Geomorphic Assessment of the Middle and Lower Swan Lake Watershed, Calhoun Division of Two Rivers National Wildlife Refuge

Report Figures



Figure 1. Location of Middle and Lower Swan Lake watersheds in Calhoun County, Illinois



Figure 2. Physiographic divisions of Illinois



Figure 3. Thickness of loess deposits in Illinois and Calhoun County (ISGS, ????)



Figure 4. Surficial deposits in Illinois and Calhoun County (ISGS, ????)



Figure 5. Geology of Hardin and Brussels Quadrangles (Rubey, 1952)



Figure 6. Digital Elevation Model (DEM) for Middle and Lower Swan Lake watersheds



Figure 7a. Stream gradients for Metz, Lower Metz, and Deer Plain Creeks: a) slope per 100 meters



Figure 7b. Stream profile for Metz, Lower Metz, and Deer Plain Creeks: b) elevation profile



LSA Units (Generalized)

Alluvial fan Natural Levee Colluvial slope

Metz Creek Lower Metz Creek Deer Plain Creek

Flp

0

Watersheds

Deer Plain Terrace Floodplain



Figure 8. Landform Sediment Assemblage (LSA) Units for Middle and Lower Swan Lake watersheds







Figure 10. Annual precipitation for wet and dry seasons, 1900-2008, at St. Charles, MO



Figure 11. NASS land cover categories for 1999 and 2008 in Calhoun County



Figure 12. Crops harvested from 1925-2008 in Calhoun County from IAS



Figure 13. Percent land area for 2008 NASS land cover categories in Middle and Lower Swan Lake watershed



Figure 14. Map of NASS land cover categories for 2008



Figure 15. Stream channel planform and Swan Lake open-water shoreline for 1940 and 2007



Figure 16. Historic stream channel and open-water shoreline planforms around Swan Lake: a) 1904 Woermann map and b) 2009 NAIP imagery



Figure 17. Representative cross-section of Swan Lake bed elevations in 1904 and 1994 [Source: Illinois State Water Survey, Demissie (1996)]



Figure 18. Land in orchards for Metz, Lower Metz, and Deer Plain Creek watersheds: a) in 1940 and 2007 and b) in 1940 and 2007 by elevation



Figure 19. Location of field survey stations for Metz, Lower Metz, and Deer Plain Creeks

CHANNEL-STABILITY RANKING SCHEME*

Station	#				Sheet #	÷	
Date:		Crew:		Site Coordinate	es:		
Picture	s: 🛛 U/S 🖵 D/S	X-section L	.B 🖵 RB	Samples:			
Pattern: Deandering Description Braided Description Description							
Field Measurements: Reach length:				Est. Reach Slope:			
	Avg channel	widths: (top)	(bottom)	_ Avg/Max channel	depth:/		
		LB angle (avg):		RB angle (avg):			
	Prima	arv bank material:		Primary bed mate	erial: (See #1)		
BHS No	ote #]	(GP=gravel; SP=san		=bedrock)		
1. Prin	nary bed material Bedrock	Boulder/Cobble	Gravel	Sand	Silt/Clay		
2 Bed	Protection	I	2	3	4		
2. 200	a) Yes						
0	OR 0		#Banks				
	b) No	(with)	Protection	One (L or R)	Both		
3. Deg	ree of floodplain s	separation**/inc	ision (Relative elev	∠ ation of "normal" low wat	ں ter: floodplain/terrace @1	00%)	
0. 209	0-10%	11-25%	26-50%	51-75%	76-100%		
	4	3	2	1	0		
4. Deg	ree of constriction	n (Relative decreas	se in top-bank wi	dth from up to down	istream)		
	0-10%	11-25%	26-50%	51-75%	76-100%		
5 Stro	U ambank prosion (1 Each bank over re	2 ach longth)	3	4		
J. 50e	None	Fluvial	Mass wasting (1	ailures)			
Le	eft 0	1	2	,			
Rig	ht 0	1	2				
6. Stre	am bank instabilit	ty (Percent of eac	h bank failing ove	er reach length)			
	0-10%	11-25%	26-50%	51-75%	76-100%		
Le	eft 0	0.5	1	1.5	2		
Rig	ht 0	0.5	1 (Dana ant af a sal	1.5	2		
7. Esta		11-25%	(Percent of each	1 Dank race over rea	ach length) 76-100%		
l e	eft 2	1.5	1	0.5	0		
Riq	ht 2	1.5	1	0.5	0		
8. Occ	urrence of bank/b	ar accretion (Pe	rcent of each ba	nk with fluvial depos	sition over reach leng	gth)	
	0-10%	11-25%	26-50%	51-75%	76-100%		
Le	eft 2	1.5	1	0.5	0		
Rig	ht 2	1.5	1	0.5	0		
9. Stag	ge of Channel Evo	olution (If applicat	ble)	17	177		
1	<i>11</i>	2	۲ <i>v</i> ک	<i>v</i> 3	15		
U	I	۷	7	5	1.5		
OTHER	OBSERVATIONS:				Total Score:		

* Adapted from Kuhnle and Simon (2000)

Figure 20. Channel-stability Ranking Scheme field form

Station # Date:		Station Description: Crew:	Samples Taken:						
Pictures:		RB							
r lotares.		RB							
			RB Riparian Zone	····					
1. Availability of favorable habitat (snags, submerged logs undercut banks; average of LWD and detritus)									
	>50% A	30-50%	10-30% 2	< 10%					
2 Pool-9	- substrate comnosi	tion	2	I					
	GP & firm SP	Soft SP & ML-CL	All ML-CL or All SP	Hardpan/ Bedrock					
	4	3	2	1					
3. Pool-v	ariability characte	r							
	Mix large/small & deep/shallow	Majority large-deep pools	Shallow pools more prevalent	Majority small- shallow or absent					
	4	3	2	1					
4. Active	e streambed/bar de	eposition			,				
	0-20%	21-50%	51-80%	81-100%					
	4	3	2	1					
5. Stream	mbed exposure	5.050/							
	0-5%	5-25%	25-75%	75-100%					
6 Dogra	4 o of "bard" chann	J al alteration (shares)	Z	1					
o. Degre	Channelization/dred	Minor or historic	2ation, dredging, embankmer 40-80% reach	>80% Disrunted/	ion/cement)				
	ing absent		disrupted	habitat altered					
	4	3	2	1					
7 (low).	Sinuosity								
	3-4	2-3	1-2	Straight					
	4	3	2	1					
7 (high).	Pool-riffle sequen	ce (% Pool + % Riffle)							
	>80%	51-80%	20-50%	<20%					
0 D	4	3	2	1					
o. Bank	Percent e	ach bank failing)	31-60%	61-100%					
l oft	2	15	1	0.5					
Riaht	2	1.5	1	0.5					
9. Veael	ative Bank Protec	tion (Bank face):	•	0.0					
J	>90% covered	70-90% cover	50-70% cover;	<50% veg					
	w/mix of veg.		disruption obvious; bare patches	disruption high					
Left	2	1.5	1	0.5					
Right	2 vien zene width (1.5	1	0.5					
10. Ripa	rian-zone width (00	10-20 m	r) 5-10 m	~5m					
l off	>20111 2	15-20111	1	0.5					
Right	∠ 2	1.5	1	0.5					
i agin	2	1.0	I	0.0					
				Total Score:					

BIOLOGICAL/HABITAT RANKING SCHEME (low gradient streams)*

Figure 21a. Biological/Habitat Ranking Scheme (low gradient) form

Station #		Station Description:		•	
Date:	ate:Crew:		_ Samples Taken:		
Pictures:	🗖 U/S: 🗖 LB 🗖 F	RB	Channel Bed	•	
	D/S: LB F	RB	LB Riparian Zone	•	
			RB Riparian Zone	•	
1. Availa	bility of favorable	habitat (snags subm	eraed loas undercut bank	s: average of I WD and	detritus)
n /wana	>70%	70-40%	40-20%	<20%	Jounday
	4	3	2	1	
2. Embe	ddedness: Gravel,	cobble, boulder %	6 surrounded by fir	ne sediment	,
	0-25%	25-50%	50-75%	>75%	
	4	3	2	1	
3. Veloc	ity/Depth Regime:	a) slow-deep, b) slow-sl m/s, deep is >0.5 m)	hallow, c) fast-deep, d) fa	st shallow; (slow is <0.3	
	All 4 regimes	3 of 4 regimes(if 'd'	2 of 4 regimes (if 'd'	Dominated by 1	
	present	is missing,score	and 'b' missing,	regime (usually 'a')	
		lower	score lower		
	4	3	2	1	
4. Active	e streambed/bar de	position			
	<5%	5-30%	30-50%	>50%	
	4	3	2	1	
5. Strear	nbed exposure				
	0-5%	5-25%	25-75%	75-100%	
	4	3	2	1	
6. Degre	e of "hard" channe	alteration (channelia	zation, dredging, embankme	nts/shoring structures, gabi	on/cement)
	Channelization/dred	Minor or historic	40-80% reach	>80% Disrupted/	
	ing absent		disrupted	habitat altered	
	4	3	2	1	
7 (high).	Pool-riffle sequen	ce (% Pool + % Riffle)			
	>80%	51-80%	20-50%	<20%	
	4	3	2	1	
8. Bank	Instability (Percent ea	ich bank failing)			
	0-5%	6-30%	31-60%	61-100%	
Left	2	1.5	1	0.5	
Right	2	1.5	1	0.5	
9. Veget	ative Bank Protect	ion (Bank face):			,
-	>90% covered	70-90% cover	50-70% cover;	<50% veg	
	w/mix of veg.		disruption obvious; bare patches	disruption high	
Left	2	1.5	1	0.5	
Right	2	1.5	1	0.5	
10. Ripa	rian-zone width (ou	t from edge of wate	r)		_
	>20m	10-20 m	5-10 m	<5m	
Left	2	1.5	1	0.5	
Right	2	1.5	1	0.5	
-					
				Total Score:	

BIOLOGICAL/HABITAT RANKING SCHEME (high gradient streams)*

Figure 21b. Biological/Habitat Ranking Scheme (high gradient) form



Figure 22. Channel Stability Index (CSI) distribution for Metz, Lower Metz, and Deer Plain Creeks



Figure 23. Biological/Habitat Index (BHI) distribution for Metz, Lower Metz, and Deer Plain Creeks



Figure 24. Channel-Stability and Biological/Habitat Index distributions for Metz, Lower Metz, and Deer Plain Creeks with corresponding stream segment identification.



Figure 25. Channel-Stability and Biological/Habitat Index and CEM profile for Metz Creek



Figure 26. Channel-Stability and Biological/Habitat Index and CEM profile for Lower Metz Creek



Figure 27. Channel-Stability and Biological/Habitat Index and CEM profile for Deer Plain Creek



Figure 28. Type of bank erosion for field survey sites and location of reach groups with mass wasting erosion



Figure 29. Percent of banks with active erosion for field survey sites and location of mass wasting reach groups



Figure 30. Percent of sediment accumulating on banks or stream bars for field survey sites and location of mass wasting reach groups



Figure 31. Percent of banks covered with woody vegetation for field survey sites and location of mass wasting reach groups



Figure 32. Percent of banks covered with vegetation for field survey sites and location of mass wasting reach groups



Figure 33. Width of riparian zone measured out from edge of water for field survey sites and location of mass wasting reach groups



Figure 34. Stage of Channel Evolution Model (CEM) for field survey sites and location of mass wasting reach groups



Figure 35. Bank Height for field survey sites and location of mass wasting reach groups



Figure 36. Channel width for field survey sites and location of mass wasting reach groups



Figure 37. Bank angle for field survey sites and location of mass wasting reach groups