Kingsbury Branch of the Winooski River Watershed River Corridor Plan October 2008



Bear Creek Environmental, LLC Friends of Winooski River Central Vermont Regional Planning Commission



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I.0 EXECUTIVE SUMMARY

In 2007, the Friends of the Winooski River (FWR), the Winooski Natural Resource Conservation District (WNRCD) and the Central Vermont Regional Planning Commission (CVRPC) completed a Phase I Stream Geomorphic Assessment of the Kingsbury Branch watershed following the protocol developed by the Vermont Agency of Natural Resources (VANR). These partners hired Bear Creek Environmental to conduct Phase 2 assessment work on the Kingsbury mainstem from its confluence with the Winooski River up to its outlet from Woodbury Lake. The Phase 2 assessment also included the lower six reaches of Pekin Brook. In total approximately 18 miles of river were assessed as part of the Phase 2 field work. The project was funded through the Vermont Clean and Clear Program, and the Vermont Department of Environmental Conservation, River Management program, provided technical expertise for both the Phase I and 2 assessments.

During Phase I seventy two river reaches, encompassing fifty three stream miles were assessed. River reaches that are impounded by lakes, ponds, and wetlands were not assessed. Tables summarizing the results of Phase I can be found later in this document. The Phase I results were an important component to selecting the reaches that were more fully assessed in Phase 2.

The Phase 2 stream geomorphic assessment included field observations and measurements that are used to verify the Phase I study, to determine the channel adjustment process, and the stream geomorphic condition, aquatic habitat condition, and quality of the riparian corridor. The collection and synthesis of this information can be used in watershed planning, for the establishment of fluvial erosion hazard zones, and for the identification of watershed improvement projects. A short summary of the Phase 2 results is as follows:

- The upper reaches of the mainstem in Calais (from East Calais Village to Woodbury Lake) are in fair to good condition. These reaches generally have good floodplain access.
- From East Calais village downstream to the confluence of Pekin Brook the Kingsbury Branch is generally moderately incised; however there is one section that has good floodplain access. The reach of the Kingsbury Branch, located immediately upstream of the Pekin Brook confluence, is heavily influenced by beavers.
- The section from Pekin Brook downstream to the Kingsbury Hydroelectric Facility is strongly influenced by North Montpelier Pond.

- The mainstem of the Kingsbury Branch in East Montpelier is much more incised. This incision may be a result of this section being sediment starved below the Kingsbury dam.
- The majority of Pekin Brook has good floodplain access. The exception is segment (T3.06-B) that includes the town hall property. This segment is highly incised but is relatively stable.

Over 20 restoration and protection projects were identified using information collected as part of the Phase 2 assessment. Four high priority projects have been identified that provide opportunities to protect the river corridor and improve the riparian buffer. Several of these landowners may be eligible for the Conservation Reserve Enhancement Program. Corridor easements will be pursued in areas that are identified as important to sediment attenuation either because of adjustment processes or because these areas are in regime and are currently providing this function. FWR and WNRCD plan to conduct outreach to target landowners in areas identified in this river corridor plan as high priority.

2.0 LOCAL PLANNING PROGRAM OVERVIEW

2.1 RIVER CORRIDOR PLANNING TEAM

The River Corridor planning Team for the Kingsbury Branch of the Winooski River is comprised of Friends of the Winooski River, Central Vermont Regional Planning Commission (CVRPC), the Vermont Department of Environmental Conservation (DEC), Bear Creek Environmental (BCE), the Winooski Natural Resource Conservation District (WNRCD), volunteers and landowners. The CVRPC, FWR, and WNRCD completed the Phase I Assessment of the Kingsbury Branch Wateshed. Bear Creek Environmental was retained by FWR and partners as part of a grant with the Vermont River Management Program, to conduct a Phase 2 Stream Geomorphic Assessment of the Kingsbury Branch main stem and Pekin Brook. Gretchen Alexander from the Vermont River Management Section of the Vermont Agency of Natural Resources (VANR) provided technical guidance for this project.

2.2 GOALS AND OBJECTIVES OF THE PROJECT

2.2.1 State River Management Goals and Objectives

The State of Vermont's River Management Program has set out several goals and objectives that are supportive of the local initiative in the Kingsbury Branch watershed. The state management goal is to, "manage toward, protect, and restore the fluvial geomorphic equilibrium condition of Vermont rivers by resolving conflicts between human investments and river dynamics in the most economically and ecologically sustainable manner." (Vermont Agency of Natural Resources, 2007c) The objectives of the Program are to avoid damage to investments due to fluvial erosion hazards, to reduce sediment and nutrient loads, and to restore and protect aquatic and riparian habitat. Additionally, the Vermont River Management Program has set out to provide funding and technical assistance to facilitate an understanding of river instability and the establishment of well developed and appropriately scaled strategies to protect and restore river equilibrium.

2.2.2 Local Goals and Objectives

A community-based river corridor management plan provides many opportunities for enhancing and restoring the Kingsbury Branch watershed. The corridor plan addresses many of the concerns voiced by residents of the Kingsbury Branch watershed including lack of riparian buffers, fluvial erosion damage to property and its negative impact on stream health, impact of development and loss of wildlife habitat.

Specifically, recommendations in the plan can be used to:

- Improve the water quality and biological integrity of the Kingsbury Branch and Pekin Brook
- Increase the recreational resource
- Restore river corridor functions
- Reduce erosion and flood hazards
- Protect existing flood and sediment attenuation areas

3.0 BACKGROUND WATERSHED INFORMATION

3.1 Geographic Setting

The Kingbury Branch watershed has an area of 53 square miles and lies within the Winooski River Watershed, which is one of the major rivers in Vermont within the Lake Champlain Basin (Figure 1). Located in the upper part of the Winooski River Watershed, the Kingsbury Branch begins in the Town of Woodbury, flows through Calais and enters the Winooski River in East Montpelier. The portion of the watershed that was studied in 2007 using the Phase 2 protocol lies within the Towns of Calais and East Montpelier. The Kingsbury Branch watershed falls under the jurisdiction of the Central Vermont Regional Planning Commission.

The Kingsbury Branch watershed drains from approximately 2200 feet in elevation at Woodbury Mountain in a southerly direction and meets the Winooski River near Cate Farm Road in East Montpelier at approximately 690 feet above sea level. The Phase 2 study area focuses on the lower 16 reaches on the Kingsbury Branch and the lower 6 reaches of Pekin Brook. The upper-most reach within the study area on the Kingsbury Branch (M16), which begins at the outlet of Woodbury Lake (also known as Sabin Pond), is approximately 230 feet higher in elevation than the lowest reach at the confluence with the Winooski River. The upper-most reach within the study area on Pekin Brook, which begins just upstream of the intersection of Kent Hill Road and Pekin Brook Road in Calais, is approximately 80 feet higher than the lowest reach on Pekin Brook at the confluence with the Kingsbury Branch. The Kingsbury Branch flows through a very gentle gradient valley. Except for reach M12, which has a channel slope of 4.7 percent, all reaches assessed for Phase 2 in the Kingsbury Branch have a channel slope of less than I percent. Pekin Brook also flows through a valley with a very gentle gradient. All reaches assessed on Pekin Brook have a slope less than I percent.

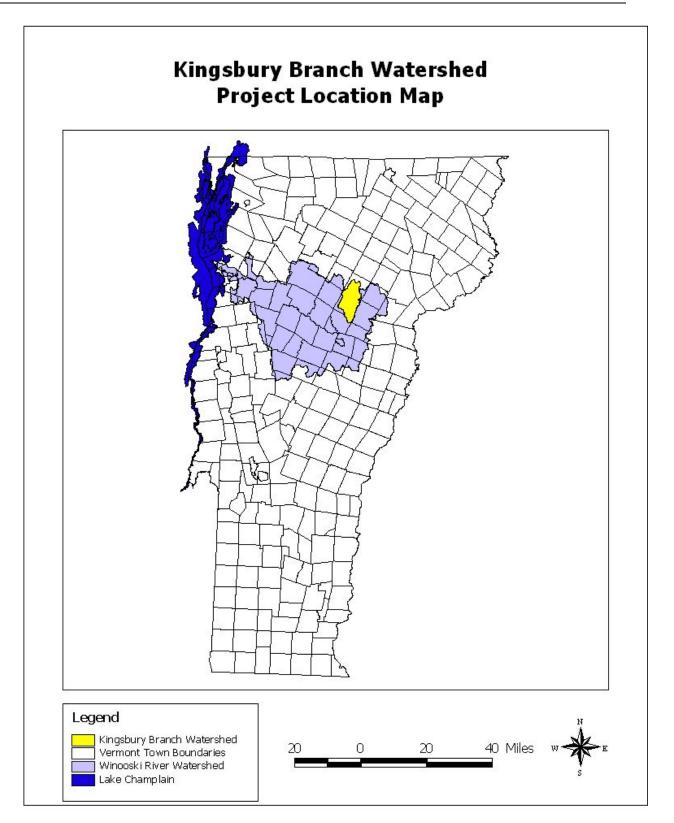


Figure 1. Project Location Map for the Kingsbury Watershed

The Kingsbury Branch watershed is dominated by forested land. However, within the Kingsbury Branch Watershed urban (residential, commercial, and industrial) land is subdominant and within the Pekin Brook Watershed cropland or urban land are subdominant land uses. As shown in Figure 2, seventy percent of the Kingsbury watershed is forest, eight percent is agriculture, ten percent is urban, eight percent is water, and four percent is wetland.

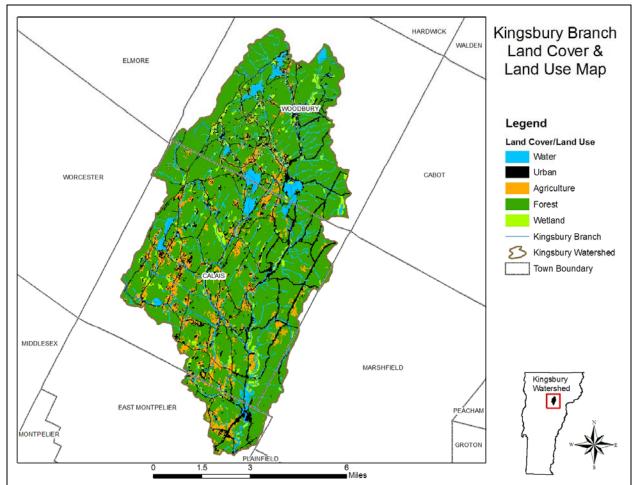


Figure 2. Land Cover & Land Use map for Kingsbury Watershed

3.2 Geologic Setting

The Kingsbury Branch Watershed is located within the Connecticut Valley Gaspe Province. This basin contains thick calcareous deposits (Doolan, 1996). This watershed was reshaped primarily by glacial activity. The last large ice sheet, the Laurentide Ice Sheet, covered all of New England and advanced up the Winooski River valley (Wright and Larsen, 2004). As the climate warmed, the glacier slowly retreated and formed glacial Lake Winooski, covering the Winooski valley and many tributaries upstream from Waterbury (Van Diver, 1987). Following the retreat of the glacier, the Winooski River and its tributaries began eroding the deposited glacial and lake sediments (Wright and Larsen, 2004). Bedrock maps of the watershed show that the watershed is primarily comprised of the Waits River Formation: a Silurian deposit of interbedded limestone and quartzite and slate, phyllite and schist (VGS, 1961). The bedrock geology of the Kingsbury Branch Watershed consists of limy sandstone and mudstone deposited during the Acadian orogeny, which was a convergence of continental masses with the western mountains (Doolan, 1996). These deposits originated from the mountains to the west (Doolan, 1996).

The dominant surficial sediments within the Kingsbury Branch Watershed are glacial lake sediments, alluvium and ice-contact deposits. In Pekin Brook, the dominant surficial sediments are alluvium and till, while subdominant deposits are comprised of alluvium, glacial lake, ice-contact deposits and till.

3.3 Geomorphic Setting

The Kingsbury Branch Watershed was divided into 94 reaches for the Phase I assessment. Phase 2 Geomorphic Assessments were conducted on the Kingsbury Branch Watershed from Woodbury Lake in Calais to the confluence of the Winooski River in East Montpelier, Vermont, including Pekin Brook from the Calais town hall to the confluence with the Kingsbury Branch (Figure 3). These reaches were selected as higher priority than upstream reaches based on results from the Phase I assessment.

Reference stream types¹ are based on the valley type, geology and climate of a region and describe what the channel would look like in the absence of human-related changes. Reference stream typing was based on both the Rosgen (1996) and Montgomery and Buffington (1997) classification systems. Table 1 shows the typical characteristics used to determine reference stream types (VANR, 2007a). The reference stream types within the Kingsbury Branch watershed strongly reflect the glacial history. Fine textured and cohesive sediments (silts and clays) resulting from glacial lake deposition are prevalent along the lower reaches of the Kingsbury River and Pekin Brook. These lower reaches are classified as "E" channels and include the section of the Kingsbury Branch from the confluence of the Winooski up to approximately Peck Hill Road (9.3 river miles) and Pekin Brook from the confluence of the Kingsbury Branch to the intersection of Pekin Brook Road and Jack Hill Road (2.3 river miles).

¹ Additional information about reference stream typing can be found on the Vermont Agency of Natural Resources web page - http://www.anr.state.vt.us/dec/waterq/rivers/docs/assessmenthandbooks/rv_weblinkpgphase1.pdf



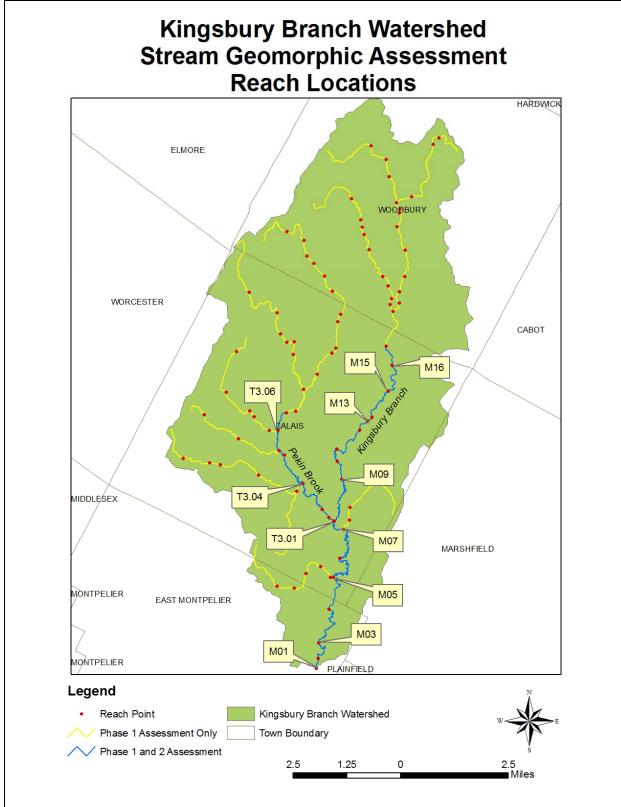


Figure 3. Reach Location Map for the Phase 2 Stream Geomorphic Assessment

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

Reference stream types for the assessed reaches are listed in Table 2. The reference stream type for reaches M01 through M10 on Kingsbury Branch and reaches T3.01 through T3.03 is type "E". These reaches have a very low slope (<1%), a low width to depth ratio, and flow through unconfined valleys. M11 has similar valley and slope conditions, but has a stream type of "C". In M12 the conditions change to a steeper gradient (~5%) and a semiconfined valley with a reference stream type of "B". The valley widens again in reach M14 with a slope less than 1% and a reference stream type of "E". Reaches 15 and 16 have unconfined valleys, slopes less than 1% and "C" reference stream types. On Pekin Brook, reaches T3.04 through T3.06, located from above the Pekin Brook Road and Jack Hill Road intersection to the Calais Town Hall are "C" channels by reference and have slightly higher slopes and larger bed material (gravel rather than sand or silt) than the lower section of Pekin Brook.

Table 2: Geomorphic Setting of Assessed Reaches						
Reach ID	Reference Stream Type	Confinement	Valley Slope	Bed Form		
M01	E	Narrow	0.16	Dune-Ripple		
M02	E	Narrow	0.24	Dune-Ripple		
M03	E	Broad	0.34	Dune-Ripple		
M05	E	Broad	0.05	Dune-Ripple		
M06	E	Broad	0.14	Dune-Ripple		

Table 2: Geomorphic Setting of Assessed Reaches						
Reach ID	Reference Stream Type	Confinement	Valley Slope	Bed Form		
M07	E	Very Broad	0.10	Dune-Ripple		
M08	E	Very Broad	0.21	Riffle-Pool		
M09	E	Broad	0.16	Riffle-Pool		
M10	E	Narrow	0.42	Riffle-Pool		
MII	С	Very Broad	0.84	Riffle-Pool		
MI2	В	Semi-confined	4.96	Plane Bed		
MI4	E	Very Broad	0.41	Riffle-Pool		
MI5	С	Very Broad	0.64	Riffle-Pool		
MI6	С	Narrow	0.45	Riffle-Pool		
T3.01	E	Broad	0.39	Dune-Ripple		
T3.02	E	Semi-confined	0.22	Dune-Ripple		
T3.03	E	Broad	0.08	Dune-Ripple		
T3.04	С	Broad	0.25	Riffle-Pool		
T3.05	С	Broad	0.62	Riffle-Pool		
T3.06	С	Broad	0.66	Riffle-Pool		

There are no alluvial fans within the assessed reaches. There are a variety of grade controls located in the reaches included in the Phase 2 assessment. On the mainstem of the Kingsbury Branch, M03 contains two ledge grade controls and there is a dam located at the upstream end of the reach. In segment M12-B there are two waterfall grade controls. There is one small ledge grade control located near the end of T3.06-B (Pekin Brook).

3.4 Hydrology

In order to better understand the flood history of the Kingsbury Branch, long term peak discharge data from the U.S. Department of the Interior, U.S. Geological Survey (USGS) gauge on the Dog River at Northfield Falls, VT (a major tributary to the Winooski) was obtained. There is no USGS gauge in the Kingsbury watershed and the Dog River gauge is in closest proximity to the Kingsbury watershed. The Dog River gauge provides a continuous record of flow from 1935 through the present. The drainage area at the Dog River gauge is 76 square miles. The confluence of this tributary with the Winooski River is located at the terminal point of the study area.

The Dog River record shows that the 10 year discharge was exceeded in water years 1952, 1976, 1987 and 1989 and between a 25 and 50 year discharge occurred in 1938. During water year 1973, the peak discharge exceeded the projected 50 year discharge. A graph of the flood frequency analysis is provided in Figure 4.

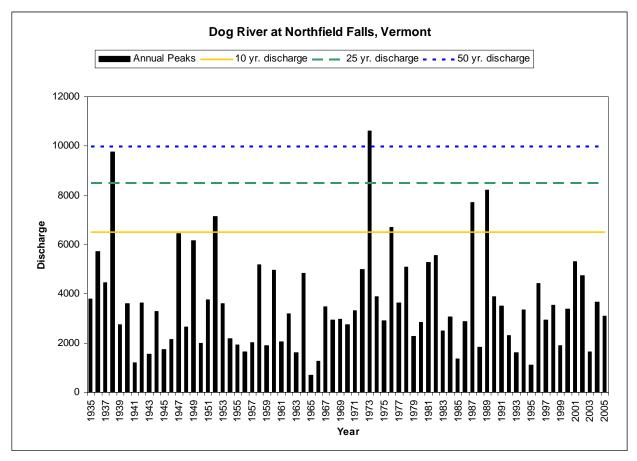


Figure 4: Flood frequency analysis for the Dog River.

Between 1995 and 1998 Vermonters suffered nearly \$60,000,000 in flood damages; much of these losses were avoidable (Vermont Agency of Natural Resources, 2006). Through Vermont's history, flood waters on the Winooski River and its tributaries have destroyed property on numerous occasions.

In recent history, local flooding occurred during a heavy rainstorm in July of 2007. One location on Pekin Brook flooded across the road where a bridge crosses the stream (just upstream from the intersection of George Road and Pekin Brook Road). Flood waters left the channel just before the bridge and flowed across the road and entered Pekin Brook just downstream of a meander.

3.5 Ecological Setting

The Kingsbury Branch watershed lies within the Northern Vermont Piedmont biophysical region. The Northern Vermont Piedmont is characterized by Thompson and Sorenson (2000) as being hilly with numerous rivers. The Kingsbury Branch and Pekin Brook watersheds have abundant wetlands (Figure 2). There are numerous beaver dams on both streams, which contributed to the deep water conditions and enhanced wetland habitat.

Water flow backed up from the dam at North Montpelier Pond in East Montpelier has also contributed to the creation of wetland habitat

4.0 METHODS

4.1 Phase I Methodology

A Stream Geomorphic Assessment process is divided into three phases, based on VT ANR protocols. Phase I, the remote sensing phase, involves the collection of data from topographic maps and aerial photographs, from existing studies, and from very limited field studies, called "windshield surveys." The Phase I remote sensing techniques allow for large watersheds (100-150 square miles) to be assessed within a few months time. The Phase I assessment provides an overview of the general physical nature of the watershed and helps prioritize stream reaches in need of Phase 2 assessment. As noted in the Executive Summary, 72 river reaches or 53 miles were assessed during Phase I.

4.2 Phase 2 Methodology

The Phase 2 assessment was conducted by BCE following procedures specified in the Vermont Stream Geomorphic Assessment Handbook Phase 2 (Vermont Agency of Natural Resources 2007b), and used version 4.56 of the Stream Geomorphic Assessment Tool (SGAT) GIS extension to index impacts within each reach.

4.3 Bridge and Culvert

The Bridge and Culvert Assessment and Survey Protocols specified in Appendix G of the Vermont Stream Geomorphic Assessment Handbook (Vermont Agency of Natural Resources, 2007d) were followed. All assessment data were recorded on the Agency of Natural Resources (ANR) Bridge and Culvert Assessment – Geomorphic and Habitat Parameters data sheet, and were entered into the ANR DMS. An ArcView shapefiles of stream crossings for the State of Vermont "TRANS_TRANSTRUC_POINT" was downloaded from the Vermont Center for Geographic Information. This shapefile includes stream crossings on state and town roads.

The bankfull channel width from the Phase 2 fieldwork was used to determine the expected bankfull width in the vicinity of a particular structure. Latitude and Longitude at each of the structures was determined using a Garmin Etrex Vista GPS unit. The assessment included photo documentation of the inlet, outlet, upstream, and downstream of each of the structures.

4.4 River Corridor Plan

The Vermont Agency of Natural Resources River Corridor Planning Guide (2007c) and Draft 9 of Chapter 5 of the plan dated October 2, 2007 were followed to generate a series of stressor maps. These maps were created using indexed data from the Phase I and Phase 2 Stream Geomorphic Assessments along with existing data available from VCGI, including railroads, e911 roads, e911 buildings and e911 driveways. The stressor maps were then used to identify potential project locations that have few constraints to channel adjustment.

4.5 Quality Control/Quality Assurance Procedures

To assure a high level of confidence in the Phase 2 SGA data, strict quality assurance/quality control (QA/QC) procedures were followed by BCE. These procedures involved a thorough in-house review of all data as well as automated and manual QC checks with the DEC River Management Program.

In November 2007, BCE completed its own in-house QA review after all the Phase 2 data were entered into the DMS and the Phase I data were updated. The Phase I DMS and ArcView shapefiles were updated by Mary Nealon and Pamela DeAndrea based on the Phase 2 field assessment work during the Phase 2 QA/QC process. The DMS and the ArcView shapefiles for the Kingsbury Branch Phase 2 study were submitted to Gretchen Alexander of the ANR for a Quality Assurance review in early November 2007. Some minor revisions were made by Bear Creek Environmental to the DMS following this review.

5.0 **RESULTS**

5.1 Phase I Results²

The tables below summarize the Phase I results. The Kingsbury Branch was divided into 94 reaches. Of these, only 72 reaches received a full Phase I assessment (see Table 3 for details). The remanding 22 reaches were not assessed because they were impounded by lakes, ponds, and wetlands.

	Reach Number	Number of Reaches in	Length of
Stream Name		Phase 1	Stream (feet)
Buck Lake Brook	T5	2	6465
Dugar Brook	T3.08S1	7	30623
Kingsbury Branch	Μ	21	94996
Pekin Brook	T3	15	49496
Still Brook	T2	3	13686
Sub Trib 1 to Trib 1 to Pekin	T3.03.S1.01s1		
Brook		1	10822
Trib 1 to Kingsbury Branch	T1	6	19994
Trib 1 to Pekin Brook	T3.03S1	5	22456
Trib 2 to Pekin Brook	T3.05S1	3	15210
Trib 3 to Pekin Brook	T3.05S2	5	12476
Trib 4 to Kingsbury Branch	T4	4	10239
Grand Total		72	286463

Table 3

² This section was prepared by Ann Smith of Friends of the Winooski River

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Table 4 shows the distribution of the number of stream reaches across reference bed form.

Table	e 4
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Stream Type	Cascade	Dune- Ripple	Plane Bed	Riffle- Pool	Step- Pool	Grand Total
Buck Lake Brook	1				1	2
Dugar Brook				6	1	7
Kingsbury Branch		6	2	13		21
Pekin Brook	1	3		9	2	15
Still Brook		1		1	1	3
Sub Trib 1 to Trib 1 to Pekin						
Brook				1		1
Trib 1 to Kingsbury Branch				5	1	6
Trib 1 to Pekin Brook	1			3	1	5
Trib 2 to Pekin Brook				1	2	3
Trib 3 to Pekin Brook	1			3	1	5
Trib 4 to Kingsbury Branch				4		4
Grand Total	4	10	2	46	10	72

Table 5 shows the length for each stream that has received modifications or human changes.

Table 5

Row Labels	Length of Stream that has been Armored (feet)	Length of Stream that has been Straightened (feet)	Length of Stream that has been Bermed (feet)	Length of Stream that has Corridor Development (feet)
Buck Lake Brook	630	1261	930	560
Dugar Brook	459	4108	6031	282
Kingsbury Branch	4242	24488	28661	5402
Pekin Brook	4754	18388	21286	1712
Still Brook	0	753	0	203
Sub Trib 1 to Trib 1 to Pekin				
Brook	95	1817	1443	324
Trib 1 to Kingsbury Branch	0	1690	719	375
Trib 1 to Pekin Brook	0	3236	3744	710
Trib 2 to Pekin Brook	0	999	0	275
Trib 3 to Pekin Brook	496	4715	1799	1385
Trib 4 to Kingsbury Branch	345	1071	942	713
Grand Total	11022	62527	65555	11943

Table 6 shows the ranges of impacts that were calculated based on the phase I assessment. These impacts range from 0 or no impact to 20 which is heavily impacted. These impacts helped the partners to prioritize the reaches to asses during Phase 2. As noted below, the Kingsbury Branch and Pekin Brook have the most reaches in the higher impact categories.

	Number of Reaches in Each Category			
Impact Ranges	0-5	6-10	11-15	16-20
Buck Lake Brook	1	0	1	0
Dugar Brook	2	3	1	1
Kingsbury Branch	1	8	8	4
Pekin Brook	2	3	5	5
Still Brook	2	1	0	0
Sub Trib 1 to Trib 1 to Pekin Brook	0	1	0	0
Trib 1 to Kingsbury Branch	2	4	0	0
Trib 1 to Pekin Brook	2	2	1	0
Trib 2 to Pekin Brook	2	1	0	0
Trib 3 to Pekin Brook	1	1	2	1
Trib 4 to Kingsbury Branch	0	3	1	0
Trib 2 to Pekin Brook Trib 3 to Pekin Brook	2 2 1 0	2 1 1 3	1 0 2 1	0 0 1 0

Table 6

5.2 Phase 2 Results

Reports from the Phase 2 stream geomorphic assessment are provided in Appendix I.

5.2.1 Rapid Geomorphic Assessment

The geomorphic condition for each Phase 2 reach is determined using the rapid geomorphic assessment (RGA) protocol, and is based on the degree of departure of the channel from its reference stream type (Vermont Agency of Natural Resources, 2007b). The reference condition for each of the Phase 2 reaches was previously identified in Table 2. Of the 23 segments where Phase 2 RGAs were conducted, 6 segments rated in the good category and 17 segments rated in the fair category. Figure 5 illustrates the geomorphic condition of the streams in relation to the watershed.

The dominant adjustment processes in the Kingsbury Branch watershed is planform adjustment. Several of the reaches studied in the Kingsbury Branch watershed are undergoing a channel evolution process in response to large scale changes in sediment, slope, and/or discharge associated with human influences on the watershed. This process is described in the following pages. Table 7 below summarizes the existing stream type, channel evolution stage, and the primary adjustment processes that are occurring for each study reach or segment.

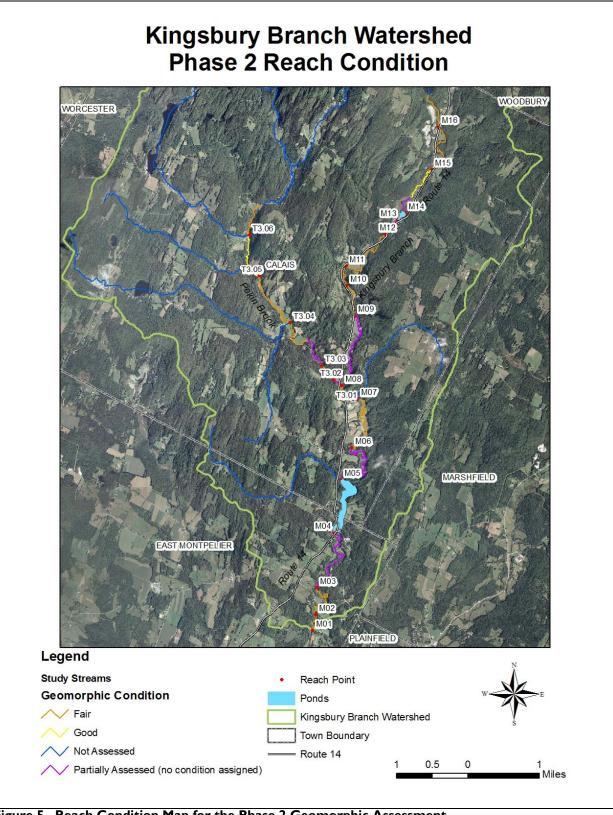


Figure 5. Reach Condition Map for the Phase 2 Geomorphic Assessment

Table 7. Stream Type and Channel Evolution Stage						
Segment Number	Entrench- ment Ratio	Width to Depth Ratio	Reference Stream Type	Existing Stream Type	Channel Evolution Stage	Active Adjustment Process
M01	4.93	12.3	E5	C5	ш	Planform Widening Aggradation
M02	6.12	16.3	E4	C4		Aggradation Widening Planform
M03		Par	tial Assessmen	t – No Prope	rty Access	
M04		N	ot Assessed – N	lorth Montpe	lier Pond	
M05		Partia	l Assessment– lı	nfluenced by I	mpoundment	
M06	10.14	8.0	E5	E5	Dllc	Aggradation Planform Widening
M07	13.58	7.9	E5	E5	Dllc	Aggradation Widening Planform
M08-A		Par	tial Assessment	– Beaver Dar	n Influence	
M08-B		Par	tial Assessment	– Beaver Dar	n Influence	
M09	10.38	11.6	E4	E4	III	Aggradation Planform Widening
M10	9.69	11.4	E4	E4	111	Aggradation Planform Widening
MII-A	15.58	19.6	C4	C4	DIId	Planform Widening Aggradation
MII-B	1.61	23.4	C4	B4c	111	Planform Widening Aggradation
MI2-A	1.62	12.6	B4	B4	III	Aggradation Planform
MI2-B			Not Asses	ssed – Bedroo	:k	
MI3			Not Assessed	– Onstream	Pond	
MI4-A				sment – Wet		
MI4-B	23.10	8.43	E5	E5	Dllc	Aggradation Planform
MI4-C	13.20	21.84	C4	C4	Dllc	Aggradation Planform Widening
MI5-A	16.13	22.77	C4	C4	DIIc	Aggradation Planform Widening

Table 7.	Table 7. Stream Type and Channel Evolution Stage							
Segment Number	Entrench- ment Ratio	Width to Depth Ratio	Reference Stream Type	Existing Stream Type	Channel Evolution Stage	Active Adjustment Process		
MI5-B	5.07	20.50	C4	C4	DIId	Planform Aggradation Widening		
M16	2.53	23.74	C4	C4	Dllc	Widening Planform Aggradation		
T3.01		Part	tial Assessment	– Beaver Dan	n Influence			
Т3.02	3.71	8.07	E5	E5	Dllc	Widening Planform Aggradation		
T3.03-A		Part	ial Assessment	– Beaver Dan	n Influence			
Т3.03-В	7.68	10.86	E5	E5	Dllc	Planform Widening Aggradation		
T3.04-A	14.41	9.06	E5	E5	Dllc	Planform Aggradation Widening		
Т3.04-В	7.91	19.13	C5	C5	Dllc	Aggradation Widening Planform		
T3.04-C	9.45	14.54	C5	C4	Dllc	Aggradation Widening Planform		
T3.05-A	11.59	25.79	C4	C4	Dllc	Aggradation Widening Planform		
Т3.05-В	3.37	27.53	C4	C4	Dllc	Aggradation Widening Planform		
T3.06-A	3.68	20.37	C4	C4	III	Aggradation Widening Planform		
Т3.06-В	9.33	14.88	C4	C4	II	Aggradation Widening Planform		
	Bold Red lettering - denotes extreme adjustment process Bold Black lettering – denotes major adjustment process Black lettering (no bold) – denotes minor adjustment process							

Both the "D" stage and "F" stage channel evolution model (Appendix C, ANR 2004) are helpful for explaining the channel adjustment processes underway in the Kingsbury Branch and Pekin Brook. The "F" stage channel evolution model is used to understand the process that occurs when a stream degrades (incises). The common stages of the "F" channel evolution stage, as depicted in Figure 8 include:

• A pre-disturbance period

- Incision channel degradation
- Aggradation and channel widening
- The gradual formation of a stable channel with access to its floodplain at a lower elevation

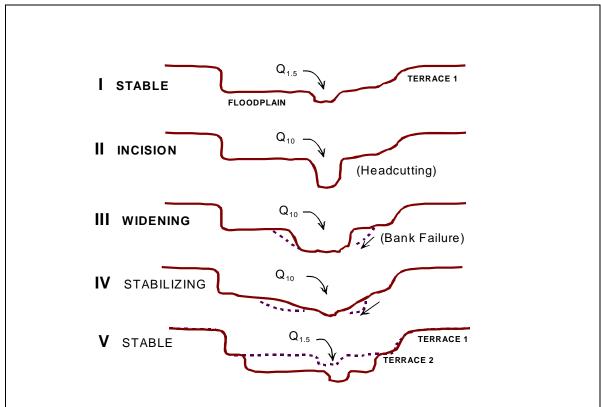


Figure 8. Typical Channel Evolution Model following incision (F-stage Channel Evolution).

Much of section of the Kingsbury Branch (reaches M12 down to M09) between Calais Village and the confluence of Pekin Brook has undergone historic incision. Channel straightening and the impact of the old mill dam likely contributed to this historic incision. In general, these reaches are in stage III of the "F" channel evolution model. This section of channel has historically incised and is going through a widening process to create a floodplain at a lower elevation. The lower three reaches of the Kingsbury Branch are also in stage III of the channel evolution model. These reaches (M03 to M01) likely incised in response to being sediment starved downstream of North Montpelier Pond. The upper reach (T3.06) on Pekin Brook have poor floodplain access; this historic incision is likely in response to the berming and channel straightening that took place in the vicinity of town hall and along Pekin Brook Road.

The bed erosion that occurs when a meandering river is straightened in its valley is a problem that translates to other sections of the stream. Localized incision will travel upstream and into tributaries eroding sediments from otherwise stable streambeds. These bed sediments will move into and clog reaches downstream leading to lateral scour and erosion of the streambanks. Channel evolution processes may take decades

to play out. Even landowners that have maintained wooded areas along their stream and riverbanks may have experienced eroding banks as stream channel slopes adjust to match the valley slopes.

It is difficult for streams to attain a new equilibrium where the placement of roads and other infrastructure has resulted in little or no valley space for the stream to access or to create a floodplain. Landowners and government agencies have repeatedly armored and bermed reaches of Vermont's rivers to contain floodwaters in channels. These efforts have proven to be temporary fixes at best, and in some cases have lead to disastrous property losses and natural resource degradation. A more effective solution is to limit encroachments within the riparian corridor and maintain a buffer of woody vegetation between the stream and adjacent land uses. Maintaining vegetated riparian corridors and offsetting development limits the conflict between property investments and the natural processes of flooding and channel migration that occurs gradually over time. Given room, a channel can adjust its shape and slope to changes in flow and sediment load. In general, the space provided by an established riparian corridor allows the river or stream system to be more resilient to watershed changes, thereby protecting the fish, wildlife, and humans that depend on Vermont's rivers and streams (Vermont Agency of Natural Resources 2005).

The majority of the channel length studied on the Kingsbury Branch and Pekin Brook during the Phase 2 assessment has adjustment processes that are best explained by the "D" stage evolution model. The more dominant adjustment process active adjustment process for the "D" stage channel evolution is aggradation, widening and planform change. Extreme deposition was noted in segments MI5-B and MII-A, making these areas important attenuation reaches.

5.2.2 Rapid Habitat Assessment

The Rapid Habitat Assessment (RHA) is used to evaluate the physical components of a stream (channel bed, banks, and riparian vegetation) and how the physical condition of the stream affects aquatic life. The results can be used to compare physical habitat condition between sites, streams, or watersheds, and also serve as a management tool in watershed planning.

Table 8 and page 64 of Appendix I shows a comparison of the habitat condition based on the Rapid Habitat Assessment (RHA) and the geomorphic condition based on the Rapid Geomorphic Assessment (RGA). For twelve of the segments both the RHA and RGA resulted in fair condition. The RGA was fair while the RHA was good for five of the segments. These segments were typically were undergoing a major adjustment process, but had good to excellent instream cover or riparian buffers resulting in a higher habitat score. Two of the segments (M15-A and T3.05-A) had a RGA score of good, while the habitat score was only fair. The lower habitat score for these segments was due to the lack of a high quality riparian buffer. Both the RGA and RHA score was good for four of the segments (M12-A, M14-B, M14-C, and T3.05-B). A variety of habitat quality was often found within a reach. For example, reach 15 had fair habitat at the lower end where it lacks a high quality buffer and had been historically straightened (Figure 9). The mid section of reach 15, which is located away from roads and development, had good habitat and contained large wood debris, high quality pools, and large trees along the banks (Figure 10).

Table 8. Comparison of RHA and RGA Scores for Phase 2 Reaches						
Segment Number	Score RGA	Score RHA	Rating RGA	Rating RHA		
M01	0.46	0.50	Fair	Fair		
M02	0.45	0.72	Fair	Good		
M06	0.59	0.59	Fair	Fair		
M07	0.61	0.59	Fair	Fair		
M09	0.52	0.54	Fair	Fair		
M10	0.45	0.64	Fair	Fair		
MII-A	0.54	0.62	Fair	Fair		
MII-B	0.52	0.71	Fair	Good		
MI2-A	0.68	0.73	Good	Good		
MI4-B	0.74	0.72	Good	Good		
MI4-C	0.65	0.70	Good	Good		
MI5-A	0.70	0.60	Good	Fair		
MI5-B	0.54	0.67	Fair	Good		
M16	0.59	0.70	Fair	Good		
—		0.40				
Т3.02	0.59	0.49	Fair	Fair		
Т3.03-В	0.62	0.55	Fair	Fair		
T3.04-A	0.56	0.60	Fair	Fair		
Т3.04-В	0.62	0.62	Fair	Fair		
T3.04-C	0.58	0.56	Fair	Fair		
T3.05-A	0.68	0.64	Good	Fair		
Т3.05-В	0.68	0.77	Good	Good		
T3.06-A	0.51	0.66	Fair	Good		
Т3.06-В	0.50	0.49	Fair	Fair		



Figure 9. Segment MI5-A rated "fair" for habitat. The segment lacked large woody debris, riparian vegetation and a diversity of pools where the channel had been historically straightened



Figure 10. This short section of M15-B had high quality habitat including excellent instream cover, deep pools, stable banks, and a high quality riparian zone.

5.2 Bridge and Culvert Assessment

Fifteen bridges/arches and four culverts were included in the assessment of stream crossings conducted during the Phase 2 field work in 2007. The geomorphic and habitat data for this bridge and culvert assessment were collected following the ANR protocol.

In order to assist local municipalities with priorities for replacement of the structures, priority lists were generated using the information and photographs taken during the assessment. The bridge span was used as a first cut in prioritizing the structures for replacement. Geomorphic stability was also considered when prioritizing bridges for replacement or retrofit. The following criteria were used to evaluate the bridges.

High Priority: Bridges with spans of approximately 50 percent of the bankfull width or less, which are significantly impeding natural sediment transport.

Moderate Priority: Bridges with spans less than 50 percent that are not causing significant geomorphic instability <u>and</u> structures with spans greater than 50% that are causing instability.

Low Priority: Stream crossing structures that are not included in either of the two categories above.

The Vermont Culvert Geomorphic Screening tool (2008a) and the Vermont Culvert Aquatic Organism Passage Screening Tool (2008b) developed by Milone and MacBroom, Inc. were used to identify culverts within the Kingsbury Branch watershed that are highest priority for replacement/retrofit due to geomorphic incompatibility and/or for being potential barriers to movement and migration of aquatic organisms.

Tables 9 (Kingsbury Branch Bridges) and Table 10 (Pekin Brook Bridges) and Table 11 (Pekin Brook Culverts) below provide a summary of the stream crossings assessed within the Kingsbury Branch watershed. Of the twelve bridge crossing on the Kingsbury Branch (see Table 9), three were identified as high priority for retrofit or replacement. The three high priority bridges on the Kingsbury Branch are located on Cate Farm Road, Still Brook Road, and Moscow Brook Road. All three of these bridges had narrow spans and were identified as interfering with sediment transport. One of the three bridges in the Pekin Brook watershed on Pekin Brook Road was also identified as high priority (see Table 10) due to a narrow span and poor alignment.

All four culverts within the Pekin Brook watershed were identified as high priority for replacement or refit. As shown in Table 11, the four culverts had narrow spans relative to the bankfull width. The Pekin Brook culvert met the criteria for allowing aquatic organism passage, but was identified as being mostly incompatible for geomorphic stability. The Peck Hill culvert also appeared to meet the criteria for aquatic organism passage and was identified as partially incompatible in terms of geomorphic stability. The highest priority stream crossing within the watershed is on Kent Hill Road. This structure was identified as blocking aquatic organism passage and resulting in full geomorphic incompatibility. The culvert on Singleton Road was identified as having the potential to reduce aquatic organism passage as well as being partially incompatible.

