BACKWATER RESTORATION OPPORTUNITIES: ILLINOIS RIVER

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During the past two centuries the Illinois River and its hydrology have been altered numerous times. Early navigation works, levees, diversion, agricultural and urban drainage practices, locks and dams and other changes all contributed to habitat modification. Over the years the river has changed from a free flowing stream bisecting a broad floodplain to a series of pools with substantial areas of leveed floodplain. The image conjured by the term "restoration" varies with the time frame used as a base. Given that all major navigation dams were in place by the1940's, a common vision of a restored river includes permanently flooded lakes and backwaters with sufficient depth to support the flora and fauna which were abundant in the early 1950's as well as recreational boating. Others envision a relatively free flowing river with a variety of backwater and side channel habitats.

A realistic concept will attempt to provide the habitat diversity necessary to support the historical species within the constraints of a navigation system and other economic and social factors. Backwater restoration and that of the main stem can be driven by determining which important habitat types are most degraded or in limited supply and seeking to protect or recreate them. For example, the river has limited fast flowing or riffle habitat. This fact makes the rapidly flowing area below the Marseilles dam particularly valuable and worthy of protection. Likewise, relatively deep water off the main channel has virtually disappeared in recent times. On the other hand, shallow water, mudflats and willow covered floodplain abound, although their habitat value is degraded by unnatural water level fluctuations.

Historic maps of the river valley can guide restoration efforts. They show areas which historically were water, marsh or land. For example, while the Peoria Lakes have been flooded since the 1940's, topographic maps show that in the 1890s they had substantial areas of marsh and several large islands downstream of Spring Bay (Fig.1). The area of the lake between Spring Bay and Chillicothe included large amounts of marsh as well as farmed land and roads (Fig. 2). The area from Chillicothe to Lacon was largely marshland with some permanent lakes and connected backwaters (Fig. 3), while Lake Senachwine was mostly marsh with connected backwaters. The reach between Chillicothe and Lacon will be emphasized in this paper as it illustrates several points.

The Woerman maps were produced by the Corps of Engineers in 1903 and show the river and floodplain during low water after Diversion from Lake Michigan began in 1900. The higher water levels expanded the area of backwater lakes and side channels. Fig. 4 shows Meadow Lake above Chillicothe in an area shown as marsh in the 1890s. Likewise Fig. 5 shows enlarged Wightman and Gar Lakes near Lacon in 1903.

By comparing the historic maps with current topographic maps and satellite imagery it is possible to identify areas which may be most suitable for restoring particular habitats. For example, sediment removed to restore depth could be placed on old island sites or shallow areas which would provide a firm base to support the material. Similarly locations that were water on the old maps are likely spots for dredging deeper pools. They are filled with relatively soft sediment which is more readily removed than original floodplain soil and less likely to contain stumps and other debris. Areas that were never deep are likely candidates for wetland, marsh and moist soil habitat restoration, and elevated habitat for mast producing trees.

By comparing maps using GIS technology it is possible to see where sedimentation has built up land over the past century. They also indicate where sediment deposits in today's uniformly shallow backwaters are deepest.

Figures 6 and 7 show Meadow Lake and Wightman and Gar lakes respectively. The figures show the 1903 Woermann map superimposed on the topographic map based on 1970 aerial photography. The small black dots depict soundings taken in backwaters for the Woermann maps, and indicate historically deeper water. On the superimposed maps the dark gray areas were water in 1903, including the main channel. The heavy line indicates the extent of water on the topographic map. This additional area was originally marsh or elevated floodplain before the navigation dams raised the water level. At that time Gar and Whightman lakes were joined. Note there are small islands and peninsulas on both figures. Areas where the Woermann soundings overlay water in figures 6 and 7 are likely locations where sediment could be readily removed from the backwaters to restore areas that were historically deep.

Figures 8 and 9 are satellite photographs of Meadow and Wightman lakes taken in the fall of 2000 (1903 sounding data is superimposed on the Meadow Lake photo). The photos clearly show that the peninsulas in both areas have greatly expanded due to sedimentation and now encompass the former small islands. A new island is forming in Wightman Lake. The sounding dots from the Woermann map are superimposed on Meadow Lake. It is apparent that the original area of Meadow and Wightman Lakes are still covered by water, but that much of Garr Lake is now covered by accumulated sediment. Inspection at ground level confirms that willows are invading this new land. Goose Lake to the right of the Lacon Bridge has shallow water over its once deep areas.

Historic maps of other sections of the river mainstem show where islands and other features have existed since the 1800s. Restoration of water depth and relative land elevation in these areas could significantly increase habitat diversity.

Environmental Management Program (EMP) projects on the Mississippi and Illinois Rivers have successfully restored selected island, backwater and wetland habitat and are providing useful insights for large scale restoration. DNR is conducting some small pilot projects on habitat restoration techniques using sediment removal and placement technology. One project involving geotextile tubes and a new dredge which uses a displacement pump to move sediment without adding water was demonstrated at the Woodford County State Fish And Wildlife Area near Chillicothe in May of 2000. Figures10 through13 show the construction of a small island as part of that project. Figures 14 and 15 show island building with a conventional clam shell dredge.

Knowledge of the Illinois River valley's physical and biological history combined with information gained from pilot projects will provide the basis for future restoration projects.

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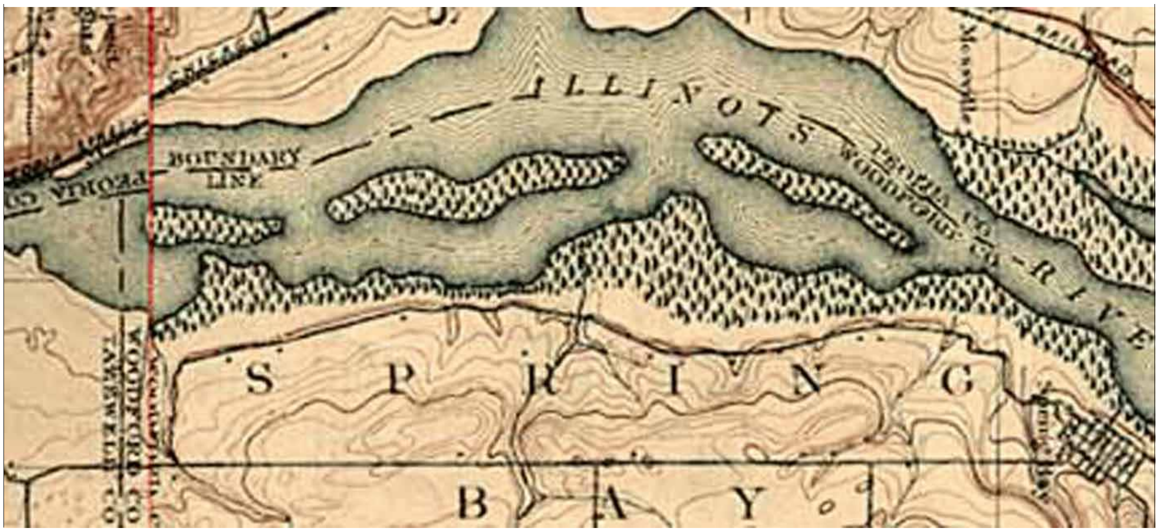

Figure 1. This topographic map from about 1890 shows Up per Peoria Lake between the narrows and Spring Bay (lower right). T he Stippled area is marsh a nd three islands are clearly visible. The islands, marsh and some floodplain were covered with water by the navigation dam. Sediment removed to deepen the lake cou ld be plac ed on the o ld islands resto ring both aq uatic and island habitat.

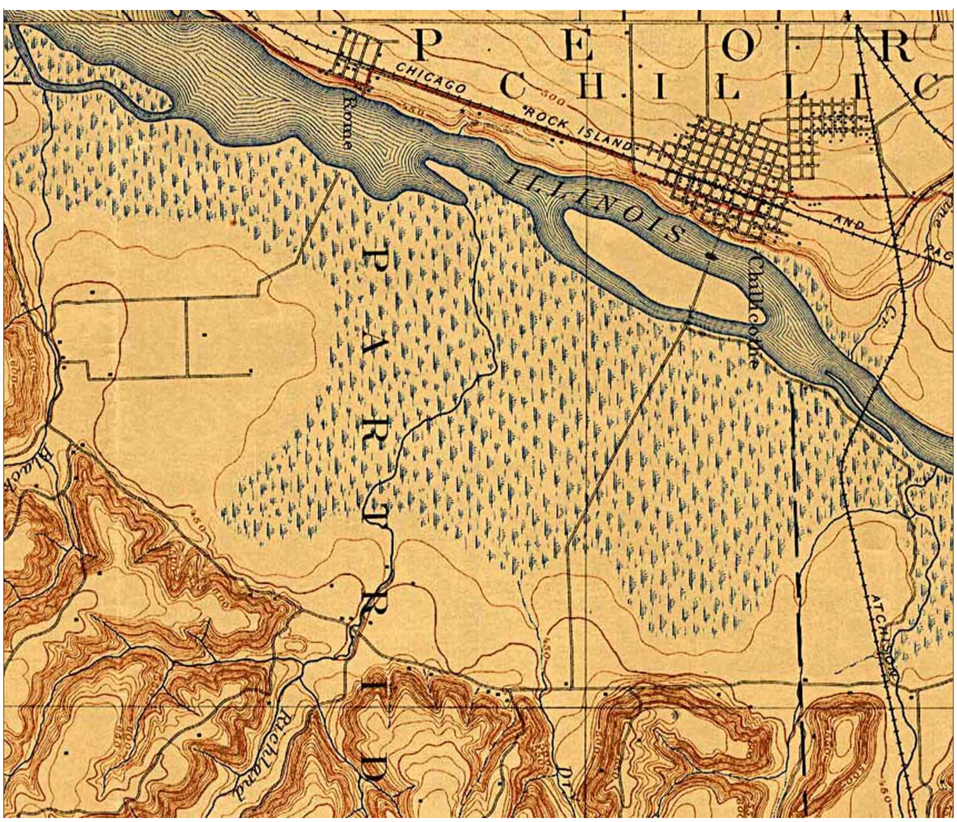

Figure 2. Upper Peoria Lake near Rome and C hillicothe in the late 1890s was largely a marsh. Roads and farm fields were covered with water by the navigation dam. Much of this area was subject to frequent flooding, esp ecially in the spring .

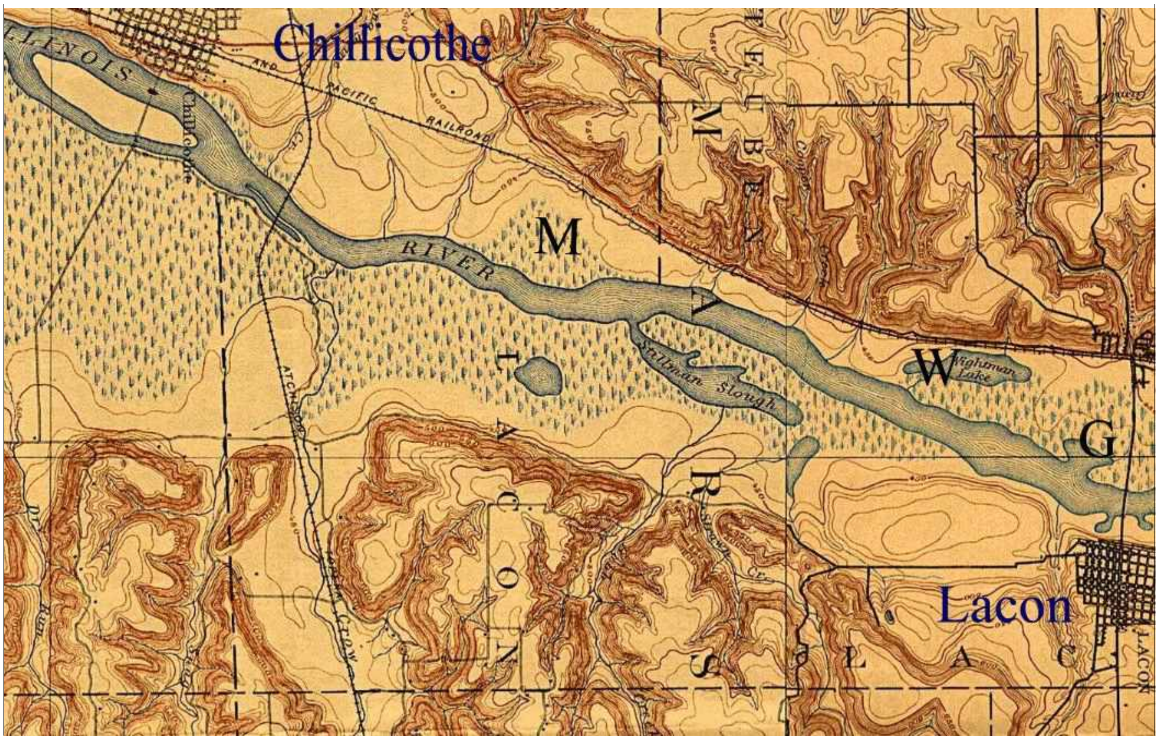

Figure 3. In 1890 the area between Chillicothe and Lacon (lower right) was largely marsh and low lying floodplain. Several permanent backwaters existed, some of which were connected to the river even at low water. During most years the natural flood cycle provided fish spawning habitat on the floodplain in the spring. When flood waters receded, moist soil plants favored by waterfowl grew on mudflats and aquatic plants thrived in the marshes. The natural flood cycle has been disrupted to the detriment of many species. M marks the spot now occupied by Meadow Lake, while W and G are on Wightman and Gar Lakes respectively.

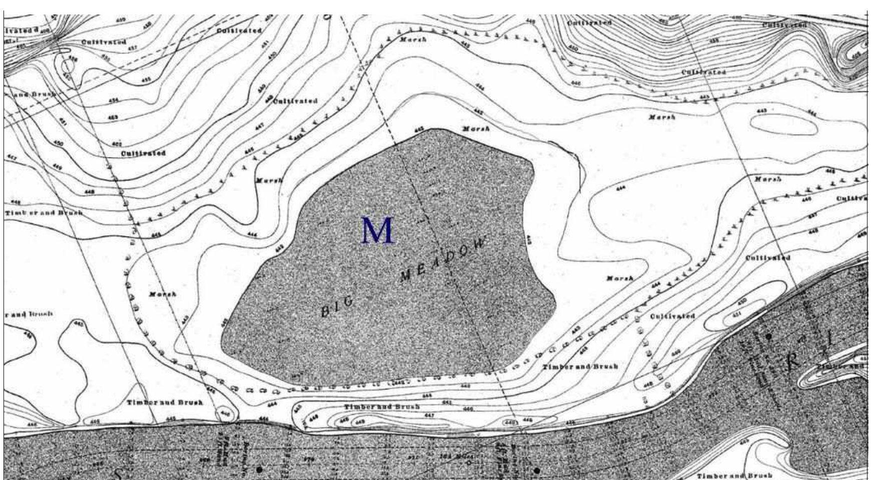

Figure 4. The water level rose when water was diverted from Lake Michigan in 1900. This figure from a Woermann map shows Meadow Lake at low water after diversion. The dark areas are permanent water and the lines are one foot contours. The main channel is at the bottom.

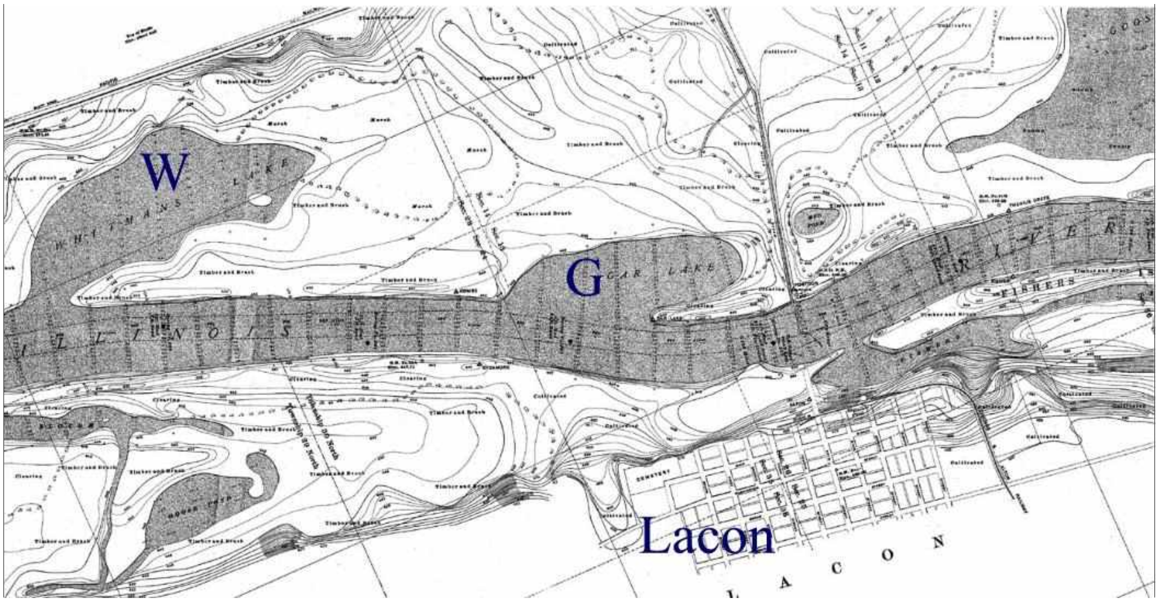

Figure 5. The Woermann map near Lacon shows Wightman Lake (W) and Gar Lake (G) as permanently connected backwaters. Goose Lake is the dark area in the upper right.

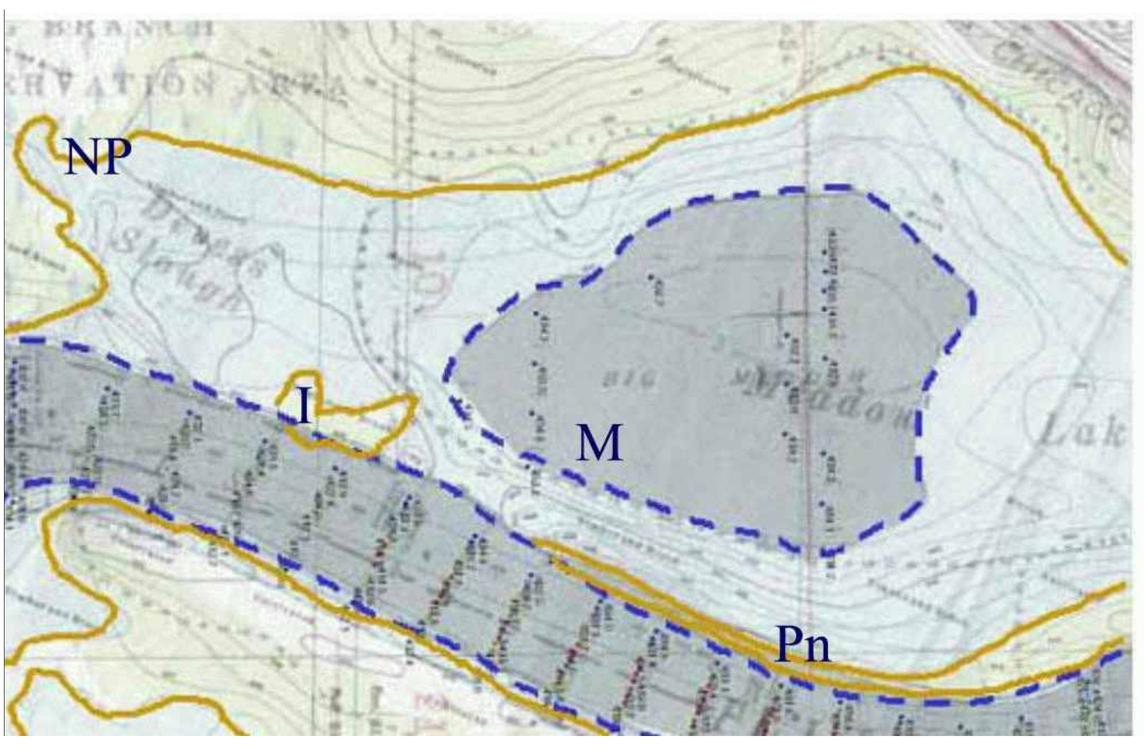

Figure 6. When the Woermann map is superimposed on the topographic map (Chillicothe quadrangle, 1972, based on 1970 photography) the influence of the navigation dam becomes apparent. The dark gray areas were water in the early 1900s. The light gray area outlined by the line marked NP (normal pool) is the extent of the water surface in 1970. Note the island (I) and peninsula (Pn) forming as a result of sediment deposition.

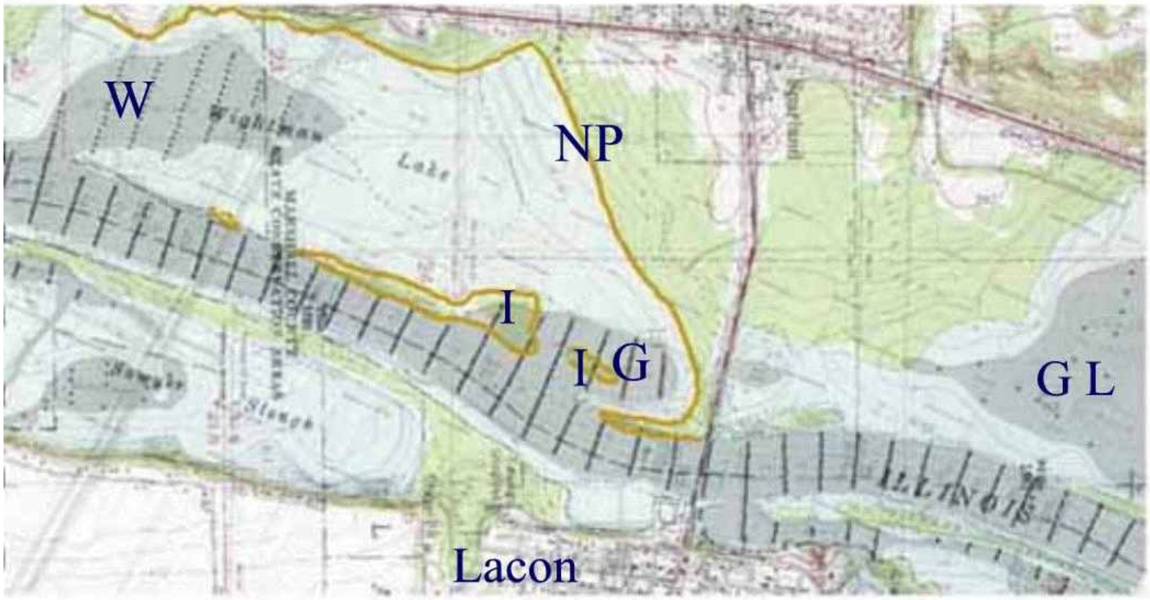

Figure 7. The superposition of the Woermann and topographic maps of the Lacon area (Lacon quadrangle, 1972) show that Wightman and Gar Lakes were joined when the dam raised the water level, although sediment islands were forming in the Gar Lake area by 1970. Much of the lower end of Goose Lake (GL) was still covered by water in 1970. The dots on the Woermann maps marked soundings in the back waters.

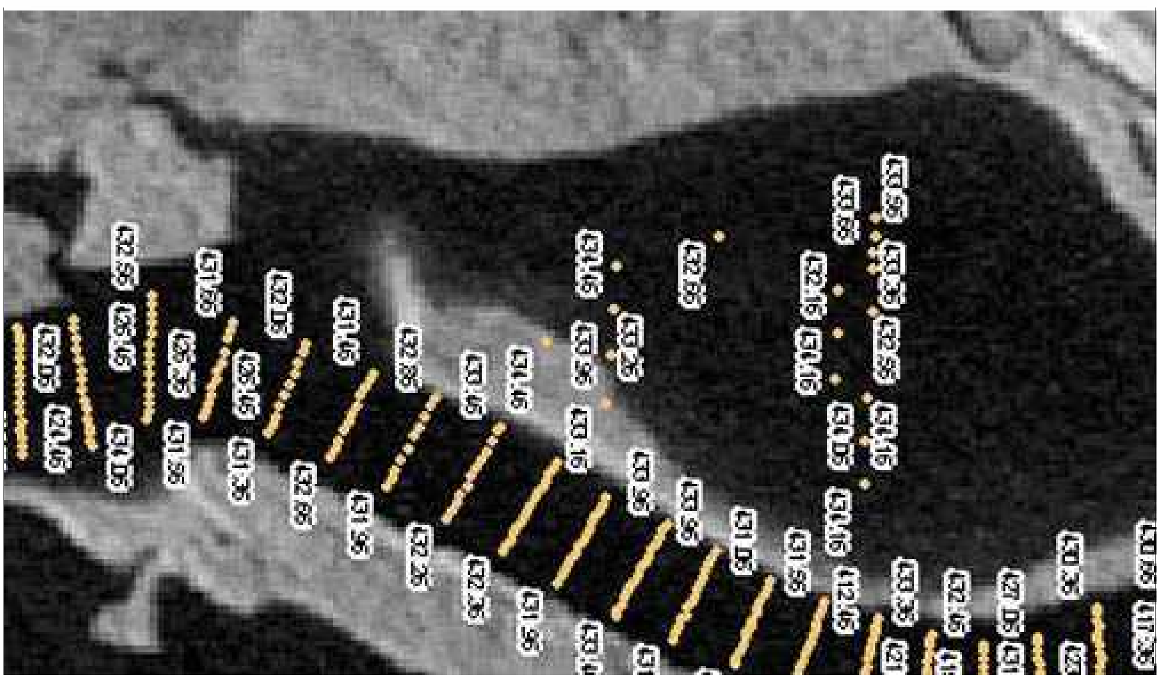

Figure 8. This is a landsat photo taken in the fall of 2000 with the Woermann map soundings superimposed. It shows that most of the deeper parts of Meadow Lake that were water prior to the dam are still covered with water. However, the peninsula shown on the 1970 map has grown and merged with the island. Meadow Lake appears to be a good candidate for restoration as a connected backwater.

Figure 9. A fall 2000 photo of the Lacon area shows that the Wightman Lake remains as water while much of Gar Lake is filled with sediment that forms a large peninsula. This location could also support a variety of restored habitats.

Figure 10. Small geotextile tubes were placed in Upper Peoria Lake near Chillicothe in the Spring of 2001. When filled with sediment the tubes formed a small trapezoidal island. The tubes are intended perform like a berm, hold the sediment in place, and prevent it from being eroded by wave action.

Figure 11. The Dry Dredge shown here lifts sediment from the lake bottom and uses a displacement pump to move it without adding water. The pump filled the geotubes with sediment and then pumped sediment with the consistency of toothpaste behind the tubes to form a small island. The island was filled on May 2.

Figure 12. Engineers are shown standing on a tube taking samples on May 22. The sediment developed dessication cracks almost immediately and consolidated rapidly. Despite high water, which flooded the island during most of June, researchers could walk on it in early July.

Figure 13. A DNR site manager stands on a geotube in August. The sediment is well consolidated and supports volunteer vegetation. Plants began growing on the island after the first week, but were generally eaten by waterfowl or killed by high water. The geotubes successfully protected the island from erosion during the summer and fall, despite frequent water level fluctuations and high winds.

Figure 14. A conventional clamshell bucket was used during high water to gently remove sediment and create small islands in several locations on June 12. The sediment was disturbed as little as possible to preserve its structural integrity.

Figure 15. By July 7 researchers could walk on the clamshelled islands. By observing the small islands, researchers will gain insights useful for building large islands and developing sediment handling techniques for Illinois River restoration projects.