Portland Water District
Sebago Lake Watershed Monitoring Programs
Tributary Biological Monitoring

Presenting results from 1989 to 2021

Nathan Whalen, Water Resources Specialist, Portland Water District

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Introduction;

Sebago Lake is the primary drinking water supply for nearly 200,000 people in 11 Greater Portland communities. Lake water was first delivered to Portland in 1869, from an intake located in the southernmost part of the lake, referred to as Lower Bay. In 1908, the Portland Water District was chartered by the Maine Legislature to provide water services to the cities of Portland and South Portland. The water system has gradually expanded to include 11 cities and town in Greater Portland. Since its inception, the District has actively monitoring and working to protect Sebago Lake.

In 1993, the District was granted a waiver to the filtration requirements of the federal Safe Drinking Water Act (SDWA) based in part on the purity of the water and the effectiveness of watershed protection efforts. This waiver agreement requires ongoing monitoring of lake water quality. The District maintains more than 10 monitoring and surveillance programs throughout the watershed and lake. In general, as one moves closer to the intakes, more samples are collected and tested for more parameters.

This report summarizes results of the Tributary Biological Monitoring program.

Methods

The Portland Water District utilizes the sampling methods outlined in the Maine Department of Environmental Protection's manual *Methods for Biological Sampling and Analysis of Maine's Streams and Rivers*. Rock filled substrate bags are placed in the tributary streams during low flow late summer conditions. Site locations are chosen with the following attributes; representative habitat of the stream, riffle/run stream section, substrate must be submerged the entire sampling period, while avoiding; Atypical influences such as bridges or culverts, bank effects (sample middle 50% of stream) and avoiding backwater eddies. Rock bags are submerged in streams for 28 days. Insects and detritus material are collected and preserved with 70% ethanol and stored in air tight containers and refrigerated for later sorting. Insects are sorted from detritus, preserved in 70% ethanol and shipped to a professional aquatic taxonomist for species identification.

Results and Discussion

Because stream conditions change rapidly and depend on numerous factors (rainfall amounts, storm water runoff, active construction projects etc...) it can be difficult to assess stream health based on intermittent sampling of traditional water quality parameters. However, by sampling the biological community of insects, one can asses stream conditions over the entire water dependent portion of their life cycle. Insects have specific adaptations and pollution tolerance thresholds of the streams they inhabit. If sensitive organisms are found, one can be reasonably sure that the stream is healthy. If these sensitive organisms are absent and only pollution tolerant organisms are found, one can be sure that the stream is being negatively impacted.

The Maine DEP has developed a tiered aquatic life standard to quantify biological community and ultimately watershed health. Live specimens are collected; each individual insect is counted and identified to species. These data are entered into a complex statistical model to produce a "water quality class." This class (or score) represents how well the biological community compares to biological communities in natural watersheds. The scores from the statistical model (from natural to polluted) are Class A, Class B, Class, C and non attainment (N/A). Class A probabilities greater than 0.6 are given a class A final determination. However, DEP can use best professional judgment based on factors not considered by the model.

The PWD has sampled the Crooked River at various locations, the Muddy River and the Northwest River since 2001. The Maine DEP sampled the Crooked River at Edes Falls in 1989 and Rt. 118 in 1991.

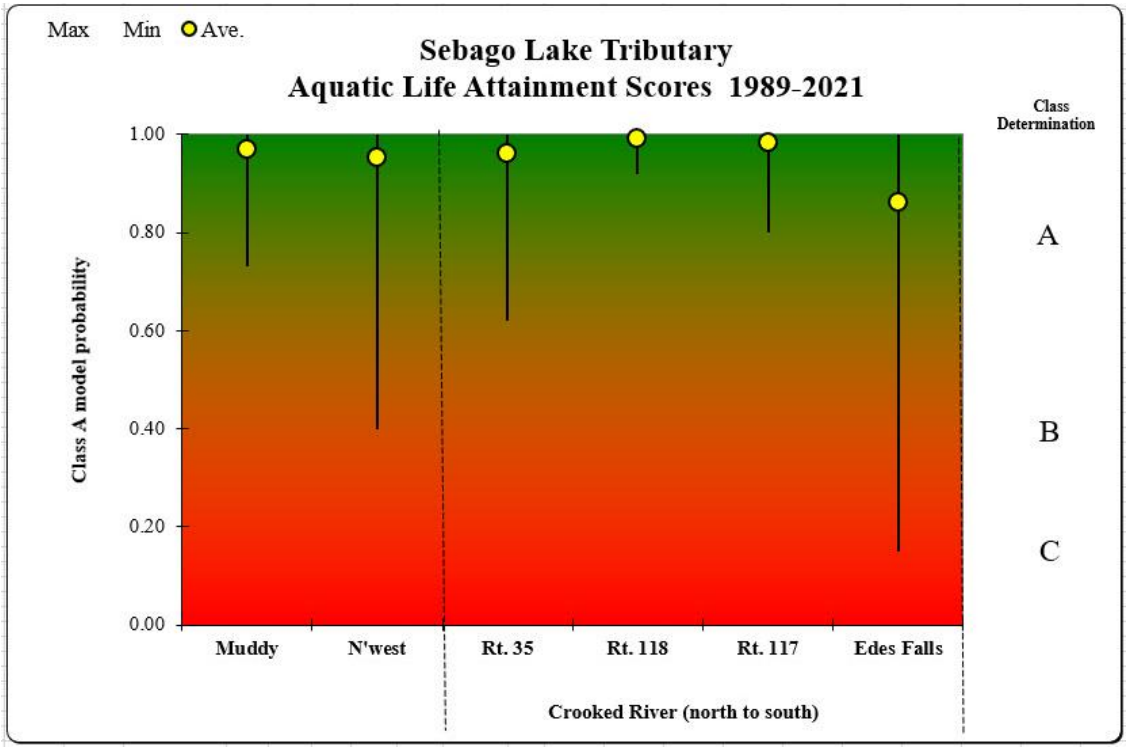
Results from the Muddy River and the Northwest River have shown a high diversity of insects with relatively low abundance of individuals. Average Class A probabilities have been > 80%. This indicates very healthy watershed conditions.

Class A Example from Muddy River 2001
Sample shows a biologically diverse assemblage of insects with a variety of functional feeding groups. Class A indicator species (stoneflies, caddisflies & mayflies) dominate with low total abundance. Class A probability score 1.00.

Results from the Crooked River have show an increase in abundance and a decrease in diversity from the northern to southern portion of the watershed. Average Class A probabilities are 0.81 at Rt. 35 (the most northern portion of the watershed) to 0.59 at Edes falls (the most southern portion of the watershed). This indicates nutrient enrichment in the system as the river nears Sebago Lake.

Enrichment is an excess of nutrients (generally phosphorous or nitrogen) that causes an increase in the abundance and a loss of diversity in the insect community. Enrichment often sounds like an improvement, but is actually a sign of pollution.

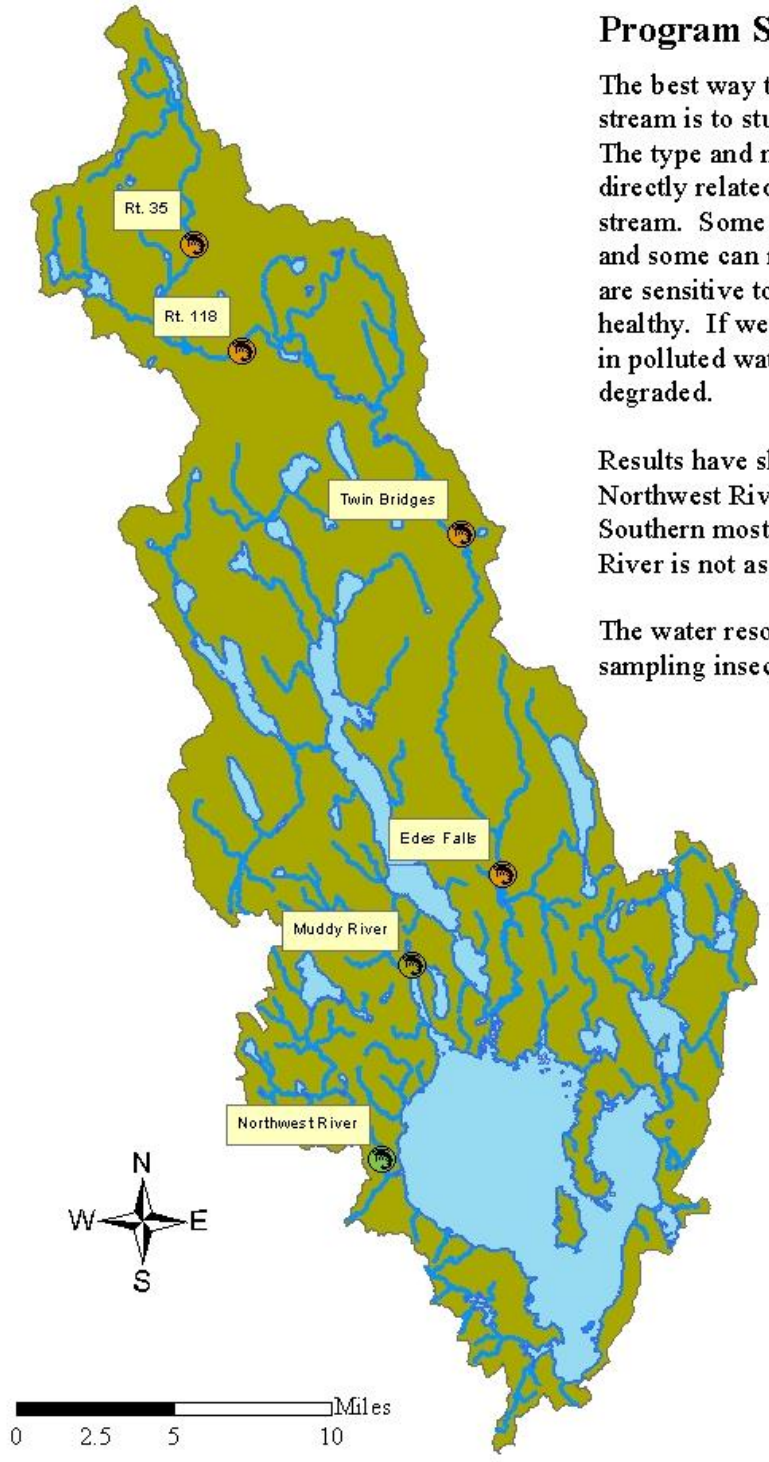
Class B Example from Edes Falls 2005
Sample shows enriched conditions with low biological diversity and a dominance of filter feeders. Class B indicator species (Midges) dominate with high total abundance. Class A probability score 0.38.



Conclusion

Overall, the Sebago Lake watershed is in excellent condition. Average scores are considered class A, "as naturally occurs." However, there have been a few sampling events that show some nutrient enrichment. Nutrient enrichment changes the number and type of bugs found in the stream. The biological community shows a shift to filter feeders and more of them. Edes falls, on the Crooked River, was rated Class B in 2005, 2015 and Class C in 2018. The Northwest River was rated Class B in 2019. Since then, all results have returned to Class A standards.

Sebago Lake Watershed Biological Monitoring Program



Program Summary

The best way to measure the health of a stream is to study the bugs that live there. The type and number of insects found are directly related to the water quality of the stream. Some bugs can tolerate pollution and some can not. If we find insects that are sensitive to pollution, the stream is healthy. If we only find bugs that can live in polluted water, then the stream is degraded.

Results have shown the Muddy River and Northwest River are very healthy. The Southern most portion of the Crooked River is not as healthy as the Northern part.

The water resource specialists will begin sampling insects in late August.