

The Gihon River

Phase I Report

Prepared by the Lamoille County Planning Commission

July 20, 2006

**Funded by the State of Vermont Department of Environmental Conservation, Division of
Water Quality-River Management Program**

Grant #2005-RCG-1-02

Background

The Gihon River is located in the Towns of Johnson and Eden, Vermont, which flows into the Lamoille River, and ultimately, Lake Champlain. Most of the river is located in forest, agricultural land, with portions running through residential development. The approximately 20 mile river accommodates a 64.75 square mile watershed, and there are 25 reaches, or segments, which were assessed (see attached map).

Current Stream Geomorphic Conditions

The Phase I assessment of the Gihon River and one of its tributaries (Wild Brook) was conducted by the Lamoille County Planning Commission during October 2005. The results of the assessment concluded that overall, the river is in fair condition. Due to a variety of autumn weather conditions (cold air and water temperature and high flow), this river was assessed in a less thorough manner than the other rivers assessed during the field season. Access points were limited in some areas, but about 2000 feet upstream and downstream of all road crossings were walked. A bridge and culvert assessment was not conducted on the Gihon River. Reaches 1-5 were walked in their entirety. There were a few sections that had significant bedrock grade control, and much of the stream had an adequate riparian buffer. Of the 26 reaches assessed on the Gihon River, eight reaches (1, 2, 3, 5, 9, 13, 14, and 18) had total impact scores greater than 12 out of a possible score of 32. A total impact score greater than 12 is considered high. Floodplain modifications (residential and road encroachments) had the most significant contribution to the impact scores with land use as a lesser but still significant stressor. Reaches 1, 3, 5, 13, and 14 all had floodplain modification impact scores of 7 or 8 out of a possible 12. Road encroachments and development within the floodplain were the most significant stressors here. Reaches 1-7 all had land use scores of 5 or greater out of a possible 6 (See **Appendix A**). Residential development within the floodplain was the most significant stressor for reaches 1-4, and crops within the floodplain were the most significant for reaches 5-7.

One tributary to the Gihon River, the Wild Brook, was also assessed (see map – last tributary on left before confluence with Lamoille River). Overall, this tributary was healthy due primarily to lack of development around the stream. The upper section is located in a conserved hunting area and adjacent to a logging operation. There was no apparent evidence that the logging was affecting the stream. The stream had a new culvert about half way up with some riprap around it that was in good condition. This site also had a bedrock grade control just upstream. Most of the stream had cobble bed material and a riffle-pool bed form, was semi-confined, and had a significant elevation drop. The confluence of the Wild Brook and the Gihon River is just downstream (about 350 feet) of the only bridge over the Wild Brook. The bridge was in good condition and did not appear to adversely affect the stream.

Predicted Stream Channel Adjustment Processes

The Gihon River has a variety of geomorphic processes affecting the stream's evolution. Reaches 1-3 are undergoing active adjustments including degradation, aggradation, planform adjustment, and to a lesser extent, widening. These reaches include frequent bedrock outcroppings, but also have ripraped banks around road crossings and some erosion and flood chutes. The river is slightly incised from past gravel mining and bank armoring, and the river is trying to establish a new floodplain at a lower elevation. Aggradation is the major adjustment

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process on reach 5 and multiple point, side, and mid-channel bars were evident. Planform adjustment is the major adjustment process for reaches 13 and 14 (See **Appendix A**). This process changes the shape and size of meander bands and the overall path the river follows. If development within the floodplain corridor is avoided, the river will establish a stable condition on its own. There are a handful of reaches in the headwaters of the river (reaches 20-25) that are largely undeveloped and have the potential to be conservation areas for the river corridor. A lack of transportation infrastructure here decreases the likelihood of development, so conserving a corridor around the river here would not conflict with much potential development.

Additional Assessment Work

Reaches 1- 5 would benefit from additional assessment work, and possibly reaches 13 and 14. The floodplain here is already extensively developed, and additional development would put additional stress on this already stressed area. A Phase II assessment will be able to predict more accurately how the river will evolve in these areas, which should be considered as land use decisions are being made within the corridor. Avoiding encroachments and land uses that conflict with the river's evolution lessen the costs of managing the river and decrease the potential for flood damage.

Stream Geomorphic Assessment

VT DEC

Gihon

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

Corridor Land Cover - Land Use

Reach ID	Commercial	Crop	Field	Forest	Industrial	Residential	Shrub	Water	Wetland	Total
M01	3.5	1.6	5.0	6.8		32.7		24.6	25.8	100.0
M02		5.8	0.6	28.9	0.7	44.0	0.6	19.3		100.0
M03	1.4	9.3	4.8	15.0		34.8		34.6		100.0
M04		13.9	0.6	26.7		27.3		31.6		100.0
M05		22.8	18.2	12.0		7.0		31.9	8.2	100.0
M06		35.2	0.7	16.2		21.3		26.6		100.0
M07		33.4		28.1		0.1		32.5	5.9	100.0
M08		1.7	2.2	57.1		1.8		37.2		100.0
M09		3.1	1.2	49.9		8.9		36.9		100.0
M10		4.8		65.3				20.8	9.1	100.0
M11		3.5	2.5	43.4		23.0		27.6		100.0
M12		2.9	1.2	60.1		1.8	0.1	28.9	4.9	100.0
M12.01		1.1		16.2		18.6	2.2	61.9		100.0
M12.02			0.2	46.3				53.4		100.0
M12.03		4.7	1.7	25.2		20.3		48.2		100.0
M12.04		2.0	4.1	19.5		4.4		70.1		100.0
M12.05			0.6	27.0				72.3		100.0
M12.06		0.7	0.3	23.0		13.8		62.2		100.0
M12.07		0.7	2.3	28.3		3.7		65.0		100.0
M12.08		2.7	0.9	66.7		0.0		29.3	0.3	100.0
M12.09		0.4		46.1				53.5		100.0
M12.10		3.5		64.1				19.0	13.5	100.0
M12.11		1.3		40.1				58.6		100.0
M13	0.3	2.4	6.1	40.4		17.5		26.1	7.2	100.0
M14	0.2	7.0	0.2	31.4		22.2		35.0	3.9	100.0
M15		7.5	0.3	65.9		0.3		25.1	0.9	100.0
M15.01		10.1	2.0	41.4		10.3		36.2		100.0
M15.02				57.4		5.1		37.5		100.0
M15.03		1.6		50.6				47.8		100.0
M15.04				44.3				55.7		100.0
M15.05				91.3				8.7		100.0
M15.06				26.8				73.2		100.0
M15.07				40.8				59.2		100.0
M15.08				81.5				14.1	4.5	100.0
M16		12.2	0.7	53.4		13.9		11.9	7.8	100.0
M16.01		4.8		32.9		1.1		37.2	23.9	100.0
M16.02		2.9	0.5	42.5		0.5		21.9	31.6	100.0
M16.03		0.7		42.7		6.7		49.9		100.0
M16.04				49.8				50.2		100.0
M16.05				57.6				42.4		100.0
M16.06				54.7				45.3		100.0
M16.07				84.6				15.4		100.0
M17		4.1	0.2	74.9		2.4		2.2	16.2	100.0
M18		1.9	0.8	57.4		13.7		8.3	17.9	100.0
M19		2.5	0.6	35.9		12.3		30.0	18.7	100.0
M20		2.5		55.6				34.9	7.0	100.0
M21		1.2		56.1				42.7		100.0
M21.01				53.4				46.6		100.0
M21.02				52.3		3.5		44.2		100.0
M21.03		8.4	2.7	45.5		16.4		26.8	0.2	100.0

M21.04	3.7	62.7		20.0	13.5	100.0
M21.05		59.1		40.9		100.0
M21.06	0.4	46.5		14.4	38.6	100.0
M21.07		47.7		52.3		100.0
M21.08		76.7		23.3		100.0
M22	0.6	50.5		48.9		100.0
M23	0.6	68.0	0.3	23.1	8.0	100.0
M23.01	6.6	49.2	3.3	39.8	1.2	100.0
M24		56.8	6.8	36.4		100.0
M25	5.0	43.8	2.3	44.6	4.4	100.0
M26	3.6	38.8	3.8	53.8		100.0

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Stream Geomorphic Assessment



Gihon

Phase 1 - Step 6. Floodplain Modification and Planform Changes

Basin: Lamoille Watershed: Lamoille River Sub-watershed: Lamoille River -- Gihon River to mouth

Step Reach ID	6.1 Berms & Roads		6.2 Corridor Development		6.3 Depositional Features		6.4 Meander Migration		6.5 Meander Width Ratio		6.6 Wa Length	
	Length	Percent Impact	Length	Percent Impact	Type	Impact	Type	Impact	Width	Ratio		Impact
M01	1058	19.2 Low	1644.7	29.9 High	Multiple	Low	Migration	Low	82	1.0	High	82
M02	1913	97.9 High	0.0	0.0 N.S.	Point	Low	None	N.S.	None	Unk.	Unk.	
M03	3054	98.9 High	1032.2	33.4 High	None	N.S.	None	N.S.	81	1.0	High	81
M04	1475	99.4 High	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M05	None	N.S.	141.6	5.3 Low	Point	Low	Migration	Low	78	1.0	High	78
M06	2142	100.8 High	0.0	0.0 N.S.	None	N.S.	None	N.S.	97	1.3	High	672
M07	None	N.S.	0.0	0.0 N.S.	None	N.S.	Migration	Low	77	1.0	High	77
M08	None	N.S.	0.0	0.0 N.S.	None	N.S.	Migration	Low	76	1.0	High	76
M09	981	22.8 High	141.6	3.3 N.S.	Point	Low	Migration	Low	76	1.0	High	76
M10	None	N.S.	0.0	0.0 N.S.	Multiple	High	Multiple	High	415	5.6	N.S.	672
M11	1526	84.9 High	295.8	16.5 Low	None	N.S.	Migration	Low	None	Unk.	Unk.	
M12	None	N.S.	0.0	0.0 N.S.	Multiple	High	Multiple	High	73	1.0	High	73
M12.01	None	N.S.	58.6	5.5 Low	Point	N.S.	None	N.S.	None	Unk.	Unk.	
M12.02	None	N.S.	0.0	0.0 N.S.	Point	N.S.	None	N.S.	None	Unk.	Unk.	
M12.03	None	N.S.	0.0	0.0 N.S.	Point	N.S.	None	N.S.	None	Unk.	Unk.	
M12.04	None	N.S.	136.9	4.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M12.05	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M12.06	1169	30.6 High	89.6	2.3 N.S.	None	N.S.	No Data	N.S.	None	Unk.	Unk.	
M12.07	None	N.S.	103.9	3.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M12.08	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M12.09	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M12.10	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M12.11	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M13	1093	22.6 High	1281.2	26.5 High	None	N.S.	Migration	Low	67	1.0	High	67
M14	826	13.0 Low	1346.4	21.2 High	Point	Low	Migration	Low	67	1.0	High	67
M15	None	N.S.	0.0	0.0 N.S.	None	N.S.	Migration	Low	63	1.0	High	63
M16	2231	46.3 High	368.7	7.7 Low	None	N.S.	None	N.S.	109	1.9	High	500
M17	2364	30.8 High	0.0	0.0 N.S.	Point	Low	None	N.S.	98	2.0	High	381
M18	None	N.S.	196.5	4.5 N.S.	None	N.S.	Migration	Low	46	1.0	High	46
M19	1088	23.1 High	464.9	9.9 Low	Point	Low	Migration	Low	66	1.6	High	392
M20	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	None	Unk.	Unk.	
M21	None	N.S.	0.0	0.0 N.S.	None	N.S.	None	N.S.	50	1.9	High	196

M22	None	N.S.	0.0	0.0	N.S.	None	N.S.	None	N.S.	53	Unk.
M23	None	N.S.	0.0	0.0	N.S.	None	N.S.	None	N.S.	2.8	High
M24	None	N.S.	90.4	5.3	Low	None	N.S.	None	N.S.	Unk.	Unk.
M25	None	N.S.	0.0	0.0	N.S.	None	N.S.	None	N.S.	Unk.	Unk.
M26	None	N.S.	104.7	3.5	N.S.	None	N.S.	None	N.S.	Unk.	Unk.

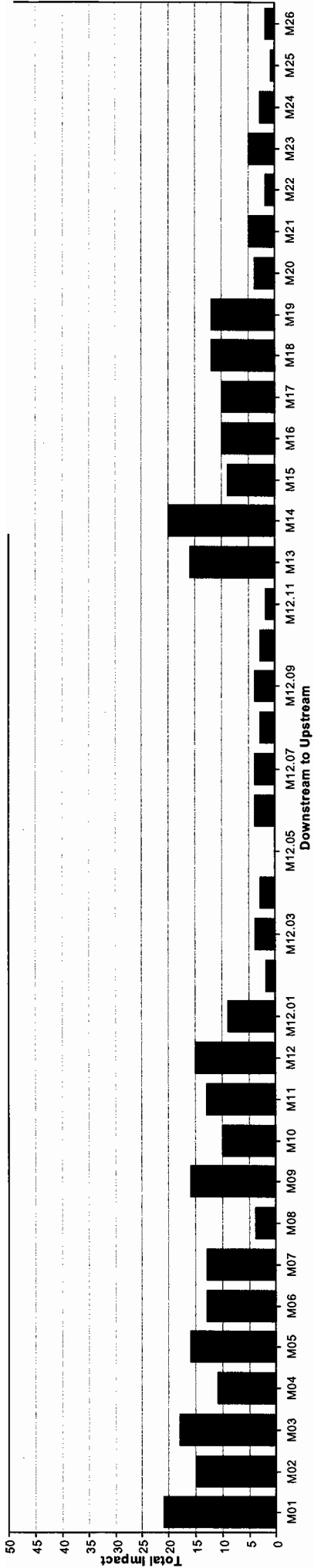
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Stream Geomorphic Assessment

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Gihon

Phase 1 - Step 8. Summary of Categorical Impacts

Basin: Lamoille Watershed: Lamoille River Sub-watershed: Lamoille River -- Gihon River to mouth

Reach ID	Stream or Tributary	Stream Type			Total (out of 32)	Step 4	Step 5	Step 6
		Stream Type	Bed Material	Subclass Slope		Land Use (out of 6)	Instream Modification (out of 10)	Floodplain Modification (out of 12)
M01	Gihon River	C	Gravel	Riffle-Pool	21	5	5	9
M02	Gihon River	B	Gravel	Plane Bed	15	6	6	3
M03	Gihon River	C	Gravel	Riffle-Pool	18	5	4	8
M04	Gihon River	B	Bedrock	Bedrock	11	5	4	2
M05	Gihon River	C	Gravel	Riffle-Pool	16	5	3	7
M06	Gihon River	C	Gravel	Riffle-Pool	13	5	4	4
M07	Gihon River	C	Gravel	Riffle-Pool	13	5	3	5
M08	Gihon River	B	Bedrock	Bedrock	4	2	1	1
M09	Gihon River	C	Gravel	Riffle-Pool	16	4	4	8
M10	Gihon River	C	Gravel	Riffle-Pool	10	3	2	4
M11	Gihon River	B	Bedrock	Step-Pool	13	4	5	4
M12	Gihon River	C	Gravel	Riffle-Pool	15	2	3	8
M12.01	Wild Brook	B	Gravel	Plane Bed	9	4	4	1
M12.02	Wild Brook	B	Gravel	Plane Bed	2	2	0	0
M12.03	Wild Brook	C	Gravel	Riffle-Pool	4	4	0	0
M12.04	Wild Brook	B	Gravel	Plane Bed	3	2	1	0
M12.05	Wild Brook	C	Gravel	Riffle-Pool	0	0	0	0
M12.06	Wild Brook	A	Cobble	Step-Pool	4	2	0	2
M12.07	Wild Brook	B	Cobble	Step-Pool	4	3	1	0
M12.08	Wild Brook	B	Cobble	Plane Bed	3	3	0	0
M12.09	Wild Brook	A	Cobble	Step-Pool	4	3	1	0
M12.10	Wild Brook	B	Cobble	Step-Pool	3	3	0	0
M12.11	Wild Brook	A	Cobble	Step-Pool	2	2	0	0
M13	Gihon River	C	Gravel	Riffle-Pool	16	4	3	9
M14	Gihon River	C	Gravel	Riffle-Pool	20	5	5	9
M15	Gihon River	C	Gravel	Riffle-Pool	9	2	2	5
M16	Gihon River	C	Gravel	Riffle-Pool	10	3	2	5
M17	Gihon River	E	Gravel	Riffle-Pool	10	2	1	6
M18	Gihon River	C	Gravel	Riffle-Pool	12	3	3	5
M19	Gihon River	C	Gravel	Riffle-Pool	12	3	2	7

	C	Sand	Riffle-Pool	4	3	0	0
M20	Gihon River	Sand	Riffle-Pool	4	3	0	0
M21	Gihon River	Sand	Riffle-Pool	5	1	0	3
M22	Gihon River	Sand	Riffle-Pool	2	2	0	0
M23	Gihon River	Gravel	Riffle-Pool	5	2	0	2
M24	Gihon River	Cobble	Cascade	3	1	1	1
M25	Gihon River	Cobble	Step-Pool	1	1	0	0
M26	Gihon River	Cobble	Cascade	2	1	1	0
Total Scores				314	112	71	118
Percent of Each Impact Category					35.7 %	22.6 %	37.6 %

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Gihon: Overview



- Reach Points
- ▲ Culverts
- Pond/Lake
- Stream/River
- - - 100' Contours

Lamoille County
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SOURCE:

POLITICAL BOUNDARIES: 1:24000 USGS Quadrangles, VCGI, 1991.

ROADS: 1:5000 E-911 Road Data, 2005.

SURFACE WATER: On-screen digitized from 1:5000 digital orthophotos using USGS 7 1/2' quadrangles and 1:20000 color infrared aerial photography as additional source material, VCGI for VHD-USGS, 2001.

IMAGERY: NAIP Photography 2003.

