Appendix A

Status of Recommendations from the 2006 *Niantic River Watershed Protection Plan*

Niantic River Watershed Protection Plan Update

FUSS & O'NEILL

Status of Completion of Recommendations from the 2006 *Niantic River Watershed Protection Plan*

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
ORGANIZATIONAL STRUCTURE (SECTION 7.1)					
Create new entities focused on executing a watershed approach for managing nonpoint source pollution in the Niantic River watershed	Hire or appoint a "watershed coordinator" for the Niantic River Watershed	Ongoing	2008-present– coordinator hired		No
	Shift Steering Committee responsibilities from planning to implementation	Completed	2009 – Watershed Advisory Group formed 2010 – Board Development, Monitoring and Education & Outreach Committees formed 2010 – mission and by-laws drafted 2010 - develop Plan of Work 2011 – muni CEOs sign watershed compact 2011 – Board of Directors formed 2014 – 501(c)3 status established	Municipal support – address through updated watershed compact or similar mechanism	No
INFORMATION & EDUCATION (SECTION 7.2)					
Increase stakeholder awareness about the link between shellfish closures and sources of bacterial pollution in the Niantic River	Within six months, complete a public outreach campaign for shoreline neighborhoods in East Lyme and Waterford about potential sources of bacterial pollution.	Completed	2010 – workshops on LID and riparian buffers 2011 – landscaping for water quality program 2019 – promoting shellfish including effects of pollution on shellfishery and how shellfish can improve water quality		No
	Every year implement stormwater management education and outreach measures throughout the watershed.	Ongoing	Annual – Celebrate East Lyme Day, Stormwater classroom, MS4 public education and participation ongoing, BMP-related targeted workshops		Yes
	In the Winter of 2006, hold a workshop for town elected officials and department staff to learn about the formation and implementation of a stormwater utility district.	Not completed	New London recently adopted and is implementing a stormwater utility and enterprise fund, the first in CT. State legislation is proposed to enable other communities in CT to do the same.	Public education and outreach - concerns about stormwater fees perceived as a "rain tax." State legislation to provide communities with the authority to implement stormwater utilities, if desired.	Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
Increase stake-holders' level of knowledge about nutrient loading and the health of the Niantic River Estuary	Within six months, complete a training for relevant municipal staff and the development community about the fate and transport of nitrogen in the watershed and how best to control it through the development process in order to promote the management of nitrogen-loading in the watershed.	Completed	2009 – develop Stormwater/LID Review Checklist		Yes
	Before Spring 2007, arrange a training session for municipal staff, interested volunteers and other watershed stakeholders about monitoring water quality for nitrogen in order to create interest and knowledge for a citizen - based water quality monitoring program.	Completed	2010 - Monitoring Committee formed 2011 - Acquire monitoring equipment through EPA equipment loan program 2012 - Water quality monitoring program initiated		Yes
Educate stakeholders about the watershed management approach and the Niantic River watershed.	Within two months of due completion, publish an executive summary of the watershed protection plan in local papers and municipal communications in order to raise awareness about the plan.	Completed	2009 – development of Niantic River Watershed Protection Plan Guided Summary		Yes
	Within six months, hold town meetings to endorse the watershed protection plan as an advisory document to guide future land use decisions in all four watershed communities.	Completed	2008 – kick-off meeting to promote watershed plan 2009 – secure agreement from four towns to establish Advisory Committee 2010 – Watershed Summit at Camp Niantic		Yes
Educate land use decision makers about the value of vegetated riparian buffers in the protection of water quality.	Within one year (included with other workshops/trainings) promote the protection of riparian buffers for the benefit of water quality and habitat protection.	Completed/ Ongoing	2010 – Workshops on LID and riparian buffers w/CT Sea Grant 2014 – installation of demonstration riparian buffer at Mago Point		Yes
	Incorporate buffer education into other watershed and NEMO training and workshops	Not completed	Collaborate with other organizations to deliver buffer education.		Yes
FINANCIAL STRATEGY (SECTION 7.4)					
Secure funding to support the implementation of the recommendations made in the 2006 plan	Identify and secure funding to support watershed coordinator position	Ongoing	Successful in securing modest funds to maintain the NRWC and partnering with Eastern Connecticut Conservation District to complete WBP implementation projects		Yes
	Identify funding sources to support projects	Ongoing	CWA §319 NPS, Dominion Foundation, Unilever, EPOC, Community Foundation of Eastern CT, Maine Community Foundation		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
[continued]	Create a membership program for fundraising, outreach, and advocacy purposes	Partial	2015 – Membership Committee developed, currently inactive		Yes
MONITORING (SECTION 7.5)					
Establish a repository of baseline water quality data for the river and tributaries	Develop a baseline of water quality and biological integrity of the tributaries of the Niantic River.	Completed/ Ongoing	2009 – began compilation of water quality data 2012 -present – long-standing and ongoing water quality monitoring program.	Resources limited to assess all tributaries and standardize data.	Yes
Create and maintain monitoring programs to: • measure the performance of implemented management strategies (if applicable) • inform future planning and management decisions	Build future monitoring efforts from current efforts	Ongoing	2012 – began water quality monitoring, based on data collected by USGS and others		Yes
	Continue monitoring and assessment of water quality and aquatic integrity of the Niantic River	Ongoing	Niantic River water quality data collected by Dominion Millstone Environmental Lab, and Save the River – Save the Hills (Save the Sound's Unified Water Study)		Yes
	Evaluate monitoring data against performance measures (e.g. indicators, targets) to evaluate the effectiveness of the watershed protection plan	Ongoing	Monitoring data, municipal MS4 data, UWS data evaluated against established water quality performance measures		Yes
	Monitor impervious surface cover/land use on watershed and local basin basis	Ongoing	Impervious surface and land cover change available from UConn CLEAR research and data sets. MS4 communities (East Lyme, Salem, and Montville) are required to do this as part of their MS4 Permit compliance – baseline (2012) estimates of Directly Connected Impervious Area (DCIA) and annual tracking of DCIA.		Yes
	Monitor net loss of wetlands and riparian corridors/streamside forests	Partial, Ongoing	Net loss of wetlands/riparian cover from UConn CLEAR research and data sets.		Yes
RECOMMENDED WATERSHED MANAGEMENT MEASURES (SECTION 6)					
6.2.1 Mitigate the impacts of increased/increasing impervious surfaces from development	Protect existing wetlands, vernal pools, and watercourses to maximum extent practicable	Completed	State wetlands/watercourses regulations are enforced. Upland Review Areas enacted in all towns (East Lyme and Waterford, 100 ft.; Salem 50 ft.; Montville, 75 ft.)		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
[continued] **6.2.1** Mitigate the impacts of increased/increasing impervious surfaces from development	Protect or establish a vegetated buffer beyond wetland and watercourse boundaries	Not completed		Resistance to adoption of exclusionary riparian buffer regulations among land use commissions	Yes
	Encourage and enforce non-structural, non-piped stormwater handling techniques wherever possible	Ongoing	MS4 towns (East Lyme, Waterford, Montville) must implement updated post-construction stormwater management requirements of the MS4 Permit in land use regulations by June 2021. East Lyme and Waterford have implemented LID on town projects and private development	Municipal staff time to review and update regulations that require incorporation of LID; education for municipal board and commission members and town staff	Yes
	Encourage porous pavements and other pervious solutions in development/redevelopment	Ongoing	See comment above regarding LID and the MS4 Permit	See comment above	Yes
	Require mitigation for wetland/riparian impacts, to re-establish vegetative filtration zones	Not completed	May be included in municipal Inland Wetland Commission review/permitting		Yes
	Encourage site development practices that provide for allowable densities with the minimum footprint	Not completed	Function of zoning commissions; would require zoning regulations revision or enforcement of existing regulations if existing.	Land-use commissioner awareness, staff training, inclusion in land use regulations	Yes
	Utilize design review to evaluate options for minimizing water quality impacts for all types of development proposals	Ongoing	See comment above regarding LID and the MS4 Permit. Use of 2009 LID/stormwater checklist	Effective regulations and review procedures, education for municipal board, commission members, town staff	Yes
	Support and carry out municipal best management practices including regular street cleaning and maintenance/repair of municipal stormwater facilities	Ongoing	MS4 communities are required to implement good housekeeping and pollution prevention measures including regular catch basin cleaning, street sweeping, and drainage system upgrades and maintenance.	Limited staff time and resources	Yes
	Adopt lot coverage/impervious surface restrictions	Not completed	PZC regulations can limit percent of lot coverage; review municipal regulations to see if this is addressed.	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes
	Restrict development on steep slopes, or create steep-slope overlay zones with design criteria	Not completed	PZC have authority to restrict and adopt overlay zones; review municipal regulations to see if this is addressed.	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
[continued] **6.2.1**	Promote education for developers, town staff, and the public	Ongoing	MS4 communities are required to implement public and municipal education programs focusing on priority pollutants and targeted audiences.	Limited staff time and resources	Yes
6.2.2 Enforce state-of-the-art stormwater management practices for all development (during & post-construction)	Codify and enforce use of the CT Stormwater Quality Manual (CTDEP, 2004a) and best management practices (BMPs) in development/redevelopment *(recommend implementations to control peak flow and volume for stormwater controls, along with BMPs for water quality)*	Ongoing	Required by the MS4 Permit for MS4 regulated communities. Eastern CT Stormwater Collaborative. Conduct outreach to construction community by trusted authority (CHBA or other).	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	Codify and enforce use of the CT Guidelines for Erosion & Sedimentation Control in development/redevelopment (CTDEP, 2002a)	Ongoing	Required by the MS4 Permit for MS4 regulated communities. Eastern CT Stormwater Collaborative Conduct outreach to construction community by trusted authority (CHBA or other).	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	Embrace stormwater BMPs for all municipal roadway construction and other municipal projects	Partial	LID implementation by East Lyme and Waterford, including municipal retrofits and incorporation of LID into planned municipal projects. Eastern CT Stormwater Collaborative Target BMP opportunities in Montville in partnership with NRWC, ECCD through CWA §319 NPS funding.	Education for municipal public works and engineering staff, limited staff and funding resources for BMP O&M	Yes
	Codify and enforce use of best site development practices, including construction staging and soil stabilization techniques	Ongoing	Required by the MS4 Permit for MS4 regulated communities.	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	Educate developers and town staff	Ongoing	MS4 communities are required to implement public and municipal education programs focusing on priority pollutants and targeted audiences. BMP project-associated targeted workshops, Eastern CT Stormwater Collaborative	Limited staff time and resources	Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
6.2.3 Implement municipal stormwater management program plans (SWMPPs) according to the General Permit for MS4	Create a stormwater management utility for MS4s in order fund control measures	Not completed	New London recently adopted and is implementing a stormwater utility and enterprise fund, the first in CT. State legislation is proposed to enable other communities in CT to do the same. Eastern CT Stormwater Collaborative	Concerns about stormwater fees perceived as a "rain tax." State legislation needed to provide authority to implement stormwater utilities, if desired.	Yes
	Target resources to implement minimum control measures as outlined in the SWMPPs	Ongoing	Ongoing MS4 Permit compliance, Eastern CT Stormwater Collaborative	Limited staff time and resources	Yes
6.2.4 Steer developers toward and/or regulating low-impact site design	Utilize design review to evaluate options for minimizing water quality impacts for all types of development proposals	Ongoing	See comment above regarding LID and the MS4 Permit Conduct targeted outreach to developers	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes
	Codify and enforce use of best site development practices, including construction staging and soil stabilization techniques	Ongoing	Required by the MS4 Permit for MS4 regulated communities. Conduct targeted outreach to developers.	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes
	Develop incentive-based programs for developers to maximize protection and use of vegetative buffers	Not completed	Look for models, conduct targeted outreach to developers	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes
	Codify and enforce lot coverage/impervious surface restrictions	Not completed	PZC have authority to restrict and adopt overlay zones; review municipal regulations to see if this is addressed.	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes
	Develop slope restrictions or steep slope overlay zone establishing design criteria	Not completed	PZC have authority to restrict and adopt overlay zones; review municipal regulations to see if this is addressed.	Effective regulations and review procedures, education for municipal board, commission members, and town staff	Yes
6.2.5 Elevate the importance of homeowners' and business' "housekeeping" practices	Educate homeowners and targeted businesses (potentially businesses on large sites)	Ongoing	MS4 communities are required to implement public and municipal education programs focusing on priority pollutants and targeted audiences. Develop and conduct outreach campaign.	Limited staff time and resources	Yes
	Establish and/or enforce annual septic pump-out requirements and inspections	Ongoing	2019 – outreach campaign in East Lyme by East Lyme High School students	Not required per state regulation or public health code	No

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan update?
6.2.6 Restore vegetative and riparian buffers where needed	Modify or enforce wetland regulations to require mitigation for wetland/riparian impacts, with emphasis on re-establishing vegetated buffers	Not completed	Towns regulate lands adjacent to wetlands/watercourses (see 6.2.1. above)	No State buffer regulations.	Yes
	Use an incentive-based program(s) for developers to restore or establish vegetative buffers as part of site development	Not completed		Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	Partner with the Connecticut Department of Transportation (CT DOT) on state roadway projects in the watershed to request Transportation Enhancement funding	Not completed	NRWC attempts to maintain awareness of upcoming CT DOT projects, review and comments where possible.	Successful partnering with CT DOT. CT DOT is implementing a stormwater management program to meet its MS4 Permit compliance obligations, which may present greater opportunities for partnerships with MS4 communities.	Yes
	Educate developers, town staff, and the public	Ongoing	2010 – workshops on LID and riparian buffers to town staff, land use commissions and general public MS4 communities are required to implement public and municipal education programs focusing on priority pollutants and targeted audiences.	Limited staff time and resources	Yes

Appendix B

Status of Recommendations from the 2009 *Guided Summary* to the *Niantic River Watershed Protection Plan*

Niantic River Watershed Protection Plan Update

FUSS & O'NEILL

Status of Completion of Recommendations from the 2009 *Guided Summary* to the *Niantic River Watershed Protection Plan*

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
Establish a Sustainable Coalition of Partners to Manage the Niantic River Watershed					
Establish a Watershed Coalition	Support the establishment of a watershed board, which: • includes representatives from each town • may include representation of environmental organizations; local, state, and federal government; utilities; educational institutions; and local businesses	Completed	2011- Established Board of Directors with town-appointed representatives; Towns endorsed Watershed Compact	Municipal support – address through updated watershed compact or similar mechanism	Yes
	Support a Watershed Coordinator Position, dedicated to assisting the watershed board in implementing the Watershed Management Plan and includes conducting the inter-jurisdictional coordination activities, grant-writing and evaluation of plan achievements.	Ongoing	2008-present – coordinator hired	Continued funding to support watershed coordinator position	Yes
Form Working Relationships with Public and Utility Organizations Impacting the Watershed	Identify organizations and contacts for all groups that impact the watershed	Ongoing	NRWC attempts to maintain open lines of communication with public and utility organizations impacting the watershed		Yes
	Establish a communication system with organizations to promote opportunities for coordinating and commenting on construction proposals and state and federal permits	Partial	Track and review proposals for utility and transportation proposals; provide comments when appropriate	Identification of key agency staff. Receive notifications in a timely manner.	Yes
Seek Grant Funding Opportunities	Identify and apply for grants that address the Watershed Management Plan goals and recommendations	Ongoing	NRWC, ECCD and watershed partners continuously review funding opportunities		Yes
	Partner with other organizations for coordinated grant efforts	Ongoing	2018-19 – strengthened relationships with partner organizations in the watershed		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
Raise Stakeholder Awareness and Involvement by Implementing a Watershed Management Information and Education Campaign					
Develop and Implement Education and Outreach Programs	Increase stakeholder awareness about the link between shellfish closures and sources of bacterial pollution in the Niantic River.	Ongoing	2010 - formed Education & Outreach Committee 2019 – targeted education at Celebrate East Lyme Day		Yes
	Increase stakeholders' level of knowledge about nutrient loading and the health of the Niantic River Estuary.	Ongoing	2008-present – outreach/education on NPS and BMPs		Yes
	Educate land use decision makers about the value of vegetated riparian buffers in the protection of water quality.	Ongoing	2010 – workshops on LID and riparian buffers		Yes
	Establish an outreach and tracking program for landowners about on-site septic system maintenance.	Partial	2019 – septic system outreach campaign developed by East Lyme High School students	Time and resources, lack of state mandate for septic system inspection and maintenance.	Yes
	Partner with other local groups to develop and implement a comprehensive education and outreach program addressing water quality and watershed management issues. • Marinas and Boat Owners • Homeowners and Business Owners • Contractors and Developers • Municipal Staff and Elected Officials • Local Schools and Youth Organizations	Ongoing	NRWC frequently partners with other local groups to identify funding and develop outreach opportunities		Yes
Protect and Restore Natural Stream Channels					
Define, Adapt and Implement Open Space Initiatives	*Key Resource Protection Recommendations:*				
	1. Set watershed land preservation goals and targets based on available (undeveloped) land and priority watershed areas	Partial	2020 – held watershed-wide open space planning workshop to develop land preservation goals and strategies		Yes
	2. Protect acres of priority watershed areas every year as identified in the Vulnerability Analysis and provide demarcation in key areas	Partial	Support municipalities and land trusts in open space protection and acquisition efforts		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
[continued] Define, Adapt and Implement Open Space Initiatives	3. Maintain no-disturb buffers around wetlands and waterbodies	Partial	Upland Review Area enacted in all towns. Areas are regulated, but disturbance can be permitted.	Resistance among land use commissions to adopt exclusionary riparian buffer zones	Yes
	4. Preserve continuous wildlife corridors	Partial	2020 – held watershed-wide open space planning workshop to develop land preservation goals and strategies		No
	Work with legislative and funding organizations to obtain monies to purchase lands for preservation.	Ongoing	Support municipalities and land trusts in open space protection and acquisition efforts		Yes
Develop and Support a Stormwater Utility Partnership	Support development of a municipal stormwater partnership for purpose of facilitating effective stormwater management, meeting Municipal Separate Storm Sewer System (MS4) requirements and implementing Stormwater Management Program Plans (SWMPPs):	Completed	2018 – established Eastern CT Stormwater Collaborative to provide a regional approach to address NPS-pollution management from municipal stormwater discharges.	Continued funding and active participation by member communities	Yes
	1. Identify and prioritize maintenance schedules including, street sweeping, and stormwater structure inspection, maintenance and repair	Ongoing	Required by the MS4 Permit for MS4 regulated communities.		Yes
	2. Identify and prioritize stormwater retrofits	Ongoing	Required by the MS4 Permit for MS4 regulated communities.		Yes
	3. Coordinate stormwater monitoring	Not completed	Stormwater monitoring required by MS4 Permit.	Cooperation between watershed municipalities, shared staff and equipment resources, cost-share for consultant services.	Yes
	4. Identify and coordinate cooperative agreements for cost-sharing of equipment and services	Not commenced	Potential cost-share (i.e., annual dues or fees) by member communities of the Collaborative.	Cooperation and willingness of communities to contribute financially for the good of all of the members.	Yes
	5. Identify and apply for funding sources	Ongoing	NRWC and ECCD work with watershed towns to identify opportunities to conduct implementation projects and obtain funding (typically CWA §319)	No dedicated funding for MS4 Permit compliance. Restrictions on use of other funding sources such as 319 NPS grant funds to meet MS4 Permit requirements.	Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
[continued] Develop and Support a Stormwater Utility Partnership	6. Provide outreach and education for staff, regulated community and general public	Ongoing	MS4 communities are required to implement public and municipal education programs focusing on priority pollutants and targeted audiences.	Limited staff time and resources	Yes
Develop Design Standards for Local Implementation	Mitigate the impacts of increased/increasing impervious surfaces from development through Low Impact Development (LID) design and Best Management Practice (BMP) implementation. Apply to new and redeveloped sites, both public and private:	Ongoing	MS4 communities are required to implement updated post-construction stormwater management requirements of the MS4 Permit in their local land use regulations by June 2021, including removal of barriers in the regulations to the use of LID, provisions for off-site stormwater mitigation, and other requirements. East Lyme and other watershed communities have implemented LID successfully on town projects and private development/redevelopment. Development of 2009 LID/Stormwater checklist was an important first step in addressing this recommendation. It is unknown at this time if towns have adopted the checklist and are actively utilizing it during permit review.	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	1. Incorporate low-impact site preparation and development techniques.				
	2. Wherever feasible, eliminate curb requirements and mandatory sidewalks, reduce road widths and require pervious surfaces.				
	3. Adopt new or modify existing cluster and/or conservation subdivision ordinances that promote density allowances with minimum footprints and limit rezoning that will result in more impervious surface and/or less wetlands in critical sub-drainage basins.				
	4. Encourage and enforce non-structural, non-piped stormwater handling techniques wherever possible, avoid short-circuiting of stormwater discharges and incorporate effective vegetative buffers in site design.				
	5. Carefully consider any rezoning that allows an increase or high percentage of impervious surface on a lot.				
	Encourage and support municipal approaches to land-use planning, development reviews and site inspections that protect watershed resources. For uniformity within the watershed, the following	Partial	NRWC supports land use planning approaches that protect watershed resources including overlay zones, POCD updates, land use regulation updates, resource management plan		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
[continued] Develop Design Standards for Local Implementation	management tools should be considered in land-use regulations and review of development proposals:		development and updates (e.g., shellfish and harbor management plans)		
	1. Conduct assessments of tributaries to establish stream preservation and restoration priority locations and needs. Assess value and functions of resources, (i.e. wetland and watercourses) as part of preliminary planning and design.	Partial	2014 – NRWC conducted stream corridor assessment of Latimer Brook Town of Waterford has retained consultants to conduct assessments of local streams.	Funding	Yes
	2. Use an Upland Review Area from inland wetlands and watercourses boundaries in Inland Wetland and Watercourse Regulations. CT DEEP and Niantic River Watershed. Recommended guideline is 100 feet.	Completed/ Partial	State wetlands/watercourses regulations are enforced. Upland Review Areas enacted in all towns (East Lyme and Waterford, 100 ft.; Salem 50 ft.; Montville, 75 ft.).		Yes
	3. Regulate activities in any other non-wetland or non-watercourse area that will likely impact inland wetland or watercourses.	Completed	IWA authorized through CT Inland Wetlands Act		No
	4. A minimum 50 foot wide vegetated buffer beyond wetland and watercourse boundaries, within which no alteration or vegetative removal is permitted, to the extent feasible. Encourage vegetative buffer restoration where needed.	Not completed		No statewide buffer regulations. Local regulation/overlay district required.	Yes
	5. A riparian buffer overlay zoning district based on delineation of perennial and associated wetlands with associated widths of 100 feet for larger streams and 50 feet for smaller, headwater streams.	Not completed		No statewide buffer regulations. Local regulation/overlay district required.	Yes
	6. Protect existing wetlands, vernal pools and watercourses to maximum extent practicable (i.e. no alteration of areas with good existing functions and values). Mitigate for any and all wetland/riparian impacts, with emphasis on re-establishing vegetated buffers (water quality filtration zones) in appropriately placed locations (even if uplands locations are the only option)	Partial	State inland-wetlands/watercourses regulations are enforced in all watershed towns. Upland Review Area established in all watershed towns		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
[continued] Develop Design Standards for Local Implementation	7. Focus on stormwater treatment at beginning of site design. Design stormwater management treatment and controls that can and will be maintained, are suited to the site, maximize pollutant removal and minimize flooding impacts. Consider soils, hydrology, peak flows, stormwater volume, wetland and watercourse values and function, receiving waters, topography and vegetation. Develop checklists for stormwater design and, construction inspection and long-term maintenance.	Ongoing	MS4 communities are required to implement updated post-construction stormwater management requirements of the MS4 Permit in their local land use regulations by June 2021, including removal of barriers in the regulations to the use of LID, provisions for off-site stormwater mitigation, and other requirements. East Lyme and other watershed communities have implemented LID successfully on town projects and private development/redevelopment. LID/stormwater checklist developed in 2009.	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	8. Use resources including 2004 CT Stormwater Quality Manual, 2002 Guidelines for Sediment and Erosion Control, and full version of the Niantic River Watershed Protection Plan for plan and site reviews.	Ongoing	Required by the MS4 Permit for MS4 regulated communities.	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	9. Apply development restrictions on steep slopes or adopt a steep slope overlay zone.	Not completed	PZCs may have established these restrictions.	Effective regulations and review procedures, education for municipal board and commission members and town staff	Yes
	10. Develop incentive-based programs where appropriate to promote resource protection.	Not completed	Incentives can include reduced permit fees, reduced/expedited permit review procedures and timelines, LID credits to reduce stormwater management volumes, etc.	Incentives often not significant enough to change behaviors. Requires modified permit application review procedures.	Yes
	Carefully consider any rezoning that allows an increase or high percentage of impervious surface on a lot.	Not completed	Incorporate requirement for stormwater mitigation practices to reduce effective IC.	PZC regulation review and revision.	Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
Improve Water Quality and Biological Monitoring for the Niantic River and its Tributaries					
Develop a Comprehensive Watershed Monitoring Plan	Support the establishment of a Total Maximum Daily Load (TMDL) for the Niantic River and its tributaries to establish water quality goals.	Completed, Ongoing	Statewide bacteria TMDL developed in 2014. Nutrient-focused water quality planning effort for Niantic River estuary planned as part of next phase of CTDEEP IWRM initiative. Provide wq data to DEEP.		Yes
	Establish a repository system for monitoring data for the Niantic River and its tributaries to promote periodic water quality assessments	Partial	NRWC's water quality monitoring data is available on website. Save the River-Save the Hills UWS data is available at Save the Sound's website.		Yes
	Integrate existing watershed monitoring programs to address water quality restoration, tracking of indicator bacteria and nitrogen, status of riparian zones and impervious surfaces, to measure management performance:	Ongoing	NRWC and municipal MS4 data are reviewed, where available.		Yes
	1. Develop a water quality and biological integrity baseline for the tributaries including, Latimer, Oil Mill and Stony Brook	Ongoing	Baselines have been completed for all tributaries. Water quality monitoring begun in 2012. Town of Waterford also monitors water quality in Oil Mill and Stony Brooks.		
	2. Evaluate monitoring data against performance measures (e.g. indicators, targets) to evaluate the effectiveness of the watershed protection plan.	Partial	Data is compared where available.		Yes
	3. Monitor impervious surface cover/land use and net loss of wetlands and riparian corridors on a watershed and local basin basis.	Partial	Impervious surface change and net loss of wetlands/riparian cover available from UConn CLEAR research and data sets. MS4 communities (East Lyme, Salem, and Montville) are required to do this as part of their MS4 Permit compliance – baseline (2012) estimates of Directly Connected Impervious Area (DCIA) and annual tracking of DCIA.		Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
[continued] Develop a Comprehensive Watershed Monitoring Plan	Support monitoring efforts conducted by town, state, federal and private organizations:				
	1. Support continued monitoring efforts by organizations including, Town Public Works Departments, Local and Regional Departments of Health, Shellfish Boards, CT-DEP, CT-Dept. of Agriculture, University of Connecticut, USGS, Dominion, City of New London Water Dept. and Save the River-Save the Hills, Inc.	Ongoing	NRWC supports efforts of partners to maximum possible extent.		Yes
	Support training sessions for municipal officials and volunteers on water quality monitoring parameters specific to the watershed	Not completed	Opportunity for volunteers to become involved in outfall monitoring in support of MS4 Permit compliance.	Volunteer interest and training	
	1. Support citizen–based water quality monitoring programs.	Ongoing	NRWC conducts volunteer water quality monitoring, RBV sampling and supports monitoring by others.		Yes
	Produce annual/biennial "State of the Watershed--Progress Report Card", including the Niantic River and its tributaries as well as the watershed as a whole:	Complete	Produce periodic water quality monitoring summary report.	Staff time and financial resources	Yes
	1. Track the implementation of the management strategies and monitoring parameters to determine status and effectiveness and identify trends. Levels of indicator bacteria and nitrogen should be tracked to measure management performance.	Not completed	Informal tracking methodology. Not all implementations can be monitored to determine effectiveness.	Limited staff time and resources	Yes
	2. Determine changes needed in monitoring protocol	Ongoing	2017 – completed 5 years of baseline monitoring, initiated wet weather event-based monitoring program in Latimer Brook		Yes
	3. Report progress and recommendations to inform planning and management decision-makers.	Partial	Report progress in annual watershed newsletter		Yes
	7. Identify and prioritize stormwater retrofits	Ongoing	MS4 Permit requires regulated communities to develop a retrofit plan by June 2020 and begin implementing retrofits to meet DCIA reduction goals	Limited funding and staff resources	Yes

Key Recommendations	Actions/Tasks	Status	Status Notes	Barriers to Completion	Address in Plan Update?
[continued] Develop a Comprehensive Watershed Monitoring Plan			by June 2021. NRWC and ECCD partner with municipalities to identify retrofits		
	8. Coordinate stormwater monitoring	Not completed	Stormwater monitoring required by MS4 Permit.	Cooperation between watershed municipalities, shared staff and equipment resources, cost-share for consultant services.	Yes
	9. Identify and coordinate cooperative agreements for cost-sharing of equipment and services	Not completed	Potential cost-share (i.e., annual dues or fees) by member communities of the Eastern CT Stormwater Collaborative.	Cooperation and willingness of communities to contribute financially for the good of all of the members.	Yes
	10. Identify and apply for funding sources	Ongoing		No dedicated funding for MS4 Permit compliance. Restrictions on use of other funding sources such as 319 NPS grant funds to meet MS4 Permit requirements.	Yes
	11. Provide outreach and education for staff, regulated community and general public	Ongoing	MS4 communities are required to implement public and municipal education programs focusing on priority pollutants and targeted audiences. Outreach by NRWC, ECCD and Eastern CT Stormwater Collaborative	Limited staff time and resources	Yes

Appendix C

Non-point Source Pollution Tracking Tool

Niantic River Watershed Protection Plan Update

NONPOINT SOURCE PROJECT TRACKING TOOL
NIANTIC RIVER WATERSHED
Version 1.0
June 30, 2020

DESCRIPTION

This nonpoint source (NPS) project tracking tool has been developed for use by the Niantic River Watershed Committee (NRWC) and other watershed stakeholders to document nonpoint source pollution mitigation projects in the Niantic River watershed and associated load reduction estimates as projects are implemented. The tool can be used to track reductions in nitrogen, phosphorus, sediment, and fecal indicator bacteria loads and the progress of implementation of the recommendations in the Niantic River Watershed Protection Plan Update. The tracking tool incorporates information on pollutant removal efficiencies from a similar application that is being developed by the New England Interstate Water Pollution Control Commission, the Center for Watershed Protection, and UCONN CLEAR for Long Island Sound.

This version of the NPS Tracking Tool calculates existing pollutant loads, but provides links and references to other documents for estimating pollutant removal efficiencies for specific structural and non-structural nonpoint source pollution mitigation projects. This tool may be revised in the future to further automate the calculation of pollutant load reductions.

INSTRUCTIONS

Cells of this color are copied cells or contain formulas.
Cells of this color designate an input is required.

Sheet	Description
1. Project Summary	Add new projects to this sheet, which contains project summary information to be provided by the user. Select information from dropdown menus where indicated.
2. Pollutant Load Reduction	Provide information about the characteristics of the area draining to each project, including land use, drainage area, impervious and pervious area, and Directly Connected Impervious Area (DCIA). Existing pollutant loads are calculated based on land use, drainage area characteristics, and land use-based pollutant export coefficients for nitrogen, phosphorus, and total suspended solids and event mean concentrations for fecal indicator bacteria. The user is required to determine and input average annual pollutant removal credits for each project type and pollutant based on recommended information sources.
3. Operation & Maintenance	Provide information on the entity responsible for performing regular operation and maintenance once the project is constructed, as well as a link to the approved Operation and Maintenance Plan and a photo of the completed project.
Project Types	A list of structural and non-structural nonpoint source pollution mitigation project types that are available in the tracking tool.
Pollutant Loading Rates	Pollutant loading rates by land use category used in the calculation of existing pollutant loads.
Pollutant Removal Credits	Recommended sources of information on pollutant removal credits/efficiencies to be used in the calculation of project-specific pollutant load reductions.

PROJECT FUNDING

Funding for this project was provided by the Community Foundation of Eastern Connecticut, the Connecticut Department of Energy and Environmental Protection via the Clean Water Act Section 319 Nonpoint Source program, and Kleinschmidt Foundation through the Community Foundation of Maine.

PROJECT SUMMARY SHEET

Nonpoint Source Project Tracking Tool - Niantic River Watershed

Version 1.0

June 30, 2020

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Project ID	**Project Name**	**Project Type** (select from list)	**Project Location Town** (select from list)	**Project Location Street Address**	**Project Location Latitude**	**Project Location Longitude**	**Subregional Basin** (select from list)	**Subwatershed (select from list)**	**Does Project Site Discharge Directly to an Impaired Water Body?** (select from list)	**Project Status** (select from list)
Example 1: RB-001-LB	*Latimer Brook Riparian Buffer Restoration*	*Vegetative Buffer Restoration - Riparian Buffer Restoration*	*East Lyme*	*XYZ Colony Road*	*41.383903*	*-72.214071*	*Latimer Brook*	*Latimer Brook*	*Yes*	*Proposed*
Example 2: SCM-001-NRE	*XYZ Niantic River Road Tree Box Filter Retrofit*	*Stormwater Controls - Tree Filter (no underdrain)*	*Waterford*	*XYZ Niantic River Road*	*41.33836*	*-72.173615*	*Niantic River*	*Niantic River Estuary*	*Yes*	*Completed*
Example 3: SCM-001-BBR	*XYZ Evergreen Lane Leaching Catch Basin Retrofit*	*Stormwater Controls - Leaching/Infiltrating Catch Basin*	*Montville*	*XYZ Evergreen Lane*	*41.451398*	*-72.201349*	*Latimer Brook*	*Bogue Brook Reservoir*	*No*	*Proposed*

POLLUTANT LOAD REDUCTION SHEET
Nonpoint Source Project Tracking Tool - Niantic River Watershed
Version 1.0
June 30, 2020

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Project ID	Project Name	Project Type	Drainage Area Size (acres)	Impervious Area		Pervious Area		Directly Connected Impervious Area (DCIA)			Estimated Pollutant Load				Average Annual Pollutant Removal Credit				Estimated Pollutant Load Reduction			
				Total Impervious Area (acres)	Primary Land Use of Impervious Area (select from list)	Pervious Area (acres)	Primary Land Use of Pervious Area (select from list)	Existing DCIA (acres)	Proposed DCIA (acres)	DCIA Reduction (acres)	Total Nitrogen (lb/yr)	Total Phosphorus (lb/yr)	Total Suspended Solids (lb/yr)	Fecal Indicator Bacteria (Billion MPN/yr)	Total Nitrogen (%)	Total Phosphorus (%)	Total Suspended Solids (%)	Fecal Indicator Bacteria (%)	Total Nitrogen (lb/yr)	Total Phosphorus (lb/yr)	Total Suspended Solids (lb/yr)	Fecal Indicator Bacteria (Billion MPN/yr)
Example 1: RB-001-LB	*Latimer Brook Riparian Buffer Restoration*	*Vegetative Buffer Restoration - Riparian Buffer Restoration*	*16.0*	*2.0*	*Residential*	*14.0*	*Developed Land Pervious*	*1.0*	*1.0*	*0.0*	*44.3*	*6.2*	*1,286.9*	*13,601*	*40%*	*60%*	*80%*	*35%*	*17.7*	*3.7*	*1,029.6*	*4,760.3*
Example 2: SCM-001-NRE	*XYZ Niantic River Road Tree Box Filter Retrofit*	*Stormwater Controls - Tree Filter (no underdrain)*	*2.0*	*1.8*	*Roadway*	*0.2*	*Developed Land Pervious*	*1.8*	*0.0*	*1.8*	*15.4*	*2.4*	*1,109.3*	*2,808*	*80%*	*85%*	*90%*	*76%*	*12.3*	*2.1*	*998.3*	*2,133.9*
Example 3: SCM-001-BBR	*XYZ Evergreen Lane Leaching Catch Basin Retrofit*	*Stormwater Controls - Leaching/Infiltrating Catch Basin*	*0.5*	*0.5*	*Roadway*	*0.0*	*Developed Land Pervious*	*0.5*	*0.0*	*0.5*	*4.2*	*0.7*	*306.5*	*777*	*75%*	*70%*	*85%*	*76%*	*3.2*	*0.5*	*260.5*	*590.3*
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A
0	0	0									#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A

Pollutant Load Calculations

1. Export Coefficient Method - Nitrogen, Phosphorus, and Total Suspended Solids

Export Coefficient Method
L = (Ci x Ai) + (Cp x Ap)

L = Annual N, P, or TSS Load (lb/yr)
Ci = Export Coefficient for Impervious Area (lb/ac/yr)
Ai = Total Impervious Area Draining to Project (ac)
Cp = Export Coefficient for Pervious Area (lb/ac/yr)
Ap = Pervious Area Draining to Project (ac)

2. Simple Method - Fecal Indicator Bacteria

Simple Method
L = 0.226 x R x C x A

L = Annual Fecal Coliform Bacteria Load (#col/yr)
R = Annual Runoff (inches)
C = Pollutant Concentration (#col/100 mL)
A = Area (acres)

Annual Runoff
R = P x Pj x Rv

R = Annual Runoff (inches)
P = Annual Rainfall = 46 inches/year
Pj = Fraction of rainfall events producing runoff (usually 0.9)
Rv = Runoff Coefficient (see tabulated values)

PROJECT OPERATION AND MAINTENANCE SHEET
Nonpoint Source Project Tracking Tool - Niantic River Watershed
Version 1.0
June 30, 2020

Cells of this color are copied cells or contain formulas.
Cells of this color designate an input is required.

Project ID	Project Name	Project Type	Project Location Town	Project Location Street Address	Entity Responsible for Operation and Maintenance				Link to Approved O&M Plan	Link to Photo of Completed Project
					Name	Title	Email Address	Phone Number		
Example 1: RB-001-LB	*Latimer Brook Riparian Buffer Restoration*	*Vegetative Buffer Restoration - Riparian Buffer Restoration*	*East Lyme*	*XYZ Colony Road*						
Example 2: SCM-001-NRE	*XYZ Niantic River Road Tree Box Filter Retrofit*	*Stormwater Controls - Tree Filter (no underdrain)*	*Waterford*	*XYZ Niantic River Road*						
Example 3: SCM-001-BBR	*XYZ Evergreen Lane Leaching Catch Basin Retrofit*	*Stormwater Controls - Leaching/Infiltrating Catch Basin*	*Montville*	*XYZ Evergreen Lane*						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						
0	0	0	0	0						

PROJECT TYPES

Nonpoint Source Project Tracking Tool - Niantic River Watershed

Version 1.0

June 30, 2020

Project Type
Stormwater Controls - Infiltration Trench
Stormwater Controls - Subsurface Infiltration
Stormwater Controls - Surface Infiltration/Basin
Stormwater Controls - Rain Garden/Bioretention (no underdrains)
Stormwater Controls - Tree Filter (no underdrain)
Stormwater Controls - Rain Garden/Bioretention (with underdrain)
Stormwater Controls - Rain Garden/Bioretention with Internal Storage Reservoir (ISR) (no infiltration)
Stormwater Controls - Gravel Wetland
Stormwater Controls - Permeable Pavement with Subsurface Infiltration
Stormwater Controls - Porous Pavement with Impermeable Liner and Underdrain
Stormwater Controls - Sand Filter with Underdrain
Stormwater Controls - Wet Pond
Stormwater Controls - Extended Dry Detention Basin
Stormwater Controls - Dry Water Quality Swale/Grass Swale
Stormwater Controls - Oil/Grit Separator
Stormwater Controls - Hydrodynamic Separator
Stormwater Controls - Leaching/Infiltrating Catch Basin
Stormwater Controls - Other
Vegetative Buffer Restoration - Urban Forest Planting
Vegetative Buffer Restoration - Stream Restoration
Vegetative Buffer Restoration - Riparian Buffer Restoration
Vegetative Buffer Restoration - Other
Subsurface Sewage Disposal Systems - Conversion to Sanitary Sewers
Subsurface Sewage Disposal Systems - Septic System Upgrades
Subsurface Sewage Disposal Systems - Other
Agricultural Practices - Grass Buffer
Agricultural Practices - Forest Buffer
Agricultural Practices - Water Control Structures
Agricultural Practices - Denitrifying Ditch Bioreactor
Agricultural Practices - Nutrient Management Plan
Agricultural Practices - Other
Natural Area Restoration - Wetland Creation
Natural Area Restoration - Wetland Restoration
Natural Area Restoration - Forest Restoration
Natural Area Restoration - Other
Non-Structural Measures - Illicit Discharge Detection and Elimination (IDDE)
Non-Structural Measures - Street Sweeping
Non-Structural Measures - Catch Basin Cleaning
Non-Structural Measures - Leaf Litter Removal
Non-Structural Measures - Other

POLLUTANT LOADING RATES

Nonpoint Source Project Tracking Tool - Niantic River Watershed

Version 1.0

June 30, 2020

Pollutant Loading Rates by Land Use Category

Land Use Category	Land Surface Cover	Load Export Rate, lb/ac/yr			Event Mean Concentraton (MPN/100 mL)	Runoff Coefficient (Rv)
		N	P	TSS	Bacteria (*E. coli* and *Enterococci*)	
Commercial	Directly Connected Impervious	15	1.8	376	4,600	0.95
Industrial	Directly Connected Impervious	15	1.8	376	2,400	0.95
Institutional	Directly Connected Impervious	15	1.8	376	4,600	0.95
Residential	Directly Connected Impervious	14	2.3	438	7,000	0.95
Roadway	Directly Connected Impervious	8.4	1.3	613	1,700	0.95
Open Land	Directly Connected Impervious	11	1.5	648	300	0.95
Forest	Pervious	0.5	0.1	29	7,000	0.03
Agriculture	Pervious	2.6	0.4	29	4,600	0.2
Developed Land Pervious	Pervious	1.2	0.1	29	300	0.2

Sources:

USGS SELDM Values. Granato, G.E., 2013, Stochastic empirical loading and dilution model (SELDM) version 1.0.0: U.S. Geological Survey Techniques and Methods, book 4, chap. C3, 112 p., CD–ROM. (Also available at http://pubs.usgs.gov/tm/04/c03/.)

EPA Values

EPA Values, equal to Developed Land Pervious HSG B

Event Mean Concentration (EMC) values for fecal indicator bacteria reported in "Tisbury, MA Impervious Cover Disconnection (ICD) Project: an Integrated Stormwater Management Approach for Promoting Urban Community Sustainability and Resilience: A Technical Direct Assistance Project Funded by the U.S. EPA Southeast New England Program (SNEP), Task 4D. Develop Planning Level GI SCM Performance Curves for Estimating Cumulative Reductions in SW-Related Indicator Bacteria" (September 30, 2019). https://www.epa.gov/sites/production/files/2020-01/documents/tisbury-subtask-4d-tm.pdf

POLLUTANT REMOVAL CREDITS
Nonpoint Source Project Tracking Tool - Niantic River Watershed
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Project Type	Applicable Structural Stormwater Control Performance Curve	Equation for Calculating Design Storage Volume (DSV) for Structural Stormwater Control Performance Curves	Pollutant Removal Credit Source and Web Link
Stormwater Controls - Infiltration Trench	Infiltration Trench	DSV = void space volumes of gravel and sand layers DSV = (L x W x D_{stone} x n_{stone})+ (L x W x D_{sand} x n_{sand})	**Nitrogen, Phosphorus, and TSS:** University of New Hampshire Stormwater Center, Stormwater BMP Performance Curves/Calculator (UNHSC, 2019) and fact sheets (UNHSC, 2020): https://www.unh.edu/unhsc/sites/default/files/media/unhsc_2019_nh_ms4_permit_bmp_performance_calculator_v4.xlsm https://www.unh.edu/unhsc/sites/default/files/media/ms4_permit_nomographs_sheet_final_2020.pdf **Bacteria:** Tisbury, MA Impervious Cover Disconnection (ICD) Project: an Integrated Stormwater Management Approach for Promoting Urban Community Sustainability and Resilience: A Technical Direct Assistance Project Funded by the U.S. EPA Southeast New England Program (SNEP), Task 4D. Develop Planning Level GI SCM Performance Curves for Estimating Cumulative Reductions in SW-Related Indicator Bacteria (September 30, 2019): https://www.epa.gov/sites/production/files/2020-01/documents/tisbury-subtask-4d-tm.pdf https://www.epa.gov/sites/production/files/2020-01/documents/tisbury-subtask-4d-ps.pdf
Stormwater Controls - Subsurface Infiltration	Infiltration Trench	DSV = Water storage volume of storage units and void space volumes of backfill materials. Example for subsurface galleyı backfilled with washed stone: DSV = (L x W x D)$_{galley}$ + (L x W x D_{stone} x n_{stone})	
Stormwater Controls - Surface Infiltration/Basin	Infiltration Basin	DSV = Water volume of storage structure before bypass. Example for linear trapezoidal vegetated swale DSV = (L x ((W_{bottom}+$W_{top@Dmax}$)/2) x D)	
Stormwater Controls - Rain Garden/Bioretention (no underdrains)	Infiltration Basin	DSV = Ponding water storage volume and void space volumes of soil filter media. Example for raingarden: DSV = (A_{pond} x D_{pond}) + (A_{soil} x D_{soil} x $n_{soil\ mix}$)	
Stormwater Controls - Tree Filter (no underdrain)	Infiltration Trench	DSV = Ponding water storage volume and void space volumes of soil filter media. DSV = (L x W x $D_{ponding}$) + (L x W x D_{soil} x $n_{soil\ mix}$)	
Stormwater Controls - Rain Garden/Bioretention (with underdrain)	Bio-filtration	DSV = Ponding water storage volume and void space volume of soil filter media. Example of a linear biofilter: DSV = (L x W x $D_{ponding}$)+ (L x W x D_{soil} x n_{soil})	
Stormwater Controls - Rain Garden/Bioretention with Internal Storage Reservoir (ISR) (no infiltration)	Enhanced Biofiltration with ISR	DSV = Ponding water storage volume and void space volume of soil filter media and gravel ISR. DSV =(A_{bed} x $D_{ponding}$)+(A_{bed} x D_{soil} x n_{soil})+(A_{ISR} x D_{gravel} x D_{gravel})	
Stormwater Controls - Gravel Wetland	Gravel Wetland	DSV = pretreatment volume + ponding volume + void space volume of gravel ISR. DSV = ($A_{pretreatmeur}$ x $D_{preTreatment}$)+ ($A_{wetland}$ x $D_{ponding}$)+(A_{ISR} x D_{gravel} x n_{gravel})	
Stormwater Controls - Permeable Pavement with Subsurface Infiltration	Infiltration Trench	DSV = void space volumes of gravel layer DSV = (L x W x D_{stone} x n_{stone})	
Stormwater Controls - Porous Pavement with Impermeable Liner and Underdrain	Porous Pavement	Depth of Filter Course = D_{FC}	
Stormwater Controls - Sand Filter with Underdrain	Sand Filter	DSV = pretreatment volume + ponding volume + void space volume of sand and washed stone layers. DSV = ($A_{pretreatmeur}$ x $D_{preTreatment}$)+ (A_{bed} x $D_{ponding}$)+ (A_{bed} x D_{sand} x n_{sand}) + (A_{bed} x D_{stone} x n_{stone})	
Stormwater Controls - Wet Pond	Wet Pond	DSV= Permanent pool volume prior to high flow bypass DSV=A_{pond} x D_{pond} (does not include pretreatment volume)	
Stormwater Controls - Extended Dry Detention Basin	Dry Pond	DSV= Ponding volume prior to high flow bypass DSV=A_{pond} x D_{pond} (does not include pretreatment volume)	
Stormwater Controls - Dry Water Quality Swale/Grass Swale	Water Quality Grass Swale	DSV = Volume of swale at full design depth DSV=L_{swale} x A_{swale} x $D_{ponding\ swale}$	
Stormwater Controls - Oil/Grit Separator	Not Applicable (sizing and performance based on flow rate)		
Stormwater Controls - Hydrodynamic Separator	Not Applicable (sizing and performance based on flow rate)		
Stormwater Controls - Leaching/Infiltrating Catch Basin	Infiltration Trench	DSV = Water storage volume of storage units and void space volumes of backfill materials. Example for subsurface galleyı backfilled with washed stone: DSV = (L x W x D)$_{galley}$ + (L x W x D_{stone} x n_{stone})	
Stormwater Controls - Other	Not Applicable		
Vegetative Buffer Restoration - Urban Forest Planting	Not Applicable	Not Applicable	Chesapeake Bay Program Forestry Workgroup (CBP-FW). 2018. A Guide for Forestry Practices in the Chesapeake Bay TMDL Phase III WIPS. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/documents/WIP_Forestry_BMP_Packet_November_26_2018.pdf
Vegetative Buffer Restoration - Stream Restoration			Schueler, T., Stack, B., Berg, J., Burch, J., Cappuccitti, D., Filoso, S., Fraley-McNeal, L., Goerman, D., Hardman, N., Kaushal, S., Medina, D., Meyers, M., Kerr, B., Stewart, S., Sullivan, B., Walter, R., Winters, J. 2014a. Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2013/05/stream-restoration-merged.pdf
Vegetative Buffer Restoration - Riparian Buffer Restoration			Chesapeake Bay Program Forestry Workgroup (CBP-FW). 2018. A Guide for Forestry Practices in the Chesapeake Bay TMDL Phase III WIPS. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/documents/WIP_Forestry_BMP_Packet_November_26_2018.pdf
Vegetative Buffer Restoration - Other			
Subsurface Sewage Disposal Systems - Conversion to Sanitary Sewers	Not Applicable	Not Applicable	Mullaney, J.R., 2015, Evaluation of the effects of sewering on nitrogen loads to the Niantic River, southeastern Connecticut, 2005–11: U.S. Geological Survey Scientific Investigations Report 2015–5011, 30 p., http://dx.doi.org/10.3133/sir20155011
Subsurface Sewage Disposal Systems - Septic System Upgrades			Vaudrey, J., Yarish, C., Pickerell, C., Brousseau, L., Eddings, G., Kim, J., Sautkulis, M. 2016. Embayment Nitrogen Loads for Long Island Sound. Presentation of Project Findings. . Cold Spring Harbor, NY. Retrieved from: https://vaudrey.lab.uconn.edu/wp-content/uploads/sites/1663/2017/02/Vaudrey_18Mar2016.pdf
Subsurface Sewage Disposal Systems - Other			
Agricultural Practices - Grass Buffer	Not Applicable	Not Applicable	Chesapeake Bay Program. 2018. Chesapeake Bay Program Quick Reference Guide for Best Management Practices (BMPs): Nonpoint Source BMPs to Reduce Nitrogen, Phosphorus and Sediment Loads to the Chesapeake Bay and its Local Waters. CBP/TRS-323-18. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/documents/BMP-Guide_Full.pdf
Agricultural Practices - Forest Buffer			
Agricultural Practices - Water Control Structures			Chesapeake Bay Program Office. 2020. Chesapeake Assessment and Scenario Tool (CAST) Source Data. . Retrieved from: https://cast.chesapeakebay.net/Home/SourceData
Agricultural Practices - Denitrifying Ditch Bioreactor			
Agricultural Practices - Nutrient Management Plan			
Agricultural Practices - Other			
Natural Area Restoration - Wetland Creation	Not Applicable	Not Applicable	Law, N., Boomer, K., Christie, J., Jackson, S., McLaughlin, E., Noe, G., Roseen, R., Strano, S., and D. Wardrop. 2019. Nontidal Wetland Creation, Rehabilitation and Enhancement: Recommendations of the Wetland Expert Panel for the nitrogen, phosphorus and sediment effectiveness estimates for nontidal wetland best management practices (BMPs). – DRAFT. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/channel_files/39308/wetland_rec_bmp_expert_panel_draft_report_with_feedback_markup_03sep2019.pdf
Natural Area Restoration - Wetland Restoration			Mason, P., Spagnolo, R., Boomer, K., Clearwater, D., Davis, D., Denver, D., Hartranft, J., Henicheck, M., McLaughlin, E., Miller, J., Staver, K., Strano, S., Stubbs, Q., Thompson, J., Uybarreta, T. 2016. Wetlands and Wetland Restoration: Recommendations of the Wetland Expert Panel for the incorporation of non-tidal wetland best management practices (BMPs) and land uses in the Phase 6 Chesapeake Bay Watershed Model. Chesapeake Bay Program Office. Annapolis, MD. Rerieved from: https://www.chesapeakebay.net/documents/Wetland_Expert_Panel_Report_WQGIT_approved_December_2016.pdf.
Natural Area Restoration - Forest Restoration			Chesapeake Bay Program. 2018. Chesapeake Bay Program Quick Reference Guide for Best Management Practices (BMPs): Nonpoint Source BMPs to Reduce Nitrogen, Phosphorus and Sediment Loads to the Chesapeake Bay and its Local Waters. CBP/TRS-323-18. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/documents/BMP-Guide_Full.pdf
Natural Area Restoration - Other			
Non-Structural Measures - Illicit Discharge Detection and Elimination (IDDE)	Not Applicable	Not Applicable	Schueler, T., Lane, C., Stack, B., Walch, M., Brosh, M., Lilly, L., Tribo, J., Whitehurst, J., Brumbaugh, B., Handy, D, Hoskins, M., Utt, K., Pitt, R., Spanno, T., Katchmark, W. 2014. Recommendations of the Expert Panel to Define Removal Rates for the Elimination of Discovered Nutrient Discharges from Grey Infrastructure. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/documents/GREY_INFRASTRUCTURE_Expert_Panel_Report_FINAL_LONG.pdf
Non-Structural Measures - Street Sweeping			US EPA Region 1.. 2017. 2017 New Hampshire General Permits for Stormwater Dishcarges from Smalll Municipal Separate Storm Sewer Systems. Appendix F: Requirements for NH Small MS4s Subject to Approved TMDLs.. US EPA Region 1. Boston, MA. Retrieved from: https://www3.epa.gov/region1/npdes/stormwater/nh/2017-appendix-f-sms4-nh.pdf
Non-Structural Measures - Catch Basin Cleaning			Schueler, T., Giese, E., Hanson, J., Wood, D., Donner, S., Frost, B., Goulet, N., Hurd, M., Law, N., Maguire, T., Selbig, B., Shafer, J., Stewart, S., Tribo, J. 2015. Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices. Chesapeake Bay Program Office. Annapolis, MD. Retrieved from: https://www.chesapeakebay.net/channel_files/22425/final_street_cleaning_expert_panel_report.pdf
Non-Structural Measures - Leaf Litter Removal			Massachusetts MS4 General Permit. Appendix F Attachment 2. https://www3.epa.gov/region1/npdes/stormwater/ma/2016fpd/appendix-f-2016-ma-sms4-gp.pdf
Non-Structural Measures - Other			

Definitions for Structural Stormwater Control Performance Curves:
Definitions: **DSV**= Design Storage Volume = physical storage capacity to hold water; **VSV** = Void Space Volume; **L** = length, **W** = width, **D** = depth at design capacity before bypass, **n** = porosity fill material, **A**= average surface area for calculating volume; **Infiltration rate** = saturated soil hydraulic conductivity

Appendix D

Matrix of Site-Specific Project Recommendations in the Niantic River Watershed

Niantic River Watershed Protection Plan Update

Matrix of Potential Site-Specific Project Recommendations in the Niantic River Watershed

Subwatershed	Site Name *(Town)*	Location Description	Potential Recommendations	Hydrologic Soil Group	Ownership
Latimer Brook	Flanders Four Corners, NE (*East Lyme*)	Commercial development, aka Flanders Plaza, on State Route 161. The property's eastern boundary is adjacent to Latimer Brook. Recent construction, with subsurface treatment structures for east of McDonald's. Direct discharges of untreated stormwater to brook. Significant directly connected impervious area.	Work with property owner(s) to develop any of the following projects: • Evaluate the feasibility of retrofitting stormwater management system with a diversion structure to offline subsurface infiltration structure or infiltration basin in SE corner of parking lot (near U.S. Route 1) • Evaluate the feasibility of retrofitting stormwater management system in front of Tri-Town Foods with subsurface infiltration structure(s) • Limited soil infiltration capacity may preclude the use of infiltration. • Relocate and/or contain dumpsters leaking to catch basin. These are located along the north edge of the parking lot and behind Tri-Town Foods. Outreach to owners/managers about Best Practices	D	private
Latimer Brook	Flanders Four Corners, SE (*East Lyme*)	Commercial development, aka Latimer Brook Commons, on State Route 161. Direct discharge of untreated stormwater to brook. Significant directly connected impervious area.	Work with property owner(s) to develop any of the following projects: • Evaluate the feasibility of retrofitting 2-3 catch basins in front of the main building with tree box filters or tree wells • East of the main building, install bioretention or water quality swale along the edge of pavement to intercept SW from roof leaders. Limited soil infiltration capacity may necessitate an underdrain. • At the SE corner of the SR-161/US-1 intersection, install bioretention with overflow to the existing SWS. Limited soil infiltration capacity may necessitate an underdrain.	B B D	private
Latimer Brook	East Lyme High School (*East Lyme*)	Campus on State Route 161, on the northern edge of Flanders Four Corners. BMPs (leaching catch basins), rain garden) installed in 2019, with additional stormwater retrofits possible. Original building and infrastructure constructed in 1967.	• In the main parking lot, install bioretention in the "teardrop" median, with overflow to the existing SWS along State Route 161. Curb cuts into the median are required; underdrain may be required • At the 2 yard drains located south and west of the flag poles, install bioretention with overflow to the existing SWS • In the parking lot between the track and baseball field, remove pavement and install bioretention around existing catch basin. This semi-circular area (525+/- sf) is currently unused space • Retrofit courtyard, located on south side of school with pervious pavers and tree box filters or tree wells • Consider education opportunities (signs, curriculum) for all proposed BMPs	B	town
Latimer Brook	Residential neighborhoods north of Flanders Four Corners (*East Lyme*)	Residential neighborhoods in close proximity to Latimer Brook and tributaries. Some streets have stormwater management system or partial system; others have none. Direct discharge of untreated stormwater to brook. Fertilizer use is a potential source of nutrients.	• Install bioretention in the existing grassy centers of cul de sacs. Feasibility varies due to infiltration capacity and drainage patterns. Good potential sites are located on: Bluebird Cir, Mallard Cir, Catbird Ln, Meadowlark Ln • For cul de sacs close to Latimer Brook, evaluate the feasibility of installing bioretention or infiltration basins, either within the paved centers or along roadsides. Potential sites are located on: Cavasin Dr, Brookfield Dr, Sylvan Glen Dr, Greenwood Cir, Winston Rd • From Egret Rd to Greentree Dr: work with the Town of East Lyme and homeowners to install bioretention/bioswales and retrofit catch basins with tree box filters or tree wells. Potential sites are located on Egret Rd, Sandpipe Ln, Latimer Dr, Cedarbrook Ln, Bobwhite Ln, Cavasin Dr, Irvingdell Pl, Joval St, Grouse Cir, Qualcrest Rd, and Village Dr	B, C	town/ private

Latimer Brook	Rocco Drive (*East Lyme*)	Cul de sac on the east side of State Route 161, with a direct discharge to existing pond (2+/- acres) that drains to Latimer Brook. Several building lots remain to be developed.	• For the existing stormwater management system discharging to a pond near State Route 161:
			  ○ Evaluate the adequacy of the existing sediment forebay below the outfall
			  ○ Options for treatment: (1) retrofit up to 13 catch basins with tree box filters or tree wells; (2) work with homeowners to install bioretention/bioswales upgradient of selected catch basins
			• For the existing SWS discharging the north portion of the cul de sac, evaluate a retrofit with bioretention or subsurface infiltration. Some parcels here may be protected open space
				B,C	private

Matrix of Potential Site-Specific Project Recommendations in the Niantic River Watershed

Subwatershed	Site Name *(Town)*	Location Description	Potential Recommendations	Hydrologic Soil Group	Ownership

