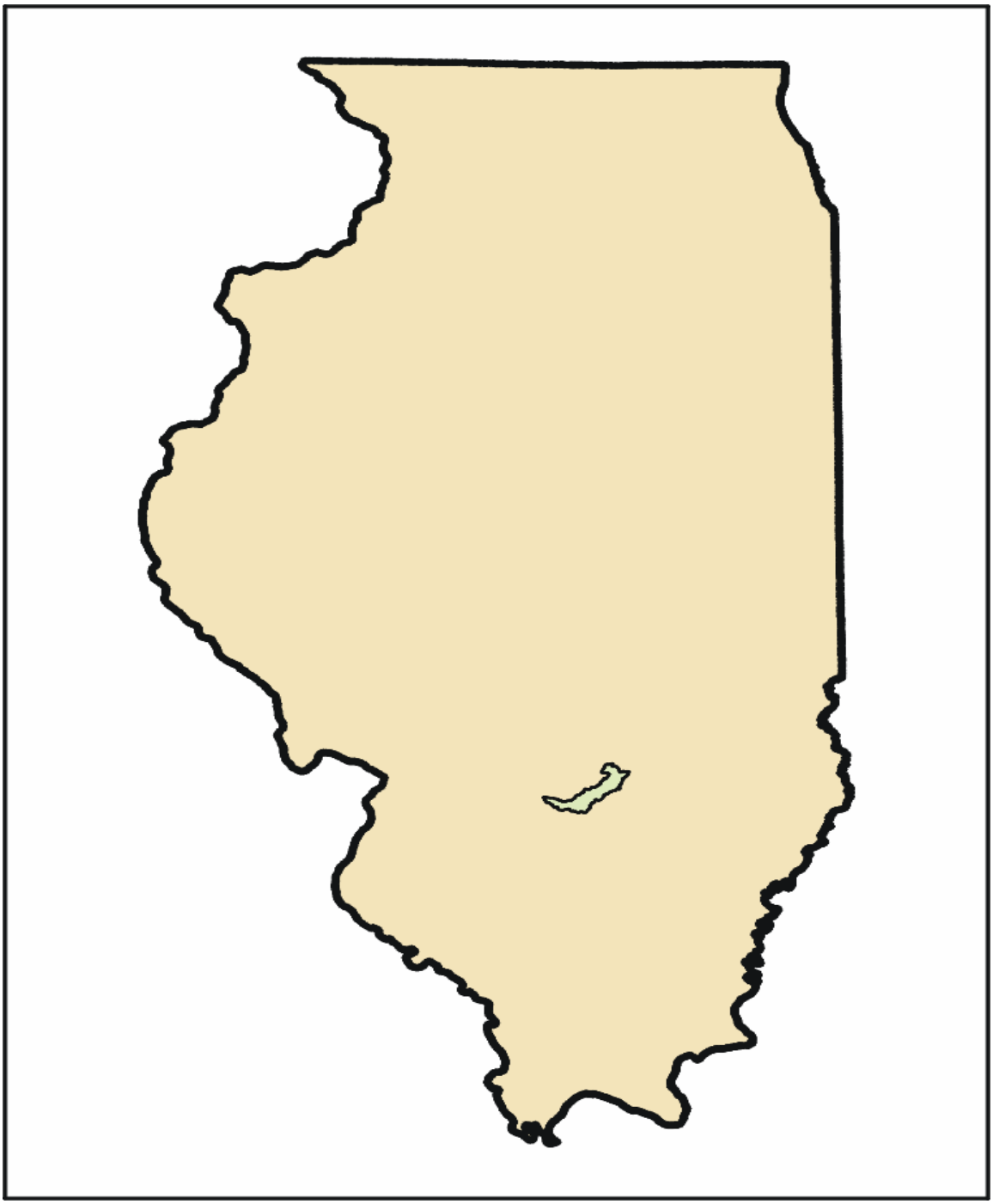


AERIAL ASSESSMENT REPORT FOR EAST FORK KASKASKIA RIVER

FAYETTE, MARION AND CLINTON COUNTIES

SEPTEMBER 2005

PREPARED BY WAYNE KINNEY, FOR IL. DEPARTMENT OF AGRICULTURE

A stage one TMDL report was prepared in April 2005 for Illinois EPA by Baetis Environmental Services, Inc. on behalf of Limno-Tech, Inc. The study found that one segment of the East Fork of the Kaskaskia River (OK01) is an impaired waterbody in need of TMDL development. This segment is impaired by low dissolved oxygen and fecal coliform bacteria. There are also four impaired water supply lakes in this watershed, however this aerial assessment is confined to the main channel of the East Fork Kaskaskia River and none of the supply lakes are located on the main channel.

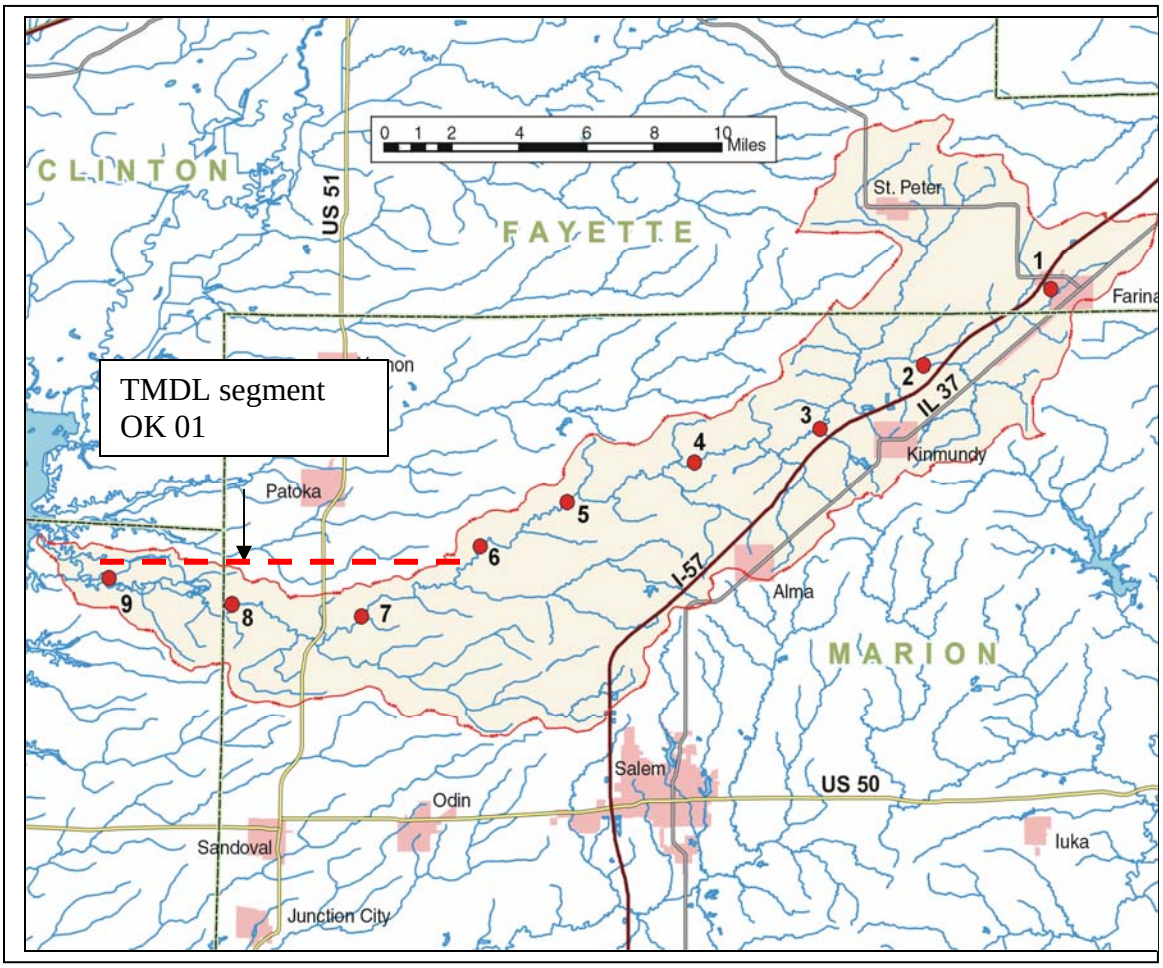


Fig. 1 Aerial Assessment Map of East Fork Kaskaskia River with Impaired Segment Location.

Assessment Procedure

Low level geo-referenced video was taken of East Fork Kaskaskia River 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 south edge of Farina, IL in Fayette County. The mapping progressed downstream to Carlyle Lake in Clinton County. Aerial video of tributaries was not part of the project, regardless of the stream size or vegetation.

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.

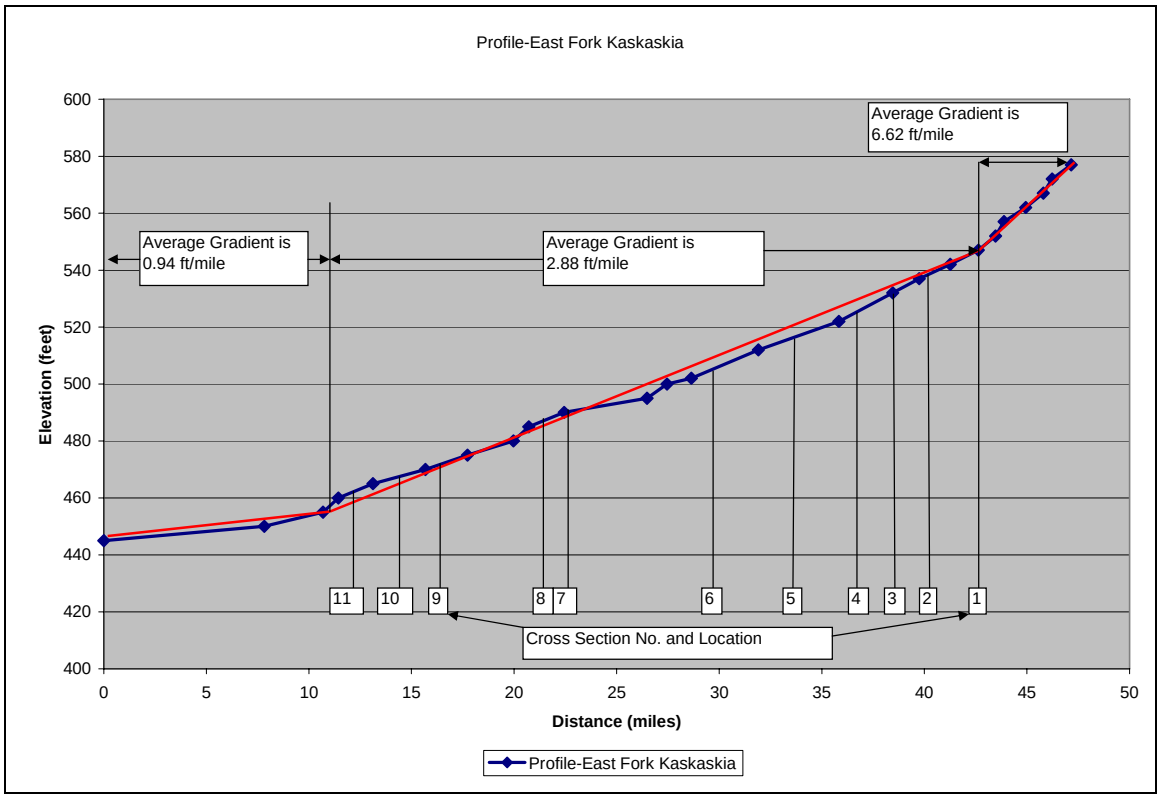


Figure 2 Channel Profile of East Fork Kaskaskia River

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				
DVD Disc	DVD chapter	Beginning Time	Report Chapter	Cross Sections
1	2	10:00	1	1
1	3	20:00	2	2,3,4
1	4	30:00:00	3	5
1	5	40:00:00	4	6
2	2	10:00	5	7
2	3	20:00	6	8,9
2	4	30:00:00	7	10,11
2	5	40:00:00	8	
2	6	50:00:00	9	

Note: Flight path is from downstream to upstream

Fig. 3 DVD Chapters and Report Guide

The DVD has been divided into “chapters” of approximately ten 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”.

