



WIND FARMS AND WILDLIFE

BIOLOGISTS BRAVE FIERCE SUBALPINE
CONDITIONS TO ASSESS THE IMPACT OF
WIND FARMS ON HIGH ELEVATION WILDLIFE

BY
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The best wind in New Hampshire is in the North Country, on high mountain peaks. Windswept ridges are coveted by wind power developers; they are also home to a suite of wildlife species, some found only in these high-elevation habitats. Whether the two values (energy production and wildlife habitat) are compatible in these special places is still a question.

To search out at least part of the answer, two graduate students – Alexej Siren at UNH and Clinton Parrish at Plymouth State University – studied the impacts of a newly constructed wind farm on two species reliant on high-elevation habitat in New Hampshire: American marten and Bicknell's thrush. Spearheaded by N.H. Fish and Game's Nongame and Endangered Wildlife Program,

the research was funded in part by U.S. Fish and Wildlife Service (USFWS) State Wildlife Grants and Granite Reliable Power, which built a 33-turbine wind farm in 2011 along the ridgelines in Millsfield and Dixville in northern New Hampshire.

The purpose of the study was to determine any changes in habitat use or behavior by marten and Bicknell's thrush before and after the wind turbines were built. The wind farm was constructed in a remote, previously undisturbed high-elevation spruce-fir forest. A wide swath of forest was cut to build new roads to the ridges and to construct the turbines on Dixville Peak, Mount Kelsey, Owlhead Mountain and Fishbrook Ridge. Each turbine stands 420 feet tall and, collectively, they are expected to generate 99 megawatts of renewable energy.



Inquisitive Martens

High-elevation spruce-fir forests, dominated by red spruce and balsam fir, occur on mountain slopes at elevations of 2,500 to 4,000 feet. Snowy and cold in winter, these are rugged, wild places, and familiar conditions for Siren, who grew up exploring the mountains and backcountry in west-central Maine. Siren studied marten year-round for three years; many days on his own, bushwhacking through dense conifers and across steep terrain.

Marten populations have been gaining ground in New Hampshire in recent years. In the early 1900s, their population had rapidly declined because of unregulated trapping, land clearing and excessive logging. To reverse that trend, the New Hampshire Legislature banned marten trapping in 1935.

“In recent years the marten has expanded south and west into parts of its historic range,” says Jill Kilborn, who studied marten for her Master’s thesis and is a wildlife biologist for N.H. Fish and Game in the North Country. “Only time will tell if this spirited mammal will continue to expand its population or be limited by its competitors, a fragmented landscape, or a changing climate.”

Marten weigh only 1-3 pounds, about the size of a small house cat. As the mid-sized member of the weasel family, marten are smaller than fisher and otter, and larger than mink, long-tailed weasel and ermine. They are remarkably cute and colorful, easily identified by their slender body, long tail, foxlike ears and irregularly shaped throat patch that ranges from straw-color to bright orange. The marten’s shiny coat ranges from dark brown in



Left to right: American marten have been making a comeback in New Hampshire in recent years, but they remain on the state threatened species list; The rugged mountain slope habitat of New Hampshire's high elevation spruce-fir forests are made up primarily of red spruce and balsam fir; New Hampshire is home to 40% of the world's Bicknell's thrush population, which breeds exclusively in the harsh subalpine habitat.

summer to a light tawny color in winter. Due to their small size and weight and relatively large, furry feet, martens are able to easily cross deep, fluffy snow.

Siren captured martens in traps baited with sardines or red raspberry jam. Once the marten was sedated, he quickly affixed a radio collar and small ear tag and recorded body measurements before releasing the animal back into the wild. He augmented the radio-tracking with trail cameras and snow track surveys to document marten habitat use, movement and home ranges.

"Martens are extremely energetic and expressive, highly vocal, and have to eat constantly to survive," says Siren. He developed detailed knowledge of each marten in his study, learning its movements and behaviors. "The intense fieldwork was worth it," Siren says, "Even having to change batteries on the telemetry towers at 3,500 feet in 40-50 mph winter winds, or tracking martens in a cold, soaking rain."

High-elevation forest provides some of the best habitat for martens in New Hampshire, which, although curious and "trap

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happy,” are adapted to mostly unfragmented and undisturbed forests. These forests are contiguous, contain a deep snowpack, and provide a combination of microhabitat features (large hollow trees, fallen logs, underground rock crevices, and overhead canopy) that provide protection from the elements and predators, and offer denning sites.

Marten also prefer these dense forested habitats for hunting their favorite prey species (voles, squirrels and snowshoe hare). They easily climb trees using their long, sharp claws, although most of their travel is on the ground on circuitous routes over large home ranges. They stay close to overhead cover and investigate openings into the subnivean world (under the snowpack), where they hunt in winter.

Rare Birds with Special Habitat Needs

Parrish also studied the impacts of the wind farm on wildlife. His focus was the Bicknell's thrush and other birds using high-elevation habitat. He conducted more than 400 bird surveys at and downslope of the 15 turbines between Dixville and Kelsey Peaks. Parrish caught thrushes in mist nets aided by playback tapes of singing males, affixing small radio transmitters to the backs of 30 captured males.

The Bicknell's thrush has one of the most restricted breeding ranges of any North American bird, breeding exclusively in high-elevation spruce-fir forests in the Northeastern U.S. and parts

of Quebec, New Brunswick and the Maritimes in Canada. The female builds a nest of twigs and mosses in a dense stand of young spruce or fir against the trunk of a small tree. In an unusual mating system, both males and females mate with multiple partners, so an individual nest often has young from different males. The female alone incubates 3-4 eggs, while more than one male brings food to the nest.

The Bicknell is a medium-sized thrush with olive-brown back, a tinge of chestnut color on tail and wings, plain gray face with no eye ring, and heavily spotted breast. Its song is similar to its close relative, the gray-cheeked thrush, with a slightly rising inflection at the end of a complex series of buzzy flute-like notes (the gray-cheeked ends in a downslur). Bicknell thrushes forage on the ground, eating insects and other invertebrates, shifting more to fruits by late summer.

Siren and Parrish helped each other with fieldwork, shared research ideas, and reported similar field experiences. Tracking marten or Bicknell's thrush is hard. Step off the road or trail and you immediately enter a dense tangle of conifers. Parrish recalls a particularly wet, cool, and foggy period in 2011: “Climbing through drenched, dense vegetation, my feet never touched the ground.” And Bicknell's is an unusually early riser, even for songbirds. Parrish and

his crew sometimes woke by 3 a.m., hiking in the dark, to start bird surveys by 4:30 a.m.

Len Reitsma, Parrish's graduate advisor at Plymouth State, admires the tenacity of both Parrish and Siren, working in this extraordinarily tough environment. "Sometimes Parrish and his crew would reach the top at dawn, only to be repelled by high winds, rain or other harsh conditions that prohibited bird surveys," says Reitsma. "The weather is unpredictable and at times the biting insects are intense, and both researchers had to manage field crews, keeping them healthy and happy while collecting data under difficult field conditions."

Disturbance by wind, ice, snow and insects at high elevations promotes patches of dense regenerating spruce-fir forest – the preferred habitat for Bicknell's thrush. These subalpine habitats are scattered in small patches across the landscape, limiting habitat availability and thus the thrush's population size. Mercury deposition, acid precipitation, climate change and loss of its primary wintering habitat in the Dominican Republic further stress this bird.

New Hampshire forms the core of the Bicknell's thrush's breeding range in the U.S. The birds arrive at their high-elevation breeding grounds in mid-May; in some years a few feet of snow still lingers. The birds leave by early fall, returning to a shrinking patchwork of dense broadleaf cloud forest in the Caribbean, where they face a new predator – rats – and continued loss of their habitat.

Questions Remain

Siren and Parrish both say that their research provides critical baseline information and is just a start to assessing the impacts of wind farms on wildlife that depend on high-elevation habitat. One year of post-construction, with the turbines spinning, was not enough time to sleuth out the long-term impacts on this unique community of plants and animals.

The short-term impacts to the bird community and marten were seemingly minor. The total number of Bicknell's thrush detected, and the number of other bird species recorded, remained stable across the three years of the study. The thrushes did not completely avoid the turbines, especially if optimal habitat was still available adjacent to the turbine. During construction of the wind turbines, marten were periodically displaced and used the area less, but they gradually returned to the site after construction was completed, although not to pre-construction levels.

However, both Parrish and Siren detected other notable changes. Bicknell's thrush males increased their home ranges in areas with operating turbines. Parrish recorded the decibel levels of the rotating turbines and speculates that males had to move farther to broadcast their songs over the turbine noise. Site fidelity – where birds return to the same territory year after year – combined with adequate habitat around the turbines, might be the reason that Bicknell's numbers remained stable. In time, Parrish thinks the forest community will shift to include a greater abundance of generalist species along the newly created edge habitat.

The clearing of forests for the wind farm allowed more sunlight into a previously closed canopy forest, changing the vegetation and creating more edge habitat along the roads and

Questions remain...is habitat that supports a unique suite of species the appropriate place for industrial-scale wind development?



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The Bicknell's thrush research crew - left to right: Clinton Parrish, Cassandra Hammond and Will Lewis.

on the mountaintops. Robins, which prefer edges, arrived soon after construction began; none were observed pre-construction. Parrish noted other changes in the bird community too: gray jays, golden-crowned kinglets and black-backed woodpeckers, which nest in the forest interior, declined, while slate-colored juncos and American robins, species that use more open habitat, increased. After the construction started, Siren reported more red fox and coyote (direct competitors of marten) at higher elevations, likely due to the newly maintained roads and snowmobile trails that now provide easy, year-round access to the ridgelines.



Newly maintained roads and snowmobile trails have allowed easier access to predators in the area, including red fox.

Wind power is an important renewable energy source. Questions remain, though. Is habitat that supports a unique suite of species the appropriate place for industrial-scale wind development? There is good wind elsewhere, but high-elevation spruce fir forests cover only about 4% of New Hampshire's land area, and are only present in the northern half of the state. Blackpoll warblers and Bicknell's thrushes breed exclusively in these forests; American marten and Canada lynx are uniquely adapted to traversing the deep snows; and moose spend winters up high, browsing on balsam fir, mountain ash and yellow birch.



Like Bicknell's thrush, blackpoll warblers breed exclusively in the high-elevation spruce-fir forests that cover just 4% of N.H.'s land area.

Siren and Parrish concur that long-term monitoring is needed to assess the impacts of wind power installations on wildlife, especially on the curious marten and the vulnerable Bicknell's thrush.

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