Use of Whiteface Mountain by Bicknell's Thrush and other Montane Forest Bird Species

2005 End-of-season report submitted to:
Olympic Regional Development Authority
218 Main Street
Lake Placid, NY 12946

Submitted by:
Michale Glennon and Leslie Karasin
Wildlife Conservation Society
7 Brandy Brook Ave, Suite 204
Saranac Lake, NY 12983
518-891-8872
mglennon@wcs.org

October 18, 2005

Executive Summary: The Wildlife Conservation Society (WCS) was contracted by the Olympic Regional Development Authority (ORDA) to assess the use of Whiteface Mtn. by Bicknell's thrush (*Catharus bicknelli*), determining, at a minimum, the presence or absence of the species at a number of locations on the mountain. A species of special concern in New York State, Bicknell's thrush makes use of high elevation conifer forest such as that found on Whiteface and other Adirondack peaks for breeding and nesting habitat during the summer months. Proposed ski trail expansion on Whiteface has raised concerns about the potential for impacts of new trail development on Bicknell's thrush habitat. In the summer of 2004, we surveyed a total of 27 sample points on the mountain in 5 categories: (1) existing glade, (2) proposed glade, (3) existing trail, (4) proposed trail, and (5) control areas. This summer, 2 additional survey locations were added to improve sample sizes within the proposed construction area for a total of 29 sample points. Study points were sampled using standard point count methods to monitor the presence of Bicknell's thrush (BITH) and 4 other high elevation bird species: blackpoll warbler (BLPW), Swainson's thrush (SWTH), winter wren (WIWR), and white-throated sparrow (WTSP). We combined data from the 2004 and 2005 seasons, allowing for larger sample sizes in all treatment types. Similar to last year, we found no significant differences in species richness, diversity, or evenness of Mt. Birdwatch species, or in the total number of Bicknell's thrush detected among existing ski trails, existing glades, proposed ski trails, proposed glades, and control areas. As stated previously, we believe that our power to detect statistical differences was good for richness, diversity, and evenness, but was not as good for individual species differences due to higher variability at the individual species level. Analysis of our second year of data shows that existing ski trails and glades do not differ statistically in terms of abundance or species richness for montane forest birds including Bicknell's thrush. Some trends appeared in the data, however, similar to our results from the 2004 season. Observed trends demonstrated that control areas and uncut forest in the proposed expansion area may have higher total bird abundance and higher diversity of bird species than existing ski trails and glades. We

again did not find Bicknell's thrush in areas of existing glades on Whiteface Mt. Glading, in particular, may be detrimental to habitat quality for Bicknell's thrush.

Introduction

The Bicknell's thrush is a species of great interest in the northeastern United States, both for birders and scientists alike. The species breeds in high elevation conifer forests, primarily above 3000 ft., on mountaintops from the Catskills to northern Maine. It is among the most rare and probably most threatened species in North America, and is ranked as the nearctic Neotropical migrant of highest conservation priority in the Northeast (Rimmer *et al.* 2001).

Bicknell's thrush habitat in the U.S. consists of montane forests dominated by balsam fir (*Abies balsamea*), with lesser amounts of red (*Picea rubens*) and black spruce (*Picea mariana*), white birch (*Betula papyrifera*), mountain ash (*Sorbus americana*), and other hardwood species. It is adapted to naturally disturbed habitats and historically probably sought out patches of regenerating forest caused by fir waves, wind throw, ice and snow damage, fire, and insect outbreaks, as well as the chronically disturbed stunted conifer forests found at high elevations in the northeast (Rimmer *et al.* 2001). Highest densities of the species are often found in continually disturbed (high winds, heavy winter ice accumulation) stands of dense, stunted fir on exposed ridgelines or along edges of human-created openings, or in regenerating fir waves (Rimmer *et al.* 2001). More than 90% of birds are believed to breed in the U.S. (versus Canada), with the Adirondacks containing the largest area of its montane breeding habitat, followed by NH, ME, VT, and the Catskills.

Bicknell's thrush wintering habitat is even more restricted than its breeding habitat, with the species occurring regularly on only 5 islands in the Greater Antilles. It prefers mesic to wet broadleaf montane forests in the Dominican Republic, Haiti, Cuba, Jamaica, and Puerto Rico. Large-scale loss and degradation of wintering habitat pose the greatest threat to the long-term viability of this species (Rimmer *et al.* 2001).

Bicknell's thrush is not well-sampled by traditional bird monitoring methods due to its preference for high elevation habitat and its uncommon mating system. Both males and females mate with multiple partners, multiple paternity is common, and more than one male often feeds nestlings at a given nest. These characteristics make it poorly sampled by bird count methods that rely on more common territorial mating systems found in many bird species. Estimates of breeding densities for the species are unreliable at best (Rimmer *et al.* 2001). Though estimation of breeding densities are difficult to obtain, Bicknell's thrush is believed to be vulnerable to extinction and has been added to the Red List of Threatened Species by the World Conservation Union. As a habitat specialist of high elevation conifer forests, it is susceptible to a number of threats on the breeding grounds including pollution (acid rain, mercury), recreational development, cell tower construction, wind power development, and climate change.

This report details the second of three seasons of field work conducted by the Wildlife Conservation Society to examine the potential impacts of ski area development on breeding habitat for Bicknell's thrush and other montane forest species on Whiteface Mtn. in the Adirondacks of New York State.

Study Area

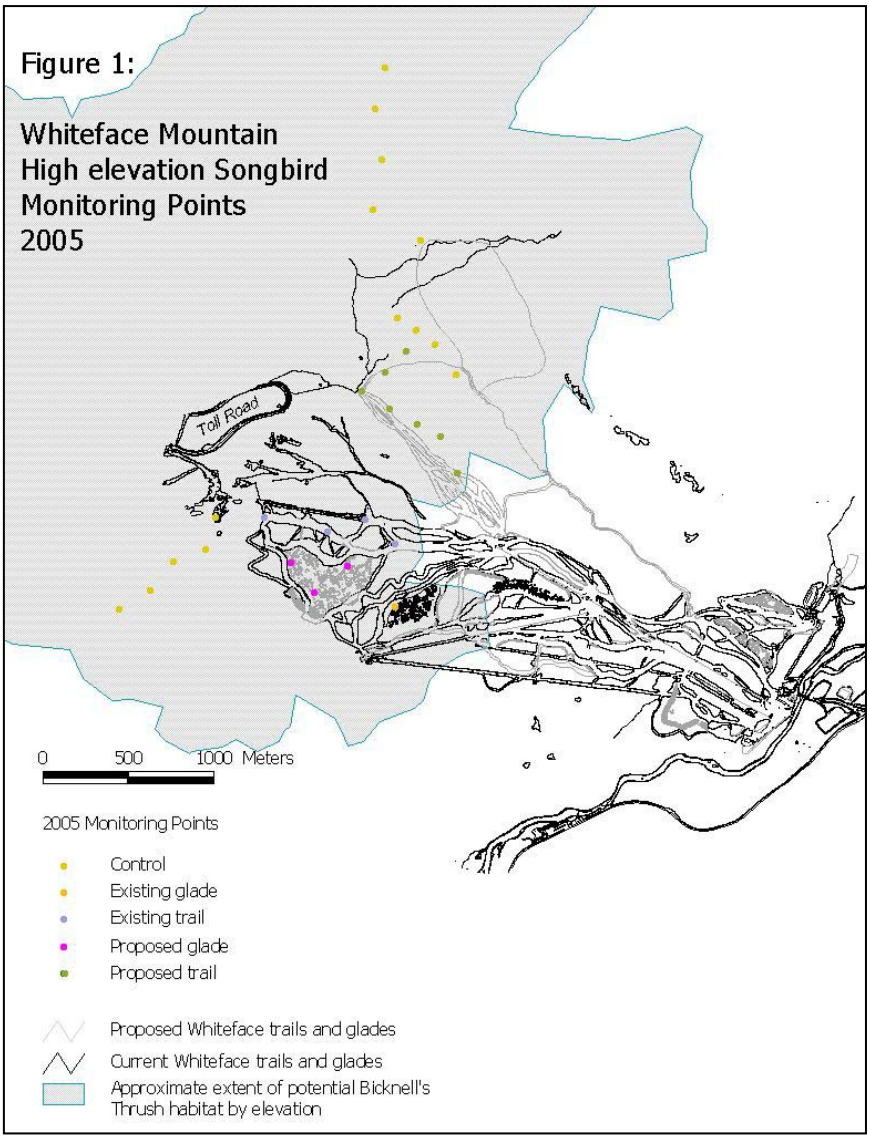
Whiteface Mtn. is located in the high peaks region of the Adirondacks and contains approximately 1,020 acres of suitable Bicknell's thrush breeding habitat, with approximately 27 acres of potential habitat within the proposed Tree Island Pod expansion area. Elevations in the high peaks region range from 1,000 – 5,300 ft. The study site is characterized by spruce-fir forest at high elevations and transitions into a mix of softwood and hardwood species including paper birch and red maple (*Acer rubrum*) at low elevations. It is important to note that delineation of habitat for Bicknell's thrush is difficult, even when conducted by experts in the field. For that reason, any estimate of the area that may be used by Bicknell's thrush on Whiteface Mt. is by no means meant to be absolute and represents an estimate of potential habitat only.

Methods

We used standard point count methods to assess presence/absence and relative abundance of BITH and other high elevation bird species on Whiteface Mtn. (Ralph *et al.* 1995, Rosenstock *et al.* 2002, Thompson 2002). In a previous report to ORDA by the Vermont Institute of Natural Science, distance sampling methods were suggested as a means by which to obtain density estimates of BITH on Whiteface Mtn. However, authors of that report and several others discussed the limitations of the distance sampling approach in providing reliable density estimates, both because of the unique characteristics of the Bicknell's thrush mating system, and also due to the difficulty of meeting stringent assumptions of distance sampling methods (Farnsworth *et al.* 2002, Ralph *et al.* 1995, Rimmer *et al.* 2004, Rosenstock *et al.* 2002, Thompson 2002). Rimmer *et al.* (2004), in their report to ORDA, mention that these limitations, coupled with the single-site study design of the work on Whiteface, mean that distance sampling methods used in this study are unlikely to produce statistically defensible results. In an effort to make the best attempt possible, given these constraints, to obtain reliable information on BITH and other species, we adopted a point count method that allows for calculation of densities for individual species, if adequate detections are made. Standard distance sampling methods require that the distance to each bird detected be accurately estimated, a requirement that we felt was challenging given the conditions of the habitat we were working in and the known difficulties in meeting this and other assumptions of distance sampling. Farnsworth *et al.* (2002) describe a technique whereby densities of individual species may be calculated from standard point count data collected in a series of time intervals, given that researchers used a fixed radius for point counts (suggested radius = 50 m). We had more confidence in our ability to detect whether birds were within or outside of a 50 m radius, than in our ability to accurately estimate exact distances to all birds heard. Therefore, we used a standard 10 minute point count method that would allow for future calculations of density given adequate numbers, but required only that we determine

whether birds were within or outside of 50 m. This point count method enables us to determine presence/absence, and relative abundance among different site on the mountain.

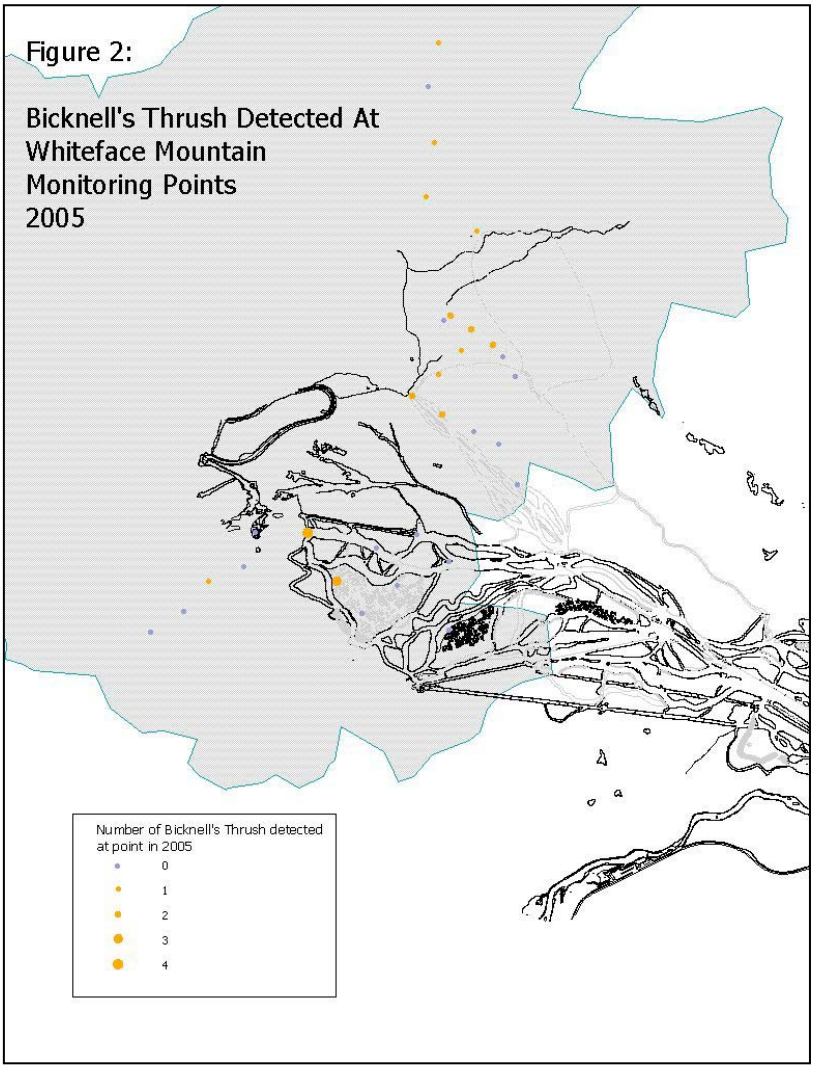
We conducted all sampling on Whiteface Mtn. between June 6th and June 10th of this year. We returned to established sampling points in 5 different treatment types: (1) existing glades (*n*=1), (2) proposed glades (*n*=3), (3) existing trails (*n*=4), (4) proposed Tree Island Pod trail area (*n*=7), and (5) control areas (*n*=14), adding 2 additional points within the proposed expansion area for a total of 29 sample points (Figure 1). Configuration of habitat on the mountain limited us to small sample sizes within several of the treatment types (i.e., existing glades, proposed glades, existing trails). To ensure that individual birds are counted only once at each sample point, standard methods require that sample points be approximately 200-250 m apart. This distance precluded us from having more than a few points within some of our treatment types. Battles *et al*. (1992, 2003) have conducted prior work on Whiteface Mtn. to examine trends in red spruce decline and tree community dynamics. In anticipation that habitat data collected at these points may one day be useful to this study, we conducted point counts at two locations also used by Battles *et al*. (1992, 2003) in one of our control areas that overlapped with their study sites.



We sampled all points between the hours of 4:20 and 6:30 am, during the time in which Bicknell's thrush is believed to be most vocal. At each sample point, bird were recorded by species, time period of detection (i.e., 0-3 minutes, 3-5 minutes, 5-10 minutes), activity (i.e., singing, calling, individual seen), and whether or not they were within 50 m of the observer. In the interest of safety, two observers were present on each sampling route, but

only one observer was responsible for data collection. **Results**

Numbers of detections of all species were far below minimal standards required for calculating densities by distance sampling. In lieu of densities, we calculated relative abundances for Bicknell's thrush and the 4 other montane bird species. We used analysis of variance (ANOVA; Zar 1999) to test whether there were differences in the number, diversity, and evenness of Mtn. Birdwatch species, and the abundance of individual species (BITH, BLPW, SWTH, WIWR, and WTSP) among the treatment types. One type, existing glades, could not be included in the analysis because we had only one sample point within an existing glade, and variance cannot be calculated from a single sample. We tested normality of variables and homogeneity of variances to ensure that we had not violated the assumptions of ANOVA. An analysis of variance allows for the test of whether there are differences in the means observed for more than 2 different treatment types. We used a commonly accepted *P* value of 0.05 to denote statistical significance; values $\leq$ 0.05 are considered statistically different. We found no statistical differences in the abundance, richness, diversity, or evenness of Mtn. Birdwatch species observed (Table 1). The only individual species difference that was statistically significant was that for SWTH, which was higher in abundance in the proposed trail area than in the control area. Figure 2 depicts the locations on Whiteface Mt. at which Bicknell's thrush was detected.



In the interest of knowing whether there were differences in bird communities found in any kind of ski trail versus the undisturbed forested areas on the mountain, we again conducted an analysis in which we lumped the existing trail data into one category (ski

trails) and compared it against a second category comprising all of the areas which at this time are undeveloped including the proposed Tree Island Pod points, the proposed glade points, and the control points (no trails). When comparing existing trails to currently uncut forest areas, we again found no statistical differences in total abundance, richness, diversity, or evenness of Mtn. Birdwatch species, or individual abundance of BITH, BLPW, SWTH, WIWR, and WTSP.

Table 1. Mean and statistical difference observed for 9 response variables among areas of proposed glade, existing trail, proposed trail, and control areas on Whiteface Mtn. Superscripts denote statistical differences.

Response variable	Proposed glade	Existing trail	Proposed trail	Control	*P* value
Total # individuals	5.167	5.625	5.583	5.339	0.972
Richness of Mtn. Birdwatch species	3.00	3.25	3.58	3.63	0.559
Diversity of Mtn. Birdwatch species	1.37	1.57	1.67	1.76	0.341
Evenness of Mtn. Birdwatch species	59.12	66.98	70.98	76.04	0.388
Bicnkell's thrush (BITH)	0.50	0.63	0.83	0.73	0.909
Blackpoll warbler (BLPW)	0.83	0.75	0.92	1.14	0.628
Swainson's thrush (SWTH)	0.83	1.13	1.50[a]	0.86[b]	0.040
Winter wren (WIWR)	1.67	1.50	1.58	1.30	0.581
White-throated sparrow (WTSP)	1.33	1.63	0.75	1.30	0.252

Though no statistical differences were detected among treatment types, control areas and as-yet-uncut trail areas demonstrated a trend of slightly higher abundance, richness, and diversity than existing trails and glades (Figure 3). Examining species representation amongst types showed, similar to 2004, that existing glades appear to be somewhat lower in species richness than the other types (Figure 4).

Figure 3. Richness, Diversity, and Abundance of Mtn. Birdwatch Species 2004-2005

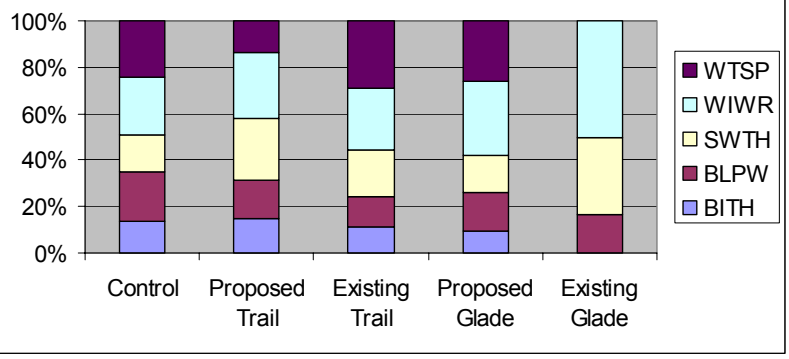
Control areas, along with proposed and existing trails and proposed glades appear to have a more even distribution of birds among species than do existing glades. An even distribution of species representation implies a more diverse community of birds in these areas.

Discussion

We have completed a second year of field work as part of a three-year study to determine the potential impacts of ski area development on habitat for Bicknell's thrush and other

montane forest birds. This year, we sampled a total of 29 points on Whiteface Mtn., though the configuration of Bicknell's thrush habitat on the study site, combined with the requirements of point count sampling, constrained us to small sample sizes for some treatment types. In particular, the amount of existing gladed area on the mountain at elevations high enough to provide potential Bicknell's thrush habitat was small and allowed for only one point within this type. Similarly, we were able to sample only 3 points in the proposed glade and 4 points in the existing trail due to constraints of the habitat, geographical constraints related to our need to space the points more than 200 meters apart from one another, and the time required to reach these points, even when camping overnight on the mountain. Our primary concern, however, was to address the potential impacts of ski development within the proposed expansion area, or Tree Island Pod, and to establish a series of sample points within this area that can be compared to control areas on the mountain not open to development.

Figure 4. Species Composition 2004-2005



One of the potential results of low sample sizes in any statistical analysis and an issue we raised subsequent to last year's field season is a low power to detect differences. Statistical power is defined as the ability to detect a statistical difference, if one is present. Our power was generally good for detecting differences in the total number, diversity, and evenness of Mtn. Birdwatch species observed. Our power was lower, however, for detecting individual species differences because the variability at the individual species level is much higher. Therefore, the conclusions drawn from these data must again be taken with some caution. Because we have sampled for 2 years, however, and because our primary interest is in the differences among the different types of trail and non-trail areas on the mountain, we were able to pool the data from 2004 and 2005 and therefore increase our statistical power to some degree.

Given the caveats mentioned, there are interesting patterns in the data obtained from years 1 and 2 of this study. We found no statistical differences in the total number, diversity, and evenness of Mtn. Birdwatch species among existing glades, proposed glades, existing trails, proposed trails, and control areas. Likewise, we found few differences in the abundances of Bicknell's thrush, blackpoll warbler, Swainson's thrush, winter wren, and white-throated sparrow among these treatment types. As we discussed last year, the Vermont Institute of Natural Science has been studying the impacts of ski area development on Bicknell's thrush on Stratton and Mansfield mountains for a number of years (Rimmer *et al.* 2004). Results from their analyses indicate that there are few differences in population and reproductive parameters for Bicknell's thrush between

existing ski areas and control areas on those 2 mountains. This study, much more extensive than our own, has examined differences in reproductive success, survivorship, and nest predation for Bicknell's nesting near or along existing ski trails versus those nesting in uncut controls and found very few differences among observed parameters between ski areas and controls. It appears that ski areas are not negatively impacting Bicknell's thrush survival or nest success on these 2 mountains. Whether these same results would be obtained for other montane forest species is unknown. Our preliminary data, however, appear to show that relative abundances of the montane species we studied are similar in existing trail and control areas on Whiteface Mtn.

It is important to note that most of the human-related activity occurring on Whiteface and other ski areas occurs during the winter months when most bird species are absent. It may be that direct effects of humans are minimal during the summer months when breeding activity is occurring, and that loss of habitat and other human impacts on the wintering grounds may be much more critical to the long-term survival of Bicknell's thrush. One of the most common results of habitat fragmentation, such as that created by ski trails, is increased predation created by better access for predators along habitat edges. Rimmer *et al.* (2004) have not detected this pattern on Stratton and Mansfield mountains, however. Nest success and predation rates appear similar in ski trail areas and in controls (Rimmer *et al.* 2004). This may be due to the fact that the generalist predators such as raccoons or coyotes that are more common in fragmented habitats at low elevations are less prevalent at high elevations where Bicknell's thrush commonly nests. Red squirrels are the most significant nest predator for Bicknell's thrush, and squirrels appear to be more evenly disbursed throughout the landscape than are more generalist predators which concentrate along and use edges as travel corridors.

It is worth noting that we again detected no Bicknell's thrush in the existing glade area, and again detected highest abundance of Bicknell's thrush in the proposed Tree Island Pod area. Rimmer *et al.* (2004) stress that glade creation may effectively eliminate suitable Bicknell's thrush habitat by removing the dense subcanopy structure favored by this species. The Tree Island Pod area, in contrast, is in an area of the mountain that has a very dense subcanopy, a habitat characteristic favored by Bicknell's thrush. We are anxious to continue this work and to determine what the effects of the trail construction will be in this area.

Acknowledgements

The Wildlife Conservation Society acknowledges the generous financial support of the Olympic Regional Development Authority in allowing us to conduct this important work. We also acknowledge the in kind support provided by the Adirondack Park Agency, the New York State Department of Environmental Conservation, and the Vermont Institute of Natural Science.

Literature Cited

Battles, J.J., A.H. Johnson, T.G. Siccama, A.J. Friedland, and E.K. Miller. 1992. Red spruce death: effects on forest composition and structure on Whiteface Mt, N.Y. Bulletin of the Torrey Botanical Club 119(4):418-430.

Battles, J.J., T.H. Fahey, T.G., Siccama, and A.H. Johnson. 2003. Community and population dynamics of spruce-fir forests on Whiteface Mt, N.Y: recent trends, 1985-2000. Canadian Journal of Forest Research 33:54-63.

Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. The Auk 119(2):414-425.

Ralph, C.J., S. Droege, and J.R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications. USDA Forest Service General Technical Report PSW-GTR-149.

Rimmer, C.G., K.P. McFarland, W.G. Ellison, and J.E. Goetz. 2001. Bicknell's thrush: *Catharus bicknelli*. *In* The Birds of North America: Life Histories for the 21st Century. Philadelphia Academy of Natural Sciences.

Rimmer, C.G., K.P. McFarland, J.D. Lambert, and R.B. Renfrew. 2004. Evaluating the use of Vermont ski areas by Bicknell's thrush – applications for Whiteface Mountain, N.Y. Final report to the Olympic Regional Development Authority, December 2004.

Rosenstock, S.S., D.R. Anderson, K.M. Giesen, T. Leukering, and M.F. Carter. 2002. Landbird counting techniques: current practices and an alternative. The Auk 119(1):46-53.

Thompson, W.L. 2002. Towards reliable bird surveys: accounting for individuals present but not detected. The Auk 119(1):18-25.

Zar, J.H. 1999. Biostatistical Analysis, Fourth Edition. Pearson Education, Inc., Delhi, India.