						DITION	TEOODY							
					CO		ATEGORY			r				KDWP, 1996;
			Optimal			Suboptima		Ma	arginal		Poor			Newton et al.,
able	3c. Instream	>7 of the	following: de			ottom includ ed in Optima	es 5-7 of the al Category	includes <	el bottom 5 of the items		l bottom include isted in Optimal			1998 USDA/NRCS
aria	Bottom	boulders/g	gravel, logs/la	arge woody				listed i	n Optimal					SVAP page 13/
< a	Topography	debris,	backwaters/	oxbows,				Ca	tegory					ovva pago io/
e	3	overhan	ging vegetati	on, riffles,										
ō		vegetate	ed shallows, i	rootwads,										
≧		undercut	banks, or sid	le channel										
ō			pools											
Enter Score for Only One Variable	Grade	10	9	8	7	6	5	4	3	2	1	0	4	
Scor					CO	NDITION C	ATEGORY	GRADE or	SCORE					
e	or		Optimal			Suboptima			arginal		Poor			
ut.			0.05 to 0.099	9		0.035 to 0.0			0.03 or >0.10	0.161	o 0.20 due to e	xcessive		
ш	3c. Manning's								0.15		n to flow or 0.0			
	n										elization and cl			
											channel.	,		
·	Grade	10	9	8	7	6	5	4	3	2	1	0		
					CO		ATEGORY		SCORE					USACE,
			Optimal			Suboptima			arginal	1	Poor		-	Norfolk District,
	3d. Channel	Incision rat	tio <u>></u> 1.0 <1.2	and Whore	Incision ra		and Where		tio <u>></u> 1.4 < 2.0	Incicion ra	tio >2.0 and W	horo channol	-	2004 SAAM
	Incision		ope >2%; En			lio <u>></u> 1.2 < 1.4 lope >2%, Ei			uo <u>></u> 1.4 < 2.0 ere channel		%, Entrenchme			
	(TLB/BFD=BH		; Where cha			iope >2%, Ei 4; Where cha			ere channel e > 2%,		%, Entrenchme ere channel slop			Form 1 #1 and
	R; 1/BHR*Adj		trenchment			rtrenchment			e > 2 %, hment ratio		trenchment rati			VT Stream
		<u><</u> 2%, EI	menchment	1410 >2.0	<u><</u> 2%, E	nuenchmenu	Talio >2.0		ere channel	En	lienchmentrau	0 <u><</u> 2.0		Geomorphic
	Factor =CI)													Assessment
									e <u><</u> 2%,					Phase 2
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	TLB =		10		BHR =	1	-			-				
Ē	BFD =		10											
	Grade	10	9	8	7	6	5	4	3	2	1	0	3	
-								· · ·				· · ·		
4	DYNAMIC SUR	FACE WA	IER STOR	AGE									-	
			A		CO		ATEGORY							Newton, et al.,
		_	Optimal			Suboptima			arginal		Poor			1998 USDA/
	4a.Pools		shallow pool			esent, but no			resent, but		sent, or the ent			NRCS SVAP
	(abundant,		n 30% of the			0% of the po			om 5-10% of	disce	rnible. No wate	er = zero.		page 14;
	present or			or pools are		ue to depth,			l bottom is					Barbour, et al.,
	absent)	at l	east 5 feet d	eep.	are a	at least 3 fee	t deep.		due to depth,					1999
	,								ols are less					
								than 3	feet deep.					
-	Grade	10	9	8	7	6	5	4	3	2	1	0	0	
	4b. Channel		•				ATEGORY							
	Flow Status		Ontinent		00					r	Deer		-	D. (
			Optimal			Suboptima			arginal		Poor			Barbour, et al.,
	(degree to		ches base of			s >75% of th			s 25-75% of		water in chann			1999 EPA RBA
	which channel		nd minimal a			el; or <25% o			ble channel,	present as	s standing pools	s. No water =		page 5-19 /A-
	is filled)	channel	substrate is	exposed.	sub	strate is exp	osed.		fle substrates		zero.			9#5; TCEQ
									tly exposed.					1999; VANR,
	Grade	10	9	8	7	6	5	4	3	2	1	0	0	2005
						~		l Function O	on o oite - la -la	L	aara/Tatal D	aaibla C		
						Cá	aculation of	Function C	apacity Index	x = 10tal S	core/Total Po		0.00	
												FCI = #/100		

I. HYDROLOGIC FUNCTIONS

S10 Trib2 (0.5-2')

Type in the second of t		ER QUALITY/E ARIABLES		EOCH	IEMICAL F	UNCTIONS		_		S10 Tri	b2 (0.5-2')			SCORE	Re
NOTES CONDITION CATEGORY GRADE or SCORE 1. SEDIMENT TRANSPORT/DEPOSITION Suboptimal Marginal Poor 1. SEDIMENT TRANSPORT/DEPOSITION Suboptimal Marginal Poor 1. SEDIMENT TRANSPORT/DEPOSITION Suboptimal Marginal Poor Stability Banks table; velocine of costs or or biomership their sections and theory, brives bank if end Suboptimal Marginal Poor Optimal To Thus problems if of the sections or the sections and theory, brives bank if end Suboptimal Marginal Botom Stark Botom Stark Optimal To Thus problems if the sections or the sections of theory, brives bank if end Suboptimal Marginal Poor Optimal To Thus problems if the sections of the sections	T	YPF					1								1	Sc
CONDITION CATEGORY GRADE or SCORE Is. Bank, Stability (score each bank, fallor absent or minimal, littlet bank, littlet, ordered or encore right facing downstream) Marginal Determinit of trutter problems. <5%; of S-30% of bank in reach has areas of s-30% of bank in reach has areas of s-30% of bank in reach has areas of south areas of erosion, high erosion potential of trutter problems. <5%; of S-30% of bank in reach has areas of Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Ho. Channel Bottom fla of bank is generally highly resistant plant/soil matrix or material. Bottom fla of bank is generally highly resistant plant/soil matrix or material. Bottom fla of bank is generally highly resistant plant/soil matrix or material. Bottom fla of bank is generally highly resistant plant/soil matrix or material. Bottom fla of bank is generally highly resistant plant/soil matrix or material. Bottom fla of bank is generally highly resistant plant/soil matrix or matrix severely compromised. Grade (Left) 10 9 8 7 <															1	
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Is. Bank Optimal Subpitmal Marginal Poor Stability Banks table; orderace of crosion mostly healed over, optimal of future problems. <5% of bank affected. Moderately stable; inforquent; Marking Moderately and areas of crosion, high erosion, potential of turine problems. <5% of bank affected. Stability Instable; 30: bank affected. Instable; 30: bank affected. <td></td>																
Stability (score each bank failure astable: orderately stable: infoquent, small bank failure aster or mining; list of bank failure aster or mining; list of stable infoquence aster or mining; list of stable (list); list); list of stable (list); list of stable (list); list); list of stable (list); list); list of stable (list); list); list of stable (list); list)							COI									Ne
generality bank laflor: absent or minimal; title hank, laflor: absent or minimal; title hank affected. 5:30% of bank in reach has areas of erosion. Got of bank in reach has areas of erosion. areas frequently along straight erosion potential during ficods. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Ho. Channel Bottom Bank Stability Extra title as an ease of material. Extra ti																et
bark left or right facility potential for future problems. <5% of bark affected. 5-30% of bank is reacin has areas of erosion. areas of erosion. yill erosion potential during floods. sections and bands: sources bank soughing: 60-100% of bank has erosional scars. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 Bottom Rank Stability Optimal Suboptimal Marginal Poor Avg.Score Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Bottom Bank Stability Bottom 1/3 of bank is generally highly residue material; plant/soil matrix compromised. Bottom 1/3 of bank is generally material; plant/soil matrix compromised. Bottom 1/3 of bank is generally material. Bottom 1/3 of bank is generally material; plant/soil matrix compromised. Bottom 1/3 of bank is generally material. Bottom 1/3 of bank is generally material. Bottom 1/3 of bank is generally material; plant/soil matrix compromised. Bottom 1/3 of bank is generally material. Bottom 1/3 of bank is generally material; plant/soil matrix compromised. Bottom 1/3 of bank is generally material. B		,														19
right facing downstream bank affected. erosion. erosion potential during floods. sloughing: 60-100% of bank has erosional scars. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 - Arg.Score CONDITION CATEGORY GRADE or SCORE - Arg.Score - Arg.Score Bottom Bank Stability Bottom 17.0 bank is generally highly resistant plant/soil matrix or material. Bottom 17.0 bank is generally resistant plant/soil matrix or material. Bottom 17.0 bank is generally matrix severely compromised. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Sadients or Substrate yes gravel or larger substrate; composition 30-50% gravel or larger substrate; gravel with some fare sedients; substrate yes if mart hang Substrate yes if mart hang Substrate yes if mart hang or bedrock; unstable arg. 2 Condition 9 8 7 6 5 4<																US CS
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Water Clarity objects visible at depth 3-6 feet (less is sight) greater nay be gright-greater, on oticeable film on submerged objects or rocks. storm event, but clears ragidly; naves is sight greater color; no oil sheen on water surface. most of the time; objects visible to depth 0.5-1.5 ft; slow socions may appear pea-green; bottom rocks or sumerged objected covered with film. the time; objects visible to depth 0.5-1.5 ft; slow socions may appear pea-green; bottom rocks or sumerged objected covered with film. the time; objects visible to depth 0.5-1.5 ft; slow socions may appear pea-green; bottom rocks or sumerged objected covered with film. Grade 10 9 8 7 6 5 4 3 2 1 0 Optimal CONDITION CATEGORY GRADE or SCORE 3a. Nutrient Enrichment Optimal Suboptimal Marginal growth, especially during warmer moths. Pea green, gray, or brow water along entire reach; does tow quantaties of many species of macrophytes; tilt algal growth on stream substrates. Green substrates. Green substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 Grade 10 9 8 7 6 5 4 3 2 1 0 Grade 10 9			Ver				Ossasiana					Versturbid			_	et
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Water Clarity surface;no noticeable film on submerged objects or rocks. have slightly green color; no oil sheen on water surface. slow sections may appear green; bottom rocks or sumsy appear green; bottom rocks or sumerged objects or rocks. other obvious water pollutants; fidating pea-green; bottom rocks or sumsy appear green; bottom rocks or sumsy appear green; bottom rocks or sumerged objects or rocks. other obvious water pollutants; fidating pea-green; bottom rocks or sumerged objects or rocks. Grade 10 9 8 7 6 5 4 3 2 1 0 3 PRESENCE OF AQUATIC VEGETATION: Presence and Percent Coverage CONDITION CATEGORY GRADE or SCORE Pea green, gray, or brown water along entire reach; diverse aquatic plant community inspecies of macrophytes; little algal growth on stream substrates. Greenish water along entire reach; algal growth, especially during warmer months. Pea green, gray, or brown water along entire reach; dates at ands of no algae present due to unstable substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 Grade 10 9 8 7 6 5 4 3 2 1 0 Grade 10 9 8 7 6 5 4 3			ifs									slow moving	g water may be	e bright-green;		US NF
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3a. Nutrient Enrichment diverse aquatic plant community includes low quantaties of many species of macrophytes; little algal growth present. along entire reach, moderate algal growth on stream substrates. reach; overabundance of lush green macrophytes; abundant algal growth, escicilly during warmer months. entire reach; dense stands of macrophytes (abust in stream) or NO algae present due to unstable substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 Or Optimal Suboptimal Marginal Poor			_			11	E. S. C.					D			-	et
Enrichment andrada brance for many species of macrophytes; little algal growth on stream substrates. green macrophytes; abundant algal growth, especially during warmer months. macrophytes clog stream; severe algal blooms create thick algal mats in stream or NO algae present due to unstable substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 Or Optimal Suboptimal Marginal Poor		3a. Nutrient														19
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Grade 10 9 8 7 6 5 4 3 2 1 0 Or CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor							.									NF S\
Grade 10 9 8 7 6 5 4 3 2 1 0 CONDITION CATEGORY GRADE or SCORE Or Optimal Suboptimal Marginal Poor				ç	prowth prese	ent.				auring wa	umer months.					pa
Or Optimal Suboptimal Marginal Poor												oubot		2010.		pu
Or Optimal Suboptimal Marginal Poor	G	rado		0	٥	8	7	6	5	4	3	2	1	0	0	5
Or Optimal Suboptimal Marginal Poor	6			0	3	0	1	U	5	4	3	4		U	0	í
Or Optimal Suboptimal Marginal Poor	Í						COI		ATEGORY	GRADE or S	SCORF				1	Pe
	1	or			Optimal								Poor			et
3b. Aquatic When present, aquatic vegetation Algae dominant in pools, larger Algal mats present, some Algal mats cover bottom, larger	L	3b. Aquatic			sent, aquati			ominant in po	ols, larger				ts cover bot		1	19
Vegetation consists of moss and patches of plants along edge. larger plants, few mosses. plants dominate the channel or NO				sists		patches of	pl	ants along ed	lge.	larger plant	s, few mosses.					R
algae. algae present due to unstable substrate. No water = zero.	I	-			algae.											No
Grade 10 9 8 7 6 5 4 3 2 1 0							ļ		1				-		ļ	_

		Outlocal		CON			GRADE or S		1			F
	Mainly	Optimal onsisting of le	aves and	Leaver	Suboptima and wood sc			rginal s or woody	Fine orac	Poor anic sedimen	it - black in	e 1
		d without sed			ebris without		debris; coa organic i	arse and fine matter with iment.	color and fo	oul odor (ana	erobic) or no to excessive	F
Grade	10	9	8	7	6	5	4	3	2	1	0	8
LAND USE PA	TTERN: Be	eyond Imme	diate Ripari	an Zone								
				CON	NDITION C	ATEGORY	GRADE or S	CORE				F
		Optimal			Suboptima			rginal		Poor		e
		bed, consistin tive prairie, ar wetlands.			ent pasture n and swamp crops		pasture; se areas may b	w crops and ome wooded be present but ed patches		lainly row cro	ops	1 F N
Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	5
Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	5
											Avg.Score	5
RIPARIAN ZON	NE WIDTH	AND CONT	INUITY:									
6a. Riparian				CON			GRADE or S		1			E
Zone Width	Midth of sir	Optimal parian zone >18)	Width of sing	Suboptima	I 8 meters (1/2-		rginal arian zone 6-12	Midth of since	Poor	meters (natural	a 1
	width of h			widui or npa	11411 20116 12-1							
(from stream edge to field)		Iths with trees, human activitio impacted zone	shrubs, or tall es have not	grasses), hur		ees, shrubs, or nave minimally	meters (1 channel wid	/3-1/2 active ith vegetated), numan activities.	vegation le width), little	ss than 1/3 ac riparian vege numan activitie	tive channel etation due to	F e R U
V = = = = = = = = = = = = = = = = = = =		lths with trees, human activiti	shrubs, or tall es have not	grasses), hur	nan activities I	ees, shrubs, or nave minimally	meters (1 channel wid	/3-1/2 active Ith vegetated),	vegation le width), little	ss than 1/3 ac riparian vege	tive channel etation due to	F e R
edge to field)	grasses),	ths with trees, human activitio impacted zone	shrubs, or tall es have not	grasses), hur	nan activities I impacted zone	ees, shrubs, or nave minimally e.	meters (1, channel wid impacted by h	/3-1/2 active hth vegetated), human activities.	vegation le width), little h	ss than 1/3 ac riparian vege numan activitie	ctive channel etation due to es.	F e R U
edge to field) Grade (left)	grasses), 10	ths with trees, human activitie impacted zone 9	shrubs, or tall es have not e. 8	grasses), hur 7 7	nan activities I impacted zone 6 6	ees, shrubs, or nave minimally e. 5 5	meters (1. channel wid impacted by h 4 4	/3-1/2 active ith vegetated), numan activities. 3 3	vegation le width), little h	ss than 1/3 ac riparian vege numan activitie	ctive channel etation due to es. 0	F e R U 6 6 6 6
edge to field) Grade (left)	grasses), 10	Iths with trees, human activitie impacted zone 9 9	shrubs, or tall es have not e. 8	grasses), hur 7 7	nan activities I impacted zone 6 6 NDITION C/	ees, shrubs, or nave minimally 5 5 ATEGORY (meters (1. channel wic impacted by h 4 4 GRADE or S	/3-1/2 active tith vegetated), numan activities.	vegation le width), little h	ss than 1/3 ac e riparian vege human activitie 1 1	ctive channel etation due to es. 0 0	6 6 6 6 6 6
edge to field) Grade (left) Grade (Right)	grasses), 10 10	Iths with trees, human activitie impacted zone 9 9 9 Optimal	shrubs, or tall es have not a. 8 8	grasses), hur 7 7 CON	nan activities I impacted zone 6 6 NDITION C/ Suboptima	ees, shrubs, or have minimally 5 5 ATEGORY (meters (1. channel wid impacted by f 4 4 GRADE or S Ma	/3-1/2 active tith vegetated), numan activities. 3 3 CORE rginal	vegation le width), little f 2 2	ss than 1/3 ac riparian vege numan activitie 1 1 Poor	tive channel tation due to es. 0 0 Avg.Score	6 6 6 6 6 6 6
edge to field) Grade (left)	grasses), 10 10 >90% plan shrubs, prai riparian zo	Iths with trees, human activitie impacted zone 9 9	shrubs, or tall as have not b. 8 8 ture trees or marsh plants, ruption from	grasses), hur 7 7 75-90% stre young specie trees behi	nan activities I impacted zone 6 6 NDITION C/ Suboptima eambank vege	ATEGORY (latation, mixed and mature evident with	meters (1, channel wic impacted by h 4 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	/3-1/2 active tith vegetated), numan activities.	vegation le width), little 2 2 Less than 5 coverage c grasses, fe density, banl	ss than 1/3 ac riparian vege numan activitie 1 1 1 Poor 0% streambai onsisting mos w trees & shru	tive channel tation due to ss. 0 0 Avg.Score hk vegetation tly of pasture ubs; low plant ed with gullies	6 6 6 6 7 8 8 8 8 8 8 8 9 8 9 8 1 8 8 8 8 8 8 8 8
edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness	grasses), 10 10 >90% plan shrubs, prai riparian zo	ths with trees, human activiti impacted zone 9 9 Optimal t density of ma rie grasses, or ne intact or dis	shrubs, or tall as have not b. 8 8 ture trees or marsh plants, ruption from	grasses), hur 7 7 75-90% stre young specie trees behi	nan activities I impacted zone 6 6 NDITION C/ Suboptima aambank vege es along chanr nd; disruption n curring at inter	ATEGORY (latation, mixed and mature evident with	meters (1, channel wic impacted by h 4 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	/3-1/2 active tht vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 5 CORE rginal streambank mixed grasses young tree or scies; breaks h some gullies	vegation le width), little 2 2 Less than 5 coverage c grasses, fe density, banl	ss than 1/3 ac riparian vege numan activitie 1 1 Poor 0% streambar onsisting mos w trees & shru k deeply scarr	tive channel tation due to ss. 0 0 Avg.Score hk vegetation tly of pasture ubs; low plant ed with gullies	6 6 6 6 6 7 8 8 8 8 8 8 8 8 8 8 8 8 1 7 8 1 8 8 1 8 8 1 8 1
edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/	grasses), 10 290% plan shrubs, prai riparian zo graz	ths with trees, human activiti impacted zone 9 9 0ptimal t density of ma rie grasses, or ne intact or dis ing/mowing mi	shrubs, or tall ss have not a. 8 8 8 ture trees or marsh plants, ruption from nimal.	grasses), hur 7 7 75-90% strr young specie trees behi breaks oc	nan activities I impacted zone 6 6 NDITION C/ Suboptima aambank vege as along chann nd; disruption - curring at inter meters.	ees, shrubs, or nave minimally s. 5 ATEGORY (I tation, mixed tel and mature evident with vals of >50	meters (1, channel wic impacted by h 4 4 6RADE or S 50-75% i vegetation of and sparse shrub spe frequent wit and scars ev	/3-1/2 active tth vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Less than 5 coverage c grasses, fe density; bani al	ss than 1/3 ac riparian vege numan activitie 1 1 0% streambaa w trees & shru k deeply scarr I along its leng	tive channel tation due to ss. 0 0 Avg.Score nk vegetation tiy of pasture ibs; low plant ed with gullies gth.	6 6 6 6 6 6 6 7 8 8 8 8 1 8 8 1 8 8 1 8 8 1 8 8 1 8 8 1 8 8 1 8 8 1 1 8 1 8 1 8 1 8 8 1 8 8 8 1 8 1 8 1 8 8 8 1 8
edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness Grade (Left)	grasses), 10 >90% plart riparian zo graz 10	ths with trees, human activitii impacted zone 9 9 0ptimal tt density of ma rie grasses, or ne intact or dis ing/mowing mi	shrubs, or tall ss have not a. 8 8 8 ture trees or marsh plants, ruption from nimal. 8	grasses), hur 7 7 75-90% strr young specie trees behi breaks oc	Anna activities I impacted zone 6 NDITION C/ Suboptima aambank vege aambank vege aambank vege aambank vege sa along chanr nd; disruption curring at inter meters.	sees, shrubs, or nave minimally s. 5 ATEGORY (1 tation, mixed tel and mature vident with vals of >50	meters (1, channel wic impacted by h 4 3RADE or S 50-75% : vegetation of and sparse shrub spe frequent wit and scars ev	/3-1/2 active th vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vegation le width), little 2 2 Less than 5 coverage c grasses, fe density; bani al	ss than 1/3 ac riparian vege numan activitie 1 1 0% streambaa w trees & shru k deeply scarr I along its leng	tive channel tation due to ss. 0 0 Avg.Score nk vegetation thy of pasture bis; low plant ed with gullies gth. 0	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6

M VARIABLES		III. HABITAT F	FUNCTIONS				S10 Tril	o2 (0.5-2')					SCORE	Sou
1	1 FLOW F	GIME	Poronnial		Intermitte	nt w/ Peren	nial Baak	Intern	oittent		Enhomeral		_	КD
	Grade	10	Perennial 9	8	7	6	5	4	3	2	Ephemeral 1	0	0	200
2	2 EPIFAU	IAL SUBSTRATE/		COVER	1						_			
		Within atroa	Optimal m bed, greater	then E0%	Within stream	Suboptima		Marg Within stream		L ooo tha	Poor an 10% habita	t footuroo	-	US.
			y stable habitat			abitat feature		coverage by s			ack of habitat			Nor
			stream faunal				ation and/or	features favora			te unstable or			200
			phibian cover. transient. Fea			ian cover. N	lany habitat ee Excellent	faunal coloni: fish/amphibian			lined channel d pools burie			SAA
			, submerged lo			ry for habitat		availability ma			el bottom may			For
		banks, roots, c			- 0	components.)	desirable, sub						(pag Bar
			and glides, or o stage to allow c					frequently dis Excellent Cate						al. 1
		habitat at a 3	lage to allow o	oronization				feature con						EPA
														Par
														et a
														AUS
	Grade	10	9	8	7	6	5	4	3	2	1	0	0	1
•		DOTTOM CUDOT		Out-starts O										
3	3 STREAM	BOTTOM SUBST	Optimal	Substrate C		on Suboptimal	1	Marg	ninal	r –	Poor			
		Mixture of sub-	strate materials	s, with gravel		soft sand, mi		All mud or clay		Hard pan	clay or bedro	ck; no root	-	Ban
			d prevalent; roo			e dominant;		little or no r		mat or s	submerged ve	getation.		al. 1
		submerge	ed vegetation of	ommon.	mats and	submerged v present.	vegatation	submerged	vegetation.					RBA
						p.00011.								pag
														Par. et a
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	AUS
					<u> </u>						<u> </u>		<u>i</u>	1
4	4 POOL V	RIABILITY									_			
		Evon mix of l	Optimal large-shallow, I	argo-doop		Suboptimal pools large-		Marg Shallow pools		Majority -	Poor of pools small-	shallow or	-	Pa-
		small-shallow	, small-deep p	ools present		few shallow.	usep, very	prevalent tha		wajonty 0	pools small- pools absent			Barl al. 1
					1					1				RBA
					1									pag
					1									Par
	<u> </u>			<u> </u>	<u> </u>	6			-	-		-		et a
5	Grade	10 NT DEPOSITION/S		8	7	6	5	4	3	2	1	0	0	4
5			Optimal			Suboptima	1	Marg	ginal		Poor		1	1
		<5% of channe	el bottom affecter	d by scour or	5-30% affect	ted by scour o	r deposition;	30-50% affect	ed by scour or		0% of the botto		f	Barl
			deposition.			strictions and Some depositi		deposition. Depo obstructions, co			nge nearly year I or absent due			<i>al.</i> 1
					stoepen. c	Some depositi	o iii poolo	bends. Some			on or excessive			RB/
					1									pag Par
														et a
	Grade	10	9	8	7	6	5	4	3	2	1	0	2	
							:							
6	6 CHANN	L FLOW STATUS			1									TCE
		Water reach	Optimal les the base of	both lower		Suboptima >75% of the		Marg Water fills 25		Very little	Poor water in the cl	hannel and		199 Wrk
			6 of channel su			channel sub		available chan			sent in standi			Barl
			exposed			exposed		substrates are r	nostly exposed		stream is dry	'		al. 1
														RBA
														pag
														Pars et a
	Grade	10	9	8	7	6	5	4	3	2	1	0	0	
7		L ALTERATION												1
		01 1	Optimal	ar dec det		Suboptima		Marg Alteration of a		Boolin 1	Poor		-	
			on, alteration, o inimal; normal			ration or cha , usually adja		Alteration or c may be e			red with gabio Concrete or			US/ Non
		stream mean	nder pattern. A	Iteration by	structu	res, (such as	bridge	embankments	(including spoil	chann	els. Instream	habitat		Dist
		stormwater	inputs absent of	or minimal		or culverts);		piles) or shori	ng structures		y altered by st			200
						ion, (I.e., cha sent, but stre		present on both stable stream m			puts. Over 80 eam reach alte			SAA
					and stability	have recover	ered; recent	has not recove	red. Alteration	Care				For
						is not prese om stormwa		from stormwate extensive. 40-						(Fie pag
					aneration fr	om stormwa inputs.	ter or other	extensive. 40-1 reach a						pag Ban
					1									al. 1
					1					1			1	RB/
					1					1			1	Par
	Grade	10	9	8	7	6	5	4	3	2	1	0	8	et a
				<u> </u>					. v		<u> </u>			1
	8 CHANNI	L SINUOSITY			1									1
8		T1 1 1	Optimal			Suboptima		Marg		Ohan 1	Poor		4	
8			n the stream in			n the stream ngth 2 to 3 tin	increase the nes longer	The bends in increase the s			raight; waterw ized for a long			Barl al. 1
8				nder than it it				times longer th		5.101110		,	1	
8	0	stream length was in a stra	3 to 4 times lor aight line. (Note	e - channel		was in a stra	light line.							
8		stream length was in a stra braiding is cor	3 to 4 times lor sight line. (Note nsidered norma	e - channel al in coastal		was in a stra	iight line.	straigh						
8		stream length was in a stra braiding is con plains and ot	3 to 4 times lor hight line. (Note nsidered normather ther low-lying a	e - channel al in coastal ireas. This		was in a stra	ignt line.							Par
8		stream length was in a stra braiding is con plains and ot	3 to 4 times lor sight line. (Note nsidered norma	e - channel al in coastal ireas. This		was in a stra	ignt line.							RBA Pars et a AUS
8		stream length was in a stra braiding is con plains and ot	3 to 4 times lor sight line. (Note nsidered norma ther low-lying a s not easily rate	e - channel al in coastal ireas. This		was in a stra	light line.							Par et a
8	0	stream length was in a stra braiding is con plains and ot	3 to 4 times lor sight line. (Note nsidered norma ther low-lying a s not easily rate	e - channel al in coastal ireas. This		was in a stra	ignt line.							Par. et a

9 BANK STAP	BILITY (SCORE E		<)									
		Optimal	cion or hor!	Moderatel	Suboptir			ginal stable; perennial	Unetable	Poor	vegetation at	-
	Banks stable; evic failure absent or					requent, small ly healed over.		stable; perennial vaterline sparse		; severe eros		
	affected), perennia	al vegetation	n to waterline;			ch has areas of	(mainly scoure	d or stripped by		cently expose		
	no raw or undercu				erosion ar), bank held by		tree falls and		
	outside of mea recently exposed r					al vegetation to aces; recently		(trees, rock d eroded back		it trees comm eas; "raw" are		
	recently exposed i	10013, 110 101	cent tree rans,			re but present.		-60% of bank in		ight sections		
							reach has area	s of erosion and	obvious ba	nk sloughing	; 60-100% of	
								utting; recently	bank	has erosiona	al scars.	
								oots and fine root n; high erosion				
								uring floods				
								5				
Grade	10	9	8	7	6	5	4	3	2	1	0	
Grade	10	9	8	7	6	5	4	3	2	1	0	
										Avg.Score	e	
	E PROTECTION			1								
IU VEGETATIV		Optimal		.)	Suboptir	aal	Mar	ginal	1	Poor		
	More than 90% of		bank surfaces	70-90% of		ibank surfaces		e streambank	Less than	50% of the s	streambank	1
	and immediate ri					etation, but one		ed by vegetation;		covered by v		1
	native vegeta				of plants is			ous; patches of			nk vegetation	1
	understory s macrophytes; veg					on evident but lant growth		losely cropped nmon; less than		gh; vegetatior o 5 centimete		1
	grazing or mowin					t extent; more		potential plant		age stubble l		1
	almost all plants a			than one-	half of the	potential plant		ht remaining.		J		1
		-		stubb	le height re	emaining.						1
				1								1
				1								1
Grade	10	9	8	7	6	5	4	3	2	1	0	
Grade	10	9	8	7	6	5	4	3	2	1	0	
										Avg.Score	Э	
	activities (I.e., park					impacted zone	meters: numa	n activities have	little or no	riparian vege	etation due to	
	cuts, lawns, or cr	ops) have r zone.	iot impacted		only minim			e a great deal.		uman activiti		
Grade	10		8	7	6	ally).		3	2		ies. 0	
Grade Grade		zone.	_			ally).	impacted zon		h	numan activiti	0 0	1
	10	zone.	8		6	ally).	impacted zon	3	2	uman activiti	0 0	
Grade	10 10	20ne. 9 9	8	777	6	ally).	impacted zon	3	2	numan activiti	0 0	1
Grade	10 10 HABITAT CONDIT	9 9 10N (SCO	8	777	6 6	ally). 5 5	impacted zon	3	2	1 1 Avg.Score	0 0	1
Grade	10 10 HABITAT CONDITI	9 9 ION (SCO	8 8 RE EACH B	7 7 ANK)	6 6 Suboptir	ally). 5 5 nal	impacted zon 4 4 4 Mar	3 3 ginal	h	1 1 Avg.Score Poor	0 0 9	1
Grade	10 10 HABITAT CONDITI Tree stratum (b) >60% tree canopy	9 9 ION (SCO Optimal h>3 inches) / cover. (Ac	8 8 RE EACH B present, with dditional forest	7 7 ANK) Tree stratu	6 6 Suboptir m (dbh>3 i o 60% tree	s 5 5 nal nches) present canopy cover.	impacted zon 4 4 4 . Tree stratum present, with <	3 3 ginal (dbh>3 inches) 30% tree canopy	2 2 Tree stra surfaces	1 1 Avg.Score Poor atum absent; s, croplands,	ies.	-
Grade	ABITAT CONDIT Tree stratum (db >60% tree canopy layers may in	9 9 9 ION (SCO Dptimal h>3 inches) c cover. (Ac clude: saplii	8 8 RE EACH B present, with didional forest ng, shrub,	7 7 ANK) Tree stratu with 30% t (See E	6 6 Suboptir m (dbh>3 i o 60% tree Excellent C	nal stegory for	A A A A A A A A A A A A A A A A A A A	3 3 ginal (dbh>3 inches) 30% tree canopy cellent Category	2 2 Tree stra surfaces r lands, culve	1 1 Avg.Score Poor atum absent; s, croplands, erted streams	ies.	-
Grade	10 10 HABITAT CONDIT Tree stratum (dbl >60% tree canopy layers may im herbaceous, a	9 9 00N (SCO 0ptimal h>3 inches) / cover. (Ac clude: saplii ind leaf litte	8 8 RE EACH B present, with Iditional forest ng, shrub, r including	7 7 Tree stratu (See E examples of	6 6 Suboptir m (dbh>3 i o 60% tree Excellent C	nches) present canopy cover. i forest layers.)	4 4 7 7 7 7 7 7 7 7 7 7 8 8 7 8 7 8 7 8	3 3 (dbh>3 inches) 30% tree canopy cellent Category additional fores	A h	1 1 Avg.Score Poor atum absent; s, croplands, creplands, ented streams ned herbaced	ies.	-
Grade	ABITAT CONDIT Tree stratum (db >60% tree canopy layers may in	9 9 9 ION (SCO Optimal h>3 inches) / cover. (Ac clude: saplii nd leaf litter d woody de	8 RE EACH B present, with Iditional forest ng, shrub, r including ibris.) Score a	7 7 Tree stratu with 30% t (See E examples of t Score at th	6 Suboptir m (dbh-3 i o 60% tree Excellent C of additiona e high end	nches) present canopy cover. i forest layers.)	A A A A A A A A A A A A A A A A A A A	3 3 (dbh>3 inches) 30% tree canopy cellent Category additional fores	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams	ies.	-
Grade	10 10 Tree stratum (dbl >60% tree canopy layers may in herbaceous, a mosses/lichens an the high end o additional layers a	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 Tree stratu with 30% tree E examples of t Score at th if ≥2 ado present.	6 6 Suboptir m (dbh-3 i o 60% tree Excellent C of additiona e high end ditional fore . Score at 1	5 5 5 5 5 5 10 11 10 11 10 11 10 10 11 10 11 10 11 11 11 12 12 13 14 10 <	A A A A A A A A A A A A A A A A A A A	3 (dbh>3 inches) 30% tree canopy cellent Category additional fores at the high end of additional ayers core at low end i	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
Grade	10 10 Tree stratum (db >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 ANK) Tree stratu with 30% t (See E examples 2 t Score at th if 22 adc present, additional	6 6 Suboptir m (dbh>3 i o 60% tree Excellent C of additiona e high end ditional fore Score at I forest laye	5 5 5 5 anches) present canopy cover. ategory for I forest layers. of Good rest. ust layers are ow end if ≤1 so are present.	4 4 4 . Tree stratum present, with < cover. (See Ex for examples of layers.) Score Fair range if ≥2 are present. St 21 additional la	3 (dbh>3 inches) 30% tree canopy additional fores additional fores core at low end i yers are present	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
Grade	10 10 Tree stratum (dbl >60% tree canopy layers may in herbaceous, a mosses/lichens an the high end o additional layers a	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 ANK) Tree stratu with 30% t (See E examples 2 t Score at th if 22 adc present, additional	6 6 Suboptir m (dbh>3 i o 60% tree Excellent C of additiona e high end ditional fore Score at I forest laye	ally). 5 5 5 nal nches) present canopy cover. ategory for il forest layers.) of Good range to dood range to dood range st layers are low end if ≤1 rs are present. with stumps	impacted zon 4 4 7 Tree stratum present, with ⊲: for examples of layers.) Score a Fair range if ≥2 are present. S ≤1 additional la OR area co	3 (dbh>3 inches) 30% tree canopy cellent Category additional fores at the high end of additional ayers core at low end i	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
Grade	10 10 Tree stratum (dbl >60% tree canopy layers may in herbaceous, a mosses/lichens an the high end o additional layers a	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 ANK) Tree stratu with 30% t (See E examples 2 t Score at th if 22 adc present, additional	6 6 6 Suboptir m (dbh>3 i o 60% tree ccellent C of additional for additional for additional for additional for est laye over areas	ally). 5 5 5 nal nches) present canopy cover. ategory for il forest layers.) of Good range to dood range to dood range st layers are low end if ≤1 rs are present. with stumps	A A A A A A A A A A A A A A A A A A A	3 3 (dbh>3 inches) 30% tree canopy additional fores a the high end oi scatta additional layers core at low end ii yers are present nsists of non- nd naturalized aceous and/or	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
Grade	10 10 Tree stratum (dbl >60% tree canopy layers may in herbaceous, a mosses/lichens an the high end o additional layers a	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 ANK) Tree stratu with 30% t (See E examples 2 t Score at th if 22 adc present, additional	6 6 6 Suboptir m (dbh>3 i o 60% tree ccellent C of additional for additional for additional for additional for est laye over areas	ally). 5 5 5 nal nches) present canopy cover. ategory for il forest layers.) of Good range to dood range to dood range st layers are low end if ≤1 rs are present. with stumps	A A A A A A A A A A A A A A A A A A A	3 (dbh>3 inches) 30% tree canopy cellent Category additional layers at the high end o additional layers are present nsists of non- nsists of non- nd naturalized	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
Grade	10 10 Tree stratum (dbl >60% tree canopy layers may in herbaceous, a mosses/lichens an the high end o additional layers a	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 ANK) Tree stratu with 30% t (See E examples 2 t Score at th if 22 adc present, additional	6 6 6 Suboptir m (dbh>3 i o 60% tree ccellent C of additional for additional for additional for additional for est laye over areas	ally). 5 5 5 nal nches) present canopy cover. ategory for il forest layers.) of Good range to dood range to dood range st layers are low end if ≤1 rs are present. with stumps	A A A A A A A A A A A A A A A A A A A	3 3 (dbh>3 inches) 30% tree canopy additional fores a the high end oi scatta additional layers core at low end ii yers are present nsists of non- nd naturalized aceous and/or	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
Grade	10 10 Tree stratum (dbl >60% tree canopy layers may in herbaceous, a mosses/lichens an the high end o additional layers a	9 9 9 ION (SCO Dptimal >3 inches) y cover. (Ac clude: saplii nd leaf litte d woody de f Excellent r are present.	8 8 Present, with Idditional forest ng, shrub, rincluding bbris). Score at low Score at low	7 7 ANK) Tree stratu with 30% t (See E examples 2 t Score at th if 22 adc present, additional	6 6 6 Suboptir m (dbh>3 i o 60% tree ccellent C of additional for additional for additional for additional for est laye over areas	ally). 5 5 5 nal nches) present canopy cover. ategory for il forest layers.) of Good range to dood range to dood range st layers are low end if ≤1 rs are present. with stumps	A A A A A A A A A A A A A A A A A A A	3 3 (dbh>3 inches) 30% tree canopy additional fores a the high end oi scatta additional layers core at low end ii yers are present nsists of non- nd naturalized aceous and/or	2 2 Tree stra surfaces lands, culve t maintain denuded s	1 1 Avg.Score Poor atum absent; s, croplands, erted streams surfaces, acti	ies.	-
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S10 Trib2 (0.5-2')

Str	eam Functior	nal Capacity C	alculation		
	S10 Trib2	(0.5-2')			
Date:					
Project:	Lake Ralph H	all			
Assessment Area:					
Assessors:					
Project Status:	X_Preproj	ect	Postproject		
		Stream	Stream	Multiplication	
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC
Hydrologic	0.30	1,705	E	0.00125	0.64
Water Quality Improvement	0.39	1,705	E	0.00125	0.83
Habitat	0.33	1,705	E	0.00125	0.69
Total	1.01	1,705			2.16
*Stream Length is the length of the Stre	am Assessme	nt Reach (SAF	R)		
**Multiplication Factors		· ·	,		
Ephemeral = 0.00125					
Intermittent = 0.0025					
Perennial = 0.0038					





SWAMPIM DATASHEETS – SOUTH EPHEMERAL 2.5 TO 5.0' PRE-PROJECT

• **S12**

ITEM VARIABLE FUNCTION CATEGORY

1

PARAMET	ER										
				CON	DITION CA	TEGORY G	RADE or S	CORE			
		Optimal			Suboptima	1	Mar	ginal		Poor	
Grade	10	9	8	7	6	5	4	3	2	1	0

Right bank- 15-10 meters to pasture, Left bank 50-60 meters to pasture. Park area surrounded by pasture.

WP 20 P59, 58

FLOW REGIM	E .		I. HYDROI		ICTIONS	S12 (2.	S-S)					SCORE	Source
	<u>_</u>												KDWP
TYPE Grade	10	Perennial 9	8	Intermitt 7	ent w/ Pere 6	nnial Pools 5	Inter 4	mittent 3	2	Ephemeral 1	0	1	Kansas Subjectiv
CHANNEL CO								5	2			· · · ·	Oubjeeth
				00		ATEGORY		SCORE					Barbour,
		Optimal			Suboptima			rginal		Poor			EPA RB
2a.Channel Condition/Alter ation (natural, altered, or downcutting)	channe eviden excessive frequency c	bannel; no st elization minin ce of downor e lateral cuttir of hydrologica channel and	mal. No utting or ng. Normal al connection	bridge a alterati recovery o Acceptab	nannelization areas) or pas on, but with s f channel be	(usually in st channel significant d and banks. of overbank	Altered c 80% of chann disrupte aggradat channel w frequency flows floodplain	hannel; 40- the reach elized or ed. Excess ion; braided ith excessive of overbank onto the n. Historical kes or levees	widening. : channnel	l is actively dow >80% of the rea ized. Degradat s prevent acces floodplain.	ach riprap or ion,dikes or		5-21; A 1998 U NRCS S page 7
								floodplain.					
Grade	10	9	8	7	6	5	4	3	2	1	0	1	-
				CO	NDITION C	ATEGORY	GRADE or	SCORE					w/ assist
2b.Channel	Ohenville	Optimal		Oberryla	Suboptima			irginal	Charles	Poor			and inpu
Capacity to		apacity to Flo				ow Frequency overflow from		Capacity to lency Ratio is		Capacity to Flov uch that bank ov			Dr. Mike Harvey a
Flow Frequency Ratio (for 2- year peak flow)		nts occur at a rear frequenc 0.75-1.25		every 1.2 tha	ts are more 5 years or le n every 2.5 y <0.75 or >1.:	/ears.	from storr more fre every ye frequent t	oank overflow n events are quent than ear or less han every 5 ears. or >1.5		ents are more fr f year or less fre every 10 years <0.24 or >2	equent than		Travant
Grade	10	9	8	7	6	5	4	3	2	1	0	0	
				CO		ATEGORY	GRADE or	SCORE					Newton,
		Optimal			Suboptima	al	Ma	rginal		Poor			USDA/ N
		le; evidence absent or m				equent, small healed over.		ely unstable; vegetation to		no perennial v e; severe erosi			SVAP p 10; Barb
2c.Channel	of bank	k affected), p	erennial	5-30% of b	ank in reach	has areas of	waterline s	parse (mainly	banks; re	ecently exposed	d tree roots		al., 1999
Bank Stability (score each bank, left or	undercut to outside of r	n to waterline banks (some meander ben	erosion on ds O.K.); no	undercuttin waterline	in most plac	vegetation to es; recently	lateral ero held by	r stripped by osion), bank hard points	undercut ti areas; "	i; tree falls and/ rees common; r raw" areas frequ	many eroded uent along		RBA pag 26; USA Norfolk I
right facing downstream)	recently e	xposed roots tree falls;	; no recent	exposed tr	ee roots rare	e but present.	and ero elsewhere bank in rea of erosio undercutt	ck outcrops) oded back e; 30-60% of ach has areas n and bank ing; recently ree roots and	bank slou	ections and ben ghing; 60-100% erosional scars	of bank has		2004
Grade (Left)	10	9	8	7	6	5		airs common:	2	1	0	5	
Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	8	
											Avg.Score	6.5	
CHANNEL RO	UGHNESS	FACTORS											
				00		ATEGORY		SCORE					Barbour,
0- 0'		Optimal			Suboptima			rginal		Poor			EPA RB
3a.Channel Sinuosity		s in the strea			s in the strea	am increase	The bends	in the stream		straight; waterwa		1	Chapter
(bends in low gradient stream) the stream length 2.5 to 4 times longer than if it was straight. the stream length 2.5 to 2.5 times longer than if it was a straight line. longer longer than if it was a straight line. gradient stream) Channel length/valley length at least >1.5. Channel length 2.5 to 4 times longer than if it was a straight line.					length 1 longer tha straight lir	the stream to 1.5 times an if it was a ne. Channel ey length 1.0	Channel	lized for a long I length/valley le			5-25; KD 1996		

1]	
			Ordinal		COI		ATEGORY (1	D			KDWP, 1996
		Little or a	Optimal o channel en	largement	Somo area	Suboptima	al oarse stones		arginal bars of rocks,	Channel	Poor divided into br	aids or stream	-	Kansas Subjective
	3b. Bottom		Iting from sed				present, little		silt common;		elized; substra			Evaluation of
	Substrate		ation; channe			moderately			ely unstable	sand, silt	, clay, or bedr	ock; unstable		Aquatic
	Composition													Habitats
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	
			-	Ŧ		-	Ţ		÷					
					100	NDITION C	ATEGORY (GRADE or	SCORE					KDWP, 1996;
			Optimal			Suboptima			arginal		Poor			Newton et al.,
e	2a Instraam		tom topograp				les 5-7 of the		el bottom		I bottom inclu			1998
iab	3c. Instream Bottom		e following: de gravel, logs/la		items list	ed in Optima	al Category		5 of the items n Optimal	items i	isted in Optim	al Category		USDA/NRCS
Vai	Topography		backwaters/						tegory					SVAP page 13/
he	ropography		ging vegetati											
0			ed shallows, r											
- Lo		undercut	banks, or sid pools	le channei										
or		10		0					-			-		
re f	Grade	10	9	8	7	6	5	4	3	2	1	0	2	
Score for Only One Variable					00		ATEGORY	SRADE or	SCORE					
ы Б	or		Optimal			Suboptima			arginal		Poor			
Enter	3c. Manning's		0.05 to 0.099	9		0.035 to 0.0			0.03 or >0.10	0.16 t	to 0.20 due to	excessive		
	n							to	0.15			01 to 0.02 due		
										to chann	elization and o channel.	clean, smooth		
	Orada	40	9	0	7	6	-		3	0		0		
	Grade	10	9	8	1	6	5	4	3	2	1	0	-	
					CO		ATEGORY (GRADE or	SCORE					USACE,
			Optimal			Suboptima			arginal		Poor			Norfolk District,
	3d. Channel		tio <u>></u> 1.0 <1.2				and Where		tio <u>></u> 1.4 < 2.0			Where channel		2004 SAAM
	Incision (TLB/BFD=BH		ope >2%; En				ntrenchment		ere channel			ent ratio <1.4;		Form 1 #1 and
	R; 1/BHR*Adj		4; Where cha htrenchment i			 Where characteristics trenchment 			e > 2%, hment ratio		ere channel slo trenchment ra			VT Stream
	Factor =CI)	<u>-</u> 2 /0, L1	litenennent	2.0	<u> </u>	ntenennen	11410 >2.0		ere channel		trenomment ra	1110 <u><</u> 2.0		Geomorphic Assessment
									e <u><</u> 2%,					Phase 2
								Entrenchm	nent ratio >2.0					1 11000 2
	TID		10		DUD	4								
	TLB = BFD =		10 10		BHR =	1								
	Grade	10	9	8	7	6	5	4	3	2	1	0	2	
	orado		Ŭ			Ū	Ŭ		Ŭ	-		Ŭ		
4	DYNAMIC SUR	FACE WA	TER STOR	AGE										
													-	
			0		CO		ATEGORY (D		-	Newton, et al.,
	4a.Pools	Doop and	Optimal shallow pools	a obundant:	Poole pre	Suboptima esent, but no			arginal resent, but	Poole ab	Poor	ntire bottom is	-	1998 USDA/ NRCS SVAP
	(abundant,		n 30% of the				ool bottom is		om 5-10% of		rnible. No wa			page 14;
	present or		due to depth,				or the pools	the poo	l bottom is					Barbour, et al.,
	absent)	at l	least 5 feet de	eep.	are a	at least 3 fee	t deep.		due to depth,					1999
	,								ools are less feet deep.					
								ulari S	ieel deep.					
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	
	4b. Channel				00		ATEGORY		SCORE					
	Flow Status		Optimal			Suboptima			arginal	r	Poor			Barbour. et al
	(degree to	Water rea	iches base of	both lower	Water fill	s >75% of th			s 25-75% of	Very little		nel and mostly		1999 EPA RBA
	which channel		ind minimal a			el; or <25% c			ble channel,	present as		ols. No water =		page 5-19 /A-
	is filled)	channel	substrate is	exposed.	sub	strate is exp	osed.		fle substrates		zero.			9#5; TCEQ
	Crode	10		0		-	-		tly exposed.		4	0	· _	1999; VANR,
	Grade	10	9	8	7	6	5	4	3	2	1	0	0	2005
					1	~	algulation of	L Function O	opooitu / Ind		ooro/Total D	ossible Secto		4
						Ci				x = 10tal S	oure/rutarP	ossible Score		1
1												FCI = #/100		

I. HYDROLOGIC FUNCTIONS

S12 (2.5-5')

	TER QUALITY/E VARIABLES	BIOGEOCH	IEMICAL F	UNCTIONS		_		S12 (2.	5-5')				SCORE	Refe
	TYPE												-	Sour
ŀ	NOTES												1	
1.	SEDIMENT TR	ANSPORT	/DEPOSIT	ON									T	
Ī]	
					COI	NDITION C/								New
	1a. Bank	-	Optimal			Suboptima			arginal		Poor		_	et al.
	Stability			of erosion or		/ stable; infre			y unstable; 30-			l areas; "raw"		1998
	(score each bank, left or			minimal; little lems. <5% of		osion mostly ank in reach			nk in reach has erosion; high		equently alor	bvious bank		USD
	right facing		bank affecte		0 00 /0 01 0	erosion.			otential during		g; 60-100% (CS S
	downstream)							fl	oods.		erosional sca			page
	uownstream)													Barb
														et al. 1999
ŀ	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	5	
	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	8	
	erude (rugrit)		, , , , , , , , , , , , , , , , , , ,	0		, ,	ů	. ·	Ū	-	I	Avg.Score		
												9		
					00	NDITION C/	ATEGORY	GRADE or	SCORE					Gall
	th Channel		Optimal			Suboptima			arginal		Poor			199
Ð	1b. Channel Bottom Bank	Bottom '	1/3 of bank is	s generally	Bottom '	1/3 of bank is			/3 of bank is	Bottom *	1/3 of bank is	s generally	1	Wa
ab			istant plant/s			ant/soil matri:			highly erodible		dible materia			CO
arı	Stability		material.		l .				lant/soil matrix		everely com		1	RS/
- e								comp	promised.				1	No.
Enter Score for Unly Une Variable											1			
Ň	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0		
5	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0		_
5												Avg.Score	•	
υ														
2	or				CO	NDITION C							_	Bar
5	1c. Channel		Optimal			Suboptima			arginal		Poor		-	et a
	Sediments or		avel or large			ravel or large		10-29.9%	gravel or larger			and, silt, clay,		199
ш	Substrate		bble boulder			substrate typ h some finer			e; dominant		pedrock; uns	stable		Pet
	Composition	Substrate	stable	ei or larger,		ioderately sta			t may still be a					et a
	0	10						The second second	and a stand a start of the					199
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	
2	WATER APPE	ARANCE:	Clarity or v	ISIDIIIty									4	
					001		TEOODY		20055				-	
		-	Ontinent		CO	NDITION C				1	Deer			Nev
		Varyalaar	Optimal or cloor but	tea-colored;	Occasiona	Suboptima lly cloudy, es			arginal ble cloudiness	Von turbid	Poor	earance most	-	et a
				3-6 feet (less		/ent, but clea			e time; objects			depth <0.5 ft;		199
				oil sheen on		ible at depth			epth 0.5-1.5 ft;	slow moving	g water may be	e bright-green;		US
	Water Clarity		no noticeat			phtly green co			ns may appear			tants; floating		NR SV/
		subme	rged objects	or rocks.	shee	n on water su	urface.		; bottom rocks		urface scum, : am on surface	sheen or heavy	/	
									ged objected	coat of 10a	zero.	. No water =		pag
								covere	d with film.					
													1	1
						<u> </u>								
ļ	Grade	10	9	8	7	6	5	4	3	2	1	0	1	4
													4	
3	PRESENCE O	- AQUATIC	; VEGETA	IION: Prese	ence and Pe	ercent Cove	erage						4	
													4	1.
					CO	NDITION C/				1			-	Nei
			Optimal			Suboptima			arginal		Poor		4	et a
	3a. Nutrient		ater along en			or slightly gr			ater along entire		gray, or brow reach; dense :	n water along	1	199
	Enrichment		quatic plant			re reach; mo on stream su			bundance of lush phytes; abundant			stands of i; severe algal		US
	Liniointont		low quantati	es of many s; little algal	giowin	on suedin SU	103110185.		vth, especially			mats in stream		NR
			growth prese						irmer months.	or NO alga	ae present due	e to unstable	1	SV
			, p.000							subst	rate. No wate	r = zero.	1	pag
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	
					COI	NDITION C/	ATEGORY	GRADE or	SCORE					Pet
	or		Optimal			Suboptima			arginal		Poor			et a
	3b. Aquatic		sent, aquati			ominant in po			present, some		ts cover bot		1	199
	Vegetation	consists	of moss and	patches of	pla	ants along eo	lge.	larger plant	s, few mosses.			nannel or NO	1	RC
1			algae.								resent due to			No.
					1			1		substra	ate. No wate	er = zero.	1	
				8			5		3					

Optimal CONDITION CATEGORY GRADE or SCORE 6b. Riparian Suboptimal Marginal Poor 2000 shubs, prairie grasses, or marsh plants, riparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation or wised prasses and sparse young tree or shrub spreise and sparse young tree or shrub spreise and sparse young tree or shrub spreise, riparian zone intact or disruption from grazing/mowing minimal. Less than 50% streambank vegetation of mature vegetation of mixed grasses and sparse young tree or shrub spreise, breaks frequent with some guillies and scars every 50 meters. Less than 50% streambank vegetation of mixed grasses and sparse young tree or shrub spreise; breaks frequent with some guillies and scars every 50 meters. Less than 50% streambank vegetation of mixed grasses and sparse young tree or shrub spreise; breaks frequent with some guillies and scars every 50 meters. all along its length. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 6					0.01		TEOODY		0005					
Mainly consisting of leaves and wood scarce: fine droganic debris without sediment. No leaves or woody color and foul door (raneerobic) or no sediment. Grade 10 9 8 7 6 5 4 3 2 1 0 7 LAND USE PATTERN: Beyond Immediate Riparian Zone CONDITION CATEGORY GRADE or SCORE Suboptimal Mainly row crops Undiscubed, consisting of forest, in the prainic, and/or natural wetlands. Personal pattern with vetlands. Mainly row crops Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 Grade (Left) <			Ontinual		CON						Dees		F	
wood without sediment. organic debris without sediment. observation color and foul dor (anerobic) or no sediment present due to excessive scouring Grade 10 9 8 7 6 5 4 3 2 1 0 7 CAND USE PATTERN: Beyond Immediate Riparian Zone CONDITION CATEGORY CRADE or SCORE CONDITION CATEGORY CRADE		Mainly cr		bayes and						Fine orga		t - black in	e 1	
LAND USE PATTERN: Beyond Immediate Riparian Zone CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor Undisturbed, consisting of forest, pristine native prairie, and/or natural wetlands. Permanent pasture mixed with woodlots and swamps, few row crops and pasture; some wooded areas may be present but as isolated patches Mainly row crops Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 RIPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 3 2 1 0 3 Riparian Zone view of field) Optimal Suboptimal Marginal Poor Marginal Poor CONDITION CATEGORY GRADE or SCORE Vidth of riparian zone < 6 meters (natural vegation los than 1/3 active channel with weres, shrubs, or tall grasses), human activities have noting unsated zone. Marginal Poor Note, human activities and the prase of the phase and the phase activities. Marginal Poor Grade (left) 10 9 8 7 6 5 4 3 2 1 0 8 Zone Width 10 9 8 7 6								debris; coa organic r	arse and fine matter with	color and fo	ul odor (ana resent due t	erobic) or no	F	
CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor Undisturbed, consisting of forest, pristine native prairie, and/or natural wetlands. Permanent pasture mixed with woodlots and swamps, few row crops Marginal Poor Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 3 RIPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 3 2 1 0 3 Condevide the interes (1-2 trons tream Width of riparian zone 318 meters (1-2 trons tream Width of riparian zone 12-18 meters (1/2 transet width with trees, shubs, or tall grasses), human activities have non impacted zone. Marginal Poor Width of riparian zone 4.12 Marginal Poor Wegation due to human activities. Width of riparian zone 4.12 Width of riparian zone 4.12	Grade	10	9	8	7	6	5	4	3	2	1	0	7	
Optimal Suboptimal Marginal Poor Undisturbed, consisting of forest, pristine native prairie, and/or natural wetlands. Permanent pasture mixed with woodlots and swamps, few row crops Mixed row crops and pasture; some wooded areas may be present but as isolated patches Mainly row crops Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 3 RIPARIAN ZONE WIDTH AND CONTINUITY: Xuboptimal Marginal Poor Avg. Score 3 Cone Width (from stream edge to field) Qptimal Suboptimal Marginal Poor Marginal Poor Grade (left) 10 9 8 7 6 5 4 3 2 1 0 grasses), human activities have not impacted zone. inspacted zone. Marginal Poor Numan activities Numan activities Avg. Score 8 Grade (left) <t< th=""><th>LAND USE PAT</th><th>ITERN: Be</th><th>yond Imme</th><th>diate Ripari</th><th>an Zone</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>	LAND USE PAT	ITERN: Be	yond Imme	diate Ripari	an Zone									
Undisturbed, consisting of forest, pristine native prairie, and/or natural welfands. Permanent pasture mixed with crops Mainly row crops and pasture; some wooded areas may be present but as isolated patches Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 3 RIPARIAN ZONE WIDTH AND CONTINUITY: CONDITION CATEGORY GRADE or SCORE 6 6 7 6 5 4 3 2 1 0 3 Ga. Riparian Zone Width from an and withs with trees, shrubs, or and inspace bare not impacted zone. Width of riparian zone 5/8 meters (1/3-1/2 active channel width witheses, shrubs, or an archives shrubs, or an impacted zone. Width of riparian vegetation due to human activities. Width of riparian vegetation due to human activities. grade (Right) 10 9 8 7 6 5 4 3 2 1 0 8 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 8 7 6 <t< th=""><th></th><th></th><th></th><th></th><th>CON</th><th>DITION CA</th><th>ATEGORY (</th><th>GRADE or S</th><th>CORE</th><th></th><th></th><th></th><th>F</th></t<>					CON	DITION CA	ATEGORY (GRADE or S	CORE				F	
pristine native prairie, and/or natural wetlands. woodlots and swamps, few row crops pasture; some wooded areas may be present but as isolated patches Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 3 RIPARIAN ZONE WIDTH AND CONTINUITY: Avg_Score 3 Con Width of riparian zone -18 meters (1-2 Width of riparian zone -18 meters (1-2) width wetatiend) wetatiend wetatien													e	
Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 3 Arg.Score 3 RIPARIAN ZONE WIDTH AND CONTINUITY: CONDITION CATEGORY GRADE or SCORE Width of riparian zone >18 meters (1-2 Width of riparian zone >18 meters (1/2, 12 width of riparian zone >18 meters (1/2, 12 width of riparian zone >18 meters (1/2, 12 width of riparian zone <1/td> Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. Width of riparian zone <12 meters (1/3-1/2 active channel width were entimately impacted zone. No			ive prairie, ar			and swamps		pasture; so areas may b	ome wooded be present but	м	ainly row cro	ps	1 F	
Avg.Score 3 RIPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 3 CONDITION CATEGORY GRADE or SCORE 6a. Riparian Optimal CONDITION CATEGORY GRADE or SCORE Cone Width Width of riparian zone >18 meters (1-2) Width of riparian zone >12 meters (1-12 active channel width width sees, shrubs, or tai grasses), human activities have not impacted zone. Width of riparian zone <6 meters (natural vegation less than 1/3 active channel Grade (left) 10 9 Optimal CONDITION CATEGORY GRADE or SCORE CONDITION CATEGORY GRADE or SCORE Optimal Aug.Score 8 Optimal CONDITION CATEGORY GRADE or SCORE Optimal Marginal Poor Source and particular weight of the structure of discuption from grazing/mowing minimal. To 5 A 3 2 A 0 8 Optimal Connel width with trees or shrubs, prairie grasses, or mark plants, riparain zone intact or discuption from grazing/mowing mini	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	3	
RIPARIAN ZONE WIDTH AND CONTINUITY: CONDITION CATEGORY GRADE or SCORE Ga. Riparian Zone Vidth (from stream zone >18 meters (1-2) (from stream) width) of riparian zone >18 meters (1-2) (width of riparian zone >12-18 meters (1/2-1/2 active channel width withrees, shrubs, or grasses), human activities have not impacted zone. Width of riparian zone < 6 meters (natural vegation due to human activities) Grade (left) 10 9 8 7 6 5 4 3 2 1 0 Width of riparian zone < 6 meters (natural vegation due to human activities) (from stream) width width of riparian zone 12-18 meters (1/2-1/2 active channel width vegetated), impacted zone. Width of riparian zone < 6 meters (natural vegation due to human activities. Grade (left) 10 9 8 7 6 5 4 3 2 1 0 8 Grade (left) 10 9 8 7 6 5 4 3 2 <th colsp<="" td=""><td>Grade (Right)</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>3</td></th>	<td>Grade (Right)</td> <td>10</td> <td>9</td> <td>8</td> <td>7</td> <td>6</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> <td>0</td> <td>3</td>	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	3
CONDITION CATEGORY GRADE or SCORE Marginal Zone Width (from stream edge to field) Width of riparian zone >18 meters (1-2 channel width swith trees, shrubs, or tall grasses), human activities have nani impacted zone. Width of riparian zone 6-12 tactive channel width witrees, shrubs, or grasses), human activities have nani impacted zone. Width of riparian zone 6-12 tactive channel width witrees, shrubs, or grasses), human activities have nani impacted zone. Width of riparian zone 6-12 tactive channel width witrees, shrubs, or grasses), human activities have nani impacted zone. Width of riparian zone 6-12 tactive channel width witrees, shrubs, or grasses), human activities Width of riparian zone 6-12 tactive channel width witrees, shrubs, or grasses), human activities have nani impacted zone. Width of riparian zone 6-12 tactive channel channel width wegetation, impacted zone. Width of riparian zone 6-12 thuman activities. Grade (left) 10 9 8 7 6 5 4 3 2 1 0 8 6b. Riparian Zone Vegetation Protection/ Completeness Optimal Suboptimal Marginal Marginal Poor Suboptimal shrubs, prairie grasses, rew trees or shrubs, prairie grasses, rew trees & shrubs, ilow plant density: bank deeply scarred w												Avg.Score	3	
6a. Riparian Zone Width (from stream) Optimal Suboptimal Marginal Poor Width of riparian zone >18 meters (1-2 (from stream) Width of riparian zone >18 meters (1/2- channel width with trees, shrubs, or tall impacted zone. Width of riparian zone <6.12 Width of riparian zone <6.12 meters (1/3-1/2 active channel width with resp. shrubs, or tall impacted zone. Width of riparian zone <6.12 Width of riparian zone <6.12 Width of riparian zone <6.12 Width of riparian zone <6.12 wegation less than 1/3 active channel width). Width of riparian zone <6.12 Width of riparian zone soft soft soft soft soft soft soft soft	RIPARIAN ZON	IE WIDTH	AND CONT	INUITY:										
Zone Width (from stream edge to field) Width of riparian zone >18 meters (1:2 channel widths with trees, shrubs, or tall grasses), human activities have not impacted zone. Width of riparian zone <12:18 meters (1/2 1 active channel width vitrees, shrubs, or grasses), human activities have not impacted zone. Width of riparian zone <12:18 meters (1/2) meters (1/3-1/2 active channel width vegetated), impacted by human activities. Width of riparian zone <6 meters (natural vegation less than 1/3 active channel width), little riparian vegetation due to human activities. Grade (left) 10 9 8 7 6 5 4 3 2 1 0 8 6b. Riparian Zone Vegetation/ Protection/ Completeness Optimal Suboptimal Marginal Marginal Poor Avg.Score 8 6b. Riparian Zone Vegetation/ grazing/mowing minimal. Suboptimal Marginal Suboptimal Marginal Marginal Poor 75-90% streambank vegetation, mixed vegetation from grazing/mowing minimal. 75-90% streambank vegetation, mixed vegetation of mixed grasses meters. 50-75% streambank vegetation of mixed grasses frequent with some guilies and scars every 50 meters. Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scared with guilies all along its length. 61 10 9 8 7 6 5 4 3 2					CON	DITION CA	TEGORY (GRADE or S	CORE				E	
(from stream edge to field)channel widths with trees, shrubs, or tall grasses), human activities have not impacted zone.1 active channel width witrees, shrubs, or grasses), human activities have not impacted zone.Image activities have not grasses), human activities have not impacted zone.Image activities have not grasses), human activities have not impacted zone.Image activities have not grasses), human activities have not impacted zone.Image activities have not meters (1/3-1/2 active channel width vegetated), impacted by human activities.Vegation less than 1/3 active channel width), little riparian vegetation due to human activities.Grade (left)1098765432108Grade (left)10987654321086b. Riparian Zone Vegetation Protection/ CompletenessOptimalSuboptimalMarginal supprise practice along channel and mature trees behind; disruption evident with set is sparse young tree or shrub species; breaks frequent with some guillies and scars every 50 meters.Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, for these & shrub; breaks occurring at intervals of >50 meters.50-75% streambank sparse young species; breaks frequent with some guillies and scars every 50 meters.Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrub; breaks and sparse young species; breaks frequent with some guillies and scars every 50 meters.Poor shrub species; breaks frequent with some guillies and scars every 50 m													a 1	
Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 8 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 8 Key Score Key Score Not Score	(from stream	channel widt grasses),	ths with trees, s human activitie	shrubs, or tall es have not	1 active char grasses), hur	nel width w/tre	es, shrubs, or have minimally	meters (1) channel wid	/3-1/2 active Ith vegetated),	vegation le width), little	ss than 1/3 ac riparian veget	tive channel tation due to	F e R U	
Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 8 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 8 Key Score Key Score Not Score	Grade (left)	10	9	8	7	6	5	4	3	2	1	0	8	
CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor 6b. Riparian Zone 50% plant density of mature trees or shubs, prairing rases, or marsh plants, riparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation, mixed your species along channel and mature updation of mixed your species along channel and mature updation of mixed your species along periodic along species along channel and mature updation of mixed your protection/ Coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies and sparse young tree or shrub species; breaks frequent with some gullies and scars every 50 meters. Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies all along its length. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 6 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 6		10	9	8	7	6	5	4	3	2	1	0	8	
Optimal Suboptimal Marginal Poor 6b. Riparian Zone >90% plant density of mature trees or shrubs, prairie grasses, or marsh plants, riparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation, mixed young species along channel and mature trees behind; disruption evident with breaks occurring at intervals of >50 meters. 50-75% streambank vegetation of mixed grasses, coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies and sparse young tree or shrub scare very 50 meters. Less than 50% streambank vegetation of mixed grasses, and sparse young tree or shrub scare very 50 meters. Coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies and scars every 50 meters. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 6 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 6												Avg.Score	8	
6b. Riparian Zone Vegetation Protection/ Completeness >90% plant density of mature trees or shrubs, prairie grasses, or marsh plants, iparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation, mixed young species along channel and mature trees behind; disruption evident with breaks occurring at intervals of >50 meters. 50-75% streambank vegetation of mixed grasses species; breaks frequent with some guillies and scars every 50 meters. Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with guillies all along its length. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 6 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 6					CON	DITION CA	TEGORY (E	
Zone Vegetation Protection/ Completeness shrubs, prairie grasses, or marsh plants, iparian zone intact or disruption from grazing/mowing minimal. young species along channel and mature trees behind; disruption evident with breaks occurring at intervals of >50 meters. vegetation of mixed grasses and sparse young tree or shrub species; breaks frequent with some guilies and scars every 50 meters. coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies all along its length. Grade (Left) 10 9 8 7 6 5 4 3 2 1 0 6 Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 6													e	
Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 6		shrubs, prair	rie grasses, or internet intact or dis	marsh plants, ruption from	young specie trees behi	es along chann nd; disruption o curring at inter	el and mature evident with	vegetation of and sparse shrub spe frequent with	mixed grasses young tree or cies; breaks h some gullies	coverage co grasses, fee density; bank	onsisting most w trees & shru k deeply scarre	ly of pasture bs; low plant ed with gullies	1 F F 6 1	
Grade (Right) 10 9 8 7 6 5 4 3 2 1 0 6	Zone Vegetation Protection/	grazi	5 5										F #	
	Zone Vegetation Protection/ Completeness	Ū		8	7	6	5	4	3	2	1	0	6	
	Zone Vegetation Protection/ Completeness Grade (Left)	10	9	-	-			-					-	
	Zone Vegetation Protection/ Completeness Grade (Left)	10	9	-	-			-				0	6	
Calculation of Function Capacity Index = Total Score/Total Possible Score 0.42 FCI = #/80	Zone Vegetation Protection/ Completeness Grade (Left)	10	9	-	-			-				0	6	

1 VARIABLI		III. HABITAT FUNCTIO	SNS S12 (2.	5-5')	SCORE So
1	1 FLOW REC TYPE	GIME Perennial	Intermittent w/ Perennial Pools	Intermittent Ephemeral	KE
	Grade	10 9 8	7 6 5	4 3 2 1	0 1 20
2	2 EPIFAUNA	AL SUBSTRATE/AVAILABLE COVER			
		Optimal Within stream bed, greater than 50%	Suboptimal Within stream bed, 30-50%	Marginal Poor Within stream bed, 10-30% Less than 10% habitat fe	atures US
		coverage by stable habitat features,	coverage by stable habitat features	coverage by stable habitat present; lack of habitat is of	bvious; No
		favorable for stream faunal colonization and/or fish/amphibian cover. Most habitat	favorable for stream faunal colonization and/or fish/amphibian	features favorable for stream substrate unstable or lac faunal colonization and/or concrete lined channels.	Linkitot
		features non transient. Features may	cover. Many habitat features not	fish/amphibian cover; habitat features and pools buried o	r lacking,
		include snags, submerged logs, undercut banks, roots, cobble, rocks, persistent leaf	transient. (See Excellent Category for habitat feature components.)	availability may be less than channel bottom may be desirable, substrate may be	flat. (pa
		packs, pools and glides, or other stable		frequently disturbed. (See	Ba
		habitat at a stage to allow colonization		Excellent Category for habitat feature components.)	al. EP
					Pa
					al.,
					AU
	Grade	10 9 8	7 6 5	4 3 2 1	0 1
	3 STREAM E	BOTTOM SUBSTRATE: Pool Substrate Ch		Newlad 2	
		Optimal Mixture of substrate materials, with gravel	Suboptimal Mixture of soft sand, mud, or clay;	Marginal Poor All mud or clay or sand bottom; Hard pan clay or bedrock;	no root Ba
		and firm sand prevalent; root mats and	mud may be dominant; some root	little or no root mat; no mat or submerged veget	
		submerged vegetation common.	mats and submerged vegatation present.	submerged vegetation.	RB
			F. 55010		pa Pa
					al.
	Grade	10 9 8	7 6 5	4 3 2 1	0 <u>1</u> AU
	4 POOL VAR	RIABILITY			
		Optimal	Suboptimal	Marginal Poor	
		Even mix of large-shallow, large-deep, small-shallow, small-deep pools present	Majority of pools large-deep; very few shallow.	Shallow pools much more Majority of pools small-sha prevalent than deep pools pools absent	allow or Ba al.
					RE
					pa
					Pa al.
	Grade	10 9 8	7 6 5	4 3 2 1	0 1
5		T DEPOSITION/SCOURING			
		Optimal <5% of channel bottom affected by scour or	Suboptimal 5-30% affected by scour or deposition;	Marginal Poor 30-50% affected by scour or More than 50% of the bottom in	a state of Ba
		deposition.	Scour at constrictions and wehre grades steepen. Some deposition in pools	deposition. Deposits and scour at obstructions, constrictions and minimal or absent due to heavy	. Pools al.
			steepen. Gome deposition in pools	bends. Some filling of pools. or excessive scouring	RE
					pa Pa
					al.,
	Grade	10 9 8	7 6 5	4 3 2 1	0 1
	6 CHANNEL	FLOW STATUS			ТС
		Optimal Water reaches the base of both lower	Suboptimal Water fills >75% of the channel; or	Marginal Poor Water fills 25-75% of the Very little water in the char	inel and Wr
		banks; <5% of channel substrate is	<25% of channel substrate is	available channel and/or riffle mostly present in standing	pools; or Ba
		exposed	exposed	substrates are mostly exposed stream is dry	al.
					RB
					Pa
	Grade	10 9 8	7 6 5	4 3 2 1	0 0
7		ALTERATION	: 0 0	· · · · · · · · · · · · · · · · · · ·	÷ 0
		Optimal	Suboptimal	Marginal Poor Alteration or channelization Banks shored with gabion,	inton of
		Channelization, alteration, or dredging absent or minimal; normal and stable	Some alteration or channelization present, usually adjacent to	Alteration or channelization Banks shored with gabion, may be extensive; concrete. Concrete or ripr	
		stream meander pattern. Alteration by	structures, (such as bridge abutments or culverts); evidence of	embankments (including spoil piles) or shoring structures significantly altered by stor	bitat Dis
		stormwater inputs absent or minimal	past alteration, (I.e., channelization)	present on both banks; normal or other inputs. Over 80%	of the
			may be present, but stream pattern and stability have recovered; recent	stable stream meander pattern stream reach altered has not recovered. Alteration	
			alteration is not present. Minor	from stormwater inputs may be	(Fi
			alteration from stormwater or other	extensive. 40-80% of stream reach altered.	pa
			inputs.	reach allereu.	Ba al.
					RB
					Pa
	1	10 9 8	7 6 5		al

8 (CHANNEL SI		Ontimol		1	Subcotine		Ma	rainal		Poor		1
		The bends in t	Optimal he stream incr	ease the	The bend	Suboptima s in the strea			rginal in the stream	Channel	Poor straight; wat	erwav has	1
		stream length 3 t was in a straig braiding is cons plains and othe	to 4 times long ht line. (Note - idered normal er low-lying are	er than if it channel in coastal eas. This	the stre	am length 2 t an if it was ir line.	to 3 times	increase the times longer th	stream 1 to 2 nan if it was in a ght line		hannelized f distance		
		parameter is n	ot easily rated areas).	in these									
(Grade	10	9	8	7	6	5	4	3	2	1	0	2
9 <mark>E</mark>	BANK STABI	LITY (SCORE E	ACH BANK) Optimal		1	Suboptima	1	Ma	rginal	1	Poor		1
		Banks stable; evi failure absent o	idence of eros			y stable; infre	quent, small	Moderately una	stable; perennial waterline sparse		no perennial	vegetation at	1
		affected), pe waterline; no raw erosion on out O.K.); no recently	erennial vegeta or undercut b side of meand	ition to anks (some er bends	5-30% of b minor undercutti to waterline	osion mostly ank in reach erosion and/ ing; perennia e in most pla ee roots rare	has areas of or bank l vegetation ces; recently	(mainly scoure lateral erosion hard points outcrops) an- elsewhere; 30 reach has area bank underci exposed tree root hairs ci	waterine sparse ad or stripped by n), bank held by s (trees, rock d eroded back -60% of bank in as of erosion and utting; recently e roots and fine ommon; high ial during floods	banks; red common; undercu eroded are along stra obvious bar	; severe eros sently expose tree falls and it trees comm eas; "raw" an ight sections nk sloughing has erosiona	ed tree roots l/or severely non; many eas frequent and bends; ; 60-100% of	
	Grade	10	9	8	7	6	5	4	3	2	1	0	Ę
(Grade	10	9	8	7	6	5	4	3	2	1 Avg.Score	0	6.5
10	VEGETATIVE	PROTECTION	(SCORE EA	CH BANK)									I
Γ			Optimal 0% of the strea	mbank	70-90% of	Suboptima the streamba			rginal ne streambank	Less than	Poor 50% of the	streambank	I.
		surfaces and im covered by nati trees, understo macrophytes; through grazing o evident; almost a	nmediate ripar ve vegetation, ry shrubs, or n ; vegetative dis or mowing min	ian zones including onwoody sruption imal or not	covered to one class represented not affe potential to than one-li	by native veg ss of plants is ed; disruption ecting full plan o any great en half of the po ile height rem	etation, but s not well- n evident but nt growth extent; more itential plant	surfaces vegetation; dis patches of bar cropped vege less than or potential plan	covered by ruption obvious; re soil or closely tation common; ne-half of the t stubble height aining.	surfaces disruption of is very hig removed to	covered by of streambar gh; vegetatio	vegetation; ik vegetation n has been ers or less in	
	Grade	10	9	8	7	6	5	4	3	2	1	0	6
	Grade Grade	10 10	9 9	8	7 7	6 6	5	444	3	2	1 1 Avg.Score	0	6
(Grade	10 DNE (SCORE EA	9 ACH BANK)	-	7 7	6	5	4	3			0	6
(Grade	10 DNE (SCORE EA Width of riparian	9 ACH BANK) Optimal zone >18 met	8 ers; human		6 Suboptima of riparian zo	5 al ne 12-18	4 Mar Width of ripa	3 rginal rian zone 6-12	2 Width of r	Poor riparian zone	0 <6 meters;	6
(Grade	10 DNE (SCORE EA	9 ACH BANK) Optimal zone >18 met rking lots, road	8 ers; human lbeds, clear	meters;	6 Suboptima	5 al ne 12-18 ities have	4 Mar Width of ripa meters; human	3 rginal	2 Width of r little or no r	Poor riparian zone	0 e <6 meters; tation due to	6
11 F	Grade	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10	9 ACH BANK) Optimal zone >18 met rking lots, roac rrops) have noi zone. 9	8 ers; human lbeds, clear impacted 8	meters;	6 Suboptima of riparian zo human activ d zone only r	5 ne 12-18 nities have ninimally).	4 Width of ripa meters; human impacted zon	rginal rian zone 6-12 n activities have ne a great deal.	2 Width of r little or no r h	Poor riparian zone riparian vege	0 <6 meters; tation due to ies. 0	e e
11 [Grade	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c	9 Optimal zone >18 met rking lots, roac rrops) have not zone.	8 ers; human Ibeds, clear impacted	meters;	6 Suboptima of riparian zo human activ d zone only r	al ne 12-18 ities have ninimally).	4 Width of ripa meters; human impacted zon	rginal rian zone 6-12 n activities have ne a great deal.	2 Width of r little or no r h	Poor riparian zone riparian vege	<pre>0 c6 meters; tation due to tes. 0 0 0</pre>	e e
11 4	Grade RIPARIAN ZC Grade Grade	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10	9 ACH BANK) Optimal zone >18 met riving lots, roac rops) have noi zone. 9 9 10N (SCORE	8 ers; human Ibeds, clear impacted 8 8	meters; impacter 7 7	6 Suboptima of riparian zo human activ d zone only r 6 6 6	5 ne 12-18 ities have ninimally).	4 Width of ripa meters; human impacted zon 4 4	rginal rian zone 6-12 n activities have ne a great deal. 3 3	2 Width of r little or no r h	Poor riparian zone riparian vege uman activiti 1 1 Avg.Score	<pre>0 c6 meters; tation due to tes. 0 0 0</pre>	е е е е
11 F	Grade RIPARIAN ZC Grade Grade	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in	9 ACH BANK) Optimal zone >18 met rking lots, roacrops) have noi zone, 9 9 ON (SCORE h>3 inches) pi y cover, (Addi lotde: sapling	8 ers; human lbeds, clear impacted 8 8 EEACH B/ resent, with tional fores; shrub,	7 7 7 7 7 ANK) Tree sl present canopy	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 8 Suboptima rratum (dbh> , with 30% to cover. (See	5 al ne 12-18 ities have ninimally). 5 5 3 inches) 60% tree Excellent	4 Width of ripa meters; human impacted zon 4 4 4 Tree stratum present, wi canopy cover.	3 rginal rian zone 6-12 n activities have te a great deal. 3 Glob>3 rginal (dbh>3 inches) th <30% tree (See Excellent	2 Width of r little or no n h 2 2 2 Tree stra surfaces lands, cu	Poor riparian zone riparian vege uman activiti 1 1 Avg.Score Poor tum absent; a, croplands, lverted strea	<pre><6 meters; tation due to es.</pre>	е е е е
11 4	Grade RIPARIAN ZC Grade Grade	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in	9 9 CH BANK) Optimal Zone >18 met iking lots, roac rops) have noi zone. 9 9 9 100 (SCORE Optimal h-3 inches) py yover. (Addi litter i and lead litter i and woody del ilitter i are present. S	8 ers; human Ibeds, clear impacted 8 8 EEACH B/ resent, with tional fores , shrub, roluding pris.) Score ange if ≥2 core at low	meters; impacter 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	6 Suboptima of riparian zo human activ d zone only r 6 6 6 8 Suboptima tratum (dbh> with 30% to with 30% to	5 I ne 12-18 titles have ninimally). 5 5 5 5 1 3 inches) 6 60% tree Excellent of additional the high end ditional forest the at low enc. layers are areas with	4 Width of ripa meters; human impacted zon 4 4 4 4 7 Tree stratum present, wi canopy cover. Category fo additional fore at the high em ≥2 addition present. Score additional lay OR area co maintained a dense herbz	rginal rian zone 6-12 n activities have e a great deal. 3 rginal (dbh>3 inches) th <30% tree	2 Width of f little or no i h 2 2 2 Tree stra surfaces lands, cu and maint denuded t	Poor riparian zone riparian vege uman activiti 1 1 Avg.Score Poor tuum absent; o, cropiands, s, cropiands,	<pre><6 meters; tation due to les.</pre>	е е е е
	Grade Grade Grade RIPARIAN H/ RIPARIAN H/ Grade I. Delineate J. Delineate	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 Tree stratum (db >60% tree canop layers may in herbaceous, i mosses/lichens ; end if ≤1 additi 10 10 10 10 10 10 10 10 10 10	9 9 ACH BANK) Optimal zone >18 met ixing lots, roac rops) have noi zone, in the second secon	8 ers; human libeds, clear t impacted 8 8 8 EACH BA resent, with tional fores; shrub, rcluding rris.) Score ange if ≥2 core at low p present. 8 8 eam bank i neasuring 9	NKC Tree st Tree st	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 6 Suboptima ratum (dbh>; with 30% to cover. (See or examples rs.) Score at ngei ±22 ad oresent. Sco titional forest OR cutover umps remain 6 6 6 0 0 Categoria g length an	5 I ne 12-18 ities have ninimally). 5 5 5 1 3 5 5 1 3 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Mat Width of ripa meters; human impacted zon 4 4 Tree stratum present, wi canopy cover. Category fo additional fore ze additional present. Score at the high end ze additional lay OR area co maintained a dense herbs woody v 4 dition Scores u d Use GIS ma	rginal rian zone 6-12 n activities have le a great deal. 3 3 (dbh>3 inches) th <30% tree (See Excellent res amples of st layers.) Score a tow end if s1 ers are present. nsists of non- night naturalized aceous and/or egetation. 3 sing the above ps may be usee	2 Width of r little or no t h 2 2 2 Tree stra surfaces lands, cu and maint denuded s p p descriptors of for this.	Poor iparian zone iparian zone uman activiti 1 1 Avg.Score Poor Iverted strea ained herbas surfaces, act asture, and of 1 1 2 2 3	<pre></pre>	E e sums of n Blocks
	Grade RIPARIAN ZC Grade Grade Grade Grade Crad Crade C	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (bb >60% tree canop layers may in herbaceous, a mosses/lichens s at the high end additional layers end if ≤1 additi 10 riparian areas all square footage %Riparian Area (9 9 1	8 ers; human libeds, clear t impacted 8 8 8 EACH BA resent, with tional fores; shrub, rcluding rris.) Score ange if ≥2 core at low p present. 8 8 eam bank i neasuring 9	NKC Tree st Tree st	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 Suboptima ratum (dbhz- , with 30% to cover. (See cov	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Width of ripa meters; human impacted zon 4 4 4 4 4 4 4 4 4 4 4 4 4	rginal rian zone 6-12 n activities have le a great deal. 3 3 (dbh>3 inches) th <30% tree (See Excellent res amples of st layers.) Score a tow end if s1 ers are present. nsists of non- night naturalized aceous and/or egetation. 3 sing the above ps may be usee	2 Width of r little or no n h 2 2 2 2 7 7 ree stra surfaces lands, cu and maint denuded s p p descriptors of for this. blocks bel blocks bel	Poor iparian zone iparian zone uman activiti 1 1 Avg.Score Poor Iverted strea ained herbas surfaces, act asture, and of 1 1 2 2 3	<pre><6 meters; tation due to les.</pre>	E e sums of n Blocks
	Grade Grade Grade RIPARIAN H RIPARIAN H Grade Grade I. Delineate J. Delineate J. Delineate J. Delineate	10 NE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in herbaceous, a at the high end additional layers end if ≤1 additi 10 10 10 10 10 10 10 10 10 10	GH BANK) Optimal Cone >18 mK Optimal Cone >18 mK Optimal	8 ers; human lbeds, clear impacted 8 8 EACH B/ resent, with tional fores; , shrub, roluding pris.) Score ange if ≥2 core at low present. 8 am bank i neasuring urposes, er	NKC Tree st Tree st	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 6 Suboptima ratum (dbh> , with 30% to cover. (See or examples rs.) Score at nge if ±2 ad present. Sco fitional forest OR cutover umps remain 6 on Categori g length an and width) a Suboptima 100 6	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Width of ripa meters; humai impacted zon 4 4 4 4 4 4 4 4 4 4 4 4 4	3 rginal rian zone 6-12 n activities have e a great deal. 3 all layers are a tow end if -1 accous and/or egetation. 3 sing the above ps may be user category in the rginal	2 Width of r little or no n h 2 2 2 2 7 7 ree stra surfaces lands, cu and maint denuded s p p descriptors of for this. blocks bel blocks bel	Poor iparian zone iparian zone uman activiti 1 1 Avg.Score Poor tum absent; , croplands, lverted strea ained herbas surfaces, act asture, and of 1 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	<pre></pre>	e sums of n Blocks
	Grade Grade Grade RIPARIAN H RIPARIAN H Grade I Delineate 2. Determineate 3. Enter the G	10 NE (SCORE E/ Width of riparian activities (I.e. par cuts, lawns, or c 10 10 Tree stratum (db >60% tree canop layers may in herbaceous, i mosses/lichens : end if ≤1 additi 10 10 10 10 10 10 10 10 10 10	9 9 1	8 ers; human lbeds, clear impacted 8 8 EACH B/ resent, with tional fores; , shrub, roluding pris.) Score ange if ≥2 core at low present. 8 am bank i neasuring urposes, er	NKC Tree st Tree st	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 6 6 6 7 Suboptima ratum (dbh>; with 30% to cover. (See or examples rs.) Score at ngei + 22 ad or examples rs.) Score at ngei + 22 ad or examples 0 f or	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Width of ripa meters; humai impacted zon 4 4 4 4 4 4 4 4 4 4 4 4 4	3 rginal rian zone 6-12 n activities have is a great deal. 3 3 3 3 3 3 3 3 3 3 3 3 3 a low of a fair range if a layers. Score if a layers. Score if a layers are a tow of a fair range at layers are res are present. nsists of non-indinatized aceous and/or egetation. 3 sing the above ps may be user category in the	2 Width of r little or no n h 2 2 2 2 7 7 ree stra surfaces lands, cu and maint denuded s p p descriptors of for this. blocks bel blocks bel	Poor iparian zone iparian zone uman activiti 1 1 Avg.Score Poor tum absent; , croplands, lverted strea ained herbas surfaces, act asture, and of 1 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	<pre><6 meters; tation due to les.</pre>	E e sums of n Blocks
	Grade Grade Grade Grade RIPARIAN H/ RIPARIAN H/ Grade 1. Delineate 2. Determine 3. Enter the S Right Bank	10 NE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in herbaceous at the high end sequare footage 10 10 10 10 10 10 10 10 10 10	Get Bankt Gotter Bankt GotterBankt GotterBankt GotterBankt GotterBankt GotterBa	8 ers; human lbeds, clear impacted 8 8 EACH B/ resent, with tional fores; , shrub, roluding pris.) Score ange if ≥2 core at low present. 8 am bank i neasuring urposes, er	A meters; impacted im	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 Suboptima ratum (dbh> , with 30% to cover. (See or examples rs.) Score at nge if ±2 ad present. Sco fitional forest OR cutover umps remain 6 6 6 6 6 100 100	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Width of ripa meters; humai impacted zon 4 4 4 4 4 4 4 4 4 4 4 4 4	3 rginal rian zone 6-12 n activities have e a great deal. 3 all layers are a tow end if -1 accous and/or egetation. 3 sing the above ps may be user category in the rginal	2 Width of r little or no n h 2 2 2 2 7 7 ree stra surfaces lands, cu and maint denuded s p p descriptors of for this. blocks bel blocks bel	Poor iparian zone iparian zone uman activiti 1 1 Avg.Score Poor tum absent; , croplands, lverted strea ained herbas surfaces, act asture, and of 1 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	<pre><6 meters; tation due to les.</pre>	e sums of n Blocks
	Grade Grade Grade RIPARIAN H RIPARIAN H Grade I Delineate 2. Determineate 3. Enter the G	10 NE (SCORE E/ Width of riparian activities (I.e. par cuts, lawns, or c 10 10 Tree stratum (db >60% tree canop layers may in herbaceous, i mosses/lichens ; end if ≤1 additi 10 10 10 10 10 10 10 10 10 10	Get Bankt Gotter Bankt GotterBankt GotterBankt GotterBankt GotterBankt GotterBa	8 ers; human lbeds, clear limpacted 8 8 8 EEACH B/ Esent, with tional fores; shrub, ccluding rris,) Score core at low present. 8 am bank i neasuring i rrposes, er	A meters; impacted im	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 Suboptima ratum (dbh> with 30% to cover. (See or examples rs.) Score at ngei + z2 ad resent. Sco ititional forest 0 GR cutover umps remain 6 6 0 6 0 100 6 6 0 100 0 6 6 1 100 100	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Mai Width of ripa meters; huma impacted zon 4 4 4 4 4 Mai Tree stratum present, wi canopy cover. Category for additional fore additional for	3 rginal rian zone 6-12 n activities have e a great deal. 3 all layers are a tow end if -1 accous and/or egetation. 3 sing the above ps may be user category in the rginal	2 Width of r little or no n h 2 2 2 2 7 Tree strates lands, cu and maint denuded 1 p g descriptors f for this. blocks bel	Poor iparian zone iparian zone uman activiti 1 1 Avg.Score Poor tum absent; , croplands, lverted strea ained herbas surfaces, act asture, and of 1 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	<pre><6 meters; tation due to es. 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</pre>	e sums of n Blocks
	Grade Grade Grade Grade RIPARIAN H/ RIPARIAN H/ Grade 1. Delineate 2. Determine 3. Enter the S Right Bank	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (bb >60% tree canop layers may in herbaceous, a otherbaceous, a otherbaceous, a at the high end additional layers end if ≤1 additi 10 riparian areas all square footage %Riparian Area (%Riparian Area	9 9 1 1 CAL BANK) Optimal Zone >18 met King lots, reacrops) have not zones. 9 9 9 1 1 0 1 1 0 1 1 0 1	8 ers; human lbeds, clear limpacted 8 8 8 EEACH B/ Esent, with tional fores; shrub, ccluding rris,) Score core at low present. 8 am bank i neasuring i rrposes, er	A meters; impacted im	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 Suboptima rratum (dbh>, with 30% to cover. (See cove	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Mai Width of ripa meters; huma impacted zon 4 4 4 4 4 Mai Tree stratum present, wi canopy cover. Category for additional fore additional for	3 rginal rian zone 6-12 n activities have te a great deal. 3 (dbh3 inches) (dbh3 inche	2 Width of r little or no n h 2 2 2 2 7 Tree stra surfaces lands, cu and maint denuded t p 2 descriptors f for this. blocks bel SubCl=(%	Poor iparian zone iparian zone iparian zone iparian zone iparian zone normality 1 1 Avg.Score Poor itum absent; s, croplands, iverted strea ained herbaa ained herbaa ained herbaa aisufaces, act oor oor 0 RA*Scores	<pre><6 meters; tation due to es.</pre>	E SUMS OF A
	Grade Grade Grade Grade RIPARIAN H/ RIPARIAN H/ Grade 1. Delineate 2. Determine 3. Enter the S Right Bank	10 DNE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (bb >60% tree canop layers may in herbaceous, a otherbaceous, a otherbaceous, a at the high end additional layers end if ≤1 additi 10 riparian areas all square footage %Riparian Area (%Riparian Area	9 9 1 1 CAL BANK) Optimal Zone >18 met King lots, reacrops) have not zones. 9 9 9 1 1 0 1 1 0 1 1 0 1	8 ers; human lbeds, clear limpacted 8 8 8 EEACH B/ Esent, with tional fores; shrub, ccluding rris,) Score core at low present. 8 am bank i neasuring i rrposes, er	A meters; impacted im	6 Suboptima of riparian zo human activ d zone only r 6 6 6 6 Suboptima rratum (dbh>, with 30% to cover. (See cove	5 I Ine 12-18 ities have ninimally). 5 5 5 1 3 inches) 60% tree Excellent of additional the high end ditional forest re at low enc layers are areas with ing. 5 5 5 5 5 5 5 5 5 5 5 5 5	4 Mai Width of ripa meters; huma impacted zon 4 4 4 4 4 Mai Tree stratum present, wi canopy cover. Category for additional fore additional for	3 rginal rian zone 6-12 n activities have te a great deal. 3 (dbh3 inches) (dbh3 inche	2 Width of r little or no t h 2 2 2 2 7 7 7 7 8 9 7 8 9 9 9 9 9 9 9 9 9 9 9 9	Poor iparian zone iparian zone iparian zone uman activiti 1 1 Avg.Score Poor tum absent; s, croplands, liverted strea ained herbas surfaces, act asture, and of ained herbas surfaces, act asture, and of and herbas surfaces, act asture, and of asture, asture,	<pre><6 meters; tation due to es.</pre>	E e sums of n Blocks

Str	eam Function	al Capacity C	alculation		
	S12 (2.5-	5')			
Date:	5/19/2006				
Project:	Lake Ralph H	all			
Assessment Area:	WP 20				
Assessors:	Holmes Voigh	it Capps			
Project Status:	X_Preproj	ect	Postproject		
		Otrasara	Otras a res	Multiplication	
		Stream	Stream	Multiplication	50
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC
Hydrologic	0.19	6,304	E	0.00125	1.46
Water Quality Improvement	0.42	6,304	E	0.00125	3.30
Habitat	0.30	6,304	E	0.00125	2.33
Total	0.90	6,304			7.09
*Stream Length is the length of the Stre	am Assessme	nt Reach (SAF	R)		
**Multiplication Factors					
Ephemeral = 0.00125					
Intermittent = 0.0025					
Perennial = 0.0038					

Pasture outside of riparian zone. Rip zone 20m or less.

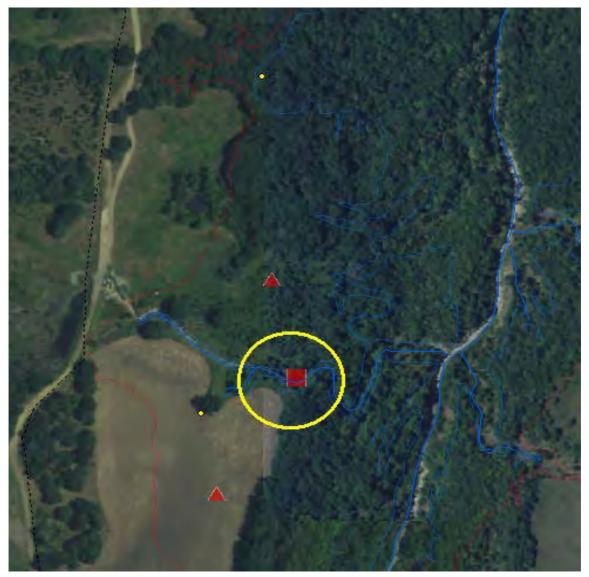


SWAMPIM DATASHEETS – SOUTH EPHEMERAL 2.5 TO 5.0' PRE-PROJECT

• **S16-TRIB4**

S16 TRIB 4 (2.5-5.0') Site 7. Assessed 25 August 2009

1535 linear foot reach Young tree and crops are the adjacent land use at and upstream of the SWAMPIM site, forest is the adjacent land use downstream of the site. Approximate 10 foot wooded riparian buffer between crops and stream



VARIABLES FLOW REGIM	E:			1	INCTIONS	S16-Trib4	(2.0 0.0)					SCORE	Source
TYPE		Perenni				ennial Pools		mittent		Epher			<i>KDWP</i> Kansas
Grade CHANNEL COI	10 NDITION:	9 Measurer	8 nent or Obse	7 rvation of S	6 Stream Cha	5 nnel Conditio	4	3	2	1	0	1	Subjecti
													L .
		Optima	<u></u>	CC	Suboptim	DATEGORY		SCORE Irginal	1	Po	or	_	Barbou EPA RE
		hannel; no	structures or		channelizatio	n (usually in		hannel; 40-		l is activel	y downcutting or		5-21;
		elization m			areas) or pa tion, but with			the reach			ne reach riprap o	r Z	1998 L
2a.Channel		nce of dow re lateral cu	itting. Normal			ed and banks.		elized or ed. Excess			radation,dikes or access to the	Natural, active, downcutting	NRCS page 7
Condition/Alter ation (natural,			ical connectio nd floodplain.		ble frequenc	y of overbank		ion; braided ith excessive		floodp	lain.	II, a	page /
altered, or	between		iu nooupiain.	IIC	JWS 01110 1100	upiairi.		of overbank				ctive	
downcutting)								onto the n. Historical				ș, do	
								kes or levees				own	
							restrict	floodplain.				cutt	
												ing.	
Grade	10	9	8	7	6	5	4	3	2	1	0	1	L
				CC		CATEGORY	SRADE or S	SCORE					w/ assis
2b.Channel		Optima			Suboptim	nal	Ma	irginal		Po			and inp
Capacity to			Flow Frequenc			low Frequency coverflow from		Capacity to lency Ratio is			o Flow Frequency ank overflow from		Dr. Mik
Flow			at a 1.25 to 2.5			frequent than		ank overflow			ore frequent than		Harvey Travan
Frequency Ratio (for 2-		year freque 0.75-1.2			.25 years or an every 2.5	ess frequent		n events are quent than	every hal	f year or le every 10	ess frequent than		
year peak		0.75-1.2	.5		<0.75 or >1			ear or less		<0.24			
flow)								han every 5					
								ears. or >1.5					
Grade	10	9	8	7	6	5	4	3	2	1	0	()
				CC		CATEGORY	GRADE or	SCORE					Newtor
		Optima			Suboptim	nal	Ma	irginal		Po			USDA/
			ce of erosion c r minimal; (<5%			requent, small y healed over.		ely unstable; vegetation to			nial vegetation at erosion of both		SVAP 10; Bar
2c.Channel	of bar	nk affected)	, perennial	5-30% of	bank in reac	h has areas of	waterline s	parse (mainly	banks; r	ecently ex	posed tree roots		al., 199
Bank Stability (score each			ine; no raw or ne erosion on		or erosion an	d/or bank Il vegetation to		r stripped by osion), bank			and/or severely non; many erode	4	RBA pa
bank, left or	outside of	meander b	ends O.K.); no	waterlin	e in most pla	ces; recently	held by l	hard points	areas; "	raw" areas	s frequent along		26; US Norfolk
right facing	recently e	exposed ro tree fall:	ots; no recent s'	exposed	tree roots ra	re but present.		ck outcrops) oded back			d bends; obvious 100% of bank ha		2004
downstream)		a oo raa	.,				elsewhere	e; 30-60% of		erosiona		-	
								ach has areas n and bank					
							undercutt	ing; recently					
								ree roots and airs common:					
Grade (north) Grade (south)	10 10	9	8	7	6	5	4	3	2	1	0	2	
Grade (South)	10	9	0	1	0	5	4	3	2	!	Avg.Scor		
CHANNEL RO	UGHNESS	FACTOR	s									_	
			<u> </u>										
		Optima	al		Suboptim	CATEGORY		Irginal		Po	or		Barbou EPA RI
3a.Channel Sinuosity		ds in the str	eam increase		ds in the stre	eam increase	The bends	in the stream		straight; w	aterway has beer	·	Chapte
(bends in low			2.5 to 4 times as straight.			5 to 2.5 times straight line.		the stream to 1.5 times			long distance.		5-25; K
gradient		ength/valley	/ length at leas		length/valley	length 1.2 to	longer that	an if it was a	Chainio	. ionga "re			1996
stream)		>1.5.			1.5			ne. Channel ey length 1.0					
								1.2.					
Grade	10	9	8	7	6	5	4	3	2	1	0	3	3
				CC		CATEGORY							KDWP,
	l ittle or	Optima no channel	al enlargement	Some or	Suboptim avel bars of	nal coarse stones		rginal bars of rocks,	Channel	Por Portivided inte	or o braids or stream		Kansas Subject
3b. Bottom	resu	ulting from s	sediment	and well-w	vashed debri	s present, little	sands, and	I silt common;	is chann	elized; sub	ostrate is uniform		Evaluat
Substrate	accumu	lation; char	nnel is stable	sil	t; moderately	v stable	moderate	ely unstable	sand, silt	, clay, or b	edrock; unstable		Aquatic
Composition													Habitat

a ⊐ 3c. Instream				CO	DITION C	ATEGORY	GRADE or S	CORE					KDWP, 1996;
a 3c. Instream		Optimal			Suboptima			ginal		Poor		1	Newton et al.,
⊕ 3c. Instream	Diverse het		phy including	Channelh		es 5-7 of the		l bottom	Channel	bottom include		-	1998
D 3C. Instream													
0		following: de		items list	ed in Optima	al Category		of the items	items lis	ted in Optima	Category		USDA/NRCS
Bottom		gravel, logs/la						Optimal					SVAP page 13/
> Topography	debris,	backwaters/	oxbows,				Cat	egory					1.3.
e	overhand	ging vegetati	ion, riffles,										
ō	vegetate	ed shallows, r	rootwads.										
<u>></u>		banks, or sid											
L L	underedt	pools											
or O	- 10		0	-		-			0		0		
g Grade	10	9	8	7	6	5	4	3	2	1	0	1	
ac. Instream Bottom Topography O AluO up Boography Grade Or Statu Sc. Manning's				COI	DITION C	ATEGORY	GRADE or S	SCORE				-	
ة or		Optimal			Suboptima	al	Ma	ginal		Poor			
	(0.05 to 0.099	9		0.035 to 0.0)5	0.021 to 0	03 or >0.10	0.16 to	0.20 due to e	xcessive		
_ 001 marming 0							to	0.15	obstruction	to flow or 0.0	1 to 0 02 due		
n										lization and cl			
									to onamic	channel.	can, smooth		
Grade	10	9	8	7	6	5	4	3	2	1	0		
				0.0		ATEGORY	SRADE or S	CORE					USACE,
		Optimal		001	Suboptima			ginal		Poor			Norfolk District,
3d. Channel	In cicica and		end M/here	la cicio a se					la cicia a soti			-	
Incision		tio <u>></u> 1.0 <1.2				and Where		o <u>></u> 1.4 < 2.0		o <u>></u> 2.0 and W			2004 SAAM
		ope >2%; En				ntrenchment		re channel		, Entrenchme			Form 1 #1 and
(TLB/BFD=BH		; Where cha			l; Where cha			> 2%,		e channel sloj			VT Stream
R; 1/BHR*Adj	<u><</u> 2%; En	ntrenchment i	ratio >2.0	<u><</u> 2%, E	ntrenchment	ratio >2.0	Entrench	ment ratio	Entr	enchment rati	o <u><</u> 2.0		Geomorphic
Factor =CI)							>1.4; Whe	ere channel					Assessment
							slope	e <u><</u> 2%,					
								ent ratio >2.0					Phase 2
							2111101101111						
TLB =		15		BHR =	3								
BFD =		5						-					
Grade	10	9	8	7	6	5	4	3	2	1	0	0	
4 DYNAMIC SU	RFACE WAT	TER STOR	AGE										
1 2 114 4110 001													
				COI	NDITION C	ATEGORY (CORE					Newton, et al.,
		Optimal											
					Suboptima		Mai	ginal		Poor			1998 USDA/
4a.Pools		shallow pools			sent, but no	t abundant;	Mai Pools pr	ginal esent, but		ent, or the ent		-	1998 USDA/ NRCS SVAP
4a.Pools (abundant,	greater than	shallow pools n 30% of the	pool bottom	from 10-3	sent, but no 0% of the po	t abundant; ool bottom is	Mar Pools pr shallow; fro	ginal esent, but om 5-10% of				-	1998 USDA/
	greater than is obscure d	shallow pools n 30% of the due to depth,	pool bottom or pools are	from 10-3 obscure d	sent, but no 0% of the po ue to depth,	t abundant; ool bottom is or the pools	Mar Pools pr shallow; fro the pool	ginal esent, but om 5-10% of bottom is		ent, or the ent			1998 USDA/ NRCS SVAP page 14;
(abundant, present or	greater than is obscure d	shallow pools n 30% of the	pool bottom or pools are	from 10-3 obscure d	sent, but no 0% of the po	t abundant; ool bottom is or the pools	Mar Pools pr shallow; fro the pool	ginal esent, but om 5-10% of		ent, or the ent		-	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i>
(abundant,	greater than is obscure d	shallow pools n 30% of the due to depth,	pool bottom or pools are	from 10-3 obscure d	sent, but no 0% of the po ue to depth,	t abundant; ool bottom is or the pools	Mai Pools pr shallow; fro the pool obscure d	ginal esent, but om 5-10% of bottom is		ent, or the ent		-	1998 USDA/ NRCS SVAP page 14;
(abundant, present or	greater than is obscure d	shallow pools n 30% of the due to depth,	pool bottom or pools are	from 10-3 obscure d	sent, but no 0% of the po ue to depth,	t abundant; ool bottom is or the pools	Mai Pools pr shallow; fro the pool obscure d or the pool	ginal esent, but om 5-10% of bottom is ue to depth, ols are less		ent, or the ent		•	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i>
(abundant, present or	greater than is obscure d	shallow pools n 30% of the due to depth,	pool bottom or pools are	from 10-3 obscure d	sent, but no 0% of the po ue to depth,	t abundant; ool bottom is or the pools	Mai Pools pr shallow; fro the pool obscure d or the pool	ginal esent, but om 5-10% of bottom is ue to depth,		ent, or the ent		-	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i>
(abundant, present or	greater than is obscure d	shallow pools n 30% of the due to depth,	pool bottom or pools are	from 10-3 obscure d	sent, but no 0% of the po ue to depth,	t abundant; ool bottom is or the pools	Mai Pools pr shallow; fro the pool obscure d or the pool	ginal esent, but om 5-10% of bottom is ue to depth, ols are less		ent, or the ent		1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i>
(abundant, present or absent) Grade	greater thar is obscure d at le	shallow pools n 30% of the due to depth, east 5 feet de	pool bottom or pools are eep.	from 10-3 obscure d are a	sent, but no 0% of the pc ue to depth, it least 3 fee 6	t abundant; bol bottom is or the pools t deep. 5	Mar Pools pr shallow; fro the pool obscure d or the pool than 3 f	ginal esent, but om 5-10% of bottom is ue to depth, ols are less eet deep. 3	discerr	ent, or the ent ible. No wate	er = zero.	1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i>
(abundant, present or absent) Grade 4b. Channel	greater thar is obscure d at le	shallow pools n 30% of the due to depth, east 5 feet de	pool bottom or pools are eep.	from 10-3 obscure d are a	sent, but no 0% of the pc ue to depth, it least 3 fee 6 NDITION C.	t abundant; pol bottom is or the pools t deep. 5 ATEGORY (Mai Pools pr shallow; fro the pool obscure d or the pool than 3 f 4 GRADE or S	ginal esent, but om 5-10% of bottom is ue to depth, ue to depth, us are less eet deep. 3 GCORE	discerr	ent, or the eni nible. No wate	er = zero.	1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i> 1999
(abundant, present or absent) Grade 4b. Channel Flow Status	greater thar is obscure d at le	shallow pools n 30% of the Jue to depth, east 5 feet de 9 Optimal	pool bottom or pools are eep. 8	from 10-3 obscure d are a 7 COI	sent, but no 0% of the pc ue to depth, It least 3 fee 6 NDITION C. Suboptima	t abundant; bol bottom is or the pools t deep. 5 ATEGORY (al	Mai Pools pr shallow; fro obscure d or the poo than 3 f 4 GRADE or S Mai	ginal esent, but om 5-10% of bottom is ue to depth, ols are less eet deep. 3 CORE ginal	discerr 2	ent, or the eni iible. No wate	er = zero.	1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i> 1999 Barbour, et al.,
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to	greater than is obscure d at le	shallow pools n 30% of the Jue to depth, east 5 feet de 9 Optimal ches base of	pool bottom or pools are eep. 8 f both lower	from 10-3 obscure d are a 7 COI Water fill	sent, but no 0% of the po ue to depth, it least 3 fee 6 NDITION C. Suboptima s >75% of th	t abundant; bol bottom is or the pools t deep. 5 ATEGORY (al ne available	Mai Pools pr shallow; fro the pool obscure d or the pool than 3 f 4 GRADE or S Mai Water fills	ginal esent, but m 5-10% of bottom is is to depth, ols are less set deep. 3 SCORE ginal 25-75% of	discerr 2 Very little w	ent, or the eni nible. No wate	el and mostly	1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i> 1999 Barbour, et al.,
(abundant, present or absent) Grade 4b. Channel Flow Status	greater than is obscure d at le	shallow pools n 30% of the Jue to depth, east 5 feet de 9 Optimal	pool bottom or pools are eep. 8 f both lower	from 10-3 obscure d are a 7 COI Water fill	sent, but no 0% of the pc ue to depth, It least 3 fee 6 NDITION C. Suboptima	t abundant; bol bottom is or the pools t deep. 5 ATEGORY (al ne available	Mai Pools pr shallow; fro the pool obscure d or the pool than 3 f 4 GRADE or S Mai Water fills	ginal esent, but om 5-10% of bottom is ue to depth, ols are less eet deep. 3 CORE ginal	discerr 2 Very little w	ent, or the eni iible. No wate	el and mostly	1	1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 Barbour, et al., 1999 EPA RBA
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	greater than is obscure d at le	shallow pools n 30% of the Jue to depth, east 5 feet de 9 Optimal ches base of	pool bottom or pools are eep. 8 f both lower amount of	from 10-3 obscure d are a 7 COI Water fill channe	sent, but no 0% of the po ue to depth, it least 3 fee 6 NDITION C. Suboptima s >75% of th	t abundant; bol bottom is or the pools t deep. 5 ATEGORY (al ne available of channel	Mai Pools pr shallow; frr the pool obscure d or the pool than 3 f 4 GRADE or 5 Mai Water fills the availal	ginal esent, but m 5-10% of bottom is is to depth, ols are less set deep. 3 SCORE ginal 25-75% of	discerr 2 Very little w	ent, or the eni nible. No wate	el and mostly	1	1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 Barbour, et al., 1999 EPA RBA page 5-19 /A-
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to	greater than is obscure d at le	shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a	pool bottom or pools are eep. 8 f both lower amount of	from 10-3 obscure d are a 7 COI Water fill channe	sent, but no 0% of the po ue to depth, it least 3 fee 6 NDITION C Suboptima s >75% of th l; or <25% o	t abundant; bol bottom is or the pools t deep. 5 ATEGORY (al ne available of channel	Mai Pools pr shallow; fro the pool obscure d or the pool than 3 f 4 GRADE or 5 Mai Water fills the availal and /or riffl	ginal esent, but esent, but bottom is ue to depth, ols are less eet deep. 3 <u>CORE</u> ginal 25-75% of ole channel, e substrates	discerr 2 Very little w	ent, or the eni lible. No wate 1 Poor rater in chann standing pool	el and mostly	1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i> 1999 <i>Barbour, et al.,</i> 1999 EPA RBA page 5-19 /A- 9#5; <i>TCEQ</i>
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	greater than is obscure d at le 10 Water read banks ar channel	shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is	8 f both lower amount of exposed.	from 10-3 obscure d are a 7 COI Water fill channe sub	6 NDITION C Suboptima s >75% of th c < 25% o strate is exp	t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al ne available of channel oosed.	Mai Pools pr shallow; fro the pool obscure d or the pool than 3 f 4 GRADE or 3 Mai Water fills the availal and /or riffl are mosti	ginal esent, but esent, but bottom is ue to depth, ols are less eet deep. 3 CORE ginal 25-75% of ole channel, e substrates y exposed.	discerr 2 Very little w present as	ent, or the eni lible. No wate 1 Poor rater in chann standing pool zero.	el and mostly s. No water =		1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 Barbour, et al., 1999 EPA RBA page 5-19 /A- 9#5; TCEQ 1999; VANR,
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	greater than is obscure d at le	shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a	pool bottom or pools are eep. 8 f both lower amount of	from 10-3 obscure d are a 7 COI Water fill channe	sent, but no 0% of the po ue to depth, it least 3 fee 6 NDITION C Suboptima s >75% of th l; or <25% o	t abundant; bol bottom is or the pools t deep. 5 ATEGORY (al ne available of channel	Mai Pools pr shallow; fro the pool obscure d or the pool than 3 f 4 GRADE or 5 Mai Water fills the availal and /or riffl	ginal esent, but esent, but bottom is ue to depth, ols are less eet deep. 3 <u>CORE</u> ginal 25-75% of ole channel, e substrates	discerr 2 Very little w	ent, or the eni lible. No wate 1 Poor rater in chann standing pool	el and mostly	1	1998 USDA/ NRCS SVAP page 14; <i>Barbour, et al.,</i> 1999 <i>Barbour, et al.,</i> 1999 EPA RBA page 5-19 /A- 9#5; <i>TCEQ</i>
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	greater than is obscure d at le 10 Water read banks ar channel	shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is	8 f both lower amount of exposed.	from 10-3 obscure d are a 7 COI Water fill channe sub	sent, but no 0% of the pc ue to depth, it least 3 fee 6 IDITION C. Suboptima s >75% of th 1; or <25% o strate is exp 6	t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al ne available of channel ioosed. 5	Mai Pools pr shallow; fro the pool obscure d or the pool othan 3 f 4 GRADE or 5 Mai Water fills the availat and /or riffl are mosti 4	ginal esent, but om 5-10% of bottom is ue to depth, ols are less eet deep. 3 SCORE ginal 25-75% of ole channel, e substrates y exposed. 3	discerr 2 Very little w present as 2	ent, or the eni lible. No wate 1 Poor rater in chann standing pool zero. 1	el and mostly s. No water =		1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 Barbour, et al., 1999 EPA RBA page 5-19 /A- 9#5; TCEQ 1999; VANR,
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	greater than is obscure d at le 10 Water read banks ar channel	shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is	8 f both lower amount of exposed.	from 10-3 obscure d are a 7 COI Water fill channe sub	sent, but no 0% of the pc ue to depth, it least 3 fee 6 IDITION C. Suboptima s >75% of th 1; or <25% o strate is exp 6	t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al ne available of channel ioosed. 5	Mai Pools pr shallow; fro the pool obscure d or the pool othan 3 f 4 GRADE or 5 Mai Water fills the availat and /or riffl are mosti 4	ginal esent, but om 5-10% of bottom is ue to depth, ols are less eet deep. 3 SCORE ginal 25-75% of ole channel, e substrates y exposed. 3	discerr 2 Very little w present as 2	ent, or the eni lible. No wate 1 Poor rater in chann standing pool zero. 1	el and mostly s. No water =	0.10	1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 Barbour, et al., 1999 EPA RBA page 5-19 /A- 9#5; TCEQ 1999; VANR,

	TER QUALITY/E VARIABLES	BIOGEOCI						S16-Trib4	(2.5-5.0)				SCORE
	TYPE												1
	NOTES												-
1.	SEDIMENT TR	ANSPORT	/DEPOSITI	ON									1
					001		TEOODY						-
	1a. Bank		Optimal		CO	NDITION CA Suboptima			arginal		Poor		
	Stability	Banks stat		of erosion or	Moderately	/ stable; infre			/ unstable; 30-	Linstable: n		areas; "raw"	-
	(score each		e absent or r			osion mostly			ik in reach has		equently alor		
	bank, left or			ems. <5% of	5-30% of b	ank in reach	has areas of		erosion; high			ovious bank	
	right facing		bank affecte	d.		erosion.			otential during oods.		; 60-100% c		
	downstream)							IIG	Jous.	e	rosional sca	15.	
	One de (ne atth)	40	0	0	7	<u> </u>	<i>c</i>	4	2	0	4	0	
ł	Grade (north) Grade (south)	<u>10</u> 10	9 9	8	7	6	5 5	4	3	2	1	0	2
	Grade (South)	10	9	0	1	0	5	4	5	Ζ	1	Avg.Score	
												711g.00010	
					COI	NDITION CA	TEGORY (SRADE or S	SCORE				
	1b. Channel		Optimal			Suboptima			arginal		Poor		1
e	Bottom Bank		1/3 of bank is			1/3 of bank is	generally	Bottom 1	/3 of bank is		/3 of bank is		1
lar	Stability	highly res	istant plant/s	oil matrix or	resistant pla	ant/soil matrix	or material.		highly erodible		dible materia		
٧a	,		material.						lant/soil matrix	matrix s	everely com	promised.	
Score for Unly Une Variable								comp	romised.				
S	Grade (north)	10	9	8	7	6	5	4	3	2	1	0	2
Ē	Grade (south)	10	9	8	7	6	5	4	3	2	1	0	2
5	,				•							Avg.Score	2
щ Э													
co	or				COI	NDITION CA				-			
	1c. Channel	500/	Optimal		00 500/	Suboptima			arginal		Poor		-
Enter	Sediments or		avel or larger			ravel or large			gravel or larger e: dominant		s uniform sa edrock: uns	nd, silt, clay,	
ш	Substrate		bble boulder type is grave			substrate typ h some finer			pe is finer than	OFL	earock; uns	lable	
	Composition	oubotrate	stable	or or largor,		oderately sta			may still be a				
	Grade	10	9	8	7	6	5	4	3	2	1	0	
2	WATER APPE		-								· · · ·		
ľ													İ
					COI	NDITION CA	ATEGORY (GRADE or S	SCORE				
			Optimal			Suboptima			arginal		Poor		
			, or clear but			lly cloudy, es			ble cloudiness			earance most depth <0.5 ft;	
			colored); no c	3-6 feet (less		vent, but clea			e time; objects epth 0.5-1.5 ft;			bright-green;	
	Water Clarity		;no noticeab			ghtly green co			ns may appear	other obviou	us water pollu	ants; floating	
		subme	rged objects	or rocks.		n on water su		pea-green	bottom rocks		Irface scum, s m on surface.	sheen or heavy	
									ged objected	coat of roa	zero.	No water =	
								covere	d with film.				
ł	Grade	10	9	8	7	6	5	4	3	2	1	0	1
ł	Giaue	10	3	0	1	U	5	4	3	2	1	U	<u> </u> '
3	PRESENCE OF	AQUATI	C VEGETAT	FION: Prese	ence and Pe	ercent Cove	rage						1
							-						1
					COI	NDITION CA	TEGORY (GRADE or S	SCORE				
			Optimal			Suboptima			arginal		Poor		1
	3a. Nutrient		ater along en			or slightly gr			ater along entire oundance of lush		gray, or brow each; dense s		
	Enrichment		aquatic plant low quantatie			re reach; moo on stream su			oundance of lush ohytes; abundant		eacn; dense s s clog stream		
			f macrophyte		giowin	5.1 50 50 50		algal grow	th, especially	blooms creat	e thick algal r	nats in stream	
1			growth prese					during wa	rmer months.		e present due		
										substr	ate. No water	= 2010.	
			9	0		<u> </u>	-	A	0	0	4	0	
	Crada	10		8	7	6	5	4	3	2	1	0	I
	Grade	10	5										
	Grade	10	<u> </u>		00		TEGORY	RADE or	SCORE				-
		10			COI	NDITION CA			SCORE		Poor		
	or		Optimal esent, aquation	c vegetation		NDITION CA Suboptima ominant in po		Ma		Algal ma	Poor ts cover bott	om, larger	•
		When pre	Optimal esent, aquation of moss and		Algae do	Suboptima	l ols, larger	Ma Algal mats	arginal	plants dom	is cover both inate the ch	annel or NO	-
	O r 3b. Aquatic	When pre	Optimal esent, aquation		Algae do	Suboptima ominant in po	l ols, larger	Ma Algal mats	arginal present, some	plants dom algae pr	ts cover both inate the ch esent due to	annel or NO unstable	
	O r 3b. Aquatic	When pre	Optimal esent, aquation of moss and		Algae do	Suboptima ominant in po	l ols, larger	Ma Algal mats	arginal present, some	plants dom algae pr	is cover both inate the ch	annel or NO unstable	1

												1
				CON		ATEGORY (F
		Optimal			Suboptima			rginal	L.	Poor		e
		onsisting of le d without sedi			and wood sc ebris without		debris; coa organic	es or woody arse and fine matter with liment.	color and fo		nt - black in aerobic) or no to excessive	1 F
Grade	10	9	8	7	6	5	4	3	2	1	0	1
LAND USE PAT	TTERN: Be	yond Imme	diate Ripari	an Zone								ł I
				CON		ATEGORY	GRADE or S	SCORE				F
		Optimal			Suboptima			rginal		Poor		e e
		ed, consisting tive prairie, ar wetlands.			ent pasture n and swamps crops		pasture; s areas may l	w crops and ome wooded be present but ed patches	N	fainly row cro	ops	1 F
Grade (north)	10	9	8	7	6	5	4	3	2	1	0	8
Grade (south)	10	9	8	7	6	5	4	3	2	1	0	8
			Ŧ			Ŧ					Avg.Score	
RIPARIAN ZON	IE WIDTH	AND CONT	INUITY:									
				CON		ATEGORY	GRADE or S	SCORE				E
6a. Riparian		Optimal			Suboptima			rginal		Poor		a 1
Zone Width (from stream edge to field)	channel wid grasses),	parian zone >18 ths with trees, s human activitie impacted zone	shrubs, or tall es have not	1 active char grasses), hur	nnel width w/tre	nave minimally	meters (1 channel wid	arian zone 6-12 /3-1/2 active dth vegetated), human activities.	vegation le width), little	han 201e < 6 ess than 1/3 ac e riparian vege human activiti	etation due to	F e R U N
Grade (north)	10	9	8	7	6	5	4	3	2	1	0	9
Grade (south)	10	9	8	7	6	5	4	3	2	1	0	7
											Avg.Score	8
				CON		ATEGORY (E
6b. Riparian	000/	Optimal t density of ma		75.000/	Suboptima eambank vege			rginal streambank	Loss these f	Poor	nk vegetation	e
	shrubs, prair riparian zo	rie grasses, or ne intact or dis ing/mowing mir	marsh plants, ruption from	young specie trees behin	earnbank vege es along chann nd; disruption o curring at inter meters.	el and mature	vegetation of and sparse shrub spe frequent wit	f mixed grasses young tree or ecies; breaks h some gullies very 50 meters.	coverage c grasses, fe density; ban	consisting mos	stly of pasture ubs; low plant red with gullies	1 F F 6 1
Zone Vegetation Protection/ Completeness												F #
Vegetation Protection/ Completeness					-			-			1 -	
Vegetation Protection/ Completeness Grade (north)	10	9	8	7	6	5	4	3	2	1	0	2
Vegetation Protection/	<u>10</u> 10	9 9	8 8	7 7	6 6	5 5	4	3 3	2	1 1	0 0 Avg.Score	2

ES 1	FLOW REGI	ME		III. HABITA	T FUNCTIO	ONS	S16-Trib4	(2.5-5.0')					SCORE
	TYPE Grade		Perennial 9	8	Intermitte 7	nt w/ Peren 6	nial Pools	Interm 4	nittent 3	2	Ephemeral 1	0	1
					1	0	5	4	3	2	I	0	
2	EPIFAUNAL	SUBSTRATE/A	VAILABLE C Optimal	OVER		Suboptimal		Marc	ninal		Poor		
		Within stream	bed, greater		Within stream	m bed, 30-50	% coverage	Within stream	bed, 10-30%		n 10% habitat		
		coverage by favorable for st				abitat feature aunal coloniz		coverage by s features favora			ack of habitat i te unstable or		
		and/or fish/amph	nibian cover.	Most habitat	fish/amphib	ian cover. M	any habitat	faunal colonia	zation and/or	concrete	lined channels	s. Habitat	
	Exposed	features non t include snags, s	ubmerged log	s, undercut		transient. (Sorry for habitat		fish/amphibian availability ma			d pools buried bottom may		
	roots but no	banks, roots, col packs, pools a			0	components.)		desirable, sub frequently dis					
	water.	habitat at a sta						Excellent Cate	gory for habitat				
								feature cor	nponents.)				
	Grade	10	9	8	7	6	5	4	3	2	1	0	1
3	STREAM BC	TTOM SUBSTR		Substrate Ch									
		Mixture of subst	Optimal rate materials	with gravel		Suboptimal soft sand, mu	id. or clav:	Marg All mud or clay		Hard pan cla	Poor ay or bedrock;	no root mat	t
		and firm sand	prevalent; roo	t mats and	mud may b	be dominant;	some root	little or no re	oot mat; no		omerged vege		
		submerged	vegetation co	mmon.	mats and	submerged v present.	egatation	submerged	vegetation.				1
										<u> </u>			<u> </u>
	Grade	10	9	8	7	6	5	4	3	2	1	0	1
4	POOL VARIA		A (1)		1						_		
		Even mix of large	Optimal -shallow, larg	e-deep. small-		Suboptimal ools large-de	ep; verv few	Marg Shallow pools		Maiority o	Poor of pools small-s	shallow or	-
			all-deep pools			shallow.	-,,	prevalent that			pools absent		
5	Grade	10 DEPOSITION/SC	9 OURING	8	7	6	5	4	3	2	1	0	1
Ũ	OLD MLLTT		Optimal			Suboptimal		Marg			Poor		
		<5% of channel b	oottom affected deposition.	by scour or		ted by scour o strictions and v		30-50% affect deposition. Depo			% of the botton nge nearly yearl		f
						Some depositi		obstructions, co bends. Some	instrictions and	minimal or ab	sent due to hea	avy deposition	ı
								benda. Gome	ming or pools.	016	500033140 30001	ing.	
	Grade	10	9	8	7	6	5	4	3	2	1	0	2
6	CHANNEL F	OW STATUS											
Ţ			Optimal			Suboptimal		Marg			Poor		
		Water reaches banks; <5% of ch				>75% of the innel substrat		Water fills 25 available chan			water in the ch sent in standin		
								substrates are r	nostly exposed		stream is dry		
	Grade	10	9	8	7	6	5	4	3	2	1	0	-
7	CHANNEL A		3	0	1	0	5	+	3			0	
		Channelization	Optimal	r dredging		Suboptimal ration or char	nelization	Marg Alteration or cha		Banke ebor	Poor red with gabior	n rinran or	4
		absent or minimal	; normal and	stable stream	present	t, usually adja	cent to	be extensive;	embankments	concrete.	Concrete or r	iprap lined	1
		meander pattern inputs a	. Alteration by bsent or mini			such as bridg rts); evidence		(including spoil p structures pre		significantly	els. Instream	ormwater or	
						I.e., channeliz , but stream p		banks; normal meander pat			. Over 80% o reach altered.		1
					stability h	ave recovere	d; recent	recovered. A	Iteration from		rodon altorod.		
						n is not preser rom stormwa		stormwater in extensive. 40-1					
						inputs.		reach a	ltered.				
								1		1			+
	Grade	10	9	8	7	6	5	4	3	2	1	0	
			9	8	7	6	5	4	3	2	1	0	
	Grade CHANNEL S	NUOSITY	9 Optimal	8	7	6 Suboptimal	5	4 Mare		2	1 Poor	0	
		NUOSITY The bends in the s	Optimal stream increa	se the stream	The bends in	Suboptimal n the stream	ncrease the	Mare The bends in	ginal the stream	Channel str	aight; waterwa	ay has been	
		NUOSITY The bends in the s length 3 to 4 time straight line. (N	Optimal stream increa es longer than lote - channel	se the stream if it was in a braiding is	The bends in stream lengt	Suboptimal	ncrease the longer than	Marg The bends ir increase the stre longer than if it v	ginal the stream am 1 to 2 times vas in a straight	Channel str channeli		ay has been	
		NUOSITY The bends in the slength 3 to 4 time straight line. (N considered nor	Optimal stream increa es longer than lote - channel mal in coastal	se the stream if it was in a braiding is plains and	The bends in stream lengt	Suboptimal n the stream h 2 to 3 times	ncrease the longer than	Marg The bends in increase the stre	ginal the stream am 1 to 2 times vas in a straight	Channel str channeli	aight; waterwa	ay has been	
		NUOSITY The bends in the s length 3 to 4 time straight line. (N considered nor other low-lying ar	Optimal stream increa es longer than lote - channel mal in coastal	se the stream if it was in a braiding is plains and ameter is not	The bends in stream lengt	Suboptimal n the stream h 2 to 3 times	ncrease the longer than	Marg The bends ir increase the stre longer than if it v	ginal the stream am 1 to 2 times vas in a straight	Channel str channeli	aight; waterwa	ay has been	
		NUOSITY The bends in the s length 3 to 4 time straight line. (N considered nor other low-lying ar	Optimal stream increa es longer than lote - channel mal in coastal eas. This par	se the stream if it was in a braiding is plains and ameter is not	The bends in stream lengt	Suboptimal n the stream h 2 to 3 times	ncrease the longer than	Marg The bends ir increase the stre longer than if it v	ginal the stream am 1 to 2 times vas in a straight	Channel str channeli	aight; waterwa	ay has been	

		Poor			1	-	ginal	arai	Ma	-		12	uboptin	с.		-)		ACH E		ITY (SCOR	IABIL	BANK	9
	egetation at		no	stable: r	Unsta	ial	jinai able; perennia			N	ent. small				/loderatel	+	or bank	sion				Banks stable	⊢		
	on of both d tree roots for severely	vere erosi ly exposed falls and/ es commo	e; se ecen ; tre ; tre	aterline nks; rec mmon; indercu	wate banks comm unc	se by by	aterline sparse I or stripped by , bank held by (trees, rock eroded back	o wat red o on), I its (ti	vegetation to (mainly scoure lateral erosion hard points	.) f (aled over. s areas of bank jetation to	ly he h ha d/or l il veg	on most in reac ision an perennia	osio ank ero 19; P	reas of er -30% of b minor	; 5 n y u	bank aterline; sion on recently	5% o to w ne ere); no	nal; (« etatio (s (so ds O.I	minim al vege t bank r bend	ent or rennia dercut ander	failure abse affected), per no raw or uno putside of me exposed			
	and bends; 60-100% of	sections a	aigh ank	ong stra ious ba	along obviou	in Ind / oot	50% of bank ir of erosion an tting; recently ots and fine roo ; high erosion ring floods	i0-60 eas c rcutti root: ion; l	elsewhere; 30 each has area bank underc xposed tree ro hairs commo	r e					xposed tr					, , ,					
2	0	1		2			3		4		5 5		6		7		8		9 9			10 10		Grade Grade	
2		/g.Score	A	2	2		0		7	-	0		0		,	-									Ē
	treambank	Poor	n 50	cc than	Loss	,	ginal streambank				surfaces		boptin		0.00% of				nal	Optim	C	PROTECT		VEGE	10
	egetation; vegetation is has been rs or less in	ered by ve eambank egetation h	s co of st gh; v to 5	urfaces iption o very hig noved t	surf disrupti ver remov	on; of d an	d by vegetatio jus; patches o posely cropped mon; less than potential plant it remaining.	ered oviou clos omm he p	urfaces cover disruption obv bare soil or c vegetation cor one-half of the	es i; II	n, but one presented fecting ful ny great If of the	etatio ell-re not af l to a ne-ha oble l	ive vege s not we ent but r potentia	nat nts i vide vth p nore al p	overed by ass of plan sruption e plant grow extent; m	y cl di	ered by derstory tes; ing or nost all	s cove es, ur rophy n graz nt; alr	i zone ing tre y mai hroug evide	oarian ncludir woody otion th or not	ate rip tion, ir or non disrup imal c	and immedia native vegetal shrubs, o vegetative mowing min plants a			
2	0	1		2			3		4		5		6		7		8		9			10		Grade	
2	0	1 /g.Score		2	2		3		4		5		6		7		8		9			10	outh	Grade	ŀ
	es.	n vegetatii an activitie		h			activities have a great deal.		impacted zor		cted zone		minima			- h	bacted		nave i	ops) h zone.	or cr	activities (I.e. cuts, lawns,			
7	0	1	-	2			3	+	4	+	5 5	-	6 6	+	7	+	8	-	9			10 10		Grade Grade	
8		/g.Score	A		_														- -						Ľ
																			800			BITAT CON	NULIA		10
		Poor				T	ginal	arai	Ма	Т		nal	boptin	Su	n)	AN				Optim				KIPAK	12
	vely grazed	ands, mine reams, mo herbaceou	crop ed s ained d sur	aces, ci culverte maintaii nuded :	surface culv ma	opy ory rest d of rers id if	dbh>3 inches) 0% tree canop sellent Catego additional fore the high end additional laye ore at low end ers are preser	n (dt <30° Exce of ac e at t 2 ac Scor	Tree stratum present, with < cover. (See E: or examples o ayers.) Score : air range if ≥ 2 re present. S	. p s c t fo la st a		ry for ry for rers.) d rar s are addit	dbh>3 ir 0% tree Catego orest lay of Goo est layer id if <u><</u> 1 :	m (e o 60 lent al fo end fore v er	vith 30% t see Excell of addition the high additional core at low	t v (S ut	al forest rub, ding Score a f ≥2 e at low	dition g, sh inclu bris.) ange Score	ches) r. (A sapli af litte ody de ellent esent	3 inc cover clude: ind lea d woor f Excel are pre	n (dbh anopy ay inc ous, a ns ano end of yers a	Tree stratum >60% tree ca layers m herbaced mosses/licher the high e additional lay end if <u><</u> 1 a			
						ł	isists of non- id naturalized us and/or woo ation.	onsi and eous	OR area co maintained a ense herbace				mps rer			ic		10 pr	,jore ,	, nai iaj		<u></u>			
auma '	0 Ensure the	1		2			3 sing the she		4		5		6		7 Conditi		8 a hank	44.6 -	9		0.6	10		Grade	
	Ensure the %Ripariar						sing the abo ps may be ι																		
	equal	v					category in	ian d	each riparia) an	d width	and											
	400		Poo	Р			ginal	argi	Ma			nal	boptin	Su				50	al	Optim		Din - i			ſ
	100									t			50 6			T		50 10			vrea	%Riparian A Score		North I	
)	0		t			3			T		5				SubCl		NUITTI	ŀ
	Г							Ť		t			-	T		T									t
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	L		0			_)	0					0					5				SubCl		_	_
		*Coorcot		CI (0/	SubCl																				
		Scores																							
CI	8	Scores	CI>	Bank C	Rt Bar	1		-		-		-		1		-		-							F
CI 0.26	8		CI> CI>	Bank C Bank C	Rt Bar LT Ba	1	pacity Index	Car	f Eurotian O	n 6															ļ

III. HABITAT FUNCTIONS

S16-Trib4 (2.5-5.0')

Str	eam Function	al Capacity C	alculation		
	S16-Trib4 (2.5	5-5.0')			
Date:	8/25/2009				
Project:	Lake Ralph H	all			
Assessment Area:	WP 19				
Assessors:	Voight Capps				
Project Status:	XPreproj	ect	Postproject		
		Stream	Stream	Multiplication	
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC
Hydrologic	0.10	1,423	E	0.00125	0.18
Water Quality Improvement	0.31	1,423	E	0.00125	0.56
Habitat	0.26	1,423	E	0.00125	0.46
Total	0.67	1,423			1.19
*Stream Length is the length of the Stre	am Assessme	nt Reach (SAF	R)		
**Multiplication Factors		,	,		
Ephemeral = 0.00125					
Intermittent = 0.0025					
Perennial = 0.0038					



SWAMPIM DATASHEETS – SOUTH EPHEMERAL 6 TO 15' PRE-PROJECT

• S25

ITEM VARIABLE FUNCTION CATEGORY

S25 (6-15')

1

PARAME1	ER										
				CONI	DITION CA	TEGORY G	RADE or S	CORE			
		Optimal			Suboptima		Mar	rginal		Poor	
Grade	10	9	8	7	6	5	4	3	2	1	0

Right bank- 15-100 meters North Sulphur, Left bank 15-100 meters to pasture. Sinuous, park area, trees before river and pasture.

WP 8 P 87, 86

	SCORE Source
FLOW REGIM	KDWP
TYPE Grade	Kansas 1 Subjecti
CHANNEL CO	
	Barbour EPA RB
	5-21;
	Newton
2a.Channel Condition/Alter	USDA/ I SVAP p
ation (natural,	0074 1
altered, or	
downcutting)	
Grade	0
	w/ assis
2b.Channel	and inpu Dr. Mike
Capacity to Flow	Harvey
Frequency	Travant
Ratio (for 2- year peak	
flow)	
Grade	0
Ciudo	
	Newton, USDA/ I
	SVAP p
2c.Channel	10; Barl al., 199
Bank Stability	RBA pa
(score each bank, left or	26; USA Norfolk
right facing	District,
downstream)	
	-
Grade (Left) Grade (Right)	5 3
	4
CHANNEL RO	
	Barbour
3a.Channel	EPA RB
Sinuosity	Chapter 5-25; <i>Kl</i>
(bondo in low	1996
(bends in low gradient	
(bends in low gradient stream)	
gradient	
gradient	8
gradient stream)	8 KDWP,
gradient stream)	<i>KDWP,</i> Kansas
gradient stream)	KDWP,
gradient stream) Grade 3b. Bottom Substrate	<i>KDWP,</i> Kansas Subjecti Evaluati Aquatic
gradient stream) Grade 3b. Bottom	<i>KDWP,</i> Kansas Subjecti Evaluati
gradient stream) Grade 3b. Bottom Substrate	<i>KDWP,</i> Kansas Subjecti Evaluati Aquatic

							CO	NDITION	CAT	EGORY	GRADE or	SCORE								KDWP, 1996
				Optima	al			Subopti	imal		Ma	rginal				Poor				Newton et a
2	3c. Instream Bottom Topography	>7 of the boulders debri overhate vegetate	ne fo s/gra s, ba ingin ated s	llowing: vel, log ckwate g vegel shallow	: de s/la rs/o tatic s, ro side	hy including ep pools, rge woody oxbows, on, riffles, ootwads, e channel		bottom incl		5-7 of the Category	includes < listed in	el bottom 5 of the ite n Optimal egory	ems	Channel items lis					Pools but no flow	1998 USDA/NRCS SVAP page
G	Grade	10		9		8	7	6		5	4	3		2	T	1	0)	1	1
5				0	-1		CO			EGORY	GRADE or			4						
2	or			Optima 05 to 0.				Subopti 0.035 to			0.021 to 0	rginal	10	0 16 to		Poor	excessive	,		
-	3c. Manning's n		0.0		000			0.000 10	0.00			0.15	10	obstruction to channe	to flo lizatio	w or 0.0	1 to 0.02	due?		
G	Grade	10		9		8	7	6		5	4	3		2		1	C)		
							00		CAT	FCORV	GRADE or	SCUPE								USACE.
				Optima	al		0	Subopti		LOOKI		rginal			-	Poor				USACE, Norfolk
:	3d. Channel	Incision I				and Where		atio <u>></u> 1.2 <	1.4 a	nd Where	Incision rat		2.0	Incision rat			/here cha	annel		District, 200
	Incision					renchment				enchment		ere channe	el	slope >2%				<u>:</u> 1.4;		SAAM Forn
	TLB/BFD=BH R: 1/BHR*Adi					nnel slope atio >2.0		4; Where				e > 2%, nment rati				nnel slo nent rat	pe <u><</u> 2%,			#1 and VT
	Factor =CI)	<u>~</u> 2 /0, 1	Linue	incrime		alio >2.0	<u>~</u> 2 /0, L	Intrenomin	Shiria	1110 22.0	>1.4; Wh			Liiu	encin	nem rat	10 <u>~</u> 2.0			Stream
											slop	e <u><</u> 2%, ent ratio >	·2.0							Geomorphic Assessment Phase 2
F	TLB =			10			BHR =	1												
	BFD =																			
				10																
G	Grade	10		10 9		8	7	6		5	4	3		2		1	()	1	-
_			ATE	9	OR,		7	6		5	4	3		2		1	0)	1	•
_	Grade		ATE	9	OR,									2		1	0)	1	
_	Grade			9 R STO				NDITION			GRADE or	SCORE		2	[0)	1	Newton, et a
_	Grade	FACE W		9 ER STO	al		CO		imal	EGORY	GRADE or Ma		t	2 Pools abs		² oor			1	Newton, et a 1998 USDA NRCS SVA
_	Grade DYNAMIC SUR 4a.Pools (abundant,	FACE W Deep an greater th	d sha nan 3	9 ER ST(Optima allow po 0% of t	al ools	AGE abundant; pool bottom	CO Pools pr from 10-3	NDITION Subopti esent, but 30% of the	not a pool	EGORY	GRADE or Ma Pools pr shallow; fr	SCORE rginal resent, bu	of	Pools abs	ent, or	Poor the en		m is	1	1998 USDA NRCS SVA page 14;
_	Grade DYNAMIC SUR 4a.Pools (abundant, present or	FACE W Deep an greater th is obscure	d sha nan 3 e due	9 ER ST(Optima allow po 0% of t e to dep	al ools the j	AGE abundant; pool bottom or pools are	CO Pools pr from 10-3 obscure	NDITION Subopti esent, but 30% of the due to dep	not a pool th, or	EGORY bundant; bottom is the pools	GRADE or Ma Pools pr shallow; fr the poo	SCORE rginal resent, bu om 5-10% l bottom is	of	Pools abs	ent, or	Poor the en	tire botto	m is	1 Pools but	1998 USDA NRCS SVA page 14; Barbour, et a
_	Grade DYNAMIC SUR 4a.Pools (abundant,	FACE W Deep an greater th is obscure	d sha nan 3 e due	9 ER ST(Optima allow po 0% of t	al ools the j	AGE abundant; pool bottom or pools are	CO Pools pr from 10-3 obscure	NDITION Subopti esent, but 30% of the	not a pool th, or	EGORY bundant; bottom is the pools	GRADE or Ma Pools pr shallow; fr	SCORE rginal resent, bu om 5-10% l bottom is e to depth	o of ; i, or	Pools abs	ent, or	Poor the en	tire botto	m is	Pools but no flow	1998 USDA NRCS SVA page 14;
_	Grade DYNAMIC SUR 4a.Pools (abundant, present or	FACE W Deep an greater th is obscure	d sha nan 3 e due	9 ER ST(Optima allow po 0% of t e to dep	al ools the j	AGE abundant; pool bottom or pools are	CO Pools pr from 10-3 obscure	NDITION Subopti esent, but 30% of the due to dep	not a pool th, or	EGORY bundant; bottom is the pools	GRADE or Ma Pools pi shallow; fr the poo obscure du the pools a	SCORE rginal resent, bu om 5-10% l bottom is e to depth	o of ; i, or	Pools abs	ent, or	Poor the en	tire botto	m is		1998 USDA NRCS SVA page 14; Barbour, et
4 D	Grade DYNAMIC SUR 4a.Pools (abundant, present or	FACE W Deep an greater th is obscure	d sha nan 3 e due	9 ER ST(Optima allow po 0% of t e to dep	al ools the j	AGE abundant; pool bottom or pools are	CO Pools pr from 10-3 obscure	NDITION Subopti esent, but 30% of the due to dep	not a pool th, or	EGORY bundant; bottom is the pools	GRADE or Ma Pools pi shallow; fr the poo obscure du the pools a	SCORE rginal resent, bu om 5-10% bottom is e to depth are less th	o of ; i, or	Pools abs	ent, or	Poor the en	tire botto	m is		1998 USDA NRCS SVA page 14; Barbour, et
4 D G	Grade OYNAMIC SUR 4a. Pools (abundant, present or absent) Grade	FACE W Deep an greater th is obscure a	d sha nan 3 e due	9 ER ST(Optima allow po 0% of t e to dep st 5 fee	al ools the j	AGE abundant; pool bottom or pools are sep.	CO Pools pr from 10- obscure are 7	NDITION Subopti esent, but 30% of the due to dep at least 3 l	imal not a pool th, or feet d	EGORY bundant; bottom is the pools eep. 5	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools a 3 fee 4	SCORE rginal resent, bu om 5-10% bottom is e to deptit are less th t deep. 3	o of ; i, or	Pools abs discerr	ent, or	Poor the en	tire botto er = zero	m is		1998 USDA NRCS SVA page 14; Barbour, et a
4 D G	Grade Aa.Pools (abundant, present or absent) Grade 4b. Channel	FACE W Deep an greater th is obscure a	d sha aan 3 e due t leas	9 ER ST(Optima allow po 0% of t 9 to dep st 5 fee 9	al ools the j oth, i t de	AGE abundant; pool bottom or pools are sep.	CO Pools pr from 10- obscure are 7	NDITION Subopti esent, but 30% of the due to dep at least 3 i 6 NDITION	not a pool th, or feet d	EGORY bundant; bottom is the pools eep. 5	GRADE or Ma Pools pr shallow; fr the pools obscure du the pools 3 fee 4 3RADE or	SCORE rginal resent, bu om 5-10% bottom is bottom is to dept t deep. 3 SCORE	o of ; i, or	Pools abs discerr	ent, or	Poor the ent No wate	tire botto er = zero	m is		1998 USDA NRCS SVA page 14; <i>Barbour, et i</i> 1999
4 D G	Arade Aa.Pools (abundant, present or absent) Grade 4b. Channel Flow Status	FACE W Deep an greater th is obscure a 10	d sha aan 3 e due t leas	9 Optima allow po 0% of t a to dep st 5 fee 9	al ools the j oth, i t de	AGE abundant; pool bottom or pools are rep. 8	CO Pools pr from 10- obscure are 7 CO	NDITION Subopti esent, but 30% of the due to dep at least 3 i at least 3 i 6 NDITION Subopti	imal not a pool th, or feet d	EGORY bundant; bottom is the pools leep. 5	GRADE or Ma Pools pi shallow; fr the pool obscure du obscure du obscure du the pools i 3 fee 4 3RADE or Ma	SCORE rginal esent, bu bottom is bottom is e to depth are less th t deep. 3 SCORE rginal	, or an	Pools abs discerr 2	ent, or hible.	Poor the en No wate	tire botto er = zero	m is		1998 USDA NRCS SVA page 14; <i>Barbour, et a</i> 1999
4 D G	Grade Aa.Pools (abundant, present or absent) Grade 4b. Channel	FACE W Deep an greater th is obscurr a 10 Water re	d sha nan 3 e due t leas	9 Optima allow po 0% of t a to dep st 5 fee 9 9 Optima	al ools the p oth, o th de al	AGE abundant; pool bottom or pools are sep.	CO Pools pr from 10- obscure are 7 7 CO Water fi	NDITION Subopti esent, but 30% of the due to dep at least 3 i 6 NDITION	mal not a pool th, or feet d CAT	EGORY bundant; bottom is the pools eep. 5 EGORY available	GRADE or Ma Pools pr shallow; fr the pools obscure du the pools 3 fee 4 3RADE or	SCORE rginal resent, bu bottom is bottom is bottom is e to depth are less th t deep. 3 SCORE rginal s 25-75%	o of , or lan	Pools abs discerr	ent, or hible.	Poor the en No wate	tire botto er = zero	m is		1998 USDA NRCS SVA page 14; <i>Barbour, et</i> 1999 Barbour, et 1999 EPA
4 D G	Arade 4a. Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to	FACE W Deep an greater th is obscure a 10 Water re banks	d sha aan 3 e due t leas	9 Optima allow po 0% of t a to dep st 5 fee 9 Optima es base minima	al ools the j oth, e t de al al al al ar	AGE abundant; pool bottom or pools are sep. 8 both lower	CO Pools pr from 10- obscure are 7 7 CO Water fi chann	NDITION Subopti esent, but 30% of the Jue to dep at least 3 f at least 3 f 6 NDITION Subopti Ils >75% o	CAT	EGORY bottom is bottom is the pools eep. 5 EGORY available thannel	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools a 3 fee 4 3RADE or Ma Water fills the availa and /or rift	SCORE rginal resent, bu om 5-10% bottom is to dept t deep. 3 SCORE rginal s 25-75% ble chann e substra	o of i, or an of el, tes	Pools abs discern 2 Very little w	ent, or hible.	Poor the en No wate	tire botto er = zero	m is		1998 USDA NRCS SVA page 14; Barbour, et 1999 Barbour, et 1999 EPA RBA page 5 /A-9#5; TCE
4 G W	Grade 4a. Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	FACE W Deep an greater th is obscure a 10 Water re banks chann	d sha aan 3 e due t leas	9 Poptimm ST(0) 9 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0	al ools the j oth, e t de al al al al ar	AGE abundant; pool bottom or pools are tepp. 8 both lower mount of exposed.	CO Pools pr from 10- obscure are are 7 CO Water fi chann su	NDITION Subopti esent, but 30% of the due to dep at least 3 i due to dep at least 3 i f 6 NDITION Subopti Ils >75% o el; or <25% bstrate is e	CAT	EGORY ibundant; bottom is the pools eep. 5 FEGORY available thannel ied.	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools : 3 fee 4 3RADE or Ma Water fills the availa and /or riff are most	SCORE rginal esent, bu om 5-10% bottom is bottom is t deept t deep. 3 SCORE rginal s 25-75% ble chann e substra y exposed	o of i, or an of el, tes	Pools abs discerr 2 Very little v present as	ent, or hible.	Poor the en No wate	tire botto er = zero lel and m s. No wa	m is oostly ater =	no flow	1998 USDA NRCS SVA page 14; Barbour, et a 1999 Barbour, et a 1999 EPA RBA page 5 /A-9#5; TCE 1999; VANF
4 D G W	Arade OYNAMIC SUR 4a. Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	FACE W Deep an greater th is obscure a 10 Water re banks	d sha aan 3 e due t leas	9 Optima allow po 0% of t a to dep st 5 fee 9 Optima es base minima	al ools the j oth, e t de al al al al ar	AGE abundant; pool bottom or pools are pool. 8 both lower mount of	CO Pools pr from 10- obscure are 7 7 CO Water fi chann	NDITION Subopti esent, but 30% of the due to dep at least 3 f at least 3 f due to dep at least 3 f due to dep due to de due to due to d	CAT	EGORY bottom is bottom is the pools eep. 5 EGORY available thannel	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools a 3 fee 4 3RADE or Ma Water fills the availa and /or rift	SCORE rginal resent, bu om 5-10% bottom is to dept t deep. 3 SCORE rginal s 25-75% ble chann e substra	o of i, or an of el, tes	Pools abs discern 2 Very little w	ent, or hible.	Poor the en No wate	tire botto er = zero	m is oostly ater =		1998 USDA NRCS SVA page 14; Barbour, et 1999 Barbour, et 1999 EPA RBA page 5 /A-9#5; TCE 1999; VANF
4 D G W	Grade 4a. Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	FACE W Deep an greater th is obscure a 10 Water re banks chann	d sha aan 3 e due t leas	9 Poptimm ST(0) 9 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0	al ools the j oth, e t de al al al al ar	AGE abundant; pool bottom or pools are tepp. 8 both lower mount of exposed.	CO Pools pr from 10- obscure are are 7 CO Water fi chann su	NDITION Subopti esent, but 30% of the due to dep at least 3 f at least 3 f at least 3 f batter MDITION Subopti Ils >75% of subopti el; or <25% battrate is 6	mal not a pool th, or feet d CAT f the 6 of c expos	EGORY boundant; bottom is the pools leep. 5 TEGORY available thannel ted. 5	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools : 3 fee 4 3RADE or Ma Water fills the availa and /or riff are most	SCORE rginal esent, bu om 5-10% bottom is e to deptf are less th t deep. 3 SCORE rginal 2 25-75% ble chann e substra y exposer 3	o of ; a, or an of el, tes d.	Pools abs discerr 2 Very little v present as 2	ent, or iible.	Poor the en No wate 1 Poor n chann ng pool zero.	tire botto er = zero lel and m s. No wa	m is ostly ater =	no flow	1998 USDA NRCS SVA page 14; Barbour, et a 1999 Barbour, et a 1999 EPA RBA page 5 /A-9#5; TCE 1999; VANF 2005

	TER QUALITY/E VARIABLES	BIOGEOCH	IEMICAL F	UNCTIONS				S25 (6-	·15')				SCORE
	TYPE												4
	NOTES												1
1.	SEDIMENT TR	ANSPORT	/DEPOSIT	ON									T I
				-									1
					COI	NDITION CA	ATEGORY (GRADE or S	SCORE				
	1a. Bank	-	Optimal			Suboptima			arginal		Poor		
	Stability			of erosion or		y stable; infre			y unstable; 30-			areas; "raw"	
	(score each			minimal; little lems. <5% of		osion mostly ank in reach			nk in reach has erosion; high		equently alor	bvious bank	
	bank, left or right facing		bank affecte		5-50 % OF D	erosion.			otential during		; 60-100% c		
	downstream)								oods.		rosional sca		
	downstream)												
	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	5
	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	3
												Avg.Score	4
					COI	NDITION CA							
	1b. Channel	_	Optimal			Suboptima			arginal	_	Poor		
ble	Bottom Bank		/3 of bank is	oil matrix or		1/3 of bank is ant/soil matri:			/3 of bank is highly erodible		/3 of bank is dible materia		
aria	Stability	inginy resi	material.	on matrix of	realatant pi	anvoor malli	s or material.		lant/soil matrix		everely com		
>									promised.		,		
Enter Score for Only One Variable			<u> </u>	<u> </u>									
Ň	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	2
ō	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	2
Ы												Avg.Score	2
ore	or				00	NDITION CA	TECOPY		SCORE				-
Sc	1c. Channel		Optimal			Suboptima			arginal		Poor		
ē	Sediments or	>50% ara	avel or large	substrate.	30-50% a	ravel or large			gravel or larger	Substrate i		nd, silt, clay,	-
ш	Substrate			s; dominant		substrate typ			e; dominant		edrock; uns		
_	Composition	substrate	type is grav	el or larger;	gravel with some finer sediments;			substrate ty	pe is finer than				
	Composition		stable		m	oderately sta	ble	gravel, but	t may still be a				
	Grade	10	9	8	7	6	5	4	3	2	1	0	
2	WATER APPE	ARANCE:	Clarity or V	'isibility									
					COI	NDITION CA				1			
		Verveleer	Optimal		Ossasiana	Suboptima			arginal ble cloudiness	Versturbid	Poor	earance most	
				tea-colored; 3-6 feet (less		Ily cloudy, esp vent, but clea			e time; objects			depth <0.5 ft;	
				oil sheen on		ible at depth			epth 0.5-1.5 ft;	slow moving	water may be	e bright-green;	
	Water Clarity		no noticeat			ghtly green co		slow sectio	ns may appear			tants; floating sheen or heavy	
		submer	ged objects	or rocks.	shee	n on water su	urface.		; bottom rocks		m on surface		
									ged objected d with film.		zero.		
	Grade	10	9	8	7	6	5	4	3	2	1	0	0
ļ								·	· · ·				
3	PRESENCE OF		VEGETA	TION: Prese	ence and Pe	ercent Cove	rage						
			0		COI	NDITION CA				1	Poor		
		Clear	Optimal iter along en	tiro rocobi	Fairly alass	Suboptima or slightly gro		Marginal Greenish water along entire reach; overabundance of lush		Pea groce	4		
	3a. Nutrient		quatic plant										
	Enrichment		low quantati		along entire reach; moderate algal growth on stream substrates.			green macrophytes; abundant					
		species of	macrophyte	s; little algal					vth, especially armer months.		te thick algal i ie present due	mats in stream	
		ç	rowth prese	nt.				during Wa			ate. No wate		
	Grade	10	9	8	7	6	5	4	3	2	1	0	
	Glaue		. ~	. ~	· · · ·	, v				-			+
	Grade												
	Glade				COI	NDITION CA	ATEGORY (GRADE or S	SCORE				
	Or		Optimal			Suboptima		Ma	arginal		Poor		
			sent, aquatio	c vegetation	Algae do	Suboptima ominant in po	l ols, larger	Ma Algal mats	arginal present, some		ts cover bot		-
	or		sent, aquation of moss and		Algae do	Suboptima	l ols, larger	Ma Algal mats	arginal	plants dom	ts cover both ninate the ch	annel or NO	-
	O r 3b. Aquatic		sent, aquatio		Algae do	Suboptima ominant in po	l ols, larger	Ma Algal mats	arginal present, some	plants dom algae pr	ts cover bot	annel or NO o unstable	

				00		ATEGORY	GRADE or S	CORE				
		Optimal			Suboptima		1	rginal		Poor		
		onsisting of le			and wood sc lebris without	arce; fine	No leave debris; coa organic i	es or woody arse and fine matter with iment.	color and fo	anic sedimen oul odor (ana present due t scouring	erobic) or no	
Grade	10	9	8	7	6	5	4	3	2	1	0	1
AND USE PA	TTERN: Be	eyond Imme	diate Ripari	an Zone								+
		Optimal		100	NDITION CA		GRADE or S			Poor		
		ed, consistin ive prairie, ar			ent pasture n and swamp	nixed with	Marginal Mixed row crops and pasture; some wooded			lainly row cro	ops	
		wetlands.			crops			present but ed patches				
Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	3
Grade (Right)	10	9	8	7	6	5	4	3	2	1	0 Avg.Score	3
6a. Riparian				CO	NDITION C	ATEGORY	GRADE or S	CORE				
6a Rinarian				1								
		Optimal			Suboptima			rginal		Poor		
Zone Width (from stream edge to field)	channel widt grasses),	Optimal arian zone >18 ths with trees, human activitie impacted zone	shrubs, or tall es have not	1 active char grasses), hur	rian zone 12-1 nnel width w/tre	8 meters (1/2- ees, shrubs, or have minimally	Width of ripa meters (1 channel wid		vegation le width), little		tation due to	-
Zone Width (from stream edge to field)	channel wid grasses), l	arian zone >18 ths with trees, human activitio impacted zone	shrubs, or tall es have not	1 active char grasses), hur	rian zone 12-1 nnel width w/tre nan activities l impacted zone	8 meters (1/2- ees, shrubs, or have minimally e.	Width of ripa meters (1, channel wid impacted by h	rginal arian zone 6-12 /3-1/2 active Ith vegetated), numan activities.	vegation le width), little h	rian zone < 6 r ss than 1/3 ac riparian vege numan activitie	tive channel tation due to es.	-
Zone Width (from stream edge to field) Grade (left)	channel widt grasses), l	arian zone >18 ths with trees, human activitie impacted zone 9	shrubs, or tall es have not e. 8	1 active char grasses), hur	rian zone 12-1 nnel width w/tre nan activities I impacted zone 6	8 meters (1/2- ees, shrubs, or have minimally e. 5	Width of ripa meters (1, channel wid impacted by h 4	rginal arian zone 6-12 /3-1/2 active tth vegetated), numan activities.	vegation le width), little h	rian zone < 6 r ss than 1/3 ac riparian vege human activitie	tation due to es.	5
Zone Width (from stream edge to field) Grade (left)	channel wid grasses), l	arian zone >18 ths with trees, human activitio impacted zone	shrubs, or tall es have not	1 active char grasses), hur 7	rian zone 12-1 nnel width w/tre nan activities l impacted zone	8 meters (1/2- ees, shrubs, or have minimally e.	Width of ripa meters (1, channel wid impacted by h	rginal arian zone 6-12 /3-1/2 active Ith vegetated), numan activities.	vegation le width), little h	rian zone < 6 r ss than 1/3 ac riparian vege numan activitie	tive channel tation due to es.	5
Zone Width (from stream edge to field) Grade (left)	channel widt grasses), l	arian zone >18 ths with trees, human activiti impacted zone 9 9	shrubs, or tall es have not e. 8	1 active char grasses), hur 7 7	rian zone 12-1 nnel width w/tre nan activities I impacted zone 6 6 NDITION C/	8 meters (1/2- ees, shrubs, or have minimally e. 5 5 ATEGORY (Width of ripa meters (1, channel wid impacted by h 4 4 GRADE or S	rginal arian zone 6-12 /3-1/2 active tth vegetated), numan activities. 3 3 3 SCORE	vegation le width), little h	rian zone < 6 r ss than 1/3 ac riparian vege numan activitie	tive channel tation due to es. 0	5
Zone Width (from stream edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation	channel wid grasses), i 10 10 90% plant shrubs, prair riparian zor	arian zone >18 ths with trees, human activitie impacted zone 9	shrubs, or tall as have not 	1 active chai grasses), hur 7 7 7 75-90% strr young specie trees behi	rian zone 12-1 nnel width witre nan activities impacted zone 6 6 8 NDITION C/ Suboptima eambank vege as along chann nd; disruption curring at inter	8 meters (1/2- bes, shrubs, or have minimally e. 5 5 ATEGORY (I tation, mixed nel and mature evident with	Width of ripa meters (1,1 impacted by f 4 4 3RADE or S Ma 50-75% s vegetation of and sparse shrub spe	rginal arian zone 6-12 3-1/2 active tth vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vegation le width), little 2 2 Less than 5 coverage c grasses, fe density, banl	rian zone < 6 r ss than 1/3 ace riparian vege numan activitie 1 1 <u>Poor</u> 0% streambar onsisting mos k trees & shru k deeply scarr	tive channel tation due to es. 0 Avg.Score k vegetation tly of pasture bs; low plant ed with gullies	5 5 5 Well covered,
Zone Width (from stream edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/	channel wid grasses), i 10 10 90% plant shrubs, prair riparian zor	arian zone >18 ths with trees, human activitie impacted zone 9 9 9 Optimal t density of ma rie grasses, or ne intact or dis	shrubs, or tall as have not 	1 active chai grasses), hur 7 7 7 75-90% strr young specie trees behi	rian zone 12-1 nnel width w/tre man activities I impacted zone 6 6 NDITION C/ Suboptima aambank vege se along chanr nd; disruption	8 meters (1/2- bes, shrubs, or have minimally e. 5 5 ATEGORY (I tation, mixed nel and mature evident with	Width of ripa meters (1,1 channel wic impacted by h 4 4 3RADE or S Ma 50-75% c vegetation of and sparse shrub spe frequent wit	rginal arian zone 6-12 /3-1/2 active thit vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vegation le width), little 2 2 Less than 5 coverage c grasses, fe density, banl	rian zone < 6 r ss than 1/3 ac r iparian vege numan activitie 1 1 1 0% streambar onsisting mosi w trees & shru	tive channel tation due to es. 0 Avg.Score k vegetation tly of pasture bs; low plant ed with gullies	5 5 5
Zone Width (from stream edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness	channel widt grasses), l 10 10 >90% plant shrubs, prair riparian zor grazi	arian zone >18 ths with trees, human activiti impacted zone 9 9 9 0ptimal t density of ma ine intact or dis ing/mowing mi 9 9	shrubs, or tall s have not b. 8 8 ture trees or marsh plants, ruption from nimal. 8	1 active chai grasses), hur 7 7 7 75-90% strr young specie trees behi breaks oc	rian zone 12-1 nel width wither man activities impacted zone 6 6 0 NDITION C/ Suboptima aambank vege aambank vege aambank vege se along chanr nd; disruption - curring at inter meters.	8 meters (1/2- bes, shrubs, or have minimally 5 5 ATEGORY (1 tation, mixed tation, mixed evident with rvals of >50 5	Width of ripa meters (1,1 channel wic impacted by h 4 4 3 3 3 3 3 3 3 3 3 3 3 4 3 3 3 3 3	rginal arian zone 6-12 /3-1/2 active thi vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	vegation le width), little 2 2 Less than 5 coverage c grasses, fe density; bani al	rian zone < 6 r ss than 1/3 ac riparian vege human activitie 1 1 1 1 0% streambar onsisting most onsisting most on sisting	tive channel tation due to ss. 0 0 Avg.Score Avg.Score by a stress of the s	5 5 5 well covered, mostly herbaceo us. 3
Zone Width (from stream edge to field) Grade (left) Grade (Right) 6b. Riparian Zone Vegetation	channel widt grasses), l 10 10 >90% plant shrubs, prair riparian zor grazi	arian zone >18 ths with trees, human activiti impacted zone 9 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	shrubs, or tall s have not 	1 active chai grasses), hur 7 7 75-90% strr young speci- trees behi breaks oc	rian zone 12-1 nel width wither nan activities impacted zone 6 6 NDITION C/ Suboptima aambank vege sa along chanr nd; disruption curring at inter meters.	8 meters (1/2- bes, shrubs, or have minimally s. 5 5 ATEGORY (Il tation, mixed tel and mature evident with rvals of >50	Width of ripa meters (1,1 channel wic impacted by h 4 4 3RADE or S Ma 50-75% c vegetation of and sparse shrub spe frequent wit and scars ev	rginal arian zone 6-12 /3-1/2 active thit vegetated), numan activities. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Less than 5 coverage c grasses, fe density; bani	rian zone < 6 r ss than 1/3 ac riparian vege human activitie 1 1 1 0% streambar 0% streambar onsisting mos w trees & shru k deeply scarr I along its leng	tive channel tation due to ss. 0 0 Avg.Score Avg.Score hk vegetation hk vegetation ty of pasture ibs; low plant ed with gullies th.	Well covered, mostly herbaceo us. 3 3

S25 (6-15')											SCORE	
1 FLOW REG TYPE	ME	Perennial		Intermitte	ent w/ Perenr	vial Pools	Inter	mittent	1	Ephemeral		4
Grade	10	9	8	7	6	5	4	3	2	1	0	
	SUBSTRATE/A											-
2 EFIFAUNAL	SUBSTRATE/	Optimal	OVER		Suboptimal		Mai	rginal		Poor		-
		m bed, greater y stable habitat			am bed, 30-50% nabitat features			n bed, 10-30% stable habitat		an 10% habitat ack of habitat		
		stream faunal o			faunal coloniza			rable for stream		ate unstable or		
	and/or fish/am	phibian cover. transient. Fea			bian cover. Ma t transient. (Se			ization and/or n cover; habitat		lined channels		
		submerged log			ory for habitat f			ay be less than		el bottom may		
	banks, roots, c	obble, rocks, p and glides, or c			components.)			bstrate may be sturbed. (See				
		tage to allow c					Excellent Cate	egory for habitat				
							feature co	omponents.)				
Grade	10	9	8	7	6	5	4	3	2	1	0	
3 STREAM BO	TTOM SUBST		Substrate C	naracterizat								l l
	Mixture of sub	Optimal strate materials	with gravel	Mixture of	Suboptimal soft sand, mu	d. or clav:		rginal or sand bottom;	Hard pan c	Poor lav or bedrock	no root mat	t
	and firm sand	d prevalent; roo	t mats and	mud may	be dominant; s	some root	little or no	root mat; no		bmerged vege		
	submerge	d vegetation co	mmon.	mats and	i submerged ve present.	egatation	submergeo	d vegetation.				1
0	4-	1 -		_		_					^	
Grade	10	9	8	7	6	5	4	3	2	1	0	
4 POOL VARI	ABILITY	Optimal		r	Suboptimal		Mai	rginal	1	Poor		4
	Even mix of larg	e-shallow, larg		Majority of	pools large-dee	ep; very few	Shallow poo	ols much more	Majority	of pools small-		1
	shallow, sr	nall-deep pools	present		shallow.		prevalent the	an deep pools		pools absent		
Orada	40		8	7		-	4	3	2		0	
Grade 5 SEDIMENT	10 DEPOSITION/S	9 COURING	0	/	6	5	4	3	2		0	
		Optimal			Suboptimal			rginal		Poor		
	<5% of channe	I bottom affected deposition.	by scour or		cted by scour or instrictions and w			ted by scour or tosits and scour at		0% of the bottor nge nearly year		
					Some deposition		obstructions, o	constrictions and	minimal or a	bsent due to hea	avy deposition	1
							bends. Some	e filling of pools.	or	excessive scour	ing.	
Grade	10	9	8	7	6	5	4	3	2	1	0	
												_
6 CHANNEL F	LOW STATUS	Optimal		r	Suboptimal		Mai	rginal	1	Poor		-
		es the base of			>75% of the c		Water fills 2	25-75% of the		water in the cl		1
	banks; <5% of o	nannei substra	te is exposed	<25% or cn	annel substrate	e is exposed		nnel and/or riffle mostly exposed	mostly pre	sent in standir stream is dry		
Grade	10	9	8	7	6	5	4	3	2	1	0	
7 CHANNEL A		Optimal			Suboptimal			rginal		Poor		1
	Channelization absent or minim	on, alteration, on alternation, or alternation, or alternation of the second second second second second second			eration or chan nt, usually adjac			annelization may embankments		red with gabio Concrete or r		
	meander patter	n. Alteration b	y stormwater	structures,	such as bridge	abutments	(including spoil	piles) or shoring	chann	els. Instream	habitat	모
	inputs	absent or mini	mal		erts); evidence (I.e., channeliza			resent on both al stable stream		y altered by sto s. Over 80% c		stur
				be presen	t, but stream pa	attern and	meander pa	attern has not	outor input	reach altered		bed
					have recovered n is not present			Alteration from inputs may be				by :
					from stormwate		extensive. 40	-80% of stream				stor
				1	inputs.		reach	altered.				Disturbed by stormwater
												ater.
Grade	10	9	8	7	6	5	4	3	2	1	0	
8 CHANNEL S	INUOSITY											-
		Optimal	no that at	The here's	Suboptimal	oroc "		rginal	Character	Poor	ny he - h]
	The bends in the length 3 to 4 tin	nes longer than	if it was in a		in the stream ir th 2 to 3 times			in the stream ream 1 to 2 times		raight; waterwa ized for a long		1
	straight line.	(Note - channe	braiding is		as in a straight		longer than if it	was in a straight		5		
1	other low-lying a	ormal in coasta areas. This par		1				ine				1
		ated in these ar										

Under the second seco	ę	BANK STAB	ILITY (SCORE EA		()		Subortin		Mar	rainal	1	Poor		
In the above or mining (1)% to get with the set of exists multiple s		1			osion or bank	Moderately					Unstable: r	Poor perennial v	vegetation at	1
And the construction of production to subtract the model is a marked in more than a marked in more than a more and a more than a more and a more than a more and a more														
Image: Source of the start is built in the			affected), perennia	al vegetation	n to waterline;	5-30% of ba	ank in reac	has areas of	(mainly scoure	d or stripped by				
equade fracts, no exact the fails, expositive fails, exposite fails, expositive fails, exposite fails, expositive f														
Expendence in the second release of an analysis of the second release in the second release is a second release in the second release is a second release in the second release is a second release release is a second release is a second release is a second relea														
Image: Section and base and endown and endown and endown and base and endown and endown and endown and			exposed roots	; no recent	tree rails;									
Image: Section of the sectio						0.00000	1001010	o but procont.						
Image contract, tiph ension potential during from Image contract, tiph ension potential during from Origonial Frande 10 9 8 7 6 5 4 3 2 1 0 2 OF Frande 10 9 8 7 6 5 4 3 2 1 0 2 OF Frande 10 9 8 7 6 5 4 3 2 1 0 2 3 0 7 0 5 0 7 0 0 0 7 0														
Patiential during fibods Patiential during fibods 10 9 8 7 6 5 4 3 2 1 0 1 10 9 8 7 6 5 4 3 2 1 0 1 10 VEGETATIVE PROTECTION (GCOBE EACH BANK) Subpoline <														
Stade 10 0 0 7 6 5 4 3 2 1 0 1 VEGETATIVE PROTECTION (SCORE EACH BANK) Number of the second structure of the second														
Grade 10 9 8 7 6 5 4 3 2 1 0 3 10 VEGETATIVE PROTECTION ISCORE EACH BANK and mediate relation cores cored by relation in the weight of the streamback and mediate relation cores cored by relation in the weight of the streamback and the core output relation core stored by relation in the weight of the streamback and the core output relation core stored by relation in the weight of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of the streamback and core downs, patcher of stream or even of streamback interest. Name and core downs, patcher of stream or even of stream or even of stream or even of stream or even of streamback interest. Stream and core downsex and streamback interest. The streamback and streamback interes									potential d	uring noods				
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Left Bank Score 3 0 5 SubCl 0 0 3 0 5 SubCl=(%R4*Score*0.01) Rt Bank Cl> 3 Cl LtT Bank Cl> 3 Cl 3 Cl	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the	10 ABITAT CONDITI Tree stratum (dbi >60% tree canopy layers may in herbaceous, a mosses/licohens an the high end of additional layers <i>i</i> end if ≤1 addition 10 riparian areas allo e square footage I %Riparian Area (9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	RE EACH B/ present, with didional forest g, shrub, rinchuding bris) Score at ange if ≥2 Score at low are present. 8 stream bank i y measuring	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptin n (dbh>3 ii 6 60% tree ent Catego al forest layer end if 41 i resent. OF stumps rer 6 on Catego og length and width	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Tree stratum present, with < cover. (See Ex for examples of layers.) Score z for examples of fair range if >2 are present. Sc of a area too maintained a dense herbaced vege 4 dition Scores to nd Use GIS mi or each riparia Mar 1	ginal (dbh>3 inches) 30% tree canopy cellent Category additional forest additional layers core at low end if vers are present. nsists of non- naturalized pus and/or woody tation. 3 sing the abovu aps may be us n category in th ginal 00	2 Tree stra surfaces, cr culverte maintain denuded t P P e descriptor ed for this.	Poor tum absent; oplands, mir d streams, m ned herbaces unfaces, act asture, and e	impervious te spoil lands, iowed and usa areas, ively grazed atc.	e sums of an Blocks
Left Bank Score 3 0 1 SubCl 0 0 3 0 1 SubCl=(%R4*Scores*0.01) Rt Bank Cl> 3 Cl Left Bank LIT Bank Cl> 3 Cl	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the	10 ABITAT CONDITI Tree stratum (dbi >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers a end if ≤1 addition riparian areas ald e square footage f %Riparian Area (Core	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	RE EACH B/ present, with didional forest y, shrub, r including bris.) Score at ange if ±2 Score at low are present. 8 stream bank i y measuring purposes, e	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptin n (dbh3 ir 0 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 : resent. OF stumps rer 6 on Catego ing length and width Suboptin	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with <2 for examples of layers.) Score e fair range if ≥2 are present. St ≤1 additional lay OR area co maintained a dense herbacec vege 4 dition Scores t nd Use GIS m; or each riparial Mar 1	ginal (dbh>3 inches) 30% tree canopy additional forest at the high end of cellent Category additional layers core at low end if vers are present. nsists of non- nd naturalized wers are present. nsists of non- distribution. 3 3 00 3	2 Tree stra surfaces, cr culverte maintain denuded t P P e descriptor ed for this.	Poor tum absent; oplands, mir d streams, m ned herbaces unfaces, act asture, and e	impervious te spoil lands, iowed and usa areas, ively grazed atc.	e sums of an Blocks
SubCl 0 3 0 5 SubCl=(%R^3Scores*0.01) Rt Bank Cl> 3 Cl LT Bank Cl> 3 Cl	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the	10 ABITAT CONDITI Tree stratum (dbi >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers a end if ≤1 addition riparian areas ald e square footage f %Riparian Area (Core	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	RE EACH B/ present, with didional forest y, shrub, r including bris.) Score at ange if ±2 Score at low are present. 8 stream bank i y measuring purposes, e	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptin n (dbh3 ir 0 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 : resent. OF stumps rer 6 on Catego ing length and width Suboptin	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with <2 for examples of layers.) Score e fair range if ≥2 are present. St ≤1 additional lay OR area co maintained a dense herbacec vege 4 dition Scores t nd Use GIS m; or each riparial Mar 1	ginal (dbh>3 inches) 30% tree canopy additional forest at the high end of cellent Category additional layers core at low end if vers are present. nsists of non- nd naturalized wers are present. nsists of non- distribution. 3 3 00 3	2 Tree stra surfaces, cr culverte maintain denuded t P P e descriptor ed for this.	Poor tum absent; oplands, mir d streams, m ned herbaces unfaces, act asture, and e	impervious te spoil lands, iowed and usa areas, ively grazed atc.	e sums of an Blocks
SubCl=(%RA*Scores*0.01) Rt Bank Cl> 3 Cl LT Bank Cl> 3 3	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the Right Bank	10 ABITAT CONDITI Tree stratum (dbi >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers a end if ≤1 additional 10 riparian areas ald e square footage f %Riparian Area (%Riparian Area Score SubCl	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	RE EACH B/ present, with didional forest y, shrub, r including bris.) Score at ange if ±2 Score at low are present. 8 stream bank i y measuring purposes, e	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptin n (dbh3 ir 0 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 : resent. OF stumps rer 6 on Catego ing length and width Suboptin	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with <2 for examples of layers.) Score e fair range if ≥2 are present. St ≤1 additional la OR area co maintained a dense herbacec vege 4 dition Scores t nd Use GIS mi or each riparia 1 1	ginal (dbh>3 inches) 30% tree canopy additional forest additional forest additional layers core at low end if yers are present. nsists of non- nd naturalized yers are present. nsists of non- nd naturalized us and/or woody tation. 3 n category in tf ginal n category in tf ginal 00 00	2 Tree stra surfaces, cr culverte maintain denuded t P P e descriptor ed for this.	Poor tum absent; oplands, mir d streams, m ned herbaces unfaces, act asture, and e	0 impervious he spoil lands, lowed and usa areas, ively grazed atc.	e sums of an Blocks
Rt Bank Cl> 3 Cl LT Bank Cl> 3 3	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the Right Bank	10 ABITAT CONDITI Tree stratum (db >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers s end if ≤1 additio riparian areas alc e square footage I %Riparian Area (%Riparian Area Score	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	8 RE EACH B/ present, with including jg, shrub, including pris, Score at ange if >2 Score at low are present. 8 stream bank i y measuring purposes, e 0	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptim n (dbh-3 ir b 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 1 resent. OF stumps rer 6 on Catego g length and width Suboptim 0	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with ∠ for examples of layers.) Score a ≤1 additional la OR area co maintained a dense herbacec vege 4 dition Scores u nd Use GIS m or each riparia 1 1	ginal (dbh>3 inches) 30% tree canopy cellent Category additional forest it the high end of yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. additional layers and/or woody tation. 3 3 00 3	2 Tree stra surfaces, cr culverte mantaii denuded t p p e descriptor ed for this. re blocks bb	Poor tum absent; oplands, min d streams, m d	0 impervious he spoil lands, lowed and usa areas, ively grazed atc.	e sums of an Blocks
LT Bank Cl> 3	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the Right Bank	10 ABITAT CONDITI Tree stratum (db >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers s end if ≤1 additio riparian areas alc e square footage I %Riparian Area (%Riparian Area Score	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	8 RE EACH B/ present, with including jg, shrub, including pris, Score at ange if >2 Score at low are present. 8 stream bank i y measuring purposes, e 0	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptim n (dbh-3 ir b 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 1 resent. OF stumps rer 6 on Catego g length and width Suboptim 0	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with ∠ for examples of layers.) Score a ≤1 additional la OR area co maintained a dense herbacec vege 4 dition Scores u nd Use GIS m or each riparia 1 1	ginal (dbh>3 inches) 30% tree canopy cellent Category additional forest it the high end of yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. addition in the present addition in the pres	2 Tree stra surfaces, or culverte maintair denuded s p e descriptor de dor this. ne blocks bd	Poor turn absent; oplands, mir 4 streams, mir 4 streams, mir a stureace, act a sture, and of a sture, and of s s elow. oor	0 impervious te spoil lands, towed and sreas, tively grazed tac.	e sums of an Blocks
	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the Right Bank	10 ABITAT CONDITI Tree stratum (db >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers s end if ≤1 additio riparian areas alc e square footage I %Riparian Area (%Riparian Area Score	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	8 RE EACH B/ present, with including jg, shrub, including pris, Score at ange if >2 Score at low are present. 8 stream bank i y measuring purposes, e 0	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptim n (dbh-3 ir b 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 1 resent. OF stumps rer 6 on Catego g length and width Suboptim 0	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with ∠ for examples of layers.) Score a ≤1 additional la OR area co maintained a dense herbacec vege 4 dition Scores u nd Use GIS m or each riparia 1 1	ginal (dbh>3 inches) 30% tree canopy cellent Category additional forest it the high end of yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. addition in the present addition in the pres	2 Tree stra surfaces, cr culverte maintain denuded t P 2 a descriptor ad for this. te blocks bt b blocks bt b blocks bt b cluckster SubCl=(%	Poor turn absent; oplands, mir d streams, mir d streams, mir ed herbaces unfaces, act asture, and e asture, and e s elow. bor 0 RA*Scores	0 impervious te spoil lands, towed and bus areas, tvely grazed atc. 0 Ensure th %Riparia equa 100	e sums of an Blocks i 100
	12	Grade RIPARIAN H Grade 1. Delineate 2. Determin 3. Enter the Right Bank	10 ABITAT CONDITI Tree stratum (db >60% tree canopy layers may im herbaceous, a mosses/lichens an the high end o additional layers s end if ≤1 additio riparian areas alc e square footage I %Riparian Area (%Riparian Area Score	9 ON (SCO) Dptimal >3 inches) cover. (Ac cover. (Ac cover. (Ac und leaf litted d woody de Excellent r are present. onal layers a 9 9 ng each s for each b or for field	8 RE EACH B/ present, with including jg, shrub, including pris, Score at ange if >2 Score at low are present. 8 stream bank i y measuring purposes, e 0	7 Tree stratur with 30% tr (See Excelle of additional additional additional score at low layers are p with 7 nto Conditid or estimatir	6 Suboptim n (dbh-3 ir b 60% tree ant Catego al forest lay and of Goo forest layer end if ≤1 1 resent. OF stumps rer 6 on Catego g length and width Suboptim 0	s al ches) present, canopy cover. y for examples ers.) Score at range if ≥2 s are present. Idditional fores cutover areas naining. 5 s and Cor and width. La and Score H	4 Mar Tree stratum present, with ∠ for examples of layers.) Score a ≤1 additional la OR area co maintained a dense herbacec vege 4 dition Scores u nd Use GIS m or each riparia 1 1	ginal (dbh>3 inches) 30% tree canopy cellent Category additional forest it the high end of yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. additional layers zore at low end if yers are present. addition in the present addition in the pres	2 Tree stra surfaces, cr culverter maintain denuded t p 2 e descriptor ed for this. re blocks bb P SubCl=(% Rt Bank C	Poor tum absent; oplands, min d streams, m d	0 impervious te spoil lands, iowed and usa areas, ively grazed tc. 0 Ensure th %Riparia equa 100 100 	e sums of an Blocks i 100

Stream Functional Capacity Calculation											
	S25 (6-15	5')									
Date:	5/17/2006	,									
Project:	Lake Ralph H	all									
Assessment Area:	WP 8										
Assessors:	Holmes Voigh	t Capps									
Project Status:	X_Preproj	ect	Postproject								
		Otragan	Otras a res	Multiplication							
		Stream	Stream	Multiplication	50						
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC						
Hydrologic	0.18	2,772	E	0.00125	0.62						
Water Quality Improvement	0.23	2,772	E	0.00125	0.78						
Habitat	0.24	2,772	E	0.00125	0.84						
Total	0.65	2,772			2.24						
*Stream Length is the length of the Stre	am Assessme	nt Reach (SAF	R)								
**Multiplication Factors											
Ephemeral = 0.00125											
Intermittent = 0.0025											
Perennial = 0.0038											

Pasture outside of riparian zone. Rip zone 20m or less.



SWAMPIM DATASHEETS – SOUTH EPHEMERAL 16 TO >25' PRE-PROJECT

• S21

ITEM VARIABLE FUNCTION CATEGORY

S21 (16-25')

1

ER											
			CON	DITION CA	TEGORY G	RADE or Se	CORE				
	Optimal			Suboptima	1	Mar	ginal		Poor		
10	9	8	7	6	5	4	3	2	1	0	
	ER 10			CONI	CONDITION CA	CONDITION CATEGORY G	CONDITION CATEGORY GRADE or S	CONDITION CATEGORY GRADE or SCORE			

Right bank- 15-10 meters to pasture, Left bank 15-30 meters to row crop. Few trees before pasture and crops.

WP 6 P 91, 90

FLOW REGIME		I. HYDROL	OGIC FUN	CTIONS		S21 (16	5-25')					SCORE	Source
TYPE	Ī	Perennial		Intermitte	ent w/ Perer	nial Poola	Inter	mittent		Ephemeral			<i>KDWP 2</i> Kansas
Grade	10	9	8	7	6	5	4	3	2	1	0	() Subjectiv
CHANNEL COI				vation of Str				5	2		0		Joubjeeuv
I				CON		ATEGORY (Barbour,
	Not sol at	Optimal		0	Suboptima			rginal	0	Poor			EPA RBA
2a.Channel Condition/Alter ation (natural, altered, or downcutting)	channel evidenc excessive frequency of	annel; no str lization minir ce of downcu lateral cuttir f hydrologica thannel and	mal. No utting or ng. Normal al connection	bridge a alteratio recovery of Acceptable	annelization areas) or pas on, but with s i channel bec e frequency o vs onto flood	t channel ignificant d and banks. of overbank	80% of channed disrupte aggradati channel wi frequency flows of floodplain	hannel; 40- the reach elized or d. Excess on; braided th excessive of overbank onto the h. Historical es or levees	widening. > channneli	is actively down 80% of the rea zed. Degradati prevent acces floodplain.	ich riprap or ion,dikes or		5-21; Ne 1998 US NRCS S page 7
Grade	10	9	8	7	6	5		loodplain.	2	1 1	0		_
Gidue	10	3	0	1	0	Э	4	3			U		4
I				CON	DITION C	ATEGORY (GRADE or S	SCORE				1	w/ assista
2b.Channel	Channel Car	Optimal			Suboptima	l w Frequency	-	rginal Capacity to		Poor apacity to Flow			and input
Capacity to Flow Frequency Ratio (for 2- year peak flow)	Ratio is such storm event		overflow from 1.25 to 2.5	Ratio is suc storm even every 1.2 that	h that bank o	overflow from requent than ss frequent ears.	Flow Frequ such that b from storm more free every ye frequent th ye	ency Ratio is ank overflow o events are quent than ear or less han every 5 ars. or >1.5	Ratio is su storm ever every half	ch that bank or nts are more frr year or less fre every 10 years <0.24 or >2	verflow from equent than equent than		Dr. Mike Harvey a Travant
Grade	10	9	8	7	6	5	4	3	2	1	0	()
				CON		ATEGORY (COPE				-	Newton,
		Optimal			Suboptima			rginal	1	Poor		-	USDA/ NI
	Banks stable		of erosion or	Moderately	stable; infre			ly unstable;	Unstable;	no perennial ve	egetation at		SVAP pa
2c.Channel	bank failure					healed over.		egetation to		e; severe erosio			10; Barbo
		affected), pe to waterline			ank in reach erosion and/	has areas of or bank		parse (mainly stripped by		cently exposed tree falls and/o			al., 1999
Bank Stability		anks (some				vegetation to		sion), bank		ees common; r			RBA page 26; USAC
Bank Stability (score each				waterline	in most place		held by h	ard points		aw" areas frequ			26, USAC
Bank Stability (score each bank, left or	outside of m								straight se	ctions and ben	ds; obvious		2004
(score each	outside of m	neander ben posed roots tree falls;		exposed tre	ee roots rare	but present.	and ero elsewhere bank in rea of erosion	k outcrops) ded back ; 30-60% of ch has areas h and bank	bank sloug	hing; 60-100% erosional scars			2004
(score each bank, left or right facing	outside of m	posed roots		exposed tre	ee roots rare	but present.	and ero elsewhere bank in rea of erosion undercutti	ded back ; 30-60% of ch has areas	bank sloug	hing; 60-100%			2004
(score each bank, left or right facing downstream)	outside of m recently ex	posed roots tree falls;	; no recent				and ero elsewhere bank in rea of erosion undercutti exposed tr fine root ba	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and <u>tirs common</u>	bank sloug	hing; 60-100% erosional scars	s.		
(score each bank, left or right facing downstream) Grade (Left)	outside of m	posed roots		exposed tre	ee roots rare	5	and ero elsewhere bank in rea of erosion undercutti exposed tr	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and tirs common: 3	bank sloug	hing; 60-100%			3
(score each bank, left or right facing downstream)	outside of m recently ex	posed roots tree falls;	; no recent	7	6		and ero elsewhere bank in rea of erosion undercutti exposed tr fine root ha 4	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and <u>tirs common</u>	bank sloug	hing; 60-100% erosional scars	0		3
(score each bank, left or right facing downstream) Grade (Left) Grade (Right)	outside of m recently ex 10 10	posed roots tree falls; 9 9	; no recent	7	6	5	and ero elsewhere bank in rea of erosion undercutti exposed tr fine root ha 4	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and tirs common: 3	bank sloug	hing; 60-100% erosional scars	o 0 0	3	3
(score each bank, left or right facing downstream) Grade (Left)	outside of m recently ex 10 10	posed roots tree falls; 9 9	; no recent	7	6	5	and ero elsewhere bank in rea of erosion undercutti exposed tr fine root ha 4	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and tirs common: 3	bank sloug	hing; 60-100% erosional scars	o 0 0	3	3
(score each bank, left or right facing downstream) Grade (Left) Grade (Right)	outside of m recently ex 10 10	posed roots tree falls; 9 9	; no recent	7 7	6 6	5	and ero elsewhere bank in rea of erosion undercutti exposed tr fine root ba 4 4	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and <u>irs common:</u> 3 3	bank sloug	hing; 60-100% erosional scars	o 0 0	3	3 <u>3</u>
(score each bank, left or right facing downstream) Grade (Left) Grade (Right) CHANNEL ROI	outside of m recently ex 10 10	posed roots tree falls; 9 9 FACTORS	; no recent	7 7	6 6 NDITION CA	5 5 ATEGORY (and ero elsewhere bank in rea of erosio undercutti exposed tr fine root bas 4 4 4	ded back ; 30-60% of ch has areass nand bank ng; recently ee roots and <u>irs common:</u> <u>3</u> <u>3</u> <u>3</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u>	bank sloug	hing; 60-100% erosional scars	5. 0 0	3	Barbour,
(score each bank, left or right facing downstream) Grade (Left) Grade (Right) CHANNEL ROI 3a.Channel	10 10 10 10 10	posed roots tree falls; 9 9	8 8	7 7 COM	6 6	5 5 ATEGORY (and ero elsewhere bank in rea of erosior undercutti exposed tr fine root ba 4 4 4 4 6 GRADE or S Mai	ded back ; 30-60% of ch has areas n and bank ng; recently ee roots and <u>irs common:</u> 3 3	bank sloug	hing; 60-100% erosional scars	0 0 Avg.Score	3	Barbour, EPA RBA
(score each bank, left or right facing downstream) Grade (Left) Grade (Right) CHANNEL ROI 3a.Channel Sinuosity	UGHNESS F	posed roots tree falls; 9 9 9 FACTORS Optimal in the stream n length 2.5	8 8 8 m increase to 4 times	7 7 CON The bend: the stream	6 6 Suboptima s in the strea n length 1.5 t	5 5 ATEGORY (Il mincrease to 2.5 times	and ero elsewhere bank in rea of erosion undercutti exposed tr fine root ba 4 4 4 3 CRADE or S Mai The bends increase	ded back ; 30-60% of ch has areas nand bank ng; recently ee roots and <u>irs common:</u> <u>3</u> <u>3</u> <u>3</u> <u>3</u> <u>3</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>5</u>	bank sloug 2 2 Channel st channel	hing; 60-100% erosional scars	0 0 Avg.Score ay has been distance.	3	Barbour, EPA RBA
(score each bank, left or right facing downstream) Grade (Left) Grade (Right) CHANNEL ROI 3a.Channel	UGHNESS F	posed roots tree falls; 9 9 9 EACTORS Optimal in the stream han if it was	8 8 8 m increase to 4 times straight.	7 7 The bend the stream longer tha	6 6 NDITION C/ Suboptima s in the strea	5 5 ATEGORY (Il mincrease to 2.5 times traight line.	and ero elsewhere bank in rea of erosioi undercutti exposed tr exposed tr 4 4 4 4 6 RADE or 5 Mai The bends increase length 1 longer tha straight lin length/alla	ded back ; 30-60% of ch has areas and bank ng; recently ee roots and <u>is common:</u> <u>3</u> <u>3</u> <u>3</u> <u>5CORE</u> rginal in the stream	bank sloug 2 2 Channel st channel	hing; 60-100% erosional scars	0 0 Avg.Score ay has been distance.	3	3

1					00		ATEGORY (SCORE						KDWP, 1996
			Optimal			Suboptima			rginal	1	Р	oor			KDWP, 1996 Kansas
		Little or n	o channel en	largement	Some grav		barse stones		bars of rocks,	Channel			ls or stream		Subjective
	Ob Datter														
	3b. Bottom		ting from sed				present, little		silt common;				is uniform		Evaluation of
	Substrate	accumula	ation; channe	i is stable	Silt;	moderately	stable	moderate	ely unstable	sand, slit	, ciay, or	pearoc	k; unstable		Aquatic
	Composition														Habitats
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					CON	IDITION C	ATEGORY (GRADE or \$	SCORE						KDWP, 1996;
			Optimal			Suboptima	al	Ma	rginal		Р	oor			Newton et al.,
		Diverse bot	tom topograp	hv includina	Channel be	ottom includ	es 5-7 of the	Chann	el bottom	Channe	bottom	includes	s <3 of the		1998
ole	3c. Instream		following: de			ed in Optima			5 of the items				Category		USDA/NRCS
ria	Bottom		gravel, logs/la						Optimal						
/aı	Tapagraphy		backwaters/						egory						SVAP page 13/
Score for Only One Variable	Topography		ging vegetation					Out	egory						
Б.			ed shallows, r												
<u>></u>			banks, or sid												
- L		underout	pools	e onanner											
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Enter	or		Optimal			Suboptima			rginal			oor			
ш	3c. Manning's		0.05 to 0.099)		0.035 to 0.0	15		.03 or >0.10				cessive		
	n							to	0.15				to 0.02 due		
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					CON		ATEGORY (USACE,
			Optimal			Suboptima			rginal			oor			Norfolk District,
	3d. Channel		tio <u>></u> 1.0 <1.2				and Where		io <u>></u> 1.4 < 2.0				ere channel		2004 SAAM
	Incision		ope >2%; En				ntrenchment	and Whe	ere channel				t ratio <u><</u> 1.4;		Form 1 #1 and
	(TLB/BFD=BH	ratio >1.4	; Where cha	nnel slope	ratio >1.4	; Where cha	annel slope	slope	ə > 2%,	Whe	re chani	nel slope	e <u><</u> 2%,		VT Stream
	R; 1/BHR*Adj	<u><</u> 2%; Er	trenchment i	atio >2.0	<u><</u> 2%, Er	trenchment						ont ratio			
	Factor =CI)						ratio > 2.0	Entrench	nment ratio	Ent	trenchm	entratio	<u><</u> 2.0		
	,						ratio >2.0		nment ratio ere channel	Ent	trenchm	entratio	<u><</u> 2.0		Geomorphic
							12110 >2.0	>1.4; Wh		Ent	trenchm	entratio	<u><</u> 2.0		Assessment
							ratio >2.0	>1.4; Who slope	ere channel		trenchm	entrado	<u><</u> 2.0		
1						arenenment	ratio >2.0	>1.4; Who slope	ere channel e <u><</u> 2%,		trenchm		<u><</u> 2.0		Assessment
	TIR -		10				ratio >2.0	>1.4; Who slope	ere channel e <u><</u> 2%,		trenchm		≤ <u></u> 2.0		Assessment
	TLB =		10		BHR =	1	ratio >2.0	>1.4; Who slope	ere channel e <u><</u> 2%,		trenchm	entratio	<u><</u> 2.0		Assessment
	BFD =		10		BHR =	1		>1.4; Wh slope Entrenchm	ere channel e <u><</u> 2%, ent ratio >2.0						Assessment
		10		8			5	>1.4; Who slope	ere channel e <u><</u> 2%,			1	00	2	Assessment
	BFD = Grade		10 9		BHR =	1		>1.4; Wh slope Entrenchm	ere channel e <u><</u> 2%, ent ratio >2.0					2	Assessment
4	BFD =		10 9		BHR =	1		>1.4; Wh slope Entrenchm	ere channel e <u><</u> 2%, ent ratio >2.0					2	Assessment
4	BFD = Grade		10 9		BHR =	1		>1.4; Wh slope Entrenchm	ere channel e <u><</u> 2%, ent ratio >2.0					2	Assessment
4	BFD = Grade		10 9		BHR = 7	1	5	>1.4; Wh slop Entrenchm	ere channel e <2%, ent ratio >2.0					2	Assessment Phase 2
4	BFD = Grade		10 9 TER STOR/		BHR = 7	1 6 IDITION C	5 ATEGORY 0	>1.4; Wh slop Entrenchm 4 GRADE or 5	ere channel e <u><</u> 2%, ent ratio >2.0 3 SCORE			1		2	Assessment Phase 2 Newton, et al.,
4	BFD = Grade DYNAMIC SUR	RFACE WA	10 9 TER STOR/ Optimal	AGE	BHR = 7 CON	1 6 IDITION C. Suboptima	5 ATEGORY (>1.4; Whi slope Entrenchm 4 GRADE or S	ere channel e <2%, ent ratio >2.0 3 SCORE rginal	2	 	1	0	2	Assessment Phase 2 Newton, et al., 1998 USDA/
4	BFD = Grade DYNAMIC SUR 4a.Pools	RFACE WA	10 9 TER STOR/ Optimal shallow pools	AGE	BHR = 7 CON Pools pre	1 6 IDITION C. Suboptima sent, but no	5 ATEGORY (al t abundant;	>1.4; Wh slop Entrenchm 4 GRADE or S Ma Pools pi	ere channel e <2%, ent ratio >2.0 3 SCORE rginal resent, but	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant,	PACE WA	10 9 TER STOR/ Optimal shallow pools n 30% of the	AGE abundant; pool bottom	BHR = 7 CON Pools pre from 10-3(1 6 IDITION C, Suboptima sent, but no 2% of the pc	5 ATEGORY (al t abundant; rol bottom is	>1.4; Whi slope Entrenchm 4 BRADE or 3 Ma Pools pr shallow; fr	ere channel = ∠2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of	2 Pools abs	 	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14;
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or	Deep and greater that is obscure of	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth,	AGE abundant; pool bottom or pools are	BHR = 7 CON Pools pre from 10-3(obscure di	1 IDITION C. Suboptima sent, but no 0% of the pc ue to depth,	ATEGORY (al t abundant; vol bottom is or the pools	>1.4; Whi slop Entrenchm 4 GRADE or 3 Pools pi shallow; fro the pool	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of b bottom is	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant,	Deep and greater that is obscure of	10 9 TER STOR/ Optimal shallow pools n 30% of the	AGE abundant; pool bottom or pools are	BHR = 7 CON Pools pre from 10-3(obscure di	1 6 IDITION C, Suboptima sent, but no 2% of the pc	ATEGORY (al t abundant; vol bottom is or the pools	>1.4; Wh slopp Entrenchm 4 CRADE or S Ma Pools pr shallow; fr the pool obscure d	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but pm 5-10% of l bottom is ue to depth,	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14;
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or	Deep and greater that is obscure of	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth,	AGE abundant; pool bottom or pools are	BHR = 7 CON Pools pre from 10-3(obscure di	1 IDITION C. Suboptima sent, but no 0% of the pc ue to depth,	ATEGORY (al t abundant; vol bottom is or the pools	>1.4; Whi slopp Entrenchm 4 4 SRADE or S Ma Pools pu shallow; fri the pool obscure d ot he po	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or	Deep and greater that is obscure of	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth,	AGE abundant; pool bottom or pools are	BHR = 7 CON Pools pre from 10-3(obscure di	1 IDITION C. Suboptima sent, but no 0% of the pc ue to depth,	ATEGORY (al t abundant; vol bottom is or the pools	>1.4; Whi slopp Entrenchm 4 4 SRADE or S Ma Pools pu shallow; fri the pool obscure d ot he po	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but pm 5-10% of l bottom is ue to depth,	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or	Deep and greater that is obscure of	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth,	AGE abundant; pool bottom or pools are	BHR = 7 CON Pools pre from 10-3(obscure di	1 IDITION C. Suboptima sent, but no 0% of the pc ue to depth,	ATEGORY (al t abundant; vol bottom is or the pools	>1.4; Whi slopp Entrenchm 4 4 SRADE or S Ma Pools pu shallow; fri the pool obscure d ot he po	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	2	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent)	Deep and greater tha is obscure o at I	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de	AGE abundant; pool bottom or pools are aep.	BHR = 7 CON Pools pre from 10-3(obscure di	1 IDITION C. Suboptima sent, but no 0% of the pc ue to depth, t least 3 fee	5 ATEGORY (al t abundant; pol bottom is or the pools t deep.	>1.4; Wh slopp Entrenchm 4 4 SRADE or S Ma Pools pr shallow; fr the pool obscure d of the pool obscure d of the pool	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less ieet deep.	Pools abl	P sent, or t	1 OOr the entir	e bottom is r = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or	Deep and greater that is obscure of	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth,	AGE abundant; pool bottom or pools are	BHR = 7 CON Pools pre from 10-3(obscure di	1 IDITION C. Suboptima sent, but no 0% of the pc ue to depth,	ATEGORY (al t abundant; vol bottom is or the pools	>1.4; Whi slopp Entrenchm 4 4 SRADE or S Ma Pools pu shallow; fri the pool obscure d ot he po	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less	2 Pools abs	P sent, or t	1 OOr the entir	0 re bottom is	0	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade	Deep and greater tha is obscure o at I	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de	AGE abundant; pool bottom or pools are aep.	BHR = 7 CON Pools pre from 10-34 obscure du are a 7	1 IDITION C. Suboptims sent, but no % of the pc at to depth, t least 3 fee 6	ATEGORY (al t abundant; ool bottom is or the pools t deep. 5	>1.4; Whi slopp Entrenchm 4 4 BRADE or 3 Ma Pools pr shallow; fr the pool obscure d or the po than 3 f	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but pm 5-10% of bottom is ue to depth, ols are less ieet deep. 3	Pools abl	P sent, or t	1 OOr the entir	e bottom is r = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel	Deep and greater tha is obscure o at I	10 9 TER STOR/ Optimal shallow pools in 30% of the jue to depth, east 5 feet de	AGE abundant; pool bottom or pools are aep.	BHR = 7 CON Pools pre from 10-34 obscure du are a 7	1 IDITION C, Suboptima Sent, but no 2% of the pc Je to depth, t least 3 fee 6 IDITION C,	ATEGORY C al t abundant; ool bottom is or the pools t deep. 5 ATEGORY C	>1.4; Whi slopp Entrenchm 4 4 3RADE or 3 Ma Pools pi shallow, fr the pool obscure d or the po than 3 1 4 3RADE or 3	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but pm 5-10% of l bottom is ue to depth, ols are less red depth. 3 SCORE 3 SCORE	Pools abl	P sent, or f rnible. N	1 oor the entir lo water 1	e bottom is r = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade	Deep and greater tha is obscure o at I	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de	AGE abundant; pool bottom or pools are aep.	BHR = 7 CON Pools pre from 10-30 obscure de are a 7 CON	1 IDITION C. Suboptima Suboptima Suboptima 0% of the pc Je to depth, t least 3 fee 6 IDITION C. Suboptima	5 ATEGORY (al t abundant; pol bottom is or the pools t deep. 5 ATEGORY (al	>1.4; Whi slopp Entrenchm 4 4 3RADE or 3 Ma Pools pi shallow, fr the pool obscure d or the po than 3 1 4 3RADE or 3	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but pm 5-10% of bottom is ue to depth, ols are less ieet deep. 3	Pools abl	P sent, or f rnible. N	1 OOr the entir	e bottom is r = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al.,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel	PACE WA Deep and greater tha is obscure o at I	10 9 TER STOR/ Optimal shallow pools in 30% of the jue to depth, east 5 feet de	AGE s abundant; pool bottom or pools are pep. 8	BHR = 7 CON Pools pre from 10-30 obscure de are a 7 CON	1 IDITION C, Suboptima Sent, but no 2% of the pc Je to depth, t least 3 fee 6 IDITION C,	5 ATEGORY (al t abundant; pol bottom is or the pools t deep. 5 ATEGORY (al	>1.4; Whi slopp Entrenchm 4 4 SRADE or S Ma Pools pr shallow; frr the pool obscure d ot he pool obscure d ot than 3 ft 4 SRADE or S Ma Ballow; frr	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but pm 5-10% of l bottom is ue to depth, ols are less red depth. 3 SCORE 3 SCORE	Pools abb discer	P P	1 oor the entirities lo water 1	e bottom is r = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status	Peep and greater tha is obscure e at I	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de 9 9	AGE s abundant; pool bottom or pools are sep. 8 8 both lower	BHR = 7 CON Pools pre from 10-3(obscure di are a 7 7 CON	1 IDITION C. Suboptima Suboptima Suboptima 0% of the pc Je to depth, t least 3 fee 6 IDITION C. Suboptima	ATEGORY (al t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al ie available	>1.4; Wh slopp Entrenchm 4 3 RADE or 3 Pools pr shallow; fr the pool obscure d or the pool obscure d or the pool than 3 ft 4 3 RADE or 3 4 3 RADE or 4 8 8 RADE or 5 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	ere channel = <2%, ent ratio >2.0 3 SCORE rginal rginal resent, but om 5-10% of bottom is ue to depth, ols are less ieet deep. 3 SCORE rginal	Pools abs discer Very little	P sent, or t mible. N	1 oor the entir lo water 1 000r channe	0 re bottom is r = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to	PACE WA Deep and greater tha is obscure of at I	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of	AGE abundant; pool bottom or pools are sep. 8 both lower mount of	BHR = 7 CON Pools pre from 10-34 obscure du are a 7 7 CON	1 iDITION C. Suboptima sent, but no % of the pc ib	ATEGORY (al t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al te available f channel	>1.4; Wh slop Entrenchm 4 4 3RADE or 3 Ma Pools pr shallow; fr the pool obscure d or the po obscure d or the po than 3 f 4 3RADE or 4 4 8RADE or 4 8 8RADE or 5 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of l bottom is ue to depth, ols are less reet deep. 3 SCORE rginal 2 25-75% of	Pools abs discer Very little	P P sent, or 1 mible. N Water in standin	1 oor the entir lo water 1 00r channe	e bottom is = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 Barbour, et al., 1999 EPA RBA page 5-19 /A-
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	PACE WA Deep and greater tha is obscure of at I	10 9 TER STOR/ Optimal shallow pools shallow pools due to depth, east 5 feet de 9 0ptimal ches base of nd minimal a	AGE abundant; pool bottom or pools are sep. 8 both lower mount of	BHR = 7 CON Pools pre from 10-34 obscure du are a 7 7 CON	1	ATEGORY (al t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al te available f channel	>1.4; Whi slopp Entrenchm 4 4 3 3 A Pools pr shallow; fir the pool obscure d or the pool obscure d of the pool of the pool o	ere channel = <2%, ent ratio >2.0 	Pools abs discer Very little	P P sent, or 1 mible. N Water in standin	1 oor the entir lo water 1 oor channe g pools.	e bottom is = zero.		Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 EPA RBA page 5-19 /A- 9#5; TCEQ
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	PACE WA Deep and greater tha is obscure of at 1 10 Water rea banks a channel	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is o	AGE a abundant; pool bottom or pools are rep. 8 both lower mount of exposed.	BHR = 7 7 Pools pre from 10-30 obscure du are a 7 7 Vater fills channe sub	1 IDITION C. Suboptima sent, but no 3% of the pc ue to depth, t least 3 fee 6 IDITION C. Suboptima > 75% of th ; or <25% of strate is exp	5 ATEGORY (al t abundant; vol bottom is or the pools t deep. 5 ATEGORY (al te available f channel osed.	>1.4; Whi slopp Entrenchm 4 3RADE or 1 4 9 Cols pr shallow; frr the pool obscure d obscure d obscure d obscure d obscure d obscure d obscure d obscure d obscure d obscure d ar 4 3 8RADE or 1 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less ieet deep. 3 SCORE rginal = 25-75% of ble channel, ble channel, y exposed.	Pools ab discer 2 Very little present as	P P sent, or in rnible. N P water in s standin z c	1 oor the entir to water 1 oor channe g pools. aro.	0 e bottom is = zero. 0 l and mostly . No water =	0	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 EPA RBA page 5-19/A 9#5; TCEQ 1999; VANR,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	PACE WA Deep and greater tha is obscure of at I	10 9 TER STOR/ Optimal shallow pools shallow pools due to depth, east 5 feet de 9 0ptimal ches base of nd minimal a	AGE abundant; pool bottom or pools are sep. 8 both lower mount of	BHR = 7 CON Pools pre from 10-34 obscure du are a 7 7 CON	1	ATEGORY (al t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al te available f channel	>1.4; Whi slopp Entrenchm 4 4 3 3 A Pools pr shallow; fir the pool obscure d or the pool obscure d of the pool of the pool o	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less eet deep. 3 SCORE rginal 2 25-75% of ble channel, be substrates	Pools abs discer Very little	P P sent, or in rnible. N P water in s standin z c	1 oor the entir lo water 1 oor channe g pools.	e bottom is = zero.	0	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 EPA RBA page 5-19 /A- 9#5; TCEQ
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	PACE WA Deep and greater tha is obscure of at 1 10 Water rea banks a channel	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is o	AGE a abundant; pool bottom or pools are rep. 8 both lower mount of exposed.	BHR = 7 7 Pools pre from 10-30 obscure du are a 7 7 Vater fills channe sub	1	5 ATEGORY (al t abundant; ol bottom is or the pools t deep. 5 ATEGORY (al te available f channel osed. 5	>1.4; Whi slopp Entrenchm 4 3 RADE or S Ma Pools pr shallow; fr the pool obscure d or the pool obscure d or the pool than 3 f 4 3 RADE or S 4 3 RADE or S 4 3 8 RADE or S 4 3 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less reet deep. 3 SCORE rginal s 25-75% of ble channel, le substrates y exposed. 3 3 3 3 3 3 3 3 3	Pools abs discer 2 Very little present as	P Sent, or 1 P water in standin zc	1 oor the entir lo water 1 channe g pools. aro. 1	0 e bottom is = zero. 0 l and mostly No water = 0	0	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 EPA RBA page 5-19/A 9#5; TCEQ 1999; VANR,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	PACE WA Deep and greater tha is obscure of at 1 10 Water rea banks a channel	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is o	AGE a abundant; pool bottom or pools are rep. 8 both lower mount of exposed.	BHR = 7 7 Pools pre from 10-30 obscure du are a 7 7 Vater fills channe sub	1	5 ATEGORY (al t abundant; vol bottom is or the pools t deep. 5 ATEGORY (al te available f channel osed.	>1.4; Whi slopp Entrenchm 4 3 RADE or S Ma Pools pr shallow; fr the pool obscure d or the pool obscure d or the pool than 3 f 4 3 RADE or S 4 3 RADE or S 4 3 8 RADE or S 4 3 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less reet deep. 3 SCORE rginal s 25-75% of ble channel, le substrates y exposed. 3 3 3 3 3 3 3 3 3	Pools abs discer 2 Very little present as	P Sent, or 1 P water in standin zc	1 oor the entir lo water 1 channe g pools. aro. 1	0 e bottom is = zero. 0 l and mostly No water = 0	0	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 EPA RBA page 5-19/A 9#5; TCEQ 1999; VANR,
4	BFD = Grade DYNAMIC SUR 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	PACE WA Deep and greater tha is obscure of at 1 10 Water rea banks a channel	10 9 TER STOR/ Optimal shallow pools n 30% of the due to depth, east 5 feet de 9 Optimal ches base of nd minimal a substrate is o	AGE a abundant; pool bottom or pools are rep. 8 both lower mount of exposed.	BHR = 7 7 Pools pre from 10-30 obscure du are a 7 7 Vater fills channe sub	1	5 ATEGORY (al t abundant; ol bottom is or the pools t deep. 5 ATEGORY (al te available f channel osed. 5	>1.4; Whi slopp Entrenchm 4 3 RADE or S Ma Pools pr shallow; fr the pool obscure d or the pool obscure d or the pool than 3 f 4 3 RADE or S 4 3 RADE or S 4 3 8 RADE or S 4 3 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	ere channel = <2%, ent ratio >2.0 3 SCORE rginal resent, but om 5-10% of bottom is ue to depth, ols are less reet deep. 3 SCORE rginal s 25-75% of ble channel, le substrates y exposed. 3 3 3 3 3 3 3 3 3	Pools abs discer 2 Very little present as	P Sent, or 1 P water in standin zc	1 oor the entir lo water 1 channe g pools. 1 1 tal Pos	0 e bottom is = zero. 0 l and mostly No water = 0	0	Assessment Phase 2 Newton, et al., 1998 USDA/ NRCS SVAP page 14; Barbour, et al., 1999 EPA RBA page 5-19/A 9#5; TCEQ 1999; VANR,

I. HYDROLOGIC FUNCTIONS

S21 (16-25')

Γ	VARIABLES												SCORE
	TYPE												
	NOTES SEDIMENT TR			ON									Т
ľ			,DEI 0011										1
					CO	NDITION CA	ATEGORY (
	1a. Bank		Optimal			Suboptima			arginal		Poor		_
	Stability (score each			of erosion or ninimal; little		/ stable; infre osion mostly			y unstable; 30- nk in reach has		nany eroded equently alor	areas; "raw" na straight	
	bank, left or			lems. <5% of		ank in reach			erosion; high	sections a	nd bends; ol	bvious bank	
	right facing		bank affecte	d.		erosion.			otential during		; 60-100% c		
	downstream)							110	oods.	е	rosional sca	18.	
(Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	3
	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	3
												Avg.Score	3
							TEOODY						
			Optimal		CO	NDITION CA Suboptima			SCORE arginal		Poor		
	1b. Channel	Bottom '	1/3 of bank is	generally	Bottom '	1/3 of bank is			/3 of bank is	Bottom 1	/3 of bank is	aenerally	
l	Bottom Bank Stability		istant plant/s			ant/soil matrix		generally h	highly erodible	highly ero	dible materia	al; plant/soil	
1	Classificy		material.						lant/soil matrix promised.	matrix s	everely com	promised.	
I								comp	aomiacu.				
(Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	0
(Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	
ŀ												Avg.Score	0
	or				CO	NDITION CA	ATEGORY (BRADE or S	SCORE				
	1c. Channel		Optimal			Suboptima			arginal		Poor		
	Sediments or		avel or large			ravel or large			gravel or larger			nd, silt, clay,	
	Substrate		bble boulder type is grav			substrate typ h some finer			e; dominant /pe is finer than	or b	edrock; uns	table	
	Composition	Substrate	stable	er or larger,		oderately sta			t may still be a				
(Grade	10	9	8	7	6	5	4	3	2	1	0	1
۱	WATER APPE	ARANCE:	Clarity or V	isibility									
			Optimal		CO	NDITION CA Suboptima			SCORE arginal		Poor		
		Very clear,		tea-colored;	Occasiona	lly cloudy, es			ble cloudiness	Very turbid		earance most	
		objects visi	ble at depth	3-6 feet (less	storm ev	ent, but clea	rs rapidly;		e time; objects			depth <0.5 ft;	
	Water Clarity		colored); no (a;no noticeab			ible at depth ghtly green co			epth 0.5-1.5 ft; ns may appear			bright-green; tants; floating	
			rged objects			n on water su			; bottom rocks		urface scum, s m on surface.	sheen or heavy	(
									ged objected d with film.	coat of foa	zero.	No water -	
								covere	a with him.				
(Grade	10	9	8	7	6	5	4	3	2	1	0	0
	PRESENCE OF		C VEGETA		ence and Pe	ercent Cove	rade						+
	RECEIVED OF	AQUAIR	5 VEGETA	1011. 11030			lage						
					CO	NDITION CA	ATEGORY (
		<u></u>	Optimal	·····	E a lat	Suboptima			arginal	Dee	Poor		_
	3a. Nutrient		ater along en aquatic plant			or slightly gro re reach; moo			ater along entire bundance of lush		gray, or brown each; dense s		
	Enrichment	includes	low quantati	es of many		on stream su		green macro	phytes; abundant	macrophyte	s clog stream	; severe algal	
			f macrophyte growth prese						vth, especially armer months.		te thick algal r ie present due	nats in stream to unstable	
		L L	arowin biese					-			ate. No water		
	Grade	10	9	8	7	6	5	А	3	2	1	0	
(Grade	10	Э	ð	/	6	5	4	3	2	1 1	U	0
					CO	NDITION CA				I	_		
	or	When n==	Optimal sent, aquation	vogotation	Alcos de	Suboptima ominant in po			arginal present, some	Alcolma	Poor	om lorger	-
	3b. Aquatic Vegetation		of moss and			ants along ed			s, few mosses.		ts cover bott ninate the ch	annel or NO	
	vegetation		algae.				-			algae pr	esent due to	unstable	
										substra	te. No wate	er = zero.	
L		10	9	8	7	6	5	4	3	2	1	0	

AND USE PATTERN: Beyond Immediate Riparian Zone CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor Undisturbed, consisting of forest, pristine native praine, and/or natural wetlands. Permanent pasture mixed with crops Mixed row crops and pasture; some wooded areas may be present but as isolated patches Mainly row crops R Irade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 IPARIAN ZONE WIDTH AND CONTINUITY: CONDITION CATEGORY GRADE or SCORE theme widthe with trees, strucks, or tall trade (Left) Mixed for your constraint acre 6-12 (Width of riparian zone 7.8 meters (1-2) Width of riparian zone 6.12 (Width of riparian zone 6.13 (Width of riparian zone 6.12 (Width of riparian activities) (Width of riparian activities) (Width of riparian activities) (Width of riparian zone width width) (Width of riparian activities) (Width of													
Mainly consisting of leaves and wood scarce: fine organic address or woody without sediment. No leaves are word fine organic address or woody address ore			Ontinual		CON						Deer		
wood without sediment. organic debris without sediment. debris; coarse and fine color and foul door (anaerobic) or no ediment present due to excessive socuring R irade 10 9 8 7 6 5 4 3 2 1 0 2 AND USE PATTERN: Beyond Immediate Riparian Zone		Mainly or		avec and	Loovos			-	J	Eino orga		t black in	
Image: sediment present due to excessive sediment. organic matter with sediment present due to excessive sediment. N irade 10 9 8 7 6 5 4 3 2 1 0 2 AND USE PATTERN. Beyond Immediate Riparian Zone CONDITION CATEGORY GRADE or SCORE Periade Net Suboptimal Marginal Poor Mainly row crops 17 6 5 4 3 2 1 0<													
AND USE PATTERN: Beyond Immediate Riparian Zone CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor Undisturbed, consisting of forest, pristine native parise, and/or natural vectors and warnes, few row obseld areas may be present but as isolated patches irade (Left) 10 9 8 7 6 5 4 3 2 1 0 2 Trade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 CONDITION CATEGORY GRADE or SCORE Suboptimal Marginal Poor IPARIAN ZONE WIDTH AND CONTINUITY: CONDITION CATEGORY GRADE or SCORE Suboptimal Table Share and the rest, shalks or the rest, shalks or the rest of								organic	matter with		resent due t		
CONDITION CATEGORY GRADE or SCORE Optimal Permanent pasture mixed with wetlands. Mariginal Poor Indisturbed, consisting of forest, wetlands. Permanent pasture mixed with woolds and swamps, few row crops Mixed row crops and pasture; some wooled areas may be present but as isolated patches Mainly row crops Hixed row crops and pasture; some wooled areas may be present but as isolated patches 10 9 8 7 6 5 4 3 2 1 0 2 Irade (Left) 10 9 8 7 6 5 4 3 2 1 0 2 IPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 3 3 1 accentro of the transmitters (1/2)	Grade	10	9	8	7	6	5	4	3	2	1	0	2
Optimal Suboptimal Marginal Poor Undisturbed, consisting of forest, prishe native priate, and/or natural wetlands. Permanent pature mixed with wooldots and swamps, few row crops Mixed row crops and pasture; some wooldd areas may be present but as isolated patchess Mainly row crops Mainly row crops irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 2 irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 2 irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 IPARIAN ZONE WIDTH AND CONTINUITY:	AND USE PA	TTERN: Be	yond Imme	diate Ripari	an Zone								
Undisturbed, consisting of forest, pristine native prairie, and/or natural wetlands. Permanent pasture mixed with modolos and swamps, few row crops Mixed work or cops and pasture; some wooded areas may be present but as isolated patches Mainly row crops 10 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 2 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 IPARIAN ZONE WIDTH AND CONTINUITY: Arg.Score A 3 2 1 0 4 Condition Gottimal Suboptimal Marginal Marginal Poor 8 If the status Width of riparian zone - 18 meters (12- impacted zone. Width of riparian zone - 6 meters (natural grasses), human activities have minimally impacted zone. Width of riparian zone - 6 meters (natural grasses), human activities have minimally impacted zone. Width of riparian vegetation due to human activities. Mit Vegetation 0 8 7 6 5 4 3 2 1 0 4 Jone Mith of riparian zone - 18 meters (12- imacted zone. Width of riparian zone -					CO		ATEGORY (GRADE or S	CORE				1
pristine native praine, and/or natural wetlands. wooldots and swamps, few row crops in a pasture some woolded areas may be present but as isolated patches in a solated patches i			Optimal			Suboptima		Ma	rginal		Poor		e
trade (Left) 10 9 8 7 6 5 4 3 2 1 0 2 irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 0 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 0 irade individes with trees, shrubs, or inspaced zone. Midth of iparian zone 5.18 metrs (naural vides have minimally chanel with vegatated), impacted zone. metra (17.12 active channel width vegatated), impacted zone. width of iparian zone 5.12 width of iparian zone 5.1			ive prairie, ar			and swamp		pasture; s areas may l	ome wooded be present but	M	ainly row cro	ops	F
irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 IPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 3 Ba. Riparian Zone Width (from stream adge to field) Optimal OCONDITION CATEGORY GRADE or SCORE Conviction stream adge to field) Width of riparian zone 13 meters (12- trade (left)) Width of riparian zone 4.1 meters (12- trade (left)) Width of riparian zone 4.6 meters (natural grasses), human activities have not impacted zone. Width of riparian zone 4.1 meters (12- trade (left)) Marginal Poor Avg.Score Avg.Score Avg.Score Avg.Score Avg.Score Avg.Score Avg.Score	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	2
IPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 3 IPARIAN ZONE WIDTH AND CONTINUITY: Avg.Score 4 IPARIAN ZONE WIDTH AND CONTINUITY: IPARIAN ZONE Marginal Poor IPARIAN ZONE WIDTH AND CONTINUITY: IPARIAN ZONE Width of riparian zone > 12 meters (12, Vadive channel width with rese, shrubs, or at grasses), human activities have not impacted zone. Midth of riparian zone > 12 meters (12, Vadive channel width vegetated), impacted zone. IPARIAN ZONE Irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Irrade (Right) 10 9 8 7 6 5 4 3 2 1 0	Grade (Right)	-		-		-	-		-			-	
CONDITION CATEGORY GRADE or SCORE 6a. Riparian Optimal Suboptimal Marginal Poor Zone Width Width of riparian zone >18 meters (1-2 channel widths with trees, shrubs, or tall grasses), human activities have not impacted zone. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation less than 1/3 active channel impacted zone. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation less than 1/3 active channel impacted zone. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone 6-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone f-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone f-12 meters (1/3-1/2 active channel width wegtation due to human activities. Width of riparian zone f-12 meters (1/3-1/2 active channel width wegtation due to human activities. U Width of riparian zone f-12 meters					•							Avg.Score	3
6a. Riparian Zone Width (from stream adge to field) Optimal Suboptimal Marginal Poor Width of riparian zone >18 meters (1-2 (from stream adge to field) Width of riparian zone 12 H8 meters (1/2) (ransses), human activities have not impacted zone. Width of riparian zone 518 meters (1/2) (ransses), human activities have not impacted zone. Width of riparian zone 518 meters (1/2) (ransses), human activities have not impacted zone. Width of riparian zone 518 meters (1/2) (ransses), human activities have not impacted zone. Width of riparian zone 518 meters (1/2) (ransses), human activities. Width of riparian zone 518 meters (1/2) active channel width vegetated), impacted by human activities. Width of riparian zone 518 meters (1/2) active channel width, little riparian vegetation due to human activities. Poor irrade (left) 10 9 8 7 6 5 4 3 2 1 0 4 Vegetation 0 9 8 7 6 5 4 3 2 1 0 4 Vegetation 0 9 8 7 6 5 4 3 2 1 0 4 Vegetation 0 9 8 7 50/5% streambank vegetation Marginal Poor Less than 50% streamba	RIPARIAN ZON	NE WIDTH .	AND CONT	INUITY:									
Zone Width (from stream adge to field) Width of riparian zone >18 meters (1-2 (from stream adge to field) Width of riparian zone >18 meters (1-2 (ananel width), with trees, shrubs, or tail grasses), human activities have minimally impacted zone. Width of riparian zone <6 meters (natural meters (1/2-1/2 active channel width) with trees, shrubs, or impacted zone. Width of riparian zone <6 meters (natural meters (1/2-1/2 active channel width), with regation less than 1/3 active channel width), impacted by human activities. Width of riparian zone <6 meters (natural vegation less than 1/3 active channel width), impacted by human activities. Interpret width, interpret active channel width wegetation, width, impacted by human activities. rirade (left) 10 9 8 7 6 5 4 3 2 1 0 4 6b. Riparian Zone vegetation grazing/mowing minimal. Suboptimal Marginal solvoptimal Marginal solvoptimal Poor shub species; breaks frequent with some guilies and scars every 50 meters. Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with guilies and scars every 50 meters. It is meters. P expected shrub species; breaks frequent with some guilies and scars every 50 meters. It is meters. Width of riparian zone < 6 meters (natural wegetation of shrub species; breaks frequent with some guilies and scars every 50 meters. It is meters. 10 9 8 7 6 <	6a. Riparian		Optimal		CON					[Poor		
grasses), human activities have not impacted zone. grasses), human activities have minimally impacted zone. channel width vegetated), impacted by human activities. width), little riparian vegetation due to human activities. width), little riparian vegetation due to human activities. rrade (left) 10 9 8 7 6 5 4 3 2 1 0 4 trade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 trade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 6b. Riparian Zone Optimal Suboptimal Marginal Poor Suboptimal vegetation, mixed young species along channel and mature treaks occurring at intervals of >50 meters. 50-75% streambank vegetation of mixed grasses and scars every 50 meters. Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrubs; by hunt density; bank deeply scared with gullies all along its length. 10 irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9	Zone Width	Width of ripa		meters (1-2		rian zone 12-1	8 meters (1/2-			Width of ripar		meters (natural	1
irrade (left) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (left) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 iparian Optimal Totopoly streambank vegetation proving consisting mostly of pasture trees or shrubs, so or song channel and mature vegetation of mixed grasses inparian zone intact or disruption from grazing/mowing minimal. Song channel and mature vegetation of mixed grasses and scars every 50 meters. Less than 50% streambank vegetation of shrub species along song channel and mature vegetation of mixed grasses and scars every 50 m	(from stream	grasses), ł		es have not	grasses), hur	nan activities I	have minimally	channel wid	th vegetated),	width), little	riparian vege	tation due to	e
Avg.Score 4 Avg.Score 4 Optimal Avg.Score 4 Optimal Avg.Score 4 Some tract or disruption from grazing/mowing minimal. Some tract or disruption from grazing/mowing minimal. Avg.Score 4 Protection/ Some tract or disruption from grazing/mowing minimal. Some tract or disruption evident with breaks occurring at intervals of >50 Marginal Poor Avg.Score 4 Image: trace (Left) 10 9 8 7 6 5 4 3 2 1 0 4 Avg.Score Avg.Score CONDITION CATEGORY GRADE or SCORE Suboptimal Marginal Poor Some tract or disruption from grazing/mowing minimal. 75-0% streambank vegetation, mixed Less than 50% streambank vegetation or mixed grasses and sparse young tree or shrubs precise; breaks Less than 50% streambank vegetation dent with some guilles and scars every 50 meters. Someters. </th <th>cage to licita)</th> <th>i</th> <th>impacted zone</th> <th></th> <th></th> <th></th> <th></th> <th>Impacted by I</th> <th>iuman activities.</th> <th>h</th> <th>uman activitie</th> <th>es.</th> <th>ι</th>	cage to licita)	i	impacted zone					Impacted by I	iuman activities.	h	uman activitie	es.	ι
CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor >90% plant density of mature trees or shrubs, praine grasses, or marsh plants, riparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation, mixed vegetation of mixed grasses inparian zone intact or disruption from grazing/mowing minimal. 10 9 8 7 6 5 4 3 2 1 0 4 ripade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21	Grade (left)		·			·							ι
Optimal Suboptimal Marginal Poor 50% plant density of mature trees or shrubs, praine grasses, or marsh plants, iparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation, mixed young species along channel and mature trees behind; disruption evident with breaks occurring at intervals of >50 meters. 50-75% streambank vegetation of mixed grasses and sparse young tree or shrub species; breaks inparian zone intact or disruption from grazing/mowing minimal. Less than 50% streambank vegetation coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies all along its length. R R # irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 Varde (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21	Ŭ ,	10	9	8	7	6	5	4	3	2	1	0	4
6b. Riparian Zone Vegetation Protection/ completeness >90% plant density of mature trees or shrubs, prairie grasses, or marsh plants, riparian zone intact or disruption from grazing/mowing minimal. 75-90% streambank vegetation, mixed young species along channel and mature trees behind; disruption evident with breaks occurring at intervals of >50 50-75% streambank vegetation of mixed grasses and sparse young tree or shrubs, prairie grasses, for meres Less than 50% streambank vegetation coverage consisting mostly of pasture and sparse young tree or shrub species; breaks frequent with some guilies and scars every 50 meters. Less than 50% streambank vegetation coverage consisting mostly of pasture density; bank deeply scared with guilies all along its length. R R # right 10 9 8 7 6 5 4 3 2 1 0 4 rade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21 0.21 0.21	Grade (left)	10	9	8	7 7	6 6	5 5	4 4	3	2	1	0	4 4 4 4
Zone Vegetation protection/ completeness shrubs, prairie grasses, or marsh plants, iparian zone intact or disruption from grazing/mowing minimal. young species along channel and mature trees behind; disruption evident with breaks occurring at intervals of >50 meters. vegetation of mixed grasses and sparse young tree or shrub species; breaks frequent with some gullies and scars every 50 meters. coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies all along its length. Price and sparse young tree or shrub species; breaks frequent with some gullies and scars every 50 meters. coverage consisting mostly of pasture grasses, few trees & shrubs; low plant density; bank deeply scarred with gullies all along its length. Price all along its length. irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 trade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21 10 2 1 0 4	Grade (left)	10	9	8	7 7	6 6 NDITION C/	5 5 ATEGORY (4 4 GRADE or S	3 3 SCORE	2	<u>1</u> 1	0	4 4 4 4
Vegetation Protection/ completeness riparian zone intact or disruption from grazing/mowing minimal. trees behind; disruption evident with breaks occurring at intervals of >50 meters. and sparse young tree or shrub species; breaks frequent with some guilles and scars every 50 meters. grasses, few trees & shrubs; low plant density; bank deeply scarred with guilles all along its length. Image: Completeness Image: Comple	Grade (left) Grade (Right)	10 10	9 9 Optimal	8 8	7 7 COM	6 6 NDITION C/ Suboptima	5 5 ATEGORY (4 4 GRADE or S Ma	3 3 SCORE rginal	2 2	1 1 Poor	0 0 Avg.Score	
Protection/ completeness grazing/mowing minimal. breaks occurring at intervals of >50 meters. shrub species; breaks frequent with som guilles and scars every 50 meters. density; bank deeply scarred with guilles all along its length. density; bank deeply scarred with guilles all along its length. irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21	Grade (left) Grade (Right) 6b. Riparian	10 10 >90% plant	9 9 Optimal t density of mat	8 8 ture trees or	7 7 CON 75-90% stre	6 6 NDITION C/ Suboptima eambank vege	5 5 ATEGORY (I Itation, mixed	4 4 GRADE or S Ma 50-75%	3 3 CORE rginal streambank	2 2 Less than 5	1 1 Poor 0% streambar	0 0 Avg.Score	4 4 4 4 4
completeness and scars every 50 meters. and scars every 50 meters. and along its length. 10 irade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21 0 4 10	Grade (left) Grade (Right) 6b. Riparian Zone	10 10 >90% plant shrubs, prairi riparian zor	9 9 Optimal t density of mat ie grasses, or r ne intact or disi	8 8 ture trees or marsh plants, ruption from	7 7 CON 75-90% stre young specie trees behi	6 6 NDITION C/ Suboptima sambank vege ss along chanr nd; disruption	5 5 ATEGORY (Il tation, mixed nel and mature evident with	4 4 BRADE or S 50-75% vegetation of and sparse	3 3 SCORE rginal streambank f mixed grasses young tree or	2 2 Less than 5 coverage cc grasses, fer	1 1 Poor 0% streambar onsisting mos	0 0 Avg.Score	4 4 4 6 6
irrade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irrade (Right) 10 9 8 7 0 1 1 1 1 1 1 1 1 </td <td>Grade (left) Grade (Right) 6b. Riparian Zone Vegetation</td> <td>10 10 >90% plant shrubs, prairi riparian zor</td> <td>9 9 Optimal t density of mat ie grasses, or r ne intact or disi</td> <td>8 8 ture trees or marsh plants, ruption from</td> <td>7 7 CON 75-90% stre young specie trees behi</td> <td>6 6 NDITION C/ Suboptima eambank vege se along chanr ad; disruption ad; disruption curring at inter</td> <td>5 5 ATEGORY (Il tation, mixed nel and mature evident with</td> <td>4 4 GRADE or S Ma 50-75% vegetation of and sparse shrub spe</td> <td>3 3 SCORE rginal streambank f mixed grasses young tree or ccies; breaks</td> <td>2 2 Less than 5 coverage co grasses, fer density; bank</td> <td>1 1 0% streambar posisting mosi v trees & shru c deeply scarr</td> <td>0 0 Avg.Score nk vegetation tly of pasture ubs; low plant ed with gullies</td> <td>4 4 4 4 6 6 7 7</td>	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation	10 10 >90% plant shrubs, prairi riparian zor	9 9 Optimal t density of mat ie grasses, or r ne intact or disi	8 8 ture trees or marsh plants, ruption from	7 7 CON 75-90% stre young specie trees behi	6 6 NDITION C/ Suboptima eambank vege se along chanr ad; disruption ad; disruption curring at inter	5 5 ATEGORY (Il tation, mixed nel and mature evident with	4 4 GRADE or S Ma 50-75% vegetation of and sparse shrub spe	3 3 SCORE rginal streambank f mixed grasses young tree or ccies; breaks	2 2 Less than 5 coverage co grasses, fer density; bank	1 1 0% streambar posisting mosi v trees & shru c deeply scarr	0 0 Avg.Score nk vegetation tly of pasture ubs; low plant ed with gullies	4 4 4 4 6 6 7 7
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irade (Left) 10 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Avg.Score 4 4 3 2 1 0 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21 0 0.21 0 0 0	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation	10 10 >90% plant shrubs, prairi riparian zor	9 9 Optimal t density of mat ie grasses, or r ne intact or disi	8 8 ture trees or marsh plants, ruption from	7 7 CON 75-90% stre young specie trees behi	6 6 NDITION C/ Suboptima eambank vege se along chanr ad; disruption ad; disruption curring at inter	5 5 ATEGORY (Il tation, mixed nel and mature evident with	4 4 GRADE or S Ma 50-75% i vegetation ol and sparse shrub spe frequent wit	3 3 CCORE rginal streambank mixed grasses young tree or cices; breaks h some gullies	2 2 Less than 5 coverage co grasses, fer density; bank	1 1 0% streambar posisting mosi v trees & shru c deeply scarr	0 0 Avg.Score nk vegetation tly of pasture ubs; low plant ed with gullies	4 4 4 4 4 4 4 6 6 6 7 6
irade (Right) 10 9 8 7 6 5 4 3 2 1 0 4 Avg.Score 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/	10 10 >90% plant shrubs, prairi riparian zor	9 9 Optimal t density of mat ie grasses, or r ne intact or disi	8 8 ture trees or marsh plants, ruption from	7 7 CON 75-90% stre young specie trees behi	6 6 NDITION C/ Suboptima eambank vege se along chanr ad; disruption ad; disruption curring at inter	5 5 ATEGORY (Il tation, mixed nel and mature evident with	4 4 GRADE or S Ma 50-75% i vegetation ol and sparse shrub spe frequent wit	3 3 CCORE rginal streambank mixed grasses young tree or cices; breaks h some gullies	2 2 Less than 5 coverage co grasses, fer density; bank	1 1 0% streambar posisting mosi v trees & shru c deeply scarr	0 0 Avg.Score nk vegetation tly of pasture ubs; low plant ed with gullies	4 4 4 4 4 4 4 4 6 6 7 7 7 7 7 7 7 7 7 7
Avg.Score 4 Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness	10 10 >90% plant shrubs, prairi riparian zor grazi	9 9 Optimal t density of mat ie grasses, or n ne intact or dist ing/mowing mir	8 8 ture trees or marsh plants, ruption from nimal.	7 7 75-90% strr young specie trees behi breaks oc	6 6 Suboptima ambank vege salong chanr nd; disruption curring at inter meters.	5 5 ATEGORY (I I tation, mixed hel and mature evident with rvals of >50	4 4 GRADE or S Ma 50-75% vegetation of and sparse shrub spe frequent wit and scars ev	3 3 CCORE rginal streambank mixed grasses young tree or (cies; breaks h some gullies very 50 meters.	2 2 Less than 5 coverage co grasses, fer density; banh al	1 1 0% streambar onsisting mosi v trees & shru c deeply scarr along its leng	0 Avg.Score	4 4 4 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
Calculation of Function Capacity Index = Total Score/Total Possible Score 0.21	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness Grade (Left)	10 10 >90% plant shrubs, prairi riparian zgrazi	9 9 Optimal t density of mat ie grasses, or 1 ne intact or dis ing/mowing mir	8 8 ture trees or marsh plants, ruption from nimal. 8	7 7 75-90% strr young specie trees behi breaks oc	6 6 NDITION C/ Suboptima eambank vege se along cham ad; disruption - d; disruption - curring at inter meters.	5 5 ATEGORY (I tation, mixed rel and mature evident with rvals of >50	4 4 GRADE or S 50-75% i vegetation of and sparse shrub spe frequent wit and scars ev	3 3 SCORE rginal streambank mixed grasses young tree or rcices; breaks h some gullies rery 50 meters. 3	2 2 Less than 5 coverage cc grasses, fer density; bank al	1 1 0% streambar onsisting mos trees & shru : deeply scarn along its leng	0 0 Avg.Score nk vegetation tly of pasture bis; low plant ed with gullies gth. 0	4 4 4 4 4 4 4 4
	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness	10 10 >90% plant shrubs, prairi riparian zgrazi	9 9 Optimal t density of mat ie grasses, or 1 ne intact or dis ing/mowing mir	8 8 ture trees or marsh plants, ruption from nimal. 8	7 7 75-90% strr young specie trees behi breaks oc	6 6 NDITION C/ Suboptima eambank vege se along cham ad; disruption - d; disruption - curring at inter meters.	5 5 ATEGORY (I tation, mixed rel and mature evident with rvals of >50	4 4 GRADE or S 50-75% i vegetation of and sparse shrub spe frequent wit and scars ev	3 3 SCORE rginal streambank mixed grasses young tree or rcices; breaks h some gullies rery 50 meters. 3	2 2 Less than 5 coverage cc grasses, fer density; bank al	1 1 0% streambar onsisting mos v trees & shru c deeply scarn along its leng	0 Avg.Score hk vegetation tly of pasture bis; low plant ed with gullies gth. 0 0	4 4 4 4 4 4 4 4
	Grade (left) Grade (Right) 6b. Riparian Zone Vegetation Protection/ Completeness Grade (Left)	10 10 >90% plant shrubs, prairi riparian zgrazi	9 9 Optimal t density of mat ie grasses, or 1 ne intact or dis ing/mowing mir	8 8 ture trees or marsh plants, ruption from nimal. 8	7 7 75-90% strr young specie trees behi breaks oc	6 6 NDITION C/ Suboptima eambank vege se along cham ad; disruption - d; disruption - curring at inter meters.	5 5 ATEGORY (I tation, mixed rel and mature evident with rvals of >50	4 4 GRADE or S 50-75% i vegetation of and sparse shrub spe frequent wit and scars ev	3 3 SCORE rginal streambank mixed grasses young tree or rcices; breaks h some gullies rery 50 meters. 3	2 2 Less than 5 coverage cc grasses, fer density; bank al	1 1 0% streambar onsisting mos v trees & shru c deeply scarn along its leng	0 Avg.Score hk vegetation tly of pasture bis; low plant ed with gullies gth. 0 0	4 4 4 4 4 4 4 4

II. WATER QUALITY/BIOGEOCHEMICAL FUNCTIONS

S21 (16-25')

	EL OVI : E E	III. HABITAT FUNCTION	S			521 (16	20)					SCORE
1	FLOW REGI	ME Perennial		Intermittent	w/ Perenni	al Pools	Interm	ittent		Ephemeral		
	Grade	10 9	8	7	6	5	4	3	2	1	0	C
2		SUBSTRATE/AVAILABLE										
-		Optimal			uboptimal		Marg			Poor		
		Within stream bed, great coverage by stable habi		Within stream by stable hab			Within stream coverage by s			n 10% habitat ack of habitat		
		favorable for stream fauna		for stream fau			features favora			te unstable or		
		and/or fish/amphibian cove		fish/amphibia			faunal coloniz			lined channel		
		features non transient. F include snags, submerged		features not tr Category	for habitat fe		fish/amphibian availability may			d pools burier bottom may		
		banks, roots, cobble, rocks	, persistent leaf		mponents.)		desirable, sub	strate may be				
		packs, pools and glides, of habitat at a stage to allow					frequently dist Excellent Categ					
							feature con					
	Grade	10 9	8	7	6	5	4	3	2	1	0	0
3	STREAM BC	OTTOM SUBSTRATE: Poo Optimal	I Substrate Ch		uboptimal		Marc	inal	1	Poor		-
		Mixture of substrate materi		Mixture of so	oft sand, mud		All mud or clay of	or sand bottom;		ay or bedrock		
		and firm sand prevalent; r submerged vegetation			dominant; so ubmerged ve		little or no ro submerged		or sub	merged vege	etation.	
		Submergeu vegetallon	sommon.		present.	gatation	Sabinergeu	·				
				ļ,								
	Grade	10 9	8	7	6	5	4	3	2	1	0	1
4	POOL VARIA				ub optime - '		Marc	lingl	1	Dc		
		Optimal Even mix of large-shallow, la	arge-deep, small-			o; very few	Shallow pools	much more		Poor of pools small-		1
	1	shallow, small-deep po	ols present		shallow.		prevalent than			pools absent		
-	Grade	10 9	8	7	6	5	4	3	2	1	0	C
5	SEDIMENT	DEPOSITION/SCOURING Optimal		S	uboptimal		Març	inal		Poor		
		<5% of channel bottom affect	ted by scour or	5-30% affecte	d by scour or o	deposition;	30-50% affecte	ed by scour or		1% of the bottor		1
		deposition.		Scour at constr steepen. So	ictions and we me deposition		deposition. Depo obstructions, co			nge nearly year sent due to he		
							bends. Some			excessive scou		
						_		-			-	
	Grade	10 9	8	1	6	5	4	3	2	1	0	1
6	CHANNEL F	LOW STATUS Optimal		6	uboptimal		Marc	inal	1	Poor		
		Water reaches the base	of both lower	Water fills >7		annel; or	Water fills 25		Very little	water in the c	hannel and	
		banks; <5% of channel subs	trate is exposed	<25% of chanr	nel substrate	is exposed	available chann substrates are n			sent in standir		
							substrates are n	nostiy exposed		stream is dry		
	Grade	10 9	8	7	6	5	4	3	2	1	0	
7	CHANNEL A		0		0	3	-	5	2		0	
	1	Optimal Channelization, alteration	or dredaina		uboptimal ition or chann	olization	Marc		Banks shore	Poor red with gabio	n rinran or	-
	1						Alteration or cha					
		absent or minimal; normal ar			usually adjace	ent to	Alteration or cha be extensive; e	mbankments		Concrete or		
		meander pattern. Alteration	h by stormwater	structures, (su	usually adjace ch as bridge	ent to abutments	be extensive; e (including spoil p	embankments biles) or shoring	channe	els. Instream	habitat	
			h by stormwater	structures, (su or culverts alteration, (I.e	usually adjace ch as bridge s); evidence c e., channeliza	ent to abutments of past ttion) may	be extensive; e (including spoil p structures pre banks; normal	embankments biles) or shoring sent on both stable stream	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	
		meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (I.e be present, b	usually adjace ch as bridge s); evidence c e., channeliza out stream pa	ent to abutments of past ttion) may ttern and	be extensive; e (including spoil p structures pre banks; normal meander pat	embankments biles) or shoring sent on both stable stream tern has not	channe significantly other inputs	els. Instream altered by st	habitat ormwater or of the stream	
		meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (l.e be present, b stability hav alteration is	usually adjace ch as bridge a s); evidence c e., channeliza out stream pa ve recovered; s not present.	ent to abutments of past ttion) may ttern and ; recent . Minor	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in	embankments biles) or shoring sent on both stable stream tern has not teration from puts may be	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	
		meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (I.e be present, b stability hav	usually adjace ch as bridge a s); evidence c e., channeliza out stream pa ve recovered; s not present. m stormwate	ent to abutments of past ttion) may ttern and ; recent . Minor	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al	embankments siles) or shoring sent on both stable stream tern has not teration from puts may be 30% of stream	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	
		meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (l.e be present, b stability hav alteration is	usually adjace ch as bridge a s); evidence c e., channeliza out stream pa ve recovered; s not present.	ent to abutments of past ttion) may ttern and ; recent . Minor	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in extensive. 40-8	embankments siles) or shoring sent on both stable stream tern has not teration from puts may be 30% of stream	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	
		meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (l.e be present, b stability hav alteration is	usually adjace ch as bridge a s); evidence c e., channeliza out stream pa ve recovered; s not present. m stormwate	ent to abutments of past ttion) may ttern and ; recent . Minor	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in extensive. 40-8	embankments siles) or shoring sent on both stable stream tern has not teration from puts may be 30% of stream	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	
		meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (l.e be present, b stability hav alteration is	usually adjace ch as bridge a s); evidence c e., channeliza out stream pa ve recovered; s not present. m stormwate	ent to abutments of past ttion) may ttern and ; recent . Minor	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in extensive. 40-8	embankments siles) or shoring sent on both stable stream tern has not teration from puts may be 30% of stream	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	
	Grade	meander pattern. Alteration	h by stormwater	structures, (su or culverts alteration, (l.e be present, b stability hav alteration is	usually adjace ch as bridge a s); evidence c e., channeliza out stream pa ve recovered; s not present. m stormwate	ent to abutments of past ttion) may ttern and ; recent . Minor	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in extensive. 40-8	embankments siles) or shoring sent on both stable stream tern has not teration from puts may be 30% of stream	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	2
8	Grade	meander pattern. Alteration inputs absent or m	n by stormwater inimal	structures, (su or culvents alteration, (l. c be present, b stability hav alteration is alteration from	usually adjace ch as bridge a s); evidence c a, channeliza out stream pa ve recovered; s not present. m stormwate inputs.	ent to abutments of past ttion) may tttern and ; recent . Minor r or other	be extensive; e (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in extensive. 40-6 reach a	mbankments iiles) or shoring sent on both stable stream tern has not terration from puts may be 30% of stream Itered.	channe significantly other inputs	els. Instream altered by sto . Over 80% c	habitat ormwater or of the stream	2
8		Neander pattern. Alteration inputs absent or m 10 9 INUOSITY Optimal	by stormwater inimal	structures, (su or culverts alteration, (l.e be present, b stability hav alteration is alteration from 7	usually adjact ch as bridge s); evidence c a,, channeliza uut stream pa ve recovered; s not present. m stormwate inputs. 6 uboptimal	ent to abutments of past tition) may ttern and r recent Minor r or other 5	be extensive; c (including spoil p structures pre banks; normal meander pat recovered. Al stormwater in extensive. 40-5 reach a	Imbankments illes) or shoring sent on both stable stream tern has not teration from puts may be 0% of stream ltered.	channe significantly other inputs	els. Instream raltered by str . Over 80% c reach altered	habitat ormwater or of the stream 0	2
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n Blocks	0 Ensure th %Riparize 100 100	pplands, minietas, minietas streams, more ed herbaceos, activiture, activiture, and el streams, activiture, and el dow. dor	surfaces, cr culverter maintair denuded d P P descriptor de for this. te blocks be Pro-	nopy igory orest ind of ayers end if sent. 1- ed ooody bove e use in the	Ibb-3 inches Ibb-3 inches % tree can ellent Categ idditional for the high enc re at low er er at low er sists of non- of naturalizes s and/or wo tion. 3 ing the ab po anal po 0	atum (d ith <30 eee Excore les of a core at t if ≥2 a it. Scoo nal layee ac cons ned and paceous vegeta res us S mag poarian Margi 100 3 3	Tree stra present, w cover. (S& for exampl layers.) Sc Fair range are present ≤1 addition OR are maintain dense herb dition Sco nd Use GI pr each rip or each rip	5 s and Cou width. La	B inches be cano gory for ayers.) bod ran vers are 1 additi DR cuto remaini gories h and th) an	m (dbh> o 60% tr ent Cate al forest lai orest lai oresent. stumps 6 on Cate ng lengt and wic Subop	with 30% t (See Excell of addition the high- additional Score at lov layers are p with 7 7 to Condition	al forest rub, ding Score at if ≥2 e at low esent. 8 m bank i asuring o	Addition ling, sh lebris.) a range t. Scorr are pro- streat by me d purp	cover. (<i>i</i> lude: sap d leaf litt l woody of Excellen re preser nal layers 9 9 ng each or each or for fie	canopy (may incl eous, and ens and end of ayers ar addition as alor otage fo Area (o O Area	>60% tree (layers i herbace) the high additional le end if ≤1 10 riparian are e square foc %Riparian 1 %Riparian 7 SubCl	 Delineate Determine Enter the 		
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S21 (16-25')

Record of Functional Assessment Results

Str	eam Functior	nal Capacity C	alculation		
	S21 (16-2	25')			
Date:	5/17/2006	,			
Project:	Lake Ralph H	all			
Assessment Area:	WP 6				
Assessors:	Holmes Voigh	nt Capps			
Project Status:	X_Preproj	ect	Postproject		
			-		
		Stream	Stream	Multiplication	
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC
Hydrologic	0.11	1,026	E	0.00125	0.14
Water Quality Improvement	0.21	1,026	E	0.00125	0.27
Habitat	0.18	1,026	E	0.00125	0.22
Total	0.50	1,026			0.64
*Stream Length is the length of the Stre	am Assessme	nt Reach (SAF	२)		
**Multiplication Factors					
Ephemeral = 0.00125					
Intermittent = 0.0025					
Perennial = 0.0038					

Pasture outside of riparian zone. Rip zone 20m or less.



SWAMPIM DATASHEETS – NORTH SULPHUR RIVER PRE-PROJECT

• NSR @ SH 34

ITEM VARIABLE FUNCTION CATEGORY

05\05\2006 NSR @ Highway 34 Bridge

SCORE Reference Source

1

VARIABLES FLOW REGIM		. III DIQU	OGIC FUN			NSR @ Hi		nuge	05\05\200			SCORE	Source
TYPE		Perennial		Intermitte	ent w/ Pere	nnial Pools	Interr	nittent		Ephemeral			<i>KDWP</i> Kansas
Grade CHANNEL CO	10 NDITION: M	9 leasureme	8 Int or Obser	7 Transition of S	6 tream Cha	5 nnel Conditio	4	3	2	1	0	4	Subject
OTRAINEL OU		leasureme	In 01 00301										
		Optimal		CON	DITION C. Suboptima	ATEGORY (CORE	1	Poor		-	Barbou EPA RE
	Natural cha		uctures or	Some ch	annelization			annel; 40-	Channel	is actively dov	vncutting or		5-21;
	channelization of downcuttin				areas) or pas			he reach lized or		>80% of the realized. Degrada			Newton
2a.Channel Condition/Alter	cutting. N	Jormal frequ	uency of	recovery of	f channel be	d and banks.		I. Excess		s prevent acce			USDA/ SVAP
ation (natural,	hydrologica	I connectio el and flood			e frequency vs onto flood	of overbank		n; braided		floodplain.			017.
altered, or	ondanin		picani			picini	frequency	of overbank					
downcutting)								nto the Historical					
							incision,dik	es or levees oodplain.					
								·					
Grade	10	9	8	7	6	5	4	3	2	1	0	0)
		Ontire of		CON		ATEGORY (1	D		1	w/ assis
2b.Channel	Channel Capa	Optimal acity to Flov	v Frequencv	Channel Ca	Suboptima apacity to Flo	al ow Frequency		ginal Capacity to	Channel C	Poor Capacity to Flor	w Frequency	1	and inp Dr. Mik
Capacity to Flow	Ratio is such	that bank o	verflow from	Ratio is suc	h that bank	overflow from	Flow Freque	ency Ratio is	Ratio is su	uch that bank o	overflow from		Harvey
Frequency	storm events yea	s occur at a ar frequenc			ts are more 5 years or le	frequent than ess frequent		ank overflow events are		ents are more fi f year or less fr			Travant
Ratio (for 2- year peak		0.75-1.25			n every 2.5 y <0.75 or >1.			uent than ar or less		every 10 year <0.24 or >2			
flow)							frequent th	an every 5					1
								ars. or >1.5					
Grade	10	9	8	7	6	5	4	3	2	1	0	0)
		Ontine al		CON		ATEGORY (1	Deer			Newton
	Banks stable	Optimal ; evidence o	of erosion or	Moderately	Suboptima stable; infre	ai equent, small		ginal / unstable;	Unstable;	Poor no perennial v	egetation at		USDA/ SVAP
2c.Channel	bank failure a	bsent or mi affected), pe		areas of er	osion mostly	healed over. has areas of	perennial v	egetation to arse (mainly	waterlin	e; severe eros ecently expose	ion of both		10; <i>Bar</i>
Bank Stability	vegetation t	o waterline	; no raw or	minor	erosion and	/or bank	scoured or	stripped by	common	; tree falls and/	or severely		<i>al., 19</i> 9 RBA pa
(score each bank, left or	undercut ba outside of me					vegetation to es; recently		sion), bank ard points		rees common; raw" areas freq			26; US
right facing	recently exp					e but present.	(trees, roc	k outcrops) led back	straight se	ections and bei ghing; 60-100%	nds; obvious		Norfolk District
downstream)		100 1013,					elsewhere	30-60% of		erosional scar			
								h has areas and bank					
							undercutti	ig; recently					
			-					e roots and		-			
Grade (Left) Grade (Right)	10 10	9	8	7	6	5 5	4	3	2	1	0	0	
		J			. ~			3	-		Avg.Score		
CHANNEL RO	UGHNESS F	ACTORS											
				CON	IDITION C	ATEGORY (GRADE or S	CORE				-	Barbou
3a.Channel	The bords '	Optimal the stream	inoroo 4		Suboptima	al	Mar	ginal	Charael	Poor	www.hoc.hoc.]	EPA RE
Sinuosity	The bends in stream lengt					n increase the 5 times longer		n the stream he stream		traight; waterw			Chapte 5-25; K
(bends in low gradient	than if it was length/valle	as straight.			s a straight l alley length	line. Channel		1.5 times	Channel	length/valley l	ength <u><</u> 1.0		1996
stream)	iengui/valle	y ierigtri at	iedat ≥1.3.	iengu/\\	aney length	1.2 10 1.3	straight lin	n if it was a e. Channel					
								y length 1.0					
Grade	10	9	8	7	6	5	4	3	2	1	0	0)
				CON		ATEGORY			1				KDWP,
	Little or no	Optimal channel en		Some grav	Suboptima /el bars of co	al barse stones	Mar Sediment b	ginal ars of rocks.	Channel d	Poor livided into brai	ids or stream	4	Kansas Subject
3b. Bottom	resultir	ng from sed	iment	and well-wa	ashed debris	present, little	sands, and	silt common;	is channe	elized; substrat	te is uniform		Evaluat
Substrate Composition	accumulati	ion; channe	i is stable	silt;	moderately	stable	moderate	y unstable	sand, silt,	clay, or bedro	юк; unstable		Aquatic Habitat
l													

				CON	IDITION C	ATEGORY	GRADE or	SCORE					KDWP, 1996
		Optima	I		Suboptima	al	Ma	rginal		Poor			Newton et al
3c. Instream Bottom Topography	>7 of the boulders/g debris, overhan	e following: gravel, logs , backwater iging vegeta	ation, riffles,		ottom includ ed in Optima	es 5-7 of the al Category	includes < listed in	el bottom 5 of the items n Optimal egory		bottom inclue sted in Optim	des <3 of the al Category		1998 USDA/NRCS SVAP page
,		ed shallows t banks, or s pools	, rootwads, side channel										
Grade	10	9	8	7	6	5	4	3	2	1	0	1	
Orace													
		Ontina	1	CON		ATEGORY (1	Poor		_	
Or 3c.	<u> </u>	Optima 0.05 to 0.0			Suboptima 0.035 to 0.0			rginal .03 or >0.10	0 16 tr	0.20 due to	excessive	-	
3c. Manning's n					0.000 10 0.0			0.15	obstruction	n to flow or 0.	01 to 0.02 due clean, smooth		
Grade	10	9	8	7	6	5	4	3	2	1	0	1	
		Ontina	1	CON		ATEGORY (Deer		_	USACE,
3d. Channel	Incision ra	Optima	2 and Where	Incision ra	Suboptima	and Where		rginal io > 1.4 < 2.0	Incision rat	Poor	Vhere channel	-	Norfolk District, 200
Incision			Intrenchment		lope >2%, Er			ere channel			ent ratio <1.4;		SAAM Form
(TLB/BFD=BH			annel slope		1; Where cha			ə > 2%,		re channel slo			#1 and VT
R; 1/BHR*Adj	<u><</u> 2%; Er	ntrenchmer	t ratio >2.0	<u><</u> 2%, E	ntrenchment	ratio >2.0		nment ratio ere channel	Ent	renchment ra	tio <u><</u> 2.0		Stream
Factor =CI)								ere channel e <2%.					Geomorphic
								ent ratio >2.0					Assessmen Phase 2
TLB =		10		BHR =	1								
BFD =		10		7								_	
Grade	10	9	8	1	6	5	4	3	2	1	0	0	
DYNAMIC SUF	RFACE WA	ATER STC	RAGE										
				CON	IDITION C	ATEGORY	GRADE or :	SCORE					Newton, et
		0								Poor			1998 USDA
		Optima			Suboptima			rginal					
4a.Pools (abundant,	greater tha	shallow po an 30% of th	l ols abundant; le pool bottom h, or pools are	from 10-3	Suboptima esent, but no 0% of the po ue to depth,	t abundant; ool bottom is	Pools pr shallow; fr	rginal resent, but om 5-10% of I bottom is			ntire bottom is ter = zero.		page 14;
	greater that is obscure	shallow po an 30% of th	ols abundant; le pool bottom h, or pools are	from 10-3 obscure d	esent, but no 0% of the po	t abundant; ool bottom is or the pools	Pools pr shallow; fro the pool obscure du the pools a	resent, but om 5-10% of		sent, or the er			page 14;
(abundant, present or	greater that is obscure	shallow po an 30% of th due to dept	ols abundant; le pool bottom h, or pools are	from 10-3 obscure d	esent, but no 0% of the po ue to depth,	t abundant; ool bottom is or the pools	Pools pr shallow; fro the pool obscure du the pools a	resent, but om 5-10% of I bottom is e to depth, or are less than		sent, or the er		1	page 14; <i>Barbour, et</i>
(abundant, present or absent) Grade	greater tha is obscure at	shallow po an 30% of th due to dept least 5 feet	ols abundant; le pool bottom h, or pools are deep.	from 10-3 obscure d are a	esent, but no 0% of the pc ue to depth, at least 3 fee 6	t abundant; ool bottom is or the pools t deep. 5	Pools pr shallow; frr the pool obscure du the pools a 3 fee 4	resent, but om 5-10% of I bottom is e to depth, or are less than it deep. 3	discer	sent, or the er nible. No wa	ter = zero.	1	page 14; <i>Barbour, et</i>
(abundant, present or absent)	greater tha is obscure at	shallow po an 30% of tr due to dept least 5 feet 9	ols abundant; le pool bottom h, or pools are deep. 8	from 10-3 obscure d are a	esent, but no 0% of the pc ue to depth, at least 3 fee 6 IDITION C/	t abundant; ool bottom is or the pools t deep. 5 ATEGORY (Pools pr shallow; frr the pool obscure du the pools a 3 fee 4 GRADE or	ressent, but om 5-10% of I bottom is e to depth, or are less than t deep. 3 SCORE	discer	sent, or the er nible. No wa	ter = zero.	1	page 14; Barbour, et 1999
(abundant, present or absent) Grade 4b. Channel	greater that is obscure of at 1 10	shallow po an 30% of th due to dept least 5 feet 9 Optima	ols abundant; le pool bottom h, or pools are deep. 8	from 10-3 obscure d are a 7 COM	esent, but no 0% of the pc ue to depth, at least 3 fee 6	t abundant; iol bottom is or the pools t deep. 5 ATEGORY (al	Pools pr shallow; frr the pool obscure du the pools a 3 fee 4 GRADE or 3 Ma	resent, but om 5-10% of I bottom is e to depth, or are less than it deep. 3	discer 2	sent, or the er nible. No wa	ter = zero.	1	page 14; Barbour, et 1999
(abundant, present or absent) Grade 4b. Channel Flow Status	greater that is obscure of at 1 10 Water real banks a	shallow po an 30% of th due to dept least 5 feet 9 Optima	ols abundant; le pool bottom h, or pools are deep. 8 1 of both lower amount of	from 10-3 obscure d are a 7 CON Water fill channe	esent, but no 0% of the po ue to depth, at least 3 fee 6 IDITION C/ Suboptima	t abundant; iol bottom is or the pools t deep. 5 ATEGORY (al ie available f channel	Pools pr shallow; fro the pool obscure du the pools a 3 fee 4 GRADE or 4 Water fills the availa and /or riffl	resent, but om 5-10% of l bottom is e to depth, or are less than t deep. 3 SCORE rginal	discer 2 Very little	sent, or the er nible. No wa	ter = zero.	1	page 14; Barbour, et 1999 Barbour, et 1999 EPA RBA page 5 /A-9#5; TCE
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	greater that is obscure of at 1 10 Water real banks a	shallow po an 30% of th due to dept least 5 feet 9 Optima aches base and minimal	ols abundant; le pool bottom h, or pools are deep. 8 1 of both lower amount of	from 10-3 obscure d are a 7 CON Water fill channe	6 <u>ADITION C,</u> Suboptima s >75% of the bit content of the poly bit	t abundant; iol bottom is or the pools t deep. 5 ATEGORY (al ie available f channel	Pools pr shallow; fro the pool obscure du the pools a 3 fee 4 GRADE or 4 Water fills the availa and /or riffl	resent, but om 5-10% of l bottom is e to depth, or are less than t deep. 3 SCORE rginal s 25-75% of ble channel, le substrates	discer 2 Very little	sent, or the er nible. No wa	ter = zero.		page 14; Barbour, et 1999 Barbour, et 1999 EPA RBA page 5 /A-9#5; TCE 1999; VANF
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	greater tha is obscure of at 1 10 Water rea banks a channel	shallow po an 30% of th due to dept least 5 feet 9 Optima acches base and minimal I substrate i	ols abundant; ie pool bottom h, or pools are deep. 8 I of both lower a mount of s exposed.	from 10-3 obscure d are a 7 CON Water fill channe sub	6 DITION C, Suboptima s >75% of th s; or <25% o strate is exp	t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al e available f channel osed.	Pools pr shallow; fr the pool obscure du the pools a 3 fee 4 GRADE or 4 Water fills the availa and /or riff are most	resent, but om 5-10% of l bottom is e to depth, or are less than t deep. 3 SCORE rginal s 25-75% of ble channel, le substrates ly exposed.	2 Very little present as	ent, or the er nible. No wa 1 Poor water in chan standing poo zero.	er = zero.	1	page 14; Barbour, et 1999 Barbour, et 1999 EPA RBA page 5 /A-9#5; TCE
(abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	greater tha is obscure of at 1 10 Water rea banks a channel	shallow po an 30% of th due to dept least 5 feet 9 Optima acches base and minimal I substrate i	ols abundant; ie pool bottom h, or pools are deep. 8 I of both lower a mount of s exposed.	from 10-3 obscure d are a 7 CON Water fill channe sub	issent, but no 0% of the pc ue to depth, tleast 3 fee ibition C. Suboptima s >75% of th s >75% of th s >75% of th s >75% of th ibition c. s >75% of th ibition c. s >75% of th ibition c. ibititititititititititititit	t abundant; ool bottom is or the pools t deep. 5 ATEGORY (al te available f channel osed. 5	Pools pr shallow; fr the pools obscure du the pools 3 fee 4 GRADE or / Ma Mater fills the availa and /or riff are most 4	seriesent, but om 5-10% of bottom is e to depth, or are less than t deep. 3 SCORE rginal s 25-75% of ble channel, le substrates ly exposed. 3	discer 2 Very little present as 2	ent, or the er nible. No wa 1 Poor water in chan standing poor zero. 1	er = zero.	1	Barbour, et a 1999 Barbour, et a 1999 EPA RBA page 5 /A-9#5; TCE 1999; VANF

Type: Image: Constrained intervent in the constrained intervent in		FER QUALITY/E VARIABLES	BIOGEOCI		UNCTIONS		05\05\2006	0	NSR @ H	ighway 34 Bri	age			SCORE
CONDITION CATEGORY GRADE or SCORE Contained the statute of ename of ename on costly basic of ename on cost of ename on costly basic of ena														1
CONDITION CATEGORY GRADE or SCORE Is. Bank Optimal Moderative sable: Request, none Marginal Unstable: marge ended area; none Banks stable; control of enset none 5:30% of bank in reach has areas of enset none Instable: marge ended area; none Instable: marge ended area; none Sociality: Enset none Instable: marge ended area; none Orded (Left) 10 3 8 7 6 5 4 3 2 1 0 0 Orded (Left) 10 3 8 7 6 5 4 3 2 1 0 0 Orded (Left) 10 3 8 7 6 5 4 3 2 1 0 0 Onded (Left) 10 9 8 7 6 5 4 3 2 1 0 0 Battom Bark Battom 13 of bark is generally Bottom 13 of bark is generally Bottom 13 of bark is generally Bottom 13 of bark is generally Marginal Marginal Marginal Marginal </td <td></td> <td></td> <td></td> <td></td> <td><u></u></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>т</td>					<u></u>									т
Is Bank Stability Deprinal Suboptimal Marginal Marginal Deprinal In Bank Stable; restore of erosion or print bank latter absent or mirmal lister ansas of erosion mostly heald or with about lister absent or mirmal lister ansas of erosion mostly heald or with bank latter absent or mirmal lister ansas of erosion mostly heald or with about lister absent absent areas of erosion mostly heald or with areas of erosion head or with areas of erosion head or with areas of erosion head areas of erosion head or with areas of erosion head or with areas of erosion areas of erosion	1.	SEDIMENT IR	ANSPORI	I/DEPOSITI	ON									4
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(scene each bank, lettor (ptriling) berk afficients (or control (or control				Optimal								Poor		
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CONDITION CATEGORY GRADE or SCORE Multiple Ib. Channell Stability Optimal Optimal Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the second material. Bottom 13 of bank is generally fully control in the compromised. Image: Second material. Image						7								
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Bottom Back Stability Optimal Suboptimal Marginal Poor Bottom 13:0 bank is generally Stability Bottom 13:0 bank is generally highly erosible material, landsol matrix or material, landsol matrix or material, landsol matrix or material, landsol matrix compromised. Bottom 13:0 bank is generally highly erosible material, plantsol matrix compromised. Bottom 13:0 bank is generally highly erosible matrix severely compromised. Crade (Left) 10 9 8 7 6 5 4 3 2 1 0 1 Crade (Left) 10 9 8 7 6 5 4 3 2 1 0 1 Control CONDITION CATEGORY GRADE or SCORE Very Column or the sedomesits graved, colbe colders; dominant substrate type is mer than asube: 30-50% gravel or larger substrate type is mer than moderally stable Substrate substrate type is mer than asube: 0 <td></td> <td></td> <td></td> <td></td> <td></td> <td>100</td> <td></td> <td></td> <td>SRADE or 9</td> <td>SCORE</td> <td></td> <td></td> <td></td> <td></td>						100			SRADE or 9	SCORE				
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B Sediments or Sediments or Substrate >50% gravel c bioger substrate: substrate type is gravel, cobib boulders; dominant substrate type is gravel, but may stilb be gravel, cobib boulders; dominant substrate type is gravel, but may stilb be a Substrate is unform sand, silt, clay, or bedrock; unstable Grade 10 9 8 7 6 5 4 3 2 1 0 2 WATER APPEARANCE: Clarity or Visibility CONDITION CATEGORY GRADE or SCORE Optimal Very turbid or mudy appearance most thene, objects visible at depth 3-6 feet (less storm event, but clears rapid); storm event, but clears rapid); store account water substrate: storm event, but clears rapid); store account water substrate. Very turbid or mudy appearance most thene, objects visible at depth -0.5 ft; storm event, but clears rapid); store account water substrate sum, thene, objects visible at depth -0.5 ft; storm event, but clears rapid); store account water substrate. Very turbid or mudy appearance most thene, objects visible at depth -0.5 ft; storm event, but clears rapid); store account water substrate sum, store account water substrate sum or of toarn on surface. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0	one Variable	Bottom Bank		istant plant/s					generally h material; p	highly erodible lant/soil matrix	highly ero	dible materia	al; plant/soil	
Bediments of Sediments of Composition >50% gravel or targes substrate (composition 30-60% gravel or targes (cobble boilders; dominant substrate) type is gravel or targes (cobble boilders; dominant substrate) type is gravel with some finer sediments; gravel with some finer, sediments; storm event, but clears rapid; bios sections may appear have slightly green color, no oil submerged objects or rocks. Very turbid or muddy appearance most here; objects visible at depth -6.5.1; storm event, but clears rapid; storm eve	ly C													1
B Softiments of Softiments of Composition 55% gravel of larger substrate: substrate type is fravel or larger substrate type is fravel or larger or larger substrate substrate type is fravel or larger or larger substrate type is fravel or larger substrate type is fravel or larger substrate type is fravel or larger substrate sound there or or surface, no noticeable film on sufface, no noticeable film on submerged objects or nocks. Suboptimal CONDITION CATEGORY GRADE or SCORE or larger submerged object or nocks. Very turbid or muddy appearance most have slightly green color, no ol sheen on water surface. Very turbid or muddy appearance most have slightly green color, no ol slow sections may appear or of frave no artice. No water = zero. 3 PRESENCE OF AQUATIC VEGETATION: Presence and Percent Coverage CONDITION CATEGORY GRADE or SCORE for larger appearent due or notable substrate. No water = zero. Pea green, grav, or town water along entire reach; during wamer months; substrate. No water = zero. 3 Aquatin Contine the stager appearen	õ	Grade (Right)	10	9	8	7	6	5	4	3	2	1	-	
B Sediments or Sediments or Sediments or Sediments of Composition Softwore of targer substrate: substrate type is mix of substrate type is mix of substrate type is gravel or larger substrate type is mix of substrate type is fine than gravel, but may slib be a Substrate is unform sand. slit, clay, or bedrock; unstable Grade 10 9 8 7 6 5 4 3 2 1 0 2 WATER APPEARANCE: Clarity or Visibility CONDITION CATEGORY GRADE or SCORE Optimal Very turbid or mudy appearance most holes to visible at depth 3-6 feet (less storm event, but clears rapid); storm event in the objects visible at depth 3-6 feet (less storm event, but clears rapid); storm event in the objects visible at depth 3-6 feet (less storm event, but clears rapid); store soci mater may be high regiment in the objects visible at depth 3-6 feet (less storm event, but clears rapid); store soci mater substrates sum fleene on suffaces sum there objects visible at depth 3-6 feet (less storm event, but clears rapid); store soci mater as a partice soci, there in the objects visible at depth 3-6 feet (less storm event, but clear water as a storm event, but clear storm event cor of toem on sufface. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0	for												Avg.Score	1
B Sediments or Sediments or Substrate >50% gravel c bioger substrate: substrate type is gravel, cobib boulders; dominant substrate type is gravel, but may stilb be gravel, cobib boulders; dominant substrate type is gravel, but may stilb be a Substrate is unform sand, silt, clay, or bedrock; unstable Grade 10 9 8 7 6 5 4 3 2 1 0 2 WATER APPEARANCE: Clarity or Visibility CONDITION CATEGORY GRADE or SCORE Optimal Very turbid or mudy appearance most thene, objects visible at depth 3-6 feet (less storm event, but clears rapid); storm event, but clears rapid); store account water substrate: storm event, but clears rapid); store account water substrate. Very turbid or mudy appearance most thene, objects visible at depth -0.5 ft; storm event, but clears rapid); store account water substrate sum, thene, objects visible at depth -0.5 ft; storm event, but clears rapid); store account water substrate. Very turbid or mudy appearance most thene, objects visible at depth -0.5 ft; storm event, but clears rapid); store account water substrate sum, store account water substrate sum or of toarn on surface. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0	ore	or				100			SRADE or 9	SCORE				
B Sediments or gravel, oble boulders, solutatate: (cmposition) 30% gravel or larger stable 30% forward or larger gravel, oble boulders, solutatate: (cmposition) 30% gravel or larger stable 30% gravel or larger gravel, both boulders, solutatate: (cmposition) Substrate view in some finer sediments: gravel, but may stilb e a or bedrock; unstable Grade 10 9 8 7 6 5 4 3 2 1 0 2 WATER APPEARANCE: Clarity or Visibility CONDITION CATEGORY GRADE or SCORE Very turbid or muddy appearance most them; objects visible at depth 3-6 feet (less visible to depth 1-5.3 ft; may have slightly green color; no oil submerged objects or noiceable film on surface; no noiceable film on submerged objects or noiceable film on surface; no noiceable film on submerged objects or noices. Sed on any appear some or the rec, objects or sumerged objected covered with film. Poor 3 Reserve Optimal CONDITION CATEGORY GRADE or SCORE Very turbid or muddy appearance most them; objects waiter oblightly appearance most solute or depth 0.5 ft; and variance, no waiter = Very turbid or muddy appearance most them; objects waiter oblightly appearance most solute or depth 0.5 ft; and variance, no waiter = Very turbid or muddy appearance most them; objects waiter oblightly appeared objects waiter and over a data mast, surface some, sheen or heavy coat of falm on surface. Very turbid or muddy appearance most them; objects waiter and over to appearemidue to the phay ore to appeared to a nor su	Sc			Ontimal								Poor		
Composition substrate type is gravel or larger; stable gravel with some finer sediments; gravel, but may still be a gravel, but may still be a gravel, but may still be a Grade 10 9 8 7 6 5 4 3 2 1 0 2 WATER APPEARANCE: Clarity or Visibility CONDITION CATEGORY GRADE or SCORE Poor Optimal Suboptimal Marginal Poor Very clear, or clear but tea-colored; objects visible at depth 3.6 feet (less) if slightly colored); no oil sheen on sufface; no noticeable film on sufface; no noticeable film on sufface; no noticeable film on sheen on water sufface. Occasionally clear, no oil sheen on water sufface. Yery tubit or muddy appearance most most of the depth 0.5-1.5 ft; slow section may appear solw section for adm on sufface. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 3 PRESENCE OF AQUATIC VEGETATION: Presence and Percent Coverage Covered with film. Poor Poor Poor 3a. Nutrient Clear water along entite reach; includes low quantates of marchytes; little algal growth	ter		>50% gr		substrate;	30-50% g					Substrate i		nd, silt, clay,	-
2 WATER APPEARANCE: Clarity or Visibility CONDITION CATEGORY GRADE or SCORE 2 Optimal Suboptimal Marginal Poor Very clear, or clear but tea-colored; objects visible at depth 3-6 feet (less if slightly colored); no oil suface; no noticeable film on suface; no noticeable film on submerged objects or rocks. Considerable cloudiness visible to depth 0.5 1.5 ft; slow sections may appear; objectar visible at depth 3-6 feet (less or sumerged objects or rocks. Very turbid or mudy appearance most there objects visible at depth 1.5.5 ft; slow sections may appear; or sumerged objects Very turbid or mudy appearance most more objects visible at depth 1.5.5 ft; slow sections may appear; or sumerged objects Very turbid or mudy appearance most more objects visible at depth 1.5.5 ft; slow sections may appear; or sumerged objected covered with film. Very turbid or mudy appearance most more objects visible at depth 1.5.5 ft; slow sections may appear; or sumerged objected covered with film. Grade 10 9 8 7 6 5 4 3 2 1 0 3 Nutrient Enrichment Clear water along entire reach; diverse aquatic plant community species of macrophytes; ititle algal growth or stream substrate. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate. Poor Pea green, gray, or brow water along macrophytes clog stream, severe algal algal growth, especially during warmer months. Grade 10 9	Ш	Substrate	gravel, co	bble boulder type is grav	s; dominant	dominant gravel wit	substrate typ h some finer	be is mix of sediments;	substrat substrate ty	e; dominant pe is finer than				
CONDITION CATEGORY GRADE or SCORE Very clear, or clear but tea-colored; objects visible at depth 3-6 feet (less) if slightly colored; no oil sheen on submerged objects or rocks. Cocasionally cloudy, especially after issume very but clear straptic particle (council and the council and the councol and the council and the council and the council and the counc		Grade	10	9	8	7	6	5	4	3	2	1	0	
Optimal Suboptimal Marginal Poor Water Clarity Very clear but tea-colored; objects visible at depth 3-6 feet (less storm event, but clears rapidly, objects visible at depth 1.5-3 ft; may submerged objects or rocks. Occasionally cloudy, especially after storm event, but clears rapidly, objects visible at depth 1.5-3 ft; may share slightly green color, no oil sheen on water surface. Very tubia to depth 0.5-1.5 ft; slow sectors may appear. other obvious water policious watere	2	WATER APPE	ARANCE:	Clarity or V	isibility					•				
Optimal Suboptimal Marginal Poor Water Clarity Very clear, or clear but tea-colored; objects visible at depth 3-6 feet (tess storm event, but clear rapidly, objects visible at depth 1.5-3 ft; may submerged objects or rocks. Occasionally cloudy, especially after storm event, but clear rapidly, objects visible at depth 1.5-3 ft; may submerged objects or rocks. Very tubia to depth 0.5-1.5 ft; slow sectors may appear. Very tubia to depth 0.5-1.5 ft; slow sectors may appear. Very tubia to depth 0.5-1.5 ft; slow sectors may appear. Very tubia to depth 0.5-1.5 ft; slow sectors may appear. Very tubia to depth 0.5-1.5 ft; slow moving water may be bright-green; slow sectors may appear. Very tubia to depth 0.5-1.5 ft; slow moving water may be bright-green; slow sectors may appear. Grade 10 9 8 7 6 5 4 3 2 1 0 3 PRESENCE OF AQUATIC VEGETATION: Presence and Percent Coverage Fairly clear or slightly greenish water along entire reach; were along entire reach; diverse aquatic plant community includes low quantaties of many species of macrophytes; little algal growth present. Fairly clear or slightly green slow aream substrates. Pea green, gray, or brow water along entire reach; dreas stands of macrophytes; clog stream; severe algal algae. Pea green, gray, or brow water along entire reach; dreas stands of macrophytes; clog stream; severe algal algae. Peor Or Optimal <														
Water Clarity Very clear, or clear but tea-colored; objects visible at depth 3-6 feet (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Considerance (adopth 0.5 ft; objects visible of depth 0.5 ft; objects visible objects or complexity objects visible objects or complexity objects visible objects or complexity objects visible objects objects visible objects objects objects visible objects visible objects visite objects objects visible objects visite ob						COI					1			_
Water Clarity objects visible at depth 3-6 feet (less if slightly colored); no oil sheen on submerged objects or rocks. storm event, but clears rapidly, objects visible at depth 1.5-3 ft; may have slightly green color, no oil sheen on water surface. most of the time; objects, visible to depth -0.5 ft; slight od poth 0.5-1.5 ft; slight od poth 0.5 ft; slig			Vancalaar		100 00loved.	Ossasiana					Versturbid			_
3 PRESENCE OF AQUATIC VEGETATION: Presence and Percent Coverage 3 PRESENCE OF AQUATIC VEGETATION: Presence and Percent Coverage CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor 3a. Nutrient Clear water along entire reach; diverse aquatic plant community species of macrophytes; little algal growth present. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrates. Greenish water along entire reach; overabundance of lush green macrophytes; abundant algal growth, especially during warmer months. Pea green, gray, or brown water along entire reach; dense stands of macrophytes clog stream; severe algal blooms create thick algal mats in stream or NO algae present due to unstable substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 1 Or 3b. Aquatic Vegetation Optimal Suboptimal Marginal Marginal Poor Vegetation When present, aquatic vegetation consists of moss and patches of algae. Algae dominant in pools, larger plants along edge. Algal mats present, some larger plants, few mosses. Algal mats cover bottom, larger plants dominate the channel or NO algae present due to unstable substrate. No water = zero.		Water Clarity	objects visi if slightly surface	ible at depth colored); no c e;no noticeab	3-6 feet (less bil sheen on le film on	storm ev objects visi have slig	vent, but clea ible at depth ghtly green co	rs rapidly; 1.5-3 ft; may blor; no oil	most of the visible to d slow sectio pea-green or sumer	e time; objects epth 0.5-1.5 ft; ns may appear ; bottom rocks ged objected	the time; obj slow moving other obvio algal mats, s	ects visible to g water may be us water pollut urface scum, s um on surface.	depth <0.5 ft; bright-green; tants; floating sheen or heavy	,
Optimal CONDITION CATEGORY GRADE or SCORE Optimal Suboptimal Marginal Poor 3a. Nutrient Clear water along entire reach; diverse aquatic plant community includes low quantaties of many species of macrophytes; little algal growth present. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrates. Greenish water along entire reach; overabundance of lush green macrophytes; abundan algal growth, especially during warmer months. Pea green, gray, or brown water along entire reach; dense stands of macrophytes clog stream; severe algal blooms create thick algal mats in stream or NO algae present due to unstable substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 1 Or 3b. Aquatic Vegetation Optimal Suboptimal Marginal Poor algae dominant in pools, larger plants along edge. Algal mats present, some algae present, due to unstable substrate. No water = zero.		Grade	10	9	8	7	6	5	4	3	2	1	0	2
Optimal Suboptimal Marginal Poor 3a. Nutrient Clear water along entire reach; diverse aquatic plant community includes low quantaties of many species of macrophytes; little algal growth present. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrates. Greenish water along entire reach; woreshundance of luke reach; woreshundance of luke green macrophytes; abundant algal growth, especially during warmer months. Peoor Grade 10 9 8 7 6 5 4 3 2 1 0 1 Or Or Optimal Suboptimal Marginal Peor 0 1 3b. Aquatic Vegetation Optimal Suboptimal Marginal Poor 1 0 1 Vegetation algae. Algae dominant in pools, larger plants along edge. Algal mats present, some larger plants, few mosses. Algal mats cover bottom, larger plants along edge. Algal mats present, some larger plants, few mosses. Algal present due to unstable substrate. No water = zero.	3	PRESENCE O		C VEGETA	FION: Prese	ence and Pe	ercent Cove	rage						
Optimal Suboptimal Marginal Poor 3a. Nutrient Clear water along entire reach; diverse aquatic plant community includes low quantaties of many species of macrophytes; little algal growth present. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrates. Greenish water along entire Greenish water along entire entire reach; dense stands of macrophytes; abundant algal growth, especially during warmer months. Pea green, gray, or brown water along entire reach; dense stands of macrophytes clog stream; severe algal blooms create thick algal mats in stream or NO algae present due to unstable substrate. No water = zero. Grade 10 9 8 7 6 5 4 3 2 1 0 Or 0 9 8 7 6 5 4 3 2 1 0 1 Vegetation Optimal Suboptimal Marginal Poor 1 1 Or Optimal Suboptimal Marginal Poor 1 1 Vegetation Optimal Suboptimal Marginal Poor 1 Algae dominant in pools, larger plants along edge. Algae dominant in pools, larger plants along edge. Algal mats present, some larger plants, few mosses. Algal mats the cha						0.01		TEOODY		00005				1
3a. Nutrient Clear water along entire reach; diverse aquatic plant community includes low quantaties of many species of macrophytes; little algal growth present. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrates. Greenish water along entire reach; overabundance of lush algal growth, especially during warmer months. Pea green, gray, or brown water along entire reach; dones stands of macrophytes; blundant algal growth, especially during warmer months. Grade 10 9 8 7 6 5 4 3 2 1 0 1 Or 0r Optimal Suboptimal Marginal Poor Algae dominant in pools, larger plants along edge. Algae dominant in pools, larger plants along edge. Algal mats present, some algae present due to unstable substrate. No water = zero.				Ontime		CO						Poor		-
algae. algae present due to unstable substrate. No water = zero.			Clear w		tire reach:	Fairly clear					Pea green.		n water along	1
algae. algae present due to unstable substrate. No water = zero.			diverse a	aquatic plant	community	along enti	re reach; mo	derate algal	reach; overal	bundance of lush	entire i	reach; dense s	stands of	
algae. algae present due to unstable substrate. No water = zero.	、	Enrichment	species o	f macrophyte	s; little algal	growth	on stream su	bstrates.	algal grov	vth, especially	blooms crea or NO alga	te thick algal r ae present due	nats in stream to unstable	
algae. algae present due to unstable substrate. No water = zero.	5	Grade	10	9	8	7	6	5	4	3	2	1	0	1
algae. algae present due to unstable substrate. No water = zero.						00				SCORE				-
algae. algae present due to unstable substrate. No water = zero.		or		Optimal								Poor		-
	,	3b. Aquatic		esent, aquation of moss and			ominant in po	ols, larger	Algal mats	present, some	plants dom algae pr	ts cover bott hinate the ch resent due to	annel or NO unstable	-
Grade 10 9 8 7 6 5 4 3 2 1 0		Grade	10	9	8	7	6	5	4	3	2	1	0	

				00		ATEOODY						
		Optimal		CO	NDITION C Suboptima	ATEGORY (SCORE		Poor		F
	Mainly co	onsisting of le	aves and	Leaves	and wood so			es or woody	Fine ora:	anic sedimer	nt - black in	e 1
		d without sedi			lebris withou		debris; coa organic	arse and fine matter with liment.	color and fo	oul odor (ana	aerobic) or no to excessive	F N
Grade	10	9	8	7	6	5	4	3	2	1	0	2
AND USE PA	TTERN: Be	yond Imme	diate Ripari	an Zone								
				CO		ATEGORY						F
		Optimal		-	Suboptima			irginal	_	Poor		e
		ed, consisting ive prairie, ar			ent pasture i and swamp			w crops and ome wooded	N	fainly row cro	ops	1
	pristine nat	wetlands.		woodiot	crops	3, 16W 10W	areas may l	be present but ed patches				F
Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	0
Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	0
											Avg.Score	0
RIPARIAN ZOI	NE WIDTH	AND CONT	INUITY:									
				00		ATEGORY	SRADE or S	SCORE				E
6a. Riparian		Optimal			Suboptima			Irginal		Poor		a
Zone Width		arian zone >18				18 meters (1/2-		arian zone 6-12		rian zone < 6	meters (natural	1
(from stream		ths with trees, s human activitie				ees, shrubs, or have minimally		/3-1/2 active oth vegetated),		ess than 1/3 ac riparian vege		F
edge to field)		impacted zone		grasses), nu	impacted zon			human activities.		numan activitie		e F
Grade (left)	10	9	8	7	6	5	4	3	2	1	0	2
Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	2
											Avg.Score	2
		Optimal		00	Suboptima	ATEGORY (acore		Poor		E
6b. Riparian	>90% plant	t density of ma	ture trees or	75-90% str	eambank vege			streambank	Less than 5	50% streamba	nk vegetation	1
Zone	shrubs, prair	rie grasses, or	marsh plants,	young speci	es along chan	nel and mature		f mixed grasses	coverage c	onsisting mos	tly of pasture	F
Vegetation		ne intact or dis ing/mowing mir			ind; disruption			e young tree or ecies; breaks		w trees & shru	ubs; low plant red with gullies	F
vegetation	grazi	ng/mowing mir	nimai.	breaks of	curring at inte meters.	rvais of >50		th some gullies		k deeply scarr Il along its len		e
Protection/								very 50 meters.	_		g	1
Protection/	and scars every so merers.									F #		
Protection/				1					2			Ħ
Protection/ Completeness	10		0	7	6	5						4
Protection/ Completeness Grade (Left)	<u>10</u>	9	8	7	6	5	4	3		1	0	1
Protection/ Completeness Grade (Left)	10 10	9	8 8		6 6	5 5		3	2	1	0	1 1 1
										-		1

1	1 FLOW RE	SIME			05\05\200			ighway 34 Bridg					SCORE	Sourc
	TYPE		Perennial		Intermitte		ennial Pools		nittent		Ephemera			KDW
	Grade	10	9	8	1	6	5	4	3	2	1	0	4	1 2000
	2 EPIFAUNA	L SUBSTRATE/A		COVER										
		Within stream	Optimal	r than 50%	Within	Suboptim stream bec		Mar Within stream		Loss that	Poor 10% habit	tat features	-	USA
		coverage by	stable habita	it features,	coverage b	by stable ha	bitat features	coverage by	stable habitat	present; la	ck of habita	at is obvious;		Norfo
		favorable for st and/or fish/ampl				ble for strea	am faunal sh/amphibian		able for stream ization and/or		e unstable (or lacking; els. Habitat		2004
		features non t	transient. Fe	atures may	cover. M	any habitat	features not	fish/amphibian	n cover; habitat	features and	d pools buri	ied or lacking	,	SAAM Form
		include snags, s banks, roots, col					ent Category omponents.)	availability ma desirable, sub	ay be less than ostrate may be	channe	I bottom ma	ay be flat.		(page
		packs, pools a	nd glides, or	other stable				frequently dis	sturbed. (See					Barbo
		habitat at a sta	age to allow	colonization				Excellent Cate feature cor						<i>al. 19</i> EPA
									1 /					Parso
														al., 20
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	AUSI
		SOTTOM SUBSTR	Ţ	-	orostorizoti				, °	~				
	3 STREAM		Optimal			Suboptim			ginal		Poor			
		Mixture of subst and firm sand					mud, or clay; nt; some root	All mud or clay little or no r	or sand bottom; oot mat; no		clay or bedr ubmerged v	rock; no root /egetation.	1	Barbo al. 19
			vegetation of			d submerge	d vegatation	submerged	vegetation.			•		RBA
						present.								page
														Parso al., 2
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	AUSI
	4 POOL VAR	RIABILITY												
			Optimal			Suboptim		Mar			Poor			
		Even mix of la small-shallow, s	rge-shallow, small-deep n	large-deep,	Majority o	of pools larg few shallo	e-deep; very w.	Shallow pool prevalent tha	ls much more in deep pools	Majority of	f pools sma pools abse	III-shallow or		Barbo al. 19
														RBA
														Pars
	Grade	10	9	8	7	6	5	4	3	2	1	0	1	Parso
		10 T DEPOSITION/SC	COURING	8	7					2		0	1	Parso
		Stress of channel	COURING Optimal bottom affecte	, v	5-30% affe	Suboptim cted by scou	al or deposition;	Mar 30-50% affect	ginal ted by scour or	More than 50	Poor % of the bott	tom in a state of	1	Parso al., 20
		Stress of channel	COURING Optimal	, v	5-30% affe Scour at co	Suboptim cted by scou	al r or deposition; d wehre grades	Mar 30-50% affect deposition. Depo	ginal ted by scour or psits and scour at	More than 50 flux or chan	Poor % of the bott age nearly yes	tom in a state of arlong. Pools		page Parso al., 20 Barbo al. 19
		Stress of channel	COURING Optimal bottom affecte	, v	5-30% affe Scour at co	Suboptim cted by scou	al r or deposition; d wehre grades	Mar 30-50% affect deposition. Depo	ginal ted by scour or osits and scour at onstrictions and	More than 50 flux or chan minimal or ab	Poor % of the bott age nearly yes	tom in a state of arlong. Pools neavy deposition		Parso al., 20 Barbo al. 19 RBA
		Stress of channel	COURING Optimal bottom affecte	, v	5-30% affe Scour at co	Suboptim cted by scou	al r or deposition; d wehre grades	Mar 30-50% affect deposition. Depo obstructions, co	ginal ted by scour or osits and scour at onstrictions and	More than 50 flux or chan minimal or ab	Poor % of the bott age nearly yes sent due to h	tom in a state of arlong. Pools neavy deposition		Parso al., 20 Barbo al. 19 RBA page Parso
	5 <u>SEDIMEN</u>	Stress of channel	COURING Optimal bottom affecte	, v	5-30% affe Scour at co	Suboptim cted by scou	al r or deposition; d wehre grades	Mar 30-50% affect deposition. Depo obstructions, co	ginal ted by scour or osits and scour at onstrictions and	More than 50 flux or chan minimal or ab	Poor % of the bott age nearly yes sent due to h	tom in a state of arlong. Pools neavy deposition		Parso al., 20 Barbo al. 19 RBA page
	5 SEDIMEN	<5% of channel	OURING Optimal bottom affecte deposition.	d by scour or	5-30% affe Scour at co steepen.	Suboptim cted by scou nstrictions an Some depos	al r or deposition; d wehre grades ition in pools	Mar 30-50% affect deposition. Depo obstructions, cr bends. Some	ginal ted by scour or osits and scour at onstrictions and filling of pools.	More than 50 flux or chan minimal or ab or e	Poor % of the bott age nearly yes sent due to h	tom in a state of arlong. Pools neavy deposition puring.		Parso al., 20 Barbo al. 19 RBA page Parso al., 20
	5 SEDIMEN	F DEPOSITION/SC <5% of channel 10 FLOW STATUS	OURING Optimal bottom affecte deposition. 9 Optimal	d by scour or	5-30% affe Scour at co steepen. 7	Suboptim cted by scour nstrictions an Some depos 6 Suboptim	al or deposition; d wehre grades ition in pools 5	Marg 30-50% affect deposition. Dep obstructions, cc bends. Some 4 4	ginal ed by scour or sists and scour at onstrictions and filling of pools.	More than 50 flux or chan minimal or ab or e	Poor % of the bott nge nearly yes sent due to h xcessive sco 1 1 Poor	tom in a state of arlong. Pools leavy deposition ouring.		Parso al., 20 Barbo al. 19 RBA page Parso al., 20 I TCE0 1999
	5 SEDIMEN	TDEPOSITION/SC <5% of channel 10 FLOW STATUS Water reaches	Optimal bottom affecte deposition. 9 Optimal s the base of	d by scour or 8	5-30% affe Scour at con steepen. 7 Water fills	Suboptim cted by scoun nstrictions an Some depos 6 Suboptim >75% of th	al or deposition; or deposition; ition in pools 5 5 al e channel; or	Marr 30-50% affect deposition. Depo obstructions, cr bends. Some 4 4 Water fills 21	ginal ed by scour or onstrictions and filling of pools. 3 ginal 5-75% of the	More than 50 flux or char minimal or ab or e 2 Very little w	Poor % of the bott ge nearly yes sent due to h xcessive sco 1 1 Poor vater in the	tom in a state of arlong. Pools neavy deposition puring. 0 channel and		Parso al., 20 Barbo al. 19 RBA page Parso al., 20 TCE0 1999 Wrks
	5 SEDIMEN	F DEPOSITION/SC <5% of channel 10 FLOW STATUS	Optimal bottom affecte deposition. 9 Optimal s the base of	d by scour or 8	5-30% affe Scour at con steepen. 7 Water fills	Suboptim cted by scou nstrictions an Some depos 6 Suboptim	al or deposition; d wehre grades ition in pools 5 al e channel; or ubstrate is	Marg 30-50% affect deposition. Dep obstructions, cc bends. Some 4 4	ginal ed by scour or onstrictions and filling of pools. 3 ginal 5-75% of the nel and/or riffle	More than 50 flux or char minimal or ab or e 2 Very little w mostly pres	Poor % of the bott ge nearly yes sent due to h xcessive sco 1 1 Poor vater in the	tom in a state of arlong. Pools neavy deposition puring. 0 channel and ding pools; or		Parso al., 20 Barbo al. 19 RBA page Parso al., 20 I TCE0 1999
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	5 <u>SEDIMEN</u> Grade 6 <u>CHANNEL</u>	TDEPOSITION/SC <5% of channel 10 FLOW STATUS Water reacher banks; <5%	Optimal optimal optimal optimal optimal s the base of of channel si exposed	d by scour or 8 both lower ubstrate is	5-30% afte Scour at cor steepen. 7 7 Water fills <25% c	Suboptim ticted by scouns nstrictions an Some depos 6 6 Suboptim >75% of th of channel s exposed	al or deposition; d wehre grades ition in pools 5 al channel; or ubstrate is	Marr 30-50% affect deposition. Depo obstructions, or bends. Some 4 Water fills 2! available chan substrates are t	ginal ed by scour or sits and scour at filling of pools. 3 ginal 6-75% of the nel and/or riffle mostly exposed	More than 50 flux or chan minimal or ab or e 2 Very little w mostly pres	Poor % of the both sent due to h xcessive sco 1 Poor vater in the eent in stand stream is d	iom in a state of arlong. Pools newy deposition uuring. 0 channel and ding pools; or ry		Parsc al., 24 Barbda al. 15 RBA page Parsc al., 20 TCE(1999 Wrks Barbda al. 15 RBA page Parsc al., 21 Parsc al.,
	5 <u>SEDIMEN</u> Grade 6 <u>CHANNEL</u> Grade	TDEPOSITION/SC <5% of channel 10 FLOW STATUS Water reaches	Optimal bottom affecte deposition. 9 Optimal s the base of of channel s	d by scour or 8	5-30% affe Scour at con steepen. 7 Water fills	Suboptim cted by scou nstrictions an Some depos 6 Suboptim >75% of th of channel s	al or deposition; or deposition; d wehre grades ition in pools 5 5 al e channel; or ubstrate is	Marr 30-50% affect deposition. Depo obstructions, ct bends. Some 4 4 Water fills 24 available chan	ginal ed by scour or onstrictions and filling of pools. 3 ginal 5-75% of the nel and/or riffle	More than 50 flux or char minimal or ab or e 2 Very little w mostly pres	Poor % of the bott ge nearly yea sent due to h xccessive sco 1 Poor vater in the event in stance	tom in a state of arlong. Pools neavy deposition puring. 0 channel and ding pools; or		Parsc al., 24 Barbda al. 15 RBA page Parsc al., 20 TCE(1999 Wrks Barbda al. 15 RBA page Parsc al., 21 Parsc al.,
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	5 <u>SEDIMEN</u> Grade 6 <u>CHANNEL</u> Grade	TDEPOSITION/SC <5% of channel 10 FLOW STATUS Water reacher banks; <5% of 10 ALTERATION ALTERATION Channelization absent or min stream meand	Optimal Optimal bottom affected deposition.	d by scour or 8 both lower ubstrate is 8 or dredging and stable literation by	5-30% affe Scour at co steepen. 7 7 Water fills <25% c 7 7 7 Some alte preser struct. abutments past altera may be pn and stabilit	Suboptim Cited by scouns nstrictions an Some depose 6 Suboptim >75% of th of channel s exposed 6 Suboptim eration or cl uvers, (such s or culverts; tion, (I.e., cl seent, but s y have recc n is not pres	al croßeposition; d wehre grades ition in pools 5 al construction 5 al annelization giacent to as bridge ; evidence of nannelization) ream pattern wered; recent	Mar 30-50% affect deposition. Depo obstructions, or bends. Some 4 Water fills 22 available chan substrates are i substrates are i 4 Alteration or or may be e embankments piles) or shor present on bot present on present present br>present present	ginal ed by scour or ssits and scour at nonstrictions and filling of pools. 3 ginal 5-75% of the neal and/or riffle mostly exposed 3 ginal channelization thannelization ing structures n banks; normal neander pattern neander pattern 80% of stream	More than 50 flux or char minimal or e 2 Very little w mostly pres 2 Banks short concrete. channe significant	Poor % of the bott uge nearly yes sent due to h xccessive sco 1 Poor vater in the nearlt in stand stream is d 1 Poor ad with gab Corcrete o Sis. Instread y altered b jouts. Over	om in a state of arlong. Pools neavy depositior nuring. 0 channel and ding pools; or iry 0 ion, riprap, of riprap, lined m habitat y stormwater 80% of the 80% of the		Parsc al., 20 Barbdaal. 19 RBA page Parsc al., 20 TCEE 1999 Parsc al., 20 TCEE 1999 Parsc al., 20 TCEE Parsc al., 20 USAC Norfc Distri 2004 SAAN Form (Field page Barbdo Barbdo Form
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	5 <u>SEDIMEN</u> Grade 6 <u>CHANNEL</u> Grade	TDEPOSITION/SC <5% of channel 10 FLOW STATUS Water reacher banks; <5% of 10 ALTERATION ALTERATION Channelization absent or min stream meand	Optimal Optimal bottom affected deposition.	d by scour or 8 both lower ubstrate is 8 or dredging and stable literation by	5-30% affe Scour at co steepen. 7 7 Water fills <25% c 7 7 7 Some alte preser struct. abutments past altera may be pn and stabilit	Suboptim cted by scoun strictions an Some depos 6 Suboptim >75% of th f channel s exposed 6 Suboptim ration or ch t, usually as tion, (I.e., cl esent, but s ty have recc n is not pres from stormw	al croßeposition; d wehre grades ition in pools 5 al construction 5 al annelization giacent to as bridge ; evidence of nannelization) ream pattern wered; recent	Marr 30-50% affect deposition. Depo- obstructions, cr bends. Some 4 Water fills 24 available chan substrates are t available chan substrates are t 4 Alteration or c may be e embankments piles) or shor present on bott stable stream m phas not recove from stormwate	ginal ed by scour or ssits and scour at nonstrictions and filling of pools. 3 ginal 5-75% of the neal and/or riffle mostly exposed 3 ginal channelization thannelization ing structures n banks; normal neander pattern neander pattern 80% of stream	More than 50 flux or char minimal or e 2 Very little w mostly pres 2 Banks short concrete. channe significant	Poor % of the bott uge nearly yes sent due to h xccessive sco 1 Poor vater in the nearlt in stand stream is d 1 Poor ad with gab Corcrete o Sis. Instread y altered b jouts. Over	om in a state of arlong. Pools neavy depositior nuring. 0 channel and ding pools; or iry 0 ion, riprap, of riprap, lined m habitat y stormwater 80% of the 80% of the		Parsc al., 21 Barbohal. 19 RBA page Parsc al., 21 TCEC Parsc al., 21 VISAC Norfoc Distri- gage Parsc al., 21 USAC Norfoc Distri- SAAN Form Form Form Form Form Form Form SAAN SAAN

8	CHANNEL S		Optimal			Suboptin	nal	Mar	rginal		Poor		
		The bends in t	he stream incre			s in the str	eam increase	The bends i	in the stream		straight; wa		1
		stream length 3 t					2 to 3 times		stream 1 to 2	been ch	hannelized f		
		was in a straig braiding is cons			longer th	an ir it was line.	in a straight		han if it was in a Iht line		distance		
		plains and othe	er low-lying area	as. This				2uig					
			ot easily rated i	n these									
			areas).		1					1			
	<u> </u>	10			-								
	Grade	10	9	8	7	6	5	4	3	2	1	0	
9	BANK STAB	ILITY (SCORE E	ACH BANK)										
			Optimal			Suboptin			rginal		Poor		
		Banks stable; evi failure absent o					requent, small ly healed over.		stable; perennial vaterline sparse			vegetation at sion of both	
			erennial vegetat				h has areas of		d or stripped by	banks; rec	ently expose	ed tree roots	
		waterline; no raw	or undercut ba side of meande		minor	erosion ar	d/or bank ial vegetation		i), bank held by (trees, rock	common; t	ree falls and trees comr	d/or severely	
		O.K.); no recently				in most p	laces; recently		d eroded back			reas frequent	
			tree falls;				re but present.		60% of bank in			s and bends;	
									s of erosion and utting; recently		nk sloughing nas erosiona	g; 60-100% of al scars.	
								exposed tree	roots and fine	Danki			
									ommon; high ial during floods				
								erosion potenti	ai uunng noods				
					1					1			
					1					1			
	Creation	10		~	-			<u> </u>	^			<u>^</u>	<u> </u>
	Grade Grade	10 10	9	8	7	6	5	4	3	2	1	0	
	Jiaud	10	э	J	. /	U	5	4	3	4	Avg.Score		
													1
10	VEGETATIV	E PROTECTION		H BANK)		0			and and		_		4
			Optimal 0% of the stream	nhank	70-90% of	Suboptin	nal bank surfaces		rginal e streambank	l ese than	Poor 50% of the	streambank	-
		surfaces and in	nmediate riparia	an zones	covered b	y native ve	egetation, but	surfaces	covered by	surfaces	covered by	vegetation;	
		covered by nati	ve vegetation, i	ncluding	one clas	s of plants	is not well-	vegetation; dis	ruption obvious;	disruption of	of streambar	nk vegetation	
		trees, understo macrophytes:	ry shrubs, or no vegetative disr				on evident but lant growth		e soil or closely tation common;			on has been ters or less in	
		through grazing	or mowing minii	mal or not	potential to	any grea	t extent; more	less than or	ne-half of the		age stubble		
		evident; almost a	all plants allowe naturally.	d to grow			ootential plant		t stubble height	1			
		'	aturdily.		stubbl	e height re	maning.	rema	aining.	1			
	Crode	10			1								
	Grade				-	^	-		^	^		^	
			9	8	7	6	5	4	3	2	1	0	
	Grade	10	9 9	8	7 7	6 6	5 5	4 4	3	2 2	1 1 Avg.Score	0	
	Grade	10	9								1 1 Avg.Score	0	
11	Grade	10 ONE (SCORE EA	9 ACH BANK)			6	5	4	3			0	
11	Grade	10 ONE (SCORE EA	9 ACH BANK) Optimal	8	7	6 Suboptir	5 nal	4 Mar	3 rginal	2	Poor	0 e	
11	Grade	10 ONE (SCORE EA Width of riparian activities (I.e., par	9 ACH BANK) Optimal zone >18 mete rking lots, roadb	8 rs; human beds, clear	7 Width c meters;	6 Suboptin f riparian : human ac	5 nal zone 12-18 tivities have	4 Mar Width of ripa meters; humar	3 rginal rian zone 6-12 n activities have	2 Width of ri little or no ri	Poor iparian zone iparian vege	e <6 meters; etation due to	
11	Grade	10 ONE (SCORE EA Width of riparian	9 ACH BANK) Optimal zone >18 mete rking lots, roadt roops) have not	8 rs; human beds, clear	7 Width c meters;	6 Suboptin f riparian : human ac	5 nal zone 12-18	4 Mar Width of ripa meters; humar	3 rginal rian zone 6-12	2 Width of ri little or no ri	Poor iparian zone	e <6 meters; etation due to	
11	Grade	10 ONE (SCORE EA Width of riparian activities (I.e., par	9 ACH BANK) Optimal zone >18 mete rking lots, roadb	8 rs; human beds, clear	7 Width c meters;	6 Suboptin f riparian : human ac	5 nal zone 12-18 tivities have	4 Mar Width of ripa meters; humar	3 rginal rian zone 6-12 n activities have	2 Width of ri little or no ri	Poor iparian zone iparian vege	e <6 meters; etation due to	
11	Grade	10 ONE (SCORE EA Width of riparian activities (I.e., par	9 ACH BANK) Optimal zone >18 mete rking lots, roadt roops) have not	8 rs; human beds, clear	7 Width c meters;	6 Suboptin f riparian : human ac	5 nal zone 12-18 tivities have	4 Mar Width of ripa meters; humar	3 rginal rian zone 6-12 n activities have	2 Width of ri little or no ri	Poor iparian zone iparian vege	e <6 meters; etation due to	
11	Grade RIPARIAN Z	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c	9 ACH BANK) Optimal zone >18 mete rking lots, roadt rops) have not zone.	8 rs; human beds, clear impacted	7 Width c meters;	6 Suboptin f riparian : human ac I zone only	5 nal zone 12-18 ivities have y minimally).	4 Width of ripa meters; humar impacted zon	rginal rian zone 6-12 n activities have e a great deal.	2 Width of ri little or no ri ht	Poor iparian zone iparian vege	e <6 meters; tetation due to ties.	-
11	Grade	10 ONE (SCORE EA Width of riparian activities (I.e., par	9 ACH BANK) Optimal zone >18 mete rking lots, roadt roops) have not	8 rs; human beds, clear	7 Width c meters; impacted	6 Suboptin f riparian : human ac	5 nal zone 12-18 tivities have	4 Mar Width of ripa meters; humar	3 rginal rian zone 6-12 n activities have	2 Width of ri little or no ri	Poor iparian zone iparian vege	e <6 meters; etation due to	
11	Grade RIPARIAN Z Grade	10 ONE (SCORE EA Width of riparian activities (I.e., par cuts, lawns, or c	9 ACH BANK) Optimal zone >18 mete rking lots, roadt rrops) have not zone. 9	8 rs; human beds, clear impacted 8	7 Width c meters; impacted	6 Suboptin f riparian a human ac I zone only	5 nal zone 12-18 ivities have y minimally).	4 Mar Width of ripa meters; humar impacted zon 4	3 rginal rian zone 6-12 n activities have e a great deal. 3	2 Width of ri little or no ri ht	Poor iparian zone iparian vege	e <6 meters; etation due to ties.	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10	9 ACH BANK) Optimal zone >18 meter king lots, roadt rops) have not zone. 9 9 9	8 rs; human beds, clear impacted 8 8	7 Width c meters; impacted 7 7	6 Suboptin f riparian a human ac I zone only	5 nal zone 12-18 ivities have y minimally).	4 Mar Width of ripa meters; humar impacted zon 4	3 rginal rian zone 6-12 n activities have e a great deal. 3	2 Width of ri little or no ri ht	Poor iparian zone iparian vege uman activit 1	e <6 meters; etation due to ties.	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE E/ Width of riparian activities (i.e., par cuts, lawns, or c 10 10	9 ACH BANK) Optimal zone >18 mete rking lots, roadt rops) have not zone. 9 9 10N (SCORE	8 rs; human beds, clear impacted 8 8	7 Width c meters; impacted 7 7	6 Suboptir f riparian : human ac I zone only 6 6	5 nal cone 12-18 ivities have y minimally). 5 5	4 Width of ripa meters; human impacted zon 4 4	rginal rian zone 6-12 n activities have e a great deal. 3 3	2 Width of ri little or no ri ht	Poor iparian zone jparian vege uman activit 1 1 Avg.Score	e <6 meters; etation due to ties.	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 ABITAT CONDIT Tree stratum (db	9 9 ACH BANK) Optimal zone >18 meter kring lots, roadt rops) have not zone. 9 9 10N (SCORE Optimal h-3 inches) pre	8 rs; human beds, clear impacted 8 8 8 EACH B/ esent, with	7 Width c meters; impacted 7 7 7 NK() Tree st	6 Suboptin f riparian a human ac I zone only 6 6 6	5 nal cone 12-18 ivities have γ minimally). 5 5 5	4 Width of ripa meters; human impacted zon 4 4 4 7ree stratum	3 rginal rian zone 6-12 n activities have e a great deal. 3 3 	2 Width of ri little or nor n ht 2 2 2	Poor iparian zone iparian vege uman activit 1 1 Avg.Score Poor tum absent;	e <6 meters; etation due to ties.	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE EA Width of riparian activities (i.e., pai cuts, lawns, or c 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop	9 ACH BANK) Optimal zone >18 meter rking lots, roadt rops) have not zone. 9 9 9 10N (SCORE Optimal h>3 inches) pre y cover. (Additi	8 rs; human peds, clear impacted 8 8 EACH B/ essent, with ional fores	7 Width c meters; impacted 7 7 7	6 Suboptir f riparian : human ac I zone only 6 6 6 6	5 s nal cone 12-18 ivities have r minimally). 5 s nal s3 inches) to 60% tree	4 Width of ripa meters; humar impacted zon 4 4 4 Tree stratum present, wi	3 rian zone 6-12 n activities have e a great deal. 3 3 inches) h <30% tree	2 Width of ri little or no ri ht 2 2 2	Poor iparian zonen iparian vege uman activit 1 1 Avg.Score Poor tum absent, um absent, croplands,	e <6 meters; etation due to ties. 0 0 e	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE E/ Width of riparian activities (i.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in	9 9 ACH BANK) Optimal zone >18 mete rking lots, roadt rops) have not zone. 9 9 9 10N (SCORE Optimal h>3 inches) pre y cover. (Additi clude: sapling,	8 rs; human peds, clear impacted 8 8 EACH B/ essent, with ional fores shrub,	7 Width c meters; impacted 7 7 7 7 NNK) Tree st t present, canopy	6 Suboptir f riparian a human ac zone only 6 6 6 8 Suboptir ratum (dbf with 30% cover. (Sc	5 nal cone 12-18 iivities have minimally). 5 5 5 nal nal cone solution c	4 Width of ripa meters; humar impacted zon 4 4 4 Tree stratum present, wi canopy cover.	3 rginal rian zone 6-12 n activities have e a great deal. 3 3 rginal (dbh>3 inches) th <30% tree (See Excellent	2 Width of ri little or no ri hu 2 2 2 Tree strat surfaces Iands, cu	Poor iparian zone iparian vege uman activit 1 1 Avg.Score Poor tum absent; , croplands, verted strea	e <6 meters; etation due to ties. 0 0 e : impervious mine spoil : impervious	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in herbaceous, a mosses/lichens s	9 9 ACH BANK) Optimal zone >18 mete rking lots, roadt zone, 218 mete rops) have not zone. 9 9 9 10N (SCORE Optimal h>3 inches) pre y cover. (Additi clude: sapling, and leaf litter in and woody debi	8 rs; human peds, clear impacted 8 8 EACH B/ esent, with ional fores shrub, cluding ris.) Score	7 Width c meters; impacted 7 7 7 XNK) Category fr forest layer	6 6 6 6 6 6 6 6 8 8 8 8 8 8 8 8 8 8 8 8	5 nal cone 12-18 ivities have minimally). 5 5 5 nal s3 inches) to 60% tree e Excellent s of additional at the high end the high end	4 Width of ripa meters; humar impacted zon 4 4 4 4 Tree stratum present, wii canopy cover. Category for additional fore:	3 ginal rian zone 6-12 n activities have e a great deal. 3 3 ginal (dbh23 inches) th <30% tree (See Excellent r examples of st layers.) Score	2 Width of ri little or no n hu 2 2 2 7 Tree strat surfaces lands, cu and mainta	Poor iparian zone iparian veguman activit 1 1 Avg.Score Poor tum absent, oroplands, verted strea ained herba urrfaces, ac	e <6 meters; tetation due to ties. impervious mine spoil ms, mowed ceous areas, tively grazed	
	Grade RIPARIAN Z Grade Grade	10 ONE (SCORE E/ Width of riparian activities (i.e., par cuts, lawns, or c 10 10 ABITAT CONDIT Tree stratum (db >60% tree canop layers may in herbaceous, i mosses/lichens i at the high end	9 9 ACH BANK) Optimal zone >18 mete rking lots, roadt rops) have not zone. 9 9 9 10N (SCORE Optimal h-3 inches) pre y cover. (Additi liculue: sapling, liculue: sapling, and leaf litter lin and woody debb	8 rs; human beds, clear impacted 8 8 BEACH B/ esent, with ional fores shrub, cluding ris.) Score nge if ≥2	7 Width c meters; impactec 7 7 7 NK() Tree st canopy Category f forest layer of Good ra	6 Suboptir f riparian : human ac l zone only 6 6 6 Suboptir ratum (dbł with 30% cover. (S5 or example s.) Score rge if ≥2 a	5 s nal cone 12-18 ivities have minimally). 5 5 5 s inches) to 60% tree e Excellent s of additional forest tiph end dditional forest	4 Width of ripa meters; human impacted zon 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 1 1 7 ree stratum present, wi canopy cover. Category fo additional fore at the high enc	3 rginal rian zone 6-12 n activities have e a great deal. 3 3 (dbh>3 inches) th <30% tree (See Excellent r examples of st layers.) Score of est range if of Fair range if	2 Width of ri little or no n hu 2 2 2 7 Tree strat surfaces lands, cu and mainta	Poor iparian zone iparian vege uman activit 1 Avg.Score tum absent; , croplands, verted strea ained herba	e <6 meters; tetation due to ties. impervious mine spoil ms, mowed ceous areas, tively grazed	
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	Grade RIPARIAN Z Grade Grade RIPARIAN H Grade 1. Delineate 2. Determini 3. Enter the Right Bank	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (fb >60% tree canop layers may in herbaceous, a at the high end additional layers end if ≤1 additi 10 riparian areas ala s equare footage %Riparian Area Score	9 9 9 ACH BANK) Optimal zone >18 mete fxing lots, roadt zone, 9 9 9 10N (SCORE Optimal h>3 inches) pre y cover. (Additi h>3 inches) pre y cover. (Additi lotder spling, and leaf litter in and woody deb of Excellent as resents. sonal layers are 9 9 ong each street for each by m or for field pui Optimal 0	8 rs; human peds, clear impacted 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	7 Width c meters; impacted 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Suboptir friparian : trimparian : zone only <u>6 </u> <u>6 </u> <u>7 </u>	5 5 7	4 Mar Width of ripa meters; humar impacted zon 4 4 4 4 Tree stratum present, with canopy cover. Category for additional fore: additional fore	3 irian zone 6-12 n activities have e a great deal. 3	2 Width of ri little or no n ht 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Poor iparian zone iparian zone iparian vege uman activit 1 1 Avg.Score Poor tum absent; , croplands, verted strea ained herba urfaces, ac asture, and 1 1 vov. oor 00 2 2	e <6 meters; tetation due to ties.	Below re sums ol
	Grade RIPARIAN Z Grade Grade RIPARIAN H Grade 1. Delineate 2. Determini 3. Enter the Right Bank	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (fb >60% tree canop layers may in herbaceous, a at the high end additional layers end if ≤1 additi 10 riparian areas ala s equare footage %Riparian Area Score	9 9 9 ACH BANK) Optimal zone >18 mete fxing lots, roadt zone, 9 9 9 10N (SCORE Optimal h>3 inches) pre y cover. (Additi h>3 inches) pre y cover. (Additi lotder spling, and leaf litter in and woody deb of Excellent as resents. sonal layers are 9 9 ong each street for each by m or for field pui Optimal 0	8 rs; human peds, clear impacted 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	7 Width c meters; impacted 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Suboptir friparian : trimparian : zone only <u>6 </u> <u>6 </u> <u>7 </u>	5 hal cone 12-18 livities have minimally). 5 5 hal 6 h	4 Width of ripa meters; humar impacted zon 4 4 4 4 4 4 Mar Tree stratum present, wi canopy cover, Category fo additional laye of area co maintained a dense herbs woody v 4 dition Scores u d Use GIS maj reach riparian Mar Mar	ginal fian zone 6-12 n activities have e a great deal. 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 Width of ri little or no ri hu 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Poor iparian zone iparian zone iparian vege uman activit 1 1 Avg.Scorr Poor tum absent; oropiands, verted strea ained herba urfaces, ac asture, and 1 1 000 2 2 2 0 RA*Scores >		Below Below Besums of an Blocks al 100
	Grade RIPARIAN Z Grade Grade RIPARIAN H Grade 1. Delineate 2. Determini 3. Enter the Right Bank	10 ONE (SCORE E/ Width of riparian activities (I.e., par cuts, lawns, or c 10 10 10 ABITAT CONDIT Tree stratum (fb >60% tree canop layers may in herbaceous, a at the high end additional layers end if ≤1 additi 10 riparian areas ala s equare footage %Riparian Area Score	9 9 9 ACH BANK) Optimal zone >18 mete fxing lots, roadt zone, 9 9 9 10N (SCORE Optimal h>3 inches) pre y cover. (Additi h>3 inches) pre y cover. (Additi lotder spling, and leaf litter in and woody deb of Excellent as resents. sonal layers are 9 9 ong each street for each by m or for field pui Optimal 0	8 rs; human peds, clear impacted 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	7 Width c meters; impacted 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Suboptir friparian : trimparian : zone only <u>6 </u> <u>6 </u> <u>7 </u>	5 hal cone 12-18 livities have minimally). 5 5 hal 6 h	4 Width of ripa meters; humar impacted zon 4 4 4 4 4 4 Mar Tree stratum present, wi canopy cover, Category fo additional laye of area co maintained a dense herbs woody v 4 dition Scores u d Use GIS maj reach riparian Mar Mar	3 irian zone 6-12 n activities have e a great deal. 3	2 Width of ri little or no ri hu 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Poor iparian zone iparian zone iparian veguman activit 1 1 1 Avg.Score Poor Immabsent, croplands, verted streas ained herba ained herba ai		Below he sums of an Blocks al 100

Record of Functional Assessment Results

Str	eam Function	nal Capacity C	Calculation		
Date:	5/5/2006				
Project:	Lake Ralph H	all			
Assessment Area:	Highway 34 b	ridge			
Assessors:	Holmes, Voigl	ht, Capps			
Project Status:	X_Preproj	ect	Postproject		
		Stream	Stream	Multiplication	
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC
Hydrologic	0.07		I	0.0025	0.00
Water Quality Improvement	0.11		I	0.0025	0.00
Habitat	0.13		I	0.0025	0.00
Total	0.31	55,570*			0.00
*Stream Length is the length of the Stre	am Assessme	nt Reach (SAF	र)		
**Multiplication Factors					
Ephemeral = 0.00125					
Intermittent = 0.0025					
Perennial = 0.0038					

*FCI scores for NSR (SH 34) and NSR (FM 2990) averaged then multiplied by linear feet of NSR impacted by conservation pool, dam, spillway: (0.31 + 0.39)/2 = 0.35; 0.35 X 55,570 X 0.0025 = 48.62 FC



SWAMPIM DATASHEETS – NORTH SULPHUR RIVER PRE-PROJECT

• NSR @ FM 2990

ITEM

VARIABLE FUNCTION CATEGORY NSR 2

NSR @ Highway 2990 Bridge

SCORE Reference Source

1

PARAMET	ER										
				CON	DITION CA	TEGORY G	RADE or S	CORE			
		Optimal			Suboptima	I	Mar	ginal		Poor	
Grade	10	9	8	7	6	5	4	3	2	1	0

05\10\2006

Active erosion Channel width 50 meters Waypoint 24 Pictures 39, 38

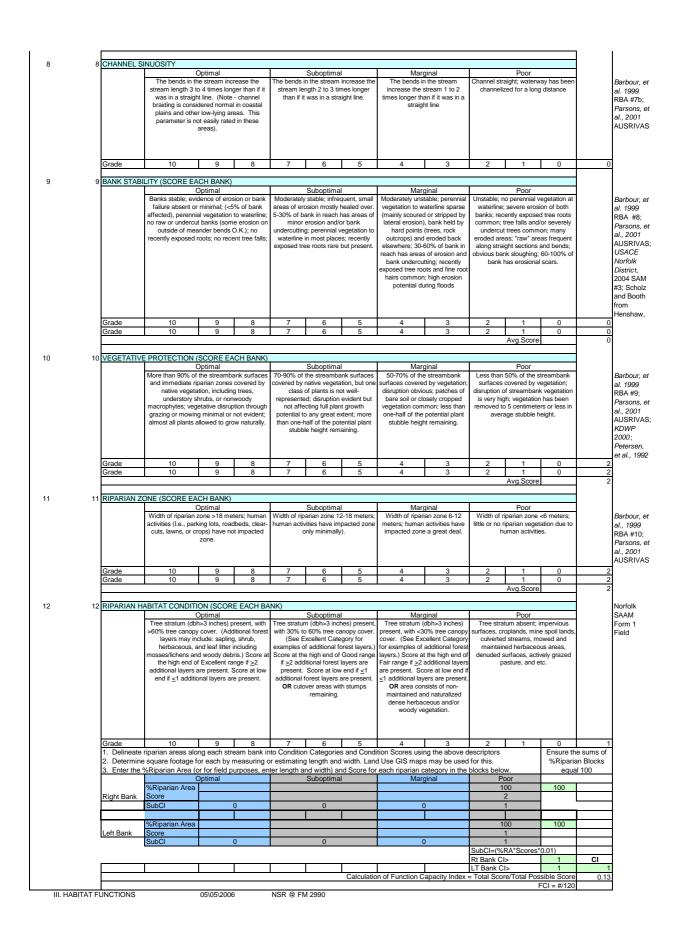
VARIABLES FLOW REGIM	E:	I. HYDI	ROLO	OGIC FUN	CHONS		NSR @ FN	/1 2990	05\05\200				SCORE	Source
TYPE	10	Peren	nial	0			nnial Pools		mittent	0	Ephem		_	Kansas
Grade CHANNEL CO	-	9 Measure	ement	8 t or Obser	7 vation of S	6 tream Cha	5 nnel Conditio	4 ns	3	2	1	0	5	Subjecti
					CO		ATEGORY (RADE or	SCORE					Barbour
		Optim				Suboptima	al	Ma	rginal		Poo			EPA RB
2a.Channel Condition/Alter	channeliza of downcu cutting	utting or e: g. Normal f	nal. No xcessiv frequer	o evidence ve lateral ncy of	bridge a alterati recovery o		st channel significant d and banks.	80% of chann disrupte	hannel; 40- the reach elized or ed. Excess	widening. : channnel	>80% of the ized. Degr s prevent a	downcutting or e reach riprap or adation,dikes or ccess to the		5-21; Newton, USDA/ I SVAP p
ation (natural, altered, or downcutting)		ical conne nnel and f				e frequency vs onto flood	of overbank Iplain.	channel w frequency flows floodplai incision,dil	ion; braided ith excessive of overbank onto the n. Historical kes or levees floodplain.		floodpla	in.		
Grade	10	9		8	7	6	5	4	3	2	1	0	C)
					CON	DITION C	ATEGORY (GRADE or	SCORE				1	w/ assis
2b.Channel	Charael O			Fraguese		Suboptima		Ma	rginal Capacity to	Charact	Poo	r Flow Frequency]	and inpu
Capacity to Flow Frequency Ratio (for 2- year peak flow)	Channel Capacity to Fl Ratio is such that bank storm events occur at year frequer atio (for 2- year peak		nk ove at a 1. Jency.	erflow from	Ratio is suc storm ever every 1.2 tha	ch that bank its are more	overflow from frequent than ess frequent years.	Flow Freque such that he from storr more fre every y	ancy Ratio is bank overflow n events are equent than ear or less than every 5	Ratio is su storm eve	uch that bai ints are mo	nk overflow from the frequent than ss frequent than years.		Dr. Mike Harvey Travant
•		1 -			_			< 0.5	ears. or >1.5	-	1 .			
Grade	10	9		8	7	6	5	4	3	2	1	0	C)
		Optim	a al		CON	NDITION C Suboptima	ATEGORY (SCORE rginal	1	Poo			Newton USDA/
2c.Channel Bank Stability (score each bank, left or right facing downstream)	vegetatic undercut outside of	ble; evider e absent o hk affected on to water banks (so	nce of e or minir d), pere rline; n ome ere bends oots; n	mal; (<5% ennial to raw or osion on O.K.); no	areas of er 5-30% of b minor undercuttin waterline	y stable; infro osion mostly ank in reach erosion and g; perennial in most plac	equent, small healed over. has areas of	Moderate perennial waterline s scoured o lateral en held by (trees, ro	ely unstable; vegetation to parse (mainly r stripped by psion), bank hard points ck outcrops) oded back	waterlin banks; re common undercut tr areas; "r straight se	no perenn e; severe e ecently exp ; tree falls a rees comm raw" areas ections and	ial vegetation at erosion of both osed tree roots and/or severely on; many eroded frequent along I bends; obvious 00% of bank has		SVAP p 10; Bark al., 1999 RBA pay 26; USA Norfolk District,
downstream)								bank in rea of erosio undercutt exposed ti	e; 30-60% of the has areas n and bank ing; recently ree roots and airs common:		erosional	scars.		
Grade (Left) Grade (Right)	10 10	9		8	7 7	6 6	5	4	3	2	1	0		
Crude (right)	10			0	•	Ŭ	Ū		Ŭ	2		Avg.Score		
CHANNEL RO	UGHNESS	S FACTC	RS										-	
					0.01		ATEGORY (Dautaa
3a.Channel		Optim			COI	Suboptim			rginal		Poo	r		Barbour EPA RB
Sinuosity (bends in low gradient stream)	stream ler than if it		o 4 time ight. C	es longer Channel	stream len than if it wa	gth 1.5 to 2.5	n increase the 5 times longer line. Channel 1.2 to 1.5	increase length 1 longer tha straight lin length/vall	in the stream the stream to 1.5 times an if it was a ne. Channel ey length 1.0 1.2.	channe	lized for a	terway has been long distance. ey length <u><</u> 1.0		Chapter 5-25; <i>KI</i> 1996
Grade	10	9		8	7	6	5	4	3	2	1	0	C)
					CON	DITION C	ATEGORY (GRADE or	SCORE				1	KDWP,
	1 (44)	Optim		aoma-t		Suboptima	al	Ma	rginal	Charac	Pool]	Kansas
3b. Bottom Substrate Composition	resu	no channe ulting from Ilation; cha	sedim	nent	and well-wa		parse stones present, little stable	sands, and	pars of rocks, I silt common; ely unstable	is channe	elized; subs	braids or stream strate is uniform edrock; unstable		Subjecti Evaluatio Aquatic Habitats

				COI	VDITION C	ATEGORY	GRADE or	SCORE					KDWP, 1996;
		Optimal			Suboptim	al	Ma	rginal		Poor			Newton et al.
3c. Instream Bottom Topography	>7 of the boulders/g debris, overhan vegetate	ttom topogra e following: o gravel, logs, backwaters ging vegeta ed shallows, banks, or s	aphy including deep pools, /large woody s/oxbows, tion, riffles,			les 5-7 of the	Chann includes < listed in	el bottom 5 of the items n Optimal legory		bottom inclue sted in Optime			1998 USDA/NRCS SVAP page 1
Grade	10	pools 9	8	7	6	5	4	3	2	1	0	0	
Grade						ATEGORY							
or		Optimal		CO	Suboptim			rginal		Poor			
O r 3c. Manning's n		0.05 to 0.0	99		0.035 to 0.0	05		.03 or >0.10 0.15	obstruction		excessive 01 to 0.02 due lean, smooth		
Grade	10	9	8	7	6	5	4	3	2	1	0		
				CO	NDITION C	ATEGORY	GRADE or	SCORE					USACE,
		Optimal			Suboptim	al	Ma	rginal io > 1.4 < 2.0		Poor	Vhere channel		Norfolk
Incision (TLB/BFD=BH R; 1/BHR*Adj Factor =CI)	Channel Incision ratio ≥1.0 <1.2 and Whe channel slope >2%; Entrenchme ratio >1.4; Where channel slope ≤2%; Entrenchment ratio >2.0 or =Cl)	ntrenchment annel slope	channel s ratio >1.			and Whe slope Entrenct >1.4; Wh slope	ere channel $\Rightarrow > 2\%$, mment ratio ere channel $e \le 2\%$, ent ratio >2.0	slope >2% Whe		ent ratio <u><</u> 1.4; ope <u><</u> 2%,		District, 2004 SAAM Form #1 and VT Stream Geomorphic Assessment Phase 2	
TLB =		10		BHR =	1				-				
BFD =													
	40	10	0	7			4	0	0				
Grade	10	9	8	7	6	5	4	3	2	1	0	0	
		9		7	6	5	4	3	2	1	0	0	
Grade		9				5 ATEGORY		L	2	1	0	0	Newton, et a
Grade	RFACE WA	9 ATER STO Optimal	RAGE	COI	NDITION C Suboptim	ATEGORY	GRADE or Ma	SCORE		1 Poor		0	1998 USDA
Grade	Deep and greater tha is obscure	9 TER STO Optimal shallow poo n 30% of th	RAGE bls abundant; e pool bottom n, or pools are	COI Pools pro from 10-3 obscure of	NDITION C Suboptim esent, but no 30% of the po	ATEGORY al ot abundant; pol bottom is or the pools	GRADE or Ma Pools pr shallow; fr the poo obscure du the pools a	SCORE	Pools abs		tire bottom is	0	1998 USDA/ NRCS SVAI page 14;
Grade DYNAMIC SUF 4a.Pools (abundant, present or	Deep and greater tha is obscure	9 TER STO Optimal shallow poo n 30% of th due to depti	RAGE bls abundant; e pool bottom n, or pools are	COI Pools pro from 10-3 obscure of	NDITION C Suboptim esent, but no 30% of the po due to depth,	ATEGORY al ot abundant; pol bottom is or the pools	GRADE or Ma Pools pr shallow; fr the poo obscure du the pools a	SCORE rginal resent, but om 5-10% of I bottom is e to depth, or are less than	Pools abs	sent, or the er	tire bottom is	0	Barbour, et a
Grade DYNAMIC SUF 4a.Pools (abundant, present or absent)	Deep and greater tha is obscure at	9 TER STO Optimal shallow poo shallow poo n 30% of th due to deptl least 5 feet	RAGE	COI Pools pr from 10-3 obscure o are	NDITION C Suboptim esent, but no 30% of the p due to depth, at least 3 fee 6	ATEGORY al ot abundant; ool bottom is or the pools ot deep.	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools a 3 fee 4	SCORE rginal resent, but orm 5-10% of bottom is e to depth, or are less than t deep. 3	Pools abs discer	sent, or the er nible. No wa	tire bottom is ter = zero.		1998 USDA NRCS SVA page 14; Barbour, et a
Grade DYNAMIC SUF 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status	Deep and greater tha is obscure of at i	9 TER STO Optimal shallow poor n 30% of th due to depti least 5 feet 9 Optimal	RAGE	COI Pools pri from 10-3 obscure c are are 7 COI	NDITION C Suboptim esent, but no 30% of the p due to depth, at least 3 fee 6 NDITION C Suboptim	ATEGORY al at abundant; pol bottom is or the pools at deep. 5 ATEGORY al	GRADE or Ma Pools pi shallow; fr the pool obscure du obscure du obscure du the pools i 3 fee 4 3RADE or Ma	SCORE rginal resent, but om 5-10% of I bottom is e to depth, or are less than t deep. 3 SCORE rginal	Pools abs discer	sent, or the er nible. No war	tire bottom is ter = zero.		1998 USDA NRCS SVAI page 14; <i>Barbour, et a</i> 1999 Barbour, et a
Grade DYNAMIC SUF 4a.Pools (abundant, present or absent) Grade 4b. Channel	Deep and greater tha is obscure at 1 10 Water rea banks a	9 TER STO Optimal shallow poor n 30% of th due to depti least 5 feet 9 Optimal	RAGE Is abundant; e pool bottom n, or pools are deep. 8 for both lower amount of	COI Pools pr from 10-3 obscure e are 7 7 COI Water fill chann	NDITION C Suboptim esent, but no 30% of the pi Jue to depth, at least 3 fee 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ATEGORY al ot abundant; ool bottom is or the pools ot deep. 5 ATEGORY al ne available of channel	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools 3 fee 4 GRADE or Ma Water fills the availa and /or mila	SCORE rginal resent, but om 5-10% of bottom is e to depth, or are less than t deep. 3 SCORE	Pools abs discer 2 Very little	sent, or the er nible. No wa 1 Poor water in chan	tire bottom is ter = zero.		1998 USDA NRCS SVAI page 14; Barbour, et a 1999 Barbour, et a 1999 EPA RBA page 5- /A-9#5; TCE
Grade DYNAMIC SUF 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel	Deep and greater tha is obscure at 1 10 Water rea banks a	9 TER STO Optimal Shallow poor n 30% of th due to depth least 5 feet 9 Optimal Ches base and minimal	RAGE Is abundant; e pool bottom n, or pools are deep. 8 f both lower amount of	COI Pools pr from 10-3 obscure e are 7 7 COI Water fill chann	NDITION C Suboptim esent, but no 30% of the p use to depth, at least 3 fee but to the p the start of the Suboptim is >75% of the b); or <25% of	ATEGORY al ot abundant; ool bottom is or the pools ot deep. 5 ATEGORY al ne available of channel	GRADE or Ma Pools pi shallow; fr the pool obscure du the pools 3 fee 4 GRADE or Ma Water fills the availa and /or mila	SCORE rginal resent, but om 5-10% of l bottom is e to depth, or are less than t deep. 3 SCORE rginal s 25-75% of ble channel, le substrates	Pools abs discer 2 Very little	sent, or the er nible. No war 1 Poor water in chan standing poo	tire bottom is ier = zero.	2	1998 USDA/ NRCS SVAI page 14; Barbour, et a 1999 Barbour, et a 1999 EPA RBA page 5- /A-9#5; TCE
Grade DYNAMIC SUF 4a.Pools (abundant, present or absent) Grade 4b. Channel Flow Status (degree to which channel is filled)	Deep and greater tha is obscure of at i 10 Water rea banks a channel	9 TER STO Optimal shallow poor n 30% of th due to deptite association of the 9 Optimal constants association Substrate is substrate is	RAGE DIs abundant; e pool bottom n, or pools are deep.	COI Pools pr from 10-3 obscure c are 7 7 COI Water fil channu sut	NDITION C Suboptim esent, but nc 30% of the p Jue to depth, at least 3 fee 6 NDITION C Suboptim Is >75% of tt el; or <25% of strate is exp 6	ATEGORY al to abundant; bool bottom is or the pools at deep. 5 ATEGORY al ne available of channel posed. 5	3RADE or Ma Pools pi shallow; fr the pools obscure du the pools a 3 fee 4 3RADE or Mater filts the availa and /or riff are most 4	SCORE rginal resent, but om 5-10% of bottom is e to depth, or are less than t deep. 3 SCORE rginal s 25-75% of ble channel, le substrates by exposed. 3	Pools abs discer 2 Very little present as	1 Poor water in chan standing poor zero. 1	titre bottom is ler = zero. 0 hel and mostly ls. No water =	2	1998 USDA/ NRCS SVAI page 14; Barbour, et a 1999 Barbour, et a 1999 EPA RBA page 5- /A-9#5; TCE 1999; VANR 2005

	TER QUALITY/E VARIABLES	ICCLOO		UNCTIONS		05\05\2006	6	NSR @ FN	A 2990				SCORE
	TYPE												ł
	NOTES												-
1.	SEDIMENT TR	ANSPORT	/DEPOSITI	ON]
							TEOODY						
	1a. Bank		Outload		CON		TEGORY (1			-
	Stability	Ranke etak	Optimal	of erosion or	Moderately	Suboptima stable; infre			unstable; 30-	l Instable: n	Poor Poor	areas; "raw"	
	(score each		e absent or r			stable, intre-			k in reach has		equently alor		
	bank, left or	potential fo	r future probl	ems. <5% of		ank in reach			erosion; high	sections a	nd bends; ol	ovious bank	
	right facing		bank affecte	d.		erosion.			tential during		; 60-100% c		
	downstream)							TIC	ods.	e	rosional sca	rs.	
	Out to (Latt)	40			-	0	-	4		0			
	Grade (Left) Grade (Right)	10 10	9	8	7	6 6	5 5	4	3	2	1	0	0
	Grade (Right)	10	3	0	'	0	5	4	5	Ζ.		Avg.Score	0
												7.1.g.00010	, , , , , , , , , , , , , , , , , , ,
					COI	DITION CA	ATEGORY (GRADE or S	SCORE				
	1b. Channel		Optimal			Suboptima			irginal		Poor		
e	Bottom Bank		1/3 of bank is			/3 of bank is			/3 of bank is		/3 of bank is		
riat	Stability	highly res	istant plant/s material.	oil matrix or	resistant pla	ant/soil matrix	or material.		ighly erodible ant/soil matrix		dible materia		
٧a			material.						romised.	matrix S	everely com	Jonnsea.	
Score for Only One Variable	1							oomp					
N N	Grade (Left)	10	9	8	7	6	5	4	3	2	1	0	0
Ö	Grade (Right)	10	9	8	7	6	5	4	3	2	1	0	0
for												Avg.Score	0
ore	or				00		TEGORY (CODE				
Sc	Or 1c. Channel		Optimal		CON	Suboptima			Irginal		Poor		
fer	Sediments or	>50% ar	avel or larger	substrate:	30-50% a	avel or large			ravel or larger	Substrate i		nd, silt, clay,	
Enter	Substrate		bble boulder			substrate typ			e; dominant		edrock; uns		
	Composition	substrate	type is grav	el or larger;		n some finer			pe is finer than				
	•		stable			oderately sta			may still be a				
	Grade	10	9	8	7	6	5	4	3	2	1	0	
2	WATER APPE	ARANCE:	Clarity or V	isibility									4
					00		TEGORY (CORE				-
			Optimal		00	Suboptima			Irginal		Poor		-
		Very clear	, or clear but	tea-colored;	Occasional	ly cloudy, esp			ole cloudiness	Very turbid		earance most	
		objects visi	ble at depth	3-6 feet (less	storm ev	ent, but clea	rs rapidly;		e time; objects	the time; obj	ects visible to	depth <0.5 ft;	
	Water Clarity		colored); no o			ble at depth			epth 0.5-1.5 ft;		water may be us water pollut	bright-green;	
			;no noticeab rged objects			htly green co n on water su			ns may appear bottom rocks			sheen or heavy	
		Subme	ged objecto	01 100103.	0100	i on water of	11000.		ged objected	coat of foa	m on surface.	No water =	
								covere	d with film.		zero.		
						•			•				
	Grade	10	9	8	7	6	5	4	3	2	1	0	6
3	PRESENCE OF				ance and De	arcent Cove	rane						ł
5													1
	1				CO	DITION CA	TEGORY (GRADE or S	SCORE				1
	1		Optimal			Suboptima		Ma	irginal		Poor]
	1		ater along en			or slightly gre	enish water	Greenish wa	ater along entire		gray, or brown		1
	3a Nutriant	diverse a							oundance of lush ohytes; abundant		each; dense s s clog stream		
ĺ	3a. Nutrient	diverse aquatic plant community includes low quantaties of many growth on stream substrate						algal grow	th, especially	blooms creat	te thick algal r	nats in stream	
1	3a. Nutrient Enrichment		species of macrophytes; little algal						rmer months.		e present due	to unstable	1
		species of	f macrophyte growth prese										
		species of								30030	ate. No water	= zero.	
	Enrichment	species of	growth prese	nt.	-	-	-		-				
		species of			7	6	5	4	3	2	1	= zero.	
	Enrichment	species of	growth prese	nt.	1								
	Enrichment	species of	growth prese	nt.	1		ATEGORY (GRADE or S					
	Enrichment Grade	species of second secon	9 Optimal esent, aquatic	nt. 8	CON Algae do	NDITION CA Suboptima minant in po	ATEGORY (I ols, larger	GRADE or S Ma Algal mats	SCORE Irginal present, some	2 Algal ma	1 Poor ts cover bott	0 om, larger	-
	Enrichment Grade Or	species of second secon	9 Optimal esent, aquatic of moss and	nt. 8	CON Algae do	NDITION CA Suboptima	ATEGORY (I ols, larger	GRADE or S Ma Algal mats	SCORE Irginal	2 Algal mar plants dom	1 Poor ts cover bott inate the ch	0 om, larger annel or NO	
	Enrichment Grade Or 3b. Aquatic	species of second secon	9 Optimal esent, aquatic	nt. 8	CON Algae do	NDITION CA Suboptima minant in po	ATEGORY (I ols, larger	GRADE or S Ma Algal mats	SCORE Irginal present, some	2 Algal mai plants dom algae pr	1 Poor ts cover bott	0 om, larger annel or NO o unstable	-

				CON	DITION C	ATEGORY (GRADE or S	SCORE				
		Optimal			Suboptima			arginal		Poor		
		nsisting of le without sedi			and wood sc ebris without		debris; co organic	es or woody arse and fine matter with liment.	color and fo	anic sedimen oul odor (ana present due t scouring	erobic) or no	
irade	10	9	8	7	6	5	4	3	2	1	0	0
AND USE PAT	TERN: Bey	ond Imme	diate Ripari	an Zone								
				CON	DITION C	ATEGORY	GRADE or S	SCORE				
	Line all a trade a	Optimal		D	Suboptima			arginal		Poor		
		ed, consisting ve prairie, ar wetlands.	g of forest, nd/or natural		ent pasture r and swamp crops		pasture; s areas may	w crops and come wooded be present but ted patches	IV	lainly row cro	ops	
ade (Left)	10	9	8	7	6	5	4	. 3	2	1	0	2
irade (Right)	10	9	8	7	6	5	4	3	2	1	0	2
											Avg.Score	2
IPARIAN ZON		AND CONT	INULLY:									
				CON		ATEGORY						
6a. Riparian Zone Width	Midth of sing	Optimal irian zone >18) meters (1.2	Width of sing	Suboptima	al 18 meters (1/2-		arginal arian zone 6-12	Midth of sing	Poor	neters (natural	
(from stream edge to field)	channel width grasses), h	man zone > re ns with trees, s uman activitie mpacted zone	shrubs, or tall es have not	1 active char grasses), hur	nel width w/tre	ees, shrubs, or have minimally	meters (1 channel wid	dian 2016 6-12 1/3-1/2 active dth vegetated), human activities.	vegation le width), little	ss than 1/3 ac riparian vege numan activitie	tive channel tation due to	
irade (left)	10	9	8	7	6	5	4	3	2	1	0	2
rade (Right)	10	9	8	7	6	5	4	3	2	1	0	2
_				0.01							Avg.Score	2
-		Optimal		COr	Suboptima	ATEGORY (arginal		Poor		
5b. Riparian Zone Vegetation Protection/ ompleteness	shrubs, prairi riparian zon	density of ma	marsh plants, ruption from	young specie trees behin	ambank vege	etation, mixed nel and mature evident with	50-75% vegetation o and sparse shrub spe frequent wit	streambank f mixed grasses o young tree or ecies; breaks th some gullies very 50 meters.	coverage c grasses, fe density; ban	0% streambar onsisting mos w trees & shru	tly of pasture ibs; low plant ed with gullies	
rade (Left)	10	9	8	7	6	5	4	3	2	1	0	2
rade (Right)	10	9	8	7	6	5	4	3	2	1	0	2
											Avg.Score	2
								pacity Index =				0.18

TYPE Permitter Ephemistrative Ephemistrative Ephemistrative Ephemistrative 2 EPIFAUNAL SUBSTRATE/AVAILABLE COVER Continual Continual Statute Statute Number of the statute for continual for the statute statute for the statute for the statute for the statute for the	1 FLOW REG	IME											
PIPALNAL SUBSTRATE/AVAILABLE COVER Optimized Marginal Marginal Marginal Vitra uses by visable habits in torin, invorces by visable habits in the visable in toring invorces by visable habits in the visable pack, pools and glos, or other tibbs pack, pools and provent, pools and the domains, to more and mark and provent, pools and the domains, to more pack, pools and provent, pools and the domains, to more submerged vegetation, and the domains, to more pack, pools and provent, pools and the domains, to more and domains and submerged vegetation common. Marginal Abits and provent, pools and blast down blast down blast provent than deep pools Pool 4 POOL VARIABILITY Event with the down blast down, small-deep pools presert Marginal Marginal Marginal down or down blast down or submerged vegetatio	TYPE								nittent		Ephemer		
Optimal Suboptimal Marginal Poor With stream bid, great that 50%. With instruct should, 10.5%. Use should be able to back the stream bid for the should be able to back the stream bid be able to back the stream bid should be able to back the stream bid be able to back the stream bid should be able to back the stream bid should be able to back the stream bid should be able to back the stream bid bable to back the stream bid bable to back the stream b	Grade	10	y	8	1	6	5	4	3	2	1	0	5
Within steam bed, gender that SDN, coverage by stable halted training from the statuse for the statuse overtex by stable halted training from cover. Hold and the statuse from cover, hold and the statuse from training from training	2 EPIFAUNAL	SUBSTRATE/A		COVER	1					1			
coverage by stable habital features. In sortication and orbitation in an orbitation in the orbitation in an orbitation orbitation in an orbitation in a orbitation in a orbitation in anorbitation in a orbitation in a orbitation in anorbita		Within stream		r than 50%	Within stream					Less tha		lat features	-
and/or flat/semption cover. Most habitat flat/semption cover. Many habitat flat/semption cover. Mabitat flat/semption cover. Many habitat flat/se		coverage by	stable habita	at features,	by stable I	habitat feature	es favorable	coverage by	stable habitat	present; la	ack of habita	at is obvious;	
retures not names Features may under construction Features not transient. (See Ecodem Cales) Instantial status Instantiantial status Instantial status <td></td>													
barks, rocts, cotsb, rocts,		features non	transient. Fe	atures may	features no	t transient. (S	See Excellent	fish/amphibiar	ocover; habitat	features an	d pools bur	ied or lacking,	,
Inability at a stage to allow colonization Excelent Category for habitating testing components.) Grade 10 9 8 7 6 5 4 3 2 1 0 3 STREAM BOTTOM SUBSTRATE: Pool Substrate Characterization Marginal Marginal Poor Moture of additation materiable, with gravel and firm send prevalent, root mats and submerged vegetation. Marginal Poor Marginal Poor Grade 10 9 8 7 6 5 4 3 2 1 0 Grade 10 9 8 7 6 5 4 3 2 1 0 4 POOL VARIABULTY Even mix of targe-deallow, large-deag, very small-shalow, small-deallow or pools absert Marginal Poor Sadew pools Sadew pools Marginal Not the sode with testing or tano sodewateeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee								desirable, sub	strate may be	Channe	I DOUOTT TH	ay be nat.	
Grade 10 9 8 7 6 5 4 3 2 1 0 3 STREAM BOTTOM SUBSTRATE: Pool Substrate Characterization Suboptimal Muture of soft stand, mud, or clay, or battoring Hard pan of substrate materials, with gravel Muture of soft stand, mud, or clay, or battorin, hard pan of sub, or battor, more not mate or submerged vegetation. Hard pan of substrate of substrate materials, with gravel Muture of soft stand, mud, or clay, or battorin, hard pan of sub, or battorin, material submerged vegetation. Hard pan of sub, or battorin, material submerged vegetation. Grade 10 9 6 7 6 5 4 3 2 1 0. Feool VARIABILITY Optimal Suboptimal Marginal Magoity of pools much more prevalent material submerged vegetation. Majoity of pools sub-sub-submerged vegetation or pools much more prevalent material submerged vegetation or pools much more prevalent material submerged vegetation or goods much more prevalent more deposition Suboptimal Magoity of pools much more prevalent material submerged vegetation or goods much more prevalent more deposition in submerged vegetation. Suboptimal Marginal Magoity of pools much more prevalent more deposition in submerged vegetation													
3 STREAM BOTTOM SUBSTRATE: Pool Substrate Characterization Marginal Marginal Poor Micure of substrate metrials, with gravel and firm sand prevalent; root mats and subregred vegetation. Micure of submerged vegetation. Hard pan days or bedrock; no root mat no submerged vegetation. Hard pan days or bedrock; no root mat no submerged vegetation. Grade 10 9 8 7 6 5 4 3 2 1 0 4 POOL VARIABILITY Optimal Marginal Marginal Poor Poor 2 even mick of large-shallow, targe-deep, small-shallow, small-deep pools present Majority of pools small-shallow or pools absent Majority of pools anall-shallow or pools absent Poor Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7		habitat at a bi	lago to allow	CONTRACTOR									
3 STREAM BOTTOM SUBSTRATE: Pool Substrate Characterization Marginal Marginal Poor Micure of substrate metrials, with gravel and firm sand prevalent; root mats and subregred vegetation. Micure of submerged vegetation. Hard pan days or bedrock; no root mat no submerged vegetation. Hard pan days or bedrock; no root mat no submerged vegetation. Grade 10 9 8 7 6 5 4 3 2 1 0 4 POOL VARIABILITY Optimal Marginal Marginal Poor Poor 2 even mick of large-shallow, targe-deep, small-shallow, small-deep pools present Majority of pools small-shallow or pools absent Majority of pools anall-shallow or pools absent Poor Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7													
3 STREAM BOTTOM SUBSTRATE: Pool Substrate Characterization Marginal Marginal Poor Micure of substrate metrials, with gravel and firm sand prevalent; root mats and subregred vegetation. Micure of submerged vegetation. Hard pan days or bedrock; no root mat no submerged vegetation. Hard pan days or bedrock; no root mat no submerged vegetation. Grade 10 9 8 7 6 5 4 3 2 1 0 4 POOL VARIABILITY Optimal Marginal Marginal Poor Poor 2 even mick of large-shallow, targe-deep, small-shallow, small-deep pools present Majority of pools small-shallow or pools absent Majority of pools anall-shallow or pools absent Poor Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7 6 5 4 3 2 1 0 6 Grade 10 9 8 7													
Deptinal Suboptimal Manual or clay or sand bottom, and firm sand prevalent; not mats and submerged vegetation Moture of soft sand mud, or clay, mats and submerged vegetation. All mud or clay or sand bottom, submerged vegetation. Hand prevalent; not mats and submerged vegetation. Hand prevalent; not clay or sand bottom, mats and submerged vegetation. Hand prevalent; not mats and submerged vegetation. Hand prevalent; not mats and submerged vegetation. Grade 10 9 8 7 6 5 4 3 2 1 0. 4 POOL VARIABILITY	Grade	10	9	8	7	6	5	4	3	2	1	0	1
Mature of subtrate materials, will grave and firm such preventions to some con- submerged vegetation common. Motor of soft sand, mud, or clay, mud may be dominants some con- mats and submerged vegetation. All mud or no root mators. Hund or no root mators. Hund or no root mators. Grade 10 9 8 7 6 5 4 3 2 1 0. 4 POOL VARIABILITY Optimal Suborptimal Marginal Poor 5 Optimal Suboptimal Marginal Poor 6 rade 10 9 8 7 6 5 4 3 2 1 0. 6 rade 10 9 8 7 6 5 4 3 2 1 0. 6 rade 10 9 8 7 6 5 4 3 2 1 0. 6 rade 10 9 8 7 6 5 4 3 2 1 0. 6 rade 10 9 8 7 6 5 4 3 2 1 0.	3 STREAM BO	OTTOM SUBSTR	RATE: Pool	Substrate C	Characterizati	on							
and firm sand prevalent; not names and submerged vegetation; present. must and submerged vegetation; mask and submerged vegetation; present. must or submerged vegetation; submerged vegetation; present. must or submerged vegetation; submerged vegetation; 4 Contract, no submerged vegetation; present. Suboptimal Marginal Poor 4 Contract, no prevalent han deep pools Contract, no submerged vegetation; Marginal Poor 5 Even mix of lagg-stabula, large-deep small-shalow, small-deep pools present Majority of pools large-deep; very few shalow. Shalow pools much more prevalent han deep pools Majority of pools absent 5 SEDIMENT DEPOSITION/SCOURING Suboptimal Marginal Poor		Mixture of subs		ls with grave	el Mixture d					Hard pap		rock: no root	-
Grade 10 9 8 7 6 5 4 3 2 1 0 4 POOL VARIABILITY Optimal Suboptimal Marginal Poor 5 Even mix of large-shallow, large-deep, small-shallow, small-shallow, small-shallow, small-shallow, small-shallow or prevalent than deep pools Majority of pools small-shallow or prevalent than deep pools Majority of pools small-shallow or prevalent than deep pools Majority of pools small-shallow or prevalent than deep pools 6 6 10 9 8 7 6 5 4 3 2 1 0 5 SEDIMENT DEPOSITION/SCOURING Marginal Marginal Poor New then 60% of the level than pastate or deposition in pools 30/0% afficional sector or decentricines and where grades 30/0% afficional sector or decentions and bends. Some filing of pool. Mare than 60% of the level than pastate or decentions and where grades 30/0% afficional sector or decentions and state decention afficional sector or decentionse and		and firm sand	prevalent; ro	ot mats and	mud may	be dominant	; some root	little or no r	oot mat; no				
Grade 10 9 8 7 6 5 4 3 2 1 0 4 POOL VARIABILITY Optimal Suboptimal Marginal Poor Poor Even mix of large-shalow, large-deep, small-shalow, small-shalow, small-deep pools present Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Majority of pools small-shalow or provident than deep pools Status or charge nearly variable or pools absent 5 SEDIMENT DEPOSITION/SCOURING Suboptimal Marginal Poor Status or charge nearly variable, charge depolic, or accessive scouring, correct deposition in pools Status or charge nearly variable, charge depolic, or accessive scouring, correct deposition or deposition in pools Status or charge nearly variable, charge depolic, or accessive scouring, correct deposition or accessive scouring		submergeo	d vegetation	common.	mats and		vegatation	submerged	vegetation.				
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5 SEDIMENT DEPOSITION/SCOURING Optimal Suboptimal Marginal Poor <5% of channel botton affected by scour or deposition. 5-30% affected by scour or deposition. 30-50% affected by scour or deposition. Deposits and scour at bends. Some filing of pools. More than 50% of the bottom in a state o flux or change nearly yearlong. Pools minimal or absent due to heavy deposition or excessive scouring. Grade 10 9 8 7 6 5 4 3 2 1 0 6 CHANNEL FLOW STATUS Very little water in the channel and banks; <5% of channel substrate is exposed										Majority o			
5 SEDIMENT DEPOSITION/SCOURING Optimal Suboptimal Marginal Poor <5% of channel bottom affected by scour or deposition. 5:30% affected by scour or deposition. 30-50% affected by scour or deposition. More than 50% of the bottom in a state o flux or change nearly veationg. Pools Grade 10 9 8 7 6 5 4 3 2 1 0 6 CHANNEL FLOW STATUS Marginal Marginal Marginal Very little water in the channel and mostly present in standing pools; or stream eaches the base of both lower banks; <5% of channel substrate is exposed													
5 SEDIMENT DEPOSITION/SCOURING Optimal Suboptimal Marginal Poor <5% of channel botton affected by scour or deposition. 5-30% affected by scour or deposition. 30-50% affected by scour or deposition. Deposits and scour at bends. Some filing of pools. More than 50% of the bottom in a state o flux or change nearly yearlong. Pools minimal or absent due to heavy deposition or excessive scouring. Grade 10 9 8 7 6 5 4 3 2 1 0 6 CHANNEL FLOW STATUS Very little water in the channel and banks; <5% of channel substrate is exposed													
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-5% of channel bottom affected by scour or deposition. 5:30% affected by scour or deposition. 30:80% affected by scour or Scour at constrictions and wehre grades steepen. Some deposition in pools More than 50% of the bottom in a state or deposition. Grade 10 9 8 7 6 5 4 3 2 1 0 6 CHANNEL FLOW STATUS Image of the base of both lower banks; <5% of channel substrate is exposed	5 SEDIMENT	DEPOSITION/SO				Suboptima	al and a second s	Mar	ginal		Poor		
Grade 10 9 8 7 6 5 4 3 2 1 0 6 CHANNEL FLOW STATUS Optimal Suboptimal Marginal Marginal Poor Very little water in the channel and valuable channel and/or riffle substrates are mostly exposed Very little water in the channel and valuable channel and/or riffle substrates is exposed Very little water in the channel and valuable channel and/or riffle substrates are mostly exposed Very little water in the channel and valuable channel and/or riffle substrates are mostly exposed Very little water in the channel and valuable channel and/or riffle substrates are mostly exposed Grade 10 9 8 7 6 5 4 3 2 1 0 Channelization, alteration, or dredging absent or minimal; normal and stable stream reacher pattern. Alteration by storeurse; (such as bridge abteration or channelization, recovered, Alteration or other meander pattern habitat significantly altered by stormwater or other stream meander pattern astability have recovered; recent stream reach altered.		<5% of channel	l bottom affecte	ed by scour or		cted by scour of	or deposition;	30-50% affect	ed by scour or		0% of the bott		f
Grade 10 9 8 7 6 5 4 3 2 1 0 6 CHANNEL FLOW STATUS Optimal Suboptimal Marginal Poor Water reaches the base of both lower Vater fills 25-75% of the available channel; or barks; <5% of channel substrate is exposed			deposition.					obstructions, c	onstrictions and	minimal or al	osent due to h	eavy deposition	n
6 CHANNEL FLOW STATUS 0 Optimal Suboptimal Marginal Poor Water reaches the base of both lower banks; <5% of channel substrate is exposed								bends. Some	filling of pools.	ore	excessive sco	ouring.	
6 CHANNEL FLOW STATUS 0 Optimal Suboptimal Marginal Poor Water reaches the base of both lower banks; <5% of channel substrate is exposed													
G CHANNEL FLOW STATUS Water reaches the base of both lower banks; <5% of channel substrate is exposed	Grade	10	9	8	7	6	5	4	3	2	1	0	1
Optimal Suboptimal Marginal Poor Water reaches the base of both lower banks; <5% of channel substrate is exposed		SUTATE WOL							· · · · · · · · · · · · · · · · · · ·				
banks; <5% of channel substrate is exposed	OCHANNELT	LOW STATUS	Optimal			Suboptima	l	Mar	ginal				
Grade 10 9 8 7 6 5 4 3 2 1 0 7 CHANNEL ALTERATION Optimal Suboptimal Marginal Poor 7 Channelization, alteration, or dredging absent or minimal; normal and stable stream meander pattern. Alteration by stormwater inputs absent or minimal; Some alteration or channelization present, usually adjacent to structures present on both banks; normal stable stream meander pattern. Alteration by atability have recovered; recent alteration is not present. But stream pattern alteration is not present. Muwater inputs and altered. Some alteration is not present. Muwater inputs may be Banks shored with gabion, riprap, o concrete. Concrete or riprap lined channels. Instream habitat isgnificantly altered by stormwater or other inputs. Over 80% of the stream reach altered.													
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CHANNEL ALTERATION Optimal Suboptimal Marginal Poor Channelization, alteration, or dredging absent or minimal; normal and stable stream meadre pattern. Alteration by stormwater inputs absent or minimal Some alteration or channelization present, usually adjacent to structures present on both may be present, but stream pattern alteration is not present. Ust stream pattern alteration is not present. Water in noy be Alteration or channelization or channelization (including sopio files) or shoring structures present on both may be present, but stream pattern alteration is not present. Ministream de pattern has not stormwater inputs Banks shored with gabion, riprap, o concrete. Concrete or riprap lined channels. Instream habitat ignificantly altered by stormwater or other inputs. Over 80% of the stream reach altered.													
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absent or minimal; normal and stable stream meander pattern. Alteration by stormwater inputs absent or minimal by stormwater inputs absent or minimal absent or minimal stormwater inputs absent or minimal by stormwater inputs absent or minimal by stormw	7 CHANNEL F	ALTERATION	Optimal			Suboptima	ıl	Mar	ginal	1	Poor		
stream meander pattern. Alteration by stormwater inputs absent or minimal past alteration, (I.e., channelization) bars alteration is not present. Minor alteration is not present. Minor													r.
past alteration, (I.e., channelization) banks; normal stable stream other inputs. Over 80% of the may be present, but stream pattern meander pattern has not and stability have recovered; recent recovered. Alteration from alteration is not present. Minor stormwater inputs may be		stream mean	der pattern.	Alteration by									
may be present, but stream pattern meander pattern has not stream reach altered. and stability have recovered; recent recovered. Alteration from alteration is not present. Minor stormwater inputs may be					abutments	or culverts);	evidence of	structures pr	esent on both	significantly			r
alteration is not present. Minor stormwater inputs may be	1				may be pr	esent, but str	eam pattern	meander pa	ttern has not				
										1			1
alteration from stormwater or other extensive. 40-80% of stream					alteratio								
inputs. reach altered.						from stormwa		extensive. 40-	80% of stream				
						from stormwa		extensive. 40-	80% of stream				



Record of Functional Assessment Results

Str	eam Function	al Capacity C	alculation		
	NSR 2 (135)				
Date:	5/10/2006				
Project:	Lake Ralph H	all			
Assessment Area:	North Sulphur	^r River, Approx	1/4 mile upstream	n of 2990 Bridge	e
Assessors:	Holmes, Voigl	ht, Capps			
Project Status:	X_Preproj	ect	Postproject		
		Stream	Stream	Multiplication	
Major Function Categories	FCI	Length (LF)*	Characterization	Factor**	FC
Hydrologic	0.08			0.0025	0.00
Water Quality Improvement	0.18		Ι	0.0025	0.00
Habitat	0.13			0.0025	0.00
Total	0.39	55,570*			0.00
*Stream Length is the length of the Stream	am Assessme	nt Reach (SAF	R)		
**Multiplication Factors					
Ephemeral = 0.00125					
Intermittent = 0.0025					
Perennial = 0.0038					

*FCI scores for NSR (SH 34) and NSR (FM 2990) averaged then multiplied by linear feet of NSR impacted by conservation pool, dam, spillway: (0.31 + 0.39)/2 = 0.35; 0.35 X 55,570 X 0.0025 = 48.62 FC





IMPOUNDMENTS SWAMPIM DATASHEETS

SWAMPIM DATASHEETS – PONDS PRE-PROJECT

Small Pond (On-channel) < 1 acre</th>OCP/7

Impoundment Evaluation from Kansas Department of Wildlife and Parks, Subjective Evaluation of Aquatic Habitats Developed by : Kansas Department of Wildlife & Parks, Environmental Services Section (Revised 2004) with minor modifications to address conditions in North Central Texas

Impoundment Habitat Evaluation

OCP-5 (<u><</u>1 acre)

PHYSICAL HAB	TAT KEY]
1.Shoreline			CON			RADE or SCOR	F				-
Development						er of circle of eq					-
			or = 2.5			edium 1.5 - 2.4	Ĺ	Low 1			
Grade	10 9	9	8 7	6	5	4	3	2	1	0	
2.Average			CON	DITION CA	TEGORY G	RADE or SCOR	RE				
Depth					1					1	1
Grade	10 9) feet 8 7	6	5	3 - 10 feet 4	3	< 3	feet 1	0	
Glade	10 9	9	0 /	0	5	4	3	2	1	0	
3.Annual			CON	DITION CA	TEGORY G	RADE or SCOR	RE				
Storage Ratio	1 - 2			2			< 1				-
Grade	5		4		3	2			1	0	
4.Substrate			CON (select two pred			RADE or SCOR		ro)			-
	Boulder/Cobble	e	Gravel	Sand		Bedrock			itus/Muck		-
Grade	5		4		3	2			1	0	
5.Number of			CON								
substrate types			CON	DITION CA	IEGURIG	RADE or SCOR					-
in littoral zone	4 or more		3 types	present		2 types pres	ent	1 type	present		
Grade	5		4		3	2			1	0	
6.Amount of			CON		TEGORY G	RADE or SCOR	PE				
Cover	(aquatic vege	tation, flood	ed timber, woody d					etation, ma	an-made stru	ictures)	
	Extensive (>75%		undant (50-75%)		(25-50%)	Sparse (5-25	,		one (0-5%)		
Grade	10 9	9	8 7	6	5	4	3	2	1	0	
7.Native			CON	DITION CA	TEGORY G	RADE or SCOR	E				-
vegetation buffer											
	> 50 meters		10 - 50 meters		meters		1 - 5 met		4	None	
Grade	5		4		3	2		-	1	0	
8.Bank erosion			CON	DITION CA	TEGORY G	RADE or SCOR	RE				
0.Darik erosion	<u></u>										
Grade	Stable ba	anks w/little :	siougning 4		erate erosioi 3	n due to livestoc 2	:K		active erosi 1	on along 0	
	sical habitat co	mponents	-		<u> </u>	-			•	•	
WATERSHED L	AND USE AND M	ANAGEME	NT KEY								
			CON			RADE or SCOR					
			CON	DITION CA	IEGURIG	RADE OF SCOR					
1.Management	Fish fences	Liv	estock exclusion	Draw	downs	Downstream	flow	Fish fe	eders	Other (I.e.	
Strategies						augmentati	ion			harvest restrictions,	
										nuisance	
										species control, etc)	
Grade	+1		+1		-1	+1		+	·1		
Total 2 Watershed La	nd Uses (Describe	e the exten	t of land use in th	eunstream	watershed)						
				e apotroarri	Wateronica)						
2a.Minimal impact land						RADE or SCOR					
uses	Ungrazed native v Entire	vegetation (I.e. woodlands, nat Abundant		tlands), good 1mon	grazing practices Moderate		w/ good to Spa		nservation None	-
Grade	+5		+4		-3	+2	,			0	
2b.Significant					-				-		
impact land						RADE or SCOR					
uses	Poor g Entire	grazing prac	ctices, cropland w/ t Abundant		nservation p	ractices, urban, in Moderate		mmercial, Spa	-	None	-
Grade	-5		-4		3	-2	,		1	0	
	tershed/manage	ment (max		1	-						
BIOLOGICAL CO	MPONENT KEY		,								
1.Fish characteristics						RADE or SCOR					
			(ii pi	1			,				-
	High quality spo	ort Pa	n & predaceous	N	1innows/pan	fish/roughfish		Minnows/	roughfish	No fish	

2.Aquatic insects	CONDITION CATEGORY GRADE or SCORE					
	> 3 orders present			1 -3 orders present	•	None
Grade	5	4	3	2	1	0
3.Mollusc/ Crayfish		CONDIT	ION CATEGORY GF	ADE or SCORE		
Grade	Common/Abundant	2	Sparse	None 0	Zebra mussels p -5	oresent
4.Other aquatic/semi-		I.	ION CATEGORY GF	-	l °	
aquatic	Common/Abundant	CONDITI			Nutrio proo	ant
vertebrates Grade	3	2	Sparse 1	None 0	Nutria prese -5	ent
Total for the biolo	ogical components (max 21)					
WATER GOALT						
1.DO/BOD	CONDITION CATEGORY GRADE or SCORE					
Grada	Rarely Limiting		Occasional 2	y Limiting 1	Frequen	tly Limiting
Grade	3	I		· · · · · ·		0
2.Nutrient enrichment	CONDITION CATEGORY GRADE or SCORE					
	Rarely Limiting		Occasional		Frequen	tly Limiting
Grade	3		2	1		0
3.Pesticides	CONDITION CATEGORY GRADE or SCORE					
	Rarely Limiting		Occasional		Frequen	tly Limiting
Grade	3		2	1		0
4.Turbidity	CONDITION CATEGORY GRADE or SCORE					
	Rarely Limiting		Occasional		Frequen	tly Limiting
Grade	3		2	1		0
5.Temperature	CONDITION CATEGORY GRADE or SCORE					
	Rarely Limiting		Occasional	y Limiting	Frequen	tly Limiting
Grade	3		2	1		0
6.Other (if applicable)	CONDITION CATEGORY GRADE or SCORE					
	Rarely Limiting		Occasional	v Limiting	Frequen	tly Limiting
Grade	3		2	1		0
	er quality components (max 15)					
Area =	sics (attach to aquatic habitat	Sh	oreline Perimeter: =_	1,290		(0.5-2),
ent Area =	51,490 square fee 0.92 acres	t SD	01 (shoreline dev. Rat	io) = <u>1.603701</u>		_
t pool) omments: alternat	0.92 acres	roject goals &	lessen adverse imp	acts on habitat		_
						_
						_
						_
						_
mpled check metho	d:seining;	dip	o-net;	electrofishing		
mpled check metho	d:seining;	dip	o-net;	electrofishing		_
mpled check metho	d:seining;	dip	o-net;	electrofishing		_
npled check metho	d:seining;	dip	o-net;	electrofishing		-
npled check metho	d:seining;	dip	-net;	electrofishing		-

Other Aquatic/Semi-Aquatic Vertebrates:

Mussels:

T/E Species Known/Likely to Occur:

Record of Functional Assessment Results

Impoundme	ents/Reservoir I	Functional C	apacity Calculati	on					
Date:									
Project:	Lake Ralph Ha	ll							
Location: OCP-5 Small Pond, WP2 (< 1 acre)									
Circle One: Small Pond (<1 acre) Pond (>1<5 acres) Lake (>5< 500 acres) Reservoir (>500 acres)									
Represented Acreage: 11.92 Total acreage of all impoundments represented by site									
Assessors:	Holmes Voight	Capps							
Project Status:	XPreproje	ct	Postproject						
			· ·						
Multiplication									
Major Function Categories	Score	RCI	Acreage	Factor*	RC				
Physical Habitat	10								
Watershed/Management	3								
Biological	8								
Water Quality	7								
Total Score	28	0.28	8.06	1.5	3.4				
*Multiplication Factors	Ref: Table A-2	of SJD Repo	rt included in Mitig	ation Plan App	oendix B				
Small Pond = 1.5			ve of 22 small por						
Pond = 1.3		•	lus 10 ponds outs		•				
Lake = 1.1	-		otal of small pond						
Reservoir = 1.04	•		d/Management + Biolo						
			iplication Factor						

Pasture outside of riparian zone. Rip zone 20m or less.

SWAMPIM DATASHEETS – PONDS PRE-PROJECT

Ponds (On-channel) >1 <5 acres: OCP10

Impoundment Evaluation from Kansas Department of Wildlife and Parks, Subjective Evaluation of Aquatic Habitats Developed by : Kansas Department of Wildlife & Parks, Environmental Services Section (Revised 2004) with minor modifications to address conditions in North Central Texas

	Jation						
		Surrou	inded by pasture	e. Few trees	s. WP 15	P69, 68	
PHYSICAL HAB	ITAT KEY						
1.Shoreline		C	ONDITION CAT	EGORY G	RADE or SCORE		
Development			r of impoundme		er of circle of equal a		
<u> </u>		High > or = 2.5			edium 1.5 - 2.4	Low 1.0-1.4	
Grade	10 9	8 7	6	5	4 3	2 1	0
2.Average		C	ONDITION CAT	FGORY G	RADE or SCORE		
Depth		0		LOON OF			
•		> 10 feet			3 - 10 feet	< 3 feet	
Grade	10 9	8 7	6	5	4 3	2 1	0
3.Annual Storage Ratio		C	ONDITION CAT	EGORY GI	RADE or SCORE		
Storage Ratio	1 - 2		>2			< 1	
Grade	5	4	3	3	2	1	0
		l		I		1	
4.Substrate		C	ONDITION CAT	EGORY G	RADE or SCORE		
					zone and average th		
	Boulder/Cobble	(> Gravel	Sand (<		Bedrock	Mud/Detritus/Muck	
Grade	5	4	3	\$	2	1	0
5.Number of		С	ONDITION CAT	EGORY GI	RADE or SCORE		
substrate types							
in littoral zone	4 or more		ypes present		2 types present	1 type present	
Grade	5	4	3	3	2	1	0
6.Amount of					RADE or SCORE		
6.Amount of Cover	(aquatic yogo	tation, flooded timber, woo				vogetation man-made s	tructures)
Cover	Extensive (>75%				Sparse (5-25%)	Little or none (0-5%)	
Grade	10 9	, , ,	,	5	4 3	2 1	0
7.Native							
vegetation		C	ONDITION CAT	EGORY G	RADE or SCORE		
buffer							
Grade	> 50 meters 5	10 - 50 meters 4	5 - 10 n 3		2	5 meters	None 0
Glaue	5	4)	2		0
8.Bank erosion		C	ONDITION CAT	EGORY G	RADE or SCORE		
o.bank erosion							
		nks w/little sloughing			due to livestock	Severe active ero	0
Grade	5	4	3	3	2	1	0
		mponents (max 54.5)					
		mponents (max 54.5) IANAGEMENT KEY					
		IANAGEMENT KEY	ONDITION CAT	EGORY GI	RADE or SCORE		
	AND USE AND M	IANAGEMENT KEY		EGORY GI	RADE or SCORE		
WATERSHED L		IANAGEMENT KEY			Downstream flow	Fish feeders	Other (I.e.
	AND USE AND M	IANAGEMENT KEY				Fish feeders	Other (I.e. harvest restrictions,
WATERSHED L	AND USE AND M	IANAGEMENT KEY			Downstream flow	Fish feeders	harvest
WATERSHED L	AND USE AND M	IANAGEMENT KEY			Downstream flow	Fish feeders	harvest restrictions, nuisance species
WATERSHED L	AND USE AND M	IANAGEMENT KEY			Downstream flow	Fish feeders	harvest restrictions, nuisance
WATERSHED L	AND USE AND M	IANAGEMENT KEY		downs	Downstream flow	Fish feeders	harvest restrictions, nuisance species
WATERSHED L 1.Management Strategies Grade Total	AND USE AND M Fish fences	Livestock exclusio	Drawd	downs 1	Downstream flow augmentation +1		harvest restrictions, nuisance species
WATERSHED L 1.Management Strategies Grade Total	AND USE AND M Fish fences	Livestock exclusio	Drawd	downs 1	Downstream flow augmentation +1		harvest restrictions, nuisance species
WATERSHED L 1.Management Strategies Grade Total	AND USE AND M Fish fences	Livestock exclusion +1	Drawd	downs 1 n watershee	Downstream flow augmentation +1 d)		harvest restrictions, nuisance species
UMATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land	AND USE AND M Fish fences +1 and Uses (Describ	Livestock exclusion +1 	Drawd	downs 1 n watershee	Downstream flow augmentation +1 d) RADE or SCORE	+1	harvest restrictions, nuisance species control, etc;
WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal	AND USE AND M Fish fences +1 Ungrazed native v	Livestock exclusion +1 we the extent of land use C C vegetation (I.e. woodlands,	Drawd	downs 1 n watershee rEGORY GF	Downstream flow augmentation +1 d) RADE or SCORE grazing practices, crop	+1	harvest restrictions, nuisance species control, etc;
UMATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land	AND USE AND M Fish fences +1 and Uses (Describ	Livestock exclusion +1 	Drawd	downs 1 n watershee FEGORY GF lands), good mon	Downstream flow augmentation +1 d) RADE or SCORE	+1	harvest restrictions, nuisance species control, etc) conservation
ATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade	AND USE AND M Fish fences +1 and Uses (Describ Ungrazed native v Entire	ANAGEMENT KEY C Livestock exclusio +1 te the extent of land use C C C C C C C C C C C C C C C C C C C	Drawd Drawd +/ e in the upstream CONDITION CAT native grass, weth Comm +(1 n watershee rEGORY Gi ilands), good mon 3	Downstream flow augmentation +1 d) RADE or SCORE grazing practices, crop Moderate +2	+1	harvest restrictions, nuisance species control, etc) conservation None
ATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade 2b.Significant	AND USE AND M Fish fences +1 and Uses (Describ Ungrazed native v Entire +5	ANAGEMENT KEY C Livestock exclusio +1 te the extent of land use C Livestock exclusio +1 te the extent of land use C Livestock exclusio +1 te the extent of land use C C C C C C C C C C C C C C C C C C C	Drawd Drawd +/ e in the upstream CONDITION CAT Comr +(CONDITION CAT	downs 1 n watershea rEGORY GF lands), good mon 3 TEGORY GF	Downstream flow augmentation +1 d) RADE or SCORE grazing practices, crop Moderate +2 RADE or SCORE	land w/ good to excellent Sparse +1	harvest restrictions, nuisance species control, etc) conservation None 0
ATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade	AND USE AND M Fish fences +1 and Uses (Describ Ungrazed native v Entire +5 Poor s	ANAGEMENT KEY C Livestock exclusio +1 te the extent of land use (vegetation (l.e. woodlands, Abundant +4 C grazing practices, cropland	Drawd Drawd +/ e in the upstream CONDITION CAT +: CONDITION CAT tw/ fair to poor cor	1 n watershee IEGORY GF Iands), good mon 3 TEGORY GF nservation pr	Downstream flow augmentation +1 d) RADE or SCORE grazing practices, crop Moderate +2 RADE or SCORE actices, urban, industri	+1 bland w/ good to excellent Sparse +1 ial, commercial, residentia	harvest restrictions, nuisance species control, etc) conservation None 0
ATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade 2b.Significant impact land	AND USE AND M Fish fences +1 and Uses (Describ Ungrazed native v Entire +5	ANAGEMENT KEY C Livestock exclusio +1 te the extent of land use C Livestock exclusio +1 te the extent of land use C Livestock exclusio +1 te the extent of land use C C C C C C C C C C C C C C C C C C C	Drawd Drawd +/ e in the upstream CONDITION CAT Comr +(CONDITION CAT	downs 1 n watershee IEGORY GF lands), good mon 3 FEGORY GF nservation pr mon	Downstream flow augmentation +1 d) RADE or SCORE grazing practices, crop Moderate +2 RADE or SCORE	land w/ good to excellent Sparse +1	harvest restrictions, nuisance species control, etc) conservation None 0

	1.Fish						TEGORY G						
	characteristics	High g	uality sport	Pan & pre			otic fish dom 1innows/pan			Minnows	/roughfish	No fish	
	Grade	10	9	8	7	6	5	4	3	2	1	0	7
	2.Aquatic				CON	DITION CA	TEGORY G	RADE or S	CORE				
	insects												
	Grade		> 3 orde	rs present 4			3		ers present 2	1	1	None 0	4
			-										
	3.Mollusc/ Crayfish				CON	DITION CA	TEGORY G	RADE or S	CORE				
				n/Abundant			arse		one	Zebra	n mussels p	resent	
	Grade 4.Other		3	2			1		0		-5		1
	aquatic/semi-				CON	DITION CA	TEGORY G	RADE or S	SCORE				
	aquatic vertebrates		Commor	n/Abundant		Sp	arse	N	one	N	lutria prese	nt	
	Grade		3	2			1		0		-5		1
D.	Total for the bid WATER QUALIT	TY COMP	ONENT KEY	(max 21)									13
					0.001		TEOODYO						
	1.DO/BOD				CON		TEGORY G	RADE of S	CORE				
	Grade		Rarely Limiti	ng		2	Occasiona	lly Limiting	1			ly Limiting 0	3
	Glade		3			2			I			0	3
	2.Nutrient enrichment				CON	DITION CA	TEGORY G	RADE or S	CORE				
	childrinent		Rarely Limiti	ng			Occasiona	lly Limiting			Frequent	ly Limiting	
	Grade		3			2			1			0	2
	3.Pesticides				CON	DITION CA	TEGORY G	RADE or S	SCORE				
			Rarely Limiti	na			Occasiona	llv Limiting	1		Frequent	ly Limiting	
	Grade		3	.9		2	Coccoloria		1			0	3
	4 T 1 1 1 1				CON	DITION CA	TEGORY G	RADE or S	CORE				
	4.Turbidity		D								-		
	Grade		Rarely Limitin 3	ng		2	Occasiona	lly Limiting	1			ly Limiting 0	3
					CON		TEGORY G						
	5.Temperature				CON		TEGORTG	RADE OF 3	CORE				
	Grade		Rarely Limitin	ng		2	Occasiona	Ily Limiting	1			ly Limiting 0	3
			5									0	5
	6.Other (if applicable)				CON	DITION CA	TEGORY G	RADE or S	CORE				
	applicable)		Rarely Limiti	ng			Occasiona	lly Limiting			Frequent	ly Limiting	
	Grade Total for the wa	ter qualit	3 tv compone	onts (max 15)	•	2			1			0	14
	ORE "RCI" = (P					+ BIOLOGI	CAL + WAT	ER QUALI	TY)/100				0.44
) /) 00 o	~~~~)
E. Impour	ndment Charact	erisics (a	ttach to aqu	uatic habitat	summary	/):					UCP-II) (2.89 a	cies)
		-	-			-	.						
Watershed	Area =					Snoreline	Perimeter: =	=	1,961		feet	-	
Impoundm		125,88		square feet		SDI (shore	eline dev. Ra	atio) =	1.559124			-	
(permanen	it pool)	2.89 acre	15										
Project Co	omments: alterr	atives po	ossible to a	ccomplish p	roject goa	als & lesse	en adverse i	mpacts or	n habitat				
												_	
												-	
												_	
												-	
												-	
												_	
Fish - If sa	mpled check met	thod:		seining;		dip-net;		electrofish	ning				

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Species

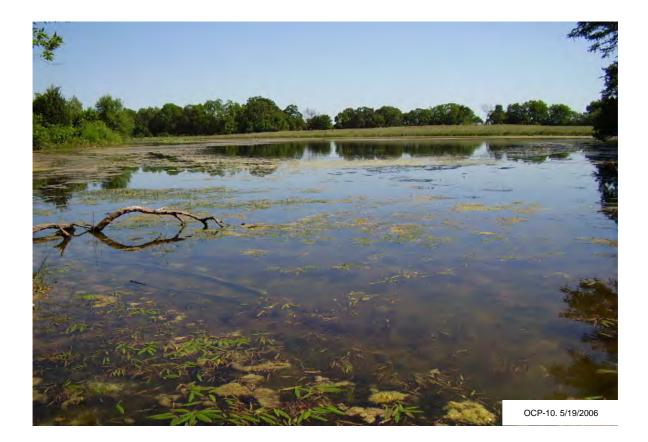
Other Aquatic/Semi-Aquatic Vertebrates:

T/E Species Known/Likely to Occur:

Mussels:

Record of Functional Assessment Results

Impoundme	ents/Reservoir F	unctional C	apacity Calculati	on					
Date:	5/18/2006								
Project:	Project: Lake Ralph Hall								
Location:	OCP-10 (2.89 a	acres)							
Circle One: Small Pond (<1 acre) Pond (>1<5 acres) Lake (>5 < 500 acres) Reservoir (>500 acres)									
Represented Acreage: 26.2 Total acreage of all impoundments represented by site									
Assessors: Holmes Voight Capps									
Project Status:	XPreproje	ct	Postproject						
				Multiplication					
Major Function Categories	Score	RCI	Acreage	Factor*	RC				
Physical Habitat	18								
Watershed/Management	-1								
Biological	13								
Water Quality	14								
Total Score	44	0.44	16.36	1.3	9.4				
*Multiplication Factors	Ref: Table A-2	of SJD Repo	rt included in Mitig	ation Plan App	pendix B				
Small Pond = 1.5			entative of 9 pond						
Pond = 1.3	pool totaling 16	.36 acres plu	is 4 ponds outside	conservation	pool				
Lake = 1.1	•	•	otal of ponds is 26						
Reservoir = 1.04	•		d/Management + Biolo		lity) / 100				
			iplication Factor		• /				



SWAMPIM DATASHEETS – PONDS PRE-PROJECT

Ponds (On-channel) >1 ≤5 acres: UP67

Impoundment Evaluation from Kansas Department of Wildlife and Parks, Subjective Evaluation of Aquatic Habitats Developed by : Kansas Department of Wildlife & Parks, Environmental Services Section (Revised 2004) with minor modifications to address conditions in North Central Texas

	uation		UP-67 Surrounde	ed by pastur	re. Few tree	es. WP	15	P69, 68		
PHYSICAL HAB										
THORACHAD										
1.Shoreline			CON	IDITION CA	TEGORY G	GRADE or SCOR	RE			
Development				f impoundm		ter of circle of ec	qual are			
<u> </u>	10		ligh > or = 2.5			1edium 1.5 - 2.4	-		1.0-1.4	
Grade	10	9	8 7	6	5	4	3	2	1	0
2.Average Depth			CON	IDITION CA	TEGORY C	GRADE or SCOR	RE			
Depth			> 10 feet		T	3 - 10 feet		- 3	3 feet	1
Grade	10	9	8 7	6	5	4	3	2	1	0
	· · ·									
3.Annual			CON	IDITION CA	TEGORY G	GRADE or SCOR	RE			
Storage Ratio										
	1 -			> 2			<	1		
Grade	5		4		3	2			1	0
					TECODYC					
4.Substrate			(select two pred			RADE or SCOR		score)		
	Boulder/Cobb	ble (>			(< 0.1")	Bedrock			ritus/Muck	r
Grade	5	,	4		3	2			1	0
			. ·		-	. –		1		. ~
5.Number of			CON	DITION CA	TEGORY G	GRADE or SCOR	RE			
substrate types in littoral zone					. <u> </u>					
	4 or n			s present		2 types pres	ent	1 type	present	
Grade	5	<u> </u>	4		3	2			1	0
C American of					TEOODY					
6.Amount of		:				RADE or SCOR				
Cover	(aquati Extensive		n, flooded timber, woody (Abundant (50-75%)		boulders, rocl e (25-50%)	k outcrops, overha Sparse (5-25		, U		ctures)
Grade	10	9	8 7	6	e (25-50%) 5	3parse (5-25	3	2	one (0-5%) 1	0
	10	3	0 1	0	5	4	5	2		0
7.Native			CON	DITION CA	TEGORY C	GRADE or SCOR	?F			
vegetation			00.							
buffer	> 50 m	neters	10 - 50 meters	5 - 10	meters		1 - 5 r	neters		None
Grade	5	j	4		3	2			1	0
8.Bank erosion			CON	IDITION CA	TEGORY G	SRADE or SCOR	RE			
					<u> </u>					
Orodo			v/little sloughing			n due to livestoc	ck		active erosi	
	5	5	4		erate erosio 3	n due to livestoo 2	ck		active erosi 1	on along 0
Total for the ph	5 nysical habit	; tat compo	4 onents (max 54.5)				ck			
Total for the ph	5 nysical habit	; tat compo	4 onents (max 54.5)				ck			
Grade Total for the ph WATERSHED L	5 nysical habit	; tat compo	4 onents (max 54.5) GEMENT KEY		3					
Total for the ph	5 nysical habit	; tat compo	4 onents (max 54.5) GEMENT KEY		3	2				
Total for the ph WATERSHED L	5 nysical habit	tat compo	4 onents (max 54.5) GEMENT KEY		3	2	RE			0 Other (I.e.
Total for the ph WATERSHED L 1.Management	5 Nysical habin AND USE A	tat compo	4 ments (max 54.5) GEMENT KEY CON		3 TEGORY G	2 GRADE or SCOR	RE		1	Other (I.e. harvest
Total for the ph WATERSHED L	5 Nysical habin AND USE A	tat compo	4 ments (max 54.5) GEMENT KEY CON		3 TEGORY G	2 GRADE or SCOR Downstream	RE		1	0 Other (I.e.
Total for the ph WATERSHED L 1.Management	5 Nysical habin AND USE A	tat compo	4 ments (max 54.5) GEMENT KEY CON		3 TEGORY G	2 GRADE or SCOR Downstream	RE		1	Other (I.e. harvest restrictions nuisance species
Total for the ph WATERSHED L 1.Management	5 Nysical habin AND USE A	tat compo	4 ments (max 54.5) GEMENT KEY CON		3 TEGORY G	2 GRADE or SCOR Downstream	RE		1	Other (I.e. harvest restrictions nuisance
Total for the ph WATERSHED L 1.Management Strategies	5 nysical habin AND USE A Fish fe	tat compo	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion	IDITION CA	3 TEGORY G	2 GRADE or SCOR Downstream augmentati	RE	Fish f	1 feeders	Other (I.e. harvest restrictions nuisance species
Total for the ph WATERSHED L 1.Management Strategies Grade	5 Nysical habin AND USE A	tat compo	4 ments (max 54.5) GEMENT KEY CON	IDITION CA	3 TEGORY G	2 GRADE or SCOR Downstream	RE	Fish f	1	Other (I.e. harvest restrictions nuisance species
Total for the ph WATERSHED L 1.Management Strategies Grade Total	5 nysical habin AND USE A Fish fe	tat compo ND MANA ences	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion +1	IDITION CA	3 TEGORY G rdowns +1	2 SRADE or SCOR Downstream augmentati +1	RE	Fish f	1 feeders	Other (I.e. harvest restrictions nuisance species
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La	5 nysical habin AND USE A Fish fe	tat compo ND MANA ences	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion	IDITION CA	3 TEGORY G rdowns +1	2 SRADE or SCOR Downstream augmentati +1	RE	Fish f	1 feeders	Other (I.e. harvest restrictions nuisance species
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal	5 nysical habin AND USE A Fish fe	tat compo ND MANA ences	4 onents (max 54.5) IGEMENT KEY CON Livestock exclusion +1 e extent of land use in	IDITION CA	3 TEGORY G rdowns +1 m watershe	2 GRADE or SCOR Downstream augmentati +1 ed)	RE flow ion	Fish f	1 feeders	Other (I.e. harvest restrictions nuisance species
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land	5 nysical habin AND USE A Fish fe +' and Uses (D	tat compo ND MANA ences	4 onents (max 54.5) GEMENT KEY CON Livestock exclusion +1 e extent of land use in CON	IDITION CA	3 TEGORY G rdowns +1 m watershe TEGORY G	2 GRADE or SCOR Downstream augmentati +1 ed) GRADE or SCOR	flow ion	Fish f	1 ieeders +1	Other (I.e. harvest restrictions nuisance species control, etc
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal	5 nysical habin AND USE A Fish fe +' and Uses (D	tat compo NND MANA ences	4 onents (max 54.5) IGEMENT KEY CON Livestock exclusion +1 e extent of land use in	IDITION CA Draw the upstrea IDITION CA	3 TEGORY G rdowns +1 m watershe TEGORY G	2 GRADE or SCOR Downstream augmentati +1 ed) GRADE or SCOR	flow ion RE	Fish f	1 ieeders +1	Other (I.e. harvest restrictions nuisance species control, etc
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses	5 nysical habin AND USE A Fish fe +' and Uses (D) Ungrazed r	tat compo tat compo ND MANA ences 1 escribe the native vegeta ire	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion +1 e extent of land use in CON ation (I.e. woodlands, nat	IDITION CA Draw the upstrea IDITION CA tive grass, we Corr	3 TEGORY G downs +1 TEGORY G TEGORY G	2 SRADE or SCOR Downstream augmentati +1 ed) SRADE or SCOR d grazing practices	flow ion RE	Fish f	1 reeders +1	Other (I.e. harvest restrictions nuisance species control, etc
Total for the ph WATERSHED L 1.Management Strategies Grade 2. Watershed La 2a.Minimal impact land uses Grade	5 nysical habin AND USE A Fish fe triand Uses (D Ungrazed r Enti	tat compo tat compo ND MANA ences 1 escribe the native vegeta ire	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion +1 e extent of land use in CON ation (I.e. woodlands, nat Abundant	IDITION CA Draw the upstrea IDITION CA tive grass, we Corr	3 TEGORY G downs +1 TEGORY G ttlands), good nmon	2 SRADE or SCOR Downstream augmentati +1 ed) SRADE or SCOR d grazing practices Moderate	flow ion RE	Fish f	1 reeders +1 o excellent cc	Other (I.e. harvest restrictions nuisance species control, etc
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade 2b.Significant	5 nysical habin AND USE A Fish fe triand Uses (D Ungrazed r Enti	tat compo tat compo ND MANA ences 1 escribe the native vegeta ire	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion +1 e extent of land use in CON ation (I.e. woodlands, nal Abundant +4	IDITION CA Draw Draw the upstrea	3 TEGORY G rdowns +1 im watershe TEGORY G etlands), good nmon +3	2 SRADE or SCOR Downstream augmentati +1 ed) SRADE or SCOR d grazing practices Moderate	RE flow ion RE	Fish f	1 reeders +1 o excellent cc	Other (I.e. harvest restrictions nuisance species control, etc
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade 2b.Significant impact land	5 nysical habin AND USE A Fish fe t+' and Uses (D) Ungrazed r Enti +5	tat compo tat compo ND MANA ences 1 escribe the native vegeta ire 5 Poor grazin	4 ments (max 54.5) GEMENT KEY CON Livestock exclusion +1 e extent of land use in CON ation (I.e. woodlands, nat Abundant +4 CON g practices, cropland w/	IDITION CA Draw Draw IDITION CA IDITION CA IDITION CA fair to poor cc	3 TEGORY G vdowns +1 TEGORY G that is a second	2 SRADE or SCOR Downstream augmentati +1 ed) SRADE or SCOR d grazing practices Moderate +2 SRADE or SCOR practices, urban, in	RE flow ion RE s, croplan RE RE dustrial,	Fish f	1 feeders +1 o excellent cc arse +1 I, residential.	Other (I.e. harvest restrictions nuisance species control, etc
Total for the ph WATERSHED L 1.Management Strategies Grade Total 2. Watershed La 2a.Minimal impact land uses Grade 2b.Significant	5 nysical habin AND USE A Fish fe triand Uses (D Ungrazed r Enti	tat compo tat compo ND MANA ences 1 escribe the native vegeta ire 5 Poor grazin ire	4 onents (max 54.5) IGEMENT KEY CON Livestock exclusion +1 e extent of land use in CON ation (I.e. woodlands, nat Abundant +4 CON	IDITION CA Draw the upstrea IDITION CA tive grass, we Con tive grass, we IDITION CA fair to poor cc Con	3 TEGORY G rdowns +1 TEGORY G etlands), good nmon +3 TEGORY G	2 GRADE or SCOR Downstream augmentati +1 ed) GRADE or SCOR Moderate +2 GRADE or SCOR	RE flow ion RE s, croplan RE RE dustrial,	Fish f	1 feeders +1 o excellent cc varse +1	Other (I.e. harvest restrictions nuisance species control, etc

1.Fish characteristics			CONDITIO	ON CATEGORY or exotic fish do	GRADE or SCO	ORE			
characteristics	High quality sport	Pan & preda		or exotic fish do	minant Score I	S -5)	Minnouvo	/roughfish	No fish
Crodo	10 9	8	7	6 5	nfish/roughfish	3	2	1	NO IISH
Grade	10 9	8	1	6 D	4	3	Z	I	U
2.Aquatic			CONDITIC	ON CATEGORY	GRADE or SCO	JBE			
insects			CONDITIO	NOATLOOKT					
	> 3 orde	rs present			1 -3 orders	present			None
Grade	5	4		3	2	procont		1	0
					_				-
3.Mollusc/			CONDITIO	ON CATEGORY	GRADE or SCO	ORE			
Crayfish									
. Γ	Common	/Abundant		Sparse	None	е	Zebra	a mussels p	oresent
Grade	3	2		1	0			-5	
4.Other									
aquatic/semi-			CONDITIO	ON CATEGORY	GRADE or SCO	ORE			
aquatic							-		
vertebrates		/Abundant		Sparse	None	е	1	Nutria prese	ent
Grade	3	2		1	0			-5	
	logical components								
WATER QUALIT	Y COMPONENT KEY	•							
-			CONDITIO	ON CATEGORY					
1.DO/BOD			CONDITIC	JN CATEGORT	GRADE OF SCO	JRE			
	Rarely Limitir	na		Occasion	ally Limiting			Frequent	ly Limiting
Grade	3	19		2		1			0
Olddo	0	1		-					•
2.Nutrient			CONDITIC	ON CATEGORY	GRADE or SCO	ORF			
enrichment									
, F	Rarely Limitir	ng		Occasior	ally Limiting			Frequent	ly Limiting
Grade	3			2		1			0
3.Pesticides			CONDITIO	ON CATEGORY	GRADE or SCO	ORE			
<u> </u>	Rarely Limitin	ng			ally Limiting				tly Limiting
Grade	3			2		1			0
_									
4.Turbidity			CONDITIC	ON CATEGORY	GRADE OF SUC	JKE			
_ F	Rarely Limitir	na		Occasion	ally Limiting			Frequent	ly Limiting
Grade	3	·9		2		1			
0.000	5							1	~
			CONDITIC	ON CATEGORY	GRADE or SCO	ORE			
5.Temperature									
, F	Rarely Limitir	ng		Occasior	ally Limiting			Frequent	ly Limiting
	3			2		1		1 1	0
Grade					•				
Grade									
6.Other (if			CONDITIC	ON CATEGORY	GRADE or SCO	ORE			
			CONDITIC			ORE			
6.Other (if applicable)	Rarely Limitir	ng	CONDITIO	Occasior	GRADE or SCO				ly Limiting
6.Other (if applicable) Grade			CONDITIO			ORE 1			tly Limiting 0

E. Impoundment Characterisics (attach to aquatic habitat summary):

Watershed Area =			Shoreline Perimeter: =	1,610	feet
Impoundment Area = (permanent pool)	139,392 3.2 acres	square feet	SDI (shoreline dev. Ratio) =	1.216472	
Project Comments: alter	natives possible	to accomplish project	t goals & lessen adverse impacts o	on habitat	

Fish - If sampled check method: ______seining; ______dip-net; _____electrofishing

Species

Other Aquatic/Semi-Aquatic Vertebrates:

T/E Species Known/Likely to Occur:

Mussels:

Record of Functional Assessment Results

Impoundme	ents/Reservoir F	Functional C	apacity Calculati	on	Impoundments/Reservoir Functional Capacity Calculation								
Date:	5/18/2006												
Project:	Lake Ralph Hal	I											
Location: UP-67 (3.2 acres)													
Circle One: Small Pond (<1 acre) Pond (>1<5 acres) Lake (>5 < 500 acres) Reservoir (>500 acres)													
Represented Acreage: 26.2 Total acreage of all impoundments represented by site													
Assessors:													
Project Status:X_PreprojectPostproject													
				Multiplication									
Major Function Categories	Score	RCI	Acreage	Factor*	RC								
Physical Habitat	9												
Watershed/Management	-3												
Biological	6												
Water Quality	4												
Total Score	16	0.16	16.36	1.3		3.4							
*Multiplication Factors	Ref: Table A-2	of SJD Repo	rt included in Mitig	ation Plan App	oendix B								
Small Pond = 1.5	Note: UP-37 is	one represer	ntative of 9 ponds	within LRH cor	nservation								
Pond = 1.3		•	Is 4 ponds outside										
Lake = 1.1	•	•	otal of ponds is 26		-								
Reservoir = 1.04	RCI Formula (Phys	ical + Watershe	d/Management + Biolo	gical + Water Qua	lity) / 100								
			iplication Factor	-									





SWAMPIM DATASHEETS – PONDS PRE-PROJECT

Lake (On-channel) >5 <500 acres: OCP17

Impoundment Evaluation from Kansas Department of Wildlife and Parks, Subjective Evaluation of Aquatic Habitats Developed by : Kansas Department of Wildlife & Parks, Environmental Services Section (Revised 2004) with minor modifications to address conditions in North Central Texas

Impoundment Habitat Evaluation OCP-17 (>5 <500 acres)

SCORE

PHYSICAL HABI	TAT KEY					
4 Ohanaliaa		001				
1.Shoreline Development			DITION CATEGORY G		20	
Development		ligh > or = 2.5	f impoundment/perimet	ledium 1.5 - 2.4	Low 1.0-1.4	
Grade	10 9	8 7	6 5	4 3	2 1	0
enddo		, , ,	ů ů		ļ <u>-</u> ļ ·	· · · ·
2.Average		CON	DITION CATEGORY G	RADE or SCORE		
Depth						
		> 10 feet		3 - 10 feet	< 3 feet	
Grade	10 9	8 7	6 5	4 3	2 1	0
3.Annual		CON	DITION CATEGORY G	RADE or SCORE		
Storage Ratio						
<u> </u>	1 - 2		2		<1	
Grade	5	4	3	2	1	0
-		CON	DITION CATEGORY G			
4.Substrate			ominant types in littoral		score)	
ŀ	Boulder/Cobble	Gravel	Sand (< 0.1")	Bedrock	Mud/Detritus/Muck	
Grade	5	4	3	2	1	0
						• •
5.Number of substrate types		CON	DITION CATEGORY G	RADE or SCORE		
in littoral zone						
	4 or more		present	2 types present	1 type present	
Grade	5	4	3	2	1	0
6.Amount of			DITION CATEGORY G			
6.Amount of Cover	(aquatia vagatatia				vegetation, man-made stru	(cturee)
Cover	Extensive (>75%)	Abundant (50-75%)	Moderate (25-50%)	Sparse (5-25%)	Little or none (0-5%)	iciules)
Grade	10 9	8 7	6 5	4 3	2 1	0
	10 0	ů i	ů ů	- 0		- °
7.Native		CON	DITION CATEGORY G	RADE or SCORE		
vegetation						
buffer	> 50 meters	10 - 50 meters	5 - 10 meters	1 - 5	meters	None
Grade	5	4	3	2	1	0
_						
8.Bank erosion		CON	DITION CATEGORY G	RADE or SCORE		
	01414	And the state of the state		P	0	
Grade	5 Stable banks	v/little sloughing	3	n due to livestock 2	Severe active eros	on along 0
	/sical habitat compo	4 nonte (may 54 5)	3	2	1 1	0
	AND USE AND MANA					_
		CON	DITION CATEGORY G	RADE or SCORE		
1.Management	Fish fences	Livestock exclusion	Drawdowns	Downstream flow	Fish feeders	Other (I.e.
Strategies				augmentation		harvest restrictions,
Strategies						nuisance
						species
						control, etc)
- ·						
Grade	+1	+1	+1	+1	+1	
Total	ad Haaa (Daardina ii	and address to a set of the				
 vvatershed Lar 	na Uses (Describe the	extent of land use in the	e upstream watershed)			
2a.Minimal		CON	DITION CATEGORY G			
impact land	Ungrazed pative veget				and w/ good to excellent c	onservation
uses	Entire	Abundant	Common	Moderate	Sparse	None
Grade	+5	+4	+3	+2	+1	0
2b.Significant		CON	DITION CATEGORY G	RADE or SCORE		
impact land	Poor grazi	ng practices, cropland w/ f			I, commercial, residential.	
uses	Entire	Abundant	Common	Moderate	Sparse	None
Grade	-5	-4	-3	-2	-1	0
	tershed/managemen	t (max 10)				
BIOLOGICAL CO	MPONENT KEY					
1.Fish			DITION CATEGORY G			
characteristics			oblem or exotic fish don		1	
0	High quality sport	Pan & predaceous		nfish/roughfish	Minnows/roughfish	No fish
Grade	10 9	8 7	6 5	4 3	2 1	0

	2.Aquatic insects		CC	NDITION CATEGORY G	RADE or SCORE			
	Grade	> 3 orders 5	present 4	3	1 -3 orders present 2	1	None 0	5
		5					0	5
	3.Mollusc/ Crayfish		CC	NDITION CATEGORY G	RADE or SCORE			
	Grade	Common/A 3	Abundant 2	Sparse 1	None 0	Zebra mussels p -5	resent	3
	4.Other aquatic/semi-	-		NDITION CATEGORY G				-
	aquatic vertebrates	Common/A		Sparse	None	Nutria prese	ent	
	Grade	3 logical components (r	2	1	0	-5		1
D	. WATER QUALIT	Y COMPONENT KEY	nax 21)					18
	1.DO/BOD		CC	NDITION CATEGORY G	RADE or SCORE			
		Rarely Limiting		Occasiona	ally Limiting	Frequent	ly Limiting	
	Grade	3		2	1		0	3
	2.Nutrient		CC	NDITION CATEGORY G	RADE or SCORE			
	enrichment	Rarely Limiting		Occasiona	ally Limiting	Frequent	ly Limiting	
	Grade	3		2	1	1104001	0	2
	3.Pesticides		CC	NDITION CATEGORY G	RADE or SCORE			
		Rarely Limiting			ally Limiting	Frequent	ly Limiting	
	Grade	3		2	1		0	3
	4.Turbidity		CC	NDITION CATEGORY G	RADE or SCORE			
	Grade	Rarely Limiting 3		Occasiona 2	ally Limiting	Frequent	ly Limiting	2
	Glade	3			· · ·		0	2
	5.Temperature		CC	NDITION CATEGORY G	RADE or SCORE			
		Rarely Limiting			ally Limiting	Frequent	ly Limiting	
	Grade	3		2	1		0	2
	6.Other (if applicable)		CC	NDITION CATEGORY G	RADE or SCORE			
		Rarely Limiting			ally Limiting		ly Limiting	
	Grade	3 ter quality component	s (may 15)	2	1		0	3 15
TOTAL S	CORE "RCI" = (PI	IYSICAL + WATERSHI	ED/MANAGEMENT	+ BIOLOGICAL + WATE	R QUALITY)/100).54
<u>E. Impou</u>	Indment Characte	risics (attach to aquat	ic habitat summar	<u>y):</u>		Impoundment Habitat	Evaluation OCP	-17
Watershe	d Area =			Shoreline Perimeter: =	4,877	feet	_	
Impoundm	nent Area =	395,506	square feet	SDI (shoreline dev. Ra	tio) = 2.187618	3		
(permane		7.98 acres			<u></u>		_	
Project C	omments: altern	atives possible to acco	omplish project go	als & lessen adverse im	pacts on habitat			
		•					_	
							_	
							_	
							-	
							-	
							-	
							- - -	
				die ooste			- - -	
Fish - If sa Species	ampled check met	10d:	seining;	_dip-net;	electrofishing		-	
	ampled check met	nod:s	seining;	dip-net;	electrofishing		- - -	
	ampled check met	10d:s	seining;	dip-net;	electrofishing		- - - -	
	ampled check met	10d:	seining;	dip-net;	electrofishing		- - - -	
	ampled check met	nod:s	seining;	dip-net;	electrofishing		- - - -	

Other Aquatic/Semi-Aquatic Vertebrates:

Mussels:

T/E Species Known/Likely to Occur:

Record of Functional Assessment Results

Impoundme	ents/Reservoir F	unctional C	apacity Calculati	on	Impoundments/Reservoir Functional Capacity Calculation								
Date:	5/17/2006												
Project:	Lake Ralph Hal	l											
Location: OCP-17 (7.98 acres)													
Circle One: Small Pond (<1 acre) Pond (>1<5 acres) Lake (>5 < 500 acres) Reservoir (>500 acres)													
Represented Acreage: 31.78 Total acreage of all impoundments represented by site													
Assessors:	Holmes Voight	Capps											
Project Status:	XPreproje	ct	Postproject										
,,,,,,,,													
Multiplication													
Major Function Categories	Score	RCI	Acreage	Factor*	RC								
Physical Habitat	23												
Watershed/Management	-2												
Biological	18												
Water Quality	15												
Total Score	54	0.54	31.78	1.1		18.9							
*Multiplication Factors	Ref: Table A-2	of SJD Repo	rt included in Mitig	ation Plan App	pendix B								
Small Pond = 1.5	Note: OCP-17 i	s representa	tive of 2 ponds wit	hin LRH conse	ervation								
Pond = 1.3	pool totaling 31	.78 acres; no	ponds outside co	onservation poo	ol								
Lake = 1.1	•		total of ponds is 3										
Reservoir = 1.04	•		d/Management + Biolo		ality) / 100								
			iplication Factor	-	- /								



SWAMPIM DATASHEETS – PONDS PRE-PROJECT

No OCPs > 500 Acres

APPENDIX D

LETTER DATED MARCH 24, 2015 FROM EPA TO USACE CONCURRING USE OF SWAMPIM AS FUNCTIONAL ASSESSMENT PROTOCOL FOR LAKE RALPH HALL



ENVIRONMENTAL PROTECTION AGENCY

Region 6, Dallas, Texas

March 24, 2015

Chandler Peter, Permits Section Regulatory Branch Fort Worth District U.S. Army Corps of Engineers P.O. Box 17300 Fort Worth, Texas 76102-0300

Dear Mr. Peter:

The Environmental Protection Agency (EPA) Region 6 has reviewed the February 9, 2015, Lake Ralph Hall Functional Assessment Comparisons Document. This document provides a comparison of two stream function assessment methods. These methods are the Texas Rapid Assessment Method, Wetlands and Streams Modules (TXRAM) and the StreamWatershed Assessment and Measurement Protocol Interaction Model for Streams and On-Channel Impoundements (SWAMPIM). Historically, the SWAMPIM method was used as a functional assessment protocol to quantify the potential impacts to unique aquatic systems affected by the proposed Lake Ralph Hall Project. At the time this was developed, there were no other functional assessment models. In October, 2010, the USACE Fort Worth District released the final draft of TXRAM. Based upon our review, EPA offers the following comment:

Both methods are comparable and examine essentially the same major and specific stream functions. The side-by-side comparison shows that the TXRAM and SWAMPIM Specific Stream Functions and Comparable Metrics overlap one another. However, the SWAMPIM functional assessment examines in more detail the stream conditions. Because SWAMPIM has already been used to assess the potential impacts to the Lake Ralph Hall Project, it is EPA's opinion that SWAMPIM should be used instead of TXRAM.

Thank you for the opportunity to comment on this document. If you have any questions regarding this comment, please contact me at 214-665-7576.

Sincerely,

Donna Mullins Wetlands Section

Cc: Tom Heger, TPW Sid Puder, USFW Robert Hansen, TCEQ

APPENDIX E

DESCRIPTION OF TYPICAL IN-STREAM STRUCTURES

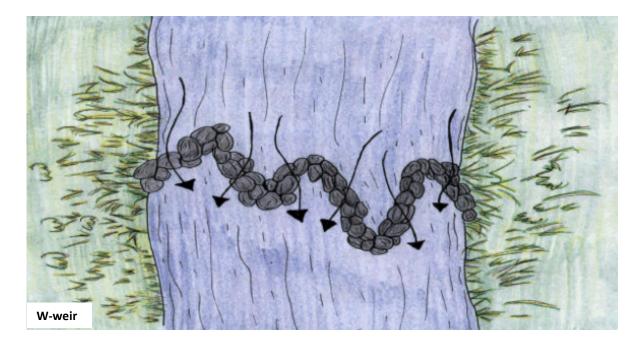
EXAMPLES OF TYPICAL IN-STREAM STRUCTURES

In-stream Structures – In-stream structures may be utilized to provide some reduction in hydraulic forces such as near-bank slope, velocity, velocity gradient, stream power, and shear stress, thus reducing erosion and providing some measure of stability. This reduction would enable the stream systems to create some variation in the channel bed form (i.e., diversify the substrate material) and induce depositional zones where natural recruitment of vegetation could occur. These structures would also provide instream habitat for aquatic organisms. Typical structures selected for use would include:

J-hook vanes: The J-hook vane is an upstream directed, sloping structure that can be composed of wood or rock material. J-hook vanes are buried in the outside bank to create a fixed point, and the vane and "hook" portion of the structure lie in the outer approximately two-thirds of the channel bed width. The structure is used as a method to reduce bank erosion by reducing the near-bank hydraulic forces and redirecting them to the center of the channel. Any J-hook vanes would be added in outside meander bends.



W-weirs: The W-weir gets its name from the "W" shape it has when looking in planview in the downstream direction. Both sides of the W-weir are directed from the bank upstream toward the bed. The outside vane arms rise from the channel bottom to intercept the banks at the ordinary high water mark. The crest of the weir rises in the downstream direction to the center of the channel and occupies one-half the channel width; the outside arms occupy one-fourth of the channel width on either side of the crest. W-weirs force two scour pools inside the vane arms and reduce velocity in the near-bank areas. These structures are intended for straighter stream reaches in over-widened channel bottoms.



Cross vanes: The cross vane is a grade control structure that also decreases near-bank hydraulic forces and increases the energy in the center of the channel, maintaining a scour pool. Cross vanes are built very similarly to W-weirs and used for the same purpose. W-weirs are better applied in wider river/stream cross sections; cross vanes are better applied in narrower cross sections.







Rock/log vanes: Vanes made of natural material are used along streambanks for stabilization, shade, detritus, and other habitat benefits. They can also reduce erosion for transplanted vegetation up- and downstream of the structure.



The structures would be constructed using locally available material to the extent available and practical, specifically using native bois d'arc trees and other woody material. The minimum diameter of tree desired for in-channel structures is 10 inches, although detailed design may result in a method that can incorporate numerous smaller trees in one structure. Structure length and spacing is based on appropriate pool-to-pool spacing, as structures tend to force pool creation.

Structure selection and placement within the stream channels located within the aquatic resources mitigation boundary would occur during detailed design.

APPENDIX F

ROBERT J. BRANDES CONSULTING

TECHNICAL MEMORANDUM: ANALYSIS OF FLOOD FLOWS FOR REVISED NORTH SULPHUR RIVER RESTORED CHANNEL



TECHNICAL MEMORANDUM

- To: Loretta Mokry Tim Noack Alan Plummer Associates, Inc.
- Copy: Ed Motley, P.E. CH2M

Larry Patterson, Deputy Executive Director Upper Trinity Regional Water District

From: Bob Brandes, P.E., Ph.D. Michelle Evans, P.E.



Subject: Analysis of Flood Flows for Revised North Sulphur River Restored Channel

Date: August 11, 2017

As requested, to support the mitigation plan for the restored channel of the North Sulphur River that is to be located on the south floodplain downstream of Lake Ralph Hall dam, we have undertaken a hydrologic/hydraulic analysis of the revised alignment and geometry for the restored channel. This study has involved the determination of peak flood flows, depths and velocities at selected locations along the revised alignment of the restored channel for a range of flood events.

For this work, an initial design cross section for the restored channel was provided by Alan Plummer Associates (APA) along with details regarding the channel slope and grade breaks. The restored channel alignment and tributary routing used in this analysis were provided by APA electronically in GIS format on June 28, 2017. Additional information describing vegetative cover projected for the watershed of the restored channel was provided by APA on August 5, 2017, followed with updated tributary sub-basin boundaries and vegetative cover refinements that were finalized on August 8, 2017. It is recognized that based on the results from this study, APA may determine that modifications to the initial design cross section and channel grade or alignment may be required to more effectively achieve the operational goals for the aquatic and terrestrial ecosystems supported with the restored channel and that additional hydrologic/hydraulic analyses may be required.

While a similar flood flow analysis of the restored channel was performed back in 2008 based on the design and alignment envisioned at that time, the currently-revised restored channel requires updates and modifications for watershed delineations, drainage areas, and various hydrologic parameters needed to effectively model runoff and flood hydraulics. In this current study, the U.S Army Corps of Engineers (Corps) Hydrologic Modeling System (HMS) model has been used for performing the flood runoff and hydrograph simulations, and the Corps' unsteady HEC River

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Analysis System (RAS) model has been applied to route the HMS flood flows through the restored channel taking into account the attenuation effects of channel storage.

The development of the input parameters used in the hydrologic and hydraulic flood modeling and a summary of the flood modeling results are presented in the following sections.

HMS FLOOD FLOW MODELING

Drainage Areas

The revised alignment of the restored channel was segmented into reaches defined primarily by tributary inflow points. Sub-basin watersheds for each tributary and the intervening areas then were delineated using GIS procedures with the UTRWD's 2-foot digital elevation contours in the vicinity of the Lake Ralph Hall dam, recent aerial photographs of the project area, and U.S. Geological Survey (USGS) digital topographic maps. A total of 10 sub-basins have been delineated, identified either as "tributary" sub-basins associated with each of the four primary tributaries that discharge into the restored channel from the south or as "channel" sub-basins for the four intervening watersheds and the two terminal watersheds. These sub-basins are shown on the aerial map of the area in Exhibit 1 following this memo. Drainage areas for these sub-basins are listed in Table 1. As shown, a total of 1,976 acres contribute runoff and inflows to the more than 19,000 feet of the restored channel from its headwaters just below the Lake Ralph Hall dam downstream to its confluence with the North Sulphur River.

Sub-Basin	Drainage Area (acres)	Curve Number	Time of Concentration (hours)	Lag Time (hours)
Channel 1	39	79	1.48	0.89
Channel 2	85	61	1.07	0.64
Channel 3	42	75	1.39	0.83
Channel 4	27	79	1.63	0.98
Channel 5	19	79	0.91	0.54
Channel 6	85	78	1.22	0.73
Tributary 1	255	78	1.21	0.72
Tributary 2	520	77	1.01	0.60
Tributary 3	342	72	0.94	0.56
Tributary 4	494	80	0.78	0.47
Tributary 5	39	79	1.49	0.90
Tributary 6	29	79	1.45	0.87
Total	1,976			

Table 1 – Sub-Basin Hydrologic Parameters

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SCS Curve Numbers

The curve number method developed by the U.S. Soil Conservation Service (SCS, now the Natural Resources Conservation Service, NRCS) was used to account for infiltration losses and surface retention associated with runoff from the sub-basin watersheds. For application of this method, information on soil runoff and infiltration characteristics and land cover is needed to establish the curve numbers that relate storm rainfall amount to runoff volume. Hydrologic soil types were determined for the entire drainage area of the restored channel using the NRCS soil classification database¹. The hydrologic soil groups (HSGs) for the watershed are shown on the aerial in Exhibit 2. Projected land use or vegetative cover information for the entire drainage area of the restored channel and its tributaries was developed by APA through discussions with RJB personnel, and this information is shown on the map in Exhibit 3. An Excel spreadsheet procedure was used to perform the area-weighted calculations necessary to determine the overall curve number value for each of the sub-basins taking into account overlays of hydrologic soil types and vegetative cover.

In the previous 2008 study, a single curve number value of 79 corresponding to normal antecedent moisture conditions was used for modeling runoff from the entire restored channel watershed. For this current study, curve numbers have been determined for each sub-basin, providing a better representation of variations in runoff conditions. Table 1 includes these curve numbers for all of the sub-basins.

Times of Concentration

The time of concentration (t_c) for each sub-basin, which relates to the time for runoff to travel overland from the most-upstream point of a sub-basin to its most-downstream outlet, have been determined using the Kerby-Kirpich method. In the 2008 study, the time of concentration was calculated using the SCS TR-55 method; however, now the Texas Department of Transportation's hydraulic design manual recommends that the Kerby-Kirpich method be used for estimating the time of concentration for watersheds in rural areas. The manual notes that the Kerby-Kirpich method is preferable since it requires comparatively few input parameters and produces time of concentration estimates consistent with values derived from real-world storms and runoff hydrographs.

The lag time for each sub-basin was calculated by multiplying the time of concentration value by 0.6, a standard SCS procedure. The resulting values for the time of concentration and the corresponding lag times also are summarized in Table 1. An Excel spreadsheet procedure was used to perform the calculations of the time of concentration and lag time for each sub-basin.

Rainfall Distribution

As in the 2008 study, the frequency storm method available in the HMS model has been used to temporally distribute precipitation amounts over a specified storm duration. The frequency storm method uses statistical data to produce balanced storms with a specific exceedance probability. For the frequency storm method, an empirical factor is built in to the HMS model for converting

¹ https://websoilsurvey.sc.egov.usda.gov

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partial-duration series to annual series for the 2-, 5- and 10-year storm events, but this factor is not included for the 1-year storm event. Therefore, the 2-year factor was also used for the 1-year storm event. For the 25-, 50-, and 100-year storm events, no conversion is needed.

Consistent with the analyses previously undertaken in 2008, the 3-hour storm duration has been used in this study for simulating watershed runoff and flood flows. Based on the times of concentration for the different sub-basins presented in Table 1 and normal channel velocities for the range of flood events being analyzed, the 3-hour duration has been determined to be appropriate. This duration is sufficiently long to allow peak flood flows to be generated for each of the sub-basins and for these flows to travel down the length of the restored channel. With an assumed channel velocity of 4 feet per second (fps), the time required for the peak flood flow to travel from the upstream end of the restored channel to its outlet at the confluence with the North Sulphur River is a little more than an hour. Hence, considering this travel time estimate together with the longest times of concentration for the sub-basins, the 3-hour storm duration is appropriate.

Rainfall Depths

For the 2008 study, rainfall depths were obtained from the U.S. Weather Bureau's Technical Paper No. 40 (TP-40) and from the National Oceanic and Atmospheric Administration's Technical Memorandum NWS HYDRO-35. Since then, revised precipitation depths have been developed for Texas and are provided in the USGS Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas – Scientific Investigations Report 2004-5041. This report contains rainfall depths for storm durations of 15 minutes and 1, 2, 3, 6, 12, and 24 hours for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events. Additional rainfall data for a 5-minute storm duration and a 1-year storm of 1, 2, 3, 6, 12, and 24-hour durations also were obtained from the HYDRO-35 and TP-40 reports, respectively. The rainfall depths compiled from these different sources for different storm durations and frequencies are summarized in Table 2.

Storm		Storm Duration								
Frequency	5-min.	15-min.	1-hour	2-hour	3-hour	6-hour	12-hour	24-hour		
1-year			1.60	1.90	2.05	2.40	2.90	3.30		
2-year	0.50	1.02	1.74	2.11	2.34	2.74	3.19	3.69		
5-year	0.57	1.30	2.22	2.71	3.02	3.57	4.20	5.10		
10-year	0.63	1.49	2.55	3.12	3.48	4.30	5.10	6.30		
25-year	0.72	1.73	2.98	3.66	4.10	5.10	6.10	7.70		
50-year	0.79	1.96	3.40	4.18	4.67	5.90	7.10	9.00		
100-year	0.86	2.17	3.81	4.70	5.26	6.60	8.10	10.50		

Table 2 – Rainfall Depths for Different Storm	Frequencies and Durations
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Runoff Hydrographs

As in the 2008 study, the Snyder Unit Hydrograph (SUH) method has been used to develop runoff hydrographs for specified rainfall events, thereby providing a common basis for comparison of results. The method was initially adopted because of its use by the Corps for developing flood inflow hydrographs for Lakes Jim Chapman and Wright Patman, both of which are located in the Sulphur Basin. The Snyder peaking coefficient $C_p = 0.5469$ was adopted from the earlier hydrologic analyses of sub-basins in the Lake Ralph Hall watershed. This value originated from analyses performed by the Corps during studies of Lake Jim Chapman.

HMS Peak Flood Flow Results

The resulting peak flood flows as simulated with the HMS model for each of the sub-basins and as combined at key junctions along the reach of the restored channel are summarized in Table 3 below for different flood frequencies, all for 3-hour storm durations. As expected, these peak flood flows increase from junction to junction in the downstream direction along the restored channel as flood inflows enter from adjacent sub-basins. As noted, for the 100-year flood event, the peak flood flow in the restored channel increases from about 140 cfs for the Channel 6 sub-basin at the upstream end to about 3,400 cfs at the downstream end at Junction 1.

HYDROLOGIC ELEMENT	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Channel 6	18	24	49	69	93	116	139
Tributary 4	167	215	436	596	796	981	1,169
Junction 6	183	234	474	650	871	1,075	1,285
Channel 5	5	7	14	20	26	32	39
Junction 5	188	241	487	669	897	1,107	1,323
Tributary 3	50	66	162	239	341	439	543
Channel 4	5	7	14	19	25	31	37
Junction 4	239	307	654	913	1,241	1,549	1,870
Tributary 2	118	152	327	460	627	784	947
Channel 3	6	8	19	27	37	47	57
Tributary 5	8	10	20	28	38	47	56
Junction 3	367	472	1,002	1,406	1,919	2,401	2,899
Tributary 1	55	71	149	207	281	350	421
Channel 2	2	4	15	26	41	57	75
Tributary 6	6	8	16	22	29	36	43
Junction 2	425	547	1,172	1,642	2,238	2,804	3,395
Channel 1	8	10	21	29	39	48	58
Junction 1	432	555	1,189	1,666	2,271	2,841	3,440

Table 3 – Summary of 3-Hour Storm Peak Flood Flows for Different Flood Frequencies
for Sub-basins and Junctions from HMS Model Simulations

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UNSTEADY RAS FLOOD ROUTING

Flood Routing Procedure

The individual flood hydrographs for each of the sub-basins simulated with the HMS model were input to the unsteady HEC-RAS model at their respective locations (channel sections) for routing and combining along the length of the restored channel and for calculating channel hydraulics. This procedure was used for each of the different flood events simulated with the HMS model. The unsteady RAS model is a dynamic wave model that accounts for flow attenuation due to channel storage as flood flows enter a watercourse and move downstream. For this application, the unsteady RAS model was operated for each flood event to simulate time-varying flows, depths and velocities at sequential cross sections located along the entire length of the restored channel.

Initial Design Cross Section

The flood routing approach used in the HEC-RAS modeling requires definition of the channel geometry along the entire length of the restored channel. For this purpose, it has been assumed that a single design cross section could be used to effectively represent the restored channel along its entire length. Even though APA's initial plans call for considerable variation in the geometry of the restored channel, including approximately 75 shallow pools with depths of ~3 feet and approximately 75 deeper pools with depths of ~7 feet, all connected with intervening shallow riffle reaches, it is anticipated that the deeper portions of these pools will not be particularly significant with regard to the conveyance of flood flows. The intervening shallow riffle reaches, being only a foot or so deep, will likely have a controlling influence on conveyance capacity. Hence, it is believed that assuming a single cross section configuration, tailored to generally represent the proposed channel conditions, for the entire restored channel should provide meaningful and realistic results in terms of channel hydraulics.

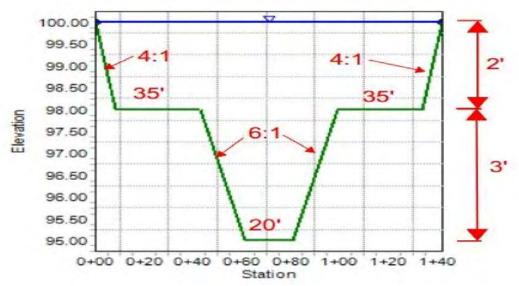
The initial design cross section for the restored stream channel as provided by APA is depicted in Figure 1. It includes a trapezoidal low-flow channel with a 20-foot bottom width, a 3-foot depth and 6:1 side slopes. For higher flows, there is an upper section with 35-foot horizontal overbanks on each side and 4:1 side slopes that extend high enough to contain the 100-year flood (even though the height of these side slopes as shown in Figure 1 is only 2.0 feet, they will be extended as necessary up to the 100-flood level).

According to APA, the proposed channel slope is to be 0.001 feet per foot, or 0.1 percent. As an initial design, the proposed flowline at the upstream end of the channel is set at elevation 498.0 feet², and the target elevation at the downstream end near the confluence with the North Sulphur River is set at 468.8 feet. The combination of the proposed channel slope and the terminal flowline elevations requires that grade control structures be installed at multiple locations along the length of the restored channel. Conceptually, these structures will be one-foot high hardened steps with a uniform 0.1-percent channel slope upstream and downstream. In order to reach the target flowline elevation of 468.8 feet at the downstream end of the restored channel, 10 one-foot drop

² The datum for these initial design elevations is approximately mean sea level; however, this will be verified with field measurements and elevations will be adjusted during final design.

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structures have been included at specified locations along the length of the restored channel for purposes of applying the HEC-RAS model. The flowline of the most downstream section in the HEC-RAS model, which is upstream of the confluence with the North Sulphur River, is 468.9 feet. As noted earlier, results from this current study may require APA to make revisions to this initial channel configuration in order to achieve hydraulic conditions that effectively support the aquatic and terrestrial ecosystems envisioned for the restored channel.





For the unsteady HEC-RAS flood routing, the initial design cross section was assigned at specific computational sections along the entire length of the restored channel, with section elevations uniformly reduced in the downstream direction at a constant slope of 0.001 feet per foot, except at the grade control structures where the channel flowline elevations were reduced by an even one foot. This overall channel slope generally conforms to the natural slope of the south floodplain of the North Sulphur River in this vicinity. The bottom elevation of the restored channel generally follows the existing bottom profile of the abandoned channel of the North Sulphur River. A total of 62 cross sections, including two cross sections at each grade control structure, have been defined along the length of the restored channel to facilitate the unsteady RAS flood routing calculations. The locations of these cross sections, along with the sub-basin delineations, are shown on the aerial map in Exhibit 4.

Considering that the conveyance capacity of the lower portions of the proposed pools along the length of the restored channel, even those with depths as shallow as 3 feet, will be limited due to the intervening shallow riffle reaches, it has been assumed for purposes of the flood routing calculations that only the upper 1.5 feet of the low-flow channel of the initial design cross section would be effective for conveying flood flows. Therefore, in the HEC-RAS model, the bottom elevation of each cross section has been raised to limit the depth of the low-flow channel to 1.5 feet, with its bottom assumed to be underlain with water. Hence, for representing overall channel roughness effects on flood flow conveyance, a composite Manning's "n" value has been calculated for the low-flow channel assuming the side slopes would be covered with grass and light vegetation (n=0.04) and the bottom of the channel would be occupied with water (n=0.02). The resulting

low-flow channel "n" value is 0.033. An "n" value of 0.12 has been specified for the higher horizontal overbanks and upper side slopes of the initial design cross section based on APA's projected vegetative condition of forest with a target density of 200 woody stems per acre with native prairie herbaceous species in the understory.

Unsteady RAS Flood Routing Results

The unsteady HEC-RAS flood routing model was run for the same 3-hour storms simulated with the HMS flood flow model. In these simulations, the flood hydrographs previously simulated for each of the sub-basins with the HMS model for each storm event were input to the HEC-RAS model and routed, and combined as appropriate, section by section downstream through the restored channel to produce final flood hydrographs at each of the computational sections and junctions.

The output from the unsteady RAS model provides a variety of information pertaining to the hydraulics of the simulated flood flows at each section, including the peak flood flow value, the corresponding water surface elevation and total depth, and flow velocities for the middle of the channel section and the overbank areas. These quantities are presented for each computational section for the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year flood events in Tables 4 through 10, respectively.

As shown in each of these tables, and as expected, peak flood flows and water depths in the channel increase in the downstream direction as runoff enters the channel from adjacent sub-basins and accumulates along the channel. Channel and overbank velocities similarly increase. The peak flood flow for the 100-year flood event at the most downstream Section 36 is 2,382 cfs, which is somewhat less than the corresponding value of 3,440 cfs calculated at Junction 1 with the HMS model. This reduction is due to the attenuation effects of channel storage on flood flows as simulated with the HEC-RAS model. Average channel velocities range from about 2.5 fps for the 1-year storm event up to about 5.0 fps for the 100-year storm event. Overbank velocities are lower, ranging from about 0.3 fps to 1.0 fps. Maximum water depths in the lower reach of the restored channel range from about 4.0 feet for the 1-year storm event up to about 8.5 feet for the 100-year storm event.

Water surface profiles along the restored channel for the 2-year flood and the 100-year flood are plotted on the graph below along with the channel flowline as represented in the HEC-RAS model and the top of the low flow channel (~3 feet above the flowline).