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Seneca Lake Rainbow Trout

This study will explain Seneca Lake fish populations and their affect on tourism within the Seneca Lake Watershed. More specifically, it will focus on the rainbow trout (*Oncorhynchus mykiss*). It is essential to examine the Rainbow trout's role within Seneca Lake in respect to the tourism around the area. As of 2009, it was the 8th most heavily fished waterbody in New York (Hammers). Being a heavily fished waterbody, it is our duty, as citizens of the area, to understand our direct and indirect interactions between the fish species here in Seneca Lake. This is important to understand for the purpose of maintaining a healthy relationship with one of the area's most important resources, the lake and its fish populations. Anglers in particular play a pivotal role in relation to the fish populations. Overfishing in Seneca Lake can be severely detrimental and crippling to the surrounding economy. On the other hand, the same effects can also be seen with over supplying the lake with one species over another. Therefore, within this report rainbow trout populations will be examined in relationship to Lake trout (*Salvelinus namaycush*). It will also investigate ideal breeding grounds for rainbow trout, the impact of native and invasive species in Seneca Lake on rainbow trout, the nutrient cycle of the lake, Sea Lamprey netting, fishing competitions such as the Lake Trout Derby, hatcheries for rainbow trout, and regulations in place for protecting species and the tourism aspect of fishing in Seneca Lake.

Seneca Lake, located in the Finger Lakes region of central New York, is the largest of the Finger Lakes. It has a volume of 15.5 km³, contains more than 50% of the water of the eleven Finger lakes, has a surface area of 175 km², has the deepest depth of 186 m and a residence time of 18.6 years (Halfman 2011). Within the Seneca Lake watershed, approximately ~100,000 people use it for drinking water and many more use it for recreation reasons, such as fishing and boating (Halfman 2003). In 2007, Anglers are estimated to have spent \$8.5 million dollars on fishing related activities in the Seneca Lake area (Connelly and Brown 2009). Thus, showing how important the maintenance and protection of fish populations in Seneca Lake is to the region.

Boasting the title of “Lake Trout Capital of the World,” Seneca Lake is the native home to lake trout (*Salvelinus namaycush*). Lake trout are the highlight of Seneca Lake due to their high abundance. Unlike the native lake trout populations, which have been around for countless years, rainbow trout were introduced in 1910. The introduction of the rainbow trout species was to encourage more anglers to travel to central New York, to diversify the species available to catch and to increase the revenue brought in through the fishing industry. Typically, rainbow trout population trends have been relatively low in comparison to lake trout (Hammers 2010). Unable to spawn in most locations in the watershed, rainbow trout habitats are limited to a select number of tributary Creeks along the lake. One particular location that has ideal breeding ground for rainbow trout is Catharine Creek. Catharine Creek is a 15-mile long stream found through Chemung and Schuyler counties at the southern end of Seneca Lake, near the Watkins Glen area of

the lake. At Catharine Creek, the NYSDEC has recognized and used this location as both a spawning and nursery habitat for rainbow trout (Hammers and Kosowski 2011). Although there are many creeks similar to Catharine Creek in the area, very few provide adequate spawning ground. The major limiting factor that has allowed Catharine Creek to become an essential spawning ground for rainbow trout is its low topography. Due to its low topography, there are no impassable falls, making it easy for rainbow trout to return during spawning seasons.

Rainbow trout spawning season occurs when the fish reaches 12-16 inches in length. This is typically attained towards the end of the second year of the fish's life. The mature rainbow trout find shallow gravel rifts during the late winter and early spring, for the spawning occurs in late March through early July (Rengstorff 2001). Nests are located shallow, gravel areas before choppy water. Each nest of rainbow trout can contain from 200-8,000 eggs that are fertilized by the male and then covered with gravel. The eggs can take anywhere from a few weeks to four months, depending on water temperature. Water temperature is dependant on the past winter's activity. Once the rainbow trout hatch, they stay within the same habitat, Catherine Creek, for the first two years and then move into larger bodies of water, Seneca Lake (Rengstorff 2001).

Seneca Lake has encountered an interesting situation in terms of invasive species within its waters over the past 20 years. In 1992, Zebra mussels were first discovered within the lake, followed by Quagga Mussels in the early 2000's. Zebra Mussels (*Dreissena polymorpha*) and Quagga Mussels (*Dreissena bugensis*) are both invasive species of shellfish. Zebra mussels supposedly made their first contact with

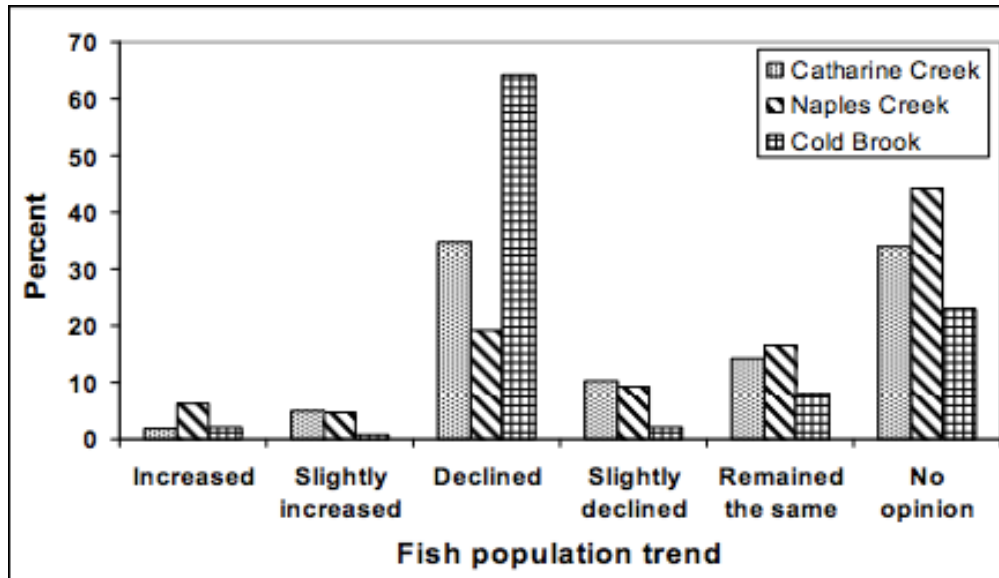
the Great Lakes/Detroit area through the discharge from an ocean going ship ballast tank (Halfman 2003). Understanding Zebra and Quagga mussels are important to the struggle of rainbow trout because these mussels are filter feeders. A filter feeder is an organism that processes the algae and nutrients that are in the water, and discharges what we consider “clean” and pure water. Therefore since they are filter feeders, they require water with existing plankton/algae populations as well as well as calcium for their shells (Lake Champlain Basin Program 2007). Zebra mussels are found at depths of less than 50 feet and Quagga mussels are found at depths between 100 and 400 feet. Both can attach to firm surfaces but Quagga mussels have the ability to live on sand and silt substrates (Lake Champlain Basin Program 2007).

The Zebra/Quagga mussels have provided Seneca Lake with a new natural filtration system, leading to an increase in water clarity. Water clarity can be measured through the use of a Secchi Disc. Secchi Discs are small disc attached to a rope, which is lowered into the water. Once the disc reaches a depth at where it cannot be seen, the depth is recorded. It is then lowered a second time beyond transparency and raised until it can be seen. This depth is also recorded. Here we average the two, resulting in a water transparency, a quality that is directly correlated with water quality. The deeper the disc can be seen, the cleaner the water and vice versa.

The introduction of these new filter feeders, the Nutrient Cycle was greatly affected. Zebra and Quagga Mussels are able to cut off much of the nutrient cycle, making it difficult for larger organisms, such as lake trout and rainbow trout to find food. Even if the rainbow trout are able to survive by finding enough forage within

Catherine Creek during the first two years of their lives, once they move into Seneca Lake finding forage becomes much more difficult. This in turn, this has turned lake trout into one of the predators of the younger and smaller rainbow trout. It has been noted that “Recent population declines have been linked to abundant lake predators, primarily lake trout, reduced lake forage, which provide a buffer between rainbow trout and lake predators, and to changes in stream habitat” (Hammers 2011). These low forage rates have resulted in higher catch rates for Anglers of most species. “This relatively high catch rate is likely a result of high predator density (i.e. lake trout) and low forage abundance, hence hungry fish more willing to strike a lure” (Hammers 2010). Therefore with low amounts of food due mostly to Quagga Mussels result in high catch rates, these high catch rates lead to lake trout becoming predators to rainbow trout. “It is not uncommon for adult lake trout to feed heavily on juvenile trout when lake trout abundance is high and forage (alewives, rainbow smelt, and sculpins) are not readily available” (Hammers 2010).

This decrease in forage for lake trout is an additional factor that contributes to low numbers of rainbow trout, on top of their already limited breeding ground.



(Figure 1 – Hammers 2011)

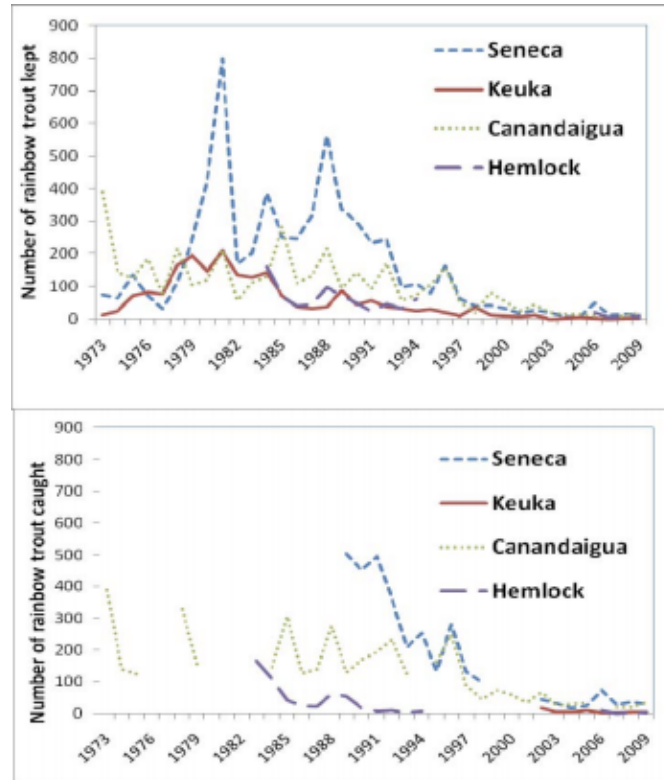
Looking at a survey (Figure 1) which was given based on Angler Perception of rainbow trout populations over the past 10 years from 1998-2008 in Catherine Creek, the results show Anglers, for the most part have seen a decrease in populations (Hammers 2010). From this survey given from April 1 – March 28, 2008, we can see that nearly 70% of the anglers experienced a population decline. Due to the importance of rainbow trout in Seneca Lake, it is essential to help them maintain a healthy population and to make sure it does not fail. Currently there is a Lake Trout Derby that helps the rainbow trout population thrive although it was not the Derby's original intentions. The New York State Department of Environmental Control (NYSDEC) has proposed several new regulation changes to help rainbow trout thrive within Seneca Lake.

Starting in 1965, the Lake Trout Derby has been an annual competition on Memorial Day for anglers to try to catch the largest lake trout. The winner of this competition is given a \$5,000 grand prize given to the largest catch, which is

determined by weight. The idea originated as a way to attract anglers to the area and has since become the longest lasting trout competition in the country. In 2012, the Lake Trout Derby will be entering into its 48th annual competition. This competition is vital for the rainbow trout's survival during times of low forage because it allows rainbow trout population indirect protection from predation. The goal of the derby is not to reduce lake trout numbers within the lake but rather a competition for the Anglers. Needless to say, it plays a role in the rainbow trout's survival.

To ensure the safety of the lake trout species and continuation of the Derby, precautionary measures were taken when Sea Lamprey became a nuisance in Seneca Lake. Sea Lamprey are similar to leeches. They attach to their host by their sharp teeth arranged in a circular pattern. Sea Lamprey became such a problem that the NYSDEC stepped in during 1982 with the application of a chemical lampricide known as 3 Trifluoromethyl-4-nitrophenol (TFM), a practice that has been used in the Great Lakes area since the 1960s (Boogaard and Kolar 2004). The area where TFM is applied coincidentally is Catherine Creek and Keuka Outlet. The breeding ground for Sea Lamprey is the same as rainbow trout due to the accessibility to return to spawn and relatively low, slower moving water. Spawning occurs when temperatures range between 17-19°C. The male and female Sea Lamprey die after spawning and it takes the eggs (average 230,000 per female) 10-13 days to hatch, emerge and remain in the substrate of the creek for 4-8 years. In July, the larval stage begins its 4-6 months metamorphosis into Sea Lamprey between 100-200 mm long (Boogaard and Kolar 2004). From this, we can conclude that depending on

water temperatures, Sea Lamprey may spawn at the same time as rainbow trout, posing a threat to the populations survival. Therefore in 1982, when attempts to decrease Sea Lamprey spawning began, a barrier was installed in Catherine Creek to prevent adult lamprey from returning to the spawning ground they share with rainbow trout.



(Figure 2 – Hammers 2011)

To ensure rainbow trout survival in the coming years, the NYSDEC has modified the regulations for Seneca Lake area to accommodate this species. As one can tell from the above graph (Hammers 2010), there is a significant decline in rainbow trout that are caught and kept. Therefore, showing a struggling population, more stringent and protective regulations created by the NYSDEC will come into effect in October 2012. The new regulations Seneca Lake anglers will see are:

1. Reduce the creel limit of rainbow trout in the tributaries from 3 to 1 per day.
2. Reduce the creel limit of rainbow trout in the lakes from 5 to 1 per day.
3. Remove the restriction in the daily limit to where no more than 3 lake trout may be harvested as part of the 5 trout and salmon allowed and allow up to 5 lake trout to be harvested per day.
4. Daily Limit: 5 in combination (catch shall include no more than 1 rainbow trout or 3 landlocked salmon).

