

VT RAPID GEOMORPHIC ASSESSMENT ----- CONFINED STREAMS

For narrowly and semi-confined valley types (confinement ratio < 4)

Stream Name: _____

Segment I.D.: _____

Location: _____

Date: _____

Observers: _____

Town: _____

Organization / Agency: _____

Elevation: _____ ft.

Reference Stream Type _____ Modified

Weather: _____

(If bedrock controlled gorge, alluvial fan, or naturally braided system see Handbook Protocols)

Rain Storm within past 7 days: Y / N

Adjustment Process	Condition Category			
	Reference	Good	Fair	Poor
7.1 Channel Degradation (Incision) <ul style="list-style-type: none"> Exposed till or fresh substrate in the stream bed and exposed infrastructure (bridge footings). New terraces or recently abandoned flood prone areas. Headcuts, or nickpoints significantly steeper bed segment and comprised of smaller bed material than typical steps. Freshly eroded, vertical banks. Alluvial sediments that are imbricated (stacked like dominoes) high in the bank. Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. Depositional features with steep faces, usually occurring on the downstream end. Stream Type Departure <input type="checkbox"/> Type of STD: _____	<input type="checkbox"/> Little evidence of localized slope increase or nickpoints.	<input type="checkbox"/> Minor localized slope increase or nickpoints.	<input type="checkbox"/> Sharp change in slope, head cuts present, and/or tributaries rejuvenating.	<input type="checkbox"/> Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.
	<input type="checkbox"/> Incision Ratio $\geq 1.0 < 1.2$ and Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio > 1.2	<input type="checkbox"/> Incision Ratio $\geq 1.2 < 1.4$ and Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio > 1.2	<input type="checkbox"/> Incision Ratio $\geq 1.4 < 2.0$ and Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio > 1.2	<input type="checkbox"/> Incision ratio ≥ 2.0 and Where channel slope < 4% Entrenchment ratio ≤ 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio ≤ 1.2
	<input type="checkbox"/> Step-pool systems have full complement of expected bed features, steps complete with coarser sediment ($\geq D80$).	<input type="checkbox"/> Step-pool systems have full complement of expected bed features, steps mostly complete.	<input type="checkbox"/> Step-pool systems with incomplete (eroded) steps, dominated by runs.	<input type="checkbox"/> Step-pool bed features eroded and replaced by plane bed features.
	<input type="checkbox"/> No significant human-caused change in channel confinement.	<input type="checkbox"/> Only minor human-caused change in channel confinement.	<input type="checkbox"/> Significant human-caused change in channel confinement but no change in valley type.	<input type="checkbox"/> Human caused change in valley type.
	<input type="checkbox"/> No evidence of historic / present channel straightening, dredging, and/or channel avulsions.	<input type="checkbox"/> Evidence of minor historic dredging and/or channel avulsion.	<input type="checkbox"/> Evidence of significant historic channel straightening, dredging, or gravel mining, and/or channel avulsions.	<input type="checkbox"/> Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsions.
	<input type="checkbox"/> No known flow alterations (i.e., increases in flow and/or decreases in sediment supply).	<input type="checkbox"/> Some increase in flow and/or minor reduction of sediment load.	<input type="checkbox"/> Major historic flow alterations, greater flows and/or reduction of sediment load.	<input type="checkbox"/> Major existing flow alterations, greater flows and/or reduction of sediment load.
