

Factsheet: Town of Bethlehem Water Quality

This document was created for each town that will be covered by the proposed Small Municipal Separate Storm Sewer System (MS4) General Permit. In addition to the 113 towns covered by the current MS4 permit, the new permit would add 8 new towns to this list as “Tier 1” MS4s. All other towns in the state (49 towns) are proposed to be designated as “Tier 2” MS4s with reduced requirements for compliance. What follows is information on how stormwater can affect water quality in streams, rivers and Long Island Sound. This factsheet is intended to help you interpret any stormwater monitoring results that you may have or may collect and assist you in compliance with the MS4 program.

Water Quality in Connecticut

Surface waters are important resources that support numerous uses, including water supply, recreation, fishing, shellfishing and sustaining aquatic life. Water quality conditions needed to support these uses are identified within the Connecticut Water Quality Standards (WQS). In order to protect and restore these uses, we need acceptable environmental conditions (physical, chemical and biological) to be present within surface waters.

To assess and track water quality conditions, CT DEEP conducts monitoring across the State. The data is synthesized into a biennial state water quality report called the Integrated Water Quality Report. Currently, specific water quality monitoring in the state encompasses about 50% of rivers, 47% of lakes, and 100% of estuary/coastline. In addition, CT DEEP may have information about certain land uses or discharges which could indicate a potential for water quality to be impacted, even if the waterbody has not been fully monitored and assessed.

To find more detailed information on water quality in your town, please see the Integrated Water Quality Report (IWQR) on the CT DEEP website at <http://www.ct.gov/dep/iwqr>. Information on water quality within your town is also presented on the maps included in this fact sheet.

Impacts of Impervious Cover on Water Quality

Impervious cover (IC) refers to hard surfaces across the landscape such as roads, sidewalks, parking lots and roofs. Studies have focused on the amount of hard surfaces to evaluate the impacts of stormwater runoff from these hard surfaces on water quality and found that IC affects both the quantity and quality of stormwater. IC forces rain to run off the land, carrying pollutants quickly and directly to lakes and streams instead of soaking into the ground and being filtered by the soil. For more information on impervious cover, please see the CT DEEP web page ([link](#)) and EPA’s web page ([EPA IC Link](#)).

In general, the higher the percentage of IC in a watershed, the poorer the surface water quality. Research in Connecticut strongly suggests that aquatic life will be harmed when the IC within a watershed exceeds 12%. Stormwater pollution from IC is a likely cause of impairment for these waterbodies.

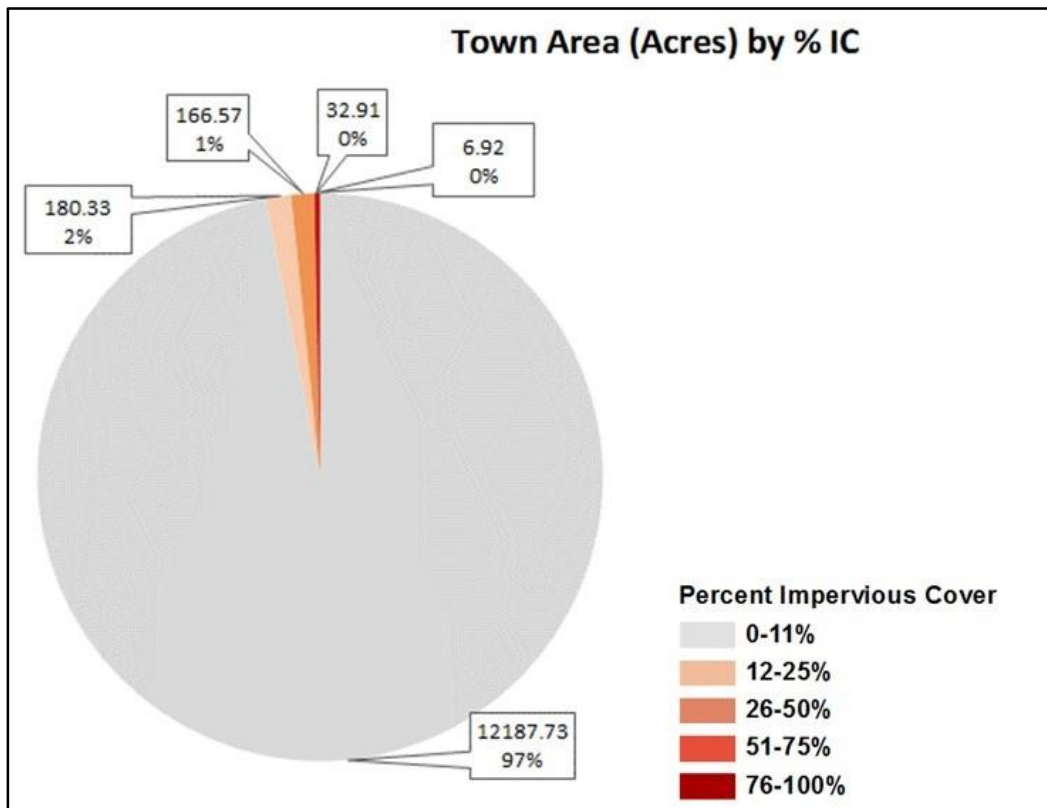
Town of Bethlehem: Impervious Cover Data

This chart shows the amount of area within your town that contains IC. Data is grouped by acres and percent IC. While all levels of IC can contribute stormwater to streams, it is important to note that land with IC greater than 12% in town is likely to be contributing enough stormwater to streams to have a negative impact on water quality.

Towns should aim to make stormwater improvements in areas with IC greater than 12% in an effort to reduce the amount of stormwater pollution reaching surface waters which will protect and improve water quality.

For more information on areas of impervious cover within your town, please see the maps at the end of this factsheet.

Amounts of Impervious Cover within the Town of Bethlehem



Pollution Reduction

Waterbodies often can handle a certain amount of pollutants and still maintain good water quality. However, impaired waterbodies have too much pollution impacting their water quality and therefore the streams do not support all uses for the waterbody. Total Maximum Daily Loads (TMDLs) are pollution reduction budgets developed for impaired waterbodies in order to meet water quality. If the pollution budget is achieved through the recommended pollution reduction measures, then the waterbody is expected to meet water quality. CT DEEP also supports impaired waters restoration through watershed based plans ([see link](#)) which provides more specific non-point source pollution control measures. The following TMDLs or pollution reduction strategies have been developed and apply to areas within your town.

TMDLs or Strategies Applicable to the Town of Bethlehem

Name of TMDL or Strategy	Pollutant	Waterbody Name	Link
A TMDL Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound	Nitrogen	Long Island Sound and contributing watersheds	http://www.ct.gov/deep/lib/deep/water/lis_water_quality/nitrogen_control_program/tmdl.pdf
Northeast Regional Mercury TMDL	Mercury	All CT Inland waters	http://www.ct.gov/deep/lib/deep/water/tmdl/tmdl_final/ne_hg_tmdl.pdf
Interim Phosphorus Reduction Strategy	Phosphorus	Certain CT Inland waters	http://www.ct.gov/deep/lib/deep/water/water_quality_standards/p/interimmgntphosstrat_042614.pdf
Statewide Bacteria TMDL	Bacteria	Weekeepeemee	http://www.ct.gov/deep/lib/deep/water/tmdl/statewidebacteria/weekeepeemeeriver6804.pdf

For more information on these TMDLs or strategies please go to our website <http://www.ct.gov/deep/tmdl> .

Stormwater Quality Monitoring

Although your town may not be required to monitor stormwater outfalls under the draft MS4 permit, regular monitoring for targeted pollutants in stormwater provides an indication of potential for water quality impacts and helps identify sources and unlawful discharges. Annual monitoring of twelve chemical parameters at 6 locations from different areas of town has been a requirement for towns covered by the current MS4 permit since 2004. CT DEEP uses that information to evaluate the quality of stormwater and the potential for impacts to surface waters as well as to

make sure that stormwater is managed properly. A few parameters currently monitored by MS4 towns are described below.

Bacteria

Escherichia coli (*E. coli*) is a bacteria that lives in the intestines of humans and other warm-blooded animals and is used to indicate the presence of fecal matter in surface waters. Some strains of *E. coli* and other pathogens found in fecal material cause serious illness in people coming in contact with it. For this reason, high amounts of bacteria will cause authorities to close beaches for swimming.

Bacteria is measured as the number of colony forming units, or CFU, per 100 ml of water. To support recreational uses of surface waters, the CT DEEP Water Quality Standards indicate that the average amount of *E. coli* found in a freshwater water body should be less than 126 CFU/100 mL and that a single sample tested for *E. coli* should be less than 235 CFU/100 mL at a designated swimming area and less than 410 CFU/100 mL in other areas. Monitoring for *E. coli* is currently required in the MS4 permit.

Enterococci is another bacteria used to indicate the presence of fecal material in salt water environments. For recreation in salt water the Water Quality Standards indicate that average amount of Enterococci should be less than 35 CFU/100 mL in a designated swimming area and that a single sample tested for Enterococci should be less than 104 CFU/100 mL and in all other areas less than 500 CFU/100 mL. These targets have been included in the statewide bacteria TMDLs. In the Draft MS4 permit, Tier 1 MS4s with *E. coli* results higher than 235 CFU/100 mL at a designated swimming area or greater than 410 CFU/100 mL in other areas requires a follow-up investigation. Individual stormwater sample results that exceed the applicable single sample maximum value for bacteria could impact water quality, so the associated outfalls should be evaluated for additional stormwater management.

Total Suspended Solids

Total Suspended Solids (TSS) is a measurement of the amount of solids (including sand and silt) found in the stormwater sample. High concentrations of TSS can lower water quality in the receiving stream by transporting various pollutants to the waterbody where they can directly affect aquatic life or affect aquatic life by absorbing light, reducing photosynthesis, and by making the water warmer. TSS can also clog fish gills and smother fish eggs and suffocate the organisms that fish eat. TSS comes from erosion and is found in agricultural, urban and industrial runoff. TSS can be reduced by protecting land from erosion and allowing stormwater time to settle before discharging to surface waters.

Currently, there is not a water quality based target for TSS in stormwater but TSS is a general indicator of water quality and, lower amounts of TSS are better. The average MS4 stormwater result reported for TSS by all towns covered by this permit is 48 mg/L. If future stormwater monitoring completed by your town finds areas that have elevated TSS, these may be places to consider additional stormwater management efforts.

Total Nitrogen

Nitrogen is an important nutrient in marine and estuarine waters such as Long Island Sound, as well as a concern in fresh water lakes and rivers. High amounts of nitrogen can lead to excessive growth of water plants and algae, which then reduces the amount of oxygen available to living things in these waters. Unlawful discharges, animal waste, failing septic systems, leaves, litter and fertilizers are common sources of high nitrogen in stormwater. Responsible use of fertilizers, maintaining septic systems and proper disposal of pet waste will help reduce nitrogen in stormwater.

The TMDL for Long Island Sound requires a 10% reduction of nitrogen in stormwater discharges to prevent low oxygen conditions in Long Island Sound. Each town should be working to reduce the amount of nitrogen in their stormwater to address this issue. Under the current draft MS4 permit, any Tier 1 MS4s with a result for total nitrogen greater than 2.5 mg/L will require a follow-up investigation. If you find areas within your town, which have elevated nitrogen, these locations may be places to consider additional stormwater management activities.

Total Phosphorus

Phosphorus is an important nutrient necessary for growth in plants and animals in freshwater. Too much phosphorus in the water can throw off the balance of aquatic ecosystems causing excessive growth of water plants and algae blooms, which reduces the amount of oxygen in the water potentially harming the fish. Sometimes these algae blooms can contain toxic forms of algae which are harmful to people and animals that come into contact with it. Sources of high phosphorus can be unlawful discharges, fertilizers, litter, leaves, erosion and animal waste.

CT DEEP is actively working with many towns to reduce the amount of phosphorus reaching Connecticut's streams and rivers. Under the current draft MS4 permit, any Tier 1 MS4 with a total phosphorus result greater than 0.3 mg/L will require a follow-up investigation. If you find areas of your town that have elevated levels of phosphorus in the stormwater, these locations are good places to develop additional stormwater controls.

Turbidity

Turbidity measures the clarity of the stormwater sample. It measures how much material (soil, algae, pollution, microbes etc.) is suspended in the sample. High turbidity lowers the water quality of a surface water by blocking sunlight for the plants and makes food harder for the fish to find and may be an indication of a higher amounts of other pollution in the water. Surface waters with high turbidity are visually less appealing for recreational use. High turbidity can be caused by erosion, failing septic systems, decaying plants or animals, and excessive algae growth. Turbidity is reported in Nephelometric Turbidity Units (NTU), which is related to how easily light passes through the water sample.

The Water Quality Standards have a criterion that indicates turbidity should not to exceed 5 NTU above ambient levels. In the draft MS4 permit, any Tier 1 MS4 with a turbidity result greater than 5 NTU over in-stream conditions will require a follow-up investigation. While there is not a fixed statewide criterion for turbidity, lower results are better for the health of the surface waters

in town. If you find areas within your town with higher levels of turbidity in stormwater, these would be good places to develop additional stormwater controls.

Town Maps

The following maps were created to show the impervious cover (IC) in your town as well as the water quality in the rivers, streams, lakes and estuaries in and around your town.

Impervious Cover on the Town Maps

IC is shown in red on the maps. Dark red areas indicate a higher percentage of IC, lighter red areas have less IC, while the grey areas indicate very little or no IC.

Water Quality on the Town Maps

Separate maps are provided for the different uses of the waterbodies such as Aquatic Life Uses, Recreation, and Shellfishing (in coastal towns). The waterbodies are colored to show the health of the waterbody. Green means that the waterbody meets the water quality requirements to fully support the specified use. Yellow means that water quality is poor and that the specified use is not met. Blue means that there is not enough information to know whether or not water quality is good or bad to support the specified use. Additionally, a small map is provided on the left side of each larger map to show which watersheds are within your town.

Waters Designated For Aquatic Life in the Town of Bethlehem

Percent Impervious Cover	Designated For Aquatic Life
0-11%	Fully Supporting
12-25%	Not Supporting
26-50%	Unassessed
51-75%	
76-100%	

Subregional Basins

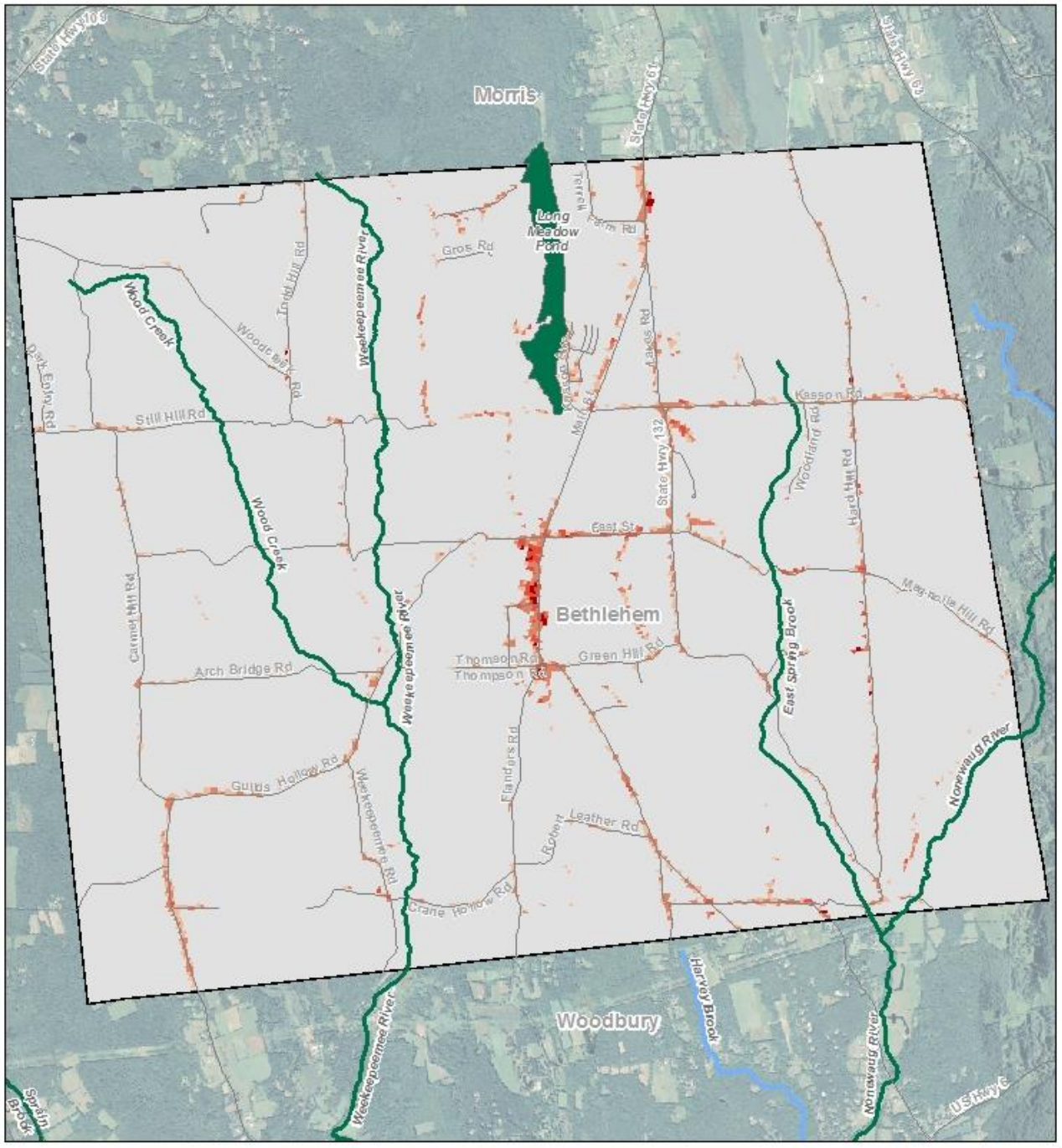
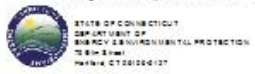


- Bantam River
- Shepaug River
- Branch Brook
- Sprain Brook
- East Spring Brook
- Weekkeepeemee River
- Nonewaug River

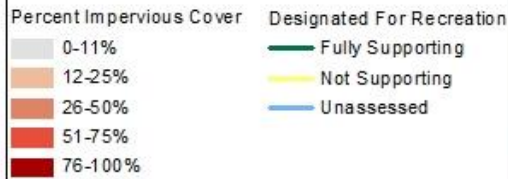


These maps were created using the National Land Cover Database (NLCD) 2011 Impervious Cover Percent Data. For more detail please review the metadata document.

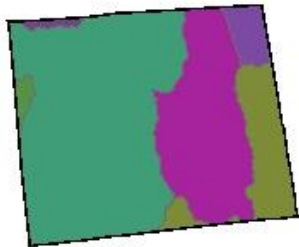
Impervious cover (IC) refers to hard surfaces across the landscape such as pavement or buildings. These hard surfaces do not absorb water and prevent rain from soaking in to the ground. As a result, runoff occurs and easily carries pollutants to nearby lakes and streams.



Waters Designated For Recreation in the Town of Bethlehem



Subregional Basins



- Bantam River
- Branch Brook
- East Spring Brook
- Nonewaug River
- Shepaug River
- Sprain Brook
- Weekepeemee River



0 0.475 0.95 Miles

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