

COST / BENEFIT ANALYSIS FOR ASSESSING PERFORMANCE OF WATER QUALITY IMPROVEMENT TECHNIQUES



Mike Malon

Resource Conservationist

Jo Daviess County Soil and Water Conservation District

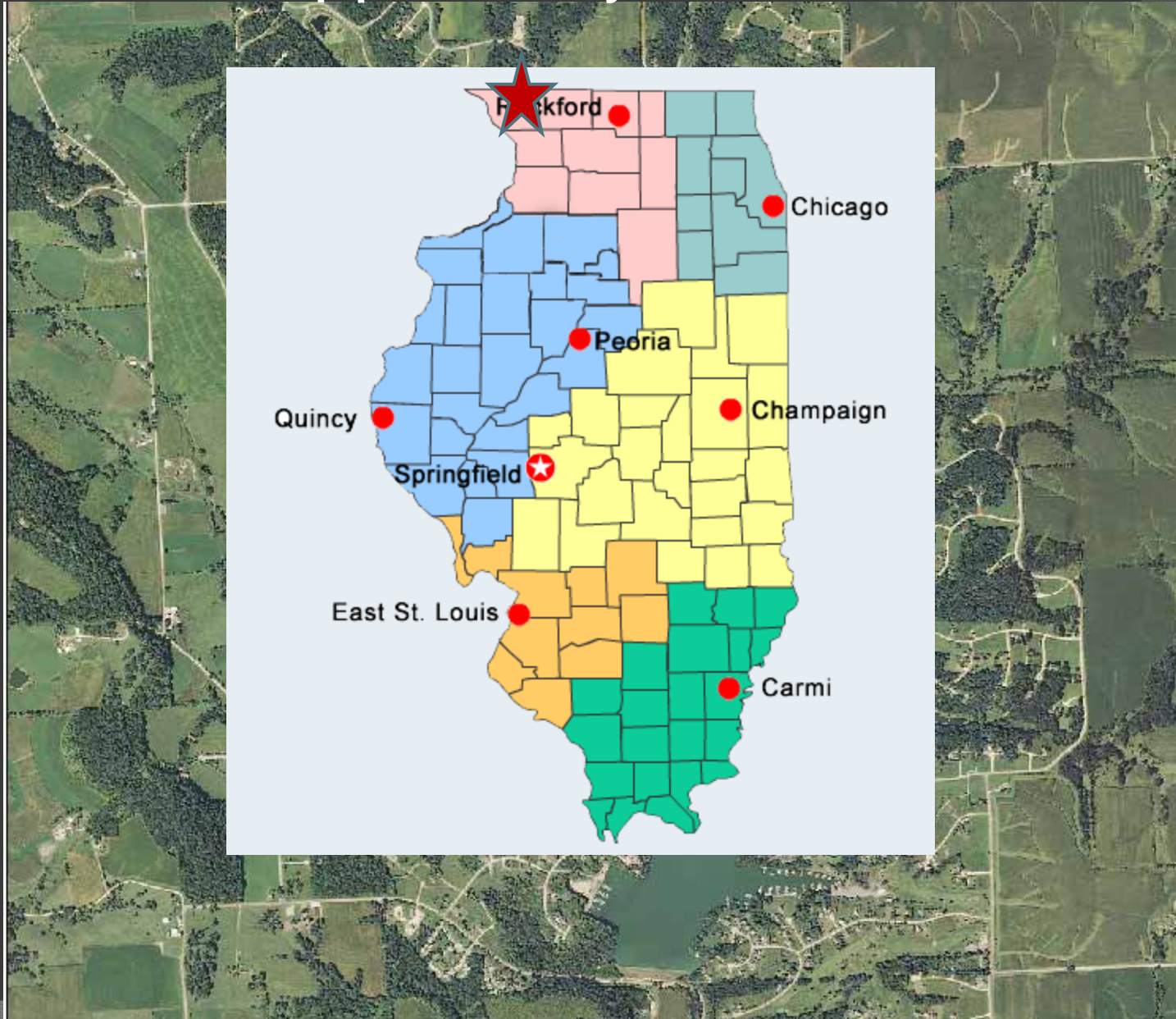
2 Caveats

1. These figures will be different in your watershed.
2. There is more to choosing a practice than cost alone.

