A Blueprint for Watershed Resource Protection through Community Scale Integrated Infrastructure Management

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Acknowledgements

Funding and Support:

This work has been supported by grants from the Town of Charlestown, RI and the U.S. Environmental Protection Agency's Region 1 Southeast New England Program (SNEP).

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EPA

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01

The Problem

Why Community-Scale Watershed Management Often Stalls



Photo: Town of Yarmouth

Why Are So Many Watersheds Still Impaired?

Analysis Paralysis

- Sanctioned studies are plentiful
  - Action is not
- Communities need help to convert study findings into Action
  - The fundamentals of Translational Ecology can help!



How do we move beyond the studies?



02

The Blueprint

A Repeatable Framework: Transforming Community Concern into Sustained Watershed Protection

What do we mean by “Blueprint”?

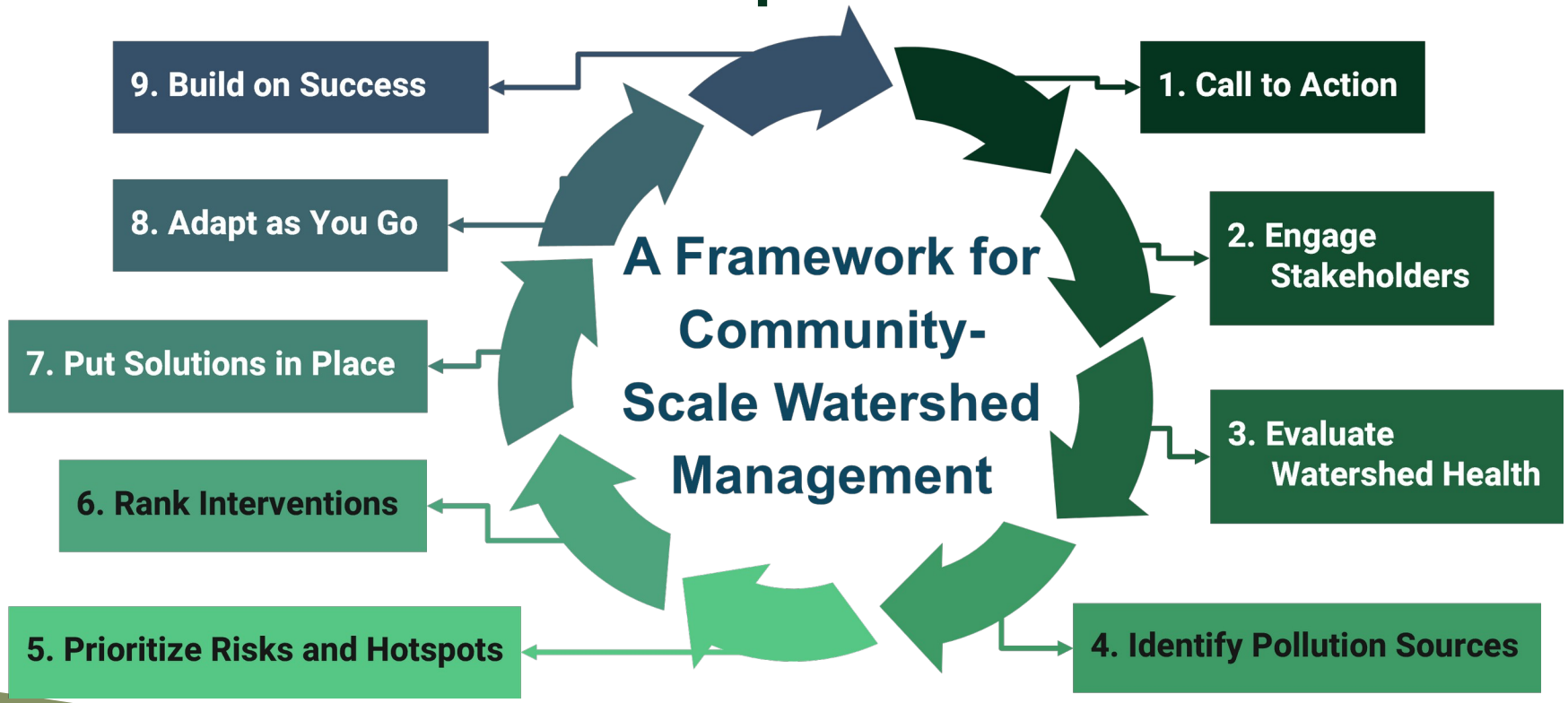
Our Blueprint **is not**:

- A single technology
- A single ordinance
- A single project

Our Blueprint **is**: A repeatable process (**framework**) that helps communities:

- Recognize problems
- Organize stakeholders
- Generate information
- Prioritize actions
- Implement solutions
- Adapt over time
- Build on success

Overview of our Blueprint's Framework:

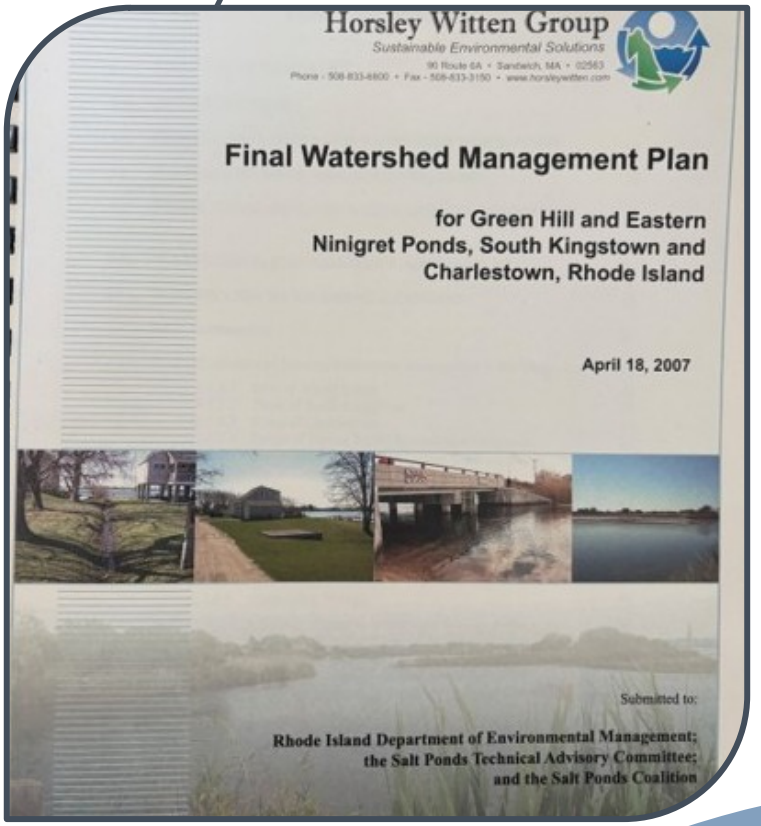


Step 1. Call to Action

Purpose: Transform local concern into community momentum

- Examples:
  - Drinking water concerns
  - Algal blooms
  - Beach closures
  - Shellfish closures
  - Regulatory impairment listings

Charlestown Example



Step 2. Engage Stakeholders

Purpose: Identify the people and build governance structure necessary to sustain the effort.

- Champions
- Stakeholder mapping
- Working groups
- Governance structures

Integrate **Translational Ecology** concepts

Charlestown Example



Step 3. Evaluate Watershed Health

Purpose: Establish baseline conditions

- Key components:
  - Existing water quality datasets
  - Groundwater monitoring
  - Surface water monitoring
  - GIS analysis
  - Community science

Charlestown Example

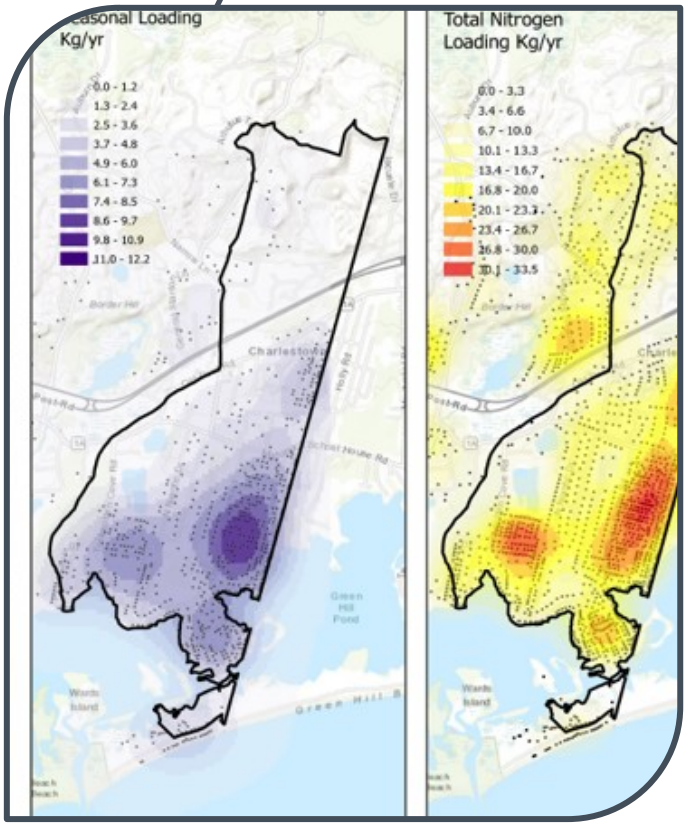


Step 4. Identify Pollution Sources

Purpose: Move from identifying impacts to identifying causes

- Key concepts:
  - Infrastructure inventories
    - OWTS mapping
    - Stormwater mapping
  - Land use analysis
  - Hotspot identification

Charlestown Example

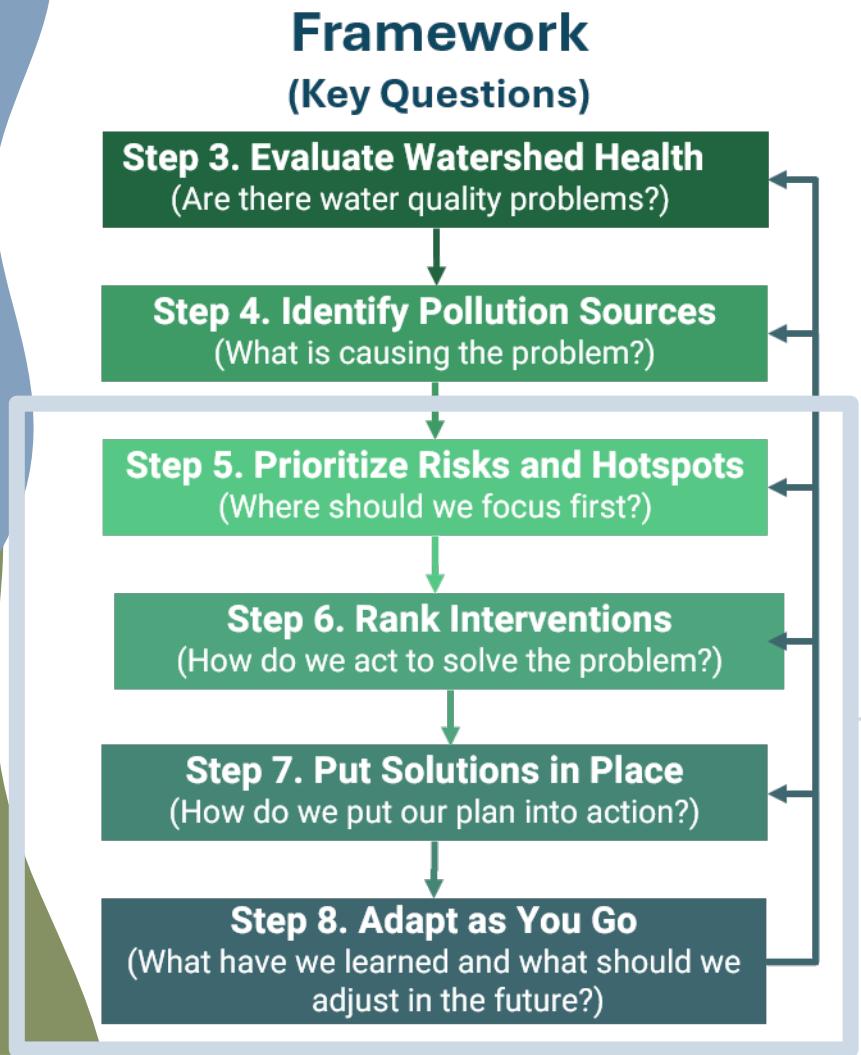




Town Hall: Where Studies and Reports

Many communities stop after documenting the problem.

(This is why many watersheds are still impaired…)

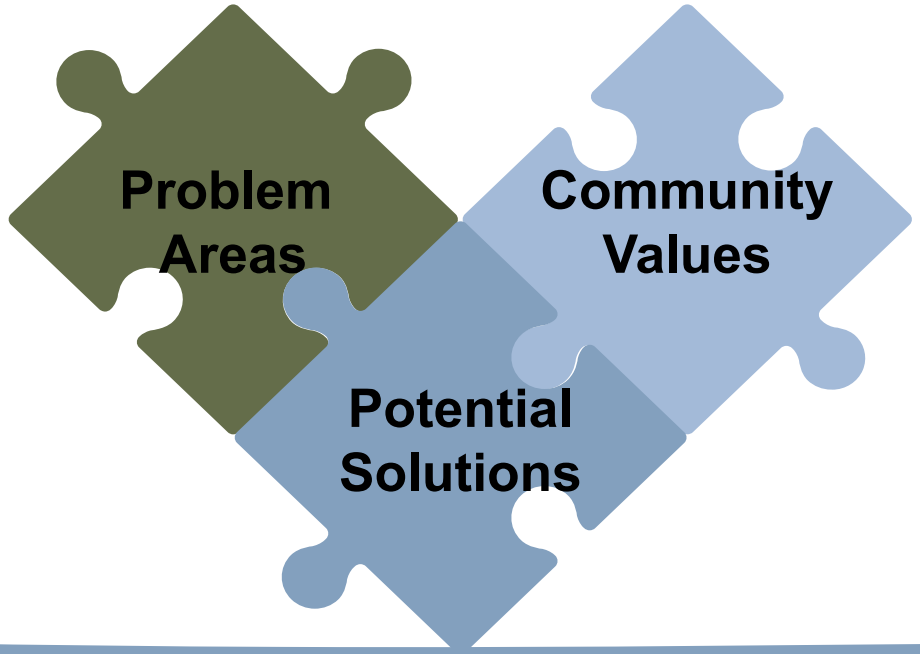


Turning Data Into Decisions

The Blueprint picks up where most studies end…

Champions turn information into action.

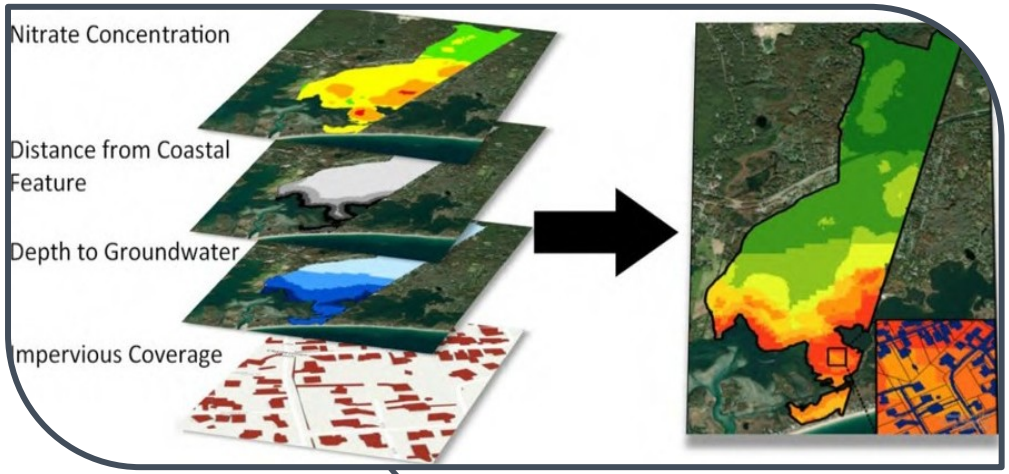
Steps 5 + 6. Prioritize Risks, Hotspots and Rank Interventions

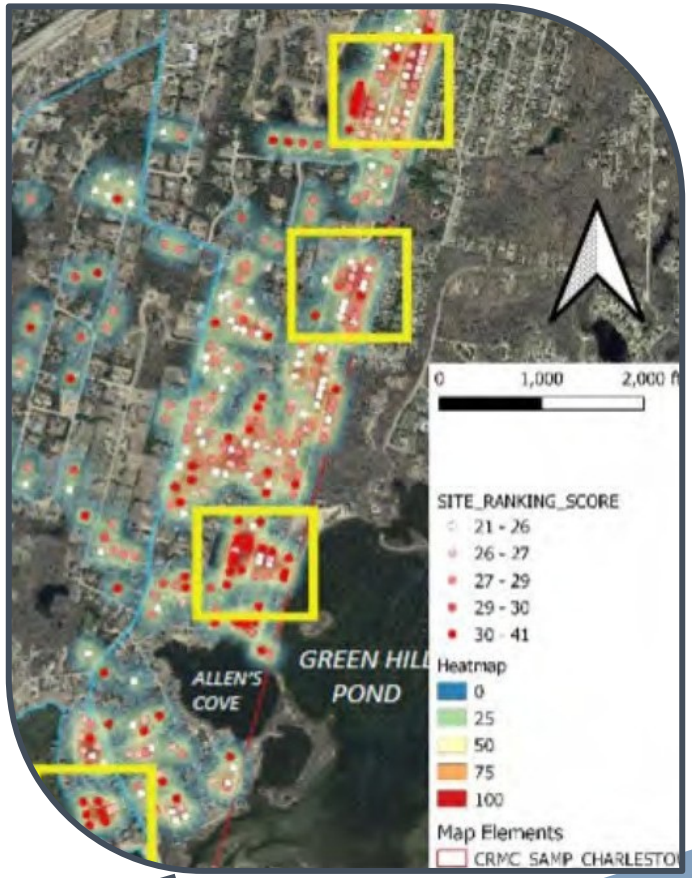


Purpose: Create transparent and defensible prioritization methods

- Prioritize problem areas to address
- Choose practical and feasible solutions
- Aligned with community values and local constraints

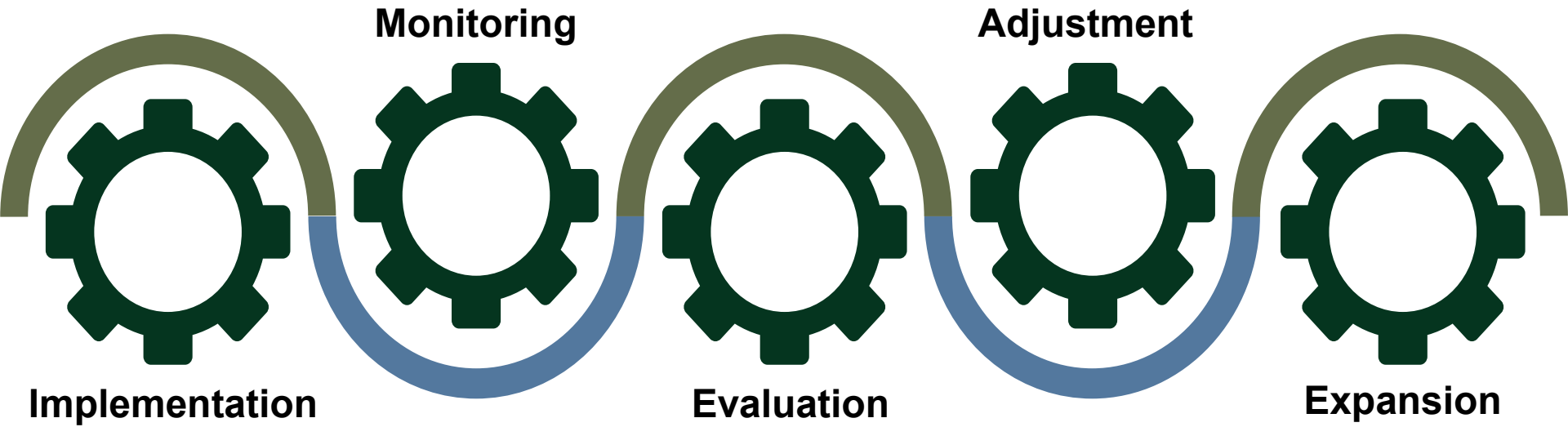
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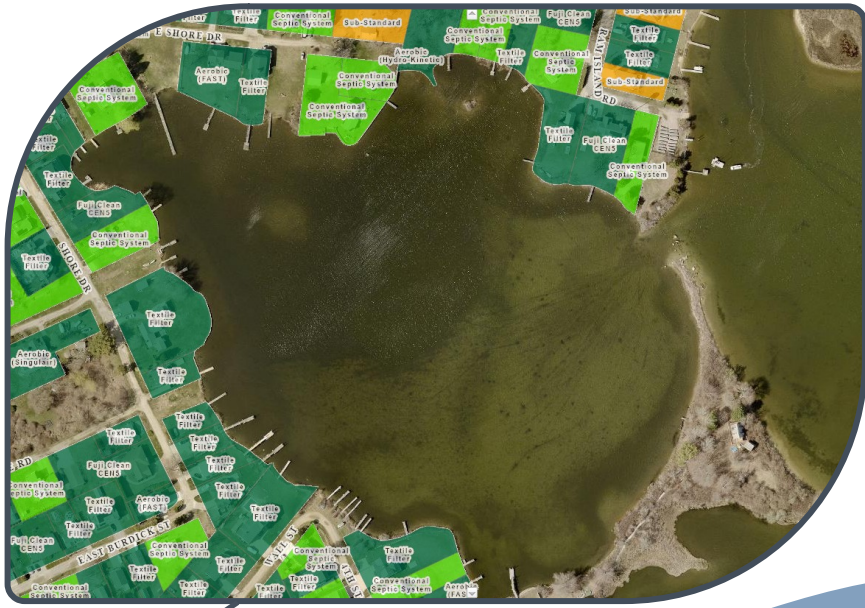
Charlestown Example

Steps 7 - 9. Put Solutions in Place, Adaptive Management + Growth



Steps 7 - 9. Put Solutions in Place, Adaptive Management + Growth





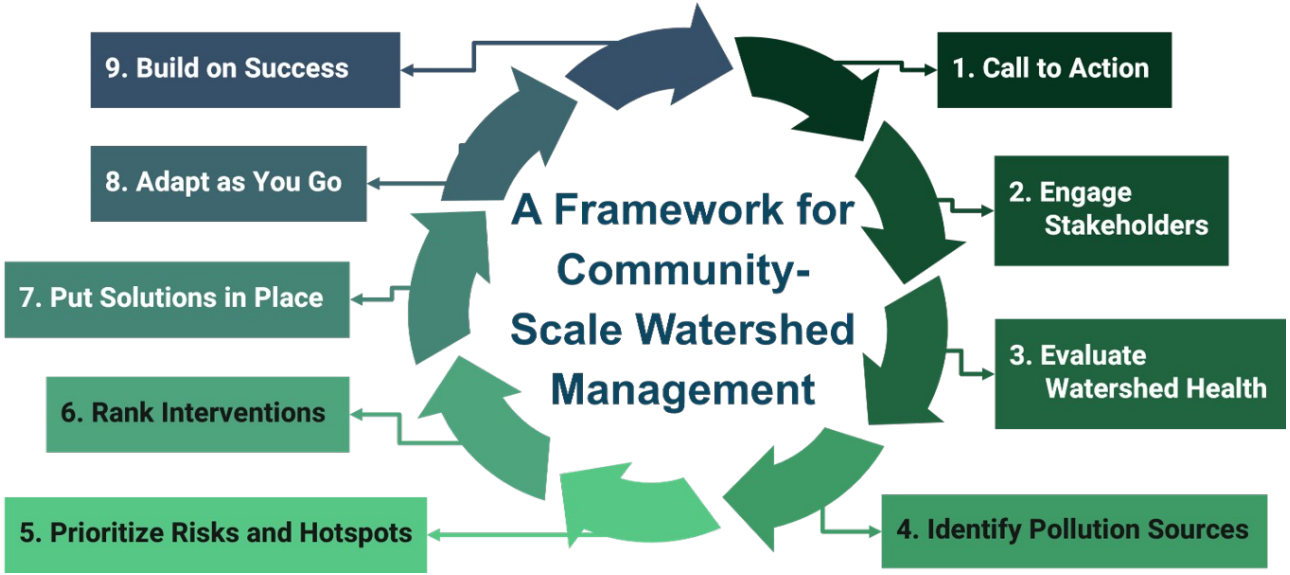
Allen's Cove Septic Upgrades

Compounding Successes

Well-designed watershed programs become self-reinforcing



Successful watershed management is not a project…



It's a system.

Does the Blueprint work?



03

The Blueprint in Action

Case Study: Charlestown, RI

Roadmap

Setting & Problem

Why Charlestown needed a different approach

Blueprint in Action

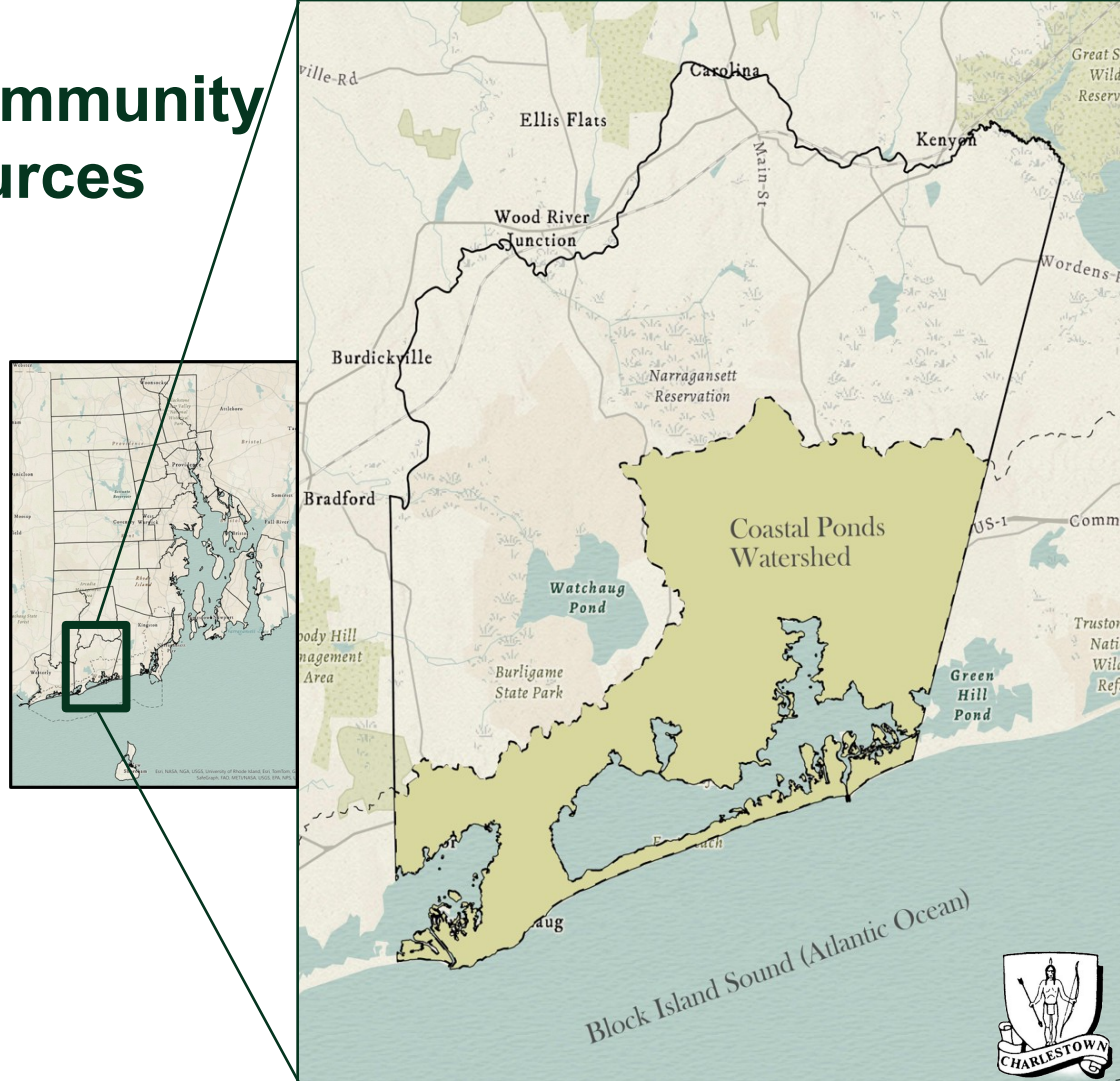
How each step was implemented in Charlestown

Results & Lessons

What 15+ years produced and what transfers

Charlestown — A Community Built on Water Resources

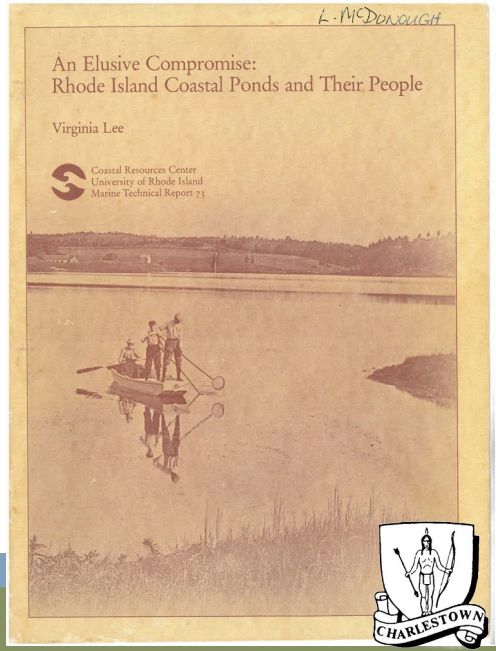
- South Shore coastal community with three lagoons
  - ≈ 2/3 of dwelling units in coastal watersheds
- Groundwater = only source of potable water
  - private wells on a sole-source aquifer
- Rely exclusively on individual OWTS



Program Origins – Step 1 & 2

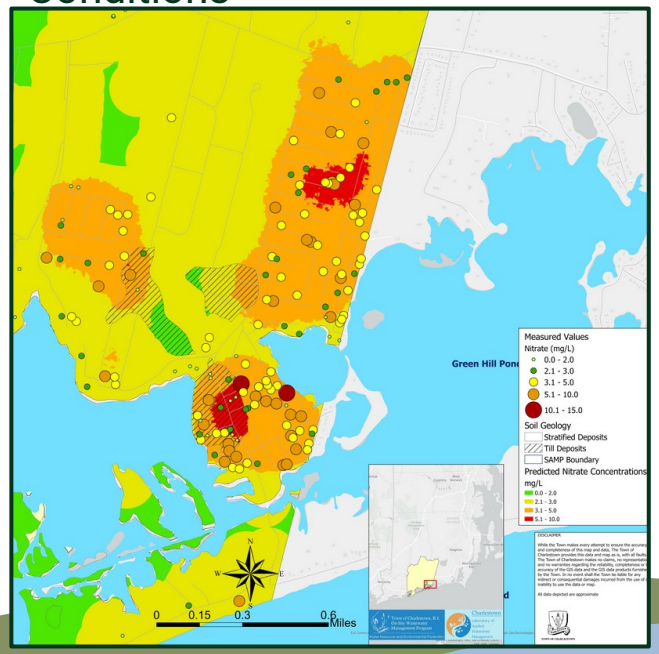
1980	Water quality impairment in the coastal ponds is documented. Onsite WW identified as the primary source.
1987	State Legislation passed enabling local control of OWTS
1990's	Grassroots efforts – Community engagement/education
1994	Town OWTS Ordinance enacted with some resistance
2006	Townwide OWTS first maintenance and inventory initiated
2008	**Full-time department staffing --> *Rapid program growth!***

Driven by local Champions!

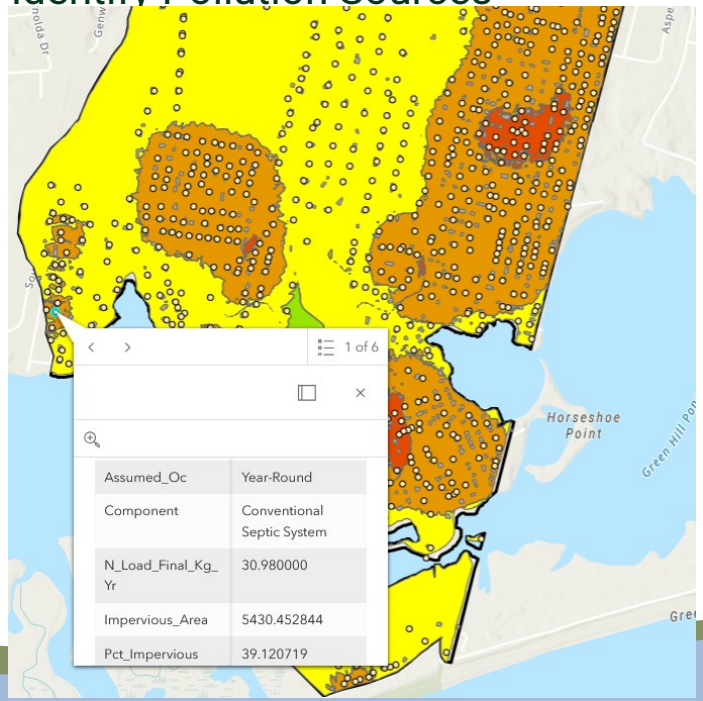


Steps 3 + 4: Evaluate Watershed Health + Identify Pollution Sources

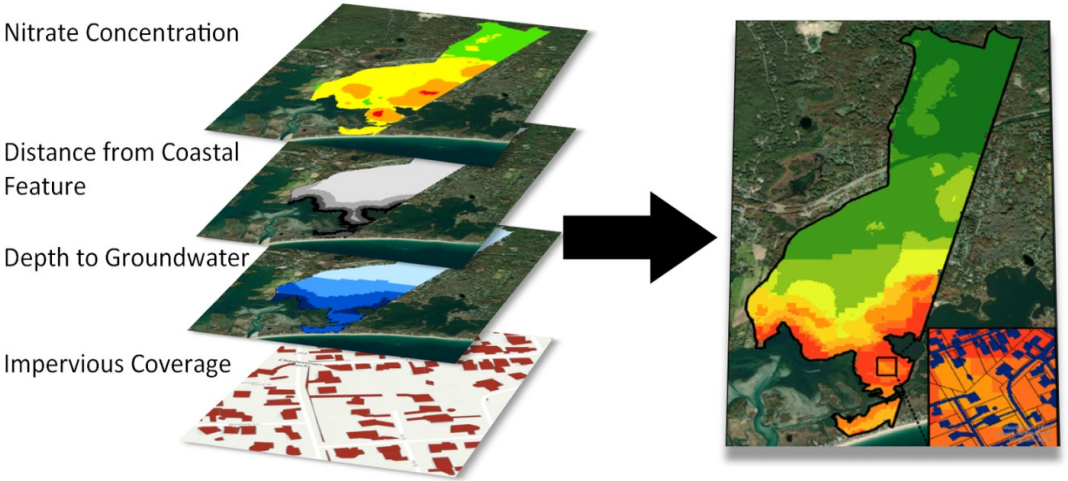
Evaluate Surface & Groundwater Conditions



Identify Pollution Sources



Step 5 – Prioritize Risks and Hotspots



Delineate areas of interest based on public health and environmental risks

Create decision matrices to rank target areas

- Rank high priority areas

Step 6: Rank Interventions

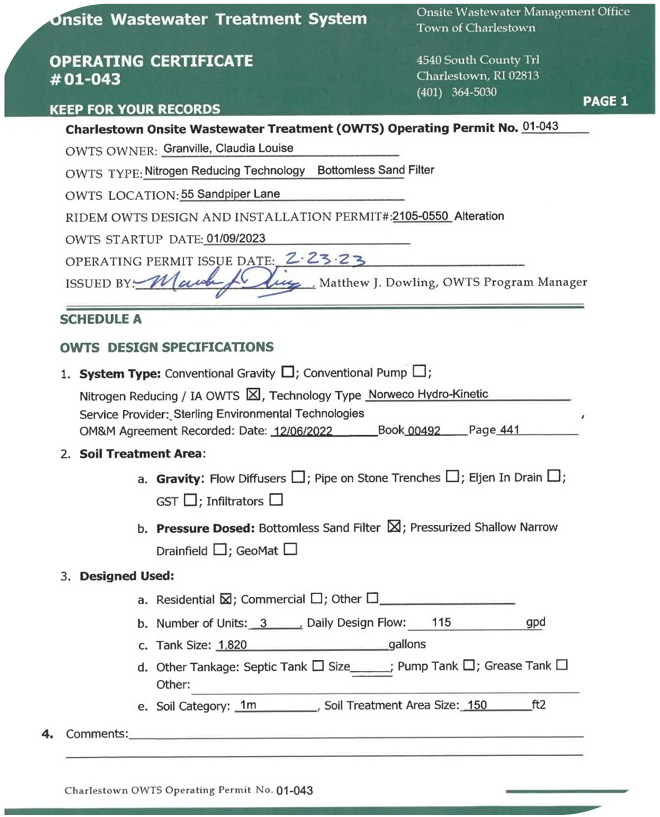
- Prioritization inputs:
  1. Community health impacts
  2. Environmental risk
  3. Cost + available funding
  4. Political feasibility
  5. Readiness of local partners
- Output: A ranked matrix of interventions to address highest value problem areas

Depth to Groundwater (Feet)	Ranking Score	Predicted Groundwater N Concentrations (mg/L)	Ranking Score	OWTS Year Installed	Ranking Score	Occupancy	Ranking Score	OWTS Type	Ranking Score	Percent Impervious Lot Coverage	Ranking Score
< 2	10	5-10	10	<1972	10	Full Time	5	Cesspool	10	>40	6
2-5	7	3-5	7	1972-1984	7	Seasonal	0	Substandard	10	25 > 40	4
5-10	3	2-3	3	1984-1994	1			Conventional	5	12 > 25	2
>10	0	1-2	0	>1994	0			Modern N Reducing	Removed	0>12	0

Step 7: Put Solutions in Place

Starting in 2008

- Town allocated fiscal resources to implement program ~$125,000/year program operating budget
  - Gather and Manage OWTS data
- Model 3 EPA Management Model – "OWTS Operating Permit"
  - OWTS owners are responsible for required maintenance and operation of OWTS



Onsite Wastewater Treatment System

Onsite Wastewater Management Office
Town of Charlestown

OPERATING CERTIFICATE
#01-043

4540 South County Trl
Charlestown, RI 02813
(401) 364-5030

KEEP FOR YOUR RECORDS

PAGE 1

Charlestown Onsite Wastewater Treatment (OWTS) Operating Permit No. 01-043

OWTS OWNER: Granville, Claudia Louise

OWTS TYPE: Nitrogen Reducing Technology Bottomless Sand Filter

OWTS LOCATION: 55 Sandpiper Lane

RIDEM OWTS DESIGN AND INSTALLATION PERMIT#: 2105-0550 Alteration

OWTS STARTUP DATE: 01/09/2023

OPERATING PERMIT ISSUE DATE: 2.23.23

ISSUED BY: Matthew J. Dowling, OWTS Program Manager

SCHEDULE A

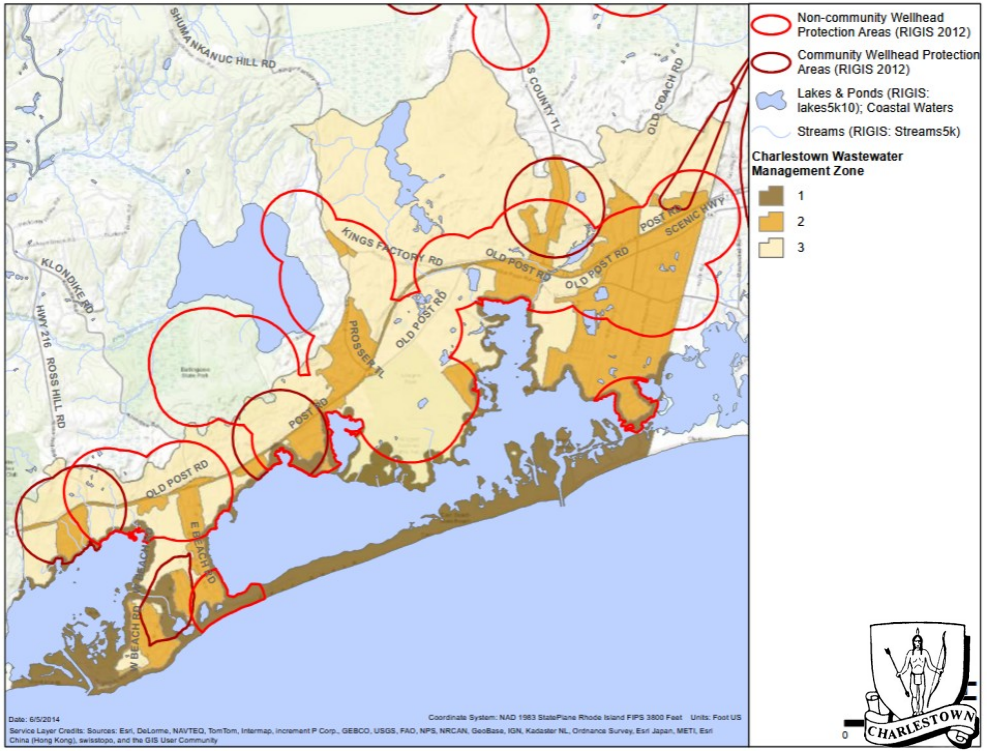
OWTS DESIGN SPECIFICATIONS

1. **System Type:** Conventional Gravity ☐; Conventional Pump ☐;
   Nitrogen Reducing / IA OWTS ☒, Technology Type Norweco Hydro-Kinetic
   Service Provider: Sterling Environmental Technologies
   OM&M Agreement Recorded: Date: 12/06/2022 Book 00492 Page 441
2. **Soil Treatment Area**:
   a. **Gravity**: Flow Diffusers ☐; Pipe on Stone Trenches ☐; Eljen In Drain ☐; GST ☐; Infiltrators ☐
   b. **Pressure Dosed:** Bottomless Sand Filter ☒; Pressurized Shallow Narrow Drainfield ☐; GeoMat ☐
3. **Designed Used:**
   a. Residential ☒; Commercial ☐; Other ☐
   b. Number of Units: 3, Daily Design Flow: 115 gpd
   c. Tank Size: 1,820 gallons
   d. Other Tankage: Septic Tank ☐ Size ; Pump Tank ☐; Grease Tank ☐
   Other:
   e. Soil Category: 1m, Soil Treatment Area Size: 150 ft2
4. Comments:

Charlestown OWTS Operating Permit No. 01-043

Steps 4-7 in Action: Cesspool Phase-out

- Cespools = IDed as major pollution source
- Identified high-risk areas
- Leveraged 2014 OWTS inventory
- Today: removed 99% of all cesspools in Town



Step 8: Adaptive Management

- Our Framework is an iterative process
  - Learn from experiences
  - Improve approach over time
- Various projects exist in many phases of the framework
- But the foundational successes provide momentum

Steps 4-7 in Action (again): Grant-funded OWTS upgrades



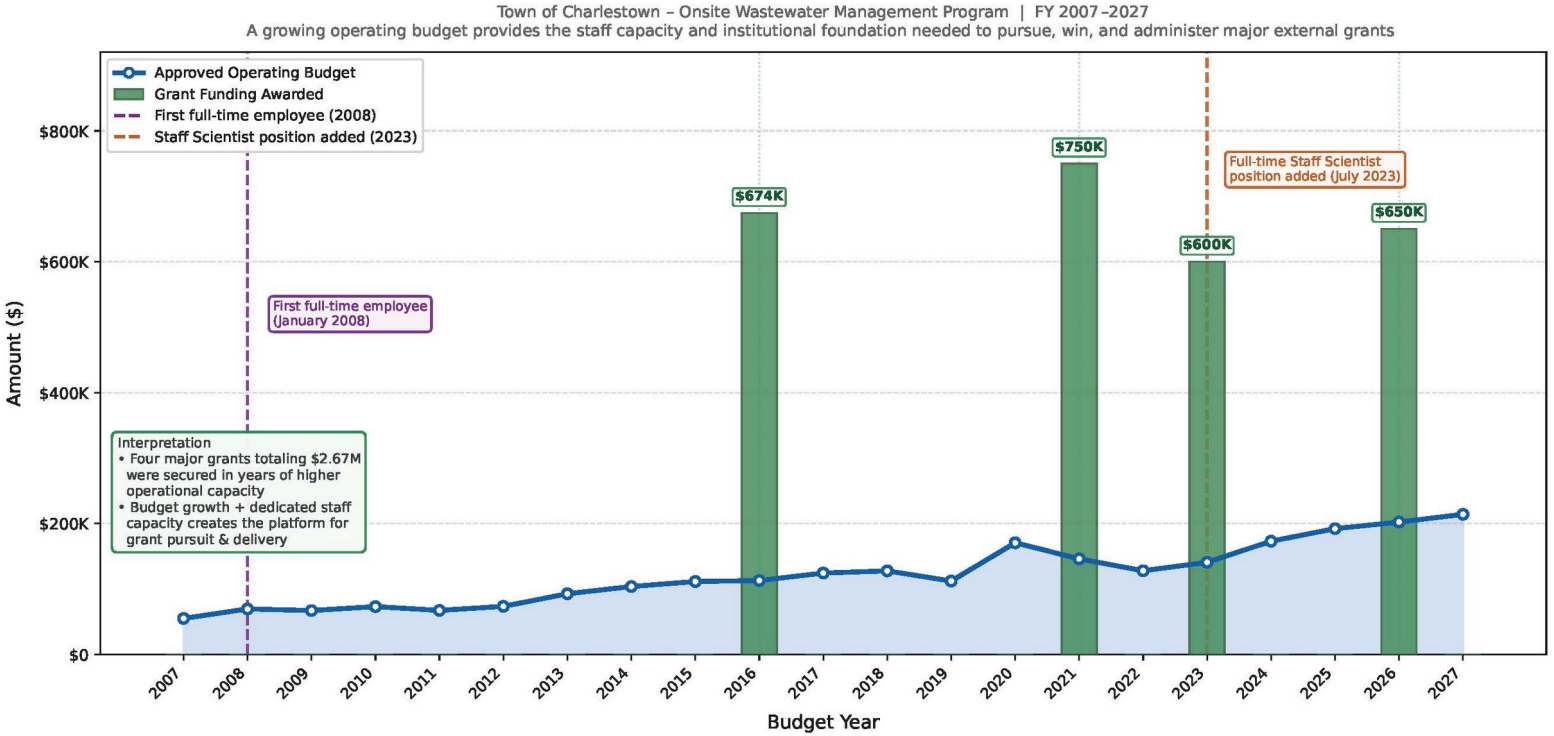
- 34 OWTS upgraded
  - Experimental Technology
- Stormwater upgrades
- Fertilizer Reduction

Step 9 – Building on Success

- Expand local capacity and data collection
- Share findings to further the science of OWTS and watershed management
  - Partner with universities + local organizations
- Drive science-backed policy development
- Pursue additional funding
  - Use programing as in-kind / fiscal contributions to implement water resource mitigation programs
  - To date: ~$3M in grant funding to implement OWTS Management and OWTS modernization where needed
  - Partnerships = critical

Building on Success

Operating Budget Growth & Grant Funding Allocations



Data source: Approved operating budgets and recorded grant awards | Single shared scale used for both series | Graphic illustrates that increases in base operating capacity can be leveraged into external grant opportunities

Our Outcomes by the Numbers

- Comprehensive OWTS Management & Tracking (Today: 6,331 Systems)
  - 12,000+ inspections conducted
  - Over 500 cesspools replaced
  - ~400 failing systems identified, managed, tracked and upgraded
    - average ~30 per year (~2% of inspections)
  - Program modernization and better community engagement over time
- Financing OWTS infrastructure
  - >$2.5M disbursed in 1% loans for failing system upgrades
  - ~$3M in grant funding for OWTS infrastructure – Reduced annual N loading by >700 lb/yr

Our Outcomes and Impact

- Built partnerships → more funding + spinoff projects

- Expanded capacity
  - Research/GIS laboratory established
  - Increased Staff
- Assist / advise other commu

Lessons for Other Communities

1. Stakeholder engagement = KEY
2. Start Small – Scale Over Time
3. Build Sustainable Systems + Document Them
4. Success Begets More Success



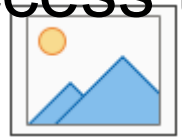
04

Closing

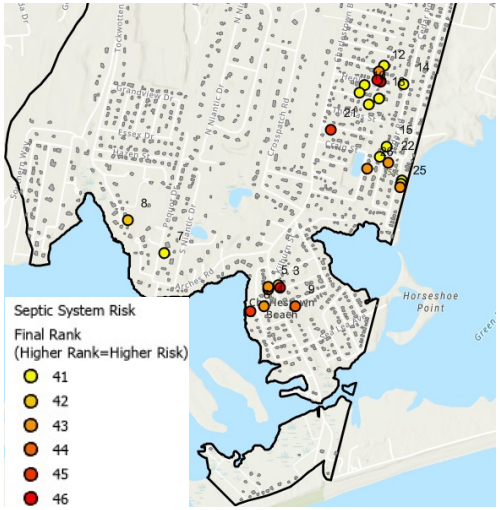
Key Take-Aways
Q&A

Key Takeaways

1. Start with people
2. Use science to inform decisions
3. Prioritize actions transparently
4. Treat implementation as a continuous process
5. Use success to build capacity



How will your community use the Framework?





- Identify risk
- Fund mitigation
- Assess / Engage-> Repeat



Questions?



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Town of Charlestown, R.I.
On-Site Wastewater Management Program
Water Resource and Environmental Protection