

Vermont Department of Environmental Conservation
Water Quality Division
Lakes and Ponds Section

**Annotation of Lake Water Quality Summary
Information Forms**

The lake information provided to you on the Lake Water Quality Summary forms is contained in the computer inventory of the Department of Environmental Conservation's Lakes and Ponds Section. It is a summary of a variety of data that will help give an overall assessment of a lake. While there may be quite a bit of information on Vermont's larger lakes, there may be little to none available on many of the smaller lakes. There also may be errors in the information presented here; the Department would be interested in corrections or additional information that you know about. The following explains the information sections of the reporting form.

GENERAL INFORMATION (page 1)

Outlet Located in Town of... Lakes are listed in our computer inventory under the town in which the outlet is located. Other towns may also be located along the shoreline; these would be indicated with a "YES" under "Shoreline on Lake?" In addition, some towns may be part of the lake's watershed, but have no shoreline acreage. These towns are indicated by "NO".

A watershed is the land area surrounding a lake that drains into the lake. Any activities occurring in the watershed affect lake water quality when the pollution resulting from an activity enters streams or groundwater that eventually feed into the lake.

Physical Information - This section lists lake acreage, watershed acreage, the lake's maximum and mean depth, and volume, if known. A zero for any of these items indicates that we do not have a reliable value to provide. The number of cottages is also provided where known.

Maps showing the boundaries of a watershed area are available on all lakes greater than five acres in size from the Lake Protection Program. In addition, two Regional Planning Commissions have complete watershed maps for their area. In Bennington County, contact the Bennington County Regional Commission at 375-2576. In Orleans, Essex and Caledonia counties, contact the Northeastern Vermont Development Association at 748-5181.

Other Information -

Water Quality Classification - Waters of the state are classified by the Water Resources Board as either A, B, or C. The vast majority of Vermont's lake acreage is Class B. Class A waters are primarily drinking water reservoirs. Class C waters are small "zones" in an otherwise Class B water created to receive permitted discharges. A few lakes in Vermont have Class C zones, notably Lake Champlain and Lake Memphremagog.

Class B waters are managed to support the following uses:

Aesthetics: quality consistently exhibits good aesthetic value

Public water supply: public drinking water supply with filtration and disinfection

Agricultural water supply: irrigation and other agricultural uses

Good habitat: provides high quality habitat for aquatic biota, fish and wildlife

Recreation: swimming and recreation

Lake Type - Lakes are listed here as "Natural" (lake's outlet is a natural formation), "Natural with Artificial Control" (outlet has a dam structure, but a natural lake existed previously), or "Artificial" (lake exists entirely because of a dam).

Is the Lake a Public Water? - The state has jurisdiction over several aspects of the use of public water, such as boating

regulations, water levels, dredging, filling, dock building, aquatic plant control, and the use of pesticides. The definition of public water is somewhat confusing, and has nothing to do with whether or not the public actually has access to the water.

Public water:

- Any natural pond or lake 20 acres or greater.
- A natural pond less than 20 acres that is not a private fish preserve as described in 10 V.S.A §5210.
- An artificial pond or lake, of any size, that is not a private fish preserve as described in 10 V.S.A §5210.

Private water:

- A natural pond less than 20 acres in size that is a private fish preserve as described in 10 V.S.A §5210.
- An artificial pond or lake, of any size, that is a private fish preserve as described in 10 V.S.A §5210.

(The above definitions cannot always be used by themselves to determine whether or not a water is public. Each case would also have to be checked against the town's land ownership records and a legal opinion should be sought.)

The public may not have access to all public waters if the shoreline is all privately owned and legally posted "No Trespassing". However, private water may become public at any time with the subdivision of the shoreland. In addition, public land could be acquired on previously private water and developed as a public access. Town planners are therefore encouraged to plan for the protection of all lakes, whether or not they are currently public.

Watershed Land Use Percentages - This shows the relative amount of the lake's watershed in either cultural or non-cultural uses. These percentages were obtained from photographs taken during either 1978 or 1995 satellite fly-overs. The source of the data is noted accordingly. Percentages obtained from 1978 provide only a general indication of land-use, as these may have changed a great deal since that time. Percentages obtained from the 1995 fly-over were developed by the Vermont Center for Geographic Information. These data have been field-verified, and can be considered the best available at this time. Not all of the newer land-use data have been entered into the VTDEC Lakes and Ponds database. If needed, newer land-use information is available upon request.

Any part of a lake's watershed may have land uses which impact water quality, regardless of whether it is along the shoreline or not. Therefore, a complete lake protection program would need to consider all towns located in the watershed.

Surface Use Regulations - Some lakes in the state have regulations on the use of the lake. Typical regulations involve speed limits, horse power limits, or a ban on the use of internal combustion motors. Special rules are sometimes enacted, and these will be noted by a "Y-WRB" in the category "Other rules?" In this case, the special regulations will be summarized. These regulations are enacted by the Water Resources Board, a quasi-judicial board separate from the Department of Environmental Conservation. The Board acts in response to a petition filed by a group of citizens by holding a hearing on the issue. They then make a decision about whether or not regulations should be adopted for that lake, and what the regulations should be. Specific questions regarding regulations on any Vermont lake should be referred to the Vermont Water Resources Board at (802) 828-3309.

WATER QUALITY INFORMATION (Page 2)

Present Uses - A "Y" indicates that this is a use of this lake. This information may be inaccurate or incomplete and we would appreciate receiving corrected information.

Public Land on Lake - This section lists the kind of public land and access that may be present on a lake. A letter or letters after the access type indicates that public access exists and specifies the owner (federal, state, municipal or utility).

Water Chemistry Monitoring Data Summary - The VTDEC has been collecting water quality data on Vermont lakes through the work of local volunteers (the VTDEC Lay Monitoring Program), as well as through other sampling programs.

Secchi disk clarity, chlorophyll-a concentration and total phosphorus concentration are sampled to reflect the

relative nutrient enrichment of a lake. Excessive nutrient enrichment is the primary water quality problem facing Vermont's lakes, resulting in reduced water clarity, excessive plant and algae growth, dissolved oxygen depletion and an altered natural habitat. Each of the parameters is explained below.

Secchi disk clarity - This is a reading of the clarity of the lake water. Clarity is measured by lowering a black and white disk into the water and recording the deepest depth to which it can be seen. The clarity of the lake water is directly related to the amount of material suspended in the water. Algae and silt reduce water clarity, therefore water clarity is widely used as a basic indication of water quality. The average reading is given here in meters (1 meter = 3.281 feet).

Chlorophyll-a concentration - Chlorophyll-a is one of the green pigments that plants, including algae (microscopic plants found in all lakes), use to photosynthesize sunlight. Therefore chlorophyll-a concentration is a measure of the amount of algae living in the lake water. Usually, the amount of algae in the water is directly proportional to the amount of nutrients in the water, thus it is also an indication of the nutrient enrichment of the lake. Chlorophyll-a concentration is measured in micrograms per liter ($\mu\text{g}/\text{l}$). A microgram is one millionth of a gram.

Total phosphorus concentration - Phosphorus is the nutrient most likely to stimulate plant and algae growth in lakes, therefore it is the most significant in terms of nutrient enrichment. Phosphorus occurs naturally in lake water, but phosphorus enrichment from cultural activities stimulates an increase in plant and algae growth, resulting in the water quality problems mentioned above. Phosphorus is often measured as "total" phosphorus, thus including all the chemical forms of phosphorus. Phosphorus is also measured in micrograms per liter ($\mu\text{g}/\text{l}$).

Two types of phosphorus measurements, spring and summer, are presented here if available. Spring phosphorus is sampled once shortly after ice melt when the lake is in spring "overturn" and all the lake water is completely mixed. The summer phosphorus number is an average of several samples taken over the course of the summer.

Trophic State - Trophic state is a classification of the degree of nutrient enrichment of a lake. As a lake ages it progresses naturally from an oligotrophic state, through mesotrophic, to a eutrophic state. The addition of cultural sources of nutrients, however, can greatly accelerate this process and result in premature eutrophication and associated water quality problems. Below is a general description of a lake in each of the three trophic states.

Oligotrophic - Very low nutrient concentrations. Such a lake is usually deep and supports a cold water fishery. An oligotrophic lake is characterized by a small algae population and very clear water all summer. Typically these lakes have mostly rocky or sandy bottoms and little plant growth.

Mesotrophic - Moderate nutrient concentrations. Mesotrophic lakes have moderate algae growth and relatively clear water. Often these lakes support plant growth around much of their shoreline and may have some shallow areas with abundant plant growth.

Eutrophic - High nutrient concentrations. Eutrophic lakes are commonly shallow lakes with a warm water fishery. Such lakes usually support abundant algae growth and thus have reduced water clarity. Typically, a eutrophic lake supports abundant plant growth around most of its shoreline and has a soft, mucky bottom. A lake classified as hypereutrophic is extremely eutrophic, and may have an impaired fishery and impairments to other biological communities.

Dystrophic - Acidic lakes with a brown color. This coppery-brown cast is due to the decomposition of acidic soil and plant material (such as would be expected from watersheds of primarily coniferous tree cover). In dystrophic lakes, the growth of algae is controlled not only by nutrient concentration, but also by the amount of available light. While dystrophy is a natural condition, some dystrophic lakes are at risk of acidification from acid rain.

In order to classify the trophic status of a lake, the Lakes and Ponds Unit uses the following table of Secchi disk clarity, chlorophyll-a concentration and total phosphorus concentration values as a guide. It is based on many years

of data, and allows general comparisons among Vermont lakes. Please note a lake's data will not always fall neatly into one trophic category; in these cases we have considered phosphorus concentration most heavily, then chlorophyll-a concentration, then Secchi disk clarity.

<u>Trophic State</u>	<u>Average summer Secchi disk transparency</u>	<u>Average summer chlorophyll-a concentration</u>	<u>Average spring total phosphorus concentration</u>
Eutrophic	0 - 3.0 meters	7.0 µg/l or more	15 µg/l or more
Mesotrophic	3.0 - 5.5	3.5 - 7.0	7.0 - 15
Oligotrophic	5.5 or more	0 - 3.5	0 - 7.0