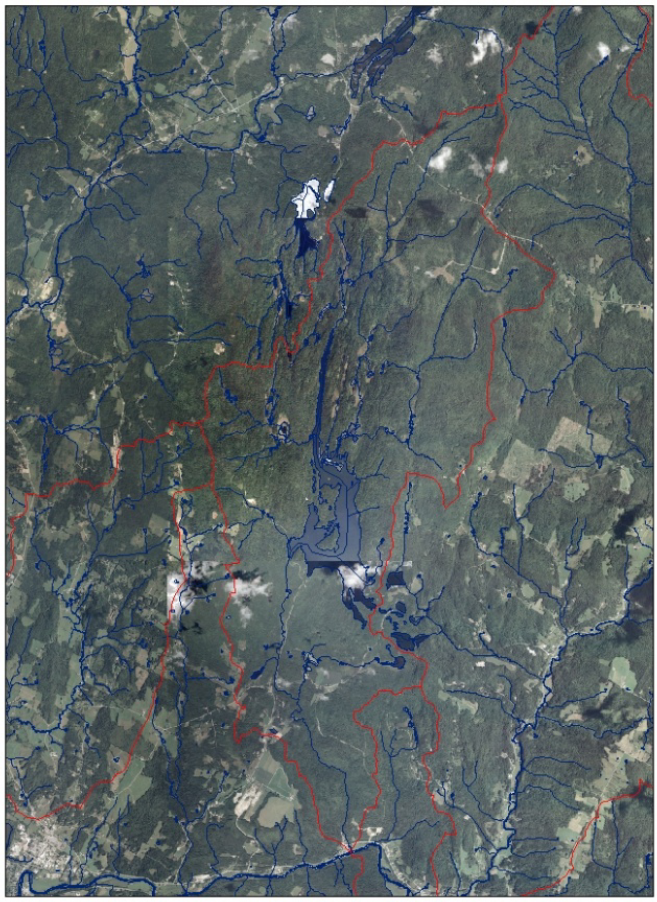
PHASE 1 STREAM GEOMORPHIC ASSESSMENT

GREEN RIVER WATERSHED

LAMOILLE COUNTY, VERMONT



Prepared by the Lamoille County Planning Commission
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EXECUTIVE SUMMARY

The River Corridor Planning for the Green River effort is sponsored by the Lamoille County Planning Commission (LCPC) with funding provided through a grant from the State of Vermont Department of Public Safety and the Agency of Commerce and Community Development. The Vermont Department of Environmental Conservation (DEC) River Management Program provided technical expertise and shared quality control/quality assurance responsibilities with Lamoille County Planning Commission (LCPC). Information for the Phase 1 Geomorphic Assessment came from the DEC, the Vermont Center for Geographic Information (VCGI), and field data collected by LCPC.

The stream geomorphic assessment data can be used by resource managers, community watershed groups, municipalities and others to identify how changes to land use and natural occurrences alter the physical processes and habitat of rivers. The Vermont Stream Geomorphic Assessment Protocol includes three phases:

1. Phase 1 – Remote sensing and cursory field assessment
2. Phase 2 – Rapid habitat and rapid geomorphic assessment to provide field data to characterize the current physical condition of a river
3. Phase 3 – Detailed survey information for designing "active" channel management

The primary objective of the Phase I report is to use stream geomorphic assessment data to identify and prioritize river reaches for further evaluation in Phase 2 Stream Geomorphic Assessments within the Green River of the Lamoille River watershed.

A Phase 1 Stream Geomorphic Assessment following Agency of Natural Resources Protocols was completed for the Green River by the Lamoille County Planning Commission (LCPC) during the summer of 2006. During Phase 1, 12 of 18 reaches on the main stem were assessed. The results of the assessment concluded that overall, the river is in stable condition. There were a few sections that had significant bedrock grade control, a bedrock river bed for a significant portion, and much of the stream had an adequate riparian buffer. The Green River is in better condition than many of the rivers in Lamoille County due to the lack of development along much of the river. Of the 12 reaches assessed on the main stem of Green River, the reach with the highest impact score was reach M08 with a score of 11 (out of a possible 32). This is largely due to a culvert that is perched about ten feet above the water surface at the outlet (see Figure 6). As part of this assessment, land use, encroachments, and buffer condition were analyzed within 150 feet on each side of the river. Residential and agricultural land use within the river corridor accounted for the majority of these high impact scores on Green River.

I. INTRODUCTION

Watershed planning in Vermont is experiencing rapid and positive change. The most significant changes are the growing recognition of environmental concerns and the broad acceptance of public participation in decision making processes. Currently the Agency of Natural Resources (ANR) is actively involved in watershed and corridor planning throughout the State. The purpose of this summary is to outline the methods used to study the Green River, define the top water quality issues to be addressed, and outline steps to begin protecting and restoring the future of the Green River. The Phase I assessment of the Green River was conducted by the Lamoille County Planning Commission (LCPC) during July of 2006. The assessment was conducted according to the protocols of the Vermont Agency of Natural Resources geomorphic assessment. A bridge and culvert assessment was also conducted on the Green River using the Vermont Agency of Natural Resources standards.

Objectives of the Phase 1 assessment are to:

- Delineate the watershed into sub-watersheds and discrete reaches for further study;
- Identify basic characteristics of each reach including slope, valley confinement, and sinuosity;
- Summarize soils and land cover / land use data by reach and by subwatershed; and
- Document natural and human disturbances to the watershed and to the river channel that, over time, may have resulted in changes to the water and sediment balance in the watershed.

II. BACKGROUND

Geographic Setting and Land Use History

Located within the Northern Green Mountains of Vermont, the Green River flows through the Towns of Wolcott, Hyde Park, and Eden into the Lamoille River, which flows into Lake Champlain. Most of the river flows through forested land, with portions running through residential areas. The approximately 12 mile river drains a 19.3 square mile watershed. Twelve of the eighteen reaches, or segments, of the main stem of the river were assessed. The remaining six were not easily accessible. Three tributaries were included in the study: one tributary enters into the sixth reach of the river, one into the 13th reach, and one into the second reach of the tributary off the 13th reach (see attached map).

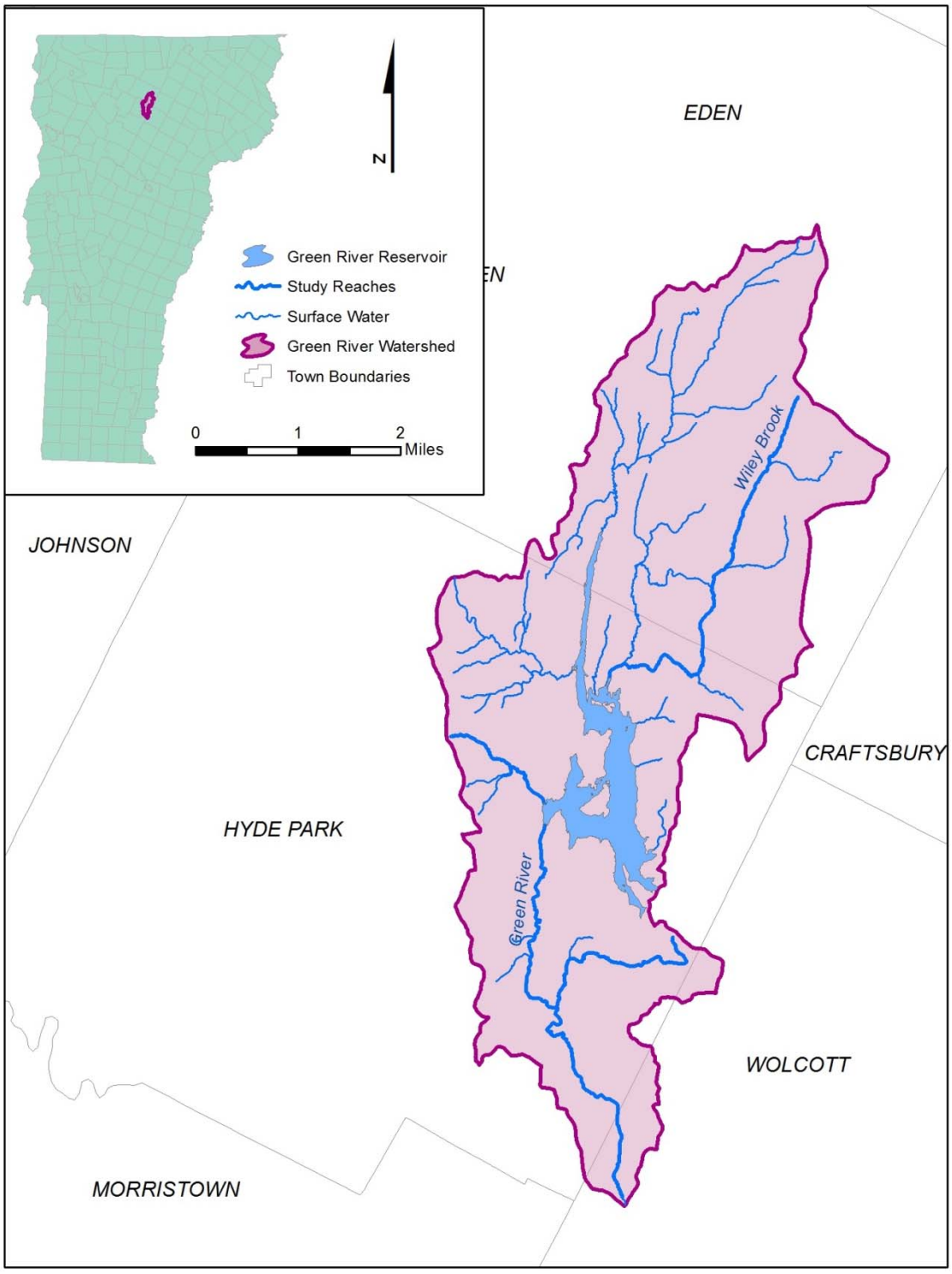

Figure 1: Study Reaches within Green River Watershed

The river is dammed at the upstream end of the twelfth reach which forms the Green River Reservoir. The dam on the Green River Reservoir (constructed in 1946 and owned by Morrisville Water and Light) makes the Green River unique among the rivers that have been

assessed in Lamoille County. The dam essentially cuts off the supply of sediment to the river downstream of the dam, thus depositional features were not as significant here as on many other rivers.

Figure 2: Reach M12 – Dam at Green River Reservoir.

The area surrounding the Green River Reservoir, formerly known as Garfield, was home to as many as five sawmills in the early 1900s. After a large flood in 1927, the Army Corps of Engineers surveyed the Lamoille River Valley to determine potential flood control measures. A gorge on the Green River was chosen as the location to construct a dam in 1946. The community of Garfield has been largely abandoned, and is currently a much smaller residential area than in the past.

Regional Geologic and Geomorphic Setting

The Green River Watershed lies within the Lamoille Watershed, which drains westward through the Green Mountains into Lake Champlain. The Green River Watershed lies within the biophysical region of the northern Green Mountains. The rocks of this region are characteristically composed of various Paleozoic sedimentary and metasedimentary rocks. The latter comprise: schists, phyllites, gneisses, slates, quartzites and marbles which have been

intensively folded and fractured. Small igneous intrusions of granite diorite, and granodiorite are scattered throughout the region. The present topography is largely influenced by erosion and has been suggested to be in the mature stages of landscape development (Wright 1974).

The Green Mountains and adjacent valleys have been covered with ice during historic glacial periods. The last large ice sheet, the Laurentide Ice Sheet, covered all of New England and advanced up the Lamoille River Valley. As the climate warmed, the glacier slowly retreated and glacial lakes were dammed in the Lamoille River valley. Following the retreat of the ice sheet, the Lamoille River and its tributaries began eroding the glacial and lake sediments that were left behind (Wright, 1974).

The surficial materials of the region are composed of transported sediments deposited primarily during or shortly after the last glacial period (Wisconsinan) of the Great Ice Age. These materials were deposited directly from active and/or stagnating glacial ice, ice-marginal meltwater streams, and pro-glacial lakes (Wright 1974). The dominant surficial material within the Green River watershed is glacial till, with significant amounts of dense till and outwash, and scattered small amounts of alluvium material near and within the river corridor.

Till is composed of an unsorted, unstratified, heterogeneous mixture of sediments, ranging in particle size from clays to boulders, deposited directly from glacial ice. In the lower slopes and across the upland flats, till deposits are widespread but remain generally less than 10 feet thick. Greater thicknesses of till (50-100 feet) are often found in the valleys and along valley walls. Due to the tact that glacial tills are unsorted and do have a wide range of textural components, they characteristically have low permeability (Wright 1974).

Outwash materials are deposited by meltwater streams flowing from glacial ice and as a result commonly have a high concentration of stratified and well-sorted sands and gravels. Outwash, therefore, characteristically has a high porosity and permeability (Wright 1974).

Recent alluvium is post-glacial sediment which has been transported by streams with little or no modification of the original materials except through mechanical disintegration. Alluvium is a fair to moderately well drained deposit which forms a layer ranging from 5 to 20 feet in thickness across most modern-day valley floors. The predominance of alluvium adjacent to most of the major river valleys throughout the region indicates areas that are most susceptible to seasonal flooding (Wright 1974).

Flood History

According to the Vermont Agency of Natural Resources document “Municipal Guide to Fluvial Erosion Hazard Mitigation” (2006), “Of all the natural hazards experienced in Vermont, flooding

is the most frequent, damaging, and costly." The guide documents that over the last 50 years, flood recovery has cost the state an average of $14 Million a year and that during the period of 1995-1998 alone, flood losses in Vermont totaled almost $57 Million. Of particular concern for towns and properties near streams, it notes that, "While some flood losses are caused by inundation (i.e. waters rise, fill, and damage low-lying structures), most flood losses in Vermont are caused by "fluvial erosion". Fluvial erosion is erosion caused by rivers and streams, and can range from gradual bank erosion to catastrophic changes in river channel location and dimension during flood events."

The Municipal Guide further documents that, "Closer study of our rivers and streams reveals that Vermont's erosion hazard problems are largely due to pervasive, human-caused alteration during the past 150 to 200 years of our waterways and landscapes they drain. By end of the nineteenth century, forests had been cleared from many watersheds, resulting in major changes in watershed hydrology and sediment production. Towns and villages, the centers of commerce, grew on the banks of rivers, whose role in power generation and transportation at first outweighed flood risks. In addition, many watersheds were changed by development, agriculture, log drives, roads and railways." The legacy of this landscape manipulation is rivers and streams, such as the Wild Branch, which are unstable and prone to fluvial erosion (Vermont Agency of Natural Resources 2006).

In order to better understand the flood history of the Green River, long term data from the U.S. Department of the Interior, U.S. Geological Survey (USGS) gauge on the Lamoille River in Johnson, VT were obtained (USGS 2007). Ninety-three years of record are available for the Lamoille River gauge at Johnson, VT which provides a continuous record of flow from 1912 through the present.

The long term record on the Lamoille gauge shows major flood events also occurred in the years 1912, 1936, 1983, 1995 and 1997. The graph below (Figure 2) provides a flood frequency analysis for the Lamoille River gauge.

