VTANR REACH HABITAT ASSESSMENT ----- RIFFLE-POOL STREAM TYPE

(Also use this form for dune-ripple stream type.)

Stream Name:	Segment I.D:	
Location:	Date:	
	Town:	
Observers:	Elevation:	ft.
Organization / Agency:	Latitude (N/S):	
USGS Map Name(s):	Longitude (E/W):	
Weather:		sq. mi.
Flow: base / low / avg. Storm within past 7 days: Y / N	Segment Length:	ft.

Flow: base / low /	avg. Storm within past 7 day	Segment Length: ft.							
Habitat		Condition (Depa	Condition (Departure) Category						
Parameter	Reference (None)	Good (Minor)	Fair (Major)	Poor (Severe)					
	☐ LWD pieces / mile > 100	$\Box 100 \ge LWD / mile > 50$	$\Box 50 \ge LWD / mile > 25$	\square LWD / mile \leq 25					
6.1 Woody Debris Cover	☐ LWD size rank 3-6 >50%	□ $50 \ge LWD \text{ rank } 3-6 > 25\%$	□ $25 \ge LWD \text{ rank } 3-6 > 10\%$	☐ LWD size rank 3-6 ≤ 10%					
LWD size rank variable	□ debris jams / mile > 5	\Box 5 \geq jams / mile $>$ 3	\square 3 \geq jams / mile > 1	☐ debris jams absent					
only used if ≥ 10 pieces	☐ high woody debris recruitment potential	☐ moderate woody debris recruitment potential	☐ low woody debris recruitment potential	no woody debris recruitment potential					
	☐ CPOM present in channel and margins	☐ CPOM limited in channel and present in margins	☐ CPOM limited in both channel and margins	☐ CPOM absent					
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1					
6.2 Bed Substrate	□ riffle embeddedness < 20% margin embeddedness < 40%	$\begin{array}{l} \square \ 20 \leq emb_{riffle} < 40\% \\ 40 \leq emb_{margin} < 60\% \end{array}$	$\begin{array}{c} \square \ 40 \leq emb_{riffle} < 75\% \\ 60 \leq emb_{margin} < 80\% \end{array}$	□ riffle embeddedness ≥ 75% margin embeddedness ≥ 80%					
Cover	□ fining* < 10%	□ 10 ≤ fining* < 20%	□ 20 ≤ fining* < 40%	□ fining* ≥ 40%					
*fines: sand if $d_{50} \ge$ gravel, otherwise silt.	☐ Riffle stability index < 70%	$\Box 70 \le RSI < 80\%$	□ 80 ≤ RSI < 90%	□ RSI ≥ 90%					
(Dune-ripple stream type: Fining only.)	☐ sediment apparently stable & sorted	□ some evidence of sediment mobility & lack of sorting	☐ major evidence of sediment mobility & lack of sorting	☐ sediments unstable, unsorted, soft underfoot					
	□ substrate free of dense algae growth	☐ small substrate patches covered by dense algae growth	☐ large substrate patches covered by dense algae growth	☐ most of substrate covered by dense algae growth					
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1					
	□ pools / mile > 40	\square 40 \geq pools / mile $>$ 20	\square 20 \geq pools / mile > 10	\square pools / mile ≤ 10					
6.3 Scour and Deposition	□ pool size rank 3-7 >50%	\Box 50 \geq pool rank 3-7 $>$ 25%	\square 25 \geq pool rank 3-7 $>$ 10%	□ pool size rank 3-7 ≤ 10%					
Features	☐ good cover > 75% of total pool surface area	☐ 75 ≥ good cover > 50% of total pool surface area	□ 50 ≥ good cover > 25% of total pool surface area	☐ good cover ≤ 25% of total pool surface area					
(Dune-ripple stream type: Only evaluate pools and ripples.)	☐ riffle (ripple) coverage > 25% reach area, distinctly formed and complete	☐ 25 ≥ riffle coverage > 10% reach area, moderately well formed and complete	□ 25 ≥ riffle coverage > 10% reach area, poorly formed and incomplete	☐ riffle (ripple) coverage ≤ 10% reach area, or mostly indistinct					
Depth-velocity <u>combinations</u> fast-shallow	$□ 5 ≤ riffle spacing ≤ 7 bankfull channel widths (w_{bkf})$	$\begin{tabular}{l} $ & \exists \ spacing < 5, \ or \ 7 < \\ & riffle \ spacing \le 10 \ x \ w_{bkf} \end{tabular}$	□ 1 ≤ riffle spacing < 3, or 10 < riffle spacing ≤ 12 x wbkf	□ riffle spacing ≥ 12 bankfull channel widths					
fast-deep slow-shallow slow-deep (cutoffs: 1.0 fps, 1.5 ft)	☐ well-defined riffle-run-pool- glide pattern with all four depth-velocity combinations present	☐ well-defined riffle-run-pool- glide pattern with three depth-velocity combinations dominant	☐ moderately defined riffle- run-pool-glide pattern with two depth-velocity combinations dominant	☐ poorly defined riffle-run- pool-glide pattern with one depth-velocity combination dominant					
Pool size rank variable only used if ≥ 5 pools	☐ finer deposition located entirely in slack water below larger substrates/debris, and along margins	nd substrates/debris, signs of substrates/debris, abundant		☐ finer deposition throughout channel, even filling pools, larger substrates almost buried or bed largely incised					
SCORE	20 19 18 17 16	mid-channel accumulation	mid-channel accumulation	5 4 3 2 1					
6.4 Channel Morphology	□ width/depth < 15, natural □ entrenchment ratio ≥ 1.4, incision ratio < 1.2, good floodplain access	□ 15 ≤ w / d < 25, widening □ entrenchment ratio ≥ 1.4, 1.2 ≤ incision ratio < 1.4, reduced floodplain access	□ 25 ≤ w / d < 40, widening □ entrenchment ratio ≥ 1.4, 1.4 ≤ incision ratio < 2.0, limited floodplain access	□ w / d > 40, over-widening □ entrenchment ratio < 1.4 or incision ratio ≥ 2.0, floodplain access unlikely					
	☐ no evidence of channel alteration	☐ evidence of minor historic channel alteration	☐ major historic or minor recent channel alteration	☐ extensive historic or major recent channel alteration					
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1					