Latimer Brook, Cranberry Meadow Brook, Silver Falls	Residential neighborhoods south of Brook Bend Place and north of Cranberry Lane (*East Lyme, Montville*)	Residential neighborhoods in close proximity to Latimer Brook. Some streets have stormwater management system or partial systems, others have none. Direct discharge of untreated stormwater to brook. Fertilizer use is a potential source of nutrients.	• Chapman Drive:
			  ○ Install bioretention in the existing grassy center of cul de sac, with overflow to existing stormwater management system. Regrading of cul de sac may be needed
			  ○ Explore a possible retrofit, such as a bioretention basin, immediately above the outfall. Existing site conditions (trees, slope, limited space) may restrict implementation
			• For cul de sacs close to Latimer Brook, evaluate the feasibility of installing bioretention or infiltration basins, either within the paved centers or along roadsides. Potential sites are located on: Pruett Place, Robin Lane, Brook Bend Lane, Cranberry Lane
			• For the existing stormwater management system discharging to Latimer Brook and its tributaries, retrofit catch basins with tree box filters. Potential sites are: Westchester Drive, Winthrop Drive, Pruett Place, Robin Lane, Brook Bend Place
				D
				
				B
				
				B, C
					town

Cranberry Meadow Brook	St. Matthias Church (*East Lyme*)	On State Route 161, just north of confluence of Latimer Book and Cranberry Meadow Brook. Direct discharge of untreated stormwater to brook. Significant directly connected impervious area. Northern sections of lot deteriorated.	Work with owners to install retrofits: • Pervious pavers in various sections of the existing parking lot • Bioretention swale along the parking lot's northern edge. This requires regrading of this section of the parking lot. • Small bioretention basin located south of office parking (and access road behind office)	B	private

Cranberry Meadow Brook	Southern end of Walnut Hill Rd (*East Lyme*)	Numerous small farms, little to no riparian buffer for Cranberry Meadow Brook. Current practices to manage livestock and manure are potential sources of bacteria, nutrients and sediment.	• Work with owners bordering Cranberry Meadow Brook to:
			  ○ Evaluate agricultural practices and related land uses with respect to local water quality. Evaluations, such as those offered by conservation planning with USDA-NRCS, can provide specific goals and resources to reduce potential impacts from manure and livestock to the brook.
			  ○ Support and maintain restoration of the riparian buffer for Cranberry Meadow Brook. Priority properties are 40, 41, and 43 Walnut Hill Rd and 22 King James Dr
				B, C, D	private

Silver Falls	Burnett's Country Gardens (*Salem*)	Garden center on State Route 85, approximately 35 acres. Latimer Brook flows through property with minimal riparian buffer. Direct discharges of untreated stormwater to brook. Significant directly connected impervious area.	• For the main parking lot:
			  ○ Cover existing stockpiles of mulch, etc. with structure to reduce leaching and material transport into stormwater management system.
			  ○ Retrofit up to 5 catch basins with hydrodynamic separators or similar devices to remove sediments and oils from stormwater
			  ○ Evaluate the feasibility of retrofitting the stormwater management system with an offline stormwater basin with sediment forebay. The practice would be installed before the outfall at Latimer Brook. Potential location is east of the garden center on parcel #17-003-000
			  ○ Consider partnering with Town on stormwater management system maintenance (sediment cleanout, pavement sweeping)
			• Work with owner to support and maintain restoration of Latimer Brook's riparian buffer through the entire property
				C, D	private

Silver Falls	The PAST Antiques (*Montville*)	Retail business adjacent to Nature's Art Village on State Route 85. Direct discharge of untreated stormwater to pond connected to brook. Significant directly connected impervious area.	• For the main parking lot, replace and lengthen the existing drainage swale along the northeast side with an approximately 300-foot long linear bioretention basin or water quality swale, with overflow to an existing catch basin at the SE end • Evaluate the feasibility of constructing a bioretention basin or step pools in the landscaped area at the northwest end of the building. The specific treatment will depend on existing SWS conveyance, buried utilities, etc. For delivery area in rear and access drive, evaluate the feasibility of retrofitting stormwater management system with subsurface infiltration structure under the existing paved area. Design and location depend on existing system, buried utilities, etc.	B	private

Matrix of Potential Site-Specific Project Recommendations in the Niantic River Watershed

Subwatershed	Site Name *(Town)*	Location Description	Potential Recommendations	Hydrologic Soil Group	Ownership
Bogue Brook Reservoir	Dr. Charles Murphy Elementary School (*Montville*)	On the south side of Chesterfield Rd. Large amount of impervious cover, though existing stormwater BMPs appear to be managing/treating most stormwater onsite.	• Obtain site plans of school and grounds to evaluate the adequacy of existing BMPs for watershed impairments • Stabilize the slope located NE of the school and playgrounds (200+/- linear feet). Erosion to catch basins observed • In the island between school and visitor parking, install bioretention with overflow to the existing stormwater management system	C B	town
Bogue Brook Reservoir	Dense residential neighborhood (*Montville*)	Oak Hill Rd, Evergreen Ln, and Beechwood Rd on the north side of Chesterfield Rd. Direct discharge of untreated stormwater to a tributary to Bogue Brook. The tributary is degraded and has minimal/no riparian buffer.	• Montville should include this area in their Illicit Discharge Detection and Elimination program, as required by the MS4 General Permit. Potential illicit discharges observed during field assessments and six outfalls here recorded in Town GIS storm system mapping/database as "ILLICIT". Investigate and, if present, eliminate illicit discharges. • With outreach and resources, Town should work with land owners to restore the tributary's riparian buffer, and to understand the impacts of fertilizer and reduce its use	B, C	private
Barnes Reservoir	Allison's Way (*Montville*)	Cul de sac off Forsyth Rd. Direct discharge of untreated stormwater to a stream flowing to Barnes Reservoir.	• Install cul-de-sac island with a bioretention basin at the center. May necessitate regrading of cul de sac and road. • Retrofit stormwater management system with a diversion structure that directs stormwater to a bioretention basin in the flat mowed area on the W side of the road	B	town private

Barnes Reservoir	Chesterfield Fire Department (*Montville*)	At the corner of SR-85 and Grassy Hill Rd. Direct discharge of untreated stormwater from roads and complex to a wetland bordering Latimer Brook. Significant directly connected impervious area.	• Options to intercept stormwater from the parking lot and rear roof leaders:
			  ○ Remove pavement and install an infiltration trench in the rear parking lot. The trench would be 100+/- linear feet and located along the contour. Adequate vehicle clearances must be maintained
			  ○ Install infiltration basins along the lowest elevation of the rear lot. May require underdrains and the pavement removal to size basins appropriately
			  ○ Install an infiltration swale along the southwest edge of the parking lot. The existing area may be not be sufficient in size or infiltration capacity. Consider removing pavement from southwest edge of lot to improve the capacity of the proposed swale.
			  ○ Consider dry wells for roof leaders on the buildings' southwest-facing sides.
				A/D	town

Stony Brook	Oswegatchie Fire Department (*Waterford*)	On U.S. Route 1, direct discharge of untreated stormwater to a tributary to Stony Brook. Significant directly connected impervious area.	• For the parking lot, install a linear bioretention swale along the northern edge of pavement. This can be the main treatment or designed as a pre-treatment and conveyance for a bioretention basin located just west of the existing shed. • If the site is repaved or more extensively renovated, work with the Town to develop a new SWS to manage stormwater onsite.	A, B/D	town

Niantic River	Niantic River Road (*Waterford*)	An approximately 0.5-mile section of the road, along the east side of the northernmost section of Keeney Cove. This area is a dense residential development along the Niantic River, with direct discharges of untreated stormwater to the river. Road was recently marked for utilities by Dig Safe.	• South of Kiddie Beach:
			  ○ When repaving occurs, install diversion structures to subsurface infiltration chambers under reconstructed sidewalk
			  ○ Stormwater management system conveys ground and/or surface water (GIS mapping shows series of pipes connecting surface water to this stormwater management system at 222 Niantic River Rd)). Evaluate alternatives to convey and treat water separately from stormwater management system
			• Coastal:
			  ○ The stormwater outfall described above is regularly submerged by tidal action
			  ○ The existing sanitary sewer Pump Station (at 236A Niantic River Rd) is located in FEMA Flood Zone AE. Evaluate the building and infrastructure for resilience to sea level rise and storm events
				A	town

Matrix of Potential Site-Specific Project Recommendations in the Niantic River Watershed

Subwatershed	Site Name *(Town)*	Location Description	Potential Recommendations	Hydrologic Soil Group	Ownership
Niantic River	The Avenues neighborhood (*Waterford*)	1st to 10th Avenues, and including Bayside Ave, Mago Blvd, and Bishop St, Wood St, and Back St. This is a dense residential neighborhood along Niantic River Rd. Many direct discharges of untreated stormwater to No Name Brook and the Niantic River. No Name Brook is a channelized stream with minimal/no riparian buffer and is a tributary to the Niantic River.	• Retrofit catch basins with tree box filters or tree wells. Between 10th Ave and Bishop St, there are 140+/- catch basins. Retrofits should be prioritized to SWS that directly discharge to the Niantic River (Bayside Ave; 4th, 7th, 9th & 10th Aves; Wood St; Bishop St; Mago Blvd) and No Name Brook (1st-7th Ave, Daniels Ave) • Install bioswales along roadsides, with overflow to existing stormwater management system. Work with homeowners and Town of Waterford to site retrofits. • Evaluate the feasibility of retrofitting the existing stormwater management system on Niantic River Rd a subsurface infiltration system under the road. Potential sites are located near Bayside Dr, Beach St, 1st Ave, and south of Bishop St • Evaluate the feasibility of retrofitting existing stormwater management system on Daniels Ave with a subsurface infiltration system under the road • With outreach and resources, support homeowners from 2nd through 7th Avenues to restore and maintain the riparian buffer along No Name Brook. Additionally, provide outreach on Best Practices, such as the impacts of fertilizer and reducing its use • Evaluate the feasibility of floodplain and/or wetland restoration or enhancement projects on privately-owned parcels along No Name Brook: ○ 10,000+/- square foot wetland bordering the brook (20 3rd Ave) ○ 0.5+/- acre wetland/stream 6 2nd Ave, and the western edge of (11 Daniels Ave) ○ 0.25+/- acre wetland/stream (89 Niantic River Rd)	A, B, C B A B B B	town, private
Niantic River	Mago Point (*Waterford*)	Developed, mixed-use site adjacent to the Niantic River. Direct discharges of untreated stormwater to the river, with a significant amount of directly connected impervious area. Little land area available for surface treatment of stormwater, and low relative elevation and high groundwater/tidal influence limit sub-surface stormwater management strategies. Redevelopment creates potential opportunities for improved SW management.	• Evaluate the adequacy/effectiveness of existing pervious pavers, and ensure that a maintenance plan is in place and being followed • Options to consider for stormwater treatment onsite: ○ For the existing SWS discharging north of 4th St, retrofit with a diversion structure to an infiltration basin. Basin would be located in the northern corner of the paved parking lot, which appears to be a closed entrance/exit to the parking lot. Implementation would require coordination between the Town (SWS owner) and CT DEEP (land owner) ○ Retrofit the existing catch basins with tree box filters on River St, 2nd St, 4th St, and Niantic River Rd ○ Redesign stormwater treatments for the proposed redevelopment of the unpaved lot (between 2nd St and Mago Point Way) to also include treatment of some or all of the existing paved lot at the boat launch ○ Install a series of dry wells in the paved parking lot. Pre-treatment for sediment, oils/grease, and floatables would be necessary. Infiltration capacity may be inadequate ○ In the existing paved lot, install an infiltration swale, or a series of swales, in place of the existing "line" of pervious pavers along the NW side of northern row of parking spaces. Revised parking plan traffic flow layout may be necessary. Infiltration capacity may be inadequate ○ Evaluate the feasibility of the analysis of SWS and subsequent design of a centralized stormwater treatment system for Mago Point	B	private, town, state
Niantic River	Cini Memorial Park and Niantic Boardwalk Parking (*East Lyme*)	Public park, providing access to beach, boardwalk and Niantic River. Direct discharges of untreated stormwater to Niantic River. Significant directly connected impervious area.	• In the boardwalk parking area, install pervious pavers along the northern and eastern sides • On the north side of the turnaround, retrofit the existing concrete SW pipe (no catch basin) with a tree box filter • On the access road from SR-156 (Main St), retrofit the 3 existing catch basins with dry wells or tree box filters.	*n/a*	town

Matrix of Potential Site-Specific Project Recommendations in the Niantic River Watershed

Subwatershed	Site Name *(Town)*	Location Description	Potential Recommendations	Hydrologic Soil Group	Ownership

Niantic River	Downtown Niantic (*East Lyme*)	Densely developed area of residential and commercial uses. Direct discharges of untreated stormwater to Niantic River. BMPs were installed in multiple location, with additional stormwater retrofit opportunities present.	• Shore Drive:
			  ○ Retrofit 3 catch basins near Morton St with tree box filters
			  ○ Maintenance: clean out existing catch basins; the outfall is below high-tide line and its headwall is failing
			  ○ Evaluate outfall and drainage area for illicit discharges (white stain observed on outfall invert). Review Town's IDDE dry weather screening/sampling data for this outfall.
			• Smith St:
			  ○ At the water access, remove pavement east of existing driveways and install a filter strip along a new access path
			  ○ Retrofit catch basin with tree box filter
			  ○ Work with owner of 83 Smith St to plant buffer – or other deterrent – along the waterfront (**geese observed on this property.)*
			• Pine Grove Rd:
			  ○ Pipe under road, 100' west of Rear Gate, Camp Niantic: improve existing swale for infiltration (swale and pipe receive stormwater from road and 250+/- of gate driveway)
			  ○ Existing bioretention basin (3+/- acres) between Pine Grove and Camp Niantic: evaluate for adequacy for watershed impairments. Receives Town and Camp SWS. (*Camp not accessible and SWS not assessed)*
			• Pine Gove neighborhood:
			  ○ At the water access (eastern end of South St), remove pavement east of Wells St, and install a filter strip along a new access path
			  ○ Install demonstration rain garden and/or rain barrel at municipal storage buildings on South St (in park)
				A	town, private

Niantic River	N Edgewood Rd (*East Lyme*)	Residential neighborhood with direct discharge of untreated stormwater to Niantic River. Significant directly connected impervious area.	• Retrofit up to 15 catch basins with tree box filters or tree wells • Evaluate the feasibility of retrofitting the existing stormwater management system with subsurface infiltration system under N Edgewood Rd. Two potential sites are located in front of 3 and 17 N Edgewood Rd	A	town private
Niantic River	Sandy Point (*East Lyme*)	Residential neighborhood with direct discharges of untreated stormwater to Niantic River. Significant directly connected impervious area. Fertilizer use is a potential source of nutrients.	• At water access between 21 and 25 Park Drive, retrofit existing stormwater management system with subsurface infiltration system to treat SW from Shawandassee Dr, Konomoc Ave, and Park Drive. The system should be located under more gently sloped sections of the access area	A	town

Matrix of Potential Site-Specific Project Recommendations in the Niantic River Watershed

Subwatershed	Site Name *(Town)*	Location Description	Potential Recommendations	Hydrologic Soil Group	Ownership

Niantic River	Veterans Memorial Park (*East Lyme*)	Municipal park, with baseball fields, and trails. Entrance and eastern parking lot has direct discharges of untreated stormwater to a perennial stream to the Niantic River (Smith Cove). Southern parking lot drains to swale with minimal treatment capacity. On east side of the NE ballfield, signs of sheetflow and moderate erosion to stream. Coordinate retrofit design and work schedule with upcoming improvements planned by Town.	• Along the east side of the entrance (Memorial Park Rd), install a 300+/- linear foot bioretention swale, with overflow to existing stormwater management system draining to the east. The swale should begin with a sediment forebay as pre-treatment
			• In the eastern parking lot at the entrance, install 2 bioretention basins: (1) replace 2 parking spaces at the eastern end of the center parking row with a bioretention basin; (2) replace existing curb cut and grass at the lot's southeast end with a bioretention basin. Install an underdrain or other device to convey overflow under entrance road to wetland/stream
			• In the southern parking lot:
			  ○ Retrofit the 3 existing curb cuts with infiltrating catch basins/dry wells upgradient of the curb cuts or sediment forebays as pre-treatment to the swale
			  ○ Evaluate the existing swale's capacity to treat stormwater for the watershed's impairments. If needed, redesign the swale as a bioretention basin with improved treatment capacity. Overflow from existing channel discharges to SWS at Memorial Park Dr
			  ○ Work with homeowners on State Route 161, south of the swale, to maintain buffer area and remove stored items and debris, which may be on the Town's parcel
			  ○ Consider constructing a shelter or other containment area for stockpiled material currently located in the parking lot
			• In the northeast ballfield, improve drainage to reduce sheetflow and prevent concentrated flows that cause erosion.
			• For the gravel access road and storage containers along the park's northern end:
			  ○ Relocate the storage containers to an area accessed from the western end of the southern parking lot. Stormwater in the new area should infiltrate in the adjacent upland or be directed to the paved parking lot and intercepted by those BMPs
			  ○ Restore the existing gravel road and storage area to reduce compacted soils and prevent sheetflow. Options include a shallow swale and adjacent vegetated berm. Maintain a walking path that, if possible, connects to existing trails
				B	town

Niantic River	Saunders Point (*East Lyme*)	Residential neighborhood with direct discharges of untreated stormwater to the Niantic River. Significant directly connected impervious area. Existing leaching catch basins on North Rd and Maples St. No sanitary sewers, all sewage treated with onsite disposal.	• At the intersection of Saunders Dr and Cedar St, retrofit 3-5 catch basins with tree box filters or tree wells • On Oak St, retrofit 2-4 catch basins with tree box filters or tree wells • Beginning at the Oswegatchie Tennis Courts, retrofit (up to 7?) catch basins with tree box filters or tree wells on Center Rd and Round Rock Rd • At water access at the eastern end of Town Rd, remove pavement (75+/- linear feet) east of the existing driveways, and replace with walking path and filter strip or infiltration swale	A, B/D	town

Appendix E

Planning-Level Costs for Site-Specific BMP Concepts

Niantic River Watershed Protection Plan Update

Niantic River Watershed Protection Plan Update
Planning-Level Costs for Site-Specific BMP Concepts

Location and Element		Order of Magnitude Cost Range													
		Construction				Planning and Design		Cost Range			Life Cycle				
		Unit Cost	Unit	Quantity	Cost (2020$)	Allowance	Cost	Total Cost	-30%	50%	Lifespan (yrs)	Annual Cost over Lifespan	O&M (% Cost)	O&M ($/yr)	Total Capitalized Cost/yr over lifespan
Flanders Plaza (East Lyme)															
1	Bioretention Area, parking lot	$ 36.53	sf	1,600	$ 58,448	30%	$ 17,530	$ 76,000	$ 53,000	$ 114,000	20	$ 5,590	10%	$ 560	$ 6,150
	Diversion Manhole	$ 4,000.00	each	1	$ 4,000	30%	$ 1,200	$ 6,000	$ 4,000	$ 9,000	20	$ 440	10%	$ 40	$ 480
							Total	**$ 82,000**	**$ 57,000**	**$ 123,000**					
Latimer Brook Commons (East Lyme)															
1	Linear Bioretention Area, rear of building	$ 36.53	sf	600	$ 21,918	30%	$ 6,580	$ 29,000	$ 20,000	$ 44,000	20	$ 2,130	10%	$ 210	$ 2,340
2	Leaching Catch Basin	$ 23,000.00	each	1	$ 23,000	30%	$ 6,900	$ 30,000	$ 21,000	$ 45,000	20	$ 2,210	10%	$ 220	$ 2,430
3	Tree Wells	$ 2,500.00	each	5	$ 12,500	30%	$ 3,750	$ 17,000	$ 12,000	$ 45,000	20	$ 1,250	10%	$ 130	$ 1,380
Add-on 1	Bioretention Area, Route 1	$ 36.53	sf	600	$ 21,918	30%	$ 6,580	$ 29,000	$ 20,000	$ 44,000	20	$ 2,130	10%	$ 210	$ 2,340
Add-on 2	Bioretention Area, Route 161	$ 36.53	sf	300	$ 10,959	30%	$ 3,290	$ 15,000	$ 11,000	$ 23,000	20	$ 1,100	10%	$ 110	$ 1,210
							Total	**$ 120,000**	**$ 84,000**	**$ 201,000**					
Residential Area North of Flanders Four Corners (East Lyme)															
Bluebird Circle															
1	Bioretention Area and Swale, at intersection	$ 36.53	sf	400	$ 14,612	30%	$ 4,380	$ 19,000	$ 13,000	$ 29,000	20	$ 1,400	10%	$ 140	$ 1,540
2	Bioretention Area, at cul -de-sac center	$ 36.53	sf	500	$ 18,265	30%	$ 5,480	$ 24,000	$ 17,000	$ 36,000	20	$ 1,770	10%	$ 180	$ 1,950
3	Tree Wells	$ 2,500.00	each	3	$ 7,500	30%	$ 2,250	$ 10,000	$ 7,000	$ 36,000	20	$ 740	10%	$ 70	$ 810
Mallard Circle															
1	Bioretention Area and Swale, at intersection	$ 36.53	sf	800	$ 29,224	30%	$ 8,770	$ 38,000	$ 27,000	$ 57,000	20	$ 2,800	10%	$ 280	$ 3,080
2	Tree Wells	$ 2,500.00	each	2	$ 5,000	30%	$ 1,500	$ 7,000	$ 5,000	$ 11,000	20	$ 520	10%	$ 50	$ 570
Tern Ct, Meadobrook Ln, Cedarbrook Ln, Bobwhite Ln															
1	Roadside Bioretention Area, Cedarbrook Ln (west)	$ 36.53	sf	500	$ 18,265	30%	$ 5,480	$ 24,000	$ 17,000	$ 36,000	20	$ 1,770	10%	$ 180	$ 1,950
2	Bioretention Area, at cul -de-sac center (Tern Ct)	$ 36.53	sf	1,000	$ 36,530	30%	$ 10,960	$ 48,000	$ 34,000	$ 72,000	20	$ 3,530	10%	$ 350	$ 3,880
3	Bioretention Area, Cedarbrook Ln (east)	$ 36.53	sf	900	$ 32,877	30%	$ 9,860	$ 43,000	$ 30,000	$ 65,000	20	$ 3,160	10%	$ 320	$ 3,480
4	Bioretention Area, Bobwhite Ln	$ 36.53	sf	900	$ 32,877	30%	$ 9,860	$ 43,000	$ 30,000	$ 65,000	20	$ 3,160	10%	$ 320	$ 3,480
5	Tree Wells	$ 2,500.00	each	9	$ 22,500	30%	$ 6,750	$ 30,000	$ 21,000	$ 45,000	20	$ 2,210	10%	$ 220	$ 2,430
							Total	**$ 286,000**	**$ 201,000**	**$ 452,000**					
Sandy Point (Waterford)															
1	Subsurface Infiltration (chambers)	$ 20.56	cf runoff treated	1,200	$ 24,672	30%	$ 7,400	$ 33,000	$ 23,000	$ 50,000	20	$ 2,430	10%	$ 240	$ 2,670
	Diversion Manhole	$ 4,000.00	each	2	$ 8,000	30%	$ 2,400	$ 11,000	$ 8,000	$ 17,000	20	$ 810	10%	$ 80	$ 890
	Pre-Treatment Structure for Subsurface Infiltration	$ 20,000.00	each	1	$ 20,000	30%	$ 6,000	$ 26,000	$ 18,000	$ 39,000	20	$ 1,910	10%	$ 190	$ 2,100
2	Tree Wells	$ 2,500.00	each	13	$ 32,500	30%	$ 9,750	$ 43,000	$ 30,000	$ 65,000	20	$ 3,160	10%	$ 320	$ 3,480
3	Permeable Pavement	$ 11.24	sf	550	$ 6,182	30%	$ 1,850	$ 9,000	$ 6,000	$ 14,000	20	$ 660	10%	$ 70	$ 730
							Total	**$ 122,000**	**$ 85,000**	**$ 185,000**					
Oswegatchie Fire Department (Waterford)															
1	Bioretention Areas	$ 36.53	sf	1,100	$ 40,183	30%	$ 12,050	$ 53,000	$ 37,000	$ 80,000	20	$ 3,900	10%	$ 390	$ 4,290
2	Water Quality Swale	$ 11.24	sf	550	$ 6,182	30%	$ 1,850	$ 9,000	$ 6,000	$ 14,000	20	$ 660	10%	$ 70	$ 730
							Total	**$ 62,000**	**$ 43,000**	**$ 94,000**					
Chesterfield Fire Department (Montville)															
1	Linear Bioretention Area, SW edge of parkng lot	$ 36.53	sf	1,300	$ 47,489	30%	$ 14,250	$ 62,000	$ 43,000	$ 93,000	20	$ 4,560	10%	$ 460	$ 5,020
2	Water Quality Swale	$ 11.24	sf	800	$ 8,992	30%	$ 2,700	$ 12,000	$ 8,000	$ 18,000	20	$ 880	10%	$ 90	$ 970
3	Bioretention Area, NW edge of parking lot	$ 36.53	sf	700	$ 25,571	30%	$ 7,670	$ 34,000	$ 24,000	$ 51,000	20	$ 2,500	10%	$ 250	$ 2,750
4	Bioretention Area, on Grassy Hill Rd	$ 36.53	sf	600	$ 21,918	30%	$ 6,580	$ 29,000	$ 20,000	$ 44,000	20	$ 2,130	10%	$ 210	$ 2,340
							Total	**$ 137,000**	**$ 95,000**	**$ 206,000**					
Residential Area North of Bogue Brook Reservoir (Montville)															
1	Bioretention Area, Chapel Hill Rd	$ 36.53	sf	600	$ 21,918	30%	$ 6,580	$ 29,000	$ 20,000	$ 44,000	20	$ 2,130	10%	$ 210	$ 2,340
2	Bioretention Area, Evergreen Ln	$ 36.53	sf	800	$ 29,224	30%	$ 8,770	$ 38,000	$ 27,000	$ 57,000	20	$ 2,800	10%	$ 280	$ 3,080
3	Tree Wells	$ 2,500.00	each	26	$ 65,000	30%	$ 19,500	$ 85,000	$ 60,000	$ 57,000	20	$ 6,250	10%	$ 630	$ 6,880
4	Riparian Buffer Restoration	$ 9.75	linear foot	1,200	$ 11,700	30%	$ 3,510	$ 16,000	$ 11,000	$ 24,000	20	$ 1,180	10%	$ 120	$ 1,300
							Total	**$ 168,000**	**$ 118,000**	**$ 182,000**					
Niantic River Road (Waterford)															
1	Bioretention Area, north of Pump Station	$ 36.53	sf	800	$ 29,224	30%	$ 8,770	$ 38,000	$ 27,000	$ 57,000	20	$ 2,800	10%	$ 280	$ 3,080
2	Bioretention Area, south of Pump Station	$ 36.53	sf	250	$ 9,133	30%	$ 2,740	$ 12,000	$ 8,000	$ 18,000	20	$ 880	10%	$ 90	$ 970
3	Subsurface Infiltration (chambers)	$ 20.56	cf runoff treated	1,700	$ 34,952	30%	$ 10,490	$ 46,000	$ 32,000	$ 69,000	20	$ 3,380	10%	$ 340	$ 3,720
	Diversion Manhole	$ 4,000.00	each	2	$ 8,000	30%	$ 2,400	$ 11,000	$ 8,000	$ 17,000	20	$ 810	10%	$ 80	$ 890
	Pre-Treatment Structure for Subsurface Infiltration	$ 20,000.00	each	1	$ 20,000	30%	$ 6,000	$ 26,000	$ 18,000	$ 17,000	20	$ 1,910	10%	$ 190	$ 2,100
4	Tree Wells	$ 2,500.00	each	11	$ 27,500	30%	$ 8,250	$ 36,000	$ 25,000	$ 69,000	20	$ 2,650	10%	$ 270	$ 2,920
							Total	**$ 169,000**	**$ 118,000**	**$ 247,000**					

Niantic River Watershed Protection Plan Update
Planning-Level Costs for Site-Specific BMP Concepts

Location and Element		Order of Magnitude Cost Range													
		Construction				Planning and Design		Cost Range			Life Cycle				
		Unit Cost	Unit	Quantity	Cost (2020$)	Allowance	Cost	Total Cost	-30%	50%	Lifespan (yrs)	Annual Cost over Lifespan	O&M (% Cost)	O&M ($/yr)	Total Capitalized Cost/yr over lifespan
Residential Area around No Name Brook (The Avenues, Waterford)															
1	Bioretention Area, Circle St	$ 36.53	sf	400	$ 14,612	30%	$ 4,380	$ 19,000	$ 13,000	$ 29,000	20	$ 1,400	10%	$ 140	$ 1,540
2	Bioretention Area, 5th Ave	$ 36.53	sf	150	$ 5,480	30%	$ 1,640	$ 8,000	$ 6,000	$ 12,000	20	$ 590	10%	$ 60	$ 650
3	Linear Bioretention Area, 4th Ave	$ 36.53	sf	200	$ 7,306	30%	$ 2,190	$ 10,000	$ 7,000	$ 15,000	20	$ 740	10%	$ 70	$ 810
4	Bioretention Area, Middle St (north)	$ 36.53	sf	250	$ 9,133	30%	$ 2,740	$ 12,000	$ 8,000	$ 18,000	20	$ 880	10%	$ 90	$ 970
5	Bioretention Area, Middle St (center)	$ 36.53	sf	250	$ 9,133	30%	$ 2,740	$ 12,000	$ 8,000	$ 18,000	20	$ 880	10%	$ 90	$ 970
6	Bioretention Area, Middle St (south)	$ 36.53	sf	250	$ 9,133	30%	$ 2,740	$ 12,000	$ 8,000	$ 18,000	20	$ 880	10%	$ 90	$ 970
7	Bioretention Area, Daniels Ave	$ 36.53	sf	1,000	$ 36,530	30%	$ 10,960	$ 48,000	$ 34,000	$ 72,000	20	$ 3,530	10%	$ 350	$ 3,880
8	Bioretention Area and Swale, 2nd Ave	$ 36.53	sf	200	$ 7,306	30%	$ 2,190	$ 10,000	$ 7,000	$ 15,000	20	$ 740	10%	$ 70	$ 810
9	Bioretention Area and Swale, Beach St	$ 36.53	sf	900	$ 32,877	30%	$ 9,860	$ 43,000	$ 30,000	$ 65,000	20	$ 3,160	10%	$ 320	$ 3,480
10	Bioretention Area and Swales, 1st Ave (west)	$ 36.53	sf	500	$ 18,265	30%	$ 5,480	$ 24,000	$ 17,000	$ 36,000	20	$ 1,770	10%	$ 180	$ 1,950
11	Bioretention Area, 1st Ave (east)	$ 36.53	sf	400	$ 14,612	30%	$ 4,380	$ 19,000	$ 13,000	$ 29,000	20	$ 1,400	10%	$ 140	$ 1,540
12	Bioretention Area and Swale, East Bishop St	$ 36.53	sf	800	$ 29,224	30%	$ 8,770	$ 38,000	$ 27,000	$ 57,000	20	$ 2,800	10%	$ 280	$ 3,080
13	Tree Wells	$ 2,500.00	each	79	$ 197,500	30%	$ 59,250	$ 257,000	$ 180,000	$ 386,000	20	$ 18,910	10%	$ 1,890	$ 20,800
14	Riparian Buffer Restoration	$ 9.75	linear foot	1,500	$ 14,625	30%	$ 4,390	$ 20,000	$ 14,000	$ 30,000	20	$ 1,470	10%	$ 150	$ 1,620
							Total	**$532,000**	**$372,000**	**$800,000**					
Downtown Niantic (East Lyme)															
1	Bioretention Area, Smith St	$ 36.53	sf	200	$ 7,306	30%	$ 2,190	$ 10,000	$ 7,000	$ 15,000	20	$ 740	10%	$ 70	$ 810
2	Bioretention Area, Shore Dr/Smith St Extension	$ 36.53	sf	350	$ 12,786	30%	$ 3,840	$ 17,000	$ 12,000	$ 26,000	20	$ 1,250	10%	$ 130	$ 1,380
3	Linear Bioretention Area, Smith St Extension	$ 36.53	sf	600	$ 21,918	30%	$ 6,580	$ 29,000	$ 20,000	$ 44,000	20	$ 2,130	10%	$ 210	$ 2,340
4	Permeable Pavement	$ 11.24	sf	550	$ 6,182	30%	$ 1,850	$ 9,000	$ 6,000	$ 14,000	20	$ 660	10%	$ 70	$ 730
5	Leaching Catch Basin	$ 23,000.00	each	1	$ 23,000	30%	$ 6,900	$ 30,000	$ 21,000	$ 45,000	20	$ 2,210	10%	$ 220	$ 2,430
							Total	**$ 95,000**	**$ 66,000**	**$ 144,000**					
							Total	**$ 1,773,000**	**$ 1,239,000**	**$ 2,634,000**					
							All Projects:	**$ 3,546,000**							

Notes:
Rate of Inflation used = 2%
Interest (discount) rate used = 6%
*Projects are proposed for these locations already. Costs estimated in this table are for adding ecological and water quality elements to the assumed original purpose of the proposed projects.
Costs should be used for planning purposes only based on screening-level evaluations of site characteristics. Construction costs could vary significantly.