The regulations are designed to address the issues of low rainbow trout populations and to help reduce the number of lake trout. The most important new regulation is changing the creel limit within tributaries from 3 to 1 rainbow trout per day. Based upon data compiled from surveys and the yearly angler diary, it has been shown that over 50% of the total catch of rainbow trout occurs in the tributaries. Reducing the number of allowable rainbow trout will significantly increase the population.

Allowing lower numbers of rainbow trout and higher numbers of lake trout will shift the focus of anglers. This shift in focus will help solve the lake trout abundance problem, ensuring less predation on rainbow trout as well as allowing rainbow trout populations to thrive (Hammers 2010). These new regulations also show the importance of rainbow trout within the area. The aspect of being able to fish for a wide variety of freshwater fish has led Seneca Lake species, rainbow trout in the case, to become a highly desirable place to visit. This desire for variety of catch therefore is important to maintain, thus why the above regulations were created.

The importance of rainbow trout is not specifically for Seneca Lake only but the Finger Lakes region in general. "These regulations are being proposed for all of the western Finger Lakes including Seneca, Keuka, Canandaigua, Hemlock and Canadice Lakes" and their tributaries (Hammers 2010).

In addition to these new regulations, NYSDEC has also decided it to be beneficial to stock 10,000 rainbow trout in Catherine Creek and 5,000 in Cold Brook

for a period of 5 years. The 10,000 to be stocked in Catherine Creek will be yearlings (typically 6-9 inches in length, aged over one year), all attached with an adipose fin clip, differentiating the stocked fish from wild ones. The stocking of Catherine Creek will be evaluated every years during the spring via electrofishing, a safe process which stuns the fish for a short period of time, as well as information gathered through the angler diary program (Hammers 2010). The NYSDEC will also stock Cold Brook with 5,000 fall fingerlings (3-5 inches in length) rainbow trout. These trout will also receive the adipose clip. The rainbow trout offspring that will be used for stocking will be supplied from Cayuga Inlet, as opposed to those already in Seneca Lake or its tributaries.

These stocked fish will be raised at Bath Hatchery, located in the Village of Bath in Steuben County. Bath Hatchery raises lake trout, brown trout and rainbow trout, which were obtained from Cayuga Lake. Latest annual production of all species is approximately 86,000 pounds (Hammers 2010). With the introduction of 15,000 rainbow trout and a 33% reduction from current stocking levels for lake (28,000 yearling) will help reduce lake trout biomass and increase the rainbow trout populations (Hammers 2010). Once the fish are released from the hatchery, they are placed into Catherine Creek and Cold Brook first. Previous attempts at stocking Seneca Lake with rainbow trout had failed due to placement directly into the lake. The NYSDEC hopes to place the stocked fish into the spawning tributaries, hoping it will encourage them to return for spawning the following year.

These regulations are to be set in place to keep Seneca Lake one of the top ranking angler destinations in New York State. Putting a heavy influence on the

importance of rainbow trout through these regulations shows their importance in the lake. Stated earlier, although rainbow trout only make up 5% of the total catch, they are a large reason why anglers come to fish here. Bringing in millions of dollars each year, the availability of fish species is cherished. Fixing the problem of over-abundant lake trout and revitalizing the rainbow trout population has recently become a main priority of the NYSDEC. Due to the fact that Seneca Lake is the largest Finger Lake, it draws the largest tourism base for fishing. The NYSDEC felt it was appropriate to create regulations to protect rainbow trout population sizes, install sea lamprey netting, distributing lampricides in key areas of Catherine Creek and the lake, listening to the input of anglers on the subject of rainbow trout, the utilization of Bath Hatchery to stock fish and understanding the nutrient cycle of the lake to protect rainbow trout.

It will be interesting to examine the rainbow trout populations after the implementation of new regulations as well as the introduction of 15,000 stocked fish. A large portion of data will come from the angler diary program and after the 5-year stocking period, it would be beneficial for the anglers to take the same survey that was taken in 2008, which was mentioned above. Taking into consideration the lake is constantly changing, once these regulations are in place and Catherine Creek/Cold Brook begin their stocking, the job is not done. The community and NYSDEC must constantly be on the lookout for any type of threatening species to rainbow trout or for any other organism in the lake. Only just recently Asian Clams have been found in nearby areas throughout the Finger Lakes. Making sure preventative measures are taken is the best way to allow the rainbow trout

population to flourish. Although Seneca Lake is the “Lake Trout Capital of the World,” it is just as important an ecosystem for rainbow trout. The input of anglers who travel across the country to fish in Seneca Lake, fill out the angler diary program and are overall concerned with the health and welfare of the lake are reasons why people come back to fish here. The community cares about Seneca Lake and knows that it is its greatest resource in terms of making revenue. Whether the lake is supplying water for the numerous vineyards in the region or it is people coming to fish, rainbow trout are just as important of a component for Seneca Lake regional economy and its draw for tourism.

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