

Vermont Environmental Report

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I-93 STILL UNRESOLVED

At press time, the Second Circuit Court had not ruled on an appeal filed by VNRC, the Green Mountain Grange No. 1, the Vermont State Grange and four St. Johnsbury farmers of a lower court action denying their request for a temporary restraining order to halt construction of I-93 near St. Johnsbury. The Court has scheduled a hearing for March on the appeal. It will also rule on a motion filed by the Agency of Transportation to dismiss the appeal.

Representative Maurice Arnold of Whiting introduced a bill in the Vermont Legislature to stop construction of the highway. The bill was referred to the House Transportation Committee.

Meanwhile, construction crews have begun pouring concrete for an underpass on the site of the proposed interstate.

THROWING COLD WATER ON HIGH HYDRO HOPES

"Is this State for hydro power? Sure, like we're for motherhood and apple pie," quipped Public Service Board Chairman Richard Saudek. "The fuel is free and the resource is indigenous," he said, "but our enthusiasm is tempered by the fact that we see no way that small, in-state hydro facilities can replace larger, more economical sources of power." Saudek called for a more "hard-headed" look at Vermont's water power potential. "Let's stop talking about 350 megawatts of untapped power. Let's admit that many sites are too small to be of value," he said.

Saudek was addressing a December 3rd conference on hydro-electric power co-sponsored by the Vermont Natural Resources Council and the Public Service Board. Despite plummeting temperatures and blowing snow, more than 200 people packed (Hydro Hopes, Page Two)



Weather Vanes, Windmills or Wind Turbines

Richard Mixer

As Vermonters wrestle with the problem of reducing our dependence on oil, we repeatedly discover that there are adverse environmental impacts associated with almost every known substitute. Two Vermont utilities have been awarded grants from the Department of Energy to construct 160-foot high meteorological towers on Stratton Mountain in Stratton and on Lincoln Ridge in Lincoln for the purpose of testing the potential for wind-generated power. The project was welcomed in Stratton, but in Lincoln it sparked a storm of controversy. In this article, Richard Mixer, an environmental consultant, says that weather and topography make wind power particularly appropriate for Vermont, that the environmental problems are relatively minor, and that in any case, we should neither condemn nor condone wind energy until we've acquired the data we need in order to make an intelligent decision.

(Photo: A wind turbine generator in Boone, North Carolina)

Vermont pioneered in using the wind to generate electricity. In 1941, Palmer Cosslett Putnam, with the backing of the General Electric Company, the Central Vermont Public Service Corporation, and the S. Morgan Smith Company, built a 120-foot tall wind generator on Grandpa's Knob near Rutland. The Smith-Putnam Project, as it was called, was at that time the largest wind machine ever built. With two 66-foot long blades, it could produce up to 1.25 megawatts of power.

The wind machine operated for 1100 hours, but it was plagued by equipment failures. World War II intervened, and the project was shut down for good in 1945. However, the Smith-Putnam Project gathered considerable data on Vermont winds during its test period.

Forty years later, the federal government is taking a second look at wind power. The U.S. Department of Energy has developed a program which includes assessing wind speed and direction, designing small and large wind turbine generators, and constructing and testing different kinds of machines.

Vermont has a high wind energy potential because of its 44-degree latitude and its mountainous terrain. Climatologists

call the prevailing westerly winds "the Roaring Forties." When westerlies blow in from Canada and the Great Plains, they are compressed by the Green Mountains. The wind picks up considerable speed as it passes over the peaks. Data from the Smith-Putnam Project and from more recent studies show that there is a definite correlation between elevation and mean annual wind speed (Table 1).

Obstructions on the ground also affect the flow of wind. Trees, buildings and other surface variations create turbulence which changes the normal speed and direction of the wind. Therefore, to ensure constant wind speed and direction, the generator must be above tree height.

The wind's presence is much

more apparent in cold weather. Does it really blow stronger and longer in the winter, or do lower temperatures just make it appear so? A typical Vermont wind speed curve (Figure 1) shows that historically, Vermont winds blow 55% faster in March than in July.

The air's moisture content is another important consideration. Have you ever wondered about the rime ice that coats every twig and every needle of every tree above 2500 feet in elevation during the winter? The ice is caused by water in clouds which condenses and freezes on foliage when the clouds flow past the mountain. The ice builds up as the winter wears on, and it can become quite thick under certain conditions.

(Wind, Page 8)

Table 1

Elevation and Mean Annual Wind Speed (preliminary estimates)

Elevation(ft.)	Mean Wind Speed (mph)	Power Density*
1000	13	232
2000	16	427
3000	19	705
4000	22	1050

*In watts. Power density equals the potential electrical output per square foot of blade surface.

Environmental Law Conference

Are all Environmental Issues Really Economic Issues?

"If we could get cheaper electricity for New York by exporting all our pollution to Vermont, we would do it," said Professor Richard Bower. Bower teaches finance and economics at Dartmouth's Tuck Business School. He also serves on New York's Public Service Commission. He said that his responsibility as a Commissioner was to get the lowest electric rates for the people of New York, and if that meant sending acid rain to Vermont, that's what he would advise the utilities to do. "The only thing that would stop us from doing it is if there were a fine or a law against it," he said. "That's why we cannot have a free market system and still protect the environment."

Bower held up the "pro" end of a debate over environmental regulation at the Third Annual Environmental Law Conference. The conference, co-sponsored by the Vermont Natural Resources Council and the Vermont Law School, took place in Killington, Vermont, on the second Friday in December.

Richard Bower responded to the conference theme, "Environmental Protection: Is Regulation Working?" by arguing that regulation must play an important role in natural resource management but that lawmakers should be more judicious about *where* and *how much* they regulate. He said the failure of environmentalists to analyze the relative costs and benefits to society of regulation accounts for the "war" between economists and conservationists. "As we try to produce more and more goods, we also

produce more and more 'bads' (environmental problems that go along with increased production). "The problem is achieving the highest level of satisfaction, and it always involves trade-offs."

Dennis Logue, who teaches business administration at the Tuck School, thinks that "all environmental issues are really economic issues." He claims that the practical effect of regulation is to freeze present technology rather than to allow experimentation with different alternatives which might in the end yield better results.

"Progress means allowing people to make choices," Logue said. He argued that zoning was one area where there was very little difference between the results of regulation and the operation of the free market. "There are no zoning regulations in Houston, Texas," he said, "but you don't find bowling alleys in the midst of residential areas." On the other hand, despite strict zoning in Ohio, "you can drive from one side of the state to the other without ever leaving a K-Mart parking lot."

Richard Brooks, Director of the Vermont Law School's Environmental Law Center, wrapped up the debate with a staunch defense of environmental regulations. He maintained that they differ from other kinds of regulations because they concern problems of health which "cannot be reduced to a production possibility analysis." Environmental regulations also reflect more than the present interests of the people. They aim to protect future generations and they help shape



Dennis Logue argued that "progress means allowing people to make choices."

Photo by MM

future preferences. Brooks tagged Richard Bower as "the most dangerous kind of conservative" and said that he "should feel morally-bound, if he doesn't already, not to export New York's pollution to Vermont." Brooks said acid rain could not be treated merely as "a problem of ill-defined property rights."

The theme of regulation versus deregulation was woven into afternoon seminars on hazardous wastes, land use planning, energy, and air and water pollution. There were lively discussions in every session, enhanced by the morning's thoughtful presentations and by the free interplay of economic and environmental perspectives. MM

Hydro Hopes

(Continued from Page One)

Montpelier's Pavilion Auditorium for the day-long conference.

The recent surge of interest in hydroelectric generation probably accounts for the large turnout. According to Richard Saudek, not a single hydroelectric facility of any significance has come on line since 1952. Now, suddenly, there are thirty-one projects involving more than fifty dams under serious consideration.

"We are in the process of allocating two sources of energy (water and wood) which have not been used for that purpose for seventy years," said Agency of Environmental Conservation Secretary Brendan Whittaker. He pointed out that most of Vermont's forests are privately-owned, but most of its waterways are public property. That gives the State more control and, therefore, more responsibility, for the development of this resource. "In theory, the fuel for hydro power is free," Whittaker said, "and there are no radioactive wastes and no nitrate or phosphate emissions. But there are major ecological impacts when flowing water is blocked and diverted." A power dam can affect water quality, fisheries, sewage treatment plants, and recreational use of surface waters. Whittaker urged the members of the audience not to forget "the great progress we have made in restoring Vermont's lakes and rivers to their natural condition" in the rush to develop the state's hydroelectric potential.

Whittaker and Saudek compiled a list of fifteen developable hydro sites which have what they consider to be a "minimum of mitigating environmental factors." The largest of the sites - Ball Mountain - would yield only twenty megawatts while the combined total for all fifteen sites is about seventy megawatts - less than one-tenth of Vermont's total electrical energy needs. "We could generate more than seventy megawatts of power, but the environmental costs would not be worth it," Whittaker said.

"Gosh, it's hard to say this," Whittaker admitted as he dashed the widely-cherished hope that Vermonters could "live off the land" by relying on home-grown hydro. "The environmental costs of small-scale backyard hydro are as great as the costs of large-scale projects, even though they do not contribute to the power grid."

Saudek's and Whittaker's cautious remarks set the tone for the day. Many of the speakers who addressed the conference in the morning or who participated in the afternoon forum suggested that the current infatuation with hydroelectric power has blinded us to some of its environmental and economic drawbacks. Brendan Whittaker said he hoped the conference would be a "benchmark on the way to a more sophisticated attitude" toward hydro power. MM

Vermont is "No Grandma Moses Painting"

"No other environmental issue has more potential for creating a mass movement than the hazardous waste issue," said Mark Lapping, outgoing Chairman of the Board of the Vermont Natural Resources Council.

Lapping gave a "critical assessment" of Vermont's environment at the Third Annual Environmental Law Conference co-sponsored by VNRC and the Vermont Law School. He thinks incidents such as Love Canal, which "affected working class people with no options," could transform environmentalism from a "liberal, elitist" movement into a popular revolt.

So far, few toxic waste dumps have been found in Vermont, but if more are, the state may be unable to protect itself from the well water contamination that often goes along with hazardous waste dumping. Lapping called ground water contamina-

tion one of Vermont's most "insidious" environmental problems. He said management of the resource is hampered by "archaic" laws which give property owners absolute control over everything on, over, and under their land, including ground water.

Lapping also stressed the need to stop the steady attrition of Vermont's agricultural lands. He said the real threat to farmland is not Pyramid Mall-size developments but a "breakdown of the zoning board and planning commission process."

"We nickel and dime our farmland to death," he said. Town selectmen routinely grant "variances," or exemptions from local zoning ordinances, to small developers. "It's almost the exception to the rule when a variance isn't granted," Lapping said. He recommended that Governor Richard Snelling's order, which

requires consideration of the agricultural impact of any State-sponsored construction project, become law. He also said the law should be administered by the Agriculture Department rather than the Executive Department.

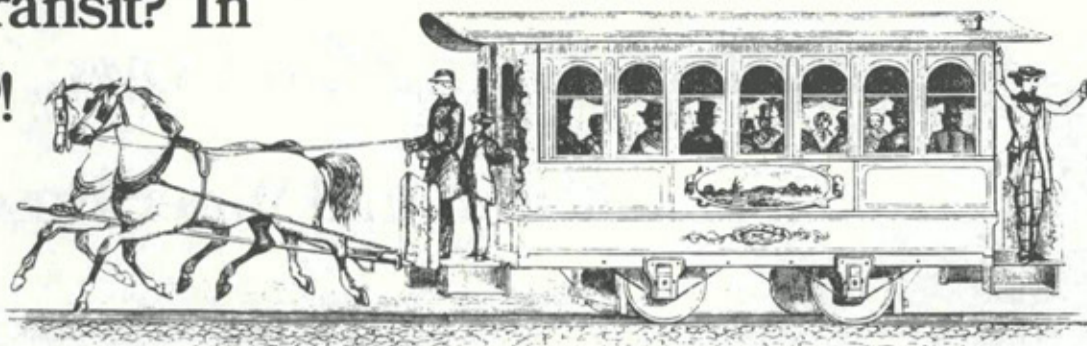
Lapping urged a hardheaded and realistic appraisal of the state's environmental problems. "The idea that this is Vermont Life country is one that we should keep denying because it's unhealthy," he said. Lapping pointed out that Vermont's population has cleared the 500,000 mark and that it now has a "real city" within its borders. At the same time, Vermont has one of the lowest per capita incomes in the nation. "We don't live in a Grandma Moses painting," he said. MM

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Mass Transit? In Vermont?!

"... the 'masses' being transported are discouragingly few and far between. . . ."

Susan Clark



The term "mass transportation" calls up images of commuter trains, crowded subways and intricate bus loops with pick-ups every five minutes. In rural states like Vermont, however, the "masses" being transported are discouragingly few and far between. Large-scale mass transportation systems which work in more urban areas do not necessarily work in Vermont. The most successful solutions to this state's transportation problems have been smaller systems which are more oriented toward individuals than toward "the masses."

Large-scale mass transit does not work well in rural states because there are too few people going to the same place at the same time. The Vermont Department of Transportation recently completed a preliminary report on the possibility of running a commuter train on some of the existing State-owned railroad tracks. The study showed that a line between Vermont's two largest cities -- Burlington and Rutland -- was the most feasible, but that even this line could not pay for itself. Trains are catching up with busses in terms of fuel economy as the price of gasoline continues to rise, but at this point, train systems are still more expensive to set up and operate. "You need high volumes of people for a system like this," says Robert Merchant of the Transportation Agency, "and there is a limited demand now."

Even the Chittenden County Transportation Authority cannot pay for itself. The CCTA has served Burlington, South Burlington, Winooski, and Essex Junction since 1973. Ridership has increased steadily, and the Authority receives the smallest federal subsidy per passenger of any bus system in Vermont. But the CCTA still receives fifty per cent of its funding from federal and town subsidies.

Four years ago, the Rutland Regional Planning Commission began a mass transit system under a grant from the Federal Rural Demonstration Program. Called "the bus," the system serves Rutland City, Rutland Town, West Rutland and Proctor. "At first, we were just trying to see whether or not we could stay alive," says Mark Blucher, Assistant Director of the Planning Commission. But after operating for two years under a full federal grant, the program is now running on a combination of federal and local funds and riders' fares.

The directors of the program

designed "the bus" to meet Rutland County's special needs. They found that the most likely users of mass transportation in their community were not daily commuters, but mid-morning to mid-afternoon riders, such as shoppers and clients of local human service agencies. They adjusted the bus schedules accordingly and many local agencies, such as Rutland Mental Health, have contracted with "the bus" to carry their clients.

This sort of small-scale system, specially fitted to individual needs, works best in Vermont. Whether encouraged by federal or state funding, or working strictly as private enterprises, small-scale mass transportation systems are springing up all over the state.

Lee Perkins heads up a three-year-old car and vanpooling program for the State Energy Office. This program, which moves only five to fifteen people in any given vehicle, has spread to all four corners of the state. Perkins estimates that at least 4000 carpools have resulted from the program, and that there are at least 100 vanpools in Vermont today.

Most vanpools are made up of groups of people who work at the same company; in fact, some are company-operated. Vans can be purchased or leased by a company, a vanpool group, or a private individual. The State Energy Office and the Agency of Transportation will supply a van to any group participating in their Vanpool Loan and Guaranteed Payment Program. The riders pay ten per cent of the cost of purchasing, registering and insuring their van, but they can take up to four years to pay back the remainder of the money. Furthermore, if a vanpool disbands during its first year of operation, the program will cover ninety per cent of the pool's financial losses.

Perkins and his partner, Mark Niemiec, try to be available at all times to advise and support pooling projects. The sign posted on interstate highways reading "Carpool-Vanpool Info: Call 1-800-642-3281" advertises a hotline to their office, and they pride themselves on being willing to meet with pooling groups twenty-four hours a day, 365 days a year, anywhere in the state. In addition, they have begun a program which will provide an extra monthly allocation of gasoline to stations which supply vanpools. This program will ensure that vanpools have adequate fuel in the event of a gasoline shortage.

Even with all of these incentives and safeguards, however, the only way to recover vanpooling costs is to collect fares, and the only way to start up and successfully run a vanpool is through voluntary, individual participation.

Perkins uses what he calls "the marketing approach" to encourage people to use his program. Not everyone is moved to use mass transportation because it is energy-saving, convenient, socially enjoyable, safe or patriotic. However, "everyone," says Perkins, "is stimulated by money."

"Vermonters are independent people," says Perkins. For many, a car is a symbol of success, and the drive to work is a time for enjoying feelings of privacy and power. However, Perkins points out that vanpooling saves commuters money and gives them greater financial independence.

There are privately-funded mass transportation businesses in Vermont, too. Joe Pechie runs his own bus company out of Bristol. His small, second-hand school bus carries more than twenty passengers, and Pechie does all of the driving. Fares from two daily round-trip runs between Bristol and Burlington, plus driving a busload of kids to the roller skating rink every Friday night, have kept Pechie's business going for three years.

Kevin Endres of Milton also runs a small bus company. He began his four-bus enterprise in August, and it serves as a charter service for local schools and community organizations. But he is "looking down the road" to a commuter bus run between Milton and Burlington. Endres says the answer to the rural mass transportation problem is "guys like me."

On the surface, mass transportation appears to hinder individual freedom, cramp schedules and circumscribe lifestyles. But a closer examination reveals that the economy of a well-planned mass transportation network leads to more independence, especially in a spread-out rural state like Vermont. With this fact in mind, Vermonters are designing mass transportation systems to fit their individual needs, and their individual, independent efforts make up the driving force of successful mass transportation in Vermont.

Susan Clark, a student in the University of Vermont's Environmental Studies Program, wrote this article during an internship with the Vermont Natural Resources Council.

Calendar

Saturday, February 14

Third Annual Well-drillers Workshop, sponsored by the Department of Water Resources and Environmental Engineering and the Vermont State Geologist, at Vermont Technical College in Randolph. The focus of the workshop will be scientific methods of finding water and improving well yields. For more information, call Jim Ashley at 828-2761.

March 15 through March 21

National Wildlife Week. See the Council Page for details.

Saturday and Sunday, March 28 and 29

The Third Annual New England Environmental Conference at Tufts University, sponsored by the Lincoln Filene Center for Citizenship and Public Affairs. The conference will include between thirty and forty workshops on current regional environmental problems. Call or write Nancy Anderson, New England Environmental Conference, Lincoln Filene Center, Tufts University, Medford, Massachusetts 02155, (617) 628-6385.

News&etc.

APPROPRIATE TECHNOLOGY

Grants of up to \$50,000 will be awarded under the Department of Energy's Appropriate Technology Program for New England to fund energy-related projects using small-scale technologies "appropriate" to local needs, skills and available energy resources. Individuals, small businesses, public interest groups, state and local agencies and Indian tribes may apply. The deadline for filing applications is March 19th, and awards will be announced in the fall. For more information, call toll free (800) 343-6388 or write A.T. Program, U.S. Department of Energy, 150 Causeway Street, Boston, Massachusetts 02114.

CONCERNED ABOUT CHEMICAL WASTES?

Are you feeling the need to fill in come gaps in your knowledge of the subject of toxic and hazardous wastes? You can make a good beginning by perusing *The Toxic Substances Dilemma*, a 123-page handbook put together by the National Wildlife Federation. It covers the causes, effects and clean-up of chemical dumps in plain English, and it includes chapters on how you can spot high hazard-potential wastewater discharges in your neighborhood. For a free copy of *The Toxic Substances Dilemma*, write to Department TD, National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20036.



During the notorious "snowless" winter of 1979-80, many Vermont wells went dry and stayed dry even after they were blanketed by several feet of snow late in the season. In October, 1980, an "underground stream" bubbled to the surface in Springfield, Vermont. It cracked foundations, forced two families to evacuate their homes and buried a local business under hundreds of tons of silt before it was cornered and subdued. This spring, the Vermont Agency of Transportation will release a study of what happens to road salt when it leaves the road and how much of it ends up in our drinking water. All these incidents are related. The common element is ground water, one of Vermont's most important -- and least understood -- natural resources.

By every measure, we are becoming more and more dependent on subsurface water. About half the nation's population uses underground water supplies. The percentage is highest in rural states, but more and more municipalities are turning to this source because of its purity and steady supply. Forty to fifty per cent of Vermont's population relies on ground water even though most of its urban areas draw water from surface sources.

Ground water is not the same as surface water, and the differences are important. When water falls to the earth as rain or snow or fog, it percolates downward and fills up pores and cracks in the rocks which make up the earth's crust. Some rocks have more cracks and therefore hold more water than others. Porous rocks like gravel and sand carry large volumes of water rather easily, while clay and bedrock restrict the flow of water. A layer of rock that carries water is called an aquifer, and one that impedes the flow of water is called an aquitard.

When water flowing downhill underground is confined between two aquitards, pressure builds up which may force the water to the surface, creating an artesian well. Artesian wells (or springs) provide some of the state's best drinking water, but they can also cause mischief. Last fall, when the owner of a tire store in Springfield began digging into the bank behind his business, water streamed out of the bank and began eroding the soft surface soils nearby. The stream turned into a torrent which rushed downhill and carried a fair amount of real estate with it. No one knows exactly what caused the torrent, but it may be that excavation behind the tire store broke through an aquitard, opening a pocket of pressurized water.

