



VNRC

Vermont

Environmental Report

Published
by the
Vermont
Natural
Resources
Council, Inc.

**JUST WHEN YOU
THOUGHT IT WAS
SAFE TO GO BACK
INTO THE WATER...**

*Lake Champlain's
Pollution Problems*

Summer
1999

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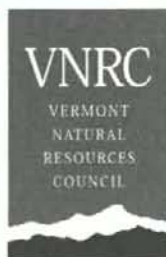
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Vermont Environmental Report

Published by the Vermont Natural Resources Council, Inc.

Summer 1999

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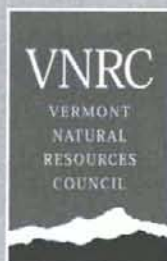
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THE INSIDE WORD

TAKING CARE

BY ELIZABETH COURTNEY
Executive Director



Last fall I had the pleasure to hear Paul Hawken, author of *The Ecology of Commerce*, address an audience in the Berkshires. He and Amory Lovins will be coming out with a new release later this year called *Natural Capitalism*. As these titles suggest, Paul Hawken is exploring the possibility of creating an economy which replicates nature. On this day, he delivered a discourse on the interface between our post industrial economic engines and the earth's ecological and human resources. One point he was bringing home to this audience of 300 was captured in a simple statement. "You can't have a culture which doesn't take care of the environment and think that it's taking care of its people."

In the vein of Hawken's logic, I would suggest that we are not taking care of Vermonters if we are not taking care of Lake Champlain. Taking care of Lake Champlain also means taking care of the hundreds of square miles of watershed that feeds this resource. For the last decade, the Clean Water Act has focused our attention on the "point" sources of water pollution — and we have made some significant strides. We are now turning to the subtler, more pervasive source of water pollution — "non-point" source pollution. This includes urban run-off, agricultural run-off and air-borne depositions such as mercury and acid rain.

Like a pulled thread that unravels a sweater, once we begin to study the problems that plague Lake Champlain, we begin to understand the incredible inter-relatedness of our situation and the consequences of our land use decisions to the Lake. As the article on page 20 concerning sprawl shows us, an example of how we are killing Lake Champlain is demonstrated by the way we develop Chittenden County. Some 18% of the nutrient load in Lake Champlain comes from urban run-off, which results from water running over

impervious surfaces. Run-off can be filled with a variety of pollutants from lawn fertilizers and pesticides to automotive residues.

If we think that we're taking care of Vermonters by encouraging the development of new highways and bypasses, allowing more big truck trips through our village centers and permitting

hugely out of scale developments in our pristine mountain watersheds, we've got a hard lesson to learn. If the figures that Tom Schueler, Executive Director of Maryland's Center for Watershed Protection, gives us are accurate, we should be keeping the total of impervious cover to less than 10% of the watershed. The Bartlett watershed in South Burlington and Shelburne along Route 7, for instance, has a 16.9% impervious surface area. Not surprisingly, the Vermont Department of Environmental Conservation has assessed the water quality in the Bartlett watershed as "poor". Across the state, we have hundreds of streams and waterways on the Vermont "Impaired Waters List".

Much of the research would indicate that the pollution problems in Lake Champlain are complex and ubiquitous. Gone are the good old days of simply identifying a single point source polluter and requiring the responsible party to clean up. We are the polluters. We who drive SUVs to the local strip mall, we who plan for and permit sprawl developments, we who inappropriately fertilize our lawns, gardens and fields.

Finding solutions to our water quality problems will require a broader acceptance of responsibility and the personal and political will to undertake significant behavioral changes. But we Vermonters have a renowned heritage of caring for our environmental treasures. Let's remember Lake Champlain as we care for our gardens, plan our communities and elect our leaders. After all, we owe it to ourselves because, "You can't have a culture which doesn't take care of the environment and think that it's taking care of its people."

I DON'T LIKE GREEN EGGS AND HAM!

BY ROBERT F. KENNEDY, JR.

The Earth Pledge Foundation asked Americans to consider, on Earth Day, the meaning of "sustainable cuisine." Arguably, the most sustainable food is the hot dog, since that's where all of the stuff that would otherwise go to waste ends up. It's like the Indians and the buffalo — they used everything. Buffalo hot dogs might be the best bet because, among all ungulates, buffalo use the prairies without destroying them. But most hot dogs are neither dogs nor buffalo but hogs, and nowadays, that means industrial pork, which is one of the most unsustainable foods on earth.

North Carolina's hogs now outnumber its citizens and produce more fecal waste than all the people in California. Some industrial pork farms produce more sewage than America's largest cities. But while human waste must be treated, hog waste, similarly fetid and virulent, is simply dumped into the environment. Stadium-size warehouses shoehorn 100,000 sows into claustrophobic cages that hold them in one position for a lifetime over metal-grate floors. Below, aluminum culverts collect and channel their putrefying waste into 10-acre, open-air pits three stories deep from which miasmal vapors choke surrounding communities and tens of millions of gallons of hog feces ooze into North Carolina's rivers.

Such practices have created a science fiction nightmare. In North Carolina, the festering effluent that escapes from industrial swine pens has given birth to *Pfiesteria piscicida*, a toxic microbe that thrives in the fecal marinade of North Carolina rivers. This tiny predator, which can morph into 24 forms depending on its prey species, inflicts pustulating lesions of fish whose flesh it dissolves with excreted toxins. The "cell from hell" has killed so

many fish — a billion in one 1991 incident — that North Carolina used bulldozers to bury them beneath the rancid shores of the Neuse River and Pamlico Sound. Scientists strongly suspect that



Pfiesteria causes brain damage and respiratory illness in humans who touch infected fish or water. Two years ago *Pfiesteria* sickened dozens of people, including fishermen, swimmers and state workers.

Industrial farming is also for the birds. Some corporate poultry farms crowd a million beakless chickens

in cramped dark cages, soaking up antibiotics and laying their guts out for the duration of their miserable lives.

Corporate farming isn't just bad for chickens and hogs — and the environment. It is destroying family farms. According

Agricultural run-off now accounts for more than half of America's water pollution.

to *Sierra Magazine*, billionaire chicken barons and billionaire hog tycoons have used their market power to drive a million family farmers out of business, including virtually every independent egg-and-broilers farmer in America. Each corporate farm puts 10 family farmers out of business. The same process of vertical integration has put the final nail in the coffin of Thomas Jefferson's vision of a democracy rooted in family-owned freeholds. Industrial meat moguls site their stinking farms in the poorest communities and pay slave wages to their minuscule work force

for performing one of the most dangerous and unhealthy jobs in America.

Massive political contributions by billionaire agricultural barons allow them to evade laws that prohibit other Americans from polluting our waterways. Agricultural run-off now accounts for more than half of American's water pollution. Last year *Pfiesteria* outbreaks connected with wastes from industrial chicken factories forced the closure of two major tributaries of the Chesapeake Bay and threatened Maryland's vital shellfish industry. Drugs and hormones needed to keep confined animals alive and growing are mainly excreted with the wastes and now saturate local waterways. Such discharges foster the growth of the drug-resistant superbugs and threaten the disruption of human and animal endocrines.

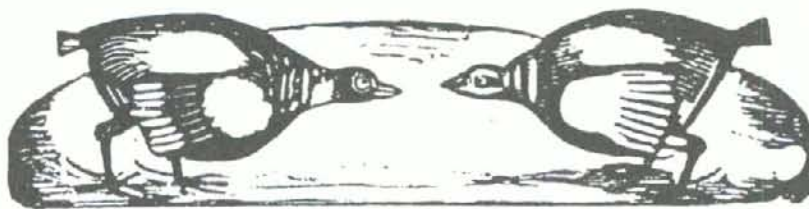
Moreover, our pork and poultry are unsavory. Factory-raised pork is soft and bland. Corporate chicken is spongy. Americans have forgotten they're not supposed to be able to cut chicken with a fork.

Americans can still find networks of family farms and farmers who raise their animals to range free on grass pastures. They feed them natural feeds without steroids, subtherapeutic antibiotics or other artificial growth promotants and treat their animals with dignity and respect. These farmers bring tasty, premium-quality meat to customers while practicing the highest standards of husbandry and environmental stewardship.

Sustainable meats taste the best. This is a case where doing right means eating well. Like other Americans, I've reconciled myself to the idea that an animal's life has been sacrificed to bring me a meal of pork or chicken. However, industrial meat production — which subjects animals to a life of torture — has escalated the karmic costs beyond recognition.

Kennedy is an attorney for the Natural Resources Defense Council and the Water Keeper Alliance.

LETTERS



I am Jaime Lavellee. I am a sixth grader at Essex Middle School. I am doing a report on snowmaking and ski areas. I am writing this letter because I am concerned about the amount of water being taken from VT rivers and streams to make snow. Fish and macroinvertebrates are being killed. Ski areas are taking too much water from rivers and streams.

For example, there are two billion gallons of water being taken from VT rivers and streams each winter. That is too much. If ski areas keep taking that much water from rivers each winter, can you imagine where we will be in the future? Our rivers and streams won't have much water in them. There is a law about this. It is that ski areas can't take a certain amount of water from rivers and streams. The law is Act 250. If it does not seem to be working though because some ski areas don't respect the law.

Are you aware that Killington ski area has been able to drain the Roaring Brook dry for thirty years? I am sure that the fish that once lived there are now gone.

I ask that this situation be changed. I think that ski areas should be made aware of the laws and the dangers of not following the law. They should come up with some kind of system that reuses snow or that would not take as much water from the river. This problem needs to be taken care of.

Thank you for your time and consideration.

Sincerely,
Jaime Lavellee

Please prevent any more Stratton type developments in Vermont. They over power the local towns and storekeepers. Keep up the good work.

Edward A. Keenan, Jr.

Do everything you can to slow down, compress, revise downward this grotesque idea offered by Les Otten for the Killington area.

Robert S. Treat

I have been reading the "winter 1999" edition of the Vermont Environmental Report. An excellent report of what is happening in Vermont today. I would like three additional copies to pass on to friends to help make them aware of what is happening to our Vermont.

Ira Hawley

(Editor's Note: If you have friends you think would be interested in VNRC's work, please let us know so we can send them information!)

Keep up the good work and especially keep Killington's feet to the fire.

Best, Bill Mares

The following letter was sent to VNRC from our friends at the Natural Resources Defense Council.

FRYING FEWER FISH

I was interested to learn from the April 30 *Star Tribune* that the public is being urged to eat less Minnesota lake fish, due to high levels of mercury.

We could do that, I suppose, or we could — oh, I don't know, maybe stop the pollution?

It always amazes me, how the public is expected to accommodate the polluters, rather than the other way around.

The Rev. Michael Mandsager
Northfield, MN

In reading some publications recently, I have become aware of the rapid development at Vermont ski areas by Les Otten and Co., Killington, etc. I hope that in the weeks ahead the VNRC and perhaps another representatives of Vermont's environmental organizations can make an appearance on VPR's "Switchboard".

Citizens of this state need to be made more aware of how further development in these sensitive areas will cause further destruction of wildlife habitat and the ecosystem they depend on. The people of Vermont need to take more action opposing more rampant "growth" in the name of more jobs, greater economic development (more condos being built, more service jobs, etc.) and a bigger "name" for Stowe, Killington and Sugarbush. I used to ski alpine a lot more, but now I realize that supporting these ski areas is just like aiding "the problem." "If you're not a part of the solution, you're a part of the problem." Well they're a part of the "problem." I wish some reasonable steps could be taken to make people more aware that further development ultimately is wrong and destructive!

Lee Alper

Dear Elizabeth Courtney,

Arthur and I are proud to be supporting the VNRC and its stalwart spokesman—yourself. We shall be watching to catch any overtones of scapegoating on the part of legislature and/or members of the administration in this issue of ski resort development. And in other situations also.

Sincerely,
Kate Brinton

AIR MAIL



LAKE CHAMPLAIN ON THE RECEIVING END OF ATMOSPHERIC POLLUTION

By WILL LINDNER

Lake Champlain is the lowest common denominator. Sparkling in the summertime and austere in winter ice, the lake is nature's repository, trail's end for the moisture that is released from the atmosphere as rain, hail or snow, or captured from the mist by broadleaf and spruce needle when the mountain peaks are swathed in clouds. Moisture turns to drops and drops turn to rivulets, and so it goes through the watershed, until what was once borne by the air has followed nature's descending imperative, downward, downward, to the beautiful Lake.

If that were all that was happening, it would be a lovely story.

But the atmospheric moisture, and even the clouds that wreath the mountain tops, are contaminated. So when the moisture makes that journey from sky to mountain stream to river and thence to the lake—or when it takes the shortcut, falling as precipitation directly into the water—it carries pollutants flushed into the air by fossil fuel-burning Midwestern power plants, or by regional waste incinerators in Claremont, New Hampshire, and Fort Edward, New York. It carries nitrous oxide discharged from the tailpipes of cars and trucks that meet today's stricter emissions standards but, by dint of the population explosion of vehicles, are sufficient in number to cause traffic jams in Burlington and Brattleboro, Barre and Rutland.

And now, mercury is upping the ante. Emanating from those same power plants,

*The watershed is the unfortunate victim
of a particularly noxious "airshed" that
bears pollutants in an easterly direction
across the continent.*

but also from industrial smelters in Canada and other sources, mercury poses not only a long-term threat to forest vegetation and soils, but clear and present threats to predators—whether otters, osprey or people—who dine on bass, pickerel, trout or walleye in Lake Champlain. Because nature draws everything down to the basin, including the poisonous byproducts of human industry, the Lake has changed from repository to receptacle.

CATCH-ALL

Air deposition is not so direct a source of pollution to Lake Champlain as, for example, agricultural runoff. But it contributes to the network of factors that are altering the character of the lake and limiting the resources for recreation and sustenance that make it precious to all who live near it.

From a broader environmental perspective, air deposition ranks among Vermont's foremost concerns because of the damage it does to the entire watershed — meaning the land resources that surround the lake, as well as the lake itself. The Champlain Basin watershed is unusual in its 18:1 ratio of land to lake-surface area. A recent examination of the connection between air-pollution damage to forests and damage to the lake (titled "Current Knowledge of Air Pollution and Air Resource Issues in the Lake Champlain Basin," authored by a group of academic and public sector scientists), points out that the lake represents just 5 percent of its total basin area, a far smaller percentage than, for example, the Great Lakes.

"These characteristics, and the relatively mountainous, high-elevation terrain, favor the capture and accumulation of air pollutants in the basin by processes including wet and dry deposition, foliar

wash-off, leaf litter-fall, spring snow melt... and stream transport," the report says.

The watershed is the unfortunate victim of a particularly noxious "airshed" that bears pollutants in an easterly direction across the continent. This is not new information. Scientists and policy makers have known about "acid rain" for almost 30 years, since University of Vermont researcher Hubert Vogelmann first studied the widespread, epidemic damage to red spruce and sugar maples on Camel's Hump.

But we have gotten too used to it. Says Chris Kilian, VNRC water program director and general counsel, "VNRC's goal is to reinvigorate the discussion on these issues, because much of the focus that was so intense earlier has waned in the last 10 years. Scientists and foresters continue to say that this is the most significant issue we face."

The damages Vogelmann and other scientists identified in virtually all the eastern states are the cumulative effects of an industrial age that is now a century old. VNRC Staff Scientist Kim Kendall points out that more than 95 percent of current sulfur emissions, and 90 percent of nitrogen emissions, come from human activities. (Sulfur and nitrogen oxides are the main components of acid rain.)

"For sulfur, the main source is coal-burning power plants," says Kendall. "For nitrogen, it's car, truck and airplane exhaust. Natural rainwater is normally slightly acidic, with a pH of 5 to 5.7. But a high percentage of the precipitation observations in Vermont range from a pH of 4.1 to 4.5, which is 10 times more acidic than normal."

The earth can neutralize acidic precipitation up to a point, with varying success depending on local rock and soil charac-

teristics. Where there are high geological concentrations of calcium, such as in limestone or marble, the threat from acid rain is reduced. But where the soil is thin, where granite forms the bedrock at high elevations, or where the neutralizing capacity of the soil or rock has been depleted by battling unnatural concentrations of acid for decades, geology provides little to buffer acidification. When it works its way into an aquatic environment, it can damage fish populations—interfering with the function of their gills and reproduction cycles—and affect other aquatic organisms as well (mollusks, insects, amphibians and algae), thereby reducing biodiversity in a lake or waterway.

"These ecosystems will remain vulnerable... until the pool of calcium in the soils is replenished through natural rock-weathering processes," says Kendall. "Soils take thousands of years to develop, so it will be a long time before acid-impacted ecosystems are healthy again."

ACID RAIN DODGES THE CAA BULLET

The problem has not been ignored; it just hasn't been solved. For example:

- "We've been doing acid rain monitoring in Vermont since 1980," says James Kellogg, aquatic biologist with the Water Quality Division of Vermont's Agency of Natural Resources, crediting a remarkably stable and enduring roster of volunteers. "We've looked at, probably, 300 lakes, and are now looking primarily at 11. We cut back because we're getting a good handle on the most sensitive lakes—plus, there've been funding restrictions from EPA (the federal Environmental Protection Agency)."

Mercury poses not only a long-term threat to forest vegetation and soils, but clear and present threats to predators – whether otters, osprey or people – who dine on bass, pickerel, trout or walleye in Lake Champlain.

- The 1970 amendments to the 1963 Clean Air Act established national air quality standards, and further amendments in 1990 required power plants upwind of the Green and Adirondack mountains to reduce their sulfur emissions. Those amendments also included Vermont in an 11-state northeastern "Ozone Transport Region" (ground-level ozone is harmful to the human respiratory system, and results from chemical interactions between airborne noxious emissions and sunlight) to focus remedial efforts on areas affected by long-distance air transport.
- In 1982, UVM established an air-quality monitoring center—the Proctor Maple Research Center, in Underhill, Vermont—to gather data and study the effects of acid rain on regional ecosystems.
- In 1984, when Gov. Richard Snelling asked state agency heads to inventory their major concerns in order to develop five-year plans for action, then-Environmental Secretary Brendan Whittaker (now a VNRC board member) identified long-range transport of air pollution as a threat to both the environment and the health of Vermont's citizens.

All that attention, and the prominence acid rain received in the press as a "poster" environmental issue, has borne fruit. Sulfur dioxide emissions dropped sharply in the mid 1990s, as power plants installed the technology to meet the emission standards required by the

latest CAA amendments.

But the environment has not rebounded. The vast acid-base imbalance continues to haunt the region, its forests and soils — and, in the course of things, the Champlain watershed.

"People looked to the 1990 Clean Air Act amendments to solve the problem," says Kilian, of VNRC. "But we're not seeing things get better. A lot of sources escape coverage under the Clean Air Act."

"The Act has been very successful in reducing sulfur emissions," says Kellogg, of the Water Quality Division. "We're seeing about 30-40 percent less sulfate in the lakes, and a lot of us lake people thought that would take care of the situation. Unfortunately, that has not been the

case."

One reason is depletion of buffering "cations" in forest soils. Another is that nitrogen oxide is now approaching an equal footing with sulfur dioxide as an acid agent in the environment, and its sources are not as easily capped and cut off as the power-plant sources of sulfur. Those plants do emit nitrogen compounds, which travel hundreds of miles before entering Vermont's ecology. But a significant portion of the nitrogen emissions are from sources closer to home.

"Nitrogen is a byproduct of high-temperature combustion," Kellogg explains. "Whereas sulfur is a pollutant coming from a stationary building, cars and lawn mowers and jet skis are all significant



*The message was clear:
We have contaminated our environment,
and it now threatens to contaminate us.*

sources of nitrogen. So not only will we have to deal with utility emissions again, we'll have to really consider the whole transportation way we function."

Nitrogen, of course, is a vital natural fertilizer. But human activity boosts natural nitrogen levels, through the overabundant production of farm animal wastes, and by burning forests to clear land and draining wetlands, which release nitrogen stored in organic debris. According to a Worldwatch report of May 3, 1999: "Natural processes probably incorporate around 140 million tons of nitrogen into the terrestrial nitrogen cycle every year. Human activity has at least doubled that amount."

"Eventually, the soils become nitrogen saturated," says Richard Poirot, of Vermont's Department of Environmental Conservation. Besides contributing to an acid imbalance in forest ecosystems, Poirot adds, nitrogen is a factor in the creation of tropospheric (ground-level) ozone, and encourages eutrophication that fills in lakes and ponds with unwanted vegetation.

"Pound for pound, nitrogen is more costly (than sulfides) to control," says Poirot, who with UVM's Dr. Timothy Scherbatskoy and two others co-authored the recent comprehensive study on air pollution in the Lake Champlain basin. "Sulfates are a lot cheaper to deal with than auto emissions."

Vermont is allied in its fight to curb acid precipitation with the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP), which includes Quebec, the province that shares Lake Champlain and its watershed with Vermont and New York. The members'

commonality of purpose encourages NEG/ECP to march to its own tune. In its May 1998 Acid Rain Action Plan proposal, NEG/ECP advocates controlling sulfate emissions fully 50 percent more than the Clean Air Act provisions. As for nitrogen, NEG/ECP implicitly derided existent efforts ("Annual nitrogen oxide emissions have not been subject to significant reductions under national acid rain control programs in the U.S. or Canada") and urged both countries to reduce annual emissions by an additional 20-30 percent "no later than the year 2007."

NEG/ECP met in Maine on June 4, 1999, to review its Acid Rain Action Plan and progress toward meeting those goals.

MERCURY "THE FIRST CONCERN"

But NEG/ECP reserved its most urgent language for another atmospheric phenomenon — mercury depositions into the watershed. In its Mercury Action Plan, also issued in May 1998, NEG/ECP concluded that the only acceptable goal was "virtual elimination of anthropogenic (human-caused)

mercury releases in the region."

"This conclusion is based on extensive scientific data that indicates that mercury is pervasive in freshwater fish in the Northeast, at levels that pose plausible health risks to people and some species of fish-eating wildlife," the action plan said. "In addition... there are important economic consequences, including reducing the recreational and commercial value of fisheries resources across the region."

The premiers and governors get no argument from VNRC. "Mercury, at this point, is the first pollutant of concern," says Kendall.

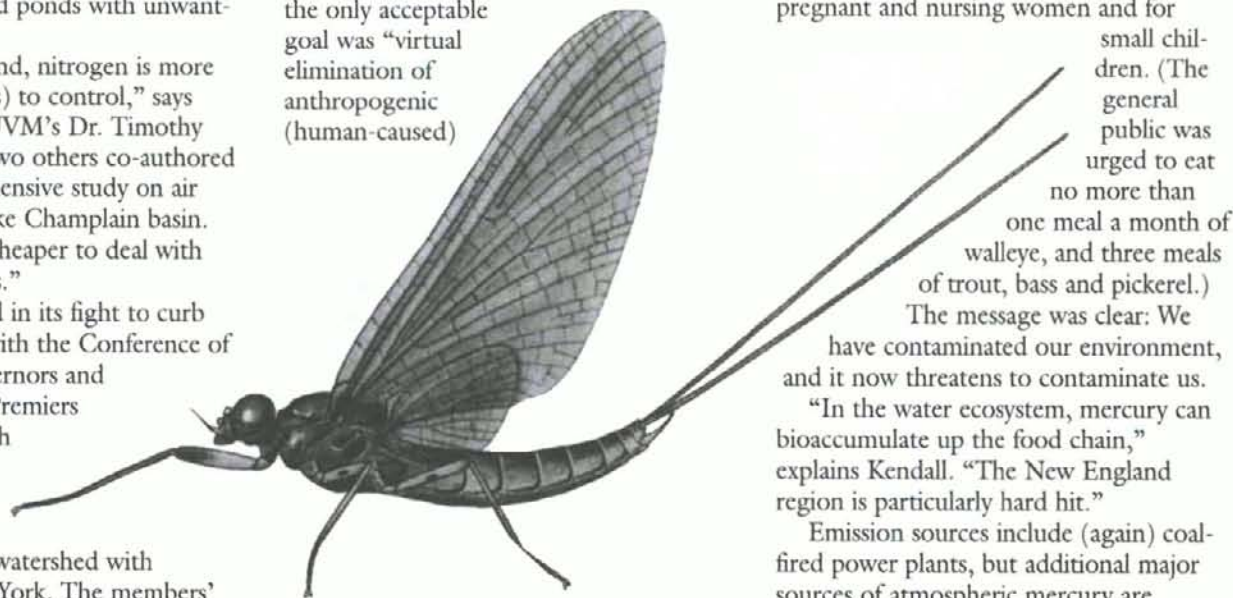
In 1995, the state Health Department issued a fish-consumption advisory, warning pregnant women, breast-feeding mothers and children age six and younger against eating any walleye caught in Vermont waters... period. Lake trout, smallmouth bass and chain pickerel also made the list; one modest (four-ounce) meal of those species in a month's time was declared the maximum safe limit for pregnant and nursing women and for

small children. (The general public was urged to eat no more than one meal a month of walleye, and three meals of trout, bass and pickerel.)

The message was clear: We have contaminated our environment, and it now threatens to contaminate us.

"In the water ecosystem, mercury can bioaccumulate up the food chain," explains Kendall. "The New England region is particularly hard hit."

Emission sources include (again) coal-fired power plants, but additional major sources of atmospheric mercury are



municipal and medical waste incinerators, the three sources accounting for 80 percent of atmospheric toxic mercury. Consumer products such as thermometers and fluorescent tubes can release the toxin when they are broken or mishandled. And certain manufacturing processes—cement, pulp and paper production—contribute further mercury.

As do sewage sludge incinerators and hazardous waste combustors, which reveals the complexity of the problem. Processes with positive environmental purposes can generate negative environmental consequences. The scientific law that matter can neither be created nor destroyed seems pernicious when the matter at hand is potentially lethal mercury.

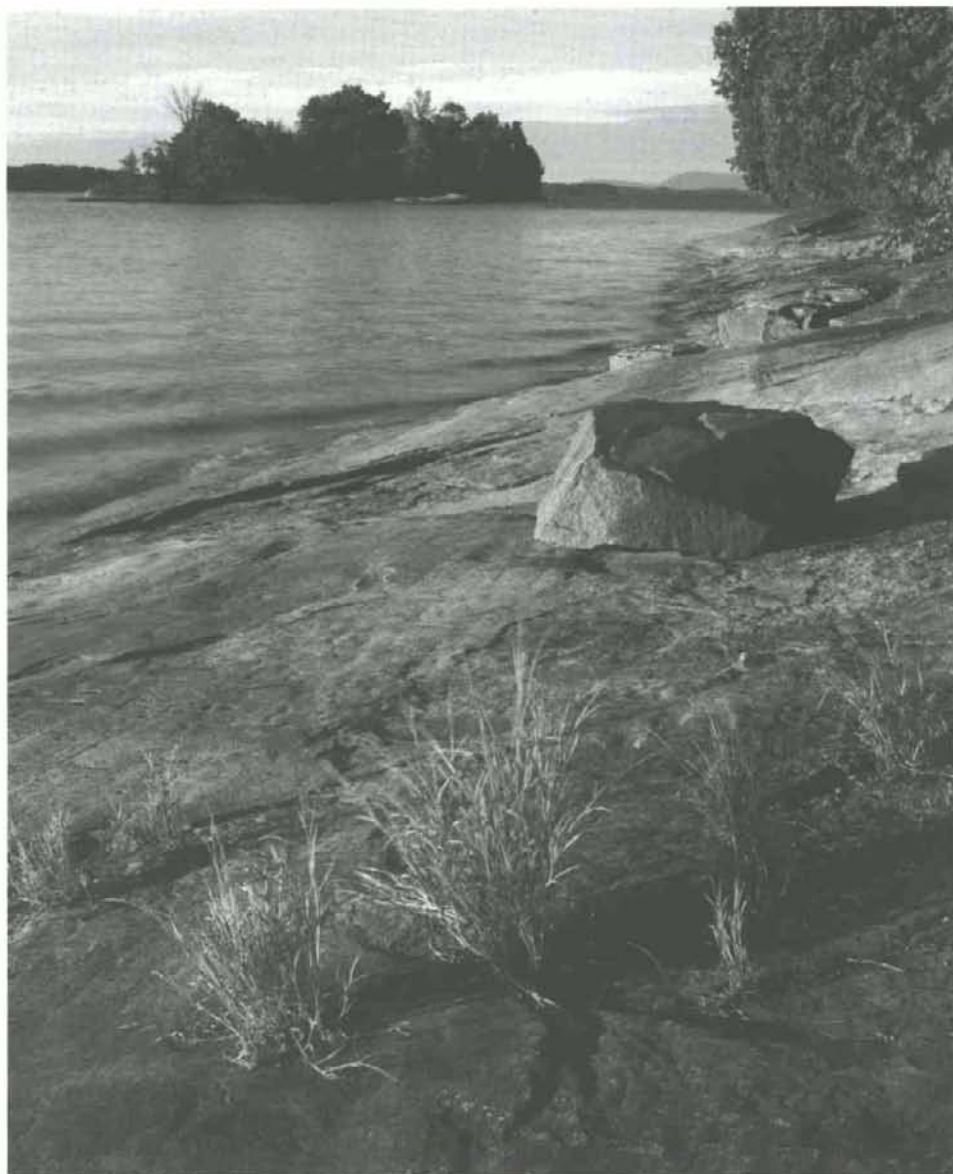
Mercury also results from natural sources such as volcanic eruptions and forest fires, as well as the slow disintegration of rocks. But scientists believe mercury has more than doubled in the atmosphere since the dawning of the industrial age. Still, levels in the ambient air are not considered dangerous. It is after the metal falls to earth in particulate form, a process encouraged by the presence of ozone (smog), that the danger is elevated.

That's particularly true when mercury enters the aquatic ecosystem. In water, micro-organisms convert inorganic mercury into methyl mercury, which is far more toxic.

"Fish accrue methyl mercury from their diet," says Kendall, "and it accumulates in their tissues to the point that it can reach concentrations millions of times higher than in the surrounding water."

He who partakes of the fish becomes the next host of such bioaccumulation. High doses of mercury can cause neurological disturbances, liver degeneration, and abnormal heart rhythms in adult human beings, and mental retardation and developmental abnormalities in fetuses or infants. In the extreme, it can cause death.

Similar effects occur in predatory birds and mammals. Jim Shallow, director of Vermont Audubon, notes that osprey, an endangered species in Vermont whose diet consists solely of fish, are making a comeback. Eleven nesting pairs were counted last year, including at sites in, or connected to, Lake Champlain. (These were at the mouth of the Lamoille River and in the Mississquoi National Wildlife Area.) And while loons are not known to nest in the lake (preferring more secluded bodies of water), Kendall adds that studies done nationally on loon chicks and eggs reveal



high levels of mercury.

"That's really disturbing, because we're seeing these species reviving in Vermont, and now we have knowledge of this new impact, possibly, on their survival. Nobody knows yet how mercury deposition will affect their ability to breed."

Of more pointed concern is the potential impact of mercury ingestion among Vermont's Abenakis, linked to the lake and its bounty for thousands of years. In 1997, the Riverwatch Network and the Mississquoi River Keepers Program, run by the Abenakis, conducted a health-assessment survey that included 125 people who fished in the river. Local concerns had been raised about mercury and perceived human health problems. Fish and sediment samples from the Mississquoi were sent to Green Mountain Laboratories for analysis.

"It was a fairly cursory study, just to get a sense of what was going on," admits Riverwatch's Steve Dickens. "In general, we found that mercury existed at levels where people should not be consuming the fish, but there was nothing to set off the alarms. Our interpretation of the results was that the hypothesis of a link between mercury and people's health problems was reasonable, but the numbers were too small to establish such a link."

The coalition hopes soon to conduct a more thorough and scientific study.

LABELING AND RECLAMATION

Meanwhile, there is action on the mercury front. The NEG/ECP's 1998 proposal called on regional states and provinces to take measures similar to those contained in S.181, Vermont's 1998



Burlington waterfront: Pollution sources now are often not as visible as 20 or 100 years ago; problems persist but are more difficult to address.

mercury labeling law, which was to be implemented by June 1, 1999. Manufacturers are required to affix warning labels upon batteries, thermostats, thermometers, certain electrical equipment and medical and scientific instruments. The products may not be disposed of "until the mercury is removed and reused, recycled, or otherwise managed to ensure that it does not become part of solid waste or wastewater." Waste haulers, regional waste districts and in some cases municipalities must make provisions to receive and handle such products.

State laws that require extra precautions by manufacturers, businesses and towns predictably meet resistance, but VNRC's Kilian says, "We're absolutely committed to defending the mercury labeling law."

More than acid rain, mercury deposition is a local problem ("The EPA has modeled patterns of mercury transport in the Northeast that suggest that in-region sources contribute 47 percent of the total deposition in the area," says VNRC's Kendall), and it should prove easier to control emissions from municipal waste and sewage sludge incinerators than power plants a thousand miles distant. The NEG/ECP, therefore, has a more ambitious scenario for opposing mercury deposition than for acid precipitation. Its

objective is to reduce total mercury emissions by 50 percent by the year 2003.

That plan could get an assist from a federal bill introduced last winter by Sen. Patrick Leahy, D-Vt. The bill attempts to plug a hole in the Clean Air Act and its amendments, which do not set emission standards for mercury. Under Leahy's bill, the EPA would establish such mercury-emission standards for fossil-fuel electric-generation plants, trash incinerators and cement plants. Importantly, it would also begin phasing out non-essential uses of mercury.

*"VNRC's goal is to
reinvigorate the discussion
on these issues, because a lot
of the focus has waned in
the last 10 years.
Scientists and foresters
continue to say this is the
most significant issue
we face."*

— Chris Kilian, VNRC

So there might be relief on the horizon.

But there is a wild card in the mercury equation. Only 5-10 percent of the mercury that reaches the forest floor makes its way through the watershed to the rivers, lakes and ponds. That leaves 90 percent on the maple leaves and pine needles and in the soil. While it seems safer for us there than in our waters, will those deposits provide an enduring source for mercury contamination in our lakes long after the faucet of air deposition has been turned off?

In some of the photographs astronauts send back from space, the elements of our blue, green and white planet appear to mix together, clouds blending with land blending with water, like a canvas by an abstract painter. From our perspective on the earth's surface, the impression is different; the elements are distinct, the land dryer than the water, and more firm than the air.

Yet the cosmic view is truer. The unfathomable distances of the universe dwarf and make imperceptible the divisions that seem grand to us, between lake and mountain summit, watershed and sky. Our home is a beautiful amalgam of gases and liquids, so mutable and inconstant that even metals can evaporate and return in the form of moisture. Air deposition of materials that harm us and destroy our forests reveals once again that to tinker with a part is to tinker with the whole, and that the mixture of the elements denies us the ability to hide from the problems we create.

ACRUMBLING FOUNDATION

Continued Degradation of Habitat in the Champlain Valley

BY KATHLEEN HENTCY

Vermonters heard jeers from far and wide when Lake Champlain won Congressional designation as "the sixth Great Lake" last year. Political and popular opposition from the states bordering the five traditional Great Lakes was so great that Lake Champlain was soon returned to its former standing as simply the sixth largest, freshwater, natural lake, lying between Vermont and New York and south of Quebec.

Anyone familiar with Lake Champlain, however, knows it is truly a great lake. Not only because geologically, it is part of the Great Lakes system, but because of the great variety of habitat found in and along the lake and within its drainage basin.

According to the Lake Champlain Basin Program, Champlain stretches from Venise-en-Quebec down to Whitehall, New York, creating a water-covered area of 435 square miles. The convoluted shoreline covers a total of 587 miles. Within that area, water depths vary from 400 feet to the sandy, ankle-deep shallows of Missiquoi Bay. There are 70 islands scattered throughout the lake, ranging from small piles of rock to the expansive reaches of the Champlain Islands in the northern part of the lake.

In addition to the expanse of the lake, however, is the extensive land area

that drains into Lake Champlain.

According to the LCBP, there are 8,234 square miles of land that tips toward the lake or that leads to a valley that drains to Champlain. Vermont is home to 56 percent of that area, New York to 37 percent, and Quebec to seven percent. And 90

percent of the water that enters the lake comes not from rain but via this drainage basin.

Clearly, then, contaminants that run off the land and into the streams, river banks that erode and send soil downstream, wetlands that are drained and developed, all inevitably have some effect on the lake and the habitats associated with it or its drainage basin.

Unfortunately, acres of in-lake habitat and miles of lake shore, stream- and river-side habitat are under severe threat. There are exotic species, both plant and animal, that move in without the natural checks-and-balances system of disease and predators, which then take over habitat from native residents. Dams stop fish from migrating up ancestral spawning streams, acid rain and other air contaminants pollute water, soil and air, killing trees and disturbing the natural balance in lake systems. Riparian zones, or the corridor of land bordering a stream or river, have largely been destroyed; white settlers cleared the fertile land nearest the rivers, and in more recent years, developers and homeowners often make a project out of keeping such land clear of vegetation. In other areas, grazing cows or other livestock are the culprits. Miles of Lake

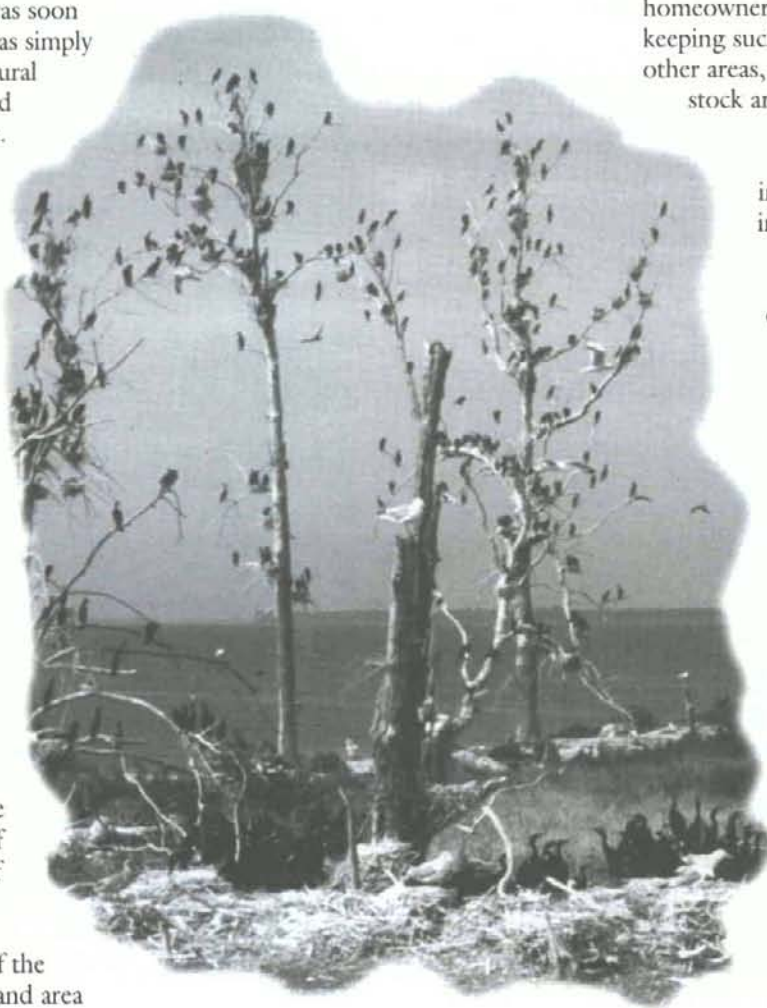
Champlain lake shore were cleared generations ago, and in some areas concrete retaining walls seal off the shoreline from any natural use.

Wetlands continue to be drained, although it appears the method of wetland destruction is changing.

And continued—or even accelerated—development and other unwise land use practices can be seen as the overarching umbrella of the threats facing the aquatic, wetland and riparian zone habitats in and around the lake.

EXOTIC SPECIES

Lake Champlain and the basin area have the unenviable distinction of being home to a large variety of exotic species. The lake itself is home to Eurasian watermilfoil, water chestnut, and the zebra mussel. In wet areas along the



shore, purple loosestrife and Phragmites, or commonreed, flourish. Japanese knotweed proliferates almost everywhere.

"Knotweed is especially successful along rivers because of the way it reproduces," says VNRC's Kim Kendall. "Its roots fragment and the pieces wash downstream and each piece is capable of creating a new knotweed colony."

The effects of these and other exotic species tends to be a variation on a theme; watermilfoil, for example, was first documented in a Vermont lake in 1962. Since then, without the diseases and predators of its native Eurasian homeland, it has spread to more than two dozen Vermont waterbodies. Once in a lake, it quickly sets up dense stands of milfoil that push out native aquatic plants that fish and other lake fauna depend upon.

Zebra mussels, first found in Lake Champlain in 1993, have been well established in the Great Lakes for at least a decade. Some scientists believe zebra mussels, which reproduce prolifically, and filter beneficial algae and other small food from

Acres of in-lake habitat and miles of lake shore, stream- and river-side habitat are under severe threat.

the water, may alter entire food chains in lakes. Scientists suspect the tiny striped mussels will remove a large amount of the food that small fish rely on, thereby greatly reducing the populations of fish on which larger fish feed.

Then there's the damage they do to native mussel populations. Zebra mussels, unlike all native fresh water mussels, attach themselves to hard surfaces. That means they attach to other mussels—zebra mussels and native mussels alike. Because of their large numbers, zebra mussels

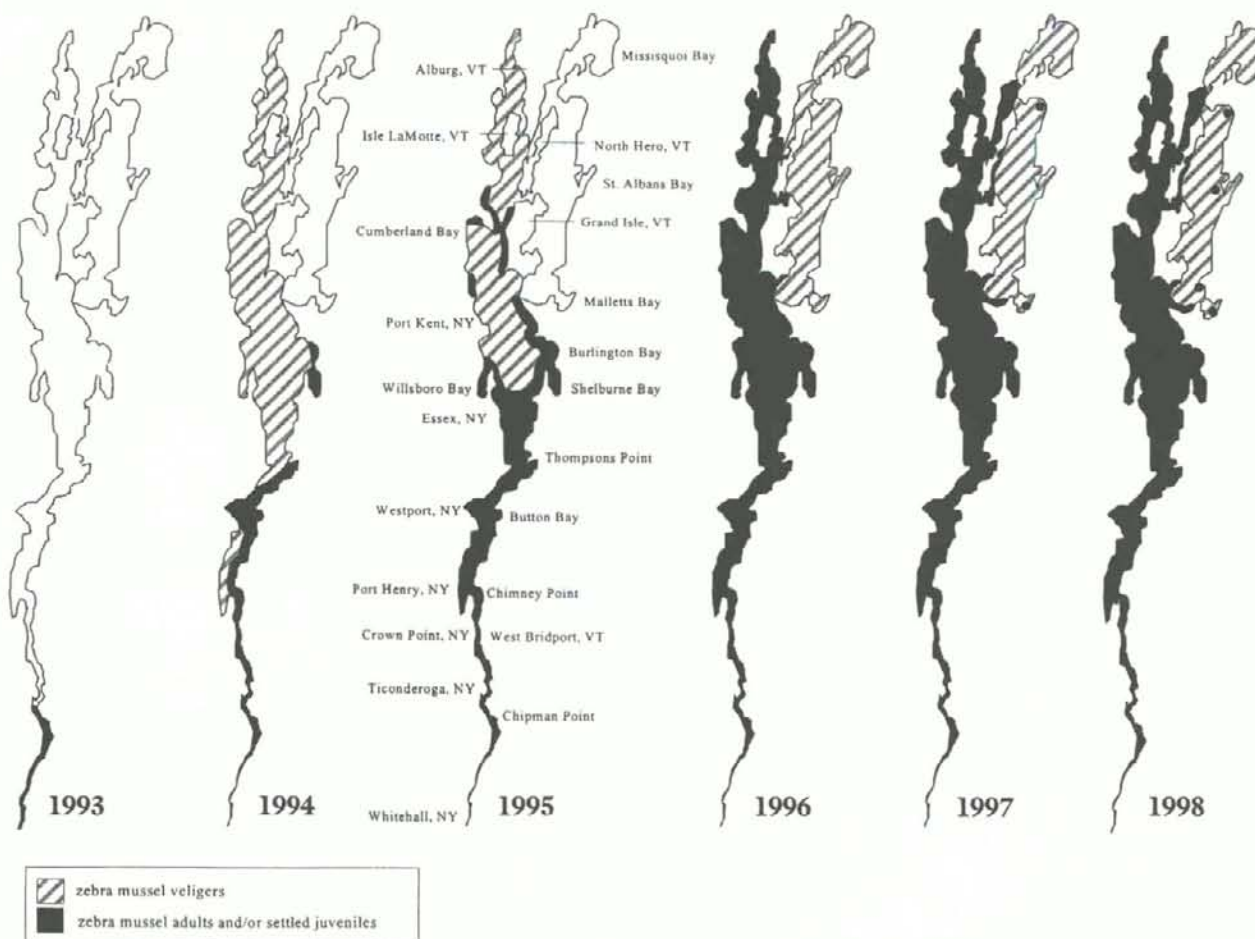
quickly overwhelm native mussels, suffocating them.

Of the 17 mussel species native to Vermont, 14 of them live in Lake Champlain or its tributaries. Eight of these species are threatened or endangered, and six of the species were added to the state's endangered species list this spring.

"A lot of this listing was driven by zebra mussels," says Steve Parren, Director of Vermont's Nongame & Natural Heritage Program. Other threats to the mussels include pollution and habitat degradation.

The state leads organized efforts to control many of these species. For milfoil, Japanese knotweed and zebra mussels, all that can be done is to stop their spread and continue the search for an effective control method; for purple loosestrife, hopes are pinned on a Eurasian beetle that has been imported. In its native home, loosestrife is kept in check by the feeding of these beetles.

ANNUAL CHANGES IN LAKE CHAMPLAIN ZEBRA MUSSEL DISTRIBUTION SINCE 1993



RIPARIAN ZONES

"The biggest threat out there that has changed riparian habitats is the land use practice," says Chris Smith, wildlife biologist with the US Fish & Wildlife Service in Essex.

"Everything from agriculture to development has either affected the riparian zones or is affecting them."

Smith works for a USFW habitat restoration program called Partners for Fish & Wildlife. The program oversees the work and funding of restoration of habitat on private property in exchange for a 30 percent in-kind match from the landowner. The landowner might supply the trees, for example, that will be used to replant the bank.

"In Vermont, riparian habitat consists of trees," Smith says. "If they get cut down, you've destroyed the riparian habitat."

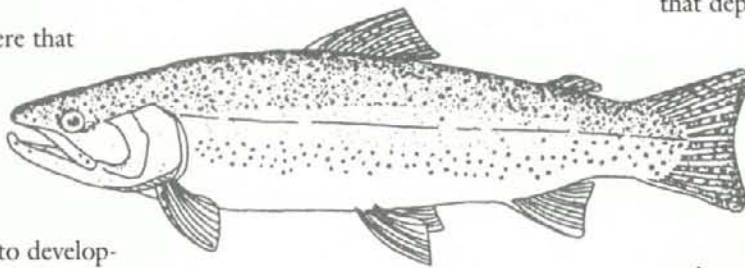
Trees and their associated understory plants shade the water, keeping it cool. And trees that fall into the stream or river, far from being unsightly messes that should simply be removed, create hiding and resting places for fish.

And the roots of the standing trees and other plants stop erosion of stream banks. Erosion not only removes tons of topsoil from the land, it sends soil into the streams, clogging the water so that clear-water fish species can't breathe. As the soil settles out, it silts-over the gravel streambeds that are habitat for aquatic insects. These insects, such as mayflies and caddisflies, are a primary food for many fish species.

Gravel streambeds are also critical fish spawning areas, and once covered, they are no longer available for egg-laying. As more sedimentation builds up, the stream becomes shallower and warms, making the water even more inhospitable to cold-water species such as trout.

"Stream sedimentation is Vermont's most extensive form of habitat degradation," Kendall says. "The areas being hit span from mountain streams that are drained for ski resort condo development to parking lots and agricultural fields replacing the natural riparian buffers in the valleys."

Forested stream and riverbanks also provide wildlife important travel corridors and act as filter areas for both surface and groundwater, removing pollutants (such as phosphorus; see article "Sprawl...and



*"We're continuing to
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endangered species list
at a faster rate than
things are coming off."*

Steve Parren

Its Effects on Lake Champlain," page 20).

Since the Partners for Fish & Wildlife program began in 1991, Smith said his office has averaged 30 to 35 projects a year. Last year alone, he said, Partners for Fish & Wildlife, with the help of local volunteers and watershed groups, completed restoration projects on 114 wetland acres, 29 upland acres, 0.3 miles of instream habitats, and 11.7 miles of riparian habitat overall.

A wetland restoration project might be as simple as plugging a drainage ditch, Smith says, or removing fill from the wetland itself. Other wetland restoration projects focus on fencing domestic livestock animals out of wetlands.

Partners for Fish & Wildlife often works with landowners to fence cows out of the riparian area, which might entail providing an alternative watering system and a different place or manner in which to cross the river or stream. Such a project would typically also include re-planting the river corridor with trees.

WETLAND LOSSES

"We're continuing to add species to our endangered species list at a faster rate than things are coming off," says Steve Parren. "There are notable successes such as the osprey, but other species are gone and some are not doing well. We haven't even begun to scratch the surface with invertebrates such as toads, frogs, salamanders and snakes — animals

that depend on wetlands.

Several species of tiger beetles are threatened, Parren says. "There are far too many people prints such as retaining walls, on the shorelines."

"The species that tend to do well are the generalists," he says. Animals that can do well

under a great variety of conditions can often adapt to human encroachment, rather than die off. The bullfrog, for example, seems to thrive in any wet spot that doesn't dry up. But some species of tiger beetles, for example, need sandy soil or cobble near water. The area must be free of pollutants and support a particular plant and animal community for the beetles to survive.

Continued draining and general degradation of wetlands also takes its toll. There is only one location left in the state where spotted turtles are found, for example, due to fragmentation of wetland complexes, Parren says. The future doesn't look good for the remaining spotted turtle site.

"A railroad track goes through the one site left," he says. "If you're a turtle, that's serious fragmentation."

This type of wetland loss is typical today, according to Peter Keibel, district wetlands ecologist for the Department of Environmental Conservation. The wetland rules, now in effect for 10 years, have stopped wholesale drainage and filling of large wetlands so effectively that overall documented wetland loss averages less than 15 acres a year. Keibel is quick to note that that figure only represents "documented" losses, however.

"There's no way to know what everyone is doing," he says. When people hire an excavator to create a pond where their land is low and wet, that's a loss of wetlands.

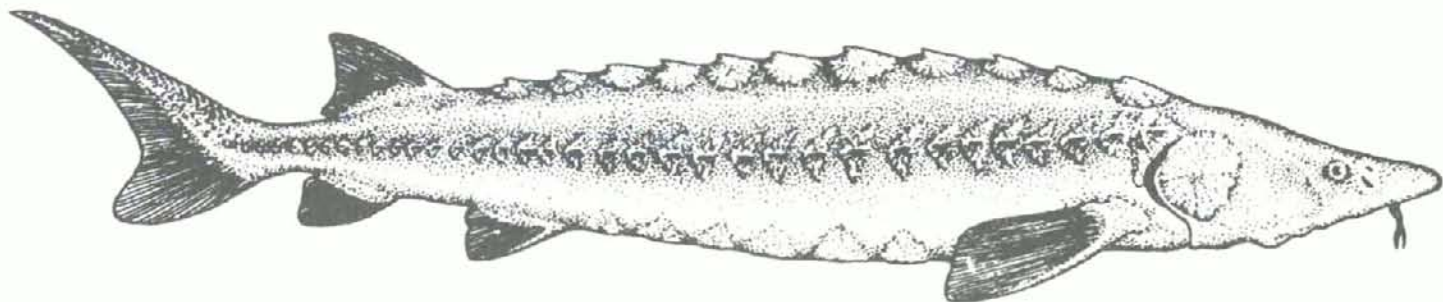
"When you look at the new digital ortho-photos, it's amazing how many ponds you see in backyards," he says. "And chances are, those ponds were not built with plastic or rubber liners, chances are they were made in wetland areas."

And when a wet meadow is converted to a housing development, that's also a loss of wetlands. When a parking lot is built adjacent to a wetland, a small portion of the wetland might be filled to eke out two more parking spaces.

"Do we even know about those? It's not likely," Keibel says. "There are lots of little impacts going on."

Then there is the issue of effectively

*The sturgeon's slow reproductive cycle,
combined with heavy commercial fishing,
has nearly driven the big fish into extinction.*



shutting-off the wetland from other habitats by surrounding it with development. The wetland is still there, but it's lost much of its value to wildlife that would normally migrate locally to or from the wetland, for breeding, feeding and shelter.

DAMS

The lake sturgeon, which used to be common in Lake Champlain, is an ancient species that is endangered in much of its range. Often called a "living fossil," these bottom feeders are partially covered with five longitudinal rows of bony plates. They have conical heads, and sucker-like mouths. On the underside of the snout there are four fleshy barbels which are sense organs. The fish uses these to gauge the distance from its mouth to the lake or stream bottom.

Sturgeon typically live 80 years, but there are reports of fish over 100 years of age and over 100 pounds. The largest lake sturgeon on record, according to Vermont Department of Fish & Wildlife Fisheries Biologist Chet McKenzie, weighed 310 pounds.

The sturgeon's slow reproductive cycle, combined with heavy commercial fishing, has nearly driven the big fish into extinction. It is prized for its meat, eggs and oil. The eggs, of course, are called caviar. In addition, a gelatin from the inner lining of its air bladder was once used to make isinglass. Isinglass was commonly used as a clarifying agent in jellies, glues and in carriage windows.

Today, sturgeon are found in the greatest numbers in the St. Lawrence River, with smaller populations in the Great Lakes, Lake Champlain, the Mississippi River and some tributaries, and other

northern waters.

Wolcott resident Bob Dean remembers netting hundreds of the big fish when he was a 10-year-old boy living in Alburg. He says that 50 years ago, he used to work with two men who had licenses to net sturgeon.

"We'd go out and set up the nets and when we pulled them in, there'd be hundreds of sturgeon in those nets," Dean says. They put the fish in holding ponds until an order came up from New York, and then they slaughtered them. Sturgeon meat was packed separately from caviar, and it all went to New York via train.

"They got \$2.50 a pound for the caviar," Dean says.

Even though the men Dean netted with were licensed, control of sturgeon harvesting was far too lax and protection of spawning habitat non-existent. Chet McKenzie heads up the state's one-year-old Lake Sturgeon Project. So far, his crews haven't seen anything like what Dean experienced.

"On our first day out last year, we put in the nets and immediately caught three sturgeon," McKenzie said. "The largest was 45 years old, and measured six feet in length. She weighed 69 pounds."

"Then we never caught another one." Not that there may not be more — perhaps even many more—to catch. McKenzie said there's no way to know how many sturgeon live in Lake Champlain without a minimum of five years of sampling, since females only become sexually mature at more than 20 years of age, and then only spawn once every four to six years. Males spawn every two to three years, and may become sexually mature at 15 years of age. Females outlive males by

many years, and 97 percent of sturgeons over 30 years of age are female. McKenzie and his crew use the barbels for DNA sampling. They take a sample of tissue from a barbel of each fish caught. When funding becomes available, the tissue will be analyzed for its DNA in order to determine the breeding viability of the remaining Lake Champlain sturgeon population.

Spawning usually occurs in swift portions of streams, including rapids or the base of small falls. If necessary, they will use rocky lake shorelines where wave action is constant. McKenzie said they wait until the water temperature is between 51° F to 60° F before spawning.

Dams on every major tributary to Lake Champlain prevent sturgeon (and many other species of fish) from moving upstream to spawn. But because sturgeon are protected from fishing, if the state study finds there are enough fish to rebuild a viable population, habitat restoration could bring back the lake sturgeon.

FUTURE OUTLOOK

"In the Champlain Valley, we're pushing the limits," Parren says. "People's backyards are starting to connect, and all the areas that were available to animals before have been split into lots."

If the riparian areas and ridgelines could be protected from all development, Parren says, it may be possible to maintain the wildlife species now living in the region.

"But if technology makes it easier to develop rocky and wet areas by giving us more options for septic design, more and more of Vermont will be threatened," he says. "What happens over the next 10 to 20 years is going to be pretty important."

Vermont stands accused, and the only honest plea it can register is "guilty as charged." It is Vermont that most degrades Lake Champlain, Vermont primarily that contributes the pollutant most harmful to the almost scorpion-shaped lake that lies at the basin of a vast watershed the state shares with New York and Quebec.

Known for its picturesque dairy farms, its languid, meandering rivers, and the broad, handsome lake on its western border, Vermont now finds that those ostensibly harmonious elements are silently in conflict. One of the greatest threats to Lake Champlain is not the cities at its shorelines, nor the great, amorphous environmental threats of overpopulation, industrialization or global warming.

It is cows. More precisely, it is the waste produced by cows, and the septic exodus of that waste into the tributaries that empty into Lake Champlain, that degrades its waters and threatens its aquatic ecosystem.

And it's not just any cows, but Vermont cows, causing these problems, because our dairy industry and farmland are concentrated significantly in the Champlain Basin, particularly in Addison and Franklin counties. That's not the case in New York, where, partly because of topography, agriculture plays a lesser role in the basin-area economy. Quebec is more agricultural than New York, and phosphorous- and nutrient-rich runoff from Canadian fields is a factor in the serious pollution problems in Lake Champlain's Missisquoi Bay. But sci-



Vermont's Farms And Lake Come In Conflict

tists have traced the smoking gun, and it's got Vermont's fingerprints all over it.

A THOUSAND COWS

A great gift of nature is the rhythmic relationship that mutually sustains plant and animal life — animals feeding off crops and vegetation, and their wastes revitalizing the soil to keep the cycle

going. But what works well when it works naturally is knocked out of balance when humans impose the imperatives of an organized economy. Milk and its byproducts now must be mass produced — or so the common wisdom has it — and it is in the flat and fertile fields of the Champlain Basin that farmers are best positioned to do that.

Consequently, a problem in the making for decades has become acute, and could get worse as Vermont's dairy profile changes.

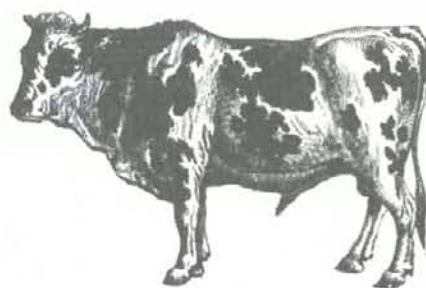
"The trend in farming is toward larger and larger farms," says Jon Anderson, executive secretary of the Natural Resources Conservation Council, an arm of the state Department of Agriculture, Food and Markets. The Conservation Council provides technical and financial assistance to farmers, helping them meet mandatory environmental-protection standards.

"You've got to have 300 to 350 dairy cows these days to make it," he says. "Even in Vermont, farmers aren't dealing with a small rural economy anymore. It's a global economy."

Ellen Taggart, of the Montpelier-based farm-advocacy group Rural Vermont, questions the inevitability of the large-farm imperative — Rural Vermont distrusts both the economy and the ecology

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of mega-farm operations — but she does not dispute the trend.

"The mainstream thinking is that the dairy industry is moving out West where the farms are big, and that we (in Vermont) need to get bigger and more efficient in order to compete," she says. "There's enormous pressure pushing in that direction."

Rural Vermont reported last year that between 1993 and 1997 Vermont lost half its older-style farms (with 50 cows or fewer). Meanwhile, the number of farms with 200 cows or more jumped by 50 percent, and the state Agriculture Department estimated there were about three dozen Vermont farms headed toward the 1,000-cow threshold.

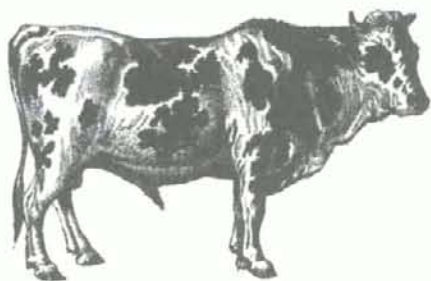
Guess where they were.

"In 1996, when the Legislature was considering Large Farm Operations (LFO) legislation, the department put together a map showing 25 farms that would need LFO permits," says Taggart. "Almost half were in the Champlain Basin. If you've got 1,000 cows in one spot, that's a lot of manure to handle and store. With the Champlain Basin, you've got a significant and very important watershed bearing the brunt of that consolidation."

Or, as Chris Kilian, VNRC general counsel, puts it: "It's not Snowflake and Bessy anymore. Vermont has retained its image of a bucolic lifestyle, but we're seeing more and more massive, productive agricultural factories."

Some of us are seeing something worse. For Roland ("Buzz") Hoerr, a self-employed sales consultant with a home on Colchester Point, pollution of the lake is very personal.

"We have periodically had incidents here of E. coli illness among local residents, including me and my family," says Hoerr, who recalls that last summer was a high rain-event year. "Many people upstream probably benefited from all that wetness — like farmers, and businesses that saw their parking lots washed clean. But it all washed right in front of our house."



*Scientists have traced
the smoking gun,
and it's got
Vermont's fingerprints
all over it.*



Testing for bacteria, performed by the town of Colchester, showed that about half the time the lake was unfit for recreational activities. In reality, though, Hoerr believes conditions were worse.

"Testing is an inexact science, because taking samples of a water column off a dock can indicate that the water is relatively clear. But you introduce running children and dogs and it stirs up the sediments. That's the water people are really swimming in."

Hoerr doesn't just complain. He acts. Since 1997 he has been chair of Vermont's Citizens Advisory Committee on Lake Champlain.

"My mission, and it actually works, is to see that citizens enjoy a high level of influence on the Champlain Basin program. Our members sit on the executive and steering committees, and we influence educational efforts and communications

with the public."

Hoerr has also gained a global perspective on pollution in Lake Champlain. He recently attended a conference in Copenhagen of people working to reclaim some of the most important lake basins in the world. There, he learned that in some lakes in Europe the sediment is so embedded with pathogens that the only cure is to dredge the lake bottom, treat the soil, and then put it back again.

"They realize that they can't metabolize those lakes back to health," he says. "Probably the closest approximation to that in our area is the Mississquoi Bay. The continued loading of nutrients and pathogens from agriculture is killing that area of Lake Champlain faster than other parts."

MADE IN VERMONT

Non-point-source pollution (the polluted runoff from rain or snowmelt) goes back decades in Vermont's history. The scientific community identified a deterioration in the lake's ecology in a 1976 report titled, "The Limnology of Lake Champlain," which analyzed causes of the problem and quantified the kinds of reductions in phosphorous the authors believed

would be necessary to restore Lake Champlain to something approaching its natural condition.

But public awareness of the deleterious effect of phosphorous was slower in coming. It was not precipitated by a crisis as much as by the gradual perception of people who used the lake for recreational and professional purposes that the water and shorelines were changing for the worse.

"In the late 1980s, a consensus began to emerge," says Eric Smeltzer, a limnologist (lake scientist) with the Vermont Agency of Natural Resources (ANR). "We began hearing from the public about (an overabundance of) algae blooms. Phosphorous was the biggest concern because phosphorous in fresh water promotes excess growth of algae. No one knew where the phosphorous was coming from or whose responsibility it was."

By 1990 Vermont had formed an

association with Quebec to address phosphorous loading. Phosphorous can be measured in the laboratory, but an equally valuable resource is the untrained eye. You don't have to be a scientist to discern that the water isn't clear and that there's too much weed growth going on. The agency therefore began a lay monitoring program, which also helped the governments set standards and goals for combating phosphorous.

"There was a qualitative relationship," says Smeltzer, "because ultimately it's not the phosphorous itself, but the effects of the phosphorous, that's of concern."

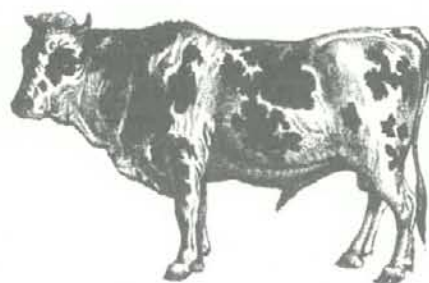
"Scientifically, we measured everything, including rain. We found phosphorous levels critical for 12 segments of the lake, and we got to the point where we knew where phosphorous was coming from. The biggest rivers contribute the greatest quantity of phosphorous — the Winooski, the Mississquoi, and Otter Creek. But concentrations are higher in other rivers — the Pike River, the La Platte River in Shelburne, the Stephens Brook in St. Albans."

This information helped researchers develop a system for focusing phosphorous reduction plans in specific subwatersheds of the Lake. But sharing responsibility among the three governments was less a scientific than a political challenge. The Lake Champlain

Designation Act of 1990 helped Vermont and New York overcome barriers. It brought together government representatives, citizens and researchers, charged by Congress to undertake a five-year research and planning process for rehabilitating the lake, and led to the founding of Vermont's Citizens Advisory Committee on Lake Champlain, currently chaired by Buzz Hoerr.

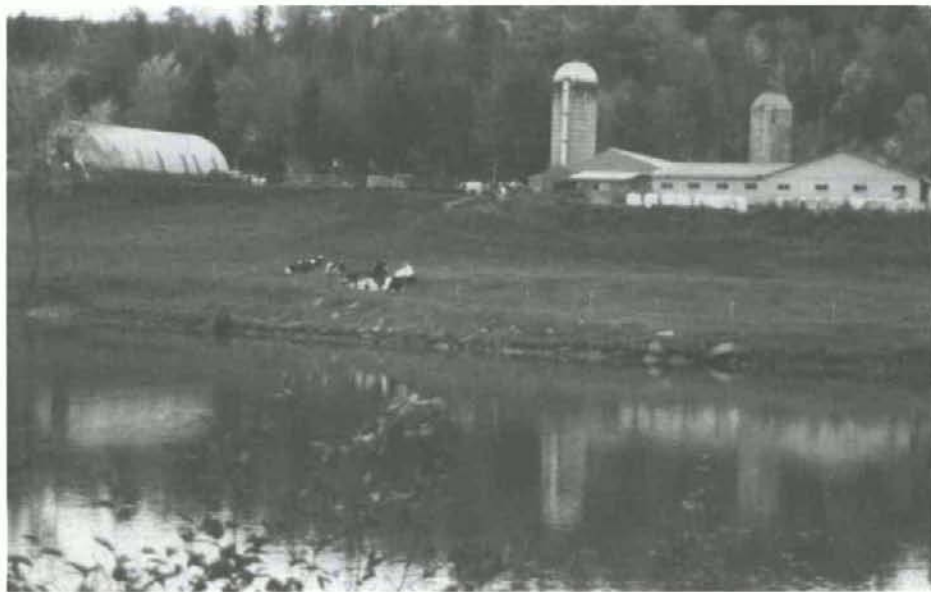
The outcome of all this effort was a 1996 agreement called "Opportunities for Action." The agreement formalizes the adoption of "target loads" (reductions) and gives the states and province 20 years to achieve those goals.

"Now," says Smeltzer, "we're in the



"It's not Snowflake and Bessy anymore. We're seeing more and more massive, productive agricultural factories."

— Chris Kilian



phase of trying to implement the plan."

Vermont bears the lion's share of the responsibility, for in both point- and non-point-source pollution our state dominates the picture. Here is the pollution profile of the lake, based on 1991 research:

Less than one-fourth (24 percent) of the lake's total phosphorous load is "natural" — i.e., coming in low concentrations through the watershed from forests and flatlands, it would be there even without us. Phosphorous from point sources accounts for 29 percent of the remaining load, with Vermont contributing 19 percent of the point-source phosphorous load against 10 percent from New York

and Quebec combined.

The remaining 47 percent of the phosphorous found in the Champlain Basin is from non-natural, non-point sources. Of that amount, 66 percent derives from agriculture.

The 20-year "Opportunities for Action" plan would still allow for impressive amounts of phosphorous, though meeting those goals would bring the lake into compliance with Vermont's water quality standards. The starting point for the program was an estimate that 496 metric tons of phosphorous were entering the lake on an annual basis in 1995. The basin plan's target load for the whole lake, after 20 years, is 439 metric tons.

The goal, then, is to reduce phosphorous loading by 57 metric tons per year.

Success is to be achieved on a schedule of 25 percent of that target every five years. Importantly, the targets call for specific reductions in specific subwatersheds.

The Mississquoi, for example, must not be permitted to continue to deteriorate while some other part of the basin is revived further than planned.

On the point-source side, about 30 wastewater treatment plants need to institute advanced treatment to remove phosphorous. "But the bigger part of the problem is non-point," Smeltzer concludes, "and the bulk of that has to come from farm

land."

Unfortunately, VNRC contends that the state had an "opportunity for action" half a dozen years before Vermont, Quebec and New York adopted the plan that was given that name, and that the agreement's 20-year time frame virtually amounts to an 18-year delay for achieving goals first envisioned in 1990.

"The Vermont Water Resources Board adopted the same targets in its water quality standards, and said those standards 'shall' be met in the lake by January 1, 1998," says Kilian. "So from a Vermont perspective, giving the parties until 2016 to achieve those same goals was a major step backwards."

Thus, the Lake Champlain Citizens Advisory Committee has urged a quicker (10-year) timetable, and VNRC advocates an even shorter schedule. "We've already wasted years," Kilian says.

Nor is it just the delayed time frame for phosphorous reduction that troubles VNRC. The 57 metric tons-per-year decrease would not begin to restore the lake.

"The targets reflect a sort of freezing of phosphorous loading at slightly below current pollution levels," says Kilian, "but everybody agrees that the lake is over-nutriented right now. Even if we achieve those targets, the lake will still be eutrophic in many of the sections of primary concern — the Missisquoi Bay, the south lake, the inland sea. VNRC is concerned that the targets don't really reflect an effort to restore the lake, but to come to a point that it doesn't get worse than it is now. That, from our perspective, is not what the lake should be."

Still, VNRC concedes there is value in the three-government plan.

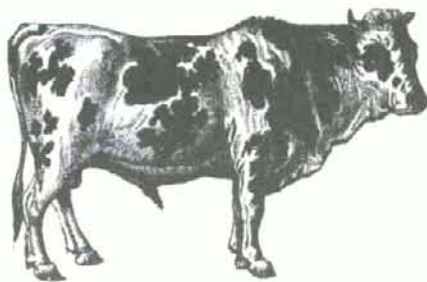
"We're finally seeing baby steps, and at least 'Opportunities for Action' requires changes to prevent the situation from getting worse. The amounts of pollution we're dumping into the lake right now are so significant that even achieving the targets will be difficult," says Kilian. "But we've got to see real action before we can feel secure that the lake is going to be cleaned up. And it's got to happen soon."

THE FARMER'S 'REBUTTABLE PRESUMPTION'

Vermont's AAP program (Accepted Agricultural Practices) is the state's primary vehicle for addressing agricultural contamination of Vermont waterways. As Conservation Council Executive Secretary Anderson explains, the AAPs were developed to help farmers meet ANR water-quality standards.

"They're called practices, but they're really performance standards," he says. "The thrust is to get all farmers at the same level of agricultural performance from an environmental-protection standpoint. And I think it's working."

Actually, the standards are practices, too, and they can take their toll in financial investments and the loss of productive farmland. Farmers must maintain buffer strips of natural vegetation to separate crop and grazing land from stream banks, and in some cases lay riprap along the banks to stabilize the soil. Another



*The biggest rivers
contribute the greatest
quantity of phosphorous —
the Winooski, the
Missisquoi, and
Otter Creek.
But concentrations are
higher in other rivers.*

requirement is to divert surface water from barnyards and wellheads. And farmers must develop nutrient-management plans so they can get good crop production from their fields without over-fertilizing.

(Something that's not often talked about is that the rich and pungent odor wafting from newly fertilized fields bears with it a touch of fantasy. Experts acknowledge that only a small percentage of the manure spread on the fields has any real agronomic value. "Most people think that every time farmers go out spraying liquid manure they're enriching the soil," says Kilian, "when all they're really doing is cleaning out the barn.")

But the major AAP provision is a ban on spreading manure in the wintertime, when the frozen ground surface expedites runoff. That usually means digging lagoons or constructing manure-storage structures.

All in all, the AAPs can represent a substantial, required investment by the farmer. Technical assistance — including a Whole Farm Plan with a field-by-field analysis of soil properties, water table, the crop demands placed upon the fields, the size of the herd and its production of manure — is provided by the state and U.S. departments of agriculture.

Anderson's Conservation Council has established 14 "conservation districts" to develop localized assistance programs.

Financial aid is available, to some degree. As Anderson says, "For pits and manure structures, you're sometimes talking \$100,000 or more. We're trying to walk the line, to get the most environmental protection we can without putting farmers out of business."

But the state has funded only about one-fifth of the AAP projects for which farmers have applied for aid.

"There's a limited number of dollars for this," Anderson concedes. "We need twice as much money and staff time for technical assistance."

Ellen Taggart, of Rural Vermont, believes that's the Achilles' heel of the program.

"The AAPs are good, but there are significant problems with enforcement that have largely to do with the human resources available," says Taggart. "I'd also say that there is not really the will, in the Agriculture Department, to enforce the standards. But the positive way to look at it is that the AAPs are a good opportunity for Vermonters to learn to better manage the runoff of nutrient pollution."

The reward for meeting AAP standards is the rebuttable presumption, and the legal protection that goes with it, that the farmer is meeting the state's water quality standards for ground and surface waters. But VNRC's Chris Kilian says the presumption is a double-edged sword.

"I believe the Legislature has put farmers in a bad place out of the illusion that AAPs are sufficient to result in avoiding polluting streams," he says. "That's not the reality. Our streams are polluted and Lake Champlain is polluted. Farmers can't affect the price of their product, but they're forced into these capital-intensive investments to do their business. And they're going to continue to get pinched because more substantial action will have to be taken."

"If it isn't, development and economic growth will have to be curtailed in Vermont because of the pollution coming from agriculture."

TMDL AND OTHER PLANS

Grave as non-point-source pollution of our lakes and rivers has become, the situation may not be without remedy. VNRC believes a crucial first step is for Vermont's Natural Resources Agency to initiate Total

Maximum Daily Load (TMDL) planning to look specifically at the problem of phosphorous content in the state's waterways. Such plans are called for in the federal Clean Water Act.

"TMDL is a vehicle for focusing the discussion on agricultural pollution, as well as a wide range of other kinds of pollution," says Kilian.

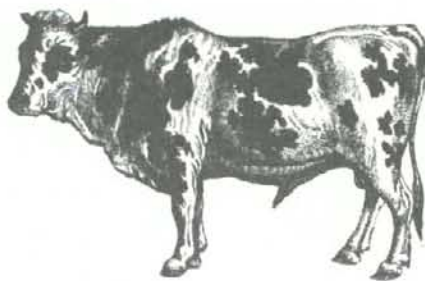
Assessing watershed conditions then leads to the drafting of water quality management plans that are reviewed by the federal Environmental Protection Agency for compliance with the Act. Employing such a regulatory approach would have the twin virtues of establishing new and scientifically credible information on the conditions of lakes and waterways, and readying the velvet hammer to force state agencies to take the necessary steps to reclaim them.

"We've gotten a commitment now that the ANR will update all the watershed management plans for the major rivers and lakes in the state by 2006," says Kilian. "It's an enforceable legal requirement, and the plans have to have implementation measures included. We see that as a way to get the state to focus on the problem of agricultural non-point-source pollution."

Meanwhile, state agencies are pursuing the 20-year phosphorous-reduction goals Vermont committed to with New York and Quebec in 1996. But the state has put \$100 million into upgrading wastewater treatment plants and only \$3 million into helping farmers. Considering that non-point-source pollution demonstrably contributes far more phosphorous than point-source discharges, those relative allocations seem questionable. And when Anderson says Vermont is on track to meet the 20-year goals of the phosphorous-reduction plan, it's important to remember that staying on track will be harder once the more-easily remedied point sources are out of the way.

The advocacy group Rural Vermont believes that economic, agricultural and political policy makers should turn the farming community away from the large-farm trend and put a premium on agricultural enterprises that are economically and environmentally sustainable.

"We can be creative and flexible in our use of agricultural land, add value through small-scale processing, and use cooperative efforts to bring products directly to consumers," says Taggart. To those who argue that small operations are not eco-



*The hope is that we
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the watershed.*

nomically rewarding, she points skeptically to large operations.

"The commodity route, with bigger farms and where the raw product just leaves the farmyard and the farmer never sees it again," she says, "has taken farmers from capturing 50 percent of the consumer dollar to 30 percent. Especially in an economy that is globalizing, this won't be successful for most farmers in Vermont. They need to get out of that system."

One of the most interesting potential solutions to nutrient pollution is coming to Vermont on an experimental basis this summer, courtesy of the Lake Champlain Citizens Advisory Committee. It is an electrical processor that purports to reduce animal waste to compost in a matter of days. Even more impressive, the device supposedly can be adjusted to produce a mixture specifically appropriate for the individual farmer's fields, with harmful bacteria virtually eliminated and nutrient levels controlled to a safe dosage for those soils at that location.

"The old saw in Vermont that you can never have too much manure is obviously not true," says Buzz Hoerr. "But this technology would allow the farmer to safely process his total animal wastes. And he may find there's cash value to the product so it could become marketable."

The closed system Hoerr describes could be trucked from farm to farm and owned cooperatively. "It was developed in Israel, where they can't afford to pollute

even one drop of water."

The citizens committee will present the equipment at the State House and elsewhere this summer, and hopes to try it in selected Vermont locations next winter to see if it functions well in cold weather.

"This represents a first step at looking at something other than storage pits," Hoerr says. "The hope is that we can figure out a way to help farmers have successful businesses that don't impact on the watershed."

It's a noble ambition — a necessary ambition, if the people of Vermont, New York and Quebec are to save the lake they share. But what may be hardest for them to accept is the slow pace that recovery is sure to take. That's why Buzz Hoerr, a father of two, takes the long view.

"It's the children we have to do it for. They're the ones who'll inherit the place and it's our job to clean up the mess we've made of it."

Most adults won't live to see the improvements anyway — shown by an experience in St. Albans Bay. When a modern treatment plant opened in St. Albans in 1986, says ANR limnologist Smeltzer, people expected an impact on the waters of the Bay that has yet to be seen. Particularly in shallow areas, where lots of sediment comes in contact with the water, phosphorous loads stored for decades continue to act upon the bay.

The same, virtually imperceptible pace of improvement is the best anyone can hope for in Mississquoi Bay, the worst phosphorous area on the eastern side of Champlain. Vermont and Quebec are just now negotiating how they'll share the responsibility for remedial efforts there.

"Mississquoi needs very large reductions," says Smeltzer, "and I don't think those waters will respond quickly either. The lake has a long memory of past abuse."



Sprawl

...AND ITS EFFECTS ON LAKE CHAMPLAIN

By KATHLEEN HENTCY

On a warm day in Burlington, thunderheads pile up spectacularly over New York's Adirondack Mountains. A breeze springs up, and the leaves on the deciduous trees flip upside-down, showing their lighter undersides as a quiet warning of what is to come. The first raindrops fall, and thunder rumbles in the distance. The high peaks of the Adirondacks are no longer visible behind a rain screen, and the lake surface darkens as the storm approaches. The breeze builds into a wind, and the rain falls harder. Lightning flashes, and anyone still on the streets runs for cover. Thunder crashes on the heels of the lightning, and the storm is in full swing.

When the rain ends an hour later, the air is fresh, the grass gleams in the new sunlight, and all feels right with the world. That's the way of thunderstorms. They make everything feel new again. Unfortunately, rainstorms over urban areas do more than clear the air of harmless dust and wash the streets clean of wholesome dirt. The water that runs down the streets and into the storm drains carries with it the microscopic and, often, macroscopic detritus of our lives. Lawn fertilizers, pesticides used on lawns and greenery, chemicals from cars, and any air-borne pollutants or nutrients that might be bound to solid particles,

carried from afar on the wind, then settled to the ground, are washed into ditches, storm sewers, streams and rivers and eventually into larger water bodies such as Lake Champlain.

"In urban watersheds, the impervious surfaces—roads, roofs, parking lots—act as collectors of pollutants," says Tom Schueler, executive director of the Center for Watershed Protection. The Center is a national nonprofit group based in Maryland, which is dedicated to the protection and restoration of streams, rivers and estuaries through research, education and improved watershed management.

And sprawl, or uncontrolled urban development, is only increasing the amount of impervious surface in the Lake Champlain basin.

The cumulative effects of unbridled sprawl can be devastating to a community and are very difficult to undo. Vermonters need to take a hard look at new development and its possible effects on our communities," says Elizabeth Courtney, VNRC's Executive Director.

According to Barry Gruessner, technical coordinator at the Lake Champlain Basin Program, a large amount of contaminants that wash into streams and then into the lake come from cars. Metals from rusting cars, brake pad linings, and aromatic hydrocarbons from gas combus-

tion and from the gas and oil stains left in parking lots and on roads are common in urban runoff. There are also contaminants from asphalt and from building materials such as roofing shingles.

"Low levels of these contaminants in the water and long-term, low-level exposure to them is something we understand very little about," Gruessner says. But there are implications that such concentrations can be harmful to the animals that live in lake sediments, such as worms and other invertebrates. And those animals form the basis of the food chain in a lake.

Another contaminant found in Lake Champlain in high quantity is fecal coliform bacteria. While poorly constructed septic systems or the old storm drain systems can be the source of human waste and its associated bacteria, pet waste—typically from dogs—is the source of significant amounts of bacteria,

Gruessner says.

Phosphorus, an important nutrient for plant growth, is another significant lake contaminant, according to State Limnologist Eric Smeltzer. It's not known where all the phosphorus found in urban run-off originates from, he says, but it could be as simple as dust particles that are bound up with phosphorus blowing into town and settling out, only to be washed into the waterways during the next storm.

Phosphorus is of concern because it accelerates the aging process of a lake.



Lakes that are not covered with algae growth, and therefore, lakes that people find attractive, are "young" lakes and are short on phosphorus. Add phosphorus in large enough quantities to a lake, however, and eventually you will get algae blooms and increased plant growth in general. This process, called eutrophication, is the process of a lake filling with sediment and dead plant growth. It is natural when it happens over thousands of years, and the lake-life changes gradually to populations that tolerate warm, nutrient-rich water. With human intervention, though, a lake or bay that may not be very deep or have much exchange of water may eutrophy in a few short years.

While phosphorus is associated with plant growth, and therefore might be assumed to come primarily from agricultural lands, on average, urban areas supply a disproportionately large amount of the phosphorus washing into waterbodies, according to Smeltzer.

"It's a gross generalization, since you may have an eroding, heavily fertilized cornfield that would yield more phosphorus," than the same size area of urban land, he says. "But the point is that ag land yields a lot less phosphorus per acre than urban land."

A forest, for example, exports into waterways 0.1 kilograms of phosphorus per hectare per year. Agricultural land exports 0.5 kilograms from the same land area over a year, while a hectare of urban land is the yearly source of 1.5 kilograms.

"So even though only three percent of the land in the basin is urban, it is contributing about 18 percent of the phosphorus load" to Lake Champlain, Smeltzer says.

Another insidious ingredient in urban runoff is pesticides. Herbicides, insecticides, fungicides and other chemicals people use on lawns, gardens, around homes and public buildings, often wash into streams and lakes, according to Sylvia Knight. Knight is a citizen activist who first became concerned with pesticides when Boise Cascade planned to spray trees in the Northeast Kingdom with herbicides.

Recently, Knight has been working with condominium associations in an attempt to minimize the amount of pesticides used on condominium grounds.

One of the problems she's running into is a lack of scientific data on what size a buffer strip along a water way should be in order to remove from runoff as much of the pesticide as possible. The city of Burlington has zoning ordinances restricting the use of pesticides to at least 500 feet from Lake Champlain or water that flows into the Lake, but other municipalities and the state require as little as 10 feet in some situations.

There are, of course, a multitude of pesticides and an even greater number and variety of effects of those pesticides, suspected and known, while enforceable restrictions on the uses and applications of those chemicals are negligible. Add in the potential of synergistic effects when an herbicide from South Burlington meets a fungicide from Shelburne, for example, and the possibilities for damaging effects multiply quickly.

While just about everyone would agree that eliminating pollutants altogether would be the best solution,

scientists and planners alike acknowledge that it isn't likely, at least not in the short term. The alternative, even while working to minimize the amount of pollutants being released into the environment, is to filter the

run-off water through soil.

"The traditional answer was to build ponds to store runoff," Schueler says.

"While that's still important, the real solution is to reduce the amount of impervious surface in the urban areas."

That means decreasing the amount of paved or other surfaces like rooftops and sidewalks that don't allow water to soak into the ground.

Sound impossible? Not according to the Center for Watershed Protection. The Center worked for two years with a Site Planning Roundtable made up of development, local government and environmental professionals to create 22 model development principles to protect streams, lakes and wetlands. Where implemented, according to the Center, the principles "fundamentally change the way that land is developed by reducing the amount of impervious cover, conserving natural areas and preventing stormwater pollution."

The principles help planners, developers and local officials identify areas where existing codes and standards can be changed to better protect

streams, lakes and wetlands at the local level. Fittingly, the principles are divided up to address three areas: habitat for cars, habitat for people, and habitat for nature.

Some of the 10 principles for car habitat include reducing the width of streets, strictly basing them on traffic volume, and reducing the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit of street length. In addition, residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, sidewalk, and vegetated open ditches.

Under lot development, or habitat for people, the Roundtable makes six recommendations including: advocating open-space design development that incorporates smaller lot sizes to minimize total impervious area; reducing total construction costs; conserving natural areas; providing community recreational space; and promoting watershed protection. As a result of this principle, residents in a new development would share a greater total area of natural space, but each would have smaller lawns and driveway areas.

The principles also recommend allowing narrower frontages to reduce total road length in the community and therefore overall impervious area, and to lessen front setback requirements to minimize driveway lengths. Communities should promote alternative driveway surfaces and shared driveways in order to reduce the amount of paved area.

To conserve natural areas, communities should create a variable-width, naturally vegetated buffer system along all streams and critical environmental features such as the 100-year floodplain, steep slopes and freshwater wetlands. The buffer strip should be maintained through the plan-review delineation, construction, and post-development stages.

Also, clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build, allow access and provide fire protection. And a fixed portion of any community open space should be managed as protected green space.

The principles, Schueler says, lead to "green parking



lots," or smaller lots with more landscaped islands that include trees and shrubs, and a significant portion of the surface cover made from permeable materials rather than from asphalt.

While some of these reductions in impervious cover may seem slight on an individual development site, every little bit counts. At this point, Schueler estimates that in Vermont, "most of the streams and

rivers leading to Lake Champlain probably have 2 to 4 percent impervious cover along them."

"On the watershed scale, you want to keep the total amount of development expressed as impervious cover to less than 10 percent," Schueler says.

The way we design or re-design our community living spaces holds the key to reducing impervious surfaces, and it's only

a matter of wise and careful planning. As Elizabeth Courtney points out, it's time to get started.

"Recognizing that our social and environmental well-being are all interdependent, we must all accept responsibility in protecting this valuable resource," says Courtney. "Lake Champlain's health is critical to the overall health of Vermont."

1999 Legislative WRAP-UP

CHAMPION LANDS

Protection of the Champion International lands in the Northeast Kingdom was a top priority for VNRC's Forest Program this year. The Legislature helped to achieve this objective with an appropriation of \$4.5 million as part of the FY 1999 Budget Adjustment Act.

The money will be used to help the Conservation Fund, a national land-conservation organization, purchase 133,000 acres of land in Vermont as part of a larger 300,000 acre, three-state deal involving New York and New Hampshire. The Vermont part of this complex transaction will consist of 48,000 acres in public ownership and 85,000 in private ownership.

The U.S. Fish and Wildlife Service will ultimately acquire 25,000 acres in the lower Nulhegan Basin to add to the Silvio O. Conte Wildlife Reserve. The other 23,000 acres of public land will be purchased by a private foundation and transferred in fee to the State of Vermont.

The \$4.5 million

appropriated by the Legislature will be used by the Vermont Housing and Conservation Board to purchase conservation and public access easements on the 85,000 acres which will be sold to private investors. Over the long term, the Vermont Land Trust and the Vermont Housing and Conservation Board will hold the conservation and public access easements on the private and state lands.

The Champion lands debate consumed almost three months of the session, during which VNRC worked to ensure that protection of natural resources received as much focus as working forests and public recreational access goals in the final legis-

lation. VNRC was also concerned that efforts to protect the entire Nulhegan watershed through petitions before the Water Resources Board for Class A and Outstanding Resource Waters might be adversely affected through language accompanying the appropriation. In the end, VNRC agreed on language which will support the highest level of protection for the Nulhegan.

Located in Essex County, the Nulhegan is one of the few free-flowing rivers in Vermont, and its water quality is so unspoiled it is considered a "reference stream" for the assessment of polluted waters. Its waters provide high-quality habitat for wild brook trout and are targeted as prime spawning habitat for Atlantic salmon, a species that federal agencies are trying to restore in the Connecticut River watershed. The Nulhegan watershed encompasses the state's largest deer yard, extensive bogs and a rich and diverse habitat for endangered species such as the common loon, osprey, spruce grouse, and black-backed woodpecker.

VERMONT HOUSING AND CONSERVATION TRUST FUND

The Housing and Conservation Trust Fund (HCTF) helps preserve agricultural and forest land, and contributes to the creation of affordable housing for Vermonters through grants to non-profit organizations and communities. The fund is administered by the Vermont Housing and Conservation Board (VHCB).

For Fiscal Year 2000, the VHCB will receive \$9.8



million, an increase of \$1.3 million over last year's appropriation. (Note: The VHCB also received a one-time \$6 million appropriation for affordable housing out of the FY 1999 surplus and around \$1.2 million in excess receipts spending authority as a result of the formula set by the Legislature in 1998.)

These figures are above and beyond the \$4.5 million appropriated for the Champion lands.

Also, as part of the Miscellaneous Tax Bill the formula for allocating revenues from the property transfer tax to the HCTF and the Municipal and Regional Planning Fund was changed and simplified with an eye toward sustaining adequate funding levels in the future for housing, land conservation, and planning. The new formula dedicates 50% of the revenues from the property transfer tax to the HCTF, 17% to the Municipal and Regional Planning Fund, and 33% to the General Fund.

MUNICIPAL AND REGIONAL PLANNING FUND

Funding for municipal and regional planning received a significant boost this year. In FY 2000, communities and regional planning commissions will have just over \$2.9 million for a variety of planning elements. This amount is roughly double the \$1.48 million that was appropriated in FY 1999.

Municipal planning grants, to be distributed under a competitive program, total \$608,000 compared to \$305,000 last year. Regional Planning Commissions will receive base funding of \$1.5 million, an increase of over \$300,000. In addition, RPCs will have over \$800,000 for Geographic Information System (GIS) natural resource data base development, commercial and industrial data base development, and intensive local government educational workshops.

Additionally, \$345,000 will go to the Vermont Center for Geographic Information for enhancing statewide GIS capability.

ENERGY EFFICIENCY UTILITY

Although the legislature fell short on a bill to restructure the state's electric utility industry, the session produced a new law that requires energy conservation services to be developed and implemented by an entity, referred to as an energy efficiency utility, appointed by the Public Service Board (PSB).

Essentially, the PSB will be able to appoint one or more entities to carry out energy efficiency and conservation programs that are intended to reduce energy demand in the state. Although utilities will continue to pay for conservation measures like energy efficient appliances, hot water heater insulation, and other energy-saving building components, the PSB may contract with a third party to deliver the conservation programs across the state.

Legislators were persuaded that such an arrangement would produce a more effective system for implementing energy conservation services than the current utility-run programs which have drawn criticism for not being aggressive enough.

ACT 250

The House Natural Resources and Energy Committee spent a large part of the session taking testimony on Act 250, the state's land use and development law. One bill that received considerable attention, H.51, would have limited citizen participation and made the Act 250 process more formal, legalistic, and bureaucratic than is necessary. In the end, no changes were made, but the House approved a study committee to take a comprehensive look at the law as it approaches its 30th year. The study committee, made up of at least eight House members, has been asked to make recommendations for legislation by January 15, 2000.

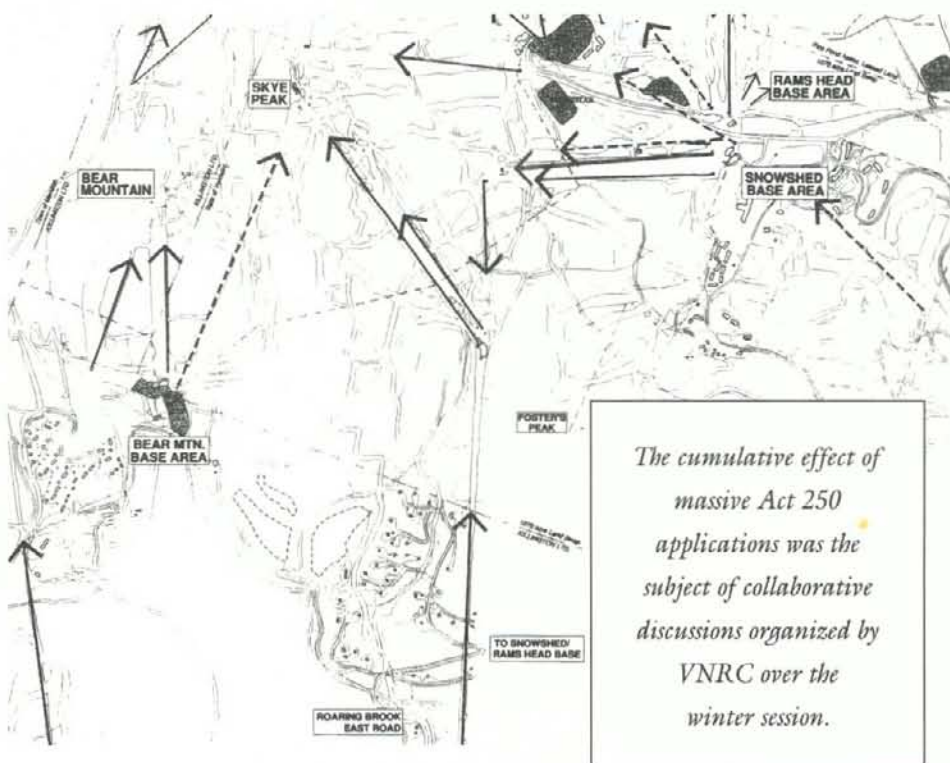
Among the issues that VNRC will request the study committee to look at are cumulative impacts and full appeal rights for permitted parties.

Currently, Act 250 does not provide for review of the cumulative impacts of large-scale developments, particularly where there are two (or more) development projects in close proximity to each other which are going forward at the same time. Act 250 still is set up to review projects only on a case-by-case basis, rather than being able to look at the "big picture". This is a major shortcoming in the law.

At present there are two general classes of parties who may participate in Act 250 proceedings: statutory and permitted. Statutory parties include the applicant, state, municipality, and regional planning commission. Permitted parties include neighbors, local and statewide organizations and others who may be affected by the project or who may be able to assist the District Environmental Commission or Environmental Board.

Statutory parties may appeal Act 250 decisions to the Vermont Supreme Court. Permitted parties may only appeal to the Environmental Board.

Act 250 is an anomaly in this respect, since all other similar quasi-judicial boards like the Public Service Board, Water Resources Board, and even the Waste Facility Panel of the Environmental Board



offer recourse to judicial review to parties with legitimate interests. All Act 250 parties should be granted the same appeal rights, and Act 250 should be on par with other similar boards with respect to appeals.

ON-SITE SEWAGE DISPOSAL

Once again, the Legislature failed to move on comprehensive reform of Vermont's approach to managing on-site septic systems. However, as part of the "Bianchi" bill, which became law and is aimed principally at providing a 15-year statute of limitations for enforcement of municipal land use permits, a Septic Technology Impact Study was authorized. A study committee will look at the environmental and land use impacts associated with alternative technologies for on-site disposal of wastewater and report back to the general assembly by January 15, 2000.

DOWNTOWNS

A pair of House bills aimed at providing incentives for developing in downtowns were discussed this year. One that bears watching next year is H.475, held over in House Commerce Committee. The bill provides for municipalities to offer developers a number of incentives like tax credits and exemptions, priority loans, and rebates from certain fees to attract development downtown. VNRC is concerned with other provisions of the bill that allows exemptions from Act 250 review, limitations on neighbors appeal rights in local zoning decisions, and exemptions from state water supply and wastewater permits.

SPRAWL

Proponents of the downtown bill H.475 have asserted that it will help control sprawl. VNRC would like to see any downtown bill coupled with efforts to reduce development in the country side. Downtown development incentives are at best only half a solution, and that's assuming they work. There is little evidence from around the country that incentives alone can curb sprawl without simultaneous initiatives addressing development in suburban and rural areas.

One way to address sprawl that might work as a companion to the downtown incentive approach is to provide state funding for infrastructure—roads, water and sewer lines—only in downtowns and designated growth centers. Maryland has adopted this approach, known as "Smart

Growth", and Maine may consider a similar approach. State and federal funding programs must support downtown revitalization efforts and be diverted away from projects that induce suburban sprawl.

Another useful model for curbing sprawl comes from Oregon which has had Urban Growth Boundaries in place for over 20 years. Each municipality has had to draw a line around the land estimated it will need for growth over a 20-year period. By most accounts, this method has been successful at channeling development into the growth areas, without stopping growth. And the system allows for expansion of the growth areas when the need can be demonstrated.

WATER RESOURCES

The House Fish, Wildlife and Water Resources Committee drafted a bill attempting to delay adoption of the Vermont Water Quality Standards, a move that would have short-circuited the legislative rulemaking process and potentially weakened both the water quality laws and the rules proposed by the Water Resources Board. Although the bill passed the House, in one of the more contentious environmental votes of the session, it did not get to a vote in the Senate.

As a last ditch effort, the Chair of the Fish, Wildlife, and Water Resources enlisted the support of three other sympathetic Chairs of House and Senate Committees in a letter asking the Water Resources Board to withdraw the rules. The Water Resources Board agreed to hold off on having the new rules take effect until July 1, 2000, but decided to go forward with the rulemaking process with the Legislative Committee on Administrative Rules. At the end of the session, attached to another bill, a final parting shot at this issue passed both houses without much debate. Future Water Resources Board appointments would be subject to confirmation by the Senate. Although this was a non-controversial measure, it was a signal that assaults on water quality laws and rules would resume.

TAX SHIFTING

The concept of tax shifting was placed on the legislature's radar screen by the Vermont Fair Tax Coalition this year. In its report, "Tax Reform that Agrees with Vermont," the Coalition urged consideration of shifting tax policy, without increasing the overall tax burden, to reduce and



remove taxes on activities society wants to encourage like earning income, owning property, purchasing goods, and being employed, and placing taxes on activities we want to discourage

like polluting air and water, wasting natural resources, and engaging in environmentally damaging production and consumption practices.

The House Ways and Means Committee gave the issue some consideration, reviewing a bill to create a Clean Car Incentive Program. The program would give rebates to buyers of low-emission, fuel-efficient vehicles, while fees on the purchase of high-emission, gas-guzzlers would be levied to support the rebates. Thus, the program would have been self-financing and revenue neutral. Agriculture, small business and some others would be exempted from the fees.

In the end the Committee decided not to take it up this year, and a study of tax shifting proposed in the House fell short by one vote on the last day of the session.

Vermont is in a time of transition already because of the need to fund public school education in new ways. The issue of tax restructuring has actually begun with the shifting away from the property—making it partially income sensitive—and toward a collection of other taxes like the gasoline tax and motor vehicle purchase and use tax. In addition, Vermont places various taxes and fees on environmentally and socially harmful activities already.

Tax restructuring is on the political agenda in Washington and many states. In fact, several states use one or more of the tax structures recommended in the report "Tax Reform that Agrees with Vermont." And several countries with healthy economies such as Germany and the Netherlands have shifted their tax base to discourage environmental damage while encouraging economic growth.

What is needed now in Vermont is an approach based on encouraging the economy and discouraging harm to the environment.

HABITAT For All

BY KATHLEEN HENTCY

Susan Morse is no Pollyanna. She sees habitat destruction all around her, and she calls it that. She sees some species endangered with extinction and little or no political will to stop the loss. But in her work with Keeping Track, the non-profit organization she founded in 1995, she sees a diversity that would warm the heart of the most stoic conservation biologist.

"We have professors, doctors, lawyers, dairy farmers, loggers, environmentalists, anti-hunters and hunters and trappers going out on tracking workshops together," Morse says.

Regional conservation commissions hire Keeping Track to establish chapters in their area. Keeping Track provides the groups seven training sessions over a year-long program, during which volunteers learn to recognize signs of black bears, bobcats, otters, fishers, mink and moose. After completing the training program, the volunteers can then choose areas to monitor.

Each transect is monitored once during each season of the year. The groups monitor the five carnivore species because they are wide-ranging or require a diversity of habitats in order to succeed, and the moose because it is species expanding its population and range. In addition, the target species are good indica-

tors of habitat health, since they are sensitive to degradation and their populations are sensitive to a decline in habitat quality. By protecting the varied habitats these species require, the habitats of a large number of Vermont's plants and animals are also protected.

So far, this work of tracking the movements of five of Vermont's top predators, plus the stately moose, has drawn interest from a broad cross-section of every participating town's population—people who often disagree sharply at town meeting.

"But they get out there in the woods and they can find common ground," Morse says.

Since Keeping Track now works with 25 towns across Vermont and New Hampshire, there's potential for an impressive amount of common ground. To Morse, finding common ground is the key to conservation—of species, of resources, but most importantly, of habitat. Without habitat, of course, there is no home for species, none of the underpinning necessary for clean water, air and for other essential pieces of the ecological puzzle.

And until such agreement is found, urbanization of rural America will continue or accelerate, fragmenting and destroying the habitat that is left.

"There are 70 million people who are within a five hour commute of this place," Morse says, pausing to let that sink in. Seventy million people, many of whom





Bear claw marks on beech tree.

hold the American rural myth sacrosanct, who think "the country life" is for them. But all too many of us, once we leave our city comforts behind, decide maybe we should have most of those city comforts in the country; we should have paved

streets on which we can drive 50 m.p.h. or more, garbage pick-up at the curb, and cappuccino at the store in town. Soon, the roadsides between the new housing lots of six and 10 acres have sprouted furniture stores, clothing outlets and car dealerships. Not far in the future is a permit application from a "big box" retailer.

It is this sort of creeping urbanization that Morse sees as the threat to natural resources, and therefore to Vermont.

"But who's to say where we can develop and where we can't?" she asks. "I think the only way we can say fairly is to base it on science."

To base such decisions on science, however, communities need data on what species use the local habitats and how the habitats are connected regionally. That's where Keeping Track comes in. The organization works with some of the top carnivore biologists in the country in order to ensure scientific rigor in the field and in data interpretation.

But even with scientific data, there are those who insist that as long as they own

the land, they can do with it as they please. If we are to have habitat for wildlife and for the underpinning of the natural resources on which we depend, however, we must realize that we don't have the right to do whatever we want with land.

"For the same reason that civil rights transcend personal rights, I don't have that right," she says. "I don't have the right to deny another their right to life, liberty and the pursuit of happiness. Flat out, I don't have it."

Neither should we have the right to deny others their right to clean water, clean air, and a healthy environment, she says.

"There is a real need for every town, every county, every state and every country to start drawing lines for what is rural and what isn't," Morse says.

"It's the fundamental issue we need to pay attention to if we are to have a future."

VNRC has been hosting bi-annual workshops with Keeping Track for the past five years. Please contact Lisa Smith at VNRC (802-223-2328) or Lars Botzjorn at Keeping Track (802-434-7000) for more information.

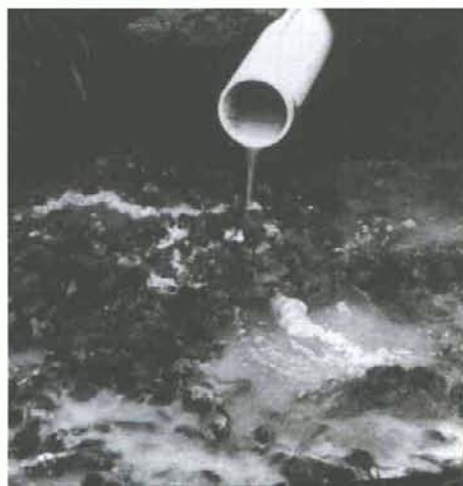
TIME FOR ACTION

Looking at using existing laws and state regulations to clean up Vermont's waters.

Vermonters care about clean water. In particular, we all cherish the unique natural beauty and ecology of Lake Champlain. However, for years the declining condition of Lake Champlain has been well documented and has been the focus of much study and debate. Due to the nature of the issues affecting the Lake, there has been very little direct, effective action to address the Lake's problems. Vermont farmers, urbanization, maxed out wastewater treatment systems, and hydropower development all contribute to the problem. And, vested interests which support these industries, and trends in these industries, conspire to create political gridlock.

In spite of this difficult political scenario, Vermont is approaching a cross-

roads where the public's will to clean up the lake will be tested. Polluters have been let off the hook for so long that opportunities for gradual, incremental changes in polluting behaviors have been lost. Now we are faced with a tough position which requires political courage and



concerted action. We all must ask ourselves—do we really want the lake cleaned up? If the answer is yes, as it is from VNRC, then we must take action now.

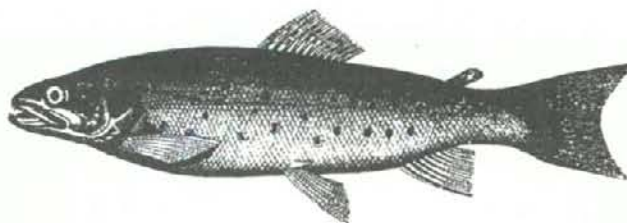
Despite Vermont's historic failure to clean up the lake, opportunities remain. Long ignored provisions of the Federal Clean Water Act of 1972 can serve as the basis for effective lake clean up actions. The Clean Water Act's water quality management planning provisions should provide the foundation for comprehensive watershed plans. It should include inventories of all current activities which cause water pollution regardless of the source and develop programs to control all water polluting activities. These plans should include broad public involvement in both their development and their implementation.

Recently, VNRC has called for the State to develop a schedule for updating all of its watershed plans within three years. So far, the Agency of Natural Resources has committed to updating them by 2006. Lake Champlain and its river watersheds should be a top priority for action. To be effective, the plans must

be based on a holistic view of the Lake's watersheds that recognizes the interrelationship between activities on land and water quality. The State must comprehensively assess water polluting activities and develop and implement effective programs to control pollution.

Other provisions of the Clean Water Act require the State to identify all waters that are so polluted that state water quality standards are being violated. Vermont has identified much of Lake Champlain in violation of mercury standards, phosphorus levels and other pollutants. As a result of this identification, Vermont must take action to correct the pollution under related provisions of the Clean Water Act. The State must develop clean-up plans known as Total Maximum Daily Loads of pollution. Through this process, Vermont must allocate the identified pollution among point and non-point sources and must include a margin of safety. The allowable loadings identified must then be implemented.

Agriculture has been recognized as the largest polluter of the Lake contributing phosphorus and additional nutrient pollution, bacteria, and other pollutants that flow from rivers and concentrate in the Lake. Furthermore, changes in farming in Vermont loom large on the horizon and will increase the pollution running into the Lake. Recent industry statistics high-



light the continuing concentration of farms in Addison and Franklin counties which are located in watersheds that flow into the Lake. Modern, large, dairy farms which rely on increased concentrated crop production and confinement of cows in concentrated feeding areas result in a greater risk of major water pollution. These farms fall within provisions of the Clean Water Act that require discharge permits and clean up of water pollution.

Vermont has the opportunity to proactively work with farmers to develop a very high level of industry practice that will avoid water pollution and clean up existing problems. Without action to address water pollution from Vermont's farms, the lake cannot be cleaned up to meet water quality standards.

Recent Environmental Protection Agency regulations implementing the Clean Water Act have also made clear that certain systems for collecting and discharging runoff from construction sites, roads, parking lots, and other developed areas must be reviewed under Federal dis-

charge permitting requirements. In fact, VNRC is aware of numerous Vermont developments which have been built without obtaining necessary permits. The Clean Water Act requires that stormwater runoff systems which cause violations of water quality stan-

dards must be reviewed under permitting programs. Similarly, construction projects that could result in a discharge to waters must be permitted.

Many of Lake Champlain's waters are the result of stormwater management systems. The provisions of the Clean Water Act requiring stormwater review provide a powerful tool for citizens and the state to address these important pollution problems. If the state fails to take action, citizens can make their voices heard by urging the Environmental Protection Agency to require the state to review these activities. As a last resort, citizens can ask federal courts to implement these provisions of the Clean Water Act to address the Lake's pollution problems.

Lake Champlain's problems can be corrected. However, to address the Lake's problems, Vermont must critically assess its commitment to clean water. If we don't act now, we may deprive future generations of the ability to enjoy Lake Champlain and the rivers that flow into it. Vermonters want clean water — now is the time to take action.

Recovery Plans for Vermont's Threatened and Endangered Species — **WHAT'S THE PROBLEM?**

Many of Vermont's species of plants and animals are facing serious decline due to habitat fragmentation, loss, and environmental degradation.

As Vermont's human population continues to grow, the diversity and richness of our state's natural communities are increasingly jeopardized.

While more than 500 species of plants and animals are considered rare in

Vermont today, this does not necessarily indicate that a species is threatened or endangered. Determining whether a Vermont species is threatened or endangered is a complex process requiring many layers of scientific and administrative oversight. According to Steve Parren, Director of Vermont's Nongame and Natural Heritage Program (a division of the Department of Fish and Wildlife), the process works like this:

1. A species is proposed for listing by any person or the Secretary of the Agency of Natural Resources (ANR) to the ANR;
2. The Endangered Species Committee assigns the species proposed for listing to a technical advisory group (there are mammal and flora technical committees);
3. A status review is prepared using state and regional information on the proposed species;
4. The advisory group determines if the species should be considered for listing;
5. The advisory group opinion is forwarded to the full Endangered Species Committee for examination;
6. If the Committee agrees with the advisory group opinion, it is

- forwarded to the Secretary of the ANR;
7. If the Secretary of ANR agrees that the proposed species be listed as T/E, the information is sent back to the Nongame and Natural Heritage division of the Department of Fish and Wildlife for rulemaking;
8. A hearing is conducted before the Administrative Rules Committee; the rule is adopted;
9. Modifications are made if necessary, and;
10. Survey work and recovery planning commences to meet the legislative intent of the The Endangered Species Act to accord protection for maintaining and enhancing the species.

As the breakdown above demonstrates, a tremendous amount of time, resources and energy are triggered when a citizen submits a request to have a species listed as threatened or endangered. Steps 1-9 are focused solely on the questions of whether a species should be listed, and if so, whether it should be listed as endangered (eg., a species whose continued existence as a viable component of the State's wild flora or fauna is determined to be in jeopardy) or threatened (eg., a species likely within the foreseeable future to become endangered). Currently, 195 species are on Vermont's list of endangered and threatened species. The breakdown looks like this:

Status	Plants	Amphipod	Insects	Mollusks	Amphibians	Reptiles	Fish	Birds	Mammals	Total
T:	91		3	3		1	2	3	1	104
E:	62	1		7	1	3	4	9	4	91
Total:	153	1	3	10	1	4	6	12	5	195

T= Threatened, E= Endangered (Source: Nongame and Natural Heritage program)

Threatened and endangered species all serve to inform the human community of the relative health of our environment. Endangered species have been called "barometers of ecological conditions." They tell us when the conditions around us are deteriorating. These are the very same conditions in which we live and

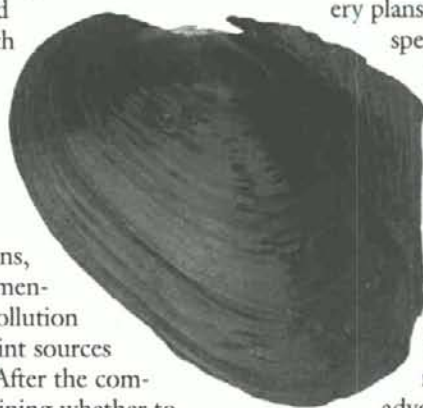


Left: Peregrine falcon chicks.

Below: Pink heel-splitter.

work.

At the time of listing a species as threatened or endangered, the problem is usually well understood by the various committees and biological experts which make the decision to list. The leading causes of threats to species stability include habitat fragmentation and loss, (eg., sprawl, subdivisions, clearcuts) and environmental degradation (eg., pollution from point and nonpoint sources in our water and air). After the complex process of determining whether to list a species, the hard work of developing and establishing conservation programs and/or recovery plans must follow. Unfortunately, Vermont's track record in this area is lamentable.



insect, mollusk, amphibian, reptile, fish, or amphipod have been completed.

Vermont's Nongame and Natural Heritage Program — while a talented group of biologists, zoologists and botanists — lack adequate staffing and funding on the issues of recovery plans, conservation programs, ecosystem management and priorities for protecting natural communities. The Secretary of the ANR is on the record as favoring development of recovery plans "so we can get those species back to health," yet

the rules for protection and conservation of such species — including conservation programs and recovery plans, are for all practical purposes, non-existent. VNRC is working to address this problem. Through statewide research, education, advocacy and collaboration with other conservation groups, VNRC is working to:

- Improve water quality in the Lake Champlain Basin which is habitat for the endangered lake sturgeon.
- Protect the Nulhegan River Basin — critical habitat for state endangered spruce grouse, endangered loons, endangered osprey and many rare plants.
- Restore adequate stream flows and safe fish passage to support the return of the Atlantic salmon and other fish to Vermont's waterways
- Collaborate with state biologists to increase the number of recovery plans for Vermont's endangered species.
- Coordinate with National Wildlife Foundation's Northeast Natural Resource Center a draft recovery plan for Peregrine Falcons — a state and federally listed endangered species.

RIVER RESTORATION THROUGH DAM REMOVAL

In 1809, Dr. Samuel Williams wrote about the salmon migration both into the Connecticut River and into Lake Champlain and its tributaries:

"In the spring, about the 25th of April, these fish begin to pass up the Connecticut river, and proceed to the highest branches. About the same time, or a little later, they are found in Lake Champlain, and the large streams which fall into it. So strong is this instinct of migration in the salmon, that in passing up the rivers, they force their passage over cataracts of several feet in height, and in opposition to the most rapid currents. They are sometimes seen to make six or seven attempts, before they can succeed to ascend the falls. When they are thus going up in the spring, they are round and fat, of an excellent taste, and flavour. From the first week in May, to the second week in June, they are taken in great numbers."

In 1853, Zadock Thompson in the History of Vermont wrote:

"The salmon, formerly very plentiful in nearly all the large streams in this state, is now so exceedingly rare a visitant that I have not been able to obtain a specimen to make a description for this work. They have entirely ceased to ascend our rivers, and only straggling individuals are now met with in lake Champlain."

Many dams were erected after 1809, and Thompson attributes the disappearance of salmon to these dams.

"The salmon and shad have probably been driven from our waters, chiefly by the erection of dams across nearly all our streams, which prevent their ascent to their favorite spawning places."

Today, despite efforts to restore salmon, natural reproduction in the Lake



Peterson dam on the Lamoille River.

Champlain basin in virtually nil, and only a handful of fish make it up the Connecticut into Vermont.

DAMS DEVASTATE RIVERS

A river system is a continuum. Downstream areas depend on upstream areas for a fresh supply of gravel, nutrients, and woody debris. Fish move upstream and downstream to spawn and feed and seek the most optimal habitat conditions during different temperatures and flows. Riverine species have adapted over time to a river's natural flow regime.

A dam is a barrier that breaks this continuum. A dam devastates habitat for many of the native species and blocks passage upstream for Vermont's migrating

fish like salmon, sturgeon, walleye, shad and others.

Water becomes stagnant upstream of a dam, and species that need flowing water die off. Impoundments which feed hydropower turbines often experience harsh drawdowns that prevent plants and aquatic life from inhabiting the normally productive shoreline zone.

In the case of hydropower dams, the river downstream runs almost dry when the project is storing water in the impoundment. Then, as operation of the project begins, water gushes downstream. Fish are not adapted to this harshly modified flow regime, and numbers and species are reduced or disappear completely. Dams also cut-off the supply of sand and gravel downstream. Poor substrate impacts the aquatic

insects and other creatures that fish feed on. Impoundments also warm up the water and reduce its level of dissolved oxygen fish need to survive.

New England has some of the highest densities of dams in the country. The Vermont Agency of Natural Resources estimates that there are somewhere between 1,500 and 2,000 dams in Vermont. About 100 of these are hydropower dams. Many of the dams in the state are old mill dams that are no longer providing economic or social benefits. In fact, cumulatively, they are a significant impact to fish habitat in Vermont rivers.

DAM REMOVAL:

A NATION-WIDE MOVEMENT

Nation-wide, citizens are re-thinking whether many of these dams make sense. On the Snake and Elwha Rivers in Washington, the Kennebec in Maine, the

Neuse in North Carolina and even the Glen Canyon Dam on the Colorado, dam removal is being considered. When public outcry ensued for restoration of the historic salmon run up the Clyde River in Vermont, the EPA ordered the complete removal of the Newport #11 dam. Now the stretch of river has been restored and successful spawning and hatching by salmon have been documented.

RIVER RESTORATION ON THE LAMOILLE

Historically, the Lamoille River, fourth largest tributary of Lake Champlain, was a renowned spawning tributary for Atlantic salmon, lake sturgeon and walleye. Atlantic salmon were extirpated from Lake Champlain by the 1830's; lake sturgeon are now endangered in Vermont; and walleye numbers have been substantially reduced.

For all these species, the first barrier they encounter migrating up the Lamoille is the Peterson Dam. Peterson was constructed less than six miles from the mouth of the river in 1948. It is now owned by Central Vermont Public Service Corporation and used for hydropower production. Not only does the dam block fish passage, it floods a series of cascades and rapids in a remote stretch of river. On most days, other than spring runoff and significant storms, the river below the dam virtually runs dry.

For more than six years, VNRC has been fighting for restoration of the Lamoille River. VNRC challenged a Vermont Agency of Natural Resources water quality permit that would have authorized continued operation of the four dams on the lower Lamoille (including Peterson) with meager water quality improvements. In 1996, the Vermont Water Resources Board rejected both the position of the Agency and the utility and denied the permit necessary for the dams. Unfortunately, the Board's decision was appealed by the utility. In the interest of preventing further litigation, the parties agreed to complete comprehensive studies of the project by October 1999 that the Agency will use to draft a new water quality permit.

VNRC, with the help of the National

Wildlife Federation and Trout Unlimited, will conduct a dam decommissioning study this summer. As part of the study, we will determine what the river was like before the dam and describe the habitat potential if the dam were removed. We will also work with the local community and historical society to document ways people used the river historically and their memories of the river. We are looking for old photos and documents that provide historic evidence of the river. Other study components include an economic valua-

tion of a restored Lamoille and an evaluation of the costs of dam removal.

Vermonters now have until October 31, 1999 to decide the fate of the Lamoille River for another 30 to 40 years. Will the Peterson remain in place continuing to block fish from their spawning grounds and preventing the cascades and rapids on the Lamoille from flowing once again? VNRC is committed to leading the fight to restore the Lamoille and bring the river back to life.

INTERN WORKING ON LAMOILLE PROJECT

This summer's Mollie Beatty intern is none other than Jeff Fellingner, Middlebury grad and Williston native, who worked for VNRC last fall helping to organize the hugely successful Green Space Conference.

Jeff will spend the summer working with Kim Kendall. He is developing the historical survey of the Lamoille River which will be used as evidence to support the need for improved water-flow regimes throughout Central Vermont Public Service's Lamoille River Hydro-Project. Jeff is looking for any documents, pictures, stories, etc. which would help him to compile further information for the survey. Any input you may have about the Lamoille River would be very much appreciated. Please contact Jeff at our Burlington office at 802-864-9600. Thanks!



VNRC SPONSORS DAM REMOVAL THINK-TANK

In light of the opportunities in New England and New York, VNRC in coordination with the Conservation Law Foundation and the National Wildlife Federation held a regional strategy session on dam removal. Advocates from across the region met for two days in Burlington to discuss legal, scientific, and financial strategies for dam removal. National groups including American Rivers and Trout Unlimited joined the discussion.

It was important for the group to address public opinion. Many communities become attached to dams in their towns because the cascade over the dam is attractive, and the impoundment forms a reflecting pool that people find pleasing. This scenario is not pleasing for most fish species, however, and public education is an important component of any dam removal project.

THE STORY OF VERMONT

By CHRIS KLYZA

In our new book (*The Story of Vermont: A Natural and Cultural History*, University Press of New England), Steve Trombulak and I tell the story of Vermont by tracing the geological, biological, and human forces that shaped and continue to shape Vermont. Each of these very different forces, working on very different time scales, interact to create the constantly changing Vermont landscape.

Our story is based on three main themes. First, landscape stories of particular regions need to be embedded within the context of larger regions. Many of the most significant changes to the Vermont landscape have been the result of policies or events or technological changes made beyond Vermont's borders. Furthermore, the natural world does not recognize political boundaries. Hence, we put the natural and cultural history of Vermont into this larger context, stressing ecoregions and tracing important decisions

made beyond Vermont.

Furthermore, Northern Cartographic in South Burlington created seventeen new maps specifically for this book to help us illustrate this theme.

Third, the Vermont landscape—like any landscape—is constantly changing. Rather than focusing on a static account of the different species that inhabit Vermont, we focus on the dynamic human forces, such as clearing the forest and building interstate highways, and natural forces, such as ice sheets and species migrations, to understand the natural communities that constitute the ever-changing Vermont landscape.

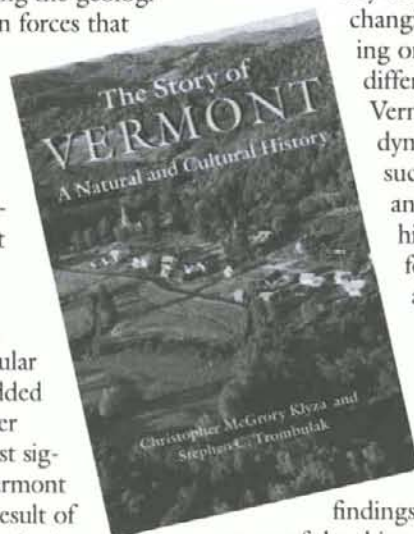
Based on our findings, we conclude that many of the things we treasure most about Vermont—the vast forests, the dairy farms, the burgeoning moose population—are not due to explicit policy decisions, but rather are due to the contingencies of history.

The decline of farming in Vermont and

New England led to the return of the forests, refrigerated rail cars and trucks made the sale of milk to Boston and New York feasible, and improved habitat allowed for the return of the moose. If we want to protect the Vermont landscape of today, however, we need proactive policies that provide as much flexibility as possible for dealing with the unknowns that are sure to come.

We close the book with visions of three potential Vermont landscapes in 2040: (1) a Vermont based on current trends, with more people and development, with less farmland and less wildland; (2) a Vermont based on hyperdevelopment, in which the landscape would be much more like that of southern New England; and (3) a Vermont based on clearly delineated dominant use zones—urban centers, working farms and forests, and wild natural communities. To achieve this final vision, the one we support, we all need to engage in and defend vigorously efforts at long-range planning for our communities and the conservation of wild nature.

Chris McGrory Klyza teaches political science and environmental studies at Middlebury College. He lives with his wife and two daughters in Bristol.



THANKS TO A LONG-TIME FRIEND

Lifelong learning is very important to Architect Dick Kellogg. When we asked our friend if he would be willing to pull out the drawings he did nearly ten years ago and revisit the addition to VNRC's home in Montpelier, he was delighted. When we asked if he could design it in as environmentally friendly way as possible, he replied even more enthusiastically that not only would the project be more interesting with the extra challenge of learning about "green" design, but that he would also use this project to improve his proficiency with a new computer graphing program.

For nearly 20 years Dick has been the sole proprietor of an architectural firm in Burlington. He brings vast experience

working on both new construction and historical buildings. Recent projects include everything from private residences on Shelburne Point to the Lawrence Barnes Elementary School Playground in Burlington to a renovation of the Huntington Town Hall.

Dick's strong sense of community is evident in everything he works on. He has spent hours volunteering his time to help improve a playground, school or non-profit organization. Dick's work on residential buildings reflects a sensitivity to the community by reusing old barns, developing additions that look like woodsheds from the outside with an interior



that is an acoustically designed music room, or additions like ours that will look more like a sunporch than new office space. All of the projects are in keeping with the aesthetics of the neighborhoods where they are located and help preserve the scenic beauty that makes Vermont special.

We cannot thank Dick enough for his infinite patience and creative spirit as we fine tuned the drawings to meet all the different interests. For all the evening meetings with committees, discussions about "greener" materials, and general availability to help as problems arose, we thank you.

Dick Kellogg can be reached at his office in Burlington at 802-862-3564 or kellogg@richardw.worldnet.att.net.

CULTIVATING NEW PARTNERSHIPS: EDUCATION FOR SUSTAINABILITY

What skills and knowledge do people need to live sustainably in the 21st century and beyond? What resources exist in Vermont's schools, communities and businesses today that are in harmony with this vision of sustainability?

These gritty questions, and more, were posed at dozens of living-room meetings early this year as part of the "Cultivating New Partnerships: Education for Sustainability" project. Launched by the Vermont Statewide Environmental Education Programs (SWEET), the project focuses on ensuring that Vermont state educational standards reflect Vermonters' values regarding community sustainability. VNRC board members hosted two of these lively forums on what Vermonters want our schoolchildren to know.

Based on citizen input, SWEET and its partners will recommend several changes to the standards this fall, emphasizing sustainable decision-making, understanding community and sense of place, and natural resource planning.

CELEBRATE THE WINOOSKI, SATURDAY, SEPTEMBER 18TH, 10 AM - 2 PM, DOWNTOWN MONTPELIER

Bring the whole family to learn about river pollution prevention, see sculptures created from river trash, enjoy live music, theatre, poetry readings, face painting and origami — and join in the parade!

For more information or to volunteer for September 12 river clean-up call Freddie Cousins at 223-7329.

MANY THANKS TO CAROL AND MATEO



Carol Moses, a summer volunteer in the Burlington office, is a full-time student at Champlain College. She will receive her BS in Business Management in December, 1999.

Carol has a strong interest in environmentally-friendly products and services, which she developed through many years in the natural foods industry. Upon graduation, Carol would like to combine her skills and education with ecology in a business which promotes the sustainable use of the earth's resources. She lives in Charlotte with her husband, Brad, and two wonderful dogs, Max and Aly.

Mateo Kehler is a full time student at Long Island University's Friend's World College, an international experiential learning program which takes as it's curriculum the world's most urgent problems. Mateo is working towards a degree in International Political Economy and is particularly interested in the relationships between trade, environment and the distribution of wealth within and between countries.

Mateo has been working on updating VNRC's 1995 report entitled, "The Valuable Role of Citizens in Act 250" in anticipation of a renewed legislative assault on Act 250's public hearing process.

He lives in Greensboro with his wife Angela.



HEADS UP

If you're concerned about Act 250, Vermont's landmark land use and development law, you might want to check out two important efforts getting underway this summer.

- A House Act 250 study committee will begin meeting this summer to come up with draft legislation by January 2000.
- The Vermont Environmental Board may begin rulemaking this summer affecting issues such as party status and presumption of compliance in Act 250 for state and local permits.

ALTERNATIVE SEPTIC SYSTEMS—LAND USE IMPACTS STUDY

This summer, a legislative committee will be looking at the land use and environmental impacts of possible rules for alternative on-site sewage disposal systems (eg. waterless toilets, constructed wetlands, etc.). Legislation may follow next year.

Look for more details in VNRC's next Bulletin or contact Steve Holmes or Lisa Smith at VNRC for more information.

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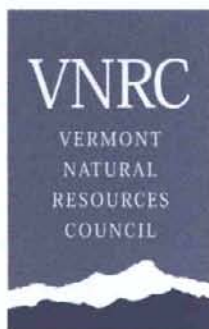
Join VNRC!

Help the leading statewide environmental group preserve Vermont's valuable resources! We have a \$20 introductory rate, with a regular membership of \$35.

**Call us at (802) 223-2328
in Montpelier
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Please return this form to:
VNRC, 9 Bailey Avenue,
Montpelier, VT 05602
E-mail: VNRC@together.net

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VNRC's 'GREEN' ADDITION

For the past 13 years VNRC has lived on the corner of Bailey Avenue and Baldwin Street. Over the years, the organization has grown and the number of staff has increased. Yet since the building was purchased, the need to make better use of the space has been clear. In fact, architect Dick Kellogg was on the VNRC Board of Directors from 1987 to 1992 and during that time offered to help design an addition. For one reason or another the project was shelved—until last year.

After searching Montpelier for another location to accommodate the organization, it became obvious that the close proximity to the State House was integral to the success of VNRC as a leading conservation advocacy organization in Vermont. The Board and Staff decided that it would be more beneficial to improve our space than to move to a different part of town.

Once again, Dick Kellogg stepped forward to help VNRC develop plans to expand our office space. In September of 1998, Dick revised old drawings and unveiled plans to demolish the garage—an “eyesore” to the community—and rebuild in its place new offices and meeting space that would take advantage of solar gain and utilize environmentally friendly materials. He also reworked some of the interior space to improve efficiency and

make the building more accessible.

The new construction incorporates passive solar design on the southern side of the building. If funding can be secured, we will also install photovoltaic panels on the south facing roof which can be conveniently masked behind the decorative railing. Our goal throughout the process is to create a space that is comfortable and healthy for the staff to work in. This means that we will use low VOC (volatile organic compounds) paint, and skip carpeting in favor of tile or wood floors. We will reuse material wherever possible, use timber from Vermont that is certified to be harvested in a sustainable manner, take advantage of products like insulation with a high recycled content and many other innovative materials.

Watch for future articles that discuss in greater detail the alternative materials we will be using in the construction of this addition. Please feel free to stop by and take a look—we hope that this project can be used as an example for others who are contemplating “green” construction projects.



Demolition of “eyesore” opens door to environmentally friendly reconstruction.