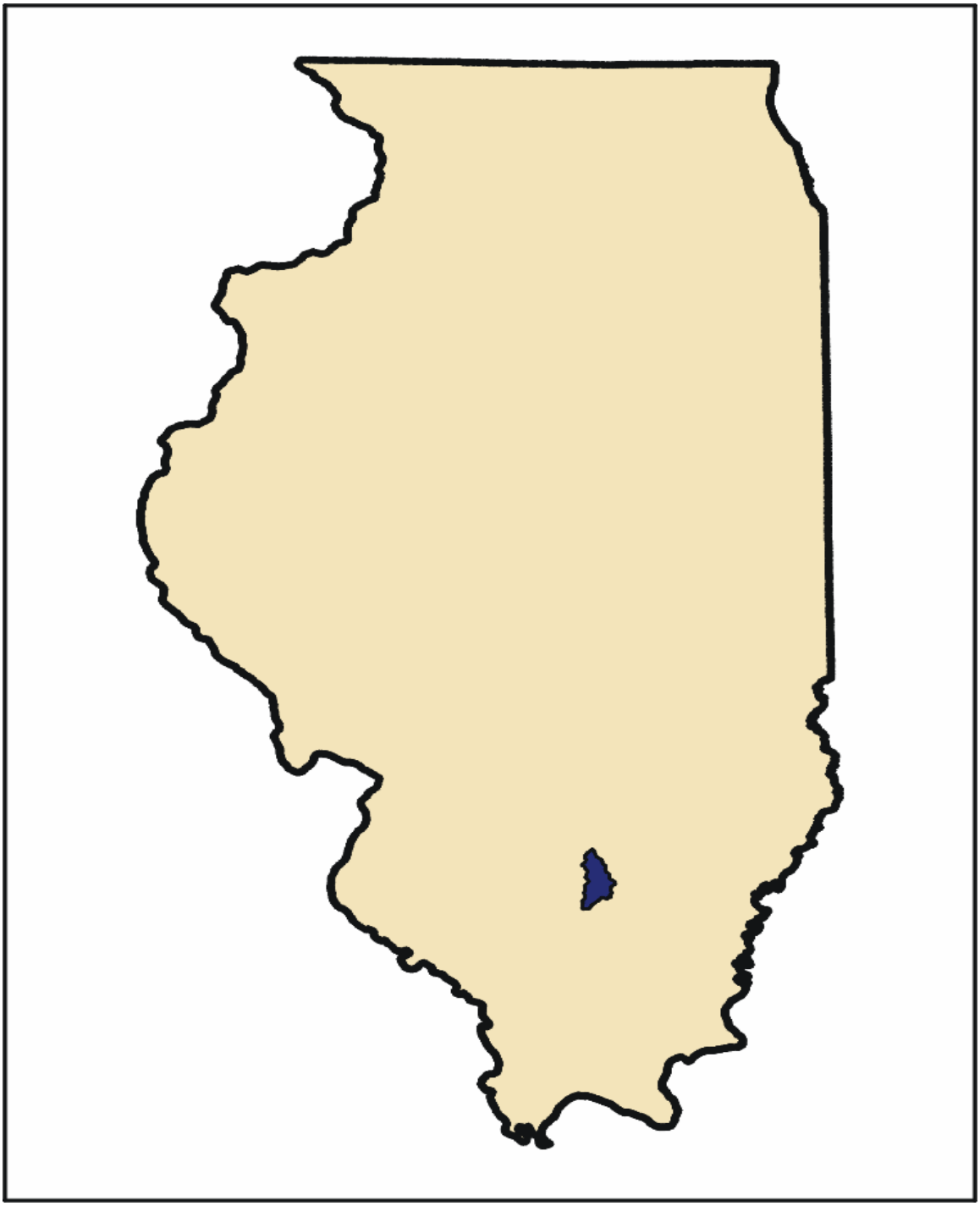


AERIAL ASSESSMENT REPORT FOR CASEY FORK

JEFFERSON COUNTY
September 2005
Prepared by Wayne Kinney for IL. Department of Agriculture

In May 2001 Illinois EPA entered into a contract with Camp Dresser & McKee, Inc. to develop Total Maximum Daily Loads (TMDLs) for Casey Fork. In the 1998 Section 303(d) List, Casey Fork (NJ10) was listed as impaired for manganese, low dissolved oxygen (DO), and total dissolved solids (TDS); Casey Fork (NJ14) was listed for manganese and low DO. (Fig.1)

"New data assessed in 2002 showed that Casey Fork segments NJ10 and NJ14 are only impaired for PCBs based on fish consumption use. This assessment was based on data extrapolated from segment NJ07. Since no new data is directly available from segments NJ10 and NJ14, Illinois EPA continued to develop TMDLs for the parameters originally listed for each of theses two segments. Numeric water quality standards exist for manganese, DO, and TDS." (page 1 Casey Fork TMDL Final Report, October 2004)

Assessment Procedure

Low level geo-referenced video was taken of Casey Fork 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 extended beyond the identified impairment segments. Mapping began near Bonnie, IL just above Rend Lake near the confluence of Dodds Creek and progressed upstream to approximately 0.5 mile south of the Jefferson and Marion County line near Kell, Illinois. Video mapping was terminated toward the upper reach as the stream size and vegetation prevented capture of useful video. 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.

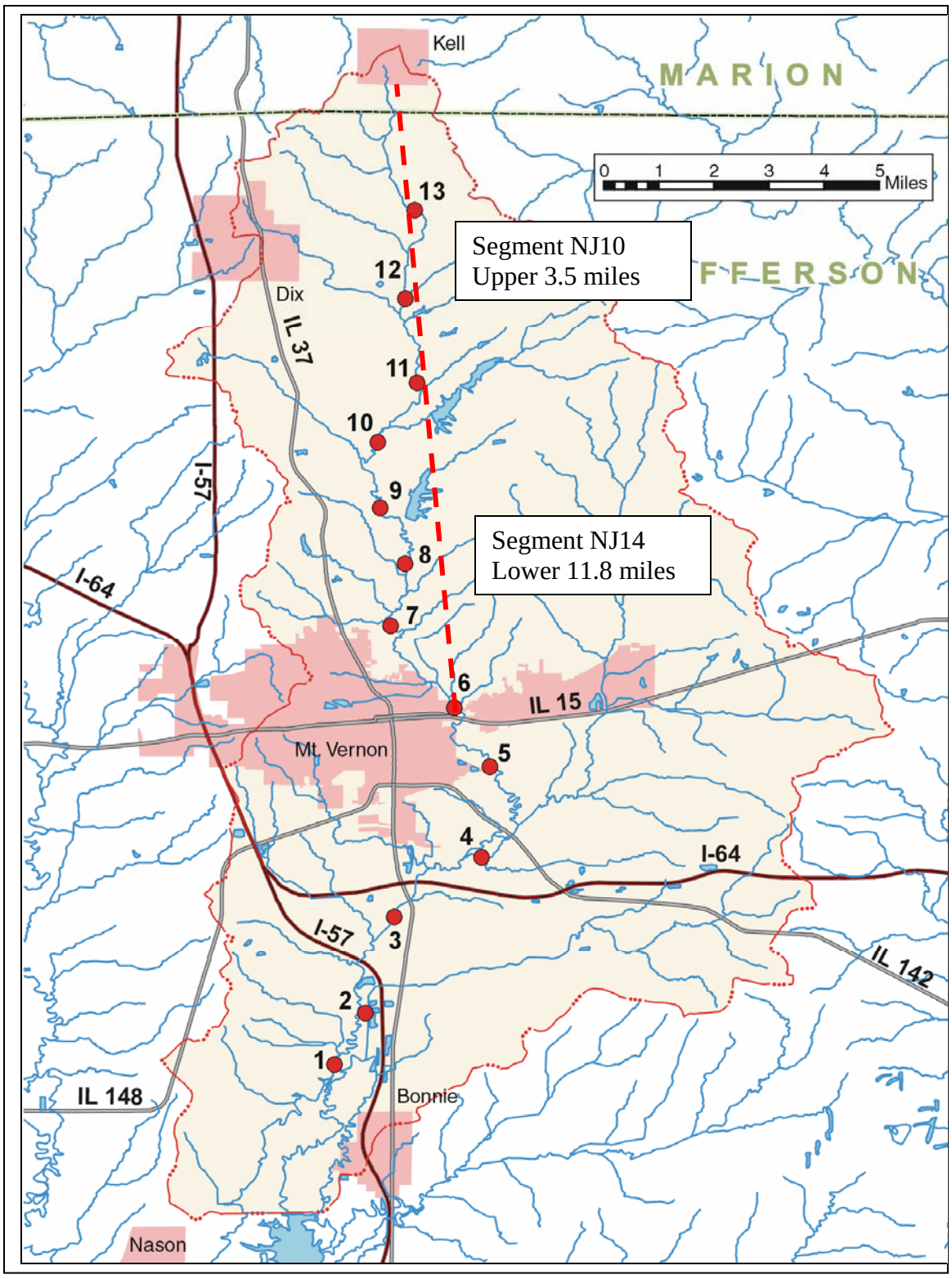


Fig. 1 Aerial Assessment Map of Casey Fork

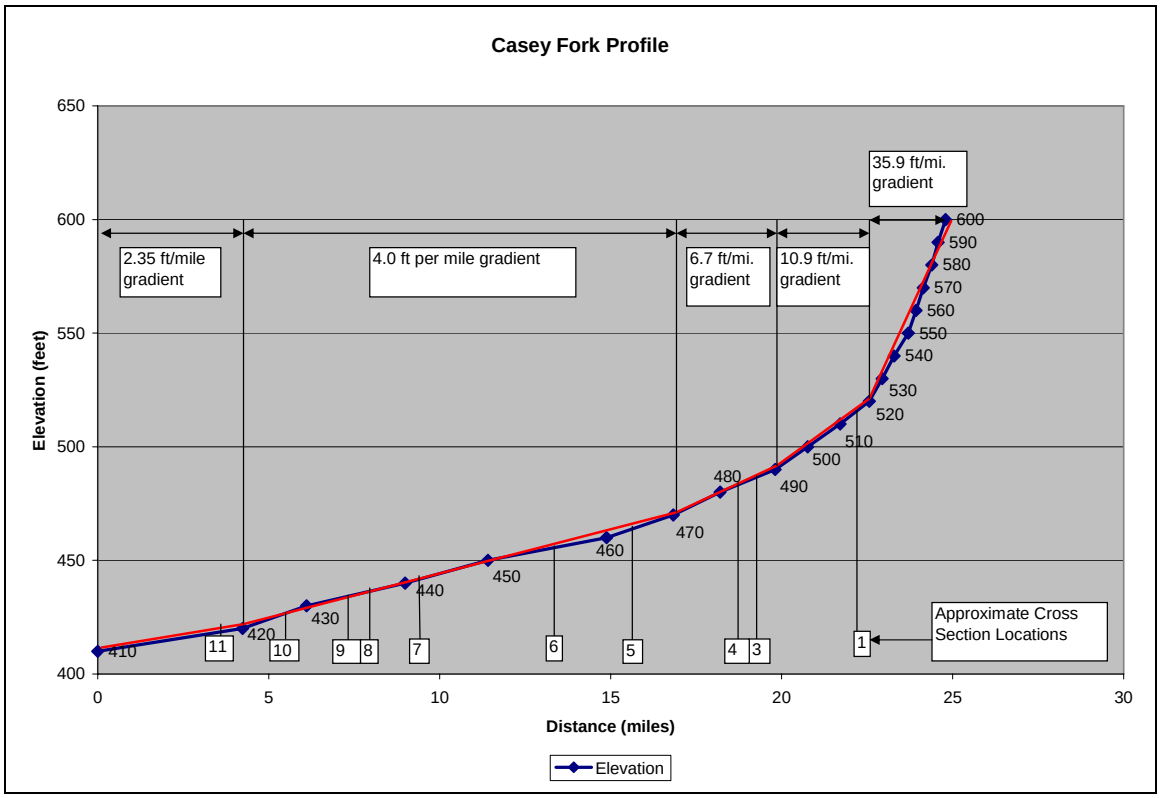


Fig. 2 Valley Profile from Topo Maps and Cross Section Locations

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 assumed 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 CASEY FORK				
DVD Disc	DVD chapter	Beginning Time	Report Chapter	Map Chapter Fig. 1
1	2	5:00	1-2	1
1	3	10:00	1-3	2
1	4	15:00:00	1-4	3
1	5	20:00:00	1-5	4
1	6	25:00:00	1-6	5
1	7	30:00:00	1-7	6
2	2	5:00	2-2	7
2	3	10:00	2-3	8
2	4	15:00:00	2-4	9
2	5	20:00:00	2-5	10
2	6	25:00:00	2-6	11
2	7	30:00:00	2-7	12
2	8	35:00:00	2-8	13
Note: Flight path is from downstream to upstream				

Fig. 3 DVD Chapters and Report Chapters 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. 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" or group of "chapters".

