

**WISCONSIN DEPARTMENT OF NATURAL  
RESOURCES**  
**SMALLMOUTH BASS IN DOOR COUNTY**  
2017 and 2021 Sturgeon Bay/Little Sturgeon Bay Population  
Assessments and Sport Fishery



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Bureau of Fisheries Management  
Wisconsin Department of Natural Resources  
Sturgeon Bay Fisheries Office**



## Executive Summary

Smallmouth bass populations in the Sturgeon Bay/Little Sturgeon Bay areas of Door County waters of Green Bay were evaluated during the pre-spawn period during the spring of 2017 and 2021. Overall, the size and numbers of fish were in good condition although some indices of abundance were lower than historical levels. Unlike in previous surveys, there appeared to be few strong year classes represented in the catch. Angling effort has declined somewhat in recent years, although smallmouth bass are still a primary target for many anglers in the nearshore waters of Door County. Recent angling catch rates are at modest levels relative to historical values but still near the long-term average. Another episode of smallmouth bass displaying a high prevalence of lesions was observed in 2021 and Largemouth Bass Virus was isolated in affected fish for the first time in this area. Several issues that are important considerations to manage Door County's smallmouth bass populations persist, including habitat alterations due to extensive shoreline development, increasing tournament activity (particularly during the spawning period), and the continued stressors from invasive species proliferation. Finally, two research studies commenced in 2022/2023 that will greatly help inform smallmouth bass management in this area.

# Introduction

The waters surrounding Door County are well known for their flourishing smallmouth bass populations both in terms of fish size and abundance. Various discrete populations can be found in areas along the Green Bay side of Door County as well as northern areas of the county along Lake Michigan. Smallmouth bass populations have been assessed in selected areas of Door County periodically since 1995 to evaluate the population structure and dynamics of this very popular sport fish. The areas around Sturgeon Bay and Little Sturgeon Bay are assessed most consistently. Herein we report results from the 2017 and 2021 Sturgeon Bay area population assessments as well as the smallmouth bass sport creel surveys for the Door County waters of Green Bay/Lake Michigan through 2022. We also draw references to historical data to illustrate changes in the population over time and discuss additional population management concerns.

## Methods

### POPULATION ASSESSMENT

Fyke nets (width = 6 feet, height = 3 feet, mesh size = 1.5 inches stretch; leads = 75 feet) were set in Little Sturgeon Bay and Sawyer Harbor (part of Sturgeon Bay) (Figure 1) beginning April 25, 2017 and most were removed after May 18. Several nets were later fished in Little Sturgeon Bay and another area of Sturgeon Bay known as the “Flats” from May 31-June 2, 2017. Between three to five nets were fished on a given date, and effort was made to place them in locations similar to past surveys while also keeping them in areas with consistent smallmouth bass activity. (Nets were removed from the water most weekends and when conditions were not conducive to netting.) In 2021, nets were set in Little Sturgeon Bay and Sawyer Harbor beginning May 4 and were removed after May 27. Several nets were later fished in the “Flats” area of Sturgeon Bay, primarily between May 22-27, 2021.

Smallmouth bass total length was measured to the nearest millimeter. In 2017, scales were used for aging and were sampled from the left side of the fish, near the tip of the relaxed pectoral fin just below the lateral line. In 2021, the second dorsal spine was sectioned and used for aging. Age structures were taken from 15 fish per 10 mm length increment, and an age-length key was developed to examine the overall population age composition. Fish health was evaluated by examining for any



**Figure 1.** Door County peninsula and surrounding areas of Green Bay and Lake Michigan. Red box indicates Sturgeon Bay/Little Sturgeon Bay area.

external lesions or other abnormalities. Specifically, any lesions were counted, and the level of severity was generally described. All other gamefish were identified, counted, measured and a fin was clipped to record fish that were captured multiple times. Non-gamefish were identified and counted, although not clipped, so recording non-game fish multiple times was possible. Estimates were sometimes made for non-gamefish on days the catch was extreme. Although the Sturgeon Bay Flats area was sampled during these surveys, the specific catch data are not described herein due to the restricted timing of the sampling (later in the spawning period) and the transition to more sub-adult fish as adult fish become more sedentary (males) and others leave the area after spawning (females). Data from Little Sturgeon and Sawyer Harbor from approximately the first three weeks in May are reported herein for key metrics such as catch-per-effort (CPE), size and age structure. Data from this period comprises the majority of the sampling effort and generally encompasses the pre-spawn period, a time when smallmouth bass are active and fish are generally mixed in terms of size and sex (Becker 1983). Restricting data to this time period also helps ensure some consistency when making interannual comparisons.

## **CREEL SURVEY**

The sport fishery for smallmouth bass has been assessed annually in the outlying Door County waters since the 1970s using a randomized angler creel survey. The creel season begins with the May opener and typically runs through mid-October. Survey sites include most of the popular access points along the Door County shoreline. Standard creel survey interview data include information collected regarding effort, catch, harvest, biological data (length, weight, marks/tags) and angler demographics (Masterson and Eggold 2013).

## **Population Survey Results**

### **CATCH**

#### **2017**

Nets were fished for a total of 48 net nights (number of nets x number of nights fished) in Sawyer Harbor and 70 net nights in Little Sturgeon Bay. A total of 1,492 smallmouth bass were caught during this survey: 389 in Little Sturgeon Bay, 951 in Sawyer Harbor and 152 from the Sturgeon Bay Flats.

Approximately 937 fish of other species were captured in Little Sturgeon Bay, including white sucker (n=28), northern pike (n=16), bullhead spp. (n=268), rock bass (n=283), yellow perch (n=200), bowfin (n=29), common carp (n=5), alewife (n=3), pumpkinseed (n=41), gar spp. (n=5), muskellunge (n=2), common shiner (n=1), carpsucker spp. (n=19), redhorse spp. (n=2), bluegill (n=2), largemouth bass (n=2), black crappie (n=1), walleye (n=29) and freshwater drum (n=1). There were 3,561 fish of other species captured in Sawyer Harbor, including white sucker (n=8), rock bass (n=1,081), northern pike (n=57), bullhead spp. (n=1,764), common carp (n=1), bowfin (n=101), gar spp. (n=5), redhorse spp. (n=1), pumpkinseed (n=106), bluegill (n=16), largemouth bass (n=2), black crappie (n=1), yellow perch (n=340) and walleye (n=78).

## 2021

Nets were fished for a total of 35 net nights (number of nets x number of nights fished) in Sawyer Harbor and 49 net nights in Little Sturgeon Bay. A total of 1,210 smallmouth bass were caught during this survey: 545 in Little Sturgeon Bay, 340 in Sawyer Harbor and 325 from the Sturgeon Bay Flats.

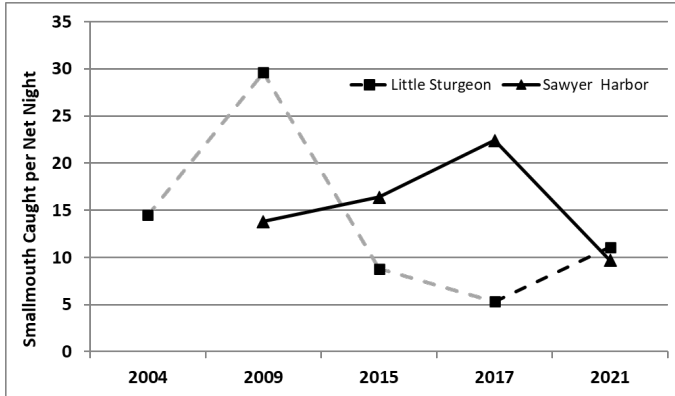
Approximately 2,688 fish of other species were captured in Little Sturgeon Bay, including white sucker (n=10), northern pike (n=17), bullhead spp. (n=607), rock bass (n=1,746), yellow perch (n=103), bowfin (n=85), common carp (n=8), alewife (n=5), pumpkinseed (n=13), longnose gar (n=5), shortnose gar (n=2), common shiner (n=1), golden shiner (n=2), redhorse spp. (n=1), bluegill (n=1), walleye (n=23), white perch (n=51) and round goby (n=8). There were 7,470 fish of other species captured in Sawyer Harbor, including white sucker (n=1), rock bass (n=1,811), northern pike (n=12), bullhead spp. (n=4,708), common carp (n=2), bowfin (n=191), pumpkinseed (n=572), bluegill (n=48), largemouth bass (n=2), white perch (n=2), yellow perch (n=120) and walleye (n=1).

### CATCH PER UNIT OF EFFORT

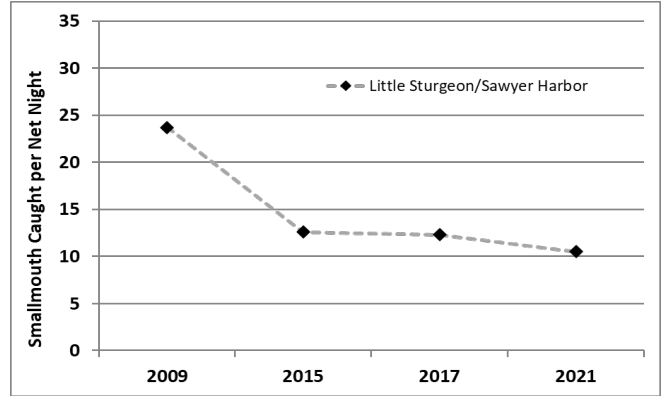
The number of smallmouth bass caught per net per night of fishing (total nets/nights fished) can be used as a general index of relative abundance. To make reasonable comparisons of this catch per unit of effort (CPE) between years, it's important that the timing and locations of sampling are as consistent as possible. However, given changing water levels and large temperature swings, maintaining interannual consistency between net sites can be challenging, and fish may change the areas they inhabit based on conditions. Nets are occasionally moved (within an embayment) to stay in areas where fish are most active and susceptible to capture. Net locations in Little Sturgeon Bay and Sawyer Harbor have been placed in relatively consistent locations over time and are generally fished during the first three weeks in May during the pre-spawn period, allowing for reasonable comparisons of catches between survey periods.

In 2017, catch rates were 5.2 fish caught per net night in Little Sturgeon and 20.4 fish caught per net night in Sawyer Harbor (a mean of 11.5 smallmouth bass caught per net night between the two locations) (Figure 2a-b). In 2021, catch rates were 11.1 fish caught per net night in Little Sturgeon and 9.7 fish caught per net night in Sawyer Harbor (a mean of 10.5 smallmouth bass caught per net night between the two locations). Since 2009, the CPE for Little Sturgeon alone has decreased considerably, although there was a small increase in 2021. However, the CPE in Sawyer Harbor had shown an increasing trend until a substantial drop in 2021. Between the 2009 and 2015 surveys, the combined CPE for these locations decreased by about 50% and then remained relatively consistent (Figure 2b).

**2a.**



**2b.**

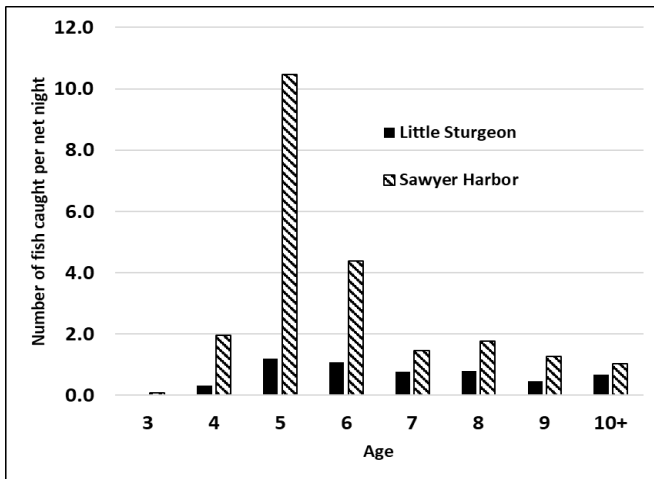


**Figure 2 a-b.** Catch per unit of effort in smallmouth bass caught per net night for surveys conducted in Little Sturgeon Bay and Sawyer Harbor independently (2a) and for the locations combined (2b). Although the surveys may have started earlier or run later, for consistency, only data from the first three weeks in May are presented here, except for 2004 and 2021 where nets were fished until May 27 (three additional days).

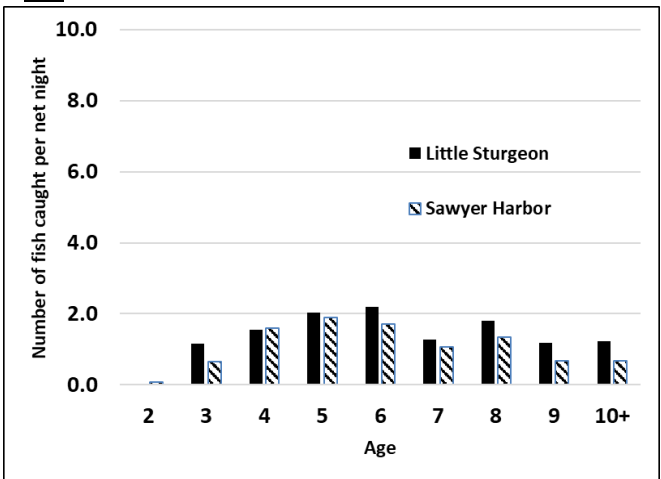
**AGE COMPOSITION**

The estimated ages of smallmouth bass sampled in Little Sturgeon and Sawyer Harbor were between three and 16 years in 2017 and between two and 17 years in 2021. Ages five and six made up the strongest year classes in 2017, suggesting stronger recruitment in 2011 and 2012 (Figure 3a). There were apparently no strong year classes (relative to 2017) represented in the 2021 survey (Figure 3b).

**3a.**



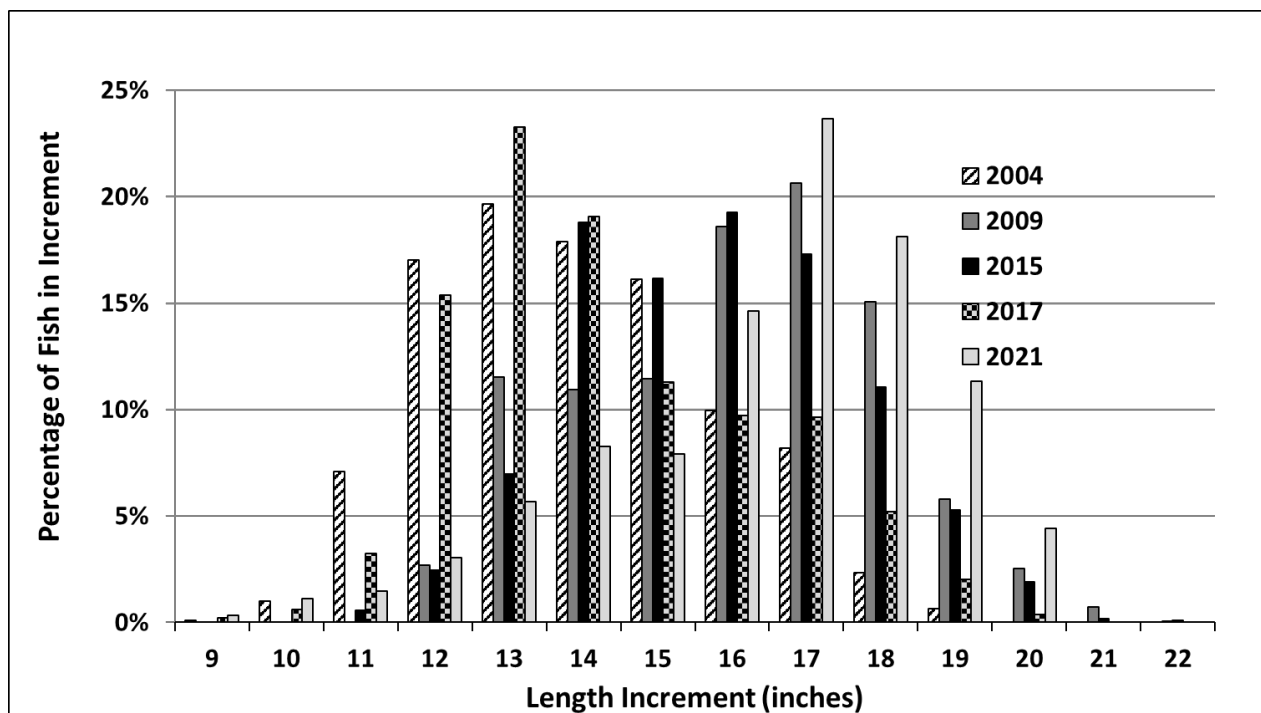
**3b.**



**Figure 3 a-b.** Age composition in number of smallmouth bass caught per net night for 2017 (Fig 3a) and 2021 (Fig 3b) spawning surveys in Little Sturgeon Bay and Sawyer Harbor. Age-10 and older fish are pooled due to smaller sample sizes and decreasing accuracy of age estimates for older fish. (Maceina and Sammons 2006).

## SIZE STRUCTURE

The combined length compositions of smallmouth bass from the Little Sturgeon and Sturgeon Bay (Sawyer Harbor) areas during 2017 indicate the population size composition was generally skewed to smaller fish, while in 2021, there was a substantial shift to larger fish in the overall population (Figure 4). This is consistent with the higher catches of younger fish in Sawyer Harbor in 2017 (i.e., younger and smaller), while conversely, catch rates for younger fish in Little Sturgeon were quite low in 2017. This would indicate that the overall size composition of fish in the 2017 survey is driven by the larger recruitment events (large numbers of younger fish) recorded in the Sawyer Harbor catch data (Figure 3a-b). Meanwhile, the shift in 2021 to larger fish in the general population suggests there was not any substantial recruitment in either location in recent years, as indicated in lower catches of younger fish (e.g., ages 3-5) in either location. Fish length ranged from 9 to 22 inches for both years, and the largest fish measured 22.2 inches. The proportion of fish 18 inches or greater doubled between 2017 and 2021, increasing from 17% to 34%. The average length of smallmouth bass sampled in the spawning surveys has remained relatively similar across the last five survey years, although there was a relatively larger increase between the last two surveys (16.1 inches in 2004, 16.5 inches in 2009, 16.3 inches in 2015, 15.7 inches in 2017 and 16.9 inches in 2021).

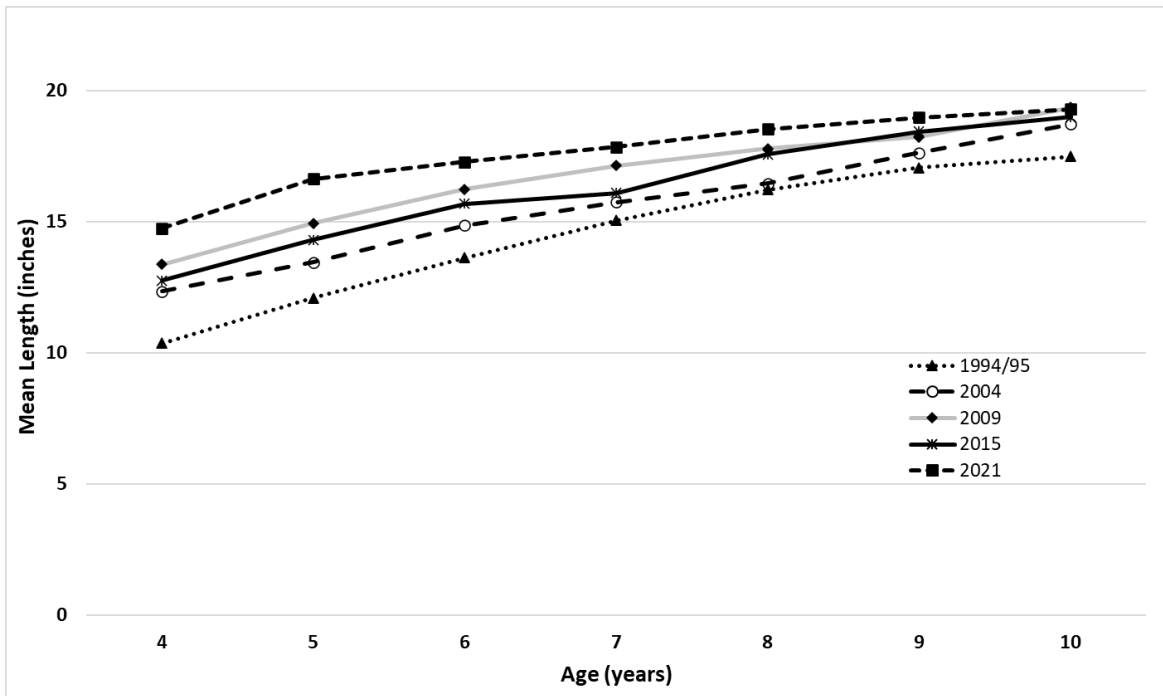


**Figure 4.** Length compositions for combined Little Sturgeon Bay and Sturgeon Bay (Sawyer Harbor) smallmouth bass surveys between 2004 and 2021. Length bins are delineated by any fish that fell within a particular inch group (e.g., a fish in the 16-inch bin could have been between 16 and 16.99 inches long).

Mean length at age has increased considerably since the mid-1990s (Figure 5). While the mean lengths at age for the 2009 and 2015 surveys were close, length data from the 2021 population surveys showed a considerable increase in sizes. This was especially true for the



younger age classes where the mean size at age increased as much as one to two inches. During the 1990s and early 2000s, on average, a fish did not reach the 14-inch legal size limit until around six or seven years of age. However, on average, fish now reach the legal limit by at least four years of age, with some even reaching 14 inches by age-3 (data not shown).



**Figure 5.** Mean length (inches) at age of smallmouth bass sampled during the 1994/1995, 2004, 2009, 2015 and 2021 spring spawning periods in Little Sturgeon Bay and Sturgeon Bay/Sawyer Harbor. Age-10 and older fish are pooled due to smaller sample sizes and decreasing accuracy of age estimates for older fish.

## Fish Health

Smallmouth bass were examined for lesions and other external health issues. And while evidence of disease-related issues was noted in some fish during the 2017 and 2021 survey periods, the incidence was not considered particularly high. However, beginning in 2008, there have been three episodes of apparently high levels of external lesions affecting smallmouth bass based on reports both from anglers and in field survey observations. These specific lesions have typically been observed on the upper portion of the fish, are often circular in shape and can severely erode the skin and muscle tissue (Figures 6 a-b). Wounds often resemble scars left by lamprey attacks. Aside from 2008, additional episodes of a relatively higher prevalence of fish with lesions occurred in 2015 and 2021 (late summer), with fewer affected fish observed for years in between. While it is not possible to compare rates of affected fish between spring field surveys and angler catch reports, it does appear that the prevalence (and possibly severity) of affected fish increased later in the season as waters warmed. While tests from the first two episodes (2008, 2015) had been inconclusive, in September 2021, 14 diseased fish tested positive for largemouth bass virus (LMBv) ([Smallmouth Bass in Door County Waters Test Positive for Largemouth Bass Virus](#)). Aside from the extreme severity of some of the lesions, the affected fish appeared to be in physically

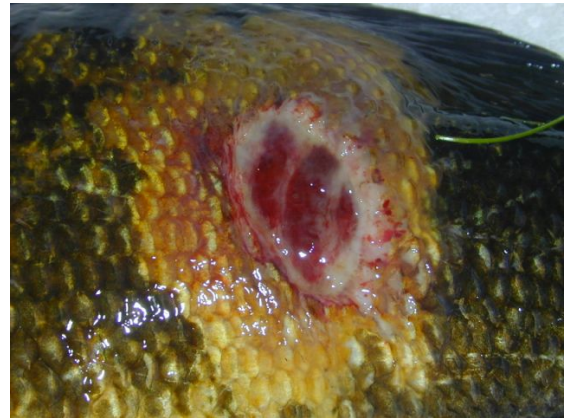


good condition. No large-scale fish kills involving smallmouth bass were reported during these outbreaks.

**6a.**



**6b.**

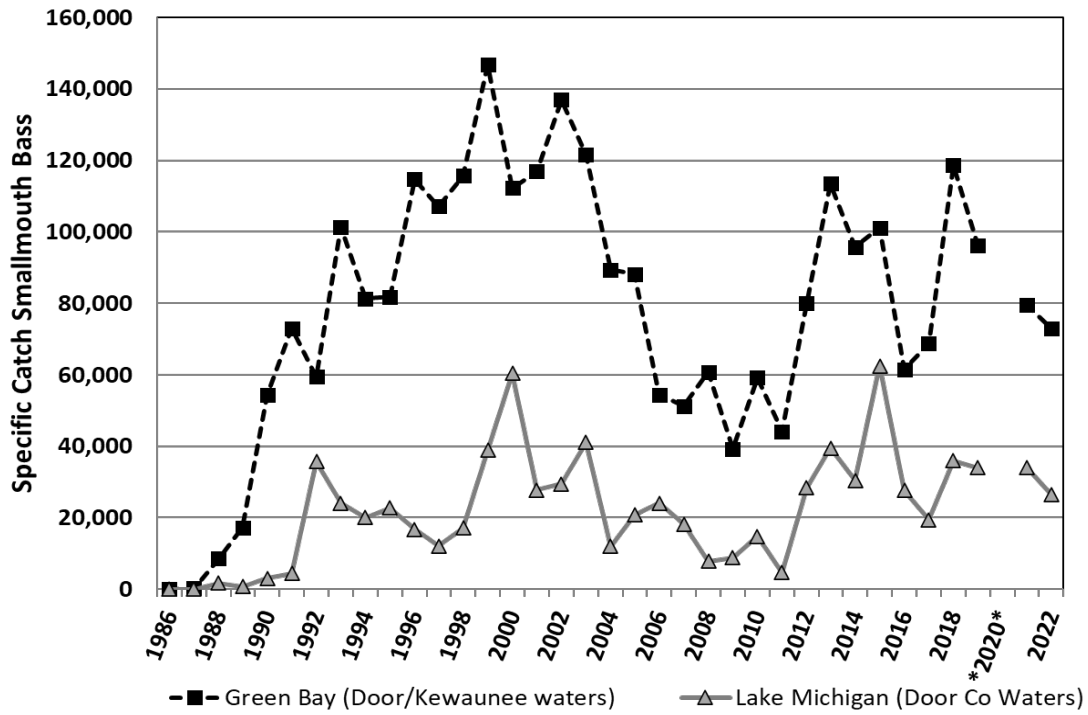


**Figures 6 a-b.** Lesions observed in smallmouth bass in 2009 (left image) and 2015 (right image).

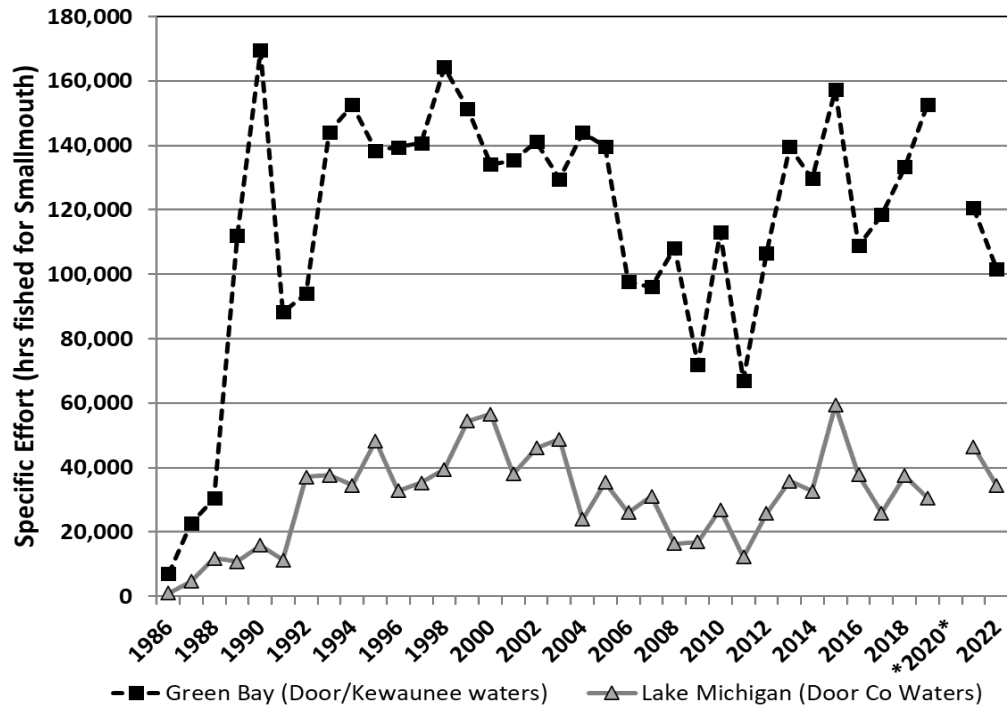
## Creel Survey

Angler fishing effort and catch for smallmouth bass in Door County waters increased rapidly beginning the late 1980s and through the 1990s, dropped somewhat through the mid-2000s, and increased again around 2012, though the values have been highly variable since then (Figures 6 a-c). Targeted catch rates (the number of smallmouth bass caught by anglers specifically targeting them) were 0.8-1.0 fish per hour in the late 1990s-2003. Catch rates declined to 0.5-0.6 fish caught per hour of fishing from 2004-2010 but have since generally increased (with some variation), peaking at nearly 0.9 fish per hour in Green Bay in 2018 and at greater than one fish per hour for several years in Lake Michigan. Catch rates over the past two years have declined from recent peaks in Green Bay and Lake Michigan. However, Green Bay catch rates for the past two years are still greater than the previous 15-year (2005-2019) mean of 0.64 fish per hour. Since 2011, the hours of fishing effort for smallmouth bass have generally climbed back to the high levels experienced in the late 1990s (140,000-160,000 hours in Green Bay and 40,000-60,000 in Lake Michigan). The 2015 angler effort for smallmouth bass on Green Bay was the third-highest, on record while during that same year, the effort on Lake Michigan was the highest on record. Effort has generally declined each year since then.

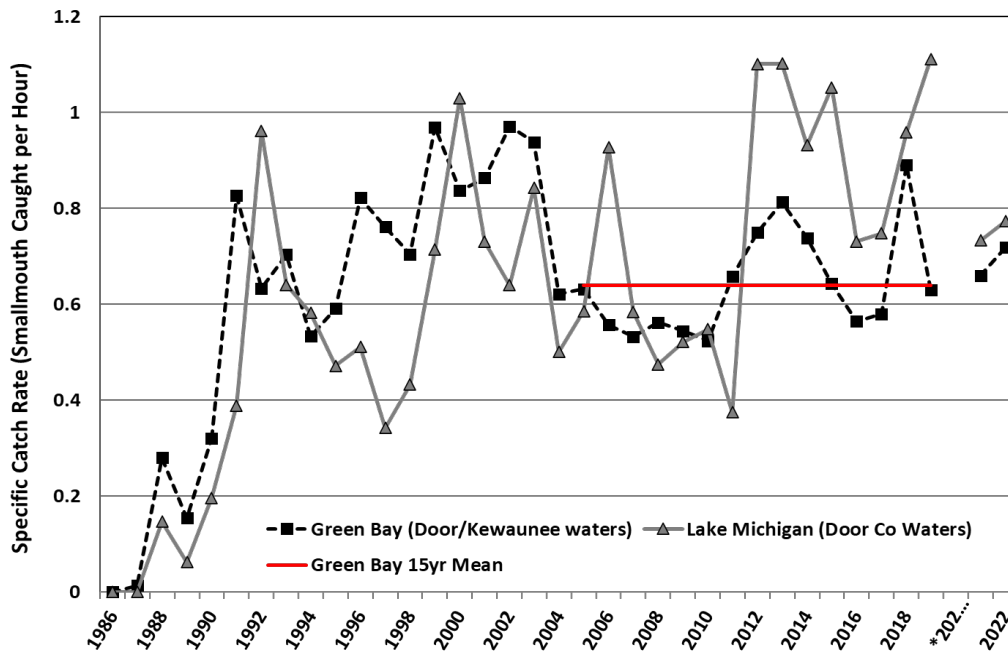
6a.



6b.

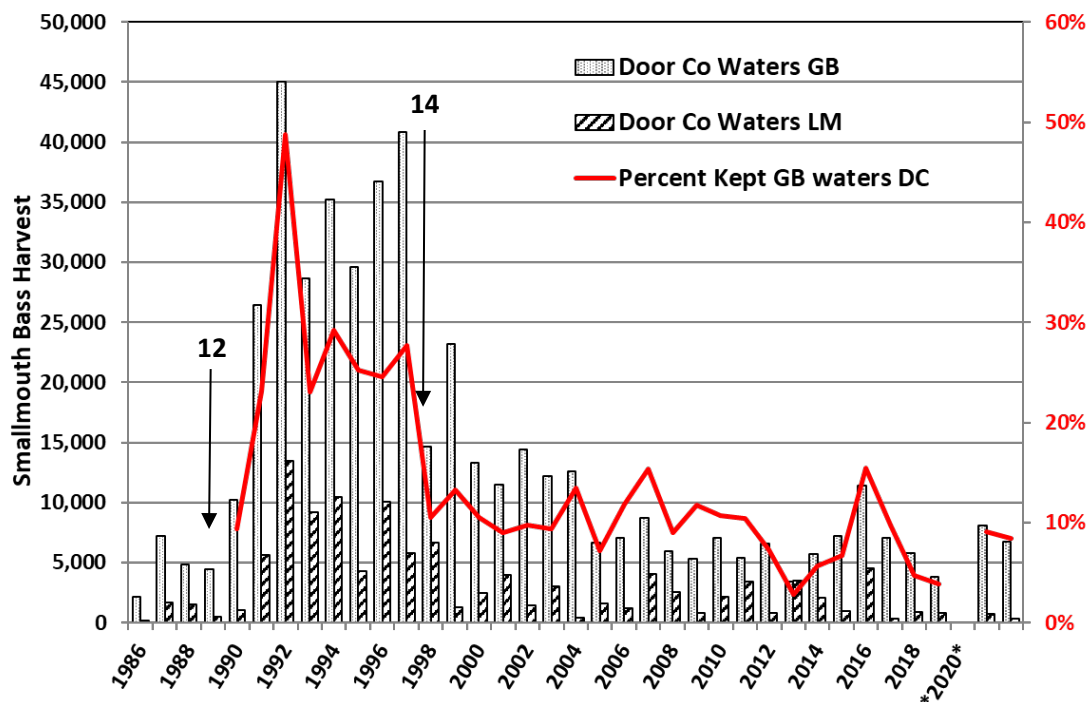


**6c.**



**Figure 6 a-c.** Creel survey results for Door County waters of Green Bay and Lake Michigan, 1986-2022. Catch, effort and catch rates are specific to anglers targeting smallmouth bass. 2020 data not shown due to incomplete creel survey year.

During the middle to late 1980s, harvest of smallmouth bass in Door County’s outlying waters was relatively low, likely due to lower population abundance. However, smallmouth bass harvest increased dramatically in the early 1990s. This occurred despite the implementation of a 12-inch size limit in 1989 (there was no size limit prior), with harvest more than doubling between 1990 and 1991 in Green Bay waters of Door County (Figure 7). The mean annual harvest from 1991 to 1997 in Green Bay waters was 34,649 ±6,314 (1 standard deviation (SD)), more than five times the average annual harvest (5,793) between 1986 and 1990. Implementation of a 14-inch size limit in 1998 likely reduced harvest dramatically and from 1998-2004 averaged 14,566 ±3,690 (1 (SD) fish annually. By 2005, a trend of lower harvest began and has remained relatively low ever since, which is likely a reflection of the strong catch and release philosophy among bass anglers. Between 2005 and 2022, the harvest in Green Bay waters averaged 6,580 ±1,832 (1 SD) fish annually. The percentage of fish kept in Green Bay waters of Door County declined in the late 1990s and has remained relatively low ever since, with generally less than 10% of fish caught being harvested annually over the last 10 years. Harvest in Lake Michigan waters of Door County generally follows the same patterns as Green Bay although the large reduction in harvest after the 1998 size limit change has perpetuated through recent years. Harvest in Lake Michigan is generally substantially lower than that in Green Bay. Limited boat access and smaller, more concentrated smallmouth bass populations characterize the fishery on the Lake Michigan side of Door County.



**Figure 7.** Smallmouth bass harvest history in the Door County waters of Green Bay and Lake Michigan, 1986-2022. Arrows indicate size limit changes in 1989 and 1998. 2020 data not shown due to incomplete creel survey year.

## Summary

Abundance and size data suggest the smallmouth bass population in the Sturgeon Bay/Little Sturgeon Bay area was in good condition during the 2017 and 2021 survey years. While angler catch rates are somewhat variable in recent years, they remain at modest levels and are slightly above average for the time series. Although fishing effort for smallmouth bass has declined over the last two years, it still accounts for around 60% of the total fishing effort in Green Bay waters of Door County, with some years as high as 80% of the total effort.

Total catch per effort from fyke nets has varied at the Little Sturgeon Bay and Sturgeon Bay area locations over the last four surveys and the trends are surprisingly not consistent between the two despite their proximity. When compared to very strong smallmouth bass production in the 1990s and 2000s, there appeared to be few strong year classes measured in both locations in recent surveys. The most recent stronger year classes appear to have been produced in 2011 and 2012, as measured in the 2017 survey of age-5 and age-6 CPEs from Sawyer Harbor. Growth continues to be very good, and even improve, with more fish reaching the legal-size limit at an earlier age than ever before. Size composition varies with year class strength (large year classes can negatively affect growth). Consequently, with apparent poor recruitment in recent years, along with a potential density-dependent effect (i.e., fewer but bigger fish due to reduced competition for resources), these factors may have contributed to a larger size structure in 2021.

Assessing Door County's smallmouth bass populations and sport fishery will continue to be an important and ongoing component of successful management of this resource. DNR

annually conducts smallmouth bass netting surveys on a rotation around Door County and has focused mainly on Little Sturgeon Bay, Sawyer Harbor/Sturgeon Bay, Rowley Bay, and Washington Island (Kroeff 1995, 1996, 1997; Kroeff and Toney 2004; Hansen and Kroeff 2014; Hansen and Kurszweski 2017). The continued monitoring of the numerous populations that make up the overall Door County smallmouth bass metapopulation will be very important in informing management decisions. However, gathering more specific population information requires targeted studies that are not possible without specifically funded projects. While the primary intent of this report is to summarize recently completed surveys, we conclude by addressing several locally important management considerations below including recruitment and movement studies, fishing tournaments, extreme water level fluctuations, shoreline development, and invasive species.

## **MANAGEMENT CONSIDERATIONS**

Lower relative angling catch rates for smallmouth bass over the past 5-10 years have raised concerns among some anglers, and indeed, catch rates are down relative to historical highs but are still around the previous 15-year average. A clear explanation for this in a complex system such as Green Bay can be very challenging. Recruitment success, or failure, is impacted by numerous variables, including water temperatures, wind events, habitat quality, predation, invasive species, angling pressure, etc. The focus on adults during our spring surveys limits our ability to thoroughly evaluate the strength of young fish in the population before they become reproductively mature and enter the sport fishery. This limits our ability to forecast the future of the sport fishery and makes it difficult to ascertain where recruitment bottlenecks may lie. While we have conducted a limited number of recruitment and nest success assessments using different gear types (seining, mini-fyke nets, snorkeling), the extent of these surveys has been relatively limited given the scale of the smallmouth bass habitat and spawning areas in the waters surrounding Door County. Furthermore, these evaluations are often characterized by generally low catch rates, further adding to the uncertainty of the results. To address some of these concerns, beginning in 2022, research staff from UW-Stevens Point began a two-year study to measure young-of-year recruitment from various Door County smallmouth bass populations using different sampling approaches to determine the most effective and efficient method for evaluating early life stages of smallmouth bass. This study was also designed to measure smallmouth nesting success/failure in these same populations and determine the mechanisms that may contribute to nesting failures, including nest predation (e.g., round gobies), angler-targeted bed fishing and climatological impacts. Information collected from these studies will help inform smallmouth bass management and target potential future regulatory changes to further protect and enhance the smallmouth bass populations around Door County.

Door County is a prominent destination for bass fishing, so much so that in 2014, Bassmaster ranked Door County waters of Green Bay as the top location in the entire United States to fish for smallmouth bass. Following 2014, the number of permitted bass fishing tournaments in Door County rose sharply. Between 2007 and 2014, there was an average of 5.75 permitted tournaments annually, while between 2015 and 2022, there was an average of 12.5 permitted tournaments annually, many of them focused on the pre-spawn and spawning periods. In 2022, there were 18 permitted bass tournaments in Green Bay waters of Door County, the highest number to date. Tournaments targeting smallmouth bass, particularly during the pre-

spawn and spawning periods, continue to be a contentious issue in Door County, with mixed opinions among stakeholders.

The previously mentioned recruitment study by UW-Stevens Point should help to address some of the questions and concerns related to tournament angling. An additional study using acoustic telemetry and genetics is investigating smallmouth bass dispersal/site fidelity and implications of large-scale displacement during angling tournaments, as smallmouth bass in Door County waters typically have a relatively small home range (Wiegert 1966; Kroeff 1993, Hansen and Kroeff 2014). This project is in the early stages and is also being conducted by researchers at UW-Stevens Point. These studies will provide very important information to assist us in the management of smallmouth bass.

While it is suspected that LMBv was involved in the development of the skin lesions on the 14 smallmouth bass tested in 2021, little is definitively known about its ability to cause disease or death in the species. LMBv has been found throughout the Eastern United States and was previously identified in Wisconsin's Mississippi River Basin (Grizzle and Brunner 2011). The virus can cause weakness, skin lesions, abnormal swimming, swim bladder over-inflation and death in largemouth bass (Zilberg et al. 2000, Boonthai et al, 2018). While the appearance of LMBv in Door County smallmouth populations has been disconcerting, there is no evidence it has had any population-level effect. Affected fish seem to be in good condition, and healed lesions have been observed. DNR staff will continue to monitor smallmouth bass populations and collect additional samples to confirm LMBv in future outbreaks. To avoid spreading LMBv and other harmful pathogens, anglers should follow the DNR's [aquatic invasive species](#) guidance and actively practice the following:

- [Drain all water from boats, motors and all equipment.](#)
- Do not move live fish away from a waterbody.
- Handle bass as quickly and gently as possible if you intend to release them.
- Target smallmouth bass during cooler weather to reduce the stress on fish.
- Refrain from hauling fish in live wells unless fish are to be harvested.
- Report smallmouth bass with skin lesions and dead or dying fish to local biologists or fish health staff.

While LMBv is not known to infect humans, the DNR urges anglers harvesting any fish to thoroughly cook their catch, never consume dead or dying fish and follow the [Center for Disease Control's food safety guidelines](#).

Great Lakes water levels have undergone extreme fluctuations over the last decade, approaching near-record lows and highs within an eight-year span from 2013 (low) to 2020 (high) (NOAA, The Great Lakes Dashboard). Smallmouth bass tend to occupy nearshore habitats for much of their life history, so fluctuating water levels have the potential to impact smallmouth bass recruitment success through loss or gain of spawning and nursery habitat. Changes to the nearshore habitat can be further exacerbated by shoreline development projects that impact the riparian zone and the aquatic life that inhabits this area. Much of the Door County shoreline is highly developed, particularly the embayments that are critical to



bass spawning and rearing, and much of this development involved decades of dredging and shoreline hardening in response to fluctuating water levels resulting in the loss of natural shoreline. During the period of 2019 to 2020, 248 permits were issued through a self-certification process for the installation of rip rap along Door County waters in response to high water. Many additional projects were done without permits, and some projects went through the normal permitting process. Shoreline development projects like this have been implicated in the direct loss of habitat and impairment to the ecological functioning of the riparian zone and the lakebed (Engel and Pederson Jr. 1998; Wensink et al 2016). These shoreline modifications may also exacerbate the impact of storms that are known to negatively impact smallmouth bass nesting success and are increasing in frequency due to climate change (Steinhart et al. 2005).

Other potential stressors to the smallmouth populations include invasive species, including the round goby (*Neogobius melanostomus*), whose impacts to native species such as smallmouth bass are still uncertain (e.g., negative impact as a nest predator vs positive impact as a major prey/food item). Round gobies well-documented to be aggressive nest predators, consuming eggs in a smallmouth bass nest in short order (Steinhart et al. 2004). Ohio closed smallmouth bass fishing in Lake Erie during May and June due to high predation rates by gobies on nests affecting recruitment. Other states maintain open seasons during this same period, including Wisconsin, who implemented a year-round catch-and-release season for smallmouth bass in 2020. Round gobies also compete with native fish to the detriment of certain species such as darters, sculpins, and other small fish (Janssen et al. 2001). However, gobies also make up a substantial part of fish diets in Green Bay (Koenig et al 2022), and their ubiquitous distribution and easy capture make them an important food source for many fish species and may be responsible for the increased growth rates of smallmouth bass in this area (Crane et al. 2016).

## **SUMMARY OF MANAGEMENT CONSIDERATIONS**

The scale and complexities surrounding Great Lakes smallmouth bass populations create considerable challenges in applying direct management actions in areas such as the waters surrounding Door County. Investigating highly specific issues at this scale is not possible with current funding and requires additionally funded projects. Fortunately, after considerable effort, we have been able to gather some internal and external funding to investigate issues such as those discussed in this report. We expect to use this information to make management and regulatory changes if needed. Furthermore, the dynamics of a changing climate and resulting changes to the aquatic ecology will require us to learn and adapt. Comprehensive stakeholder input and involvement will continue to be a factor in any future management decisions.

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