



**Jacques Whitford**

**GROUNDWATER SUPPLY,  
MANAGEMENT and PROTECTION**

**By Dr. Scott Schillereff, P.Geo.**

**SAFE DRINKING WATER CONFERENCE**

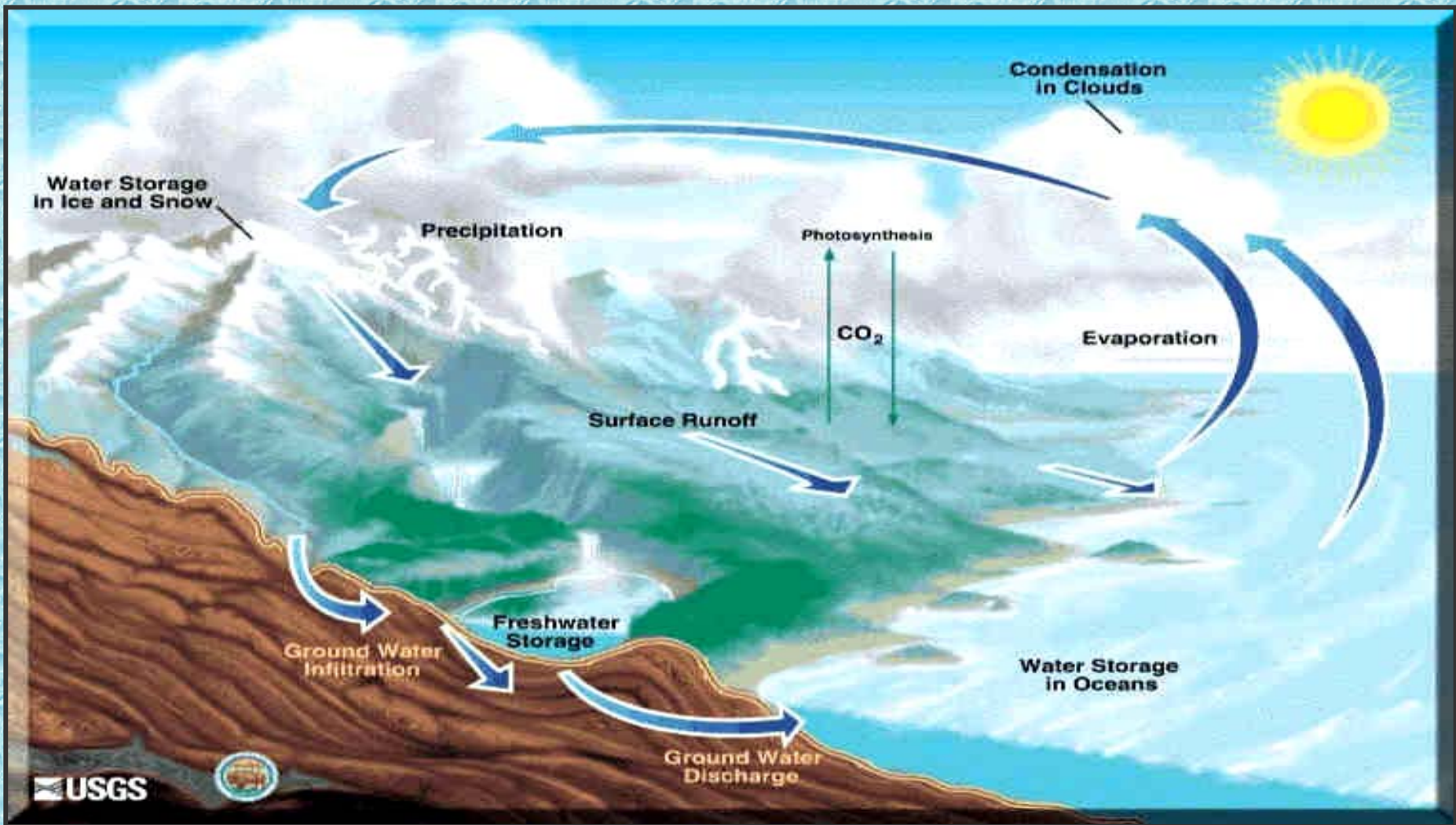
*Gander, NF - March 26-27, 2001*

# KEY WATER SUPPLY ISSUES:

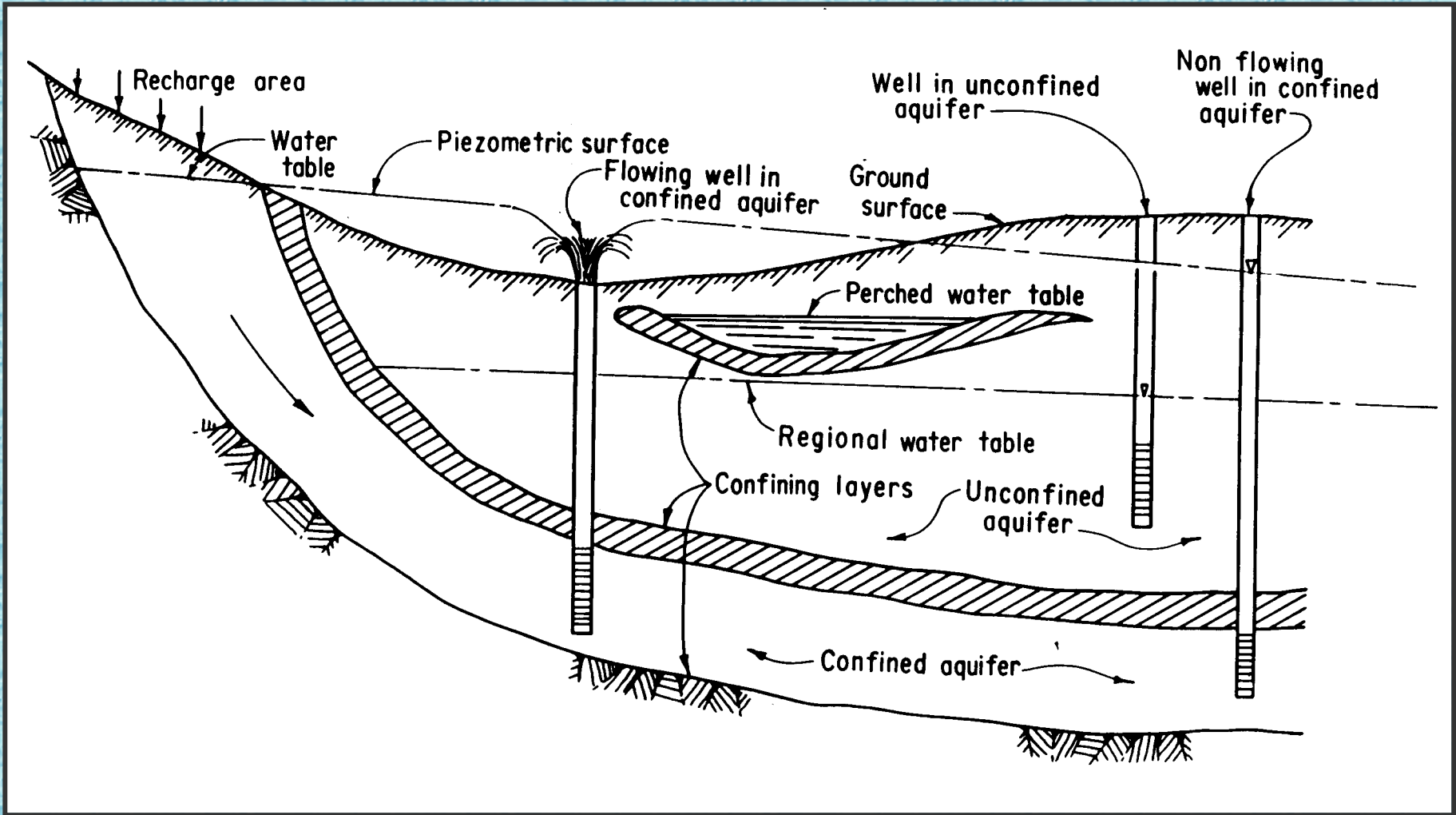
- QUANTITY
- QUALITY
- PROTECTION
- MANAGEMENT



# HYDROLOGIC- HYDROGEOLOGIC CYCLE



# TYPES of AQUIFERS



# GROUNDWATER SUPPLY OPTIONS

- Drilled Wells
  - Open Hole (Bedrock)
  - Screen (Sand & Gravel)
- Dug Wells (Glacial Till)
- Infiltration Galleries (by rivers)
- Springs

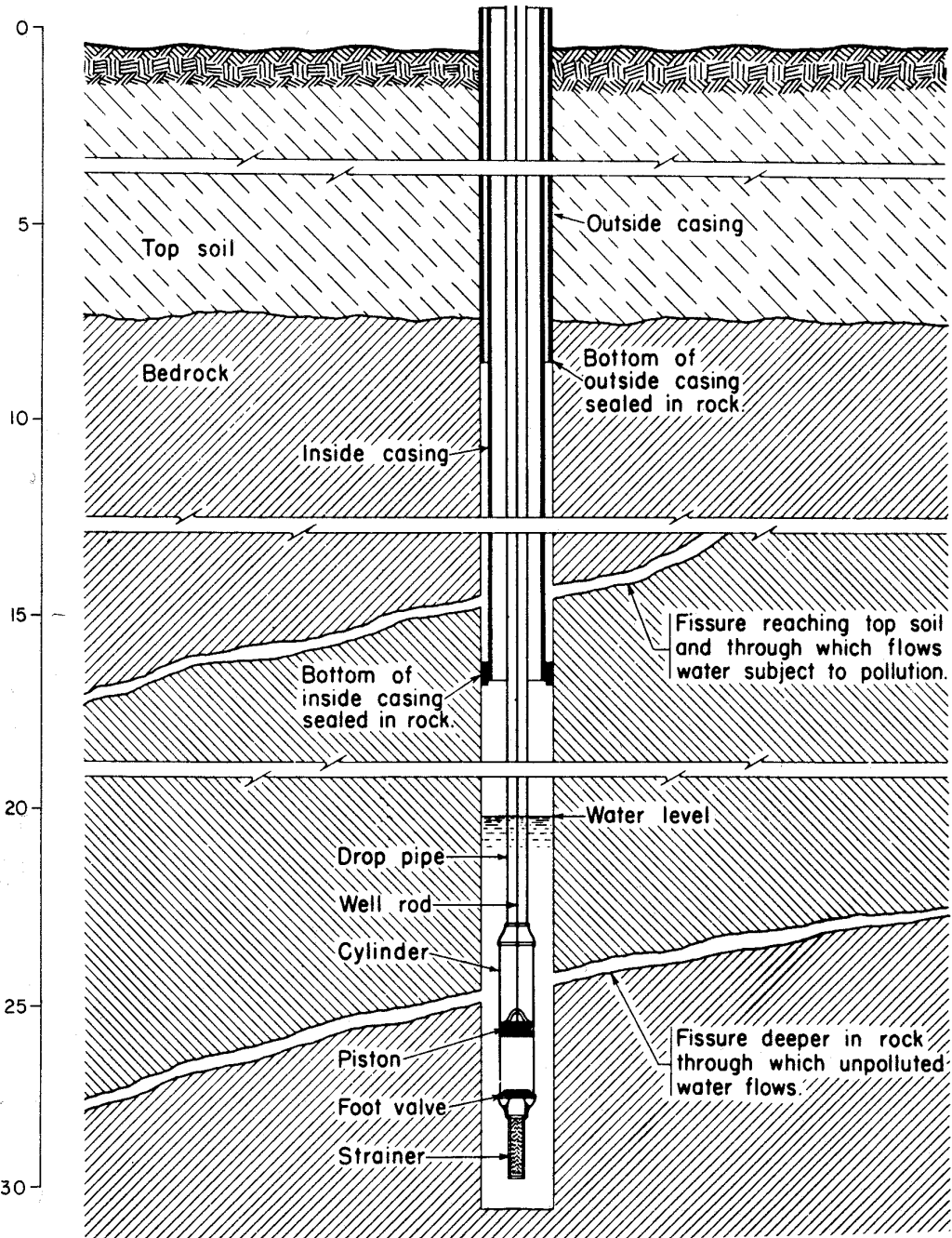


# ATLANTIC CANADA GROUNDWATER USE

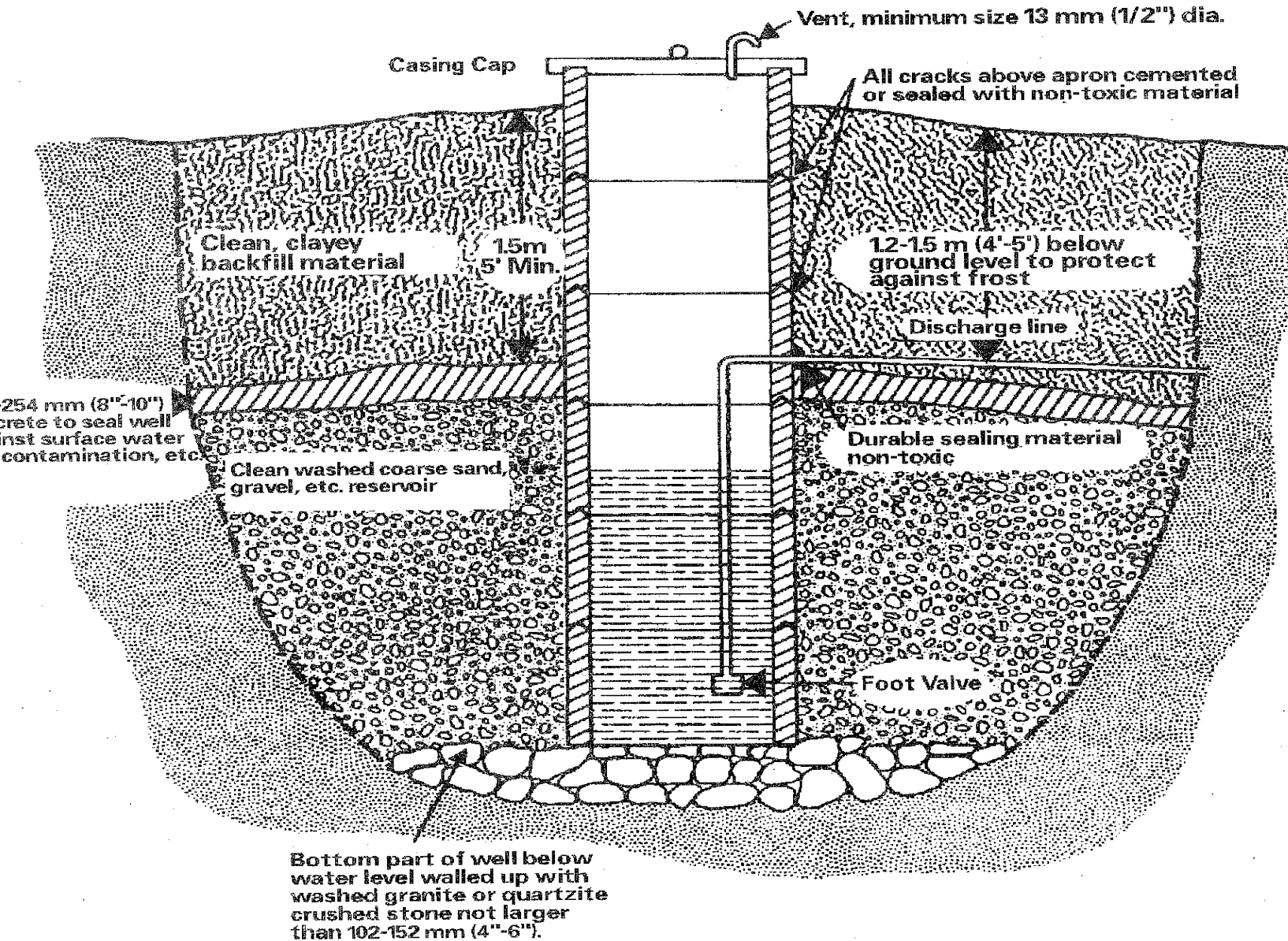
- Prince Edward Island 100 %
- New Brunswick 64 %
- Nova Scotia 55 %
- Newfoundland 29 %



# Typical Drilled Well (Open Hole)

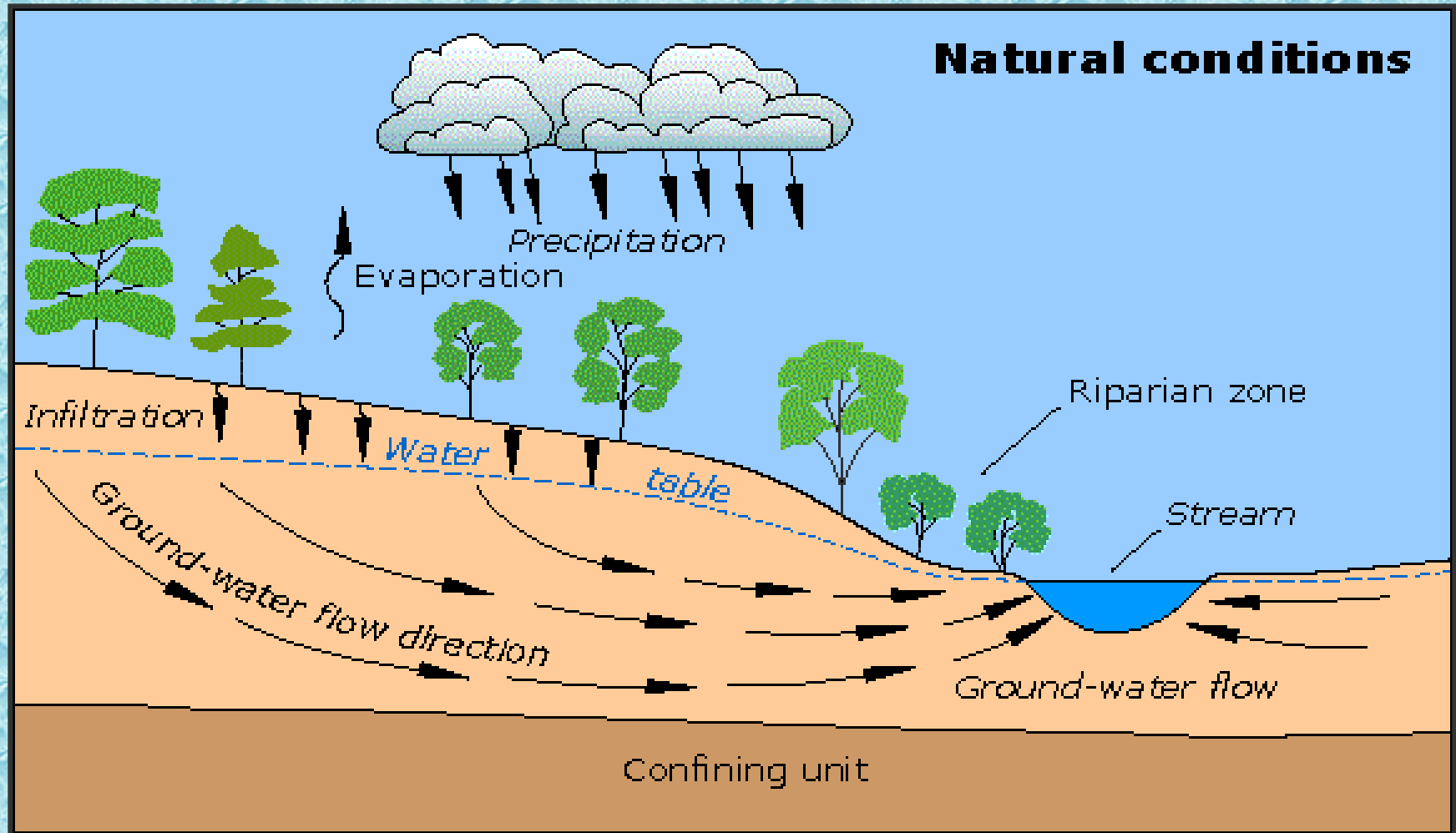


# Typical Dug Well

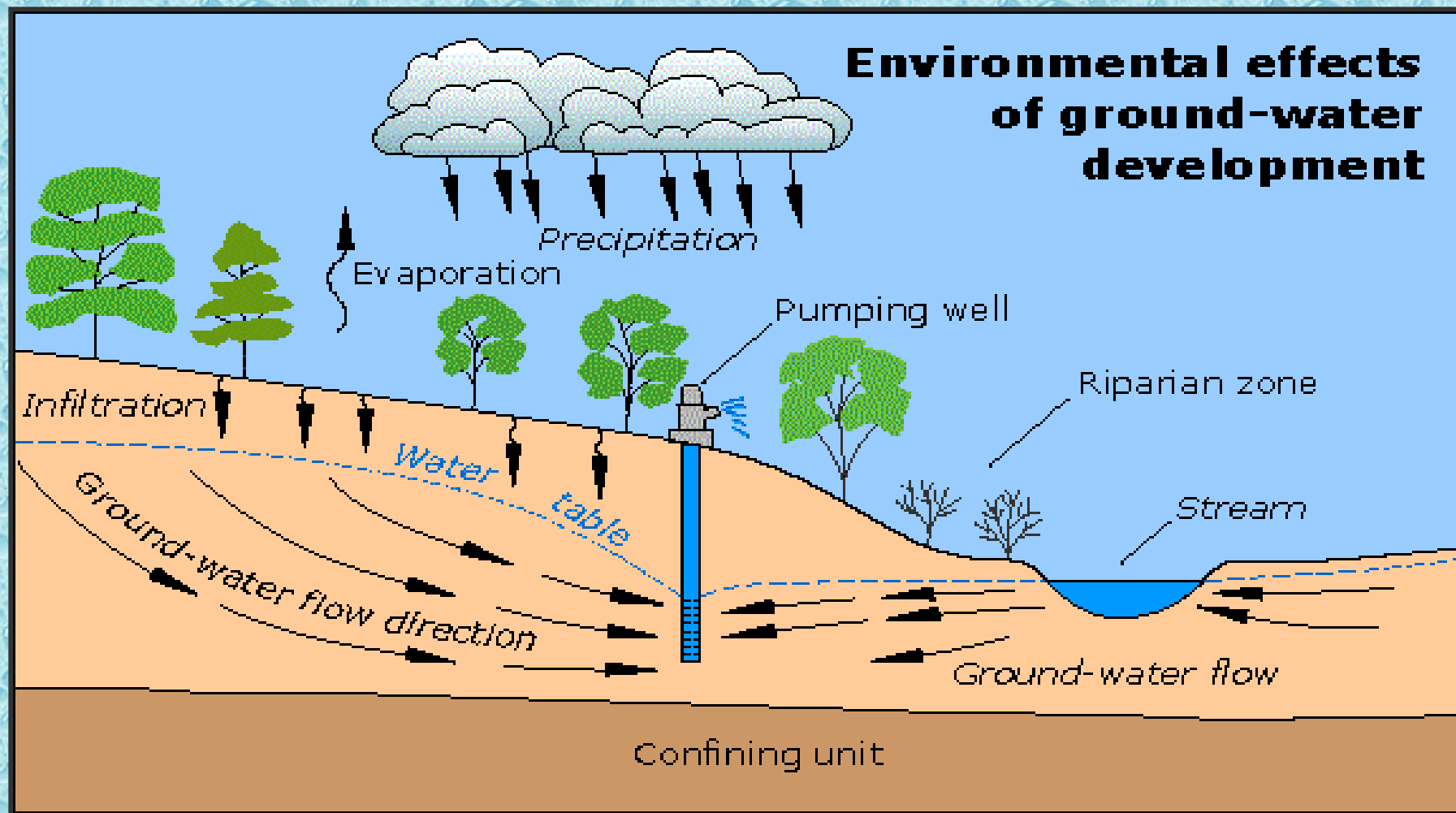


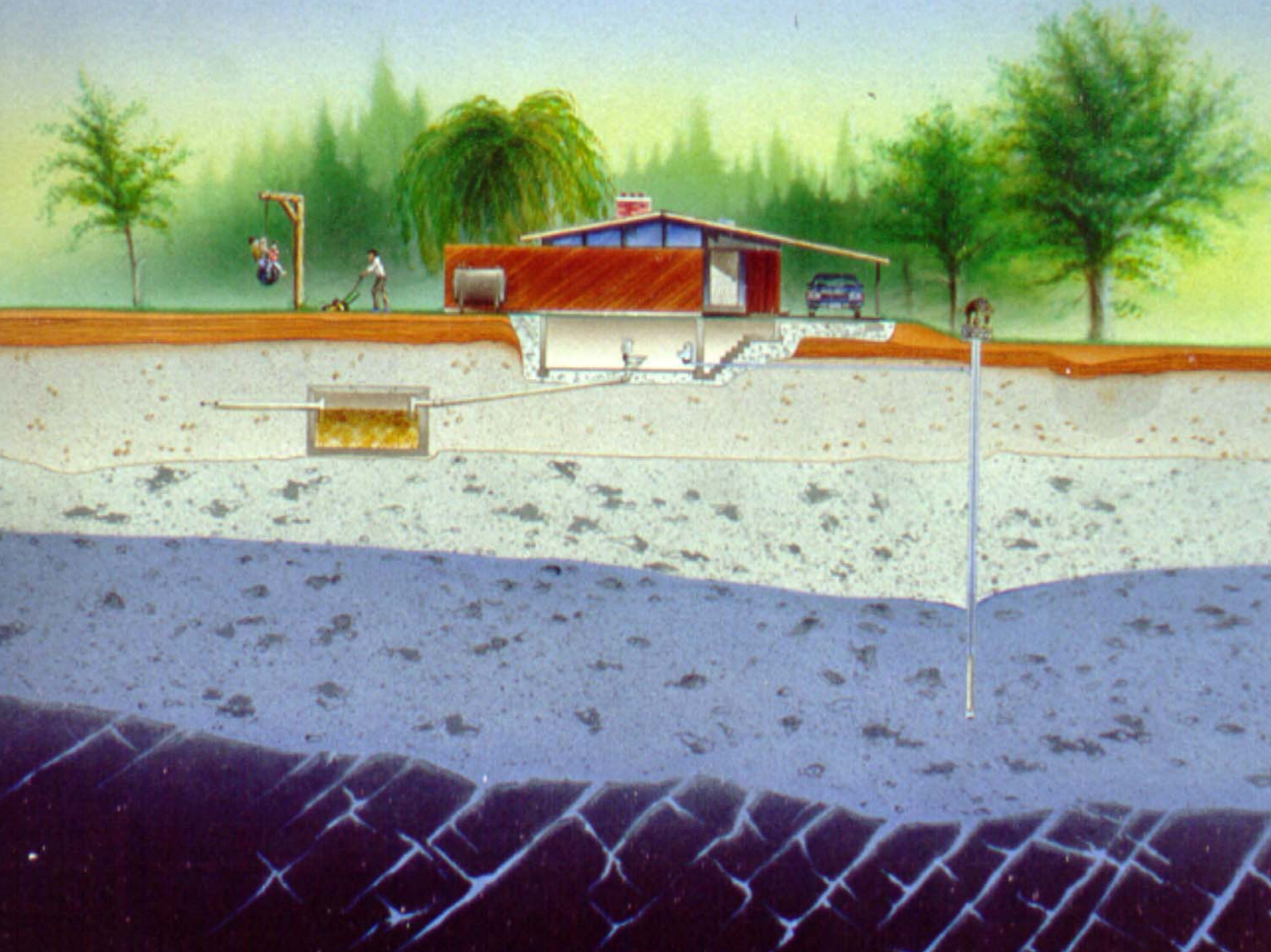


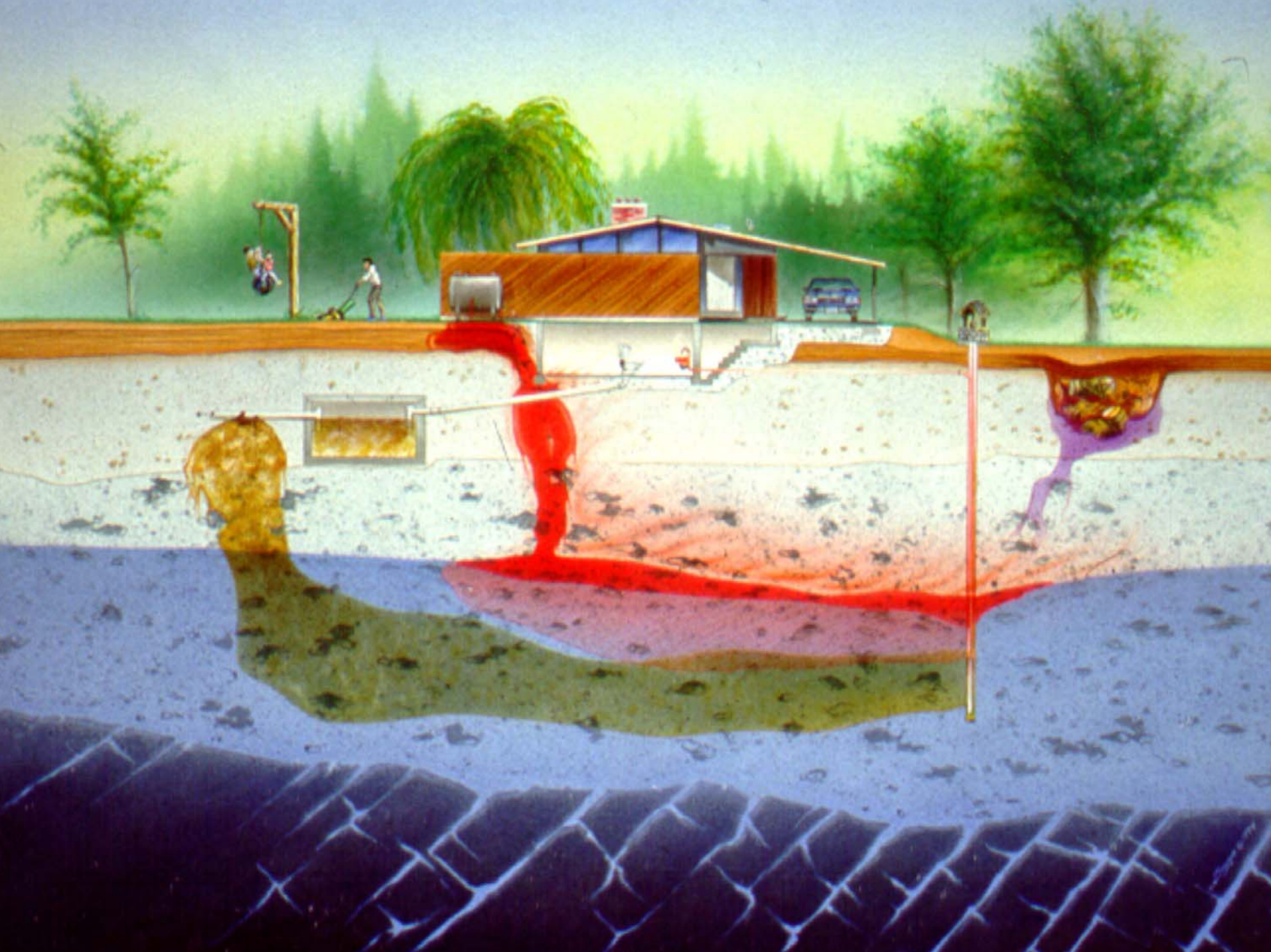
# GROUNDWATER-SURFACE WATER INTERACTION



# GROUNDWATER-SURFACE WATER INTERACTION





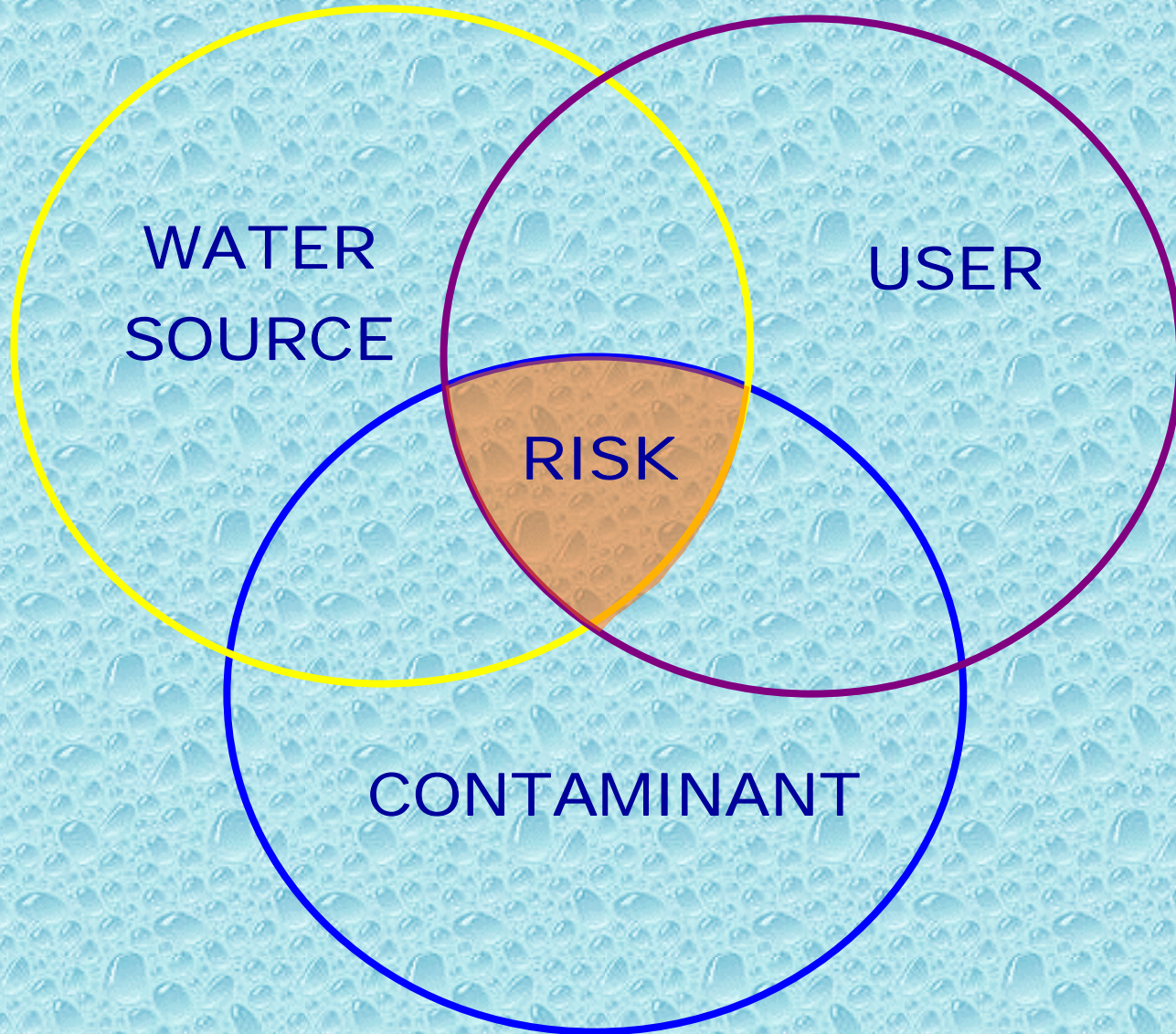


# **WATER SUPPLY RISK MANAGEMENT**

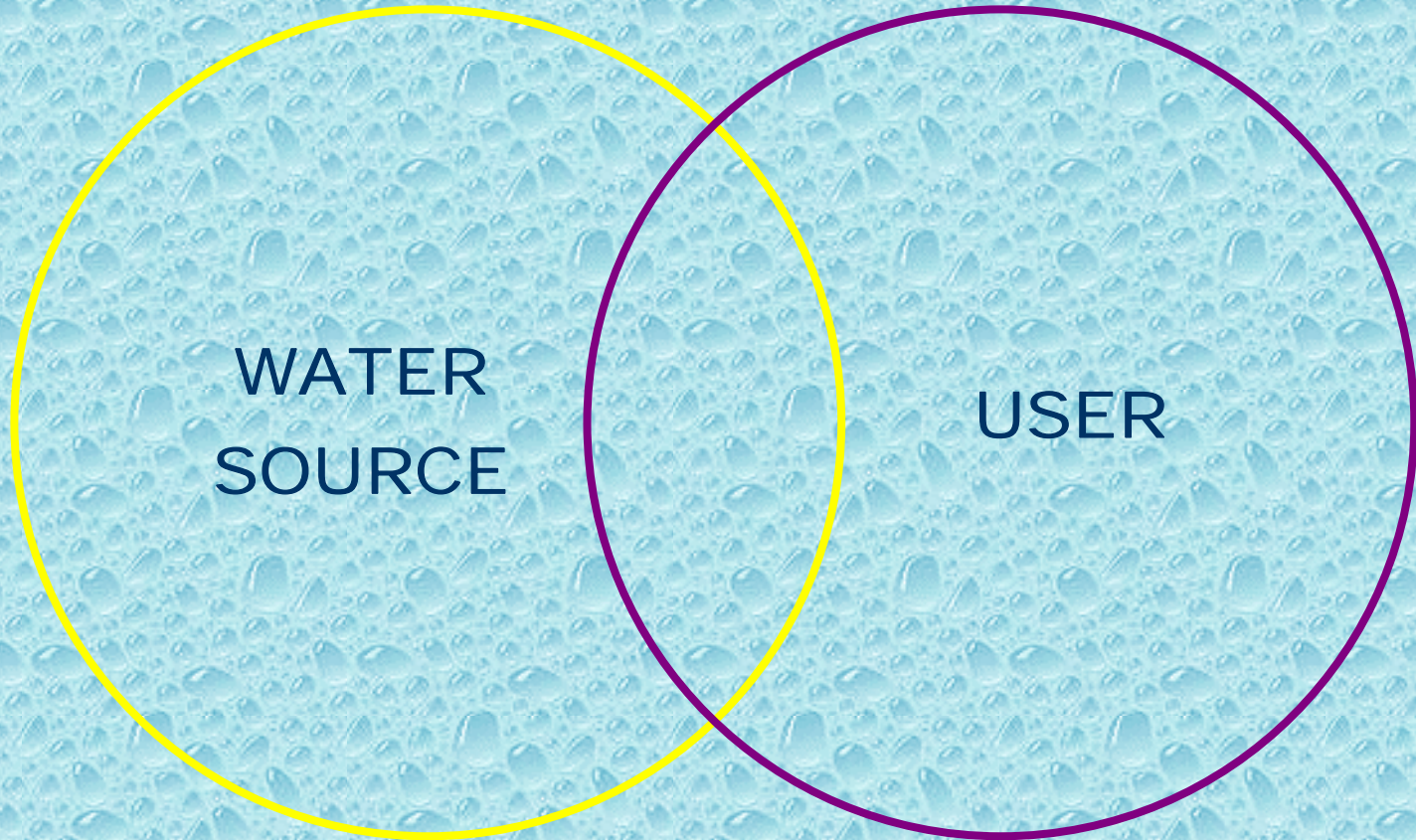
- **Manage Quantity and Quality**
- **Identify Contaminant Sources**
- **Identify Contaminant Pathways**
- **Identify Receptors (Wells/Aquifers)**
- **Wellhead/Aquifer Protection Strategy**



# WATER SUPPLY PROTECTION



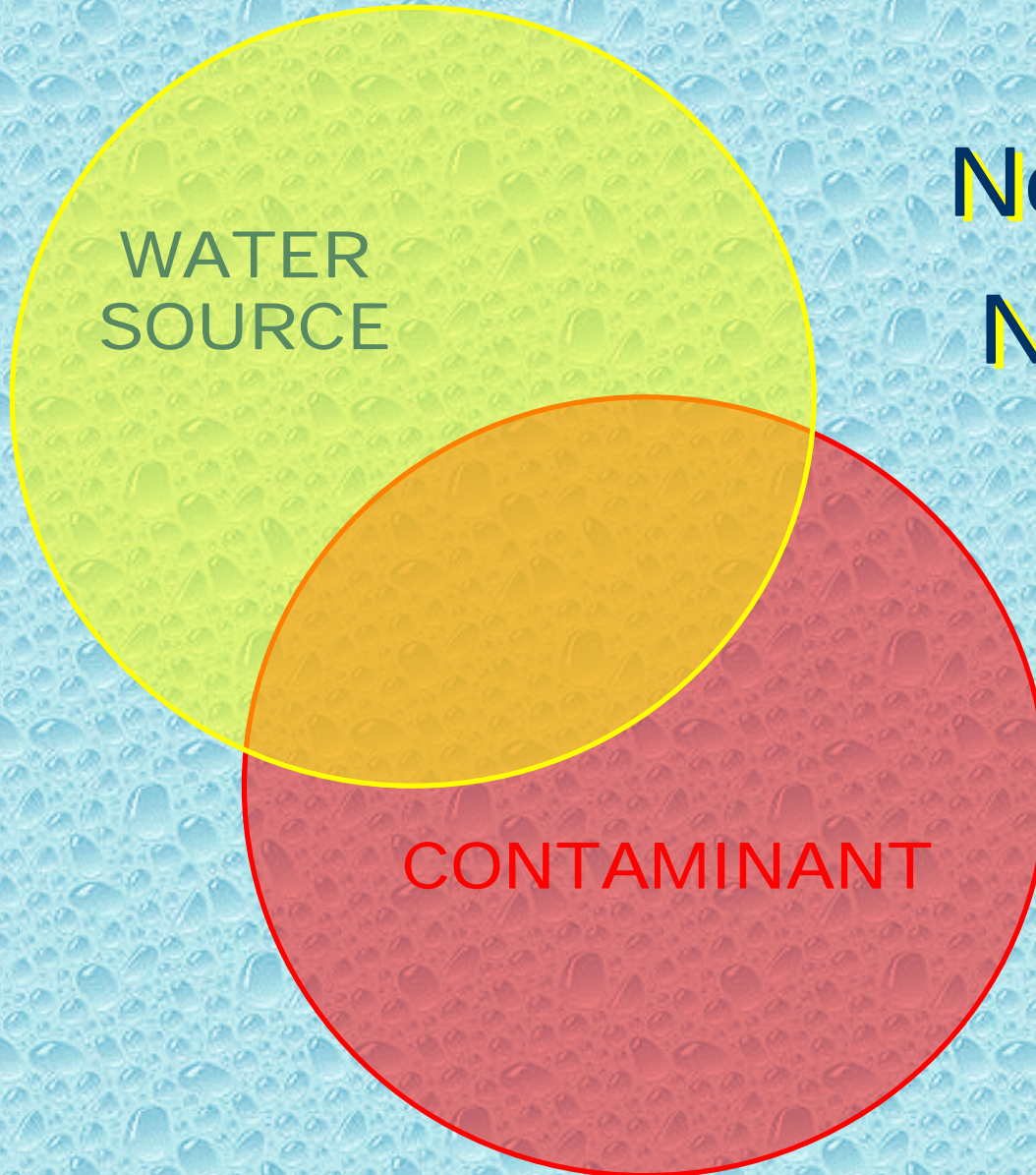
# WATER SUPPLY PROTECTION



No Contaminant = NO RISK



# WATER SUPPLY PROTECTION

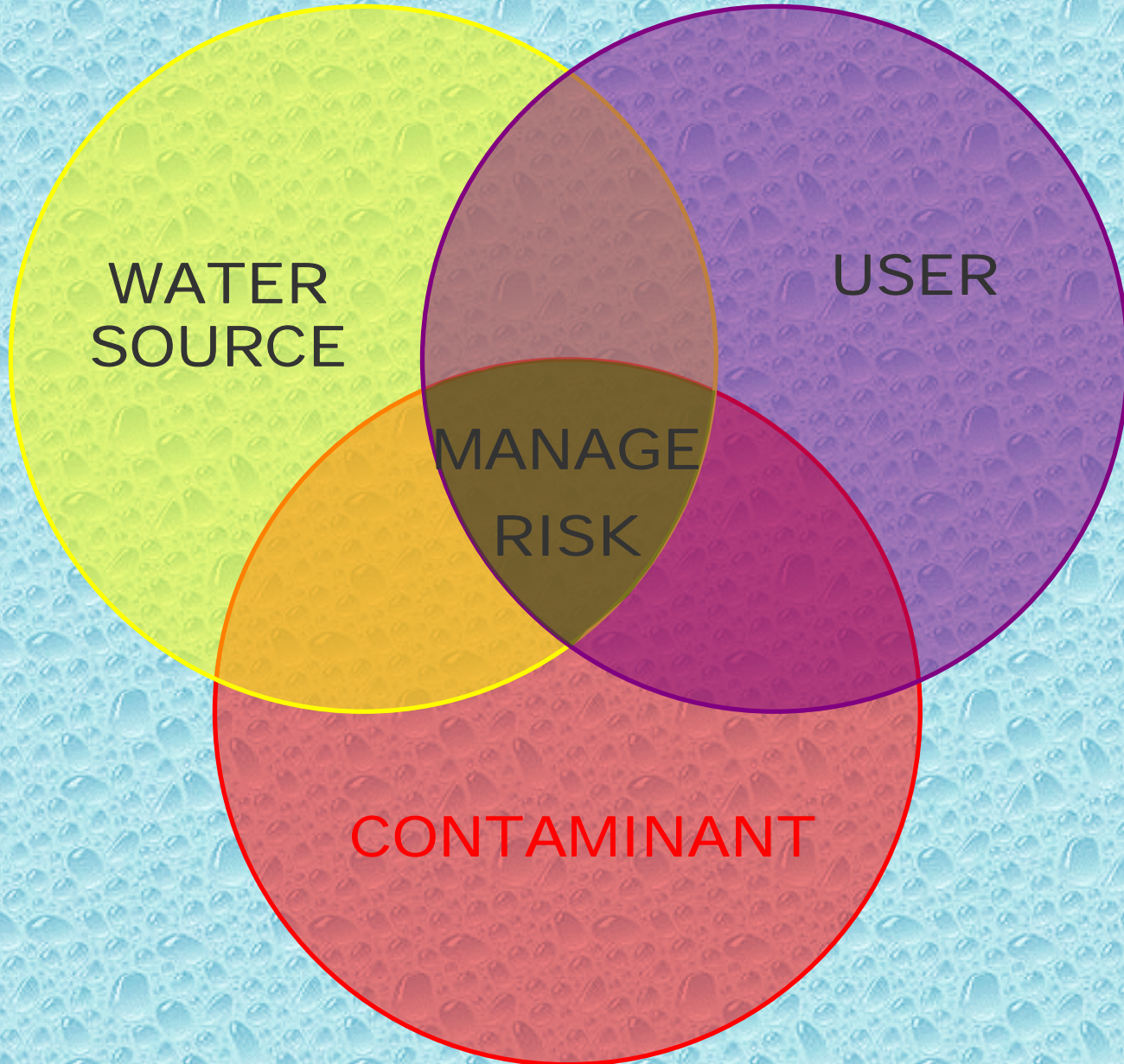


No User =  
NO RISK





# WATER SUPPLY PROTECTION



# THREATS TO GROUNDWATER QUANTITY

- People
- Overuse
- Lack of Enforcement
- Lack of User Cooperation
- Climate Change



# **MANAGEMENT of WATER QUANTITY RISK**

- Well Location
- Well Construction
- Determine Sustainable Aquifer Yield
- Monitoring (Yield, Water Levels)
- Maintenance
- Conservation



# THREATS TO GROUNDWATER QUALITY

- People
- Urban Development
- Farm Practices
- Waste Practices
- Loss of Forest & Wetlands
- Well Construction
- Well Location



# MANAGEMENT of WATER QUALITY RISK

- Well Location
- Contain Contaminants
- Substitute Water Source
- Treat Water Source



# AQUIFER PROTECTION PLAN (APP)

- Combine Hydrogeology and Land Use Planning
- Manage all activities within the capture area of a well field

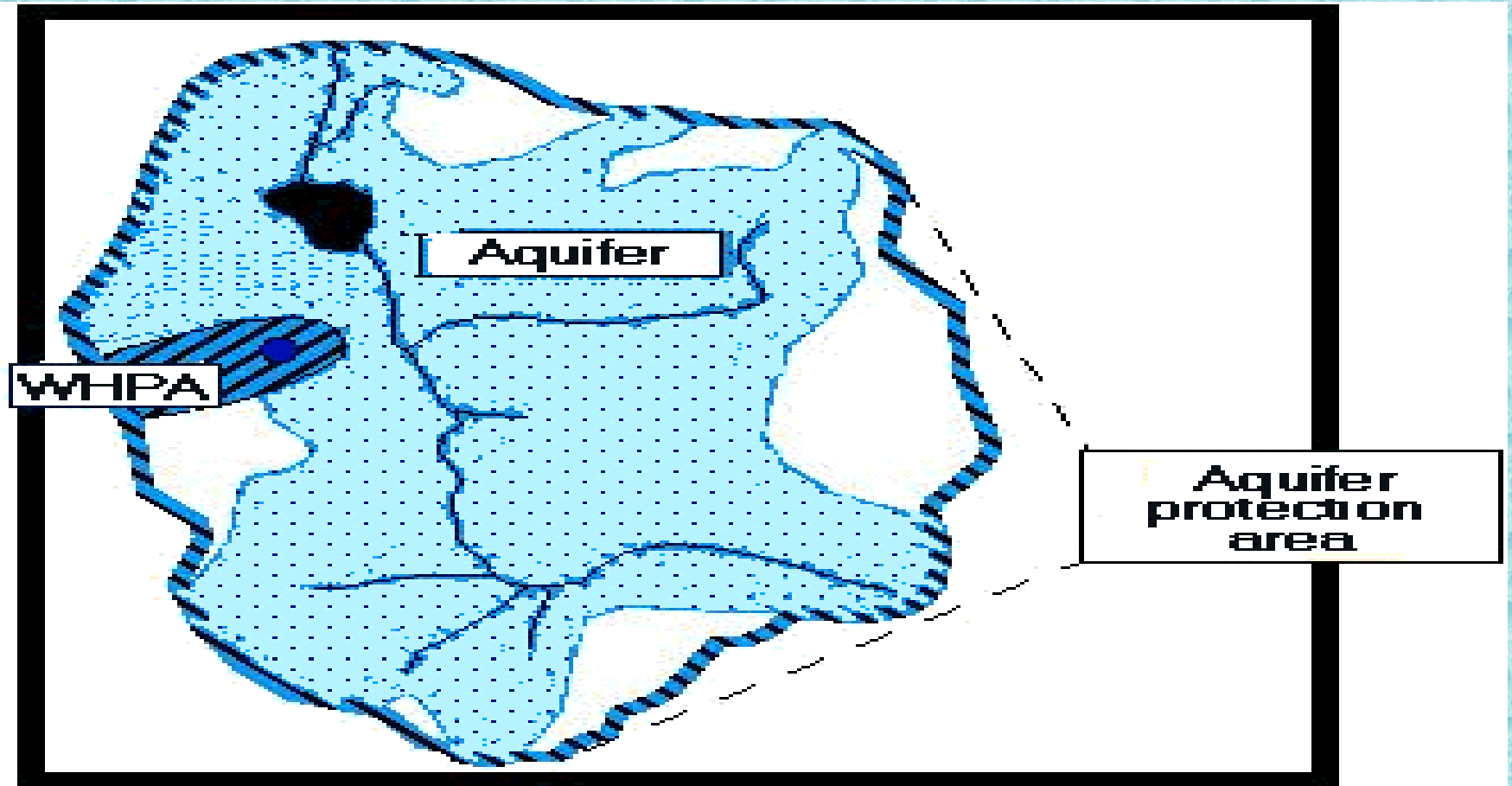


# WELL HEAD PROTECTION AREA (WHPA)

- Area around a well where contamination could be drawn in and affect water quality.



# WELL HEAD AND AQUIFER PROTECTION





# AQUIFER PROTECTION TOOLS

- Zoning
- Planning
- Design Standards (UST, Septic, Landfill)
- Operating Standards
- Property Purchase around Well
- Contaminant Control
- Public Education
- Groundwater Monitoring
- Water Conservation



# USER GROUPS

- Provincial Government
- Municipalities
- First Nations
- Developers
- Industry
  - Aquaculture
  - Bottled Water
  - Mining
  - Construction



# JACQUES WHITFORD

- Groundwater Resources
- Groundwater Protection Planning
- Laboratory Testing
- Land Use Planning
- Public Consultation/Regulator Liaison
- Environmental, Geotechnical and Materials Engineering

