

### **AERIAL ASSESSMENT REPORT FOR Hodges and Otter Creek** Macoupin County

December 2005 Prepared by Wayne Kinney for IL. Dept. of Agriculture The DRAFT TMDL study of Hodge's Creek completed by Limno-Tech, Inc in July 2005. The report lists Otter Lake, a 765 acre water supply reservoir, as impaired by manganese, however Hodges Creek watershed is yet to be addressed in a TMDL report. Hodges Creek has been identified by IEPA as a waterbody impaired by Dissolved Oxygen (DO).

#### **Assessment Procedure**

Low level geo-referenced video was taken of Hodges and Otter Creek in March, 2004. Video taping was completed by Fostaire Helicopters, Sauget, IL, using a camera mounted beneath a helicopter to record data from just above tree top level in DVD format for further evaluation and assessment. Video mapping began at the upper reaches of Otter Creek just above the Macoupin-Sangamon County line and preceded downstream to the confluence of Hodges Creek with Macoupin Creek near Rockbridge, IL. Aerial video of tributaries was not part of the project, regardless of the stream size or vegetation.

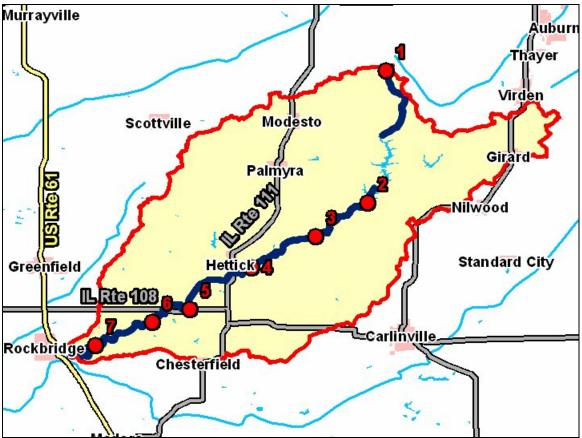


Fig. 1 Aerial Assessment Map of Hodges Creek

After videotaping the stream, the DVD tapes were processed by USGS to produce a georeferenced DVD showing flight data and location. Next, USGS identified features from the video and created shapefiles containing the GPS location, type of feature identified, and the time on the DVD to allow cross referencing. The shape-files along with the DVD were then used to identify and locate the points where ground investigations were needed to verify aerial assessment assumptions and gather additional data.

The ground investigations or "ground truthing" is intended to accomplish two primary functions. First, it provides those viewing videos the opportunity to verify the correct interpretation of the video. Second, the video allows the user to identify and gather field data at the most appropriate locations to more closely represent the entire study portion of the stream.

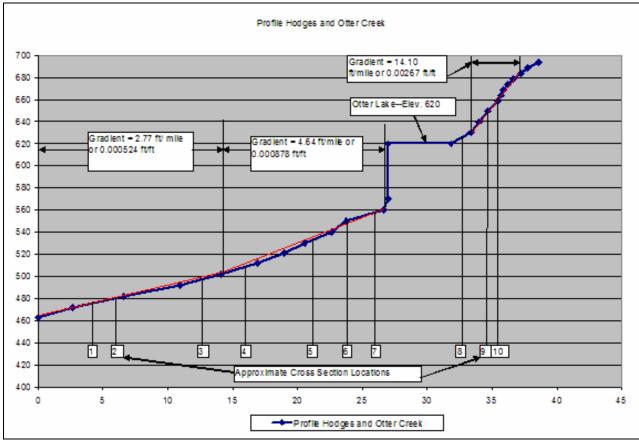


Fig. 2 Channel Profile Hodges and Otter Creek

Detailed elevation data is not available; therefore the channel slope is calculated from USGS topo maps by measuring the channel length between contour lines. The report refers to this as "valley profile" although a true valley profile would use a straight line distance down the floodplain rather than channel length. However, this method is used because it incorporates sinuosity into the calculation and allows the channel slope to be assume equal to "valley slope" in order to estimate channel capacity, velocity, etc., although there are short segments where the channel slope may differ significantly near roads, logjams, knickpoints, etc.

	CHAPTERS C Otter Creek	ON DVD ANI	D ASSESS	MENT REPOR	RT
DVD		Beginning	Report	Cross	
Disc	DVD chapter	Time	Chapter	Section	
1	2	10:00	1	8,9,10	
1	3	20:00	2	6,7	
1	4	30:00:00	3	5	
1	5	40:00:00	4	*	
2	2	10:00	4	3,4	
2	3	20:00	5	*	
2	4	30:00:00	6	1,2	
2	5	40:00:00	7	*	

Note: Flight path is from upstream to downstream

#### Fig. 3 DVD Chapters and Report Guide

The DVD has been divided into "chapters" of approximately five minutes of video (Fig. 3) to enhance the ability to navigate within the flight video and provide a simple way to identify and discuss different stream segments. Although the report will begin with a broader more general assessment of the entire study reach, it will also provide an assessment and treatment recommendations by chapter or group of chapters. The chapter divisions are clearly arbitrary and do not reflect "change points" in the stream characteristics or treatment recommendations. For clarity the conclusions and recommendations are presented for each stream "chapter".

#### **Chapter Division and Cross Section locations**

Figures 4 thru 10 below show the locations of the seven (7) chapters and the ten (10) cross sections used to develop the analysis of Hodges and Otter Creeks.

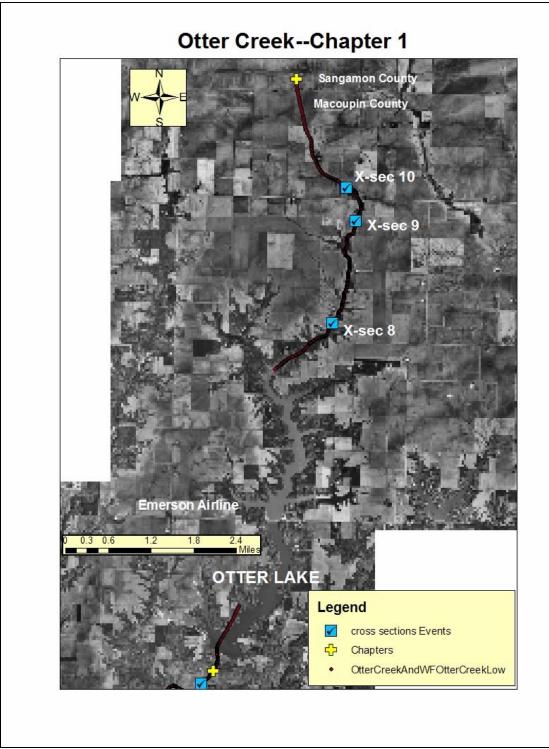


Figure 4

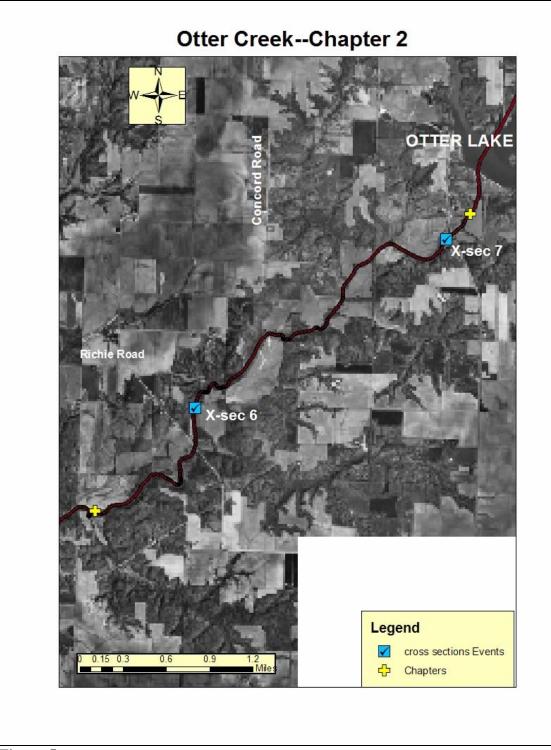


Figure 5

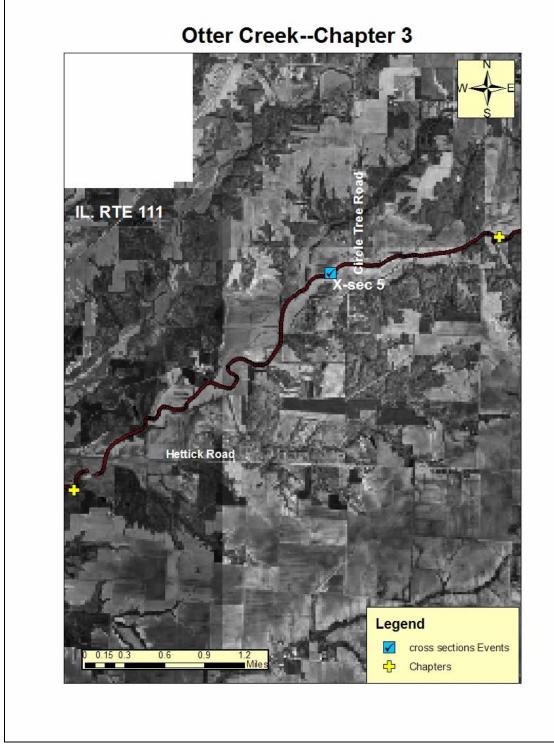


Figure 6

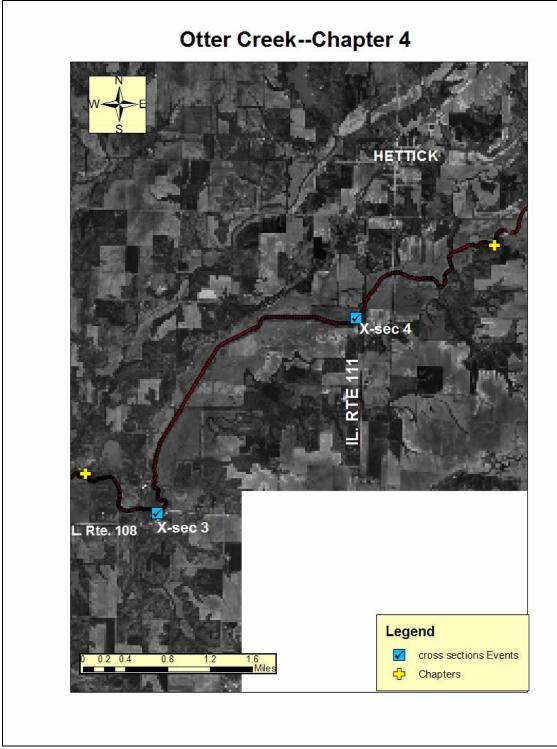


Figure 7

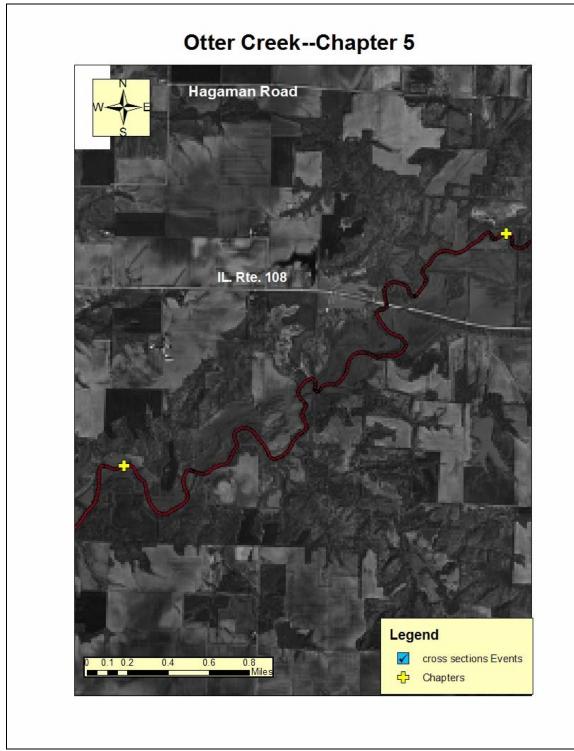
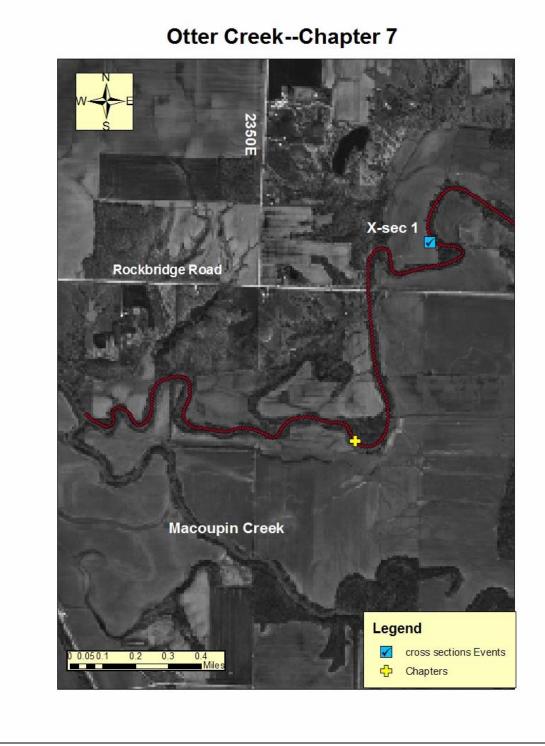


Figure 8



Figure 9



### Figure 10

The major factors indicating channel conditions identified from the aerial assessment have been totaled by DVD chapter in Table 1 below. This tabulation allows a general comparison of the relative dominance of features found in each chapter and provides a

	FEATURES IDENTIFIED BY CHAPTER										
	Otter Creek										
	ROCK		GEOTECH		BED	BED	BANK	BREAK		SEVERE	
CHAPTER	OUTCROP	LOGJAM	FAILURE	DEPOSITION	STRUCTURE	CONTROL	CONTROL	POINT	EROSION	EROSION	
1	0	3	0	1	0	0	0	16	23	0	
2	1	11	20	1	1	1	0	29	30	1	
3	1	3	19	1	1	1	1	26	35	10	
4	0	10	16	1	0	0	0	16	44	0	
5	0	6	16	0	0	0	0	6	47	1	
6	1	8	18	2	0	0	0	3	40	2	
7	0	1	18	0	0	0	0	0	2	0	
TOTALS	3	42	107	6	2	2	1	96	221	14	

means of comparing stream characteristic between chapters. A discussion of the major differences will follow later in this report.

 Table 1 Features by Chapter Identified with Aerial Assessment

Ten cross sections were taken at selected locations on Hodges and Otter Creeks after viewing the DVD's. The cross sections are located at "riffle" locations to best represent the channel characteristics and to allow for comparison of width, depth, x-sec. area, etc. along the channel at similar geometric locations. The result of the hydraulic analysis at each site is presented in summary form in Table 2 and the approximate location of each cross section along the channel profile is found in Fig. 2. Exact locations as Eastings and Northings and more detail can be found in Appendix A.

	CROSS SECTION SUMMARY - OTTER CREEK												
					BKF		Vel.		Tap Bk.	BKF	Top Bk	BKF cfs/	Top Bk/
X-sec	ADA	Q2 ofs	BKFdfs	BKF/sq.mi.	Width	Max D	FPS	W/D	Depth	X-Area	X-Area	Q2.cfs	BKFarea
1	229.92	5190	3185	13.90	80	15.7	3.9	10.3	17	821	941	0.61	1.15
2	187.81	4649	2777	14.80	85	12.6	3.6	9.4	13.7	769	867	0.60	1.13
3	112.38	3356	962	8.60	61	9.2	2.7	10.5	9.3	355	361	0.29	1.02
4	105.72	3444	1800	17.00	59	9.4	4.1	7.9	11.2	442	564	0.52	1.28
5	65.38	2537	1303	19.90	44	10.4	4	5.9	12.8	328	463	0.51	1.41
6	58.99	2568	1157	19.61	53	8	3.6	8.7	8.7	324	370	0.45	1.14
7	52.67	2291	975	18.50	53	8.1	3.4	9.7	9.2	291	355	0.43	1.22
8	6.84	496	164	24.00	22	4	2.6	7.5	6	64	120	0.33	1.88
9	3.41	280	102	29.90	15	3	3.1	6.8	5.9	33	104	0.36	3.15
10	3.09	252	87	28.20	15	2.9	2.9	7.5	5.3	30	109	0.35	3.63

 Table 2 Cross Section Summary

#### **General Observations**

1. No USGS flow data is available for Hodges or Otter Creeks. The flow data from Macoupin Creek would appear to be the best available showing a 1.5 yr. R.I discharge of approximately 9.2 cfs/sq. mile of drainage area. Hodges Creek discharge appears to be somewhat higher at 14 to 20 cfs/sq. mile below Otter Lake. This discharge determined from field indicators appears to be consistent given drainage on Hodges Creek is much smaller (50 to 230 sq. miles compared to 868 sq. miles at the Macoupin gage site) and smaller watersheds tend to have higher per unit discharge rates.

- 2. Width/Depth ratios throughout Hodges and Otter Creeks are narrow with the largest ratio being 10.5 and 5 of 10 cross sections have a W/D ratio of less than 8.0. Combined with the incision that has already occurred and the presence of active downcutting these low ratios indicate a very unstable channel dimension.
- 3. Previously identified degradation on the receiving waters of Macoupin Creek will continue to drive the degradation process in spite of treatment applied to the Hodges Creek watershed.
- 4. Gradient below Otter Lake drops to 4.6 ft/mile from 14 ft/mile above Otter Lake. The steeper gradient above Otter Lake is degrading also although Otter Lake obviously acts as a grade control to prevent any degradation below Otter Lake from impacting the area above the dam.
- 5. Larger cobble founding the bed above Otter Lake may be armoring the bed and reducing or halting degradation, however the channel has already incised approximately 3 times its bankfull flow depth and will continue to cause the channel to widen as predicted by the Channel Evolution Model (CEM).
- 6. The low Width/Depth ratios make use of redirection techniques for lateral migration very limited. Therefore all lateral migration will be assumed to need Stone Toe Protection.
- 7. Rock Riffle Grade Control Structures are being recommended throughout this study reach. As the gradient decreases below Otter Lake and continues to decrease downstream the riffle heights can be increased without negatively impacting flooding or backwater conditions. Riffle heights can reach 4.0 ft. or more in the lower reaches which impact the cost but also are more effective in dissipating energy and providing better aquatic habitat.

#### Recommendations

#### Chapter 1

Chapter 1 is the very upper end of the aerial assessment and represents the only portion inventoried above Otter Lake. Cross section 8, 9 and 10 are in this segment. Cross sections 9 and 10 show incision to a depth of over 3 times the bankfull depth. Section 8 is nearer to Otter Lake and influenced by its backwater effects limiting incision to slightly less than twice the bankfull depth. Cross section 8 is depositional in CEM stage 5 while 9 and 10 are degrading although they are partially armored by the heavy cobble eroded from the glacial till exposed in this reach. There are 16 breakpoints and 23 erosion sites identified in chapter 1.

The recommendation is to install Rock Riffle Grade Control structures above cross section 8 to a point about one half mile above cross section 10. While preliminary analysis shows that riffle more than 0.6 ft. in height will increase the water surface profile significantly this segment is incised approximately 2.5 to 3.0 ft. and therefore riffles 2.0 ft. high can be safely installed without increasing out of bank flow. Lateral bank treatment is recommended using Stone Toe Protection at the 23 identified sites. Table 3 shows the estimated treatment costs and quantities required for this segment.

	TREATMENTCHAPTER 1									
	Lateral Bank Treatment									
Chapter	Erosion Sites	Average Length(ft)	Total Length	Average Cost/foot	Total Cost					
1	23	75	1725	\$25.00	\$43,125.00					
Total	23		1725		\$43,125.00					
			_							
	Rock Riffl	e Grade Cont	rol							
	Number	Average	Total	Average	Total					
Chapter	Riffles	Tons Stone	Tons Stone	Cost/ton	Cost					
1	125	90	11250	\$30.00	\$337,500.00					
Total	125		11250		\$337,500.00					

 Table 3. Treatment for Otter Creek Chapter 1

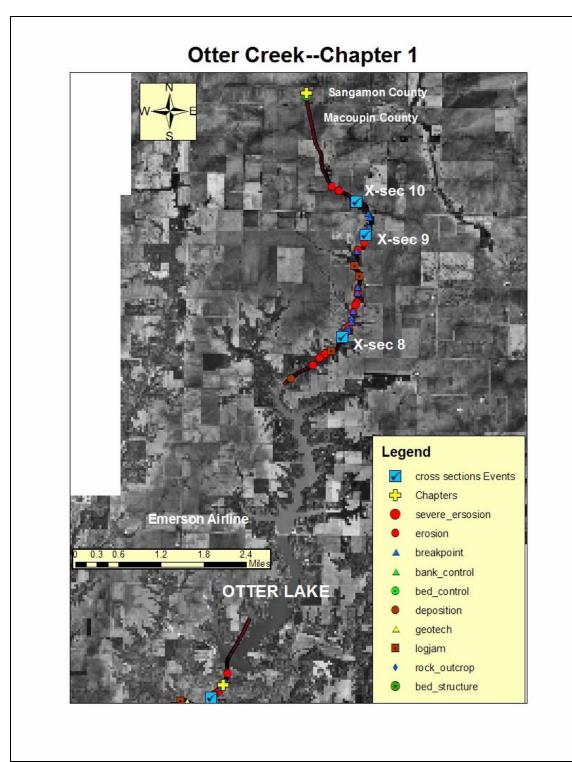


Figure 11. Chapter 1 Features

#### Chapter 2

This segment begins below Otter Lake and extends downstream approximately 4 miles. Cross sections 6 and 7 are located in chapter 2. There are 30 erosion sites, 20 geotechnical failures and 11 logjams identified in this reach as well as 29 breakpoints. The identification of such a large number of problems indicate a very unstable channel in this segment, although the cross sections do not indicate significant degradation. Cross sections 6 and 7 have bankfull elevations within one foot of the floodplain elevations and the diameter of the bedload is less than 1 inch however no exposed residual material was found in the "breakpoints" identified.

This segment is in CEM stage 4 where the channel is both degrading and widening resulting in the multiple problems of bank failure through lateral erosion and geotechnical failures.

The recommended treatment is to install Rock Riffle Grade control structures approximately 2.5 ft. above the riffle (breakpoint) elevations. The increased pool depths created will dissipate energy, halt downcutting and improve aquatic habitat. Lateral bank erosion is severe and will require additional treatment with Stone Toe protection. The estimated treatment needs and cost are presented in Table 4 below.

	TREATMENTCHAPTER 2										
	Lateral Bank Treatment										
	Erosion	Average	Total	Average	Total						
Chapter	Sites	Length(ft)	Length	Cost/foot	Cost						
2	50	300	15000	\$25.00	\$375,000.00						
Total	50		15000		\$375,000.00						
Rock R	iffle Grade	Control									
	Rock	Average	Ave. Cost	Average							
	Riffles	Tonnage	Ton	Cost/Riffle							
3	70	300	\$30.00	\$9,000.00	\$630,000.00						
Total	70			9,000	\$630,000.00						

 Table 4. Treatment for Otter Creek Chapter 2

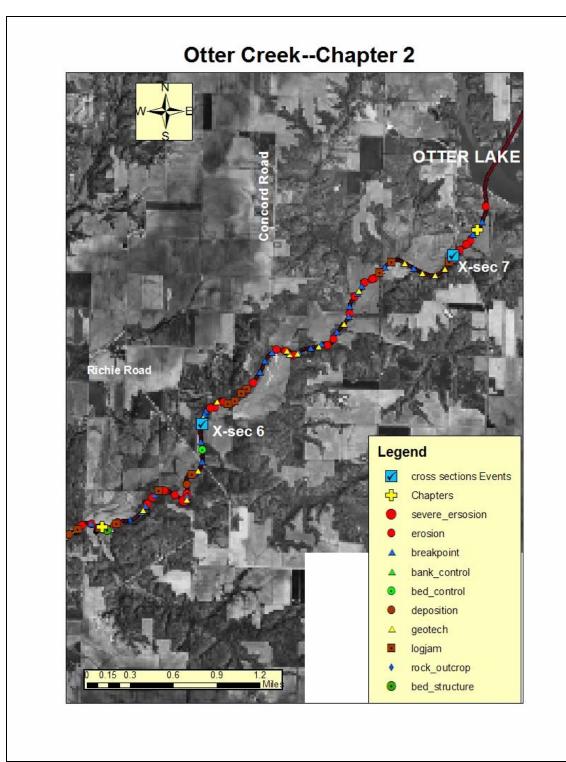


Figure 12. Chapter 2 Features



Logjam in Chapter 2 caused by failing banks

#### Chapter 3

This reach is about 4.5 miles long and extends downstream approximately one half mile below Hettick Road. Chapter 3 contains cross section 5 which is located below Circle Tree Road and is located in a definite "knickzone" where degradation is severe. The channel is incised approximately 2 feet at this location and has a very narrow width/depth ratio of 5.9 indicating a very unstable channel. Chapter 3 has 35 erosion sites, plus 10 additional sites identified with severe erosion, 19 geotechnical failures and 26 breakpoints identified by the aerial assessment.

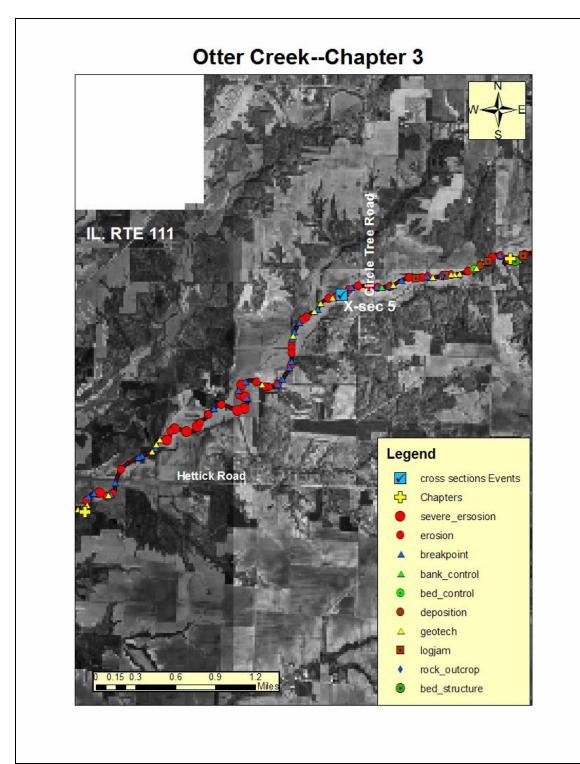
This reach is extremely unstable and will require use of Rock Riffle Grade control structures and lateral bank treatment to achieve any stability in the near future. The preliminary analysis indicates that riffles may be built to a height of 3.0 feet with no impact on out of bank flow or backwater. Given the incision that has already occurred even greater riffle heights would be feasible and perhaps desirable. For this report a riffle height of 3.0 ft. will be used to determine estimated cost. Table 5 provides the estimated treatment needs for Chapter 3.

`	TREATMENTCHAPTER 3									
	Lateral Bank Protection									
	Erosion	Average	Total	Average	Total					
Chapter	Sites	Length(ft)	Length	Cost/foot	Cost					
3	64	300	19200	\$25.00	\$480,000.00					
Total	64		19200		\$480,000.00					
	Rock Riffle	e Grade Cont	rol							
	Rock	Average	Ave. Cost	Average	Total					
Chapter	Riffles	Tonnage	Ton	Cost/Riffle	Cost					
3	79	350	\$30.00	\$10,500.00	\$829,500.00					
Total	79			10,500	\$829,500.00					

 Table 5. Treatment needs for Chapter 3



Failing banks in Chapter 3 causing mature trees to collapse into channel



**Figure 13. Chapter 3 Features** 



Severe Erosion in Chapter 3

#### Chapter 4

This chapter is approximately 6 miles in length ending about a mile above the IL. Rte. 108 bridge. Cross sections 3 and 4 are located in this chapter. This segment has been extensively channelized and no doubt contributes significantly to the problems identified in chapters 2 and 3. However, the same problems of degradation and widening are occurring below this site as well, but at a reduced intensity and are thought to be impacted by the extensive channelization and downcutting found downstream in Macoupin Creek. Cross section 3 near the end of chapter 4 appears to be well connected to the floodplain, however there is a knickpoint at this location on residual soil material indicating active downcutting is beginning to occur and will migrate upstream if left untreated.

This chapter has 44 erosion sites, 16 geotechnical failures and 16 breakpoints identified by the aerial assessment. Treatment recommendations for this segment remain the same with a need for Rock Riffle Grade control structures approximately 3.0 ft. high and lateral bank protection with Stone Toe Protection. Table 6 provides the estimated treatment needs.

	TREATMENTCHAPTER 4									
	Lateral Bank Treatment									
	Erosion	Average	Total	Average	Total					
Chapter	Sites	Length(ft)	Length	Cost/foot	Cost					
4	60	300	18000	\$25.00	\$450,000.00					
Total	60		18000		\$450,000.00					
	Rock Riffl	e Grade Cont	rol							
	Number	Average	Total	Average	Total					
Chapter	Riffles	<b>Tons Stone</b>	<b>Tons Stone</b>	Cost/ton	Cost					
4	80	500	40000	\$30.00	\$1,200,000.00					
Total	80		40000		\$1,200,000.00					

 Table 6. Treatment needs for Chapter 4

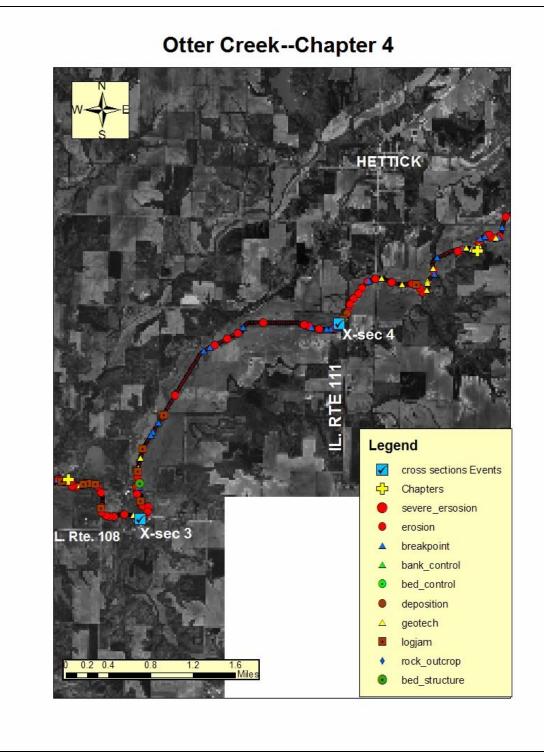


Figure 14. Chapter 4 Features

#### Chapter 5 through 7

These chapters represent the remaining length of Otter and Hodges Creeks ending at the confluence with Macoupin Creek. The total length of these segments is approximately 10 miles. In this segment there is a marked decrease in breakpoints although the number of erosion sites and geotechnical failures remains fairly consistent with the upper chapters.

Given present knowledge about the downcutting occurring in Macoupin Creek and the continued stream instability it seems highly likely that even this lower reach of Hodges Creek is degrading. Cross sections 1 and 2 located in Chapter 6 would tend to support that conclusion as the floodplain is at least 1 foot above the bankfull elevation.

Therefore, evening the absence of obvious "breakpoints" the recommendation is to continue with the installation of Rock Riffle Grade control structures to halt any current downcutting masked by low flow conditions re-depositing bedload and to prevent additional degradation on Macoupin Creek from migrating up Hodges Creek. Rock Riffle Grade control structures can be at least 4.0 ft. high in this segment with no impact on out of bank flow (flooding) or backwater.

•	TREATMENTCHAPTER 5-7									
Lateral Bank Protection										
Chapter	Erosion Sites	Average Length(ft)	Total Length	Average Cost/foot	Total Cost					
5	63	400	25200	\$25.00	\$630,000.00					
6	58	400	23200	\$25.00	\$580,000.00					
7	20	400	8000	\$25.00	\$200,000.00					
Total	141		56400		\$1,410,000.00					
	Rock Riffle	e Grade Cont	rol							
Chapter	Rock Riffles	Average Tonnage	Ave. Cost Ton	Average Cost/Riffle	Total Cost					
5	40	800	\$30.00	\$24,000.00	\$960,000.00					
6	52	800	\$30.00	\$24,000.00	\$1,248,000.00					
7	14	800	\$30.00	\$24,000.00	\$336,000.00					
Total	106			\$24,000.00	\$2,544,000.00					

Table 7 provides the estimated treatment needs for this reach.

 Table 7. Treatment needs for Chapter 5 through 7

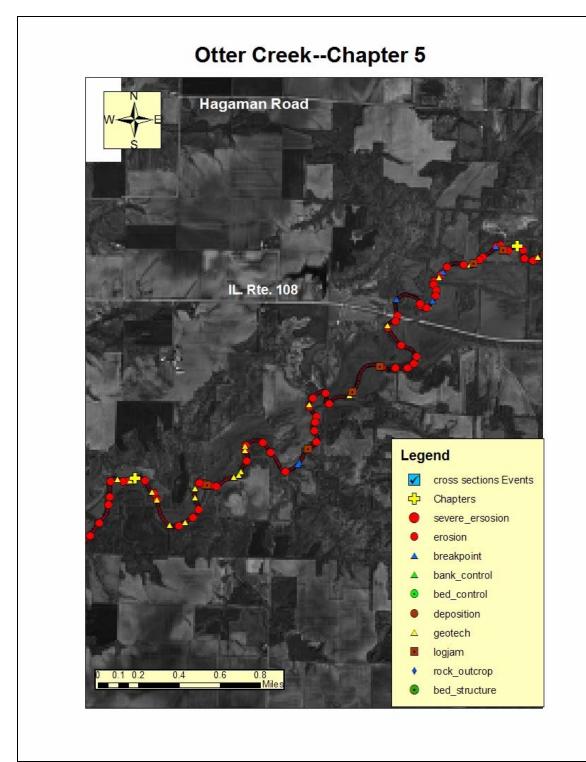


Figure 15. Chapter 5 Features

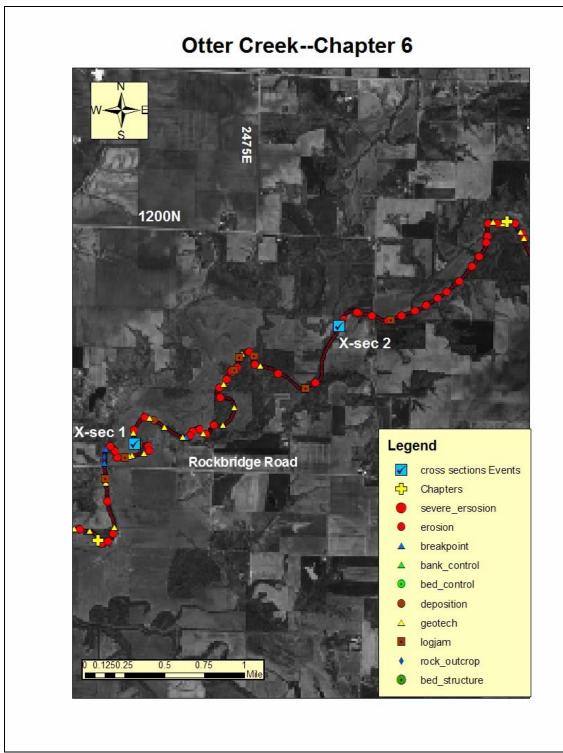
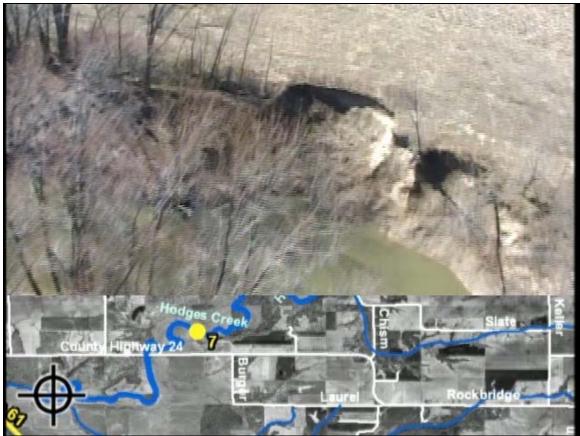


Figure 16. Chapter 6 Features



Logjam in Chapter 6



Geotechnical failure just above the confluence of Hodges and Macoupin Creek

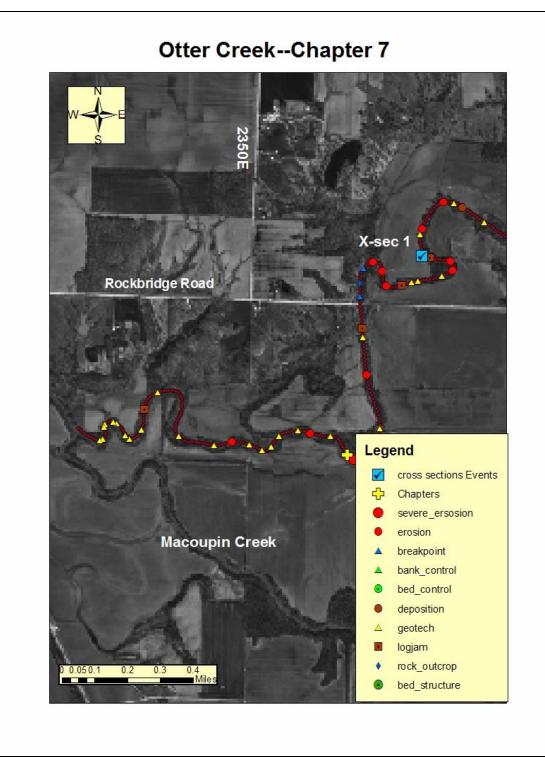


Figure 17. Chapter 7 Features

## APPENDIX A

# **CROSS SECTION DATA**

Stream St	abilizat	ion I & E Fo	rm	ILLINOIS NI	RCS - Version 2.0	5- modified 9/12/04 R.Bo	ok
County	Macoupin	•	т.	R.		Sec.	
Date	12/2	3/2005	Ву	Wayne Kinney			
Stream Name		Otter Creek		ITU	M Coord.	E74443	1 N4350725
Landowner Nan	ne	X sec 1					
Drainage Area		229.92 sq. n	ni.		Clea	ar Cells	
Regional Curve							
Bankfull dimens	sions	Width Depth	124 ft. 7.2 ft.	Cross Sectional	Area	<mark>898</mark> sq. ft.	
Reference Strea	am Gage:						
Macoupin Creek n	ear Kane		•		587000	Gage C	
Greene County,		IL			<mark>8 sq.mi</mark> FERENCE ST	Regressio REAM DATA ONLY	n ( <u>11800 cfs</u>
		Des l'alland					
USGS Flood-Pe	ак Dischar	ge Predictions: ft./mi. (user-ente	ered)			Regression C	2 6255 cfs
		ft/mi (from works		fall <u>3.40 in</u> <i>(2 y</i>	/r, 24 hr)	Adjusted 0	Q <sub>2</sub> 5190 cfs
	0.0010	ft./ft.	Regional Fac		-	Typical Range for Ba	ankfull Discharge:
						207	0 to 4160 cfs
Local Stream M	orphology:						
Channel De		(c) Clean, winding	g, some pools and sho	pals			<b>*</b>
Manning's "n"	0.04	_	Stream L	enath	ft.		
Basic Field Data:			Valley Le	0	ft.		
Bankfull Width		80 ft.	Contour	Interval	feet	-	
Mean Bankfull	•	10.26 ft.	Estimate	d Sinuosity			
Width/Depth Ra	itio	7.80	Channel	1	Donk	full O from	
Max. Bankfull D	epth	15.7 ft.	Channel S Survey			full Q from: oss-Section 3063	cfs
Width at twice n	•	1500 ft.	Estimate			ic field data 3307	cfs
	( 31.4 ft.)					Selected Q 3185	cfs
Entrenchment F	Ratio	18.75		Curvature (Rc)	ft.		
			Ro	:/Bankfull width:	0.00		
Bankfull Velocit	y Check:	(typical Illinois s	treams will have a	average bankfull velo	ocity between	3 and 5 ft/sec.)	
Bedload:	D <sub>90</sub>	1 <b>v</b> in.	Velocity	required to move D <sub>9</sub>	10:	2.1 ft./sec.	
	D <sub>50</sub>	in.	Velocity	from Cross-Section	data:	3.73 ft./sec.	
GOAL: Develop		, ,		from basic field data	ι:	4.03 ft./sec.	
velocities	s from differ	ent sources.	Velocity	from selected Q:		3.9 ft./sec.	
Channel Evoluti	on Stage	IV 💌	Stream	Type (Rosgen)			
Notes							
13.9 cfs/sq. mi.							
10.3 013/34. 1111.							

Natur	al Op	en Channel Flow
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> :	Wayne Kinney 12/20/2005 0.000524 0.040	$\begin{bmatrix} Q & \square & \square & A & R^3 & S^2 \\ n & & \\ \hline ft/ft & assuming uniform, steady flow \end{bmatrix}$ Clear Cells
Flow Depth: Survey Data: Rod (ft) 3.1 2.9 3.0	15.6 Distance (ft) 0.0 8.0 13.0	It         Trial Depth 2         Trial Depth 3           Selected Flow Depth:         15.6 ft         17.0           Channel Flow ( <b>Q</b> ):         3,063.1 cfs         3,325.6           Channel Velocity:         3.7 ft/sec         3.5           Cross-Sectional Area ( <b>A</b> ):         821.5 sq.ft.         941.2           Hydraulic Radius ( <b>R</b> ):         9.2 ft         8.5
6.4         9.3         13.7         14.5         18.7         19.9         19.70         19.30         18.70         18.10         13.20         4.40         3.3         2.0         2.0	20.0 27.0 36.0 40.0 44.0 47.0 58 68 75 77 85 96 100 106 108	0.0 20.0 40.0 Distance (ft) 80.0 100.0 120.0 0.0 5.0 5.0 10.0 120.0 0.0 5.0 5.0 10.0 120.0 0.0 5.0 10.0 120.0 0.0 5.0 10
		COMMENTS:

Stream St	abilizat	ion I & E	Form		ILLIN	OIS NRCS - Vers	ion 2.05- modified 9	/12/04 R.Book	(
County	Macoupin	•		т.	F	8.	Sec		
Date	12/2	20/2005		Ву	Wayne Kir	ney	1		
Stream Name Landowner Nan		Otter Cree X sec 2	k		_	UTM Coord.		E746415	N4352051
Lanuowner Man	le	X 560 Z							
Drainage Area		187.81	sq. mi.			<u>.                                    </u>	Clear Cells		
Regional Curve									
Bankfull dimens	sions	Width		115 ft.	Cross Sec	tional Area	78:	<mark>3</mark> sq. ft.	
		Depth		6.8 ft.					
Reference Strea	am Gage:								
Maggymin Crook n	oon Kono			-	Station No			Gage Q <sub>2</sub>	
Macoupin Creek n					Drainage Are			Regression	11800 cfs
Greene County,		IL				REFERENC	E STREAM DA	TAONLY	
USGS Flood-Pe	eak Dischar	ge Prediction	ns:						
Valley Slope:	6.1	ft./mi. (use	r-entered)				Re	gression Q <sub>2</sub>	5604 cfs
		ft/mi (from	workshee	t) Ra	ainfall 3.40 in	(2 yr, 24 hr)	A	Adjusted Q <sub>2</sub>	4649 cfs
	0.0012	ft./ft.	I	Regional F	actor 1.057	<b>-</b> · · · ·	Typical Ra	nge for Ban	kfull Discharge
				-		_		1850	
Local Stream M	larahalamu								
								_	1
Channel De	-	(c) Clean,	winding, son	ne pools and	shoals			•	
Manning's "n"	0.04	_		Stroor	n Length		ft.		
Basic Field Data:					Length		ft.		
Bankfull Width		85	ft.		ur Interval		feet 🔻		
Mean Bankfull	Depth	9.05	ft.		ated Sinuosity				
Width/Depth Ra	atio	9.39			-		-		
			_	Channe	el Slope:		Bankfull Q from	:	
Max. Bankfull D	•	12.6	ft.		eyed: 0.000524		Cross-Section	-	cfs
Width at twice n		1500	ft.	Estim	ated:	ft./ft.	Basic field data		cfs
Entropolymont F	( 25.2 ft.	,		Dadiua	of Cumoturo (De		Selected C	2777	cfs
Entrenchment F	Callo	17.65			of Curvature (Ro Rc/Bankfull width		ft.		
						1. 0.00			
Bankfull Velocit	v Check:	(typical Illir	nois strear	ns will hav	e average bankfu	ıll velocitv betv	veen 3 and 5 ft/s	ec.)	
Bedload:	D <sub>90</sub>	1 🔻	in.		ty required to mo		2.1	ft./sec.	
	D <sub>50</sub>		in.	Veloci	ty from Cross-Se	ction data:	3.51	ft./sec.	
GOAL: Develop	confidence	by matchin	g	Veloci	ty from basic field	data:	3.71	ft./sec.	
velocities	s from differ	rent sources.	-	Veloci	ty from selected	Q:	3.6	ft./sec.	
<u>Channel Evoluti</u>	on Stage	IV	•	Strea	am Type (Rosger	)			
Notes									
14.8 cfs/sq. mi.									

Project: X sec 2 Assisted by: Wayne Kinney Date: 12/20/2005 Channel Slope (S): 0.000524 Manning's n: 0.040 Flow Depth: 12.6 tt       Lassuming uniform, steady flow       Dack to I&E form Clear Cells         Survey Data:         Trial Depth 2       Trial Depth 2       Trial Depth 3         Survey Data:         Selected Flow Depth: 12.6 tt       13.7         Colspan="2">Colspan="2">Colspan="2">Selected Flow Depth: 12.6 tt       13.7         Colspan="2">Trial Depth 2       Trial Depth 3         Selected Flow Depth: 12.6 tt       13.7         Colspan="2">Colspan="2">Selected Flow Depth: 12.6 tt       13.5 fivsec 3.4         Coss-Sectional Area (A): 769.2 sq.tt. 867.2         Hydraulic Radius (R): 8.4 tt       8.0         115.4       37.0       16.3       43.0         14.2       32.0       10.0       10.0       10.0       2.0         115.40       80       9       0.0       10.0       12.0       10.0       10.0       10.0       10.0       10.0       10.0       12.0       10.0       12.0       10.0       10.0       12.0       10.0       12.0       10.0       10.0<	Natur	al Op	en Channel Flow
Trial Depth 2         Trial Depth 3           Survey Data:         Trial Depth 2         Trial Depth 3           Rod (ft)         Distance (ft)         Selected Flow Depth: Channel Flow (Q): Channel Velocity: 3.8         12.6 ft         13.7           3.0         8.0         Channel Velocity: Cross-Sectional Area (A): Hydraulic Radius (R):         3.5 ft/sec         3.4            6.1         17.0          6.8         20.0          8.4 ft         8.0           12.4         26.0            8.4 ft         8.0             15.4         37.0	Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> :	Wayne Kinney 12/20/2005 0.000524 0.040	$Q \square \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$ <i>ti/ft assuming uniform, steady flow Clear Cells</i>
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Survey Data: Rod (ft) 2.9 3.0	Distance (ft) 0.0 8.0	Trial Depth 2         Trial Depth 2         Trial Depth 3           Selected Flow Depth:         12.6 ft         13.7           Channel Flow ( <b>Q</b> ):         2,702.6 cfs         2,956.6           Channel Velocity:         3.5 ft/sec         3.4           Cross-Sectional Area ( <b>A</b> ):         769.2 sq.ft.         867.2
	6.8         12.4         14.2         15.4         16.3         16.60         15.70         15.70         15.40         9.50         4.10         2.2         0.4	20.0 26.0 32.0 37.0 43.0 50 58 71 80 89 99 102 108	Distance (ft) 0.0 2.0 4.0 6.0 8.0 £ 10.0 <sup>0</sup> / <sub>2</sub> 12.0 14.0 10.0 <sup>0</sup> / <sub>2</sub> 12.0 14.0 10.0 <sup>0</sup> / <sub>2</sub> 12.0 14.0 10.0 <sup>0</sup> / <sub>2</sub> 10.0 <sup>0</sup> / <sub>2</sub> 10.0 <sup>0</sup> / <sub>2</sub> 12.0 14.0 16.0 18.0

Stream S	tabilizat	ion I & E F	orm	ILLING	DIS NRCS - Vers	ion 2.05- modified 9/	'12/04 R.Book	
County	Macoupin	-	Т.	R.		Sec		
Date	12/2	20/2005	Ву	Wayne Kinr	ney	l		
Stream Name Landowner Na	ime	Otter Creek X sec 3			UTM Coord.		E752075	N4354739
Drainage Area		112.38 sq	. mi.			Clear Cells		
Regional Curv								
Bankfull dimen	nsions	Width Depth	94 ft. 5.9 ft.	Cross Section	onal Area	553	sq. ft.	
Reference Stre	eam Gage:						0 0	
Macoupin Creek	near Kane		-	Station No. Drainage Area	05587000 868 sq.mi	R	Gage Q <sub>2</sub> Regression	9790 cfs 11800 cfs
Greene County	ν,	IL		Drainago / i oa		E STREAM DAT		11000 013
		5						
Valley Slope:	Peak Dischar 7.2	ge Predictions: ft./mi. (user-er	ntered)			Reg	ression Q <sub>2</sub>	4045 cfs
valley blope.	1.2	ft/mi (from wo		fall 3.40 in	(2 yr, 24 hr)		djusted Q <sub>2</sub>	3356 cfs
	0.0014	ft./ft.	Regional Fac		( <b>_ )</b> ., <b>_</b> )			full Discharge
		-	5			51	1340	to 2690 cfs
Local Stream I	Morphology:							
Channel D		• () 01 1					_	
Manning's "n"	0.04	(c) Clean, wind	ling, some pools and sho	Dals				
3.4		-	Stream L	_ength		ft.		
Basic Field Data:			Valley Le	-		ft.		
Bankfull Width		61 ft.	Contour			feet		
Mean Bankfull Width/Depth R	•	5.82 ft. 10.48	Estimate	ed Sinuosity				
	allo	10.40	Channel S	lope:		Bankfull Q from		
Max. Bankfull	Depth	9.2 ft.	Surveye		ft./ft.	Cross-Section		cfs
Width at twice	max. depth	1000 ft.	Estimate	ed:	ft./ft.	Basic field data	980	cfs
_	(18.4 ft.	,				Selected C	962	cfs
Entrenchment	Ratio	16.39		Curvature (Rc)		ft.		
			RC	:/Bankfull width:	0.00			
Bankfull Veloc	ity Check:	(typical Illinois	streams will have a	average bankful	I velocity betw	veen 3 and 5 ft/s	ec.)	
Bedload:	D <sub>90</sub>	2 🔻 in.	Velocity	required to mov	e D <sub>90</sub> :	2.9	ft./sec.	
	D <sub>50</sub>	in.	Velocity	from Cross-Sec	tion data:	2.66	ft./sec.	
GOAL: Develo		, ,		from basic field		2.76	ft./sec.	
velocitie	es from diffei	rent sources.	Velocity	from selected Q	):	2.7	ft./sec.	
Channel Evolu	tion Stage	IV 💌	Stream	Type (Rosgen)		l		
Notes								
8.6 of c/co								
8.6 cfs/sq. mi.								

<b>Natural Open Channel Flow</b>								
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> :	X sec 3 Wayne Kinney 12/20/2005 0.000524 0.040 9.2	$ \begin{array}{c c}                                    $						
Flow Depth: Survey Data: Rod (ft) 7.1 7.1 7.4	9.2 Distance (ft) 0.0 12.0 15.0	Trial Depth 2         Trial De						
9.2 13.5 14.3 15.2 15.7 16.4 15.70 15.20 13.70 12.30 9.80 8.00 2.2	20.0 26.0 30.0 33.0 40.0 45.0 50 53 60 65 70 73 75	0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 0.0 2.0 4.0 6.0 6.0 70.0 80.0 4.0 10.0 2.0 4.0 6.0 10.0 2.0 4.0 10.0 2.0 4.0 10.0 2.0 4.0 10.0 2.0 4.0 10.0 2.0 4.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 2.0 10.0 10						
		COMMENTS:						

Stream S	tabilizat	ion I & E F	orm	ILLINOIS NRO	CS - Version 2.05-	modified 9/12/04 R.E	Book
County	Macoupin	•	Т	R.		Sec.	
Date	12/2	20/2005	Ву	Wayne Kinney			
Stream Name Landowner Na	me	Otter Creek X sec 4		UTM	Coord.	E7548	97 N4357893
Drainage Area		105.72 sq.	mi.		Clear 0	Cells	
Regional Curv							
Bankfull dimen	isions	Width Depth	92 ft. 5.8 ft.	Cross Sectional A	vrea	<mark>530</mark> sq. ft.	
Reference Stre	eam Gage:						
Macoupin Creek	near Kane		-		87000 sq.mi	Gage Regressi	
Greene County	/,	IL		-		EAM DATA ONL	
Valley Slope:	8.4 0.0016	rge Predictions: ft./mi. (user-en ft/mi (from wor ft./ft.	,		, 24 hr) Ty		
Local Stream I	Morpholoav:						
Channel D		(c) Cloan wind	ng, some pools and sho	alc			-
Manning's "n"	0.04		rig, some pools and sho	115		-	•
			Stream L	·	ft.		
Basic Field Data:		50 4	Valley Le		ft.	-	
Bankfull Width Mean Bankfull		59 ft. 7.49 ft.	Contour I	I Sinuosity	feet		
Width/Depth R	•	7.88	Loundee				
-			Channel Slo			ll Q from:	
Max. Bankfull	•	9.4 ft.	Surveye			s-Section 173	
Width at twice	max. depth ( 18.8 ft.	1000 ft.	Estimate	d:ft./ft.		field data 1868 elected Q 1800	
Entrenchment		16.95	Radius of	Curvature (Rc)	ft.		
				. ,	).00		
Bankfull Veloc. Bedload:	ity Check: D <sub>90</sub>	_(typical Illinois 1		verage bankfull veloc equired to move D <sub>90</sub> :	<i>.</i>	and 5 ft/sec.) 2.1 ft./sec.	
Douloud.	D <sub>50</sub>	in.	-	om Cross-Section da		.92 ft./sec.	
GOAL: Develo	••			om basic field data:		.23 ft./sec.	
		rent sources.		om selected Q:	4	4.1 ft./sec.	
Channel Evolu	tion Stage	III <b>–</b>	Stream	Type (Rosgen)			
Notes							
17.0 of -/							
17.0 cfs/sq. mi							

Natur	al Op	en Channel Flow	
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> :	Wayne Kinney 12/20/2005 0.000878 0.040	$\begin{array}{c c} Q & \square & \overbrace{n} \\ \hline n \\ n \\$	
Flow Depth: Survey Data: Rod (ft) 3.9 4.0 5.7	9.4 Distance (ft) 0.0 11.0 18.0	Trial Depth 2           Selected Flow Depth:         9.4 ft         11.2           Channel Flow ( <b>Q</b> ):         1,732.7 cfs         1,945.0           Channel Velocity:         3.9 ft/sec         3.5           Cross-Sectional Area ( <b>A</b> ):         441.7 sq.ft.         563.6           Hydraulic Radius ( <b>R</b> ):         6.7 ft         5.6	Trial Depth 3
12.4         14.0         14.4         14.5         14.8         15.1         14.40         14.70         14.20         10.90         4.20         3.7	25.0 28.0 35.0 44.0 50.0 56.0 62 63 69 72 78 88 95	0.0 20.0 40.0 60.0 80.0 Distance (ft) 60.0 10 10 10 10 10 10 10 10 10 10 10 10 10	100.0 0.0 2.0 4.0 6.0 10.0 10.0 12.0 14.0 14.0 16.0
		COMMENTS:	

Stream S	tabilizat	ion I & E F	orm	ILLINOIS N	RCS - Version 2.	.05- modified 9/1	12/04 R.Book	
County	Macoupin	-	Т.	R.		Sec.		
Date	12/2	20/2005	Ву	Wayne Kinney				
Stream Name Landowner Na	me	Otter Creek X sec 5		UTI	M Coord.		E242961 I	N4361889
Drainage Area		65.38 sq	. mi.		C	ear Cells		
Regional Curve								
Bankfull dimen	sions	Width Depth	76 ft. 5.0 ft.	Cross Sectional	Area	383	sq. ft.	
Reference Stre	am Gage:							
Macoupin Creek	near Kane		-		5587000 68 sq.mi	R	Gage Q <sub>2</sub>	9790 cfs 11800 cfs
Greene County		IL		-	FERENCE S		-	11000 015
Valley Slope:	9.8 0.0019	ge Predictions: ft./mi. (user-ei ft/mi (from wo ft./ft.			∕r, 24 hr)	A	ession Q <sub>2</sub> djusted Q <sub>2</sub> ge for Bank 1010	3058 cfs 2537 cfs full Discharge to 2030 cfs
Local Stream N	Aorphology:							
Channel D		· (c) Cloan wind	ling, some pools and sho	als			-	
Manning's "n"	0.04		ang, some pools and sho				<u> </u>	
			Stream L	°	ft.			
Basic Field Data:		4.4 54	Valley Le	-	ft.	_		
Bankfull Width Mean Bankfull	Denth	44 ft. 7.45 ft.	Contour I	d Sinuosity	feet			
Width/Depth R		5.91	LStimated					
			Channel Sk			hkfull Q from:		
Max. Bankfull [	•	10.4 ft.	Surveye		· · · · · · · · ·	ross-Section		cfs
Width at twice	max. depth ( 20.8 ft.	1000 ft.	Estimate	ed: <i>ft./f</i>	t. Ba	sic field data Selected Q		cfs cfs
Entrenchment		22.73	Radius of	Curvature (Rc)	ft.	Selected Q	1303	613
				/Bankfull width:	0.00			
Bankfull Veloci Bedload:	ty Check: D <sub>90</sub>		s streams will have a Velocity r	<u>verage bankfull vel</u> equired to move D <sub>9</sub>		a 3 and 5 ft/se 2.1	c.) ft./sec.	
Deuloau.	D <sub>50</sub>	1 ▼ In.	-	rom Cross-Section		3.73	ft./sec.	
GOAL: Develo				rom basic field data		4.21	ft./sec.	
		rent sources.		rom selected Q:		4.0	ft./sec.	
Channel Evolu	tion Stage	III <b>–</b>	Stream	Type (Rosgen)				
Notes								
19.9 cfs/sq. mi								

Natur	al Op	en Channel Flow
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> : Flow Depth:		$ \begin{array}{c}                                     $
Survey Data: Rod (ft) 2.7 2.7 14.3	Distance (ft) 90.0 79.0 71.0	Trial Depth 2         Trial Depth 2         Trial Depth 3           Selected Flow Depth:         10.4 ft         12.8           Channel Flow ( <b>Q</b> ):         1,223.6 cfs         1,406.5           Channel Velocity:         3.7 ft/sec         3.0           Cross-Sectional Area ( <b>A</b> ):         328.1 sq.ft.         463.3           Hydraulic Radius ( <b>R</b> ):         6.2 ft         4.6
15.0 15.5 15.4 15.0 7.8 5.1 4.50 2.70 3.10 3.90	65.0 63.0 58.0 47.0 39.0 33.0 29 24 15 0	COMMENTS:

Stream St	tabilizat	ion I & E	Form		ILLIN	OIS NRCS - Vers	sion 2.05- modified 9	/12/04 R.Book	
County	Macoupin	-	7	Г	R		Sec		
Date	12/2	20/2005		Ву	Wayne Kin	ney			
Stream Name Landowner Nar	ne	Otter Creek X sec 6	<			UTM Coord.		E246133	N4363472
Drainage Area		58.99	sq. mi.			_	Clear Cells		
Regional Curve								-	
Bankfull dimens	sions	Width Depth		<mark>3</mark> ft. 9 ft.	Cross Sect	ional Area	35	<mark>7</mark> sq. ft.	
Reference Stre	am Gage:								
Macoupin Creek r	near Kane			-	Station No. Drainage Area	05587000 868 sq.mi	_	Gage Q <sub>2</sub> Regression	9790 cfs 11800 cfs
Greene County	,	IL			Brainage Aree		E STREAM DA	0	11000 013
USCS Flood D	aak Diaaba	an Dradiation							
USGS Flood-Pe	eak Dischar 11.9	ft./mi. (use					Re	gression Q <sub>2</sub>	3096 cfs
		ft/mi (from	,	Rai	nfall 3.40 in	(2 yr, 24 hr)		Adjusted Q <sub>2</sub>	2568 cfs
	0.0023	ft./ft.	-	egional Fa				nge for Ban	kfull Discharge
				-				1020	to 2060 cfs
Local Stream N	Iorphology:								
Channel D	,	· (a) Cloan )	winding, some	pools and sh				-	
Manning's "n"	0.04		winding, some	pools and si	IOdis				
_		-		Stream	Length		ft.		
Basic Field Data:				Valley L	0		ft.		
Bankfull Width	Danth	53	ft.		r Interval		feet		
Mean Bankfull I Width/Depth Ra	•	6.1 8.69	ft.	Estimat	ed Sinuosity		_		
Widen Doper He		0.00		Channel	Slope:		Bankfull Q from	:	
Max. Bankfull D	Depth	8	ft.	Surve	yed: 0.000878	ft./ft.	Cross-Sectio	n 1122	cfs
Width at twice r		600	ft.	Estima	ted:	ft./ft.	Basic field dat		cfs
	(16.0 ft.						Selected (	ຊ <u>1157</u>	cfs
Entrenchment F	Ratio	11.32			of Curvature (Rc c/Bankfull width		ft.		
					C/Dankrun width	. 0.00			
Bankfull Velocit		(typical Illin					veen 3 and 5 ft/s	,	
Bedload:	D <sub>90</sub>	1 🔻	in.		required to mov		2.1	ft./sec.	
	D <sub>50</sub>		in.		from Cross-See		3.47	ft./sec.	
GOAL: Develop		,	9		from basic field		3.69 3.6	ft./sec.	
velocitie	s from almer	rent sources.		velocity	rfrom selected C	J.	3.0	ft./sec.	
Channel Evolut	ion Stage	IV 💌		Stream	n Type (Rosgen	)	1		
Notes									
10.01.1.1									
19.61 cfs/sq. m	l.								

Natur	al Op	en Channel Flow	
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> : Flow Depth:	X sec 6 Wayne Kinney 12/20/2005 0.000878 0.040 8.0	$Q \square \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$ $ft/ft$ $assuming uniform, steady flow$	
Survey Data: Rod (ft) 6.7 7.0 11.4	Distance (ft) 0.0 7.0 11.0	Trial Depth 2         Trial De	ial Depth 3
12.1         15.3         15.7         16.0         15.7         15.5         15.70         15.90         15.70         14.80         11.70         7.30         7.8         8.0	14.0         19.0         24.0         28.0         32.0         37.0         41         46         48         50         56         62         70         77	0.0 20.0 40.0 60.0 80.0 10 Distance (ft) 40.0 000000000000000000000000000000000	00.0 0.0 2.0 4.0 6.0 10.0 112.0 14.0 14.0 16.0 18.0
		COMMENTS:	

Stream St	tabilizat	ion I & E Fo	orm	ILLINOIS NRCS	- Version 2.05- modified	9/12/04 R.Book	
County	Macoupin	-	Т.	R.	Se	с.	
Date	12/2	20/2005	Ву	Wayne Kinney			
Stream Name Landowner Nar	ne	Otter Creek X sec 7			oord.	E248936 N436	5362
Drainage Area		52.67 sq.	mi.		Clear Cells		
Regional Curve	Predictions	s:					
Bankfull dimens	sions	Width Depth	70 ft. 4.7 ft.	Cross Sectional Are	a <u>33</u>	<mark>31</mark> sq. ft.	
Reference Stre	am Gage:						
Macoupin Creek r	near Kane		-	Station No. 05587 Drainage Area 868 so		-	'90 cfs 800 cfs
Greene County		IL		5	RENCE STREAM DA	-	500 CIS
	3						
USGS Flood-P		•			De		
Valley Slope:	11.3	ft./mi. (user-ent	,			-	'61 cfs
	0.0004	ft/mi (from work	,		,	-	91 cfs
	0.0021	ft./ft.	Regional Facto	or <u>1.057</u>	Typical Ra	ange for Bankfull D 910 to 1	Iscnarge
							010010
Local Stream N	lorphology:						
Channel D	escription	(c) Clean, windir	ng, some pools and shoa	ls		-	
Manning's "n"	0.04	_					
			Stream Le	°	ft.		
Basic Field Data: Bankfull Width		53 ft.	Valley Ler Contour Ir	°	ft. feet		
Mean Bankfull	Denth	5.49 ft.		Sinuosity	leet		
Width/Depth Ra	•	9.65	Loundtoo				
			Channel Slo	pe:	Bankfull Q fror	n:	
Max. Bankfull D	•	8.1 <i>ft</i> .	Surveye	d: 0.000878 ft./ft.	Cross-Section		
Width at twice r		500 ft.	Estimate	d: <i>ft./ft.</i>	Basic field da		
Entrenchment I	(16.2 ft.	) <u>9.43</u>	Dedius of (		ft.	Q 975 cfs	
Entrenchment	Nalio	9.43		Curvature (Rc) Bankfull width: 0.0			
			IXC/		0		
Bankfull Veloci		(typical Illinois		verage bankfull velocity	/ between 3 and 5 ft/	/sec.)	
Bedload:	D <sub>90</sub>	1 🔻 in.	Velocity re	equired to move D <sub>90</sub> :	2.1	ft./sec.	
	D <sub>50</sub>	in.		om Cross-Section data		ft./sec.	
GOAL: Develop		, ,		om basic field data:	3.44	ft./sec.	
velocitie	s from differ	rent sources.	Velocity fr	om selected Q:	3.4	ft./sec.	
Channel Evolut	ion Stage	IV 💌	Stream	Type (Rosgen)			
Notes							
18.5 of c ca mi							
18.5 cfs.sq. mi.							

Natur	al Op	en Channel Flow
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> : Flow Depth:	X sec 7 Wayne Kinney 12/20/2005 0.000878 0.040 8.1	$Q \square \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$ $ft/ft$ $assuming uniform, steady flow$
Survey Data: Rod (ft) 9.0 9.0 9.5	Distance (ft) 0.0 8.0 17.0	Trial Depth 2         Trial Depth 2         Trial Depth 3           Selected Flow Depth:         8.1 ft         9.2           Channel Flow ( <b>Q</b> ):         949.4 cfs         1,045.7           Channel Velocity:         3.3 ft/sec         2.9           Cross-Sectional Area ( <b>A</b> ):         291.1 sq.ft.         354.7           Hydraulic Radius ( <b>R</b> ):         5.1 ft         4.4
13.7         17.1         18.2         17.8         17.3         15.60         12.90         12.70         10.10         8.80         8.30	21.0 26.0 27.0 33.0 43.0 51.0 54 62 65 70 77 83	COMMENTS:

Stream Sto	abilizati	ion I & E f	Form	ILLINOIS NRCS - Ve	ersion 2.05- modified 9/12/04 F	R.Book
County	Macoupin	-	Т.	R.	Sec.	
Date	12/2	3/2005	By	Wayne Kinney	_	
Duic	12/2	0/2000	Dy	Wayne Rinney	-	
Stream Name Landowner Nam	е	Otter Creek X sec 8		UTM Coor	d. <u>E25</u>	1906 N4373485
Drainage Area		6.84 s	n mi	_	Clear Cells	
Ū.	Destini		1			
Regional Curve Bankfull dimensi		: Width	32 ft.	Cross Sectional Area	83 sq. f	•
	0.110	Depth	2.6 ft.		<u> </u>	
Reference Strea	m Gage:					
Macoupin Creek ne	ar Kano		-	Station No. 05587000	_	e Q <sub>2</sub> 9790 cfs
				Drainage Area 868 sq.m	~	
Greene County,		IL		KEFEREN	CE STREAM DATA ON	LT
USGS Flood-Pe	ak Dischar	ge Predictions.				
Valley Slope:	13.4	ft./mi. (user-e	entered)		Regressio	on Q <sub>2</sub> 597 cfs
		ft/mi (from we	orksheet) Rain	fall 3.40 in (2 yr, 24 hi	r) Adjuste	ed Q <sub>2</sub> 496 cfs
	0.0025	ft./ft.	Regional Fac	ctor 1.057	Typical Range fo	r Bankfull Discharge:
		-	J.			190 to 400 cfs
Local Stream Mo						
Channel De		(c) Clean, wir	ding, some pools and she	oals		-
Manning's "n"	0.04	_	<u> </u>		<i>c</i>	
			Stream I	0	ft.	
<i>Basic Field Data:</i> Bankfull Width		22 ft	Valley Le Contour	•	ft.	
Mean Bankfull D	onth	2.92 ft		ed Sinuosity	feet	
Width/Depth Rat	•	7.53	Estimate		_	
Widen/Departical		1.00	Channel S	lone:	Bankfull Q from:	
Max. Bankfull De	epth	4 ft				57 cfs
Width at twice m	•	200 ft				71 cfs
	( 8.0 ft.)				Selected Q 1	64 cfs
Entrenchment R	atio	9.09	Radius of	f Curvature (Rc)	ft.	
			Ro	c/Bankfull width: 0.00		
	<b>.</b>					
Bankfull Velocity Bedload:	<u>Check:</u> D <sub>90</sub>			average bankfull velocity be required to move D <sub>90</sub> :		
Bedioad:	D <sub>90</sub> D <sub>50</sub>	1 <b>T</b> in				
		ir.		from Cross-Section data:	2.44 ft./se	
GOAL: Develop			,	from basic field data:	2.66 ft./se	
velocities	nom amer	ent sources.	Velocity	from selected Q:	2.6 ft./se	Ю.
Channel Evolution	on Stage	v 🔻	Stream	Type (Rosgen)		
Notes						
24.0 cfs/sq. mi.						
0.0,0q. mit						

Natur	al Op	en Channel Flow
Project: Assisted by: Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> : Flow Depth:	X sec 8 Wayne Kinney 12/20/2005 0.001220 0.040 4.0	$ \begin{array}{c}                                     $
Survey Data:           Rod (ft)           6.0           5.8           13.5	4.0 Distance (ft) 50.0 45.0 40.0	Trial Depth 2         Trial Depth 2         Trial Depth 3           Selected Flow Depth:         4.0 ft         6.0           Channel Flow ( <b>Q</b> ):         156.9 cfs         288.4           Channel Velocity:         2.4 ft/sec         2.4           Cross-Sectional Area ( <b>A</b> ):         64.4 sq.ft.         120.0           Hydraulic Radius ( <b>R</b> ):         2.6 ft         2.5
14.2 14.2 13.7 11.2 10.2 8.6 8.20 8.20 8.20	39.0 32.0 27.0 23.0 20.0 13.0 5 0	0.0 10.0 20.0 30.0 40.0 50.0 60.0 0.0 2.0 2.0 0.0 2.0 4.0 2.0 4.0 50.0 10.0 10.0 10.0 10.0 10.0 10.0 10
		COMMENTS:

Stream S	tabilizat	ion I & E F	form	ILLINOIS NRC	CS - Version 2.05-	modified 9/12/	/04 R.Book	
County	Macoupin	•	Т.	R.		Sec.		
Date	12/2	20/2005	Ву	Wayne Kinney				
Stream Name Landowner Na	ime	Otter Creek X sec 9		UTM	Coord.	E	252424 N	14375795
Drainage Area	I	3.41 sq	. mi.		Clear	Cells		
Regional Curv								
Bankfull dimer	nsions	Width Depth	24 ft. 2.1 ft.	Cross Sectional A	rea	<mark>52</mark> s	q. ft.	
Reference Stre	eam Gage:			<b>0</b>				
Macoupin Creek	near Kane		-		87000 sq.mi		Gage Q <sub>2</sub>	9790 cfs 11800 cfs
Greene Count		IL		-	ERENCE STR	-	-	11000 015
							-	
USGS Flood-F	Peak Dischar 12.8	ge Predictions: ft./mi. (user-e	ntarad			Reare	ssion Q <sub>2</sub>	337 cfs
valley Slope.	12.0	-		oll 2.40 in (2.1/r	24 hr	•	usted $Q_2$	280 cfs
	0.0024	ft/mi (from wo ft./ft.	Regional Fact		24 hr)	-	_	full Discharge
	0.0024	11./11.	Regionariaci	01 1.007	13		110 Jank	to 230 cfs
_								
Local Stream	Morphology:							
Channel E		: (c) Clean, wind	ding, some pools and sho	als			-	
Manning's "n"	0.04	_	Stroom	anath	4			
Basic Field Data:			Stream L Valley Le	°	ft. ft.			
Bankfull Width	1	15 ft.	Contour I	-	feet	-		
Mean Bankfull		2.19 ft.		d Sinuosity				
Width/Depth R	latio	6.85		·				
			Channel Slo			ull Q from:		
Max. Bankfull		3 ft.	Surveye		-	s-Section		ofs
Width at twice	max. depth ( 6.0 ft.	40 ft.	Estimate	d: <i>ft./ft.</i>		field data		cfs cfs
Entrenchment	· ·	2.67	Radius of	Curvature (Rc)	ft.		102 0	.15
Lintononin	rano	2.07			.00			
Bankfull Veloc			111 7	verage bankfull veloc	ity between 3		/	
Bedload:	D <sub>90</sub>	3 <b>▼</b> in.	-	equired to move D <sub>90</sub> :			./sec.	
	D <sub>50</sub>	in.		rom Cross-Section da			./sec.	
GOAL: Develo		, ,		rom basic field data:			./sec.	
Velocitie	es from differ	rent sources.	velocity f	rom selected Q:		3.1 ft	./sec.	
Channel Evolu	ition Stage	III <b>–</b>	Stream	Type (Rosgen)				
Notes								
29.9 cfs/sq. mi	i							
-0.0 013/34. III								

		en Channel Flow	
Project: Assisted by: \ Date: Channel Slope ( <b>S</b> ): Manning's <b>n</b> :	X sec 9 Wayne Kinney 12/20/2005 0.002670 0.040	$Q \downarrow \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$ $ft/ft \qquad assuming uniform, steady flow$	<u>orm</u>
Flow Depth:	3.0	ft Trial Depth 2 Selected Flow Depth: 3.0 ft 5.9	Trial Depth 3
Rod (ft)	Distance (ft)	Channel Flow ( <b>Q</b> ): 96.9 cfs 361.8	
8.5	0.0	Channel Velocity: 3.0 ft/sec 3.5	
9.1	3.0	Cross-Sectional Area ( <b>A</b> ): 32.8 sq.ft. 103.6	
9.5	7.0	Hydraulic Radius ( $\mathbf{R}$ ): 1.9 $ft$ 2.5	
10.6	10.0		
13.0	13.0	0.0 10.0 20.0 (30.0 40.0	50.0
13.4	15.0	Distance (ft)	
14.4	16.0		
14.4	20.0		2.0
14.3 11.30	23.0 26		4.0
	-		
10.10	28 32		6.0
10.00			E . E
9.00	37		8.0 (H) Koq (H)
8.20	40		10.0
			10.0
		│ <mark>╞╤╴┾╶╞╤╡┇<mark>┟╤╡╺╴┾╤<mark>┦</mark>╺┤╊╤╎╺┤┾╤</mark>╵┫╎╎╎┤</mark>	12.0
			12.0
			14.0
			16.0
		COMMENTS:	

Stream St	abilizat	ion I & E	Form		ILLING	OIS NRCS - Vers	ion 2.05- mod	ified 9/12/04 F	R.Book	
County	Macoupin	-	T.		R			Sec.		
Date	12/2	20/2005		Ву	Wayne Kini	ney				
Stream Name Landowner Nar	ne	Otter Creek Xsec 10				UTM Coord		E252	2224 N	N4376545
Drainage Area		3.09	sq. mi.				Clear Cells			
Regional Curve										
Bankfull dimens	sions	Width Depth	23 2.1		Cross Sect	ional Area		<mark>48</mark> sq. f	t.	
Reference Stre	am Gage:									
Macoupin Creek r	near Kane			-	Station No. Drainage Area	05587000 868 sq.mi	-	Gag Regres	$pe Q_2$	9790 cfs 11800 cfs
Greene County	,	IL			Dramago / not	REFERENC	E STREAM	•	_	11000 013
LISCS Flood D	ook Dioohou	rao Prodiction	o:							
USGS Flood-Pe Valley Slope:	12.1	ft./mi. (user-						Regressio	$n Q_2$	304 cfs
<u> </u>		ft/mi (from v	,	Rainfa	all 3.40 in	(2 yr, 24 hr)		Adjuste	ed Q <sub>2</sub>	252 cfs
	0.0023	ft./ft.	,	ional Facto			Typica			full Discharge
									100	to 210 cfs
Local Stream N	lorpholoav:									
Channel D		· (c) Clean w	inding, some p	ools and shoa	le				-	
Manning's "n"	0.04		inding, some p		15					
-		-		Stream Le	•		ft.			
Basic Field Data:		45		Valley Ler	•		ft.			
Bankfull Width Mean Bankfull I	Donth	-	ft. ft.	Contour Ir Estimated			feet			
Width/Depth Ra	•	7.54	п.	Estimated	Sinuosity		_			
•				Channel Slo	pe:		Bankfull Q			
Max. Bankfull D		-	ft.	Surveye		ft./ft.	Cross-Se			cfs
Width at twice r	•		ft.	Estimate	d:	ft./ft.	Basic field			cfs 
Entrenchment F	( 5.8 ft. Ratio	) 4.67		Radius of (	Curvature (Rc	)	ft.	ted Q 8	37 c	cfs
Entreneninent	tallo	4.07			Bankfull width		1.			
Bankfull Velocit Bedload:	ty Check: D <sub>90</sub>		ois streams ( in.		verage bankfu equired to mov		ween 3 and 3.6	5 ft/sec.) ft./se		
Beuluau.	D <sub>90</sub> D <sub>50</sub>		in.		om Cross-Sec		2.78	ft./se		
GOAL: Develop					om basic field		3.05	ft./se		
		rent sources.			om selected C		2.9	ft./se		
Channel Evolut	ion Stage	IV 🔻		Stream 7	Type (Rosgen	)				
Notes										
110103										
28.2 cfs/sq. mi.										

<b>Natural Open Channel Flow</b>									
Project: Xsec 10 Assisted by: Wayne Kinney Date: 12/20/2005 Channel Slope ( <b>S</b> ): 0.002670 Manning's <b>n</b> : 0.040		$\begin{bmatrix} Q & \square & \square & A & R^3 & S^2 \\ n & & & \\ \hline ft/ft & & assuming uniform, steady flow \end{bmatrix}$ Clear Cells							
Flow Depth: Survey Data: Rod (ft) 9.2 10.3 10.2	2.9 Distance (ft) 0.0 11.0 20.0	It         Trial Depth 2         Trial Depth 2         Trial Depth 3           Selected Flow Depth:         2.9 ft         5.3         5.3           Channel Flow ( <b>Q</b> ):         82.8 cfs         306.9         5.3           Channel Velocity:         2.8 ft/sec         2.8         5.3           Cross-Sectional Area ( <b>A</b> ):         29.8 sq.ft.         109.4         5.3           Hydraulic Radius ( <b>R</b> ):         1.7 ft         1.8         5.3							
10.4         11.6         14.3         14.4         14.5         13.5         13.70         11.50         10.60         10.40         9.10         8.00	23.0 26.0 28.0 29.0 31.0 35.0 38 41 45 50 60 65	0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 0.0 2.0 2.0 4.0 50.0 60.0 70.0 0.0 2.0 4.0 6.0 0.0 10.0 10.0 10.0 10.0 10.0 10.0							
		COMMENTS:							