The Springfield spring confounded local citizens and had both hydrologists and geologists scratching their heads, but aquitards and artesian wells are common throughout New England. Most of the region is underlain by a thick, dense layer of metamorphic and igneous rock. This crusty core can block or divert the flow of water, creating an aquitard or an artesian well, but it can also serve as an aquifer. Even relatively impermeable rocks like granite carry some water in fractures and

What's Going On Down There?

Vermont's Ground Water Resources

Ninety per cent of the world's fresh water supply lies below the ground. Ground water is one of our most abundant and important natural resources, but tragedies like Love Canal demonstrate that we aren't doing enough to protect it, and severe shortages in the West remind us that subsurface water is abundant, but not unlimited. Vermont has a good supply of potable ground water, but we are not immune to the quantity and quality problems that plague other parts of the country. This is the first in a five-part series on ground water prepared by the Vermont Natural Resources Council under a public information grant from the Environmental Protection Agency.

joints which were created after the rock was formed. Most of Vermont's wells tap into these bedrock aquifers.

There is another type of aquifer in some of the state's river valleys, made up of more permeable sand and gravel soils which were deposited by the glaciers during their most recent visit. These "younger" unconsolidated aquifers are less common than bedrock aquifers, but they are much more popular. Because sand and gravel aquifers are closer to the surface, they can be tapped without extensive drilling. They yield a higher volume of water (fifty to two thousand gallons per minute compared to five to ten gallons per minute from the average bedrock well), and the water contains fewer minerals because it hasn't been in the ground as long. But the same features which make unconsolidated aquifers attractive to developers make them less able to withstand high density development. Permeable soils carry a high volume of good quality water, but they also permit rapid infiltration of pollutants from the land surface and from nearby lakes and rivers.

A polluted lake or stream can contaminate local aquifers because there is a continual exchange of water between the surface and the subsurface. Like rainfall, surface water percolates down through the soil and lodges in nooks and crannies in the rock. Like surface water, ground water runs downhill. It moves much more slowly -- its speed is measured in feet per year -- but it can travel many miles below the surface of the earth. Some of it lodges in impermeable layers of rock, but most of it eventually seeps into a swamp, runs into a river, or springs up as an artesian well. Thus ground water helps maintain the level of lakes, streams and rivers during dry spells.

All veterans of mud season know that there is an annual cycle of high and low water in Vermont. The water table reaches its highest point in April or May, just after the spring thaw. It declines throughout the summer when growing plants drink up the moisture in the soil before it trickles down to the water table. In the fall, the trees lose their leaves and other plants die off and the water table begins to rise again.

An abnormally dry fall followed by a relatively "snowless" winter caused wells to go dry all over Vermont in 1979-80. Because of the light snow cover, the ground froze much more deeply than usual. When the snow finally arrived, it was too late to do much good. Most Vermonters had to wait until the spring thaw for melted snow to replenish their thirsty wells.

Some western states are literally running out of ground water because they do not receive enough rainfall to replace the water taken from the ground for irrigation, industrial and household uses. Most northeastern states receive plenty of rainfall. Vermont gets thirty to forty inches of rain per year. It has a small population, few industries and very little

irrigation. Most of its urban areas draw their water from surface sources. Generally speaking, Vermont's only ground water quantity problems stem from occasional droughts and from interference between neighboring wells.

Quality, not quantity is Vermont's most serious ground water problem. Nearly everything that happens on the earth's surface can contaminate the ground water. And once an aquifer is contaminated, it is extremely difficult to clean it up, even after the source of contamination is removed. Ground water is better protected than surface water from pollutants carried by air, rainfall, and storm water runoff, but it is not exposed to the wind, sunlight, and rapid stream flow which help purify lakes, streams and rivers.

Private cess pools and septic systems are significant sources of ground water contamination in Vermont. These systems use soil to remove bacteria and some organic and inorganic chemicals from wastewater, but contamination can occur if the soil is too porous or too impermeable, if the leachfield is too close to the water table, or if the septic system is poorly constructed.

Municipal sewage treatment plants are not necessarily any safer than private septic systems. Most central treatment facilities in Vermont separate solid from liquid wastes just like a septic tank does. Treated liquid wastes are discharged into the river, and solids settle into the bottom of the tank. But disposing of the solids, or sludge, which collects in the bottom of the tank is a very sticky problem. In this state, it is usually disposed of on land, but if there are contaminants in the sludge, they can make their way into the aquifers.

Sanitary landfills can be most unsanitary. We once built dumps on low-lying or marshy ground -- areas that were considered unfit for most other purposes. But marshes and swamps are often ground water recharge areas. Paint thinner, cleaning solutions and other household chemicals dumped there can go directly into the aquifer. Landfills are more carefully sited now, and outmoded dumps are being phased out. But even landfills on relatively impermeable ground can pollute ground water reservoirs. Rainfall reacts with chemical contaminants in household trash to form a concentrated leachate which can percolate down and poison the water.

(Ground Water, Page 5)



Ground Water

(Continued from Page 4)

If it's on the ground, it may be in the water. Herbicides and pesticides can enter the water table from fields or indirectly by way of a river or lake. Vermont uses a liberal sprinkling of road salt to keep its highways clear of ice and snow, but this practice may account for a high sodium count in some of the state's wells. The Vermont Agency of Transportation is studying the problem of road salt in the water table, but preliminary results indicate that improperly sited salt storage piles pose a greater threat to ground water than random runoff from State roads.

Then there's the whole range of petrochemicals and poisons which fall under the heading of "toxic and hazardous wastes." So far, no one has discovered a "Love Canal" or its equivalent in Vermont, but local industries *did* dump chemical wastes in lagoons and some of those lagoons were improperly lined. Also, some contamination occurs every time a pipeline breaks, or a fuel truck overturns, or a barrel of chemicals corrodes, or an underground oil storage tank leaks its contents into the ground.

The greatest obstacle to locating and eliminating ground water contamination in Vermont is that we know so little about the resource. Because we have so much water in Vermont, we've given very little thought to it. There are very few studies of where Vermont's aquifers are or what condition they're in. Consequently, we don't know the dimensions of the state's ground water problems and we don't know whether those problems are becoming more serious or less so.

The Department of Water Resources and Environmental Engineering is gathering data on Vermont's aquifers and drafting a strategy to protect them. Department officials presented their plan for drafting a ground water protection strategy at a public forum in Montpelier on December 4th, 1980. Nearly ninety people attended.

The Department is considering a system for classifying aquifers according to their present quality and potential usefulness. Activities in areas where there are aquifers of drinking water quality would be strictly regulated, while there would be fewer restrictions in areas where the water is already contaminated.



Some members of the audience suggested that the State offer more protection for ground water. A few were concerned that creating "exempt" zones would imply that "these are good places to do bad things." Others wondered how the different zones would be identified and defined. The State's current plans are to use surficial geology rather than more detailed (and more expensive) hydrological studies to determine the location and extent of aquifers, but officials from the Department of Water Resources and Environmental Engineering admit that it is "very easy to guess wrongly" with this method. Finally, it is unclear who will administer the ground water protection program and how it will be enforced. The State hopes that local governments will take responsibility for regulating new developments in classified zones, but who will prevail in case of a dispute, and who will bear the cost of formulating and administering ground water regulation?

The State is seeking both oral and written comments on its plan to devise a ground water protection strategy. It will hold a series of public meetings before it adopts a final strategy. The next meetings are scheduled for March. Watch your local newspaper for exact dates.

Vermont is blessed with an abundance of good, clean water, but that does not mean that we are immune to the problems that plague other parts of the country. Landfills, septic systems and hazardous wastes contaminate subsurface water in Vermont just as they do elsewhere. We must act now to protect it from further degradation. How we live affects our ground water and how we manage our ground water will affect the way we live. MM

TAX LAW CHANGES HAVE COST CHARITABLE ORGANIZATIONS \$5,000,000,000 SINCE 1970

Seward Weber

Imagine the United States without the Boy Scouts, the American Red Cross, the NAACP, the National Wildlife Federation or the Environmental Defense Fund. Imagine Vermont without the United Way, Middlebury College, Planned Parenthood or the Vermont Natural Resources Council.

The thousands of local, state and national organizations collectively referred to in the tax laws as "charitable organizations" are woven into the fabric of our lives. They do things that business and government cannot or should not do. They represent concerns so fundamental that we give freely of our time and our money to support them.

Because Congress recognizes the importance of these institutions, it allows taxpayers to deduct charitable contributions from their income taxes. This policy is as old as the income tax itself and it has been reaffirmed and liberalized many times. There is another provision in the income tax law, however, which discourages charitable contributions. It is the standard deduction. The standard deduction has been increased five times in the last eight years. Its current maximum of \$3200 for a married couple is more than triple what it was in 1970.

As the standard deduction increases, the number of taxpayers who itemize their deduction decreases, and those who no longer itemize contribute a smaller percentage of their personal income. Charitable organizations have lost about five billion dollars since 1970 due to increases in the standard deduction and virtually all of them have been forced to curtail their activities as a result.

During the last congressional session, Senators Moynihan of New York and Packwood of Oregon sponsored a bill which would enable taxpayers to deduct their charitable contributions regardless of whether or not they itemize their deduction. Senator Leahy of Vermont was among the co-sponsors of this bill. Fisher of Virginia and Conable of New York introduced a similar measure in the House which was co-sponsored by 253 representatives including Vermont Congressman James Jeffords.

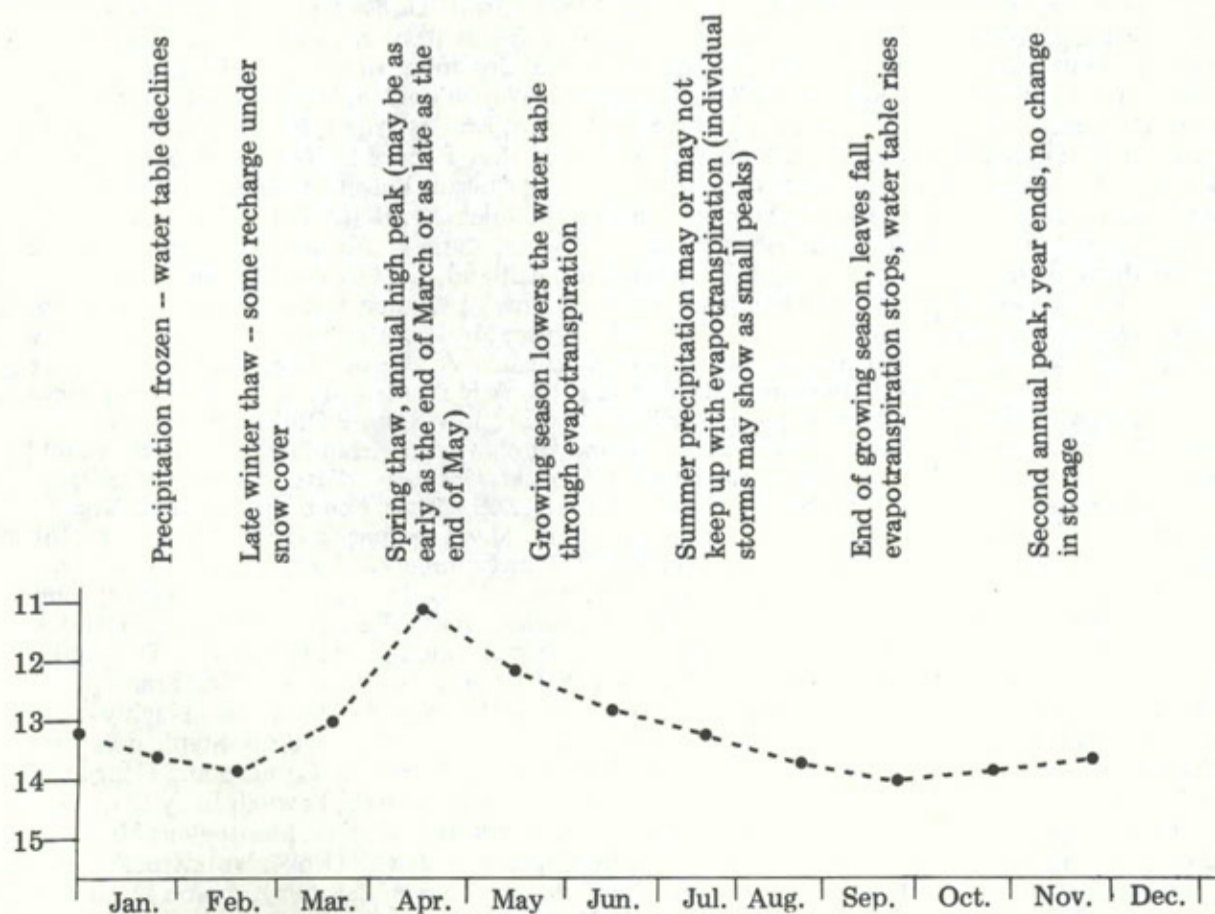
These bills will be re-introduced in the 97th Congress early this year. They have a good chance of becoming law if grassroots support remains strong, if the new administration backs the measure and if the tax cut proposed by the House Ways and Means Committee and the Senate Finance Committee provides for substantive changes rather than an across-the-board reduction.

Charitable contributions legislation would give philanthropic groups an extra \$5.7 billion per year. We urge readers of the *Vermont Environmental Report* to let Senators Stafford and Leahy and Congressman Jeffords know that you support this bill and that you believe in the importance of private sector organizations like VNRC.

VERMONT ENVIRONMENTAL REPORT

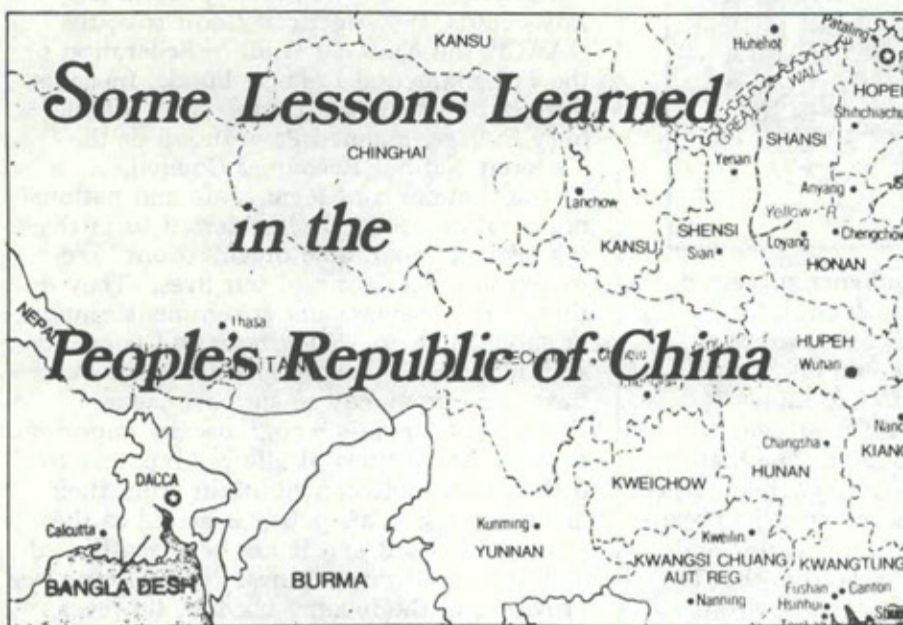
Editor Marion MacDonald
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 Chairman of the Board Carl Reidel

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A Hydrograph Showing Water Levels in a Typical Vermont Well Unaffected by Pumping (from *Ground Water Problems in Vermont* by David Butterfield).

Commentary



Carl H. Reidel

Carl Reidel was a member of a seven-person team of U.S. foresters who visited the People's Republic of China this past summer as part of the Science and Technology agreement between the United States and China. The team traveled from Peking north into Manchuria and south as far as the Leichow Peninsula. They visited remote villages, several field research institutes, forestry colleges and wood products manufacturers. They observed logging operations and large reforestation projects throughout China.

When first asked to report on my travels in China for the *Vermont Environmental Report*, I had no idea how difficult such an assignment could be. It wasn't because I didn't learn a lot about forestry and natural resource management in China -- I did! And it wasn't that I didn't find China a fascinating and intriguing place; on the contrary, the Middle Kingdom was a truly total experience that revived long-forgotten senses and emotions. It is difficult to report on my visit because China is a land of enormous complexity and diversity -- a land where *McDonald's* and *Holiday Inns* and network television haven't blurred regional differences. Contrary to conventional wisdom about communist countries, China is a land where people and food and local traditions remain distinctive. A popular travel guide sums it up best when it describes China as "the longest-running show on earth."

It is the timeless character of China that most impresses a first-time visitor. There is a sensation of looking across time through telescoped centuries; the blink of an eye can produce a snapshot of the past or a projection of the future. Agriculture depends on immense, awesome water diversions visible only from the air, yet my most vivid memories are of people working in small, carefully-tended gardens and of factories and craft shops where almost every task is done by hand. China has made monumental changes through the determined efforts of its people. For example, the land area of China's forests has nearly doubled since the 1949 Revolution, and the national goal is to redouble that area by the end of the century. This remarkable reforestation is almost

entirely the result of hand-planting. The Chinese have truly learned to "think globally and act locally."

This is not to suggest that the Chinese have no problems. Despite the massive reforestation effort, productivity lags. Shortages of fuelwood and large construction materials are getting worse. Wood is harvested in remote areas and then shipped long distances to outmoded processing plants. Forestry research programs lag far behind those of most Western nations. Colleges lack adequate libraries and the facilities are spartan.

Meeting basic human needs is a nearly insurmountable problem in a nation which has almost one billion people but only one-third the arable land of the United States. It is a nation dominated by mountains; most of western China consists of deserts and high plateaus. 95% of the population lives in the third of the country where the climate is mild and soils are intensively cultivated. There is severe air and water pollution in urban areas.

But China is determined to continue modernizing. Its leaders are committed to raising educational levels through formal schooling for young people and through extension programs in remote villages and crowded urban areas. There is widespread public awareness of national forestry programs and objectives. Posters, field demonstrations and popular slogans help teach good forestry practice to city children and peasants alike. The national government controls the program from Peking through a complex network of administrative and party bureaucracies. But somehow this centralized planning builds upon community, family

and local institutions. The Chinese recognize that cooperation, not coercion, is the key to making the nation's millions a powerful force for peaceful change.

One of the principal tasks of our forestry team was to assess the potential for future exchanges between American and Chinese foresters. Certainly, the PRC can gain most from sharing technological know-how and forestry research findings. For the United States, a scientific exchange with a nation which has over 2800 tree species could assist genetic research and plant-breeding programs. We could also learn a great deal from China about planning and implementing extension programs.

But the most important lessons I learned in China were not about China, but about us -- about our nation and its values. The most vivid impressions from my travels came as we flew inland from the Pacific over the rich forests and farmlands of western Washington state on a clear bright day. I rediscovered something I had always known: that we in America live in a land of enormous natural beauty and richness. We are truly the stewards of a "land of milk

and honey," and we have a responsibility to conserve and husband these resources. If we make a determined conservation ethic part of our lives, we can prosper with what we have and still share our resources with a world in desperate need. Organizations like VNRC are far too timid in a world that is looking to us for help, leadership and an example of global stewardship.

I also came away from China with a better vision of America. Everywhere I traveled, people from all walks of life told me that we are respected. The Chinese regard us as a compassionate people with a genuine sense of democracy, and as a revolutionary nation which has created a truly free society. They aspire to both our freedom and our material accomplishments. For the Chinese, as for people everywhere, we remain a great hope: we must not disappoint them.

Carl H. Reidel is the Director of the University of Vermont's Environmental Studies Program and the Chairman of the Board of the Vermont Natural Resources Council.

Welcome to VNRC!

The Vermont Natural Resources Council is pleased to welcome the following new members who joined us in November and December: Dr. and Mrs. Edward Shephard, Woodstock; Nancy Hayden, Marlboro, New Hampshire; Brenda Clarkson, East Calais; John J. Newberry, Jr., Stowe; Charles Buckley, Jr., Fair Haven; Pat and Ray Mainer, Hinesburg; Susan K. Smith, Stowe; Frank C. Reed, South Royalton; Deb Davis and Ed Everts, Charlotte; Barbara and Wes Sawyer, Poultney; Frank Suchomel, Adamant; Mr. and Mrs. Robert F. Lewis, South Woodstock; Bill Powell, Northfield; Peter M.J. Corbett, Burlington; Mr. and Mrs. Coleman Hoyt, Woodstock; Gloria Chadwick, East Burke; Bob Kemp, Montpelier; V. Louise and M. Trevor Bray, St. Johnsbury; Gopher Broke Land Trust, Wolcott; Evan Watkins John, Berkeley, California; Robert and Carolyn Badger, Rutland; Wayne Feiden, White Plains, New York; Mr. and Mrs. Philip Erb, Jericho; Ernest Wright, Randolph; Mr. and Mrs. George A. Squier, North Clarendon; Sandra L. Read, New York, New York; Peg Garland, Burlington; Chester Eaton, Hartland; Eldon Dyer, Belvidere; Donald Arbitblit, Middlebury; Helen T. Chatfield, Bradford; Jonathan Bouton, Saxtons River; Maria E. Ahearn, Randolph; Rutland County Solid Waste District, Rutland; L. Metcalfe Walling, Randolph Center; Champlain Valley League of Women Voters, South Burlington; Ann W. Linde, Underhill Center; Mr. and Mrs. Spencer Putnam, Vergennes; Mr. and Mrs. Norman Williams, Jr., Woodstock; John A. Brown, Jr., Londonderry; Mr. and Mrs. Frank McMullan, Woodbridge, Connecticut; Mrs. George N. Gardiner, Weston; Rev. Louise Drake and Family, Dorset, England; David and Gisela Gamper, Londonderry; Earl "Butch" True, Colchester; Nestor Trottier, Grand Isle; Mrs. Robert Tedford, Randolph Center; Dr. and Mrs. D.S. Chase, Shelburne; Mr. and Mrs. John B. Murphy, N. Duxbury; Memphremagog Group, Newport; Robert G. Westphal, Burlington; Robert Chimileski, Westford; Mildred Olsen, East Highgate; Betsy Coy, Winooski; G. Dick Finlay, Manchester; John Stone, New York, New York; Mrs. Ivan Albright, Woodstock; Beverley White, Putney; David Selby, Essex Junction; Arnold Morse, Thetford Center; Mr. and Mrs. Robert Tucker, Bristol; Mr. and Mrs. Frank S. Chase, Springfield; Mary Martha McClary, Windsor; Alice Blachly, Marshfield; Mr. and Mrs. John S. Burgess, Brattleboro; Stephen Pastner, Charlotte; Larry J. Karp, Craftsbury Common; Cornelia and Henry Swayze, Tunbridge; Mr. and Mrs. Paul Harsch, Pownal; Lucy Bergland, Windsor; Mike Kinsler, Pittsford; Jeffrey Harvey, Montpelier; Mr. and Mrs. Everett C. Bailey, Burlington; Curtiss C. Grove, Woodstock; Mrs. Harold Townshend, Plainfield; Ray Doyle, Salisbury; Austin D. Cleaves, East Montpelier; Paul L. Miner, Londonderry; Deborah DeGraff, East Calais; Louise and Foster Clement, Manchester; Robert P. Davison, Essex Junction, Mrs. K. Payne Moseley, Grafton.

The Council

LEGISLATIVE COMMITTEE

The new Legislative Action Committee will fortify VNRC's presence in the Vermont Legislature this year. In mid-December, the Committee sent out a bulletin asking for volunteers to help with lobbying and letter-writing. About three dozen responses have come in so far. Says Committee Chairman Rebecca Davison, "we are gratified by the response and we will call on these people during the legislative session to help with some important environmental bills."

VNRC BROWN BAG LUNCHES

Over the past year, VNRC has been holding a series of informal noontime discussions with leading environmentalists, State officials, legislators and other people who have a lot to say about preserving and protecting the quality of Vermont's environment. We meet in VNRC's conference room between 12:15 and 1:30. If you'd like to join us, give us a call beforehand. Bring a brown bag lunch and lots of questions and ideas. The schedule for February and March is:

Monday, February 2nd -- George Dunsmore, Commissioner of Agriculture.

Tuesday, February 10th -- Henry Carse, Chairman of the House Natural Resources Committee.

Friday, February 27th -- *Ben Thresher's Mill*, a film about a water-powered woodworking mill in Barnet that's operated continuously since the 1840's.

Monday, March 16th -- Carl Reidel, Chairman of the Board of the Vermont Natural Resources Council.

YES, YOU CAN STILL GET A COPY OF THE ENVIRONMENTAL LAW MANUAL!

We'd like to remind you that the VNRC Environmental Law Manual is still available. The Manual summarizes each of Vermont's numerous environmental laws in concise, readable language. The summaries come in an attractive loose-leaf binder and they are updated as laws and regulations change. It's an excellent resource for attorneys, real estate brokers, engineers, town officials, and others who need accurate, up-to-date information on environmental laws for personal or professional reasons.

The cost of the Manual is \$24.00 (\$20.00 for VNRC members), which includes one year of the updating service. You can receive a copy by mailing your order and a check to Environmental Law Manual, VNRC, 7 Main Street, Montpelier, Vermont 05602.

DO IT YOURSELF AND SAVE!

Do you often need multiple copies of printed materials? Do you prefer the polished look of photo-offset copy? But are you put off by the cost of professional typesetting and design?

VNRC may be able to help. We have typesetting and paste-up facilities at our office on the second floor of the Old Depot at 7 Main Street in Montpelier. We rent these materials at reasonable rates (\$4.00 per hour for the composer for members, \$4.50 for non-members), and we can train you to use them if you don't already know how. Call VNRC Office Manager Donna Pollard at 223-2328 for more information.



WEST RIVER WHITEWATER RAFTING

On Sunday, April 4th, Vermont Whitewater is sponsoring a white-water rafting trip on the West River to benefit the Vermont Natural Resources Council. The trip will be approximately ten miles long. It will cover the section of the river between Ball Mountain Dam and Townshend Dam which is known for its beautiful scenery and challenging whitewater. The fare for the trip is \$35.00, including guides, lunch and transportation from the meeting point in Townshend. No whitewater experience is required, and while the trip is open to everyone, VNRC members and guests will receive priority until March 15th. All participants must register and pay in advance. Vermont Whitewater is a division of Great Adventures, Inc., a Vermont company that has operated commercial whitewater river trips in Vermont and Maine for several years. For a brochure describing the trip, call or write Vermont Whitewater, P.O. Box 800, Norwich, VT 05055 or (802) 649-1191. Ask for VNRC benefit trip information.

NATIONAL WILDLIFE WEEK SET FOR MARCH 15-21

This spring, for the 44th year in a row, the National Wildlife Federation is coordinating the celebration of National Wildlife Week. NWF has prepared posters, a slide show and a teachers' guide to help educators present this year's theme, "We Care About Oceans," in their classrooms. As the Federation's Vermont affiliate, VNRC is working with the Department of Education to distribute the curriculum kits to schools throughout the state. We'll be mailing them out this month. If we have overlooked you, or if you'd just like to receive the education kit for your own use, please write or call Don Hooper at VNRC.

WHY JANUARY RENEWALS?

If you are one of the approximately 500 people who joined VNRC in 1980, you may wonder why we are asking you to renew so soon. The reason is that VNRC does not have the staff and budget to run its renewal operations year-round, despite donated computer time. Also, if we changed to the "anniversary date" renewal system that most magazines use, we would not be sending out enough reminders in any one month to take advantage of low bulk mailing rates. People who joined VNRC in the last quarter of 1980 will not be asked to renew until January, 1982. Many thanks to all those of you who have already renewed for 1981.

BY THE TIME YOU READ THIS . . .

. . . you should have already received your copy of VNRC's new membership survey. Please take a few minutes to fill it out and mail it back to us promptly. Your response will help determine what direction the Council takes and which issues receive its highest priority.

The Perfect Cure for Cabin Fever



Have busted pipes, frozen gas lines and dead batteries got you down? Is the novelty of sub-zero temperatures beginning to wear off? Are you tired of spending all your waking hours trying to keep the home fires burning? (Mother never told you about green wood, did she?)

We know how you feel. And we suggest you brighten your day (or someone else's) with a membership in the Vermont Natural Resources Council.

We promise to remind you of all that good stuff under the snow -- like clean lakes, and rivers teeming with fish, and rich farmland -- and we think you'll feel better when you know you're doing something to help protect it.

Do something for the environment that's doing so much for you. Join VNRC today!

Name _____

Street Address or RFD _____

Town or City _____ Zip _____

- () Please bill me.
 () Enclosed is \$ _____ for a membership in the following category: () Individual -- \$15.00
 () Family -- \$20.00 () Student -- \$5.00 () Fixed or Limited Income -- \$6.00 () Business -- \$75.00

Wind

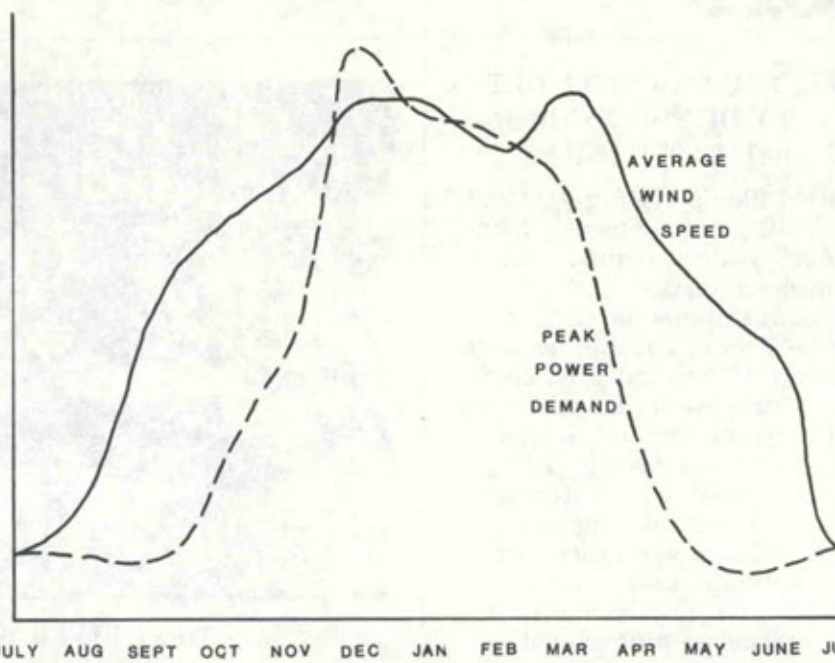
(Continued from Page One)

To determine the suitability of a particular site for a wind turbine generator, the designer must know the variables of wind speed, turbulence, direction and moisture content. The Smith-Putnam wind measurement program provided a good deal of valuable information, but one of the reasons the generator failed is that the design assumed conditions which did not exist on Grandpa's Knob because of the lack of reliable wind data. Therefore, before building any of the newer, larger wind machines in Vermont, there should be an extensive wind resource management study.

For years, wind turbine generators (WTGs) have been used for milling grain, pumping water and providing power for other small agricultural and industrial operations. Part of the DOE/NASA program is to design, construct and test small WTGs that produce between one and fifteen kilowatts of electrical energy (1000 watts equals one kilowatt and 1000 kilowatts equals one megawatt). But the average Vermont home needs at least thirty kilowatts of electricity in the winter months. Since few home owners can afford to invest in a system that meets only their summertime power needs, DOE and NASA are also investigating large wind turbine generators which would be owned and operated by utilities.

Large wind turbine generators have been designed and built since 1975. They come in many different shapes and sizes and they are operating under a variety of terrain, elevation and climatic conditions. The larger turbines are between 100 and 200 feet tall with blade diameters ranging from 125 to 350 feet. They produce anywhere from 100 to 2500 kilowatts of electricity (Table 2).

FIGURE 1:
TYPICAL PEAK POWER DEMAND AND AVERAGE WIND SPEED CURVES FOR VERMONT



There are designs on the drawing table for even larger machines which could produce up to 5000 kilowatts.

The present DOE program in Vermont is a wind assessment study. It involves placing wind speed/direction measurement stations at several locations in the Champlain and Connecticut valleys as well as in the Green Mountains. In order to determine the best machine for a particular site, or, conversely, the best site for a particular machine, the basic data must be available. The design engineer cannot plan the wind turbine generator without knowing what the winds are and how they work.

Figure 1 shows Vermont's "peak power demand." Notice that the average wind speed is highest during the same months that the demand for power is greatest. Normally, utilities meet the increased wintertime demand by starting up oil-fired generators.

But wind generators which operate during peak demand periods could help reduce dependence on expensive foreign oil. This method is called "peak power management." The public utility which has additional resources to maintain power while reducing costs can better perform in the public interest.

The environmental problems of constructing and operating a wind turbine are minor compared to those associated with most other forms of electric generation. In general, a WTG takes up no more than one quarter acre of land and the total area disturbed is about two acres. The wind machine does not change air or water quality. Soil erosion during construction can be controlled with standard procedures, and since mountains and hilltops have limited watersheds, storm water management requires few or no special features. The construction crew needs only temporary sanitary facilities, and no water is needed to operate the machine.

The noise produced by the WTG depends on the strength of the wind. Some of the test machines have been noisy at times, but design modifications have reduced noise levels to that of conversational speech. Most noise from the wind turbines cannot be heard above natural noise when one is more than 500 feet away.

The difficulty of providing access to the WTG for construction and maintenance is directly related to site selection. The higher the site, the steeper the slope and the longer the distance from existing roads, the greater the disturbance of the natural area. A construction way need be only ten feet wide with a cleared area twenty feet wide. Designers must strike a balance of factors involving access, machine size, number of machines and economics. Location of transmission lines, telecommunication (TV and radio) paths, safety zones and archaeological sites must also be considered.

The most serious environmental impact of a wind turbine generator may be its effect on local scenery. Here again, the site selection, access and the size and number of machines will determine the aesthetic suitability of a particular location. On balance, bigger may not necessarily be better. Costs of access, machine icing at high elevations and excessive wind speeds may result in a decision to place more machines in a cluster at lower elevations in more remote areas.

As for wind stations, they have little or no environmental impact. Their bases are two feet square, no vehicles are needed to build them, and they remain in place only for the duration of the testing program. But data gathered from these stations will enable wind energy experts to predict wind speeds at almost any location in Vermont. Without this data, it will be impossible to determine whether or not wind turbine generators will work in this state.

The wind is a very valuable natural resource in Vermont. A map should be made showing the wind power density throughout the entire state. Only then can intelligent decisions be made about whether to use the wind on a small-scale backyard basis or as a significant part of the New England power grid.

Richard Mixer is an environmental engineer and land use planner. He is an Adjunct Professor with the Johnson State College Environmental Studies Program and he works for New England Wind Energy Conversion Systems, consultants for Green Mountain Power.

Table 2

Existing DOE/NASA Experimental Wind Turbine Generators

Location	Size	Hub Height	Blade Diameter
Sandusky, Ohio	100 Kw	100 ft.	125 ft.
Block Island, RI	200 Kw	100 "	125 "
Boone, NC	1000 Kw	140 "	200 "
Goodnoe Hills, WA	2500 Kw	200 "	300 "

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