	Score: Historic <input type="checkbox"/>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
7.2 Channel Aggradation <ul style="list-style-type: none"> Shallow pool depths. Abundant sediment deposition on side bars and unvegetated mid-channel bars and extensive sediment deposition at obstructions, channel constrictions. Islands may be present Most of the channel bed is exposed during typical low flow periods. Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. Stream Type Departure <input type="checkbox"/> Type of STD: _____	<input type="checkbox"/> Step-pool systems have full complement of expected bed features, complete steps and deep pools.	<input type="checkbox"/> Step-pool systems with full complement of bed features. Pools filling with fine sediment and may be only slightly deeper and wider than runs.	<input type="checkbox"/> Step-pool systems with incomplete steps, dominated by runs. Pools filling with fine sediment and may be absent with runs prevailing.	<input type="checkbox"/> Step-pool bed features are filled with sediment and stream appears as a plane bed.
	<input type="checkbox"/> Minor side or delta bars present. Minor depositional features typically less than half bankfull stage in height.	<input type="checkbox"/> Single to multiple mid-channel, side or diagonal bars present. Minor depositional features typically less than bankfull stage in height.	<input type="checkbox"/> Multiple unvegetated mid-channel, side or diagonal bars present. Sediment buildup at constrictions leading to steep riffles and/or flood chutes.	<input type="checkbox"/> Multiple unvegetated mid-channel, side or diagonal bars or islands present, splitting or braiding flows even under low flow conditions.
	<input type="checkbox"/> No apparent increase in gravel / sand substrates (pebble count).	<input type="checkbox"/> Some increase in small gravel / sand substrates that may comprise over 50% of the sediments.	<input type="checkbox"/> Large increase in gravel / sand substrates that may comprise over 70% of the sediments.	<input type="checkbox"/> Homogenous gravel/sand substrates may comprise over 90% of the sediments. Fine sediment feels soft underfoot.
	<input type="checkbox"/> Low width/depth ratio ≤ 20 for channel slopes < 4% ≤ 12 for channel slopes $\geq 4\%$	<input type="checkbox"/> Low to moderate W/d ratio $> 20 \leq 30$ for slopes < 4% $> 12 \leq 20$ for slopes $\geq 4\%$	<input type="checkbox"/> Moderate to high W/d ratio $> 30 \leq 40$ for slopes < 4% $> 20 \leq 30$ for slopes $\geq 4\%$	<input type="checkbox"/> High width/depth ratio > 40 for channel slopes < 4% > 30 for channel slopes $\geq 4\%$
	<input type="checkbox"/> No known flow alterations (i.e., decrease in flow and/or increase in sediment supply).	<input type="checkbox"/> Minor reduction in flow and / or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.	<input type="checkbox"/> Major historic flow alterations, reduction in flows and / or increase in sediment load.	<input type="checkbox"/> Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.
	<input type="checkbox"/> No human-made constrictions causing upstream deposition.	<input type="checkbox"/> Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	<input type="checkbox"/> Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	<input type="checkbox"/> Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.
	Score: Historic <input type="checkbox"/>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

Adjustment Process	Condition Category																								
	Reference					Good					Fair					Poor									
7.3 Widening Channel <ul style="list-style-type: none"> Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. Erosion on both right and left banks. Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). Fracture lines at the top of the bank that appear as cracks parallel to the river. Evidence of landslides and mass failures. Mid-channel bars and side bars may be present. Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement. 	<input type="checkbox"/> Low width/depth ratio ≤ 20 for channel slopes $< 4\%$ ≤ 10 for channel slopes $\geq 4\%$					<input type="checkbox"/> Low to moderate W/d ratio $> 20 \leq 30$ for slopes $< 4\%$ $> 10 \leq 12$ for slopes $\geq 4\%$					<input type="checkbox"/> Moderate to high W/d ratio $> 30 \leq 40$ for slopes $< 4\%$ $> 12 \leq 20$ for slopes $\geq 4\%$					<input type="checkbox"/> High width/depth ratio > 40 for channel slopes $< 4\%$ > 20 for channel slopes $\geq 4\%$									
	<input type="checkbox"/> Little to no scour and erosion at the base of both banks. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.					<input type="checkbox"/> Minimal to moderate scour and erosion at the base of both banks. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.					<input type="checkbox"/> Moderate to high scour and erosion at the base of both banks. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.					<input type="checkbox"/> Continuous and laterally extensive scour and erosion at the base of both banks. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.									
	<input type="checkbox"/> Incision Ratio $\geq 1.0 < 1.2$ and Where channel slope $< 4\%$ Entrenchment ratio > 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio > 1.2					<input type="checkbox"/> Incision Ratio $\geq 1.2 < 1.4$ and Where channel slope $< 4\%$ Entrenchment ratio > 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio > 1.2					<input type="checkbox"/> Incision Ratio $\geq 1.4 < 2.0$ and Where channel slope $< 4\%$ Entrenchment ratio > 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio > 1.2					<input type="checkbox"/> Incision ratio ≥ 2.0 and Where channel slope $< 4\%$ Entrenchment ratio ≤ 1.4 Where channel slope $\geq 4\%$ Entrenchment ratio ≤ 1.2									
	<input type="checkbox"/> Minor side or delta bars present. Depositional features typically less than half bankfull stage in height.					<input type="checkbox"/> Single to multiple mid-channel or side bars present. Minor depositional features typically less than half bankfull stage in height.					<input type="checkbox"/> Multiple unvegetated mid-channel or side bars present. Major sediment buildup at the head of constrictions leading to steep riffles and/or flood chutes.					<input type="checkbox"/> Multiple unvegetated mid-channel, side or diagonal bars or islands present, splitting or braiding flows even under low flow conditions.									
	<input type="checkbox"/> No known channel and / or flow alterations (i.e., increase in flow and/or change in sediment supply).					<input type="checkbox"/> Minor increase in watershed input of flows and/or sediment. Episodic (flood) discharges resulting in short-term enlargement.					<input type="checkbox"/> Major channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).					<input type="checkbox"/> Major and extensive channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).									
Score:	Historic <input type="checkbox"/>					20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
7.4 Change in Planform <ul style="list-style-type: none"> Flood chutes present. Channel avulsions evident or impending. Change or loss in bed form structure, sometimes resulting in a mix of plane bed and step-pool forms. Island formation and/or multiple thread channels. 	<input type="checkbox"/> Low bank erosion on outside bends, little or no change in sinuosity within the reach.					<input type="checkbox"/> Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.					<input type="checkbox"/> Moderate to high lateral bank erosion on most outside bends, may include moderate change in reach sinuosity.					<input type="checkbox"/> Extensive lateral bank erosion on most outside bends, may include major change in sinuosity within the reach.									
	<input type="checkbox"/> Little or no evidence sediment buildup, only minor delta or side bars typically less than half bankfull stage in height.					<input type="checkbox"/> Single to multiple unvegetated mid-channel, delta, or side bars. Some potential for channel avulsion.					<input type="checkbox"/> Multiple unvegetated mid-channel, delta, or side bars, typically greater than bankfull stage in height. Evidence of past channel avulsion and/or islands.					<input type="checkbox"/> Multiple and major mid-channel, delta, and/or side bars. Evidence of recent channel avulsion, multiple thread channels, and islands.									
	<input type="checkbox"/> No human-caused alteration of channel planform and / or the width of the floodprone area.					<input type="checkbox"/> Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.					<input type="checkbox"/> Major alteration of channel planform and/or width of the floodprone area resulting from historic encroachment, dredging, or channel straightening.					<input type="checkbox"/> Major alteration of channel planform and the width of the floodprone area resulting from recent and extensive encroachment, dredging, and/or channel straightening.									
	<input type="checkbox"/> Human-made constrictions causing only negligible upstream deposition.					<input type="checkbox"/> Human-made constrictions smaller than floodprone width, causing minor to moderate upstream / downstream deposition.					<input type="checkbox"/> Human-made constrictions significantly smaller than floodprone width, causing major upstream / downstream deposition.					<input type="checkbox"/> Human-made constrictions significantly smaller than bankfull width, causing extensive major upstream / downstream deposition and flow bifurcation.									
Score:	Historic <input type="checkbox"/>					20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition Departure	Reference N/S	Good Minor	Fair Major	Poor Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation								
Aggradation								
Widening								
Planform								
Sub-totals:					Total Score:			

