LIMNOLOGY PRACTICUM POSTER SESSION 2010

STUDENT INDEPENDENT PROJECTS

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ABSTRACT BOOK

SONG LAKE PROJECTS

The Ups and Downs of Groundwater Exchange: Investigating the Hydrology of Song Lake

Rachael Weiter

Despite its presence in the Tully Moraine for about 10,000 years, Song Lake has received relatively little attention from researchers. In 2001 Kappel et al. published the first major hydrologic study describing the subsurface flows of water through the Tully Moraine, indicating that both the surface water level and the direction of subsurface flow vary seasonally. Subsurface flow travels almost directly south during the autumn, the time during which this project was completed, while in the spring it travels from the northeast to the southwest. The lack of an inlet or outlet to the lake made this an excellent site to study groundwater inputs and outputs to the lake. By measuring temperatures above and within the sediment on several days the flow patterns predicted above were generally confirmed, but some anomalous patterns on the third sampling date in mid-November suggest that groundwater exchange with the lake may be influenced or controlled by local weather patterns, particularly wind.

Following the Flush: Are Nutrient Levels in Song Lake, NY a Concern? An assessment of phosphorus and *E.coli*, and their relationship in Song Lake

Cassandra Ziemba & Elizabeth Keyser

The analysis of Song Lake water quality with respect to phosphorus and *E.coli* levels was done because of the current lack of information available to the lake community and the public about this potential issue. There has not been previous work done on this topic at the lake, so we hope our assessment helps contribute to a better understanding of Song Lake chemistry. Phosphorus is an important nutrient for growth and energy of organisms living in the lake. Phosphorus is also important to study in aquatic systems because it is the most limiting nutrient relative to other essential elements needed by organisms. Excess levels of phosphorus can affect productivity in the lake. Because excess phosphorus often comes from anthropogenic sources such as agriculture and septic, it is important to see how different areas of the lake contribute to the phosphorus levels. We also wanted to make sure Song Lake was not facing any danger of high *E.coli* levels that may also be from the previous sources, so at four of the eight sites we collected samples to test for *E.coli.* We grouped the sites into the east, west, north, and south sides of the lake, and statistically compared the average phosphorus levels. We found that the west side average phosphorus levels were significantly higher than the east side averages. We believe that the increased development and thus more septic systems may be contributing to the higher phosphorus levels on west side of the lake. We also found that the south end of the lake had significantly higher phosphorus levels than the north end. It is possible that agricultural runoff from the nearby fields may contain fertilizer with high levels of phosphorus. *E.coli* was measured at four of the eight sites and site 6 produced the most coliform colonies. We hypothosized that there may be some correlation between phosphorus and *E.coli,* but the increased coliform counts at site 6 are not correlated with higher phosphorus levels at that site. The other sites only produced a few, if any, coliform colonies. The difference between site 6 and the others may be due to error, or the fact that there is something at the site contributing to increased bacteria levels. The low counts at the other sites may also be because of the cold water. Repetition and more samples would allow for a more thorough analysis of this study and a better understanding of what is happening in the lake.

Comparative analysis of Song Lake Water with Residence Wells

Daniel Larkin, Dominick Mosca, & Stephen 'Pat' Rook

The purpose of this project was to test and compare total phosphorus in Song Lake's surface water to resident's well water. Using these data it can be determined if significant inputs are occurring through ground seepage or primary inputs are through overland flow. The trophic state of the lake can also be estimated from lake surface samples. Results yielded higher levels of phosphorus in the surface water, which is to be expected in due to phosphorus loss to land vegetation and soil reactions. Using a t-test we determined that the differences in the phosphorus data between well and lake water were statistically significant at 95% confidence and the null hypothesis that the difference in the levels of phosphorus from well samples to surface samples was not due to chance. The average level of phosphorus in the lake was calculated and the lake was found to be from mesotrophic to eutrophic according to the trophic state index.

Song Lake Bioassay: An Assessment of Phytoplankton Nutrient Limitations

Joe Schafran & Kieran Siao

In recent years concerns have developed over summer algal blooms in Song Lake, a kettle lake located in Tully, NY. In order to understand why these algal blooms occur, a determination on the limiting nutrient in the lake must be made. By performing a bioassay on lake water samples from near shore and off shore and then testing their chlorophyll a concentrations, it was found that in both lake zones, phytoplankton growth is not limited by just one nutrient. Algal growth was greatest in samples spiked with trace metals, silica, phosphorus, and nitrogen, versus those samples spiked with just one of these nutrients or a combination of nitrogen and phosphorus. Also, control samples showed little phytoplankton growth suggesting that these algal blooms are a result of recent increases in nutrient inputs to the lake system. Further analysis of Song Lake and the development of a nutrient budget should help to determine the source of these inputs.

What's Growing On?
An in-depth analysis of the macrophyte community within Song Lake

David Daly, Kara Jaenecke & Matt Coll

For our independent research project, we investigated the macrophyte community composition within Song Lake located in Tully, New York. Our objective was to collect, identify, and compare the macrophytes in Song Lake with those listed in the 1978 DEC report. To do this, we first set up three transects at four sampling sites. These four sites were specifically chosen due to the variety of habitats that they represented and were within close proximity to the four fish trap nets laid out by fellow classmates. The three transects consisted of two 50-meter lines parallel to shore and one 8-meter transect perpendicular to shore. Then, we used two standardized quadrats (hula-hoops) to determine percent coverage of each species of macrophytes within the sampling area. Once the percent coverage was estimated within each standardized sampling unit, one representative from each species found within the ring was collected and brought back to the lab for identification and further analysis. Upon returning to the lab, the macrophytes were identified using scientific macrophyte identification guides and photos of each species were then taken and archived for future reference. We found ten different macrophytes species, all of which were native to the area. The macrophyte community of Song Lake was comprised mostly of submersed macrophytes especially *Neobeckia aquatica*, a threatened species in New York state. After finding an entirely native community composition including a few threatened New York state species, we feel that it is necessary for future managers to protect the lake from invasive species.

Diversity of Benthic Macro Invertebrates in Song Lake, Tully NY

Shawn Ruzzi & Chad Walz

Song lake is a small kettle lake in the Tully Lakes region in upstate New York. This small privately owned lake is fed entirely by ground water inputs, and there are no surficial inlets or outlets. Because it is primarily ground water fed and is private, this lake seems to have not been invaded by Zebra mussels, Quagga mussels, or other aquatic invasive species that are now common in NY. For this study we used a D net to collect 8 benthic samples from 4 areas around the lake in late October. The samples were preserved, and sorted for any macro invertebrates, which were then identified to family, and if possible, genus. We found 22 families of organisms, from 10 orders, most of which were various families of arthropods. The invertebrates were native and generally indicators of good water quality.

General Fish Diversity of Song Lake and Characteristics of *Erimyzon succetta* (lake chubsucker)

Eric Bauer & Amanda Ranger

Song Lake is a kettle lake in central New York; with no in or outflows the lake is essentially isolated from other bodies of water. Furthermore no public boat access has saved the lake from being invaded by exotic species. Some residents have raised some concerns about the health of the fish communities of the lake after the triploid grass carp was introduced for aquatic macrophyte management. The purpose of this study was to determine if fish communities have been altered since the last fish survey of the lake was conducted in 1978 by the NY DEC. The DEC report also indicated the presence of the lake chubsucker, *Erimyzon succetta*, which is threatened in NY State and according to the DEC's website has not been reported in decades. To assess the community differences, four trap nets were set out overnight to sample the fish community, and to detect the presence of the lake chubsucker. Simpson's and Shannon's diversity indices were calculated to quantify the fish community changes. Catch per unit effort was also calculated to determine relative abundance changes between 1978 and 2010. The fish communities have changed since 1978 and gives reason to conduct further studies to determine if the changes are due to grass carp introductions. The lake chubsucker was caught but in far less numbers than in 1978. However the chubsuckers that were caught do not strictly adhere to the descriptions of the lake chubsucker and genetic analysis may be needed to determine if they are lake chubsuckers or an entirely different species of fish.

PROJECTS ON OTHER AQUATIC SYSTEMS

Habitat and food availability assessment in a private pond to determine optimum fish species for stocking efforts

Stacy Furgal

The study took place in a private pond in Williamstown, NY. The pond itself is man-made, spring fed, has a small outlet to the west branch of Fish Creek, and is surrounded by wetlands. Previous stocking efforts have taken place erratically since the pond was created. The goal of this study was to find an optimum species to stock for recreational fishing purposes. The most abundant members of the present fish community were identified, and habitat quality and food availability were accessed. Prior to the onset of the study, a list of possible species and their requirements was compiled to compare with the collected data. After examining the data, it was recommended that rainbow trout (*Oncorhynchus mykiss*) be stocked. Its temperature, oxygen, and pH tolerance ranges were well within those recorded in the study site. Appropriate food and habitat for rainbow was also found to be available. Rainbow trout are already stocked by the New York State Department of Environmental Conservation in surrounding water bodies, so if any of the privately stocked fish were to enter Fish Creek, they would not cause an unnatural disturbance. However, it is strongly suggested further data collection be done before any final decisions are made. Information was only collected during the late fall. Oxygen concentrations and water temperature in the summer months could be substantially different from those observed, altering the recommendation.

Productivity Pond Comparison Between Two Neighboring Long Island Ponds.

Erica Brown

Two neighboring ponds, Brown Pond and Thomas Pond, show visibly different productivity levels despite similar areas and proximity on the south shore of Long Island, NY. No previous studies on the ponds' ecology have been conducted. Brown Pond is dominated by large algae blooms annually in the summer, while Thomas Pond, 75 meters to the east, remains clear. The purpose of the study is to reveal what factors, abiotic or biotic, cause Brown Pond's eutrophic condition. Brown Pond could have larger nutrient inputs compared to the Thomas's Pond increasing phytoplankton biomass. To determine the cause of the algae blooms, field sampling was done for pond comparison. To study the physical parameters in the ponds a YSI mutiprobe sonde was used. Depth measurements were also taken every meter to create pond profiles and estimate the volumes of the study sites. Water samples were also taken at the surface and filtered to analyze chlorophyll a concentrations. Silica, nitrogen and phosphorus concentrations were additionally analyzed using filtered and unfiltered water samples. To compare the diversity between lakes a 50-µm zooplankton net was towed through the water column. The zooplankton were identified using a dissecting microscope. Analysis reveals that the chlorophyll a concentration was higher in Brown Pond (7.74 µg/L) compared to the Thomas Pond (5.59 µg/L). There is a high concentration of chlorophyll a implying high density algal biomass in Brown Pond verifying the water's eutrophic condition. The phosphorus levels were also doubled in the Brown Pond providing more nutrients for phytoplankton. Conductivity is higher in Brown Pond possibly due to saltwater inputs tapped by its greater depth. This input can possibly be depositing additional, algae limiting, nutrients into the system. Despite Brown Pond's eutrophic condition it still contains a lower Simpson's Diversity Index for zooplankton diversity (0.29) as compared to Thomas Pond (0.39). Limitations due to the data make it hard to say specifically how more phosphorus is available in Brown Pond.

Are Zebra Mussel Larvae Eaten by Small Fish in Jamesville Reservoir?

Elizabeth Bradshaw

Invasive zebra mussels are present in Jamesville Reservoir. Are they consumed by fish due to their high abundance, or do the fish prefer to search for less abundant, higher quality food items? Sixteen small fish were captured in six minnow traps set out along the littoral zone, and their stomach contents examined through dissection. Plankton species were also caught with a tow net and examined. No zebra mussels were found in any of the fish, with crustaceans and insect larvae the only definable food items. This suggests that small and young fish in the reservoir do not consume zebra mussels, and the presence of the invasive species has no discernable benefits for them.

Benthic Invertebrate Diversity Comparison of Tully and Crooked Lake

Nathan Felix

This study was focused on comparing the communities of two lakes near Syracuse, NY. Results from this study will show the differences in community structure and diversity (if any) between Tully and Crooked Lake. The main sampling technique was using a D-net. Distance from shore was also measured using a transect line. Simpson and Shannon-Weiner indices were used to determine species richness and evenness for the two lakes. Tully and Crooked Lake yielded similar indices.

Effect of Presence of a Great Blue Heron Rookery in a Forest Swamp in Oswego County, NY

Carol S. Hutchinson

Great Blue Herons nest in colonies of a few to over a hundred nests averaging 30 meters off the ground in wetland areas of North America. Mainly fish eaters, Great Blue Herons also prey on amphibians, reptiles, invertebrates, birds and small mammals. Returning migration occurs mid-February in the northeast, with breeding pairs re-using existing nests for many years to raise one brood of young. Incubation of eggs lasts an average of 28 days; rearing of chicks from hatch to leaving the nest is 6 – 8 weeks, and fledglings return to the nest to be fed by adults for another 3 weeks (Butler 1992). Much debris is ejected from the nest during this time, such as eggshells, feces, partly eaten prey, regurgitates and dead chicks. Addition of this biological material to the water directly below the nests supplies food for many trophic levels and contributes to the organic layer of sediment.

This study was conducted to test whether the additional nutrients from the heron waste add significantly enough to the waters below the nests to effect changes in the food web. In a wetland in Oswego County, NY, water samples were collected from directly under the nests of a heron rookery and from the beaver dam approximately 90 meters distance from the rookery. In addition, minnow traps were set out and macrophytes collected at both locations. Water samples were analyzed for pH and conductivity with the YSI Probe, as well as filtered for fluoroscopic analysis as an indication of relative algal biomass. Nutrient analysis was conducted in the lab for concentrations of Total P and N. Minnow trap captures were inconclusive for fish, but notable for amphibians and insects. Macrophytes were neither abundant nor diverse, however water collected from the sheltered area where masses of *Lemna* spp. and a red algae were found showed a remarkable variety of microscopic species, some not yet identified in our lab. As projected, the levels of Total Phosphorus and N in the water under the heron nests were approximately double those found away from the nest site. Notable as well was the difference in pH level between the two water parcels. Water under the nests showed significantly higher alkalinity than water away from the nests. This would be expected from the level of nutrient additions to the water at the rookery, however whether these effects would be distributed throughout the wetland was unknown. It is possible that fish were reduced in the rookery waters owing to reduced oxygen levels due to respiration and decomposition of the additional nest debris. The low number of macrophytes cannot return enough oxygen to the water to make a difference for fish habitat.

This sampling was conducted in late Fall when heron activity was reduced due to migration, and should be conducted again in late spring of the year when the herons are established and have hatchlings in the nests. It is possible there would be a greater diversity of macrophytes and fish species during that season to more accurately evaluate the food web of this wetland. Due to the increase in wetland areas facilitated by the recovery of beaver populations, the Great Blue Heron has become a more common part of our northern landscape. With this increase in wetland areas comes increased conflict with infrastructure development resulting in wetland mitigation banking programs. It is imperative that we continue to learn about the complex interactions of all of the species using our wetlands so that they may be replicated accurately to accommodate this diversity.