

Bathymetric Data and Aerial Photography Provide Insight into Five Decades of Lower Mississippi River Side Channel Change

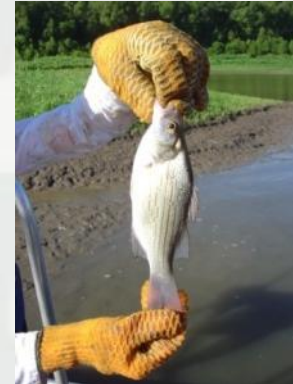
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Importance of Side Channels

- Lateral interaction between river, side channels and floodplain critical to maintain ecological process (Laux and Keevin 2004)
- Support greater numbers and diversity of fish than the main channel (Weigel et al. 2006; Yildirim and Pegg 2009)
- Habitat for spawning, rearing and overwintering fish
- Invertebrate source for main channel (Ward and Stanford 1995)



Side Channel Alterations

- Habitat transformation (connected – backwater – terrestrial)
- Control structures prevent large scale flood events from resetting ecological succession
- Locks and Dams, levees, and urbanization alter flow



Our Study



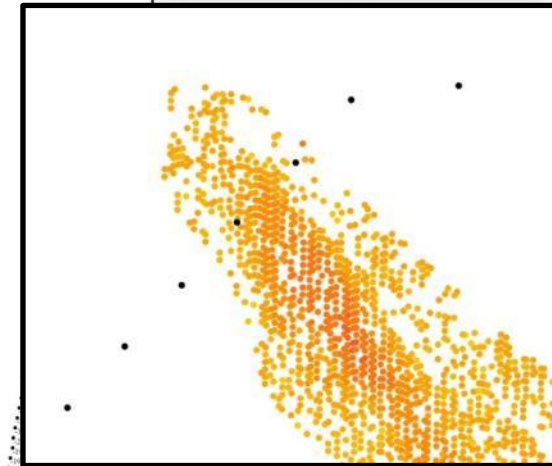
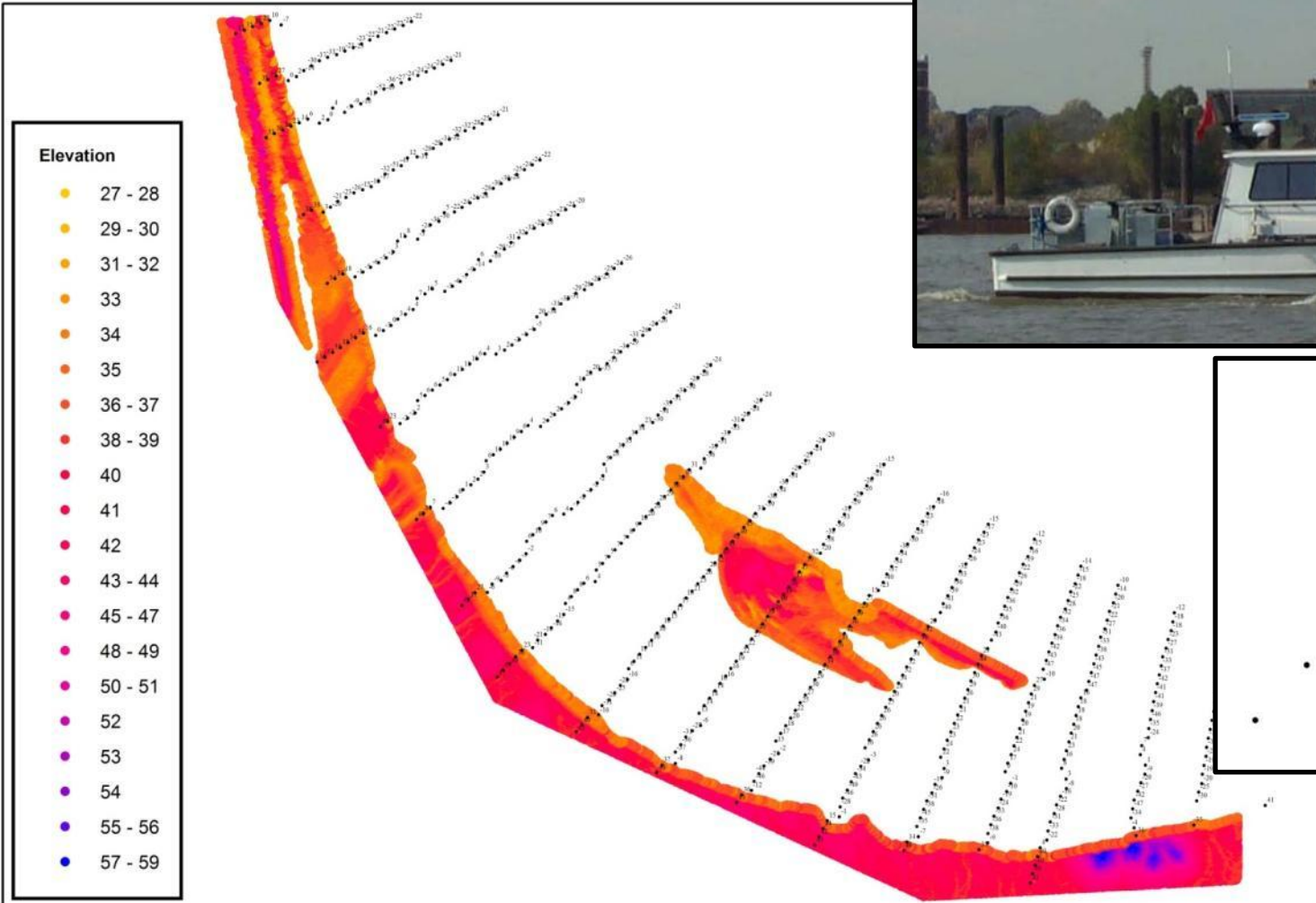
- This study is a continuation of the 2003 study initiated by Dr. Donald Williams, MVD
- Scope – Mississippi River from Cairo, Illinois to the Head of Passes
- Purpose – determine change in side channel area and volume over time
- **Our study calculates side channel area and volume with ArcGIS for each decade from the 1960s to 2000s.**



Hydrographic Surveys 1960 – 90s



Light Detection and Ranging (LIDAR) and Bathymetric Data 2000s

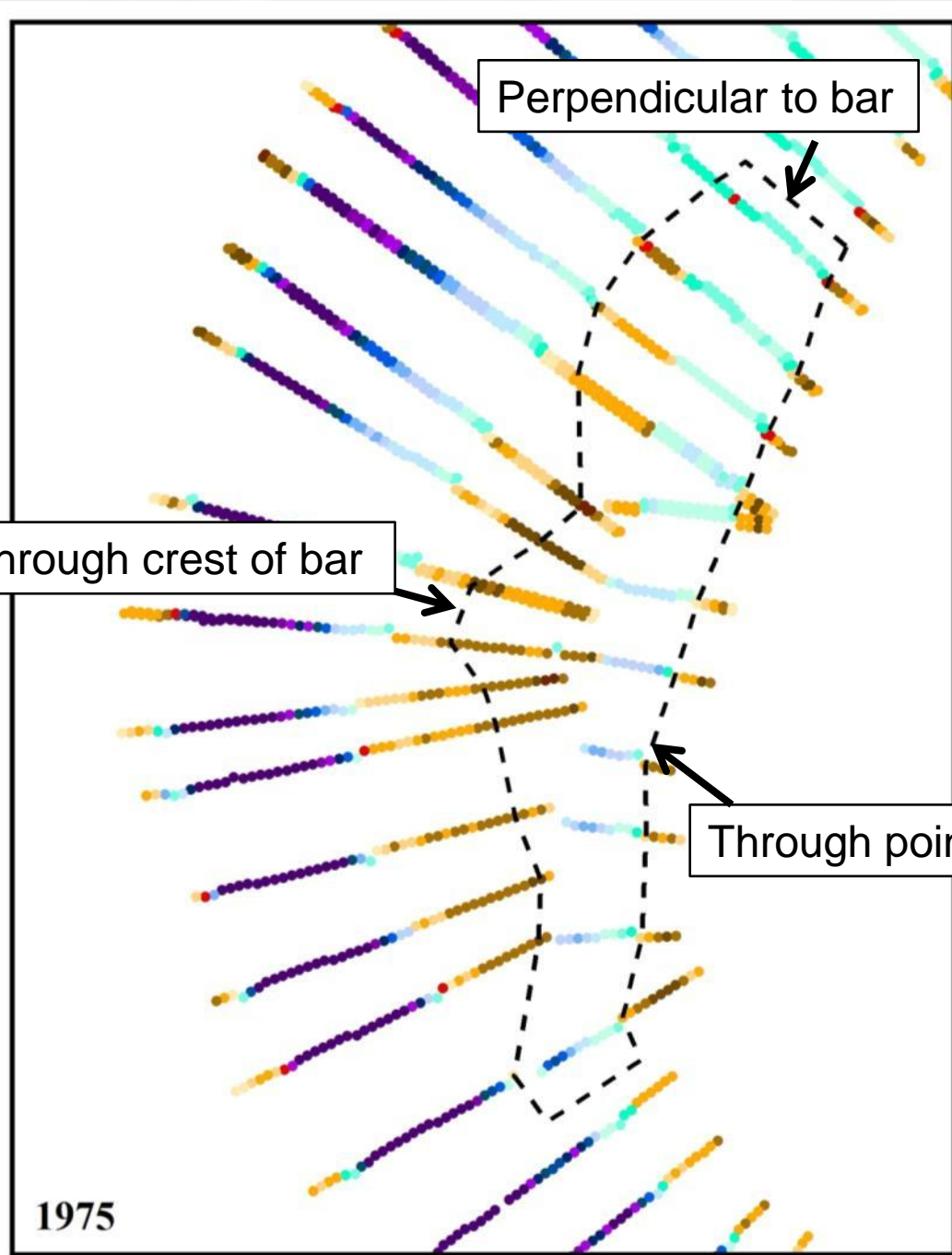


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Side Channel Definition

- Channel bed is separated from the main channel by a bar with a crest elevation $\geq +5$ ft LWRP.
- Riverside bank of side channel is the crest of the bar
- Side channel landward bank is a bathymetric point $\geq +10$ ft LWRP
- Upstream and downstream side channel ends are an imaginary line extending perpendicular from the ends of the bar across the channel to the top bank





1975

Perpendicular to bar

Outline through crest of bar

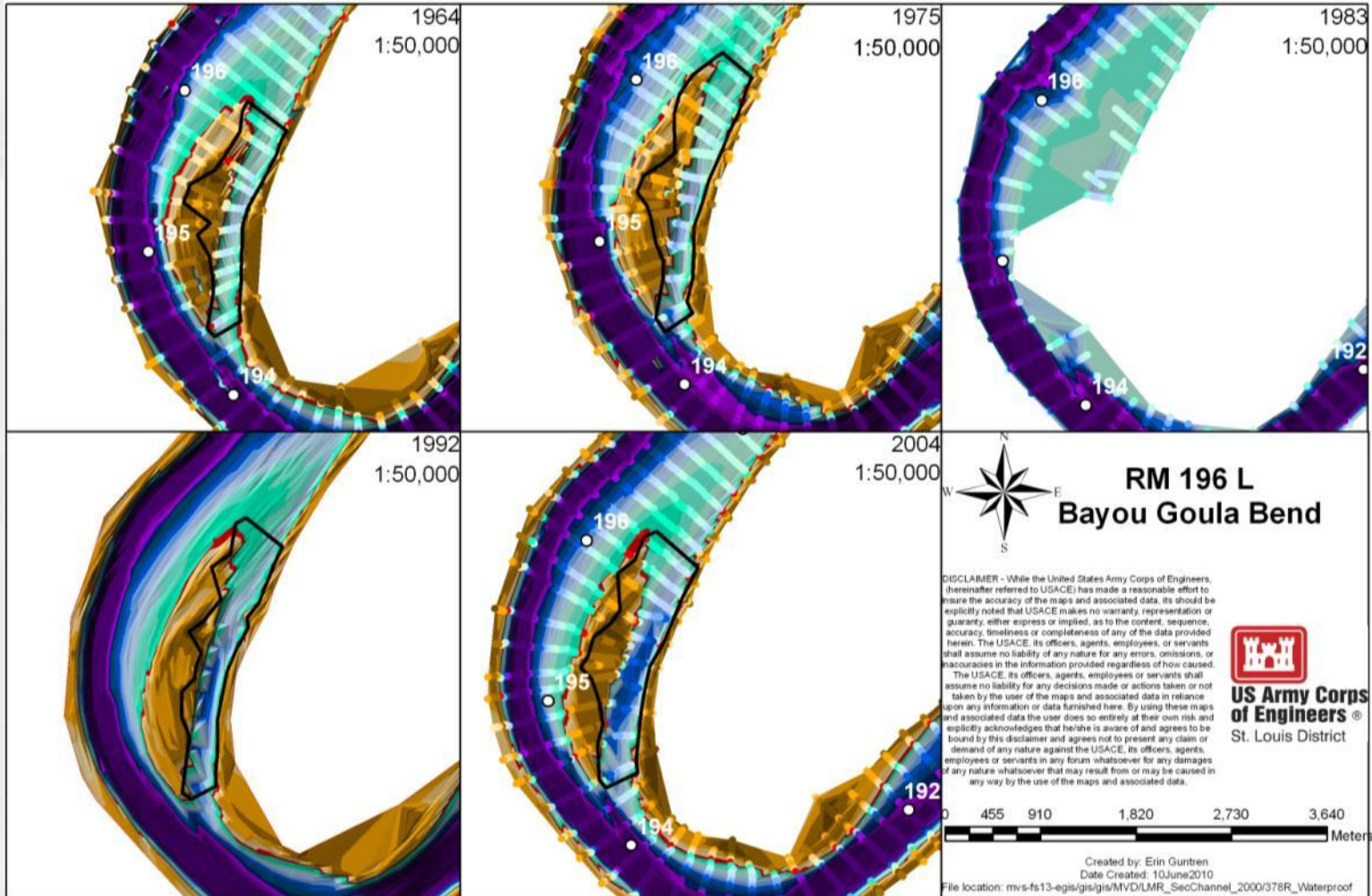
Through point > + 10 LWRP

1

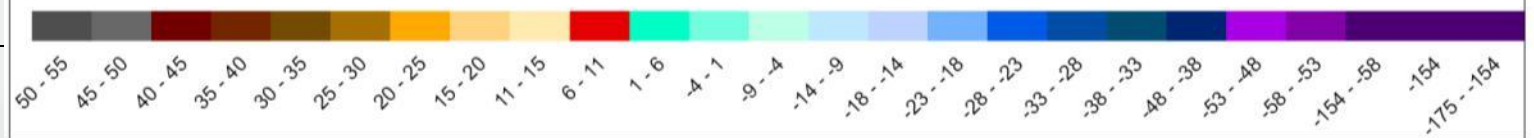
Bathymetry

- -154 - -59
- -58 - -54
- -53 - -49
- -48 - -44
- -43 - -39
- -38 - -34
- -33 - -29
- -28 - -24
- -23 - -19
- -18 - -15
- -14 - -10
- -9 - -5
- -4 - 0
- 1 - 5
- 6 - 10
- 11 - 14
- 15 - 19
- 20 - 24
- 25 - 29
- 30 - 34
- 35 - 39
- 40 - 44
- 45 - 49
- 50 - 54
- 55 - 59

Bayou Goula Bend, RM 196

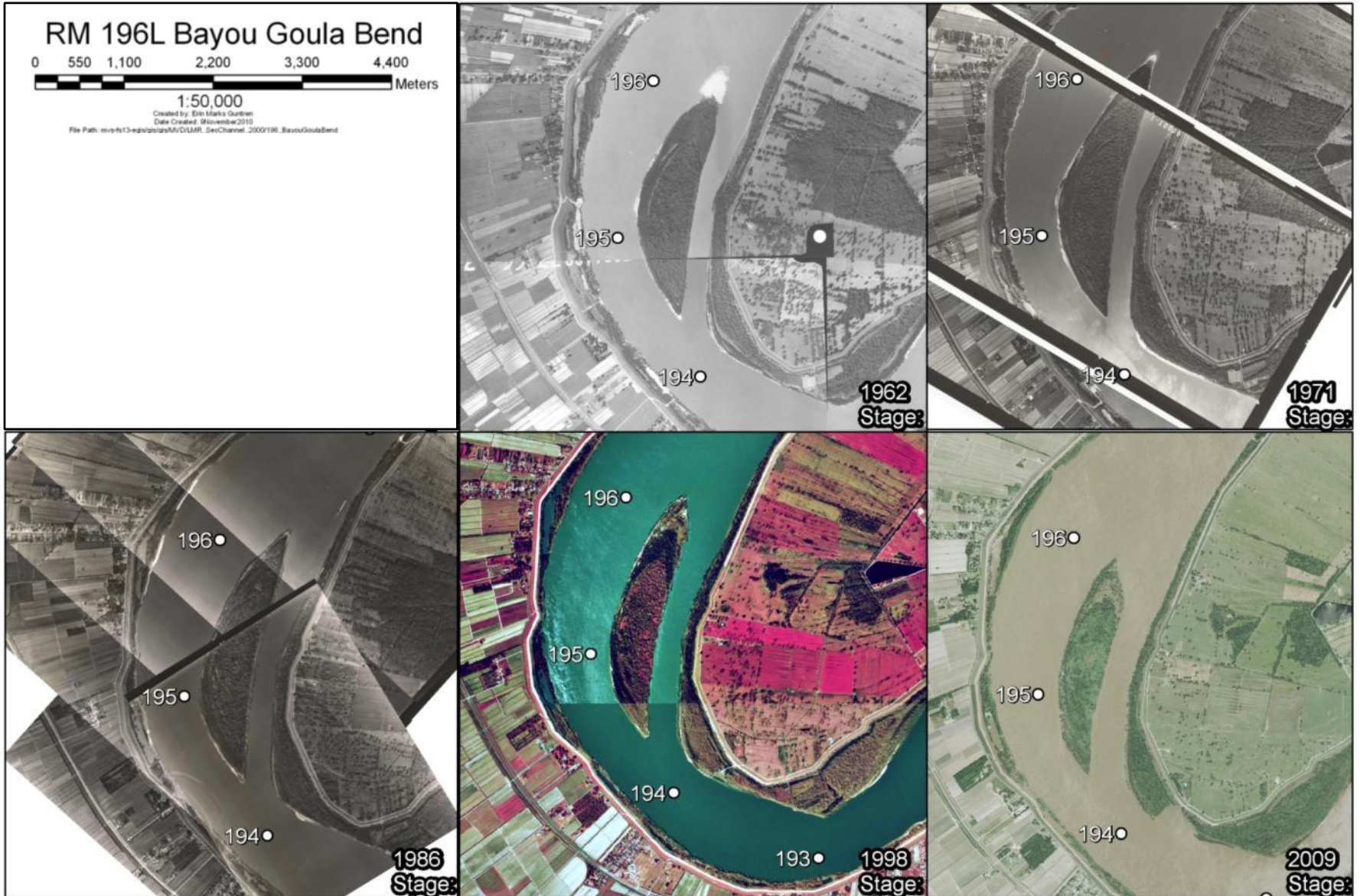


Elevation



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Bayou Goula Bend, RM 196



Bayou Goula Bend, RM 196

Table. Area and volume of Bayou Goula Bend from 1964 - 2002.

	Area - 5	Area 0	Area 5	Area 10	Vol 0	Vol 10
1964	170	500	980	1,570	260,000	409,000
1975	370	840	1,480	2,260	360,000	534,000
1983	-	-	-	-	-	-
1992	970	1,590	2,360	3,240	456,000	599,000
2004	1,640	2,370	3,240	4,220	262,000	327,000

Table. Percent difference in area and volume from 1964.

	Area - 5	Area 0	Area 5	Area 10	Vol 0	Vol 10
1975	130%	70%	50%	40%	40%	30%
1983						
1992	490%	220%	140%	110%	80%	50%
2004	890%	370%	230%	170%	0%	-20%



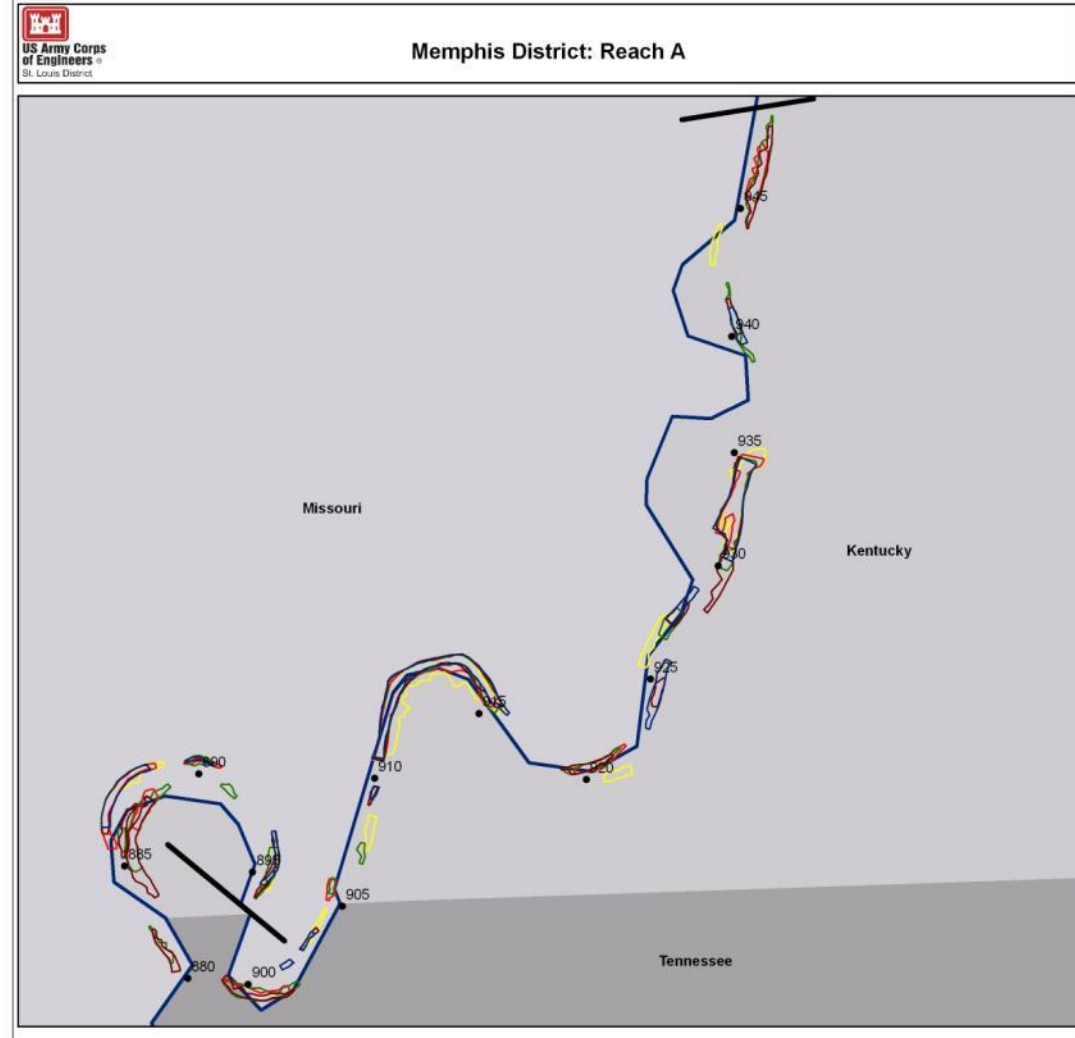
Side Channel Summary

- 202 side channels in study area from 1960 – 2000
- 54 with data from all 5 decades
- 38 of 202 side channels not present in 2000s
- 46 of 202 not present in 1960s



50 Mile Reaches

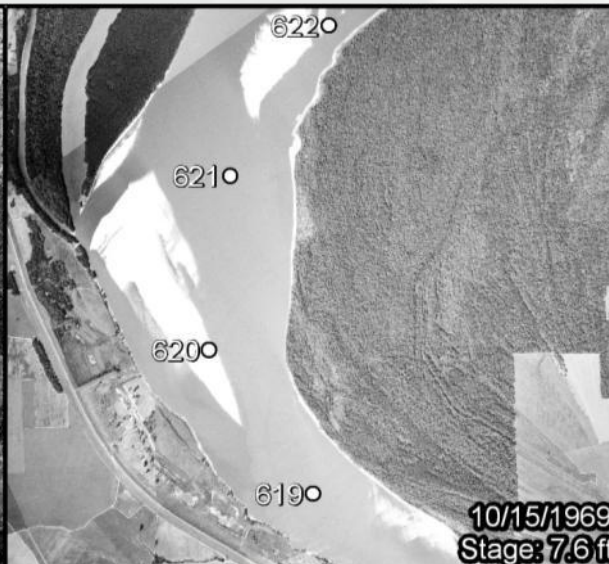
- Memphis District
- River mile 954 – 599
 - ▶ Cairo, IL to Rosedale, MS
- 100 side channels
- 7 reaches (~ 50 miles)
 - ▶ 62 side channels with data 1964, 1975, 1992, 2002



Reach A

Table. Area and volume of Reach A for 1964, 1975, 1994 and 2004.

	Area - 5	Area 0	Area 5	Area 10	Vol 0	Vol 10
1964	1,960	2,560	3,130	3,660	178,179,000	339,696,000
1975	1,880	2,470	3,060	3,060	154,003,000	226,014,000
1992	1,860	2,440	3,340	4,330	148,632,000	323,846,000
2002	1,350	1,980	2,580	3,300	93,807,000	229,854,000



Reach Change

Table. Cumulative change in area and volume for seven reaches in the Memphis District.

	Area - 5	Area 0	Area 5	Area 10	Vol 0	Vol 10
A	-600	-600	-600	-400	-84,370,000	-109,840,000
B	0	-100	-600	-1,000	8,700,000	-25,520,000
C	-600	-900	-900	-400	-43,720,000	-85,850,000
D	100	300	600	900	5,590,000	37,260,000
E	-1,100	-1,700	-1,800	-1,200	-90,110,000	-178,150,000
F	0	-100	-200	-200	-1,340,000	-9,860,000
G	-700	-800	-1,100	-1,600	-50,630,000	-110,890,000



What should we do with this information?

- Determine areas in need
- Prioritize restoration projects
- Monitor status
- Measure project success
- Predict communities



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Any Questions?

References

Ward, J.V., and J.A. Stanford. 1995. Ecological connectivity in alluvial river ecosystems and its disruption by flow regulation. *Regulated Rivers: Research and Management*. 11:105-119.

Weigel, B. M., J. Lyons, and P. W. Rasmussen. 2006. Fish Assemblages and Biotic Integrity of a Highly Modified Floodplain River, the Upper Mississippi, and a Large, Relatively Unimpacted Tributary, the Lower Wisconsin. *River Research and Applications*. 22:923-936. accessed through Wiley Interscience.

Yildirium, A. and M. A. Pegg. 2009. Spatial and Temporal Variability of Fish Communities of the Upper Mississippi River. *Animal Biology*. 59:67-85.

