



## TMDL Assessment Summary

# Card Brook

### Watershed Description

This **TMDL** assessment summary applies to a 1.2-mile section of Card Brook, located in the City of Ellsworth, Maine. Card Brook, a small tributary to the Union River, begins in a wetland area west of Macquinn Road in Hancock. The stream flows across U.S. Route 1 and past a golf course before entering a large wetland across the Ellsworth town line. The small streams that flow into Card Brook meet in the wetland, and the impaired segment of Card Brook begins downstream of this point. Card Brook continues under High Street and travels through a heavily developed area before flowing into the Union River estuary near the Ellsworth Marina. The Card Brook watershed covers 4,217 acres in the City of Ellsworth and the towns of Hancock and Lamoine.

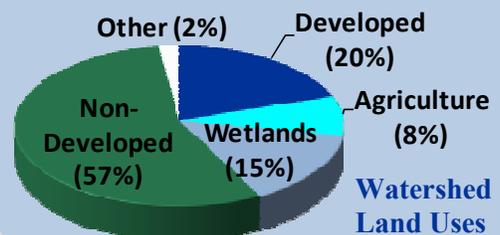
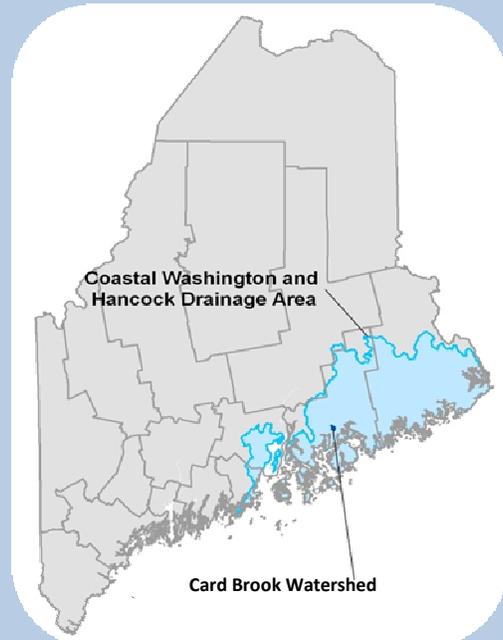
- Stormwater runoff from **impervious cover (IC)** is the largest source of pollution and stream channel alteration to Card Brook. Stormwater falling on roads, roofs and parking lots in developed areas flows quickly off impervious surfaces, carrying dirt, oils, metals, and other pollutants, and sending high volumes of flow to the nearest section of the stream.
- A number of High Street storm drains, which are linked directly to Card Brook, funnel runoff from roads and parking lots down to the stream.
- Exposed tree roots along the banks of Card Brook, an unstable streambank, and an over-widened stream channel are clear signs of degraded habitat for life living in the stream (URWC, 2005).
- Wetland and woodlands in a large portion of the central Card Brook watershed absorb and filter stormwater pollutants, and help protect both water quality in the stream and stream channel stability.

### Definitions

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

### Waterbody Facts

- **Segment ID:**  
ME0105000213\_514R\_01
- **City:** Ellsworth, ME
- **County:** Hancock
- **Impaired Segment Length:** 1.2 miles
- **Classification:** Class B
- **Direct Watershed:** 6.59 mi<sup>2</sup> (4,217 acres)
- **Watershed Impervious Cover:** 7%
- **Major Drainage Basin:** Coastal Washington and Hancock



## Why is a TMDL Assessment Needed?

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



*Card Brook upstream of Water Street.  
(Photo: Maine DEP Biomonitoring Program)*

Recreational impairments in Card Brook have already been addressed in DEP's 2009 statewide bacteria TMDL [<http://www.maine.gov/dep/water/monitoring/tmdl/tmdl2.html>].

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

## Sampling Results & Pollutant Sources

Sampling Station	Sample Date	Statutory Class	Model Results
814	8/8/2006	B	NA
814	8/10/2011	B	NA
815	8/8/2006	B	NA
815	8/10/2011	B	C

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

Card Brook impairment is based on data collected by DEP in 2006 at sampling stations upstream of High Street (S-814) and downstream of Water Street (S-815) (DEP, 2010b). Data collected at these stations indicate Class B Card Brook is "non attaining" (NA), meaning it does not meet Class A, B, or C conditions during most of the sampling events. Card did attain Class C in 2011, but not the Statutory Class B.

