Pleasant River Watershed Survey Report

Presumpscot River Watch

In partnership with:

Cumberland County Soil and Water Conservation District

& Maine Department of Environmental Protection

September 2009

Cumberland County Soil & Water Conservation District

Acknowledgements

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APPENDICES

1. Introduction

The Presumpscot River Watch (PRW) and its partners have identified the Pleasant River as the top emerging threat to the water quality of the Presumpscot River. PRW has been monitoring the Pleasant River's water quality for 18 years, and their data (collected under a MDEP and USEPA approved Quality Assurance Project Plan) show that since 1999 the Pleasant River has consistently failed to meet the class B standards for dissolved oxygen. One site in the upper portion of the River failed to meet the class B standards every year from 2000 through 2005. Data indicate that the Pleasant River has also suffered from an increasing rate of bacterial contamination, with *E coli* numbers repeatedly exceeding the class B standard in both dry and wet weather.

The signs of stress exhibited by the Pleasant River are likely the result of **nonpoint source pollution (NPS)** that flows into the River from its surrounding **watershed**. Increased development throughout the watershed is an anticipated source of this stress. A comprehensive survey of the watershed is the best way to identify and prioritize sources of pollution impacting the Pleasant River, in order to ensure future remediation.

Nonpoint Source (NPS) Pollution is polluted runoff that cannot be traced to a specific origin or starting point, but is transported by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human made pollutants, finally collecting in lakes, rivers, wetlands, coastal waters.

PRW has demonstrated a strong commitment to protecting the Presumpscot River and its tributaries. Four sites along the Pleasant River have been monitored since 1989, and there is currently one datasonde (continuous data logger) deployed in the River recording dissolved oxygen, temperature, pH, conductivity, and turbidity readings every 15 minutes from May 1st through October 1st. In addition to PRW's monitoring efforts MDEP also conducts biomonitoring along Pleasant River, Baker Brook, and Gray Meadow.

A **watershed** describes an area of land that contains a common set of streams and rivers that all drain into a single larger body of water, such as a larger river, lake or ocean.

In 2005, PRW was one of the Presumpscot River Watershed Coalition partner organizations to be awarded a Targeted Watershed Initiative Grant from the US Environmental Protection Agency. This $739,000 grant aims to restore the Presumpscot River by implementing on-the-ground fixes that reduce pollution, providing education and outreach to the watershed community, and increasing water quality monitoring efforts throughout the watershed. The findings in this watershed study will help continue the momentum built through the Targeted Watershed Initiative Grant by raising awareness of the needs of the Pleasant River and encouraging the watershed community to take an active role in its stewardship.

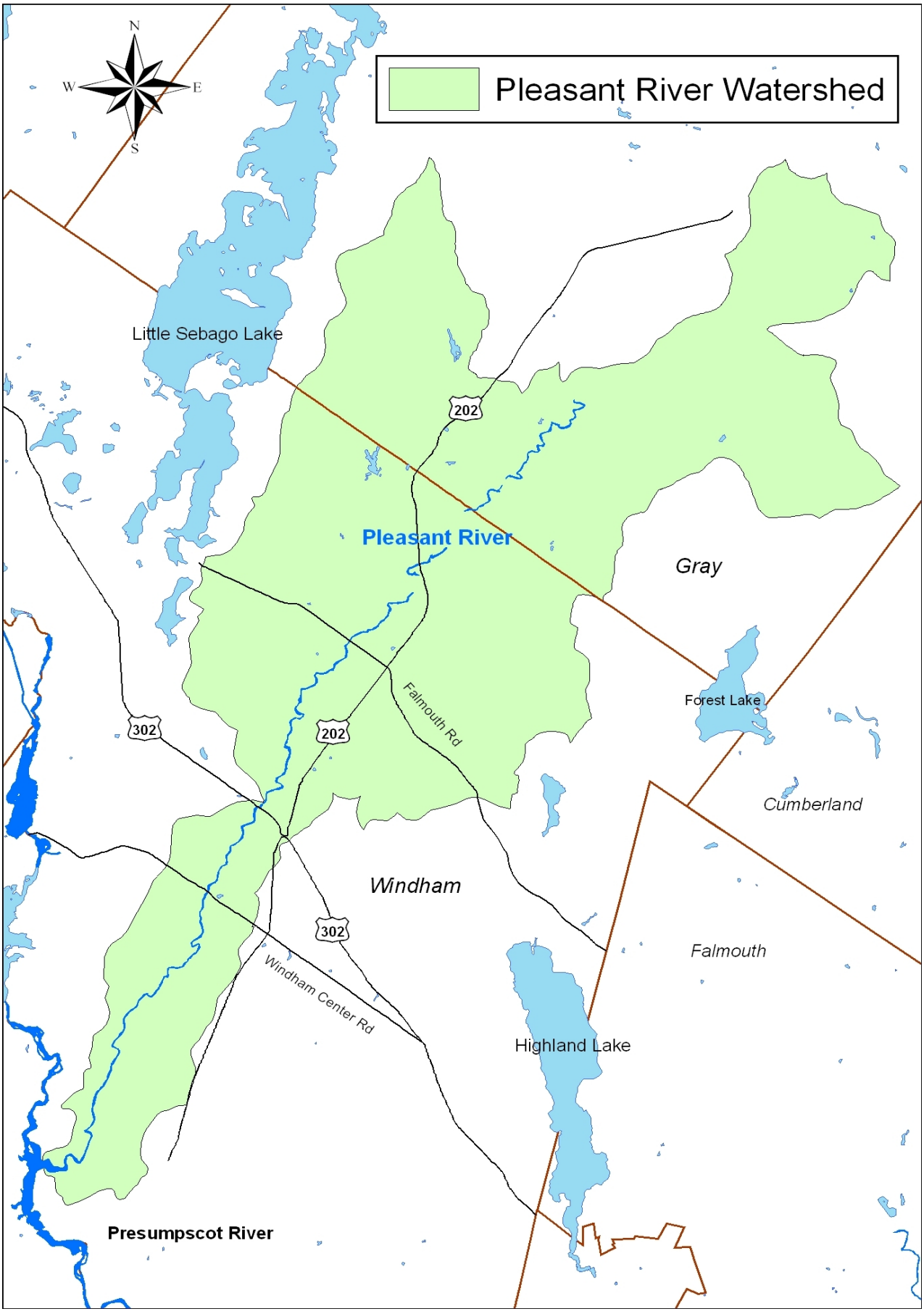


Figure 1: *Pleasant River Watershed Map*

2. Project Purpose

The purpose of this survey is to identify, document and prioritize polluted runoff sites in the Pleasant River Watershed and to recommend **Best Management Practices (BMPs)** that can be installed to mitigate problems at each of these sites. It is anticipated that implementation efforts to repair priority NPS problem sites will follow the survey. In addition to the traditional polluted runoff survey, staff and volunteers also participated in a rapid geomorphic/habitat survey of selected reaches of the river corridor to document baseline conditions and an intensive neighborhood source assessment/hotspot analysis of three medium density residential/commercial areas within the watershed. PRW's long-term goal for this watershed is to reduce pollutant loading to help protect and improve the water quality of the Pleasant River.

Best Management Practices (BMPs) are techniques used to reduce or prevent polluted runoff.

3. General Watershed Characteristics

The Pleasant River Watershed is a 29 square mile watershed located in the Towns of Gray and Windham in Cumberland County, Maine. The headwaters of the Pleasant River originate at both Gray Meadows and Thayer Brook in Gray. Many smaller tributaries and wetlands feed the Pleasant River, of those worth noting include: Wiggins Brook, Allen Bog, Baker Brook, and Ditch Brook which drains Collins Pond. Near River Road in South Windham, the Pleasant River joins the Presumpscot River, a Maine Department of Environmental Protection (MDEP) Nonpoint Source Priority Watershed river, which drains into Casco Bay. Likewise, MDEP has placed the Pleasant River on its Nonpoint Source Priority Watershed List due to high bacteria counts, its support of cold-water fishery, and its proximity to a densely populated area.

As Figure 2 indicates, the land cover in the watershed is dominated by forested land (68%). Agriculture is the next most prevalent land use (14%) followed by wetlands (4%), open space (4%), high intensity development (4%), low intensity development (3%), and medium intensity development (2%). There is considerable development pressure within the watershed, as the Towns of Windham and Gray are both experiencing rapid growth (14.5% and 15.5%, respectively, since 1990), and there continues to be new development throughout the watershed.

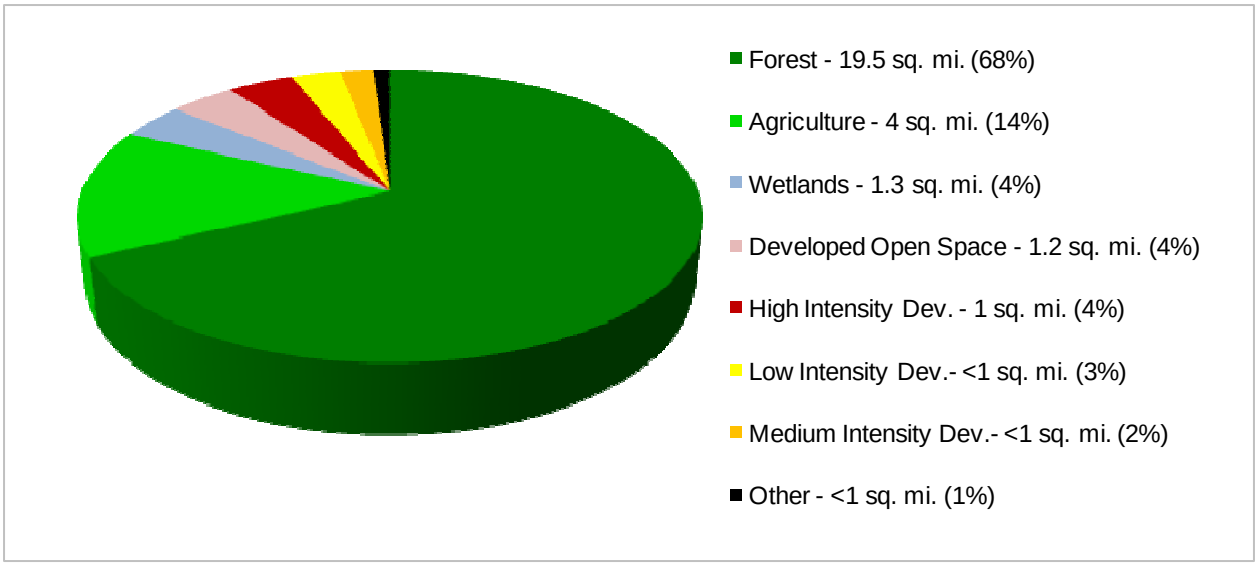


Figure 2: *Land Uses in the Pleasant River Watershed*

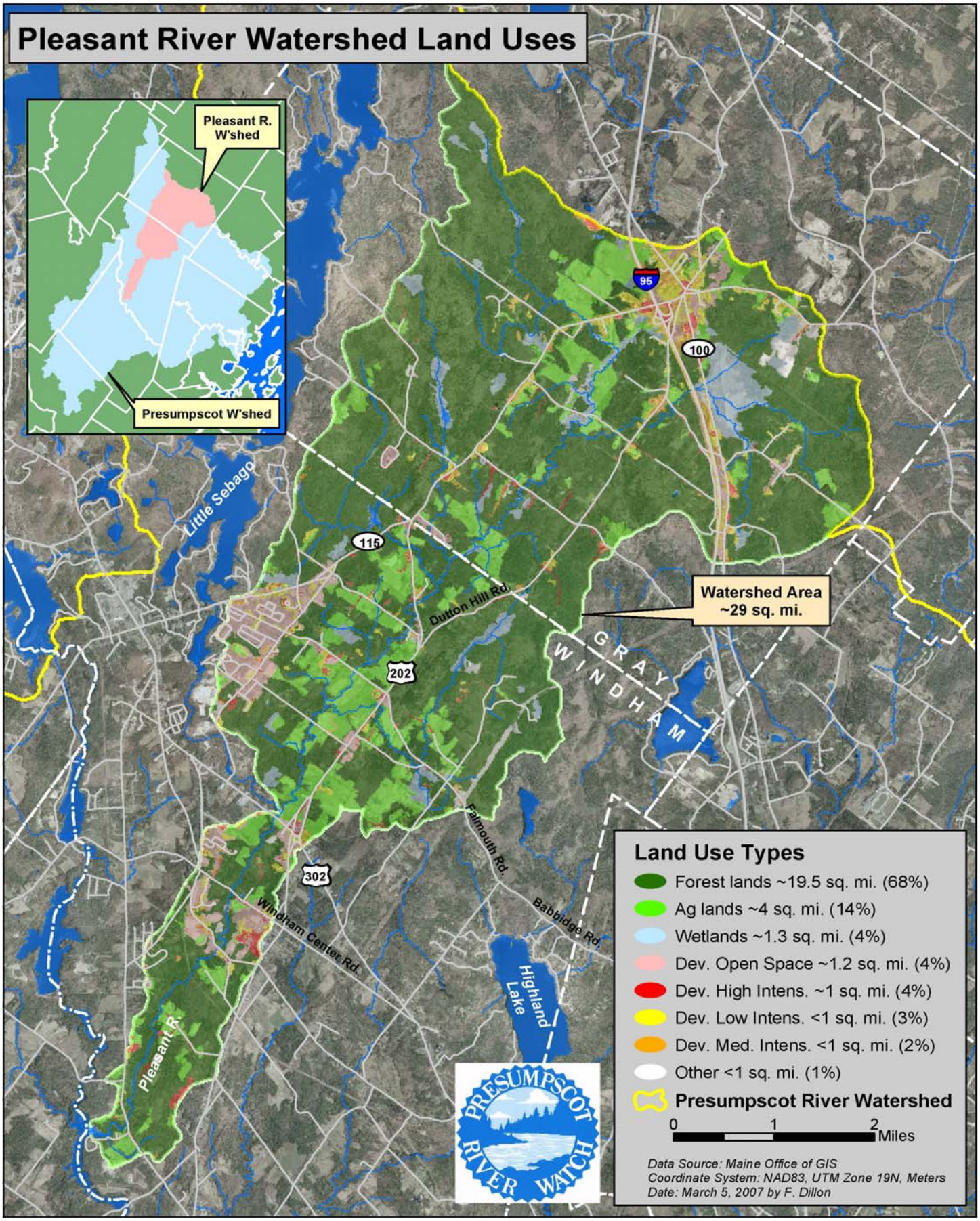


Figure 3: *Map of Pleasant River Watershed Land Uses*

4. Watershed Survey

4.1 Methodology

The entire Pleasant River watershed was surveyed through this project. Using land use and impervious cover GIS data, it was determined that only eight of the 29 square miles of the Pleasant River watershed required intense surveying. Other areas of the watershed were surveyed using a rapid method, which is described in Section 5 of this report. Survey methods were based on those outlined in the MDEP's publication, *A Citizen's Guide to Lake Watershed Surveys*, but were modified to address the anticipated NPS sources that are likely causes of the water quality problems such as excessive bacteria and low dissolved oxygen in the river. Volunteers were trained to rate the water quality impact of each site and to develop recommendations for fixing these sites. This information will serve as a preliminary guide for future implementation efforts.

Prior to the survey, landowners were notified of the survey through mailings, press releases in local newspapers, and through the Cumberland County Soil and Water Conservation District (CCSWCD) and Presumpscot River Watch (PRW) websites. A description of the project was provided and landowners were offered an opportunity to exclude their property from the survey. These outreach methods were also used to recruit survey volunteers. Outreach materials are included in Appendix A.

