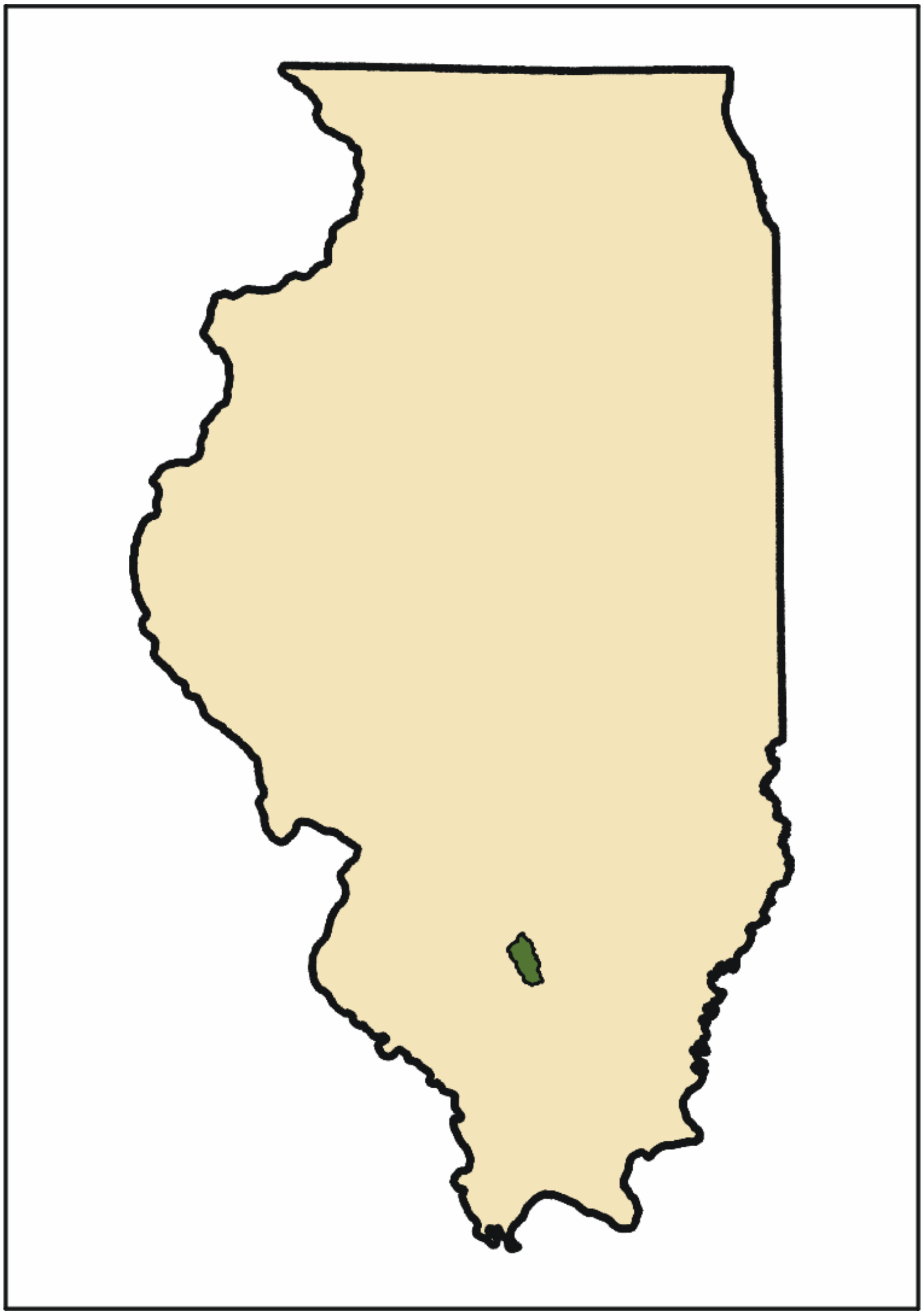


AERIAL ASSESSMENT OF RAYSE CREEK
JEFFERSON AND WASHINGTON COUNTIES
February, 2005
Prepared by Wayne Kinney for IL. Dept. Of Agriculture

In September 2003, Montgomery Watson Harza Inc., (MWH) prepared a Rayse Creek TMDL and Implementation Plan for the Illinois Environmental Protection Agency. This report lists phosphorus and siltation as the causes of impairment in Rayse Creek segment ILNK01, which begins at the confluence of Novak Creek and extends downstream to the confluence of Rayse Creek and the Big Muddy River. Rayse Creek segment ILNK02, upstream from Novak Creek to the headwaters, was found to be fully supporting its designated uses and therefore does not require a TMDL.

Segment ILNK01 is approximately 13 miles in length and ILNK02 is approx. 16 miles long. USGS Gage #05595730 near Waltonville is located on ILNK01 approx. 5.1 miles above the confluence with the Big Muddy. The gage is located on the Rayse Creek bridge at County Road 600E and has continuous records from 1980 to the present. The "Annual Maximum Peak Discharge" measurements (Fig. 3) from this record have been analyzed and used to determine a return frequency discharge curve at this site (Fig. 4) and used as a benchmark for flow estimates throughout the watershed.

Assessment Procedure

Low level geo-referenced video was taken of Rayse 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 near the upper end of ILNK02 where the stream size and vegetative cover allowed the capture of useful video images and proceeded downstream along the main channel until reaching backwater area of Rend Lake. 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. 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.

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. 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”.

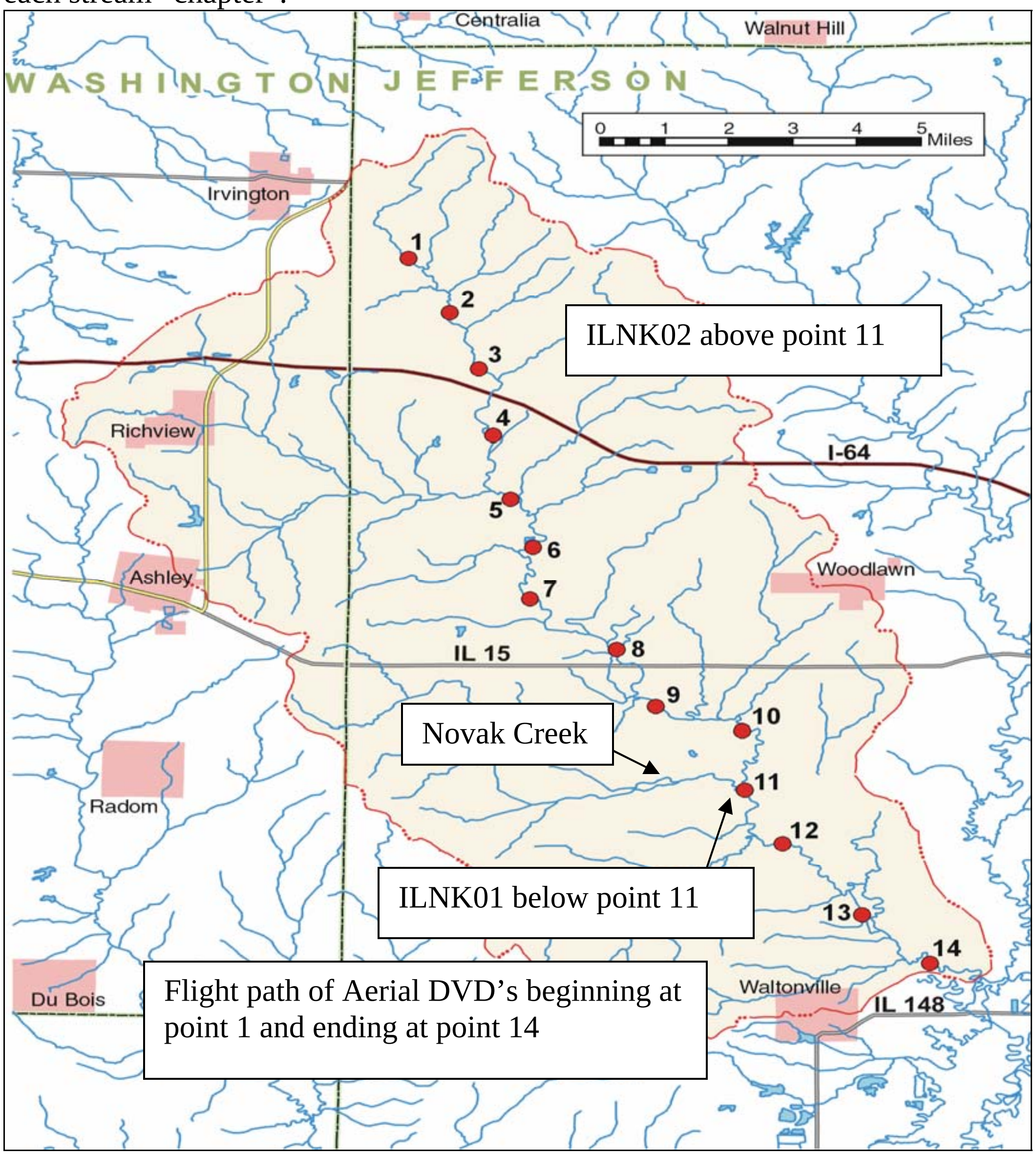


Figure 1. On DVD and Maps actual chapters will begin at 2 and end with 15.

