpoint

source pollution throughout the watershed. Ongoing planning, regulatory and research efforts are discussed in this document as the building blocks of future action. The plan should help coordinate and build upon ongoing efforts by offering management (*e.g.* communication and implementation) strategies to do so. It is also **prioritizes** efforts and actions that should be focused on in order to reach watershed management and water quality goals.

It should also be noted that the plan's recommendations are derived from current watershed assessments, *i.e.* they are original works of this study. The results of these assessments provide a scientific basis for the management recommendations included in the plan, which strive to affect land use decisions. Land use decisions on the local level, in particular, can be guided by the results and recommendations in this plan. In this regard, the plan will *strengthen* land use decision-making by informing the process with valuable scientific information.

It is important to recognize past and recent efforts to prevent pollution of the Niantic River and its tributaries. Many participants in this planning process expressed interest in learning if these efforts have made a difference in the water quality of the river so far and how this current effort will build on past successes. Below is a list of some of the water quality protection milestones that have been met in recent years:

- Infrastructural improvements (*e.g.* centralized wastewater treatment) in East Lyme and Waterford have decreased the potential impact of aging septic systems serving the shoreline neighborhoods of these towns.
- Town planning and zoning in the watershed has generally trended toward more protective stormwater management measures.

- Application for “No Discharge Zone” designation for the Connecticut coastline including the Niantic River decreases the risk of sewage discharge from marine vessels into the system.<sup>4</sup>

This study did not ascertain the effectiveness of these past efforts to improve the Niantic River. Water quality monitoring was not a facet of this project. With that, the study assumes that past efforts to decrease pollution sources are having a positive impact on the watershed and the river. This assumption has led to two important points to consider for the future of managing the watershed: 1) nonpoint sources of pollution are the greatest water quality management challenges and 2) the lack of water quality data for the Niantic River and its tributaries is greatly impeding how well we can account for past (and future) investments to improve them. On a positive note, several research and management efforts are underway that will increase our understanding of the water quality and ecological health of the river, which must be considered in a comprehensive management strategy for the watershed (Table 2.3-1).

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<sup>4</sup> For No Discharge Zone designation for the CT coast from Eastern Point in Groton to Hoadley Point in Guilford refer to CFR 71 FR 27721, dated May 12, 2006.

**Table 2.3-1. Current Research and Management Activities that are Important to Protection of the Niantic River and its Tributaries**

Entity/Organization	Program/Project	Purpose/Expected Outcome/Status
Departments of Public Works East Lyme and Waterford	<i>Stormwater Management Program Plan Implementation</i>	Decrease in the volume and pollution of stormwater runoff into the Niantic River. Six stormwater management measures: 1) public education, 2) public involvement, 3) illicit discharge detection and elimination, 4) construction site stormwater runoff control, 5) post-construction stormwater management, and 6) municipal good housekeeping/pollution prevention. The Program Plan has been completed however funding for implementation is extremely limited.
Town of Waterford	<i>Jordan Cove Urban Watershed Monitoring Project</i>	A nonpoint source pollution management project in Jordan Cove (a watershed adjacent to the Niantic) that demonstrated many contemporary approaches to control nonpoint source pollution in a coastal watershed. Project is complete.
UCONN Marine Sciences Program at Avery Point	<i>Nitrogen Loading Model</i>	This scientific study strives to quantify the effects of nitrogen loading on estuarine ecosystems like the Niantic River. Research in progress.
Dr. James Kremer		
United States Geological Survey John Mullaney	<i>Study to Determine Nitrogen Discharge from Groundwater to the Niantic River</i>	<ul style="list-style-type: none"> <li>▪ Determine pre-sewer nutrient concentrations in shallow and deep ground water based on two rounds of samples.</li> <li>▪ Use dissolved gas concentrations to evaluate denitrification in the aquifer.</li> <li>▪ Monitor post-sewer nitrate concentrations in ground water for one year.</li> <li>▪ Estimate ground-water loads of nitrogen to the Niantic River before and after sewerage.</li> </ul>
		Research in progress.
CTDEP Nonpoint Source Pollution Program and Long Island Sound Study	<ul style="list-style-type: none"> <li>▪ <i>Development of a Nutrient Criteria for the Niantic River</i></li> </ul>	Set critical limits for bacteria and nutrient loadings to the Niantic River as the basis for water quality restoration activities. Research in progress.
Paul Stacey	<ul style="list-style-type: none"> <li>▪ <i>Development of a Total Maximum Daily Load (TMDL) for bacteria and nutrients in the Niantic River</i></li> </ul>	

2.4 Who should read this plan?

There are four categories of watershed plan stakeholders. The categories are defined by the role the stakeholders play in moving the plan forward. In Table 2.4-1, the stakeholder roles are defined by the questions listed in the left column and the stakeholders in the right column. Many of these stakeholders were involved in the planning process and others may play a minor role in plan implementation.

**Table 2.4-1. Watershed Plan Stakeholders**

<p><i>Who is responsible for implementing the plan?</i></p>	<p>Property Owners and Managers (<i>e.g.</i> Homeowners, Business-owners)          Developers, contractors and realtors          Local government:  <ul style="list-style-type: none"> <li>• Directors of Department of Public Works – East Lyme, Montville, Salem, Waterford</li> <li>• Directors of Planning – East Lyme, Montville, Salem, Waterford</li> <li>• Environmental Planner/Wetland Officer – East Lyme, Montville, Salem, Waterford</li> <li>• Zoning Officers</li> <li>• East Lyme-Waterford Shellfish Commission</li> <li>• Ledge Light Health District</li> <li>• Save the River, Save the Hills</li> </ul>         State agencies:  <ul style="list-style-type: none"> <li>• CTDEP Bureau of Water Protection and Land Reuse – OLISP, Nonpoint Source Pollution Program, Coastal Management</li> <li>• CTDEP Bureau of Natural Resources – Fisheries, Wildlife</li> <li>• Connecticut Department of Transportation (ConnDOT)</li> </ul> </p>	
<p><i>Who is affected by the implementation of the plan?</i></p>	<p>Property owners          Anglers</p>	<p>Recreational users          Boaters</p>

<p><b><i>Who can provide information on the issues and concerns in the watershed?</i></b></p>	<p>Property owners          Anglers          Boaters          Local government:  <ul style="list-style-type: none"> <li>•Boards of Selectman, planning, zoning, wetland commissions in East Lyme, Montville, Salem, Waterford. East Lyme-Waterford Shellfish Commission</li> </ul>         State agencies:  <ul style="list-style-type: none"> <li>•CT Department of Agriculture/Bureau of Aquaculture, CTDEP Bureau of Natural Resources</li> </ul> </p>
<p><b><i>Who can provide technical and financial assistance in developing and implementing the plan?</i></b></p>	<p>State agencies and institutions:  <ul style="list-style-type: none"> <li>•CTDEP Bureau of Water Protection and Land Reuse – OLISP, Nonpoint Source Pollution Program, Coastal Management</li> <li>•CTDEP Bureau of Natural Resources – Fisheries, Wildlife</li> <li>•ConnDOT</li> <li>•CT Department of Agriculture/Bureau of Aquaculture, CTDEP Bureau of Natural Resources (DA/BA)</li> <li>•University of Connecticut Cooperative Extension</li> </ul>         Federal agencies:  <ul style="list-style-type: none"> <li>•NOAA, USEPA, USGS, USDA NRCS, USFWS</li> </ul> </p>

2.5 How is this plan organized?

Following this introductory section, the plan provides an overview of the Niantic River and its watershed (Section 3.0). It describes the Niantic River Watershed as an ecosystem with many remarkable characteristics, unique components and a wide range of uses. The results of the land cover analysis is presented to expand the description of the watershed using several robust datasets developed over the past two decades using digital photogrammetry and GIS.

Section 4.0 discusses the water quality concerns we are attempting to address with this management plan. We begin this discussion by describing the ‘driving forces’ behind this plan, which are both regulatory and non-regulatory. After completing a

review of the nonpoint source pollution issues in the Niantic River Watershed, the plan presents the results of several assessments conducted as a part of this study.

The first assessment is one of future land use and impervious surface cover. These assessments help us predict future threats to the Niantic's water quality by examining future land use. Secondly, a watershed vulnerability assessment is presented, which helps us identify critical areas or high risk areas for nonpoint source pollution. Finally, the results of stormwater modeling are presented. These results include estimates of nonpoint source pollution generated from the watershed under various conditions, including the application of Best Management Practices to control stormwater and the pollutants it carries.

Section 5.0 summarizes the municipalities, agencies and organizations who currently manage the lands and waters in the watershed. Each of these stakeholders are, and will be, responsible for the implementation and enforcement of this plan.

Section 6.0 of the plan presents watershed management recommendations. The recommendations address specific water quality issues of concern. Each recommendation is assigned to a stakeholder(s) responsible for its implementation. Performance measures or indicators are provided for each management measure and strategy for monitoring implementation. Finally, financial options and strategies are discussed in order to address the concern of financing plan implementation.

The final section of the plan, Section 7.0, provides a strategy for an Implementation Program. The Organizational Structure, I/E, Outreach, Schedule, Financial Strategy and Monitoring Components are all presented to assist the Stakeholders in successfully implementing the Watershed Management recommendations presented here.