Channel Adjustment Processes: _____

*STD = Stream Type Departure where existing stream type is no longer the same as the reference stream type.

7.7 Stream Sensitivity: Very Low / Low / Moderate / High / Very High / Extreme

- * Channel Condition "default" to **poor** – significant flood damage (not able to get accurate channel data) **Y/N** ;
- * Channel Condition default to **poor** - Due to channel alterations from work in channel after flood: **Y/N**
- * Stream Sensitivity "default" to **poor** – significant flood damage (not able to get accurate channel data) **Y/N** ;
- * Stream Sensitivity "default" to **poor** Due to channel alterations from work in channel after flood: **Y/N**

VT RAPID GEOMORPHIC ASSESSMENT ----- UNCONFINED STREAMS

For narrow and broad to very broad valley types (confinement ratio ≥ 4) Typically Riffle-pool and Dune-Ripple Stream Types

Stream Name: _____

Segment I.D.: _____

Location: _____

Date: _____

Observers: _____

Town: _____

Organization /Agency: _____

Elevation: _____ ft.

Reference Stream Type _____ Modified

Weather: _____

(If alluvial fan or naturally braided system see Handbook Protocols)

Rain Storm within past 7 days: Y / N

Adjustment Process	Condition Category																			
	Reference					Good					Fair					Poor				
7.1 Channel Degradation (Incision) <ul style="list-style-type: none"> • Exposed till or fresh substrate in the stream bed and exposed infrastructure(bridge footings) • New terraces or recently abandoned floodplains. • Headcuts, or nickpoints that are 2-3 times steeper than typical riffle. • Freshly eroded, vertical banks. • Alluvial (river) sediments that are imbricated (stacked like dominoes) high in bank. • Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. • Bars with steep faces, usually occurring on the downstream end of a bar. <p>Stream Type Departure <input type="checkbox"/> Type of STD: _____</p>	<input type="checkbox"/> Little evidence of localized slope increase or nickpoints.					<input type="checkbox"/> Minor localized slope increase or nickpoints.					<input type="checkbox"/> Sharp change in slope, head cuts present, and/or tributaries rejuvenating.					<input type="checkbox"/> Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.				
	<input type="checkbox"/> Incision Ratio $\geq 1.0 < 1.2$ and Entrenchment ratio > 2.0					<input type="checkbox"/> Incision Ratio $\geq 1.2 < 1.4$ and Entrenchment ratio > 2.0					<input type="checkbox"/> Incision Ratio $\geq 1.4 < 2.0$ and Entrenchment ratio > 2.0					<input type="checkbox"/> Incision ratio ≥ 2.0 OR Entrenchment ratio ≤ 2.0				
	<input type="checkbox"/> Riffle heads complete and comprised of coarser sediments ($\geq D80$). Full complement of expected bed features.					<input type="checkbox"/> Riffle heads mostly complete. Riffle lengths may appear shorter. Full complement of expected bed features.					<input type="checkbox"/> Riffles or dunes may appear incomplete; bed profile dominated by runs.					<input type="checkbox"/> Riffle-pool or ripple-dune features replaced by plane bed features.				
	<input type="checkbox"/> No significant human-caused change in channel confinement or valley type.					<input type="checkbox"/> Only minor human-caused change in channel confinement but no change in valley type.					<input type="checkbox"/> Significant human-caused change in channel confinement enough to change valley type, but still unconfined.					<input type="checkbox"/> Human-caused change in valley type, unconfined or narrow changed to confined.				
	<input type="checkbox"/> No evidence of historic / present channel straightening, gravel mining, dredging and/or channel avulsions.					<input type="checkbox"/> Evidence of minor bar scalping on a point bar and/or channel avulsion; but <u>minor to</u> no historic channel straightening, gravel mining, or dredging.					<input type="checkbox"/> Evidence of significant historic channel straightening, dredging, gravel mining and/or channel avulsions.					<input type="checkbox"/> Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsion.				
	<input type="checkbox"/> No known flow alterations (i.e., increases in flow or decreases in sediment supply).					<input type="checkbox"/> Minor flow alterations, some flow increase and/or reduction of sediment load.					<input type="checkbox"/> Major historic flow alterations, greater flows and/or reduction of sediment load.					<input type="checkbox"/> Major existing flow alterations, greater flows and/or reduction of sediment load.				
Score: Historic <input type="checkbox"/>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
