ENVIROTHON

A NATURAL RESOURCE ENCOUNTER FOR THE NEXT GENERATION

Non-point Source Pollution:

It begins at home!

Wildlife depends on clean habitat—and nonpoint source pollution threatens it.

Runoff carrying pesticides, fertilizers, oil, and sediment can contaminate food sources, nesting areas, and drinking water. Healthy wildlife populations rely on intact ecosystems where pollution is prevented before it reaches the landscape.

Aquatic systems feel the impacts first—and often the hardest.

Excess nutrients fuel algal blooms, sediment clouds water, and pollutants reduce dissolved oxygen. These changes disrupt aquatic food webs and threaten fish, macroinvertebrates, and overall stream health.

Soils & Land Use

What happens on the land doesn't stay on the land.

Soil erosion, urban development, agriculture, and construction all influence how water moves across the landscape. When soils aren't protected, runoff carries sediment, nutrients, and pollutants directly into waterways.

Forests can be pollution filters—or pollution sources—depending on management.
Well-managed forests reduce erosion, slow runoff, and protect water quality. Poor road placement, overharvesting, or lack of buffers can increase sediment and nutrient runoff into nearby streams.

Current Issue

Nonpoint source pollution is a growing challenge in a changing world.

Climate change, extreme weather, land-use pressure, and population growth are increasing runoff risks.

Today's conservation solutions rely on collaboration, science, and innovative land management strategies.

NCF Envirothon Special Topic Study Guide:

- https://envirothon.org/wp-content/uploads/2025/09/2026-Current-Issues-Part-A.pdf

- What are common Non Point Source Pollutants?

What are the common NPS Pollutants?

- Understanding what they are helps us think about where they come from and how to mitigate them.
- Here are four major categories:
  - **Sediment**: Soil particles washed from construction sites, farmlands, and eroding streambanks, clouding water, smothering habitats, and carrying other pollutants.
  - **Nutrients** (Nitrogen & Phosphorus): From fertilizers and manure, causing excess algae growth (eutrophication), leading to oxygen depletion and "dead zones".
  - **Pathogens & Bacteria**: From livestock, pet waste, and failing septic systems, posing risks to human health and wildlife.
  - **Toxic Substances**: Including oils, grease, heavy metals (lead, mercury, zinc) from urban areas, pesticides, and industrial chemicals that harm aquatic life and humans.

Nonpoint Sources Typically Discharge **Indirectly** to Waterways:

- Agriculture
- Hydromodification
- Urban Runoff
- Roads, Highways and Bridges
- Abandoned Mine Drainage
- Atmospheric Deposition
- Marinas and Boating
- Timber Harvest
- Septic System

Point Sources Typically Discharge **Directly** to Waterways:

- Factory
- Wastewater Treatment Plant
- Stormwater Discharge

Hydrologic Cycle:

- Overland Flow
- Infiltration
- Groundwater Flow
- Transpiration
- Evaporation
- Rainfall
- Aquifer

Water Cycle and Biochemical Cycles

- Understanding the Water Cycle
- Understanding function and disruption of Nutrient Cycles
  - Carbon Cycle
  - Phosphorus Cycle
  - Nitrogen Cycle

Watershed Hydrology and Geomorphology

How do these affect the way water moves in a watershed?

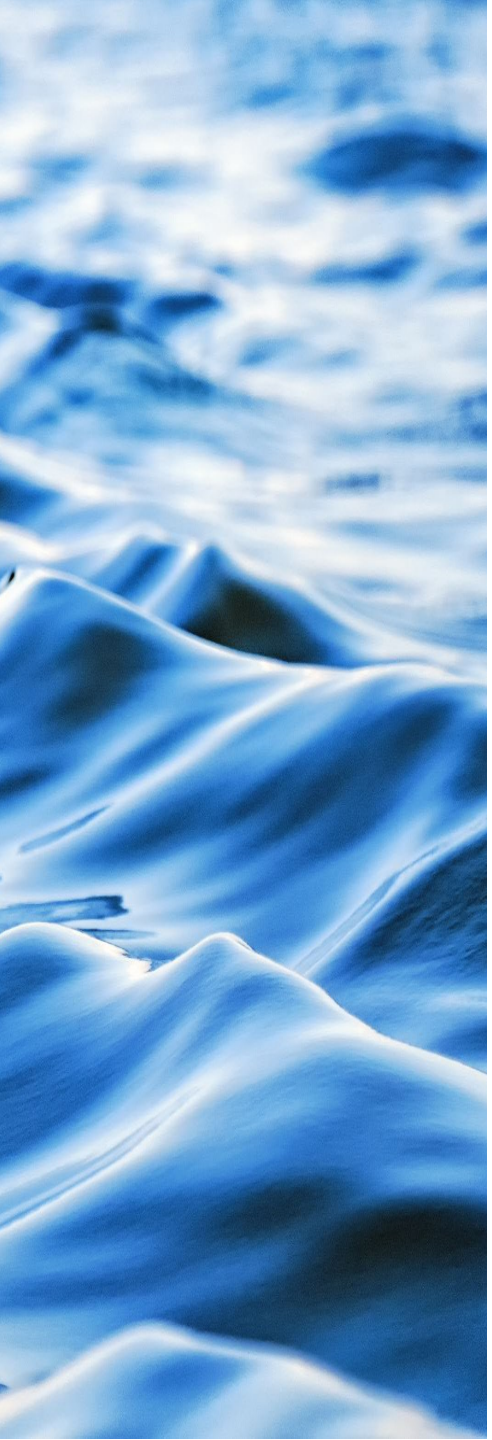
How does add to or mitigate non point source pollution?

US EPA Clean Water Act

Designated Uses- “those uses specified in water quality standards for each water body or segment whether or not they are being attained. Each DU is protected by an associated level of water quality.

These criteria are essential when implementing key CWA requirements such as effluent limitations for point source dishchargers in NPDES permits under CWA Section 402 and TMDL for waters not meeting applicable WQS under CWA Section 303(d). 303(d) specifies that states will compile a list of impaired waters.

What are TMDL’s and what are some common threshholds?



TMDL

- A TMDL (Total Maximum Daily Load) is the EPA-regulated limit on the total amount of a pollutant a waterbody can receive daily and still meet water quality standards, developed by states for impaired waters, setting pollution caps for point/nonpoint sources. Common thresholds aren't fixed numbers but derived from Water Quality Standards (WQS) for specific pollutants (e.g., bacteria, nutrients, metals) and can be expressed as concentrations (like E. coli counts) or loads (like pounds of phosphorus per day), often incorporating seasonal variations or allowances for wet/dry weather.
- What is a TMDL?
- Definition: A science-based calculation of the maximum daily pollutant load a water body can handle without violating water quality standards (like safe drinking, fishing, or swimming).
- Purpose: To restore water quality in "impaired" waters listed under Section 303(d) of the Clean Water Act.
- Components: Includes allocations for point sources (factories, stormwater), nonpoint sources (runoff), a margin of safety, and potentially reserve amounts.

Key Examples in Nebraska

- Niobrara River Basin TMDL (E. coli): A significant TMDL focused on bacteria in several tributaries, submitted in 2005 and approved, with goals to improve water quality for contact recreation by reducing bacterial loads.
  - A common TMDL threshold for E. coli in rivers for recreation uses two criteria: a geometric mean of 126 cfu/100mL (over 30 days) from multiple samples, and a single sample maximum (acute) not exceeding 235 cfu/100mL
- Fremont Lake Phosphorus TMDL: Implemented a treatment with aluminum sulfate (alum) to control excessive phosphorus and prevent harmful algal blooms, keeping beaches open for swimmers.
- Pawnee Reservoir Sediment TMDL: Addressed sediment pollution in the reservoir, a common issue in Nebraska's lakes and reservoirs.

TMDL- Total Maximum Daily Limit

- Common Pollutants Addressed
  - Sediment: Affects clarity, habitat.
  - Nutrients: Nitrogen & Phosphorus (cause algae blooms, low oxygen).
  - Bacteria/Pathogens: E. coli, impacting recreation.
  - Metals: Mercury, copper, etc..

TMDL

- Common TMDL Thresholds & Implementations
- Numeric Criteria: Direct limits, e.g., E. coli geometric mean of 126 colonies/100mL for recreation.
- Mass-Based Limits: Pounds of phosphorus per day (e.g., for nutrient-sensitive lakes).
- Seasonal/Weather-Based: Different limits for wet vs. dry seasons or days (e.g., nitrogen limits for winter).
- Allowable Exceedance Days: For bacterial impairments, defining how many days per year a beach can exceed standards, often compared to natural reference beaches.
- Modeling & Allocation: Uses models (mass balance, water quality) to translate these targets into specific actions for dischargers (NPDES permits for point sources) and management practices (for nonpoint sources).
- Essentially, the "threshold" is the numeric or narrative water quality standard, and the TMDL is the total loading calculation and allocation plan to reach and maintain that standard.

Urban Runoff

What is it and how does it affect NPS pollution?

How can we mitigate it?

Why do urban areas increase NPS pollution overall?

LID: Low Impact Design

Agricultural Runoff

How do agricultural practices add to NPS Pollution?

What can we do about it?

Study aspects and elements of LID Low Impact Design to mitigate Urban Runoff

- In the back of the study guide: EPA Revising Local Codes to Facilitate Low Impact Design
- Stormwater Infiltration Trench
- Stormwater Retention Areas
- Parking Lot Island with curb cuts
- Permeable Pavers
- Vegetated rain gardens and features that catch rainwater before it goes to the stormwater drains and nearby creeks.

LID Elements