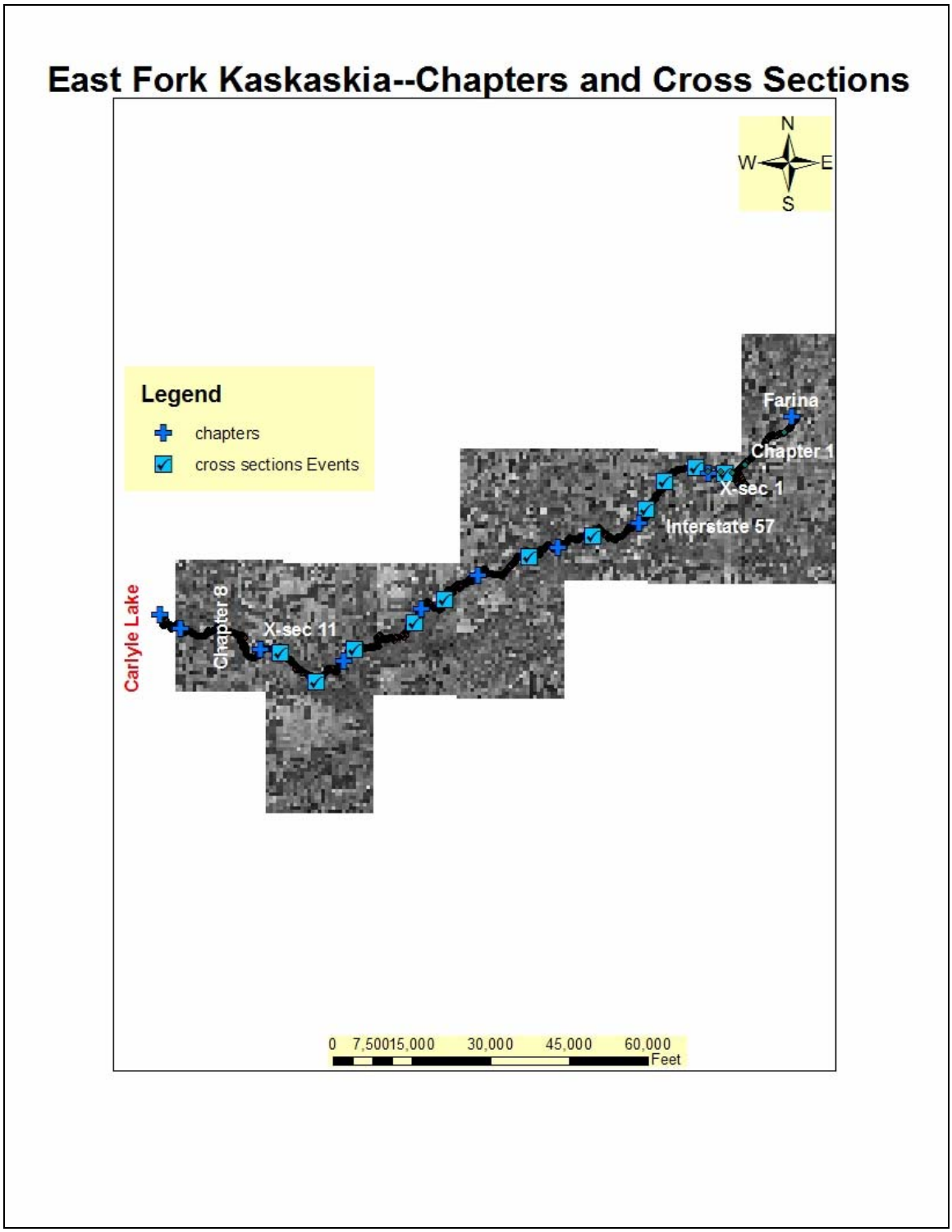


Fig. 4 Chapter Division and Cross Section locations

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								
CHAPTER	ROCK OUTCROP	LOGJAM	GEOTECH FAILURE	DEPOSITION	BED CONTROL	BREAK POINT	EROSION	SEVERE EROSION
1	0	17	0	3	4	2	36	1
2	0	5	2	3	2	3	60	0
3	2	7	4	0	2	0	50	0
4	8	3	4	0	1	7	55	0
5	2	10	0	1	0	5	65	0
6	7	5	0	1	0	10	62	0
7	7	5	7	2	0	2	51	1
8	2	3	2	1	1	0	48	1
9	0	1	0	0	0	0	11	0
TOTALS	28	56	19	11	10	29	438	3

Table 1 Features by Chapter Identified with Aerial Assessment

Eleven cross sections were taken at selected locations on the East Fork Kaskaskia River 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. Aerial views of cross sections locations are shown in Figs. and thru. Exact locations as Eastings and Northings and more detail can be found in Appendix A

Cross Section Summary --East Fork Kaskaskia River

X-Sec	Easting	Northing	ADA	Valley Slope ft/m	Q2 CFS	BKF CFS	Width	Depth	Vel. FPS	Bedload Dia.	CEM Stage	CFS per Sq. Mi.	BKF cfs/ Q2 cfs
1	341363	4296613	19.29	7.3	1310	540	47	3.83	3	1	3	28	0.41
2	339661	4296929	22.39	5	1236	525	33	5.67	2.8	1	3	23.4	0.42
3	337838	4296149	41.93	5	2015	905	53	5.53	3.1	1	3	21.6	0.45
4	336750	4294502	46.45	4.8	2144	831	68	4.53	2.7	1	1	17.9	0.39
5	333679	4292966	56.62	4.4	2409	782	54	5.71	2.5	1	1	13.8	0.32
6	329960	4291748	65.39	3.8	2528	785	76	4.39	2.4	1	1	12	0.31
7	325042	4289279	73.66	3.4	2623	793	50	6.07	2.6	2	1	10.8	0.3
8	323321	4287973	75.91	2.8	2455	876	55	5.24	3	1	3	11.5	0.36
9	319797	4286392	91.45	2.9	2882	979	58	6.44	2.6	1	3	10.7	0.34
10	317592	4284508	94.4	2.9	2955	1002	66	6.15	2.5	1	3	10.61	0.34
11	315539	4286209	115.58	2.8	3410	1166	61	6.85	2.8	1	3	10.8	0.34

Table 2 Cross Section Summary

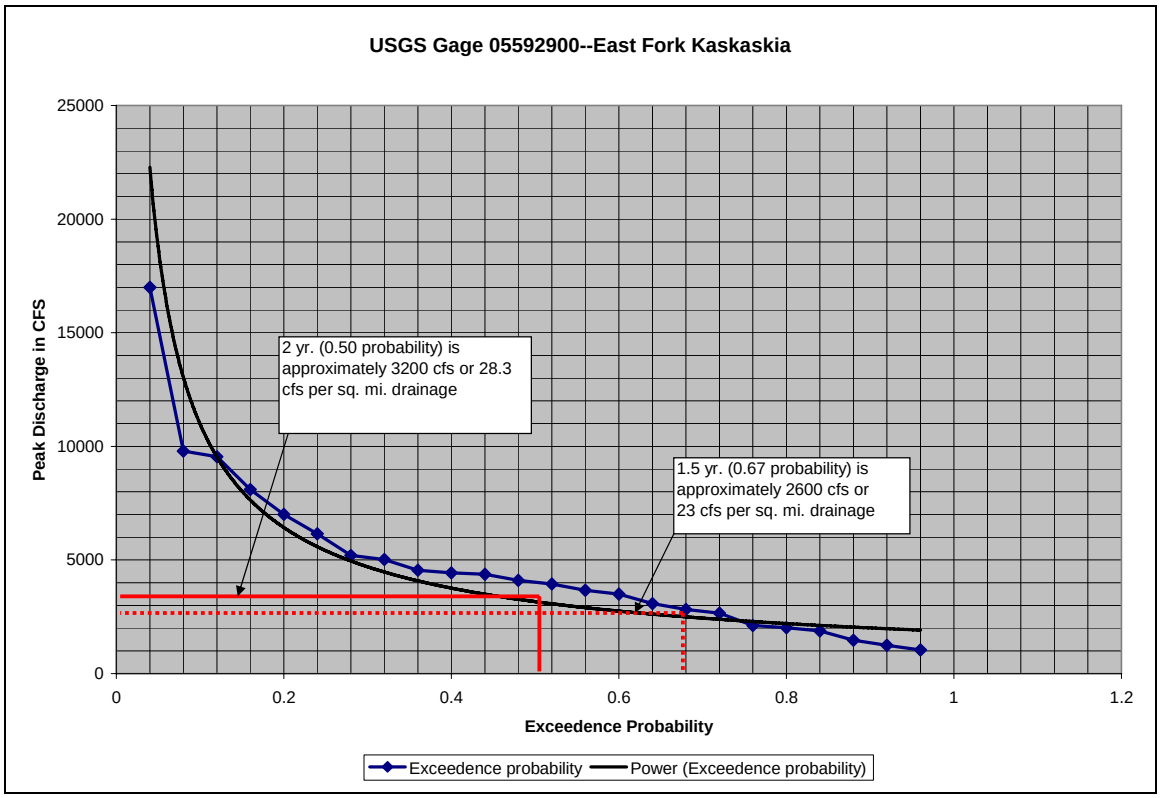


Fig. 5 Annual Maximum Peak Probability Curve: USGS Gage #05592900

A plot of the discharge probability curve from USGS Gage # 05592900 over the last 24 yrs. of continuous record (1981-2004) in Fig. 5 indicates the 2 yr. discharge (50% probability) at approx. 3200 cfs and the 1.5 yr. discharge (67% probability) at approx. 2600 cfs. The drainage area at Gage # 05592900 near Sandoval, IL. is 113 sq. miles; therefore the discharge per sq. mile is 28.3 and 23 cfs per sq. mile respectively for the 2 yr. and the 1.5 yr. R.I. discharge. The field determined "bankfull" discharge in the study area ranges from 10.6 to 28 cfs/sq. mile. Referring to Table 2 the data indicates the bankfull discharge at cross section 11 is 10.8 cfs per square mile. Cross section 11 has a drainage area of 115.58 sq. mi., therefore if the data is extrapolated to the gage site the discharge would be 1220 cfs (10.8 x 113) and represents a Return Interval (R.I.) of approx. 1.11 yrs at cross section 11 near the gage site. It is expected that the cfs/sq. mile discharge would increase as the drainage area decreases and the valley slope increases. This is the case with East Fork Kaskaskia River.

Discharges at the lower reaches where the channel is in CEM stage 3 have been calculated on "field determined" indicators. The discharge per sq. mile drops only slightly from 12 to 14 cfs/sq. mi. (cross sections 4-7) in the stable reaches to 10 to 12 cfs/sq. mi. (cross sections 8-11). This reduction is expected as the drainage area increases. The evidence is therefore reinforced that the established R.I for the "geomorphic bankfull" discharge is the 1.11 yrs. calculated at cross section 11.

General Observations

1. Upper reaches at Cross Section 1 through 3 are incised and appear to be continuing to downcut.
2. Middle reaches at Cross Sections 4 through 7 are not incised and bankfull indicators are at or near top bank elevation.
3. Lower reaches at Cross Sections 8 through 11 are definitely incised and continuing to downcut with defined knickpoints obvious in a clay bed.
4. The channel bedload material is primarily silt and clay with very little large material and therefore little turbulence to increase DO levels within the stream. Increasing turbulence within the channel at low flow by installing Rock Riffles would be beneficial for both DO and bed stability.
5. There are 438 erosion sites identified, 172 of them in the impaired reach OK01. Many, if not most could be stabilized with installation of a riffle-pool sequence to dissipate energy in the deepened pools and turbulent flow over riffles.
6. With the fine bedload material found in East Fork the bedload transport continuity should not be interrupted with a riffle-pool sequence, even if it does not extend upstream of OK01.
7. Recommendations include cost for both riffle-pools installation and lateral bank protection; however the cost of lateral protection can be reduced dramatically if riffle-pool structures are installed in the same reach.

Recommendations: Chapters 1 and 2

This is the very upper segment of the East Fork Kaskaskia and is approximately 8 miles long. The channel runs between the sewage treatment cells south of Farina and erosion between sewage ponds may be considered a very high priority requiring special design. There are 96 erosion sites in this segment and cross sections 1 thru 3 indicate this channel is incised. Therefore installation of Rock Riffles is recommended and will greatly reduce, although not completely eliminate the need for lateral bank protection. Table 3 provides an estimate of the quantities and cost associated with this segment.

	TREATMENT --CHAPTERS 1 THRU 2				
	Lateral Bank Protection				
Chapter	Erosion Sites	Average Length(ft)	Total Length	Average Cost/foot	Total Cost
1	36	200	7200	$25.00	$180,000.00
2	60	200	12000	$25.00	$300,000.00
Total	96		19200		$480,000.00

	Rock Riffle Grade Control				
Chapter	Rock Riffles	Average Tonnage	Ave. Cost Ton	Average Cost/Riffle	Total Cost
1	90	200	$30.00	$6,000.00	$540,000.00
2	92	250	$30.00	$7,500.00	$690,000.00
Total	182				$1,230,000.00

Table 3. Treatment Recommendations Chapters 1 and 2

East Fork Kaskaskia erosion site between Farina Sewage Treatment Lagoons

East Fork Kaskaskia eroding into embankment of Farina Sewage Treatment Lagoon

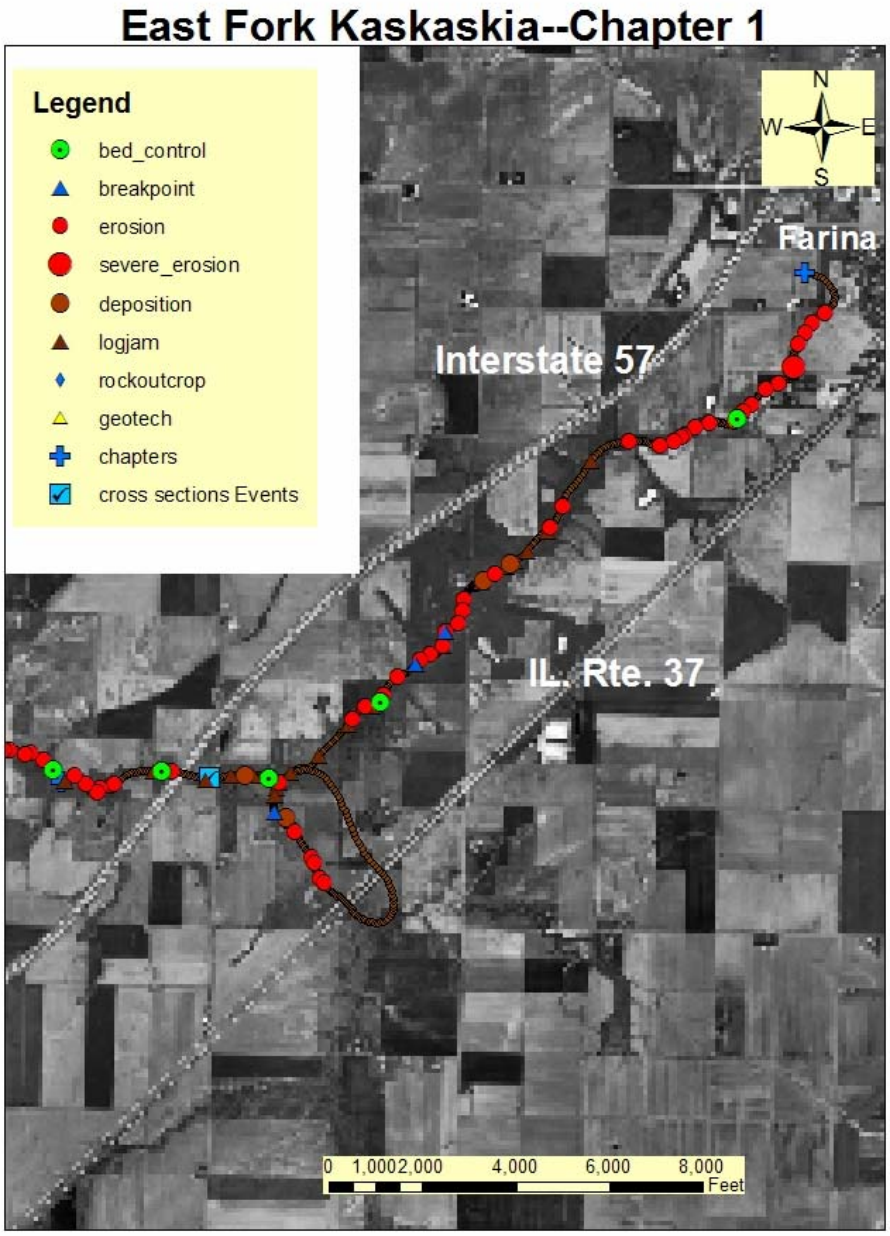

East Fork Kaskaskia--Chapter 1
Legend
bed_control
breakpoint
erosion
severe_erosion
deposition
logjam
rockoutcrop
geotech
chapters
cross sections Events
N
W
E
S
Farina
Interstate 57
IL. Rte. 37
0 1,000 2,000 4,000 6,000 8,000
Feet

Fig. 6 Chapter 1

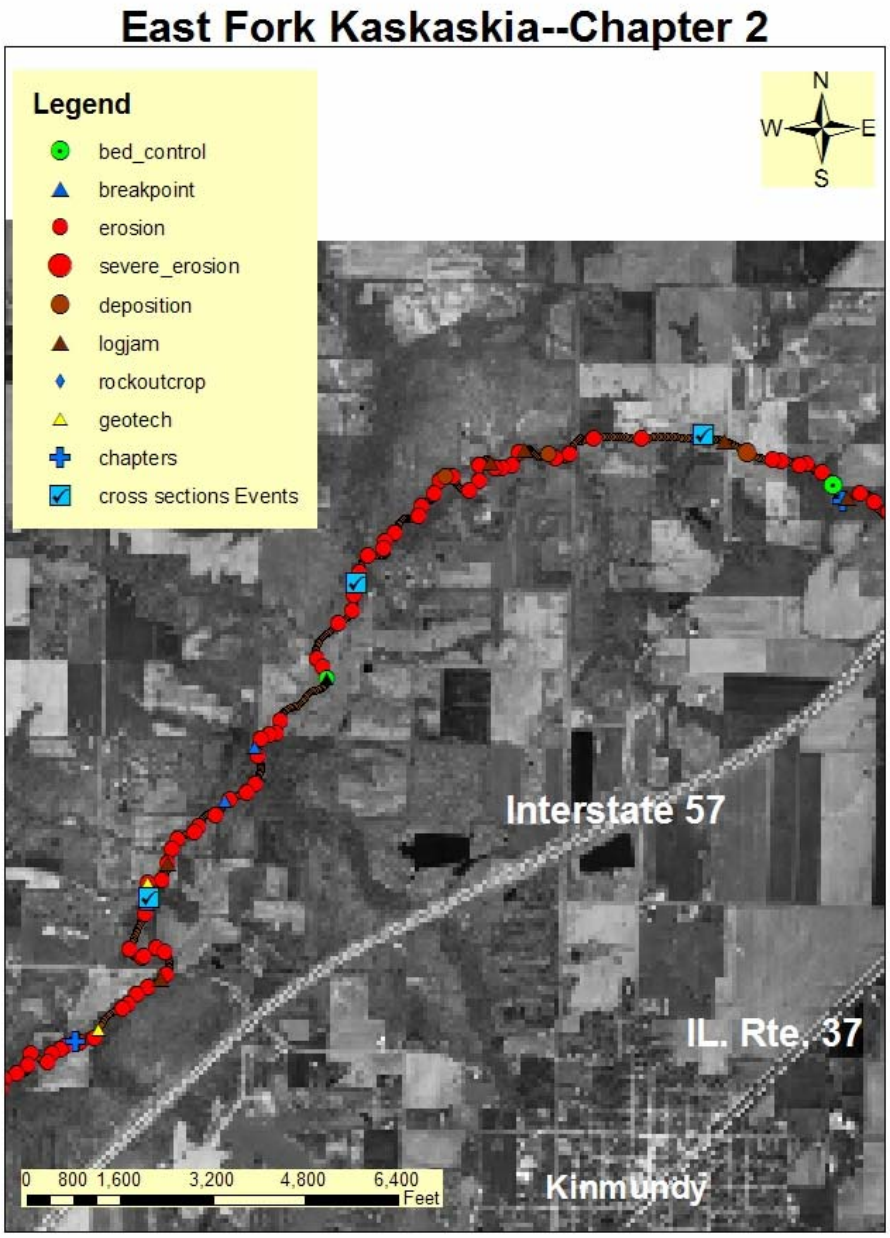


Fig. 7 Chapter 2

Recommendations: Chapters 3, 4 and 5

This segment is approximately 13 miles long and has a channel that is well connected to the floodplain. All cross sections (5, 6 and 7) were determined to be CEM stage 1 with geomorphic bankfull flows at or near the top bank elevation. Cross section 7 however in Chapter 5 is on a shale bed and provides the grade stability that has prevented the migration of incision in this segment.

Preliminary calculations indicate that Rock Riffle Grade Controls can however be built in Chapter 5 to a height of approximately 2.5 ft. with no impact on flooding or backwater. Therefore Rock Riffle Grade Controls are recommended for Chapter 5 in this segment for bank stability and re-aeration as Chapter 5 is immediately above the impaired reach OK01.

Table 4 provides an estimate of treatment needs for this reach.

	TREATMENT --CHAPTERS 3 through 5				
	Lateral Bank Treatment				
Chapter	**Erosion Sites**	**Average Length(ft)**	**Total Length**	**Average Cost/foot**	**Total Cost**
3	50	250	12500	$25.00	$312,500.00
4	55	250	13750	$25.00	$343,750.00
5	65	250	16250	$25.00	$406,250.00
Total	**170**				**$1,062,500.00**
Rock Riffle Grade Control					
	Rock Riffles	**Average Tonnage**	**Ave. Cost Ton**	**Average Cost/Riffle**	
3	n/a	0	$0.00	$0.00	$0.00
4	n/a	0	$0.00	$0.00	$0.00
5	77	275	$30.00	$8,250.00	$635,250.00
Total	**77**				$635,250.00

Table 4. Treatment Recommendations Chapter 3, 4 and 5

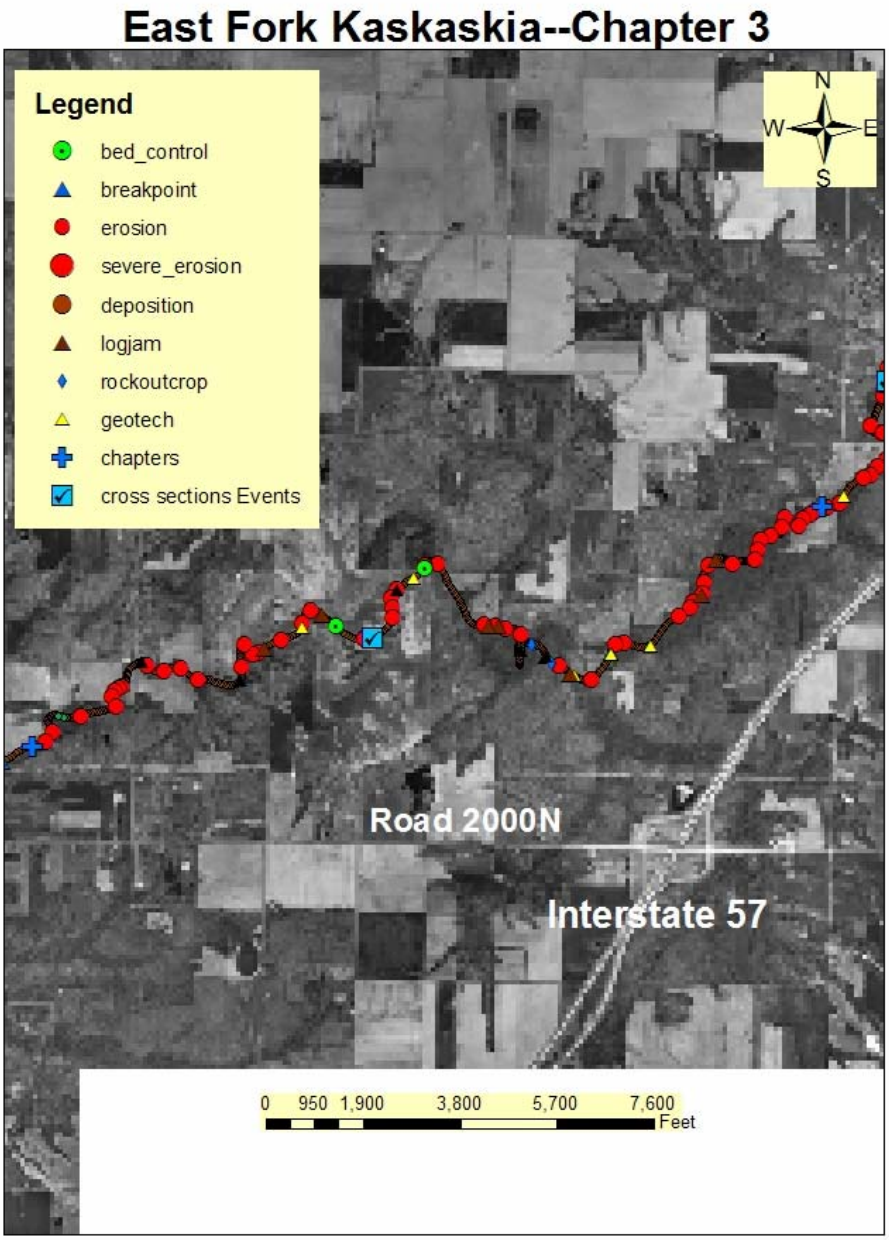


Fig. 8 Chapter 3

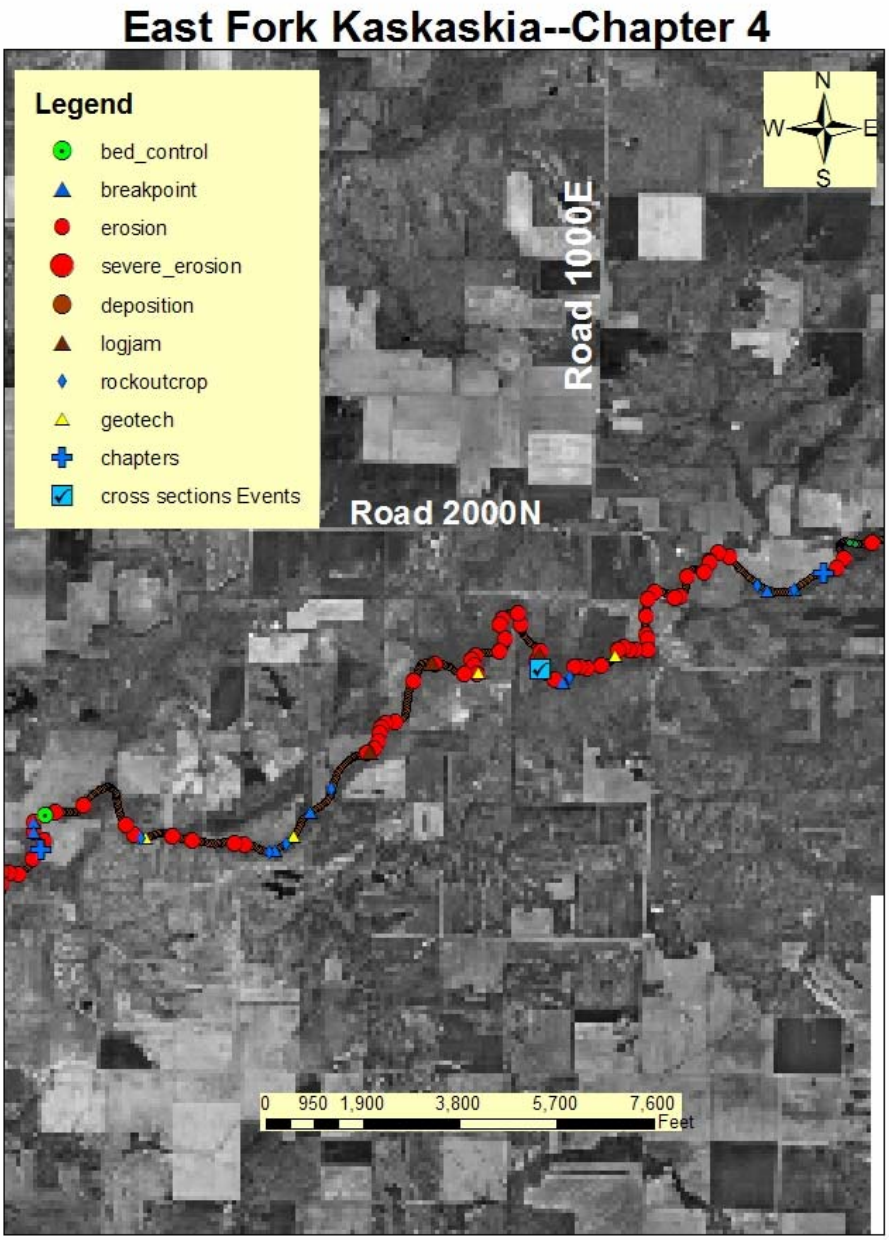


Fig. 9 Chapter 4

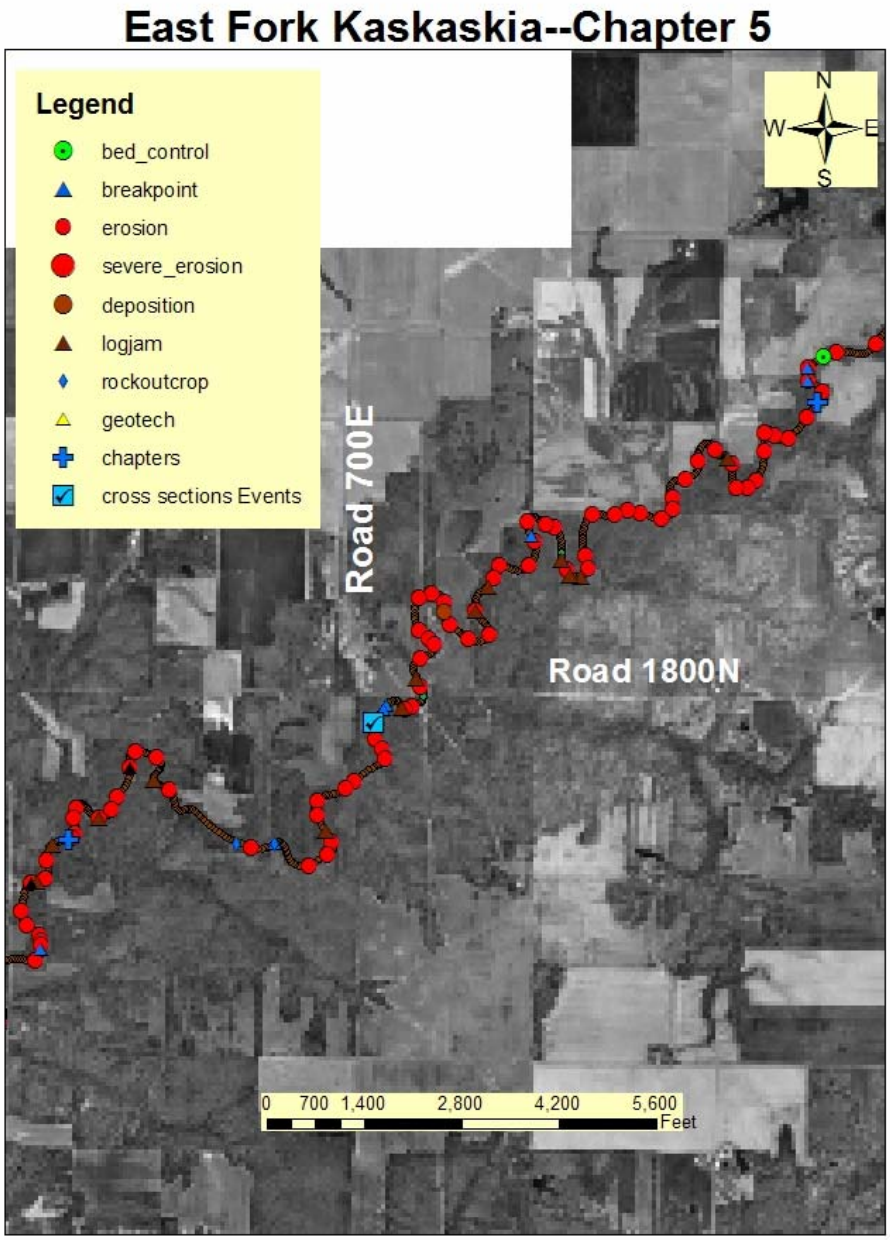


Figure 10 Chapter 5

Recommended Treatment: Chapters 6, 7 and 8

This segment along with Chapter 9 represents the impaired segment OK01. All cross sections in this reach are incised with no evidence of shale or other natural grade control. There are 161 erosion sites identified in this segment and cross sections (8, 9, 10 and 11) in this reach are all incised by 2 ft. at x-sec 8 to 5 ft. at x-sec 10 and 11. The erosion sites can be treated with Stone Toe Protection, Stream Barbs or similar techniques, however if an effective riffle-pool sequence is established the need for lateral protection will be greatly reduced.

The treatment recommendation is therefore to install a series of Rock Riffle Grade Controls at an approximate spacing of 350 ft. to stabilize the channel bed, reduce lateral bank erosion and provide re-aeration benefits to improve DO levels. The final design should consider the use of emergent boulders and a significant narrowing of the channel cross section at very low flows to gain maximum re-aeration during times of low flow. Table 5 provides an estimate of the treatment needs for this segment, although the lateral bank treatment needs should be significantly reduced by installation of the Rock Riffles. The recommendation is to begin with the Rock Riffles and monitor for several years before determining the need for lateral bank protection.

Cross section 11 showing degrading clay channel bed

TREATMENT --CHAPTERS 6 through 8					
Lateral Bank Treatment					
Chapter	Erosion Sites	Average Length(ft)	Total Length	Average Cost/foot	Total Cost
6	62	250	15500	$25.00	$387,500.00
7	51	250	12750	$25.00	$318,750.00
8	48	250	12000	$25.00	$300,000.00
Total	**161**		**40250**		**$1,006,250.00**

Rock Riffle Grade Control					
Chapter	Number Riffles	Average Tons Stone	Total Tons Stone	Average Cost/ton	Total Cost
6	78	300	23400	$30.00	$702,000.00
7	79	450	35550	$30.00	$1,066,500.00
8	81	450	36450	$30.00	$1,093,500.00
Total	**238**		**95400**		**$2,862,000.00**

Table 5. Treatment Recommendations Chapter 6, 7 and 8

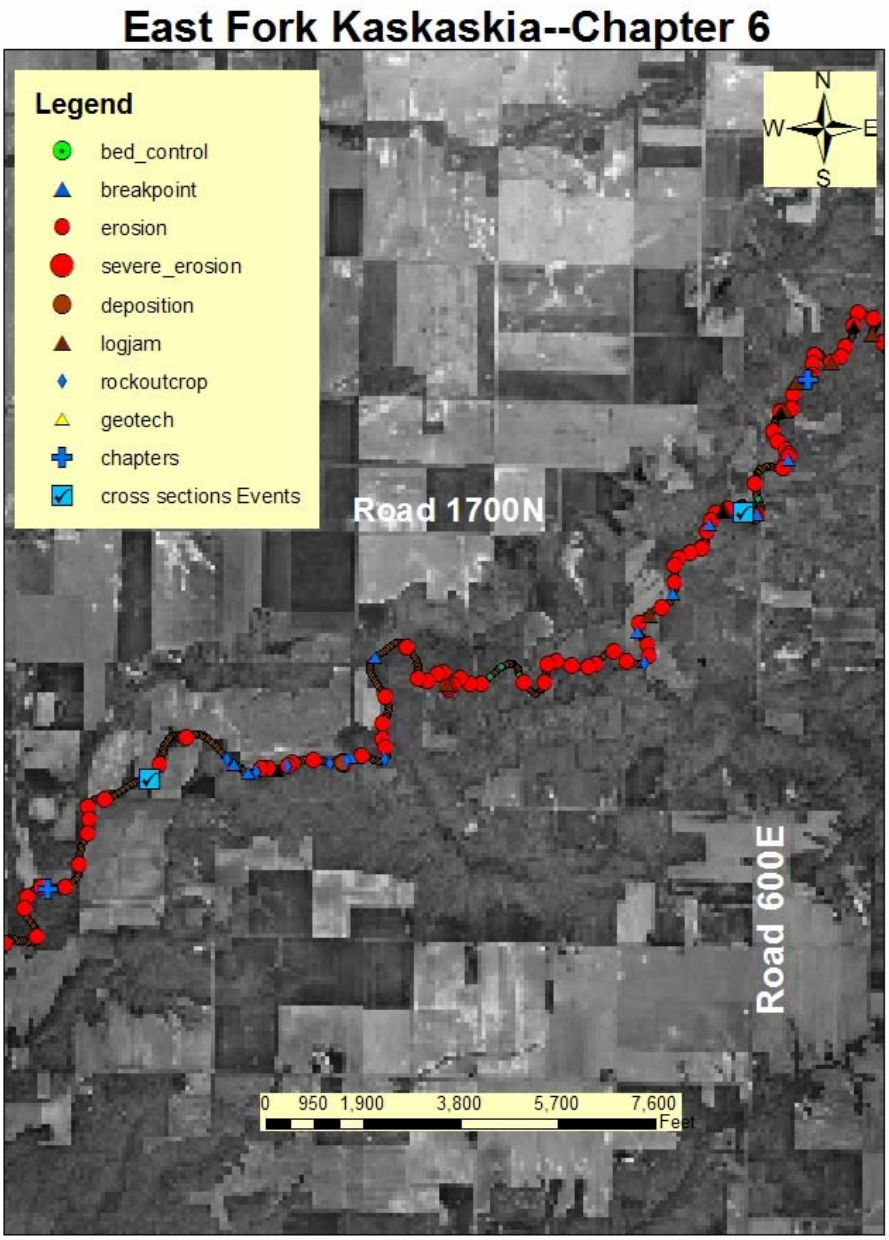


Fig. 11 Chapter 6

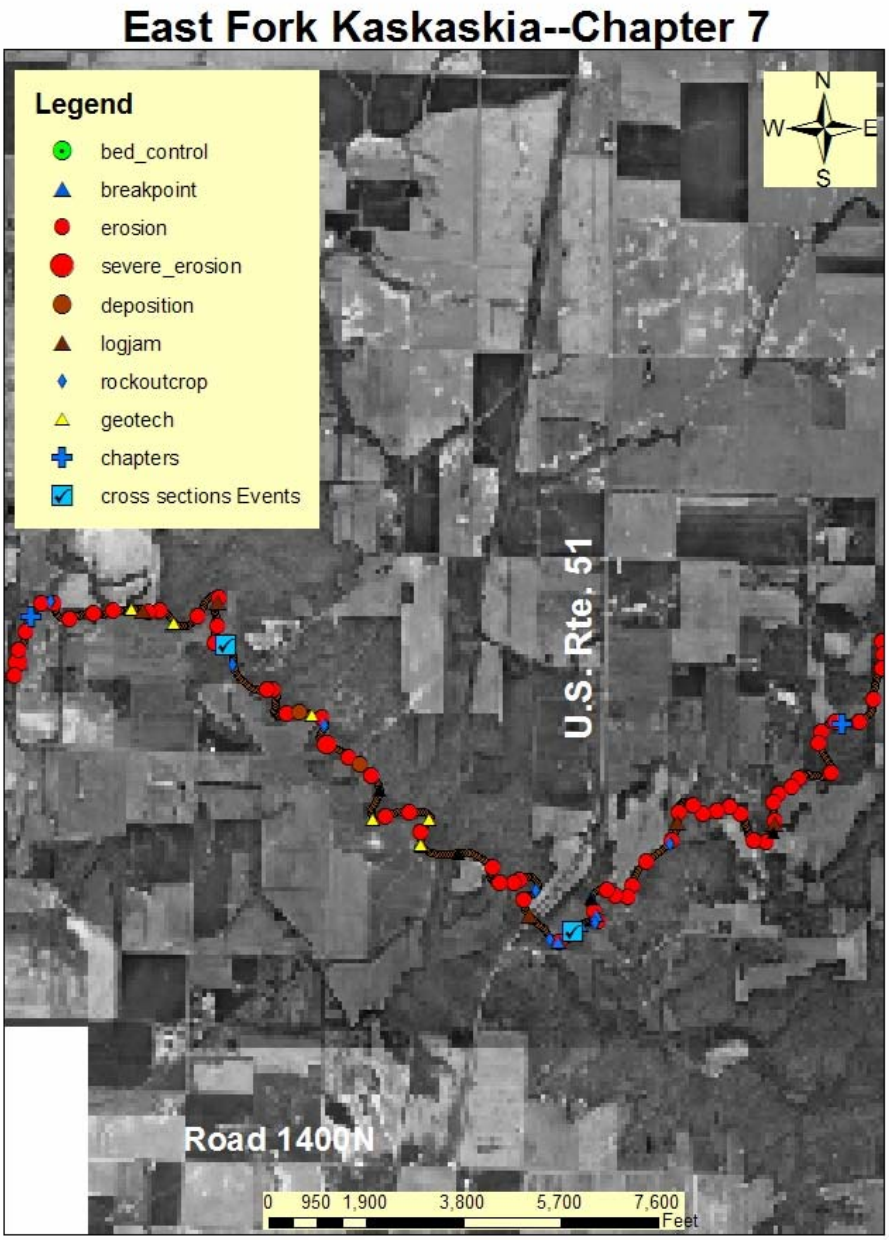


Figure 12 Chapter 7

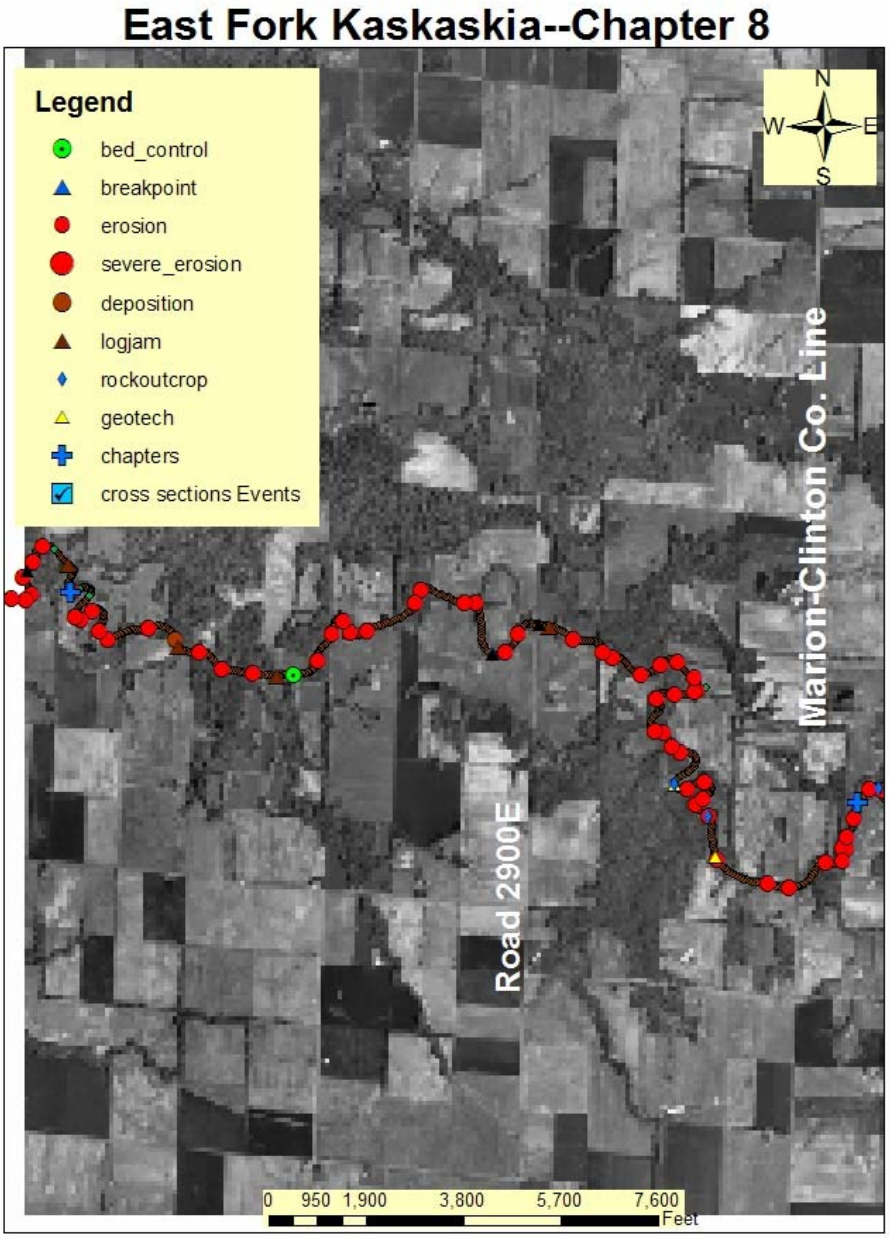


Fig. 13 Chapter 8

Recommended Treatment: Chapter 9

This segment is approximately 1.75 miles long and is immediately above Carlyle Lake. Much of this reach has backwater effects from lake levels in Carlyle Lake and installation of Rock Riffles to improve DO levels would be very difficult to achieve. There are 11 erosion sites in this reach that can be treated with Stone Toe Protection or Stream Barbs. The recommendation is to install Stream Barbs at these sites due to the varying heights of backwater from Carlyle Lake and the potential to increase DO by providing additional turbulence to enhance re-aeration.
Table 6 provides an estimate of treatment needs for this reach.