7.2 Channel Aggradation <ul style="list-style-type: none"> • Shallow pool depths. • Abundant sediment deposition on point bars and mid-channel bars and extensive sediment deposition at obstructions, channel constrictions, and at the upstream end of tight meander bends. Islands may be present. • Most of the channel bed is exposed during typical low flow periods. • High frequency of debris jams. • Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. <p>** This parameter may be a difficult to infeasible to evaluate in ripple-dune stream types</p> <p>Stream Type Departure <input type="checkbox"/> Type of STD: _____</p>	<input type="checkbox"/> Complete riffle heads and deep pools in riffle-pool systems.** Full complement of expected bed features.					<input type="checkbox"/> Mostly complete riffles and/or some filling of pools with fine sediment. Pools may only be slightly deeper and wider than runs.**					<input type="checkbox"/> Incomplete riffles or dunes and dominated by runs. Significant filling of pools with sediment, pools may be absent with runs prevailing.					<input type="checkbox"/> Riffle-pool or ripple-dune features replaced by plane bed features.				
	<input type="checkbox"/> Minor point or delta bars present. Minor depositional features typically less than half bankfull stage in height.					<input type="checkbox"/> Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.					<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present. Major sediment buildup at the head of bendways leading to steep riffles and flood chutes.					<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.				
	<input type="checkbox"/> No apparent increase in fine gravel/sand substrates (pebble count).**					<input type="checkbox"/> Some increase in fine gravel/sand substrates that may comprise over 50% of the sediments.					<input type="checkbox"/> Large incr. in fine gravel/sand substrates that may comprise over 70% of the sediments. Sediment feels soft underfoot.					<input type="checkbox"/> Homogenous fine gravel/sand substrates may comprise over 90% of the sediments. Sediment feels soft underfoot.				
	<input type="checkbox"/> Low width/depth ratio ≤ 20 for C or B type channels ≤ 10 for E type channels					<input type="checkbox"/> Low to moderate W/d ratio $>20 \leq 30$ for C or B channels $>10 \leq 12$ for E channels					<input type="checkbox"/> Moderate to high W/d ratio $>30 \leq 40$ for C or B channels $>12 \leq 20$ for E channels					<input type="checkbox"/> High width/depth ratio >40 for C or B type channels >20 for E type channels				
	<input type="checkbox"/> No known flow alterations (i.e., decrease in flow or increase in sediment supply).					<input type="checkbox"/> Minor reduction in flow and/or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.					<input type="checkbox"/> Major historic flow alterations, reduction in flows and / or increase in sediment load.					<input type="checkbox"/> Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.				
	<input type="checkbox"/> No human-made constrictions causing upstream deposition.					<input type="checkbox"/> Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.					<input type="checkbox"/> Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.					<input type="checkbox"/> Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.				
Score: Historic <input type="checkbox"/>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Adjustment Process	Condition Category			
	Reference	Good	Fair	Poor
7.3 Widening Channel <ul style="list-style-type: none"> Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. Erosion on both right and left banks in riffle sections. Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). Fracture lines at the top of the bank that appear as cracks parallel to the river. Mid-channel bars and side bars may be present. Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement. 	<input type="checkbox"/> Low width/depth ratio ≤ 20 for C or B type channels ≤ 10 for E type channels	<input type="checkbox"/> Low to moderate W/d ratio $>20 \leq 30$ for C or B channels $>10 \leq 12$ for E channels	<input type="checkbox"/> Moderate to high W/d ratio $>30 \leq 40$ for C or B channels $>12 \leq 20$ for E channels	<input type="checkbox"/> High width/depth ratio >40 for C or B type channels >20 for E type channels
	<input type="checkbox"/> Little to no scour and erosion at the base of both banks at the riffle section. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.	<input type="checkbox"/> Minimal to moderate scour and erosion at the base of both banks at the riffle section. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	<input type="checkbox"/> Moderate to high scour and erosion at the base of both banks at the riffle section. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	<input type="checkbox"/> Continuous and laterally extensive scour and erosion at the base of both banks at the riffle section. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.
	<input type="checkbox"/> Incision Ratio $\geq 1.0 < 1.2$ and Entrenchment ratio > 2.0	<input type="checkbox"/> Incision Ratio $\geq 1.2 < 1.4$ and Entrenchment ratio > 2.0	<input type="checkbox"/> Incision Ratio $\geq 1.4 < 2.0$ and Entrenchment ratio > 2.0	<input type="checkbox"/> Incision ratio ≥ 2.0 OR Entrenchment ratio ≤ 2.0
