TMDL Assewsment Summary

Unnamed Tributary to the Androscoggin (near River Rd.)

Watershed Description

This **TMDL** assessment summary applies to a 1.85-mile unnamed tributary to the Androscoggin River, located in the City of Brunswick, Maine. The Unnamed Tributary begins in a wetland area between Old Portland Road (Route 1) and Route 295 in Brunswick. The stream flows south across Route 1, through a business park along Industrial Parkway and then continues in an easterly direction, roughly parallel to a busy commercial section of Route 1. Two smaller tributaries flow into the stream – one from the north and another from the south. The unnamed Tributary flows behind numerous businesses along Route 1 before crossing River Road and joining the Androscoggin River. The Unnamed Tributary watershed covers 749 acres in the City of Brunswick.

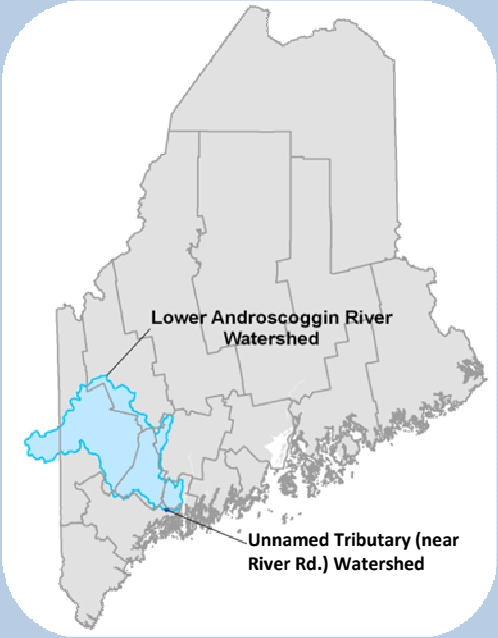
- Stormwater runoff from **impervious cover (IC)** is the largest source of pollution and stream channel alteration to the Unnamed Tributary. Stormwater falling on roads, roofs and parking lots in developed areas flows quickly off impervious surfaces, carrying dirt, oils, metals, and other pollutants, and sending high volumes of flow to the nearest section of the stream.
- A number of Route 1 storm drains, which are linked directly to the unnamed tributary, funnel runoff from roads and parking lots down to the stream.
- Exposed tree roots along the banks the Unnamed Tributary and an unstable streambank are signs of degraded habitat for life living in the stream.
- Wetland and woodlands in the north- and south-eastern part of the watershed absorb and filter stormwater

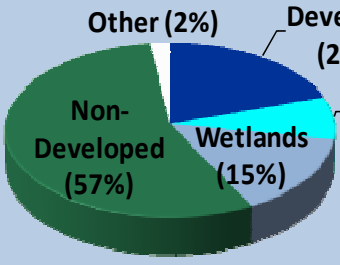
Definitions

- **TMDL** *is an acronym for* ***Total Maximum Daily Load****, representing the total amount of a pollutant that a water body can receive and still meet water quality standards.*
- **Impervious cover** *refers to landscape surfaces (e.g. roads, sidewalks, driveways, parking lots, and rooftops) that no longer absorb rain and may direct large volumes of stormwater runoff into the stream.*

Waterbody Facts

- **Segment ID:** ME0104000210_420R01
- **City:** Brunswick, ME
- **County:** Cumberland
- **Impaired Segment Length:** 1.85 miles
- **Classification:** Class B
- **Direct Watershed:** 1.17 mi² (749 acres)
- **Watershed Impervious Cover:** 23%
- **Major Drainage Basin:** Lower Androscoggin River





Watershed Land Uses

pollutants, and help protect water quality in the stream.

Why is a TMDL Assessment Needed?

The Unnamed Tributary to the Androscoggin River (near River Road) a Class B freshwater stream, has been assessed by DEP as not meeting water quality standards for aquatic life use, and has been listed on the 303(d) list of impaired waters. The Clean Water Act requires that all 303(d)-listed waters undergo a TMDL assessment that describes the impairments and establishes a target to guide the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

Unnamed Tributary downstream of River Road (Station 641). *(Photo: FB Environmental)*

The impervious cover TMDL assessment for the Unnamed Tributary addresses the water quality impairments to aquatic life use (based on stream habitat and benthic macroinvertebrate assessments). These impairments are associated with a variety of pollutants in urban stormwater as well as erosion, habitat loss and unstable stream banks caused by excessive amounts of runoff.

Sampling Results & Pollutant Sources

Sampling Station	Sample Date	Statutory Class	Model Results
S-641	8/29/2002	B	NA
S-641	8/13/2008	B	NA

DEP makes aquatic life use determinations using a statistical model that incorporates 30 variables of data collected from rivers and streams, including the richness and abundance of streambed organisms, to determine the probability of a sample meeting Class A, B, or C conditions. Biologists use the model results and supporting information to determine if samples comply with standards of the class assigned to the stream or river (Davies and Tsomides, 2002).

The stream's impairment is based on stream habitat assessments. DEP also collected benthic-macroinvertebrate data in 2006 and 2008 at a sampling station downstream of River Road (S-641) (Maine DEP, 2010b). Data collected at this station indicates Class B the Unnamed Tributary is "non attaining" (NA), meaning it does not meet Class A, B, or C conditions.

***8% IC** represents an approximate **65% reduction** in stormwater runoff volume and associated pollutants when compared to existing pollutant loads.*

Impervious Cover Analysis

Increasing the percentage of impervious cover (%IC) in a watershed is linked to decreasing stream health (CWP, 2003). Because the Unnamed Tributary's impairment is not caused by a single pollutant, %IC is used for this TMDL to represent the mix of pollutants and other impacts associated with excessive stormwater runoff. The Unnamed Tributary watershed has an impervious surface area of **23%** (Figure 1). DEP has found that in order to support Class B aquatic life use, the Unnamed Tributary watershed may require the

Impervious Cover GIS Calculations

The Impervious Cover Calculations are based on analysis of GIS coverage's presented in Figure 1. The impervious area is derived from 2007 1 meter satellite imagery and the watershed boundary is an estimation based on contours and digital elevation models.

characteristics of a watershed with **8%** impervious cover. This WLA & LA target is intended to guide the application of Best Management Practices (BMP) and Low Impact Development (LID) techniques to reduce the *impact* of impervious surfaces. Ultimate success of the TMDL will be the stream's compliance with Maine's water quality criteria for aquatic life.

Next Steps

Because Unnamed Tributary to the Androscoggin River (near River Road) is an impaired water, specific sources of stormwater runoff in the watershed should be considered during the development of a watershed management plan to:

- Encourage greater citizen involvement (through the Androscoggin River Watershed Council) to ensure the long term protection of the Unnamed Tributary;
- Address existing stormwater problems in the Unnamed Tributary watershed by installing structural and applying non-structural best management practices (BMPs); and
- Prevent future degradation of the Unnamed Tributary through the development and/or strengthening of local stormwater control ordinances.

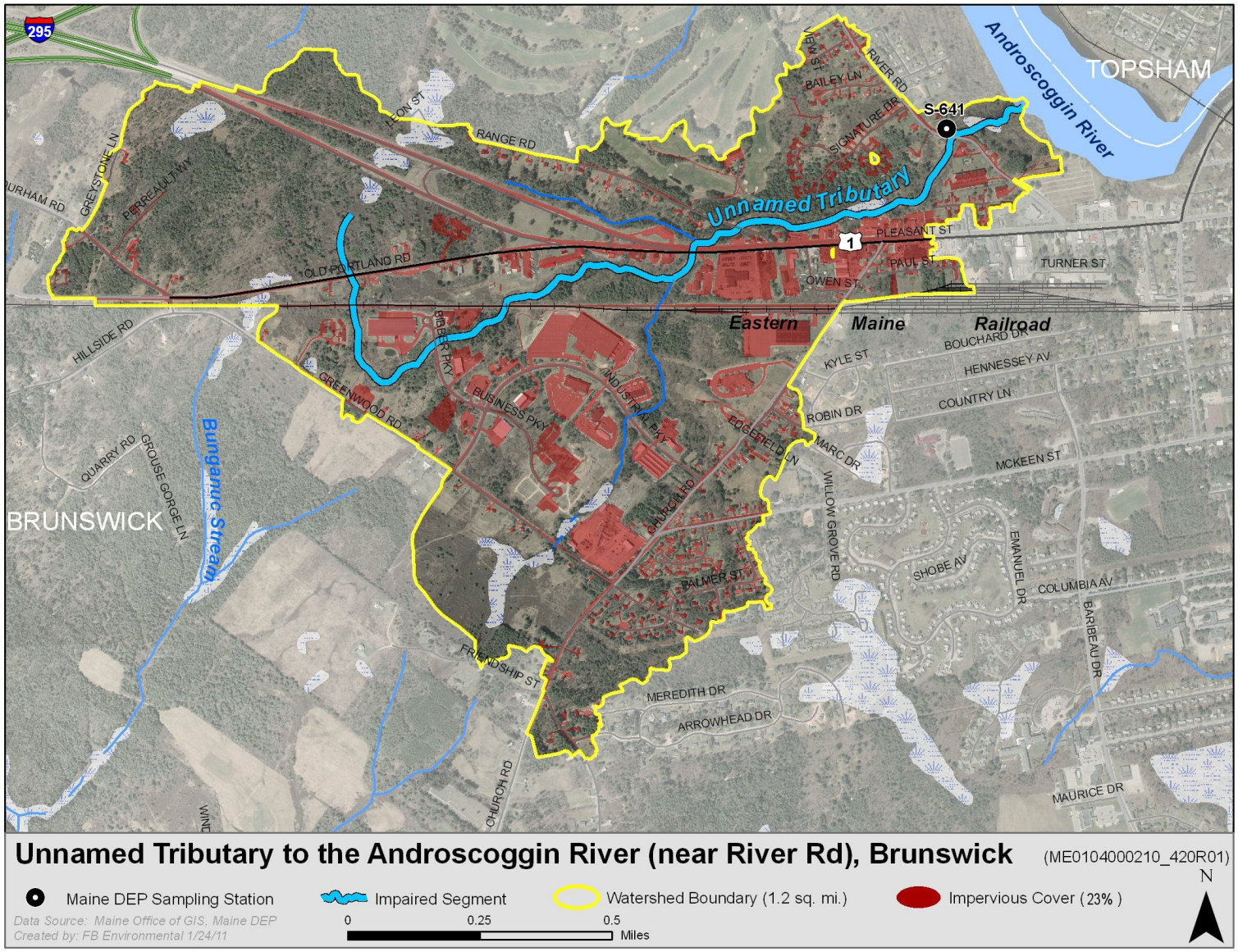


Figure 1: *Map of Unnamed Tributary to the Androscoggin River (near River Road) watershed impervious cover.*

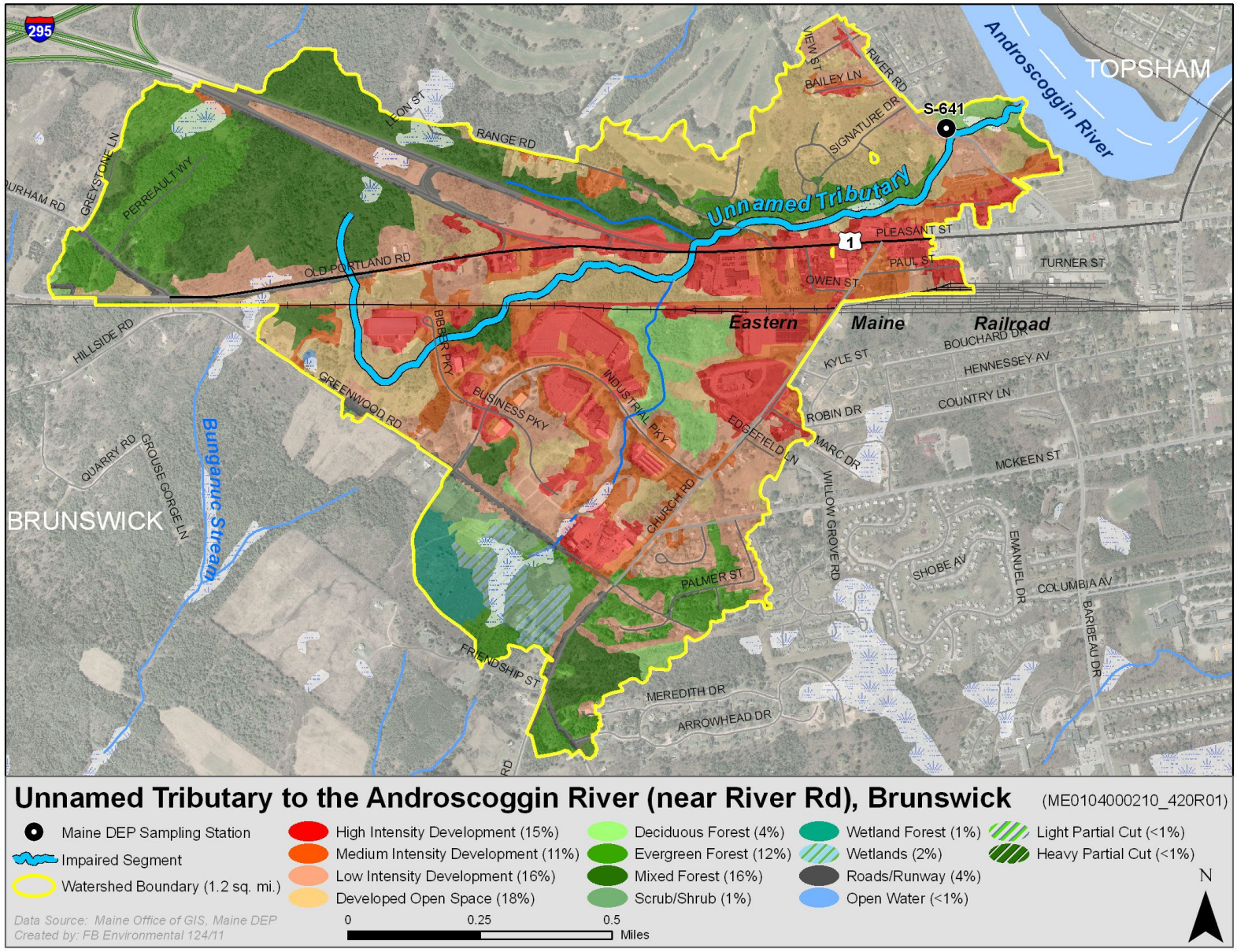


Figure 2: *Map of Unnamed Tributary to the Androscoggin River (near River Road) watershed land cover.*

Unnamed Tributary Watershed Reconnaissance Survey

A one-day reconnaissance survey of the Unnamed Tributary to the Androscoggin River (near River Road) watershed was conducted on October 15, 2010. As shown in Figure 2, the Unnamed Tributary originates in a wetland area north of Old Portland Road (Route 1) in Brunswick. The watershed is highly developed, with the majority of uses being commercial and industrial. The stream runs parallel to a busy commercial section of Route 1 in the northeastern portion of the watershed, and a smaller tributary to the stream flows through an area of industrial development in the central part of the watershed. The stream is exposed for the majority of its length, but includes some culverted road and railway crossings. The stream and its smaller tributaries appear to be directly connected to impervious cover in multiple locations.

The goal of the survey was to provide a list of preliminary locations for site-specific stormwater mitigation (e.g., structural and non-structural Best Management Practices (BMPs)) in the watershed. There are many locations in the Unnamed Tributary watershed where stormwater mitigation would be beneficial. Six potential stormwater mitigation sites have been selected and are described below to demonstrate the types of mitigation that may be appropriate in the watershed.

Locations of the potential stormwater mitigation sites identified during the reconnaissance survey are shown in Figure 4 below.

Figure 4: *Locations of potential stormwater mitigation sites in the Unnamed Tributary watershed.*

Site 1 – *Route 1 / McDonalds*

Site 1 is located behind the McDonalds building on Route 1. In this reach, the Unnamed Tributary flows parallel to Route 1. A steep slope behind the businesses along Route 1 leads down to the stream. At Site 1, two large culverts, stacked one above the other, emerge from the steep bank behind the McDonalds building. These culverts appear to be linked to a storm catchment that drains a portion of Route 1 and some of the nearby businesses. Where the culverts emerge from the embankment, slope failure and erosion has resulted in large amounts of soil entering the stream. At the time of the reconnaissance visit, heavily sediment-laden water was flowing under the culverts and directly to the stream in addition to stormwater flowing out of the culverts. Approximately 50 feet to the east of the culverts, a concrete sluiceway appears to drain the McDonald's parking lot. Runoff from the lot flows down the outfall and into the stream untreated.

Along this stream reach, similar steep slopes with embankment erosion were noted behind other businesses as well, in addition to trash and yard waste debris. Thus, this entire reach of river should be evaluated for potential mitigative BMP implementation. Several types of invasive species also grow thickly along the banks, including Japanese knotweed, Japanese barberry, multiflora rose, and bittersweet.

Figure 5: *Location of potential stormwater mitigation Site 1behind McDonalds on Rte 1.*

Types of stormwater mitigation that may be appropriate for this site include:

1. **Retrofit Reconnaissance Inventory (RRI).** An RRI survey of the commercial businesses draining to the outlet at this site would support characterization and reduction of excessive stormwater flow volumes reaching the stream from this location. This type of survey includes a rapid field assessment of potential stormwater storage and on-site retrofit sites in the area. Retrofits provide stormwater treatment in locations where practices previously did not exist or were ineffective, and include modification to existing stormwater practices or construction of new practices. Typical sites that may be investigated for possible retrofitting include culverts, storm drain outfalls, highway rights-of-way, open spaces, parking lots, and existing detention ponds.

2. **Rock rip-rap and native vegetation.** Stabilizing bare soil on the steep slopes surrounding the culverts at Site 6 with stone rip-rap and native vegetation would help to reduce impacts to water quality at the site. Riprap is a permanent, erosion-resistant ground cover constructed of large, loose, angular or rounded stone. Its purpose is protecting the soil surface from the erosive forces of concentrated runoff; to slow the velocity of concentrated runoff while enhancing the potential for infiltration; and to stabilize steep slopes. It should be used in combination with native vegetation plantings to shade the stone and protect against increasing stream temperature.

3. **Check dams.** A check dam is a small dam built across a minor channel, swale, or drainage ditch. Building check dams across the existing channel draining the McDonald's lot would help lower the speed of water flow during storm events and allow sediments and pollutants to settle.

4. **Plunge pool.** A plunge pool at the outfall of the concrete channel and/or culverts would help to dissipate the velocity of stormwater runoff and provide some pretreatment.

Site 1 Photos: *Storm drain on Route 1 that is linked to the culverts behind McDonalds (left; view of area draining to the storm drain (middle); stacked culverts behind McDonalds (right).*

Site 1 Photos, continued: *View from above of failed bank surrounding the culverts (upper left); sediment-laden water flows under culverts (upper right); sediment laden water entering stream (bottom left); concrete sluiceway draining McDonalds lot (bottom right).*

Site 2 – *Hancock Lumber, Church Road*

Site 2 is located at the Hancock Lumber property off of Church Road (Figure 6). The property is situated adjacent to the headwaters of the small stream that flows into the Unnamed Tributary, and consists of a main building and paved parking area in front and a large unpaved lot with several small outbuildings in back.

Two separate locations on the property were noted during the reconnaissance visit:

- **Site 2A:** On the northeastern side of the property, a large portion of the unpaved lot drains into a storm drain which outlets into the nearby stream. Because the soil around the drain is not stabilized, sediment and debris flow freely into the drain and the stream. Nearby, overland flow from the portions of the unpaved lot drains directly to the stream, which has little to no vegetated buffer to help filter sediment.
- **Site 2B:** On the northwestern side of the property, overland flow from the unpaved lot and roof runoff drains directly to the stream. Large pieces of trash were also noted in the stream nearby.

Figure 6: *Location of potential stormwater mitigation Site 2 at Hancock Lumber off Church Rd. Blue arrows indicate direction of direct flow to stream.*

Types of stormwater mitigation that may be appropriate for this site include:

1. **Stabilize bare soil.** Stabilizing bare soil in the unpaved lot and around the storm drain at Site 2A will greatly reduce impacts to water quality at the site. A coarse gravel surface material could be used to resurface the lot. With the high amounts of traffic at the site, regular maintenance is critically important.

2. **Redirect flow.** The unpaved lot could be regraded to direct stormwater flow away from the stream to a grassed swale, detention basin and/or rain garden.

3. **Vegetated buffers.** Plant to increase the buffer strip of native vegetation adjacent to the stream. Vegetated buffers slow stormwater runoff, provide an area where runoff can permeate the soil, contribute to ground water recharge, and filter sediment. Slowing runoff also helps to prevent soil erosion and streambank collapse.

4. **Redirect flow.** Stormwater flowing directly from roofs and unpaved parking lots should be redirected and hydrologically disconnected from the stream. This could be accomplished by regraded to direct stormwater flow away from the stream to a grassed swale or infiltration gallery.

Site 2A Photos: *A storm drain surrounded by unstabilized soil drains the unpaved lot, delivering sediment and debris to the stream (left). Portions of the unpaved lot drains through an unvegetated passage directly to the stream (right).*

Site 2B Photos: *Runoff from the unpaved lot and from nearby structure roofs drains to the stream (left). Sediment-laden water flows directly to the stream (right).*

Site 3 – *Industrial Parkway*

Site 3 is located on Industrial Parkway, just south of the property at 4 Industrial Parkway (Figure 7). As shown in the photographs below, a curb cut leads to a ~15 foot long metal half-culvert at this site. Runoff from the roadway and adjacent commercial building flows down the culvert and directly to a stream. The invasive Japanese knotweed was also noted at the site.

Figure 7: *Location of potential stormwater mitigation Site 3 near 4 Industrial Parkway.*

Types of stormwater mitigation that may be appropriate for this site include:

1. **Rock rip-rap and native vegetation.** Replacing the metal culvert at Site 3 with a channel of rock rip-rap interspersed with native vegetation would help to slow water flow and filter sediments. Riprap is a permanent, erosion-resistant ground cover constructed of large, loose, angular or rounded stone. Its purpose is protecting the soil surface from the erosive forces of concentrated runoff; to slow the velocity of concentrated runoff while enhancing the potential for infiltration; and to stabilize steep slopes. It should be used in combination with native vegetation plantings to shade the stone and protect against increasing stream temperature.

2. **Plunge pool.** A plunge pool at the channel outlet would allow the dissipation of energy filtration of sediment before water enters the stream.

Site 3 Photos: *Stormwater from Industrial Parkway drains to a road curb cut (left and middle) which leads to a metal half-culvert (right) that channels water to the stream.*

Site 4 – *LL Bean Warehouse, Industrial Parkway*

Figure 8: *Location of potential stormwater mitigation Site 4 at LL Bean off Industrial Pkwy.*

Site 4 is located at the LL Bean warehouse off Industrial Parkway in the central part of the watershed (Figure 8). The property is located adjacent to a small stream that flows into the Unnamed Tributary (Figure 8). Although much of the stormwater runoff from this property is directed to a stormwater detention pond, the existing treatment does not capture all of the stormwater on the property. Specifically, some of the stormwater drains to the northeast corner of the property. Here, stormwater flows across an area of bare soil and down an eroding channel that leads directly to the stream. Additionally, an uncovered dumpster was noted at the northeast corner of the building. Runoff from the dumpster was noticed nearby.

Types of stormwater mitigation that may be appropriate for this site include:

1. **Good housekeeping.** Implementation of aggressive street sweeping, catch basin cleanout and other good housekeeping measures in the parking lot will help reduce pollutant loads by removing materials from impervious surfaces prior to storm events. *The dumpster should also remain covered at all times.*
2. **Plant vegetation.** The area of bare soil in the northeast corner of the lot is a good location for a grassed swale or rain garden that would help capture and detain runoff. A rain garden is a planted depression that allows rainwater runoff from impervious urban areas like roofs, driveways, walkways, parking lots, and compacted lawn areas the opportunity to be absorbed. This reduces rain runoff by allowing stormwater to soak into the ground.
3. **Stabilize ditch.** The existing eroding ditch on the northeast corner of the property could be stabilized with vegetation or stone rip-rap to prevent further erosion.

Site 4 Photos: *An uncovered dumpster is located near the NE corner of the building (left). Stormwater flowing over ran area of bare soil (middle) leads to an eroding ditch (right) which flows directly to the stream.*

Site 5 – *Owens Corning Industrial Building, Bibber Parkway*

At Site 5, the Unnamed Tributary flows around the Owens Corning building off of Bibber Parkway (Figure 9). During rainstorms, large amounts of rainwater flow off the roof and pavement at the Owens Corning property. Most of this stormwater runoff is directed to treatment systems such as a large stormwater detention pond and rock-lined ditches. However, two locations on the property were noted as having either inadequate or non-existent stormwater treatment in place.

- **Site 5A:** On the back side of the Owen's Corning building, a large volume of water flows off the roof during rain storms. A rock lined swale on the back side of the building directs some of the flow to a stormwater detention pond. However, during the reconnaissance visit, it was noted that instead of being filtered through the rock swale, some of the rainwater pools nearby, creating an erosive channel that flows into the woods above the stream rather than flowing into the detention basin. This problem seems to be due to inadequate maintenance of the treatment system.
- **Site 5B:** On the front side of the building, flow from a building drainage pipe has created an eroding channel that flows down the driveway and eventually into a grass-lined ditch that is also eroding. Water from this ditch then flows past the Bibber Parkway pump station, and sediment-laden water flows directly to the stream.

Figure 9: *Locations of potential stormwater mitigation Sites 5A, 5B and 6 off of Bibber Parkway.*

Types of stormwater mitigation that may be appropriate for Site 5 include:

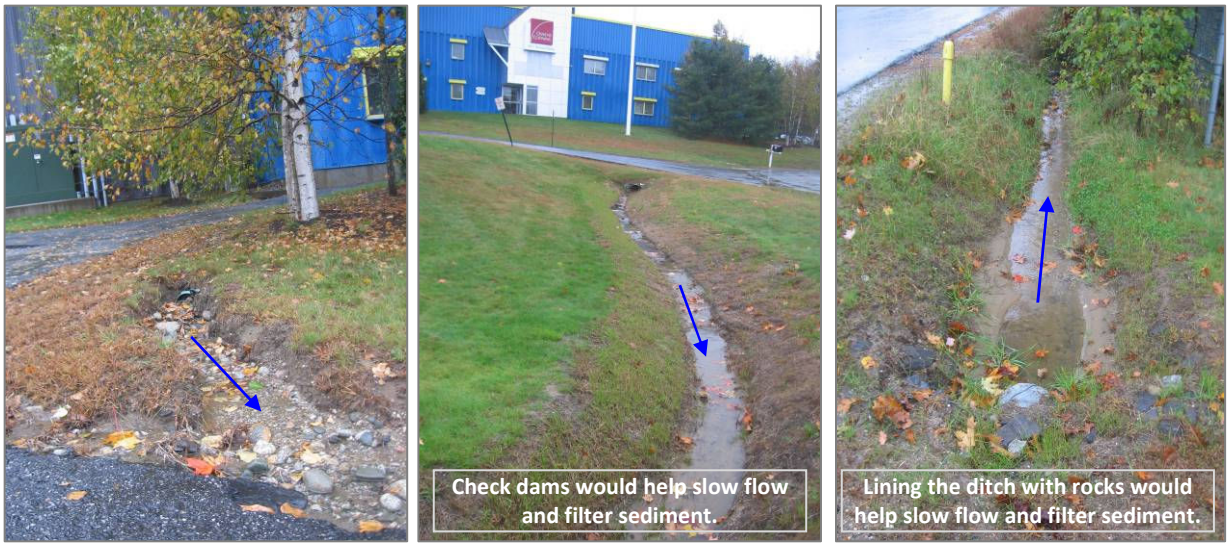
1. **Maintain and inspect existing BMPs regularly.** Properly conducted inspections and maintenance ensure that BMPs function properly and help prevent pollution discharges.

Infiltration systems in particular should be inspected several times in the first year of operation and at least annually thereafter. Conduct the inspections after large storms to check for surface ponding near the inlet that may indicate clogging (e.g. Site 5A).

Additionally, implementation of aggressive street weeping, catch basin cleanout and other good housekeeping measures in the driveway and parking lot will help to reduce pollutant loads by removing materials from impervious surfaces prior to storm events.

2. **Improve ditches.** At Site 5B, adding a rock-lined catch basin or plunge pool at the drainage pipe outlet and check dams to the grass swale would help slow and filter stormwater, thus reducing erosion issues. From the pump station down to the stream, lining the ditch with rock rip-rap would further reduce the chances of sediment-laden water reaching the stream.
3. **Redirect flow.** Stormwater flowing directly from roofs and parking lots should be redirected and hydrologically disconnected from the stream. This could be accomplished by regraded to direct stormwater flow away from the stream to a grassed swale, detention basin or rain garden.

Site 5A Photos: *Stormwater runoff pools behind the Owen's Corning building (left); water pools at the detention basin inlet (middle); excess runoff results in an eroding channel (right).*



Site 5B Photos: *Flow from the drainage pipe creates an eroding channel (left); the flow then leads to an eroding grass-lined swale (middle); runoff flows in a channel parallel to the road to the stream (right).*

Site 6 – *Ouellette Associates General Contractors, Bibber Parkway*

Site 6 is situated immediately downstream of Site 5 (Figure 10). From the Owens Corning property, the Unnamed Tributary flows under Bibber Parkway and past a property owned by Ouellette Associates (Figure 10). Behind the Ouellette office building, a large paved area is located adjacent to the stream. The steep slope leading from the paved area to the stream is stabilized with rock rip-rap. However, much of the runoff from the roof and paved appears to reach the stream untreated. Roof and paved-area runoff flows to a storm drain on the eastern corner of the property, which outlets from a culvert in the steep bank near the stream. Contracting equipment and machinery is stored uncovered on the paved area. This equipment and any associated pollutants would flow directly to the stream during rain events.

Site 6 Photos: *Runoff from paved surfaces (upper left) and the building rooftop (upper right) drains to a stormwater drain in the back corner of the property (bottom left). The drain outlets from a culvert adjacent to the stream (bottom right).*

Types of stormwater mitigation that may be appropriate for Site 6 include:

1. **Good housekeeping.** Implementation of aggressive street sweeping, catch basin cleanout and other good housekeeping measures in the parking lot adjacent to the stream will help reduce pollutant loads by removing materials from impervious surfaces prior to storm events.
2. **Covered storage.** Providing a covered storage area for machinery and supplies may reduce pollutants being washed into the stream via stormwater.
3. **Sediment basin.** There are many techniques available to capture and route the runoff to an appropriately designed discharge location. The goal of these systems is to reroute harmful stormwater flows to areas where water can infiltrate to groundwater or receive treatment prior to entering the stream. One option at Site 6 would be the installation of a sediment basin or plunge pool at the storm drain outlet to allow sediment to settle out before the runoff is discharged to the stream.
4. **Redirect flow.** Stormwater flowing directly from roofs and parking lots should be redirected and hydrologically disconnected from the stream. This could be accomplished by regraded to direct stormwater flow away from the stream to a grassed swale, infiltration gallery or rain garden.

References

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