

Onsite Wastewater BMPs to Protect Public Health and Watersheds



George Loomis

**Cooperative Extension Onsite Wastewater Training Center
University of Rhode Island**



Funding Sources

- Rhode Island Aqua Fund
- USEPA Nat'l. Comm. Decent. Demo Project
- USEPA National Onsite Demonstration Project II
- RIDEM Nonpoint Source Program (Section 319)
- URI Agricultural Experiment Station
- URI Cooperative Extension
- Community, industry, private sector partners

Research Team

George Loomis, David Dow, Terri Gentes,
Mark Stolt, Linda Green, and Arthur Gold

Natural Resources Science

University of Rhode Island



Presentation topics -

- Septic system facts
- Rhode Island demo systems
- Trends in an evolving field
- Treatment performance
- Getting the information *OUT*
to our clientele groups



Onsite wastewater system facts:

- **25% US population use these systems**
- **Number same for past 30 years**
- **30% of Rhode Islanders rely on them**

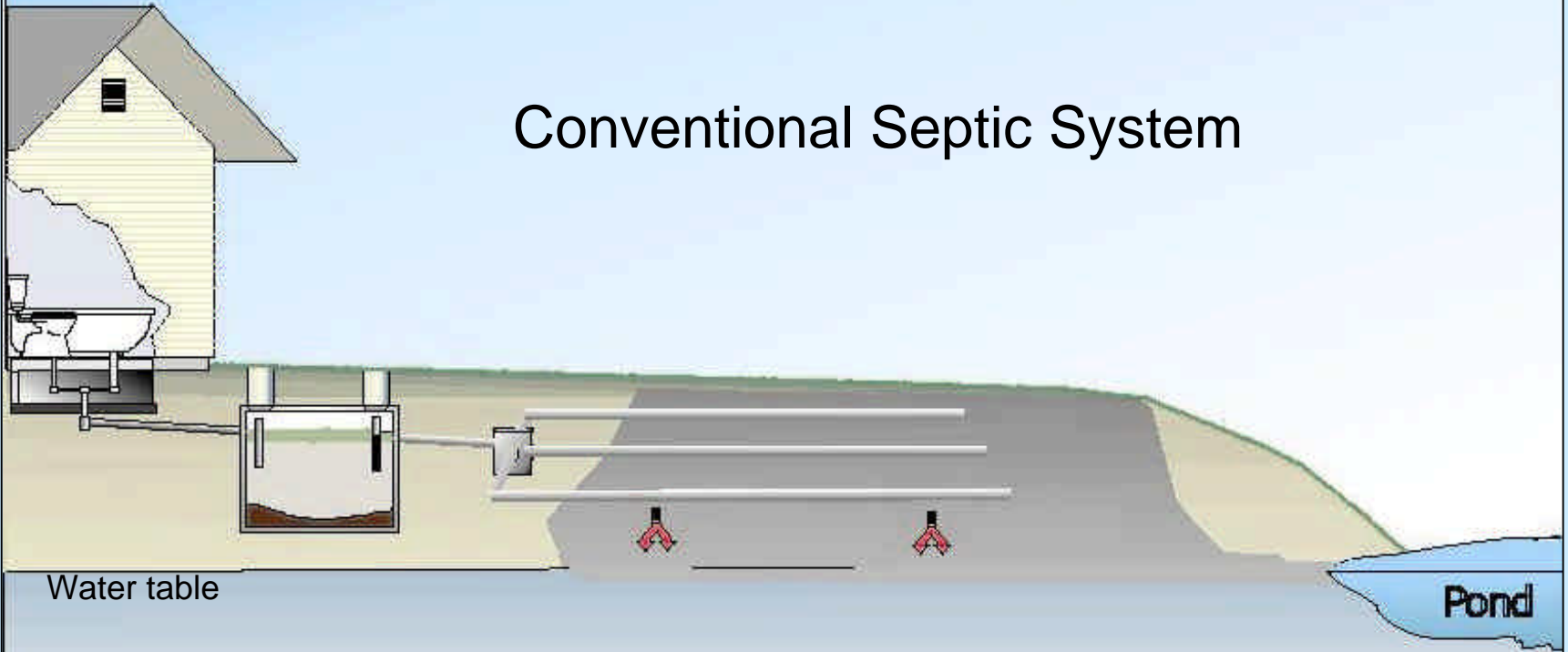




- Estimated 40% of R.I. systems are substandard.
- Most new development in R.I. use onsite systems.
- Conventional systems ***do not*** remove nitrogen; and pathogen and phosphorus removal can be limited.



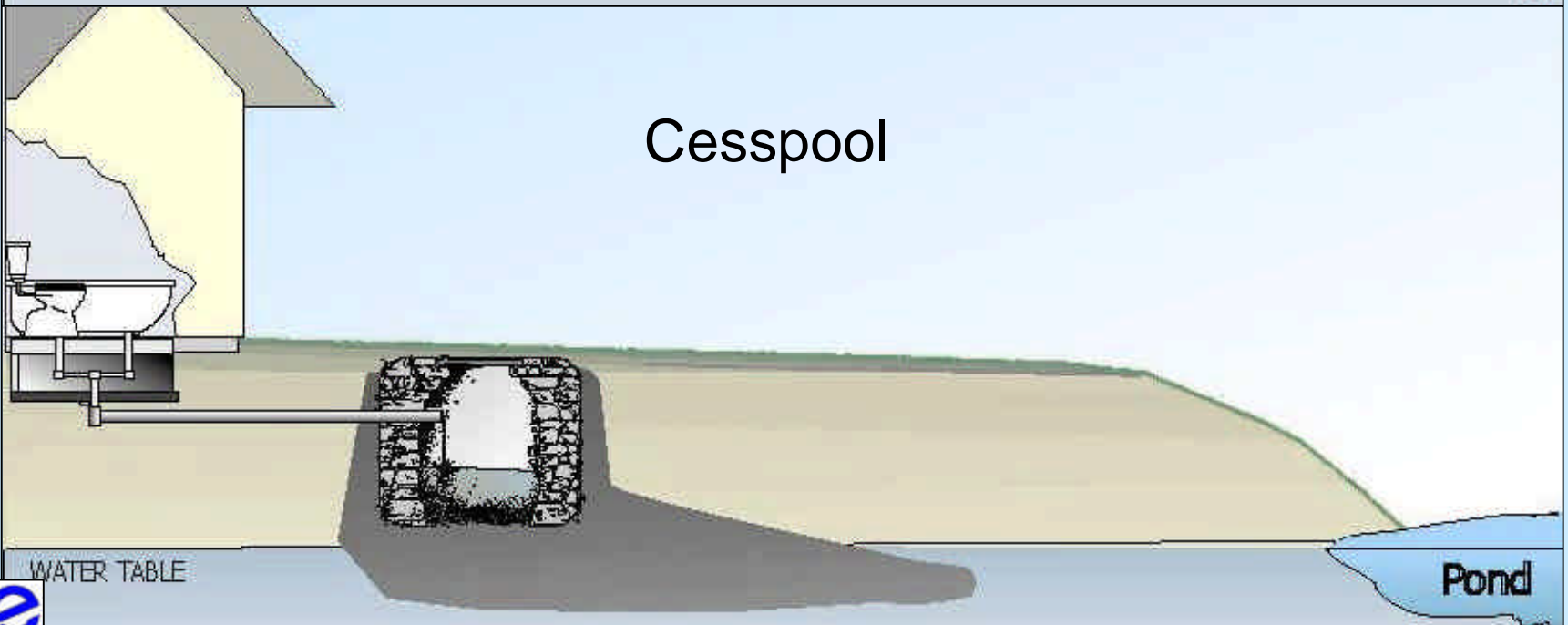
Conventional Septic System



Water table

Pond

Cesspool

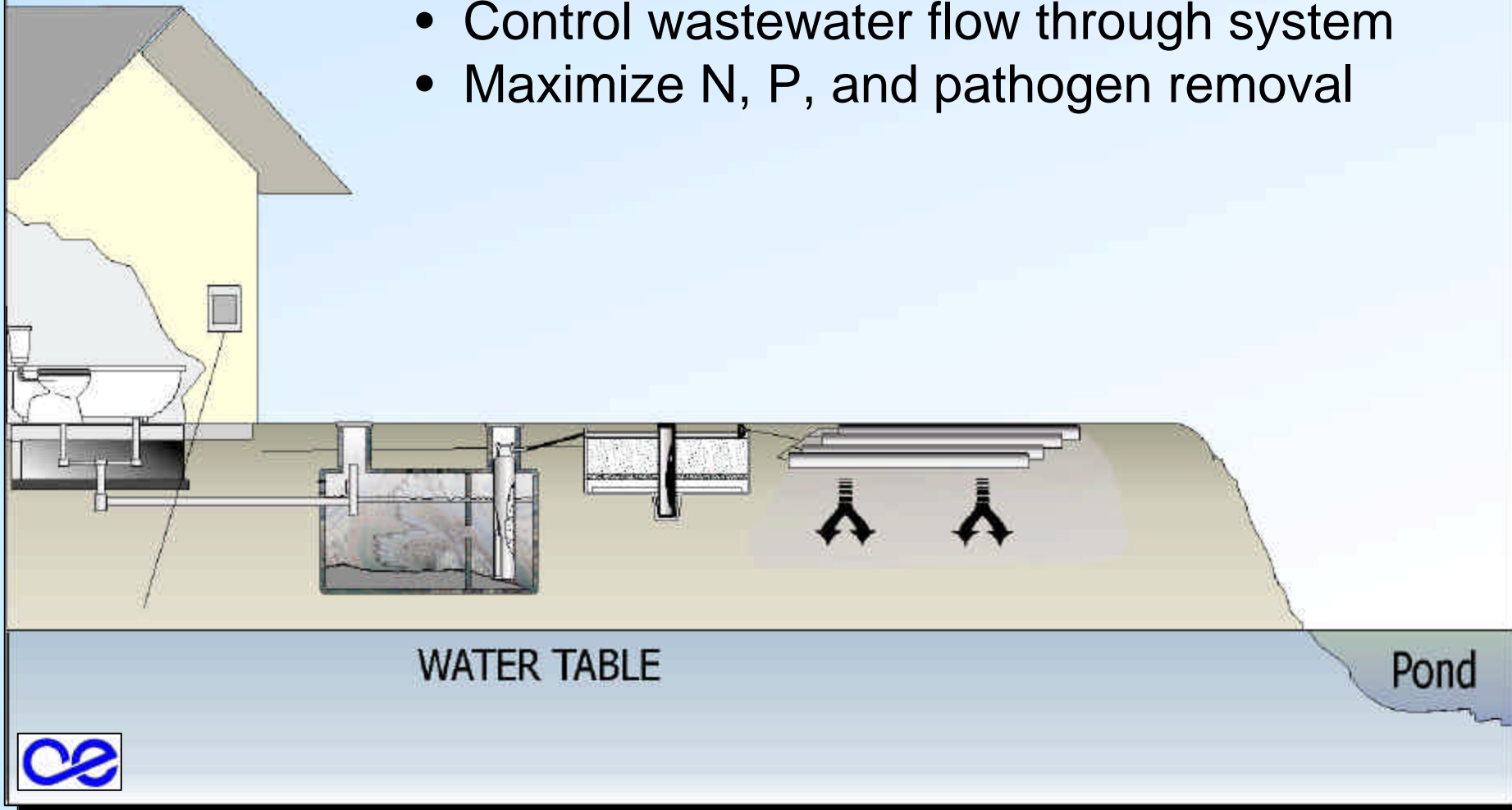


WATER TABLE

Pond



- Intermediate treatment steps
- Designed to remove specific contaminants
- Control wastewater flow through system
- Maximize N, P, and pathogen removal

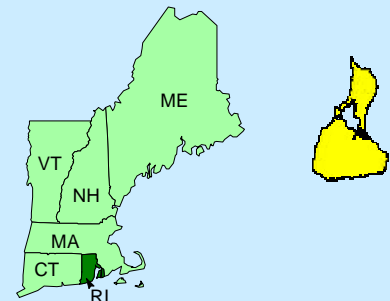
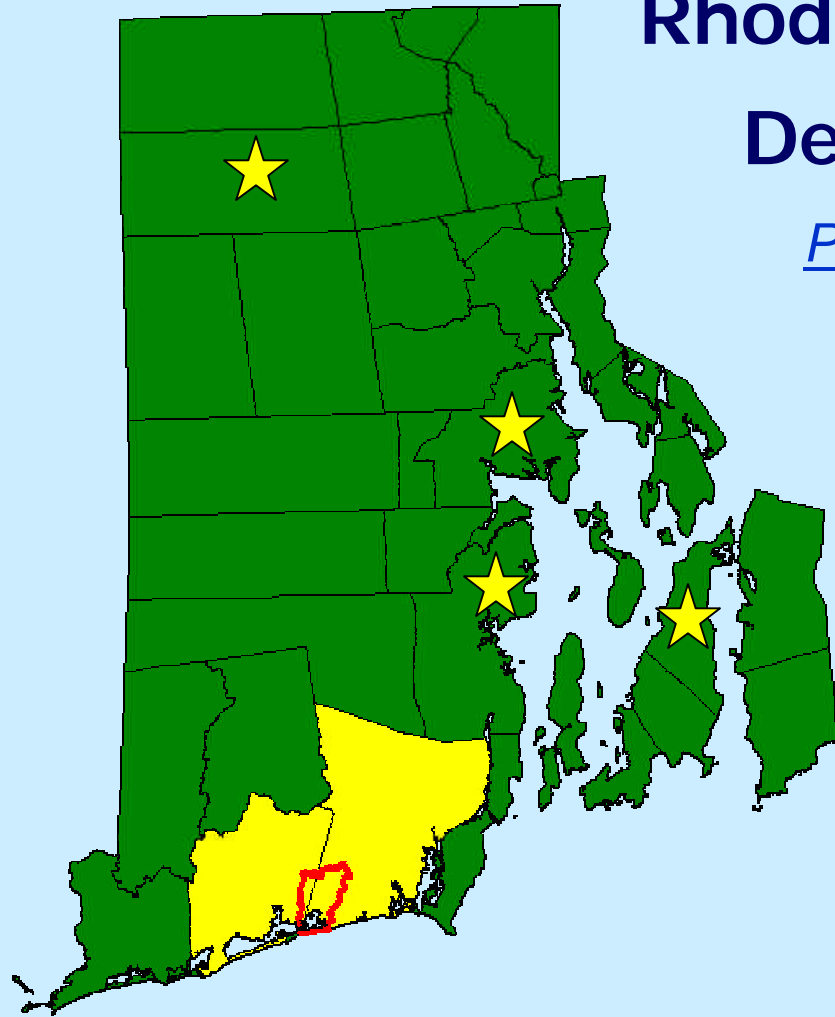


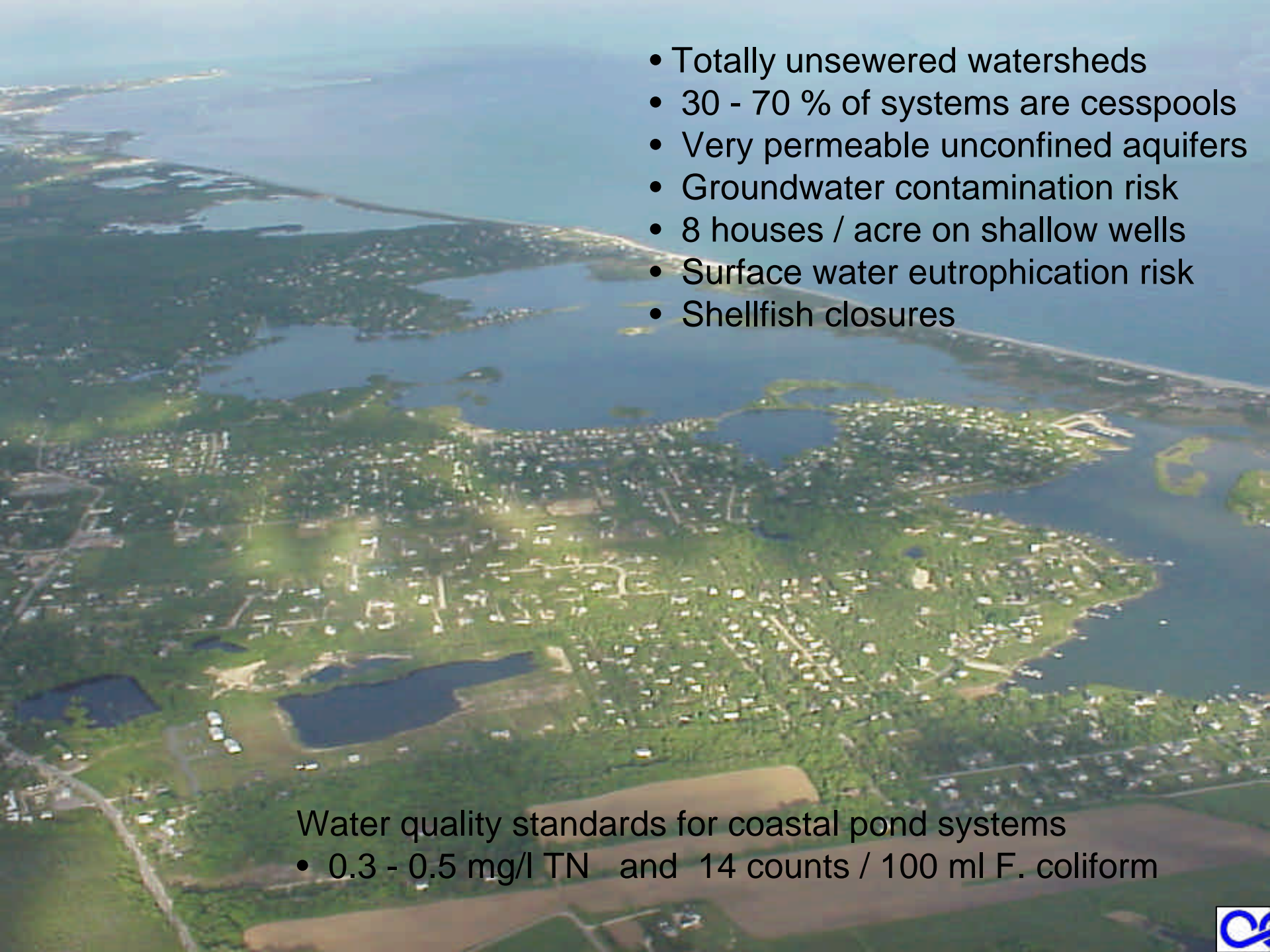
Alternative Treatment Systems

Rhode Island Onsite Wastewater Demo Projects 1996 - 2003

Project Objectives -

- 7 communities
- **55** demonstration systems
- Replace failed septic systems with innovative technologies
- Do on jobsite installation training
- Evaluate treatment performance
- Document operation and maintenance needs
- Report to regulatory agency
- Transfer information to clientele



- 
- An aerial photograph showing a coastal region with a dense network of interconnected ponds and waterways. The land is a mix of green vegetation and residential development, with many small houses and buildings scattered throughout. The water bodies vary in size and color, from deep blue to a more turbid brownish-green. The coastline is irregular, with many inlets and peninsulas.
- Totally unsewered watersheds
 - 30 - 70 % of systems are cesspools
 - Very permeable unconfined aquifers
 - Groundwater contamination risk
 - 8 houses / acre on shallow wells
 - Surface water eutrophication risk
 - Shellfish closures

Water quality standards for coastal pond systems

- 0.3 - 0.5 mg/l TN and 14 counts / 100 ml F. coliform



Site Conditions

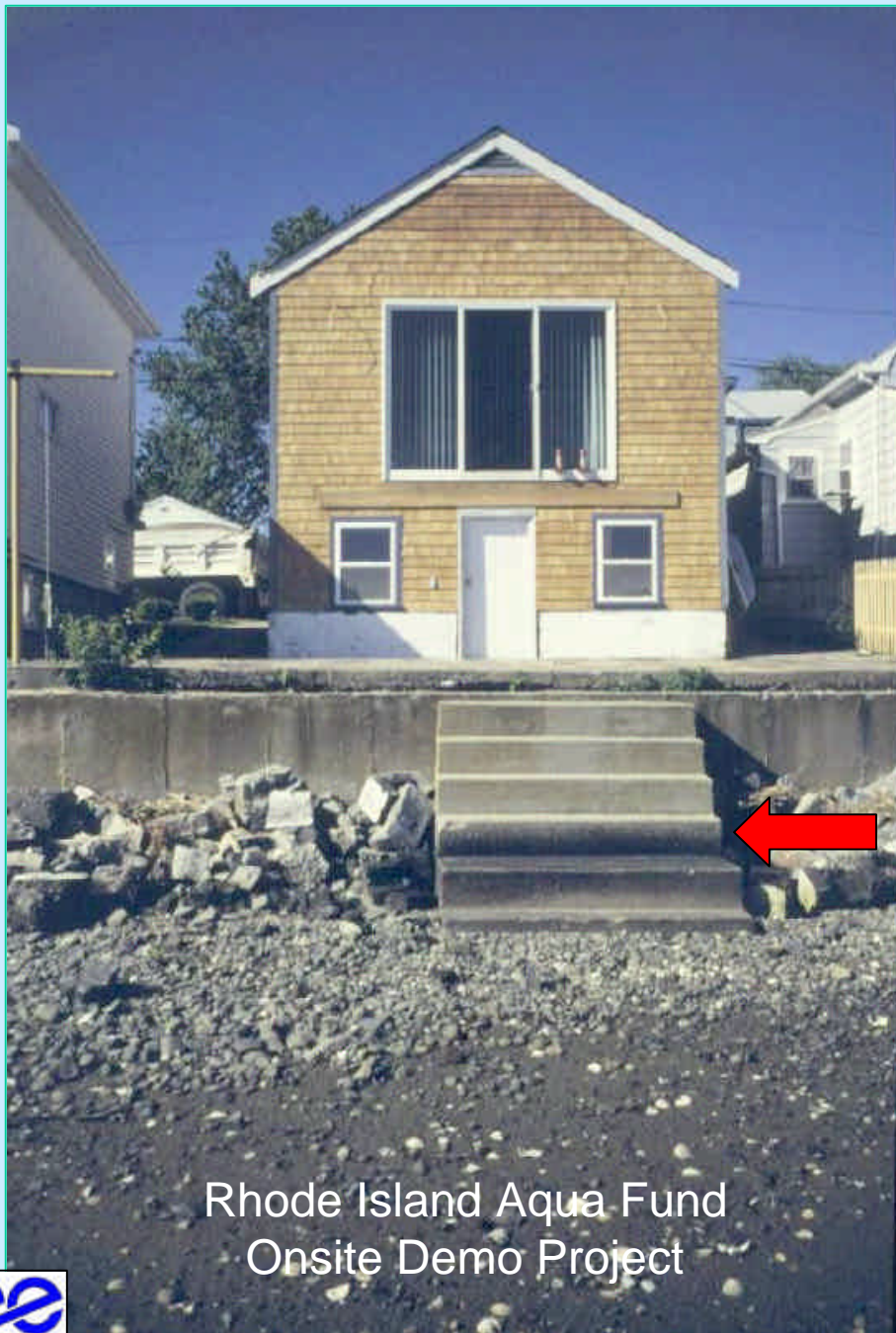


- 50 ft. Well setback
- Shallow water tables
- Wet soils
- Limited buffers and access / space



Site Characteristics

- 2,500 ft² lot
- Critical resource area
- Cesspool in groundwater
- Tidal flushing twice daily
- No natural soil
- Completely impervious surface



Rhode Island Aqua Fund
Onsite Demo Project



Technologies Demonstrated

Single Pass Sand Filters for Pathogen removal



Performance - Fecal coliform

- 3.2 - 3.8 log₁₀ reduction
- 200 - 580 Ct / 100 ml



Bottomless Sand Filters as *Drainfield* options and enhanced pathogen removal



- 2 ft sand
- E.S. = 0.33 mm
- U.C. < 4

RI F. coliform treatment
guideline
 ≤ 1000 ct / 100 ml

- *Limited site disturbance; small footprint*
- *Must follow advanced treatment system*



Modular Peat Filters



Ultraviolet (UV) light disinfection unit

Modular, absorbent peat, pathogen reduction technologies.



Recirculating Sand Filters targeting Nitrogen removal



*Meet Rhode Island TN
treatment standards:*

≥ 50 % TN removal

≤ 19 mg / l TN
concentration



Textile Filters

- Modular 4 X 8' footprint
- Absorbent felt-like media
- R.I. approved
N reduction system





- Modular units
- Absorbent open cell foam
- Small footprint

Foam Biofilters



Fixed Activated Sludge System



Approved R.I. N removal system



UV light disinfection unit



Wastewater Dispersal Options that Promote Nutrient Utilization and Recycling



Drip Irrigation



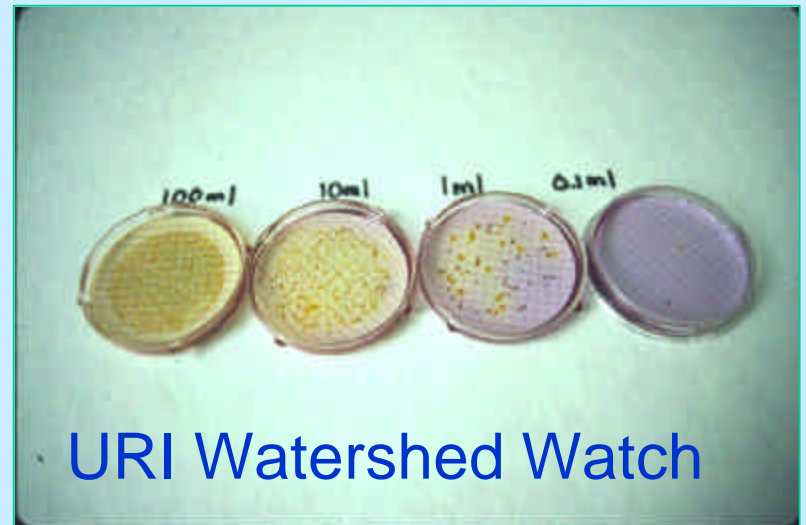
Shallow narrow pressure dosed drainfield



Treatment performance



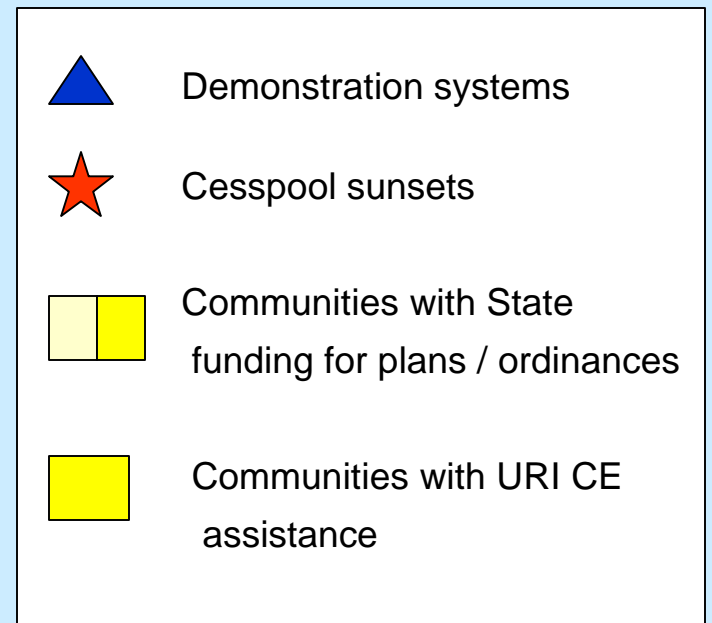
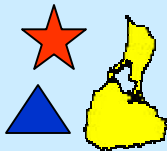
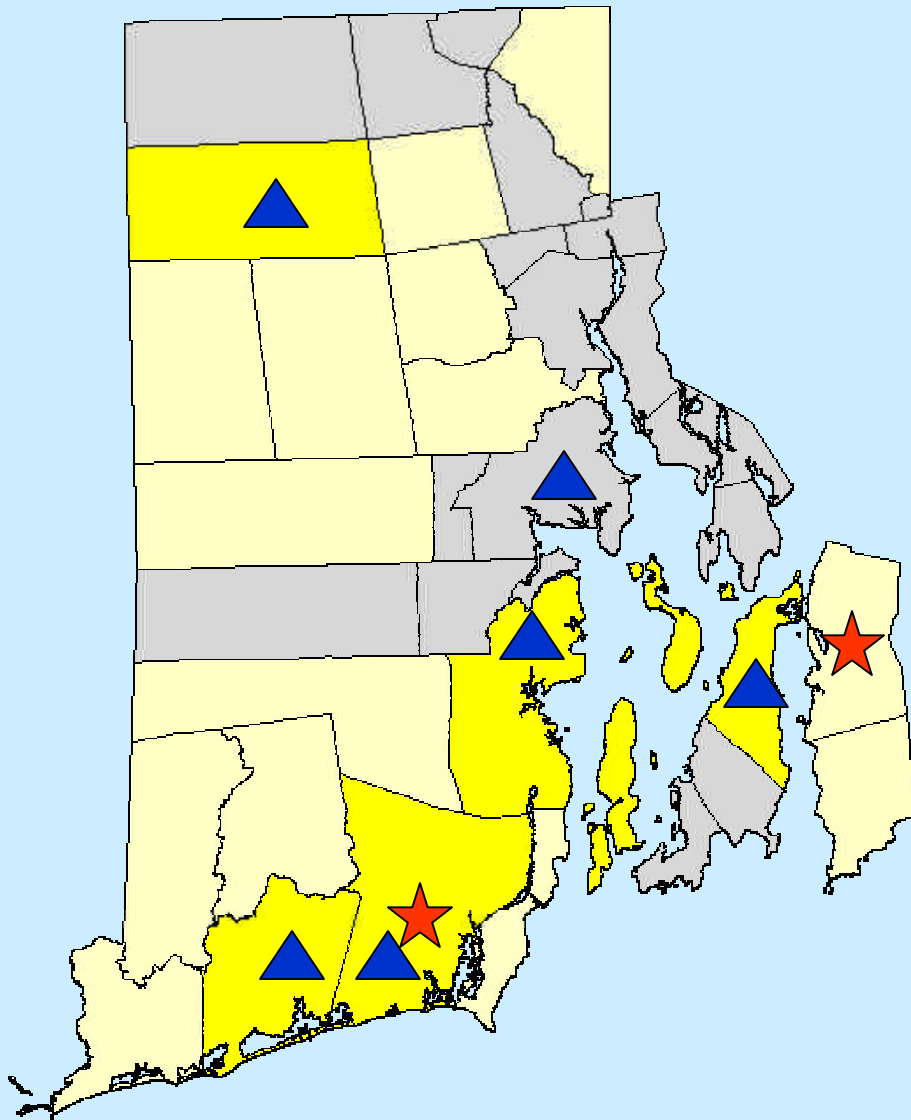
- Monthly sampling
- BOD, TSS
- pH, alkalinity
- TN, TP
- Fecal coliform



Treatment performance summaries available



Decentralized Wastewater Treatment System Activities in Rhode Island



Serving our clientele groups with research based ...

Outreach education



Communities

Rhode Island NEMO

Homeowners

Rhode Island
Home*A*Syst



Research based...

Training & Continuing Education

- All wastewater professionals in close partnership with State
- Regulatory support / policy changes
- Code and guidance documents
- Experiential learning
- Contractors and undergrad students



Thanks for Your Kind Attention



Rhode Island Onsite Demo Project Team



Published companion papers -
2 in 2001 ASAE Proceedings
1 in 2002 NW Onsite Proceedings



www.uri.edu/ce/wq/owtc