	<input type="checkbox"/> Minor point or delta bars present. Depositional features less than half bankfull stage in height.	<input type="checkbox"/> Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present. Major sediment buildup at the head of bendways leading to steep riffles and flood chutes.	<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.
	<input type="checkbox"/> No known channel and / or flow alterations (i.e., increase in flow and / or change in sediment supply).	<input type="checkbox"/> Minor increase in watershed input of flows or sediment. Episodic (flood) discharges through reach resulting in short-term enlargement.	<input type="checkbox"/> Major channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).	<input type="checkbox"/> Major and extensive channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).
Score: Historic <input type="checkbox"/>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.4 Change in Planform <ul style="list-style-type: none"> Flood chutes or neck cut-offs may be present. Channel avulsions may be evident or impending. Change or loss in bed form structure, sometimes resulting in a mix of plane bed and riffle-pool forms. Island formation and/or multiple thread channels. In meandering streams the thalweg, or deepest part of the channel, typically travels from the outside of a meander bend to the outside of the next meander bend. Pools are located on downstream third of the concave bends. Riffles are at the cross-over between the pools on successive bends. During planform adjustments, the thalweg may not line up with or follow this pattern. As a result of the lateral extension of meander bends, additional deposition and scour features may be in a channel length typically occupied by a single riffle-pool sequence. 	<input type="checkbox"/> Low bank erosion on outside bends, little or no change in sinuosity within the reach.	<input type="checkbox"/> Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.	<input type="checkbox"/> Moderate to high lateral bank erosion on most outside bends, may include potential neck cut-offs and moderate change in sinuosity.	<input type="checkbox"/> Extensive lateral bank erosion on most outside bends, may include impending neck cut-offs and major change in sinuosity within the reach.
	<input type="checkbox"/> Little evidence of flood chutes crossing inside of meander bends, only minor point or delta bars.	<input type="checkbox"/> Minor flood chutes crossing inside of meander bends, evidence of minor to moderate unvegetated mid-channel, delta, or diagonal bars. Some potential for channel avulsion.	<input type="checkbox"/> Historic or active flood chutes crossing inside of meander bends, evidence of channel avulsion, islands, and unvegetated mid-channel, delta, or diagonal bars.	<input type="checkbox"/> Active large flood chutes crossing inside of most meander bends, evidence of recent channel avulsion, multiple thread channels, islands, and unvegetated mid-channel, delta, or diagonal bars.
	<input type="checkbox"/> No additional deposition and scour features in the channel length typically occupied by a single riffle-pool sequence. Thalweg lined up with planform.	<input type="checkbox"/> Additional minor deposition and scour features in the channel length typically occupied by a single riffle-pool sequence.	<input type="checkbox"/> Additional large deposition and scour features in the channel length typically occupied by a single riffle-pool sequence. Thalweg not lined up with planform.	<input type="checkbox"/> Multiple sequences of large deposition and scour features in the channel length typically occupied by a single riffle-pool sequence.
	<input type="checkbox"/> No human-caused alteration of channel planform and / or the width of the floodprone area.	<input type="checkbox"/> Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.	<input type="checkbox"/> Major alteration of channel planform and/or the width of the floodprone area resulting from historic floodplain encroachment, dredging, or channel straightening.	<input type="checkbox"/> Major alteration of channel planform and width of the floodprone area resulting from recent and extensive floodplain encroachment, dredging, and/or channel straightening.
	<input type="checkbox"/> Human-made constrictions causing only negligible upstream deposition.	<input type="checkbox"/> Human-made constrictions smaller than floodprone width, causing minor to moderate upstream / downstream deposition.	<input type="checkbox"/> Human-made constrictions significantly smaller than floodprone width, causing major upstream / downstream deposition.	<input type="checkbox"/> Human-made constrictions significantly smaller than bankfull width, causing extensive and major upstream / downstream deposition and flow bifurcation.
	Score: Historic <input type="checkbox"/>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition Departure	Reference N/S	Good Minor	Fair Major	Poor Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation							7.6 Stream Condition:	
Aggradation								
Widening								
Planform								

Channel Adjustment Processes: _____

7.7 Stream Sensitivity: Very Low / Low / Moderate / High / Very High / Extreme

* Channel Condition "default" to **poor** – significant flood damage (not able to get accurate channel data) **Y/N** ;

* Channel Condition default to poor - Due to channel alterations from work in channel after flood: **Y/N**

* Stream Sensitivity "default" to **poor** – significant flood damage (not able to get accurate channel data) **Y/N** ;

* Stream Sensitivity "default" to **poor** Due to channel alterations from work in channel after flood: **Y/N**

VT RAPID GEOMORPHIC ASSESSMENT ----- PLANE BED STREAMS

Typically found in semi-confined to narrow valley types (confinement ratio ≥ 3 and ≤ 5)

Reminder: This RGA form should only be used on streams which are plane bed systems by reference. Many existing plane bed streams in Vermont represent a departure from another stream type.

Stream Name: _____

Segment I.D: _____

Location: _____

Date: _____

Observers: _____

Town: _____

Organization /Agency: _____

Elevation: _____ ft.

Reference Stream Type _____ Modified

Weather: _____

(If alluvial fan or naturally braided system see Handbook Protocols)

Rain Storm within past 7 days: Y / N

Adjustment Process	Condition Category			
	Reference	Good	Fair	Poor
<p>7.1 Channel Degradation (Incision)</p> <ul style="list-style-type: none"> • Exposed till or fresh substrate in the stream bed and exposed infrastructure (bridge footings). • New terraces or recently abandoned floodplains. • Headcuts, or nickpoints that are 2-3 times steeper than typical riffle. • Freshly eroded, vertical banks. • Alluvial (river) sediments that are imbricated (stacked like dominoes) high in bank. • Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. <p>Stream Type Departure <input type="checkbox"/> Type of STD: _____</p>	<input type="checkbox"/> Little evidence of localized slope increase or nickpoints.	<input type="checkbox"/> Minor localized slope increase or nickpoints.	<input type="checkbox"/> Sharp change in slope, head cuts present, and/or tributaries rejuvenating.	<input type="checkbox"/> Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.
	<input type="checkbox"/> Incision ratio $\geq 1.0 < 1.2$ and Where channel slope $> 2\%$ Entrenchment ratio > 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio > 2.0	<input type="checkbox"/> Incision ratio $\geq 1.2 < 1.4$ and Where channel slope $> 2\%$ Entrenchment ratio > 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio > 2.0	<input type="checkbox"/> Incision ratio $\geq 1.4 < 2.0$ and Where channel slope $> 2\%$ Entrenchment ratio > 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio > 2.0	<input type="checkbox"/> Incision ratio ≥ 2.0 and Where channel slope $> 2\%$ Entrenchment ratio ≤ 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio ≤ 2.0
	<input type="checkbox"/> No significant human-caused change in channel confinement or valley type.	<input type="checkbox"/> Only minor human-caused change in channel confinement but no change in valley type.	<input type="checkbox"/> Significant human-caused change in channel confinement enough to change valley type, but still not narrowly confined.	<input type="checkbox"/> Human-caused change to a narrowly confined valley type.
	<input type="checkbox"/> No evidence of historic or present channel straightening, gravel mining, dredging and/or channel avulsions.	<input type="checkbox"/> Evidence of minor mid-channel bar scalping and/or channel avulsion, but <u>minor to no</u> historic channel straightening, gravel mining or dredging.	<input type="checkbox"/> Evidence of significant historic channel straightening, dredging, gravel mining and/or channel avulsions.	<input type="checkbox"/> Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsion.
	<input type="checkbox"/> No known flow alterations (i.e., increases in flow or decreases in sediment supply).	<input type="checkbox"/> Minor flow alterations, some flow increase and/or minor reduction of sediment load.	<input type="checkbox"/> Major historic flow alterations, greater flows and/or reduction of sediment load.	<input type="checkbox"/> Major existing flow alterations, greater flows and/or reduction of sediment load.
	<p>Score: Historic <input type="checkbox"/></p>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<p>7.2 Channel Aggradation</p> <ul style="list-style-type: none"> • Very shallow pocket pools around and below boulders. • Abundant sediment deposition on side, point and mid-channel bars and extensive sediment deposition at obstructions, channel constrictions, and at the upstream end of tight bendways. Islands may be present. • Most of the channel bed is exposed during typical low flow periods. • Increased frequency of woody debris in channel. • Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. <p>Stream Type Departure <input type="checkbox"/> Type of STD: _____</p>	<input type="checkbox"/> Minor side, point or delta bars present. Minor depositional features typically less than half bankfull stage in height.	<input type="checkbox"/> Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present. Sediment buildup at the head of bendways leading to steep riffles and flood chutes.	<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.
	<input type="checkbox"/> No apparent increase in fine gravel/sand substrates (pebble count).	<input type="checkbox"/> Some increase in fine gravel/sand substrates that may comprise over 50% of the sediments.	<input type="checkbox"/> Large increase in fine gravel/sand substrates that may comprise over 70% of the sediments. Fine sediment feels soft underfoot.	<input type="checkbox"/> Homogenous fine gravel/sand substrates may comprise over 90% of the sediments. Fine sediment feels soft underfoot.
	<input type="checkbox"/> Low width/depth ratio W/d ≤ 20	<input type="checkbox"/> Low to moderate W/d ratio W/d $>20 \leq 30$	<input type="checkbox"/> Moderate to high W/d ratio W/d $>30 \leq 40$	<input type="checkbox"/> High width/depth ratio W/d >40
	<input type="checkbox"/> No known flow alterations (i.e., decrease in flow or increase in sediment supply).	<input type="checkbox"/> Minor reduction in flow and/or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.	<input type="checkbox"/> Major historic flow alterations, reduction in flows and / or increase in sediment load.	<input type="checkbox"/> Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.
	<input type="checkbox"/> No human-made constrictions causing upstream deposition.	<input type="checkbox"/> Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	<input type="checkbox"/> Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	<input type="checkbox"/> Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.
	<p>Score: Historic <input type="checkbox"/></p>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

