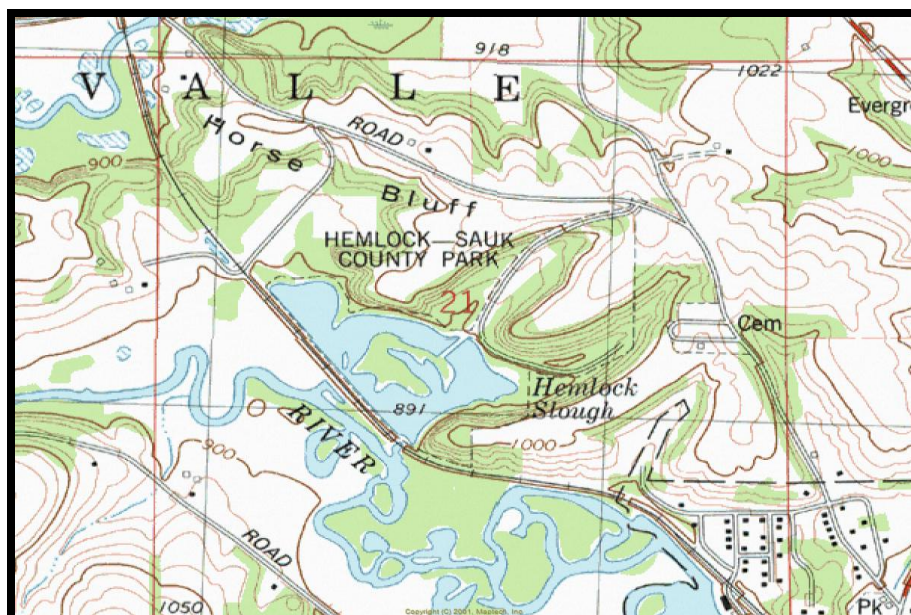
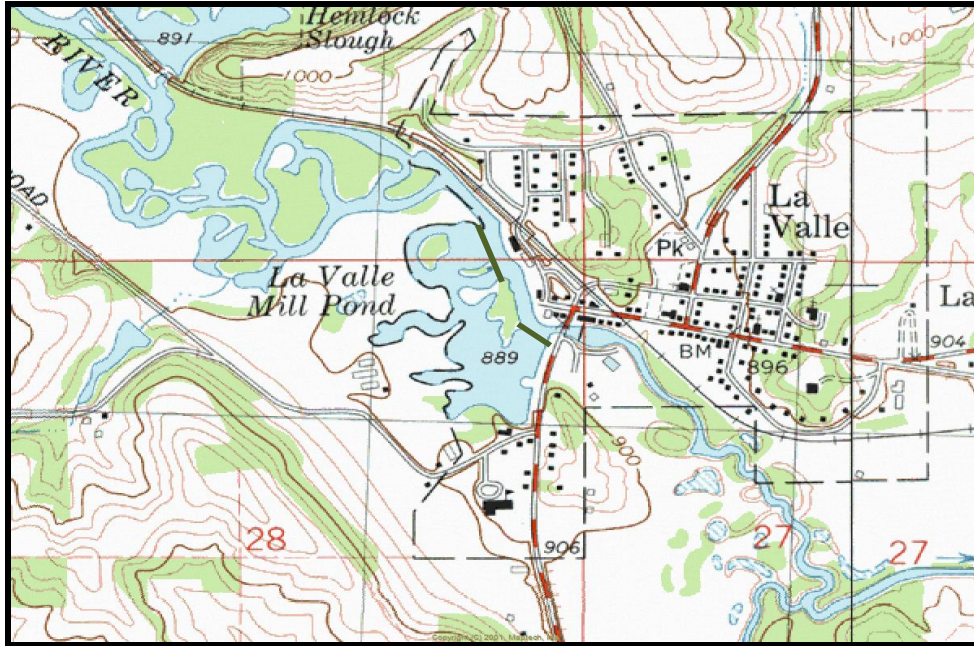


Paired Lake Study and Management Plan Preparation for Hemlock Slough and LaValle Millpond

- a. **Description of Project Area:** Hemlock Slough (WBIC 1286100) is a 12 acre floodplain lake located along the Baraboo River in the Town of La Valle, Sauk County (T13N – R3E, Sec 21). The lake was established when the Chicago Northwestern Railroad constructed an embankment across a section of the Baraboo River floodplain some time before 1900. An outlet structure is located within the rail embankment. A lobe of the floodplain was isolated by the embankment impounding surface water. It appears, from the topographic and soils mapping, that meander scars and oxbows were submerged. It also likely that groundwater discharges into the lake from joints and fractures in sandstone bedrock outcrops along the east and northeast shoreline.

The Surface Water Resources of Sauk County (circa 1972) includes a narrative on the slough but this publication is obviously outdated. Little is known about the water quality, the aquatic habitat, and ecological value of the lake. Hemlock County Park surrounds the lake, with day use facilities and boat landing that accommodates 15 automobiles with trailers. The site is a popular resource for fishing and quiet water recreation. LaValle Pond (WBIC 1285800) is a 15 acre floodplain lake located along the Baraboo River in the Town of LaValle, Sauk County (T13N – R3E, Sec 28). In 2000, the La Valle Millpond dam was removed and an off-channel slough or lake was created by constructing a separation berm along the main channel of the Baraboo River. A water control structure was installed in the berm for water level management including drawdowns. The lake was designed to mitigate (and address local public concerns) the loss of the millpond and associated lentic open water. The project involved substantial resources both money, staff time, and it required federal partners. The former millpond was highly degraded and was a significant common carp (*Cyprinus carpio*) recruitment area within the Baraboo River.





b. Description of problem to be addressed by project: This project involves the collection of comprehensive biological, chemical and watershed data to enhance the management of this slough and also serve as part of a paired lake study of the LaValle Pond off-channel Baraboo River slough.

While most glacial lakes and impoundments in southern Wisconsin have been the focus of lake monitoring, planning and management, another entire class of lakes has been largely ignored. Scores of oxbow lakes provide critical habitat for numerous aquatic communities within a transitional area linking rivers with small tributaries and extensive wetlands. Unfortunately we know very little about floodplain lakes along the Baraboo River.

Like many millponds, the former La Valle Millpond was hypereutrophic, supported a prolific common carp population, and useful water storage capacity was lost. The LaValle Millpond dam was removed in 2000 and an off-channel slough was created in 2001 by constructing a separation berm along the main channel of the Baraboo River. The slough was designed to mitigate local public concerns for the loss of lentic open water. The project involved substantial resources both money and time and required federal partners. The construction of the slough was also controversial. Some resource managers were concerned that an off-channel slough/lake would trap and destroy desirable sportfish populations during floods and create another common carp recruitment site.

For management, an outlet drain was constructed at the downstream end of the slough to allow for periodic drawdowns. In 2004, a single boom shocking survey found that common carp had become established in the lake. The waterbody was then lowered to concentrate carp for removal. No further surveys have been conducted.

The potential resource value and impacts of the created slough remains unresolved since there has been no systematic effort to monitor the water quality or biota. As it stands, this unmonitored project offers limited value as a template for future dam removal projects or off-channel habitat management. With baseline data, decision making will be enhanced not only for management of the LaValle pond but for similar project elsewhere.

Hemlock Slough is located upstream of the La Valle mitigation slough. It is ideally suited as an experimental control or reference site for this project because of its hydrology, physical characteristics, and location within the Baraboo River Watershed. Also, base line data on Hemlock Slough will support long-term planning and management of the entire Baraboo River System.

- c. **Discussion of project goals and objectives:** This project involves the collection of comprehensive biological, chemical, TSI and watershed data to enhance the management of these sloughs and also serve as part of a paired lake study of off-channel Baraboo River sloughs. The project also establishes a monitoring program for future water resources assessments, lakes monitoring and management that are anticipated. Future related lake planning grant projects will establish baseline conditions, characterize resources and habitat attributes, identify threats and recommend management alternatives for protecting a unique class of lakes along the Baraboo River.

Oxbows and other off-channel lakes typically form along natural stream channels and are important ecological wetland systems within river floodplains. They provide unique habitat for both fish and wildlife including herptiles, furbearers, waterfowl, marsh birds, passerines, and birds of prey. In fact, cut-off channel oxbows along the Lower Wisconsin River sustain diverse fish, plant and aquatic communities and common carp reproduction is rare. Natural oxbow lakes appear to control common carp populations at least along the Lower Wisconsin River. Most of these floodplain waterbodies are not manipulated with water control structures and drawdown.

Currently, we don't know if (in general) created slough mimic natural floodplain lakes or if they have water quality and biota similar to degraded millponds. We also don't have enough information to determine how artificial floodplain lakes should be managed. Are frequent drawdowns desirable or do they sustain disturbance conditions that common carp can thrive in at the expense of native fisheries and wildlife?

Goals – The goal of the project is to collect important baseline data and information on Hemlock Slough as an experimental control for the paired lake study. This study will determine the efficacy of future off-channel mitigation projects that coincide with dam removals. The LaValle Pond will serve as an example of a mitigation pond following dam removal and partial loss of millpond surface area. This project will also provide a model for future off-channel water quality and habitat planning grant studies along the Baraboo River. The project will establish base line data on an off line water body and it will attempt to answer the question – do these and other flood plain water bodies need management or will natural flood flow pulses maintain the systems to their maximum potential?

Objective - Our study of Hemlock Slough will serve as a control or reference site because of its location in the watershed and because it is a historic river floodplain feature. We will assess how it compares with the LaValle Pond off-channel mitigation. Baseline data on Hemlock Slough and LaValle Pond will also help to management of this important resource. We propose a one year study including water quality monitoring, wetland/aquatic plant surveys, habitat assessments and near shore fish electroshocking, seining, dipnetting surveys, of Hemlock Slough. The surveys will include an assessment of the floristic quality of wetlands by type, along the gradient from wet meadow to open water communities. The wetland evaluation will include wetland communities that comprise more than 10% of the total wetland area of the site. The assessment will rely on the Minnesota Rapid Assessment Methodology of Wetland Functional Values (MnRam 3.4) and the procedures in the 1987 Corps of Engineers Wetland Delineation Manual. In addition, field observations of wildlife will be recorded including- avian, furbearer, and herptile species. We will recruit and train volunteers through contacts with the local community to assist with the study. The effort will encourage participation in decision making by an informed public, and facilitate better stewardship of natural resources.

Funding of this project is dependent on the award of two large-scale lake planning grants (one for each lake). In addition to the paired floodplain habitat surveys, we also plan to conduct a one time or snapshot survey of other floodplain waterbodies along the Baraboo River to expand our reference sites.

- d. Description of methods and activities:** A Garmin 76 will be used to log all sampling locations. Sampling will be conducted on a monthly basis from June through September 2012. A YSI Model 52 meter will be used to measure dissolved oxygen and temperature. A YSI Model 63 meter will be used to measure pH and specific conductivity. Calibration of the instruments followed manufacturer recommendations including the 2 point calibration for pH. Back-up systems for pH included a LaMotte meter and ExStik conductivity probe. Secchi transparency measurements will be collected. Aquatic plant species will be inventoried along with other habitat features at each site. Photographs routinely captured aquatic plant and shoreline habitat conditions at each site. Habitat conditions were estimated by assigning Low = 1, Medium = 2 and High = 3. Nutrient samples will be collected and submitted to the State Lab of Hygiene Inorganic Chemistry Unit. (See Table 1 for survey and chemical sampling schedule).

The nutrient data will be transformed to Trophic State Indices (TSI). Local watershed areas will be delineated along with major land uses. Annual phosphorus loading rates will be estimated using WILMS.

Nearshore fish population sampling included small mesh dipnetting, small mesh seining and towed DC electro-shocker. The combination of sampling gear is needed to effectively sample the different niches and behaviors of diverse fish populations. All specimens were immediately released after field identification and enumeration except where immature specimens required further review. The fish surveys are designed to sample populations of nongame species and juvenile stages of sportfish. The surveys are indicators of ecological diversity and distribution of fishes that inhabit nearshore areas within floodplain habitats. This type of survey does not evaluate the growth rates, size

distribution or population densities of sport fish populations. Qualitative biological surveys will include birds, furbearer, and herptile sight and sound observations.

The local community will be informed of our study and we will attempt to recruit and train volunteers to assist with the field work.

- e. Description of project deliverables:** A final report will describe and compare the limnology and ecology of two oxbow lakes along with a discussion of management alternatives and recommendations. Additional findings will include watershed phosphorus loading rates and upland landuse recommendations. In the future, additional planning grant projects will focus on other Baraboo River floodplain lakes and determine how they compare and how they should be managed.
- f. Description of data to be collected:** (1), lake water chemistry data, (2) fisheries data, (3) aquatic plant inventories, (4) list and enumeration of all NHI fish species, (5) groundwater locations and water quality data, (6) location of potential Sensitive Areas or critical areas, (7) watershed land use data and predicted phosphorus loading rates (WILMS), TSI.
- g. Description of existing and proposed partnerships:** Partners include the Sauk County Land Conservation Department, Sauk County Parks Department, Town of La Valle, WDNR, USFWS, Wisconsin Wetlands Association and NRCS.
- h. Discussion of role of project in planning and/or management of lake:** This project will provide the first lake management based water quality information on these unique Baraboo River oxbows. The water chemistry data will allow managers to consider these important resources from the reference of other floodplain lakes and how they compare regionally and geologically. The combined water quality, aquatic plants, fisheries and other biological data collections will greatly enhance Sauk County to fine-tune their resource management priorities and highlight valuable resources in their backyard. WDNR staff has already recognized the dearth of information on the oxbow lakes and welcome new information as the master planning effort moves forward. The information on potential NHI species will greatly assist WDNR Endangered Resources in their efforts to track and management endangered resources. This project will provide a substantial amount of information needed to effectively manage and protect the Baraboo River floodplain and corridor habitats. The paired lake study will help determine if future mitigation off-channel lakes is a viable alternative to existing millponds.
- i. Timetable for implementation of key activities:** Chemical and biological surveys will begin June 2012 and will continue on a monthly basis through September. Data analysis and modeling will be completed by the end of October and a draft report will be submitted to River Alliance by the end of November 2012.
- j. Plan for sharing project results:** The study results will be published in local newspapers in addition to announced public meetings designed to receive public input toward the ultimate management goal of managing these sloughs. A presentation of

findings will occur in December 2012. A final report will be shared with the various partners.

k. Additional information: attached tables

Table 1: Work Schedule

2012 Activities	June	July	August	September	October	November
Vertical profiles secchi, obser.	X	X	X	X		
Total phosphorus and chlorophyll	X	X	X	X		
Aquatic plants, habitat, including wetlands, wildlife observation		X				
Nearshore fish surveys	X		X			
Land use inventory, data analysis and WILMS					X	
Report preparation						X

Table 2: Budget

	Cash Costs	Donated Value
Administration	\$3000	
Consulting (\$85/hr)	\$20,606.38	\$8,900.00
SLOH	\$393.62	
Volunteers		\$400.00
County staff		\$600.00
Donated Equipment Use		\$1,300.00
Travel Expenses		\$800.00
Totals	\$24,000.00	\$12,000.00
Project Total	\$36,000.00	