Stream Buffer Report

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Report Prepared by the

South Burlington Stormwater Utility

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Introduction

Purpose

Forested buffers provide numerous benefits to the streams they border. Some of these benefits include:

- Erosion and sediment control through the filtration of runoff and the stabilization of stream banks
- Maintaining a natural balance of nutrients (e.g. nitrogen and phosphorous) as they flow to the stream
- Water temperature control by providing shade cover for streams.
- Habitat and food for all levels of the food web
- Flood control by slowing run-off as it enters the stream and decreasing water velocity and soaking up excess water as it escapes the stream banks.

Since the onset of agriculture, areas of stream buffer have been continuously degraded throughout the U.S. Vermont, with its rich history of agriculture, is no exception to this and there are areas in the State where stream buffers are threatened or no longer exist. The loss of these areas can result in the partial or complete destruction of the adjacent stream habitat, as well as negative impacts on downstream reaches. Nowadays, urban development continues to threaten buffer areas and the encroachment of impervious surface area into stream buffers can accelerate the negative effects observed due to the loss of the forested buffer area.

This report will review the current status and adequacy of the stream buffers in the stormwater impaired watersheds located in the City of South Burlington, Vermont. It will outline options for enhancing the protection of stream corridors within the City. The buffer areas for each stormwater impaired watershed will be evaluated. In addition, a map of stream corridors depicting areas that have been converted to impervious surface is included with problem areas called out.

Protection of Stream Buffers in South Burlington

The City of South Burlington protects stream buffers through regulation and by offering a monetary incentive to property owners. Section 12.01 of the South Burlington Land Use Regulations lists buffer requirements for surface waters (Table 1). These requirements vary depending upon the surface water affected and are enforced by the Department of Planning & Zoning. Individuals must keep a certain distance away from streams and are not allowed to remove trees, or disturb the buffer area during development of their property.

In addition to regulations limiting the activities allowed in stream buffers, the South Burlington Stormwater Utility offers credits for individuals who maintain a buffer around streams. All properties in the City pay a monthly fee to the Stormwater Utility. This fee is based on the amount of impervious surface area found on the property. The Stormwater Utility offers a 10%

fee reduction if a property meets the Stream Buffer Credit requirements as set forth in section 3.4 of the Vermont Stormwater Management Manual (VSMM) used by the Vermont Agency of Natural Resources (ANR)

Table 1 – Buffer Requirements in South Burlington

Surface Water	Buffer Distance (feet)
Muddy Brook	100
Potash Brook, main stem	100
Winooski River	100
Minor streams	50
Drainage way	10
Lake Champlain	150

Methods

Problem areas were identified through geographic analysis based on both state and local data sets and from South Burlington stormwater utility staff familiarity with our impaired watersheds. Impervious surface encroachment into stream buffers were highlighted by overlaying stream buffers on impervious surface areas as identified from satellite imagery.

Base data sets:

- Impervious surfaces—South Burlington purchased multi-spectral (2.4 m resolution) and panchromatic (0.6 m resolution) satellite imagery collected in August, 2006, from Digital Globe. The University of Vermont (UVM) classified the imagery into vegetated and impervious surfaces using Ecognition object-oriented imagery classification software. South Burlington manually identified impervious areas in the buffer of Potash Brook's main channel prior to this report. Our manual classification yielded slightly more impervious surface, about 4.6%. Impervious areas missed by the automated classification generally resulted from overhanging vegetation and shadows. UVM calculated the overall accuracy of its classification for the Potash watershed at 96.8%.
- Watershed boundaries—Vermont stormwater watersheds - VT impaired waters 303(d) 2004, downloaded from Vermont Center for Geographic Information.
- Stream hydrography—two datsets.
    - Reach and stream sensitivity data from Fitzgerald Environmental Associates' Phase 2 Stream Geomorphic Assessments.
    - Vermont Hydrography Dataset (1:5000) tributary reaches not included in Fitzgerald data.
    - 50-foot buffers applied to all stream reaches, except for a 100-foot buffer applied to the main channel of Potash Brook as identified in the Fitzgerald data.
- Catch basin, storm drainage line, culvert, parcel—City of South Burlington. Basins, lines, and culverts originally developed by Chittenden County Regional Planning Commission (CCRPC), with additions and edits by South Burlington in 2006 and 2007. Parcel boundaries current as of August, 2007.
- Orthophotography background, 1:1250 natural color, May 2004; CCRPC.

- Area statistics calculated in ArcGIS from the above datasets.

Watershed Buffer Comparison

Comparison of buffer data for the four stormwater impaired watersheds in South Burlington shows varying conditions within each watershed (Table 2). No impervious area encroaches upon the Munroe Brook stream buffer. However, our analysis of the Munroe Brook buffer area ended at the South Burlington City boundary. It is possible that buffer encroachments exist where the stream is located in Shelburne. In Centennial Brook, impervious area has encroached upon the stream buffer only slightly. This is largely due to the fact that a large portion of the brook is located within the Centennial Woods Natural Area. Similar to Munroe Brook, our analysis of buffer impacts in Centennial Brook ended at the South Burlington City boundary. It is possible that additional buffer impacts can be found in areas where Centennial Brook is located in the City of Burlington.

The stream buffer for Bartlett Brook has moderate encroachment of impervious area. Just over 2 acres of impervious area exist within the Bartlett Brook stream buffer. This equates to about 5% of the total stream buffer area (~46.6 acres).

Of the four stormwater impaired watersheds located in South Burlington, Potash Brook has the largest surface area of stream buffer (~1099 acres). It also has the most impervious area located in its stream buffer (130 acres). Approximately 12% of the Potash Brook stream buffer is impervious area. When comparing these figures, it should be noted that the buffer area for the main stem of Potash Brook used in this analysis varies from the distance used for the other streams. The main stem of Potash Brook was given a 100' buffer compared to 50' for the other streams and tributaries. This larger distance was used because it is the required buffer distance listed in the South Burlington Land Use Regulations (Table 1).

Table 2 – Impervious Area Within Stream Buffers

Subwatershed	Buffer area (ft^2)	Buffer Impervious area (ft^2)	Buffer % Impervious
Bartlett Brook	2,029,471	95,325	4.7%
Centennial Brook*	1,702,677	28,739	1.7%
Munroe Brook*	347,351	-	0.0%
Potash Brook	47,868,982	5,638,997	11.8%

* South Burlington area only

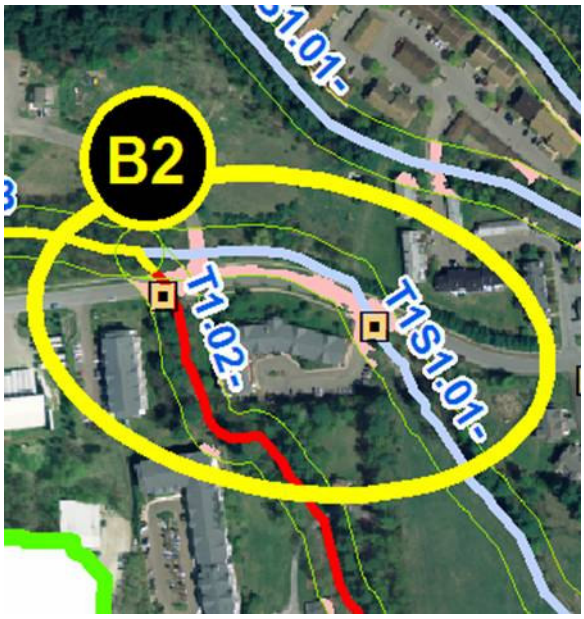
Bartlett Brook

Description

Bartlett Brook is located almost entirely in the City of South Burlington. The lower portion of the watershed is a mixture of residential and commercial land uses while the upper reaches are surrounded by predominantly residential land use. Stream Geomorphic Assessment (SGA) data provided by the Vermont Agency of Natural Resources (ANR) indicates that portions of the brook are extremely sensitive. Mass failures of the stream bank have been noted in several locations. Presumably, these failures are the result of urbanization and the increased amount of stormwater runoff that this generates within the watershed. There are a number of areas throughout the watershed where the stream corridor and buffer area are encroached upon by impervious area. This is also a likely contributor to the impairment observed in Bartlett Brook.

Areas of Concern

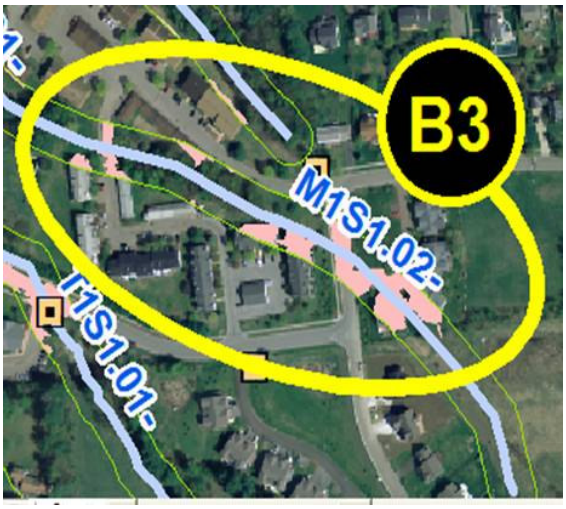
There have been 4 areas of concern identified in the Bartlett Brook watershed. The first area (B1) is located near the bottom of the watershed. The two main branches of the brook are carried underneath Shelburne Road (Rt. 7) by large culverts. The northern culvert is 60 inches in diameter and carries the main stem of the brook for 606 feet. The southern culvert has a 64 inch diameter and carries the stream for 173 feet. As would be expected at a road crossing, there is significant encroachment of impervious surface area into the stream buffer. In addition, SGA data for the area surrounding the southern culvert classified the reach as "extremely sensitive".

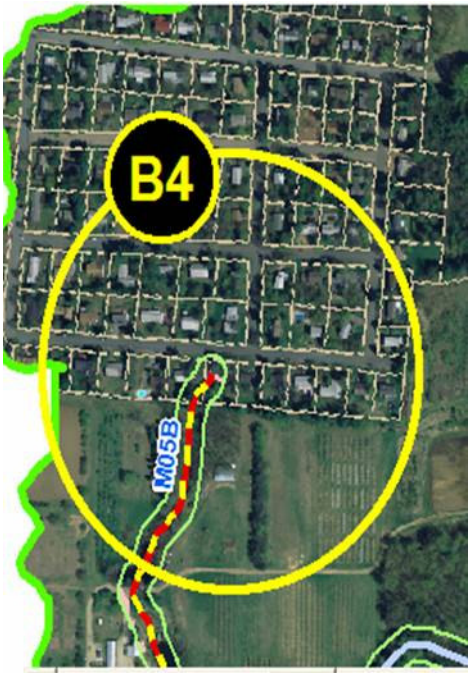


Area B2 is located along Harbor View Road, upstream of the southern culvert identified in area B1. In this location, the brook runs along the road for approximately 350 feet. During this distance, the entire width of Harbor View Road is within the 50' stream buffer. Steep banks lead from the road down to the brook. In addition, two culverts (one 48" and the other 24" in diameter) carry the stream beneath Harbor View Road in this area. The portions of the brook that have been

evaluated by ANR in this area have “extreme” and “high” sensitivity ratings.

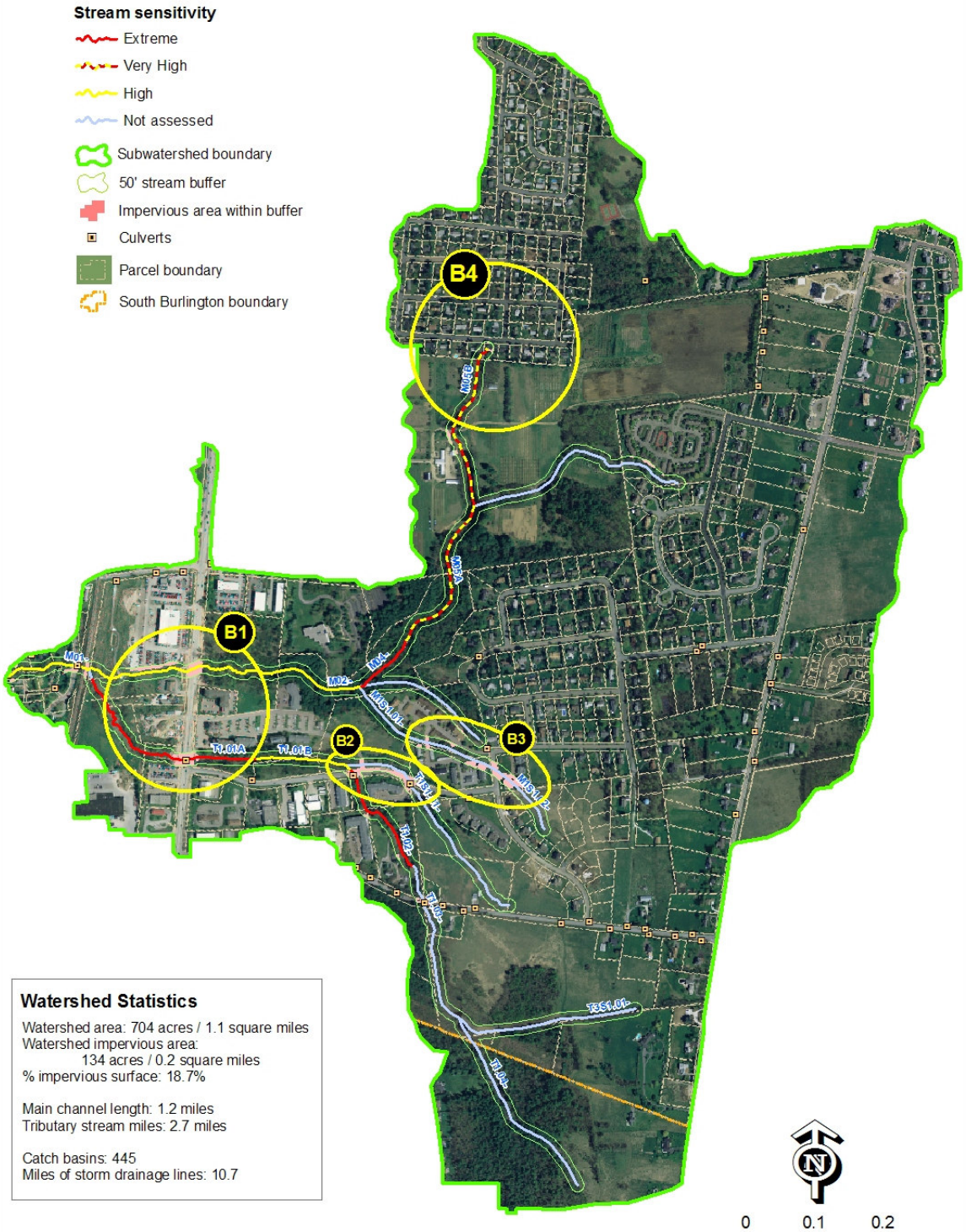
Area B3 is located near Bay Crest Drive. Multi-family residential units have been constructed in this area. Impervious area encroaching upon the 50’ stream buffer in this area includes rooftop, driveway, and roadway. No SGA data is available for this reach, however, areas downstream have been given a sensitivity rating of “high”.





The fourth area of concern (B4) identified in Bartlett Brook is located in the Laurel Hill South neighborhood. Although it is not shown on the map, Bartlett Brook runs along the UVM farm and City bike path before entering into the catch basin and piping system underneath Sebring Road. The stream travels through the piping system for approximately 1,000 feet before it daylights to the south of the Laurel Hill neighborhood and onto the UVM Horticultural Farm. SGA data collected for the portion of the Brook located south of the Laurel Hill neighborhood classifies its sensitivity as “very high”. In addition, there are in-stream ponds that UVM uses for irrigation located within this reach. Although these did not appear in our analysis of impervious area, they are obviously within the protected stream buffer.

Bartlett Brook Subwatershed



Watershed Statistics

Watershed area: 704 acres / 1.1 square miles
Watershed impervious area:
134 acres / 0.2 square miles
% impervious surface: 18.7%

Main channel length: 1.2 miles
Tributary stream miles: 2.7 miles

Catch basins: 445
Miles of storm drainage lines: 10.7

Data sources:
Stream sensitivity: Fitzgerald Environmental Associates
Additional stream lines: Vermont Hydrography Dataset, VCGI
Impervious surfaces: City of South Burlington
Parcel and city boundaries: City of South Burlington
Orthophotography: 2004, Chittenden County Regional Planning Commission
All data Vermont State Plane Coordinate system, NAD 1983

South Burlington
Stormwater Services

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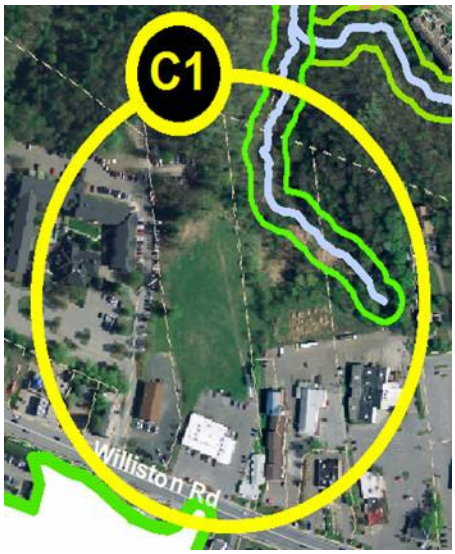
Centennial Brook

Description

The Centennial Brook watershed is located in both Burlington and South Burlington. The portion of the Brook that is located in South Burlington contains the main channel and the higher elevation tributaries. Centennial Brook runs through the Centennial Woods Natural Area (CWNA). This section has excellent riparian buffer and corridor conditions. There is significant beaver activity in areas located within the CWNA. The highest reaches in the watershed come into contact with commercial and residential development. Some small impervious areas encroach upon the Brook in these locations.

Areas of Concern

Two locations were identified as areas of concern in the Centennial Brook watershed. Although there are currently no encroachments into the 50' stream buffer in area C1, this location has been identified due to the likelihood of future development. In this location, Centennial Brook approaches Williston Road and the surrounding commercial businesses. An increase of impervious area north of Williston Road would approach the stream, and this development is likely to occur in the near future. Currently, the stormwater that flows to this reach from Williston Road and the surrounding businesses receives no treatment. Although an assessment of this reach has not yet been conducted by ANR, visual observation by City staff indicates that problems exist and treatment of stormwater runoff is needed in this area.



The second area of concern (C2) is located near the intersection of Airport Parkway and Picard Circle. At this location, Centennial Brook enters a 36 inch corrugated metal culvert for approximately 80 feet. As would be expected at a road crossing, there is significant encroachment of impervious surface area into the stream buffer. Downstream of this road crossing the SGA data provided by ANR shows that the stream has a sensitivity rating of "very high".

There are no other areas of substantial encroachment of impervious area in the Centennial Brook watershed.

Centennial Brook Subwatershed

Stream sensitivity
- Extreme
- Very High
- High
- Not assessed

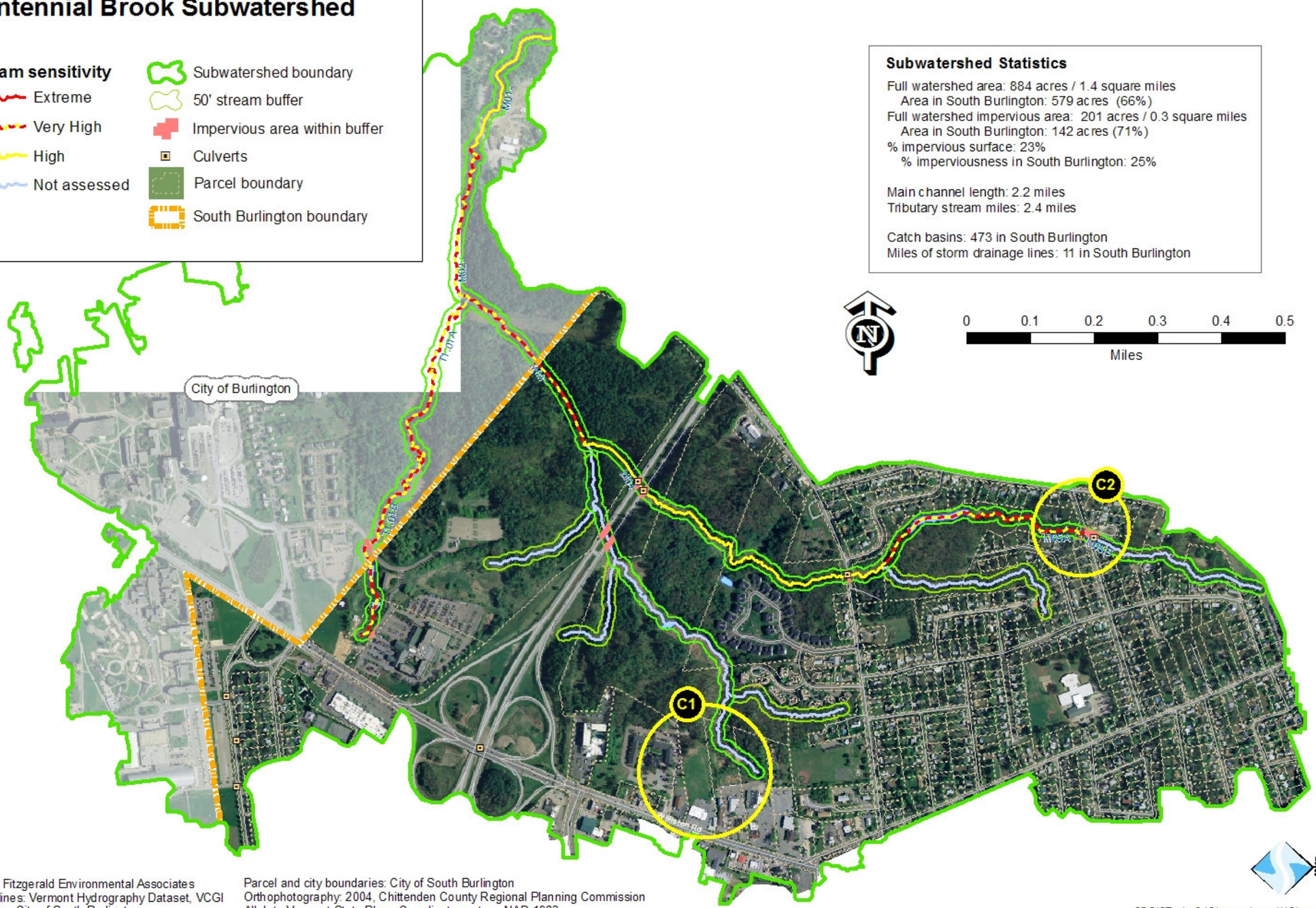
- Subwatershed boundary
- 50' stream buffer
- Impervious area within buffer
- Culverts
- Parcel boundary
- South Burlington boundary

Subwatershed Statistics

Full watershed area: 884 acres / 1.4 square miles
Area in South Burlington: 579 acres (66%)
Full watershed impervious area: 201 acres / 0.3 square miles
Area in South Burlington: 142 acres (71%)
% impervious surface: 23%
% imperviousness in South Burlington: 25%

Main channel length: 2.2 miles
Tributary stream miles: 2.4 miles

Catch basins: 473 in South Burlington
Miles of storm drainage lines: 11 in South Burlington



Data sources:
Stream sensitivity: Fitzgerald Environmental Associates
Additional stream lines: Vermont Hydrography Dataset, VCGI
Impervious surfaces: City of South Burlington

Parcel and city boundaries: City of South Burlington
Orthophotography: 2004, Chittenden County Regional Planning Commission
All data Vermont State Plane Coordinate system, NAD 1983

South Burlington Stormwater Services

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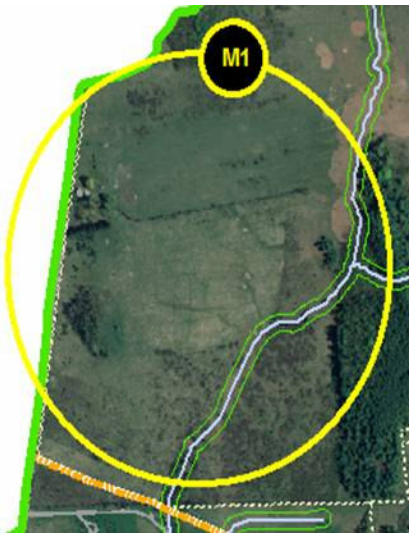
Munroe Brook

Description

Only a small portion of Munroe Brook is located in South Burlington. The majority of the brook is located in Shelburne. The portion of Munroe Brook that is in South Burlington flows through open farm field. The northern end of the brook approaches, but does not reach, Nowland Farm Road.

Areas of Concern

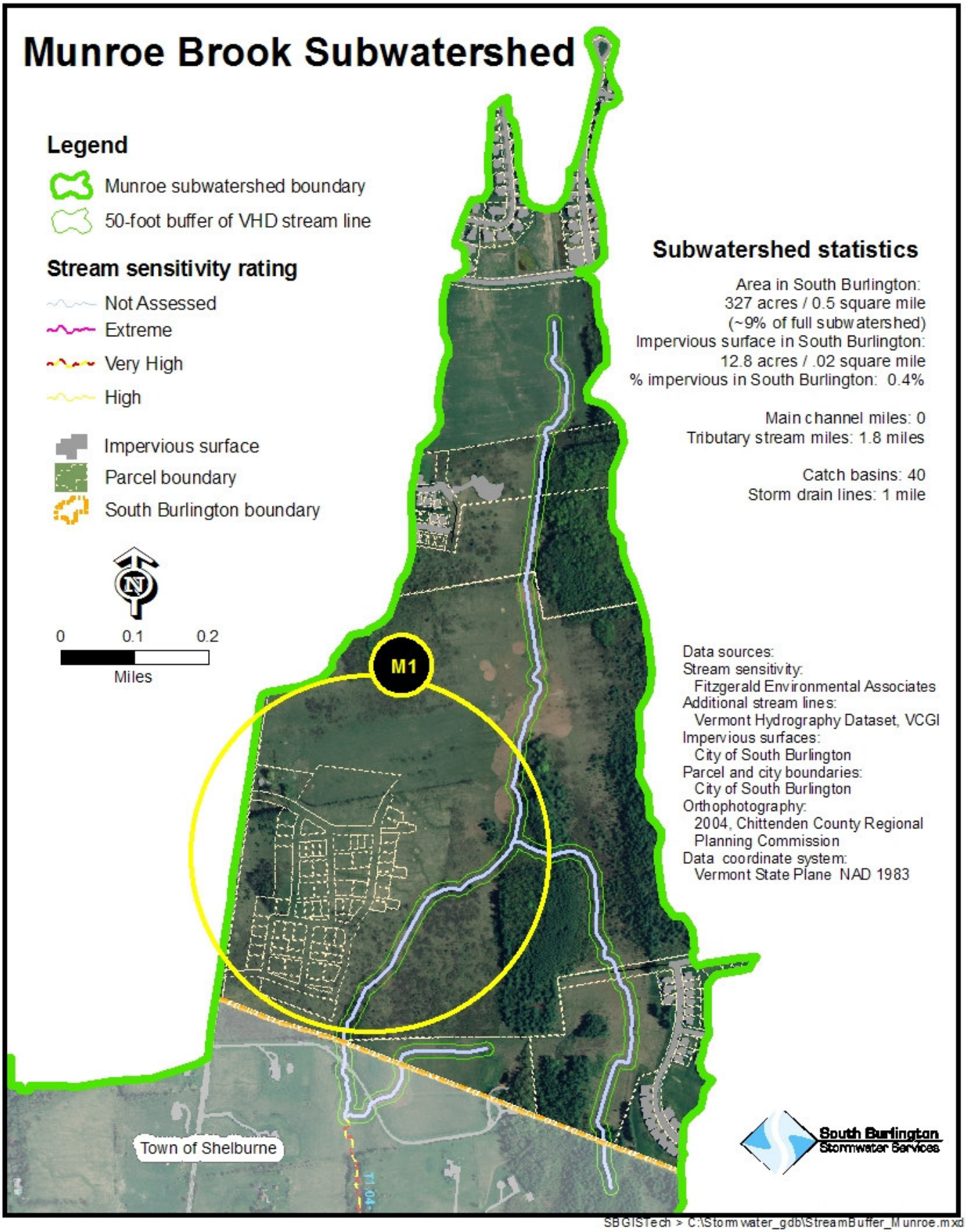


Our analysis did not identify any major buffer impacts in the portion of Munroe Brook that is located in South Burlington. Portions of the stream are provided with little shading as it flows through open field, but there is no impervious area located within the fifty foot stream buffer.

Area M1 was identified as needing special attention in the future. Construction of the South Village neighborhood is currently underway in this area. The plans show that an appropriate buffer will be maintained around the stream, with the notable exception of two areas where a new road will cross the brook.

Areas of Munroe Brook located in South Burlington have not yet been assessed by the State. Therefore, Stream Geomorphic Assessment (SGA) data relating to stream sensitivity for these portions of the brook is not included in this analysis.

Munroe Brook Subwatershed



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Potash Brook

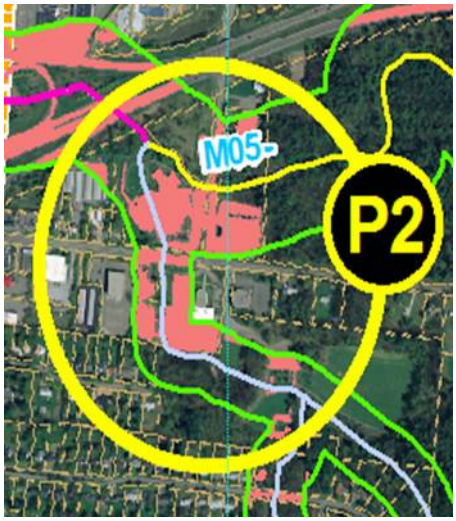
Description

Potash Brook and its associated drainage area are located almost entirely within the City of South Burlington. It is the largest of the four stormwater impaired watersheds found in South Burlington. The City's land use regulations require a 100' buffer around the main stem of Potash Brook and a 50' buffer around its tributaries. For these reasons, and due to the large amount of development within the watershed, Potash Brook has more impervious area encroaching upon its stream corridor than the other brooks.

Vermont ANR recently released the Stream Geomorphic Assessment (SGA) data that shows stream sensitivity ratings vary from "High" to "Extreme" throughout the brook. Many of the areas rated as "Very High" or "Extreme" are adjacent to areas where impervious area is encroaching upon the stream buffer. More specific information concerning these areas is included below.

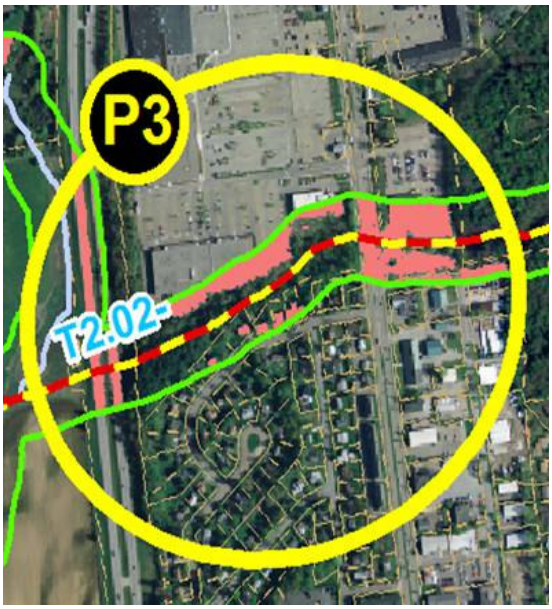
Areas of Concern

Eight areas with significant buffer impacts were identified in Potash Brook. The first area (P1) is located near the mouth of the brook, along the Shelburne Road (Rt. 7) and I-189 intersection. In this area, the brook flows through culverts beneath Shelburne Road and the I-189 turning ramps. The brook also flows near a commercial plaza with a large amount of impervious area. Steep banks lead from the buildings and parking area down to the brook in the northern section of area P1. In addition, the sensitivity of the stream in this area has been rated as "extreme" and "very high".



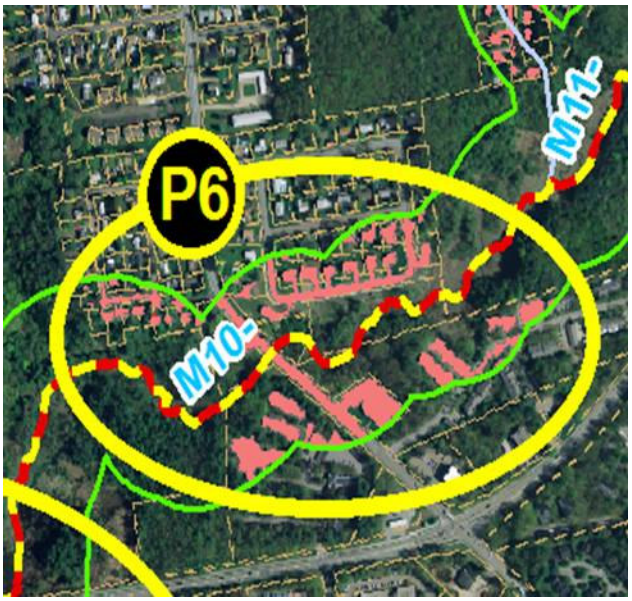
Area P2 is located slightly upstream of area P1. In this section, a tributary of the brook joins the main stem in an area predominantly covered by impervious surface. A large parking area and office building are very close to the tributary in this location. The main stem is encroached upon by parking lot and buildings associated with the correctional facility and other nearby commercial development. The brook is classified as "extremely sensitive" downstream of the confluence of the main stem and tributary. In the summer of 2007, the City of South Burlington completed construction of a large stormwater project in this area. Stormwater runoff from Farrell and Swift Street, as wels as some of the surrounding businesses will now receive treatment prior to discharging to the brook.

Moving upstream, area P3 was also identified for impervious encroachment into the buffer area. In this location, the brook flows under Dorset Street and adjacent to the nearby commercial development. Impervious area associated with the University Mall, Sears, and Hannafords encroaches upon the 100' stream buffer in this location. Prior to crossing under Dorset Street in a 60 inch culvert that is approximately 250 feet long, the stream is confined by impervious area nearly to its banks on both sides. Beaver activity in upstream areas can cause flooding of the adjacent commercial properties if not monitored. The stream sensitivity has been classified as "very high" in this area.

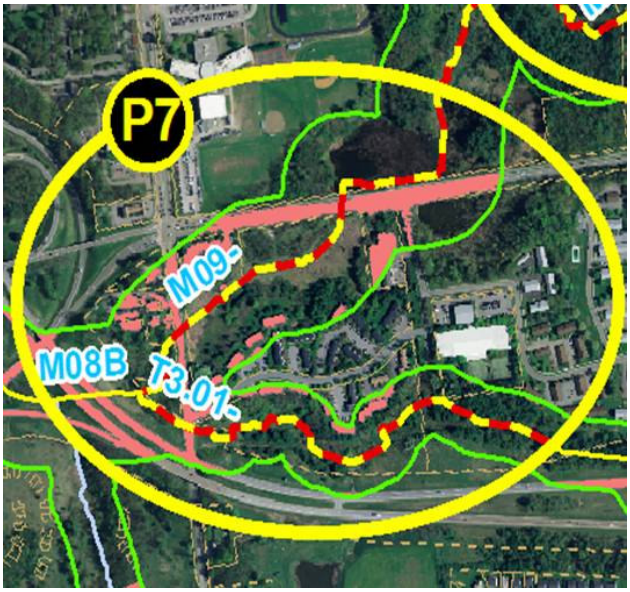


In area P4 the brook comes into contact with more residential and commercial development. Impervious area from Williston and Hinesburg Road, as well as the nearby commercial development, encroaches upon the 50' stream buffer. The stream gets its start as numerous pipes empty behind the Grand Union grocery store. The stream is obviously impaired due to stormwater runoff in this area and the SGA data supplied by ANR lists this stream reach's sensitivity as "very high".

Area P5 is located near the eastern most boundary of the watershed. In this location, the main stem of Potash Brook flows through commercial development surrounding the Williston Road and Kennedy Drive intersection. Encroachment of the stream buffer extends all the way to Kimball Avenue. Throughout this stream reach, the SGA data supplied by ANR classifies the brook's sensitivity as "extreme" or "very high".



As Potash Brook flows beneath Hinesburg Road in area P6 it is encroached upon by numerous residential developments. In addition, the culvert that allows the brook to pass beneath Hinesburg Road is undersized and easily plugged. In the past, clogging of this culvert has caused upstream flooding of a residence on Beechwood Lane and has threatened residences in the Winding Brook neighborhood. In addition, the stream is classified as "very highly" sensitive in this area. Stormwater treatment was recently improved along Kennedy Drive and plans are currently underway to improve the stormwater treatment facility in the Winding Brook neighborhood.



Encroachments to the stream buffer are also observed in area P7. In this location, the stream passes beneath 3 major roadways (Kennedy Drive, Dorset Street, and I-89). Stream sensitivity has been classified as "very high" in this area. Recently, the City of South Burlington has improved stormwater treatment along the Kennedy Drive corridor and the Winooski Natural Resource Conservation District worked with both VTRANS and the City to install stormwater treatment for a portion of Dorset Street and I-89.

Stream encroachments also exist in the Butler Farm and Oak Creek Village neighborhoods (area P8). In these neighborhoods, the brook has been straightened and numerous residences are located within the 50' buffer. In addition to the impervious impacts within the buffer, this section of the brook lacks shading. The surrounding land has been cleared for lawn and few trees exist. The stream is significantly degraded as it runs through the neighborhood and residences regularly have issues relating to flooding. The stream is listed as extremely sensitive in this area. The City of South Burlington is currently working with residents to plan and construct stormwater treatment in this area.

Potash Brook Subwatershed

Stream Sensitivity

- Extreme
- Very High
- High
- Not Assessed
- Buffer--100 or 50 foot
- Impervious surface
- Parcel boundary
- South Burlington boundary

Subwatershed Statistics

Total area: 4517 acres = 7 square miles
Total impervious area: 861 acres = 1.3 square miles
Percent impervious: 19%

Main channel length: 7.8 miles
Tributary lengths: 14.1 miles

Catch basins within subwatershed: 2018
Storm drain lines: 53 miles

Data sources:
Stream sensitivity: Fitzgerald Environmental Associates
Additional stream lines: Vermont Hydrography Dataset, VCGI
Impervious surfaces: City of South Burlington
Parcel and city boundaries: City of South Burlington
Orthophotography: 2004, Chittenden County Regional Planning Commission
All data Vermont State Plane Coordinate system, NAD 1983

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