Reach/	Structure No.	Structure	Road Name/	% Channel Width	Blocks AOP	Problems Noted		Priority for
Segment No.		Туре	Location	vvidth		Sediment Transport	Alignment	Replacement
M01	101207002112071	Bridge	Cate Farm Road	34	NA			High
M03	200037007112072	Bridge	Route 14 N	74	NA			Low
M05	101205002812051	Bridge	Max Gray Road	74	NA			Low
M06	70000000412053	Bridge	Farm Access	59	NA			Low
M06	70000000312053	Bridge	Farm Road	73	NA			Low
M08	40000000012051	Bridge	Still Brook Road	32	NA			High
M09	70000000112053	Bridge	Driveway	52	NA			Low
MH	200037007712052	Bridge	Route 14	114	NA			Moderate
MH	70000000212053	Bridge	Private Snowmobile Bridge	89	NA	V		Moderate
M12	401205002712051	Bridge	Moscow Woods Road	29	NA	V		High
M15	200037008212052	Bridge	Route 14	100	NA		V	Low
M15	200037008112052	Bridge	Route 14 (top of M15)	68	NA			Moderate

Reach/ Segment No.	Structure No.		Road Name/ Location		Blocks AOP	Problems Noted		Priority for Replacement
Segment NO.		Туре	Location	* • Idtii		Sediment	Alignment	Replacement
						Transport	-	
T3.01	200037007412052	Bridge	Route 14	156	NA			Low
T3.04	990003001112051	Bridge	Pekin Brook Road	33	NA			High
T3.04	70000000012053	Bridge	Driveway off Pekin Brook Rd	27	NA			Moderate

Reach/ Segment No.	Structure No.	Structure Type	Road Name/ Location	% Channel Width	Aquatic Organism Passage (AOP)	Geomorphic Compatibility	Priority for Replacement
T3.03	400003012412051	Culvert	Pekin Brook Road	35	Full AOP	Mostly incompatible	High
T3.04	400036040212051	Culvert	Peck Hill Road	42	Full AOP	Partially incompatible	High
T3.06	930001000512051	Culvert	Kent Hill Road	35	No AOP (except adult salmonids)	Fully incompatible	Highest
T3.06	400048055912051	Culvert	Singleton Road	27	Reduced AOP	Partially incompatible	High

6.0 STRESSOR, DEPARTURE AND SENSITIVITY ANALYSIS

Stressor, departure and sensitivity maps are presented here as a means of displaying the effects of all significant physical processes occurring within the Kingsbury Branch stream network that were observed during the Phase I and Phase 2 Stream Geomorphic Assessments. These maps also provide an indication of the degree to which the channel adjustment processes within the watershed have been altered, at both the watershed scale and the reach scale. The analysis of existing and historic departures from equilibrium conditions along a stream network allows for the prediction of future alterations within the watershed. This is helpful in developing and prioritizing potential protection and restoration projects.

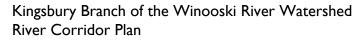
6.1 Departure Analysis and Stressor Identification

6.1.1 Hydrologic Regime Stressors

The hydrologic regime is the timing, volume, and duration of flow events throughout the year and over time and is characterized by the input and manipulation of water at the watershed scale. When the hydrologic regime has been significantly changed, stream channels will respond by undergoing a series of channel adjustments. The land use within the watershed plays a role in the hydrology of the receiving waters. The percentage of urban and cropland development within the watershed are factors which change a watershed's response to precipitation. The most common effects of urban and cropland development discharges and runoff by reducing infiltration and travel time (United States Department of Agriculture 1986).

The dominant watershed land cover/land use within the Kingsbury Branch watershed is forest. All of the twenty reaches evaluated in the study had less than 10% watershed land cover/land use quantified as crop and/or urban. Analysis of hydric soils located where current land uses are agricultural or urban indicates some minor loss of wetlands within the Kingsbury Branch watershed. The loss of wetlands decreases the attenuation of peak flows within the watershed. Based on hydric soils in areas that are urban or agricultural, the lowermost subwatersheds of the Kingsbury Branch and Pekin Brook have likely experienced wetland loss of approximately 10 percent of the subwatershed area.

The Kingsbury Branch watershed has a modest network of roads as shown in Figure 11. Two subwatersheds within the study area have road densities greater than 7 miles per square mile (M12 and T3.01). This may contribute to localized increased flows resulting both from increased runoff and stormwater ditching. All other subwatersheds within the study area have road densities less than 5 miles per square mile. According to Foreman and Alexander (1998), increased peak flows in streams may be evident at road densities of 3.2 miles/ square mile. Subwatersheds with road densities of greater than 3.2 mile/ square mile account for approximately 17 percent of the entire Kingsbury Branch watershed.



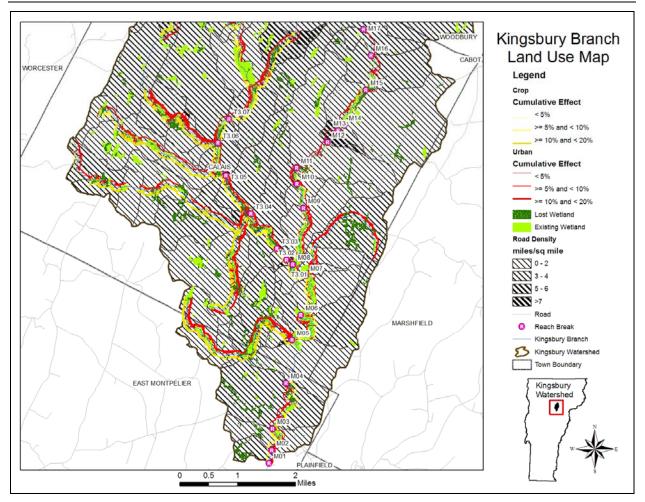


Figure 11. Land use map showing cumulative percent of urban land use, agricultural land use, road density, existing wetlands and lost wetlands

6.1.2 Sediment Regime Stressors

The sediment regime is the quantity, size, transport, sorting and distribution of sediments. The sediment regime may be influenced by the proximity of sediment sources, the hydrologic regime, and the specific morphology of the valley, floodplain, and stream. The Sediment Load Indicators Map (Page I and 2 of Appendix 2) show the distribution of sediment load indicators in the Kingsbury Branch watershed at the watershed scale. Bank erosion and mass failures contribute to sediment inputs along the Kingsbury Branch and Pekin Brook. Bank erosion is defined as "an area of raw and barren soil where the vegetation does not have the ability to hold the soil and/or the soil has slumped or fallen into the channel". Mass failures can occur when "a perennial stream erodes into or undercuts a high erodible landform, such as glacial lacustrine terrace". (Vermont Agency of Natural Resources, 2007b).

Mass wasting sites were common during the Stream Geomorphic Assessment and were mapped in many reaches. Thirty-one mass failures were mapped within the fourteen Kingsbury Branch reaches. The total length of mass failures on the Kingsbury Branch is approximately 2200 linear feet (3 percent of the total channel length). Four mass failures were mapped along the six Pekin Brook reaches, amounting to 300 linear feet or one percent of the channel length. These mass failures represent a significant source of sediment within the Kingsbury Branch watershed. Localized areas of bank erosion and depositional features (steep riffles, mid channel bars, delta bars, flood chutes, and/or avulsions) are prevalent. As shown below in Table 12, the majority of the segments on the Kingsbury Branch and Pekin Brook have high bank erosion (>20% of the length) and/or depositional features (> 5 per mile).

6.1.3 Reach Scale Sediment Regime Stressors

The previously discussed alterations to flow and sediment load at the watershed scale serve as a pretext for understanding the timing and degree to which reach scale modifications are contributing to field observed channel adjustment. When the valley, floodplain, channel and channel boundary conditions are modified, a stream may change the way sediment is transported, sorted, stored and distributed. The stressors that alter these conditions either increase or decrease stream power and or increase or decrease the resistance of its boundary conditions. This is helpful for determining why a reach is under adjustment and what types of management activities will be beneficial in returning the stream to equilibrium conditions. The primary stressors in each segment of the Kingsbury Branch watershed are identified in Table 12 (Kingsbury Branch) and Table 13 (Pekin Brook).

Table 12. King	Table 12. Kingsbury Branch Hydrologic and Sediment Load Stressors						
	Watershed I	nput Stressors	Reach Modific	ation Stressors			
River Segment	Hydrologic	Sediment load	Stream Power Bold=increase Plain=decrease	Boundary Resistance Bold =increase Plain=decrease			
M01	Road Density (M) % Urban (M)	Historic Degradation Bank Erosion (H)	Straightening (H) Encroachment (H) Constriction	Armoring (M)			
M02	% Urban (M)	Bank Erosion (H) Historic Degradation	Straightening (M) Encroachment (M)				
M03	Road Density (M) % Urban (M)		Grade Controls Constriction	Reduced riparian vegetation (M) Grade Controls			
M04 (POND)							
M05	Road Density (M) % Urban (M)		Constriction				

Table 12. Kir	ngsk	oury Branch Hydrologic	and Sediment Load	Stressors	
		Watershed Inp	out Stressors	Reach Modifica	ation Stressors
River Segment		Hydrologic	Sediment load	Stream Power Bold=increase Plain=decrease	Boundary Resistance Bold =increase Plain=decrease
M06		% Urban (M)	Bank Erosion (H)	Straightening (H) Encroachment (M) Constriction	Reduced riparian vegetation (M)
M07		% Urban (M)	Bank Erosion (H) Depositional Features (H)	Straightening (H) Encroachment (H)	Reduced riparian vegetation (M)
M08	A	% Urban (M)			Reduced riparian vegetation (M)
M08	В	% Urban (M)		Constriction	Reduced riparian vegetation (E)
M09		Stormwater Inputs (M) % Urban (M)	Bank Erosion (H) Historic Degradation Depositional Features (M)	Straightening (H) Encroachment (H) Constriction	Reduced riparian vegetation (H)
M10		Road Density (M) % Urban (M)	Bank Erosion (H) Historic Degradation Depositional Features (H)	Straightening (H) Encroachment (H)	Armoring (M)
M11	А	% Urban (M)	Bank Erosion (M) Depositional Features (H)	Straightening (H) Encroachment (H) Constriction	Reduced riparian vegetation (E)
	B	% Urban (M) Road Density (E) % Urban (M)	Bank Erosion (M) Historic Degradation Depositional Features (H) Historic Degradation Depositional Features (H)	Straightening (H) Encroachment (H)	Reduced riparian vegetation (M)
		Road Density (E)		Grade Controls	
M12 M13 (POND)	B	% Urban (M) Road Density (M)		Constrictions Grade Control	Grade Controls
	А	% Urban (M)			
	В	Stormwater Inputs (H) %Urban (M)		Straightening (H) Encroachment (M)	Reduced riparian vegetation (M)
M14	C	% Urban (M)	Bank Erosion (M) Depositional Features (H)	Encroachment (H)	Reduced riparian vegetation (M)

			<u>tic and Sediment Load</u> nput Stressors		ation Stressors
		Water Sheu I		Keach Wibulite	Boundary
				Stream Power	Resistance
River				Bold =increase	Bold =increase
Segment		Hydrologic	Sediment load	Plain=decrease	Plain=decrease
beginent		Ilydiologic	Historic	Tium=decrease	T fum=decredse
			Degradation		
			Bank Erosion (M)	Straightening (H)	Armoring (M)
		Road Density (M)	Depositional	Encroachment (H)	Reduced riparian
M15	А	% Urban (M)	Features (H)	Constrictions	vegetation (H)
			Bank Erosion (M)		Armoring (M)
		Road Density (M)	Depositional	Straightening (H)	Reduced riparian
M15	В	% Urban (M)	Features (H)	Encroachment (H)	vegetation (M)
			Historic		
		Road Density (M)	Degradation		Reduced riparian
M16		% Urban (M)	Bank Erosion (M)	Straightening (H)	vegetation (H)
		Stormwater Inputs and	d Depositional Features	2-5 per mile; Road Densi	ty 3-4 mi/sq. mi.
		Straightening, Bank A	Armoring, Erosion, and E	Encroachment 5-20%	
Moderate		Urban 5-10%; Reduce	ed Riparian Buffer 5-20%	%	
				>5 per mile; Road Densit	y 5-6 mi/sq. mi.
			Armoring, Erosion, and E		- 1
High			ced Riparian Buffer 20-5		
Extreme		Road Density >7 mi/s	a mi Reduced Rinarian	Buffer >50%: Urban >2	0%

Extreme Road Density >7 mi/sq. mi; Reduced Riparian Buffer >50%; Urban >20% *Shading indicates segment was not assessed

Table 13. P	Table 13. Pekin Brook Hydrologic and Sediment Load Stressors						
		Watershed Inpu	it Stressors	Reach Modification S	tressors		
River Segment		Hydrologic	Sediment load	Stream Power Bold=increase Plain=decrease	Boundary Resistance Bold =increase Plain=decrease		
T3.01		Stormwater Inputs (H) Road Density(E) % Urban (M)			Reduced riparian vegetation (H)		
T3.02		Stormwater Inputs (M) Road Density (M) % Urban (M)	Bank Erosion (H)	Straightening (H) Encroachment (H)	Armoring (M) Reduced riparian vegetation (M)		
T3.03	А	Road Density (M)		Constriction	Reduced riparian vegetation (H)		

Table 13. Pekin Brook Hydrologic and Sediment Load Stressors						
	Watershed Inpu	t Stressors	Reach Modification St	ressors		
River Segment	Hydrologic	Sediment load	Stream Power Bold=increase Plain=decrease	Boundary Resistance Bold =increase Plain=decrease		
Т3.03 В	Stormwater Inputs (H) Road Density (M) % Urban (M)	Bank Erosion (H) Depositional Features (H)	Straightening (H) Encroachment (H)	Armoring (M) Reduced riparian vegetation (E)		
T3.04 A	Road Density (M) % Urban (M)	Bank Erosion (H)	Straightening (H) Encroachment (H) Constriction	Reduced riparian vegetation (E)		
Т3.04 В	Road Density (M) % Urban (M)	Bank Erosion (H) Depositional Features (H)	Straightening (H) Encroachment (M)	Reduced riparian vegetation (E)		
T3.04 C	Stormwater Inputs (M) Road Density (M) % Urban (M)	Bank Erosion (H)	Straightening (H) Encroachment (H) Constriction	Reduced riparian vegetation (H)		
T3.05 A	Road Density (M) % Urban (M)	Bank Erosion (M) Depositional Features (H)	Straightening (H)	Armoring (M)		
Т3.05 В	Road Density (M) % Urban (M)	Bank Erosion (M) Depositional Features (H)	Straightening (H)			
T3.06 A	Stormwater Inputs (M) Road Density (M) % Urban (M)	Historic Degradation Bank Erosion (M)	Straightening (H) Encroachment (H) Constriction	Armoring (M) Reduced riparian vegetation (H)		
Т3.06 В	Stormwater Inputs (H) Road Density (M) % Urban (M)	Historic Degradation Bank Erosion (M) Depositional Features (H)	Straightening (H) Encroachment (H) Constriction Grade Control	Armoring (H) Reduced riparian vegetation (E)		
Moderate B	Stormwater Inpu Straightening, Ba Urban 5-10%; Re	ts and Depositional Features 2 ink Armoring, Erosion, and E educed Riparian Buffer 5-209	2-5 mile; Road Density 3- Encroachment 5-20%	-4 mi/sq. mi.		
High	Straightening, Ba	ts and Depositional Features ink Armoring, Erosion, and E Reduced Riparian Buffer 20-5	Encroachment >20%	6 mi/sq. mi.		
Extreme	Road Density >7	mi/sq. mi; Reduced Riparian	Buffer >50%; Urban >20)%		

*Shading indicates segment was not assessed

6.1.4 Channel Slope Modifiers

Results from the Kingsbury Branch watershed indicate that primary stressors include extensive straightening of the channel along with road and development encroachments (see Channel Slope Modifiers map on page 3 and 4 of Appendix 2). Beaver dams are also common within the watershed. There are no records at the Vermont Agency of Natural Resources regarding dredging of the channel along the Kingsbury Branch or Pekin Brook. Likewise, no collected field data indicates that dredging has occurred within the area of concern in this study. However, where the channel showed that it had been straightened, it is likely that some dredging may have occurred during the straightening process.

6.1.5 Boundary Conditions and Riparian Modifiers

Riparian buffers provide many benefits. Some of these benefits are protecting and enhancing water quality, providing fish and wildlife habitat, providing streamside shading, and providing root structure to prevent bank erosion (see Boundary Conditions and Riparian Modifiers map on page 5 and 6 of Appendix 2). Three segments on Pekin Brook (T3.03-B, T3.04-A, T3.04-B) had 75 percent or more of the reach with little or no buffer on at least one bank. These stream reaches which lack a high quality riparian buffer are at a significantly higher risk of experiencing high rates of lateral erosion. Many stream banks are stabilized with rip rap or hard bank armoring where they are adjacent to human constructed infrastructure.

6.1.6 Constraints to Sediment Transport and Attenuation

Successful river corridor restoration and protection projects depend on a thorough understanding of the sources, volumes, and attenuation of flood flows and sediment loads within the stream network. If increased loads are transported through the network to a sensitive reach, where conflicts with human investments are creating a management expectation, little success can be expected unless the restoration design accommodates the increased load or finds a way to attenuate the loads upstream (Vermont Agency of Natural Resources, 2007c).

Within a reach, the principles of stream equilibrium dictate that stream power and sediment will tend to distribute evenly over time (Leopold, 1994). Changes or modifications to watershed inputs and hydraulic geometry create disequilibrium and lead to an uneven distribution of power and sediment. Large channel adjustments observed as dramatic erosion and deposition may be the result of this uneven distribution and may continue.

The sediment regime departure map (Figure 12) shows the Phase I reference stream sediment conditions for each reach within the stream network. These reference type streams use available floodplain access as a means to store sediment within the watershed. The majority of the stream network has a reference sediment regime of a

Coarse Equilibrium (in=out) & Fine Deposition. One bedrock dominated reach on the Kingsbury Branch (M12) is a Transport reach by reference.

Changes in hydrology (primarily development within the riparian corridor) and sediment storage within the watershed have altered the reference sediment regime types for some reach segments. Sediment regime departures were derived from the DMS according to the sediment regime criteria established by the Vermont Agency of Natural Resources (2007c). Some segments (M01, M02, M09, M10, M11-B, and T3.06-A) that were *Coarse Equilibrium (in=out) & Fine Deposition* type segments by reference have been converted to *Fine Source and Transport & Coarse Deposition* sediment regimes based on the Phase 2 Stream Geomorphic Assessment data. This means that most fine sediment entering the stream is either being transported through without being deposited as a result of channel incision and reduced floodplain access. M01, M02, and M11-B may have incised as a result of being sediment starved below onstream ponds. The Kingsbury Branch within reaches M09 and M10 have undergone historic straightening along Route 14 and subsequent incision. Segment T3.06-A on Pekin Brook has also been influenced by straightening along Pekin Brook Road.

Additionally coarse sediment storage is increased due to increased load along with lower transport capacity. One segment (M12-A) that was *Coarse Equilibrium (in=out)* & *Fine Deposition* by reference has been converted to a *Confined Source and Transport* sediment regime due to increased transport capacity derived from an incised channel below Woodbury Lake. T3.06-B that were *Coarse Equilibrium (in=out)* & *Fine Deposition* by reference has been converted to an *Unconfined Source and Transport* sediment regime due to increased transport capacity derived from bank armoring and channel straightening in the vicinity of the Calais Town Hall. These channel management practices have resulted in reduced attenuation of flood waters and sediment.

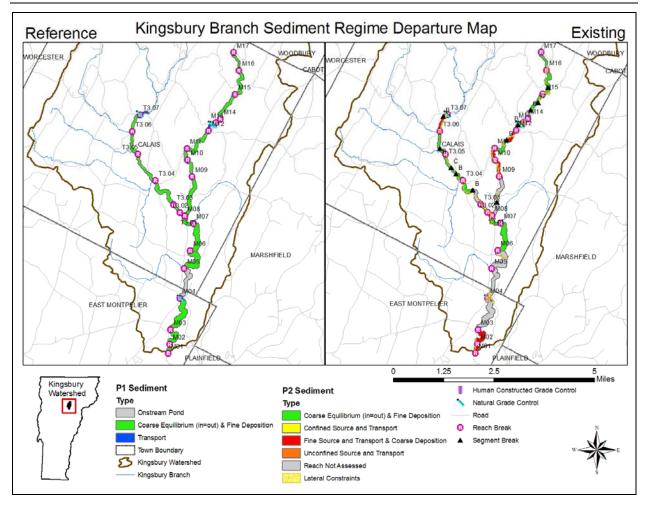


Figure 12. Sediment Regime Departure Map

The existing sediment regime for the Kingsbury Branch watershed includes reduced floodplain access, increased stream power, reduced boundary resistance, and lateral constraints at various locations throughout the stream network. Watersheds which have lost attenuation or sediment storage areas, due to human related constraints, are generally more sensitive to erosion hazards, transport greater quantities of sediment and nutrients to receiving waters, and lack the sediment storage and distribution processes that create and maintain habitat (Vermont Agency of Natural Resources, 2007c). Segments and reaches of the Kingsbury Branch watershed that can act as attenuation assets are identified below to help in designing stream corridor protection and restoration projects within the stream network. These segments include:

M05 (mostly wetland) M06 M07 M08 M11-A M14 MI5 T3.03 T3.04-B T3.05

6.2 Sensitivity Analysis

Stream sensitivity refers to the likelihood that a stream will respond to a watershed or local disturbance or stressor, such as; floodplain encroachment, channel straightening or armoring, changes in sediment or flow inputs, and/or disturbance of riparian vegetation (Vermont Agency of Natural Resources, 2007b). Assigning a sensitivity rating to a stream is done with the assumption that some streams, due to their setting and location within the watershed, are more likely to be in an episodic, rapid, and/or measurable state of change or adjustment. A stream's inherent sensitivity may be heightened when human activities alter the setting characteristics that influence a stream's natural adjustment rate including: boundary conditions; sediment and flow regimes; and the degree of confinement within the valley. Streams that are currently in adjustment, especially those undergoing degradation or aggradation, may become acutely sensitive (Vermont Agency of Natural Resources, 2007b).

There are many variables that are contributing to the sensitivity of the streams in the Kingsbury Branch watershed. Bank vegetation has helped to improve the boundary condition between water and land and has reduced the sensitivity of sections of the Kingsbury Branch and Pekin Brook that are well buffered. Removal of this vegetation tends to make stream segments more sensitive to channel adjustment. The location and slope of a stream also affects is morphology and sensitivity. Streams that are transporting sediment through the channel are less sensitive than streams that are storing and responding to sediment. Low gradient streams, like many in reaches in the Kingsbury Branch watershed, with high sediment supplies are very sensitive and may undergo adjustment following minor changes in channel geometry or boundary conditions.

Additionally, flow regime and floodplain constrictions may be affecting the sensitivity of Kingsbury Branch and Pekin Brook stream reaches. Changes in land use and land cover that increase impervious cover, peak discharges, and/or the frequency of high flows will heighten a stream's sensitivity to change and adjustment. Confinement becomes a significant sensitivity concern when structures such as roads, railroads, and berms significantly change the confinement ratio, reduce or restrict a stream's access to floodplain, and result in higher stream power during flood stage. Figure 13 is a map presenting the stream sensitivity, generalized according to stream type and condition, and current adjustments for each reach segment in the Kingsbury Branch watershed. Sensitivity ratings were assigned using the most current draft (September 25, 2008) of "River Corridor Protection: A Technical Guide" prepared by the Vermont River Management Program. The stream sensitivity map also documents vertical channel adjustments currently going on within a reach segment. Major aggradation adjustment processes are displayed on the corridor where they were found to be actively occurring and not evaluated as historic. This information is helpful in prioritizing the implementation of the projects identified in section

7 of this report, as certain management actions may be influenced by these active adjustment processes. Current vertical channel adjustments exist in the following reaches:

Segment ID	Current Major Adjustment Process
M01	Aggradation
M02	Aggradation
M10	Aggradation
MII-A	Aggradation
MI5-B	Aggradation
M16	Aggradation

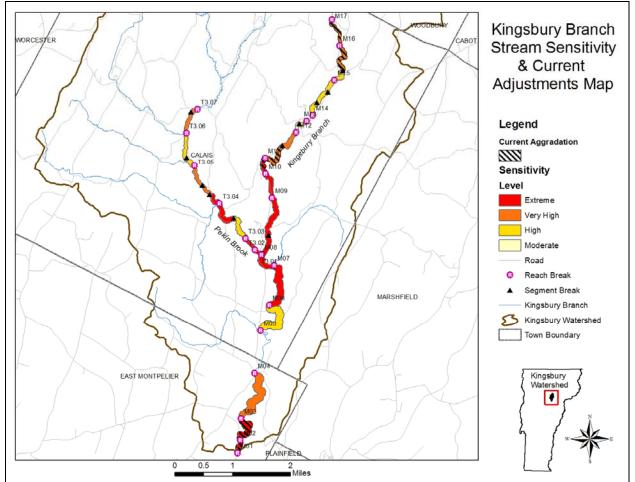


Figure 13. Kingsbury Branch Watershed Stream Sensitivity and Current Adjustment Map

7.0 PRELIMINARY PROJECT IDENTIFICATION AND PRIORITIZATION

The departure and sensitivity analyses presented in Section 6.0 of this report provide beneficial background for selecting potential projects that will effectively help the channel return to equilibrium conditions by assessing limiting factors and by identifying underlying causes of channel instability. The stream reaches evaluated in this study present a variety of planning and management strategies which can be classified under one of the following categories: Active Geomorphic Restoration, Passive Geomorphic Restoration, and Conservation.

<u>Active Geomorphic Restoration</u> implies the management of rivers to a state of geomorphic equilibrium through active, physical alteration of the channel and/or floodplain. Often this approach involves the removal or reduction of human constructed constraints or the construction of meanders, floodplains or stable banks. Active riparian buffer revegetation and long-term protection of a river corridor is essential to this alternative.

<u>Passive Geomorphic Restoration</u> allows rivers to return to a state of geomorphic equilibrium by removing factors adversely impacting the river and subsequently using the river's own energy and watershed inputs to re-establish its meanders, floodplains and equilibrium conditions. In many cases, passive restoration projects may require varying degrees of active measures to achieve the ideal results. Active riparian buffer revegetation and long-term protection of a river corridor is also essential to this alternative.

<u>Conservation</u> is an option to consider when stream conditions are generally good and nearing a state of dynamic equilibrium. Typically, conservation is applied to minimally disturbed stream reaches where river structure and function and vegetation associations are relatively intact.

7.1 Watershed-Level Opportunities

Fluvial Erosion Hazard Zones

Of all types of natural hazards experienced in Vermont, flash flooding represents the most frequent disaster mode and has resulted in by far the greatest magnitude of damage suffered by private property and public infrastructure. While inundation-related flood loss is a significant component of flood disasters, the predominant mode of damage is associated with the dynamic, and oftentimes catastrophic, physical adjustment of stream channel dimensions and location during storm events due to bed and bank erosion, debris and ice jams, structural failures, flow diversion, or flow modification by man-made structures. These channel adjustments and their devastating consequences have frequently been documented wherein such adjustments are related to historic channel management activities, floodplain encroachments, adjacent land use practices and/or changes to watershed hydrology associated with land use and drainage.

The purpose of defining Fluvial Erosion Hazard Zones is to prevent increases in fluvial erosion resulting from uncontrolled development in identified fluvial erosion hazard areas;

minimize property loss and damage due to fluvial erosion; prohibit land uses and development in fluvial erosion hazard areas that pose a danger to health and safety; and discourage the development of property that is unsuited for the intended purposes due to fluvial erosion hazards.

The basis of a Fluvial Erosion Hazard Zone is a defined river corridor which includes the course of a river and its adjacent lands. The width of the corridor is defined by the lateral extent of the river meanders, called the meander belt width, which is governed by valley landforms, surficial geology, and the length and slope requirements of the river channel. The width of the corridor is also governed by the stream type and sensitivity of the stream. River corridors, defined through VTANR Stream Geomorphic Assessment (2007b), are intended to provide landowners, land use planners, and river managers with a meander belt width which would accommodate the meanders and slope of a balanced or equilibrium channel, which when achieved, would serve to maximize channel stability and minimize fluvial erosion hazards. Additional information regarding Fluvial Erosion Hazard Zones is available on the Vermont River Management website

(http://www.anr.state.vt.us/dec/waterq/rivers/htm/rv_floodhazard.htm) in the Municipal Guide to Fluvial Erosion Hazard Mitigation (Vermont Agency of Natural Resources, 2008). A model fluvial erosion hazard overlay district is provided at the end of Municipal Guide to provide local municipalities with a tool to minimize human/river conflicts and limit losses caused by fluvial erosion.

Figure 14 displays the Draft Fluvial Erosion Hazards Zones for the Kingsbury Branch watershed. The map includes a legend that provides the erosion potential from very low erosion hazard to extreme erosion hazard. As previously discussed in Section 6.2, the Sensitivity ratings are based on stream type and condition. The fluvial erosion hazard corridor widths used in draft fluvial erosion hazard zones for the Kingsbury Branch watershed are based on the recommendations presented in the draft (September 25, 2008) guidance document, "River Corridor Protection: A Vermont Technical Guide", prepared by the Vermont River Management Program. Kari Dolan of the Vermont Agency of Natural Resources River Management Program and Dan Currier of the Central Vermont Regional Planning Commission work together to develop the draft Fluvial Erosion Hazard Zones.

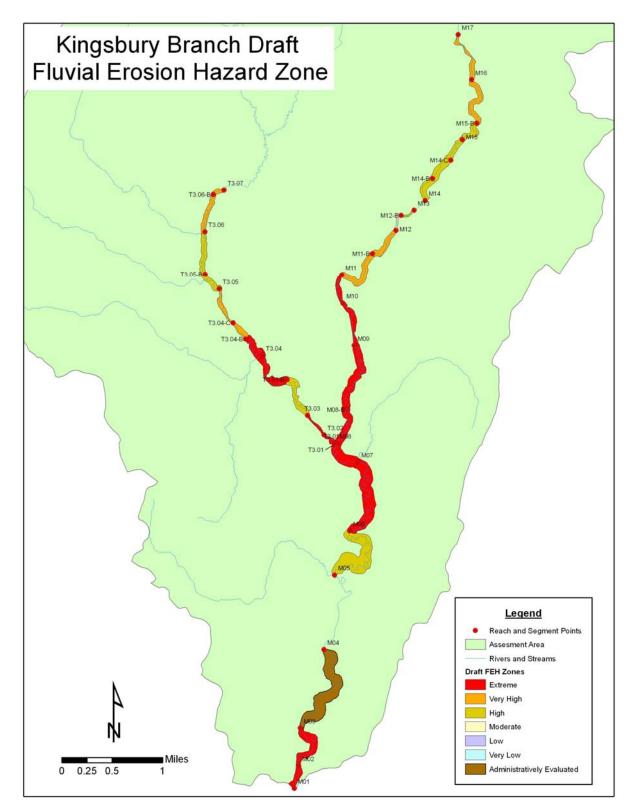


Figure 14. Draft Fluvial Erosion Hazard Zone Map for the Kingsbury Branch and Pekin Brook (prepared by Dan Currier of the Central Vermont Regional Planning Commission)

7.2 Reach-Level Opportunities

A description of each reach/segment is provided in this section along with general recommendations for restoration and protection strategies. The reaches are listed from downstream to upstream on the Kingsbury Branch and then downstream to upstream on Pekin Brook.

KINGSBURY BRANCH

Reach M01 I. Protect River Corridor

Reach M01 begins at the confluence of the Kingsbury Branch and the Winooski River. This reach has undergone a stream type departure from an "E" to a "C" channel that lacks significant bedforms and is experiencing extreme aggradation.

This section of channel has been influenced by the North Montpelier Pond upstream. The reach has a healthy riparian zone with a dominant buffer width of greater than 100 feet.

Reach M02

I. Protect River Corridor

Reach M02 begins about 1200 feet upstream of the bridge at Cate Farm Road. This reach is highly sinuous and is also highly influenced by North Montpelier Pond. The lack of sediment below the pond has likely contributed to historic incision within this reach. This reach has undergone a

stream type departure from an "E" to a "C" channel due to widening or planform migration and is currently undergoing a major aggradation process. M02 has an excellent riparian buffer and has abundant wetlands adjacent to the channel.

Reach M03

I. Protect River Corridor

Located directly downstream of North Montpelier Pond, Reach M03 is highly influenced by the Kingsbury Hydroelectric Project. The photos below show the river below the power house prior to and after a release on September 17, 2007. Bedrock ledge, acting as a grade control, was noted above the Route 14 bridge that is located directly below North Montpelier and upstream of the powerhouse. A partial geomorphic assessment was conducted of this reach due to limited landowner access. Although no cross section was surveyed, the reach appeared to be highly incised. This incision is likely attributed to the influence of North Montpelier Pond. The river may have incised in this area due to being sediment starved. M03 was dominated by buffer widths of greater than 100 feet of the river. There were some areas with buffers less than 25 feet



in length adjacent to commercial landuse. The reach was walked under very low flow conditions (prior to release from the hydroelectric project). Over 200 pieces of large



woody debris was counted in this reach, in part due to the amount of stream bed that was exposed due to the low flow conditions.



Reach M04 – North Montpelier Pond

North Montpelier Pond is an onstream impoundment created by a concrete, gravity dam that was constructed in 1920. The dam is 15 feet high



and 85 feet wide and is owned by the Kingsbury Hydroelectric Company. The facility is store and release with a maximum discharge of 1200 cubic feet per second. The impoundment is used for



recreational purposes (FindLakes, 2008).

Reach M05 1. Protect River Corridor



The Kingsbury Branch within reach M05 is highly influenced by North Montpelier dam and did not receive a full phase 2 assessment for this reason. There are abundant wetlands adjacent to the channel and shrub sampling dominates the near bank, buffer and riparian corridor.

Reach M06

- I. Protect Corridor
- 2. Evaluate Tributary 2

Reach M06 begins upstream of the impounded influence from North Montpelier Pond. Much of this reach was historically straightened for agricultural purposes and it runs through Legare Farm. The



Winooski Conservation District has been working with the farmer to plant native woody vegetation within the river corridor. This vegetation is small at this time, and will provide a high quality buffer in the future. This "E" channel is not incised but is experiencing major planform adjustment as it attempts to regain sinuosity. A tributary entering from the east at the reach break between M06 and M07 is contributing considerable sediment. A Phase 2 assessment of Tributary 2 is recommended.

Reach M07

I. Protect River Corridor

Reach M07 begins about 950 feet downstream of where Route 14 encroaches along the Kingsbury Branch, just upstream of Legare Farm. This "E" channel has been historically channelized, and major planform adjustment is evident. Overall the riparian vegetation seems to be holding the channel in place.



Reach M08

- I. Improve Buffer (M08-B)
- 2. Protect River Corridor



The downstream end of reach M08 is at the confluence of Pekin Brook. M08 is highly influenced by beaver dams and did not receive a full Phase 2 assessment. This reach was broken into two segments due to differences in land use. The lower segment was dominated by shrub sampling in the near bank, buffer and riparian corridor and had abundant wetland adjacent to the channel. The buffer width was generally greater than 100 feet in width. The upper segment (M08-

B) is hayed and is a good candidate for riparian buffer improvement.

Reach M09

I. Protect River Corridor

Reach M09 begins where the channel becomes very straight and begins to run very close to Route 14. The riffle pool bedform in this "E" channel is weak primarily due to historic straightening. Some areas are becoming more sinuous and the stream is beginning to build small benches. The channel is still widening and migrating laterally due to increased stream power. The buffer is generally good,



although some areas where the stream runs very close to Route 14 are less than 25 feet wide.

Reach MI0 I. Protect River Corridor

Reach MI0 begins where the Kingsbury become more sinuous along Route 14. This "E" channel is undergoing major widening with evidence of a newly created bankfull bench. This reach is also experiencing major aggradation of fine sediment and severe bank erosion on all outside beds indicating

major planform adjustment. The riparian buffer is generally wider than 50 feet, although some isolated area close to Route 14, where the buffer is less than 25 feet.

Segment MII-A

- I. Improve Riparian Buffer
- 2. Protect River Corridor

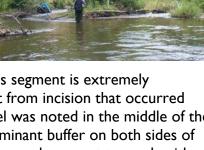
Segment MII-A begins just upstream of where Peck Hill Road meets Route 14, where the stream begins to move away from Route 14. This "C" channel has very good floodplain access and its location along the Kingsbury Branch is where the stream types

change from "E" by reference to "C" by reference. This segment is extremely aggradational, having become overloaded with sediment from incision that occurred upstream in MII-B and reach 12. Also a braided channel was noted in the middle of the segment indicating major planform adjustment. The dominant buffer on both sides of this segment was substandard (<25 feet) and would be a good segment to work with landowners on river corridor protection and improving buffers.

Segment MII-B

Segment MII-B begins approximately 800 feet upstream of the snowmobile bridge in segment MII-A. This segment has historically incised resulting in a stream type departure from a "C" to a "B" channel, likely in response to being sediment starved from the onstream pond located in reach MI3. This

segment has an excellent riparian buffer and many downed trees creating good habitat.







Segment MI2-A



I. Protect River Corridor

Segment M12-A begins about 900 feet upstream of the Route 14 bridge. This "B" channel is a transitional segment between upstream bedrock falls and "C" channels downstream. This segment has incised due to being sediment starved from onstream pond upstream in reach M13. Major planform adjustment is occurring at the base of the falls and the lower end of the

segment. This segment has excellent riparian vegetation that may be preventing the channel from widening.

Segment MI2-B



The upper portion of Segment M12-B contains an undersized bridge over Moscow Woods Road. Below the bridge is a 20 foot wide penstock. Both the bridge and the penstock are major channel constrictions within this segment.



Below the penstock is bedrock controlled falls.

Reach MI3 – Old Mill Dam



An old Mill Dam is located at the lower end of the reach, resulting in an impoundment.

Reach MI4

M14 was was broken into three segments for the Phase 2 assessment. The lower segment, M14-A, did not receive a full phase 2 assessment because it is highly influenced by an old mill dam and is a wetland. A description of the other two segments is provided below.



Segment MI4-B I. Protect River Corridor

Segment MI4-B begins where wetlands end just upstream of Calais recreational fields. This segment is a classic "E" channel with a broad valley and very few depositional features. This segment also has abundant wetlands adjacent to the channel.

Segment MI4-C

Segment M14-C begins where channel changes from "E" ripple dune to "C" riffle pool near meander that is close to Route 14. Numerous remnant beaver dams were noted in this segment. This segment is not incised and has abundant wetlands adjacent to the channel. Major planform adjustment is occurring in this segment. This segment has excellent riparian buffers.

Segment MI5-A I. Improve Riparian Buffer

Segment M15-A begins just downstream of the Route 14 bridge near the intersection of Route 14 and Sand Hill Road. This "C" channel has little to no riparian buffers and it is not incised, making it a good candidate for buffer restoration. This segment is experiencing minor planform adjustment.



Segment MI5-B I. Protect River Corridor



Segment M15-B begins where buffer becomes more forested than downstream. This "C" channel has been historically straightened and likely pushed up against the valley wall. This has resulted in extreme planform adjustment within the segment and many mass failures are contributing abundant sediment resulting in major aggradation. The riparian buffer is generally good.

Reach M16 1. Protect River Corridor

Reach M16 begins just upstream of the Route 14 bridge that is in between the Route 14 intersections with Balentine Road and Lamberton Camp Road and continues to the outlet of Sabin Pond. The sinuosity and planform has changed due to debris jam influence on this "C" channel. This reach generally has excellent riparian buffers.



PEKIN BROOK

Reach T3.01 1. Improve Riparian Buffer

The lowest reach on Pekin Brook was heavily influenced by beavers during the Phase 2 assessment in 2007. Three beaver dams were recorded within 800 feet. Reach T3.01 is an "E" ripple-dune system. Pekin Brook Road has been responsible for a human caused change in valley width, which has also resulted in channel straightening along much of the reach. Overall, this reach appeared to be in fair geomorphic condition. The section below the Route 14 crossing and the confluence of the Kingsbury Branch had buffers less than 25 feet on both sides.



Reach T3.02



Reach T3.02 begins about 550 feet upstream of the Route 14 Bridge near Pekin Brook Road. This "E" channel has been historically straightened and has considerable bank erosion along both banks along with evidence of failed rip rap. Two remnant beaver dams were noted within the reach. Major widening and planform adjustment is occurring within this reach. Riparian buffers are generally good.

Reach T3.03

T3.03 was segmented due to beaver dam influence in the lower half of the reach. A description of the upper segment, which received a full phase 2 assessment, is provided below.

Segment T3.03-B

- I. Improve Riparian Buffer
- 2. Protect River Corridor

Segment T3.03-B begins about 1300 feet upstream of Pekin Brook Road culvert. This "E" channel runs through an agricultural area and lacks a healthy riparian buffer along most of the segment. This segment is undergoing major planform adjustment.

Segment T3.04-A

- I. Improve Riparian Buffer
- 2. Protect River Corridor

Segment T3.04-A begins at the culvert on Peck Hill Road near the intersection of Peck Hill Road and Pekin Brook Road. This "E" channel runs through agricultural fields that are hayed and used as cow pastures and now lacks a healthy riparian buffer. This segment was likely all straightened and is now readjusting. This segment is experiencing extreme

planform adjustment and erosion is significant along this segment. The bridge at the upstream end of the segment may be causing problems in T3.04-B as flood waters have crossed the road during flood events.

Segment T3.04-B

- I. Improve Riparian Buffer
- 2. Protect River Corridor

Segment T3.04 begins just upstream of the bridge near the intersection of Jack Hill Road and Pekin Brook Road. This "C" channel has a well developed floodplain and runs along a field on the left bank that is mowed for hay regularly leading to buffer widths



<25 feet. Mass failures and erosion are present on the outside of meander bends and major planform adjustment is evident.

Segment T3.04-C



I. Improve Riparian Buffer

Segment T3.04-C begins at the driveway bridge off Pekin Brook Road. This "C" channel has significant erosion on the outside of meander bends, and some locations with little to no riparian buffer. This segment is experiencing major planform adjustment



in response to a corridor encroachment and historic grazing within the corridor.

Segment T3.05-A I. Protect River Corridor

Segment T3.05-A begins about 0.5 miles upstream of the intersection of Jack Hill Road and Pekin Brook Road where valley opens up. This "C" segment has a fairly healthy and new riparian buffer, as it used to be a dairy farm but cows are no longer grazing within the corridor. No major adjustment processes are occurring within this segment.

Segment T3.05-B I. Protect River Corridor

Segment T3.05-B begins where vegetation changes to densely forested, and thus it has a very healthy riparian buffer. This "C" segment is experiencing major planform adjustment but has good vegetation holding the banks in place.



Segment T3.06-A I. Protect River Corridor



Segment T3.06-A begins just downstream of the intersection of Singleton Road and Pekin Brook Road where a major tributary enters Pekin Brook. This "C" segment has incised historically and is now experiencing major planform adjustment as it works to rebuild new floodplain. This segment generally has a healthy riparian buffer.

Segment T3.06-B

- I. Improve Riparian buffer
- 2. Alternative Analysis for Berm Removal

Segment T3.06-B begins where a small tributary enters on the right bank, about 450 feet downstream of the Kent Hill Road culvert. This segment has been altered and its floodplain has been bermed to protect the town hall. This segment is experiencing major planform alteration and is lacking a healthy riparian buffer in many areas.



7.3 Site Level Opportunities

Site specific projects were identified using the criteria outlined by the ANR in Chapter 6 Preliminary Project Identification and Prioritization (Vermont Agency of Natural Resources, 2007c). This planning guide is intended to aid in the development of projects that protect and restore river equilibrium. The site level projects that were developed for the Kingsbury Branch and Pekin Brook are provided below in Tables 14 and 15. The project strategy, technical feasibility, and priority for each project are listed by project number and reach. Maps of the high priority project sites are found in Appendix 3.

7.4 Next Steps

The river corridor planning team has identified 21 potential protection and restoration projects that could successfully restore portions of the Kingsbury Branch and Pekin Brook. These projects have been identified as high, moderate or low priority based on their effectiveness and feasibility. The top ten projects have been identified for further project evaluation. Eight of the top ten projects have been rated as high priority, while two of the projects have a moderate rating. The high priority projects include buffer improvement and/or river corridor protection projects within the following reaches: M06, M07, M08, M11, M15, T3.03, T3.04 and T3.05. Two potential projects located within reach T3.06 on Pekin Brook have been given a moderate priority rating. These two projects are contingent upon an alternatives analysis for removing the berm in the vicinity of the Town Hall.

Project #, Reach	Condition and Channel Evolution Stage	Site Description Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits	Costs	Land Use Conversion	Potential Partners
#I M0I	Fair, F-III	Influenced by North Montpelier Pond and hydroelectric facility; incised; current extreme aggradation	Protect River Corridor	Moderate priority (only one landowner)	Flood and sediment attenuation asset;	Cost of river corridor easement acquisition	No additional structures in corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#2 M02	Fair, F- III	Influenced by North Montpelier Pond and hydroelectric facility; incised; abundant adjacent wetlands and few lateral constraints	Protect River Corridor	Moderate priority	Flood and sediment attenuation asset	Cost of river corridor easement acquisition	No additional structures in corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#3 M03	Fair	Influenced by North Montpelier Pond and hydroelectric facility; incised; a few areas with buffers less than 25 feet in commercial locations; few lateral constraints	Protect River Corridor	Moderate priority	Flood and sediment attenuation asset	Cost of river corridor easement acquisition	No additional structures in corridor	FWR, WRNCD, ANR, VRC, CVRPC, landowners
#4 M05	Good	Located above North Montpelier Pond, strongly influenced by impoundment; abundant wetland	Protect River Corridor	Low priority (likely too wet for development within river corridor)	Flood and sediment attenuation asset	Cost of river corridor easement acquisition	None	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#5 M06 and lower part of M07	Fair, D-IIC	Currently acting as attenuation area for sediment	Protect River Corridor	Moderate (Acquisition of a corridor easement would compliment buffer work by Winooski NRCD; downstream of straightened section along Rt 14; one landowner; wetland offers protection)	Flood and sediment attenuation asset	Cost of river corridor easements	Agricultural land to river corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#6 M08-B	Fair	Dominant buffer width is 0-25 feet; this segment is highly influenced by beaver	Improve Riparian Buffer	High priority	Reduce water temperature and improve bank stability	Would recommend passive revegetation due to influence of beavers	Hay to vegetated buffer	CREP, FWR, ANI

Project #, Reach	Condition and Channel Evolution Stage	Site Description Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits	Costs	Land Use Conversion	Potential Partners
# 7 M08-B	Fair	Currently acting as attenuation area for sediment	Protect River Corridor	High priority (few lateral constraints; Below reaches M09 and M10 that are straightened along Route 14; wetland at lower end of segment offer some protection; one landowner)	Flood and sediment attenuation asset	Cost of river corridor easement acquisition	No additional structures in corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#8 M09 and M10	Fair, F-III	These reaches have undergone extensive straightening due to Route 14	Protect River Corridor	Low priority (Route 14 acting as a lateral constraint, not a current attenuation asset)	There are only a few select areas that are currently offering flood and sediment attenuation	Cost of river corridor easement acquisition	No additional structures in corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#9 MII-A	Fair, DII-d	This segment has good floodplain access and is located in a critical flood and sediment attenuation area	Protect River Corridor	High priority (few property owners)	Flood and sediment attenuation asset	Cost of river corridor easements	No additional structures in corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#10 M11-A	Fair, DII-d	Dominant buffers are less than 25 feet in width	Improve Riparian Buffer	High priority (few property owners)	Reduce water temperature and improve bank stability	Cost of plants or allow the buffer to regenerate on its own	Hay to buffer	CREP, Landowners, WNRCD, FWR, CVRPC, ANR,
#II MI2-A	Fair, F-III	This segment has incised due to being sediment starved from onstream pond; The excellent riparian buffer may be preventing the river from widening.	Protect River Corridor and Existing Buffer	Moderate (few property owners)	Conservation of excellent buffer that is preventing extensive widening	Cost of river corridor easements	No additional structures in corridor	FWR, WNRCD, ANR, VRC, CVRPC, landowners
#12 M14	Good, Dll-d	Abundant wetland in this reach already provides some degree of protection from development and filling within the river corridor; currently an attenuation asset	Conserve and Protect River Corridor	Low priority	Conservation	Cost of river corridor easements	No additional structures in corridor	Landowners, WRNCD, FWR, ANR, CVRPC

Project #, Reach	Condition and Channel Evolution Stage	Site Description Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits	Costs	Land Use Conversion	Potential Partners
#13 M15-A	Good, Dll-d	This segment has little to no riparian buffer and is not incised making it a good candidate for a riparian buffer improvement project.	Improve Riparian Buffer	High priority (one landowner in area with poor buffer)	Decrease water temperature, improve stability of banks	Cost of plants or allow the buffer to regenerate on its own	Hay to vegetated buffer	CREP , Landowners, FWR, ANR, WNRCD, CVRPC
#14 M15	Fair to good, DII-d	Located below reach M- 16 (narrow confinement); Segment M-15 is undergoing major aggradation and planform adjustment	Protect River Corridor	High priority	Provide attenuation asset	Cost of river corridor easements	No additional structures in corridor	Landowners, FWR, WNRCD, ANR; VRC

Project #, Reach	Condition and Channel Evolution Stage	Site Description Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits	Costs	Land Use Conversion	Potential Partners
#I T3.01 to T3.03-A	Fair, D-IIC	The floodplain in the lower section of Pekin Brook has been impacted by Pekin Brook Road	Protect River Corridor	Low priority (wetland offers some degree of protection from filling and development; Pekin Brook Road acts as a lateral constraint)	Provide attenuation asset	Cost of river corridor easements	No additional structures in corridor	Property owner, ANR, FWR, WNRCD, CVRPC
#2 T3.03-B T3.04-A	Fair, D-IIC	These segments involve few landowners. The existing buffer is less than 25 feet in most locations. The river is not incised in this location making this section a good candidate for riparian buffer enhancement; beaver in lower end of watershed	Buffer improvement	High priority (few landowners)	Reduce water temperature, improve bank stability	Cost of trees and shrubs or allow vegetation to regenerate on its own	Agricultural land to buffer	CREP, Property owner, ANR, FWR, WNRCD, CVRPC
#3 T3.03-B to T3.05-A	Good to Fair, D-IIC	A portion of this segment was likely straightened and is experiencing major to extreme planform adjustment and erosion	Protect River Corridor	High priority (wetlands do not offer protection; important attenuation asset)	Allow channel to continue to adjust and provide attenuation asset	Cost of river corridor easements	No additional structures in corridor	Landowners, FWR, ANR, VRC
#4T3.05B	Good-DII-C	This segment is experiencing major planform adjustment but has good vegetation holding the banks	Protect River Corridor	Low priority (wetland offers some degree of protection from filling and development)	Provide attenuation asset	Cost of river corridor easements	No additional structures in corridor	Landowners, FWR, ANR, VRC, WNRCD

Project #, Reach	Condition and Channel Evolution Stage	Site Description Including Stressors and Constraints	Project or Strategy Description	Technical Feasibility and Priority	Other Social Benefits	Costs	Land Use Conversion	Potential Partners
#5 T3.06-A	Fair, F-III	The segment has historically incised and is currently experiencing major planform adjustment as it works to rebuild new floodplain	Protect River Corridor	Low priority (good attenuation areas downstream of this segment)	Allow channel to continue to adjust	Cost of river corridor easements	No additional structures in corridor	Landowners, FWR, ANR, VRC, WNRCD
# 6 Т3.06-В	Fair, F-II	This segment has been channelized and the floodplain has been bermed to protect the Calais Town Hall; it may not be possible to remove berm without causing flooding threat to town hall	Alternatives Analysis for Removing Berm near Town hall	Moderate priority (reach seems fairly stable, but is channelized straight), alternatives analysis may be expensive	Improve habitat and geomorphic stability	Cost of alternatives analysis for berm removal, excavation, and planting	Berm to floodplain	Town of Calais, FWR, ANR, WNRCD, CVRPC
#7 Т3.06-В	Fair, F-II	Pekin Brook is currently incised in this reach; The dominant buffer is less than 25 feet in width; an alternatives analysis for removing the berm near the Town Hall should be done prior to planting in this area	Improve Riparian Buffer	Moderate Priority (this reach is fairly stable due to riprap on the banks and a berm)	Town property may be a perfect location for a demonstration project	Variable cost depending on size, type and quantity of plants	New buffer	Landowners, FWR, ANR, WNRCD

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APPENDIX I STANDARD PHASE 2 DMS REPORTS

-	bury Braı Kingsbur	nch ry Branch		Re		Phase ^{M01}	2 Segment S	, and the second s	age 1 of 2 egment: 0	September 22 Completion Da		AT Version: 4.56 gust 10, 2007
Organization: Fr	riends of	the Winoosk	i River	Obse	ervers: I	MN, Fra	nk	Wh	y Not assessed:	·	-	Rain: Yes
Segment Length (ft	:):	1,336	Se	gment Loc	cation:	Segme	nt begins at cor	nfluence of Ki	ngsbury Branc	h and Winooski	River, jus	t downstream
QC Status - Staff:	,	al Cons	Passed	•	ep 2. (Cor	-	-	3. Riparian Fea				w Modifiers
Step 1. Valley				nd. Floodpln		7.80 ft.	3.1 Stream Bank	-		4.1 Springs / See		Minimal
1.1 Segmentation No				Elev Floodp		0.00 ft.	Typical Bank SI			4.2 Adjacent We	•	Minimal
1.2 Alluvial Fan	None			h/Depth Ra	-	12.30	Bank Texture	Left	t Right	4.3 Flow Status		Moderate
1.3 Corridor Encroach	nments		2.7 Entre	enchment R	Ratio	4.93	Upper			4.4 # of Debris J	ams	0
Length (ft)	One	Both	2.8 Incis	ion Ratio		1.66	Material Type	Sand	Sand	4.5 Flow Regulat	ion Type	None
Berms	0	0	Human I	Elevated Inc	c Rat	0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulatio	n Use	
height	0	0	2.9 Sinu	osity		Low	Lower			Impoundments		None
Roads	1,336	0	2.10 Riff	les Type	Sedime	ented	Material Type	Sand	Sand	Impoundmt. Lo	cation	
height	, 0	0	2.11 Riff	ile/Step Spa	acing (ft)	0	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down stri	n flow reg	Up Stream
Railroads	0	0	2.12 Sub	ostrate Com	nposition		Bank Erosion	Left		(old) Upstrm Fl	ow Reg	
height	0	0	Bedroc	k		0%	Erosion Length			4.7 StormwaterIng	puts	
Improved Paths	0	0	Boulde	r		0%	Erosion Height	(ft) 15.27	6.00	Field Ditch) Road	Ditch 0
height	0	0	Cobble	ł		0%	Revetmt. Type	None	Rip-Rap	Other 0) Tile D	Drain 0
Development	0	23		Gravel		0%	Revetmt. Lengt	h (ft) 0	182	Overland Flow 0	Urb S	trm Wtr Pipe 0
1.4 Adjacent Side	Left	Right	Fine G			4%	Near Bank Veg.	Type Left		4.9 # of Beaver		0
Hillside Slope	Steep	Steep	Sand	avoi		79 %	Dominant	Herbaceous	Herbaceous	Affected Len		0
Continuous w/S	ometimes	Sometimes		d smaller		7%		Shrubs/Saplin	Shrubs/Saplin		• • • •	Planform Chang
W/in 1 Bankfill S	ometimes	Sometimes	Ontand	Smaller		70	Bank Canopy	Left		5.1 Bar Types	- Bou and I	
Texture	Not Evalua	Not Evalua	Silt/Clay	Present?	Ye	s	Canopy %	1-25	1-25	Mid	Point	Side
1.5 Valley Features			Detritus		8 9	%	Mid-Channel Ca		Open	0	0	4
Valley Width (f	ft) 284		# Large	Woody	3	2	3.2 Riparian Buff			-	•	•
Width Determinatio	,	nated	2.13 Ave	erage Large	est Particle	e on	Buffer Width	Left		Diagonal 0	Delta 0	lsland 0
Confinement Typ			Bed	N/A			Dominant	>100		-	-	-
Rock Gorge			Bar	N/A			Sub-dominant	51-100		5.2 Other Featur		∖ <u>Braiding</u>
Human-caused Chan							W less than 25	0	-	Flood Neck Cu	toff <u>Avulsi</u>	<u>on</u> \ 0
Step 2. Stream			2.14 Str	eam Type			Buffer Veg. Typ		Right	5.3 Steep Riffles	•	Cute
2.1 Bankfull Width		46	Str	eam Type:	С		Dominant		Shrubs/Saplin		Head Cuts	
2.2 Max Depth (ft)		4.70	Be	ed Material:	Sand		Sub-dominant	Deciduous	5 Deciduous	Steep Riffles		<u>Trib Rejuv.</u> Yes
2.3 Mean Depth (ft)		4.70 3.74		lass Slope:			3.3 Riparian Cor		D	5.4 Stream Ford	v or Animal	No
2.4 Floodprone Widtl		227		Bed Form:		Bed	Corridor Land	Left		5.5 Straightening		Straightenin
·		££1		leasured Slo	•		Dominant		t Shrubs/Saplin	Straightening	-	691
Notes:		and in the field		ference Stre		-	Sub-dominant	None		5.5 Dredging	,	Nor
Phase 1 valley walls and the phase 1 valle			(if dif	fferent from	Phase 1)	Mass Failures	(
result in confinement	•	•					Height	C) 0	Note: Step 1.6 -	Grade Con	trols
The phase 2 channel			3.3 old	Amount	Mean	Height	Gullies	(and Step 4.8 - C		
Phase 1 channel wid			Failures	None		0.00	Height	(0 0	are on The seco		
determine the Phase	2 channel	confinement	Gullies	None		0.00				report - with Ste	ps 6 throug	h 7.

•	Branch sbury Branch s of the Winooski 4,436	i River Obs	Phase each # M02 ervers: MN, DS cation: Segme		Seg Why	ge 1 of 2 gment: 0 Not assessed: feet upstream	Completion [gust 9, 2007 Rain: Yes	
QC Status - Staff: Provi	sional Cons	Passed Ste	ep 2. (Contued)		3. Riparian Feat		Step 4.	Flow & Flov	/ Modifiers	
Step 1. Valley and	Floodplain	2.5 Aband. Floodpl	-	3.1 Stream Banl			4.1 Springs / S	-	Minimal	
1.1 Segmentation None		Human Elev Flood	•	Typical Bank S			4.2 Adjacent W		Abundant	
1.2 Alluvial Fan Non	e	2.6 Width/Depth Ra		Bank Texture	Left	Right	4.3 Flow Status		Moderate	
1.3 Corridor Encroachment	s	2.7 Entrenchment I		Upper	. .		4.4 # of Debris		0	
Length (ft)	One Both	2.8 Incision Ratio	1.44	Material Type	Sand	Sand	4.5 Flow Regul		None	
Berms	0 0	Human Elevated In	nc Rat 0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulat			
height	0 0	2.9 Sinuosity	High	Lower			Impoundmen			
Roads	748 0	2.10 Riffles Type	Not Applicable	Material Type	Sand	Sand	Impoundmt. L			
height	0 0	2.11 Riffle/Step Sp	acing (ft) 0	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down s	•	Up Stream	1
Railroads	0 0	2.12 Substrate Cor	nposition	Bank Erosion	Left	Right	(old) Upstrm	Flow Reg		
height	0 0	Bedrock	0%	Erosion Length		1,225	4.7 Stormwaterl	nputs		
Improved Paths	0 0	Boulder	0%	Erosion Height	(ft) 5.42	6.17	Field Ditch	0 Road	Ditch	0
height	0 0	Cobble	0%	Revetmt. Type	None	Rip-Rap	Other	0 Tile D	rain	0
Development	0 0	Coarse Gravel	7%	Revetmt. Lengt	h (ft) 0	79	Overland Flow	0 Urb St	rm Wtr Pipe	0
1.4 Adjacent Side	Left Right	Fine Gravel	14%	Near Bank Veg.	Type Left	Right	4.9 # of Beave		1	
Hillside Slope	Flat Hilly	Sand		Dominant	Shrubs/Saplin	Shrubs/Saplin	4.9 # 01 Beave		150	
Continuous w/ Someti	-		79 %	Sub-dominant	Herbaceous	Herbaceous				
W/in 1 Bankfill Someti		Silt and smaller	0%	Bank Canopy	Left	Right	Step 5. Chanr	iei beu anu r	Planform Cha	anges
Texture Not Ex		Silt/Clay Present?	Yes	Canopy %	1-25	1-25	5.1 Bar Types			
1.5 Valley Features		Detritus	15 %	Mid-Channel C	anopy	Open	Mid	Point	Side	
	004	# Large Woody	84	3.2 Riparian Buf	fer		1	8	7	
	361	2.13 Average Large		Buffer Width	Left	Right	Diagonal	Delta	Island	
	Estimated	Bed N/A		Dominant	>100	>100	0	0	0	
	Broad			Sub-dominant	0-25	0-25	5.2 Other Feat	ures	\ Braiding	J
· · · · · · · · · · · · · · · · · · ·	No	Bar N/A		W less than 25	89	91	Flood Neck C	utoff Avulsion	on 🔪 0	
Human-caused Change?	No			Buffer Veg. Typ	e Left	Right	1 1	1	_ \	
Step 2. Stream Char	nnel	2.14 Stream Type Stream Type:		Dominant	Shrubs/Saplin	Shrubs/Saplin	5.3 Steep Riffle	es and Head	Cuts	
2.1 Bankfull Width	59			Sub-dominant	Herbaceous	Herbaceous	Steep Riffles	Head Cuts	Trib Rejuv	v.
2.2 Max Depth (ft)	6.30	Bed Material:		3.3 Riparian Co	ridor		0	0	Yes	
2.3 Mean Depth (ft)	3.60	Subclass Slope:		Corridor Land	Left	Right	5.4 Stream For	d or Animal	No	
2.4 Floodprone Width (ft)	360	Field Measured S	Dune-Ripple	Dominant	Shrubs/Saplin		5.5 Straighteni	ng	Straighte	ning
Notes:			•	Sub-dominant	None	None	Straighteni	ng Length:	297	7
M02 is highly sinuous. Thi	is reach also highly	2.15 Reference Str		Mass Failures	172	61	5.5 Dredging		١	None
influence by Montpelier Po		(if different from	n Phase 1)							
sediment (sediment starve				Height	70	20	Note: Step 1.6	- Grade Con	trols	
likely contributed to incision		3.3 old Amount	Mean Height	Gullies	0	0	and Step 4.8 -			
ration was 1.44 (fair) and a		Failures None	0.00	Height	0	0	are on The sec			
(trib) was noted within the	reach.	Gullies None	0.00				report - with St	teps 6 throug	n 7.	

Project: Kingsbu Stream: Ki				Poo		e 2 Segment S		age 1 of 2	•	SGAT Version: 4.56
	•	[,] Branch he Winoosk	Divor					gment: 0	no property access	September 17, 2007
0		8,138		Observ Amont Loca			-		oelectric project	Rain: No
Segment Length (ft):						1		1		
QC Status - Staff: Pr			Passed		2. (Contued)		3. Riparian Feat	ures		K Flow Modifiers
Step 1. Valley a		dplain		nd. Floodpln	0.00 ft	0.1 Olican Dan			4.1 Springs / Seeps	Minimal
1.1 Segmentation Non				Elev Floodplr		. Typical Bank Sl Bank Texture	ope Steep Left	Pight	4.2 Adjacent Wetlands 4.3 Flow Status	Minimal Low
	None			h/Depth Ratio		Upper		<u>Right</u>	4.4 # of Debris Jams	3
1.3 Corridor Encroachm				enchment Rat ion Ratio		Material Type	Sand	Sand	4.5 Flow Regulation Ty	
Length (ft)	One	Both		Elevated Inc F	0.00	Consistency	Non-cohesive	Non-cohesive	• •	
Berms	0	0			Rat 0.00	Lower	NOII-COIIeSive	Non-conesive	Impoundments	Hydro-electric
height	0	0	2.9 Sinu	-		Material Type	Sand	Sand	Impoundmt. Location	
Roads	2,312	104		les Type		Consistency	Non-cohesive	Non-cohesive	•	
height	0	0		le/Step Spaci	• • •	Bank Erosion	Left	Right	(old) Upstrm Flow Re	•
Railroads	0	0	$\frac{2.12}{500}$	ostrate Comp	osition	Erosion Length		1,737	· · ·	'9
height	0	0				Erosion Height		10.38	4.7 StormwaterInputs	
Improved Paths	0	0				Revetmt. Type	Multiple	Multiple		Road Ditch 1
height	0	0 261				Revetmt. Lengt	-	487		Tile Drain 0
Development	217	-				Near Bank Veg.		Right		Urb Strm Wtr Pipe 0
1.4 Adjacent Side Hillside Slope	Left	Right Hilly				Dominant	···	Shrubs/Saplin	4.9 # of Beaver Dams	
•	Steep	•					Shrubs/Saplin	-	Affected Length (ft	
Continuous w/		Sometimes				Bank Canopy	Left	Right	Step 5. Channel Bed	and Planform Changes
W/in 1 Bankfill Son		Sometimes	Silt/Clav	Present?		Canopy %	1-25	1-25	5.1 Bar Types	
Texture No	ot Evalua	Not Evalua	Detritus	1 resent:	0 %	Mid-Channel Ca		Open	Mid Point	t <u>Side</u>
1.5 Valley Features			# Large	Moody	0	3.2 Riparian Buf	• •	- p	0 0	0
Valley Width (ft)			-	-	•	Buffer Width	Left	Right	Diagonal Delta	a Island
Width Determination	Estima	ated		erage Largest	Particle on	Dominant	>100	>100	0 0	0
Confinement Type	Broad		Bed	0.0		Sub-dominant	0-25	0-25	5.2 Other Features	\ Braiding
Rock Gorge?	No		Bar	0.0		W less than 25	1,227	547	Flood Neck Cutoff A	Avulsion 0
Human-caused Change	e? no			-		Buffer Veg. Typ	e Left	Right	0 0	0
Step 2. Stream C	Channel			eam Type	_	Dominant	Herbaceous	Shrubs/Saplin	5.3 Steep Riffles and H	lead Cuts
2.1 Bankfull Width		0		eam Type: E		Sub-dominant	Shrubs/Saplin	Herbaceous	Steep Riffles Head (Cuts Trib Rejuv.
2.2 Max Depth (ft)	0	.00		d Material:		3.3 Riparian Cor	-		0 0	
2.3 Mean Depth (ft)	0	.00		ass Slope: N Bed Form: D		Corridor Land	Left	Right	5.4 Stream Ford or An	imal No
2.4 Floodprone Width	(ft)	0		leasured Slop		Dominant	Shrubs/Saplin		5.5 Straightening	Straightening
Notes:				ference Strea		Sub-dominant	-	Commercial	Straightening Leng	gth: 2,104
FWR not able to obtain	landowne	er permisison		ferent from P		Mass Failures	321	120	5.5 Dredging	None
along both banks. This		•			1036 1)	Height	56	56		
but no cross-section wa	•			A	Ma	Gullies	0	0	Note: Step 1.6 - Grade	
reach appeared to be in			3.3 old	Amount	Mean Height	Height	0	0	and Step 4.8 - Channe	
geomorphic condition.			Failures	None	0.00		0	U	are on The second pag report - with Steps 6 th	
when this reach was wa	aikeu uue		Gullies	None	0.00					

•	iry Branc ngsbury			Reach #	Phase M05	2 Segment S	s ann an y	ge 1 of 2 gment: 0	September Completion		GAT Version: 4.56 gust 17, 2007
Organization: Frie	nds of th	e Winoosk		Observers:	•	•	•	Not assessed:	mpounded		Rain: No
Segment Length (ft):		8,888	Segm	ent Location:	Immedi	iately above No	orth Montpelier	Pond			
QC Status - Staff: Pro	ovisional	Cons	Passed	Step 2. (C	ontued)	Step	3. Riparian Feat	ures	Step 4	. Flow & Flow	<i>w</i> Modifiers
Step 1. Valley a	nd Flood	plain	2.5 Aband. F	loodpln	0.00 ft.	3.1 Stream Banl			4.1 Springs / S	Seeps	Abundant
1.1 Segmentation None	e		Human Elev	[,] Floodpln	0.00 ft.	Typical Bank S	lope Steep		4.2 Adjacent V		Abundant
1.2 Alluvial Fan	lone		2.6 Width/De	epth Ratio	0.00	Bank Texture	Left	Right	4.3 Flow Statu	S	Moderate
1.3 Corridor Encroachm	ients		2.7 Entrench		0.00	Upper			4.4 # of Debris		2
Length (ft)	One	Both	2.8 Incision	Ratio	0.00	Material Type	Sand	Sand	4.5 Flow Regu	••	None
Berms	0	0	Human Elev	ated Inc Rat	0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regula		
height	0	0	2.9 Sinuosity	/		Lower			Impoundmer		
Roads	2,780	0	2.10 Riffles	Гуре		Material Type	Silt	Silt	Impoundmt.		
height	0	0	2.11 Riffle/S	tep Spacing (ft) 0	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down s	•	Down Stream
Railroads	0	0	2.12 Substra	te Compositio	n	Bank Erosion	Left	Right	(old) Upstrm	Flow Reg	
height	0	0			-	Erosion Length		1,356	4.7 Stormwater	Inputs	
Improved Paths	0	0				Erosion Height	(ft) 5.00	4.02	Field Ditch	1 Road	Ditch 0
height	0	0				Revetmt. Type	None	Rip-Rap	Other	0 Tile D	Drain 0
Development	0	27				Revetmt. Lengt	th (ft) 0	19	Overland Flow	Urb S	strm Wtr Pipe 0
1.4 Adjacent Side	Left	Right				Near Bank Veg.	Type Left	Right	4.9 # of Beav		0
Hillside Slope Ver	y Steep	Hilly				Dominant	Shrubs/Saplin	Shrubs/Saplin	Affected L		0
Continuous w/Son		Never				Sub-dominant	Shrubs/Saplin	Herbaceous			Planform Change
W/in 1 Bankfill Sor						Bank Canopy	Left	Right			
Texture No		Not Evalua	Silt/Clay Pre	sent?		Canopy %	26-50	26-50	5.1 Bar Types	-	Q: de
1.5 Valley Features			Detritus	0	%	Mid-Channel C	anopy	Open	Mid	Point	Side
Valley Width (ft)	633		# Large Woo	ody	0	3.2 Riparian Buf	fer		0	4	3
Width Determination	Estimat	ad	2.13 Averag	e Largest Parti	cle on	Buffer Width	Left	Right	Diagonal	Delta	Island
		eu	Bed	0.0		Dominant	>100	>100	0	1	1
Confinement Type	Broad		Bar	0.0		Sub-dominant	51-100	51-100	5.2 Other Fea	tures	∖ <u>Braiding</u>
Rock Gorge?	No		Dai	0.0		W less than 25	0	0	Flood Neck (ion \ 0
Human-caused Change	•		2.14 Stream	Туре		Buffer Veg. Typ	be <u>Left</u>	Right	0 2		N N
Step 2. Stream C	hannel	_		Type: E		Dominant	Shrubs/Saplin	Shrubs/Saplin	5.3 Steep Riff	es and Head	Cuts
2.1 Bankfull Width		0		aterial: Sand		Sub-dominant	Deciduous	Deciduous	Steep Riffles	Head Cuts	Trib Rejuv.
2.2 Max Depth (ft)	0.0			Slope: None		3.3 Riparian Co	rridor		0	0	No
2.3 Mean Depth (ft)	0.0	00		Form: Dune-	Ripple	Corridor Land	Left	Right	5.4 Stream Fo		No
2.4 Floodprone Width ((ft)	0		ured Slope:		Dominant	Shrubs/Saplin		5.5 Straighten	-	Straightening
Notes:				nce Stream Ty	pe	Sub-dominant	Residential	Residential	-	ing Length:	383
Only a small portion of t	this reach v	was		nt from Phase		Mass Failures	106	148	5.5 Dredging		None
mapped. It was very de					''	Height	15	12			
many side channels. Th						Gullies	0	0	Note: Step 1.6		
significant debris jams.					n Height	Height	0	0	and Step 4.8 -		
influenced by the impou				one	0.00	rieigiit	Ū	0	are on The se		
Montpelier Pond) and is	s character	ized as a	Gullies No.	one	0.00				report - with S	heps o throug	

Project: King Stream: Organization:	-	inch ry Branch f the Winoosk		Phase Reach # M06 Servers: Mary, L	e 2 Segment S	Se	age 1 of 2 gment: 0 Not assessed:	Completion	22, 2008 SG Date: Aug	AT Version: gust 14, 20 Rain: No	
Segment Length		8,589		• •	am of impound						
QC Status - Stat	()	,		tep 2. (Contued)		3. Riparian Feat	1	•	. Flow & Flov	w Modifiors	
Step 1. Vall			2.5 Aband. Floodp		3.1 Stream Ban			4.1 Springs / S		Abundan	
1.1 Segmentation		ouplain	Human Elev Floor					4.2 Adjacent V	-	Abundan	
1.2 Alluvial Fan	None		2.6 Width/Depth R	•	Bank Texture	Left	Right	4.3 Flow Statu		Moderate	
1.3 Corridor Encro			2.7 Entrenchment		Upper			4.4 # of Debris	Jams	1	
Length (ft		e Both	2.8 Incision Ratio	1.00	Material Type	Sand	Sand	4.5 Flow Regu	lation Type	None	
Berms			Human Elevated I		Consistency	Non-cohesive	Non-cohesive	Flow Regula	tion Use		
heigh) 0	2.9 Sinuosity	High	Lower			Impoundmer	nts		
Roads			2.10 Riffles Type	•	Material Type	Clay	Clay	Impoundmt.	Location		
heigh	-) 0	2.11 Riffle/Step Sp		Consistency	Cohesive	Cohesive	4.6 Up/Down s	strm flow reg	None	
Railroads) 0	2.12 Substrate Co		Bank Erosion	Left	Right	(old) Upstrm	Flow Reg		
heigh) 0	Bedrock	0%	Erosion Length	(ft) 4,105	3,446	4.7 Stormwater	Inputs		
Improved Paths) 0	Boulder	0%	Erosion Height	(ft) 4.69	6.15	Field Ditch	0 Road	Ditch	0
heigh) 0	Cobble	0%	Revetmt. Type	Rip-Rap	Rip-Rap	Other	0 Tile D		0
Developmen			Coarse Gravel	0%	Revetmt. Lengt	h (ft) 134	363	Overland Flov	-	trm Wtr Pipe	€ 0
1.4 Adjacent Side	Let	ft Right	Fine Gravel	0%	Near Bank Veg.	Type Left	Right	4.9 # of Beav		0	
Hillside Slope	Extremel		Sand	80 %	Dominant	Shrubs/Saplin	Shrubs/Saplin	Affected L		0	
Continuous w		r Sometimes			Sub-dominant	Herbaceous	Herbaceous	Step 5. Chan	•	-	handoe
		s Sometimes	Silt and smaller	20 %	Bank Canopy	Left	Right	5.1 Bar Types			nanges
	e Not Evalu		Silt/Clay Present?	Yes	Canopy %	1-25	1-25			Cida	
1.5 Valley Feature			Detritus	7 %	Mid-Channel C	anopy	Open	Mid	Point	Side	
Valley Widtl	_		# Large Woody	43	3.2 Riparian Buf	fer		1	14	8	
Width Determina	. ,	mated	2.13 Average Larg	est Particle on	Buffer Width	Left	Right	Diagonal	Delta	Island	
Confinement 1		Broad	Bed N/A		Dominant	0-25	0-25	0	0	1	
Rock Go		Bioau	Bar N/A		Sub-dominant	>100	>100	5.2 Other Fea		Braidir	ıg
Human-caused Ch	•				W less than 25	-	198	Flood Neck 0		<u>on</u> \ 0	
Step 2. Strea	-		2.14 Stream Type		Buffer Veg. Typ		Right	• •	-	O ute	
2.1 Bankfull Width		36	Stream Type		Dominant	Herbaceous	Herbaceous	5.3 Steep Riff			
2.1 Bankruit Widtr 2.2 Max Depth (ft)		30 6.70	Bed Material	: Sand		Shrubs/Saplin	Shrubs/Saplin	Steep Riffles	Head Cuts	Trib Rej	
			Subclass Slope	None	3.3 Riparian Cor			0 5 4 Stream 5	0 National	No	
2.3 Mean Depth (1		4.43	Bed Form	: Dune-Ripple	Corridor Land	Left	Right	5.4 Stream Fo		No	
2.4 Floodprone W	idth (ft)	360	Field Measured S	Slope:	Dominant	Pasture	Crop	5.5 Straighten	-	Straight 3,0	-
Notes:			2.15 Reference St	ream Type	Sub-dominant	Shrubs/Saplin	Shrubs/Saplin	5.5 Dredging	ing Length:	3,0	None
Much of this reach		•	(if different fror	n Phase 1)	Mass Failures	0	0	5.5 Dreuging			NOTIC
straightened for ag topo). Some faile					Height	0	0	Note: Step 1.6	S - Grade Cor	trols	
the field. This rea			3.3 old Amount	Mean Height	Gullies	0	0	and Step 4.8 -			
Farm. The Winoo			Failures None	0.00	Height	0	0	are on The see			
has been working	with the farm	ner by planting	Gullies None	0.00				report - with S	teps 6 throug	h 7.	

Project: Kings Stream:	sbury Brar Kingsbur			Re	Phase each # M07	se 2 Segment	• annan y	age 1 of 2 gment: 0	September 22, 20 Completion Date:	08 SGAT Version: 4.56 August 14, 2007
	-	the Winoosk	i River			Laura, Clay		Not assessed:	•	Rain: No
Segment Length (1		2,817					•			es along the Kingsbury
QC Status - Staff:	,	•	Passed	0	p 2. (Contued)					/ & Flow Modifiers
Step 1. Valley				nd. Floodpln			o 3. Riparian Feat	ures	4.1 Springs / Seeps	Minimal
1.1 Segmentation N	•	Japian		Elev Floodp		0.1 Otream Dar			4.2 Adjacent Wetland	
1.2 Alluvial Fan	None			th/Depth Rat			Left	Right	4.3 Flow Status	Moderate
1.3 Corridor Encroad				renchment R					4.4 # of Debris Jams	ы О
Length (ft)	One	Both	2.8 Incis	sion Ratio	1.18		Sand	Sand	4.5 Flow Regulation	Type None
Berms	0110	0	Human	Elevated Inc	c Rat 0.0	Consistency	Non-cohesive	Non-cohesive	Flow Regulation U	se
height	0	0	2.9 Sinu	Josity	Moderate	e Lower			Impoundments	
Roads	2,437	0	2.10 Rif	fles Type	Not Applicabl	e Material Type	Sand	Sand	Impoundmt. Locati	on
height	0	0	2.11 Rif	fle/Step Spa	cing (ft) 0	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down strm flo	ow reg None
Railroads	0	0	2.12 Su	bstrate Com	position	Bank Erosion	Left	Right	(old) Upstrm Flow	Reg
height	0	0	Bedroo	ck	0%	Erosion Lengt		1,156	4.7 StormwaterInputs	
Improved Paths	0	0	Boulde	er	0%	Erosion Heigh		4.58	Field Ditch 0	Road Ditch 1
height	0	0	Cobble	9	0%	Revetmt. Type		Rip-Rap	Other 0	Tile Drain 0
Development	0	0	Coarse	e Gravel	0%	Revetmt. Leng	gth (ft) 0	104	Overland Flow 0	Urb Strm Wtr Pipe 0
1.4 Adjacent Side	Left	Right	Fine G	iravel	6%	Near Bank Veg		Right	4.9 # of Beaver Dar	ns 0
Hillside Slope	Hilly	Extremely	Sand		72%	Dominant	Shrubs/Saplin	-	Affected Length	(ft) 0
Continuous w/	Never	Never	Silt and	d smaller	22%	Sub-dominant		Herbaceous	-	ed and Planform Changes
W/in 1 Bankfill	Never	Never				Bank Canopy	Left	Right	5.1 Bar Types	0
Texture	Not Evalua	Not Evalua	Silt/Clay	/ Present?	Yes	Canopy %	1-25	1-25	Mid Po	int Side
1.5 Valley Features			Detritus		2 %	Mid-Channel (Open	3 5	
Valley Width	(ft) 732		# Large	-	1	3.2 Riparian Bu		Diabt	Diagonal De	-
Width Determinati	ion Estim	ated	2.13 Av	erage Large	st Particle on	Buffer Width Dominant	<u>Left</u> >100	<u>Right</u> >100	$\frac{1}{0}$ $\frac{1}{1}$	
Confinement Ty	pe Very	Broad	Bed	N/A		Sub-dominant		26-50	5.2 Other Features	\ Braiding
Rock Gorg	e? No		Bar	N/A		W less than 25		20-50	Flood Neck Cutoff	\ <u> </u>
Human-caused Cha						Buffer Veg. Ty		Right	$\frac{1000}{0}$ $\frac{1000}{0}$	
Step 2. Stream	n Channel			ream Type	_	Dominant	Shrubs/Saplin		5.3 Steep Riffles and	d Head Cuts
2.1 Bankfull Width		34		ream Type:		Sub-dominant		Shrubs/Saplin	Steep Riffles Head	
2.2 Max Depth (ft)	!	5.60		ed Material:		3.3 Riparian Co			$\frac{1}{0}$ $\frac{1}{0}$	No
2.3 Mean Depth (ft)		4.33	Subc	lass Slope:		Corridor Land	Left	Right	5.4 Stream Ford or A	
2.4 Floodprone Wid	lth (ft)	465		Bed Form: Aeasured Sk	Dune-Ripple	Dominant	Shrubs/Saplin		5.5 Straightening	Straightening
Notes:	. ,			eference Stre	•	Sub-dominant	-	Residential	Straightening Le	ngth: 1,416
Only 150 feet with ri	prap, but ev	vidence of		ifferent from		Mass Failures		Nesidential 0	5.5 Dredging	None
failed riprap was alo					1 11030 I)	Height	0	0		
channel.	-			A .		Culling	0	5 N	Note: Step 1.6 - Gra	
			3.3 old	Amount	Mean Heigh		0	0	and Step 4.8 - Chan	
The watershed divid found to be off. A new			Failures		0.00	, -	Ū	U	are on The second p report - with Steps 6	
	ew ws snap	CITE Was	Gullies	None	0.00	'				

•	ry Branch ngsbury Bran	ch		Reach	Phase # M08	2 Segment S	s a many	age 1 of 2 gment: A	September Completion		GAT Version: 4	
	nds of the Wi		i River	Observers	: Mary ar	nd David	Why	Not assessed:	beaver dam		Rain: No	
Segment Length (ft):	3,27	'8	Seg	ment Location	: Segme	ent starts about	600 feet downs	stream of Still	Brook Road at	change in	landuse.	
QC Status - Staff: Pro	ovisional Cons		Passed	Step 2. (i.	3. Riparian Feat			. Flow & Flov		
Step 1. Valley a				d. Floodpln	0.00 ft.	3.1 Stream Ban	-		4.1 Springs / S		Abundant	
1.1 Segmentation Bank			Human E	lev Floodpln	0.00 ft.	Typical Bank S			4.2 Adjacent V		Abundant	
	lone			/Depth Ratio	0.00	Bank Texture	Left	Right	4.3 Flow Statu	S	Moderate	
1.3 Corridor Encroachm	ents		2.7 Entrer	nchment Ratio	0.00	Upper			4.4 # of Debris		0	
Length (ft)	One	Both	2.8 Incisio	on Ratio	0.00	Material Type	Sand	Sand	4.5 Flow Regu	lation Type	None	
Berms	0	0	Human El	levated Inc Rat	0.00	Consistency	Non-cohesive	Non-cohesive	5			
height	0	0	2.9 Sinuo	sity		Lower			Impoundmer			
Roads	0	0	2.10 Riffle	es Type		Material Type	Sand	Gravel	Impoundmt.			
height	0	0	2.11 Riffle	e/Step Spacing ((ft) O	Consistency	Non-cohesive	Non-cohesive		•	None	
Railroads	0	0	2.12 Subs	strate Compositi	on	Bank Erosion	$\frac{\text{Left}}{200}$	Right	(old) Upstrm	Flow Reg		
height	0	0				Erosion Length		659	4.7 Stormwater	Inputs		
Improved Paths	0	0				Erosion Height		5.06	Field Ditch	0 Road	Ditch	0
height	0	0				Revetmt. Type	None	None	Other	0 Tile D		0
Development	0	0				Revetmt. Lengt		0	Overland Flow	√0 Urb S	strm Wtr Pipe	0
1.4 Adjacent Side	Left	Right				Near Bank Veg.		Right	4.9 # of Beav	er Dams	6	
Hillside Slope	Steep	Hilly				Dominant	Shrubs/Saplin		Affected L	ength (ft)	2,680	
Continuous w/Som	netimes I	lever				Sub-dominant	Herbaceous	Herbaceous	Step 5. Chan	nel Bed and	Planform Cha	anges
W/in 1 Bankfill Som		lever	0.11/01			Bank Canopy Canopy %	<u>Left</u> 26-50	Right 1-25	5.1 Bar Types			
Texture No	t Evalua Not E	valua	Silt/Clay F			Mid-Channel C			Mid	Point	Side	
1.5 Valley Features			Detritus		0%			Open	0	8	5	
Valley Width (ft)	450		# Large W	-	0	3.2 Riparian Buf Buffer Width	Left	Right	Diagonal	Delta	Island	
Width Determination	Estimated			age Largest Par	rticle on	Dominant	>100	>100	0	0	1	
Confinement Type	Broad		Bed	0.0		Sub-dominant	None	0-25	5.2 Other Fea	tures	\ Braiding	a
Rock Gorge?	No		Bar	0.0		W less than 25		183	Flood Neck C		\	5
Human-caused Change	? no		_	_		Buffer Veg. Typ	be Left	Right	0 1	1	\	
Step 2. Stream C	hannel		2.14 Strea			Dominant	Shrubs/Saplin		5.3 Steep Riffl	es and Head	Cuts	
2.1 Bankfull Width	0			am Type: E		Sub-dominant	•	Herbaceous	Steep Riffles	Head Cuts	 Trib Reju	IV.
2.2 Max Depth (ft)	0.00			Material: San		3.3 Riparian Co	rridor		0	0	No	
2.3 Mean Depth (ft)	0.00			iss Slope: Non Bed Form: Dun		Corridor Land	Left	Right	5.4 Stream Fo	rd or Animal	No	
2.4 Floodprone Width (ft) O			ea Form: Dun easured Slope:	e-rrippie	Dominant	Shrubs/Saplin		5.5 Straighten	ing	Ν	None
Notes:				erence Stream T	vne	Sub-dominant	Forest	None	Straighten	ing Length:	0)
This lower segment was	s not assessed c	ue to		erent from Phas		Mass Failures	48	131	5.5 Dredging		١	None
beaver dams, wetlands,				crementoni i nas	U 1)	Height	20	24				
human caused change		as	2224		on Unicht	Gullies	0	0	Note: Step 1.6			
noted in segment A. Th	•	+	3.3 old		ean Height	Height	0	0	and Step 4.8 - are on The sec			
naturally narrower than Therefore, the phase 2		ent.		None	0.00		Ŭ	Ŭ	report - with S			
			Gullies	None	0.00						,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

Project: Kings Stream:	bury Brand Kingsbury			Rea	Pha ach # M08		2 Segment S	· • · · · · · · · · · · · · · · · · · ·	age 1 of 2 egment: B	September 22 Completion Da		AT Version: 4 Iy 31, 2007	4.56
		ne Winooski	River	Obser		-	d David		y Not assessed	•		Rain: No	
Segment Length (f	t):	6,321	Se			-				ately 600 feet bel			
QC Status - Staff:	,	Cons	Passed	-	o 2. (Contue		•	3. Riparian Fea		-	low & Flow		
Step 1. Valley				id. Floodpln		00 ft.	3.1 Stream Bank	•	tures	4.1 Springs / See		Minimal	
1.1 Segmentation B		-		Elev Floodpl)0 ft.	Typical Bank SI			4.2 Adjacent Wet		Abundant	
1.2 Alluvial Fan	None			n/Depth Rati		.00	Bank Texture	Left	Right	4.3 Flow Status		Moderate	
1.3 Corridor Encroac	hments			enchment Ra		.00	Upper			4.4 # of Debris Ja	ams	0	
Length (ft)	One	Both	2.8 Incisi	ion Ratio	0.	.00	Material Type	Sand	Sand	4.5 Flow Regulat	ion Type	None	
Berms	0	0	Human E	Elevated Inc	Rat 0.	.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulation	n Use		
height	0	0	2.9 Sinuo	osity			Lower			Impoundments			
Roads	202	0	2.10 Riff	es Type			Material Type	Sand		Impoundmt. Lo			
height	0	0	2.11 Riff	e/Step Spac	cing (ft)	0	Consistency	Non-cohesive			-	None	
Railroads	0	0	2.12 Sub	strate Comp	position		Bank Erosion	(ft) Left		(old) Upstrm Fl	•		
height	0	0					Erosion Length			4.7 StormwaterInp	outs		
Improved Paths	0	0					Erosion Height	. ,		Field Ditch 1			1
height	0	0					Revetmt. Type	Rip-Rap		Other 0			0
Development	449	32					Revetmt. Lengt		-	Overland Flow 0	Urb Str	rm Wtr Pipe	0
1.4 Adjacent Side	Left	Right					Near Bank Veg. Dominant	Type <u>Left</u> Herbaceous		4.9 # of Beaver	Dams	9	
Hillside Slope	Steep	Hilly							Shrubs/Saplin	Affected Len	gth (ft)	3,820	
Continuous w/S		Never					Bank Canopy	Left		Step 5. Channe	Bed and P	lanform Ch	anges
W/in 1 Bankfill S		Never	Silt/Clay	Procent?			Canopy %	1-25		5.1 Bar Types			
	Not Evalua	Not Evalua	Detritus	FIESEIII!	0 %		Mid-Channel Ca		Open	Mid	Point	Side	
1.5 Valley Features			# Large	Noody	0 %		3.2 Riparian Buff	••	opon	0	9	12	
Valley Width (-	-	-		Buffer Width	Left	Right	Diagonal	Delta	Island	
Width Determination					st Particle or	<u> </u>	Dominant	0-25	·	0	0	1	
Confinement Ty		road	Bed	0.0			Sub-dominant	>100	>100	5.2 Other Featur	es	\ Braiding	J
Rock Gorge			Bar	0.0			W less than 25	2,104	3,442	Flood Neck Cut	off Avulsio	on \ 0	
Human-caused Cha			2 14 Str	eam Type			Buffer Veg. Typ	e <u>Left</u>	Right	0 3	1	- \	
Step 2. Strean	n Channel			eam Type:	F		Dominant	Herbaceous	Herbaceous	5.3 Steep Riffles	and Head C	Cuts	
2.1 Bankfull Width		0		d Material:			Sub-dominant	Shrubs/Saplin	Shrubs/Saplin	Steep Riffles H	lead Cuts	Trib Rejuv	
2.2 Max Depth (ft)		00		ass Slope:			3.3 Riparian Cor	ridor		0	0	Yes	
2.3 Mean Depth (ft)		00			Riffle-Pool		Corridor Land	Left	Right	5.4 Stream Ford		No	
2.4 Floodprone Wid	th (ft)	0		easured Slo			Dominant	Hay	Hay	5.5 Straightening		Straighte	-
Notes:				erence Stre			Sub-dominant	Forest	Shrubs/Saplin	Straightening	Length:	443	
Segment M08-B was			(if dif	ferent from I	Phase 1)		Mass Failures	28	0	5.5 Dredging		ſ	None
beaver dams. Overa							Height	20	0	Noto: Stan 1.0	Crade Cast	rolo	
a Rosgen "E" stream bedform, but some c			3.3 old	Amount	Mean Hei	ight	Gullies	C) 0	Note: Step 1.6 - and Step 4.8 - Ch			
dominated by sands			Failures	None		00	Height	C) 0	are on The secor			
		,	Gullies	None		00				report - with Step			
				-						1			

Project: Kin Stream:	igsbury Kings		ch Branch		Re	each #	Phase M09	2 Segment S		page 1 of 2 Segment: (Septembe Completion		SGAT Version July 31, 200	
Organization:	Friend	s of th	he Winooski	River	Obse	ervers:	MN, Dav	/e	W	hy Not ass	sessed:	-		Rain: Ye	s
Segment Length	h (ft):		2,682	Se	gment Loo	cation:	Segme	nt begins where	e channel be	comes ve	ry stra	ight along Rt	14 and co	ontinues 268	2 feet
QC Status - Sta	aff: Provi	sional	Cons	Passed	Ste	p 2. (Co	ontued)	Step	3. Riparian Fe	atures		Step 4	4. Flow & F	low Modifiers	5
Step 1. Val	lley and	Flood	dplain	2.5 Abar	nd. Floodplr	า	6.70 ft.	3.1 Stream Bank	-			4.1 Springs / S		Minimal	_
1.1 Segmentation	-		<u> </u>	Human	Elev Floodp	oln	0.00 ft.	Typical Bank SI				4.2 Adjacent \	Netlands	Abundar	nt
1.2 Alluvial Fan	Non	е		2.6 Widt	h/Depth Ra	tio	11.58	Bank Texture	Le	eft	Right	4.3 Flow Statu	JS	Moderate	e
1.3 Corridor Encro	oachment	s		2.7 Entre	enchment R	latio	10.38	Upper				4.4 # of Debris		0	
Length (f	ft)	One	Both	2.8 Incis	ion Ratio		1.67	Material Type	San	d	Sand	4.5 Flow Regu	ulation Type	e None	
Berm	is	0	0	Human I	Elevated Ind	c Rat	0.00	Consistency	Non-cohesiv	ve Non-co	ohesive	Ũ			
heigh	ht	0	0	2.9 Sinu	osity		Low	Lower				Impoundme			
Road		,155	0	2.10 Riff	les Type	Com	plete	Material Type	San		Sand	Impoundmt.			
heigł	ht	0	0	2.11 Riff	le/Step Spa	acing (ft)	380	Consistency	Non-cohesiv	ve Non-co	ohesive	•		eg None	
Railroad	ds	0	0	2.12 Sub	ostrate Com	positior	<u>n</u>	Bank Erosion			Right	(old) Upstrm	Flow Reg		
heigh	ht	0	0	Bedroc	k		0%	Erosion Length			372	4.7 Stormwate	rInputs		
Improved Path	าร	0	312	Boulde	r		0%	Erosion Height			4.35	Field Ditch	0 Ro	oad Ditch	2
heigh	ht	0	0	Cobble			2%	Revetmt. Type	Non		p-Rap	Other	0 Til	e Drain	0
Developmer	nt	221	25	Coarse	Gravel		14%	Revetmt. Lengt		0	88	Overland Flow	w 0 Url	b Strm Wtr Pip	e 0
1.4 Adjacent Side	2	Left	Right	Fine G	ravel		37%	Near Bank Veg.	· · ·		Right	4.9 # of Beav	er Dams	0	
Hillside Slop	be S	teep	Steep	Sand			47%	Dominant	Herbaceou			Affected L	_ength (ft)	0	
Continuous v	w/Someti	imes	Never	Silt and	smaller		0%	Sub-dominant			· ·	Step 5. Chan	nel Bed ar	nd Planform C	hanges
W/in 1 Bankf	fill Someti	imes	Sometimes					Bank Canopy	Le		Right	5.1 Bar Types			
Textur	re Not Ev	valua	Not Evalua	-	Present?		es	Canopy %	1-2		1-25	Mid	- Point	Side	
1.5 Valley Feature	es			Detritus			%	Mid-Channel Ca		Open		2	2	3	
Valley Wid	lth (ft) 3	310		# Large	Woody		15	3.2 Riparian Buff		. 4.	Diacht	– Diagonal	_ Delta	Island	4
Width Determin	nation E	Estima	ted	2.13 Ave	erage Large	st Partic	cle on	Buffer Width	Le		Right 26-50	0	0	1	-
Confinement	Type E	Broad		Bed	2.5		inches	Dominant Sub-dominant	>10 0-2		>100	5.2 Other Fea	•	∖ Braidi	na
Rock Go	••	No		Bar	1.0		inches	W less than 25	75		79	Flood Neck			ng
Human-caused C	•	yes						Buffer Veg. Typ			Right				
Step 2. Stre	-	•			eam Type			Dominant	Shrubs/Sapli	-		5.3 Steep Riff	les and He	ad Cuts	
2.1 Bankfull Widt			32		eam Type:			Sub-dominant	Herbaceou		-	Steep Riffles	Head Cu		iuv
2.2 Max Depth (ff	t)	4.	00		d Material:		1				Leous	0	0	Ye	
2.3 Mean Depth			72		ass Slope:			3.3 Riparian Cor Corridor Land	Le	.ft	Right	5.4 Stream Fo	ord or Anim		
2.4 Floodprone V			27		Bed Form:		Pool		Shrubs/Sapli			5.5 Straighter		Straigh	
Notes:					leasured Sl	•		Dominant				-	ning Length	-	347
Weak riffle-pool b	ed form	Some	nlane hed		ference Stre			Sub-dominant	Ha 10	ay Shrubs/S	-	5.5 Dredging		,	None
by lower section of				(if dif	fferent from	Phase	1)	Mass Failures	-		0				
Low w/d ratio prol			v v					Height	1	17	0	Note: Step 1.	6 - Grade (Controls	
incision. Few poir	nt bars in	reach.	Some	3.3 old	Amount	Mea	n Height	Gullies		0	0	and Step 4.8			
areas within the re				Failures	None		0.00	Height		0	0	are on The se			
sinuous and the s	stream is l	beginn	ing to build	Gullies	None		0.00					report - with S	Steps 6 thro	ough 7.	

Segment Length (t): 2,452 Segment Location: Seg	Stream: K Organization: Fri	oury Branch Kingsbury E iends of the	Branch e Winooski		Obse	ervers:	M10 MN, Da'		S Wr	age 1 of 2 egment: 0 y Not assessed:	Completion	Date: J	GAT Version: July 27, 2007 Rain: No	7
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Index of a lars000	height	0	0	Bedroc	k		0%	-	()		4.7 Stormwater	Inputs		
Development00Contrain00Contrain00	Improved Paths	0	0	Boulde	r		0%	-			Field Ditch	0 Roa	d Ditch	0
1.4 Adjacent Side Left Right Hillside Slope Very Steep Very Steep Very Steep Very Steep Sita and smaller 1% Sand 23% Sita and smaller 1% J.5 Valley Features Not Evalue Sit/Clay Present? No Valley Width (ft) 255 # Large Woody 42 Valley Features # Large Woody 42 Valley Width (ft) 255 # Large Woody 42 Valley Features # Large Woody 42 51 Rock Gorge? No Bar 1.0 inches Bar 1.0 inches Sub-dominant None 52 Step 2. Stream Channel 2.14 Stream Type: E Bed Material: Gravel Sub-dominant Sub-dominant None <td>height</td> <td>0</td> <td>0</td> <td>Cobble</td> <td></td> <td></td> <td>2%</td> <td></td> <td></td> <td></td> <td>Other</td> <td>0 Tile</td> <td>Drain</td> <td>0</td>	height	0	0	Cobble			2 %				Other	0 Tile	Drain	0
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TextureNot EvaluaNot EvaluaSit/Clay Present?NoCarloby %209012231.5 Valley Kidth (ft)255Detritus5 %Mid-Channel CanopyOpenMid-Channel CanopyMid-Channel Canopy </td <td>W/in 1 BankfillSo</td> <td>ometimes</td> <td>Never</td> <td></td> <td></td> <td></td> <td>- 70</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td><u> </u></td>	W/in 1 Bankfill So	ometimes	Never				- 70							<u> </u>
1.5 Valley Features Definition 5 % Mile Channel Campby Open 4 5 4 Valley Width (ft) 255 # Large Woody 42 3.2 Riparian Buffer Buffer Width Extinated 2.13 Average Largest Particle on Buffer Width Extinated Diagonal Delta Island Confinement Type Broad Bed 3.5 inches Buffer Width 5.2 Other Features Braiding Braiding Braiding Braiding 0 0 2 Stock Gorge? No Buffer Width Stock Gorge? Verset and Particle Campby Verset and Particle Campby Stock Gorge? Stock Gorge? No Bar 1.0 inches Buffer Veg. Type Left Right Flood Neck Cutoff Avulsion 0 0 0 0 0 0 Verset and Particle Campby Stock Gorge? Stock Gorge? No Stock Gorge? Stock Gorge? No Stock Gorge? No 0 0 0 0 0 0 Verset and Particle Campby Stock Campby Stock Campby Stock Campby Stock Campby Stock Campby Stock Campby <td< td=""><td>Texture N</td><td>lot Evalua</td><td>Not Evalua</td><td>Silt/Clay</td><td>Present?</td><td>N</td><td>lo</td><td></td><td></td><td></td><td></td><td>-</td><td>Side</td><td></td></td<>	Texture N	lot Evalua	Not Evalua	Silt/Clay	Present?	N	lo					-	Side	
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Project: Kingsbur Stream: Kin	y Branc gsbury			Re	P ach # N	hase	2 Segment S		age 1 of 2 gment: A	September 2 Completion Da		AT Version: Iy 24, 2007	
		e Winoosk	i River		rvers: N				Not assessed:	•		Rain: Yes	
Segment Length (ft):		3,199					nt begins where	-		rom Rt 14 throu	ah pasture		
QC Status - Staff: Pro	visional		Passed	•	p 2. (Cont	-	-			1			
Step 1. Valley an				nd. Floodpln		3.65 ft.		3. Riparian Fea	ures	4.1 Springs / Se	Flow & Flow	Minimal	
1.1 Segmentation Chan		-		Elev Floodp		0.00 ft.	3.1 Stream Bank Typical Bank Sl			4.1 Ophings / Set 4.2 Adjacent We	•	None	
	one	11510115		•		19.61	Bank Texture	Left	Right	4.3 Flow Status	lianus	Moderate	
				h/Depth Rat		15.58	Upper		<u>rtight</u>	4.4 # of Debris J	ame	1	
1.3 Corridor Encroachme				ion Ratio	allo	1.00	Material Type	Sand	Sand	4.5 Flow Regula		None	
Length (ft)	One	Both			Det	0.00	Consistency	Non-cohesive	Non-cohesive	-		None	
Berms	0	0		Elevated Inc			Lower	Non-conesive	Non-conesive	Impoundments			
height	0	0	2.9 Sinu	•		erate	Material Type	Sand	Sand	Impoundmt. Lo			
Roads	805	0		les Type	Compl		Consistency	Non-cohesive	Non-cohesive	·		None	
height	0	0		le/Step Spa	- · ·	300	Bank Erosion			(old) Upstrm F	•	None	
Railroads	0	0		ostrate Com	<u> </u>		Erosion Length	(ft) <u>Left</u>	Right 401		-		
height	0	0	Bedroc			0%	Erosion Height	()	4.84	4.7 StormwaterIn			
Improved Paths	0	0	Boulde		(0%	-			Field Ditch	-		0
height	0	0	Cobble		4	4%	Revetmt. Type	None	None	Other (-		0
Development	0	38	Coarse	Gravel	44	4%	Revetmt. Lengt		0	Overland Flow C	Urb St	rm Wtr Pipe	; 0
1.4 Adjacent Side	Left	Right	Fine G	ravel	29	9%	Near Bank Veg.	· · ·	Right	4.9 # of Beaver	Dams	0	
Hillside Slope Extr	emely	Hilly	Sand		23	3%	Dominant	Shrubs/Saplin	-	Affected Ler	ngth (ft)	0	
Continuous w/Some	etimes	Never	Silt and	smaller	(0%	Sub-dominant	Herbaceous		Step 5. Channe	Bed and F	Planform Ch	nange
W/in 1 Bankfill Some	etimes	Never					Bank Canopy	Left	Right	5.1 Bar Types			
Texture Not	Evalua	Not Evalua	Silt/Clay	Present?	No		Canopy %	1-25	1-25	Mid	Point	Side	
1.5 Valley Features			Detritus		5 %	o	Mid-Channel Ca		Open	8	2	6	
Valley Width (ft)	689		# Large	Woody	50)	3.2 Riparian Buf			Diagonal	Delta	Island	
Width Determination	Estimat	ed	2.13 Ave	erage Larges	st Particle	on	Buffer Width	Left	Right	0	0	<u>1518110</u> 5	
Confinement Type	Very Br		Bed	6.0	in	ches	Dominant	0-25	0-25	•	•	-	_
Rock Gorge?	No	ouu	Bar	1.0	in	ches	Sub-dominant	26-50	26-50	5.2 Other Featur		Braidin	g
Human-caused Change?							W less than 25	678	1,998	Flood Neck Cu	toff <u>Avulsio</u>	$\frac{n}{2}$ 1	
Step 2. Stream Ch	•		2.14 Str	eam Type			Buffer Veg. Typ		<u>Right</u>		Ū	2.40	
2.1 Bankfull Width		16		eam Type:	С		Dominant	Shrubs/Saplin		5.3 Steep Riffles			
				d Material:			Sub-dominant		Shrubs/Saplin	Steep Riffles	Head Cuts	Trib Reju	
2.2 Max Depth (ft)	3.6			lass Slope:			3.3 Riparian Cor					No	
2.3 Mean Depth (ft)	2.3			Bed Form:		lool	Corridor Land	Left	Right	5.4 Stream Ford		Yes	
2.4 Floodprone Width (ft) 70	19	Field M	leasured Slo	ope:		Dominant	Pasture	Pasture	5.5 Straightening	-	Straighte	-
Notes:			2.15 Re	ference Stre	eam Type		Sub-dominant	None	None	Straightening	J ∟ength:	2,55	
About 200' of straightening	•		(if di	fferent from	Phase 1)		Mass Failures	159	0	5.5 Dredging			None
w/snowmobile bridge. No					,		Height	17	0				
lower section was straigh			3.3 old	Amount	Mean I	Height	Gullies	C	0	Note: Step 1.6 - and Step 4.8 - C			
absent), but is very straig It is possible that the stre			Failures	None	mean	0.00	Height	C	0	and Step 4.8 - C			
straightened (moved up			Gullies	None		0.00	5	-	_	report - with Ste			

-	oury Brand Cingsbury			Re	PI each # M ²		2 Segment S	on the second se	age 1 of 2 gment: B	September 2 Completion D		AT Version: 4 Iy 24, 2007	
		ne Winooski	i River			N, AS			Not assessed:	Completion D		Rain: Yes	
Segment Length (ft)		2,337					nt begins appro	•		of snowmobile b			1-A
QC Status - Staff: P		•	Passed	0	p 2. (Contu	-	• • • •	3. Riparian Feat			Flow & Flow	•	
Step 1. Valley				nd. Floodplr		0.00 ft.	3.1 Stream Bank	•		4.1 Springs / Se		Minimal	
1.1 Segmentation Cha		•		Elev Floodp		.00 ft.	Typical Bank Sl			4.2 Adjacent We	-	None	
	None			h/Depth Ra		3.43	Bank Texture	Left	Right	4.3 Flow Status		Moderate	
1.3 Corridor Encroach	ments			enchment R		1.61	Upper			4.4 # of Debris	ams	2	
Length (ft)	One	Both	2.8 Incis	ion Ratio		3.33	Material Type	Sand	Sand	4.5 Flow Regula	tion Type	None	
Berms	0	0	Human E	Elevated Inc	c Rat	0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulation	on Use		
height	0	0	2.9 Sinu	osity	Mode	rate	Lower			Impoundments	;		
Roads	1,505	0	2.10 Riff	les Type	Comple	te	Material Type	Gravel	Gravel	Impoundmt. Lo	ocation		
height	, 0	0	2.11 Riff	le/Step Spa	acing (ft)	450	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down str	m flow reg	None	
Railroads	0	0	2.12 Sub	ostrate Com	position		Bank Erosion	Left	Right	(old) Upstrm F	low Reg		
height	0	0	Bedroc	k	0	%	Erosion Length		247	4.7 StormwaterIn	puts		
Improved Paths	0	0	Boulde	r	0	%	Erosion Height (5.32	Field Ditch	D Road I	Ditch	0
height	0	0	Cobble		27	%	Revetmt. Type	Rip-Rap	Rip-Rap	Other	D Tile Dr	ain	0
Development	264	81	Coarse	Gravel	43	%	Revetmt. Length		132	Overland Flow	Urb St	rm Wtr Pipe	0
1.4 Adjacent Side	Left	Right	Fine Gr	ravel	21	%	Near Bank Veg.		Right	4.9 # of Beaver	Dams	0	
Hillside Slope	Steep	Hilly	Sand			%	Dominant	Shrubs/Saplin		Affected Le	ngth (ft)	0	
Continuous w/So	ometimes	Sometimes	Silt and	l smaller		%	Sub-dominant	Invasives	Invasives	Step 5. Channe	Bed and F	lanform Ch	anges
W/in 1 Bankfill So	ometimes	Sometimes					Bank Canopy	Left 51-75	<u>Right</u> 51-75	5.1 Bar Types			
Texture N	lot Evalua	Not Evalua	-	Present?	No		Canopy %			Mid	Point	Side	
1.5 Valley Features			Detritus		10 %		Mid-Channel Ca	••	Open	7	1	4	
Valley Width (ft) 322		# Large	•	75		3.2 Riparian Buff Buffer Width	er Left	Right	Diagonal	Delta	Island	
Width Determination	n Estima	ted	2.13 Ave	erage Large	st Particle	on	Dominant	>100	>100	0	0	0	
Confinement Type	e Broad		Bed	8.0	inc	hes	Sub-dominant	0-25	51-100	5.2 Other Featu	res	\ Braiding	1
Rock Gorge?	? No		Bar	2.0	inc	hes	W less than 25	132	274	Flood Neck Cu		\	-
Human-caused Chang	ge? yes		-				Buffer Veg. Typ		Right	$\frac{1}{0}$ $\frac{1}{0}$	0	<u> </u>	
Step 2. Stream	Channel			eam Type T	-		Dominant	Mixed Trees		5.3 Steep Riffle	and Head C	Cuts	
2.1 Bankfull Width		49		eam Type:			Sub-dominant	Shrubs/Saplin	Shrubs/Saplin	Steep Riffles	Head Cuts	Trib Rejuv	v.
2.2 Max Depth (ft)	3.	00		d Material:			3.3 Riparian Corr			3	0	Yes	
2.3 Mean Depth (ft)	2.	07		ass Slope: Bed Form:			Corridor Land	Left	Right	5.4 Stream Ford	or Animal	No	
2.4 Floodprone Width	(ft)	78		leasured Sl		,	Dominant	Forest		5.5 Straightenin	g	Straighte	ning
Notes:				ference Stre	•		Sub-dominant	Residential	Forest	Straightenin	g Length:	1,18 [.]	1
200' riprap, 500' addtio	onal possibl	le historic		ferent from			Mass Failures	137	53	5.5 Dredging		1	None
straightening along fie			in un		11000 1)		Height	50	20				
along Rt 14 bridge.			3304	Amount	Moon L	aight	Gullies	0	0	Note: Step 1.6			
Two groop pactions		d in this	3.3 old Failures	Amount None	Mean H	<u>eignt</u> 0.00	Height	0	0	and Step 4.8 - C are on The secc			
Two cross sections we segment. The lower of			Gullies			0.00	U A	-	-	report - with Ste			
			Guilles	None		0.00							

Project: Kingsbury Branch Stream: Kingsbury Branch Organization: Friends of the Winoosk Segment Length (ft): 961	Reach # M12 xi River Observers: MN, D	Se	age 1 of 2 gment: A Not assessed: ream of Route		u ly 27, 2007 Rain: No
QC Status - Staff: Provisional Cons	Passed <u>Step 2. (Contued)</u>	Step 3. Riparian Feat		Step 4. Flow & Flo	
Step 1. Valley and Floodplain	2.5 Aband. Floodpln 4.60			4.1 Springs / Seeps	Minimal
1.1 Segmentation Grade Controls	Human Elev Floodpln 0.00 f	Typical Bank Slope Steep		4.2 Adjacent Wetlands	None
1.2 Alluvial Fan None	2.6 Width/Depth Ratio 12.60	Bank Texture Left	Right	4.3 Flow Status	Moderate
1.3 Corridor Encroachments	2.7 Entrenchment Ratio 1.62	Upper		4.4 # of Debris Jams	0
Length (ft) One Both	2.8 Incision Ratio 1.31	Material Type Sand	Sand	4.5 Flow Regulation Type	None
Berms 0 0	Human Elevated Inc Rat 0.00	Consistency Non-cohesive	Non-cohesive	Flow Regulation Use	
height 0 0	2.9 Sinuosity Low	Lower		Impoundments	
Roads 0 0	2.10 Riffles Type Not Applicable	Material Type Gravel	Gravel	Impoundmt. Location	
height 0 0	2.11 Riffle/Step Spacing (ft) 0	Consistency Non-cohesive	Non-cohesive	1 0	Up Stream
Railroads 0 0	2.12 Substrate Composition	Bank Erosion Left	Right	(old) Upstrm Flow Reg	
height 0 0	Bedrock 0%	Erosion Length (ft) 43	0	4.7 StormwaterInputs	
Improved Paths 0 0	Boulder 10%	Erosion Height (ft) 6.00	0.00	Field Ditch 0 Road	l Ditch 0
height 0 0	Cobble 40%	Revetmt. Type None	None	Other 0 Tile [Drain 0
Development 0	Coarse Gravel 38%	Revetmt. Length (ft) 0	0	Overland Flow 0 Urb S	Strm Wtr Pipe 0
1.4 Adjacent Side Left Right	Fine Gravel 8%	Near Bank Veg. Type	Right	4.9 # of Beaver Dams	0
Hillside Slope Very Steep Steep	Sand 4%	Dominant Deciduous	Coniferous	Affected Length (ft)	0
Continuous w/Sometimes Sometimes	Silt and smaller 0%	Sub-dominant Coniferous	Deciduous	Step 5. Channel Bed and	Planform Changes
W/in 1 Bankfill Sometimes Sometimes		Bank Canopy Left	Right	5.1 Bar Types	
Texture Not Evalua Not Evalua	Silt/Clay Present? No	Canopy % 76-100	76-100	Mid Point	Side
1.5 Valley Features	Detritus 2 %	Mid-Channel Canopy	Open	$\frac{1000}{2}$ $\frac{1000}{1}$	1
Valley Width (ft) 100	# Large Woody 2	3.2 Riparian Buffer			-
Width Determination Estimated	2.13 Average Largest Particle on	Buffer Width Left	Right	Diagonal Delta	Island
Confinement Type Semi-confined	Bed 10.0 inches	Dominant >100	>100	0 0	2
Rock Gorge? No	Bar 6.0 inches	Sub-dominant None	None	5.2 Other Features	Braiding
Human-caused Change? no		W less than 25 0	0	Flood Neck Cutoff Avuls	— \
Step 2. Stream Channel	2.14 Stream Type	Buffer Veg. Type Left	Right		
2.1 Bankfull Width 36	Stream Type: B	Dominant Mixed Trees	Mixed Trees	5.3 Steep Riffles and Head	
	Bed Material: Gravel	Sub-dominant Herbaceous	Herbaceous	Steep Riffles Head Cuts	Trib Rejuv.
2.2 Max Depth (ft) 3.50	Subclass Slope: None	3.3 Riparian Corridor		0 0	No
2.3 Mean Depth (ft) 2.89	Bed Form: Plane Bed	Corridor Land Left	Right	5.4 Stream Ford or Animal	No
2.4 Floodprone Width (ft) 59	Field Measured Slope:	Dominant Forest	Forest	5.5 Straightening	None 0
Notes:	2.15 Reference Stream Type	Sub-dominant None	None	Straightening Length:	U None
Falls, islands, step pool (very short). Plane	(if different from Phase 1)	Mass Failures 0	0	5.5 Dredging	NOTE
bed. Transitional segment between falls & C channel. Most is plane bed (one long riffle).		Height 0	0	Note: Step 1.6 - Grade Cor	atrole
In terms of the channel evolution model, this	3.3 old Amount Mean Heigh	Gullies 0	0	and Step 4.8 - Channel Cor	
channel may be in early stage F-III. They	Failures None 0.00	Height 0	0	are on The second page of	
excellent vegetation (large trees) on the	Gullies None 0.00			report - with Steps 6 throug	gh 7.

Project: Kingsbury Branch Stream: Kingsbury Branch	Phase Reach # M12	e 2 Segment Sumn	nary page 1 c Segment		September 22, 2008 SGAT Version: 4.56 Completion Date: July 27, 2007
Organization: Friends of the Winoosk		5	•		bedrock gorge Rain: No
Segment Length (ft): 797	Segment Location: Segme	ent begins where grad			tion begins and continues until about 100
QC Status - Staff: Provisional Cons	Passed Step 2. (Contued)		arian Features		Step 4. Flow & Flow Modifiers
Step 1. Valley and Floodplain	2.5 Aband. Floodpln 0.00 ft.	3.1 Stream Banks	anan reatures		4.1 Springs / Seeps
1.1 Segmentation Grade Controls	Human Elev Floodpln 0.00 ft.	Typical Bank Slope			4.2 Adjacent Wetlands
1.2 Alluvial Fan None	2.6 Width/Depth Ratio 0.00	Bank Texture	Left	Right	4.3 Flow Status
1.3 Corridor Encroachments	2.7 Entrenchment Ratio 0.00	Upper			4.4 # of Debris Jams 0
Length (ft) One Both	2.8 Incision Ratio 0.00	Material Type			4.5 Flow Regulation Type None
Berms 0 0	Human Elevated Inc Rat 0.00	Consistency			Flow Regulation Use
height 0 0	2.9 Sinuosity	Lower			Impoundments
Roads 168 307	2.10 Riffles Type	Material Type			Impoundmt. Location
height 0 0	2.11 Riffle/Step Spacing (ft) 0	Consistency			4.6 Up/Down strm flow reg Up Stream
Railroads 0 0	2.12 Substrate Composition	Bank Erosion	Left	Right	(old) Upstrm Flow Reg
height 0 0		Erosion Length (ft)	93	0	4.7 StormwaterInputs
Improved Paths 0 0		Erosion Height (ft)	20.00	0.00	Field Ditch 0 Road Ditch 0
height 0 0		Revetmt. Type		Rip-Rap	Other 0 Tile Drain 0
Development 245 312		Revetmt. Length (ft)	244	270	Overland Flow 0 Urb Strm Wtr Pipe 0
1.4 Adjacent Side Left Right		Near Bank Veg. Type	Left	Right	4.9 # of Beaver Dams 0
Hillside Slope Very Steep Very Steep		Dominant			Affected Length (ft) 0
Continuous w/Sometimes Sometimes		Sub-dominant	l off	Diaht	Step 5. Channel Bed and Planform Changes
W/in 1 Bankfill Always Always		Bank Canopy	Left	Right	5.1 Bar Types
Texture Not Evalua Not Evalua	Silt/Clay Present?	Canopy %			Mid Point Side
1.5 Valley Features	Detritus 0 %	Mid-Channel Canopy			0 0 0
Valley Width (ft) 90	# Large Woody 0	3.2 Riparian Buffer Buffer Width	Left	Right	Diagonal Delta Island
Width Determination Estimated	2.13 Average Largest Particle on	Dominant	Len	rtigitt	
Confinement Type Narrowly	Bed 0.0	Sub-dominant			5.2 Other Features \ Braiding
Rock Gorge? Yes	Bar 0.0	W less than 25	0	0	Flood Neck Cutoff Avulsion 0
Human-caused Change? No		Buffer Veg. Type	Left	Right	$\overline{0}$ $\overline{0}$ $\overline{0}$ $\overline{0}$
Step 2. Stream Channel	2.14 Stream Type	Dominant		_ <u> </u>	5.3 Steep Riffles and Head Cuts
2.1 Bankfull Width 0	Stream Type: A	Sub-dominant			Steep Riffles Head Cuts Trib Rejuv.
2.2 Max Depth (ft) 0.00	Bed Material: Cobble	3.3 Riparian Corridor			0 0
2.3 Mean Depth (ft) 0.00	Subclass Slope: None Bed Form: Cascade	Corridor Land	Left	Right	5.4 Stream Ford or Animal No
2.4 Floodprone Width (ft) 0	Field Measured Slope:	Dominant		<u> </u>	5.5 Straightening Straightening
Notes:	2.15 Reference Stream Type	Sub-dominant			Straightening Length: 460
Much of this segment consisted of a steep,	(if different from Phase 1)	Mass Failures	0	0	5.5 Dredging None
bedrock falls. The upper part of the segment	A 3 Non Cascade	Height	0	0	
in the vicinity of Moscow Bridge Road was		Gullies	0	0	Note: Step 1.6 - Grade Controls
riprapped.	3.3 oldAmountMean HeightFailuresNone0.00	Height	0	0	and Step 4.8 - Channel Constrictions are on The second page of this
"Other" constriction is a penstock. It was	FailuresNone0.00GulliesNone0.00			-	report - with Steps 6 through 7.

-	ury Branch ingsbury E		Rea	Phase ach # M14	2 Segment Summ	ary page 1 of Segment:		September 22, 2008 Completion Date:	SGAT Version: 4.56 July 18, 2007
Organization: Frie	ends of the	e Winooski	River Obser	rvers: CS, MN		Why Not as	ssessed:	wetland	Rain: Yes
Segment Length (ft):	:	1,533	Segment Loca	ation: Goes tl	hrough wetland. Hard	to walk (no ac	cess).		
QC Status - Staff: P	rovisional C	Cons	Passed Step	2. (Contued)	Step 3, Ripa	rian Features		Step 4. Flow & F	low Modifiers
Step 1. Valley a	and Flood	olain	2.5 Aband. Floodpln	0.00 ft.	3.1 Stream Banks			4.1 Springs / Seeps	<u></u>
1.1 Segmentation			Human Elev Floodpl	In 0.00 ft.	Typical Bank Slope			4.2 Adjacent Wetlands	
1.2 Alluvial Fan			2.6 Width/Depth Rati	io 0.00	Bank Texture	Left	Right	4.3 Flow Status	
1.3 Corridor Encroachn	nents		2.7 Entrenchment Ra	atio 0.00	Upper			4.4 # of Debris Jams	0
Length (ft)	One	Both	2.8 Incision Ratio	0.00	Material Type			4.5 Flow Regulation Type	e
Berms	0	0	Human Elevated Inc	Rat 0.00	Consistency			Flow Regulation Use	
height	0	0	2.9 Sinuosity		Lower			Impoundments	
Roads	0	0	2.10 Riffles Type		Material Type			Impoundmt. Location	
height	0	0	2.11 Riffle/Step Space	cing (ft) 0	Consistency			4.6 Up/Down strm flow re	g
Railroads	0	0	2.12 Substrate Comp	position	Bank Erosion	Left	Right	(old) Upstrm Flow Reg	
height	0	0			Erosion Length (ft)	0	0	4.7 StormwaterInputs	
Improved Paths	0	0			Erosion Height (ft)	0.00	0.00	Field Ditch 0 Ro	oad Ditch 0
height	0	0			Revetmt. Type			Other 0 Til	e Drain 0
Development	0	0			Revetmt. Length (ft)	0	0	Overland Flow 0 Url	o Strm Wtr Pipe 0
1.4 Adjacent Side	Left	Right			Near Bank Veg. Type	Left	Right	4.9 # of Beaver Dams	0
Hillside Slope					Dominant			Affected Length (ft)	0
Continuous w/					Sub-dominant		D : 17	Step 5. Channel Bed ar	nd Planform Changes
W/in 1 Bankfill					Bank Canopy	Left	Right	5.1 Bar Types	<u> </u>
Texture			Silt/Clay Present?		Canopy %			Mid Point	Side
1.5 Valley Features			Detritus	0 %	Mid-Channel Canopy			0 0	0
Valley Width (ft)	0		# Large Woody	0	3.2 Riparian Buffer	1	Diaht	Diagonal Delta	Island
Width Determination	1		2.13 Average Larges	st Particle on	Buffer Width Dominant	Left	<u>Right</u>	$\frac{1}{0}$ $\frac{1}{0}$	0
Confinement Type	;		Bed 0.0		Sub-dominant			5.2 Other Features	∖ Braiding
Rock Gorge?	•		Bar 0.0		W less than 25	0	0		
Human-caused Chang	je?				Buffer Veg. Type	Left	Right	$\frac{1000}{0} 1000000000000000000000000000000000000$	
Step 2. Stream (Channel		2.14 Stream Type	-	Dominant		<u>rugru</u>	5.3 Steep Riffles and He	ad Cuts
2.1 Bankfull Width		0	Stream Type:		Sub-dominant			Steep Riffles Head Cu	
2.2 Max Depth (ft)	0.0	0	Bed Material:		3.3 Riparian Corridor			0 0	
2.3 Mean Depth (ft)	0.0	0	Subclass Slope:		Corridor Land	Left	Right	5.4 Stream Ford or Anim	al
2.4 Floodprone Width	(ft) (D	Bed Form: Field Measured Slo		Dominant		<u></u>	5.5 Straightening	
Notes:			2.15 Reference Stre	•	Sub-dominant			Straightening Length	: 0
KDolan RMP 5/2/08: a	dded sensiti	vitv rating	(if different from I		Mass Failures	0	0	5.5 Dredging	
in step 7;		,		111030 1)	Height	ů O	0		
				M	Gullies	õ	0	Note: Step 1.6 - Grade (
			<u>3.3 old</u> <u>Amount</u>	Mean Height	Height	0	ů N	and Step 4.8 - Channel C	
			Failures	0.00	. loight	5	v	are on The second page report - with Steps 6 thro	
			Gullies	0.00					Jugir 7.

•	Branch bury Branch s of the Winooski		Phase Reach # M14 servers: CS, MN	2 Segment S	Seg	ige 1 of 2 gment: B Not assessed:	September 2 Completion D		AT Version: I ly 18, 2007 Rain: Yes	7
Segment Length (ft):	1,860		ocation: Segme				of Calais rec fi	eld.		
QC Status - Staff: Provis	ional Cons	•	Step 2. (Contued)	1	3. Riparian Feat			Flow & Flow	v Modifiers	·
Step 1. Valley and F		2.5 Aband. Flood	pln 3.30 ft.	3.1 Stream Ban	-	<u> </u>	4.1 Springs / Se		Abundant	Ł
1.1 Segmentation Channel	-	Human Elev Floo	odpln 0.00 ft.	Typical Bank S			4.2 Adjacent We	etlands	Abundant	Ł
1.2 Alluvial Fan None)	2.6 Width/Depth F	Ratio 8.43	Bank Texture	Left	Right	4.3 Flow Status		Moderate	:
1.3 Corridor Encroachments	i	2.7 Entrenchment	t Ratio 23.10	Upper			4.4 # of Debris	Jams	0	
Length (ft) C	Dne Both	2.8 Incision Ratio	1.00	Material Type	Sand	Sand	4.5 Flow Regula	ation Type	None	
Berms	0 0	Human Elevated	Inc Rat 0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulation	on Use		
height	0 0	2.9 Sinuosity	Moderate	Lower			Impoundments	S		
-	381 0	2.10 Riffles Type	Not Applicable	Material Type	Sand	Sand	Impoundmt. Lo	ocation		
height	0 0	2.11 Riffle/Step S	pacing (ft) 0	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down str	m flow reg	None	
Railroads	0 0	2.12 Substrate Co	omposition	Bank Erosion	Left	Right	(old) Upstrm F	low Reg		
height	0 0	Bedrock	0%	Erosion Length	. ,	52	4.7 StormwaterIn	puts		
Improved Paths	0 0	Boulder	0%	Erosion Height	(ft) 3.00	3.00	Field Ditch	1 Road	Ditch	1
height	0 0	Cobble	0%	Revetmt. Type	None	None	Other	0 Tile D	rain	0
Development	80 0	Coarse Gravel	0%	Revetmt. Lengt	th (ft) 0	0	Overland Flow	0 Urb S	trm Wtr Pipe	÷ 0
1.4 Adjacent Side	Left Right	Fine Gravel	25%	Near Bank Veg.		Right	4.9 # of Beaver		0	
Hillside Slope St	eep Steep	Sand	75 %	Dominant		Shrubs/Saplin	Affected Le		0	
Continuous w/ Ne	ever Never	Silt and smaller	0%	Sub-dominant	Shrubs/Saplin	Herbaceous	Step 5. Channe	• • •	Planform Ch	handes
W/in 1 Bankfill Ne	ever Never	Ont and smaller	• 70	Bank Canopy	Left	Right	5.1 Bar Types	bea ana i		langee
Texture Not Eva	alua Not Evalua	Silt/Clay Present?	, No	Canopy %	1-25	1-25	Mid	Point	Side	
1.5 Valley Features		Detritus	1 %	Mid-Channel C		Open	0	0	5	
	90	# Large Woody	6	3.2 Riparian But				-	-	
• • • •	stimated	2.13 Average Lar	gest Particle on	Buffer Width	Left	Right	Diagonal 0	Delta 0	Island 0	
	ery Broad	Bed N/A		Dominant	>100	>100	-	-	Ū	
Rock Gorge? N	-	Bar N/A		Sub-dominant	0-25	None	5.2 Other Featu		Braidin	g
Human-caused Change?	-			W less than 25		0 Diskt	Flood Neck Cu	utoff <u>Avulsi</u>	<u>on</u> \ 0	
Step 2. Stream Chan		2.14 Stream Type	e	Buffer Veg. Typ		Right	5.3 Steep Riffle	n and Hoad	Cuto	
2.1 Bankfull Width	21	Stream Type	e: E	Dominant		Shrubs/Saplin				
2.2 Max Depth (ft)	3.30	Bed Materia	al: Sand		Shrubs/Saplin	Herbaceous	Steep Riffles	Head Cuts	<u>Trib Rej</u> u No	
2.3 Mean Depth (ft)	2.49	Subclass Slope		3.3 Riparian Co			5.4 Stream Ford	U Lor Animal	No	
2.4 Floodprone Width (ft)	485		n: Dune-Ripple	Corridor Land	Left	Right	5.5 Straightenin		Straighte	
	400	Field Measured	•	Dominant	Shrubs/Saplin	-	Straightenin	-	44	-
Notes:	<i></i>	2.15 Reference S	Stream Type	Sub-dominant	Residential	None	5.5 Dredging	g Longui.		None
No pebble count (too deep)	- estimated.	(if different fro	,	Mass Failures	0	0	S.C Drodying			
This segment was rated as	and for both the	E 5 N	on Dune-Ripple	Height	0	0	Note: Step 1.6	- Grade Con	trols	
RGA and the RHA. Segme	•	3.3 old Amoun	t Mean Height	Gullies	0	0	and Step 4.8 - C			
classic "E" channel with a ve		Failures None	0.00	Height	0	0	are on The seco	ond page of t	his	
and very few depositional fe	eatures. A few	Gullies None	0.00				report - with Ste	eps 6 throug	h 7.	

•	oury Branch		ch # M14	2 Segment S	Seg	ge 1 of 2 gment: C Not assessed [:]	September 22, 200 Completion Date:	8 SGAT Version: 4.56 July 18, 2007 Rain: Yes
0	1,692		,				pple-dune to C: riffle	
Organization: Friends of Segment Length (ft): QC Status - Staff: Provision Step 1. Valley and Fill 1.1 Segmentation 1.2 Alluvial Fan None 1.3 Corridor Encroachments Length (ft) Of Berms height Roads 1,60 height Improved Paths height Development 1.4 Adjacent Side Hillside Slope Step Outinuous w/ W/in 1 Bankfill Not Eval 1.5 Valley Features Valley Width (ft)	of the Winooski 1,692 onal Cons loodplain Dimensions <u>he</u> <u>Both</u> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	River Observer Segment Locat Passed Step 2 2.5 Aband. Floodpln Human Elev Floodpln Human Elev Floodpln 2.6 Width/Depth Ratio 2.7 Entrenchment Rat 2.8 Incision Ratio Human Elevated Inc Floodpln 2.9 Sinuosity 2.10 Riffles Type 2.11 Riffle/Step Spacin 2.12 Substrate Compo Bedrock Boulder Cobble Coarse Gravel Fine Gravel Sand Silt and smaller Silt/Clay Present? Detritus # Large Woody 2.13 Average Largest	ch # M14 rers: CS, MN tion: Segme 2. (Contued) 3.30 ft. 0.00 ft. 1.00 Rat 0.00 Moderate Complete ng (ft) 175 osition 0% 0% 0% 0% 0% 33% 44% 23% 0% No 1 % 25 Particle on	nt begins where	Sec Why e channel chan 3. Riparian Feature Sope Steep Left Sand Non-cohesive Sand Non-cohesive (ft) 195 (ft) 3.26 Rip-Rap h (ft) 33 Type Left Shrubs/Saplin S Herbaceous Left 1-25 anopy	Not assessed: ges from E: rigures Right Sand Non-cohesive Sand Non-cohesive Right 196 5.60 None 0 Right	Step 4. Flow Step 4. Flow 4.1 Springs / Seeps 4.2 Adjacent Wetlands 4.3 Flow Status 4.4 # of Debris Jams 4.5 Flow Regulation T Flow Regulation Use Impoundments Impoundments Impoundment Flow R 4.7 StormwaterInputs Field Ditch 0 Other 0 Overland Flow 0 4.9 # of Beaver Dam Affected Length (free	Rain: Yes pool near meander & Flow Modifiers Abundant s Abundant Moderate 1 ype None eg None eg Road Ditch 0 Tile Drain 0 Urb Strm Wtr Pipe 0 s 0 t) 0 Land Planform Changes
Confinement Type Ve Rock Gorge? No Human-caused Change? y		Bed 2.0 Bar 0.1	inches inches	Sub-dominant W less than 25 Buffer Veg. Typ	0-25 243	None 0 Right	5.2 Other Features Flood Neck Cutoff 0	Avulsion 0
Step 2. Stream Chann 2.1 Bankfull Width 2.2 Max Depth (ft) 2.3 Mean Depth (ft) 2.4 Floodprone Width (ft) Notes: Numerous remnant beaver d in this segment. One of the I this segment mentioned that been trapped and relocated.	42 3.30 1.90 548 ams were noted andowners in beaver had This segment	2.14 Stream Type Stream Type: C Bed Material: C Subclass Slope: N Bed Form: R Field Measured Slop 2.15 Reference Stream (if different from Pl 3.3 old Amount Failures None	Gravel Ione Riffle-Pool e: m Type hase 1) Mean Height	Dominant Sub-dominant <u>3.3 Riparian Cor</u> Corridor Land Dominant Sub-dominant Mass Failures Height Gullies Height	Shrubs/Saplin S Herbaceous ridor Shrubs/Saplin S Residential 0 0 0	Herbaceous Right	5.3 Steep Riffles andSteep RifflesHead105.4 Stream Ford or Ar5.5 Straightening Straightening Len5.5 DredgingNote: Step 1.6 - Grad and Step 4.8 - Channa are on The second part	Cuts Trib Rejuv. No nimal No gth: 0 None
was found to be in good cond both the RGA and RHA. The		Failures None Gullies None	0.00 0.00		Ū		report - with Steps 6	•

	oury Brand Kingsbury			Re	Ph ach # M1	ase 5	2 Segment S			e 1 of 2 ment: A	Septembe Completion	,	SGAT Version: July 17, 200	
		he Winoosk	i River	Obse	rvers: MN	, AW	1	V	Vhy I	Not assessed:	·		Rain: Yes	5
Segment Length (ft)):	1,813	Seg	gment Loc	ation: Se	gmei	nt begins appro	ximately 30	00 fe	et downstrea	m of most do	wnstream	Route 14 br	idge
QC Status - Staff: F	Provisional	Cons	Passed	Ste	o 2. (Contue	ed)	Step 3	3. Riparian F	eatu	res	Step	4. Flow & F	low Modifiers	
Step 1. Valley	and Flood	dplain	2.5 Aban	d. Floodpln	3.	10 ft.	3.1 Stream Banks	•			4.1 Springs / 3		Minimal	
1.1 Segmentation Ba	nks and Bu	uffers	Human E	Elev Floodp	oln 0. 0	00 ft.	Typical Bank Slo		te		4.2 Adjacent	Netlands	None	
1.2 Alluvial Fan	None		2.6 Width	n/Depth Rat	tio 22	.77	Bank Texture	L	_eft	Right	4.3 Flow State	JS	High	
1.3 Corridor Encroach	ments		2.7 Entre	nchment R	atio 16	.13	Upper				4.4 # of Debri		0	
Length (ft)	One	Both	2.8 Incisi	on Ratio	1	.00	Material Type	Sa	Ind	Sand	4.5 Flow Reg	ulation Type	e None	
Berms	0	0	Human E	levated Inc	: Rat 0	.00	Consistency	Non-cohesi	ive	Non-cohesive	Flow Regula			
height	0	0	2.9 Sinuc	osity	L	ow	Lower				Impoundme	nts		
Roads	1,108	0	2.10 Riffl	es Type	Complete	e	Material Type	Grav		Gravel	Impoundmt.			
height	0	0	2.11 Riffl	e/Step Spa	cing (ft) 1	90	Consistency	Non-cohesi	ive	Non-cohesive	4.6 Up/Down		eg None	
Railroads	0	0	2.12 Sub	strate Com	position		Bank Erosion		_eft	Right	(old) Upstrm	I Flow Reg		
height	0	0	Bedrock	<	0%	, b	Erosion Length	()	172	53	4.7 Stormwate	rInputs		
Improved Paths	0	0	Boulder		0%	, D	Erosion Height (,	.00	5.00	Field Ditch	0 Ro	ad Ditch	0
height	0	0	Cobble		1%	, D	Revetmt. Type	Rip-R	-	None	Other	0 Tile	e Drain	0
Development	86	46	Coarse	Gravel	70 %	,	Revetmt. Length		285	0	Overland Flo	w 0 Urk	o Strm Wtr Pipe	e 0
1.4 Adjacent Side	Left	Right	Fine Gra	avel	21 %	,	Near Bank Veg.		_eft	Right	4.9 # of Beav	/er Dams	1	
Hillside Slope	Steep	Hilly	Sand		8%		Dominant			hrubs/Saplin	Affected I	Length (ft)	420	
Continuous w/	Never	Never	Silt and	smaller	0%		Sub-dominant	-					nd Planform C	hanges
W/in 1 Bankfill Sc	ometimes	Never					Bank Canopy	L	_eft	Right	5.1 Bar Types			
Texture N	Not Evalua	Not Evalua	Silt/Clay	Present?	No		Canopy %		0	1-25	Mid	– Point	Side	
1.5 Valley Features			Detritus		2 %		Mid-Channel Ca		C	Open	2	1	3	
Valley Width (ft	t) 480		# Large V	Noody	10		3.2 Riparian Buff	_	-44	Dialat	– Diagonal	Delta	Island	
Width Determination	n Estima	ated	2.13 Ave	rage Large	st Particle or	<u>n</u>	Buffer Width	_	_eft	Right 0-25	0	0	0	
Confinement Type	e Very B	road	Bed	6.0	inch	es	Dominant Sub-dominant	-0- 26-	-25 50	0-25 26-50	5.2 Other Fea	-	∖ Braidir	a
Rock Gorge	? No		Bar	3.0	inch	es	W less than 25		-30 841	621	Flood Neck		ulsion $\sqrt{\frac{D(a)a}{0}}$	<u>'9</u>
Human-caused Chang	ge? yes						Buffer Veg. Type		eft	Right	$\frac{1000}{1}$			
Step 2. Stream				eam Type			Dominant	Herbaceo		Herbaceous	5.3 Steep Rif	iles and He	ad Cuts	
2.1 Bankfull Width		40	Stre	eam Type:	С		Sub-dominant			hrubs/Saplin	Steep Riffles	Head Cu		uv.
2.2 Max Depth (ft)	3.	.10		d Material:			3.3 Riparian Corr		Ju3 0	in abs/oapiiii	1	0	<u>No No</u>	
2.3 Mean Depth (ft)		.77		ass Slope:			Corridor Land		_eft	Right	5.4 Stream Fo	•		
2.4 Floodprone Width		50			Riffle-Pool		Dominant	_	lay	Hay	5.5 Straighter		Straight	ening
Notes:	., -			easured Slo	•		Sub-dominant	For	-	Residential	-	ning Length:		
Straightening in this re	each includ	es: riprap		erence Stre			Mass Failures	FUN	0	Residential 0	5.5 Dredging			None
on the bend adjacent			(ir alfi	ferent from	rnase T)		Height		0	0				
bridge abutment and i	newer bridg	je. Upper		_			Gullies		0	0	Note: Step 1.			
part of segment appea			<u>3.3 old</u>	Amount	Mean He	<u> </u>			0	0	and Step 4.8			
straightened at one po	oint - no roc	ck riprap.	Failures	None		.00	Height		U	U	are on The se			
			Gullies	None	0.	.00					report - with S	sieps 6 thro	bugn 7.	

Stream:	bury Brand Kingsbury riends of tl		i River		 each # I ervers: I	M15	2 Segment S	Se	age 1 of 2 gment: B 7 Not assessed:	Septembe Completion	r 22, 2008 S0 Date: J	GAT Version: uly 17, 200 Rain: Yes	7
Segment Length (ft		3,559				•	nt begins where			ted about 180	0 feet upstr	eam of sta	rt of
QC Status - Staff:	,	Cons	Passed	<u> </u>	p 2. (Cor	-		3. Riparian Feat	1		I. Flow & Flo		
Step 1. Valley				nd. Floodplr		3.20 ft.	3.1 Stream Bank	•		4.1 Springs / S		Minimal	
1.1 Segmentation Ba		-	Human	Elev Flood	oln	0.00 ft.	Typical Bank S			4.2 Adjacent \		Abundan	t
1.2 Alluvial Fan	None			h/Depth Ra		20.50	Bank Texture	Left	Right	4.3 Flow Statu	IS	High	
1.3 Corridor Encroach	nments		2.7 Entre	enchment R	Ratio	5.07	Upper			4.4 # of Debri	s Jams	3	
Length (ft)	One	Both	2.8 Incis	ion Ratio		1.00	Material Type	Sand	Sand	4.5 Flow Reg	ulation Type	None	
Berms	0	0	Human I	Elevated Ind	c Rat	0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regula	tion Use		
height	0	0	2.9 Sinu	osity	Мо	derate	Lower			Impoundme	nts		
Roads	758	0	2.10 Riff	iles Type	Sedime	ented	Material Type	Gravel	Gravel	Impoundmt.			
height	0	0	2.11 Riff	ile/Step Spa	acing (ft)	235	Consistency	Non-cohesive	Non-cohesive	•	•	None	
Railroads	0	0	2.12 Sub	ostrate Com	nposition		Bank Erosion	Left	Right	(old) Upstrm	Flow Reg		
height	0	0	Bedroc	k		0%	Erosion Length		241	4.7 Stormwate	rInputs		
Improved Paths	0	0	Boulde	r		0%	Erosion Height		5.47	Field Ditch	0 Road	d Ditch	0
height	0	0	Cobble	;	2	25%	Revetmt. Type	None	Rip-Rap	Other	0 Tile I	Drain	0
Development	83	58	Coarse	Gravel	5	58%	Revetmt. Lengt	. ,	251	Overland Flor	w 0 Urb S	Strm Wtr Pipe	÷ 0
1.4 Adjacent Side	Left	Right	Fine G	ravel		8%	Near Bank Veg.		Right	4.9 # of Beav	er Dams	0	
Hillside Slope	Steep	Hilly	Sand			9%	Dominant	Shrubs/Saplin	•	Affected I	ength (ft)	0	
Continuous w/Se	ometimes	Never	Silt and	d smaller		0%	Sub-dominant	Herbaceous	Herbaceous	Step 5. Chan	nel Bed and	Planform Cl	hanges
W/in 1 Bankfill Se	ometimes	Never					Bank Canopy	<u>Left</u> 1-25	Right	5.1 Bar Types	5		
Texture	Not Evalua	Not Evalua		Present?	N	-	Canopy %		1-25	Mid	- Point	Side	
1.5 Valley Features			Detritus		20		Mid-Channel C		Open	7	6	12	
Valley Width (f	ft) 490		# Large	•	12		3.2 Riparian Buf		Dight	Diagonal	Delta	Island	
Width Determinatio	on Estima	ted	2.13 Ave	erage Large	est Particl	e on	Buffer Width Dominant	<u>Left</u> >100	<u>Right</u> 26-50	0	0	4	
Confinement Typ	e Very B	road	Bed	5.0	i	nches	Sub-dominant	0-25	0-25	5.2 Other Fea	tures	\ Braidin	าต
Rock Gorge	? No		Bar	3.0	i	nches	W less than 25		311	Flood Neck			<u>.</u>
Human-caused Chan	nge? yes						Buffer Veg. Typ		Right	$\frac{11000}{11}$ $\frac{110000}{1}$	1		
Step 2. Stream	Channel			eam Type	-		Dominant	Shrubs/Saplin		5.3 Steep Riff	les and Head	Cuts	
2.1 Bankfull Width		41		eam Type:			Sub-dominant	-	Herbaceous	Steep Riffles	Head Cuts	Trib Rej	uv.
2.2 Max Depth (ft)	3.	20		d Material:			3.3 Riparian Cor			5	0	No	
2.3 Mean Depth (ft)	2.	.00		lass Slope:			Corridor Land	Left	Right	5.4 Stream Fo	ord or Animal	No	
2.4 Floodprone Widtl	h (ft) 2	08		Bed Form: leasured Sl		001	Dominant		Shrubs/Saplin	5.5 Straighter	ning	Straight	ening
Notes:				ference Stre	•	_	Sub-dominant	Shrubs/Saplin	Residential	Straighter	ning Length:	1,6	54
Straightening associa	ated with Rt	14. Looks		fferent from		-	Mass Failures	193	0	5.5 Dredging			None
like this segment hist					1 11026 1	,	Height	52	0				
against the valley wal	II. Also straig	ghtened at	00-1-1	A	N 4	المتعادية	Gullies	0	0	Note: Step 1.			
stream crossing.			3.3 old	Amount	iviean	Height	Height	0	0	and Step 4.8			
			Failures	None		0.00	iloigint	0	Ŭ	are on The se report - with \$			
			Gullies	None		0.00				iepoir - with a		gii /.	

Project: Kingsbur Stream: Kin	y Brancl gsbury I			Re	P ach # N	Phase 116	2 Segment S	annary	ge 1 of 2 gment: 0	September 22, Completion Dat		AT Version: I y 19, 2007	
		e Winooski	i River	Obse	rvers: P	D, CM		•	Not assessed:	•		Rain: Yes	
Segment Length (ft):		2,841	Se	gment Loc	ation: J	Just up	stream from Rt	14 bridge unti	I outlet of Sab	in Pond.			
QC Status - Staff: Pro	visional	Cons	Passed	Ste	p 2. (Cont	tued)	Step 3	B. Riparian Feat	ires	Step 4, Fl	ow & Flow	Modifiers	
Step 1. Valley ar	d Flood	plain		nd. Floodpln		3.30 ft.	3.1 Stream Banks			4.1 Springs / See		Minimal	
1.1 Segmentation None			Human	Elev Floodp	oln	0.00 ft.	Typical Bank Slo			4.2 Adjacent Wetl	ands	Minimal	
1.2 Alluvial Fan N	one		2.6 Widt	h/Depth Rat	tio	23.74	Bank Texture	Left	Right	4.3 Flow Status		Moderate	
1.3 Corridor Encroachme	ents			enchment R		2.53	Upper			4.4 # of Debris Ja	ns	8	
Length (ft)	One	Both	2.8 Incis	ion Ratio		1.18	Material Type	Sand	Sand	4.5 Flow Regulation	on Type	None	
Berms	0	0	Human E	Elevated Inc	Rat	0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulation	Use		
height	0	0	2.9 Sinu	osity	Mod	lerate	Lower			Impoundments			
Roads	151	0	2.10 Riff	les Type	Compl	lete	Material Type	Gravel	Gravel	Impoundmt. Loc	ation		
height	0	0	2.11 Riff	le/Step Spa	cing (ft)	275	Consistency	Non-cohesive	Non-cohesive		•	Up Strean	n
Railroads	0	0	2.12 Sub	ostrate Com	position		Bank Erosion	Left	Right	(old) Upstrm Flo	w Reg		
height	0	0	Bedroc	k	(0%	Erosion Length		238	4.7 StormwaterInp	uts		
Improved Paths	0	0	Boulde	r	(0%	Erosion Height (ft) 4.17	2.77	Field Ditch 0	Road I	Ditch	0
height	0	0	Cobble			0%	Revetmt. Type	Rip-Rap	None	Other 0	Tile Dr	ain	0
Development	311	0	Coarse			8%	Revetmt. Length	n (ft) 83	0	Overland Flow 0	Urb Str	rm Wtr Pipe	0
1.4 Adjacent Side	Left	Right	Fine Gr			0%	Near Bank Veg.	Гуре <u>Left</u>	Right	4.9 # of Beaver D)ams	0	
Hillside Slope Very	Steep	Very Steep	Sand			8%	Dominant	Herbaceous	Herbaceous	Affected Leng		0	
Continuous w/Som	etimes S	Sometimes		l smaller		4%	Sub-dominant	Coniferous	Coniferous	Step 5. Channel		lanform Ch	Jander
W/in 1 Bankfill Som	etimes S	Sometimes	Silt and	SITIALIEI		• %	Bank Canopy	Left	Right	5.1 Bar Types			langes
Texture	Sand	Sand	Silt/Clay	Present?	No	>	Canopy %	76-100	76-100		Point	Side	
1.5 Valley Features			Detritus		15 %	6	Mid-Channel Ca	nopy C	losed	3	5	<u>5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 </u>	
Valley Width (ft)	221		# Large	Woody	70)	3.2 Riparian Buff			-	•	-	
Width Determination	Estimat	ed	2.13 Ave	erage Large	st Particle	on	Buffer Width	Left	Right		Delta	Island	
Confinement Type	Narrow	cu	Bed	6.0	in	ches	Dominant	>100	>100	0	0	3	
Rock Gorge?	No		Bar	3.0	in	ches	Sub-dominant	0-25	51-100	5.2 Other Feature		Braidin	<u>g</u>
Human-caused Change							W less than 25	572	187	Flood Neck Cuto	off <u>Avulsio</u>	<u>on</u> \ 0	
Step 2. Stream Ch			2.14 Str	eam Type			Buffer Veg. Type		Right	•	•	``````````````````````````````````````	
2.1 Bankfull Width		7		eam Type:	С		Dominant	Mixed Trees	Mixed Trees	5.3 Steep Riffles			
			Ве	d Material:	Gravel		Sub-dominant	Herbaceous	Herbaceous		ead Cuts	Trib Reju	
2.2 Max Depth (ft)	2.8		Subcl	ass Slope:	None		3.3 Riparian Corr			-	0 vr Animal	No	
2.3 Mean Depth (ft)	1.9			Bed Form:	Riffle-Po	loc	Corridor Land	Left	Right	5.4 Stream Ford of	i Animai	Yes	
2.4 Floodprone Width (f	t) 11	9	Field M	easured Slo	ope:		Dominant	Forest	Forest	5.5 Straightening	Longth	Straighte	-
Notes:			2.15 Ref	ference Stre	eam Type		Sub-dominant	Residential	Bare	Straightening	Lengin:	80	None
Sinuosity and planform h	-	ed quite a	(if dif	ferent from	Phase 1)		Mass Failures	0	171	5.5 Dredging			NOUG
bit due to debris jam influ	uence.						Height	0	20	Note: Step 1.6 - 0	Prade Cont	role	
Poor bankfull indicators	in this rea	ch	3.3 old	Amount	Mean I	Height	Gullies	0	0	and Step 4.8 - Ch			
			Failures	None		0.00	Height	0	0	are on The secon			
Since this reach is just d	ownstrear	n of Sabin	Gullies	None		0.00				report - with Step			

	sbury Bran Pekin Bro			Baaab	Phase # T3.01	2 Segment S	, ann an y	ge 1 of 2 gment: 0	September 22, 2		Version: 4	4.56
		the Winoosk			# 13.01 s: MN,PD,	46		Not assessed:	Completion Date	-	/ 5, 2007 ain: Yes	
Segment Length (f		814					•		nch and continues			0.911
	,											E 014
QC Status - Staff:			Passed		(Contued)		3. Riparian Feat	ures		w & Flow N		
Step 1. Valley	•	apiain		l. Floodpln	0.00 ft.	3.1 Stream Bank			4.1 Springs / Seep 4.2 Adjacent Wetla		Abundant Minimal	
1.1 Segmentation N				lev Floodpln	0.00 ft.	Typical Bank Sl Bank Texture	Left	Right	4.3 Flow Status		Moderate	
1.2 Alluvial Fan	None			Depth Ratio	0.00 0.00	Upper		rtight	4.4 # of Debris Jan			
1.3 Corridor Encroac			2.7 Entrei		0.00	Material Type	Silt	Silt	4.5 Flow Regulatio		v None	
Length (ft)	One	Both		evated Inc Rat		Consistency	Cohesive	Cohesive	U U		None	
Berms	0	0	2.9 Sinuo		0.00	Lower	oonesive	Concarve	Impoundments	550		
height	0	0	2.10 Riffle	•		Material Type	Clay	Clay	Impoundmt. Loca	ition		
Roads	511	0		/Step Spacing	(ft) 0	Consistency	Cohesive	Cohesive	•		None	
height Railroads	0	0		strate Composi		Bank Erosion	Left	Right	(old) Upstrm Flov	•		
height	0	0	2.12 0003			Erosion Length		267	4.7 StormwaterInpu	-		
Improved Paths	0	0				Erosion Height	(ft) 5.25	5.39	Field Ditch 0	Road Di	tch	2
height	0	0				Revetmt. Type	Multiple	Hard Bank	Other 0	Tile Drai		2
Development	0	48				Revetmt. Lengt	-	43	Overland Flow 0		n Wtr Pipe	v
1.4 Adjacent Side	Left	Right				Near Bank Veg.		Right			3	•
Hillside Slope	Hilly	Very Steep				Dominant	Shrubs/Saplin		4.9 # of Beaver D Affected Lengt		650	
Continuous w/	Never	Sometimes				Sub-dominant	Herbaceous	Coniferous	-	N P		
W/in 1 Bankfill						Bank Canopy	Left	Right	Step 5. Channel I		aniorm Ch	anges
	Not Evalua	Not Evalua	Silt/Clay F	Present?		Canopy %	1-25	26-50	5.1 Bar Types	N = ¹ = 4	0:1-	
1.5 Valley Features			Detritus		0 %	Mid-Channel Ca	anopy	Open		Point	Side	
Valley Width ((ft) 200		# Large V	/oody	0	3.2 Riparian Buf	fer		0	0	0	
Width Determination	. ,	atod	2.13 Aver	age Largest Pa	article on	Buffer Width	Left	Right		Delta	Island	
Confinement Ty			Bed	0.0		Dominant	51-100	>100	0	0	0	
Rock Gorge	•		Bar	0.0		Sub-dominant	0-25	0-25	5.2 Other Features	-	Braiding]
Human-caused Cha						W less than 25	284	283	Flood Neck Cutor	f <u>Avulsion</u>	0	
Step 2. Strean	• •		2.14 Strea	am Type		Buffer Veg. Typ		Right	• •	•	, .ta	
2.1 Bankfull Width		0	Stre	am Type: E		Dominant		Shrubs/Saplin	5.3 Steep Riffles a			
2.2 Max Depth (ft)	0	0.00	Bed	Material: Sar	nd	Sub-dominant	•	Mixed Trees	Steep Riffles He	ad Cuts	Trib Reju	<u>v.</u>
2.3 Mean Depth (ft)).00	Subcla	ss Slope: Nor	ne	3.3 Riparian Cor			5.4 Stream Ford o	Animal	No No	
1 ()			B	ed Form: Dur	ne-Ripple	Corridor Land	Left	Right	5.5 Straightening	Animai	Straighte	ning
2.4 Floodprone Wid	un (II)	0		asured Slope:		Dominant	Residential	Forest	Straightening L	enath:	69(-
Notes:				erence Stream		Sub-dominant	Shrubs/Saplin	-	5.5 Dredging	ongui.		None
There is some road side. Buffer <25' is d			(if diffe	erent from Pha	se 1)	Mass Failures	0	0	S.o Brodying		•	
species and not encl	•					Height	0	0	Note: Step 1.6 - G	rade Contro	ols	
of Rt 14.		aomiotroum	3.3 old	Amount M	lean Height	Gullies	0	0	and Step 4.8 - Cha			
			Failures	None	0.00	Height	0	0	are on The second			
KDolan RMP 5/2/08:	: Added sen	sitivity to	Gullies	None	0.00				report - with Steps	6 through 7	7.	

Stream: P	oury Branch Pekin Brook iends of the Winoosk : 1,389	i River Observ	ach # T3.02 vers: MN	2 Segment S	Sec Why	ge 1 of 2 gment: 0 Not assessed: m of Route 14	September 2 Completion Da	-	ust 10, 200 Rain: Yes	07
QC Status - Staff: P	Provisional Cons	Passed Step	2. (Contued)		3. Riparian Feat	1	Step 4. I	Flow & Flow	/ Modifiers	
	and Floodplain	2.5 Aband. Floodpln	5.50 ft.	3.1 Stream Bank			4.1 Springs / Se	•	Abundant	
1.1 Segmentation Nor		Human Elev Floodplr		Typical Bank S		D : 14	4.2 Adjacent We	tlands	Abundant	
	None	2.6 Width/Depth Ratio		Bank Texture	Left	Right	4.3 Flow Status		Moderate	
1.3 Corridor Encroach	ments	2.7 Entrenchment Ra		Upper	0	a	4.4 # of Debris J		2	
Length (ft)	One Both	2.8 Incision Ratio	1.15	Material Type	Sand	Sand	4.5 Flow Regula		None	
Berms	0 0	Human Elevated Inc I	Rat 0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulatio			
height	0 0	2.9 Sinuosity	Low	Lower	0	a	Impoundments			
Roads	1,389 0	2.10 Riffles Type	Sedimented	Material Type	Sand	Sand	Impoundmt. Lo			
height	0 0	2.11 Riffle/Step Space	ing (ft) 0	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down str	•	None	
Railroads	0 0	2.12 Substrate Comp	osition	Bank Erosion		Right	(old) Upstrm F	ow Reg		
height	0 0	Bedrock	0%	Erosion Length		1,119	4.7 StormwaterIn	puts		
Improved Paths	0 0	Boulder	0%	Erosion Height		4.25	Field Ditch) Road I	Ditch	1
height	0 0	Cobble	0%	Revetmt. Type	Rip-Rap	Rip-Rap	Other () Tile Dr	rain	0
Development	0 0	Coarse Gravel	3%	Revetmt. Lengt	h (ft) 102	119	Overland Flow C	Urb St	rm Wtr Pipe	0
1.4 Adjacent Side	Left Right	Fine Gravel	21 %	Near Bank Veg.	Type Left	Right	4.9 # of Beaver	Dams	0	
Hillside Slope	Steep Steep	Sand	64 %	Dominant	Shrubs/Saplin	Shrubs/Saplin	Affected Ler		0	
Continuous w/	Never Sometimes	Silt and smaller	12%	Sub-dominant	Herbaceous	Herbaceous	Step 5. Channe	• • •	- Danform Ch	andee
W/in 1 Bankfill So	ometimes Sometimes	Sill and Smaller	12 %	Bank Canopy	Left	Right	5.1 Bar Types			anges
Texture N		Silt/Clay Present?	Yes	Canopy %	1-25	51-75		Deint	Cida	
1.5 Valley Features		Detritus	3 %	Mid-Channel C	anopy	Open	Mid	Point	Side	
Valley Width (ft	i) 130	# Large Woody	7	3.2 Riparian Buf	fer		0	0	2	
•	•	2.13 Average Largest	t Particle on	Buffer Width	Left	Right	Diagonal	Delta	Island	
Width Determination		Bed N/A		Dominant	26-50	>100	0	0	0	
Confinement Type		Bar N/A		Sub-dominant	0-25	None	5.2 Other Featur	es	\ Braiding	<u>g</u>
Rock Gorge				W less than 25	146	0	Flood Neck Cu	toff Avulsic	<u>on</u> \ 0	
Human-caused Chang	•	2.14 Stream Type		Buffer Veg. Typ	e <u>Left</u>	Right	0 0	0	Υ.	
Step 2. Stream		Stream Type:	F	Dominant	Shrubs/Saplin	Shrubs/Saplin	5.3 Steep Riffles	and Head (Cuts	
2.1 Bankfull Width	31	Bed Material:		Sub-dominant	Herbaceous	Deciduous	Steep Riffles	Head Cuts	Trib Reju	IV.
2.2 Max Depth (ft)	4.80	Subclass Slope:		3.3 Riparian Cor	ridor		0	0	No	
2.3 Mean Depth (ft)	3.88	Bed Form:		Corridor Land	Left	Right	5.4 Stream Ford	or Animal	No	
2.4 Floodprone Width	n (ft) 116	Field Measured Slop		Dominant	Shrubs/Saplin	Forest	5.5 Straightening	J	Straighte	ning
Notes:		2.15 Reference Strea		Sub-dominant	Residential	None	Straightening	រ Length:	1,36	i5
Reach runs along Pek	kin Brook Rd evidence	(if different from P		Mass Failures	0	0	5.5 Dredging		l	None
5	c straightening likely in		nase ij	Height	0	0				
100% of reach). Ther				Gullies	0 0	0	Note: Step 1.6 -			
	3% of the banks). There	<u>3.3 old</u> <u>Amount</u>	Mean Height	Height	0	0	and Step 4.8 - C			
•	her the RAF should be	Failures None	0.00		U	U	are on The seco			
bankfull or the left ban	ik; either way the	Gullies None	0.00				report - with Ste	ps 6 through	۱7.	

Organization: Friends of the Winooski River Observers: PD, TM Why Not assessed beaver dam Rain: Yes Segment Length (ft): 3,396 Segment Location: Segment begins near where natural valley gets wider and the continues until about 1300 QC Status - Staff: Provisional Cons Step 1. Valley and Floodplain Passed Step 2. (Conlued) Step 3. Riparian Features Step 4. Flow & Flow Modifiers 1.1 Segmentation Banks and Buffers 2.5 Aband. Floodpln 0.001 t. 1. Step 3. Riparian Features 3. Step 3. Riparian Features 3. Step 3. Riparian Features 4.1 Springs / Spesso Minimal 1.2 Aluvial Fan None 2.6 Width/Depth Ratio 0.000 1. Step 3. Riparian Features 3. Step 3. Riparian Features 4.2 Adjacent Wetlands Minimal 1.3 Corridor Encroachments 2.7 Entrenchemt Ratio 0.000 1.7 Entrenchemt Ratio 0.000 Material Type Sand 4.4 # of Debris Jams 1 1.3 Corridor Encroachments 2.10 Riffles Type 2.10 Riffles Type Clay Clay Clay Clay 1.4 # of Debris 1.4 Adjacent Side 0 0 2.11 Riffle/Step Spacing (ft) 0 0 0 1.4 # of Debris 4.7 Stormwaterinpus 1.4 Adjac	Project: Kingsbury Branch Stream: Pekin Brook	Phase Reach # T3.03	2 Segment Summary page 1 of Segment:	
Segment Length (ft): 3,396 Segment Location: Segment begins near where natural valley gets wider and then continues until about 1300 QC Status - Staff: Provisional Cons Step 1. Valley and Floodplain 1.1 Segmentation Banks and Buffers Assee Step 2. (Contuel) (Control - Encroachments) Step 3. Riparian Features Step 4. Flow & Flow Modifiers 1.1 Segmentation Banks and Buffers 2.6 Width/Depth Ratio 0.00 1.3 tream Banks 4.1 Springs / Seeps 4.1 Springs / Seeps 4.1 Springs / Seeps Minimal 1.2 Alluvial Fan None 2.6 Width/Depth Ratio 0.00 1.4 tream Elevated Inc Rat 0.00 1.2 loststrate Composition 1.3 tream Banks 1.4 tream Elevated Inc Rat 1.4 tream Elevate	Organization: Friends of the Winc		0	
Based Step 1. Valley and Floodplain Step 2. (Contued) Step 3. Riparian Features Step 4. Flow & Flow Modifiers 1.1 Segmentation Banks and Buffers 1.2 Alluvial Fan None 2.6 Modn. Floodpln 0.00 n. 3.1 Strema Banks 3.1 Strema Banks 3.1 Strema Banks 4.1 Springs / Seeps Minimal 1.2 Alluvial Fan None 2.6 Widht/Depth Ratio 0.00 1.3 Corridor Encroachments 2.6 Widht/Depth Ratio 0.00 Material Type Stand Stand 4.4 for Debris Jams 1 1.3 Corridor Encroachments 2.9 Sinusity 2.16 Niftles Type Stand Stand Stand Stand Stand None Hours Stand None Hours Stand	0	•	-	
Step 1. Valley and Floodplain 2.5 Aband. Floodplin 0.00 ft. 1.1 Segmentation Banks and Buffers Human Elev Floodplin 0.00 ft. 1.2 Alluvial Fan None 2.6 Kindt/Depth Ratio 0.00 ft. 1.3 Corridor Encroachments 2.7 Entrenchment Ratio 0.00 Typical Bank Slope Steep 4.1 Springs / Seeps 4.2 Adjacent Wetlands 1.3 Corridor Encroachments 2.7 Entrenchment Ratio 0.00 Type Ial Bank Slope Steep 4.3 Flow Status Moderate 1.3 Corridor Encroachments 2.8 Incision Ratio 0.00 Material Type Sand 4.4 # of Debris Jams 1 1.6 uppt Mither 0 2.3 Sinuosity Consistency None-cohesive None 4.3 Flow Regulation Type None 1.6 uppt Mither 0 2.11 Riffle/Step Spacing (ft) 0 Consistency Cohesive Cohesive <t< td=""><td> • • • •</td><td>· · ·</td><td></td><td>-</td></t<>	• • • •	· · ·		-
1.1 Segmentation Banks and Buffers Human Elev Floodpin 0.00 ft. Typical Bank Slope Steep 4.2 Adjacent Wetlands Moderate 1.2 Alluvial Fan None 2.6 Width/Depth Ratio 0.00 Bank Stope Steep 4.3 Flow Status Moderate 1.3 Corridor Encroachments 2.6 Width/Depth Ratio 0.00 Material Type Sand Sand 4.4 # of Debris Jams 1 Length (ft) One Boh 2.3 Incision Ratio 0.00 Material Type Sand Sand 4.4 # of Debris Jams 1 Length (ft) One 2.3 Incision Ratio 0.00 Consistency Non-cohesive Non-cohesive None 4.5 Flow Regulation Type None Material Type Clay Clay Clay Clay Impoundments Impoundments Impoundments Impoundments Impoundments Impoundments Impoundments Field Ditch 0<				
1.2 Alluvial Fan None 2.6 Width/Depth Ratio 0.00 Hart Reture Left Right 4.3 Flow Status Moderate 1.3 Corridor Encroachments 2.7 Entrenchment Ratio 0.00 Upper 4.4 # of Debris Jams 1 Length (ft) One Both 2.7 Entrenchment Ratio 0.00 Material Type Sand 4.3 Flow Status 1 Berms 0 0 Human Elevated Inc Rat 0.00 Consistency Non-cohesive Non-cohesive Flow Regulation Use Impoundments Impoundments Inpoundments None Adjacent Side 2.10 Riffles Type 2.11 Riffle/Step Spacing (ft) 0 Consistency Cohesive Cohesive Cohesive Cohesive 4.5 Up/Down strm flow reg None Impoundments 2.12 Substrate Composition Consistency Cohesive				
1.3 Corridor Encroachments 2.7 Entrenchment Ratio 0.00 Upper 4.4 # of Debris Jams 1 Length (ft) One Borth 2.8 Incision Ratio 0.00 Material Type Sand Sand 4.5 Flow Regulation Type None height 0 0 2.9 Sinuosity Consistency Non-cohesive Non-cohesive Non-cohesive Flow Regulation Type Impoundments Neight 0 0 2.11 Riffle/Step Spacing (ft) 0 Consistency Cohesive C				Right 4.3 Flow Status Moderate
Lengin (tr)OneDomBerms00height002.9 Sinuosity2.10 Riffles Typeheight002.9 Sinuosity2.10 Riffles Typeheight002.11 Riffle/Step Spacing (ft)01.12 Substrate Composition2.12 Substrate Compositionheight001.14 Adjacent SideLeftHillside StopeSteepValley Width (ft)245Valley Features%Valley Width (ft)245Valley Width (ft)2.13 Average Largest Particle onRock Gorge?NoreHuman-caused Change? yes2.14 Cheme Ture	1.3 Corridor Encroachments	-	Upper	4.4 # of Debris Jams 1
Berms00Human Elevated Inc Rat0.00ConsistencyNon-cohesiveNon-cohesiveFlow Regulation UseNeight002.9 SinuosityLowerImpoundmentsImpoundmentsImpoundmentsRailroads002.11 Riffle/Step Spacing (ft)0ConsistencyCohesiveCohesiveCohesiveCohesiveRailroads002.12 Substrate CompositionConsistencyCohesiveCohesiveCohesiveCohesive6 lb/Down strm flow regNon-Impoundments02.12 Substrate CompositionConsistencyCohesiveCohesiveCohesive6 lb/Down strm flow regNoneImpoundments02.12 Substrate CompositionErosion Leight (ft)4.084.064.07Impoundments00Revetmt. TypeNoneNoneNoneIntervelopment02.8Field Ditch0Revetmt. Length (ft)01.4 Adjacent SideLeftRightNot EvaluaNt EvaluaSitt/Clay Present?LeftRightMin 1 Bankfill SometimesSometimesSitt/Clay Present?Sitt/Clay Present?Mid-Channel CanopyOpen3.2 Riparian BufferValley Width (ft)245# Large Woody03.2 Riparian BufferMidDiagonalDeltaIslandVidth DeterminationEstimated0.0Sub-dominant51-10026-50StodeSiz Other FeaturesMidNon-acused Change? yes2.44 Chanen TuroBuffer Width <t< td=""><td>Length (ft) One E</td><td>h 2.8 Incision Ratio 0.00</td><td>Material Type Sand</td><td>Sand 4.5 Flow Regulation Type None</td></t<>	Length (ft) One E	h 2.8 Incision Ratio 0.00	Material Type Sand	Sand 4.5 Flow Regulation Type None
Integrit Roads2,10 Riffles Type2.10 Riffles TypeMaterial TypeClayClayImpoundmt. LocationRoads2,18602.11 Riffle/Step Spacing (ft) 2.12 Substrate Composition004.6 Up/Down strm flow regNoneRailroads002.12 Substrate Composition1.6 Kiffles Type004.6 Up/Down strm flow regNoneImpoundmt. Location2.12 Substrate Composition2.12 Substrate Composition1.6 Kiffles TypeConsistencyCohesiveCohesiveCohesive4.6 Up/Down strm flow regNoneImpoundmt. Location2.12 Substrate Composition2.12 Substrate CompositionErosion Length (ft)4.084.004.7 StormwaterInputsImpoundmt. Location2.13 Average Largest Particle onRevetmt. Length (ft)000001.6 Valley FeaturesSilt/Clay Present? DetritusDetritus0 %%1-251.25 Channel Ead and Planform ChangNidd DeterminationEstimated Confinement TypeSilt Olay Present? Detritus0 %3.2 Riparian Buffer Buffer WidthSilter WidthLeft Buffer WidthMid DeintSild SildNuman-caused Change?NoBar0.0Sub-dominant51-10026-505.2 Other Features GoldSild Olay PresentNuman-caused Change?Name1.4 Agenem Tupe00Sild1.5 Valley FeaturesBar 0.0Sub-dominant51-10026-505.2 Other FeaturesMid Bar 0.0Sild Clay PresentNone <td></td> <td>-0.000Human Elevated Inc Rat0.00</td> <td>Consistency Non-cohesive Non-cohesive</td> <td>_</td>		-0.000Human Elevated Inc Rat0.00	Consistency Non-cohesive Non-cohesive	_
Kodus2,16002.11 Rifle/Step Spacing (ft)0height002.12 Substrate Composition0height002.12 Substrate Composition0Improved Paths000height0height0height1.5 Valley FeaturesValley Width (ft)245Widt DeterminationEstimatedConfinement TypeNoreNoteBarheid0 <t< td=""><td>height 0</td><td>0 2.9 Sinuosity</td><td></td><td></td></t<>	height 0	0 2.9 Sinuosity		
Railroads002.11 Rimetocop optioning (tr)0Railroads00height00Improved Paths00height15215height213 Average Largest Particle onRock Gorge?NoHuman-caused Change? yes214 Stream Turo <td>Roads 2,186</td> <td>0 2.10 Riffles Type</td> <td></td> <td></td>	Roads 2,186	0 2.10 Riffles Type		
Raindads002.12 Edustrie Compositionheight00Improved Paths0height0height0height0Development028LeftHillside SlopeSteepContinuous w/SometimesSometimesWin 1 Bankfill SometimesSometimesTexture Not EvaluaNot Evalua1.5 Valley Weath (tit)245Valley Width (tit)245Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2.14 Staem Ture	height 0	0 2.11 Riffle/Step Spacing (ft) 0		
Image: Non-Reight00Improved Paths00height00Development0281.4 Adjacent SideLeftRightHillside SlopeSteepExtremelyContinuous w/SometimesSometimesWin 1 Bankfill SometimesSometimesTexture Not EvaluaNot Evalua1.5 Valley FeaturesSilt/Clay Present?Valley Width (ft)245Valley Width (ft)245Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2.14 Surger TypeAuman-caused Change?2.44 Surger TypeLater SourceSuffer Veg. TypeLater SourceSuffer Veg. TypeLater SourceSub-dominantStruct SourceSitter SourceSourceSitter SourceSourceSitter SourceSitter SourceSitter SourceSitter SourceSitter SourceSitter SourceSitter SourceSourceSitter SourceSourceSitter Source <td< td=""><td>Railroads 0</td><td>0 2.12 Substrate Composition</td><td></td><td></td></td<>	Railroads 0	0 2.12 Substrate Composition		
Imploved Pairs000height00Development0281.4 Adjacent SideLeftRightHillside SlopeSteepExtremelyContinuous w/SometimesSometimesWin 1 Bankfill SometimesSometimesTexture Not EvaluaNot Evalua1.5 Valley FeaturesSilt/Clay Present?Valley Width (ft)245Valley Width (ft)245Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2.44 Stream Ture2.44 Stream Ture2.44 Stream Ture	-	0		4.7 Storniwaterinputs
InightI of the second seco	•	0	U U U	Field Ditch U Road Ditch U
1.4 Adjacent Side Left Right Hillside Slope Steep Extremely Continuous w/Sometimes Sometimes Sometimes Sometimes Sub-dominant Shrubs/Saplin Herbaceous Herbaceous Affected Length (ft) 2,370 Win 1 Bankfill Sometimes Sometimes Sometimes Sub-dominant Shrubs/Saplin Shrubs/Saplin Shrubs/Saplin Texture Not Evalua Not Evalua Not Evalua Silt/Clay Present? Detritus 0 % Mid-Channel Canopy Open Silde Silde Valley Width (ft) 245 # Large Woody 0 3.2 Riparian Buffer Buffer Width Left Right Diagonal Delta Island Confinement Type Narrow Bed 0.0 Bar 0.0 Sub-dominant 51-100 26-50 5.2 Other Features Braiding Human-caused Change? yes 244 Stream Tupe Buffer Veg. Type Left Right Silde 4.9 # of Beaver Dams 3.4 ffected Length (ft) 2.9 # of Beaver Dams 3.6 # 4 Diagonal Delta Large Woody 0 3.2 Riparinan Buffer <td>C C</td> <td></td> <td></td> <td></td>	C C			
Juild SingeSteepExtremelyHillside SlopeSteepExtremelyContinuous w/SometimesSometimesWin 1 Bankfill SometimesSometimesTextureNot Evalua1.5 Valley FeaturesSilt/Clay Present?Valley Width (ft)245Valley Width (ft)245Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2.44 Stream Ture2.44 Stream Ture2.44 Stream Ture				Overland Flow U OID Still Will lipe U
Affected Length (ft)2,370Continuous w/SometimesSometimesWin 1 Bankfill SometimesSometimesTextureNot Evalua1.5 Valley FeaturesSilt/Clay Present?Valley Width (ft)245Valley Width (ft)245Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2.44 Stream TureAtterner Type2.44 Stream Ture		-		
Wind Bankfill Sometimes	· · ·	-		Affected Length (ft) 2,370
With H Bankin SometimesSometimesSometimesTextureNot EvaluaNot EvaluaSilt/Clay Present?1.5 Valley FeaturesDetritus0 %Valley Width (ft)245# Large Woody0Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?yes			-	Step 5. Channel Bed and Plantorm Changes
InstructionNot EvaluationOnly of reserveMid of y reserveMid of y reserve1.5 Valley FeaturesDetritus0 %Valley Width (ft)245Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?9 %Valley Width (ft)2.14 Stream TurpeAutority Features0 %Mid-Channel CanopyOpenMid-Channel CanopyOpenSub-dominantS100Sub-dominantS1-100Velses than 250Mider VelseNeck CutoffMider VelseNeck Cutoff		0111/01-11 Data a 40		$=$ 5.1 Bor Lypoc
1.5 Valley Features2 45# Large Woody0Valley Width (ft)245# Large Woody0Width DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2 14 Stream Type2 14 Stream Type				
Valley Width (ft)245In Large HoodyIWidth DeterminationEstimatedWidth DeterminationEstimatedConfinement TypeNarrowRock Gorge?NoHuman-caused Change?922.14 Stream Type2.14 Stream TypeLeftRightDiagonalDeltaDiagonal0Diagonal0Buffer Width-100Sub-dominant51-100Sub-dominant51-100Buffer Veg. TypeEftRight0O0Buffer Veg. TypeEftRight0O0DeltaIslandDominant51-100Sub-dominant51-100Sub-dominant51-00Sub-dominant51-00Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant51-00Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-dominant0Sub-domina				2 6 4
Width DeterminationEstimated2.13 Average Largest Fatter offConfinement TypeNarrowRock Gorge?NoHuman-caused Change?2.14 Stream Type2.14 Stream TypeLeftRock Gorge?NoHuman-caused Change?2.14 Stream Type	•		·	Right Diagonal Delta Island
Rock Gorge?NoBar0.0Sub-dominant51-10026-505.2 Other FeaturesBraidingHuman-caused Change?yes2.14 Stream TuncBuffer Veg. TypeLeftRightFloodNeck CutoffAvulsion0			Dominant >100	>100 0 0 0
Human-caused Change? yes Wess than 25 0 766 Flood Neck Cutoff Avulsion 0 Human-caused Change? yes 2.14 Stream Type Left Right Flood Neck Cutoff Avulsion 0	••		Sub-dominant 51-100	26-50 5.2 Other Features Braiding
2 14 Streem Type	0		W less than 25 0	
		2.14 Stream Type	Buffer Veg. Type	
Stream Type: E Dominant Shrubs/Saplin Shrubs/Saplin 5.3 Steep Rifles and Head Cuts			Dominant Shrubs/Saplin Shrubs	
2.1 Bankiuli Width U Bed Material: Sand Sub-dominant Shrubs/Saplin Mixed Trees Steep Riffles Head Cuts Trib Rejuv.			Sub-dominant Shrubs/Saplin Mixed	
2.2 Max Depth (it) 0.00 Subclass Slope: None 3.3 Riparian Corridor 0 0 0 No			3.3 Riparian Corridor	
2.3 Mean Depth (ft) 0.00 Bed Form: Dune-Ripple Corridor Land Left Right 5.4 Stream Ford or Animal No		-	Corridor Land Left	Right
Field Measured Slope: Dominiant Residential Totest		Field Measured Slope:	Dominant Residential	
Notes: 2.15 Reference Stream Type Sub-dominant Shrubs/Saplin Shrubs/Saplin Straightening Length: 170 Beach was segmented due to changes in 2.15 Reference Stream Type Mass Failures 0 0 5.5 Dredging Non		2.15 Reference Stream Type	Sub-dominant Shrubs/Saplin Shrubs	
(if different from Phase 1) Mass Failures 0 0 0		(if different from Phase 1)	Mass Failures 0	
buffer and beaver dam influence. Height 0 0 Note: Step 1.6 - Grade Controls	butter and beaver dam influence.			0 Note: Step 1.6 - Grade Controls
KDolan RMP 5-2-08: Added sensitivity to 3.3 old Amount Mean Height Gullies 0 0 and Step 1.6 - Grade Controls	KDolan RMP 5-2-08: Added sensitivity to	3.3 old Amount Mean Height	Gullies 0	
Step 7. Failures None 0.00 Height 0 0 are on The second page of this		Failures None 0.00	Height 0	0 are on The second page of this
Gullies None 0.00 report - with Steps 6 through 7.		Gullies None 0.00		report - with Steps 6 through 7.

Stream: P	oury Bran Pekin Bro	ok		Reach # T3.	.03	2 Segment S	Se	ge 1 of 2 gment: B	September 22, Completion Dat	te: Aug	ust 16, 200	07
0		he Winoosk		oservers: PD		nt hagina ahaut	,	Not assessed:	Presk Dd aulya		Rain: Yes	
Segment Length (ft)		3,369	-		-	-			n Brook Rd culver			Tien
QC Status - Staff: F				Step 2. (Contue	<u> </u>		3. Riparian Featu	ures		ow & Flow	Modifiers Minimal	
Step 1. Valley		-	2.5 Aband. Floor	•	.50 ft.	3.1 Stream Banks			4.1 Springs / See 4.2 Adjacent Wetl		Minimal	
1.1 Segmentation Bar		utters	Human Elev Flo		.00 ft.	Typical Bank Slo Bank Texture	ope Steep Left	Right	4.3 Flow Status	anus	Moderate	
	None		2.6 Width/Depth		0.86	Upper	Len	<u>Kight</u>	4.4 # of Debris Ja	me	2	
1.3 Corridor Encroach			2.7 Entrenchmer 2.8 Incision Ration		7.68 1.00	Material Type	Sand	Sand	4.5 Flow Regulation		2 None	
Length (ft)	One	Both	Human Elevated		0.00	Consistency	Non-cohesive	Non-cohesive	-		None	
Berms	0	0	2.9 Sinuosity	Moder		Lower	Non-conesive	Non-conesive	Impoundments	036		
height	0	0	-			Material Type	Silt	Silt	Impoundmt. Loc	etion		
Roads	2,453	0	2.10 Riffles Type			Consistency	Cohesive	Cohesive	•		None	
height	0	0	2.11 Riffle/Step		0	Bank Erosion	Left	Right	(old) Upstrm Flo	•		
Railroads	0	0	2.12 Substrate C			Erosion Length		1,082		•		
height	0	0	Bedrock	09		Erosion Height (5.13	4.7 StormwaterInp			•
Improved Paths	0	0	Boulder	09		Revetmt. Type	Rip-Rap	Rip-Rap	Field Ditch 1	Road I		3
height	0	0	Cobble	09		Revetmt. Length		469	Other 0	Tile Dr		0
Development	60	0	Coarse Gravel	22 9	%	Near Bank Veg.			Overland Flow 0	Urb Sti	rm Wtr Pipe	U
1.4 Adjacent Side	Left	Right	Fine Gravel	28 %	%	Dominant	· · ·	Right Shrubs/Saplin	4.9 # of Beaver D		1	
Hillside Slope	Steep	Extremely	Sand	43 %	%		Shrubs/Saplin S	-	Affected Leng	jth (ft)	100	
Continuous w/So		Never	Silt and smaller	· 79	%	Bank Canopy	Left	Right	Step 5. Channel	Bed and P	lanform Ch	anges
W/in 1 Bankfill So		Never	Silt/Clay Present	? Yes		Canopy %		0	5.1 Bar Types			
Texture N	lot Evalua	Not Evalua				Mid-Channel Ca	•	Open	Mid	Point	Side	
1.5 Valley Features			Detritus	20 %		3.2 Riparian Buff	• •	Open	8	10	5	
Valley Width (ft	:) 380		# Large Woody	75		Buffer Width	Left	Right	Diagonal	Delta	Island	
Width Determination	n Estim a	ated	2.13 Average La		<u>n</u>	Dominant	0-25	0-25	0	0	0	
Confinement Type	e Very E	Broad	Bed N/A			Sub-dominant	>100	26-50	5.2 Other Feature	s	\ Braiding	a
Rock Gorge	? No		Bar N/A			W less than 25	1,414	3,094	Flood Neck Cuto			~
Human-caused Chang	ge? yes					Buffer Veg. Type		Right	$\frac{1000}{0}$ $1000000000000000000000000000000000000$	0	- \	
Step 2. Stream	Channel		2.14 Stream Typ			Dominant	Herbaceous	Herbaceous	5.3 Steep Riffles	and Head (Cuts	
2.1 Bankfull Width		38	Stream Typ				Shrubs/Saplin S		i	ead Cuts	 Trib Reju	IV.
2.2 Max Depth (ft)	4	.50	Bed Materi			3.3 Riparian Corr	-	2 480,04pm	0	0	No	
2.3 Mean Depth (ft)		.50	Subclass Slop			Corridor Land	Left	Right	5.4 Stream Ford of	or Animal	No	
2.4 Floodprone Width		292		m: Dune-Ripp	pie	Dominant	Hay	Residential	5.5 Straightening		Straighte	
Notes:	. /		Field Measurec 2.15 Reference			Sub-dominant	Forest	Hay	Straightening	Length:	1,30	-
Most of reach is ripple	dune but	there are				Mass Failures	67	О	5.5 Dredging		I	None
some riffle-pool featur			(if different fr	om Phase 1)		Height	40	0				
segmented due to cha						Gullies	40 0	0	Note: Step 1.6 - 0			
beaver dam influence			3.3 old Amou		<u> </u>		-	•	and Step 4.8 - Ch			
segment has a lot of h			Failures None		0.00	Height	0	0	are on The secon			
there is no buffer alter	nating on I	eft and right	Gullies None	0	0.00				report - with Step	s 6 through	17.	

Based Step 2. (Contact) QC Status - Staff: Provisional Cons Step 1. Valley and Floodplain 2.5 Aband. Floodplain 2.5 Aband. Floodplain 3.1 Stream Banks 3.1 Stream Banks 3.1 Stream Banks 4.1 Springs/ Steps. Minimal 1.2 Alluvial Fan None 2.5 Aband. Floodplain 0.00 title 0.00 title 4.1 Springs/ Steps. Minimal 1.3 Gronder Encoachments 2.5 Aband. Floodplain 2.6 Width/Depth Raio 9.06 title 4.1 Springs/ Steps. Minimal 1.3 Gronder Encoachments 2.9 Sinucsity Hight 0.00 title Consistency None checking 4.5 Flow Kedulation Type None 1.3 Gronder Encoachments 2.1 Stream Elevisation (none) Consistency Consistency None checking 4.5 Flow Kedulation Type None 1.3 Gronder Encoachments 2.1 Stream Elevisation (none) Consistency Consistency Consistency Consistency None checking 4.5 Flow Kedulation Type None Raidoads 0 0 2.11 Rifficites Type Not Applicable Material Type Site Checking 4.5 Flow Kedulation Type None Raidoads 0 0 Consistency Consistency Consistency	Stream: Pe	ury Branch ekin Brook ends of the Winoosk 2,654		[#] T3.04 : PD, AW		Seę Why	ge 1 of 2 gment: A Not assessed: i jil Rd near int	September 22, Completion Dat	e: Aug	just 9, 200 Rain: Yes)7
Step 1. Valley and Floodplaim 2.5 Aband. Floodplaim 3.1 Stream Banks 4.1 Springer Banks 1.2 Gundar Encroachments 2.6 Widh/Depth Railo 9.06 1.3 Condide Encroachments 2.6 Widh/Depth Railo 9.06 2.6 Widh/Depth Railo 9.06 1.3 Condide Encroachments 2.6 Widh/Depth Railo 9.06 2.6 Widh/Depth Railo 9.06 1.3 Condide Encroachments 2.6 Nichtwick 9.06 Length (1) One 6.00 Bermis 0 0 2.5 Incesion Railo None 2.10 Rifles Type Not Applicable Consistency Non-cohesiv Non-cohesiv Non-cohesive Non-cohesive Non-cohesive Non-cohesive None 2.11 Ritific/Step Separing (1) 0.0 Consistency Non-cohesive Non-cohesive None 2.11 Ritific/Step Separing (1) 0.0 Consistency Cohesive A.1 Springer Series Non-cohesive None 2.11 Ritific/Step Separing (1) 0.0 Consistency Cohesive A.1 Springer Series Non-cohesive None 2.12 Substrate Composition Bedrock 0% Revertm. Tipe RipHrap Rip-Rap Ripe Ripe Accounts <t< td=""><td></td><td>•</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td></t<>		•					1				
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Longert (h) Outside Human Elevated Inc Rat 0.00 Consistency Non-cohesive Flow Regulation Use Barms 0 0 2.9 Situasity High Lower Impoundments Address 1,595 0 2.10 Riffles Type Not Application Matrial Type Sitt Sitt Impoundments Impoundments All Adjacent Side 0 0 2.12 Substrate Composition Bark Erosion Length (t) 1.061 523 4.7 StormwaterInputs Improved Paths 0 0 Coarise Gravel 7% Reventr. Type Reventr. Type Right 0 Oute Stand 0 Oute Stand 0 0 Oute Stand 0 Oute Stand 0 0 Oute Stand 0 0 0 Oute Stand 0	1.3 Corridor Encroachm	nents	2.7 Entrenchment Ratio	14.41	Upper			4.4 # of Debris Ja	ms	1	
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1.4 Adjacent Side Left Right Fine Gravel 3.3 v/s Near Bank Veg. Type Left Right 4.9 # of Beaver Dams 0 Hillside Stope Hilly Extremely Sand 44 % Sub-dominant Herbaceous Invasives Sub-dominant Mid Point Site D. Schannel Bed and Planform Changes 5.1 Bar Types 5.2 Other Features Mid Point 4.9 # 6 Beaver Dams 6.0 % 5.2 Other Features Mid 9.0 % 6.0 % 5.2 Other Features 5.2 Other Features 5.2 Other Features 5.2 Other Features 5.3 Steep Riffles and Head Cuts<		44 70			Revetmt. Lengt	h (ft) 59	155	Overland Flow 0	Urb St	rm Wtr Pipe	0
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2.4 Floodprone Width (ft)418Field Measured Slope:DominantHayResidential5.5 StraighteningStraighteningNotes:StraighteningStraighteningStraighteningStraighteningStraighteningStraighteningFields along reach are hayed and used as cow pasture. The segment is experiencing adjustment in two locations. The upstream location is where T3.04-B wants to avulseField Measured Slope:DominantHay Mass FailuresStraighteningStraighteningStraighteningBalance2.15 Reference Stream Type (if different from Phase 1)Mass Failures00StraighteningStraighteningStraighteningBalance3.3 oldAmount FailuresMean Height NoneMean Height 0.000Note:Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this			-		Corridor Land	Left	Right		or Animal		
Fields2.15 Reference Stream TypeSub-dominantSub-dominantSub-dominantFields/SapinHayFields along reach are hayed and used as cow pasture. The segment is experiencing adjustment in two locations. The upstream location is where T3.04-B wants to avulse right near bridge. Flood waters during July(if different from Phase 1) E 5 Non Dune-Ripple Amount FailuresMass Failures0003.3 old FailuresAmount NoneMean Height 0.00000Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this	2.4 Floodprone Width	(ft) 418			Dominant	Нау	Residential	• •		-	-
Inclusion of feach are hayed and used as cow pasture. The segment is experiencing adjustment in two locations. The upstream location is where T3.04-B wants to avulse right near bridge. Flood waters during JulyImage (if different from Phase 1) NoneMass FailuresImage (if different from Phase 1) HeightImage (if different from Ph	Notes:		2.15 Reference Stream Ty	уре	Sub-dominant	Shrubs/Saplin	Hay		Length:	-	
adjustment in two locations. The upstream location is where T3.04-B wants to avulse right near bridge. Flood waters during JulyE5NoneMean Height 0.00Integrit00Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this			(if different from Phase	e 1)	Mass Failures	0	0	5.5 Dredging			NONE
location is where T3.04-B wants to avulse right near bridge. Flood waters during July Failures None None Mean Height 0.00 Height 0 0 0 and Step 4.8 - Channel Constrictions are on The second page of this			E 5 Non Dune	e-Ripple	Height	0	0	Noto: Star 4.0	Irada Cart	rolo	
right near bridge. Flood waters during July Failures None 0.00 Height 0 0 are on The second page of this	•	•	3.3 old Amount Me	an Height	Gullies	0	0				
					Height	0	0	•			
			Gullies None	0.00							

-	ury Bran ekin Bro			Re	P each # T	hase 3.04	2 Segment S	, ann an y	page 1 of 2 Segment: B	Septemb Completior		GAT Version: 4.56 I gust 9, 2007
		he Winoosk	i River		ervers: P				ny Not assesse	•		Rain: Yes
Segment Length (ft):		1,327	Se	gment Loc	cation: S	Segme	nt begins just u	pstream of b	ridge near Ja	ck Hill Rd inters	section with	Pekin Brook Ro
QC Status - Staff: Pi		I Cons	Passed	-	p 2. (Cont	-		3. Riparian Fe	-	i.	4. Flow & Flov	
Step 1. Valley a				nd. Floodpln		4.60 ft.	3.1 Stream Bank	-	atures	4.1 Springs /		Minimal
1.1 Segmentation Cor		-		Elev Floodp		0.00 ft.	Typical Bank SI			4.2 Adjacent	•	Minimal
	None			h/Depth Ra		19.13	Bank Texture	Le	ft Righ	-		Moderate
1.3 Corridor Encroachm	nents			enchment R		7.91	Upper			4.4 # of Debr	ris Jams	0
Length (ft)	One	Both	2.8 Incis	ion Ratio		1.28	Material Type	San	d Sano	d 4.5 Flow Reg	julation Type	None
Berms	0	0	Human I	Elevated Inc	c Rat	0.00	Consistency	Non-cohesiv	e Non-cohesi	i ve Flow Regul	lation Use	
height	0	0	2.9 Sinu	osity	Mod	erate	Lower			Impoundme	ents	
Roads	93	0	2.10 Riff	les Type	Compl	ete	Material Type	Cla		· ·		
height	0	0	2.11 Riff	le/Step Spa	acing (ft)	160	Consistency	Cohesiv	e Cohesi		n strm flow reg	None
Railroads	0	0	2.12 Sub	ostrate Com	position		Bank Erosion	Le			m Flow Reg	
height	0	0	Bedroc	k	(0%	Erosion Length			4.7 Stornwate	ərInputs	
Improved Paths	0	0	Boulde	r	(0%	Erosion Height			Field Ditch	0 Road	I Ditch 0
height	0	0	Cobble		(0%	Revetmt. Type	Non		Other	0 Tile D	Drain 0
Development	0	0	Coarse	Gravel	23	3%	Revetmt. Lengt		-	Overland Flo	_{ow} 0 Urb S	Strm Wtr Pipe 0
1.4 Adjacent Side	Left	Right	Fine G	ravel	19	9%	Near Bank Veg.				ver Dams	0
Hillside Slope	Hilly	Very Steep	Sand		35	5%	Dominant	Herbaceou		Affected	Length (ft)	0
Continuous w/	Never	Never	Silt and	l smaller		3%		-	n Shrubs/Saplir	Step 5, Cha	nnel Bed and	Planform Change
W/in 1 Bankfill	Never	Sometimes					Bank Canopy	Le 1-2			 9S	
Texture No.	ot Evalua	Not Evalua	-	Present?	Yes		Canopy %			Mid	– Point	Side
1.5 Valley Features			Detritus		20 %		Mid-Channel Ca		Open	2	4	1
Valley Width (ft)	260		# Large	•	40		3.2 Riparian Buf		ft Righ	t Diagonal	Delta	Island
Width Determination	Estima	ated	2.13 Ave	erage Large	st Particle	on	Buffer Width Dominant	Le 0-2			0	0
Confinement Type	Narrow	w	Bed	1.5	in	ches	Sub-dominant	26-50			atures	\ Braiding
Rock Gorge?	No		Bar	1.0	in	ches	W less than 25	1,32		0 Flood Neck		\
Human-caused Chang	e? no						Buffer Veg. Typ	-			$\frac{1}{0}$ $\frac{1}{0}$	\
Step 2. Stream C	Channel			eam Type	•		Dominant		s Shrubs/Saplir	-	ffles and Head	Cuts
2.1 Bankfull Width		44		eam Type:			Sub-dominant		n Mixed Trees			Trib Rejuv.
2.2 Max Depth (ft)	3	.60		d Material:			3.3 Riparian Cor	-		0	0	No
2.3 Mean Depth (ft)	2	.30		ass Slope: Bed Form:			Corridor Land	Le	ft Righ	t 5.4 Stream F	Ford or Animal	No
2.4 Floodprone Width	(ft) 3	348		leasured Slo			Dominant	Ha		- 55 Straighto	ning	Straightening
Notes:				ference Stre	•		Sub-dominant		n Shrubs/Saplir	n Straighte	ening Length:	448
Field on left bank is mo	owed for h	ay regularly		ferent from	<u> </u>		Mass Failures		0 65	5.5 Dredging	J	None
leading to buffer widths	s <25'. Ma	iss failure			1 11036 1)		Height		0 10			
and erosion present on			2224	Amount	Maar		Gullies			Note: Step 1	I.6 - Grade Con	
bends. At downstream			<u>3.3 old</u>	Amount None	Mean I		Height		-	and Step 4.8	 Channel Con econd page of t 	
before bridge) flood wa into T3.04-A during Jul			Failures	None		0.00			-	ale on the s	Steps 6 throug	
	, 2007 110	ou. Druge	Gullies	None		0.00						

Project: Kingsbury Branch Stream: Pekin Brook	Phase Reach # T3.04	2 Segment Summary page 1 of 2 Segment: C	September 22, 2008 SGAT Version: 4.56 Completion Date: July 26, 2007
Organization: Friends of the Winoosk		5	
Segment Length (ft): 2,627		nt begins at driveway bridge and continues	
QC Status - Staff: Provisional Cons	Passed Step 2. (Contued)	Step 3. Riparian Features	Step 4. Flow & Flow Modifiers
Step 1. Valley and Floodplain	2.5 Aband. Floodpln 4.95 ft.	3.1 Stream Banks	4.1 Springs / Seeps Minimal
1.1 Segmentation Corridor Encroachment	Human Elev Floodpln 0.00 ft.	Typical Bank Slope Steep	4.2 Adjacent Wetlands Abundant
1.2 Alluvial Fan None	2.6 Width/Depth Ratio 14.54	Bank Texture Left Right	4.3 Flow Status Moderate
1.3 Corridor Encroachments	2.7 Entrenchment Ratio 9.45	Upper	4.4 # of Debris Jams 1
Length (ft) One Both	2.8 Incision Ratio 1.16	Material Type Sand Sand	4.5 Flow Regulation Type None
Berms 0 0	Human Elevated Inc Rat 0.00	Consistency Non-cohesive Non-cohesive	Flow Regulation Use
height 0 0	2.9 Sinuosity Moderate	Lower	Impoundments
Roads 2,089 0	2.10 Riffles Type Complete	Material Type Silt Silt	Impoundmt. Location
height 0 0	2.11 Riffle/Step Spacing (ft) 220	Consistency Cohesive Cohesive	1
Railroads 0 0	2.12 Substrate Composition	Bank Erosion Left Right	(old) Upstrm Flow Reg
height 0 0	Bedrock 0%	Erosion Length (ft) 834 605	4.7 StormwaterInputs
Improved Paths 0 0	Boulder 0%	Erosion Height (ft) 6.84 3.62	Field Ditch 0 Road Ditch 2
height 0 0	Cobble 0%	Revetmt. Type Rip-Rap Rip-Rap	Other 0 Tile Drain 0
Development 0 25	Coarse Gravel 30%	Revetmt. Length (ft) 128 92	Overland Flow 0 Urb Strm Wtr Pipe 0
1.4 Adjacent Side Left Right	Fine Gravel 35%	Near Bank Veg. Type Left Right	4.9 # of Beaver Dams 0
Hillside Slope Hilly Very Steep	Sand 29%	Dominant Herbaceous Shrubs/Saplin	Affected Length (ft) 0
Continuous w/ Never Sometimes	Silt and smaller 6%	Sub-dominant Shrubs/Saplin Herbaceous	Step 5. Channel Bed and Planform Changes
W/in 1 Bankfill Sometimes Sometimes		Bank CanopyLeftRightCanopy %1-251-25	5.1 Bar Types
Texture Not Evalua Not Evalua	Silt/Clay Present? Yes	Mid-Channel Canopy Open	Mid Point Side
1.5 Valley Features	Detritus 10 %	3.2 Riparian Buffer	1 14 5
Valley Width (ft) 210	# Large Woody 6	Buffer Width Left Right	Diagonal Delta Island
Width Determination Estimated	2.13 Average Largest Particle on	Dominant 26-50 >100	0 0 0
Confinement Type Broad	Bed 1.0 inches	Sub-dominant 0-25 None	5.2 Other Features \ Braiding
Rock Gorge? No	Bar 1.5 inches	W less than 25 1,147 26	Flood Neck Cutoff Avulsion 0
Human-caused Change? yes		Buffer Veg. Type Left Right	<u>5</u> <u>1</u> <u>2</u>
Step 2. Stream Channel	2.14 Stream Type Stream Type: C	Dominant Herbaceous Shrubs/Saplin	5.3 Steep Riffles and Head Cuts
2.1 Bankfull Width 33		Sub-dominant Shrubs/Saplin Mixed Trees	Steep Riffles Head Cuts Trib Rejuv.
2.2 Max Depth (ft) 4.25	Bed Material: Gravel Subclass Slope: None	3.3 Riparian Corridor	0 0 Yes
2.3 Mean Depth (ft) 2.27	Bed Form: Riffle-Pool	Corridor Land Left Right	5.4 Stream Ford or Animal No
2.4 Floodprone Width (ft) 312	Field Measured Slope:	Dominant Residential Forest	5.5 Straightening Straightening
Notes:	2.15 Reference Stream Type	Sub-dominant Shrubs/Saplin Shrubs/Saplin	Straightening Length: 1,323
Some road encroachment is present on this	(if different from Phase 1)	Mass Failures 83 0	5.5 Dredging None
reach which has resulted in some locations		Height 10 0	
having <25' buffer. Significant erosion on	3.3 old Amount Mean Height	Gullies 0 0	Note: Step 1.6 - Grade Controls
outside of meander bends.	Failures None 0.00	Height 0 0	and Step 4.8 - Channel Constrictions are on The second page of this
The floodprone width at the cross section was		-	report - with Steps 6 through 7.

Project: Kingsbury Stream: Peki	r Branch in Brook	Re	Phase ach # T3.05	2 Segment S	, ann an y	ge 1 of 2 gment: A	September 22, 2 Completion Date	008 SGAT Version: 4.56 : July 6, 2007
	ds of the Winoosk		rvers: MN, AS	. DS		Not assessed:		Rain: Yes
Segment Length (ft):	1,481		•		,		tersection of Jack	
QC Status - Staff: Prov	•	•	p 2. (Contued)		3. Riparian Featu	1		w & Flow Modifiers
Step 1. Valley and		2.5 Aband. Floodpln		3.1 Stream Bank			4.1 Springs / Seeps	
1.1 Segmentation Banks		Human Elev Floodp	-	Typical Bank SI			4.2 Adjacent Wetlar	
1.2 Alluvial Fan No		2.6 Width/Depth Rat		Bank Texture	Left	Right	4.3 Flow Status	Moderate
1.3 Corridor Encroachmen		2.7 Entrenchment R		Upper			4.4 # of Debris Jam	s 0
Length (ft)	One Both	2.8 Incision Ratio	1.00	Material Type	Sand	Sand	4.5 Flow Regulation	n Type None
Berms	$\frac{0}{0}$ $\frac{0}{0}$	Human Elevated Inc	Rat 0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regulation L	Jse
height	0 0	2.9 Sinuosity	Moderate	Lower			Impoundments	
Roads	0 0	2.10 Riffles Type	Complete	Material Type	Sand	Sand	Impoundmt. Locat	ion
height	0 0	2.11 Riffle/Step Spa	cing (ft) 250	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down strm f	low reg None
Railroads	0 0	2.12 Substrate Com	- · ·	Bank Erosion	Left	Right	(old) Upstrm Flow	Reg
height	0 0	Bedrock	0%	Erosion Length		298	4.7 StormwaterInput	5
Improved Paths	0 0	Boulder	0%	Erosion Height	(ft) 5.25	4.70	Field Ditch 0	Road Ditch 0
height	0 0	Cobble	0%	Revetmt. Type	Rip-Rap	None	Other 0	Tile Drain 0
Development	0 0	Coarse Gravel	43%	Revetmt. Lengt	h (ft) 159	0	Overland Flow 0	Urb Strm Wtr Pipe 0
1.4 Adjacent Side	Left Right	Fine Gravel	37%	Near Bank Veg.	Type Left	Right	4.9 # of Beaver Da	ums 0
Hillside Slope Very S	Steep Steep	Sand	20%	Dominant	Herbaceous	Herbaceous	Affected Length	
Continuous w/	Never Never	Silt and smaller	0%				-	ed and Planform Changes
W/in 1 Bankfill Some	times Sometimes		• 70	Bank Canopy	Left	Right	5.1 Bar Types	<u></u>
Texture Not E	Evalua Not Evalua	Silt/Clay Present?	No	Canopy %	1-25	1-25		oint Side
1.5 Valley Features		Detritus	10 %	Mid-Channel Ca		Open		$\frac{1}{5}$ $\frac{1}{2}$
	550	# Large Woody	31	3.2 Riparian Buff		D : 1.4	_	elta Island
	Estimated	2.13 Average Large	st Particle on	Buffer Width	Left	Right		0 0
Confinement Type	Very Broad	Bed 5.0	inches	Dominant	51-100	>100	5.2 Other Features	
	No	Bar 2.5	inches	Sub-dominant	None	None		Avulsion B raiding
Human-caused Change?				W less than 25	0	0 Diabt	Flood Neck Cutoff	$\frac{\text{Avulsion}}{0}$
Step 2. Stream Cha		2.14 Stream Type		Buffer Veg. Typ Dominant		Right Herbaceous	5.3 Steep Riffles ar	d Head Cuts
2.1 Bankfull Width	47	Stream Type:	С		Herbaceous			ad Cuts Trib Rejuv.
2.2 Max Depth (ft)	3.30	Bed Material:		Sub-dominant	•	Shrubs/Sapin		No
2.3 Mean Depth (ft)	1.83	Subclass Slope:		3.3 Riparian Cor Corridor Land		Diaht	5.4 Stream Ford or	
2.4 Floodprone Width (ft)			Riffle-Pool		Left Bosture	Right Shruha/Sanlin	5.5 Straightening	Straightening
Notes:		Field Measured Slo		Dominant		Shrubs/Saplin	Straightening Lo	
Reach was segmented du	le to changes in	2.15 Reference Stre		Sub-dominant Mass Failures	Shrubs/Saplin	None 0	5.5 Dredging	None
buffer. On the orthophoto,	-	(if different from	Phase 1)		0	-		
no buffer on either bank.				Height	0	0	Note: Step 1.6 - Gr	ade Controls
regeneration of speckled	alders. This used to	<u>3.3 old</u> <u>Amount</u>	Mean Height	Gullies	0	-	and Step 4.8 - Char	
be a dairy farm, but cows	are no longer	Failures None	0.00	Height	0	0	are on The second	
grazing along buffer.		Gullies None	0.00				report - with Steps	o through 7.

Stream: Organization:		ook the Winoosk		Obse	each # ervers:	T3.05 MN, AS	•	Sey Why	ige 1 of 2 gment: B Not assessed:	Completion	Date:	SGAT Version: July 6, 2007 Rain: Yes	•
Segment Length	()	2,920		•			nt begins wher	e vegetation cr	nanges approx	•	•		
QC Status - Staff			Passed		ep 2. (Col	<u> </u>	Step	3. Riparian Feat	ures			low Modifiers	
Step 1. Valle				nd. Floodplr		3.20 ft.	3.1 Stream Banl			4.1 Springs / S	•	Minimal	
1.1 Segmentation		Buffers		Elev Floodp		0.00 ft.		lope Moderate	5.14	4.2 Adjacent V		Minimal	
1.2 Alluvial Fan	None			h/Depth Ra		27.53	Bank Texture	Left	Right	4.3 Flow Statu		Moderate	•
1.3 Corridor Encroa	chments			enchment R	Ratio	3.37	Upper Material Turne	Cond	Crowal	4.4 # of Debris		2	
Length (ft)	One	Both		ion Ratio	_	1.00	Material Type	Sand	Gravel	4.5 Flow Regu		None	
Berms	0	0		Elevated Ind		0.00	Consistency	Non-cohesive	Non-cohesive	0			
height	0	0	2.9 Sinu	•		derate	Lower	Cond	Const	Impoundmer			
Roads	0	87	2.10 Riff	les Type	Comp	plete	Material Type	Sand	Sand	Impoundmt.			
height	0	0		ile/Step Spa		200	Consistency	Non-cohesive	Non-cohesive			g None	
Railroads	0	0	2.12 Sul	ostrate Com	nposition		Bank Erosion	$\frac{\text{Left}}{242}$	Right	(old) Upstrm	•		
height	0	0	Bedroc	k		0%	Erosion Length	. ,	560	4.7 Stormwater	Inputs		
Improved Paths	0	0	Boulde	r		0%	Erosion Height		3.83	Field Ditch	0 Roa	ad Ditch	0
height	0	0	Cobble	;		0%	Revetmt. Type	Rip-Rap	None	Other	0 Tile	e Drain	0
Development	0	0	Coarse	Gravel	;	38%	Revetmt. Lengt	. ,	0	Overland Flow	v 0 Urb	Strm Wtr Pipe	0
1.4 Adjacent Side	Left	Right	Fine G	ravel		28%	Near Bank Veg.	· ·	Right	4.9 # of Beav	er Dams	0	
Hillside Slope	Very Steep	Steep	Sand			20%	Dominant	Shrubs/Saplin	Shrubs/Saplin	Affected L		0	
Continuous w/	Never	Sometimes		d smaller		14%	Sub-dominant	Herbaceous	Herbaceous			d Planform Ch	hanges
W/in 1 Bankfill	Never	Sometimes	One and	Sindici		14 /0	Bank Canopy	Left	Right	5.1 Bar Types			langee
Texture	Not Evalua	Not Evalua	Silt/Clay	Present?	N	lo	Canopy %	26-50	1-25	Mid	<u>r</u> Point	Side	
1.5 Valley Features	;		Detritus		20	%	Mid-Channel C	anopy	Open	5	<u>12</u>	<u>10</u>	
Valley Width	-		# Large	Woody	7	71	3.2 Riparian Buf			-		-	
Width Determinat	. ,	nated	2.13 Ave	erage Large	est Partic	le on	Buffer Width	Left	Right	Diagonal	Delta	Island	
Confinement T			Bed	5.0	i	nches	Dominant	>100	>100	1	0	1	
Rock Gor		u	Bar	2.5	i	nches	Sub-dominant	None	0-25	5.2 Other Fea		Braidin	ng
Human-caused Cha	•				•		W less than 25		0	Flood Neck ($\frac{1}{0}$ 0	
	-		2.14 Str	eam Type			Buffer Veg. Typ		Right	• •		•	
Step 2. Strea		40		ream Type:	С		Dominant	Shrubs/Saplin	-	5.3 Steep Riff			
2.1 Bankfull Width		49		ed Material:			Sub-dominant	Mixed Trees	Herbaceous	Steep Riffles	Head Cut		
2.2 Max Depth (ft)		3.20	Subc	lass Slope:	None		3.3 Riparian Co	rridor		1	0	No	
2.3 Mean Depth (ft	,	1.78		Bed Form:		Pool	Corridor Land	Left	Right	5.4 Stream Fo			
2.4 Floodprone Wi	dth (ft)	165		leasured Sl			Dominant	Shrubs/Saplin	Shrubs/Saplin	5.5 Straighten	-	Straighte	-
Notes:			2.15 Re	ference Stre	eam Typ	e	Sub-dominant	Forest	Forest	-	ning Length:		
			(if di	fferent from	Phase 1)	Mass Failures	0	81	5.5 Dredging			None
							Height	0	80				
			3.3 old	Amount	Mean	Height	Gullies	0	0	Note: Step 1.0			
			Failures	None	wedi	0.00	Height	0	0	and Step 4.8 - are on The se			
			Gullies	None		0.00	č	-	-	report - with S			
			Guilles	None		0.00							

Project: Kingsbu Stream: Pe	ry Brano kin Broo			Re	each #	Phase	2 Segment S		ge 1 of 2 gment: A	September Completion	22, 2008 SG	AT Version: AT	
	-	he Winoosk	i River			MN, PD,	AS		Not assessed:	Completion		Rain: Yes	
Segment Length (ft):		2,826				• •	nt begins just d			f Sinaleton Rd	and Pekin		
QC Status - Staff: Pr	ovisional		Passed	•	p 2. (Co	-			1		. Flow & Flov		
Step 1. Valley a				nd. Floodpln		5.90 ft.	3.1 Stream Bank	3. Riparian Feat	ures	4.1 Springs / S		None	
1.1 Segmentation Bank				Elev Floodp		0.00 ft.	Typical Bank Sl			4.2 Adjacent V		Minimal	
-	lone			th/Depth Rat		20.37	Bank Texture	Left	Right	4.3 Flow Statu		Moderate	
1.3 Corridor Encroachm				enchment R		3.68	Upper			4.4 # of Debris	Jams	0	
Length (ft)	One	Both		sion Ratio		1.84	Material Type	Sand	Gravel	4.5 Flow Regu	lation Type	None	
Berms	0	0	Human	Elevated Inc	Rat	0.00	Consistency	Non-cohesive	Non-cohesive	Flow Regula	tion Use		
height	0	0	2.9 Sinu	iosity	Мо	oderate	Lower			Impoundmer	nts		
Roads	2,319	55	2.10 Rif	fles Type	Com	plete	Material Type	Sand	Sand	Impoundmt.	Location		
height	_,0	0	2.11 Rif	fle/Step Spa	cing (ft)	150	Consistency	Non-cohesive	Non-cohesive	4.6 Up/Down s	strm flow reg	None	
Railroads	0	0		bstrate Com			Bank Erosion	Left	Right	(old) Upstrm	Flow Reg		
height	0	0	Bedroo	k	-	0%	Erosion Length		385	4.7 Stormwater	Inputs		
Improved Paths	0	0	Boulde	er		0%	Erosion Height	(ft) 4.18	4.24	Field Ditch	1 Road	Ditch	1
height	0	0	Cobble	9		0%	Revetmt. Type	Rip-Rap	Rip-Rap	Other	0 Tile D	rain	0
Development	0	37		Gravel		50%	Revetmt. Lengt	h (ft) 213	131	Overland Flov	, 0 Urb St	trm Wtr Pipe	0
1.4 Adjacent Side	Left	Right	Fine G			18%	Near Bank Veg.		Right	4.9 # of Beav	er Dams	2	
Hillside Slope Ver	y Steep	Steep	Sand	lavoi		32%	Dominant	Shrubs/Saplin	Shrubs/Saplin	Affected L		1,050	
Continuous w/Son	netimes	Never		d smaller		0%	Sub-dominant	Herbaceous	Herbaceous	Step 5. Chan	•		ande
W/in 1 Bankfill Son	netimes	Never				• /0	Bank Canopy	Left	Right	5.1 Bar Types			lange
Texture No	t Evalua	Not Evalua	Silt/Clay	Present?	Y	es	Canopy %	1-25	1-25	Mid	Point	Side	
1.5 Valley Features			Detritus		1	%	Mid-Channel Ca		Open	1	12	4	
Valley Width (ft)	307		# Large	Woody		15	3.2 Riparian Buf				Delta	- Island	
Width Determination	Estima	ated	2.13 Av	erage Large	st Partic	cle on	Buffer Width	Left	Right	Diagonal 0	<u>Dena</u> 0	<u>1518110</u> 0	
Confinement Type	Broad		Bed	2.6		inches	Dominant	51-100	>100	•	-	-	~
Rock Gorge?	No		Bar	2.6		inches	Sub-dominant	26-50	0-25	5.2 Other Feat		on Braiding	<u>9</u>
Human-caused Change							W less than 25	0	612 Dight	Flood Neck C	Cutoff Avulsi		
Step 2. Stream C			2.14 Str	eam Type			Buffer Veg. Typ		<u>Right</u>	5.3 Steep Riffl	beal bac a	Cute	
2.1 Bankfull Width		44	St	ream Type:	С		Dominant	Shrubs/Saplin	-	Steep Riffles	Head Cuts	Trib Reju	N7
2.2 Max Depth (ft)		.20		ed Material:		I	Sub-dominant		Herbaceous	0	0	<u>No</u>	
2.3 Mean Depth (ft)		.16	Subc	lass Slope:			3.3 Riparian Cor		Diaht	5.4 Stream Fo	-	No	
2.4 Floodprone Width (62		Bed Form:		Pool	Corridor Land	Left Decidential	Right Results (Combined	5.5 Straighten		Straighte	
Notes:	•••	<u>~-</u>		leasured Slo			Dominant		Shrubs/Saplin		ing Length:	1,33	-
	loodelaie			ference Stre		_	Sub-dominant	Shrubs/Saplin	Residential	5.5 Dredging	5 - 5		None
Reach is building new f	iooupiain.		(if di	fferent from	Phase '	1)	Mass Failures	0	0	0.0			
							Height	0	0	Note: Step 1.6	6 - Grade Con	trols	
			3.3 old	Amount	Mear	n Height	Gullies	0	0	and Step 4.8 -	Channel Con	strictions	
			Failures	None		0.00	Height	0	0	are on The sec			
			Gullies	None		0.00				report - with S	teps 6 throug	h 7.	

Project: King Stream:	gsbury Br Pekin B			Re	Phase each # T3.06	2 Segment S	- ann an y	age 1 of 2 gment: B	Septembe Completion	r 22, 2008 SG Date: Ju	AT Version: Ily 19, 2007	
Organization:	Friends of	of the Winoosk	i River	Obse	rvers: PD, CM	l, AS	Why	Not assessed:			Rain: Yes	;
Segment Length	(ft):	661	Se	gment Loc	ation: Segme	nt begins where	e tributary ente	ers on right ba	nk and contin	ues about 2	00 feet	
QC Status - Stat	ff: Provisio	onal Cons	Passed	Ste	p 2. (Contued)	Step	3. Riparian Feat	ures	Step 4	I. Flow & Flov	w Modifiers	
Step 1. Vall	ley and Fl	oodplain	2.5 Abar	nd. Floodpln	7.40 ft.	3.1 Stream Bank			4.1 Springs / S		Minimal	
1.1 Segmentation	Banks and	Buffers	Human	Elev Floodp	oln 0.00 ft.	Typical Bank S			4.2 Adjacent V	Vetlands	None	
1.2 Alluvial Fan	None		2.6 Widt	h/Depth Rat	tio 14.88	Bank Texture	Left	Right	4.3 Flow Statu	IS	Moderate	;
1.3 Corridor Encro	achments		2.7 Entre	enchment R	atio 9.33	Upper			4.4 # of Debris		0	
Length (ft	:) Or	e Both	2.8 Incis	ion Ratio	1.95	Material Type	Sand	Sand	4.5 Flow Regu	lation Type	None	
Berms	s <u>25</u>	i3 139	Human I	Elevated Inc	c Rat 0.00	Consistency	Non-cohesive	Non-cohesive	0			
heigh	t	0 0	2.9 Sinu	osity	Low	Lower			Impoundme			
Roads		62 0	2.10 Riff	les Type	Not Applicable	Material Type	Gravel	Gravel	Impoundmt.			
heigh	ıt	0 0	2.11 Riff	le/Step Spa	icing (ft) 0	Consistency	Non-cohesive	Non-cohesive		-	None	
Railroads	S	0 0	2.12 Sub	ostrate Com	position	Bank Erosion	Left	Right	(old) Upstrm	Flow Reg		
heigh	ıt	0 0	Bedroc	k	0%	Erosion Length		70	4.7 Stormwater	Inputs		
Improved Paths	S	0 0	Boulde	r	1%	Erosion Height		4.48	Field Ditch	0 Road	Ditch	1
heigh	ıt	0 0	Cobble		36%	Revetmt. Type	Rip-Rap	Rip-Rap	Other	0 Tile D	Irain	0
Developmen	it 10	8 217	Coarse	Gravel	40%	Revetmt. Lengt	h (ft) 307	484	Overland Flov	w 0 Urb S	trm Wtr Pipe) (
1.4 Adjacent Side	Le	eft Right	Fine G	ravel	9%	Near Bank Veg.	··	Right	4.9 # of Beav	er Dams	0	
Hillside Slope	e Hil	ly Hilly	Sand		14%	Dominant	Shrubs/Saplin	Shrubs/Saplin	Affected L		0	
Continuous w	/ Nev	er Never		l smaller	0%	Sub-dominant	Herbaceous	Herbaceous	Step 5. Chan		Planform Cl	hanges
W/in 1 Bankfi	ll Nev	er Never			0 78	Bank Canopy	Left	Right	5.1 Bar Types			<u></u> jet
Texture	e Not Evalu	ua Not Evalua	Silt/Clay	Present?	No	Canopy %	1-25	1-25	Mid	Point	Side	
1.5 Valley Feature	S		Detritus		3 %	Mid-Channel C	••	Open	0	1	1	
Valley Widt			# Large	Woody	2	3.2 Riparian Buf			Diagonal	Delta	Island	
Width Determina		imated	2.13 Ave	erage Large	st Particle on	Buffer Width	Left	Right	<u>Diagonai</u> 1	<u>Dena</u> 1	<u>1518110</u> 0	
Confinement 7		y Broad	Bed	10.0	inches	Dominant	0-25	0-25	-	-	•	
Rock Go		<i>j</i> <u></u>	Bar	4.0	inches	Sub-dominant	51-100	51-100	5.2 Other Fea		Braidin	ig
Human-caused Ch	-	26				W less than 25	-	471	Flood Neck		<u>on</u> \ 0	
Step 2. Stre	-		2.14 Str	eam Type		Buffer Veg. Typ		<u>Right</u>	5.3 Steep Riff	•	Cute	
2.1 Bankfull Width		32	Str	eam Type:	С	Dominant	Herbaceous	Herbaceous	Steep Riffles		Trib Rej	1.1.7
2.2 Max Depth (ft)		3.80	Be	d Material:	Gravel		Shrubs/Saplin	Shrubs/Sapiin				
2.3 Mean Depth (i		2.15		ass Slope:		3.3 Riparian Cor		5.14	0 5.4 Stream Fo	0 ord or Animal	No	
2.4 Floodprone W		299	1		Plane Bed	Corridor Land	Left	Right	5.5 Straighter		Straight	
		299		easured Slo		Dominant	Residential	Residential	•	ing Length:	66	-
Notes:				ference Stre	<u>, , , , , , , , , , , , , , , , , , , </u>	Sub-dominant	Hay	Forest	5.5 Dredging			None
Segment has been		•	(if dit	ferent from	Phase 1)	Mass Failures	0	0	ele Broaging			
bermed to protect appears stable and		•				Height	0	0	Note: Step 1.	6 - Grade Con	trols	
sides of stream. La			3.3 old	Amount	Mean Height	Gullies	0	-	and Step 4.8 -			
mows close to stre			Failures	None	0.00	Height	0	0	are on The se	cond page of	this	
on both sides, but	not many.		Gullies	None	0.00				report - with S	Steps 6 throug	h 7.	

Project: Stream: Organizatio	Kingsbury Bran Kingsbury on: Friends of t	y Branch	oski River	Reach # Observers:	Phase 2 Read M01 MN, Frank	ch Summary	page 2 of 2 Segment: 0		Completic	on Date: Rain:	October 24, 2008 August 10, 2007 Yes
Segment L	ength (ft):	1,336	Segme	ent Location:	Segment beg	ins at conflue	ence of Kingsbury E	Branch a	and Winoos	ski River	, just
1.6 Gra	de Controls None						Step 7. Rapio	d Geomo	rphic Assess	ment Dat	a
Туре	Location	Total	Total Heigh	t Photo Ta	^{k∉™} GPSTaken		Confinement Type	Uncon	fined		
туре	Location	TOtal	Above Wate	er	GFSTAKEIT				Score	STD	Historic
						7.1 Channe	el Degradation		7	None	Yes
						7.2 Channe	el Aggradation		5	Other	Νο
						7.3 Widenir	ng Channel		12		No
						7.4 Change	e in Planform		13		Νο
							Tota	al Score	37		
							Geomorphic	Rating	0.4625		
							Channel Evolutior	n Model	F		
							Channel Evolution		III		
							Geomorphic Co	•	Fair		
							Stream Ser	nsitivity	Extreme		
							Step 6. Rapid Habi	itat Asses	ssment Data		
4.8 Cha	nnel Constrictions						Stream Gradient Ty	pe I	Low		
	Photo	GPS	Channel	Floodprone						Score	
Туре	Width Taken?			Constriction?		6.1 Epifaunal	Substrate - Available	Cover		6	
Bridge	25.6 Yes	Yes	Yes	Yes			6.2 Pool Sub	ostrate		6	
	roblem Depositio			100			6.3 Pool Var	iability		3	
							6.4 Sediment Dep			8	
							6.5 Channel Flow			15	
							6.6 Channel Alte			9	
							6.7 Channel Sir	5		7	
							6.8 Bank S	5		B Right:	
							Bank Vegetation Prot			B Right:	
						6.10 Ripa	rian Vegetation Zone			P Right:	8
								l Score		100	
							Habitat	Rating		0.5	
Narrative	e:						Habitat Stream	Conditior	1	Fair	

Major historical degradation, extreme aggradation (upstream reaches contributing sediment), minor widening & planform adjustment.

Project: Stream: Organizatic	-	nch ry Branch ⁻ the Winoo	ski River (Reach # Observers:		h Summary	page 2 of 2 Segment: 0	Completio	n Date: Rain:	October 24, 2008 August 9, 2007 Yes
Segment L	,	4,436	Segment	t Location:	Segment beg	ins approximate	ely 1200 feet upstream	of the bridg	e at Ca	te Farm Road.
1.6 Gra	de Controls None	9					Step 7. Rapid Geom	orphic Assess	ment Dat	ta
Туре	Location	Total	Total Height Above Water	Photo Ta	^{ke –} GPSTaken	Col	nfinement Type Uncor	nfined Score	STD	Historic
						7.1 Channel D 7.2 Channel A 7.3 Widening (7.4 Change in	ggradation Channel Planform	8 9 10 9	None None	Yes No No No
							Total Score Geomorphic Rating Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity	III Fair		
4.8 Char	nnel Constrictions Photo		Channel Fl	oodprone		-	Step 6. Rapid Habitat Asse ream Gradient Type	Low	Score	
Туре	Width Taken?			onstriction?		6.1 Epifaunal Su	bstrate - Available Cover 6.2 Pool Substrate 6.3 Pool Variability		12 13 13	
							6.4 Sediment Deposition6.5 Channel Flow Status6.6 Channel Alteration		16 17 15	
							6.7 Channel Sinuosity 6.8 Bank Stability		11 Right	
							nk Vegetation Protection n Vegetation Zone Width	Left: 9	Right Right	
							Total Score Habitat Rating		144).72	
Narrative		valated to N	Montrolior Dond	codimont	stanuad) major		Habitat Stream Conditio		Good	latoral bank

Major historic deg. (likely related to N. Montpelier Pond - sediment starved), major aggradation, widening and planform adjustment. Fair amount of lateral bank erosion. An avulsion and neck cutoff mapped within this reach.

Project: Stream: Organizatic Segment L		Branch		Reach # Observers: It Location:	MN, AS	-	page 2 of 2 Segment: 0 Montpelier Pond, at hydro	Completion Date: Rain: electric project	•
1.6 Gra	de Controls						Step 7. Rapid Geomo	rphic Assessment Da	ta
Туре	Location	Total	Total Height Above Water		^{lk∉™} GPSTaken		Confinement Type		
Ledge	Mid-segment	0.00	0.00	Yes					
Ledge	Mid-segment	0.00	0.00	Yes					
Dam	Mid-segment	15.00	15.00	Yes					
							Channel Evolution Model		
							Channel Evolution Stage		
							Geomorphic Condition	Fair	
							Stream Sensitivity	Extreme	
							Step 6. Rapid Habitat Asses	ssment Data	
4.8 Char	nnel Constrictions						Stream Gradient Type		
Type Bridge	Photo	Taken? Co Yes		loodprone onstriction? Yes					
Narrative	2:						Habitat Stream Conditior	1	

Project:	Kingsbury Bran	ch			Phase 2 Reach Su	mmary page 2	2 of 2		October 24, 2008
Stream:	Kingsbury			Reach #	M05	Segme	ent: 0	Completion Date:	August 17, 2007
Organizatio		the Winoosk	ci River	Observers:	Mary, Laura, Clay			Rain:	No
Segment L	ength (ft):	8,888	Segmen	t Location:	Immediately abov	e North Montpelier F	Pond		
1.6 Gra	de Controls None					Step	7. Rapid Geomo	orphic Assessment Da	ta
Туре	Location	Total	Total Height Above Water	Photo Ta	^{ke -} GPSTaken	Confinement	Туре		
						Channel E	volution Model volution Stage rphic Condition	Good	
							eam Sensitivity Did Habitat Asse	High	
								SSMENI Dala	
4.8 Chai	nnel Constrictions					Stream Grad	ient Type		
Type Bridge P	Photo Width Taken? 53.0 Yes roblem Scour Abo	Taken? Co Yes	No	oodprone onstriction? Yes					
Narrative	2:					Habitat S	Stream Condition	ı	

roject: tream:)rganizatic	Kingsbury Bran Kingsbury		ri River (Reach #	Phase 2 Reach M06 Mary, Laura, a	-	page 2 of 2 Segment: 0	Completion	Date: <i>I</i> Rain: I	October 24, 2008 August 14, 2007
-	ength (ft):	8,589			•••	-	nfluence from North Mont	pelier Pond		
•	de Controls None	-1				•	Step 7. Rapid Geomo		ent Data	
_			Total Height	Photo Ta	^{k∉™} GPSTaken		Confinement Type Uncon	•		-
Гуре	Location	Total	Above Water		GPSTaken			Score	STD	Historic
						7.1 Chann	el Degradation	16	None	Νο
						7.2 Chann	el Aggradation	12	None	Νο
						7.3 Widen	ing Channel	13		Νο
						7.4 Chang	e in Planform	6		Νο
							Total Score	47		
							Geomorphic Rating	0.5875		
							Channel Evolution Model	D		
							Channel Evolution Stage	IIc		
							Geomorphic Condition	Fair		
							Stream Sensitivity	Extreme		
							Step 6. Rapid Habitat Asse	ssment Data		
4.8 Char	nnel Constrictions						Stream Gradient Type	Low		
	Photo	GPS Ch	nannel Flo	odprone				S	core	
Туре	Width Taken?			nstriction?		6.1 Epifauna	I Substrate - Available Cover		10	
Bridge	26.0 Yes	Yes	Yes	Yes			6.2 Pool Substrate		6	
	roblem Depositio						6.3 Pool Variability		14	
Bridge	21.0 Yes	Yes	Yes	Yes			6.4 Sediment Deposition		14	
Pr	roblem Depositio	n Above,De	position Below	v,Scour			6.5 Channel Flow Status	2	20	
Bridge	25.0 Yes	No	Yes	No			6.6 Channel Alteration		11	
Pr	roblem Depositio	on Above,Sco	our Above,Sco	our			6.7 Channel Sinuosity		13	
							6.8 Bank Stability	Left: 4	Right:	5
						6.9	Bank Vegetation Protection	Left: 8	Right:	8
						6.10 Rip	arian Vegetation Zone Width	Left: 2	Right:	2
							Total Score	1	17	
							Habitat Rating	0.	585	
Na weath							Habitat Stream Condition	n	Fair	
Narrative							ng. Channel has some planeb			

Project: Stream: Organizatio	Kingsbury Bran Kingsbury on: Friends of t	y Branch	ki River O	Reach # bservers:	Phase 2 Reac M07 Mary, Laura, (-	page 2 of 2 Segment: 0		Completion	n Date: Rain:	October 24, 2008 August 14, 2007 No
Segment Le	ength (ft):	2,817	Segment	Location:	Segment begi	ins about 95	0 feet downstream	of whe	re Rt 14 enc	roache	es along the
1.6 Gra	de Controls None						Step 7. Rapio	d Geomo	rphic Assessn	nent Da	ta
Туре	Location	Total	Total Height Above Water	Photo Ta	^{k∉™} GPSTaken		Confinement Type	Uncon	f ined Score	STD	Historic
						7.2 Channe 7.3 Widenii	el Degradation el Aggradation ng Channel e in Planform		16 13 12 8	None None	No No No No
						<u>r enang</u>		al Score Rating	49 0.6125		
							Channel Evolution Channel Evolution Geomorphic Co Stream Se	n Stage ondition	D IIc Fair Extreme		
							Step 6. Rapid Hab				
4.8 Char		None					Stream Gradient Ty	pe L	.ow		
Tuno	Photo			odprone		4 1 Enifound	Substrate - Available	Cover	3	core	
Туре	Width Taken?	Taken? C	onstriction? Co	nstriction?		o. i epitautiai	6.2 Pool Sub			8 9	
							6.3 Pool Var			13	
							6.4 Sediment Dep	5		14	
							6.5 Channel Flow			16	
							6.6 Channel Alte			8	
							6.7 Channel Sir	nuosity		9	
							6.8 Bank S	tability	Left: 4	Right	:: 4
						6.9	Bank Vegetation Prot	tection	Left: 9	Right	:: 9
						6.10 Ripa	arian Vegetation Zone		Left: 9	Right	: 6
								Score		18	
							Habitat	Rating	C	.59	
Narrative	2:						Habitat Stream	Condition	1	Fair	

Steeper gradient imposed through channelization has likely led to increased stream power. Channel appears to be moving laterally with major planform adjustment evident. Overall the good vegetation (shrub-sapling) is holding the channel in place.

Stream: Kingsbury Branch Reach # M08 Segment: A Completion Date: July 31, 2007 Organization: Friends of the Winooski River Observers: Mary and David Rain: No Segment Length (ft): 3,278 Segment Location: Segment tarts about 600 feet downstream of Still Brook Road at change in landuse. 1.6 Grade Controls None Total Height Photo Take GPSTaken Step 7. Rapid Geomorphic Assessment Data Type Location Total Total Height Photo Take GPSTaken Confinement Type 4.8 Channel Constrictions Photo GPS Channel Floodprone Step 6. Rapid Habitat Assessment Data Type Width Taken? Taken? Constriction? Step 5. No Problem Deposition Above, Scour No Step 0. Rapid Habitat Assessment Data Stream Gradient Type Photo Genstriction? Step 1. Rapid Habitat Assessment Data Stream Gradient Type Photo Genstriction? Stream Gradient Type
Segment Length (ft): 3,278 Segment Location: Segment starts about 600 feet downstream of Still Brook Road at change in landuse. 1.6 Grade Controls None Total Height Above Water Total Height Above Water Photo Take GPSTaken Step 7. Rapid Geomorphic Assessment Data Type Location Total Total Height Above Water Photo Take GPSTaken Confinement Type Image: Constriction Stage Channel Evolution Model Channel Evolution Model Channel Evolution Stage Geomorphic Condition Fair Stream Sensitivity Extreme Image: Step 6. Rapid Habitat Assessment Data Stream Gradient Type Stream Gradient Type Image: Witch Photo GPS Channel Floodprone Type Witch Taken? Taken? Constriction? Bridge 29.0 Yes Yes No
Step 7. Rapid Geomorphic Assessment Data Type Location Total Height Above Water Photo Take GPSTaken Channel Evolution Model Channel Evolution Model Channel Evolution Stage Geomorphic Assessment Data Geomorphic Assessment Data Channel Evolution Model Channel Evolution Stage Geomorphic Assessment Data Geomorphic Assessment Data Step 7. Rapid Geomorphic Assessment Data Step 7. Rapid Geomorphic Assessment Data Confinement Type Channel Evolution Model Channel Evolution Stage Geomorphic Constrictions Stream Sensitivity Yppe Photo GPS Vidth Taken? Floodprone Type Width Taken? Bridge 29.0 Yes Yes No Yes No
Type Location Total Total Height Above Water Photo Take GPSTaken Confinement Type Channel Evolution Model Channel Evolution Stage Geomorphic Condition Channel Evolution Stage Geomorphic Condition Fair Stream Sensitivity 4.8 Channel Constrictions Type Photo GPS Channel Floodprone Constriction? Type Width Taken? Taken? Constriction? Bridge 29.0 Yes Yes No
And the first state Channel Evolution Model Channel Evolution Stage Geomorphic Condition Figure 1 Photo GPS Channel Floodprone Type Width Taken? Taken? Channel Floodprone Stream Gradient Type
A.8 Channel ConstrictionsFloodprone Constriction?Step 6. Rapid Habitat Assessment Data Stream Gradient TypeVidthPhoto Taken?GPS Taken?Channel Constriction?Floodprone Constriction?Bridge29.0YesYesYesNo
A.8 Channel ConstrictionsFloodprone Constriction?Stream Gradient TypeVidthPhoto Taken?GPS Taken?Channel Constriction?Floodprone Constriction?Bridge29.0YesYesYesNo
A.8 Channel ConstrictionsFloodprone Constriction?Stream Gradient TypeVidthPhoto Taken?GPS Taken?Channel Constriction?Floodprone Constriction?Bridge29.0YesYesYesNo
ABCHARTING CONSTRUCTIONS Floodprone Type Width Photo Taken? GPS Taken? Channel Constriction? Floodprone Constriction? Bridge 29.0 Yes Yes Yes
Stream Sensitivity ExtremeStream Sensitivity ExtremeStream Sensitivity Extreme4.8 Channel ConstrictionsFloodproneTypePhotoGPSChannelFloodproneTypeWidthPaken?Taken?Constriction?Bridge29.0YesYesYesNo
Step 6. Rapid Habitat Assessment DataStep 6. Rapid Habitat Assessment Data4.8 Channel ConstrictionsFloodproneTypeWidthGPSChannelFloodproneTypeWidthTaken?Taken?Constriction?Bridge29.0YesYesYesNo
A.8 Channel Constrictions Photo GPS Channel Floodprone Type Width Taken? Taken? Constriction? Constriction? Bridge 29.0 Yes Yes No
Photo GPS Channel Floodprone Type Width Taken? Taken? Constriction? Bridge 29.0 Yes Yes No
PhotoGPSChannelFloodproneTypeWidthTaken?Taken?Constriction?Bridge29.0YesYesYesNo
TypeWidthTaken?Taken?Constriction?Bridge29.0YesYesNo
Bridge 29.0 Yes Yes No
Habitat Stream Condition
Narrative:

Project:	Kingsbury Brar	nch			Phase 2 Reach Summa	ry page 2 of 2	October 24, 2008
Stream:	Kingsbur	y Branch		Reach #	M08	Segment: B	Completion Date: July 31, 2007
Organizatio	on: Friends of	the Winoos			Mary and David		Rain: No
Segment L	ength (ft):	6,321	Segme	nt Location:	Segment starts at top of	of reach and ends approximat	ely 600 feet below Still Brook Road
1.6 Gra	de Controls None					Step 7. Rapid Geomo	rphic Assessment Data
Туре	Location	Total	Total Height Above Wate	^t Photo Ta r	ke GPSTaken	Confinement Type	
Type Bridge	nnel Constrictions Photo Width Taken? 16.0 Yes roblem Scour Ab	Taken? C Yes	onstriction? (Yes	Floodprone Constriction? Yes		Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity <u>Step 6. Rapid Habitat Asses</u> Stream Gradient Type	Fair Extreme ssment Data
						Habitat Stream Conditior	
Narrativo	2:				I		•

Project: Stream: Organizatior		y Branch the Winoosl			MN, Dave		page 2 of 2 Segment: 0			Rain: Y	
Segment Le	5 ()	2,682	Segment	Location:	Segment beg	ins where cha	nnel becomes ver		-		
1.6 Grad	le Controls None		Tatal Usiaht				Step 7. Rapi		•	nent Data	-
Туре	Location	Total	Total Height Above Water	Photo Ta	ke GPSTaken	Ĺ	Confinement Type	Uncon	Score	STD	Historic
			7.1 Channel 7.2 Channel 7.3 Widening			8 12 13	None None	Yes No No			
						7.4 Change	in Planform		9		No
					Tota Geomorphic	al Score c Rating	42 0.525				
							Channel Evolutio Channel Evolutio Geomorphic Co Stream Se	n Stage ondition	F III Fair Extreme		
							Step 6. Rapid Hab		ssment Data		
4.8 Chani	nel Constrictions						Stream Gradient Ty	pe I	_ow		
	Photo	GPS C	hannel Flo	odprone						Score	
Туре	Width Taken?	Taken? C	onstriction? Co	onstriction?		6.1 Epifaunal S	Substrate - Available			10	
Bridge	26.0 Yes	Yes	Yes	Yes			6.2 Pool Su			10	
Pro	oblem Depositio	on Above,Sc	our Above,Sco	bur			6.3 Pool Var	5		9	
							6.4 Sediment Dep 6.5 Channel Flow			9 14	
							6.6 Channel Alt			14	
				6.7 Channel Si			3				
				6.8 Bank S	5	Left [,] 6	Right:	7			
			6.9 E	Bank Vegetation Pro	5	Left: 7	-				
					ian Vegetation Zone			Right:			
								I Score		108	
						Habitat	Rating	C	0.54		
Narrative:		minor widoni	na haarodotion	and major	planform adjus	tmont Some or	Habitat Stream eas stream is becom			Fair	ilding small

Major historic degradation, minor widening, aggradation and major planform adjustment. Some areas stream is becoming more sinuous. Stream is building small bankfull benches on both sides.

Project: Stream: Organizatio	Kingsbury Bran Kingsbury on: Friends of t	/ Branch	ski River	Reach # Observers:	Phase 2 Reac M10 MN, Dave S.	h Summary	page 2 of 2 Segment: 0	Complet	on Date: : Rain: :	October 24, 2008 July 27, 2007 No
Segment Le	,	2,452	Segmen	t Location:	Segment beg	ins where stre	am begins to become	more sinuou	along R	t 14 and
1.6 Gra	de Controls None						Step 7. Rapid Geo	morphic Asses	sment Dat	a
Туре	Location	Total	Total Height Above Water	Photo Ta	^{k∉™} GPSTaken	C	onfinement Type Une	confined Score	STD	Historic
						7.1 Channel 7.2 Channel 7.3 Widening 7.4 Change i	Aggradation Channel	8 10 10 8	None None	Yes No No No
							Total Sco Geomorphic Rati Channel Evolution Moo Channel Evolution Sta	ng 0.45 Iel F		
							Geomorphic Conditi Stream Sensitiv Step 6. Rapid Habitat A	on Fair ity Extreme		
4.0.Ch		N					Stream Gradient Type	High	<u></u>	
4.8 Char	nnel Constrictions Photo	None GPS (Channel E	laadaraaa				ingii	Score	
Туре	Width Taken?			loodprone onstriction?		6.1 Epifaunal S	Substrate - Available Cove		11	
						6	6.2 Embeddednes .3 Velocity/Depth Patterr		8 13	
						0	6.4 Sediment Deposition		13	
							6.5 Channel Flow Statu		15	
							6.6 Channel Alteratio	n	11	
						6.7	Frequency of Riffles/Step	S	13	
							6.8 Bank Stabili	y Left:	4 Right:	5
						6.9 B	ank Vegetation Protectio		9 Right:	
						6.10 Ripari	an Vegetation Zone Wid		9 Right:	7
							Total Scor Habitat Ratin		127 0.635	
Narrative	2:						Habitat Stream Cond	tion	Fair	

Major historic degradation; Major widening with evidence stream is trying to create bankfull bench; Major aggredation (upper portion of reach very soft underfoot). Bank erosion on all outside bends (major planform adjustment).

Project:Kingsbury BranchPhase 2 RoStream:Kingsbury BranchReach #M11Organization:Friends of the Winooski RiverObservers:MN, AS	each Summarypage 2 of 2October 24, 2008Segment: ACompletion Date: July 24, 2007Rain: Yes
Segment Length (ft): 3,199 Segment Location: Segment L	begins where stream begins to go away from Rt 14 through pasture and
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Total Height Photo Take GPSTaker	Confinement Type Unconfined Score STD Historic
	7.1 Channel Degradation18NoneNo7.2 Channel Aggradation7NoneNo7.3 Widening Channel13No7.4 Change in Planform5No
	Total Score43Geomorphic Rating0.5375
	Channel Evolution Model D Channel Evolution Stage IId Geomorphic Condition Fair Stream Sensitivity Very High
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type High
Photo GPS Channel Floodprone Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover14
Bridge 44.0 Yes Yes No Yes Problem Deposition Above,Deposition Below,Scour	6.2 Embeddedness86.3 Velocity/Depth Patterns15
Problem Deposition Above, Deposition Delow, 3000	6.4 Sediment Deposition 14
	6.5 Channel Flow Status146.6 Channel Alteration11
	6.7 Frequency of Riffles/Steps 16 6.8 Bank Stability Left: 7 Right: 7
	6.9 Bank Vegetation Protection Left: 8 Right: 8
	6.10 Riparian Vegetation Zone Width Left: 1 Right: 0 Total Score 123
	Habitat Rating 0.615
Narrative:	Habitat Stream Condition Fair e islands. Channel have become overloaded with sediment from incison that occurred

Good floodplain access, extreme planform adjustment. Braided channel, multiple islands. Channel have become overloaded with sediment from incison that occurred upstream in M11-B.

Stream:Kingsbury BranchReach # M11Organization:Friends of the Winooski RiverObservers: MN, AS	
	nt begins approximately 800 feet upstream of snowmobile bridge in segment
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
TypeLocationTotalTotal HeightPhoto TakeAbove WaterGPSTa	aken Confinement Type Unconfined Score STD Historic
	7.1 Channel Degradation3C to BYes7.2 Channel Aggradation13NoneNo7.3 Widening Channel13No7.4 Change in Planform13No
	Total Score42Geomorphic Rating0.525
	Channel Evolution Model F Channel Evolution Stage III Geomorphic Condition Fair Stream Sensitivity Very High
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type High
Photo GPS Channel Floodprone Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover 16
Bridge 34.0 Yes Yes Yes Yes	6.2 Embeddedness 13
Problem Scour Above,Alignment Bridge 18.0 Yes Yes Yes Yes	6.3 Velocity/Depth Patterns146.4 Sediment Deposition15
Problem Deposition Above, Scour Above, Scour	6.5 Channel Flow Status156.6 Channel Alteration11
	6.7 Frequency of Riffles/Steps146.8 Bank StabilityLeft: 7 Right: 7
	6.9 Bank Vegetation Protection Left: 9 Right: 9
	6.10 Riparian Vegetation Zone Width Left: 5 Right: 7 Total Score 142
	Habitat Rating 0.71
Narrative:	Habitat Stream Condition Good

Major historic incision, stream type departure from C to B, minor aggradation, widening & planform adjustment. Good vegetation may have helped to maintain some stream stability.

Project: Stream: Organizatic		Branch he Winoos		Reach # Observers:	MN, DS	-	page 2 of 2 Segment: A		Rain:	
Segment L	,	961	Segmen	t Location:	Segment beg	ins about 900 f	feet upstream of Rou	te 14 bridge a	and conti	nues until
1.6 Gra	de Controls None						Step 7. Rapid Geo	omorphic Asses	sment Da	ta
Туре	Location	Total	Total Height	Photo Ta	^{ike G} PSTaken	Co	onfinement Type Pla	ne Bed		
1900	Location	Total	Above Water	-	or or uncert			Score	STD	Historic
						7.1 Channel I	Degradation	13	None	Yes
						7.2 Channel /	••	14	None	Νο
						7.3 Widening		18		Νο
						7.4 Change ir		9		Νο
							Total Sco			
							Geomorphic Rati	ng 0.675		
							Channel Evolution Mo	del F		
							Channel Evolution Sta			
							Geomorphic Conditi	•		
							Stream Sensitiv	ity Moderat	е	
							Step 6. Rapid Habitat A	ssessment Dat	а	
4 8 Char	nnel Constrictions	Nono				g	Stream Gradient Type	High		
			hannal E	loodprone		_		9	Score	
Туре				onstriction?	,	6.1 Epifaunal S	ubstrate - Available Cov	er	11	
JT	Tuken					- F	6.2 Embeddedne		15	
						6.	3 Velocity/Depth Patterr	IS	11	
							6.4 Sediment Deposition		14	
							6.5 Channel Flow Statu	IS	16	
							6.6 Channel Alteration	'n	16	
						6.7 F	Frequency of Riffles/Step)S	7	
							6.8 Bank Stabili	ty Left:	9 Right	: 9
						6.9 Ba	ank Vegetation Protectio	n Left: 1	0 Right	: 10
						6.10 Riparia	an Vegetation Zone Wid	h Left:	9 Right	: 9
							Total Sco	е	146	
							Habitat Ratin	g	0.73	
Narrative							Habitat Stream Cond	ition	Good	

Historic degradation (sediment starved from onstream pond - M13). Minor aggradation, no evidence of widening, major planform adjustment at base of falls & lower end of segment (islands, mid-channel bars).

Project: Stream: Organizatior Segment Lei		Branch		Reach # Observers:	MN, DS	Segment: B	October 24, 2008 Completion Date: July 27, 2007 Rain: No n begins and continues until about
-	e Controls	,,,,	Segmen			-	rphic Assessment Data
Туре	Location	Total	Total Height Above Wate	•	^{ke G} PSTaken	Confinement Type	<u></u>
Waterfall	Mid-segment	0.00	0.00	Yes			
Waterfall	Mid-segment	0.00	0.00	Yes		Channel Evolution Model	
						Channel Evolution Stage	
						Geomorphic Condition Stream Sensitivity	Good High
						Step 6. Rapid Habitat Asses	ssment Data
4.8 Chanr	nel Constrictions					Stream Gradient Type	
	Photo (loodprone Constriction?			
Bridge Pro	13.7 Yes blem Scour Belo	Yes	Yes	Yes			
Other Pro	20.0 Yes oblem	Yes	Yes	Yes			
Narrative:						Habitat Stream Condition	

Project:	King	sbury Brai	nch			Phase 2 Reach	Summary	page 2 of 2	October 24, 200
Stream:		Kingsbur	-		Reach #			Segment: A	Completion Date: July 18, 2007
Organizatio		Friends of			Observers:				Rain: Yes
Segment L	ength (ft):	1,533	Segm	ent Location:	Goes through	wetland. Har	d to walk (no access).	
1.6 Gra	ide Con	trols						Step 7. Rapid Geomo	rphic Assessment Data
Туре	Loc	cation	Tota	Total Heigl I Above Wat	ht Photo Ta ter	^{ke –} GPSTaken	(Confinement Type	
								Channel Evolution Model Channel Evolution Stage Geomorphic Condition Stream Sensitivity	Good High
								Step 6. Rapid Habitat Asses	ssment Data
4.8 Chai	nnel Co	nstrictions						Stream Gradient Type	
Туре	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	,			
Narrative	e:							Habitat Stream Condition	I

Project: Stream: Organizatic	Kin on: Frie	iry Branch ngsbury Branc ends of the Wir	ooski River	Reach # Observers:	CS, MN	-	page 2 of 2 Segment: B			Rain:	October 24, 2008 July 18, 2007 Yes
Segment L	• • • •	1,860	Segr	nent Location:	Segment beg	ins where we	tland ends just up	stream	of Calais r	ec field.	
1.6 Gra	de Control	s None					Step 7. Rapic	d Geomo	rphic Asses	sment Da	ta
Туре	Locatio	n Te	Total Heig	ht Photo Ta	ike GPSTaken	0	Confinement Type	Uncon			
туре	Locatio		Above Wa	ter	OF STAKEN				Score	STD	Historic
						7.1 Channel	Degradation		16	None	Νο
						7.2 Channel	l Aggradation		13	None	Νο
						7.3 Widenin	g Channel		18		Νο
						7.4 Change	in Planform		12		Νο
							Tota	I Score	59		
							Geomorphic	Rating	0.7375		
							Channel Evolution	Model	D		
							Channel Evolution		IIc		
							Geomorphic Co	-	Good		
							Stream Ser		High		
							Step 6. Rapid Habi	tat Asses	ssment Data	<u>a</u>	
4.8 Char	nnel Constr	rictions None					Stream Gradient Typ	be I	Low		
		Photo GPS	Channel	Floodprone						Score	
Туре		Taken? Taken?		Constriction?		6.1 Epifaunal	Substrate - Available	Cover		8	
							6.2 Pool Sub	ostrate		8	
							6.3 Pool Vari	iability		12	
							6.4 Sediment Depo	osition		16	
							6.5 Channel Flow	Status		19	
							6.6 Channel Alte	eration		14	
							6.7 Channel Sin	uosity		9	
							6.8 Bank St	ability	Left: 1	0 Right	t: 10
						6.9	Bank Vegetation Prot	ection	Left: 9	9 Right	: 10
						6.10 Ripar	ian Vegetation Zone		Left: 8	3 Right	: 10
								Score		143	
							Habitat F	Rating		0.715	
Narrative		& planform adius					Habitat Stream (Conditior	1	Good	

Minor aggradation & planform adjustment.

Project: Stream: Organizatio	on: Friends o	iry Branch of the Wino	oski River	Reach # Observers:	CS, MN	-	page 2 of 2 Segment: C			Rain:	
Segment Le		1,692	Segm	ent Location:	Segment beg	ins where cha	nnel changes from				
1.6 Gra	ide Controls Non	е					Step 7. Rapio		•	sment Da	ta
Туре	Location	Tota	al Total Heig Above Wa	ht Photo Ta ter	^{ke –} GPSTaken	(Confinement Type	Uncon	fined Score	STD	Historic
							in Planform	I Score	17 13 13 9 52	None None	No No No
							Geomorphic Channel Evolution Channel Evolution Geomorphic Co Stream Se	n Model n Stage ondition	0.65 D IIC Good High		
							Step 6. Rapid Hab			a	
4.8 Char	nnel Constrictions	-					Stream Gradient Ty	pe I	low	Scoro	
Туре	Photo Width Taken	GPS ? Taken?	Channel Constriction?	Floodprone Constriction?		6.1 Epifaunal S	Substrate - Available	Cover		Score 13	
			oonstriction				6.2 Pool Sub			13	
							6.3 Pool Var	3		13	
							6.4 Sediment Dep 6.5 Channel Flow			13 13	
							6.6 Channel Alte			16	
							6.7 Channel Sir			11	
							6.8 Bank S	3	Left:	8 Right	: 8
						6.9 [Bank Vegetation Prot	3		7 Right:	
						6.10 Ripar	ian Vegetation Zone	Width		6 Right:	
							Total	Score		141	
							Habitat	Rating		0.705	
Narrative		, . .					Habitat Stream		1	Good	

Minor aggradation and widening; major planform adjustment. Three mid-channel bars, 2 flood chutes, and 1 steep riffle.

Project:Kingsbury BranchPhase 2 ReaStream:Kingsbury BranchReach # M15Organization:Friends of the Winooski RiverObservers:MN, AW	Segment: A Completion Date: July 17, 2007 Rain: Yes	7
	jins approximately 300 feet downstream of most downstream Route 14	<u>ا</u>
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data	
Type Location Total Height Photo Take GPSTaken	Confinement Type Unconfined	
Above Water GPSTaken	Score STD Historic	
	7.1 Channel Degradation 16 None Yes	
	7.2 Channel Aggradation 13 None No	
	7.3 Widening Channel15No	
	7.4 Change in Planform12No	
	Total Score 56	
	Geomorphic Rating 0.7	
	Channel Evolution Model D Channel Evolution Stage IIC Geomorphic Condition Good Stream Sensitivity High	
	Step 6. Rapid Habitat Assessment Data	
4.8 Channel Constrictions	Stream Gradient Type High	
Photo GPS Channel Floodprone	Score	
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover 8	
Old 35.0 Yes No Yes Yes	6.2 Embeddedness 11	
Problem Scour Above, Scour Below, Alignment	6.3 Velocity/Depth Patterns 13	
Bridge 30.0 Yes Yes Yes Yes	6.4 Sediment Deposition 12	
Problem Deposition Below, Scour Below	6.5 Channel Flow Status 17	
	6.6 Channel Alteration 7	
	6.7 Frequency of Riffles/Steps 16	
	6.8 Bank Stability Left: 8 Right: 9	
	6.9 Bank Vegetation Protection Left: 6 Right: 8	
	6.10 Riparian Vegetation Zone Width Left: 2 Right: 4	
	Total Score121Habitat Rating0.605	
Narrative:	Habitat Stream Condition Fair	

Minor widening, aggradation and planform adjusment. Dominant process is planform adjustment with 2 mid-channel bars, one flood chute, a steep riffle.

Project: Stream: Organizatio		y Branch the Winoc		Reach # Observers:	MN, AW	Ĩ	page 2 of 2 Segment: B			Rain: N	
Segment Le		3,559	Segm	ent Location:	Segment beg	ins where bu	ffer becomes more	e foreste	ed about 18	00 feet u	ipstream of
1.6 Grad	de Controls None						Step 7. Rapi		•	ment Data	1
Туре	Location	Tota	Total Heig Above Wa	ht Photo Ta	ake - GPSTaken		Confinement Type	Uncon		OTD	Llistania
51			ADOVE WA	lei					Score	STD	Historic
							el Degradation		16	None	Νο
							Aggradation		8	None	Νο
						7.3 Widenir	•		14		Νο
						7.4 Change	e in Planform		5		No
							Tota Geomorphic	al Score c Rating	43 0.5375		
							Channel Evolutio Channel Evolutio Geomorphic Co Stream Se	n Stage ondition	D IId Fair Very High		
							Step 6. Rapid Hab				
4.8 Chan	nnel Constrictions						Stream Gradient Ty	ре	High	C	
Turna	Photo	GPS	Channel	Floodprone		(1 Enifound	Cubatrata Available	Cover		Score	
Туре	Width Taken?	Taken?	Constriction?	Constriction?)	o.i Epilaunai	Substrate - Available 6.2 Embedd			16 14	
Bridge	30.0 Yes	Yes	No	Yes						14	
Pr	roblem None						6.3 Velocity/Depth P 6.4 Sediment Dep			14	
							6.5 Channel Flow			15	
							6.6 Channel Alt			8	
						6.7	7 Frequency of Riffles			16	
							6.8 Bank S	-	Left: 8	Right:	8
						6.9	Bank Vegetation Pro	5		Right:	
							rian Vegetation Zone			Right:	
								I Score		134	
							Habitat	Rating	(0.67	
Narrative							Habitat Stream p riffles/diagonal ban			Good	

Major aggradation, extreme planform adjustment with MCB, DJ, Islands, NC, FC. Also many steep riffles/diagonal bars. This may be brought on by historic channelization probably in most of segment. Mass failures contributing to sediment in channel.

Project: Stream: Organizatio	on: Friends	oury Branch of the Winc	oski River	Reach # Observers:	PD, CM	-	page 2 of 2 Segment: 0			n Date: Rain:	October 24, 2008 July 19, 2007 Yes
_	ength (ft):	2,841	Segme	nt Location:	Just upstrear	n from Rt 14 b	oridge until outlet				
1.6 Gra	ade Controls No	ne	Tatal Hainh				Step 7. Rapic			ment Da	ta
Туре	Location	Tota	al Total Heigh Above Wate	t Photo Ta er	ike GPSTaken		Confinement Type	Uncon	Score	STD	Historic
							-		16 10 12 9	None None	Yes No No No
							Tota Geomorphic	l Score Rating	47 0.5875		
							Channel Evolution Channel Evolutior Geomorphic Co Stream Ser	n Stage Indition	D IIc Fair Very High		
							Step 6. Rapid Habi	tat Asses	ssment Data		
4.8 Chai	nnel Constriction		Observat	Flooderopo			Stream Gradient Typ	be I	High	Score	
Туре	Photo Width Take			Floodprone Constriction?	,	6.1 Epifaunal S	Substrate - Available	Cover		14	
.)			CONSTICTION	CONSTRUCTION			6.2 Embedde			12	
						6	5.3 Velocity/Depth Pa			18	
							6.4 Sediment Depo			8	
							6.5 Channel Flow			15	
							6.6 Channel Alte	eration		9	
						6.7	Frequency of Riffles	/Steps		18	
							6.8 Bank St	ability	Left: 7	Right	: 8
						6.9 E	Bank Vegetation Prot	ection	Left: 9	Right	: 9
						6.10 Ripar	ian Vegetation Zone	Width	Left: 7	Right	: 7
							Total	Score		141	
							Habitat F	Rating	0	.705	
Narrative							Habitat Stream (he presense of many			Good	

Major aggradation and minor widening. Stream is undergoing major planform adjustment due to the presense of many debris jams.

Project:	Kingsbury Branc	:h			Phase 2 Reac	h Summary	page 2 of 2	October 24, 2008
Stream:	Pekin Broo			Reach #	T3.01		Segment: 0	Completion Date: July 5, 2007
Organizatio	on: Friends of th	ne Winoos			MN,PD,AS			Rain: Yes
Segment L	ength (ft):	814	Segmen	t Location:	Segment begi	ins at confluenc	e with Kingsbury Branc	h and continues under Rt 14 bridge
1.6 Gra	ide Controls None						Step 7. Rapid Geomo	rphic Assessment Data
Туре	Location	Total	Total Height Above Water	Photo Ta	^{ke –} GPSTaken	Со	nfinement Type	
							Channel Evolution Model	
							Channel Evolution Stage	
							Geomorphic Condition	Fair
							Stream Sensitivity	Extreme
						•	Step 6. Rapid Habitat Asse	ssment Data
4.8 Cha	nnel Constrictions					St	tream Gradient Type	
		GPS C	hannel Fl	oodprone				
Туре	Width Taken?	Taken? C	onstriction? C	onstriction?	,			
Bridge P	39.0 Yes roblem Depositior	Yes Above,De	No eposition Belo	Yes w				
Narrative	·د						Habitat Stream Condition	ı

Project: Stream: Organizatic		ok he Winoo		Reach # Observers:	MN	-	page 2 of 2 Segment: 0			Rain:	
Segment Lo	,	1,389	Segment	Location:	Reach begins	about 550 fe	et upstream of Ro	oute 14 E	Bridge near	Pekin B	Brook Rd and
1.6 Gra	de Controls None						Step 7. Rapi			ment Da	ta
Туре	Location	Total	Total Height	Photo Ta	ike GPSTaken	(Confinement Type	Uncon			
1960	Loodton	rotar	Above Water						Score	STD	Historic
						7.1 Channel	l Degradation		17	None	No
							l Aggradation		14	None	Νο
						7.3 Widenin	•		8		Νο
						7.4 Change	in Planform		8		Νο
								al Score	47		
							Geomorphic	c Rating	0.5875		
							Channel Evolution	n Model	D		
							Channel Evolutio	n Stage	IIc		
							Geomorphic Co	-	Fair		
							Stream Se	ensitivity	Extreme		
							Step 6. Rapid Hab	oitat Asses	ssment Data		
4.8 Char	nnel Constrictions	None					Stream Gradient Ty	rpe I	Low		
			Channel Fl	oodprone						Score	
Туре				onstriction?	,	6.1 Epifaunal	Substrate - Available	e Cover		4	
							6.2 Pool Sul	bstrate		7	
							6.3 Pool Var	riability		5	
							6.4 Sediment Dep	osition		17	
							6.5 Channel Flow	Status		17	
							6.6 Channel Alte	eration		11	
							6.7 Channel Sir	5		3	
							6.8 Bank S	5		Right	
						6.9	Bank Vegetation Pro	tection		Right	
						6.10 Ripar	ian Vegetation Zone		Left: 4	Right:	10
								l Score		98	
							Habitat	Rating	(0.49	
Narrative	2:						Habitat Stream	Conditior	I	Fair	

Channel was likely historically straightened. Evidence of failed riprap on both sides. Bank erosion and scour along much of reach on both sides, very narrow valley. Has plane bed features. Channel trying to regain sinuosity.

Project:	Kingsbury Bran	ch			Phase 2 Reach	Summary	page 2 of 2		October 24, 2008
Stream:	Pekin Bro	ok		Reach #	T3.03		Segment: A	•	August 16, 2007
Organizati	on: Friends of t	he Winoosl		Observers:	•			Rain:	
Segment L	ength (ft):	3,396	Segmen	t Location:	Segment begins	s near where I	natural valley gets wide	er and then continu	ues until about
1.6 Gra	ade Controls None						Step 7. Rapid Geomo	rphic Assessment Da	ta
Туре	Location	Total	Total Height Above Water	Photo Ta	^{ke –} GPSTaken	Cor	nfinement Type		
							Channel Evolution Model		
							Channel Evolution Stage		
							Geomorphic Condition	Good	
							Stream Sensitivity	High	
						S	Step 6. Rapid Habitat Asse	ssment Data	
4 8 Cha	nnel Constrictions					-	ream Gradient Type		
	Photo	GPS CI	nannel Fl	oodprone					
Туре	Width Taken?			onstriction?	,				
Culvert	18.0 Yes	Yes	Yes	Yes					
	roblem Depositio								
Narrativ	e:						Habitat Stream Condition	ו	

Project: Stream: Organizatic	on: Fri		ok ne Winoo	oski River	Reach # Observers:	PD, TM	-	page 2 of 2 Segment: B			Rain:	
Segment L			3,369	Segn	nent Location:	Segment beg	ins about 1300) feet upstream o	of Pekin	Brook Rd cı	lvert w	here land use
1.6 Gra	ade Contro	ls None								rphic Assessr	nent Dat	<u>a</u>
Туре	Locati	ion	Tota	Total Heig	ht Photo Ta	^{ike –} GPSTaken	Co	onfinement Type	Uncon			
1360	Locati		Tota	Above Wa	ter	or or uncert				Score	STD	Historic
							7.1 Channel I	Degradation		18	None	No
							7.2 Channel /	••		12	None	Νο
							7.3 Widening	Channel		12		Νο
							7.4 Change in	n Planform		8		Νο
									al Score	50		
								Geomorphic	c Rating	0.625		
								Channel Evolutio	n Model	D		
								Channel Evolutio		IIc		
								Geomorphic C	•	Fair		
								Stream Se	ensitivity	Extreme		
								Step 6. Rapid Hab	oitat Asses	ssment Data		
4.8 Chai	nnel Const	trictions N	lone				9	Stream Gradient Ty	pe L	Low		
			GPS	Channel	Floodprone			,		ç	Score	
Туре	Width		Taken?	Constriction?	Constriction?		6.1 Epifaunal S	ubstrate - Available	e Cover		13	
5.		ranonn	- anoni					6.2 Pool Su			18	
								6.3 Pool Va	riability		14	
								6.4 Sediment Dep	osition		9	
								6.5 Channel Flow	Status		18	
								6.6 Channel Alt	eration		8	
								6.7 Channel Si	nuosity		11	
								6.8 Bank S	Stability	Left: 4	Right:	6
							6.9 B	ank Vegetation Pro	tection	Left: 4	Right:	3
							6.10 Riparia	an Vegetation Zone		Left: 1	Right:	1
									I Score		110	
								Habitat	Rating	C).55	
Narrative	e:							Habitat Stream	Conditior	ı	Fair	

Major planform adjustment due to encroachment and channel alteration and lack of buffer on both banks.

Project:Kingsbury BranchPhase 2Stream:Pekin BrookReach #T3.04Organization:Friends of the Winooski RiverObservers:PD, AW	Reach Summary page 2 of 2 October 24, 2008 Segment: A Completion Date: August 9, 2007 Rain: Yes
Segment Length (ft):2,654Segment Location:Segment	begins at culvert on Peck Hill Rd. near intersection of Peck Hill Rd and Pekin
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Height Photo Take GPSTake	Confinement Type Unconfined
Above Water GPSTak	Score STD Historic
	7.1 Channel Degradation 18 None No
	7.2 Channel Aggradation 12 None No
	7.3 Widening Channel12No
	7.4 Change in Planform 3 No
	Total Score 45
	Geomorphic Rating 0.5625
	Channel Evolution Model D Channel Evolution Stage IIC Geomorphic Condition Fair Stream Sensitivity Extreme
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type Low
Photo GPS Channel Floodprone	Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover13
Culvert 12.5 Yes Yes Yes Yes	6.2 Pool Substrate 18
Problem Deposition Above, Deposition Below, Scour	6.3 Pool Variability 19
Bridge 15.0 Yes Yes Yes Yes	6.4 Sediment Deposition 11
Problem Scour Above, Scour Below, Alignment	6.5 Channel Flow Status 15
	6.6 Channel Alteration 7
	6.7 Channel Sinuosity 12
	6.8 Bank Stability Left: 5 Right: 7
	6.9 Bank Vegetation Protection Left: 4 Right: 5
	6.10 Riparian Vegetation Zone Width Left: 1 Right: 4
	Total Score 121
	Habitat Rating 0.605
Narrative:	Habitat Stream Condition Fair

Major aggradation and widening; Extreme planform adjustment due to channelization and encroachment.

Project: Stream: Organizatic	Kingsbury Bran Pekin Bro on: Friends of t	ok	oski River	Reach # Observers:		ch Summary	page 2 of 2 Segment: B		Completic	on Date: Rain:	October 24, 2008 August 9, 2007 Yes
Segment L	ength (ft):	1,327	Segmer	nt Location:	Segment beg	ins just upstr	eam of bridge nea	r Jack H	ill Rd inter	section	with Pekin
1.6 Gra	de Controls None						Step 7. Rapi	d Geomo	rphic Assess	ment Da	ita
Туре	Location	Tota	Total Height	Photo Ta	ike GPSTaken	(Confinement Type	Uncon			
			Above Water	ſ					Score	STD	Historic
						7.1 Channe	I Degradation		17	None	Νο
							I Aggradation		12	None	No
						7.3 Widenin	ig Channel		12		No
						7.4 Change	in Planform		9		No
							Tota	al Score	50		
							Geomorphic	c Rating	0.625		
							Channel Evolutio	n Model	D		
							Channel Evolutio		IIc		
							Geomorphic C	-	Fair		
							Stream Se	ensitivity	Very High	n	
							Step 6. Rapid Hab	oitat Asses	ssment Data	l	
4 8 Char	nnel Constrictions	None					Stream Gradient Ty	rpe I	High	-	
	Photo	GPS	Channel F	loodprone					-	Score	
Туре	Width Taken?	Taken?		Constriction?		6.1 Epifaunal	Substrate - Available	e Cover		11	
51	. another	ranonn					6.2 Embedd	edness		7	
						e	6.3 Velocity/Depth P	atterns		16	
							6.4 Sediment Dep	osition		8	
							6.5 Channel Flow	Status		15	
							6.6 Channel Alt	eration		11	
						6.7	Frequency of Riffles	s/Steps		16	
							6.8 Bank S	Stability	Left:	7 Righ ⁻	t: 7
						6.9	Bank Vegetation Pro	tection	Left: S	5 Righ ⁻	t: 6
						6.10 Ripar	rian Vegetation Zone	e Width	Left: 6	Right	: 10
							Tota	l Score		125	
							Habitat	Rating	(0.625	
Narrative	e:						Habitat Stream	Conditior	I	Fair	

Major planform adjustment with moderate to high lateral bank erosion; two mid channel bars. Minor aggradation and widening. Not incised - wide floodplain.

Project:Kingsbury BranchPhase 2 RStream:Pekin BrookReach #T3.04Organization:Friends of the Winooski RiverObservers:PD, CM	each Summarypage 2 of 2October 24, 200Segment: CCompletion Date:July 26, 2007Rain: No
Segment Length (ft):2,627Segment Location:Segment	begins at driveway bridge and continues 2050 feet to T3.05.
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Height Photo Take GPSTake	Confinement Type Unconfined Score STD Historic
	7.1 Channel Degradation16NoneNo7.2 Channel Aggradation11NoneNo7.3 Widening Channel12No7.4 Change in Planform7No
	Total Score46Geomorphic Rating0.575
	Channel Evolution Model D Channel Evolution Stage IIC Geomorphic Condition Fair Stream Sensitivity Very High
	Step 6. Rapid Habitat Assessment Data Stream Gradient Type High
4.8 Channel Constrictions	Stream Gradient Type High Score
Photo GPS Channel Floodprone Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover 15
	6.2 Embeddedness 8
Bridge 12.5 Yes Yes Yes Yes Problem Deposition Below, Scour Above, Scour	6.3 Velocity/Depth Patterns 12
	6.4 Sediment Deposition 7
	6.5 Channel Flow Status 13
	6.6 Channel Alteration 8
	6.7 Frequency of Riffles/Steps 14
	6.8 Bank Stability Left: 6 Right: 7
	6.9 Bank Vegetation Protection Left: 4 Right: 6
	6.10 Riparian Vegetation Zone Width Left: 4 Right: 9
	Total Score113Habitat Rating0.565
Narrative: minor widening, major planform adjustment & some aggradation. Segment is i	Habitat Stream Condition Fair

minor widening, major planform adjustment & some aggradation. Segment is readjusting to encroachment and lack of buffer previously from grazing.

Stream:Pekin BrookReach # T3.05Organization:Friends of the Winooski RiverObservers:MN, AS, DS	Ach Summary page 2 of 2 October 24, 2008 Segment: A Completion Date: July 6, 2007 Rain: Yes
	gins about 0.5 miles upstream of the intersection of Jack Hill Rd and Pekin
1.6 Grade Controls None	Step 7. Rapid Geomorphic Assessment Data
Type Location Total Total Height Photo Take GPSTaken	Confinement Type Unconfined
Above Water GPSTaken	Score STD Historic
	7.1 Channel Degradation 16 None No
	7.2 Channel Aggradation 12 None No
	7.3 Widening Channel13No
	7.4 Change in Planform13No
	Total Score 54
	Geomorphic Rating 0.675
	Channel Evolution Model D Channel Evolution Stage IIC Geomorphic Condition Good Stream Sensitivity High
	Step 6. Rapid Habitat Assessment Data
4.8 Channel Constrictions	Stream Gradient Type High
Photo GPS Channel Floodprone	Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover11
Bridge 0.00 No No Yes Yes	6.2 Embeddedness 12
Problem Deposition Above, Deposition Below	6.3 Velocity/Depth Patterns 15
	6.4 Sediment Deposition 11
	6.5 Channel Flow Status 14
	6.6 Channel Alteration 13
	6.7 Frequency of Riffles/Steps 16
	6.8 Bank Stability Left: 6 Right: 6
	6.9 Bank Vegetation Protection Left: 4 Right: 4
	6.10 Riparian Vegetation Zone Width Left: 7 Right: 9
	Total Score128Habitat Rating0.64
Narrative:	Habitat Stream Condition Fair

Not incised, no major adjustment process. Vegetation starting to come in. Speckled Alder growth in buffer.

Project: Stream: Organizatio		ok he Winoosl			MN, AS, DS	-	page 2 of 2 Segment: B			Rain:	
	ength (ft):	2,920	Segment	Location:	Segment beg	ins where veg	jetation changes a	approxin	nately 1400	upstrea	am of T3.05-A.
1.6 Gra	ade Controls None								rphic Assessm	nent Data	<u>a</u>
Туре	Location	Total	Total Height Above Water	Photo Ta	^{ke –} GPSTaken	(Confinement Type	Unconf	f ined Score	STD	Historic
						7.1 Channel	Degradation		18	None	No
						7.2 Channe	Aggradation		12	None	No
						7.3 Widenin	g Channel		14		No
						7.4 Change	in Planform		10		No
							Tota	al Score	54		
							Geomorphic	Rating	0.675		
							Channel Evolution Channel Evolutio Geomorphic Co Stream Se	n Stage	D IIc Good High		
							Step 6. Rapid Hab	itat Asses	sment Data		
4.8 Cha	nnel Constrictions	None					Stream Gradient Ty	pe H	ligh		
	Photo	GPS CI	nannel Flo	odprone						core	
Туре	Width Taken?	Taken? Co	onstriction? Co	nstriction?		6.1 Epifaunal	Substrate - Available			15	
							6.2 Embedde			13	
						e	5.3 Velocity/Depth Pa			15	
							6.4 Sediment Dep			15	
							6.5 Channel Flow			14	
						<i>,</i> –	6.6 Channel Alte			11	
						6.7	Frequency of Riffles			18 D'alat	0
						()	6.8 Bank S	5	Left: 8		
							Bank Vegetation Pro		Left: 9	-	
						6. IU Ripar	ian Vegetation Zone		Left: 9		9
							Habitat	l Score Rating		53 765	
Narrativ	e:						Habitat Stream	Condition	n (Good	

Not incised, Some mid-channel bars and one island. Major planform adjustment. Good vegetation holding banks. Minor aggradation and widening.

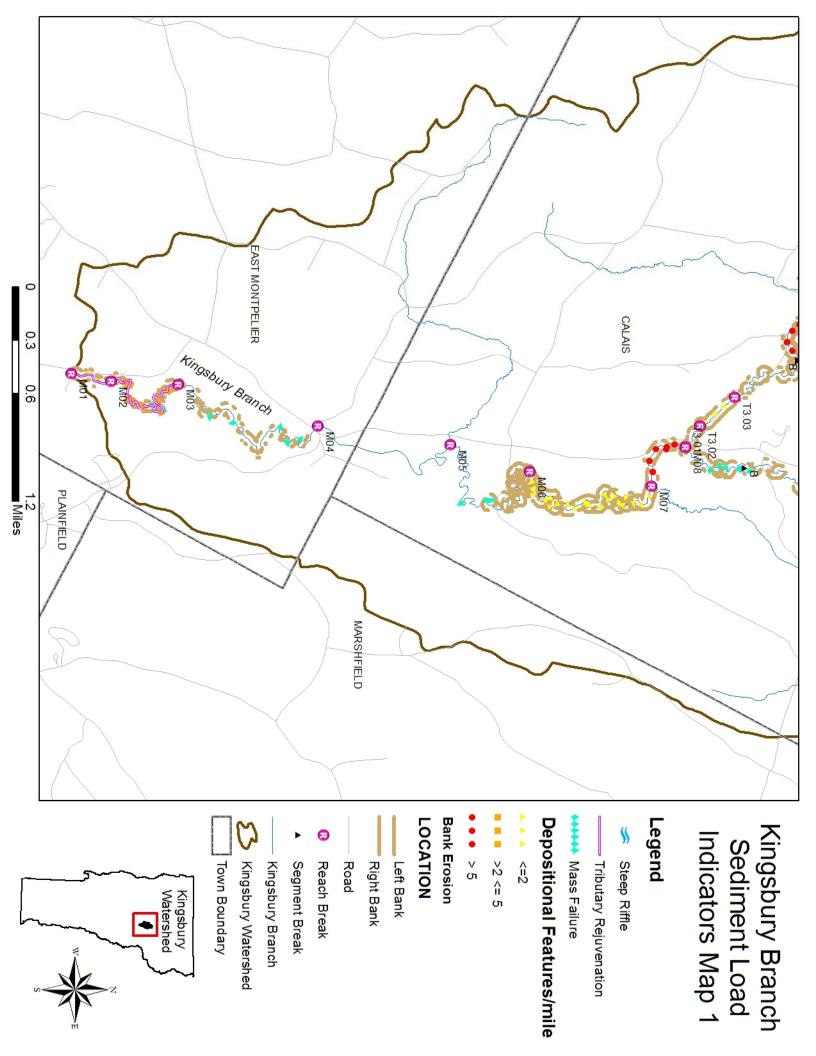
roject: Kingsbury Branch rream: Pekin Brook Reach #	Phase 2 Reach Summarypage 2 of 2IS.06Segment: A	October 24, 20 Completion Date: July 5, 2007
rganization: Friends of the Winooski River Observers:	5	Rain: Yes
egment Length (ft): 2,826 Segment Location:	Segment begins just downstream of intersection o	of Singleton Rd and Pekin Brook Rd
1.6 Grade Controls None	Step 7. Rapid Geor	norphic Assessment Data
Total Height Photo Tak	GPSTaken Confinement Type Unco	onfined
Type Location Total Above Water	GPSTaken	Score STD Historic
	7.1 Channel Degradation	7 None Yes
	7.2 Channel Aggradation	12 None No
	7.3 Widening Channel	14 No
	7.4 Change in Planform	8 No
	Total Scor	
	Geomorphic Ratin	g 0.5125
	Channel Evolution Mode	el F
	Channel Evolution Stag	
	Geomorphic Conditio	
	Stream Sensitivit	
	Step 6. Rapid Habitat As	sessment Data
4.8 Channel Constrictions	Stream Gradient Type	Low
Photo GPS Channel Floodprone		Score
Type Width Taken? Taken? Constriction? Constriction?	6.1 Epifaunal Substrate - Available Cover	15
Culvert 12.0 Yes Yes Yes Yes	6.2 Pool Substrate	14
Problem Deposition Above,Scour Below,Alignment	6.3 Pool Variability	13
	6.4 Sediment Deposition	10
	6.5 Channel Flow Status	14
	6.6 Channel Alteration	8
	6.7 Channel Sinuosity	14
	6.8 Bank Stability	5
	6.9 Bank Vegetation Protection	Left: 7 Right: 8
	6.10 Riparian Vegetation Zone Width	Left: 6 Right: 8
	Total Score	
	Habitat Rating	0.655
	Habitat Stream Condit	ion Good
Narrative: Some historic incision, some aggradation, minor widening, and majo		

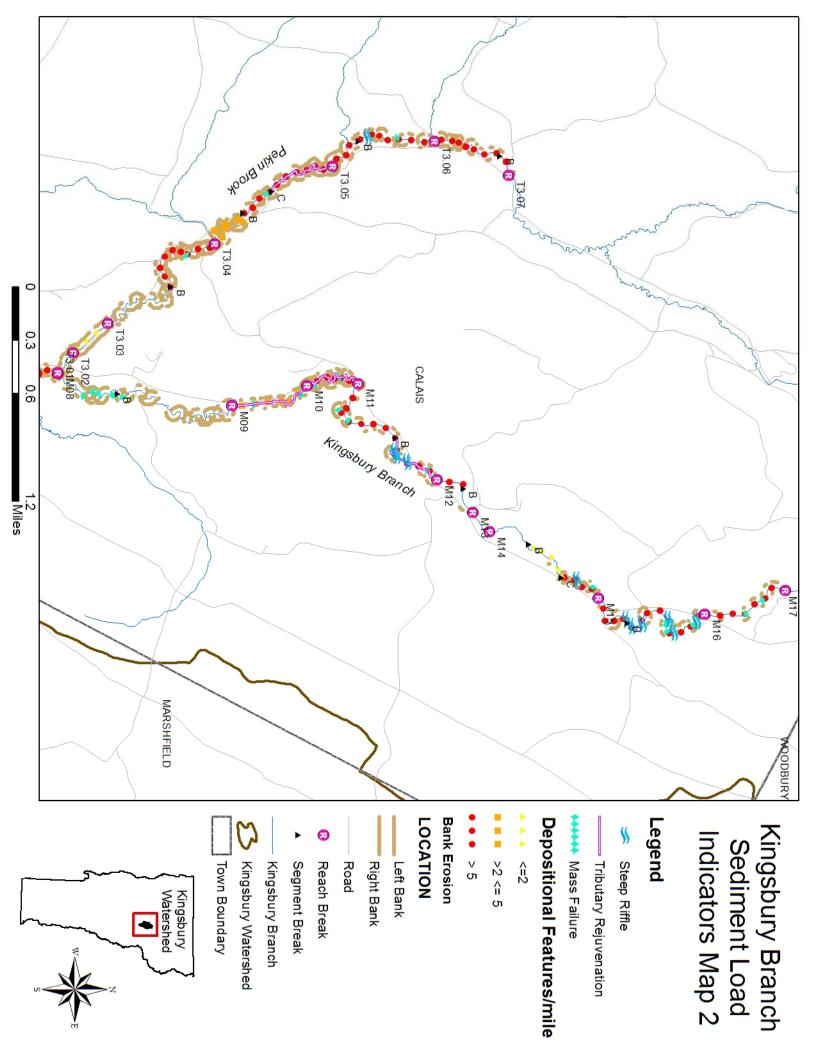
Some historic incision, some aggradation, minor widening, and major planform adjustment as reach builds new floodplain. The new floodplain bench is fairly narrow - probably in stage III.

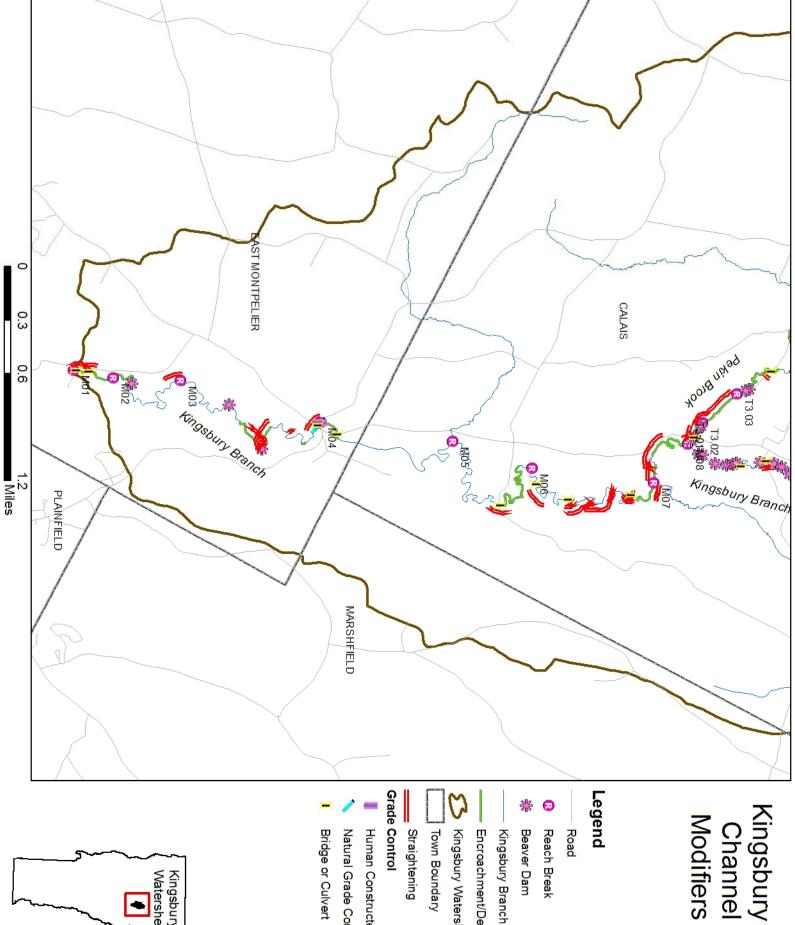
Project: Stream: Organizatic	Kingsbury Branch Pekin Brook on: Friends of the		Reach # Observers:	Phase 2 Read T3.06 PD, CM, AS	ch Summary	page 2 of 2 Segment: B		Completior	n Date: Rain:	October 24, 2008 July 19, 2007 Yes
Segment L	ength (ft):	661 Segm	ent Location:	Segment beg	ins where trib	utary enters on ri	ight ban	k and contir	nues ab	out 200 feet
1.6 Grade Controls					Step 7. Rapid Geomorphic Assessment Data					
Туре	Location	Total Heig Total Above Wa	ht Photo Ta ter	ake GPSTaken	C	Confinement Type	Uncon	fined Score	STD	Historic
Ledge	Mid-segment	2.00 1.00	No		7.1 Channel 7.2 Channel 7.3 Widening 7.4 Change	Aggradation g Channel in Planform	n Model on Stage ondition	6 12 14 8 40 0.5 F II Fair	None None	Yes No No
4.8 Channel Constrictions Photo GPS Channel Floodprone					Step 6. Rapid Habitat Assessment Data Stream Gradient Type High					
Type Culvert	11.2 Yes	aken? Constriction? Yes Yes Above,Scour Below,	Constriction? Yes	2		Substrate - Available 6.2 Embedd 3 Velocity/Depth Pa.	edness		9 18 7	
	obient Deposition	Above, scour below,	Angriment			6.4 Sediment Dep 6.5 Channel Flow	oosition Status		17 19	
						6.6 Channel Alte Frequency of Riffles 6.8 Bank S	s/Steps	4		
						Bank Vegetation Pro an Vegetation Zone	tection	Left: 2 Left: 1	Right	: 1
						Tota Habitat	l Score Rating		98 .49	
Narrative	2:					Habitat Stream	Conditior	I	Fair	

Major historic incision and planform change due to channel alterations. Some aggradation and widening.

APPENDIX 2 STRESSOR AND DEPARTURE MAPS







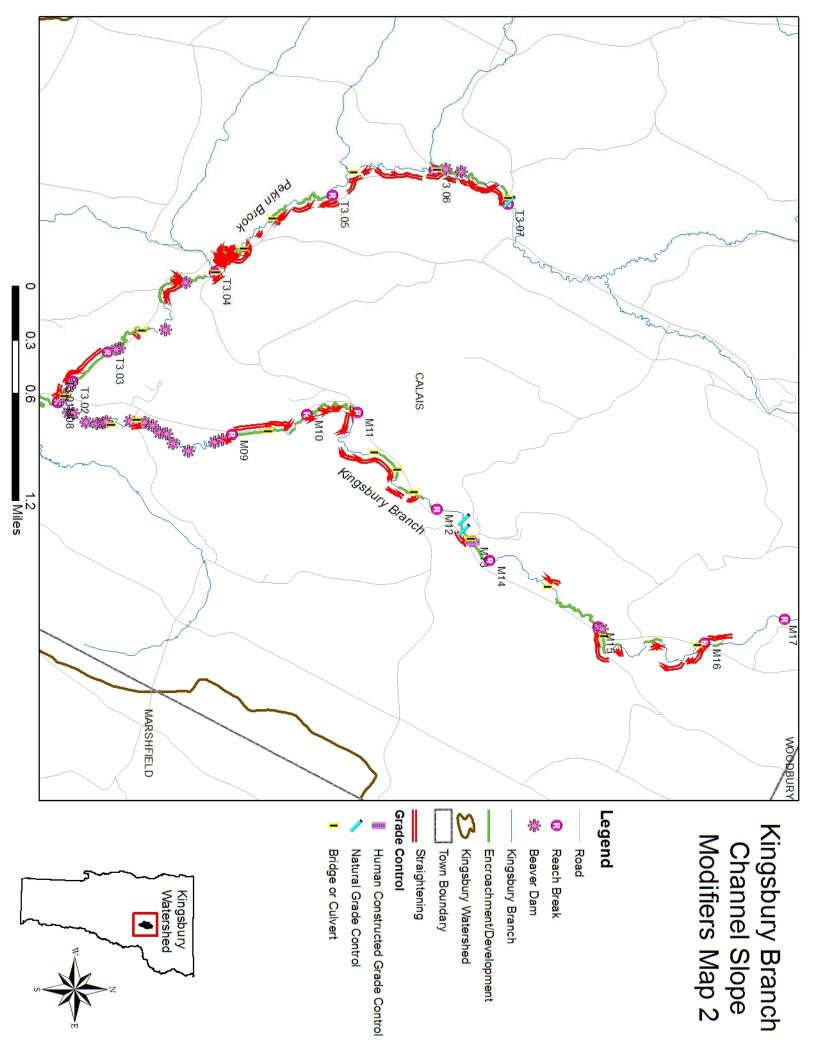
Kingsbury Branch Channel Slope Modifiers Map 1

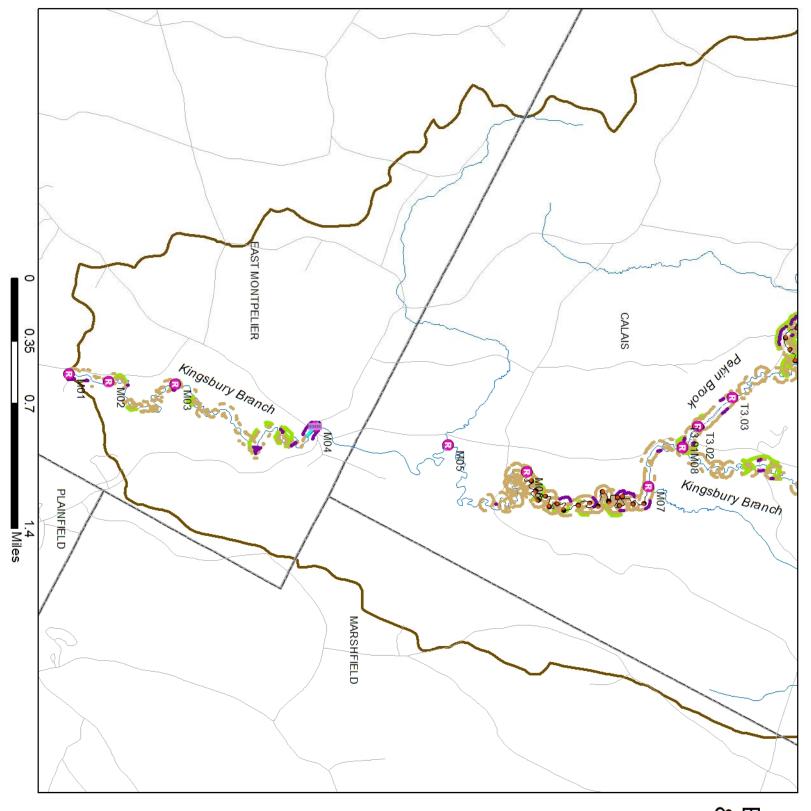
- Beaver Dam
- Encroachment/Development
- Kingsbury Watershed
- Town Boundary
- Straightening

Grade Control

- Human Constructed Grade Control
- Natural Grade Control
- Bridge or Culvert







Kingsbury Branch Boundary Conditions & Riparian Modifiers Map 1

Legend

- P2 Cohesive Bank
- P2 Coarse Bed

Grade Control

- Human Contructed Grade Control
- Natural Grade Control

Armoring

- LOCATION
- Left Bank Right Bank

Bank Erosion

LOCATION

- Left Bank

Right Bank

Buffer less 25

LOCATION

- Left Bank
- Right Bank
- 0
- Reach Break

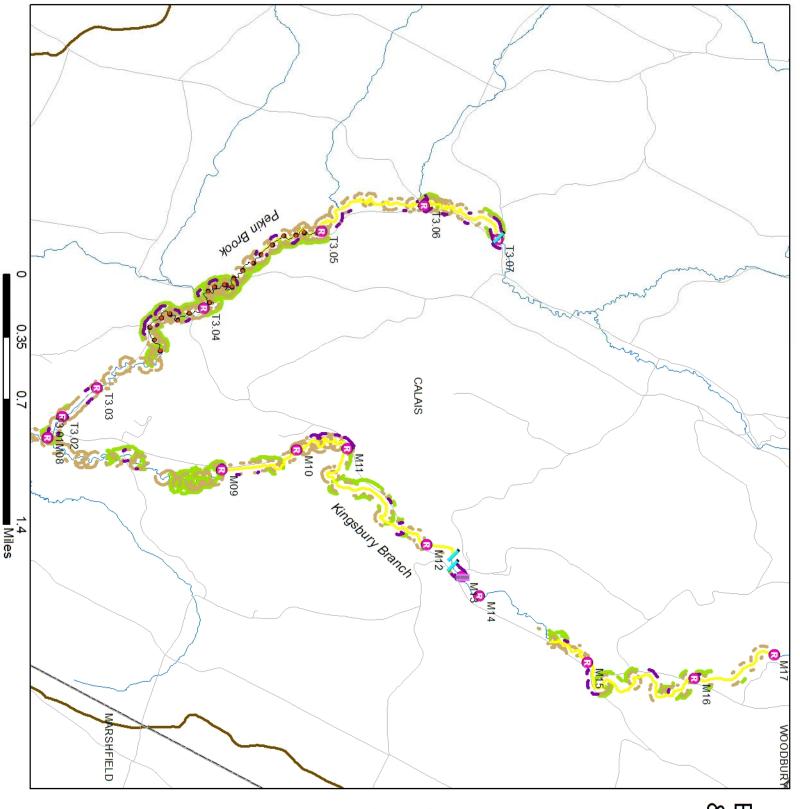
- Kingsbury Branch

Kingsbury Watershed

Town Boundary

Kingsbury Watershed

- Road



Kingsbury Branch Boundary Conditions & Riparian Modifiers Map 2

Legend

- P2 Cohesive Bank
- P2 Coarse Bed

Grade Control

- Human Contructed Grade Control
- Natural Grade Control

Armoring

- LOCATION
- Left Bank Right Bank

Bank Erosion

LOCATION

- Left Bank
- Right Bank

Buffer less 25

LOCATION

- Left Bank
- Right Bank
- 0 Reach Break

- Road

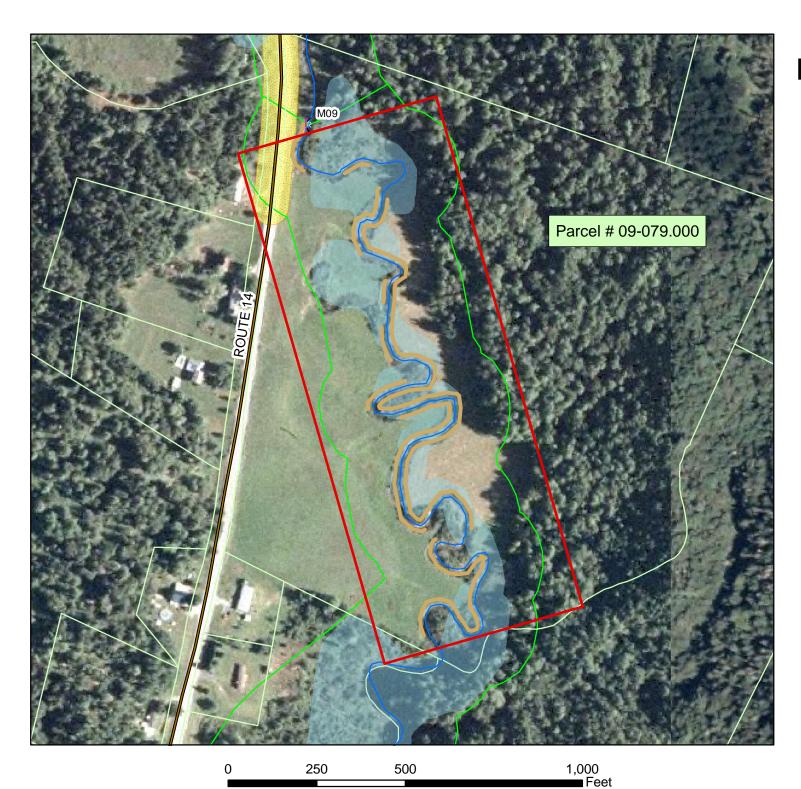
Kingsbury Watershed

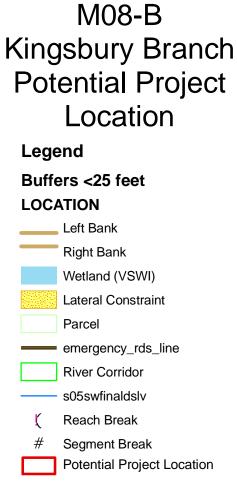
Kingsbury Branch

Town Boundary

Kingsbury Watershed

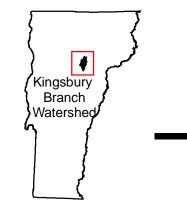
APPENDIX 3 MAPS OF POTENTIAL PROJECTS

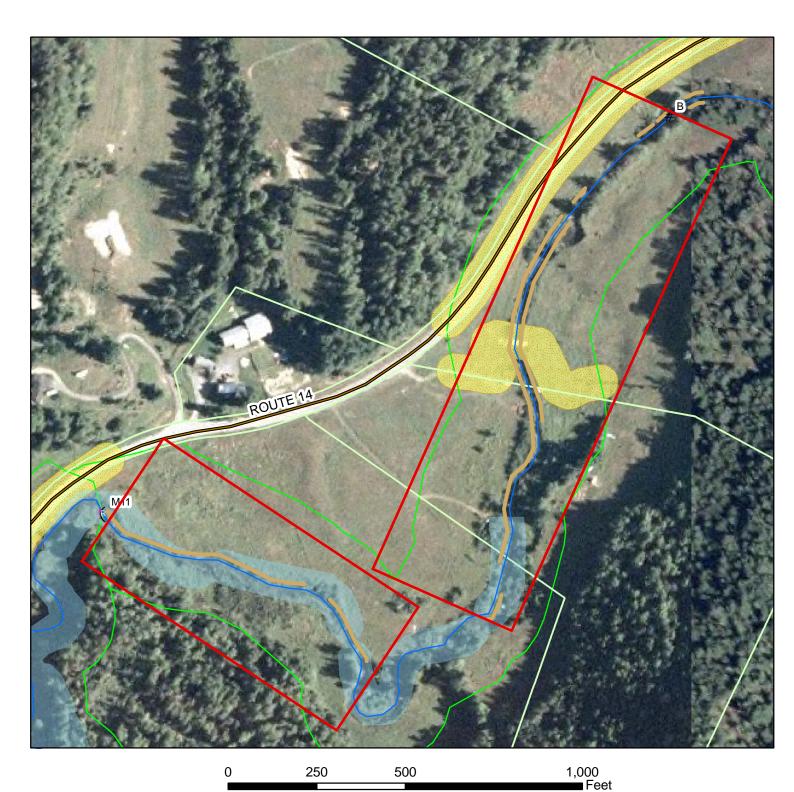


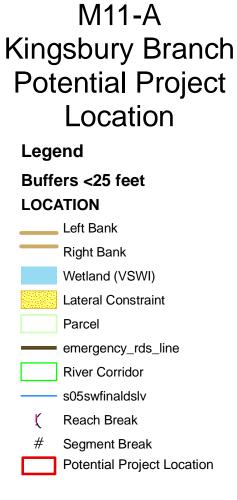


Project Description

Improve Riparian Buffer
 Protect River Corridor







Project Description

Improve Riparian Buffer
 Protect River Corridor