Unit Costs

Element	2020 Adjusted Cost	Unit	Cost	$YEAR	Source
Low Impact Development/Green Infrastructure Stormwater Control Measure					
Curbside Bioswale	$ 15,420.00	each	$ 15,000.00	2018	Bids for New Haven West River Bioswales (70 bioswales), Fuss & O'Neill (2018)
Large Bioretention Retrofit	$ 13.44	cubic foot runoff treated	$ 10.50	2006	Center for Watershed Protection Urban Subwatershed Retrofit Manual 3 (2007)
Small Bioretention Retrofit (<0.5 acre)	$ 36.53	square foot	$ 32.50	2012	District of Columbia Water and Sewer Authority, George S. Hawkins, General Manager, Green Infrastructure Summit 2012, February 29, 2012
Bioretention	$ 71,036.80	acre impervious cover treated	$ 63,200.00	2012	Houle, J.J., Roseen, R.M., Ballestero, T.P., Puls, T.A., Sherrard Jr., J. (2013). Comparison of Maintenance Cost, Labor Demands, and System Performance for LID and Conventional Stormwater Management. *Journal of Environmental Engineering* . pp.932-938.
Rain Garden	$ 8.18	square foot	$ 7.28	2012	Woodard & Curran - Route 1 Falmouth Commercial District Stormwater Management, 2012
Water Quality Swale	$ 11.24	square foot	$ 10.00	2012	District of Columbia Water and Sewer Authority, George S. Hawkins, General Manager, Green Infrastructure Summit 2012, February 29, 2012
Porous Asphalt	$ 4.24	cubic foot storage volume	$ 3.94	2016	Mataleska, Karen, "MS4 Resource: BMP Cost Estimates" (2016). UNH Stormwater Center. 32. https://scholars.unh.edu/cgi/viewcontent.cgi?article=1031&context=stormwater
Porous Asphalt	$ 3.15	square foot	$ 2.80	2012	UNH Stormwater Center 2012 Biennial Report
Permeable Pavers	$ 11.24	square foot	$ 10.00	2012	Center for Watershed Protection Urban Subwatershed Retrofit Manual 3 (2007)
Reinforced Gravel Parking	$ 5.07	square foot	$ 5.07	2013	http://www.boddingtonsonline.com/products/grass-ground-reinforcement/grass-reinforcement-protection/bodpave-85-permeable-gravel-pavers.php; Added $2/sf for installation
Subsurface Infiltration (chambers)	$ 20.56	cubic foot runoff treated	$ 20.00	2018	Fuss & O'Neill, City of Pawtucket Grant Application, 2018
Leaching Catch Basin	$ 23,000.00	each	$ 23,000.00	2020	NRWC and Town of East Lyme. Town of East Lyme Engineering Department design (parking lot catch basin retrofit)
Dry Well	$ 12,850	each	$ 12,500.00	2018	Oregon State University, Dry Wells: Low-impact development fact sheet, May 2019. https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9200.pdf (non-residential dry well)
Green Roof	$ 25.85	square foot	$ 23.00	2012	District of Columbia Water and Sewer Authority, George S. Hawkins, General Manager, Green Infrastructure Summit 2012, February 29, 2012
Blue Roof	$ 5.62	square foot	$ 5.00	2012	NYC Department of Environmental Protection (2012), Rooftop Detention: A Low-Cost Alternative for Complying with New York City's Stormwater Detention Requirements and Reducing Urban Runoff
Subsurface Gravel Wetland	$ 24.54	cubic foot runoff treated	$ 21.83	2012	Woodard & Curran - Route 1 Falmouth Commercial District Stormwater Management, 2012
Pond Retrofit	$ 14,208.00	impervious acre of runoff treated	$ 11,100.00	2006	Center for Watershed Protection Urban Subwatershed Retrofit Manual 3 (2007)
French Drain/Infiltration Trench	$ 20.48	linear foot	$ 16.00	2006	Center for Watershed Protection Urban Subwatershed Retrofit Manual 3 (2007)
Tree Well	$ 2,500.00	each	$ 2,500.00	2020	NRWC and Town of East Lyme costs for recent municipal BMPs. Infiltrating tree well with no engineered soil media and no overflow or underdrain connections to storm drainage system.
Infiltration Basin	$ 19.20	cf runoff treated	$ 15.00	2006	Center for Watershed Protection Urban Subwatershed Retrofit Manual 3 (2007)
Constructed Wetland	$ 5.34	square foot	$ 4.17	2006	Center for Watershed Protection Urban Subwatershed Retrofit Manual 3 (2007)
Restoration Practices					
Vegetated Buffer Restoration	$ 12,482.91	acre	$ 10,543	2010	Oregon Department of Environmental Quality, 2010, Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon
Vegetated Buffer Restoration	$ 9.75	linear foot	$ 9	2011	Integrated Water Resources Plan - Ecological Restoration and Stream Enhancement Technical Analysis. CDM for the City of Franklin, TN, IWRP
Stream Channel Restoration	$ 14,602.27	acre	$ 12,333	2010	Oregon Department of Environmental Quality, 2010, Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon
Remove Invasive Species	$ 3,788.80	acre	$ 3,200	2010	Professional Engineering Experience
Tree Planting	$ 500.00	each	$ 500	2020	Street tree cost
Bank stabilization	$ 59.20	river mile	$ 50.00	2010	Professional Engineering Experience
Educational Signage	$ 1,329.60	each	$ 1,200	2013	Professional Engineering Experience
Agricultural Practices					
Filter Berm	$ 14.22	linear foot	$ 12.65	2013	Warner et al. (2013) Designing Contour Weep Berms to Reduce Agricultural Nonpoint Source Pollution. Applied Engineering in Agriculture 29: 521-528. $41.50 per linear meter. Converted to

Inflation Rates

http://www.usinflationcalculator.com/

Inflation from	Inflation to	Percent
2004	2020	36.60%
2006	2020	28.00%
2010	2020	18.40%
2011	2020	14.70%
2012	2020	12.4%
2013	2020	10.8%
2016	2020	7.5%
2018	2020	2.8%
2020	2020	0.0%

Appendix F

Potential Funding Sources, Technical Assistance, and Other Resources

Niantic River Watershed Protection Plan Update

FUSS & O'NEILL

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
Federal Sources		
EPA and WEF National Municipal Stormwater and Green Infrastructure Awards Program	The National Municipal Stormwater and Green Infrastructure Awards program, led by the Water Environment Federation (WEF) through a cooperative agreement with the U.S. Environmental Protection Agency (EPA), has been established to recognize high-performing regulated Municipal Separate Stormwater Sewer Programs (MS4s). The objective of the program is to inspire MS4 program leaders to seek new and innovative ways to meet and exceed regulatory requirements in a manner that is both technically effective as well as financially efficient. Recognition of innovative approaches is also a highlight of this program.	http://www.wef.org/ms4awards/
EPA Healthy Communities Grant Program	EPA New England's main competitive grant program to work directly with communities to reduce environmental risks to protect and improve human health and the quality of life.	http://www.epa.gov/region1/eco/uep/hcgp.html
EPA Environmental Education Grants	The Grants Program sponsored by EPA's Office of Environmental Education (OEE), Office of External Affairs and Environmental Education, supports environmental education projects that enhance the public's awareness, knowledge, and skills to help people make informed decisions that affect environmental quality.	https://www.epa.gov/education/environmental-education-ee-grants
FEMA (Federal Emergency Management Agency) Preparedness (Non-Disaster) Grants	FEMA provides state and local governments with preparedness program funding to enhance the capacity of their emergency responders to prevent, respond to, and recover from a range of hazards.	https://www.fema.gov/non-disaster-grants-management-system
EPA Smart Growth	EPA helps communities improve their development practices and get the type of development they want. EPA works with local, state, and national experts to discover and encourage development strategies that protect human health and the environment, create economic opportunities, and provide attractive and affordable neighborhoods for people of all income levels.	https://www.epa.gov/smartgrowth/epa-smart-growth-grants-and-other-funding

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Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
FEMA Hazard Mitigation Assistance	FEMA's Hazard Mitigation Assistance grant programs provide funding to protect life and property from future natural disasters. • Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation measures following a major disaster. • Pre-Disaster Mitigation (PDM) provides funds for hazard mitigation planning and projects on an annual basis. • Flood Mitigation Assistance (FMA) provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.	http://www.fema.gov/hazard-mitigation-assistance
US Forest Service Land and Water Conservation Fund	The Land and Water Conservation Fund (LWCF) provides money to federal, state and local governments to purchase land, water and wetlands for the benefit of all Americans.	https://www.fs.fed.us/land/staff/LWCF/
US Forest Service Community Forest Program	Competitive grant program that provides financial assistance to tribal entities, local governments, and qualified conservation non-profit organizations to acquire and establish community forests that provide community benefits. Community benefits include economic benefits through active forest management, clean water, wildlife habitat, educational opportunities, and public access for recreation.	https://www.fs.usda.gov/managing-land/private-land/community-forest
United States Fish and Wildlife Service (USFWS)	The USFWS administers a variety of natural resource assistance grants to governmental, public and private organizations, groups and individuals.	http://www.fws.gov/grants/
USFWS North American Wetlands Conservation Act (NAWCA)	NAWCA provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada, and Mexico for the benefit of wetlands-associated migratory birds and other wildlife.	https://www.fws.gov/birds/grants/north-american-wetland-conservation-act/how-to-apply-for-a-nawca-grant.php

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
USFWS National Coastal Wetlands Conservation Grant Program (NCWCGP)	The NCWCGP provides States with financial assistance to protect and restore these valuable resources. Projects can include (1) acquisition of a real property interest (e.g., conservation easement or fee title) in coastal lands or waters (coastal wetlands ecosystems) from willing sellers or partners for long-term conservation or (2) restoration, enhancement, or management of coastal wetlands ecosystems. All projects must ensure long-term conservation.	http://www.fws.gov/coastal/coastalgrants/
USFWS Partners for Fish and Wildlife Program	The Partners Program provides technical and financial assistance to private landowners and Tribes who are willing to work with USFWS and other partners on a voluntary basis to help meet the habitat needs of Federal Trust Species. The Partners Program can assist with projects in all habitat types which conserve or restore native vegetation, hydrology, and soils associated with imperiled ecosystems such as longleaf pine, bottomland hardwoods, tropical forests, native prairies, marshes, rivers and streams, or otherwise provide an important habitat requisite for a rare, declining or protected species.	http://www.fws.gov/partners/
National Oceanic and Atmospheric Administration (NOAA) Coastal Resilience Grants Program	This competitive grant program funds projects that are helping coastal communities and ecosystems prepare for and recover from extreme weather events, climate hazards, and changing ocean conditions.	http://www.coast.noaa.gov/resilience-grant
NRCS Conservation Reserve Program	The Conservation Reserve Program (CRP) pays a yearly rental payment in exchange for farmers removing environmentally sensitive land from agricultural production and planting species that will improve environmental quality.	https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index
NRCS Environmental Quality Incentives Program (EQIP)	For implementation of conservation measures on agricultural lands.	https://www.nrcs.usda.gov/wps/portal/nrcs/main/ct/programs/financial/eqip/

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
NRCS Emergency Watershed Protection (EWP) Program	Designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, wind-storms, and other natural occurrences. EWP is an emergency recovery program, which responds to emergencies created by natural disasters. It is not necessary for a national emergency to be declared for an area to be eligible for assistance. EWP is designed for installation of recovery measures. Activities include providing financial and technical assistance to remove debris from stream channels, road culverts, and bridges, reshape and protect eroded banks, correct damaged drainage facilities, establish cover on critically eroding lands, repair levees and structures, and repair conservation practices.	http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/
NRCS Floodplain Easement Program	The Emergency Watershed Protection - Floodplain Easement Program (EWP-FPE) provides an alternative measure to traditional EWP recovery, where it is determined that acquiring an easement in lieu of recovery measures is the more economical and prudent approach to reducing a threat to life or property. The easement area will be restored to the maximum extent practicable to its natural condition. Restoration utilizes structural and nonstructural practices to restore the flood storage and flow, erosion control, and improve the practical management of the easement. Floodplain easements restore, protect, maintain and enhance the functions of floodplains while conserving their natural values such as fish and wildlife habitat, water quality, flood water retention and ground water recharge. Structures, including buildings, within the floodplain easement must be demolished and removed, or relocated outside the 100-year floodplain or dam breach inundation area.	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/programs/financial/ewp/?cid=stelprdb1244478
NRCS Healthy Forests Reserve Program	Helps landowners restore, enhance and protect forestland resources on private lands through easements and financial assistance.	http://www.nrcs.usda.gov/programs/hfrp/proginfo/index.html
NRCS Watershed and Flood Prevention Operations Program (PL-566)	Provides technical and financial assistance to States, local governments and Tribes to plan and implement watershed project plans for the purpose of watershed protection, flood mitigation, water quality improvement, fish and wildlife enhancement, wetlands and wetland function creation and restoration, groundwater recharge, and wetland and floodplain conservation easements.	https://www.nrcs.usda.gov/wps/portal/nrcs/main/ct/programs/planning/wpfp/

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
NRCS Regional Conservation Partnership Program	Projects where NRCS and partners co-invest in impactful and innovative solutions to on-farm, watershed, and regional natural resource concerns. Proposed projects must generate conservation benefits by addressing specific natural resource objectives in a State/multistate area or address one or more primary resource concerns within an NRCS-designated critical conservation area (CCA).	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/rcpp/?cid=nrcseprd1477816
U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Program	The Community Development Block Grant (CDBG) program is a flexible program that works to ensure decent affordable housing, provide services to the most vulnerable in our communities, and create jobs through the expansion and retention of businesses. CDBG-financed projects could incorporate green infrastructure into their design and construction. The Disaster Relief Appropriations Act of 2013 (Pub. L. 113–2) allocated $5,400,000,000 of Community Development Block Grant disaster recovery (CDBG–DR) funds for the purpose of assisting recovery in the most impacted and distressed areas declared a major disaster due to Superstorm Sandy.	https://www.hud.gov/program_offices/comm_planning/communitydevelopment/programs
Long Island Sound Study (funded by EPA) - Long Island Sound Research Grant Program	To support research that will enhance scientific understanding of Long Island Sound, and provide information needed by managers to protect and effectively manage the Sound and its valuable resources. Available to Connecticut academic institutions.	http://longislandsoundstudy.net/research-monitoring/lis-research-grant-program/
State Sources		
CT Department of Agriculture (CT DOAG) Farmland Restoration Program (FLRP)	The main objective of this voluntary program is to increase the State's resource base for food and fiber production agriculture focusing primarily on prime and important farmland soils.	http://www.ct.gov/doag/cwp/view.asp?a=3260&Q=498322
CTDEEP Section 319 Grant Program	Federal Clean Water Act Section 319 funds, administered by CTDEEP, are intended to effectively and efficiently address nonpoint source pollution are available to municipalities, nonprofit environmental organizations, regional water authorities/planning agencies, and watershed associations. Section 319 funds may be used for watershed based plans implementation projects, watershed based plan development, implementation of non-structural BMPs, and other related activities.	http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325594&deepNav_GID=1654

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
CTDEEP Connecticut Clean Water Fund	The Connecticut Clean Water Fund (CWF) is the state's environmental infrastructure assistance program. The fund was established in 1986 to provide financial assistance to municipalities for planning, design and construction of wastewater collection and treatment projects. This program was developed to replace state and federal grant programs that had existed since the 1950s. The 1987 amendments to the Federal Clean Water Act required that states establish a revolving loan program by 1989. The fund was modified in 1996 to include the Drinking Water State Revolving Fund (DWSRF) to assist water companies in complying with the Safe Drinking Water Act by providing low cost financing. The CWSRF currently includes set-asides or reserves categories for green infrastructure, river restoration and small community wastewater (including decentralized) systems.	http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325576&deepNav_GID=1654%20
Local Transportation Capital Improvement Program	The Local Transportation Capital Improvement Program (LOTCIP) provides State funds to urbanized area municipal governments in lieu of Federal funds otherwise available through Federal transportation legislation. Under the LOTCIP, the COGs across Connecticut will be responsible for the solicitation, ranking and prioritizing of their municipal members' project proposals. Potential source of funding for stormwater green infrastructure associated with roadway improvement projects (green streets).	https://portal.ct.gov/DOT/Office-of-Engineering/Highway-Design-Local-Roads---LOTCIP
CTDEEP Recreational Trails Grants Program	Since 2015, CTDEEP's recreational trails program has provided funding to non-profits, municipalities, state departments and tribal governments in support of trail construction and/or restoration projects, accessibility improvements, purchase of trail maintenance equipment, land acquisition, and educational programs. Requests should be under $1million, and a 20% match is required.	http://www.ct.gov/deep/cwp/view.asp?a=2707&q=513740&deepNav_GID=1650
CTDEEP Long Island Sound License Plate Program	Section 14-21e of the Connecticut General Statutes (CGS) authorizes the issuance of the Long Island Sound license plate by the Department of Motor Vehicles, while CGS Section 22a-27k establishes the Long Island Sound Fund to be administered by the Department of Energy and Environmental Protection into which proceeds from the sale of the plates are deposited.	http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323782&depNav_GID=1635

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
CTDEEP Open Space and Watershed Land Acquisition	The Open Space and Watershed Land Acquisition (OSWA) Grant Program provides financial assistance to municipalities and nonprofit land conservation organizations to acquire land for open space and to water companies to acquire land to be classified as Class I or Class II water supply property.	http://www.ct.gov/dep/cwp/view.asp?a=2706&q=323834&depNav_GID=1641
CTDEEP Recreation and Natural Heritage Trust Program	The Recreation and Natural Heritage Trust program was created by the Legislature in 1986 in order to help preserve Connecticut's natural heritage. It is the CTDEEP's primary program for acquiring land to expand the state's system of parks, forests, wildlife, and other natural open spaces.	http://www.ct.gov/dep/cwp/view.asp?a=2706&q=323840&depNav_GID=1641
CTDEEP Urban Forestry Grant Programs	America the Beautiful Urban Forestry Grants: Grants of up to $12,000 are available to assist municipalities and non-profits in local urban forestry efforts. Urban Forestry Outreach Grant: Grants for non-profit organizations in urbanized areas to foster outreach in these areas.	http://www.ct.gov/dep/cwp/view.asp?a=2697&q=322872&depNav_GID=1631&depNav=|
Connecticut Institute for Resilience and Climate Adaptation (CIRCA) – Municipal Resilience Grant Program and Matching Funds Program	The Municipal Resilience Grant Program is for municipal governments and councils of government for initiatives that advance resilience, including the creation of conceptual design, construction (demonstration projects or other) of structures, or the design of practices and policies that increase their resilience to climate change and severe weather. The Matching Funds Grant Program is applicable to municipalities, institutions, universities, foundations, and other non-governmental organizations for matching funds for projects that address the mission of CIRCA. As of June 1, 2017, CIRCA is currently not accepting applications for the Municipal Resilience Grant Program or Matching Funds Program.	https://circa.uconn.edu/
CTDEEP Supplemental Environmental Project (SEP) Funds	In the settlement of an environmental enforcement case, CTDEEP will require the alleged violator to achieve and maintain compliance with State environmental laws and regulations and to pay a civil penalty. To further CTDEEP's goals to protect and enhance public health and the environment, in certain instances one or more environmentally beneficial projects, or Supplemental Environmental Projects, may be included in the settlement.	https://www.ct.gov/deep/lib/deep/enforcement/policies/seppolicy.pdf

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
CT Office of Policy and Management (OPM) Small Town Economic Assistance Program (STEAP)	Funds economic development, community conservation and quality of life projects for localities that are ineligible to receive Urban Action (CGS Section 4-66c) bonds. This program is administered by the Office of Policy and Management. STEAP funds are issued by the State Bond Commission and can only be used for capital projects. Eligible projects include projects involving environmental protection.	http://www.ct.gov/opm/cwp/view.asp?Q=382970
Connecticut In-Lieu Fee Program	The National Audubon Society, Inc., through its Connecticut program (Audubon Connecticut) is the sponsor of an In-Lieu Fee Program for aquatic resource compensatory mitigation required by Department of the Army authorizations. Audubon Connecticut administers a competitive grant funding program, soliciting proposals for wetland and waters restoration, enhancement, creation and/or preservation.	http://ct.audubon.org/conservation/in-lieu-fee-program http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/In-Lieu-Fee-Programs/CT/
Sustainable CT Community Match Fund	Supports community-driven projects that foster resident engagement and build collaboration between residents and their local government. Partnership with a non-profit, civic-oriented crowdfunding organization that provides fundraising coaching and support, and an online fundraising platform to help all project leaders publicize their work and fundraise for their project. Sustainable CT provides a live match to every donation a project receives. Anyone in a Sustainable CT registered municipality can participate in this program, meaning that municipalities themselves, schools, libraries, nonprofits, community groups, and even individual residents can all propose a project and access the funding.	https://sustainablect.org/funding/
NOAA Community-Based Restoration Program Partnership	These grants are designed to provide support for local communities that are utilizing dam removal or fish passage to restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory fish. Other NOAA grant programs: Coastal Resilience Grants Program, Ocean Acidification Program, Environmental Literacy Program	https://www.fisheries.noaa.gov/national/habitat-conservation/strategic-habitat-restoration

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
Other Sources		
Private Foundations	Community Foundation of Eastern Connecticut, Dominion Foundation, Maine Community Foundation, Charter Oak Federal Credit Union,	https://www.cfect.org/, https://sustainability.dominionenergy.com/community-development/philanthropy/, , https://charteroak.org/content/grants-program/
FishAmerica Foundation Conservation Grants	FishAmerica, in partnership with the NOAA Restoration Center, awards grants to local communities and government agencies to restore habitat for marine and anadromous fish species. Successful proposals have community-based restoration efforts with outreach to the local communities.	https://www.fishamerica.org/grants/
National Fish and Wildlife Foundation (NFWF) Five Star and Urban Waters Restoration Grant Program	The Five Star and Urban Waters Restoration Program seeks to develop nation-wide-community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Projects seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. The program focuses on the stewardship and restoration of coastal, wetland and riparian ecosystems across the country.	http://www.nfwf.org/fivestar/Pages/home.aspx
NFWF Long Island Sound Futures Fund	The Long Island Sound Futures Fund supports projects in local communities that aim to protect and restore Long Island Sound. It unites federal and state agencies, foundations and corporations to achieve high-priority conservation objectives. Funded activities demonstrate a real, on-the-ground commitment to securing a healthy future for the Long Island Sound.	http://longislandsoundstudy.net/about/grants/lis-futures-fund/
NFWF New England Forests and Rivers Fund	The National Fish and Wildlife Foundation (NFWF) New England Forests and Rivers Fund is dedicated to restoring and sustaining healthy forests and rivers that provide habitat for diverse native bird and freshwater fish populations in the six New England states. Major funding for the New England Forests and Rivers Fund is provided by Eversource Energy, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture's Natural Resources Conservation Service and Forest Service.	http://www.nfwf.org/newengland/Pages/home.aspx

Niantic River Watershed Protection Plan Update - Potential Funding Sources, Technical Assistance, and Other Resources

Funding Source	Description	Reference
NFWF National Coastal Resilience Fund	Invests in conservation projects that restore or expand natural features such as coastal marshes and wetlands, dune and beach systems, oyster and coral reefs, forests, coastal rivers and floodplains, and barrier islands that minimize the impacts of storms and other naturally occurring events on nearby communities.	https://www.nfwf.org/programs/national-coastal-resilience-fund
National Forest Foundation	Through its on-the-ground conservation programs, the National Forest Foundation supports action-oriented projects that directly enhance the health and well-being of America's National Forests and Grasslands and that engage the public in stewardship.	https://www.nationalforests.org/grant-programs
Corporate Wetlands Restoration Partnership (CWRP)	The Corporate Wetlands Restoration Partnership (CWRP) is an innovative private-public initiative aimed at preserving, restoring, enhancing and protecting aquatic habitats throughout the United States. Bringing together corporations, federal and state agencies, non-profit organizations and academia, the CWRP allows members to contribute in a fundamental way to crucial projects involving America's coastal and inland aquatic resources and support related education programs. Since its inception in 1999, CWRP has aided in the restoration of more than 64,000 acres and 1,050 stream miles through the monetary donations and in-kind services of its corporate partners.	http://www.cwrp.org/
Trout Unlimited Embrace A Stream	Embrace-A-Stream (EAS) is a matching grant program administered by TU that awards funds to TU chapters and councils for coldwater fisheries conservation.	http://www.tu.org/conservation/watershed-restoration-home-rivers-initiative/embrace-a-stream
Wildlife Conservation Society Climate Adaptation Fund	Provides $2.5 million in funding annually, with awards ranging from $50,000 to $250,000. The program focuses on projects that promote functionality of ecosystems, long-term conservation impact, and landscape-scale impacts. All projects must conduct on-the-ground implementation; research and planning are not funded.	https://www.wcsclimateadaptationfund.org/program-information/

Note: Some grant programs, particularly federally-funded grant programs, may not allow the use of funds for projects/actions that are required as part of State or federal permit or enforcement-related actions. For example, projects intended to meet mandated requirements of the MS4 General Permit are not eligible for Section 319 NPS grants. However, Section 319 NPS grant proposals that provide stormwater mitigation above and beyond permit requirements may be considered.

Grant Search Resources

Please also see the following grant search resources for assistance in finding additional state, federal, local, and private sources of funding related to nonpoint source pollution management:

- Grants.gov
  http://grants.gov/

- CTDEEP Water - Grants and Financial Assistance
  https://portal.ct.gov/DEEP/Business-and-Financial-Assistance/Grants-Financial-Assistance/Water---Grants-and-Financial-Assistance

- Sustainable CT Grants Portal
  https://sustainablect.org/funding/grants-portal

- EPA Funding Sources for Watershed Protection and Restoration
  https://www.epa.gov/nps/funding-resources-watershed-protection-and-restoration

- EPA Watershed Funding
  http://water.epa.gov/aboutow/owow/funding.cfm

- EPA Water Infrastructure and Community Resiliency Finance Center
  https://www.epa.gov/waterfinancecenter

- EPA Green Infrastructure Funding Website
  https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities

- Foundation Center: Philanthropy News Digest
  http://philanthropynewsdigest.org/rfps/(search)/?tags_interest[]=environment

- USDA National Agriculture Library: Water Quality Information Center
  https://www.nal.usda.gov/waic/water-quality#quicktabs-waic_water_quality=2

Other Nonpoint Source Funding Opportunities

Congressional Appropriation - Direct Federal Funding
State Appropriations - Direct State Funding
Membership Drives Membership drives can provide a stable source of income to support watershed management programs.
Donations Donations can be a major source of revenue for supporting watershed activities, and can be received in a variety of ways.
User Fees, Taxes, and Assessments Taxes are used to fund activities that do not provide a specific benefit, but provide a more general benefit to the community.
Rates and Charges State law authorizes some public utilities to collect rates and charges for the services they provide.
Stormwater Utility A stormwater utility operates much like an electric or drinking water utility. Fees collected from property owners go into a dedicated fund to pay specifically for the work of operating, maintaining, and improving stormwater infrastructure.
Impact Fees Impact fees are also known as capital contribution, facilities fees, or system development charges, among other names.
Special Assessments Special assessments are created for the specific purpose of financing capital improvements, such as provisions, to serve a specific area.
Property Tax These taxes generally support a significant portion of a county's or municipality's non-public enterprise activities.

Other Nonpoint Source Funding Opportunities

Excise Taxes These taxes require special legislation, and the funds generated through the tax are limited to specific uses: lodging, food, etc.
Bonds and Loans Bonds and loans can be used to finance capital improvements. These programs are appropriate for local governments and utilities to support capital projects. **Green Bonds** are a growing mechanism for funding green projects, including green infrastructure and flood resilience projects. Green bonds are debt instruments issued to finance environmental projects focused on climate change initiatives. The identification and labeling of a green bond is typically based on a set of voluntary standards drafted by a consortium of investment banks that outlines the process for issuers to designate specific green projects. The guidelines specify that a bond issue qualifies as green if the issuer uses the proceeds solely for capital expenditures associated with green or climate-related environmental benefits in accordance with certain standards.
Investment Income Some organizations have elected to establish their own foundations or endowment funds to provide long-term funding stability. Endowment funds can be established and managed by a single organization-specific foundation or an organization may elect to have a community foundation to hold and administer its endowment. With an endowment fund, the principal or actual cash raised is invested. The organization may elect to tap into the principal under certain established circumstances.
Emerging Opportunities for Program Support for Water Quality Trading Allows regulated entities to purchase credits for pollutant reductions in the watershed or a specified part of the watershed to meet or exceed regulatory or voluntary goals. There are a number of variations for water quality credit trading frameworks. Credits can be traded, or bought and sold, between point sources only, between NPSs only, or between point sources and NPSs.
Mitigation and Conservation Banks Created by property owners who restore and/or preserve their land in its natural condition. Such banks have been developed by public, nonprofit, and private entities. In exchange for preserving the land, the "bankers" get permission from appropriate state and federal agencies to sell mitigation banking credits to developers wanting to mitigate the impacts of proposed development. By purchasing the mitigation bank credits, the developer avoids having to mitigate the impacts of their development on site. Public and nonprofit mitigation banks may use the funds generated from the sale of the credits to fund the purchase of additional land for preservation and/or for the restoration of the lands to a natural state.

Other Nonpoint Source Funding Opportunities

Public Private Partnerships (P3s)

Innovative financing mechanisms are being explored at the national level, particularly tapping into the resources of the private sector through public–private partnerships (P3s). Traditionally, water and wastewater infrastructure has been funded through municipal bonds, with help from EPA State Revolving Loan funds, while stormwater is typically funded either through its limited share of local general funds or stormwater utilities. The Chesapeake Bay states are exploring P3s to meet TMDL obligations for nutrients and sediment. A P3 is an arrangement between government and the private sector in which the private sector assumes a large share of the risk in terms of financing, constructing, and maintaining the infrastructure. Government repays the private sector over the long term if the infrastructure is built and maintained according to specifications. Prince George's County, Maryland is implementing a P3 program to retrofit 2,000 acres of impervious surfaces in the public right of way. Private funds will finance 30% to 40% of the program costs upfront, enabling project construction to begin sooner and proceed more quickly. This program is part of the County's Watershed Protection and Restoration Program.

Appendix G

2006 Niantic River Watershed Protection Plan
Niantic River Watershed Protection Plan Update

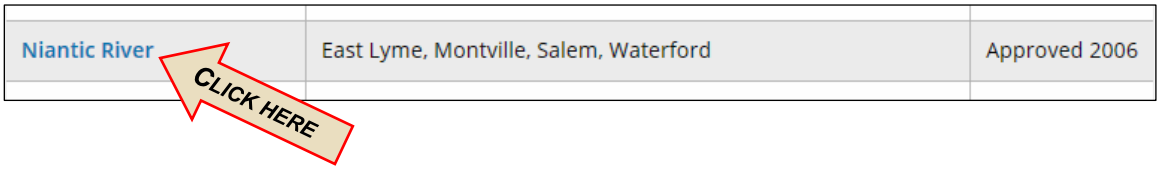
FUSS & O'NEILL

Access to the 2006 *Niantic River Watershed Protection Plan*

All watershed management plans for the state of Connecticut are publicly available on CT DEEP's website. The full *Niantic River Watershed Protection Plan* (NRWPP), adopted in 2006, can be accessed at the webpage "DEEP Watershed Management Plans and Documents" by following the steps below:

1. Click this link to the main page: https://portal.ct.gov/DEEP/Water/Watershed-Management/Watershed-Management-Plans-and-Documents

2. Scroll down through the alphabetized table to **Niantic River**, and click on that link



(For future reference, this link can be bookmarked for direct access to the Plan sections shown in step #3: https://portal.ct.gov/DEEP/Water/Watershed-Management/Watershed-Management-Plans-and-Documents#nianticriver)

3. The full NRWPP and its Attachments are accessible through the links provided to seven parts of the Plan, as shown below. The 2009 *Guided Summary* to the NRWPP is also available.

Niantic River Watershed Protection Plan 2006 (NRWPP) (7 files plus summary)
Guided Summary (PDF, 1.5 MB) derived from NRWPP in March 2009
NRWPP Part 1 of 7 (PDF, 11.9 MB) Report 1.0-4.4.5
NRWPP Part 2 of 7 (PDF, 15.2 MB) Report 4.5-8.0
NRWPP Part 3 of 7 (PDF, 11.3 MB) Appendix A-F4
NRWPP Part 4 of 7 (PDF, 19.4 MB) Appendix F5p1
NRWPP Part 5 of 7 (PDF, 19.4 MB) Appendix F5p2
NRWPP Part 6 of 7 (PDF, 19.4 MB) Appendix F5p3
NRWPP Part 7 of 7 (PDF, 24.2 MB) Appendix F5p4-G

Appendix H

Memorandum: Summary of Stakeholder Workshops of October 29, 2019
Niantic River Watershed Protection Plan Update

FUSS & O'NEILL

MEMORANDUM

TO: Niantic River Watershed Committee

FROM: Fuss & O'Neill, Inc.

DATE: November 25, 2019

RE: Summary of Stakeholder Workshops of October 29, 2019
Update to the 2006 Niantic River Watershed Protection Plan

Two workshop meetings were held in the Niantic River watershed on October 29, 2019 to receive stakeholder input for the development of an update to the 2006 Niantic River Watershed Protection Plan (NRWPP). To encourage a broad representation of municipal staff and land use commissioners and other local community stakeholders, one workshop was held during the afternoon in the upper Niantic River watershed at the Chesterfield Fire Department in Montville, and the other workshop was held during the evening in the lower watershed at the Waterford Town Hall. Both workshops were open to the public and the second workshop was scheduled during evening hours so that the public could attend.

The stakeholder workshops were designed to facilitate discussion of:

1. Completed watershed plan goals and objectives
2. Uncompleted watershed plan goals and objectives
3. Barriers to uncompleted goals and objectives
4. Recommendations to address barriers and facilitate completion of uncompleted goals and objectives
5. Additional challenges not included in the 2006 NRWPP.

This memorandum summarizes the stakeholder workshops and associated outcomes and action items that will inform the preparation of the NRWPP update. The following workshop materials and documentation are attached:

- Attachment A: Stakeholder Invitation Letter (2 pages)
- Attachment B: NRWC Workshop Flyer (1 page)
- Attachment C: Online Survey (1 page)
- Attachment D: Workshop Agenda (1 page)
- Attachment E: Workshop Sign-in Sheets (2 pages)
- Attachment F: Workshop Presentation (7 pages)
- Attachment G: Topic Discussion Handouts (4 pages)
- Attachment H: Completed Question Boards (8 pages)
- Attachment I: Photographs (2 pages)

Stakeholder Identification, Workshop Invitations, and Watershed Survey

Fuss & O'Neill drafted a list of potential stakeholders to invite to the workshops. The list was developed with input and review from the Niantic River Watershed Committee (NRWC) and the NRWC Coordinator, Judy Rondeau. It included municipal staff and officials from the four towns in the watershed, members of municipal and coastal management committees, representatives from the Connecticut Department of Energy & Environmental Protection (DEEP), the Southeastern Connecticut Council of Governments (SCCOG), local land trusts, business owners, and advocacy groups. These individuals were invited to workshops on October 29, 2019 via a letter sent by NRWC in September 2019 (Attachment A). In addition, the NRWC used social media and flyers (Attachment B) posted in the watershed to invite members of the public to attend. Both methods were successful, resulting in approximately 25 attendees at the afternoon workshop in Montville and approximately 35 attendees at the workshop the same evening in Waterford. The stakeholders had the opportunity to provide input on the watershed before the workshops though an online survey. The survey was created for this project to gain some understanding of stakeholders' perceptions and priorities prior to the workshops through a series of eight questions. The full survey is provided in Attachment C, and a summary of the survey responses to date were shared during the workshop presentations.

Workshop Preparation

Preparation for the workshops included a review of the watershed management recommendations contained in the 2006 NRWPP. The goal of the review was to evaluate the status of completion of the 2006 Plan recommendations, reasons why some recommendations were never completed, and identification of topics/challenges that were not addressed when the Plan was initially drafted. Fuss & O'Neill also reviewed the 2009 Guided Summary, which is a reorganization by the NRWC of the NRWPP's recommendations, and the framework for the committee's latest work plan. The review findings were shared at the workshops in abbreviated version (the full review will be included in the NRWPP Addendum).

In addition, Fuss & O'Neill produced a series of watershed maps to illustrate the natural resource qualities and anthropogenic factors that affect current water quality conditions in the watershed. For the workshops, GIS spatial analysis was utilized to highlight certain conditions, such as changes in land cover and high-priority areas for conversation/restoration. The watershed maps were displayed on poster boards at the workshop meetings.

Slide Presentation

The workshops began with brief introductions, followed by a slide presentation (Attachment F) that addressed the following topics:

1. Watershed Planning Process
2. Successes and Challenges of the 2006 NRWPP
3. Goals for Updating the 2006 NRWPP
4. Status of 2006 NRWPP Implementation
5. Summary of Conditions in the Niantic River Watershed

Judy Rondeau, NRWC Coordinator, provided an overview of the committee's key accomplishments relative to on-the-ground implementation projects, water-quality monitoring programs, and education/outreach initiatives. The bulk of the presentation, given by Erik Mas and Michael Soares of Fuss & O'Neill, focused on a review of the 2006 NRWPP implementation status and a summary of current watershed conditions. To summarize current conditions and trends in the watershed, a series of maps and related analyses were presented and discussed along the following themes:

- Water Quality Impairments
- Land Use/Land Cover
- Impervious Cover
- Soils by Hydrologic Group
- Riparian Land Cover
- Forest, Wetlands, Critical Habitat
- Protected Open Space
- Wastewater & Permitted Discharges
- Watershed Management Priority Areas

Break-out Session

Following the presentation, a "break-out session" was held to provide a forum for smaller group discussions focused around the following topics as they relate to the Niantic River watershed:

- Stormwater Management & Water Quality
- Coastal/Estuarine Issues
- Land Use Policy & Planning
- Open Space & Conservation.

Stakeholders were organized into discussion groups based on their area of interest and/or expertise. Groups were pre-assigned prior to the workshops. Drop-ins were assigned groups randomly or according to their interest/expertise. To facilitate the discussions, each group received a 3'x4' watershed map and a handout for recording their conversations (Attachment G); in addition, NRWC members volunteered to moderate discussion groups. Fuss & O'Neill staff and the NRCW Coordinator floated among groups to answer questions and provide assistance as needed.

Stakeholders were given approximately 45 minutes to discuss their respective topics in order to complete two objectives: (1) identify the top five issues of concern for the Niantic River watershed, and (2) recommend actions, site-specific or watershed-wide, that may address those issues. At the end of the sessions, each list of prioritized issues or actions was recorded on a poster board, which each group used to share their lists of issues and actions to all workshop attendees (all boards were photographed – see Attachment H).

Break-out Session Outcomes

The following are common themes and frequently identified responses to the questions posed during the break-out sessions for both workshops.

Issues of Concern

- **Runoff and Nonpoint Sources of Pollution:** Regardless of the topic or workshop location, stakeholders repeatedly identified sources of runoff and non-point source (NPS) pollution as high priorities. Stakeholders documented issues stemming from existing sources throughout the watershed, such as: inadequate or failing stormwater infrastructure (e.g., directly discharging outfalls); illicit discharges; impervious surfaces, including roads; and chronic inputs from waterfowl, fertilizers, and on-site sewage disposal.

- **Watershed Development:** In addition, most discussion groups stated a high level of concern about new development in the watershed. New development was discussed from two perspectives. The first can be described as the potential increase in measureable impacts to water quality from increases in impervious surface, loss of open space and other buffers, and hydromodification. The second perspective targeted the need for new or improved land-use policy/planning and regulations. In general, stakeholders expressed that regulations are needed to require more sustainable development and better protections for inland and coastal waters. Similarly, strategic planning is wanted to effectively manage coastal areas restoration/resiliency and to conserve open space, particularly to discourage the development of sensitive areas (e.g., Oswegatchie Hills) and to conserve riparian buffers along freshwater streams and their headwaters. Development concerns were discussed in terms of both site-specific and watershed-wide issues. There was also concern about inconsistent land use regulations within the four watershed communities relative to development standards and water quality protection.

- **Degraded Coastal Systems & Habitats:** These concerns are related to the problems with development described previously, as nonpoint source pollution from developed areas is a major contributor to the diminishing health and vigor of local fisheries, including shellfishing. At the Waterford workshop, the group discussing Land Use Policy & Planning identified the need for more support for aquaculture via policy, regulation, and restoration projects (e.g., eelgrass beds). In both workshops, coastal issues related to climate change were listed as a high priority. Stakeholders stated that sea level rise has and will continue to cause coastal flooding and loss of tidal marshes, the latter providing valuable habitat and protection against coastal storm damage. Issues with coastal recreation were also noted, including opposing perspectives. There is concern that the quality of swimming and boating is decreasing; on the other hand, concerns were raised that some recreational activities, such as motorboats access and speed limits in the Niantic River, exacerbate siltation and are harmful to fisheries.

- **Education and Monitoring Programs:** Stakeholders expressed a need for expanded water-quality monitoring programs, which may even be standardized for better correlation and tracking of data among towns, NGOs, researchers, etc. throughout the watershed. Stakeholders also recognized the value of past and ongoing outreach initiatives by NRWC, DEEP, and local advocacy groups and want to expand upon them. Specifically, education and outreach were noted as essential to raising awareness on the issues and related resources for homeowners (septic system maintenance/evaluation, vegetated buffers, fertilizer use, adaptive coastal management strategies) and for developers (Low Impact Development, green infrastructure, LID, effective erosion/sedimentation control, and other Best Management Practices (BMPs)).

Recommended Actions

- **Coordinated and Strengthened Municipal Land Use Regulations & Policy:** Most commonly, stakeholders identified coordinated regulations and related watershed-wide policy/planning as the actions to address a range of issues. For example, the Stormwater Management & Water Quality groups at both workshops suggested coordinating zoning/regulations/policies in the four watershed towns in order to: 1) require new development and redevelopment projects to implement Low-Impact Development (LID) practices; 2) establish consistent inland-wetland protections; 3) develop climate resiliency plans, including vulnerability assessments of infrastructure; and, 4) evaluate existing stormwater systems for potential maintenance and retrofits. Other topic groups reinforced the desire for inter-town planning and project management with actions recommending a watershed-wide policy/planning strategy to conserve open space, protect/restore buffers, support and implement MS4 permit compliance activities, and identify locations for potential BMPs to reduce runoff. Similar to such coordination are recommendations to strengthen and expand existing coalitions to improve outreach, secure funding, and share resources.

- **Maintain & Improve Stormwater Management Systems:** Runoff and its appropriate management were highlighted as one of the top issues across all the topic groups. In response, stakeholders frequently recommended actions to establish or expand regulations requiring that development projects follow LID practices. In this respect, recommendations stressed again that municipalities coordinate applicable zoning and regulations to effectively manage stormwater and reduce runoff throughout the watershed; this coordinated approach included targeted outreach (e.g., reducing impervious surfaces, BMPs for active construction sites) and enforcement of required erosion & sedimentation control measures. For existing stormwater infrastructure, stakeholders' recommendations focused on local programs to develop and implement plans to evaluate existing infrastructure for (1) maintenance needs and (2) to determine the suitability of retrofitting stormwater infrastructure. It was noted that such evaluations must include the most recent data on precipitation and stream flows. Site-specific water-quality monitoring was recommended for these improved/maintained locations, as well as for areas with high percentages of impervious surface or impacted historically by runoff and NPS pollution.

- **Expand Outreach & Messaging Efforts:** Stakeholders repeatedly recommended the expanded use of educational programming and outreach initiatives to build strong branding that will effect a "culture change" among residents, developers, and business owners in the watershed. Targeted outreach programs were recommended to continue and/or increase initiatives on issues such as fertilizer use, septic system maintenance/evaluation, feeding waterfowl, recreational boating BMPs, open space conservation, the importance of local fisheries, and resiliency planning for climate change.

- **Build Coalitions:** Many actions – securing funds, open space conservation, expanded monitoring, coordinating regulations, improving communication among stakeholder groups – included references to building new partnerships and cultivating new partners. Coalitions, like NRWC, were described as being critical to leveraging the support needed to achieve these goals and provide long-lasting momentum to projects and initiatives.

Prioritization: Reporting and Dot-voting

When the smaller discussion groups had completed their lists of prioritized issues and actions, a "reporter" from each group summarized their issues of concern and recommended actions. Following the report from each of the four groups, stakeholders were directed to use stickers to vote on the issues and actions most important to them to help prioritize the updated watershed plan recommendations. The issues of concern and recommended actions, in order of priority (1 being the highest priority in each category), for each of the four groups are summarized on the following two pages.

Workshop 1: Montville

Prioritized Issues of Concern

Stormwater & Water Quality

1. Regulation and enforcement
2. Implementation of water quality BMPs
3. Finding problem septic systems and illicit discharges
4. Surface area and SW runoff
5. Loss of riparian buffer (residential & agricultural)

Coastal/Estuarine

1. Health of eelgrass beds and increasing aquaculture
2. Increased temperature of coastal waters, partly due to climate change
3. Loss of fisheries species (winter flounder)
4. Residents feeding waterfowl
5. Coastal flooding and poor access in low flood zones

Land Use Policy & Planning

1. Local regulations for consistency regarding development and stormwater control. Evaluate sensitive areas.
2. Limiting or preventing development of Oswegatchie Hills and proposed solar installation
3. With respect to development, engage DEEP for better regulation oversight and to preserve water quality
4. Ensuring Latimer Brook gets adequate flow to meet goals
5. Alternatives and issues for aquaculture/shellfish

Open Space & Conservation

1. Stewardship – education (fertilizer, septic systems); forest management; resources and awareness for homeowners
2. Development pressure (including over paving)
3. Drinking water (surface/aquifer) – no method to prioritize properties with "higher value"
4. Climate change impacts
5. Lack of uniformity and connectivity

Prioritized Recommended Actions

Stormwater & Water Quality

1. Consistent regulations and enforcement within watershed
2. Promote disconnecting impervious surfaces
3. Add more BMPs to existing development, and infrastructure
4. Restore riparian buffers
5. Septic system awareness, education, inspections
6. Standardized WQ monitoring program
7. Access to expert analysis for monitoring results

Coastal/Estuarine

1. Habitat restoration (eelgrass & riparian buffers)
2. Vulnerability assessments – roads, neighborhoods, pump stations, marshes (e.g., Latimer Brook bridge)
3. Address upland sources of sediment and nutrients (maybe dredge)
4. More public outreach for waterfowl, septic systems
5. Bacteria identification/DNA of sources

Land Use Policy & Planning

1. Request watershed town to review regulations for consistency for conservation
2. Establish communication with DEEP regarding proposed development projects
3. Establish dialogue with stakeholders for landowners and businesses with potential impacts
4. Encourage towns to communicate land use concerns
5. Engage with DEEP and city when regulations are finalized

Open Space & Conservation

1. Evaluate land values, seek public-private partnerships for acquisitions
2. Work with landowner concerns – lawn fertilizer, septic, woodlots
3. Uniformity of long-range conservation (connectivity) among watershed towns
4. Prioritize existing preserved areas, including water supply areas
5. Explore uses of open lands for flooding and climate adaptability

Workshop 2: Waterford

Prioritized Issues of Concern

Stormwater & Water Quality
1. Runoff from impervious surfaces, particularly roads
2. Controlling NPS sources (nutrients, sediment/siltation)
3. Direct, untreated outfall discharges into the Niantic River
4. Maintaining existing stormwater infrastructure
5. Changes in surface water flow patterns from development

Coastal/Estuarine
1. Non-point sources of pollution
2. Climate change, and sea level rise
3. Development
4. Ecosystem services
5. Recreation

Land Use Policy & Planning
1. Unsustainable development
2. Sea level rise
3. Policy collaboration among towns
4. Impervious surfaces
5. Culture change among stakeholders

Open Space & Conservation
1. Put more funding to open space preservation
2. Lack of public awareness about issues
3. Large ground-mounted solar
4. Development pressures

Prioritized Recommended Actions

Stormwater & Water Quality
1. Prioritize highly impervious surface area for disconnections
2. Inspect infrastructure, develop and implement maintenance schedule. Retrofit infrastructure where needed.
3. Evaluate stormwater systems, update to manage increased flows
4. For direct-discharge outfalls, install/construct retrofits
5. Good housekeeping practices (E&S) and site-specific retrofits

Coastal/Estuarine
1. Develop climate resiliency plans that contain natural solutions (living shorelines, marsh restoration, dunes, oyster beds)
2. Control development through inter-town coordination of zoning
3. Decrease NPS sources – LID, reduce inputs from fertilize, septic systems via ordinances or outreach
4. Increase land preservation
5. Support healthy aquatic ecosystems (eelgrass) through all actions.
6. Recreation - limit moorings/boat slips; BMPs for marinas and boaters; speed limits or encourage to move farther offshore

Land Use Policy & Planning
1. Towns need clear, creative solutions for sustainable development
2. Coalition building – quarterly "common meetings" for municipal committees; SCCOG and DEEP resources
3. Identify LID sites and retrofits to existing stormwater systems
4. Employ direct action: canvassing, outreach, resource sharing
5. Sea level rise – preserve properties landward of marshes; identify vulnerable areas; adopt CIRCA recommendations

Open Space & Conservation
1. Towns, land trusts, etc. work together to preserve land
2. Line items for open space
3. Towns monitor stormwater at large solar installations
4. Put a "higher value" on forests and open space
5. Outreach: aquaculture, open space, watershed signage
6. Towns need plans to preserve open space

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Attachment A

Stakeholder Invitation Letter

Niantic River Watershed Committee, Inc.

www.nianticriverwatershed.org

September 30, 2019

RE: Niantic River Watershed Protection Plan Update Workshops

Dear Niantic River Watershed Resident/Stakeholder,

The Niantic River Watershed Committee (NRWC) would like to invite you to participate in the development of an updated watershed management plan for the Niantic River Watershed.

For the next 12 months, the project stakeholders will work collaboratively with NRWC and Fuss & O'Neill through participation in two workshops and the review of an update to the 2006 Niantic River Watershed Protection Plan. The purpose of the workshops is to draw upon stakeholders' experience and knowledge of the Niantic River and the surrounding watershed in order to identify, review, and prioritize updated recommendations and projects that will have a positive impact on the Niantic River.

The stakeholder workshops will be held on **Tuesday, October 29, 2019** to gather public input regarding the current state of the watershed and actions that can be incorporated into the plan to improve and/or protect water quality in the Niantic River and the watershed as a whole.

The schedule for the workshops is as follows:

- **Workshop #1: Tuesday Oct. 29, 2019, 2-4 pm, Chesterfield Fire Department - 1606 Route 85, Oakdale, CT.**
- **Workshop #2: Tuesday Oct. 29, 2019, 6:30-8:30 pm, Waterford Town Hall Auditorium - 15 Rope Ferry Road, Waterford, CT.**

Before the stakeholder workshops next month, **please take a moment to complete this short survey:** www.surveymonkey.com/r/LW3VLMY. Our goal is to better understand your concerns on water quality issues and conditions in the Niantic River and its watershed. Survey responses from stakeholders and the community will help to inform and prioritize workshop discussions. Your input makes a difference!

Developed in 2006, the Niantic Watershed Protection Plan (Plan) is a blueprint for the sound management of the Niantic River watershed and its resources. The Plan provides a detailed summary of the existing conditions throughout the watershed that may impact water quality in the Niantic River and its tributaries. The Plan provides key recommendations to address the sources of non-point source pollution that have impacted the Niantic River, based on the available data and analyses done in 2006. For over 12 years, the Plan has guided the successful implementation of many of these recommendations throughout the watershed. These include the installation of water quality improvement practices throughout the watershed, the establishment of a water quality monitoring program, and the development of an active education and outreach program.

This project is being led by the Niantic River Watershed Committee (NRWC) and consultant Fuss & O'Neill, Inc. with support through grants from the Community Foundation of Eastern Connecticut and the Connecticut Department of Energy and Environmental Protection via the US EPA Clean Water Act Section 319 Nonpoint Source program. The project participants will include representatives from NRWC, Fuss & O'Neill, CT DEEP, municipal leaders and staff from our watershed communities (East Lyme, Montville,

Salem, Waterford), government organizations, educational institutions, non-profit organizations, local businesses, and residents of the watershed.

The main objectives of this project are to:

- strengthen partnerships with and among key stakeholders, and use their local knowledge to effectively identify recommendations and prioritize project
- assess whether the 2006 Plan was useful in guiding local restoration and protection efforts, and recommend how the 2006 Plan can be improved for broader community involvement
- develop a focused update of the Plan that characterizes current causes and sources of water quality impairments in the watershed
- identify best management practices to reduce bacteria and nutrient loading at the sources, with an emphasis on green infrastructure

A Watershed Summit is planned for the late summer of 2020 to introduce the updated watershed plan to stakeholders and the general public.

If you would like to participate in the watershed plan update and attend one or both workshops, please contact me by email (judy.rondeau@comcast.net) or phone at (860) 774-9600 extension 13. I look forward to your participation as we plan for the continued protection of the Niantic River watershed.

Sincerely,

Judy Rondeau
NRWC Coordinator

Cc: Chris Tomichek, Chair, NRWC
Eric Thomas, Watershed Manager CT DEEP
Dan Stewart, First Selectman, Town of Waterford
Mark Nickerson, First Selectman, Town of East Lyme
Kevin Lyden First Selectman, Town of Salem
Ronald McDaniel, Mayor, Town of Montville

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Attachment B

NRWC Workshop Flyer

NIANTIC RIVER WATERSHED PROTECTION PLAN UPDATE WORKSHOPS

The Niantic River Watershed Committee invites you to participate in the Niantic River Watershed Protection Plan Update.

The stakeholder workshops will be held on **Tuesday, October 29, 2019** to gather public input regarding the current state of the watershed and actions that can be incorporated into the plan to improve and/or protect water quality in the Niantic River and the watershed as a whole.

Workshop #1: 2-4 pm, Chesterfield Fire Department - 1606 RT 85, Oakdale, CT.

Workshop #2: 6:30-8:30 pm, Waterford Town Hall Auditorium - 15 Rope Ferry Road, Waterford, CT.

Before the stakeholder workshops, please take a moment to complete this short survey: www.surveymonkey.com/r/LW3VLMY. Survey responses will help us to develop and prioritize workshop discussions. Your input makes a difference!

Please call or email Judy Rondeau at 860-774-9600 x13 or judy.rondeau@comcast.net to register. Please indicate which workshop you plan to attend.

Visit our website at www.nianticriverwatershed.org for more info.

This project is funded in part by the Connecticut Department of Energy and Environmental Protect and the Community Foundation of Eastern Connecticut.

Community Foundation *of* Eastern Connecticut

FUSS & O'NEILL

Attachment C

Online Survey

Niantic River Watershed Protection Plan Update Stakeholder Survey
September 2019

Thank you for participating in the Niantic River Watershed Protection Plan (NRWPP) update. Your input makes a difference! Please take a moment to complete this short survey so that we may understand what you value about the Niantic River, its watershed and the concerns you have about water quality.

* 1. How would you rate the water quality of the Niantic River?

☐ Very poor ☐ Poor ☐ Average ☐ Good ☐ Very good

* 2. How would you rate the water quality of other waterbodies in the Niantic River watershed?

☐ Very poor ☐ Poor ☐ Average ☐ Good ☐ Very good

* 3. How concerned are you about the effects of climate change and sea level rise on your local community?

☐ Not concerned ☐ Slightly concerned ☐ Somewhat concerned ☐ Concerned ☐ Very concerned

* 4. What are your top five concerns regarding the Niantic River Watershed?

1.
2.
3.
4.
5.

5. Do you know of any work being done to address these concerns? If yes please describe, or share what else can be done to improve water quality:

6. What action or outcomes would you most like to see included in this update to the 2006 Niantic River Watershed Protection Plan?

7. If you represent a municipality, do you see ways for the update to complement your efforts to improve/protect water quality in the Niantic River and its watershed? Can you give specific examples?