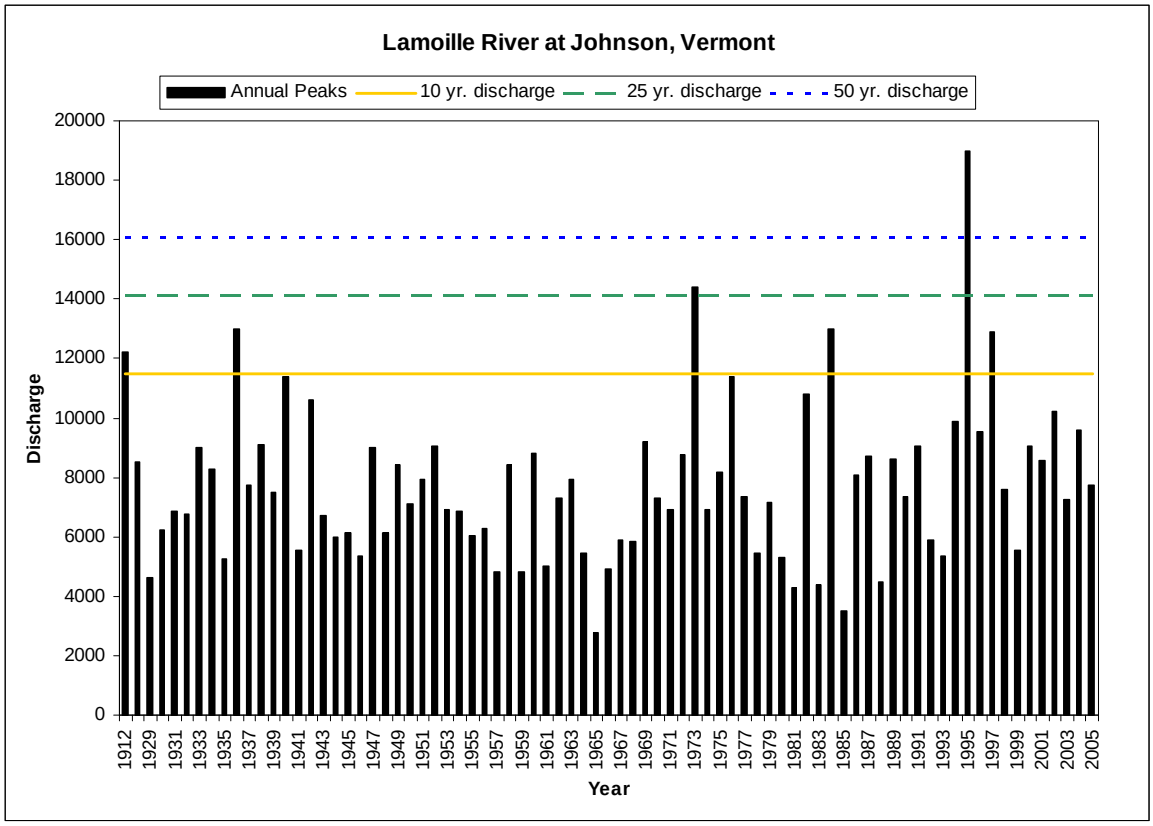

Figure 3: Peak Discharges for USGS Gage Station #04292000, Lamoille River at Johnson, VT. (Data obtained from USGS on-line surface water data, <http://waterdata.usgs.gov/vt/nwis>

Table 1: Notable Flood Events in the Green River Watershed

Flood Date	Description	Data Source
1869	Flood	Perkins Landscape Change Program
1927	Largest flood on record in Vermont.	
1936	Estimated 20 year flood (see Figure 2)	USGS
1973	Estimated 25 year flood (see Figure 2)	USGS
1984	Estimated 20 year flood (see Figure 2)	USGS
1996	A mid-winter flood event brought statewide destruction of private and public property with eleven counties included in the declared disaster area. This event left more than 150 communities eligible for public assistance	USGS, FEMA
1997	Excessive rain in several northern Vermont counties caused flash flooding and destruction of public and private property	FEMA

1998	Eleven of the fourteen Vermont counties experienced severe damage from excessive rainfall (FEMA-1228-DR-VT). The torrential rains came in much the same pattern as they had in the summer of 1997, but occurred further south than the 1997 floods. The flash flooding left many homes destroyed, roads and bridges damaged, and communities cut off from the rest of the state.	USGS, FEMA
2008	Severe storms and flooding caused a federal disaster to be declared in Addison, Caledonia, Essex, Lamoille, Orange, Washington and Windsor counties on September 12, 2008	FEMA
2011	Excessive rain and severe floods sweep across northern Vermont and the Champlain Valley, with a federal disaster declared for Addison, Chittenden, Essex, Franklin, Grand Isle, Lamoille and Orleans counties on June 15, 2011.	FEMA

III. ASSESSMENT METHODS

The Phase I assessment of the Green River was conducted by the Lamoille County Planning Commission (LCPC) during June 2006, in accordance with the Stream Geomorphic Assessment: Phase 1 Handbook (VTANR, 2006), with the exception that LCPC walked most of the river rather than the "windshield survey" described in the Agency of Natural Resources geomorphic assessment protocols. Reaches M01-M12 were walked in their entirety and the upper six reaches of the mainstem were not assessed due to lack of accessibility. In select locations VTANR Bridge & Culvert Surveys were completed to support this Phase 1. Phase 1 Bridge & Culvert surveys were completed following protocols contained in Appendix G of the VTANR protocols (2006).

The Phase 1 assessment was accomplished through a combination of remote-sensing methods, as well as field surveys, limited historical research, and interviews with persons knowledgeable of the watershed. The Green River watershed was delineated into geomorphic reaches using remote sensing methods supported by field surveys. Geomorphic reaches were defined based on variation in valley confinement, slope, and sinuosity. Reach delineation, stream typing, and evaluation of soils, geology and land cover / land use were accomplished for all delineated reaches of the watershed. The following parameters and their respective impacts were inventoried and/or calculated, and assessed:

- Valley side slopes
- River corridor delineation
- River corridor and reach land use and land cover
- Riparian buffer condition
- Soils and geology influences
- Alluvial fans
- Grade controls
- River corridor development
- Bank armoring
- Bridge and culverts
- Flow regulation and water withdrawal
- Channel modifications
- Flood plain encroachments
- Dredging and channel mining history
- Depositional features
- Meander migration
- Meander geometry
- Debris jam potential
- Dominant bed form and materials

SGAT and Remote-Sensing Resources

Steps 2 through 4 of the Phase 1 were completed using version 4.56 (issued in 2007) of the Stream Geomorphic Assessment Tool (SGAT), an extension of Arc View 3.2 Geographic Information System software (Environmental Systems Research Institute, Inc.). Select features were geo-located using the Feature Indexing Tool of SGAT (v.4.56). Phase 1 data were entered into the VTANR web-based Data Management System (DMS) - https://anrnode.anr.state.vt.us/ssl/sga/index.cfm.

Using the Stream Geomorphic Assessment Tool (SGAT), numerous parameters were calculated including: valley width, length, and slope; channel length and slope; stream confinement; sinuosity; and reference channel width. Based on this data, reference stream types were classified according to characteristics of the valley, geology, and climate of the stream. The reference stream type describes the natural channel tendency of channel form and process in the absence of human-related changes to the channel.

Remote sensing resources used included 1:5000 black and white orthophotographs (1995), USGS topographic maps (various dates), National Agricultural Imagery Program aerial photography (2003) and historic USGS topographic maps (various dates in the late 1800s and early 1900s). Additional resources included the Natural Resources Conservation Service (NRCS) soil mapping for Lamoille County, surficial and bedrock mapping resources available from the Vermont Geological Survey, land cover / land use coverage (1995) and other GIS data available from the Vermont Center for Geographic Information Services (see references listed at the end of this report).

Quality Assurance Review

Precision, accuracy, representativeness completeness, and comparability of data collection were addressed through adherence to the standardized methods outlined in the current version of the VTANR protocols (2006). Data sources consulted for each Phase 1 step were recorded in the metadata section of the online DMS.

Delineation of the Green River watershed into geomorphic reaches, yielded a GIS coverage of reach breaks and "subsheds" outlining the aerial extent of lands draining to each reach. Reach breaks and subsheds were defined through a review of topographic maps and orthophotographs, as well as consultation of soils and geologic mapping. Reach break locations were also field verified where vehicle-accessible. A Quality Assurance review of the reach break and subshed delineations was performed by River Management Section staff.

During the use of SGAT to support stream typing and accomplish stream corridor generation, a Quality Assurance review of digitized valley walls and meander center lines was performed by River Management Section staff. The QA-approved valley wall delineations and meander center lines were utilized to generate the Phase 1 / Phase 2 stream corridor for delineated reaches following Appendix E of the VTANR protocols (2006).

QA reviews were also performed by River Management Section staff following completion of Phase 1 Step 2 (stream typing) and periodically during development of Phase 1 Steps 3 through 7.

IV. RESULTS

Reach Delineations

Stream reaches were defined by creating reach breaks using valley width and slope, geologic materials, and tributary influence. Eighteen reaches were delineated on the Green River main stem within Lamoille County. Reaches were numbered to efficiently organize, track, and communicate reach-related data. After stream reaches were defined, and reach sub-watershed areas were delineated and calculated (Figure 4).

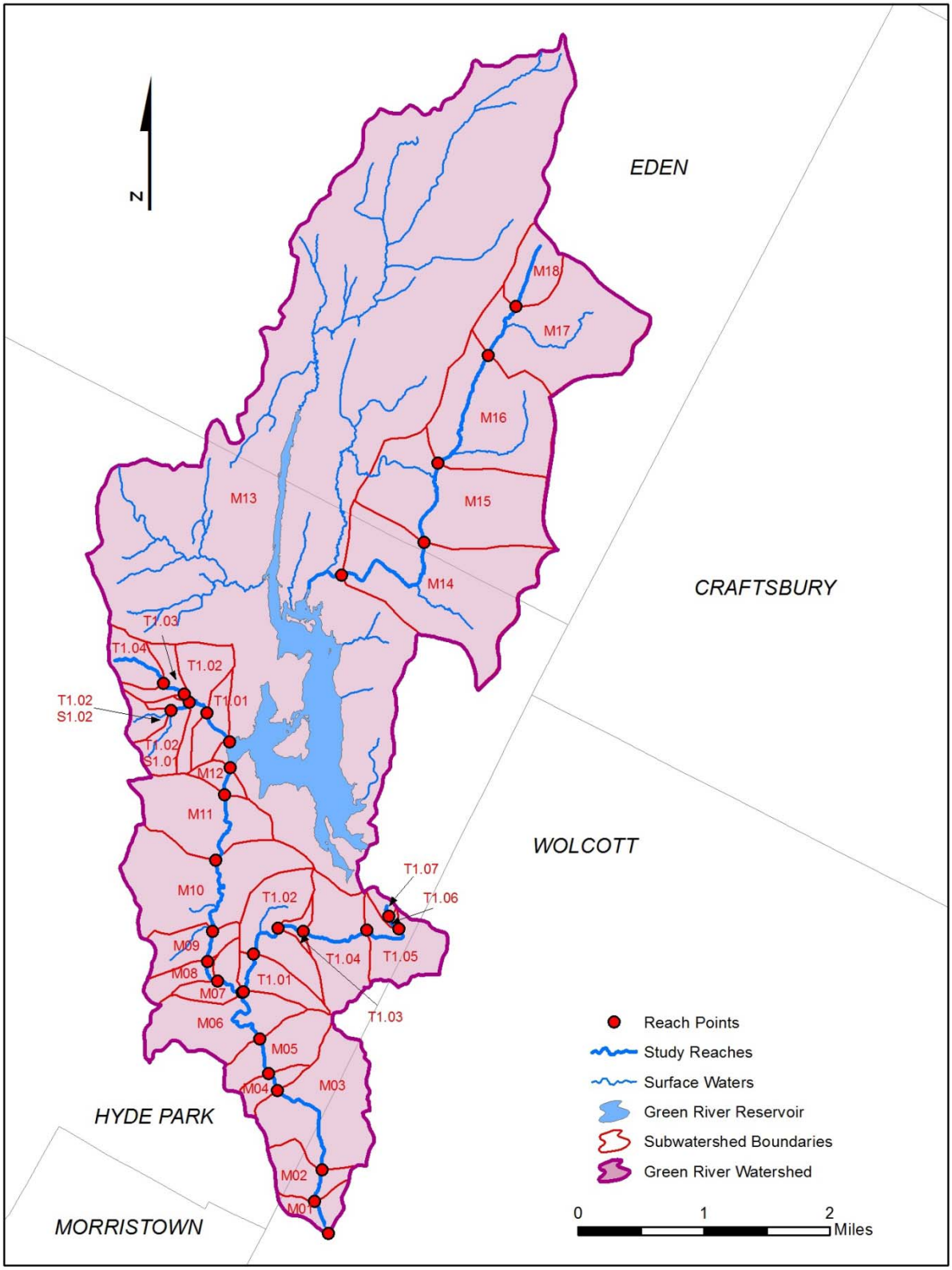

Figure 4: Green River subwatershed and reach delineations.

Reference Stream Types

Using the Stream Geomorphic Assessment Tool (SGAT), numerous parameters were calculated including: valley width, length, and slope; channel length and slope; stream confinement; sinuosity; and reference channel width. Based on this data, reference stream types were classified (Table 2) according to characteristics of the valley, geology, and slope of the stream. The reference stream type describes the natural channel tendency of channel form and process in the absence of human-related changes to the channel.

Table 2: Reference stream type characteristics

Stream Type	Valley Confinement	Channel Slope (%)	Sinuosity	Bedform	Number of Study Reaches
A	Confined	> 4 %	Low	Cascade or Step-pool	1
B	Confined or semi-confined or narrow	2 – 4%	Low	Step-pool or Plane bed	6
C	Unconfined	< 2%	Moderate	Riffle Pool	5
D	Unconfined	< 4%		Braided	0
E	Unconfined	< 2%	High	Riffle Pool or Dune-Ripple	0

Figure 5 shows the reference stream types by reach. M08 is the only reach of type A; M02 - M05 and M11-M12 are type B; M01, M06-M07, and M09-M10 are type C, and no reaches are identified as type D or E.

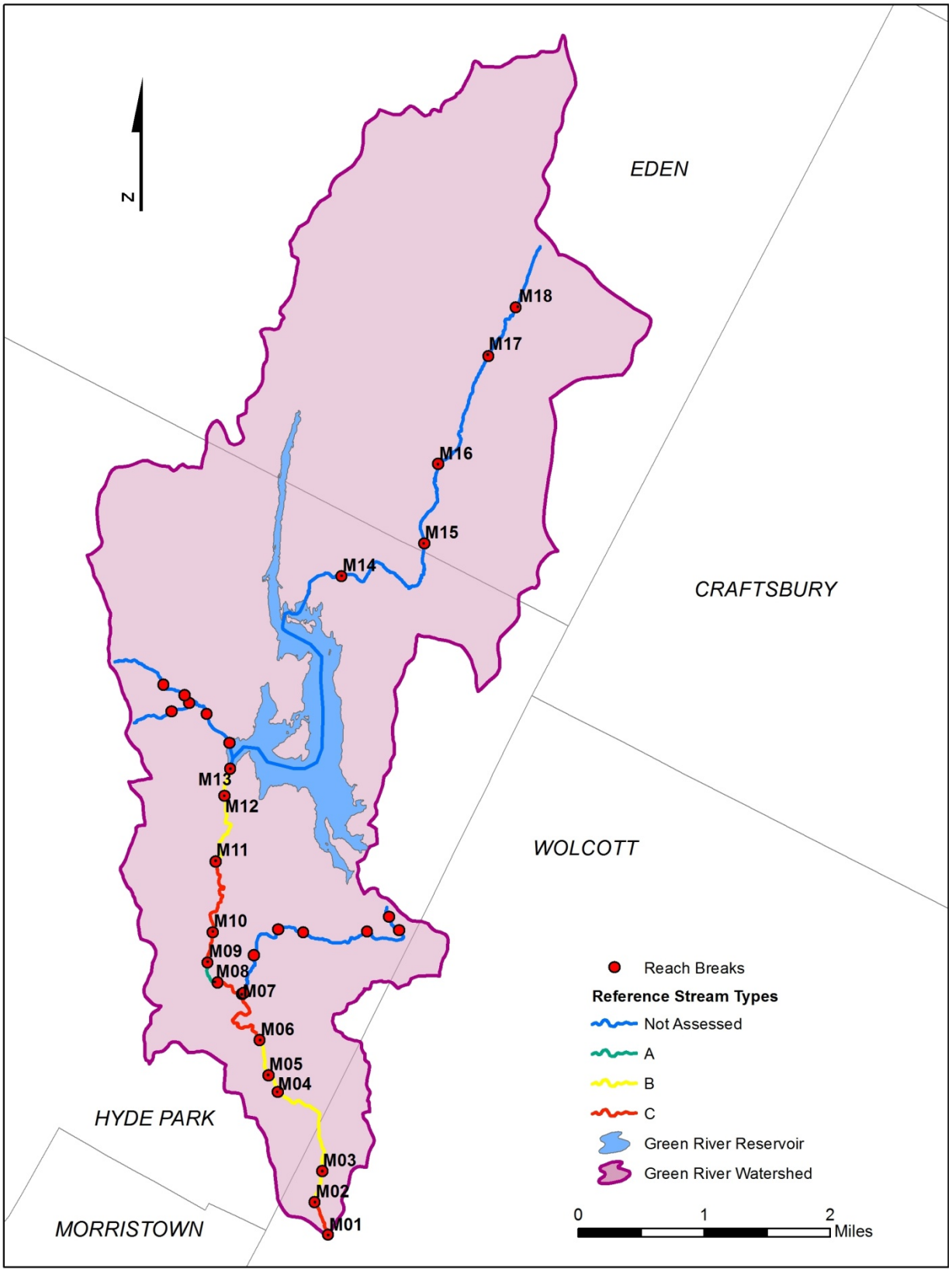

Figure 5: Reference stream types of the Green River Watershed

Watershed Geology and Soils

Alluvial Fans / Points of Slope Reduction

Alluvial fans are areas where there is an abrupt change in slope. This rapid change in slope causes the river to drop and deposit sediment. Alluvial fans usually indicate highly active channels that have a tendency to migrate laterally. The presence of alluvial fans was determined using a combination of a topographic map and the soils layer; however, no alluvial fans were identified in the study area.

Grade Controls

Using available resources and windshield surveys, assessed reaches of the Green River were reviewed to identify the presence of channel-spanning bedrock or constructed dams and weirs. Natural bedrock grade controls were noted in six of the twelve assessed reaches (M02, M03, M04, M06, M07, and M08). A dam is located in reach M12, just below the Green River Reservoir.

Figure 6: Reach M-08 - Natural grade control

Geologic Materials

The NRCS soils data (NRCS, 2006) was used to review the parent material of the watershed. Figure 7 depicts the main classes of parent materials distributed across the watershed, as well as the location of natural grade controls. The dominant parent material within the Green River watershed is glacial till, with significant amounts of dense till and outwash, and scattered small amounts of alluvium material near and within the river corridor.

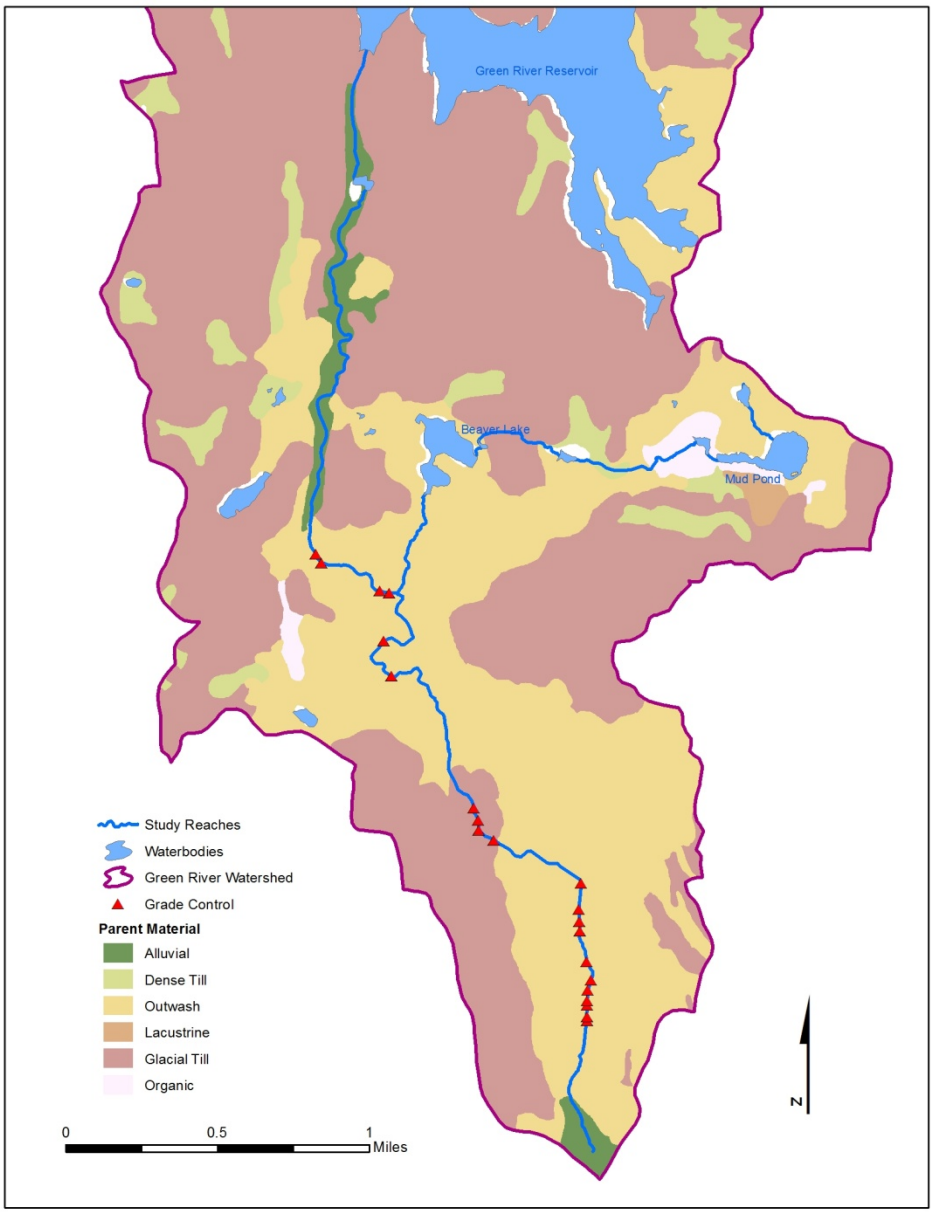

Figure 7: Parent materials and natural grade controls within the Green River Watershed

Valley Side Slopes

Valley side slopes were estimated and categorized for each of the assessed reaches, through review of topographic maps. Results are shown in Appendix 3. The high percentage of reaches with valley side slopes in the very steep (5 of 12 reaches) and extremely steep (3 of 12 reaches) categories reflects the mountainous, bedrock-controlled nature of the watershed topography.

Soil Properties

NRCS soil survey data were used to summarize soil properties for each assessed reach. Characteristics documented include infiltration (or runoff) potential (Hydrologic Soil Group), flooding potential, erodibility (HEL – overland flow erosion); water table depth; and presence of hydric soils. Data are summarized in Appendix 4. Reaches M02-M08 have soils with "very severe" erodibility, while reach M12 has soils with "severe" erodibility. The other reaches have soils with "slight" erodibility. Reaches M09, M10 and M11 have frequent flooding potential, while the other reaches have none/rare or occasional flooding potential.

Land Cover and Reach Hydrology

Watershed Land Cover / Land Use

Lakes, wetlands, and perennial vegetation play an important role in a watershed by storing water and trapping sediment, which helps reduce flood peaks and maintain summer base flows in rivers and streams. Urban development and cropland typically increase the peak and change the duration of stormwater and sediment runoff events. Recent orthophotos were used to evaluate this parameter.

Table 3: Watershed land cover/land use for reaches with high impact ratings

Reach ID	% Forested	% Crop	% Developed
M06T1.06	77	0	13
M06T1.07	71	0	17
M13T1.02S1.02	67	15	11

The results are presented in Appendices 5 and 6. The reaches with greater than 10% of their watershed in urban or crop land uses were rated as being highly impacted, as shown in Table 3. Though not fully assessed, reaches M06T1.06, M06T1.07, and M13T1.02S1.02 recorded high impact ratings for watershed land use land cover. None of the reaches along the mainstem had high impact ratings; the amount of residential development in these watersheds ranged from 1 to 22% (M09), while the amount of agricultural land ranged from 0 to 26% (M01). Figure 8

illustrates the relative amount and location of different land cover types in the Green River watershed.

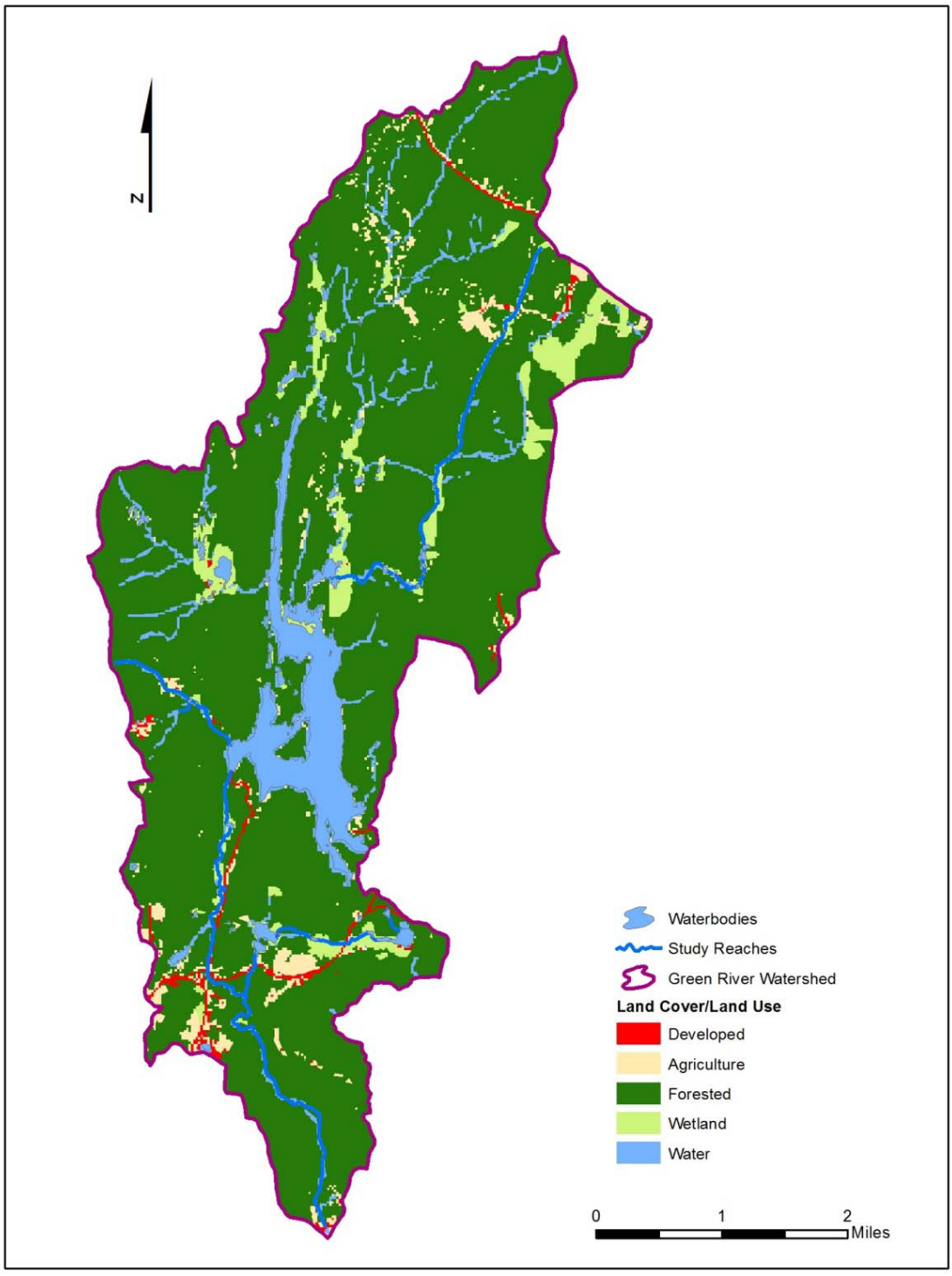

Figure 8: Land Cover/Land Use within the Green River Watershed

Corridor Land Cover / Land Use

Land use/land cover within the stream corridor is particularly important with respect to sediment deposition and erosion during annual flood events. Wetlands, ponds, and perennial vegetation moderate stormwater and sediment runoff, while impervious surfaces within urban areas and the exposed soils found in cropland have the potential to increase watershed inputs.

Table 4: Corridor land cover/land use for reaches with high impact ratings

Reach ID	% Forested	% Crop	% Developed
M01	34	26	9
M06T1.01	42	0	13
M06T1.07	16	0	22
M08	38	10	16
M09	45	0	22
M10	55	0	11
M13T1.02S1.02	49	6	19
M13T1.03	16	26	1

The results are presented in Appendix 7. High impact rating scores indicate 10% or more of the reach corridor is crop and/or developed. Reaches M01, M06T1.01, M06T1.07, M08-M10, M13T1.02S1.02, and M13T1.03 resulted in high impact rating scores (Table 4).

Riparian Buffer

The riparian buffer is the area of land directly adjacent to the channel along the channel's banks and floodplain that is covered with native woody vegetation and largely unmanaged. Riparian buffers protect and enhance water quality, fish and wildlife habitats, aesthetics, and recreational values associated with streams. Streams without riparian vegetation often experience high rates of lateral erosion and may see such large increases in sediment that they undergo major adjustment of channel dimension, pattern, and profile. Orthophotos were used to estimate the percent of each buffer width category along the right and left banks.

The results are presented in Appendix 8. High impact rating scores indicate that 75% of the reach has little or no buffer (0-25 feet) on one or both banks. All of the mainstem reaches had a dominant buffer width of greater than 100 feet and an impact score of 0.

Instream Channel Modifications

Impoundments and Flow Regulations

Dams serve valuable functions in society related to flood control, provision of safe drinking water, fire prevention, power generation and recreation. However, dams disrupt the flow dynamics and sediment transport continuity of streams to varying degrees and extents, depending on their size, height, topographic setting, and operational status, and depending on the hydrologic, geomorphic and geologic characteristics of the river being impounded (Williams and Wolman, 1984; Kondolf, 1997). The Phase 1 assessment seeks to understand the potential influence of dams on the transport of water and sediments in the river network.

Sediments are trapped in the impoundment upstream of a dam; bed load and a portion of the suspended sediment load settle out in the still water environment of the reservoir. Water leaving the impoundment is essentially devoid of its sediment (bed) load, and possesses enhanced energy to erode the stream bed and banks. Depending on the nature of sediments in the channel margins and underlying surficial deposits, and vegetative boundary conditions, this increased erosional potential can lead to channel incision and/or widening downstream of the dam as the river seeks to restore its sediment load – a condition often termed "hungry water" (Kondolf, 1997). If scour is significant, the channel can incise below the surrounding floodplain.

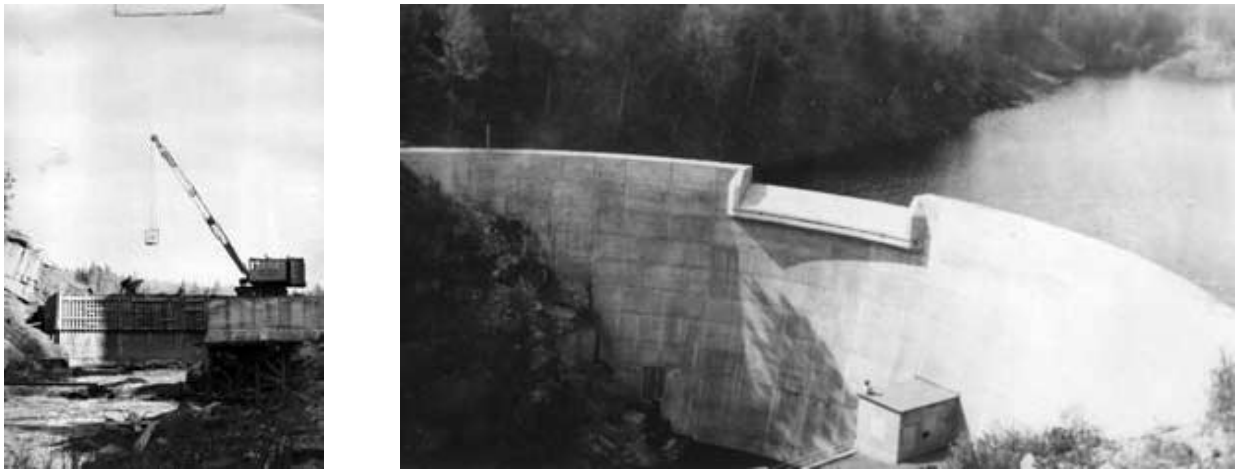

Figure 9: Historic images of the Green River Dam, from *A Brief History of the Green River Project and the area covered by it*, Willard K. Sanders, 1951.

The Green River is dammed at the upstream end of the twelfth reach which forms the Green River Reservoir. The dam on the Green River Reservoir (constructed in 1946 and owned by Morrisville Water and Light) makes the Green River unique among the rivers that have been assessed in Lamoille County. Because the dam is technically within the M13 reach, which was not assessed, the Stream Geomorphic Assessment Tool (SGAT) does not show it as significantly impacting flow regulation in reach M12 (see Appendix 9). This is somewhat misleading, as the

dam essentially cuts off the supply of sediment to the river; potentially causing erosion of the channel bed, and reducing depositional features. Fewer depositional features were noted here as on many other rivers in similar settings. Because the Green River is largely a bedrock controlled stream with adequate riparian buffer and little development along much of its length, the dam seems not to have caused significant erosion or channel incisioning/widening downstream.

Bridges and Culverts

Locations of bridge and culvert crossings were indexed on the Green River main stem. The number of crossing structures and the length of channel inferred to be impacted by each structure is recorded in Appendix 9 (Step 5 report in the DMS). Impact ratings were assigned to each assessed reach based on the percentage of the reach impacted by the crossing, as follows:

Table 5: Bridge and culvert impact ratings (VT ANR, 2006)

Impact	Condition
HIGH	≥ 20% of the reach length is channelized, has split flow, or makes a sharp "S" bend upstream or downstream of a crossing structure
LOW	≥ 5% and < 20% of the reach is impacted by crossing structure(s), as described above
Not Significant	< 5% of the reach is impacted by crossing structure(s)

Only two of the assessed reaches on the Green River mainstem, M01 and M08, had crossing structures and their impacts were not considered significant. However, there is some significant erosion downstream and aggradation further downstream aggradation along reach M08 due to a perched culvert.

Bank Armoring

Locations of bank armoring and revetments on the reaches were documented under Phase 1 Step 5.3. Approximate locations of armoring (e.g., rip-rap, hard bank) were documented using the Feature Indexing Tool of SGAT and uploaded to the Phase 1 database. Impact ratings were assigned to each reach based on the percentage (by length) of bank armoring on the left bank and/or right bank:

Table 6: Bank armoring/revetment impact ratings (VT ANR, 2006)

Impact	Condition
HIGH	≥ 20% of the reach armored on the right and/or left bank
LOW	≥ 5% and < 20% of the reach armored on the right and/or left bank
Not Significant	< 5% of the reach armored on the right and/or left bank

Results are presented in Appendix 9 (Step 5 report in the DMS). With the exception of M12, none of the reaches had evidence of bank armoring. M12 had about 44 feet of armored bank (3.7% of the reach) and the impact was not considered significant.

Channelization

Channelization is the process of changing the natural path of a river through activities such as windrowing and straightening. A channelized stream may degrade, or cut down vertically into its bed and cause the channel to lose access to its floodplain. The sediment resulting from the degradation process is re-deposited downstream of the channelized area. This results in aggradation, or building up, of the channel bed in this downstream area. Aggradation can result in channel widening, bank instability, and other channel responses, most of which are detrimental to both riverside land and aquatic habitat. Interviews with natural resource professionals, and review of orthophotos and topographic maps were used to examine this parameter.

Approximate locations of channel straightening on the Green River main stem and major tributaries were documented using the Feature Indexing Tool of SGAT and uploaded to the Phase 1 database. Impact ratings were assigned to each reach based on the percentage of inferred straightening (see Appendix 9):

Table 7: Channel Straightening impact ratings (VT ANR, 2006)

Impact	Condition
HIGH	≥ 20% of the reach channelized
LOW	≥ 5% and < 20% of the reach channelized
Not Significant	< 5% of the reach channelized

Sections of the Green River main stem impacted by straightening are shown in Figure 10. Reaches M09 and M12 resulted in high impact scores. There is evidence of channel straightening in Reaches M01 and M08, but the impacts are considered low.

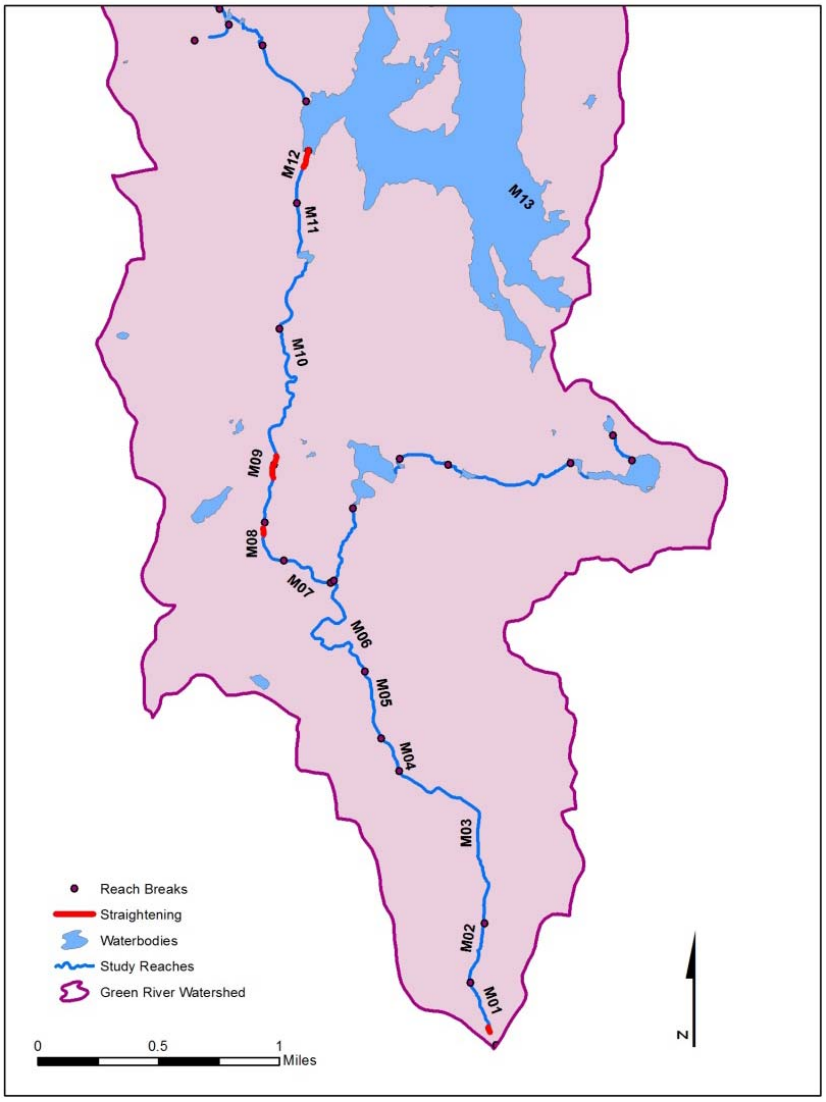

Figure 10: Channel straightening in Green River watershed.

Dredging and Gravel Mining History

Channel dredging and in-stream gravel extraction have been undertaken in Vermont streams and rivers (often as part of flood recovery work) with the intention of improving channel flow by removal of sediment bars, woody debris and large boulders. Gravel was sometimes removed from stream beds for commercial use. Dredging and mining gravel bars from a channel may initiate a channel evolution process. Such activities straighten and steepen the channel and cause the river to cut down and erode its bed. The stream channel eventually aggrades with sediment supplied from upstream reaches as headcuts in the streambed move up-valley. Information and records from DEC's Stream Alteration Engineer was used to determine the relative frequency and volume of gravel extraction.

High impact rating scores indicate that the reach was historically used for commercial gravel mining and/or dredged for flood remediation. None of the reaches assessed on the Green River had any significant gravel mining or dredging, probably due to the fact that the dam on reach M12 impedes sediment transport to downstream reaches.

Floodplain and Planform Modifications

Berms, Roads, Railroads, Improved Paths (Encroachments)

Berms, roads, driveways, railroads and improved paths located within close proximity to river channels often constrain the lateral movement of the channel and can reduce or prevent floodplain access by the channel during bankfull or higher magnitude flood events. Infrastructure within the river corridor is often at risk of fluvial erosion (and inundation) losses during a flood. Moreover, infrastructure present within the corridor may threaten downstream communities and lead to downstream channel adjustments. These risks to downstream areas result both from the increased flow velocity and magnitudes resulting from reduced floodplain access and channelization associated with the encroachments, as well as actual physical debris washed downstream in a flood event.

The presence of roads and driveways, railroads, improved paths, and berms was noted for each assessed reach in accordance with Step 6.1 of the Phase 1 protocols. Methods used for this step include windshield surveys, 1995 orthophotographs and 2003 aerial imagery, and GIS road and railroad layers (VCGI, 2006).

The length of each of these encroaching features within each reach corridor was indexed using the Feature Indexing Tool of SGAT and uploaded to the Phase 1 database. Indexing was performed to record whether each encroachment was present along one side of the channel at a time or both sides of the channel simultaneously. Impact ratings were assigned to each reach based on the presence or absence of these features and the cumulative percent by length of the reach:

Table 8: Encroachment impact ratings (VT ANR, 2006)

Impact	Condition
HIGH	Berms, roads, railroads or improved paths are present within the river corridor along ≥ 20% of the right and/or left bank.
LOW	Berms, roads, railroads or improved paths are present within the river corridor along ≥ 5% and < 20% of the right and/or left bank
Not Significant	Berms, roads, railroads or improved paths are present within the river corridor along < 5% of the right and/or left bank

Results are presented in Appendix J (Step 6 report in the DMS). In reaches M01-M07 and reach M11, there was no evidence of berms or roads; while in reaches M08, M09, M10 and M12, berms and/or roads were present and their impact significant. Along these reaches, the Green River Dam road runs parallel and in close proximity to the Green River.

River Corridor Development

Developments located within close proximity to river channels can also constrain the lateral movement of the channel and may serve as a berm in the floodplain that reduces or prevents floodplain access by the channel during bankfull or higher-magnitude flood events. Buildings, bridges and associated infrastructure within the river corridor are often at risk of fluvial erosion (and inundation) losses during a flood. Also, development present within the corridor may threaten downstream communities and lead to downstream channel adjustments. These risks to downstream areas result both from the increased flow velocity and magnitudes resulting from reduced floodplain access and channelization associated with the development, as well as actual physical debris washed downstream in a flood event.

The length of channel associated with development in the corridor was indexed using the Feature Indexing Tool of SGAT and uploaded to the Phase 1 database. Indexing was performed to record whether development was present along one side of the channel at a time or both sides of the channel simultaneously. Impact ratings were assigned to each reach based on the presence or absence of these features and the cumulative percent by length of the reach:

Table 9: Development impact ratings (VT ANR, 2006)

Impact	Condition
HIGH	Developments are present within the river corridor along ≥ 20% of the right and/or left bank.
LOW	Developments are present within the river corridor along ≥ 5% and < 20% of the right and/or left bank
Not Significant	Developments are present within the river corridor along < 5% of the right and/or left bank

Results are presented in Appendix J (Step 6 report in the DMS). Reaches M01 and M08 each had corridor development, but the impacts were not considered significant. An encroaching junkyard in reach M01 is shown in Figure 11.

Figure 11: Reach M01 – Floodplain encroachment from junk yard behind the large fence.

Depositional Features

An unvegetated bar is a sign that the bar was recently formed and is growing. Mid-channel bars, large unvegetated point bars, and delta bars may indicate an increased sediment load (from upstream) and the high likelihood that the streambed is actively aggrading and/or undergoing rapid lateral movement. The sediment sources for these bars may be from bank failures or the degradation of the channel upstream. It may also be from upland watershed sources. Orthophoto interpretation and windshield surveys were used to evaluate this parameter.

Results are presented in Appendix J. High impact rating scores indicate numerous, large unvegetated mid-channel, point and/or delta bars present. Only reach M08 resulted in high impact scores during this Phase 1 assessment.

Meander Migration

Some amount of lateral migration is natural in most alluvial stream systems, but the rate of migration may be increased in streams due to changes in the sediment supply and/or sediment transport capacity of the channel and/or changes in the amount of flow to the channel. Comparisons of paths of the channel from similarly scaled orthophotos of different year were

used to identify channel migration, bifurcation, and/or avulsions. Channel migration occurs as the channel erodes its outer banks on meander bends. Bifurcation describes when the stream has split into two or more active channels. An avulsion describes a channel plan form change due to meander cutoffs.

Evidence of channel movements were indexed using FIT and impact ratings assigned according to the frequency of occurrences. An impact rating was assigned – "High" for frequent occurrences; "Low" for a few occurrences; and "Not Significant" for no significant channel movements evident from the orthophotographs. "No Data" was assigned for those reaches where it was not possible to discern channel movements. Results are presented in Appendix J (Step 6 report in the DMS).

High impact rating scores indicate frequent occurrences of channel migration, bifurcation, and/or channel avulsions along the reach. No significant channel migration was seen along the mainstem reaches. The Green River dam plays a role in reducing the likely hood of channel migration by preventing sediment transport to the downstream reaches and through controlled flow regulation of the dam for power generation.

Meander Geometry

The meander belt width is the horizontal distance between the opposite banks of fully developed meanders. Unconfined, gravel-based streams in shallow-sloped valleys that are in regime have belt widths generally in the range of 5 to 8 times the width of the channel. Higher values may indicate that the stream, possibly due to an increase in fine sediment, has started to aggrade and become more sinuous, decreasing its channel slope as it migrates laterally. Lower values may indicate that the stream has become straighter and steeper, possibly degrading its bed and losing access to its floodplain. Orthophotos and topographic maps were used to determine the reach's average belt width.

Results are presented in Appendices J and K. High impact rating scores indicate the meander width ratio is less than 3 or greater than 10, well outside the 5-8 range of reaches within regime. Many of the mainstem are in narrow or confined valleys, so were less likely to have full meander development; those reaches in wider valleys had no significant impact for changes in the expected meander geometry.

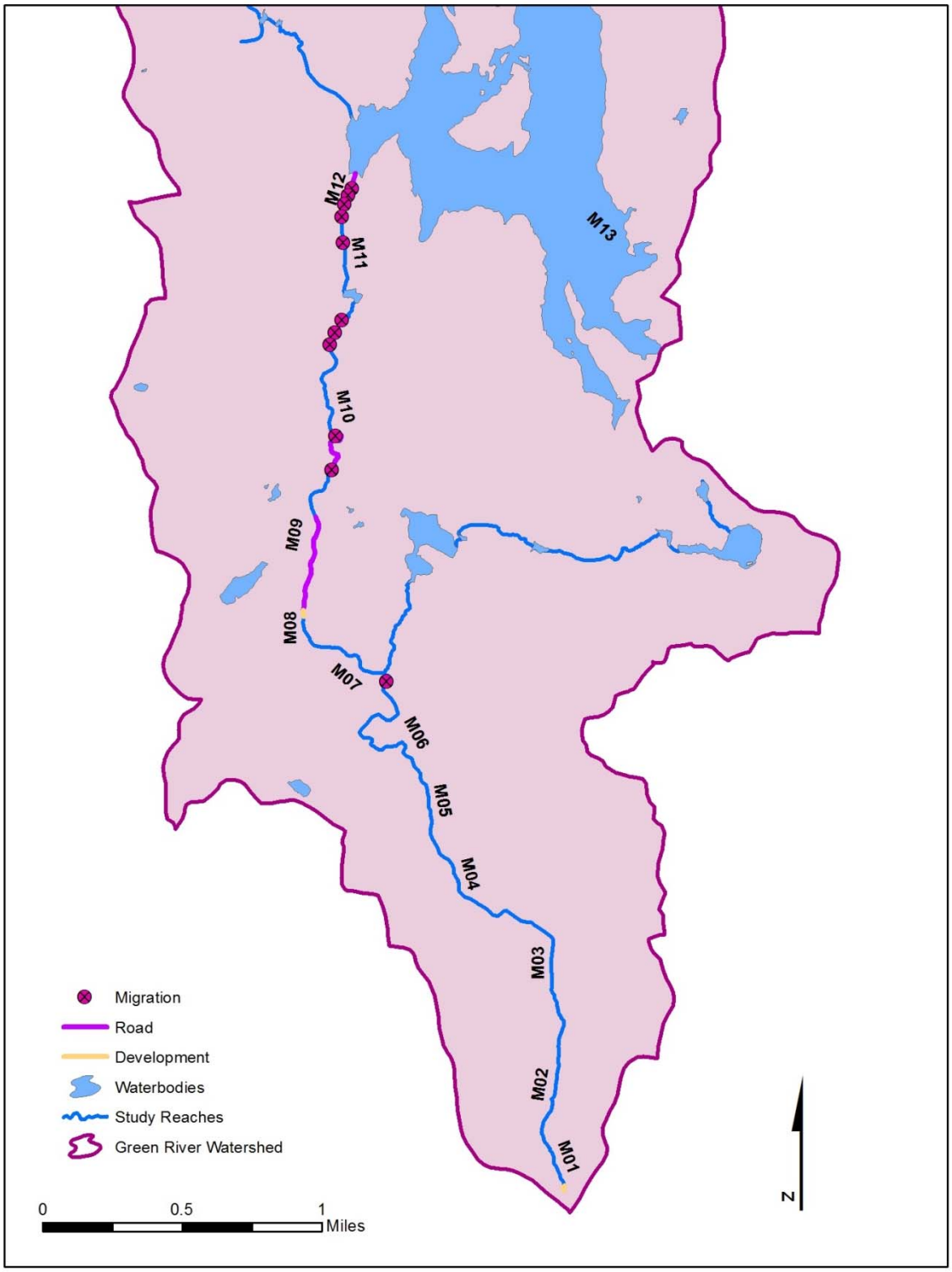

Figure 12: Floodplain and Planform Changes in the Green River watershed.

Bed and Bank Windshield Survey

Field surveys were conducted in the Green River watershed to:

- characterize stream channel conditions at vehicle accessible points in support of stream typing (Phase 1 Step 2);
- note erosion conditions including length and height; and
- identify the potential for debris or ice jams.

Field surveys were conducted in June 2006. LCPC walked most of the river rather than the "windshield survey" described in the Agency of Natural Resources geomorphic assessment protocols. Reaches M01-M12 were walked in their entirety and the upper six reaches of the mainstem were not assessed due to lack of accessibility.

Bank Erosion

Observed locations of stream bank erosion were recorded and indexed using the Feature Indexing Tool. Data were uploaded to the DMS and an impact rating was generated based on the percentage (by length) of the reach impacted by right bank and/or left bank erosion.

Table 10: Bank erosion impact ratings (VT ANR, 2006)

Impact	Condition
HIGH	Bank erosion observed along ≥ 20% of the right and/or left bank.
LOW	Bank erosion observed along ≥ 5% and < 20% of the right and/or left bank
Not Significant	Bank erosion observed along < 5% of the right and/or left bank

Results are presented in Appendix L (Step 7.1 report in DMS). The location of observed bank erosion is shown in Figure 13. Only one reach, M06, was documented with bank erosion and its impact was not considered significant.

Debris and Ice Jam Potential

Features along each of the reaches that could suggest the potential for debris jams were noted, including undersized bridges or culverts, sharp meander bends (greater than 90 degrees), wide and shallow channel sections with depositional bars, and presence of woody debris. A "High" impact rating was assigned for reaches with a known, recorded history of ice or debris jams. A

"Low" impact was assigned for reaches with features suggesting the potential for jams, but for which no record of previous jams was found. A "Not Significant" impact rating was assigned for reaches with no recorded history of jams and no features suggesting the potential for jams. Step 7.2 results are summarized in Appendix L. Locations of beaver dams and potential and observed debris jams are shown in Figure 13. Only two reaches, M08 and M11, had high impact ratings due to debris jams; M04 and M05 had low impact ratings; the remaining reaches had ratings of "Not Significant."

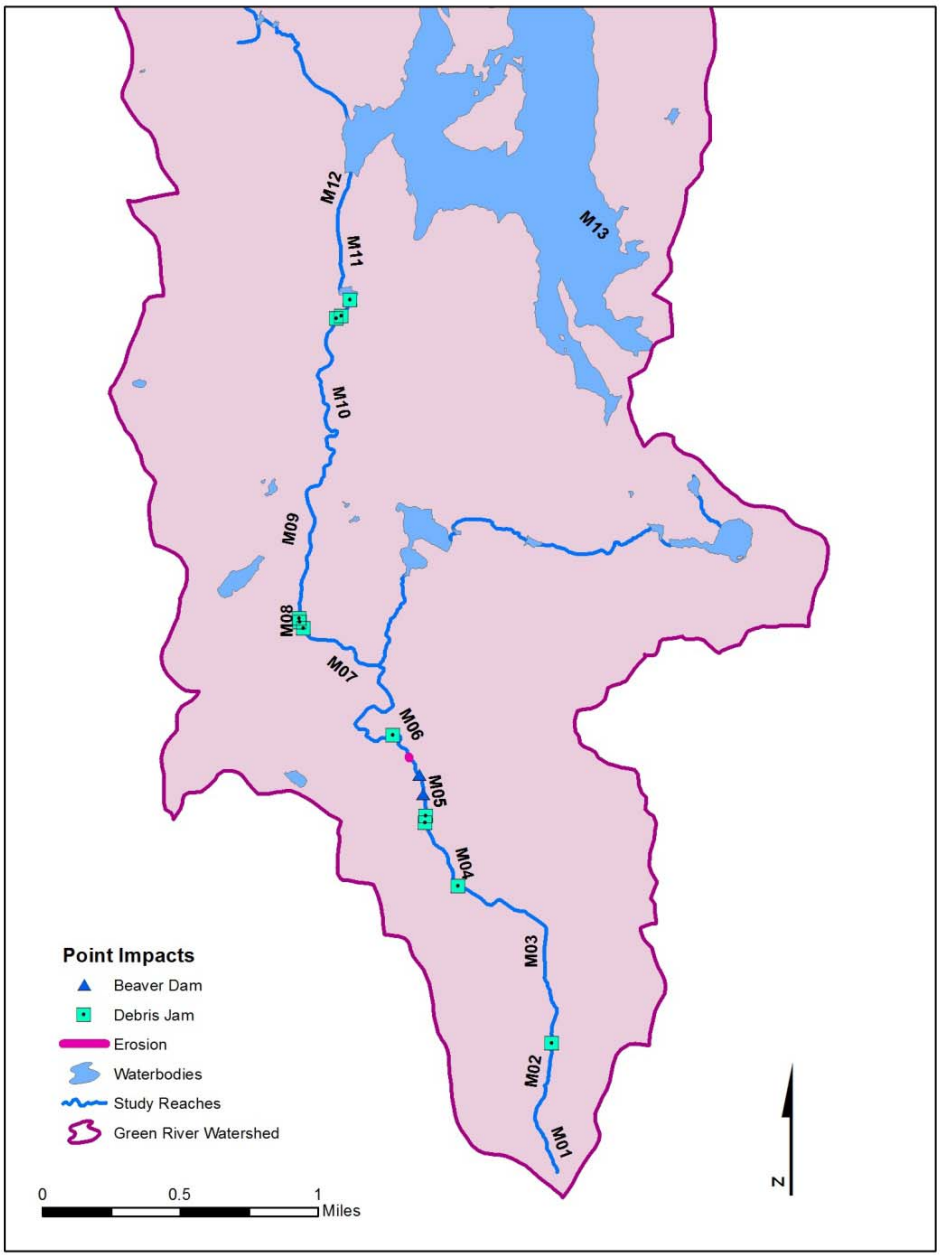

Figure 13: Point impacts in the Green River watershed.

Bridge and Culvert- field verified data

A watershed-wide bridge and culvert inventory and assessment was conducted to determine if stream crossings were contributing to localized streambank erosion, sedimentation, and impaired fish passage. The Agency of Natural Resources Bridge and Culvert Phase 1 protocols were used (ANR, 2003). Bridge spans and culvert diameter measurements were compared to calculated bankfull width measurements. The bankfull width, also known as the channel forming flow, is directly related to watershed drainage area. The bankfull flow is the discharge at which the majority of erosion and deposition takes place. Undersized bridges and culverts are not designed to accommodate both flow and sediment. During flood events large point bars can consequently deposit upstream of undersized bridges and culverts. During catastrophic flood events crossings can become outflanked, taking out large sections of roads and driveways. Significant sediment discharges to waterways can result. Sedimentation of the river poses water quality and aquatic habitat concerns. Only three bridges and culverts were assessed on the Green River main stem due to limited road crossings along this river which is located mostly within forested land. An undersized and perched culvert at reach M08 (see Figure 14) impedes fish passage. The other two structures assessed were bridges and both are slightly undersized.

Figure 14: Reach M08 – Perched culvert.

V. CURRENT STREAM AND GEOMORPHIC CONDITION

Total impact scores were assigned to each assessed reach by aggregating the impact scores assigned under Phase 1 Steps 4 through 7, which evaluated various parameters under the broader categories of Land Use, Instream Modification, Floodplain Modification, and Bed and Bank Survey (Table 11). For each parameter, a "Not Significant" rating is equivalent to a score of zero; a "Low" impact is assigned a score of 1; and a "High" impact is given a score of 2. The maximum total impact score for a given reach is 32, or 2 points assigned for each of the parameters listed in Table 11.

Table 11: Phase 1 parameters comprising impact scores (VT ANR, 2006)

Impact Category	Phase 1 Step #	Description
Land Use	4.1	Watershed Land Cover / Land Use
	4.2	Corridor Land Cover / Land Use
	4.3	Riparian Buffer Width
Instream Modification	5.1	Flow Regulations / Water Withdrawals
	5.2	Bridges & Culverts
	5.3	Bank Armoring / Revetments
	5.4	Channel Straightening
	5.5	Dredging / Gravel Mining History
Floodplain Modification	6.1	Berms & Roads
	6.2	River Corridor Development
	6.3	Depositional Features
	6.4	Meander Migration/ Channel Avulsion
	6.5	Meander Belt Width Ratio
	6.6	Meander Wavelength Ratio
Bank and Bank Survey	7.2	Bank Erosion
	7.3	Debris & Ice Jam Potential

Summarized in Appendices M and N, the total impact scores for the Green River are generally low. Of the reaches assessed on the main stem, reach M08 received the highest total impact score of 11 (out of a possible score of 32). Reaches M09 and M12 received the second highest impact score of 7 with reaches M01 and M10 receiving an impact score of 5. Residential and agricultural land use within the river corridor accounted for the majority of the high impact scores on the Green River. Reach M08 had 10% crop land and 16% residential land, and reach M09 had 22% residential land. A secondary factor in impact scores was floodplain modifications: the impact of berms and roads was ranked as high for reaches M08, M09, M10 and M12; while depositional features were assigned a high impact for reach M08. The results

of the assessment concluded that overall, the river is in good condition. There are sections with significant bedrock grade controls (see Figure 6), and much of the stream has an adequate riparian buffer.

VI. ADJUSTMENT PROCESS AND REACH CONDITION

Adjustment Process and Reach Condition is summarized in Appendix O. The Green River watershed and river corridor is largely undeveloped. The few exceptions are floodplain encroachments along M01 (see Figure 11) from crops and a junkyard. Reaches M08-M10 are also impacted by floodplain encroachments from a road leading to the reservoir (see Figure 12). Most of the assessed reaches include frequent bedrock outcroppings which helps stabilize the river and prevents major adjustments such as degradation. There is some significant erosion downstream and aggradation further downstream along reach M08 due to the perched culvert (see Figure 13) and sediment entering the stream from road runoff. The river would benefit from replacement of this structure with one that is not perched, as well as the installation of erosion reducing measures along the road. Slight planform adjustment was observed in reach M09, just upstream of the bedrock and culvert in reach M08. This process changes the shape and size of meander bands and the overall path the river follows.

Given the generally stable condition of the Green River and the lack of development along the river, a Phase 2 Assessment is not recommended at this time. . If development and modifications within the floodplain are avoided, the river will establish a stable condition on its own. The lack of roads along much of the river decreases the likelihood of development, so conserving a corridor around the river here would not conflict with much potential development and would be an effective and simple method of preserving the Green River.

VII. REFERENCES

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VIII. GLOSSARY OF TERMS

Adapted from:

Restoration Terms, by Craig Fischenich, February, 2000, USAE Research and Development Center, Environmental Laboratory, 3909 Halls Ferry Rd., Vicksburg, MS 39180 and Vermont Stream Geomorphic Assessment Handbook, Appendix Q, 2004, VT Agency of Natural Resources, Waterbury, VT. Available at http://www.vtwaterquality.org/rivers/docs/assessmenthandbooks/rv_apxqglossary.pdf

Adjustment process – type of change that is underway due to natural causes or human activity that has or will result in a change to the valley, floodplain, and/or channel condition (e.g., vertical, lateral, or channel plan form adjustment processes).

Aggradation - A progressive buildup or raising of the channel bed and floodplain due to sediment deposition. The geologic process by which streambeds are raised in elevation and floodplains are formed. Aggradation indicates that the stream discharge and/or bed load characteristics are changing. Opposite of degradation.

Alluvial fan – A fan-shaped accumulation of alluvium (alluvial soils) deposited at the mouth of a ravine or at the juncture of a tributary stream with the main stem where there is an abrupt change in slope.

Alluvial soils – Soil deposits from rivers.

Alluvium – A general term for detrital deposits made by streams on riverbeds, floodplains, and alluvial fans.

Avulsion – A change in channel course that occurs when a stream suddenly breaks through its banks, typically bisecting an overextended meander arc.

Bank Stability – The ability of a streambank to counteract erosion or gravity forces.

Bankfull channel depth - The maximum depth of a channel within a riffle segment when flowing at a bankfull discharge.

Bankfull channel width - The top surface width of a stream channel when flowing at a bankfull discharge.

Bankfull discharge - The stream discharge corresponding to the water stage that overtops the natural banks.
This flow occurs, on average, about once every 1 to 2 years and given its frequency and magnitude is responsible for the shaping of most stream or river channels.

Bar – An accumulation of alluvium (usually gravel or sand) caused by a decrease in sediment transport capacity on the inside of meander bends or in the center of an over wide channel.

Berms – Mounds of dirt, earth, gravel or other fill built parallel to the stream banks designed to keep flood flows from entering the adjacent floodplain.

Cascade – River bed form where the channel is very steep with narrow confinement. There are often large boulders and bedrock with waterfalls.

Channelization – The process of changing (usually straightening) the natural path of a waterway.

Culvert – A buried pipe that allows flows to pass under a road.

Degradation – (1) A progressive lowering of the channel bed due to scour. Degradation is an indicator that the stream's discharge and/or sediment load is changing. The opposite of aggradation.

Delta bar – A deposit of sediment where a tributary enters the main stem of a river.

Depositional features – Types of sediment deposition and storage areas in a channel (e.g. mid-channel bars, point bars, side bars, diagonal bars, delta bars, and islands).

Drainage Basin – The total area of land from which water drains into a specific river.

Dredging – Removing material (usually sediments) from wetlands or waterways, usually to make them deeper or wider.

Erosion – Wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical, chemical, or biological forces.

Floodplain – Land built of sediment that is regularly covered with water as a result of the flooding of a nearby stream.

Gaging Station – A particular site in a stream, lake, reservoir, etc., where hydrologic data are obtained.

Grade control - A fixed feature on the streambed that controls the bed elevation at that point, effectively fixing the bed elevation from potential incision; typically bedrock, dams or culverts.

Gradient – Vertical drop per unit of horizontal distance.

Habitat – The local environment in which organisms normally grow and live.

Headwater – Referring to the source of a stream or river.

Incised River – A river that erodes its channel by the process of degradation to a lower base level than existed previously or is consistent with the current hydrology.

Islands – Mid-channel bars that are above the average water level and have established woody vegetation.
Lacustrine soils- Soil deposits from lakes.

Meander - The winding of a stream channel, usually in an erodible alluvial valley. A series of sine-generated curves characterized by curved flow and alternating banks and shoals.

Meander migration – The change of course or movement of a channel. The movement of a channel over time is natural in most alluvial systems. The rate of movement may be increased if the stream is out of balance with its watershed inputs.

Meander belt width – The horizontal distance between the opposite outside banks of fully developed meanders determined by extending two lines (one on each side of the channel) parallel to the valley from the lateral extent of each meander bend along both sides of the channel.

Meander wavelength - The lineal distance downvalley between two corresponding points of successive meanders of the same phase.

Meander wavelength ratio – The meander wavelength divided by the bankfull channel width.

Meander width ratio – The meander belt width divided by the bankfull channel width.

Mid-channel bar – Sediment deposits (bar) located in the channel away from the banks, generally found in areas where the channel runs straight. Mid-channel bars caused by recent channel instability are unvegetated.

Planform - The channel shape as if observed from the air. Changes in planform often involve shifts in large amount of sediment, bank erosion, or the migration of the channel.
Plane bed – Channel lacks discrete bed features (such as pools, riffles, and point bars) and may have long stretches of featureless bed.

Point bar –The convex side of a meander bend that is built up due to sediment deposition.

Pool -- A habitat feature (section of stream) that is characterized by deep, low-velocity water and a smooth surface.

Reach - Section of river with similar characteristics such as slope, confinement (valley width), and tributary influence.

Restoration – The return of an ecosystem to a close approximation of its condition prior to disturbance.

Riffle - A habitat feature (section of stream) that is characterized by shallow, fast-moving water broken by the presence of rocks and boulders.

Riffle-pool - Channel has undulating bed that defines a sequence of riffles, runs, pools, and point bars. Occurs in moderate to low gradient and moderately sinuous channels, generally in unconfined valleys with well-established floodplains.

Riparian Buffer – The width of naturally vegetated land adjacent to the stream between the top of the bank and the edge of other land uses. A buffer is largely undisturbed and consists of the trees, shrubs, groundcover plants, duff layer, and naturally uneven ground surface.

Riparian Corridor – Lands defined by the lateral extent of a stream's meanders necessary to maintain a stable stream dimension, pattern, profile and sediment regime.

Segment – A relatively homogeneous section of stream contained within a reach that has the same reference stream characteristics but is distinct from other segments in the reach.

Sensitivity – The valley, floodplain and/or channel condition's likelihood to change due to natural causes and/or anticipated human activity.

Side bar – Unvegetated sediment deposits located along the margins or the channel in locations other than the inside of channel meander bends.

Step-pool – Characterized by longitudinal steps formed by large particles (boulder/cobbles) organized into discrete channel-spanning accumulations that separate pools, which contain smaller sized materials. Often associated with steep channels in confined valleys.

Surficial sediment/geology – Sediment that lies on top of bedrock.

Tributary – A stream that flows into another stream, river, or lake.

Urban runoff – Storm water from city streets and gutters that usually carries a great deal of litter and organic and bacterial wastes into the receiving waters.

APPENDICES

A. Step 1: Reach Locations

B. Step 2: Preliminary Reference Stream Types

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D. Step 3: Soils Summary

E. Step 4: Land Cover – Reach Hydrology

F. Step 4: Watershed Land Cover/Land Use

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K. Step 7: Channelization Report

L. Step 7: Bed and Bank Windshield Survey

M. Step 8: Stream and Watershed Impact Rating

N. Step 8: Summary of Categorical Impacts

O. Step 9: Adjustment Process and Reach Condition

P. Phase 1 Reach Summary Report

Q. Metadata

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

August, 01 2011

Phase 1 - Step 1. Reach Locations

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Reach ID	Stream Name	Excluded ?	Towns	Description
M01	Green River		WOLCOTT	This reach begins at the confluence of the stream with the Lamoille River, in the Town of Wolcott. Continues for about 1700 feet, about 1100 feet after crossing under Route 15.
M02	Green River		WOLCOTT	Continues for about 1400 feet. There are no significant reference points along this reach.
M03	Green River		HYDE PARK, WOLCOTT	Continues for about 4500 feet. Crosses in to the Town of Hyde Park. There are no significant reference points along this reach.
M04	Green River		HYDE PARK	Continues for just over 800 feet. There are no significant reference points along this reach.
M05	Green River		HYDE PARK	Continues for just over 1500 feet. There are no significant reference points along this reach.
M06	Green River		HYDE PARK	Continues for about a quarter mile upstream to a tributary entering from the northeast.
M06T1.01	Tributary at M06 of Green River	Not Assessed	HYDE PARK	Begins at the end (upstream end) of reach M06. Continues for about a third of a mile, ends about 350 feet after crossing Garfield Road.
M06T1.02	Tributary at M06 of Green River	Not Assessed	HYDE PARK	This reach is a series of ponds. It is about 4 tenths of a mile long with a small tributary entering from the northwest at about the middle of the reach.
M06T1.03	Tributary at M06 of Green River	Not Assessed	HYDE PARK	Continues for just over 1000 feet, ending about 350 feet before a small pond.
M06T1.04	Tributary at M06 of Green River	Not Assessed	HYDE PARK	This reach is just over a half mile long, ending about 1000 feet after crossing Garfield Road.
M06T1.05	Tributary at M06 of Green River	Not Assessed	HYDE PARK	This reach is also made up of a large pond. It is about 4 tenths of a mile long.
M06T1.06	Tributary at M06 of Green River	Not Assessed	HYDE PARK	
M06T1.07	Tributary at M06 of Green River	Not Assessed	HYDE PARK	A small pond, about 500 feet long, end of tributary.
M07	Green River		HYDE PARK	Continues for a quarter mile. There are no significant reference points along this reach.
M08	Green River		HYDE PARK	Continues for just over 1000 feet, about 150 feet past Garfield Road.
M09	Green River		HYDE PARK	Continues for about 1300 feet to a tributary entering from the northwest.
M10	Green River		HYDE PARK	Continues for about three quarters of a mile, about a half mile past a wooden bridge on a dirt road.
M11	Green River		HYDE PARK	Continues for a little over a half mile, about 1000 feet past a large beaver pond that makes up most of this reach.

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Reach ID	Stream Name	Excluded ?	Towns	Description
M12	Green River		HYDE PARK	Continues for just over 1000 feet to a dam at the southwestern side of the Green River Reservoir.
M13	Green River	Not Assessed	HYDE PARK	
M13T1.01	Tributary at M13 of Green River	Not Assessed	HYDE PARK	This reach begins at the southwestern end of the Green River Reservoir. Continues for about 1500 feet, ending at a small logging/access road.
M13T1.02	Tributary at M13 of Green River	Not Assessed	HYDE PARK	Continues for about 1500 feet, through 2 small ponds, ending about 200 feet past the upstream end of the second pond.
M13T1.02S1.01	Tributary1 of Tributary at M13 of Green River	Not Assessed	HYDE PARK	Begins at the second pond on reach M13T1.02, continues for about 900 feet, ends about 350 feet past a tributary entering from the southwest.
M13T1.02S1.02	Tributary1 of Tributary at M13 of Green River	Not Assessed	HYDE PARK	Continues for about 1600 feet, ends about 700 feet after entering a field at a small pond.
M13T1.03	Tributary at M13 of Green River	Not Assessed	HYDE PARK	Continues for about 1000 feet. There are non significant reference points along this reach.
M13T1.04	Tributary at M13 of Green River	Not Assessed	HYDE PARK	Continues for just under a half mile, ends about 4 tenths of a mile after crossing a small dirt logging/access road.
M14	Green River	Not Assessed	EDEN, HYDE PARK	Continues for just over a mile, through a series of small ponds, ends at the north end of a pond, about a third of a mile past a tributary entering from the east. Crosses into the Town of Eden.
M15	Green River	Not Assessed	EDEN	Continues for about seven tenths of a mile, about 600 feet past a tributary entering from the west.
M16	Green River	Not Assessed	EDEN	Continues for about a mile, to about 1200 feet downstream of a tributary entering from the east.
M17	Green River	Not Assessed	EDEN	Continues for just under a half mile to a dirt logging road, about 1000 feet past a tributary entering from the east.
M18	Green River	Not Assessed	EDEN	Continues for about a half mile, about 500 feet southwest of East Hill Road.

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Phase 1 - Step 2. Preliminary Reference Stream Type

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Step	2.1		2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10		2.11		
	Elevation		Valley		Channel		Watershed		Channel	Valley	Confinement		Reference		
ReachID	Up (ft.)	Down (ft.)	Length (ft.)	Slope (ft.)	Length (ft.)	Slope (%)	Sinuosity	Area (sq. mi.)	Width (ft.)	Width (ft.)	Ratio	Type	Stream Type	Bedform	QC
M01	705	666	1,526	2.56	1,578	2.47	1.03	19.29	48.2	503	10.4	VB	C	Riffle-Pool	2
M02	761	705	1,378	4.06	1,399	4.00	1.02	19.19	48.1		0.0	NC	B	Step-Pool	2
M03	899	761	4,321	3.19	4,638	2.98	1.07	19.01	47.9		0.0	NW	B	Plane Bed	2
M04	909	899	851	1.18	879	1.14	1.03	18.35	47.1	101	2.1	SC	B	Riffle-Pool	2
M05	960	909	1,523	3.35	1,573	3.24	1.03	18.27	47.0	93	2.0	NC	B	Step-Pool	2
M06	970	960	2,215	0.45	3,886	0.26	1.75	17.99	46.7	450	9.6	BD	C	Riffle-Pool	2
M07	1,027	970	1,343	4.24	1,401	4.07	1.04	16.27	44.7		0.0	BD	C	Riffle-Pool	2
M08	1,109	1,027	1,000	8.20	1,017	8.06	1.02	16.14	44.5		0.0	NC	A	Cascade	2
M09	1,129	1,109	1,301	1.54	1,336	1.50	1.03	16.04	44.4		0.0	NW	C	Riffle-Pool	2
M10	1,130	1,129	3,123	0.03	3,762	0.03	1.20	15.86	44.2	442	10.0	VB	C	Dune-Ripple	2
M11	1,194	1,130	2,878	2.22	3,312	1.93	1.15	15.11	43.3	214	4.9	NW	B	Plane Bed	2
M12	1,227	1,194	1,170	2.82	1,180	2.80	1.01	14.64	42.7		0.0	NW	B	Plane Bed	2

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Phase 1 - Step 3. Basin Characteristics: Geology

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

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	QC
M01	None	None	Alluvial	92.0	Ice-Contact	Flat	Flat	2
M02	None	Ledge	Ice-Contact	100.0		Hilly	Steep	2
M03	None	Ledge	Ice-Contact	91.0	Till	Steep	Steep	2
M04	None	Ledge	Till	100.0		Steep	Very Steep	2
M05	None	None	Ice-Contact	82.0	Till	Very Steep	Very Steep	2
M06	None	Ledge	Ice-Contact	100.0		Very Steep	Very Steep	2
M07	None	Ledge	Ice-Contact	100.0		Very Steep	Very Steep	2
M08	None	Ledge	Ice-Contact	86.0	Alluvial	Very Steep	Very Steep	2
M09	None	None	Alluvial	85.0	Till	Extremely Steep	Steep	2
M10	None	None	Alluvial	79.0	Till	Steep	Extremely Steep	2
M11	None	None	Alluvial	85.0	Till	Extremely Steep	Extremely Steep	2
M12	None	Dam	Till	69.0	Alluvial	Extremely Steep	Extremely Steep	2

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Phase 1 - Step 3. Soils Summary

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

	3.5 Soil Properties										
	Hydrologic				Water Table						
Reach ID	Group	%	Flooding	%	Deep	%	Shallow	%	Erodibility	%	QC
M01	B	92.0	Occasional	92.0	6.0	100.0	6.0	100.0	slight	7.0	2.0
M02	A	100.0	None/Rare	100.0	6.0	100.0	6.0	100.0	Very Severe	100.0	2.0
M03	A	91.0	None/Rare	100.0	6.0	100.0	6.0	100.0	Very Severe	99.0	2.0
M04	C	82.0	None/Rare	100.0	6.0	100.0	6.0	100.0	Very Severe	100.0	2.0
M05	A	82.0	None/Rare	100.0	6.0	100.0	6.0	100.0	Very Severe	100.0	2.0
M06	A	100.0	None/Rare	100.0	6.0	100.0	6.0	100.0	Very Severe	99.0	2.0
M07	A	100.0	None/Rare	100.0	6.0	100.0	6.0	100.0	Very Severe	100.0	2.0
M08	A	86.0	None/Rare	89.0	6.0	89.0	6.0	89.0	Very Severe	89.0	2.0
M09	Not Rated	85.0	Frequent	85.0	0.5	85.0	0.0	85.0	slight	14.0	2.0
M10	Not Rated	79.0	Frequent	79.0	0.5	79.0	0.0	79.0	slight	19.0	2.0
M11	Not Rated	85.0	Frequent	85.0	0.5	85.0	0.0	85.0	slight	14.0	2.0
M12	D	69.0	None/Rare	69.0	6.0	69.0	6.0	69.0	Severe	69.0	2.0

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Phase 1 - Step 4. Land Cover - Reach Hydrology

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

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.			Grndwater	
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	QC
M01	Forest	Forest	83.0	Crop	0.0	3.0	Low	Forest	Forest	34.0	Crop	9.0	26.0	High							N.D.	None	2
M02	Forest	Forest	83.0	Crop	0.0	3.0	Low	Forest	Forest	61.0				N.S.	>100	>100	None	None			N.D.	None	2
M03	Forest	Forest	83.0	Crop	0.0	3.0	Low	Forest	Forest	66.0				N.S.	>100	>100	None	None			N.D.	Abundant	2
M04	Forest	Forest	82.0	Crop	0.0	3.0	Low	Forest	Forest	56.0				N.S.	>100	>100	None	None			N.D.	Minimal	2
M05	Forest	Forest	82.0	Crop	0.0	3.0	Low	Forest	Forest	64.0				N.S.	>100	>100	None	None			N.D.	Minimal	2
M06	Forest	Forest	82.0	Crop	0.0	3.0	Low	Forest	Forest	74.0	Crop		1.0	N.S.	>100	>100	None	None			N.D.	None	2
M07	Forest	Forest	83.0	Crop	0.0	3.0	Low	Forest	Forest	52.0	Urban	1.0		N.S.	>100	>100	None	None			N.D.	Minimal	2
M08	Forest	Forest	83.0	Crop	0.0	3.0	Low	Forest	Forest	38.0	Urban	16.0	10.0	High	>100	>100	None	51-100			N.D.	Minimal	2
M09	Forest	Forest	83.0	Crop	0.0	2.0	Low	Forest	Forest	45.0	Urban	22.0		High	>100	>100	None	26-50			N.D.	Minimal	2
M10	Forest	Forest	83.0	Crop	0.0	2.0	Low	Wetland	Forest	55.0	Wetland	11.0	0.0	High	>100	>100	26-50	26-50			N.D.	Minimal	2
M11	Forest	Forest	83.0	Crop	0.0	2.0	Low	Wetland	Forest	62.0	Wetland		1.0	N.S.	>100	>100	None	None			N.D.	Minimal	2
M12	Forest	Forest	83.0	Crop	0.0	2.0	Low	Forest	Forest	44.0	Urban	6.0		Low	>100	>100	None	None			N.D.	Minimal	2

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Phase 1 - Step 4. Watershed Land Cover - Land Use

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** (Numbers are in %) QA Status: **Step 2 done**

Reach ID	Commercial	Crop	Field	Forest	Industrial	Residential	Shrub	Water	Wetland	Total
M01		3.0	0.0	83.0		0.0		9.0	0.0	95.0
M02		3.0	0.0	83.0		0.0		9.0	0.0	95.0
M03		3.0	0.0	83.0		0.0		9.0	0.0	95.0
M04		3.0	0.0	82.0		0.0		9.0	0.0	94.0
M05		3.0	0.0	82.0		0.0		9.0	0.0	94.0
M06		3.0	0.0	82.0		0.0		9.0	0.0	94.0
M06T1.01		4.0	2.0	80.0		2.0		3.0	3.0	94.0
M06T1.02		2.0	2.0	84.0		2.0		3.0	3.0	96.0
M06T1.03		1.0	0.0	87.0		2.0		2.0	3.0	95.0
M06T1.04		1.0	0.0	86.0		2.0		2.0	3.0	94.0
M06T1.05				83.0		4.0		4.0	4.0	95.0
M06T1.06				77.0		13.0		6.0		96.0
M06T1.07				71.0		17.0		9.0		97.0
M07		3.0	0.0	83.0		0.0		10.0	0.0	96.0
M08		3.0	0.0	83.0		0.0		10.0	0.0	96.0
M09		2.0	0.0	83.0		0.0		10.0	0.0	95.0
M10		2.0	0.0	83.0		0.0		10.0	0.0	95.0
M11		2.0		83.0		0.0		10.0	0.0	95.0
M12		2.0		83.0		0.0		11.0	0.0	96.0
M13		2.0		83.0		0.0		11.0	0.0	96.0
M13T1.01		3.0		89.0		1.0		4.0	0.0	97.0
M13T1.02		3.0		88.0		1.0		4.0	0.0	96.0
M13T1.02S1.01		5.0		83.0		3.0		6.0		97.0
M13T1.02S1.02		15.0		67.0		11.0		3.0		96.0
M13T1.03		5.0		87.0				5.0		97.0
M13T1.04		0.0		92.0				5.0		97.0
M14		2.0		91.0		0.0		3.0	0.0	96.0
M15		3.0		91.0		0.0		4.0	0.0	98.0
M16		5.0		86.0		0.0		5.0	0.0	96.0
M17		8.0		84.0		1.0		3.0	0.0	96.0
M18		3.0		89.0				5.0	1.0	98.0

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Phase 1 - Step 4. Corridor Land Cover - Land Use

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** (Numbers are in %) QA Status: **Step 2 done**

Reach ID	Commercial	Crop	Field	Forest	Industrial	Residential	Shrub	Water	Wetland	Total
M01	1.0	26.0	1.0	34.0		8.0		25.0		95.0
M02				61.0				38.0		99.0
M03				66.0				32.0		98.0
M04				56.0				42.0		98.0
M05				64.0				33.0		97.0
M06		1.0		74.0				23.0		98.0
M06T1.01		0.0		42.0		13.0		41.0		96.0
M06T1.02				55.0				10.0	33.0	98.0
M06T1.03				93.0				6.0		99.0
M06T1.04		1.0		53.0		3.0		4.0	34.0	95.0
M06T1.05				51.0				5.0	42.0	98.0
M06T1.06				96.0				2.0		98.0
M06T1.07				16.0		22.0		60.0		98.0
M07				52.0		1.0		45.0		98.0
M08		10.0		38.0		16.0		33.0		97.0
M09				45.0		22.0		30.0		97.0
M10		0.0		55.0		11.0		14.0	14.0	94.0
M11		1.0		62.0				25.0	8.0	96.0
M12				44.0		6.0		47.0		97.0
M13		1.0		3.0		0.0		93.0	0.0	97.0
M13T1.01		3.0		85.0				9.0		97.0
M13T1.02		2.0		40.0				51.0	4.0	97.0
M13T1.02S1.01				60.0				38.0		98.0
M13T1.02S1.02		6.0		49.0		19.0		22.0		96.0
M13T1.03		26.0		16.0		1.0		54.0		97.0
M13T1.04		2.0		58.0				37.0		97.0
M14		2.0		66.0		0.0		26.0	1.0	95.0
M15		2.0		85.0				7.0	2.0	96.0
M16		0.0		47.0				50.0		97.0
M17		7.0		51.0		2.0		35.0	1.0	96.0
M18		1.0		49.0		0.0		46.0	0.0	96.0

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Phase 1 - Riparian Condition Summary

Green River

Basin: **Lamoille**

Watershed: **Lamoille River**

SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River**

QA Status: **Step 2 done**

	Riparian Corridor				Riparian Buffer							
					Left Bank			Right Bank				
	Dominant Corridor	Urban	Crop	Corridor Land Cover	Buffer Width		Length where	Buffer Width		length where	Buffer width	QC
Reach ID	Land Cover	%	%	Impact	Dominant	Sub-Dominant	less than 25 ft.	Dominant	Sub-Dominant	less than 25 ft.	Impact	Status
M01	Forest	9.0	26.0	High							N.D.	2
M02	Forest			N.S.	>100	None		>100	None		N.D.	2
M03	Forest			N.S.	>100	None		>100	None		N.D.	2
M04	Forest			N.S.	>100	None		>100	None		N.D.	2
M05	Forest			N.S.	>100	None		>100	None		N.D.	2
M06	Forest		1.0	N.S.	>100	None		>100	None		N.D.	2
M07	Forest	1.0		N.S.	>100	None		>100	None		N.D.	2
M08	Forest	16.0	10.0	High	>100	None		>100	51-100		N.D.	2
M09	Forest	22.0		High	>100	None		>100	26-50		N.D.	2
M10	Forest	11.0	0.0	High	>100	26-50		>100	26-50		N.D.	2
M11	Forest		1.0	N.S.	>100	None		>100	None		N.D.	2
M12	Forest	6.0		Low	>100	None		>100	None		N.D.	2

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Phase 1 - Step 5. Instream Channel Modification

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Step	Channel	5.1 Flow Regulation				5.3 Bridges - Culverts				5.3 Bank Armoring			5.4 Channel Straightening			5.5 Dredging History		
Reach ID	Length	Type	Use	Old	Impact	Number	Length	Percent	Impact	Length	Percent	Impact	Length	Percent	Impact	Type	Impact	QC
M01	1,578			None	N.S.	1	0	0.0	N.S.	0	0.0	N.S.	117	7.4	Low	None	N.S.	2
M02	1,399			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M03	4,638			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M04	879			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M05	1,573			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M06	3,886			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M07	1,401			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M08	1,017			None	N.S.	1	0	0.0	N.S.	0	0.0	N.S.	140	13.8	Low	None	N.S.	2
M09	1,336			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	338	25.3	High	None	N.S.	2
M10	3,762			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	168	4.5	N.S.	None	N.S.	2
M11	3,312			None	N.S.	0	0	0.0	N.S.	0	0.0	N.S.	0	0.0	N.S.	None	N.S.	2
M12	1,180			None	N.S.	0	0	0.0	N.S.	44	3.7	N.S.	379	32.1	High	None	N.S.	2

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Phase 1 - Step 6. Floodplain Modification and Planform Changes

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Step	6.1 Berms & Roads									6.2 Corridor Development			6.3 Depositional Features		6.4 Meander Migration		6.5 Meander Width			6.6 Wavelength			
	Road		RR		Path		Berm																
Reach ID	Len	%	Len	%	Len	%	Len	%	Impact	Length	Percent	Impact	Type	Impact	Type	Impact	Width	Ratio	Impact	Length	Ratio	Impact	QC
M01	0	0	0	0	0	0	0	0	Unk.	101	6.4	Low	None	N.S.		N.S.		0.0	N.D.		0.0	N.D.	2
M02	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	None	N.S.		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2
M03	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	None	N.S.		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2
M04	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	None	N.S.		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2
M05	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	Multiple	Low		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2
M06	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	Multiple	Low		N.S.		0.0	N.D.		0.0	N.D.	2
M07	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	None	N.S.		N.S.		0.0	N.D.		0.0	N.D.	2
M08	Berms & Roads length: 216, 21 %								High	127	12.6	Low	Multiple	High		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2
M09	Berms & Roads length: 1331, 99 %								High	0	0.0	N.S.	None	N.S.		N.S.		0.0	N.D.		0.0	N.D.	2
M10	Berms & Roads length: 1551, 41 %								High	0	0.0	N.S.	None	N.S.		N.S.		0.0	N.D.		0.0	N.D.	2
M11	0	0	0	0	0	0	0	0	Unk.	0	0.0	N.S.	Side	N.S.		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2
M12	Berms & Roads length: 377, 31 %								High	0	0.0	N.S.	Multiple	Low		N.S.	N/A	0.0	N/A	N/A	0.0	N/A	2

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Phase 1 - Step 7. Channalization Report

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Step	2.5	2.11 Stream Type				5.4 Channel Straightening			6.5 Meander Width			6.6 Wavelength			
Reach ID	Channel Slope	Reference Stream Type	Dominant Bedform	Subclass Slope	Dominant Bed Material	Length	Percent	Impact	Width	Ratio	Impact	Length	Ratio	Impact	QC
M01	2.47	C	Riffle-Pool		Gravel	117 ft.	7.4	Low	ft.	0.00	N.D.	ft.	0.00	N.D.	2
M02	4.00	B	Step-Pool		Cobble	0 ft.	0.0	N.S.	ft.	0.00	N/A	ft.	0.00	N/A	2
M03	2.98	B	Plane Bed		Gravel	0 ft.	0.0	N.S.	ft.	0.00	N/A	ft.	0.00	N/A	2
M04	1.14	B	Riffle-Pool	c	Gravel	0 ft.	0.0	N.S.	ft.	0.00	N/A	ft.	0.00	N/A	2
M05	3.24	B	Step-Pool		Cobble	0 ft.	0.0	N.S.	ft.	0.00	N/A	ft.	0.00	N/A	2
M06	0.26	C	Riffle-Pool		Sand	0 ft.	0.0	N.S.	ft.	0.00	N.D.	ft.	0.00	N.D.	2
M07	4.07	C	Riffle-Pool	a	Gravel	0 ft.	0.0	N.S.	ft.	0.00	N.D.	ft.	0.00	N.D.	2
M08	8.06	A	Cascade		Boulder	139 ft.	13.8	Low	ft.	0.00	N/A	ft.	0.00	N/A	2
M09	1.50	C	Riffle-Pool		Gravel	338 ft.	25.3	High	ft.	0.00	N.D.	ft.	0.00	N.D.	2
M10	0.03	C	Dune-Ripple		Sand	167 ft.	4.5	N.S.	ft.	0.00	N.D.	ft.	0.00	N.D.	2
M11	1.93	B	Plane Bed		Gravel	0 ft.	0.0	N.S.	ft.	0.00	N/A	ft.	0.00	N/A	2
M12	2.80	B	Plane Bed		Gravel	379 ft.	32.1	High	ft.	0.00	N/A	ft.	0.00	N/A	2

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Phase 1 - Step 7.

Bed and Bank Windshield Survey

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Step	2.11 Stream Type					7.1 Bank Erosion - Bank Height			7.2 Ice & Debris Jam Potential		
Reach ID	Ref. Stream Type	Mod Ref. Stream Type	Dominant Bedform	Subclass Slope	Dominant Bed Material	Bank Erosion	Bank Height	Impact	Type	Impact	QC
M01	C	No	Riffle-Pool		Gravel	0 ft	0 ft	N.S.	None	N.S.	2
M02	B	No	Step-Pool		Cobble	0 ft	0 ft	N.S.	None	N.S.	2
M03	B	No	Plane Bed		Gravel	0 ft	0 ft	N.S.	Debris	N.S.	2
M04	B	No	Riffle-Pool	c	Gravel	0 ft	0 ft	N.S.	Debris	Low	2
M05	B	No	Step-Pool		Cobble	0 ft	0 ft	N.S.	Debris	Low	2
M06	C	No	Riffle-Pool		Sand	28.05 ft	0 ft	N.S.	N.D.	N.S.	2
M07	C	No	Riffle-Pool	a	Gravel	0 ft	0 ft	N.S.	None	N.S.	2
M08	A	No	Cascade		Boulder	0 ft	0 ft	N.S.	Debris	High	2
M09	C	No	Riffle-Pool		Gravel	0 ft	0 ft	N.S.	None	N.S.	2
M10	C	No	Dune-Ripple		Sand	0 ft	0 ft	N.S.	N.E.	N.S.	2
M11	B	No	Plane Bed		Gravel	0 ft	0 ft	N.S.	Debris	High	2
M12	B	No	Plane Bed		Gravel	0 ft	0 ft	N.S.	None	N.S.	2

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Phase 1 - Step 8. Stream and Watershed Impact Rating

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

	Stream Type				Confine-ment	Water-shed	Step Number with Impact Score																	
							| 0 = Not Significant or No Data or N. E. or Unknown or N/A | 1 = Low | 2 = High																Total	Priority	
Reach ID	Stream Type	Bed Material	Subclass 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	Ranking	QC
M01	C	Gravel		Riffle-Pool	VB	19.3sq mi	1	2	0	0	0	0	1	0	0	1	0	0	0	0	0	0	5		2
M02	B	Cobble		Step-Pool	NC	19.2sq mi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		2
M03	B	Gravel		Plane Bed	NW	19.0sq mi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		2
M04	B	Gravel	c	Riffle-Pool	SC	18.4sq mi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2		2
M05	B	Cobble		Step-Pool	NC	18.3sq mi	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3		2
M06	C	Sand		Riffle-Pool	BD	18.0sq mi	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2		2
M07	C	Gravel	a	Riffle-Pool	BD	16.3sq mi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		2
M08	A	Boulder		Cascade	NC	16.1sq mi	1	2	0	0	0	0	1	0	2	1	2	0	0	0	0	2	11		2
M09	C	Gravel		Riffle-Pool	NW	16.0sq mi	1	2	0	0	0	0	2	0	2	0	0	0	0	0	0	0	7		2
M10	C	Sand		Dune-Ripple	VB	15.9sq mi	1	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	5		2
M11	B	Gravel		Plane Bed	NW	15.1sq mi	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3		2
M12	B	Gravel		Plane Bed	NW	14.6sq mi	1	1	0	0	0	0	2	0	2	0	1	0	0	0	0	0	7		2

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Phase 1 - Step 8.

Summary of Categorical Impacts

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

		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	Floodplane Modification out of 12	Bed & Bank Survey out of 4	QC
M01	Green River	C	Gravel		Riffle-Pool	5	3	1	1	0	2
M02	Green River	B	Cobble		Step-Pool	1	1	0	0	0	2
M03	Green River	B	Gravel		Plane Bed	1	1	0	0	0	2
M04	Green River	B	Gravel	c	Riffle-Pool	2	1	0	0	1	2
M05	Green River	B	Cobble		Step-Pool	3	1	0	1	1	2
M06	Green River	C	Sand		Riffle-Pool	2	1	0	1	0	2
M07	Green River	C	Gravel	a	Riffle-Pool	1	1	0	0	0	2
M08	Green River	A	Boulder		Cascade	11	3	1	5	2	2
M09	Green River	C	Gravel		Riffle-Pool	7	3	2	2	0	2
M10	Green River	C	Sand		Dune-Ripple	5	3	0	2	0	2
M11	Green River	B	Gravel		Plane Bed	3	1	0	0	2	2
M12	Green River	B	Gravel		Plane Bed	7	2	2	3	0	2
					Total Scores	48 out of 384	21 out of 72	6 out of 120	15 out of 144	6 out of 48	
					Percent of Each Impact Category	12.50%	29.17%	5.00%	10.42%	12.50%	

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Phase 1 - Step 9. Adjustment Process and Reach Condition

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** **Stream Name:** All QA Status: **Step 2 done**

		Stream Type						9.1 Predicted Adjustment Scores				9.2 Reach Condition		9.3	
Reach ID	Confinement Type	Stream Type	Bed Material	Subclass Slope	Bedform	Watershed Area	Total Impact	Degrad.	Aggrad.	Widen.	Planf.	Project	Statewide	Reach Sensitivity	QC
M01	VB	C	Gravel		Riffle-Pool	19.3 sq. mi.	5	3	3	0	1	Good	Reference	High	2
M02	NC	B	Cobble		Step-Pool	19.2 sq. mi.	1	2	1	0	0	Reference	Reference	Moderate	2
M03	NW	B	Gravel		Plane Bed	19.0 sq. mi.	1	2	1	0	0	Reference	Reference	Moderate	2
M04	SC	B	Gravel	c	Riffle-Pool	18.4 sq. mi.	2	2	1	0	0	Reference	Reference	Moderate	2
M05	NC	B	Cobble		Step-Pool	18.3 sq. mi.	3	2	1	0	0	Reference	Reference	Moderate	2
M06	BD	C	Sand		Riffle-Pool	18.0 sq. mi.	2	2	1	0	0	Reference	Reference	High	2
M07	BD	C	Gravel	a	Riffle-Pool	16.3 sq. mi.	1	2	1	0	0	Reference	Reference	High	2
M08	NC	A	Boulder		Cascade	16.1 sq. mi.	11	5	7	5	0	Fair	Good	Very Low	2
M09	NW	C	Gravel		Riffle-Pool	16.0 sq. mi.	7	6	5	3	5	Poor	Good	High	2
M10	VB	C	Sand		Dune-Ripple	15.9 sq. mi.	5	4	3	0	0	Good	Reference	High	2
M11	NW	B	Gravel		Plane Bed	15.1 sq. mi.	3	2	3	0	0	Good	Reference	Moderate	2
M12	NW	B	Gravel		Plane Bed	14.6 sq. mi.	7	6	4	2	4	Fair	Good	Moderate	2

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M01**
SGAT Version: **4.53**
Date Last Edited: **January, 17 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location

1.1 Reach Description: **This reach begins at the confluence of the stream with the Lamoille River, in the Town of Wolcott. Continues for about 1700 feet, about 1100 feet after crossing under Route 15.**

1.2 Towns: **Wolcott**

1.3 Downstream Latitude: **44.5720129064**

1.3 Downstream Longitude: **-72.5156134928**

Step 2. Stream Type

2.1 Elevation Upstream: **705**
2.1 Elevation Downstream: **666**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,526.0** ft. **0.29** Miles
2.3 Valley Slope: **2.6**
2.4 Channel Length: **1,578.0** ft. **0.30** Miles
2.5 Channel Slope: **2.47 %**
2.6 Sinuosity: **1.03**
2.7 Watershed Area: **19.3** Square Miles
2.8 Channel Width: **48.2** feet
2.9 Valley Width: **503.0** feet
2.10 Confinement Ratio: **10.4**
2.10 Confinement Type: **Very Broad**
2.11 Reference Stream Type: **C**
Bedform: **Riffle-Pool**
Sub-Class Slope:
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **None**
3.3 Dominant Geological Mat.: **Alluvial** **92.0** %
3.3 Sub-dom. Geological Mat.: **Ice-Contact**
3.4 Valley Slope Left: **Flat**
3.4 Valley Slope Right: **Flat**
3.5 Soils
Hydrologic Group: **B** **92.0** %
Flooding: **Occasional** **92.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **slight** **7.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **34.0** %
Current Sub-Dominant Land Cover: **Crop**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:		
Sub-dominant:		
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **None**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **1** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **117.5** **7.4** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **101.8** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **None**

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	7.1	7.3	Total
1 Low	2 High	0 N.D.	0 N.S.	0 N.S.	0 N.S.	1 Low	0 N.S.	0 Unk.	1 Low	0 N.S.	0 N.S.	0 N.D.	0 N.D.	0 N.S.	0 N.S.	5

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M02**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for about 1400 feet. There are no significant reference points along this reach.**

1.1 Reach Description:
1.2 Towns: **Wolcott**
1.3 Downstream Latitude: **44.5758489957**
1.3 Downstream Longitude: **-72.5177285803**

Step 2. Stream Type

2.1 Elevation Upstream: **761**
2.1 Elevation Downstream: **705**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,378.0** ft. **0.26** Miles
2.3 Valley Slope: **4.1**
2.4 Channel Length: **1,399.0** ft. **0.26** Miles
2.5 Channel Slope: **4.00 %**
2.6 Sinuosity: **1.02**
2.7 Watershed Area: **19.2** Square Miles
2.8 Channel Width: **48.1** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrowly Confined**
2.11 Reference Stream Type: **B**
Bedform: **Step-Pool**
Sub-Class Slope:
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Ice-Contact** **100.0** %
3.3 Sub-dom. Geological Mat.:
3.4 Valley Slope Left: **Hilly**
3.4 Valley Slope Right: **Steep**
3.5 Soils
Hydrologic Group: **A** **100.0** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **Very Severe** **100.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **61.0** %
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **None**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Rato: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **None**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	0 N.S.	0 N.S.	0 N/A	0 N/A	0 N.S.	0 N.S.	1

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M03**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location

1.1 Reach Description: **Continues for about 4500 feet. Crosses in to the Town of Hyde Park. There are no significant reference points along this reach.**

1.2 Towns: **Hyde Park, Wolcott**

1.3 Downstream Latitude: **44.5794305402**
1.3 Downstream Longitude: **-72.5165984665**

Step 2. Stream Type

2.1 Elevation Upstream: **899**
2.1 Elevation Downstream: **761**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **4,321.0** ft. **0.82** Miles
2.3 Valley Slope: **3.2**
2.4 Channel Length: **4,638.0** ft. **0.88** Miles
2.5 Channel Slope: **2.98 %**
2.6 Sinuosity: **1.07**
2.7 Watershed Area: **19.0** Square Miles
2.8 Channel Width: **47.9** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrow**
2.11 Reference Stream Type: **B**
Bedform: **Plane Bed**
Sub-Class Slope:
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Ice-Contact** **91.0** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Steep**
3.4 Valley Slope Right: **Steep**
3.5 Soils
Hydrologic Group: **A** **91.0** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **Very Severe** **99.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **66.0** %
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Rato: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **Debris**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	0 N.S.	0 N.S.	0 N/A	0 N/A	0 N.S.	0 N.S.	1

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M04**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for just over 800 feet. There are no significant reference points along this reach.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.5885039274**
1.3 Downstream Longitude: **-72.5238153409**

Step 2. Stream Type

2.1 Elevation Upstream: **909**
2.1 Elevation Downstream: **899**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **851.0** ft. **0.16** Miles
2.3 Valley Slope: **1.2**
2.4 Channel Length: **879.0** ft. **0.17** Miles
2.5 Channel Slope: **1.14 %**
2.6 Sinuosity: **1.03**
2.7 Watershed Area: **18.4** Square Miles
2.8 Channel Width: **47.1** feet
2.9 Valley Width: **101.0** feet
2.10 Confinement Ratio: **2.1**
2.10 Confinement Type: **Semi-confined**
2.11 Reference Stream Type: **B**
Bedform: **Riffle-Pool**
Sub-Class Slope: **c**
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Till** **100.0** %
3.3 Sub-dom. Geological Mat.:
3.4 Valley Slope Left: **Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **C** **82.0** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **Very Severe** **100.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **82.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **56.0** %
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Rato: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **Debris**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	0 N.S.	0 N.S.	0 N/A	0 N/A	0 N.S.	1 Low	2

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M05**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for just over 1500 feet. There are no significant reference points along this reach.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.5904823118**
1.3 Downstream Longitude: **-72.5252652744**

Step 2. Stream Type

2.1 Elevation Upstream: **960**
2.1 Elevation Downstream: **909**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,523.0** ft. **0.29** Miles
2.3 Valley Slope: **3.3**
2.4 Channel Length: **1,573.0** ft. **0.30** Miles
2.5 Channel Slope: **3.24 %**
2.6 Sinuosity: **1.03**
2.7 Watershed Area: **18.3** Square Miles
2.8 Channel Width: **47.0** feet
2.9 Valley Width: **93.0** feet
2.10 Confinement Ratio: **2.0**
2.10 Confinement Type: **Narrowly Confined**
2.11 Reference Stream Type: **B**
Bedform: **Step-Pool**
Sub-Class Slope:
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **None**
3.3 Dominant Geological Mat.: **Ice-Contact** **82.0** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **A** **82.0** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **Very Severe** **100.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **82.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **64.0** %
Current Sub-Dominant Land Cover:

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Rato: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **Debris**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	1 Low	0 N.S.	0 N/A	0 N/A	0 N.S.	1 Low	3

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M06**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for about a quarter mile upstream to a tributary entering from the northeast.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.5944845616**
1.3 Downstream Longitude: **-72.5266095**

Step 2. Stream Type

2.1 Elevation Upstream: **970**
2.1 Elevation Downstream: **960**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **2,215.0** ft. **0.42** Miles
2.3 Valley Slope: **0.5**
2.4 Channel Length: **3,886.0** ft. **0.74** Miles
2.5 Channel Slope: **0.26 %**
2.6 Sinuosity: **1.75**
2.7 Watershed Area: **18.0** Square Miles
2.8 Channel Width: **46.7** feet
2.9 Valley Width: **450.0** feet
2.10 Confinement Ratio: **9.6**
2.10 Confinement Type: **Broad**
2.11 Reference Stream Type: **C**
Bedform: **Riffle-Pool**
Sub-Class Slope:
Bed Material: **Sand**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Ice-Contact** **100.0** %
3.3 Sub-dom. Geological Mat.:
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **A** **100.0** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **Very Severe** **99.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **82.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **74.0** %
Current Sub-Dominant Land Cover: **Crop**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **None**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration:
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **28.05** ft
7.2 Bank Height: **Low** ft
7.3 Ice/Debris Jam Potential: **No Data**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	1 Low	0 N.S.	0 N.D.	0 N.D.	0 N.S.	0 N.S.	2

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M07**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for a quarter mile. There are no significant reference points along this reach.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.5997818744**
1.3 Downstream Longitude: **-72.5295458752**

Step 2. Stream Type

2.1 Elevation Upstream: **1,027**
2.1 Elevation Downstream: **970**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,343.0** ft. **0.25** Miles
2.3 Valley Slope: **4.2**
2.4 Channel Length: **1,401.0** ft. **0.27** Miles
2.5 Channel Slope: **4.07 %**
2.6 Sinuosity: **1.04**
2.7 Watershed Area: **16.3** Square Miles
2.8 Channel Width: **44.7** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Broad**
2.11 Reference Stream Type: **C**
Bedform: **Riffle-Pool**
Sub-Class Slope: **a**
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Ice-Contact** **100.0** %
3.3 Sub-dom. Geological Mat.:
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **A** **100.0** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **100.0** %
Erodibility: **Very Severe** **100.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **52.0** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **None**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	0 N.S.	0 N.S.	0 N.D.	0 N.D.	0 N.S.	0 N.S.	1

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M08**
SGAT Version: **4.53**
Date Last Edited: **April, 01 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for just over 1000 feet, about 150 feet past Garfield Road.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.6011439662**
1.3 Downstream Longitude: **-72.5338798465**

Step 2. Stream Type

2.1 Elevation Upstream: **1,109**
2.1 Elevation Downstream: **1,027**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,000.0** ft. **0.19** Miles
2.3 Valley Slope: **8.2**
2.4 Channel Length: **1,017.0** ft. **0.19** Miles
2.5 Channel Slope: **8.06 %**
2.6 Sinuosity: **1.02**
2.7 Watershed Area: **16.1** Square Miles
2.8 Channel Width: **44.5** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrowly Confined**
2.11 Reference Stream Type: **A**
Bedform: **Cascade**
Sub-Class Slope:
Bed Material: **Boulder**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Ice-Contact** **86.0** %
3.3 Sub-dom. Geological Mat.: **Alluvial**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **A** **86.0** %
Flooding: **None/Rare** **89.0** %
Water Table Deep: **6.0** **89.0** %
Water Table Shallow: **6.0** **89.0** %
Erodibility: **Very Severe** **89.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **38.0** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**51-100**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **1** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **140.0** **13.8** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **216.4** ft. **21.3**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **128.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Ratio: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **Debris**

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	7.1	7.3	Total
1 Low	2 High	0 N.D.	0 N.S.	0 N.S.	0 N.S.	1 Low	0 N.S.	2 High	1 Low	2 High	0 N.S.	0 N/A	0 N/A	0 N.S.	2 High	11

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M09**
SGAT Version: **4.53**
Date Last Edited: **April, 02 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for about 1300 feet to a tributary entering from the northwest.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.6034755972**
1.3 Downstream Longitude: **-72.5350278717**

Step 2. Stream Type

2.1 Elevation Upstream: **1,129**
2.1 Elevation Downstream: **1,109**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,301.0** ft. **0.25** Miles
2.3 Valley Slope: **1.5**
2.4 Channel Length: **1,336.0** ft. **0.25** Miles
2.5 Channel Slope: **1.50 %**
2.6 Sinuosity: **1.03**
2.7 Watershed Area: **16.0** Square Miles
2.8 Channel Width: **44.4** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrow**
2.11 Reference Stream Type: **C**
Bedform: **Riffle-Pool**
Sub-Class Slope:
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **None**
3.3 Dominant Geological Mat.: **Alluvial** **85.0** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Ext. Steep**
3.4 Valley Slope Right: **Steep**
3.5 Soils
Hydrologic Group: **Not Rated** **85.0** %
Flooding: **Frequent** **85.0** %
Water Table Deep: **0.5** **85.0** %
Water Table Shallow: **0.0** **85.0** %
Erodibility: **slight** **14.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **45.0** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**26-50**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **338.2** **25.3** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **1,331.3** ft. **99.7**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **None**

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	7.1	7.3	Total
1 Low	2 High	0 N.D.	0 N.S.	0 N.S.	0 N.S.	2 High	0 N.S.	2 High	0 N.S.	0 N.S.	0 N.S.	0 N.D.	0 N.D.	0 N.S.	0 N.S.	7

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M10**
SGAT Version: **4.53**
Date Last Edited: **April, 02 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for about three quarters of a mile, about a half mile past a wooden bridge on a dirt road.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.6069541599**
1.3 Downstream Longitude: **-72.534177525**

Step 2. Stream Type

2.1 Elevation Upstream: **1,130**
2.1 Elevation Downstream: **1,129**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **3,123.0** ft. **0.59** Miles
2.3 Valley Slope: **0.0**
2.4 Channel Length: **3,762.0** ft. **0.71** Miles
2.5 Channel Slope: **0.03 %**
2.6 Sinuosity: **1.20**
2.7 Watershed Area: **15.9** Square Miles
2.8 Channel Width: **44.2** feet
2.9 Valley Width: **442.0** feet
2.10 Confinement Ratio: **10.0**
2.10 Confinement Type: **Very Broad**
2.11 Reference Stream Type: **C**
Bedform: **Dune-Ripple**
Sub-Class Slope:
Bed Material: **Sand**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **None**
3.3 Dominant Geological Mat.: **Alluvial** **79.0** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **Not Rated** **79.0** %
Flooding: **Frequent** **79.0** %
Water Table Deep: **0.5** **79.0** %
Water Table Shallow: **0.0** **79.0** %
Erodibility: **slight** **19.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Wetland**
Current Dominant Land Cover: **Forest** **55.0** %
Current Sub-Dominant Land Cover: **Wetland**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**26-50**	**26-50**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **167.6** **4.5** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **1,551.8** ft. **41.2**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **None**
6.4 Meander Migration:
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **Not Evaluated**

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	7.1	7.3	Total
1 Low	2 High	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	2 High	0 N.S.	0 N.S.	0 N.S.	0 N.D.	0 N.D.	0 N.S.	0 N.S.	5

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M11**
SGAT Version: **4.53**
Date Last Edited: **April, 02 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for a little over a half mile, about 1000 feet past a large beaver pond that makes up most of this reach.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.6151066254**
1.3 Downstream Longitude: **-72.5337877818**

Step 2. Stream Type

2.1 Elevation Upstream: **1,194**
2.1 Elevation Downstream: **1,130**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **2,878.0** ft. **0.55** Miles
2.3 Valley Slope: **2.2**
2.4 Channel Length: **3,312.0** ft. **0.63** Miles
2.5 Channel Slope: **1.93 %**
2.6 Sinuosity: **1.15**
2.7 Watershed Area: **15.1** Square Miles
2.8 Channel Width: **43.3** feet
2.9 Valley Width: **214.0** feet
2.10 Confinement Ratio: **4.9**
2.10 Confinement Type: **Narrow**
2.11 Reference Stream Type: **B**
Bedform: **Plane Bed**
Sub-Class Slope:
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **None**
3.3 Dominant Geological Mat.: **Alluvial** **85.0** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Ext. Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **Not Rated** **85.0** %
Flooding: **Frequent** **85.0** %
Water Table Deep: **0.5** **85.0** %
Water Table Shallow: **0.0** **85.0** %
Erodibility: **slight** **14.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Wetland**
Current Dominant Land Cover: **Forest** **62.0** %
Current Sub-Dominant Land Cover: **Wetland**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **Side**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Ratio: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **Debris**

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	7.1	7.3	Total
1 Low	0 N.S.	0 N.D.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 Unk.	0 N.S.	0 N.S.	0 N.S.	0 N/A	0 N/A	0 N.S.	2 High	3

Green River

Phase 1 - Reach Summary Report

Basin: **Lamoille**
Stream Name: **Green River**
Topo Maps: **EDEN, MORRISVILLE**
Watershed: **Lamoille River**
Sub-watershed: **Lamoille River -- headwaters to Gihon River**

Reach ID: **M12**
SGAT Version: **4.53**
Date Last Edited: **April, 02 2008**
QA Status: **Step 2 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Continues for just over 1000 feet to a dam at the southwestern side of the Green River Reservoir.**

1.1 Reach Description:
1.2 Towns: **Hyde Park**
1.3 Downstream Latitude: **44.6225777441**
1.3 Downstream Longitude: **-72.5323114635**

Step 2. Stream Type

2.1 Elevation Upstream: **1,227**
2.1 Elevation Downstream: **1,194**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **1,170.0** ft. **0.22** Miles
2.3 Valley Slope: **2.8**
2.4 Channel Length: **1,180.0** ft. **0.22** Miles
2.5 Channel Slope: **2.80 %**
2.6 Sinuosity: **1.01**
2.7 Watershed Area: **14.6** Square Miles
2.8 Channel Width: **42.7** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrow**
2.11 Reference Stream Type: **B**
Bedform: **Plane Bed**
Sub-Class Slope:
Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Dam**
3.3 Dominant Geological Mat.: **Till** **69.0** %
3.3 Sub-dom. Geological Mat.: **Alluvial**
3.4 Valley Slope Left: **Ext. Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **D** **69.0** %
Flooding: **None/Rare** **69.0** %
Water Table Deep: **6.0** **69.0** %
Water Table Shallow: **6.0** **69.0** %
Erodibility: **Severe** **69.0** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **83.0** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **44.0** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**None**	**None**
Length w / less than 25 ft.:	ft.	ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old): **None**
Type:
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **43.7** **3.7** %
Left: **43.7** ft. Right: **0.0** ft.
5.4 Channel Straightening: **379.1** **32.1** %
5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **377.1** ft. **32.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration:
6.5 Meander Width: **N/A** Rato: **0.0**
6.6 Wavelength: **N/A** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **0** ft
7.2 Bank Height: **No Data** ft
7.3 Ice/Debris Jam Potential: **None**

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	7.1	7.3	Total
1 Low	1 Low	0 N.D.	0 N.S.	0 N.S.	0 N.S.	2 High	0 N.S.	2 High	0 N.S.	1 Low	0 N.S.	0 N/A	0 N/A	0 N.S.	0 N.S.	7

Stream Geomorphic Assessment

VERMONT Agency of Natural Resouces

VT DEC

Vermont.gov

August, 01 2011

Phase 1 Project Metadata

Green River

Basin: **Lamoille** Watershed: **Lamoille River** SGAT Version: **4.53**

Sub-Watershed: **Lamoille River -- headwaters to Gihon River** QA Status: **Step 2 done**

Parameter Description	Metadata
Alluvial fan	1:24K topos, field obs.
Bank armoring and revetments	1:24K topos, 1:5K orthos, files, field obs.
Bank erosion - relative magnitude	Field obs. along entire reach
Dominant bed form and material	Preliminary estimate
Belt width	1:5K NHD, 1:5K orthos
Berms and roads	1:24K topos, 1:5K orthos, files
Bridges and culverts	1:24K topos, 1:5K NHD & orthos, files, field obs.
Channel length	SGAT automated
Channel straightening	1:24K topos, 1:5K NHD & orthos, files, field obs.
Confinement type	1:24K topos
Corridor land use - land cover data	Land use - land cover (1990s statewide)
Corridor soil data	NRCS soil survey maps - updated 2005
Debris and ice jam potential	Field obs. along entire reach
Depositional features	1:5K orthos, field obs.
Dredging and gravel mining history	Interviews - DEC, NRCS
Downstream and upstream elevations	1:24K topos
Flow regulations and water withdrawals	1:24K topos, 1:5K NHD & orthos
Grade controls	1:24K topos, field obs.
Latitude and Longitude	SGAT automated
Meander centerline	1:24K topos, 1:5K NHD
Meander migration and channel avulsion	1:5K orthos (1990s & 1970s), other aerial photos
Historic corridor land use - land cover	1:5K orthos (1970s), old aerial photos, topos
Historic watershed land use - land cover	1:5K orthos (1970s), old aerial photos, topos
Reach breaks	1:24K topos, 1:5K NHD
Riparian buffer width	Digitial corridor land use - land cover
River corridor development	1:24K topos, 1:5K orthos, files
Stream type	1:24K topos
Towns that reaches are in	1:24K topos
Valley length	SGAT automated
Valley side slopes	1:24K topos, field obs.
Valley walls	1:24K topos
Valley width	SGAT automated
Groundwater and small tributary inputs	1:5K NHD, NWI maps, field obs.
Wavelength	1:5K NHD, 1:5K orthos
Watershed delineations	1:24K topos, 1:5K NHD
Watershed land use - land cover data	Land use - land cover (1990s statewide)