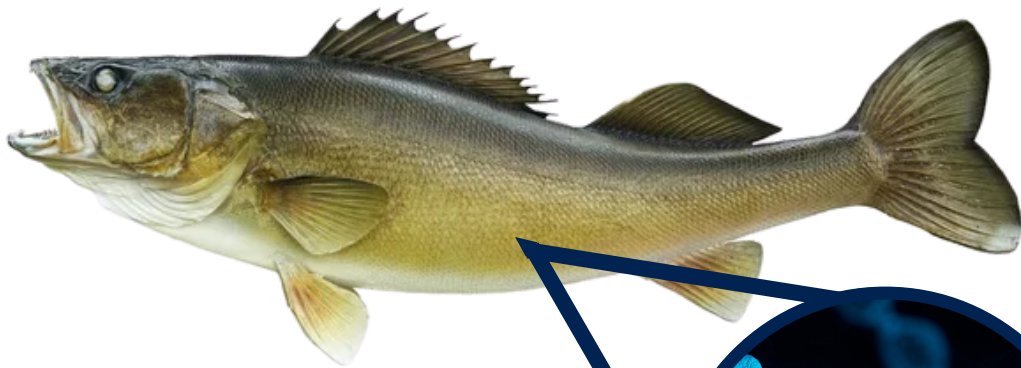




BROADALBIN-PERTH SCIENCE RESEARCH

FALL 2019 - SPRING 2023

# Great Sacandaga Lake Walleye Study



# Great Sacandaga Lake Walleye Study

*Broadalbin-Perth Science Research Class (2019-2022)*

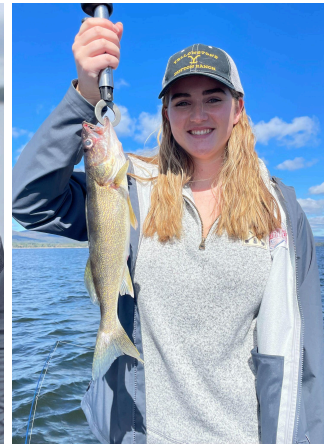


## INTRODUCTION:

The Great Sacandaga Lake (GSL) is 29.2 miles long and encompasses parts of Fulton and Saratoga County, New York. It was created as a reservoir in 1930 following the completion of the Conklingville Dam. The lake is managed by the Hudson River-Black River Regulating District with shorelines of private and public access including residential homes, boat launches, restaurants, marinas, campgrounds, and beaches. It is classified as a meso-oligotrophic lake which means it is a water body that has relatively intermediate productivity due to the low/moderate nutrient content in the lake. The Great Sacandaga Lake is home to over a dozen fish species including largemouth bass, smallmouth bass, yellow perch, brown bullhead, northern pike, chain pickerel, redbreast sunfish, rock bass, brown trout, rainbow trout, channel catfish, common carp, black crappie, and walleye.

From 2019 to 2022, students in the Broadalbin-Perth Science Research course have collected data on the walleye population in the Great Sacandaga Lake. Their focus was to get a better understanding of the growth, behavior, and genetics of this very desirable fish species. The data presented below represents the work completed by three separate groups of students from 2019 to 2022.

Walleye were caught in the southern basin of the lake at four different locations: Sand Island Area; Deer Island Area; Sunset Bay Area; and Beacon Island Area. A total of 325 walleye were caught during our study period and various data was collected including location of the catch on the lake, length of fish, age of the fish, stomach contents, and genetic relatedness to stocked individuals. 241 of the 325 walleye were caught by the Science Research students. 84 of the 325 walleye were harvested by local fishermen and the Broadalbin-Perth Fishing Club. The gill plates and stomachs of these 84 fish were sent to the school for the age and diet study. In addition, 75 tissue samples from GSL-caught walleye and 40 tissue samples from hatchery-raised walleye from Hickling's Fish Farm were sent to West Virginia University for genetic analysis to determine if the stocked fish are contributing to the walleye population size of the Great Sacandaga Lake.



