STATE OF MAINE
LAND USE REGULATION COMMISSION

Application for Development of)
Maine Mountain Power LLC)
Black Nubble Wind Farm Application)
Rezoning Application ZP 702

PREFILED DIRECT TESTIMONY OF
DR. JEFFREY WELLS
ON BEHALF OF
THE NATURAL RESOURCES COUNCIL OF MAINE

I. Summary

The Natural Resources Council of Maine (NRCM) asked me to assess what the potential risk might be to Bicknell's Thrush as a result of construction of an 18-turbine wind power project on Black Nubble Mountain, in Redington Township. I was asked to review material in the hearing record dealing with Bicknell's Thrush, gather field data at both Black Nubble and Redington, and evaluate and compare the full range of known risks to the long-term viability of Bicknell's Thrush in Maine and throughout their range.

The testimony herein provides my best professional judgment on these matters, based on my training as a wildlife ecologist and conservation biologist specializing in birds and bird conservation with over 20 years of professional experience.

Primary conclusions:

1. Bicknell's Thrush is broadly considered to be a species at risk due to limited and declining breeding and wintering habitat and relatively small population size.

2. Bicknell's Thrush currently utilize habitat on both Black Nubble and Redington Pond Range.

3. Of the two mountains (Redington Pond Range and Black Nubble), Redington Pond Range appears to provide more significant and higher value habitat for Bicknell's Thrush.

4. Using a science-based approach, the Black Nubble project would have a very small impact on the total estimated Bicknell's Thrush population. The loss of 64 acres of habitat on Black Nubble, due to clearing for the wind farm, may

eliminate habitat that theoretically could support up to 6 males. This potential impact is very small: 0.03% of the total estimated global Bicknell's Thrush population of 40,000. Available evidence suggests that the threat of population level impacts to Bicknell's Thrush as a result of collisions with wind turbine blades is minimal.

5. Protection of habitat on Redington Pond Range would be more significant than any potential habitat loss on Black Nubble. Based on theoretical projections of habitat utilization, the 517 acres of land on Redington Pond Range that would be protected from wind power development (as proposed by the applicant) could support 47 male Bicknell's Thrush – compared to the potential loss of habitat that theoretically could support 6 males.

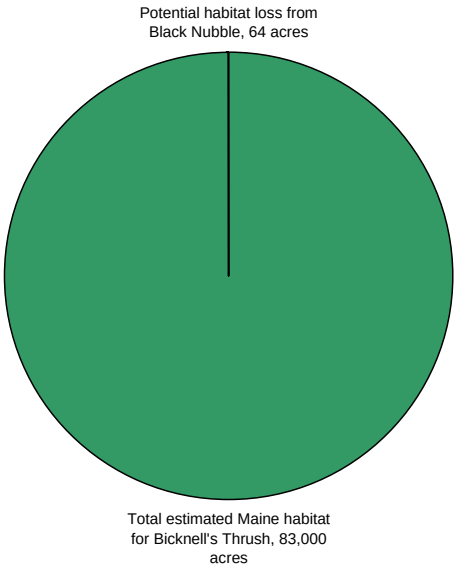
6. The loss of 64 acres of Bicknell's Thrush habitat on Black Nubble would be inconsequential in terms of survival of the species, since this is such a small amount (0.02%) of total estimated U.S. habitat. A 2005 study estimates that there is 336,373 acres of Bicknell's Thrush habitat within the northeastern United States, with 83,178 acres in Maine. Actual Bicknell's Thrush habitat in Maine may be as high as 181,178 acres, based on increased understanding that the species utilizes regenerating clear cuts.

7. The greatest immediate threat to the survival of the Bicknell's Thrush comes from the loss of wintering habitat, primarily in the Dominican Republic, Cuba, and Jamaica. Audubon New York, the Nature Conservancy, Cornell Lab of Ornithology, Vermont Institute of Natural Science, and the Wildlife Conservation Society are among groups that have recognized this fact and created an international fund to protect wintering habitat for Bicknell's Thrush.

8. The greatest long-term threat to survival of the Bicknell's Thrush in the United States comes from the projected impact of global warming. Modeling results predict that global warming could result in a 96% reduction in area of balsam fir habitat in the eastern U.S. within 100 years, which would mean the virtual elimination of Bicknell's Thrush habitat, and the species, from the U.S.

9. Atmospheric deposition of mercury in high elevation habitats, and habitat impacts caused by acid rain, are significant threats to Bicknell's Thrush. A 2005 study found that Bicknell's Thrush had the highest levels of mercury in their blood of any of four species of high-elevation songbird species that were tested Mercury pollution and acid rain are caused by combustion of fossil fuels. These threats may be reduced if renewable energy, including wind power, is able to lessen society's reliance on fossil fuels.

Figure 1. Scale of potential habitat loss from Black Nubble wind farm



II. Background and Qualifications

As mentioned above, I am a wildlife ecologist and conservation biologist specializing in birds and bird conservation with over 20 years of professional experience. I hold Ph.D. and M.S. degrees in Ecology and Evolutionary Biology from Cornell University and a B.A. from the University of Maine/Farmington. Currently I am a Senior Scientist with the Boreal Songbird Initiative and a Visiting Fellow with the Cornell University Lab of Ornithology. I have worked in a variety of positions over the last 20 years as a researcher and conservation biologist with organizations including the Cornell Lab of Ornithology, National Audubon, Audubon New York, Maine Audubon, and The Nature Conservancy. I have authored and co-authored more than 35 academic publications in a variety of peer-reviewed journals and books including The Auk, Biological Conservation, Canadian Journal of Zoology, Condor, Journal of Caribbean Ornithology, Journal of Field Ornithology, Oikos, Studies in Avian Biology, Wildlife Society Bulletin, and Wilson Bulletin. I have written three books, the most recent being *Birder's Conservation Handbook: 100 North American Birds at Risk* due out with Princeton University Press in October, 2007. From 1999-2002, I was the chair of the Partners In Flight Northeast Working Group. I have received a number of grants and awards including the National Audubon Society New Star Award for Exemplary Achievement, Manomet Bird Observatory's Anderson Award, an Andrew W. Mellon Foundation Award, International Council For Bird Preservation (ICBP) Grant, and a Conservation Biology Grant from The Nature Conservancy. I am a member of the American Ornithologists' Union, Association of Field Ornithologists, Cooper Ornithological Society, Society for Conservation Biology, Society for the Study and Conservation of Caribbean Birds, and the Wilson Ornithological Society.

My most recent book focuses on 100 North American bird species of conservation concern (including the Bicknell's Thrush) with major emphasis on the status, threats, and conservation actions for the major habitat types within which they occur on both breeding and wintering grounds.

Before working for the Boreal Songbird Initiative, I held the position of National Bird Conservation Director for the National Audubon Society. I have years of experience in the assessment of the conservation status of bird species and their habitats for the development of conservation strategies. In 1995 I co-authored a major report for Partners In Flight (PIF) that prioritized northeastern U.S bird-habitat suites for conservation action, identified the major stresses on priority habitats, and provided recommendations for strategies to abate those threats. Later, as the Chair of the Northeast Working Group of PIF, I helped lead the development of physiographic regional bird conservation plans for the northeast U.S.

I have also been heavily involved in developing inventories of site-based conservation priorities through my work with the Important Bird Areas (IBA) program. The IBA program itself is a site-based, priority-setting exercise that uses conservation biology principles to identify sites that are important for the survival of bird populations. I led one of the first IBA programs in the Western Hemisphere as the New York IBA coordinator and succeeded in completing the first IBA inventory for the U.S. In my book that resulted from this program, *Important Bird Areas In New York State*, I completed a unique analysis to identify stresses and threats impacting multiple IBA targets to guide Audubon's implementation of conservation strategies.

III. Background

Bicknell's Thrush is a restricted-range songbird species that breeds only in higher elevation habitats within the northeastern U.S. and adjacent regions of Canada (Rimmer et al. 2001). The species has been identified as a "conservation concern" because of its limited breeding and wintering range and relatively small population size, estimated at 40,000 individuals in 2004 (Rich et al. 2004, Rosenberg and Wells 2005). It has been listed as "Vulnerable" by the International Union for Conservation of Nature and Natural Resources (IUCN). It has been designated a species of "extremely high priority" by Partners In Flight, and it is listed as a "species of special concern" in three states (Maine, New Hampshire, and Vermont [Wells 2007]).

In its breeding grounds, the species prefers stunted and second-growth balsam-fir dominated stands, generally at elevations above 3,400 feet in the southernmost portion of the breeding range (Catskill Mountains of New York) but at increasingly lower elevations farther north (Rimmer et al. 2001, Lambert et al. 2005). In northern Maine, Bicknell's Thrush have been found as low as 2,280 feet and in Canada, as low as 570 feet (Lambert et al. 2005).

A recent study that measured the amount of predicted Bicknell's Thrush habitat within the northeastern U.S. found it totaled 336,373 acres, with 83,178 acres in Maine (Lambert et al. 2005). In Maine and adjacent Canadian provinces, Bicknell's Thrush have been found with increasing frequency in regenerating clear cuts typically dominated by balsam fir, or at least with a significant component of balsam fir (Nixon et al. 2001, Rimmer et al.2001, Connolly et al. 2002, Lambert et al. 2005, Hale 2006, Wells pers. obs., Woodlot Alternatives 2006). In Maine such habitats have only recently begun to be more regularly surveyed for Bicknell's Thrush. Lambert et al. (2005) point out that there may be as much as 98,000 additional acres in Maine that fall within this category, which would raise the total estimated habitat in the state to 181,178 acres.

Hale (2006) in a study of Bicknell's Thrush in the White Mountains of New Hampshire noted that although the species occurred at lower densities in lower elevation forested habitats, the fact that the geographic extent of such habitat was so much larger than the highest elevation habitat meant that the total number of Bicknell's Thrush inhabiting such areas may be higher than the total number in the highest elevation habitat.

The species winters in montane forests of eastern Cuba, eastern Jamaica, the Dominican Republic, Haiti, and occasionally in eastern Puerto Rico. The bulk of the species population is thought to winter in what remains of the once expansive forestlands of the Dominican Republic on the island of Hispaniola, with highest densities in montane forests (Rimmer et al. 2001).

IV. Threats to Bicknell's Thrush

The greatest immediate threat to the species' survival comes from loss of wintering habitat. The estimated loss of forests in its wintering grounds are 98.5% in Haiti, 90% in the Dominican Republic, 80-85% in Cuba, and 75% in Jamaica (Rimmer et al. 2001). Most habitat loss in the wintering grounds is from conversion to agriculture, burning for charcoal, or other types of activities that generally result in more-or-less permanent conversion of the habitat from forest to non-forest or at best, to degraded forest. (See Exhibits 1-3: Threats to Wintering Habitat)

The Cornell Lab of Ornithology, Vermont Institute of Natural Science, Audubon New York, and other organizations in July 2007 helped launch a "Bicknell's Thrush Habitat Protection Fund" specifically aimed at protecting the species' wintering grounds in the Caribbean. As explained in a press release issued by Audubon New York, "Scientists believe that loss and degradation of forests where it spends the winter are the greatest threats to the species' long-term viability" (Audubon New York 2007).