During the survey, the Pleasant River watershed was divided into 10 sectors (Figure 4 - following page) to provide an approximately equal number of potential NPS sites in each sector. (Areas shown in pink on Figure 4 indicate the 8 acres that required a more intensive survey method.) Binders containing maps and standardized watershed survey field sheets (Appendix B) were assembled for each sector.

On July 7, 2008, survey volunteers received two hours of classroom training on field survey techniques to identify various sources of polluted runoff. Survey teams then traveled throughout the watershed documenting polluted runoff sources using hand-held global positioning systems (GPS), cameras and the standardized field data sheets. To ensure accurate data collection, technical staff served as leaders for each survey team. In all, 95 polluted runoff sites were identified by the survey. Surveyors developed preliminary recommendations for the remediation of each identified site and ranked sites based the following criteria:

Survey volunteers documenting various polluted runoff sites during the Pleasant River NPS Survey.

1. Impact to surface water quality;
2. Technical level required to install recommended practices; and
3. Cost of material and labor required for recommended practices.

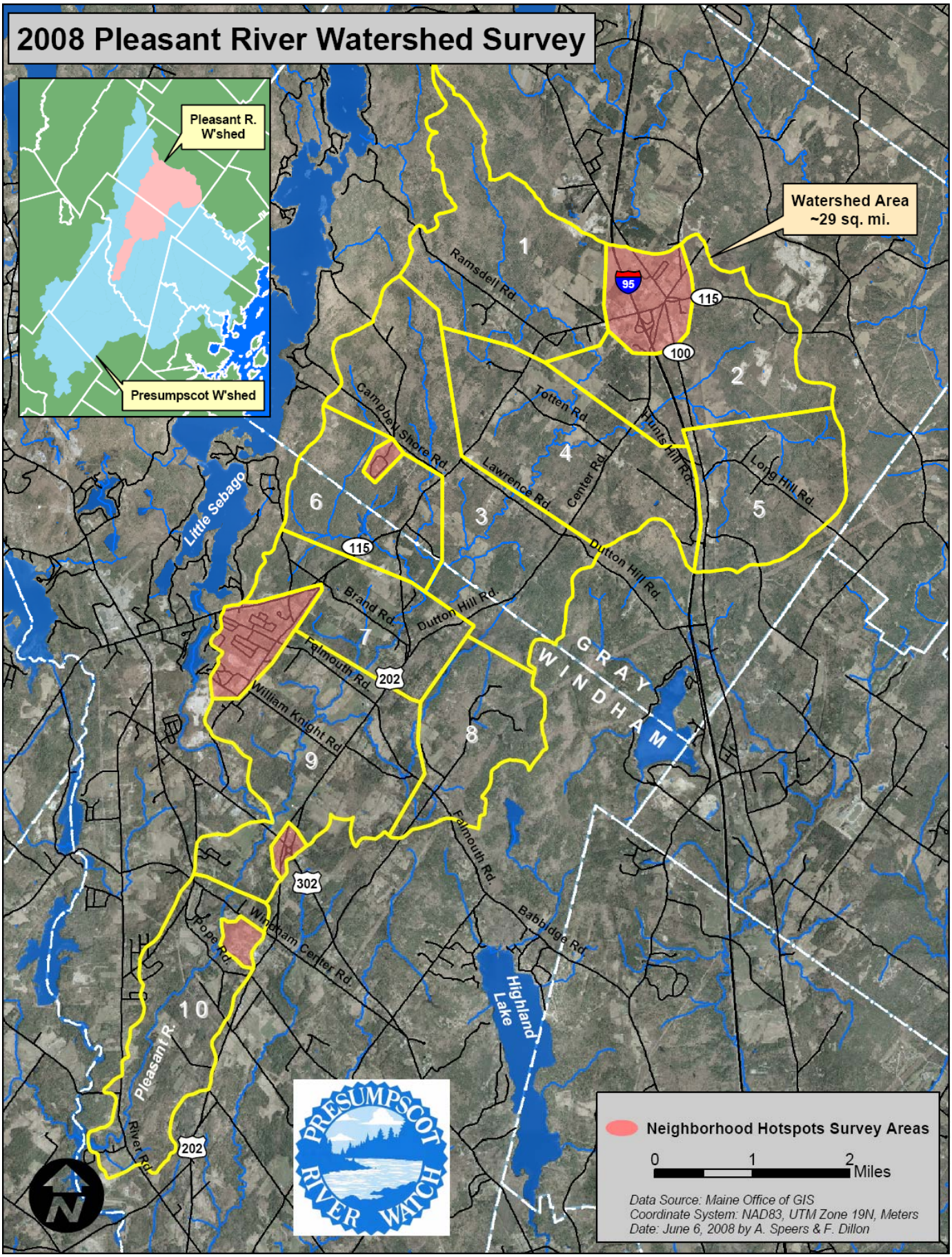


Figure 4: *Pleasant River Watershed Survey Sectors*

Project staff then used these criteria to develop an associated scoring system that roughly prioritizes problem sites. Scores were assigned as indicated in Table 1 and Table 2 provides an example of scoring for a hypothetical site. Thus, a problem site rated with a high impact to water quality and low Best Management Practice (BMP) technical level and installation cost was scored as a high priority since fixing it would result in the "biggest bang for the buck." Sites with lower scores (including those with high impacts that will be more expensive to remediate) are also worthy of consideration but should perhaps receive attention after the higher priority sites are addressed.

Table 1: *Range of possible scores for each NPS assessment category*

	Water Quality Impact	Technical Level to Install Recommended Practices	Cost of Materials and Labor
High	9	1	1
Medium	5	5	5
Low	1	9	9

For every site, each of the three assessment categories were given scores of 1, 5, or 9.

Table 2: *Example of NPS site prioritization scoring**

	Water Quality Impact	Technical Level to Install Recommended Practices	Cost of Materials and Labor
High	9		
Medium			
Low		9	9
		Total Score:	27

A site with a high WQ impact and low cost and technical level would result in the highest possible "score" of 27.

Technical staff conducted follow-up visits to all sites not assessed during the training. Follow-up was conducted in October and November of 2008. In addition, calculations of soil loss for all medium and high impact sites were made by project staff.

4.2 Survey Results

Observations for all 95 sites were transferred from the standardized field data sheets into a computer spreadsheet (Appendix C) and the physical locations were plotted on maps using GIS (Geographic Information Systems). The summarized results are as follows.

Land Uses

Most of the documented sites were associated with town roads, private roads and residential areas (35% town owned roads - 33 sites, 15% private roads - 14 sites, and 13% residential areas - 12 sites). The remaining sites were associated with a variety of other land use types (Figure 5 - following page).

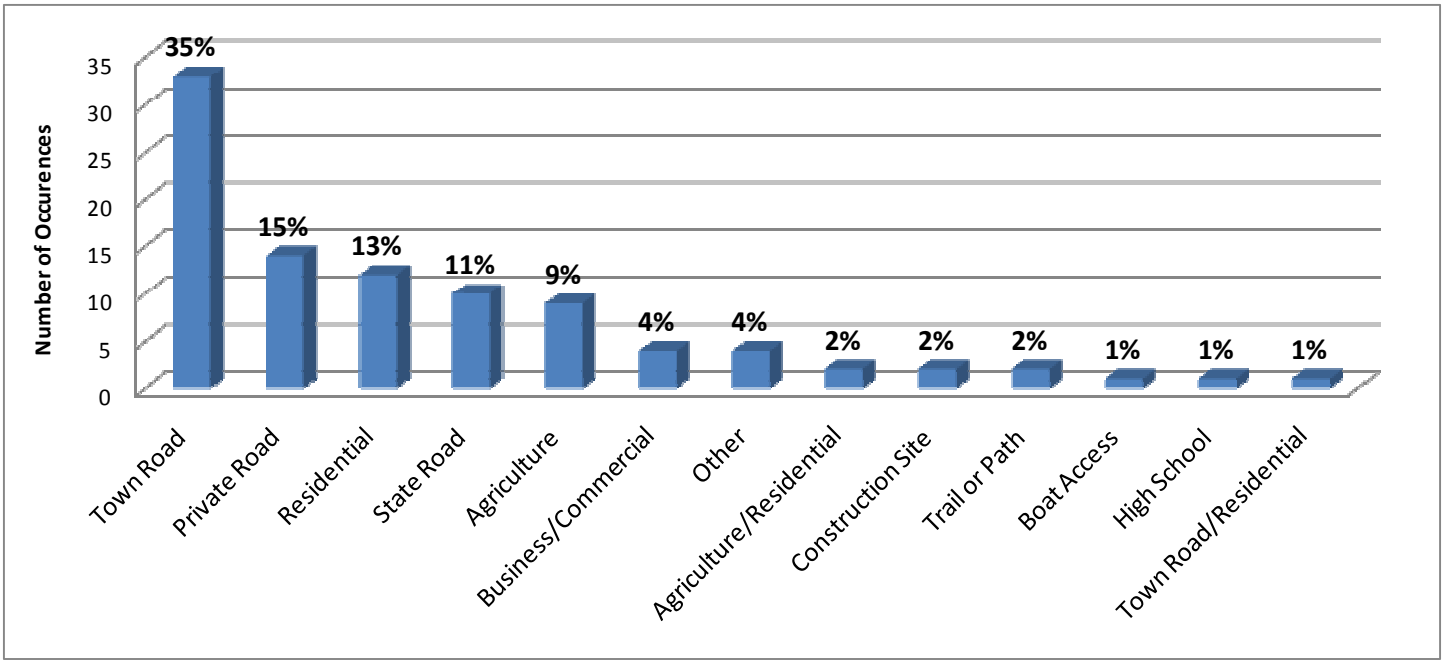


***Figure 5**: Observed land use types for polluted runoff sites in Pleasant River Watershed Survey*

Types of Problems Identified

Survey teams identified a variety of problem types (Figure 6). The most commonly observed problems were related to soil erosion (32%), which is the single largest pollutant source by volume to Maine's surface waters. Soil erosion can originate from a number of places, including unpaved roads and road shoulders, ATV trails and unstable stream banks to name just a few. Because the nutrient phosphorus is often attached to soil particles, erosion can result in algal blooms in surface waters. Additionally, as rainwater or melting snow flows across paved

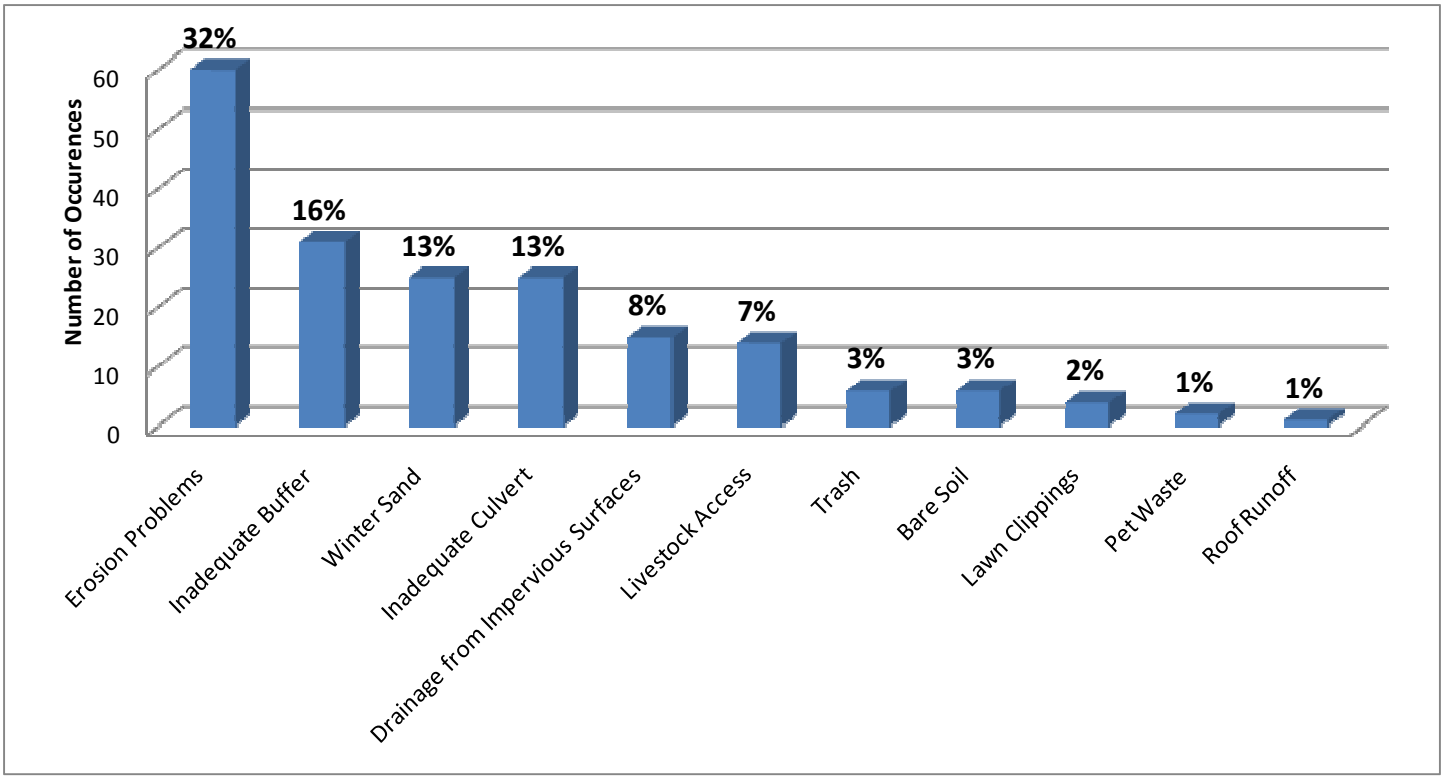


***Figure 6**: Frequency and percentage of polluted runoff problems by type*

or unpaved surfaces it can carry a variety of pollutant types into nearby streams. Pollutants can include oil and grease from roads and parking lots; pesticides and herbicides from lawns, gardens and playing fields; and bacteria and viruses from improperly handled animal waste or malfunctioning septic systems (see Appendix C for a more complete list).

Example of erosion on a road shoulder.

Example of an inadequate vegetated buffer along the stream bank.

The next most commonly observed problems were due to inadequate vegetated buffers (16%). Shoreline buffers are strips of vegetated land that are left in their "natural" state and are important because they stabilize soil and prevent or reduce other pollutants from entering a stream. Adequate vegetated buffers are needed to stabilize riparian soils. Lack of an adequate vegetated buffer increases and intensifies the effects of surface water runoff, which can scour and erode stream channels during peak or prolonged rain events. Additionally, shading is important because it allows for lower temperatures that more sensitive aquatic organisms need to survive.

Example of a hanging culvert.

Example of winter sand buildup.

After inadequate buffers, the most frequently observed problems were related to culverts (13%) and winter sand (13%). Culverts are underground pipes that convey water from one area to another, usually under a road or driveway. They are an important part of the storm water collection system because they can help alleviate roadway flooding and soil erosion. However, culverts can also be sources of polluted runoff if not properly designed,

installed and maintained by altering the water flow characteristics of stream channels and resulting in stream bank erosion. Winter sand - sand spread on roads during inclement winter weather - can wash into adjacent waterbodies and wetlands, resulting in excessive sediment buildup.

The remainder of observed polluted runoff problems included: drainage from impervious surfaces (8%), livestock access (7%), trash (3%), bare soil (3%), lawn clippings (2%), pet waste (1%), and roof runoff (1%).

Example of trash in stream.

Example of livestock access to stream.

Example of bare soil at a construction site.

Example of yard waste piled adjacent to shoreline.