8. Are you interested in becoming a member of the Steering Committee? Would you like to volunteer for watershed activities? (*If yes, please include your name and contact information.*)

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Attachment D

Workshop Agenda

AGENDA
Stakeholder Workshop Meeting
Niantic River Watershed Protection Plan Update
October 29, 2019

1. Introduction **5 minutes**

a. Niantic River Watershed Committee
b. Fuss & O'Neill
c. Stakeholders
d. Funding

2. Presentation **35 minutes**

a. Watershed Planning Process
b. Successes and Challenges
c. Goals for Updating the 2006 Plan
d. Status of 2006 Plan Implementation
e. Summary of Conditions in the Niantic River Watershed

3. Break-out Session: Prioritizing Issues & Actions **50 minutes**

a. Focus-group discussions on the following topics:
    i. Stormwater Management & Water Quality
    ii. Coastal/Estuarine Issues
    iii. Land Use Policy & Planning
    iv. Open Space & Conservation

b. Objectives for each group:
    i. Determine the top 5 Issues of Concern
    ii. Recommend Action(s) to address the Issues of Concern

4. Group Discussion Following Break-out Session **25 minutes**

a. Brief summary from each group
b. Prioritizing Issues & Actions
c. Discussion

5. Next Steps and Closing Remarks **5 minutes**

Community Foundation *of* Eastern Connecticut

FUSS & O'NEILL

Attachment E

Workshop Sign-in Sheets

Niantic River Watershed Protection Plan Update Workshop - 10/29/19 - Waterford Town Hall - 6:30-8:30 pm				
Name	**Town**	**Organization (if any)**	**Email**	**Signature/Initials**
Judy Rondeau		NRWC		
Chris Tomichek	Waterford	NRWC		
Don Danila	East Lyme	NRWC		
John Jasper	East Lyme	NRWC		
Don Landers	East Lyme	NRWC/ELHMSC		
Deb Moshier-Dunne	Waterford	Save the River- Save the Hills		
Penny Heller	East Lyme	East Lyme Conservation Commission		
Ray Heller	East Lyme			
Laura Ashburn	East Lyme	East Lyme High School		
Jim Hamsher	Waterford	Waterford Harbor Management Commission		
Philip Fine	Waterford	Waterford Harbor Management Commission		
Kelly Streich		CT DEEP		
Eric Thomas		CT DEEP		
Mary-beth Hart		CT DEEP		
Tim Londregan		Niantic Bay Shellfish Farm		
Mike O'Connor	Waterford	WHS		
Wilmer Diaz	Waterford	WHS Student		
Ruth Savalle	Salem	Salem P&ZC		
Jim Foertch	Waterford			
Michele Maitland		Town of Groton		
Dan Mullins		ECCD		
Doug Lawson	Waterford	NRWC/Wfd Shellfish Commission		
Peter Harris		NRWC/WELSCO		
Nick Gauthier	Waterford			
Fred Wise	Waterford	WHHC		
Nancy Kane	Waterford			
Marcia Benvenuto	W	WELSCO		
Bob Dutton	WFD	Harbor		
Bob DeRosa	WFD	Harbor		
Willmar Diaz	WFD			
Steve Drinsmore	East Lyme	ELHMSFC		
Bud Bray	WFD	SCIF		
Steven Fortuna	Waterford			
JOEL STOCKARD	WATERFORD			

Niantic River Watershed Protection Plan Update Workshop - 10/29/19 - Chesterfield Fire Dept - 2-4 pm				
Name	**Town**	**Organization (if any)**	**Email**	**Signature/Initials**
Judy Rondeau		NRWC	[redacted]	
Melissa Bezanson	Salem	NRWC		
Ralph Bates	East Lyme	NRWC		
Chris Tomichek	Waterford	NRWC		
Don Danila	East Lyme	NRWC		
Don Landers	East Lyme	NRWC/ELHMSC		
Doug Brush	Montville	Montvillle IWC		
Fred Grimsey	Waterford	STR-STH		
Fred Wise	Waterford	Waterford Harbor Management Commission		
Bob Dutton	Waterford	Waterford Harbor Management Commission		
Victor Benni	East Lyme	East Lyme DPW		
Ron Luich	East Lyme	East Lyme Land Trust/Avalonia Land Conservancy		
John Bialowans	East Lyme	Resident		
Carol Murcko	East Lyme	Resident		
Eric Thomas		CT DEEP		
Mary-beth Hart		CT DEEP		
Mary Bieckert		The Day		
Marcia Vlaun	Montville	Planner		
Colleen Bezanson	Montville	Assistant Planner		
Sam Alexander		SCCOG		
Justin LaFountain		SCCOG/Salem		
Dan Mullins		ECCD		
Dave Lersch	Waterford	Waterford Land Trust		
Jacquelin Sullivan	~~Waterford~~ EAST LYME	(GOLDEN SPUR COVE)		
Maureen Fitzgera	Waterford	Waterford Environmental Planner		
marissa Mackowicz		PROJECT OCEANOLOGY		
JOE Hitchery	NIANTIC	East Lyme Harbor Management Comm		
SAM ALEXANDER	SCCOG	SCCOG /Borough		
Pete Reed	East Lyme	STR-STH		Pete Reed
Dave Turner	Montville	NRWC		
Maggie Fenetti	mystic	US CGA		silence.org

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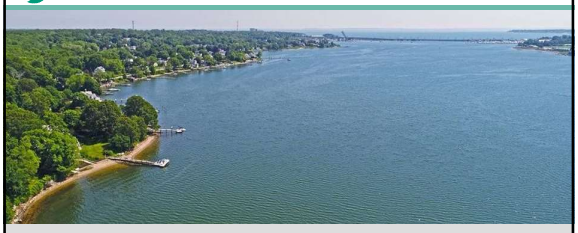
Attachment F

Workshop Presentation

FUSS & O'NEILL



NRWC Stakeholder Workshop

Updating the 2006 Niantic River Watershed Protection Plan

October 29, 2019

Project Team

- Watershed Stakeholders
- Project Funding
  - CT DEEP through an EPA Clean Water Act Section 319 Nonpoint Source Grant
  - Eastern Connecticut Community Foundation
  - Kleinschmidt Foundation

Workshop Agenda

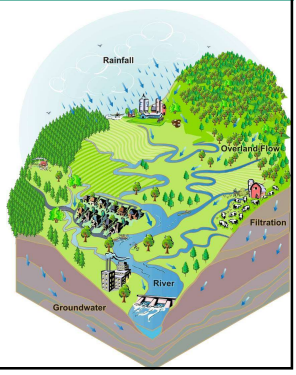
1. Watershed Planning Process
2. Goals for Updating the 2006 Plan
3. Status of 2006 Plan Implementation
4. Summary of Watershed Conditions
5. Break-out Session
6. Discussion: Prioritizing Issues & Actions
7. Next Steps/Closing

Purpose of the Workshop Meeting

- Describe the watershed plan update process
- Summarize watershed conditions and issues
- Provide a forum for stakeholder input and discussion
  - Issues of concern
  - Local priorities
  - Project ideas

Why Watersheds?

- Hydrologically defined
- Cross municipal boundaries
- Logical approach for managing water resources
- Watershed management = land use management
- Every-day activities



Watershed Management in the Niantic

2006 – Plan adopted (aka, "NRWPP")

2008 – NRW Advisory Group formed
Watershed Coordinator hired

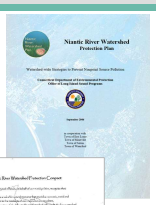
2009 – *Guided Summary*

2011 – Board of Directors
Watershed Compact endorsed

2015 – Incorporated, 501(c)3 non-profit

2017 – *2017-2018 Work Plan*

2019 – RFP to update the 2006 Plan
2019-2020 Work Plan



Other Key Accomplishments

- Installation of water quality improvement practices


Colony Road Tree Filters (2012)


Clark Pond Riparian Buffer Restoration (2012)


Mago Point Riparian Buffer (2014)


Pennsylvania Ave Niantic Tree Filters (2015)


Mago Point Tree Filters (2016)


Pine Grove Riparian Buffer (2017)


Grand Street Tree Wells (2017-2018)


East Lyme High School Rain Garden (2018)


East Lyme High School Infiltration Project (2019)


Clark Pond Rain Garden (2018)

Other Key Accomplishments

- Establishment of volunteer water quality monitoring program
  - Stream water quality monitoring (2012)
  - Riffle Bioassessments (RBV) (2012)
  - Stream Temperature Monitoring (2013)
  - Stream Corridor Assessments (2014)

Other Key Accomplishments

- Development of active education & outreach program

Homeowner BMPs (2011)


Teacher Water Quality Kit (2012)


Celebrate East Lyme Day (2012)


Hole in the Wall Outdoor Stormwater Classroom (2014)

Rain Garden Initiative (2017)


Rain Barrel Sales (2011 & 2018)

Lawn Fertilizer Reduction Social Marketing Campaign Pilot Project (2018)

Challenges and Areas for Improvement

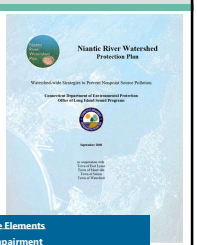
- Land-use policies
  - Coordinated regulations and initiatives, MS4 assistance
- Outreach to businesses and developers
- Communication platform for stakeholders
  - Track projects, share data, seek funding
- New issues
  - Climate change, sea level rise, coastal resiliency and adaptation, marsh migration
  - Inland flooding
  - Estuarine habitat restoration – eelgrass, shellfish
  - Hydromodification and in-stream flows, water withdrawals

Goals for Updating the NRWPP

- Strengthen stakeholder partnerships
- Assess the success of the 2006 Plan – how can it be improved?
  - Better guide local restoration and protection efforts
  - Broader community involvement?
- Focused Plan Update
  - Summarize current conditions – causes and sources of water quality issues
  - Update and prioritize recommendations
  - 10-year Planning Timeline

Watershed Plan Update Process

1. Review 2006 Plan
2. Review and Summarize Existing Watershed Conditions
3. Conduct Stakeholder Workshops
4. Visual Field Assessments
5. Draft Plan Addendum
6. Final Plan Addendum
7. Watershed Summit



EPA Nine Elements

1. Impairment
2. Load Reduction
3. Management Measures
4. Technical & Financial Assistance
5. Public Information & Education
6. Schedule
7. Milestones
8. Performance Criteria
9. Monitoring

NRWPP Update Stakeholder Survey

Niantic River Watershed Protection Plan Update Stakeholder Survey
September 2019

Thank you for participating in the Niantic River Watershed Protection Plan (NRWPP) update. Your input makes a difference! Please take a moment to complete this short survey so that we may understand what you value about the Niantic River, its watershed and the concerns you have about water quality.

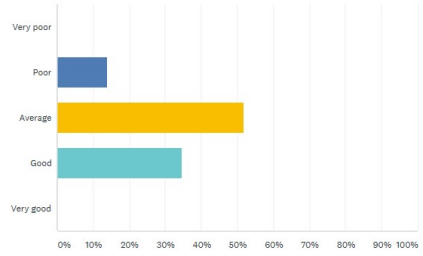
OK

* 1. How would you rate the water quality of the Niantic River?

Very poor | Poor | Average | Good | Very good

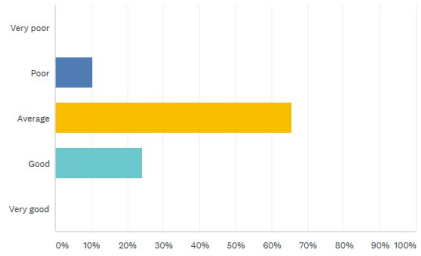
What we heard from you …

How would you rate the quality of the Niantic River?



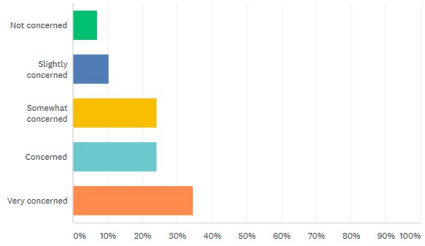
What we heard from you …

How would you rate the quality of other waterbodies in the Niantic River Watershed?



What we heard from you …

How concerned are you about the effects of climate change and sea level rise on your local community?



What we heard from you …

What are your top five concerns in the watershed?

	Most Frequent Response	*2nd Most Frequent Response*	*3rd Most Frequent Response*
1.	NPS pollution ("runoff")	Development/ conservation	Shellfishing/fisheries
2.	Development/ conservation	Loss of natural systems (eelgrass, forest, wetland)	Shellfishing
3.	Development/ conservation	NPS pollution	Planning/zoning coordination
4.	Development/ conservation	More projects & programs needed	NPS pollution, Climate change
5.	Development/ conservation	Watershed planning: BMPs, regulation	Expand outreach

Themes

- Top concern is existing sources of NPS (nutrients, bacteria, warm water) harming the watershed, and the increase in sources from new development (i.e., loss of buffer systems)
- Desire to coordinate planning & regulation throughout watershed
- More outreach to residents, contractors/developers, Town officials

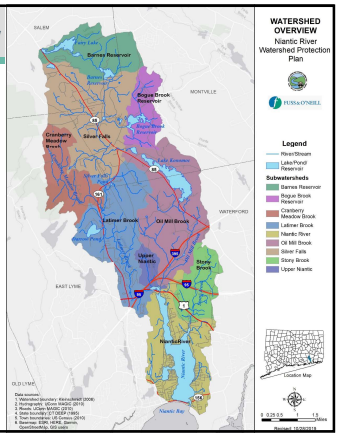
What we heard from you …

What are outcomes you would most like to see in the Update to the 2006 Plan?

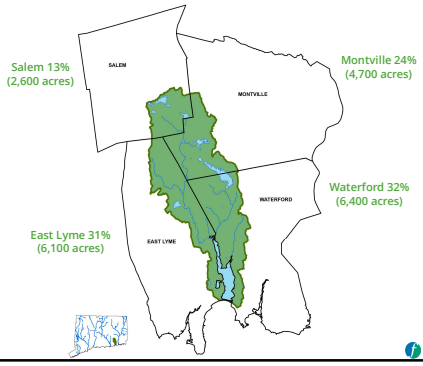
- **"Watershed-wide" land use policy & planning**
  - Planning/Zoning coordination
  - Dedicated process to track/share data and projects' status
  - Reduce and disconnect impervious surfaces
- **Buffer systems**
  - Protect via "focused land conservation initiatives"
  - Green infrastructure and living shorelines (benefits climate resiliency)
- **On the Ground**
  - Continue & "enhance WQ monitoring and assessment"
  - Specific "high-impact projects"
- **Shellfish/Fisheries**
  - More support
  - Specific recommendations for the Niantic River (eelgrass restoration)
- **Outreach**
  - Report Card, BMPs (fertilizer, geese, upper←→lower watershed)

Watershed Overview

- 31.3 square miles, or about 20,000 acres
- Nine subwatersheds
  - Latimer Brook
  - Cranberry Meadow Brook
  - Oil Mill Brook
  - Stony Brook
  - Niantic River
- Major Transportation Corridors
- Niantic River Estuary



Watershed Overview



Water Quality

- Water quality in the Niantic River Estuary and its watershed is impacted by two primary pollutants: Fecal Indicator Bacteria and Nitrogen

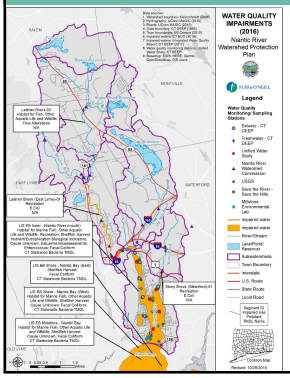
Fecal Indicator Bacteria

- Coliform bacteria present in feces of warm-blooded animals and humans
- Does not typically cause illness but its presence in water indicates that disease-causing organisms (pathogens) could potentially be in the water
- *E. coli* and *Enterococci* subgroups
- Contamination by sewage or animal waste
- Swimming area and shellfish bed closures
- Sources: runoff, septic, illicit discharges

Nitrogen

- Nitrogen is essential for cell growth in all living things
- Excess nitrogen can fuel blooms of algae, seaweed, and phytoplankton
  - Nuisance aquatic plant growth
  - Rapid consumption of oxygen and dead zones
  - Can contribute to a reduction in eelgrass and estuarine species such as bay scallops and winter flounder
- Sources: septic systems, fertilizer, atmospheric deposition, runoff

Water Quality Impairments



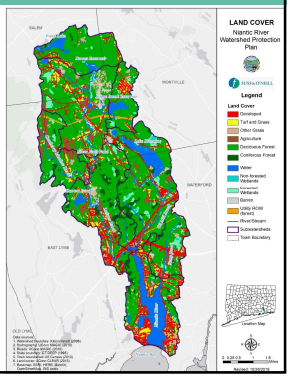
- Niantic River
  - Aquatic Habitat, Recreation, Shellfish Harvest
  - Nitrogen & Bacteria
- Latimer Brook
  - Aquatic Habitat & Recreation
  - Flow Alteration & Bacteria
- Stony Brook
  - Recreation
  - Bacteria
- Niantic Bay
  - Shellfish & Aquatic Habitat
  - Bacteria

Water Quality Monitoring

- NRWC Volunteer Monitoring Program
- CTDEEP Ambient Water Quality Monitoring
- USGS Water Quality Monitoring
- Dominion Millstone Environmental Lab
- UConn Department of Marine Sciences (Dr. Vaudrey)
- CFE/Save the Sound Unified Water Study
- Save the River - Save the Hills

Land Use/Cover (UConn CLEAR)

- 60% Forested
- 25% Developed, Turf & Grass
- 12% Wetlands/Water
- Highest development in Niantic River, Stony Brook, and Latimer Brook subwatersheds



Land Use/Cover – Change Since 2006

- Modest changes in land cover between 2006 and 2015
  - Developed (+50 to 60 acres)
  - Grass (+20 acres)
  - Forest (+12 acres)
  - Barren (-83 acres)

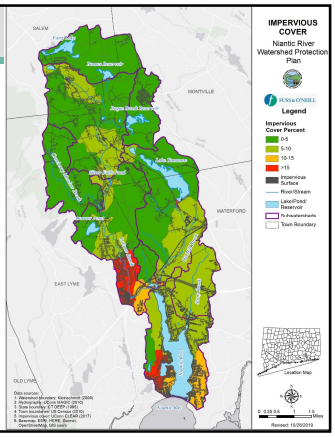
Land Cover	2015 % Cover	2015 Area (sq mi)	2006 Area (sq mi)	Change (sq mi)
Developed	13.56	4.19	4.10	0.09
Turf and Grass	4.62	1.43	1.44	-0.01
Other Grass	2.67	0.82	0.78	0.04
Agriculture	3.31	1.02	1.02	0.0
Deciduous Forest	57.34	17.70	17.67	0.03
Coniferous Forest	4.32	1.33	1.34	-0.01
Water	7.34	2.27	2.27	0.0
Non-Forested Wetlands	0.33	0.10	0.10	0.0
Forested Wetlands	4.47	1.38	1.38	0.0
Barren	1.42	0.44	0.57	-0.13
Utility ROW (forest)	0.62	0.19	0.19	0.0
Total	100.00	30.87	30.87	

Impervious Cover

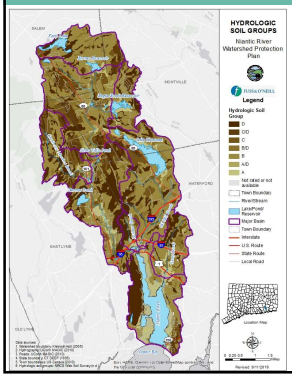
- 1-foot resolution data
- CTDEEP Local Basins

Subwatershed	Impervious Cover (%)
Silver Falls	4.38
Upper Niantic	3.30
Bogue Brook Reservoir	3.81
Cranberry Meadow Brook	2.91
Stony Brook	7.44
Niantic River	10.11
Latimer Brook	6.83
Oil Mill	3.85
Barnes Reservoir	1.62
Watershed	**5.3**

- Local basins >10-15%
- Niantic River subwatershed >10%

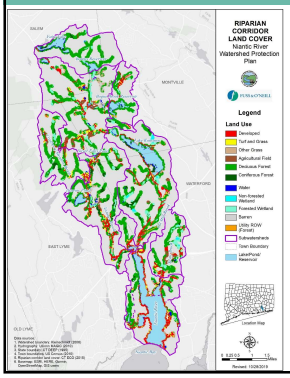


Soils



- Soils data from USDA NRCS
- Runoff & infiltration potential
- Infiltration capacity higher in A&B soils
- Impacts the feasibility and design of infiltration-based GI/LID and septic systems
- Mostly B soils in the watershed, followed by D soils

Riparian Corridor Land Cover



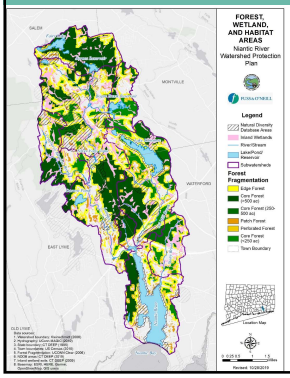
- UConn CLEAR, 2015 Land Cover Statewide Analysis
- 300-foot buffer on either side of a stream centerline or waterbody shoreline
- Mapped perennial and intermittent streams

Riparian Corridor Land Cover

Land Cover (%)	Silver Falls	Upper Niantic	Bogue Brook Reservoir	Cranberry Meadow Brook	Stony Brook	Niantic River	Latimer Brook	Oil Mill	Barnes Reservoir
Developed	9.80	19.54	10.24	8.67	12.94	35.62	17.48	14.10	1.27
Turf and Grass	5.20	2.99	2.14	6.62	2.84	9.88	5.49	2.29	0.27
Other Grass	6.12	2.29	2.98	0.51	2.71	2.46	2.21	1.98	0.50
Agriculture	7.56	0.00	0.13	6.07	8.21	0.00	1.86	2.30	0.00
Deciduous Forest	53.13	64.61	72.97	63.51	50.27	39.57	51.38	52.61	85.49
Coniferous Forest	0.11	4.58	0.97	5.71	2.12	2.75	9.31	8.44	5.26
Water	1.77	1.58	1.69	0.39	0.36	4.99	1.94	1.92	3.81
Non-Forested Wetlands	0.13	0.00	0.00	0.12	1.40	0.06	0.06	2.59	0.32
Forested Wetlands	11.15	2.46	7.52	7.25	18.44	3.16	8.19	12.19	3.08
Barren	4.78	0.18	0.00	0.00	0.50	1.51	2.03	0.74	0.00
Utility ROW (forest)	0.27	1.76	1.36	1.14	0.23	0.00	0.04	0.84	0.00
	100	100	100	100	100	100	100	100	100

- Deciduous Forest – predominant riparian land cover in most subwatersheds (40-85%)
- Subwatersheds with most developed riparian corridor
  - Niantic River (45%), Upper Niantic (22%), and Latimer Brook (23%)
- Subwatershed with least developed riparian corridor
  - Barnes Reservoir (1.5%) (and highest percentage of forest)
- Agriculture – Silver Falls, Cranberry Meadow Brook, and Stony Brook

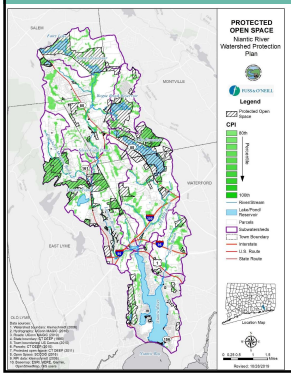
Forests, Wetlands, Critical Habitat



Subwatershed	Wetland Soils %	Core Forest %	NDDB Area %
Silver Falls	18.66	28.75	30.58
Upper Niantic	7.91	65.63	18.73
Bogue Brook Reservoir	11.44	46.75	1.11
Cranberry Meadow Brook	16.22	46.06	10.75
Stony Brook	20.28	37.88	0.00
Niantic River	2.24	17.45	37.70
Latimer Brook	11.36	37.86	12.61
Oil Mill	11.94	43.66	25.92
Barnes Reservoir	7.73	65.38	11.19
Watershed	12.00	38.49	20.63

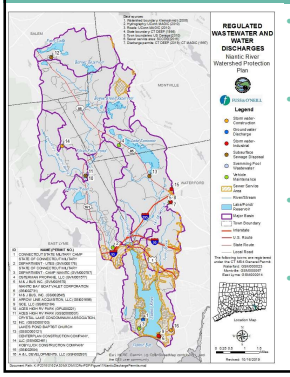
- 18-67% Core Forest
  - Upper Niantic highest
  - Niantic River lowest
- Oswegatchie Hills
- Nehantic State Forest
- Public Drinking Water Watersheds

Protected Open Space



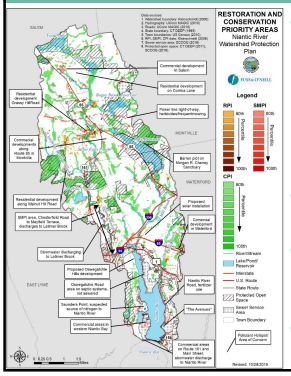
- Protected open space data from SCCOG and CT DEEP
- Mix of municipal, state, and federal land and privately protected open space
- Variety of protection mechanisms
- Most large, undeveloped tracts are already protected

Wastewater and Permitted Discharges



- No municipal WWTF discharges to Niantic River or tributaries
- Sewers serve most of East Lyme and Waterford in the watershed (pumped to New London)
- Areas generally north of I-395 rely on on-site wastewater disposal
- Other permitted stormwater & groundwater discharges

Watershed Management Priority Areas



- Watershed Vulnerability Indices (2006 NRWPP)
  - Restoration Priority Index (RPI)
  - Stormwater Management Priority Index (SMPI)
  - Conservation Priority Index (CPI)
- Priority conservation along stream corridors
- Priority stormwater management in developed areas
- Other pollution hotspots & areas of concern

Breakout Session

Prioritizing Issues & Actions

Breakout Session – Instructions

- Organize into groups of 4 to 6 people based on your pre-assigned group number
  - Group 1: Stormwater Management & Water Quality
  - Group 2: Coastal/Estuarine Issues
  - Group 3: Land Use Policy & Planning
  - Group 4: Open Space & Conservation
- Designate a note-taker and spokesperson for your group. The spokesperson for each group will report back to the rest of the workshop participants when we reconvene.

Breakout Session – Instructions

- Respond to two questions as they relate to your assigned topic. As a group, discuss possible responses to the questions and select the top 5 responses to both questions to share with the other workshop participants when we reconvene.
- Write your top 5 responses on the large sheets provided.
- Also use the maps provided to mark the locations of site-specific issues of concern or recommended actions, as applicable.

Breakout Session – Questions (50 minutes)

Question 1. What are the top 5 issues of concern for the Niantic River watershed relative to your assigned topic?

Question 2. What are 5 recommended actions that should be taken to address the issues of concern that you identified in Question 1? Actions can be short- or long-term, site-specific or watershed-wide.

Reconvene and Group Discussion (25 minutes)

- Present your group's responses to each question (spokesperson)
- Hand in your sheets with your group's top 5 responses to both questions (not ranked in any order), which will be posted for voting by the workshop participants
- Each person will vote for their top 4 responses to Question 1 and top 4 responses to Question 2 using dot stickers
- Group discussion

Next Steps

Report of Workshop Outcomes	November 2019
Visual Field Assessments	December 2019
Draft Watershed Plan Addendum	February 2020
Final Watershed Plan Addendum	April/May 2020
Watershed Summit	June 2020

Additional Comments or Questions:

Judy Rondeau
Niantic River Watershed Coordinator
860-774-9600 x13
judy.rondeau@comcast.net

Thank you for your time and input!

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Attachment G

Topic Discussion Handouts

STORMWATER MANAGEMENT & WATER QUALITY

1. **What are the top 5 issues of concern for the Niantic River watershed relative to your assigned topic?**
   Examples: municipal stormwater permit compliance, impervious surfaces, non-point source pollution, development impacts, homeowner or business impacts, etc.

2. **What are 5 recommended actions that should be taken to address the issues of concern that you identified in Question 1? Actions can be short- or long-term, site-specific or watershed-wide.**
   Examples: specific on-the-ground projects, water quality monitoring, Low Impact Development (LID) & green infrastructure, education & outreach, dedicated stormwater funding mechanism (utility fee), etc.

Coastal/Estuarine Issues

1. **What are the top 5 issues of concern for the Niantic River watershed relative to your assigned topic?**
   Examples: shellfish/fishing, eelgrass decline, climate change and sea level rise, non-point source pollution, marinas/boating, septic systems, etc.

2. **What are 5 recommended actions that should be taken to address the issues of concern that you identified in Question 1? Actions can be short- or long-term, site-specific or watershed-wide.**
   Examples: monitoring, education and outreach, climate adaptation measures, living shorelines, nature-based measures, habitat restoration, programs to address inadequate septic systems, etc.

Land Use Policy & Planning

1. **What are the top 5 issues of concern for the Niantic River watershed relative to your assigned topic?**
   Examples: ineffective or outdated municipal regulations/policies, regulatory barriers to LID, impervious surfaces (i.e., development), inconsistent municipal policy and regulations across the watershed, etc.

2. **What are 5 recommended actions that should be taken to address the issues of concern that you identified in Question 1? Actions can be short- or long-term, site-specific or watershed-wide.**
   Examples: strengthening municipal land use regulations, strengthening local regulations to require Low Impact Development (LID) and green infrastructure, conservation planning, integrating watershed planning with POCDs updates, etc.

OPEN SPACE & CONSERVATION

1. **What are the top 5 issues of concern for the Niantic River watershed relative to your assigned topic?**
   Examples: loss of buffer systems, development pressure, protection of headwaters, funding mechanisms, prioritizing open space parcels for conservation

2. **What are 5 recommended actions that should be taken to address the issues of concern that you identified in Question 1? Actions can be short- or long-term, site-specific or watershed-wide.**
   Examples: priority sites/areas, strategic planning (for towns and the watershed), partnerships, funding, etc.

