Tilting Toward Windmills

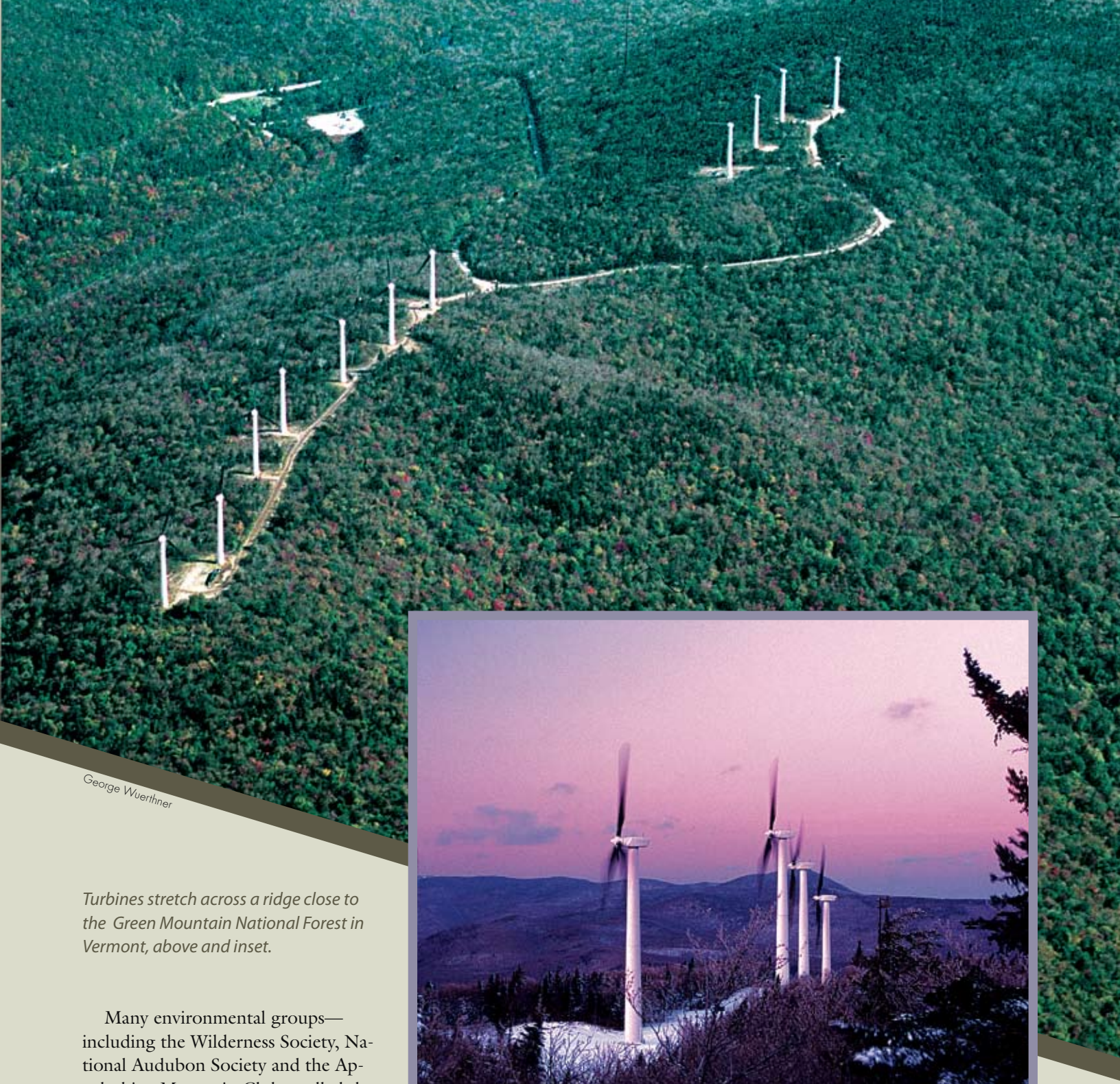
Wind constantly shapes forests, for better and worse. Local breezes spread seeds and litter, while regional and continental currents move weather systems across the country, often depositing pollutants from faraway sources. Storms cause blow downs that can improve forest growth by letting in light, or harm it by creating fodder for insect pests and eroding soil. And soon, wind may leave its mark on national forests in a more structured way—as an energy source.

Developers have proposed building wind farms on national forest land in Vermont, Michigan and Virginia, and other sites are being studied. Many factors are driving this interest: high energy prices, the country's reliance on imported fuels, concerns about global climate change and state laws promoting renewable energy. But although wind is a free and abundant power source, and turbines generate electricity without contributing to air pollution or global warming, siting wind farms can be contentious—especially in protected areas where their presence affects wildlife and sensitive ecosystems. Concerns about local environmental impacts and spoiled views have blocked proposed projects in Maine, Vermont, Massachusetts and other northeast states during the past decade, and slowed the review process for others.

No federal guidelines are in place for siting and permitting wind power projects, although some states have developed their own policies. The Bureau of Land Management and the Minerals Management Service have done the same for federal lands within their jurisdictions. As of mid-2007, about a dozen wind projects were operating or proposed on BLM lands in California, Idaho, Nevada, Arizona and Montana. The Minerals Management Service is currently reviewing several applications for offshore wind projects along the East Coast.

The U.S. Forest Service is also drawing up guidelines for wind energy development, responding to a provision in the 2005 Energy Policy Act that deemed alternative energy projects to be an appropriate use for national forests and grasslands. However, both the wind industry and environmental groups heavily criticized a draft version of the guidelines released in late 2007. The American Wind Energy Association argued that parts of the guidelines could unduly hinder wind development. For example, it said, the guidelines could be read as requiring developers to conduct several years of wildlife surveys before they could put up temporary towers to gather meteorological data, which is the first step in determining whether a site is economically viable for harnessing wind power. Under another provision, the Forest Service could require turbines to be moved after they were already operating in order to reduce impacts on species. This process, the association said, would cost millions of dollars and could make projects impossible to finance.

BY JENNIFER WEEKS



George Wuerthner

John Zimmerman, Vermont Environmental Research Associates

Turbines stretch across a ridge close to the Green Mountain National Forest in Vermont, above and inset.

Many environmental groups—including the Wilderness Society, National Audubon Society and the Appalachian Mountain Club—called the guidelines an apparent reversal of the agency's policy to make public lands unavailable for development if the proposed uses could take place on private lands. They also argued that in addition to wilderness areas, the guidelines should put many other types of land off-limits for wind projects, including national recreation areas and national historic and scenic trails.

Both the wind association and environmentalists urged the Forest Service to start over again to establish comprehensive guidelines for wind projects on its lands. Until the directives are finalized, it falls to forest managers to assess how individual proposals to capture wind power will affect the surrounding forests.

MORE POWERFUL, MORE VISIBLE

To see wind power up close, many people have traveled to the small town of Searsburg in southern Vermont's Deerfield Valley, where eleven white wind turbines with revolving black blades jut above a Green Mountain ridgeline. The towers are clearly visible from a vantage point about a mile

downhill, but the most audible sounds in the area are birdcalls, wind in the trees and streams draining down to the Deerfield River.

Searsburg Wind Power, operated by Green Mountain Power, was the largest wind farm east of the Mississippi when it was built on private land in 1997. Now a second company, PPM Energy, wants to expand the site by adding seventeen turbines—seven next to the existing site and ten on a parallel ridge across the road to the west. About three-quarters of the project area lies within the Manchester Ranger District of the Green Mountain National Forest. PPM has applied to the Forest Service for a special use permit for the expansion, known as Deerfield Wind. The project is also under review by the Vermont Public Service Board, which screens all proposed electric generation facilities in the state. The board is expected to announce its decision in late 2008 or early 2009.

Comparing the existing Searsburg towers to models that would be used for the expansion shows how dramatically wind energy technology has changed over the past decade. Each existing turbine is just under 200 feet tall with its blades in a vertical position and has a generating capacity of 0.55 megawatts, for a combined capacity of six megawatts. An electric power plant with one megawatt of capacity generates enough energy to power about 1,000 homes if it runs continuously, as most large coal-fired and nuclear plants typically do. But winds don't blow around the clock, so turbines usually only generate 25 to 40 percent of their theoretical maximum output. This means that a six-megawatt wind farm like Searsburg generates enough electricity to power roughly 2,000 homes.

The seventeen proposed Deerfield Wind turbines, however, would pack a greater punch. Each turbine would be twice as tall as the original towers, reaching about 384 feet high, and they would generate approximately two megawatts of electricity each—enough to fuel 14,000 homes. Bigger turbines generate power more efficiently and at lower cost than small ones because they sweep larger areas and wind speed generally increases with altitude. As a rough rule, power available from wind is proportional to the cube of the wind speed—if wind speed doubles, available power increases by a factor of eight—so capturing faster winds by reaching higher greatly increases output. These and other improvements have cut the average cost of wind-generated electricity from more than thirty cents per kilowatt-hour in 1980 to around five cents per kilowatt-hour today, making wind power economically competitive with fossil fuels and nuclear power in many locations.

But bigger turbines are also more intrusive. They rise high above treelines, an important concern for outdoor advocates who don't want to see blades spinning on the horizon in wild areas. Under Federal Aviation Administration regulations, turbines taller than 200 feet at the hub must be painted white or a light color. Those on the perimeter of wind farms must carry red or white nighttime warning lights. And although some cleared areas may be allowed to re-vegetate after construction is completed, erecting turbines in wooded areas often means building or widening roads and clearing staging areas so that massive components and cranes large enough to lift them can be moved to the tower sites.

Probably the most controversial aspect of wind power is how it affects wildlife, especially bats and birds. Some early projects, notably the Altamont Pass wind farm in California's Diablo Range, killed many birds and prompted critics to dub wind turbines "Cuisinarts for condors." Many factors made Altamont, which was built in the 1970s without environmental review, a textbook example of how not to site a wind farm: the pass lies on an important bird migration route, raptors hunt in the area and the latticed turbine towers created inviting bird perches. Today the wind industry is more sophisticated about siting. Wind projects typically start with several years of data collection and environmental monitoring before turbines are erected, and many permits require post-construction monitoring and adaptive management to address unexpected impacts. Recent reports by the General Accounting Office and the National Academy of Sciences have concluded that turbines account for a small percentage of bird deaths

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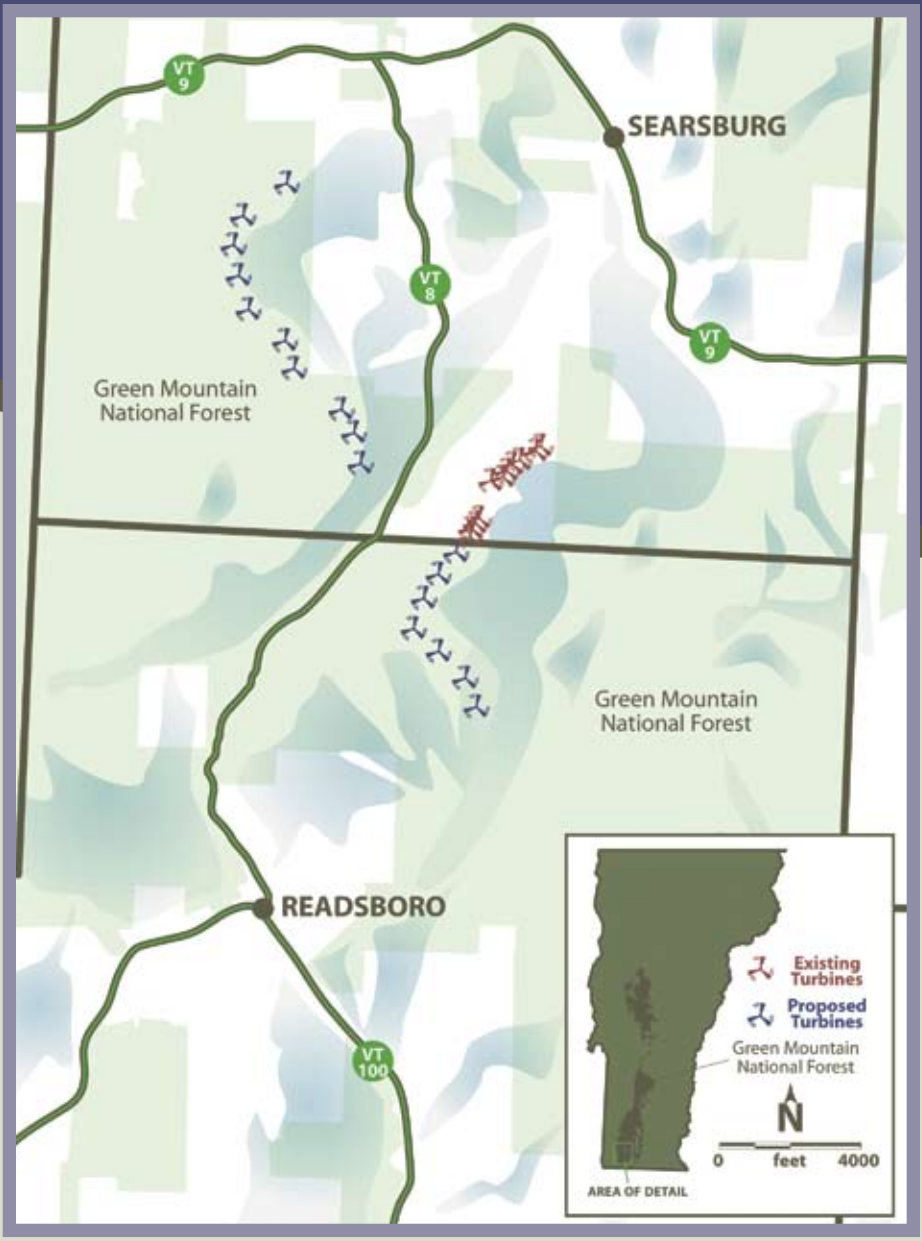

Mark Lesh, A-Frame Maps and Illustration

nationwide, but that more systematic studies are needed to assess threats to individual species in specific locations.

Public opinion about the Searsburg wind farm is generally positive, but some residents are fighting the expansion. "A national forest is a protected area that shouldn't be built on," says Brian Totaro, who belongs to a grassroots opposition group called Save Vermont Ridgelines. "This is the first project that's been proposed for a national forest, so if it goes through, it will open the door for others across the United States. It's true that there are ski slopes and other operations in national forests [including three in the Green Mountain National Forest], but they're not industrial operations," he argues. Another member, Tom Shea, who lives near the existing turbines, predicts that the expanded wind farm will generate noise and "shadow flicker"—a strobe-like effect that occurs when sunlight passes through rotating blades—that will disturb wildlife.

The Green Mountain National Forest released a draft environmental impact statement on Deerfield Wind in September. Forest Supervisor Meg Mitchell deferred a decision on the permit application until the state's Public Service Board finishes its review of the wind farm. However, the draft found that the project conforms to three goals in the current forest management plan: maintaining or improving air quality on the forest; demonstrating innovative, scientifically and ecologically sound management practices that can be applied elsewhere; and providing opportunities for renewable energy research and development.

According to the review, constructing Deerfield Wind would require about eighty acres in the Green Mountain (out of more then 400,000) to accommodate turbine towers and support facilities, including a substation, service roads and an operations building. The draft found that the wind farm would not significantly affect scenic viewpoints in the local area, which is roughly eight miles from the Appalachian Trail, or harm any endangered or threatened reptiles, animals or fish species. The review also determined that the area is not an important raptor migration route and that the project's impact on bat and birds would be minimal.

One wildlife issue looms larger, however. Black bears forage in the project area, and their habitat would be affected by land clearing and grading. "Bears feed heavily on beech nuts in the fall, and to build access roads and pads, we'd have to take out a number of bear-scarred beech trees. Those are the trees that the bears climb, so they seem to favor those," says Bob Bayer, project coordinator for the forest. According to the draft,

When improperly sited, turbines can pose a threat to migrating birds, right, and disrupt black bear habitat, below.

building the wind farm would involve removing about 540 bear-scarred beeches, which represents less than 2 percent of all beeches in the project area. The review concluded that the project was unlikely to threaten the local population of black bears, but Mitchell considers impacts on bear habitat a key issue, and Vermont's Agency of Natural Resources opposes the project because of them.

The draft also found that Deerfield Wind would produce significant climate and air quality benefits. In its first seven years of operation, generating power from the wind farm instead of a plant that burns fossil fuel would avoid an estimated 79,640 tons of carbon dioxide emissions yearly, equivalent to taking more than 13,000 cars off the road. This figure is projected to diminish somewhat later in the project's life, to 58,543 tons of carbon dioxide per year, because existing state mandates will move New England's electric power generators toward lower-carbon fuels.

The wind farm would also displace more than 111 tons of nitrous oxides and 300 tons of sulfur dioxide annually in its early years, later falling to 28 tons of sulfur dioxide and 39 tons of nitrous oxide per year. Both gasses are emitted during fossil fuel combustion and are major contributors to acid rain, which has damaged many forested areas and acidified lakes and streams in the Green Mountains.

TEST CASE

The issues raised by the draft environmental impact statement highlight a central challenge of siting wind farms: the benefits they produce are regional and national, but their impacts are local. If the state's service board decides that building Deerfield Wind will serve the public good, forest officials will have to weigh cleaner air against lost beeches and other environmental issues. The choice isn't obvious. Vermont's black bear population is between 4,600 to 5,700, its highest level in more than 200 years, and the state allows controlled hunting—indeed, the project area is a popular bear-hunting zone. As the draft points out, plenty of beech trees will remain, and bears will gain access to other food sources, such as fruit-bearing plants and insects, at the edges of newly cleared areas.

"Just doing preconstruction studies won't give us all the answers," says Bayer. "We also need to look hard at what kind of monitoring can be done after construction to see how bears actually respond." That could mean years of baseline data collection and follow-up studies, perhaps radio-collaring bears or doing DNA analysis on hair samples to see whether bears change their foraging patterns around new towers and outbuildings. One thing is certain: Wind development is creating lots of work for wildlife biologists.

Two other wind projects in national forests are currently under review. White Pines Wind Farm LLC has applied for a special use permit to build twenty to twenty-eight turbines in Michigan's Huron-Manistee National Forest; the Forest Service expects to issue a draft environmental impact statement in May 2009 and a final decision in December 2009. FreedomWorks LLC, an energy company based in West Virginia, has asked the FAA to review potential impacts of siting 130 turbines on Shenandoah Mountain in the George Washington National Forest. The company sought FAA approval before applying to the Forest Service to determine whether the project would interfere with air traffic. The project straddles the ridge of North Mountain in Shenandoah and Hardy counties, and it will require approval from federal and state officials in Virginia and West Virginia.

Is a wind rush on in national forests? "There are definitely opportunities to develop on many different kinds of lands," says Laurie Jodziewicz, a policy specialist with the American Wind Energy Association. "Most wind projects to date have been built on private land, but there's also interest in public sites. Forest Service lands should be considered, but they're not the only possibilities."

A 2005 study by the Forest Service and the Department of Energy's National Renewable Energy Laboratory found that ninety-nine national forest units had high potential for wind

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and/or solar energy development. Most of the areas with significant potential are in midwestern and western states like Colorado, Kansas, Nebraska, the Dakotas and Wyoming. But in addition to strong wind resources, successful wind development sites need two other elements to be commercially viable: access to transmission lines and markets for their electricity output. The pending projects in Vermont, Michigan and Virginia fit this model; they have good connections to energy demand centers or to power providers who will buy their output. "Demand and transmission make those projects economic, even if they're not the largest wind resources," says Jodziewicz.

Developers recognize that many parts of national forests, such as roadless and wilderness areas, are unlikely to be built on. Industry wind resource assessments—estimates of how much land is available for development in a given area—typically exclude federal lands that are designated as wilderness, wilderness study areas, wild and scenic rivers or inventoried roadless areas, and they discount remaining Forest Service lands by 50 percent to reflect that these acres are managed for multiple uses. Within those constraints, says Jodziewicz, the industry sees wind farms as compatible with national forest goals. "Wind is different from many other activities that take place on Forest Service land, because you can still use the land for other purposes like recreation," she says. "Wind turbines and infrastructure take up a relatively small land area. There are all kinds of activities on Forest Service land, and we think wind can fit into that environment."

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A thumbs-up for Deerfield Wind could influence permitting processes in other national forests, especially since Vermont has high environmental standards for major projects. "This study is one of the most thorough analyses we've ever done," says Green Mountain project coordinator Bayer of the draft environmental impact statement. "Vermont scrutinizes proposals of this size very carefully. We've solicited a lot of information and dug around for the most up-to-date studies, and we feel very comfortable that we've thought long and hard about the consequences of potential actions."

Green Mountain district ranger Alex Sinkiewicz seconds this view and emphasizes that all forest uses cause some impact. "We're talking about a national forest with a multiple-use mandate, and it's challenging for everyone involved—including environmentalists, alternative energy advocates and our adjoining communities—to figure out how we should move forward," he says. "It's not as simple as picking a right or wrong action." FM