Impact Ratings

Each site was rated for its potential impact to surface water quality. Impact ratings for each site were based on slope, soil type, amount of soil eroding, proximity to water or buffer, and buffer size:

- "Low" impact sites are those with limited soil transport off-site.
- At "medium" impact sites, sediment is transported off-site, but the erosion doesn't reach a high magnitude.

- "High" impact sites are large sites with significant erosion that flows directly into a stream or the lake.

Figure 7 summarizes the distribution of impact ratings among all survey sites. Most sites (43%) were rated as medium impact, followed by low impact sites at 38%.

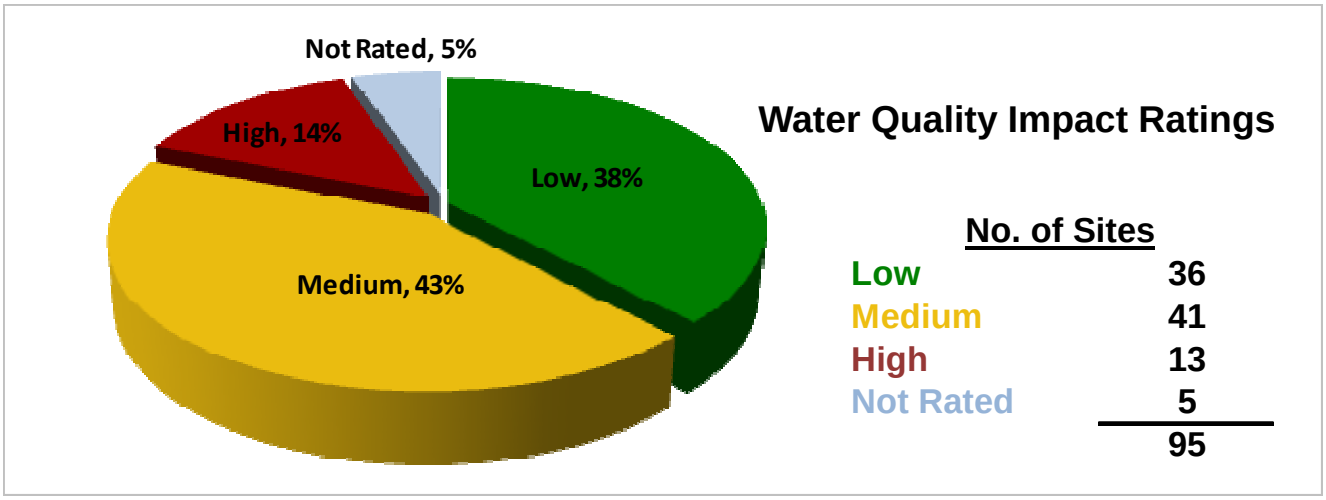


Figure 7: *Summary of water quality impact ratings for survey sites*

Technical Level Ratings

Each survey site was also rated based on the estimated technical level required to install recommended best management practices (BMPs).

- "Low" technical level sites are those where the property owner can accomplish the recommended practices with proper reference materials and/or technical advice.
- "Medium" technical level sites require a technical person to visit the site and make recommendations.
- "High" technical level sites require an engineered design.

Figure 8 summarizes the distribution of technical level ratings among all survey sites. Most sites were rated as medium impact (45%) or high impact (43%).

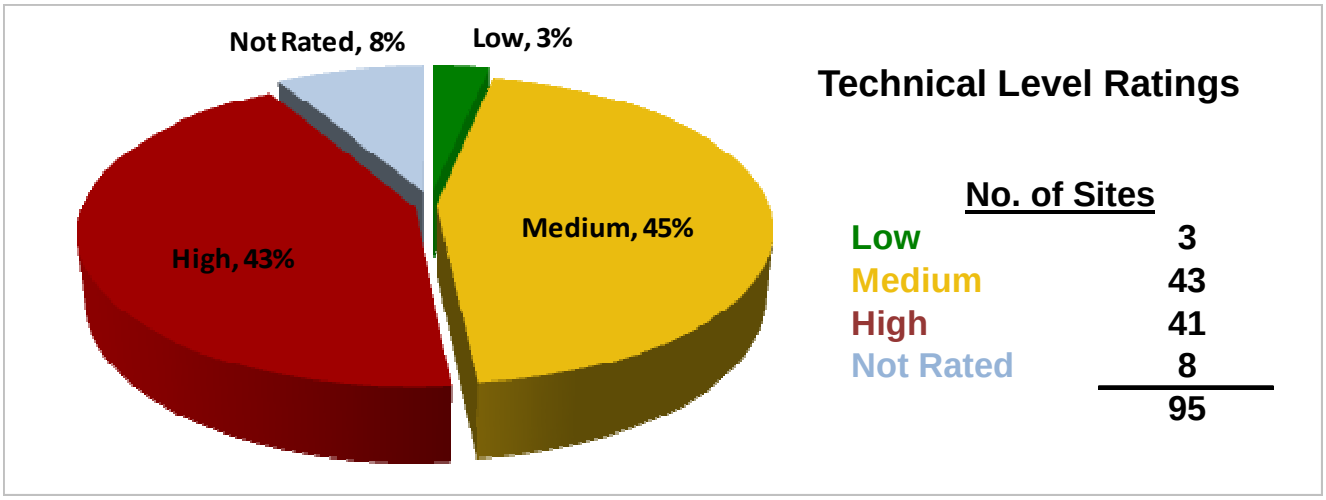


Figure 8: *Summary of technical level ratings for survey sites*

Cost Ratings

The associated cost of labor and materials required to install recommended best management practices were estimated for each survey site. Cost is an important factor in planning for restoration. The cost of labor and materials to fix each site was rated as follows:

- "Low" cost sites are estimated to cost less than $500.
- "Medium" rated sites are estimated to cost between $500 and $2,500.
- If the estimated cost to fix a site exceeds $2,500, a "high" rating is assigned.

Approximately 47% entail only a moderate cost. As shown below (Figure 9), 8% can be fixed inexpensively with low-cost materials.

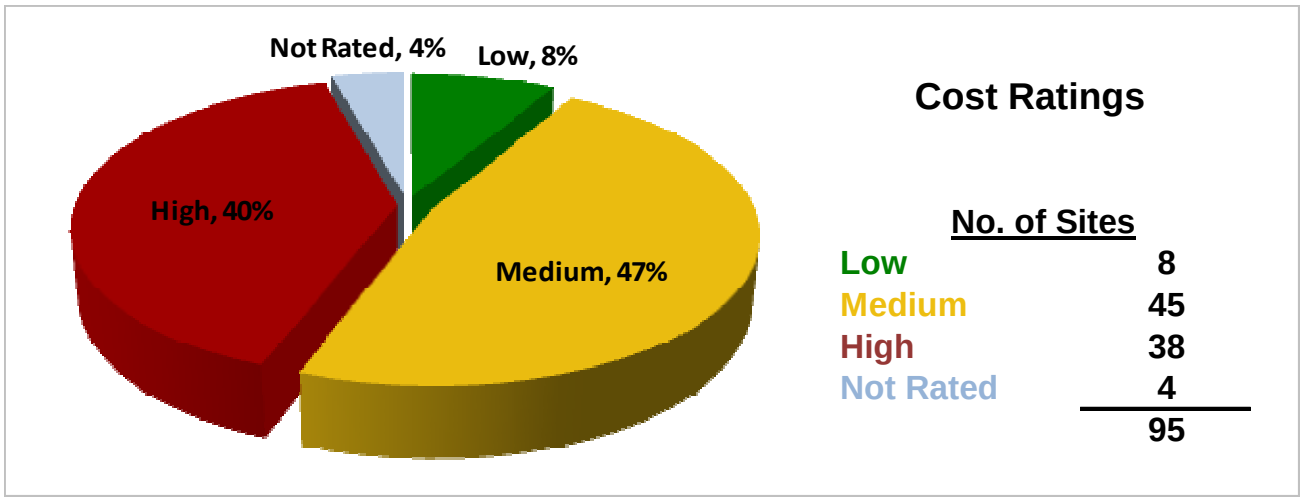


Figure 9: *Summary of cost ratings for survey sites*

Prioritization of Problem Sites

As discussed earlier, project staff developed a method to prioritize all sites that were rated for the 3 assessment categories: impact to surface water quality, level of technical assistance required, and BMP installation cost. These categories were combined so that relative "scores" could be established for each polluted runoff site. The scored values for all the sites ranged from 5 to 27. High, medium and low prioritization classes were established to assist in indentifying which sites should be considered first for remediation. High priority sites were assigned scores of 19 or 23; medium priority sites were assigned scores of 14 or 15; and lower priority sites were assigned scores of 5 or 11.

Over half (52%) of the sites were rated as high remediation priorities; 29% were rated as medium remediation priorities; and just under 15% were rated as lower remediation priorities. The remaining 4% of the sites were not rated and could not be prioritized for remediation. The prioritization scoring system employed here is intended to be used merely as a flexible guide for determining which sites to fix first. Therefore, sites that scored as low remediation priorities can certainly be considered for improvements sooner rather than later depending on the availability of resources and interest. Table 3 summarizes the results for all scored sites by landuse type. A map of prioritized sites is presented in Figure 10 on page 14. As illustrated below, the majority (36%) of high priority sites are along town roads, followed by residential sites (18%) and state and private roads (14% and 12%, respectively).

Table 3: *Summary of all scored sites by landuse type*

Landuse Type	High Priority	Medium Priority	Lower Priority	Not Rated	*Totals*
Agriculture	5	3	1	0	*9*
Agriculture/Residential	0	2	0	0	*2*
Boat Access	1	0	0	0	*1*
Business/Commercial	1	2	1	0	*4*
Construction Site	1	1	0	0	*2*
High School	1	0	0	0	*1*
Other	0	1	0	3	*4*
Private Road	6	5	3	0	*14*
Residential	8	4	0	0	*12*
State Road	7	1	2	0	*10*
Town Road	18	8	7	0	*33*
Trail or Path	0	1	0	1	*2*
Town Road/Residential	1	0	0	0	*1*
Totals	*49*	*28*	*14*	*4*	*95*
% Total	*52%*	*29%*	*15%*	*4%*	*100%*

Soil Loss Estimates

Soil that is transported to streams, lakes and rivers by the process of erosion is referred to as sediment. Sediment is easily transported after a rain event in roadside ditches, down storm drains, and into streams. Once in the stream or river, sediment can be harmful to aquatic organisms by burying them, smothering fish eggs, and even clogging fish gills. Eroded sediment carries phosphorus, a naturally occurring nutrient in Maine soils, which is also the key ingredient that stimulates algal growth in our waterbodies.

In the Pleasant River watershed soil erosion was the most frequently documented type of problem identified among the 95 NPS sites. Severe soil erosion occurred most frequently at or near unpaved and poorly maintained town and private roads, on trails and paths, and near structures such as bridges and culverts.

To estimate the amount of soil and associated phosphorus loads, resulting from erosion at some of the surveyed sites, Cumberland County SWCD staff calculated soil loss associated with high and medium impact soil erosion sites using the methods described in the publication *Pollutants Controlled Calculation and Documentation for Section 319 Watershed Training Manual* and the United States Forest Service's Forest Road Erosion Predictor. As Table 4 illustrates, just 23 of the high and medium impact sites together erode over 204 tons of soil per year, and over 191 lbs of soil each year.

Table 4: *Summary of soil loss and associated phosphorus loads at selected high and medium impact sites*

Site #	Soil Loss (tons/year)	Phosphorus (lbs/year)
1-1	**18.82**	**15.99**
1-2	**0.21**	**0.18**
1-8	**2.61**	**2.22**
1-4	**51.16**	**43.49**
1-6	**1.74**	**1.48**
1-7	**1.36**	**1.16**
2-1	**2.54**	**2.16**
3-1	**0.25**	**0.21**
3-8	**0.78**	**0.67**
4-2	**0.70**	**0.62**
4-3	**1.97**	**1.67**
4-4	**1.25**	**1.06**
5-2	**2.18**	**1.86**
5-3	**0.89**	**0.83**
5-6	**1.13**	**0.96**
5-8	**5.26**	**5.15**
5-11	**2.67**	**2.67**
5-12	**1.64**	**1.75**
7-3	**1.49**	**1.46**
7-4	**2.63**	**2.63**
9-2	**19.05**	**19.05**
9-4	**81.70**	**81.70**
9-8	**2.51**	**2.14**
	204.54	**191.10**

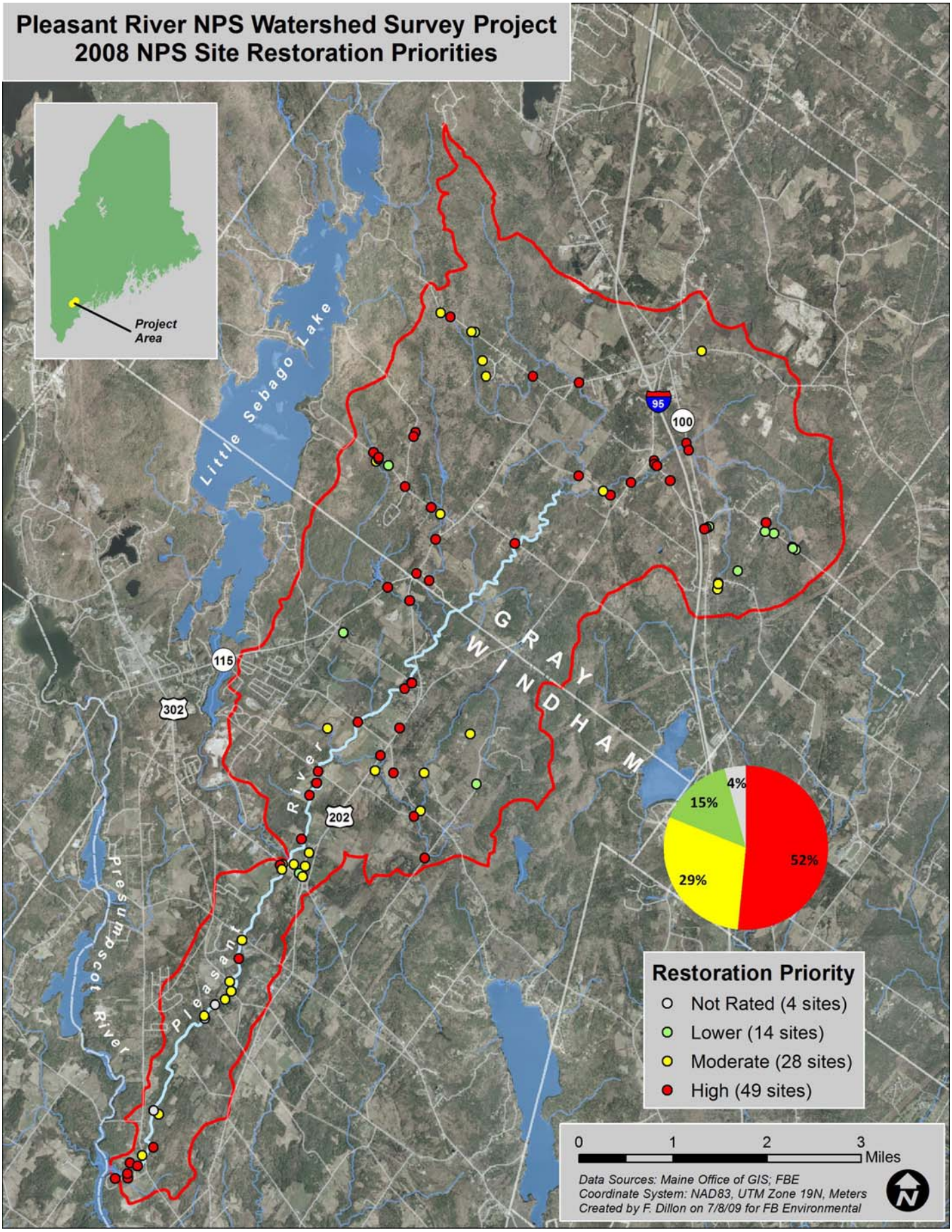


Figure 10: *Pleasant River NPS survey prioritized restoration sites*

4.3 Conclusions

The watershed survey results indicate that the Pleasant River is being adversely affected by adjacent land uses. Over 81% of the identified polluted runoff sites were rated as medium or high priorities for remediation (Table 3, page 13). While the majority of problem sites were related to roads and residential land uses, agricultural and commercial lands also figured prominently in contributing polluted runoff to the Pleasant River and its tributaries (Figure 5, page 8). Over 32% of the identified problem sites were erosion-related, with the next most common problem type being inadequate livestock access, followed by the remaining problem types (Figure 6, page 8).

High and medium priority sites occurred throughout the watershed (Figure 10, page 14). While the initial emphasis for remediating problem sites should focus on those with higher priorities, it will also be important to eventually consider the cumulative impacts of low priority sites.

4.4 Recommendations

Soil erosion is the most common cause of polluted runoff in the Pleasant River watershed, and has been documented in every type of land use - along roadways, shorelines, and on residential and agricultural properties. Remediating polluted runoff in the Pleasant River watershed will require a combination of Best Management Practices, or BMPs. BMPs are any structural or non-structural practice to treat, prevent or reduce water pollution. These practices can be as simple as revegetating bare soil and planting shrubs along the water front, to installing sediment detention basins to capture and filter sediments before they enter the water course. Often, a variety of BMPs may be needed to adequately treat NPS pollution. The following list provides examples of many different BMPs that can be applied to some of the more common NPS problems identified in the Pleasant River watershed survey (specific practices recommended for each site can be found in Appendix C):

Erosion on Roads and Driveways

- Add new surface material to stabilize roadways
- Install runoff diverters (e.g.) broad-based dip, rubber razor, waterbar
- Install ditch turnouts or diversion channels to send overland flows to stable areas
- Use Detention Basins at ditch turnouts to retain water between runoff events, and remove suspended sediments and adsorbed pollutants.
- Remove grader berms
- Remove excess winter sand
- Reshape/vegetate road shoulder
- Reshape or crown road to reduce water on surface
- Pave dirt roads
- Install permeable pavement to allow water infiltration in high traffic areas

Inadequate Vegetated Buffer and Bare Eroding Soil

- Establish Buffer to reduce direct flow to waterbody
- Extend Buffer to a minimum of 75’ on all streams, and 100’ on all lakes.
- Plant Trees and Shrubs and ground covers to stabilize soil and reduce runoff
- Seed bare soil with grass to provide temporary or permanent cover

- Mulch bare soil with straw, wood fiber or chips etc. over a seeded area to protect the bed from erosion and drying
- Use Sod transplants to stabilize erosion prone areas

Construction Site Erosion Controls

- Put up fences and signs to contain damage caused by heavy equipment
- Use Grading plans to minimize erosion
- Use filter strips and buffers to prevent runoff, and stabilize erosion prone slopes.
- Place soil piles where they will not erode into watercourse
- Seed and install effective erosion barriers (temporary BMPs) around spoil piles
- Stage projects to minimize area of exposed soil at any one time
- Select and protect trees to the maximum extent possible, prior to construction.
- Dewater with well points/ cofferdams and pumps to remove ground and surface water from a construction site to reduce scarring and erosion
- Install Filters of crushed stone, straw or geotextile to remove sediment from stormwater before it exits a construction site

Poorly Functioning Culverts

- Clean out culvert regularly to minimize blockage and backflow
- Enlarge, replace, or lengthen culvert to account for type of flow
- Install plunge pool to reduce downstream erosion
- Stabilize inlet/outlet with rock and vegetation to reduce erosion

Inadequate Ditches

- Install new ditches to capture runoff from roads
- Armor with stone to stabilize ditch and minimize erosion by runoff water
- Stabilize ditches with a grass to allow for concentrated flow without erosion
- Reshape ditches to minimize pitch and maximize storage
- Install turnout to convey water to reduce flow to waterbody
- Install check dams to reduce erosive flows in drainage ditches/allow revegetation

Direct Flow from Roof Runoff

- Install a stone-filled dripline trench to capture and infiltrate rainwater
- Install a drywell at gutter down spout to capture water and prevent overland flow

Unstable Shoreline/Beach Access

- Revegetate or terrace steep eroding slopes
- Eliminate raking to bare soil
- Establish a defined path for foot traffic
- Install steps to reduce erosion on steep foot paths

- Design winding paths to waterfront instead of straight paths
- Minimize path widths (must be less than 6')

A number of tasks must be completed before BMP implementation can begin. Table 5 summarizes a preliminary action plan for this process.

Table 5: *Preliminary action plan to remediate polluted runoff sites in the Pleasant River watershed*

TASK	WHO	WHEN
Present survey findings to Town officials and Presumpscot River Watershed Coalition	PRWC/CCSWCD	Winter/Spring 2010
Develop BMP designs for high and medium priority sites.	CCSWCD	Fall 2010
Continue to monitor health of the Pleasant River	PRW	Ongoing
Develop grant proposals from multiple funding sources to address high priority BMPs	CCSWCD/PRW	Spring 2011
Develop plan to address all medium and low priority sites in watershed	CCSWCD/PRW	Summer 2011
Implement BMPs	CCSWCD/PRW	2011-2013

5. Neighborhood Source Assessment and Hotspot Inventory

5.1 Methodology

This survey used methods described in the Center for Watershed Protection's Urban Subwatershed Restoration Manual Series, specifically Manual No. 11, titled *Unified Subwatershed and Site Reconnaissance (USSR)*. Project staff used the manual's protocols as a base but altered the survey parameters to ensure that the statistical information collected would be useful. These protocols are rapid field surveys that evaluate potential pollution sources and restoration opportunities within urban subwatersheds.

The **Neighborhood Source Assessment** (NSA) evaluates pollutant-producing behaviors in individual neighborhoods and assigns a pollutant severity index for screening purposes. The NSA rates neighborhoods for overall restoration potential and identifies specific restoration projects that include pollution prevention, structural retrofits, ordinance adjustments, and education. The NSA evaluates yard and lawn conditions, driveways, sidewalks and curbs, rooftop runoff and common areas.

An example of a parcel with little to no landscaping and high impervious cover.

The **Hotspot Site Investigation** (HSI) evaluates and documents vehicle operations and parking, storage of materials outside, turf management, waste management and stormwater infrastructure. The HSI results in the creation of an inventory of stormwater hotpots and rates the severity of the hotspots with regard to their potential to generate stormwater. The HSI process also suggests appropriate follow-up and feasibility for on-site stormwater retrofits. In preparation for the assessments, the Pleasant River Watershed was strategically divided (Figure 11 - page 19) into three different areas consisting of residential and commercial properties. Project staff utilized Geographic Information System (GIS) and analyzed aerial photographs to choose survey neighborhoods. Sectors were also determined based on local knowledge of known problem areas and development densities and road patterns. The survey was completed by an experienced technical team led by FB Environmental Associates, Inc.

The Neighborhood Source Assessment and Hotspot Site investigation field work was completed during August and September of 2009.

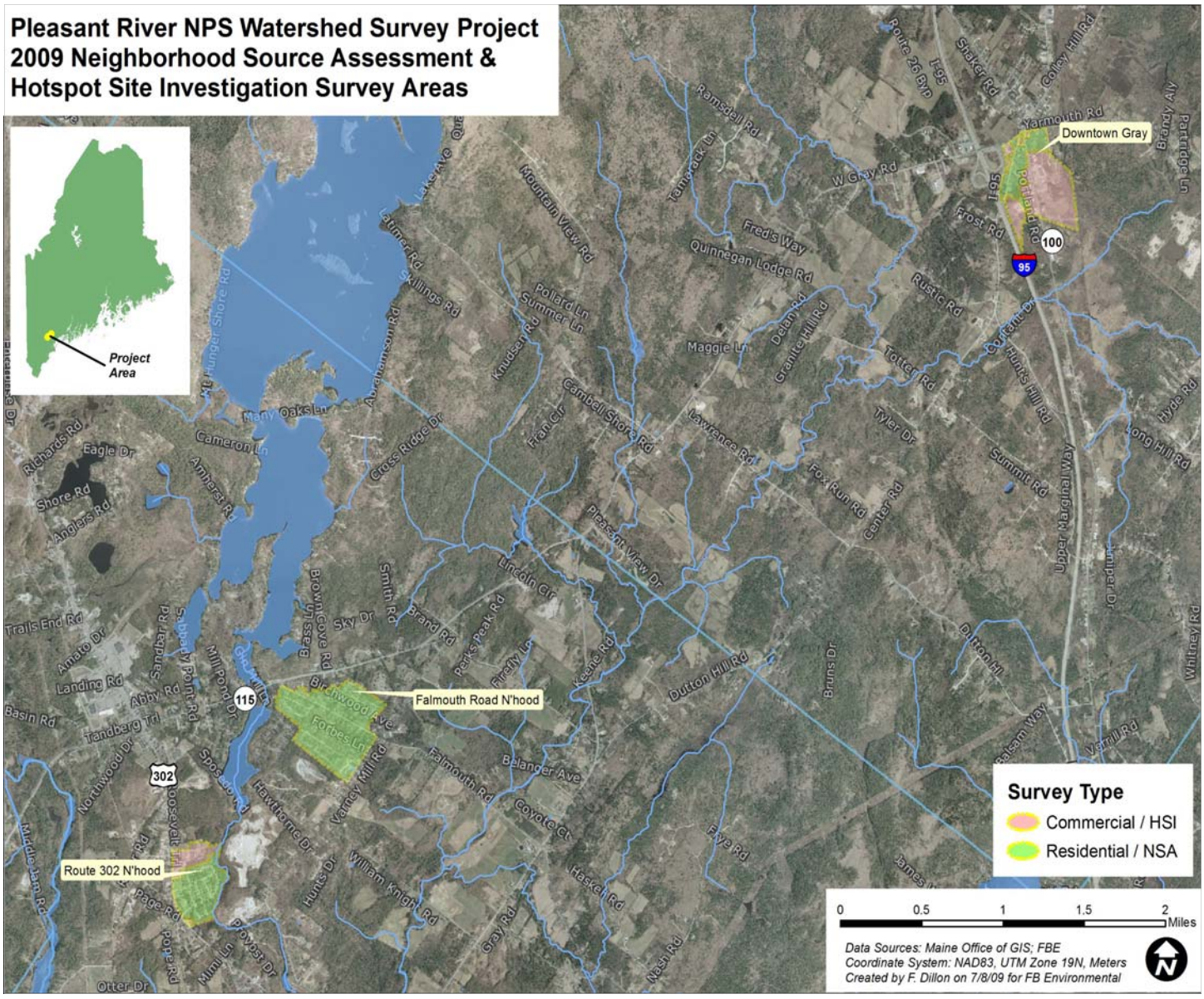


Figure 11: *Map of NSA and HSI Survey Areas*

5.2 Data Analysis/Assessment Summary

The NSA and HSI completed were subject to the assessor's interpretation of the property units and sites, and are therefore qualitative. Certain restrictions applied in some cases, such as when view or access to property were restricted. These surveys are capable of providing a general interpretation of the areas surveyed and help predict trends in the watershed. Observations for all three survey areas were transferred from the standardized field data sheets and compiled into a condensed spreadsheet found in Appendix D. Following are the summarized results for the NSA and the HSI.

5.3 NSA Results

Three distinct areas of the watershed were surveyed in the Neighborhood Source Assessment. For purposes of reporting, the sections will be referred to as: 1) downtown Gray 2) Rte. 302 (Windham) and 3) Falmouth Rd. (Gray). In total, 352 residential units were surveyed: 216 in the Falmouth Rd. neighborhood, 110 in the Rte. 302 neighborhood, and 26 in downtown Gray. Upon analysis, trends in the data include:

1. Housing Type - The section of downtown Gray that was surveyed consisted of 71% mixed residential, on a parcel-basis; the rest are commercial businesses. The overall acreage of commercial businesses was covers a larger area; although there are far fewer commercial parcels, the commercial parcels are much larger than the residential parcels. The Falmouth Rd. neighborhood consisted of nearly 100% single family detached homes while the Rte. 302 neighborhood consisted of 10% commercial businesses with the remaining 90% single family detached units.

2. Lot Size - In both the Rte. 302 and Falmouth Rd. sections, the percentage of homes with lots that were less than a 1/4 acre fell between 75-90% and lots that were between 1/4 and 1/2 acre was 2%. There were only several house lots in each section that were more than 1/2 acre. In downtown Gray, 70% of the house lots were under 1/2 acre in size, and 30% measured 1/2 acre or more.

3. Driveway Condition - The driveways in both the Rte. 302 and Falmouth Rd. sections had relatively clean, paved driveways. In fact, nearly 70% of the driveway surfaces were noted to be in good condition. Twenty percent were noted to be stained and breaking up in the Rte 302 area. Only a handful of homes in these neighborhoods had driveways that were unpaved, but 15% of homes surveyed had recently seal-coated driveways (seal-coating has been linked to the release of harmful PAHs (*Polyaromatic hydrocarbons*) into stormwater). In downtown Gray, the situation was quite different, with 73% of homes having unpaved driveways, 20% were either stained or dirty, and 20% were clean.

Typical large, seal coated driveway.

4. Roof Runoff - In general, roof runoff was not primarily managed by downspouts in any of the three neighborhoods- only 30% of the homes had this feature. Between 35-45% of homes had situations in which the runoff led directly to a paved surface. In the Falmouth Rd. area, 90% of homes also had the situation in which runoff would lead to a pervious area; in the Rte. 302 and downtown Gray area it was between 60-70%. This shows that although there is a considerable amount of runoff being deposited onto pervious surfaces, most homes also have portions of the roof draining onto vegetated areas. Approximately 40% of homes surveyed had an ideal situation for rain garden installation to help infiltrate roof/downspout runoff.

Example of downspouts leading directly to impervious surface of driveway.

5. Yard and Lawn - 10% of homes surveyed in the Falmouth Rd. and Rte. 302 areas had pools; in downtown Gray there were none noted. Improper draining of pools can be a possible pollution source. The total estimated number of pools is relatively low and therefore not believed to be a high priority issue. In 1-2% of homes there was trash or junk noted in yard; the exception to this was the downtown Gray area in which 32% of homes surveyed had this present on the property. Trash can contribute to dirty and/or clogged storm drains.

An example of a home practicing a high level of turf management.

6. Lawn Care - This particular parameter was difficult to ascertain specifically because the survey was completed in mid-summer, after one of the rainiest summers on Maine record. Lawns were particularly lush for this time of year, although there were noticeable situations in which it was obvious that turf management was high. Conservative estimations were made due to the contributing factor of heavy rainfall for the many weeks pre-survey. In the Rte. 302 and Falmouth Rd. areas, between 15-25% of homes appeared to practice a high level of lawn care; 35% practiced a medium or moderate level of lawn care and 40-50% appeared to practice little to no lawn care. A high level of lawn care refers to lawns that are over fertilized, over watered or treated with pesticides. The downtown Gray area was quite different, with over 80% of homes practicing little to no lawn care.

7. Typical Lot Features - For each neighborhood surveyed, a "Typical Lot" was chosen on each road and assessed based on % impervious cover (IC) , % grass cover, % natural plants/landscaping and % bare soil. An average was then calculated for each neighborhood overall. Comparatively, % impervious cover averaged out at between 35-45% for both the Rte. 302 and Falmouth Rd. neighborhoods, due to the common feature of excessively large driveways and garages which increased the IC substantially. The % grass cover was also similar for these areas, coming in between 35-45%; natural plants and landscaping was a bit higher in the Falmouth Rd. area with 25% coverage, and 10% in the Rte. 302 area. The IC coverage for downtown Gray was overall a bit lower, coming in at between 30-35% due to larger lots, unpaved driveways and lack of garages. A minimal amount of bare soil was noted overall, with an average of 0-5% for all three neighborhoods.

8. Other - One of the additional features assessed was garages. In both the Rte. 302 and Falmouth Rd. neighborhoods, over 75% of homes had garages were of substantial size. This increased the overall impervious cover of the lot. Additionally, many of the garage roofs drained directly onto a large driveway or other paved surface.

5.4 NSA Pollution Severity Index and Restoration Opportunity Index

Table 6: *NPS Pollution Severity Ranking*

Pollution Severity Index	***Section***
Low	Downtown Gray
Moderate	Rte. 302, Falmouth Rd.
High	N/A
Severe	N/A

Table 7: *Restoration Opportunity Ranking*

Restoration Opportunity Index	***Section***
Low	Downtown Gray, Rte. 302, Falmouth Rd.
Moderate	N/A
High	N/A

The ***Pollution Severity Index*** and the ***Restoration Opportunity Index*** was tallied for the individual neighborhoods using an adapted protocol in the Center for Watershed Protection Manual cited earlier in this document. Tables 6 and 7 above show the index ratings for both pollution severity and restoration opportunities.

5.5 Recommended Actions

The NPS pollution rating of "moderate" for both the Rte. 302 and Falmouth Rd. areas was assigned because they met a certain benchmark, per the protocol. In this case, the benchmark was met due to the presence of a septic system and high turf management. In the downtown Gray area, the NPS pollution rating of "low " was met due to a high percentage of trash/junk noted on the properties.

Many on-site retrofits can be installed by homeowners to reduce the amount of stormwater from their lots. Following are recommendations for some on-site restoration or Best Management Practices (BMPs), as well as local town programs that could be implemented to reduce stormwater.

- **Encourage residents to reduce lawn size and plant more trees, shrubs and other plants on their properties.**

The Towns of Gray and Windham could assist in this effort by planting street trees or creating a program to encourage homeowners to plant more trees on their properties. Project Canopy (Maine Forest Service) is a potential source of grant-funding and technical assistance.

In all of the neighborhoods surveyed, there is a lack of adequate landscaped vegetation and a high percentage of impervious and semi-pervious areas of lawn. If landscaping and tree canopy increased, more rainfall and runoff would be intercepted and infiltrated. BMPs such as drywells and rain gardens catch and infiltrate stormwater and reduce the overall amount ending up in the sewer system and river. Another alternative is to encourage homeowners to declare part of their lawn a "no-mow zone" allowing their grass to grow several inches taller , which would increase infiltration and slow down the flow of water. With proper public education, homeowners can reduce their impact to the water quality of Pleasant River by practicing low impact landscaping techniques.

- **Encourage and Demonstrate Low Impact Development (LID) practices in the Pleasant River watershed**

The Towns of Gray and Windham could work with local, state, and federal partners to install and demonstrate low impact development practices in this highly impervious area. Recommended LID actions could include: tree box filters, vegetated swales, downspout disconnection projects, rain barrel dissemination projects, reduction of paved roadways (for areas that are unnecessarily wide), neighborhood rain gardens, and porous pavement and pervious parking area demonstrations. Funding is available for these type of projects—particularly through the Maine DEP (207-822-6300).

5.5 HSI Results

Out of a total of seventeen (17) commercial properties surveyed, seven (7) were determined to be "potential" hotspot sites. Potential hotspots are designated, as defined by the Center for Watershed Protection's protocol, when a commercial operation exhibits a certain number of pollution sources, such as poor dumpster maintenance. Potential hotspots have no direct observed pollution sources (e.g., an abandoned vehicle leaking fluids).

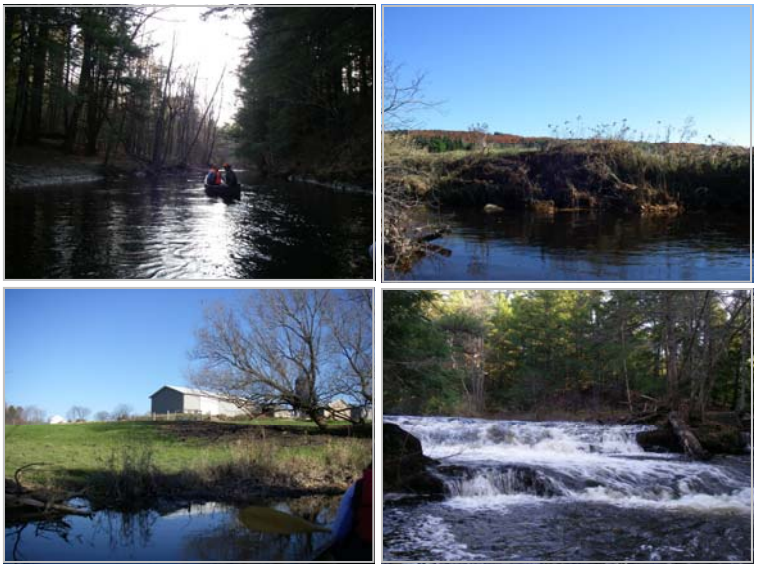
The areas surveyed that contained commercial businesses were the Rte. 302 area and downtown Gray. The identified potential hotspots include six (6) commercial businesses and one (1) municipal property. These sites were rated using the system in the Center for Watershed Protection, Manual 11. The ranking is based on observations related to vehicle operations, poor housekeeping (spills and leaks), waste management issues, condition of physical building, turf/landscaping practices and stormwater infrastructure. There were no confirmed or severe hotspots identified in either section. The table in Appendix E details each property surveyed and cites possible retro-fit opportunities.

Downspouts such as these that drain to an impervious surface contributed to the designation of these properties as "potential" hotspots.

6. Rapid Habitat/Geomorphic Survey

Stream corridor surveys were performed on portions of the Thayer River and Thayer Brook (Gray, ME; tributaries to the Pleasant River) in mid-October 2008. In addition to the surveys of Thayer River and Brook, members of Maine DEP, PRW, Cumberland County Soil & Water Conservation District (CCSWCD), and Casco Bay Estuary Partnership (CBEP) decided to canoe a long stretch of the Pleasant River in Windham, ME, from Falmouth Road down to River Road, in late October 2008. This crew used an abbreviated adaptation of the stream corridor survey method (i.e., basically taking photographs, GPS locations, and brief descriptions of key observations of river features and conditions) to gather preliminary, reconnaissance information on the Pleasant River which could help red flag potential-problem areas worthy of more detailed follow-up surveys that potentially could be done in the future.

Example of the range of conditions found during the Thayer River and Thayer Brook surveys.



Example of the range of conditions found during the Pleasant River survey.

Preliminary review of photographs and field data sheets results in an observation of riparian and floodplain lands adjacent to the Pleasant River, Thayer River, and Thayer Brook having a predominant pattern of alternating stretches of mature forest and agricultural lands, with some occasional stretches of residential (i.e., lawn) and road land uses near the streams and sporadic stretches of what appear to be old agricultural lands that have reverted to early-stage, shrub-dominated, forest. The habitats of many reaches of Pleasant River, Thayer River, and Thayer Brook, appear to be in fairly good (healthy) condition, due primarily to extensive widths of mature deciduous and coniferous forests. Some stretches of the streams or rivers are slow, meandering streams with sandy-silty bottoms, while others are moderately-fast waters flowing over stretches of exposed ledge, ledge cascades, and rocky-gravel areas. The Pleasant River region appears to be fortunate that there is only a moderate amount of dense urban development in the watershed, though urbanization and other development is on the rise. (These surveys did not investigate the urban portions of the watershed.)

Despite this generally positive situation, one type of stress to the river that appeared to be fairly common was the

presence of poorly-managed riparian buffer lands in many of the agricultural stretches along the streams/rivers. These areas had poor vegetation stands comprised mainy of grasses and weeds, with an occasional shrub. Thus, the streambanks offered poor shading of the water and lacked a vast network of dense tree and shrub root systems to bind the soils together. Many of these areas were slumping off the bank and into the river, and other areas evidently were easily access by grazing livestock, contributing apparently large loads of sediment and nutrients to the river. Raising concerns because of the potentially detrimental impact sediments can have on the habitats of coldwater fish and invertebrate (e.g., aquatic insects, mussels) communities.

Excess nutrients can cause excessive algae and plant growth in the Pleasant River and its receiving water – the Presumpscot River, leading to lowered dissolved oxygen levels when these excessive amounts of plant material decay. Some farms apparently had attempted to install fencing to keep livestock back away from the edge of the stream banks of these waterways, and this appears to be working in some situations. In other instances, the fencing did not appear to be installed far enough from the edge of the river and some posts and wire are falling into the river, or livestock are simply trampling banks of ditches that are draining the larger waterways. A few examples of extreme river-width widening or bank slumping along the Pleasant River were documented, and may be the result of high flow events, human activities, or both, and require further investigation. Finally, no water quality data was collected during these surveys, so other sources of information (e.g., MDEP biomonitoring, IFW fish records, Presumpscot River Watch [including Targeted Watershed Initiative monitoring]) will be researched and included in the report as it becomes available.

APPENDIX A: Survey Outreach Documents - *Pre-Survey Press Release*

Cumberland County Soil & Water Conservation District

35 Main Street, Suite 3
Windham, ME 04062

Phone: 207.892.4700
Fax: 207.892.4773

November 29, 2009

PRESS RELEASE

Contact: **Heather True**
207.892.4700
htrue@cumberlandswcd.org

FOR RELEASE WEEK OF May 19, 2008

Watershed Survey to Look for Pollution to Pleasant River

A volunteer watershed survey throughout the Pleasant River Watershed will be conducted starting on June 7th. The survey is a joint project between the Cumberland County Soil & Water Conservation District, Presumpscot River Watch and the Maine Department of Environmental Protection.

Pleasant River is an important resource for thousands of people in Maine. It is stocked with Brown Trout and Brook Trout every year and has become one of the most popular fly-fishing rivers in Southern Maine.

The survey will focus not only on the River's shore but also on the entire Watershed. A watershed is the land that drains to a water body by surface runoff, tributary streams, springs, and groundwater recharge. Pleasant River's Watershed covers 29 square miles in the towns of Windham and Gray. The River itself is a tributary to the Presumpscot River and is considered to be the top emerging threat to the water quality of the Presumpscot River and Casco Bay.

Through the survey, volunteers from all areas of the Watershed will be looking for sites where soil erosion and other polluted runoff is taking place. Soil is the largest pollutant to Maine's lakes, ponds and rivers and it can have far-reaching consequences. Soil particles carry the nutrient phosphorus, which essentially "fertilizes" the River and leads to nuisance algae blooms. Fish habitat can also be affected due to increased turbidity and decreased dissolved oxygen as more and more oxygen is used up by the algae.

The Pleasant River Watershed has been labeled as a *Nonpoint Source Priority Watershed* by the Maine DEP due to high bacteria counts, its support of cold-water fishery and its proximity to a densely populated area. The Presumpscot River Watch has been collecting data for 18 years on the Pleasant River's water quality and the River has consistently failed to meet standards for dissolved oxygen and E coli. The dissolved oxygen levels are of particular concern because they can stress cold water fish species.

The Cumberland County Soil & Water Conservation District works cooperatively with landowners to protect natural resources. Information collected in this survey will not be used for regulatory or enforcement purposes. Rather, it is the first step in a long-term program to work with the community to correct pollution problems in the Pleasant River Watershed.

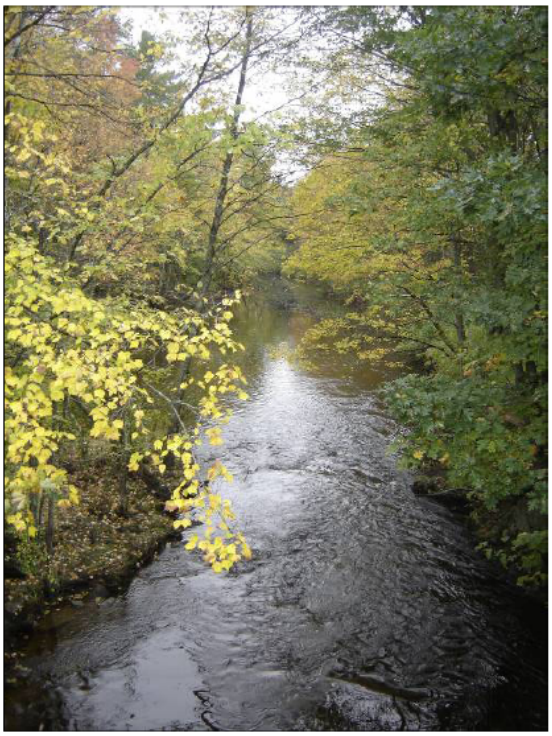
If you would like more information about the project or would like to volunteer with the survey, please contact Heather True at the Cumberland County Soil & Water Conservation District by calling 892-4700.

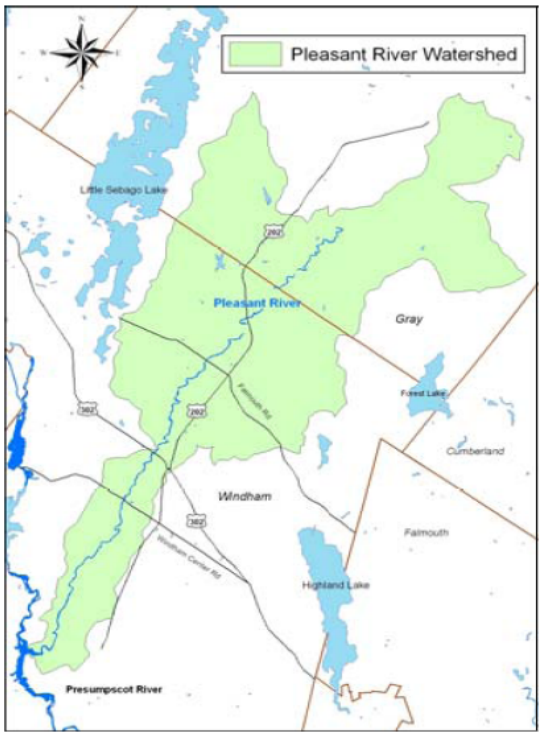
Assist and educate the public to promote stewardship of soil and water resources.

APPENDIX A: Survey Outreach Documents - *Pre-Survey Postcard Mailing*

FRONT

Pleasant River Watershed Survey





BACK

ATTENTION
Pleasant River Watershed Residents

Starting on June 7th, volunteers will be surveying the Pleasant River Watershed for potential pollution that could be washing into the River. Information gathered from this survey will be used to leverage funding to fix key problem sites. This is a voluntary, non-regulatory program.

Contact Heather True at the Cumberland County Soil & Water Conservation District at 892-4700 or htrue@cumberlandswcd.org if you want to volunteer or you wish to exclude your property from this survey.

For more information, please visit:
www.cumberlandswcd.org

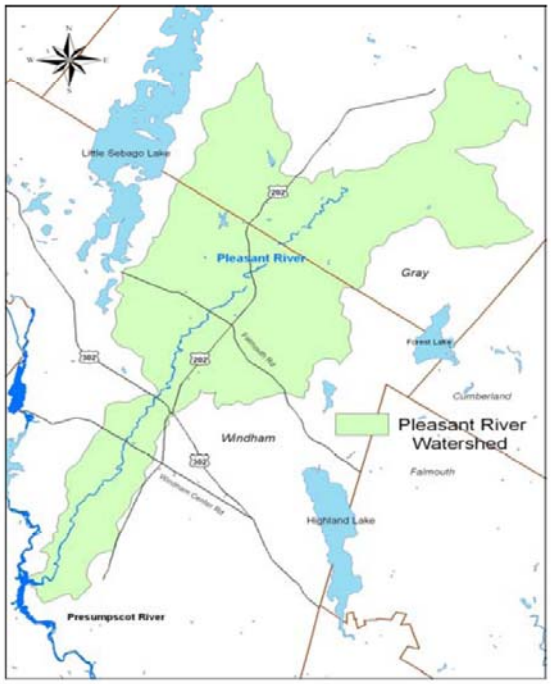
Cumberland County Soil & Water Conservation District

The Pleasant River Watershed Survey is funded by the US Environmental Protection Agency (EPA) under Section 319 of the Clean Water Act. Section 319 grants are administered by the Maine Department of Environmental Protection in partnership with EPA in order to prevent or reduce water pollution in Maine.

APPENDIX A: Survey Outreach Documents - *Call for Volunteers Flyer*

Volunteers Needed

Pleasant River Watershed Survey



Learn to identify and help document pollution impacting Pleasant River.

Date: Saturday, June 7th
Time: 8:00am - 2:00pm
Location: Windham High School

For more information or to sign up to volunteer, please contact Heather True at 892-4700 or visit www.cumberlandswcd.org.

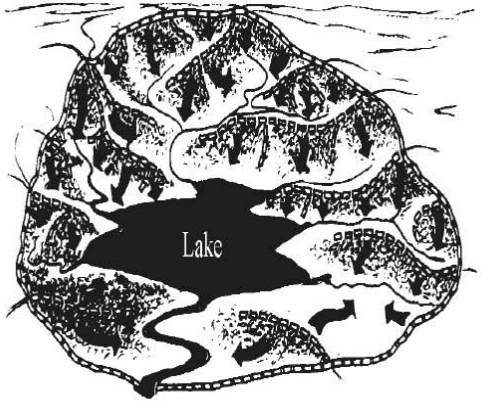
Cumberland County Soil & Water Conservation District

PRESUMPSCOT RIVER WATCH

The Pleasant River Watershed Survey is funded by the Environmental Protection Agency (EPA) under Section 319 of the Clean Water Act. Section 319 grants are administered by the Maine Department of Environmental Protection in partnership with EPA in order to prevent or reduce water pollution in Maine.

What is a Watershed?

A watershed is the geographic region within which water drains into a particular river, stream, lake or ocean. A watershed includes hills, lowlands, and the body of water into which the land drains.



This drawing illustrates the concept of a watershed and shows that even land uses far from a water body still affect that water body, although often indirectly through small brooks. streams and groundwater.

Why is your Watershed Important?

Healthy watersheds are vital for a healthy environment and economy. Our watersheds provide water for drinking, irrigation and industry. Many people also enjoy lakes, streams, and the ocean for boating, fishing, swimming and for their aesthetic pleasure. Wildlife also need healthy watersheds for food and shelter.

Individual ACTIONS

☑ Do your part around your home:
- prevent soil erosion - use trees and shrubs instead of lawns to filter runoff
- keep your lawn small
- use less fertilizers and pesticides*
- dispose of chemicals properly
- pump septic systems every 2 to 3 years
- compost your waste
- reduce, reuse and recycle

☑ Get involved in watershed planning
- organize a watershed survey
- volunteer to monitor water quality
- participate in local planning efforts

☑ Learn more: the DEP has more information on new laws as well as a variety of information on non-point source pollution. Just call and ask: 287-3901

**For more information on fertilizer and pesticide free lawn care, please visit: www.cumberlandswcd.org/yardscape*

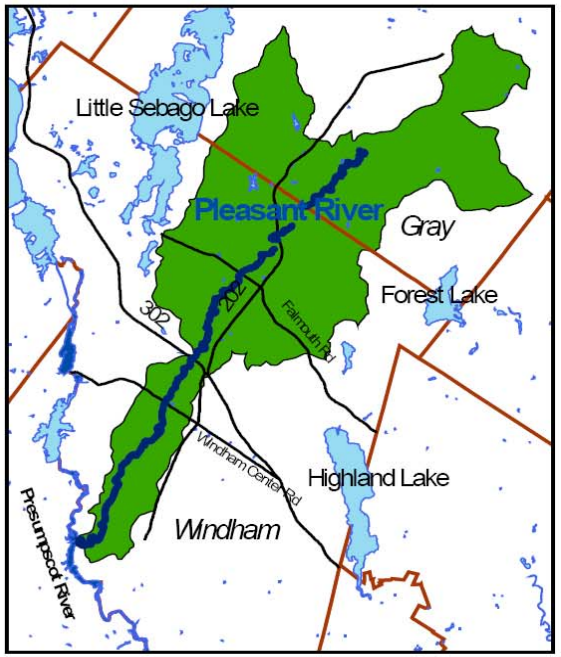
Clean water starts with you!

Cumberland County Soil & Water Conservation District
www.cumberlandswcd.org

For more information on the 2008 Pleasant River Watershed Survey, please contact Heather True of Cumberland County Soil and Water Conservation District at 892-4700.

Why Should You Conduct A Watershed Survey?

Pleasant River Watershed



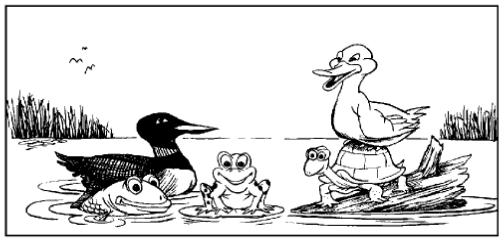
The greatest threat to our lakes, rivers, and oceans is a lack of awareness and understanding on the part of the general public about what affects water quality. Few people realize that activities which take place great distances from the water can have as much impact on water quality as those that occur along the shoreline area. Streams and ditches miles away from the lake, river, or ocean can still be in the watershed, eventually draining to the waterbody and carrying pollutants for miles.

What is a Watershed Survey

A watershed survey is a volunteer effort designed to locate sites of runoff and erosion that are serving as sources of phosphorus, nutrients, and sediment which could have a negative impact on water quality. It is important to note that the results of the watershed survey are not used for enforcement purposes. The spirit of the survey is to work cooperatively with land owners toward a common goal of preserving long term water quality.

When to Conduct a Watershed Survey:

The best time to conduct the survey is in the spring, soon after the snow has melted and the ground is exposed (generally no later than May). At this time, runoff from rain storms will be at a maximum, and erosion problems will be more visible. In addition, maintenance on town and private roads will not have taken place, so problems will be more obvious then they would be after roads have been regraded and culverts have been reset.



Benefits of a Watershed Survey

- Raises public awareness about the need to protect water quality from stormwater runoff and soil erosion problems.
- Helps people living within a watershed to understand the watershed concept.
- Identifies sources of pollution in a cost-effective way by using volunteers.
- Documents types of problems existing in the watershed.
- Provides landowners with information about how to reduce or eliminate soil erosion problems and phosphorus runoff from their property.
- Provides an important component of a comprehensive strategy for long-term water quality protection.

Where Does Water Pollution Come From?

Water pollution is caused, in great part, by nonpoint source (NPS) pollution. NPS pollution is simply polluted runoff that doesn't come from a specific, easily monitored source (i.e. a factory). NPS pollutants are picked up by rainwater and snow melt (stormwater runoff) somewhere within the land surrounding a waterbody (the watershed) and carried into that lake, stream, or ocean.

Many substances within the watershed can be transported by runoff, particularly small soil particles which carry phosphorus and nitrogen. They eventually reach the lake and can affect water quality. Past lake and river protection efforts have focused on shoreline land use, perhaps mistakenly creating the impression that only activities along the shore influence water quality. In truth, land use anywhere within a watershed affects the health of the waterbody.

When forests, vegetation, and natural depressions are replaced by houses, lawns, and roads, both the volume of runoff and the concentration of sediment are increased. As a result, a developed area may discharge up to ten times as much sediment as a forested area.

Excessive amounts of nutrients can lead to algal blooms.

2008 Pleasant River Watershed Survey

Sector & Site_____Date_____Surveyor Initials _____Tax Map & Lot _____Landowner Name_____

Location *(house #, road, utility pole #)*_____Building Color_____Talked to Landowner?_____

GPS Coordinates in UTM 83: ☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐

(in NAD83 or WGS84)

Photos Taken _____

Land Use: (circle one)

State Road	Town Road	Private Road	Driveway	Residential	Business/Commercial	Recreational Area	Boat Access
Trail or Path	Logging	Agriculture	Construction Site	Parking Lot	Gravel Pit	Other:	

Issues: (circle all that apply)

Bacteria / Nutrients / Toxics

Roads/Driveways/Parking Lots

Shoulder erosion:
- slight
- moderate
- severe

Surface erosion:
- slight
- moderate
- severe

Berm
Winter sand
Ditch:
- Inadequate size
- Erosion:
  - slight
  - moderate
  - severe

Catch basins (needs cleaning)

Culverts

Unstable inlet / outlet
Clogged
Broken / rusted

Undersized
Hanging
Misaligned

Other Sediment Issues

Bare soil / fields
Stockpiled soil
Unstable water access
Streambank erosion

Manure / Animal Waste

Livestock access to stream
Improper manure storage
Waterfowl / wildlife gathering area
Pet waste

Miscellaneous

Septic system problem
Sewer line problem

Trash/Spills/"Dumpster Juice"

In water, explain:

Near water, explain:

Lawn Care

Signs of fertilizer use
Pesticide flags
Lawn clippings next to stream

Algae mats
Other:

Temperature and Buffers

Inadequate Vegetative Buffer

Lack of a vegetated buffer
Buffer not wide enough (<25ft)
Poor / degraded buffer
Concentrated flow path of stormwater through buffer

Eroding streambank

Rip-rap on streambank

Drainage from impervious surfaces

Drainage from impoundment

Direct Flow to: **River/Stream** **Ditch** **Vegetation**

Distance to Water:_____

Slope: **Flat** **Moderate** **Steep**

Size of Area Exposed or Eroded (Length x Width):_____

Site is linked to another: Cause of Site # Result of Site #

Recommendations: (circle all that apply)

Bacteria / Nutrients / Toxics						Temperature and Buffers
Roads/Driveways/Parking Lots		**Other Sediment Issues**	**Trash/Spills/"Dumpster Juice"**	**Inadequate Vegetative Buffer**
Add better road gravel	Install turnout	Vegetate exposed soil	Remove trash from water	Plant / increase native buffer
Pave or reclaim	Install check dams	Cover exposed soil	Remove trash location near water	Let natural buffer grow/ reduce cutting and mowing in area
Build up / crown road	Install runoff diverter	Install infiltration steps	Clean up trash/spill near water	
Reshape/veg shoulder	Install sediment/catch basin	Stabilize streambank		**Streambank Erosion**
Install erosion controls (ex. Silt fence)	Reshape and riprap existing ditch/turnout/sed. basin	**Manure / Animal Waste**	**Lawn Care**	Plant along streambank
Remove grader berms	Armor ditch with stone or grass	Fence livestock out / away from water	Stop fertilizer / pesticide use	Eliminate / reduce streambank access
Remove winter sand	Clean out ditch / turnout / sediment basin / catch basin	Improve manure storage	Move lawn clippings away from stream	
Install ditch		Deter waterfowl/wildlife gathering area	Reduce lawn size	**OTHER:**
Culverts		Pick up pet waste		
Clean out culvert	Lengthen culvert			
Replace culvert	Stabilize inlet and/or outlet	**Septic/Sewer**		
Enlarge culvert	Install plunge pool	Fix septic system / sewer line problems		

Impact	**Technical Level to Install Recommended Practices**	**Cost of Materials and Labor**
High Large area with significant erosion and direct flow to water	**High** Site requires an engineered design	**High** Greater than $2,500
Medium Sediment transported off site but does not reach high magnitude	**Medium** Technical person should visit the site and make recommendations	**Medium** $500-$2,500
Low Limited transport of soil off site, small site with no evidence of rills or gullies	**Low** Property owner can accomplish recommendation with proper reference materials and/or technical advice	**Low** Less than $500

APPENDIX C: Watershed Survey Results and Recommendations

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
1-1	6/7/2008	SD, CD	Trail or Path	severe road surface erosion; stream running over recreational trail	10'x100'	build up / crown trail; install runoff diverter; install culvert; possibly eliminate trail access	medium	medium	medium
1-2	6/7/2008	SD, CD	Town Road	slight road shoulder erosion; berm; winter sand; algae mats	4'x300'	reshape/veg shoulder; remove grader berms; remove winter sand	medium	low	low
1-3	6/7/2008	SD, CD	Private Road	moderate road surface erosion	road is quarter mile long	add better road gravel; pave or reclaim; build up / crown road; reshape / veg shoulder; install ditch; install turnout; install runoff diverter; install sediment / catch basin	low	medium	medium
1-4	6/7/2008	SD, CD	Town Road	severe road shoulder erosion; winter sand; lack of vegetated buffer	4'x150'	reshape/veg shoulder; remove winter sand; install ditch; install sediment / catch basin; armor ditch with stone or grass; plant / increase native buffer	medium	medium	medium
1-5	6/25/2008	SD, CD	State Road	moderate road surface erosion; lack of vegetated buffer	3'x12'	reshape/veg shoulder; install turnout; install sediment/catch basin; plant/increase native buffer	medium	low	low
1-6	6/25/2008	SD, CD	Town Road	moderate road surface erosion; lack of vegetated buffer; eroding streambank; drainage from impervious surfaces		reshape/veg shoulder; reshape and riprap existing ditch/turnout/sediment basin; stabilize culvert inlet and/or outlet; stabilize streambank; plant/increase native buffer	medium	low	medium
1-7	6/25/2008	SD, CD	Town Road	severe road suface erosion; inadequate size ditch; clogged culvert	4'x200'	reshape/veg shoulder; install turnout; reshape and riprap existing ditch/turnout/sediment basin; armor ditch with stone or grass; clean out ditch/turnout/sediment basin/catch basin; clean out culvert	medium	medium	medium
1-8	10/16/2008	HT, EB	Town Road	severe shoulder erosion; unstable culvert outlet	10'10" x 15"	install turnouts; stabilize culvert outlet; vegetate exposed soil	medium	medium	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
2-1	6/7/2008	AS, LC	Town Road	slight road shoulder erosion; dog pet waste	200'x5'	remove winter sand; clean out ditch/turnout/sediment basin/catch basin; clean out culvert across street; pick up pet waste	medium	low (town)	low
2-2	6/7/2008	AS, LC	Town Road	moderae shoulder erosion (rill from bridge to stream); winter sand; delta at culvert; failing silt fence on both sides of road	50'	reshape/veg shoulder; install erosion controls (ex silt fence); divert road water runoff	high	medium	medium
2-3	6/7/2008	AS, LC	Town Road / Residential	clogged culvert		clean out culvert	low	low	low
2-4	6/7/2008	AS, LC	Town Road	clogged culvert; clean out check dams up hill of house #41; lack of vegetated buffer?	500'x4'	remove winter sand; clean out check dam; let natural buffer grow; culverts and road ditches along entire road shoulder warrant attention - clean out and/or vegetate; bank erosion present in some areas but not most	medium	low (town)	low
2-5	6/7/2008	AS, LC	State Road	winter sand; sand delta at bridge; trash near water, some trash in water; some algae; poor/degraded buffer	25'	reshape/veg shoulder; remove trash near and within water; plant/increase native buffer (HT note on 10/17/08: Shoulder vegetation appears intact at this time of year - issue may just be the need to remove witner sand closer to final spring melt)	low	low	low
2-6	6/7/2008	AS, LC	State Road	winter sand; sand delta at bridge; trash near water, some trash in water; some algae; poor/degraded buffer	25'	reshape/veg shoulder; remove trash near and within water; plant/increase native buffer (HT note on 10/17/08: Shoulder vegetation appears intact at this time of year - issue may just be the need to remove witner sand closer to final spring melt)	low	low	low

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
2-7	6/7/2008	AS, LC	Construction Site	clogged culvert (sediment and leaves and stone maybe due to construction site); bare soil; lack of erosion control measures on new construction site		install erosion controls (ex. Silt fences); clean out culvert; cover exposed soil	low	low	medium
3-1	6/7/2008	JV, JF	Private Road	moderate shoulder erosion; winter sand; broken/rusted culvert; slightly hanging culvert; wingwall erosion	6'x12'	reshape/veg shoulder; remove winter sand; replace culvert, enlarge culvert; stabilize culvert outlet	medium	medium	medium
3-2	6/7/2008	JV, JF	Residential / Unused stone bridge	clogged culvert; bare soil; streambank erosion; buffer not wide enough (<25ft)	soil: 5'x5'; buffer: 50 ft	clean out culvert; possibly enlarge culvert; plant/increase native buffer; lt natural buffer grow/reduce cutting and mowing in area; plant along streambank	medium	high (to enlarge culvert); low (to clean out culvert)	high (to enlarge culvert); low (to clean out culvert)
3-3	6/7/2008	JV, JF	Town Road	slight shoulder erosion; undersized and slightly hanging culvert; poor/degraded buffer	eroded: 4'x4'; buffer: 200'	reshape/veg shoulder; replace culvert; enlarge culvert; let natural buffer grow/reduce cutting and mowing in area	low	low	low
3-4	6/7/2008	JV, JF	Town Road	hanging culvert; manmade stone dam upstream from site		replace culvert; consider removing dam	low	medium	medium
3-5	6/7/2008	JV, JF	Private Road	moderate shoulder erosion; slight surface erosion; inadequate size ditch; moderate ditch erosion	400'	add better road gravel; install ditch; install turnout; install check dams; install runoff diverter; armor ditch with stone or grass	medium	low	medium
3-6	6/7/2008	JV, JF	Private Road	stockpiled soil		silt fence may be improperty installed	low*	low	low
3-7	6/7/2008	JV, JF	Town Road	winter sand	10'x30'	reshape/veg shoulder; remove winter sand	low	low	low

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
3-8	6/7/2008	JV, JF	Town Road	moderate shoulder erosion; slight surface erosion; moderate ditch erosion; hanging culvert; upstream dam; lack of vegetated buffer	culvert: 15'x30'; ditch: 300'	pave or reclaim shoulder; remove winter sand; install check dams; replace culvert; enlarge culvert; let natural buffer grow/reduce cutting and mowing in area; plunge pool is blocking fish passage	medium	medium	medium
3-9	6/7/2008	JV, JF	Town Road	moderate shoulder erosion; winter sand; poor/degraded buffer	10'x10'	reshape/veg shoulder; remove winter sand	low	low	low
3-10	6/7/2008	JV, JF, LC	Town Road	winter sand; misaligned bridge; lawn clippings next to stream; buffer not wide enough (<25ft); poor/degraded buffer; eroding streambank		remove winter sand; move lawn clippings away from stream; plant/increase native buffer; let natural buffer grow/reduce cutting and mowing in area	low	low	low
3-11	10/19/2008	HT, CT	Private Road	slight shoulder erosion; slight surface erosion; streambank erosion; lack of vegetated buffer (residential lawn to edge of small impoundment drainage)	streambank erosion: 40'x1'; surface/shoulder erosion: 15'x15'	stabilized culvert inlet and/or outlet; stabilize streambank; plant/vegetate native buffer; let natural buffer grow/reduce cutting and mowing in area	low	low	low
3-12	10/19/2008	HT, CT	Town Road	slight shoulder erosion; possible winter sand; unstable culvert inlet/outlet; road runoff washing into north side of road/ditching	20'x5' (on each side of culvert)	install turnout into vegetation away from ditch; stabilize culvert inlet and outlet with more rip rap	low	low	low
4-1	6/7/2008	HG, HT	Town Road	winter sand	25'x5'	remove winter sand	medium	low	low

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
4-2	6/7/2008	HG, HT	Town Road	slight shoulder erosion; winter sand; unstable water access; sink hole above culvert	sinkhole: 5'x4'; water access: 25'x5'	remove winter sand; install turnout on road; stabilize sinkhole; stabilize water access	medium	medium	medium
4-3	6/7/2008	HG, HT	Town Road	moderate shoulder erosion above culvert and along roadside; winter sand	6'x2'	remove winter sand; stabilize top of culvert	medium	low	low
4-4	6/7/2008	HG, HT	Town Road	moderate shoulder erosion; winter sand; small fridge or safe-like box	30'x5'	remove winter sand; remove trash from water; stabilize road shoulder	medium	low	low
5-1	6/7/2008	FD, JA	State Road	slight shoulder erosion; moderate surface erosion; winter sand; drainage from impervious surfaces	10'x5'	remove winter sand; stabilize streambank	low	medium	medium
5-2	6/7/2008	FD, JA							
5-3	6/7/2008	FD, JA	Private Road	moderate shoulder erosion; moderate surface erosion; lack of vegetated buffer; drainage from impervious surfaces	20'x15'	install turnout; install runoff diverter; armor ditch with stone or grass	medium	low	low
5-4	6/7/2008	FD, JA	Town Road	slight shoulder erosion; berm; winter sand; no ditch; drainage from impervious surfaces	70'x5'	reshape/veg shoulder; remove winter sand; armor ditch with stone or grass	low	medium	medium
5-5	6/7/2008	FD, JA	Private Road	moderate shoulder erosion; moderate surface erosion; drainage from impervious surfaces	shoulder	armor shoulder with stone or grass; lengthen culvert	low	low	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
5-6	6/7/2008	FD, JA	Driveway (and Town Road)	moderate shoulder erosion; slight surface erosion; some concentrated flow path of stormwater through buffer; drainage from impervious surfaces; sediment coming from shoulder of Whitney Road and driveway	50'x50'	armor ditch with stone or grass; clean out culvert; reduce lawn size	medium	medium	medium
5-7	6/7/2008	FD, JA	Private Road	modeate shoulder erosion; rip-rap on streambank; drainage from impervious surfaces	40'x10'	lengthen culvert	low	medium	high
5-8	6/7/2008	FD, JA	Town Road	moderate shoulder erosion; winter sand; moderate ditch erosion; unstable culvert inlet; misaligned culvert; streambank erosion on inlet side; drainage from impervious surfaces	175'x10'	install turnout; install check dams; realign culvert; stabilize culvert inlet	medium	medium	high
5-9	6/7/2008	FD, JA	Town Road	moderate shoulder erosion; slight ditch erosion; broken/rusted culvert; hanging culvert; algae mats; drainage from impervious surfaces	25'x10'	install turnout; install check dams; armor ditch with stone or grass; replace culvert	low	medium	high

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
5-10	6/7/2008	FD, JA	Town Road	moderate shoulder erosion; winter sand; slight ditch erosion; drainage from impervious surfaces; snow plow pile	175'x10'	remove winter sand; install turnout; install check dams above ditch; armor ditch with stone or grass	low	medium	medium
5-11	6/7/2008	FD, JA	Town Road	severe shoulder erosion; slight surface erosion; unstable culvert inlet/outlet; hanging culvert; possible misaligned culvert (although installed long ago); streambank erosion (especially on inlet side); eroding streambank (slight on upstream culvert inlet side); drainage from impervious surfaces; sediment also washing from adjacent driveway directly into stream	30'x10'	remove winter sand; armoer shoulder with stone or grass; replace culvert; lengthen culvert; stabilize inlet and/or outlet	high	high	high

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
5-12	6/7/2008	FD, JA	State Road	moderate shoulder erosion; moderate surface erosion; winter sand; hanging outlet culvert; streambank erosion; lawn clippings and leaves right next to stream; algae mats especially at outlet; drainage from impervious surfaces	100'x10'; leaves/lawn clippings: 25'x10'	remove winter sand; armor shoulder with stone or grass; replace culvert (to remove hanging culvert); possibly lenthen culvert; move lawn clipping away from stream	medium	high	high
5-13	9/9/2008	FD	Residential	signs of fertilizer use; lack of a vegetated buffer		stop fertilizer/pesticide use; reduce lawn size	low	low	low
6-1	10/21/2008	HT, CT	State Road	moderate shoulder erosion; winter sand; moderate ditch erosion; sand washing into stream by nearby turnaround and ATV trailhead		reshape/veg shoulder; remove winter sand; install turnout; armor ditch with stone or grass	medium	medium	low
6-2	10/21/2008	HT, CT	Residential	Extensive lawn; appears to have no fish passage; sand may have been brought in for beach area and boat launch; lack of vegetated buffer; moderate eroding streambank; rip-rap on streambank	Approx. 4 acres lawn; Bank eros.: 30' x 15'	reduce lawn size; plant/ increase native buffer; create fish ladder	medium	low	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
6-3	10/21/2008	HT, CT	State Road	moderate shoulder erosion; some trash on shoulder near water; sink hole at guard rail - unsure if it affects water quality	30' x 1'	stabilize shoulder	low	low	low
6-4	10/21/2008	HT, CT	Town Road	slight shoulder erosion; walking paths on each side of road to river's edge - causing some erosion	20' x 1' on each side of road	stabilize walking path with something smaller than infiltration steps	low	low	low
6-5	10/21/2008	HT, CT	State Road	slight shoulder erosion; stone/gravel parking lot at Stonehedge with ~25 ft natural buffer between lot and river	1' x 15'	stabilize shoulder	low	low	low
7-1	6/7/2009	WG, KM	Agriculture	improper manure stroage - not adjacent		improve manure storage	low	low	low
7-2	6/7/2008	WG, KM	Residential	unstable water access; streambank erosion; pet waste; lack of a vegetated buffer; buffer not wide enough (<25 ft); eroding streambank	100' x 20'	pick up pet waste; add fence?; plant/increase native buffer	low	low	low
7-3	6/7/2008	WG, KM	Town Road	severe and moderate shoulder erosion; berm; winter sand; slight ditch erosion; drainage from impervious surfaces - road	150' x 5'	reshape/veg shoulder; remove grader berms; remove winter sand	medium	low	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
7-4	6/7/2008	WG, KM	Business/commercial (car lot)	moderate shoulder erosion; moderate surface erosion; bare soil - parking; Note: small salvage yard with vehicles adjacent to stream; HT note on 10/21/08: slight eroding streambank	200 sq. ft seen	add better surface gravel; reshape parking area; store vehicles away from stream; drain fluids	medium	low	low
7-5	6/7/2008	WG, KM	Town Road	slight shoulder erosion; Berm; slight surface erosion; unstable outlet; undersized culvert - too short; trash in water at culvert (inlet)	10' x 2'	reshape/veg shoulder; remove grader berms; lengthen culvert; stabilize inlet and/or outlet; remove trash from water	low	low	medium
7-6	6/7/2008	WG, KM	Agriculture	improper manure stroage; buffer not wide enough (<25 ft); drainage from impoundment		improve manure storage	low	low	low
8-1	6/7/2008	BW, KW	driveway	unstable culverts inlet/outlet; clogged culvert	25' x 10'	armor ditch with stone or grass; clean out ditch; clean out culvert; lengthen culvert; stabilize inlet and/or outlet	low	low	low
8-2	6/7/2008	BW, KW	Private Road	moderate shoulder erosion; moderate surface erosionl; lack of ditch; unstable inlet/oulet; broken/rusted culvert	440' x 12'	pave or reclaim shoulder; reshape/veg shoulder; install erosion controls; install ditch; install turnout; install check dams; install runoff diverter; install sediment/catch basin; attempt to divert with rubber razors; clean out culvert; replace culvert; lengthen culvert; stabilize inlet and/or outlet	low	medium	high

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
8-3	11/4/2008	HT, CT	Private Road	moderate shoulder erosion (created by snow plow?); severe surface erosion; moderate ditch erosion; undersized culvert - too short; erodiong streambank - undercutting; HT note on 11/4/08: road is washing into stream		add better road gravel; build up / crown road; install ditch - improve ditches (need more swale shape); lengthen culvert	high	medium	high
9-1	6/7/2008	TLP, LR, PR	State Road	severe, extended shoulder erosion; unstable culvert outlet;		stabilize culvert outlet	high	medium	high
9-2	10/24/2008	HT, LR, PR	Town Road	moderate shoulder erosion - adjacent to bridge on each side of road; lack of a vegetated buffer; ~ 200' farm area along stream 75'; HT note 10/24/08: North side of road, tree down next to bridge causing erosion spot	~2' x 8'	plant/increase native buffer; stabilize erosion sites with vegetation or rip-rap	medium	low	low
9-3	10/24/2008	HT, LR, PR	State Road	eroding streambank - natural; farm adjacent to stream, once allowed cattle access	50' x 15'	plant along streambank (possibly) --look into flow of river, has it been altered by humans and is that why bank erosion is occuring?...	low	low	low
9-4	10/24/2008	HT, LR, PR	Town Road	severe ditch erosion; lack of a vegetated buffer; adjacent farm land	25' x 8'	create sediment basin for farm driveway's culvert--plant area eroded	high	medium	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
9-5	10/24/2008	HT, LR, PR	Town Road	moderate shoulder erosion; possible spills near water - old car (not in use) in residential lot ~25' from stream; extensive sand along streambank; path to water may cause some erosion	20' x 20'	rip-rap shoulder	medium	medium	medium
9-6	10/24/2008	HT, LR, PR	Town Road	moderate shoulder erosion; shoulder erosion washing large boulders/ rip-rap above stream	4' x 3'	further rip-rap top of culvert inlet	low	low	low
9-7	10/24/2008	HT, LR, PR	Residential	eroding streambank/ditch ; roof runoff directed into stream		HT note on 10/24/08: fertilizer is not used; reduce lawn size; plant/increase native buffer; let natural buffer grow/ reduce cutting and mowing in area; redirect roof runoff into ground	high	medium	medium
9-8	10/24/2008	HT, LR, PR	Private Road	moderate shoulder erosion; moderate surface erosion; significant amount of gravel observed in stream		pave or reclaim; reshape/veg and stabilize shoulder; install turnout	medium	medium	medium
9-9	10/24/2008	HT, LR, PR	Commercial?	old road stream crossing washed out; stockpiles of loam, mulch, and brush			medium	medium	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
9-10	11/4/2008	HT, CT	Agricuture	Lawn clippings next to stream; *Livestock access to stream --livestock manure runoff directly into tributary flowing into Pleasant River (potential direct livestock access)	entire length of property	fence livestock out/away from water; move lawn clippings away from stream; let natural buffer grow/ reduce cutting and mowing in area;	high - for bacteria	medium	medium
9-11	11/4/2008	HT, CT	Business/commercial	drainage from impervious surfaces - parking lot adjacent to PR tributary	parking lot ~140 ft long	install catch basin; plant/ increase native buffer; let natural buffer grow/ reduce cutting and mowing in area; increase buffer between parking lot and stream	medium - phosphorus input	high	medium
9-12	11/12/2008	HT (via google earth)	Agriculture	Livestock access to tributary; lack of vegetated buffer		fence livestock out/away from water; plant / increase native buffer; let natural buffer grow / reduce cutting and mowing in area	medium - bacteria	medium	medium
9-13	11/12/2008	HT (via google earth)	Agriculture	potential livestock access to stream?; lack of vegetated buffer		fence livestock out/away from water; plant / increase native buffer	medium - bacteria	medium	medium
9-14	11/12/2008	HT (via google earth)	Agriculture	potential livestock access to stream; lack of vegetated buffer	entire width of field ~ 750 ft	fence livestock out/ away from water; plant / increase native buffer; let natural buffer grow / reduce cutting and mowing in area	medium - bacteria	medium	medium
9-15	11/12/2008	HT (via google earth)	Agricuture/ Residential	potential livestock access to stream; lack of vegetated buffer		fence livestock out/away from water; plant/increase native buffer; let natural buffer grow/reduce cutting and mowing area	medium - bacteria	medium	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
10-1	6/7/2008	CD, HW, JG	Residential/ Construction Site	bare soil; stockpiled; soil piles in yard: ditch dug for installation project--water line?; silt fence is breaking; excellent riparian buffer	15' x 75' (side of house)	install erosion controls (ex. Silt Fence) in front yard; maintain silt fence	low	low	low
10-2	6/7/2008	CD, HW, JG	Private Road	slight shoulder erosion; winter sand; bare soil/ fields in seating area; clogged culverts -- some rip-rap stones-- fish passage barrier?	4' x 100' along roadside	remove winter sand; clean out culverts	low	low	low
10-3	6/7/2008	CD, HW, JG	Boat Access	slight surface erosion at launch point; streambank erosion; lawn clippings next to stream; buffer not wide enough (<25 ft) on tributary	1' x 3'	move lawn clippings away from stream; plant / increase native buffer; let natural buffer grow / reduce cutting and mowing in area; install gravel or amror boat launch	low	low	low
10-4	6/7/2008	CD, HW, JG	Residential	lack of a vegetated buffer; eroding streambank	125' x 75'	stabilize streambank; plant / increase native buffer; let natural buffer grow / reduce cutting and mowing in area	low	low	low
10-5	6/7/2008	CD, HW, JG	Residential	bare soil / fields; wood chips next to stream; fill added to point -- fill type: overturned sod	3' x 50'	vegetage exposed soil; let natural buffer grow; *stop filling in edge of river	low	low	low
10-6	6/7/2008	CD, HW, JG		winter sand; HT note on 10/21/08: small put boat launch-- minimal erosion	1' x 50'	remove winter sand	medium	medium	medium?

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
10-7	6/7/2008	CD, HW, JG	Private Road	hanging culvert; drainage from impervious surfaces; natural and paved road runoff; HT note on 10/21/08: small tributary has been rip-rapped and tuwned into a ditch adjacent to Evan's Ridge Rd. for ~100 ft		replace culvert?; install plunge pool?; HT note on 10/21/08: possibly redirect stream so that is isn't a ditch for road runoff	medium	medium	medium
10-8	6/7/2008	CD, HW, JG	Trail or Path	slight surface erosion	5'x 200'	??notify DEP to prevent future erosion??			
10-9	6/7/2008	CD, HW, JG	Town Road	moderate shoulder erosion; winter sand; public access--potential for high use	3' x 300'	reshape/veg. shoulder; install erosion controls (ex. Silt fence) --needs to be permanent	medium	medium	medium
10-10	6/7/2008	CD, HW, JG							
10-11	6/7/2008	CD, HW, JG		reports of where ATVs have been crossing river at site; eroding streambank					
10-12	10/21/2008	HT, CT	Residential	trash-couple of soda bottles in water; lack of a vegetated buffer; HT note on 10/21/08: small tributary ditched under yard--ends at edge of yard/lawn	lawn ~1 acre	reduce lawn size;	low	low	low
10-13	11/4/2008	HT, CT	Town Road	severe shoulder erosion--undercutting paved road; turnout erosion; HT note on 10/21/08: **large amounts of accumulated sand on road		install turnout; rip-rap shoulder erosion; pitch gravel/turnout into vegetation	medium	medium	medium

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
PR-1	10/31/2008	HT, MC, MC, JV	Agriculture	livestock access to stream; eroding streambank; cattle path to river; fence has collapsed	50' x 4'	fence livestock out / away from water; plant / increase native buffer	high	medium	medium
PR-2	10/31/2008	HT, MC, MC, JV	Agriculture	livestock access to stream--recent evidence, though may be prevented now; trash--lots of tires--in water; lack of a vegetated buffer; eroding streambank; cattle fence within 10ft of river; drainage from cornfield	150' x 20'	remove trash from water; plant / increase native buffer; make sure cattle aren't accessing stream; move fence away from water's edge	high	medium	medium
PR-3	10/31/2008	HT, MC, MC, JV	Agriculture	livestock access to stream; eroding streambank; cattle access to stream leading directly to Pleasant River; horses; livestock access in parts of property / no fence; fence right on Pleasant River, yet cattle access to tributary of River	~100' x 50'	stabilize streambank; plant along streambank; move fence back from River's edge; block cattle from accessing tributary	high	medium	medium
PR-4	10/31/2008	HT, MC, MC, JV	Private Road?	unstable water access; streambank erosion	25' x 4'	install infiltration steps or redirect access to streambank; stabilize streambank	medium	medium	low

APPENDIX C: Watershed Survey Results and Recommendations - *Continued*

Sector & Site	Date	Surveyor Initials	Land Use	Issues	Size of Area Exposed or Eroded	Recommendations	Impact Rating	Technical Level Rating	Cost Rating
PR-5	10/31/2008	HT, MC, MC, JV	Agriculture ?/Residential?	streambank erosion--90 degree bank erosion; lack of vegetated buffer--field is mowed to river's edge--little to no native buffer; cattle fence right on river's edge; lots of invasive barberry along streambank; signs of stone used in one place to try to stabilize bank erosion		stabilize streambank; plant / increase native buffer; let natural buffer grow / reduce cutting and mowing in area; transfer fence back from edge of river	high	high (potentially)	medium
PR-6	10/31/2008	HT, MC, MC, JV	Town: Windham High School	eroding streambank; possible septic pip outflow shortly downstream of this erosion site; PVC pipe observed in water	25' x 25'	stabilize streambank--possibly with rip-rap; move running trail back from streambank edge; *look into pipe discharge	high	medium	medium
PR-7	10/31/2008	HT, MC, MC, JV	Residential	severe streambank erosion	200' x 150'	erosion appears to be occurring naturally	high	high	medium
PR-8	10/31/2008	HT, MC, MC, JV	Residential	washed out road over tributary leading to Pleasant River	30' x 50'	remove remaining sediment and debris that is in the tributary; stabilize streambank with native plants	medium	medium	medium
PR-9	10/31/2008	HT, MC, MC, JV	Business/Commercial	streambank erosion		install ATV bridge or eliminate ATV access; plant banking or let natural buffer grow	medium	medium	medium

APPENDIX D: Neighborhood Source Assessment Survey Results

SURVEY AREA	Rte. 302 Windham	Falmouth Rd. Windham	Downtown Gray
TOTAL # OFHOMES PER SECTION	**110**	**216**	**26**
HOUSING TYPE			
Single Family Detached	**109**	**216**	**23**
Single Family Attached	**0**	**0**	**0**
Multifamily	**1**	**0**	**3**
LOT SIZE			
Less than 1/4 acre	**85**	**194**	**7**
1/4 acre	**14**	**15**	**9**
1/2 acre	**8**	**7**	**5**
1 acre or more	**3**	**0**	**5**
DRIVEWAYS (check all that apply)			
Clean	**63**	**153**	**5**
Stained (oil, grease)	**2**	**0**	**6**
Dirty	**4**	**18**	**5**
Unpaved	**13**	**0**	**19**
Recently seal coated	**10**	**27**	**0**
Breaking up	**18**	**12**	**0**
ROOF RUNOFF (check all that apply)			
Gutters and downspouts	**32**	**65**	**9**
Runoff to road/driveway	**30**	**96**	**8**
Runoff to pervious area	**66**	**198**	**19**
Flat area for rain garden	**45**	**86**	**11**
YARD AND LAWN (check all that apply)			
Swimming pool	**11**	**17**	**0**
Junk or trash in yard	**12**	**13**	**8**
Permanent irrigation	**0**	**1**	**0**
Pet waste evident	**0**	**0**	**0**

APPENDIX D: Neighborhood Source Assessment Survey Results - *Continued*

SURVEY AREA	Rte. 302 Windham	Falmouth Rd. Windham	Downtown Gray
TOTAL # OF HOMES PER SECTION	**110**	**216**	**26**
LAWN CARE (check one per lot)			
High input lawn	**16**	**55**	
Medium input lawn	**40**	**81**	**5**
Low input lawn	**54**	**80**	**21**
TYPICAL LOT			
% Impervious cover	**40%**	**35%**	**30-35%**
% Grass cover	**45%**	**35%**	**30%**
% Natural plants and landscaping	**10%**	**25%**	**30%**
% Bare soil	**5%**	**1%**	**5%**
OTHER			
Garage	**82**	**168**	**13**
Remodeling or infill development	**14**	**12**	

APPENDIX E: HSI Rankings

DOWNTOWN GRAY				
Business Name	***Potential Hotspot***	***Confirmed Hotspot***	***Severe Hotspot***	***Retro-fit Options***
Gray Plaza (15 businesses)	X			Porous pavement, green roof, bioretention
Maine Ladder & Staging	X			Bioretention, rain garden, increase
Tsukoff Photography				Not a Hotspot
Napa Auto Parts/Special Effects Salon (one bldg)				Not a Hotspot
Sunoco Gas Station	X			Rain barrels, bioretention
Mobil Gas Station	X			Rain barrels, bioretention
The Fitch Co.				Not a Hotspot
Tee Um' Up Golf Center	X			Rain garden, porous pavement
Maine St. DOT yard	X			Porous pavement, bioretention
ROUTE 302 NEIGHBORHOOD, WINDHAM				
Flue Gas Solutions				Not a Hotspot
Maine-ly Marine Boatyard	X			Bioretention, increase vegetation
Maine's Real Estate Connection				Not a Hotspot
Windham Chiro & Rehab/ Attorneys				Not a Hotspot
Portland Natural Gas Trans. System				Not a Hotspot
Timmons Fabrication/Machine				Not a Hotspot
Yarde Metals				Not a Hotspot
Commons Ave. Businesses (one bldg)				Not a Hotspot

APPENDIX F: NSA Data Sheet Template

Neighborhood Source Assessment (NSA) Form

Watershed:	**Sector:**	**Date:**
Surveyors:	**Photo #s:**	**Page _____ of _____**

Directions - Walk down each street. Stop at each house and place a hash mark in each section to describe observed conditions (e.g., 1st house is single family detached, less than ¼ acre, paved & stained driveway etc.).

	Road Name	Berwick St.	Lebanon St.	Prescott St.	**Total**
	Total # of homes				
Housing Type (check one per lot)	Single Family Detached				
	Single Family Attached (duplex, row homes)				
	Multifamily (apts, condos)				
	Commercial				
Lot Size (check one per lot)	Less than ¼ acre				
	¼ acre				
	½ acre				
	1 acre or more				
Driveways (check all that apply)	Clean				
	Stained (oil, grease)				
	Dirty				
	Unpaved				
	Paved				
	Recently seal-coated				
	Breaking up				
Roof Runoff (check all that apply)	Gutters & Downspouts				
	Runoff to road/driveway				
	Runoff to pervious area				
	Flat area for raingarden[1]				

APPENDIX F: NSA Data Sheet Template - *Continued*

Neighborhood Source Assessment (NSA) Form

	Road Name	Berwick St.	Lebanon St.	Prescott St.	Total
Yard and Lawn (check all that apply)	Swimming pool				
	Junk or trash in yard				
	Permanent irrigation or "non target" watering				
	Pet waste evident				
Lawn Care (check one per lot – see handout)	High-input lawn				
	Medium-input lawn				
	Low-input lawn				
Typical Lot #1 (should total 100%)	% Impervious Cover				
	% Grass Cover				
	% Natural Plants and Landscaping				
	% Bare Soil				
Typical Lot #2 (should total 100%)	% Impervious Cover				
	% Grass Cover				
	% Natural Plants and Landscaping				
	% Bare Soil				
Other	Garage				
	Remodeling or Infill Development				
	Basement				

[1] Note on sector map.

APPENDIX G: HSI Data Sheet Template

Hotspot Site Investigation **HSI**

WATERSHED:	SUBWATERSHED:	UNIQUE SITE ID:	
DATE: ___/___/_____	ASSESSED BY:	CAMERA ID:	PIC#:
MAP GRID:	LAT ___°_____'_____" LONG ___°_____'___"		LMK #

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address: _____

_____

_____

SIC code (if available): _____

NPDES Status: ☐ Regulated ☐ Unregulated ☐ Unknown

Category: ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related
Miscellaneous ☐ Golf Course ☐ Marina ☐ Animal Facility

Basic Description of Operation: _____

	INDEX*
B. VEHICLE OPERATIONS ☐ N/A *(Skip to part C)*	**Observed Pollution Source?** ☐
B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☐ Other: _____	
B2. Approximate number of vehicles: _____	
B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled Fueled Washed Stored	○
B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☐ Can't Tell Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell	○
B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☐ Can't Tell	○
B6. Are uncovered outdoor fueling areas present? ☐ Y ☐ N ☐ Can't Tell	○
B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☐ Can't Tell	○
B8. Are vehicles washed outdoors? ☐ Y ☐ N ☐ Can't Tell Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell	○
C. OUTDOOR MATERIALS ☐ N/A *(Skip to part D)*	**Observed Pollution Source?** ☐
C1. Are loading/unloading operations present? ☐ Y ☐ N ☐ Can't Tell If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell	○
C2. Are materials stored outside? ☐ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description: _____ Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☐ bermed area	○
C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☐ Can't Tell	○
C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell	○
C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell	○
C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☐ Can't Tell	○
C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell	○
D. WASTE MANAGEMENT ☐ N/A *(Skip to part E)*	**Observed Pollution Source?** ☐
D1. Type of waste *(check all that apply)*: ☐ Garbage ☐ Construction materials ☐ Hazardous materials	○
D2. Dumpster condition (*check all that apply*): ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing	○
D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell	○
E. PHYSICAL PLANT ☐ N/A *(Skip to part F)*	**Observed Pollution Source?** ☐
E1. Building: Approximate age: _____ yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☐ Don't know	○ ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

APPENDIX G: HSI Data Sheet Template - *Continued*

Hotspot Site Investigation **HSI**

E2. Parking Lot: Approximate age _____ yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up
Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know ○

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don't know ☐ None visible
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don't know ○

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☐ **N/A** *(skip to part G)* **Observed Pollution Source?** ☐

F1. % of site with: Forest canopy ____% Turf grass _____ % Landscaping ____% Bare Soil ____% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ **N/A** *(skip to part H)* **Observed Pollution Source?** ☐

G1. Are storm water treatment practices present? ☐ Y ☐ N ☐ Unknown If yes, please describe: _____ ○

G2. Are private storm drains located at the facility? ☐ Y ☐ N ☐ Unknown
Is trash present in gutters leading to storm drains? If so, complete the index below. ○

Index Rating for Accumulation in Gutters

	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

G3. Catch basin inspection – Record SSD Unique Site ID here: _____ Condition: ☐ Dirty ☐ Clean

H. INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:
- ☐ Refer for immediate enforcement
- ☐ Suggest follow-up on-site inspection
- ☐ Test for illicit discharge
- ☐ Include in future education effort
- ☐ Check to see if hotspot is an NPDES non-filer
- ☐ Onsite non-residential retrofit
- ☐ Pervious area restoration; complete PAA sheet and record Unique Site ID here: _____
- ☐ Schedule a review of storm water pollution prevention plan

Notes: