

FINAL MEMO

REVIEW OF BASIN 17 STREAM GEOMORPHIC ASSESSMENTS & SEDIMENT STRESSED CONDITIONS IN STEARNS BROOK

FY22 TACTICAL BASIN PLANNING SUPPORT GRANT TASK 3.3

PREPARED FOR:

Vermont Agency of Natural Resources
374 Emerson Falls Road
St. Johnsbury, VT 05819
Contact: Ben Copans
802.751.0130



PREPARED BY:

Memphremagog Watershed Association, Inc.
PO Box 513
Newport, VT 05855
Contact: Patrick Hurley
781.389.4494



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Stream Geomorphic Assessments

1.1 Acknowledgements

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- Orleans County Natural Resource Conservation District (Sarah Damsell)
- NorthWoods Stewardship Center (Meghann Carter)
- Vermont Department of Fish & Wildlife (Peter Emerson)
- Essex County Natural Resource Conservation District (Emily Finnegan)
- Connecticut River Conservancy (Fritz Gerhardt)

1.2 Purpose

This memo serves as the deliverable for Task 3.3 of MWAs Tactical Basin Plan (TBP) support grant workplan agreement. The purpose of this memo is to summarize information gathered during the Basin 17 Stream Geomorphic Assessment (SGA) review process and Stearns Brook site visit. MWA performed this review and site visit in collaboration with DEC and has provided priority SGA needs for the Basin, as well as strategies to address the sediment stressed conditions observed in the Stearns Brook watershed. These efforts will help progress TBP Implementation Table Strategies #47 and #48. The outcomes are clearer information and priorities for follow up geomorphic assessments and project development work that will complement ongoing assessment, project identification, and project development work in the basin.

1.3 Literature & Data Review

To identify reaches and streams that may need further assessment, MWA reviewed all available SGA reports, River Corridor Plans, and water quality studies. This included the following reports:

- Restoring Water Quality in the Lake Memphremagog Basin: River Corridor Plan for the Barton & Johns River (M Dyer, 2008)
- Restoring Water Quality in the Lake Memphremagog Basin: Clyde River Phase I and II Stream Geomorphic Assessments (M Dyer, 2008)
- Restoring Water Quality in the Lake Memphremagog Basin: River Corridor Plan for the Black River (M Dyer et al., 2011)

- Restoring Water Quality in the Lake Memphremagog Basin: Phosphorus and Nitrogen Levels along the Johns River and Seven Smaller Tributaries (F Gerhardt, 2010)
- Restoring Water Quality in the Lake Memphremagog Basin: 2010 Black River Water Quality Report (F Gerhardt, 2011)
- Restoring Water Quality in the Lake Memphremagog Basin: 2011 Black River Water Quality Report (F Gerhardt, 2012)
- Basin 17 Lake Memphremagog, Tomifobia, and Coaticook Tactical Basin (DEC, 2017)
- VT DEC Watersheds Projects Database
- Lake Memphremagog and Stearns Brook Watershed Water Quality Monitoring 2019 Season Annual Report (S Damsell, 2020)
- Sucker Brook Erosion Survey (T Banister, 2021)

MWA reviewed these reports and planning documents to glean information related to as-yet uncompleted SGAs, fluvial erosion-related issues, and recommendations for additional geomorphic assessments. Several River Corridor Plans recommended specific reaches or tributaries for follow-up SGA work. In addition, the Watershed Projects Database provided a list of assessment needs based on reports, studies, or observations made over the past 15 years.

The 2017 TBP provided a helpful overview of streams and reaches that may require assessments to better understand the geomorphic conditions and develop appropriate projects to improve river health and function. The following excerpts were taken directly from the TBP:

In the Black River watershed, additional assessments on the Seaver Branch in Craftsbury, Shalney Branch in Albany, Daniels Road tributary to Lords Creek in East Albany, Black River main stem from reach M30 up to Whitney Branch, and of the lowest reaches of Lords Creek are recommended for Phase 2 stream geomorphic assessments. In the Barton River watershed, the additional assessments that are a priority going forward are the lowest reaches of the Brownington Branch and Willoughby Rivers as well as the Barton River in Glover. Stearns Brook has been identified as stressed due to sedimentation which may be in part from fluvial conditions, and so a field visit to this stream and discussions with locals to see if there is support for a phase 2 assessment or consideration of river corridor zoning is recommended in which case this may be a priority for a phase 2 stream geomorphic assessment. At this time, there are no priorities for Phase 1 or 2 assessment for the Clyde, Johns, or Coaticook river watersheds.

The SGAs in this basin were completed before the river corridor planning document was produced and so potential projects were not evaluated as to their priority through this lens. A project database was created based on all three stream geomorphic assessment efforts as a shapefile with over 290 potential projects, and this has been updated over time where over 80 buffer plantings have taken place. These potential projects need to be updated to be consistent with the current river corridor planning guide and updated information on landowner interest. This project database has been useful in tracking buffer planting efforts described above, however there has been less progress in the use of river corridor easements, updating local zoning to include river corridors, or more active restoration projects identified in these reports or in the project database. To move these projects along a local partner could seek funding to hire a qualified consultant to complete recommended additional stream geomorphic assessments, evaluate feasibility, and complete preliminary

design for projects identified in the existing project database as well as those identified through these additional assessments.

Entries in the Watershed Projects Database also identified potential opportunities for initial or follow-up assessment work by stream or reach. Some of these recommendations stem from observed water quality issues that may relate to geomorphic conditions or stream alterations. The following table provides a summary of all projects in the database that indicate a potential need for SGAs.

Table 1. Entries taken from the Watershed Projects Database that were reviewed to identify potential reaches for Phase 2 assessments.

Project ID	Project Name	Project Type	Notes
5011	Black River High priority Assessment 6846 feet on Both banks in Craftsbury	Stream Geomorphic Assessment Phase 2	SGA WORK DIDN'T FLAG THIS AREA, THOUGH AERIAL PHOTOS SUGGEST NEED FOR BUFFERS/ EASEMENT; DO FIELD CHECK
5012	Black River High priority Assessment 3579 feet on Both banks in Coventry	Stream Geomorphic Assessment Phase 2	SGA PHASE 2; NEED ACCESS PERMISSION FROM CALKINS SAND AND GRAVEL- CHRIS MARTEL GEN MANAGER 802-626-5755
5013	Black River High priority Assessment 4439 feet on Both banks in Coventry	Stream Geomorphic Assessment Phase 2	SGA PHASE 2; NEED ACCESS PERMISSION FROM CALKINS SAND AND GRAVEL- CHRIS MARTEL GEN MANAGER 802-626-5755
5016	Black River High priority Assessment 3576 feet on Both banks in Craftsbury	Stream Geomorphic Assessment Phase 2	SGA WORK DIDN'T FLAG THIS AREA, THOUGH AERIAL PHOTOS SUGGEST NEED FOR BUFFERS/ EASEMENT; DO FIELD CHECK
5070	Holbrook Bay Tributary High priority River - Planting 3139 feet on Both banks in Newport Town	River - Planting	WATER QUALITY!; MINIMAL OR NO BUFFER THROUGH VARIOUS OWNERSHIPS
5071	Holbrook Bay Tributary High priority River - Planting 3458 feet on Both banks in Newport Town	River - Planting	WATER QUALITY!; MINIMAL OR NO BUFFER THROUGH VARIOUS OWNERSHIPS
5072	Holbrook Bay Tributary High priority River - Planting 1810 feet on Both banks in Newport Town	River - Planting	WATER QUALITY!; NO SGA DONE HERE- SHOULD FIELD CHECK
5073	Holbrook Bay Tributary High priority River - Planting 2609 feet on Both banks in Newport Town	River - Planting	WATER QUALITY!; MINIMAL OR NO BUFFER

5069	Holbrook Bay Tributary High priority River - Planting 3622 feet on Both banks in Newport Town	River - Planting	WATER QUALITY!; NO SGA DONE - SHOULD FIELD CHECK
5079	Holbrook Bay Tributary High priority River - Planting 2135 feet on Both banks in Newport Town	River - Planting	WATER QUALITY!; NO SGA DONE - SHOULD FIELD CHECK
5119	Stoney Brook Medium priority River - Planting 1068 feet on Left Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP
5120	Stoney Brook Medium priority River - Planting 1958 feet on Left Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP
5121	Stoney Brook Medium priority River - Planting 102 feet on Left Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP
5203	Stoney Brook Medium priority River - Planting 1107 feet on Right Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP
5204	Stoney Brook Medium priority River - Planting 446 feet on Right Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP
5205	Stoney Brook Medium priority River - Planting 369 feet on Right Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP
5206	Stoney Brook Medium priority River - Planting 220 feet on Right Bank in Coventry	River - Planting	WATER QUALITY!; SGA PHASE 1 ONLY; POSS CREP

1.4 Existing SGA Coverage

MWA reviewed the SGAT layers on the VT Atlas to evaluate which reaches within the Basin 17 area of interest have undergone SGAs in the past. For this effort, the Basin 17 area of interest is defined as the Memphremagog basin and the Stearns Brook watershed, excluding the Coaticook watershed. According to the DEC Rivers Program, the past assessments performed in Basin 17 were divided up into 4 subbasins, with a unique Stream Geomorphic Assessment Tool (SGAT) project for the

Barton/Willoughby, Clyde, Black, and Johns rivers. An SGAT project has not been created yet for Stearns Brook.

According to these data, SGA Phase 1 has been performed on 738.5 miles of stream and Phase 2 assessments have been performed on 67.6 miles of stream (Figures 1 & 2). When viewed in context to the 1,213.1 miles of streams mapped by the Vermont Hydrography Dataset, Phase 1 assessments have been performed across 61% of the area of interest, whereas Phase 2 assessments have occurred across only 6%.

1.5 Recommendations

MWA and ANR compiled a list of streams and reaches that may warrant additional assessment and study to better characterize the geomorphic conditions and stressors, identify conservation and restoration opportunities, and initiate project development and outreach efforts. This list is not intended to be exhaustive or comprehensive, but rather a needs-based strategic approach to expand the narrative and data collection efforts that help characterize river conditions. Figure 3 provides a map of streams and reaches where further geomorphic assessments would provide valuable data and insight to the geomorphic conditions and processes in the basin. These reaches comprise 49.9 stream miles, which would provide a 4% increase in geomorphic assessment coverage across the basin, bringing the total to 117.5 miles (10% of total). The primary reaches and streams proposed for geomorphic or similar assessments are listed in Table 2.

Table 2. List of streams and reaches identified as potential priorities for stream geomorphic or similar assessments.

Subbasin/ SGAT Project	Stream Name	Proposed Reaches	Priority Tier	Notes
<i>Black</i>	Stony Brook	T1.01-T1.03, T1.05-T1.06	1	
	Brighton Brook	T3.01-T3.03	3	
	Lords Creek	T4.01 -T4.03, T4.05 to part of T4.07, T4.06S1.01, & lower T4.06S1.02	1/2	
	Lamphear Brook	T5.01	1	Dynamic reach downstream of previously assessed phase 2 reaches; could have

				floodplain/wetland restoration potential
	Shalney Branch	T7.01-T7.02	1	
	Cass Brook	T10.01	1	
	Black River (Craftsbury)	M30-M34	1	
	Whetstone Brook	Lower T11.01, parts of T11.05 & T11.06	2	
-	Whitney Brook	T12.01	3	-
	Seaver Branch	T9.01 & T9.02	2	Craftsbury/Albany town line
Barton	Willoughby River	T3.05 - T3.12	1	T3.09 and T3.10 have highest priority of these reaches because of encroachment/development
	Brownington Branch	T3S4.01, S4.02	1	
	Roaring Brook and trib	T5.01 - T5.05	2	T5S3.01 drains less than 2 square miles; simple walk may suffice
	Barton River (Glover)	M12 - M14, T6.01 to Shadow Lake,	2	Confluence area potential attenuation asset; document condition below Shadow Lake dam
Clyde	Trib to Sucker Brook	parts of T1.09, T1.11-T1.12	2	trib ~ 3 square miles; impacts but could do simple walk
	Mad Brook	T2.01-T2.05	1	
Stearns Brook (no SGAT Project)	Stearns Brook and Tribs	No Reach IDs; from CA border upstream to upper main	2/3	

		stem, Twin Bridge Road tributary		
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A shapefile of these proposed reaches was provided to the Watershed Planner and River Scientist as part of the deliverables for this project.

During conversations with the Watershed Planner and River Scientist, several challenges and constraints were identified that may limit the priority and funding availability for Phase 2 geomorphic assessments of many of the above mentioned reaches in the near term. Phase 2 assessments are typically prioritized in systems that pose potential fluvial erosion hazard risks, have documented stressors related to sediment or other issues, or represent greater than first- or second-order streams. Systems that exhibit such characteristics are often prioritized over smaller streams or streams with relatively little development encroachment. Many of the reaches recommended for Phase 2 assessments in Basin 17 are second-order streams with relatively minimal fluvial erosion hazard risks. Thus, discussions shifted to identifying alternative funding mechanisms or assessment protocols to reduce the expense of performing geomorphic assessments while still addressing the most important parameters and providing progress toward project identification and development.

Discussions identified potential use of 'Phase 2 lite' assessment protocols to minimize the time and expense of performing field assessments. This abbreviated protocol focuses on the most important geomorphic parameters for understanding river conditions and may be suitable for use in smaller, lower priority reaches. This protocol provides data and information that are necessary to utilize the Functioning Floodplains Initiative, a program developed to quantify phosphorus and other water quality credits for stream restoration projects. Clean Water Funds may be available for direct contracting of Phase 2 work in the future, although currently limited funding is available for this work in other parts of the State.

Excluding the Clean Water Fund, potential alternative funding for SGA work may be available by incorporating Phase 2 lite protocols within existing Riparian Lands streambank assessments, currently being performed by MWA in Basin 17. The streambank assessments focus on riparian habitat quality and project development but involve walking and assessing stream reaches much as one would during an SGA. Streambank assessments have been performed on State-Owned Lands throughout the basin, as well as all reaches of the Johns River watershed. Plans to expand these assessments to the Clyde River are currently under development and the project will initiate in Spring 2022. Department of Fish & Wildlife (DFW) staff, who provide financial support for streambank assessments through Great Lakes Fisheries Commission funding, have indicated a willingness to support efforts to combine streambank assessments with components of SGAs to increase logistical efficiency, reduce assessment costs, and streamline data collection, project identification, project development, and landowner outreach efforts. Challenges associated with this alternative include: adequate funding or matched funding sources; a need to define and tweak SGA Phase 2 lite protocols to fit into streambank assessments; data collection, curation and submittal; and the ability to scale this effort to the greater watershed.

There exists further need to coordinate geomorphic assessments into the broader assessment program in the basin, develop organizational capacity to conduct these assessments, and long-term initiatives that will result in successful project development and implementation. Conversations will continue

between MWA, DEC, and local and regional partners to identify the appropriate means and methods for conducting the much-needed work of restoring river functions and health in Basin 17.

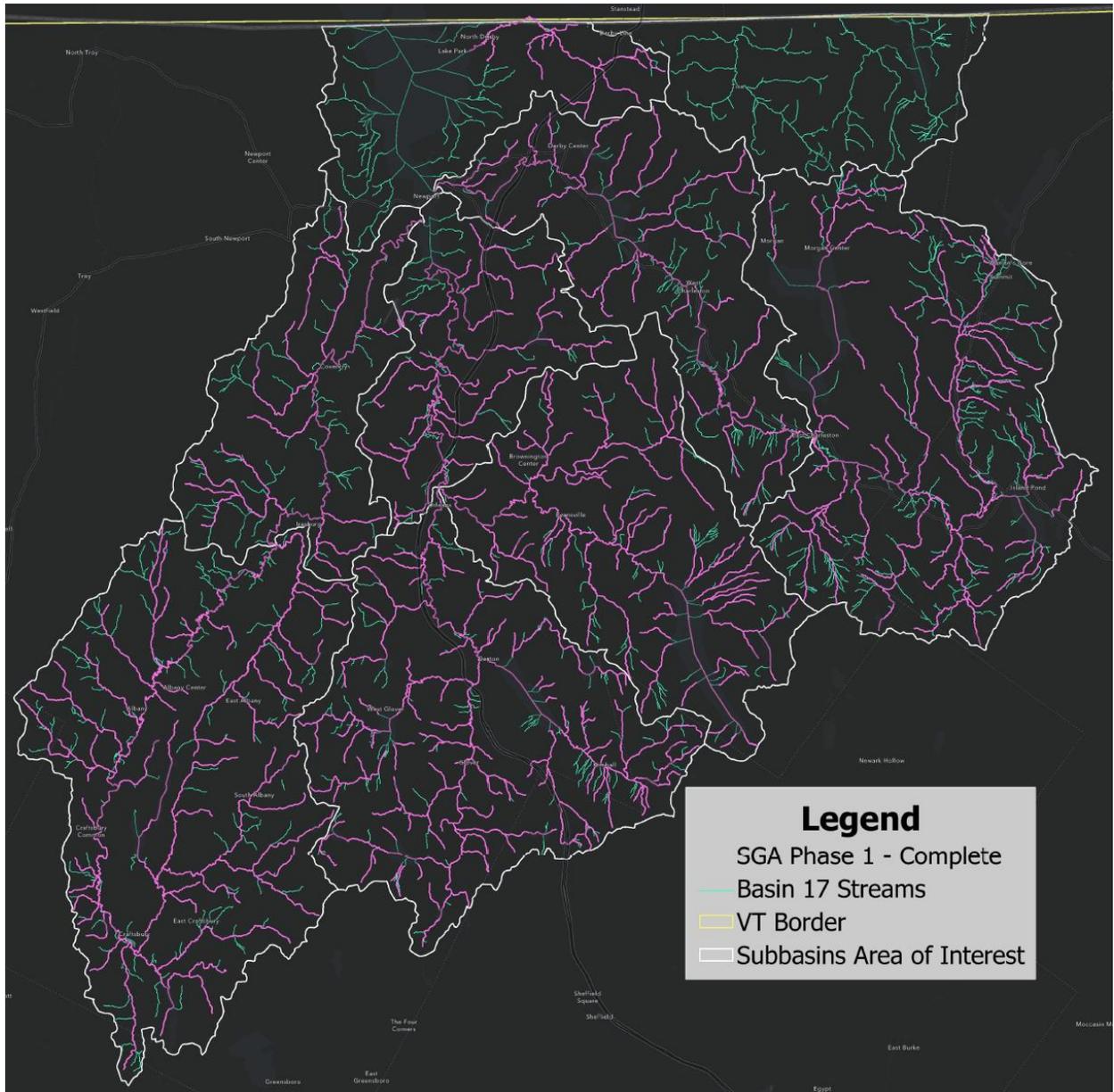


Figure 1. Map illustrating the Basin 17 area of interest by subbasins (white polygons), streams as mapped by the VHD (cyan lines), and all reaches with completed Phase 1 assessments (pink lines).

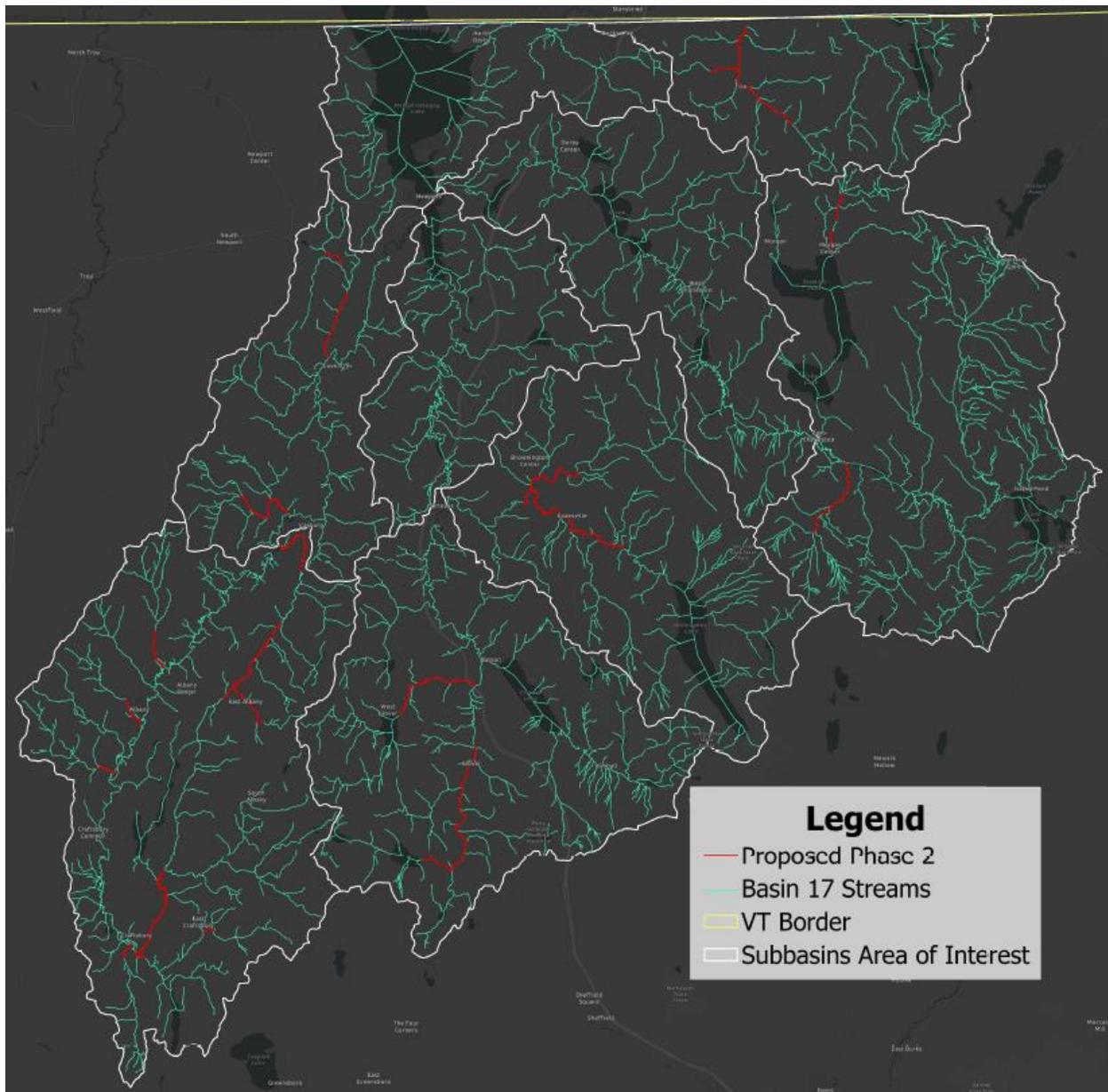


Figure 3. Map illustrating the Basin 17 area of interest by subbasins (white polygons), streams as mapped by the VHD (cyan lines), and all reaches with proposed Phase 2, Phase 2 lite, or similar geomorphic condition assessments (red lines).

Stearns Brook Sediment Stressed Conditions

2.1 Site Visit

MWA and DEC performed a site visit to Stearns Brook on October 28, 2021 to identify potential sources or remedies for the documented sediment stressed conditions in the watershed. During the site visit, several stops were made at road-stream crossings and other locations to observe conditions related to sediment sourcing and fluvial erosion (Figure 4). In addition, MWA walked the lower reaches of Stearns Brook downstream of Twin Bridges Road and recorded observations of streambank erosion, riprap, riparian encroachment, and 4x4 trail stream crossings. The site visit provided valuable field observations of potential water quality concerns and a review of past, in progress, and future potential clean water projects.

Discussions with DEC focused on identifying the most appropriate mechanisms to perform stream geomorphic or similar assessments to characterize sediment-related conditions and identify opportunities for river conservation and restoration, fishery enhancement, and water quality improvement. The comparatively small size of the watershed combined with the lack of a TMDL and the fact that it discharges into the Tomifobia River in Canada do not lend Stearns Brook to being a statewide priority for SGA work, although this has not been ruled out. It is apparent that some form of watershed-based assessment, river corridor planning, and project identification and development work is needed to address the sediment stressed conditions in Stearns Brook. As of the drafting of this memo, conversations with DEC and DFW have indicated that priority reaches and tributaries of Stearns Brook may be incorporated into riparian assessments being performed in other sub-basins with Basin 17.

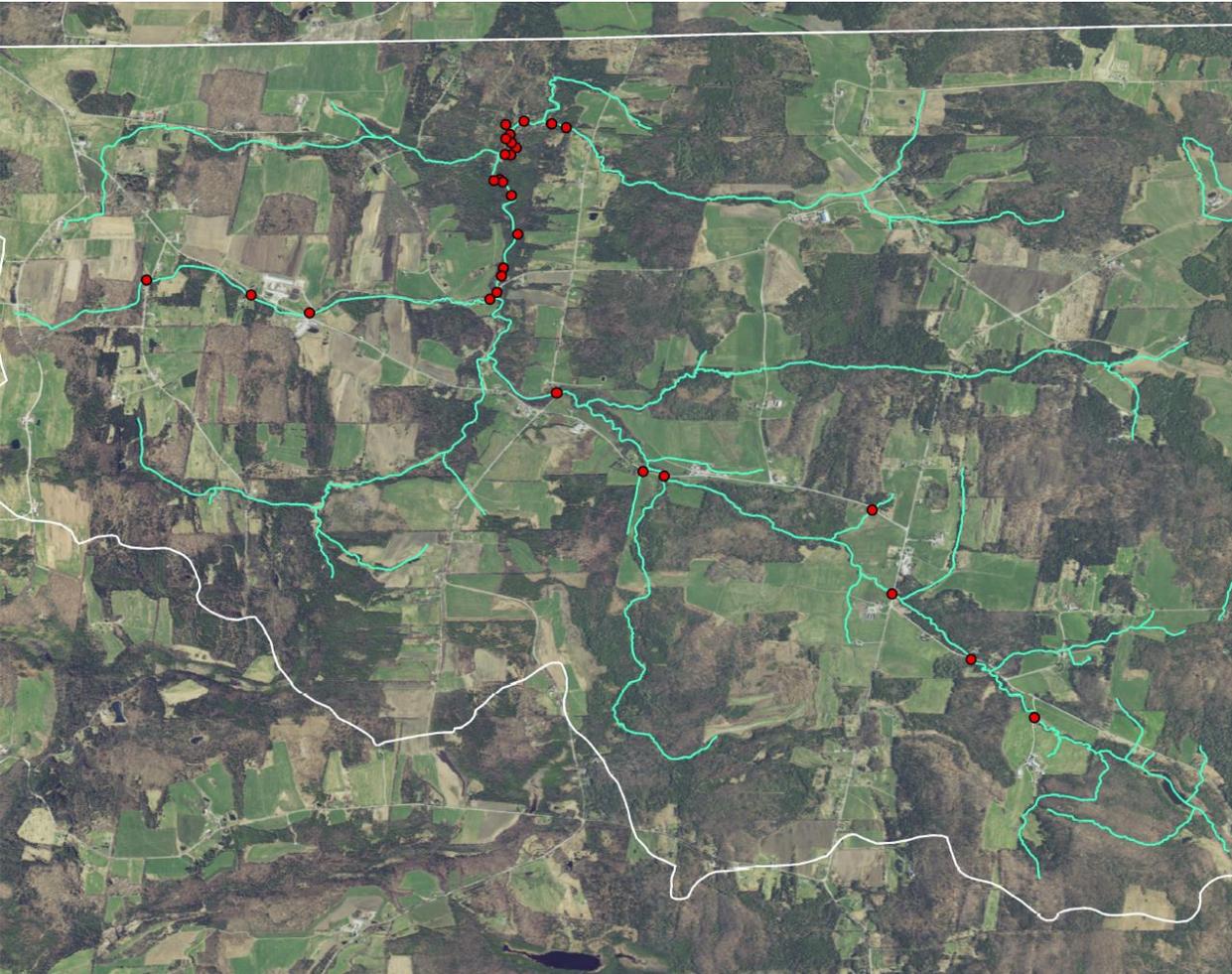


Figure 4. Map illustrating streams in the Stearns Brook subbasin and observations made during the October 2021 site visit.



Figure 5. Sediment deposition near the Valley Rd and Tice Hurst Rd stream crossing, downstream of a large dairy operation.



Figure 6. Bank erosion near the downstream end of an unnamed tributary flowing from the west alongside Holland Rd, prior to the confluence with Stearns Brook.



Figure 7. Boulder-bedrock substrate dominates the channel at the bridge crossing on Stearns Brook Rd.



Figure 8. Riparian degradation and channel and bank erosion resulting from cattle pressure near the large culvert crossing on Valley Rd, downstream of a large dairy operation.



Figure 9. Soil compaction, riparian degradation, and channel and bank erosion resulting from cattle pressure near the large culvert crossing on Valley Rd, downstream of a large dairy operation.



Figure 10. A potential compromised culvert crossing on Valley Rd downstream of Truscott Rd, with fine and coarse sediment deposition.



Figure 11. Riparian degradation and erosion resulting from cattle pressure on Fortin Farm Rd. A potential opportunity for wetland and stream restoration using low-tech, process-based restoration approaches.



Figure 12. Landowner-installed bank armoring on lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 13. Overhanging vegetation and gravel bars along lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 14. Mowed lawn and point bar excavation or grading along left bank, Stearns Brook, downstream of Twin Bridges Rd.



Figure 15. Bank failure on an outer bend, lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 16. A snowmobile trail and apparent indications of alterations to streambanks on lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 17. Overhanging vegetation on lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 18. Looking upstream at an outer bend, lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 19. Vehicle or ATV ford dug into streambank on lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 20. Vehicle or ATV ford dug into streambank on lower Stearns Brook, downstream of Twin Bridges Rd.



Figure 21. Channel avulsion caused by woody debris jams on unnamed tributary draining Stearns Brook Rd, upstream of the Canadian border.