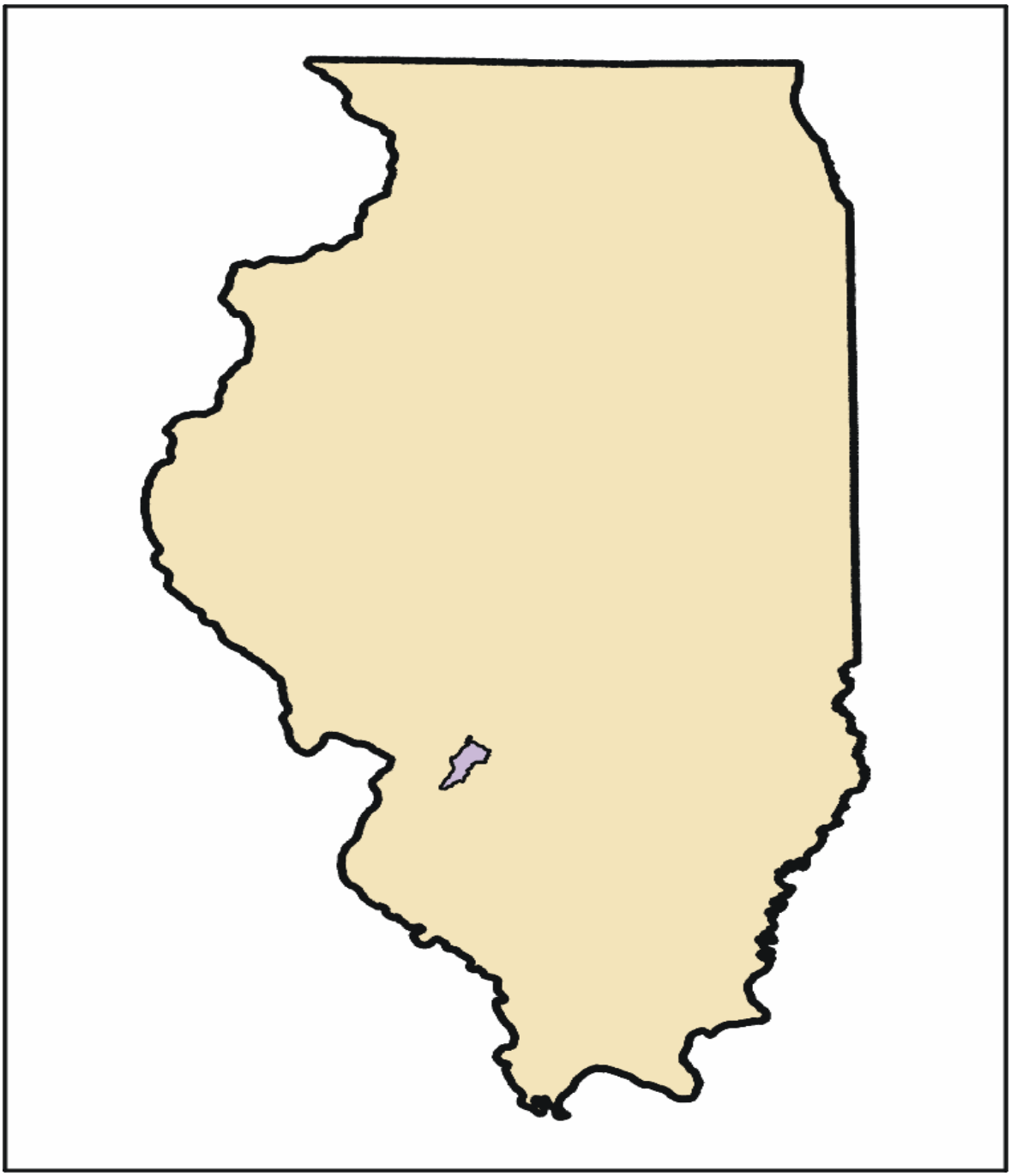


Aerial Assessment Report on Highland Silver Lake and East Fork of Silver Creek, Feb. 2005

Prepared for IL. Dept. of Agric. by Wayne Kinney

The impaired water in this project area is Highland Silver Lake, a 550 acres impoundment constructed in 1962 as a water supply for the City of Highland, IL. The lake is also used for recreation. The watershed draining to Highland Silver Lake is approximately 48 sq. miles.

In July 2004 Limno-Tech, Inc. prepared the initial "Quarterly Report" for Highland Silver Lake Watershed for the Illinois Environmental Protection Agency. The report concludes that:
"The listing of Highland Silver Lake on the Illinois 303(d) list for impairment due to dissolved oxygen, total phosphorus, manganese, aldrin and chlordane has been confirmed based on a review of the data."
" Potential sources contributing to the listing of Highland Silver Lake include: runoff from cropland, pastureland, animal feeding operations and lawns; lakeshore and streambank erosion; lake bottom sediments; failing septic systems; brine pumped from oil wells; and natural background sources." (Limno-Tech, Inc., Quarterly Progress Report, Highland Silver Lake Watershed, July 2004, Page 2)

Additional reports have been produced in September 2004 and October 2004 with the following conclusions drawn.

"Assumptions Underlying the Recommended Methodologies"

--Nutrient enrichment is the primary cause of dissolved oxygen, such that dissolved oxygen problems can be addressed via attainment of the total phosphorus standard.
--The only controllable source of manganese to the lake is that which enters from lake sediments during periods of low dissolved oxygen; this source can be (partially) controlled by reducing phosphorus loads and increasing hypolimnetic dissolved oxygen concentrations.
--No active remediation strategies are planned to address chlordane and aldrin.
--A credible TMDL implementation plan can be developed based upon relatively simple models.

"LTI believes that these assumptions are appropriate. Phosphorus concentrations, which contribute to dissolved oxygen and manganese problems, currently exceed the water quality standard by a factor of six. This indicates that phosphorus loads will need to be reduced by more than 80% to attain water quality standards. The dominant land use in the watershed is agriculture. This level of load reduction is likely not attainable in the near future, if at all. Implementation plans for agricultural sources will require voluntary controls, applied on an incremental basis. The recommended approach, which requires no additional data collection, will expedite these implementation efforts." (Limno-Tech, Inc., Second Quarterly Progress Report, Highland Silver Lake Watershed, September 2004, Page 20)

"Potential sources contributing to the listing of Highland Silver Lake include: runoff from cropland, pastureland, animal feeding operations and lawns; lakeshore and streambank erosion; lake bottom sediments; failing septic systems; brine pumped from oils wells; and

natural background sources." Page 2, Limno-Tech, Quarterly Progress Report July 2004, Highland Silver Lake Watershed (ROZA)

Sources of impairment determined through this study:
Cause of impairment Potential Source(s)
Manganese ---Naturally elevated concentrations in groundwater; streambank and lakeshore erosion of soils naturally enriched with manganese;
release from lake bottom sediments during anoxic conditions;
brine from oil wells
Total phosphorus--- Crop fertilization with commercial fertilizers or manure; animal feeding operations and pastureland runoff; lake bottom sediments
during anoxic conditions; failing septic systems; lakeshore and
streambank erosion; runoff from fertilized lawns
Dissolved oxygen--- Lake bottom sediment oxygen demand; algal respiration; crop fertilization with commercial fertilizers or manure; animal feeding
operations and pastureland runoff; runoff from fertilized lawns;
lakeshore and streambank erosion
Aldrin--- Cropland runoff; lake bottom sediments
Chlordane--- Cropland runoff; runoff from lawns; lake bottom sediments
(Limno-Tech, Inc. Quarterly Progress Report, July 2004, Page 30)

One of the potential sources of the impairments for manganese, total phosphorus and dissolved oxygen all have been identified as lakeshore and streambank erosion. This report will examine the potential contributions from streambank erosion contributing to water quality impairment in Highland Silver Lake. (Figure 1) The report will also examine the streambank conditions below Highland Silver Lake to the confluence of the East Fork of Silver Creek with Silver Creek near Troy, IL. (Figure 2)

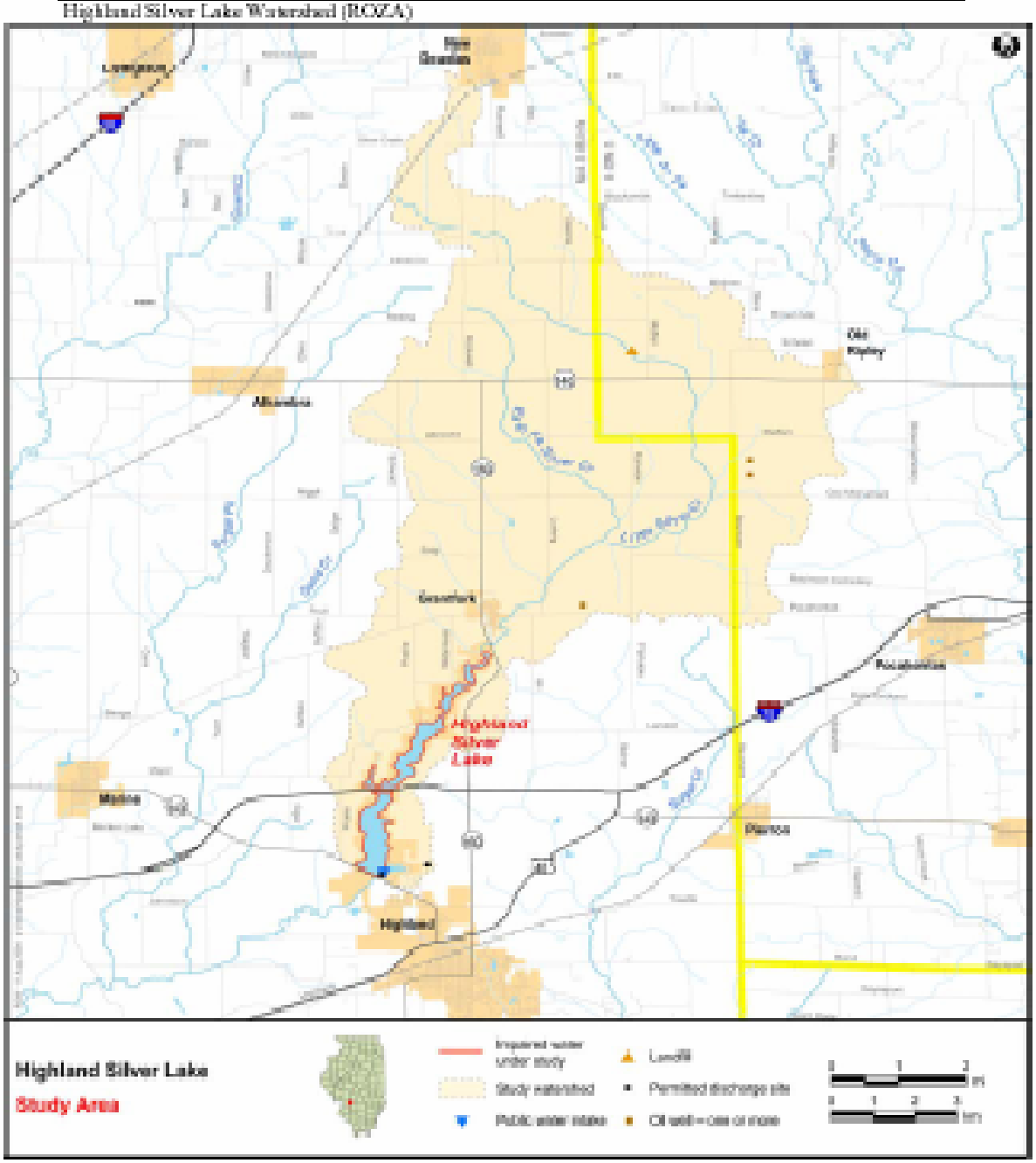


Figure 1. Study area map

Figure 1. TMDL Study Area

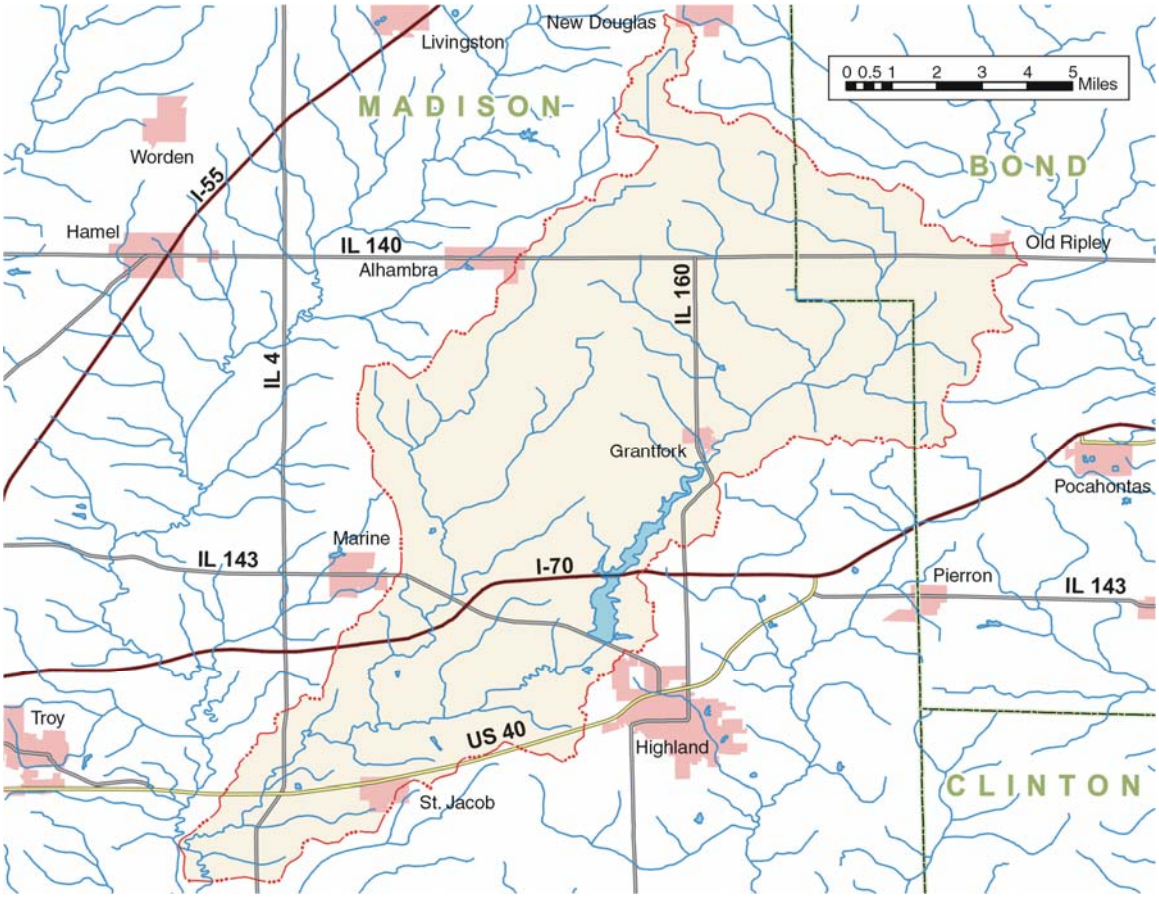


Figure 2. Project Area Map, Aerial DVD Assessment

Assessment Procedure

Low level geo-referenced video was taken of East Fork of Silver Creek in April, 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 confluence of East Fork Silver Creek and Silver Creek near Troy, IL. Video mapping progressed upstream until the stream size and vegetative cover would not allow the capture of useful video images near IL. Rte. 140, 6 miles east of Alhambra, IL. 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.

Detailed elevation data is not available; therefore the channel slope is calculated from USGS topo maps by measuring the channel length between contour lines (Fig. 3). 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.

