EXECUTIVE SUMMARY

Thank you for your continued hard work sampling **Robinson Pond, Hudson** this year! Your monitoring group sampled the deep spot **five** times this year and has done so for many years. As you know, conducting multiple sampling events each year enables DES to more accurately detect water quality changes. Keep up the great work!

The New Hampshire Department of Environmental Services (DES), in conjunction with the U.S. Environmental Protection Agency (EPA) and the environmental consulting firm AECOM, conducted a Total Maximum Daily Load (TMDL) for total phosphorus for your pond. The TMDL refers to the pollutant reductions a waterbody needs to meet New Hampshire's water quality standards. Robinson Pond was listed on the 2008 impaired waters [303(d)] list because elevated algal growth impaired the primary contact recreation (swimming) use. Phosphorus is the nutrient responsible for algal growth and is the pollutant to be reduced to control algal growth. DES is required by the Federal Clean Water Act (CWA), Section 303(d), to report every two years to the EPA on all waters not meeting state water quality standards.

The TMDL conducted at your pond identified an in-lake target phosphorus value that, when met, should result in no additional primary contact recreation impairments due to algal growth. A phosphorus budget was constructed, phosphorus sources identified and phosphorus reductions allocated to each of the sources to meet the target value. An implementation plan provides recommendations on watershed remediation activities to reduce phosphorus inputs to the pond.

The draft TMDL will be provided to your pond association, town, and watershed stakeholders for review and will also be available on the DES website at www.des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm. There will be a period for public review and comment, anticipated for Summer 2009, where DES and/or ENSR will present it's findings to interested stakeholders. We anticipate a TMDL informational session in conjunction with the annual VLAP Workshop scheduled for May 16, 2009. We encourage your pond association and/or residents to attend the workshop to learn more about TMDLs in general and the TMDL for your pond. Phosphorus load reductions can only occur with the knowledge, participation and action of watershed residents, businesses and stakeholders. If you are interested in participating in an informational session at the VLAP Workshop please contact the VLAP Coordinator at sara.steiner@des.nh.gov or 603-271-2658. If you are interested in learning more about the TMDL Program, or attending additional informational sessions, please contact Peg Foss, TMDL Coordinator, at Margaret.foss@des.nh.gov or 603-271-5448.

Volunteers from your pond participated in the Lake Host™ Program this year. The Lake Host™ Program is funded through DES and Federal grants. The program was developed in 2002 by NH LAKES and NHDES to educate and prevent boaters from spreading exotic aquatic plants to lakes/ponds in New Hampshire. Since then, the number of participating lakes/ponds and volunteers has doubled, the number of boats inspected has tripled, and the number of “saves” (exotic plants discovered) has increased from four in 2002 to a total of 224 in 2008. The program is invaluable in educating boaters and protecting NH’s waterbodies from exotic aquatic plant infestations, thereby preventing recreational hazards, property value decline, aquatic ecosystem decline, aesthetic issues, and saving costly remediation efforts. Lake Host™ staff made **176** “saves” at your pond and discovered the following aquatic vegetation entering or leaving your pond in 2008:

Variable milfoil (exotic)
Fanwort (exotic)
Bladderwort (native)
Coontail (native)

Great work! We encourage volunteers to continue participating in the Lake Host™ Program to protect the future of your pond.

OBSERVATIONS & RECOMMENDATIONS

DEEP SPOT

➢ Chlorophyll-a

Chlorophyll-a, a pigment found in plants, is an indicator of algal or cyanobacteria abundance. Algae are typically microscopic plants that are naturally found in the lake ecosystem. The measurement of chlorophyll-a in the water gives biologists an estimation of the algal concentration or lake productivity. Table 14 in Appendix A lists the current year chlorophyll-a data.

Figure 1 depicts the historical and current year chlorophyll-a concentration in the water column.

The median summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 4.58 mg/m^3.

The current year data (the top graph) show that the chlorophyll-a concentration ***increased*** from **May** to **August**, and then ***decreased*** from **August** to **September**. Chlorophyll-a concentrations were ***elevated*** in **June, July and August**. Typically, chlorophyll-a concentrations above **15 mg/m^3** are indicative of an algal bloom.

Please note that the **7/1/2008** chlorophyll-a concentration was used to represent the **June** chlorophyll-a concentration.

The historical data (the bottom graph) show that the **2008** chlorophyll-a mean is ***much greater than*** the state and similar lake medians. For more information on the similar lake median, refer to Appendix D.

Overall, visual inspection of the historical data trend line (the bottom graph) shows a ***variable*** in-lake chlorophyll-a trend since monitoring began. Specifically the mean chlorophyll concentration has ***fluctuated between approximately 6.08 and 25.83 mg/m^3*** since **2000**.

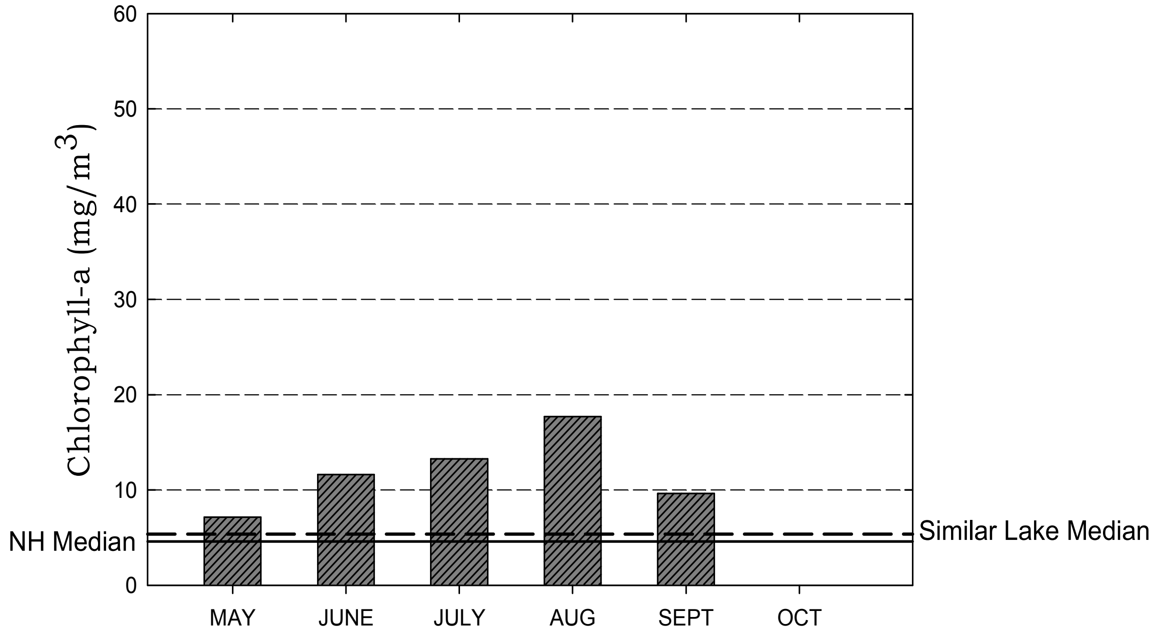
Please keep in mind that this trend is based on only ***nine*** years of data. After 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