# Great Sacandaga Lake Walleye Study

Broadalbin-Perth Science Research Class (2019-2022)



## TOTAL NUMBER OF FISH CAUGHT & LENGTH DATA:

**Total Number of Walleye Caught/Collected  
(2019-2022)**

Year	Walleye Caught	Walleye Harvested
2019	99	0
2020*	0	0
2021	107	87^
2022	119	52
<b>TOTAL</b>	<b>325</b>	<b>139</b>

\* COVID 19 Pandemic - course was not offered  
^84 of 87 walleye were harvested by local fishermen  
and B-P Fishing Club for age and diet study

**Total Number of Walleye Caught by B-P Researchers  
Each Fall (2019-2022)**

Year	Walleye Caught	Walleye Harvested
Fall 2019	99	0
Fall 2020*	0	0
Fall 2021	23	3
Fall 2022	119	52
<b>TOTAL</b>	<b>241</b>	<b>55</b>

\* COVID 19 Pandemic - course was not offered

**Length Distribution of Total Number of Walleye Caught Each Fall (2019-2022)**

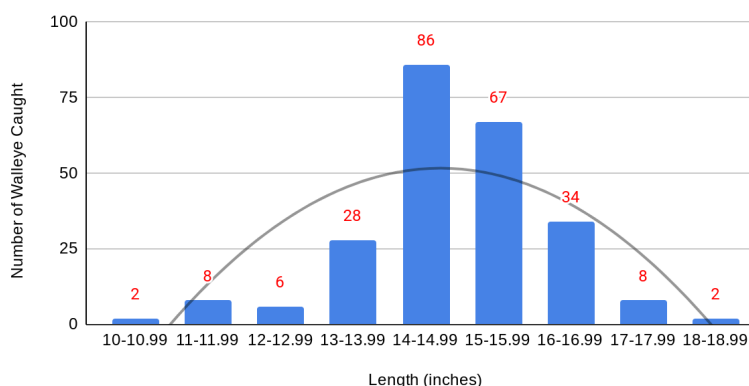
Year	10-10.99 inches	11-11.99 inches	12-12.99 inches	13-13.99 inches	14-14.99 inches	15-15.99 inches	16-16.99 inches	17-17.99 inches	18-18.99 inches	19-19.99 inches	20-20.99 inches	Total
Fall 2019	0	3	4	16	40	26	7	2	1	0	0	99
Fall 2021	2	4	0	5	7	4	1	0	0	0	0	23
Fall 2022	0	1	2	7	39	37	26	6	1	0	0	119
<b>Total</b>	<b>2</b>	<b>8</b>	<b>6</b>	<b>28</b>	<b>86</b>	<b>67</b>	<b>34</b>	<b>8</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>241</b>

**46.1 % of the walleye caught were of legal size (15.00" or greater)**

**Length Distribution of Total Number of Walleye Harvested by Local Fishermen and B-P Fishing Club For  
Age & Diet Study in Spring 2022**

Year	10-10.99 inches	11-11.99 inches	12-12.99 inches	13-13.99 inches	14-14.99 inches	15-15.99 inches	16-16.99 inches	17-17.99 inches	18-18.99 inches	19-19.99 inches	20-20.99 inches	Total
Spring 2022	0	0	0	0	0	45	26	7	4	1	1	84

**GSL Walleye Length Frequency Distribution  
(Total Walleye Caught 2019-2022)**



# Great Sacandaga Lake Walleye Study

Broadalbin-Perth Science Research Class (2019-2022)



## CATCH PER UNIT EFFORT:

The Catch Per Unit Effort (CPUE) is an indirect measure of the abundance of a target species. Changes in the catch per unit effort are inferred to signify changes to the target species' true abundance. A decreasing CPU indicates overexploitation, behavioral changes, or negative environmental impacts (biotic and abiotic), while an unchanging or positive CPUE indicates sustainable harvesting, increase in migration to an area, or favorable environmental conditions. Numerous variables need to be considered when determining the abundance of the targeted fish species including, but not limited to availability of forage, competition, and reproductive fitness. The CPUE is calculated by dividing the catch of each fishing trip by the number of hours fished during that trip.

### Walleye Catch Per Unit Effort (CPUE) For Each Location on GSL

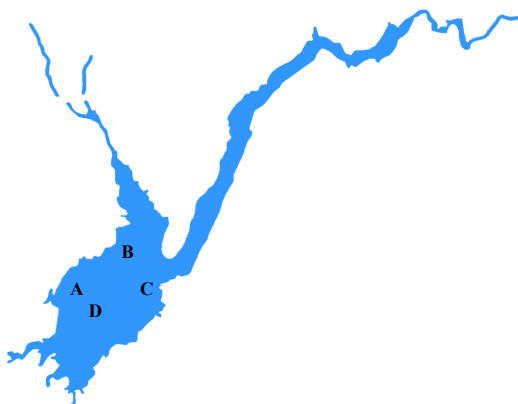
Location	Fall 2019	Fall 2021	Fall 2022	Trend
Sunset Bay Area	32 walleye/6 hrs. 5.33 walleye/hr.	N/A	97 walleye/18 hrs. 5.39 walleye/hr.	↔
Deer Island Area	8 walleye/4 hrs. 2.00 walleye/hr.	N/A	7 walleye/2 hrs. 3.50 walleye/hr.	↑
Sand Island Area	32 walleye/8 hrs. 4.00 walleye/hr.	21 walleye/8 hrs. 2.63 walleye/hr.	10 walleye/4 hrs. 2.50 walleye/hr.	↓
Beacon Island Area	N/A	N/A	5 walleye/2 hours 2.50 walleye/hr.	—
TOTAL	72 walleye/18 hrs. 4.00 walleye/hr.	21 walleye/8 hrs. 2.63 walleye/hr.	119 walleye/26 hrs. 4.58 walleye/hr.	—

*"If you continue those fishing trips for multiple years and record data in the same fashion, you can compare the CPUE from each year to monitor changes in the abundance of adult walleye. To make sure that your comparisons are as precise as possible, it is important to conduct surveys at the same time from year to year. Simply put, walleye tend to inhabit different areas of the lake during different seasons due to water temperature, dissolved oxygen, food availability and many other factors. Therefore it would be inaccurate to compare your CPUE from trolling in the fall to trolling in the spring or summer." Kyle Jones NYSDEC*

A total of 212 walleye were caught during our CPUE trips (52 hours) for an average of 4.08 walleye/hr. Results indicate that the walleye population has dipped slightly around the Sand Island area, stayed relatively constant throughout the Sunset Bay area, and increased at the Deer Island area. The Sand Island area was the only location sampled three years in a row (see above table).

### GLS Walleye Fishing Sites:

- A = Sunset Bay Area
- B = Deer Island Area
- C = Sand Island Area
- D = Beacon Island Area





# Great Sacandaga Lake Walleye Study

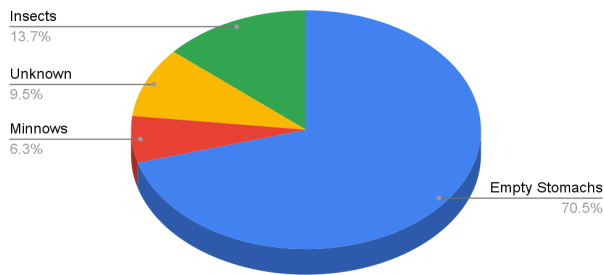
Broadalbin-Perth Science Research Class (2019-2022)



## DIET ANALYSIS:

- 95 walleye stomachs were dissected
  - 28 of 95 (29.5%) walleye stomachs had measurable food content in them (minnows, aquatic insects, unknown digested materials)
  - 67 of 95 (70.5%) had empty stomachs

**Distribution Percentage of GSL Walleye Stomach Contents**



**Example of Stomach Contents From a Harvested GSL Walleye:**



Results show that a vast majority of harvested walleye had empty stomachs. Unknown material is defined as forage that was too digested to properly identify.

### Possible factors that are attributing to this observed data may include:

1. Limited food resources (bait populations are small and variable from year to year)
2. Trophic state of GSL is meso-oligotrophic
  - a. A meso-oligotrophic lake is one which has a relatively moderate to low productivity due to the limited nutrient content in the lake
3. The annual "drawdown" of the lake levels has also affected the biomass of the lake
  - a. Less cover and shoreline structure for the low end of the food chain when the water is let out of the lake
4. Interspecific competition with other species (bass, pike)
5. Environmental factors
  - a. Temperature, pH, dissolved oxygen, turbidity, etc. can affect prey and predator populations
6. Spiny Water Flea (aquatic invasive species)
  - a. The spiny water flea disrupts the food web by preying upon zooplankton, which is an important food source for young walleye
7. Parasitic tapeworms found in the digestive tract of six walleye in the Sunset Bay area (Spring 2022)



# Great Sacandaga Lake Walleye Study

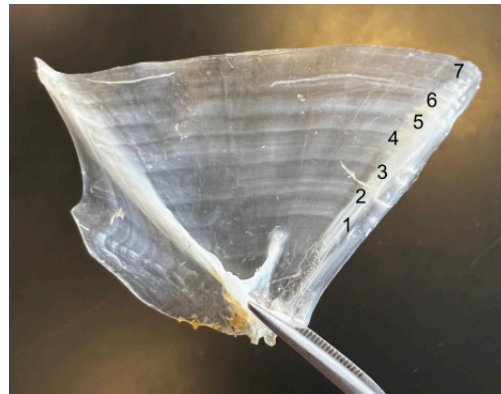
Broadalbin-Perth Science Research Class (2019-2022)



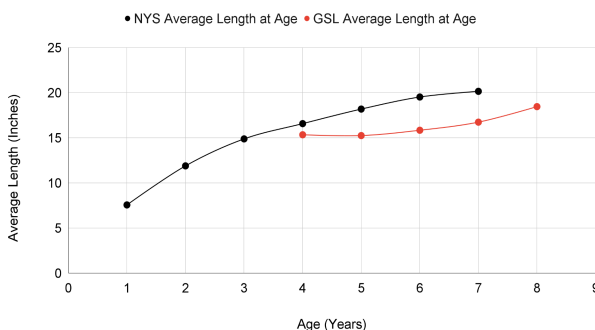
## AGE DETERMINATION:

- 138 opercular bones from legal walleye were prepared & ages were determined
  - Average length of a 5-year-old walleye in GSL is **15.25 inches**
  - Average length of a 5-year-old walleye in NYS is **18.19 inches** (*NYSDEC fisheries database*)
  - 5-year-old walleye in GSL are **2.94 inches** shorter on average than 5-year-old walleye in NYS

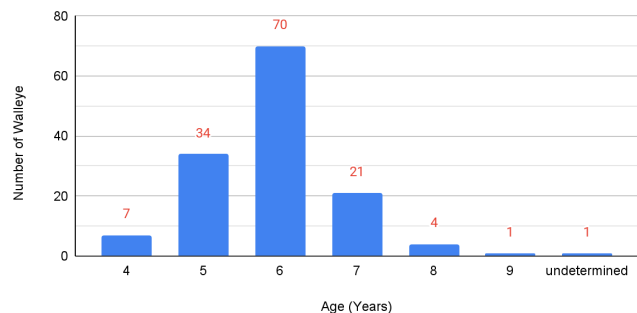
Opercular Plate Showing Age Rings From a 7-Year-Old GSL Walleye



Average Length at Age for Walleye (NYS vs GSL)



GSL Walleye Age Frequency Distribution (Fall 2021- Fall 2022)



Results show that the average length of a 5-year-old walleye in the Great Sacandaga Lake is 15.25 inches while the average length of a 5-year-old walleye in New York State is 18.19 inches (*via the NYSDEC fisheries database*), which is a difference of 2.94 inches. Fish grow at different rates depending on the type of water body they live in. Environmental fluctuations, water depth, food resources and competition for available resources all play a role in the development of legal-sized fish. This study has shown that walleye in the Great Sacandaga Lake are smaller in length than the New York State average at the same age.

# Great Sacandaga Lake Walleye Study

Broadalbin-Perth Science Research Class (2019-2022)



## GENETIC ANALYSIS:

- Genetic results indicate that we can't assume there is only one walleye population in GSL.
- Natal philopatry commonly refers to the return to the area the animal was born in, or to animals remaining in their natal territory. Populations of walleye could have been reproductively isolated over time due to the locations on the lake where they spawn.
- This may have created two populations of walleye in the lake that have shown some genetic variation. Computer generated models indicate that there may be two wild walleye populations in GSL.
  - The two groups "live together" but they are not "sleeping together". In other words, the walleye populations spawn in specific locations (natal philopatry) on the lake which has kept their genome isolated from each other, but they get back together after their breeding season is over. The two populations are intermingled for most of the year, but separate again when it is time to spawn. As a result of this separation, it is feasible that two populations currently exist in GSL.

*\*Structure Plots to help visualize ancestry of each population and contribution of ancestry to each individual.*



Orange = Hatchery Fish

Purple = Unknown Population

Blue = Wild Population

## STOCKING CAMPAIGN:

- There is a likelihood that the hatchery fish are succeeding in the wild.
- Hatchery influence on the wild is impossible to measure without studying it. This study indicated that the wild fish population shows evidence of hatchery ancestry.
- Results show an average of 7.6% ancestry of hatchery population in the wild population.
  - Ranges from 0.7% to 68% hatchery ancestry were found in the wild population.
- Of the 75 wild-caught fish we sampled for this study, none of them were 100% hatchery reared.



*\* Photos taken from Hickling's Fish Farm where the hatchery raised fish have been purchased by the GSLFF*

# Great Sacandaga Lake Walleye Study

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## RECOMMENDATIONS:

Walleye populations in the Great Sacandaga Lake are influenced by various factors including available forage, habitat, interspecific competition, sport fishing, and stocking. These variables have shown both positive and negative impacts on walleye success rates in GSL.

Improving the walleye fishery in the Sacandaga will require additional research and data collection. Studies conducted on walleye forage availability can help to better understand forage preference. Tracking walleye migration in the lake to determine if preferred water temperature, depth, and diet is seasonally dependent can help shed light on GSL walleye behavior. This three-year study has shown that walleye in the Great Sacandaga Lake are shorter in length than the New York State average at the same age. Walleye are piscivores (fish eaters). Over 70% of walleye stomachs analyzed from harvested fish were empty and approximately 14% had aquatic insects in them. These results show that many of the walleye are not consuming enough food or not feeding on their natural forage. It may also indicate that there is not enough bait fish in GSL to sustain healthy populations of walleye. Further research and monitoring are needed to determine the reason behind the slower growth rate that was documented.

The Great Sacandaga Fisheries Federation walleye stocking campaign has shown to be working. Continued efforts to add more walleye to the lake through enhanced stocking efforts will only improve the population and strengthen the fishery.

Management practices may include creating slot limits to regulate the size of the fish that can legally be harvested from GSL and reducing the number of legal fish kept per outing to help improve walleye growth rates within the population. These suggested fishing regulations can have a positive long term effect on the population of walleye in the lake.

Continued collaboration with the New York State Department of Environmental Conservation, Great Sacandaga Lake Advisory Committee, and the Great Sacandaga Lake Fisheries Federation will be an essential practice to help monitor the walleye populations and to help improve the GSL fishery.

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