	TREATMENT CHAPTER 9 Lateral Bank Treatment with Stream Barbs				
Chapter	Erosion Sites	Average Length	Total Length	Average Cost/foot	Total Cost
9	11	400	4400	$40.00	$176,000

Table 6. Treatment Recommendation Chapter 9

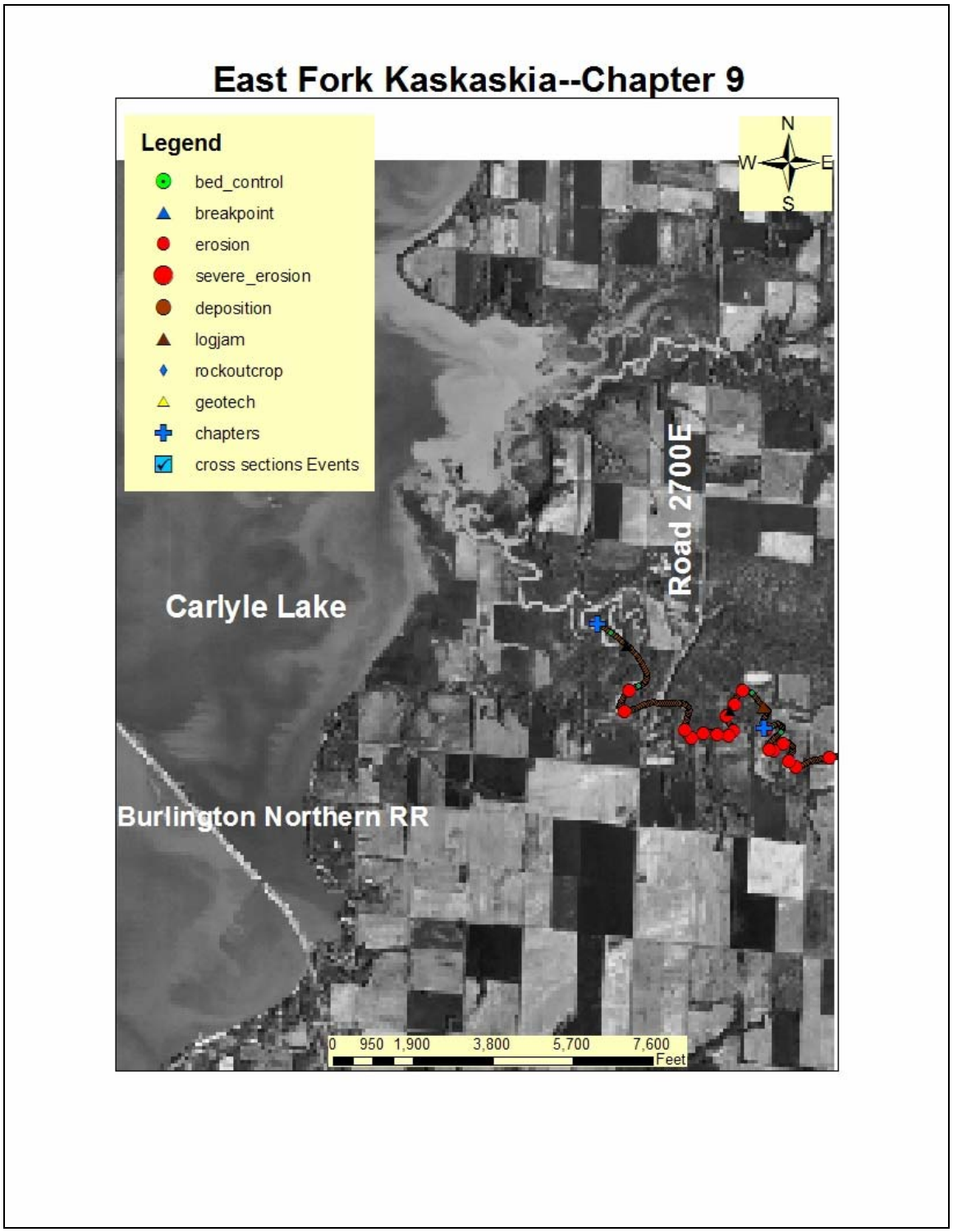


Fig. 14 Chapter 9

APPENDIX A

CROSS SECTION DATA

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E341363 N4296613

Landowner Name Xsec 1

Drainage Area 19.29 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	47 ft.	Cross Sectional Area	167 sq. ft.
	Depth	3.5 ft.		

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2	5000 cfs
	Drainage Area	208 sq.mi	Regression (	3850 cfs
Marion County, IL		**REFERENCE STREAM DATA ONLY**		

USGS Flood-Peak Discharge Predictions:

Valley Slope:	7.3	*ft./mi. (user-entered)*			Regression Q_2	1009 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in *(2 yr, 24 hr)*	Adjusted Q_2	1310 cfs
	0.0014	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					520	to 1050 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	47	*ft.*	Contour Interval		feet
Mean Bankfull Depth	3.83	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	12.27				

			Channel Slope:			Bankfull Q from:		
Max. Bankfull Depth	5.2	*ft.*	Surveyed:	0.00113	*ft./ft.*	Cross-Section	528	*cfs*
Width at twice max. depth	1000	*ft.*	Estimated:		*ft./ft.*	Basic field data	552	*cfs*
(10.4 ft.)						Selected Q	540	*cfs*
Entrenchment Ratio	21.28		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:	2.94	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.07	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.0	*ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

28.0 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 1	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.001130	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	5.0	*ft*

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

assuming uniform, steady flow

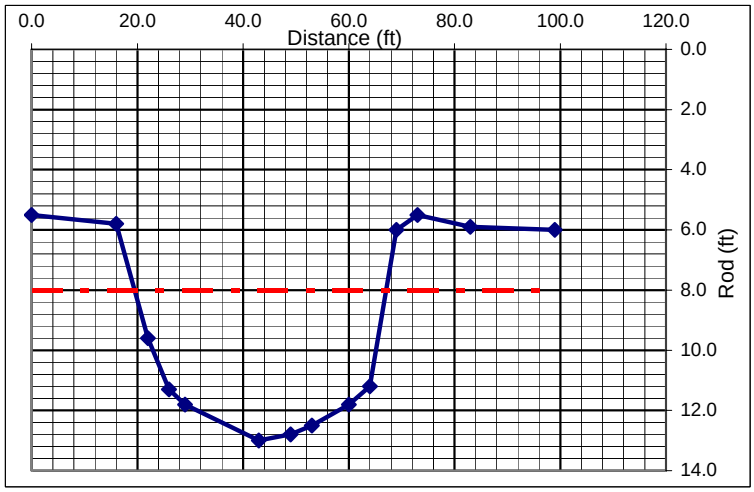
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	5.0 *ft*	7.0	
Channel Flow (***Q***):	528.5 *cfs*	1,018.7	
Channel Velocity:	2.9 *ft/sec*	3.6	
Cross-Sectional Area (***A***):	180.0 *sq.ft.*	280.3	
Hydraulic Radius (***R***):	3.6 *ft*	5.0	

Survey Data:

Rod *(ft)*	Distance *(ft)*
5.5	0.0
5.8	16.0
9.6	22.0
11.3	26.0
11.8	29.0
13.0	43.0
12.8	49.0
12.5	53.0
11.8	60.0
11.20	64
6.00	69
5.50	73
5.90	83
6.00	99



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E339661 N4296929

Landowner Name Xsec 2

Drainage Area 22.39 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	50 ft.	Cross Sectional Area	185	sq. ft.
	Depth	3.7 ft.			

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2	5000 cfs	
	Drainage Area	208 sq.mi	Regression (	3850 cfs	
Marion County, IL	**REFERENCE STREAM DATA ONLY**				

USGS Flood-Peak Discharge Predictions:

Valley Slope:	5.0	*ft./mi. (user-entered)*				Regression Q_2	952 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in	*(2 yr, 24 hr)*	Adjusted Q_2	1236 cfs
	0.0010	*ft./ft.*	Regional Factor	1.057		Typical Range for Bankfull Discharge:	
						490	to 990 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	33	*ft.*	Contour Interval		feet
Mean Bankfull Depth	5.67	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	5.82				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	8.1	*ft.*	Surveyed:	0.00063 *ft./ft.*	Cross-Section 493 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:	*ft./ft.*	Basic field data 557 *cfs*
(16.2 ft.)					Selected Q 525 *cfs*
Entrenchment Ratio	30.30		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:	2.63	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.97	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.8	*ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

23.4 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 2	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000630	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.1	*ft*

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

assuming uniform, steady flow

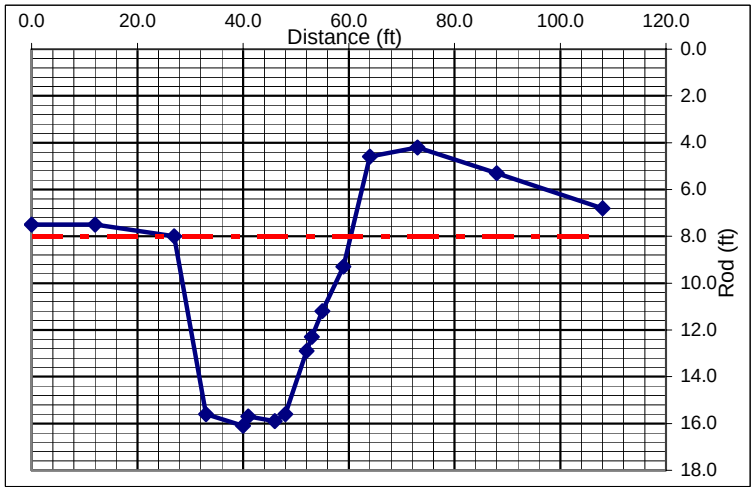
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.1 *ft*	8.6	
Channel Flow (***Q***):	493.1 *cfs*	411.2	
Channel Velocity:	2.6 *ft/sec*	2.0	
Cross-Sectional Area (***A***):	187.1 *sq.ft.*	207.7	
Hydraulic Radius (***R***):	4.7 *ft*	3.1	

Survey Data:

Rod *(ft)*	Distance *(ft)*
7.5	0.0
7.5	12.0
8.0	27.0
15.6	33.0
16.1	40.0
15.7	41.0
15.9	46.0
15.6	48.0
12.9	52.0
12.30	53
11.20	55
9.30	59
4.60	64
4.20	73
5.30	88
6.8	108



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E337838 N4296149

Landowner Name Xsec 3

Drainage Area 41.93 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 64 ft. Cross Sectional Area 283 sq. ft.

Depth 4.4 ft.

Reference Stream Gage:

Skillet Fork near Iuka Station No. 03380350 Gage Q_2 5000 cfs

Drainage Area 208 sq.mi Regression (3850 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 5.0 *ft./mi. (user-entered)* Regression Q_2 1552 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2015 cfs

0.0009 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

800 to 1620 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 5.53 *ft.* Estimated Sinuosity

Width/Depth Ratio 9.58

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 8 *ft.* Surveyed: 0.000734 *ft./ft.* Cross-Section 885 *cfs*

Width at twice max. depth 800 *ft.* Estimated: *ft./ft.* Basic field data 925 *cfs*

(16.0 ft.) Selected Q 905 *cfs*

Entrenchment Ratio 15.09 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: 3.02 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.16 *ft./sec.*

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

Channel Evolution Stage III Stream Type (Rosgen)

Notes

21.6 cfs/ sq. mi.

Natural Open Channel Flow

Project:	Xsec 3	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000734	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.0	*ft*

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

assuming uniform, steady flow

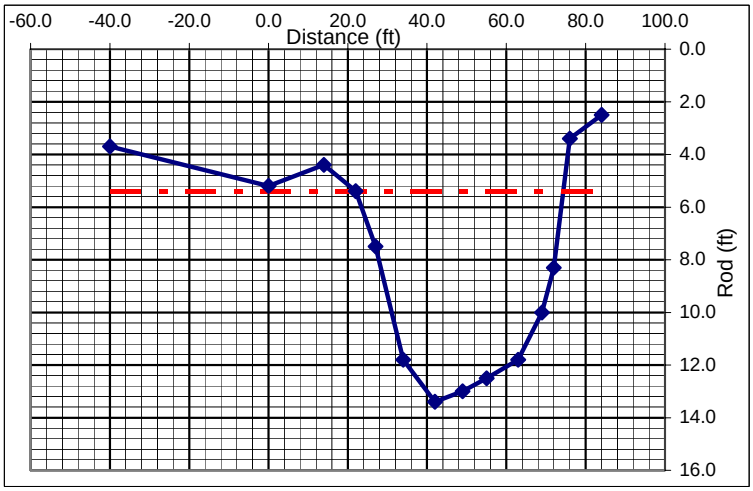
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.0 *ft*	9.7	
Channel Flow (***Q***):	885.4 *cfs*	1,042.2	
Channel Velocity:	3.0 *ft/sec*	2.4	
Cross-Sectional Area (***A***):	293.0 *sq.ft.*	438.2	
Hydraulic Radius (***R***):	5.2 *ft*	3.6	

Survey Data:

Rod *(ft)*	Distance *(ft)*
3.7	-40.0
5.2	0.0
4.4	14.0
5.4	22.0
7.5	27.0
11.8	34.0
13.4	42.0
13.0	49.0
12.5	55.0
11.80	63
10.00	69
8.30	72
3.40	76
2.50	84



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E336750 N4294502

Landowner Name Xsec 4

Drainage Area 46.45 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	67 ft.	Cross Sectional Area	304 sq. ft.
	Depth	4.6 ft.		

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2 5000 cfs
	Drainage Area	208 sq.mi	Regression (3850 cfs
Marion County, IL		**REFERENCE STREAM DATA ONLY**	

USGS Flood-Peak Discharge Predictions:

Valley Slope:	4.8	*ft./mi. (user-entered)*			Regression Q_2 1651 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in *(2 yr, 24 hr)*	Adjusted Q_2 2144 cfs
	0.0009	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:
					850 to 1720 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	68	*ft.*	Contour Interval		feet
Mean Bankfull Depth	4.53	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	15.01				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	7.9	*ft.*	Surveyed:	0.00072 *ft./ft.*	Cross-Section 819 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:	*ft./ft.*	Basic field data 843 *cfs*
(15.8 ft.)					Selected Q 831 *cfs*
Entrenchment Ratio	14.71		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:	2.66	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.74	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.7	*ft./sec.*

Channel Evolution Stage I Stream Type (Rosgen)

Notes

17.9 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 4	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000720	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	7.9	*ft*

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

assuming uniform, steady flow

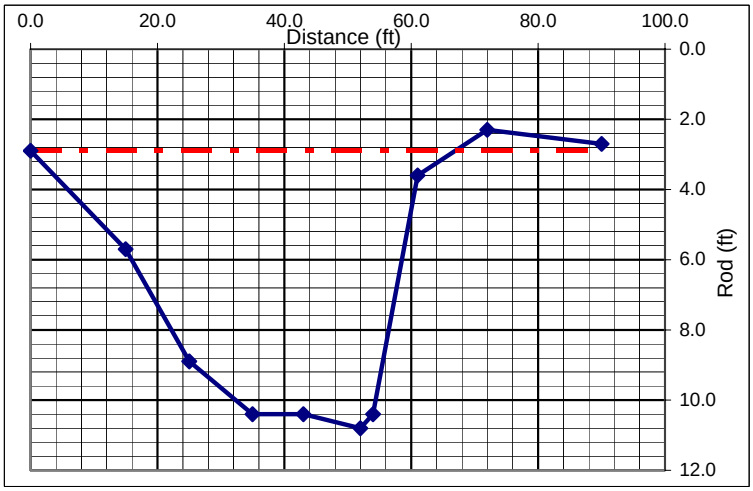
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	7.9 *ft*	7.9	
Channel Flow (***Q***):	819.3 *cfs*	819.3	
Channel Velocity:	2.7 *ft/sec*	2.7	
Cross-Sectional Area (***A***):	308.0 *sq.ft.*	308.0	
Hydraulic Radius (***R***):	4.4 *ft*	4.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.9	0.0
5.7	15.0
8.9	25.0
10.4	35.0
10.4	43.0
10.8	52.0
10.4	54.0
3.6	61.0
2.3	72.0
2.70	90



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E333679 N4292966

Landowner Name Xsec 5

Drainage Area 56.62 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	72 ft.	Cross Sectional Area	347 sq. ft.
	Depth	4.8 ft.		

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2	5000 cfs
	Drainage Area	208 sq.mi	Regression (	3850 cfs
Marion County, IL			**REFERENCE STREAM DATA ONLY**	

USGS Flood-Peak Discharge Predictions:

Valley Slope:	4.4	*ft./mi. (user-entered)*			Regression Q_2	1855 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in *(2 yr, 24 hr)*	Adjusted Q_2	2409 cfs
	0.0008	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					960 to 1930 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	54	*ft.*	Contour Interval		feet
Mean Bankfull Depth	5.71	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	9.46				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	8.9	*ft.*	Surveyed:	0.00048 *ft./ft.*	Cross-Section 759 *cfs*
Width at twice max. depth	800	*ft.*	Estimated:	*ft./ft.*	Basic field data 804 *cfs*
(17.8 ft.)					Selected Q 782 *cfs*
Entrenchment Ratio	14.81		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:	2.46	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.61	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.5	*ft./sec.*

Channel Evolution Stage I Stream Type (Rosgen)

Notes

13.8 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 5	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000480	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.9	*ft*

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

assuming uniform, steady flow

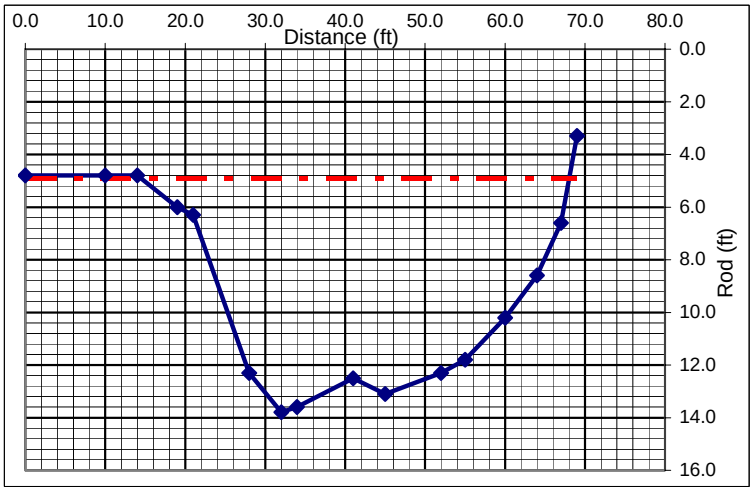
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.9 *ft*	9.0	
Channel Flow (***Q***):	758.6 *cfs*	673.5	
Channel Velocity:	2.5 *ft/sec*	2.1	
Cross-Sectional Area (***A***):	308.2 *sq.ft.*	313.6	
Hydraulic Radius (***R***):	5.3 *ft*	4.3	

Survey Data:

Rod *(ft)*	Distance *(ft)*
4.8	0.0
4.8	10.0
4.8	14.0
6.0	19.0
6.3	21.0
12.3	28.0
13.8	32.0
13.6	34.0
12.5	41.0
13.10	45
12.30	52
11.80	55
10.20	60
8.60	64
6.60	67
3.3	69



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E329960 N4291748

Landowner Name Xsec 6

Drainage Area 65.39 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:

Skillet Fork near Iuka Station No. 03380350 Gage Q_2 5000 cfs

Drainage Area 208 sq.mi Regression (3850 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 3.8 *ft./mi. (user-entered)* Regression Q_2 1946 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2528 cfs

0.0007 *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 76 *ft.* Contour Interval feet

Mean Bankfull Depth 4.39 *ft.* Estimated Sinuosity

Width/Depth Ratio 17.31

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 8.2 *ft.* Surveyed: 0.00058 *ft./ft.* Cross-Section 767 *cfs*

Width at twice max. depth 800 *ft.* Estimated: *ft./ft.* Basic field data 803 *cfs*

(16.4 ft.) Selected Q 785 *cfs*

Entrenchment Ratio 10.53 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: 2.30 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.41 *ft./sec.*

velocities from different sources. Velocity from selected Q: 2.4 *ft./sec.*

Channel Evolution Stage I Stream Type (Rosgen)

Notes

12.0 cfs/sq. mi

Natural Open Channel Flow

Project:	Xsec 6	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000580	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.2	*ft*

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

assuming uniform, steady flow

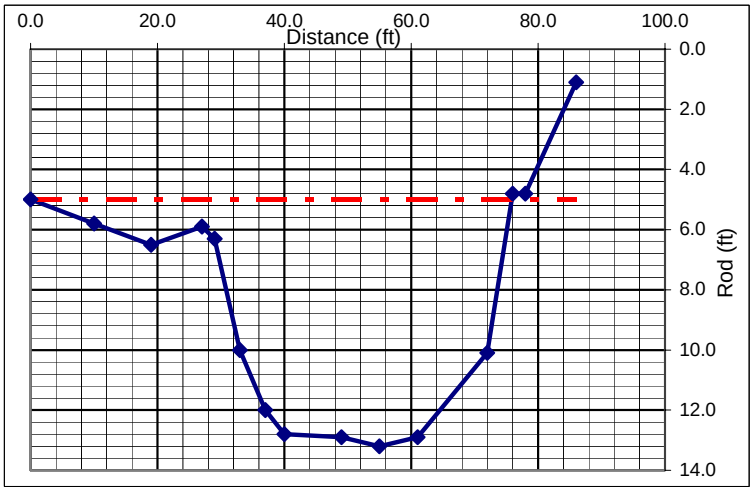
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.2 *ft*	8.2	
Channel Flow (***Q***):	767.2 *cfs*	767.2	
Channel Velocity:	2.3 *ft/sec*	2.3	
Cross-Sectional Area (***A***):	333.5 *sq.ft.*	333.5	
Hydraulic Radius (***R***):	4.1 *ft*	4.1	

Survey Data:

Rod *(ft)*	Distance *(ft)*
5.0	0.0
5.8	10.0
6.5	19.0
5.9	27.0
6.3	29.0
10.0	33.0
12.0	37.0
12.8	40.0
12.9	49.0
13.20	55
12.90	61
10.10	72
4.80	76
4.80	78
1.10	86



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E325042 N4289279

Landowner Name Xsec 7

Drainage Area 73.66 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 80 ft. Cross Sectional Area 415 sq. ft.

Depth 5.2 ft.

Reference Stream Gage:

Skillet Fork near Iuka Station No. 03380350 Gage Q_2 5000 cfs

Drainage Area 208 sq.mi Regression (3850 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 3.4 *ft./mi. (user-entered)* Regression Q_2 2019 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2623 cfs

0.0006 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

1040 to 2100 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 50 *ft.* Contour Interval feet

Mean Bankfull Depth 6.07 *ft.* Estimated Sinuosity

Width/Depth Ratio 8.24

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 8.1 *ft.* Surveyed: 0.00047 *ft./ft.* Cross-Section 770 *cfs*

Width at twice max. depth 1000 *ft.* Estimated: *ft./ft.* Basic field data 816 *cfs*

(16.2 ft.) Selected Q 793 *cfs*

Entrenchment Ratio 20.00 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: 2.54 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.69 *ft./sec.*

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

Channel Evolution Stage III Stream Type (Rosgen)

Notes

10.8 cfs/sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	Xsec 7	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000470	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.1	*ft*

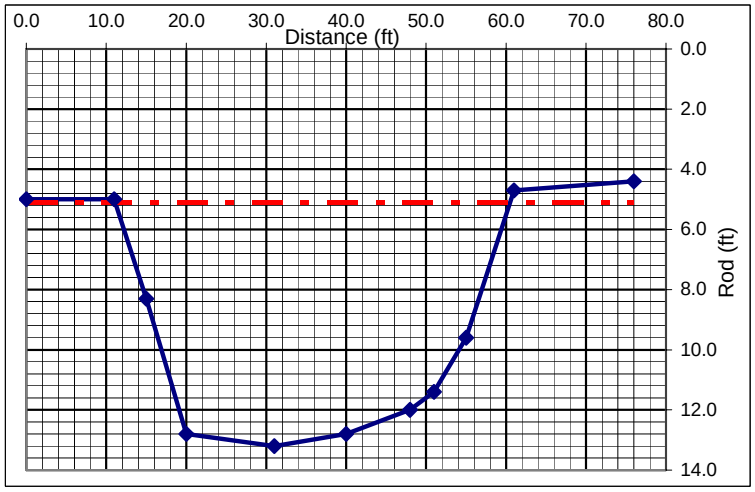
$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.1 *ft*		
Channel Flow (***Q***):	769.8 *cfs*		
Channel Velocity:	2.5 *ft/sec*		
Cross-Sectional Area (***A***):	303.7 *sq.ft.*		
Hydraulic Radius (***R***):	5.6 *ft*		

Survey Data:

Rod *(ft)*	Distance *(ft)*
5.0	0.0
5.0	11.0
8.3	15.0
12.8	20.0
13.2	31.0
12.8	40.0
12.0	48.0
11.4	51.0
9.6	55.0
4.70	61
4.40	76



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E323321 N4287973

Landowner Name Xsec 8

Drainage Area 75.91 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	81 ft.	Cross Sectional Area	424 sq. ft.
	Depth	5.3 ft.		