Habitat	Condition (Departure) Category											
Parameter	Refe	erence (N	one)	Go	od (Min	or)	Fa	air (Majo	r)	Poor (Severe)		
	□ wetted w	vidth / W _{bkf}	> 0.75	\square 0.75 \geq V	V _{wet} / W _{bkf}	> 0.50	□ 0.50 ≥ V	W _{wet} / W _{bkf}	> 0.25	\square W _{wet} / W _{bkf} \leq	0.25	
6.5 Hydrologic Characteristics	□ exposed	substrate <	20%	□ 20 <u><</u> exp	o. substrate	e < 40%	□ 40 ≤ exp	p. substrate	e < 60%	□ exposed subs	trate ≥ 60%	
	☐ adjacent springs, seeps, and wetlands extensive			☐ adjacent wetland	t springs, s s present	eeps, and		t springs, se s minimal	eeps, and	□ adjacent sprin wetlands abs	ngs, seeps, and ent or altered	
	□ no know	n flow alte	ration	☐ minor flow alteration likely due to flow regulation and/or land use changes			due to f	ow alterati low regulate changes	on likely tion and/or	runoff characteristics completely altered due to flow regulation and storm water influence		
SCORE	20 19		17 16	15 14	13	12 11	10 9	8	7 6	5 4 3	3 2 1	
6.6 Connectivity Tend towards a	block loa	uctions in r ngitudinal i ic species o st flows	novement	obstruct	ck movem	nt in reach	bankfull in reach	wo small to l obstruction that block ent of aqua	ons present	☐ more than tw obstructions j that block mo aquatic specie	present in reach	
higher/lower score for natural/man-made obstructions	□ system o	bstructions	absent	□ limited	system obs	structions	□ system o	obstruction	is present	□ many system	obstructions	
	□ abundan refuge	t low and h	nigh flow	□ abundar or high	it refuge, v flow refug		☐ limited line refuge	low and hi	gh flow	☐ refuge absent		
SCORE	20 19		17 16	15 14		12 11	10 9	8	7 6	5 4 3		
6.7 River Banks	☐ bank erosion <10%, typical of natural conditions, little or no bank revetments						□ 30 ≤ bank erosion < 60%, mod. unstable banks, and/or extensive bank revetments			□ bank erosion ≥ 60%, banks unstable, extensive erosion, and failing bank revetments		
Select different boxes for LB and RB if necessary	bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank			□ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank			in two c reduced create li	nk vegetation three lay diversity, imited cover not stabili	ers, plants er and	, □ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank		
Undercut size rank variable only used if ≥ 5	□ bank car	nopy > 90%	ò	□ 90 <u>≥</u> bar	nk canopy	> 75%	\Box 75 \geq bank canopy $>$ 50%			□ bank canopy ≤ 50%		
undercuts	□ undercut			\square 30 \geq undercuts / mile > 15				dercuts / m		□ undercuts / m		
	□ undercut 50%	t bank size	rank 3-6 >	\Box 50 \geq uno 3-6 > 2:		k size rank	\Box 25 \geq uno 3-6 > 10		k size rank	d undercut bank size rank 3-6 ≤ 10%		
	stable bo	t banks with oundaries, a ging vegeta nt water ad	abundant ation, and	reduced vegetati	ts with sore boundarie overhang on, and co diacency	es or ing	undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced			undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency		
(score each bank)	□ no mass	failures in	valley		failure in v	allev	water adjacency □ 1 - 2 mass failures in valley		$\square \ge 3$ mass fail	ares in valley		
SCORE (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	
SCORE (RB)	Right Bank		9	8	7	6	5	4	3	2	1	
6.8 Riparian Area Select different boxes for LB and RB if necessary	shrub and herb layers, diverse assemblages, no invasives, maximum channel canopy		minimal invasives, maximum channel canopy			h ☐ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy			layer, several types absent, large altered areas, invasives present, reduced canopy			
(score each side of the channel)		astructure a		☐ river con and infr	astructure			rridor deve astructure		☐ river corridor and infrastrue	eture abundant	
SCORE (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	
SCORE (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	

6.9	Score: front + back = total					
	Percentage: total score x (100 / 160) =					
	Overall Physical Habitat Condition:					
	SHTD ☐ Existing Stream Habitat Type:					

Score	Percentage	Condition (Departure)
136 – 160	85 – 100	Reference (None)
104 – 135	65 – 84	Good (Minor)
56 – 103	35 – 64	Fair (Major)
0 – 55	0 - 34	Poor (Severe)

VTANR REACH HABITAT ASSESSMENT ----- STEP-POOL STREAM TYPE

(Also use this form for cascade and bedrock stream types.)