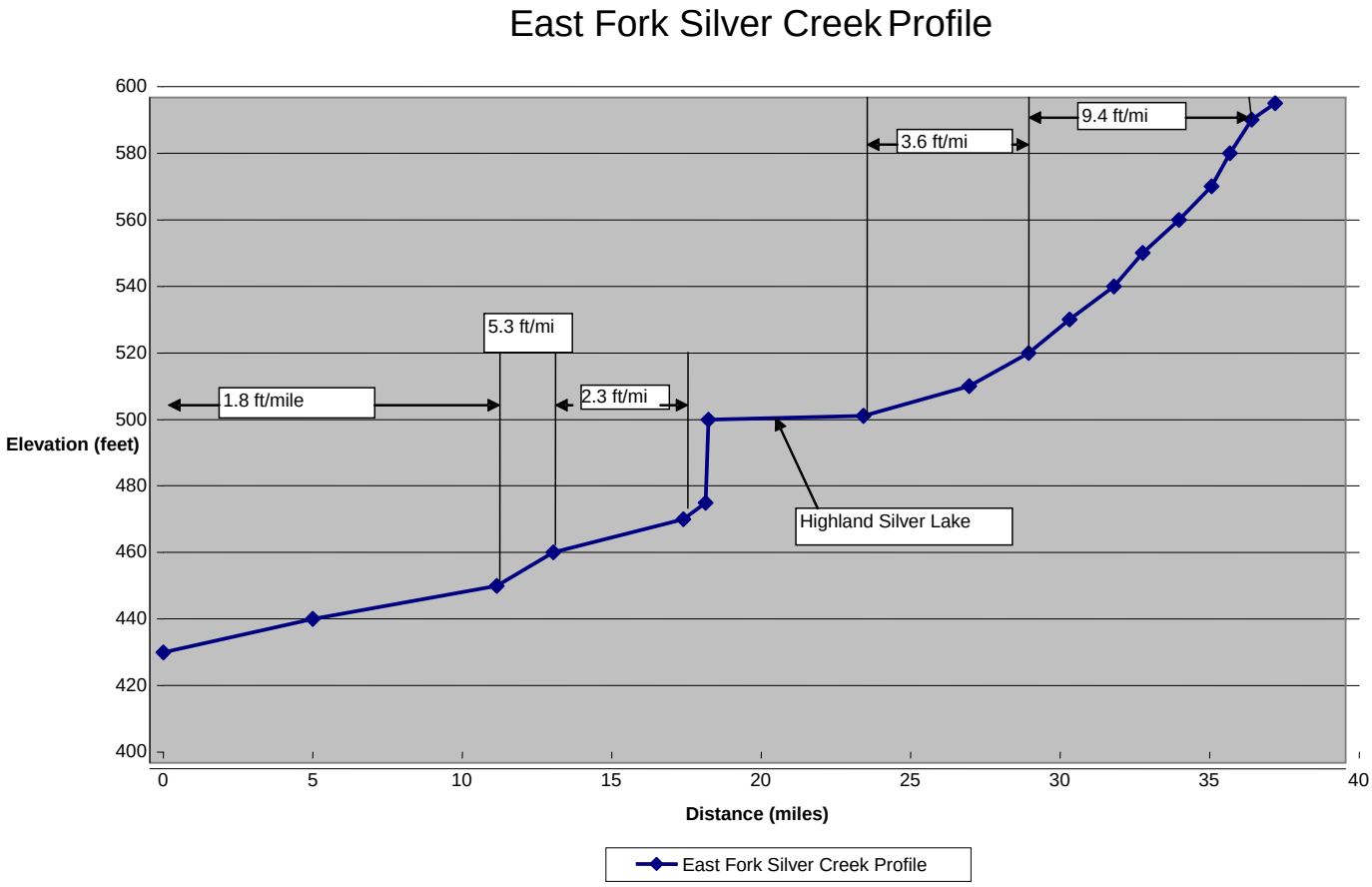


Figure 3. East Fork Silver Creek Profile

The DVD has been divided in “chapters” of approximately five minutes of video to enhance the ability to navigate within the flight video and provide a simple way to identify and discuss different stream segments.(Figure 4 and 5) 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".

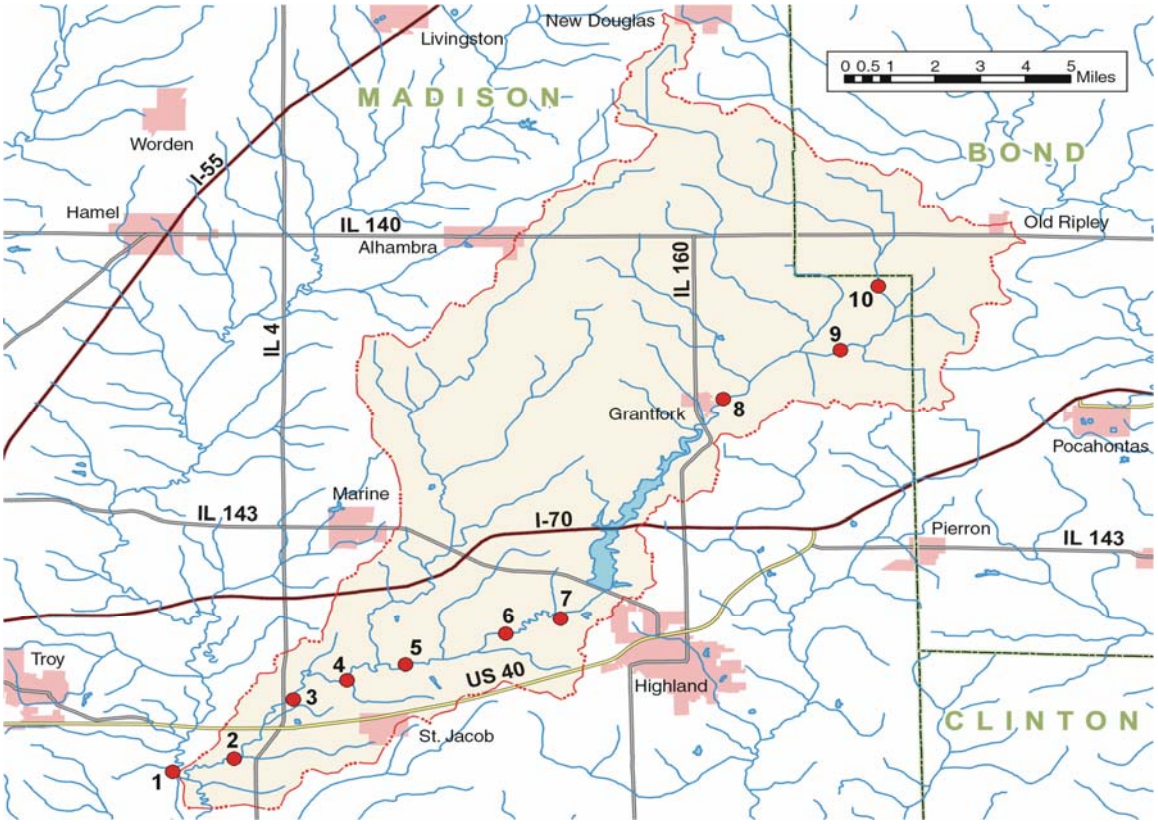


Figure 4. Chapter Divisions on East Fork Silver Creek

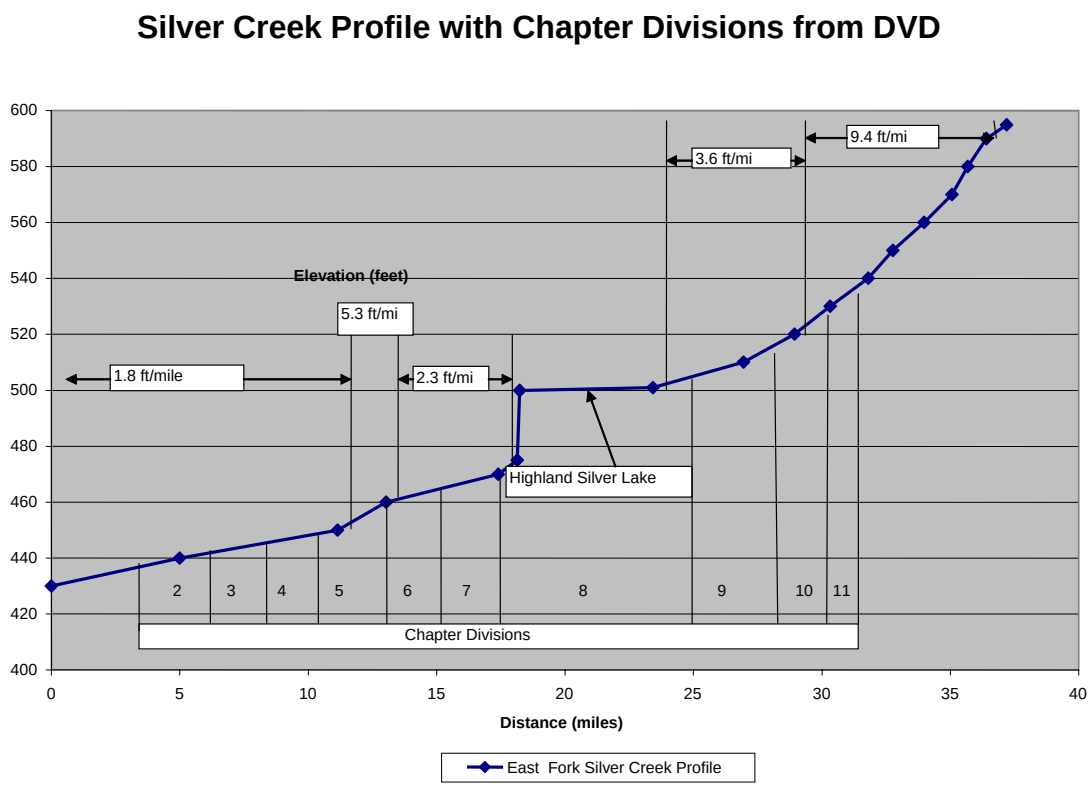


Figure 5. East Fork Silver Creek Profile with DVD Chapter divisions

East Fork of Silver Creek has a gradient of approx. 9.4 ft per mile for 7.4 miles in the upper reaches above Highland Silver Lake (HSL) and then reduces to 3.6 ft/mile for approx. 5.6 miles immediately above HSL. Approximately 3.5 miles above HSL at 43:41 on the DVD continuing through 44:00 there exists a bedrock channel bed that is providing grade control and preventing any incision from advancing upstream. (Figure 6) There is a 3.5ft. difference in elevation in about 350 ft. at the lower end of this bedrock section indicating the amount of incision that is being controlled. This break in the channel bed does not appear in the channel profile created from the USGS topographic maps due to the 10 foot contour interval.

General Observations of East Fork Silver Creek

1. The lower portion of East Fork Silver Creek below Highland Silver Lake is well connected to its floodplain and near an equilibrium condition with only minor streambank erosion.
2. The upper reaches of East Fork Silver Creek above Highland Silver Lake are influenced and controlled by the lake and by bedrock in the channel bottom for the lower 4 or 5 miles immediately above HSL.
3. The upper 10 miles of channel with the steepest gradient does not have grade control and has incised from 2.5 ft to 4 ft. below “geomorphic bankfull” depths based on the NRCS Streambank Inventory and Evaluation procedures.
4. The increased frequency of logjams and depositional features in Chapters 9, 10 and 11 are the likely result of an increase in bank failure as a result of incision.

5. Bedload and depositional features are dominated by sand and silt with only minor deposits of larger material above the lake and almost none below the lake.
6. Installation of Rock Riffle Grade Controls along with some bank treatment above HSL would significantly reduce the quantity of sediments being generated from within the stream system. Initial hydraulic calculations indicate riffle heights of 2.0 ft. or less would have no effect on the water surface profile at bankfull stage.

Figure 6: Captured image showing bedrock channel bed from 43:41 min. to 44:00 min. on DVD. Note bank stability in the area of bedrock grade control.

Table 1 shows the features identified from the DVD by chapter division. While the number of erosion sites in chapters 4 thru 7 are the highest of the entire study reach, there are only minor areas of deposition and/or point bar development. This absence of bar development suggests two conclusions. First, that the channel migration is very minor and erosion rates are low. Second, the channel is very efficient at transporting the sediment load generated in the watershed.

Number of Features Identified by Chapter							
Chapter	**Erosion**	**Logjams**	**Deposition**	**Rock Outcrop**	**Breakpoint**	**Bed Control**	**Geotech Failure**
2	0	0	0	0	0	0	0
3	12	3	0	1	0	1	1
4	21	5	1	0	1	1	0
5	26	4	0	0	0	1	0
6	24	3	2	1	0	0	0
7	31	3	1	1	1	0	0
8	13	0	1	1	0	0	0
9*	15	1	9	5	0	4	0
10*	19	8	7	3	0	1	0
11*	4	6	0	0	0	0	1
Totals	**162**	**33**	**21**	**12**	**2**	**8**	**2**

(* Indicates Chapters located above Highland Silver Lake)

Table 1. Features Identified by Chapter.

Channel cross sections were completed at 9 sites in the study reach. Cross sections 1 thru 6 are above HSL and sections 7 thru 9 are below HSL. A summary of findings is presented in Table 2. Actual cross section data is found in appendix A. The analysis shows that velocities are typically between 2.5 to 3 ft./sec. with bedload material less than 1 inch in diameter. It is significant that the Width/Depth (W/D) Ratio decreases significantly below HSL where the least amount of incision has occurred and the channel is well connected to the floodplain and little deposition is found within the channel.
Figure 9 compares the “geomorphic bankfull” channel dimensions and the total channel dimensions below the floodplain elevation. It is a way to compare the existing channel dimensions to those that would be expected had the channel not incised. It is expressed in terms of Td (total depth below floodplain)/Md (maximum geomorphic bankfull depth) and by Tw (total width at floodplain elevation)/Mw (maximum bankfull width at geomorphic bankfull elevation). Each of these factors is then multiplied by a factor of ten so that they can be represented on the same graph as the W/D ratio. Taken together these three measurements show numerically what the Channel Evolution Model predicts hypothetically. Under “equilibrium conditions” the Td/Md and Tw/Mw would be 1 (or 10 after applying the factor of 10). The deviation of these values above 10, the “equilibrium” condition, is an indication of past incision and progression of the Channel Evolution Model predictions.
Notice that cross sections below HSL are all near a value of 10, which represents a channel whose total depth is equal to the “geomorphic bankfull” depth, i.e., the channel has not incised.
It is also significant that both the bankfull width and the total top width below HSL are narrower than those above HSL. A convincing proof that the channel has incised above HSL and an indicator of the amount of bank erosion that has occurred over time.

East Fork Silver Creek

Cross Section Data: NRCS Streambank Inventory and Evaluation Procedure

X-Sec	Easting	Northing	ADA Sq. Mi.	Valley Slope ft/mi.	Q2 CFS	BKF CFS	Width ft.	Mean Depth	W/D	Vel. FPS	Bedload In. Dia.	CEM (Simon)	CFS sq. mi.	BKF cfs /Q2 cfs
1	272659	4308282	7.67	10.8	559	465	37	3.35	11	3.8	1	5	60.6	0.83
2	273595	4305887	11.83	9.9	755	516	42	4.3	9.8	2.9	1	5	39.5	0.68
3	273921	4304327	15.88	9.9	952	647	52	4.38	12	2.8	1	5	40.7	0.68
4	271553	4303190	20.1	8	1037	753	60	4.28	14	2.9	2	2	37.5	0.73
5	271369	4303234	20.38	8	1047	765	57	5	11	2.7	1	5	37.5	0.73
6	269743	4301603	36.13	8	1646	1276	65	5.8	11	3.4	1	6	35.3	0.77
7	261918	4291837	53.54	4.8	1756	763	48	5.8	8.3	2.7	1	1	14.25	0.43
8	259758	4291200	57.97	4.8	1870	757	38	6.63	5.7	3	1	1	13.03	0.4
9	256960	4290596	91.9	4.1	2495	1139	52	7.9	6.6	2.8	1	1	12.4	0.45

Table 2. Cross Section Data for East Fork Silver Creek

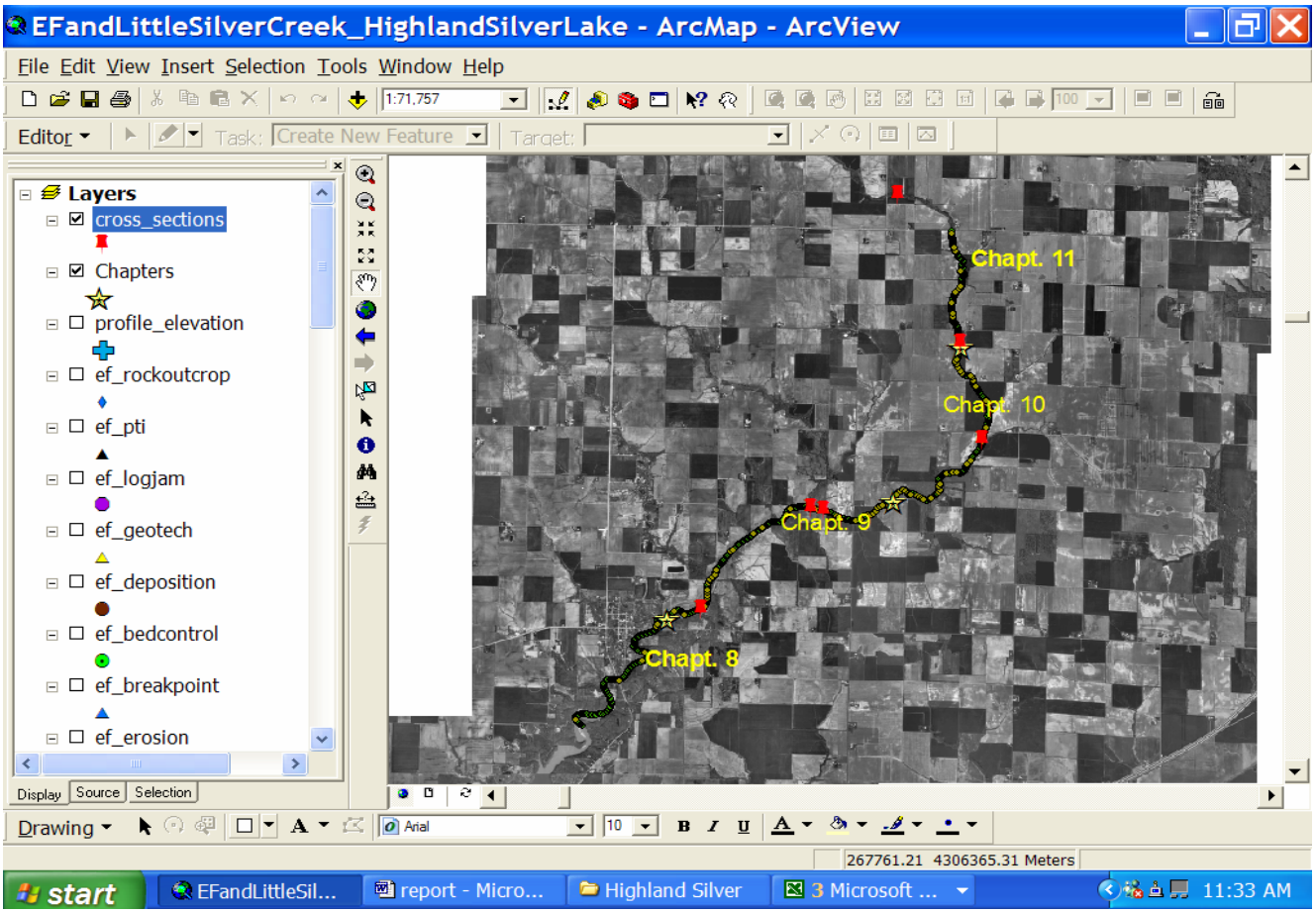


Figure 7. Cross Section Locations above HSL

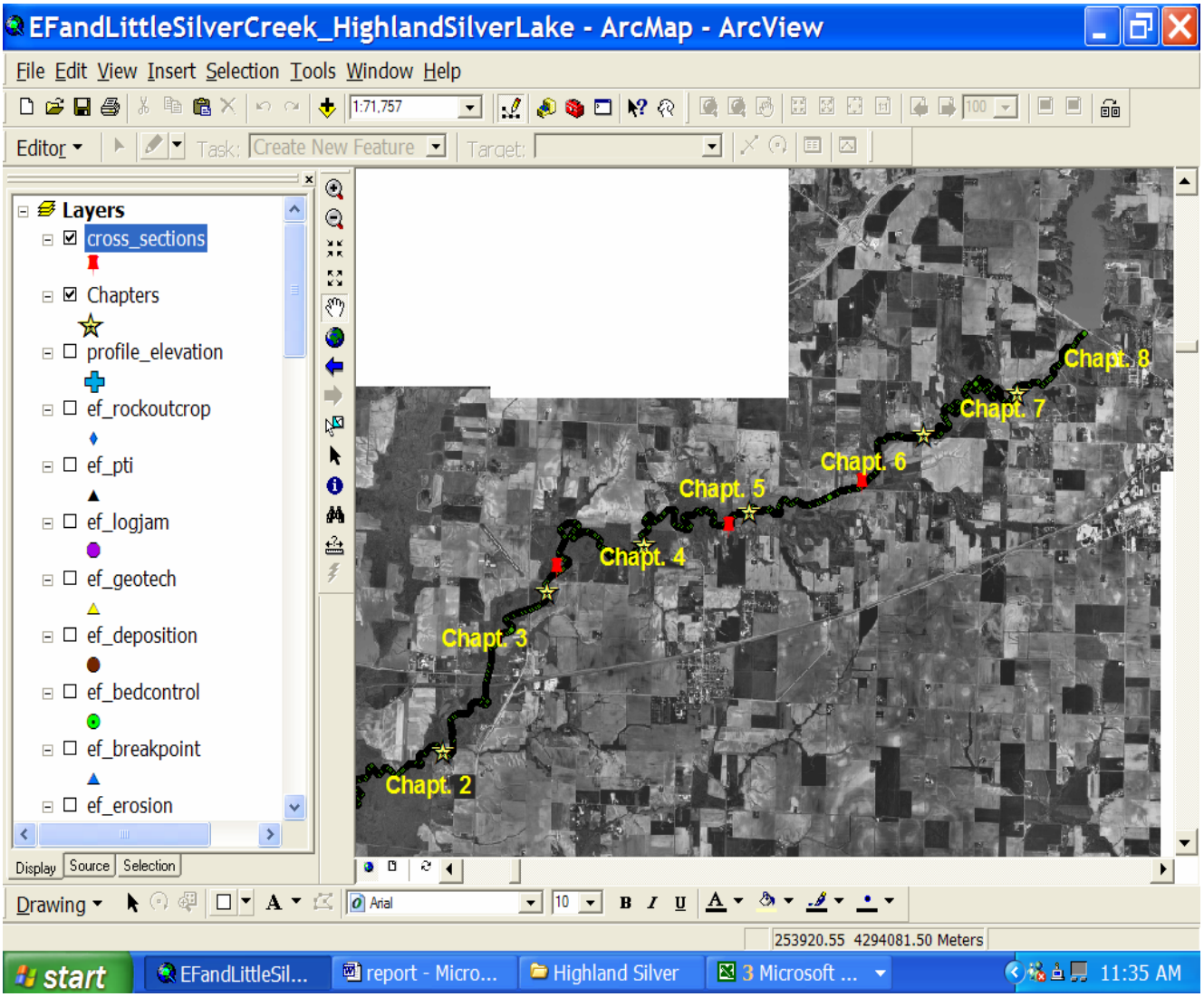
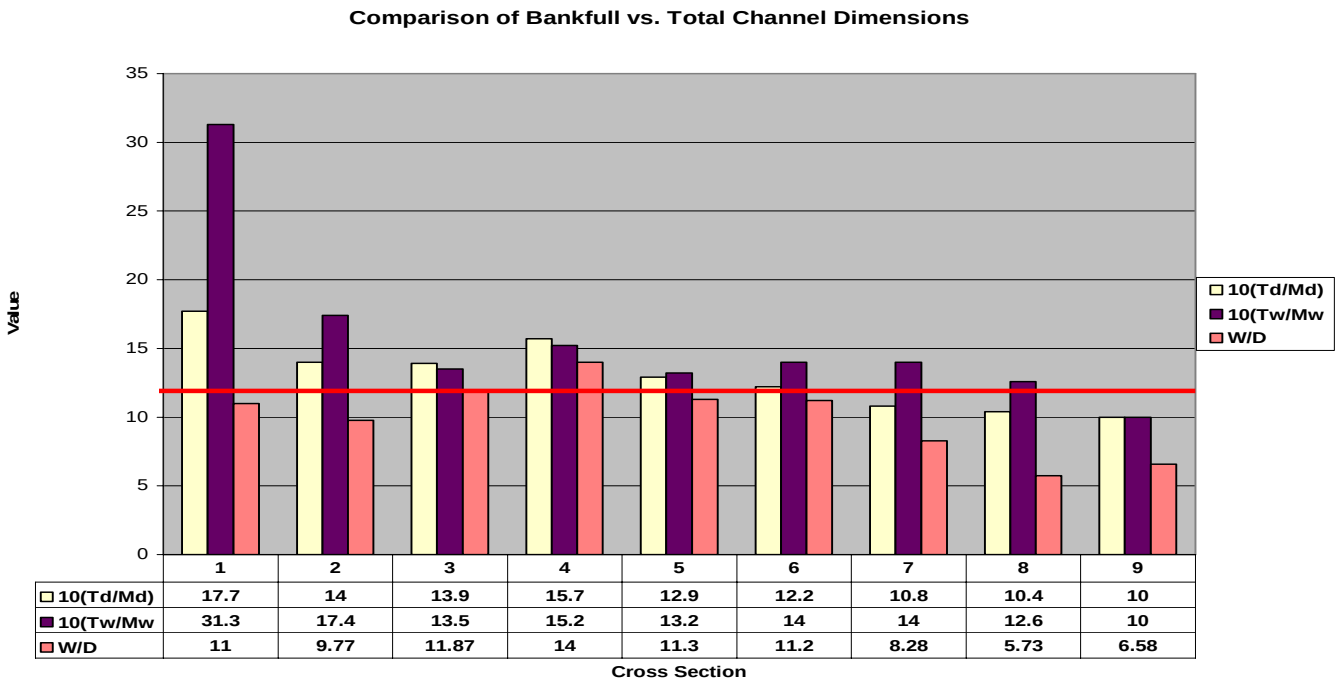


Figure 8. Cross Section Locations below HSL



	1	2	3	4	5	6	7	8	9
10(Td/Md)	17.7	14	13.9	15.7	12.9	12.2	10.8	10.4	10
10(Tw/Mw	31.3	17.4	13.5	15.2	13.2	14	14	12.6	10
W/D	11	9.77	11.87	14	11.3	11.2	8.28	5.73	6.58

Figure 9. Comparison of "Bankfull Dimensions" to Total Channel Dimensions

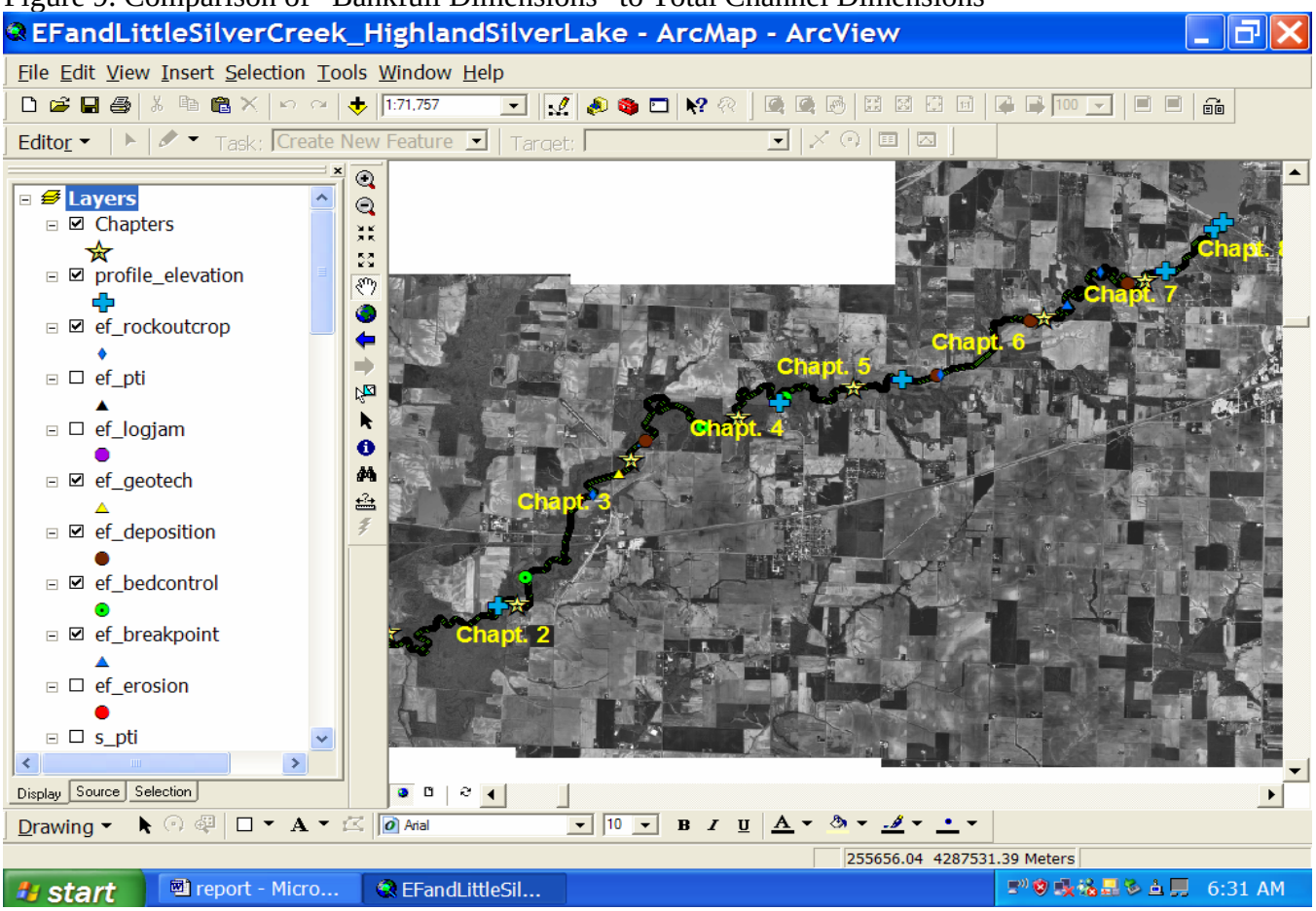


Figure 10. Chapters 2 thru 7 reach from Silver Creek to just below Highland Silver Lake

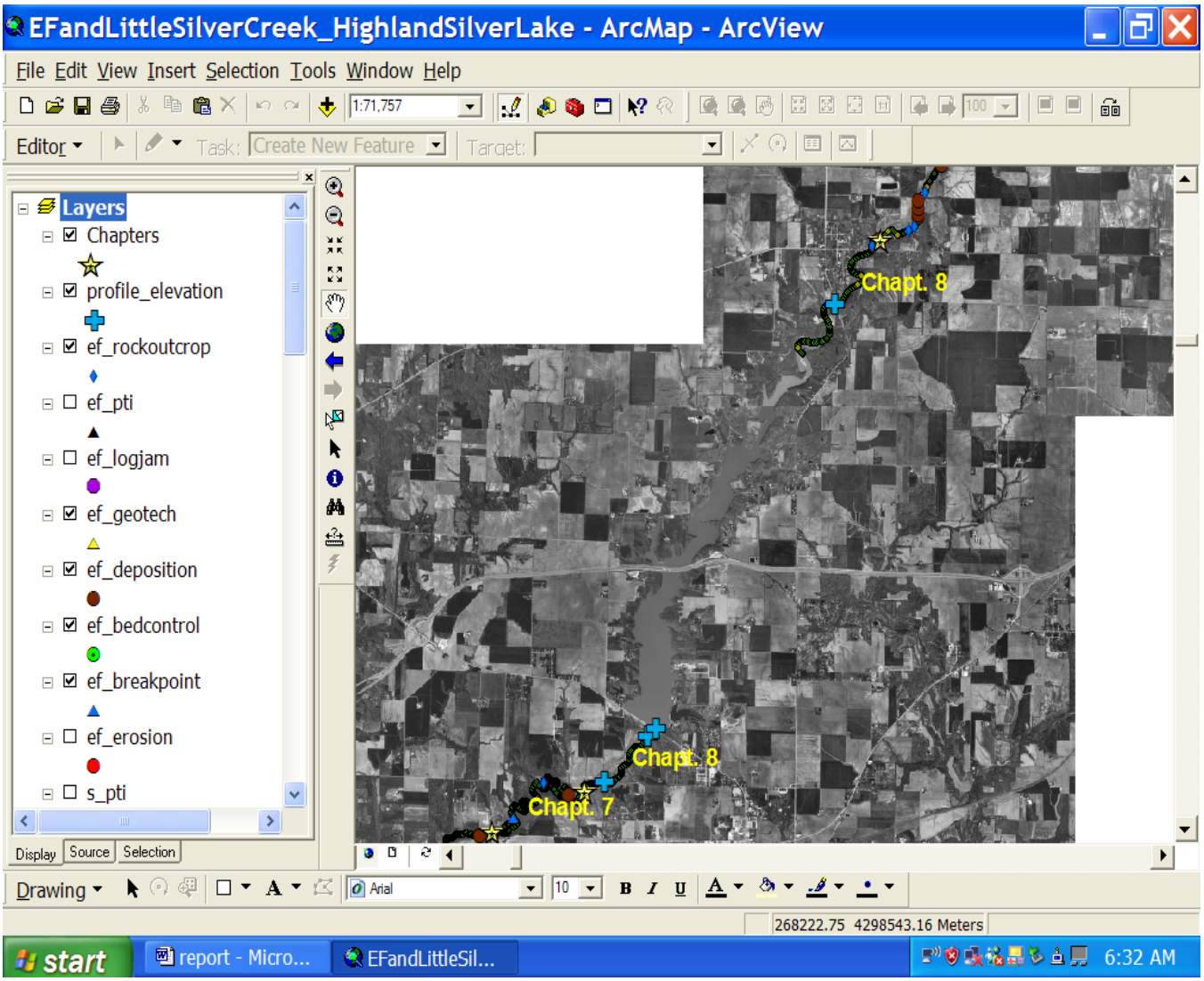


Figure 11. Chapter 8 begins below HSL and then continues above HSL

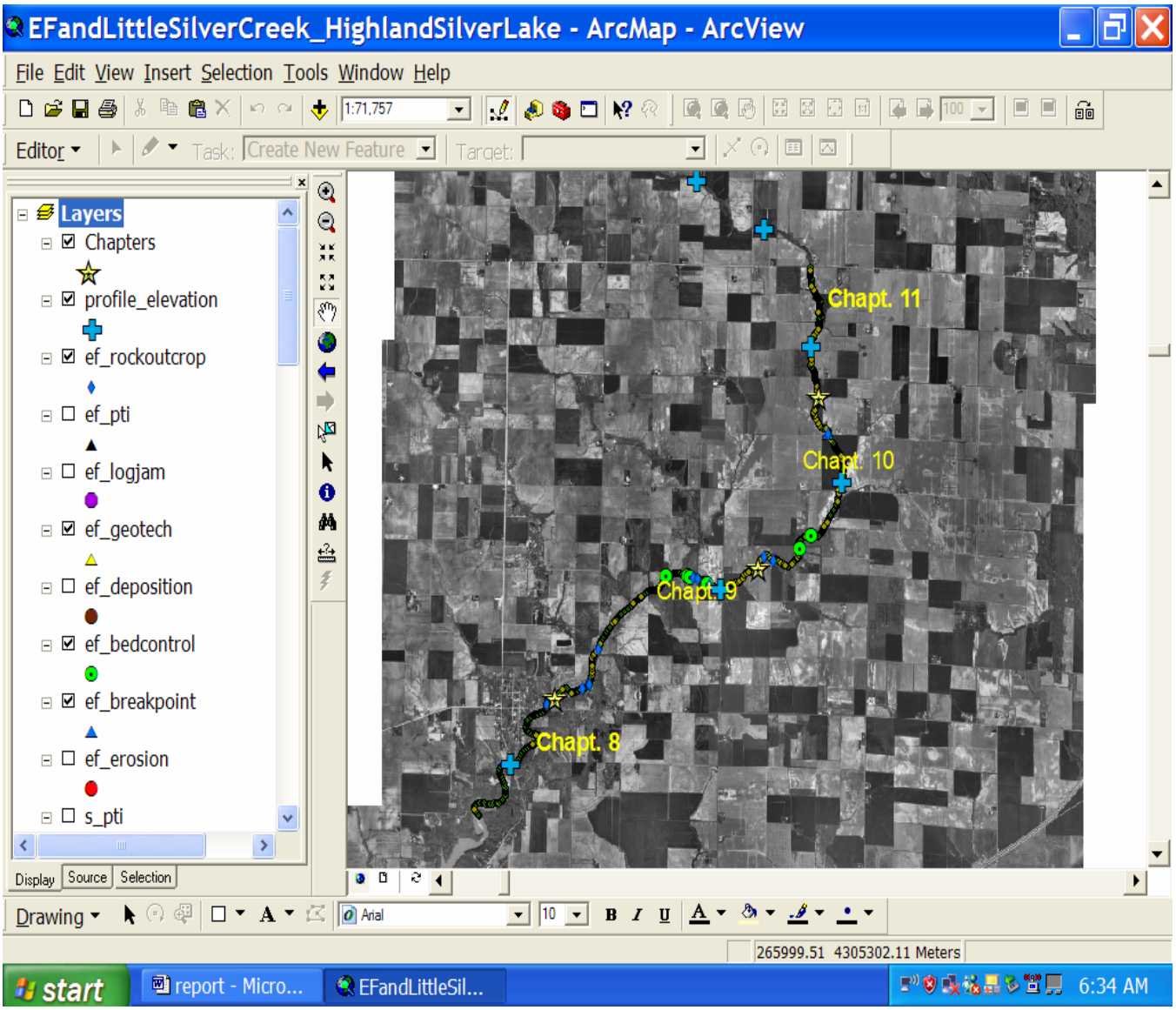
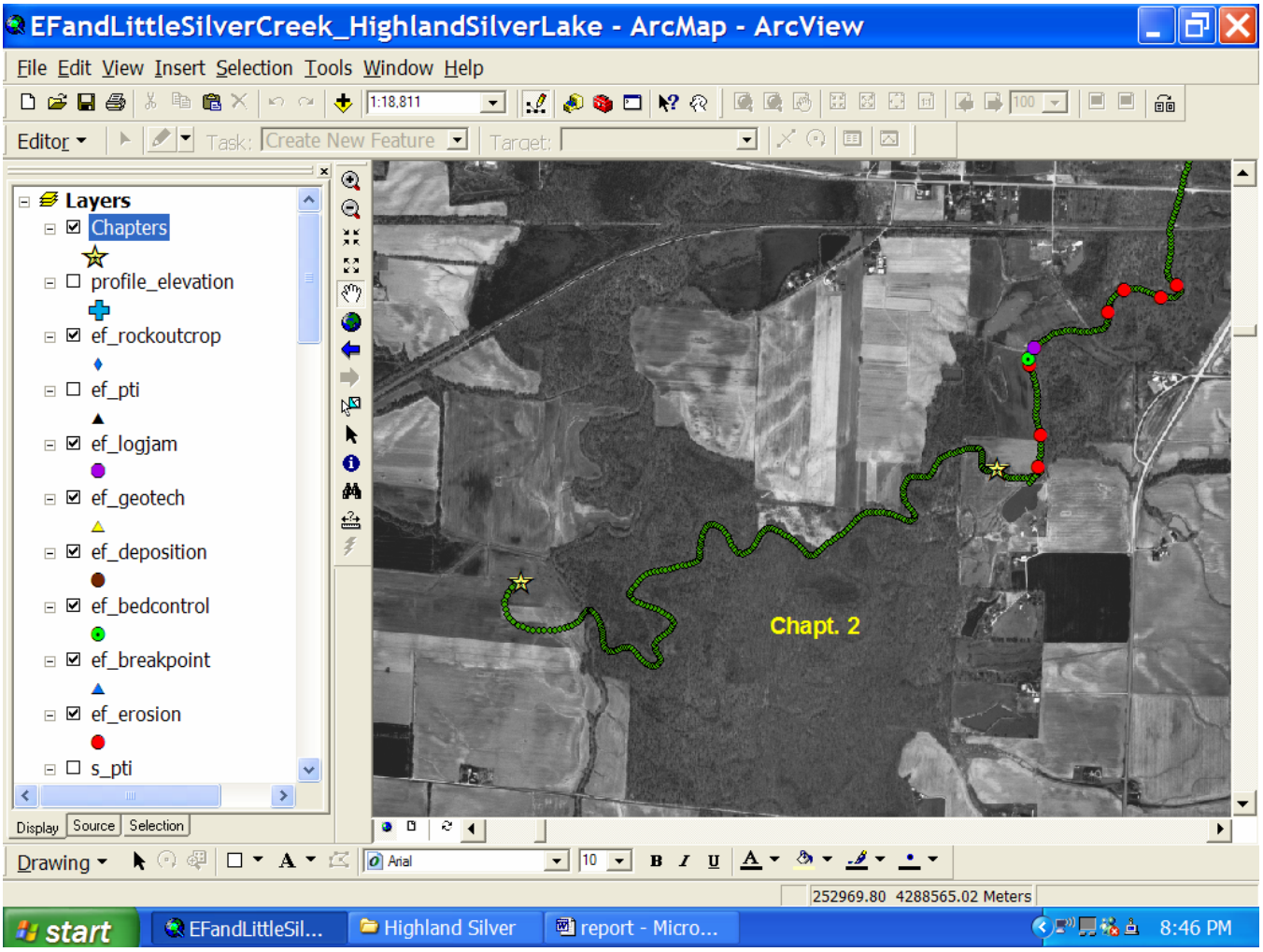


Figure 12. Chapters 9 thru 11 are above HSL ending at IL Rte. 140

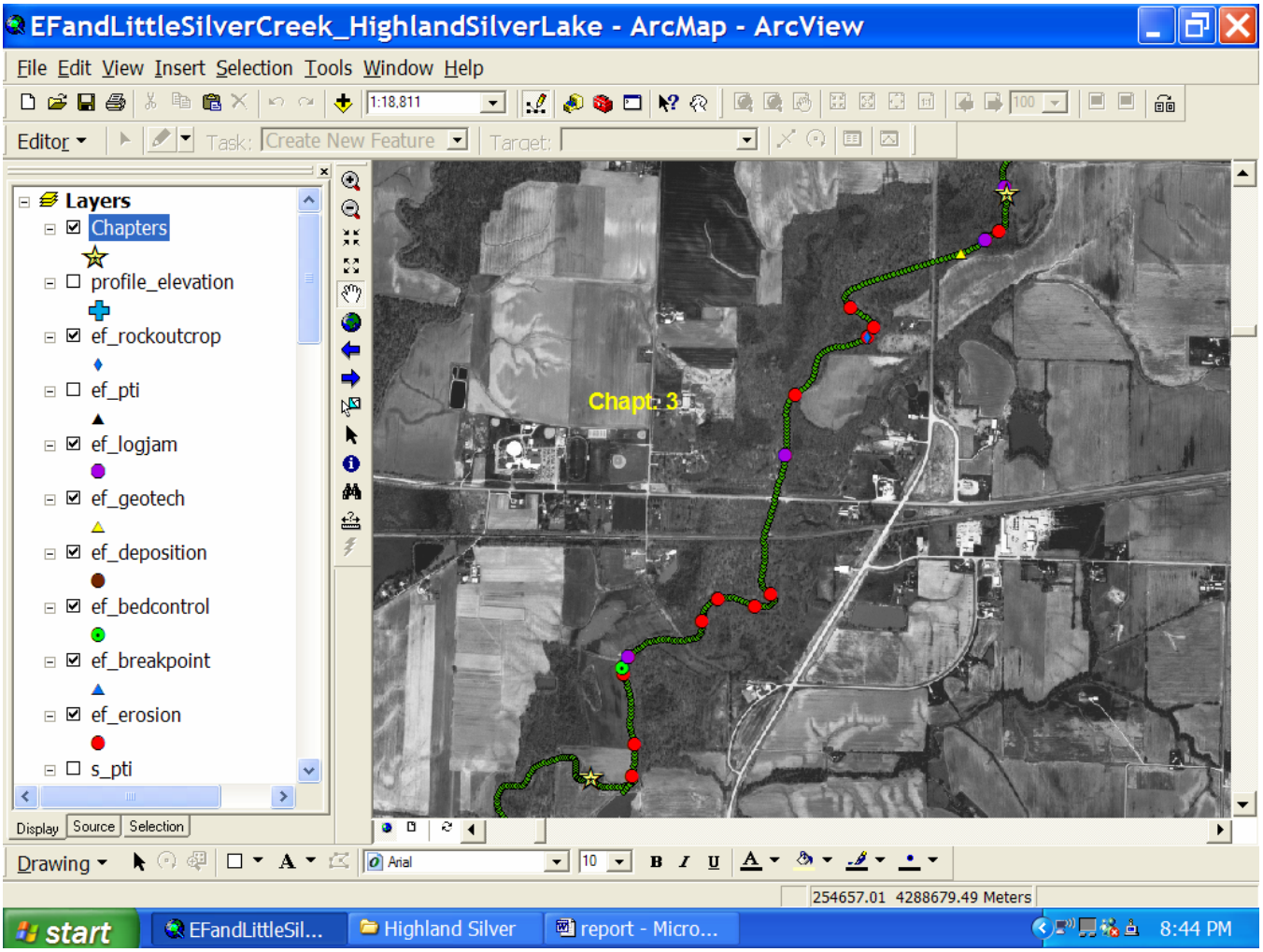
Recommendations by Chapter Divisions



Chapter 2: East Fork Silver Creek

Chapter 2 Recommendations

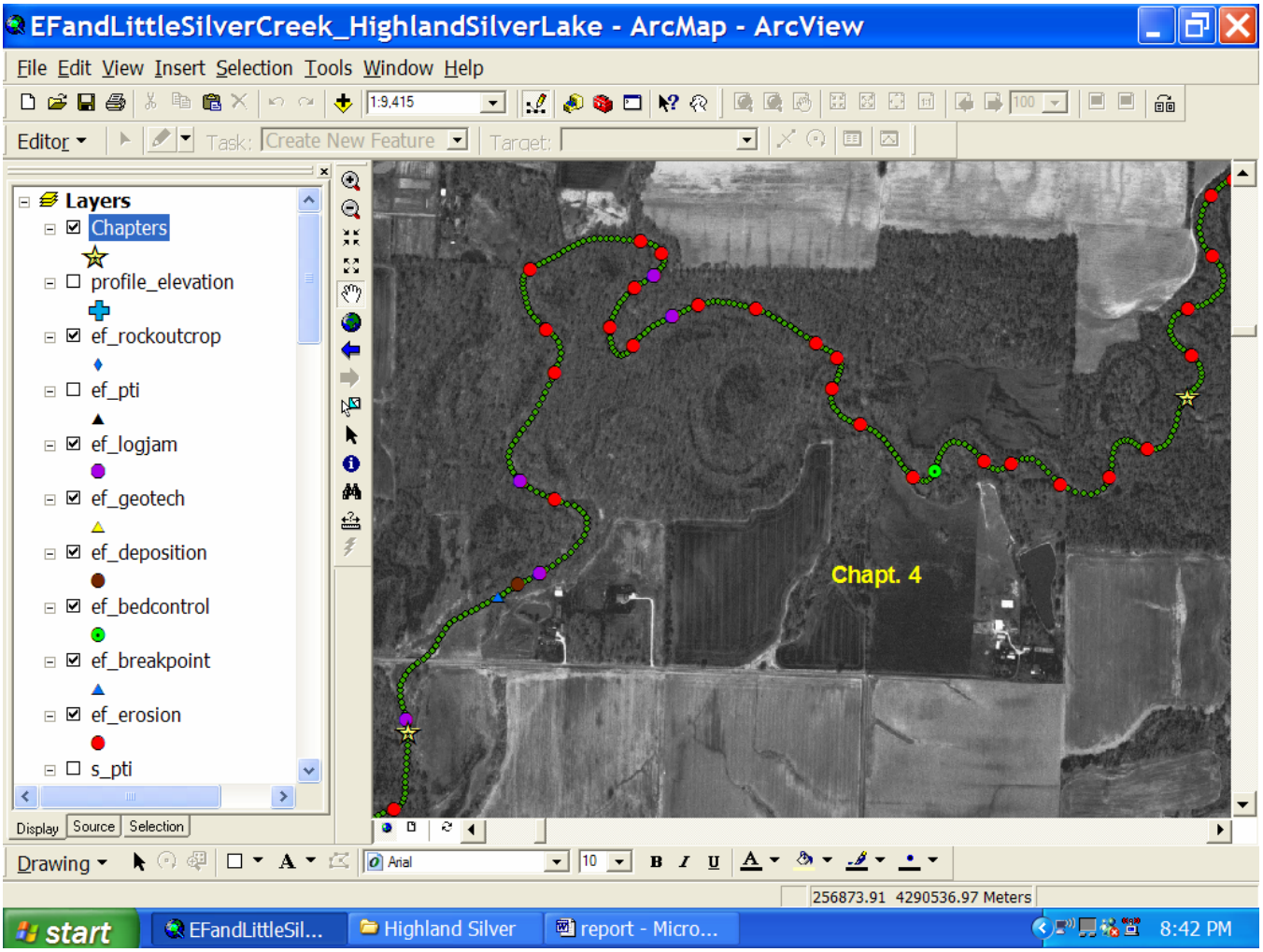
This chapter begins at Silver Creek and represents the most downstream reach of the study. No features were identified in this reach and no cross sections were taken. This entire reach is in bottomland timber and is thought to be in equilibrium. No treatment is needed.



Chapter 3: East Fork Silver Creek

Chapter 3 Recommendations

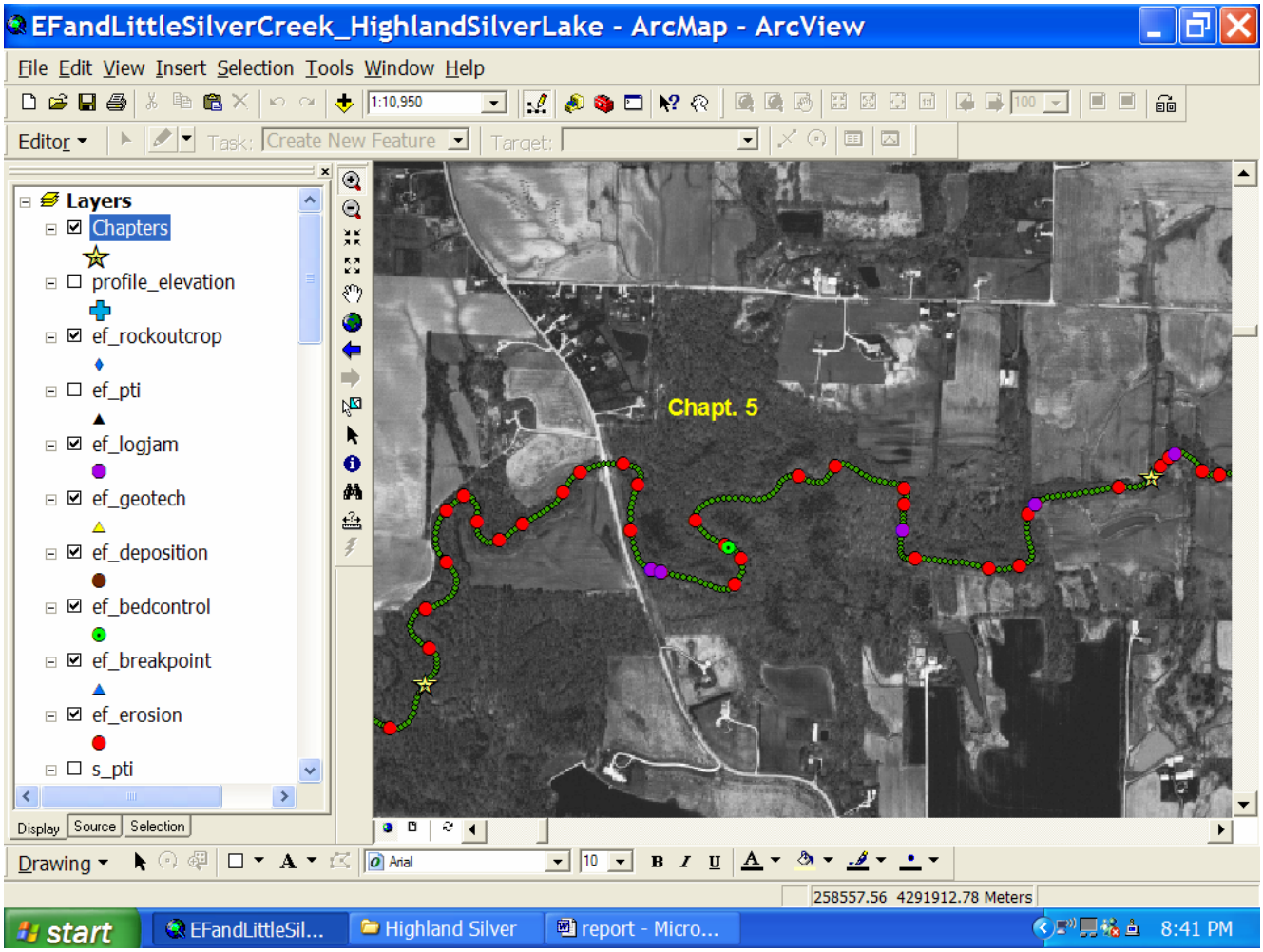
This chapter has 12 erosion sites identified and 3 logjams. It, like Chapter 2, is entirely within bottomland timber. Erosion sites are relatively slowly migrating outside bends or the result of obstructions in the channel causing lateral scour action. The one “bed control” is a man made crossing. There are no areas of deposition identified and no bar development is visible. Therefore, the 12 erosion sites should be considered as “normal” for this channel and no action taken to address the erosion. Removal of the three log jams would be beneficial to reduce local scouring action, however access would appear to be a limiting factor and is therefore not considered a priority issue. No action recommended.



Chapter 4: East Fork Silver Creek

Chapter 4 Recommendations

This chapter has 21 erosion sites and 5 logjams. Cross section 9 is located near the lower end of Chapter 4 and indicates that the floodplain is equal to the geomorphic bankfull elevation. Again the channel is completely contained within bottomland timber and there is no evidence of bar formation that would indicate rapid erosion rates. Therefore there is no recommendation for treatment.



Chapter 5: East Fork Silver Creek

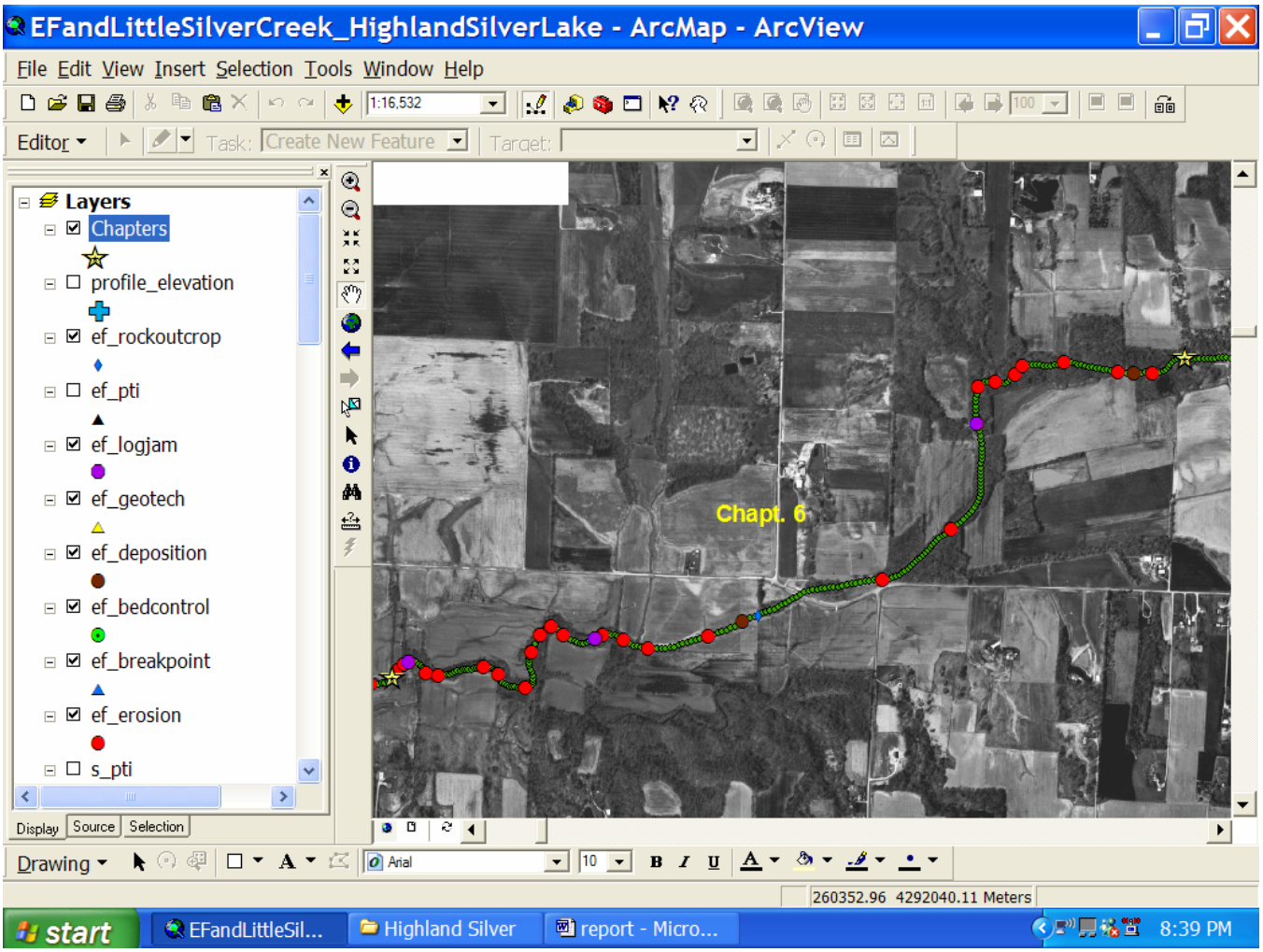
Chapter 5 Recommendations

This chapter has as the only identified features 26 erosion sites and 4 logjams. There is a portion of this reach that has only a narrow woody riparian corridor and there is some scouring evident within the cropland portion of the floodplain. Cross section 8 was taken within this chapter. Again this reach shows little sign of incision and there is frequent out of bank flow in this section that overtops the county road at this point. Erosion sites that are not threatening property should be left untreated as once again there is no evidence of any rapid lateral migration in this reach.

There is one erosion site at DVD time 22:00 where the lateral migration is threatening a county road and electrical utility line for approx. 600 ft. While the erosion rate appears to be slow, treatment of this site should be considered before the road and utility are damaged.

The recommended treatment is application of Stone Toe Protection at the rate of 1 ton per foot, plus a 100 foot section of Riprap where the channel impinges directly on the roadway. The estimated stone requirements are approx. 700 tons of RR-5 quarry stone at

an estimated cost of $30 per ton installed or $21,500 for the STP and 200 tons of RR-5 for the riprap for a cost of $6,000.



Chapter 6: East Fork Silver Creek

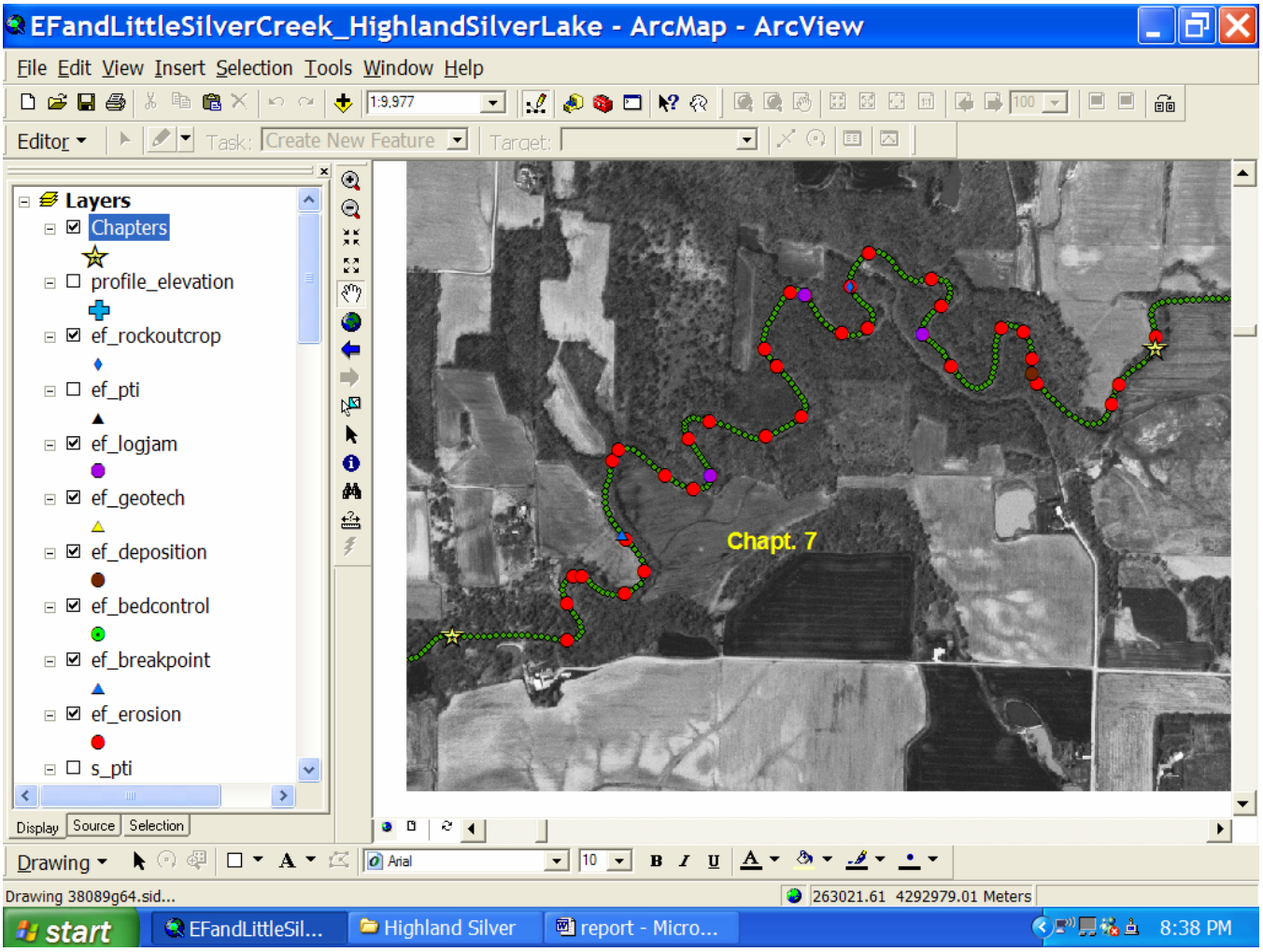
Chapter 6 Recommendations

This reach has 24 identified erosion sites, 3 logjams and 2 deposition areas. The rock outcrop identified from the DVD at 27:22 is actually an area of concrete rubble that has no geomorphic significance. This reach has a section from DVD time 27:00 to 27:50 that has been channelized. Cross section 7 is found within this chapter and indicates that in spite of the channelization there does not appear to be any significant incision in this reach.

The reach is primarily through a cropland region with only a narrow riparian corridor along the channel and therefore some of the erosion sites identified will likely become an economic concern to the adjacent landowners. There is also significant out of bank flow in this reach that has caused some scour erosion in the adjacent cropland.

Due to the narrow W/D ratio and the absence of any downcutting, the recommended solution for any erosion site that is treated would be the use of Stone Toe Protection at a

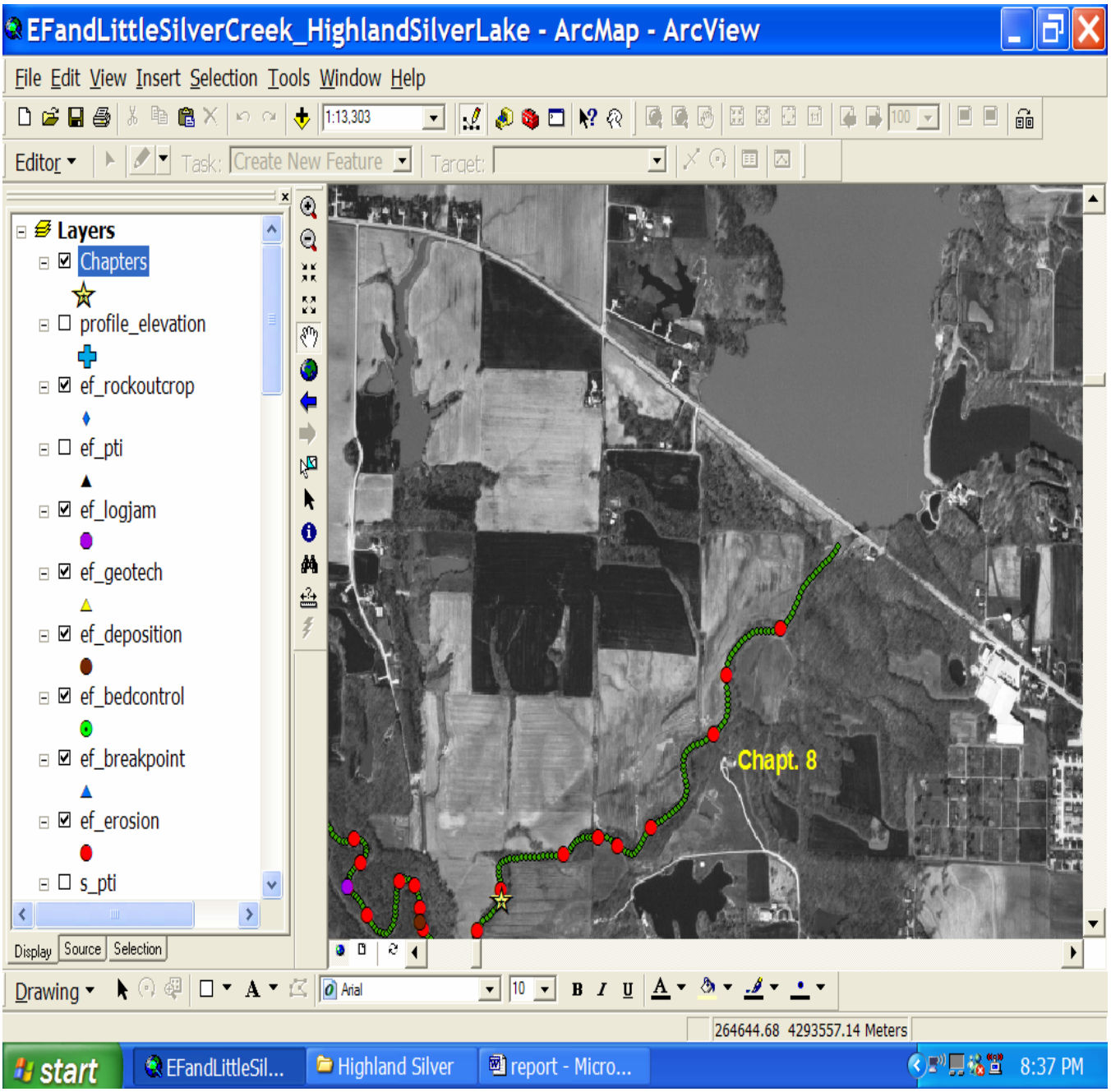
rate of 0.75 tons/ft. The identified sites are small and it is estimated that 7 sites of 200 ft. each will require attention. The material per site is estimated at 175 tons of RR-5 stone at $30 per ton, or $5,250 per site. Total estimated cost for Chapter 6 is $36,750.



Chapter 7: East Fork Silver Creek

Chapter 7 Recommendations

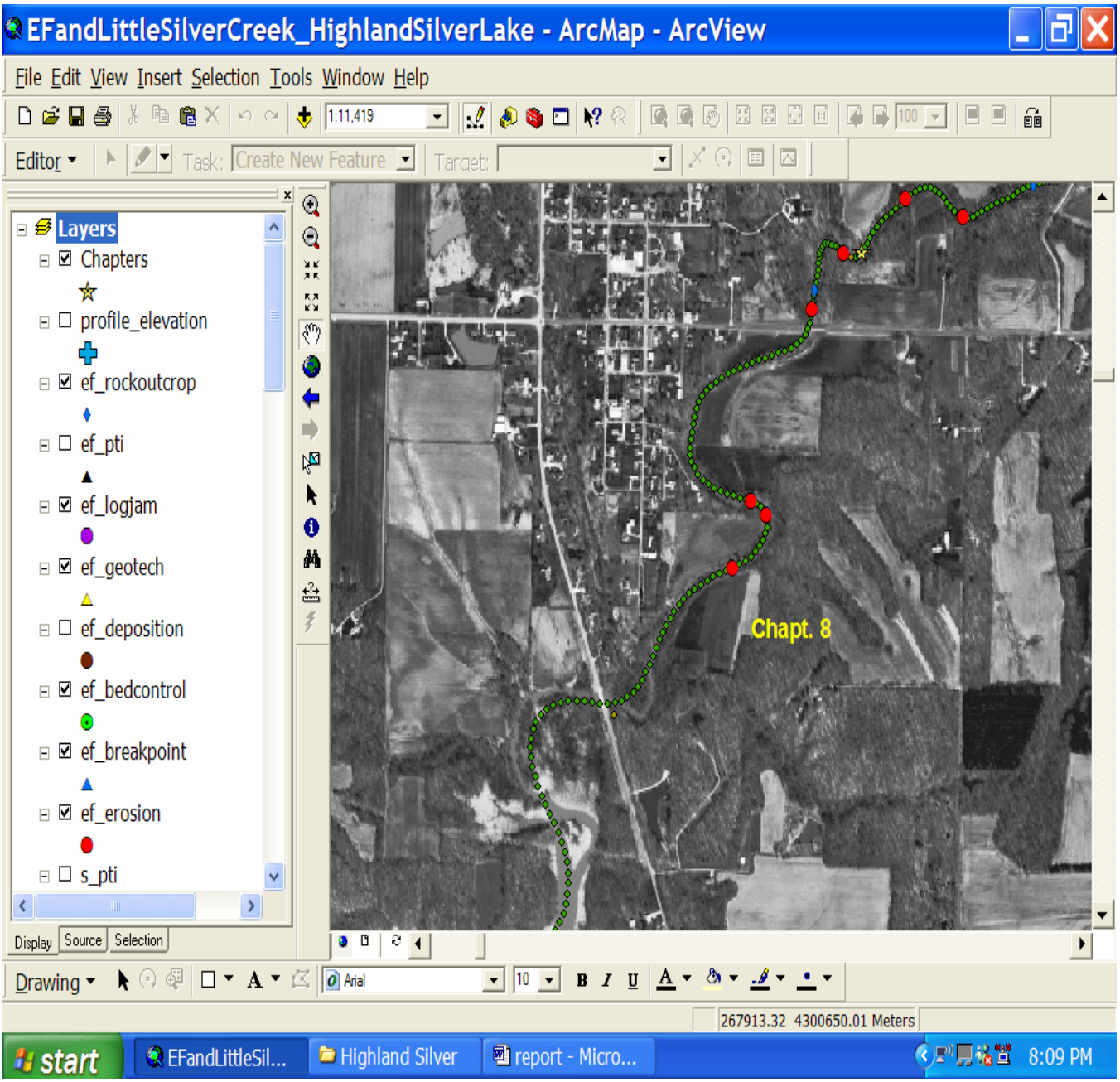
This chapter is a very sinuous reach of channel with 31 identified erosion sites and 3 logjams. There are no cross sections within this reach and there are no significant areas of bar development or deposition. Once again the lateral migration is slow in this reach, but will accelerate rapidly if the channel migrates into the adjacent cropland where there is no permanent root structure to slow the erosion rate.
Six such sites are identified on the DVD and the recommended treatment is Stone Toe Protection for the same reasons cited in chapter 6. At a similar cost of $5250 per site the total estimated cost is $31,500.



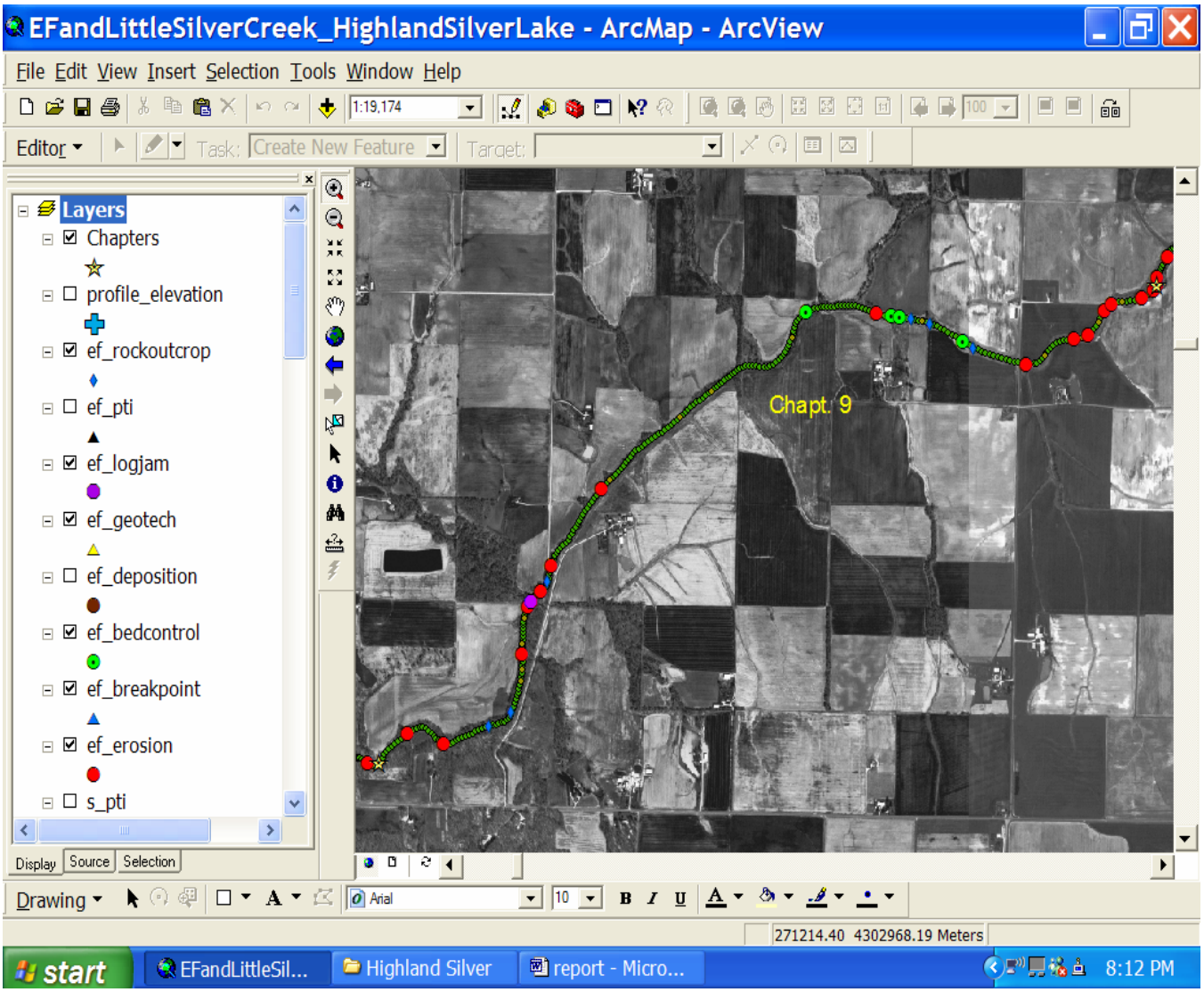
Chapter 8: East Fork Silver Creek Below Highland Silver Lake

Chapter 8 Recommendations

This reach is divided into one section below the lake and another above the lake. There is a total of 13 erosion sites identified with eight of thirteen being below the lake. In all cases the channel is again within a narrow woody riparian corridor and the treatment recommended to prevent migration and accelerated erosion is the use of STP. All thirteen sites should be addressed at an estimated cost of $5250 per site for a total cost of $68,250 for chapter 8.



Chapter 8: East Fork Silver Creek, Above Highland Silver Lake

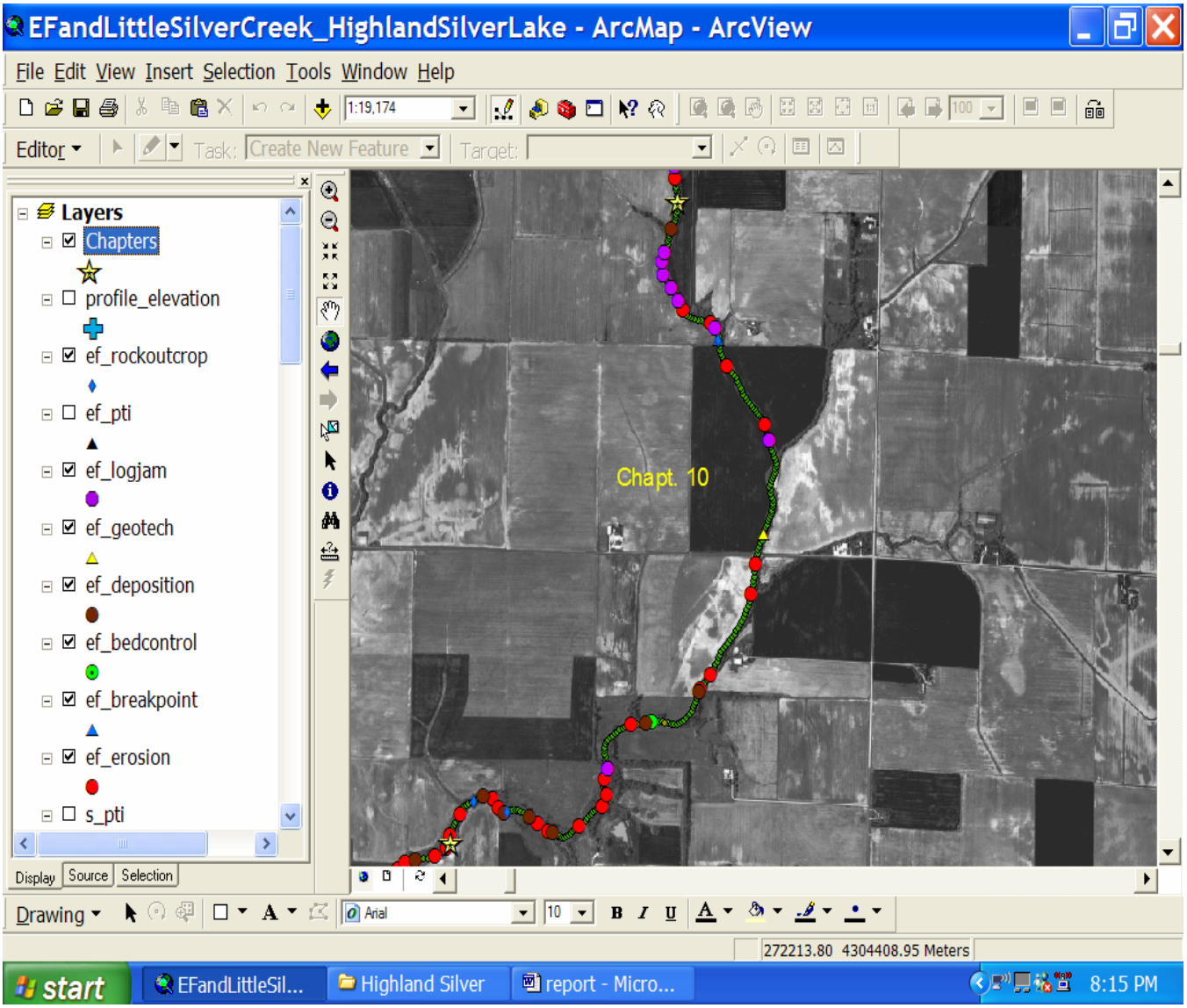


Chapter 9: East Fork Silver Creek

Chapter 9 Recommendations

There are 15 identified erosion sites, 1 logjam, 9 areas of deposition and 4 bed control locations in this chapter. This reach of channel contains the major location of bed control in the watershed above HSL and can be seen on the DVD at 43:41 thru 44:00. The existing bedrock is controlling approx. 3.5 feet of potential downcutting, however the bedrock is substantial and there appears to be no reason to expect the channel to bypass or erode through the bedrock control.
There are three cross section (4, 5 and 6) in this chapter. Taken together, they indicate that the channel has incised below the bedrock by approx. 2 ft. There is a significant change in the amount of deposition in the channel in this reach. The deposition may be a result of backwater from HSL reducing velocity and allowing material to drop out of suspension, but it is also likely that there is more sediment being generated from this reach due to channel incision resulting in more deposition.

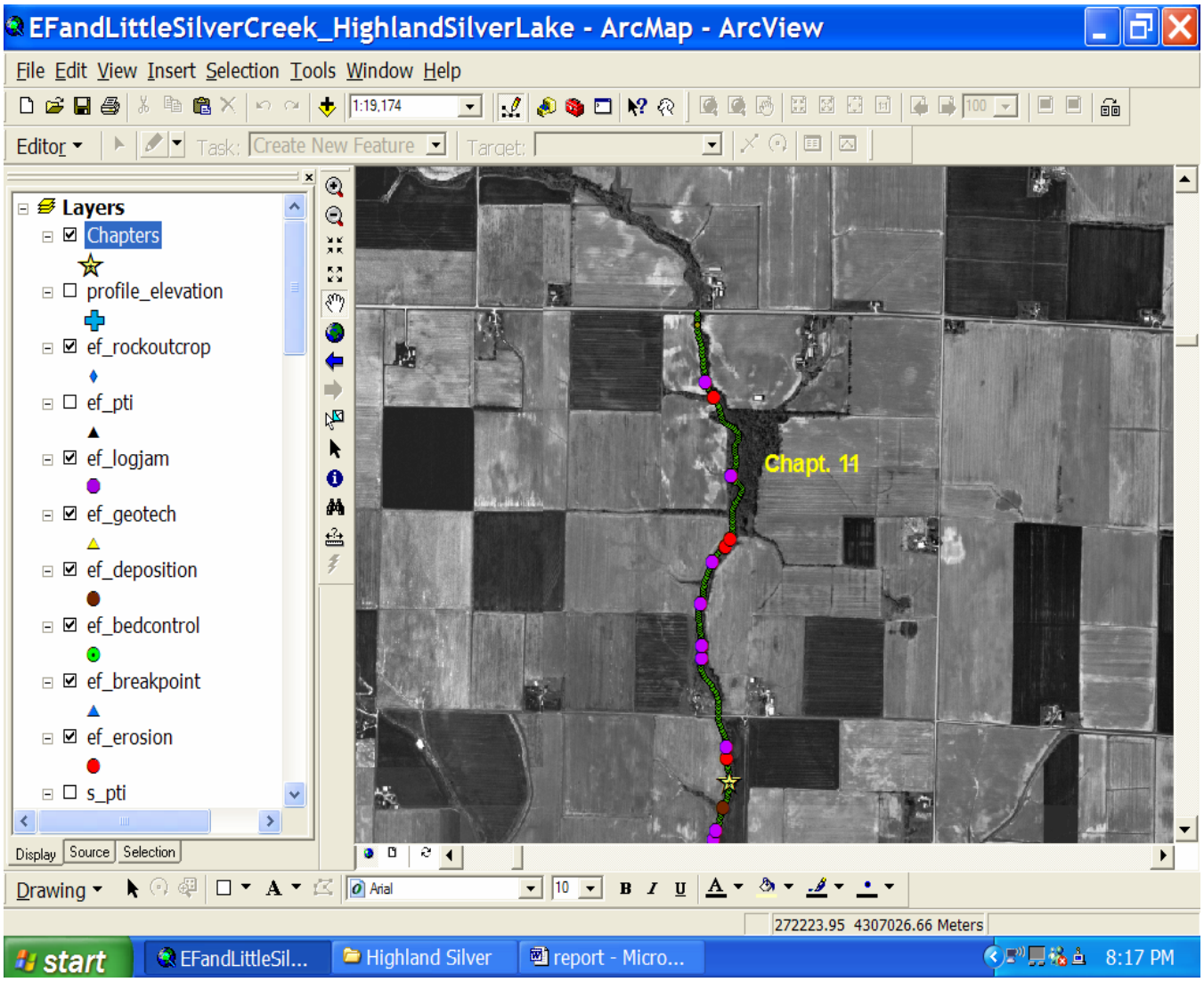
The initial hydraulic analysis indicates that Rock Riffle Grade Controls could be build below the bedrock section to a height of approx. 2 ft. without effecting the flooding in this reach. Installation of Rock Riffles would help to reduce the sediment generated from bank erosion and improve the dissolved oxygen in the stream due to increased turbulence. There may be need for some lateral bank treatment, however installation of Rock Riffle Grade Controls should be the initial treatment option with lateral migration treatment to follow, if needed.
There is approx. 7600 ft. of channel below the bedrock reach that would benefit from Rock Riffle Grade Control and then another 1200 feet at the very upper reaches of Chapter 9 above the bedrock reach.
The average channel width in this chapter is about 60 ft. therefore riffles are recommended every 350 to 400 ft. (6 bankfull widths) for 8800 ft. The total number of riffles would then be 22 to 25 riffles at approx. 250 tons of RR-6 stone each. At $30 per ton in place the cost per riffle would be $7,500 each or the total cost would be approx. $187,500 for chapter 9.



Chapter 10: East Fork Silver Creek

Chapter 10 Recommendations

This chapter has 19 identified erosion sites, 8 logjams and 7 areas of deposition. The increase in logjams and deposition in this reach is reasoned to be the result of incision as it is well above the backwater effects of Highland Silver Lake. Cross section 3 is located in this reach and shows an incision of approx. 2.8 feet. The recommended treatment is therefore again to install a system of Rock Riffle Grade Controls to raise the bed and prevent further downcutting. The result will be to stabilize the erosion sites (although some lateral treatment may also be needed), dissipate energy, reduce sediment loading and increase aeration resulting in improved dissolved oxygen levels.
This chapter is approx 13,000 ft long and the bankfull width is 41 ft. resulting in a need for riffles every 250 ft. or a total of 52 riffles. The narrower channel width will allow a 2 ft. high riffle to be built using approx. 200 tons of RR-6 stone at an estimated cost of $6,000 per structure. The total estimated cost is then $312,000 for chapter 10.



Chapter 11. East Fork Silver Creek

Chapter 11 Recommendations

This chapter has 4 erosion sites and 6 logjams. This chapter is the upper limit of the DVD where the channel became too narrow and vegetation too dense to make additional video useful. Therefore this reach is only 6600 ft. long, or approx. half the length of chapter 10. Cross section 2 is in this chapter and cross section 1 is approx. one half mile upstream of the end of the DVD flight. Both cross sections show an incision of at least 2.5 ft.
The treatment recommendation is again to use Rock Riffle Grade Control to prevent additional downcutting, reduce channel erosion and increase aeration. The channel has now narrowed to 38 ft. but the spacing will remain at 225 to 250 ft. between riffles (6 bankfull widths). The bottom width has also narrowed allowing a 2 ft. high riffle to be built with approx. 150 tons of RR-6 stone. The cost per riffle will then be $4,500 and a total of 26 structures will be required for a cost of $117,000.
Additional rock riffles are presumed to be needed above the end of the DVD, however no investigation was made and no estimates are available.

Summary

The conclusions of this report are that East Fork Silver Creek above Highland Silver Lake has incised in all locations except a short reach of about 4000 ft. where a natural rock outcrop in the channel bed has prevented the downcutting process. All incised reaches would benefit greatly by the installation of Rock Riffle Grade Controls at a spacing of approximately 6 bankfull widths. Grade control would reduce the bank erosion, prevent additional incision and subsequent bank failure, dissipate energy, increase aeration and dissolve oxygen within the stream and reduce the sediment loading to Highland silver Lake.
Below HSL the East Fork of Silver Creek is near equilibrium, with a few areas needing Stone Toe Protection to control lateral migration and prevent the channel from migrating through the riparian corridor where erosion rates would accelerate dramatically.
The estimated cost for the recommended treatment is presented in Table 3.

Estimated Treatment Cost for Streambank Stabilization East Fork Silver Creek					
Chapter	Treatment	Length	Number	Cost	Cost per Chapter
2	none	0	0	0	0
3	none	0	0	0	0
4	none	0	0	0	0
5	Stone Toe	600 ft	1	$21,500	
5	Riprap	100 ft	1	$6,000	$27,500
6	Stone Toe	200 ft	7	5,250	$36,750
7	Stone Toe	200 ft	6	$5,250	$31,500
8	Stone Toe	200 ft	13	$5,250	$68,250
9	Rock Riffles	n/a	25	$7,500	$187,500
10	Rock Riffles	n/a	52	$6,000	$312,000
11	Rock Riffles	n/a	26	$4,000	$117,00
			TOTAL COST		**$663,500**

APPENDIX A

ANALYSIS OF CROSS SECTION DATA

Stream Stabilization I & E Form

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

County Madison T. 5N R. 5W Sec. 11

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E272659 N4308282

Landowner Name X-sec. 1

Drainage Area 7.67 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 33 ft. Cross Sectional Area 90 sq. ft.

Depth 2.7 ft.

Reference Stream Gage:

Silver Creek near Troy Station No. 05594450 Gage Q_2 3840 cfs

Drainage Area 154 sq.mi Regression (4200 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 10.8 *ft./mi. (user-entered)* Regression Q_2 611 cfs

ft/mi (from worksheet) Rainfall 3.45 in *(2 yr, 24 hr)* Adjusted Q_2 559 cfs

0.0020 *ft./ft.* Regional Factor 1.057 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 37 *ft.* Contour Interval feet

Mean Bankfull Depth 3.35 *ft.* Estimated Sinuosity

Width/Depth Ratio 11.04

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 5.3 *ft.* Surveyed: 0.00197 *ft./ft.* Cross-Section 445 *cfs*

Width at twice max. depth 400 *ft.* Estimated: *ft./ft.* Basic field data 459 *cfs*

(10.6 ft.) Selected Q 465 *cfs*

Entrenchment Ratio 10.81 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: 3.58 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.70 *ft./sec.*

velocities from different sources. Velocity from selected Q: 3.8 *ft./sec.*

Channel Evolution Stage V Stream Type (Rosgen)

Notes

Natural Open Channel Flow

Project:	X-sec. 1	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.001970	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	5.2	*ft*

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

assuming uniform, steady flow

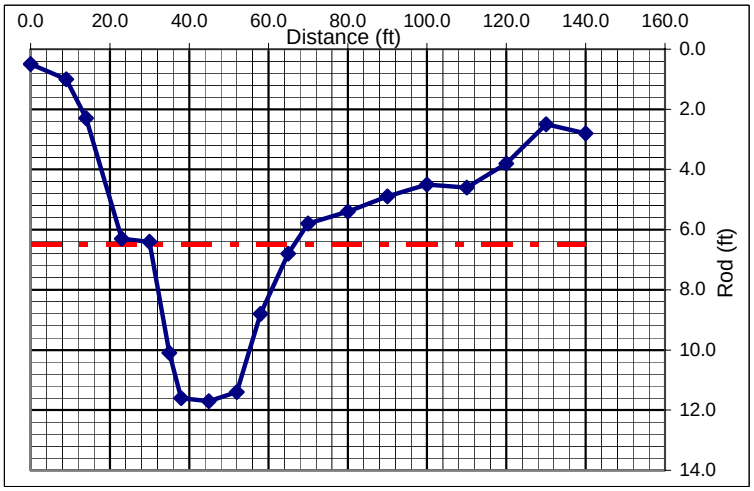
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	5.2 *ft*	9.2	
Channel Flow (***Q***):	444.7 *cfs*	1,605.6	
Channel Velocity:	3.6 *ft/sec*	3.5	
Cross-Sectional Area (***A***):	124.1 *sq.ft.*	453.3	
Hydraulic Radius (***R***):	3.2 *ft*	3.1	

Survey Data:

Rod *(ft)*	Distance *(ft)*
0.5	0.0
1.0	9.0
2.3	14.0
6.3	23.0
6.4	30.0
10.1	35.0
11.6	38.0
11.7	45.0
11.4	52.0
8.80	58
6.80	65
5.80	70
5.40	80
4.90	90
4.50	100
4.6	110
3.8	120
2.5	130
2.8	140



COMMENTS:
Total top Width = 116
Total Depth = 9.2
BKF Depth = 5.3
BKF Width = 37

Stream Stabilization I & E Form

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

County Madison T. 5N R. 5W Sec. 24

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E273595 N4305887

Landowner Name x-sec 2

Drainage Area 11.83 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	39 ft.	Cross Sectional Area	120 sq. ft.
	Depth	3.1 ft.		

Reference Stream Gage:

Silver Creek near Troy	Station No.	05594450	Gage Q_2	3840 cfs
	Drainage Area	154 sq.mi	Regression (	4200 cfs
Madison County, IL		**REFERENCE STREAM DATA ONLY**		

USGS Flood-Peak Discharge Predictions:

Valley Slope:	9.9	*ft./mi. (user-entered)*			Regression Q_2	825 cfs
		ft/mi (from worksheet)	Rainfall	3.45 in *(2 yr, 24 hr)*	Adjusted Q_2	755 cfs
	0.0019	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					300	to 610 cfs

Local Stream Morphology:

Channel Description: (d) Same as (c), but some weeds and stones

Manning's "n" 0.045

Basic Field Data:							
			Stream Length		*ft.*		
			Valley Length		*ft.*		
Bankfull Width	42	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	4.3	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	9.77						
			Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth	6.2	*ft.*	Surveyed:	0.00122	*ft./ft.*	Cross-Section	519 *cfs*
Width at twice max. depth	300	*ft.*	Estimated:		*ft./ft.*	Basic field data	553 *cfs*
(12.4 ft.)						Selected Q	516 *cfs*
Entrenchment Ratio	7.14		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:	2.86	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.06	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.9	*ft./sec.*

Channel Evolution Stage V Stream Type (Rosgen)

Notes

Abundance of woody debris in channel increasing "n" values

Natural Open Channel Flow

Project:	x-sec 2	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.001220	*ft/ft*
Manning's ***n***:	0.045	
Flow Depth:	6.5	*ft*

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

assuming uniform, steady flow

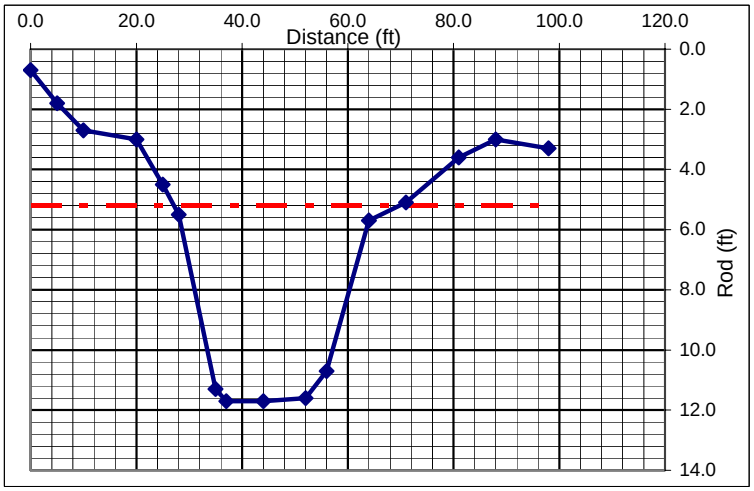
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.5 *ft*	8.7	
Channel Flow (***Q***):	519.2 *cfs*	783.2	
Channel Velocity:	2.9 *ft/sec*	2.6	
Cross-Sectional Area (***A***):	181.5 *sq.ft.*	304.1	
Hydraulic Radius (***R***):	3.9 *ft*	3.3	

Survey Data:

Rod *(ft)*	Distance *(ft)*
0.7	0.0
1.8	5.0
2.7	10.0
3.0	20.0
4.5	25.0
5.5	28.0
11.3	35.0
11.7	37.0
11.7	44.0
11.60	52
10.70	56
5.70	64
5.10	71
3.60	81
3.00	88
3.3	98



COMMENTS:
Total Top Width = 68
Total Depth = 8.7
BKF Depth = 6.2
BKF Width = 39

Stream Stabilization I & E Form

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

County Madison T. 5N R. 5W Sec. 25

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E273921 N4304327

Landowner Name x-sec 3

Drainage Area 15.88 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 44 ft. Cross Sectional Area 147 sq. ft.

Depth 3.3 ft.

Reference Stream Gage:

Silver Creek near Troy Station No. 05594450 Gage Q_2 3840 cfs

Drainage Area 154 sq.mi Regression (4200 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 9.9 *ft./mi. (user-entered)* Regression Q_2 1042 cfs

ft/mi (from worksheet) Rainfall 3.45 in *(2 yr, 24 hr)* Adjusted Q_2 952 cfs

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

380 to 770 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 52 *ft.* Contour Interval feet

Mean Bankfull Depth 4.38 *ft.* Estimated Sinuosity

Width/Depth Ratio 11.87

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 6.4 *ft.* Surveyed: 0.00084 *ft./ft.* Cross-Section 635 *cfs*

Width at twice max. depth 600 *ft.* Estimated: *ft./ft.* Basic field data 659 *cfs*

(12.8 ft.) Selected Q 647 *cfs*

Entrenchment Ratio 11.54 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: 2.79 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 2.89 *ft./sec.*

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

Channel Evolution Stage V Stream Type (Rosgen)

Notes

Natural Open Channel Flow

Project:	x-sec 3	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000840	*ft/ft*
Manning's ***n***:	0.040	
Flow Depth:	6.4	*ft*

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

assuming uniform, steady flow

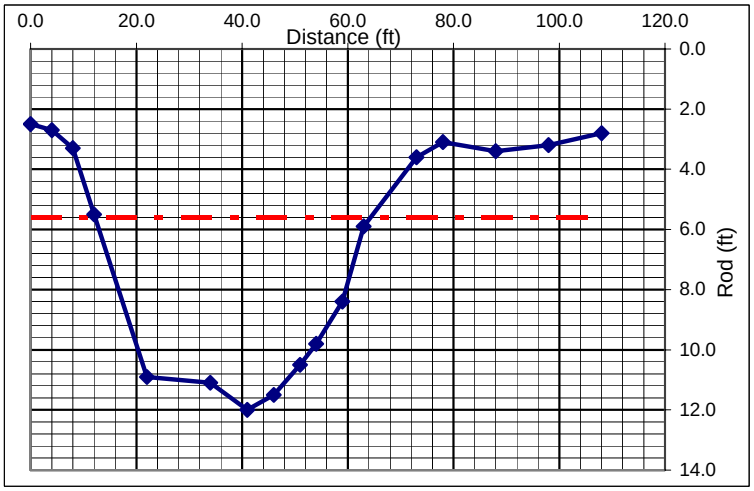
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	6.4 *ft*	9.2	
Channel Flow (***Q***):	634.9 *cfs*	1,088.4	
Channel Velocity:	2.8 *ft/sec*	2.6	
Cross-Sectional Area (***A***):	227.8 *sq.ft.*	411.3	
Hydraulic Radius (***R***):	4.2 *ft*	3.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.5	0.0
2.7	4.0
3.3	8.0
5.5	12.0
10.9	22.0
11.1	34.0
12.0	41.0
11.5	46.0
10.5	51.0
9.80	54
8.40	59
5.90	63
3.60	73
3.10	78
3.40	88
3.2	98
2.8	108



COMMENTS:
Total Top Width =70
Total Depth 8.9
BKF Width = 41
BKF Depth = 6.1

Stream Stabilization I & E Form

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

County Madison T. 5N R. 5W Sec. 26

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E 271553 N4303190

Landowner Name x-sec 4

Drainage Area 20.1 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	48 ft.	Cross Sectional Area	172 sq. ft.
	Depth	3.6 ft.		

Reference Stream Gage:

Silver Creek near Troy	Station No.	05594450	Gage Q_2	3840 cfs
	Drainage Area	154 sq.mi	Regression (	4200 cfs
Madison County, IL		**REFERENCE STREAM DATA ONLY**		

USGS Flood-Peak Discharge Predictions:

Valley Slope:	8.0	*ft./mi. (user-entered)*			Regression Q_2	1134 cfs
		ft/mi (from worksheet)	Rainfall	3.45 in *(2 yr, 24 hr)*	Adjusted Q_2	1037 cfs
	0.0015	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					410	to 830 cfs

Local Stream Morphology:

Channel Description: (b) Same as (a), but more stones and weeds

Manning's "n" 0.035

			Stream Length		*ft.*
Basic Field Data:			Valley Length		*ft.*
Bankfull Width	60	*ft.*	Contour Interval		feet
Mean Bankfull Depth	4.28	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	14.02				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	5.3	*ft.*	Surveyed:	0.0007 *ft./ft.*	Cross-Section 743 *cfs*
Width at twice max. depth	500	*ft.*	Estimated:	*ft./ft.*	Basic field data 763 *cfs*
(10.6 ft.)					Selected Q 753 *cfs*
Entrenchment Ratio	8.33		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:	2.89	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.97	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.9	*ft./sec.*

Channel Evolution Stage II Stream Type (Rosgen)

Notes

Channelized on solid bedrock --no degradation and banks appear stable

Natural Open Channel Flow

Project:	x-sec 4	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000700	*ft/ft*
Manning's ***n***:	0.035	
Flow Depth:	5.3	*ft*

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

assuming uniform, steady flow

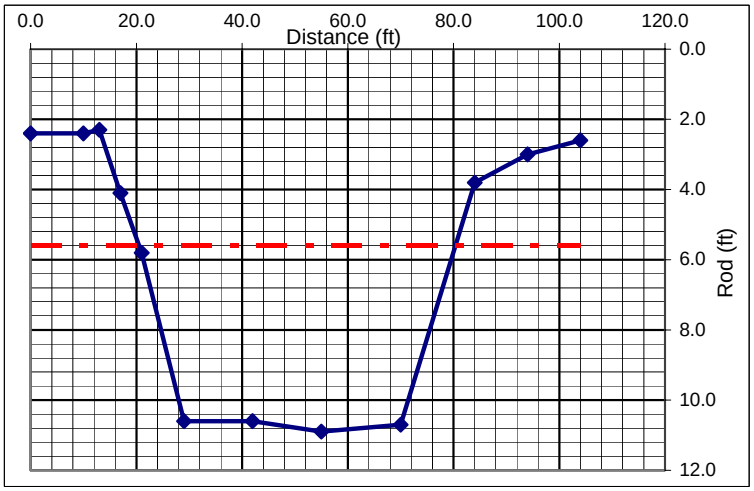
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	5.3 *ft*	8.3	
Channel Flow (***Q***):	742.8 *cfs*	1,515.3	
Channel Velocity:	2.9 *ft/sec*	3.3	
Cross-Sectional Area (***A***):	257.2 *sq.ft.*	464.8	
Hydraulic Radius (***R***):	4.1 *ft*	4.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.4	0.0
2.4	10.0
2.3	13.0
4.1	17.0
5.8	21.0
10.6	29.0
10.6	42.0
10.9	55.0
10.7	70.0
3.80	84
3.00	94
2.60	104



COMMENTS:
Total Top Width = 91
Total Depth = 8.3
BKF Width = 61
BKF Depth = 5.5

Stream Stabilization I & E Form

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

County Madison T. 5N R. 5W Sec. 26

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E271369 N4303234

Landowner Name X-sec 5

Drainage Area 20.38 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	48 ft.	Cross Sectional Area	174 sq. ft.
	Depth	3.6 ft.		

Reference Stream Gage:

Silver Creek near Troy	Station No.	05594450	Gage Q_2	3840 cfs
	Drainage Area	154 sq.mi	Regression (	4200 cfs
Madison County, IL		**REFERENCE STREAM DATA ONLY**		

USGS Flood-Peak Discharge Predictions:

Valley Slope:	8.0	*ft./mi. (user-entered)*			Regression Q_2	1145 cfs
		ft/mi (from worksheet)	Rainfall	3.45 in *(2 yr, 24 hr)*	Adjusted Q_2	1047 cfs
	0.0015	*ft./ft.*	Regional Factor	1.057	Typical Range for Bankfull Discharge:	
					410	to 840 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	5.03	*ft.*	Estimated Sinuosity		
Width/Depth Ratio	11.33				
			Channel Slope:		Bankfull Q from:
Max. Bankfull Depth	8.5	*ft.*	Surveyed:	0.00063 *ft./ft.*	Cross-Section 744 *cfs*
Width at twice max. depth	500	*ft.*	Estimated:	*ft./ft.*	Basic field data 787 *cfs*
(17.0 ft.)					Selected Q 765 *cfs*
Entrenchment Ratio	8.77		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:	2.59	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	2.75	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	2.7	*ft./sec.*

Channel Evolution Stage V Stream Type (Rosgen)

Notes

immediately below bedrock --aggrading and widening--probably some influence of backwater from Silver Lake

Natural Open Channel Flow

Project:	X-sec 5	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000630	*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

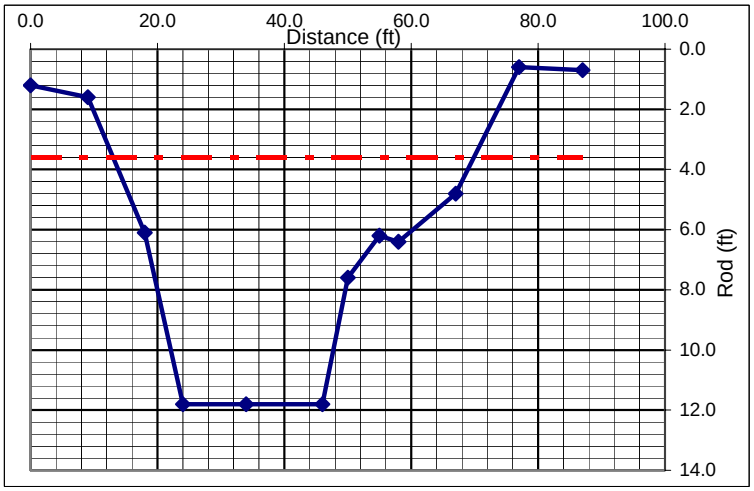
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.2 *ft*	10.6	
Channel Flow (***Q***):	744.5 *cfs*	1,251.0	
Channel Velocity:	2.6 *ft/sec*	2.9	
Cross-Sectional Area (***A***):	287.5 *sq.ft.*	438.2	
Hydraulic Radius (***R***):	4.6 *ft*	5.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
1.2	0.0
1.6	9.0
6.1	18.0
11.8	24.0
11.8	34.0
11.8	46.0
7.6	50.0
6.2	55.0
6.4	58.0
4.80	67
0.60	77
0.70	87



COMMENTS:
Total Top Width = 75
Total Depth = 10.6
BKF Width =58
BKF Depth = 8.5

Stream Stabilization I & E Form

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

County Madison T. 5N R. 5W Sec. 34

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E269743 N4301603

Landowner Name X-sec 6

Drainage Area 36.13 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 60 ft. Cross Sectional Area 256 sq. ft.

Depth 4.2 ft.

Reference Stream Gage:

Silver Creek near Troy Station No. 05594450 Gage Q_2 3840 cfs

Drainage Area 154 sq.mi Regression (4200 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 8.0 *ft./mi. (user-entered)* Regression Q_2 1800 cfs

ft/mi (from worksheet) Rainfall 3.45 in *(2 yr, 24 hr)* Adjusted Q_2 1646 cfs

0.0015 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

650 to 1320 cfs

Local Stream Morphology:

Channel Description: (b) Same as (a), but more stones and weeds

Manning's "n" 0.035

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 65 *ft.* Contour Interval feet

Mean Bankfull Depth 5.8 *ft.* Estimated Sinuosity

Width/Depth Ratio 11.21

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 9.5 *ft.* Surveyed: 0.00063 *ft./ft.* Cross-Section 1251 *cfs*

Width at twice max. depth 800 *ft.* Estimated: *ft./ft.* Basic field data 1301 *cfs*

(19.0 ft.) Selected Q 1276 *cfs*

Entrenchment Ratio 12.31 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: 3.31 *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 VI Stream Type (Rosgen)

Notes

Bedrock in channel bed approx. 3/4 of bottom width--no degradation--definitely influenced by backwater from Silver Lake

Natural Open Channel Flow

Project:	X-sec 6	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000630	*ft/ft*
Manning's ***n***:	0.035	
Flow Depth:	7.8	*ft*

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

assuming uniform, steady flow

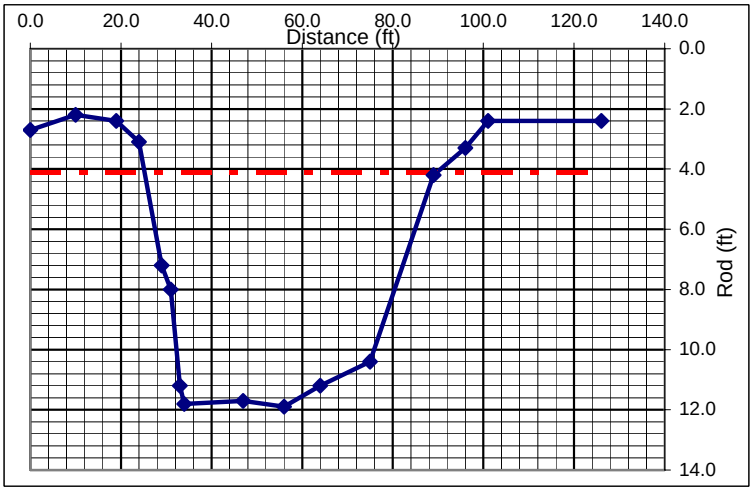
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	7.8 *ft*	9.5	
Channel Flow (***Q***):	1,250.9 *cfs*	1,405.2	
Channel Velocity:	3.3 *ft/sec*	2.8	
Cross-Sectional Area (***A***):	378.1 *sq.ft.*	502.4	
Hydraulic Radius (***R***):	5.5 *ft*	4.3	

Survey Data:

Rod *(ft)*	Distance *(ft)*
2.7	0.0
2.2	10.0
2.4	19.0
3.1	24.0
7.2	29.0
8.0	31.0
11.2	33.0
11.8	34.0
11.7	47.0
11.90	56
11.20	64
10.40	75
4.20	89
3.30	96
2.40	101
2.4	126



COMMENTS:
Total Top Width = 91
Total Depth = 9.5
BKF Width = 64
BKF Depth = 7.7

Stream Stabilization I & E Form

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

County Madison T. 4N R. 6W Sec. 35

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E261918 N4291837

Landowner Name X sec 7

Drainage Area 53.54 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 70 ft. Cross Sectional Area 334 sq. ft.

Depth 4.7 ft.

Reference Stream Gage:

Silver Creek near Troy Station No. 05594450 Gage Q_2 3840 cfs

Drainage Area 154 sq.mi Regression (4200 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 4.8 *ft./mi. (user-entered)* Regression Q_2 1921 cfs

ft/mi (from worksheet) Rainfall 3.45 in *(2 yr, 24 hr)* Adjusted Q_2 1756 cfs

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

700 to 1410 cfs

Local Stream Morphology:

Channel Description: (b) Same as (a), but more stones and weeds

Manning's "n" 0.035

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 48 *ft.* Contour Interval feet

Mean Bankfull Depth 5.8 *ft.* Estimated Sinuosity

Width/Depth Ratio 8.28

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 7 *ft.* Surveyed: 0.00043 *ft./ft.* Cross-Section 732 *cfs*

Width at twice max. depth 1500 *ft.* Estimated: *ft./ft.* Basic field data 794 *cfs*

(14.0 ft.) Selected Q 763 *cfs*

Entrenchment Ratio 31.25 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: 2.85 *ft./sec.*

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

Channel Evolution Stage I Stream Type (Rosgen) E6

Notes

Natural Open Channel Flow

Project:	X sec 7	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000430	*ft/ft*
Manning's ***n***:	0.035	
Flow Depth:	7.0	*ft*

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

assuming uniform, steady flow

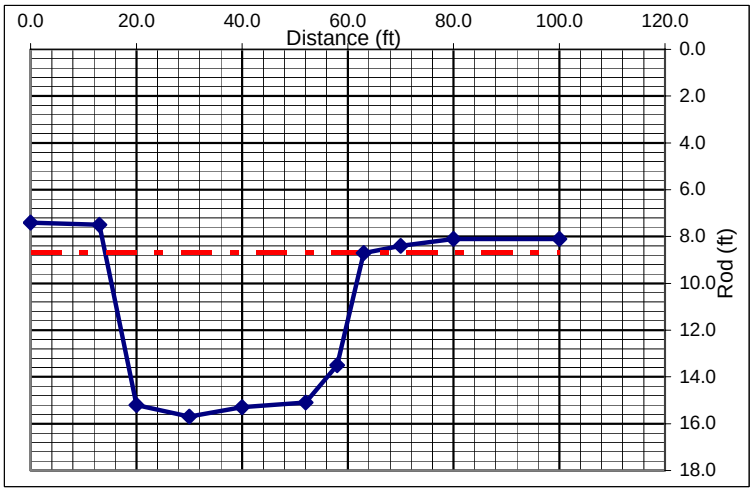
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	7.0 *ft*		
Channel Flow (***Q***):	731.5 *cfs*		
Channel Velocity:	2.6 *ft/sec*		
Cross-Sectional Area (***A***):	278.3 *sq.ft.*		
Hydraulic Radius (***R***):	5.2 *ft*		

Survey Data:

Rod *(ft)*	Distance *(ft)*
7.4	0.0
7.5	13.0
15.2	20.0
15.7	30.0
15.3	40.0
15.1	52.0
13.5	58.0
8.7	63.0
8.4	70.0
8.10	80
8.10	100



COMMENTS:
Md = 7.0
Td = 7.6
Mw = 48
Tw = 67

Stream Stabilization I & E Form

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

County Madison T. 3N R. 6W Sec. 3

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E259758 N4291209

Landowner Name X-sec 8

Drainage Area 57.97 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 73 ft. Cross Sectional Area 353 sq. ft.

Depth 4.9 ft.

Reference Stream Gage:

Silver Creek near Troy Station No. 05594450 Gage Q_2 3840 cfs

Drainage Area 154 sq.mi Regression (4200 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 4.8 *ft./mi. (user-entered)* Regression Q_2 2045 cfs

ft/mi (from worksheet) Rainfall 3.45 in *(2 yr, 24 hr)* Adjusted Q_2 1870 cfs

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

740 to 1500 cfs

Local Stream Morphology:

Channel Description: (b) Same as (a), but more stones and weeds

Manning's "n" 0.035

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 38 *ft.* Contour Interval feet

Mean Bankfull Depth 6.63 *ft.* Estimated Sinuosity

Width/Depth Ratio 5.73

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 8.1 *ft.* Surveyed: 0.00047 *ft./ft.* Cross-Section 693 *cfs*

Width at twice max. depth 1500 *ft.* Estimated: *ft./ft.* Basic field data 821 *cfs*

(16.2 ft.) Selected Q 757 *cfs*

Entrenchment Ratio 39.47 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: 2.75 *ft./sec.*

GOAL: Develop confidence by matching Velocity from basic field data: 3.26 *ft./sec.*

velocities from different sources. Velocity from selected Q: 3.0 *ft./sec.*

Channel Evolution Stage I Stream Type (Rosgen) E6

Notes

Natural Open Channel Flow

Project:	X-sec 8	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000470	*ft/ft*
Manning's ***n***:	0.035	
Flow Depth:	8.1	*ft*

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

assuming uniform, steady flow

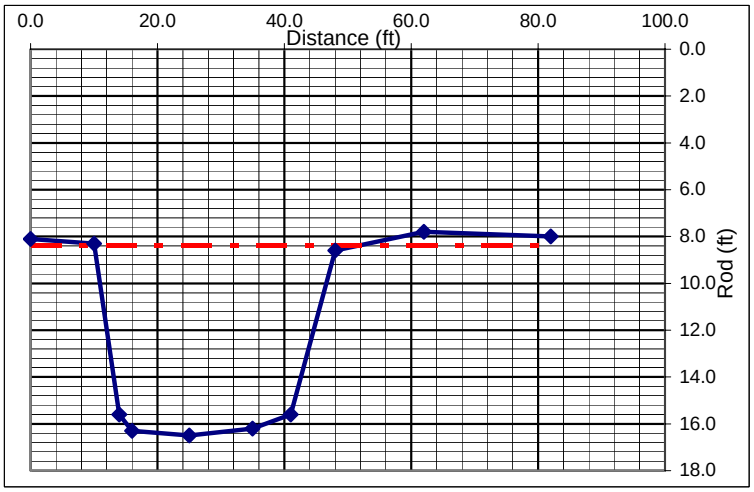
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	8.1 *ft*	8.4	
Channel Flow (***Q***):	693.5 *cfs*	633.1	
Channel Velocity:	2.8 *ft/sec*	2.4	
Cross-Sectional Area (***A***):	252.1 *sq.ft.*	266.3	
Hydraulic Radius (***R***):	5.2 *ft*	4.2	

Survey Data:

Rod *(ft)*	Distance *(ft)*
8.1	0.0
8.3	10.0
15.6	14.0
16.3	16.0
16.5	25.0
16.2	35.0
15.6	41.0
8.6	48.0
7.8	62.0
8.00	82



COMMENTS:
Md= 8.1
Td = 8.4
Mw = 38
Tw = 48

Stream Stabilization I & E Form

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

County Madison T. 3N R. 6W Sec. 5

Date 8/25/2005 By Wayne Kinney

Stream Name East Fork Silver Creek UTM Coord. E256960 N4290596

Landowner Name X-sec 9

Drainage Area 91.9 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions Width 87 ft. Cross Sectional Area 482 sq. ft.

Depth 5.6 ft.

Reference Stream Gage:

Silver Creek near Troy Station No. 05594450 Gage Q_2 3840 cfs

Drainage Area 154 sq.mi Regression (4200 cfs

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

USGS Flood-Peak Discharge Predictions:

Valley Slope: 4.1 *ft./mi. (user-entered)* Regression Q_2 2728 cfs

ft/mi (from worksheet) Rainfall 3.45 in *(2 yr, 24 hr)* Adjusted Q_2 2495 cfs

0.0008 *ft./ft.* Regional Factor 1.057 Typical Range for Bankfull Discharge:

990 to 2000 cfs

Local Stream Morphology:

Channel Description: (b) Same as (a), but more stones and weeds

Manning's "n" 0.035

Stream Length *ft.*

Basic Field Data: Valley Length *ft.*

Bankfull Width 52 *ft.* Contour Interval feet

Mean Bankfull Depth 7.9 *ft.* Estimated Sinuosity

Width/Depth Ratio 6.58

Channel Slope: Bankfull Q from:

Max. Bankfull Depth 9.8 *ft.* Surveyed: 0.00031 *ft./ft.* Cross-Section 1055 *cfs*

Width at twice max. depth 1500 *ft.* Estimated: *ft./ft.* Basic field data 1222 *cfs*

(19.6 ft.) Selected Q 1139 *cfs*

Entrenchment Ratio 28.85 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: 2.57 *ft./sec.*

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

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

Channel Evolution Stage I Stream Type (Rosgen) E6

Notes

Natural Open Channel Flow

Project:	X-sec 9	
Assisted by:	Wayne Kinney	
Date:	8/25/2005	
Channel Slope (***S***):	0.000310	*ft/ft*
Manning's ***n***:	0.035	
Flow Depth:	9.8	*ft*

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

assuming uniform, steady flow

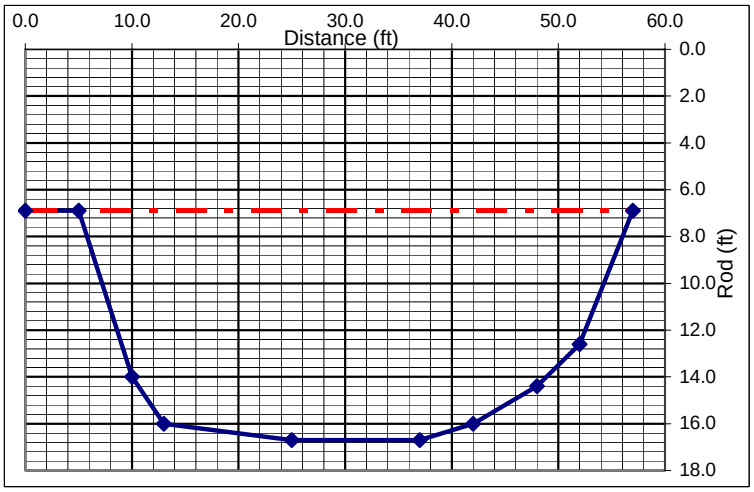
back to I&E form

Clear Cells

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	9.8 *ft*		
Channel Flow (***Q***):	1,054.5 *cfs*		
Channel Velocity:	2.6 *ft/sec*		
Cross-Sectional Area (***A***):	410.8 *sq.ft.*		
Hydraulic Radius (***R***):	6.4 *ft*		

Survey Data:

Rod *(ft)*	Distance *(ft)*
6.9	0.0
6.9	5.0
14.0	10.0
16.0	13.0
16.7	25.0
16.7	37.0
16.0	42.0
14.4	48.0
12.6	52.0
6.90	57



COMMENTS:
Md= 9.8
Td = 9.8
Mw=52
Tw=52