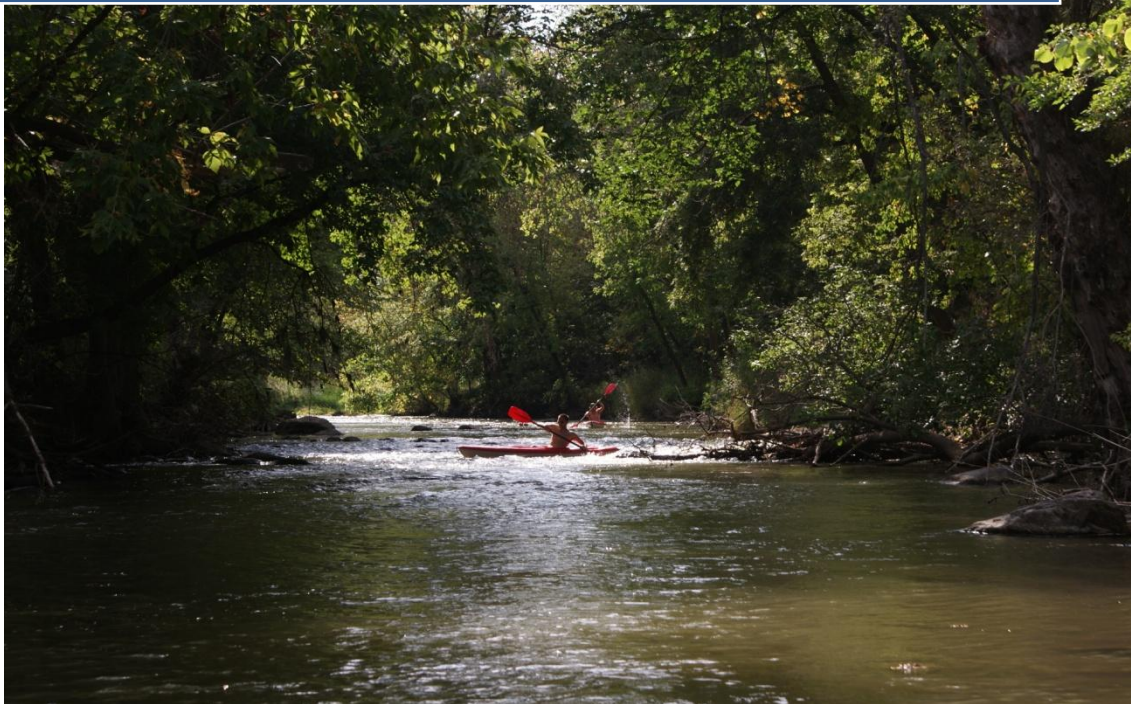


Running *free*

The Baraboo River Restoration Story



“The practice of conservation must spring from a conviction of what is ethically right, as well as what is economically expedient.”

- Aldo Leopold

Alicia Jepsen
October 2009



www.sandcounty.net

Contents

ACKNOWLEDGMENTS	2
ABOUT SAND COUNTY FOUNDATION.....	3
A FOREWORD FROM SAND COUNTY FOUNDATION PRESIDENT.....	4
INTRODUCTION	6
A CELEBRATION	6
GEOLOGIC PAST.....	7
NATIVE AMERICANS AND FRENCH FUR TRADERS.....	11
WHITE SETTLERS AND DAM CONSTRUCTION.....	13
THE LIFE AND TALES OF EIGHT WATER POWERS	14
Elroy Dam.....	15
Wonewoc Dam.....	15
Reedsburg Woolen Mills Dam.....	17
Island Woolen Mill Dam	18
Waterworks (City) Dam.....	20
Oak Street Dam.....	25
LaValle Dam.....	27
Linen Mill (Glenville) Dam	33
DAM SAFETY	34
ABOUT THE FISH AND MACROINVERTEBRATES	35
Good Science	36
RECREATIONAL USE	40
RIVERFRONT REDEVELOPMENT	41
CONCLUSION.....	44

ACKNOWLEDGMENTS

Sand County Foundation would like to acknowledge all who assisted with the drafting of this story. A special thanks to the Wisconservation Corps Program which was made possible through the Natural Resources Foundation of Wisconsin, the Northwest Service Academy, and the AmeriCorps Program. The Wisconservation Corps Program engages conservation partners throughout the state to help build much needed capacity to effectively coordinate and train citizen volunteers, educate and engage the public, and steward and monitor State Natural Areas and other important natural lands. A special thanks to the many partners of the Baraboo River restoration and dam removals: Sauk County Land Conservation Department, City of Baraboo, Citizens for Waterfront Revitalization, Baraboo Kiwanis Club, Baraboo River Canoe Club, River Alliance of Wisconsin, U.S. Army Corps of Engineers, University of Wisconsin (UW)-Extension, U.S. Fish and Wildlife Service, UW-Center for Limnology, UW-Stevens Point, Wisconsin Cooperative Fishery Research Unit, Natural Resource Conservation Service, National Fish and Wildlife Foundation, Bradley Fund for the Environment, Wisconsin Department of Natural Resources, Alliant Energy, MSA Professional Services, B & L Excavating, Village of LaValle, LaValle Sportsman's Club, other cities and towns, and Sand County Foundation. A very special thanks to those who volunteered their time to be interviewed for this story, these people include: Joe Van Berkel, Ed Geick, Karna Hanna, Terry Kramer, Dave Lawrence, Mike Palm, Rick Eilertson, Bob Dewel, John Exo, Emily Stanley, Matt Catalano, Mike Bozek, Brian Weigel, Dan Fuller, Tom Bainbridge, Andy Morton, Konny Margovsky, Susan Josheff, Rich Vogt, Bob Hansis, Jim Ruwaldt, Todd Ambs, Stephanie Lindloff, Marty Finkler, Dale Schultz, Tony Pillow, Scott Mueller, Jeff Searing, David Doering, Daryl Hansen, Daniel Dee, Janis Pearson, Ed Bodendein, Rodney Henke, Dennis Plantenberg, Darren Bush, John Laub, Brent Haglund, Reed Coleman, and Alex Echols. While attempts were made to contact those partners and individuals who made and continue to make the Baraboo River restoration a success, we would like to extend a special thanks to all the unsung heroes who are not mentioned in this report. Without their support and involvement, this river restoration project would not have been possible.

ABOUT SAND COUNTY FOUNDATION

Sand County Foundation was initially formed in 1965 to protect the Aldo Leopold Shack property and adjacent private lands from encroaching development. The original 120-acre Leopold farm is now surrounded by more than 1,900 acres of cooperatively managed land known as the Leopold Memorial Reserve. Today, the role of Sand County Foundation has expanded from founding organization of the Leopold Memorial Reserve to working with private landholders across the United States and elsewhere to improve the quality of their lands through science, ethics, and incentives. Sand County Foundation's mission is to advance the use of ethical and scientifically sound land management practices and partnerships for the benefit of people and the ecological landscape. Contact us at:

Sand County Foundation
5999 Monona Drive
P.O. Box 6587
Monona, WI 53716
Telephone: (608) 663-4605
Fax: (608)663-4617
info@sandcounty.net

A FOREWORD FROM SAND COUNTY FOUNDATION PRESIDENT

When a colleague asked Sand County Foundation to become involved in the Baraboo River Restoration efforts in the late 1990s, I distinctly remember turning the offer down. At Sand County Foundation, we focus our efforts on projects that can be replicated. Dam removals are each unique and can rarely be “replicated” in the true sense of the word.

Over time, we began to realize that, although a project of this nature could not be duplicated, the general principles and lessons learned could certainly serve as a model for other river and floodplain improvement projects based on science, education, and partnerships. So in 1999, Sand County Foundation joined the numerous other partners to remove the dams and create a free-flowing Baraboo River. We saw an opportunity to focus our efforts on the removal of the LaValle Dam. With partnership funding from the Bradley Fund for the Environment and the National Fish and Wildlife Foundation, among others, Sand County Foundation was able to coordinate the successful removal of the LaValle Dam while at the same time creating leading-edge research opportunities. More importantly, this was done in such a way that dam owner rights were respected and the community was actively involved in the project.

As we have arrived at the ten year anniversary of our initial involvement, we are taking this opportunity to revisit the influential river restoration project. Sand County Foundation feels that it is important to document this story, because it illustrates what is possible when community members, government agencies, and non-government organizations work together to improve a waterway, leading to better fish and wildlife habitat, economic revitalization, and enhanced recreational opportunities. We sat down and spoke with many of the individuals who were involved and even canoed down stretches of the river’s free-flowing waters. What did we learn? What is still happening, in a conservation sense, along the river today? These are all questions that are addressed in the following restoration biography.

We hope this story proves to be both insightful and entertaining. We appreciate your interest and hope the evidence and the perspectives inspire you to become involved in the care of your local watershed or river.

Bar M. Highland

INTRODUCTION

According to national dam statistics, there are approximately 83,000 dams inventoried in the U.S. nationwide, but some estimate there could be as many as 2 million. With about one-quarter of the inventoried structures being built in the 1960s (for hydropower, irrigation, and recreation purposes among others), many of these dams are now in need of repair or removal. A striking number are decidedly unsafe to humans. Because the cost of repair or replacement often far outweighs the cost of removal, the latter is often the more feasible option. On average the cost of removal for small to mid-sized dams is one-third the cost of repair. Many articles and studies have been written on the economic, environmental, and social effects of dam removal. This special report aims to take an intimate look at these three aspects by studying the successful removal of four dams that opened up an approximate 120-mile stretch of the Baraboo River in south-central Wisconsin. In-person, telephone, and email interviews were conducted with approximately forty individuals who were involved in the dam removals. These individuals represent members of the public, environmental organizations, government agencies, local and state elected officials, and business owners. This report tells the stories of those involved.

Put simply, dam removals are controversial. While they are not often popular with the general public, they can lead to improvements to the environment and relieve taxpayer burden. Although it is often tempting to use this success story as a recipe or “how-to” for other projects, this is not the aim. Each and every dam removal is different and comes with a unique set of circumstances, players, and challenges. Putting this limitation aside, the story of the Baraboo River, its past, the recent rehabilitation, and the work that remains provide valuable insights and general principles for future river restorations.

A CELEBRATION

As U.S. Congresswoman Tammy Baldwin, former Wisconsin Department of Natural Resources (WDNR) Secretary Darrell Bazzell, and members of Sand County Foundation round the bend in the Baraboo River, they come upon a group of cheering people. The

river sits low in its banks forcing the travelers to crane their necks to see beyond the bank. It is reminiscent of days as a child when you could not quite see what was happening outside of the car window. This momentous canoe trip began in Elroy, Wisconsin, but for many others on the Baraboo River's banks, the real journey began years before this day. They have decided to call this celebration, "Running Free," and they have gathered to celebrate the removal of the fourth and final dam along the Baraboo River in south central Wisconsin. As the guests of honor come into view, the crowd of one hundred plus, gathered on the river's banks in Ringlingville (the historic grounds of the Ringling Brothers Circus), cheer and clap. To many people who were involved in the dam removals, there are only feelings of joy and accomplishment. This is, in fact, one of the longest stretches of main stem river to be restored to free flowing status through dam removal. However, for some local community members this is a bittersweet moment. They may have had relatives who worked at one of the mills or spent many afternoons fishing below the dams. This event marked the passing of an era of small dams on this river. For many of these people, the realities of safety, cost effectiveness, and fish passage were all logical reasons for removal of the dams, but the nostalgia associated with the dams often trumped these reasons. Todd Ambs, former River Alliance of Wisconsin Executive Director, described dam removal as part economic, part environmental, but most of all social. This document will focus on each of these aspects of dam removal but it will also take a broader look into the history of the river. The journey will extend back to geologic times, through Native American inhabitation, European settlement, and to the present day. We began our journey at the ending, so let us now journey back to the beginning.

GEOLOGIC PAST

Between 10,000 and 26,000 years ago the Green Bay Lobe of the Wisconsin-era Glacier covered much of the area near the City of Baraboo. As the glacier began to melt, waters formed a lake, Glacial Lake Wisconsin, which was as large as the Great Salt Lake with depths of up to 150 feet. This massive lake reached as far north as modern day Wisconsin Rapids and as far west as present day Tomah. A finger of this lake, which



Glacial Lake Wisconsin. Map courtesy of the book "The Physical Geography of Wisconsin."

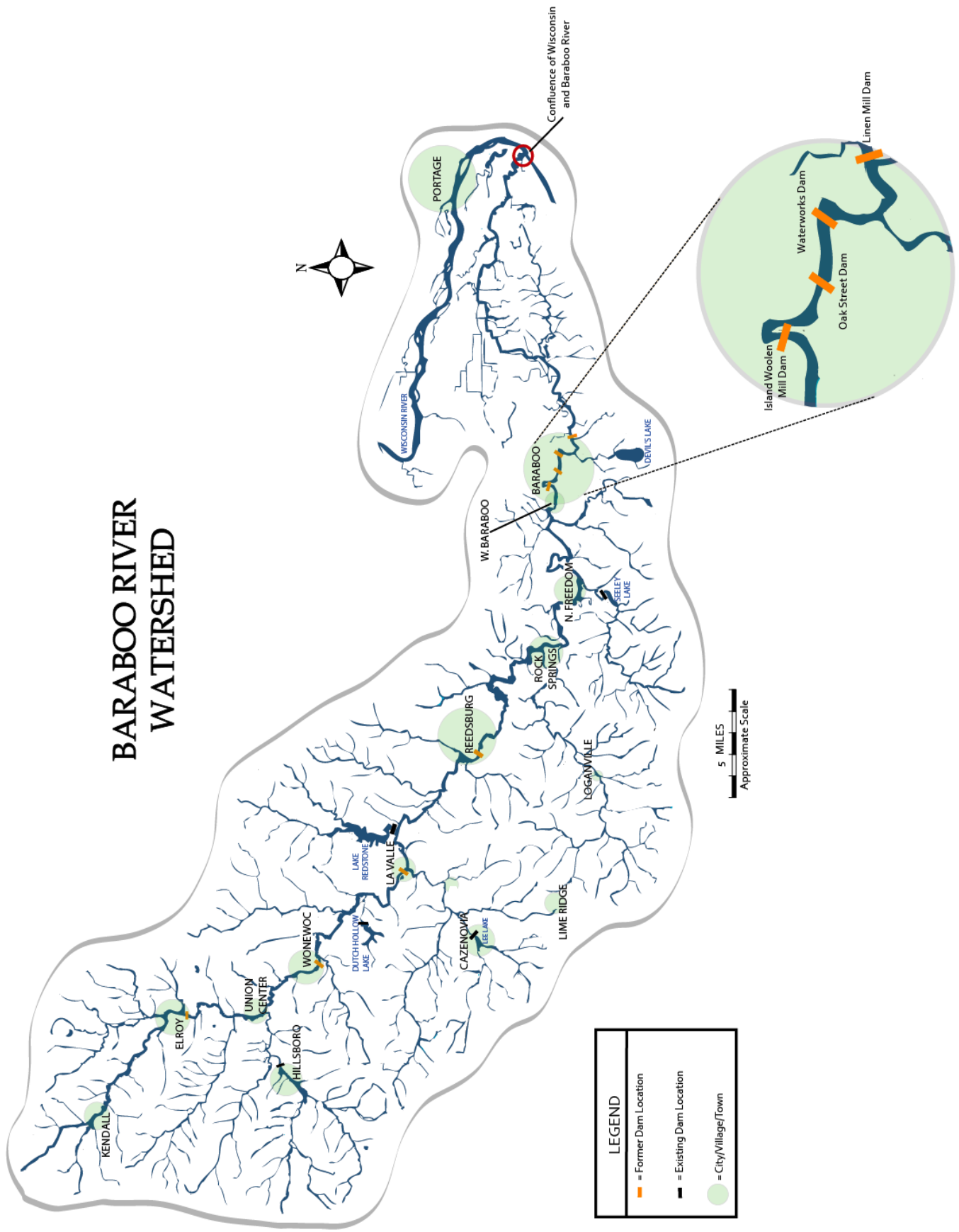
would later be called the Baraboo River, stretched through present day Baraboo, Reedsburg, and Elroy. As the sunny days bore down on the massive sheet of ice, an ice dam gave way along the eastern Baraboo Hills and a torrent of water drained from the lake in a matter of weeks. What was left after Mother Nature pulled the plug on Glacial Lake Wisconsin is breathtaking in many respects. The horizontally stratified rocky gorges of the

Wisconsin Dells are a testament to the erosive power of rushing

water. The rocky moraine deposits dammed up Devil's Lake on the north and southeastern sides, creating what is today the most visited state park (1.4 million annual visitors) in Wisconsin.

The effects of the lake drainage on the finger of water that extended from Elroy to Baraboo caused a conversion from lake to river, a river that would later be called the Baraboo River. The river's headwaters begin near Kendall and continue approximately 120-miles through nine more communities: Elroy, Union Center, Wonewoc, LaValle, Reedsburg, Rock Springs, North Freedom, West Baraboo, and finally, Baraboo before emptying into the Wisconsin River just south of the City of Portage (See Page 8 map). The river's watershed encompasses more than 650 square miles and parts of five counties including Monroe, Vernon, Juneau, Sauk, and Columbia. The Baraboo River falls approximately 150-feet in elevation with about 50-feet of that drop within the City of Baraboo.

BARABOO RIVER WATERSHED



Though often overshadowed by the more popular Wisconsin Dells tourist area, many spectacular rock faces can be seen in the river stretches between Union Center and LaValle. Third Castle is a rock bluff located west of the Village of Wonewoc. The Wonewoc-Union Center School District owns a 100-acre natural outdoor environmental learning area adjacent to Third Castle. The Baraboo Hills represent another unique geologic feature to the area. This ancient Baraboo quartzite range is thought to be home to some of the oldest rocks in North America. It measures approximately 30 miles from west to east and 10 miles north to south with the City of Baraboo in the general center.



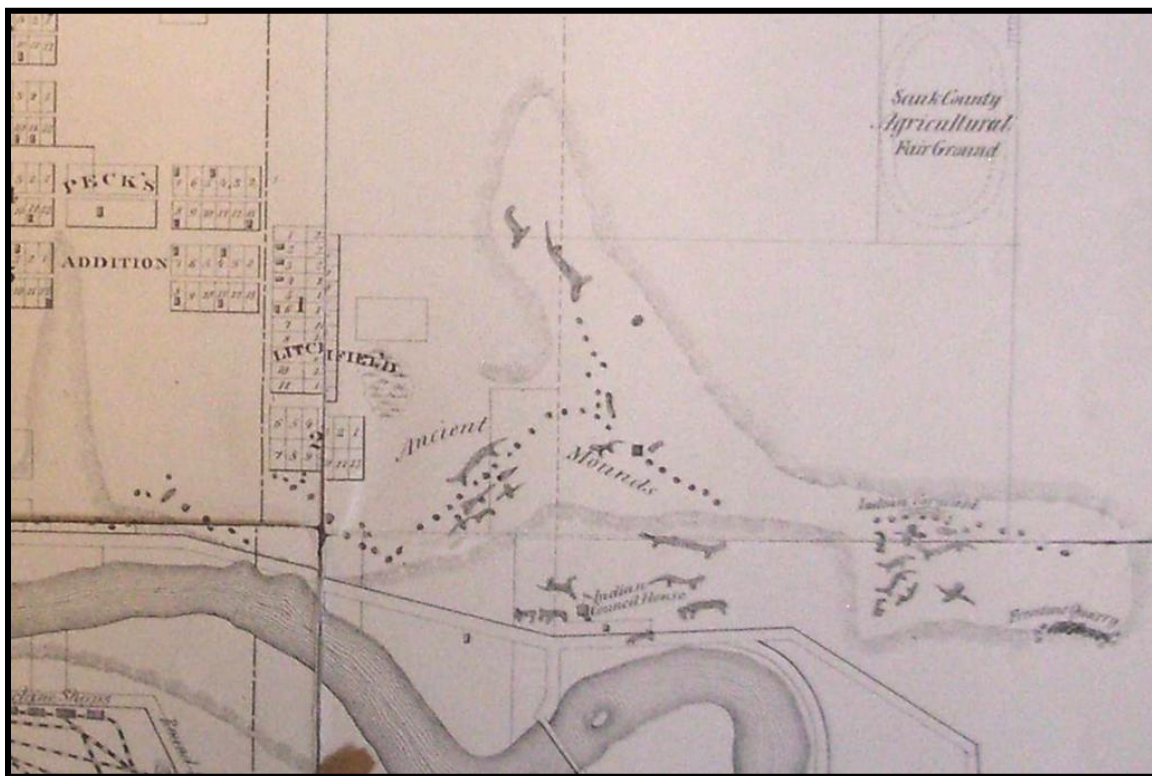
Third Castle rock is located west of Wonewoc on the Baraboo River. Photograph courtesy of author.

As the Wisconsin-era Glacier continued to retreat across Wisconsin, the edge paused for a while in what was to become the City of Baraboo. This pause led to a deposition of glacial materials, which in geologic terms, is called an “end” or “terminal” moraine. The moraine included soil, rock, and boulders that accumulated as the glacier’s edge melted. The Johnstown Moraine extends approximately 200 miles from Antigo in northern Wisconsin,

through Baraboo and continues southward to Whitewater, in southern Wisconsin. What effects do moraines have on the look of the landscape? In Baraboo, this line of moraine depositions and underlying bedrock structures resulted in an elevation drop of about 50 feet over a 4.5 mile stretch of the Baraboo River. The shallow, rocky waters in Baraboo provide prime spawning habitat for fish living in the Wisconsin River system.

NATIVE AMERICANS AND FRENCH FUR TRADERS

Because the region was rich in resources, including wildlife, water, and fertile soils, many Native Americans found the Baraboo River watershed a favorable place to live. Ancient mound builders inhabited areas of Wisconsin from 300AD to 1400AD. Their documented presence can be seen on William H. Canfield's 1891 map of Baraboo below.



William H. Canfield's "Baraboo and its Surroundings Survey Map", dated 1891, indicating ancient Native American mounds. Map courtesy of the book "Outline Sketches of Sauk County, Wisconsin."

Although at one time there were numerous effigy mounds in and around Sauk County, nearly all were destroyed due to agricultural development. One prominent mound can

still be found at Man Mound Park located approximately four miles northeast of the City of Baraboo on Man Mound Road.

In addition to mound builders, the Ho-Chunk (Winnebago) people inhabited large areas of Wisconsin. Jean Nicolet was one of the first



Early twentieth century photograph of Man Mound (outlined in flour). Photograph courtesy Sauk County Historical Society.

Europeans to visit the Ho-Chunk along the banks of Lake Winnebago in 1634. A trade relationship grew between the French, whose main interests were in furs, especially the beaver pelts which were used to make hats, and the Ho-Chunk whose trade interests lay largely with guns, ammunition, glass beads, and tobacco. One of the most prominent fur traders in the Baraboo area was a voyageur named Francois Barbeau. His trading post, located at the confluence of the Baraboo and Wisconsin Rivers, was ideal because it allowed his men to hunt and fish while also maintaining a central location to trade with the Ho-Chunk.

French Canadian fur traders heading to Wisconsin would travel from Fort Michilimackinac (present day Mackinac Island, Michigan) through Lake Michigan to Green Bay. Their journey would continue up the Fox River and include a portage across the present day City of Portage to the Wisconsin River. Once on the Wisconsin, it was a short trip down the river to reach the mouth of the Baraboo River. If successful, the trip would take approximately one month for a canoe carrying a crew of about eight to twelve men to their destination. Canoes at that time were constructed of birch bark and were very fragile. In order to protect their canoes against the elements, and to prevent drying and cracking, the traders often buried them in large holes in the ground over winter.

During the eighteenth century, the Ho-Chunk expanded their territories to include the Wisconsin River Valley and other tributaries such as the Baraboo River. Historical accounts document Ho-Chunk villages along the Baraboo River in present day Reedsburg and Baraboo. They enjoyed prosperous times until about the 1830s. At this time, white settlers began to arrive in the area. Although some local newspapers recount stories of white settlers living in peace with the native people, the United States government ordered the Ho-Chunk to relocate to lands west of the Mississippi River. From about the 1830s to the 1870s, many accounts detail the forcible removal of the Ho-Chunk out of Wisconsin and, for some, their subsequent migration back to the lands of the Wisconsin River Valley. A *Reedsburg Free Press* newspaper article dated December 29, 1921 describes an historical account of approximately 100 Ho-Chunk being taken from Reedsburg, including Chief Ah-Ho-Cho-Ka (Chief Blue Wing). After their return, another attempt at removal ended in failure as a group of local “sturdy” white men came to their assistance. After repeated unsuccessful attempts at removal, the government finally decided the remaining Ho-Chunk could stay.

WHITE SETTLERS AND DAM CONSTRUCTION

During the period when the Ho-Chunk people were being removed, white settlers were laying claim to areas along the Baraboo River. The Mill Dam Act of 1840 encouraged settlers to construct dams and went so far as to allow a person to flood their neighbor’s property. A need to mill lumber, grain, and textiles led settlers to harness the power of the Baraboo Rapids, as it was originally called.

“The building of the mills [in Baraboo] of course brought many newcomers, and as early as 1845, quite a village had sprung up. Previous to this, times had been hard for the settlers. People pounded the wheat and corn they used for bread, or ground it in hand-mills. Captain Moore had a hand mill which for quite a time served the whole country.”

-1880 The History of Sauk Co., Wisconsin

Over the course of decades, as many as eleven dams were built along the river. Early dams were often built of large timbers, boulders, and earth. The dams along the Baraboo River were all low-head run of river dams. “Low-head,” meaning they were generally less than 15-feet tall, and “run of river,” meaning that minimal impoundments were created and the dams used the natural flow of the river to power the turbine. These dams span the entire width of the river and function by channeling a portion of the river’s water into a narrow power channel where the water would fall on a turbine and rotate it. Turbines were connected by shafts and gears to turn millstones or other associated machinery in a mill building. The dams along the Baraboo River were each uniquely designed. Some had power channels that ran alongside both banks of the river and allowed for a mill on each side. Others had a detached power canal wherein the water was diverted from the river along a separate channel. This design allowed for multiple mills along one power channel.

“The beautiful Baraboo River, gracefully winding through the valley . . . is the Archimedean lever that turns numberless mill-wheels, and offers a cheap, immense and inexhaustible motive power to future mills and factories that must sooner or later arise upon its banks.”
-1863 unknown writer; The History of Sauk Co., Wisconsin

THE LIFE AND TALES OF EIGHT WATER POWERS

Throughout history, there were as many as eleven documented dams along the Baraboo River. Our focus will be on the eight most notable of these dams. The journey begins by discussing the four dams (Elroy, Wonewoc, Reedsburg, and Island Woolen Mill) that were removed prior to 1973, starting upstream and traveling downstream. The trip will continue with an in-depth look at four other dams (three in Baraboo and one in LaValle) that were removed from the late 1990s to the early 2000s and were part of the Baraboo River Restoration project. These last four dams will be discussed in order of their removal: Waterworks (Baraboo), Oak Street (Baraboo), LaValle, and Linen Mill (Baraboo).

Historically, it was common for each town or village along the river to have a milldam. The history of most dams usually involved the following cycle: original construction followed by a washout during a flood, then reconstruction of the dam in nearly the same location, and likely additional reconstructions and/or modifications over the years. The following brief survey of the dams along the Baraboo will not document the full history of each and every dam but rather highlight general aspects of their use over time.

Elroy Dam

The City of Elroy was historically a railway town along the Baraboo River and is now known for its popular bike trails including the Sparta-Elroy Trail and the 400 State Trail.

The Elroy Dam was constructed of timbers and filled with rock in 1857. It originally powered a saw mill. In 1859 a grist mill was built to grind flour and feed so locals did not have to travel twelve miles to the Lemonweir Mill to grind their grains. In 1928 a flood washed out the dam. Although historic records

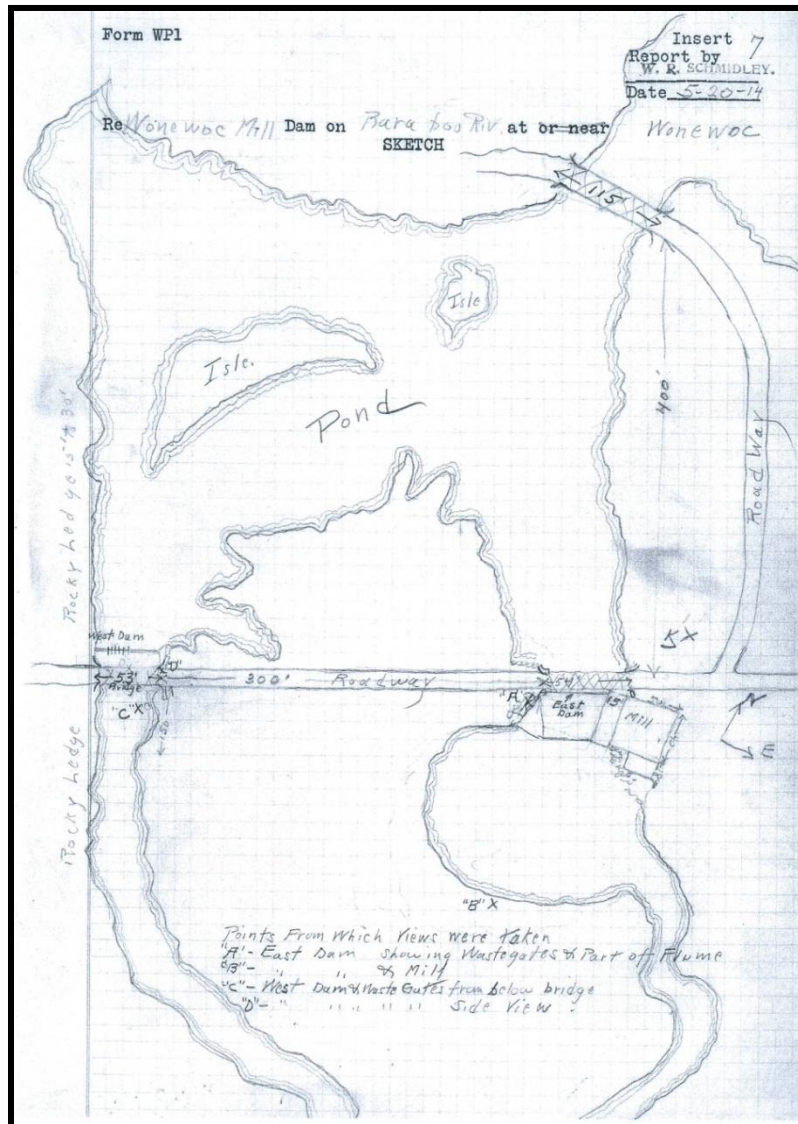


dating from 1932 indicate there were talks of rebuilding the dam, it was never reconstructed. Over 150 years since its initial construction, remnants of the Elroy Dam can still be seen below the 400 State Trail bridge.

Wonewoc Dam

The Village of Wonewoc is located in the southwest corner of Juneau County. The population of approximately 800 people is largely of German descent. The village boasts a beautiful countryside and a quaint downtown district. The Wonewoc Dam was built in 1855 and was unique in that it consisted of two separate dams, a west and an east dam.

This operation provided power for a saw and grist (grain) mill and later for hydropower. It was one of Wisconsin Power and Light's initial hydropower projects until 1944 when it was sold to a group of five farmers. An inspection of the dam in 1952 found the gates to be left wide open and the dam appeared abandoned. According to historical documents, dating from 1968, State Assemblyman Tommy Thompson and two others inspected the abandoned dam to evaluate the feasibility of its restoration. Thompson would later serve as Governor of Wisconsin during the removal of the last four dams along the river. No further mention of the Wonewoc Dam is made until 1996 when the dam was removed. Remnant scars of the west dam can still be on the bluff walls near the Washington Street Bridge in Wonewoc.



1914 sketch of the Wonewoc dam. Courtesy of WDNR dam files.

Reedsburg Woolen Mills Dam

With its central downtown location, the Reedsburg Woolen Mills Dam was a landmark within the community. Historic records indicate the first dam in Reedsburg was built in 1847. It powered a flour mill on its west side and a woolen mill on its east side. The woolen mill was a major industry in Reedsburg for years until its closure in the mid-1960s. Upon a period of property tax delinquency, Sauk County became the owner of the mill and dam in 1971. The county applied for abandonment the following year, and the dam was demolished in 1973. Many members of the community resented the WDNR because the millpond was left to dry up. According to local newspaper editor and long time resident Jeff Seering, “The DNR came in and took it [the dam] out and said everything was going to be wonderful and they really didn’t plan anything about it. They just said the fishing would be better. That drained a millpond. It wasn’t a high quality fishery or anything like that, but it was kind of pretty. It went up against one of the city’s major parks and they just let it dry.” The Reedsburg Dam and mills were located just south of the East Main Street Bridge.



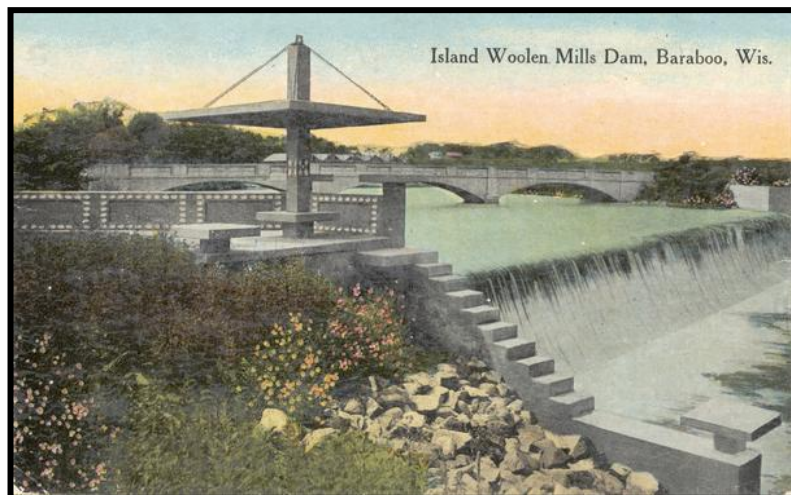
Reedsburg Woolen Mills Dam in 1912. Photograph courtesy of WDNR dam files.

Reedsburg Saw Log War

In the mid-1800s, as settlers were making land claims in the area, it was customary to loot timber from lands owned by the U.S. government and then float them downriver. This involved sending the large timbers over the dams along the river. One such incident occurred upstream of Reedsburg when two men from Baraboo decided to take advantage of this “free” timber. It was customary for David Reed, the Reedsburg Dam owner, to lower the water so the looters could pass the logs over the dam. Upon taking a closer look at his strategic position, Reed decided to halt the passing of logs over his dam to maintain its structural integrity and possibly obtain the logs for a reduced cost. His plan backfired when a U.S. Marshall ordered the dam to be cut so the logs could pass. The Reedsburg townsfolk were angered and had the Marshall arrested but eventually released him on the advice of the town’s lawyer.

Island Woolen Mill Dam

According to historic accounts, the first dam on the Baraboo was constructed in 1840 and located along the west oxbow (U-shaped bend in a river) near Haskins Park in Baraboo. Shortly after being built, the dam was swept away in a flood and rebuilt a few years later. The Island Woolen Mill, for which the dam would later get its name, was built in 1863 and produced a twilled wool suit fabric called “cassimere.” Most dams at this time provided power for more than one operation and in the late 1860s a furniture factory would be built. Soon thereafter the dam was equipped to provide electrical power. The dam had a rather large head of water measuring 17.5 vertical feet and powering two turbines; one 16-inch and one 45-inch in diameter. The dam and mill continued



Postcard showing Island Woolen Mills Dam circa 1910. Postcard (Image ID WHi-29038) courtesy Wisconsin Historical Society.

to operate until the 1960s and in 1967 was given to the Circus World Museum, providing electric power until 1968.

In 1971, the Wisconsin Department of Natural Resources (WDNR) conducted inspections showing numerous deficiencies in the dam that would cost approximately \$50,000 to repair. Due to the fact that estimates for removal of the dam were half as much as repair, the Circus World Museum applied for a permit to abandon and remove the dam in January of 1972. A public hearing was held in May of that year at the Baraboo Courthouse

to allow citizens to voice their opinions regarding the matter. Due to the controversial nature of the case, the WDNR deferred action on the permit for 120 days to allow for the possibility of a willing party to buy the dam. After no such party was found, the WDNR granted a permit for removal in the fall of 1972.

In an interview with a local group, Citizens for Waterfront Revitalization president Mike Palm stated that the Island Woolen Mill Dam, “was a rather significant dam in that it was thought that Frank Lloyd Wright might have had some fingerprints on it as far as the design. When that dam got taken out, nothing was kept or saved or documented and we

The WISCONSIN DEPARTMENT OF NATURAL RESOURCES (WDNR) was given jurisdiction over most of the state’s dams in 1967. With respect to dams, the WDNR’s two main responsibilities are to: Inspect large dams every ten years and remove abandoned dams if repair is not feasible. The WDNR also administers two grants: 1) The Dam Maintenance, Repair, Modification, Abandonment, and Removal Grant and 2) the Small and Abandoned Dam Removal Grant.

lost something when that happened.” If interested in viewing the former location of this historic dam, one can look just north of the Shaw Street Bridge.



Island Woolen Mills Dam observation deck and spillway circa 1910. Photograph courtesy Sauk County Historical Society Trimpey Collection.

Waterworks (City) Dam

The City of Baraboo acts as the central commercial hub along the river and has a population of about 11,000. It is most notable for being the winter headquarters for the Ringling Brothers Circus from 1884 to 1919. Up until the mid-1990s, the Waterworks



Baraboo River showing Ringlingville tents along the south bank just upstream of the former Waterworks Dam. Photograph courtesy John Laub, SCF.

Dam was the middle dam in the City of Baraboo, with the Oak Street Dam located upstream and the Linen Mill Dam downstream. The Waterworks Dam was constructed of rock and timber around 1858. According to Dave Lawrence, former

Baraboo water superintendent, the Waterworks Dam's power generation was used to pump water from wells to the municipal water supply mains. The dam's secondary use was to generate electricity.

In 1974 the WDNR completed an inspection that determined the dam to be deficient. At this time, there were discussions of removal but many were reluctant to do so after seeing the public outcry during the removal of the Island Woolen Mill Dam just two years prior. Shortly

thereafter, the turbines became inoperable and the dam was no longer used. For the next twenty years the dam lay quietly. Over these years Sauk County Conservationist Joe Van Berkel and other local leaders had informal discussions about the possibility of a river without dams. But, another dam inspection, conducted by then WDNR Dam Safety Engineer Susan Josheff in the fall of 1994, documented many repairs that were necessary for the dam to comply with the state's Dam Design and Construction Standards.

It was also at this time in the fall of 1994 that WDNR fish biologist Tim Larson conducted a fisheries survey of the Baraboo River near the location of the three dams. The survey found that there were, "ten fish species present below the lower dam [that] were not found above." This study provided the evidence that the dams were also preventing the passage of fish species on the river.

A repair/removal cost comparison estimated it would cost about \$630,000-\$990,000 to repair the dam and \$397,000 to remove it. After discussions with the Baraboo Water Commission, it was decided that, due to economics, removal was the preferred option and

DID THE BARABOO RIVER DAMS PREVENT FLOODING?

The dams along the Baraboo River were not flood control structures. Of Wisconsin's 3,800 dams, only about 200 serve as flood control structures. Had they been in place during the most recent floods of 2008, the dams along the Baraboo River would have been completely overtopped. Furthermore, the strength of floodwaters could have possibly led to a dam failure.

the city began to draft a proposal for removal of the dam. In addition, the city applied for a WDNR dam removal grant through the State Dam Repair/Removal Grant Program, which they later received in the amount of approximately \$200,000.

Although the Waterworks Dam was not as visible as the other two dams located in the City of Baraboo at this time, it impounded water up to the popular Ringling Brothers Circus Headquarters National Historic Landmark (NHL), which includes the Circus World Museum. As locals and members of the Circus World Museum became aware of the city's intentions to remove the dam, the letters to the editor were plentiful. Many people were concerned with what would happen if the dam was removed. Their worries included the possibility of the river drying up, permanent mudflats, harm to the fish, and worsened flooding. Circus World Museum staff members were adamantly opposed to dam removal because it might alter the historic appearance of the Ringling Brothers Circus Headquarters or Ringlingville property. According to Dave Lawrence, former Baraboo water superintendent, the city

THE RIVER ALLIANCE OF WISCONSIN (RAW), whose mission is to advocate for the protection, enhancement, and restoration of Wisconsin's rivers and watersheds, was an instrumental partner in the three dam removals in the City of Baraboo. In 1997 they initiated a new Small Dams Program which focused on restoring rivers through selective dam removal. Their work on the Baraboo River became one of their initial flagship projects. Terry Kramer, who was Baraboo's city engineer at the time, explained that RAW was extremely helpful in providing the public information to the community about the benefits of dam removals in other communities.

The BARABOO RIVER CANOE CLUB (BRCC) has been around for at least 20 years and has approximately 75 members. They lead annual river clean-ups and canoe trips, and they focus their efforts on restoration of the 4.5-mile stretch of Baraboo Rapids. As former BRCC president Joe Van Berkel puts it, "It's our neighborhood river so we try to take care of it and improve it."

offered to sell the dam and associated properties to the Circus World Museum for \$1. This was unfeasible as the Wisconsin State Building Commission (owner of the Circus World Museum's real estate assets) operates under policies which preclude it from property purchases with environmental issues.

Over the course of the next year, the City of Baraboo, WDNR, University of Wisconsin-Extension, River Alliance of Wisconsin, Baraboo River Canoe Club,

Sauk County Land Conservation Department, Citizens for Waterfront Revitalization, and local citizens attended numerous public meetings to discuss the benefits of dam removal, which included improvements to fish populations, water quality, recreational opportunities, safety, and large economic benefits to the city and its taxpayers. John Exo, UW-Extension public educator, worked to educate people about the two options of repair or removal and how each would affect the cities along the river, as well as the river itself. The Circus World Museum was initially opposed to the project because of aesthetic changes that might affect their lands on the impoundment. In an effort to prevent the dam removal, state elected officials even discussed incorporating legislation that would allow the WDNR to make grants for up to 90% of the repair costs to state lands, such as the Circus World Museum property, that would be significantly devalued by dam removal. This legislation was ultimately defeated, and after extensive negotiations between the Circus World Museum and the City of Baraboo, a mitigation plan was agreed upon by the two parties. It was determined that the dam would be removed on the condition that the city would pay for aesthetic improvements to the Circus World Museum properties that were adversely affected by the removal of the dam.

In December of 1997, work to remove the Waterworks Dam began. According to former city engineer, Terry Kramer, dynamite was used to remove the dam spillway because it was too strong to be removed with a backhoe. After setting up seismographs to confirm that nearby historic Ringling buildings would not be affected, the Waterworks Dam spillway was

“Taking out a full set of dams, that’s got value because that’s a breakthrough that’s an innovation.”

- Brent Haglund, Sand County Foundation President

removed and the project was fully completed five months later in April of 1998. Following the dam removal, Ringlingville elephants could be seen splashing in the river.

The removal of the Waterworks Dam paved the way for three other remaining dams to be removed along the Baraboo River. Stephanie Lindloff, former Small Dams Coordinator of the River Alliance of Wisconsin said community support for dam removal is imperative. She explained, “It’s so key to have those local champions. The people who

“We went down there after the dams had been drawn down. It was just cold and the mudflats were frozen so it was a good time to go down and get debris out of the mudflats. There was this guy out there who was just angry and just yelling at me. I just let him talk and come to find out his grandmother had just died and he was very close to his grandmother and a couple years before that his grandfather had died. By just letting him talk I found out that his grandmother and grandfather had their first kiss at the Waterworks Dam. That’s what it was all about.”

– Todd Ambs former Executive Director, River Alliance of Wisconsin

are going to be talking about it at the coffee shop, the barber shop, or their bowling league ... or the people that are located in the town that would be affected by the decision. They don't necessarily need to be elected officials but so much of the issue is related to 'what is in the court of public opinion' and encouraging people in the affected community to at least consider the option and gather enough information to feel like they can make a well informed decision. The fact that Joe [VanBerkel] and John Exo and the mayor [Dean Steinhorst] were definitely strong leaders in that role made a huge difference." The former locations of the power channel (also called a raceway, millrace, or headrace) and dam can be seen by following Race Drive in Baraboo to its intersection with Potter Street near the river.

Oak Street Dam

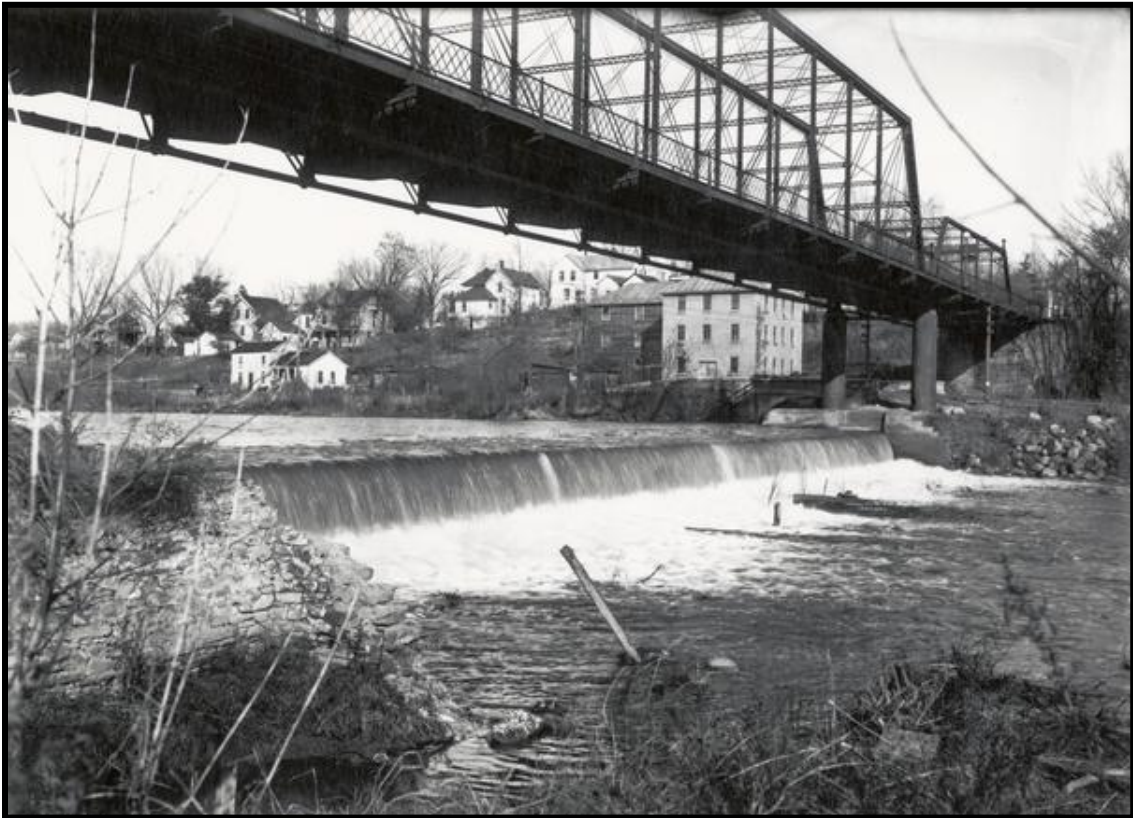
Historic records indicate that two dams were located at the Oak Street Dam location prior to the construction of the most recent one in 1885 in Baraboo. While building one of the initial mills in 1844, settlers discovered the skeleton of a prehistoric animal.

"While excavating for the mill, the workmen found the remains of a mammoth, some eight feet from the surface. The position of the bones showed the animal to have been some thirty-six feet long. The bones, though apparently well-kept, on being taken from their resting place, gradually air-slaked and became dust."

- Western Historical Company (1880)

The Oak Street Dam powered a textile mill that produced towels and rugs. In addition, the power channel supplied power to a flour mill, a machine shop, and, later, a hydroelectric generator. The power channel was approximately 300 feet long and snaked under Water Street twice before passing through the power house to turn the turbines and return to the river.

In 1998, Steve MacArthur, owner of the dam, was notified that the dam needed extensive repairs. It was also about this time that the dam was coming up for initial licensing with the Federal Energy Regulatory Commission (FERC). FERC is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. The agency is also in charge of licensing hydropower projects. With an extensive list of expensive repairs and FERC licensing looming, the owner opted to sell the dam to the WDNR for one dollar with the intent to abandon and remove it. In 1997, the River Alliance of Wisconsin was awarded a National Fish and Wildlife Foundation (NFWF) grant for \$33,000 which was matched by additional funding to help finance the removal.

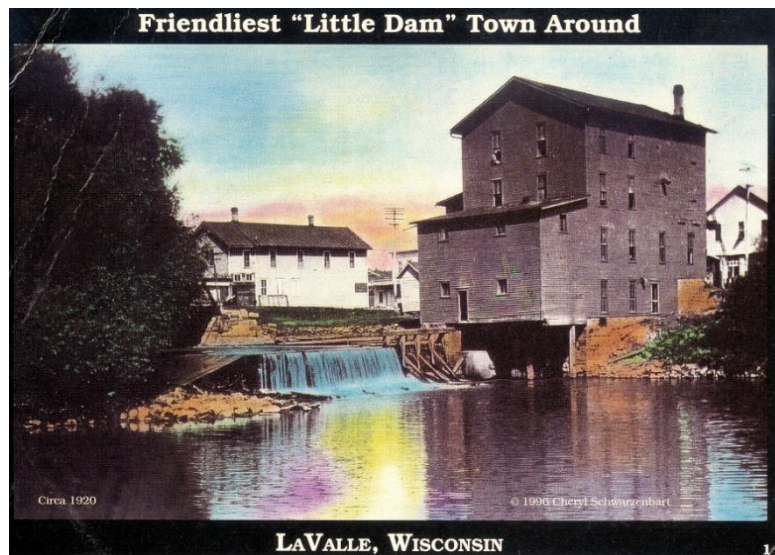


Oak Street Dam shown under the High Bridge circa 1918. Photograph (Image ID WHi-29095) courtesy Wisconsin Historical Society.

Upon preliminary dam removal inspections, it was discovered that coal tar deposits were present upstream of the dam in the millpond. These contaminants were associated with a coal gasification plant that had been operated by a company later acquired by Alliant Energy (formerly Wisconsin Power & Light) in the late nineteenth and early twentieth centuries. In order to safely remove the contaminants, Alliant Energy contracted RMT Engineering to remediate the site at a cost of \$600,000. A coffer dam of linked sheet metal was constructed around the contaminated soils, and the millpond was slowly drained of water through a notch in the dam. After affected soils were excavated, the coffer dam was removed and the dam removal process resumed. Stephanie Lindloff of the River Alliance of Wisconsin stated, “I remember how impressed people were that the industry stood up [to] take responsibility. They did not want to stand in the way of seeing a really great restoration project through.” RMT Engineering went on to win the Engineering Excellence Award for its work with this project. Dam removal was completed in 2000. A plaque commemorating the dams along the north bank of the river near Baraboo Kiwanis Riverwalk Park now sits near the former location of the Oak Street Dam.

LaValle Dam

The Village of LaValle is one of the smallest communities on the Baraboo River with a population of just over 300 people. The LaValle Dam and associated mill were built in 1849. Upon construction of the dam, the lands southwest of the spillway created a millpond



Postcard showing the old mill in LaValle circa 1920. Postcard courtesy of WDNR dam files.

in the Village of LaValle that would become a prominent feature of the community for years to come. Over the years, the mill provided an array of services to the community in

the form of a saw mill, flour mill, hydroelectric power, and even a place to project outdoor movies. Barrel staves and broom handles were made at the mill in 1864. As was the case with many mill buildings of the time, it met an unfortunate end when it burned in 1937. A *Wisconsin State Journal* article dated February 22, 2001 included an interview of a relative of the dam owner about the fire: “[He] came running out of the flames with his hair singed and a feed sack full of money held triumphantly in his hands.” Always a tight-knit community, the village residents rebuilt the mill in just three months.

“It [LaValle millpond] was full of a lot of rough fish ... but as a child a fish was a fish, big carp was big game to us.”
– Tony Pillow, Former LaValle resident

The mill and dam continued to operate, grinding corn and grains for local farmers and Amish people into the mid-1990s. With the loss of small dairy farmers in the surrounding area, it was becoming increasingly difficult for the owners, the Hansens, to operate the business. In addition to a slowing business, the owners received notice from the WDNR in 1998 that the dam needed extensive repairs to bring it up to state design standards. At this time, Sand County Foundation (SCF) was becoming increasingly interested in the dam removal efforts along the Baraboo River. After speaking with Mr. Hansen about the state of the business and the necessary repairs, SCF offered to purchase

“[By the 1990s] the small family farms were eroding very fast. In our area most of the farmers were retiring. The business was getting less and less and I either had to expand ... which would cost more or sell out.”

- Daryl Hansen, former LaValle mill owner

the mill and dam with the intention of removing the dam to allow for a free-flowing river, improved fish population, and water quality. After further discussions, a fair market price was agreed upon between the two parties and the WDNR was notified of the proposed sale and SCF’s intent to abandon and remove the dam.

Knowing there was local opposition to draining the LaValle millpond, SCF and its partners wished to work with the community, businesses, local river users, and riparian (land on the banks of the river) landowners. They decided to approach a small group of elected local and state leaders, including Senator Dale Schultz, of their intent to purchase and remove the dam before informing the general public. Former WDNR Water Basin Supervisor Tom Bainbridge attended this initial meeting. “We weren’t all holding hands when we walked out of that meeting ... but it was very important and I think we definitely accomplished what we wanted to accomplish.” This meeting achieved the initial goal of creating an open dialogue between SCF, the WDNR, and local community members. An open house was organized shortly thereafter to inform the general public. Much public opposition centered on the possible loss of the LaValle Millpond. Former town chairman and adjacent landowner, Ed Bodendein, explained the local sentiment at the time, “The way I remember it, they wanted to do away with the pond entirely and well, I don’t think there was anybody in the village that wanted it taken out.” This, along with losses to wildlife, aesthetics, and historical aspects, were high on the community’s list of concerns. Many people had nostalgic ties to the dam. One comment read, “Leave the dam alone, don’t destroy it because it no longer serves its purpose ... my grandma can’t make cookies anymore but I don’t get rid of her.”

“I think it’s a win-win situation for the [LaValle] community and for restoration of the river. That doesn’t usually happen. Usually there’s a loser but there were no losers in this situation.”

– Dennis Plantenberg, Club Chapparral Campground; located between Wonewoc, WI and LaValle, WI

SCF purchased the mill and dam in 1999. Although the millpond did not provide an exceptional fishery, many in the community had grown up with it. SCF, the WDNR, and others acknowledged that the success of the project lay largely on the ability to work with the local community on a solution.

“The number one thing is you have to make these people your friends. It may sound extremely simplistic and extremely hokey and not very scientific but that’s the bottom line.”

- John Laub, SCF River/Floodplain Program Director

An advisory committee was formed of local community members, along with members of state and federal agencies, and representatives of SCF. The LaValle Citizens Advisory Committee considered the options, which included creating multiple smaller ponds, one large pond, or allowing the pond to drain completely. It was decided that one large pond, resembling the one

the village already had, was the preferred option. Jeff Seering described it well in his February 15, 2001 *Reedsburg Independent* news article, “LaValle didn’t get what it really wanted: to keep the dam and mill pond in place. But the DNR gave LaValle all it could short of keeping the dam. That’s called a compromise. Hopefully it will be one both the LaValle community and state will be happy with for years to come.”

Demolition of the LaValle Dam took place in February of 2001 and a riffle area below the dam was constructed to retain the spill pool that had been there prior to dam removal. An unintended consequence of the LaValle dam removal was a discovery of a sanitary sewer line leak. Rick Eilertson, former engineer with MSA Professional Services, Inc., worked on designing a new sanitary sewer force main at the LaValle Dam and explained that wastewater was dumped directly into the river due to the leak in the sanitary sewer line.

Lead SCF project manager, John Laub, was heavily involved in orchestrating the negotiations in LaValle. “It was a tremendous public – private thing where the right people working together could get something done that couldn’t have been done for years under normal circumstances.” Throughout the process SCF President Brent Haglund described SCF’s approach as “kitchen table environmentalism.”

“... a very important dynamic here is that former Governor Thompson comes from Elroy just north of there [LaValle] my job and my relationship with him was to look after the home people . . . so it put extra pressure on the state representative and myself to be there and help people.”

– WI State Senator Dale Schultz

Put simply, they applied an on-the-ground effort to identify those individuals who had a stake in the project and made an effort to work toward a fair solution. In a small community, such as LaValle, this meant a



lot of discussions at the local cafe and volunteer fire house. [The reconstructed LaValle millpond. Photograph courtesy of author.](#)

Reconstruction of the LaValle Millpond

Though not a customary practice for the WDNR and other agencies, a dike was built between the river and former millpond to create a shallow pond. The U.S. Fish and Wildlife Service (USFWS), Natural Resources Conservation Service (NRCS), and WDNR were instrumental in developing the plans for the constructed millpond and providing the necessary funding. In 2002, the WDNR purchased approximately twenty acres of land within the old millpond from four adjacent landowners for \$20,000. Land surveys were conducted and plans were developed to rebuild the LaValle millpond. The USFWS contributed two consecutive years of funding to the constructed pond project. B & L Excavating, Inc., a local contractor from LaValle, was hired to conduct much of the wetland and riverbank restoration work. The land was scraped in three areas to deepen water levels. Natural springs provided the necessary water supply to refill the millpond. A pipe was placed in the dike, allowing the pond to be drained with the pull of a plug. To curb the possibility of creating a carp nursery, it was agreed that the pond would be drained once a year if the Baraboo River overtopped the constructed dike. In 2003, the

WDNR transferred ownership of the 20-acre constructed pond to the Village of LaValle for “public recreation and wildlife and fish habitat.”

Today, when locals speak of the millpond, they often describe the beautiful view of the Fourth of July fireworks over the water. Tony Pillow boasts, “For a small town they have some of the best fireworks around and anyone from age two-years-old to eighty-years-old [are] all lined up on that dike down there watching fireworks.” After speaking with many locals of LaValle, it appears that they are happy with the outcome. As local business owner Janis Pearson puts it, “I have to say the millpond is much better than it was. The teachers use the mill pond for educational purposes and take the kids down to the pond with canoes and kayaks. The pond is getting wonderful use.”

LaValle Mill Then and Now

Being one of the last remaining water powered grinding mills, the people of LaValle were sad to see the mill close its doors and be sold to an out-of-town organization. Local prayers seemed to be answered when Mike and Jody Cummings, who had been long time patrons of the mill, bought the old mill building from Sand County Foundation. When Mike received the call that their offer on the mill had been accepted, he remembered telling his wife, “I think we bought a feed mill. Now what are we going to do?” They later decided to open an antique store, which they aptly named “The Treasure Mill.” A tinkerer and true engineer by nature, Mike requested that the headrace of the dam be left in place to allow just enough water power to turn the wooden gears of the mill for demonstration purposes. For LaValle, the history of



The former LaValle grain mill has now been transformed into The Treasure Mill, an antique and Amish furniture store. Photograph courtesy Robert Kinsey.

the village's milldam has been preserved in several rare and tangible ways.

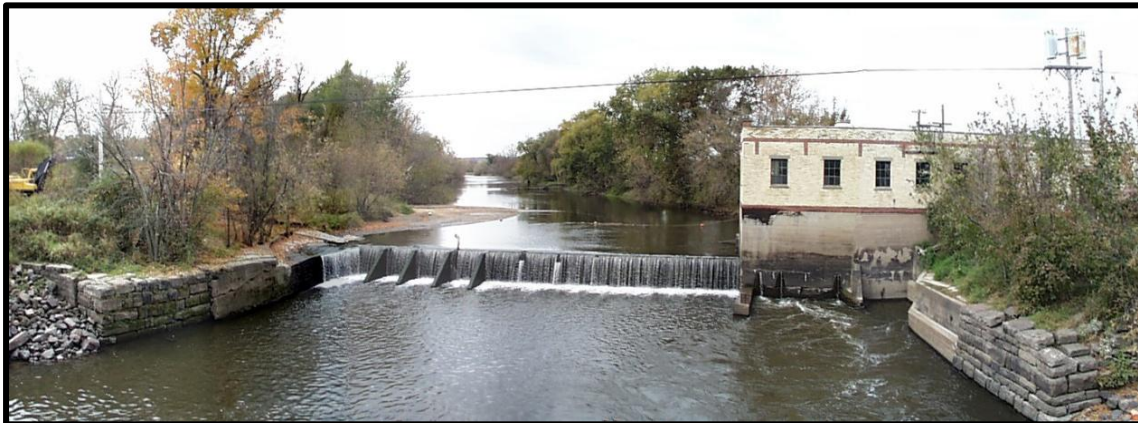
Linen Mill (Glenville) Dam

The Linen Mill Dam, the second McArthur dam, was the most downstream dam on the Baraboo River. It has a somewhat contradictory history with regard to its construction date. Some sources indicate an initial construction date of 1844 while others list it as late as 1898. The Linen Mill, as its name implies, spun flax fibers into linen cloth. A power house was constructed in 1927 to allow for hydroelectric power generation.

“They built a dam [Linen Mills/Glenville Dam] a few rods above the [Highway 113] bridge which produced a fall of some eight or nine feet and also constructed a towel mill on the north side of the river. The farmers of the neighborhood cooperated to a considerable extent in all this work. They hauled many tons of huge boulders from the Bluff to help anchor the dam and aided in various other ways. For many years they continued to manufacture towels and rugs . . . At the present time the power at the Glenville plant is used exclusively for generating electric current, furnishing light and power to a large number of rural customers and also to the cottages at Devils Lake.”

-1937 account by Harry Slye, Sauk County Historical Society

An historical account of the Linen Mill Dam drafted by Robert McArthur in 1987 stated that the dam's unique buttresses on the downstream side provided extra strength to break up large ice sheets passing down the river.



Linen Mill (Glenville) Dam. Photograph courtesy WDNR dam files.

After an inspection showed that expensive repairs and modifications were needed, Steve McArthur decided to sell the dam to the WDNR for abandonment and removal in 2001. When an outstanding power generating contract stood in the way of the sale, Sand County Foundation stepped in and contributed additional funds to buy out the remaining contract. This allowed the owner to move forward with signing over the dam to the WDNR. In October of 2001, the Linen Mill Dam was removed, resulting in a free-flowing river that had not been seen there since the 1930s. The old Linen Mill can still be seen just west of the State Road 113 bridge near Baraboo.

DAM SAFETY

Although low head dams appear relatively small and harmless, they can actually be quite dangerous. As water passes over the spillway, it creates a back current. If someone is caught below the dam they will be pulled by the back current to the face of the dam. They often become trapped in this back roller, unable to break free from the force of the back current. Newspaper accounts from 1972 describe the story of two men who narrowly escaped drowning below the Linen Mills Dam. In more recent history, two individuals drowned at the dam just a couple of months before its 2001 removal.

Wisconsin is a leader across the nation in using selective dam removal as an option to address the aging dam infrastructure in the state. Susan Josheff, former WDNR dam

safety engineer, explained that one of the strengths of the state’s Dam Safety Program is that it is located within a conservation organization such as the WDNR. “We’re able to put the whole picture together for people to see not only the benefits or liabilities of the structure but of what it’s doing to the environment.” Although the WDNR has the authority to force a private dam owner to remove a dam, they operate in such a way as to give the dam owner options: Either perform the necessary repairs to bring the dam up to safety standards or remove the dam. The catch is usually in the cost differences of the two options. Despite the fact that removal is becoming more popular and more economical, Ms. Josheff reports that the majority of dams in Wisconsin are still being repaired. The reason is simply that many people dislike change.

ABOUT THE FISH AND MACROINVERTEBRATES

During early settlement, accounts of fish in the Baraboo River described a plentiful and varied fishery including, among others, black bass, rock bass, pickerel, pike, and

“In company with Ed Kingsley, going down the lower Baraboo Rapids each on a crib, I halloed to him to look – that somebody seemed to have made a dam of stone across the river. As we approached we saw it was the backs and tails of fishes. We were soon among them and found they were sturgeons. I killed three with a handspike. In jumping into the water to get them I was knocked down by others running against my legs. For a short distance the river seemed to be jammed full of them.”

- 1841 Archibald Barker, Baraboo and Other Place Names in Sauk County WI, 1912

sturgeon. As settlement progressed and additional dams were built on the river, a change was taking place below the surface. For thousands of years fish had enjoyed free passage from the Wisconsin River up the approximate 120-mile length of the Baraboo River. In addition to the Baraboo River, these fish also had access to approximately 500 miles of associated tributaries, including the Little Baraboo, Skillet Creek, Narrows Creek, and Seeley Creek. From the time the first dam was constructed in 1840, about six more dams were built over the course of 13 years. This caused a fragmentation of the fish populations and also prevented fish from traveling upstream. Susan Josheff, current WDNR Water Team Leader for the Rock River basin, recalled one historical account describing sturgeon so numerous, people mistook them for logjams. She also recounted the tale of the last paddlefish found upstream of the dams. It was caught against the trash racks of the Island Woolen Mill Dam in 1950 and was possibly the last of the species living on the stretch of river, isolated between two dams for quite some time.

As settlers continued to harness the power of the fast moving rapids, the river was transformed from a lotic or flowing water system, to a more lentic, or still water system. The series of stagnant pools formed by the dams created an environment suitable for lower quality fish species, including carp. Fish below the lowest dam in Baraboo included higher quality fish such as walleye, sauger, burbot, and lake sturgeon.

Good Science

In 1994, a WDNR fisheries survey was completed by Tim Larson that revealed, “ten fish species present below the lower dam were not found above.” In order to obtain further baseline research data, WDNR fisheries biologist John Lyons, conducted a fisheries survey of the five mile stretch of rapids in Baraboo in the fall of 1997.

As with most dam removals during this time, scientific studies showing changes to fisheries, macroinvertebrates species, and sediment transport were not well documented. Researchers at the WDNR, Wisconsin Cooperative Fishery Research Unit, University of Wisconsin, and Sand County Foundation saw the opportunities for cutting edge research on the effects of dam removal to ecosystems and riverine species. Matt Catalano, a

graduate student from UW – Stevens Point, conducted a study on the effects of dam removal on the assemblage and distribution of fish in the Baraboo River. A grant through the Federal Aid in Sport Fish Restoration funded this six year research project. Thirty-five study sites were surveyed along the Baraboo River and its tributaries. Results found that nine fish species that were absent or rarely seen above the lowest dam (Linen Mill Dam) rebounded with better than expected numbers once the dam was removed. “I felt like I was on the cutting edge of some things that were getting a lot of interest in the scientific community,” Catalano explained.

Catalano’s research also displayed a 35-50 point increase in the Index of Biotic Integrity (IBI) at three of the

four dam removal sites. The IBI is a measurement tool to capture overall fish health and abundance in relation to human influences on rivers and streams. The IBI measurement focuses on five main categories: 1) species richness and composition, 2) habitat specializations, 3) tolerance to environmental degradation, 4) trophic and reproductive function, and 5) abundance and individual condition. WDNR research scientist John Lyons developed two IBI standards for warm water streams in Wisconsin. The fourth dam site, the LaValle Dam, had a reduction in IBI scores. Dan Fuller, WDNR fish

The Wisconsin Cooperative Fishery Research Unit

(WICFRU) is a partnership of the University of Wisconsin – Stevens Point, WDNR, and the United States Geological Survey. They work to connect graduate students with “world class fisheries and aquatic science research” opportunities. In addition, WICFRU strives to meet the research needs of the partnership organizations. The Baraboo River fish study was recognized as a premier river research opportunity.

technician, explained the sentiment for some in the agency at the time. “We felt that the dam removals on the Baraboo River were good for the system as a whole, but not necessarily good for the fishery in the immediate area of the LaValle Dam. We saw the greatest value of the dam removals as opening the doors to the riffles in Baraboo to be used by spawning fish from the Wisconsin River and the Baraboo River.” The fact that the fishery decreased in LaValle is evident in the Catalano research data. The reason for the decrease can be attributed to activities happening downstream of the LaValle Dam. Lake Redstone is located approximately three miles downstream of LaValle and is frequently stocked with fish. Fish, including walleye and muskellunge, come over the spillway of the Lake Redstone dam and some proceed upstream. Before the dam was removed, the fish gathered below the LaValle Dam and provided a prime spot to fish. Removal of the dam allowed fish to swim beyond this obstacle and scatter to the upper reaches of the river, therefore decreasing the number of fish congregating in the immediate LaValle area.

Some fish species use the Baraboo River for spawning only. For example, paddlefish and lake sturgeon are two species that only use the river for a couple weeks out of the year.

The effects of dam removals on these species could not be accounted for in the six-year study because their life cycles dwarf this study. The life expectancy of lake sturgeon ranges from 50 to 150 years and they do



not reach sexual maturity until about

WDNR Fisheries Team conducts a fishery survey on the Baraboo River in 2009. Onlookers observe from the Circus World Museum pedestrian bridge. Photo courtesy of author.

20 years of age. A long-term survey of the Baraboo River would need to be conducted for species such as these.

The WDNR continues to conduct fisheries surveys of the Baraboo River. Brian Weigel, WDNR River Research Ecologist, recently led an effort to survey ten sites that were previously surveyed during the Catalano study. He plans to conduct an additional year of surveys to contrast current fish populations with those identified in the Catalano study. In addition, the WDNR continues to monitor the Baraboo River's tributary streams such as Narrows Creek. This creek has undergone extensive habitat and bank reconstruction in an effort to make it a better smallmouth bass fishery and act as a nursery for the Baraboo River.

While a diverse fish population is an important component of a healthy river ecosystem, the fish would not exist if it were not for the macroinvertebrate community. Pick up a rock along the Baraboo Rapids and flip it over and one will surely find a plethora of creepy crawly creatures. A typical mayfly larva starts its life as one of these creatures in riffle areas along a river. The fast moving water provides fresh oxygen and cooler water temperatures, both necessary requirements for these insect larvae to mature. These riffle areas are often referred to as "food factories" because they provide the food for fish such as the small mouth bass and walleye. WDNR biologist Dave Marshall and University of Wisconsin-Madison river ecologist Emily Stanley conducted a survey of macroinvertebrates in the Baraboo River from the spring of 1996 to the fall of 2002. Findings showed that "within three impoundments, macroinvertebrate communities mirrored existing riffle communities within approximately one year of each dam removal." The return of macroinvertebrates such as mayflies, caddisflies, and stoneflies are all indications of good water quality.

Emily Stanley and University of North Carolina Professor Martin Doyle also conducted research on river channel adjustments that resulted from the removal of the LaValle Dam. This research was one of the first of its kind and was partially funded by a grant from the Bradley Fund for the Environment, a partnership of the Sand County Foundation and The

Lynde and Harry Bradley Foundation. Channel changes near the LaValle dam occurred in a matter of weeks, which was largely due to the fact that some sediment had been removed during previous dam draw downs. The study found that the river channel narrowed and upstream sediments were transported two to three miles downstream. While dam removals are becoming common practice, additional research, like that conducted on the Baraboo River, is needed to analyze the effects to fisheries, macroinvertebrates species, sediment transport, and river channel changes.

RECREATIONAL USE

The Baraboo River is host to many recreation events throughout the year. The City of Baraboo has hosted a Milk Jug Regatta race with more recent events, including the Baraboo River Rendezvous. The 4.5-mile stretch of river through Baraboo offers a scenic Class I whitewater rapid, ideal for beginners to the sport of whitewater kayaking or canoeing. Reedsburg hosts an annual Lazy Beaver Canoe Race, which begins in LaValle and ends in Reedsburg. This race boasts prizes for the “best decorated” canoe or kayak. Hillsboro hosts the Hill Country Trail and River Challenge, which involves a bike ride along the 400 State Trail, a five-mile run, and a six-mile paddle along the Baraboo River. The popular 400 Trail follows the Baraboo River from Reedsburg to Elroy and provides excellent opportunities for bicycle and canoe/kayak combination trips. The Village of Wonewoc recently constructed a canoe landing complete with a picnic shelter and restroom facilities.

The river still faces challenges with respect to recreational use. One unavoidable challenge is that the water levels are often low in the summer months, which can lead to difficult passage for canoes and kayaks. Other challenges include adequate canoe landings, canoe trail signage, shuttle services, and cleared canoe paths through log jammed areas. As a sport fishery, the Baraboo River is often overshadowed by other nearby recreation spots, including Devil’s Lake, with its stunning rock faces, as well as Lake Redstone, which is only five miles northwest of Reedsburg. Other challenges include muddy and turbid water, which is a partial result of decades of agricultural runoff. Both can deter recreationalists who prefer a cleaner and clearer river. Despite



Creative portage techniques are sometimes necessary to navigate the Baraboo River. Photograph courtesy of author.

these drawbacks, people continue to recreate on the river. Most will agree that removal of the dams along the Baraboo River has improved paddling and fishing opportunities.

The extent of recreational opportunity improvements has not yet been analyzed. With the help of Sand County Foundation and the Bradley Fund for the Environment, researchers at Lawrence University are currently gathering data to identify recreational and economic changes associated with the dam removals along the Baraboo River. This study will also identify opportunities to improve recreation and associated enterprises along the river.

RIVERFRONT REDEVELOPMENT

The removal of the dams along the Baraboo River helped to act as a catalyst for other riverfront redevelopment and revitalization. Although trails have long wound their way along the river through Baraboo, there was never an official trail until the Baraboo Kiwanis Club decided to take on the Riverwalk project in the City of Baraboo during the

mid-1990s. One completed section of the paved trail currently extends from the Oschner Park area to the newly created Baraboo Kiwanis Riverwalk Park. Future plans include extending the Riverwalk to the east end of the city. Estimates as of 2009 indicate the Baraboo Kiwanis Club has invested about \$50,000 into the Riverwalk. This trail received additional funding through the WDNR's Knowles Nelson Stewardship Program in 1998.



The Baraboo Kiwanis were instrumental in the creation of the paved Riverwalk trail. The newly commemorated Riverwalk Park was dedicated to the Baraboo Kiwanis in 2009. Photograph courtesy of author.

As the Baraboo River gained publicity regarding dam removal, a grass roots movement began to develop. The Citizens for Waterfront Revitalization (CWR) was organized in 1997 during the proceedings for the Waterworks Dam removal. The non-profit organization's mission is to create an awareness, to beautify, and to revitalize the downtown Baraboo River corridor. The group became one of the early proponents of the dam removals in the City of Baraboo. CWR saw the dam removals as an opportunity to make improvements to river recreation, economic redevelopment, public policy, river education, river identity, and water quality. In 2000, CWR received a \$10,000 river

planning grant from the WDNR. They used the funding to draft a document, called the *Baraboo Rapids Strategic Plan*, which detailed improvements for the riverfront. This plan was later adopted by the City of Baraboo and Village of West Baraboo. CWR worked to bridge the gap between those who felt deep nostalgia to the past with those who saw the great opportunities that a free flowing river afforded. Rick Eilertson, CWR secretary explained, “This is really where the City of Baraboo got its start, with the businesses that built the dams and powered those industries. Many of those businesses are still around and while they were not actively using the dams for power there is obviously still a fair amount of nostalgia related to the dams.” CWR drafted two reports highlighting the historical significance of the river and dams, the first called *Phase I: Baraboo River Historical Photos* and the second called *Phase II: A Brief History of the Dams Along the Baraboo River*.

“The splendor of the Baraboo Rapids is returning. Recent dam removals . . . have changed the nature of the river. The rapids can no longer be seen as the ‘backwater’ area of the city, neglected and underappreciated. The river needs to be seen as the public asset and beautiful natural resource it is.”

– Baraboo Rapids Strategic Plan 2001

In 2000 the City of Baraboo received a \$250,000 Wisconsin Department of Commerce Brownfields Grant and a \$30,000 WDNR Brownfield Site Assessment Grant. A brownfield is a general term for “an industrial or commercial site that is idle or underused because of real or perceived environmental pollution.” In this case, the grants were used to revitalize an old railroad yard near the river. The city now uses this property to house the City Services Center. In March of 2006, the City of Baraboo received a \$2.5 million dollar Department of Commerce grant toward redevelopment of Baraboo’s riverfront. With this funding, local leaders could assist in relocating incompatible industrial land use away from the river. The majority of this funding was used to purchase a piece of land along the river that was owned by Alliant Energy. The Survey Research Center at the

University of Wisconsin – River Falls conducted a citizen survey to better understand their knowledge of the redevelopment plans in 2006. Results provide the baseline data to assess “the impact of the river corridor redevelopment project.” A follow-up survey is tentatively planned for 2011.



Conceptual plan of Ringling Riverfront Redevelopment. Illustration courtesy of Vandewalle and Associates.

In 2008, the City of Baraboo received three \$200,000 U.S. Environmental Protection Agency Brownfield Clean-up Grants. This funding will be used to clean up properties along the river in the Ringling Riverfront District and redevelop them for mixed uses. With the help of Vandewalle and Associates, the city has developed a master plan and is currently moving forward with plans to redevelop these properties. The City of Baraboo continues to set a high standard for obtaining grant monies to revitalize areas along its riverfront.

CONCLUSION

Looking back on a project that included so many people, obstacles, and challenges, it is quite amazing that in the span of four years, four dams were removed along the Baraboo River to return it to a near natural state. Some describe it as the stars aligning, others say it was luck, and even others describe it as a determined people working toward a common

goal. Whatever the reason, it stands as a national showcase of how environmental concerns and local social concerns can both be addressed when involved parties are willing to compromise and respect one another. The dam removals are but one phase in a much larger project to restore a watershed. Removing a concrete structure along a waterway will not in itself restore a river but it is a step in the right direction. Taking a step back and viewing this project from 10,000 feet up, this project seems to be just a drop in the bucket when it comes to more sweeping watershed concerns like water pollution and Gulf of Mexico hypoxia (a biologically impoverished zone caused by nutrient loading that leads to depleted oxygen levels for marine species). Although this is but a small puzzle piece in the much larger effort to restore our nation's watersheds, Sand County Foundation and its partners hope that this project will act as a catalyst for future monitoring and many other improvements such as implementation of improved agricultural practices, stream bank stabilization, river clean-ups, and continued urban renewal projects.

Bibliography available upon request.