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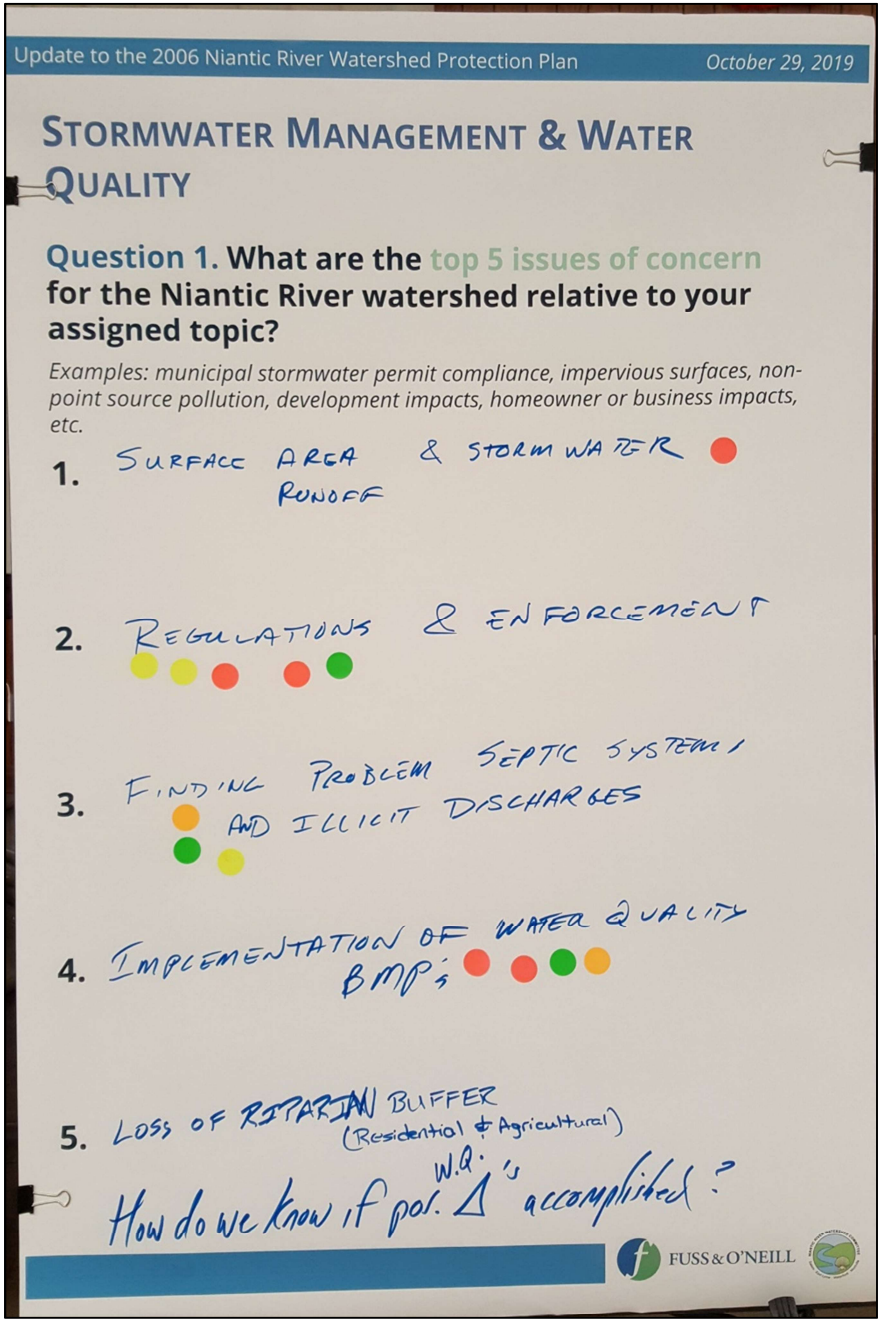
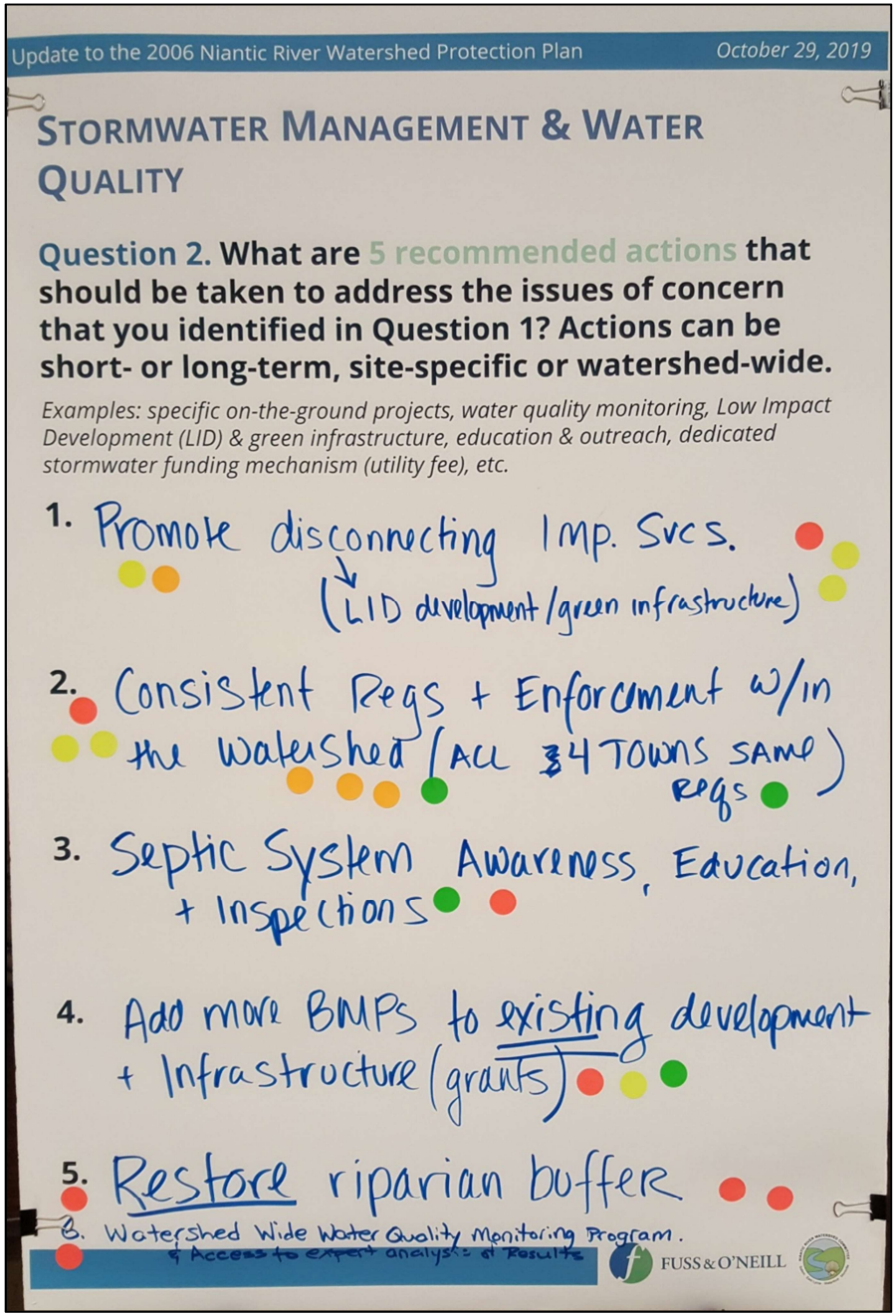
Attachment H

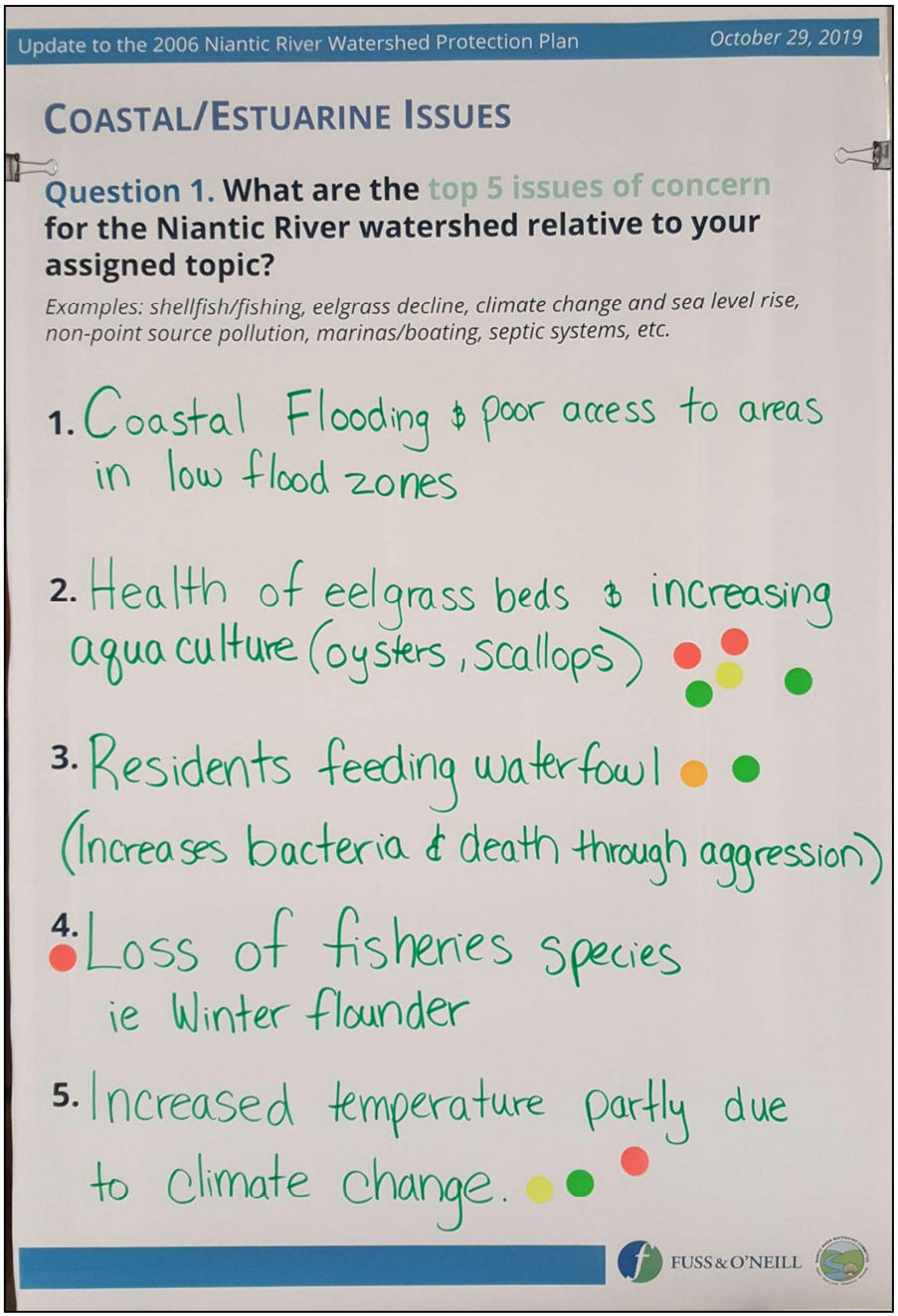
Completed Question Boards

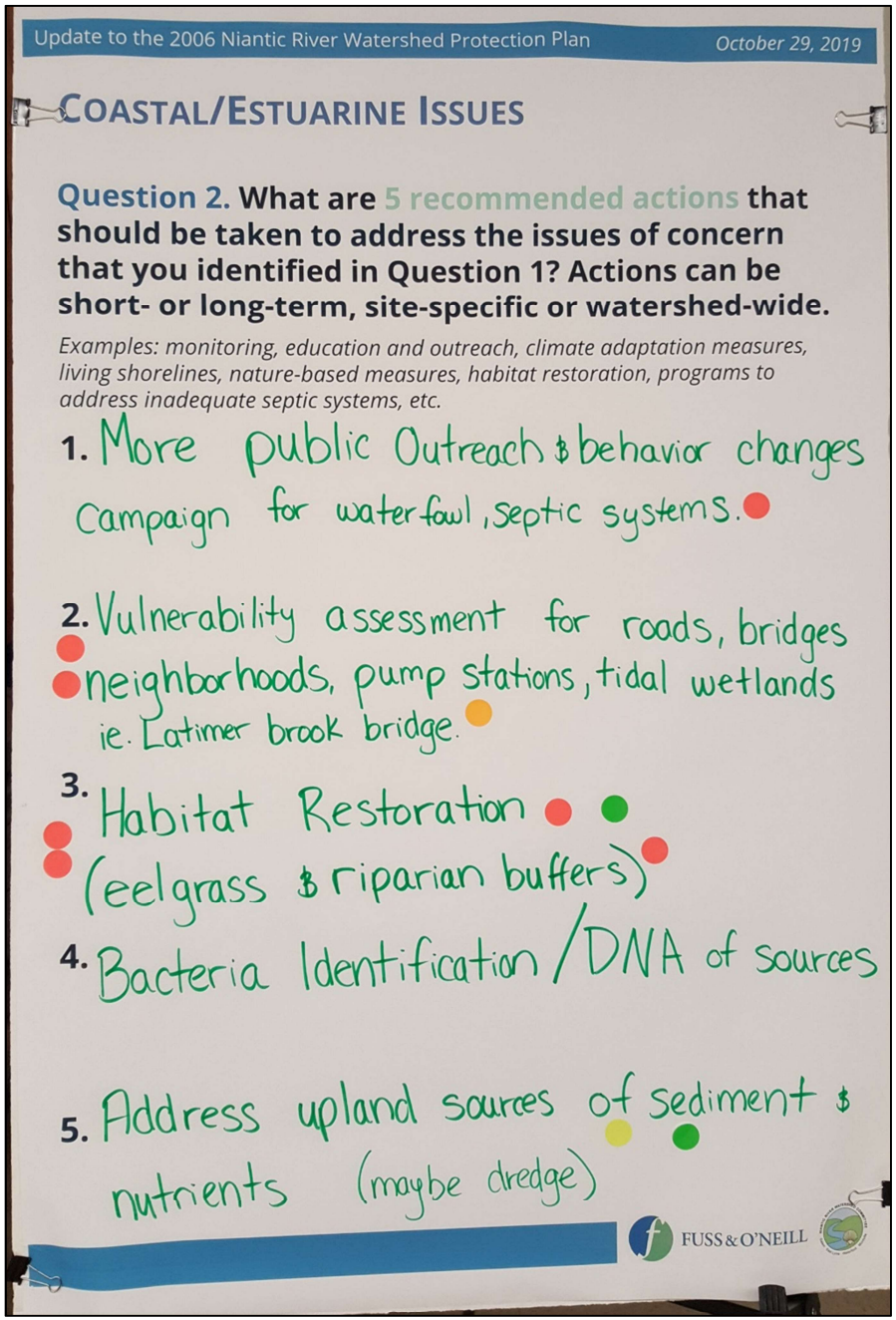
NWRPP Update
Stakeholder Workshops: Completed "Issues" & "Recommended Actions" Boards





Chesterfield Fire Department, October 29, 2019, 2-4pm





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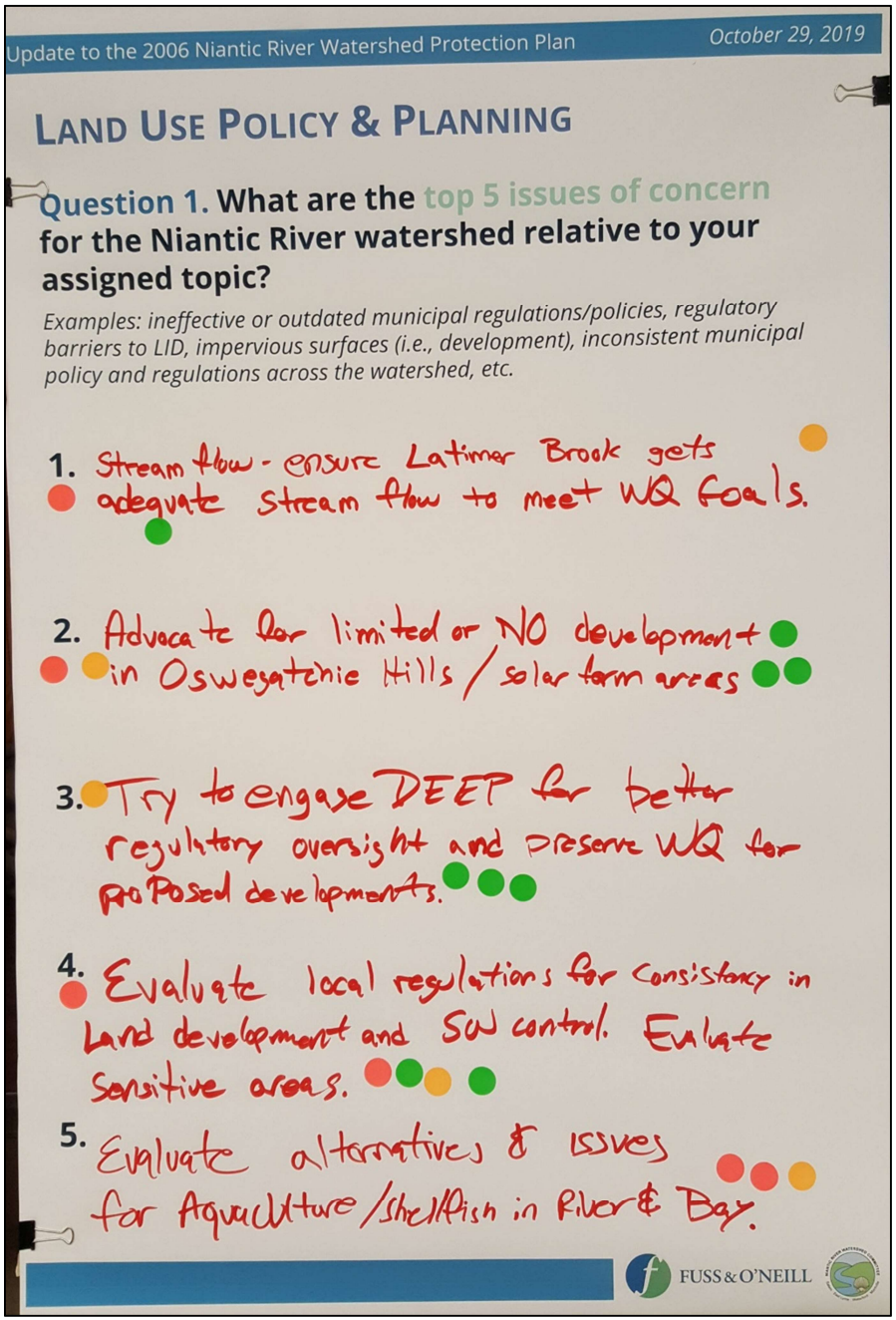
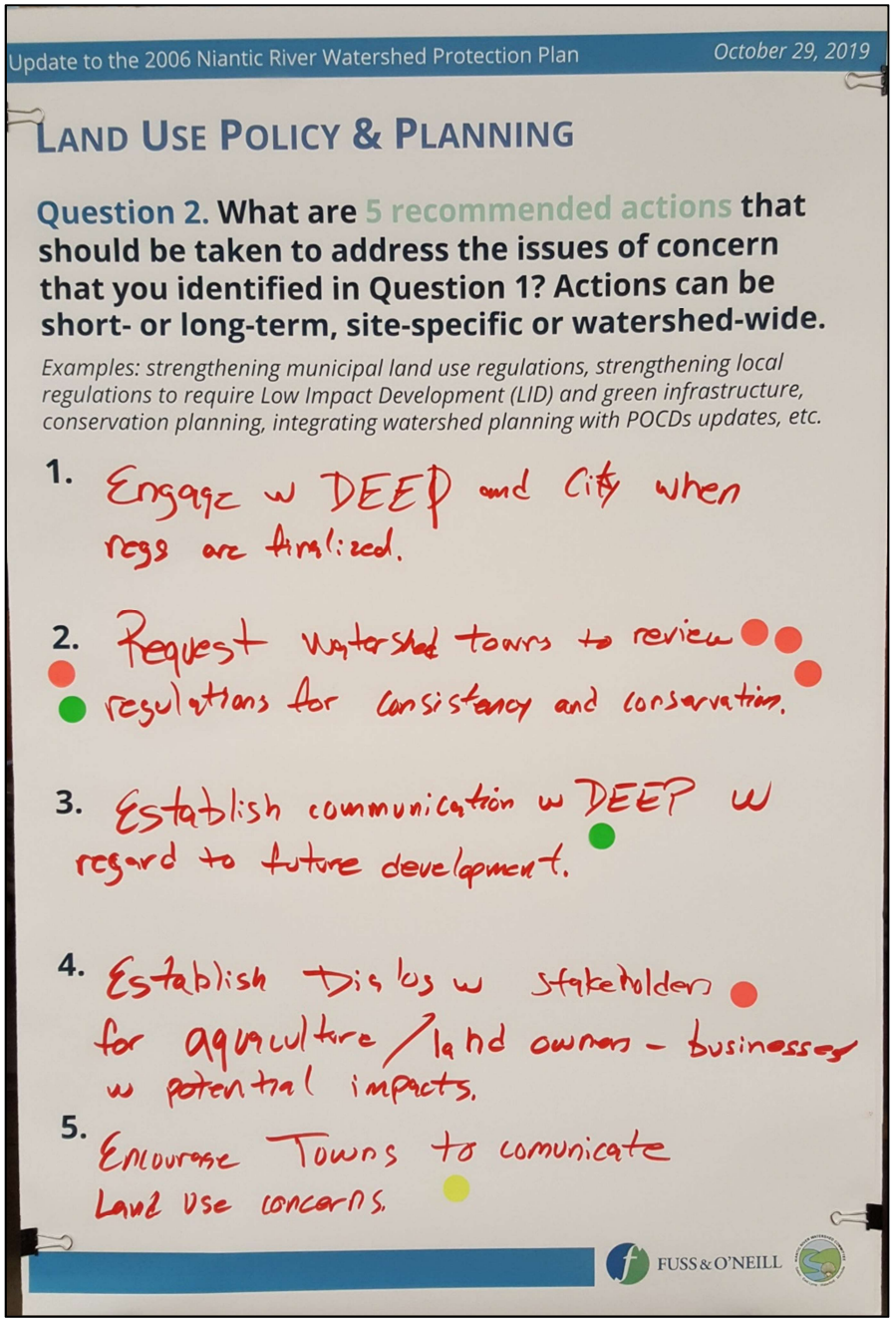
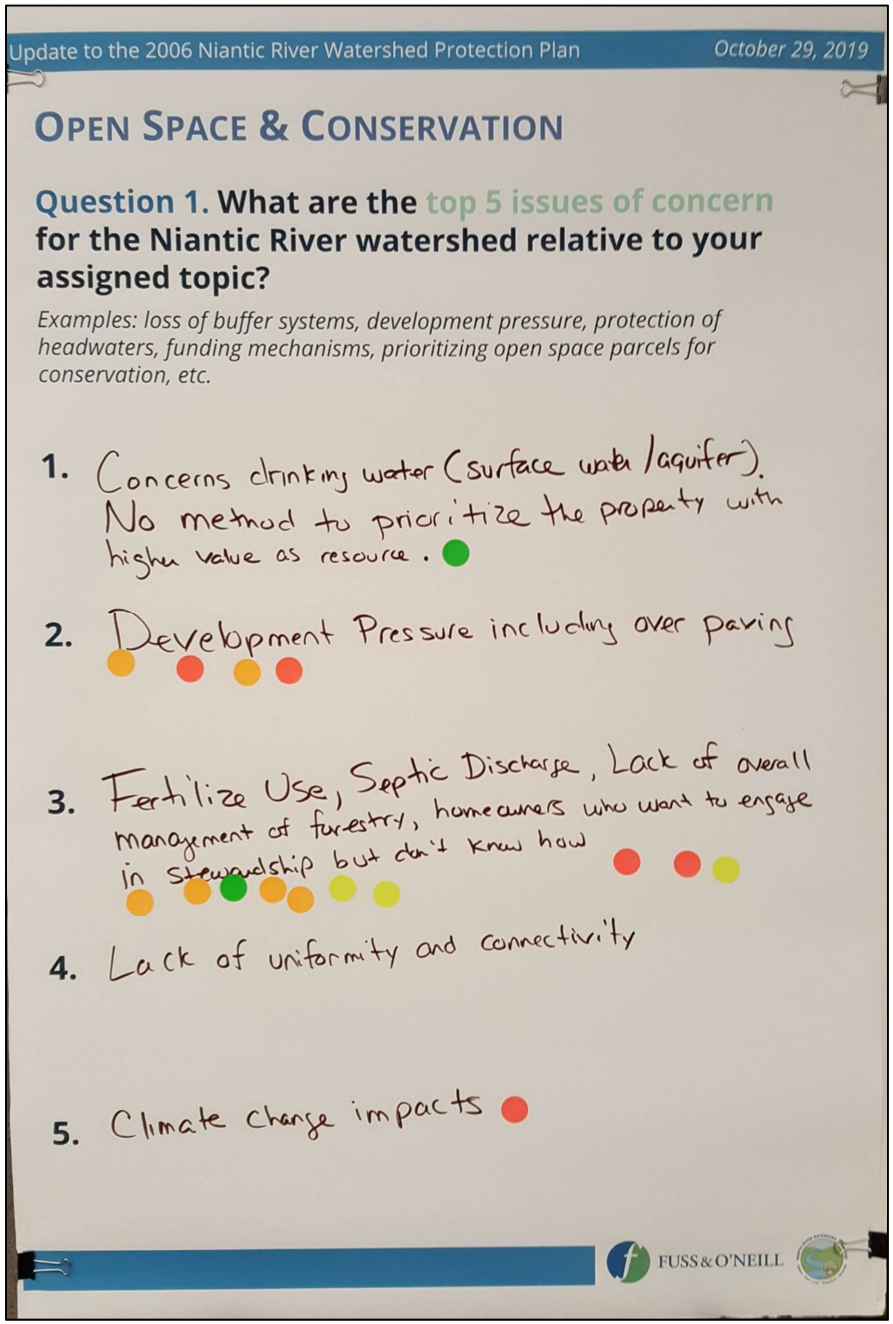
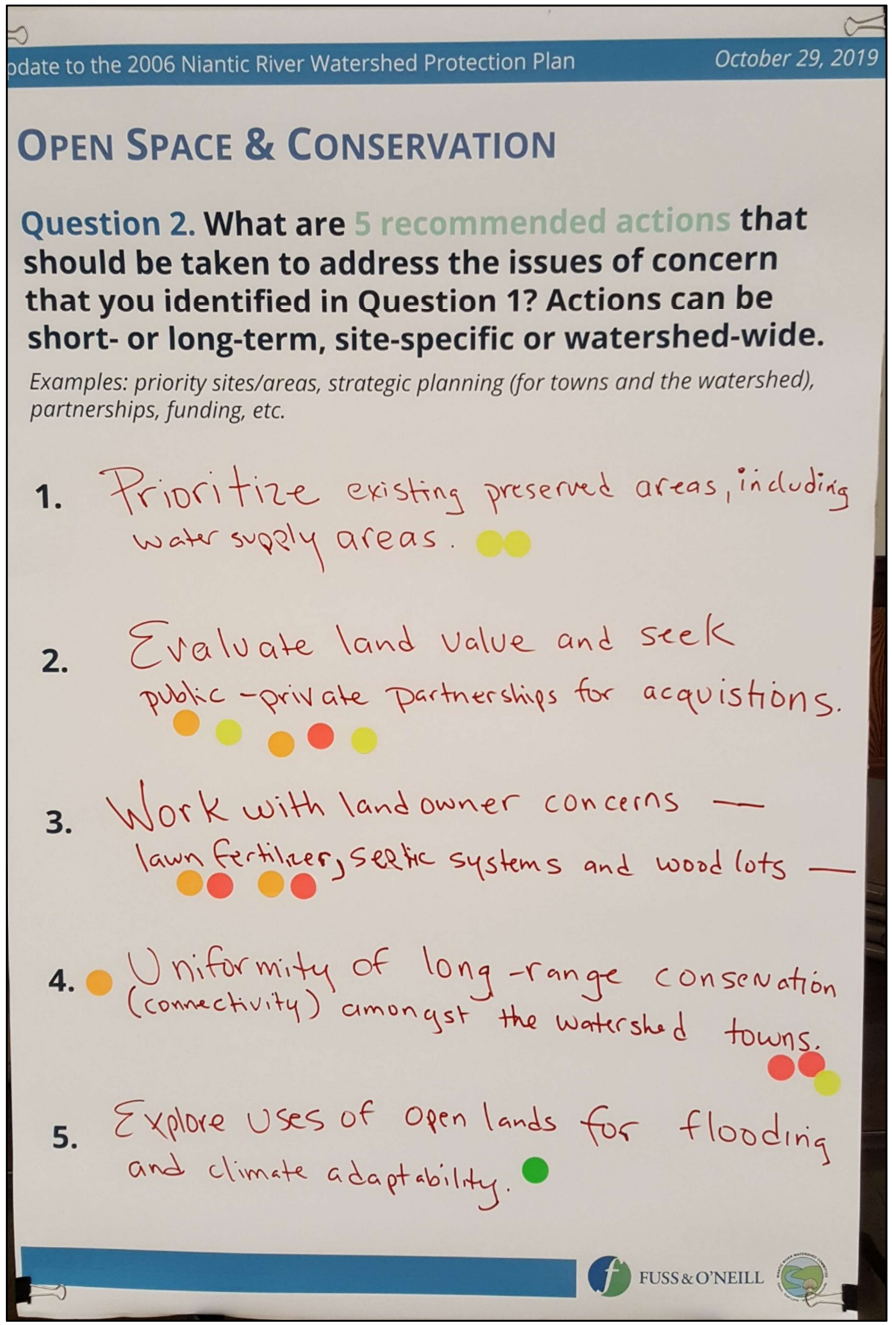
NWRPP Update
Stakeholder Workshops: Completed "Issues" & "Recommended Actions" Boards