In contrast, much of the species' breeding range in North America is within existing protected areas (especially in New York, Vermont, and New Hampshire) or is within areas managed for forestry (Maine, Quebec, New Brunswick, Nova Scotia).

The greatest immediate threat to the species in its breeding grounds is likely from the bioaccumulation of toxics and the degradation of the birds' upper elevation habitat – both

a result of pollution from coal-fired energy plants (Rimmer et al. 2001, Rosenberg and Wells 2005, Wells 2007). Tree mortality in upper elevation northeastern U.S. forests through the 1960's and 1970's was well-documented and was thought to be caused by acid rain generated from burning of coal (Rimmer et al. 2001). A recent study found that the probability of breeding success in the closely-related Wood Thrush in the eastern U.S. was lower in areas with high acid rain deposition, probably because of the reduction in available calcium in such areas, which can decrease the number of eggs laid as well as eggshell strength (Hames et al. 2002). Such an effect has been postulated as a potential concern for species like Bicknell's Thrush occurring in high elevation habitats that receive high acid rain deposition (Rosenberg and Wells 2005).

The atmospheric deposition of mercury in high elevation habitats in the northeastern U.S. as a byproduct of pollutants produced by coal-fired energy plants has been documented (Rimmer et al. 2001). Research published in 2005 found that Bicknell's Thrush had the highest levels of mercury in their blood of any of four species of high-elevation songbird species that were tested (Rimmer 2005). Mercury is known to have many adverse impacts on birds, ranging from death (at high mercury concentration levels) to various sublethal effects that could cause decreases in populations by lowering reproductive success and/or increasing mortality (Evers and Clair 2005).

Available evidence suggests that the threat of population level impacts to Bicknell's Thrush as a result of collisions with wind turbine blades is minimal. Bicknell's Thrushes are known to be difficult to observe because of their tendency to remain hidden within their favored stunted coniferous forest habitat (Rimmer et al. 2001). This behavioral trait lowers their risk of being struck by a wind turbine blade on the breeding grounds, since it places them far below the lowest point reached by a spinning blade. (Bicknell's Thrushes spend the vast majority of their time between 5-20 feet off the ground; turbine blades on Black Nubble will be 130 feet off the ground at their lowest point.) Males sometimes engage in dawn and dusk flight displays during a short period of the breeding season (Rimmer et al. 2001) during which an individual could fly high enough to be within range of a wind turbine blade. However it should be noted that research has indicated that most birds are able to see and avoid moving wind turbine blades (Drewitt and Langston 2006) and that small birds with good maneuverability are at lower risk of collisions (Drewitt and Langston 2006). These traits, combined with the short duration of flight display behavior during the year, make collision risk a small threat compared to the other threats discussed here.

The most serious, long-term threat to Bicknell's Thrush comes from the projected impact of global warming as a result of the unchecked production of carbon into the atmosphere. Modeling results predict a 96% reduction in area of balsam fir habitat in the eastern U.S. within 100 years unless there is a reduction in carbon emissions (Iverson et al. 1999, Iverson and Prasad 2002, Frumhoff et al. 2007). In a recent modeling analysis for the Northeast Climate Impact Assessment, Rodenhouse et al. (2007) showed that even under moderate levels of carbon emissions, changes in balsam fir habitat would result in the loss of 90% of Bicknell's Thrush habitat in the U.S. Such an effect would lead to a major decline, possible extirpation of the species from the U.S. (Rodenhouse et al. 2007) and

highly increase the risk of global extinction for Bicknell's Thrush (Lambert et al. 2005, Rosenberg and Wells 2005, Rimmer et al. 2001). Already, the documented disappearance of Bicknell's Thrush from some locations along the southern range border and at coastal locations in Canada (and possibly eastern Maine) has been observed to be consistent with global warming-induced range shifts seen in other species (Lambert et al. 2005).

Bicknell's Thrush is only one of the many bird species that are predicted to show major adverse impacts from climate change both within the specialized high elevation coniferous forest community and beyond (Price and Glick 2002, Root and Schneider 2002, Mathews et al. 2004, Glick 2005). Species that co-occur with Bicknell's Thrush on Black Nubble and other similar locations in the northeastern U.S., like the Yellow-bellied Flycatcher and Blackpoll Warbler, would likely no longer occur in the U.S. as breeders under current global warming modeling scenarios. Exactly this scenario has been predicted for a number of other similar balsam fir-dependent bird species (all of which occur on Black Nubble and Redington Pond Range), including: Nashville Warbler, Yellow-rumped Warbler, and Evening Grosbeak. Other common birds that occur in balsam fir as well as mixed forest habitat in the region are projected to show major decreases in abundance in the U.S., including the Purple Finch, White-throated Sparrow, Dark-eyed Junco, Lincoln's Sparrow, Blue-headed Vireo, Magnolia Warbler, Mourning Warbler, Canada Warbler, Winter Wren, Red-breasted Nuthatch.

In a recent modeling study of 150 common bird species of the northeastern U.S., half were expected to show a decrease in abundance of at least 25% under current climate change scenarios (Mathews et al. 2004). The state bird of Maine, the Black-capped Chickadee, would experience a 60% decline in abundance under the current high emissions trend (Rodenhouse et al. 2007).

The conservation problems that we are likely to see as a result of global warming pollution will make many of the traditional short-term threats seem insignificant. A modeling study published in the peer-reviewed journal Nature in 2004 found that 15-37 percent of 1,103 animal and plant species that were considered will likely become extinct at current expected rates of climate change. Further, the study showed that in most regions the projected extinction rates from global climate change were far greater than those even from habitat loss and degradation (Ferreira de Siqueira et al. 2004).

V. Bicknell's Thrush on Black Nubble

Although previous surveys at Black Nubble had not confirmed the presence of Bicknell's Thrush in habitat on Black Nubble, surveys completed in 2007 did confirm the presence of the species at three locations within the proposed project area (Wells pers. obs.). (See Exhibit 4: Survey locations for Bicknell's Thrush) To assess the current presence or absence of Bicknell's Thrush on Black Nubble and Redington Mountains, I carried out surveys following a protocol established by the Vermont Institute of Natural Sciences (VINS) Mountain Birdwatch for establishing presence or absence of Bicknell's Thrush. Two sets of surveys were carried out on Black Nubble and one on Redington Mountain, between June 21 and June 28, 2007.

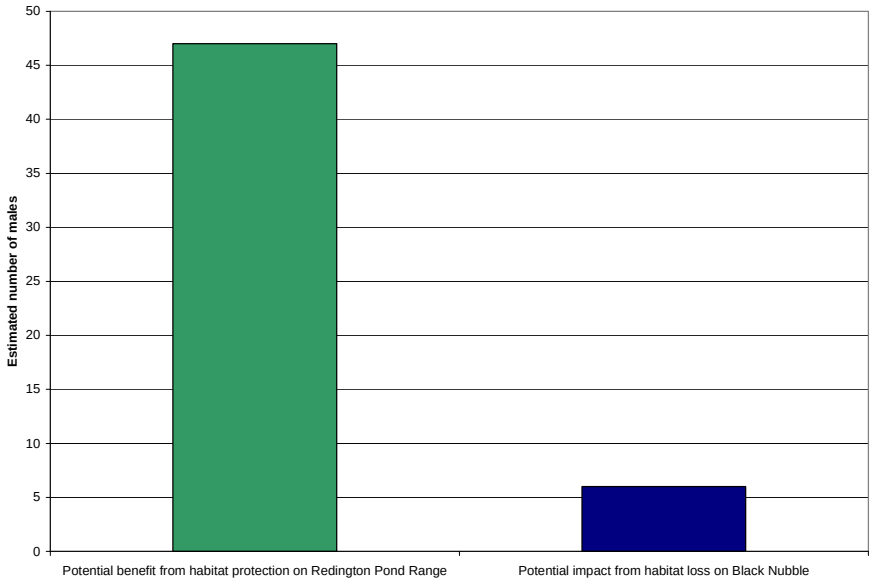
The proposed wind project is expected to result in the loss of 64 acres of habitat that could represent potential Bicknell's Thrush habitat. This would represent less than 0.02% of predicted Bicknell's Thrush habitat in the U.S. and between 0.08% and 0.03% of predicted habitat for the species in Maine (depending on assumptions about utilization of regenerating clear cuts).

When assessing this threat, it should not be overlooked that although regulations have been in place in Maine since 1974 to protect habitat over 2,700 feet, LURC files document more than 21,300 acres that have been harvested since 1974. It is impossible to determine how much of that territory may have been Bicknell's Thrush habitat, although some of it certainly would be potential habitat. In total area it is the equivalent of between 17% and 36% of current estimated Bicknell's Thrush habitat in Maine. As far as I have been able to determine, this harvesting has been done largely without consideration of any potential impact on conservation of and global population levels of Bicknell's Thrush.

Fortunately for the species, preliminary evidence suggests that individuals are now inhabiting these regenerating clear cuts, though there appears to be no plans for ensuring maximal available Bicknell's Thrush habitat over the long-term through a landscape-level forest harvesting plan. The long-term population levels and extirpation risk of the species will likely be strongly related to the future logging regimens applied to these habitats. Issues like the timing of harvest, the size of harvested areas, and proximity to protected areas maintaining source populations of the species (as at the proposed Redington conservation area) are known from risk analysis to be major drivers of the probability of regional persistence for a species (Goodman 1987, Burgman et al. 1993, Ruggerio et al. 1994, Wells 1997).

Some simple calculations can be made of the maximal possible impact of habitat loss from the Black Nubble project development on Bicknell's Thrush numbers. These estimates are overestimates by any standard since a large proportion of the habitat within the project area is mature conifer forest with little understory, making it unsuitable for Bicknell's Thrush. In some portions of the proposed project area, activities will increase available habitat for the species by converting mature forest to early successional forest more suitable for the species. Average home range size for male Bicknell's Thrush is 11 acres (Hale 2006). If all habitat within the Black Nubble project area were suitable for the species (487 acres), there would be space for approximately 44 males, each with an 11-acre home range. The protected area on Redington Mountain of 517 acres would encompass space for an additional 47 males for a total of 91 males. The projected habitat loss of 64 acres would encompass space that could theoretically support 6 males (approximately 0.03% of global population).

Figure 2. Estimated impacts of habitat loss and protection from Black Nubble wind farm



VI. Bicknell's Thrush on Redington Pond Range

A significant population of Bicknell's Thrush has been documented from the applicant-owned portion of Redington Mountain since at least 1994 (Woodlot Alternatives 2006) and continuing to 2007 (J. Wells pers. obs.).

