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WISCONSIN DEPARTMENT OF NATURAL RESOURCES

The Economic Impacts of Remediating and Restoring Wisconsin's Sheboygan River



Source: John Karl / UW Sea Grant Institute (2013)

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OVERVIEW

An economic impact study was developed to explore economic sectors affected by habitat restoration and toxic sediment remediation on the Sheboygan River (Figure 1). This study, initiated by the University of Wisconsin Sea Grant Institute and Wisconsin Department of Natural Resources (WDNR), focuses on recreational fishing and waterfront business impacts. Recreational fishing is a cornerstone of ecosystem-based tourism around the Great Lakes. Linking changes in fishing effort, i.e., amount of time spent fishing in specific waterbodies, to coastal economic impacts provides a quantitative basis for evaluating the consequences of changes to Great Lakes ecosystem health. Recreational fishing impacts were explored through surveys with shoreline anglers and charter boat captains. What follows are the survey results from charter captains who moor on the Sheboygan River.



Figure 1. Toxic Sediment Removal (left) and Restored Habitat (right) along the Sheboygan River

Source: UW Extension (2015)

Survey questions focused on how toxic sediment remediation and habitat restoration in the Sheboygan River have affected charter captains' fishing experiences and any economic changes (e.g., changes in client base, revenues or business investments) they have perceived due to the cleanup. Of the 24 captains surveyed, 92% did not experience a change in the number of clients and 87% had no change in revenue due to the cleanup work that was completed in 2013. Although most captains did not experience any changes to their revenues or client base due to the cleanup, a majority perceived that sediment dredging improved navigation and prevented boat mechanical issues associated with low water levels. Of those surveyed, 50% experienced trouble with low water levels prior to the cleanup. Sediment dredging prevented their boats from sucking up mud, sediment and invasive mussels and helped captains avoid costly repairs to their fleets. Increased water depth was noted by 78% of captains as improving their fishing experience.

Sheboygan charter captains charge on average \$455 per trip and have average revenues of \$72 thousand per year plus client tips. The annual revenue for the 42 Sheboygan charter captains is estimated at \$3.2 million. An estimated \$8.4 million per year is spent by Sheboygan charter fishing parties on charter services, transportation, lodging, food and refreshments, and other items they purchase for their fishing trip.

BACKGROUND

The Sheboygan River Area of Concern (AOC) is one of 43 Great Lakes AOCs identified by the International Joint Commission in 1987 for their environmentally degraded conditions. Beneficial use impairments in the Sheboygan AOC included restrictions on dredging activities, restrictions on fish and wildlife consumption, degradation of fish and wildlife populations, fish tumors, degradation of benthos, and loss of fish and wildlife habitat, among others. In 2011, the majority of remediation and mitigation efforts began on the Sheboygan AOC, totaling \$80 million. Completed in June 2013, cleanup efforts included the dredging of approximately 400,000 cubic yards of contaminated sediment, habitat and shoreline restoration, bank stabilization and in-stream habitat projects. Figure 2 displays a map of the Sheboygan AOC and highlights the areas where sediment dredging and habitat restoration occurred.

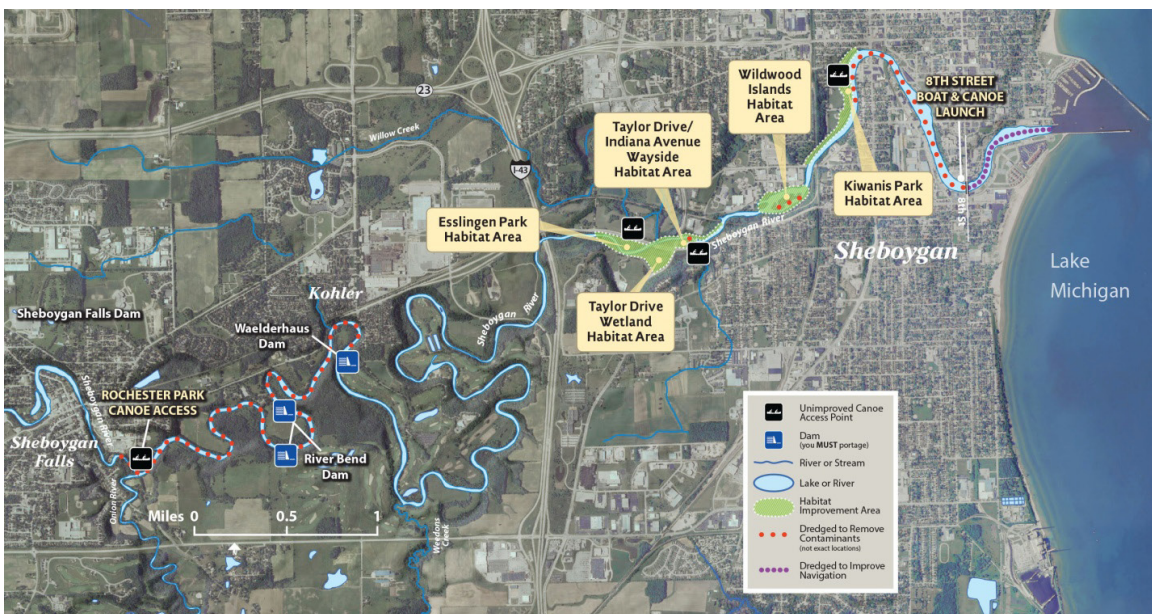


Figure 2. Sheboygan River Area of Concern

Source: UW Extension (2015)

Riverine sediments may serve as long-term repositories for toxic contaminants, which harm aquatic organisms and can result in fish consumption advisories to protect human health (Adriaens et al. 2002; Zarull et al. 2001). Sediment transport via tributaries to the Great Lakes has long been considered a primary source of contamination due to direct discharge from industrial operations based along the rivers. Polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) originated from point sources like industrial waste and paper plants, whereas mercury has direct industrial inputs along with more diffuse sources (e.g., atmospheric deposition).

Sediment remediation is likely to result in lower contaminant concentrations in desirable sport fishes, which will result in the removal of fish consumption advisories. It can also benefit individual fish by reducing occurrences of tumors (Baumann et al. 1996), lesions and DNA damage (Otter et al. 2012). Following removal of contaminated sediments, biotic integrity in the fish assemblage may improve but improvements may take time (e.g., Little Scioto River after 20 years (Meier et al. 2013)). Recent assessments of the biotic integrity of the lower Sheboygan River were generally

good for fish but only fair for macroinvertebrates (Hron et al. 2012). Future improvements to the riverine fish assemblage may be observed through additional monitoring.

Habitat restoration may benefit resident river fish that depend on the Sheboygan River for spawning, nursery habitat and habitat for prey. The species community in the lower river is considered a warm-water sport fish community; examples of these species include smallmouth bass, northern pike and walleye. This type of fishery is valuable because it can be accessed from the shore (i.e., shore fishing) without expensive equipment or boats.

The inner harbor of the Sheboygan River leads to a valuable open water fishery on Lake Michigan. The main species of interest are the native lake trout and non-native Chinook salmon, coho salmon, brown trout and steelhead (rainbow trout) (Figure 3). These species are stocked by the WDNR along with other state, federal and tribal agencies around Lake Michigan. The juveniles spend a limited time in the tributaries, although they do return to spawn later in their life cycle. These species are less likely to benefit directly from the habitat improvement, although improved water quality is likely to enhance survival of juvenile stocked fish. Naturally reproducing salmonids, however, are likely to benefit from improvements to the tributaries. Natural reproduction of Chinook salmon has been documented in Lake Michigan (Claramunt et al. 2008; Johnson et al. 2010), with a large proportion (>60%) of wild Chinook salmon being caught in the fishery. Some evidence of successful spawning of salmonids has been observed in Willow and Weedens Creeks, which are tributaries to the Sheboygan AOC (Hron et al., 2012).



Figure 3. Varieties of Trout and Salmon Found in Lake Michigan. Clockwise from the upper left: brook trout, lake trout, coho salmon, Chinook salmon, steelhead (rainbow trout) and brown trout.

Source: Beck (2012)

Charter captains surveyed moor their boats in the Sheboygan River harbor and bring their clients out into Lake Michigan to target the open water fishing for large salmonids. Lake Michigan and its tributaries have a continuous fishing season, for trout and salmon (with the exception of a limited season for lake trout March 1 – Oct. 31) (WDNR 2015-2016). Charters are most common in the warmer months, with the best times between May and August. Lake Michigan is the most-visited waterway in Wisconsin and has the most species diversity (WDNR 2015). The WDNR has invested in the Lake Michigan fishery near Sheboygan through the stocking of sport fishes (Table 1).

Species	2010	2011	2012	2013	2014
Brown Trout	52,751	39,429	61,299	66,803	44,374
Chinook Salmon	153,745	97,160	83,920	63,603	86,342
Coho Salmon	40,820	62,903	63,577	30,924	64,812
Rainbow Trout	56,237	16,600	35,525	17,748	34,730

Table 1: Sheboygan area (statistical zone 1502) stocking numbers.

Source: Great Lakes Fishery Commission (2015)

SURVEY METHOD

Surveys were conducted in January and February of 2015, during the captains' off-season. Web-based and phone surveys were attempted with the 42 captains that moor at Sheboygan Harbor. The response rate was 57%; 24 out of 42 captains participated in the study.

The survey estimated the economic impacts of the cleanup from the charter captains' perspective. Prior to dissemination, the survey was piloted with several Lake Michigan charter captains to improve survey design and question clarity. A link to a Web-based survey was initially emailed to the charter captains. Nine of the 24 respondents participated in the online platform; the remaining 15 were contacted and surveyed by phone.

SURVEY RESULTS

The sediment and habitat work done during the cleanup increased water depth and added new vegetation, rock formations and log structures. Captains were asked whether they were aware of these changes, and if they were aware, whether the changes improved, worsened or left their fishing experience the same. Additional questions focused on specific differences captains experienced due to the cleanup. Before the cleanup's completion, the captains experienced problems with their boat sucking up unwanted mud, sediment and quagga or zebra mussels due to low water levels. Follow-up questions asked about the amount of money spent to fix the problem, number of hours worked to fix the problem and if the sediment dredging helped the problem. Captains were asked if they had made investments since the cleanup and, if so, follow-up questions about their investment, including how much money spent, over what time period and how the upgrade was related to the cleanup.

All captains surveyed were aware of the change in river depth, noting that it made the river more navigable and able to serve as a deep-water port. One captain recalled, "Especially on the west side of the river, very shallow up by the [14th Street] bridge. It was almost unusable." Prior to the cleanup, some captains could not access gas pumps at Riverfront Bait & Tackle. A new charter captain described how the cleanup affected his decision to open a new business: "To have the river more navigable has helped me get into business in the first place."

Captains were much less aware of other changes due to the cleanup (Figure 4). All captains surveyed noticed a change in river depth, while only 50% percent noticed new logs and log structures, 29% noticed new boulders and 29% noticed changes in vegetation. Many captains noted that they only moor their boat in the river and do not fish in the river; thus, they were less likely to notice the habitat restoration work compared with upriver shoreline and stream anglers.

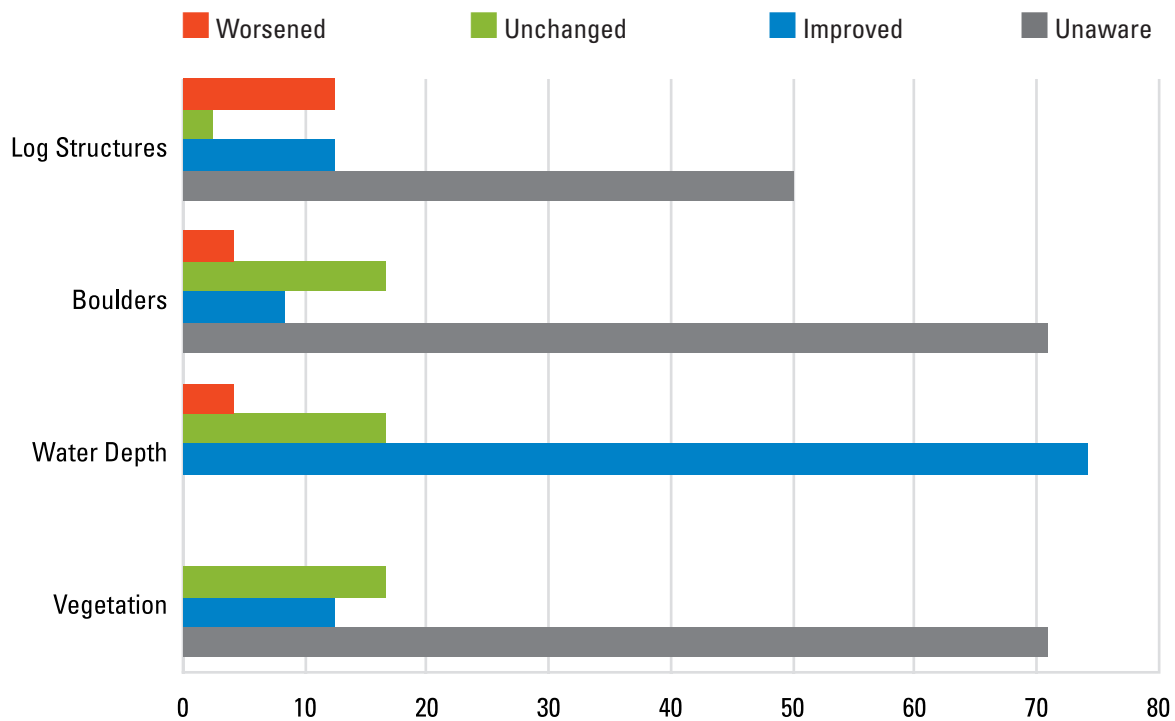


Figure 4. Changes in Charter Captains' Fishing Experience

Prior to sediment dredging, 50% of the captains experienced boat mechanical issues due to low water levels. Captains spent money to fix the problem and invested their own time and labor to correct the damage. One captain explained, "Mud and zebra [quagga] mussels caused the boat engines to overheat." Some captains picked up vegetation, another source of overheating. Filters had to be cleaned out more often to prevent mechanical complications. One captain described the mechanical issues he experienced: "I went through two AC pumps, four propellers. I am the mechanic, so I work on all of the problems. I spent around \$1,000 in materials and parts." Of the captains who experienced mechanical issues due to low water levels, four captains had to spend money to fix the problem. The average amount spent annually was \$1,206.67 and a median of \$1,000 spent. Ten of the captains spent time working on low-water related problems, spending 12.9 hours per year and a median number of 4.5 hours per year working on their boats. Of those



captains experiencing problems due to low water, 92% said sediment dredging helped the problem. One captain discussed the impact of the cleanup: "We are no longer picking up mud and mussels. The cooling lines no longer plug. Our engines no longer overheat." Figure 5 depicts a boat propeller clogged with quagga mussels.

Figure 5. Quagga Mussels Clog Boat Propeller

Source: Activist Angler (2014)

ECONOMIC IMPACTS

Survey questions asked about the overall economic impacts of a charter excursion and whether the cleanup had affected the captains' client load, revenue and business investments. The charter captains charge on average \$454.52 per trip, with a median cost of \$500 per charter excursion. A typical captain serves an average of 4.5 clients per charter with a maximum six clients per excursion. The number of clients per year per captain ranged from 30-8,000 people. The average number of clients was 713 per year and the median value was 135 clients per year. Hence the captains average revenues of \$72,016.17 with a median revenue of \$15,000/year. Also, it is customary to tip the captain's first mate a minimum of 10% per person (Sheboygan Tourism 2015). With this information and an estimated 42 captains using the Sheboygan River area, the annual revenue by the Sheboygan charter fishing industry is estimated at \$3,240,727.60.



Figure 6. Recent Shoreline Development at the Sheboygan Harbor

Source: City of Sheboygan (2011)

Economic impacts of the charter fishing industry are not limited to the cost of the charter services that anglers incur. Individuals purchasing charter services spend additional money on transportation, lodging, food and refreshments, fishing gear and other activities associated with their charter fishing trip. Michigan Sea Grant estimates that each Michigan Great Lakes fishing party spends an average of \$1,269.96 in 2009 dollars on a charter fishing excursion (O'Keefe and Miller 2011). Considering there are 42 Sheboygan captains that serve on average 713 clients or 158 fishing parties per year, a total of \$8,427,454.56 per year is spent by fishing parties using Sheboygan charter services. These expenditures do not account for additional ripple effects in the economy. Charter captains spend money in their local economies from the income they generate, and the employees of the businesses they frequent further spend those earnings in the local economy, creating a multiplier effect.

Two of the 24 captains experienced a change in the number of customers they served relating to the cleanup; in both cases the change was positive. The two captains noted the river was more navigable, allowing them to pick customers up further up the river. When asked about changes

in gross revenue, two captains responded that they noticed a positive change. The majority of the captains did not make business investments or upgrades related to the cleanup. Of the 24 captains surveyed, two captains made investments, including the captain that started his business and another captain who constructed riverfront lodging. Several captains who work for the same company discussed their employer's \$300,000 investment in new waterfront condominiums (Figure 6). One captain explained the rationale for the investment, "It is okay to build there knowing that in the long term the area will be clean and successful. It's about being more confident in the area."

SHEBOYGAN NUMBERS IN PERSPECTIVE

To put the Sheboygan numbers into perspective, Wisconsin is home to 333 charter captains that fish Lake Michigan waters including Green Bay. The type of charter captain data collected in this study could be collected for other ports.

Revenues may be considerably higher in the waters of Green Bay and other locations where harvest rates (Table 2) and angler effort (Table 3) are higher. For example, harvest of yellow perch is much higher in Green Bay waters compared to Lake Michigan waters. The 42 Sheboygan River charter captains account for 12.6% of angler effort in Lake Michigan waters, resulting in Sheboygan captain revenues of \$3,240,727.60 per year.

LIMITATIONS

The number of charter captains that could be reached may have limited the perspectives and views of the Sheboygan River cleanup offered in this report. Of those captains contacted, 57% chose to participate; greater participation may have improved accuracy of the results. Additional survey data are needed to compare economic impacts of the charter industry across Lake Michigan and Lake Superior ports.

Table 2. Harvest (number per hour, all anglers combined) of yellow perch in Wisconsin waters of Lake Michigan and Green Bay in 2013.

Location	Harvest (number per hour)
Green Bay	215,422
Lake Michigan	8,830

Table 3. Angler effort (hours) in Wisconsin waters of Lake Michigan and Green Bay in 2013.

Location	Angler Effort (hours)
Kenosha Co.	128,865
Racine Co.	122,651
Milwaukee Co.	290,866
Ozaukee Co.	203,739
Sheboygan Co.	206,006
Manitowoc Co.	178,186
Kewaunee Co.	373,777
E. Door Co.	197,007
Green Bay	1,078,064
TOTAL EFFORT	2,779,161

Source: Masterson and Eggold (2014)

CONCLUSIONS

While many charter captains were unaware of the habitat restoration work completed in the Sheboygan River, 100% of captains were aware of the increased river depth. The habitat restoration work occurred upriver and largely out of sight from the captains, while the sediment dredging had obvious impacts on their ability to moor their boats in certain locations, reach needed services (e.g., gas pumps and repair services), access clients upriver and avoid costly boat repairs. It's unlikely though that enough time has passed to see changes in the fish assemblage or populations due to the cleanup.

Additional outreach and education may be needed to make both local and visiting anglers aware of the impacts of the cleanup. One captain explained, "It does give peace of mind that the fish are cleaner. It will take a few years before anyone (customer wise) starts to catch on. We have had people come from Chicago and Milwaukee to Sheboygan to fish because their sense is that the water is cleaner here, prior to the cleanup. Now that the river is cleaner, it will be more concrete." These concrete changes need to be well advertised and capitalized on for additional economic impacts to result from the cleanup work.

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