General Observations from Assessment

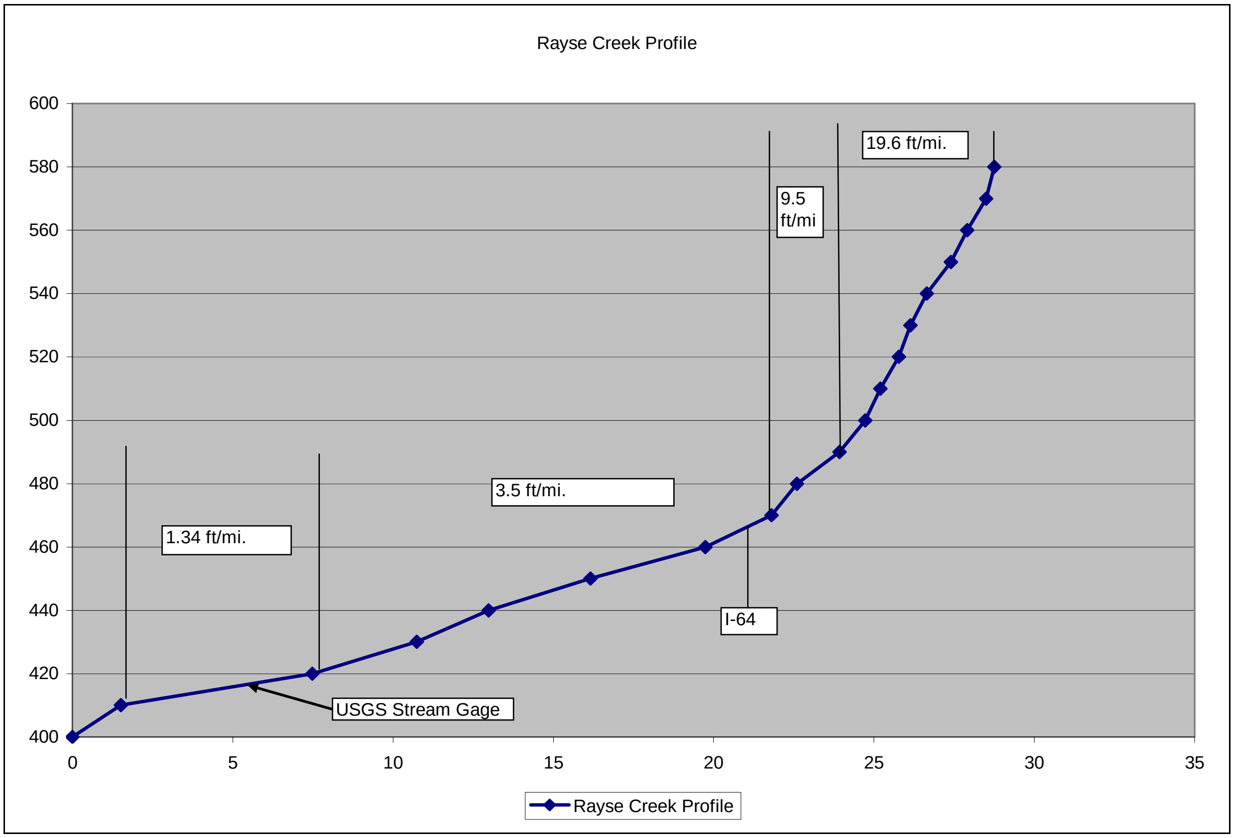


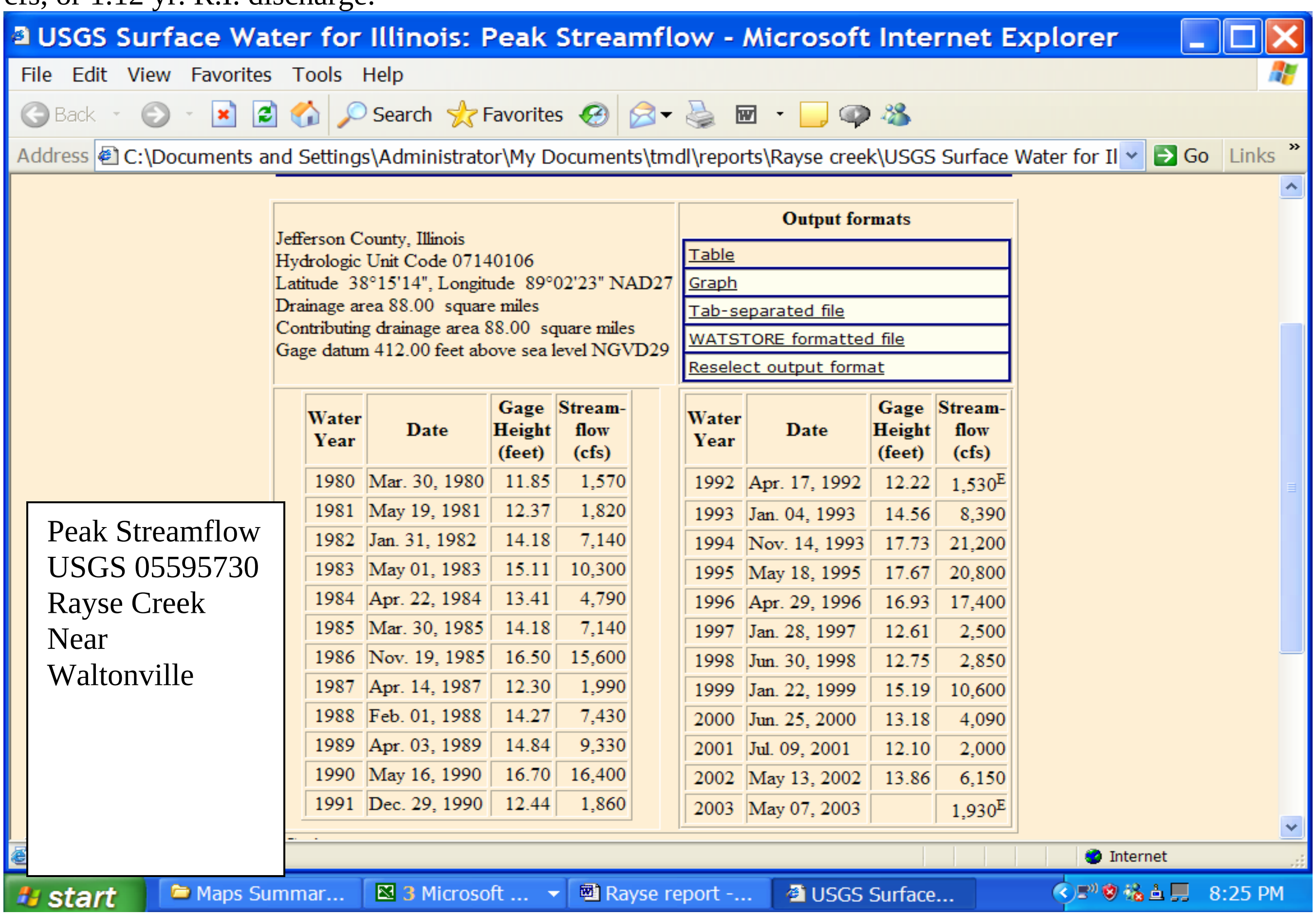
Figure 2

Rayse Creek empties into the Big Muddy at Rend Lake at approx. 400MSL and has a gradient of 1.34 to 3.5 ft/mi. on the lower 22 miles of channel. There is then a significant grade change near elevation 470 just above Interstate 64 going from 3.5 ft/mi. to 9.5 ft/mi. Then near elevation 490 the gradient again increases from 9.5 ft/mi. to 19.6 ft/mi. and remains uniform for 4.5 miles to the headwaters. While there are approx. 29 miles of stream, only about 25 miles of video was taken. Figure 1 shows the portion video taped. The major stream features identified from the DVD in this 25 mile reach are:

Break Points --- 79 total (33 in Chapters 2 thru 4)
Logjams -------- 47 total (26 in Chapter 4 thru 8, with minimum of 1 in every chapter)
Geotech Failure—32 (16 in Chapter 4 thru 8)
Erosion Sites –307 (more or less uniformly distributed through all chapters)

With over 40% of the breakpoints in the upper three chapters and 55% of the logjams and 50% of the geotechnical failures in the next 4 chapters downstream (Ch. 4-8) the data was thought to suggest that Rayse Creek may be experiencing incision with the major degradation having advanced as far upstream as chapter 4. This assumption made prior to "ground truthing" was based on the processes described by the Channel Evolution Model (CEM) that predicts increased bank failure and widening as the bank heights increase due to incision. Ground investigation has determined that incision however is not the primary reason for geotech failures and logjams, although some incision may be occurring. The erosion sites, being more uniformly distributed, suggest that the entire stream is undergoing some channel adjustment and few if any reaches should be considered stable. With 307 eroding bank sites identified in approx. 25 miles of stream channel the average is about 12 sites per mile or one site every 440 feet. Changes in flow regime due to land use changes or increased velocity due to channel modifications could also result in the type of system wide failures observed in Rayse Creek and may be the primary reason for the observed channel adjustments. This conclusion is based the ‘ground truthing” data presented below.

Typical streams near equilibrium have been found to experience out of bank flows on a 1 to 3 yr. frequency (Leopold). The limited data from personal experience has found Illinois streams generally have return intervals of 1 to 2 yrs. at the “channel forming” or “bankfull” discharge. Because accurate flow data for Rayse Creek is available from 20+ years of USGS gage data the 1 to 2 year return interval storm discharge can be calculated and used in assessing the degree of incision.
Figure 4 is a frequency analysis of Rayse Creek using the Maximum Annual Peak Discharges from the USGS gage showing that the 1.5 yr. R.I. event produces 4500 cfs while the channel capacity at cross section 8, approx. 400 ft. below the gage, is only 2068 cfs, or 1.12 yr. R.I. discharge.



Jefferson County, Illinois
Hydrologic Unit Code 07140106
Latitude 38°15'14", Longitude 89°02'23" NAD27
Drainage area 88.00 square miles
Contributing drainage area 88.00 square miles
Gage datum 412.00 feet above sea level NGVD29

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1980	Mar. 30, 1980	11.85	1,570
1981	May 19, 1981	12.37	1,820
1982	Jan. 31, 1982	14.18	7,140
1983	May 01, 1983	15.11	10,300
1984	Apr. 22, 1984	13.41	4,790
1985	Mar. 30, 1985	14.18	7,140
1986	Nov. 19, 1985	16.50	15,600
1987	Apr. 14, 1987	12.30	1,990
1988	Feb. 01, 1988	14.27	7,430
1989	Apr. 03, 1989	14.84	9,330
1990	May 16, 1990	16.70	16,400
1991	Dec. 29, 1990	12.44	1,860

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1992	Apr. 17, 1992	12.22	1,530^E
1993	Jan. 04, 1993	14.56	8,390
1994	Nov. 14, 1993	17.73	21,200
1995	May 18, 1995	17.67	20,800
1996	Apr. 29, 1996	16.93	17,400
1997	Jan. 28, 1997	12.61	2,500
1998	Jun. 30, 1998	12.75	2,850
1999	Jan. 22, 1999	15.19	10,600
2000	Jun. 25, 2000	13.18	4,090
2001	Jul. 09, 2001	12.10	2,000
2002	May 13, 2002	13.86	6,150
2003	May 07, 2003		1,930^E

Peak Streamflow
USGS 05595730
Rayse Creek
Near
Waltonville

Figure 3

The frequency analysis, at the USGS gage, shows that the channel overflows onto the floodplain at 2068 CFS which is below the 1.5 yr. R.I. that is often taken as the "assumed" channel forming discharge. This R.I. is consistent with other data from USGS gage sites in Southern Illinois. The data therefore does not support the assumption that Rayse Creek has incised at the USGS gage site. With 88 sq. miles of drainage area at the gage this represents 23.5 cfs per sq. mile of drainage area. For this analysis 23.5 cfs/sq. mi. will be assumed to be the lowest discharge allowable with higher values permitted as the drainage area decreases and the gradient increases upstream.

The cross sections located along the study reach were then analyzed for discharge, velocity, width, depth, etc. coupled with the existing flow records to determine if incision has occurred at other locations. By carefully selecting these sites at riffle locations the data gathered can be used to represent conditions found throughout Rayse Creek. Table 1 shows discharge rates that are over twice that value in the upper end of the watershed and then drop significantly until at cross section 4 (just above Rte. 15) the value reaches the gage value and then remains nearly constant at the remaining cross sections. The summary of the cross sections taken (Table 1) along with Figure 5 showing the comparisons of the "bankfull dimensions" with the "total channel" dimensions confirm that Rayse Creek has not incised significantly if at all, at least below Rte. 15.

The absence of incision is impacted by the intermittent presence of a shale bed. Other elements that may be limiting incision are the presence of large woody debris forming temporary grade controls and the 47 logjams found in the channel.

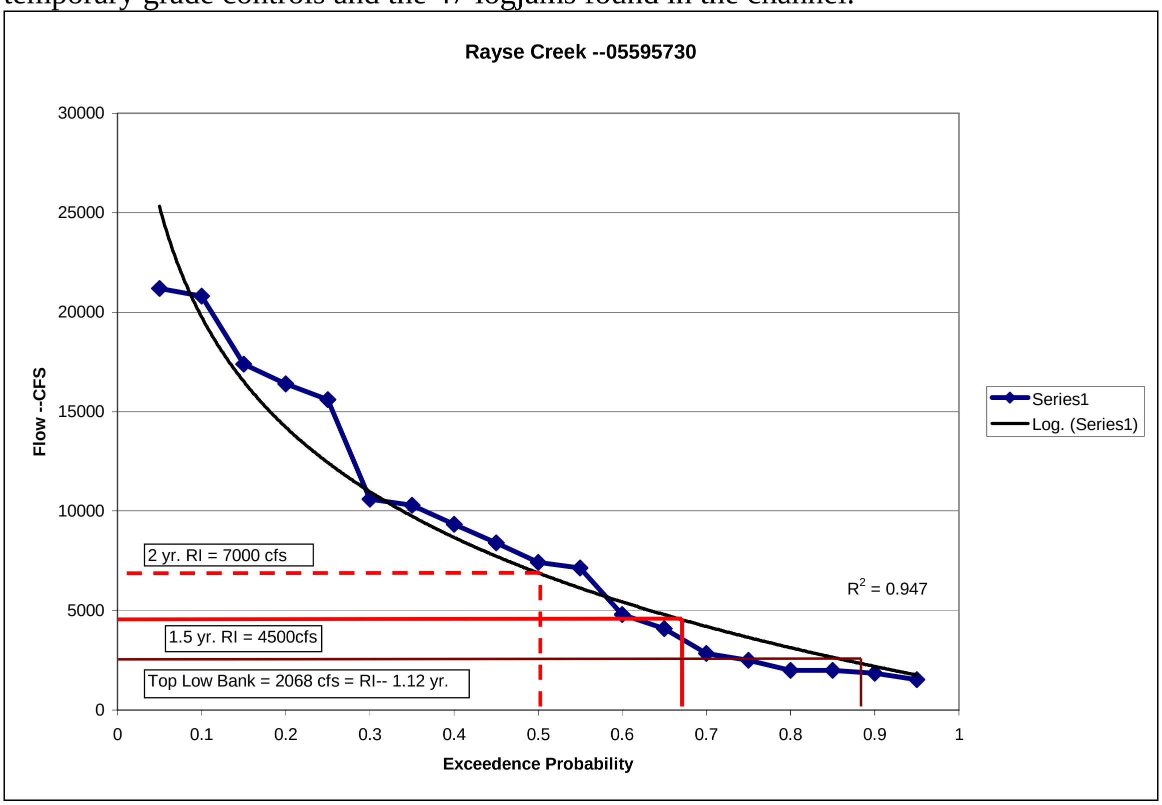


Figure 4

With the very numerous erosion sites contributing significant sediment, it should be noted that there is very little “point bar” development in Rayse Creek. The absence of point bars indicates that the sediment produced is being carried in suspension through Rayse Creek all the way to the backwater area of Rend Lake. The soils in this watershed are predominantly silt loams and silty clay loams producing very fine silts and clays that are easily transported and do not tend to contribute to large point bar formations.

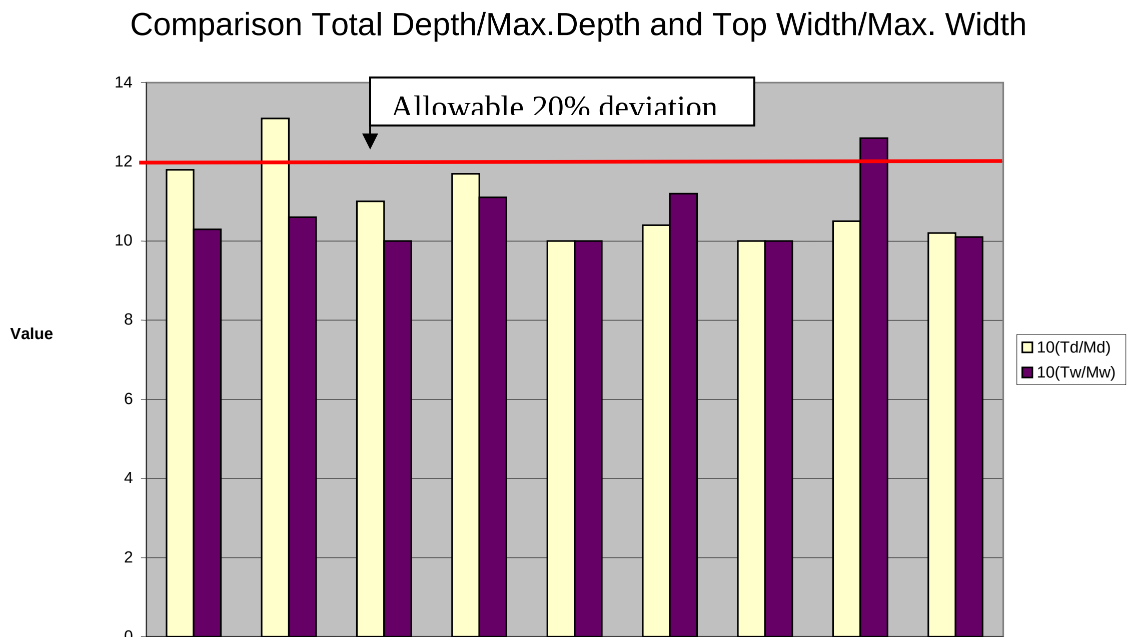
RAYSE CREEK

Table 1. Cross Section Data from NRCS Streambank Inventory and Evaluation Procedures

X-Sec	Easting	Northing	ADA Sq. Mi.	Valley Slope ft/mi.	Q2 CFS	**B**ankfull CFS	**W**idth (BKF) ft.	Mean Depth Ft.	W/D	Velocity Ft/sec.	Bedload In. Dia.	CEM (Simon)	cfs/sq. mi.
1	315066	4251556	8.79	15.1	717	500	30	4.56	6.68	3.7	2	2	56.9
2	315607	4250387	12.29	14.9	929	621	33	3.82	8.64	4.9	2	2	50.5
3	316364	2425913	43.14	11.7	2230	1296	74	5.8	12.8	3	<1	5	30.1
4	317857	4242034	53.28	7.3	2100	1247	54	6.9	7.83	3.3	<1	2	23.4
4A	318444	4240743	56	6.5	2066	1344	56	6.52	8.59	3.7	<1	1	24
5	319436	4240329	59.58	6.5	2169	1559	52	7.49	6.94	4	<1	2	26.2
6	320288	4237092	78.92	5.5	2499	1770	57	7.62	7.48	4.1	<1	1	22.4
7	321310	4236268	87.8	5.5	2719	2062	57	8.37	6.81	4.3	<1	1	23.5
8	321518	4235954	88	5.5	2724	2068	69	7.47	9.24	4	<1	1	23.5

The detailed cross section data for each location is presented in Appendix A comparing values with Regional Curve Data and USGS Flood Peak Discharge Predictions from regional regression analysis.

The cross section data has also been analyzed by comparing the “maximum depth” (Md) of flow at the calculated “bankfull discharge” with the “total depth” (Td) of the channel at the floodplain elevation. Along with this comparison the “maximum width” (Mw) of flow is related to the “total width” (Tw) of the channel at the floodplain elevation. Under “equilibrium conditions” these values would be equal where Td = Md and Tw = Mw. The comparison of these values provides another way to express the degree of incision in a channel and provides some guide to the current CEM stage. A variation of 20% is allowed for field error in determining the bankfull discharge from field indicators. Fig. 5 shows this comparison of values, multiplied by 10, to be within the 20% allowable range with only two minor exceptions.



	1	2	3	4	5	6	7	8	9
10(Td/Md)	11.8	13.1	11	11.7	10	10.4	10	10.5	10.2
10(Tw/Mw)	10.3	10.6	10	11.1	10	11.2	10	12.6	10.1

Cross Section

Figure 5

Legend for Figure 5.
Td = Total depth from lowest point in cross section to top bank (floodplain)
Md = Maximum depth at “bankfull elevation” or “channel forming discharge”
Tw = Top width at the floodplain elevation
Mw = Width of channel at “bankfull elevation”
Values below Red Line @ value of 12 represent a channel well connected to its floodplain.

Conclusions

1. Rayse Creek is undergoing a systemwide adjustment to channel geometry and dimension that does not appear to be driven by incision.
2. The lack of incision is probably due to the natural grade control provided by a combination of periodic exposure of shale in the channel bed, low water stream crossings and large deposits of woody debris.
3. The current erosion and resulting channel widening appears to be a relatively recent development as the data indicates the channel has not over widened and the riparian corridor is dominated by mature timber on both sides of the channel which could only develop on a relatively stable channel.
4. Explanations for the channel adjustments underway are not well defined. Possible explanations are:
    a. Changes in flow regime from land use changes, climatic changes, etc. resulting in larger peak flows causing the channel to enlarge as it adjusts to higher flows.
    b. Several major channelized reaches are evident that may have increased the

gradient and velocity in the lower reaches enough to impact stability. However historic aerial photography suggests these were made over 50 years ago and any impact would have likely been seen much earlier.

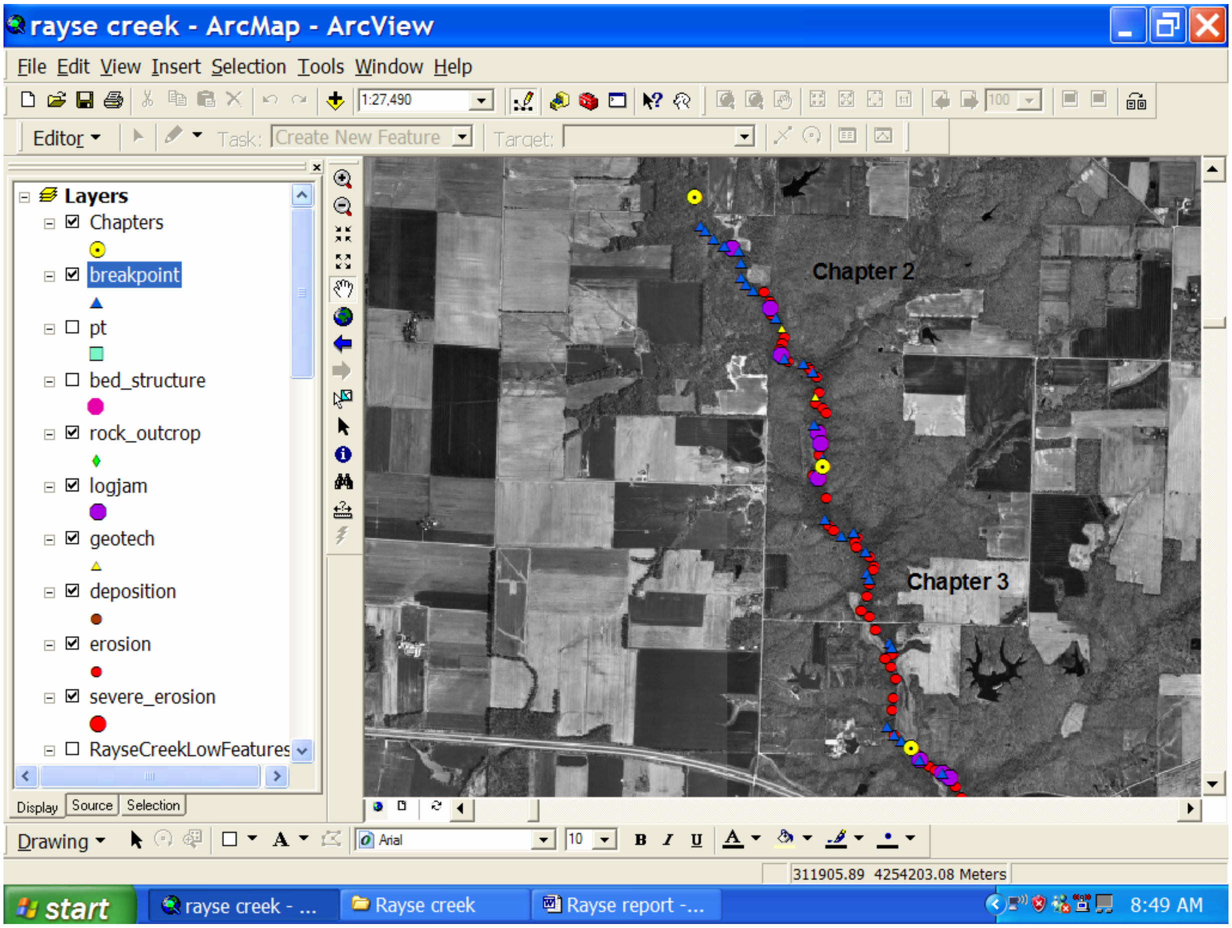
   c. The three highest peak flows recorded since the USGS gage was installed in 1980 came in successive years in 1994, 1995 and 1996. These three years of extreme flooding could have crossed a threshold of stability triggering a period of rapid adjustment to latent changes that had been building for years.
   d. The observed results could also be the result of a combination of any two or three of the previous explanations.

5. Rayse Creek is very efficient at transporting sediment within the channel. There are no areas of significant bar development or large areas of deposition. This is due partially to the fine sediments available for transport and limited availability of coarser material. The small Width/Depth ratio's of 10 or less also make very efficient channels to transport sediment. Therefore a very large percentage of the sediment reaching Rayse Creek can be expected to be transported from ILNK02 thru ILNK01 and appears to be transported all the way into Rend Lake.
6. The TMDL standards for phosphorus and siltation in ILNK01 will continue to be impacted by the channel erosion found throughout the study reach until the ongoing channel adjustments are complete and Rayse Creek reaches a new equilibrium. While there is no significant incision at this time, the shale, woody debris, etc. may not provide long term bed stability. Since any future or ongoing incision would only prolong and increase the magnitude of these channel adjustments it is recommended that Rock Riffle Grade Controls should be considered in some stream segments to prevent incision.
7. The aerial assessment and ground truthing is insufficient to make specific recommendations for Rayse Creek. Additional data needs to be collected and analyzed to determine the specific treatment recommendations for Rayse Creek. The first need is for a channel profile survey and additional cross section data to determine the need for and location and design of future grade control structures and/or bank stabilization. As part of the design and construction recommendations, more detailed assessment of the causes of the systemwide channel instability is an urgent need.
8. Because of the remaining uncertainty of the root causes of the erosion in Rayse Creek, the
   detailed chapter recommendations for action must be very general in nature.

Recommendations for Action

Chapter 2 and 3

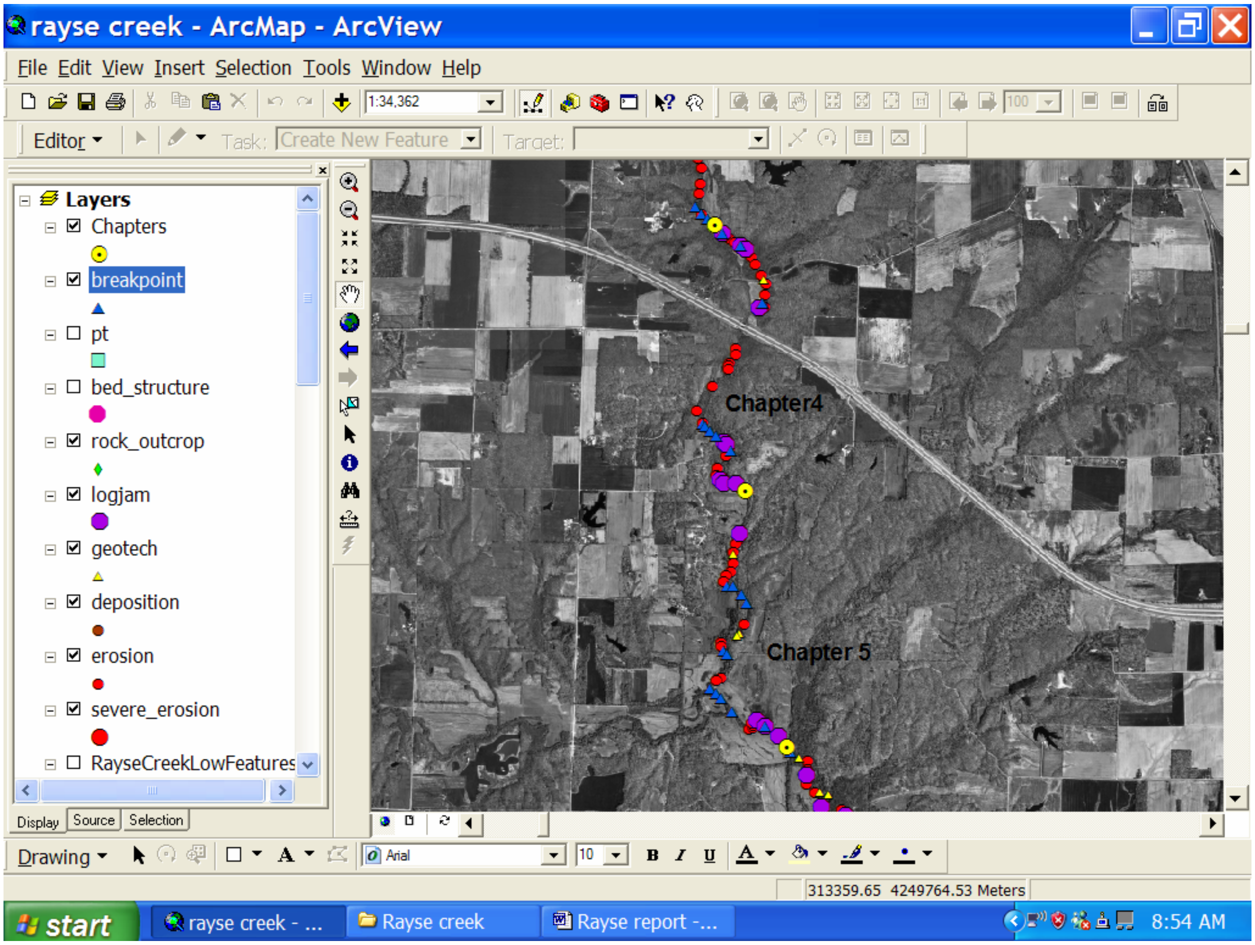
These chapters are above Interstate 64 and have a gradient of 19.6 ft./mi. and show some minor incision. Cross section #1 is located at 13:24 on DVD disc 1. The incision in this reach has been controlled primarily by the presence of shale in many locations, although the shale when exposed weathers rapidly and should be expected to continue to degrade over time, although at a rather slow rate. These reaches are located in mature timber areas, however the lateral migration is severe and many break points identified in these reaches are due to woody debris from the failing banks causing temporary grade control.



Even though there is severe lateral migration in these chapters, the extent of the treatment needs makes an economically feasible solution very doubtful. Use of Rock Riffle grade control and Stone Toe Protection (STP) could be effective in these reaches, but no treatment recommendations are suggested at this time. Treatment should be directed instead to the lateral tributaries of the headwaters to control gully advancement and possibly reduce peak flows.

Chapter 4 and 5

Chapter 4 is the transition area where the gradient flattens from 19.6 ft./mi. to only 3.5 ft/mi. Cross section #2 is located at 16:09 on DVD disc1. With the severe lateral migration occurring just upstream this would likely be a zone where deposition would be evident, however no deposition in the channel or point bars is observed indicating that the sediment transport capacity is sufficient to continue to move the sediment downstream.



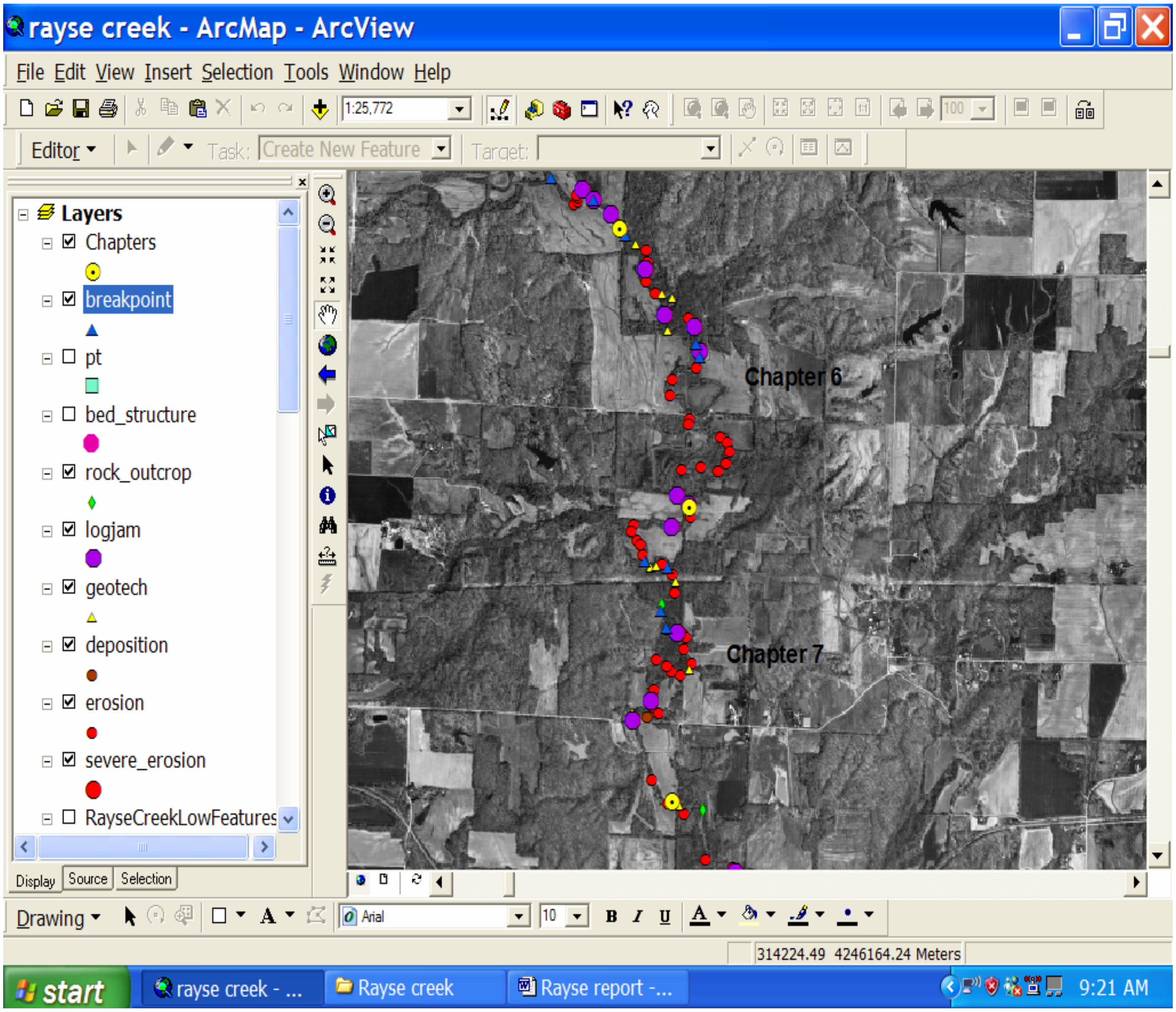
The lateral migration appears to be somewhat less severe in these chapters however there are twelve locations where the woody debris has accumulated in the channel causing a logjam and many more mature trees are being undercut which will continue to add to the debris accumulations. There continues to be numerous grade breaks in these chapters, many of which are again due to the woody debris jams.

In the lower portion of Chapter 5 the land use begins to intensify and numerous crop fields begin to narrow the woody riparian zone.

Treatment recommendations are the same as for Chapters 2 and 3.

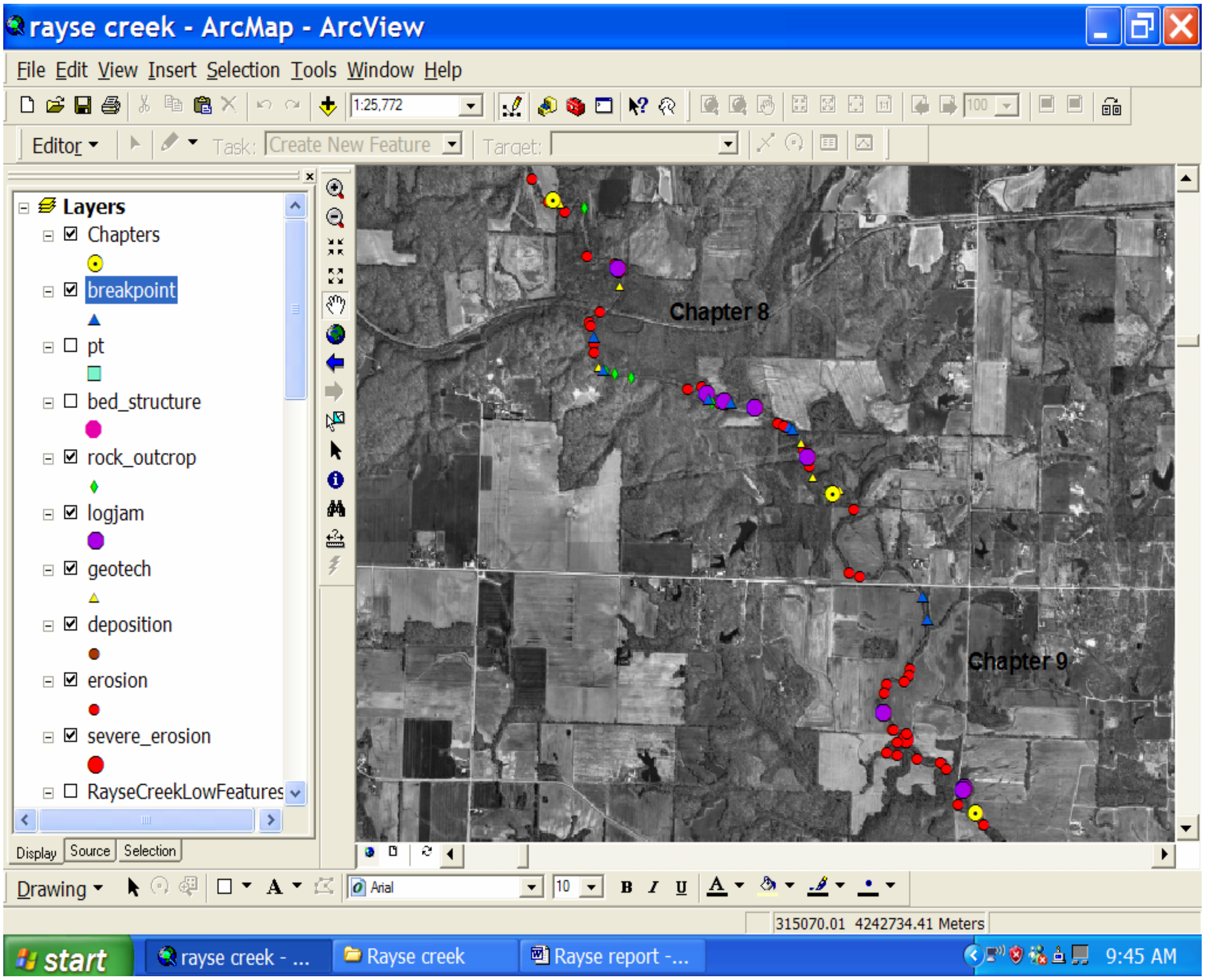
Chapter 6 and 7

These chapters continue to have moderate to severe lateral bank migration with very deep scalloping along the banks. Cross section #3 is located at 28:41 on DVD disc1. At 28:04 on DVD Disc 1 there is a road crossing on County Road 1500 that has been flanked and washed out. Repair of this crossing is an opportunity to continue to provide a measure of grade control by designing and constructing a Rock Riffle at this location with a road crossing above it.



Chapters 8 and 9

These chapters do not differ significantly from previous chapters. Cross section #4 is located at 6:08 on DVD disc2 and Cross section #4A is located at 9:56 on DVD disc2. No recommendations for treatment at this time.



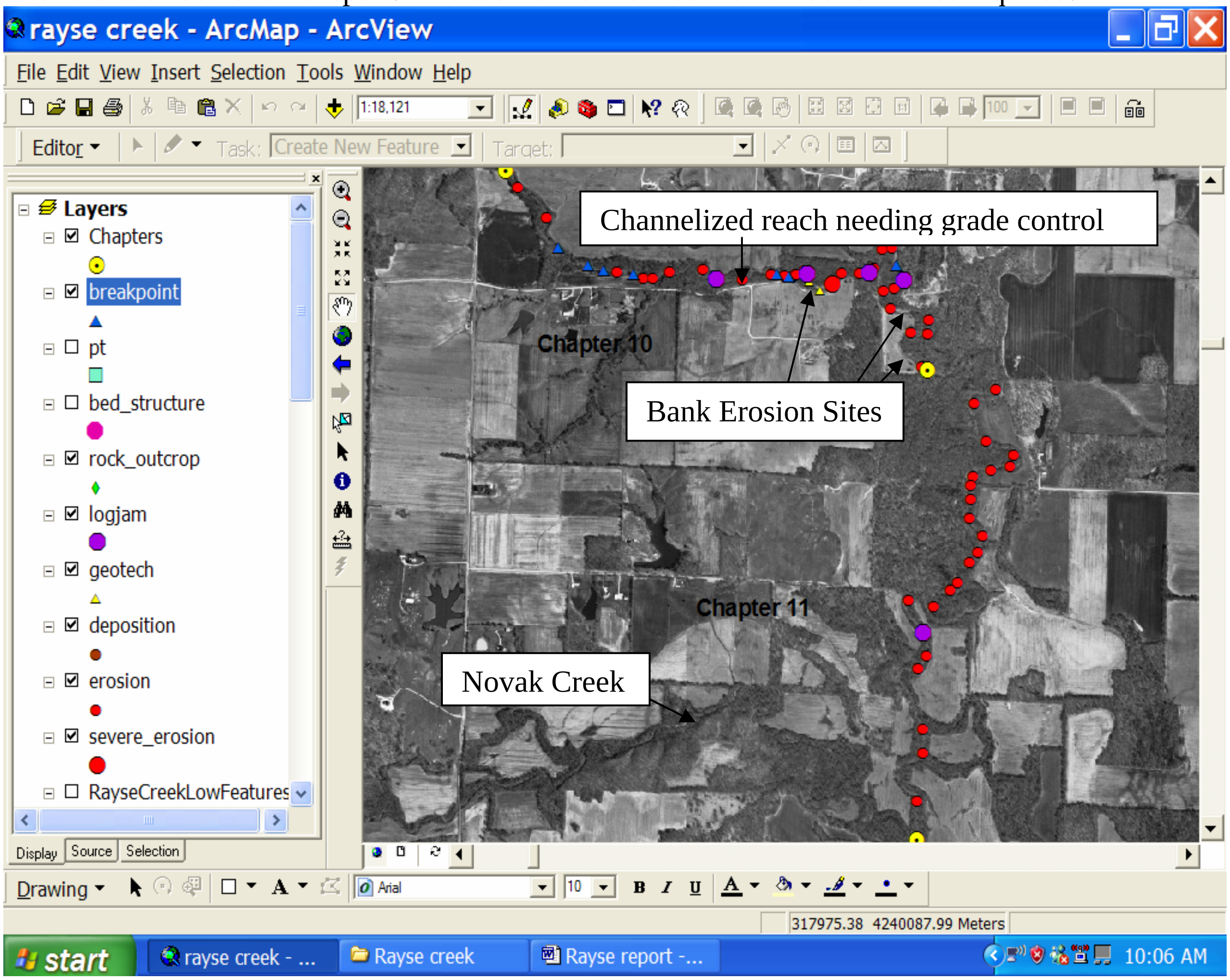
Chapters 10 and 11

These chapters represent the area just above the TMDL segment ILNK01 and are the first segments in this study for which a treatment recommendation is warranted. Cross section #5 is located at 11:54 on DVD disc2. This cross section in Chapter 10 is in a straightened section of Rayse Creek and shows strong evidence of degradation, even though the hydraulic analysis indicates only 0.5 ft. incision. The presence of residual clay material in the riffle sections strongly suggests that the bed is not stable in this reach and more incision is anticipated. There are seven break points in Chapter 10 that appear to be actively downcutting. This is certainly a knickzone that will advance upstream without treatment. Chapter 11 is located below the channelized section and has no break points.

Recommendation:
The recommendation for Chapter 10 is installation of Rock Riffle Grade Controls to halt the active incision in this reach. The degrading reach is approx. 4400 ft. long and at 6 bankfull width between structures the preliminary estimate of spacing is 350 ft. requiring a series of 12 riffles. Preliminary hydraulic calculations indicate a riffle height of 2.0 feet would not

create any increase in backwater or out of bank flow. Using this as a guide then each riffle would require approx. 200 tons of stone and cost an estimated $8,000 each. The total cost for Rock Riffles in Chapter 10 would then be $96,000.

A profile of the channel will be required to develop a final plan and given the absence of large bedload material size, it may be possible to lengthen the spacing between riffles and not interfere with bedload transport. This would then reduce the number of riffles required.



There are also three sites in the lower portion of Chapter 10 below the proposed riffle locations that have migrated into cropland. Having no woody riparian area, these sites will certainly erode at an accelerated rate and contribute significant sediment into Rayse Creek. Therefore treatment of these sites is recommended using Stone Toe protection (STP) at the rate of 1 ton per lineal foot. These sites total approx. 2000 ft. of bank and with appropriate "keys", approx. 2300 tons of stone will be required for treatment. The estimated cost would be $69,000.

Chapters 12 and 13

These chapters represent the upstream end of segment ILNK01 which requires a TMDL plan for phosphorus and siltation. Cross section #6 is located at 20:43 on DVD disc2, Cross section #7 is at 26:00 on the same DVD and USGS stream gage # 05595730 is located on County Road 600 at 26:45.

Just above Cross section #6 on County Road 1000 is a low water crossing with 3.5 ft. of overfall. The crossing appears to be in reasonably good condition, but appears to be made of broken concrete and rock covered with a concrete cap and subject to undercutting and subsequent failure. The structure appears to have been in place for quite some time and a field check of the upstream pool found little evidence of sediment accumulation. An indication that the spacing of the riffles recommended for Chapter 10 may be safely increased.

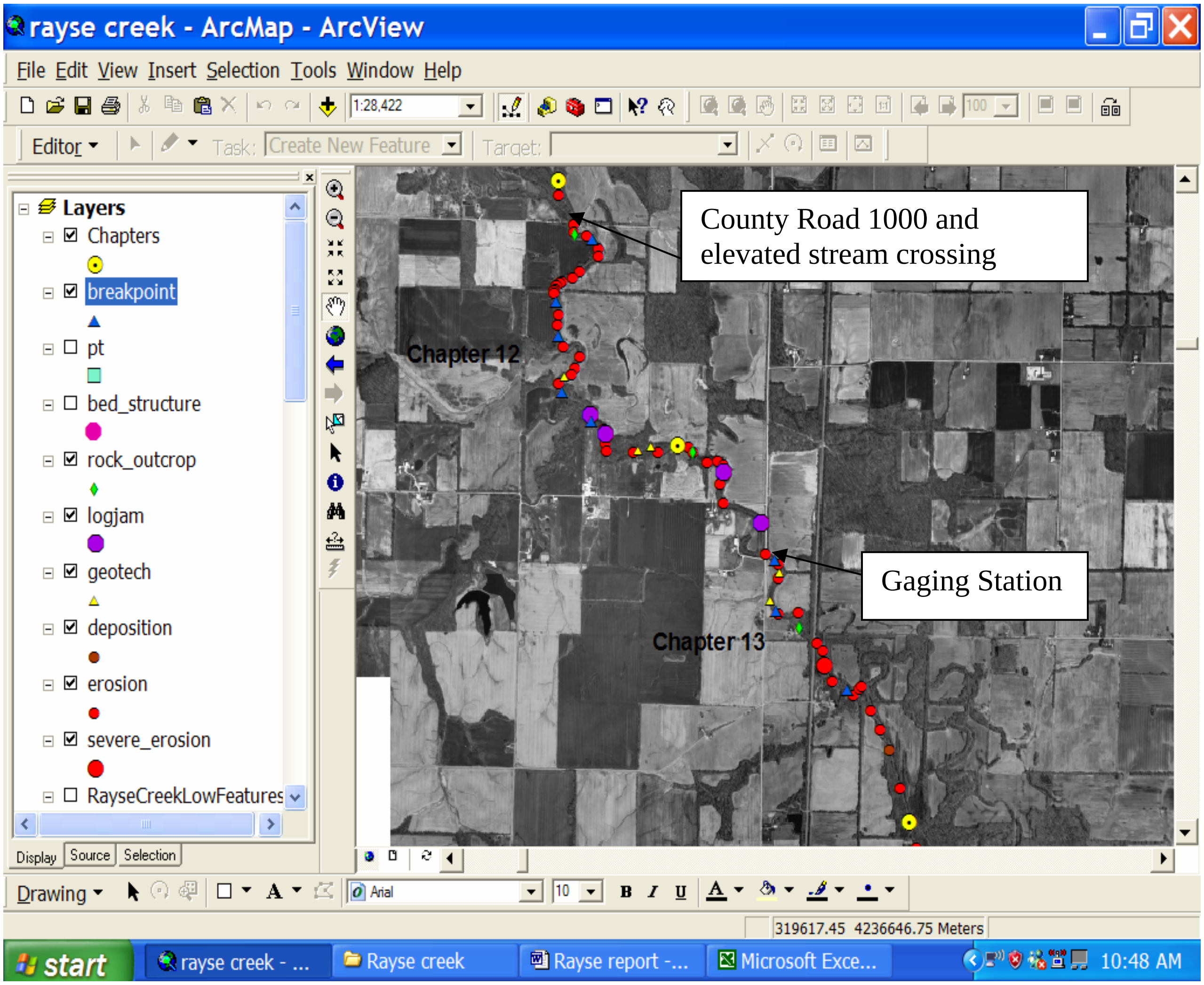
Cross section 6 was taken in the next riffle downstream approx. 500 feet at a riffle composed of very poor quality fractured stone. The hydraulic analysis of this riffle however found that there is no incision at this location so there is no recommendation for grade control. The data shows that the 3.5 ft. overfall at County Road 1000 is due to the roadbed being elevated rather than downstream degradation of the channel bed.

Cross section #7 is also located below a natural rock riffle grade control and shows only minor incision.

The stream segment immediately upstream of the elevated crossing on County Road 1000 does seem to be more stable than other segments below the crossing, therefore some discussion of the benefit to creating deeper pool and riffle sections may be warranted.

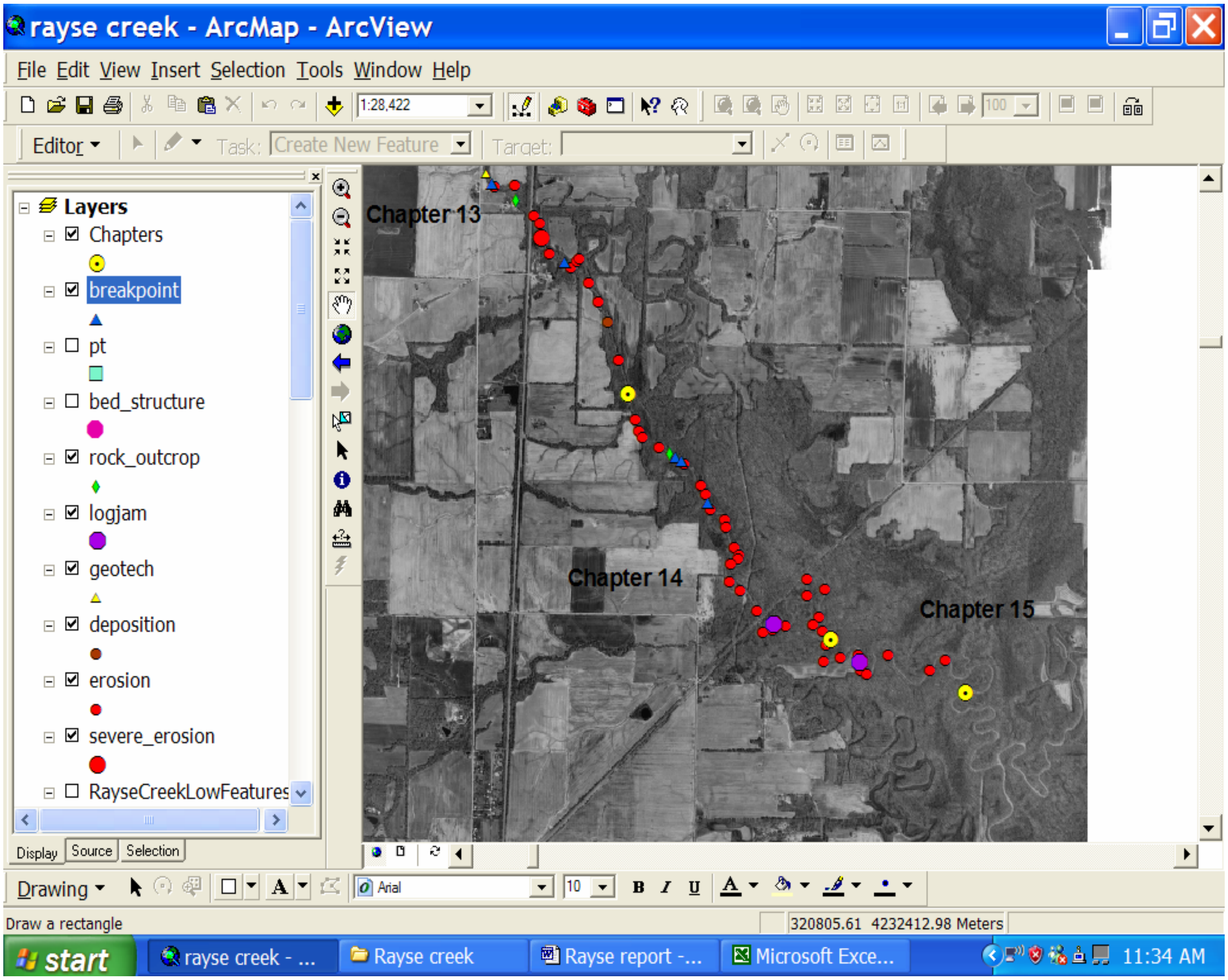
There is also a stream crossing at 28:18 on DVD disc2 with a very small overfall on the downstream side. There seems to be no benefit to upstream stability at this location, presumably due to the low overfall not creating a deeper pool to dissipate energy. The reach below this crossing at 28:18 has been channelized in the past making a significant change in channel length and the bank in this reach continues to be unstable although no active degradation was detected.

This entire reach through Chapter 12 and 13 would appear to benefit from a riffle pool sequence to dissipate energy in the deepened pools, but more profile information and analysis would be needed before that recommendation could be made. This section obviously floods frequently and overtops County Road 900N and 600E making it imperative that any decision to raise the channel bed in this reach could be done with local approval and no increase in flood elevations or frequency. Therefore there is no recommendation for treatment in chapter 12 or 13 at the present time.



Chapter 14 and 15

These chapters are just above the confluence with the Big Muddy River and in the backwater area of Rend Lake. The channel continues to erode in these chapters, but becomes more stable as Rayse Creek approaches the broad floodplain area of the confluence with the Big Muddy River and Rend Lake Sub Impoundment Reservoir. No recommendation is made for treatment although Chapter 14 should be considered along with Chapter 12 and 13 for possible enhancement of the pools and riffles.



Summary

While Rayse Creek exhibits a system-wide adjustment to changing watershed characteristics, the root causes are not well understood. There is very little incision evident, although at least Chapter 10 appears to be actively downcutting and is the only reach for which this rapid aerial assessment has enough data to make a recommendation. Other reaches of Rayse Creek would seem to benefit from enhancement of the riffle pool sequence to dissipate energy and reduce lateral migration and potential incision, however a more detailed analysis needs to be completed to determine the feasibility of such action both in economic and technical terms. A final design for Chapter 10 could be completed with a channel profile survey through Chapter 10, but additional recommendations will require more detailed hydraulic and economic analysis.

APPENDIX A

ANALYSIS OF 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 8/22/2005 | By Wayne Kinney

Stream Name Rayse /creek | UTM Coord. E315066 N4251556

Landowner Name xsec 1

Drainage Area 8.79 sq. mi.

Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	35 ft.	Cross Sectional Area	98 sq. ft.
	Depth	2.8 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: 15.1 *ft./mi. (user-entered)* | Regression Q_2 717 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: 280 to 580 cfs

Local Stream Morphology:

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

Manning's "n" 0.04

Stream Length ft.

Valley Length ft.

Contour Interval feet

Estimated Sinuosity

Basic Field Data:

Bankfull Width 30 ft.

Mean Bankfull Depth 4.56 ft.

Width/Depth Ratio 6.58

Max. Bankfull Depth 5.3 ft.

Width at twice max. depth 300 ft.

(10.6 ft.)

Entrenchment Ratio 10.00

Channel Slope:

Surveyed: 0.00143 *ft./ft.*

Estimated: *ft./ft.*

Radius of Curvature (Rc) ft.

Rc/Bankfull width: 0.00

Bankfull Q from:

Cross-Section 472 *cfs*

Basic field data 530 *cfs*

Selected Q 500 *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: 3.45 *ft./sec.*

GOAL: Develop confidence by matching | Velocity from basic field data: 3.88 *ft./sec.*

velocities from different sources. | Velocity from selected Q: 3.7 *ft./sec.*

Channel Evolution Stage II | Stream Type (Rosgen)

Notes

BKF = 56.88 cfs/sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	xsec 1
Assisted by:	Wayne Kinney
Date:	8/22/2005
Channel Slope (***S***):	0.001430 ft/ft
Manning's ***n***:	0.040
Flow Depth:	5.3 ft

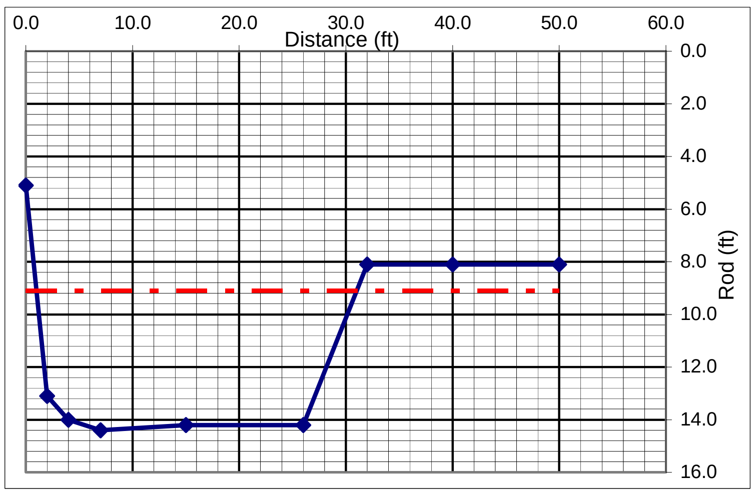
$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	5.3 *ft*	6.3	
Channel Flow (***Q***):	471.8 *cfs*	488.0	
Channel Velocity:	3.5 *ft/sec*	2.9	
Cross-Sectional Area (***A***):	136.7 *sq.ft.*	167.3	
Hydraulic Radius (***R***):	3.9 *ft*	3.0	

Survey Data:

Rod *(ft)*	Distance *(ft)*
5.1	0.0
13.1	2.0
14.0	4.0
14.4	7.0
14.2	15.0
14.2	26.0
8.1	32.0
8.1	40.0
8.1	50.0



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 8/22/2005 By Wayne Kinney

Stream Name Rayse Creek UTM Coord. E315607 N4250387

Landowner Name x-sec 2

Drainage Area 12.29 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width 40 ft.	Cross Sectional Area	123 sq. ft.
	Depth 3.1 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:	14.9	*ft./mi. (user-entered)*		Regression Q_2	929 cfs
		ft/mi (from worksheet)	Rainfall 3.40 in *(2 yr, 24 hr)*	Adjusted Q_2	-
	0.0028	*ft./ft.*	Regional Factor 0.983	Typical Range for Bankfull Discharge:	370 to 750 cfs

Local Stream Morphology:

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

Manning's "n" 0.035

Basic Field Data:			Stream Length		*ft.*		
			Valley Length		*ft.*		
Bankfull Width	33	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	3.82	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	8.64		*Channel Slope:*			Bankfull Q from:	
Max. Bankfull Depth	6.3	*ft.*	Surveyed:	0.0024	*ft./ft.*	Cross-Section	600 *cfs*
Width at twice max. depth	400	*ft.*	Estimated:		*ft./ft.*	Basic field data	643 *cfs*
(12.6 ft.)						Selected Q	621 *cfs*
Entrenchment Ratio	12.12		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:	4.76	*ft./sec.*
GOAL: Develop confidence by matching		Velocity from basic field data:	5.10	*ft./sec.*
velocities from different sources.		Velocity from selected Q:	4.9	*ft./sec.*

Channel Evolution Stage II Stream Type (Rosgen)

Notes

BKF = 50 cfs/mi

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	x-sec 2
Assisted by:	Wayne Kinney
Date:	8/22/2005
Channel Slope (*S*):	0.002400 ft/ft
Manning's *n*:	0.035
Flow Depth:	4.8 ft

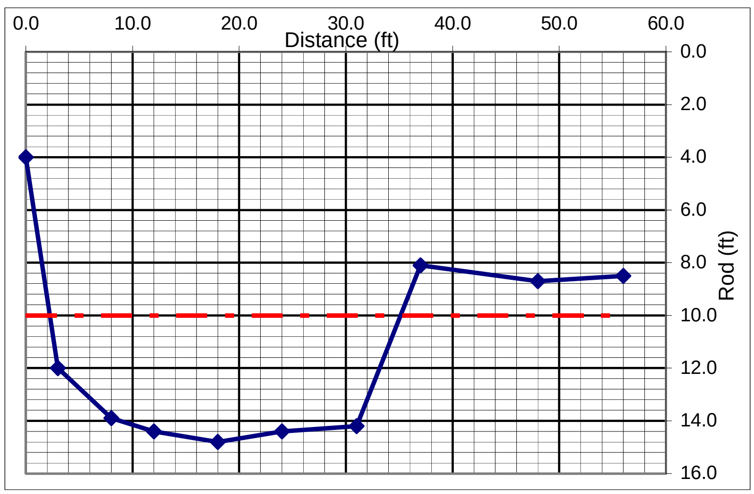
$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	4.8 *ft*	6.3	
Channel Flow (*Q*):	599.9 *cfs*	843.6	
Channel Velocity:	4.8 *ft/sec*	4.7	
Cross-Sectional Area (*A*):	126.1 *sq.ft.*	178.1	
Hydraulic Radius (*R*):	3.5 *ft*	3.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
4.0	0.0
12.0	3.0
13.9	8.0
14.4	12.0
14.8	18.0
14.4	24.0
14.2	31.0
8.1	37.0
8.7	48.0
8.50	56



COMMENTS:

Stream Stabilization I & E Form

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

County	Jefferson	T.		R.		Sec.	
Date	8/22/2005	By	Wayne Kinney				
Stream Name	Rayse Creek			UTM Coord.		E316364 N4245913	
Landowner Name	xsec 3						
Drainage Area	43.14 sq. mi.			Clear Cells			

Regional Curve Predictions:

Bankfull dimensions	Width	65 ft.	Cross Sectional Area	289 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:	11.7	*ft./mi. (user-entered)*		Regression Q_2	2230 cfs
		ft/mi (from worksheet)	Rainfall 3.40 in *(2 yr, 24 hr)*	Adjusted Q_2	-
	0.0022	*ft./ft.*	Regional Factor 0.983	Typical Range for Bankfull Discharge:	890 to 1790 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	74 *ft.*	Contour Interval		feet	
Mean Bankfull Depth	5.8 *ft.*	Estimated Sinuosity			
Width/Depth Ratio	12.76				
		Channel Slope:		Bankfull Q from:	
Max. Bankfull Depth	10 *ft.*	Surveyed:	0.00066 *ft./ft.*	Cross-Section	1266 *cfs*
Width at twice max. depth	600 *ft.*	Estimated:	*ft./ft.*	Basic field data	1327 *cfs*
(20.0 ft.)				Selected Q	1296 *cfs*
Entrenchment Ratio	8.11	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:	2.95	*ft./sec.*
GOAL: Develop confidence by matching		Velocity from basic field data:	3.09	*ft./sec.*
velocities from different sources.		Velocity from selected Q:	3.0	*ft./sec.*

Channel Evolution Stage: V   Stream Type (Rosgen)

Notes

BKF = 30.05 cfs/sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	xsec 3
Assisted by:	Wayne Kinney
Date:	8/22/2005
Channel Slope (***S***):	0.000660 *ft/ft*
Manning's ***n*** :	0.040
Flow Depth:	10.0 *ft*

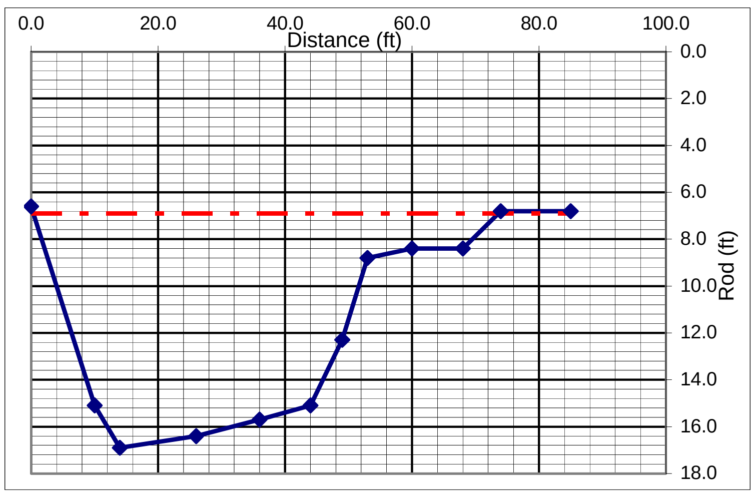
$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	10.0 *ft*	10.1	
Channel Flow (***Q***):	1,266.0 *cfs*	1,189.1	
Channel Velocity:	2.9 *ft/sec*	2.7	
Cross-Sectional Area (***A***):	429.2 *sq.ft.*	436.5	
Hydraulic Radius (***R***):	5.4 *ft*	4.8	

Survey Data:

Rod *(ft)*	Distance *(ft)*
6.6	0.0
15.1	10.0
16.9	14.0
16.4	26.0
15.7	36.0
15.1	44.0
12.3	49.0
8.8	53.0
8.4	60.0
8.40	68
6.80	74
6.80	85



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 8/22/2005 By Wayne Kinney

Stream Name Rayse Creek UTM Coord. E317857 N4242034

Landowner Name xsec 4

Drainage Area 53.28 sq. mi.

Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	70 ft.	Cross Sectional Area	333 sq. ft.
	Depth	4.7 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:	7.3	ft./mi. (user-entered)			Regression Q_2	2100 cfs
		ft/mi (from worksheet)	Rainfall	3.40 in (2 yr, 24 hr)	Adjusted Q_2	-
	0.0014	ft./ft.	Regional Factor	0.983	Typical Range for Bankfull Discharge:	830 to 1680 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	54 ft.	Contour Interval	feet		
Mean Bankfull Depth	6.9 ft.	Estimated Sinuosity			
Width/Depth Ratio	7.83				
		Channel Slope:		Bankfull Q from:	
Max. Bankfull Depth	11.2 ft.	Surveyed:	0.00066 ft./ft.	Cross-Section	1200 cfs
Width at twice max. depth	700 ft.	Estimated:	ft./ft.	Basic field data	1293 cfs
(22.4 ft.)				Selected Q	1247 cfs
Entrenchment Ratio	12.96	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:	3.23 ft./sec.
GOAL: Develop confidence by matching		Velocity from basic field data:	3.47 ft./sec.
velocities from different sources.		Velocity from selected Q:	3.3 ft./sec.

Channel Evolution Stage II Stream Type (Rosgen)

Notes

BKF = 23.4 cfs/ sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	xsec 4
Assisted by:	Wayne Kinney
Date:	8/22/2005
Channel Slope (S):	0.000660 *ft/ft*
Manning's n:	0.040
Flow Depth:	9.6 *ft*

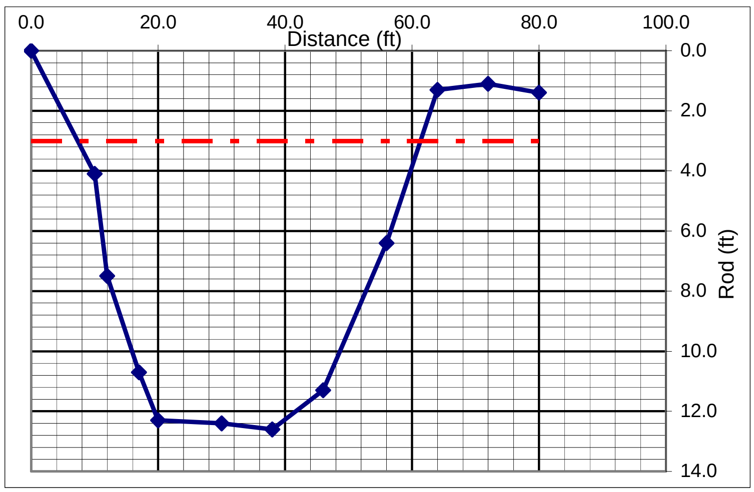
$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	9.6 *ft*	11.2	
Channel Flow (Q):	1,200.2 *cfs*	1,605.8	
Channel Velocity:	3.2 *ft/sec*	3.5	
Cross-Sectional Area (A):	371.7 *sq.ft.*	463.3	
Hydraulic Radius (R):	6.2 *ft*	6.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
0.0	0.0
4.1	10.0
7.5	12.0
10.7	17.0
12.3	20.0
12.4	30.0
12.6	38.0
11.3	46.0
6.4	56.0
1.30	64
1.10	72
1.40	80



COMMENTS:

Stream Stabilization I & E Form

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

County	Jefferson	T.		R.		Sec.	
Date	8/22/2005	By	Wayne Kinney				
Stream Name	Rayse Creek		UTM Coord.		E318444 N4240743		
Landowner Name	xsec 4A						
Drainage Area	56 sq. mi.		Clear Cells				

Regional Curve Predictions:

Bankfull dimensions	Width	72 ft.	Cross Sectional Area	345 sq. ft.
	Depth	4.8 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:	6.5	*ft./mi. (user-entered)*				Regression Q_2	2066 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:	
						820 to 1660 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	56	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	6.52	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	8.59						
			Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth	12	*ft.*	Surveyed:	0.00066	*ft./ft.*	Cross-Section	1294 *cfs*
Width at twice max. depth	800	*ft.*	Estimated:		*ft./ft.*	Basic field data	1395 *cfs*
(24.0 ft.)						Selected Q	1344 *cfs*
Entrenchment Ratio	14.29		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:	3.54	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	3.82	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	3.7	*ft./sec.*

Channel Evolution Stage: I

Stream Type (Rosgen):

Notes

BKF = 24.0 cfs/ sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

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

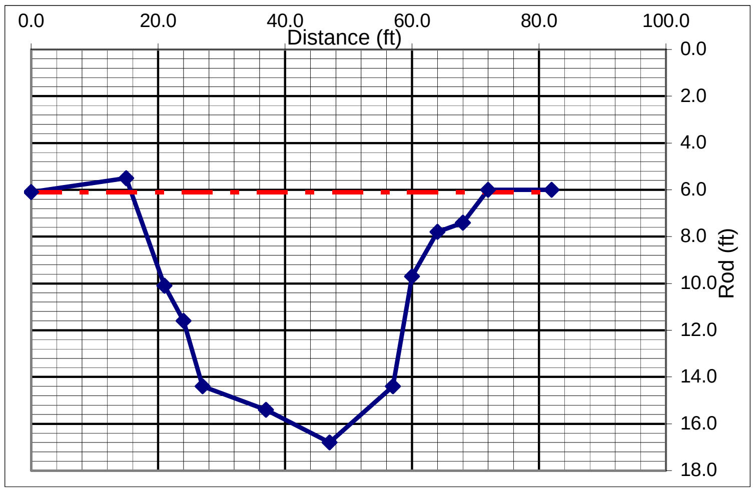
assuming uniform, steady flow

Project:	xsec 4A	
Assisted by:	Wayne Kinney	
Date:	8/22/2005	
Channel Slope (***S***):	0.000660	*ft/ft*
Manning's ***n***:	0.035	
Flow Depth:	10.7	*ft*

		Trial Depth 2	Trial Depth 3
Selected Flow Depth:	10.7 *ft*	10.7	
Channel Flow (***Q***):	1,293.6 *cfs*	1,293.6	
Channel Velocity:	3.5 *ft/sec*	3.5	
Cross-Sectional Area (***A***):	365.2 *sq.ft.*	365.2	
Hydraulic Radius (***R***):	5.9 *ft*	5.9	

Survey Data:

Rod *(ft)*	Distance *(ft)*
6.1	0.0
5.5	15.0
10.1	21.0
11.6	24.0
14.4	27.0
15.4	37.0
16.8	47.0
14.4	57.0
9.7	60.0
7.80	64
7.40	68
6.00	72
6.00	82



COMMENTS:

Stream Stabilization I & E Form

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

County	Jefferson	T.		R.		Sec.	
Date	8/22/2005	By	Wayne Kinney		
Stream Name	Rayse Creek	UTM Coord.	E319436 N4240329		
Landowner Name	xsec 5		Clear Cells		
Drainage Area	59.58 sq. mi.				

Regional Curve Predictions:

Bankfull dimensions	Width	73 ft.	Cross Sectional Area	359 sq. ft.
	Depth	4.9 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:	6.5	*ft./mi. (user-entered)*			Regression Q_2	2169 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:	860 to 1740 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	7.49 *ft.*	Estimated Sinuosity				
Width/Depth Ratio	6.94					
		Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth	12 *ft.*	Surveyed:	0.00066	*ft./ft.*	Cross-Section	1486 *cfs*
Width at twice max. depth	800 *ft.*	Estimated:		*ft./ft.*	Basic field data	1632 *cfs*
(24.0 ft.)					Selected Q	1559 *cfs*
Entrenchment Ratio	15.38	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:	3.82	*ft./sec.*
GOAL: Develop confidence by matching		Velocity from basic field data:	4.19	*ft./sec.*
velocities from different sources.		Velocity from selected Q:	4.0	*ft./sec.*

Channel Evolution Stage: II — Stream Type (Rosgen):

Notes

BKF = 26.16 cfs/ sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	xsec 5
Assisted by:	Wayne Kinney
Date:	8/22/2005
Channel Slope (***S***):	0.000660 *ft/ft*
Manning's ***n***:	0.035
Flow Depth:	11.5 *ft*

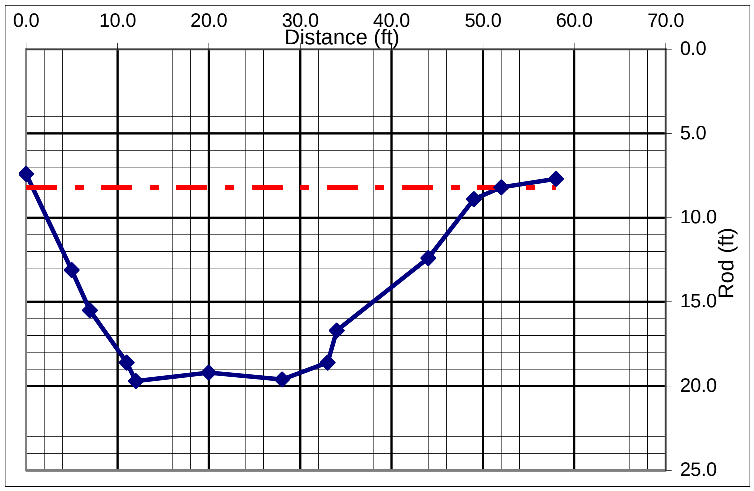
$$Q = \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	11.5 *ft*	12.0	
Channel Flow (***Q***):	1,485.8 *cfs*	1,549.2	
Channel Velocity:	3.8 *ft/sec*	3.7	
Cross-Sectional Area (***A***):	389.4 *sq.ft.*	416.7	
Hydraulic Radius (***R***):	6.5 *ft*	6.3	

Survey Data:

Rod *(ft)*	Distance *(ft)*
7.4	0.0
13.1	5.0
15.5	7.0
18.6	11.0
19.7	12.0
19.2	20.0
19.6	28.0
18.6	33.0
16.7	34.0
12.40	44
8.90	49
8.20	52
7.70	58



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson | T. | R. | Sec.

Date 8/22/2005 | By Wayne Kinney

Stream Name: Rayse Creek | UTM Coord. E320288 N4237092

Landowner Name: xsec 6

Drainage Area: 78.92 sq. mi.

Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	82 ft.	Cross Sectional Area	435 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:	5.5	*ft./mi. (user-entered)*		Regression Q_2	2499 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:	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	57	*ft.*	Contour Interval		feet		
Mean Bankfull Depth	7.62	*ft.*	Estimated Sinuosity				
Width/Depth Ratio	7.48						
			Channel Slope:			Bankfull Q from:	
Max. Bankfull Depth	10.5	*ft.*	Surveyed:	0.00066	*ft./ft.*	Cross-Section	1700 *cfs*
Width at twice max. depth	800	*ft.*	Estimated:		*ft./ft.*	Basic field data	1841 *cfs*
(21.0 ft.)						Selected Q	1770 *cfs*
Entrenchment Ratio	14.04		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:	3.91	*ft./sec.*
GOAL: Develop confidence by matching			Velocity from basic field data:	4.24	*ft./sec.*
velocities from different sources.			Velocity from selected Q:	4.1	*ft./sec.*

Channel Evolution Stage I | Stream Type (Rosgen)

Notes

BKF =22.4 cfs/ sq. mi.

Stream Stabilization I & E Form

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

County Jefferson T. R. Sec.

Date 8/22/2005 By Wayne Kinney

Stream Name Rayse Creek UTM Coord. E321310 N4236268
Landowner Name xsec 7

Drainage Area 87.8 sq. mi. Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	85 ft.	Cross Sectional Area	468 sq. ft.
	Depth	5.5 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: 5.5 *ft./mi. (user-entered)* | Regression Q_2 2719 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: 1080 to 2180 cfs

Local Stream Morphology:

Channel Description: (b) Same as (a), but more stones and weeds
Manning's "n" 0.035

Basic Field Data:

Bankfull Width	57 *ft.*	Stream Length	*ft.*		
Mean Bankfull Depth	8.37 *ft.*	Valley Length	*ft.*		
Width/Depth Ratio	6.81	Contour Interval	feet		
		Estimated Sinuosity			
		Channel Slope:		Bankfull Q from:	
Max. Bankfull Depth	11.9 *ft.*	Surveyed:	0.00066 *ft./ft.*	Cross-Section	1971 *cfs*
Width at twice max. depth	1000 *ft.*	Estimated:	*ft./ft.*	Basic field data	2153 *cfs*
(23.8 ft.)				Selected Q	2062 *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:	4.13	*ft./sec.*
GOAL: Develop confidence by matching		Velocity from basic field data:	4.51	*ft./sec.*
velocities from different sources.		Velocity from selected Q:	4.3	*ft./sec.*

Channel Evolution Stage I Stream Type (Rosgen)

Notes

BKF = 23.5 cfs/sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

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

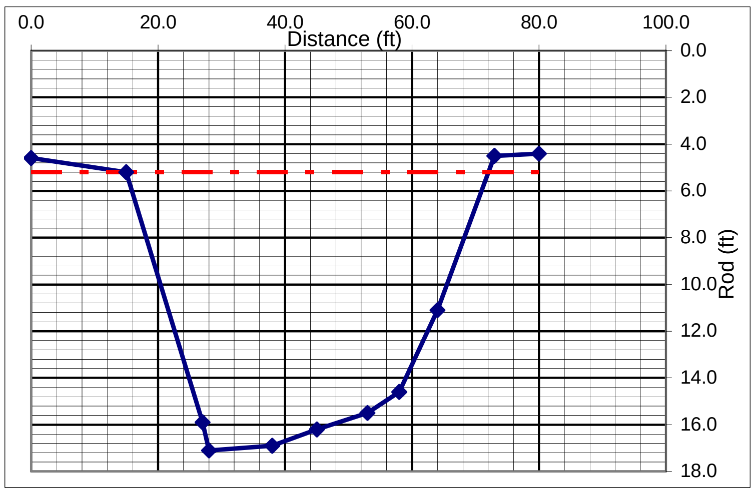
assuming uniform, steady flow

Project:	xsec 7	
Assisted by:	Wayne Kinney	
Date:	8/22/2005	
Channel Slope (***S***):	0.000660	*ft/ft*
Manning's ***n*** :	0.035	
Flow Depth:	11.9	*ft*

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	11.9 *ft*	12.5	
Channel Flow (***Q***):	1,970.9 *cfs*	1,938.4	
Channel Velocity:	4.1 *ft/sec*	3.8	
Cross-Sectional Area (***A***):	477.0 *sq.ft.*	516.0	
Hydraulic Radius (***R***):	7.4 *ft*	6.4	

Survey Data:

Rod *(ft)*	Distance *(ft)*
4.6	0.0
5.2	15.0
15.9	27.0
17.1	28.0
16.9	38.0
16.2	45.0
15.5	53.0
14.6	58.0
11.1	64.0
4.50	73
4.40	80



COMMENTS:

Stream Stabilization I & E Form

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

County Jefferson   T.   R.   Sec.

Date 8/22/2005   By Wayne Kinney

Stream Name Rayse Creek   UTM Coord. E321518 N4235954

Landowner Name xsec 8

Drainage Area 88 sq. mi.   Clear Cells

Regional Curve Predictions:

Bankfull dimensions	Width	85 ft.	Cross Sectional Area	468 sq. ft.
	Depth	5.5 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:	5.5	*ft./mi. (user-entered)*			Regression Q_2	2724 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:	
						1080 to 2180 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	69 *ft.*	Contour Interval	feet		
Mean Bankfull Depth	7.47 *ft.*	Estimated Sinuosity			
Width/Depth Ratio	9.24				
		Channel Slope:		Bankfull Q from:	
Max. Bankfull Depth	11.6 *ft.*	Surveyed:	0.00066 *ft./ft.*	Cross-Section	1980 *cfs*
Width at twice max. depth	1000 *ft.*	Estimated:	*ft./ft.*	Basic field data	2156 *cfs*
(23.2 ft.)				Selected Q	2068 *cfs*
Entrenchment Ratio	14.49	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:	3.84	*ft./sec.*
GOAL: Develop confidence by matching		Velocity from basic field data:	4.18	*ft./sec.*
velocities from different sources.		Velocity from selected Q:	4.0	*ft./sec.*

Channel Evolution Stage I   Stream Type (Rosgen)

Notes

BKF = 23.5 cfs/sq. mi.

Natural Open Channel Flow

back to I&E form

Clear Cells

Project:	xsec 8
Assisted by:	Wayne Kinney
Date:	8/22/2005
Channel Slope (***S***):	0.000660 *ft/ft*
Manning's ***n***:	0.035
Flow Depth:	11.6 *ft*

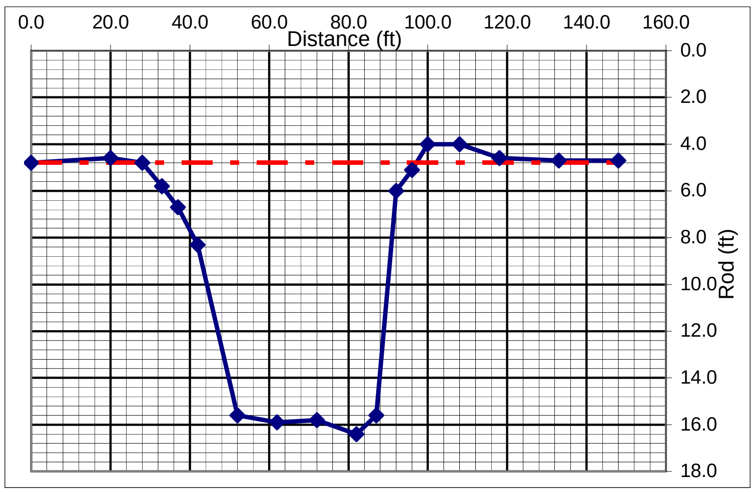
$$Q \cong \frac{1.486}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

assuming uniform, steady flow

		Trial Depth 2	*Trial Depth 3*
Selected Flow Depth:	11.6 *ft*	11.8	
Channel Flow (***Q***):	1,980.4 *cfs*	1,425.2	
Channel Velocity:	3.8 *ft/sec*	2.7	
Cross-Sectional Area (***A***):	515.5 *sq.ft.*	534.6	
Hydraulic Radius (***R***):	6.6 *ft*	3.8	

Survey Data:

Rod *(ft)*	Distance *(ft)*
4.8	0.0
4.6	20.0
4.8	28.0
5.8	33.0
6.7	37.0
8.3	42.0
15.6	52.0
15.9	62.0
15.8	72.0
16.40	82
15.60	87
6.00	92
5.10	96
4.00	100
4.00	108
4.6	118
4.7	133
4.7	148



COMMENTS: