Supplementary Information
Indicator B: Stormwater
State of Casco Bay 6th Edition

References

Wehrly, Kevin E.; Wang, Lizhu; Mitro, Matthew (2007). "Field-Based Estimates of Thermal Tolerance Limits for Trout: Incorporating Exposure Time and Temperature Fluctuation." Transactions of the American Fisheries Society 136(2):365-374.

Code of Maine Rules (CMR) 2020. Surface Water Quality for Toxic Pollutants. 06-096 CMR 584. Available at the Maine DMR water quality standards page: https://www.maine.gov/dep/water/wqs/. (Chloride standards).

Maine Revised Statutes Annotated (MRSA) 2016. Standards for classification of fresh surface waters. 38 MRSA 465-A. Available at the Maine DMR water quality standards page: https://www.maine.gov/dep/water/wqs/. (Oxygen standards).

Further Reading

Interlocal Stormwater Working Group. Cumberland County Soil & Water Conservation District. (n.d.). https://www.cumberlandswcd.org/iswg.

ISWG is a coalition of 14 municipalities and two MS4 communities in the Greater Portland and Saco areas. Here you can find information about implementing the MS4 permits, annual reports, and maps.

Cumberland County Soil & Water Conservation District. (n.d.). Think Blue Maine. Retrieved from http://thinkbluemaine.cumberlandswcd.com/.

Think Blue Maine is a campaign to educate residents, businesses, and municipalities about how to reduce stormwater pollution.

Long Creek Watershed Management District. (n.d.). Retrieved from https://www.restorelongcreek.org/.

LCWMD is quasi-municipal non-profit corporation that manages stormwater pollution in the Long Creek watershed on behalf of some 130 landowners and businesses. Their mission is to restore and protect the Long Creek watershed. You can find their long-term monitoring plan and annual reports and various fact sheets about threats facing the watershed.

Minimizing stormwater pollution factsheet. Casco Bay Estuary Partnership. (2011). Retrieved from https://www.cascobayestuary.org/wp-content/uploads/2021/01/2011_cbep_stormwater_factsheet.pdf.

A fact sheet detailing the causes of stormwater pollution and potential solutions. The document, while somewhat out of date, also outlines some of Casco Bay Estuary Partnership's efforts in reducing pollution through facilitating projects, education, and monitoring.

Cooper, C.A., Mayer, P.M. & Faulkner, B.R. Effects of road salts on groundwater and surface water dynamics of sodium and chloride in an urban restored stream. *Biogeochemistry* 121**,** 149–166 (2014). https://doi.org/10.1007/s10533-014-9968-z

This study details the negative effects of road salts in an urban Maryland stream. Data was measured before, during, and after storm events to display the change in water quality. Results show that salinity levels near roads can be high enough to be unsafe for aquatic biota and human consumption.

Methods and Data Sources

Long Creek water quality data was provided directly by the Long Creek Watershed Management District (LCWMD) and GZA Geoenvironmental, Inc, the monitoring and data management contractor for LCWMD. Daily weather data from the Portland Jetport was accessed via a NOAA on-line data API. Information on the API is available here: https://www.ncdc.noaa.gov/cdo-web/webservices/v2. Geographic data on the location of the "MS4Regulated Areas" was downloaded from the Maine DEP website at (https://www.maine.gov/dep/gis/datamaps/).

Data was analyzed principally using generalized linear models (GLMs), and generalized additive models (GAMs). High frequency data from the Long Creek data loggers poses specific data analysis challenges, as sequential observations are highly correlated. To address that problem, we focused on daily median values, rather than the raw data (collected variously at 15 minute and one-hour intervals). Our analyses also incorporated an autocorrelated error (*AR(1)*) term. We explored a large number of models including terms for location, impervious cover, air and water temperature, precipitation, stream flow, recent rainfall. To account for long-term effects of weather on the stream, we ran hierarchical (mixed) models that treated the year as a random factor. Tree-based classification models proved especially helpful generating insight into relationships between multiple explanatory variables and water quality. Results reported in the Chapter are robust to reasonable alternative model selection. Detailed explanations and R code are available in the GitHub archives.

Access to data and summary of data analysis can be found at https://github.com/CBEP-SoCB. For a full archive of data and all analyses steps head to https://github.com/CBEP-SoCB-Details.