Canaan Street Lake

Preserving our Recreation and Water Source
Why YOU should care!

A discussion on the current state of the lake, why it is changing, and what you can do.

Tuesday, August 5th at 6:30 pm
Cardigan Mountain School Auditorium

Sponsored by:
Canaan Conservation Commission
Canaan Lake Association
Cardigan Mountain School
Upper Valley Land Trust
Water Source Protection Committee
Canaan Street Lake’s Protection Plan

John Bergeron
Dave Shinnlinger
Town of Canaan
Source Water Protection Committee
Introduction

- Basic statistics
- Canaan village public water supply
- Potential contamination sources
- Water quality
- Recommendations
- DES source protection grant
- Comprehensive shoreland act
- Summary
Basic Statistics
Canaan St. Lake Watershed

- The Canaan Street Lake watershed is defined as the area of land and network of wetlands, ponds, and tributaries that drains to Canaan Street Lake.
Public Water Systems

Intake Area

Large amount of forested land
BASIC STATISTICS

- Watershed Size: 1,600 acres (2.5 sq. mi.)
- Lowest Elevation: 1,142 ft. (outflow point)
- Highest Elevation: 1,476 ft.
- Topography: gentle to steep slopes (3-80%)
- Relatively Undeveloped
- Good Water Quality
- Entirely within Canaan
BASIC STATISTICS

- Avg. Lake Depth: 11 feet
- Max Lake Depth: 22 feet
- Shoreline: 4 miles
- Predominantly Spring Fed
BASIC STATISTICS

- Lake Area: 303 acres
- Lake Volume: 3,330 acre feet (4.1 mill. m³)
- Flushing Rate: 0.7 times per year
  - NH average flush rate is 3.0
Recreational Activities

- Swimming
- Fishing
- Boating
- Water-skiing
- Beaches
- Loon watching
- Snowmobile

- Ice-skating
- CC Skiing
- Ice fishing
- Bird hunting
- Seaplane
- Fireworks

All prohibited in reservoir area
Canaan Village Public Water Supply

Source is Canaan Street Lake
Treatment System can...

- Filter Suspended Particles
- Adjust pH
- Disinfect water for bacteria and most viruses
Death Rate for Typhoid Fever
United States, 1900-1960

Treatment System can't remove:

- Toxic Algae Blooms
- Petroleum Products
- Hazardous wastes
- Certain viruses
- MTBE

*Better to protect the source of our water proactively.*
Treatment Creates Byproducts

- Canaan's drinking water has high DBPs
  - DBPs are disinfection byproducts
    - These can cause cancer
  - EPA lowered the safe limit recently
    - We were passing, but now fail frequently

- DBPs are caused by high organic carbon
  - Plants, fish, animals, birds, insects, etc.

- Organics flourish with high nutrient levels
Treatment Creates Byproducts

Sources of nutrients (phosphorous)
- Older septic systems
  - May be too close to water or water table
  - Tank full or leach field flooded
  - Irregular pumping schedule
- Stormwater delivers sand and silt to lake
  - Phosphorous binds to silt and carries to lake
- Shore vegetative buffer impaired by road salt
  - Salt stunts growth and reduces phosphorous uptake
- Lawn fertilizer (even away from shoreline)
Treatment Creates Byproducts

- Byproducts are a common problem
- Caused by EPA lowering limits
- Town has hired engineering firm
- Firm will identify solution for Canaan
## Active Public Water Supplies

<table>
<thead>
<tr>
<th>System Name</th>
<th>System Type</th>
<th>Population</th>
<th>Source Type</th>
<th>Well Depth</th>
<th>Yield (gpm)</th>
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<tbody>
<tr>
<td>Canaan Water Department</td>
<td>Community</td>
<td>600</td>
<td>Surface</td>
<td>--</td>
<td>1 million</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(gpd)</td>
</tr>
<tr>
<td>Cardigan Mountain School (Well #1)</td>
<td>Community</td>
<td>300</td>
<td>Bedrock</td>
<td>540</td>
<td>23</td>
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<tr>
<td>Cardigan Mountain School (Well #2)</td>
<td>Community</td>
<td>300</td>
<td>Bedrock</td>
<td>525</td>
<td>12</td>
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<tr>
<td>Crescent Campsites-North</td>
<td>Non-community Transient</td>
<td>211</td>
<td>Bedrock</td>
<td>500</td>
<td>3</td>
</tr>
<tr>
<td>Crescent Campsites-South</td>
<td>Non-community Transient</td>
<td>25</td>
<td>Bedrock</td>
<td>190</td>
<td>15</td>
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</tbody>
</table>
Potential Contamination Sources
Water Quality
Recommendations
Potential Contamination Sources

- Roads (salt and sand/silt)
  - Salt reduces shore vegetation nutrient uptake
  - Silt carries nutrients and viruses into lake

- Recreational Activities on Lake
  - Discarded fish parts & dying bait
  - Trucks dropping salt & sand on ice
  - Power boats churning lake bottom
  - Human and dog waste at beach and shore
Erosion / Silt
Septic System

- Distance to lake is critical
- Height above water table is critical
- Inspection every three years is critical
Failed Septic System

- This failure not is in Canaan
Potential Contamination Sources

- Two cycle engines
  - Inject oil and fuel into water
  - New fuel injected two cycle engines are safer
- Refueling while on the lake
  - Boats, snowmobiles, ice augers
- Exterior above ground tanks
- Underground storage tanks
Potential Contamination Sources

- Inadequate Water Resources Protection (e.g. no town ordinance)
  - Auto repair shops
  - Hair salons
  - Veterinarians
  - Animal feedlots
  - Gasoline dealers
  - Fuel depots
  - Snow dumps
## Water Quality Monitoring

<table>
<thead>
<tr>
<th>Date</th>
<th>Chlorophyll-a</th>
<th>Color</th>
<th>Secci</th>
<th>Phosphorous</th>
<th>Conductivity</th>
<th>Chloride</th>
<th>PH</th>
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</thead>
<tbody>
<tr>
<td>1979</td>
<td>2.7</td>
<td>10</td>
<td>5.0</td>
<td>3</td>
<td>44</td>
<td>3</td>
<td>6.5</td>
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<tr>
<td>1990</td>
<td>2.5</td>
<td>16</td>
<td>4.0</td>
<td>9</td>
<td>54</td>
<td>5</td>
<td>7.2</td>
</tr>
<tr>
<td>2005</td>
<td>6.8</td>
<td>18</td>
<td>4.7</td>
<td>7</td>
<td>75</td>
<td>11</td>
<td>7.1</td>
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</table>

### Guide

<table>
<thead>
<tr>
<th></th>
<th>Good</th>
<th>Color</th>
<th>Phosphorous</th>
<th>Conductivity</th>
<th>Chloride</th>
<th>PH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>0-5</td>
<td>0-25</td>
<td>2-4.5</td>
<td>Below 10</td>
<td>0-100</td>
<td>*</td>
</tr>
<tr>
<td>Poor</td>
<td>Above 15</td>
<td>0-1.9</td>
<td>Above 20</td>
<td></td>
<td></td>
<td>**</td>
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* NH remote surface water chloride mean is 4
** NH drinking water chloride typically below 75

DES Lake Survey data
Lake is Slowly Changing

- Home sites are being added
- Conversions from seasonal to year round
- Old septic systems are no longer efficient
- Lawns and gardens are stressing the lake
- Stormwater brings undesirables into lake
- Above applies to entire watershed
  - Tributaries and springs are bringing trouble to the lake
Recommendations

- Roads
  - Control stormwater
- Septic Systems
  - Septic survey
- Recreation
  - Study boating impact
- Land use
  - Regulate hazards
- New construction
  - Maintain buffers
  - Conserve land
- Fuel storage
  - Emergency plan
- Reservoir markers
  - Mark in winter
- Testing program
  - Identify problems
Des Source Protection Grant

- Watershed Protection Plan 2006
  - For drinking water protection
  - Developed many recommendations
- Submitted grant proposal 2007
  - Implements a few recommendations
  - With PSU Center for the Environment
- DES awarded drinking water grant 2008
  - 34 proposals submitted, 16 awards
  - Average award $12k, ours $19k
  - Funds come from EPA through DES
DES Source Protection Grant

- Comprehensive testing program
  - 51 samples, 18 months, 6 parameters
    (phosphorus, nitrate, sodium, chloride, turbidity, color)
- Septic system survey
  - Locate high risk systems
- Watershed boundary signs
- Educate land owners and lake users
  - Shoreland, septic, recreation, land use
- Long range recommendations
Septic Survey (sample)

- Red = older
- White = newer
- Green = vacant
Soil characteristics

- Drainage class
- Water table
Comprehensive Shoreland Act
Comprehensive Shoreland Act

- Protects water quality with vegetative buffer
  - Captures nutrients, silt, bacteria, viruses
  - Salt reduces buffer effectiveness
  - Lawn & garden fertilizer can disable buffer
  - Lawns are not effective buffers

- Vegetative buffer is 250 feet wide

- Stormwater carries all of above toward lake
  - Channel flow reaches lake
  - Sheet flow is largely captured by buffer
The Protected Shoreland

250'

150' Natural Woodland Buffer

50' Primary Building Setback

Reference line

Waterfront Buffer

Towns may maintain or enact more stringent setbacks.
Within 50 feet of water

- Limited tree cutting
- Retain groundcover, stumps, brush, rocks
- Trimming above 3 feet allowed for view
- Six foot wide path to water allowed
- Existing lawns may be maintained
  - However you may attract geese
- Beach permit required
- Single dock allowed
- Accessory building allowed with permit
Between 50 and 150 Feet

- If lot has over $\frac{1}{2}$ acre between 50 & 150 ft
  - 50% of pervious area must be unaltered

- Otherwise
  - 25% of pervious area must be unaltered
Within 250 Feet of Water

- DES shoreland permit required for almost all construction, filling, or excavation
- 80% of area within 250 ft must be pervious
- One dwelling unit per 150 ft of shore
- Building distance from shore
  - At least 50 feet for primary building
  - At least 20 feet for secondary building
- Conversion from seasonal to year round
  - Requires septic permit
Summary
Summary

- Canaan Street Lake is in good condition
- Threats to water quality are increasing
- Water quality is slowly degrading
- Drinking water is marginally safe
  - Organic carbon is the problem
- Protection measures will be implemented
- Additional measures are needed