CASEY FORK FEATURES IDENTIFIED BY CHAPTER							
CHAPTER	ROCK OUTCROP	LOGJAM	GEOTECH FAILURE	DEPOSITION	BED STRUCTURE	BREAK POINT	EROSION
1-2	0	8	2	1	1	0	5
1-3	1	6	0	0	1	0	11
1-4	1	3	1	0	1	0	14
1-5	0	1	1	6	1	0	12
1-6	1	2	3	1	1	3	17
1-7	0	6	2	0	2	1	15
2-2	0	5	4	1	1	0	20
2-3	2	5	0	0	0	3	22
2-4	0	6	4	0	0	2	20
2-5	0	4	4	2	2	2	30
2-6	1	4	3	1	1	1	19
2-7	3	5	1	1	1	0	28
2-8	2	0	1	0	0	0	20
Totals	11	55	26	13	12	12	233

Table 1. Features identified by DVD Chapter

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.

Cross Section Summary Casey Fork

X Sec	Easting	Northing	ADA sq. mi.	Valley Slope	Q2 CFS	BKF CFS	Width	Depth	Vel. FPS	Bedload (inches)	CEM	BKF CFS/ sq. mi.	BKF Q/ Q2 CFS
1	334137	4257826	3.99	32.8	558	248	27	2.74	3.4	3	3	62.16	0.44
3	334403	4253651	15.07	17	1163	502	38	4.13	3.2	1	3	33.31	0.43
4	334441	4252038	17.29	15.4	1236	556	39	4.32	3.3	1	3	32.16	0.45
5	333243	4249935	28.27	10.8	1537	654	44	4.67	3.2	2	3	23.13	0.43
6	334040	4246979	32.09	10.8	1699	861	37	6.74	3.5	1	1	26.83	0.51
7	334257	4243909	39.88	6.9	1626	782	63	4.47	2.8	1	1	19.61	0.48
8	334996	4242132	45.03	6.3	1713	571	40	4.95	2.9	1	3	12.68	0.33
9	335806	4241612	45.3	6.3	1721	945	48	6	3.3	1	3	20.86	0.55
10	336175	4239153	77.47	5.1	2375	1093	48	6.7	3.4	1	3	14.11	0.46
11	335209	4238032	80.5	5.1	2448	1140	57	7.19	2.8	1	3	14.16	0.47

Table 2. Cross Section Data

CASEY FORK INCISION COMPARISON FROM CROSS SECTION DATA

X Sec	BKF Max D	Top Bank Depth	Top Bk. D/ Max D	BKF CFS	Top Bank CFS	Top Bk. CFS/ BKF CFS
1	3.4	6.9	2.03	248	697	2.81
3	5.6	8.6	1.54	502	969	1.93
4	6	8.2	1.37	556	857	1.54
5	6.3	9.4	1.49	654	1161	1.78
6	8.7	9.2	1.06	861	861	1.00
7	7.2	7.2	1.00	782	782	1.00
8	6	6.1	1.02	571	571	1.00
9	8.1	8.9	1.10	945	977	1.03
10	9.7	11.1	1.14	1093	1114	1.02
11	10.4	10.7	1.03	1140	1140	1.00

Table 3. Cross section data identifying incision on Casey Fork

Eleven (11) cross sections were taken at selected locations on Casey Fork 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 Tables 2 and 3. 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. 10 thru 24. Exact locations as Eastings and Northings and more detail can be found in Appendix A.

Annual Maximum Peak Discharge data from USGS Gage #05595820 on Casey Fork at Mt. Vernon was used to create a probability curve to identify the 1.5 and 2.0 yr. return interval event. (Fig. 3) The drainage area at this site is 76.9 square miles, therefore the 2700 cfs determined as the 1.5 yr. event represents approximately 35 cfs per square mile of drainage area. The 2 yr. event produces an estimated 47 cfs per square mile. Typically the "geomorphic bankfull" or "channel forming discharge" is assumed to be near the 1.5 year return interval event. (Leopold)

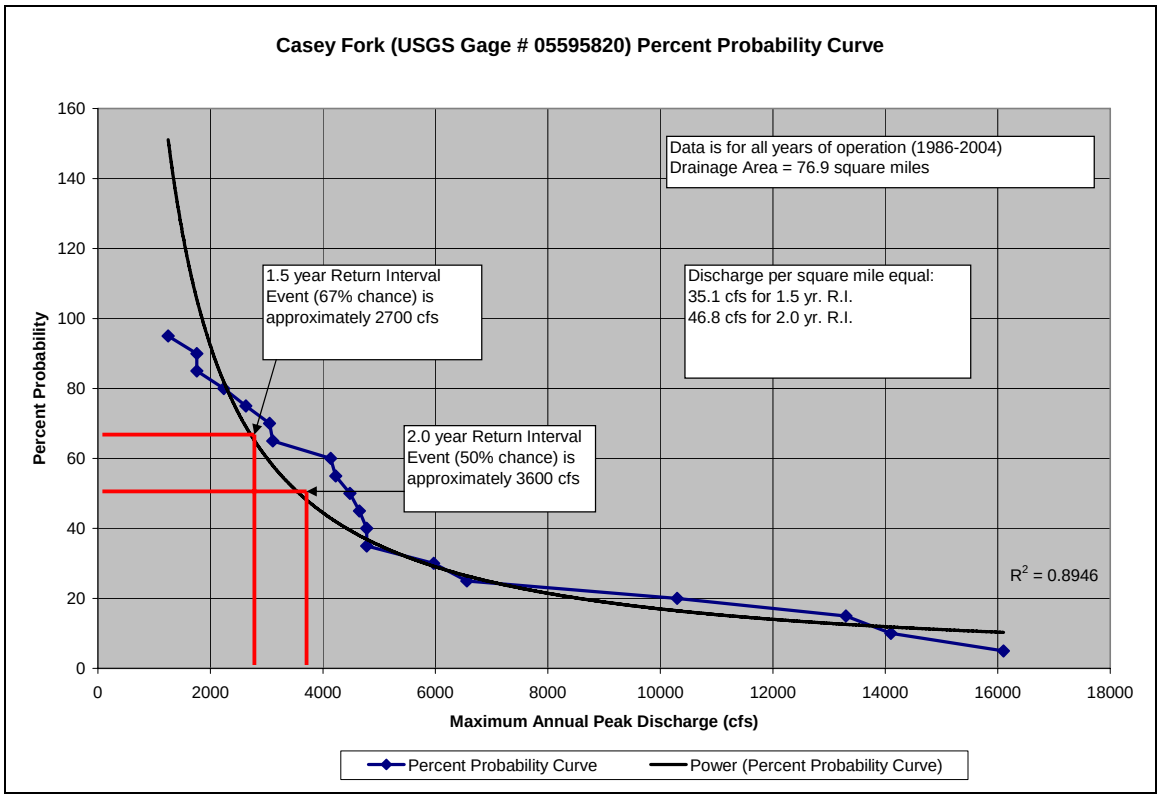


Fig. 3 Annual Maximum Peak Discharge Probability Curve from USGS Gage 05595820 (Casey Fork at Mt. Vernon)

General Observations

1. Cross sections 1 through 5 are incised with over 150% of depth and capacity to carry the "geomorphic bankfull" discharge.(Table 3) (Chapters 2-4 through 2-8)
2. Cross sections 6 though 11 have bankfull discharges at or near the top bank elevation indicating little or no downcutting in the past. (Table 3)
3. Cross sections 8 and 9 show obvious knickpoints with exposed clay bed and active downcutting even though there are not incised at this time. (Chapter 1-6)
4. USGS Gage# 05595820 on Casey Fork at Rte. 142 southeast of Mt. Vernon shows a 1.5 yr. return interval storm produces approximately 2700 cfs or 35 cfs per square mile of drainage. The channel will carry only 15 to 20 cfs per square mile at top bank elevation, therefore the return interval for "bankfull discharge" is then near or slightly below the 1.0 yr. event.
5. Nine (9) "bed structures" were identified on the video, however only the structure at 32:16 on DVD disc1 is a true control. Others sites are typically farm crossings or loose stone under bridges that should not be considered reliable bed control structures.
6. The active knickzone found at cross section 8 and 9 in Chapter 1-6 should be treated with grade control structures to prevent upstream migration, increase aeration to improve DO levels and prevent the channel from progressing through a potentially destructive series of channel adjustments.

7. Due to the low stream gradients, even the segments not currently incised can have Grade Control Structures installed approximately 2.5 ft. high without impacting flooding or backwater effects.

Fig. 4 Dam above Tolle Road. Only true grade control identified in assessment.

Fig. 5 Cross Section 5 –Shale bed provides relative bed stability as shale erodes slowly

Fig. 6 Knickpoint below Rte. 15; clay bed is actively downcutting

Fig. 7 Knickpoint above Road 1250N; bed is actively downcutting


Fig. 8 Cross Section 10 –Below USGS Gage Site #05595820 (Rte. 142)

Recommendations: Chapters 1-2 and 1-3

These chapters are the lower reaches of the aerial assessment beginning just above Rend Lake. No cross sections were taken in this reach due to water depth indicating probable bed stability. There are also 14 logjams identified in this reach that may be contributing to the deeper stagnant pools. The erosion in this reach is relatively minor with 16 identified sites.

Of interest in Chapter 1-2 is what appears to be the "capture" of Casey Fork into Dodds Creek at 9:50 on the video. The flight path followed Casey Fork this first chapter in what is identified as Casey Fork, however there is little flow in Casey Fork downstream of 9:50 and then the active Casey Fork Channel can be seen moving east to combine with Dodds Creek. The video did not capture Dodds Creek, therefore an investigation into the effects of the "capture" of Casey Fork into Dodds may be warranted to determine the impact on Dodds Creek.

Chapter 1-3 is then the first chapter that captures Casey Fork however the gradient is low at 2.35 ft/mile, the riparian corridor is mature timber and the erosion appears to be minor. Therefore there is no recommended treatment to this stream segment.

Fig. 9 Image of Casey Fork active channel (upper channel) and Casey Fork abandoned channel at bottom of picture.

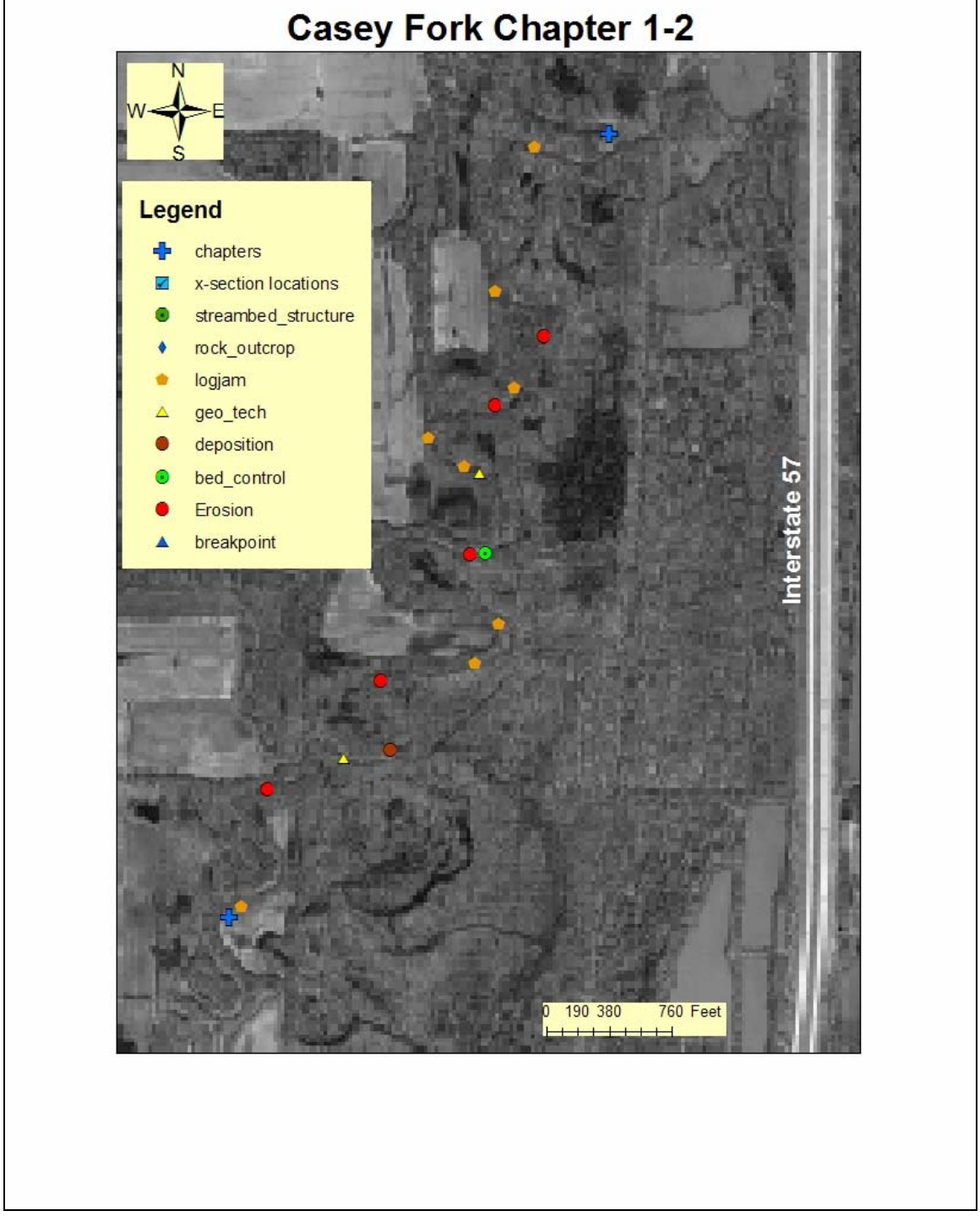


Fig. 10 Chapter 1-2

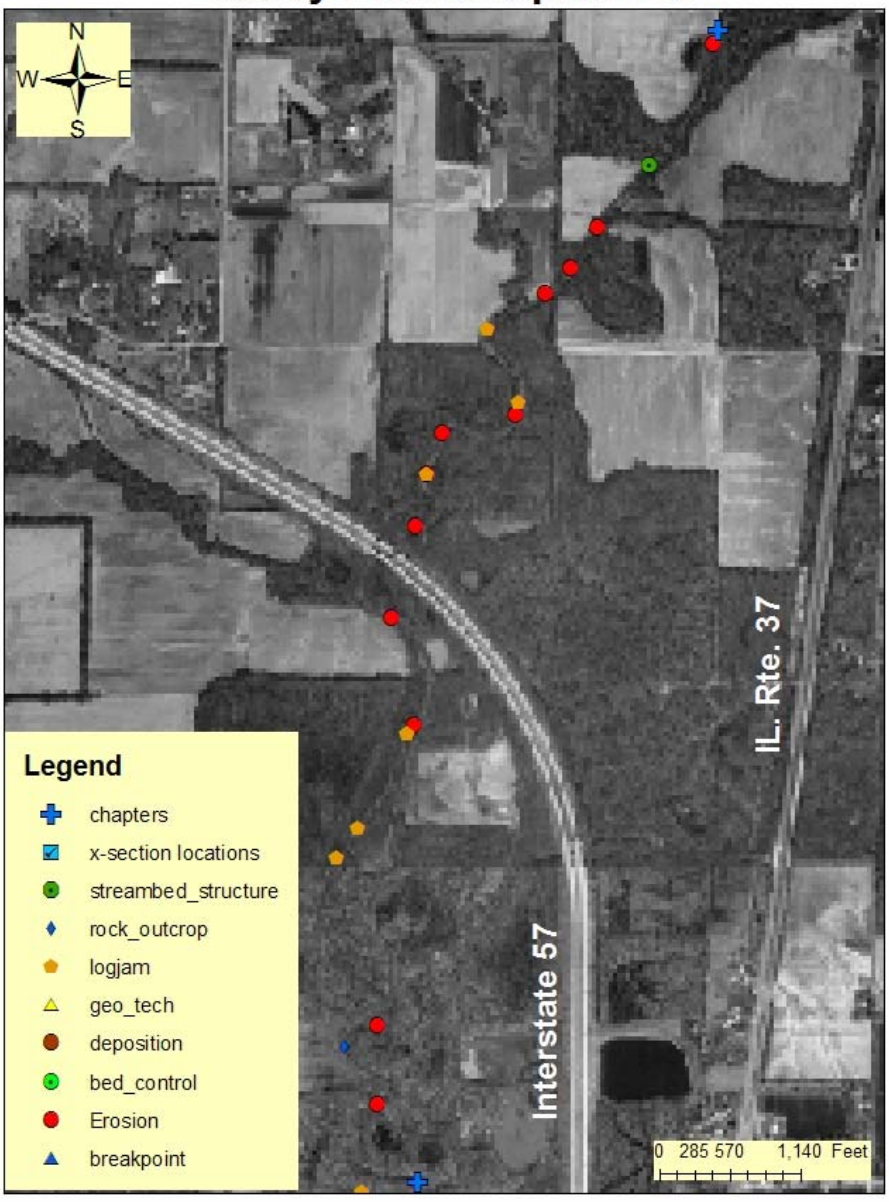


Fig. 11 Chapter 1-3

Recommendations: Chapters 1-4 through 1-6

Chapter 1-4 begins just downstream of I-64 and ends near IL. Rte. 15. This segment includes cross sections 8 thru 11 which do not indicate an incised channel, but have definite active knickzones apparent at cross sections 8 and 9. (Fig. 6 and 7)
The evidence of downcutting is also found at a farm crossing with a significant overfall (Fig. 12) and eroded residual "pedestals" in a channelized section above IL. Rte. 142 (Fig. 13)

Fig. 12 Farm Crossing with overfall downstream

If left untreated this segment will continue to degrade and will incise over time resulting in potentially severe and damaging channel adjustments over time. Therefore the recommended treatment is to install Rock Riffle Grade Control Structures in this entire reach with an average height of approximately 2.5 feet and an average spacing of 300ft. There are 43 erosion sites identified in this segment, however the recommendation is to install the "riffle-pool" sequence and defer any treatment of the lateral erosion as the grade control structures will have a large positive impact that may preclude the need for lateral bank stabilization.

The riffle–pool sequence will also help address the low DO and manganese impairments on Casey Fork by re-aeration and introduction of limestone as a passive treatment to increase pH as recommended in Section 9.1.2.3in the Casey Fork Final Report.

Fig. 13 Eroded residual pedestals in channelized reach of Casey Fork

The estimated treatment cost per chapter is presented in Table 4 below.

TREATMENT --CHAPTERS 1-4 through 1-6 Riffles					
Chapter	Number Riffles	Average Tons Stone	Total Tons Stone	Average Cost/ton	Total Cost
1-4	40	285	11,400	$30.00	$342,000.00
1-5	38	285	10,830	$30.00	$324,900.00
1-6	35	285	9,975	$30.00	$299,250.00
Total	**113**		**32,205**		**$966,150.00**

Table 4 Treatment Cost for Chapters 1-4 through 1-6

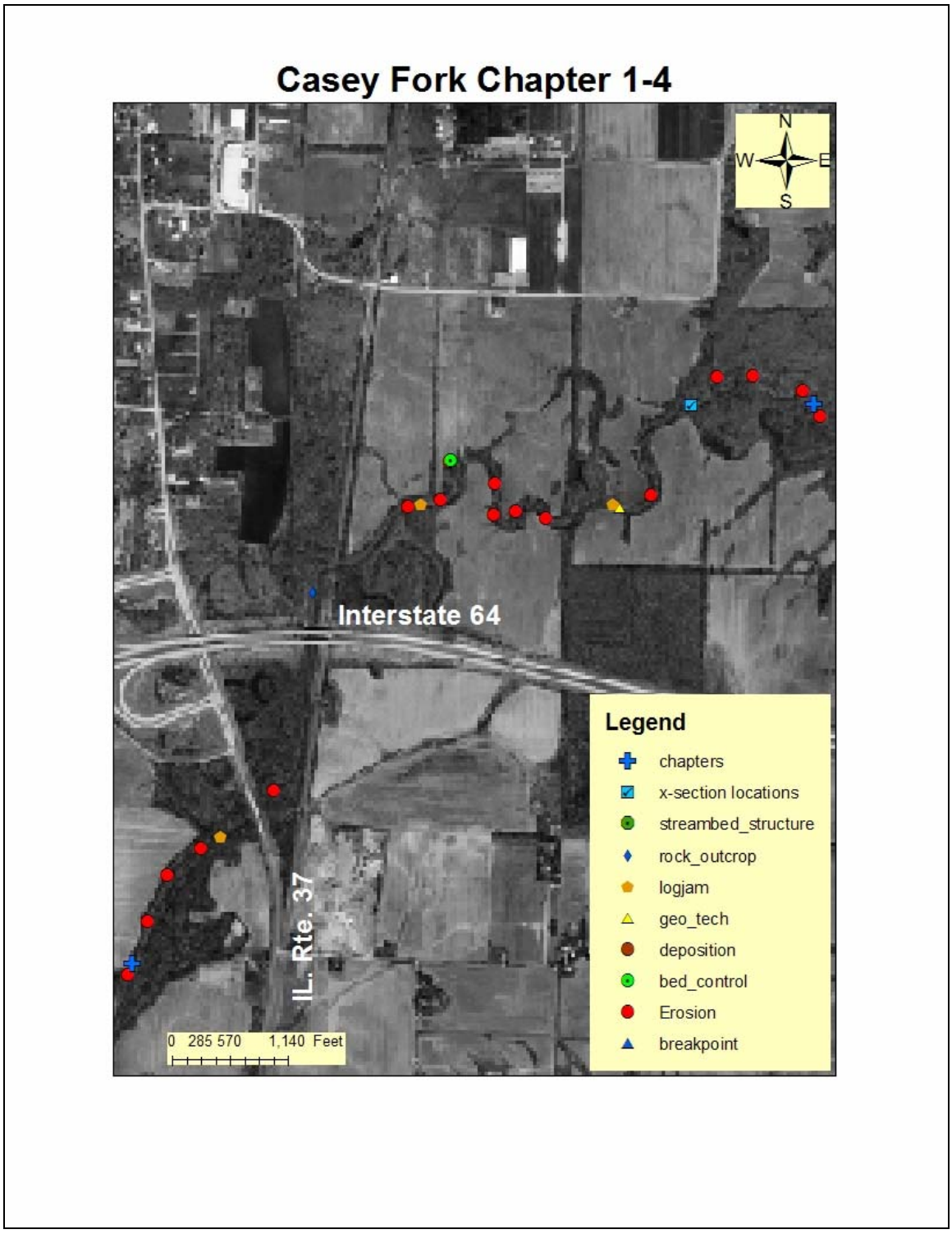


Fig. 14 Chapter 1-4

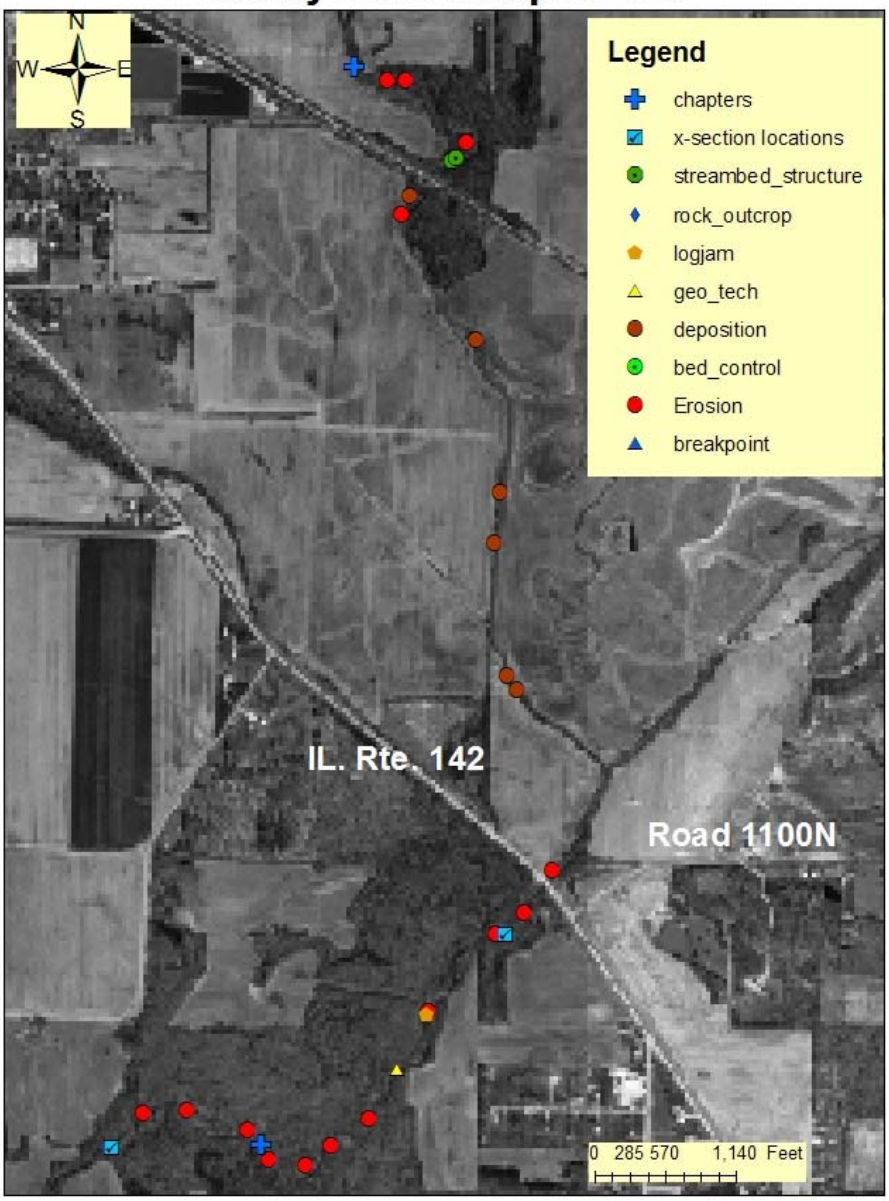


Fig. 15 Chapter 1-5

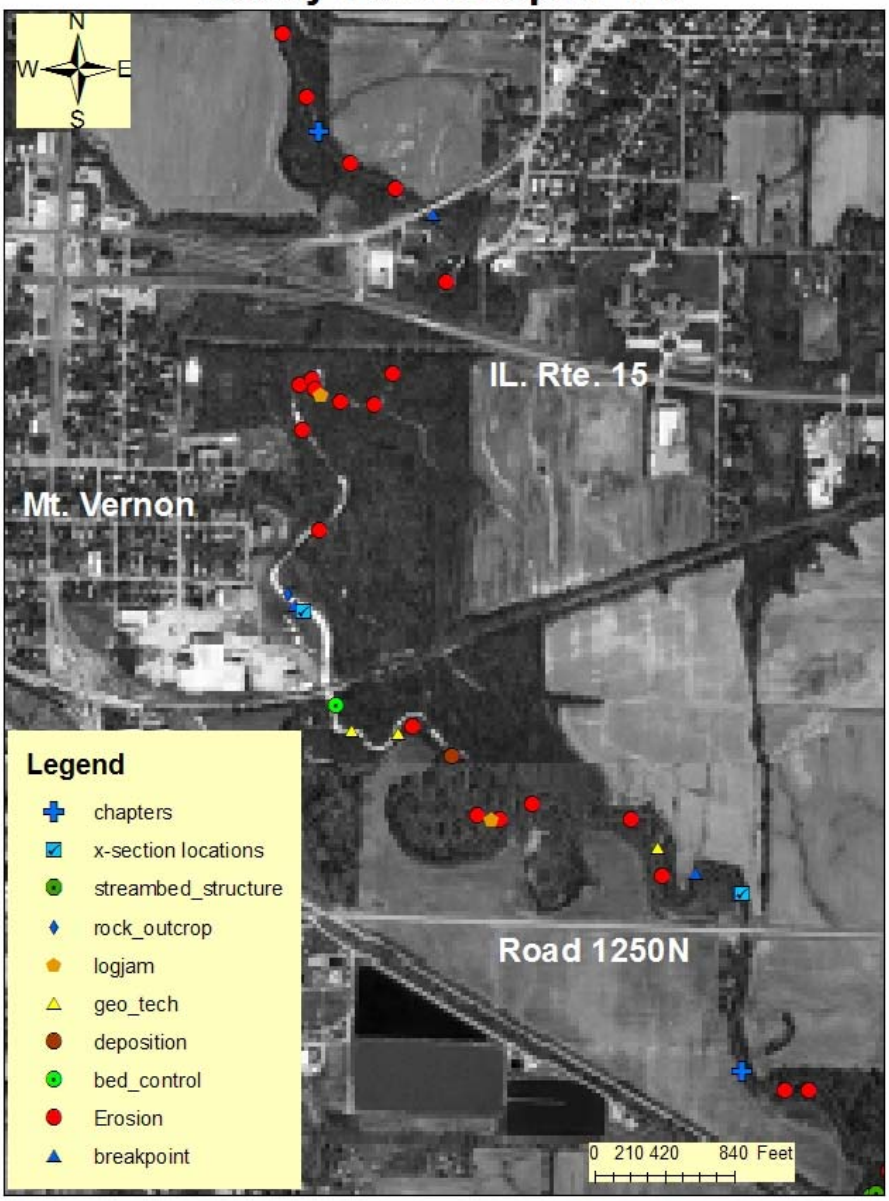


Figure 16 Chapter 1-6

Recommended Treatment: Chapters 1-7 through 2-3

This segment contains the existing concrete dam above Tolle Road which provides a reliable grade control. It also has cross sections 6 and 7 which indicate that there has been little or no incision in this segment and there is evidence at some locations of a firm shale bed that will degrade very slowly. The combination of natural and man-made grade control has kept this segment from degrading.

There are 57 erosion sites in this 5 mile segment and 16 logjams from failing banks allowing trees to enter the channel. Normally these sites would be treated with lateral bank protection, however to increase the re-aeration of Casey Fork and increase the alkalinity to address the manganese impairment this segment can be successfully treated with Rock Riffle Grade Controls. The preliminary calculations indicate that riffle heights of 2.0 ft. can be planned with no adverse effect on flooding or backwater. The increase of pool depths of 2.0 feet should then be monitored for a few years before determining if any additional lateral bank stabilization is needed.

With channel widths of 40 to 50 feet the riffle spacing should be approximately 250 to 300 ft. to insure bedload passage and also to increase the amount of re-aeration. Table 5 below shows the estimated quantities and cost for treating this segment.

TREATMENT --CHAPTERS 1-7 through 2-3 Riffles					
Chapter	Number Riffles	Average Tons Stone	Total Tons Stone	Average Cost/ton	Total Cost
1-7	33	200	6,600	$30.00	$198,000.00
2-2	27	200	5,400	$30.00	$162,000.00
2-3	28	200	5,600	$30.00	$168,000.00
Total	**88**		**17,600**		**$528,000.00**

Table 5 Treatment quantities and cost for chapter 1-7 thru 2-3

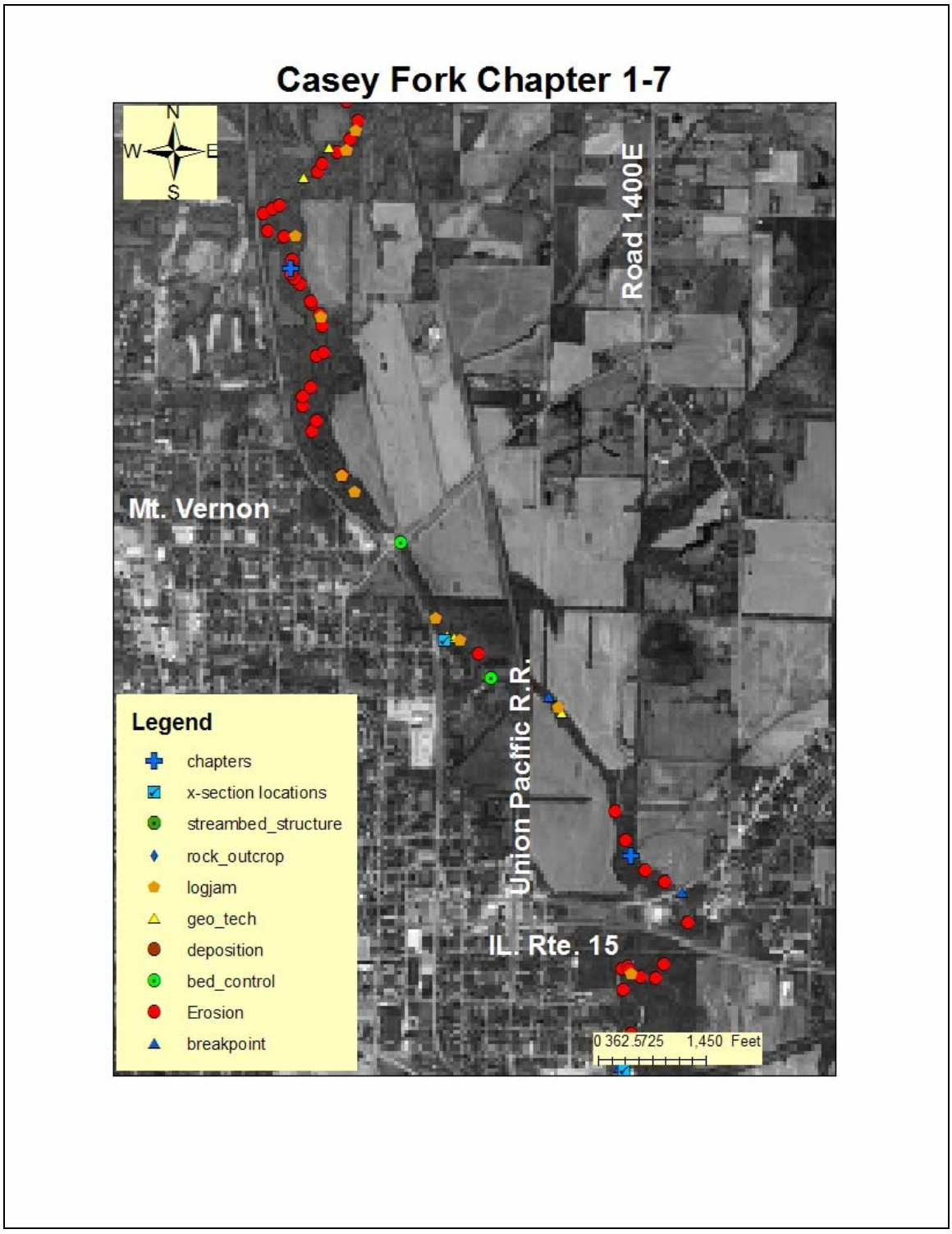


Fig. 17 Chapter 1-7

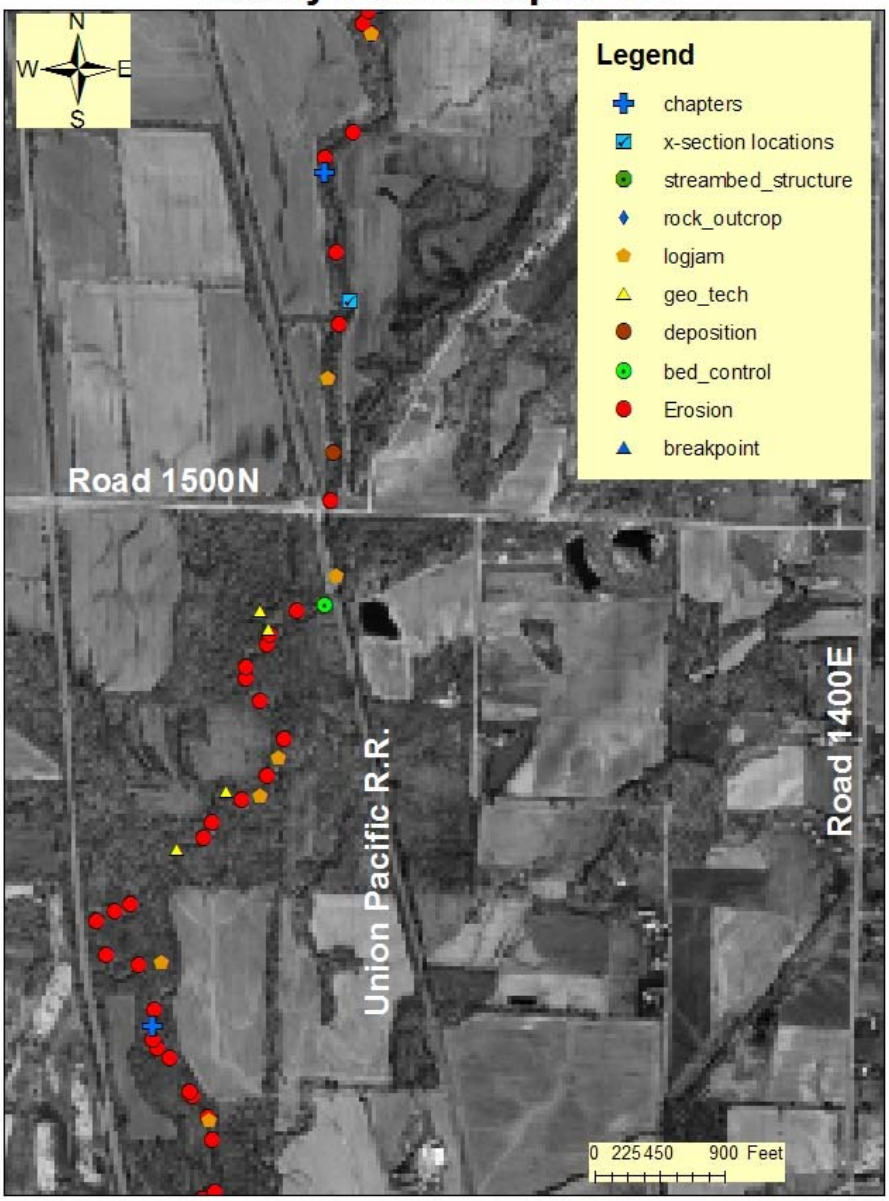


Fig. 18 Chapter 2-2

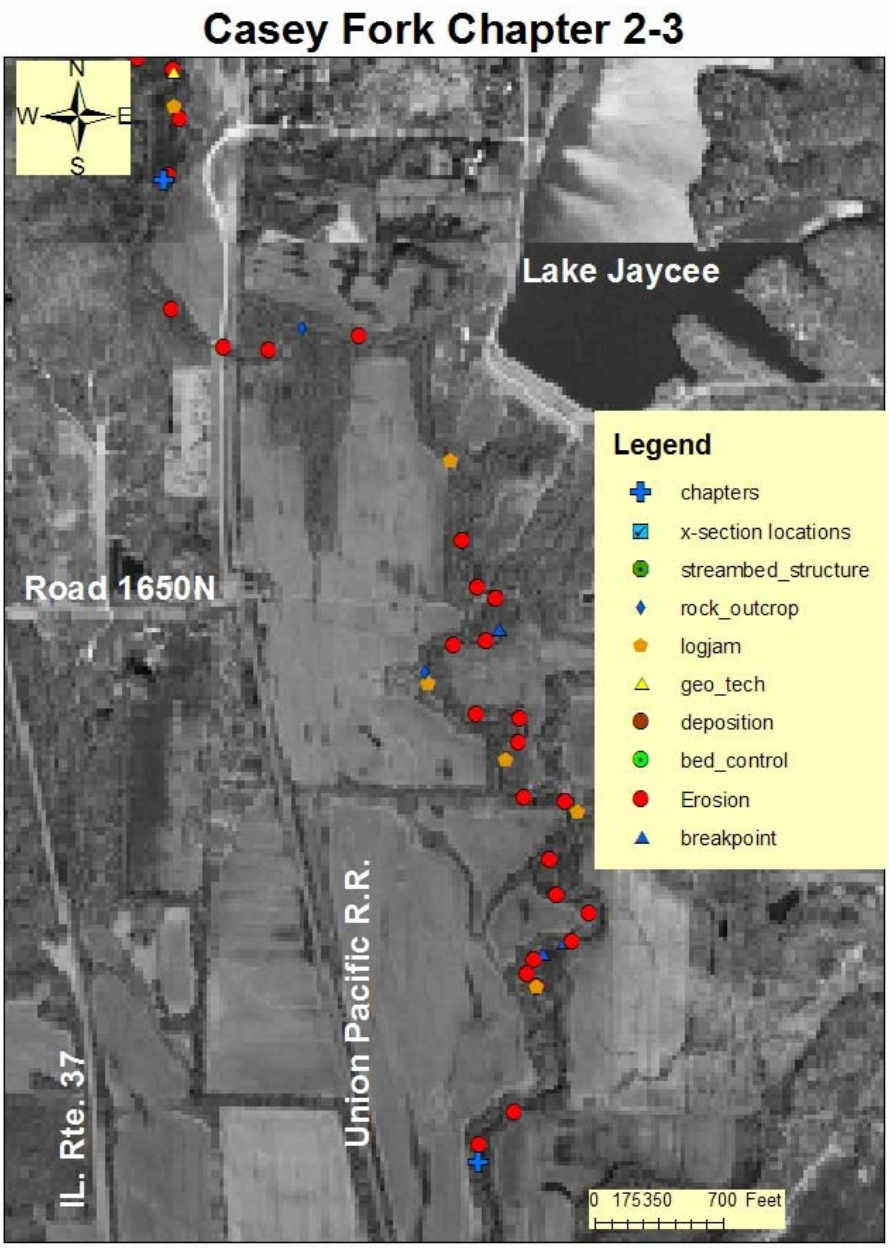


Figure 19 Chapter 2-3

Recommended Treatment: Chapters 2-3 through 2-8

This segment contains cross section 1 and cross sections 3 through 5, all of which are incised by approximately 50% or more in both depth and capacity. (Table 3) There are 117 erosion sites and 19 logjams in this segment. The treatment recommendation for most effective treatment of erosion control, re-aeration and passive manganese treatment with limestone is to install rock riffle grade control structures in this entire 8 mile segment. Rock riffles can be spaced approximately 200 to 240 feet apart and built to a height of 2.0 ft. The lateral bank erosion should then be monitored for a few years to determine the need for lateral treatment.
The estimated quantity and cost for this segment is found in table 6 below.

TREATMENT --CHAPTERS 2-4 through 2-8 Riffles					
Chapter	Number Riffles	Average Tons Stone	Total Tons Stone	Average Cost/ton	Total Cost
2-4	36	180	6,480	$30.00	$194,400.00
2-5	34	180	6,120	$30.00	$183,600.00
2-6	39	180	7,020	$30.00	$210,600.00
2-7	39	180	7,020	$30.00	$210,600.00
2-8	35	180	6,300	$30.00	$189,000.00
Total	**183**		**32,940**		**$988,200.00**

Table 6 Quantity and cost estimate for Chapters 2-3 through 2-8

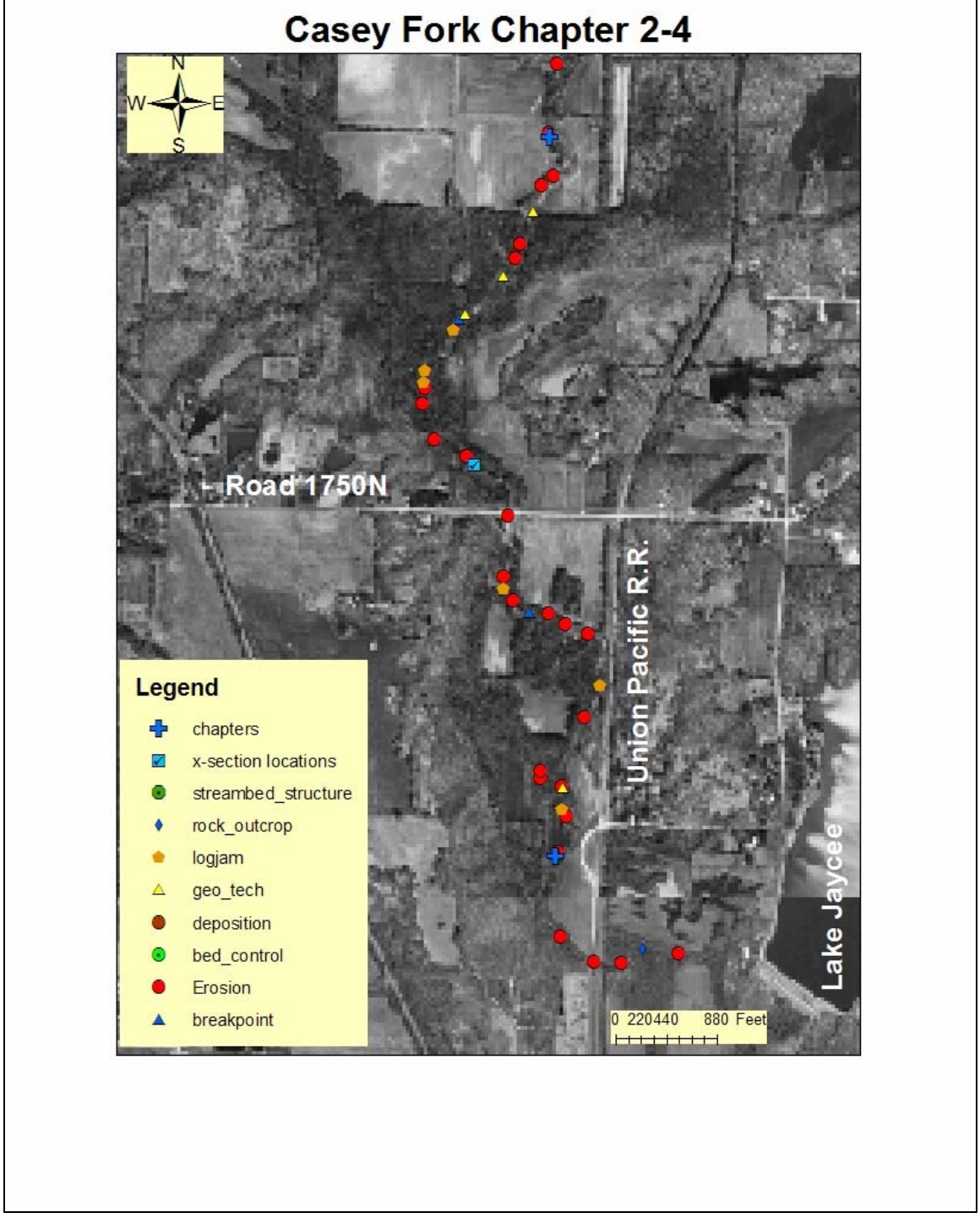


Fig. 20 Chapter 2-4

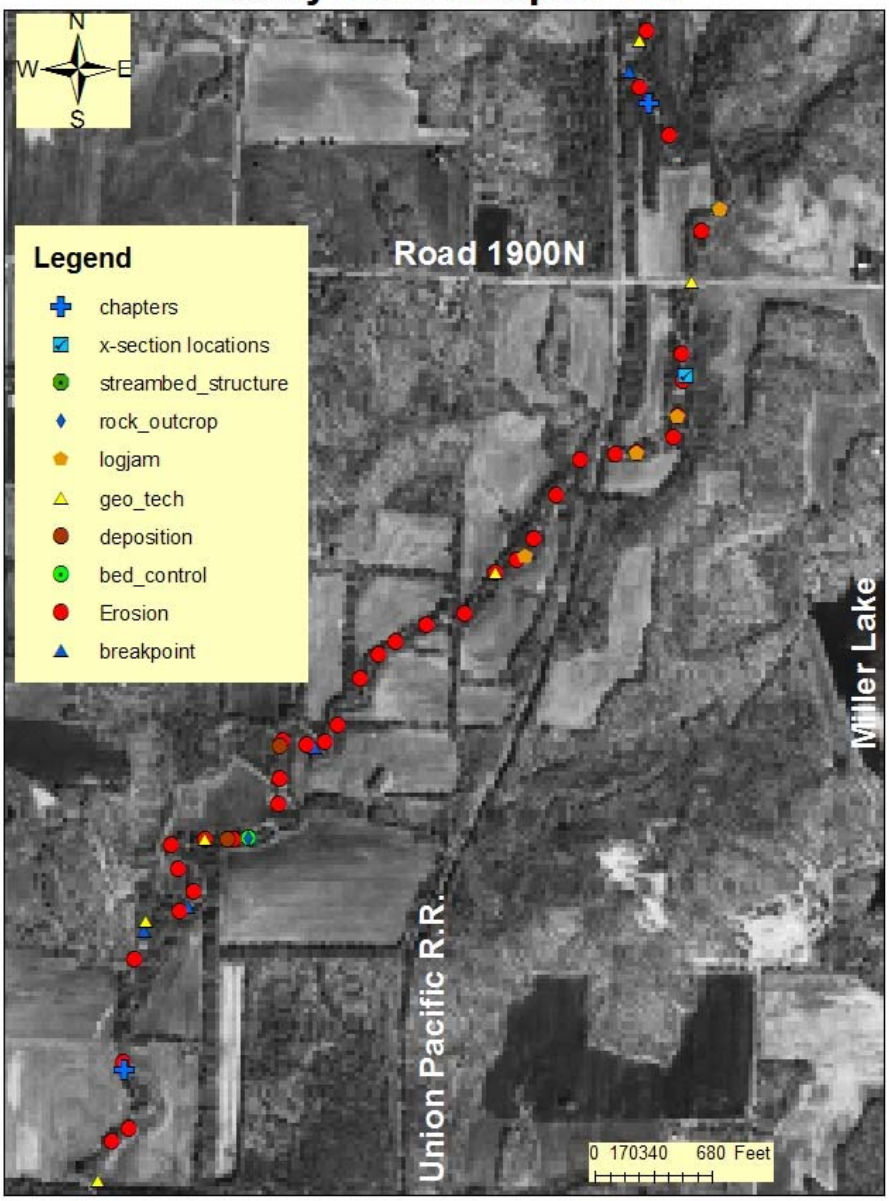
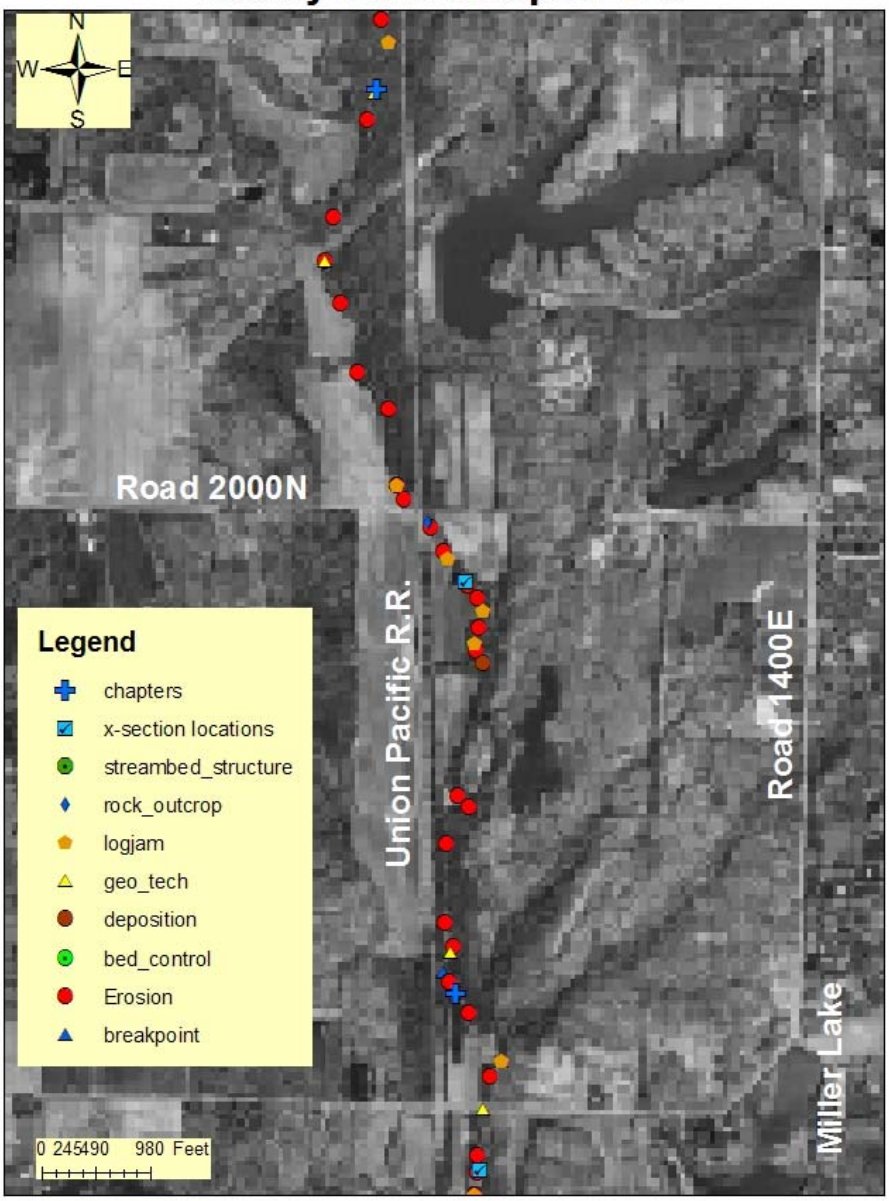


Fig. 21 Chapter 2-5



Chapter 22 Chapter 2-6

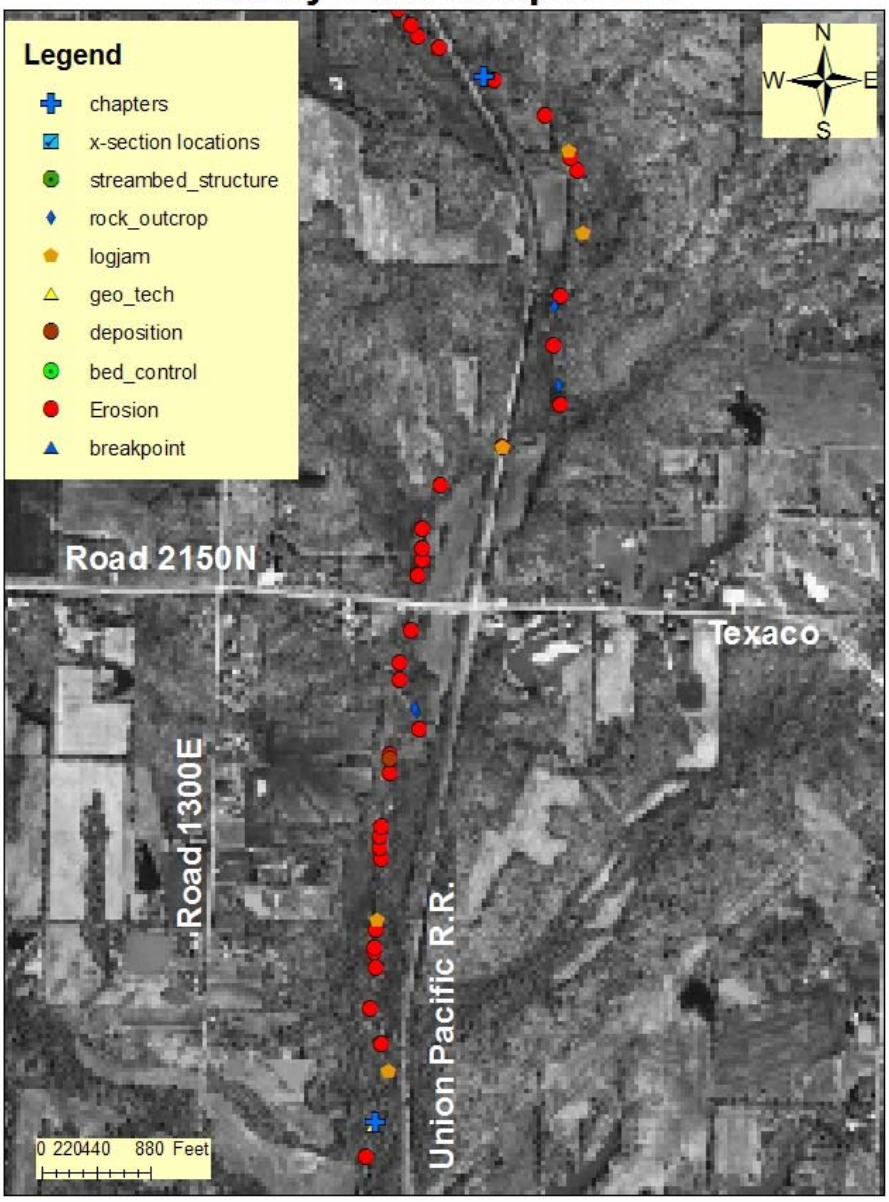


Fig. 23 Chapter 2-7

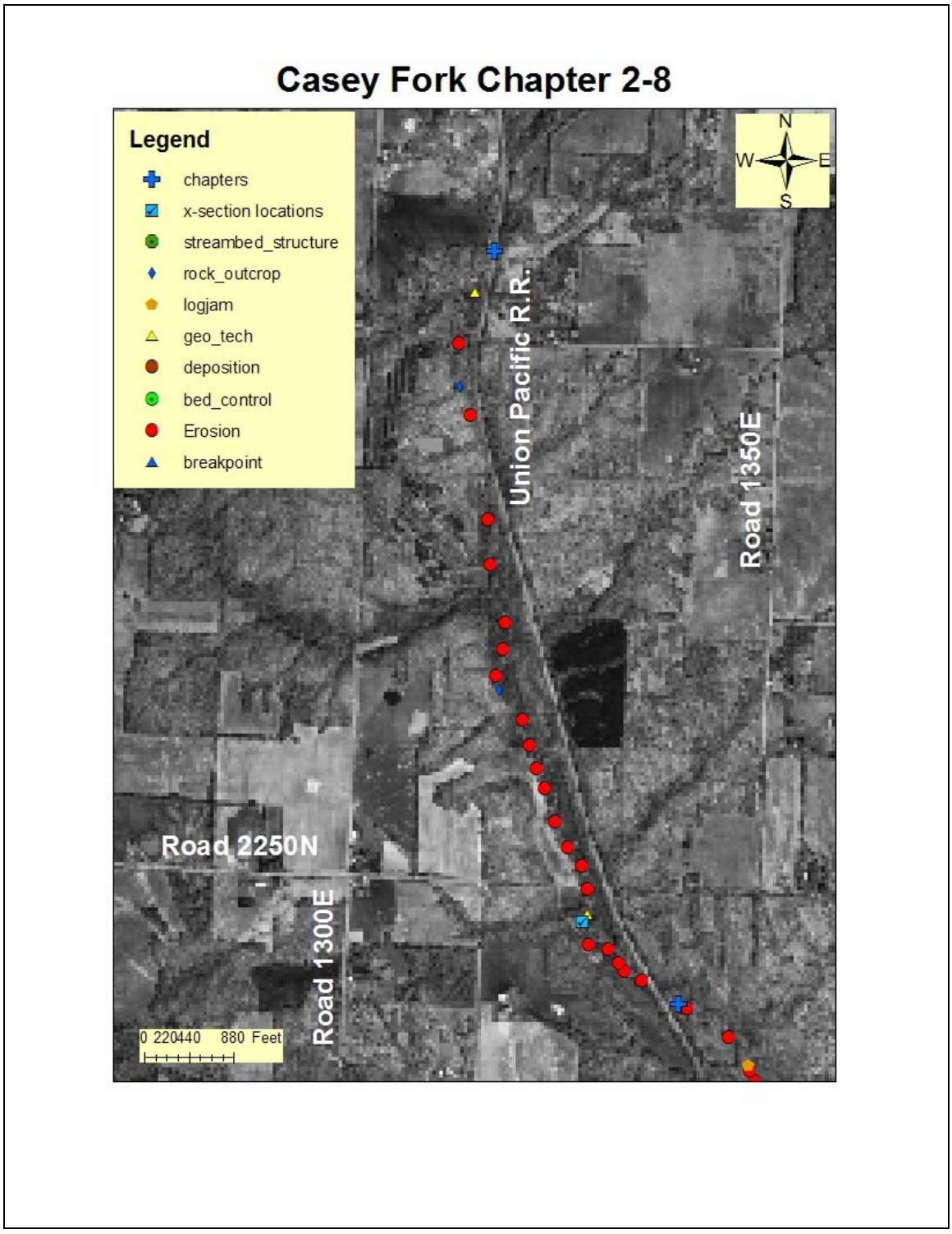


Fig. 24 Chapter 2-8

APPENDIX A

CROSS SECTION DATA

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E334137 N4257826

Landowner Name Xsec 1

Drainage Area 3.99 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 26 ft. Cross Sectional Area 57 sq. ft.

Depth 2.2 ft.

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression -

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 32.8 *ft./mi. (user-entered)* Regression Q_2 558 cfs

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

0.0062 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

220 to 450 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 27 *ft.* Contour Interval feet

Mean Bankfull Depth 2.74 *ft.* Estimated Sinuosity

Width/Depth Ratio 9.85

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 3.4 *ft.* Surveyed: 0.00223 *ft./ft.* Cross-Section 241 *cfs*

Width at twice max. depth 72 *ft.* Estimated: *ft./ft.* Basic field data 255 *cfs*

(6.8 ft.) Selected Q 248 *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: 3.26 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.45 *ft./sec.*

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

Channel Evolution Stage III Stream Type (Rosgen)

Notes

62.2 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 1
Assisted by:	Wayne Kinney
Date:	9/12/2005
Channel Slope (***S***):	0.002230 ft/ft
Manning's ***n***:	0.040
Flow Depth:	3.4 ft

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

assuming uniform, steady flow

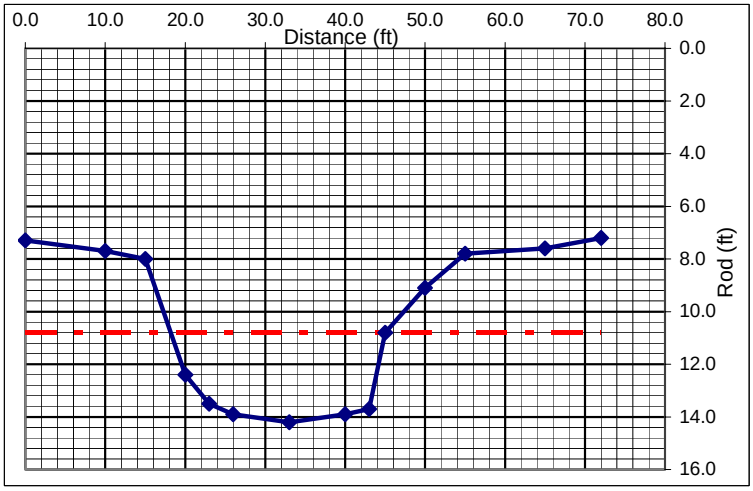
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	3.4 *ft*	6.9	
Channel Flow (***Q***):	241.4 *cfs*	697.4	
Channel Velocity:	3.3 *ft/sec*	3.4	
Cross-Sectional Area (***A***):	74.0 *sq.ft.*	203.1	
Hydraulic Radius (***R***):	2.5 *ft*	2.7	

Survey Data:

Rod *(ft)*	Distance *(ft)*
7.3	0.0
7.7	10.0
8.0	15.0
12.4	20.0
13.5	23.0
13.9	26.0
14.2	33.0
13.9	40.0
13.7	43.0
10.80	45
9.10	50
7.80	55
7.60	65
7.20	72



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E334403 N4253651

Landowner Name Xsec 3

Drainage Area 15.07 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions				
	Width	43 ft.	Cross Sectional Area	142 sq. ft.
	Depth	3.3 ft.		

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression -

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 17.0 *ft./mi. (user-entered)* Regression Q_2 1163 cfs

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

0.0032 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge: 460 to 940 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Basic Field Data:					
Bankfull Width	38	*ft.*	Stream Length		*ft.*
Mean Bankfull Depth	4.13	*ft.*	Valley Length		*ft.*
Width/Depth Ratio	9.20		Contour Interval		feet
			Estimated Sinuosity		
Max. Bankfull Depth	5.6	*ft.*	*Channel Slope:*		
Width at twice max. depth (11.2 ft.)	800	*ft.*	Surveyed:	0.00118	*ft./ft.*
Entrenchment Ratio	21.05		Estimated:		*ft./ft.*
			Radius of Curvature (Rc)		ft.
			Rc/Bankfull width:	0.00	

Bankfull Q from:

Cross-Section	487	*cfs*
Basic field data	517	*cfs*
Selected Q	502	*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: 3.10 *ft./sec.*

GOAL: Develop confidence by matching velocities from different sources.

