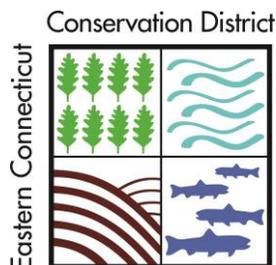
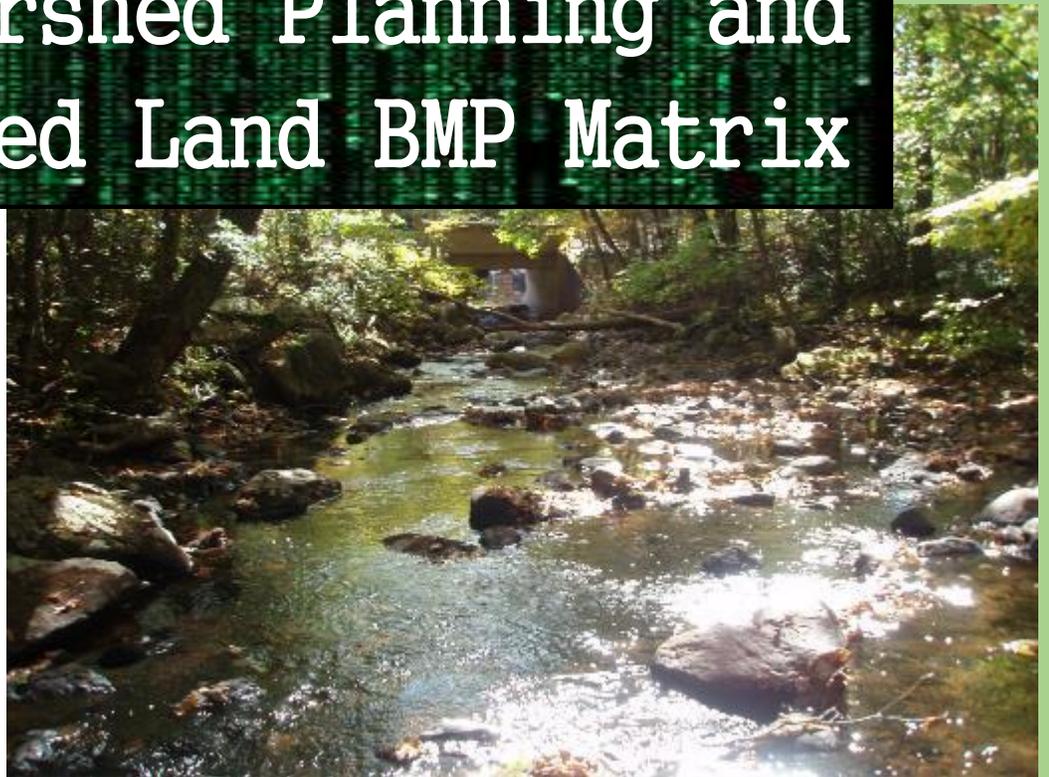


2014

Mount Hope River Implementation-based Watershed Planning and Developed Land BMP Matrix



Eastern Connecticut Conservation District
238 West Town Street, Norwich, CT 06360
4/1/2014

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Mount Hope River Implementation-based Watershed Planning and Developed Land BMP Matrix

Executive Summary

The Mount Hope River (CT3206-00_02) has been listed in the CT Department of Energy and Environmental Protection's Integrated Water Quality Report 303d list, most recently in 2012, as impaired for recreation due to periodic high levels of *E. coli* bacteria (CT DEEP, 2012). The Eastern Connecticut Conservation District undertook a comprehensive investigation of the watershed in 2013 that included a bacteria track down survey and a watershed review to look for the most probable sources of bacterial contamination detected in the river. While no specific source was documented as a result of this study, potential sources from agricultural, wildlife, residential, commercial and municipal sources were determined and recommended remedial actions are outlined in this report.

Introduction

The Mount Hope River (CT3206-00_02) has been listed in the CT Department of Energy and Environmental Protection's (DEEP) Integrated Water Quality Report 303d list, most recently in 2012, as impaired for recreation due to periodic high levels of *E. coli* bacteria (CT DEEP, 2012). Data collected between 2006 and 2009 by the DEEP Water Quality Monitoring and Assessment Program near the Ashford Volunteer Fire Department's Warrenville Station on Route 89 in Ashford, CT indicates that the river does not meet CT Water Quality Standards for recreational contact. The *Mount Hope River Bacteria Total Maximum Daily Load* (CT DEEP, 2012) prepared by DEEP indicated the need for a 38% reduction in *E. coli* concentrations in order for the river to comply with current water quality standards.

The entire Mount Hope River watershed, including the tributary Squaw Hallow Brook watershed, is upstream of the Willimantic Reservoir. The reservoir serves as a drinking water supply to residents and businesses in Windham and Mansfield, CT. Public Health Code regulations restrict industrial or municipal wastewater from being discharged into surface water upstream of a drinking water supply intake. Clean water discharges or emergency water discharges are allowed by permit only. Therefore, any water quality issues in the Mount Hope River are from indirect or non-point sources.

The *Mount Hope River Total Maximum Daily Load* (TMDL) report estimates the watershed consists of 75% forest, 10% urban, and 8% agriculture land uses, and 7% of the watershed consists of surface water. "Urban" in the TMDL report refers to the estimated measure of impervious cover associated with developed land in the watershed. This includes roadways, rooftops, driveways, parking lots or any other surface that acts as a water infiltration barrier. Using the generally accepted impervious cover model first published by Tom Schueler in 1994, it is predicted when impervious cover in a watershed is less than 10%, then it is usually indicates minimally impacted water quality from land runoff. However, in 2007 Roy Schiff and Gaboury Benoit published data from a study of the West River in New Haven, CT. Their study showed water quality, especially for aquatic life support, declined when impervious area was above 5%. More specifically, their study showed that impervious cover within 100 meters of a river or

stream was found to have the strongest negative correlation with water quality (Schiff & Benoit, 2007). The CT DEEP determined that the aquatic life use support status of Eagleville Brook in Mansfield, CT was impaired resulting from a mix of pollutants conveyed by stormwater. A TMDL for impervious cover based on a maximum of 12% effective impervious cover was developed based on that study.

http://www.ct.gov/deep/lib/deep/water/tmdl/tmdl_final/eaglevillefinal.pdf.

State Route 89 is a major mostly north/south roadway in Mansfield and Ashford, CT. In portions of the watershed, the road runs approximately parallel to the Mount Hope River, crossing over the river's serpentine pathway four times. A pattern of rural development along this major thoroughfare including village centers is noted along this roadway and portions of the Mount Hope River. State Route 44 intersects with Route 89 in the Warrentown section of town. Interstate Highway 84 intersects Morey Pond in the headwater region of the watershed.

In the spring of 2013, the Eastern Connecticut Conservation District (ECCD) developed a monitoring plan to collect water samples to be assessed for *E. coli* bacteria in the Mount Hope River and select perennial tributaries in an effort to track down the sources of fecal contamination in the river. Upon approval of the monitoring plan by DEEP, ECCD collected water samples at thirteen locations within the Mount Hope River watershed over an eight week period. The data collected confirmed that the Mount Hope River does not meet the Connecticut Water Quality Standards for recreational contact, and at least two tributaries to the Mount Hope River contribute to the bacteria load in the river.

ECCD bacteria sampling results from 2013 indicate that water samples collected from the Mount Hope River at the same location as DEEP's sampling site near the Ashford firehouse continued to fail to meet CT water quality standards for recreational contact. In addition to several individual samples exceeding the maximum of 410 cfu/100 ml, the geometric mean (geomean) of the sample set was 265 cfu/100 ml or 110% higher than the allowable 126 cfu/100 ml geomean of the sample set. Additional sampling sites were carefully selected both above and below the known impaired site at the firehouse to characterize bacteria levels in the main stem of the Mount Hope River and to identify potential contributions from tributaries and land uses often associated with contaminated runoff. Potential contributions include agricultural activity and other anthropogenic sources. The information gained from this study has been utilized in the development this Mount Hope River Implementation-based Watershed Planning and Developed Land BMP Matrix, identifying projects designed to significantly reduce bacteria loading to the Mount Hope River.

Possible Bacteria Sources

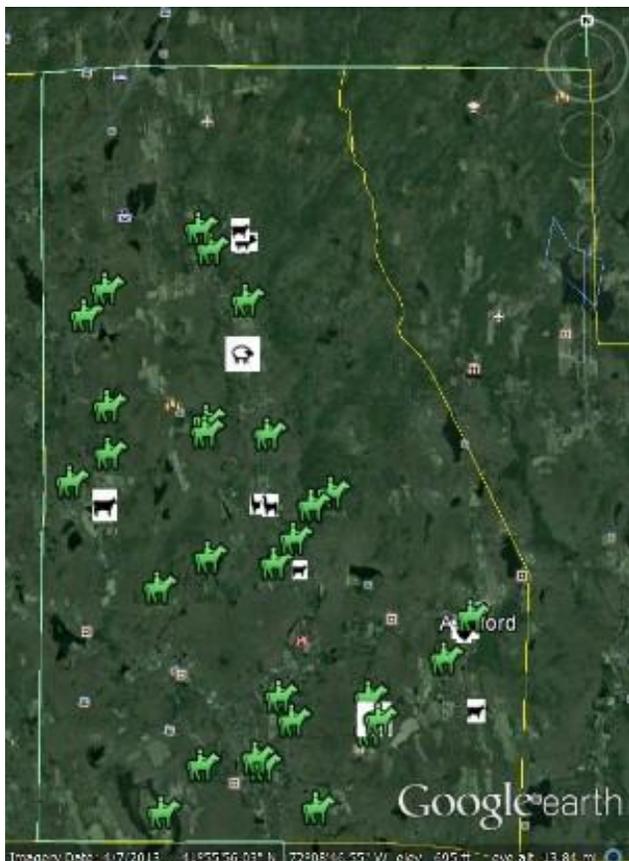
The outcome of the 2013 water quality investigation indicates that the Mount Hope River both below the first road crossing of Route 89 north of Mansfield Hollow Lake (CT 3206-00_1) and above that road crossing up to the Morey Pond outlet (CT 3206-00_2) did not meet the Connecticut Water Quality Standards for recreational contact. The East Branch Mount Hope River (CT 3206-03_1) and Basset Brook (CT 3206-07) also failed to meet water quality standards in 2013. In general, the data suggest the sources of fecal contamination detected in the Mount Hope River at the Ashford Firehouse originate from multiple non-point sources including wildlife, agricultural and domestic animals. Human sources from failed septic systems or illicit discharges were neither confirmed nor eliminated as a potential contributing source. The full analysis of the water quality data can be found in *11-01D – NPS Management Mount Hope River*

Task 1b. Pre-installation Water Quality Monitoring/Analysis and Reporting (ECCD, 2013) submitted to the CT DEEP on 12/20/2013.

Agricultural Sources

Land use maps produced by the Center for Landuse Education and Research (CLEAR) indicate that approximately 8% of the land use in the Mount Hope River watershed is used for agricultural purposes. The Mount Hope River TMDL lists agricultural runoff as a potential source of *E. coli* in the river.

There are several agribusinesses in Ashford and Mansfield, CT that involve grazing animals, some of which are pastured in areas prone to flooding. A “windshield survey” of these properties demonstrated use of exclusionary fencing along river frontage, but in some cases, narrow riparian buffer areas. A list of some of the Ashford agribusinesses is available in an Ashford Grown brochure that was produced in the spring of 2011 (http://aginfolgv.org/agvocate_program/PDFs%20and%20Documents/AshfordGrownWeb.pdf) and Mansfield Agribusinesses are listed in a Mansfield Grown brochure produced in spring 2012 (http://www.mansfieldct.gov/filestorage/1904/3389/2012_mansfieldgrown.pdf).



Distribution of grazing animals, Ashford, CT

Additionally, there are private land owners who maintain horses and other large grazing animals on their property, some of which are within the sloped areas adjacent to the Mount Hope River. Improper manure management can be a significant source of fecal and nutrient contamination in the river.

ECCD staff requested a list of horses registered with the Ashford and Mansfield Assessors' offices. The Town of Ashford had a comprehensive list. Mansfield did not. This inventory was supplemented by field data obtained during field reconnaissance work and information obtained by the *Ashford Grown* and *Mansfield Grown* brochures. Using Google Earth mapping tools, the general areas where large grazing animals are known to exist were plotted to a map of Ashford. This included horses, cattle, llamas, pigs, and sheep, as well as small flocks of chickens. Grazing animal reports in Mansfield were minimal and mostly not within the most critical areas of concern for the Mount Hope River, so no map was created for the Mansfield part of the watershed.

In 2006, DEEP and U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) partnered in a stream bank stabilization project on Out of Site Farm to restore 1000 feet of the Mt. Hope River. The project included the installation of fencing to exclude the cattle from the streambank, installation of fortified stream crossing areas to allow the cattle to cross to pastures located on both sides of the river flood plain, replanting the riparian buffer along the stream with suitable trees and soil bioengineering and geomorphology techniques to protect the banks. This project resulted in a deeper and narrower stream channel more suitable to native fish and invertebrates (CT DEEP, 2006). The riparian vegetation planted as part of this project has not yet fully grown in.

Recommendations for agricultural sources of E. coli:

The Ashford Agriculture Commission and Mansfield Agriculture Committee, in cooperation with the local Conservation Commissions and other partners, should develop an education and outreach program regarding animal waste Best Management Practices. Brochures can be distributed in public locations including town buildings and local farmer's markets. *Good Horse Keeping: Best Management Practices Manual for Protecting the Environment* was produced by the Horse Environmental Awareness Program (HEAP) in 2011 and is a good example of material to use for this outreach.

If not already in place, eligible agricultural producers should work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) to develop Comprehensive Nutrient Management Plans for their farming activities. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict access by livestock, including horses to streams and wetlands, and that animal waste handling, storage, disposal, and other appropriate Best Management Practices (BMPs) are in place.

Smaller farms or individual horse owners may not be eligible for NRCS programs yet may still have a considerable impact on water quality in the Mount Hope River watershed. They may need an alternate source of financial support or consulting services to develop a Manure Plan and to implement Best Management Practices on their farms. There are several resources including the UCONN Extension System and ECCD that can provide Best Management Practice information and recommendations on a site by site basis.

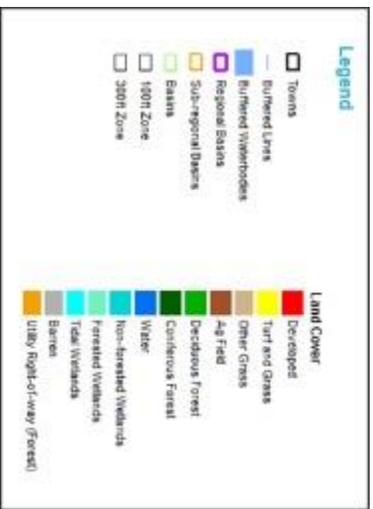
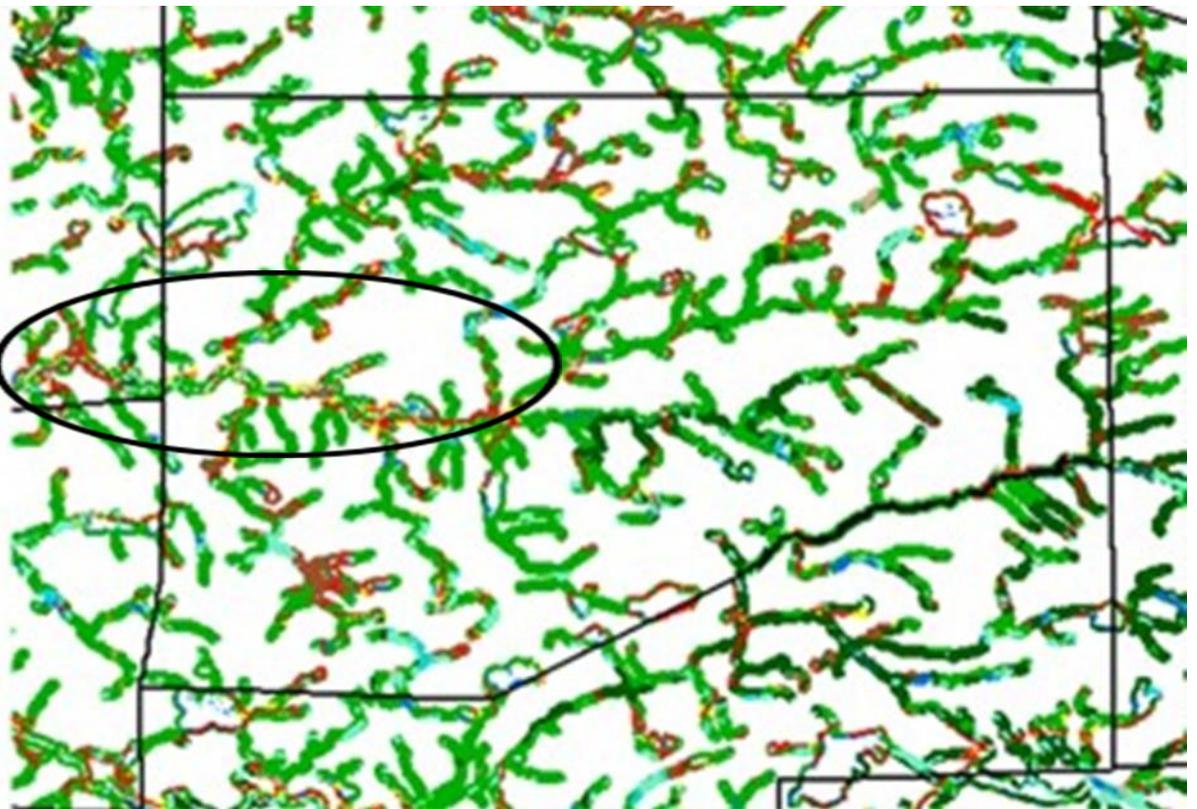
Residential Sources

There are no urbanized locations, as defined by the U.S. Census Bureau, within the Mount Hope River watershed. Therefore, the towns are not currently included in an MS4 area and are not required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the CT DEEP (CT DEEP, 2012).

Stormwater Runoff from Residential Properties

In 2006, the Center for Landuse Education and Research (CLEAR) conducted a statewide review of land cover change in Connecticut. They also reviewed the land cover conditions within a 300

**2006 Center for Landuse
Education and Research
(CLEAR) 300 foot riparian
corridor analysis, Ashford, CT**



2006 Riparian Corridor Map, Ashford, CT from the Center for Landuse Education and Research

foot wide riparian corridor along rivers and streams. The map on the previous page shows the outcomes of this analysis in Ashford, CT. Areas in red indicate impervious cover associated with developed land. Areas in yellow indicate turf and grass, which is associated with residential development, the school and parks. The area in the black oval below indicates where a higher concentration of impervious cover and residential lawns are located along the river. In that area, Route 89 runs roughly parallel to the Mount Hope River.

Stormwater runoff from residential properties can carry a variety of pollutants including pet waste, lawn fertilizers, herbicides and organic material (leaves, grass clippings and floatable debris).

Recommendations for residential sources of fecal bacteria *E. coli*:

Streamside Vegetated Buffers

Promote streamside vegetated buffers through an education and outreach campaign directed at land use officials as well as residential property and business owners to demonstrate the ecological and economic value of native streamside vegetation. This is especially important where flood plain vegetation has been identified as a Natural Diversity Data Base area for species that are Endangered, Threatened or of Special Concern in Connecticut, or listed as a Critical Habitat.

Low Impact Development and Green Infrastructure

Promote the installation of “green infrastructure” into the residential landscape through an education and outreach campaign. Green infrastructure includes rain gardens, rain barrels, pervious pavers and other techniques designed to reduce stormwater runoff. Green infrastructure reduces storm water runoff and increases infiltration of rainwater after a storm. This helps to recharge ground water and uses nature to filter contaminants from stormwater runoff.

On-site Waste Water Disposal Systems

Mount Hope River Bacteria Total Maximum Daily Load Report and Mount Hope River Watershed Watershed-Based Plan of Conservation: Phase 1A (Burchsted, 2007) both cite failed septic systems as a potential source of water quality degradation. Eastern Connecticut Conservation District staff requested a list of addresses where property owners were issued a septic tank repair permit by the Eastern Highlands Health District between August 2009 and November 2013. This list only includes locations where issues were reported to the health district and does not imply that all failing systems during this time period were included. These addresses were plotted using Google Earth mapping tools and reviewed for any evidence of clustering.

The largest cluster of repair permits was issued around Lake Chafee in Ashford. According to the Town of Ashford 2005 Plan of Conservation and Development (Committee, 2005), the densely populated community around Lake Chafee “is under an order from the Department of

Environmental Protection (DEEP) to mitigate water quality problems created by residential septic systems in the area. The order is currently in abeyance until a cost-effective mitigation measure can be found.” Results of water quality monitoring downstream of the Lake Chaffee outlet to Chaffee Brook did not indicate Lake Chaffee as a significant source of bacteria loading to the Mount Hope River in 2013.

During field reconnaissance, a small shed resembling an outhouse was noted on private land at the confluence of a small unnamed stream and the East Branch Mount Hope River. This was reported by ECCD staff to the Eastern Highlands Health Department as a possible health code violation.

Recommendations for On-site Waste Water Disposal Systems:

Ashford, Union and Mansfield, CT, in partnership with the Eastern Highlands Health District (EHHD) and other partners, should initiate an education and outreach program focused on proper septic tank management. Outreach should also include information on fixtures and appliances that conserve water to reduce the hydraulic load in the soils associated with the leach fields.

The Town of Ashford and the Eastern Highlands Health District should continue to focus on water quality issues in the Lake Chaffee watershed, even if doesn't contribute to water quality issues in the Mount Hope River.

Ashford, Union and Mansfield, CT working together with the Eastern Highlands Health District and other partners, should establish a program to ensure that existing septic systems are properly operated and maintained, and create an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard systems within a reasonable timeframe can be adopted.

For property owners along rivers where Department of Public Health minimum setback requirements cannot be met due to narrow lot sizes, alternate treatment systems may be required. The CT DEEP Subsurface Disposal and Agriculture Program, Water Permitting and Enforcement Division must be involved in the planning and permitting of such systems.

Ashford, Union and Mansfield should continue to participate in the Housing Rehabilitation Revolving Loan Program through the Connecticut Small Cities Grant Program to be able to assist income eligible citizens with funding assistance to replace or repair obsolete, older and failing systems.

Commercial Properties

Brialee Campground

Brialee Campground is located at 174 Laurel Lane, Ashford, CT. It is a campground with 260 camping sites. Approximately sixty of the camp sites are for seasonal campers with full sewer hookups included. Most of the additional sites provide hookups for grey water disposal only.

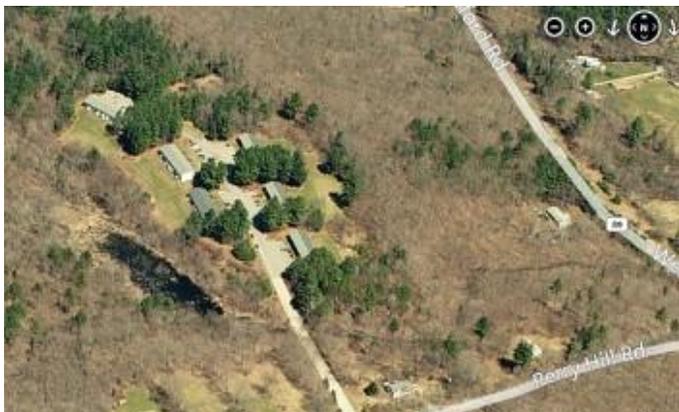
Ten sites are without any hookups available. Sewage disposal stations are located at both entrances to the campground.

The campground includes a centrally located stream fed pond. The pond has waterfront camp sites, a bathing beach with a swim platform and a separate pet beach further down shore. The outflow from the pond drains to an unnamed stream that flows into the Mount Hope River. The Eastern Highlands Health District collects water samples at the campground swim beach weekly during the bathing season to test for fecal contamination as indicated by the level of *E. coli* bacteria. ECCD has reviewed the data collected from the 2005 – 2013 seasons and noted that during seven of the previous nine years, the beach experienced, at least once per season, *E. coli* levels that exceed the State of Connecticut Beach Bathing Water Standards.

Recommendations for Lake Briallee Campground:

ECCD recommends that the owners of Briallee Campground invest in a stormwater management review to identify existing stormwater patterns, and to make management recommendations to improve lake water quality.

Perry Hill Estates



Perry Hill Estates image courtesy of Bing Maps

Perry Hill Estates is a commercial rental property consisting of six multi-dwelling units built in 1970. Pets are permitted at this complex. The access road to the apartments crosses Basset Brook, a first order headwater stream that drains into the Mount Hope River. Both sides of the access road are lined with bituminous asphalt curbing. Basset Brook flows under the access road through a cement culvert approximately 4 feet in diameter. The west side of the access road may have buried utilities in the right of way area.

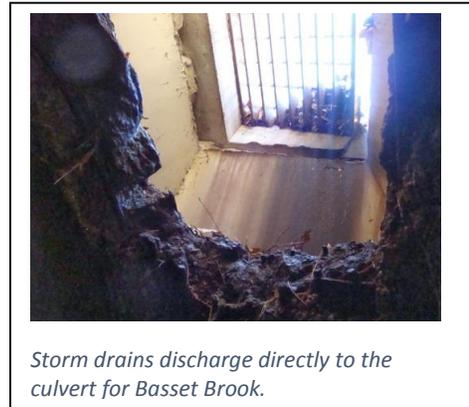
This apartment complex was constructed prior to the enactment of the Connecticut Department of Public Health Code 19-13-B32, Sanitation of Watersheds which requires storm water drain pipes, except for crossing culverts, to terminate 100 feet from the river unless such termination is impractical and the design of stormwater drainage facilities shall be such as to minimize soil erosion and maximize absorption of pollutants by the soil.

During our field investigation, it was determined that a stormwater drain at the entrance to the complex terminated directly into the culvert conveying the brook. A second storm drain located in the parking area for the complex also drained directly into Basset



Storm drain near entrance at Perry Hill Road

Brook within the culvert. Two additional storm drains located above of the culvert drained directly into to the brook below.



Records obtained from the Town of Ashford Building Department indicate that the onsite wastewater disposal systems for the complex are under jurisdiction of the CT DEEP. On the west side of the complex, the leach fields for at least two of the buildings are situated in a tiered manner along the slope on the rear side of the buildings. The slope drains towards a wetland complex behind the buildings. Basset Brook drains through that wetlands complex. Data obtained from CT DEEP indicates elevated levels of total nitrogen had been measured in the groundwater test wells for these systems. There were no indications of elevated total coliform bacteria in the groundwater test wells or reports of sewage breakouts from the septic system leach fields. Gardner and Peterson Associates LLC have been contracted on behalf of the property owners, Perry Ridge Investments, LLC, to evaluate the groundwater quality and make remedial recommendations. Sanitarian Engineer Ramona Goode of the CT DEEP Subsurface Disposal and Agriculture Program in the Water Permitting and Enforcement Division reports through email correspondence that the remedial recommendations presented by Gardner and Peterson are under technical review by her department at the this time.

Recommendations for Perry Hill Estates

Pet waste management

Develop and enforce a pet waste cleanup policy. Install and manage pet waste disposal bag dispensers to encourage compliance with the policy.

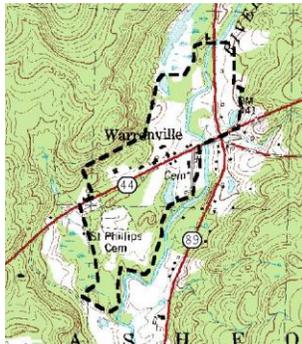
Access Road

Retrofit the stormwater conveyance system along the access road to be in compliance with Connecticut Department of Public Health Code 19-13-B32. If stormwater infiltration systems are considered for stormwater management, check with DEEP Subsurface Disposal and Agriculture Program to verify that stormwater infiltration near the apartment buildings will not interfere with the groundwater hydraulics and negatively impact the proper functioning of the onsite wastewater disposal system. Contact *Call Before You Dig* to determine if buried utilities are a concern along the access road.

Perry Hill Estates Subsurface Wastewater Treatment System

The property owners or their designated contractor should continue to monitor groundwater quality in the test wells downstream of the leach fields and carefully review leach fields for signs of surface breakouts above the wetlands behind the complex. Remediation activities, once approved by CT DEEP, should be implemented.

Route 44/Route 89 Commercial Area



Warrenville is located at the intersection of Route 44 and Route 89 and is considered the main center of the Town of Ashford. The Ashford Town Hall, library, senior center and fire department are located in this area zoned as a Special Planning Area in the Ashford Plan of Conservation and Development. Commercial development includes a gas station/convenience store. There are also two places of worship located in Warrenville. The area also includes a sand and gravel quarry.

Recommendations for the Warrenville Special Planning Area

Ashford Town Hall Rain Garden

Stormwater from the lower parking lot of the Ashford Town Hall is collected in a conveyance system which outlets less than 100 feet from the Mount Hope River. The existing vegetation between this storm water outfall and the river is mostly herbaceous plants that are mowed each fall as a means to control the establishment of invasive vegetation. Due to the proximity of this stormwater outfall to the rear entrance of the Ashford Town Hall, this location would serve as an ideal location for a demonstration rain garden with educational signage.

Riparian Buffer Demonstration Project Adjacent to the Ashford Town Hall

The Town of Ashford does not own the strip of land between the municipal property where the town hall is located and the Mount Hope River. The landowners permitted a fisherman's easement to allow access to the river. The land contains mature trees immediately along the river, but limited woody understory vegetation due to seasonal mowing conducted by town staff.

If permission is granted by the landowner, replacement of the herbaceous vegetation with native woody understory vegetation suitable for a riparian flood zone is recommended. This will help to reduce introduction of invasive species, stabilize the streambank, reduce erosion and provide natural filtration of storm water runoff as well as provide wildlife habitat for special concern species including wood turtles. As a demonstration project with signage, this project would serve to educate residents of Ashford, especially those that have land with river frontage, about the importance of native riparian vegetation as a natural water filtration system.

Gas station/convenience store

The sale of fuel is a regulated activity in the State of Connecticut. The owners of the gas station are required to abide by all state and local regulations to prevent the contamination both ground and surface water resources. Additionally, parking lot good housekeeping, including sidewalk/driveway sweeping to collect excess salt or sand from winter weather treatments and cleaning/inspecting storm drains will prevent contaminated runoff from the parking area from potentially draining into the Route 44 storm drainage system.

Church/commercial parking areas

Look for opportunities to retrofit roof and parking lot drainage to spread out, slow down, and infiltrate stormwater runoff. Routine parking lot good housekeeping is also recommended.

Wildlife Sources

The rural condition of the Mount Hope River watershed is best described by its land cover. The Mount Hope River watershed area is predominantly undeveloped land. The Center for Landuse Education and Research 2006 estimate of land cover indicates that 78% of the watershed is forested. Another 8% of the watershed is agricultural land. Contributing to the Mount Hope River is the Squaw Hollow Brook watershed. This watershed area was estimated to be 77% forested with 7% of the land in agricultural use.

In a study of 30 least developed watersheds in Connecticut, Bebbington Brook, Gardner Brook and Knowlton Brook in Ashford were selected to be included in the study (Bellucci, 2009). The East Branch Mount Hope River was also considered for inclusion in the study, but was excluded due to poor access. The large blocks of forested land and agricultural fields that predominate the

watershed provide habitat to a wide array of mammals, birds, waterfowl and other warm blooded species that are a natural source of *E. coli* bacteria in their fecal material.

Beaver dams and other indicators of beaver activity are a common sight on the Mount Hope River and its tributaries. During field reconnaissance, multiple beaver dams were documented both upstream and downstream of monitoring locations, although no actual beaver sightings were reported. Beaver are a normal component of the natural landscape. However, if beaver dams cause flooding that impacts the hydraulic capacity of the soils near an on-site



Beaver Dam, Ashford, CT

wastewater treatment system or leach field, it would be important to manage the situation to prevent failure of the system.

Limited data is available regarding other wildlife population densities. The most recently acquired statistics for deer population densities from winter 2013/14 were obtained for Zone 4a, which includes the towns of Ellington, Stafford, Somers, Tolland, Union and Willington. Ashford and Mansfield are not located in Zone 4a, but the towns share boundary lines with several towns within this region. This study indicated a deer population density averaging 28 deer per square mile (email correspondence from Howard Kilpatrick, CT DEEP Wildlife Division). Mr. Kilpatrick further stated that if deer densities average 28 deer/square mile, there will be pockets within that area with much higher (non-hunted lands) and much lower (large, heavily hunted lands like the state forests) deer densities.

Recommendations for wildlife sources of *E. coli*:

When land is purchased or set aside as open space, consider the value of legal hunting and trapping on the property as a wildlife management tool. Open space land without a wildlife management plan that includes regulated hunting can become subjected to severe deer browse resulting in decreased habitat value of the land for other species. Not only do deer feces contain *E. coli* bacteria, but it also can be a vector for the dispersal of seeds of various invasive species.

Educate property owners in flood prone areas on the importance of reporting beaver activity that may impact the functioning of their on-site wastewater disposal system to the Eastern Highlands Health District. If flooding of the system is a concern, CT DEEP provides the following recommendations:

- During the regulated trapping season (December 1 - March 31), the landowner can contact a volunteer beaver trapper or hire a licensed Nuisance Wildlife Control Operator (NWCO), who has been approved by DEEP to provide assistance with beaver nuisance problems. No additional permits are required from DEEP.
- Outside of the regulated trapping season (April 1 - November 30), any landowner or municipality which is experiencing beaver problems should contact the DEEP, Wildlife Division at 860-424-3011 regarding a special permit to trap beaver. The Wildlife Division may issue authorizations to trap beaver if damage threatens public health and safety (ex. road flooding, well inundation, and septic leach field flooding), causes damage to agricultural crops or livestock or qualifies as severe property damage. Landowners who feel that they qualify for a special out of season permit should call the Wildlife Division regarding an application and a list of volunteers and licensed companies that can conduct trapping activities.

The DEEP also maintains a listing of persons who install Water Level Control devices as a non-lethal method of mitigating damage caused by beaver.

Municipal Properties

Mount Hope Park, Mansfield – Complete Trail Maintenance along the Mount Hope River

A portion of the hiking trail directly along the Mount Hope River at Mount Hope Park has been undercut by streambank erosion. The surface of the trail is compacted with no vegetation. The

trail should be moved away from the unstable area, and the unstable area should be planted with suitable native vegetation to stabilize the streambank.



Mount Hope Park, Mansfield - Install Pet Waste Disposal Bag Dispenser

Mount Hope Park in Mansfield is a 35 acre park with hiking trails and river access along the Mount Hope River. There is signage regarding a town ordinance requiring hikers with dogs to clean up pet waste, and a trash can, but there are no pet waste bags available to facilitate this requirement.

Ashford Park, Ashford – Install Pet Waste Disposal Bag Dispenser



Ashford Park is located along the Mount Hope River. It includes several improved ball fields and a loop trail that includes a section along the Mount Hope River. There are signs posted regarding a town ordinance requiring hikers with dogs to clean up pet waste, but there are no pet waste bags available to facilitate this requirement.

Pompey Hollow Park near the Ashford Senior Center Complex– Install Pet Waste Disposal Bag Dispenser

A portion of Pompey Hollow Park is located on land adjacent to the Mount Hope River. The land includes a hiking trail along the river. There is signage regarding a town ordinance requiring hikers with dogs to clean up pet waste, but there are no pet waste bags available to facilitate this requirement.

Ashford School

Ashford School is located on the east side of Route 89 and the west side of Bucks Brook. A portion of the school property drains to Bucks Brook and the remainder towards a marsh complex associated with the Mount Hope River on the west side of Route 89. The school facilities, including the buildings, sidewalks and parking areas make up a significant amount of impervious cover. The Town should investigate ways to retrofit stormwater drainage on this property in areas that won't interfere with the on-site wastewater disposal system.

Ashford Volunteer Fire Department Warrenville Station



*Ashford Volunteer Fire Department
Warrenville Station parking area drainage*

The Ashford Volunteer Fire Department Warrenville Station parking area was designed to sheet flow to a grassy swale. This practice allows for the infiltration of stormwater runoff before it reaches the river. Parking lot maintenance, including annual sweeping, should be practiced to prevent the accumulation of sand along the parking lot edge. Sand accumulation can become vegetated with undesired weeds and then act as a berm that may concentrate the flow of stormwater. Concentrated stormwater flows can cause erosion during heavy precipitation events or during winter snow melt.

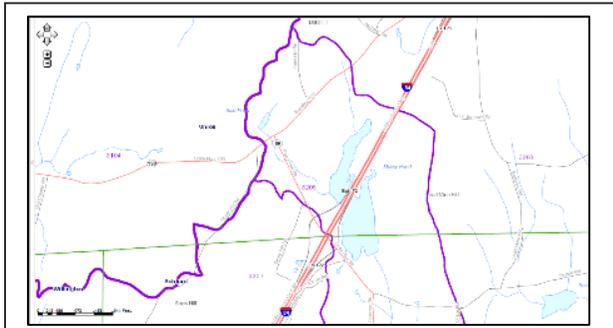
State Roads and Interstate Highways

Existing road networks, including State Routes 89, 44, 74 and 190, provide travel routes through the Mount Hope River watershed. Approximately 0.7 miles of Interstate Highway 84 intersect the watershed in the sensitive Morey Pond headwater region. Also significant is the approximate 17 miles of Route 89 that runs adjacent to the river in many areas and crosses the river in four locations. Historically, road networks were built following river valleys where the land was typically flatter. Road beds can seriously impact shallow groundwater flow and channelize stormwater runoff to high volume discharge pipes and/or under road culverts. Winter road treatments including salt and sand also have high impact on water quality. While not necessarily a significant source of bacterial contamination, stormwater runoff from road systems can carry high amounts of other non-point source pollutants including hydrocarbons, toxic metals, salts, sediment and thermal pollution to the river. Roadways and other impervious cover associated with development closer to rivers and streams may more significantly impact water quality than development further away from rivers (Schiff & Benoit, 2007).

A December 2010 Special Report by the Cary Institute of Ecosystem Studies outlines ten methods to improve road salt application efficiency (Kelly, Findlay, Schlesinger, Menking, & Chatrchyan, 2010). Not only do the recommendations in this study provide for the most efficient use of road salt for environmental purposes, but also highlight the cost/benefit analysis of salt application efficiency. Unintended side effects of road salt include higher levels of salt ions in drinking water, infrastructure damage from the corrosive effects of salt on concrete and steelwork, and aquatic habitat quality degradation.

Road salt, when infiltrated into the ground as a stormwater management practice, can increase the sodium and chloride ion concentrations in groundwater. Groundwater is the dominant source of river baseflow during dry periods. Most inland aquatic organisms are not adapted to the increases in chloride ions that have been measured in surface water near areas treated with road salt. At a March 2014 conference on *Road Salt Use in Connecticut: Balancing Safety and Water Quality Statewide*, sponsored by the Center for Landuse Education and Research (CLEAR), many of the presenters showed evidence that the chloride ion concentration in groundwater has been increasing where salt is used for winter road deicing. In these same areas where river water conductivity was monitored during non-rainy periods, increases in conductivity in the rivers was noted. Long term impacts to aquatic life is not fully understood, and research on this issue continues.

The Connecticut Department of Transportation (CTDOT) has developed a Stormwater Management Plan “for the purpose of establishing, implementing and enforcing a stormwater management program to reduce the discharge of pollutants from the department’s highways, roadways, railways and facilities to the maximum extent practicable, to protect water quality, and to satisfy the appropriate requirements of the Clean Water Act.” (CTDOT, 2004) The focus of the plan is on areas identified as urbanized areas as a result of the 2000 US Census, but also provides for all interstate highways, salt storage areas and maintenance facilities regardless of location. There are no areas identified as urbanized areas within the Mount Hope River watershed. CTDOT maintains a salt storage facility along Route 89 in Ashford. This property abuts the Mount Hope River just upstream of the Ashford Fire Department.



Interstate Highway 84 at Morey Pond
Source: Connecticut Environmental Conditions Online

Approximately 0.7 miles of Interstate Route 84 cross the northern tip of the Mount Hope River watershed. Although the highway lane miles of this intersection is relatively small, the impacts to the watershed may be significant as this intersection occurs through Morey Pond in the sensitive headwater region of the watershed. The outfall from the Morey Pond dam is the start of the Mount Hope River. The water quality in Morey Pond was not assessed as part of this project.

Recommendations for State Roads and Interstate Highways

Best management practices for highway maintenance as presented in the CTDOT Stormwater Management Plan (SWMP) should be followed on all state roads in the watershed regardless of whether it is considered an urbanized area. There are six minimum control measures outlined in the CTDOT SWMP and several BMPs suggested under each of the minimum control measures.

The ten ways to improve [salt] application efficiency, as recommended in the 2010 Carey Institute of Ecosystem Studies special report on *Road Salt: Moving Toward the Solution*, should be implemented by the CT DOT if not already in place.

Water quality monitoring for conductivity of the Mount Hope River above and below the salt storage facility should be conducted periodically to determine if water quality in the river is being impacted by undetected leachate from the salt storage area.



Route 44 bridge over the Mount Hope River in Ashford

Bridge structures often have sheltered level areas favored by roosting and/or nesting birds. Bird droppings are not only a source of *E. coli* bacteria, but other pathogens that can negatively impact human health as well. Birds and other wildlife should be discouraged from roosting and/or nesting under bridges. State highway and local bridges over rivers and streams should be inspected to determine their potential to act as a wildlife area and retrofitted with deterrents if conditions warrant.

Future Development

Currently, development in the Mount Hope River watershed is limited to approximately 10% as determined by impervious cover indicators. Large parcels of undeveloped forested land and, to a lesser extent, agricultural land, are the dominant land cover types found in the watershed. However, the percentage of the permanently protected land in Ashford is less than 16%. In Mansfield, approximately 10% of the Mount Hope River watershed is permanently protected from development. The statewide goal for open space is 21% by 2023. Watershed land in a

public drinking water supply watershed area is important for enhancing and conserving water quality. Open space protection for the provision of potable water should have a high priority for protection from development. Many tools and strategies are available to ensure that any future development can be compatible with water quality goals of this drinking water supply area.

Recommendations for future development:

When developing future road networks, design the roadways to minimize impacts to water quality. Plan roadway networks to minimize stream and wetland crossings and to direct development away from critical watershed areas adjacent to rivers and streams.

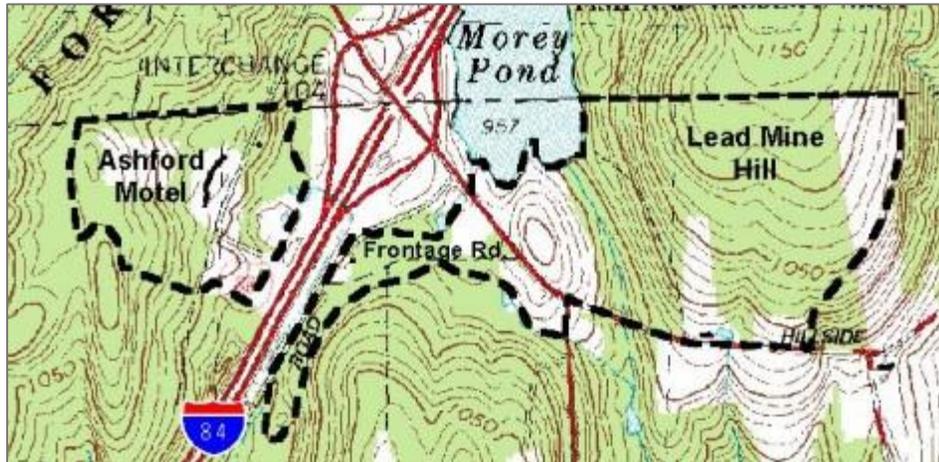
Working with partners established during the Natchaug River Basin Conservation Action Plan, complete the “Dashboard Manual of Best Management Practices for Road Maintenance and Construction Tasks”. This quick reference guide project was initiated as an outcome of the Natchaug River Basin Conservation Compact, but was never completed. References to the CTDOT SWMP and the Carey Institute 2010 Road Salt special report should be included in this document.

The General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities ("Construction General Permit") requires developers and builders to implement a Stormwater Pollution Control Plan to prevent the movement of sediments off construction sites into nearby water bodies and to address the impacts of stormwater discharges from a project after construction is complete. The Construction General Permit became effective on October 1, 2013. Land use commissions and their staff must assure compliance with the Permit requirements during pre-construction, construction and post-construction activities in the Mount Hope River watershed. The modified Construction General Permit, guidance documents, registration forms and instructions may be accessed on the CT DEEP website at http://www.ct.gov/deep/cwp/view.asp?a=2721&q=325702&deepNav_GID=1654.

Pursuant to the General Statutes of Connecticut Section 22a-39, the Department of Energy and Environmental Protection (DEEP) is charged with developing an annual comprehensive training program for inland wetlands agency members. This training is designed for new agency members and staff. The Comprehensive Training Program consists of an on-line course offered through a CCSU website platform. This interactive, multi-media, self-paced, on-line training course will teach participants the fundamentals of the Connecticut Inland Wetlands and Watercourses Act (CCSU, 2014). It is strongly recommended that all new agency members and staff complete the comprehensive training program. In addition to the three part training series, CT DEEP also has prepared an award winning video training series (CT DEEP, 2014) for Inland Wetlands and Watercourse officials. Inland wetland and watercourse commissioners should be encouraged to take advantage of available training to better understand the resources and regulations designed to protect these resources from degradation.

Future Development at Interstate Route 84 Exit 72 Interchange

In the Ashford 2005 Plan of Conservation and Development, a Special Planning Area has been described for the exit 72 interchange of Interstate 84 and the Hillside Road/Frontage Road.



Ashford Special Planning Area for Route 84 interchange.

Several different scenarios are described for the Lead Mine Hill area on page 28 of this document.

“The Lead Mine Hill section should serve as a rural gateway to Ashford. While development may be a challenge, this area provides an opportunity to locate a large commercial or industrial development. The overall scene should be preserved while allowing for planned development.

Objective viii: Support the establishment of selective large lot commercial or industrial development in the Lead Mine Hill section of the Interstate 84 SPA.

Action a. Designate zoning to allow for large scale commercial and industrial development.

Action b. Plan to preserve a significant portion of the open land between Route 89 and Morey Pond as open space.

Action c. Coordinate with Union to maximize mutual tax revenue while minimizing aesthetic, environmental, and other impacts. “

The Mount Hope River begins at the outlet of the Morey Pond dam. At this point, the river is a second order headwater stream. Headwater streams are highly influenced by surface runoff because they are too high up in the watershed to be strongly "fed" by base flow. Therefore, any development in an upper watershed area may have a greater effect on headwater streams, including the effects of increased stormwater volume and velocity, as well as the pollutants transported by the stormwater runoff. Headwater stream ecology is highly dependent on the condition of the riparian area, including vegetative cover and the amount of impervious cover in the surrounding area. Without careful consideration of stormwater controls, upland development can quickly degrade water quality in this area of the river.

Recommendations for Lead Mine Hill in Ashford:

Any future development in the Lead Mine Hill area should be carefully planned to reduce potential impacts to water quality in the Mount Hope River. The best land use in the riparian

area, especially those with slopes >15%, is dedicated open space. Upland development should employ low impact development strategies to manage stormwater runoff and reduce offsite impacts.

ECCD staff reviewed the draft Ashford Zoning Regulations prior to their review at a public hearing scheduled for March 10, 2014. Limited references to Low Impact Development or the inclusion of green infrastructure into long range planning strategies were present. Local Zoning and Subdivision regulations should be reviewed for compatibility with the 2004 Connecticut Storm Water Quality Manual and the 2011 Low Impact Development Appendix. If necessary, the Town of Ashford should consider hiring a qualified consultant to review their current zoning regulations and advise modifications to the regulations to be compatible with the DEEP guidelines.

Union Plan of Conservation and Development

In Union, CT, Route 84 intersects the upper end of Morey Pond just north of the Exit 72 interchange. A review of the Town of Union Zoning Map indicates the land along the northwest frontage of Route 84 in this area is zoned for commercial and industrial development. This area includes the shoreline of the western lobe of Morey Pond on the northwest side of Interstate 84.

Recommendations for Morey Pond shoreline:

Review Union Zoning Regulations for compatibility with the 2004 CT Storm Water Quality Manual and 2011 Low Impact Development Appendix. If necessary, the Town of Union should consider hiring a qualified consultant to review their current zoning regulations and advise modifications to the regulations for compatibility. Any development along the Morey Pond shoreline should minimize stormwater impacts to the pond.

General recommendation for Interstate 84 Exit 72 interchange

The Towns of Ashford and Union should work together, possibly through the Northeast Connecticut Council of Governments (NECCOG), to review their land use plans and policies in a coordinated, or inter-local approach relative to future development at the Exit 72 interchange and its potential impact on the Mount Hope River.

Open Space Planning

In 2006, the Mount Hope River in Mansfield and Ashford was designated a State of Connecticut Greenway as part of a natural resource conservation strategy.

The Ashford 2005 Plan of Conservation and Development acknowledges the limited protected open space along the primary river and stream corridors.

“Riparian land along many of the primary rivers and streams is less well protected than the drainage basins at large, despite the greater importance at preserving the riparian corridor for protection of in-stream habitat and water quality. A focus on

acquisition and regulation of riparian areas is recommended, particularly in the upper Mount Hope River.

The Mount Hope River watershed is comprised primarily of open land that provides area residents and visitors with an abundance of recreational opportunities, wildlife habitat, and a connection to the landscape. Large parcels within the Mount Hope watershed are held as open space by the State of Connecticut, land trusts, universities, camps, towns, and large landowners. The Nipmuck Trail, a state-designated greenway passes through the watershed.”

The Ashford Conservation Commission is currently in the process of updating the open space inventory and developing an open space plan for the Town of Ashford.

The Mansfield Open Space Committee developed an open space plan for the town including recommendations to “follow-up on the Natchaug Watershed Compact with outreach to landowners along the Fenton, Mt. Hope and Natchaug Rivers Greenways. Recommend a conservation project with other towns and Joshua’s Trust to provide information about land management and conservation options along riverfronts.”

Recommendations for open space planning:

Use available tools to conserve land in the critical riparian areas and flood plains of the Mount Hope River. These tools include:

- Education and outreach to property owners on the importance of critical watershed land conservation
- Conservation subdivisions to set aside critical watershed land along the Mount Hope River and its tributaries
- Partnering with land trusts to acquire easements or land donations along rivers and streams
- Establishment of a municipal open space fund for the purpose of purchasing critical watershed land along the river and its tributaries in Ashford, Mansfield and Union. The open space fund can be used as match funding for the CT DEEP Open Space and Watershed Land Acquisition Grant Program.

Area land trusts and municipal open space planning authorities should work together to develop a regional strategy that includes support for open space acquisitions along stream corridors.

Conclusion

The Mount Hope River is documented to have water quality impairment due to fecal contamination. The impairment has been demonstrated to be from a variety of sources linked to stormwater runoff. It will be important to systematically address the recommendations in this report and review the water quality conditions over time to measure the effectiveness of the remedial actions.

Despite the elevated bacterial concentrations in the Mount Hope River, the river provides high quality habitat for fish and macroinvertebrates. Several local watersheds have been identified as

having least disturbed status. Pollution prevention is much more cost effective than clean-up of pollution after the fact.

The future of water quality in the Mount Hope River will take a coordinated effort between the Towns of Union, Ashford and Mansfield. It is highly recommended that a tri-town Mount Hope River Task Force be formed. Students and school leaders involved with the Yale School of Forestry Quiet Corner Initiative have demonstrated an interest in water quality issues within the Mount Hope River and may be useful in leading and/or participating this effort. The potential issues have been identified in this report. The next steps will involve prioritization of the recommendations and assumption of leadership positions by organizations to follow up with the necessary education and outreach to area residents and businesses in the watershed and finally, implementation of those recommendations.

Appendices

Appendix A Estimated NPS Load Reductions for Best Management Practices Recommended in the Mount Hope River Implementation-based Watershed Planning and Developed Land BMP Matrix.

Appendix B Table of BMP Recommendations for the Mount Hope River

Works Cited

- Bellucci, C. M. (2009). *Physical, Chemical, and Biological Attributes of Least Disturbed Watersheds in Connecticut*. Hartford, CT: CT DEEP.
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Appendix A

Estimated NPS Load Reductions for Best Management Practices Recommended in the Mount Hope River Implementation-based Watershed Planning and Developed Land BMP Matrix

Rain Gardens/Bioretenention Basins

- 75% of phosphorus and nitrogen;
- 95% of metals
- 90% of organics, bacteria, and total suspended solids

Source: Metropolitan Area Planning Council in Boston, Massachusetts
<http://www.mapc.org/resources/low-impact-dev-toolkit/bioretenention-areas>

Riparian Buffers

Buffer Width	Buffer Type	Sediment			Nitrogen			Phosphorus		
		Input Conc.	Output Conc.	Reduction	Input Conc.	Output Conc.	Reduction	Input Conc.	Output Conc.	Reduction
Meters		--mg L--	--mg L--	%	--mg L--	--mg L--	%	--mg L--	--mg L--	%
4.61	Grass	7284	2841	61.0	14.11	13.55	4.0	11.30	8.09	28.5
9.21	Grass	7284	1852	74.6	14.11	10.91	22.7	11.30	8.56	24.2
19.02	Forest	6480	661	89.9	27.59	7.08	74.3	5.03	1.51	70.0
23.65	Grass/ Forest	7284	290	96.0	14.11	3.48	75.3	11.30	2.43	78.5
28.26	Grass/ Forest	7284	188	97.4	14.11	2.80	80.1	11.30	2.57	77.2

Source: Effects of different size riparian buffers on reductions of sediment and nutrients from field surface runoff (Lowrance et al., 1995)
<http://www.soil.ncsu.edu/publications/BMPs/buffers.html>

Other BMPs to reduce *E. coli* contamination on a watershed scale were not available.

Individual BMPs for *E. coli* load reductions will vary by slope, soil type, project scale and source of contamination.

Mount Hope River Implementation Based Watershed Planning and Developed Land BMP Matrix

Agricultural Source Remediation

Source of Contaminants	BMP Recommendation	Lead Agency	Priority	Estimated cost
Mixed livestock, 0 - 300 animal units	Develop Comprehensive Nutrient Management Plan	NRCS	Medium	\$7570/farm
Beef Cattle grazing area	Enhanced Riparian Buffer	Property Owners	Medium	\$500 - \$4500/acre
Horse enclosures near the river	Enhanced Riparian Buffer	Property Owners	Medium	\$500 - \$4500/acre
Horse enclosures near the river	Manure Plan Assistance	Property Owners	High	\$2000 per property
Horse manure storage areas	Implement BMPs to reduce NPS pollution	Property Owners	High	\$200 - \$2000/property plus labor
Llama grazing area	Manure Plan Assistance	Property Owners	High	\$2000 per property
Llama grazing area	Install covered manure storage area	Property Owners	High	\$2000 - 3000
Llama grazing area	Enhanced Riparian Buffer	Property Owners	Medium	\$500 - \$4500/acre
Insufficient Agricultural BMP Knowledge	Agriculture BMP Education and Outreach	USDA NRCS, Uconn Extension, ECCD, local Conservation and Agriculture Commissions	High	\$0.50/ brochure @ 1000 brochures

Residential Source Remediation

Source of Contaminants	BMP Recommendation	Lead Agency	Priority	Estimated cost
On-site Waste Water Treatment System	Septic system maintenance and BMPs; Education and Outreach (brochures or educational record keeping folders)	EHHD,NDDH	High	\$0.50 - \$3.00 per household
On-site Waste Water Treatment System	Install Water Conservation Fixtures to reduce hydraulic load impact	Property Owners	Low	\$200 - \$5000 per household
On-site Waste Water Treatment System	Mitigate onsite waste water disposal system issues in the Lake Chaffee area as ordered by CT DEEP	Property Owners	High	undetermined at this time
On-site Waste Water Treatment System	Develop system to require periodic pumpout and inspections	EHHD	Low	Start up costs high
On-site Waste Water Treatment System	Continue to maintain Housing Rehabilitation Revolving Loan Program to assist income eligible homeowners with septic tank repairs or replacements	Town Administration of Mansfield, Ashford, Union	High	Medium cost to staff program oversight
Stormwater runoff from residential properties; landowners with river frontage	Enhanced Riparian Buffer	Property Owners	Medium	\$500 - \$4500/acre
Stormwater runoff from residential properties	Decrease stormwater runoff with rain gardens, rain barrels, grassy swales and other infiltration practices	Property Owners	Low	\$5 - \$45/ square foot
Illicit discharge from outhouse	Investigate report of potential outhouse and if non-compliant with regulations, remediate	EHHD	High	Regulated activity to be funded by property owner
Stormwater runoff from residential properties	Education and outreach on stormwater Best Management Practices	ECCD, Conservation Commissions, Ashford Garden Club	Low	Low

Commercial Properties

Source of Contaminants	BMP Recommendation	Lead Agency	Priority	Estimated cost
NPS in road runoff at Perry Hill Estates	Retrofit stormwater system to be in compliance with CT PHC 19-13-B32, Sanitation of Watersheds	Perry Ridge Investors	High	\$8000/ tree filter
Onsite waste water disposal system at Perry Hill Estates	Remediate on-site waste water disposal system in accordance to recommendations of CT DEEP Subsurface Disposal and Agriculture Program in the Water Permitting and Enforcement Division	Perry Ridge Investors	High	Regulated activity to be funded by property owner
Pet waste at Perry Hill Estates	Install pet waste disposal bag dispenser	Perry Ridge Investors	Low	\$200
Stormwater runoff at Lake Briallee Campground	Conduct stormwater management review and implement high priority recommendations	Briallee Campground owner	Medium	\$1200 plus implementation costs
Commercial Properties in Warrenville section of Ashford	Conduct stormwater management review and impliment storm water best management practices for parking areas	Ashford Conservation Commission with assitance from ECCD	Medium	\$1200 per property

Wildlife Sources

Source of Contaminants	BMP Recommendation	Lead Agency	Priority	Estimated cost
Beaver dams near septic system areas	Prevent flooding of soils used to infiltrate waste water by managing nearby beaver activities	Private Land owners, licensed hunters	High	Low
Fecal material from native wildlife	Consider wildlife population management through licensed hunting and trapping as a wildlife management tool option	Land managers	Medium	Very low

Municipal Properties

Source of Contaminants	BMP Recommendation	Lead Agency	Priority	Estimated cost
Runoff from Ashford Town Hall lower parking area	Rain Garden	Town of Ashford, Ashford Garden Club	Low - medium	\$1000 - 2000
Runoff from Ashford Town Hall/adjoining property	Enhanced Riparian Buffer	Town of Ashford, Ashford Garden Club	Medium	\$500 - \$4500/acre
Pet waste at Town of Ashford, Ashford Park	Install pet waste disposal bag dispenser	Town of Ashford	Low	\$200
Pet waste at Town of Ashford, Pompey Hollow Park	Install pet waste disposal bag dispenser	Town of Ashford	Low	\$200
Pet waste at Town of Mansfield, Mount Hope Park	Install pet waste disposal bag dispenser	Town of Mansfield	Low	\$200
Eroded trail at Town of Mansfield, Mount Hope Park	Redirect eroded trail, replant river buffer with native vegetation to stabilize stream bank	Town of Mansfield	Low	\$3000 - 6000
Runoff from Ashford School	Install a demonstration rain garden project on the property and develop school curriculum to accompany project	Ashford CC, Ashford School staff	Medium	\$ 2000 -3000

State and Local Roadways

NPS in road runoff	Maintain storm drains, street sweeping, removal of dead animal carcasses	Local and state DPW	Medium	Per employee pay scale
NPS in road runoff	Complete dashboard manual for DPW drivers as initiated by the Natchaug CAP	ECCD, NEMO, DPW	Low	\$15,000 labor and materials
NPS in road runoff	Maintain compliance with CTDOT Stormwater Mangement Plan	CTDOT, Ashford, Mansfield, Union DPW staff	High	Per employee pay scale
NPS in road runoff	Implement the Ten Ways to Improve [salt] Application Efficiency as recommended by the Carey Institute	CTDOT, Ashford, Mansfield, Union DPW staff	High	Variable depending on mechanism

Future Development

Source of Contaminants	BMP Recommendation	Lead Agency	Priority	Estimated cost
Sediment and other NPS from Construction sites and new developed properties	Enforce CGS Public Act No. 06-53 Sanitation of Watersheds notification requirement	Local land use office	High	Low
Road runoff Route 84 Exit 72 Interchange, Union, CT	Ensure Commercial and Industrial Zone Development is compatible with 2004 CT Stormwater Quality Manual and 2011 Low Impact Development Appendix	Union Planning and Zoning Commission	High	Consultant fee \$100/hour
Road runoff Route 84 Exit 72 Interchange, Ashford, CT	Ensure Commercial Zone Development is compatible with 2004 CT Stormwater Quality Manual and 2011 Low Impact Development Appendix	Ashford Planning and Zoning Commission	High	consultant fee \$100/hour
General	Encourage new Inland Wetland and Watercourse Commission members to complete recommended training and for established members to take advantage of continuing education opportunities	local IWWC	High	free - low cost

Additional Recommendations

Ashford Open Space Plan	Use available tools to conserve land in the riparian areas of the Mount Hope River	Ashford Planning and Zoning Commission	High	Variable depending on mechanism
Mansfield Open Space Plan	Use available tools to conserve land in the riparian areas of the Mount Hope River	Mansfield Planning and Zoning Commission	High	Variable depending on mechanism
Union Open Space Plan	Use available tools to conserve land in the riparian areas of the Mount Hope River/Morey Pond area	Union Planning and Zoning Commission	High	Variable depending on mechanism
Regional Open Space Planning	Organize a regional meeting to discuss open space priorities and develop a regional plan for watershed protection through land preservation for the Mount Hope River	Towns of Union, Ashford, Mansfield and Yale School of Forestry Quiet Corner Initiative, Local Land Trusts, The Last Green Valley	Medium	Low

Initiate a tri-town Mount Hope River Task Force to prioritize and implement recommendations of this report	Organize a regional meeting to discuss the Mount Hope River Best Management Plan Matrix and develop priorities and assign leadership for follow up actions	Towns of Union, Ashford, Mansfield and Yale School of Forestry Quiet Corner Initiative	High	Low
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Sources Cited for BMP Cost Estimates

Comprehensive Nutrient Management Plan cost based on 2013 USDA NRCS rates
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Manure Plan Assistance cost based on ECCD estimate of 36 hours at \$56/hour.
Pond stormwater review cost based on ECCD estimate of 22 hours at \$56/hour