The 517 acres of habitat on Redington Pond Range proposed to be protected from wind power development represents one of Maine's largest remaining unprotected blocks of habitat over 2,700 feet, and over 6% of the remaining 8,630 acres of unfragmented forest over 3,000 feet within the region (Pelletier 2006). Permanent protection of this habitat block would establish a significant protected area for Bicknell's Thrush and other species.

Given the average home range size for male Bicknell's Thrush of 11 acres (Hale 2006), these 517 acres would encompass space for 47 males *if* all the available habitat were suitable for the species. The number of Bicknell's Thrush detected in surveys within the 517 acre habitat block was estimated at 18 individuals in 1994 when the most intensive survey was completed (Woodlot Alternatives 2006). In a less intensive survey in 2002, the number of Bicknell's Thrushes detected was 6-11 individuals (Woodlot Alternatives 2006). I detected four Bicknell's Thrushes during a single day survey on Redington Mountain in June 2007. This clearly indicates that this is not only a population with significant numbers, but habitat that has continued to support the population over 13 years.

VII. Conclusion: Seeing These Threats in Context

In weighing the relative impacts of the proposed Black Nubble Wind Power Project to Bicknell's Thrush and other species, it is important to assess the direct, immediate site-specific impacts against both the long-term benefits of a carbon neutral energy source and the current known impacts from carbon-based energy sources. I have already discussed the projected massive changes expected from global warming and the current impacts from mercury deposition and acid rain. The direct site-specific impacts on North American birds, including many of Maine's migrant and wintering species, from ongoing oil, gas, and coal mining industries is immense but has never been comprehensively assessed. (See Exhibit 5: Impacts to habitat from fossil fuel extraction in North America)

Non-renewable energy sources that account for the majority of energy consumption in Maine and throughout the U.S. have already and will continue to cause the direct loss of hundreds of thousands of birds. Such energy sources, if their development is continued unabated will also, in the long term through global warming, result in extinctions as well as declines in abundance.

Based on this analysis, and viewed within the full range of threats to Bicknell's Thrush, I conclude that the proposed Black Nubble project would not pose a significant risk to Bicknell's Thrush, and that protection of Redington Pond Range would contribute to the conservation objectives for this species.

LITERATURE CITED

American Petroleum Institute. 2006. Exploring for Gas and Oil: Where Does the U.S. Produce Oil and Natural Gas? URL:http://api-ec.api.org/policy/index (Accessed 1 March 2006).

Anielski, M.,and S. Wilson. 2005. Counting Canada's Natural Capital: Assessing the Real Value of Canada's Boreal Ecosystems. Canadian Boreal Initiative, Ottawa, and Pembina Institute, Drayton Valley, Alberta. 78 pp.

Audubon New York. 2007. Audubon Helps Launch International Fund to Protect Winter Habitat for Bicknell's Thrush. URL: http://ny.audubon.org/NewsPubs_Press-July17th2007.html (Accessed 20 August, 2007).

Blancher, P., and J. V. Wells. 2005. The Boreal Forest Region: North America's Bird Nursery. American Birds 59:30-39.

Burgman, M.A., S. Ferson, and H.R. Akcakaya. 1993. Risk Assessment in Conservation Biology. Chapman and Hall, London, UK.

Canadian Association of Petroleum Producers. 2005. CAPP Releases 2004 Petroleum Reserves Estimate. URL:http://www.capp.ca (Accessed 1 March 2006).

Connolly, V., G. Seutin, J.P.L. Savard, and G. Rompre. 2002. Habitat Use by Bicknell's Thrush in the Estrie Region, Quebec. Wilson Bulletin 114:333-341.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming.

Debevoise, N., and C. Rawlins (eds). 1996. The Red Desert Blues: The Industrialization of Southwest Wyoming. Wyoming Outdoor Council, Lincoln, Wyoming.

Drewitt, A.L., and R.H.W. Langston. 2006. Assessing the Impacts of Winds Farms on Birds. Ibis 148:29-42.

Erskine, A.J. 1977. Birds in Boreal Canada. Report Series Number 41, Canadian Wildlife Service, Ottawa, Canada.

Evers, D.C., and T.A. Clair (eds.). 2005. Biogeographical Patterns of Environmental Mercury in Northeastern North America. Ecotoxicology 14.

Ferreira de Siqueira, M., A. Grainger, L. Hannah, L. Hughes, B. Huntley, A.S. Van Jarrsveld, G.F. Midgley, L. Miles, M.A. Ortega-Huerta, A.T. Peterson, O.L. Phillips, and S.E. Williams. 2004. Extinction Risk From Climate Change. Nature 427:145-148.

Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions. Synthesis Report of the Northeast Climate Impacts Assessment (NECIA), Union of Concerned Scientists, Cambridge, MA.

Glick, P. 2005 The Waterfowler's Guide to Global Warming. National Wildlife Federation, Washington, D.C. 37 pp.

Goodman, D. 1987. How Do Any Species Persist? Lessons for Conservation Biology. Conservation Biology 1:59-62.

Government of Alberta. 2004. Oil Sands. URL:http://www.energy.gov.ab.ca/89.asp (Accessed 2 March 2006).

Hale, S.R. 2006. Using Satellite Imagery to Model Distribution and Abundance of Bicknell's Thrush (*Catharus bicknelli*) in New Hampshire's White Mountains. Auk 123:1038-1051.

Hamel, P. B. 2000. Cerulean Warbler (Dendroica cerulea). In The Birds of North America, No. 511 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Hames, R. S., K. V. Rosenberg, J. D. Lowe, S. E. Barker, and A. A. Dhondt, 2002. Adverse Effects of Acid Rain on the Distribution of the Wood Thrush *Hylocichla mustelina* in North America. Proceedings of the National Academy of Sciences 99:11235-11240.

Horwitt, D., C. Campbell, S. Gray, J. Mata-Fink, S. Myers, J. Houlihan. 2006. Big Access, Little Energy — the Oil and Gas Industry's Hold on Western Lands. Environmental Working Group, Washington, D.C. URL:http://www.ewg.org/oil_and_gas/execsumm.php (Accessed 2 March 2006).

Iverson, L.R., and A.M. Prasad. 2002. Potential Distribution of Tree Species Habitat Under Five Climate Change Scenarios in the Eastern U.S. Forest Ecology and Management 155:205-222.

Iverson, L.R., A.M. Prasad, B.J. Hale, and E.K. Sutherland. 1999. Atlas of Current and Potential Future Distributions of Common Trees of the Eastern United States. General Technical Report NE-265, USDA Forest Service, Northeastern Research Station, Radnor, Pennsylvania.

Lambert, J.D., K.P. McFarland, C.R. Rimmer, S.D. Faccio, and J.L. Atwood. 2005. A Practical Model of Bicknell's Thrush Distribution in the Northeastern United States. Wilson Bulletin 117:1-11.

Mackenzie Wild. 2006. Mackenzie Gas Project. URL: http://mackenziewild.ca/gas-project/index.html (Acceseed 2 March 2006).

Mathews, S.N., R.J. O'Connor, L.R. Iverson, and A.M. Prasad. 2004. Atlas of Climate Change Effects in 150 Bird Species of the Eastern United States. Gen. Tech. Rep. NE-318. U.S. Department of Agriculture, Forest Service, Northeastern Research Station, Newton Square, PA. 340 pp.

Nixon, E.A., S.B. Holmes, and A.W. Diamond. 2001. Bicknell's Thrushes (*Catharus bicknelli*) in New Brunswick Clear Cuts: Their Habitat Associations and Co-occurrence with Swainson's Thrushes (*Catharus ustulatus*). Wilson Bulletin 113:33-40.

Pelletier, S.K. 2006. Prefiled Direct Testimony of Steven K. Pelletier on Behalf of Maine Mountain Power, LLC, to State of Maine Land Use Regulation Commission.

Price, J., and P. Glick. 2002. The Birdwatcher's Guide to Global Warming. National Wildlife Federation and American Bird Conservancy, Reston VA, and The Plains, VA. 32 pp.

Rich, T. D., C. Beardmore, H. Berlanga, P. Blancher, M. Bradstreet, G. Butcher, D. Demarest, E. Dunn, C. Hunter, E. Inigo-Elias, J. Kennedy, A. Martell, A. Panjabi, D. Pashley, K. Rosenberg, C. Rustay, S. Wendt, T. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Rimmer, C. C., K. P. McFarland, W. G. Ellison, and J. E. Goetz. 2001. Bicknell's Thrush (Catharus bicknelli). In The Birds of North America, No. 592 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Rimmer, C.C., K.P. McFarland, D.C. Evers, E.K. Miller, Y. Aubry, S. Busby, and R.J. Taylor. 2004 Mercury Concentrations in Bicknell's Thrush and Other Insectivorous Passerines in Montane Forests of Northeastern North America. Ecotoxicology 14:223–240.

Rodenhouse, N.L., S.N. Matthews, K.P. McFarland, J.D. Lambert, L.R. Iverson, A. Prasad, T.S. Sillett and R.T. Holmes. 2007. Potential Effects of Climate Change on Birds of the Northeast. Mitigation and Adaptation Strategies for Global Change. In press for 2008.

Root, T.L., and S.H. Schneider. 2002. Climate Change: Overview and Implications for Wildlife. In (S.H. Schneider and T.L. Root, eds.) Wildlife Responses to Climate Change: North American Case Studies. Island Press, Covelo, CA.

Rosenberg, K.V., and J.V. Wells. 2005. Conservation Priorities for Terrestrial Birds in the Northeastern United States. Pp. 236-253 *In* (C.J. Ralph and T.D. Rich, eds.) Bird Conservation Implementation and Integration in the Americas:Proceedings of the Third

International Partners In Flight Conference. 2002 March 20-24; Asilomar, CA, Volume 1. USDA Forest Service, Gen. Tech. Rep. PSW-GTR-191, Albany, CA.

Ruggiero, L., G.D. Hayward, and J.R. Squires. 1994. Viability Analysis in Biological Evaluations: Concepts of Population Viability Analysis, Biological Population, and Ecological Scale. Conservation Biology 8:364-372.

Sierra Club of Canada. 2005. Mackenzie Valley Pipeline and Alberta Oil Sands. http://www.sierraclub.ca/national/programs/atmosphere-energy/energy-onslaught/campaign.shtml?x=307 (Accessed 2 March 2006).

Schneider, R. R., J. B. Stelfox, S. Boutin, and S. Wasel. 2003. Managing the cumulative impacts of land uses in the Western Canadian Sedimentary Basin: a modeling approach. Conservation Ecology 7(1): 8. [online] URL: http://www.consecol.org/vol7/iss1/art8

Schultz, C., and S. Hazell. 2005. Migratory Birds and IBAs: Technical Review of Mackenzie Gas Project EIS. Nature Canada, Ottawa. Available at: http://www.cnf.ca/parks/mgp.html.

United States Government Accountability Office. 2005. Oil and Gas Development: Increased Permitting Activity Has Lessened BLM's Ability to Meet Its Environmental Protection Responsibilities. GAO-05-418. Available at: http://www.gao.gov/new.items/d05418.pdf.

U.S. Environmental Protection Agency. 2005. Mountaintop Mining/Valley Fills in Appalachia: Final Programmatic Environmental Impact Statement. Available online at http://www.epa.gov/region3/mtntop/index.htm

Wells, J.V. 1997. Population Viability Analysis for Maine Grasshopper Sparrows. Pp. 153-170 in Grasslands of Northeastern North America. (P.D. Vickery and P. W. Dunwiddie, eds.), Massachusetts Audubon Society, Lincoln, MA.

Wells, J.V. 1998. Important Bird Areas in New York State. National Audubon Society, Albany, NY. 243 pp.

Wells, J.V. 2007. Birder's Conservation Handbook: 100 North American Birds at Risk. Princeton University Press, Princeton, NJ.

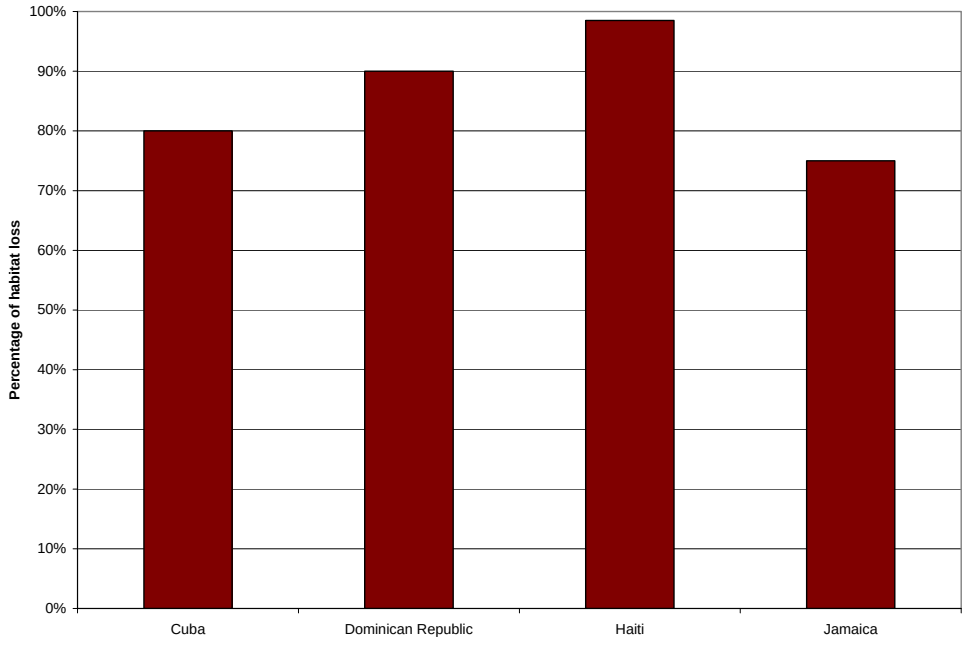
Woodlot Alternatives. 2006. Redington Wind Farm, LURC DEP Application Section 7 – Wildlife and Fisheries.

Woynillowicz, D., C. Severson-Baker, M. Raynolds. 2005. Oil Sands Fever: The Environmental Implications of Canada's Oil Sands Rush. Pembina Institute, Drayton Valley, Alberta. 86 pp.

Exhibits 1-3: Threats to Wintering Habitat of Bicknell's Thrush

1: Photo of forest habitat destruction in Dominican Republic (Jeff Wells, 1999)

2: Percentage of wintering habitat loss in primary wintering locations



3. Remaining broad-leaf forested habitat in Dominican Republic (green). An estimated 90% of Bicknell's Thrush habitat has been destroyed. Courtesy Vermont Institute of Natural Sciences.

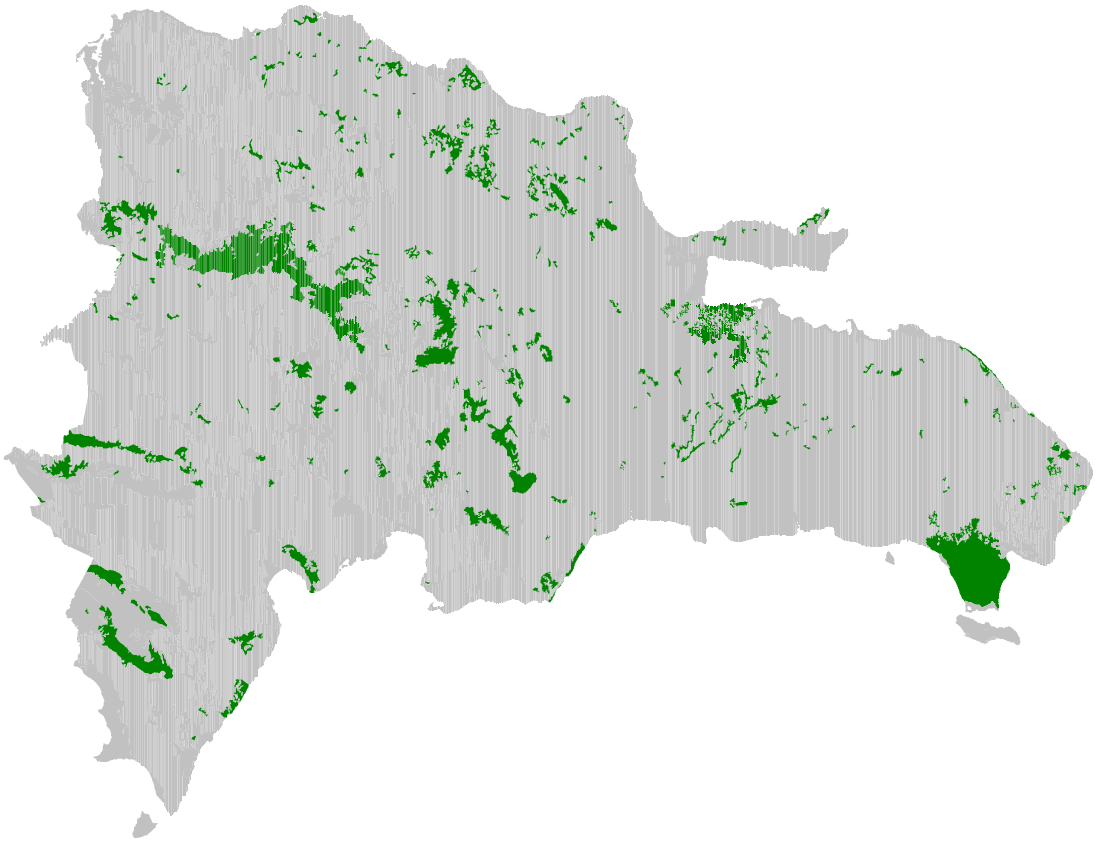


Exhibit 4: Survey locations for Bicknell's Thrush by Wells, 2007

- See separate file

Exhibit 5: Impacts to habitat from fossil fuel extraction in North America

Coal mining

- In the Appalachians, mountaintop removal mining is destroying hundreds of thousands of acres of habitat for rapidly declining species of high conservation concern.
- Species of concern include the Cerulean Warbler, Golden-winged Warbler, and Louisiana Waterthrush.
- The federal government reported that 816,000 acres was lost or degraded by mountaintop removal mining as of 2005.
- Some 1,200 miles of streams were filled-in within the region between 1992 and 2002.
- Habitat loss on this scale must translate into the loss of tens of thousands, if not hundreds of thousands of Cerulean Warblers, and loss of similar numbers of the many co-occurring bird species in these habitats. (Given a density of this at-risk species in occupied areas of 1 pair/acre; rangewide average as given by Hamel 2000—much higher densities are reported from the habitats destroyed by mountaintop removal mining.)

U.S. oil and gas drilling

- A study in 2004 estimated that a minimum of over 120 million acres of habitat in the western U.S. were impacted by oil and gas well pads, pipelines, and roads (Connelly et al. 2004).
- There are more than one million gas and oil wells across North America. (American Petroleum Institute 2006). Over 500 million acres of public land in the U.S. are available for oil and gas leasing (Horwitt et al. 2006).
- The number of drilling permits approved for public lands by the Bureau of Land Management increased by over 350%, from 1,803 in 1999 to 6,399 in 2004 (US Government Accountability Office 2005). A 1996 report estimated that 6,000-11,000 new oil and gas wells would be developed in southwestern Wyoming by 2016. In the Powder River Basin of Wyoming and Montana, over 65,000 additional wells are being considered for development (Debevoise and Rawlins 1996).
- There is no doubt such activities have or will account for the loss and degradation of habitat for hundreds of thousands of birds including some of our nation's most threatened. Much of the current oil and gas well development in the western U.S. is precisely in areas harboring remaining populations of at-risk species like Greater Sage-Grouse and Lesser Prairie Chicken (Wells 2007).

Canadian oil and gas

- In Canada, the source nation for the majority of U.S. oil and gas imports, major new development plans are underway for the building of natural gas and oil pipelines. This includes an 800-mile long pipeline through the Mackenzie Valley of the Northwest Territories to provide fuel for extraction of oil from the Alberta oil sands deposits of

northern Alberta (Schultz and Hazell 2005, Sierra Club of Canada. 2005, Mackenzie Wild 2006).

- Already one study in the region has documented the loss of over 350,000 acres of habitat, mostly for oil and gas development in a section of northeastern Alberta (Schneider et al. 2003). The oil sand deposits underlay an area of about 35 million acres (Government of Alberta 2004). One of the largest existing oil sand mining operations already occupies 32,000 acres (Woynillowicz et al. 2005).
- In Canada, a record 22,800 oil and gas wells were drilled in 2004 and the number of new wells drilled annually is projected to continue increasing (Canadian Association of Petroleum Producers 2005).
- An analysis in 2006 by Global Forest Watch Canada estimated the current industrial footprint from oil and gas extraction activities throughout Canada's boreal region at 114 million acres (Anielski and Wilson 2005).

Impacts on boreal birds

- Canada's boreal region is the major breeding area for the majority of Maine's migratory and wintering birds. This includes such well-known common birds as Barrow's and Common goldeneye; Bufflehead; Surf, White-winged, and Black scoter; Red-breasted and Common merganser; Lesser and Greater yellowlegs; Solitary Sandpiper; Short-billed Dowitcher, Northern Shrike; Bohemian Waxwing; Cape May Warbler; Palm Warbler; Fox Sparrow; Rusty Blackbird; and Pine Grosbeak (Blancher and Wells 2005).
- Given that millions of acres of habitat have been or will be destroyed for energy production in the Canadian boreal region, there is no doubt that energy demands from U.S. consumers, if not tempered with renewable energy sources, will result in the loss of hundreds of thousands of these familiar bird species (Given average densities of boreal birds range from 0.4-2.4 pairs per acre as per Erskine 1977).