

# PROTECTING HUMAN HEALTH

## GOAL

Minimize the risks to humans from water-related health hazards in the Lake Champlain Basin.

LCBP



Controlling bacterial contamination of public waters is essential to protect human health in the Basin.

Everyday we face a variety of voluntary risks (e.g., cigarette smoking or driving a car) and involuntary risks (e.g., breathing air of poor quality or being struck by lightning). Determining what is an acceptable level of voluntary risk is an individual decision based on knowledge of the risks. Many environmental regulatory actions are directed towards reducing involuntary risk from exposure to substances in air, water, and food. Such actions involve determining what is an acceptable level of risk and limiting exposure to that level.

This section focuses on potential health threats associated with poor water quality in Lake Champlain and is limited to assessing risks from drinking water, eating fish and wildlife, and swimming in the Lake, as well as source water protection programs mandated under the Federal Safe Drinking Water Act (SWDA). It does not otherwise address ground water quality, other surface water bodies in the Basin, or air quality issues in the Basin.

## Controlling Bacterial and Pathogen Contamination of Public Waters

Pathogens are disease-causing agents such as bacteria, viruses, and parasites. Water-related pathogens cause gastrointestinal illnesses when ingested. Exposure to pathogens is primarily through ingestion, either accidentally while swimming, or when drinking water from the Lake. Drinking water suppliers depend on high quality source water to produce the highest quality drinking water as economically as possible. The presence of pathogens causes occasional beach closings around the Lake, most commonly in Chittenden County, VT. Many sources of pathogens are addressed

by recommendations included elsewhere in this Plan. For example, agricultural wastes, a significant source of bacterial pathogens, are also addressed in the phosphorus section. It is important to address failed septic tanks as sources of potential pathogen contamination and devise flexible solutions to the problems they pose. Combined sewer overflows and sanitary sewer overflows are sources of pathogens that degrade source water for drinking water supplies. Urban stormwater runoff is also a potential source of pathogens to surface waters.

Waters near the shores of Lake Champlain and many of its tributaries frequently exceed standards for coliform contamination. Although some strains of coliform bacteria are harmless

and live in the digestive tract of humans, other strains produce powerful toxins that can cause severe illness in humans, damaging the kidneys and intestinal tract.

Local health departments sample the water at public beaches to determine any potential threats to human health from pathogens. Elevated levels of fecal coliform present in the water is a common indicator. When pathogens are found in elevated levels, preventing potential disease transmission requires beach closures until sampling indicates that bacteria levels have been reduced to safer levels by wind and wave action or cooler water temperatures. A number of lakeshore communities has been required to close public beaches temporarily as a result of elevated bacteria levels. Other beaches serving motels, camps, and campgrounds can also be affected if they are close to stormwater discharges, municipal wastewater treatment plants, failing septic systems, agricultural runoff, or other pollutant sources. Because informal swimming areas and other locations where people may use the Lake for recreation are not tested for bacteria levels, the public should avoid swimming in areas immediately downstream from wastewater treatment plant discharges or where animal waste obviously drains from agricultural areas.

Because some harmful strains of the bacterium *E. coli* thrive in domestic animals, animal waste often is contaminated. Consequently, animal waste management is a vital component of the plan to control the associated risk to human health. Identifying the animal groups at the source of *E. coli* contamination through a technique known as DNA tracking offers

great potential to strengthen management strategies to control the problem, and should be applied at selected problem areas throughout the Basin. Actions to control bacterial pathogens at the source include agricultural and urban best management practices, and improved stormwater management.

## Contamination of Public Waters by Blue-Green Algae Toxins

Blue-green algae, also known as cyanobacteria, are normally harmless and widely scattered through the surface waters of Lake Champlain. Under favorable conditions for growth, however, thick blue-green algae blooms develop, especially in calm and shallow waters. Some strains of common blue-green algae species can produce neurotoxins that can damage the nervous systems; others produce hepatotoxins harmful to liver functions. In both 2000 and 2001, both neurotoxins and hepatotoxins were detected in Lake Champlain. When the water surface temperature is high and the required nutrients are abundant, blue-green algae blooms may generate concentrations of toxins that pose a risk to human health.

The risk to the health of swimmers and those who ingest contaminated water is compounded by the locations of blue-green algae blooms, which tend to be close to shore and near areas tapped for public water supplies.

Although researchers have begun to identify the conditions which cause some blue-green algae to produce toxins, important questions remain. The LCBP and the Centers for Disease Control have funded the Vermont Department

of Health, the University of Vermont, and Syracuse University to monitor Lake Champlain for blue-green algae blooms and toxins, especially near drinking water intakes and beaches. Remaining questions include: 1) What is the frequency, distribution, and severity of algae toxins in the lake? 2) What role do microclimatic conditions and nutrient availability play in facilitating blue-green algae blooms and the production of toxins? 3) How can toxic conditions be monitored effectively to provide prompt public notification when hazards to human health develop? and 4) How can risks caused by contamination of drinking water and swimming areas be mitigated?

## Availability of Comprehensive, Statistically Valid Fish Tissue Data

Mercury and PCBs, found in both sediment and biota, are of particular concern because of their tendency to bioaccumulate to high levels in some fish species, particularly the larger predators. The Federal Drug Administration sets "action levels" or tolerances for contaminants found in fish species. If fish tissue analysis indicates that levels of contamination exceed these action levels in a significant number of fish, a fish consumption advisory for that body of water is established by the State Health Department. As a result of mercury and PCB (polychlorinated biphenyls) contamination, health advisories exist for several species of fish caught in Lake Champlain. There is also an advisory for all yellow perch caught in Cumberland Bay and a ban on commercial sale of perch caught in the Bay. More restrictive guidelines exist in both states for women of childbearing age and children. Health advisories also exist for waterfowl consump-

tion. The fish sampling programs for Vermont, New York, and Québec are currently not well coordinated, and do not yet provide a comprehensive database. One reason the state programs are limited in scope is the high cost associated with sampling fish for the types of contaminants of concern. However, it is difficult to discover trends or provide statistically valid conclusions without a more extensive database. Efforts to expand the available database and to improve coordination of management efforts among partners should be coordinated with the Comprehensive Toxics Management Strategy called for elsewhere in the Plan.

### Potential Human Health Risks to the Public, Including Those Related to Fish Consumption Advisories

Communicating risks is an important part of any effort to protect human health. New York and Vermont have worked together to inform each other of any press releases or health advisories before they are released and both states use similar methods of educating the public and communicating risks. For example, New York hands out information on all fish advisories with every fishing license issued; and Vermont has included information about the advisories in the *Digest of Game Laws* since 1994. However, some of the general advisories regarding the consumption of mercury—and PCB—contaminated fish flesh are not consistent and therefore pose a challenge when communicating health risks. For example, the New York health advisory for Lake Champlain includes general guidance for all fish species (no more than one meal per week) as opposed to six meals per month from all Vermont waters. The age at which

advisories apply to children and women of childbearing age also varies between jurisdictions.

As other kinds of contamination are recognized, for example, those due to the toxins sometimes produced by blue-green algae, or high bacterial pathogen levels in public waters due to agricultural or urban runoff, there should be effective means to alert the public about the associated health risks. Vermont, New York, and Québec are considering how to best coordinate communication on these issues.

### Threats to Public Water Supplies

All Lake Champlain Basin Program partners and citizens throughout the watershed share the need to support federal, provincial, state, and local efforts to protect public water supplies from terrorist threats. Improved communications, risk management, spill response agreements, and citizen involvement will also help reduce accidental water supply contamination.



At Burlington's Blanchard's Beach, near the outlet of Englesby Brook, a sign recommends not to swim because of consistently high bacteria levels in the water.

LCBP

## Protecting and Improving Public Water Supplies

Approximately 188,000 people, or 32% of the Basin population, depend on the Lake for their drinking water. Of the 99 water systems withdrawing supplies from the Lake, 64 are motels, trailer parks, businesses, restaurants, etc., and 35 are community supplies. Twenty-five of the community supplies serve less than one thousand people.

### OBJECTIVES

*(not listed in priority order)*

- 1) Where a water quality related health risk is identified, communicate results to the public promptly and implement plans to reduce that risk.
- 2) Control sources of pathogens found in the Lake and its Basin to ensure drinkable and swimmable water and eliminate the need for closing beaches.
- 3) Improve public understanding of health issues related to water recreation and drinking water.
- 4) Identify potential human health risks from eating fish caught in Lake Champlain—including toxic substances of concern, populations of concern, and fish species of concern — and communicate these risks effectively to the public.
- 5) Identify potential human health risks from drinking water contamination caused by blue-green algae toxins.
- 6) Ensure that public water systems, especially small privately owned systems, are able to meet the technical and financial requirements of the Safe Drinking Water Act.

The Federal Safe Drinking Water Act (SDWA) presently requires all public water systems serving the same population for more than six months to monitor for 84 contaminants in drinking water. Public water systems serving a transient population are required to monitor for acute contaminants, including bacteria and nitrate. Of particular concern is the “surface treatment rule,” which requires filtration of all surface water sources unless the water supplier can meet certain strict criteria related to the protection of the supply from sources of contamination. This burden falls most heavily on small water systems, many of which are privately owned. Costs of treatment are difficult for small systems to bear, and technical

expertise is not as readily available to them. For drinking water systems not under the auspices of the SDWA, such as individual home-

owner systems, education can help protect the health of users. Surface water should always be properly treated before it is consumed.

## HIGHEST PRIORITY ACTION

### 1) Improve Risk Communication by Making Appropriate Information Readily Available to the Public

This action would coordinate information about fish advisories, beach closings, and blue-green algae toxins, and include a public education and outreach effort to communicate with people in all three jurisdictions surrounding the Lake. This effort would also include an aggressive educational program regarding what the risks are to particular groups of individuals, and what an individual can do to minimize the risks from eating fish and wildlife or from contact with contaminated water. Care should be taken to ensure that risks are neither overstated nor understated.

*a) New York, Vermont, and Québec should work together to develop common fish advisory standards.*

**Potential key LCBP partners:** VTDOH, VTDEC, VTDAFM, NYSDAFM, NYSDOH, NYSDEC, QC MENV, QC RRSSS, local health units, private health organizations, municipalities

**Cost estimate:** \$60,000 per year

**Potential funding sources:** state and federal appropriations, USEPA

**Timeframe:** Ongoing

**Benchmark:** Risk communication approach developed and implemented

## HIGH PRIORITY ACTIONS

(not listed in priority order)

### 2) Investigate Areas of Potential Pathogen Contamination and Devise Flexible Solutions to the Problems

In areas where faulty septic systems, wastewater treatment discharges, or nonpoint source runoff cause problems with pathogens in the water, or where there is reason to suspect contamination, this action recommends cooperating closely with municipalities to locate sources, devise solutions, and provide technical assistance where possible. This action focuses on human risks from pathogens, and especially addresses water supplies, beaches, and shoreline areas. This recommendation encourages the consideration of alternative solutions to bacterial pathogen problems. Municipalities should receive cost-sharing funds from state or federal agencies for any remediation or upgrades required. Elements of this action include:

- a) Insure adequate monitoring of source water used for drinking water supplies and water at public recreation areas.*
- b) Improve monitoring data sharing, coordination, and communication.*
- c) Develop a public education and outreach program that focuses on individual citizen actions to reduce the risk of pathogen contamination of public water supplies and recreation areas, such as inserts in water bills and other appropriate outreach techniques.*

*d) Assist communities in finding technologies and resources to address pathogen contamination problems that impact community water supplies, beaches, and shoreline areas.*

*e) Support the study of water movements in the areas near wastewater treatment discharges and drinking water supply source areas to identify water flow patterns that affect water quality.*

*f) Determine the importance of failed septic systems as sources of pathogens and examine alternative sewage disposal technologies for existing sites.*

**Potential key LCBP partners:** VTDOH, VTDEC, VTDAFM, NYSDAFM, NYSDOH, NYSDEC, QC MENV, QC RRSS, local health units, private health organizations, municipalities

**Cost estimate:** \$60,000 per year for staffing and in-kind participation

**Potential funding sources:** State and federal appropriations, USEPA

**Timeframe:** Ongoing

**Benchmark:** Data sharing protocol, educational materials, technical assistance, and water movement research

### 3) Develop the Means to Quickly Identify Conditions Causing Toxic Blue-Green Algae Blooms and Provide Timely Information to Public Water System Managers

Isolated cases of toxic blue-green algae blooms in Lake Champlain have led to the death of dogs which drank lake water in the vicinity of the blooms.

- a) Support improved sampling, identifying, and communication about blue-green algae bloom locations, progressions, and durations, and inform the public about potential dangers.*

## ACCOMPLISHMENTS

### TRACKING BACTERIAL SOURCES

With the USEPA's help, Colchester and Winooski are using *E.coli* monitoring and DNA tracking to link bacteria samples from streams and beaches to species in the watershed (such as humans, dogs, cows, or waterfowl). If results can successfully identify sources, the USEPA will work with other agencies and the LCBP to assist municipalities with targeted measures to reduce bacteria levels.

### MONITORING BLUE-GREEN ALGAE

In 1999, the temporary presence of toxins produced by blue-green algae, known as cyanobacteria, was confirmed on Lake Champlain. Warm surface temperatures augmented by calm winds and limited vertical mixing of the water column create favorable conditions for blue-green blooms that sometimes produce toxins. In response, the LCBP has provided financial support to a monitoring project being conducted by the University of Vermont, VT Department of Health, Syracuse University, and the Federal Centers for Disease Control. The Québec Ministry of the Environment has continued testing for blue-green algae on Missisquoi Bay since 1999. The data can be used to alert the public about the presence of blue-green algae blooms.

*b) Develop a Basin-wide training and outreach program for water suppliers who draw Lake water to improve recognition of algae blooms, provide contacts for algal identification and analysis of samples for toxins, and suggest protocols for responding to bloom conditions.*

**Potential key LCBP partners:** VTDOH, VTDEC, VTDAFM, NYSDAFM, NYSDOH, NYSDEC, QC MENV, QC RRSST, Federal Centers for Disease Control and Prevention, local health units, academic institutions, private health organizations, municipalities

**Cost estimate:** \$40,000 for additional testing and response capabilities, and in-kind participation

**Potential funding sources:** State and federal appropriations, CWA Section 319 Program

**Timeframe:** Ongoing

**Benchmark:** Continued monitoring, established communication protocol

## PRIORITY ACTIONS

*(not listed in priority order)*

### 4) Encourage the States and Federal Government to Provide Funds to Implement the Safe Drinking Water Act

The SDWA provides the mechanisms to protect human health; however, its requirements are expensive, particularly for small water systems. This action recommends that funds continue to be made available so that water systems, especially small water systems presently regulated under the SDWA, can implement source water assessments and protection.

**Potential key LCBP partners:** USEPA, VTDEC, NYSDOH, water system operators, citizens

**Cost estimate:** In-kind participation

**Potential funding sources:** Not applicable

**Timeframe:** Immediate

**Benchmark:** Letters to state and federal representatives documenting the difficulties faced in implementing the SDWA, followed up by phone calls, testimony, as appropriate

### 5) Undertake Further Focused Research and Risk Assessment Related to Fish Consumption

Assess the need for further research on fish consumption patterns in the Basin, focusing on the following four issues:

*a) Comprehensive review of existing programs.*

*b) Following removal of PCB contaminants in Cumberland Bay, assess PCB levels in fish tissue to determine if this cleanup resulted in lower levels lakewide.*

*c) Because the first consumption survey focused only on licensed anglers, assess consumption patterns of other fish consumers, particularly local populations, including Native Americans and Asians who may consume larger amounts of fish from the Lake.*

*d) Because of the particular sensitivity of children and women of childbearing age to consumption of contaminated fish, assess their consumption patterns.*

*e) If average fish consumption rates are higher for Lake Champlain anglers than for the United States population as a whole, develop a risk assessment specific to the population around Lake Champlain.*

**Potential key LCBP partners:** VTDEC, VTDOH, VTFWD, NYSDEC, NYSDOH, QC MENV, QC RRSST, USEPA contractor support, private health organizations, universities

**Cost estimate:** \$50,000 to \$100,000

**Potential funding sources:** State and federal appropriations

**Timeframe:** 2001-2006

**Benchmark:** Completion of reports characterizing the fish consumption patterns of local populations and the associated risks; report assessing the level of contaminants in fish in Cumberland Bay

## ANOTHER ACTION FOR CONSIDERATION

### 6) Provide Opportunities for Technology/Information Transfer Focusing on the Needs of Small Water Supply Systems

This action would provide a forum for a transfer of expertise from large water supply systems to smaller systems. This assumes that personnel at large systems may have had greater training and educational opportunities which would benefit individuals responsible for small systems. The VTANR provides mandatory free training to small system operators already, so this action may just expand the existing training. New York water system operators are required to be trained, so this may be incorporated into the existing training.

**Potential key LCBP partners:** VTDEC, NYSDOH, QC MENV, QC RRSST, and water system operators

**Cost estimate:** In kind participation of agencies

**Potential funding sources:** Same as key partners

**Timeframe:** Ongoing

**Benchmark:** Expanded training programs for water system operators which focus on the issues facing small systems