ENVIROTHON NB - AQUATIC ECOLOGY

Aquatic Ecology Study Guide

A comprehensive eight-module resource for **Envirothon NB teams** preparing for the provincial competition — covering watersheds, wetlands, water quality, macroinvertebrates, non-point source pollution, legislation, and field skills.

8	60K km	2026	May
Study modules	NB rivers & streams	Focus: NPS pollution	NB provincial competition

WELCOME

Welcome to this guide

New Brunswick is defined by water. Nearly 60,000 km of rivers and streams, thousands of lakes and ponds, extensive coastal wetlands shaped by the world's highest tides, and some of the most productive salmon rivers on Earth — this province is one of the best places in Canada to study aquatic ecology in the field.

This guide was built specifically for Envirothon NB teams preparing for the provincial competition in May. Every module is rooted in NB examples, NB legislation, and the species and watersheds you're most likely to encounter — from the Petitcodiac to the Miramichi to the Wolastoq/Saint John River.

Work through the modules in order, or jump to the areas where you need the most preparation. Each module ends with a Quick Check — use these honestly to gauge your readiness before competition day.

2026 CURRENT ISSUE — NON-POINT SOURCE POLLUTION

This year's NPS pollution focus connects directly to every other subject area — from watershed processes and wetland function, to macroinvertebrate communities and water quality legislation. Module 6 covers the full NPS story in depth, and NPS connections are woven throughout all eight modules. The oral presentation scenario will almost certainly be NPS-centred.

CONTENTS

The Eight Modules

1	**Watersheds & the Water Cycle** What a watershed is, how water moves through the landscape, stream order (Strahler method), drainage patterns, fluvial processes, and NB's major watersheds — the Saint John, Miramichi, Petitcodiac, and Bay of Fundy. `Watersheds` `Water cycle` `Stream order` `NB rivers`	Foundation
2	**Aquatic Environments & Wetlands** Lake zones and stratification, lotic vs. lentic systems, the River Continuum Concept, the six NB wetland types, riparian zone functions, coastal and estuarine environments, and the Bay of Fundy's semipalmated sandpiper spectacle. `Wetlands` `Riparian zones` `Bay of Fundy` `WAWA 2020`	Ecosystems
3	**Water Quality & Monitoring** CCME guidelines for all key parameters (temperature, DO, pH, turbidity, nutrients, E. coli), the eutrophication chain, cyanobacteria blooms in NB, the CABIN biomonitoring network, EPT richness, and field monitoring tools including the Grand Lake CyanoTracker. `CCME guidelines` `CABIN` `Cyanobacteria` `Grand Lake`	Monitoring
4	**Benthic Macroinvertebrates** Pollution tolerance groups 1–3, EPT orders in detail (mayflies, stoneflies, caddisflies), functional feeding groups, CABIN kick-net field protocol, water quality scoring methods, NB freshwater mussels, and the 2023 Zebra Mussel arrival. `EPT identification` `Tolerance groups` `Freshwater mussels` `Field protocol`	Bioindicators
5	**Fish Identification & Ecology** Thermal classification of NB fish (cold-, cool-, warm-water), species identification using diagnostic features (parr marks, vermiculations, scutes, chain pattern), anadromous vs. catadromous vs. resident life histories, conservation status of fish species at risk, aquatic invasive fish (smallmouth bass, chain pickerel, muskellunge), host-fish relationships for native mussels, and fish monitoring methods including electrofishing, smolt wheel, and eDNA. `Species ID` `Thermal groups` `Species at risk` `Invasive fish`	Bioindicators
6	**Non-Point Source Pollution ★ 2026 Focus** Point vs. non-point pollution, transport pathways, agricultural/forestry/urban NPS pollutants, the eutrophication and sediment impact chains, best management practices for all land uses, NB regulation, and the $2.3M Wolastoq federal initiative (February 2026). `Point vs. NPS` `BMPs` `Eutrophication` `Wolastoq 2026`	★ Focus topic

7	**Legislation & Water Governance** NB Clean Water Act (1989), WAWA 30 m buffer rule, Wetlands Conservation Policy, NB Water Strategy 2018–2028, federal Fisheries Act (ss. 35 & 36), SARA/COSEWIC, Canada Water Agency Act (October 2024), and Wolastoqey and Mi'kmaq water rights in NB. `Clean Water Act` `WAWA permits` `Fisheries Act` `Canada Water Agency`	Governance
8	**Field Skills & NB Exam Preparation** NB competition station format, rapid macroinvertebrate ID guide, fish species ID from photos, water quality data interpretation method, watershed mapping skills, NB species and sites checklist, oral presentation strategy (DIAG–LINK–SOLVE), master knowledge checklist, and rapid-fire NB fact sheet. `Species ID` `Data reading` `Oral prep` `Master checklist`	Capstone

NEW BRUNSWICK IN NUMBERS

Why New Brunswick?

This guide is built on New Brunswick's water story. These are some of the key facts and figures that appear throughout the eight modules — all of them worth knowing before competition day.

`60,000 km`	Approximate length of rivers and streams in New Brunswick.
`2,500+`	Lakes and ponds in NB, covering approximately 1,460 km² of surface water.
`16 metres`	Maximum tidal range of the Bay of Fundy at Minas Basin — the highest on Earth.
`75%`	Of the world's semipalmated sandpiper population stages in the Bay of Fundy each August.
`4%`	Of NB's total land area is currently classified as wetland.
`65%`	Of NB's historic salt marshes have been lost, mostly to agricultural dyking.
`$24,000/ha`	Ecosystem services value of NB wetlands per hectare per year (Nature Trust NB).
`30 metres`	Mandatory no-disturbance buffer zone around all NB watercourses and wetlands (WAWA).
`29`	Drinking water watersheds protected under NB's Clean Water Act since 2001.
`42 days/yr`	Average annual surface runoff days in Atlantic Canada — highest in Canada; nearly 4× the Prairies.
`2023`	Year Zebra Mussels were confirmed for the first time in NB (Madawaska River, August 2023).
`Oct. 15, 2024`	Date the Canada Water Agency Act came into force as a standalone federal agency.
`$2.3 million`	Federal investment in 14 NPS-focused projects in the Wolastoq watershed (February 2026).

CROSS-MODULE CONNECTIONS

How the modules connect

Envirothon rewards students who see the whole system. These are the most important cross-module connections to understand before competition day.

Watershed → Water Quality	Land use in a watershed determines what ends up in the stream. Modules 1 and 3 are two sides of the same coin — what happens on the land drives what you measure in the water.
Riparian zones → Macroinvertebrates	Remove riparian trees and you lose stream shading, CPOM leaf litter inputs, and bank stability. Module 2's riparian zone functions directly predict Module 4's EPT richness outcomes.
Fish → Bioindicators & food web	Cold-water fish like Atlantic salmon and brook trout are the biological endpoint of watershed health. Their presence or absence integrates Modules 1–6 — temperature, DO, turbidity, NPS, macroinvertebrate prey, and riparian protection all determine whether fish survive.
Macroinvertebrates → NPS evidence	Low EPT richness and high Chironomidae ratios are the biological fingerprint of NPS pollution. Module 4's field data is the evidence that Module 6's NPS impact chains are actually happening.
Legislation → BMPs	NB's WAWA 30 m buffer rule is both a legal requirement (Module 7) and the most important single BMP for controlling agricultural and forestry NPS pollution (Module 6).
Water quality → Species at risk	The decline of Brook Floater mussels, Atlantic salmon, and Wood Turtles in NB is inseparable from NPS pollution, habitat loss, and the water quality parameters covered in Modules 3, 4, 5, and 6.
All modules → Oral presentation	The oral scenario will draw on all five Envirothon subjects simultaneously. Module 8's DIAG–LINK–SOLVE framework shows you how to thread all five subjects into a coherent NPS solution.

→ **Begin with Module 1: Watersheds & the Water Cycle**