Otter Creek Watershed Tributaries
Phase I Stream Geomorphic Assessment
Furnace Brook, Roaring Brook and Baker Brook
January 2009

Kiln Brook in Chittenden, Vermont - Tributary to Furnace Brook

Prepared by: Bear Creek Environmental, LLC

Prepared for: Rutland Natural Resources Conservation District

Bear Creek **Environmental**

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January 5, 2009

Ms. Nanci McGuire
Rutland NRCD
Rutland, VT 05701

RE: Otter Creek Watershed Tributaries Report
Phase 1 Stream Geomorphic Assessment
Furnace Brook, Roaring Brook and Baker Brook

Dear Nanci:

Enclosed please find one bound copy of the Otter Creek Tributaries Phase 1 Report. The bound copy includes a CD of the Phase 1 project files and photos. I have also mailed a bound report and CD to Shannon Pytlik and Mike Kline, ANR River Management Program.

Bear Creek Environmental, LLC has thoroughly enjoyed working with the Rutland Natural Resources Conservation District and the ANR River Management Program on this project. Please feel free to contact me if you have questions.

Sincerely,

Mary Nealon
Principal

cc: Shannon Pytlik, ANR (bound report and CD)
Mike Kline, ANR (bound report and CD)

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Phase 1 Stream Geomorphic Assessment

January 5, 2009

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EXECUTIVE SUMMARY

A Phase I Stream Geomorphic Assessment of three tributaries (Furnace Brook, Roaring Brook and Baker Brook) within the Otter Creek Watershed was conducted by Bear Creek Environmental, LLC under the direction of the Rutland Natural Resources Conservation District (RNRCD). These assessments provide information about the physical condition of three tributaries within the Otter Creek Watershed and the factors that influence the stability of the river systems.

The Phase I study used a combination of remote sensing (i.e. mapping) and windshield surveys to examine the natural and human disturbances that may have influenced the tributaries of the Otter Creek Watershed. The protocols developed by the Vermont River Management Program were used to complete the Phase I assessment. The focus of the Phase I study is to evaluate impacts that may cause channel adjustment such as floodplain modifications, channel modifications, and land use. Of the 16 parameters measured during the Phase I Assessment, watershed land use, corridor land use and riparian buffer were the categories identified as having the greatest potential for causing channel adjustment in the Furnace Brook Watershed. These categories were also identified in the Roaring Brook and Baker Brook watersheds as well as berms and roads and ice/debris jam potential. A review of orthophotos and topographic maps show that there is a lack of high quality riparian zone in many reaches in all three watersheds.

Most of the reaches on the main stem of Furnace Brook have stream types ("C" or "E") that are very susceptible to shifts in both lateral and vertical stability caused by direct channel disturbance, the removal and alteration of streambank vegetation, and changes in the flow and sediment regimes of the contributing watershed. In the Roaring Brook Watershed, the main stem reaches fell mostly within the "B" stream type except for the uppermost reach, which had a stream type of "C". The main stem of Baker Brook alternates between type "C" and "B" streams. The stream geomorphic assessment information presented in this report will be used as the basis for recommending reaches for Phase 2 Geomorphic Assessment on the three tributaries of Otter Creek. Due to the high level of observed impact and reach condition, several reaches within all three watersheds were recommended for a Phase 2 assessment. Fourteen of the 53 assessed reaches have been recommended for Phase 2 assessments within the Furnace Brook Watershed. These reaches are located on the main stem of Furnace Brook, Sugar Hollow Brook, Little Brook and Unnamed Tributaries. All of the main stem reaches of Roaring Brook as well as one reach on Bully Brook have been recommended for Phase 2 assessments. The most downstream and upstream reaches on the main stem of Baker Brook as well as two unnamed tributary reaches have also been recommended for Phase 2 assessments.

Otter Creek Watershed Tributaries
Furnace Brook, Roaring Brook and Baker Brook
Phase 1 Stream Geomorphic Assessment

1.0 PROJECT OVERVIEW

Bear Creek Environmental (BCE) was retained by the Rutland Natural Resources Conservation District (RNRCD), as part of a grant with the Vermont River Management Program, to complete the Phase 1 Stream Geomorphic Assessment for three tributaries of the Otter Creek Watershed: Furnace Brook, Roaring Brook, and Baker Brook. The Stream Geomorphic Assessment Tool (SGAT) was already run for these reaches. BCE completed the remaining steps in the Phase 1 Geomorphic Assessment. The Phase 1 information available for the three tributaries is summarized in Section 2 of this report. Locations along these tributaries have undergone channel alterations in the past as well as some development within their river corridors. This Phase 1 assessment provides a stream impact rating that enables a priority ranking for each reach. This ranking can be used to determine where more detailed Phase 2 Geomorphic Assessments should be conducted within the watershed.

2.0 BACKGROUND INFORMATION

2.1 Description of Study Area

The Otter Creek is one of the major rivers in Vermont that flows into Lake Champlain (Figure 1). The portion of the watershed that was studied lies within Rutland County and includes the following tributaries: Furnace Brook, Roaring Brook, and Baker Brook. These tributary watersheds are dominated by forested land (Figures 2-4). However, cropland, agricultural fields, or urban land are sub-dominant land uses within the Furnace Brook watershed (Figure 2). Urban land and cropland are sub-dominant land uses within the Roaring Brook and Baker Brook watersheds (Figures 3 and 4).

The Otter Creek Watershed is located within the Vermont Valley physiographic province. This valley is a narrowly shaped valley that is located to the east of the Taconic Mountains

and to the west of the Green Mountains (Van Diver, 1987). The Vermont Valley trends north-south and consists primarily of limestone. The Otter Creek Watershed has been reshaped primarily by glacial activity. Glacial deposits such as kames and moraines are located in this area with a very large continuous moraine called the Mendon moraine trending north-south (Van Diver, 1987). Following the glacier activity in this area, the climate warmed and the large ice sheets melted forming Lake Vermont, which extended down into the Otter Creek Watershed area. The surficial sediments within the Furnace Brook valley are primarily glacial till, ice-contact deposits, and alluvium. In Baker Brook and Roaring Brook valleys, the surficial sediments are primarily glacial till and ice-contact deposits.

The Furnace Brook Watershed flows through a moderate gradient valley, with the most downstream reaches in a very gentle gradient valley (Table 1). Most reaches have a channel slope less than five percent, with many reaches in the lower portion of the watershed less than two percent. The greatest slopes are usually located in the most upstream reaches. The Roaring Brook watershed flows through a slightly steeper valley with most slopes between three and seven percent and one upper reach with a high slope of 16 percent. The Baker Brook watershed has a moderate gradient with all slopes less than five percent.

Table 1. Tributary Slopes

Watershed	Greatest Reach Slope	Range of other Reach Slopes
Furnace Brook Watershed	17 %	<1 – 17 %
Roaring Brook Watershed	16 %	1 – 7 %
Baker Brook Watershed	4 %	1 – 4 %

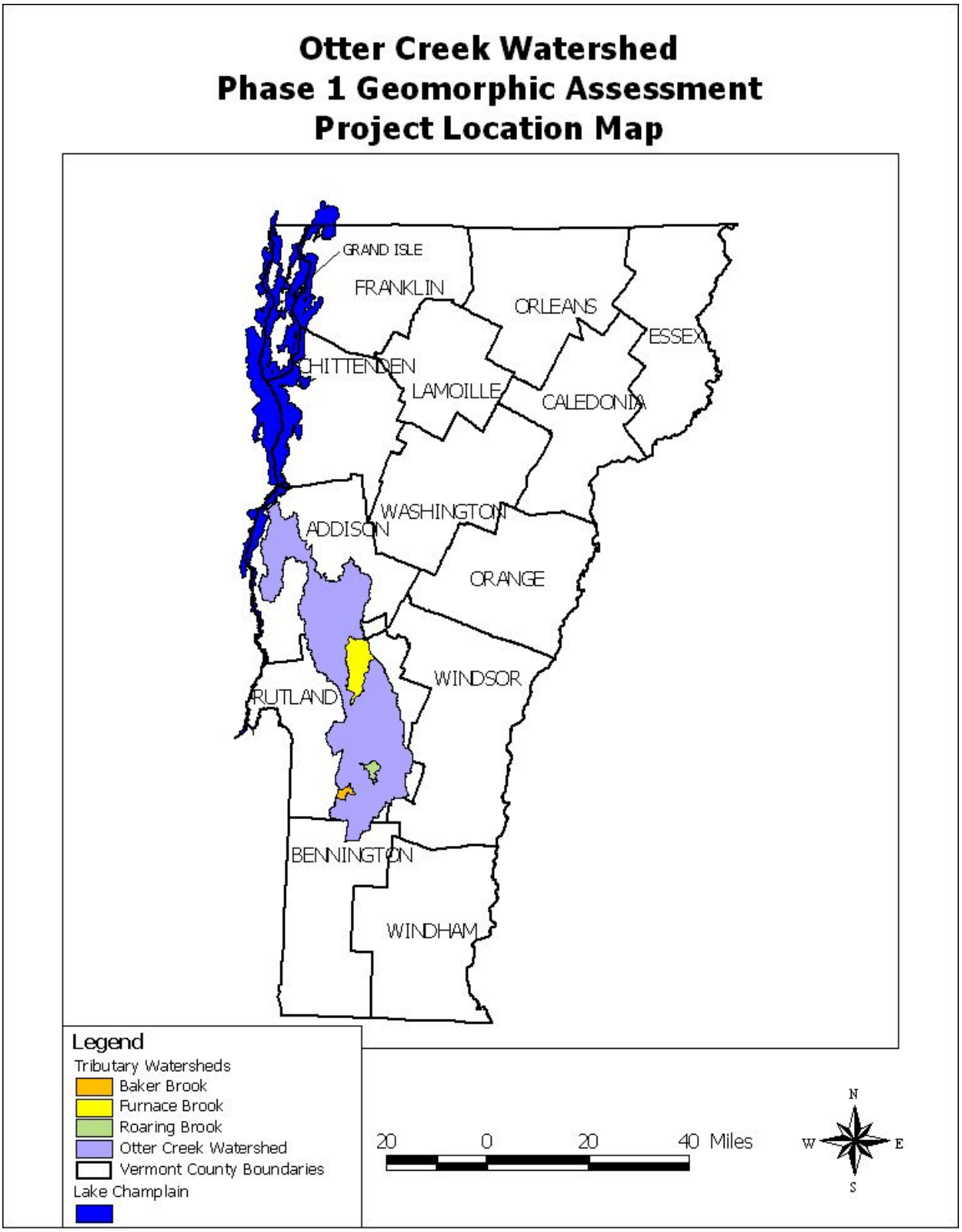

Figure 1. Project Location Map for the Phase 1 Assessment

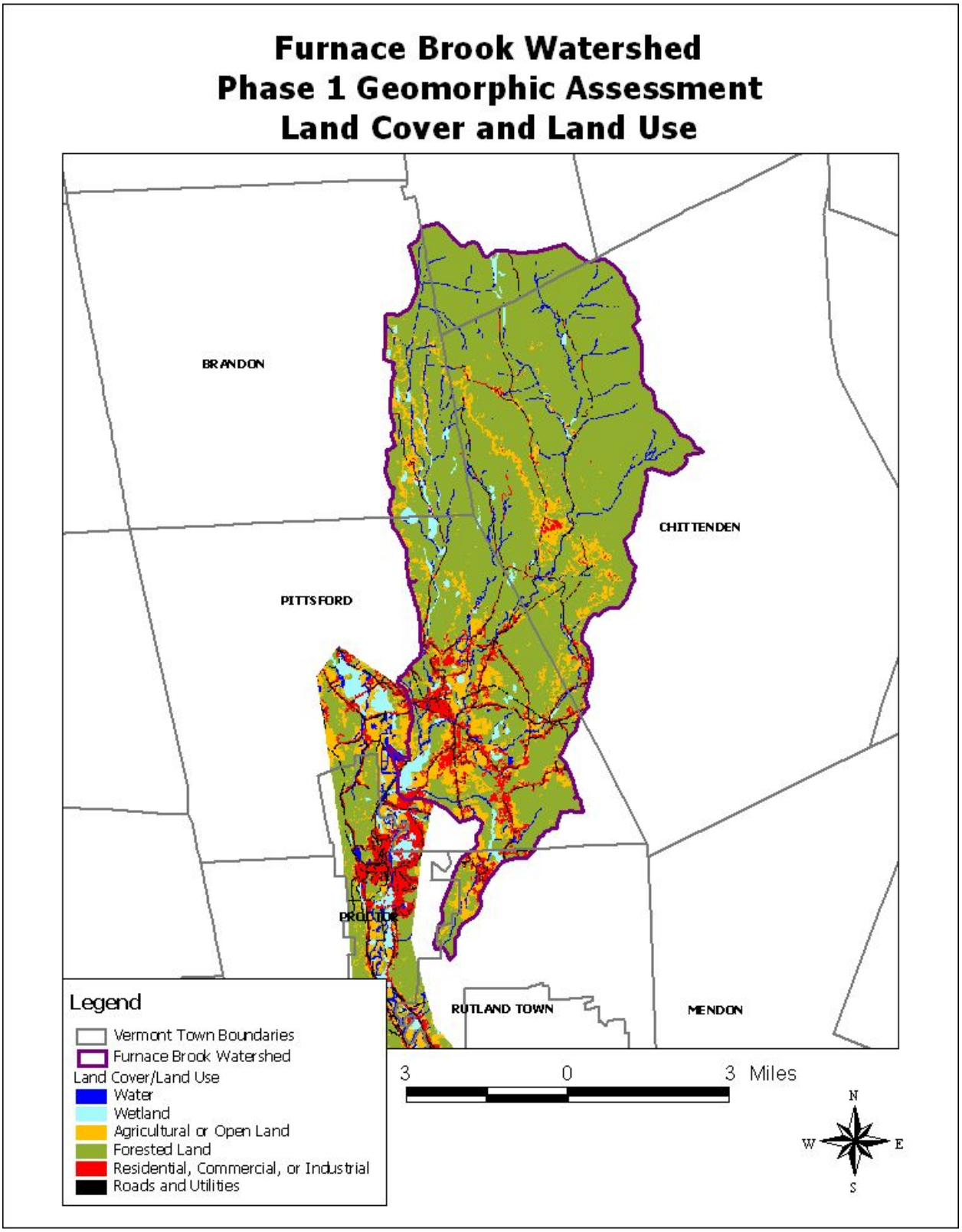

Figure 2. Land Cover and Land Use in Furnace Brook Watershed

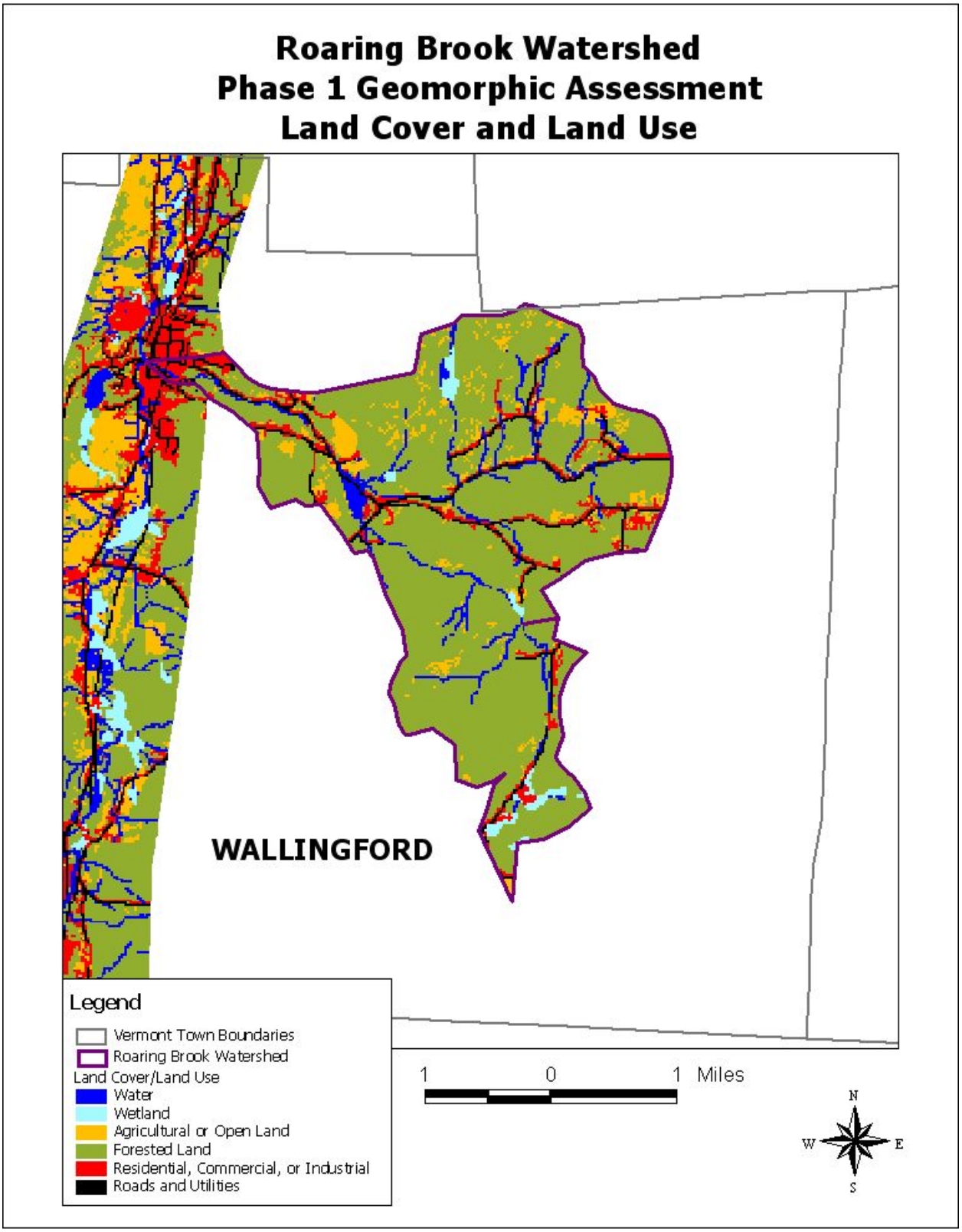

Figure 3. Land Cover and Land Use in Roaring Brook Watershed

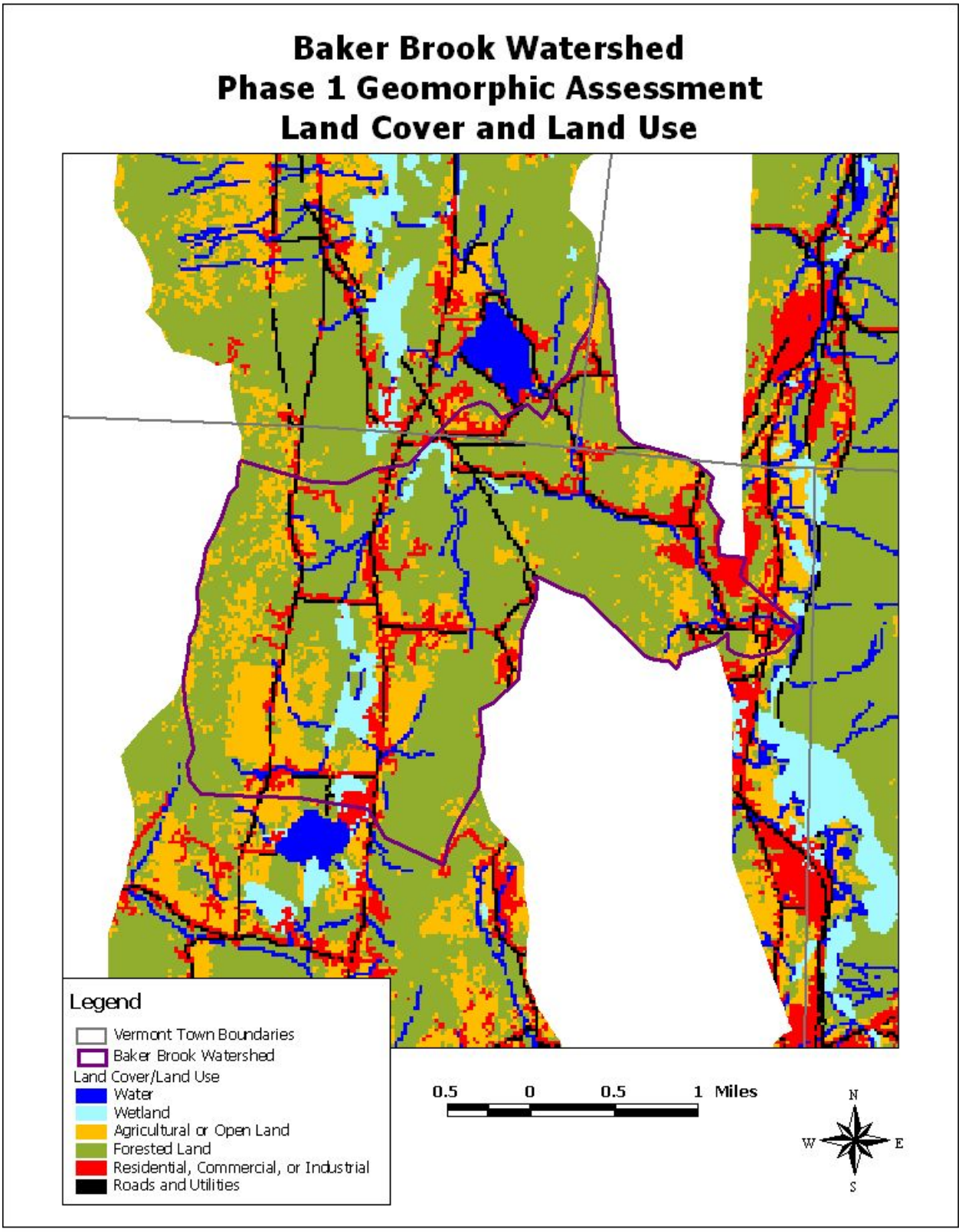

Figure 4. Land Cover and Land Use in Baker Brook Watershed

2.2 Flood History

Between 1995 and 1998 Vermonters suffered nearly $60,000,000 in flood damages; much of these losses were avoidable (Vermont Agency of Natural Resources 2006). In order to better understand the flood history of the tributaries of the Otter Creek Watershed, long term peak discharge data from the U.S. Department of the Interior, U.S. Geological Survey (USGS) gauge on the Otter Creek at Rutland, VT was obtained. The gauge provides a continuous record of flow from 1929 through the present. The drainage area at the Otter Creek gauge is 307 square miles. The long term record shows peak discharges between a ten year and 25 year recurrence interval occurred during water years[1] 1947, 1949, 1973, 1976, 1977, and 1987 as shown below in Figure 5. A Flood less frequent than the 50 year discharge occurred during water year 1938. These USGS peak discharge flow values for each year do not account for the effects of flow regulations and diversions.

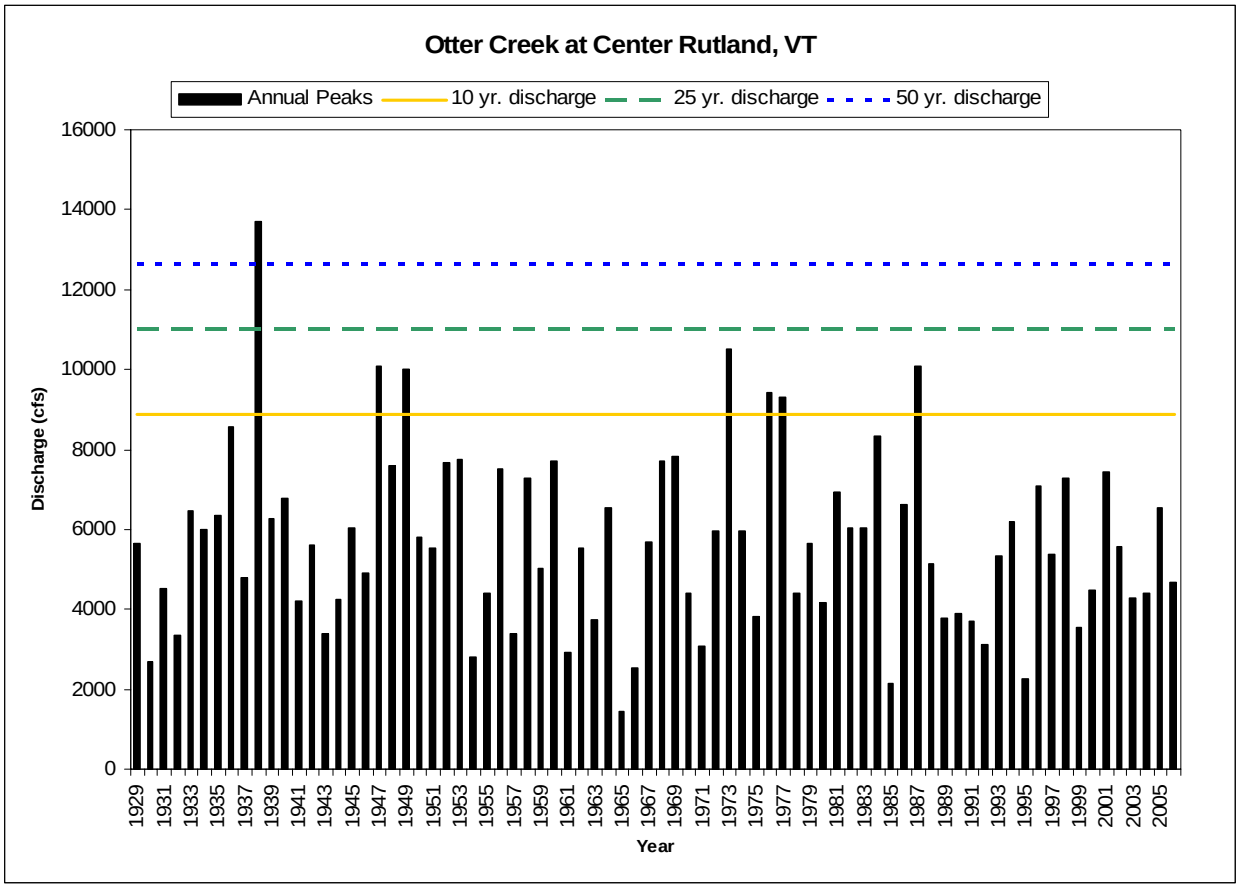

Figure 5: Flood frequency analysis for Otter Creek

[1] A water year is the twelve month period from October 1 through September 30.

3.0 PHASE 1 METHODOLOGY

The Phase I assessment was conducted by BCE following procedures specified in the Vermont Stream Geomorphic Assessment Handbook Phase 1 (Vermont Agency of Natural Resources 2007), and used version 4.57 of the Stream Geomorphic Assessment Tool (SGAT) GIS extension. Assessment data were recorded on the DEC Phase I data sheets or obtained digitally, and when possible, entered or uploaded into the Vermont River Management Program's Data Management System (DMS).

3.1 Phase 1 Parameters

During the Phase 1 Assessment, data were collected for each parameter in Table 2. The parameters were then rated according to the following menu options (NS – not significant, low impact, high impact or No data). A zero was scored for options NS and No data, a one for low impact and a two for high impact.

Table 2. Parameters Included in Impact Scores

Step #	Parameter
4.1	Watershed Land Cover/ Land Use
4.2	Corridor Land Cover/ Land Use
4.3	Riparian Buffer Width
5.1	Flow Regulations and Water Withdrawals
5.2	Bridges and Culverts
5.3	Bank Armoring and Revetments
5.4	Channel Modifications
5.5	Dredging and Gravel Mining History
6.1	Berms and Roads
6.2	River Corridor Development
6.3	Depositional Features
6.4	Meander Migration / Channel Avulsion
6.5	Meander Width Ratio
6.6	Wavelength Ratio
7.1	Bank Erosion – Relative Magnitude
7.2	Ice and Debris Jam Potential

The feature indexing tool (FIT) (a computer mapping program) was used to map impact features observed in the following steps:

- Step 3.1 Alluvial Fan
- Step 3.2 Grade Control
- Step 4.3 Riparian Buffer Width <25 feet
- Step 5.1 Flow Regulation and Water Withdrawals
- Step 5.2 Bridges and Culverts
- Step 5.3 Bank Armoring and Revetment
- Step 5.4 Channel Straightening
- Step 5.5 Dredging and Gravel Mining
- Step 6.1 Berms and Roads (Encroachments)
- Step 6.2 River Corridor Development
- Step 6.4 Meander Migration / Channel Avulsions
- Step 7.1 Erosion

This tool is an extension of ArcView (a computer mapping program) and utilizes the Vermont Hydrography Dataset (VHD) to automate measuring the length of impact on stream segments and the placement of impact points along the stream. The FIT generated an attribute table, which was uploaded to the DMS. A GIS shapefile was created for points of photos taken during the windshield survey and shapefiles for meander belt width and wavelength ratio locations were also created.

3.2 Phase 1 QA Review

To assure a high level of confidence in the Phase 1 SGA data, strict Quality Assurance/ Quality Control procedures were followed by BCE. These procedures involved a thorough in-house review of all data as well as automated and manual QC checks with the DEC River Management Program. BCE conducted its own in-house QA review after all the Phase 1 data were entered into the DMS.

4.0 PHASE 1 RESULTS

4.1 Reach Locations

The three tributary watersheds were divided into 74 reaches for the Phase 1 Assessment (Figures 6, 7, and 8). Three reaches were excluded in this study due to wetlands or impoundments leaving 71 reaches to be assessed. Pages 1 through 4 of the Appendix

provides the reach locations including reach description and town where the reach is located.