## Impervious Cover Analysis

Increasing the percentage of impervious cover (%IC) in a watershed is linked to decreasing stream health (CWP, 2003). Because Card Brook's impairment is not caused by a single pollutant, %IC is used for this TMDL to represent the mix of pollutants and other impacts associated with excessive stormwater runoff. The Card Brook watershed has an impervious surface area of **7%** (Figure 1). DEP has found that in order to support Class B aquatic life use, the Card Brook watershed may require the characteristics of a watershed with **5%** impervious cover. The target for Card Brook is lower than the target recommended for Class B streams in the IC Guidance (Appendix 2), of the TMDL report. Not all watersheds are created equally and the

*5% IC represents an approximate **29% reduction** in stormwater runoff volume and associated pollutants when compared to existing pollutant loads.*

guidance does include an option to apply Best Professional Judgment when choosing streams' targets. The development is concentrated in the most downstream portion of the watershed (Figure 1) and exerts a disproportionate effect on the lower impaired stream segment. This segment does exhibit characteristics associated with impairment due to stormwater runoff, therefore a target was chosen to reduce the impact of IC and achieve water quality classification. The center of the watershed is dominated by a large open wetland complex, which may also influence the downstream portion of the stream. The relative contribution of the wetland needs to be evaluated during the development of a Watershed Specific Plan, as recommended in the IC TMDL.

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

### **Impervious Cover GIS Calculations**

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

### **Next Steps**

Because Card Brook is an impaired water, specific sources of stormwater runoff in the watershed should be considered during the development of a watershed management plan to:

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

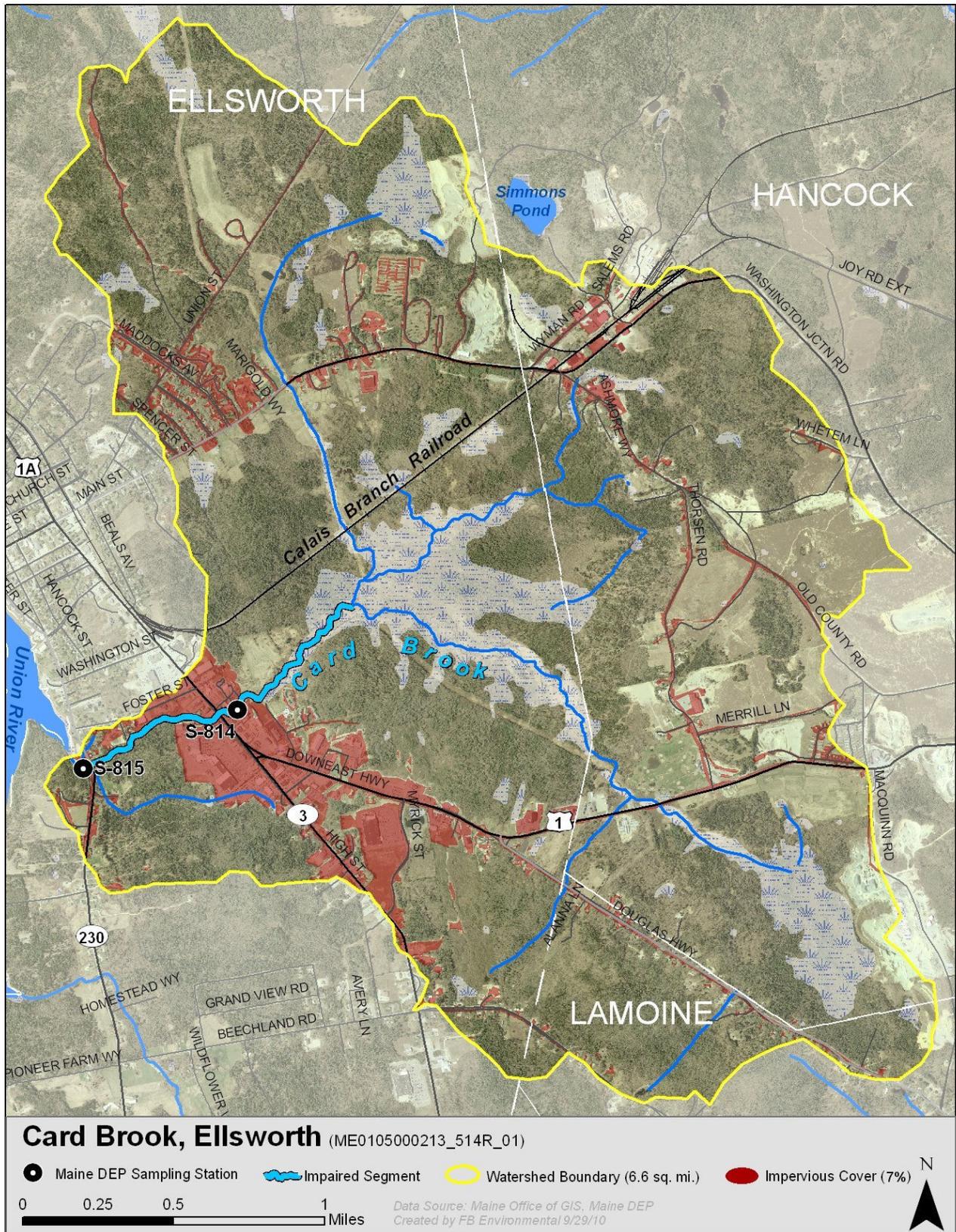


Figure 1: Map of Card Brook watershed impervious cover.

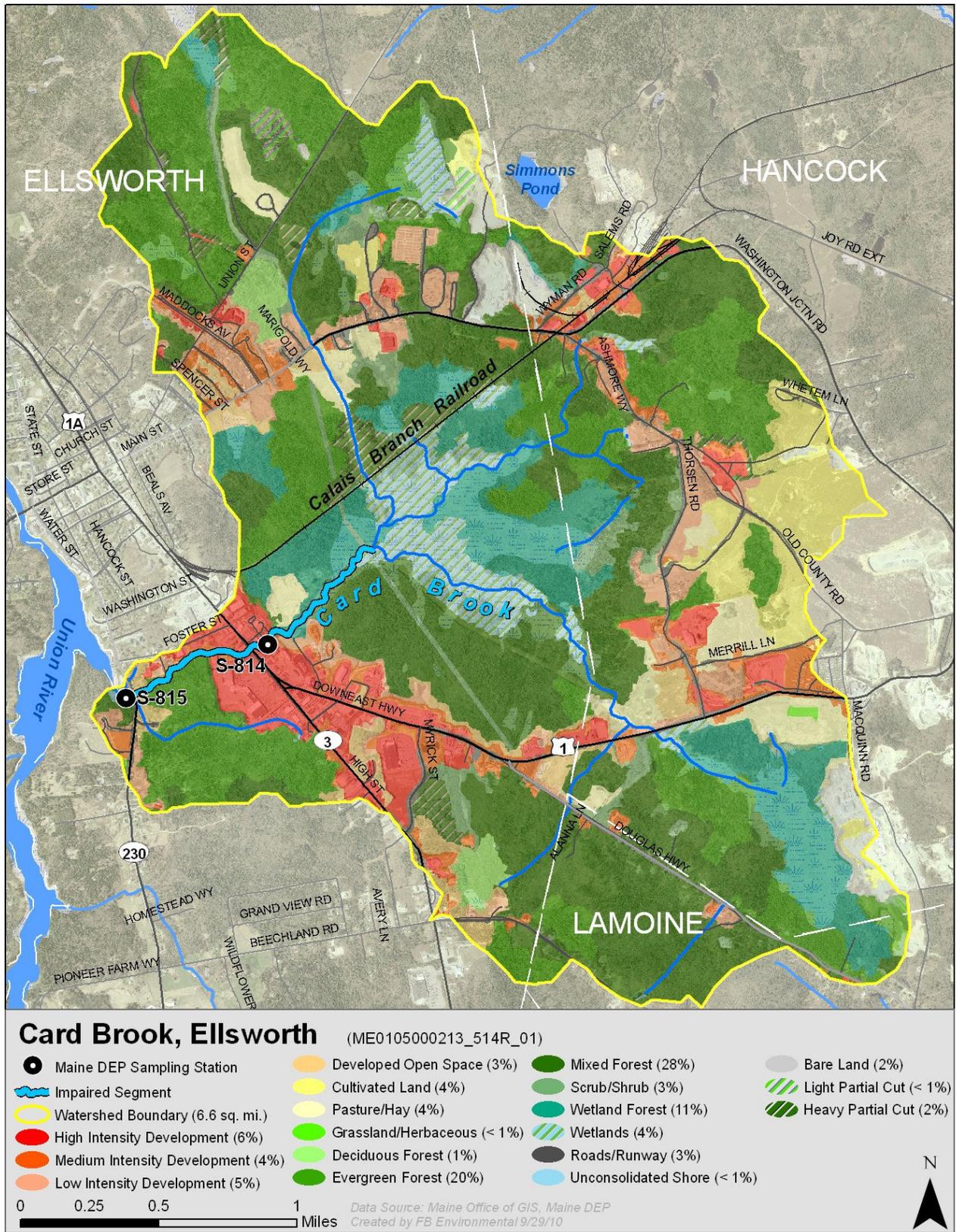


Figure 2: Map of Card Brook watershed land cover.

## References

- Center for Watershed Protection (CWP). 2003. Impacts of Impervious Cover on Aquatic Systems. Watershed Protection Research Monograph No. 1. Center for Watershed Protection, Ellicott City, MD. 142 pp.
- Davies, Susan P. and Leonidas Tsomides. 2002. Methods for Biological Sampling and Analysis of Maine's Rivers and Streams. Maine Department of Environmental Protection. Revised August, 2002. DEP LW0387-B2002.
- Maine Department of Environmental Protection (DEP). 2010a. Draft 2010 Integrated Water Quality Monitoring and Assessment Report. Bureau of Land and Water Quality, Augusta, ME. DEPLW-1187.
- Maine Department of Environmental Protection (DEP). 2010b. Assessment Database Detail Report for Card Brook (Ellsworth). Bureau of Land and Water Quality, Augusta, ME.
- Union River Watershed Coalition (URWC). Union River Watershed Coalition Baseline Study 2005 Field Season Report. 2005. Bar Harbor, ME.