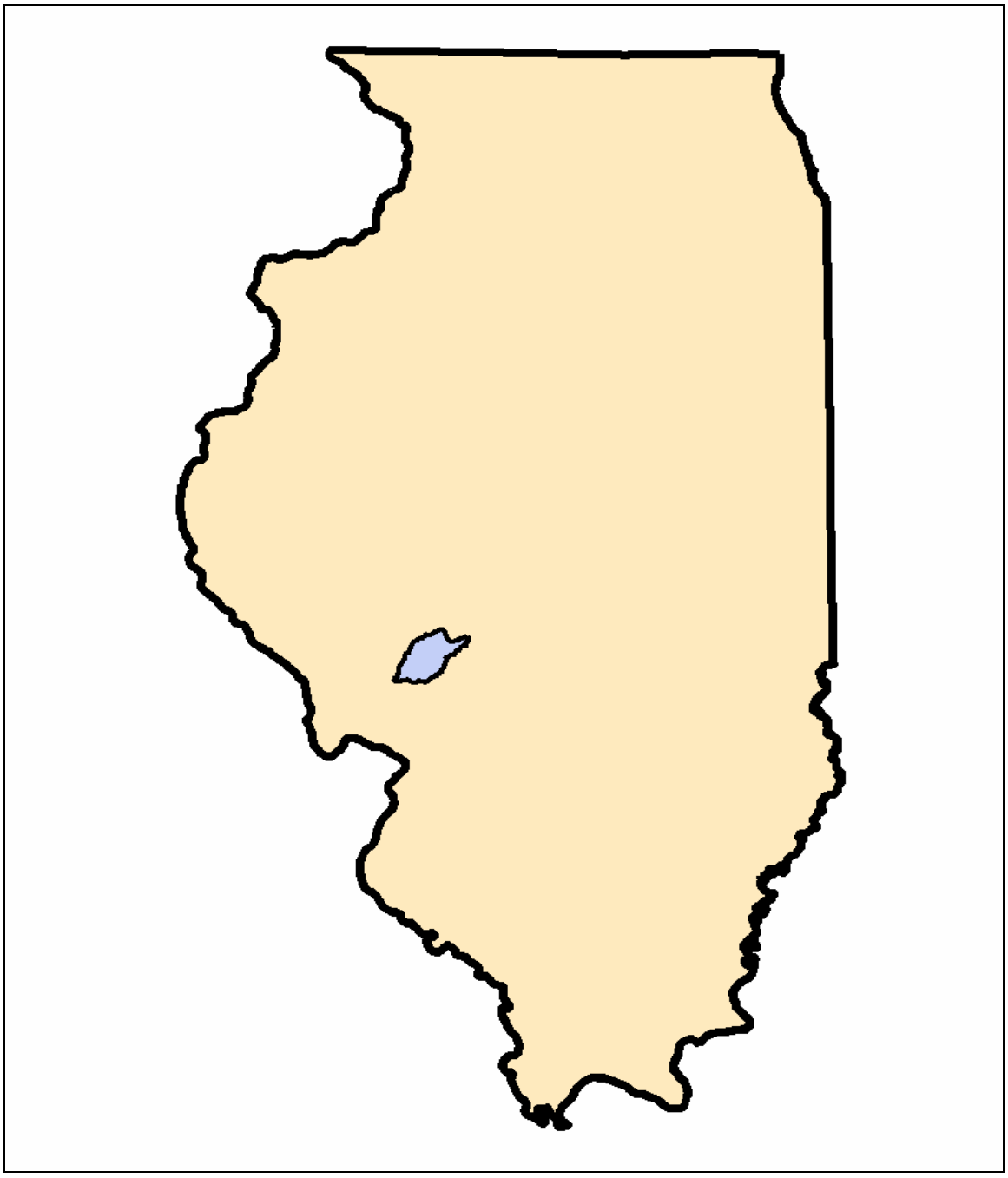


AERIAL ASSESSMENT REPORT FOR Hodges and Otter Creek

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.

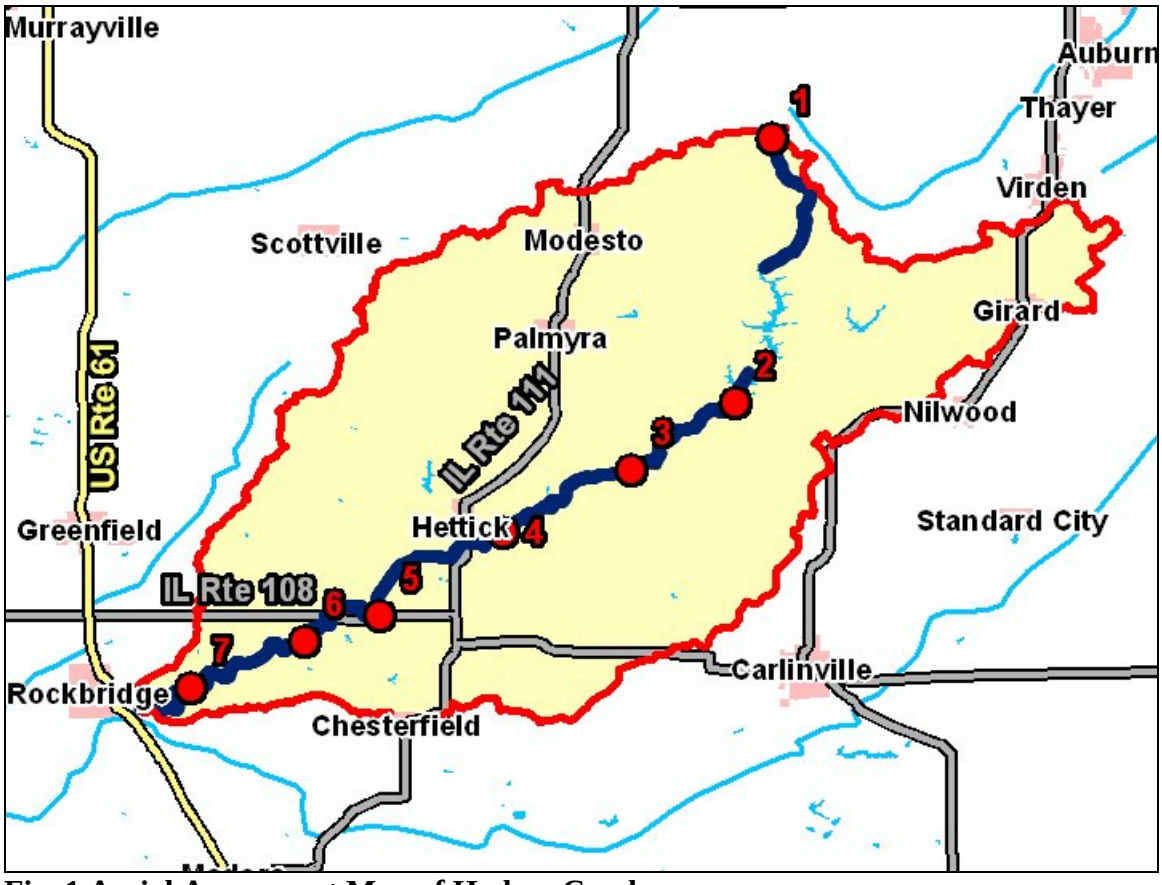


Fig. 1 Aerial Assessment Map of Hodges Creek

After videotaping the stream, the DVD tapes were processed by USGS to produce a geo-referenced 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.

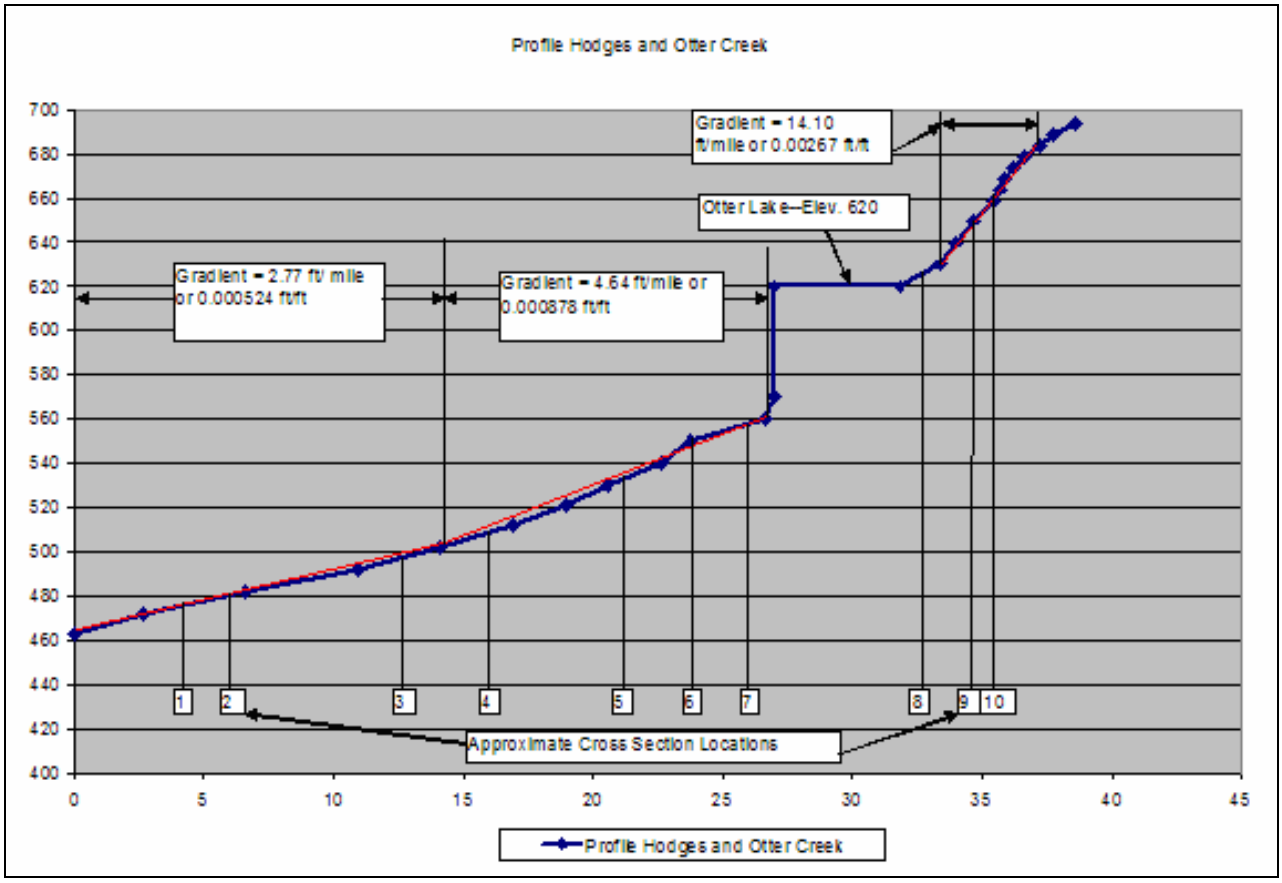


Fig. 2 Channel Profile Hodges and Otter Creek

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 ON DVD AND ASSESSMENT REPORT Otter Creek				
DVD Disc	DVD chapter	Beginning Time	Report Chapter	Cross 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.

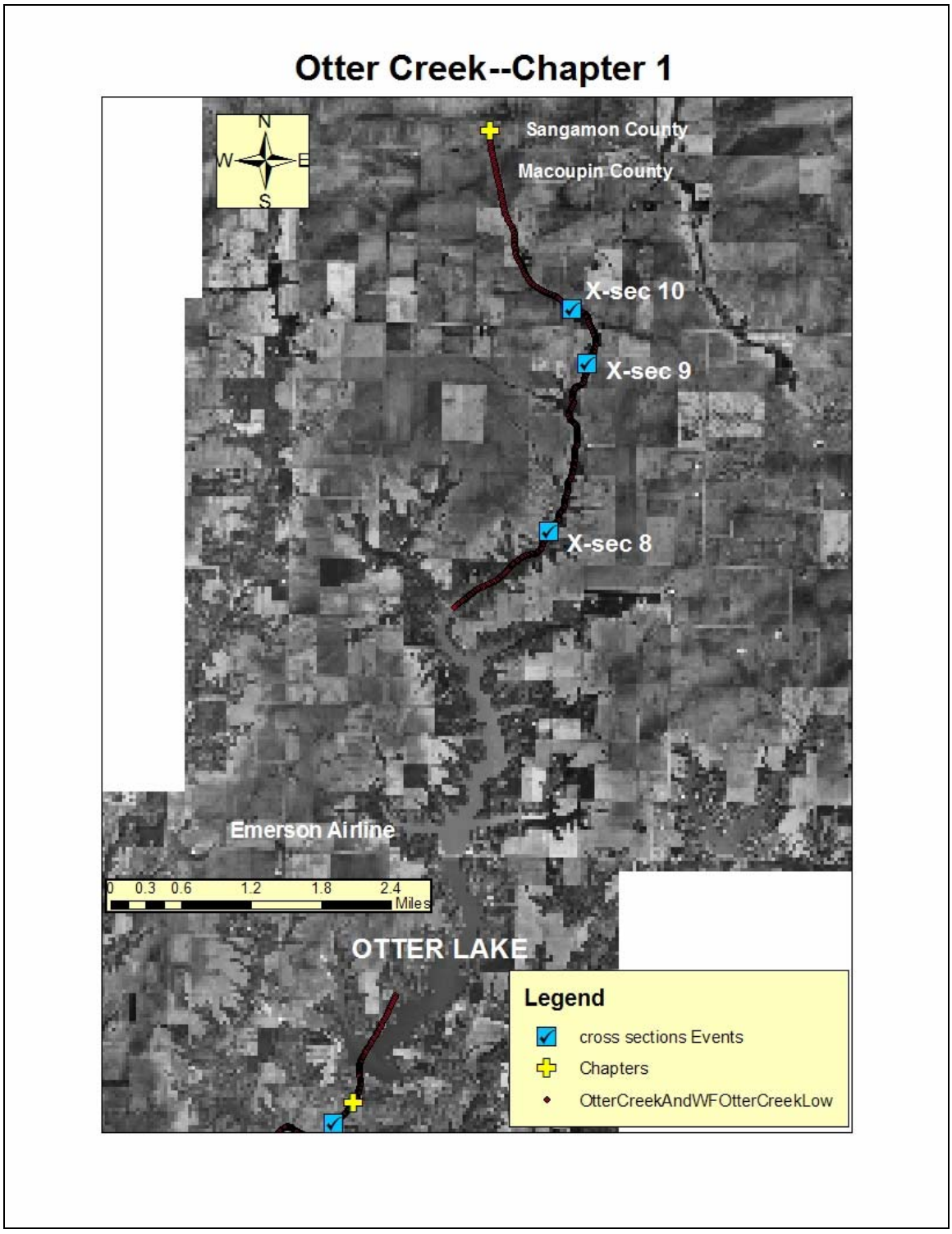

Otter Creek--Chapter 1
N
W
E
S
Sangamon County
Macoupin County
X-sec 10
X-sec 9
X-sec 8
Emerson Airline
0 0.3 0.6 1.2 1.8 2.4
Miles
OTTER LAKE
Legend
cross sections Events
Chapters
OtterCreekAndWFOtterCreekLow

Figure 4

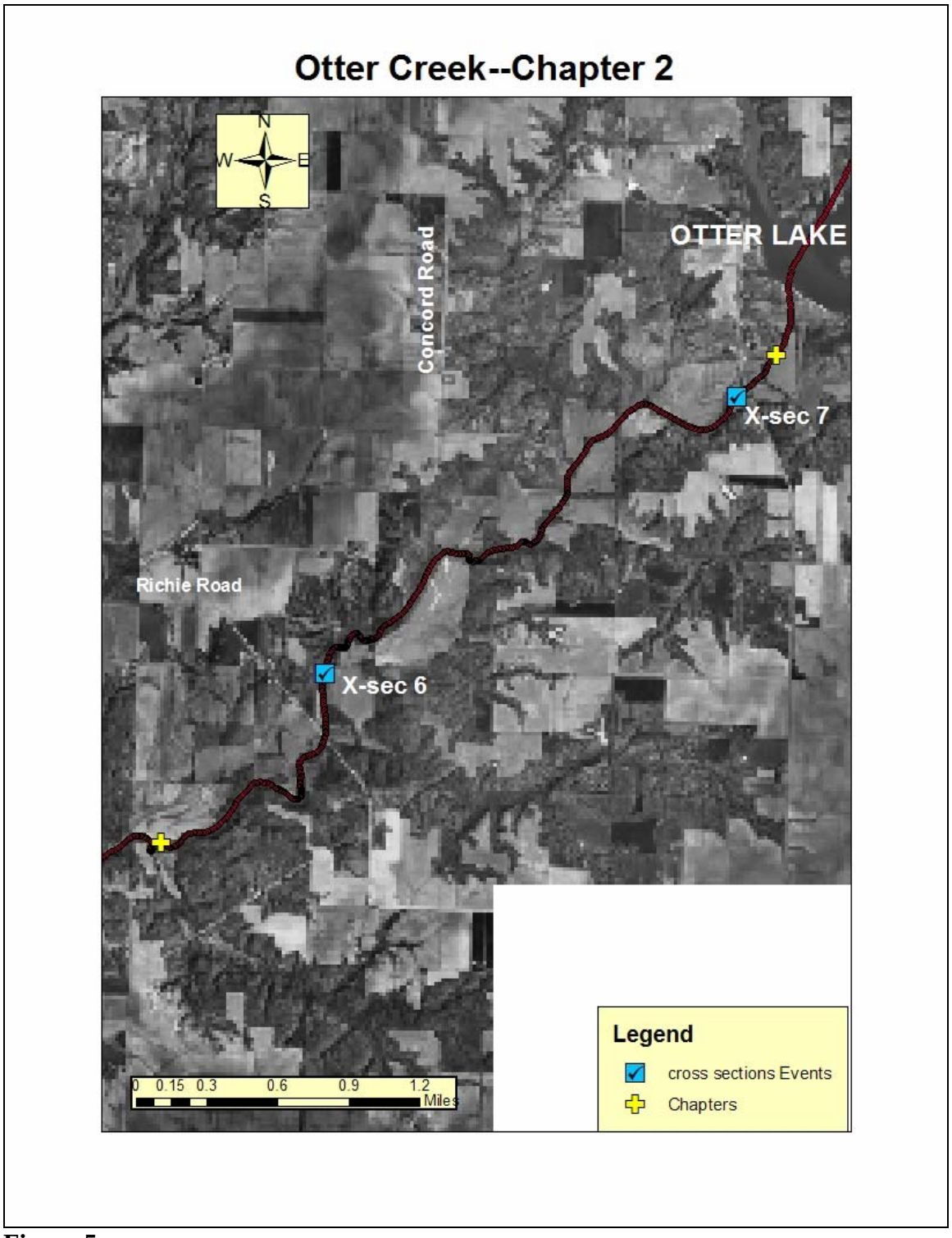

Otter Creek--Chapter 2
N
W
E
S
Concord Road
OTTER LAKE
X-sec 7
Richie Road
X-sec 6
0 0.15 0.3 0.6 0.9 1.2
Miles
Legend
cross sections Events
Chapters

Figure 5

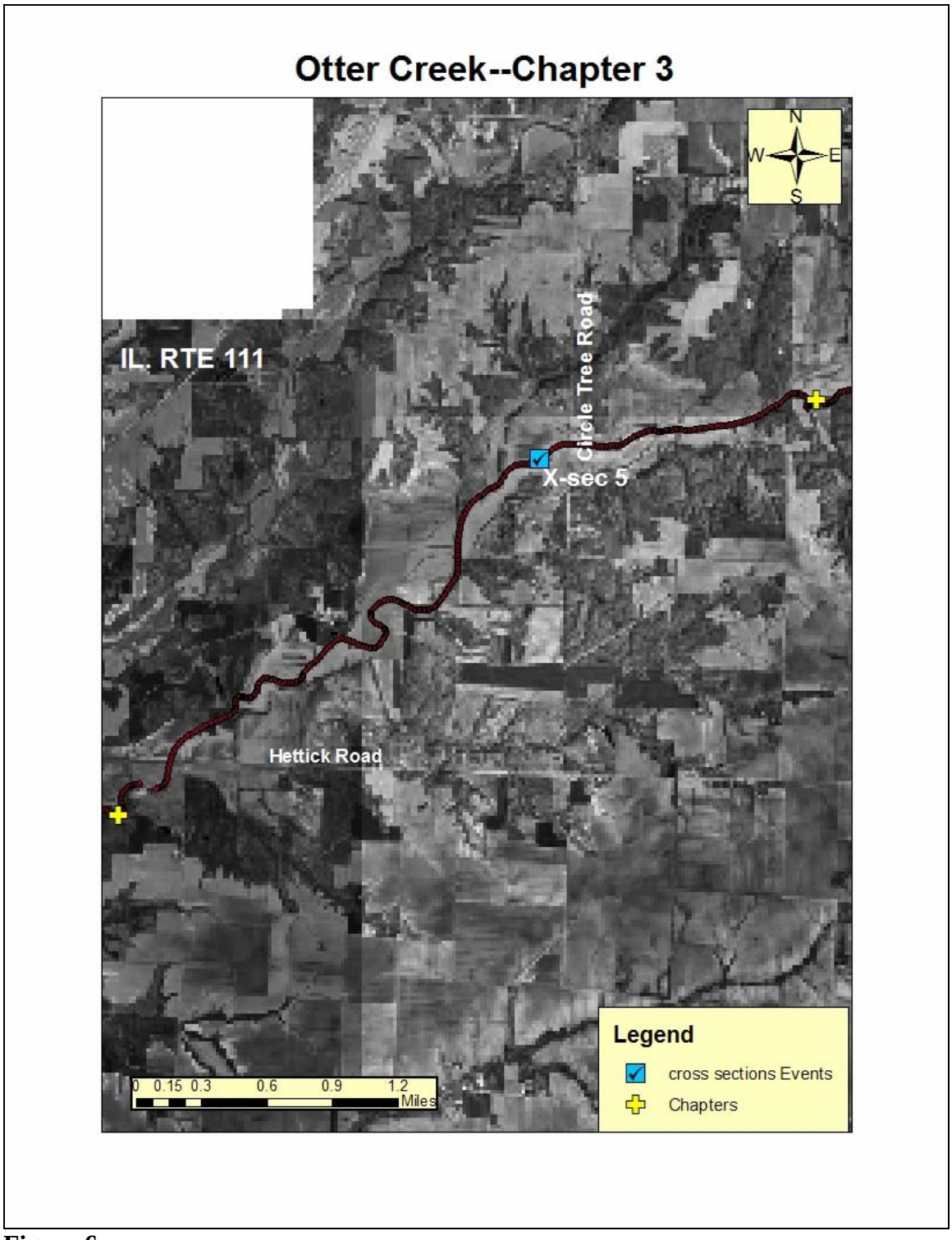

Otter Creek--Chapter 3
N
W
E
S
IL. RTE 111
Circle Tree Road
X-sec 5
Hettick Road
0 0.15 0.3 0.6 0.9 1.2
Miles
Legend
cross sections Events
Chapters

Figure 6

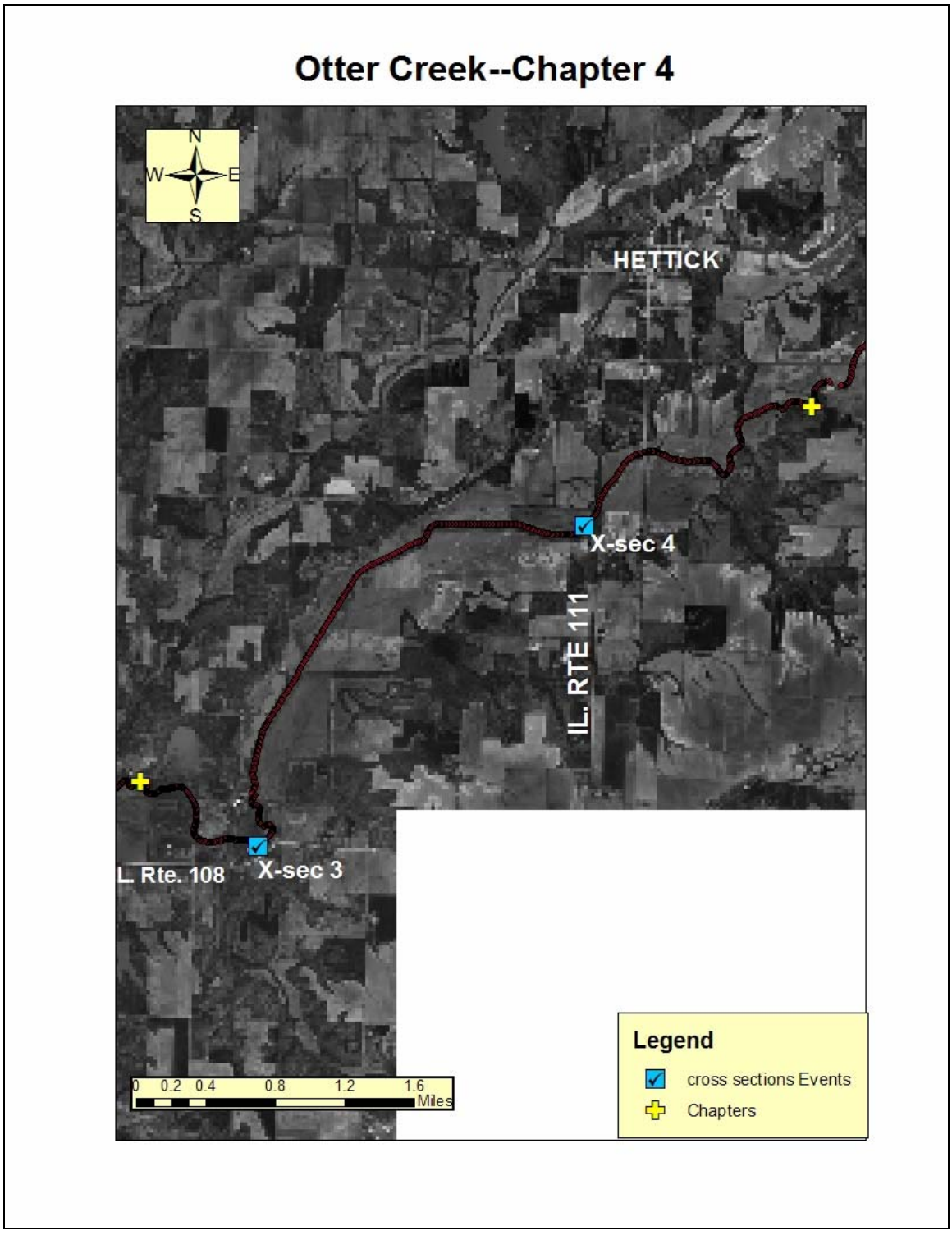

Otter Creek--Chapter 4
N
W
E
S
HETTICK
X-sec 4
IL. RTE 111
L. Rte. 108
X-sec 3
0 0.2 0.4 0.8 1.2 1.6
Miles
Legend
cross sections Events
Chapters

Figure 7

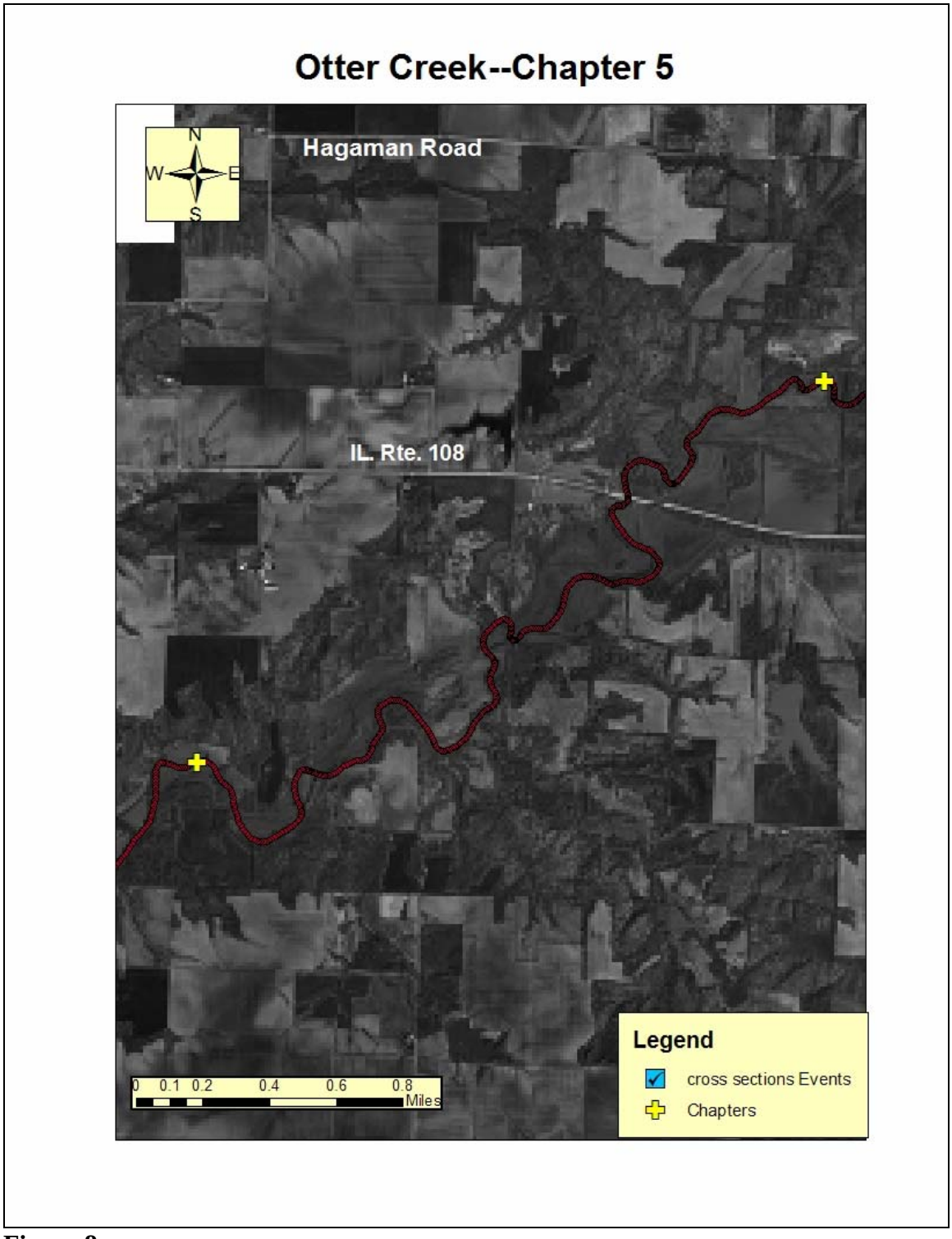

Otter Creek--Chapter 5
N
W
E
S
Hagaman Road
IL. Rte. 108
0 0.1 0.2 0.4 0.6 0.8
Miles
Legend
cross sections Events
Chapters

Figure 8

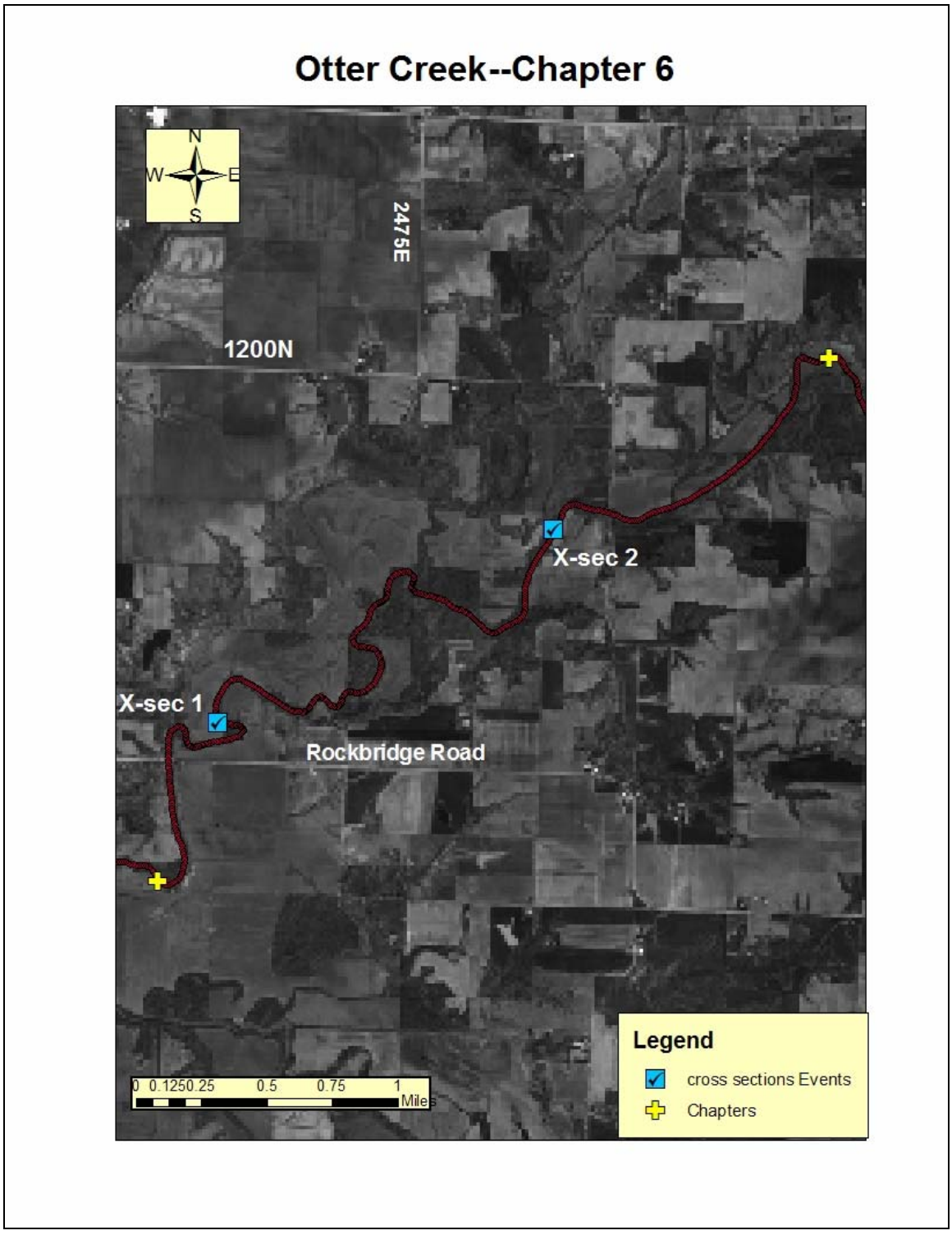

Otter Creek--Chapter 6
N
W
E
S
2475E
1200N
X-sec 2
X-sec 1
Rockbridge Road
0 0.1250.25 0.5 0.75 1
Miles
Legend
cross sections Events
Chapters

Figure 9

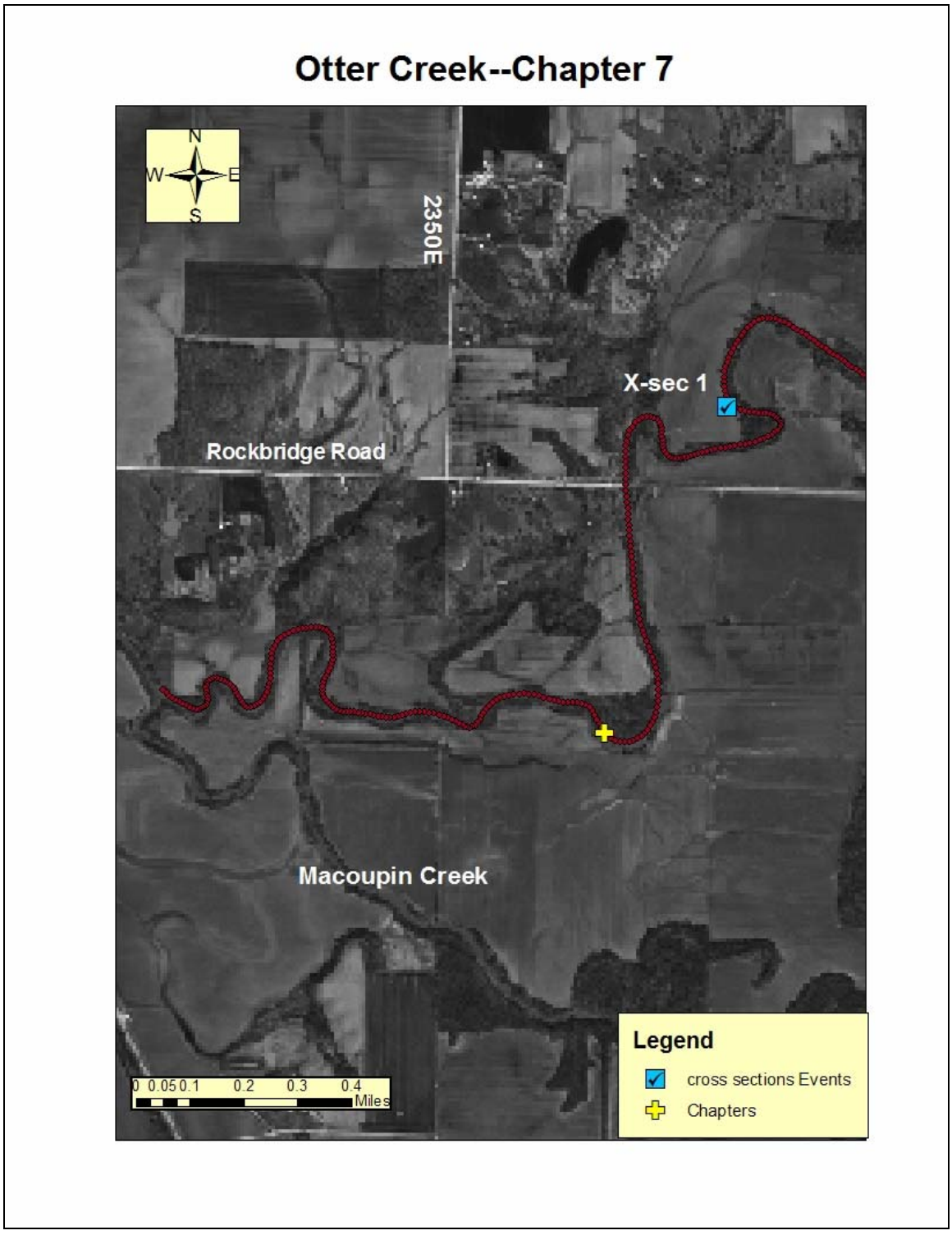


Figure 10

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

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

FEATURES IDENTIFIED BY CHAPTER										
Otter Creek										
CHAPTER	ROCK OUTCROP	LOGJAM	GEOTECH FAILURE	DEPOSITION	BED STRUCTURE	BED CONTROL	BANK CONTROL	BREAK POINT	EROSION	SEVERE 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

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													
X-sec	ADA	Q2 cfs	BKF cfs	BKF/sq.mi.	BKF Width	Max D	Vel. FPS	W/D	Top Bk. Depth	BKF X-Area	Top Bk X-Area	BKF cfs/ Q2 cfs	Top Bk/ BKF area
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.

TREATMENT --CHAPTER 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 Riffle Grade Control					
Chapter	Number Riffles	Average Tons Stone	Total Tons Stone	Average Cost/ton	Total Cost
1	125	90	11250	$30.00	$337,500.00
Total	**125**		**11250**		**$337,500.00**

Table 3. Treatment for Otter Creek Chapter 1

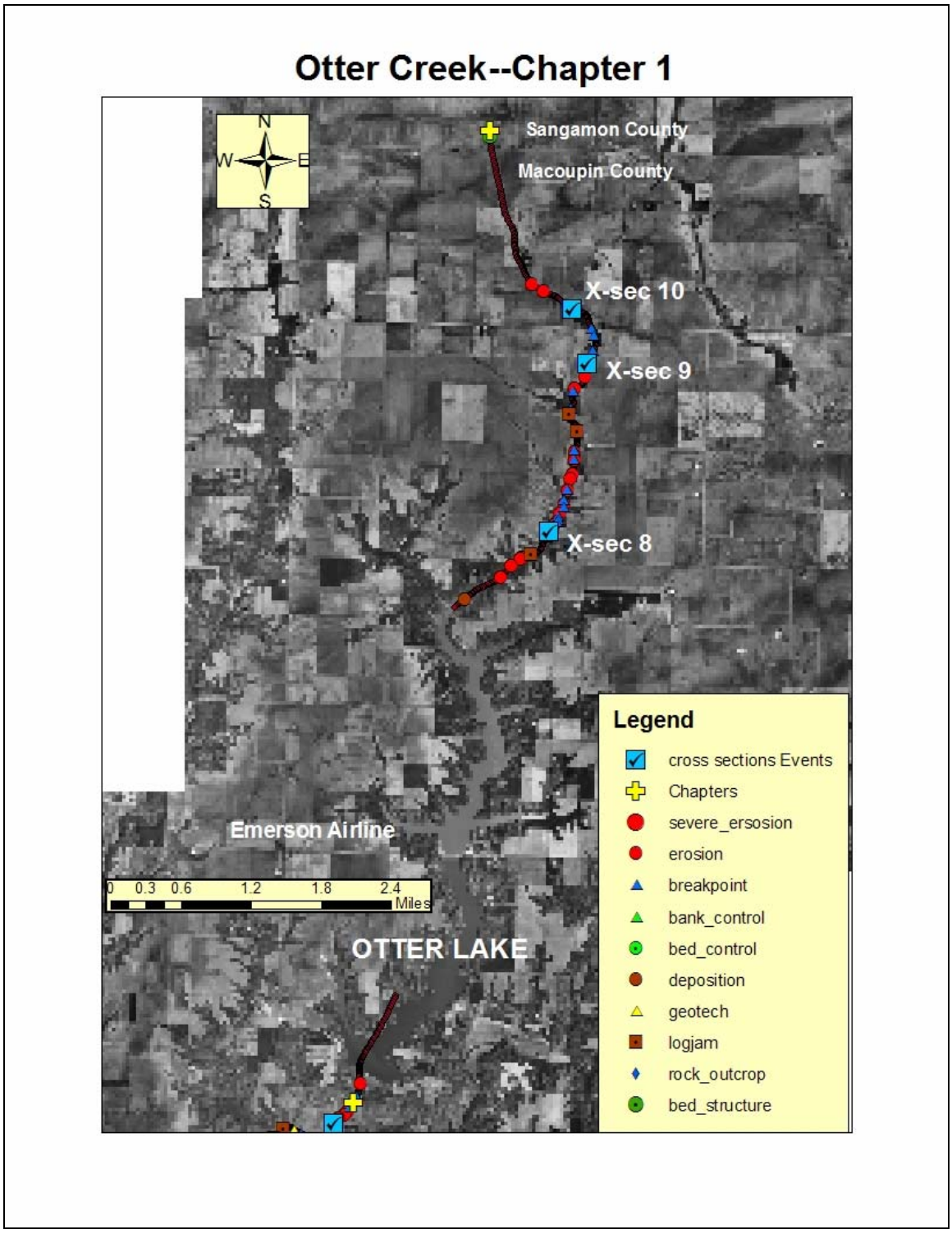


Figure 11. Chapter 1 Features

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.

TREATMENT --CHAPTER 2					
Lateral Bank Treatment					
Chapter	**Erosion Sites**	**Average Length(ft)**	**Total Length**	**Average Cost/foot**	**Total Cost**
2	50	300	15000	$25.00	$375,000.00
Total	**50**		**15000**		**$375,000.00**
Rock Riffle Grade Control					
	Rock Riffles	**Average Tonnage**	**Ave. Cost Ton**	**Average 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

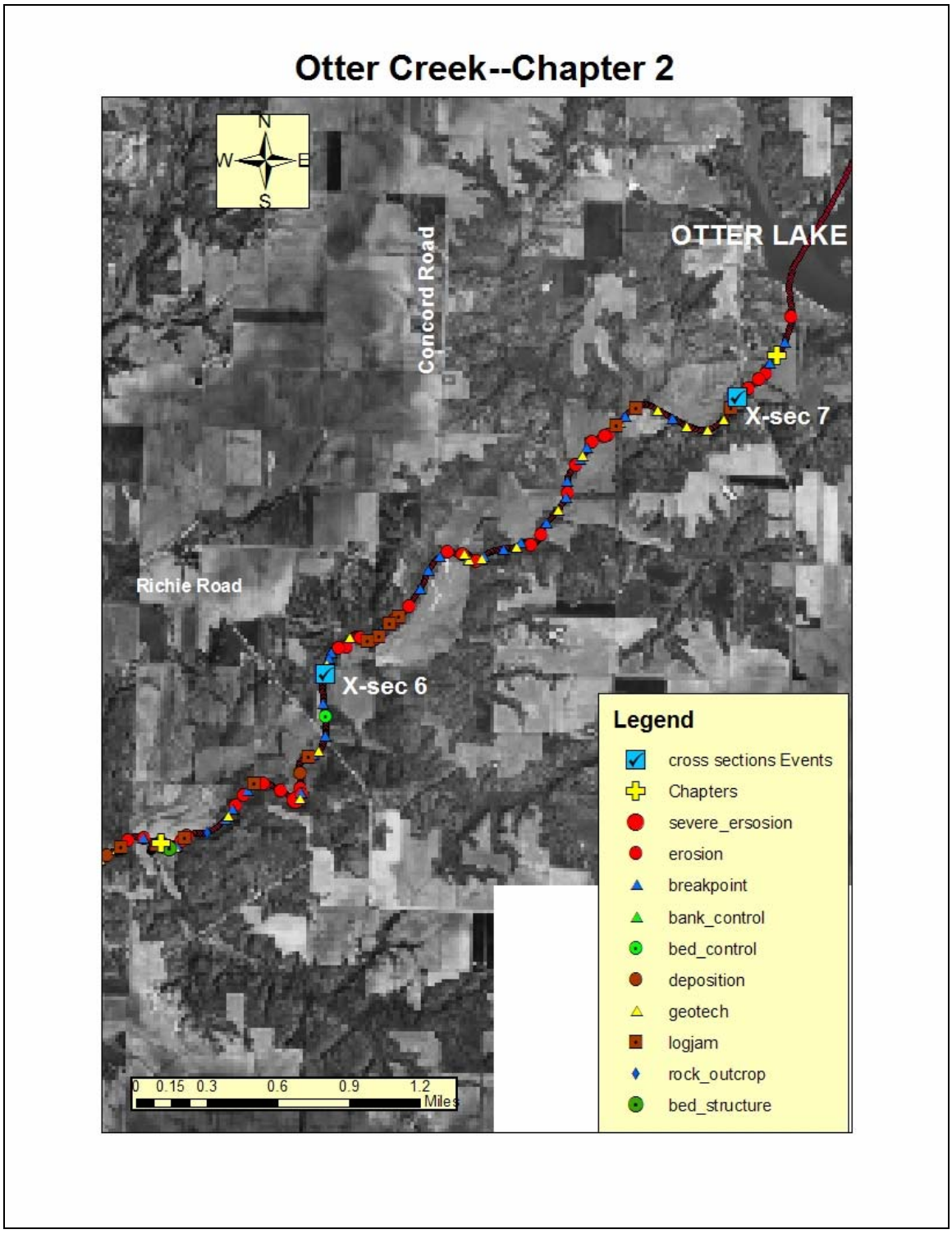


Figure 12. Chapter 2 Features

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.

`	TREATMENT --CHAPTER 3				
	Lateral Bank Protection				
Chapter	Erosion Sites	Average Length(ft)	Total Length	Average Cost/foot	Total Cost
3	64	300	19200	$25.00	$480,000.00
Total	**64**		**19200**		**$480,000.00**
	Rock Riffle Grade Control				
Chapter	Rock Riffles	Average Tonnage	Ave. Cost Ton	Average Cost/Riffle	Total 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

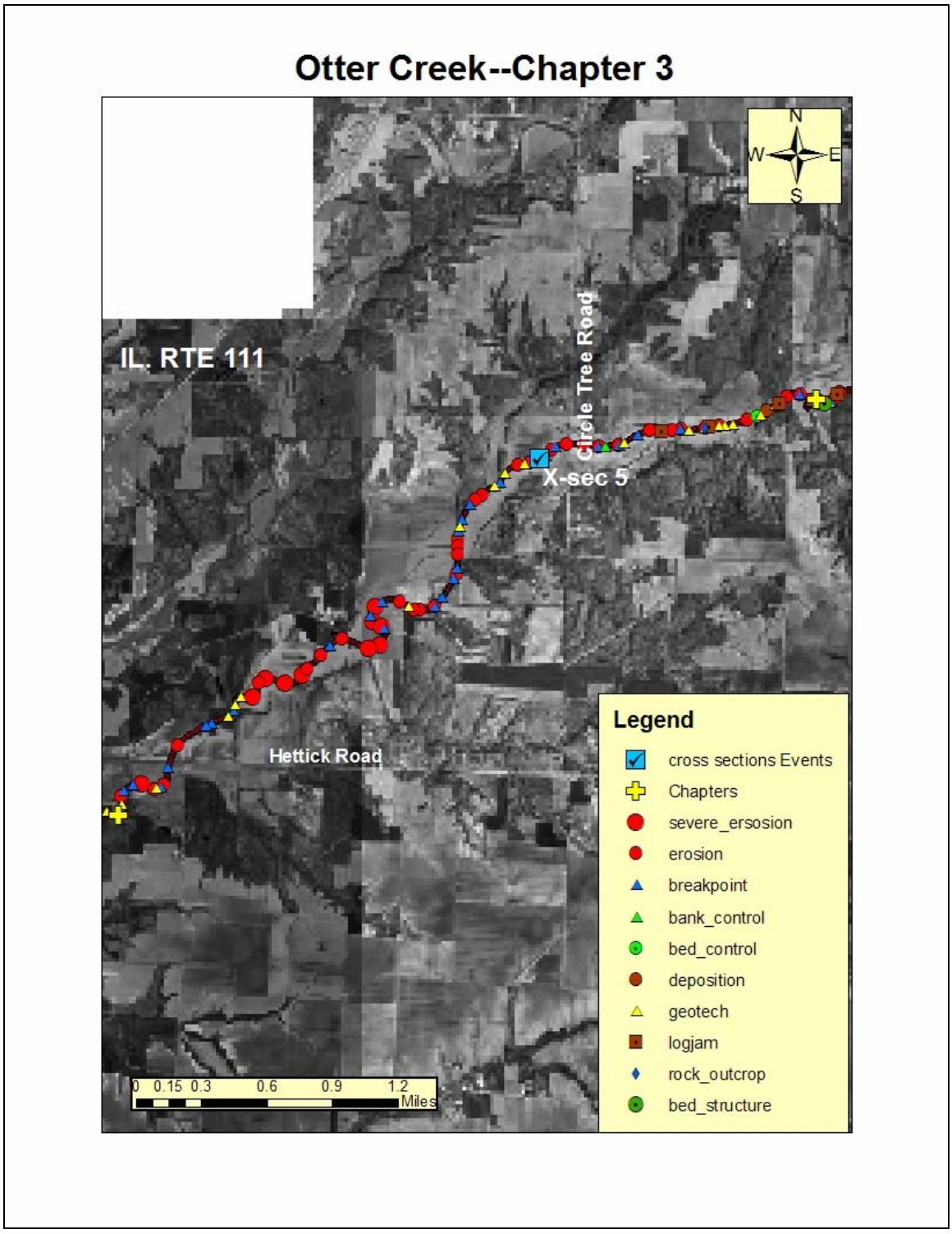


Figure 13. Chapter 3 Features

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.

TREATMENT --CHAPTER 4					
Lateral Bank Treatment					
Chapter	Erosion Sites	Average Length(ft)	Total Length	Average Cost/foot	Total Cost
4	60	300	18000	$25.00	$450,000.00
Total	**60**		**18000**		**$450,000.00**
Rock Riffle Grade Control					
Chapter	Number Riffles	Average Tons Stone	Total Tons Stone	Average Cost/ton	Total 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

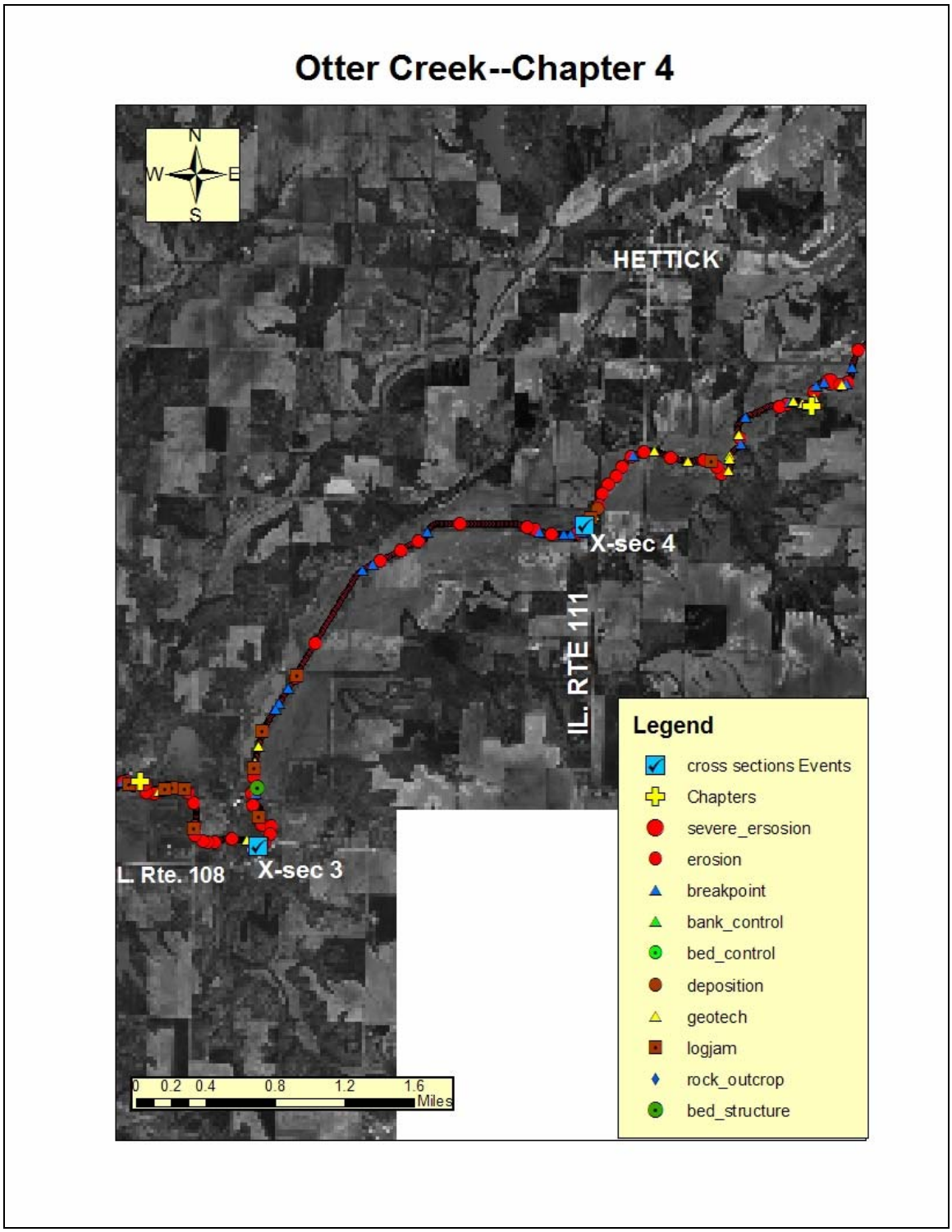


Figure 14. Chapter 4 Features

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.
Table 7 provides the estimated treatment needs for this reach.

`	TREATMENT --CHAPTER 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 Grade Control				
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. Treatment needs for Chapter 5 through 7

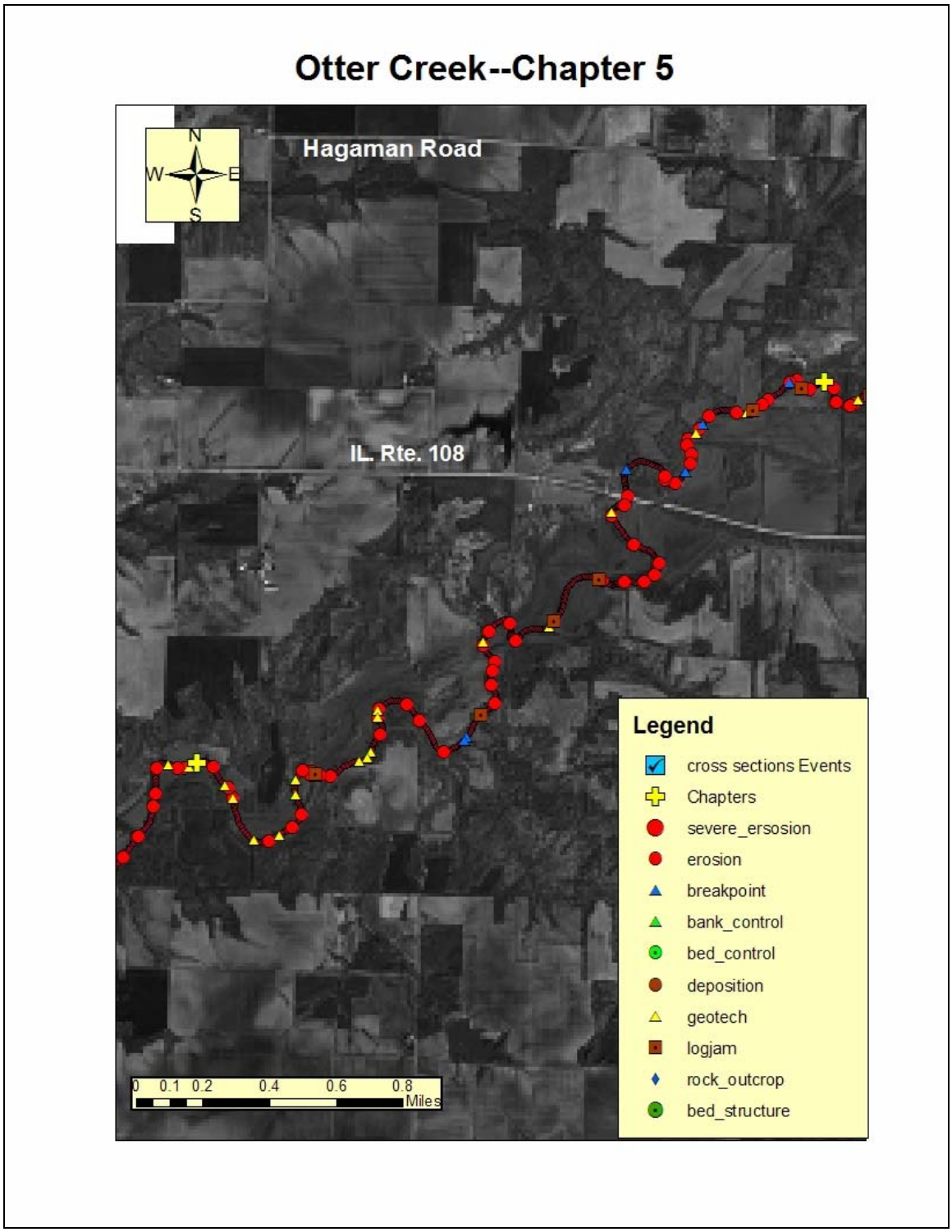


Figure 15. Chapter 5 Features

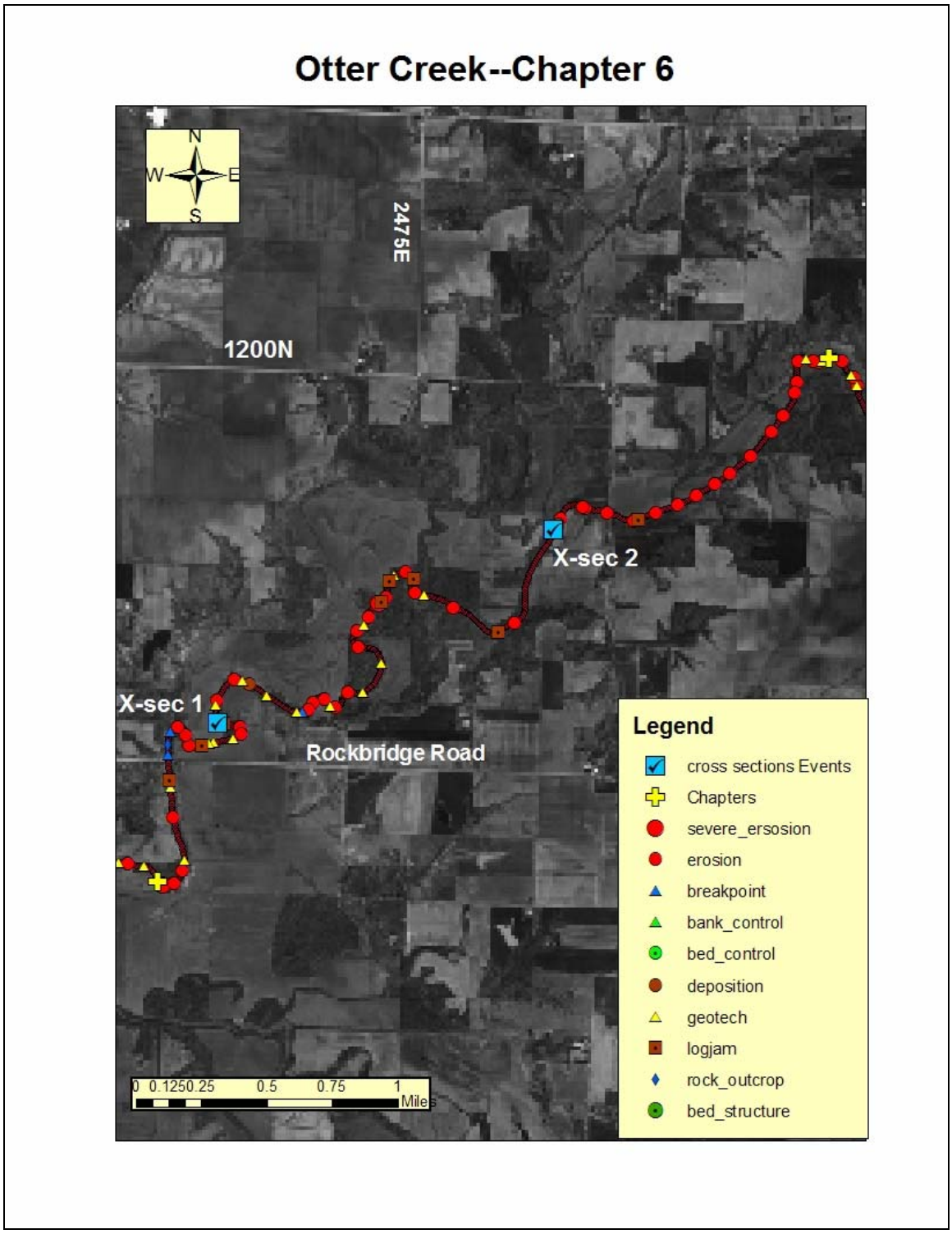


Figure 16. Chapter 6 Features

Logjam in Chapter 6

Geotechnical failure just above the confluence of Hodges and Macoupin Creek

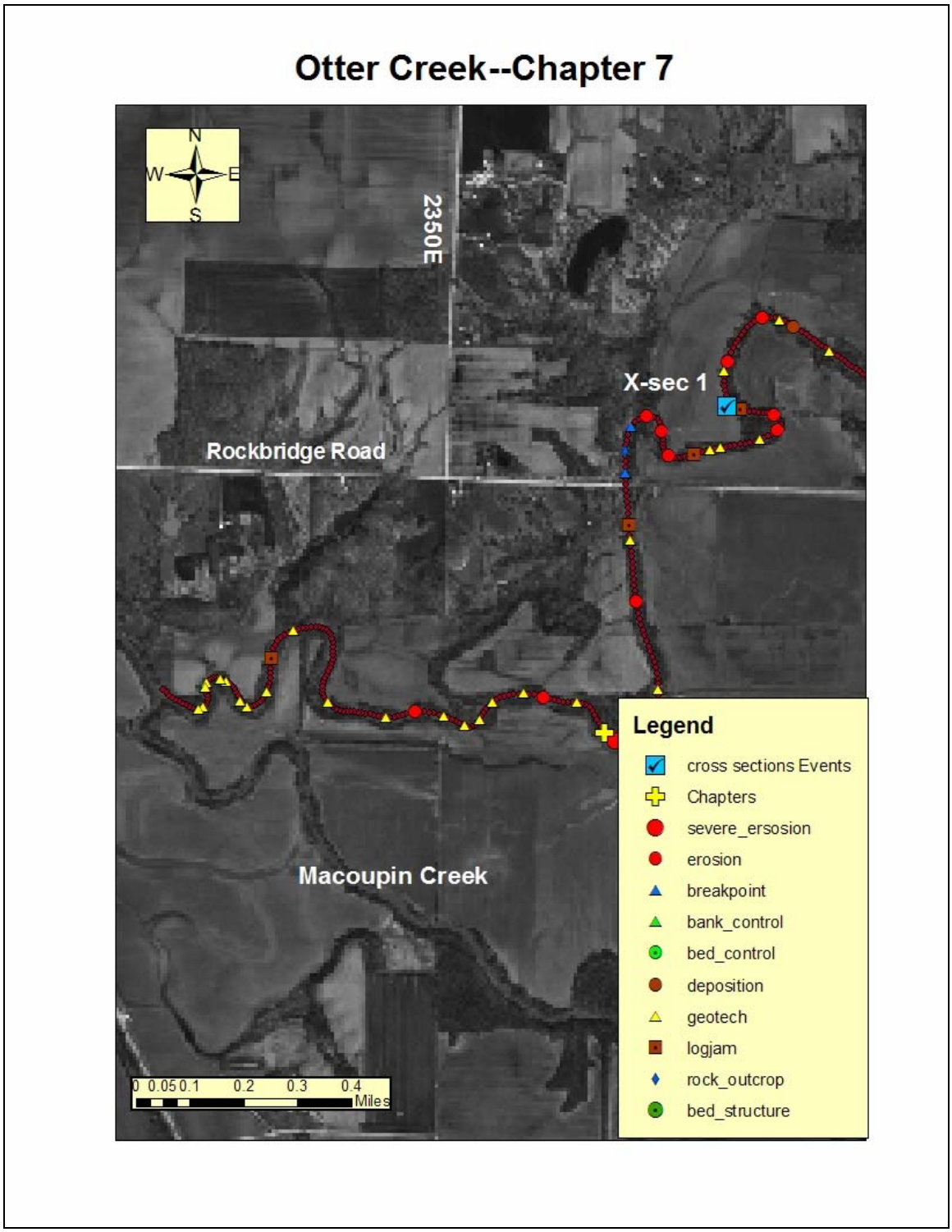


Figure 17. Chapter 7 Features

APPENDIX A

CROSS SECTION DATA

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/23/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E744431 N4350725

Landowner Name X sec 1

Drainage Area 229.92 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	124 ft.	Cross Sectional Area	898	sq. ft.
	Depth	7.2 ft.			

Reference Stream Gage:

Macoupin Creek near Kane — Station No. 05587000 — Gage Q_2 9790 cfs

Drainage Area 868 sq.mi — Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 5.5 *ft./mi. (user-entered)* — Regression Q_2 6255 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* — Adjusted Q_2 5190 cfs

0.0010 *ft./ft.* Regional Factor 1.057 — Typical Range for Bankfull Discharge: 2070 to 4160 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Basic Field Data:			Stream Length		*ft.*
			Valley Length		*ft.*
Bankfull Width	80	*ft.*	Contour Interval		feet
Mean Bankfull Depth	10.26	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	7.80				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	15.7	*ft.*	Surveyed:	0.000524 *ft./ft.*	Cross-Section 3063 *cfs*
Width at twice max. depth	1500	*ft.*	Estimated:	*ft./ft.*	Basic field data 3307 *cfs*
(31.4 ft.)					Selected Q 3185 *cfs*
Entrenchment Ratio	18.75		Radius of Curvature (Rc)		ft.
			Rc/Bankfull width:	0.00	

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload:	D_{90}	1 *in.*	Velocity required to move D_{90}:	2.1	*ft./sec.*
	D_{50}	*in.*	Velocity from Cross-Section data:	3.73	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	4.03	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.9	*ft./sec.*

Channel Evolution Stage IV — Stream Type (Rosgen)

Notes

13.9 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 1	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.000524	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	15.6	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

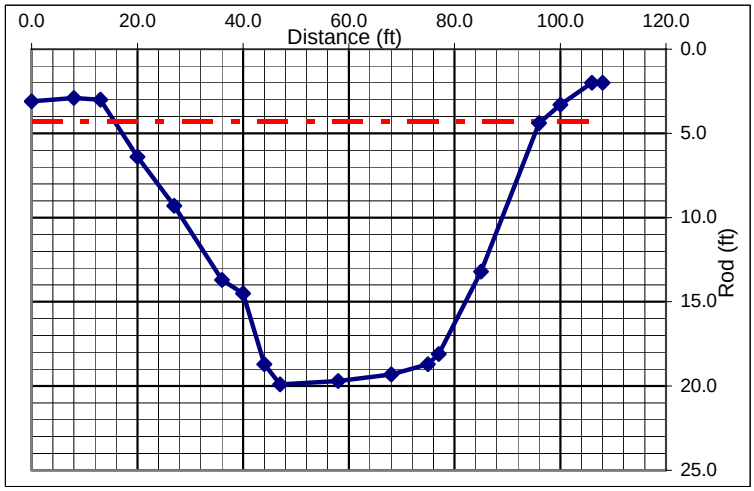
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	15.6 *ft*	17.0	
Channel Flow (***Q***):	3,063.1 *cfs*	3,325.6	
Channel Velocity:	3.7 *ft/sec*	3.5	
Cross-Sectional Area (***A***):	821.5 *sq.ft.*	941.2	
Hydraulic Radius (***R***):	9.2 *ft*	8.5	

Survey Data:

Rod *(ft)*	Distance *(ft)*
3.1	0.0
2.9	8.0
3.0	13.0
6.4	20.0
9.3	27.0
13.7	36.0
14.5	40.0
18.7	44.0
19.9	47.0
19.70	58
19.30	68
18.70	75
18.10	77
13.20	85
4.40	96
3.3	100
2.0	106
2.0	108



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E746415 N4352051

Landowner Name X sec 2

Drainage Area 187.81 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	115 ft.	Cross Sectional Area	783	sq. ft.
	Depth	6.8 ft.			

Reference Stream Gage:

Macoupin Creek near Kane — Station No. 05587000 — Gage Q_2 9790 cfs

Drainage Area 868 sq.mi — Regression (11800 cfs

Greene County, IL — **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 6.1 *ft./mi. (user-entered)* — Regression Q_2 5604 cfs

ft/mi (from worksheet) — Rainfall 3.40 in *(2 yr, 24 hr)* — Adjusted Q_2 4649 cfs

0.0012 *ft./ft.* — Regional Factor 1.057 — Typical Range for Bankfull Discharge: 1850 to 3720 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Basic Field Data:

Bankfull Width	85	*ft.*	Stream Length		*ft.*
Mean Bankfull Depth	9.05	*ft.*	Valley Length		*ft.*
Width/Depth Ratio	9.39		Contour Interval		feet
			Estimated Sinuosity		
Max. Bankfull Depth	12.6	*ft.*	*Channel Slope:* Surveyed: 0.000524	*ft./ft.*	Bankfull Q from:
Width at twice max. depth (25.2 ft.)	1500	*ft.*	Estimated:	*ft./ft.*	Cross-Section 2703 *cfs*
					Basic field data 2851 *cfs*
					Selected Q 2777 *cfs*
Entrenchment Ratio	17.65		Radius of Curvature (Rc)		ft.
			Rc/Bankfull width:	0.00	

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload:	D_{90}	1 *in.*	Velocity required to move D_{90}:	2.1	*ft./sec.*
	D_{50}	*in.*	Velocity from Cross-Section data:	3.51	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.71	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.6	*ft./sec.*

Channel Evolution Stage IV — Stream Type (Rosgen)

Notes

14.8 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 2	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.000524	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	12.6	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

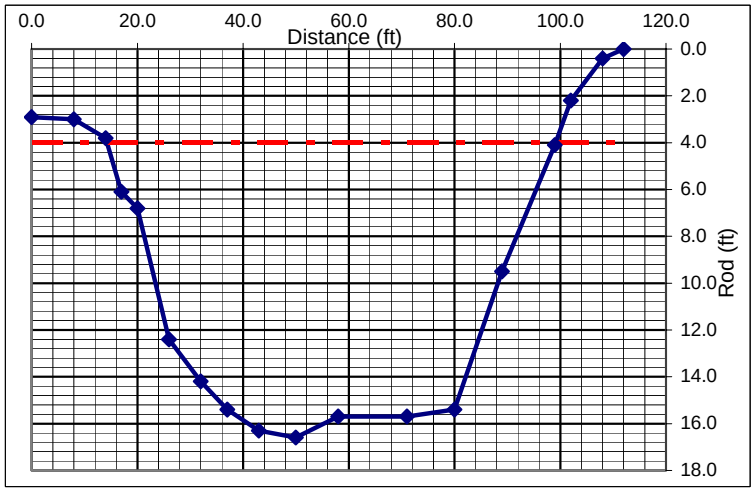
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	12.6 *ft*	13.7	
Channel Flow (***Q***):	2,702.6 *cfs*	2,956.6	
Channel Velocity:	3.5 *ft/sec*	3.4	
Cross-Sectional Area (***A***):	769.2 *sq.ft.*	867.2	
Hydraulic Radius (***R***):	8.4 *ft*	8.0	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.9	0.0
3.0	8.0
3.8	14.0
6.1	17.0
6.8	20.0
12.4	26.0
14.2	32.0
15.4	37.0
16.3	43.0
16.60	50
15.70	58
15.70	71
15.40	80
9.50	89
4.10	99
2.2	102
0.4	108
0.0	112



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E752075 N4354739

Landowner Name X sec 3

Drainage Area 112.38 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 94 ft. Cross Sectional Area 553 sq. ft.

Depth 5.9 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Greene County, IL Drainage Area 868 sq.mi Regression (11800 cfs

REFERENCE STREAM DATA ONLY

USGS Flood-Peak Discharge Predictions:

Valley Slope: 7.2 *ft./mi. (user-entered)* Regression Q_2 4045 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 3356 cfs

0.0014 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

1340 to 2690 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 61 *ft.* Contour Interval feet

Mean Bankfull Depth 5.82 *ft.* Estimated Sinuosity

Width/Depth Ratio 10.48

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 9.2 *ft.* Surveyed: 0.000524 *ft./ft.* Cross-Section 944 *cfs*

Width at twice max. depth (18.4 ft.) 1000 *ft.* Estimated: *ft./ft.* Basic field data 980 *cfs*

Selected Q 962 *cfs*

Entrenchment Ratio 16.39 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 2 *in.* Velocity required to move D_{90}: 2.9 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 2.66 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.76 *ft./sec.*

velocities from different sources. Velocity from selected Q: 2.7 *ft./sec.*

Channel Evolution Stage IV Stream Type (Rosgen)

Notes

8.6 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 3
Assisted by:	Wayne Kinney
Date:	12/20/2005
Channel Slope (***S***):	0.000524 *ft/ft*
Manning's ***n***:	0.040
Flow Depth:	9.2 *ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

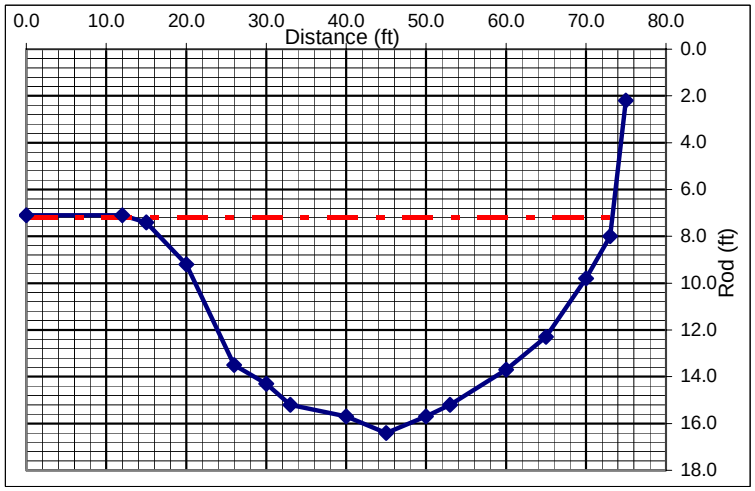
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	9.2 *ft*	9.3	
Channel Flow (***Q***):	943.6 *cfs*	857.8	
Channel Velocity:	2.7 *ft/sec*	2.4	
Cross-Sectional Area (***A***):	355.3 *sq.ft.*	361.3	
Hydraulic Radius (***R***):	5.5 *ft*	4.7	

Survey Data:

Rod *(ft)*	Distance *(ft)*
7.1	0.0
7.1	12.0
7.4	15.0
9.2	20.0
13.5	26.0
14.3	30.0
15.2	33.0
15.7	40.0
16.4	45.0
15.70	50
15.20	53
13.70	60
12.30	65
9.80	70
8.00	73
2.2	75



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E754897 N4357893

Landowner Name X sec 4

Drainage Area 105.72 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 92 ft. Cross Sectional Area 530 sq. ft.

Depth 5.8 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Drainage Area 868 sq.mi Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 8.4 *ft./mi. (user-entered)* Regression Q_2 4151 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 3444 cfs

0.0016 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

1370 to 2760 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 59 *ft.* Contour Interval feet

Mean Bankfull Depth 7.49 *ft.* Estimated Sinuosity

Width/Depth Ratio 7.88

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 9.4 *ft.* Surveyed: 0.000878 *ft./ft.* Cross-Section 1733 *cfs*

Width at twice max. depth 1000 *ft.* Estimated: *ft./ft.* Basic field data 1868 *cfs*

(18.8 ft.) Selected Q 1800 *cfs*

Entrenchment Ratio 16.95 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 1 *in.* Velocity required to move D_{90}: 2.1 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 3.92 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 4.23 *ft./sec.*

velocities from different sources. Velocity from selected Q: 4.1 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

17.0 cfs/sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

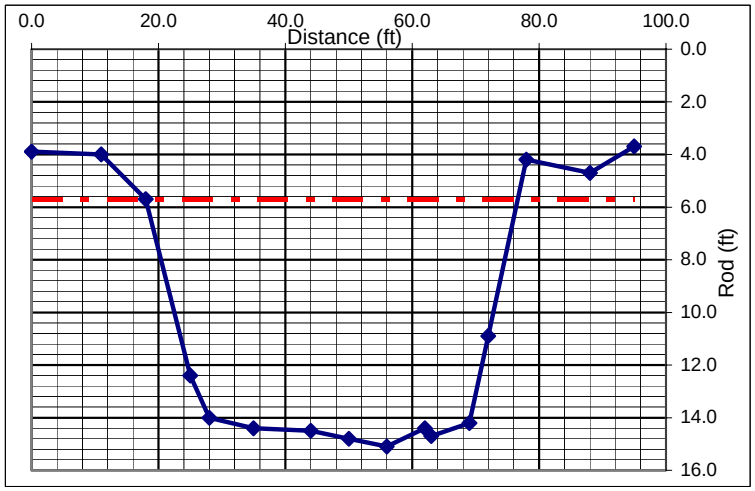
assuming uniform, steady flow

Project:	X sec 4
Assisted by:	Wayne Kinney
Date:	12/20/2005
Channel Slope (***S***):	0.000878 *ft/ft*
Manning's ***n***:	0.040
Flow Depth:	9.4 *ft*

Survey Data:

Rod *(ft)*	Distance *(ft)*
3.9	0.0
4.0	11.0
5.7	18.0
12.4	25.0
14.0	28.0
14.4	35.0
14.5	44.0
14.8	50.0
15.1	56.0
14.40	62
14.70	63
14.20	69
10.90	72
4.20	78
4.70	88
3.7	95

	Selected Flow Depth:	*Trial Depth 2*	*Trial Depth 3*
Selected Flow Depth:	9.4 *ft*	11.2	
Channel Flow (***Q***):	1,732.7 *cfs*	1,945.0	
Channel Velocity:	3.9 *ft/sec*	3.5	
Cross-Sectional Area (***A***):	441.7 *sq.ft.*	563.6	
Hydraulic Radius (***R***):	6.7 *ft*	5.6	



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E242961 N4361889

Landowner Name X sec 5

Drainage Area 65.38 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 76 ft. Cross Sectional Area 383 sq. ft.

Depth 5.0 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Drainage Area 868 sq.mi Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 9.8 *ft./mi. (user-entered)* Regression Q_2 3058 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2537 cfs

0.0019 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

1010 to 2030 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 44 *ft.* Contour Interval feet

Mean Bankfull Depth 7.45 *ft.* Estimated Sinuosity

Width/Depth Ratio 5.91

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 10.4 *ft.* Surveyed: 0.000878 *ft./ft.* Cross-Section 1224 *cfs*

Width at twice max. depth 1000 *ft.* Estimated: *ft./ft.* Basic field data 1381 *cfs*

(20.8 ft.) Selected Q 1303 *cfs*

Entrenchment Ratio 22.73 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 1 *in.* Velocity required to move D_{90}: 2.1 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 3.73 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 4.21 *ft./sec.*

velocities from different sources. Velocity from selected Q: 4.0 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

19.9 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 5	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.000878	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	10.4	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

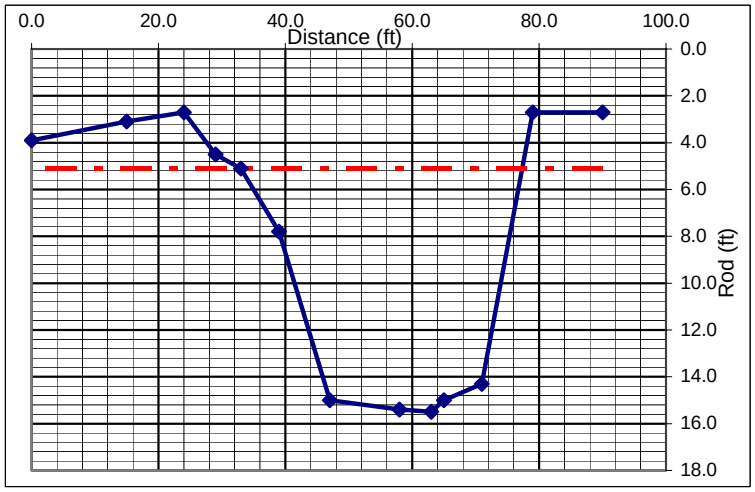
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	10.4 *ft*	12.8	
Channel Flow (***Q***):	1,223.6 *cfs*	1,406.5	
Channel Velocity:	3.7 *ft/sec*	3.0	
Cross-Sectional Area (***A***):	328.1 *sq.ft.*	463.3	
Hydraulic Radius (***R***):	6.2 *ft*	4.6	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.7	90.0
2.7	79.0
14.3	71.0
15.0	65.0
15.5	63.0
15.4	58.0
15.0	47.0
7.8	39.0
5.1	33.0
4.50	29
2.70	24
3.10	15
3.90	0



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E246133 N4363472

Landowner Name X sec 6

Drainage Area 58.99 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 73 ft. Cross Sectional Area 357 sq. ft.

Depth 4.9 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Drainage Area 868 sq.mi Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 11.9 *ft./mi. (user-entered)* Regression Q_2 3096 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2568 cfs

0.0023 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

1020 to 2060 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 53 *ft.* Contour Interval feet

Mean Bankfull Depth 6.1 *ft.* Estimated Sinuosity

Width/Depth Ratio 8.69

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 8 *ft.* Surveyed: 0.000878 *ft./ft.* Cross-Section 1122 *cfs*

Width at twice max. depth 600 *ft.* Estimated: *ft./ft.* Basic field data 1192 *cfs*

(16.0 ft.) Selected Q 1157 *cfs*

Entrenchment Ratio 11.32 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 1 *in.* Velocity required to move D_{90}: 2.1 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 3.47 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.69 *ft./sec.*

velocities from different sources. Velocity from selected Q: 3.6 *ft./sec.*

Channel Evolution Stage IV Stream Type (Rosgen)

Notes

19.61 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 6	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.000878	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.0	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

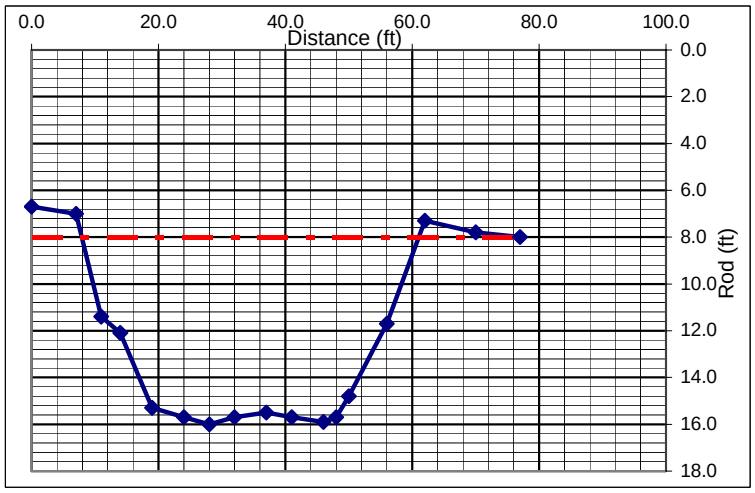
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.0 *ft*	8.7	
Channel Flow (***Q***):	1,122.4 *cfs*	1,113.7	
Channel Velocity:	3.5 *ft/sec*	3.0	
Cross-Sectional Area (***A***):	323.6 *sq.ft.*	369.9	
Hydraulic Radius (***R***):	5.6 *ft*	4.5	

Survey Data:

Rod *(ft)*	Distance *(ft)*
6.7	0.0
7.0	7.0
11.4	11.0
12.1	14.0
15.3	19.0
15.7	24.0
16.0	28.0
15.7	32.0
15.5	37.0
15.70	41
15.90	46
15.70	48
14.80	50
11.70	56
7.30	62
7.8	70
8.0	77



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E248936 N4365362

Landowner Name X sec 7

Drainage Area 52.67 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 70 ft. Cross Sectional Area 331 sq. ft.

Depth 4.7 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Drainage Area 868 sq.mi Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 11.3 *ft./mi. (user-entered)* Regression Q_2 2761 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2291 cfs

0.0021 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

910 to 1840 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 53 *ft.* Contour Interval feet

Mean Bankfull Depth 5.49 *ft.* Estimated Sinuosity

Width/Depth Ratio 9.65

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 8.1 *ft.* Surveyed: 0.000878 *ft./ft.* Cross-Section 949 *cfs*

Width at twice max. depth 500 *ft.* Estimated: *ft./ft.* Basic field data 1000 *cfs*

(16.2 ft.) Selected Q 975 *cfs*

Entrenchment Ratio 9.43 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 1 *in.* Velocity required to move D_{90}: 2.1 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 3.26 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.44 *ft./sec.*

velocities from different sources. Velocity from selected Q: 3.4 *ft./sec.*

Channel Evolution Stage IV Stream Type (Rosgen)

Notes

18.5 cfs.sq. mi.

Natural Open Channel Flow

Project:	X sec 7	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.000878	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.1	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

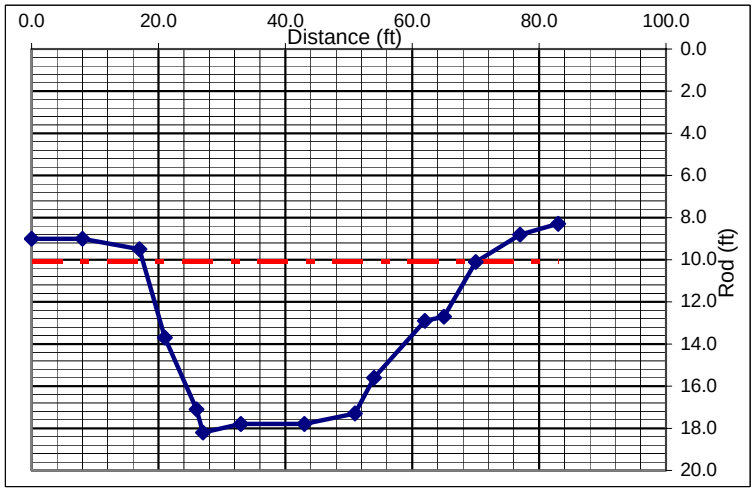
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.1 *ft*	9.2	
Channel Flow (***Q***):	949.4 *cfs*	1,045.7	
Channel Velocity:	3.3 *ft/sec*	2.9	
Cross-Sectional Area (***A***):	291.1 *sq.ft.*	354.7	
Hydraulic Radius (***R***):	5.1 *ft*	4.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
9.0	0.0
9.0	8.0
9.5	17.0
13.7	21.0
17.1	26.0
18.2	27.0
17.8	33.0
17.8	43.0
17.3	51.0
15.60	54
12.90	62
12.70	65
10.10	70
8.80	77
8.30	83



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/23/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E251906 N4373485

Landowner Name X sec 8

Drainage Area 6.84 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 32 ft. Cross Sectional Area 83 sq. ft.

Depth 2.6 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Drainage Area 868 sq.mi Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 13.4 *ft./mi. (user-entered)* Regression Q_2 597 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 496 cfs

0.0025 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

190 to 400 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 22 *ft.* Contour Interval feet

Mean Bankfull Depth 2.92 *ft.* Estimated Sinuosity

Width/Depth Ratio 7.53

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 4 *ft.* Surveyed: 0.00122 *ft./ft.* Cross-Section 157 *cfs*

Width at twice max. depth (8.0 ft.) 200 *ft.* Estimated: *ft./ft.* Basic field data 171 *cfs*

Selected Q 164 *cfs*

Entrenchment Ratio 9.09 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 1 *in.* Velocity required to move D_{90}: 2.1 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 2.44 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.66 *ft./sec.*

velocities from different sources. Velocity from selected Q: 2.6 *ft./sec.*

Channel Evolution Stage v Stream Type (Rosgen)

Notes

24.0 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 8	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.001220	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	4.0	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

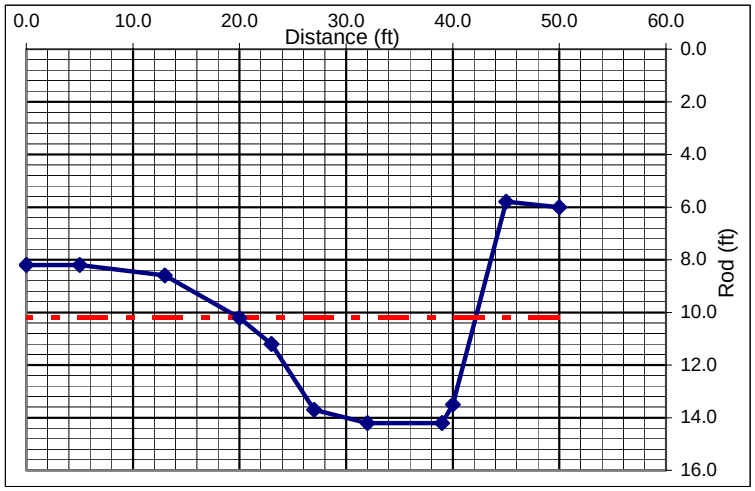
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	4.0 *ft*	6.0	
Channel Flow (***Q***):	156.9 *cfs*	288.4	
Channel Velocity:	2.4 *ft/sec*	2.4	
Cross-Sectional Area (***A***):	64.4 *sq.ft.*	120.0	
Hydraulic Radius (***R***):	2.6 *ft*	2.5	

Survey Data:

Rod *(ft)*	Distance *(ft)*
6.0	50.0
5.8	45.0
13.5	40.0
14.2	39.0
14.2	32.0
13.7	27.0
11.2	23.0
10.2	20.0
8.6	13.0
8.20	5
8.20	0



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E252424 N4375795

Landowner Name X sec 9

Drainage Area 3.41 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 24 ft. Cross Sectional Area 52 sq. ft.

Depth 2.1 ft.

Reference Stream Gage:

Macoupin Creek near Kane Station No. 05587000 Gage Q_2 9790 cfs

Drainage Area 868 sq.mi Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 12.8 *ft./mi. (user-entered)* Regression Q_2 337 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 280 cfs

0.0024 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

110 to 230 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 15 *ft.* Contour Interval feet

Mean Bankfull Depth 2.19 *ft.* Estimated Sinuosity

Width/Depth Ratio 6.85

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 3 *ft.* Surveyed: 0.00267 *ft./ft.* Cross-Section 97 *cfs*

Width at twice max. depth (6.0 ft.) 40 *ft.* Estimated: *ft./ft.* Basic field data 107 *cfs*

Selected Q 102 *cfs*

Entrenchment Ratio 2.67 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload: D_{90} 3 *in.* Velocity required to move D_{90}: 3.6 *ft./sec.*

D_{50} *in.* Velocity from Cross-Section data: 2.96 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.25 *ft./sec.*

velocities from different sources. Velocity from selected Q: 3.1 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

29.9 cfs/sq. mi.

Natural Open Channel Flow

Project:	X sec 9
Assisted by:	Wayne Kinney
Date:	12/20/2005
Channel Slope (***S***):	0.002670 *ft/ft*
Manning's ***n***:	0.040
Flow Depth:	3.0 *ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

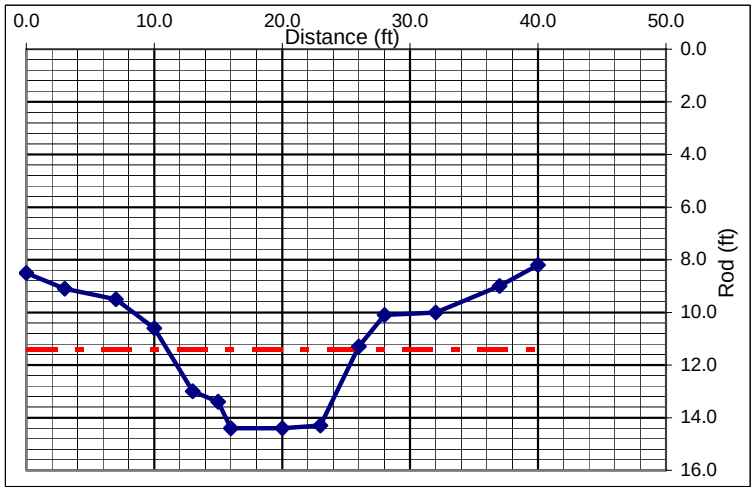
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	3.0 *ft*	5.9	
Channel Flow (***Q***):	96.9 *cfs*	361.8	
Channel Velocity:	3.0 *ft/sec*	3.5	
Cross-Sectional Area (***A***):	32.8 *sq.ft.*	103.6	
Hydraulic Radius (***R***):	1.9 *ft*	2.5	

Survey Data:

Rod *(ft)*	Distance *(ft)*
8.5	0.0
9.1	3.0
9.5	7.0
10.6	10.0
13.0	13.0
13.4	15.0
14.4	16.0
14.4	20.0
14.3	23.0
11.30	26
10.10	28
10.00	32
9.00	37
8.20	40



COMMENTS:

Stream Stabilization I & E Form

ILLINOIS NRCS - Version 2.05- modified 9/12/04 R.Book

County Macoupin T. R. Sec.

Date 12/20/2005 By Wayne Kinney

Stream Name Otter Creek UTM Coord. E252224 N4376545

Landowner Name Xsec 10

Drainage Area 3.09 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions			Cross Sectional Area	
	Width	23 ft.	48	sq. ft.
	Depth	2.1 ft.		

Reference Stream Gage:

Macoupin Creek near Kane — Station No. 05587000 — Gage Q_2 9790 cfs

Drainage Area 868 sq.mi — Regression (11800 cfs

Greene County, IL **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 12.1 *ft./mi. (user-entered)* — Regression Q_2 304 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* — Adjusted Q_2 252 cfs

0.0023 *ft./ft.* Regional Factor 1.057 — Typical Range for Bankfull Discharge: 100 to 210 cfs

Local Stream Morphology:

Channel Description: (c) Clean, winding, some pools and shoals

Manning's "n" 0.04

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 15 *ft.* Contour Interval feet

Mean Bankfull Depth 1.99 *ft.* Estimated Sinuosity

Width/Depth Ratio 7.54

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 2.9 *ft.* Surveyed: 0.00267 *ft./ft.* Cross-Section 83 *cfs*

Width at twice max. depth 70 *ft.* Estimated: *ft./ft.* Basic field data 91 *cfs*

(5.8 ft.) Selected Q 87 *cfs*

Entrenchment Ratio 4.67 Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Velocity Check: *(typical Illinois streams will have average bankfull velocity between 3 and 5 ft/sec.)*

Bedload:				Velocity required to move D_{90}:	3.6	*ft./sec.*
	D_{90}	3	*in.*			
	D_{50}		*in.*	Velocity from Cross-Section data:	2.78	*ft./sec.*
GOAL: Develop confidence by matching				Velocity from basic field data:	3.05	*ft./sec.*
velocities from different sources.				Velocity from selected Q:	2.9	*ft./sec.*

Channel Evolution Stage IV Stream Type (Rosgen)

Notes

28.2 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 10	
Assisted by:	Wayne Kinney	
Date:	12/20/2005	
Channel Slope (***S***):	0.002670	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	2.9	*ft*

$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

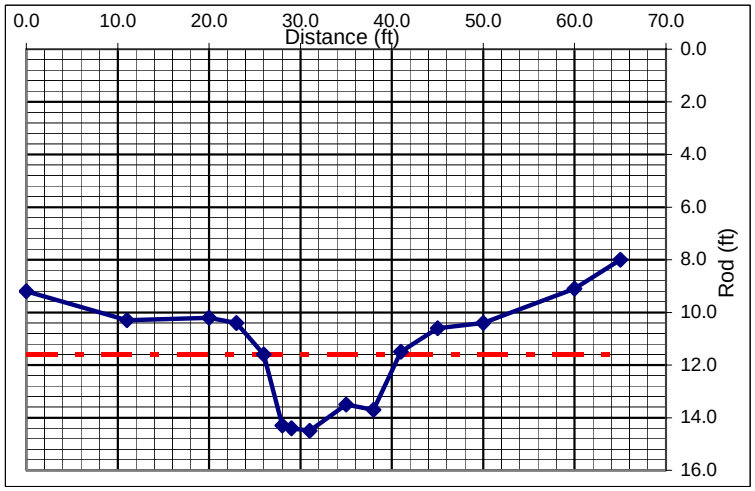
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	2.9 *ft*	5.3	
Channel Flow (***Q***):	82.8 *cfs*	306.9	
Channel Velocity:	2.8 *ft/sec*	2.8	
Cross-Sectional Area (***A***):	29.8 *sq.ft.*	109.4	
Hydraulic Radius (***R***):	1.7 *ft*	1.8	

Survey Data:

Rod *(ft)*	Distance *(ft)*
9.2	0.0
10.3	11.0
10.2	20.0
10.4	23.0
11.6	26.0
14.3	28.0
14.4	29.0
14.5	31.0
13.5	35.0
13.70	38
11.50	41
10.60	45
10.40	50
9.10	60
8.00	65



COMMENTS: