

Designing an Effective Plan to Protect Drinking Water Resources



Source: <http://ww2.dianemacphersonart.com>

***Your Water, Your Decision
Making Plans and Protecting Local Drinking Water Resources
in the Upper Valley Region***

Date: Tuesday, February 1, 2011

Place: Kilton Library, 80 Main St, West Lebanon, NH (directions)

Time: 9:00 am – 3:00 pm

Context...

The Multiple Barrier Approach to Protecting Public Health

The multiple barrier approach provides “defense in depth” against waterborne pathogens and chemical contaminants that can cause a variety of illnesses and conditions, some of them potentially fatal. By erecting barriers against these contaminants at each step in the process from raw, untreated source water to the delivery of treated finished water, system owners and operators can protect the health and well being of the people who rely on them for potable water.



Source Water

Barriers: Selecting and protecting the best source of supply.



Treatment

Barriers: Installing treatment methods, implemented by a certified operator, that will improve the quality of the source water.



Storage and Distribution

Barriers: Constructing, operating, and maintaining well-engineered storage facilities and distribution systems.



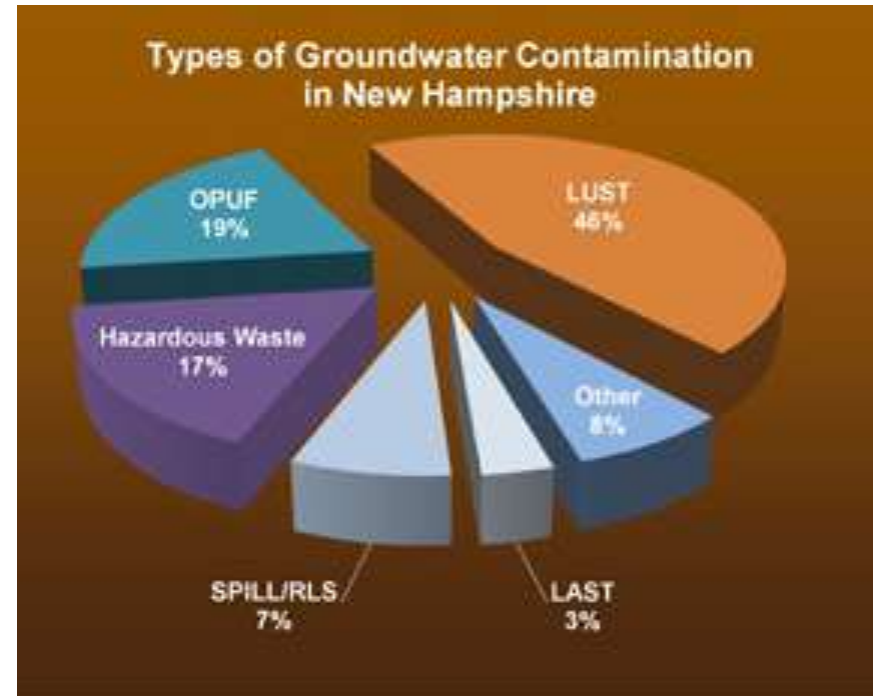
Monitoring and Public Information

Barriers: Providing consumers with information on water quality and health effects.

Figure 8-6. Multiple-barrier approach to safe drinking water. Source: USEPA, 2003.

Contaminants from Human Activity

- 7,000 contamination sites
 - 2,300 required remediation
 - Typically localized
- More widespread
 - Road salt
 - MtBE (very low levels – ppb)



Cleaning up petroleum related contamination has required \$180 million over last 20 years

What is “source water”?

Untreated water from streams, rivers, lakes, and underground aquifers

Figure 2.6 Active public water systems in the Waukegan Watershed.



What is the purpose of a source protection plan?

- Identifies threats and contamination risks
- Sets priorities for actions that reduce risks to water supplies

Priorities? Prevent contamination and preserve availability



Why prevent contamination? (cost)

- Capital investments in well/piping/storage
- Cost of replacement well
- Reduced value of millions of gallons of water rendered undrinkable
- Diminished property values
- Reduced opportunities for economic development
- Cost to clean up and monitor

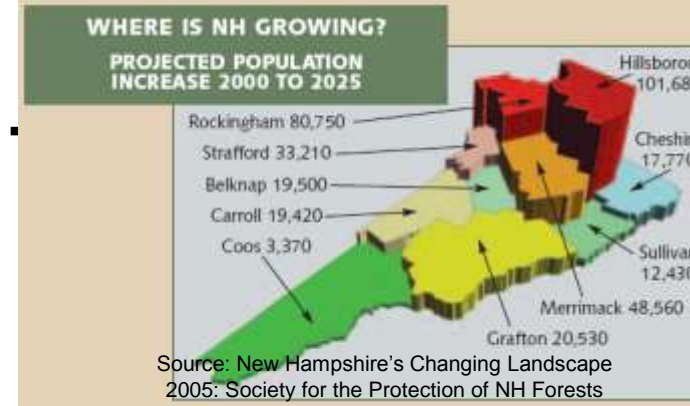


Why preserve availability?



Availability May Depend Upon...

- Population growth
- Increasing impervious surface
- Leaky infrastructure
- Wasteful discretionary use
- Lack of public understanding



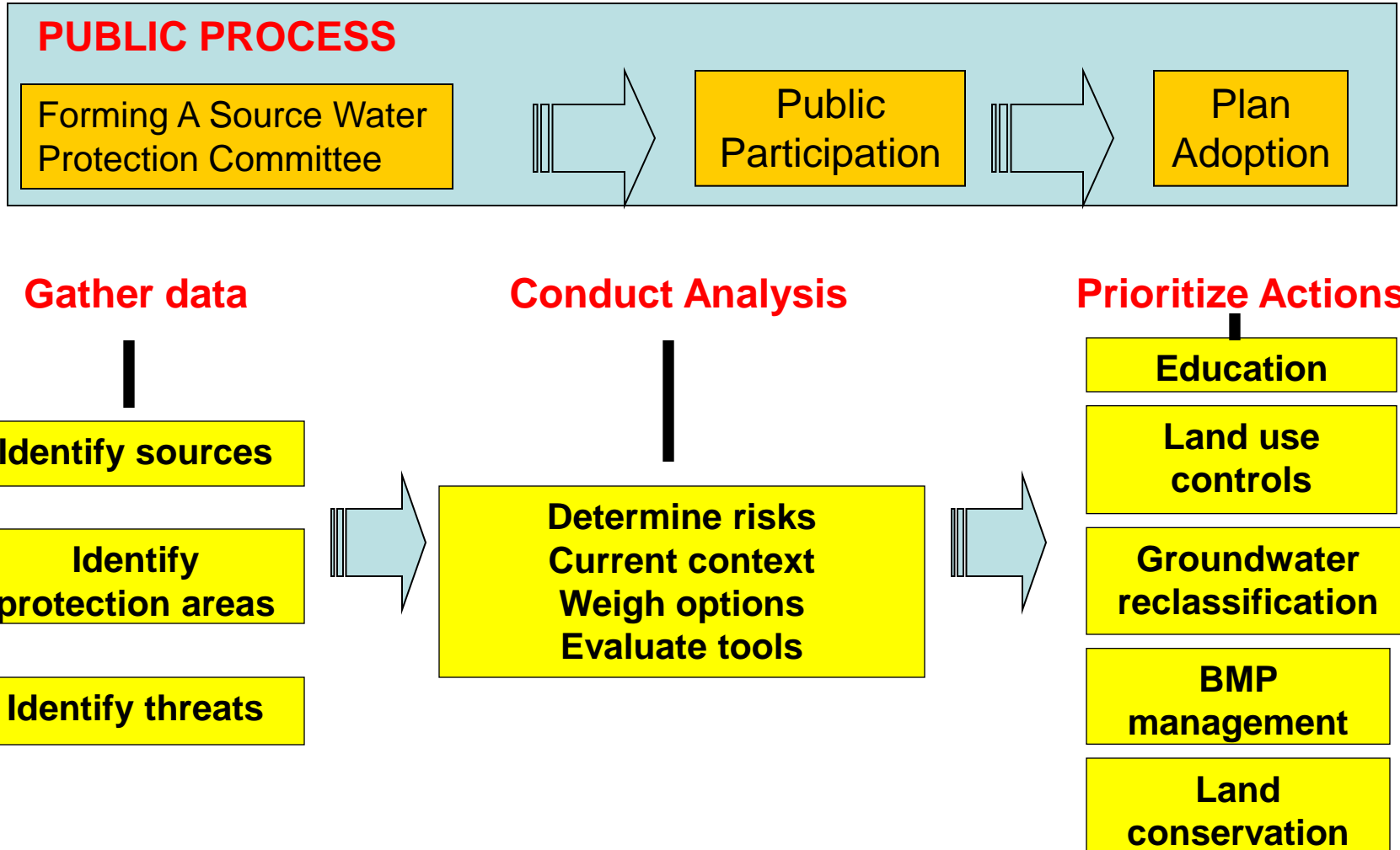
Form / Appoint a Committee



Canaan Drinking Water Protection Committee: *(left to right)* David Shinnlinger, John Bergeron, Robert Reagan, Tim Jennings, Jay Waldner. *(Not pictured: Wally Medeiros, Bill Wilson, Jim Linn, and Joe Damour)*

Think, Plan, Act

PLAN DEVELOPMENT PROCESS



Considerations for developing source water protection plans



What is the geographic scope of the resource/plan?

WHPA(s), watershed or entire community

What information needs to be gathered to develop the plan?

DW source locations, potential contamination sources

What resources or expertise will be necessary to complete the plan?

Water supplier(s)? Planner or engineer? Hydrologist?

Who are the most relevant stakeholders to involve in the plan development process?

Water supplier(s), businesses considered threats within WHPA(s) or watershed(s)

How will other plans complement source protection? (master plans, open space plans, etc.)

Coordinating process and actions

What's in a plan? (typical outline)

I. Introduction

Why is the plan important?

What are the plan objectives?

Who was involved? (public process)

II. Characteristics of the sources and Source Protection Areas

Watershed, aquifer characteristics

Water quality issues/data

Water use, service connections

III. Inventory of Potential Contamination Sources

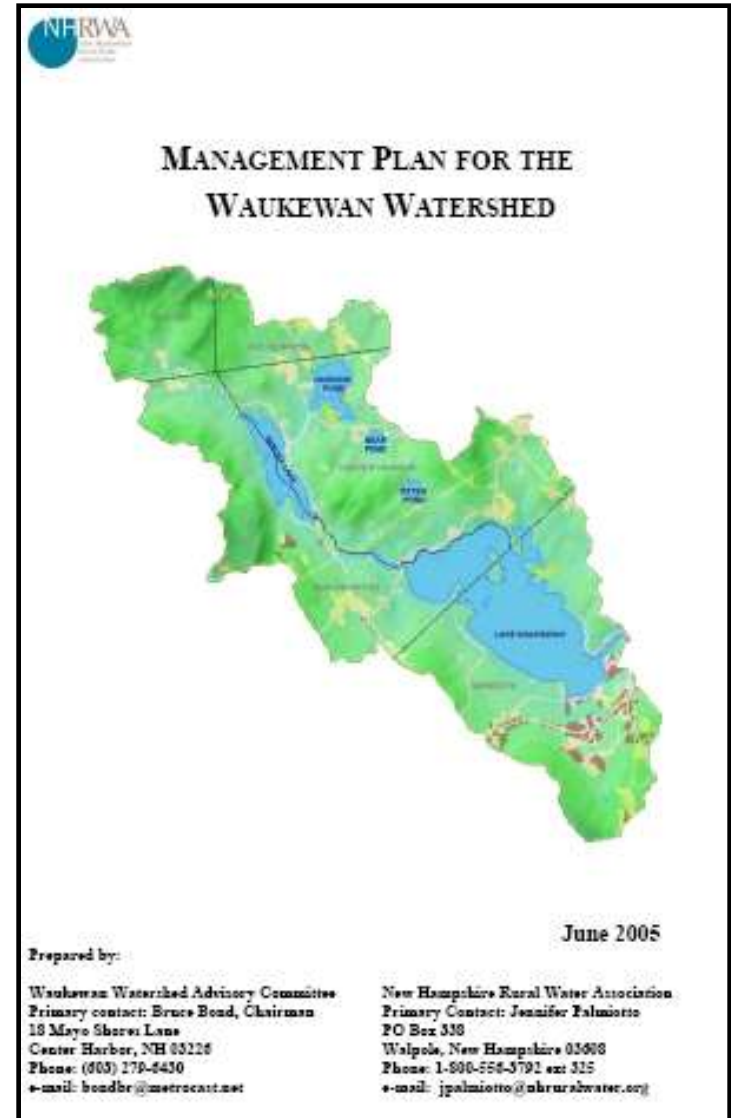
Existing and future (potential) risks

IV. Management of Risk (Actions)

Strategic actions to manage risks

Prioritization and schedule of actions

V. Emergency Response Plans (Optional)



I. Introduction: state plan objectives

Safe, sustainable use

Published 8/7/09

Concern Over Canaan Water

Conservationists Fret Over Source

By Martin F. Downs
Valley News Staff Writer

Canaan -- Although only 190 customers use the Canaan town water system, conservationists say that protecting the source, Canaan Street Lake, matters to everyone in town.

The water quality of the lake is threatened, and “we may not have anything else,” said Dave Shinnlinger, chairman of the Canaan Source Water Protection Committee.

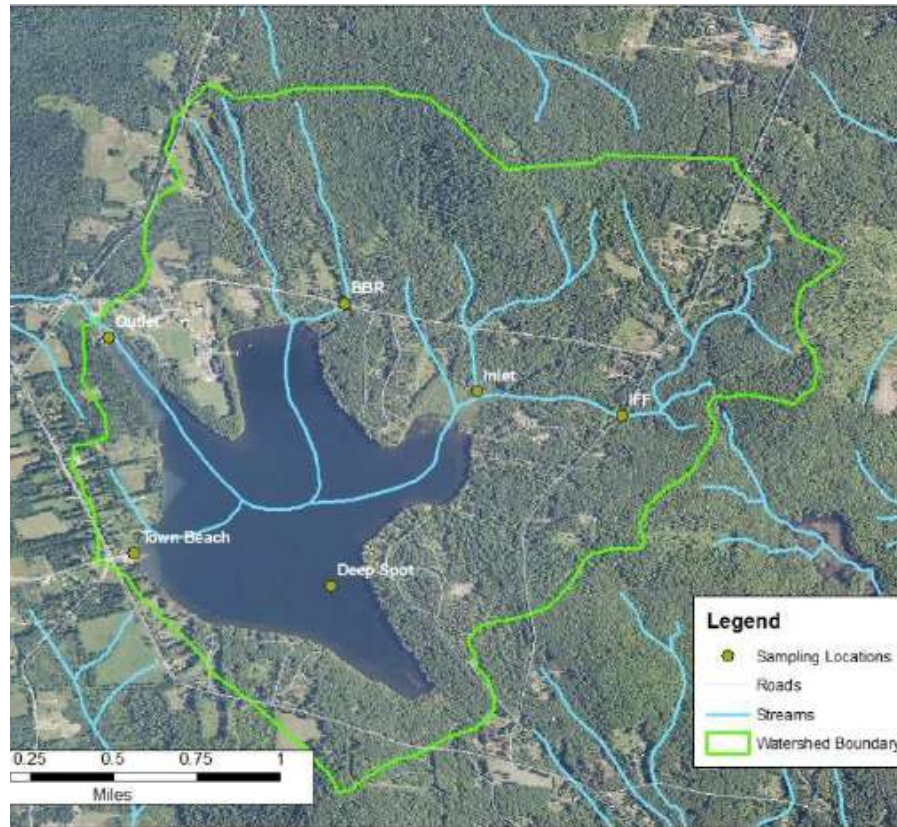
“The water has slowly been getting worse,” Shinnlinger said.

But replacing the lake as a public drinking water source would



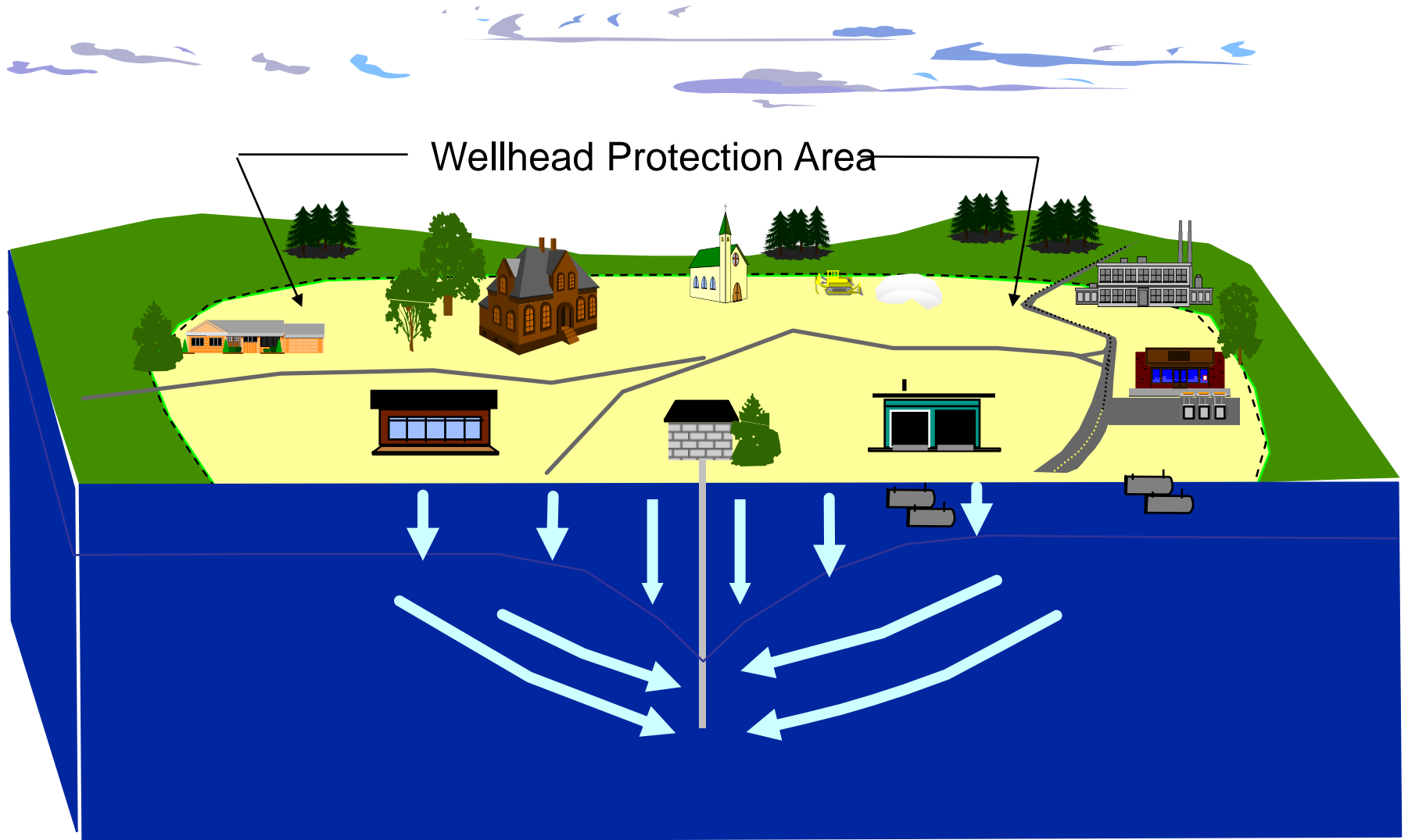
After a dip in Canaan Street Lake, Vyasa Molloy, 18, of Canaan, checks the arm of her sister, Josie Christian, 11, after reading a warning that high levels of bacteria in the water could cause a rash and other symptoms yesterday. (**Valley News — James M. Patterson**)

I. Identify scope of the plan



Source Water Protection Area: (example) Surface area within a watershed contributing water to lake, reservoir or stream that provides untreated (raw) water to a public water system.

I. Wellhead protection areas (WHPAs)

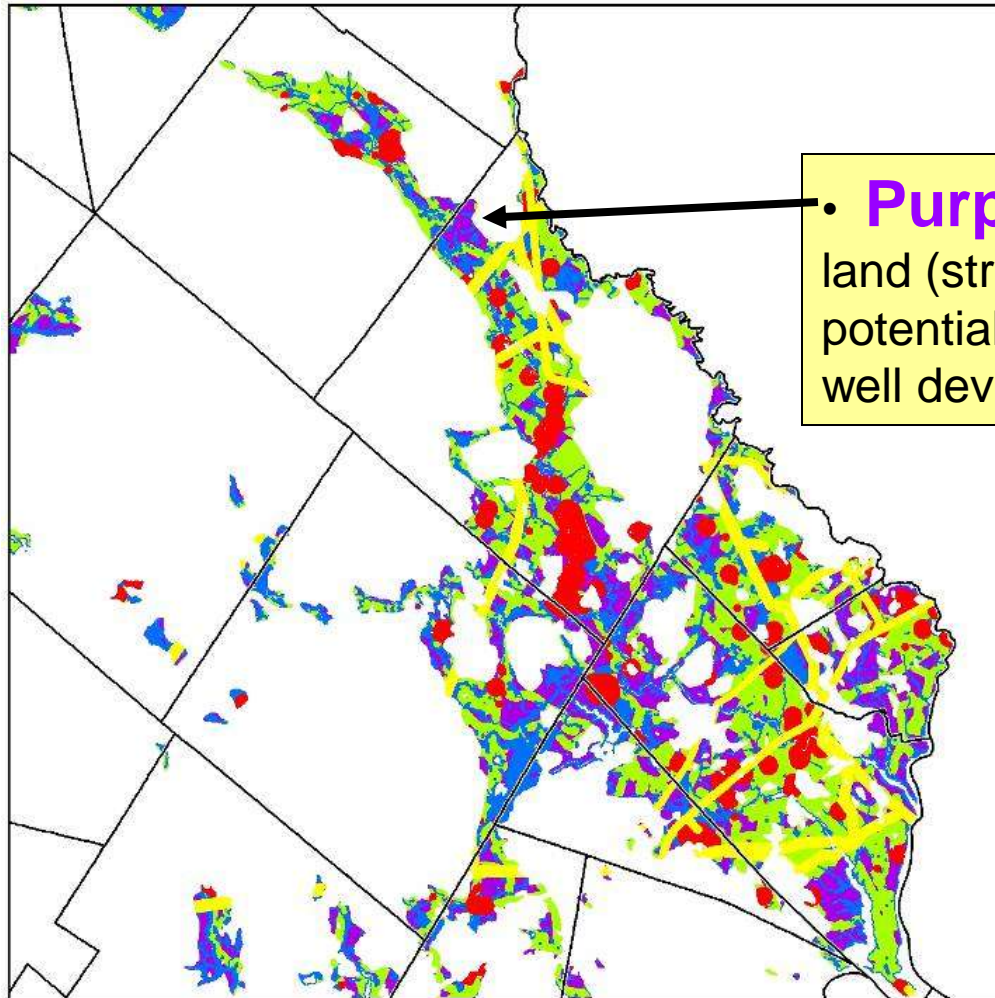




A geological map of a region, likely in New England, showing various geological features. The map is bounded by a thick black line. The area is divided into several colored regions: yellow, blue, and green. The yellow regions are irregularly shaped and scattered throughout the map, representing stratified drift aquifers. The blue regions are also irregularly shaped and scattered, representing water bodies or other geological features. The green regions are more uniform and represent other geological formations. The map includes labels for several towns: Weare at the top, Goffstown on the right, Amherst at the bottom right, Bedford on the bottom right, Lyndeborough on the bottom left, and Francesstown on the left. There are also labels for roads: 136 on the left, 13 in the center, and 17 at the top. The text "Stratified Drift Aquifers store and potentially yield large volumes of groundwater." is overlaid on the map in a large, black, sans-serif font.

Stratified Drift Aquifers store and potentially yield large volumes of groundwater.

Note: N.H. is losing high-yield aquifer areas favorable for future municipal wells



Favorable Gravel Well Analysis

- **Purple** is the remaining land (stratified drift) area potentially suitable for municipal well development.

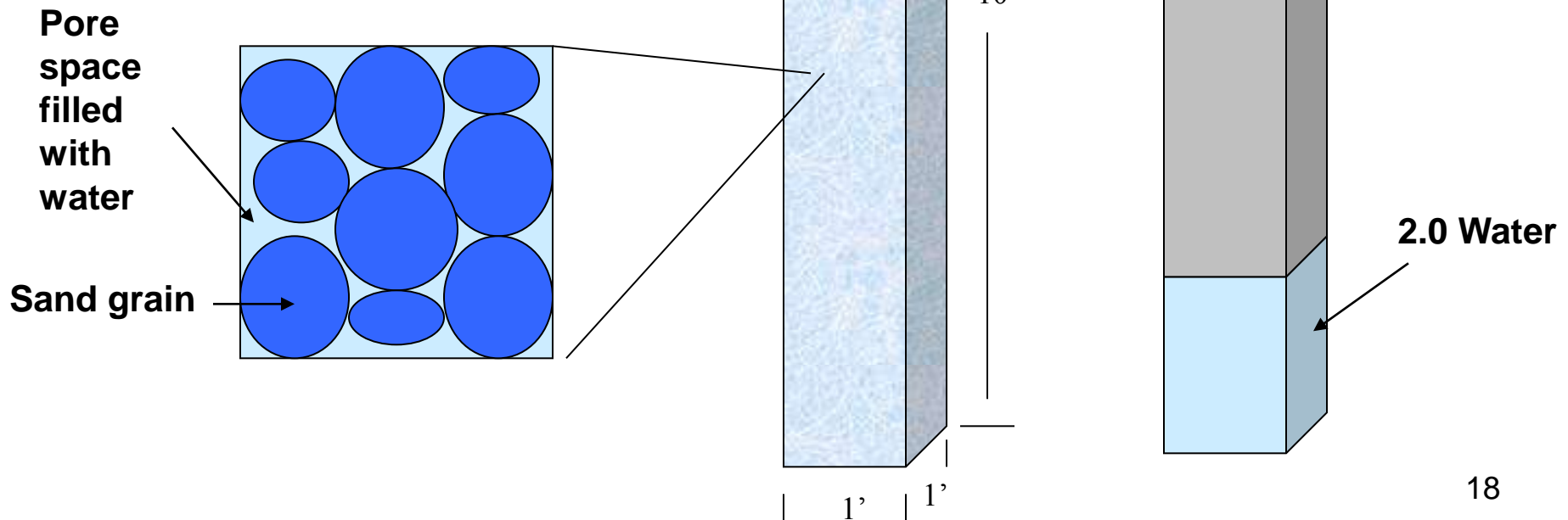
- **75% of favorable areas are unprotected**

- **FGWA data available from DES and SPNHF**

Source: D. Sundquist, SNHPF (2010)

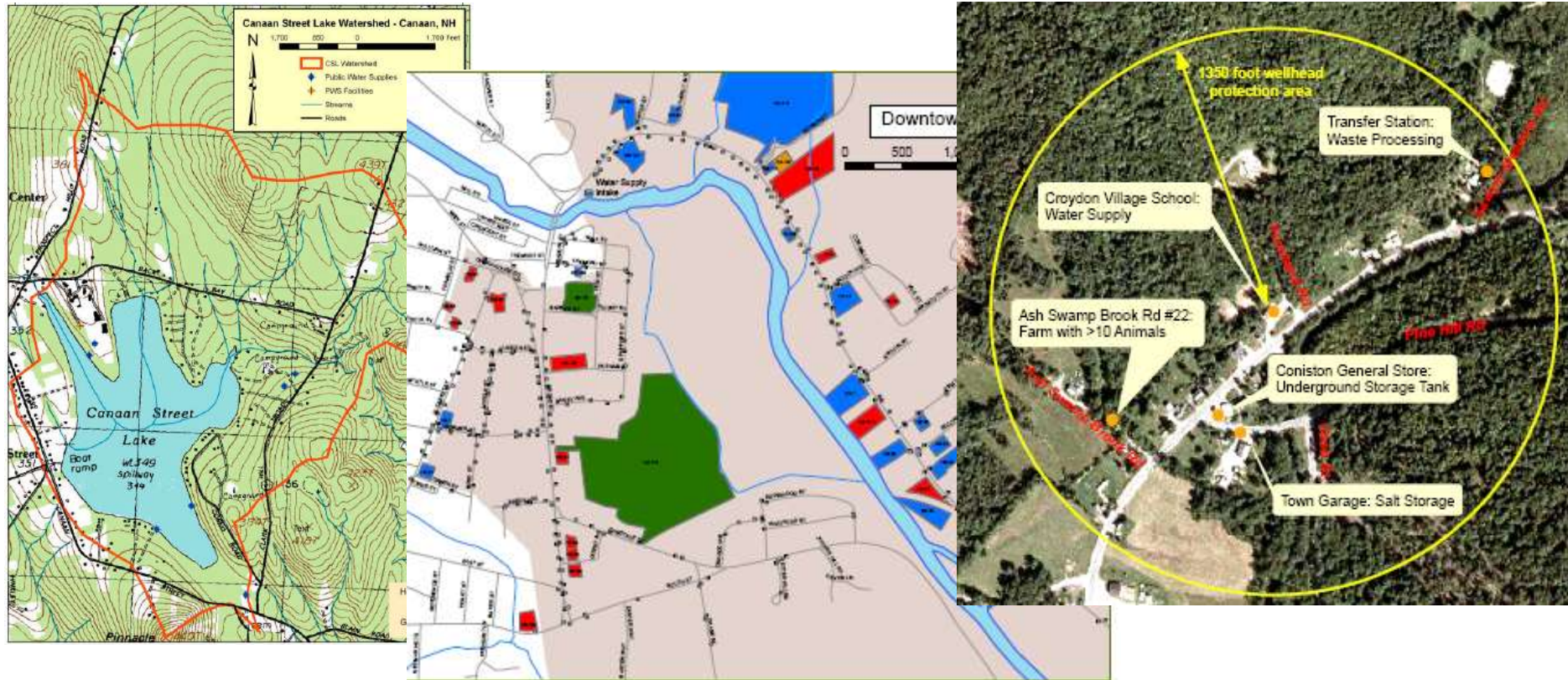
Groundwater storage in stratified-drift deposits

10 cubic feet of well sorted, saturated sand with 20% porosity could store 2.0 cubic feet of water!



(NHGS, 2002)

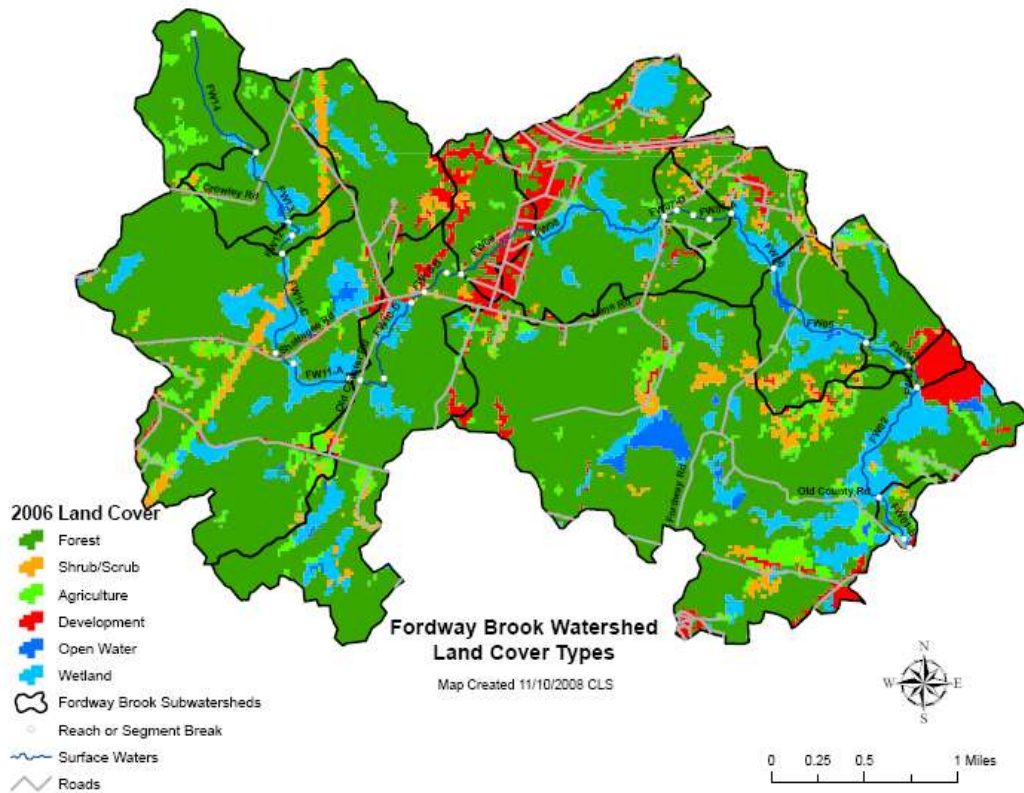
II. Characteristics of the sources and Source Protection Areas



Natural features (aquifer, watershed), thematic maps, water use charts, water quality trends relevant to evaluating risks

II. Characteristics – land use / cover trends

Land cover



Land use



II. Characteristics - Water based activities



II. Characteristics - Water quality trends may suggest types of contamination sources

Chlorophyll-a Category

| | |
|----------------------------|---------------------|
| 0-5 mg/m ³ | Good |
| 5.1 – 15 mg/m ³ | More than desirable |
| >15 mg/m ³ | Nuisance Amounts |

Total Phosphorus (TP) Ranges for New Hampshire Lakes and Ponds

| <u>TP (ug/L)</u> | <u>Category</u> |
|------------------|-----------------|
| 1-10 | Low (good) |
| 11-20 | Average |
| 21-40 | High |
| >40 | Excessive |

Statistical Summary of Turbidity Values for NH Lakes and Ponds

| <u>Turbidity (NTUs)</u> | <u>Category</u> |
|-------------------------|-----------------|
| <0.1 | Minimum |
| 22.0 | Maximum |
| 1.0 | Median |

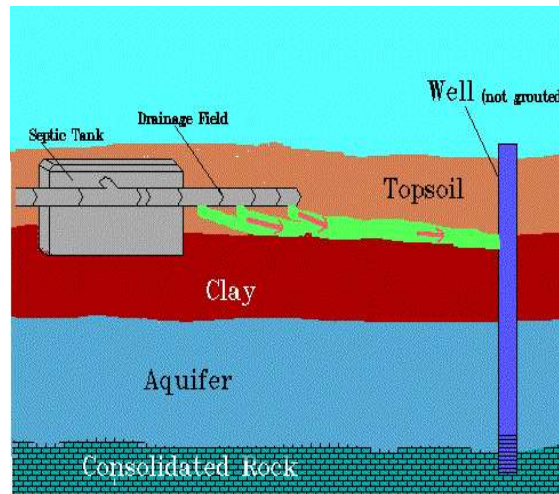


...does the data indicate a need for certain management?

III. Inventory of potential contamination sources (PCSs)



Blue green algae often start as small clumps.



J. Murray

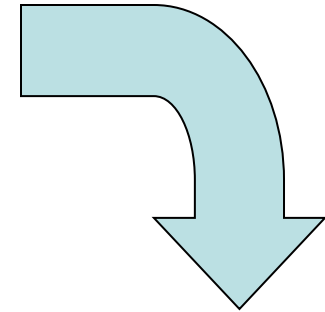
III. Where may contamination come from?

surface water

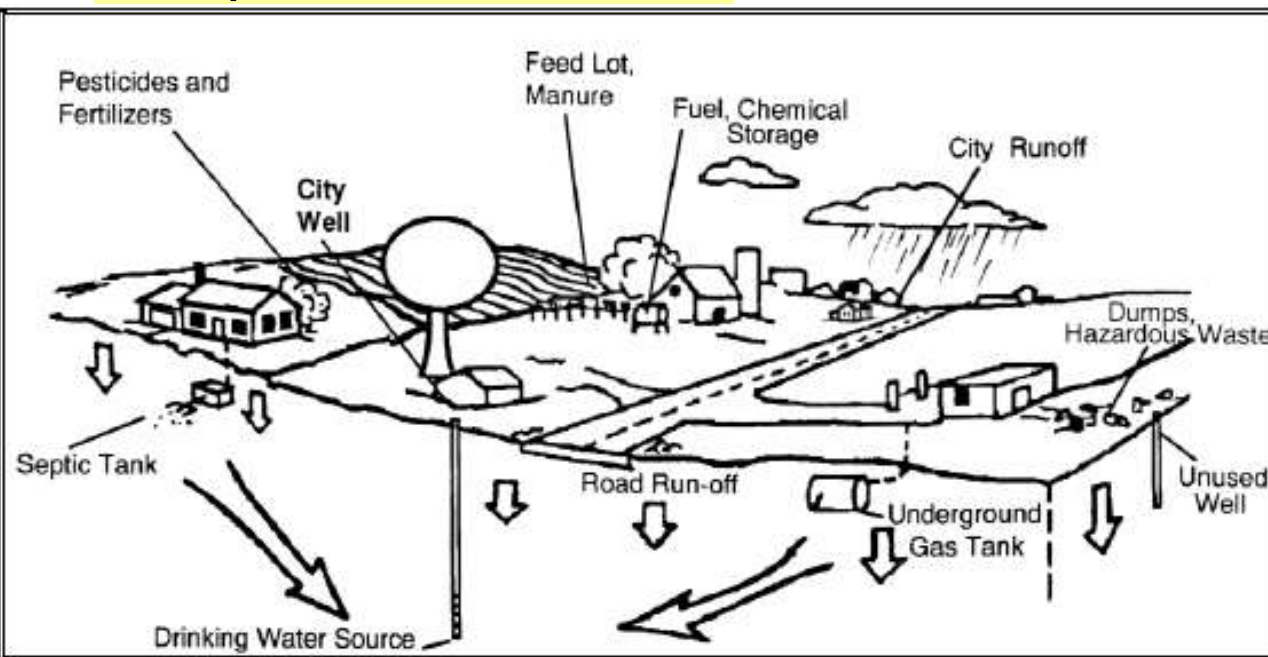
Stormwater
Lawn care
Landscape changes
Motor boating
Swimming
Seaplanes

groundwater

Fuel tanks
Sewer
Septic systems
Blasting



Microbials
(bacteria, viruses, etc.)
Nitrates
Phosphorus
Pesticides
Volatile organic compounds (VOCs)



Examples of Source Water Contamination

III. RSA 485-C:7 Potential Contamination Sources

Active management through local BMP inspection

- ✓ **Vehicle service & repair**
- ✓ **General service & repair**
- ✓ **Metalworking**
- ✓ **Manufacturing**
- ✓ **Waste & scrap processing**
- ✓ **Laboratories**
- ✓ **Hazardous waste facilities**
- ✓ **Concrete, asphalt, tar manufacturing**



A greater number of PCSs in WHPAs correlates with higher frequency of contamination “detects” in public water supply wells

III. Example of PCS Inventory Table

Plan narrative identifies PCS activities and contaminants

Table 3. South Main St. Water District Potential Contamination Sources (PCS's) Inventory

| Property Tax Map ID | Name / Address | Property Use | Contaminant | PCS # | Location |
|---------------------|---|--|--|-------|--------------------|
| 10-40 | Warren School District 11 School St. Warren, NH 03279 | School- Septic system Parking Lot | Pathogens | 1 | Outside WHPA |
| | | | Automotive chemicals | 2 | In Sanitary radius |
| 10-237 | ROW Town of Warren PO Box 66 Warren, NH 03279 | Recreational trail used by ATVs, horses, cars, motorbikes, bicycles, dog sled teams, and x-country skiers. | Volatile organic chemicals Pathogens | 3 | In Sanitary Radius |
| 10-256 | Gary & Tammy Stevens 447 NH RT 25 Warren, NH 03279 | Residential – Septic system, household hazardous waste Horse pasture | Pathogens | 4 | In WHPA |
| | | | Pathogens | 5 | In WHPA |
| 10-234 | Town of Warren PO Box 66 Warren, NH 03279 | Town Offices Salt/Sand Storage Parking Lot | Sodium Chloride Automotive chemicals from parking lot | 6 | In Sanitary Radius |

III. Inventory of Potential Contamination Sources

Plan narrative describes activities having the potential to contaminate the source (optional and typically based on site visits)

Airport (PCS #1)

Within the wellhead protection area and approximately 670 feet from well #1 and 1,600 feet from well #2 is an airport and landing strip. There is no re-fueling or maintenance permitted at the airport. Potential contamination sources include airplane storage, and potential spills from an airplane accident.

Transportation Corridors (PCS #2)

There are three roads within the wellhead protection area. These roads include Main St., Mascott Street, Bellevue Ave, and a multi-modal road (PCS #14). Roads are potential contamination sources because of de-icing materials and automotive chemicals. Volatile organic chemicals (VOCs) volatilize rapidly and thus are less of a concern for surface water supplies.

(Source Water Protection Plan, Gorham 2004)

IV. Management Plan (actions)

PLAN ANALYSIS

Water quality issues?

Threats?

Current management & protection?

Possible management actions?

Context?

PRIORITIZING ACTIONS

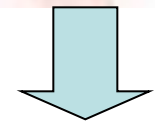
How likely is the activity to contaminate?

What is the potential severity (impact)?

How feasible is the action?

Actions should...

**Reduce
contamination**



Prioritize Management Actions

- **LAND CONSERVATION.** Protecting the most sensitive water supply areas through land conservation easements or land purchases
- **LAND USE RESTRICTIONS.** Prohibiting inherently high-risk activities through local land use controls (e.g. zoning) or establishing vegetated buffers
- **WATER USE RESTRICTIONS.** Limiting certain activities in or on the water (e.g. swimming, motor boating, ice fishing, snowmobiling)
- **LAND USE MANAGEMENT.** Ensuring that Potential Contamination Sources (PCSs) follow “best management practices” (defined in Env-Wq 401 Best Management Practices for Groundwater Protection)
- **SOCIAL MARKETING / PUBLIC EDUCATION.** Increasing public awareness of surface and/or groundwater resources and values with a view to influencing human behaviors that affect water supply resources

Protection Approaches to Address Threats (from DES Fact Sheet 12-8)

| | | |
|---|---|--|
| Septic systems (or sewer lines) located within WHPA or windshield survey area (see note below). | Education Household hazardous waste collection Health ordinance Water quality monitoring | Septic pumping program; or health ordinance could require maintenance of septic systems |
| Urban land cover in WHPA or HAC. | Education Health ordinance Inspection program Household hazardous waste collection Water quality monitoring | Map storm drain system; look for opportunities for improvements. Consider zoning and site plan/subdivision review to limit future density. |
| Agricultural land cover in WHPA or within 300 ft of surface water in HAC. | Education Inspection program Water quality monitoring Land acquisition Watershed rule (for surface sources) | Inspection program would be voluntary on the part of farmers. Special grants available for certain on-farm projects. |
| Farms with 10 or more outdoor animal units in WHPA or watershed. | | |
| Wastewater treatment, spray irrigation, lagoons in WHPA or watershed. | Education Emergency response planning Water quality monitoring | |
| Projected trophic status based on computer modeling (for certain lakes and reservoirs only). | Education Land acquisition Subdivision and site plan review Zoning Watershed rule Water quality monitoring | More intensive modeling Watershed planning |

Management (groundwater focus)

Managing Land Use
(Inspection of PCSs)

Site Plan Review

Subdivision Regulations

Stormwater Regulations

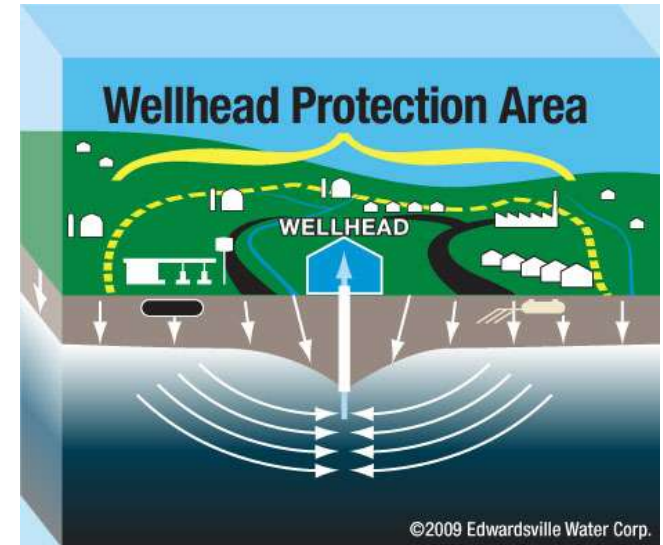
Health Regulations

Groundwater Reclassification

Aquifer / WHPA Protection
Ordinance

Gravel Excavation Ordinance

Septic System Ordinance



Management Options (surface water focus)

| Watershed Protection Practices Used by Large Systems in U.S. | Respondents Using |
|---|-------------------|
| Zoning (esp. large-lot residential) | 90% |
| Land acquisition/conservation easements | 72% |
| Shoreline <i>and tributary</i> stream buffers | 90% |
| Encourage better site design (e.g., cluster subdivs, impervious cover limits) | 68% |
| Erosion and sediment control | 100% |
| Stormwater treatment | 95% |
| Exclude wastewater discharges | 86% |
| Regulate hazardous waste | 73% |
| Education | 86% |

Source: Center for Watershed Protection survey, 2001

Non-Regulatory Opportunities to Work with Landowners



Cardinal Street Before



Cardinal Street After

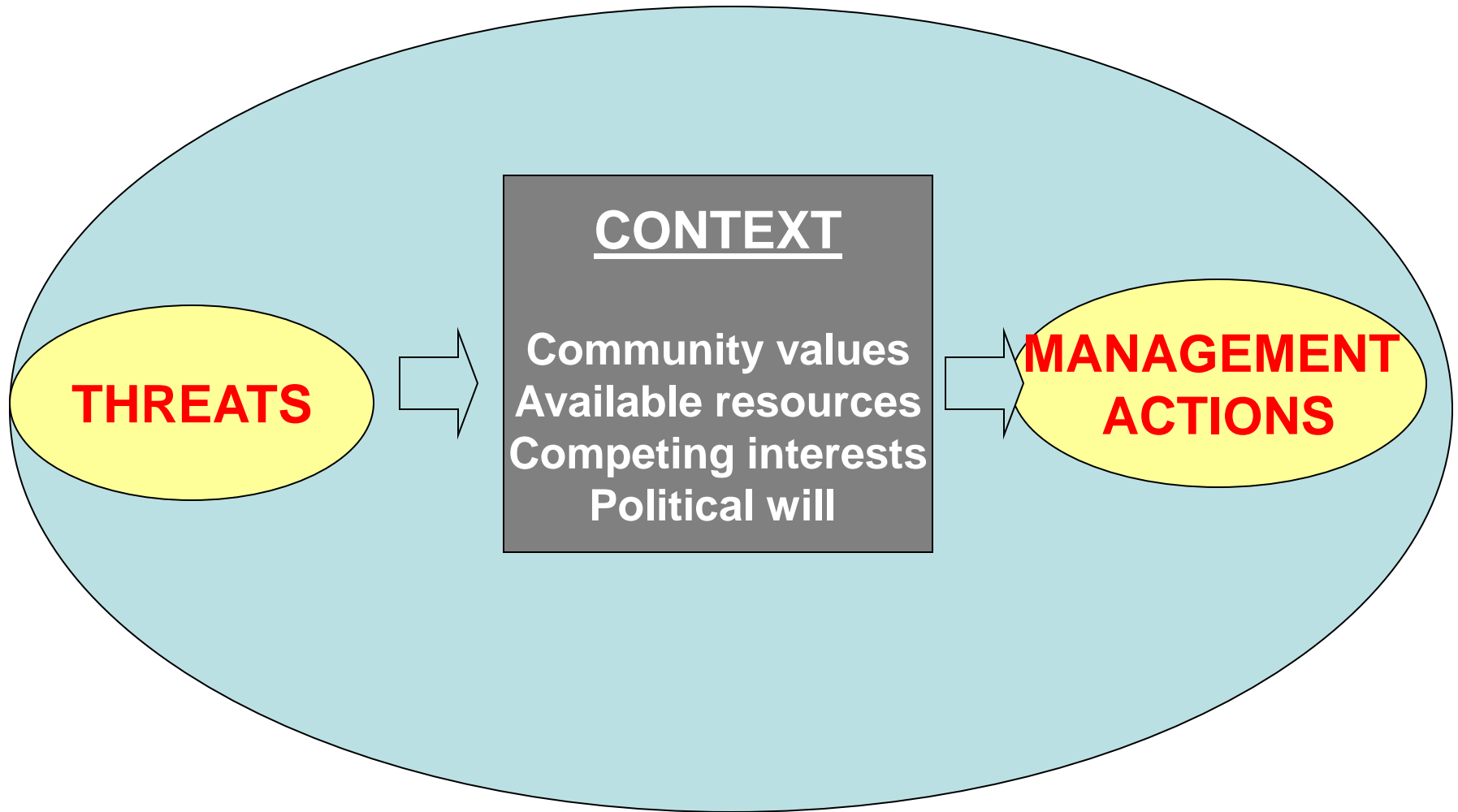


Cardinal Street Before



Cardinal Street After

IV. Management – Connecting The Dots

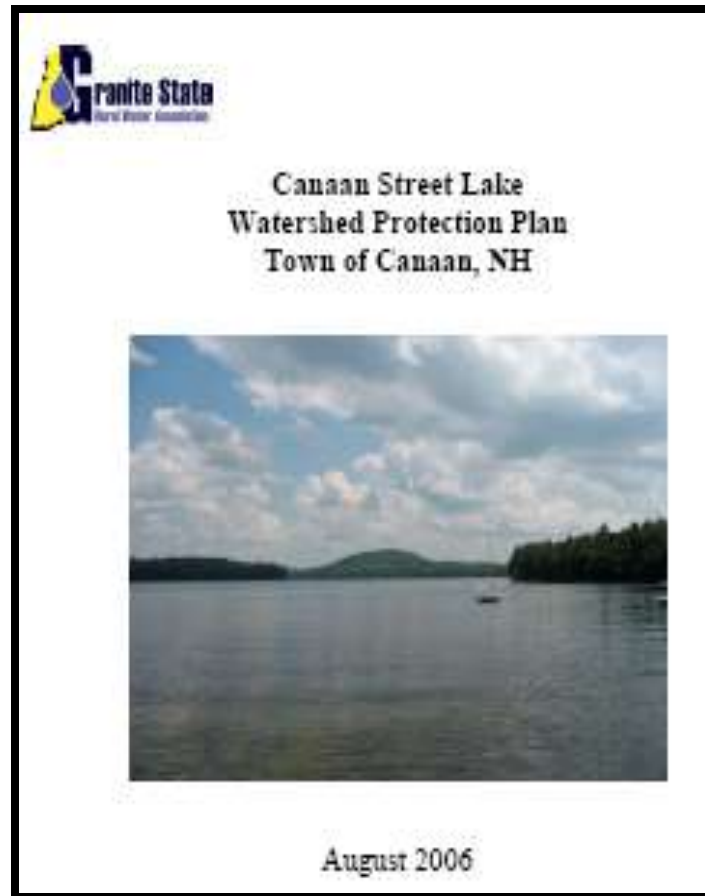


Technical Guides for Drafting Plans

- Standard Report Format for EXISTING Surface Water Sources, Utah DEQ,
http://www.drinkingwater.utah.gov/documents/spec_services/sw_source_protection_plans.pdf
- Template for Source Water Protection Plan, PA Rural Water Association - Source Water Protection
http://www.sourcewaterprotection.org/documents/SWP_Plan_template_MS_2000.doc

Completed Plans

- Meredith
- Canaan
- Gorham
- Sunapee
- Warren
- Walpole



http://des.nh.gov/organization/divisions/water/dwgb/dwspp/nh_source.htm

Questions!