Velocity from basic field data: 3.30 *ft./sec.*

Velocity from selected Q: 3.2 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

33.3 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 3	
Assisted by:	Wayne Kinney	
Date:	9/12/2005	
Channel Slope (***S***):	0.001180	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	5.6	*ft*

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

assuming uniform, steady flow

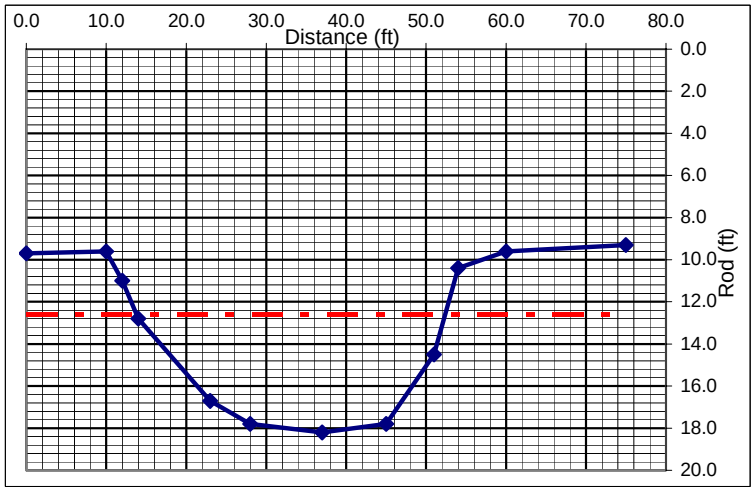
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	5.6 *ft*	8.6	
Channel Flow (***Q***):	487.1 *cfs*	968.9	
Channel Velocity:	3.1 *ft/sec*	3.4	
Cross-Sectional Area (***A***):	157.0 *sq.ft.*	284.2	
Hydraulic Radius (***R***):	3.8 *ft*	4.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
9.7	0.0
9.6	10.0
11.0	12.0
12.8	14.0
16.7	23.0
17.8	28.0
18.2	37.0
17.8	45.0
14.5	51.0
10.40	54
9.60	60
9.30	75



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. _____ R. _____ Sec. _____

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E334441 N4252038

Landowner Name Xsec 4

Drainage Area 17.29 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions				
	Width	45 ft.	Cross Sectional Area	155 sq. ft.
	Depth	3.4 ft.		

Reference Stream Gage:

none Station No. - Gage Q_2 -

0 - Drainage Area - Regression (-

REFERENCE STREAM DATA ONLY

USGS Flood-Peak Discharge Predictions:

Valley Slope: 15.4 *ft./mi. (user-entered)* Regression Q_2 1236 cfs

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

0.0029 *ft./ft.* Regional Factor 0.983 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

Basic Field Data:			Stream Length		*ft.*
			Valley Length		*ft.*
Bankfull Width	39	*ft.*	Contour Interval		feet
Mean Bankfull Depth	4.32	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	9.03				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	6	*ft.*	Surveyed:	0.00118 *ft./ft.*	Cross-Section 540 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:	*ft./ft.*	Basic field data 572 *cfs*
(12.0 ft.)					Selected Q 556 *cfs*
Entrenchment Ratio	25.64		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:	3.20 *ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.40 *ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.3 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen) _____

Notes

Natural Open Channel Flow

back to I&E form

Clear Cells

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

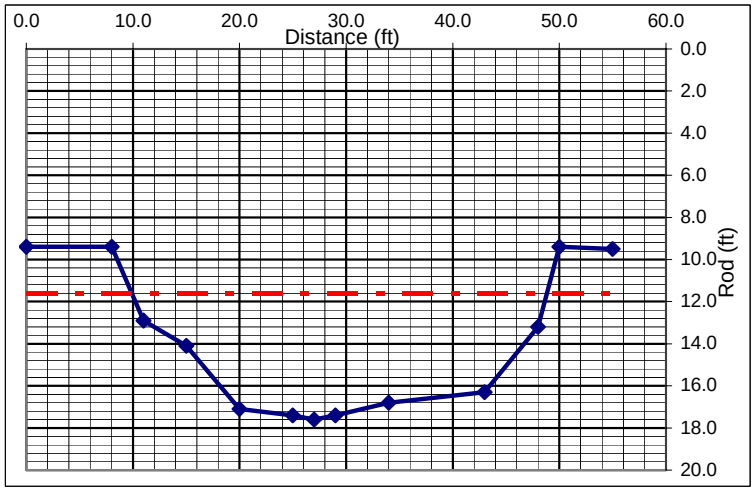
assuming uniform, steady flow

Project:	Xsec 4	
Assisted by:	Wayne Kinney	
Date:	9/12/2005	
Channel Slope (***S***):	0.001180	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	6.0	*ft*

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.0 *ft*	8.2	
Channel Flow (***Q***):	539.5 *cfs*	856.7	
Channel Velocity:	3.2 *ft/sec*	3.3	
Cross-Sectional Area (***A***):	168.6 *sq.ft.*	258.0	
Hydraulic Radius (***R***):	4.0 *ft*	4.2	

Survey Data:

Rod *(ft)*	Distance *(ft)*
9.4	0.0
9.4	8.0
12.9	11.0
14.1	15.0
17.1	20.0
17.4	25.0
17.6	27.0
17.4	29.0
16.8	34.0
16.30	43
13.20	48
9.40	50
9.50	55



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E333243 N4249935

Landowner Name Xsec 5

Drainage Area 28.27 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions				
	Width	55 ft.	Cross Sectional Area	217 sq. ft.
	Depth	3.9 ft.		

Reference Stream Gage:

none Station No. - Gage Q_2 -

0 - Drainage Area - Regression -

REFERENCE STREAM DATA ONLY

USGS Flood-Peak Discharge Predictions:

Valley Slope: 10.8 *ft./mi. (user-entered)* Regression Q_2 1537 cfs

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

0.0020 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

610 to 1230 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Basic Field Data:					
Bankfull Width	44	*ft.*	Stream Length		*ft.*
Mean Bankfull Depth	4.67	*ft.*	Valley Length		*ft.*
Width/Depth Ratio	9.42		Contour Interval		feet
			Estimated Sinuosity		
Max. Bankfull Depth	6.3	*ft.*	*Channel Slope:*		
Width at twice max. depth	1000	*ft.*	Surveyed:	0.00097 *ft./ft.*	
(12.6 ft.)			Estimated:	*ft./ft.*	
Entrenchment Ratio	22.73		Radius of Curvature (Rc)		ft.
			Rc/Bankfull width:	0.00	

Bankfull Q from:

Cross-Section	642	*cfs*
Basic field data	666	*cfs*
Selected Q	654	*cfs*

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: 3.13 *ft./sec.*

GOAL: Develop confidence by matching velocities from different sources.

Velocity from basic field data: 3.24 *ft./sec.*

Velocity from selected Q: 3.2 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

23.1 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 5
Assisted by:	Wayne Kinney
Date:	9/12/2005
Channel Slope (***S***):	0.000970 *ft/ft*
Manning's ***n***:	0.040
Flow Depth:	6.3 *ft*

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

assuming uniform, steady flow

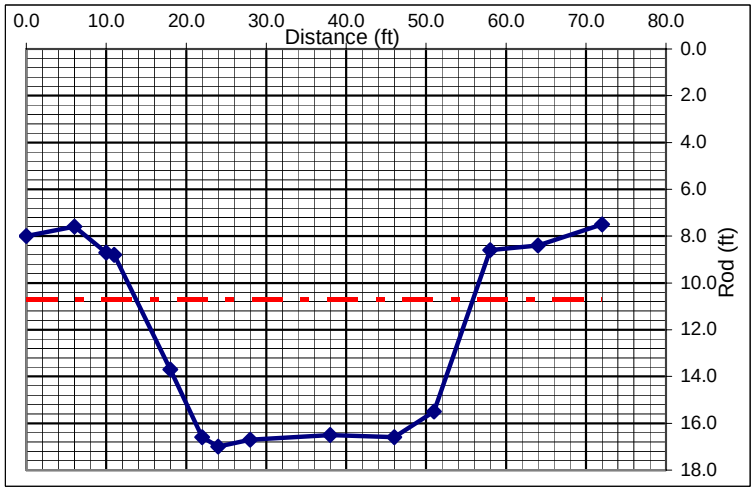
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.3 *ft*	9.4	
Channel Flow (***Q***):	642.0 *cfs*	1,160.8	
Channel Velocity:	3.1 *ft/sec*	3.2	
Cross-Sectional Area (***A***):	205.3 *sq.ft.*	358.9	
Hydraulic Radius (***R***):	4.4 *ft*	4.7	

Survey Data:

Rod *(ft)*	Distance *(ft)*
8.0	0.0
7.6	6.0
8.7	10.0
8.8	11.0
13.7	18.0
16.6	22.0
17.0	24.0
16.7	28.0
16.5	38.0
16.60	46
15.50	51
8.60	58
8.40	64
7.50	72



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E334040 N4246979

Landowner Name Xsec 6

Drainage Area 32.09 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions				
	Width	58 ft.	Cross Sectional Area	236 sq. ft.
	Depth	4.1 ft.		

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression (-

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 10.8 *ft./mi. (user-entered)* Regression Q_2 1699 cfs

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

0.0020 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge: 670 to 1360 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Basic Field Data:					
Bankfull Width	37	*ft.*	Stream Length		*ft.*
Mean Bankfull Depth	6.74	*ft.*	Valley Length		*ft.*
Width/Depth Ratio	5.49		Contour Interval		feet
			Estimated Sinuosity		
Max. Bankfull Depth	8.7	*ft.*	*Channel Slope:*		
Width at twice max. depth	1000	*ft.*	Surveyed:	0.00076 *ft./ft.*	
(17.4 ft.)			Estimated:	*ft./ft.*	
Entrenchment Ratio	27.03		Radius of Curvature (Rc)		ft.
			Rc/Bankfull width:	0.00	

Bankfull Q from:

Cross-Section	808	*cfs*
Basic field data	914	*cfs*
Selected Q	861	*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: 3.24 *ft./sec.*

GOAL: Develop confidence by matching velocities from different sources.

Velocity from basic field data: 3.67 *ft./sec.*

Velocity from selected Q: 3.5 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

22.8 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 6	
Assisted by:	Wayne Kinney	
Date:	9/12/2005	
Channel Slope (***S***):	0.000760	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	8.7	*ft*

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

assuming uniform, steady flow

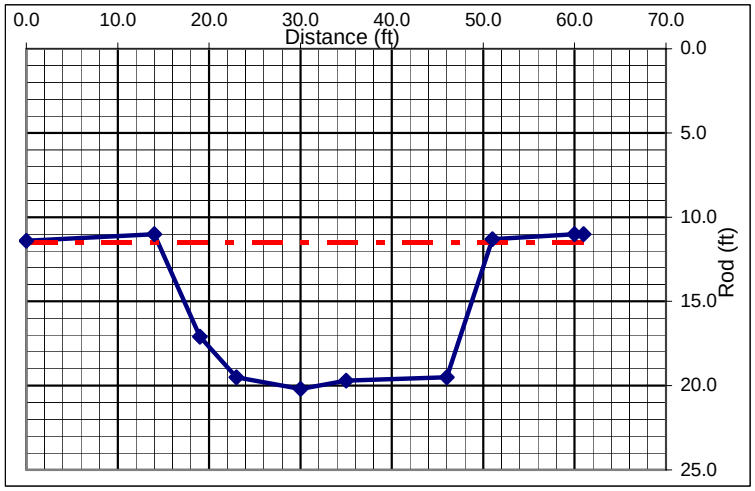
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.7 *ft*	9.2	
Channel Flow (***Q***):	807.7 *cfs*	693.2	
Channel Velocity:	3.2 *ft/sec*	2.5	
Cross-Sectional Area (***A***):	249.4 *sq.ft.*	271.9	
Hydraulic Radius (***R***):	5.6 *ft*	3.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
11.4	0.0
11.0	14.0
17.1	19.0
19.5	23.0
20.2	30.0
19.7	35.0
19.5	46.0
11.3	51.0
11.0	60.0
11.00	61



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E334257 N4243909

Landowner Name Xsec 7

Drainage Area 39.88 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions			Cross Sectional Area	
	Width	63 ft.	274	sq. ft.
	Depth	4.4 ft.		

Reference Stream Gage:

none — Station No. - Gage Q_2 -

Drainage Area - Regression -

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 6.9 *ft./mi. (user-entered)* Regression Q_2 1626 cfs

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

0.0013 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

650 to 1310 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Basic Field Data:						
Bankfull Width	63	*ft.*	Stream Length		*ft.*	
Mean Bankfull Depth	4.47	*ft.*	Valley Length		*ft.*	
Width/Depth Ratio	14.09		Contour Interval		feet	
			Estimated Sinuosity			
			Channel Slope:			Bankfull Q from:
Max. Bankfull Depth	7.2	*ft.*	Surveyed:	0.00078	*ft./ft.*	Cross-Section 768 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:		*ft./ft.*	Basic field data 795 *cfs*
(14.4 ft.)						Selected Q 782 *cfs*
Entrenchment Ratio	15.87		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:	2.82	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.8	*ft./sec.*

Channel Evolution Stage II Stream Type (Rosgen)

Notes

Natural Open Channel Flow

Project:	Xsec 7
Assisted by:	Wayne Kinney
Date:	9/12/2005
Channel Slope (***S***):	0.000780 *ft/ft*
Manning's ***n***:	0.040
Flow Depth:	7.2 *ft*

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

assuming uniform, steady flow

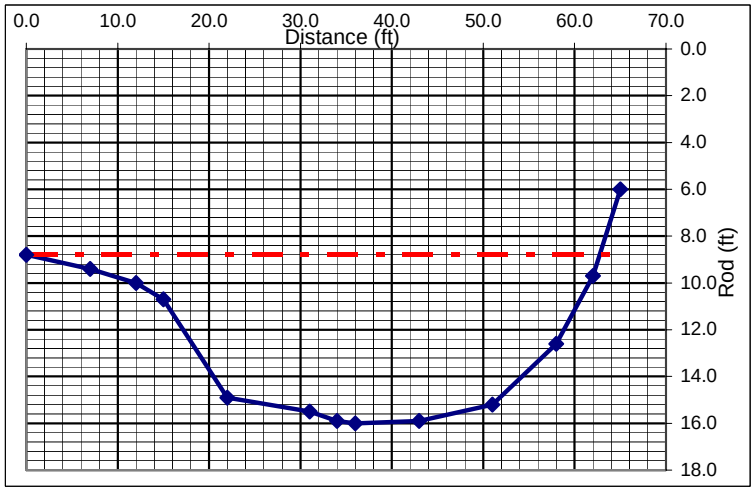
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	7.2 *ft*	7.2	
Channel Flow (***Q***):	767.7 *cfs*	767.7	
Channel Velocity:	2.7 *ft/sec*	2.7	
Cross-Sectional Area (***A***):	281.3 *sq.ft.*	281.3	
Hydraulic Radius (***R***):	4.3 *ft*	4.3	

Survey Data:

Rod *(ft)*	Distance *(ft)*
8.8	0.0
9.4	7.0
10.0	12.0
10.7	15.0
14.9	22.0
15.5	31.0
15.9	34.0
16.0	36.0
15.9	43.0
15.20	51
12.60	58
9.70	62
6.00	65



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E334996 N4242132

Landowner Name Xsec 8

Drainage Area 45.03 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 66 ft. Cross Sectional Area 297 sq. ft.