Stream Name:	Segment I.D:	
Location:	Date:	
	Town:	
Observers:	Elevation:	ft
Organization /Agency:	Latitude (N/S):	
USGS Map Name(s):	Longitude (E/W):	
Weather:	Drainage Area:	sq. mi
Flow: base / low / avg. Storm within past 7 days: Y / N	Segment Length:	ft

Habitat	D.C. (M.)	Condition (Depa	, , , , , , , , , , , , , , , , , , ,	D (C)			
Parameter	Reference (None)	Good (Minor)	Fair (Major)	Poor (Severe)			
	☐ LWD pieces / mile > 200	\square 200 \geq LWD / mile $>$ 100	\square 100 \geq LWD / mile $>$ 50	\square LWD / mile \leq 50			
6.1 Woody Debris Cover	□ LWD size rank 3-6 >75%	□ $75 \ge LWD \text{ rank } 3-6 > 50\%$	\Box 50 \geq LWD rank 3-6 $>$ 25%	☐ LWD size rank 3-6 ≤ 25%			
LWD size rank variable	□ debris jams / mile > 25	\square 25 \geq jams / mile $>$ 15	\Box 15 \geq jams / mile $>$ 5	□ jams / mile ≤ 5			
only used if ≥ 10 pieces	high woody debris recruitment potential	☐ moderate woody debris recruitment potential	low woody debris recruitment potential	☐ no woody debris recruitment potential			
	☐ CPOM present in channel and margins	☐ CPOM limited in channel and present in margins	☐ CPOM limited in both channel and margins	☐ CPOM absent			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
6.2 Bed Substrate	□ pool embeddedness < 25% margin embeddedness < 40%	$\begin{array}{c} \square \ 25 \leq emb_{pool} < 50\% \\ 40 \leq emb_{margin} < 60\% \end{array}$	$\begin{array}{c} \square \ 50 \leq emb_{pool} < 75\% \\ 60 \leq emb_{margin} < 80\% \end{array}$	□ pool embeddedness ≥ 75% margin embeddedness ≥ 80%			
Cover	☐ fining* < 10%	□ 10 ≤ fining* < 20%	□ 20 ≤ fining* < 40%	☐ fining* ≥ 40%			
*fines: sand if $d_{50} \ge$ gravel, otherwise silt.	☐ sediment apparently stable & sorted	□ some evidence of sediment mobility & lack of sorting	☐ major evidence of sediment mobility & lack of sorting	☐ sediments unstable, unsorted, soft underfoot			
	□ substrate free of dense algae growth	□ small substrate patches covered by dense algae growth	☐ large substrate patches covered by dense algae growth	☐ most of substrate covered by dense algae growth			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
	\square pools / mile > 70	\square 70 \geq pools / mile $>$ 50	\square 50 \geq pools / mile $>$ 30	\square pools / mile \leq 30			
6.3 Scour and Deposition	□ pool size rank 3-7 >50%	$\Box 50 \ge \text{pool rank } 3-7 > 25\%$	\square 25 \geq pool rank 3-7 $>$ 10%	□ pool size rank 3-7 ≤ 10%			
Features	☐ good cover > 75% of total pool surface area	□ 75 ≥ good cover > 50% of total pool surface area	□ 50 ≥ good cover > 25% of total pool surface area	☐ good cover over ≤ 25% of total pool surface area			
Depth-velocity <u>combinations</u> fast-shallow fast-deep	☐ steps are distinctly formed, complete and stable	☐ steps are moderately well formed, complete and stable	☐ steps are poorly formed, incomplete and unstable	steps are indistinct or absent, or very unstable			
slow-shallow slow-deep (cutoffs: 1.0 fps, 1.5 ft)	□ 5 ≤ step spacing ≤ 7 bankfull channel widths (wbkf)	$□ 3 \le \text{step spacing} < 5, \text{ or } 7 < $ $\text{step spacing} \le 10 \text{ x } w_{bkf}$	□ 1 ≤ step spacing < 3, or 10 < step spacing ≤ 15 x wbkf	□ step spacing ≥ 15 bankfull channel widths			
Pool size rank variable only used if \geq 5 pools	☐ more than two depth-velocity combinations present	☐ two depth-velocity combinations present	one or two depth-velocity combinations present	☐ one depth-velocity combination present			
(Cascade and bedrock stream types: Do not evaluate variables related to step pattern.)	☐ finer deposition located entirely in slack water below larger substrates/debris, and along margins	☐ finer deposition located in slack water below larger substrates/debris, signs of mid-channel accumulation	very large depositional features below larger substrates/debris, abundant mid-channel accumulation	☐ finer deposition throughout channel, even filling pools, larger substrates almost buried or bed largely incised			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
	□ width/depth < 12, natural	\Box 12 \le w / d < 15, widening	\Box 15 \le w / d < 25, widening	\square w / d \ge 25, over-widening			
6.4 Channel Morphology	□ entrenchment ratio ≥ 1.2, incision ratio < 1.2, good floodplain access	□ entrenchment ratio ≥ 1.2, 1.2 ≤ incision ratio < 1.4, reduced floodplain access	□ entrenchment ratio ≥ 1.2, 1.4 ≤ incision ratio < 2.0, limited floodplain access	□ entrenchment ratio < 1.2 or incision ratio ≥ 2.0, floodplain access unlikely			
	☐ no evidence of channel alteration	☐ evidence of minor historic channel alteration	☐ major historic or minor recent alteration	☐ extensive historic or major recent alteration			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			

Habitat	Condition (Departure) Category												
Parameter	Refe	erence (N	one)	G	ood (Min	or)		Fa	ir (Majo	or)		Poor (Severe)
	□ wetted w	idth / W _{bkf}	> 0.75	□ 0.75 ≥ ¹	W _{wet} / W _{bkt}	> 0.50	□ 0.5	$0 \ge V$	V _{wet} / W _{bk}	$_{\rm f} > 0.25$	□ W,	vet / W _{bkf}	≤ 0.25
6.5 Hydrologic Characteristics	\square exposed	substrate <	< 10%	□ 10 ≤ ex	\Box 10 \le exp. substrate < 30% \Box 30				\square 30 \leq exp. substrate \leq 50%			osed subs	trate ≥ 50%
	□ adjacent and wetl	springs, se ands exten			t springs, s lands pres				springs, s ands mini				ngs, seeps, and ent or altered
	□ no know	n flow alte	ration	likely d	low alterat ue to flow and use ch	regulation	like	ly du	ow alterati e to flow ind use cha	regulation	conflow		tered due to on and storm
SCORE	20 19		17 16	15 14		12 11	10	9	8	7 6	5		3 2 1
6.6 Connectivity Tend towards a higher/lower score for	block lor			obstruc	ck movem	nt in reach	ban in r	kfull each t	that block	ons present	obst that	ructions	o bankfull present in reach ovement of es
natural/man-made obstructions	□ system o	bstructions	s absent	□ limited	system ob	structions	□ syst	tem o	bstruction	is present	□ mar	y system	obstructions
	□ abundan refuge	t low and l	nigh flow		nt refuge, v flow refug		□ lim		low and h	igh flow	□ refi	ige absen	t
SCORE	20 19	18	17 16	15 14	13	12 11	10	9	8	7 6	5	4	3 2 1
6.7 River Banks		conditions,	, typical of little or no	infrequ	nk erosion ent small a vetments	< 20%, areas, some	mo	d. uns	k erosion stable ban e bank rev	ks, and/or	uns	table, ext	\geq 50%, banks ensive erosion, ank revetments
Select different boxes for LB and RB if necessary	- 1 1			□ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank			☐ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank			, □ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank			
Undercut size rank variable only used if ≥ 5	□ bank can	opy > 90%	ó	□ 90 > ba	nk canopy	> 80%	\Box 80 \geq bank canopy $>$ 60%			> 60%	□ ban	canopy	≤ 60%
undercuts	□ undercut	banks / m	ile > 15	\Box 15 \geq undercuts / mile > 10			□ 10 ≥	≥ und	ercuts / m	ile > 5	□ und	ercuts / m	nile ≤ 5
	□ undercut 50%	bank size	rank 3-6 >		□ $50 \ge$ undercut bank size rank $3-6 > 25\%$ □ $25 \ge$ undercut bank size rank $3-6 > 10\%$			k size rank	nk ☐ undercut bank size rank 3-6 ≤ 10%				
(score each bank)	 □ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency □ no mass failures in valley 			undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency			undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency				 □ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency □ > 3 mass failures in valley 		
		1		□ 1 mass	failure in v	1 -	□ 1 - 3	2 mas	ss failures				
SCORE(LB)	Left Bank	10	9	8	7	6	5		4	3		2	1
SCORE (RB)	Right Bank	10	9	8 = 200 > b	7 uffer widtl	6 > 150 ft	5) > bu	4 ffer width	3 > 100 ft	□ buft	2 For width	1 100 ft
6.8 Riparian Area Select different boxes for LB and RB if necessary	shrub and herb layers, diverse			 □ 200 ≥ buffer width > 150 ft □ 90 ≥ rip. veg. > 75% in each layer, one plant type absent, minimal invasives, maximum channel canopy 			h \Box 75 \geq rip. veg. $>$ 50% in each			% in each s absent, vasives	□ buffer width ≤ 100 ft □ rip. veg. ≤ 50% in each layer, several types absent, large altered areas, invasives present, reduced canopy		
(score each side of the channel)	and infra	ridor devel	bsent	and infi	rridor deve	minimal	and		ridor deve	common		infrastru	development cture abundant
SCORE(LB)	Left Bank	10	9	8	7	6	5		4	3		2	1
SCORE (RB)	Right Bank	10	9	8	7	6	5		4	3		2	1

6.9	Score: front + back = total
	Percentage: total score x (100 / 160) =
	Overall Physical Habitat Condition:
	SHTD Existing Stream Habitat Type

Score	Percentage	Condition (Departure)
136-160	85 – 100	Reference (None)
104 – 135	65 – 84	Good (Minor)
56 – 103	35 – 64	Fair (Major)
0 - 55	0 - 34	Poor (Severe)

Stream Name:	Segment I.D:	
Location:	Date:	
	Town:	
Observers:	Elevation:	ft.
Organization / Agency:	Latitude (N/S):	
USGS Map Name(s):	Longitude (E/W):	
Weather:	Drainage Area:	sq. mi.
Flow: base / low / avg. Storm within past 7 days: Y / N	Segment Length:	ft.

Habitat		Condition (Depa	rture) Category	_			
Parameter	Reference (None)	Good (Minor)	Fair (Major)	Poor (Severe)			
	☐ LWD pieces / mile > 50	\square 50 \geq LWD / mile $>$ 25	\square 25 \geq LWD / mile $>$ 10	\square LWD / mile ≤ 10			
6.1 Woody Debris Cover	□ LWD size rank 3-6 >50%	□ $50 \ge LWD \text{ rank } 3-6 > 25\%$	□ $25 \ge LWD \text{ rank } 3-6 > 10\%$	☐ LWD size rank 3-6 ≤ 10%			
LWD size rank variable	□ debris jams / mile > 5	\Box 5 \geq jams / mile $>$ 3	\square 3 \geq jams / mile > 1	☐ debris jams absent			
only used if ≥ 10 pieces	high woody debris recruitment potential	☐ moderate woody debris recruitment potential	☐ low woody debris recruitment potential	☐ no woody debris recruitment potential			
	☐ CPOM present in channel and margins	☐ CPOM limited in channel and present in margins	☐ CPOM limited in both channel and margins	□ CPOM absent			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
6.2 Bed Substrate	□ run embeddedness < 20% margin embeddedness < 40%	$\begin{array}{c} \square \ 20 \leq emb_{run} < 40\% \\ 40 \leq emb_{margin} < 60\% \end{array}$	$\begin{array}{c} \square \ 40 \leq emb_{run} < 75\% \\ 60 \leq emb_{margin} < 80\% \end{array}$	□ run embeddedness $\geq 75\%$ margin embeddedness $\geq 80\%$			
Cover	☐ fining* < 10%	□ 10 ≤ fining* < 20%	□ 20 ≤ fining* < 40%	□ fining* \geq 40%			
*fines: sand if $d_{50} \ge$ gravel, otherwise silt.	☐ sediment apparently stable & sorted	☐ some evidence of sediment mobility & lack of sorting	☐ major evidence of sediment mobility & lack of sorting	☐ sediments unstable, unsorted, soft underfoot			
	☐ imbrication limited, or mostly with the short axis of particles overlapping in the direction of flow	☐ imbrication moderate, mostly with the short axis of particles overlapping in the direction of flow	☐ imbrication moderate, mostly with the long axis of particles overlapping in the direction of flow	☐ imbrication extensive, mostly with the long axis of particles overlapping in the direction of flow			
	□ substrate free of dense algae growth	☐ small substrate patches covered by dense algae growth	☐ large substrate patches covered by dense algae growth	☐ most of substrate covered by dense algae growth			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
6.3 Scour and	□ pool formation evident, with ≥50% pool size rank 3-7	□ pool formation evident, with <50% pool size rank 3-7	☐ limited trace of pool formation	☐ pool formation completely absent			
Deposition Features	□ widespread riffle formation	□ moderate riffle formation	☐ limited riffle formation	□ no riffle formation			
Depth-velocity combinations	more than two depth-velocity combinations present	two depth-velocity combinations present	one or two depth-velocity combinations present	one depth-velocity combination present			
fast-shallow fast-deep slow-shallow slow-deep (cutoffs: 1.0 fps, 1.5 ft)	☐ meandering thalweg clearly identifiable in cross section, with evidence of side and lateral bar formation	☐ meandering thalweg moderately identifiable in cross section, with some evidence of bar formation	☐ meandering thalweg barely identifiable in the cross section, with minimal evidence of bar formation	☐ meandering thalweg not identifiable in the cross section, with no evidence of bar formation			
Pool size rank variable only used if ≥ 5 pools	☐ finer deposition located entirely in slack water below larger substrates/debris, and along margins	☐ finer deposition located in slack water below larger substrates/debris, signs of mid-channel accumulation	□ very large depositional features below larger substrates/debris, abundant mid-channel accumulation	☐ finer deposition throughout channel, even filling pools, larger substrates almost buried or bed largely incised			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
6.4 Channel Morphology	□ width/depth < 15, natural □ entrenchment ratio ≥ 1.4, incision ratio < 1.2, good floodplain access	☐ 15 ≤ w / d < 25, widening ☐ entrenchment ratio ≥ 1.4, ☐ 1.2 ≤ incision ratio < 1.4, ☐ reduced floodplain access	□ $25 \le w/d \le 40$, widening □ entrenchment ratio ≥ 1.4 , $1.4 \le incision ratio \le 2.0$, limited floodplain access	 □ w /d ≥ 40, over-widening □ entrenchment ratio < 1.4 or incision ratio ≥ 2.0, floodplain access unlikely 			
	☐ no evidence of channel alteration	evidence of minor historic channel alteration	☐ major historic or minor recent channel alteration	 extensive historic or major recent channel alteration 			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			