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2 5000 cfs
	Drainage Area	208 sq.mi	Regression (3850 cfs
Marion County, IL			**REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope:	2.8	*ft./mi. (user-entered)*			Regression Q_2 1890 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in *(2 yr, 24 hr)*	Adjusted Q_2 2455 cfs
	0.0005	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:
					980 to 1970 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	55	*ft.*	Contour Interval		feet
Mean Bankfull Depth	5.24	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	10.50				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	6.7	*ft.*	Surveyed:	0.00077 *ft./ft.*	Cross-Section 853 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:	*ft./ft.*	Basic field data 899 *cfs*
(13.4 ft.)					Selected Q 876 *cfs*
Entrenchment Ratio	18.18		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:	2.96	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.12	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.0	*ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	Xsec 8	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000770	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	6.7	*ft*

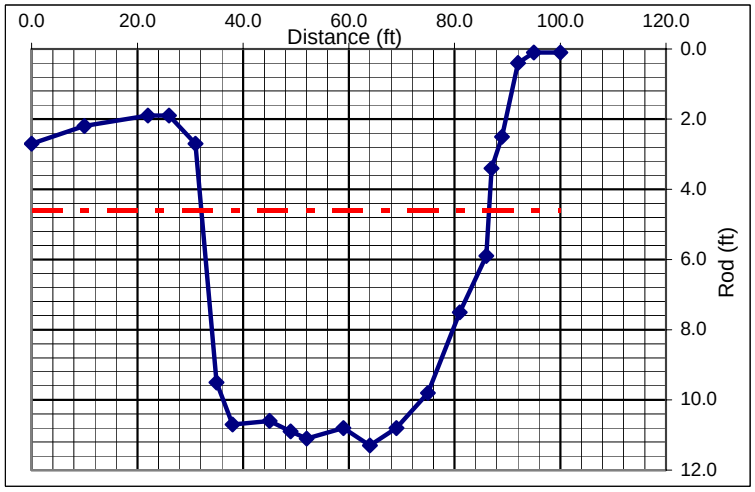
$$Q \left(\frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}} \right)$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.7 *ft*	8.6	
Channel Flow (***Q***):	852.9 *cfs*	1,357.0	
Channel Velocity:	3.0 *ft/sec*	3.4	
Cross-Sectional Area (***A***):	288.0 *sq.ft.*	393.6	
Hydraulic Radius (***R***):	4.9 *ft*	6.1	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.7	0.0
2.2	10.0
1.9	22.0
1.9	26.0
2.7	31.0
9.5	35.0
10.7	38.0
10.6	45.0
10.9	49.0
11.10	52
10.80	59
11.30	64
10.80	69
9.80	75
7.50	81
5.9	86
3.4	87
2.5	89
0.4	92
0.1	95
0.1	100



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E319797 N4286392

Landowner Name Xsec 9

Drainage Area 91.45 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	87 ft.	Cross Sectional Area	481 sq. ft.
	Depth	5.5 ft.		

Reference Stream Gage:

Skillet Fork near Iuka

Station No. 03380350 Gage Q_2 5000 cfs

Drainage Area 208 sq.mi Regression (3850 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 2.9 *ft./mi. (user-entered)* Regression Q_2 2219 cfs

ft/mi (from worksheet) Rainfall 3.40 in *(2 yr, 24 hr)* Adjusted Q_2 2882 cfs

0.0005 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

1150 to 2310 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Basic Field Data:

Bankfull Width 58 *ft.*

Mean Bankfull Depth 6.44 *ft.*

Width/Depth Ratio 9.01

Max. Bankfull Depth 8.5 *ft.*

Width at twice max. depth 1000 *ft.*

(17.0 ft.)

Entrenchment Ratio 17.24

Stream Length *ft.*

Valley Length *ft.*

Contour Interval feet

Estimated Sinuosity

Channel Slope:

Surveyed: 0.00044 *ft./ft.*

Estimated: *ft./ft.*

Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Q from:

Cross-Section 947 *cfs*

Basic field data 1011 *cfs*

Selected Q 979 *cfs*

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: 2.54 *ft./sec.*

GOAL: Develop confidence by matching velocities from different sources.

Velocity from basic field data: 2.71 *ft./sec.*

Velocity from selected Q: 2.6 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

Natural Open Channel Flow

Project:	Xsec 9	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000440	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.5	*ft*

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

assuming uniform, steady flow

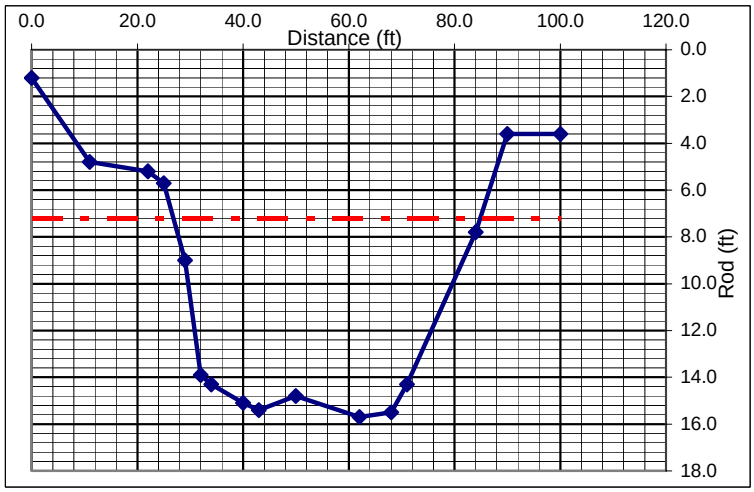
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.5 *ft*	12.1	
Channel Flow (***Q***):	947.3 *cfs*	1,629.1	
Channel Velocity:	2.5 *ft/sec*	2.6	
Cross-Sectional Area (***A***):	373.4 *sq.ft.*	619.9	
Hydraulic Radius (***R***):	5.9 *ft*	6.2	

Survey Data:

Rod *(ft)*	Distance *(ft)*
1.2	0.0
4.8	11.0
5.2	22.0
5.7	25.0
9.0	29.0
13.9	32.0
14.3	34.0
15.1	40.0
15.4	43.0
14.80	50
15.70	62
15.50	68
14.30	71
7.80	84
3.60	90
3.6	100



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E317592 N4284508

Landowner Name Xsec 10

Drainage Area 94.4 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	88 ft.	Cross Sectional Area	491 sq. ft.
	Depth	5.6 ft.		

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2	5000 cfs
	Drainage Area	208 sq.mi	Regression (	3850 cfs
Marion County, IL		**REFERENCE STREAM DATA ONLY**		

USGS Flood-Peak Discharge Predictions:

Valley Slope:	2.9	*ft./mi. (user-entered)*			Regression Q_2	2276 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in *(2 yr, 24 hr)*	Adjusted Q_2	2955 cfs
	0.0005	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					1180	to 2370 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	66	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	6.15	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	10.73						
			Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth		*ft.*	Surveyed:	0.00041	*ft./ft.*	Cross-Section	976 *cfs*
Width at twice max. depth		*ft.*	Estimated:		*ft./ft.*	Basic field data	1028 *cfs*
						Selected Q	1002 *cfs*
Entrenchment Ratio	0.00		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:	2.40	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.53	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.5	*ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

10.6 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 10	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000410	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.3	*ft*

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

assuming uniform, steady flow

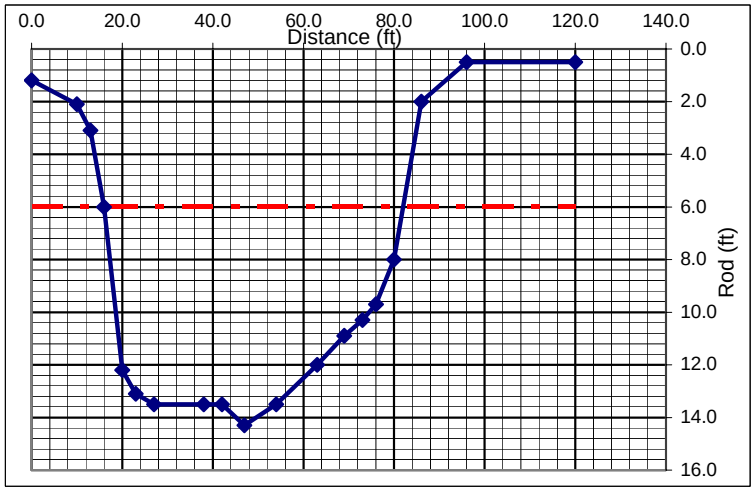
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.3 *ft*	13.1	
Channel Flow (***Q***):	975.7 *cfs*	2,192.0	
Channel Velocity:	2.4 *ft/sec*	2.9	
Cross-Sectional Area (***A***):	406.1 *sq.ft.*	755.0	
Hydraulic Radius (***R***):	5.7 *ft*	7.6	

Survey Data:

Rod *(ft)*	Distance *(ft)*
1.2	0.0
2.1	10.0
3.1	13.0
6.0	16.0
12.2	20.0
13.1	23.0
13.5	27.0
13.5	38.0
13.5	42.0
14.30	47
13.50	54
12.00	63
10.90	69
10.30	73
9.70	76
8.0	80
2.0	86
0.5	96
0.5	120



COMMENTS:

Stream Stabilization I & E Form

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

County Marion T. R. Sec.

Date 9/13/2005 By Wayne Kinney

Stream Name East Fork Kaskaskia UTM Coord. E315539 N4286209

Landowner Name Xsec 11

Drainage Area 115.58 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	95 ft.	Cross Sectional Area	563 sq. ft.
	Depth	5.9 ft.		

Reference Stream Gage:

Skillet Fork near Iuka	Station No.	03380350	Gage Q_2	5000 cfs
	Drainage Area	208 sq.mi	Regression (	3850 cfs
Marion County, IL			**REFERENCE STREAM DATA ONLY**	

USGS Flood-Peak Discharge Predictions:

Valley Slope:	2.8	*ft./mi. (user-entered)*			Regression Q_2	2626 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in *(2 yr, 24 hr)*	Adjusted Q_2	3410 cfs
	0.0005	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					1360	to 2730 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	61	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	6.85	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	8.91						
			Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth	9.5	*ft.*	Surveyed:	0.00045	*ft./ft.*	Cross-Section	1139 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:		*ft./ft.*	Basic field data	1192 *cfs*
(19.0 ft.)						Selected Q	1166 *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}	1 *in.*	Velocity required to move D_{90}:	2.1 *ft./sec.*
	D_{50}	*in.*	Velocity from Cross-Section data:	2.73 *ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.85 *ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.8 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

10.08 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 11	
Assisted by:	Wayne Kinney	
Date:	9/13/2005	
Channel Slope (***S***):	0.000450	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	9.5	*ft*

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

assuming uniform, steady flow

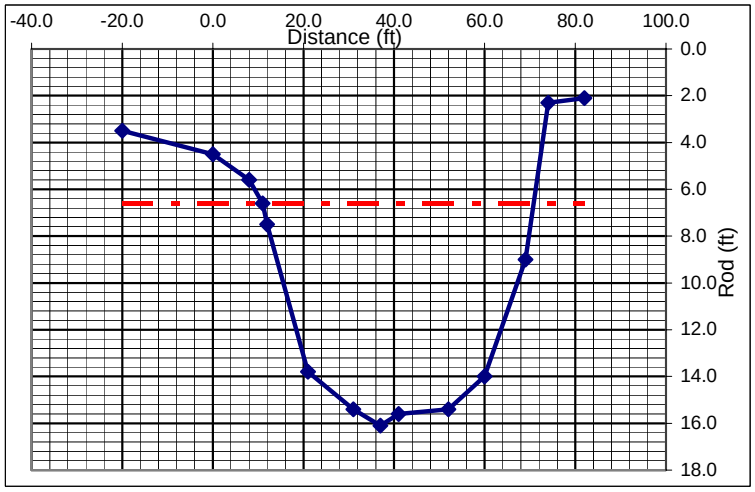
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	9.5 *ft*	12.6	
Channel Flow (***Q***):	1,138.7 *cfs*	1,723.7	
Channel Velocity:	2.7 *ft/sec*	2.7	
Cross-Sectional Area (***A***):	417.7 *sq.ft.*	636.9	
Hydraulic Radius (***R***):	6.4 *ft*	6.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
3.5	-20.0
4.5	0.0
5.6	8.0
6.6	11.0
7.5	12.0
13.8	21.0
15.4	31.0
16.1	37.0
15.6	41.0
15.40	52
14.00	60
9.00	69
2.30	74
2.10	82



COMMENTS: