Rhode Island
2005 Envirothon

Aquatics Training

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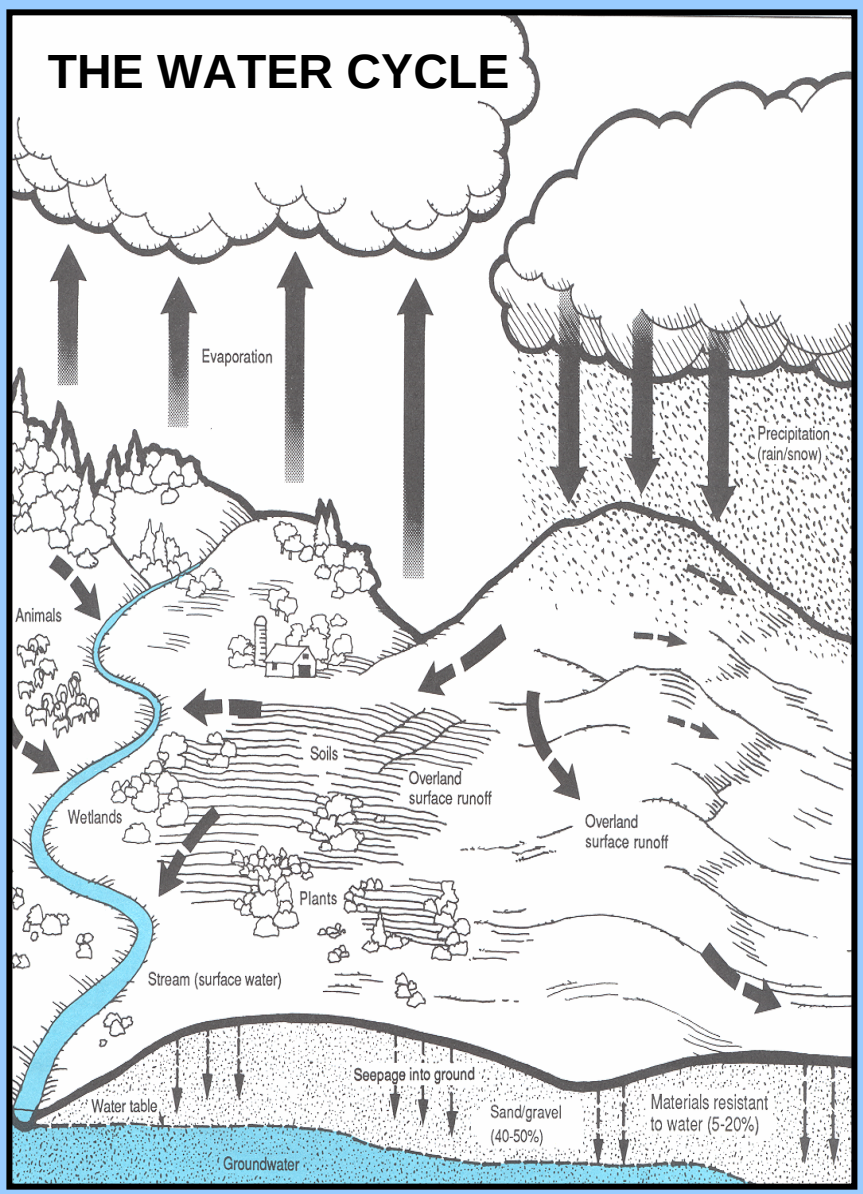
Main Topics -- Aquatics Rhode Island Envirothon, January 2005

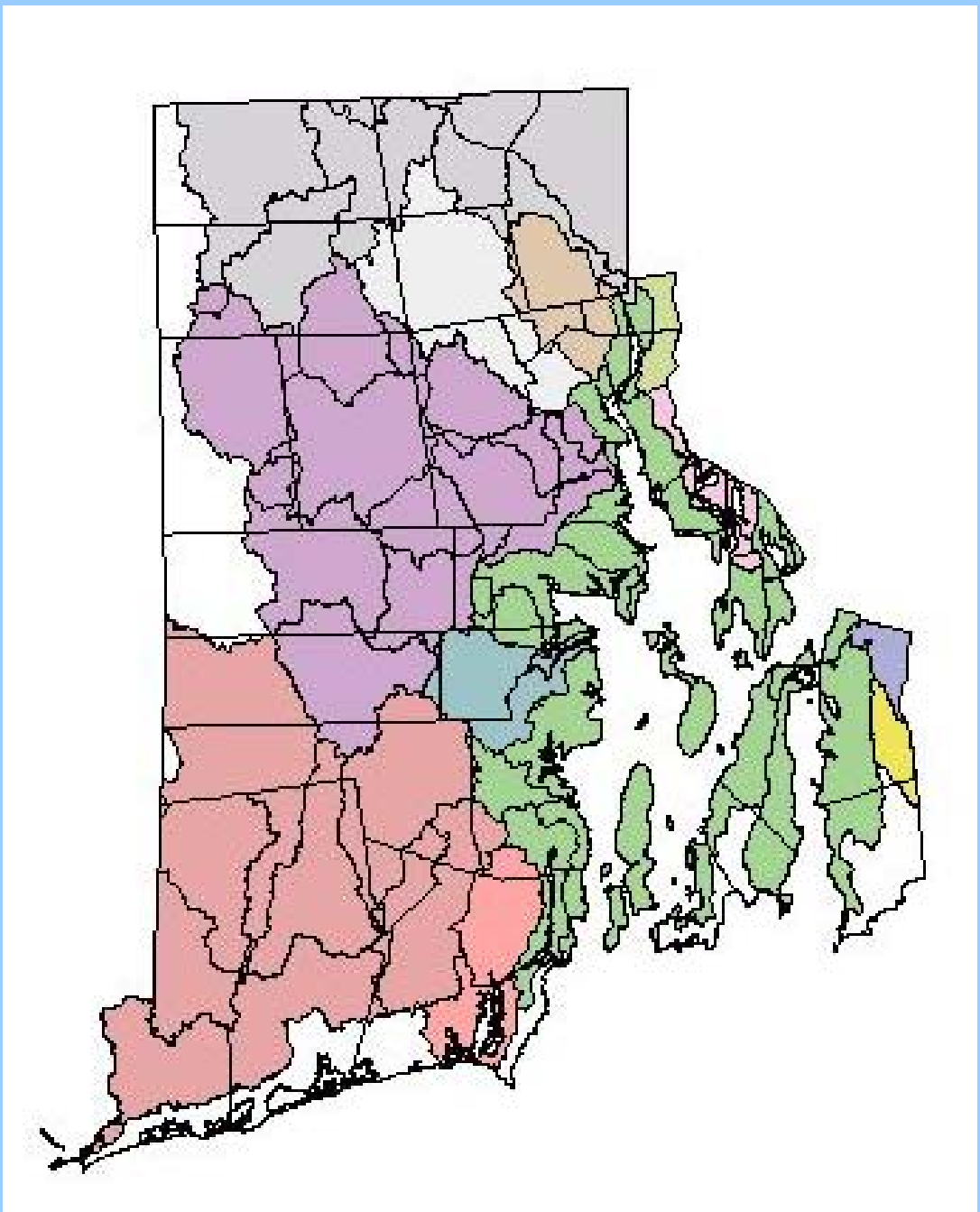
- Water Cycle, watersheds & aquifers
- Delineating a watershed boundary
- Chemical and physical properties of water
- Aquatic ecosystems, organisms & water quality monitoring
- Function and value of wetlands and riparian areas
- Land use and water resource protection and classification
- Water conservation and competing uses of water
- Agencies and major laws responsible for protecting water resources

What is a WATERSHED?

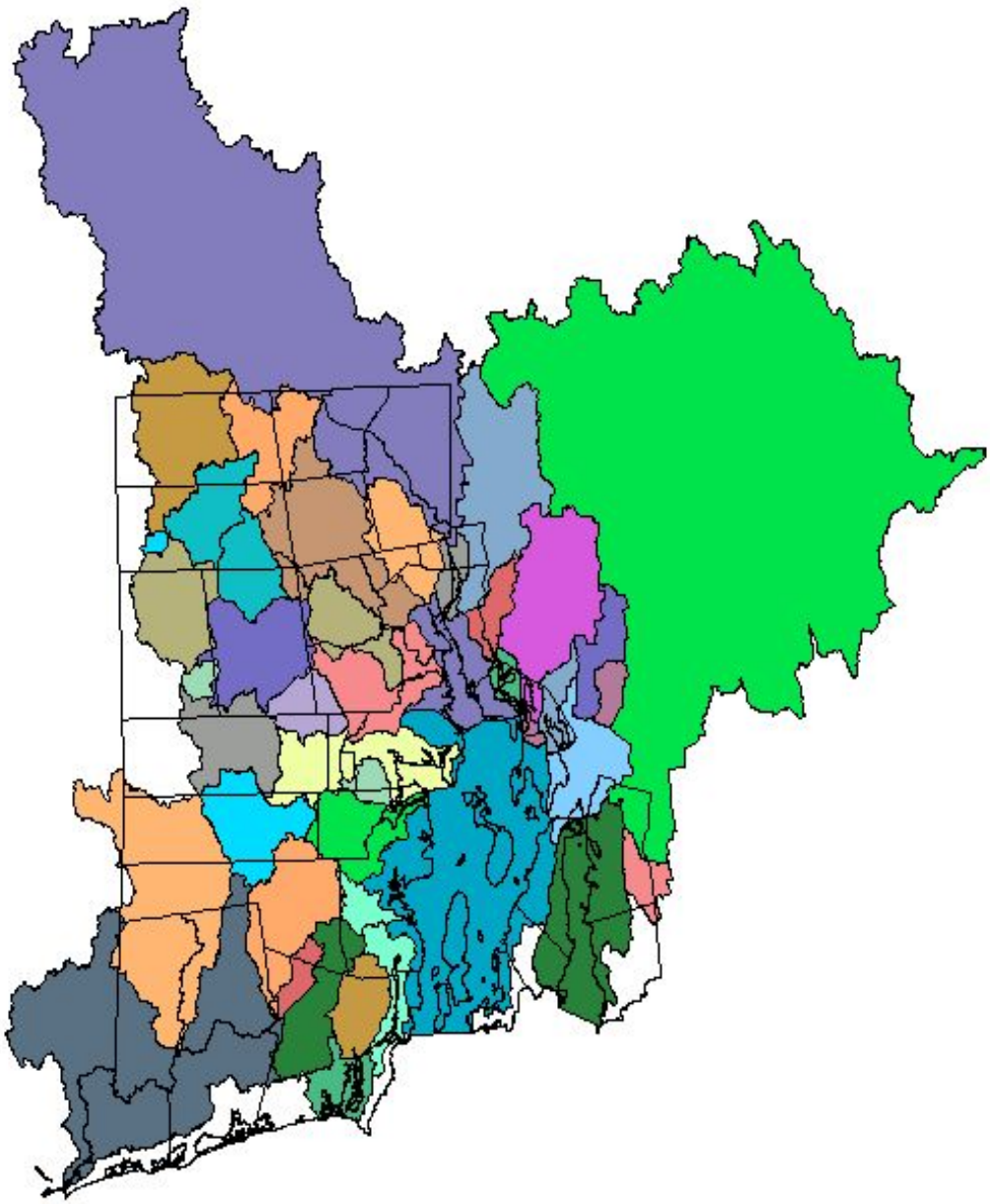
- **The lands that drain to or contribute water to a body of water.**
- **Most of the precipitation that falls on this land drains to the water body.**
- **Groundwater is part of the Watershed.**



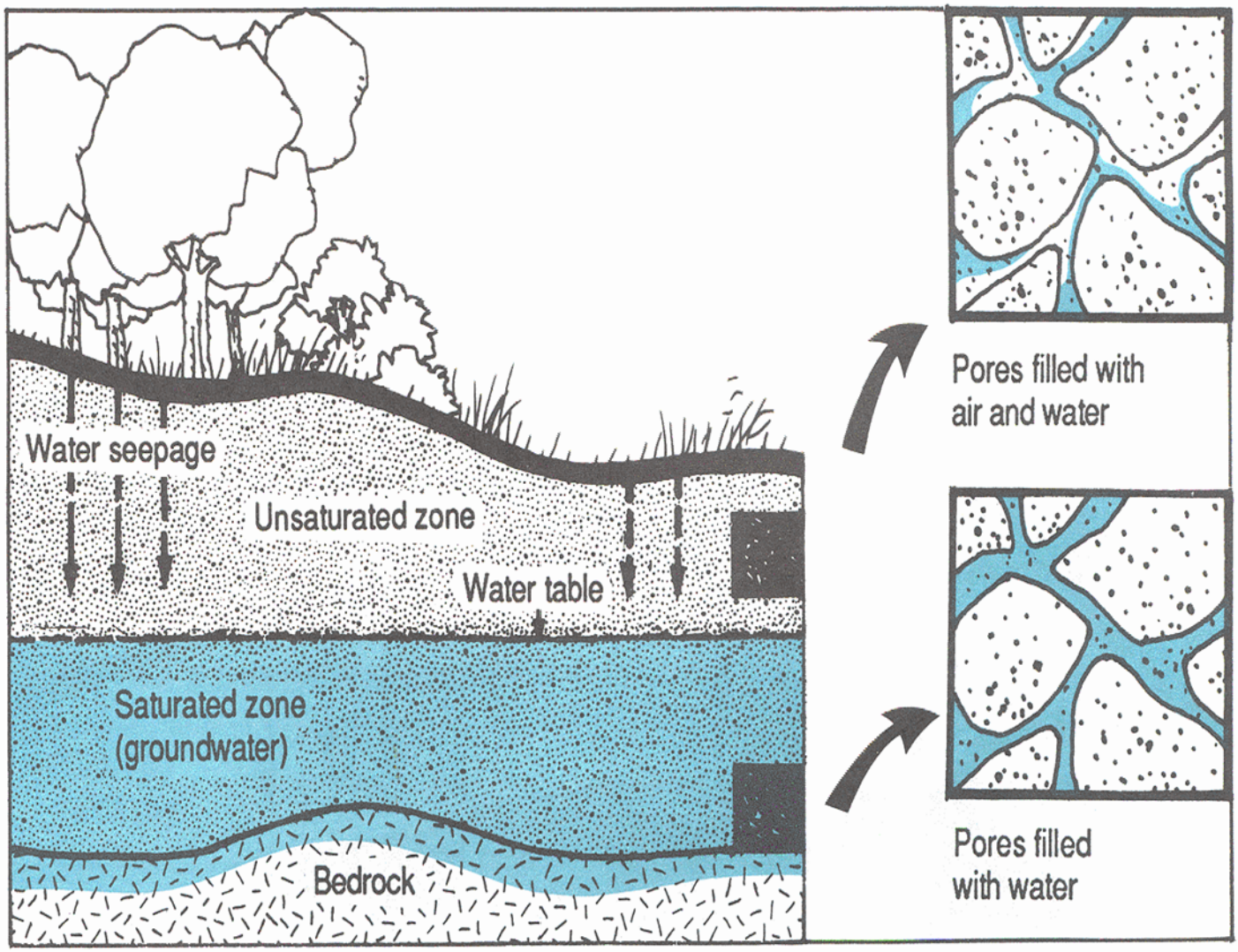
Main Rhode Island Watersheds



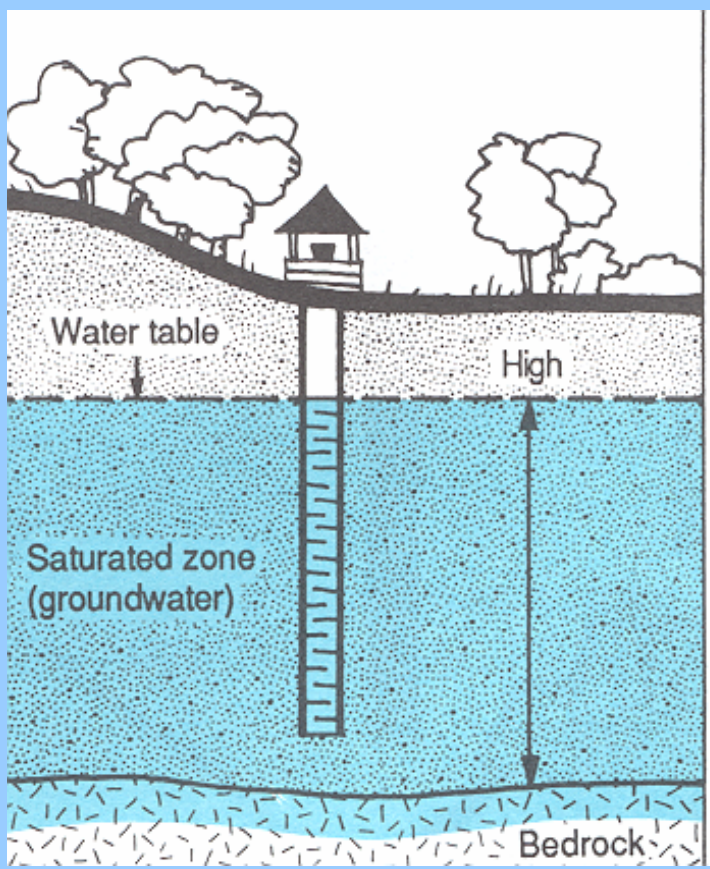
Rhode Island Sub-Watersheds

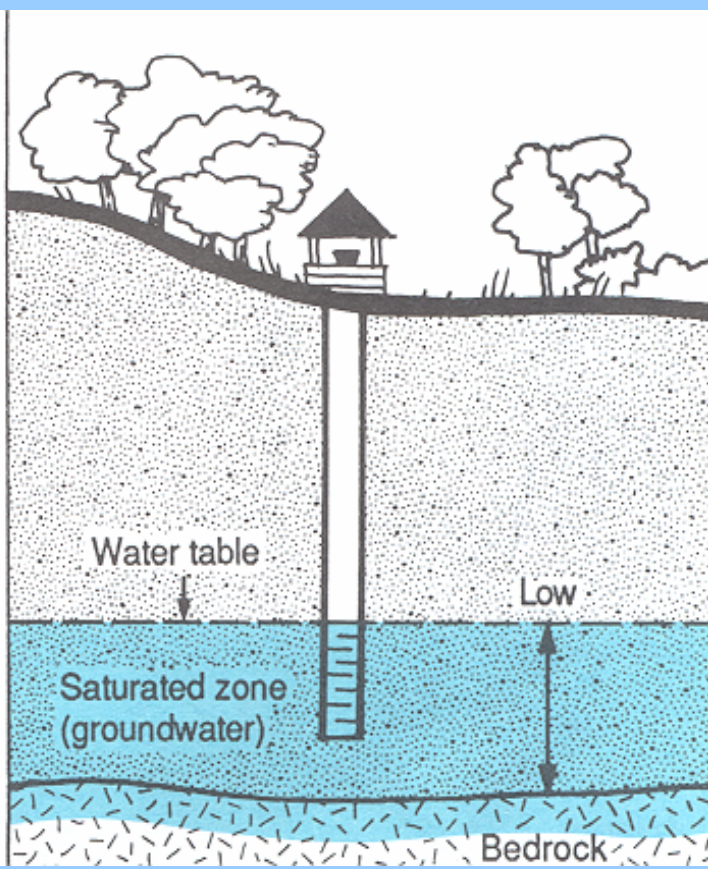


Saturation Zone



The water table fluctuates





Key Definitions

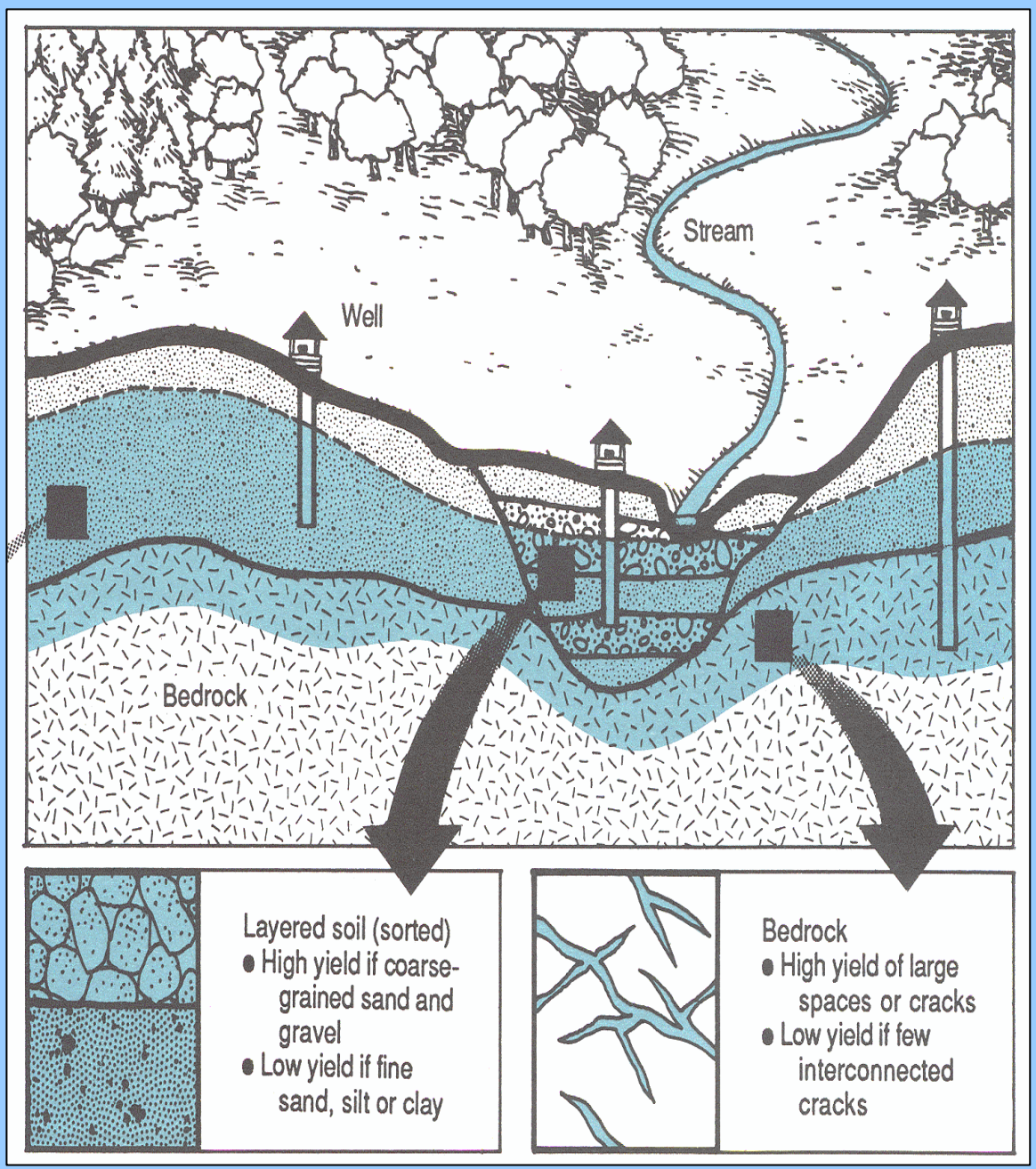
Aquifer – Any soil or rock formation capable of holding and yielding groundwater.

Sand-and-Gravel Aquifer – Sorted layers of sand and gravel. More uniform pore spaces. Highly permeable and productive.

Till Aquifer – Unsorted layers of materials. Pore spaces are less uniform in size. Not very permeable or productive.

Bedrock Aquifer – Fractures in bedrock filled with water. Productivity defined by how connected and large the fractures are.

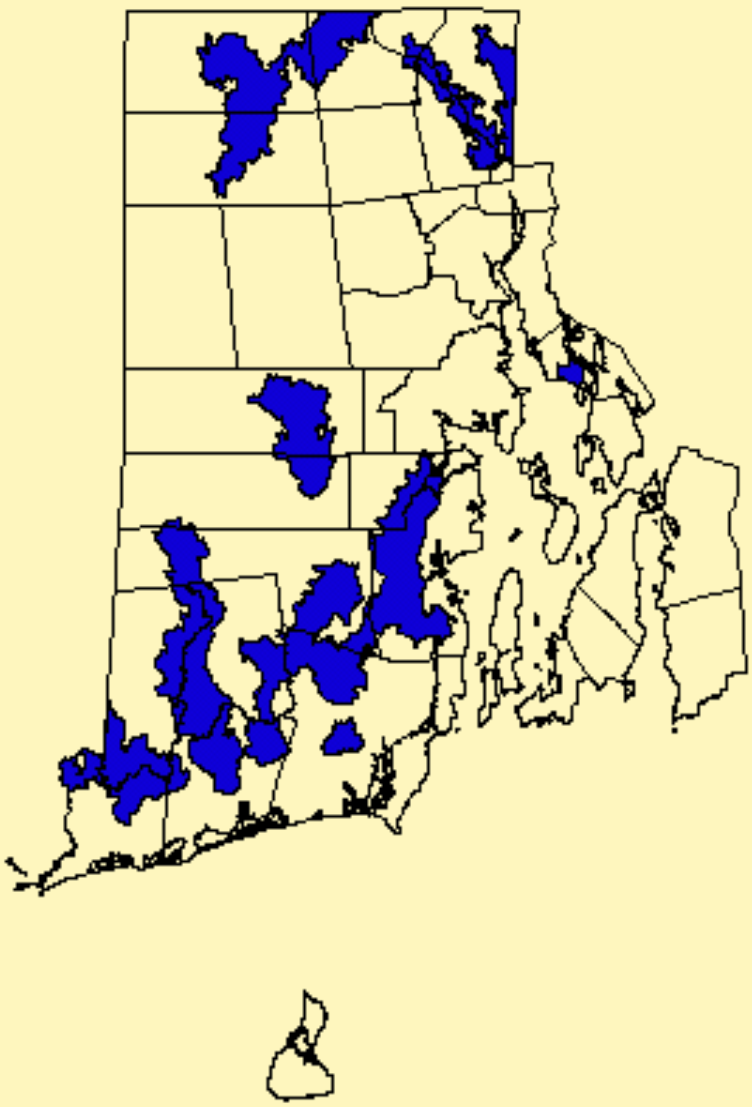
Aquifers



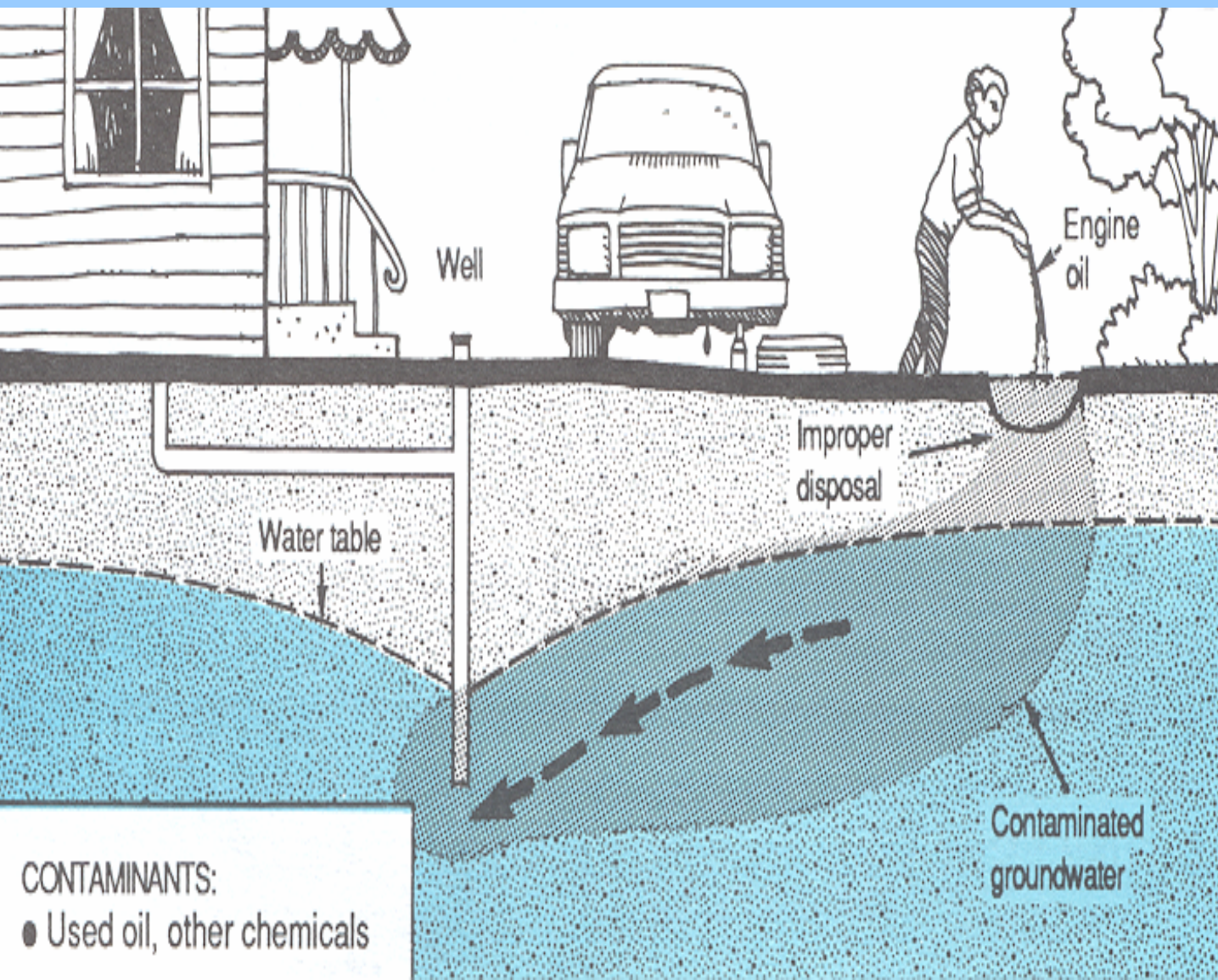
Water-bearing soil and rock beneath the earth's surface.

Groundwater is recharged from above, from areas of the land that have permeable soil.

RI's Principle Groundwater Resources



Groundwater Contamination



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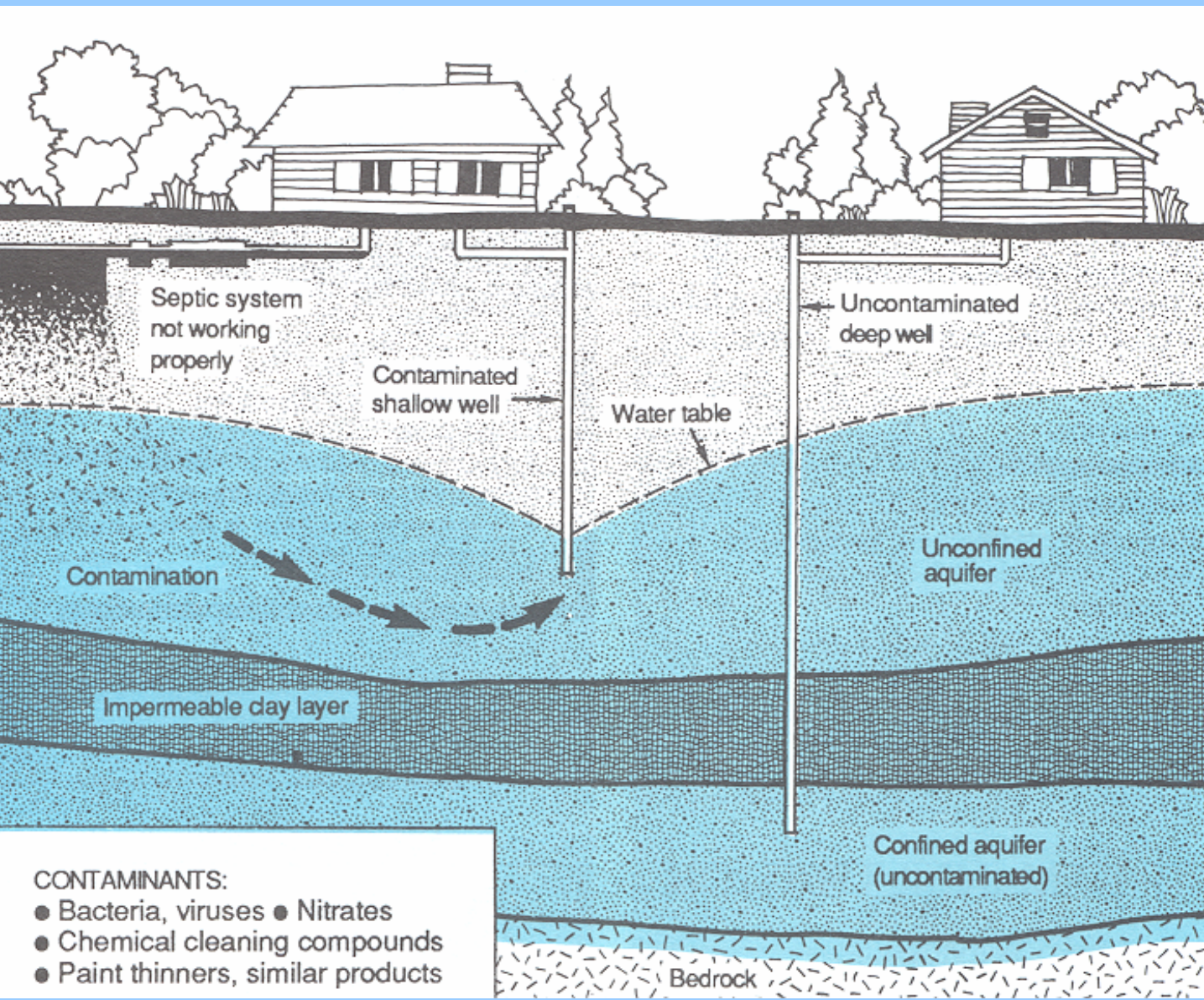


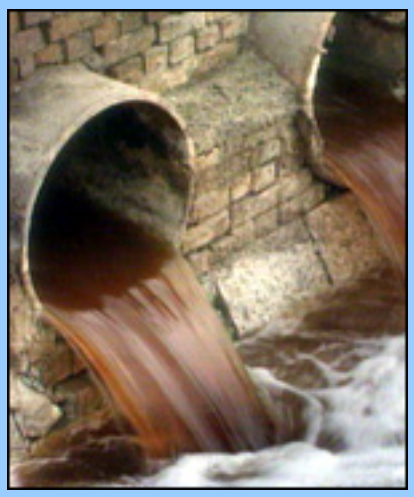
Water quality is affected by what happens on land.

Our everyday activities.

Types of Pollution:

Point Source and Nonpoint Source

Point Source Pollution



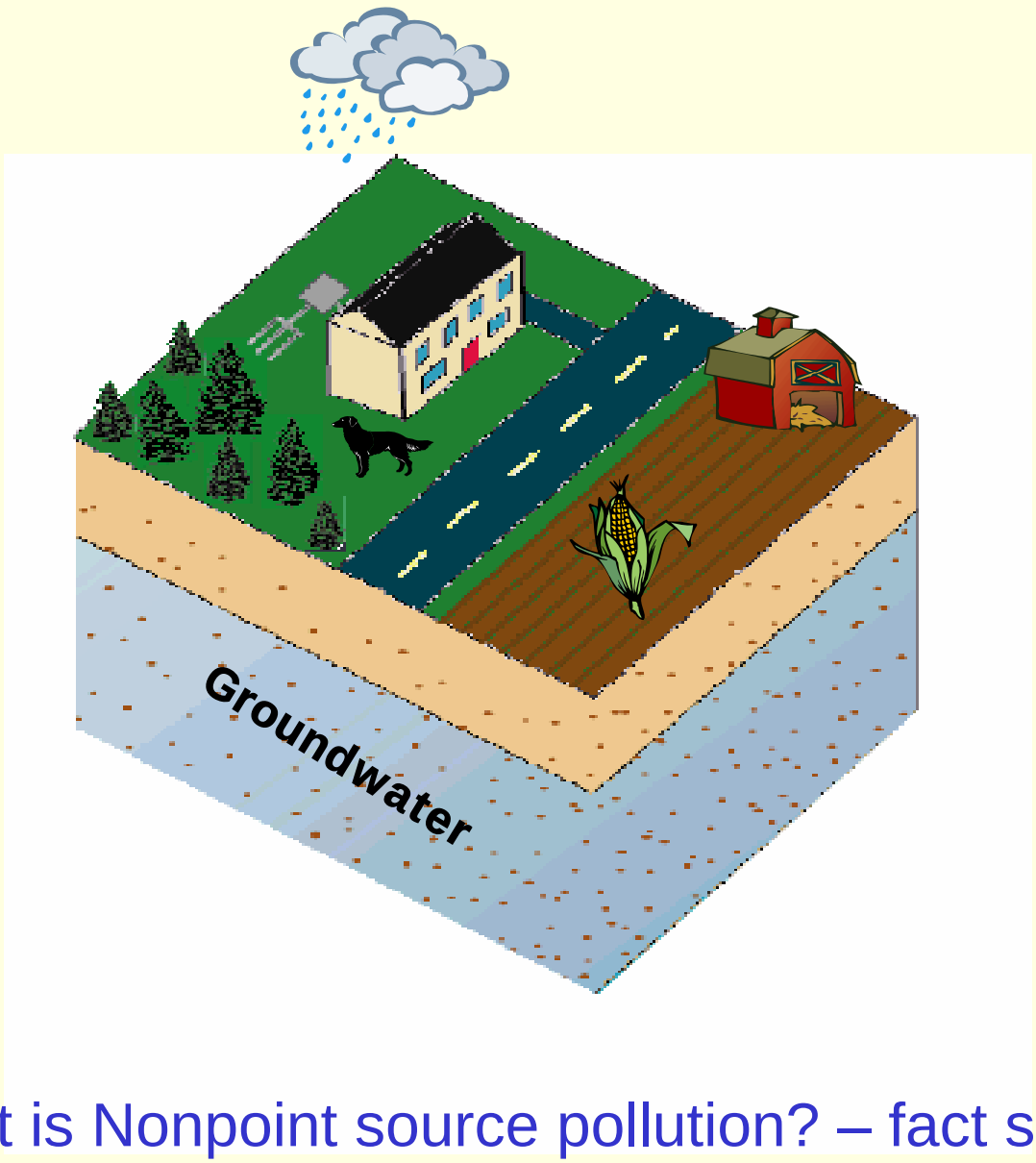
sewage treatment plant discharge

Pollution to a water body that originates from a clearly defined point, channel, or conduit.

Clean Water Act regulates point source pollution discharge. RI Department of Environmental Management regulates at state level – RI Pollutant Discharge Elimination System – see website link

Nonpoint Source Pollution

Pollution that originates over widespread diffuse areas of the landscape. Pollutants travel in runoff or soak down into the groundwater with precipitation.



What is Nonpoint source pollution? – fact sheet

Nonpoint Source Pollution Prevention

- Depend on individual, voluntary "good housekeeping practices" – see our Home*A*Syst Program Handbook and website for more info
- RI DEM Community Nonpoint Source Pollution Management Guide
- Grants to fund education and other watershed programs
- Local ordinances and programs – examples include groundwater overlay ordinances, septic system management ordinances

What Pollutants Impact Water Quality?

Pathogens - Bacteria, viruses, parasites & other microorganisms cause disease. Boil water advisories, shellfishing areas and beaches closed.

Sources: septic systems, sewage discharge, leaky sewers, animal waste

Nutrients - Nitrogen & Phosphorus, promote algae blooms in surface waters – Greenwich Bay Fish Kill. Nitrate-nitrogen is a drinking water contaminant.

Sources: septic systems, sewage discharge, leaky sewers, animal waste, compost, fertilizers

What Pollutants Impact Water Quality?

Sediments/Road Salts – soil erosion from areas with exposed soils, road and urban runoff

Salinity affects aquatic ecosystems and drinking water. Sediments make water cloudy and turbid, affecting aquatic life and drinking water quality. Sediments may have pollutants attached – especially Phosphorus.

Heavy Metals – industrial sites, landfills, auto salvage yards

Toxic – health risks

Other Hazardous Chemicals & Products -- gas, oil, petroleum products, pesticides, solvents, paint thinner & other cleaning products

Toxic – health risks

Greenwich Bay Fish Kill

August 2003

http://www.state.ri.us/dem/pubs/fishkill.pdf

Lack of oxygen due to algae bloom (excess Nitrogen). Both point and nonpoint sources of nitrogen contributed to the algae bloom

Riparian Buffers

They are critical for:

- **Providing shade along shorelines, keeping water temperature cooler**
- **Filtering pollutants in surface runoff and subsurface flows**
- **Improving and restoring terrestrial and aquatic wildlife habitats**

Shoreland Buffers and WQ Protection – fact sheet

URI Watershed Hydrology Laboratory – website

Lack of Adequate Riparian Buffers

Ideal Riparian Buffers

FEDERAL CLEAN WATER ACT

- 1972, amended in 1977, 1981, and 1987
- Objective: Restore & maintain chemical, physical, & biological integrity of nation's waters.
- Gave EPA authority to implement pollution control programs, ex. setting wastewater standards for industry.
- Established basic structure for regulating discharges of pollutants into US waters.
- Continued requirements to set water quality standards for all contaminants in surface waters.
- Made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless permitted.
- Funded construction of sewage treatment plants & recognized need for planning to address critical problems posed by NPS pollution.
- In Rhode Island, DEM in charge of implementing rules & regulations of Clean Water Act – see DEM website links on water resource assessment reports & classification.

FEDERAL SAFE DRINKING WATER ACT

- **1974, amended in 1986, 1988, and 1996.**
- **Authorizes EPA to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants in public drinking water.**
- **Passed to protect public health by regulating nation's public drinking water supply.**
- **Does not regulate private wells that serve fewer than 25 individuals.**
- **In Rhode Island, Dept. of Health is in charge of implementing the rules and regulations of the Safe Drinking Water Act.**

DEM Freshwater Wetlands Act

- April 1998, amended 2001
- Purpose: Preserve, protect, and/or restore purity and integrity of all freshwater wetlands so that they shall be available for all beneficial uses and thus protect the health, welfare, and general well being of the population and the environment
- Limits cutting and clearing of vegetation
- Limits maintenance and repair activities
- Limits demolition, additions, or repairs to existing structures
- Maintains authority over any activity that could be held inside the boundaries of freshwater wetlands
- http://www.state.ri.us/dem/pubs/regs/regs/water/wetlnd98.pdf

Coastal Resources Management Council - Jurisdiction

- Created in 1971 by the Rhode Island General Assembly
- Environmental regulatory and management agency
- Responsible for preservation, protection, development, and restoration of coastal areas
  - Has regulatory authority over area extending from territorial sea limit, 3 miles offshore, to 200 feet inland from any coastal feature.
  - Natural features such as coastal beaches and dunes, barrier beaches, coastal wetlands, cliffs, bluffs, and banks, rocky shores, and manmade shorelines all have an extended contiguous area of 200 feet from their inland borders under authority of Council.
  - Cultural features of historical or archaeological significance are within jurisdiction of Council.

Rhode Island

Private Well Legislation

- Law Passed During Summer 2002 Session
- Requires Drinking Water Standards/Guidelines for Private Well Water
- Requires Testing of New Wells Beginning 7/03
- Requires Testing Upon Sale of Existing Homes Beginning 7/06
- Delays in Implementation of Regulation are Expected

Rhode Island
Private Well Legislation

- **Testing for 8 parameters required - Coliform Bacteria, Nitrate, Nitrite, Iron, Manganese, Lead, Fluoride and Turbidity**
- **Town May Require More Analyses**
- **HEALTH Will Create Web Page Showing Known Areas of Contamination**
- **http://www.rilin.state.ri.us/billtext/billtext02/housetext02/h6789.htm**

Regulating Local Land Use

Cities and Towns can develop more stringent rules to protect water quality

- **Wetlands**
  - **South Kingstown**
- **Septic System Management**
  - **Charlestown**
  - **South Kingstown**
  - **Glocester**
- **Aquifer Protection Overlay Districts**
  - **South Kingstown**
  - **North Kingstown**
- **Zoning Ordinances**