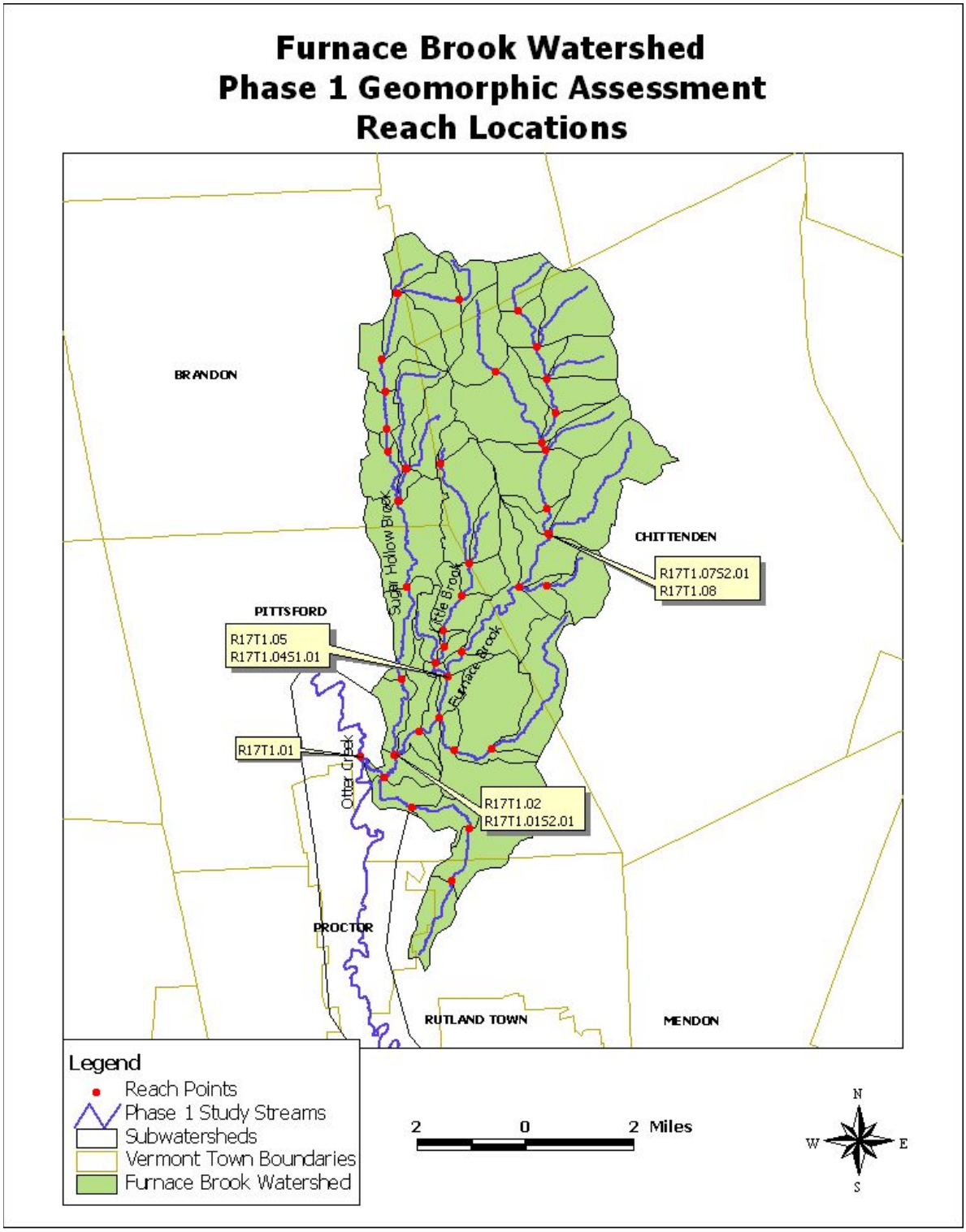

Figure 6. Furnace Brook Watershed Reach Location Map for Stream Geomorphic Assessment

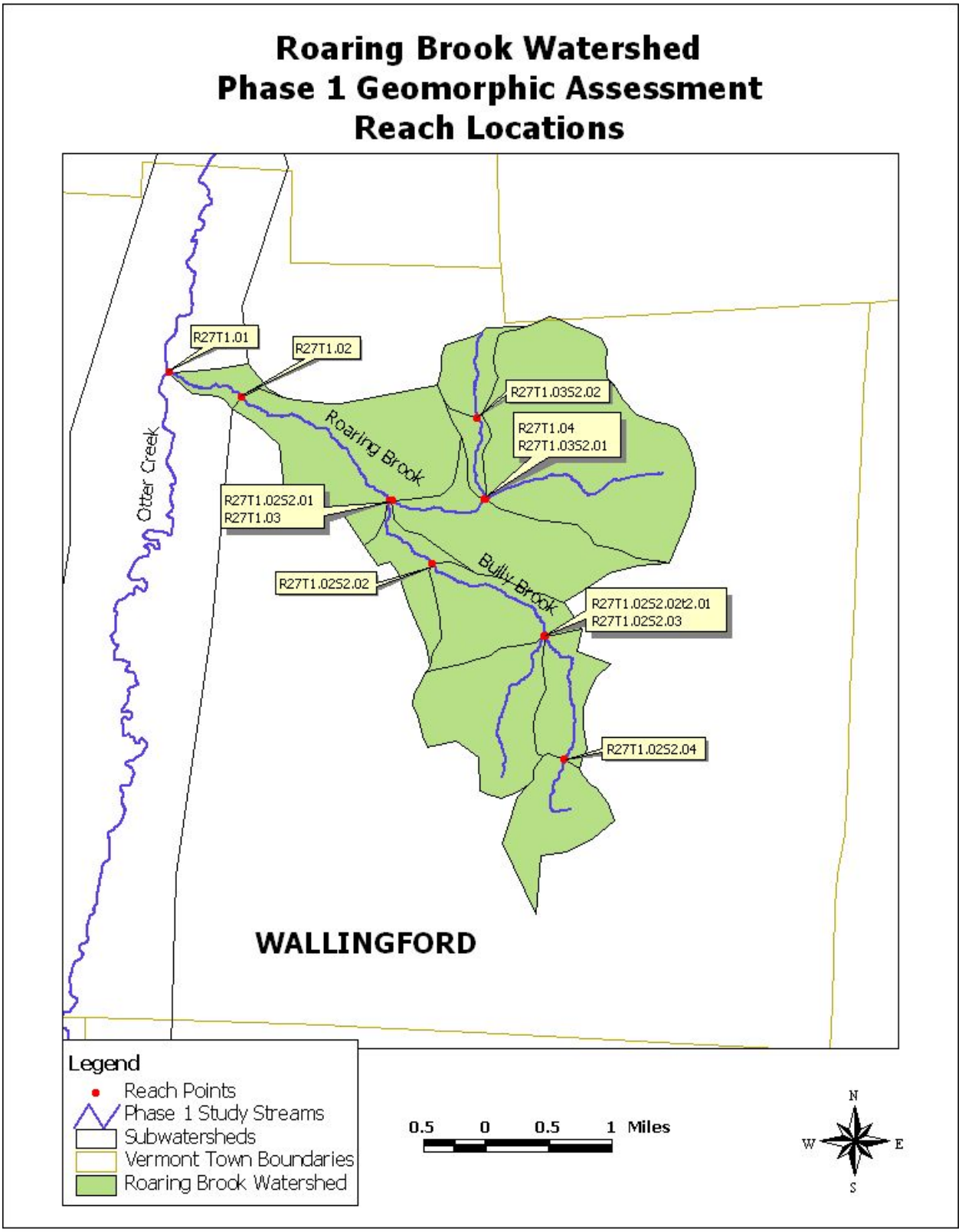

Figure 7. Roaring Brook Watershed Reach Location Map for Stream Geomorphic Assessment

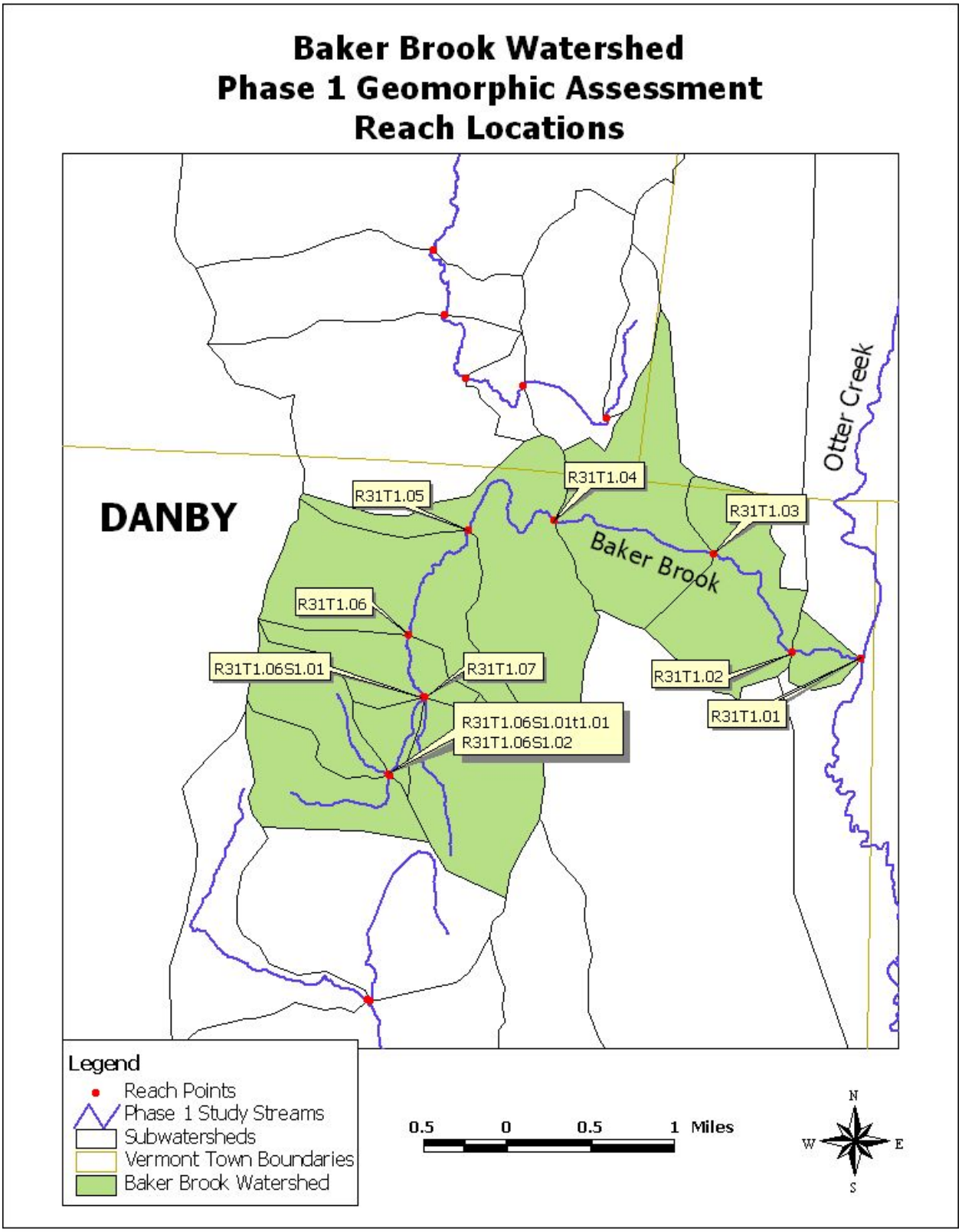

Figure 8. Baker Brook Watershed Reach Location Map for Stream Geomorphic Assessment

4.2 Reference Stream Types

Reference stream types are defined as stream channel forms and processes that would exist in the absence of human-related changes to the channel, floodplain, and/or watershed. Stream and valley characteristics including valley confinement, and slope determined through remote sensing were used to determine the reference stream type. The reference reach characteristics were later refined during the windshield survey. Reference reach typing was based on both the Rosgen (1996) and the Montgomery and Buffington (1997) classification systems.

Table 3 shows the typical characteristics used to determine reference stream types (Vermont Agency of Natural Resources, 2007). Pages 5 through 7 of the Appendix provide a listing of reference stream types for each reach within the project area. Figures 9 through 11 show the various stream types of the reaches within the Furnace, Roaring, and Baker Brook watersheds. The majority of reaches on the main stem of Furnace Brook fall within the "C" stream type. In general, the reference "C" streams are unconfined and have moderate to gentle slopes. The most downstream reach on Furnace Brook was of stream type "E". "E" channels have a very low width to depth ratio and flow through unconfined valleys with moderate to gentle slopes. These streams are often highly sinuous and have cohesive bank material associated with lacustrine soils. Five reaches on the main stem were of stream type B. "B" channels typically flow through confined, semi-confined or narrow valleys and have moderate to steep slopes. The most upstream reach on the main stem of Furnace Brook had an "A" stream type. "A" streams flow through steep gradient terrain and are often associated with a cascade bed form. In the Roaring Brook Watershed, main stem reaches fell mostly within the "B" stream type except for the uppermost reach, which had a stream type of "C". The main stem of Baker Brook alternates between type "C" and "B" streams.

Table 3: Reference Stream Type

Stream Type	Confinement	Valley Slope	Bed Form
A	Narrowly Confined	Very steep > 6.5 %	Cascade
A	Confined	Very steep 4.0 - 6.5 %	Step-Pool
B	Confined or Semi- confined	Steep 3.0 – 4.0 %	Step-Pool
B	Confined, Semi-confined or Narrow	Moderate to Steep 2.0 – 3.0 %	Plane Bed
C or E	Unconfined (Narrow, Broad or Very Broad)	Moderate to Gentle <2.0 %	Riffle-Pool or Dune-Ripple
D	Unconfined (Narrow, Broad or Very Broad)	Moderate to Gentle <4.0 %	Braided Channel

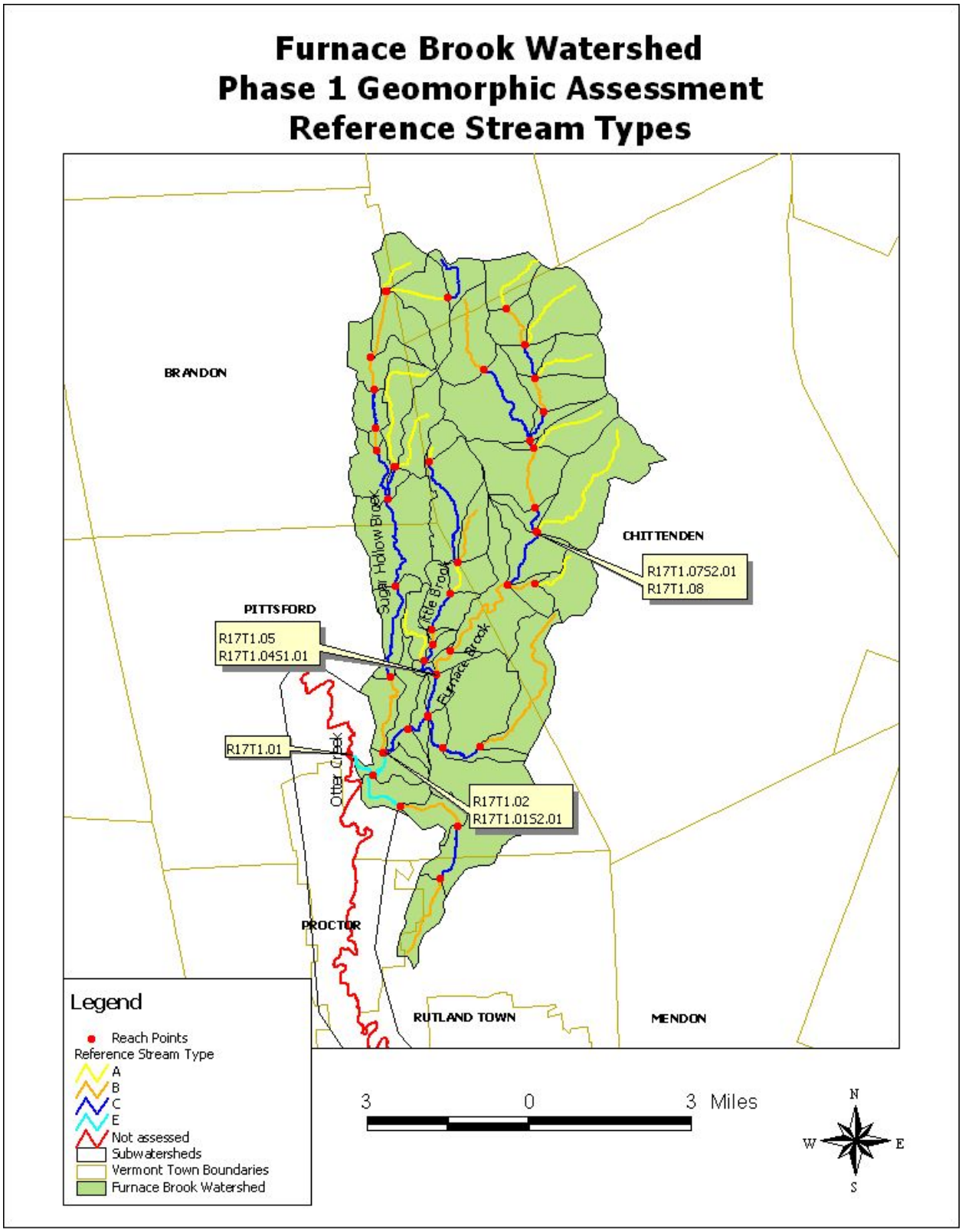

Figure 9. Reference Stream Types within the Furnace Brook Watershed

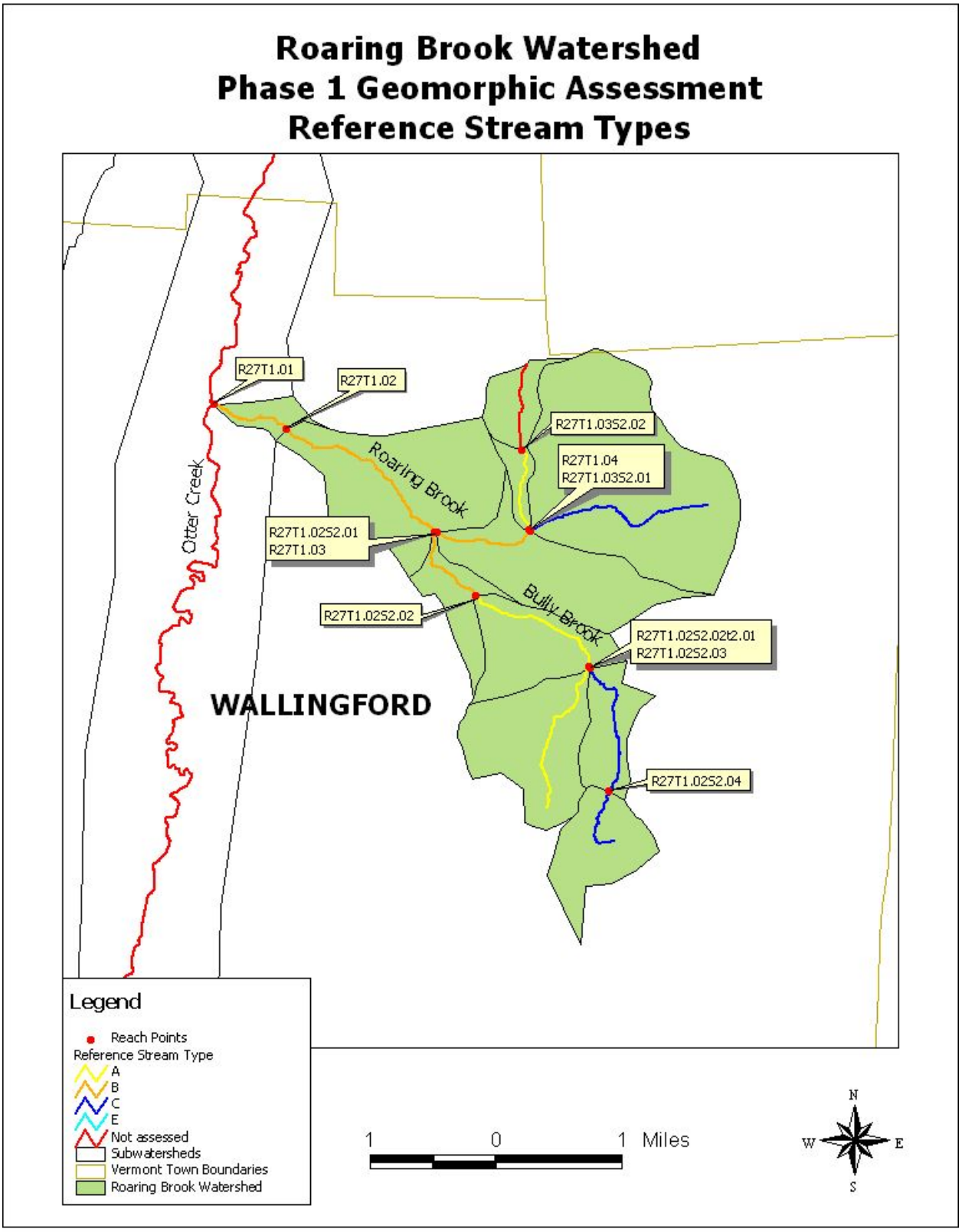

Figure 10. Reference Stream Types within the Roaring Brook Watershed

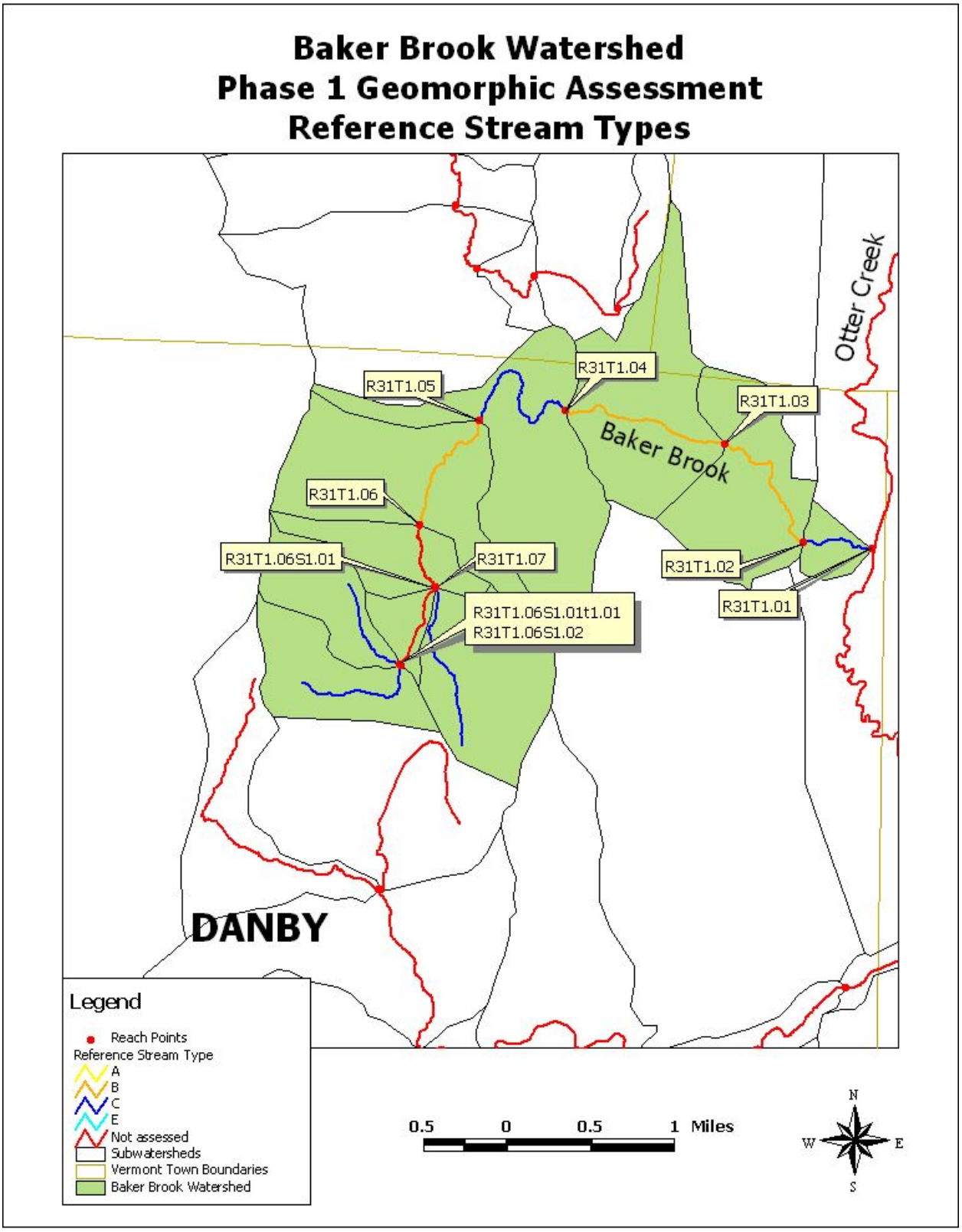

Figure 11. Reference Stream Types within the Baker Brook Watershed

4.3 Basin Geology and Soils

The characteristics of the study tributaries of the Otter Creek Watershed were determined using a combination of soils data, review of topographic maps, and information acquired during the windshield survey. Pages 8 through 10 of the Appendix, provides a summary of the basin characteristics, such as alluvial fans, grade control structures, geologic materials, and valley side slopes.

In the Furnace Brook Watershed, 16 possible alluvial fans were noted due to abrupt changes in slope. There were no alluvial fans noted within the Roaring Brook and Baker Brook watersheds. Grade controls such as bedrock ledges and dams were noted in nine reaches in the Furnace Brook Watershed during the windshield survey and from USGS topographic maps or orthophotos. These elements act as a grade control by keeping the base elevation of a river from being lowered, and prevent the river from incising in that location. There is one dam on the main stem of Furnace Brook, two dams on Sugar Hollow Brook (a tributary of Furnace Brook), one on the main stem of Kiln Brook (a tributary to Furnace Brook), and one dam on an unnamed tributary. Other grade controls found in the Furnace Brook Watershed include four ledge grade controls and one waterfall. The waterfall was located on Furnace Brook and the ledge grade controls were found on Furnace Brook, Little Brook and an unnamed tributary. In the Roaring Brook Watershed, there were two dams noted on the main stem of Roaring Brook and one dam on Bully Brook. There also are some ledge grade controls in this watershed: one on Roaring Brook and one on Bully Brook. On the main stem of Baker Brook, only one ledge grade control was noted.

The steepness of the valley side slopes was determined using a combination of a topographic map and the soils layer. In the Furnace Brook Watershed, the valley side slope steepness ranged from flat to extremely steep side slopes. Valley side slopes ranged from steep to extremely steep in the Roaring Brook Watershed and flat to extremely steep in the Baker Brook Watershed.

Pages 11 through 13 of the Appendix, provides a summary of the soil characteristics. The dominant surficial geology of the Furnace Brook Watershed consists of alluvial, ice-contact deposits and till. The subdominant surficial geology of the watershed consists of alluvial, ice-contact deposits, till and other deposits. With one exception, the subdominant surficial geology in the main stem reaches of Furnace Brook is till or ice-contact deposits. In R17T1.05 the subdominant surficial geology is alluvium, but the reach's dominant deposit is ice-contact. In the Roaring Brook Watershed, the dominant surficial geology is till and ice-contact deposits and the subdominant is mostly ice-contact deposits with one reach having till and one reach having other deposits as subdominant. The dominant surficial geology in the Baker Brook Watershed is till, ice-contact and other deposits. With one exception, the subdominant deposits are also till, ice-contact and other. The first reach on Baker Brook, R31T1.01, contains alluvium as the subdominant surficial geology.

4.4 Land Cover – Reach Hydrology

The land use within a watershed plays an important role in the hydrology of the receiving waters. The percentage of urban and cropland development within the watershed are factors which change a watershed's response to precipitation. The most common effects of urban and cropland development is increasing peak discharges and runoff by reducing infiltration and travel time (United States Department of Agriculture 1986). The land use/land cover within the stream corridor itself is also an important parameter to evaluate. This land use/land cover plays an important role in the sediment deposition and erosion which occurs during annual flood events.

As outlined in the Phase I handbook, impact ratings were assigned for watershed land cover/land use and stream corridor land cover/land use as follow:

High – 10% or more is crop and/or urban
Low – Between 2 and 10 % is crop and/or urban
NS – Not Significant – Less than 2 % is crop and/or urban

The land cover/land use information is provided on pages 14 and 15 of the Appendix. In the Furnace Brook Watershed, 18 of the 53 assessed reaches resulted in a watershed/land use impact rating of high and the rest were low or not significant. The dominant land

cover/land use within the watershed was forest for all of the reaches and the subdominant land cover/land use was either urban, field or crop land. For Roaring Brook, six out of the ten assessed reaches had an impact rating of high and the remaining four reaches were rated as low. All eight assessed reaches in the Baker Brook Watershed had a high impact rating for watershed land use. The dominant watershed land use for both of the Roaring Brook and Baker Brook watersheds was forest. The subdominant watershed land cover/land use was urban or crop land.

Twenty two reaches in the Furnace Brook Watershed resulted in a high impact rating for corridor land cover/use (because of agriculture or development in the corridor). The dominant corridor land cover/land use for the main stem is primarily forest with two exceptions where the dominant land cover/land use is urban land. In the Roaring Brook Watershed, seven reaches had an impact rating of high for corridor land cover/land use. The first three reaches on the main stem of Roaring Brook had a dominant corridor land use of urban land, while the rest of the reaches were dominated by forest land in the corridor. In Baker Brook, six of the eight assessed reaches resulted in an impact rating of high and the remaining two were rated as low. With one exception, the dominant land cover/land use in the corridor is forest or urban land. The dominant land use in R31T1.06S1.01t1.01 is agricultural field. The subdominant land cover/land use in the corridor for Baker Brook is forest or urban land except for one reach. The most upstream reach, R31T1.07, contains cropland as the subdominant land use in the corridor.

4.5 Historic Channel Modifications

Channel modifications may impact a stream reach by affecting the hydraulics and the sediment regime. Historic channel modifications were assessed for all study reaches. These reaches were assessed by evaluating flow regulations, bridge and culvert impacts, bank armoring, windrowing, straightening, and dredging. The percentage by length of reach impacted by one or more of these channel modifications was estimated and is summarized on pages 16 and 17 of the Appendix.

Flow Regulations

Impoundments potentially disrupt natural sediment transport within the reach and are flagged as possible causes of instability.

Furnace Brook Watershed: Due to small withdrawals for drinking water, the following reaches located within the Furnace Brook Watershed were assigned an impact rating of low: R17T1.08 on the main stem of Furnace Brook and R17T1.07S2.01 on Kiln Brook. The withdrawal on Furnace Brook is located just above the confluence with Kiln Brook and is used as a drinking water source for the town of Proctor. The drinking water withdrawal on Kiln Brook is located just above the confluence with Furnace Brook. All other reaches within the watershed had no known flow regulation.

Roaring Brook Watershed: On Roaring Brook, there is one small withdrawal for drinking water that was assessed as having an impact rating of low. The intake is on the main stem of Roaring Brook, just a couple of miles from the town center along Route 140 heading east. This withdrawal is an emergency water supply for the town of Wallingford, but it is no longer used. There is another impoundment in uppermost reach of Bully Brook, where there is a water withdrawal for drinking water. This is a small withdrawal, which resulted in a low impact rating.

Baker Brook Watershed: There were no flow regulations found in the Baker Brook Watershed.

Bridges and Culverts

As part of the Phase 1 Stream Geomorphic Assessment, bridges and culverts within each reach were identified where roads or driveways crossed the stream on the topographic maps and orthophotos. These stream crossings were confirmed during the windshield survey. The percentage of the reach impacted by stream crossing structures was estimated for the study reaches. Impact ratings for bridge and culverts were evaluated by determining the percentage of the reach length that is channelized, has split flow, or makes a sharp "S"

bend upstream or downstream of bridges or culverts. There were no reaches with an impact rating of high.

Furnace Brook Watershed: In the Furnace Brook Watershed, the impact from bridge and culverts on stream dimension, pattern or profile was assigned as low for 10 of the 53 reaches (less than 20% of the reach is impacted by bridges and culverts). The remaining reaches had an impact rating of not significant.

Roaring Brook Watershed: Two of the ten assessed reaches in the Roaring Brook Watershed resulted in a low impact rating for bridges and culverts. One of the reaches was the first reach of Roaring Brook (R27T1.01) and the other reach was the first reach of Bully Brook (R27T1.02S2.01). The rest of the reaches in this watershed had an impact rating of not significant.

Baker Brook Watershed: The only reach in this watershed with an impact rating of low for bridges and culverts was the first reach on Baker Brook (R31T1.01). The remaining reaches had an impact rating of not significant.

Bank Armoring

The amount of bank armoring within a watershed is often indicative of the occurrence of channel processes, which result in bank erosion. Bank armoring, also called revetments, can be made of a variety of material including wooden cribs, gabions, logs, and rock riprap. The most common type of revetment in Vermont is rock riprap. The following criterion was used to provide an impact rating for human placed bank armoring.

H	High – Greater than 30% of the reach length is armored
L	Low – Between 10 and 30% of the reach length is armored
NS	Not Significant – Less than 10% of the reach length is armored
No Data	Bank armoring has not been evaluated for the entire reach and impact at the reach level is unknown

The two types revetment noted within the study area were rock rip rap and hard bank. Bank armoring was recorded on 27 of the 71 assessed reaches.

Furnace Brook Watershed: Eighteen of the 53 assessed reaches had bank armoring present. Two of the reaches (R17T1.03 and R17T1.07), which were both located on the main stem of Furnace Brook, had a high impact rating for bank armoring. Seven reaches had an impact rating of low while the remaining reaches were not significant.

Roaring Brook Watershed: One reach, R27T1.01, was assessed as having an impact rating of high and one reach, R27T1.02, had an impact rating of low. The rest of the reaches were assessed as not having a significant impact.

Baker Brook Watershed: One reach, R31T1.02, was assessed as having an impact rating of high and one reach, R31T1.01, had an impact rating of low. The rest of the reaches were assessed as not having a significant impact.

Channel Modifications (Windrowing and Straightening)

During the Phase 1 assessment, the total reach length (in feet) and the percentage of the reach length directly impacted by channel modification were noted for 31 of the 71 reaches. Categories considered as part of the Step 5.4 (Channel Modifications) included the following menu options:

- Straightening – Manual straightening of a channel without windrowing.
- With Windrowing – pushing gravel up from the stream bed onto the top of either bank as part of the straightening of the river.
- None – No known channel straightening.
- Not evaluated – All data sources have not been evaluated.

Channel straightening was identified by reviewing orthophotos, contacting the state river management engineer, and through field confirmation during the windshield survey. Portions of stream reaches that have been historically channelized or straightened are shown below in Figures 12, 13 and 14. Twenty of the 71 reaches were given an impact

rating of high (greater than 20% of reach has been impacted) due to channel straightening while six reaches had an impact rating of low (less than 20% of reach length impacted).

Furnace Brook Watershed: Channel straightening was noted on twenty one of the reaches in the Furnace Brook Watershed. The Furnace Brook Watershed has experienced extensive historic straightening primarily due to the development of roads parallel to the river. Fourteen of the reaches had an impact rating of high for channel straightening. Four reaches had an impact rating of low and the remaining reaches were not significant.

Roaring Brook Watershed: Two reaches had an impact rating of high for channel straightening. One reach was the first reach of Roaring Brook, R27T1.01, and the other reach was the first reach on Bully Brook, R27T1.02S2.01. One reach on Roaring Brook, R27T1.02, had an impact rating of low. The remaining reaches in the Roaring Brook Watershed were rated as not significant.

Baker Brook Watershed: Four reaches had an impact rating of high for channel straightening (R31T1.01, R31T1.02, R31T1.06S1.01t1.01, and R31T1.06S1.02). The last reach on Baker Brook, R31T1.07, had an impact rating of low. The remaining reaches had no channel straightening and an impact rating of not significant.

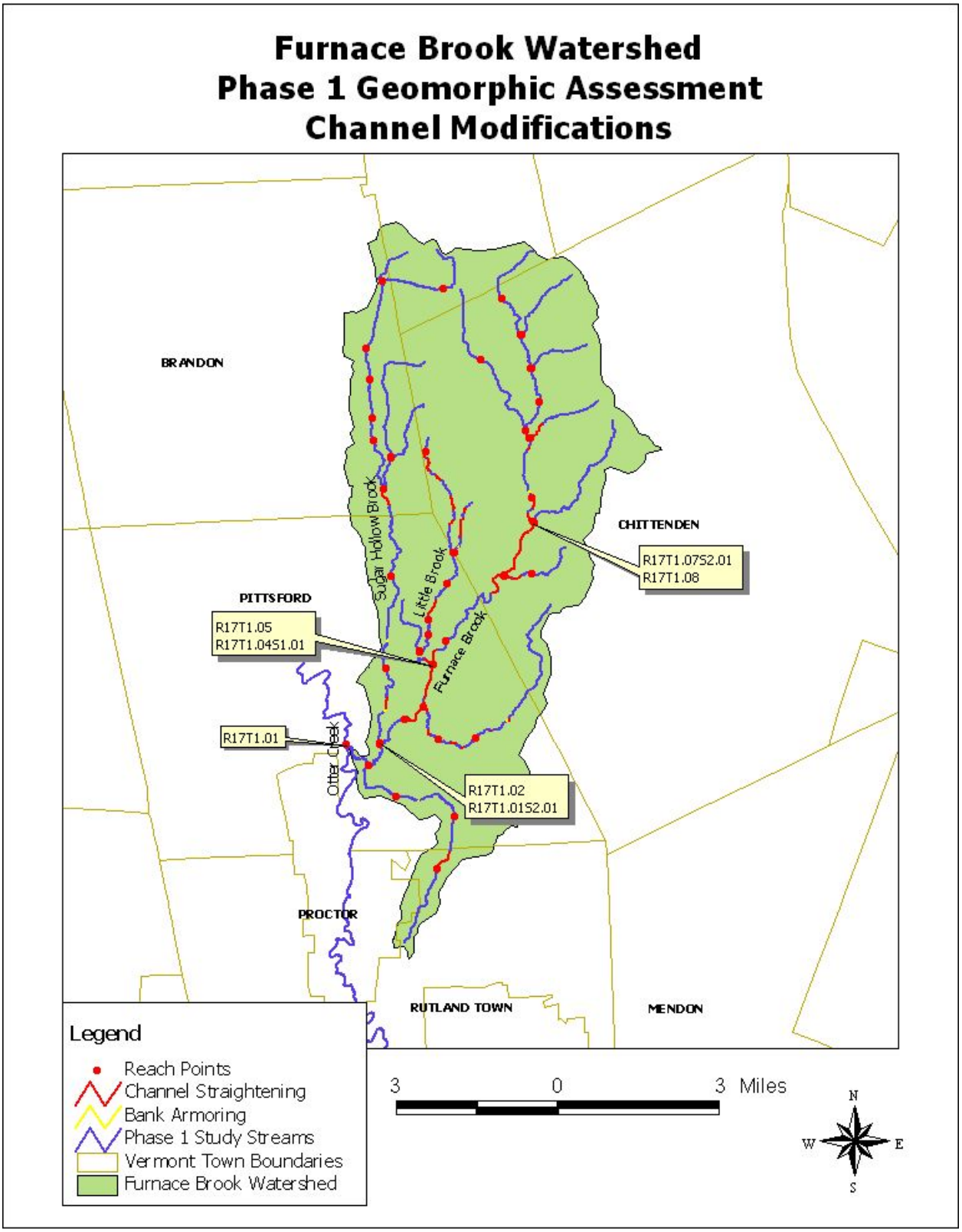

Figure 12. In-stream Channel Modifications Identified for the Furnace Brook Watershed

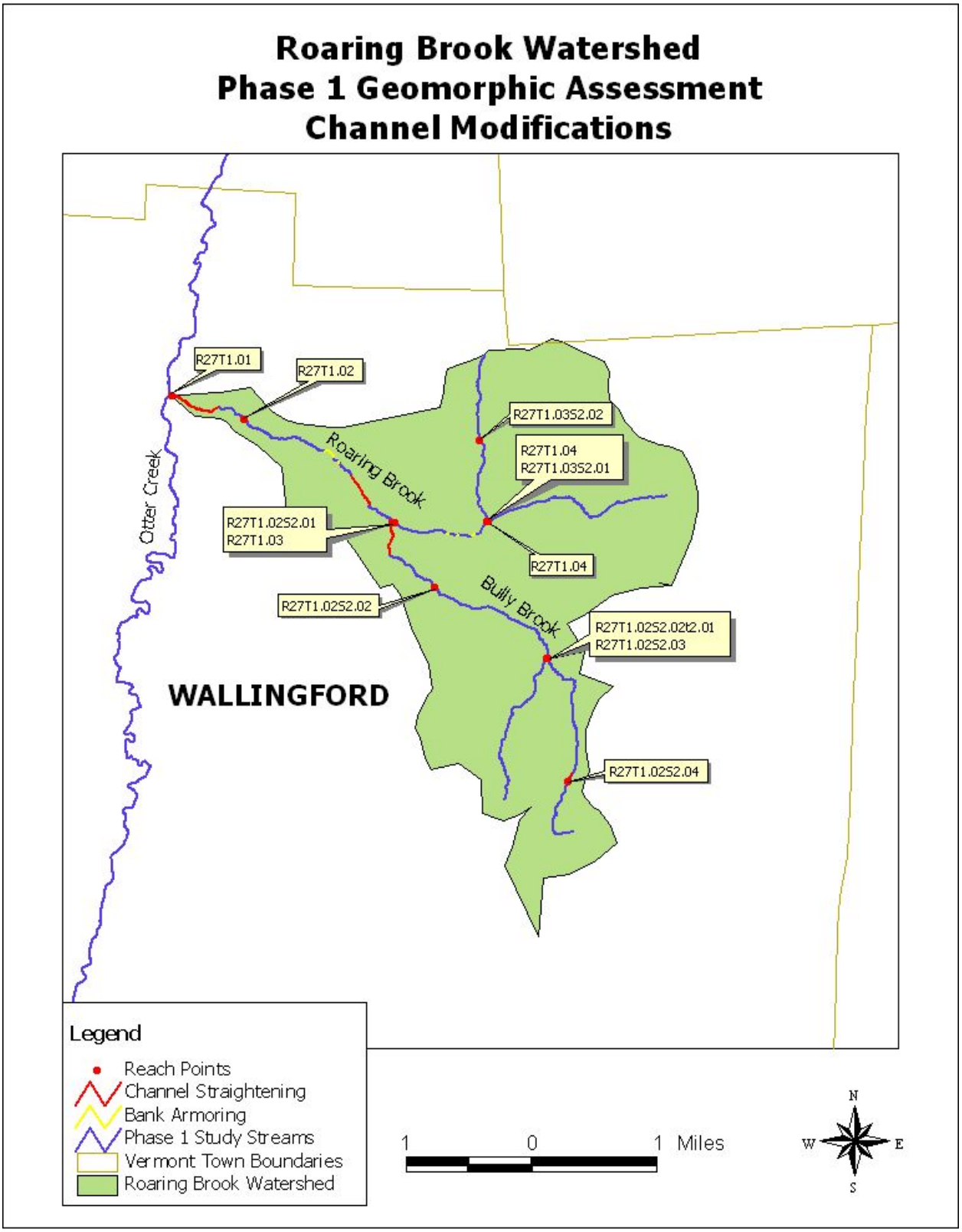

Figure 13. In-stream Channel Modifications Identified for the Roaring Brook Watershed

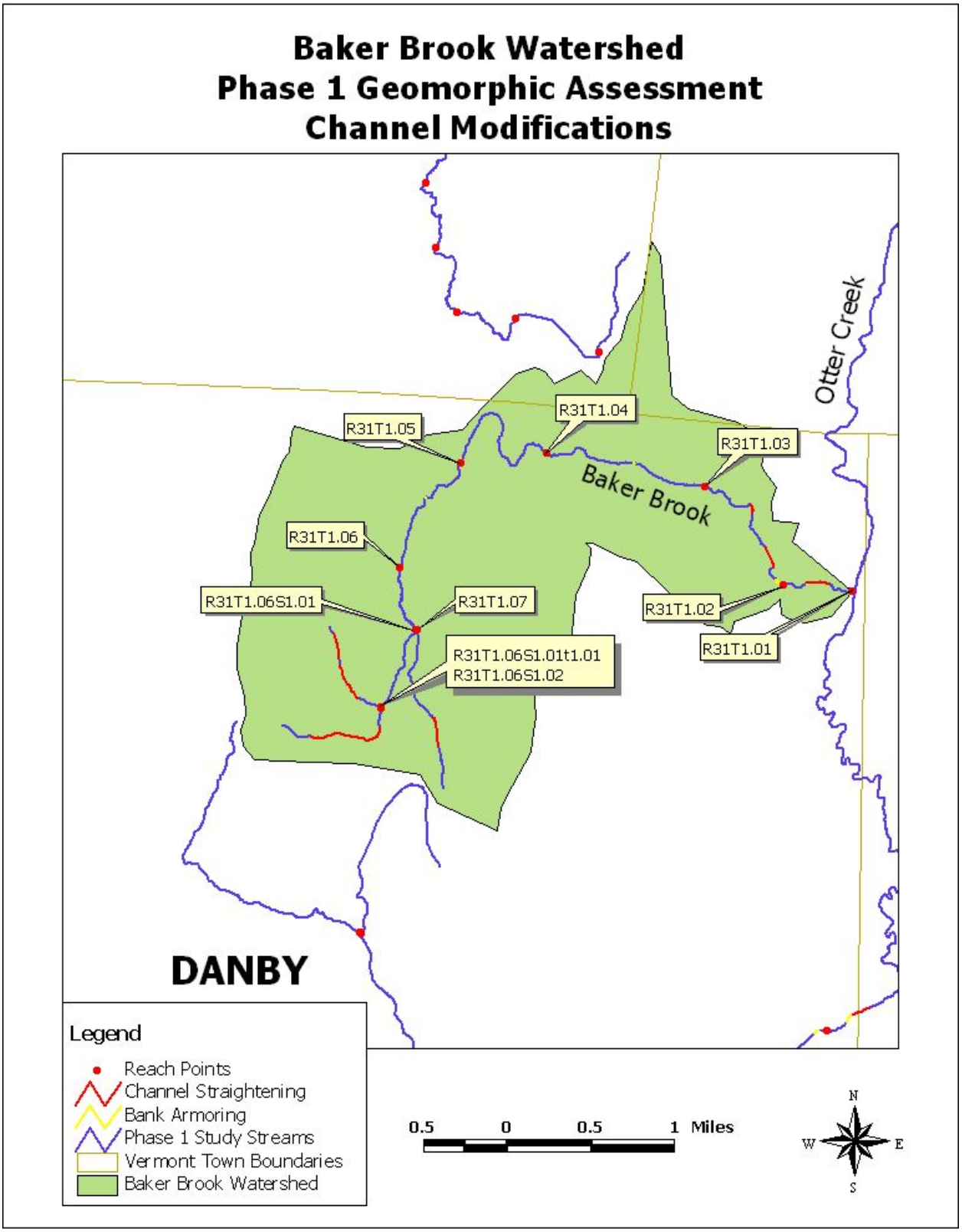

Figure 14. In-stream Channel Modifications Identified for the Baker Brook Watershed

Dredging History

BCE contacted DEC Stream Alteration Engineer Fred Nicholson. Mr. Nicholson reported that no gravel extraction has been permitted on Furnace Brook, Baker Brook or Roaring Brook in the past 30 years. During the windshield survey areas of probable dredging and/or gravel extraction associated with berms and channel straightening were observed.

Furnace Brook Watershed: Dredging was most likely associated with a straightened section upstream of the Route 7 Bridge in reach R17T1.03. In reach R17T1.07, evidence of gravel extraction was observed during the windshield survey. Gravel extraction appears to be occurring on the second meander along the reach that is located next to River Road.

Roaring Brook Watershed: There were no areas observed where dredging or gravel extraction has occurred in this watershed.

Baker Brook Watershed: In the most upstream reach on the main stem, R31T1.07, the channel appears as it has been straightened and dredged to accommodate grazing horses for a nearby horse farm.

4.6 Floodplain Modifications

In the Floodplain Modifications step of the Phase I assessment, careful attention is paid to infrastructure and other development which restricts access to the floodplain, resulting in vertical or lateral confinement of flood flows. The parameters included in this step are: Berms and Roads, River Corridor Development, Depositional Features, Meander Migration/Channel Avulsion, Meander Width Ratio, and Wavelength Ratio. Some of the primary factors, which may influence floodplain function for the three tributaries of the Otter Creek Watershed are discussed below. Pages 18 and 19 of the Appendix contain the Phase 1 information for floodplain modifications.

Berms and Roads

An estimate of the percentage of the river corridor length along which berms, roads, railroad, or improved paths run parallel to the stream was estimated for the study reaches using information from maps, orthophotos, and the windshield survey. Reaches where berms, roads, railroads or improved paths were located along 20 percent or more of the river corridor were given impact ratings of high.

Furnace Brook Watershed: Seven reaches within the Furnace Brook Watershed received an impact rating of high for berms and roads (>20% berms, roads, railroads or improved paths within the river corridor by length). Thirteen reaches resulted in an impact rating of low for berms and roads (5 to 20% berms, roads, railroads or improved paths within the river corridor by length), and the remaining eight reaches with encroaching berms or roads had an impact rating of not significant (less than 5% encroachments by length).

Roaring Brook: Six reaches within Roaring Brook Watershed had an impact rating of high for berms and roads. The only other reach with roads in the corridor resulted in an impact rating of not significant.

Baker Brook: Two out of the eight assessed reaches had an impact rating of high for berms and roads. For four out of the eight assessed reaches, the impact rating was low and the remaining two reaches were not significant.

River Corridor Development

The river corridor development parameter looks at whether developments within the river corridor are effectively decreasing the belt width within which the river can adjust. The percentage of the reach length with houses, fill, parking lots or other development within the river corridor was determined using topographic maps, orthophotos, GIS shapefile of emergency 911 structures, and knowledge from the windshield survey.

Furnace Brook Watershed: Only four reaches within the Furnace Brook Watershed had an impact rating of high (>20% development within the river corridor by length) for

development. There reaches were R17T1.03, R17T1.03S2.01, R17T1.06S2.01, and R17T1.07. Eleven out of the 53 assessed reaches had a low impact rating (5% to 20% of reach impacted) for river corridor development. The remaining reaches were not significant.

Roaring Brook Watershed: The only reach in this watershed with a high impact rating for river corridor development was the first reach on the main stem of Roaring Brook, R27T1.01. The next reach, R27T1.02, and the last reach, R27T1.04, on the main stem had a low impact rating. The remaining reaches did not have significant impact ratings for corridor development.

Baker Brook Watershed: Only one reach, R31T1.02, had a high impact rating for river corridor development. Two reaches, R31T1.01 and R31T1.06S1.02, had impact ratings of low. The remaining reaches did not have significant impact ratings for corridor development.

Depositional Features

The National Agricultural Imagery Program (NAIP) orthophotos as well as results from the windshield survey were used to evaluate depositional features within the tributaries of the Otter Creek Watershed. The presence of bars (mid-channel or point bars), deltas, and islands were noted in 38 of the study reaches. The DEC has included depositional features as a component of the Phase I analysis because these features are indicative of an increased sediment load and a high likelihood that the streambed is actively aggrading and/or undergoing lateral migration. An unvegetated bar indicates the bar has recently formed or is in the process of growing.

Furnace Brook Watershed: No reaches in the Furnace Brook Watershed were classified as having a high impact from sediment deposition. Nine reaches were given a low impact rating due primarily to the presence of point bars, mid-channel bars, side bars and islands. The 15 remaining reaches, where depositional features were observed, were not significant for depositional features.

Roaring Brook Watershed: There were no reaches in this watershed with a high impact rating for depositional features. Four of the ten assessed reaches had a low impact rating for depositional features. The low impact rating in the last reach, R27T1.04, was due to an island in the reach and the low impact ratings for the other three reaches were from the presence of multiple types of deposits: islands, side bars, mid-channel bars, and point bars. The two remaining reaches, where side bars were observed, were not significant.

Baker Brook Watershed: No reaches in the Baker Brook Watershed were classified as having a high impact from sediment deposition. There were just three reaches that were classified as having an impact rating of low for depositional features. Reach R31T1.01 contained side bars. R31T1.03 contained a mid-channel bar and an island, while a mid-channel bar and a side bar was observed in R31T1.04. The only other reach where depositional features were observed was R31T1.01 with a side bar that was not significant.

Meander Migration

Orthophotos were used to evaluate areas where the three tributaries in the Otter Creek Watershed have migrated, bifurcated, or avulsed. Current NAIP digital ortho imagery from 2003 and historic orthophotos from the 1970s were compared to evaluate changes in the location of the river channel over time. The current and the historic photos span a range of approximately 25 years. In addition to the aerial photo analysis, windshield surveys helped to verify channel avulsions and islands observed on the orthophotos.

Furnace Brook Watershed: Five reaches in this watershed (R17T1.01, R17T1.01S2.01, R17T1.01S2.03, R17T1.02, and R17T1.04S1.04) received an impact rating of high (frequent occurrences) due to evidence of frequent channel migration, avulsion, neck cutoffs and flood chutes. This active movement of the stream channel is an indicator of significant channel adjustment. Thirteen reaches were classified as low impact (few occurrences) also due to the presence of channel migration, avulsion, neck cutoffs and flood chutes. The remaining reaches were classified as not significant.

Roaring Brook Watershed: The only reach in this watershed with any evidence of channel migration was R27T1.02 due to two flood chutes observed in the reach. This reach was classified with a low impact rating for meander migration. The rest of the reaches were classified as not significant.

Baker Brook Watershed: There were no reaches in this watershed with a high impact rating for meander migration. Two reaches in the Baker Brook Watershed (R31T1.01 and R31T1.06S1.02) were classified with an impact rating of low. R31T1.01 showed evidence of meander migration and R31T1.06S1.02 contained a channel avulsion. The rest of the reaches were classified as not significant.

Meander Width and Wavelength

The NAIP series (1:5000) orthophotos in conjunction with topographic maps were used to determine the meander belt width and the meander wavelength for reference C or E riffle-pool or ripple dune stream types (i.e. unconfined systems). The topographic maps were used to determine the valley direction, while the most current orthophoto series was used to provide the accurate location of channel meanders.

The meander belt width is the horizontal distance between two opposite, outside banks on fully developed meanders. The meander width ratio is calculated by dividing the average belt width for the reach by the bankfull width. Leopold 1994 and Williams 1986 (cited in Vermont Agency of Natural Resources, 2007) consider unconfined, gravel dominated streams with moderate to gentle gradients, which are in regime, to have belt widths in the range of 5 to 8 times the channel width.

The meander wavelength consists of two bend ways. The wavelength ratio is calculated by dividing the average wavelength by the bankfull channel width. Leopold 1994 and Williams 1986 (cited in Vermont Agency of Natural Resources, 2007) have also shown unconfined, gravel dominated streams in shallow-sloped valleys to have wavelengths in the range of 10 to 12 times the channel width.

Furnace Brook Watershed: Ten of the 24 type "C" or "E" reaches on the main stem of the Furnace Brook Watershed fell outside of the range expected for channels which are in regime. These reaches (R17T1.01, R17T1.01S2.03, R17T1.02, R17T1.03, R17T1.03S2.02, R17T1.04, R17T1.04S1.06, R17T1.07, R17T1.08, and R17T1.10) were rated as high impact for meander width ratio (<3 or >10). The length of five of these reaches located on the main stem of Furnace Brook (R17T1.03, R17T1.04, R17T1.07, R17T1.08, and R17T1.10) had been straightened by more than 50%, which resulted in a meander width ratio of 1.0. Twelve reaches were classified with a low impact rating (>3 and <5 or >8 and <10) for meander belt width. Two reaches, R17T1.01S2.04 and R17T1.04S1.02, were rated as not significant (>5 and <8).

Twelve of the 24 type "C" or "E" reaches (R17T1.01, R17T1.01S2.03, R17T1.02, R17T1.03, R17T1.03S2.02, R17T1.04, R17T1.04S1.02, R17T1.07, R17T1.08, R17T1.10, R17T1.11, and R17T1.13) resulted in high impact ratings for wavelength ratio (<6 or >16). For five of these reaches, the wavelength ratio was 1.0 since they were more than 50% straightened by length. Six reaches (R17T1.01S1.01, R17T1.01S1.03, R17T1.01S2.03t1.01, R17T1.01S2.06, R17T1.01S2.08t1.02, and R17T1.04S1.06) were classified as having an impact rating of low (>6 and <8 or >14 and <16). The remaining six reaches of stream type "C" or "E" had not significant impact ratings for wavelength ratio (>8 and <14).

Roaring Brook Watershed: One of the three reaches with an "E" or "C" stream type (R27T1.04) resulted with a high impact rating for meander width ratio. This reach is located on the main stem of Roaring Brook and was straightened more than 50%. The remaining two reaches (R27T1.02S2.04 and R27T1.03) were assessed as having an impact rating of low for meander belt width. The higher values for meander belt width in these reaches may indicate that the streams are becoming more sinuous and are aggrading.

Two reaches within this watershed (R27T1.02S2.03 and R27T1.04) were classified with impact ratings of high for wavelength ratio (<6 or >16). Reach R27T1.02S2.04 on Bully Brook was assessed as having a not significant rating (>8 and <14).

Baker Brook Watershed: Two reaches (R31T1.06S1.01t1.01 and R31T1.06S1.02) resulted in high impact ratings for meander belt width. Both of these reaches were straightened by more than 50% by length. Reaches with low impact ratings were both located on the main stem of Baker Brook, R31T1.01 and R31T1.04.

The two reaches that were straightened more than 50% (R31T1.06S1.01t1.01 and R31T1.06S1.02) were classified with high impact ratings for wavelength ratio. The other two reaches, R31T1.01 and R31T1.04, had impact ratings for wavelength ratio that were not significant.

4.7 Bed and Bank Windshield Survey

In order to verify data collected remotely, the Phase 1 assessment includes a field observation component known as a "windshield survey". The windshield survey involves driving around the watershed to rapidly verify data collected in the office and flag any areas of great concern that are easily observed from the banks of the river.

Three major observations: the stream type (including dominant bed form, dominant bed material, and subclass slope), bank erosion/bank height, and debris/ ice jam potential were recorded during the windshield survey; these results are summarized in on pages 20 through 22 of the Appendix. The stream type, dominant bed form and dominant bank material were previously discussed under Section 2.2.2, Reference Stream Types. The amount of bank erosion observed along a reach and the bank height were evaluated in conjunction with each other to provide a bank erosion impact rating. Bank erosion was rated as low for two reaches within the Furnace Brook Watershed. The remaining reaches accessed in this watershed during the windshield survey were not significant for bank erosion. All reaches accessed in the Roaring Brook and Baker Brook watersheds had an impact rating of not significant for bank erosion.

<u>Debris/Ice Jam Potential</u>

Undersized culverts or bridges with spans less than the average channel width were the primary factors identified as potential for ice and debris jams. These structures, which are

likely to cause constrictions during high flow events may result in lateral erosion or channel avulsions or may even endanger infrastructure.

Furnace Brook Watershed: In the Furnace Brook Watershed, two reaches (R17T1.01S2.01 and R17T1.03S2.03) had impact ratings of high (existing jams causing erosion and stream migration or history of jams and flooding for debris/ice-jam potential due to multiple causes. Twenty two reaches had a low impact rating (channel dimensions, pattern and profile indicate jams are possible). Four reaches were noted as not significant (no noticeable sharp bends, narrow stream crossings, or wide shallow channel areas that may lead to jams).

Roaring Brook Watershed: There was one reach with an impact rating of high for debris/ice jam potential. This reach, R27T1.02, was located on the main stem of Roaring Brook and was rated high due to bridges and debris present. The remaining seven reaches that were accessed during the windshield survey were classified with a low impact rating.

Baker Brook Watershed: All reaches in this watershed were given an impact rating of low for debris/ice jam potential.

5.0 PHASE 1 DATA ANALYSIS

5.1 Phase 1 Impact Scores

The impact scores for each Phase 1 step and total scores are reported on pages 23 through 24 of the Appendix. The Phase 1 evaluates parameters that may cause channel adjustment. These parameters are grouped into four major categories: land use, in-stream modifications, floodplain modifications, and bed and bank windshield survey. Reach summary reports of these four categories are provided on pages 25 through 27 of the Appendix Adjustment scores, reach condition, and reach sensitivity for all reaches are provided on pages 28 through 30 of the Appendix.

Furnace Brook Watershed: For each parameter, the maximum impact score for the Furnace Brook Watershed is 106 (53 reaches times impact score of 2). As shown below in Figure 15, the watershed land use, corridor land use, and riparian buffers received the highest impact ratings for the watershed. The parameters channel straightening, berms and roads, meander migration, belt width, average wavelength, and debris jam potential also resulted in higher scores, but were still below 50.

The total impact scores (out of 32 possible) for the Phase I assessment for the main stem of Furnace Brook are summarized below in Figure 16. Reach R17T1.03 had the highest total impact rating of 23. Reach R17T1.03 was the only reach in the Furnace Brook Watershed that resulted in a Phase 1 reach condition of poor (Figure 17). This reach has undergone significant land use/land cover, channel and floodplain modifications which may have resulted in a change in planform, profile, and dimension such that the stream is no longer in balance with the flow and sediment regime of its watershed.

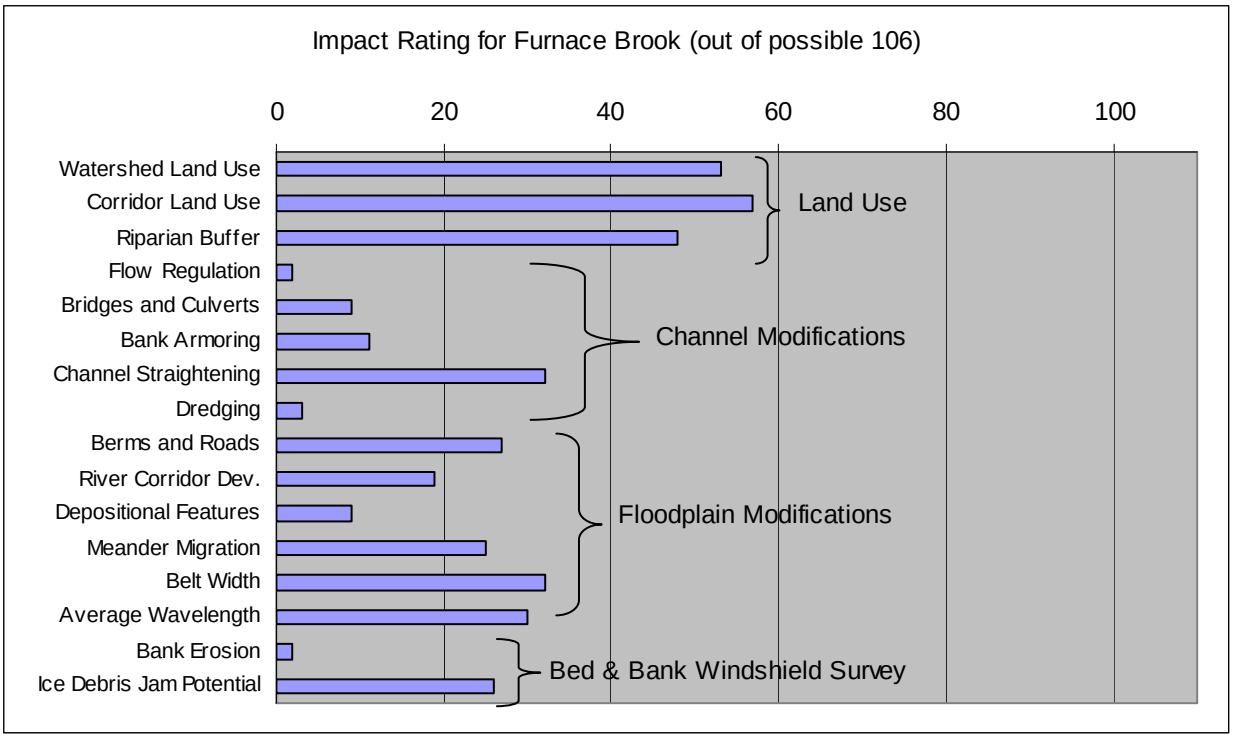

Figure 15: Impact Rating for Furnace Brook Watershed by Parameter and Category

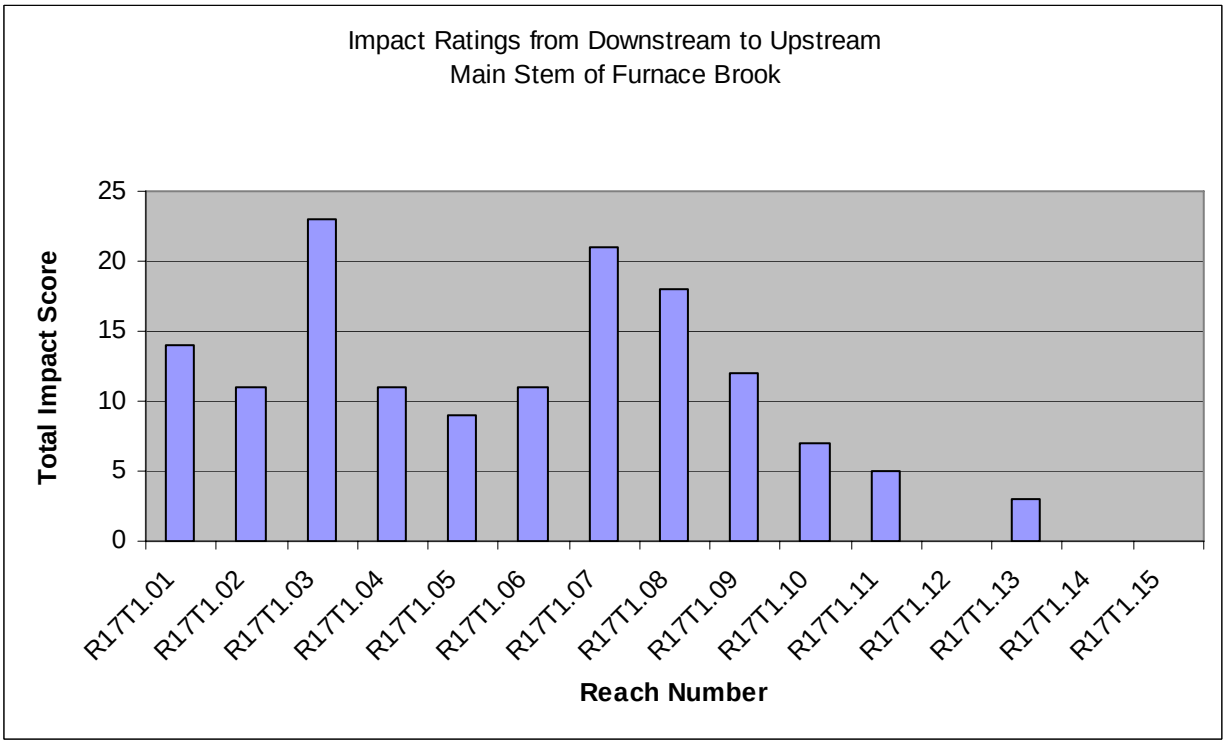

Figure 16: Impact Ratings (out of 32) from downstream to upstream on the main stem of Furnace Brook

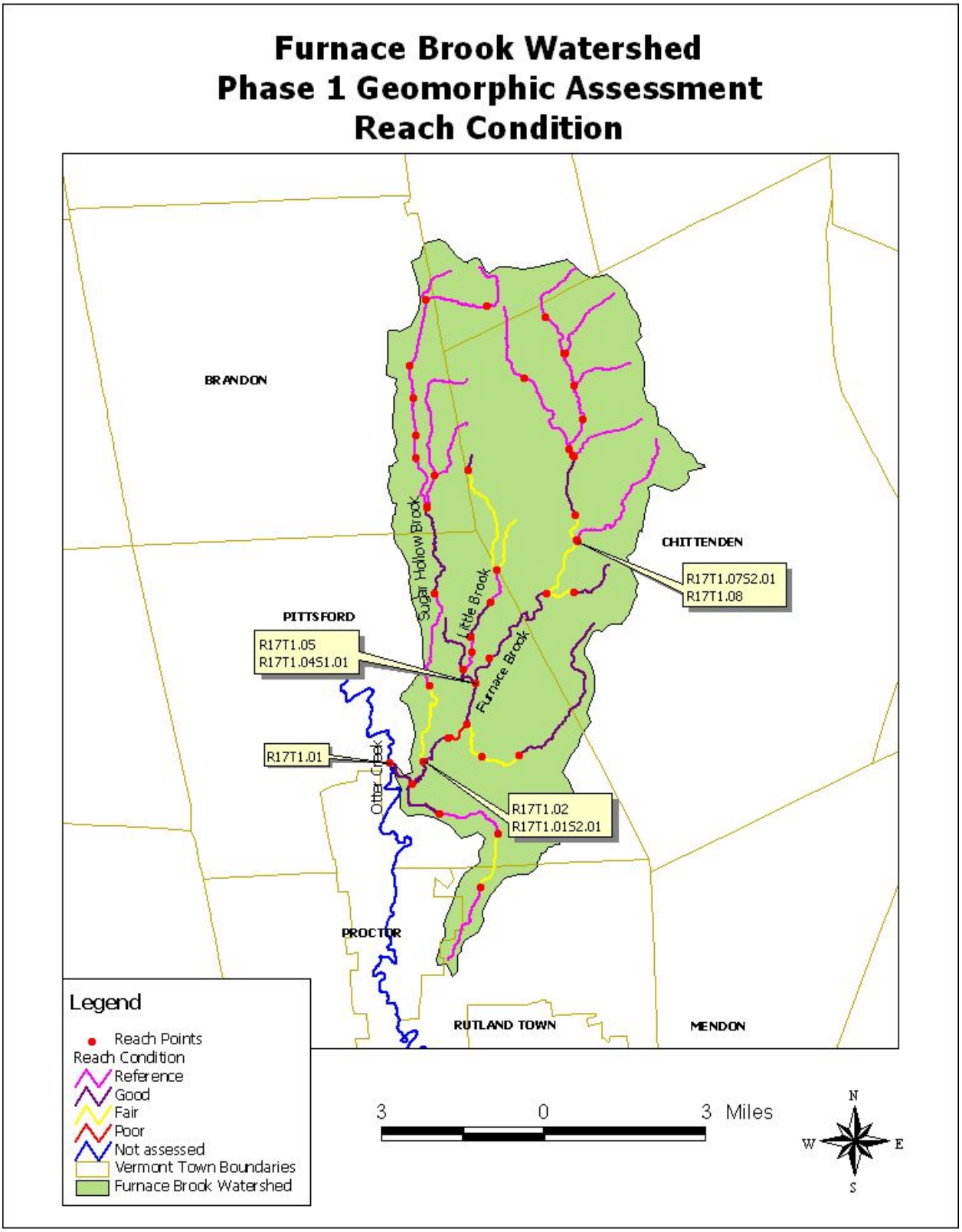

Figure 17: Reach Condition in the Furnace Brook Watershed

Streams in fair condition are likely in adjustment and experiencing major and rapid changes due to recent floodplain and channel modifications, land cover changes, and/or loss of riparian buffer. Nine reaches (R17T1.01S1.03, R17T1.01S2.01, R17T1.03S2.01, R17T1.03S2.02, R17T1.04S1.05t1.01, R17T1.04S1.06, R17T1.06S2.01, R17T1.07, and R17T1.08) fell into this category (Figure 17).

Reaches in good condition are thought to have experienced some degree of human-induced change to their watershed, floodplain and/or channel and are likely to be undergoing only minor adjustments. A reference reach has no significant channel or floodplain modifications and has a forested buffer, adjacent to the channel. In other words, these reaches are close to the natural condition. The remaining 43 reaches in the Furnace Brook Watershed were in good or reference condition.

Roaring Brook Watershed: For each parameter, the maximum impact score for the Roaring Brook Watershed is 20 (10 reaches times impact score of 2). As shown below in Figure 18, the corridor land use and watershed land use received the highest impact ratings. The parameters riparian buffer, berms and roads, and ice/debris jam potential also resulted in high scores.

The total impact scores (out of 32 possible) for the Phase I assessment for the main stem of Roaring Brook are summarized below in Figure 19. Reaches R27T1.01 and R27T1.02 had the highest total impact rating of 16, while reach R27T1.03 had the lowest total impact rating of 12.

Reach condition in the Roaring Brook watershed was variable (Figure 20). Reach R27T1.01 (the most downstream reach on the main stem) was the only reach in the Roaring Brook Watershed that resulted in a Phase 1 reach condition of poor (Figure 20). Except one reach, all reaches in fair condition were located on the main stem of Roaring Brook (R27T1.02, R27T1.02S2.03, R27T1.03 and R27T1.04). The remaining five assessed reaches in the watershed were either in good or reference condition.

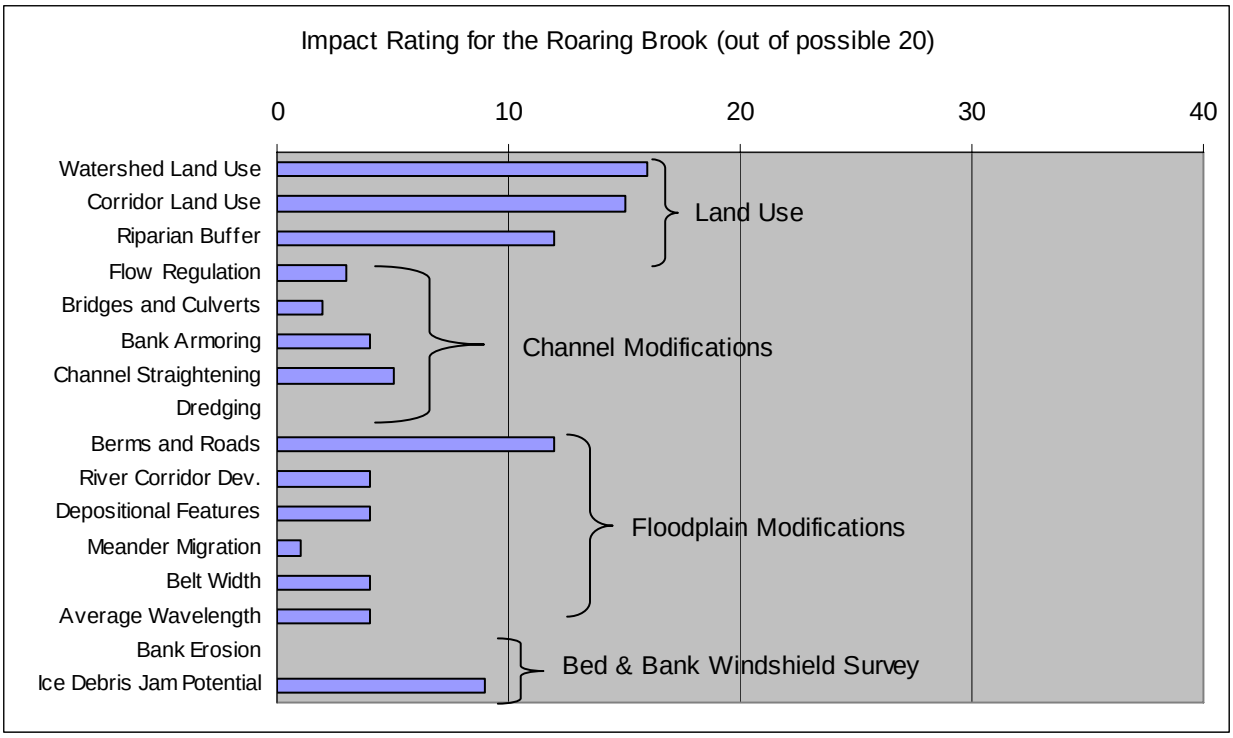

Figure 18: Impact Rating for Roaring Brook Watershed by Parameter and Category

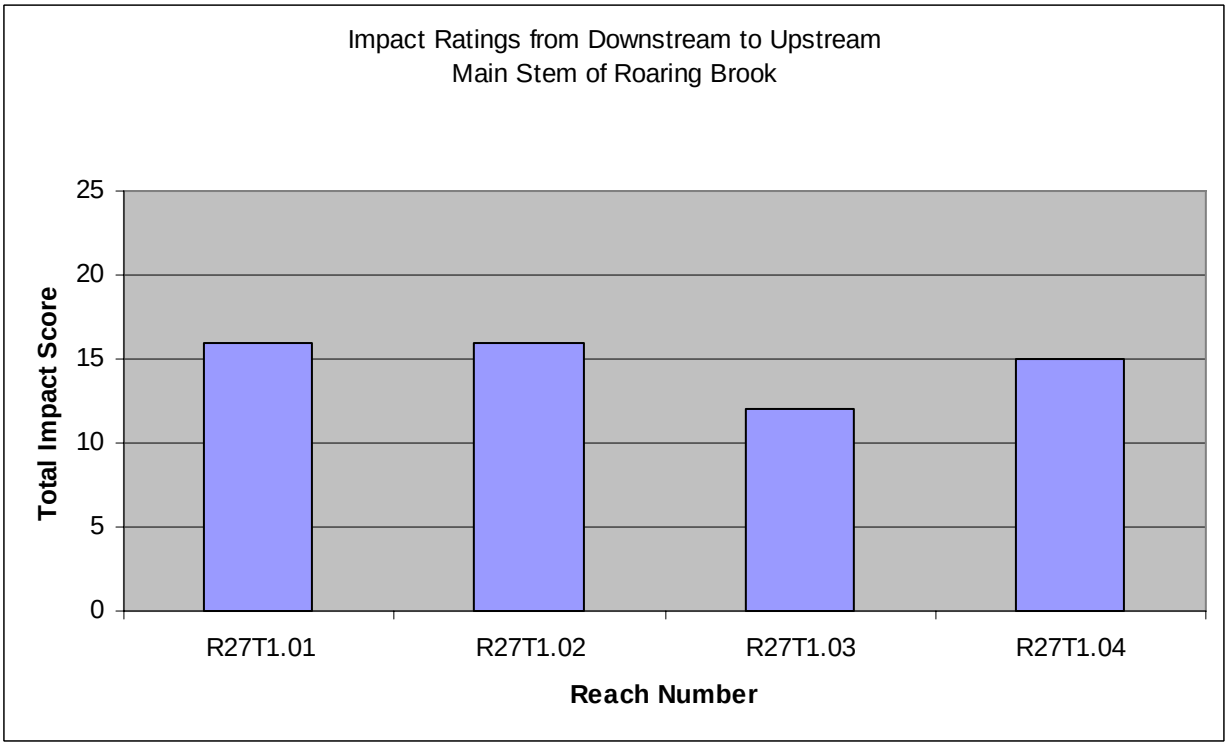

Figure 19: Impact Ratings (out of 32) from downstream to upstream on the main stem of Roaring Brook

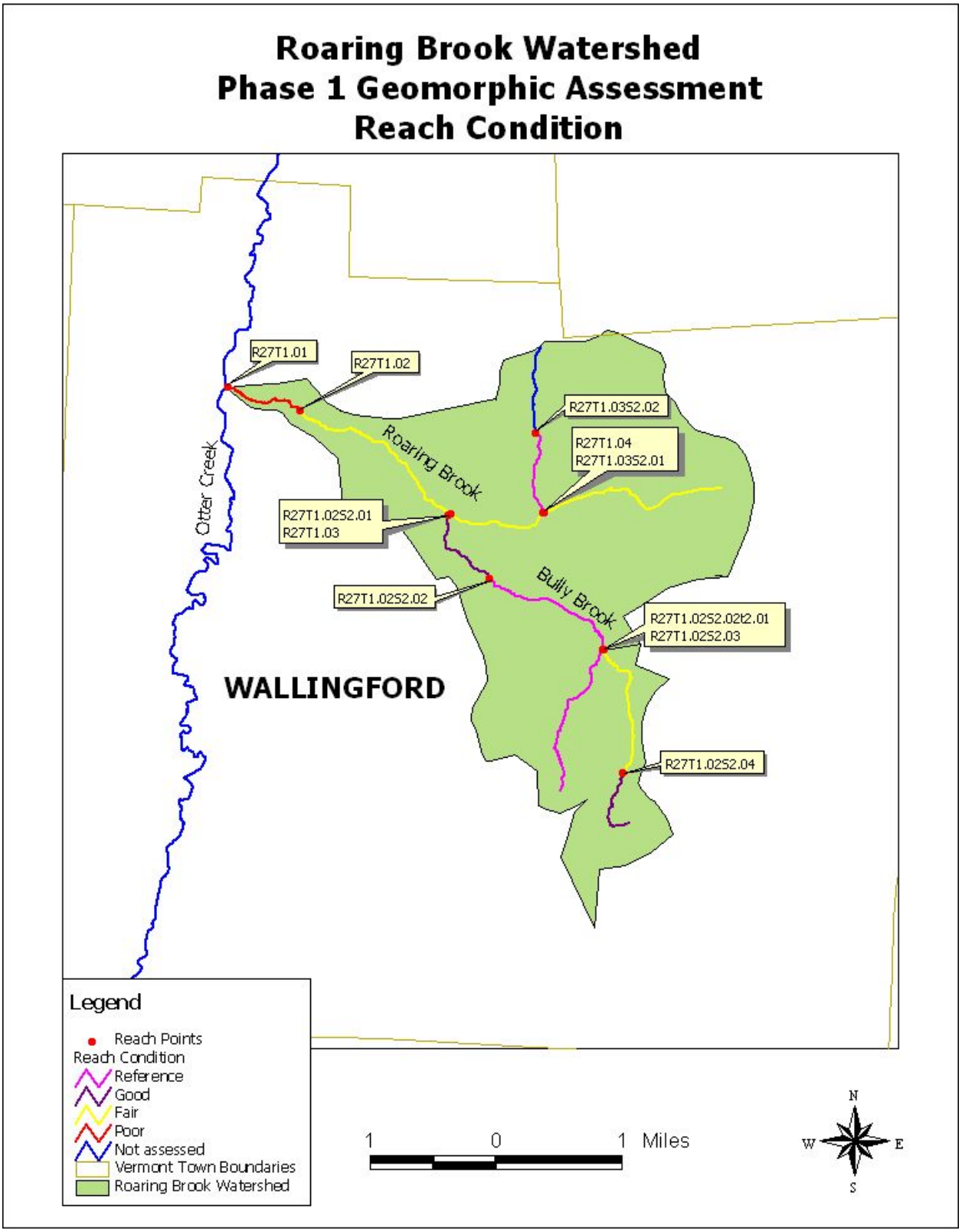

Figure 20: Reach Condition in the Roaring Brook Watershed

Baker Brook Watershed: For the Baker Brook Watershed, the maximum score for each parameter is 16 (8 reaches times impact score of 2). The watershed and corridor land use resulted in the highest impact ratings (Figure 21). The parameters riparian buffer, berms and roads, and ice/debris jam potential also resulted in high scores.

The total impact scores (out of 32 possible) for the Phase I assessment for the main stem of Baker Brook are summarized below in Figure 22. Reach R31T1.02 had the highest total impact rating of 16, while reaches R31T1.04 and R31T1.05 had the lowest total impact ratings of 6. The reach with the next highest total impact rating of 15 was R31T1.01. Based on the Phase 1 study, the two most downstream reaches on Baker Brook are the most impacted within this watershed.

Reach condition in this watershed was predominantly (5 out of 8 assessed reaches) fair (Figure 23). The reaches in fair condition (R31T1.01, R31T1.02, R31T1.06S1.01t1.01, R31T1.06S1.02, and R31T1.07) were located at the mouth and the most upstream locations of the watershed. There were no reaches resulting in poor condition. The remaining three assessed reaches in the watershed were either in good or reference condition.

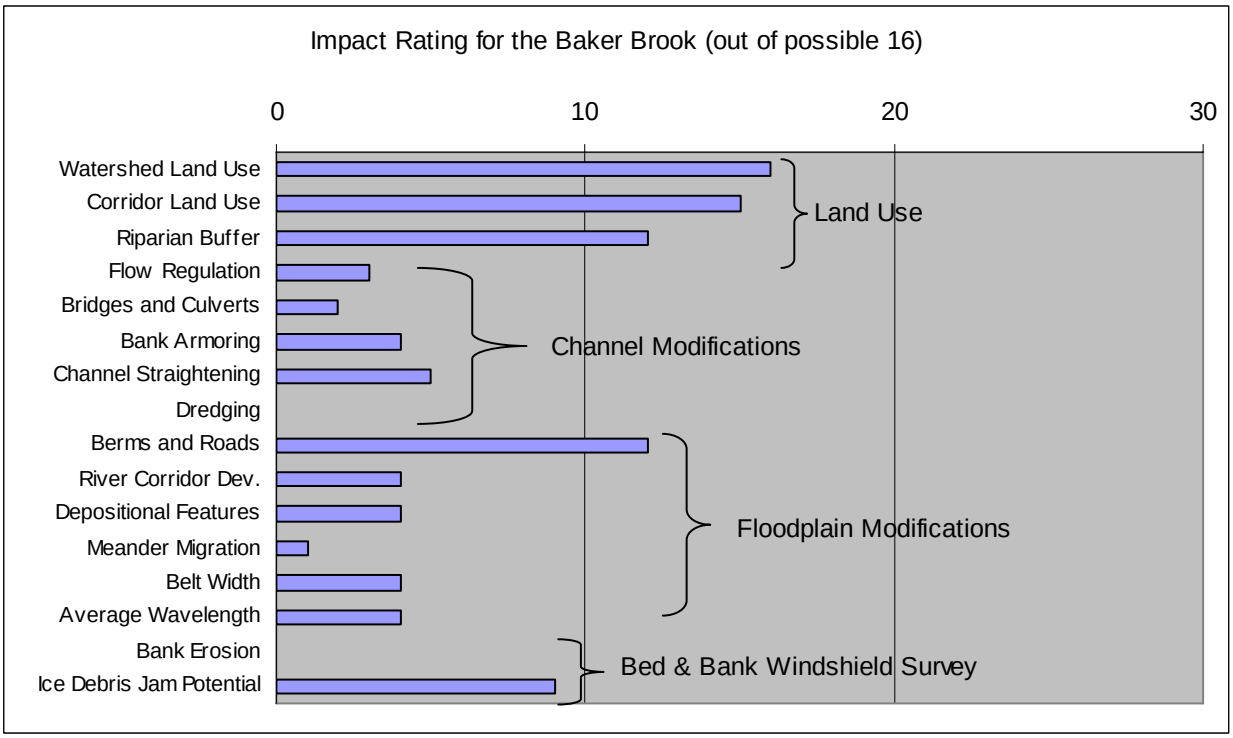

Figure 21: Impact Rating for Baker Brook Watershed by Parameter and Category

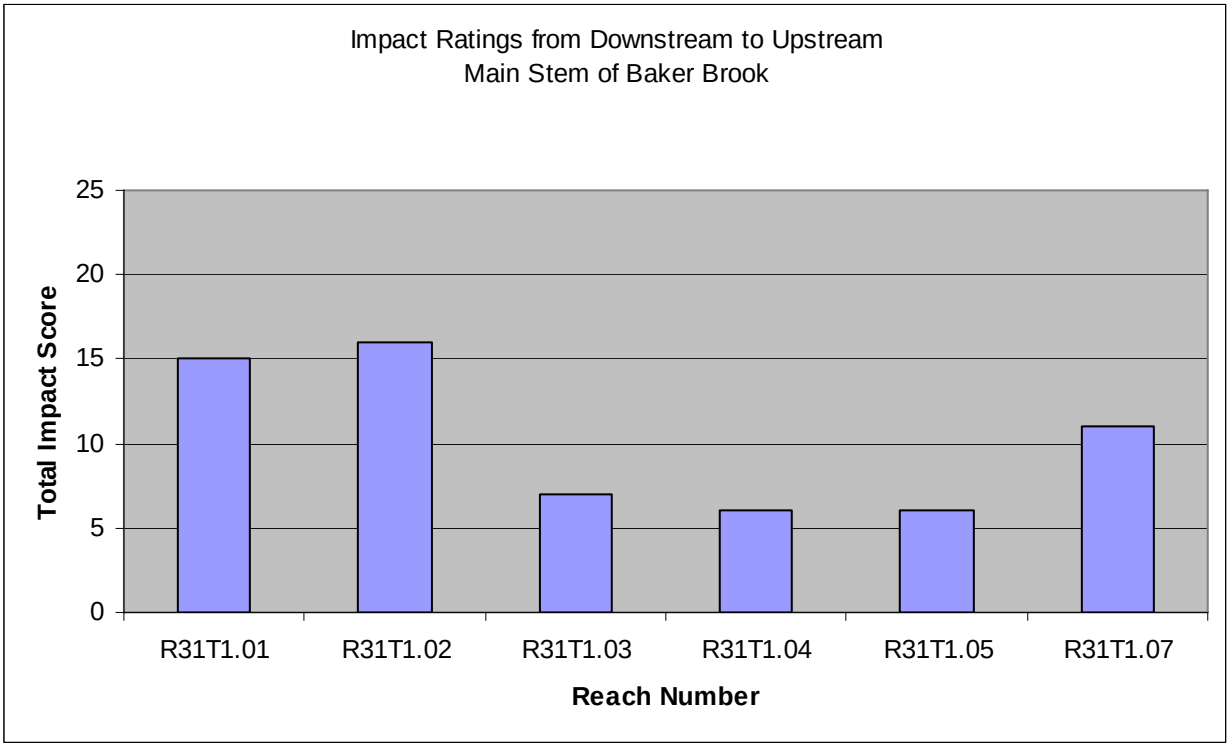

Figure 22: Impact Ratings (out of 32) from downstream to upstream on the main stem of Baker Brook

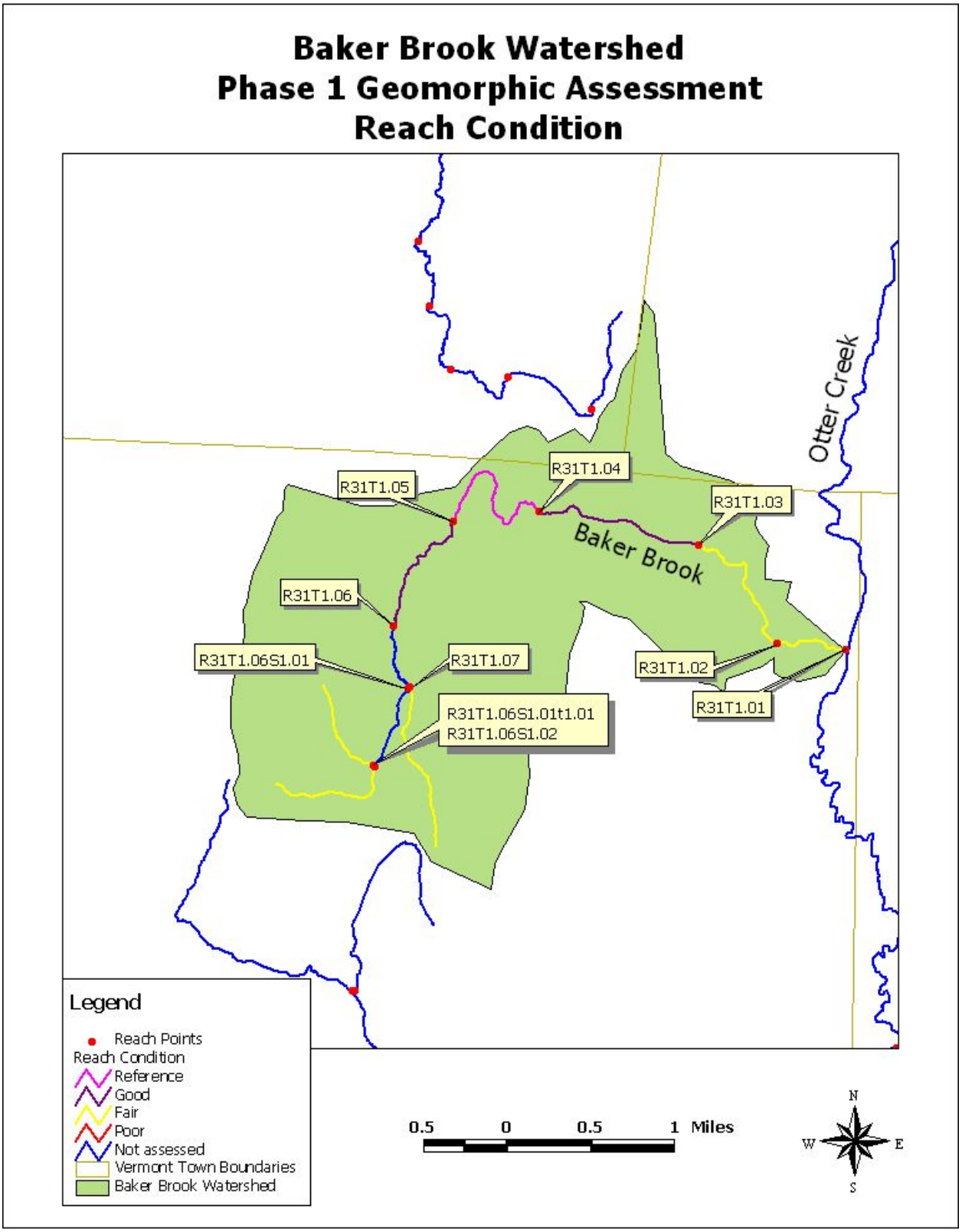

Figure 23: Reach Condition in the Baker Brook Watershed

5.2 Phase 1 Adjustment Processes

The Phase 1 data suggest that many of the stream reaches are experiencing more than one type of channel adjustment process. Based on the Phase 1 data, degradation, aggradation and planform adjustment were identified as the primary adjustment processes in some reaches in the Furnace Brook Watershed. In the most downstream reach of Roaring Brook (R27T1.01), degradation and planform adjustment were identified as the primary adjustment processes. Aggradation was the primary adjustment process in the next reach R27T1.02. For most of the remaining reaches, there was no primary adjustment process. The second most downstream reach in the Baker Brook Watershed (R31T1.02) resulted in degradation and planform adjustment as the primary adjustment processes. The remaining reaches in this watershed did not have any major adjustment process.

5.3 Phase 1 Reach Sensitivity

The stream sensitivity is automated in the DMS based on the existing stream type and condition of each reach. Highly sensitive reaches are more likely to be in adjustment, and are very sensitive to land use changes within the watershed.

Furnace Brook Watershed: Twenty three of the reaches resulted in a high sensitivity rating. These reaches had valleys that were narrow to very broad. Sixteen reaches were classified as having a moderate reach sensitivity. Most of these reaches are narrowly confined or semi-confined and have a "B" stream type that is less sensitive to change. Thirteen reaches had a very low sensitivity. These reaches had narrowly confined or semi-confined valleys a reference stream type of "A".

Roaring Brook Watershed: Three reaches within the Roaring Brook Watershed were assigned a high reach sensitivity. All of these reaches are unconfined and had a stream type of "C". Two of these reaches were located on Bully Brook, and the other reach was the most upstream reach on Roaring Brook. Three reaches had a reach sensitivity of moderate: the two most downstream reaches on Roaring Brook and the first reach on Bully Brook. Very

low reach sensitivities were recorded for the remaining four reaches in the Roaring Brook Watershed.

Baker Brook Watershed: Five reaches within the Baker Brook Watershed (R31T1.01, R31T1.04, R31T1.06S1.01t1.01, R31T1.06S1.02, and R31T1.07) were classified with a high reach sensitivity. All of these reaches had a very broad valley and a stream type of "C". Two reaches (R31T1.02 and R31T1.03) had a moderate reach sensitivity, while one reach, R31T1.05, resulted in a very low reach sensitivity. All three of these reaches were located on Baker Brook.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The Phase 1 Geomorphic Assessment of the three tributaries within the Otter Creek Watershed indicated that land use and floodplain modification have been the greatest contributors to instability in the stream system. In the Furnace Brook Watershed, the majority of the downstream reaches and one reach further up in the watershed on the main stem (R17T1.07) are actively undergoing a process of major geomorphic adjustment. In Roaring Brook, the most downstream reaches are experiencing significant adjustment. At the mouth of Baker Brook and a tributary as well as the uppermost main stem reach are adjusting to disturbances. These adjustments will likely continue to cause streambank erosion that is evidence of planform migration. As these processes unfold, habitat in the tributaries may continue to be impacted. In all tributary watersheds, there has been some road encroachment into the floodplain that at this point is difficult to change due to the road infrastructure. However, wherever possible long term protection and restoration of the riparian corridor may help to improve habitat, water quality, and stream stability and to reduce the impact from such extensive floodplain encroachment.

The Phase 1 data generated through this study will allow for a prioritization of reaches where Phase 2 Geomorphic Assessments should be conducted. Phase 2 data will provide information to pinpoint those areas where stream restoration would most benefit the habitat of the

tributaries of the Otter Creek Watershed. The following are recommendations for the three tributaries.

1. Use results from this Phase 1 Geomorphic Assessment to prioritize reaches for Phase 2 Geomorphic Assessments. Conduct Phase 2 Geomorphic Assessments on these reaches and identify potential areas for river corridor restoration. Due to the high level of observed impact and reach condition, reaches listed below are recommended for Phase 2 assessment work:

   - Furnace Brook – Ten reaches (R17T1.01 through R17T1.10)
   - Tributary 1 to Furnace Brook – Three reaches (R17T1.01-S1.01 through R17T1.01-S1.03)
   - Sugar Hollow Brook –Three reaches (R17T1.01S2.01 through R17T1.01S2.03)
   - Tributary 3 to Furnace Brook – Two reaches (R17.T1.03S2.01 through R17.T1.03S2.02)
   - Roaring Brook – Four reaches (R27T1.01 through R27T1.04)
   - Baker Brook – Two reaches (R31T1.01-T31T1.02)

2. Develop and implement a River Corridor Management Plan through community outreach and meetings with landowners with the coordination of local watershed groups. The implementation of a River Corridor Management Plan goes a long way towards reducing fluvial erosion hazards and minimizing land use conflicts. The River Corridor Management Plan would also provide some structure for identifying river restoration and corridor protection project types and effective approaches.

7.0 REFERENCES

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Appendix

Otter Creek Watershed Tributaries
Furnace Brook, Roaring Brook and Baker Brook
Phase 1 DMS Reports

Phase 1 - Step 1. Reach Locations

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Reach ID	Stream Name	Excluded?	Towns	Description
R17T1.01	Furnace Brook		Pittsford	Reach begins at confluence with Otter Creek and continues upstream to confluence with R17T1.01S2.0.
R17T1.01S1.01	Tributary to Furnace Brook		Pittsford	Begins at confluence with Furnace Brook and continues upstream through farmland and ends about 1900 feet upstream of the Route 3 stream crossing.
R17T1.01S1.02	Tributary to Furnace Brook		Pittsford	Begins after corridor becomes forested and valley becomes narrow and continues until valley opens up.
R17T1.01S1.03	Tributary to Furnace Brook		Pittsford, Rutland Town	Begins where valley becomes wider than downstream and continues upstream until about 350 feet past the Ox Yoke Drive stream crossing in Rutland Town.
R17T1.01S1.04	Tributary to Furnace Brook		Proctor, Rutland Town	Begins about 350 feet upstream of the Ox Yoke Drive stream crossing and continues upstream through forested land to the top of the watershed near the border of Rutland town and Proctor.
R17T1.01S2.01	Sugar Hollow Brook		Pittsford	Begins at the confluence with Furnace Brook and continues upstream until corridor becomes forested and valley becomes narrow, about 3000 feet downstream of the Plains Road stream crossing in Pittsford.
R17T1.01S2.02	Sugar Hollow Brook		Pittsford	narrow than downstream and continues upstream through forested land with narrow valley until just upstream of the SUgar Hollow Road crossing.
R17T1.01S2.03	Sugar Hollow Brook		Brandon, Pittsford	Begins just upstream of the Sugar Hollow Road crossing and continues upstream to about 1700 feet upstream of the Birch Hill Road stream crossing where a tributary enters on the left bank.
R17T1.01S2.03t1.01	Tributary to Sugar Hollow Brook		Brandon	Begins at confluence with trib to Furnace Brook and continues upstream until another trib enters on the right bank.
R17T1.01S2.03t1.01s1.01	trib to trib of Sugar Hollow Brook		Brandon, Chittenden	Begins at confluence with trib of Sugar Hallow Brook and continues upstream to Lead Mine Mountain in Chittenden.
R17T1.01S2.03t1.02	Tributary to Sugar Hollow Brook		Brandon, Chittenden	Begins where trib enters on right bank and continues upstream to just past West Road stream crossing in Chittenden.
R17T1.01S2.04	Sugar Hollow Brook		Brandon	Begins where tributary enters on left bank about 1700 feet upstream of Birch Hill Road stream crossing and continues for about 6268 feet upstream to where valley becomes very narrow.
R17T1.01S2.05	Sugar Hollow Brook		Brandon	Begins where valley becomes very narrow and continues through forested land for about 2300 feet.
R17T1.01S2.06	Sugar Hollow Brook		Brandon	Begins where valley opens up slightly and continues for approximately 4300 feet upstream.
R17T1.01S2.07	Sugar Hollow Brook		Brandon	Begins where valley becomes more narrow than downstream and continues for approximately 3300 feet upstream through forested land until a small trib enters on right bank.
R17T1.01S2.08	Sugar Hollow Brook		Brandon	Begins where small trib enters on right bank and continues upstream through forested land until about 450 feet downstream of Duval Road crossing, at the confluence with Basin Brook.
R17T1.01S2.08t1.01	Basin Brook		Brandon, Goshen	Begins at confluence with Sugar Hallow Brook and continues upstream through forested land for approximately 6600 feet.
R17T1.01S2.08t1.02	Basin Brook		Goshen	Begins about 1300 feet downstream of wetland area and continues upstream to top of basin near Waste Hill.
R17T1.01S2.09	Sugar Hollow Brook		Brandon, Goshen	Begins at confluenc with Basin Brook and continues upstream to top of basin near Waste Hill.
R17T1.02	Furnace Brook		Pittsford	Begins at confluenc with Sugar Hollow Brook and continues upstream for approximately 4959 feet.
R17T1.03	Furnace Brook		Pittsford	Begins about 1200 feet downstream of the Rout 7 stream crossing near Arch Streem and Route 3 and continues upstream until a trib enters on the left bank, near the Oxbow Road crossing on the trib.
R17T1.03S2.01	Tributary to Furnace Brook		Pittsford	Begins at the confluenc with Furnace Brook and continues until just upstream of the Gloriosa Drive stream crossing.

Phase 1 - Step 1. Reach Locations

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Reach ID	Stream Name	Excluded?	Towns	Description
R17T1.03S2.02	Tributary to Furnace Brook		Pittsford	Begins just upstream of the Gloriosa Drive stream crossing and continues upstream for approximately 5219 feet.
R17T1.03S2.03	Tributary to Furnace Brook		Chittenden, Pittsford	Begins about 1925 feet downstream of the Parker Road stream crossing in Pittsford and continues upstream to the top of the basin in Chittenden.
R17T1.04	Furnace Brook		Pittsford	Begins at confluence with trib on left bank and continues upstream to confluence with Little Brook on right bank.
R17T1.04S1.01	Little Brook		Pittsford	Begins at confluence with Furnace Brook and continues upstream for approximately 2972 feet until a trib enters on right bank.
R17T1.04S1.01t1.01	Tributary to Little Brook		Pittsford	Begins at confluence with Little Brook and continues upstream to wetland area at top of basin.
R17T1.04S1.02	Little Brook		Pittsford	Begins where trib enters on right bank and continues upstream for approximately 2339 feet.
R17T1.04S1.03	Little Brook		Pittsford	Begins about 350 feet upstream of Plains Road crossing bear Four Seasons Lane and continues upstream for about 1759 feet.
R17T1.04S1.04	Little Brook		Pittsford	Begins where valley becomes wider than downstream and continues for about 4756 feet until valley becomes more narrow again.
R17T1.04S1.05	Little Brook		Pittsford	Begins where valley becomes more narrow and continues for about 3807 feet upstream until a trib enters on the right bank near the town line between Chittenden and Pittsford.
R17T1.04S1.05t1.01	Tributary to Little Brook		Chittenden	Begins at confluence with Little Brook and continues upstream to top of basin about 1000 feet upstream of the Lazy Acre Road stream crossing.
R17T1.04S1.06	Little Brook		Chittenden, Pittsford	Begins where trib enters on left bank and continues upstream for about 12186 feet.
R17T1.04S1.07	Little Brook		Chittenden	Begins about 1677 feet downstream of West Road stream crossing and continues upstream to West Road stream crossing.
R17T1.05	Furnace Brook		Pittsford	Begins at the confluence with Little Brook and continues upstream for about 3400 feet, to about 500 feet upstream of the Furnace Road stream crossing.
R17T1.06	Furnace Brook		Chittenden, Pittsford	Begins about 500 feet upstream of Furnace Road stream crossing and continues upstream until a trib enters on the left bank.
R17T1.06S2.01	Tributary to Furnace Brook		Chittenden	Begins at confluence with Furnace Brook and continues upstream for about 3251 feet until valley becomes more narrow.
R17T1.06S2.02	Tributary to Furnace Brook		Chittenden	Begins about 1300 feet downstream of the McKinlay Road stream crossing and continues upstream through forested land for about 5519 feet.
R17T1.07	Furnace Brook		Chittenden	Begins at Holden Road stream crossing and continues upstream to about 250 feet beyond the second River Road stream crossing.
R17T1.07S2.01	Kiln Brook		Chittenden	Begins at confluence with Furnace Brook and continues upstream through forested land for approximately 16550 feet.
R17T1.08	Furnace Brook		Chittenden	Begins about 250 feet above the second River Road crossing and continues upstream about 3062 feet to where the valley becomes much more narrow.
R17T1.09	Furnace Brook		Chittenden	Begins where valley becomes much more narrow than downstream about 900 feet upstream of the third River Road stream crossing and continues upstream through a narrow valley for about 6331 feet.
R17T1.09S2.01	Beaudry Brook		Chittenden	Begins at confluence with Furnace Brook and continues upstream through forested land for about 8335 feet.
R17T1.10	Furnace Brook		Chittenden	Begins at confluence with Beaudry Brook and continues 834 feet upstream to confluence with Baker Brook.

Phase 1 - Step 1. Reach Locations

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Reach ID	Stream Name	Excluded?	Towns	Description
R17T1.10S1.01	Baker Brook		Chittenden	Begins at confluence with Furnace Brook and continues upstream for approximately 10000 feet through forested land until valley becomes more narrow than downstream.
R17T1.10S1.02	Baker Brook		Chittenden, Goshen	Begins where valley becomes very narrow and continues upstream for approximately 8140 feet.
R17T1.11	Furnace Brook		Chittenden	Begins at confluence with Baker Brook and continues upstream for approximately 3669 feet.
R17T1.12	Furnace Brook		Chittenden	Begins just downstream of a small trib entering on the left bank and continues upstream until the confluence with Bee Brook.
R17T1.12S1.01	Kettle Brook		Chittenden	to reflect the correct drainage subwatershed in R17T1 (Furnace Brook). Begins at confluence with Furnace Brook and continues for 8893 feet.
R17T1.12S2.01	Bee Brook		Chittenden	Begins at confluence with Furnace Brook and continues upstream through forested land for about 6905 feet.
R17T1.13	Furnace Brook		Chittenden	Begins at confluence with Bee Brook and continues upstream for about 3791 feet to confluence with Kettle Brook.
R17T1.14	Furnace Brook		Chittenden	Begins at confluence with Kettle Brook and continues upstream for 5103 feet until valley gets more narrow.
R17T1.15	Furnace Brook		Chittenden, Goshen	Begins where valley becomes more narrow than downstream and continues upstream for approximately 7242 feet.
R27T1.01	Roaring Brook		Wallingford	Begins at confluence with Otter Creek and continues upstream through a residential area for approximately 3624 feet.
R27T1.02	Roaring Brook		Wallingford	Begins about 2600 feet upstream of the South Main Street stream crossing and continues upstream to where Bully Brook enters on the left bank about 1700 feet upstream of the Van Wyck Road stream crossing.
R27T1.02S2.01	Bully Brook		Wallingford	Begins at confluence with Roaring Brook and continues upstream for about 3879 feet.
R27T1.02S2.02	Bully Brook		Wallingford	Begins about 2500 feet upstream of where corridor becomes densely forested and continues through a narrow valley for approximately 6262 feet.
R27T1.02S2.02t2.01	Tributary to Bully Brook		Wallingford	Begins at confluence with Bully Brook and continues upstream for approximately 7091 feet.
R27T1.02S2.03	Bully Brook		Wallingford	Begins where trib enters on left and continues upstream to about 450 feet past the second Wallingford Pond Road stream crossing.
R27T1.02S2.04	Bully Brook		Wallingford	Begins about 450 feet upstream of the second Wallingford Pond Road crossing and continues upstream for approximately 3403 feet.
R27T1.03	Roaring Brook		Wallingford	Begins at confluence with Bully Brook on left bank and continues to confluence with Patch Brook.
R27T1.03S2.01	Patch Brook		Wallingford	Begins at confluence with Roaring Brook and continues upstream for about 3720 feet to just below an onstream pond area.
R27T1.03S2.02	Patch Brook	Impounded	Wallingford	Begins just below pond area and continues through wetland area to top of basin approximately 3901 feet.
R27T1.04	Roaring Brook		Wallingford	Begins at confluence with Patch Brook and continues upstream for approximately 8462 feet to top of basin.
R31T1.01	Baker Brook		Danby	Begins at the confluence with Otter Creek and continues upstream to just below Scottsville Road stream crossing.
R31T1.02	Baker Brook		Danby	Begins just upstream of Scottsville Road stream crossing and continues upstream for approximately 4865 feet.

Phase 1 - Step 1. Reach Locations

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Reach ID	Stream Name	Excluded?	Towns	Description
R31T1.03	Baker Brook		Danby	Begins about 2300 feet downstream of the intersection of Scottsville Road and Baker Brook Road ad continues upstream for approximately 5530 feet running close to the road the entire way.
R31T1.04	Baker Brook		Danby	Begins where stream becomes more sinuous and valley begins to widen and continues upstream for approximately 5824 feet.
R31T1.05	Baker Brook		Danby	Begins approximately 1900 feet downstream of the Timouth road stream crossing and continues upstream to the Hoisington Cross Road stream crossing.
R31T1.06	Baker Brook	Impounded	Danby	Begins at the Hoisington Cross Road stream crossing and continues upstream for about 2242 feet until a tributary enters on the left.
R31T1.06S1.01	Tributary to Baker Brook	Impounded	Danby	Begins at the confluence with Baker Brook and continues upstream for about 2907 feet until a tributary enters on the left bank.
R31T1.06S1.01t1.01	Trib to Trib to Baker Brook		Danby	Begins at confluence with trib to Baker Brook and continues upstream for approximately 3294 feet to top of basin.
R31T1.06S1.02	Tributary to Baker Brook		Danby	Begins where trib enters on left bank and continues upstream to top of basin, about 1500 feet past Old Otis Road Stream crossing.
R31T1.07	Baker Brook		Danby	Begins where trib enters on left bank and continues upstream to top of basin about 1400 feet past a private driveway stream crossing.

Phase 1 - Step 2. Preliminary Reference Stream Type

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	2.1		2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.1		2.11	
	Elevation		Valley	Valley	Channel	Channel		Watershed	Channel	Valley	Confinement		Reference	
	Up	Down	Length	Slope	Length	Slope	Sinuosity	Area	Width	Width	Ratio	Type	Stream	Bedform
Reach ID	(ft.)	(ft.)	(ft.)	(%)	(ft.)	(%)		(sq. mi.)	(ft.)	(ft.)			Type	
R17T1.01	363	357	6308	0.1	8805	0.07	1.4	44.37	69.5	964	13.9	VB	E	Dune-Ripple
R17T1.01S1.01	387	357	4667	0.64	6034	0.5	1.29	3.56	22.9			VB	E	Dune-Ripple
R17T1.01S1.02	660	387	6940	3.93	7415	3.68	1.07	2.95	21.1			SC	B	Riffle-Pool
R17T1.01S1.03	687	660	6035	0.45	6036	0.45	1	2.39	19.2	1547	80.4	VB	C	Riffle-Pool
R17T1.01S1.04	1131	687	7884	5.63	8633	5.14	1.1	0.8	11.9			SC	B	Riffle-Pool
R17T1.01S2.01	523	363	8341	1.92	9556	1.67	1.15	10.9	37.5			NC	B	Step-Pool
R17T1.01S2.02	708	523	9500	1.95	10143	1.82	1.07	10.27	36.5	160	4.4	NW	C	Riffle-Pool
R17T1.01S2.03	739	708	9260	0.33	11591	0.27	1.25	9.47	35.2	1012	28.7	VB	C	Riffle-Pool
R17T1.01S2.03t1.01	772	739	3230	1.02	3751	0.88	1.16	1.95	17.6	427	24.3	VB	C	Riffle-Pool
R17T1.01S2.03t1.01s1.01	2059	772	6800	18.93	7773	16.56	1.14	0.92	12.7			NC	A	Cascade
R17T1.01S2.03t1.02	2495	772	13400	12.86	14086	12.23	1.05	0.89	12.4			NC	A	Cascade
R17T1.01S2.04	781	739	5096	0.82	6268	0.67	1.23	5.3	27.3	865	31.7	VB	C	Riffle-Pool
R17T1.01S2.05	827	781	2181	2.11	2311	1.99	1.06	4.56	25.5			NW	B	Plane Bed
R17T1.01S2.06	906	827	3852	2.05	4340	1.82	1.13	4.49	25.4	609	24	VB	C	Riffle-Pool
R17T1.01S2.07	919	906	3146	0.41	3304	0.39	1.05	4.02	24.2			SC	B	Plane Bed
R17T1.01S2.08	1123	919	6698	3.05	6886	2.96	1.03	3.18	21.8			NC	B	Step-Pool
R17T1.01S2.08t1.01	1651	1129	6130	8.52	6591	7.92	1.08	1.55	15.9			NC	A	Cascade
R17T1.01S2.08t1.02	1823	1651	5402	3.18	6183	2.78	1.14	0.52	9.8	1123	114.6	VB	C	Riffle-Pool
R17T1.01S2.09	1758	1123	4325	14.68	4825	13.16	1.12	0.68	11.1			NC	A	Cascade
R17T1.02	379	363	3676	0.44	4959	0.32	1.35	29.31	57.9	748	12.9	VB	C	Riffle-Pool
R17T1.03	438	379	2797	2.11	3004	1.96	1.07	28.56	57.3	420	7.3	BD	C	Riffle-Pool
R17T1.03S2.01	524	443	3887	2.08	4251	1.91	1.09	5.75	28.3	291	10.3	VB	C	Riffle-Pool
R17T1.03S2.02	604	524	4115	1.94	5219	1.53	1.27	3.9	23.8			VB	C	Riffle-Pool
R17T1.03S2.03	1765	604	17400	6.67	19784	5.87	1.14	1.76	16.8			NC	B	Step-Pool
R17T1.04	476	438	4278	0.89	4279	0.89	1	22.51	51.6			VB	C	Riffle-Pool
R17T1.04S1.01	488	476	2442	0.49	2972	0.4	1.22	4.52	25.4	594	23.4	VB	C	Riffle-Pool
R17T1.04S1.01t1.01	862	488	6670	5.61	7041	5.31	1.06	0.46	9.3			NC	A	Step-Pool
R17T1.04S1.02	544	488	1975	2.84	2339	2.39	1.18	3.95	24	482	20.1	VB	C	Riffle-Pool
R17T1.04S1.03	604	544	1500	4	1759	3.41	1.17	3.79	23.5			SC	B	Step-Pool
R17T1.04S1.04	721	604	4111	2.85	4756	2.46	1.16	3.73	23.4	1160	49.6	VB	C	Riffle-Pool

Phase 1 - Step 2. Preliminary Reference Stream Type

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	2.1		2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.1		2.11	
	Elevation		Valley	Valley	Channel	Channel		Watershed	Channel	Valley	Confinement		Reference	
	Up	Down	Length	Slope	Length	Slope	Sinuosity	Area	Width	Width	Ratio	Type	Stream	Bedform
Reach ID	(ft.)	(ft.)	(ft.)	(%)	(ft.)	(%)		(sq. mi.)	(ft.)	(ft.)			Type	
R17T1.04S1.05	917	721	3610	5.43	3807	5.15	1.05	2.93	21			NC	A	Step-Pool
R17T1.04S1.05t1.01	1443	915	5540	9.53	6311	8.37	1.14	0.58	10.3			SC	B	Step-Pool
R17T1.04S1.06	1380	917	11030	4.2	12186	3.8	1.1	1.85	17.2			VB	C	Riffle-Pool
R17T1.04S1.07	1605	1380	1560	14.42	1677	13.42	1.08	0.29	7.6			NC	A	Cascade
R17T1.05	590	476	3345	3.41	3403	3.35	1.02	17.7	46.4			NC	B	Step-Pool
R17T1.06	996	590	11400	3.56	12355	3.29	1.08	17.48	46.1			SC	B	Step-Pool
R17T1.06S2.01	1236	989	2817	8.77	3251	7.6	1.15	1.24	14.4	365	25.4	VB	B	Step-Pool
R17T1.06S2.02	2000	1236	5333	14.33	5519	13.84	1.03	0.9	12.5			NC	A	Cascade
R17T1.07	1106	996	6427	1.71	6734	1.63	1.05	14.54	42.5	532	12.5	VB	C	Riffle-Pool
R17T1.07S2.01	2689	1108	14480	10.92	16550	9.55	1.14	2.47	19.5			NC	A	Cascade
R17T1.08	1205	1106	2588	3.83	3062	3.23	1.18	11.07	37.7	457	12.1	VB	C	Riffle-Pool
R17T1.09	1348	1205	5969	2.4	6331	2.26	1.06	10.77	37.3			NC	B	Step-Pool
R17T1.09S2.01	2778	1359	7734	18.35	8335	17.02	1.08	0.89	12.5			SC	A	Step-Pool
R17T1.10	1360	1348	806	1.49	834	1.44	1.03	8.38	33.4	371	11.1	VB	C	Riffle-Pool
R17T1.10S1.01	1528	1364	8655	1.89	10036	1.63	1.16	3.24	22	523	23.8	VB	C	Riffle-Pool
R17T1.10S1.02	1719	1528	7825	2.44	8140	2.35	1.04	1.26	14.5			SC	B	Plane Bed
R17T1.11	1502	1360	3271	4.34	3669	3.87	1.12	5.06	26.7	428	16	VB	C	Riffle-Pool
R17T1.12	1705	1502	3548	5.72	4125	4.92	1.16	4.77	26.1	305	11.7	VB	B	Step-Pool
R17T1.12S1.01	3033	1810	7930	15.42	8893	13.75	1.12	1.46	15.5			NC	A	Cascade
R17T1.12S2.01	2784	1705	6248	17.27	6905	15.63	1.11	0.81	12			NC	A	Cascade
R17T1.13	1810	1705	3523	2.98	3791	2.77	1.08	3.19	21.8	648	29.7	VB	C	Riffle-Pool
R17T1.14	1972	1810	4251	3.81	5103	3.17	1.2	1.34	14.9	466	31.3	VB	B	Step-Pool
R17T1.15	3118	1972	6575	17.43	7242	15.82	1.1	0.78	11.7			NC	A	Cascade
R27T1.01	715	577	3273	4.22	3624	3.81	1.11	7.55	31.9	422	13.2	VB	B	Step-Pool
R27T1.02	987	715	7970	3.41	8589	3.17	1.08	7.41	31.6	156	4.9	NW	B	Step-Pool
R27T1.02S2.01	1263	980	3750	7.55	3879	7.3	1.03	2.64	20.1	99	4.9	NW	B	Step-Pool
R27T1.02S2.02	1724	1263	5990	7.7	6262	7.36	1.05	2.34	19			NC	A	Cascade
R27T1.02S2.02t2.01	2132	1721	6640	6.19	7091	5.8	1.07	0.84	12.1			NC	A	Step-Pool
R27T1.02S2.03	2057	1724	5876	5.67	6274	5.31	1.07	0.9	12.5	175	14	VB	C	Riffle-Pool
R27T1.02S2.04	2098	2057	3207	1.28	3403	1.2	1.06	0.52	9.8	645	65.7	VB	C	Riffle-Pool
R27T1.03	1165	987	4160	4.28	4534	3.93	1.09	3.43	22.5	84	3.7	SC	B	Step-Pool
R27T1.03S2.01	1762	1164	3460	17.28	3720	16.08	1.08	0.37	8.5			NC	A	Cascade

Phase 1 - Step 2. Preliminary Reference Stream Type

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	2.1		2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.1		2.11	
	Elevation		Valley	Valley	Channel	Channel		Watershed	Channel	Valley	Confinement		Reference	
	Up	Down	Length	Slope	Length	Slope	Sinuosity	Area	Width	Width	Ratio	Type	Stream	Bedform
Reach ID	(ft.)	(ft.)	(ft.)	(%)	(ft.)	(%)		(sq. mi.)	(ft.)	(ft.)			Type	
R27T1.04	1399	1165	8120	2.88	8462	2.77	1.04	2.16	18.4	110	6	NW	C	Riffle-Pool
R31T1.01	699	638	2238	2.73	2425	2.52	1.08	5.59	27.9	793	28.4	VB	C	Riffle-Pool
R31T1.02	906	699	4200	4.93	4865	4.25	1.16	5.47	27.7	152	5.5	NW	B	Step-Pool
R31T1.03	1048	906	5200	2.73	5530	2.57	1.06	4.76	26	57	2.2	SC	B	Plane Bed
R31T1.04	1168	1048	4716	2.54	5824	2.06	1.23	3.86	23.7	558	23.5	VB	C	Riffle-Pool
R31T1.05	1341	1168	3960	4.37	4447	3.89	1.12	2.82	20.7			NW	B	Step-Pool
R31T1.06S1.01t1.01	1491	1387	3200	3.25	3294	3.16	1.03	0.34	8.2			VB	C	Riffle-Pool
R31T1.06S1.02	1574	1389	4080	4.53	4206	4.4	1.03	0.45	9.2			VB	C	Riffle-Pool
R31T1.07	1432	1365	5326	1.26	5421	1.24	1.02	0.69	11.1	791	71	VB	C	Riffle-Pool

Phase 1 - Step 3. Basin Characteristics: Geology

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	3.1	3.2	3.3 Geologic Materials			3.4 Valley Side Slope	
Reach ID	Alluvial Fan	Grade Control	Dominant	%	Sub-Dominant	Left	Right
R17T1.01	None	None	Alluvial	86	Ice-Contact	Flat	Hilly
R17T1.01S1.01	Yes	None	Alluvial	76	Other	Flat	Hilly
R17T1.01S1.02	None	None	Ice-Contact	86	Other	Steep	Steep
R17T1.01S1.03	None	None	Other	50	Alluvial	Steep	Flat
R17T1.01S1.04	Yes	None	Till	87	Alluvial	Extremely Steep	Steep
R17T1.01S2.01	None	Dam	Ice-Contact	36	Till	Hilly	Steep
R17T1.01S2.02	Yes	Dam	Till	63	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.01S2.03	None	None	Alluvial	63	Ice-Contact	Steep	Very Steep
R17T1.01S2.03t1.01	None	None	Ice-Contact	68	Alluvial	Extremely Steep	Flat
R17T1.01S2.03t1.01s1.01	Yes	None	Till	90	Other	Extremely Steep	Extremely Steep
R17T1.01S2.03t1.02	Yes	None	Till	81	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.01S2.04	None	None	Ice-Contact	81	Alluvial	Very Steep	Very Steep
R17T1.01S2.05	None	None	Ice-Contact	87	Till	Extremely Steep	Extremely Steep
R17T1.01S2.06	None	None	Ice-Contact	51	Alluvial	Extremely Steep	Very Steep
R17T1.01S2.07	None	None	Ice-Contact	61	Till	Extremely Steep	Very Steep
R17T1.01S2.08	Yes	None	Till	84	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.01S2.08t1.01	Yes	None	Till	97	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.01S2.08t1.02	Yes	None	Till	67	Other	Very Steep	Steep
R17T1.01S2.09	Yes	None	Till	77	Ice-Contact	Extremely Steep	Very Steep
R17T1.02	None	None	Alluvial	55	Ice-Contact	Very Steep	Very Steep
R17T1.03	None	Ledge	Ice-Contact	75	Till	Hilly	Hilly
R17T1.03S2.01	None	Dam	Till	95	Ice-Contact	Hilly	Hilly
R17T1.03S2.02	None	None	Alluvial	61	Ice-Contact	Hilly	Hilly
R17T1.03S2.03	Yes	Ledge	Till	53	Ice-Contact	Steep	Very Steep

Phase 1 - Step 3. Basin Characteristics: Geology

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	3.1	3.2	3.3 Geologic Materials			3.4 Valley Side Slope	
Reach ID	Alluvial Fan	Grade Control	Dominant	%	Sub-Dominant	Left	Right
R17T1.04	None	None	Ice-Contact	40	Till	Very Steep	Flat
R17T1.04S1.01	None	None	Ice-Contact	94	Till	Flat	Extremely Steep
R17T1.04S1.01t1.01	Yes	None	Till	51	Ice-Contact	Very Steep	Extremely Steep
R17T1.04S1.02	None	None	Ice-Contact	100	---	Flat	Hilly
R17T1.04S1.03	None	None	Ice-Contact	98	Till	Hilly	Steep
R17T1.04S1.04	Yes	None	Ice-Contact	73	Till	Very Steep	Very Steep
R17T1.04S1.05	None	None	Till	77	Ice-Contact	Very Steep	Steep
R17T1.04S1.05t1.01	None	None	Till	96	Ice-Contact	Steep	Steep
R17T1.04S1.06	Yes	Ledge	Till	94	Ice-Contact	Very Steep	Very Steep
R17T1.04S1.07	None	None	Till	99	Ice-Contact	Very Steep	Extremely Steep
R17T1.05	None	Multiple	Ice-Contact	81	Alluvial	Very Steep	Hilly
R17T1.06	None	None	Ice-Contact	80	Till	Extremely Steep	Very Steep
R17T1.06S2.01	Yes	None	Ice-Contact	97	Till	Very Steep	Extremely Steep
R17T1.06S2.02	None	None	Till	63	Ice-Contact	Very Steep	Very Steep
R17T1.07	None	None	Ice-Contact	70	Till	Extremely Steep	Extremely Steep
R17T1.07S2.01	Yes	Dam	Till	92	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.08	None	Dam	Ice-Contact	87	Till	Very Steep	Extremely Steep
R17T1.09	None	None	Till	86	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.09S2.01	None	None	Till	88	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.10	None	None	Ice-Contact	100	---	Steep	Very Steep
R17T1.10S1.01	None	None	Ice-Contact	69	Till	Extremely Steep	Extremely Steep
R17T1.10S1.02	None	None	Till	75	Ice-Contact	Extremely Steep	Extremely Steep
R17T1.11	None	None	Ice-Contact	85	Till	Extremely Steep	Extremely Steep
R17T1.12	None	None	Till	98	Ice-Contact	Extremely Steep	Very Steep

Phase 1 - Step 3. Basin Characteristics: Geology

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	3.1	3.2	3.3 Geologic Materials			3.4 Valley Side Slope	
Reach ID	Alluvial Fan	Grade Control	Dominant	%	Sub-Dominant	Left	Right
R17T1.12S1.01	Yes	None	Till	99	---	Extremely Steep	Extremely Steep
R17T1.12S2.01	None	None	Till	99	---	Extremely Steep	Extremely Steep
R17T1.13	None	None	Till	99	---	Very Steep	Very Steep
R17T1.14	None	None	Till	97	Ice-Contact	Very Steep	Very Steep
R17T1.15	None	None	Till	99	---	Extremely Steep	Extremely Steep
R27T1.01	None	None	Ice-Contact	100	---	Steep	Steep
R27T1.02	None	Dam	Ice-Contact	77	Other	Very Steep	Extremely Steep
R27T1.02S2.01	None	None	Ice-Contact	71	Till	Steep	Steep
R27T1.02S2.02	None	None	Till	82	Ice-Contact	Extremely Steep	Extremely Steep
R27T1.02S2.02t2.01	None	None	Till	99	---	Very Steep	Steep
R27T1.02S2.03	None	None	Till	99	---	Very Steep	Steep
R27T1.02S2.04	None	Multiple	Till	99	---	Very Steep	Hilly
R27T1.03	None	Ledge	Till	60	Ice-Contact	Extremely Steep	Extremely Steep
R27T1.03S2.01	None	None	Till	87	Ice-Contact	Very Steep	Very Steep
R27T1.04	None	Dam	Till	76	Ice-Contact	Extremely Steep	Extremely Steep
R31T1.01	None	None	Ice-Contact	61	Alluvial	Hilly	Hilly
R31T1.02	None	Ledge	Other	37	Till	Very Steep	Very Steep
R31T1.03	None	None	Till	83	Other	Very Steep	Extremely Steep
R31T1.04	None	None	Other	46	Ice-Contact	Steep	Steep
R31T1.05	None	None	Till	99	---	Steep	Steep
R31T1.06S1.01t1.01	None	None	Till	99	---	Steep	Steep
R31T1.06S1.02	None	None	Till	98	---	Flat	Flat
R31T1.07	None	None	Till	65	Other	Flat	Steep

Phase 1 - Step 3. Basin Characteristics: Soils

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

	3.5 Soil Properties									
	Hydrologic				Water Table					
Reach ID	Group	%	Flooding	%	Deep	%	Shallow	%	Erodibility	%
R17T1.01	B	50	Occasional	47	2	47	0	38	Slight	2
R17T1.01S1.01	C	75	Frequent	75	1.5	75	0	75	Slight	2
R17T1.01S1.02	A	86	None/Rare	99	6	87	6	87	Severe	57
R17T1.01S1.03	D	72	None/Rare	63	0	72	-1	72	Slight	9
R17T1.01S1.04	C	66	None/Rare	90	3	77	1.5	77	Very Severe	89
R17T1.01S2.01	B	43	None/Rare	66	3	49	1.5	67	Moderate	46
R17T1.01S2.02	D	47	None/Rare	99	6	97	6	97	Very Severe	97
R17T1.01S2.03	D	48	Frequent	63	0.5	37	0	63	Slight	21
R17T1.01S2.03t1.01	A	58	None/Rare	70	6	60	6	60	Severe	59
R17T1.01S2.03t1.01s1.01	D	58	None/Rare	100	6	73	6	73	Very Severe	93
R17T1.01S2.03t1.02	D	45	None/Rare	100	6	60	6	60	Very Severe	97
R17T1.01S2.04	A	52	None/Rare	90	6	61	6	61	Very Severe	87
R17T1.01S2.05	A	87	None/Rare	100	6	94	6	94	Very Severe	99
R17T1.01S2.06	A	51	None/Rare	54	6	54	6	54	Severe	54
R17T1.01S2.07	B	75	None/Rare	99	2.5	61	1.5	61	Very Severe	98
R17T1.01S2.08	D	82	None/Rare	100	6	83	6	83	Very Severe	99
R17T1.01S2.08t1.01	B	92	None/Rare	99	6	85	2	83	Very Severe	99
R17T1.01S2.08t1.02	B	67	None/Rare	100	6	67	2	67	Severe	66
R17T1.01S2.09	B	68	None/Rare	100	6	85	2	54	Very Severe	99
R17T1.02	B	64	Occasional	54	2	54	1.5	82	Slight	25
R17T1.03	B	64	None/Rare	99	3	66	1.5	76	Severe	65
R17T1.03S2.01	C	82	None/Rare	100	3	54	1.5	54	Very Severe	95
R17T1.03S2.02	C	67	Frequent	61	1.5	61	0	63	Slight	12
R17T1.03S2.03	C	34	None/Rare	100	6	65	6	65	Very Severe	86
R17T1.04	B	48	None/Rare	76	3	40	1.5	68	Moderate	50
R17T1.04S1.01	B	55	None/Rare	100	3	55	1.5	55	Moderate	43
R17T1.04S1.01t1.01	C	37	None/Rare	100	6	79	6	79	Very Severe	82
R17T1.04S1.02	B	60	None/Rare	100	3	60	1.5	60	Very Severe	99
R17T1.04S1.03	A	51	None/Rare	100	6	52	6	52	Severe	52

Phase 1 - Step 3. Basin Characteristics: Soils

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

	3.5 Soil Properties									
	Hydrologic				Water Table					
Reach ID	Group	%	Flooding	%	Deep	%	Shallow	%	Erodibility	%
R17T1.04S1.04	B	64	None/Rare	100	3	63	1.5	63	Moderate	36
R17T1.04S1.05	C	77	None/Rare	100	6	68	6	68	Very Severe	77
R17T1.04S1.05t1.01	C	91	None/Rare	100	3	47	1.5	47	Very Severe	96
R17T1.04S1.06	C	61	None/Rare	100	6	46	6	46	Very Severe	93
R17T1.04S1.07	C	99	None/Rare	100	6	76	6	76	Very Severe	99
R17T1.05	A	60	None/Rare	86	6	60	6	60	Severe	65
R17T1.06	A	72	None/Rare	100	6	91	6	91	Very Severe	91
R17T1.06S2.01	A	69	None/Rare	100	6	69	6	69	Severe	71
R17T1.06S2.02	C	61	None/Rare	100	6	64	6	36	Very Severe	99
R17T1.07	A	39	None/Rare	92	6	62	6	62	Severe	72
R17T1.07S2.01	B	59	None/Rare	100	6	72	6	66	Very Severe	99
R17T1.08	B	70	None/Rare	100	3	63	1.5	63	Very Severe	99
R17T1.09	C	60	None/Rare	100	6	98	6	98	Very Severe	99
R17T1.09S2.01	C	72	None/Rare	100	6	75	2	47	Very Severe	99
R17T1.10	B	69	None/Rare	100	6	100	6	100	Very Severe	99
R17T1.10S1.01	A	58	None/Rare	100	6	73	6	73	Severe	75
R17T1.10S1.02	C	53	None/Rare	91	6	91	6	72	Very Severe	91
R17T1.11	B	88	None/Rare	100	6	52	6	52	Very Severe	99
R17T1.12	C	86	None/Rare	100	3.5	84	1.5	84	Very Severe	99
R17T1.12S1.01	C	92	None/Rare	100	3.5	55	1.5	71	Very Severe	99
R17T1.12S2.01	C	100	None/Rare	100	6	68	2	67	Very Severe	99
R17T1.13	C	90	None/Rare	100	2.5	85	1.5	94	Very Severe	99
R17T1.14	C	54	None/Rare	100	2.5	48	1.5	70	Very Severe	99
R17T1.15	B	55	None/Rare	99	6	61	2	53	Very Severe	99
R27T1.01	A	100	None/Rare	100	6	100	6	100	Very Severe	99
R27T1.02	A	67	None/Rare	77	6	67	6	67	Severe	66
R27T1.02S2.01	A	68	None/Rare	100	6	97	6	97	Very Severe	96
R27T1.02S2.02	C	74	None/Rare	100	6	81	6	81	Very Severe	99
R27T1.02S2.02t2.01	C	65	None/Rare	100	2	33	-1	33	Very Severe	99

Phase 1 - Step 3. Basin Characteristics: Soils

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

	3.5 Soil Properties									
	Hydrologic				Water Table					
Reach ID	Group	%	Flooding	%	Deep	%	Shallow	%	Erodibility	%
R27T1.02S2.03	C	39	None/Rare	100	6	42	6	42	Very Severe	99
R27T1.02S2.04	D	75	None/Rare	100	2	75	-1	75	Very Severe	100
R27T1.03	C	60	None/Rare	86	6	83	6	83	Very Severe	82
R27T1.03S2.01	C	87	None/Rare	100	6	92	6	92	Very Severe	99
R27T1.04	B	47	None/Rare	91	6	82	6	82	Very Severe	90
R31T1.01	B	49	None/Rare	61	2	49	6	41	Moderate	41
R31T1.02	Not Rated	37	None/Rare	62	6	62	6	62	Severe	61
R31T1.03	C	84	None/Rare	85	6	41	1.5	43	Very Severe	84
R31T1.04	Not Rated	46	None/Rare	53	6	42	6	42	Severe	52
R31T1.05	C	100	None/Rare	100	6	67	6	67	Very Severe	99
R31T1.06S1.01t1.01	C	95	None/Rare	100	6	65	6	65	Very Severe	95
R31T1.06S1.02	C	69	None/Rare	100	6	37	6	37	Severe	68
R31T1.07	D	58	None/Rare	100	0	58	-1	58	Moderate	41

Phase 1 - Step 4. Land Cover - Reach Hydrology

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	4.1 Watershed Land Cover - Land Use							4.2 Corridor Land Cover - Land Use							4.3 Riparian Buffer							4.4
		Current							Current						Dominant		Sub-Dominant		LT 25 ft.			Groundwater
Reach ID	Historic	Dom.	%	Sub-D.	Urban	Crop	Impact	Historic	Dom.	%	Sub-D.	Urban	Crop	Impact	L Bank	R Bank	L Bank	R Bank	L Bank	R Bank	Impact	Inputs
R17T1.01	Forest	Forest	75	Crop	6	7	High	Forest	Forest	38	Crop	6	10	High	>100	>100	51-100	51-100	355	501	Low	Abundant
R17T1.01S1.01	Forest	Forest	54	Field	14	9	High	Forest	Forest	37	Wetland	10	5	High	>100	>100	51-100	0-25	115	2564	High	Abundant
R17T1.01S1.02	Forest	Forest	60	Field	11	8	High	Forest	Forest	60	Crop	2	3	Low	>100	>100	51-100	51-100	0	250	N.S.	Minimal
R17T1.01S1.03	Forest	Forest	61	Urban	12	8	High	Forest	Forest	54	Urban	10	8	High	>100	>100	0-25	0-25	2418	1767	High	Abundant
R17T1.01S1.04	Forest	Forest	63	Field	3	6	Low	Forest	Forest	27	Field	5	0	Low	>100	>100	None	51-100	217	393	Low	Minimal
R17T1.01S2.01	Forest	Forest	79	Crop	3	8	High	Forest	Forest	38	Urban	17	5	High	>100	>100	26-50	51-100	1572	511	High	Minimal
R17T1.01S2.02	Forest	Forest	82	Crop	2	8	High	Forest	Forest	67	Urban	7	0	Low	>100	>100	51-100	0-25	225	155	N.S.	Abundant
R17T1.01S2.03	Forest	Forest	82	Crop	0	8	Low	Forest	Forest	68	Wetland	4	0	Low	>100	>100	0-25	0-25	1237	1723	High	Abundant
R17T1.01S2.03t1.01	Forest	Forest	79	Crop	0	10	High	Forest	Forest	64	Crop		9	Low	>100	>100	None	51-100	16	17	N.S.	Minimal
R17T1.01S2.03t1.01s1.01	Forest	Forest	80	Crop	1	10	High	Forest	Forest	55	Urban	1	0	N.S.	>100	>100	26-50	0-25	66	18	N.S.	Abundant
R17T1.01S2.03t1.02	Forest	Forest	78	Crop	0	11	High	Forest	Forest	56	Crop	1	6	Low	>100	>100	26-50	0-25	168	16	N.S.	Minimal
R17T1.01S2.04	Forest	Forest	84	Crop	0	8	Low	Forest	Forest	54	Crop	0	15	High	>100	>100	0-25	51-100	23	100	N.S.	Abundant
R17T1.01S2.05	Forest	Forest	88	Crop	0	5	Low	Forest	Forest	39	Crop		36	High	>100	>100	None	None			N.D.	Minimal
R17T1.01S2.06	Forest	Forest	88	Crop	0	5	Low	Forest	Forest	49	Crop		18	High	>100	>100	None	None			N.D.	Minimal
R17T1.01S2.07	Forest	Forest	90	Crop	0	2	Low	Forest	Forest	53	Crop		5	Low	>100	>100	None	51-100	0	0	N.S.	Minimal
R17T1.01S2.08	Forest	Forest	93	Crop	0	0	N.S.	Forest	Forest	54	Crop		5	Low	>100	>100	None	None	0	0	N.S.	Minimal
R17T1.01S2.08t1.01	Forest	Forest	94	Urban	0		N.S.	Forest	Forest	66	Urban	2		Low	>100	>100	None	51-100	0	0	N.S.	Abundant
R17T1.01S2.08t1.02	Forest	Forest	93	Urban	1		N.S.	Forest	Forest	85	Wetland			N.S.	>100	>100	0-25	0-25	15	17	N.S.	Abundant
R17T1.01S2.09	Forest	Forest	93	Urban	0		N.S.	Forest	Forest	65	Urban	1		N.S.	>100	>100	0-25	26-50	29	271	Low	Minimal
R17T1.02	Forest	Forest	78	Crop	6	6	High	Forest	Forest	48	Crop	3	6	Low	>100	>100	0-25	0-25	412	220	Low	Minimal
R17T1.03	Forest	Forest	79	Crop	5	6	High	al	Urban	46	Forest	46	1	High	26-50	51-100	>100	>100	1171	243	High	Minimal
R17T1.03S2.01	Forest	Forest	64	Urban	14	10	High	Forest	Forest	31	Urban	26	3	High	>100	51-100	51-100	>100	897	1142	High	Minimal
R17T1.03S2.02	Forest	Forest	70	Urban	11	10	High	Forest	Forest	28	Crop	1	20	High	>100	>100	0-25	0-25	1800	1795	High	Minimal
R17T1.03S2.03	Forest	Forest	65	Crop	13	13	High	Forest	Forest	46	Crop	9	9	High	>100	>100	26-50	26-50	1126	1206	Low	Abundant
R17T1.04	Forest	Forest	85	Crop	3	5	Low	Forest	Forest	51	Urban	7	3	High	>100	51-100	0-25	0-25	52	1394	High	Minimal
R17T1.04S1.01	Forest	Forest	79	Crop	4	5	Low	Field	Forest	19	Field	8	7	High	0-25	0-25	>100	>100	2762	2032	High	Minimal
R17T1.04S1.01t1.01	Forest	Forest	76	Crop	5	12	High	Forest	Forest	72	Crop	2	8	High	>100	>100	51-100	26-50	142	100	N.S.	Abundant
R17T1.04S1.02	Forest	Forest	83	Crop	3	5	Low	Forest	Urban	28	Forest	28	8	High	>100	26-50	26-50	>100	284	145	Low	None
R17T1.04S1.03	Forest	Forest	84	Crop	2	5	Low	Forest	Forest	19	Crop		18	High	>100	>100	None	None			N.D.	Minimal
R17T1.04S1.04	Forest	Forest	86	Crop	2	4	Low	Crop	Forest	33	Crop		8	Low	0-25	>100	>100	0-25	3061	716	High	Minimal
R17T1.04S1.05	Forest	Forest	86	Crop	2	4	Low	Forest	Forest	72	---			N.S.	>100	>100	0-25	0-25	1412	1041	High	Minimal
R17T1.04S1.05t1.01	Forest	Forest	88	Urban	2	1	Low	Forest	Forest	47	Urban	7		Low	0-25	0-25	>100	26-50	2313	3013	High	Minimal
R17T1.04S1.06	Forest	Forest	85	Crop	2	6	Low	Forest	Forest	58	Urban	4		Low	0-25	0-25	>100	>100	5934	6351	High	Abundant
R17T1.04S1.07	Forest	Forest	83	Crop	2	9	High	Forest	Forest	57	Urban	8		Low	26-50	>100	0-25	51-100	526	65	High	Minimal
R17T1.05	Forest	Forest	86	Crop	2	4	Low	Forest	Forest	53	Urban	9		Low	>100	>100	0-25	51-100	167	176	Low	Minimal
R17T1.06	Forest	Forest	87	Crop	2	4	Low	Forest	Forest	49	Urban	7	4	High	>100	>100	0-25	0-25	902	1369	Low	Minimal
R17T1.06S2.01	Forest	Forest	80	Crop	2	13	High	Crop	Forest	47	Crop	10	14	High	0-25	0-25	>100	>100	1116	1334	High	Minimal
R17T1.06S2.02	Forest	Forest	80	Crop	1	15	High	Forest	Forest	70	Crop	1	18	High	>100	>100	0-25	51-100	52	55	N.S.	Minimal
R17T1.07	Forest	Forest	89	Crop	0	3	Low	Forest	Forest	48	Urban	21	3	High	0-25	>100	26-50	26-50	4900	2036	High	Minimal
R17T1.07S2.01	Forest	Forest	94	Crop		0	N.S.	Forest	Forest	54	---			N.S.	>100	>100	None	51-100	0	0	N.S.	Abundant
R17T1.08	Forest	Forest	90	Crop	1	2	Low	Forest	Forest	45	Urban	16	10	High	26-50	>100	>100	0-25	292	1120	High	Minimal
R17T1.09	Forest	Forest	90	Crop	1	1	Low	Forest	Forest	32	Urban	28	8	High	>100	>100	51-100	26-50	1118	1221	High	Minimal

Phase 1 - Step 4. Land Cover - Reach Hydrology

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	4.1 Watershed Land Cover - Land Use							4.2 Corridor Land Cover - Land Use							4.3 Riparian Buffer							4.4
		Current							Current						Dominant		Sub-Dominant		LT 25 ft.			Groundwater
Reach ID	Historic	Dom.	%	Sub-D.	Urban	Crop	Impact	Historic	Dom.	%	Sub-D.	Urban	Crop	Impact	L Bank	R Bank	L Bank	R Bank	L Bank	R Bank	Impact	Inputs
R17T1.09S2.01	Forest	Forest	93	Crop	0	0	N.S.	Forest	Forest	47	Urban	6	1	Low	>100	>100	0-25	26-50	264	409	Low	Minimal
R17T1.10	Forest	Forest	90	Crop	0	1	N.S.	Forest	Forest	79	Urban	1		N.S.	>100	>100	26-50	None	48	0	Low	Abundant
R17T1.10S1.01	Forest	Forest	90	Crop	2	2	Low	Forest	Forest	55	Crop	0	8	Low	>100	>100	51-100	51-100	745	387	Low	Abundant
R17T1.10S1.02	Forest	Forest	93	Urban	1	0	N.S.	Forest	Forest	69	---			N.S.	>100	>100	None	None			N.D.	Abundant
R17T1.11	Forest	Forest	93	Crop	0	0	N.S.	Forest	Forest	65	Crop		7	Low	>100	>100	0-25	51-100	369	333	Low	Abundant
R17T1.12	Forest	Forest	93	Crop	0	0	N.S.	Forest	Forest	58	---			N.S.	>100	>100	None	None			N.D.	Minimal
R17T1.12S1.01	Forest	Forest	93	Urban	0		N.S.	Forest	Forest	48	Urban	1		N.S.	>100	>100	0-25	0-25	34	35	N.S.	Abundant
R17T1.12S2.01	Forest	Forest	94	Crop	0	0	N.S.	Forest	Forest	56	Urban	1		N.S.	>100	>100	0-25	51-100	38	38	N.S.	Minimal
R17T1.13	Forest	Forest	93	Urban	0		N.S.	Forest	Forest	61	---			N.S.	>100	>100	None	None			N.D.	Minimal
R17T1.14	Forest	Forest	95	Urban	0		N.S.	Forest	Forest	69	Urban	1		N.S.	>100	>100	None	None			N.D.	Minimal
R17T1.15	Forest	Forest	95	---			N.S.	Forest	Forest	79	---			N.S.	>100	>100	None	None			N.D.	Minimal
R20T1.01	Field	Forest	67	Urban	11	9	High	cial	Urban	60	Forest	60	0	High	0-25	0-25	26-50	51-100	0	0	N.S.	Abundant
R27T1.01	Forest	Forest	76	Urban	9	4	High	al	Urban	40	Forest	40	0	High	>100	51-100	26-50	>100	1189	483	High	Minimal
R27T1.02	Forest	Forest	77	Urban	8	4	High	al	Urban	37	Forest	37	0	High	>100	51-100	0-25	>100	2095	574	High	Minimal
R27T1.02S2.01	Forest	Forest	85	Urban	4	2	Low	Forest	Forest	54	Urban	16		High	>100	>100	26-50	0-25	473	300	Low	Minimal
R27T1.02S2.02	Forest	Forest	86	Urban	3	2	Low	Forest	Forest	55	Crop		0	N.S.	>100	>100	None	26-50			N.D.	Minimal
R27T1.02S2.02t2.01	Forest	Forest	91	Crop		3	Low	Forest	Forest	81	Crop		0	N.S.	>100	>100	None	None			N.D.	Abundant
R27T1.02S2.03	Forest	Forest	80	Urban	10	1	High	Forest	Forest	35	Urban	24	0	High	>100	>100	0-25	51-100	99	301	Low	Minimal
R27T1.02S2.04	Forest	Forest	80	Urban	11	1	High	Forest	Forest	44	Urban	42	0	High	>100	>100	26-50	51-100	111	89	Low	Abundant
R27T1.03	Forest	Forest	74	Urban	11	6	High	al	Urban	45	Forest	45		High	>100	>100	0-25	0-25	792	1562	High	Minimal
R27T1.03S2.01	Forest	Forest	80	Crop	0	6	Low	Forest	Forest	57	Urban	8	1	Low	>100	>100	0-25	51-100	87	114	Low	Minimal
R27T1.04	Forest	Forest	72	Urban	10	7	High	al	Forest	36	Urban	32	0	High	>100	26-50	26-50	0-25	2474	1769	High	Abundant
R31T1.01	Forest	Forest	61	Urban	14	12	High	al	Urban	32	Forest	32	1	High	>100	>100	51-100	0-25	165	497	High	Minimal
R31T1.02	Forest	Forest	61	Urban	13	12	High	al	Urban	43	Forest	43	6	High	0-25	>100	26-50	0-25	1971	464	High	Minimal
R31T1.03	Forest	Forest	62	Crop	12	12	High	Forest	Forest	43	Urban	9		Low	>100	>100	51-100	51-100	33	35	N.S.	Abundant
R31T1.04	Forest	Forest	60	Crop	12	14	High	Forest	Forest	76	Urban	4		Low	>100	>100	51-100	None			N.D.	Abundant
R31T1.05	Forest	Forest	57	Crop	11	16	High	Forest	Forest	52	Urban	13	4	High	>100	>100	0-25	26-50	33	40	N.S.	Minimal
R31T1.06S1.01t1.01	Crop	Forest	38	Crop	6	27	High	Field	Field	32	Forest	6	4	High	0-25	0-25	>100	>100	1632	1235	High	Minimal
R31T1.06S1.02	Crop	Forest	45	Crop	12	18	High	Field	Urban	26	Forest	26	10	High	0-25	0-25	>100	>100	2691	2539	High	Abundant
R31T1.07	Forest	Forest	65	Crop	9	10	High	Forest	Forest	62	Crop	7	8	High	>100	>100	26-50	0-25	520	910	High	Abundant

Phase 1 - Step 5. Instream Channel Modification

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step		5.1 Flow Regulation				5.2 Bridges - Culverts				5.3 Bank Armoring			5.4 Channel Straightening			5.5 Dredging History	
Reach ID	Channel Length	Type	Use	Old	Impact	Number	Length	Percent	Impact	Length	Percent	Impact	Length	Percent	Impact	Type	Impact
R17T1.01	8805	None			N.S.	1	250	2.8	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S1.01	6034	None			N.S.	1	200	3.3	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S1.02	7415	None			N.S.	1	120	1.6	N.S.	57	0.8	N.S.	None		N.S.	None	N.S.
R17T1.01S1.03	6036	None			N.S.	2	370	6.1	Low	110	1.8	N.S.	2347	38.9	High	None	N.S.
R17T1.01S1.04	8633	None			N.S.	1	150	1.7	N.S.	None		N.S.	262	3	N.S.	None	N.S.
R17T1.01S2.01	9556	None			N.S.	2	350	3.7	N.S.	467	4.9	N.S.	1171	12.3	Low	None	N.S.
R17T1.01S2.02	10143	None			N.S.	2	150	1.5	N.S.	235	2.3	N.S.	None		N.S.	None	N.S.
R17T1.01S2.03	11591	None			N.S.	2	170	1.5	N.S.	None		N.S.	1568	13.5	Low	None	N.S.
R17T1.01S2.03t1.01	3751	None			N.S.	1	50	1.3	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.03t1.01s1.01	7773	None			N.S.	1	50	0.6	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.03t1.02	14086	None			N.S.	1	50	0.4	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.04	6268	None			N.S.	2	75	1.2	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.05	2311			None	N.S.	None			N.S.	None		N.S.	None		N.S.		N.S.
R17T1.01S2.06	4340			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.07	3304	None			N.S.	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.08	6886	None			N.S.	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.08t1.01	6591	None			N.S.	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.08t1.02	6183	None			N.S.	1	50	0.8	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.01S2.09	4825	None			N.S.	1	50	1	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.02	4959	None			N.S.	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.03	3004	None			N.S.	1	500	16.6	Low	1323	44	High	2568	85.5	High	Dredging	High
R17T1.03S2.01	4251	None			N.S.	4	260	6.1	Low	259	6.1	Low	916	21.6	High	None	N.S.
R17T1.03S2.02	5219	None			N.S.	1	100	1.9	N.S.	None		N.S.	854	16.4	Low	None	N.S.
R17T1.03S2.03	19784	None			N.S.	8	590	3	N.S.	736	3.7	N.S.	534	2.7	N.S.	None	N.S.
R17T1.04	4279	None			N.S.	0	0	0	N.S.	None		N.S.	3705	86.6	High	None	N.S.
R17T1.04S1.01	2972	None			N.S.	2	350	11.8	Low	441	14.8	Low	463	15.6	Low	None	N.S.
R17T1.04S1.01t1.01	7041	None			N.S.	1	100	1.4	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.04S1.02	2339	None			N.S.	1	100	4.3	N.S.	131	5.6	Low	None		N.S.	None	N.S.
R17T1.04S1.03	1759			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.04S1.04	4756	None			N.S.	0	0	0	N.S.	None		N.S.	1594	33.5	High	None	N.S.
R17T1.04S1.05	3807	None			N.S.	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.04S1.05t1.01	6311	None			N.S.	6	520	8.2	Low	207	3.3	N.S.	2300	36.4	High	None	N.S.
R17T1.04S1.06	12186	None			N.S.	7	650	5.3	Low	308	2.5	N.S.	4767	39.1	High	None	N.S.
R17T1.04S1.07	1677	None			N.S.	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.05	3403	None			N.S.	1	250	7.3	Low	118	3.5	N.S.	1626	47.8	High	None	N.S.
R17T1.06	12355	None			N.S.	2	600	4.9	N.S.	1384	11.2	Low	3069	24.8	High	None	N.S.

Phase 1 - Step 5. Instream Channel Modification

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step		5.1 Flow Regulation				5.2 Bridges - Culverts				5.3 Bank Armoring			5.4 Channel Straightening			5.5 Dredging History	
Reach ID	**Channel Length**	**Type**	**Use**	**Old**	**Impact**	**Number**	**Length**	**Percent**	**Impact**	**Length**	**Percent**	**Impact**	**Length**	**Percent**	**Impact**	**Type**	**Impact**
R17T1.06S2.01	3251	None			N.S.	7	530	16.3	Low	310	9.5	Low	1343	41.3	High	None	N.S.
R17T1.06S2.02	5519	None			N.S.	1	150	2.7	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.07	6734	None			N.S.	5	490	7.3	Low	4607	68.4	High	6714	99.7	High	Mining	Low
R17T1.07S2.01	16550	Withdra	Drinking		Low	0	0	0	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.08	3062	Withdra	Drinking		Low	2	150	4.9	N.S.	240	7.8	Low	1882	61.5	High	None	N.S.
R17T1.09	6331	None			N.S.	4	550	8.7	Low	895	14.1	Low	222	3.5	N.S.	None	N.S.
R17T1.09S2.01	8335	None			N.S.	3	180	2.2	N.S.	160	1.9	N.S.	2043	24.5	High	None	N.S.
R17T1.10	834	None			N.S.	0	0	0	N.S.	None		N.S.	438	52.5	High	None	N.S.
R17T1.10S1.01	10036	None			N.S.	3	120	1.2	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.10S1.02	8140			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.11	3669	None			N.S.	1	150	4.1	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.12	4125			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.12S1.01	8893	None			N.S.	1	60	0.7	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.12S2.01	6905	None			N.S.	1	50	0.7	N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.13	3791			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.14	5103			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R17T1.15	7242			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R27T1.01	3624	None			N.S.	3	500	13.8	Low	981	27.1	High	2189	60.4	High	None	N.S.
R27T1.02	8589	Withdra	Drinking		Low	4	250	2.9	N.S.	612	7.1	Low	1449	16.9	Low	None	N.S.
R27T1.02S2.01	3879	None			N.S.	2	200	5.2	Low	30	0.8	N.S.	1374	35.4	High	None	N.S.
R27T1.02S2.02	6262			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R27T1.02S2.02t2.01	7091			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R27T1.02S2.03	6274	None			N.S.	5	220	3.5	N.S.	None		N.S.	196	3.1	N.S.	None	N.S.
R27T1.02S2.04	3403	Withdra	Drinking		Low	1	100	2.9	N.S.	30	0.9	N.S.	None		N.S.	None	N.S.
R27T1.03	4534	None			N.S.	3	170	3.7	N.S.	434	9.6	Low	None		N.S.	None	N.S.
R27T1.03S2.01	3720	None			N.S.	3	175	4.7	N.S.	None		N.S.	None		N.S.	None	N.S.
R27T1.04	8462	None			N.S.	5	400	4.7	N.S.	None		N.S.	None		N.S.	None	N.S.
R31T1.01	2425	None			N.S.	2	280	11.5	Low	256	10.6	Low	741	30.6	High	None	N.S.
R31T1.02	4865	None			N.S.	3	160	3.3	N.S.	1230	25.3	High	1023	21	High	None	N.S.
R31T1.03	5530	None			N.S.	1	50	0.9	N.S.	153	2.8	N.S.	None		N.S.	None	N.S.
R31T1.04	5824			None	N.S.	None			N.S.	None		N.S.	None		N.S.	None	N.S.
R31T1.05	4447	None			N.S.	1	150	3.4	N.S.	65	1.5	N.S.	None		N.S.	None	N.S.
R31T1.06S1.01t1.01	3294	None			N.S.	1	50	1.5	N.S.	None		N.S.	1993	60.5	High	None	N.S.
R31T1.06S1.02	4206	None			N.S.	1	200	4.8	N.S.	None		N.S.	2534	60.3	High	None	N.S.
R31T1.07	5421	None			N.S.	3	250	4.6	N.S.	None		N.S.	964	17.8	Low	Dredging	High

Phase 1 - Step 6. Floodplain Modification and Planform Changes

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	6.1 Berms & Roads									6.2 Corridor Development			6.3 Depositional Features		6.4 Meander Migration		6.5 Meander Width Ratio			6.6 Wavelength Ratio		
Reach ID	Road Len	%	RR Len	%	Path Len	%	Berm Len	%	Impact	Length	Percent	Impact	Type	Impact	Type	Impact	Width	Ratio	Impact	Length	Ratio	Impact
R17T1.01	0	0	0	0	0	0	0	0	Unk.	504.5	5.7	Low	Point	Low	Multiple	High	139	2	High	229	3.3	High
R17T1.01S1.01	0	0	0	0	0	0	0	0	Unk.	43.5	0.7	N.S.	Point	N.S.	Migration	Low	96	4.2	Low	138	6	Low
R17T1.01S1.02	0	0	0	0	0	0	0	0	Unk.	0	0	N.S.	Side	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S1.03	250	4.1	0	0	0	0	0	0	N.S.	828.2	13.7	Low	No Data	N.S.	Migration	Low	84	4.4	Low	270	14	Low
R17T1.01S1.04	83	1	0	0	0	0	0	0	N.S.	43.4	0.5	N.S.	No Data	N.S.	Multiple	Low	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.01	1,026	10.7	0	0	0	0	0	0	Low	1423.3	14.9	Low	Point	N.S.	Multiple	High	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.02	0	0	0	0	0	0	0	0	Unk.	328	3.2	N.S.	Island	Low	Avulsion	Low	146	4	Low	344	9.4	N.S.
R17T1.01S2.03	1,824	15.7	0	0	0	0	0	0	Low	99	0.9	N.S.	Point	Low	Multiple	High	73	2.1	High	194	5.5	High
R17T1.01S2.03t1.01	20	0.5	0	0	0	0	0	0	N.S.	20.9	0.6	N.S.	No Data	N.S.	Migration	Low	55	3.1	Low	129	7.3	Low
R17T1.01S2.03t1.01s1.01	300	3.9	0	0	0	0	0	0	N.S.	71.4	0.9	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.03t1.02	475	3.4	0	0	0	0	0	0	N.S.	64.6	0.5	N.S.	No Data	N.S.	Multiple	Low	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.04	401	6.4	0	0	0	0	0	0	Low	30.8	0.5	N.S.	No Data	N.S.	Multiple	Low	165	6	N.S.	254	9.3	N.S.
R17T1.01S2.05	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.06	None								N.S.	None		N.S.	Point	N.S.		N.S.	102	4	Low	168	6.6	Low
R17T1.01S2.07	449	13.6	0	0	0	0	0	0	Low	0	0	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.08	0	0	0	0	0	0	0	0	Unk.	0	0	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.08t1.01	187	2.8	0	0	0	0	0	0	N.S.	158	2.4	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.01S2.08t1.02	0	0	0	0	0	0	0	0	Unk.	33	0.5	N.S.	No Data	N.S.		N.S.	40	4.1	Low	147	15	Low
R17T1.01S2.09	0	0	0	0	0	0	0	0	Unk.	171.6	3.6	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.02	0	0	0	0	0	0	0	0	Unk.	0	0	N.S.	Point	Low	Multiple	High	101	1.7	High	290	5	High
R17T1.03	2,593	86.3	0	0	0	0	978	32.6	High	1590.3	52.9	High	Side	N.S.	Flood Chute	Low	57	1	High	57	1	High
R17T1.03S2.01	266	6.2	0	0	0	0	0	0	Low	1107.8	26.1	High	No Data	N.S.	Flood Chute	Low	92	3.3	Low	274	9.7	N.S.
R17T1.03S2.02	182	3.5	0	0	0	0	0	0	N.S.	110.1	2.1	N.S.	Point	N.S.	Neck Cutoff	Low	66	2.8	High	131	5.5	High
R17T1.03S2.03	1,628	8.2	0	0	0	0	0	0	Low	680.6	3.4	N.S.	Mid-channel	Low		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.04	0	0	0	0	0	0	0	0	Unk.	119.6	2.8	N.S.	Multiple	N.S.		N.S.	52	1	High	52	1	High
R17T1.04S1.01	201	6.8	0	0	0	0	0	0	Low	471.2	15.9	Low	Point	N.S.	Migration	Low	87	3.4	Low	246	9.7	N.S.
R17T1.04S1.01t1.01	0	0	0	0	0	0	0	0	Unk.	48.5	0.7	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.04S1.02	0	0	0	0	0	0	0	0	Unk.	121.3	5.2	Low	No Data	N.S.	Multiple	Low	126	5.3	N.S.	658	27.4	High
R17T1.04S1.03	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.04S1.04	0	0	0	0	0	0	0	0	Unk.	0	0	N.S.	Point	N.S.	Migration	High	74	3.2	Low	197	8.4	N.S.
R17T1.04S1.05	0	0	0	0	0	0	0	0	Unk.	105	2.8	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.04S1.05t1.01	1,259	20	0	0	0	0	84	1.3	High	345.6	5.5	Low	Side	N.S.	Neck Cutoff	Low	Not Applicable		N/A	Not Applicable		N/A
R17T1.04S1.06	1,980	16.2	0	0	0	0	0	0	Low	1399.4	11.5	Low	Side	N.S.	Multiple	Low	28	1.6	High	133	7.8	Low
R17T1.04S1.07	168	10	0	0	0	0	0	0	Low	0	0	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.05	439	12.9	0	0	0	0	58	1.7	Low	286.4	8.4	Low	Side	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.06	4,277	34.6	0	0	0	0	0	0	High	2231.5	18.1	Low	Side	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.06S2.01	1,105	34	0	0	0	0	0	0	High	1429.3	44	High	Point	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.06S2.02	448	8.1	0	0	0	0	0	0	Low	38.8	0.7	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.07	6,307	93.7	0	0	0	0	204	3	High	2280.5	33.9	High	Side	Low		N.S.	43	1	High	43	1	High
R17T1.07S2.01	112	0.7	0	0	0	0	0	0	N.S.	72.5	0.4	N.S.	Mid-channel	Low		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.08	1,304	42.6	0	0	0	0	0	0	High	198.4	6.5	Low	Multiple	Low		N.S.	38	1	High	38	1	High
R17T1.09	5,674	89.6	0	0	0	0	0	0	High	459.4	7.3	Low	Mid-channel	Low		N.S.	Not Applicable		N/A	Not Applicable		N/A

Phase 1 - Step 6. Floodplain Modification and Planform Changes

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	6.1 Berms & Roads									6.2 Corridor Development			6.3 Depositional Features		6.4 Meander Migration		6.5 Meander Width Ratio			6.6 Wavelength Ratio		
Reach ID	Road Len	%	RR Len	%	Path Len	%	Berm Len	%	Impact	Length	Percent	Impact	Type	Impact	Type	Impact	Width	Ratio	Impact	Length	Ratio	Impact
R17T1.09S2.01	1,145	13.7	0	0	0	0	0	0	Low	343.8	4.1	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.10	0	0	0	0	0	0	0	0	Unk.	0	0	N.S.	No Data	N.S.		N.S.	33	1	High	33	1	High
R17T1.10S1.01	1,739	17.3	0	0	0	0	0	0	Low	299.8	3	N.S.	Point	N.S.	Avulsion	Low	66	3	Low	222	10.1	N.S.
R17T1.10S1.02	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.11	0	0	0	0	0	0	0	0	Unk.	29.2	0.8	N.S.	Point	N.S.		N.S.	128	4.8	Low	442	16.5	High
R17T1.12	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.12S1.01	0	0	0	0	0	0	0	0	Unk.	35.9	0.4	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.12S2.01	0	0	0	0	0	0	0	0	Unk.	35.5	0.5	N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.13	None								N.S.	None		N.S.	No Data	N.S.		N.S.	94	4.3	Low	380	17.4	High
R17T1.14	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R17T1.15	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.01	1,554	42.9	0	0	0	0	45	1.2	High	2260.7	62.4	High	Side	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.02	7,333	85.4	0	0	0	0	121	1.4	High	707.1	8.2	Low	Multiple	Low	Flood Chute	Low	Not Applicable		N/A	Not Applicable		N/A
R27T1.02S2.01	155	4	0	0	0	0	0	0	N.S.	114.2	2.9	N.S.	Side	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.02S2.02	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.02S2.02t2.01	None								N.S.	None		N.S.	No Data	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.02S2.03	2,427	38.7	0	0	0	0	0	0	High	275	4.4	N.S.	Multiple	Low		N.S.	55	4.4	Low	225	18	High
R27T1.02S2.04	1,513	44.5	0	0	0	0	0	0	High	101	3	N.S.	Multiple	N.S.		N.S.	81	8.2	Low	135	13.7	N.S.
R27T1.03	3,179	70.1	0	0	0	0	48	1.1	High	66.2	1.5	N.S.	Multiple	Low		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.03S2.01	0	0	0	0	0	0	0	0	Unk.	83.4	2.2	N.S.	None	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R27T1.04	8,139	96.2	0	0	0	0	0	0	High	627.6	7.4	Low	Island	Low		N.S.	28	1.5	High	100	5.4	High
R31T1.01	0	0	0	0	0	0	159	6.6	Low	183.9	7.6	Low	Side	N.S.	Migration	Low	84	3	Low	358	12.8	N.S.
R31T1.02	2,857	58.7	0	0	0	0	203	4.2	High	1379.9	28.4	High	Side	Low		N.S.	Not Applicable		N/A	Not Applicable		N/A
R31T1.03	1,911	34.6	0	0	0	0	0	0	High	33.9	0.6	N.S.	Multiple	Low		N.S.	Not Applicable		N/A	Not Applicable		N/A
R31T1.04	None								N.S.	None		N.S.	Multiple	Low		N.S.	89	3.8	Low	280	11.8	N.S.
R31T1.05	304	6.8	0	0	0	0	124	2.8	Low	144.6	3.3	N.S.	Side	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A
R31T1.06S1.01t1.01	203	6.2	0	0	0	0	0	0	Low	36.5	1.1	N.S.	None	N.S.		N.S.	8	1	High	8	1	High
R31T1.06S1.02	104	2.5	0	0	0	0	0	0	N.S.	281.8	6.7	Low	None	N.S.	Avulsion	Low	9	1	High	9	1	High
R31T1.07	293	5.4	0	0	0	0	0	0	Low	105.8	2	N.S.	None	N.S.		N.S.	Not Applicable		N/A	Not Applicable		N/A

Phase 1 - Step 7. Bed and Bank Windshield Survey

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	2.11 Stream Type					7.1 Bank Erosion - Bank Height			7.2 Ice & Debris Jam Potential	
Reach ID	Reference Stream Type	Mod. Ref. Stream Type	Dominant Bedform	Subclass Slope	Dominant Bed Material	Bank Erosion	Bank Height	Impact	Type	Impact
R17T1.01	E	No	Dune-Ripple	None	Sand	37.06	5	N.S.	Bridge	Low
R17T1.01S1.01	E	No	Dune-Ripple	None	Sand	0	0	N/A	Multiple	Low
R17T1.01S1.02	B	No	Riffle-Pool	None	Cobble	18.59	4	N.S.	Culvert	Low
R17T1.01S1.03	C	No	Riffle-Pool	None	Gravel	46.76	3	N.S.	Culvert	Low
R17T1.01S1.04	B	No	Riffle-Pool	a	Cobble	0	0	N/A	Culvert	Low
R17T1.01S2.01	B	No	Step-Pool	c	Cobble	31.97	10	N.S.	Multiple	High
R17T1.01S2.02	C	No	Riffle-Pool	None	Gravel	42.57	10	N.S.	Multiple	Low
R17T1.01S2.03	C	No	Riffle-Pool	None	Gravel	50.3	2	N.S.	Culvert	Low
R17T1.01S2.03t1.01	C	No	Riffle-Pool	None	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.03t1.01s1.01	A	No	Cascade	None	Bedrock	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.03t1.02	A	No	Cascade	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.04	C	No	Riffle-Pool	None	Gravel	830.84	3	Low	Bend	Low
R17T1.01S2.05	B	No	Plane Bed	None	Cobble			N/A	Not Evaluated	N.D.
R17T1.01S2.06	C	No	Riffle-Pool	None	Gravel			N/A	Not Evaluated	N.D.
R17T1.01S2.07	B	No	Plane Bed	c	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.08	B	No	Step-Pool	None	Cobble	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.08t1.01	A	No	Cascade	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.08t1.02	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.01S2.09	A	No	Cascade	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.02	C	No	Riffle-Pool	None	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.03	C	No	Riffle-Pool	b	Gravel	124.05	10	N.S.	Multiple	Low
R17T1.03S2.01	C	No	Riffle-Pool	b	Gravel	30.44	10	N.S.	Multiple	Low
R17T1.03S2.02	C	No	Riffle-Pool	None	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.03S2.03	B	No	Step-Pool	None	Cobble	201.66	16.3	N.S.	Multiple	High
R17T1.04	C	No	Riffle-Pool	None	Gravel	54.11	3	N.S.	None	N.S.
R17T1.04S1.01	C	No	Riffle-Pool	None	Gravel	133.81	2.64	N.S.	Multiple	Low
R17T1.04S1.01t1.01	A	No	Step-Pool	None	Boulder	35.67	20	N.S.	Multiple	Low

Phase 1 - Step 7. Bed and Bank Windshield Survey

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	2.11 Stream Type					7.1 Bank Erosion - Bank Height			7.2 Ice & Debris Jam Potential	
Reach ID	Reference Stream Type	Mod. Ref. Stream Type	Dominant Bedform	Subclass Slope	Dominant Bed Material	Bank Erosion	Bank Height	Impact	Type	Impact
R17T1.04S1.02	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Bridge	Low
R17T1.04S1.03	B	No	Step-Pool	None	Cobble			N/A	Not Evaluated	N.D.
R17T1.04S1.04	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.04S1.05	A	No	Step-Pool	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.04S1.05t1.01	B	No	Step-Pool	None	Cobble	43.21	2	N.S.	Multiple	Low
R17T1.04S1.06	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Culvert	Low
R17T1.04S1.07	A	No	Cascade	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.05	B	No	Step-Pool	None	Cobble	215.76	15	Low	None	N.S.
R17T1.06	B	No	Step-Pool	None	Cobble	34.58	5	N.S.	Multiple	Low
R17T1.06S2.01	B	No	Step-Pool	None	Cobble	97.94	4	N.S.	Culvert	Low
R17T1.06S2.02	A	No	Cascade	None	Boulder	98.1	2	N.S.	Culvert	Low
R17T1.07	C	No	Riffle-Pool	None	Gravel	24.59	4	N.S.	Multiple	Low
R17T1.07S2.01	A	No	Cascade	None	Boulder	56.14	3	N.S.	None	N.S.
R17T1.08	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Bridge	Low
R17T1.09	B	No	Step-Pool	None	Cobble	0	0	N/A	Multiple	Low
R17T1.09S2.01	A	No	Step-Pool	None	Boulder	51.14	5	N.S.	Multiple	Low
R17T1.10	C	No	Riffle-Pool	None	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.10S1.01	C	No	Riffle-Pool	None	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.10S1.02	B	No	Plane Bed	None	Cobble			N/A	Not Evaluated	N.S.
R17T1.11	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Not Evaluated	N.D.
R17T1.12	B	No	Step-Pool	None	Cobble			N/A	Not Evaluated	N.D.
R17T1.12S1.01	A	No	Cascade	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.12S2.01	A	No	Cascade	None	Boulder	0	0	N/A	Not Evaluated	N.D.
R17T1.13	C	No	Riffle-Pool	b	Gravel			N/A	Not Evaluated	N.D.
R17T1.14	B	No	Step-Pool	None	Cobble			N/A	Not Evaluated	N.D.
R17T1.15	A	No	Cascade	None	Boulder			N/A	Not Evaluated	N.D.
R27T1.01	B	No	Step-Pool	None	Cobble	64.77	3	N.S.	Multiple	Low

Phase 1 - Step 7. Bed and Bank Windshield Survey

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

Step	2.11 Stream Type					7.1 Bank Erosion - Bank Height			7.2 Ice & Debris Jam Potential	
Reach ID	Reference Stream Type	Mod. Ref. Stream Type	Dominant Bedform	Subclass Slope	Dominant Bed Material	Bank Erosion	Bank Height	Impact	Type	Impact
R27T1.02	B	No	Step-Pool	None	Cobble	416.01	5.22	N.S.	Multiple	High
R27T1.02S2.01	B	No	Step-Pool	a	Cobble	98.78	2	N.S.	Multiple	Low
R27T1.02S2.02	A	No	Cascade	None	Boulder			N/A	Not Evaluated	N.D.
R27T1.02S2.02t2.01	A	No	Step-Pool	None	Boulder			N/A	Not Evaluated	N.D.
R27T1.02S2.03	C	No	Riffle-Pool	b	Gravel	146.06	3.17	N.S.	Multiple	Low
R27T1.02S2.04	C	No	Riffle-Pool	None	Gravel	19.56	2	N.S.	Multiple	Low
R27T1.03	B	No	Step-Pool	a	Boulder	13.54	2	N.S.	Multiple	Low
R27T1.03S2.01	A	No	Cascade	None	Boulder	30.46	3	N.S.	Culvert	Low
R27T1.04	C	No	Riffle-Pool	b	Gravel	48.46	3	N.S.	Multiple	Low
R31T1.01	C	No	Riffle-Pool	b	Gravel	189.2	4.38	N.S.	Multiple	Low
R31T1.02	B	No	Step-Pool	None	Cobble	44.07	10	N.S.	Multiple	Low
R31T1.03	B	No	Plane Bed	None	Cobble	0	0	N/A	Multiple	Low
R31T1.04	C	No	Riffle-Pool	b	Gravel			N/A	Debris	Low
R31T1.05	B	No	Step-Pool	None	Boulder	21.97	4	N.S.	Multiple	Low
R31T1.06S1.01t1.01	C	No	Riffle-Pool	b	Gravel	0	0	N/A	Culvert	Low
R31T1.06S1.02	C	No	Riffle-Pool	a	Gravel	0	0	N/A	Culvert	Low
R31T1.07	C	No	Riffle-Pool	None	Gravel	0	0	N/A	Culvert	Low

Phase 1 - Step 8. Stream and Watershed Impact Rating

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

	Stream Type						Step Number with Impact Score														
	Stream	Bed	Subclass		Confinement	Watershed	| 0 = Not Significant or No Data | 1 = Low | 2 = High |														Total
Reach ID	Type	Material	Slope	Bed Feature	Type	Area	4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.2	7.3	Score
R17T1.01	E	Sand	None	Dune-Ripple	VB	44.4	2	2	1	0	0	0	0	0	0	1	1	2	2	2	0	1	14
R17T1.01S1.01	E	Sand	None	Dune-Ripple	VB	3.6	2	2	2	0	0	0	0	0	0	0	0	1	1	1	0	1	10
R17T1.01S1.02	B	Cobble	None	Riffle-Pool	SC	2.9	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
R17T1.01S1.03	C	Gravel	None	Riffle-Pool	VB	2.4	2	2	2	0	1	0	2	0	0	1	0	1	1	1	0	1	14
R17T1.01S1.04	B	Cobble	a	Riffle-Pool	SC	0.8	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	5
R17T1.01S2.01	B	Cobble	c	Step-Pool	NC	10.9	2	2	2	0	0	0	1	0	1	1	0	2	0	0	0	2	13
R17T1.01S2.02	C	Gravel	None	Riffle-Pool	NW	10.3	2	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	7
R17T1.01S2.03	C	Gravel	None	Riffle-Pool	VB	9.5	1	1	2	0	0	0	1	0	1	0	1	2	2	2	0	1	14
R17T1.01S2.03t1.01	C	Gravel	None	Riffle-Pool	VB	2	2	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	6
R17T1.01S2.03t1.01s1.01	A	Bedrock	None	Cascade	NC	0.9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
R17T1.01S2.03t1.02	A	Boulder	None	Cascade	NC	0.9	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4
R17T1.01S2.04	C	Gravel	None	Riffle-Pool	VB	5.3	1	2	0	0	0	0	0	0	1	0	0	1	0	0	1	1	7
R17T1.01S2.05	B	Cobble	None	Plane Bed	NW	4.6	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
R17T1.01S2.06	C	Gravel	None	Riffle-Pool	VB	4.5	1	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	5
R17T1.01S2.07	B	Gravel	c	Plane Bed	SC	4	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
R17T1.01S2.08	B	Cobble	None	Step-Pool	NC	3.2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
R17T1.01S2.08t1.01	A	Boulder	None	Cascade	NC	1.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
R17T1.01S2.08t1.02	C	Gravel	b	Riffle-Pool	VB	0.5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
R17T1.01S2.09	A	Boulder	None	Cascade	NC	0.7	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
R17T1.02	C	Gravel	None	Riffle-Pool	VB	29.3	2	1	1	0	0	0	0	0	0	0	1	2	2	2	0	0	11
R17T1.03	C	Gravel	b	Riffle-Pool	BD	28.6	2	2	2	0	1	2	2	2	2	2	0	1	2	2	0	1	23
R17T1.03S2.01	C	Gravel	b	Riffle-Pool	VB	5.8	2	2	2	0	1	1	2	0	1	2	0	1	1	0	0	1	16
R17T1.03S2.02	C	Gravel	None	Riffle-Pool	VB	3.9	2	2	2	0	0	0	1	0	0	0	0	1	2	2	0	0	12
R17T1.03S2.03	B	Cobble	None	Step-Pool	NC	1.8	2	2	1	0	0	0	0	0	1	0	1	0	0	0	0	2	9
R17T1.04	C	Gravel	None	Riffle-Pool	VB	22.5	1	2	2	0	0	0	2	0	0	0	0	0	2	2	0	0	11
R17T1.04S1.01	C	Gravel	None	Riffle-Pool	VB	4.5	1	2	2	0	1	1	1	0	1	1	0	1	1	0	0	1	13
R17T1.04S1.01t1.01	A	Boulder	None	Step-Pool	NC	0.5	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
R17T1.04S1.02	C	Gravel	b	Riffle-Pool	VB	4	1	2	1	0	0	1	0	0	0	1	0	1	0	2	0	1	10
R17T1.04S1.03	B	Cobble	None	Step-Pool	SC	3.8	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
R17T1.04S1.04	C	Gravel	b	Riffle-Pool	VB	3.7	1	1	2	0	0	0	2	0	0	0	0	2	1	0	0	0	9
R17T1.04S1.05	A	Boulder	None	Step-Pool	NC	2.9	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3
R17T1.04S1.05t1.01	B	Cobble	None	Step-Pool	SC	0.6	1	1	2	0	1	0	2	0	2	1	0	1	0	0	0	1	12
R17T1.04S1.06	C	Gravel	b	Riffle-Pool	VB	1.8	1	1	2	0	1	0	2	0	1	1	0	1	2	1	0	1	14
R17T1.04S1.07	A	Boulder	None	Cascade	NC	0.3	2	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0	6
R17T1.05	B	Cobble	None	Step-Pool	NC	17.7	1	1	1	0	1	0	2	0	1	1	0	0	0	0	1	0	9
R17T1.06	B	Cobble	None	Step-Pool	SC	17.5	1	2	1	0	0	1	2	0	2	1	0	0	0	0	0	1	11

Phase 1 - Step 8. Stream and Watershed Impact Rating

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

	Stream Type						Step Number with Impact Score														
	Stream	Bed	Subclass		Confinement	Watershed	| 0 = Not Significant or No Data | 1 = Low | 2 = High |														Total
Reach ID	Type	Material	Slope	Bed Feature	Type	Area	4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.2	7.3	Score
R17T1.06S2.01	B	Cobble	None	Step-Pool	VB	1.2	2	2	2	0	1	1	2	0	2	2	0	0	0	0	0	1	15
R17T1.06S2.02	A	Boulder	None	Cascade	NC	0.9	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1	6
R17T1.07	C	Gravel	None	Riffle-Pool	VB	14.5	1	2	2	0	1	2	2	1	2	2	1	0	2	2	0	1	21
R17T1.07S2.01	A	Boulder	None	Cascade	NC	2.5	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
R17T1.08	C	Gravel	b	Riffle-Pool	VB	11.1	1	2	2	1	0	1	2	0	2	1	1	0	2	2	0	1	18
R17T1.09	B	Cobble	None	Step-Pool	NC	10.8	1	2	2	0	1	1	0	0	2	1	1	0	0	0	0	1	12
R17T1.09S2.01	A	Boulder	None	Step-Pool	SC	0.9	0	1	1	0	0	0	2	0	1	0	0	0	0	0	0	1	6
R17T1.10	C	Gravel	None	Riffle-Pool	VB	8.4	0	0	1	0	0	0	2	0	0	0	0	0	2	2	0	0	7
R17T1.10S1.01	C	Gravel	None	Riffle-Pool	VB	3.2	1	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0	6
R17T1.10S1.02	B	Cobble	None	Plane Bed	SC	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R17T1.11	C	Gravel	b	Riffle-Pool	VB	5.1	0	1	1	0	0	0	0	0	0	0	0	0	1	2	0	0	5
R17T1.12	B	Cobble	None	Step-Pool	VB	4.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R17T1.12S1.01	A	Boulder	None	Cascade	NC	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R17T1.12S2.01	A	Boulder	None	Cascade	NC	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R17T1.13	C	Gravel	b	Riffle-Pool	VB	3.2	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3
R17T1.14	B	Cobble	None	Step-Pool	VB	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R17T1.15	A	Boulder	None	Cascade	NC	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R27T1.01	B	Cobble	None	Step-Pool	VB	7.5	2	2	2	0	1	2	2	0	2	2	0	0	0	0	0	1	16
R27T1.02	B	Cobble	None	Step-Pool	NW	7.4	2	2	2	1	0	1	1	0	2	1	1	1	0	0	0	2	16
R27T1.02S2.01	B	Cobble	a	Step-Pool	NW	2.6	1	2	1	0	1	0	2	0	0	0	0	0	0	0	0	1	8
R27T1.02S2.02	A	Boulder	None	Cascade	NC	2.3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
R27T1.02S2.02t2.01	A	Boulder	None	Step-Pool	NC	0.8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
R27T1.02S2.03	C	Gravel	b	Riffle-Pool	VB	0.9	2	2	1	0	0	0	0	0	2	0	1	0	1	2	0	1	12
R27T1.02S2.04	C	Gravel	None	Riffle-Pool	VB	0.5	2	2	1	1	0	0	0	0	2	0	0	0	1	0	0	1	10
R27T1.03	B	Boulder	a	Step-Pool	SC	3.4	2	2	2	0	0	1	0	0	2	0	1	0	0	0	0	1	11
R27T1.03S2.01	A	Boulder	None	Cascade	NC	0.4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4
R27T1.04	C	Gravel	b	Riffle-Pool	NW	2.2	2	2	2	0	0	0	0	0	2	1	1	0	2	2	0	1	15
R31T1.01	C	Gravel	b	Riffle-Pool	VB	5.6	2	2	2	0	1	1	2	0	1	1	0	1	1	0	0	1	15
R31T1.02	B	Cobble	None	Step-Pool	NW	5.5	2	2	2	0	0	2	2	0	2	2	1	0	0	0	0	1	16
R31T1.03	B	Cobble	None	Plane Bed	SC	4.8	2	1	0	0	0	0	0	0	2	0	1	0	0	0	0	1	7
R31T1.04	C	Gravel	b	Riffle-Pool	VB	3.9	2	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	6
R31T1.05	B	Boulder	None	Step-Pool	NW	2.8	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1	6
R31T1.06S1.01t1.01	C	Gravel	b	Riffle-Pool	VB	0.3	2	2	2	0	0	0	2	0	1	0	0	0	2	2	0	1	14
R31T1.06S1.02	C	Gravel	a	Riffle-Pool	VB	0.4	2	2	2	0	0	0	2	0	0	1	0	1	2	2	0	1	15
R31T1.07	C	Gravel	None	Riffle-Pool	VB	0.7	2	2	2	0	0	0	1	2	1	0	0	0	0	0	0	1	11

Phase 1 - Step 8. Summary of Categorical Impacts

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

		Stream Type					Step 4	Step 5	Step 6	Step 7
Reach ID	Stream or Tributary	Stream Type	Bed Material	Subclass Slope	Bedform	Total (out of 32)	Land Use (out of 6)	Instream Modification (out of 10)	Floodplain Modification (out of 12)	Bed & Bank Survey (out of 4)
R17T1.01	Furnace Brook	E	Sand	None	Dune-Ripple	14	5	0	8	1
R17T1.01S1.01	Tributary to Furnace Brook	E	Sand	None	Dune-Ripple	10	6	0	3	1
R17T1.01S1.02	Tributary to Furnace Brook	B	Cobble	None	Riffle-Pool	4	3	0	0	1
R17T1.01S1.03	Tributary to Furnace Brook	C	Gravel	None	Riffle-Pool	14	6	3	4	1
R17T1.01S1.04	Tributary to Furnace Brook	B	Cobble	a	Riffle-Pool	5	3	0	1	1
R17T1.01S2.01	Sugar Hollow Brook	B	Cobble	c	Step-Pool	13	6	1	4	2
R17T1.01S2.02	Sugar Hollow Brook	C	Gravel	None	Riffle-Pool	7	3	0	3	1
R17T1.01S2.03	Sugar Hollow Brook	C	Gravel	None	Riffle-Pool	14	4	1	8	1
R17T1.01S2.03t1.01	Tributary to Sugar Hollow Brook	C	Gravel	None	Riffle-Pool	6	3	0	3	0
R17T1.01S2.03t1.01s1.01	Trib to trib of Sugar Hollow Brook	A	Bedrock	None	Cascade	2	2	0	0	0
R17T1.01S2.03t1.02	Tributary to Sugar Hollow Brook	A	Boulder	None	Cascade	4	3	0	1	0
R17T1.01S2.04	Sugar Hollow Brook	C	Gravel	None	Riffle-Pool	7	3	0	2	2
R17T1.01S2.05	Sugar Hollow Brook	B	Cobble	None	Plane Bed	3	3	0	0	0
R17T1.01S2.06	Sugar Hollow Brook	C	Gravel	None	Riffle-Pool	5	3	0	2	0
R17T1.01S2.07	Sugar Hollow Brook	B	Gravel	c	Plane Bed	3	2	0	1	0
R17T1.01S2.08	Sugar Hollow Brook	B	Cobble	None	Step-Pool	1	1	0	0	0
R17T1.01S2.08t1.01	Basin Brook	A	Boulder	None	Cascade	1	1	0	0	0
R17T1.01S2.08t1.02	Basin Brook	C	Gravel	b	Riffle-Pool	2	0	0	2	0
R17T1.01S2.09	Sugar Hollow Brook	A	Boulder	None	Cascade	1	1	0	0	0
R17T1.02	Furnace Brook	C	Gravel	None	Riffle-Pool	11	4	0	7	0
R17T1.03	Furnace Brook	C	Gravel	b	Riffle-Pool	23	6	7	9	1
R17T1.03S2.01	Tributary to Furnace Brook	C	Gravel	b	Riffle-Pool	16	6	4	5	1
R17T1.03S2.02	Tributary to Furnace Brook	C	Gravel	None	Riffle-Pool	12	6	1	5	0
R17T1.03S2.03	Tributary to Furnace Brook	B	Cobble	None	Step-Pool	9	5	0	2	2
R17T1.04	Furnace Brook	C	Gravel	None	Riffle-Pool	11	5	2	4	0
R17T1.04S1.01	Little Brook	C	Gravel	None	Riffle-Pool	13	5	3	4	1
R17T1.04S1.01t1.01	Tributary to Little Brook	A	Boulder	None	Step-Pool	5	4	0	0	1
R17T1.04S1.02	Little Brook	C	Gravel	b	Riffle-Pool	10	4	1	4	1
R17T1.04S1.03	Little Brook	B	Cobble	None	Step-Pool	3	3	0	0	0
R17T1.04S1.04	Little Brook	C	Gravel	b	Riffle-Pool	9	4	2	3	0

Phase 1 - Step 8. Summary of Categorical Impacts

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

		Stream Type					Step 4	Step 5	Step 6	Step 7
Reach ID	Stream or Tributary	Stream Type	Bed Material	Subclass Slope	Bedform	Total (out of 32)	Land Use (out of 6)	Instream Modification (out of 10)	Floodplain Modification (out of 12)	Bed & Bank Survey (out of 4)
R17T1.04S1.05	Little Brook	A	Boulder	None	Step-Pool	3	3	0	0	0
R17T1.04S1.05t1.01	Tributary to Little Brook	B	Cobble	None	Step-Pool	12	4	3	4	1
R17T1.04S1.06	Little Brook	C	Gravel	b	Riffle-Pool	14	4	3	6	1
R17T1.04S1.07	Little Brook	A	Boulder	None	Cascade	6	5	0	1	0
R17T1.05	Furnace Brook	B	Cobble	None	Step-Pool	9	3	3	2	1
R17T1.06	Furnace Brook	B	Cobble	None	Step-Pool	11	4	3	3	1
R17T1.06S2.01	Tributary to Furnace Brook	B	Cobble	None	Step-Pool	15	6	4	4	1
R17T1.06S2.02	Tributary to Furnace Brook	A	Boulder	None	Cascade	6	4	0	1	1
R17T1.07	Furnace Brook	C	Gravel	None	Riffle-Pool	21	5	6	9	1
R17T1.07S2.01	Kiln Brook	A	Boulder	None	Cascade	2	0	1	1	0
R17T1.08	Furnace Brook	C	Gravel	b	Riffle-Pool	18	5	4	8	1
R17T1.09	Furnace Brook	B	Cobble	None	Step-Pool	12	5	2	4	1
R17T1.09S2.01	Beaudry Brook	A	Boulder	None	Step-Pool	6	2	2	1	1
R17T1.10	Furnace Brook	C	Gravel	None	Riffle-Pool	7	1	2	4	0
R17T1.10S1.01	Baker Brook	C	Gravel	None	Riffle-Pool	6	3	0	3	0
R17T1.10S1.02	Baker Brook	B	Cobble	None	Plane Bed	0	0	0	0	0
R17T1.11	Furnace Brook	C	Gravel	b	Riffle-Pool	5	2	0	3	0
R17T1.12	Furnace Brook	B	Cobble	None	Step-Pool	0	0	0	0	0
R17T1.12S1.01	Kettle Brook	A	Boulder	None	Cascade	0	0	0	0	0
R17T1.12S2.01	Bee Brook	A	Boulder	None	Cascade	0	0	0	0	0
R17T1.13	Furnace Brook	C	Gravel	b	Riffle-Pool	3	0	0	3	0
R17T1.14	Furnace Brook	B	Cobble	None	Step-Pool	0	0	0	0	0
R17T1.15	Furnace Brook	A	Boulder	None	Cascade	0	0	0	0	0
R27T1.01	Roaring Brook	B	Cobble	None	Step-Pool	16	6	5	4	1
R27T1.02	Roaring Brook	B	Cobble	None	Step-Pool	16	6	3	5	2
R27T1.02S2.01	Bully Brook	B	Cobble	a	Step-Pool	8	4	3	0	1
R27T1.02S2.02	Bully Brook	A	Boulder	None	Cascade	1	1	0	0	0
R27T1.02S2.02t2.01	Tributary to Bully Brook	A	Boulder	None	Step-Pool	1	1	0	0	0
R27T1.02S2.03	Bully Brook	C	Gravel	b	Riffle-Pool	12	5	0	6	1

Phase 1 - Step 8. Summary of Categorical Impacts

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

		Stream Type					Step 4	Step 5	Step 6	Step 7
Reach ID	Stream or Tributary	Stream Type	Bed Material	Subclass Slope	Bedform	Total (out of 32)	Land Use (out of 6)	Instream Modification (out of 10)	Floodplain Modification (out of 12)	Bed & Bank Survey (out of 4)
R27T1.02S2.04	Bully Brook	C	Gravel	None	Riffle-Pool	10	5	1	3	1
R27T1.03	Roaring Brook	B	Boulder	a	Step-Pool	11	6	1	3	1
R27T1.03S2.01	Patch Brook	A	Boulder	None	Cascade	4	3	0	0	1
R27T1.04	Roaring Brook	C	Gravel	b	Riffle-Pool	15	6	0	8	1
R31T1.01	Baker Brook	C	Gravel	b	Riffle-Pool	15	6	4	4	1
R31T1.02	Baker Brook	B	Cobble	None	Step-Pool	16	6	4	5	1
R31T1.03	Baker Brook	B	Cobble	None	Plane Bed	7	3	0	3	1
R31T1.04	Baker Brook	C	Gravel	b	Riffle-Pool	6	3	0	2	1
R31T1.05	Baker Brook	B	Boulder	None	Step-Pool	6	4	0	1	1
R31T1.06S1.01t1.01	Trib to Trib to Baker Brook	C	Gravel	b	Riffle-Pool	14	6	2	5	1
R31T1.06S1.02	Tributary to Baker Brook	C	Gravel	a	Riffle-Pool	15	6	2	6	1
R31T1.07	Baker Brook	C	Gravel	None	Riffle-Pool	11	6	3	1	1
					Total Scores	962 (out of 3936)	420	119	371	52
					Percent of Each Impact Category	24.40%	43.70%	12.40%	38.60%	5.40%

Phase 1 - Step 9. Adjustment Process and Reach Condition

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

		Stream Type						9.1 Predicted Adjustment Scores				9.2 Reach Condition		9.3
Reach ID	Confinement Type	Stream Type	Bed Material	Subclass Slope	Subclass Bedform	Watershed Area	Total Impact	Degrad.	Aggrad.	Widen.	Planf.	Project	Statewide	Reach Sensitivity
R17T1.01	VB	E	Sand	None	Dune-Ripple	44.37	14	4	5	4	4	Good	Good	High
R17T1.01S1.01	VB	E	Sand	None	Dune-Ripple	3.56	10	2	6	6	4	Good	Good	High
R17T1.01S1.02	SC	B	Cobble	None	Riffle-Pool	2.95	4	4	3	2	0	Reference	Reference	Moderate
R17T1.01S1.03	VB	C	Gravel	None	Riffle-Pool	2.39	14	6	8	7	9	Fair	Fair	High
R17T1.01S1.04	SC	B	Cobble	a	Riffle-Pool	0.8	5	2	3	0	0	Reference	Reference	Moderate
R17T1.01S2.01	NC	B	Cobble	c	Step-Pool	10.9	13	5	10	7	0	Fair	Good	Moderate
R17T1.01S2.02	NW	C	Gravel	None	Riffle-Pool	10.27	7	4	3	2	0	Reference	Reference	High
R17T1.01S2.03	VB	C	Gravel	None	Riffle-Pool	9.47	14	3	4	2	5	Good	Good	High
R17T1.01S2.03t1.01	VB	C	Gravel	None	Riffle-Pool	1.95	6	4	3	2	0	Reference	Reference	High
R17T1.01S2.03t1.01s1.01	NC	A	Bedrock	None	Cascade	0.92	2	4	2	2	0	Reference	Reference	Very Low
R17T1.01S2.03t1.02	NC	A	Boulder	None	Cascade	0.89	4	4	3	2	0	Reference	Reference	Very Low
R17T1.01S2.04	VB	C	Gravel	None	Riffle-Pool	5.3	7	0	3	0	0	Reference	Reference	High
R17T1.01S2.05	NW	B	Cobble	None	Plane Bed	4.56	3	2	3	0	0	Reference	Reference	Moderate
R17T1.01S2.06	VB	C	Gravel	None	Riffle-Pool	4.49	5	0	3	0	0	Reference	Reference	High
R17T1.01S2.07	SC	B	Gravel	c	Plane Bed	4.02	3	2	2	0	0	Reference	Reference	Moderate
R17T1.01S2.08	NC	B	Cobble	None	Step-Pool	3.18	1	2	1	0	0	Reference	Reference	Moderate
R17T1.01S2.08t1.01	NC	A	Boulder	None	Cascade	1.55	1	2	1	0	0	Reference	Reference	Very Low
R17T1.01S2.08t1.02	VB	C	Gravel	b	Riffle-Pool	0.52	2	1	0	0	0	Reference	Reference	High
R17T1.01S2.09	NC	A	Boulder	None	Cascade	0.68	1	2	1	0	0	Reference	Reference	Very Low
R17T1.02	VB	C	Gravel	None	Riffle-Pool	29.31	11	4	4	2	2	Good	Reference	High
R17T1.03	BD	C	Gravel	b	Riffle-Pool	28.56	23	15	8	7	15	Poor	Fair	High
R17T1.03S2.01	VB	C	Gravel	b	Riffle-Pool	5.75	16	9	8	7	11	Fair	Fair	High
R17T1.03S2.02	VB	C	Gravel	None	Riffle-Pool	3.9	12	5	8	7	7	Fair	Good	High
R17T1.03S2.03	NC	B	Cobble	None	Step-Pool	1.76	9	4	7	4	0	Good	Good	Moderate
R17T1.04	VB	C	Gravel	None	Riffle-Pool	22.51	11	4	5	4	6	Good	Good	High
R17T1.04S1.01	VB	C	Gravel	None	Riffle-Pool	4.52	13	4	5	4	6	Good	Good	High
R17T1.04S1.01t1.01	NC	A	Boulder	None	Step-Pool	0.46	5	4	4	2	0	Good	Reference	Very Low
R17T1.04S1.02	VB	C	Gravel	b	Riffle-Pool	3.95	10	2	4	0	0	Reference	Reference	High
R17T1.04S1.03	SC	B	Cobble	None	Step-Pool	3.79	3	2	3	0	0	Reference	Reference	Moderate
R17T1.04S1.04	VB	C	Gravel	b	Riffle-Pool	3.73	9	4	4	2	6	Good	Good	High
R17T1.04S1.05	NC	A	Boulder	None	Step-Pool	2.93	3	2	3	2	0	Reference	Reference	Very Low
R17T1.04S1.05t1.01	SC	B	Cobble	None	Step-Pool	0.58	12	7	6	5	6	Fair	Good	Moderate
R17T1.04S1.06	VB	C	Gravel	b	Riffle-Pool	1.85	14	5	6	5	9	Fair	Good	High

Phase 1 - Step 9. Adjustment Process and Reach Condition

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

		Stream Type						9.1 Predicted Adjustment Scores				9.2 Reach Condition		9.3
Reach ID	Confinement Type	Stream Type	Bed Material	Subclass Slope	Subclass Bedform	Watershed Area	Total Impact	Degrad.	Aggrad.	Widen.	Planf.	Project	Statewide	Reach Sensitivity
R17T1.04S1.07	NC	A	Boulder	None	Cascade	0.29	6	4	5	6	0	Good	Good	Very Low
R17T1.05	NC	B	Cobble	None	Step-Pool	17.7	9	5	5	3	0	Good	Good	Moderate
R17T1.06	SC	B	Cobble	None	Step-Pool	17.48	11	6	6	3	2	Good	Good	Moderate
R17T1.06S2.01	VB	B	Cobble	None	Step-Pool	1.24	15	11	8	7	11	Fair	Fair	Moderate
R17T1.06S2.02	NC	A	Boulder	None	Cascade	0.9	6	4	4	2	0	Good	Reference	Very Low
R17T1.07	VB	C	Gravel	None	Riffle-Pool	14.54	21	12	7	5	14	Fair	Fair	High
R17T1.07S2.01	NC	A	Boulder	None	Cascade	2.47	2	2	0	0	0	Reference	Reference	Very Low
R17T1.08	VB	C	Gravel	b	Riffle-Pool	11.07	18	6	7	5	8	Fair	Good	High
R17T1.09	NC	B	Cobble	None	Step-Pool	10.77	12	5	7	5	0	Good	Good	Moderate
R17T1.09S2.01	SC	A	Boulder	None	Step-Pool	0.89	6	4	2	0	0	Reference	Reference	Very Low
R17T1.10	VB	C	Gravel	None	Riffle-Pool	8.38	7	4	1	0	2	Reference	Reference	High
R17T1.10S1.01	VB	C	Gravel	None	Riffle-Pool	3.24	6	2	3	0	0	Reference	Reference	High
R17T1.10S1.02	SC	B	Cobble	None	Plane Bed	1.26	0	2	0	0	0	Reference	Reference	Moderate
R17T1.11	VB	C	Gravel	b	Riffle-Pool	5.06	5	2	2	0	0	Reference	Reference	High
R17T1.12	VB	B	Cobble	None	Step-Pool	4.77	0	2	0	0	0	Reference	Reference	Moderate
R17T1.12S1.01	NC	A	Boulder	None	Cascade	1.46	0	2	0	0	0	Reference	Reference	Very Low
R17T1.12S2.01	NC	A	Boulder	None	Cascade	0.81	0	2	0	0	0	Reference	Reference	Very Low
R17T1.13	VB	C	Gravel	b	Riffle-Pool	3.19	3	2	0	0	0	Reference	Reference	High
R17T1.14	VB	B	Cobble	None	Step-Pool	1.34	0	2	0	0	0	Reference	Reference	Moderate
R17T1.15	NC	A	Boulder	None	Cascade	0.78	0	2	0	0	0	Reference	Reference	Very Low
R20T1.01	BD	C	Gravel	None	Riffle-Pool	48.13	15	10	6	5	8	Fair	Fair	High
R27T1.01	VB	B	Cobble	None	Step-Pool	7.55	16	13	8	7	13	Poor	Fair	Moderate
R27T1.02	NW	B	Cobble	None	Step-Pool	7.41	16	7	10	7	7	Fair	Fair	Moderate
R27T1.02S2.01	NW	B	Cobble	a	Step-Pool	2.64	8	5	6	3	6	Good	Good	Moderate
R27T1.02S2.02	NC	A	Boulder	None	Cascade	2.34	1	2	1	0	0	Reference	Reference	Very Low
R27T1.02S2.02t2.01	NC	A	Boulder	None	Step-Pool	0.84	1	2	1	0	0	Reference	Reference	Very Low
R27T1.02S2.03	VB	C	Gravel	b	Riffle-Pool	0.9	12	6	7	5	4	Fair	Good	High
R27T1.02S2.04	VB	C	Gravel	None	Riffle-Pool	0.52	10	4	5	4	2	Good	Good	High
R27T1.03	SC	B	Boulder	a	Step-Pool	3.43	11	6	8	7	3	Fair	Good	Very Low
R27T1.03S2.01	NC	A	Boulder	None	Cascade	0.37	4	2	3	0	0	Reference	Reference	Very Low
R27T1.04	NW	C	Gravel	b	Riffle-Pool	2.16	15	6	8	7	6	Fair	Good	High
R31T1.01	VB	C	Gravel	b	Riffle-Pool	5.59	15	7	8	7	9	Fair	Fair	High
R31T1.02	NW	B	Cobble	None	Step-Pool	5.47	16	12	8	7	12	Fair	Fair	Moderate

Phase 1 - Step 9. Adjustment Process and Reach Condition

Basin: **Otter, Little Otter, Lewis** Watershed: **Otter Creek** Sub-watershed: **Otter Creek -- Furnace Brook to Lemon Fair River**

		Stream Type						9.1 Predicted Adjustment Scores				9.2 Reach Condition		9.3
	Confinement	Stream	Bed	Subclass		Watershed	Total							Reach
Reach ID	Type	Type	Material	Slope	Bedform	Area	Impact	Degrad.	Aggrad.	Widen.	Planf.	Project	Statewide	Sensitivity
R31T1.03	SC	B	Cobble	None	Plane Bed	4.76	7	6	5	5	1	Good	Good	Moderate
R31T1.04	VB	C	Gravel	b	Riffle-Pool	3.86	6	4	3	2	0	Reference	Reference	High
R31T1.05	NW	B	Boulder	None	Step-Pool	2.82	6	4	4	2	0	Good	Reference	Very Low
R31T1.06S1.01t1.01	VB	C	Gravel	b	Riffle-Pool	0.34	14	6	8	7	8	Fair	Fair	High
R31T1.06S1.02	VB	C	Gravel	a	Riffle-Pool	0.45	15	6	8	7	8	Fair	Fair	High
R31T1.07	VB	C	Gravel	None	Riffle-Pool	0.69	11	7	8	7	9	Fair	Fair	High