Chesterfield Fire Department, October 29, 2019, 2-4pm





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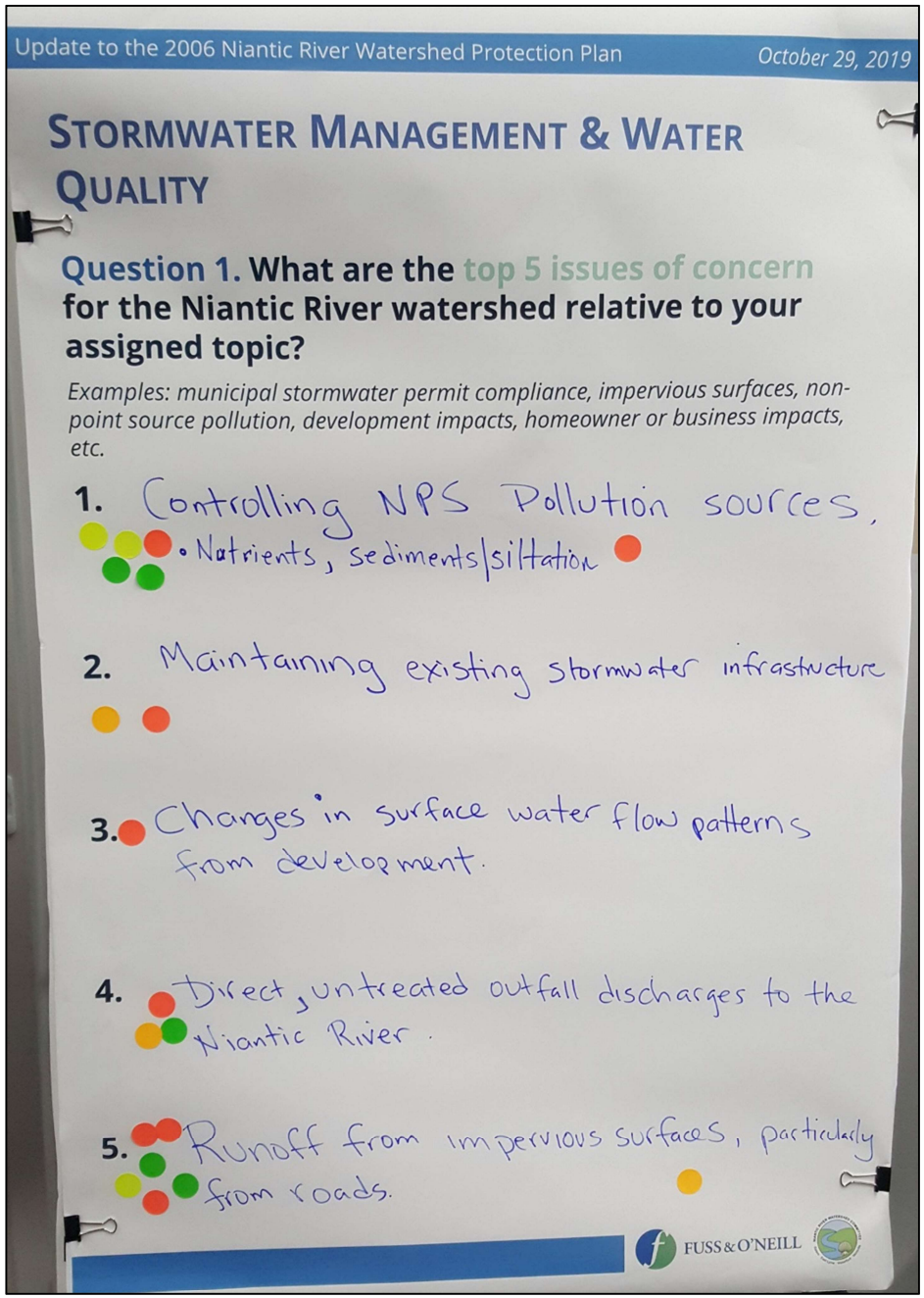
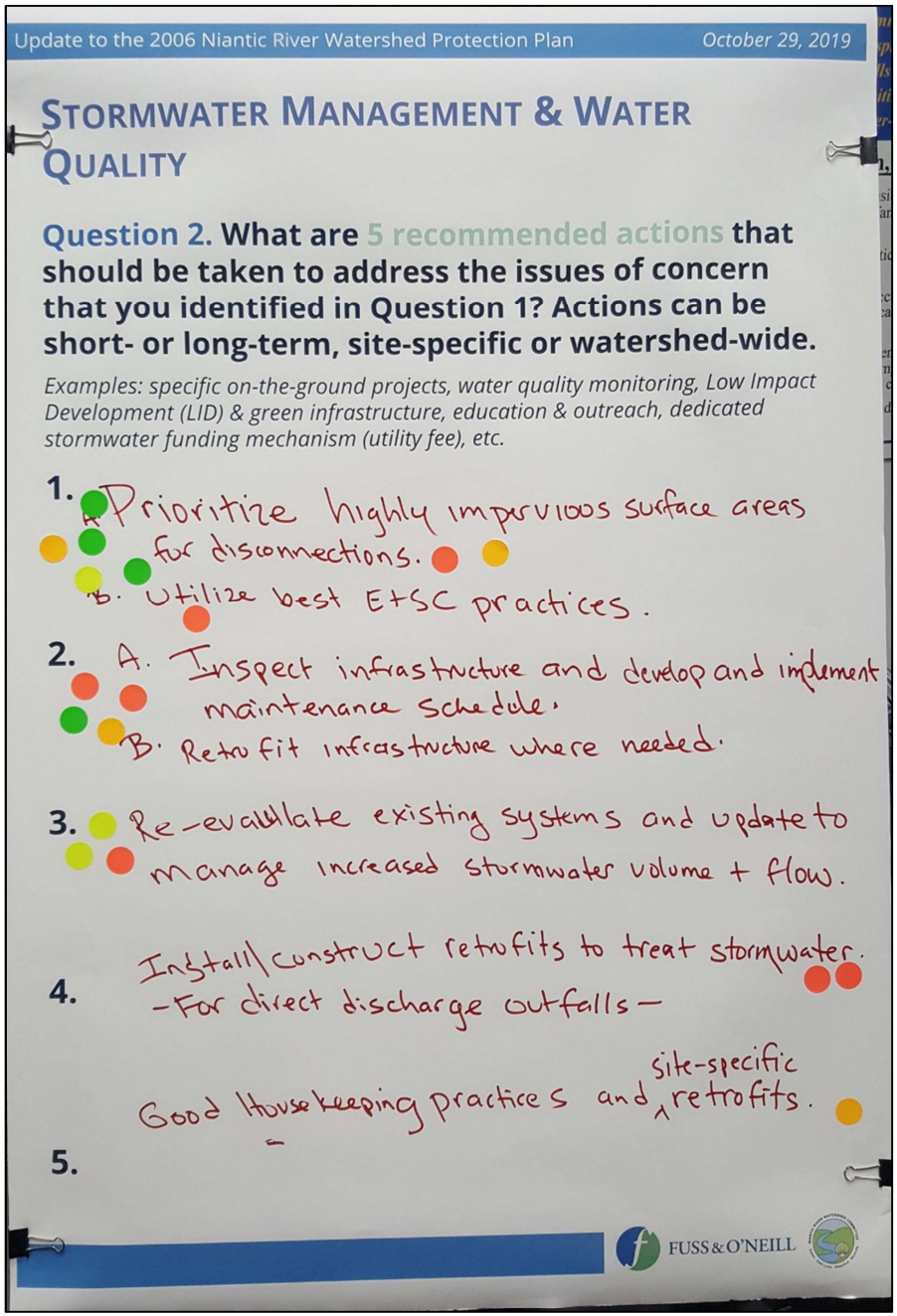
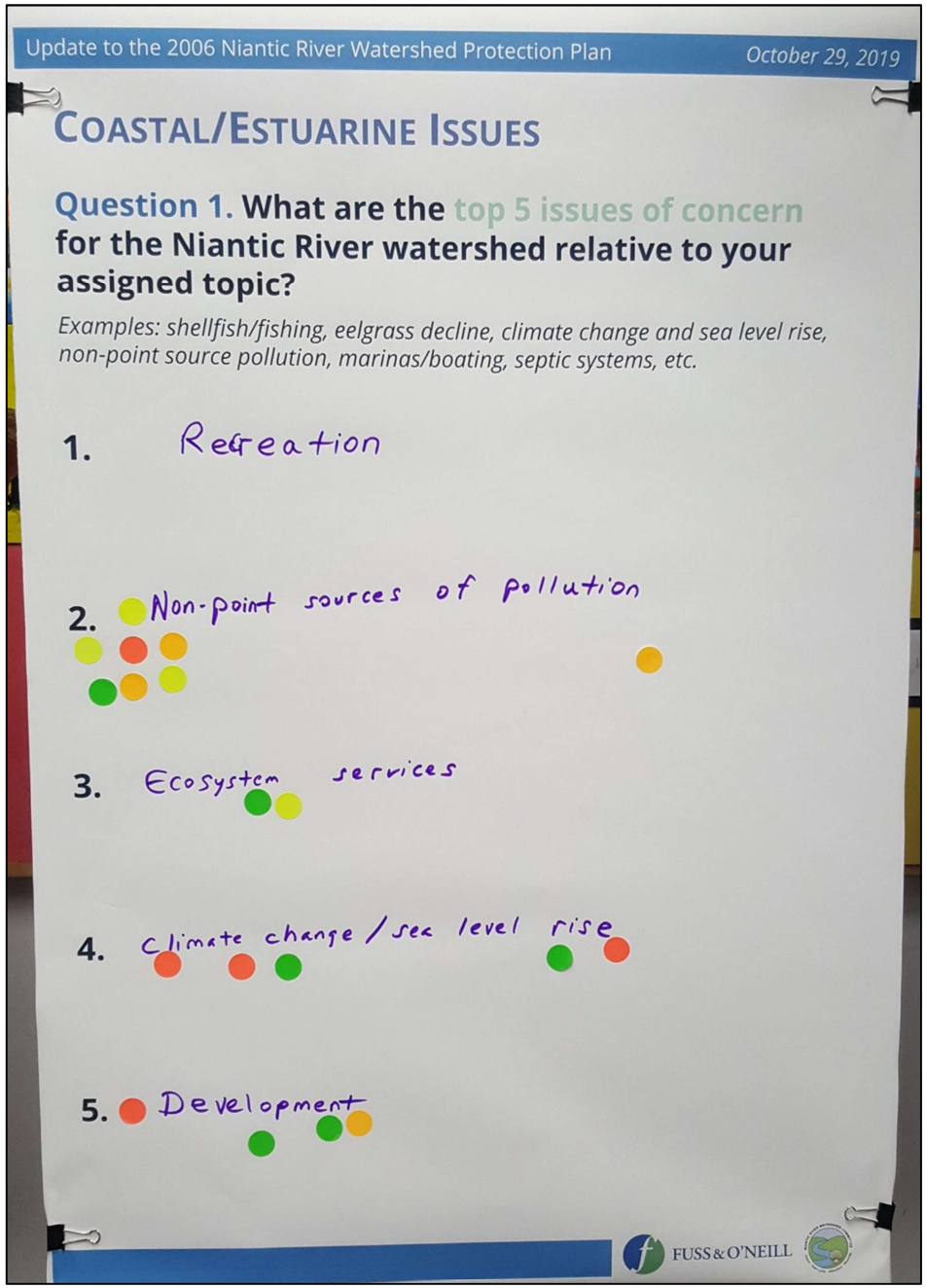


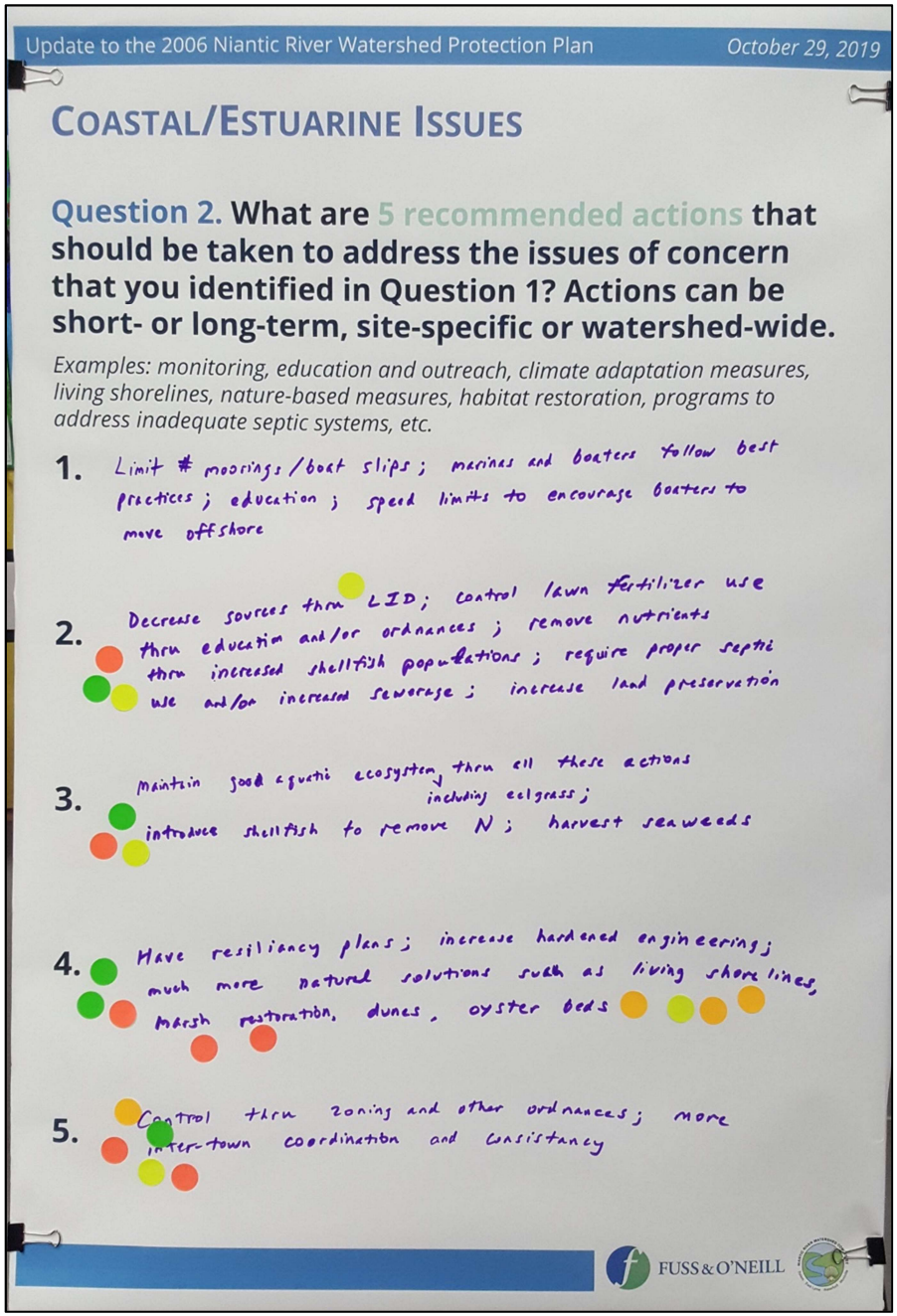


Waterford Town Hall, October 29, 2019, 6:30-8:30pm

NWRPP Update

Stakeholder Workshops: Completed "Issues" & "Recommended Actions" Boards





Waterford Town Hall, October 29, 2019, 6:30-8:30pm

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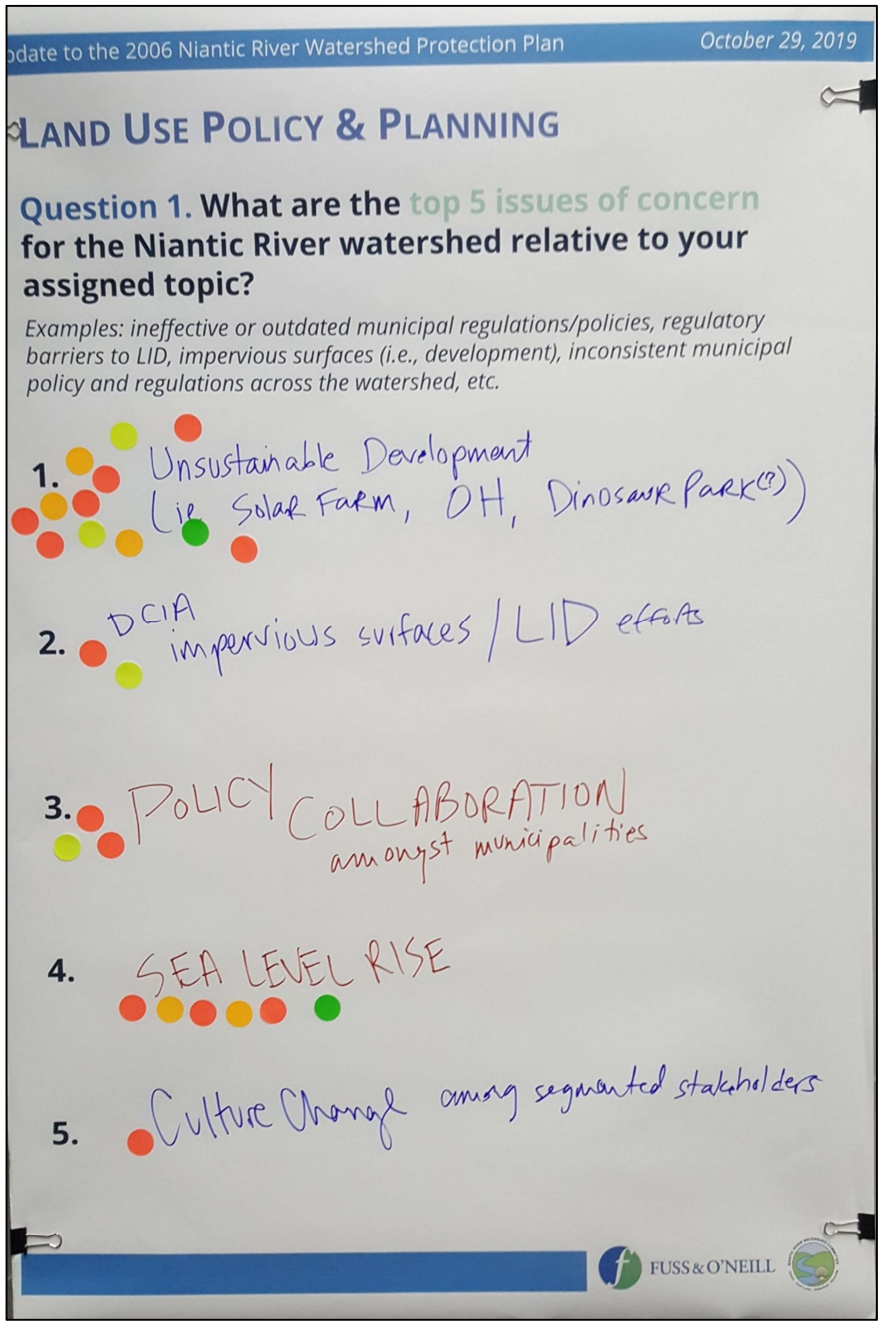

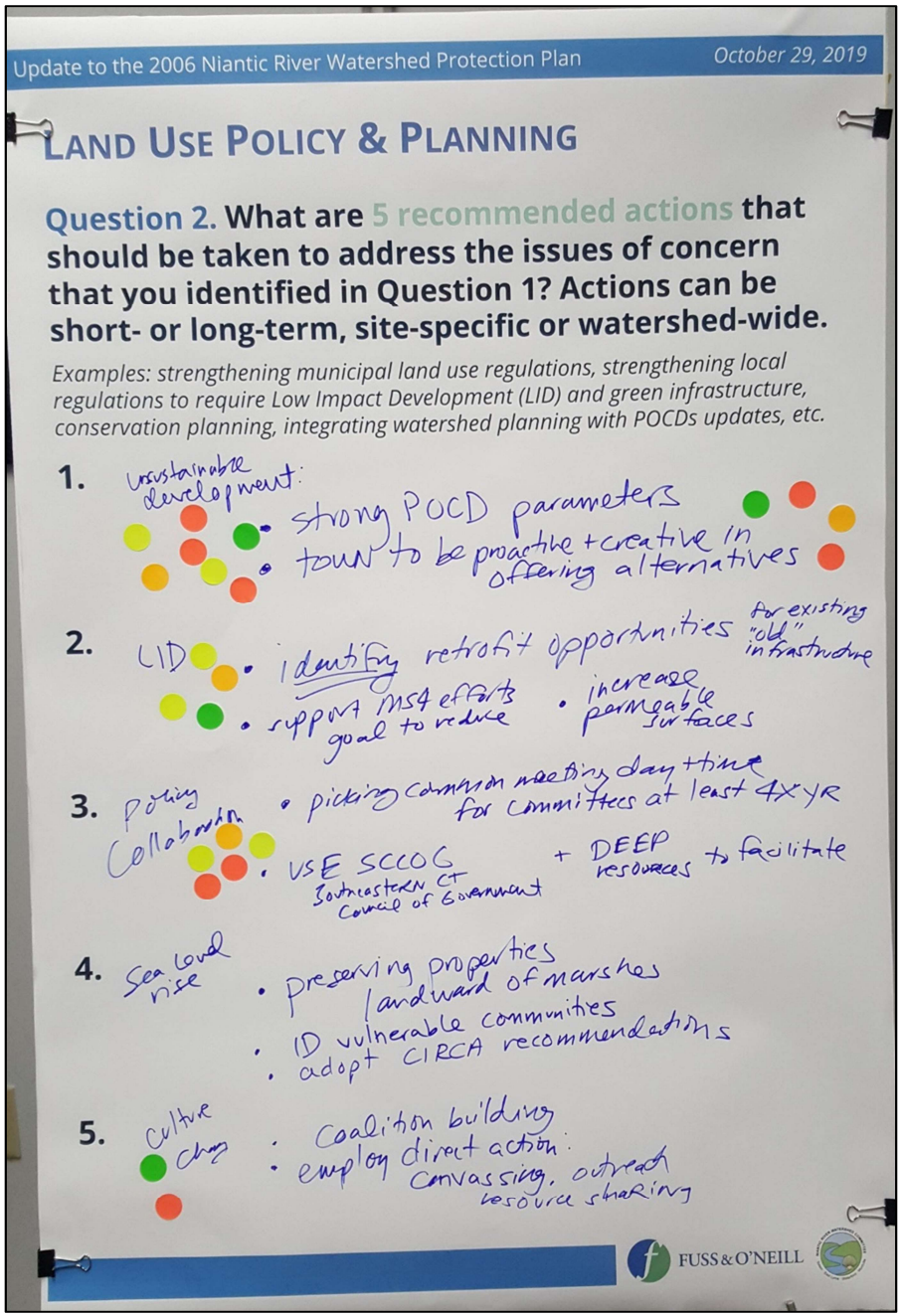

Waterford Town Hall, October 29, 2019, 6:30-8:30pm

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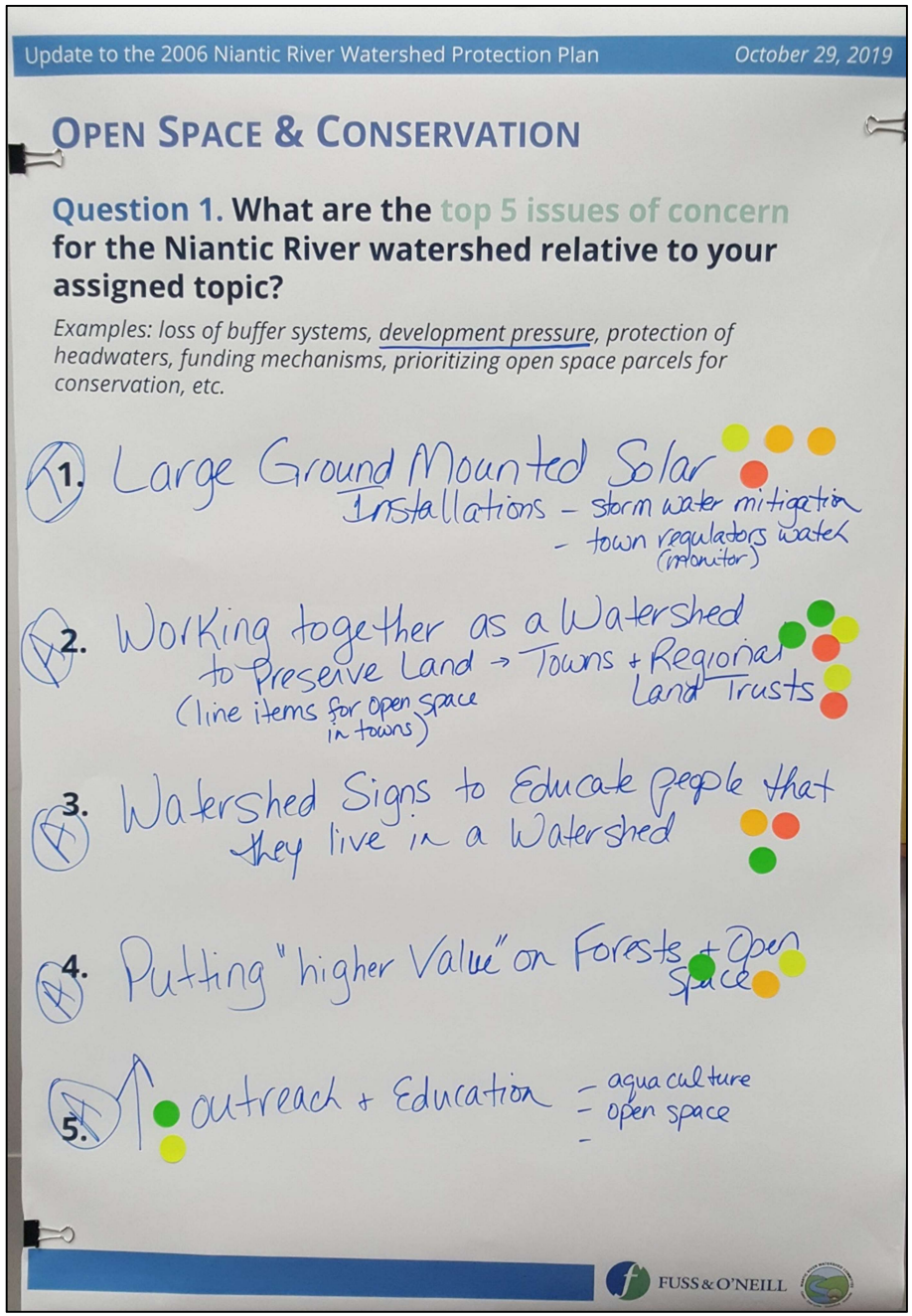

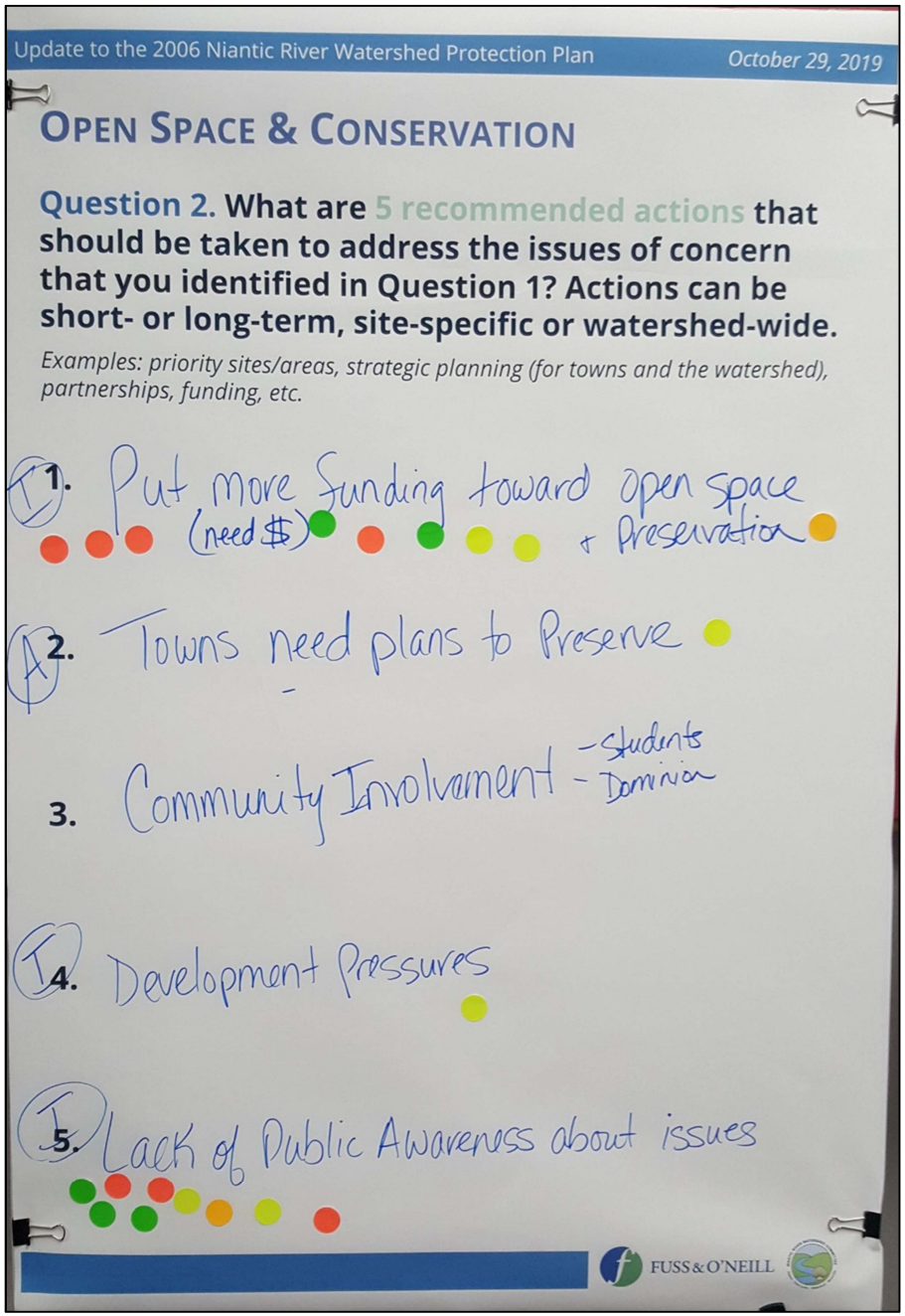

Waterford Town Hall, October 29, 2019, 6:30-8:30pm

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Attachment I

Photographs

FUSS & O'NEILL

Photographs of Stakeholder Workshop 1: Montville

FUSS & O'NEILL

Photographs of Stakeholder Workshop 2: Waterford

Funding for this project was provided by the Community Foundation of Eastern Connecticut, the Connecticut Department of Energy and Environmental Protection via the Clean Water Act Section 319 Nonpoint Source program, and Kleinschmidt Foundation through the Community Foundation of Maine.

Community Foundation of Eastern Connecticut | Connecticut Energy Environment | Kleinschmidt | Maine Community Foundation

Photo Credits

Front

Row 1: Judy Rondeau, Niantic River Watershed Committee | Row 2: Eric Kanter | Row 3: Chris Tomichek, Suzanne Thompson

Back

Row 1: (left and center) Niantic River Watershed Committee, Eric Kanter | Row 2: Chris Tomichek

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