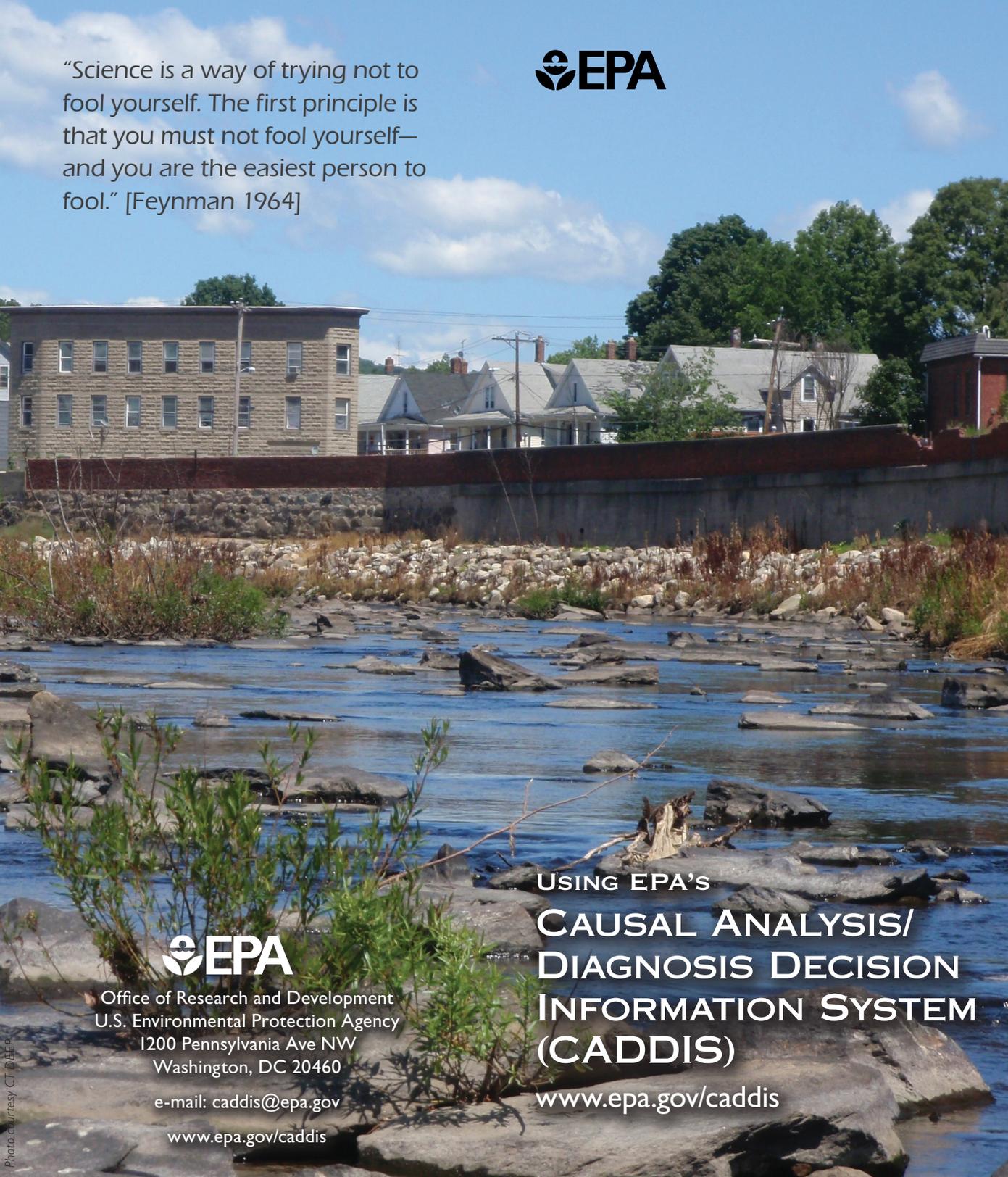## Why Is A Body of Water Impaired?

To help assessors identify possible causes of biological impairment of our waters, the U.S. EPA developed the CADDIS methodology and this web site. It is critical that causes be identified so that management efforts such as Total Maximum Daily Load (TMDL) calculations can be implemented and waters can be restored.

Photo courtesy USGS

"Science is a way of trying not to fool yourself. The first principle is that you must not fool yourself— and you are the easiest person to fool." [Feynman 1964]

Photo courtesy CT DEEP

Using EPA's

Causal Analysis/ Diagnosis Decision Information System (CADDIS)

www.epa.gov/caddis

What is CADDIS?

Causal Analysis/Diagnosis Decision Information System (CADDIS) is a web-based application that provides guidance, tools, and useful information for identifying causes of degradation of streams, rivers, and other bodies of water. The web site contains a detailed explanation of the causal assessment framework; a library of sources, stressors, and responses; case examples; data analysis tools; and a literature database.

Why was it developed and where can it help?

Thousands of bodies of water in the United States are biologically degraded, many by unknown causes. Causes must be identified so that management efforts can be implemented and waters can be restored.

CADDIS can assist with Clean Water Act implementation and other management efforts, such as:
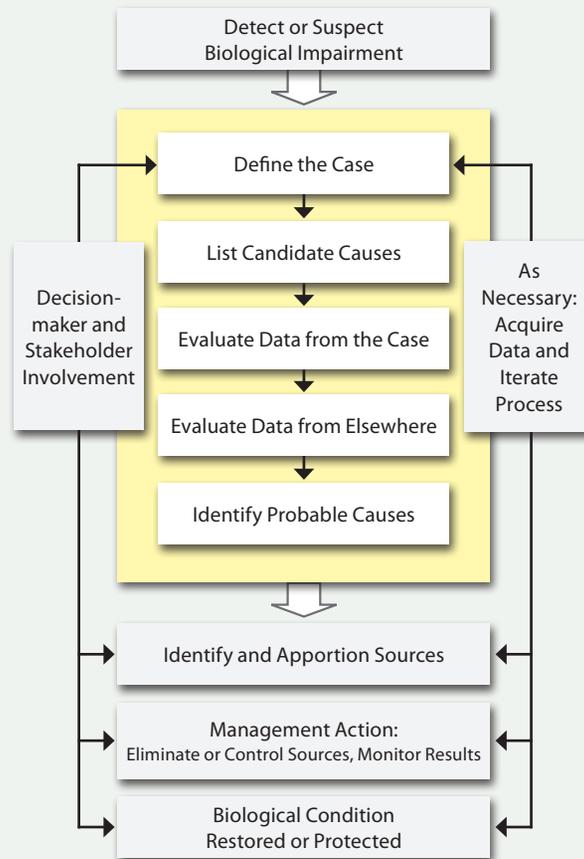
- More accurately identifying the causes of impairment in 305(b) reporting
- Accurately identifying the cause(s) of water quality standards violations for 303(d) listing and Total Maximum Daily Load (TMDL) calculations
- Prioritizing stressors for control, remediation, and restoration.

Why use CADDIS in TMDL development?

Before the TMDL process can be used to formulate appropriate management actions, the cause of impairment must be determined. TMDLs may require costly retrofits, thus the identified causes of impairment must be scientifically defensible. Defensibility requires knowledge of causal pathways by which stressors affect ecosystems, and understanding of symptoms and stressor-response relationships. CADDIS provides assessors with necessary knowledge to appropriately identify the pollutants causing the degradation.

Methodology

The causal assessment framework follows the step-by-step process outlined in the diagram below.

This framework:

- Provides scientifically defensible and reproducible evaluations
- Prevents biases and other lapses of logic
- Identifies causal relationships that are not immediately apparent
- Increases confidence that management efforts can improve biological condition.

CADDIS web site
WWW.EPA.GOV/CADDIS

The CADDIS web site contains information on all aspects of the causal assessment process. It is organized into five volumes:

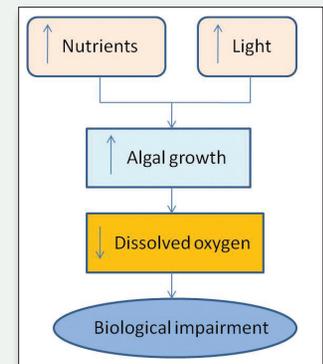**Volume 1** explains the causal assessment framework.

Volume 2 describes common pollutants (nutrients, metals, herbicides, etc.) including their origins and effects. Relationships among sources, stressors, and biotic responses are described in conceptual diagrams.

Volume 3 includes case studies and examples of techniques, methods, and tools. A recently added feature allows users to click on locations on a map to view details about case studies.

Volume 4 houses downloadable software, tools, and scripts for use in analysis of data.

Volume 5 contains a literature database (CADLit) and the Interactive Conceptual Diagram (ICD) Tool, which allows users to create conceptual diagrams for their causal assessments, and then link supporting literature to those diagrams.

Example of a conceptual diagram. Conceptual diagrams describe relationships among sources, stressors, and biotic responses useful for identifying potential causes.