Habitat	Condition (Departure) Category										
Parameter	Reference (None)		Good (Minor)			Fair (Major)			Poor (Severe)		
	□ wetted wi	dth / W _{bkf}	> 0.75	$\Box 0.75 \ge W_{\text{wet}} / W_{\text{bkf}} > 0.50$		$\Box 0.50 \ge W_{\text{wet}} / W_{\text{bkf}} > 0.25$			\square W _{wet} / W _{bkf} \leq	0.25	
6.5 Hydrologic Characteristics	□ exposed s			_		\Box 40 \le exp. substrate < 60\%		□ exposed substrate ≥ 60%			
	☐ adjacent springs, seeps, and wetlands extensive		☐ adjacent springs, seeps, and wetlands present		☐ adjacent springs, seeps, and wetlands minimal		☐ adjacent springs, seeps, and wetlands altered or absent				
	□ no known flow alteration		ration	☐ minor flow alteration likely due to flow regulation and/or land use changes			☐ major flow alteration likely due to flow regulation and/or land use changes			□ runoff characteristics completely altered due to flow regulation and storm water influence	
SCORE	20 19	18	17 16	15 14 13 12 11		10 9	8	7 6	5 4 3 2 1		
6.6 Connectivity Tend towards a	 no obstruction block long of aquatice the lowest 	gitudinal n species o		☐ one or two small low flow obstructions present in reach that block movement of aquatic species		 one or two small to medium bankfull obstructions present in reach that block movement of aquatic species 		☐ more than two bankfull obstructions present in reach that block movement of aquatic species			
higher/lower score for natural/man-made obstructions	□ system ob	structions	absent	☐ limited s	system obs	tructions	□ system o	obstruction	s present	□ many system	obstructions
0001110110	□ abundant refuge	low and h	igh flow		it refuge, w flow refug		☐ limited low and high flow refuge			☐ refuge absent	
SCORE	20 19		17 16	15 14		12 11	10 9 8 7 6		5 4 3		
6.7 River Banks	□ bank erosion <10%, typical of natural conditions, little or no bank revetments			<u> </u>		☐ 30 ≤ bank erosion < 60%, mod. unstable banks, and/or extensive bank revetments		☐ bank erosion ≥ 60%, banks unstable, extensive erosion, and failing bank revetments			
Select different boxes for LB and RB if necessary	□ bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank		layers, s, plants	□ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank		☐ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank		□ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank			
Undercut size rank variable only used if ≥ 5	□ bank canopy > 90%			\square 90 \geq bank canopy $>$ 75%		\Box 75 \geq bank canopy $>$ 50%		☐ bank canopy	≤ 50%		
undercuts	□ undercut l	banks / mi	le > 20	\square 20 \geq undercuts / mile > 15		\square 15 \geq undercuts / mile > 5		□ undercuts / mile \leq 5			
	□ undercut l 50%	bank size i	rank 3-6 >	□ 50 ≥ undercut bank size rank 3-6 > 25%		\square 25 \geq undercut bank size rank 3-6 > 10%		□ undercut bank size rank 3-6 ≤ 10%			
(score each bank)	☐ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency ☐ no mass failures in valley		bundant tion, and acency	undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency			undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency			□ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency □ > 3 mass failures in valley	
(*****	□ no mass i	iditates iii	variey	□ 1 mass f	ailure in v	alley	□ 1 - 2 ma	ss failures	in valley	- 5 mass ran	ares in variey
SCORE(LB)	Left Bank	10	9	8	7	6	5	4	3	2	1
SCORE (RB)	Right Bank ☐ buffer wice	10	9 Ft	8 □ 150 > bi	7 ıffer width	> 100 ft	5 □ 100 > bi	4 uffer width	> 50 ft	2 □ buffer width	< 50 ft
6.8 Riparian Area Select different boxes for LB and RB if necessary	☐ rip. vegetation > 75% in tree, shrub and herb layers, diverse assemblages, no invasives, maximum channel canopy		% in tree, rs, diverse rasives,	□ 150 ≥ buffer width > 100 ft □ 75 ≥ rip. veg. > 50% in each layer, one plant type absent, minimal invasives, maximum channel canopy			□ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy			□ rip. veg. ≤ 50% in each layer, several types absent, large altered areas, invasives present, reduced canopy	
(score each side of the channel)		tructure al	bsent	☐ river corridor development and infrastructure minimal		☐ river corridor development and infrastructure common		☐ river corridor development and infrastructure abundant			
SCORE(LB)	Left Bank	10	9	8	7	6	5	4	3	2	1
SCORE (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1

6.9	Score: front + back = total					
	Percentage: total score x (100 / 160) =					
	Overall Physical Habitat Condition:					
	SHTD Existing Stream Habitat Type:					

Score	Percentage	Condition (Departure)
136 – 160	85 – 100	Reference (None)
104 – 135	65 – 84	Good (Minor)
56 – 103	35 – 64	Fair (Major)
0 - 55	0 - 34	Poor (Severe)

VTANR REACH HABITAT ASSESSMENT ----- BRAIDED STREAM TYPE

(Also use this form for alluvial fans.)

Stream Name:	Segment I.D:	
Location:	Date:	
	Town:	
Observers:	Elevation:	ft.
Organization /Agency:	Latitude (N/S):	
USGS Map Name(s):	Longitude (E/W):	
Weather:	Drainage Area:s	sq. mi
Flow: base / low / avg. Storm within past 7 days: Y / N	Segment Length:	ft.

Flow: base / low /	avg. Storm within past 7 day	ys: Y / N	Segment Length:	ft.			
Habitat	Condition (Departure) Category						
Parameter	Reference (None)	Good (Minor)	Fair (Major)	Poor (Severe)			
	☐ LWD pieces / mile > 100	\square 100 \geq LWD / mile $>$ 50	\Box 50 \geq LWD / mile \geq 25	\square LWD / mile \leq 25			
6.1 Woody Debris Cover	□ LWD size rank 3-6 >50%	□ $50 \ge LWD \text{ rank } 3-6 > 25\%$	$\Box 25 \ge LWD \text{ rank } 3-6 > 10\%$	☐ LWD size rank 3-6 ≤ 10%			
	□ debris jams / mile > 5	\Box 5 \geq jams / mile $>$ 3	$ms / mile > 3$ $\square 3 \ge jams / mile > 1$				
LWD size rank variable only used if ≥ 10 pieces	☐ high woody debris recruitment potential	☐ moderate woody debris recruitment potential	☐ low woody debris recruitment potential	□ no woody debris recruitment potential			
	☐ CPOM present in channel and margins	☐ CPOM limited in channel and present in margins	☐ CPOM limited in both channel and margins	☐ CPOM absent			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
6.2 Bed Substrate	□ riffle embeddedness < 20% margin embeddedness < 40%	$\begin{array}{c} \square \ 20 \leq emb_{riffle} < 40\% \\ 40 \leq emb_{margin} < 60\% \end{array}$	$\begin{array}{c} \square \ 40 \leq emb_{riffle} < 75\% \\ 60 \leq emb_{margin} < 80\% \end{array}$	□ riffle embeddedness ≥ 75% margin embeddedness ≥ 80%			
Cover	☐ fining* < 10%	\Box 10 \le fining* < 20%	\square 20 \le fining* < 40%	□ fining* ≥ 40%			
*fines: sand if $d_{50} \ge$ gravel, otherwise silt.	☐ Riffle stability index < 70%	□ 70 ≤ RSI < 80%	□ 80 ≤ RSI < 90%	□ RSI ≥ 90%			
	☐ sediment apparently stable & sorted	☐ some evidence of sediment mobility & lack of sorting	☐ major evidence of sediment mobility & lack of sorting	☐ sediments unstable, unsorted, soft underfoot			
	□ substrate free of dense algae growth	☐ small substrate patches covered by dense algae growth	☐ large substrate patches covered by dense algae growth	☐ most of substrate covered by dense algae growth			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
	□ pools / mile > 40	\square 40 \geq pools / mile $>$ 20	\square 20 \geq pools / mile > 10	\square pools / mile ≤ 10			
6.3 Scour and Deposition	□ pool size rank 3-7 >50%	\square 50 \geq pool rank 3-7 $>$ 25%	\square 25 \geq pool rank 3-7 $>$ 10%	□ pool size rank $3-7 \le 10\%$			
Features	□ good cover > 75% of total pool surface area	☐ 75 ≥ good cover > 50% of total pool surface area	☐ 50 ≥ good cover > 25% of total pool surface area	☐ good cover ≤ 25% of total pool surface area			
Depth-velocity <u>combinations</u> fast-shallow fast-deep slow-shallow	□ riffle coverage > 25% reach area, distinctly formed and complete	☐ 25 ≥ riffle coverage > 10% reach area, moderately well formed and complete	□ 25 ≥ riffle coverage > 10% reach area, poorly formed and incomplete	☐ riffle coverage ≤ 10% reach area, or mostly indistinct or absent			
slow-deep (cutoffs: 1.0 fps, 1.5 ft)	$\begin{tabular}{l} \square $5 \le $riffle spacing \le 7$ bankfull \\ $channel widths (w_{bkf})$ \end{tabular}$	$\begin{tabular}{l} \square $3 \le $riffle spacing < 5, or 7 < \\ $riffle spacing \le 10 \ x \ w_{bkf} \end{tabular}$		☐ riffle spacing ≥ 12 bankfull channel widths			
Pool size rank variable only used if ≥ 5 pools	☐ well-defined riffle-run-pool- glide pattern with all four depth-velocity combinations present	☐ well-defined riffle-run-pool- glide pattern with three depth-velocity combinations dominant	☐ moderately defined riffle- run-pool-glide pattern with two depth-velocity combinations dominant	□ poorly defined riffle-run- pool-glide pattern with one depth-velocity combination dominant			
	□ stable bars, vegetative cover on depositional features ≥ 50%, particles well-sorted	□ mostly stable bars, vegetative cover on depositional features 50- 25%, particles moderately sorted	□ unstable bars present, vegetative cover on depositional features 25- 10%, particles minimally sorted	☐ mostly unstable bars, vegetative cover on depositional features < 10%, particles not sorted			
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1			
6.4 Channel Morphology	□ width/depth < 30, natural □ entrenchment ratio ≥ 2.0, incision ratio < 1.0, good floodplain access	☐ 30 ≤ w/ d < 40, widening ☐ entrenchment ratio ≥ 2.0, 1.0 ≤ incision ratio < 1.2, reduced floodplain access	□ 40 ≤ w / d < 50, widening □ entrenchment ratio ≥ 2.0, 1.2 ≤ incision ratio < 1.4, limited floodplain access	 □ w / d ≥ 50, over-widening □ entrenchment ratio < 2.0 or incision ratio ≥ 1.4, floodplain access unlikely 			
	no evidence of channel	□ evidence of minor historic	major historic or minor	□ extensive historic or major			
SCORE	alteration 20 19 18 17 16	channel alteration 15 14 13 12 11	recent channel alteration recent channel alteration 1 10 9 8 7 6 5 4 3 2 1				
SCORE	20 17 10 17 10	10 17 10 12 11	7 0 7 0	J 7 J 2 1			

Habitat	Condition (Departure) Category										
Parameter	Refe	erence (N	one)	Go	ood (Min	or)	Fair (Major)			Poor (S	Severe)
	□ wetted v	vidth / W _{bkf}	> 0.50	□ 0.50 ≥ V	W _{wet} / W _{bkf}	> 0.30	$\Box 0.30 \ge W_{wet} / W_{bkf} > 0.10$			\square W _{wet} / W _{bkf} \leq	0.10
6.5 Hydrologic Characteristics	□ exposed	substrate <	50%	\square 50 \leq exp. substrate $<$ 60%		\Box 60 \le exp. substrate < 70%			□ exposed substrate ≥ 70%		
	☐ adjacent springs, seeps, and wetlands extensive		☐ adjacent springs, seeps, and wetlands present		☐ adjacent springs, seeps, and wetlands minimal		□ adjacent sprii wetlands abso	ngs, seeps, and ent or altered			
	□ no known flow alteration			☐ minor flow alteration likely due to flow regulation and/or land use changes			☐ major flow alteration likely due to flow regulation and/or land use changes			☐ runoff characteristics completely altered due to flow regulation and storm water influence	
SCORE	20 19		17 16	15 14 13 12 11			10 9 8 7 6			J , ,	3 2 1
6.6 Connectivity Tend towards a higher/lower score for	block lo	uctions in r ngitudinal r ic species o est flows	novement	obstruct	ck moveme	nt in reach	 one or two small to medium bankfull obstructions present in reach that block movement of aquatic species 			☐ more than tw obstructions in that block more aquatic specie	present in reach
natural/man-made obstructions	□ system o	bstructions	s absent	□ limited	system obs	structions	□ system o	obstruction	ns present	□ many system	obstructions
	□ abundan refuge	t low and l	nigh flow		nt refuge, v flow refug		☐ limited refuge	low and h	igh flow	□ refuge absen	t
SCORE	20 19		17 16	15 14	_	12 11	10 9	8	7 6		3 2 1
6.7 River Banks	□ bank erosion <10%, typical of natural conditions, little or no bank revetments						☐ 30 ≤ bank erosion < 60%, mod. unstable banks, and/or extensive bank revetments			☐ bank erosion ≥ 60%, banks unstable, extensive erosion, and failing bank revetments	
Select different boxes for LB and RB if necessary	□ bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank			□ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank			☐ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank			□ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank	
Undercut size rank variable only used if > 5	□ bank canopy > 90%			\square 90 \geq bank canopy $> 75\%$			\Box 75 \geq bank canopy $>$ 50%			□ bank canopy	<u>≤</u> 50%
undercuts	□ undercut banks / mile > 30		ile > 30	\square 30 \geq undercuts / mile > 15		\square 15 \geq undercuts / mile > 5		□ undercuts / mile \leq 5			
	□ undercut 50%	t bank size	rank 3-6 >	0 50 ≥ undercut bank size rank 3-6 > 25%		□ 25 ≥ undercut bank size rank 3-6 > 10%		□ undercut bank size rank 3-6 ≤ 10%			
(score each bank)	☐ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency ☐ no mass failures in valley			undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency			undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency			□ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency □ > 3 mass failures in valley	
GCODE (I.D.)	1.00.1	10	0		failure in v			ss failures	in valley	2	
SCORE (LB) SCORE (RB)	Left Bank Right Bank	10	9	8	7	6	5	4	3	2 2	1
SCORE(RD)		vidth > 150	_	\Box 150 \geq b		_		uffer width	_	□ buffer width	< 50 ft
6.8 Riparian Area Select different boxes for LB and RB if necessary	☐ rip. vegetation > 75% in tree,			\Box 75 \geq rip. veg. $>$ 50% in each			□ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy				
(score each side of the channel)		ridor devel astructure a		☐ river corridor development and infrastructure minimal			☐ river corridor development and infrastructure common			☐ river corridor development and infrastructure abundant	
SCORE (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1
SCORE (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1

0.9	Score: front + back	= total	
	Percentage: total score	x (100 / 160) =	
	Overall Physical Habitat Co	ondition:	_
	SHTD Existing Stream H	abitat Type:	

Score	Percentage	Condition (Departure)
136 – 160	85 – 100	Reference (None)
104 – 135	65 – 84	Good (Minor)
56 – 103	35 – 64	Fair (Major)
0 - 55	0 - 34	Poor (Severe)