Adjustment Process	Condition Category																			
	Reference					Good					Fair					Poor				
7.3 Widening Channel <ul style="list-style-type: none"> Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. Erosion on both right and left banks in riffle sections. Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). Fracture lines at the top of the bank that appear as cracks parallel to the river. Mid-channel bars and side bars may be present. Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement. 	<input type="checkbox"/> Low width/depth ratio W/d < 20					<input type="checkbox"/> Low to moderate W/d ratio W/d > 20 < 30					<input type="checkbox"/> Moderate to high W/d ratio W/d > 30 < 40					<input type="checkbox"/> High width/depth ratio W/d > 40				
	<input type="checkbox"/> Little to no scour and erosion at the base of both banks. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.					<input type="checkbox"/> Minimal to moderate scour and erosion at the base of both banks. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.					<input type="checkbox"/> Moderate to high scour and erosion at the base of both banks. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.					<input type="checkbox"/> Continuous and laterally extensive scour and erosion at the base of both banks. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.				
	<input type="checkbox"/> Incision Ratio $\geq 1.0 < 1.2$ and Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio > 2.0					<input type="checkbox"/> Incision Ratio $\geq 1.2 < 1.4$ and Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio > 2.0					<input type="checkbox"/> Incision Ratio $\geq 1.4 < 2.0$ and Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio > 2.0					<input type="checkbox"/> Incision ratio ≥ 2.0 and Where channel slope $\leq 2\%$ Entrenchment ratio ≤ 1.4 Where channel slope $\leq 2\%$ Entrenchment ratio ≤ 2.0				
	<input type="checkbox"/> Minor side, point or delta bars present. Minor depositional features typically less than half bankfull stage in height.					<input type="checkbox"/> Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.					<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present. Sediment buildup at the head of bendways leading to steep riffles and flood chutes.					<input type="checkbox"/> Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.				
	<input type="checkbox"/> No known channel and / or flow alterations (i.e., increase in flow and/or change in sediment supply).					<input type="checkbox"/> Minor increase in watershed input of flows or sediment. Episodic (flood) discharges through reach resulting in short-term enlargement.					<input type="checkbox"/> Major channel and / or flow alterations, increase in flows and/or change in sediment load (increase or decrease).					<input type="checkbox"/> Major and extensive channel and/or flow alterations, increase in flows and / or change in sediment load (increase or decrease).				
Score: Historic <input type="checkbox"/>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
7.4 Change in Planform <ul style="list-style-type: none"> Flood chutes may be present. Channel avulsions may be evident or impending. Change or loss in bed form structure, sometimes resulting in a mix of plane bed and riffle-pool forms. Island formation and/or multiple thread channels. 	<input type="checkbox"/> Low bank erosion on outside bends, little or no change in sinuosity within the reach.					<input type="checkbox"/> Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.					<input type="checkbox"/> Moderate to high lateral bank erosion on most outside bends, may include moderate change in sinuosity.					<input type="checkbox"/> Extensive lateral bank erosion on most outside bends, may include major change in sinuosity within the reach.				
	<input type="checkbox"/> Little evidence of flood chutes crossing inside of bends, only minor side, point, or delta bars.					<input type="checkbox"/> Minor flood chutes crossing inside of bends, evidence of single to multiple unvegetated mid-channel, delta, or diagonal bars. Some potential for channel avulsion.					<input type="checkbox"/> Historic or active flood chutes crossing inside of bends, evidence of channel avulsion, islands, and multiple unvegetated mid-channel, delta, or diagonal bars.					<input type="checkbox"/> Active large flood chutes, evidence of recent channel avulsion, multiple thread channels, islands, and multiple unvegetated mid-channel, delta, or diagonal bars.				
	<input type="checkbox"/> No human-caused alteration of channel planform and / or the width of the floodprone area.					<input type="checkbox"/> Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.					<input type="checkbox"/> Major alteration of channel planform and/or the width of the floodprone area resulting from historic floodplain encroachment, dredging, or channel straightening.					<input type="checkbox"/> Major alteration of channel planform and width of the floodprone area resulting from recent and extensive floodplain encroachment, dredging, and/or channel straightening.				
	<input type="checkbox"/> Human-made constrictions causing only negligible upstream deposition.					<input type="checkbox"/> Human-made constrictions smaller than floodprone width, causing minor to moderate upstream / downstream deposition.					<input type="checkbox"/> Human-made constrictions significantly smaller than floodprone width, causing major upstream / downstream deposition.					<input type="checkbox"/> Human-made constrictions significantly smaller than bankfull width, causing extensive and major upstream / downstream deposition and flow bifurcation.				
Score: Historic <input type="checkbox"/>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition	Reference	Good	Fair	Poor	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Departure	N/S	Minor	Major	Extreme				
Degradation							7.6 Stream Condition:	
Aggradation								
Widening								
Planform								
Sub-totals:					Total Score:			

Channel Adjustment Processes: _____

7.7 Stream Sensitivity: Very Low / Low / Moderate / High / Very High / Extreme

* Channel Condition "default" to **poor** – significant flood damage (not able to get accurate channel data) **Y/N** ;

* Channel Condition default to poor - Due to channel alterations from work in channel after flood: **Y/N**

* Stream Sensitivity "default" to **poor** – significant flood damage (not able to get accurate channel data) **Y/N** ;

* Stream Sensitivity "default" to **poor** Due to channel alterations from work in channel after flood: **Y/N**