While algae are naturally present in all waterbodies, an excessive or increasing amount of any type is not welcomed. Phosphorus is the nutrient that algae typically depend upon for growth in New Hampshire lakes and ponds. Algal concentrations increase as nonpoint sources of phosphorus from the watershed

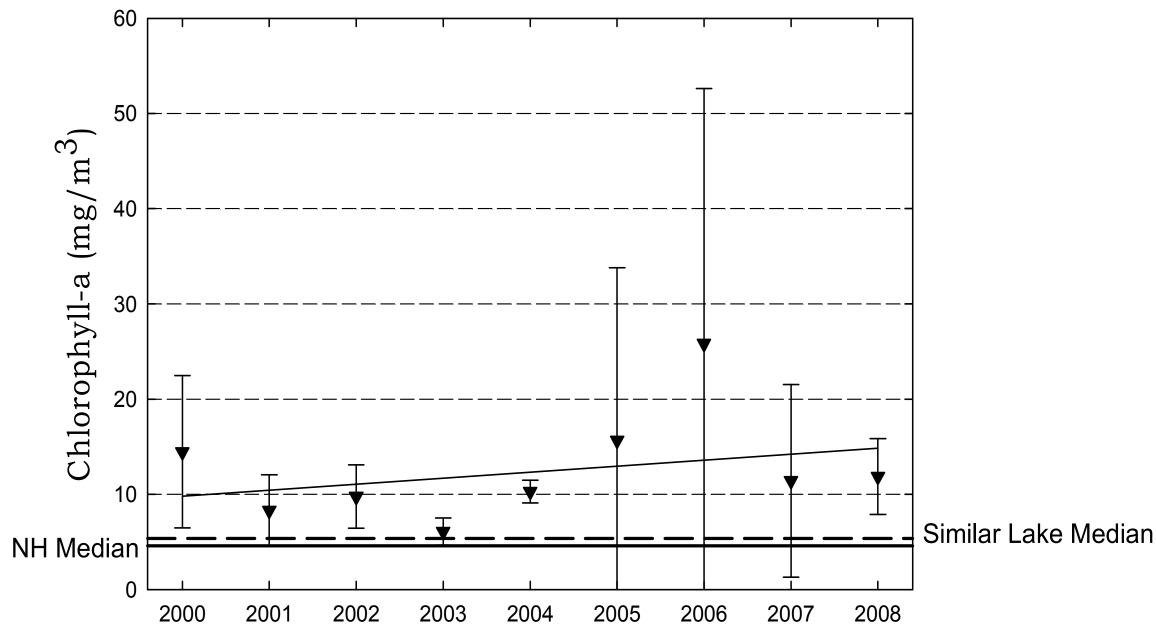
increase, or as in-lake phosphorus sources increase. Increased Chlorophyll-a concentrations can also affect water clarity, causing Secchi-disk transparency to decrease (worsen) and turbidity to increase (worsen).
Therefore, it is extremely important for volunteer monitors to continually educate all watershed residents about management practices that can be implemented to minimize phosphorus loading to surface waters.

Robinson Pond, Hudson

Figure 1. Monthly and Historical Chlorophyll-a Results



2008 Chlorophyll-a Results



Historical Chlorophyll-a Results

➢ Phytoplankton and Cyanobacteria

Table 1 lists the phytoplankton (algae) and/or cyanobacteria observed in the pond in **2008**. Specifically, this table lists the three most dominant phytoplankton and/or cyanobacteria observed and their relative dominance in the sample.

Table 1. Dominant Phytoplankton/Cyanobacteria 2008

Date	Division	Genus	% Dominance
5/27/2008	Bacillariophyta	Asterionella	34.8
5/27/2008	Bacillariophyta	Cyclotella	29.6
5/27/2008	Cyanophyta	Anabaena	26.6
7/1/2008	Chrysophyta	Synura	45.7
7/1/2008	Pyrrophyta	Ceratium	39.9
7/1/2008	Cyanophyta	Anabaena	7.6
7/29/2008	Cyanophyta	Anabaena	51.7
7/29/2008	Cyanophyta	Oscillatoria	31.0
7/29/2008	Chrysophyta	Dinobryon	10.3
8/26/2008	Cyanophyta	Oscillatoria	59.6
8/26/2008	Cyanophyta	Anabaena	16.3
8/26/2008	Bacillariophyta	Fragilaria	7.7
9/29/2008	Bacillariophyta	Tabellaria	57.5
9/29/2008	Chrysophyta	Dinobryon	29.2
9/29/2008	Cyanophyta	Anabaena	7.9

Phytoplankton populations undergo a natural succession during the growing season. Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding seasonal plankton succession. Diatoms and golden-brown algae populations are typical in New Hampshire's less productive lakes and ponds.

The cyanobacteria ***Anabaena and Oscillatoria*** were observed in the plankton samples throughout the summer. ***These cyanobactieria, if present in large amounts, can be toxic to livestock, wildlife, pets, and humans.*** Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding cyanobacteria.

A cyanobacteria surface scum was noted at the Town Beach on **7/16/2008** and **8/8/2008**. Samples were collected and returned to the DES Limnology Center for analysis. **Beach advisories** were posted on **7/16/2008** and **8/8/2008** notifying the public of the presence of potentially toxic cyanobacteria. The cyanobacteria were identified as ***Anabaena***, potentially toxic cyanobacteria. Samples were collected regularly during the advisory period and the beach advisories were removed on **7/24/2008 and 8/21/2008**. To learn more about cyanobacteria and associated toxin production, please refer to the Data Interpretation section of your report.

Cyanobacteria can reach nuisance levels when phosphorus loading from the watershed to surface waters is increased and favorable environmental conditions occur, such as a period of sunny, warm weather.

The presence of cyanobacteria serves as a reminder of the pond's delicate balance. Watershed residents should continue to act proactively to reduce nutrient loading to the pond by eliminating fertilizer use on lawns, keeping the pond shoreline natural, re-vegetating cleared areas within the watershed, and properly maintaining septic systems and roads.

In addition, residents should also observe the pond in September and October during the time of fall turnover (lake mixing) to document any algal blooms that may occur. Cyanobacteria have the ability to regulate their depth in the water column by producing or releasing gas from vesicles. However, occasionally lake mixing can affect their buoyancy and cause them to rise to the surface and bloom. Wind and currents tend to "pile" cyanobacteria into scums that accumulate in one section of the pond. If a fall bloom occurs, please collect a sample in any clean jar or bottle and contact the VLAP Coordinator.

- **Secchi Disk Transparency**

Volunteer monitors use the Secchi disk, a 20 cm disk with alternating black and white quadrants, to measure how far a person can see into the water. Transparency, a measure of water clarity, can be affected by the amount of algae and sediment in the water, as well as the natural color of the water. Table 14 in Appendix A lists the current year transparency data. **The median summer transparency for New Hampshire's lakes and ponds is 3.2 meters.**

Figure 2 depicts the historical and current year transparency ***with and without*** the use of a viewscope.

The current year ***non-viewscope*** in-lake transparency ***increased*** from **May** to **June**, ***decreased*** from **June** to **July**, ***remained stable*** from **July** to **August**, and then ***increased*** from **August** to **September**.

Please note that the **7/1/2008** transparency was used to represent the **June** transparency.

The transparency was not measured with the viewscope. We apologize for the inconvenience.

The historical data (the bottom graph) show that the **2008** mean non-viewscope transparency is ***less than*** the state and similar lake medians. Please refer to Appendix D for more information about the similar lake median.

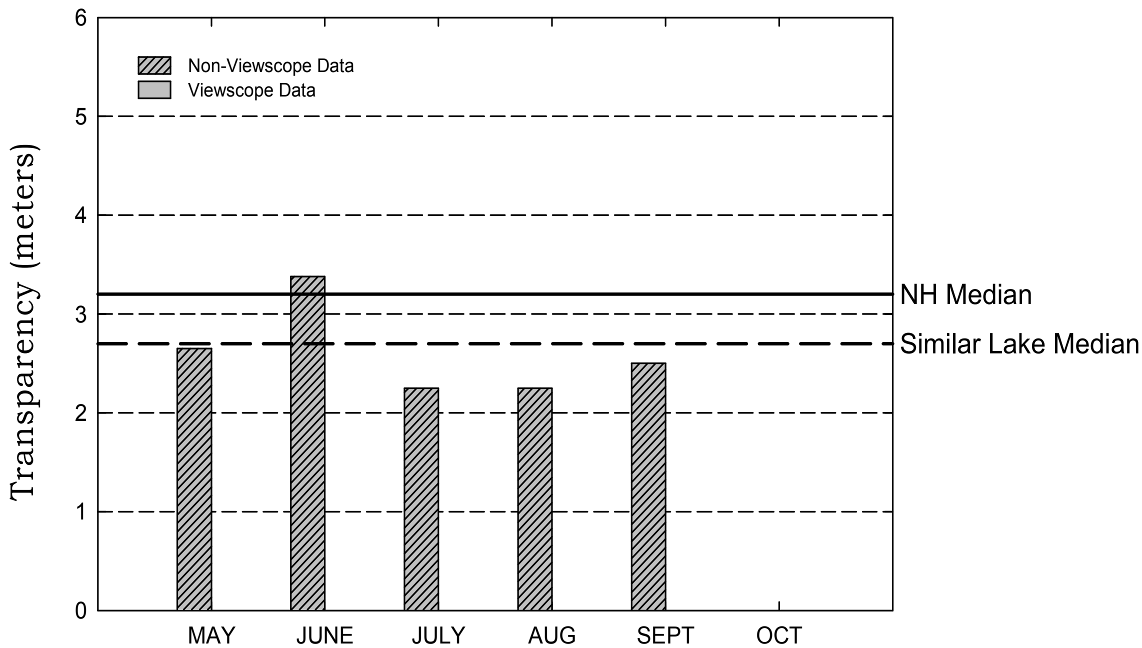
Visual inspection of the historical data trend line (the bottom graph) shows a ***decreasing*** trend, meaning that the transparency has ***worsened*** since monitoring began in **2000**.

Please keep in mind that this trend is based on only ***nine*** years of data. After 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

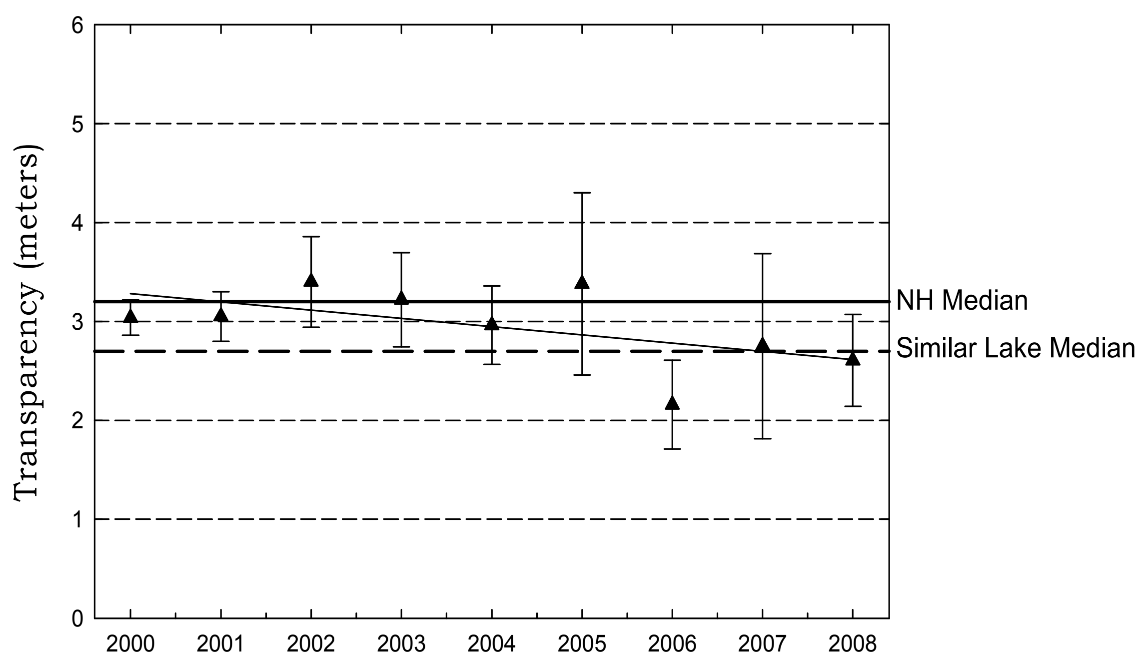
Typically, high intensity rainfall causes sediment-laden stormwater runoff to flow into surface waters, thus increasing turbidity and decreasing clarity. Efforts should continually be made to stabilize stream banks, pond shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the pond. Guides to best management practices that can be implemented to reduce, and possibly even eliminate, nonpoint source pollutants, are available from DES upon request.

Robinson Pond, Hudson

Figure 2. Monthly and Historical Transparency Results



2008 Transparency Viewscope and Non-Viewscope Results



Historical Transparency Non-Viewscope Results

➢ Total Phosphorus

Phosphorus is typically the limiting nutrient for vascular plant and algae growth in New Hampshire's lakes and ponds. Excessive phosphorus in a pond can lead to increased plant and algal growth over time. Table 14 in Appendix A lists the current year total phosphorus data for in-lake and tributary stations. **The median summer total phosphorus concentration in the epilimnion (upper layer) of New Hampshire's lakes and ponds is 12 ug/L. The median summer phosphorus concentration in the hypolimnion (lower layer) is 14 ug/L.**

The graphs in Figure 3 depict the historical amount of epilimnetic (upper layer) and hypolimnetic (lower layer) total phosphorus concentrations; the inset graphs depict current year total phosphorus data.

The current year data for the epilimnion (the top inset graph) show that the phosphorus concentration ***increased*** from **May** to **June**, ***decreased*** from **June** to **July**, ***increased*** from **July** to **August**, and then ***decreased*** from **August** to **September**.

The historical data show that the **2008** mean epilimnetic phosphorus concentration is ***slightly greater than*** the state and similar lake medians. Refer to Appendix D for more information about the similar lake median.

The current year data for the hypolimnion (the bottom inset graph) show that the phosphorus concentration ***increased*** from **May** to **June**, ***decreased*** from **June** to **July**, ***increased*** from **July** to **August**, and then ***decreased*** from **August** to **September**.

Please note that the **7/1/2008** phosphorus concentration was used to represent the **June** phosphorus concentration.

The hypolimnetic (lower layer) turbidity samples were ***elevated*** on each sampling event (**5.2, 6.28, 6.99, 10.9, and 15.7 NTUs**). This suggests that the pond bottom may have been disturbed by the anchor or by the Kemmerer Bottle while sampling and/or ***that the pond bottom is covered by an easily disturbed thick organic layer of sediment.*** When the pond bottom is disturbed, phosphorus rich sediment is released into the water column. When collecting the hypolimnion sample, make sure that there is no sediment in the Kemmerer Bottle before filling the sample bottles.

The historical data show that the **2008** mean hypolimnetic phosphorus concentration is ***much greater than*** the state and similar lake medians. Please refer to Appendix D for more information about the similar lake median.

Overall, visual inspection of the historical data trend line for the epilimnion shows a ***relatively stable*** phosphorus trend. Specifically, the mean annual epilimnetic phosphorus concentration has ***remained approximately the same*** since monitoring began in **2000**.

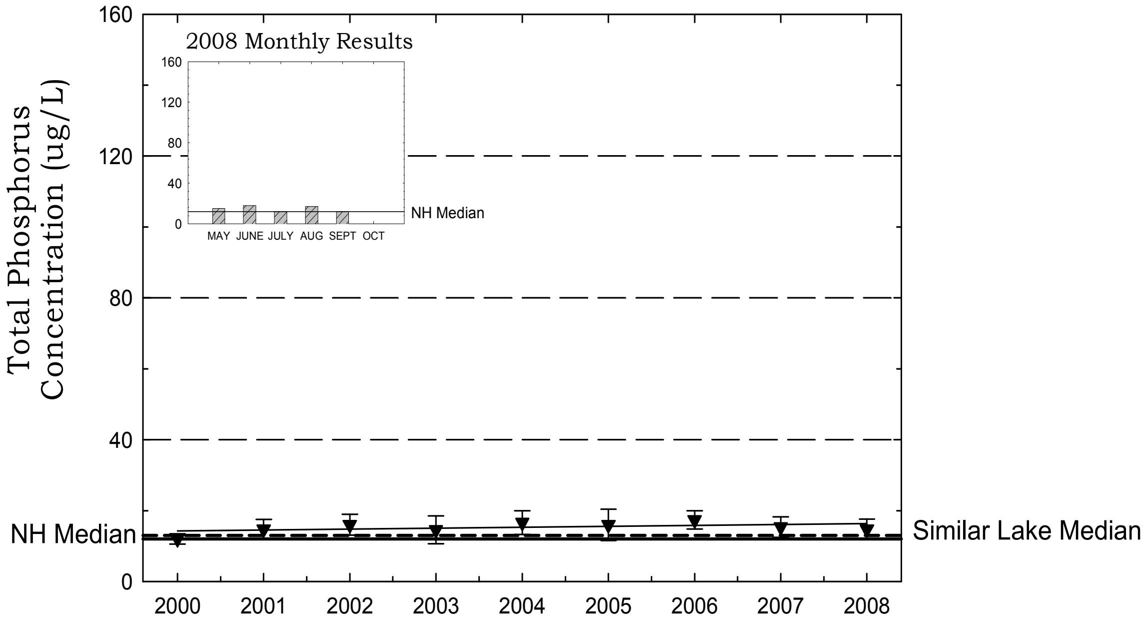
Overall, visual inspection of the historical data trend line for the hypolimnion shows a ***variable*** phosphorus trend since monitoring began. Specifically the mean annual hypolimnetic phosphorus concentration has ***fluctuated between approximately 26.5 and 64.8 ug/L*** since monitoring began in **2000**.

As discussed previously, after 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean phosphorus concentration since monitoring began.

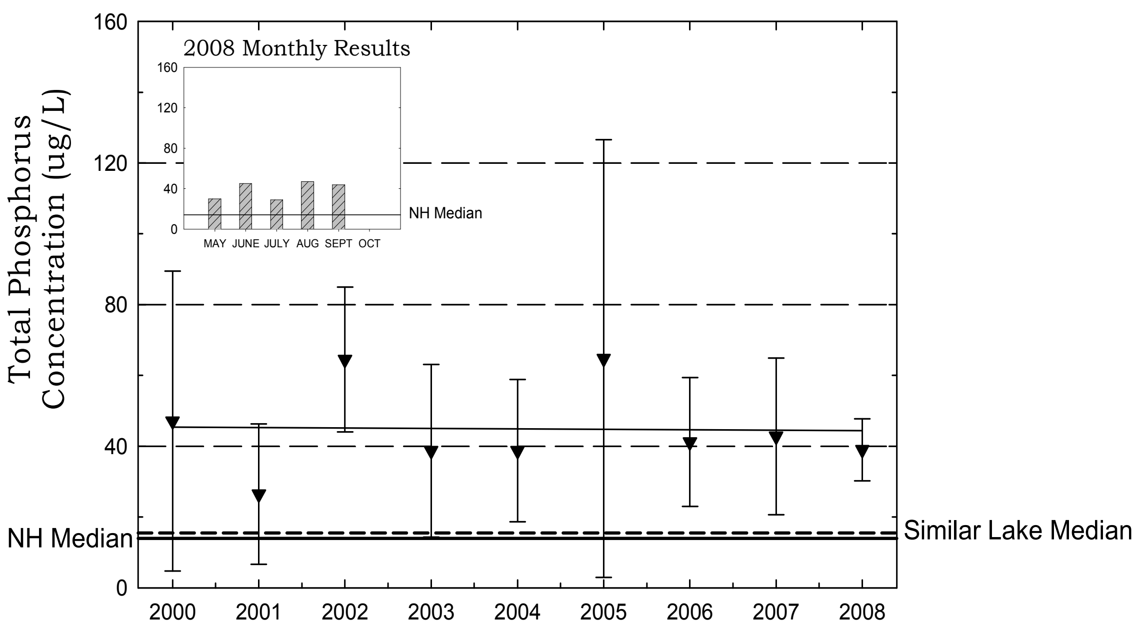
One of the most important approaches to reducing phosphorus loading to a waterbody is to continually educate watershed residents about the watershed sources of phosphorus and how excessive phosphorus loading can negatively affect the ecology and the recreational, economical, and ecological value of lakes and ponds.

Robinson Pond, Hudson

Figure 3. Monthly and Historical Total Phosphorus Data



Epilimnion (Upper Water Layer)



Hypolimnion (Lower Water Layer)

➢ pH

Table 14 in Appendix A presents the current year pH data for the in-lake stations.

pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 6.0 typically limits the growth and reproduction of fish. A pH between 6.0 and 7.0 is ideal for fish. The median pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.6**, which indicates that the state surface waters are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

The pH at the deep spot this year ranged from **6.46 to 7.04** in the epilimnion and from **6.15 to 6.35** in the hypolimnion, which means that the water is ***slightly acidic***.

It is important to point out that the hypolimnetic (lower layer) pH was ***lower (more acidic)*** than in the epilimnion (upper layer). This increase in acidity near the bottom is likely due to the decomposition of organic matter and the release of acidic by-products into the water column.

Due to the state's abundance of granite bedrock and acid deposition received from snowmelt, rainfall, and atmospheric particulates, there is little that can be feasibly done to effectively increase pond pH. The pH at the deep spot, however, is sufficient to support aquatic life.

➢ Acid Neutralizing Capacity (ANC)

Table 14 in Appendix A presents the current year epilimnetic ANC for the deep spot.

Buffering capacity (ANC) describes the ability of a solution to resist changes in pH by neutralizing the acidic input. The median ANC value for New Hampshire's lakes and ponds is **4.9 mg/L**, which indicates that many lakes and ponds in the state are at least "moderately vulnerable" to acidic inputs. For a more detailed explanation about ANC, please refer to the "Chemical Monitoring Parameters" section of this report.

The acid neutralizing capacity (ANC) of the epilimnion (upper layer) ranged from **10.6 mg/L to 18.8 mg/L**. This indicates that the pond has a ***low vulnerability*** to acidic inputs.

➢ Conductivity

Table 14 in Appendix A presents the current conductivity data for in-lake stations.

Conductivity is the numerical expression of the ability of water to carry an electric current, which is determined by the number of negatively charged ions from metals, salts, and minerals in the water column. The median conductivity value for New Hampshire's lakes and ponds is **40.0 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

The in-lake conductivity is ***much greater than*** the state median. Typically, increasing conductivity indicates the influence of pollutant sources associated with human activities. These sources include failed or marginally functioning septic systems, agricultural runoff, and road runoff which contains road salt during the spring snow-melt. New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which could also contribute to increasing conductivity. In addition, natural sources, such as iron and manganese deposits in bedrock, can influence conductivity.

We recommend that your monitoring group conduct a shoreline conductivity survey of the pond and tributaries with ***elevated*** conductivity to help identify the sources of conductivity.

To learn how to conduct a shoreline or tributary conductivity survey, please refer to the 2004 special topic article, which is posted on the VLAP website at ***http://www.des.nh.gov/organization/divisions/water/wmb/vlap/categories/publications.htm****, or contact the VLAP Coordinator.*

It is possible that de-icing materials applied to nearby roadways during the winter months may be influencing the conductivity in the pond. In New Hampshire, the most commonly used de-icing material is salt (sodium chloride).

A limited amount of chloride sampling was conducted during ***2008****. Please refer to the chloride discussion for more information.*

Therefore, we recommend that the **epilimnion** (upper layer) be sampled for chloride next year. This additional sampling may help us identify what areas of the watershed are contributing to the increasing in-lake conductivity.

Please note that the DES Limnology Center in Concord is able to conduct chloride analyses, free of charge. As a reminder, it is best to conduct chloride sampling in the spring as the snow is melting and during rain events.

➢ Dissolved Oxygen and Temperature

Table 9 in Appendix A depicts the dissolved oxygen/temperature profile(s) collected during **2008**.

The presence of sufficient amounts of dissolved oxygen in the water column is vital to fish and amphibians and also to bottom-dwelling organisms. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

During this year, and many past sampling years, the pond has experienced a lower dissolved oxygen concentration and higher total phosphorus concentration in the hypolimnion (lower layer) than in the epilimnion (upper layer). These data suggest that the process of ***internal phosphorus loading*** is occurring in the pond. When the hypolimnetic dissolved oxygen concentration is depleted to less than 1 mg/L, **as it was on the annual biologist visit this year and on many previous annual visits**, the phosphorus that is normally bound up with metals in the sediment may be re-released into the water column. Since an internal source of phosphorus in the pond may be present, it is even more important that watershed residents act proactively to minimize phosphorus loading from the watershed.

- **Turbidity**

Table 14 in Appendix A presents the current year data for in-lake turbidity.

Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the "Other Monitoring Parameters" section of this report for a more detailed explanation.

The turbidity of the metalimnion (middle layer) sample was ***elevated*** (**5.42 and 10.9 NTUs**) on the **7/29/2008 and 8/26/2008** sampling events. This suggests that a layer of algae may have been present at this location. Algae are often found in the metalimnion of ponds due to the differences in density between the epilimnion and the hypolimnion and the resulting abundance of food in that layer.

As discussed previously, the hypolimnetic (lower layer) turbidity was ***elevated*** (**5.2, 6.28, 6.99, 10.9, and 15.7 NTUs**) on each sampling event. In addition, the hypolimnetic turbidity has been elevated on many sampling events during previous sampling years. This suggests that the pond bottom may have been disturbed by the anchor or by the Kemmerer Bottle while sampling and/or that the lake bottom is covered by an easily disturbed thick organic layer of sediment. When the pond bottom is disturbed, phosphorus rich sediment is released into the water column. When collecting the hypolimnion sample, make sure that there is no sediment in the Kemmerer Bottle before filling the sample bottles.

TRIBUTARY SAMPLING

➢ Total Phosphorus

Table 14 in Appendix A presents the current year total phosphorus data for tributary stations. Please refer to the "Chemical Monitoring Parameters" section of the report for a detailed explanation of total phosphorus.

The phosphorus concentrations in **Juniper Brook** were the lowest measured since 2001. We hope to see this continue!

The phosphorus concentrations in the **Howard Brook** samples on the **7/1/2008, 7/29/2008 and 8/26/2008** sampling events were ***elevated*** **(52, 42 and 31 ug/L),** however, the turbidity was ***not elevated*** **(1.62, 1.41 and 1.81 NTUs)**. It is possible that watershed wetland systems were releasing phosphorus-enriched water into the lake from tributaries that drain the wetland area.

The phosphorus concentrations in the **Launch Brook** samples on the **5/27/2008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events were ***elevated*** **(34, 41, 33, and 47 ug/L),** however, the turbidity was ***not elevated*** **(1.18, 0.67, 1.09, and 1.91 NTUs)**.

The phosphorus concentrations in the **Row Brook** samples on the **5/27/2008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events were ***elevated*** **(120, 84, 58, and 74 ug/L),** however the turbidity was ***not elevated*** **(2.12, 1.27, 0.97, and 1.03 NTUs)**. In addition, the phosphorus concentration in Row Brook has increased dramatically since monitoring began. Please contact the VLAP Coordinator in the spring to conduct a stream survey and bracket sampling.

The phosphorus concentrations in the **Woodcrest Brook** samples on the **5/27/2008, 7/1/2008 and 7/29/2008** sampling events were ***elevated*** **(130, 180 and 170 ug/L),** however the turbidity was ***only slightly elevated*** **(1.73, 1.95 and 2.15 NTUs)**. In addition, the phosphorus concentration in Woodcrest Brook has increased dramatically since monitoring began. Please contact the VLAP Coordinator in the spring to schedule a site visit to conduct a stream survey and bracket sampling.

It had rained during the **24-72 hours** prior to the **7/1/2008, 7/29/2008 and 8/26/2008** sampling events. Rain events typically carry phosphorus laden watershed runoff to tributaries. Phosphorus sources in the watershed can include agricultural runoff, failing or marginal septic systems, stormwater runoff, road runoff, and watershed development.

The phosphorus concentrations in the **Stoney Lane Drainage** samples on the **7/1/2008, 7/29/2008 and 8/26/2008** sampling events were ***elevated*** **(34, 35 and 90 ug/L),** and the turbidity was also ***elevated*** **(10.9, 8.12 and 33.5**

NTUs). Elevated turbidity levels are most often a result of sediment and/or organic material present in the sample. These materials typically contain attached phosphorus and when present in elevated amounts contribute to elevated tributary phosphorus levels.

➢ pH

Table 14 in Appendix A presents the current year pH data for the tributary stations. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation of pH.

The pH of **Launch Brook, Howard Brook, Juniper Brook, Stoney Lane Drainage, and Row Brook** ranged from **6.11 to 6.95 (> 6)** and is sufficient to support aquatic life.

The pH of the **Woodcrest Brook** appears to be slightly acidic. This can be caused by the presence of humic, tannic and fulvic acids. Humic, tannic and fulvic acids naturally occur as a result of decomposing organic matter such as leaves. These acids may also cause the water to be tea colored. In New Hampshire the presence of granite bedrock and acid deposition also naturally lowers the pH of freshwaters.

➢ Conductivity

Table 14 in Appendix A presents the current conductivity data for the tributary stations. Please refer to the "Chemical Monitoring Parameters" section of the report for a more detailed explanation of conductivity.

The tributaries have experienced elevated conductivity levels since monitoring began. We recommend that your monitoring group conduct a conductivity survey of tributaries with ***elevated*** conductivity and along the shoreline of the pond to help identify the sources of conductivity. As previously mentioned increasing conductivity typically indicates the influence of pollutant sources associated with human activities.

In addition, it appears that the conductivity levels in **Woodcrest Brook** may be influenced by iron deposits. The sample receipt checklist in **July** noted an orange color to the sample. Typically, when samples have an orange hue, it indicates the presence of iron or iron bacteria in the sample. Iron is a mineral, that when present in high concentrations, can increase conductivity levels.

We recommend that your monitoring group conduct stream surveys and rain event sampling along the tributaries with ***elevated*** conductivity so that we can determine potential sources to the lake.

For a detailed explanation on how to conduct rain event sampling and stream surveys, please refer to the 2002 VLAP Annual Report special topic article, which is posted on the VLAP website at

http://www.des.nh.gov/organization/divisions/water/wmb/vlap/categories/publications.htm*, or contact the VLAP Coordinator.*

To learn how to conduct a shoreline or tributary conductivity survey, please refer to the 2004 special topic article, which is posted on the VLAP website at ***http://www.des.nh.gov/organization/divisions/water/wmb/vlap/categories/publications.htm****, or contact the VLAP Coordinator.*

➢ Turbidity

Table 14 in Appendix A presents the current year turbidity data for the tributary stations. Please refer to the "Other Monitoring Parameters" section of the report for a more detailed explanation of turbidity.

Overall, tributary turbidity levels ***decreased*** during the **2008** sampling season. This is a good sign indicating samples are collected when there is sufficient flow in the tributaries.

The **Stoney Lane Drainage** experienced turbid conditions in **July and August**, likely the result of stormwater runoff from significant rain events prior to sampling. Rainfall creates runoff that washes sediment and organic materials into tributaries causing turbid water conditions. Eventually, the suspended solids settle out once the flow is reduced or the tributary flow enters the lake.

➢ Bacteria (*E. coli*)

Table 14 in Appendix A lists the current year data for bacteria *(E.coli*) testing. *E. coli* is a normal bacterium found in the large intestine of humans and other warm-blooded animals. *E.coli* is used as an indicator organism because it is easily cultured and its presence in the water, in defined amounts, indicates that sewage **may** be present. If sewage is present in the water, potentially harmful disease-causing organisms **may** also be present. Please refer to the "Other Monitoring Parameters" section of the report for a more detailed explanation.

The *E. coli* concentration was **low** at the **Epilimnion, Howard Brook, Juniper Brook, Row Brook, and Launch Brook** sampled on the **5/27/2008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events. Specifically, each result was **100 counts or less**, which is ***much less than*** the state standard of 406 counts per 100 mL for recreational surface waters that are not designated public beaches.

The **Stoney Brook** *E. coli* concentration was ***elevated*** on the **7/1/2008 and 8/26/2008** sampling events. However, the **200 and 220** counts per 100 mL concentration ***were not greater than*** the state standard of 406 counts per 100 mL for recreational waters that are not designated public beaches.

If you are concerned about *E. coli* levels at this station, your monitoring group should conduct rain event sampling and bracket sampling in this area to determine the bacteria sources.

For a detailed explanation on how to conduct rain event sampling and stream surveys, please refer to the 2002 VLAP Annual Report special topic article, which is posted on the VLAP website at ***http://www.des.nh.gov/organization/divisions/water/wmb/vlap/categories/publications.htm****, or contact the VLAP Coordinator.*

The *E. coli* concentration in the **Woodcrest Brook** samples was ***elevated*** on the **7/1/2008 and 7/29/2008** sampling events. The **510 and 640** counts per 100 mL concentration ***were greater than*** the state standard of 406 counts per 100 mL for recreational waters that are not designated public beaches.

We recommend that your monitoring group conduct rain event sampling and bracket sampling next year in this area. This additional sampling may help us determine the source of the bacteria.

For a detailed explanation on how to conduct rain event sampling and stream surveys, please refer to the 2002 VLAP Annual Report special topic article, which is posted on the VLAP website at ***http://www.des.nh.gov/organization/divisions/water/wmb/vlap/categories/publications.htm****, or contact the VLAP Coordinator.*

➢ Chlorides

Table 14 in Appendix A lists the current year data for chloride sampling. The chloride ion (Cl^-) is found naturally in some surface waters and groundwaters and in high concentrations in seawater. Research has shown that elevated chloride levels can be toxic to freshwater aquatic life. In order to protect freshwater aquatic life in New Hampshire, the state has adopted **acute and chronic** chloride criteria of **860 and 230 mg/L** respectively. The chloride content in New Hampshire lakes is naturally low, generally less than 2 mg/L in surface waters located in remote areas away from habitation. Higher values are generally associated with salted highways and, to a lesser extent, with septic inputs. Please refer to the “Chemical Monitoring Parameters” section of this report for a more detailed explanation.

The **epilimnion** was sampled for chloride during the **5/27/2008, 7/1/2008, 7/29/2008, 8/26/2008, and 9/29/2008** sampling events. The results were **36, 36, 37, 51, and 32 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria. However, this concentration is ***greater than*** what we would normally expect to measure in undisturbed New Hampshire surface waters.

The **Launch Brook** tributary was sampled for chloride on the **5/27/2008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events. The results were **41, 31, 30, and 48 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria.

The **Howard Brook** tributary was sampled for chloride on the **7/1/2008, 7/29/2008 and 8/26/2008** sampling events. The results were **11, 14 and 19 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria.

The **Juniper Brook** tributary was sampled for chloride on the **5/27/20008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events. The results were **34, 41, 44, and 58 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria.

The **Stoney Lane Drainage** was sampled for chloride on the **5/27/20008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events. The results were **25, 25, 24, and 38 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria.

The **Woodcrest Brook** tributary was sampled for chloride on the **5/27/20008, 7/1/2008 and 7/29/2008** sampling events. The results were **61, 66, and 53 mg/L**, which is ***much less than*** the state acute and chronic chloride criteria.

The **Row Brook** tributary was sampled for chloride on the **5/27/20008, 7/1/2008, 7/29/2008, and 8/26/2008** sampling events. The results were **66, 81, 74, and 93 mg/L**, which is ***less than*** the state acute and chronic chloride criteria.

These chloride concentrations are ***much greater than*** what we expect to see in undisturbed New Hampshire surface waters. We recommend that your monitoring group continue to conduct chloride sampling at the epilimnion and tributaries, particularly in the spring during snow-melt and rain events during the summer. This will establish a baseline of data that will assist your monitoring group and DES to determine lake quality trends in the future. As well as assist your monitoring group to establish low salt application zone around the pond.

Please note that chloride analyses can be run free of charge at the DES Limnology Center. Please contact the VLAP Coordinator if you are interested in chloride monitoring.

DATA QUALITY ASSURANCE AND CONTROL

Annual Assessment Audit:
During the annual visit to your pond, the biologist conducted a sampling procedures assessment audit for your monitoring group. Specifically, the biologist observed the performance of your monitoring group while sampling and filled-out an assessment audit sheet to document the volunteer monitors' ability to follow the proper field sampling procedures, as outlined in the VLAP Monitor's Field Manual. This assessment is used to identify any aspects of sample collection in which volunteer monitors failed to follow proper procedures, and also provides an opportunity for the biologist to retrain the volunteer monitors as necessary. This will ultimately ensure that the samples

volunteer monitors collect are truly representative of actual lake and tributary conditions.

Overall, your monitoring group did an ***excellent*** job collecting samples on the annual biologist visit this year! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the biologist to provide additional training. Keep up the good work!

Sample Receipt Checklist

Overall, the sample receipt checklist showed that your monitoring group did a ***very good*** job when collecting samples this year! Specifically, the members of your monitoring group followed the majority of the proper field sampling procedures when collecting and submitting samples to the laboratory. However, the laboratory did identify a few aspects of sample collection that your group could improve upon, as follows:

- **Sample labeling:** Please label your samples with a waterproof pen preferably by using a black permanent before sampling. ***Please label sample bottles with the Lake name, station name, station depth, date and time samples were collected.*** Check to make sure that the ink does not wash off the bottle when exposed to water. If your association has made its own sample bottle labels, please fold over one corner of each label before placing it on a sample bottle so that the label will not become permanently attached to the bottle. In addition, please make sure that the labels will stick to the bottles when they are wet.

- **Sample bottle volume:** Please fill each sample bottle up to the neck of the bottle where the bottle curves in. This will ensure that the laboratory staff will have enough sample water to conduct all of the necessary tests.

  Please be careful to not overflow the small brown bottle used for phosphorus sampling since this bottle contains acid. If you do accidentally overflow the small brown bottle, please rinse your hands and the outside of the sample bottle and make a note of this on your field sampling sheet. The laboratory staff will put additional acid in the bottle in the laboratory to preserve the sample.

USEFUL RESOURCES

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, DES Booklet WD-03-42, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-03-42.pdf.

Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms, DES fact sheet WMB-10, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-10.pdf.

Impacts of Development Upon Stormwater Runoff, DES fact sheet WD-WQE-7, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/aot/documents/wqe-7.pdf.

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, DES fact sheet WD-BB-9, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-9.pdf.

Low Impact Development: Taking Steps to Protect New Hampshire's Surface Waters, DES fact sheet WD-WMB-17, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-17.pdf.

Proper Lawn Care In the Protected Shoreland, The Comprehensive Shoreland Protection Act, DES fact sheet WD-SP-2, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/sp/documents/sp-2.pdf.

Road Salt and Water Quality, DES fact sheet WD-WMB-4, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-4.pdf.

Sand Dumping - Beach Construction, DES fact sheet WD-BB-15, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/bb/documents/bb-15.pdf.

Shorelands Under the Jurisdiction of the Comprehensive Shoreland Protection Act, DES fact sheet SP-4, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/sp/documents/sp-4.pdf.

Soil Erosion and Sediment Control on Construction Sites, DES fact sheet WQE-6, (603) 271-2975 or www.des.nh.gov/organization/commissioner/pip/factsheets/aot/documents/wqe-6.pdf.