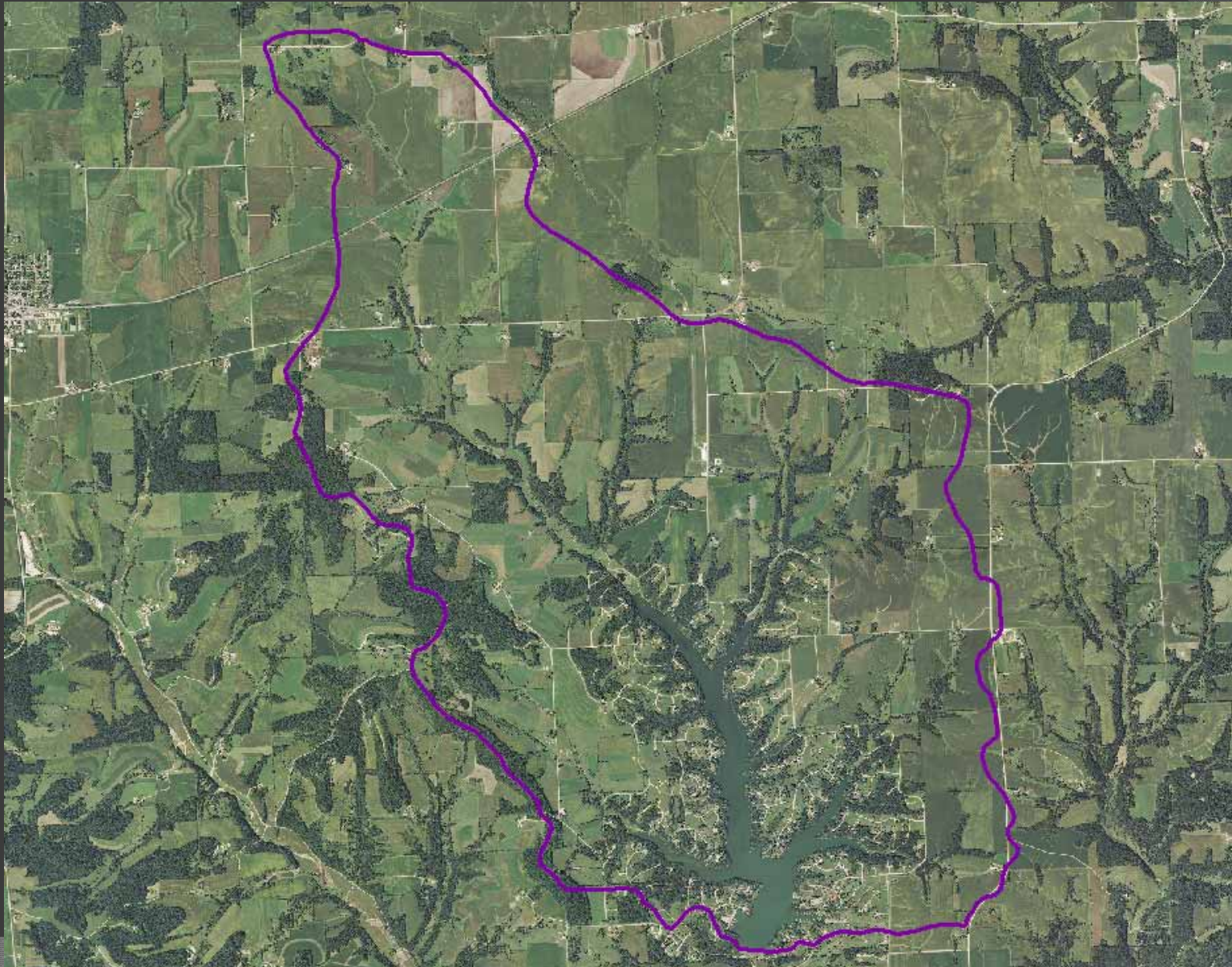
Apple Canyon Lake



Apple Canyon Lake

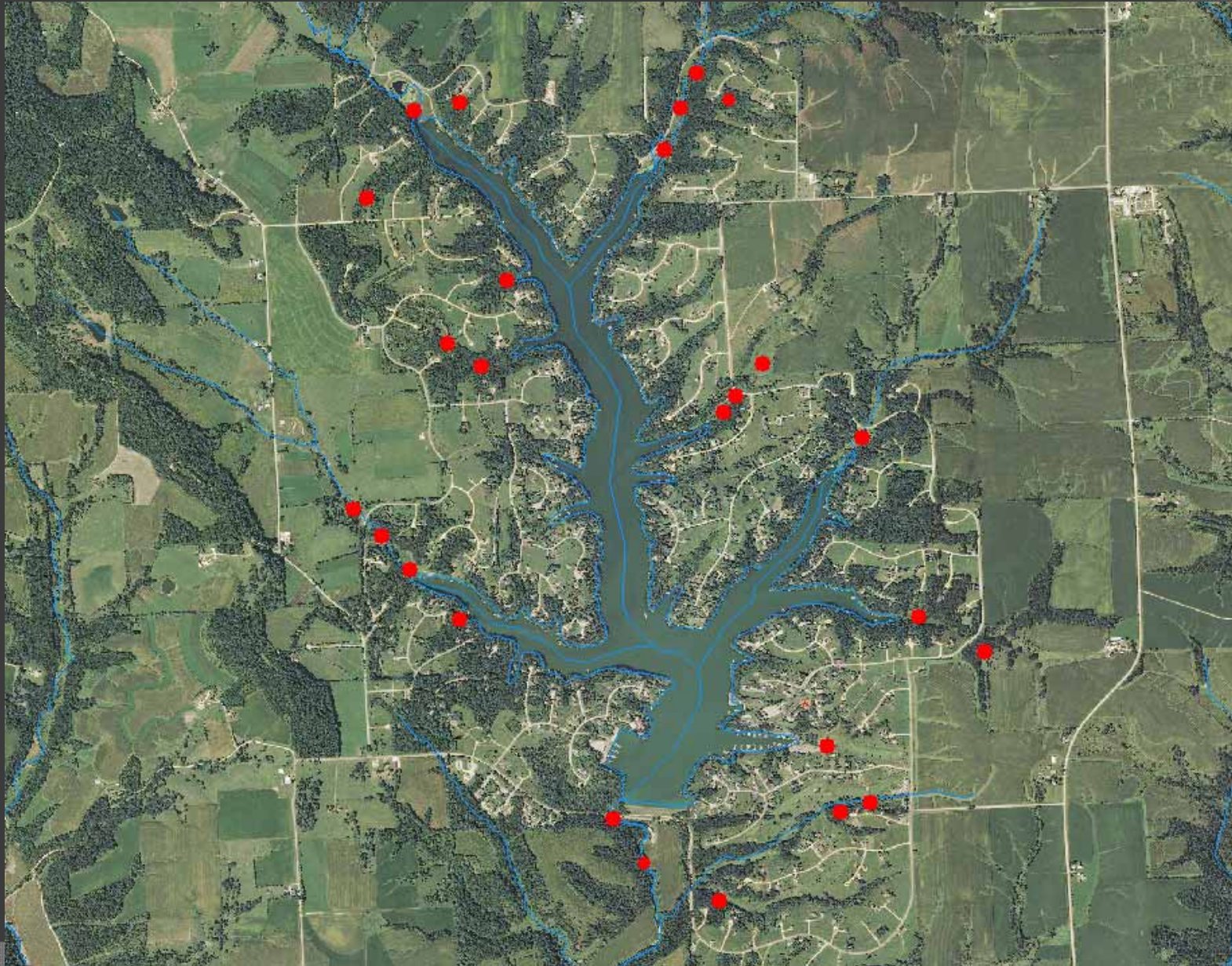


Apple Canyon Lake Watershed





Apple Canyon Lake



Dredging Program

Annual Dredging Budget:

Dredge Insurance	\$6600
Lake Monitor Supplies	\$1000
Licenses and Permits	\$505
Crane Expense	\$3200
Consulting	\$2000
Gas/Oil	\$10,000
Maintenance Expense	\$6600
Water Testing	\$3600
Conference/training	\$1000
Labor with benefits	\$22,882
-Total Annual Cost	\$57,387

2012 Dredging
170,000 tons of sediment removed

Bottom Line:

\$0.38 per ton

Original cost of dredge	\$200,000
Approximate Lifespan	25 years
Depreciation	\$8000 per year

2012 Total Dredging Costs: \$65,387

Dredging Program

Past Years

1998: Contracted Dredging

\$1.10 per ton

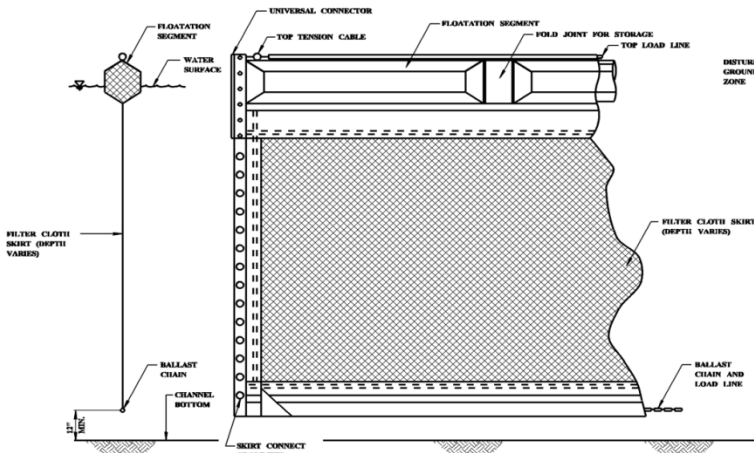
Adjusted to 2012 US Dollar

\$1.55 per ton

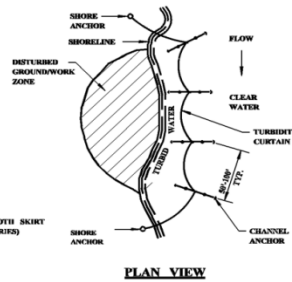
Turbidity Curtain

STATE PROJECT NO.
MISS. _____

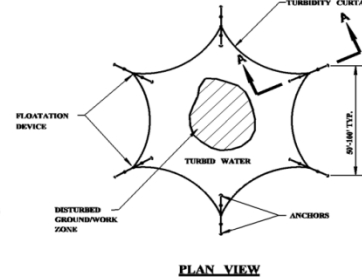
FLOATING TURBIDITY CURTAIN



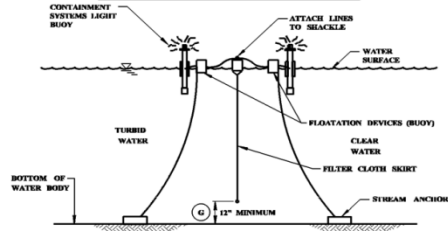
TYPICAL ANCHORING PLAN FOR SHORELINE/RIVER EDGE WORK



TYPICAL ANCHORING PLAN FOR MID CHANNEL WORK (BRIDGE PIER, CAISSON, ETC.)



TYPICAL ANCHORING SECTION



SECTION A-A

AUTOMATIC FLASHING LIGHT BUOY (ON AT DUSK-OFF AT DAWN) 18\"/>

EROSION CONTROL PLAN LEGEND: FLOATING TURBIDITY CURTAIN

FLOATING TURBIDITY CURTAIN GENERAL NOTES

- A. FLOATING TURBIDITY CURTAINS (ALSO KNOWN AS TURBIDITY BARRIERS OR SILT CURTAINS) CREATE A BARRIER TO PREVENT TURBID WATER FROM ENTERING CLEAR WATER. FLOATING TURBIDITY CURTAINS SHOULD BE USED TO ISOLATE ACTIVE CONSTRUCTION AREAS WITHIN OR ADJACENT TO A BODY OF WATER TO MINIMIZE THE MIGRATION OF SILT LOADED WATER OUT OF THE CONSTRUCTION ZONE.
- B. TURBIDITY CURTAINS SHALL NOT BE INSTALLED PERPENDICULAR ACROSS THE MAIN FLOW OF A SIGNIFICANT BODY OF MOVING WATER.
- C. FLOATING TURBIDITY CURTAINS SHALL NOT BE USED WHERE THE ANTICIPATED FLOW VELOCITIES WILL EXCEED 5 FT/SEC.
- D. TURBIDITY CURTAINS SHALL BE ANCHORED TO PREVENT DRIFT SHOREWARD OR DOWNSTREAM. ANCHORAGE SHALL BE INSTALLED ON BOTH SHORE AND STREAM SIDE. CURTAINS SHALL BE INSTALLED AS CLOSE TO PROJECT SITE AS POSSIBLE. BARRIERS SHOULD BE A BRIGHT COLOR (YELLOW OR 'INTERNATIONAL' ORANGE ARE RECOMMENDED) THAT WILL ATTRACT THE ATTENTION OF NEARBY BOATERS.
- E. SHORE ANCHORS SHALL CONSIST OF A POST WITH DEADMAN OR APPROVED EQUAL STREAM ANCHORS SHALL BE OF SUFFICIENT SIZE TO STABILIZE THE BARRIER WITH NUMBER AND SPACING DEPENDENT ON WATERWAY VELOCITIES AND MANUFACTURER'S RECOMMENDATIONS.
- F. IN SHALLOW WATER (3 FEET OF DEPTH OR LESS) A TURBIDITY CURTAIN MAY BE INSTALLED ON STAKES DRIVEN INTO THE BED OF THE WATER BODY.
- G. FABRIC SECTIONS SHALL BE CONNECTED END TO END WITH MINIMUM 6" DIAMETER POLYPROPYLENE ROPE. FABRIC SHALL BE SEAMED TOGETHER IN A MANNER THAT RETAINS THE OVERALL TENSILE STRENGTH.
- H. DESIGN OF CURTAIN AND ANCHORAGE SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. FILTER CLOTH SKIRT SHOULD BE ABLE TO WITHSTAND THE FORCES IMPARTED ON IT DUE TO THE CONDUCTED WIND VELOCITY OR STREAM VELOCITY. FABRIC SHALL BE MADE OF A NON-DETERIORATING MATERIAL SUCH AS PLASTIC OR NYLON, WHICH WILL ALLOW WATER TO PASS THROUGH WHILE STILL RETAINING SEDIMENT.
- I. THE TURBIDITY CURTAIN AND ADJACENT WORK AREAS SHALL NOT BE DISTURBED 12 HOURS PRIOR TO REMOVAL FROM WATER BODY. MAINTENANCE SHALL BE PERFORMED AS NEEDED. CONTRACTOR SHALL REMOVE THE CURTAIN AT COMPLETION OF WORK IN A MANNER THAT WILL PREVENT SILTATION OF THE WATERWAY. DURING REMOVAL, EXTREME CARE SHOULD BE TAKEN NOT TO DISTURB ANY SEDIMENT DEPOSITS.
- J. MAINTAIN 12" MINIMUM GAP BETWEEN SKIRT BOTTOM AND CHANNEL BOTTOM TO PREVENT ACCUMULATED SEDIMENT FROM PULLING TOP OF CURTAIN BELOW WATER SURFACE.
- K. IN WIND OR WAVE ACTION SITUATIONS, THE MAXIMUM DEPTH OF THE CURTAIN SHALL BE 13 FEET.
- L. CONCENTRATED FLOWS SHALL NOT DISCHARGE BEYOND FLOATING TURBIDITY CURTAIN. CURTAINS ARE NOT TO BE INSTALLED ACROSS FLOWING BODY OF WATER.
- M. WHEN INSTALLED IN A NAVIGABLE WATERWAY, BUOYS SHOULD BE LIT ACCORDING TO REGULATORY AGENCY STANDARDS.
- N. WHEN ESTIMATING THE LENGTH OF TURBIDITY CURTAIN, ALLOW 10 TO 30 PERCENT VARIANCE IN STRAIGHT LINE MEASUREMENT.
- O. PAYMENT FOR FLOATING TURBIDITY CURTAIN SHALL INCLUDE ALL MATERIAL AND LABOR NECESSARY FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF TURBIDITY CURTAINS.
- P. ONLY FLOATING TURBIDITY CURTAINS LISTED ON THE APPROVED PRODUCTS LIST MAY BE USED.

MISSISSIPPI DEPARTMENT OF TRANSPORTATION	
FLOATING TURBIDITY CURTAIN	
DATE	DESIGN TEAM
FILENAME: EROSION CONTROL\ECD-19.DGN	WORKING NUMBER ECD-19
CHECKED	DATE
	SHEET NUMBER

Turbidity Curtain



Turbidity Curtain

Original Cost: \$5883

Five year performance: 55,223 tons

\$0.11 per ton.

Removal of sediment: \$23,000

Bottom Line:

\$0.52 per ton



Streambank Stabilization

- 8000 tons over 10 years
- Total Cost: \$221,440
- **\$27.68 / per ton**

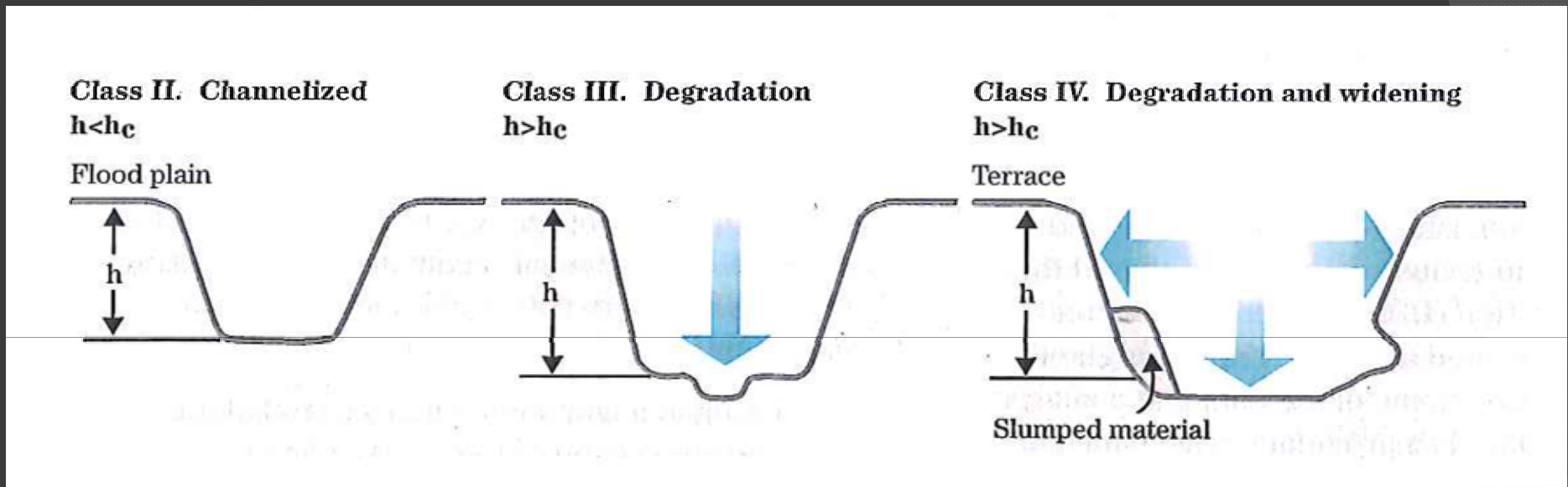


Streambank Stabilization Using Stormwater Wetlands

- 5820 tons over 10 years
- Total Cost: \$13,146
- **\$2.26 / per ton**



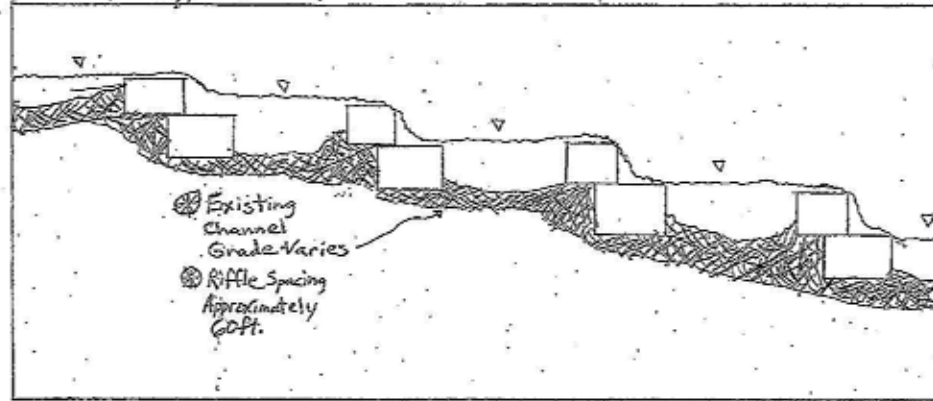
Streambank Stabilization Using Wall Rock Drop Structures



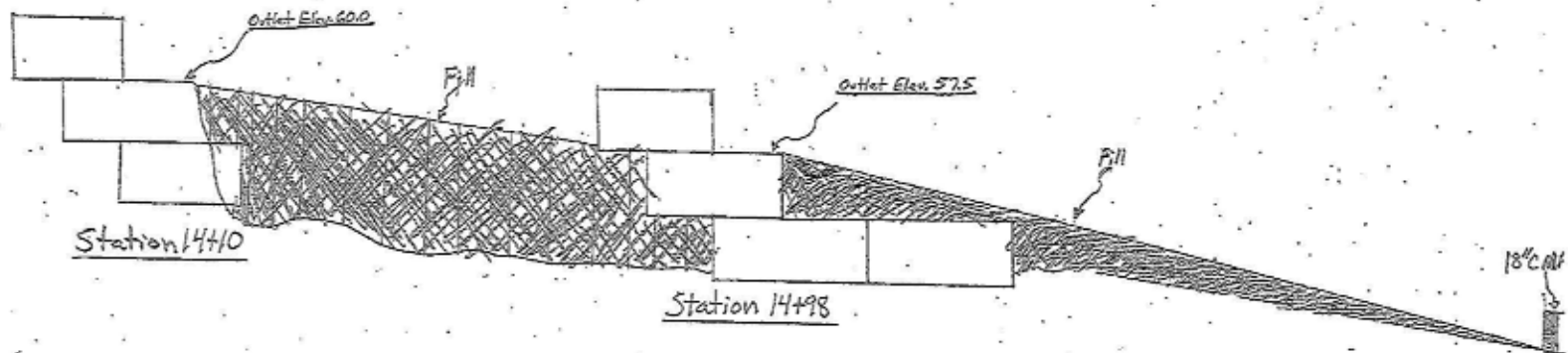
Streambank Stabilization Using Wall Rock Drop Structures

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Typical Step Pools (Station 0+70 thru 11+32) Profile



Typical Step Pool (Station 14+10 thru 15+45) Profile



Streambank Stabilization Using Wall Rock Drop Structures

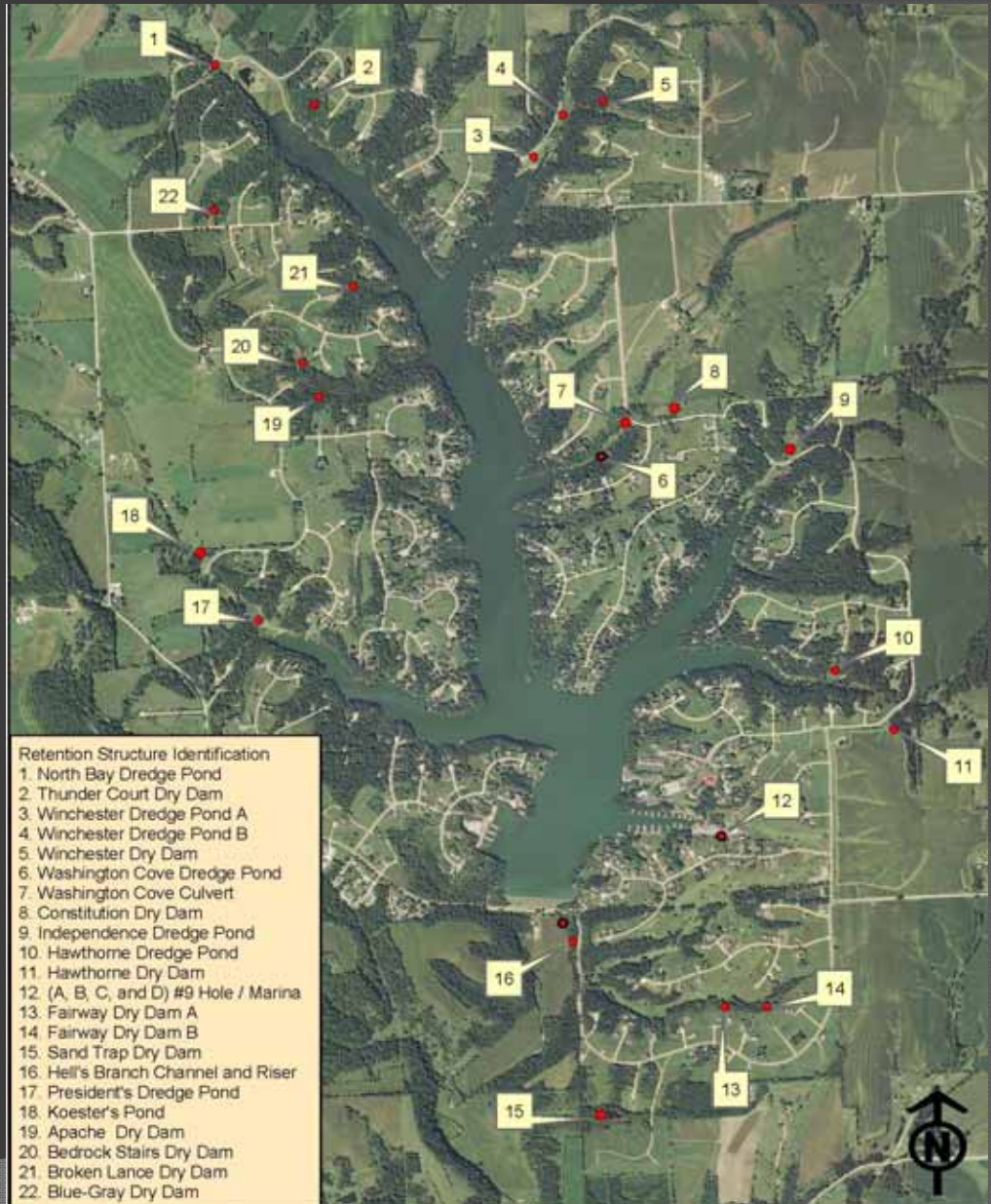
- 780 tons over 10 years
- Total Cost: \$19,235
- **\$24.66 / per ton**



Dry Dam Structures

- 10 Year Lifespan
- 870 Tons of soil average per 10 year period
- Average Cost of Structure: \$6,647
- Bottom Line:

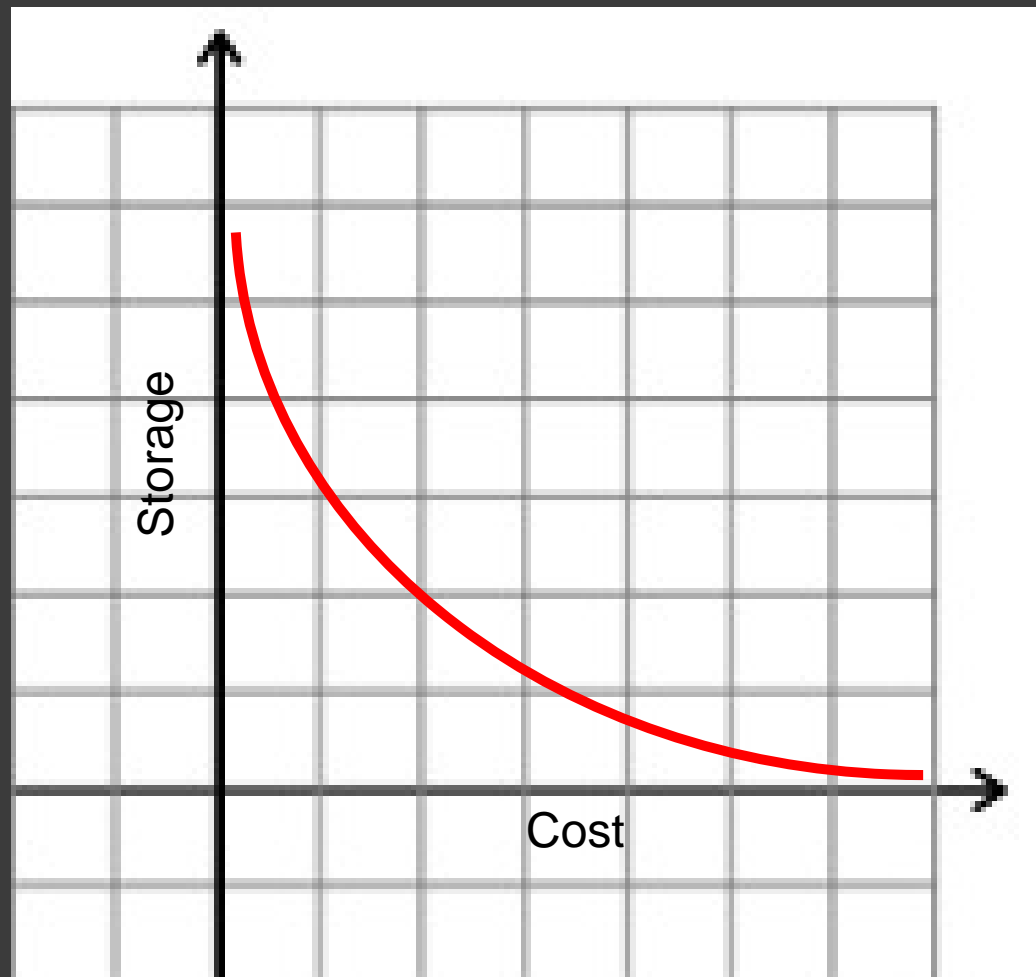
\$ 7.63 per ton



Practice Summary

Practice	Cost per Ton
Hydraulic Dredging (Internal)	\$ 0.38
Hydraulic Dredging (Contract)	\$ 1.55
Turbidity Curtain	\$ 0.52
Streambank Stabilization	\$ 27.68
Wetland Stormwater Retention	\$ 2.26
Streambank Stabilization Using Wall Rock Drop Structures	\$ 24.66
Dry Dams / Grade Stabilization Structure	\$ 7.63

Correlations?



References:

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