OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from the **Ossipee Lake System (Lake Ossipee, Lower Danforth Pond, Broad Bay, Leavitt Bay, and Berry Bay)**, the program coordinators have made the following observations and recommendations.

Thank you for your continued hard work sampling the deep spots of these five waterbodies this year. As you know, conducting multiple sampling events each year enables DES to more accurately detect water quality changes. Keep up the good work!

If your monitoring group's sampling events this year were limited due to not having enough time to pick-up or drop-off samples at the Limnology Center in Concord, please remember the Plymouth State University Center for the Environment Satellite Laboratory is open in Plymouth. This laboratory was established to serve the large number of lakes/ponds in the greater North region of the state. This laboratory is inspected by DES and operates under a DES approved quality assurance plan. We encourage your monitoring group to utilize this laboratory next summer for all sampling events, except for the annual DES biologist visit. To find out more about the Center for the Environment Satellite Laboratory, and/or to schedule dates to pick up bottles and equipment, please call Adam Baumann, laboratory manager, at (603) 535-3269.

A Weed Watcher training was conducted at **Danforth Ponds** during **2008**. Volunteers were trained to survey the ponds once a month from **May** through **September**. To survey, volunteers slowly boat, or even snorkel, around the perimeter of the lake or pond and any islands it may contain. Using the materials provided in the Weed Watcher kit, volunteers look for any species that are suspicious. After a trip or two around the lake or pond, volunteers will have a good knowledge of its plant community and will immediately notice even the most subtle changes. If a suspicious plant is found, the volunteers immediately send a specimen to DES for identification. If the plant specimen is an exotic species, a biologist will visit the site to determine the extent of the problem and to formulate a management plan to control the nuisance infestation. Remember that early detection is the key to controlling the spread of exotic plants.

Volunteers from **Ossipee Lake** participated in the Lake Host™ Program this year. The Lake Host™ Program was initiated in 2002 by NH LAKES and DES to educate and prevent boaters from spreading exotic aquatic plants to lakes and ponds in New Hampshire. Since then, the number of participating lakes and ponds has doubled, the number of 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 157 in 2007. 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 discovered the following suspicious aquatic vegetation entering or leaving your lake in 2008:

Milfoil species (potentially exotic; sent for DNA testing)

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

FIGURE INTERPRETATION

- **Figure 1:** Figure 1 in Appendix A shows the historical and current year chlorophyll-a concentration in the water column. Table 14 in Appendix B lists the current year chlorophyll-a data.

  Chlorophyll-a, a pigment found in plants, is an indicator of the algal abundance. Because algae are usually microscopic plants that contain chlorophyll-a, and are naturally found in lake ecosystems, the chlorophyll-a concentration measured in the water gives an estimation of the algal concentration or lake productivity. **The median summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 4.58 mg/m^3.**

Ossipee System 2008 Chlorophyll-a Data

	2008 Annual Mean Result (mg/m^3)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	2.24	Less than	Less than
Lower Danforth Pond	4.29	Slightly greater than	Slightly greater than
Broad Bay	3.05	Less than	Approximately equal to
Leavitt Bay	2.68	Much less than	Much less than
Berry Bay	2.57	Much less than	Much less than

The mean annual chlorophyll-a concentration was ***highest*** at the **Lower Danforth Pond (4.29 mg/m^3)** deep spot and ***lowest*** at the

Lake Ossipee (2.24 mg/m³) deep spot. The mean chlorophyll-a concentrations at **Lake Ossipee and Berry Bay *remained stable*** in 2008. The mean chlorophyll-a concentrations at **Broad Bay, Leavitt Bay and Lower Danforth Pond *increased*** in 2008.

Ossipee System Historic Chlorophyll-a Data

	Sampling Period	**Visual Analysis Trend**
Lake Ossipee	2003 - 2008	Relatively Stable (ranging from 1.57 to 3.0 mg/m³)
Lower Danforth Pond	2003 - 2008	Variable (ranging from 2.21 to 4.53 mg/m³)
Broad Bay	1990 - 2008	Slightly Variable (ranging between approx. 1.23 – 3.46 mg/m³)
Leavitt Bay	1990 - 2008	Increasing (ranging from 1.07 to 3.24 mg/m³, but overall worsening)
Berry Bay	2003 - 2008	Relatively Stable (ranging from 1.92 to 2.94 mg/m³)

Overall, visual inspection of the historical data trend lines for **Lake Ossipee** and **Berry Bay** show a ***relatively stable*** in-lake chlorophyll-a trend since monitoring began in **2003**. Visual inspection of the historical data trend line for **Lower Danforth Pond** shows a ***variable*** in lake chlorophyll-a trend since **2003**. 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 chlorophyll-a concentration since monitoring began at these three deep spots.

Visual inspection of the historical data show that the **Broad Bay** mean annual chlorophyll-a concentration has ***fluctuated slightly***, ***between approximately 1.23 and 3.46 mg/m³***, since monitoring began in **1990**.

Visual inspection of the historical data shows that the **Leavitt Bay** chlorophyll-a concentration has ***increased slightly (meaning worsened),*** since monitoring began in **1990**.

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

- **Figure 2:** Figure 2 in Appendix A shows the historical and current year data for transparency with and without the use of a viewscope. Table 14 in Appendix B lists the current year transparency data measured with and without the viewscope.

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. **The median summer transparency for New Hampshire's lakes and ponds is 3.2 meters.**

Ossipee System 2008 Non-Viewscope Transparency Data

	2008 Annual Mean	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	4.82	Slightly greater than	Slightly greater than
Lower Danforth Pond	4.08	Slightly greater than	Slightly less than
Broad Bay	3.68	Slightly greater than	Less than
Leavitt Bay	4.28	Slightly greater than	Slightly less than
Berry Bay	3.76	Slightly greater than	Slightly less than

Overall, the **2008** non-viewscope transparency annual means were ***less than*** the 2007 annual means for each of the five deep spots. It is likely that wet weather conditions increased the amount of stormwater runoff, which increased the amount of sediment and organic material entering the system, as well as increased algal growth leading to the decreased transparency.

The current year data (the top graph) show that the transparency at each deep spot was also measured with the viewscope on each sampling event. The transparency measured with the viewscope was generally ***greater than*** the transparency measured without the viewscope. As discussed previously, a comparison of the transparency readings taken with and without the use of a viewscope shows that the viewscope typically increases the depth to which the Secchi disk can be seen into the lake, particularly on sunny and windy days. We recommend that your group measure Secchi disk transparency with and without the viewscope on each sampling event.

It is important to note that viewscope transparency data is not compared to a New Hampshire median or similar lake median. This is because lake transparency has not been historically measured by

DES with a viewscope. At some point in the future, the New Hampshire and similar lake medians for viewscope transparency will be calculated and added to the appropriate graphs.

Ossipee System Historic Transparency Data

	Sampling Period	Visual Analysis Trend
Lake Ossipee	2003 - 2008	Variable (fluctuating between 2.7 and 4.9 meters)
Lower Danforth Pond	2003 - 2008	Slightly variable (ranging between 3.28 and 4.75 meters)
Broad Bay	1990 - 2008	Decreasing (worsening)
Leavitt Bay	1990 - 2008	Decreasing (worsening)
Berry Bay	2003 – 2008	Slightly variable, but overall decreasing

Visual inspection of the historical data trend line (the bottom graph) shows a ***variable*** transparency trend for **Lake Ossipee, Lower Danforth Pond,** and **Berry Bay**.

As previously discussed, after 10 consecutive years of sample collection at the **Lake Ossipee, Lower Danforth Pond,** and **Berry Bay** deep spots, 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.

Visual inspection of the historical data trend lines for **Broad Bay and Leavitt Bay** shows that the non-viewscope transparency has ***decreased*** (meaning ***worsened***) since **1990**. Please refer to Appendix E for the statistical analysis explanation and data print-out.

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, lake shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the lake. Guides to best management practices that can be implemented to reduce, and possibly even eliminate, nonpoint source pollutants, are available from DES upon request.

- **Figure 3:** The graphs in Figure 3 in Appendix A show the amount of epilimnetic (upper layer) phosphorus and hypolimnetic (lower layer) phosphorus; the inset graphs show current year data. Table 14 in

Appendix B lists the current year total phosphorus data for each deep spot station.

Phosphorus is typically the limiting nutrient for plant and algae growth in New Hampshire's lakes and ponds. Excessive phosphorus in a lake can lead to increased plant and algal growth over time. **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.**

Ossipee System 2008 Deep Spot Epilimnetic Phosphorus Data

	2008 Epilimnetic Annual Mean (ug/L)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	6.4	Less than	Slightly less than
Lower Danforth Pond	12.4	Slightly less than	Greater than
Broad Bay	6.0	Much less than	Approximately equal to
Leavitt Bay	6.4	Much less than	Slightly less than
Berry Bay	7.2	Much less than	Slightly less than

The mean annual epilimnetic total phosphorus concentrations ***descreased*** in 2008 at each deep spot station.

Ossipee System 2008 Deep Spot Hypolimnetic Phosphorus Data

	2008 Hypolimnetic Annual Mean (ug/L)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	5.9	Much less than	Slightly less than
Lower Danforth Pond	9.0	Less than	Less than
Broad Bay	7.0	Much less than	Slightly less than
Leavitt Bay	7.1	Much less than	Much less than
Berry Bay	7.6	Much less than	Much less than

The mean annual hypolimnetic phosphorus concentration was the ***lowest*** total phosphorus concentration measured at **Ossipee Lake** and **Lower Danforth Pond** since monitoring began.

Ossipee System Historic Epilimnetic Phosphorus Data

	Sampling Period	Visual Analysis Trend
Lake Ossipee	2003 – 2008	Relatively stable (ranging between 6 and 9.5 ug/L)
Lower Danforth Pond	2003 – 2008	Slightly variable (ranging from 8 to 12.3 ug/L)
Broad Bay	1990 – 2008	Variable (ranging between approx 3 and 11.2 ug/L)
Leavitt Bay	1990 – 2008	Variable (Ranging between approx 3 and 12 ug/L)
Berry Bay	2003 – 2008	Relatively stable (ranging between 6.5 to 9.5 ug/L)

Visual inspection of the mean historical epilimnetic phosphorus data shows a ***relatively stable*** trend for **Lake Ossipee** and **Berry Bay,** and a ***variable*** trend for **Lower Danforth Pond, Broad Bay** and **Leavitt Bay** since monitoring began.

Ossipee System Historic Hypolimnetic Phosphorus Data

	Sampling Period	Visual Analysis Trend
Lake Ossipee	2003 – 2008	Relatively stable (ranging from 6 to 9 ug/L)
Lower Danforth Pond	2003 – 2008	Decreasing (*improving*)
Broad Bay	1990 – 2008	Variable (ranging from 4.0 to 11.0 ug/L)
Leavitt Bay	1990 – 2008	Variable (ranging from 4.0 to 14.0 ug/L)
Berry Bay	2003 – 2008	Relatively stable (ranging from 6.4 to 10 ug/L)

Overall, visual inspection of the mean historical hypolimnetic phosphorus data shows a ***variable*** trend for **Broad Bay** and **Leavitt Bay,** a ***relatively stable*** trend for **Lake Ossipee** and **Berry Bay,** and a ***decreasing (improving)*** trend for **Lower Danforth Pond** since monitoring began.

As previously discussed, after 10 consecutive years of sample collection at the **Lake Ossipee, Lower Danforth Pond,** and **Berry Bay** deep spots, 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 epilimnetic and hypolimnetic 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 sources of phosphorus in a watershed and how excessive phosphorus loading can negatively affect the ecology and the recreational, economical, and ecological value of lakes and ponds.

TABLE INTERPRETATION

- **Table 2: Phytoplankton**
  Table 2 in Appendix B lists the current and historical phytoplankton species observed in the lake. Specifically, this table lists the three most dominant phytoplankton species observed in the sample and their relative abundance in the sample.

  The dominant phytoplankton and/or cyanobacteria observed in the **August** sample at **Ossipee Lake** were ***Tabellaria*** **(Diatom),** ***Asterionella*** **(Diatom),** and ***Dinobryon*** **(Golden-Brown)**.

  The dominant phytoplankton and/or cyanobacteria observed in the **August** sample at **Lower Danforth Pond** were ***Dinobryon*** **(Golden-Brown),** ***Synura*** **(Golden-Brown),** and ***Ceratium*** **(Dinoflagellate)**.

  The dominant phytoplankton and/or cyanobacteria observed in the **August** sample at **Broad Bay** were ***Tabellaria*** **(Diatom),** ***Dinobryon*** **(Golden-Brown),** and ***Asterionella*** **(Diatom)**.

  The dominant phytoplankton and/or cyanobacteria observed in the **August** sample at **Leavitt Bay** were ***Tabellaria*** **(Diatom),** ***Asterionella*** **(Diatom),** and ***Dinobryon*** **(Golden-Brown)**.

  The dominant phytoplankton and/or cyanobacteria observed in the **August** sample at **Berry Bay** were ***Tabellaria*** **(Diatom),** ***Asterionella/Dinobryon*** **(Diatom/Golden-Brown),** and ***Rhizosolenia*** **(Diatom)**.

  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.

- **pH**
  Table 14 in Appendix B presents the in-lake and tributary current year and pH data.

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 surface waters in the state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

Ossipee System 2008 pH Data

	Mean Epilimnetic pH	Mean Hypolimnetic pH
Lake Ossipee	6.65	5.87
Lower Danforth Pond	6.58	6.18
Broad Bay	6.65	5.95
Leavitt Bay	6.58	6.31
Berry Bay	6.63	6.22

Overall, the mean pH among the five deep spots ranged from **5.87 (Lake Ossipee)** to **6.31 (Lower Danforth Pond)** in the hypolimnion and from **6.58 (Berry Bay and Lower Danforth Pond)** to **6.65 (Lake Ossipee and Broad Bay)** in the epilimnion, 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) at each deep spot. This increase in acidity near the lake bottom is likely due to the decomposition of organic matter and the release of acidic by-products into the water column.

Due to the presence of granite bedrock in the state and acid deposition received from snowmelt, rainfall, and atmospheric particulates, there is not much that can be feasibly done to effectively increase lake pH.

- **Acid Neutralizing Capacity**

Table 14 in Appendix B presents the current year epilimnetic ANC for each year the lake has been monitored through VLAP.

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) in the epilimnion (the upper layer) at the five deep spots, ranged from **3.8 mg/L (Lake Ossipee) to 7.8 mg/L (Lower Danforth Pond)**, and indicates that the surface water at each deep spot is ***moderately vulnerable*** to acidic inputs.

- **Conductivity**

Table 14 in Appendix B presents the current conductivity values for tributaries and in-lake data. 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 mean epilimnetic conductivity at the deep spots ranged from **37.77 uMhos/cm (Lake Ossipee)** to **54.33 uMhos/cm (Lower Danforth Pond)**, which is ***slightly greater than*** the state median.

The conductivity in **Lake Ossipee, Lower Danforth Pond** and **Berry Bay** is relatively ***stable***. However, the conductivity is ***slightly elevated***. Typically conductivity levels greater than 100 uMhos/cm indicate the influence of pollutant sources associated with human activities.

The epilimnetic conductivity has ***gradually increased*** at the **Broad Bay** and **Leavitt Bay** deep spots since monitoring began in **1990**. 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 lakes 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/wmb/vlap/2004/documents/Appendix_D.pdf or contact the VLAP Coordinator.

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

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.

- **Total Phosphorus**
  Table 14 in Appendix B presents the current year total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  Tributary sampling was not conducted through VLAP during the summer of 2003, 2004, 2005, 2006, 2007, or 2008. Consequently, DES cannot discuss the tributary data for the Lake Ossipee System.

  It would be best to sample the tributaries in the spring during snow-melt and during rainstorms to determine the quality of water that flows into each waterbody.

- **Table 9: Dissolved Oxygen and Temperature Data**
  Table 9 in Appendix B shows the dissolved oxygen/temperature profile(s) collected during **2007**. Table 10 in Appendix B shows the historical and current year dissolved oxygen concentration in the hypolimnion (lower layer). The presence of dissolved oxygen is vital to fish and amphibians in the water column and also to bottom-dwelling organisms. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  The dissolved oxygen concentration was ***lower in the hypolimnion (lower layer) than in the epilimnion (upper layer)*** at the **Ossipee Lake** and **Broad Bay** deep spots on the **August** sampling event. As stratified lakes age, and as the summer progresses, oxygen typically becomes ***depleted*** in the hypolimnion by bacterial decomposition. Specifically, the reduction of hypolimnetic oxygen is primarily a result of biological organisms using oxygen to break down organic matter, both in the water column and particularly at the bottom of the lake or pond where the water meets the sediment. When the hypolimnetic oxygen concentration is depleted to less than 1 mg/L, the phosphorus that is normally bound up in the sediment may be re-released into the water column, a process referred to as ***internal phosphorus loading***.

The dissolved oxygen concentration was greater than **100 percent** saturation between the **surface** and **3.0** meters at the **Broad Bay** deep spot on the **August** sampling event. Wave action from wind can also dissolve atmospheric oxygen into the upper layers of the water column. Layers of algae can also increase the dissolved oxygen in the water column, since oxygen is a by-product of photosynthesis. Considering that the depth of sunlight penetration into the water column was approximately **3.5** meters on this sampling event, as shown by the Secchi disk transparency depth, we suspect that an abundance of algae in the epilimnion caused the oxygen super-saturation.

The dissolved oxygen concentration was ***much lower in the hypolimnion (lower layer) than in the epilimnion (upper layer)*** at the **Lower Danforth Pond** and **Berry Bay** deep spots on the **August** sampling event. Specifically, the dissolved oxygen was **< 1.0 mg/L**. As stratified ponds age, and as the summer progresses, oxygen typically becomes ***depleted*** in the hypolimnion by the process of decomposition. Specifically, the reduction of hypolimnetic oxygen is primarily a result of biological organisms using oxygen to break down organic matter, both in the water column and particularly at the bottom of the lake or pond where the water meets the sediment. When hypolimnetic oxygen concentration is depleted to less than 1 mg/L, the phosphorus that is normally bound up in the sediment may be re-released into the water column, a process referred to as ***internal phosphorus loading***.

The dissolved oxygen concentration was ***high*** at all deep spot depths sampled at the **Leavitt Bay** deep spot on the **August** sampling event. We suspect that the dissolved oxygen concentration measured at **13 meters** was questionable as the probe may have been in the bottom sediment. As thermally stratified lakes age, and as the summer progresses, oxygen typically becomes ***depleted*** in the hypolimnion (lower layer) by bacterial decomposition. Specifically, the loss of oxygen in the hypolimnion results primarily from biological organisms using oxygen to break down organic matter, both in the water column and particularly at the bottom of the lake or pond where the water meets the sediment. The ***high*** oxygen level in the hypolimnion is a sign of the lake's overall good health. We hope this continues!

- **Turbidity**
  Table 14 in Appendix B lists the current year data for in-lake and tributary 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 hypolimnetic (lower layer) turbidity was ***elevated*** (**7.84 NTUs**) at the **Berry Bay** deep spot on the **8/21/2008** sampling event. This suggests that the lake 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 lake 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.

- **Bacteria (*E.coli*)**
  Table 14 in Appendix B 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.

  Bacteria sampling was **not** conducted during **2008**. If residents are concerned about sources of bacteria such as failing septic systems, animal waste, or waterfowl waste, it is best to conduct *E. coli* testing when the water table is high, when beach use is heavy, or immediately after rain events.

- **Chloride**
  Table 14 in Appendix B lists the current year data for chloride sampling. The chloride ion (Cl^-) is found naturally in some surfacewaters 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.

Chloride sampling was **not** conducted during **2008**.

- **Table 14: Current Year Biological and Chemical Raw Data**
  Table 14 in Appendix B lists the most current sampling year results. Since the maximum, minimum, and annual mean values for each parameter are not shown on this table, this table displays the current year "raw," meaning unprocessed, data. The results are sorted by station, depth, and then parameter.

- **Table 15: Station Table**
  As of the spring of 2004, all historical and current year VLAP data are included in the DES Environmental Monitoring Database (EMD). To facilitate the transfer of VLAP data into the EMD, a new station identification system had to be developed. While volunteer monitoring groups can still use the sampling station names that they have used in the past and are most familiar with, an EMD station name also exists for each VLAP sampling location. Table 15 in Appendix B identifies what EMD station name corresponds to the station names you have used in the past and will continue to use in the future.

DATA QUALITY ASSURANCE AND CONTROL

Annual Assessment Audit:

During the annual visit to the **Ossipee Lake system**, the biologist conducted a sampling procedures assessment audit for your monitoring group. Specifically, the biologist observed the performance of your monitoring group and completed 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 samples that the 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:

Each time your monitoring group dropped off samples at the laboratory this summer, the laboratory staff completed a sample receipt checklist to assess and document if your group followed proper sampling techniques when collecting the samples. The purpose of the sample receipt checklist is to minimize, and hopefully eliminate, future re-occurrences of improper sampling techniques.

Overall, your monitoring group performed ***very well*** while collecting samples on the annual biologist visit this year! Specifically, the members of your monitoring group followed the majority of the proper field sampling procedures. However, the biologist did identify a few aspects regarding sample collection that the volunteer monitors could improve upon, as follows:

- **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.

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

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/factsheets/bb/bb-9.htm.

Low Impact Development: Taking Steps to Protect New Hampshire's Surface Waters, DES fact sheet WD-WMB-16, (603) 271-2975 or www.des.nh.gov/factsheets/wmb/wmb-17.htm.

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/factsheets/sp/sp-2.htm.

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

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

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

Through the Looking Glass: A Field Guide to Aquatic Plants, North American Lake Management Society, 1988, (608) 233-2836 or www.nalms.org.

Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, DES fact sheet WD-BB-4, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-4.htm.

Watershed Districts and Ordinances, DES fact sheet WD-WMB-16, (603) 271-2975 or www.des.nh.gov/factsheets/wmb/wmb-16.htm.