Depth 4.5 ft.

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression -

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 6.3 *ft./mi. (user-entered)* Regression Q_2 1713 cfs

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

0.0012 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

680 to 1380 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Basic Field Data:

Bankfull Width 40 *ft.* Stream Length *ft.*

Valley Length *ft.*

Mean Bankfull Depth 4.95 *ft.* Contour Interval feet

Estimated Sinuosity

Width/Depth Ratio 8.08

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 6 *ft.* Surveyed: 0.00076 *ft./ft.* Cross-Section 552 *cfs*

Width at twice max. depth 1000 *ft.* Estimated: *ft./ft.* Basic field data 591 *cfs*

(12.0 ft.) Selected Q 571 *cfs*

Entrenchment Ratio 25.00 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: 2.79 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.98 *ft./sec.*

velocities from different sources. Velocity from selected Q: 2.9 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

11.8 cfs/sq. mi. (xsec on clay headcut in channelized reach)

Natural Open Channel Flow

Project:	Xsec 8
Assisted by:	Wayne Kinney
Date:	9/12/2005
Channel Slope (***S***):	0.000760 *ft/ft*
Manning's ***n***:	0.040
Flow Depth:	6.0 *ft*

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

assuming uniform, steady flow

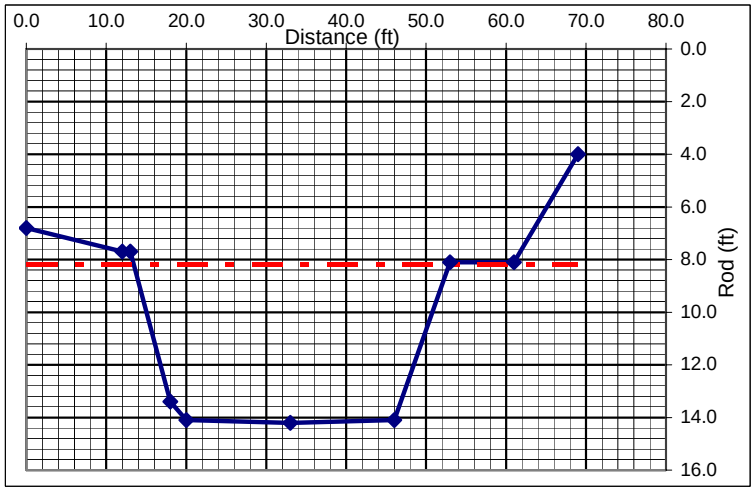
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.0 *ft*	6.1	
Channel Flow (***Q***):	551.7 *cfs*	508.4	
Channel Velocity:	2.8 *ft/sec*	2.5	
Cross-Sectional Area (***A***):	198.0 *sq.ft.*	201.9	
Hydraulic Radius (***R***):	4.5 *ft*	3.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
6.8	0.0
7.7	12.0
7.7	13.0
13.4	18.0
14.1	20.0
14.2	33.0
14.1	46.0
8.1	53.0
8.1	61.0
4.00	69



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E335806 N4241612

Landowner Name Xsec 9

Drainage Area 45.3 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	66 ft.	Cross Sectional Area	299	sq. ft.
	Depth	4.5 ft.			

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression -

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 6.3 *ft./mi. (user-entered)* Regression Q_2 1721 cfs

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

0.0012 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

680 to 1380 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	48	*ft.*	Contour Interval		feet
Mean Bankfull Depth	6	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	8.00				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	8.1	*ft.*	Surveyed: 0.00076	*ft./ft.*	Cross-Section 912 *cfs*
Width at twice max. depth	800	*ft.*	Estimated:	*ft./ft.*	Basic field data 977 *cfs*
(16.2 ft.)					Selected Q 945 *cfs*
Entrenchment Ratio	16.67		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}	1 *in.*	Velocity required to move D_{90}:	2.1	*ft./sec.*
	D_{50}	*in.*	Velocity from Cross-Section data:	3.17	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.39	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.3	*ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

19.4 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 9
Assisted by:	Wayne Kinney
Date:	9/12/2005
Channel Slope (***S***):	0.000760 *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

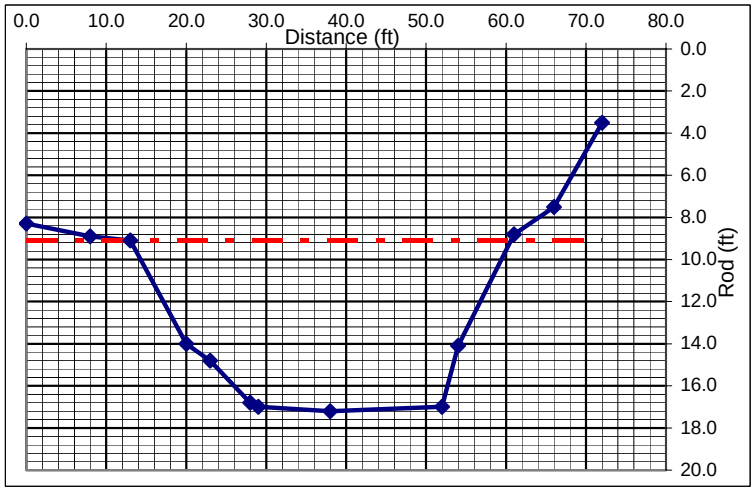
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.1 *ft*	8.9	
Channel Flow (***Q***):	912.0 *cfs*	977.3	
Channel Velocity:	3.2 *ft/sec*	2.9	
Cross-Sectional Area (***A***):	287.8 *sq.ft.*	332.5	
Hydraulic Radius (***R***):	5.4 *ft*	4.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
8.3	0.0
8.9	8.0
9.1	13.0
14.0	20.0
14.8	23.0
16.8	28.0
17.0	29.0
17.2	38.0
17.0	52.0
14.10	54
8.80	61
7.50	66
3.50	72



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E336175 N4239153

Landowner Name Xsec 10

Drainage Area 77.47 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 81 ft. Cross Sectional Area 430 sq. ft.

Depth 5.3 ft.

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression -

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 5.1 *ft./mi. (user-entered)* Regression Q_2 2375 cfs

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

0.0010 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

950 to 1910 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	48	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	6.7	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	7.16						
			Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth	9.7	*ft.*	Surveyed:	0.00076	*ft./ft.*	Cross-Section	1011 *cfs*
Width at twice max. depth	1000	*ft.*	Estimated:		*ft./ft.*	Basic field data	1174 *cfs*
(19.4 ft.)						Selected Q	1093 *cfs*
Entrenchment Ratio	20.83		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:	3.14	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.65	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.4	*ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

16.3 cfs/sq. mi.

Natural Open Channel Flow

Project:	Xsec 10	
Assisted by:	Wayne Kinney	
Date:	9/12/2005	
Channel Slope (***S***):	0.000760	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	9.7	*ft*

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

assuming uniform, steady flow

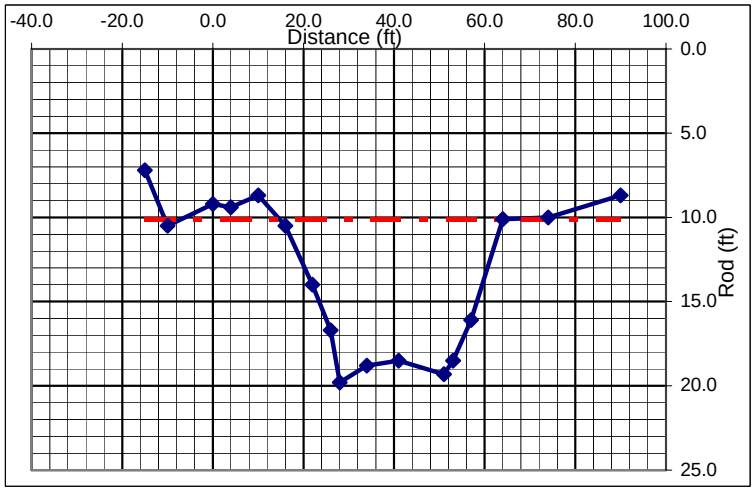
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	9.7 *ft*	11.1	
Channel Flow (***Q***):	1,010.8 *cfs*	1,114.4	
Channel Velocity:	3.1 *ft/sec*	2.6	
Cross-Sectional Area (***A***):	321.7 *sq.ft.*	435.6	
Hydraulic Radius (***R***):	5.4 *ft*	3.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
7.2	-15.0
10.5	-10.0
9.2	0.0
9.4	4.0
8.7	10.0
10.5	16.0
14.0	22.0
16.7	26.0
19.8	28.0
18.80	34
18.50	41
19.30	51
18.50	53
16.10	57
10.10	64
10.0	74
8.7	90



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 9/12/2005 By Wayne Kinney

Stream Name Casey Fork UTM Coord. E335209 N4238632

Landowner Name X sec11

Drainage Area 80.5 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 83 ft. Cross Sectional Area 441 sq. ft.

Depth 5.3 ft.

Reference Stream Gage:

none Station No. - Gage Q_2 -

Drainage Area - Regression (-

0 - **REFERENCE STREAM DATA ONLY**

USGS Flood-Peak Discharge Predictions:

Valley Slope: 5.1 *ft./mi. (user-entered)* Regression Q_2 2448 cfs

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

0.0010 *ft./ft.* Regional Factor 0.983 Typical Range for Bankfull Discharge:

970 to 1960 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 57 *ft.* Contour Interval feet

Mean Bankfull Depth 7.19 *ft.* Estimated Sinuosity

Width/Depth Ratio 7.93

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 10.4 *ft.* Surveyed: 0.00045 *ft./ft.* Cross-Section 1073 *cfs*

Width at twice max. depth 1000 *ft.* Estimated: *ft./ft.* Basic field data 1207 *cfs*

(20.8 ft.) Selected Q 1140 *cfs*

Entrenchment Ratio 17.54 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: 2.62 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.95 *ft./sec.*

velocities from different sources. Velocity from selected Q: 2.8 *ft./sec.*

Channel Evolution Stage III Stream Type (Rosgen)

Notes

Natural Open Channel Flow

Project:	X sec11
Assisted by:	Wayne Kinney
Date:	9/12/2005
Channel Slope (***S***):	0.000450 *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

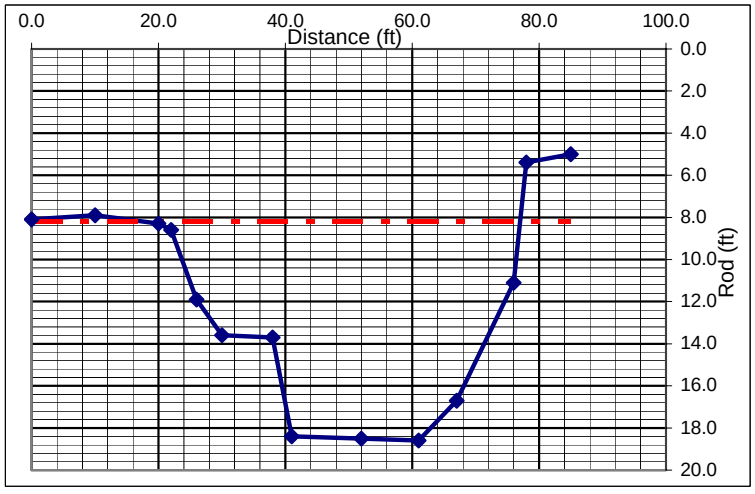
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	10.4 *ft*	10.7	
Channel Flow (***Q***):	1,072.6 *cfs*	993.5	
Channel Velocity:	2.6 *ft/sec*	2.3	
Cross-Sectional Area (***A***):	409.6 *sq.ft.*	429.5	
Hydraulic Radius (***R***):	6.1 *ft*	5.0	

Survey Data:

Rod *(ft)*	Distance *(ft)*
8.1	0.0
7.9	10.0
8.3	20.0
8.6	22.0
11.9	26.0
13.6	30.0
13.7	38.0
18.4	41.0
18.5	52.0
18.60	61
16.70	67
11.10	76
5.40	78
5.00	85



COMMENTS: