

INCREASING AQUATIC HABITAT KNOWLEDGE AND STEWARDSHIP IN THE LEWIS CREEK WATERSHED

Lewis Creek Watershed | Starksboro, Hinesburg, Monkton, Charlotte, and Ferrisburgh, Vermont

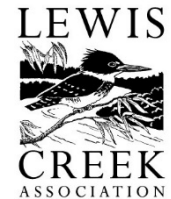
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METHODS

Important refugia locations were identified for conservation or restoration in order to support brook trout (*Salvelinus fontinalis*) and other coldwater species populations. Refugia are locations where species can perform life-cycle functions particularly during stressful times such as sheltering during high flows, residing in coldwater pockets during low flows when water temperatures rise, and seeking cover beneath riparian vegetation to avoid predation. The Lewis Creek watershed has been extensively studied by Lewis Creek Association and others, and existing data were used to guide identification of refugia locations for restoration and protection. The following data sources were used in this analysis.

- Aquatic natural communities classifications (VTDEC, 2012)
- Reach habitat assessments describing the habitat condition, deficiencies, and potential projects on select mainstem and tributary reaches (MMI, 2009a; MMI, 2009b).
- Stream geomorphic assessment data (SMRC, 2004, 2007)
- Water quality data (SMRC, 2012)
- The River Corridor Conservation and Management Plan (SMRC, 2010)
- The Otter Creek Tactical Basin Plan (VTDEC, 2019 Draft)
- The Riparian Gap Find Tool for Lewis Creek (VTANR, 2019)
- Biomonitoring data (VTDEC)
- Stakeholder input

This work focused on aquatic natural communities where brook trout and other coldwater species are expected including: Small Cold Water High Gradient, Small-Moderate Mixed Water Low Gradient; Moderate Mixed Water/Cool High Gradient; and Lake Marsh Outlet Stream Reaches Community Types (Figure 1).

Past temperature monitoring in the Lewis Creek and tributaries confirmed the expected pattern that water temperature increases moving downstream and that all monitoring stations except Hollow Brook have some recorded days with stream temperatures above 70 degrees Fahrenheit (SMRC, 2012) that is widely considered to be an upper water temperature limit for stressed living conditions for coldwater species. The Pond Brook tributary has a warming effect on Lewis Creek, likely due to a lack of woody vegetation in the riparian buffer leading to an almost entirely open canopy. A large increase in water temperature exists on Lewis Creek between the ballfields near State Prison Hollow Road and Tyler Bridge Road. Coldwater refugia locations within these reaches that are occasionally too warm for brook trout are especially important.

The Riparian Gap Find Tool for Lewis Creek (VTANR, 2019) was used to identify locations where natural riparian vegetation is limited or absent next to coldwater habitat (Figure 2). The Riparian Gap Find Tool also includes links to biomonitoring results and the aquatic natural communities to assess riparian vegetation needs. Community members, anglers, and partners provided information on local populations and potential project locations.

Potential project locations identified through previous studies and mapping were visited in the field on October 28, 2019 by Jessica Louisos of Milone & MacBroom, Kate Kelly and Matt Gorton of Lewis Creek Association, and Mike Kline of Fluvial Matters. Possible improvements in coldwater refugia were confirmed in the field to finalize the project list (Table 1) and map (Figure 3). The potential coldwater refugia restoration and protection projects are described in more detail in the following pages. Projects are listed in order from the most to the least recovery of coldwater refugia and stream habitat length.

Many of the recommended coldwater refugia projects are located on private lands. Landowner outreach was not completed as part of this work and is the next step to begin project implementation.

Table 1
Summary of Refugia Restoration Locations

	Stream	Reach	Location	Aquatic Natural Community	Project Description
1	Hollow Brook	T4.04/ T4.05A,B	Sugar House Lane / Lazy Brook mobile home park	Small Cold Water High Gradient	Culvert replacement at Sugar House Lane, Add wood structures to straightened channel, plant riparian buffer, evaluate mass failures
2	Lewis Creek	M16 / M17A	Hop Farm, previous cow farm	Small-Moderate Mixed Water Low Gradient	riparian buffer plantings and instream wood structures
3	Lewis Creek	M22	Hillsboro Road / Route 116	Moderate Mixed Water / Cool High Gradient	riparian buffer plantings and instream wood structures
4	Lewis Creek	M19A	Ballfields	Moderate Mixed Water / Cool High Gradient	riparian buffer plantings and instream wood structures
5	Pond Brook	T3.03	State's Prison Hollow Road area	Small-Moderate Warm Water Low Gradient	riparian buffer plantings
6	Lewis Creek	M17C	State's Prison Hollow Road Extension	Moderate Mixed Water / Cool High Gradient	riparian buffer plantings
7	Lewis Creek	M13	off Silver Street	Moderate Mixed Water / Cool High Gradient	riparian buffer plantings and instream wood structures
8	Hollow Brook	T4.02B	driveway	Small Cold Water High Gradient	culvert replacement at driveway

1 – HOLLOW BROOK, T4.04 & T4.05 A & B

A double culvert passes under Sugar Hollow Lane that is perched, trapping sediment upstream, and blocking fish passage. The landowner reports that they regularly have to remove wood caught at the upstream side of the culvert and that the culvert has been overtopped. The landowner is interested in replacing the culvert but has not pursued the project due to the high cost and the need to access private land that runs along the right side of the stream. A home is located immediately upstream of the culvert and is at risk of flooding and erosion damage if the culvert is clogged. It is recommended that this culvert is replaced with a larger structure that matches the stream geomorphology and provides aquatic organism passage.

Hollow Brook has been straightened and natural riparian vegetation has been reduced due to historic and present agricultural fields downstream of Sugar Hollow Road. Adding large wood to the channel to create instream cover and planting a riparian forest over 1,800 feet to restore the shade canopy is recommended. The large wood additions will also encourage channel (re)meandering through the meadow to regain dynamic equilibrium at a stable channel slope to reduce erosion and allow the channel to naturally form and maintain instream habitat. A river corridor easement is proposed to protect this work and limit further vegetation removal and encroachments. A 50-foot minimum width forest area on both sides of the channel is recommended, but considered a minimum width as many sources recommend a 100 to 300 foot wide buffer to support all life functions of riparian species.

Lazy Brook Mobile Home park has encroached on the channel with development, roads, homes, and an informal rock berm on the river left (looking downstream) side of the channel. The floodplain on river right is accessible during flooding. There is no action recommended at the rock berm due to high risk to downstream homes if the berm is removed and the presence of connected floodplain on the far side of the river.

Upstream of Lazy Brook Mobile Home park the channel is in a narrowly confined valley with steep walls. Two mass failures and steep gullies exist that are transporting sediment into the channel. An evaluation is recommended to identify potential upland erosion control actions that may be paired with the recommended downstream restoration actions.



Lazy Brook Mobile Home park adjacent to Hollow Brook, looking upstream from Sugar Hollow Lane culvert.



Straightened channel with limited riparian buffer, looking downstream from Sugar Hollow Lane culvert.



Sugar Hollow Lane culverts, viewed from downstream.

2 – LEWIS CREEK, M16 & M17A

The Lewis Creek mainstem through the upper half of assessment reach M16 and all of M17A was formerly impacted by direct cow access. The banks of the stream are trampled and raw with erosion. The near bank and buffer vegetation has almost no woody vegetation and a tree canopy does not exist. Refugia are absent from the channel. Cows are no longer in the channel due to a change in farm operations that provides an opportunity for buffer restoration. The riparian area should be revegetated with native forest at least 50 feet on each side of the channel. Large wood should be added to the channel to enhance instream habitat.



Lewis Creek viewed from Route 116 looking downstream.



Lewis Creek channel viewed from Route 116.

3 – LEWIS CREEK, M22

Reach M22 of Lewis Creek (beginning 500 feet upstream of Hillsboro Road, extending through the Hillsboro Road and Route 116 crossings, and extending 700 feet downstream of Route 116) is located in a broad, low-gradient valley just downstream of a steep, forested headwater reach. This area is the first major gap in the riparian vegetation moving downstream from the headwaters on the mainstem of Lewis Creek (VTANR, 2019). Limited trees and shrubs exist leading to a lack of shade canopy and limited roughness in the riparian buffer that would filter runoff. The river channel is expected to be dynamic in this area based on the break in valley slope where sediment deposition is the driving process and the river will regularly adjust its path as it carves through recent deposits. Planting a riparian forest over 2,200 feet of channel, addition of large wood to the channel downstream of Route 116 to enhance instream habitat and stabilize the channel, and a river corridor easement recommended.



Lewis Creek viewed from Route 116 looking upstream.



Lewis Creek viewed from Route 116 looking downstream.

4 – LEWIS CREEK, M19A

Reach M19 of the Lewis Creek mainstem channel (near the ballfields at State Prison Hollow Road) was historically cleared and has a baseball field and park in the right floodplain. The near bank vegetation has shrub vegetation with only a few trees. The lack of large trees near the channel limits both the shade canopy and large wood habitat features in the channel. Limited refugia are present without instream wood and overhanging vegetation. Planting additional shade trees over 3,000 feet of the channel is recommended. The buffer should be at least 50 feet wide on each side of the channel. Adding large wood to the channel to increase instream cover is recommended.



Lewis Creek Mainstem near State Prison Hollow Road ballfields.



Lewis Creek Mainstem upstream of State Prison Hollow Road ballfields.

5 – POND BROOK, T3.03

Pond Brook near State's Prison Hollow Road flows through agricultural fields and has minimal to no woody buffer. This riparian area should be revegetated over 3,000 feet to create a naturally (re)vegetated buffer that is at least 50 feet wide. Replanting the buffer with native shade trees and designating a no-mow area is recommended.



Pond Brook at State's Prison Hollow Road, looking downstream.



Pond Brook at State's Prison Hollow Road, looking upstream.

6 – LEWIS CREEK, M17C

Segment M17C of the Lewis Creek mainstem (State’s Prison Hollow Extension Road) completely lacked refugia. Upstream of the road crossing the right bank riparian area is mowed lawn with a small strip of trees on the riverbank. Downstream of the road crossing the right bank riparian area is a meadow that appears to have recently been used for agriculture and is not currently being used. Replanting the buffer with native shade trees and designating a no-mow riparian area is recommended. The buffer should be at least 50 feet wide on each side of the channel.



Lewis Creek channel downstream of State’s Prison Hollow Road Extension, viewed looking downstream.



Lewis Creek right floodplain downstream of State’s Prison Hollow Road Extension.

7 – LEWIS CREEK, M13

Reach M13 of Lewis Creek (Silver Street) is one of the larger riparian vegetation gaps along the mainstem Lewis Creek (VTANR, 2019). Tree canopy and shrub layers are limited both in density and width, providing little shade or filtering. This riparian area should be revegetated and the proposed buffer should be at least 50 feet wide on each side of the channel. Replanting with native shade trees and designating a no-mow riparian area is recommended. Addition of wood to the stream is recommended to enhance instream habitat.



Lewis Creek viewed from Silver Street looking upstream.



Lewis Creek viewed from Silver Street looking downstream.

8 – HOLLOW BROOK, T4.02B

Hollow Brook flows through a triple pipe culvert that passes under a driveway that is trapping sediment and debris upstream and has created a large scour pool downstream. The culverts are not perched and do not appear to be a fish passage issue at this time. The presence of older abutments indicate that there is likely a history of erosion and driveway washouts at this location. Replacement of this crossing with a geomorphically compatible structure is recommended. The structure should be replaced following future damages and would be required to meet standards outlined in the Vermont Stream Alteration Permit.



Driveway culvert viewed from downstream.



Driveway culvert viewed from upstream.

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<http://vtanr.maps.arcgis.com/apps/View/index.html?appid=65f4d8e56e4e41eab9f3b4a1de67472d>

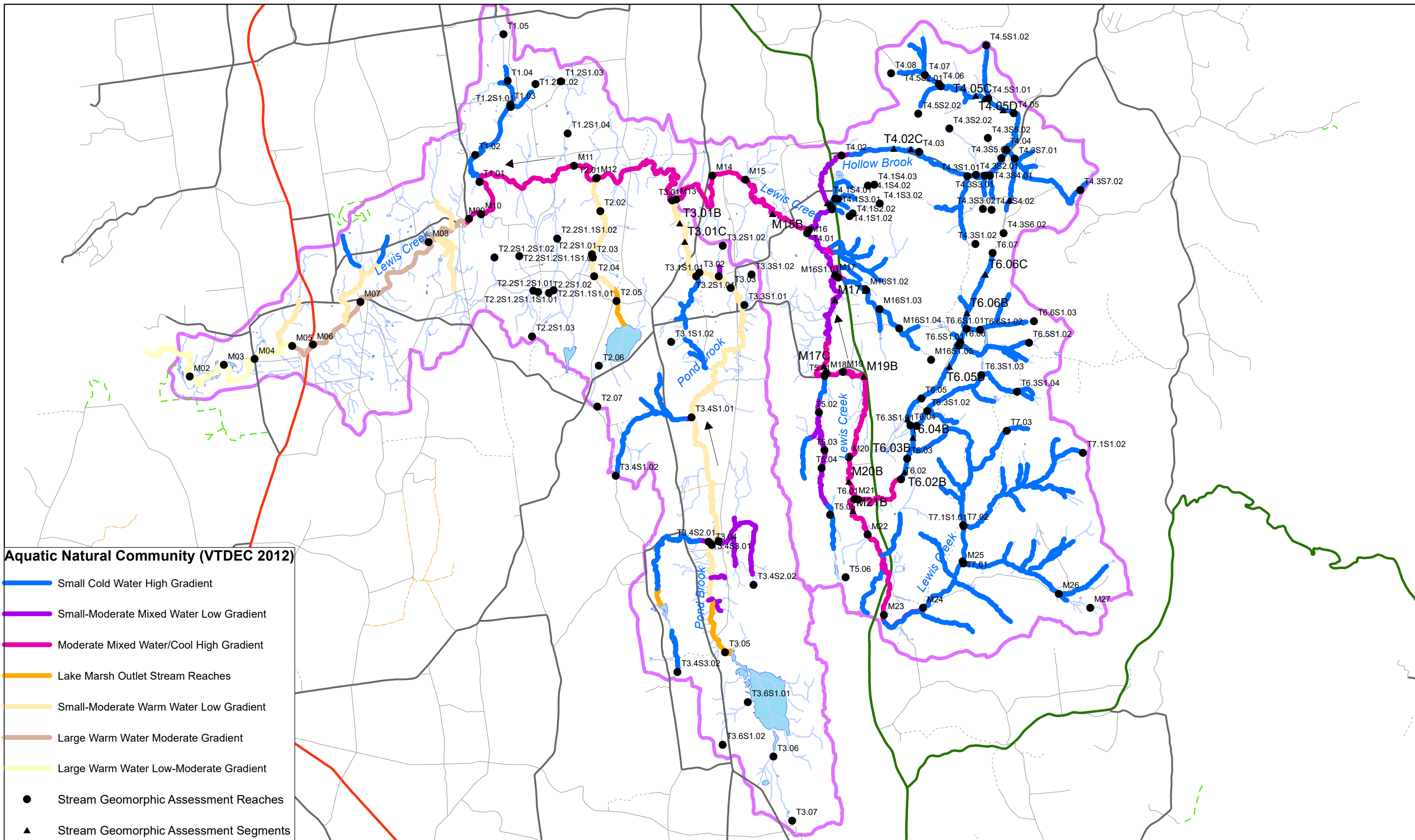
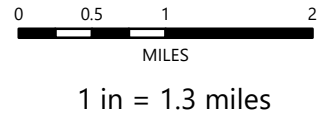


FIGURE 1: AQUATIC NATURAL COMMUNITIES
 INCREASING AQUATIC HABITAT KNOWLEDGE AND STEWARDSHIP
 LEWIS CREEK WATERSHED



MILONE & MACBROOM
 1 South Main St
 Waterbury, VT 05676
 802-882-8335

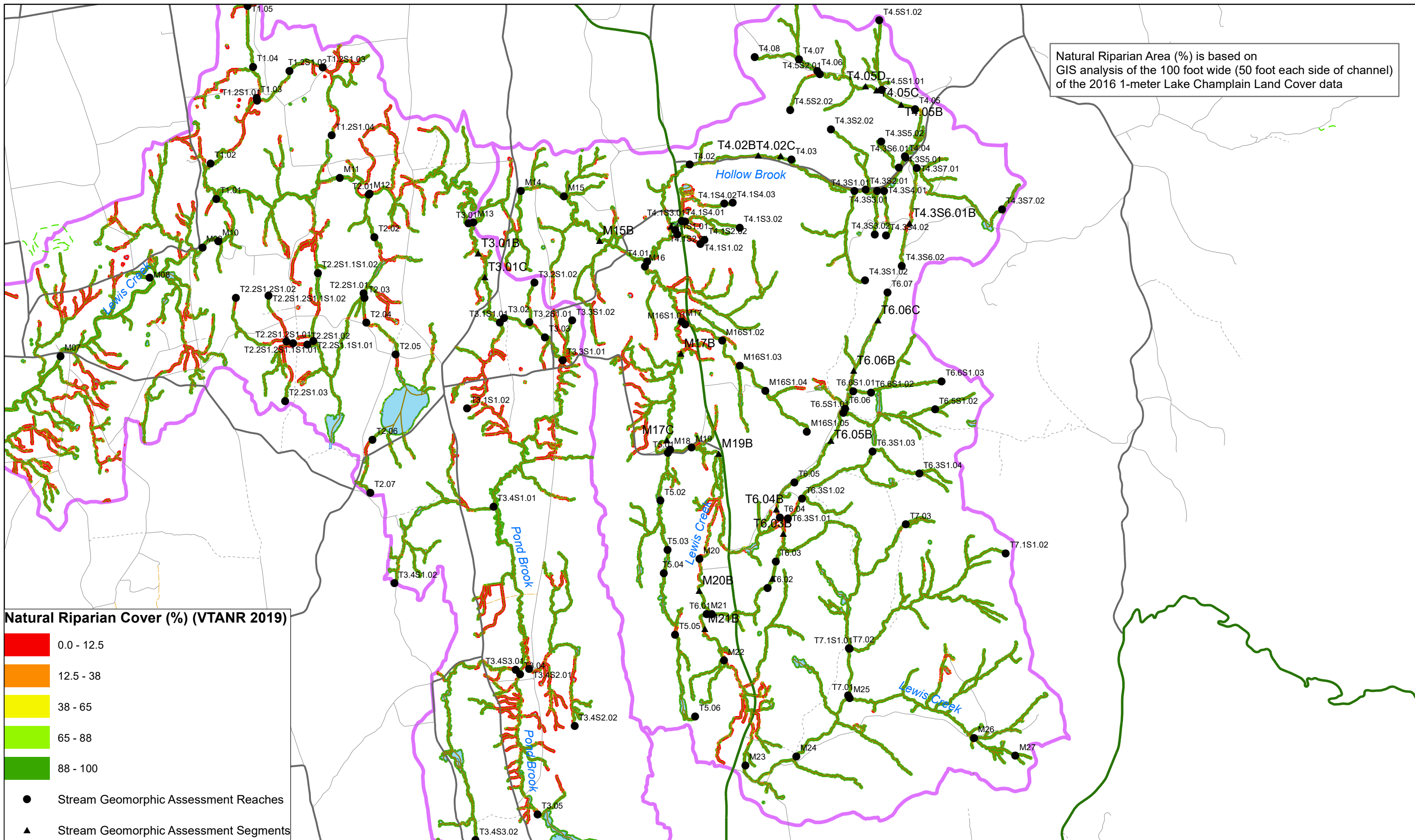
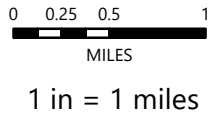


FIGURE 2: NATURAL RIPARIAN COVER
INCREASING AQUATIC HABITAT KNOWLEDGE AND STEWARDSHIP
LEWIS CREEK WATERSHED



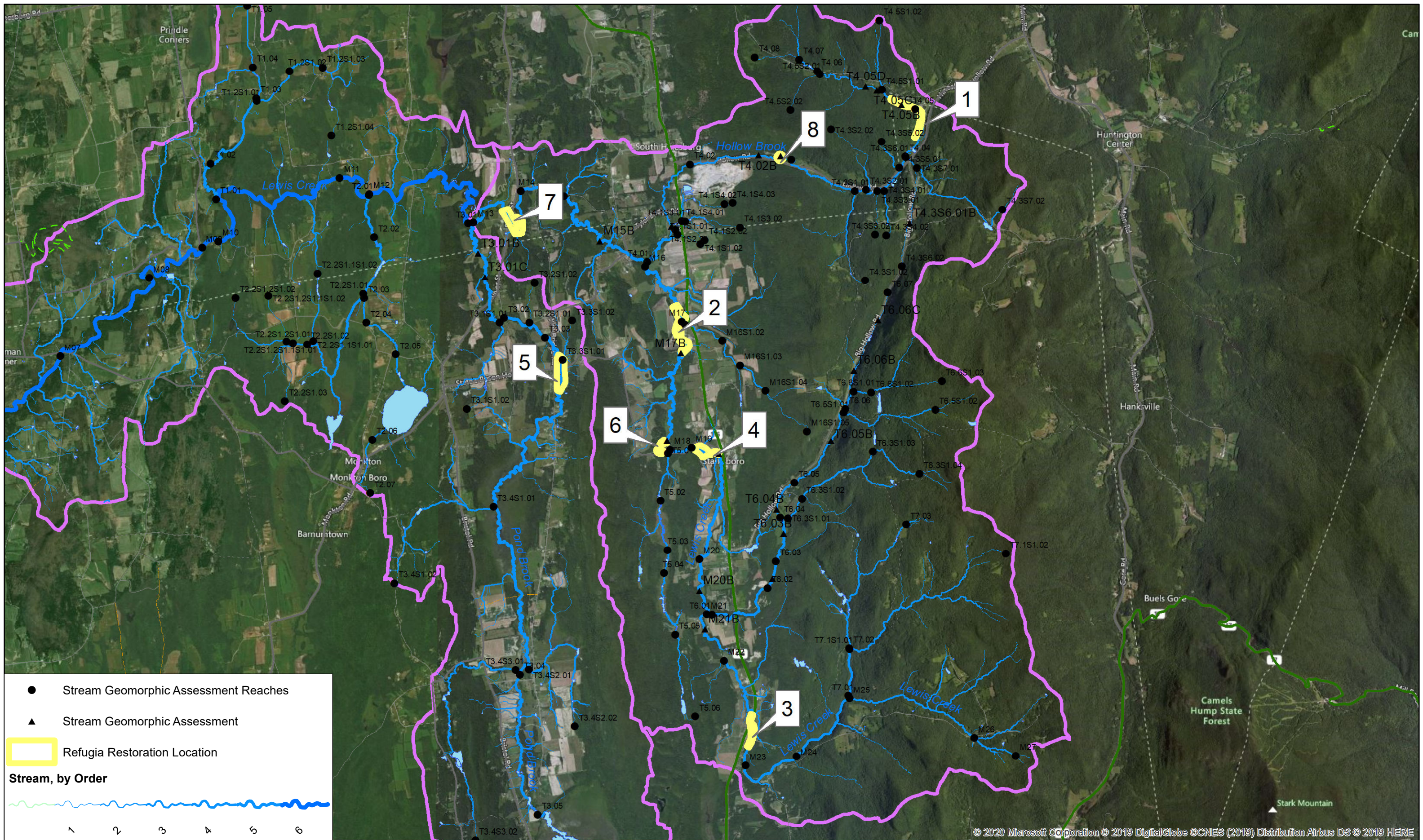


FIGURE 3: PROJECT LOCATIONS
 INCREASING AQUATIC HABITAT KNOWLEDGE AND STEWARDSHIP
 LEWIS CREEK WATERSHED

0 0.25 0.5 1
 MILES
 1 in = 1 miles

