

ROBINSON POND

NONPOINT IMPLEMENTATION PROJECT

DECEMBER 2000

Prepared by the



Nashua Regional Planning Commission

Under contract with the

**New Hampshire Department
Of Environmental Services**

PROJECT SUMMARY AND GOALS

The goal of the *Robinson Pond Restoration Project* is to improve water quality in the Pond. Accomplishing this goal involved:

- ❖ Water quality monitoring at 11 fixed sampling sites on a monthly basis from May through September
- ❖ Conducting a septic system survey to determine the status of existing septic systems
- ❖ Identification and evaluations of existing stormwater systems
- ❖ A watershed mailing of best management practices (BMPs) on lawn care, septic maintenance, the importance of maintaining buffers, etc.
- ❖ Zoning and regulation review to identify changes that would have a positive impact on water quality
- ❖ Developing a parcel specific database to include information on file with the health department

Introduction

The *Robinson Pond Nonpoint Implementation Project* implemented the recommendations of the *Robinson and Ottarnic Ponds Diagnostic/Feasibility Study* completed by NH Department of Environmental Services. Nonpoint pollution sources (NPS) were identified as the major source of nutrient loading to the Pond. The project concentrated on four major categories to address NPS within the watershed: water quality, land use, education, and regulations.

Project Tasks

Task 1. Data Management: A parcel specific GIS database and data management system was developed for the approximate 450 property owners for educational mailings.

Task 2. Volunteer Water Quality Monitoring: The training by NHDES Volunteer Lakes Assessment Program (VLAP) was completed on May 13th for the shoreline and in pond sampling. In addition the Quality Assurance Officer (QA), Steve Couture, provided additional in-pond training on the first sampling date. A Quality Assurance Protection Plan was developed for Dissolved Oxygen (DO), pH, E.coli, Total Phosphorus (TP), Turbidity, Chlorophyll A, and Alkalinity. This report uses designated beach standards for *E.coli* since people swim all around the pond.

Designated beach areas have more stringent standards: 88 *E.coli* /100mL in any one sample or a geometric mean of three samples over a sixty days of 47 *E.coli*/100mL. The new standards for Class B waters specify that no more than 406 *E. coli*/100mL or a geometric mean based on at least 3 samples obtained over a sixty day period be greater than 126 *E. coli*/100mL. See Appendix A for data sheets.

Site 1 (Beach Brook) – Beach Brook dried up in mid-July. Samples were taken on May 24 and June 21 but no testing was done for conductivity, turbidity, and pH. The numbers for the other parameters may not truly represent what range of NPS enters the pond. The 1994 *Study* revealed that Beach Brook had the lowest mean total phosphorous (0.018 Mg/L) count of runoff entering the pond. It is recommended that this site be tested earlier in the spring and more often to get a better set of data. This brook is very close to the beach so the low *E.coli* counts are really good news. Historically the beach has had high levels and had to be closed on several occasions.

| Site 1 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|----------------|----------------------|
| Site Range | .018 - .031 | No Data | No Data | No Data | 1 - 5 |
| Site Average | .025 | No Data | No Data | No Data | 2.5 |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

* Designated beach areas

Site 2 (Launch Brook) – This site drains from a residential, single family home development that includes all of David Drive, all of the streets of Kiena Drive south of Julie Lane and the swales along Robinson Road east of Parker Drive. The *E.coli* samples were taken on May 24 and June 21 and remains a mystery why 3 sampling dates are missing. Conductivity, turbidity, and pH were recorded for two sampling dates, July 26 and September 27. Conductivity is high but turbidity and pH are within satisfactory limits.

| Site 2 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|----------------|----------------------|
| Site Range | .007 - .027 | 198 - 210 | 0.42 - 0.5 | 7.15 - 7.17 | 13 - 81 |
| Site Average | .016 | 204 | 0.435 | 7.16 | 47 |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas



Site 3 (Howard Brook) — The only sampling at this site was for E. coli, the count was greater than 200 on May 24. This brook drains a large beaver pond/wetland in the northwest section of the watershed. It collects water from the residential area north of Julie Lane along Kiena Road. The landscape is heavily wooded on the west side of the wetland. The brook itself is shallow and marshy all the way to the pond. A small “hobby” farm drains to this brook. The brook had water all season but none of it appeared to be flowing. This is another site that would benefit from starting sampling in April to monitor the snowmelt and catch the early spring rains. In the 1994 *Study*, Howard Brook had the highest mean total phosphorous concentrations of the ponds major tributaries with 0.048 Mg/L.

| Site 3 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|----------------|----------------------|
| Site Range | No data | No data | No data | No data | No data |
| Site Average | No Data | No Data | No Data | No Data | No Data |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas

Site 4 (Juniper Brook) – Juniper Brook is essentially residential runoff flowing from the northwestern side of the pond. Results for phosphorous and *E.coli* were only available on May 24 and August 23 due to lack of flow on the sampling days. The conductivity, turbidity, and pH figures were taken on August 23. In the 1994 *Study*, Juniper Brook had the least mean turbidity value (0.41 NTU) and the lowest median value (0.28 NTU) for the major tributaries.

| Site 4 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|------------------|----------------------|
| Site Range | 0.016 - 0.053 | 253 | 0.6 | 6.72 | 119 |
| Site Average | 0.034 | Only 1 sample | Only 1 sample | Only 1 sample | Only 1 sample |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas

Site 5 (Stoney Lane Drainage) – Although there was only one sample taken for several of the parameters, this appears to be the most problematic site with the exception of pH. In the 1994 *Study*, the Stoney Lane drain had the highest mean turbidity value (2.48 NTU) and greatly exceeded the acceptable limits for the other parameters. There are 14 acres on conservation land abutting the pond in this drainage. The conservation property is down gradient from site 5 and is inaccessible for sampling. Possibly this wetland area acts as a sink and the runoff reaching the pond has improved.

| Site 5 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|------------------|----------------------|
| Site Range | 0.016 - 0.209 | 214 | 4.7 | 6.86 | 2 - 200 |
| Site Average | .083 | Only 1 sample | Only 1 sample | Only 1 sample | Only 2 samples |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas

Site 6 (Woodcrest Brook) – This small brook drains most of Woodcrest Drive and a portion of Beechwood Drive. Most of the parameters are above the level of concern but are not exceedingly high. There are several small forested wetlands in this drainage area that help retain the runoff from this residential neighborhood.

| Site 6 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|----------------|----------------------|
| Site Range | 0.01- 0.059 | 169.1 - 172.8 | 0.6 - 3.1 | 6.54 - 6.87 | No samples |
| Site Average | 0.027 | 170.5 | 1.83 | 6.74 | No samples |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas

Site 7 (Right-of-Way) – This site essentially receives all of the runoff from Hazelwood Road and a swale that runs parallel to Woodcrest Drive. There are several vacant lots in this area that are too wet to develop but not quite wetlands. Conductivity is the only concern at this site.

| Site 7 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|----------------|----------------------|
| Site Range | 0.008 - 0.016 | 168.7 - 171.6 | 0.3 - 0.78 | 6.8 - 6.94 | 7-10 |
| Site Average | 0.0124 | 170.07 | .59 | 6.9 | 8.5 |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas



Site 8 (Outlet of the Pond) – This southern end of the pond is sparsely developed and has a good riparian buffer. The pond is very shallow, averaging four feet, in this section. The high levels of phosphorous and conductivity are probably from anoxia as opposed to watershed runoff. Anoxia allows for the release of phosphorous from the bottom sediments, which is then carried out of the pond.

| Site 8 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | pH | E. coli Cts/100ml |
|----------------------|-----------------|-----------------------|------------------|----------------|----------------------|
| Site Range | 0.01- 0.09 | 162.8 - 167.9 | 0.22 - 0.32 | 6.37-6.64 | 3 |
| Site Average | 0.053 | 166.1 | 0.28 | 6.47 | Only 1 sample |
| State Median | 0.011 | 56.8 | 1.0 | 6.7 | |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 6.0 or > 8.0 | > 88* |

*Designated beach areas

In-Pond Sampling: Sites 9 - 11

Site 9 (Epilimnion Layer) - This upper layer increased in depth from an average of 1.5 meters on June 21 to 5 meters on September 27. The acid neutralizing capacity (ANC) describes the ability of a water body to resist changes in pH by neutralizing acidic inputs. During the sampling season the pond stayed in the sensitive range and did not affect pH, which remained in the “Good” range. This upper level of the pond had good phosphorous and turbidity readings. Conductivity remained high and may be attributed to fertilizer, septic system leachate, and other pollutants this time of year.

| Site 9 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | DO Mg/L | ANC Mg/L CaCO ₃ | pH |
|----------------------|-----------------|-----------------------|------------------|------------|----------------------------------|-------------------|
| Site Range | 0.01- 0.013 | 168.7 - 171.0 | 0.32 - 0.51 | 2.4 - 7.34 | 11.4 - 13.1 | 6.97 - 7.16 |
| Site Average | 0.012 | 169.7 | .427 | 5.02 | 12.4 | 7.06 |
| State Median | 0.011 | 56.8 | 1.0 | 4 - 7 | 6.5 | 6.7 |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 4 | > 10- 20 | < 6.0 or > 8.0 |



Site 10 (Metalimnion) - This middle layer increased in depth from an average of 4.0 meters on June 21 to 6.5 meters on September 27. Dissolved oxygen levels are clearly a problem at this level with a site average of 1.04. This coincides with the excessive phosphorous, conductivity, and chlorophyll A counts.

Chlorophyll A Counts

| Sample Date | Description | Percentage |
|-------------|----------------|------------|
| June 9 | Ceratium | 44 |
| | Coelosphaerium | 18 |
| | Mallomonas | 7 |
| July 26 | Oscillatoria | 35 |
| | Mallomonas | 23 |
| | Staurastrum | 13 |
| August 23 | Oscillatoria | 96 |

Total phosphorous reached a peak in August and is twice the level of concern. Robinson Pond is essentially anoxic at this level because of the decomposition of organic matter (algae). This results in the release of phosphorous from the bottom sediments, also known as internal phosphorous loading.

| Site 10 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | DO Mg/L | Chl A Mg/m3 | pH |
|----------------------|-----------------|-----------------------|------------------|------------|----------------|-------------------|
| Site Range | 0.012 - 0.085 | 165.4 - 187.5 | 0.53 - 8.6 | 0.28 - 5.2 | 5.26 - 24.49 | 6.43 - 6.64 |
| Site Average | 0.037 | 172.75 | 3.97 | 1.80 | 14.35 | 6.54 |
| State Median | 0.011 | 56.8 | 1.0 | 4 - 7 | 4.45 | 6.7 |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 4 | > 5.1 | < 6.0 or > 8.0 |

Site 11 (Hypolimnion) - The problems only get worse in this layer with dissolved oxygen falling to an average of 0.35. This bottom layer increased in depth from an average of 7.5 meters on June 21 to 8.5 meters on September 27. Secchi disk readings are indicative of the waters transparency. The median transparency for New Hampshire lakes is 3.4 meters. Robinson Pond ranged from 2.8 to 3.25 which is considered in the "Good" range. The turbidity average is rather high because of a 26 NTU reading on August 23. This is probably attributed to some sort of general bottom disturbance or non-representative debris suspended in the sample.

| Site 11 | Total P Mg/L | Conductivity uS/cm | Turbidity NTU | DO Mg/L | Secchi M | pH |
|----------------------|------------------|-----------------------|------------------|------------|-------------|-------------------|
| Site Range | 0.011 - 0.086 | 175.1 - 198 | 2.2- 26 | 0.1- 0.45 | 2.8 - 3.25 | 6.45 - 6.74 |
| Site Average | 0.036 | 186.48 | 9.23 | 0.35 | 2.98 | 6.59 |
| State Median | 0.011 | 56.8 | 1.0 | 4 - 7 | 3.4 | 6.7 |
| Concern Level | > 0.02 | > 100 | > 10.0 | < 4 | < 2 | < 6.0 or > 8.0 |

General Recommendations for Water Sampling

- Begin water sampling in April to catch the snow melt and spring rainstorms.
- Sample bi-weekly during April, May, and June at Sites 1, 3, 4, and 5.
- Sample the culvert at the southeast corner of David Drive and Kienia Road.
- Select a volunteer coordinator that will arrange for contacting the lab(s) for an account number and chain-of-custody procedure, equipment scheduling, labeling of bottles, and transport of samples to the lab.
- When picking up equipment at the VLAP Lab, count the bottles, including duplicates.
- Call volunteers the night before a sample date to make sure the site is covered.
- Note the previous three days' weather and amount of rain received in the last 48 hours.
- Take field duplicates at each site at least once to insure accurate data.

Task 3. Educational Materials: Educational materials were mailed last February to the approximately 450 residents in the watershed. Materials included information on septic system maintenance, alternative septic systems, composting, groundcovers, buffers, proper disposal of grass clipping, fertilizer application, drainage, and household hazardous waste. Public monthly meetings are held and the Friends of Hudson Natural Resources (Friends), many of whom live in the watershed, continue to publicize activities at the pond. An informational kiosk is in the works at the boat ramp. This will contain information on water quality monitoring, invasive species, waterfowl, and general activities in the watershed. This has been documented and submitted with the last billing.

Task 4. Specific BMPs for Landowners: The hobby farm owner has been presented BMPs for manure and erosion control. Landowners are contacted when a potential problem or existing problem occurs by members of the Friends living in the watershed. This includes grass clippings in the pond, erosion, grass lawns up to the shore, etc.

Task 5. Existing Stormwater Measures: NRPC and the Hudson Sewer/Drain Division Foreman investigated the catch basins, man holes, and swales in the watershed. The direction of flow was determined and marked on a watershed map. All existing stormwater measures were in good shape with the exception of a few swales. Highway Department personnel were contacted about cleaning the catch basins and drains. The same crew has been cleaning the drains in the watershed for 12 years. There has never been a problem with the stormwater systems in the watershed. The drains only need to be flushed and vacuumed every 2-3 years.

Task 6. Septic Survey: A cover letter explaining the phosphorous problem in the watershed and an anonymous septic survey was sent to residents with property on the shoreline. The response to the survey was 48% and is summarized below in *Italics*. See Appendix B for the cover letter and survey. NRPC, with the cooperation of the Town Health Officer/Building Inspector, researched the septic system history/permits for properties on the shoreline. It quickly became evident that the majority of properties were developed prior to 1970. The only records found were for new or replacement systems. The database in Appendix C illustrates the lack of information on record.

10. What size lot do you own?

1/4 acre (1) 1/2 acre 1 acre greater than 1 acre (12)

11. How far away from the pond edge is your home located?

10 - 20 feet 20 - 50 feet 50 - 75 feet (2) greater than 75 feet (10)

12. What is your drinking water source?

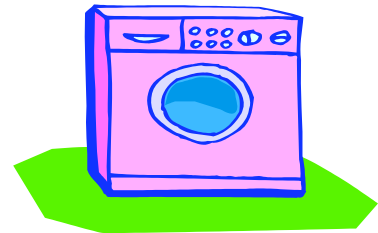
Dug Well Drilled Well (12) Public Water Bottled Water I don't know

13. How many bedrooms does your home/cottage have?

1 2 (2) 3 (5) more than 3 (5)

14. How many people typically occupy your lot?

1 (2) 2 (5) 3 (3) 4 (1) 5 (1) greater than 5



15. Which of the following water-using machines do you have in your lakefront dwelling?

Washing Machine (11) Garbage Disposal (3) Dishwasher (9) Water Softener (3)

Other: _____

Comments given by residents (optional):

- No lawn fertilizer is used.
- Very seldom use the dishwasher.
- What about reducing wetlands to put in docks?
There is an application before the Town now.
- What about jet skis? We thought they were outlawed.
Even residents have them.
- Thank you for your interest. We will consider getting involved.
- Phosphorous may be a serious problem, but I think we have Milfoil, a far, far more serious problem. Milfoil covers about 25% of the pond already. If not eliminated, Robinson Pond will no longer exist in a few years.

Task 7. Zoning Ordinance and Land Use Regulations: The Robinson Pond watershed lies within the Town of Hudson's General Zone. It is recommended that the Town establish a Watershed Overlay District (District) for the entire watershed. Non-point source pollution and land use are closely linked. Natural ground cover, which in the northeastern United States is forest, provides the greatest water purification and runoff treatment of any other vegetative type. It is recommended that the following issues be addressed within the District:

- Amend the Site Plan and Subdivision regulations to address the protection of existing vegetation, especially large trees in development sites. Clear cutting or near clear cutting should be prohibited.
- Adopt a greater effective shoreline buffer for the pond and tributaries on all undeveloped land. The U.S. Forest Service recommends a minimum of 125 feet.
- Minimize lawn sizes, encourage the use of native species for landscaping wherever possible, and leave native vegetation in place as a buffer.
- Adopt rigorous soil erosion and sediment control measures which would comprehensively address many of the non-point sources of water quality degradation in all new developments.
- Stormwater management practices on new development sites should provide for the capture and treatment of all stormwater created by the ten year, twenty-four hour storm event on the impervious surfaces within the District and that adequate storage capacity is provided for such stormwater.
- The stormwater management system on newly developed sites provides for the disposal of stored stormwater by infiltration.
- To reduce potential damage to the watershed from significant storm events, overflow capacity must be provided with vegetated swales. Piping, headwalls, rip rap and all other techniques other than vegetative swales should be prohibited.
- All stormwater management systems should be submitted with a maintenance plan.
- In the cases where parking lots or other structures are placed in the District, procedures shall be submitted with the maintenance plan which provide for the removal of snow to an infiltration area.
- All stormwater management systems should not impede the flow of ground water below it.
- Prohibit the underground storage of petroleum, refined petroleum products, or the hazardous materials.
- Increase the minimum lot size to two acres to decrease impervious surfaces and increase vegetation.
- Building should be prohibited on soils rated as severely limited for septic systems.

GENERAL RECOMMENDATIONS

- Update the tax maps and data layers to get an accurate count and location of all catch basins, sewer lines, and current land uses in the watershed.
- Once the data layers are updated identify areas to target for future conservation.
- Build a bathroom at the beach before expanding recreational activities at the pond.
- Continue to educate watershed residents on best management practices for septic maintenance, disposal of yard waste, household hazardous waste, groundcovers, buffers, and invasive species of aquatic plants.
- Continue water quality monitoring and incorporate the sampling recommendations listed earlier.
- Develop a septic inspection program using the database developed by NRPC.
- Based on the septic database, mail out septic pumping inspections to insure timely maintenance of septic systems.
- The *Friends of Hudson Natural Resources* could expand the septic database to include the entire watershed.
- The *Friends* could also research the last time septic systems were inspected by contacting local septic haulers and create a schedule database. Hauler will likely help research the project since it will promote business.
- Continue to support the *Friends of Hudson Natural Resources* in their efforts to improve water quality and recreational potential within the watershed.

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