Illinois Stream Restoration Habitat Opportunities

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SIUC Carbondale IL

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Illinois DNR Office of Mines and Minerals

June 1999

ILLINOIS REGULATION

Sec. 1816.43 Diversions (Temp or Permanent)

Design Construct Maintain

- Stable
- Flood Protection
- Sediment Control
- Riparian Vegetation Establishment
- Natural Channel – Cross Section
  - Meander, Gradient
- Aquatic Habitats - Riffles Pools
- Floodplain -

62 ILLINOIS ADMIN. CODE CH I

Sec. 1816.43 Diversions (Temp or Permanent)

Design - Hydraulic

Channel Capacity: Equal to Upstream and Downstream

Channel Bank and Floodplain

Pass – 100 yr 6 hour precip. event

62 ILLINOIS ADMIN. CODE CH I

Sec. 1816.57 Hydrologic Balance

Stream Buffer Zones

Protection – > 100 ft Top of Bank

Restoration –(Sec. 1816.43)

- Channel
- In-stream habitat
- Riparian Buffer – Floodplain

STREAM ASSESSMENT[1]
Diversions Restorations

IDNR Stream Restoration Program

CWRL - SIUC

Baseline (Up – Downstream)

1979 – 1994

Industry

Regulatory Compliance -5[+] yr post

1980 – 2005[++]

[1] Perry Co IL [2] CWRL [3] CONSOL

STREAM ASSESSMENT[1]

Diversions

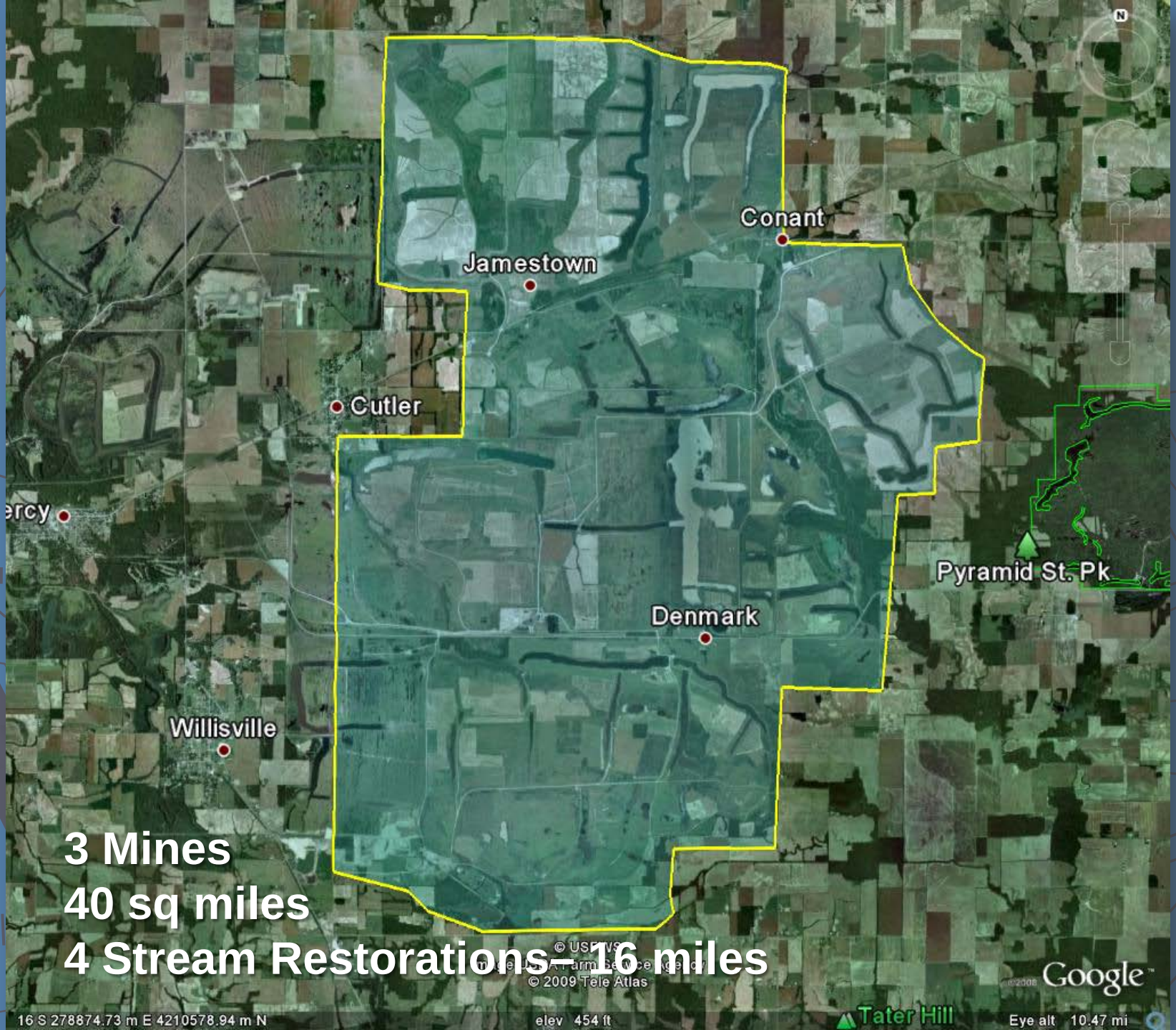
Galum[2]	1981-1982
Panther Creek[2]:	1981-1982
Pipestone[2]	1983-1994

Restorations

Pipestone[2]	1990-1994
Galum ARCH[2]	1981 1988
Galum CONSOL[3]	2002-2006
Bonnie[2]	2002-2006
White Walnut[3]	2002-2005

[1] Perry Co IL [2] CWRL [3] CONSOL

CAP. 550 LBS
5

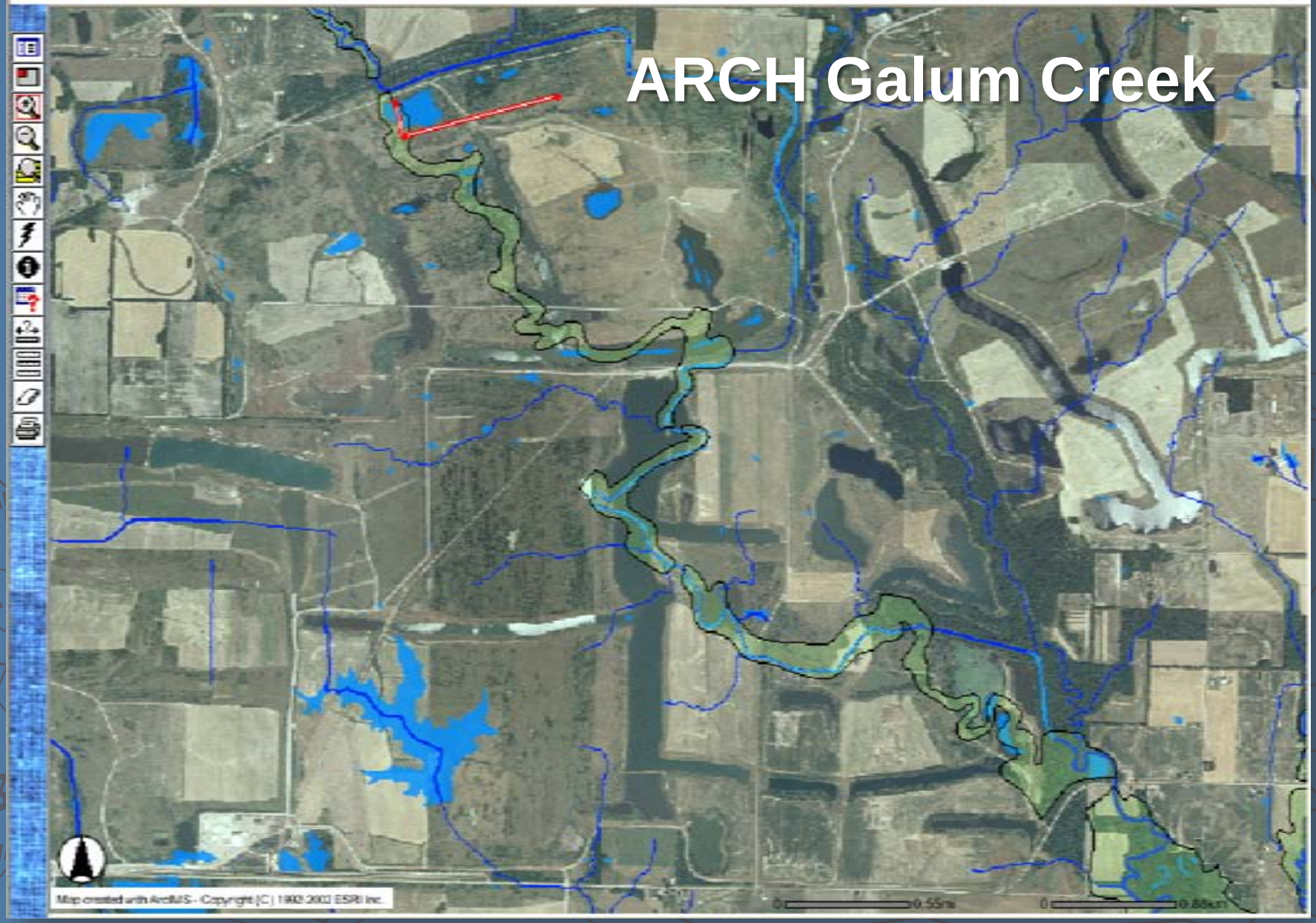


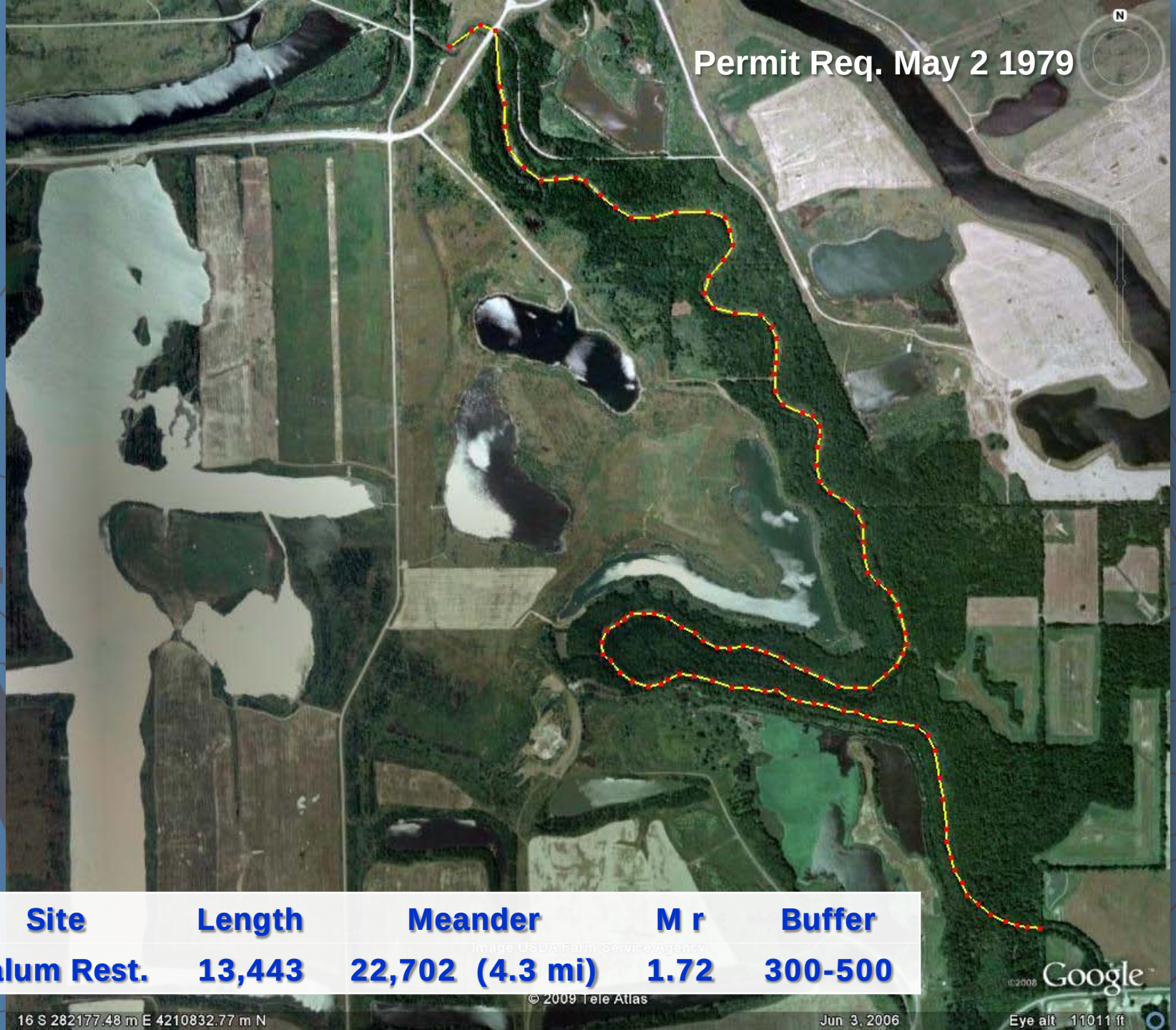
3 Mines
40 sq miles
4 Stream Restorations– 16 miles

SITE	LENGTH ft	MEANDER ft	M ratio	BUFFER ft
CONSOL Burning Star 4				
Galum Rest.	13,443	22,702 (4.3 mi)	1.72	300-500
Bonnie Rest.	11,842	19,311 (3.7 mi)	1.63	500-750
Galum Diver.	16,400	-	-	
ARCH Captain				
Galum Rest.	9,135	18,480 (3.5 mi)	2.02	
Pipestone Diver.	11,342	-	-	85
AMAX Leahy				
Pipestone NW Diver.	5,808			
Pipestone Rest.	16,685	24,288 (4.6 mi)	1.45	300-750
Pipestone SE Div.	4,115	-		
Pipestone Temp Div.	22,704	-		
TOTAL Restoration 4	51,095	84,781 (16 mi)	1.66	
TOTAL Diversion P 4	37,665			

Illinois Department of Natural Resources
Office of Mines & Minerals
Land Reclamation Division

ArcIMS Illinois Coal Mine Permit Viewer

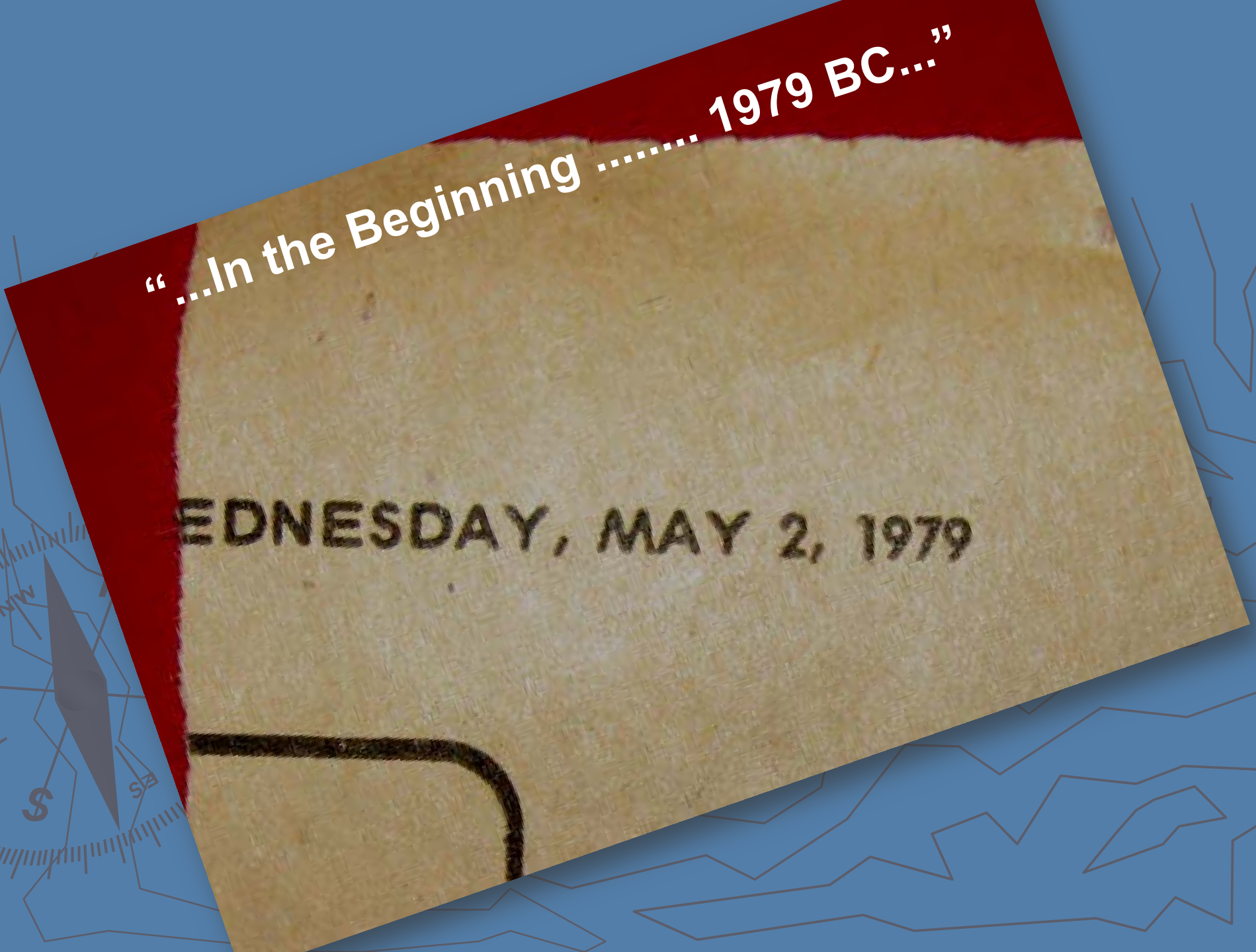




Site	Length	Meander	M r	Buffer
Galum Rest.	13,443	22,702 (4.3 mi)	1.72	300-500

ARCH GALUM

“...In the Beginning ..... 1979 BC...”



ARCH – Galum Creek Restoration March 1979

Perry County

Plan to move creek supported at hearing

By Evan M. Davis
Of The Southern Illinoisan

A plan to move about 3.5 miles of Galum Creek in southwestern Perry County prompted several questions, no outright objections and the support of a zoology instructor of Southern Illinois University-Carbondale at a public hearing in Du Quoin Tuesday night.

The plan was presented by Southwestern Illinois Coal Corp., which wants to surface mine the land under and around the stream bed. It calls for construction of a new section of the stream to the northeast of the current section. The version is designed to closely resemble the current stream in length, amount of curvature, water flow characteristics and, eventually, in plant and animal life.

Southwestern needs permission from both the U.S. Army Corps of Engineers, which held the public hearing, and the Illinois Department of Transportation's Division of Water Resources to move the creek section. A division spokesman, David R. Boyce, said the division probably will grant its permit, pending further information from Southwestern.

Perhaps the most supportive testimony for the plan came in a written statement sent by and read for professor W.D. Klimstra, a Southern Illinois University-Carbondale zoologist who has been involved with coal mine reclamation laws as they affect wildlife. He said the Southwestern plan is "a unique situation for studying man's ability to change the course of a stream" and rebuild the life around it.

Most questions at the hearing came from farmers, particularly those with land south of the proposed diversion, who are afraid the flow of water on their land might significantly increase, despite Southwestern's computer-based predictions to the contrary.

One of them, Charles Greer, said he thinks the plan will work, but asked, "What if this does not work? How am I protected?"

John Kilker, chief of the regulation functions branch in the Corps' St. Louis office, told Greer the Corps has the power to tell a permitee to revise its program if it is not functioning in the public interest.

Most of Southwestern's presentation was made by Robert Holloway, the company's manager of land resources. He discussed two basic reasons Southwestern wants to move the creek: economics and environment.

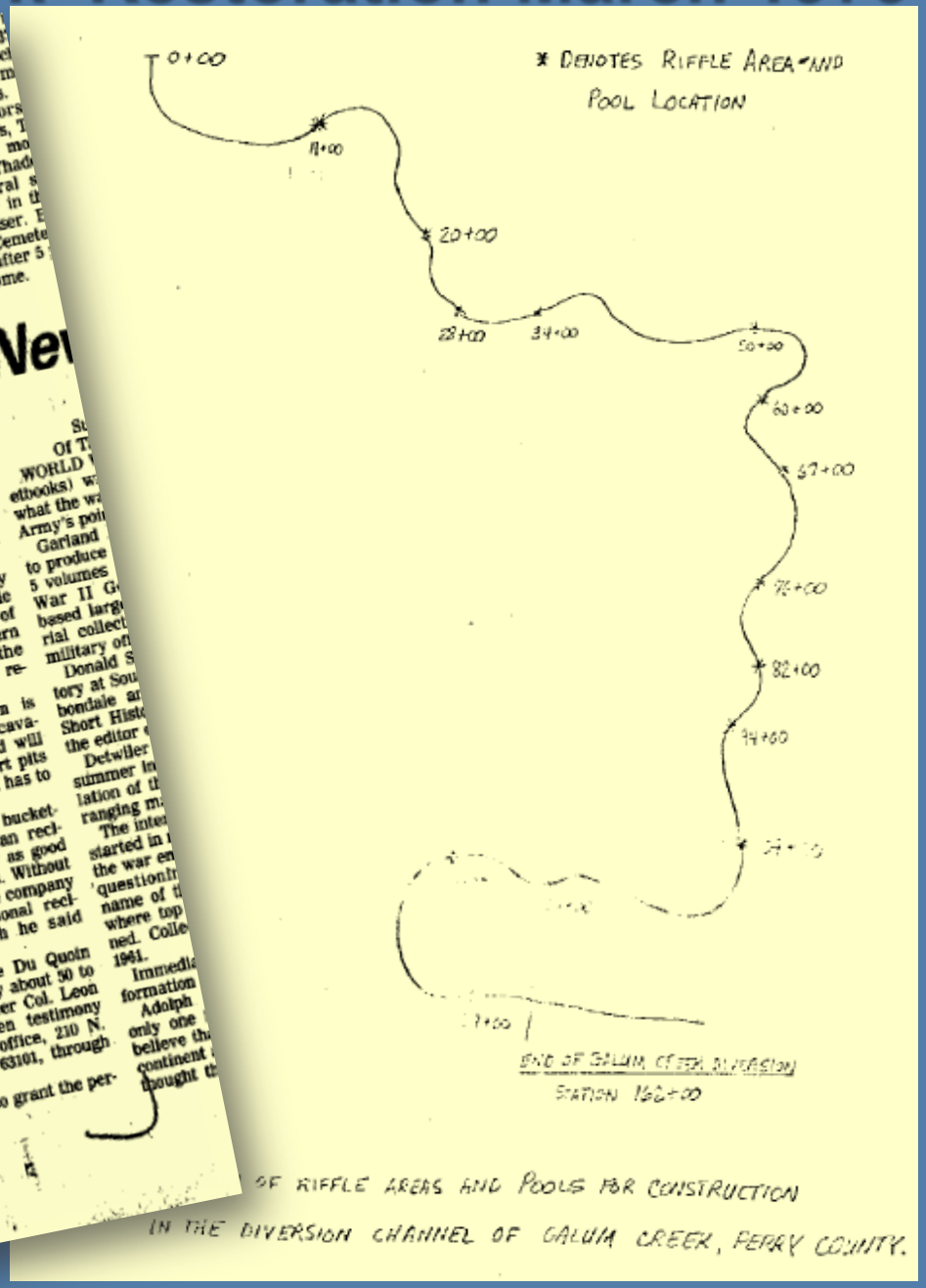
First, Holloway said, the company would lose nine million tons of mineable coal either under or within 100 feet of the creek. Also, he said, Southwestern would not be able to reclaim the stripped land as well if the creek remains where it is.

Southwestern's reclamation plan is based on a huge bucket-wheel excavation system, which Holloway said will not operate efficiently in the short pits Southwestern would have left if it has to jump over the creek.

Holloway said that with the bucket-wheel system, Southwestern can reclaim the land to a productivity as good or better than it currently has. Without moving the creek, he said, the company would have to use conventional reclamation machinery, which he said would not be as effective.

The hearing, held in the Du Quoin VFW Hall, was attended by about 50 to 60 persons. Presiding officer Col. Leon E. McKinney said written testimony will be accepted at his office, 210 N. 12th St., St. Louis, Mo., 63101, through May 11.

The decision whether to grant the permit is up to McKinney.



"...unique .....studying man's ability to change the course of a stream ...and rebuild life..."

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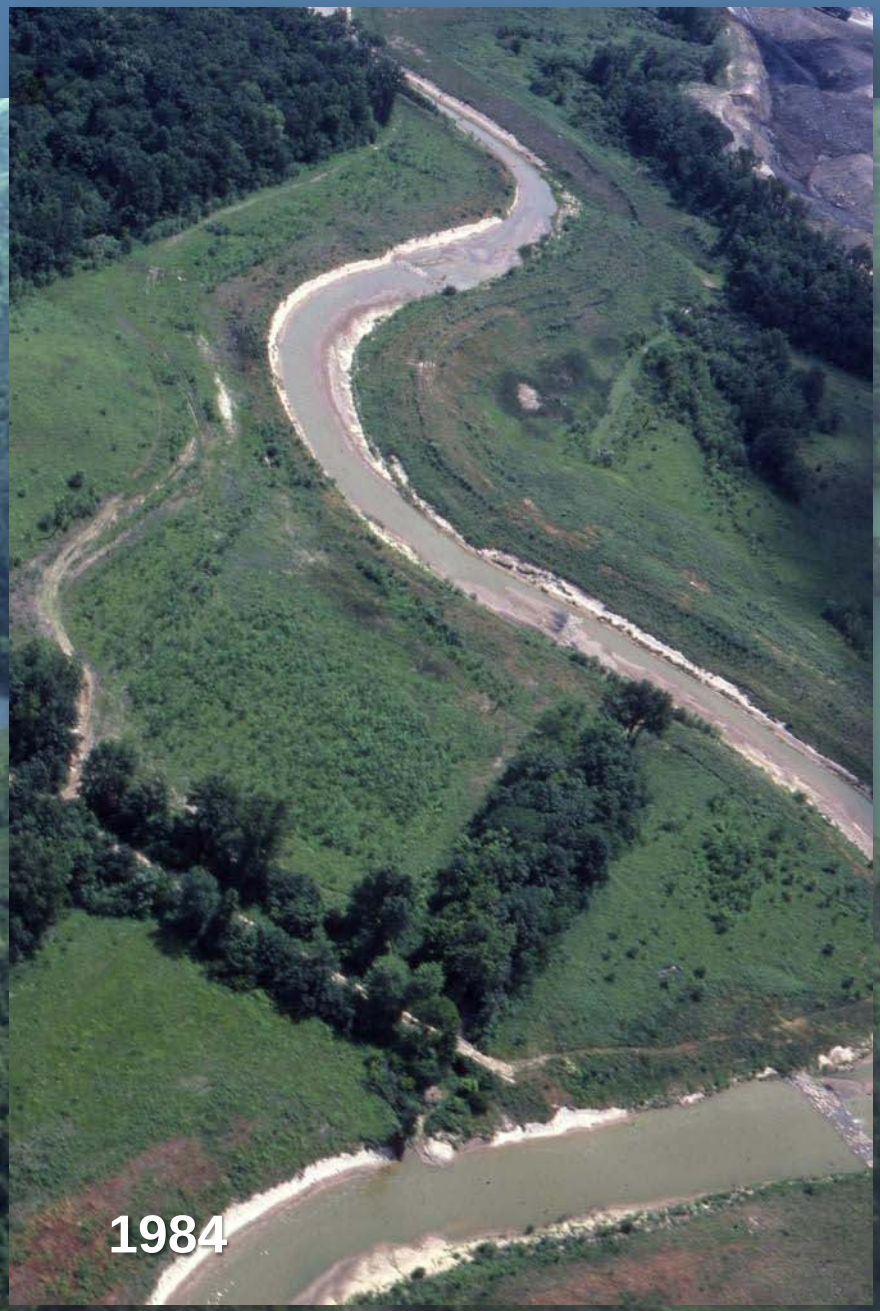
Most questions at the hearing came

August 1987


1984

ARCH Restoration 2005

DESIGN AND ENGINEERING

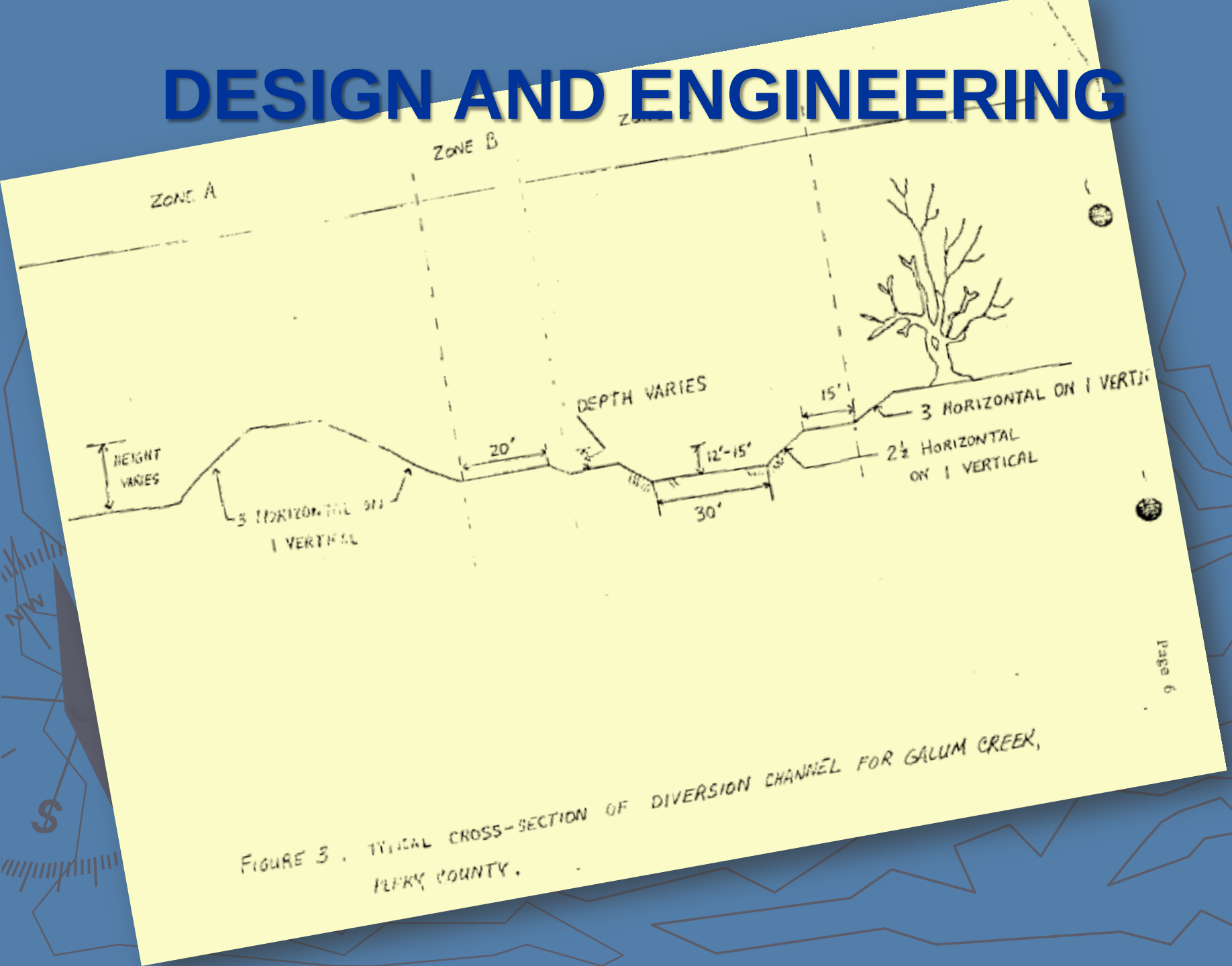


FIGURE 3. TYPICAL CROSS-SECTION OF DIVERSION CHANNEL FOR GALUM CREEK, PERRY COUNTY.

USACE DESIGN CRITERIA

MINIMUM CRITERIA FOR AN ACCEPTABLE DIVERSION CHANNEL FOR GALUM CREEK

On the basis of a preliminary assessment by St. Louis District, a replacement channel satisfying the following conditions would not be expected to produce significant environmental effects:

1. During construction of the new 50-foot wide diversion channel:

a. Construction activities will be restricted to the right bank facing downstream. All channel excavation will be done from the right bank. All excavated material will be disposed of along the right bank.

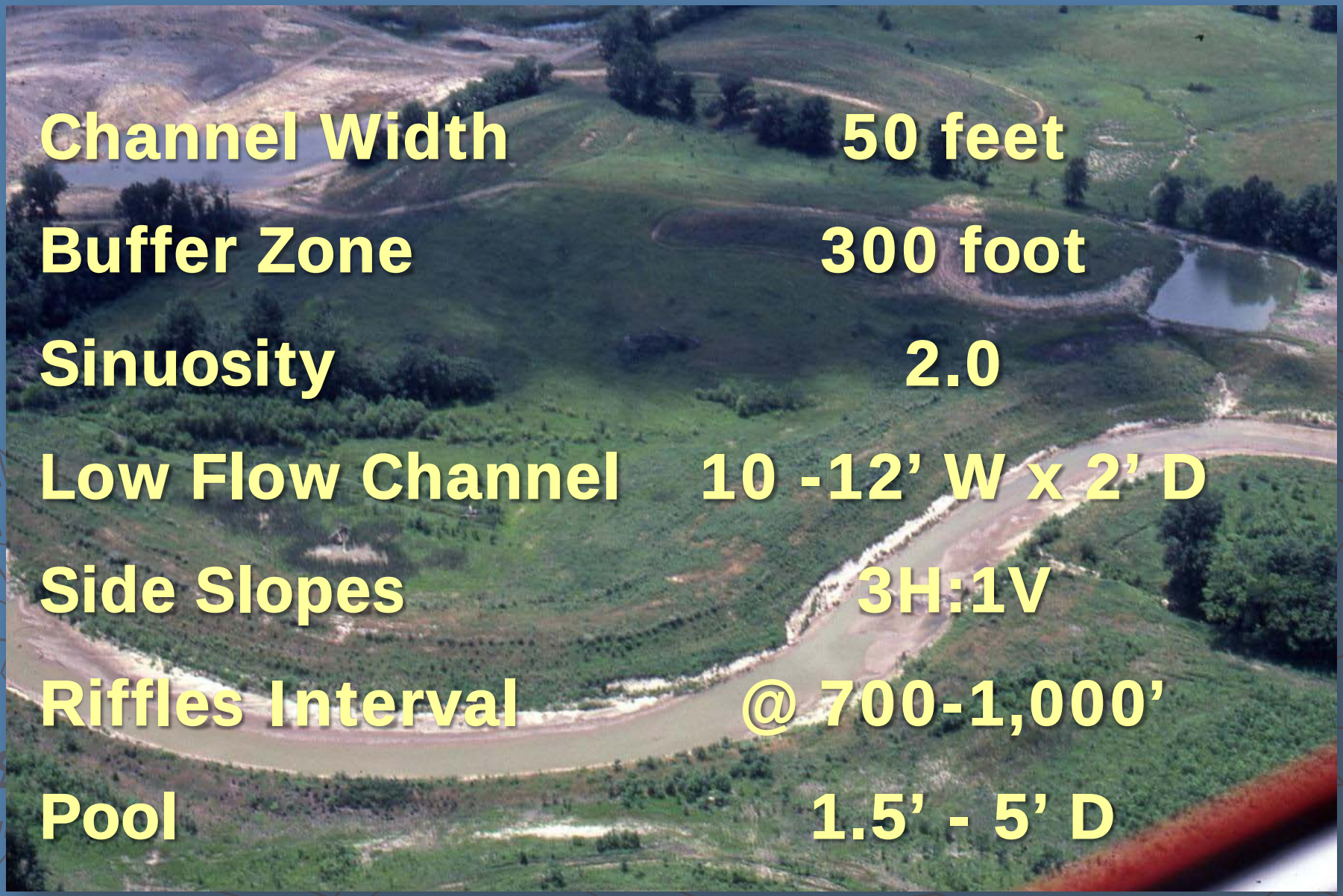
b. A 300-foot wide buffer strip shall be established and maintained along the entire left bank of the diversion channel, as measured out from the top of the left side slope. No disturbance through clearing, burning, draining, grazing, or mowing will be permitted in this strip as long as the applicant owns the property.

c. The diversion channel will be constructed to meander throughout its length to provide a sinuosity measurement of 2.0 or greater.

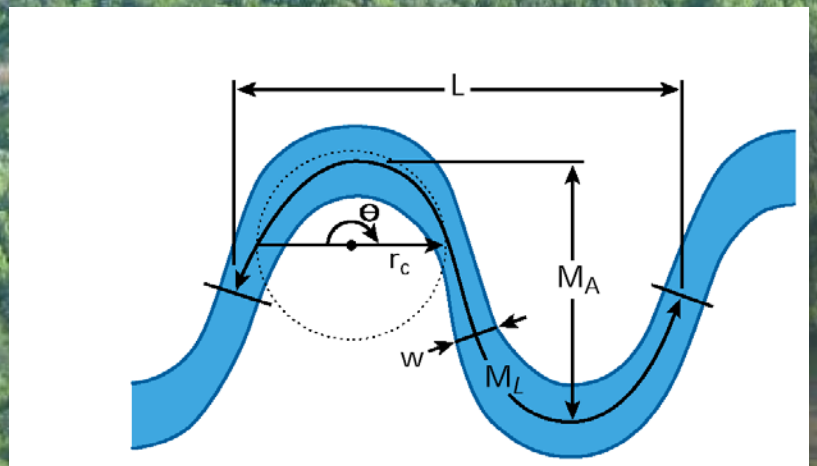
d. A low flow channel 10 to 12 feet wide and 2 feet deep must be constructed in the bottom of the diversion channel. The low flow channel must meander from side to side of the larger channel at intervals of 100 to 150 feet.

e. The side slopes of the diversion channel must be constructed in a horizontal to vertical ratio of 3 to 1.

USACE DESIGN CRITERIA



Channel Width	50 feet
Buffer Zone	300 foot
Sinuosity	2.0
Low Flow Channel	10 -12’ W x 2’ D
Side Slopes	3H:1V
Riffles Interval	@ 700-1,000’
Pool	1.5’ - 5’ D



L meander wavelength
M_L meander arc length
w average width at bankfull discharge
M_A meander amplitude
r_c radius of curvature
θ arc angle

2005

CHANNEL DESIGN : Riffles Pools

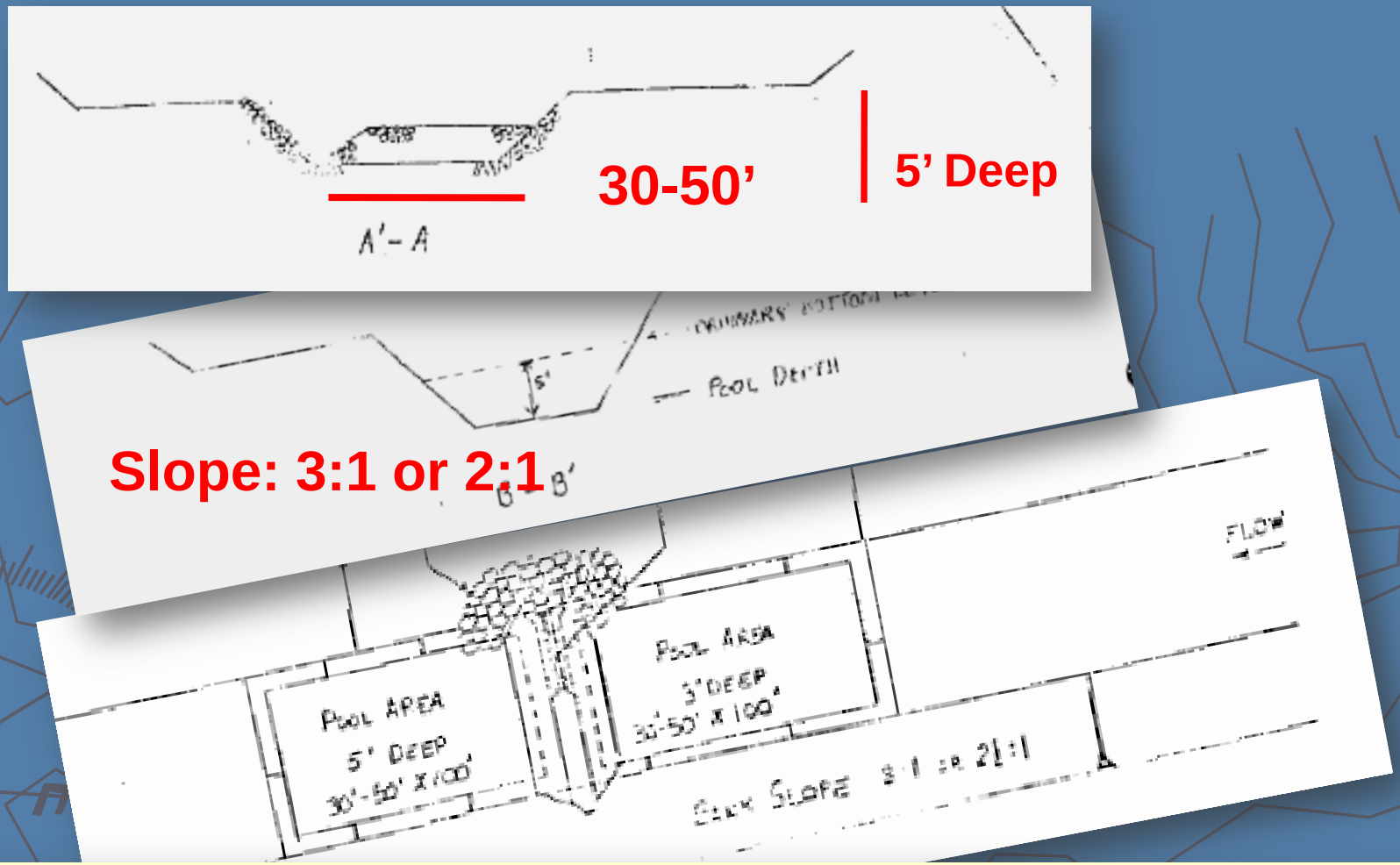


FIGURE 2. TYPICAL RIFFLE AREA DESIGN FOR PLACEMENT IN THE DIVERSION CHANNEL OF GALLIM CREEK, PERRY COUNTY.

ARCH Galum Restoration June 1986

ARCH Galum Restoration Plan-1979 : Vegetation

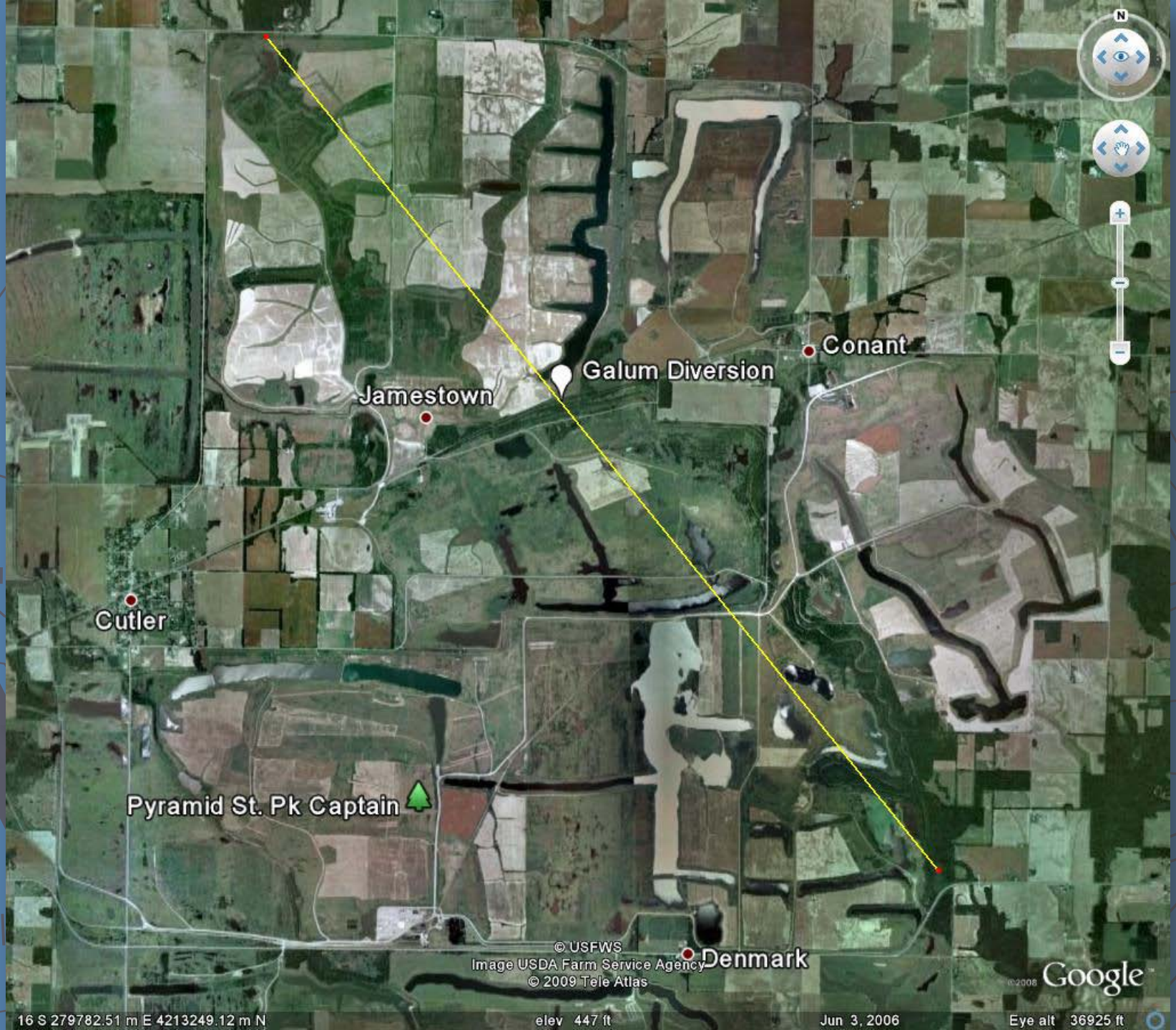
Floodplain	Riparian Corridor	Transition Forest
Bald Cypress	Bald Cypress	Pecan
River Birch	Sweet Gum	Bitternut Hickory
Black Willow	Overcup oak	Shagbark Hickory
Green Ash	Green Ash	Shellbark hickory
Hackberry	Hackberry	Water hicory
Cottonwood	Black Walnut	Black Walnut
Pin Oak	Pin Oak	Bur Oak
Silver Maple	Silver maple	Cherrybark Oak
	Swamp White Oak	Shumard Oak
	Honey Locust	S. Red Oak
		Swamp Chestnut Oak

FIGURE 3. TYPICAL CROSS-SECTION OF DIVERSION CHANNEL FOR GALUM CREEK, PERRY COUNTY.

ARCH Galum Restoration 1981

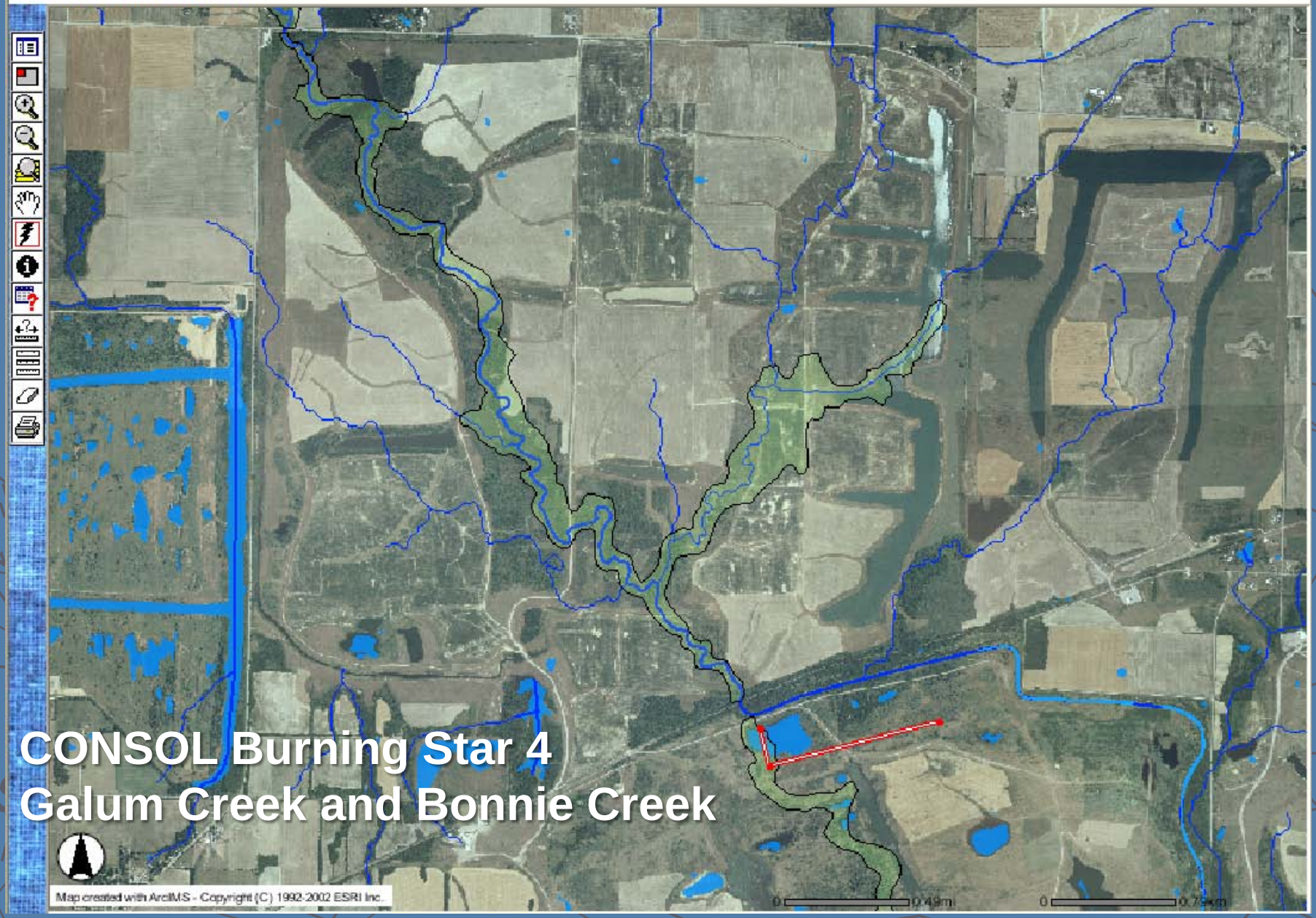
ARCH Galum Restoration April 09

ARCH Galum Downstream
April 2009


Conant
Galum Diversion
Jamestown
Cutler
Pyramid St. Pk Captain
Denmark
© USFWS
Image USDA Farm Service Agency
© 2009 Tele Atlas
Google
16 S 279782.51 m E 4213249.12 m N
elev 447 ft
Jun 3, 2006
Eye alt 36925 ft

Illinois Department of Natural Resources
Office of Mines & Minerals
Land Reclamation Division

ArcIMS Illinois Coal Mine Permit Viewer



CONSOL Burning Star 4
Galum Creek and Bonnie Creek

Site	Length	Meander	M r	Buffer
Galum Rest.	13,443	22,702 (4.3 mi)	1.72	300-500

Site	Length	Meander	M r	Buffer
Bonnie Rest.	11,842	19,311 (3.7 mi)	1.63	500-750

N
Jamestown
Jamestown Rd
© USFWS
Image USDA Farm Service Agency
© 2009 Tele Atlas
©2008 Google
16 S 278358.16 m E 4214647.66 m N
elev 428 ft
Jun 3, 2006
Eye alt 5765 ft

CONSOL Galum & Bonnie Creek

Active Mine	2 million tons /yr production 4,800 acre permit area Seam 6 @ 70 - 95 feet
Watershed	18 sq miles
Channel Length	21,000 ft (Galum)
Channel Gradient	4 –7 ft/mi
Channel Restoration	Reconstructed Mine Soils
Riparian Forest Restoration	140 acres
Bonnie Creek – Restoration	19,000 ft

(From: Ervin Anderson CONSOL 1987)

CONSOL Burning Star 4
Galum & Bonnie Creeks

Design and Engineering	May 1979
Permit Approval	November 1982
Construction (8.0mi)	June 1984 - ~1998
Floodplain Restoration	1984 - 1998
Channel Reconnection	June 1999
Monitoring	2002 – 2006
OSM National Award	2002

News Release

CONSOL Energy Wins National Reclamation Award; Former Surface Mine in Illinois Now Home to Wildlife, Waterfowl

WASHINGTON, Sept. 18 2002 -- The U.S. Office of Surface Mining ..... 2002 OSM National Award for innovative reclamation practices at the company's Burning Star No. 4 Mine property in southern Illinois....

...the first time in Illinois that two major streams in a minefield were diverted during mining and then restored to their original locations. .....reclaimed as a habitat for wildlife and waterfowl.

Design – Enhancement

- Channel
  - Riffles
  - Pools
  - Deep Water Habitat
    - Sediment Control
    - Base Flow
- Connectivity
  - High Water Flow – Wetlands
  - Corridor
  - Confluence – Bonnie Ck. Restoration

Floodplain

Storm Retention –
<0.5 ft Upstream W.L increase
Flow & Velocity (downstream)
June 2006

Habitat Enhancement

Habitat – Riparian PFO1A, PSSC, PEMA/C
(inundate - 2 yr design storm)
Buffer – Protection
300-500 ft.

Design – “Enhancement”

Deep Water Habitat Connectivity

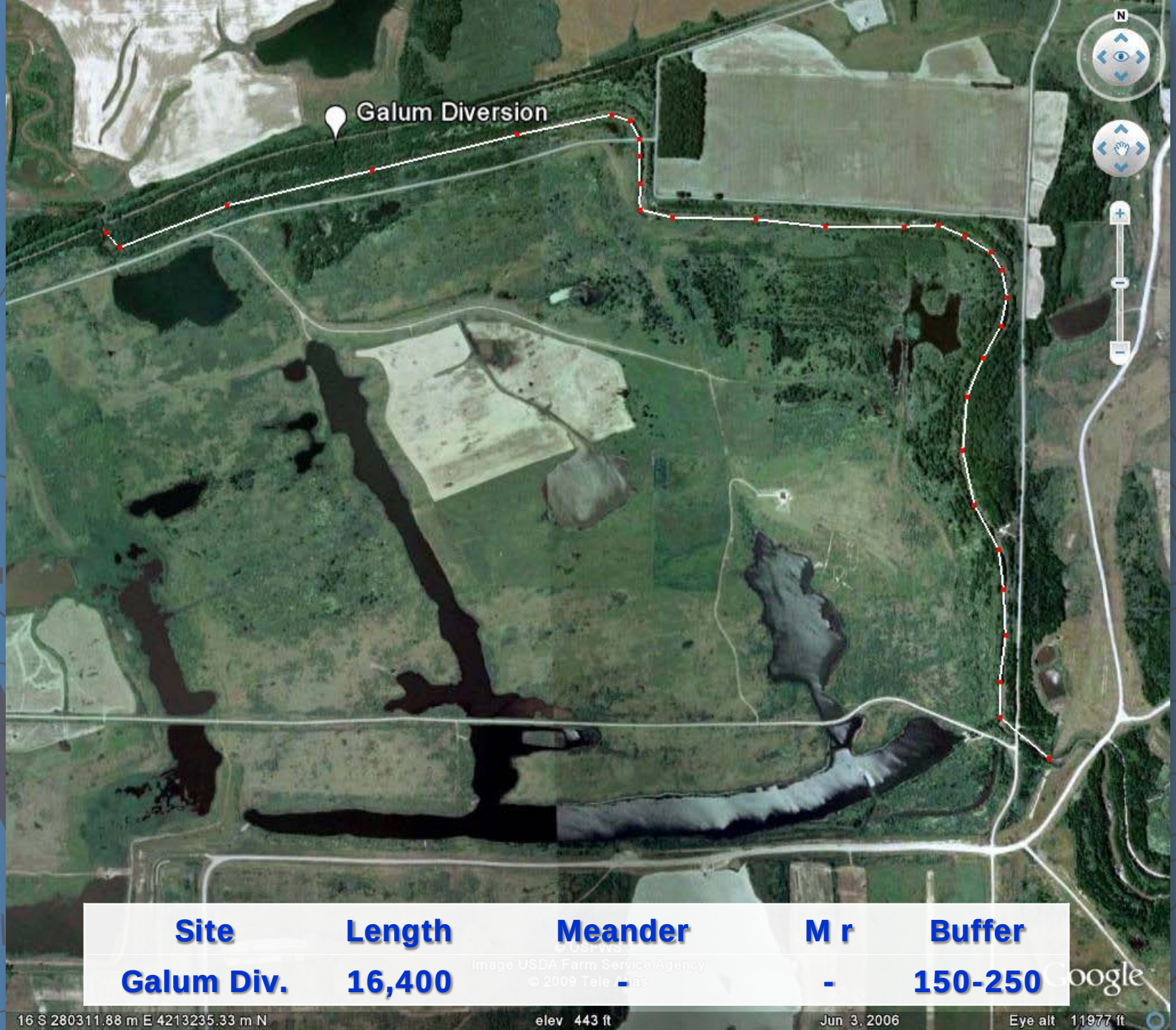
Sediment Control

Base Flow

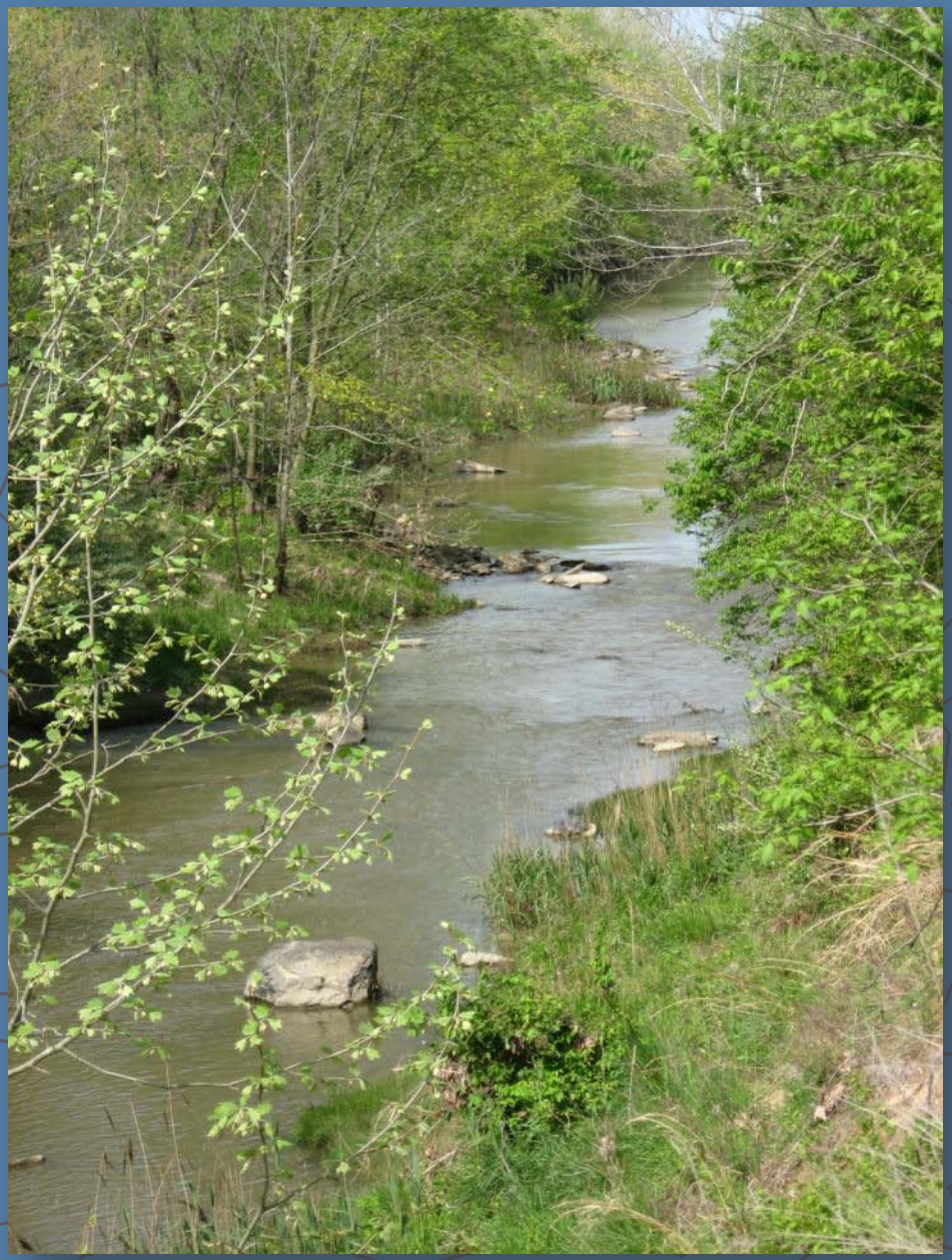
CONSOL Burning Star 4: Galum Creek

Bald Cypress
Hackberry
Box elder
Red maple
Silver maple
Swamp white oak
Beech
American Elm

Ash
Sweetgum
Sycamore
Cotttonwood
River birch
Pin Oak
Pecan
American plum



Site	Length	Meander	M r	Buffer
Galum Div.	16,400	-	-	150-250



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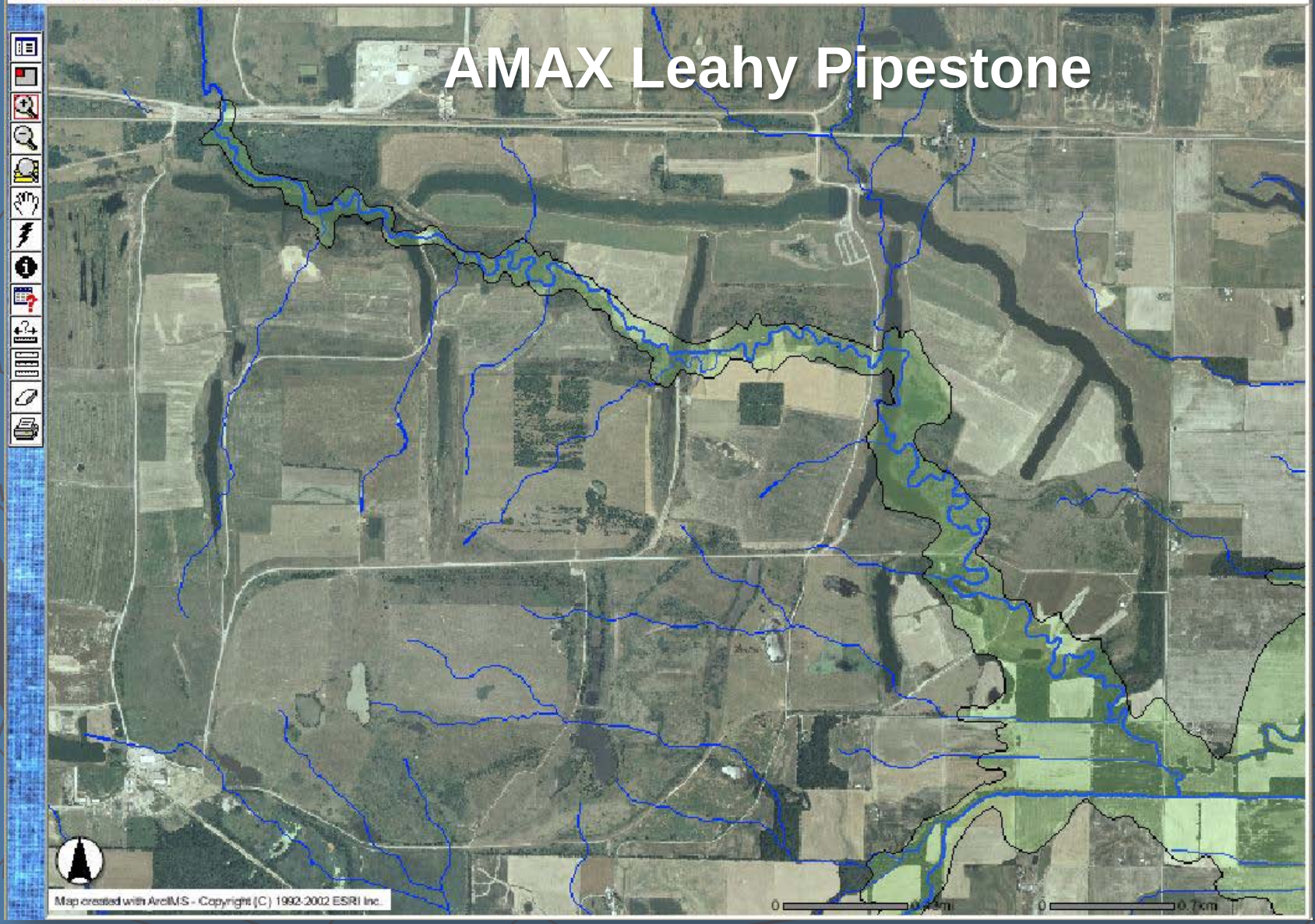
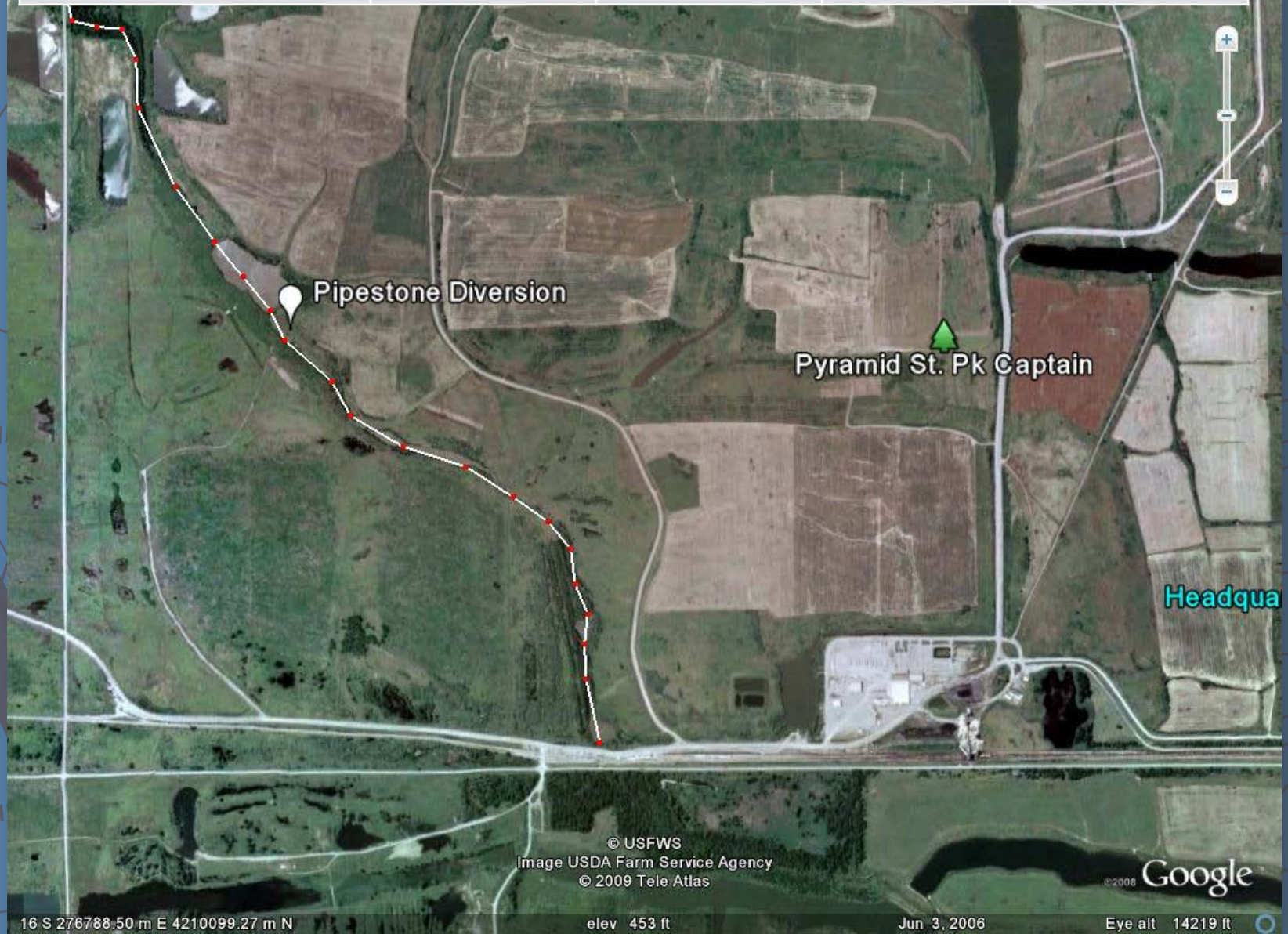
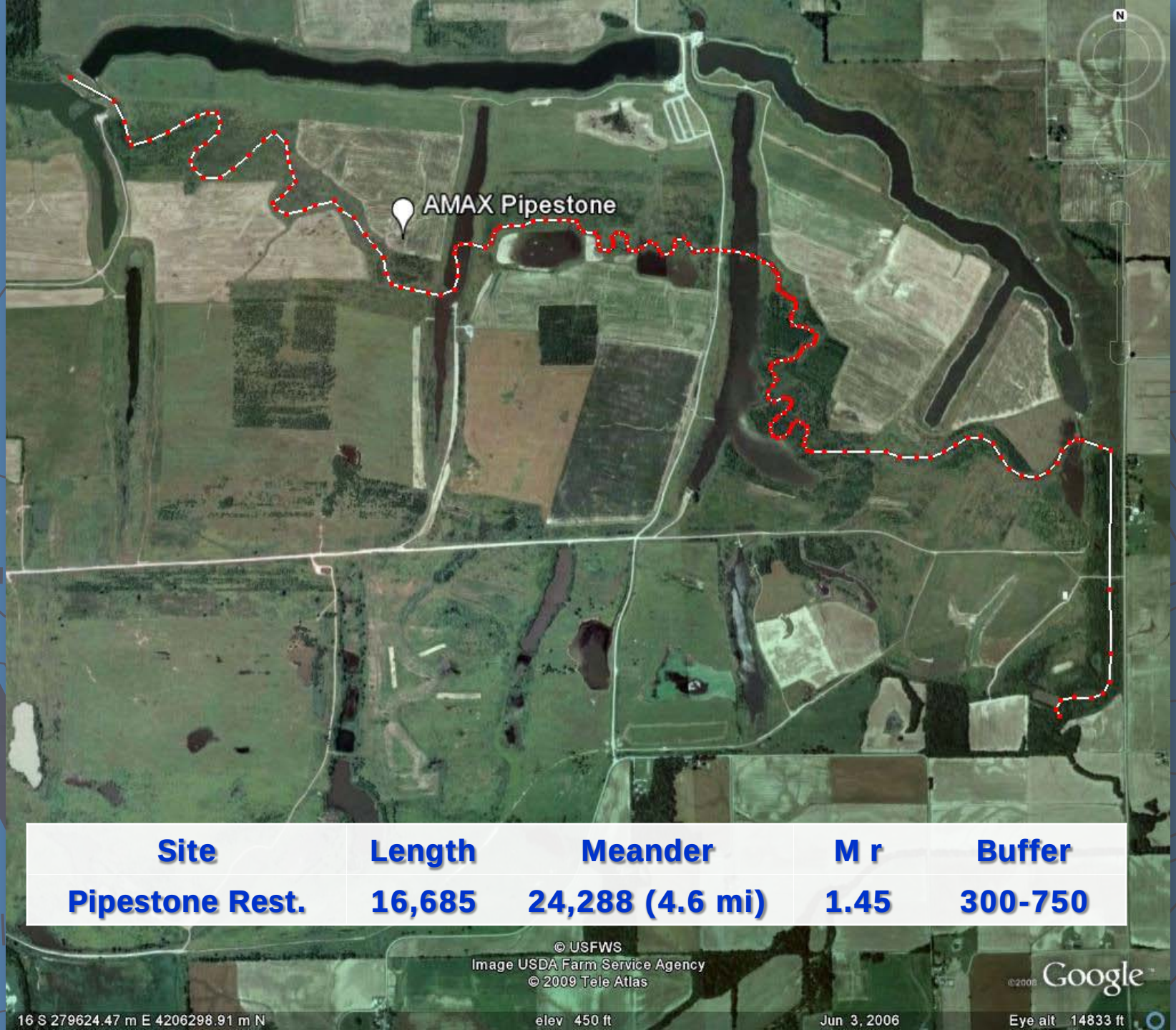


Site	Length	Meander	M r	Buffer
Pipestone Diver.	11,342	-	-	85



Site	Length	Meander	M r	Buffer
Pipestone Temp Div.	22,704	-	-	-



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Pipestone Rest.	16,685	24,288 (4.6 mi)	1.45	300-750

Woodrail Rd
Union School Rd
Tangen Cmtry Rd
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Image USDA Farm Service Agency
© 2009 Tele Atlas
Google
16 S 280811.26 m E 4206735.06 m N
elev 439 ft
Jun 3, 2006
Eye alt 7448 ft

AMAX Leahy

Sept 1985

April 2009
Reconnection Fall 1991

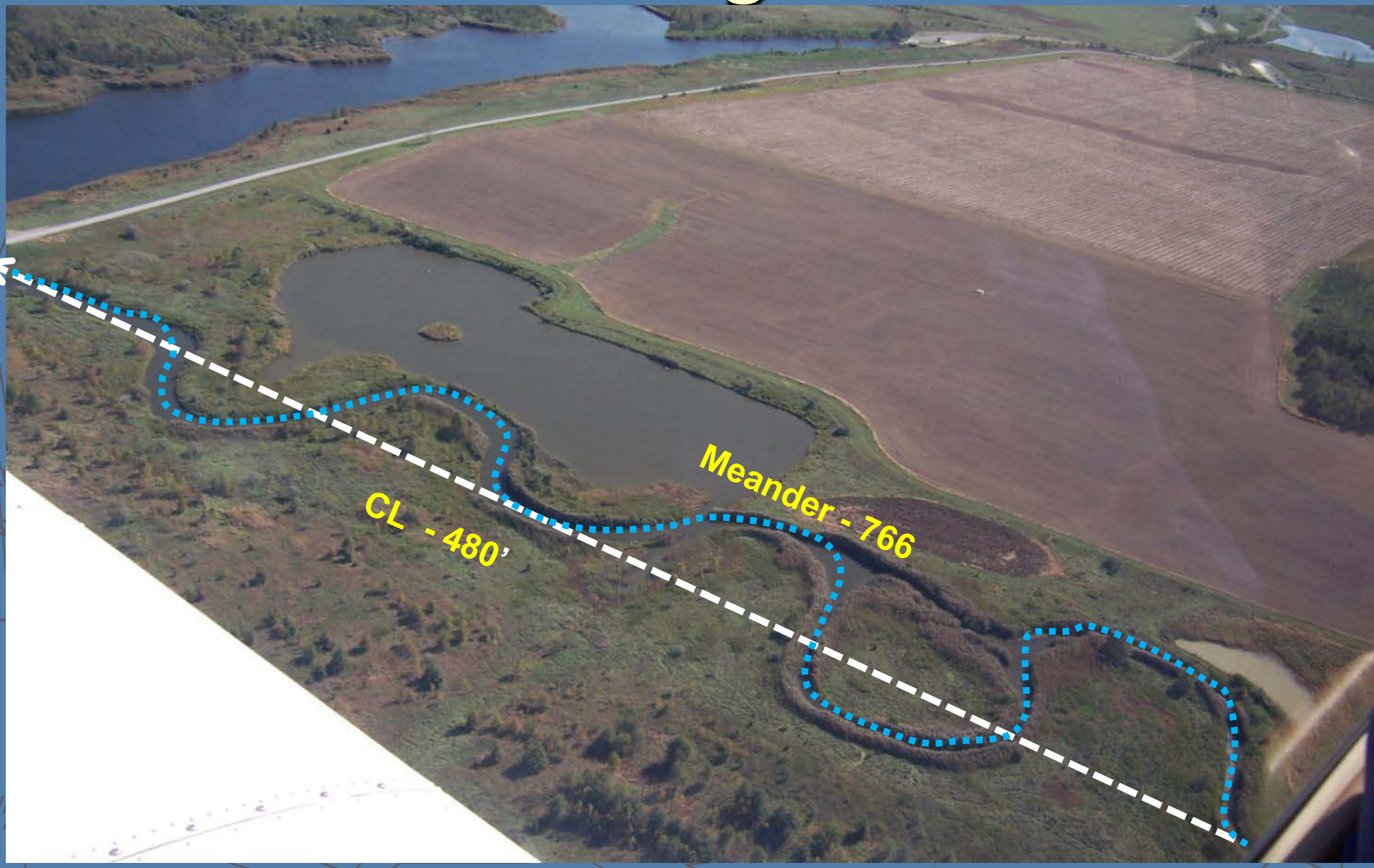
Sept 1985

June 2005

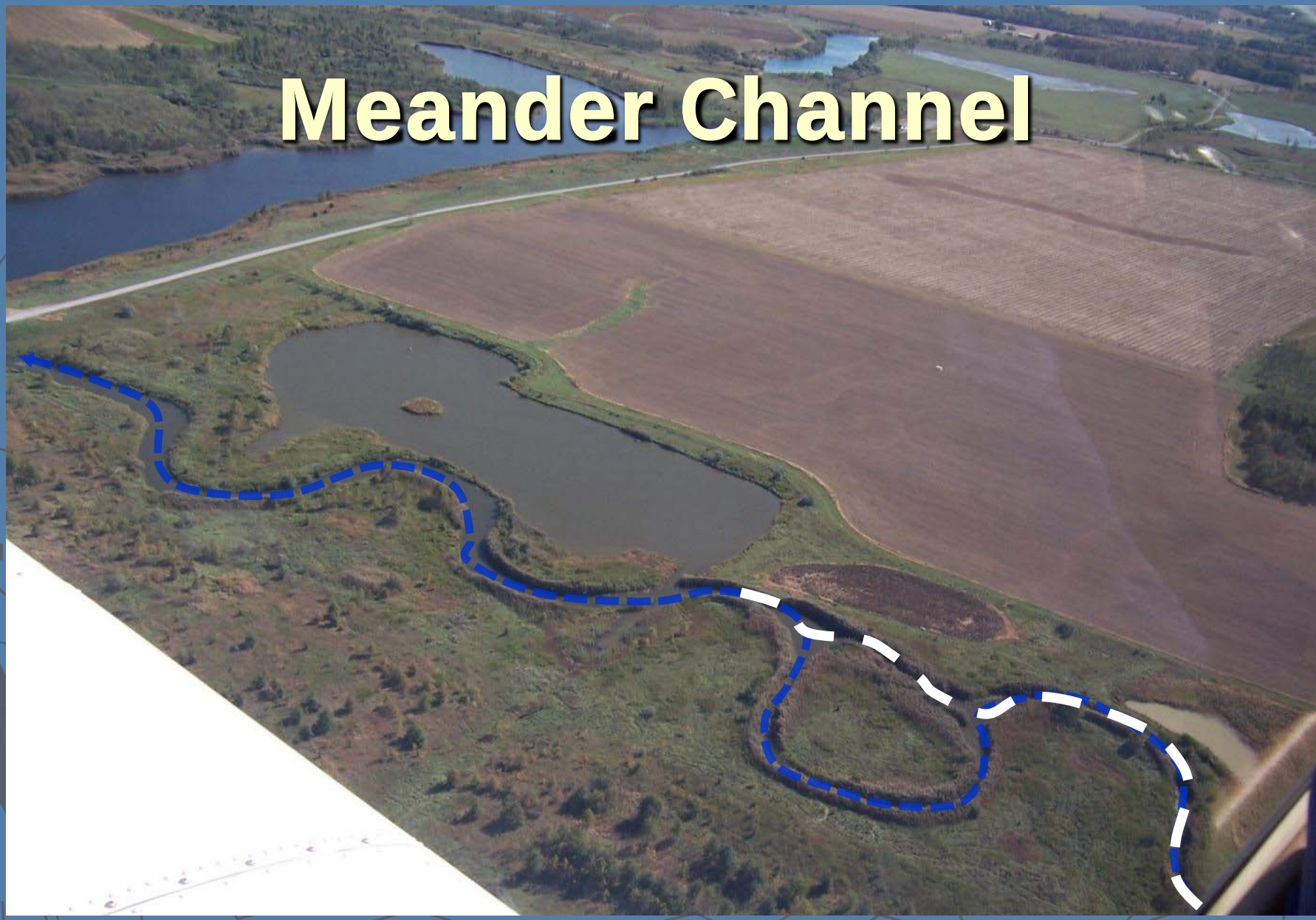
Design

Floodplain Wetland
Conservation Buffer / Corridor - 500 – 750 '
Meander

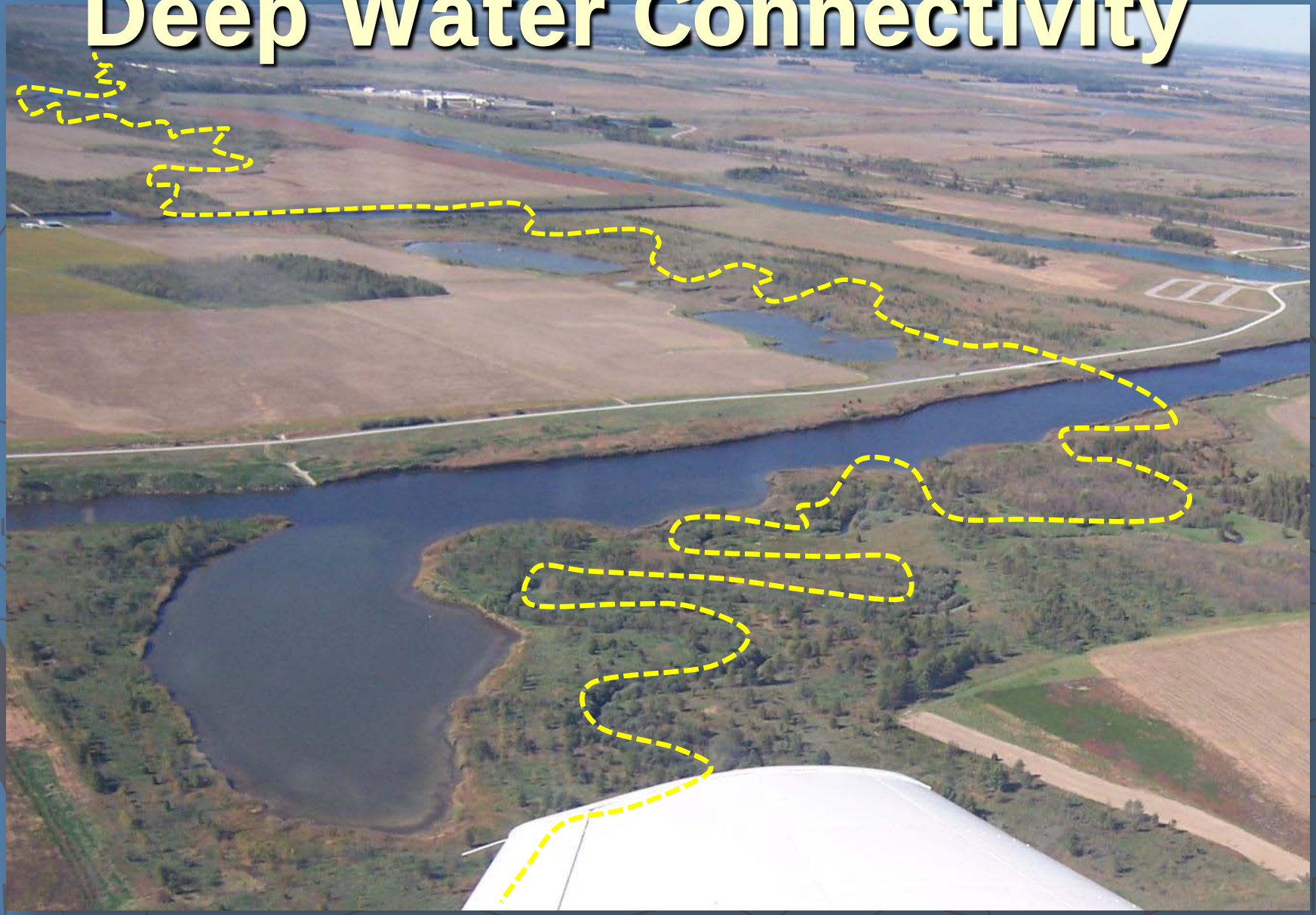
Design



Meander Channel



Deep Water Connectivity



METHODS

GEOMORHOLOGICAL

- Bank
- Channel
- Flow
- Bed Substrate

PHYSICAL- CHEMICAL

BIOLOGICAL

- Fish & Invertebrates
- Buffer Zone Canopy

Monitoring: Streamflow

Pipestone	Discharge (cfs)				
Winter (1/17 - 18/95)	L7	R1	R2	R3	L3
	-	-	9.33	6.71	7.52

* Restoration reconnection downstream of L7 prior to June 92

Sediment Reduction

Pipestone *June 92	Turbid (NTU)	SS (ppm)	Fe (total)	pH
Upstream - L7	36	34	0.98	7.2
Downstream - R3	8	3	0.23	6.8
November 93				
Upstream - L7	26	28	1.14	9.2
Downstream - R3	8	12	0.62	8.3

* Restoration reconnection downstream of L7 prior to June 92

Monitoring: “Indicator“ Species

Pipestone

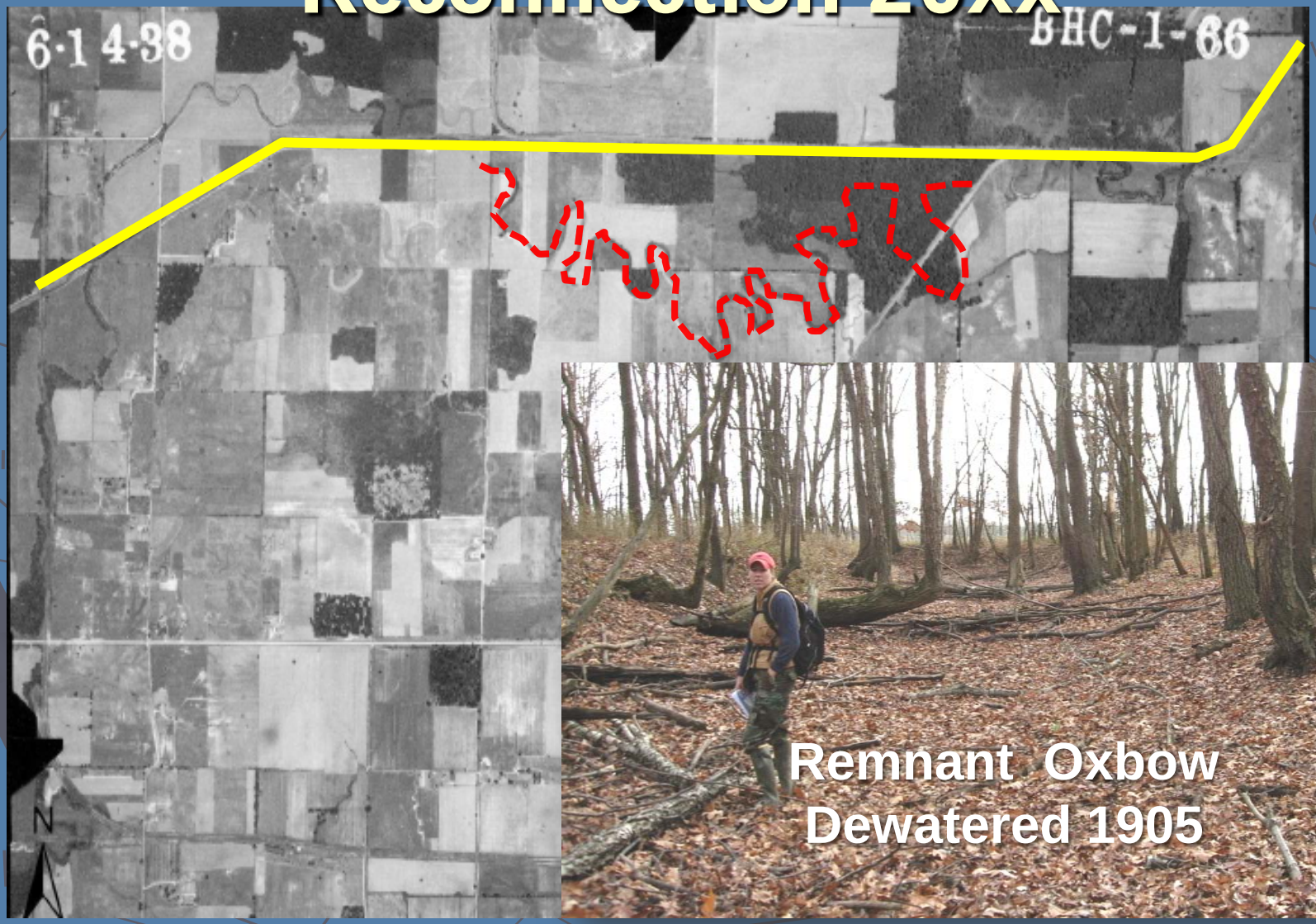
Winter 95	L7	R1	R2	R3	L3
Brook Silversides	19	>50	>50	34	-
Blackstripe Top Min.	1	0	15	4	2
Mayfly (Canidae)	-	-	P	P	-
Flies (Chironomidae)	P	P	P	P	P
Stonefly ’88 (Perlidae)					40

* Restoration reconnection downstream of L7 prior to June 92

PIPESTONE:

Remnant Oxbow
Dewatered 1905

Channelized 1905-Reconnection 20xx

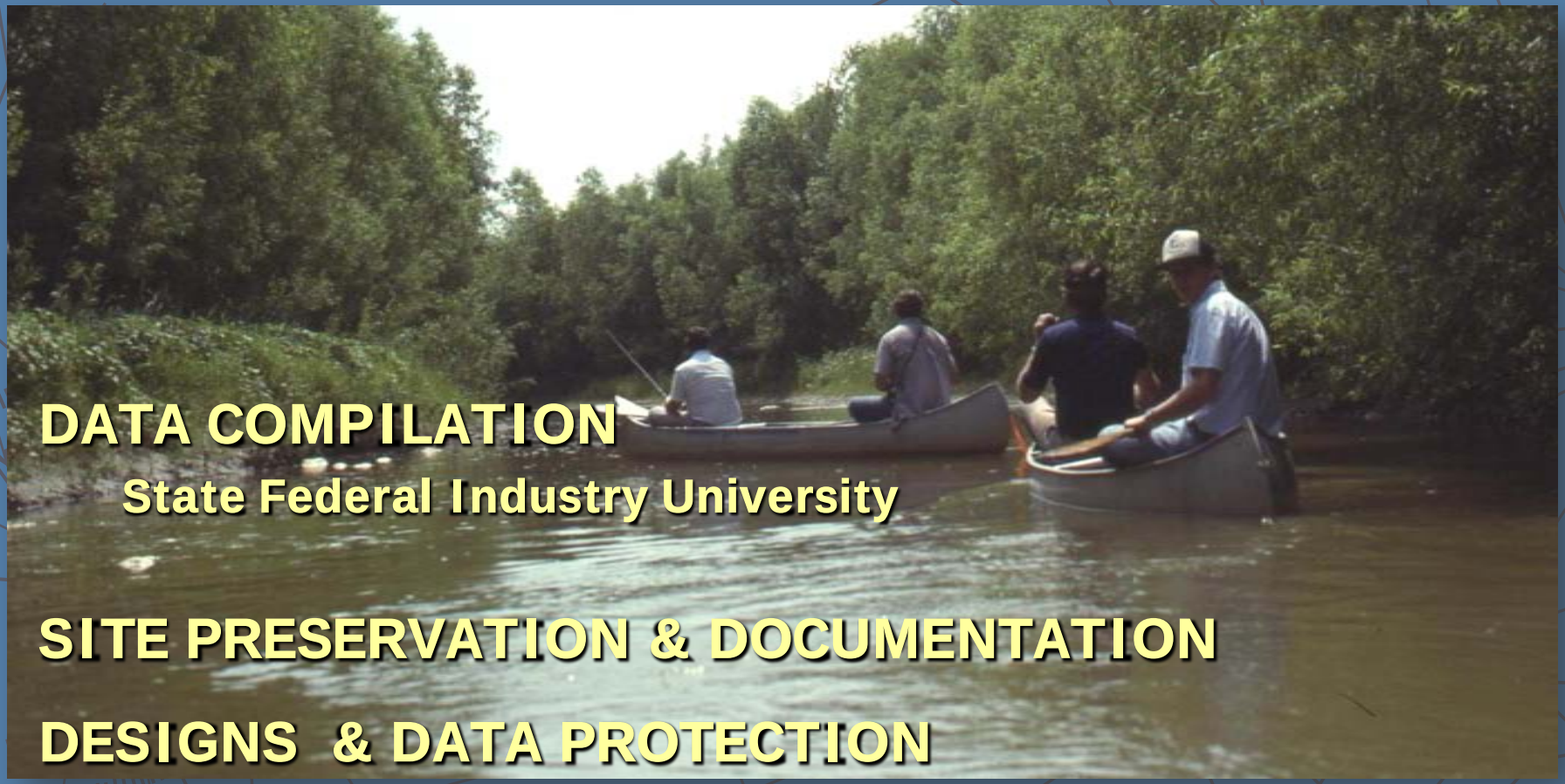


Remnant Oxbow
Dewatered 1905

30 YEAR REASSESSMENT

RESTORATION SUCCESS

Functions and Values



DATA COMPILATION

State Federal Industry University

SITE PRESERVATION & DOCUMENTATION

DESIGNS & DATA PROTECTION

PIPESTONE CREEK: FALL 1989
ARCH OF ILLINOIS - PIPESTONE CR
Aquatic Monitoring 1987
PIPESTONE CREEK 1986 SURVEY
OF ILLINOIS PIPESTONE CREEK
Diversion - Monitoring
AMAX
COAL COMPANY
1984 MINE STREAM SURVEY
LEAHY MINE
PREPARED BY
Gilbert/Commonwealth, Inc.

DATA ARCHIVE

GALUM

File Edit View Favorites Tools Help

Back Search Folders

Address C:\Documents and Settings\jnawrot\My Documents\STREAM RESTORATION\MONITOR DATA Archives OMM\GALUM Go

Folders

- Desktop
  - My Documents
    - STREAM RESTORATION
      - BACKGROUND DOCS
      - MAPS PHOTOS
      - MONITOR DATA Archives OMM
        - BONNIE
        - GALUM
        - WHITE WALNUT
      - PHOTO DOC
      - PRESENTATIONS
      - PROGRAM REGIST
      - REGULATIONS
      - TRAVEL
  - My Computer
  - My Network Places
  - Recycle Bin

Name	Size	Type	Date Mod
Galum Creek 2002 Appendix 1	1,420 KB	Microsoft Office Word...	3/26/200
Galum Creek 2002 Report Text	28 KB	Microsoft Office Word...	3/26/200
Galum Creek 2002 Table 1	24 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2002 Table 2-1	21 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2002 Table 2-2			3/26/200
Galum Creek 2002 Table 2-3			3/26/200
Galum Creek 2002 Table 2-4			3/26/200
Galum Creek 2002 Table 3			3/26/200
Galum Creek 2003 APPENDIX 1			3/26/200
Galum Creek 2003 Part 1	31 KB	Microsoft Office Word...	3/26/200
Galum Creek 2003 Part 2	218 KB	Microsoft Office Word...	3/26/200
Galum Creek 2003 Part 3	21 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2003 Part 4	27 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2003 Part 5	19 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2004 Part 1	31 KB	Microsoft Office Word...	3/26/200
Galum Creek 2004 Part 2	218 KB	Microsoft Office Word...	3/26/200
Galum Creek 2004 Part 3	23 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2004 Part 4	30 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2004 Part 5	21 KB	Microsoft Office Excel...	3/26/200
GALUM CREEK 2004 Part 6	13,052 KB	Microsoft Office Word...	3/26/200
Galum Creek 2005 Part 1	225 KB	Microsoft Office Word...	3/26/200
Galum Creek 2005 Part 2	23 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2005 Part 3	30 KB	Microsoft Office Excel...	3/26/200
Galum Creek 2005 Part 4	21 KB	Microsoft Office Excel...	3/26/200
GALUM CREEK 2005 Part 5	13,055 KB	Microsoft Office Word...	3/26/200
Galum Creek 2006 Part 1	766 KB	Adobe Acrobat 7.0 D...	3/26/200
Galum Creek 2006 Part 2	28 KB	Adobe Acrobat 7.0 D...	3/26/200

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Author: Dale
Date Modified: 3/26/2009 4:12 PM
Size: 21.0 KB

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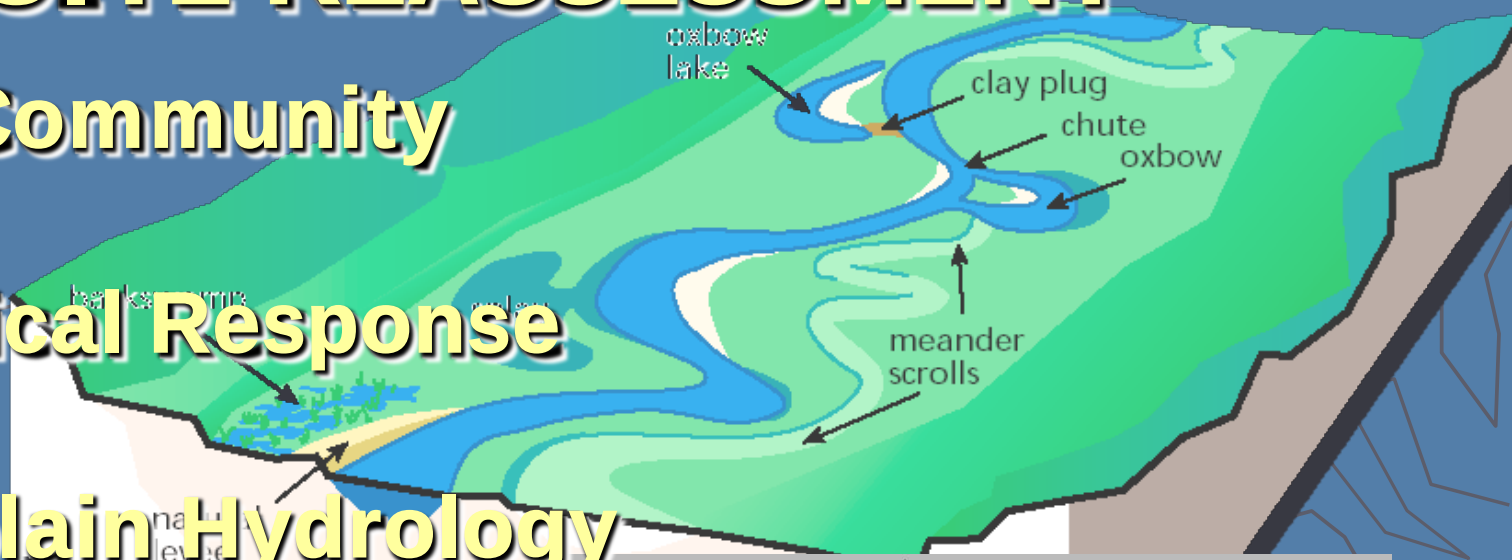
SITE REASSESSMENT

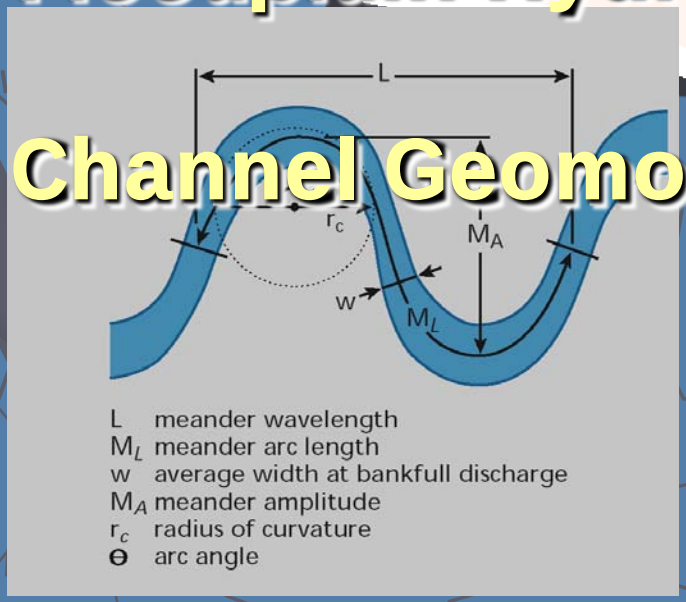
Plant Community

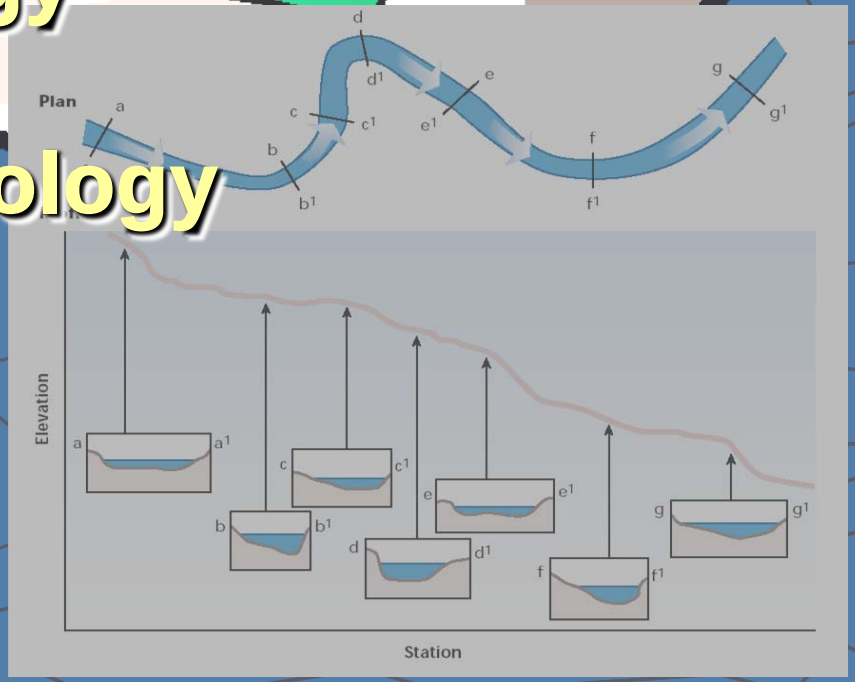
Biological Response

Floodplain Hydrology

Channel Geomorphology







“..but can you restore .....
the functions and values?”