Mountain Birdwatch 2007-2008

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ANNUAL REPORT TO THE UNITED STATES FISH AND WILDLIFE SERVICE

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VERMONT CENTER FOR ECOSTUDIES

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Contents

I. Executive Summary

Mountain Birdwatch is a long-term monitoring program for songbirds that breed in high-elevation forests of the northeastern United States. Initiated in 2001, Mountain Birdwatch has prepared skilled volunteers to conduct annual surveys along 1-km point-count routes located in Massachusetts, New York, Vermont, New Hampshire, and Maine. Primary emphasis is placed on Bicknell's Thrush, a montane-fir specialist that breeds only in the Northeast and adjacent portions of Canada. Other focal species include Blackpoll Warbler, Swainson's Thrush, White-throated Sparrow, and Winter Wren. In 2007, Mountain Birdwatchers conducted point-count surveys on 139 routes; in 2008, they completed surveys at 115 routes. Bicknell's Thrush was detected at 57% of the point-count locations in 2007, and 60% in 2008, frequencies that were similar to those observed in previous years. An average of 0.33 Bicknell's Thrush were detected per point count in 2007, and an average of 0.31 were detected per point count in 2008, both years exceeding the previous high count of 0.3 observed in 2005. Counts of Swainson's Thrush continued their increase, reaching levels exceeding those from any previous year in both 2007 (0.93 individuals per point count) and 2008 (0.84 individuals per point count). Blackpoll Warblers were detected in numbers similar to those observed in 2005 (0.78 and 0.82 individuals per point count in 2007 and 2008, respectively). White-throated Sparrows were the most commonly detected species, rebounding to levels not seen since 2001 and 2002, with observers detecting 1.02 individuals per point count in 2007 and 0.95 individuals per point count in 2008. Winter Wren was the only species that declined substantially, from a record high of 1.01 individuals per point count in 2006 to a new low of 0.45 individuals per point count in 2007. Winter Wren numbers rebounded modestly to an average of 0.65 individuals per point count in 2008, close to the long-term (2001-2008) average of 0.67 individuals per point count.

Mountain Birdwatch also underwent a programmatic review and evaluation during the past reporting period. The purpose of this review was to identify whether improvements could be made in survey design, implementation, and data management, and to evaluate whether coordination with other monitoring programs (e.g., the High-

Elevation Landbird Program [HELP] of Bird Studies Canada) could be improved. This review process resulted in the formation of a partnership among the existing programs that monitor high-elevation songbirds, which was formally recognized as the Mountain Bird Working Group of the Northeast Coordinated Bird Monitoring Partnership. This group identified a new, international sampling frame for monitoring high-elevation landbirds based on the extent of Bicknell's Thrush breeding habitat. New sampling locations for Mountain Birdwatch and its Canadian partner programs will be drawn from this sampling frame in 2009.

Based on consultations with statisticians, recent scientific literature, and preliminary analysis of existing datasets, we developed two alternative bird-survey protocols to evaluate during the field season of 2008. These two protocol options were piloted by volunteer observers, hired technicians, and staff of the Vermont Center for Ecostudies (VCE) in June 2008. One protocol consisted of monitoring all target species using repeated simple counts with a concurrent, time-of-detection protocol for monitoring Bicknell's Thrush. The second protocol consisted of "presence-absence" counts for all target species concurrent with a time-of-detection protocol for Bicknell's Thrush. Data were analyzed using a variety of approaches, which, encouragingly, yielded broadly similar results.

During the past year, Mountain Birdwatch also provided results to a variety of audiences in order to inform responsible stewardship of sensitive mountain habitat.

II. Background and Rationale

The high-elevation forests of the northeastern United States provide habitat for a unique assemblage of breeding birds, many of which reach the southern limits of their distribution in these montane forests of spruce and fir. Most notably, mountain forests provide habitat for Bicknell's Thrush, the region's only endemic songbird. However, due to the inaccessibility of the high-elevation forests of the Northeast, this assemblage of birds is not included in any of the standardized state or Federal bird monitoring schemes (e.g., the Breeding Bird Survey). As such, generating even rudimentary estimates of population trends or population size has proven difficult for species in this habitat, and the development of scientifically-defensible conservation strategies have lagged accordingly. Mountain Birdwatch, a program of the Vermont Center for Ecostudies (VCE) was created to fill these information gaps. The objectives of Mountain Birdwatch are: 1) to monitor the distribution and abundance of mountain-breeding birds in northern New England and New York; 2) to describe the influence of landscape and habitat features on mountain bird distribution and abundance; and 3) to guide stewardship of high-elevation forests.

Mountain Birdwatch began under the auspices of the VCE Forest Bird Monitoring Program. Volunteers surveyed 12 mountains from 1993 to 1999 in order to monitor changes in the status of Bicknell's Thrush and other high-elevation songbirds. In 2000, VCE biologists launched Mountain Birdwatch as an independent program with fifty additional routes in Vermont and offered observers the option to concentrate on five species: Bicknell's Thrush, Swainson's Thrush (*Catharus ustulatus*), Blackpoll Warbler (*Dendroica striata*), White-throated Sparrow (*Zonotrichia albicollis*), and Winter Wren (*Troglodytes troglodytes*). The following year, we expanded the survey region to include over 100 new routes in New York, New Hampshire, and Maine.

Data collected under Mountain Birdwatch since 2000 have been put to a variety of uses: we have assessed Mountain Birdwatch's power to detect population trends (Lambert et al. 2001); examined the influence of landscape structure on high-elevation

bird communities (Lambert et al. 2002); measured habitat characteristics on 45 survey routes (Lambert 2003); quantified short-term population trends (Lambert 2005); produced and validated a Bicknell's Thrush distribution model (Lambert et al. 2005); and projected effects of climate change on Bicknell's Thrush distribution (Lambert and McFarland 2004). We have also identified key management units and conservation opportunities for Bicknell's Thrush (Lambert 2003). Most recently, we have used data from Mountain Birdwatch to develop a tool that can be used to evaluate the likely impact of wind-energy development on mountains and ridgelines throughout the northeast (McFarland and Lloyd, in preparation).

During the 2007 breeding season, Mountain Birdwatch volunteers monitored 139 routes; in 2008, these citizen scientists monitored 115 routes. Results from these surveys are presented in this report.

III. Methods

A. Mountain Birdwatch surveys

1. Volunteer engagement

We announced the opportunity to volunteer for Mountain Birdwatch on our web site (http://www.vtecostudies.org/MBW/) and in a variety of other publications. Cooperating conservation organizations publicized the project through electronic and print media. The Appalachian Mountain Club hosted a workshop for all of its hut naturalists. Mountain Birdwatchers received maps, survey instructions, an identification guide to high-elevation songbirds, and a training tape with an auditory identification quiz. The Mountain Birdwatch listserv (http://groups.yahoo.com/group/ MountainBirdwatch/) and other on-line information (http://www.vtecostudies.org/MBW/) help inform, coordinate, and engage participants in the survey.

2. Site selection, route placement and coverage

Site selection was based on a GIS model of potential Bicknell's Thrush habitat that incorporates elevation, latitude, and forest type (Lambert et al. 2005). The model depicts conifer-dominated forests above an elevation threshold that drops 81.63 m for every

one-degree increase in latitude (-81.63 m/1º latitude). The threshold's slope corresponds closely with the latitude-elevation relationship for treeline in the Appalachian Mountain chain, which is -83 m/1º latitude (Cogbill and White 1991). Four routes have been established on peaks lying below the elevation threshold, while forty routes cross the threshold due to the limited availability of trails or land area above the threshold. We made an attempt to randomize site selection by randomly assigning priority ranks to discrete units of high-elevation habitat. However, the choice of sites was constrained by the availability of volunteers and the location of existing trails.

When placing routes, we favored discrete starting points (e.g. trail junction), extensive conifer stands, and upper elevations. Volunteers establishing a route for the first time placed five points at 200- to 250-m intervals along a mapped course. Monitors submitted a detailed description of each station in order to facilitate its location in future years.

In 2007, Mountain Birdwatchers completed 139 surveys; in 2008, they completed 115 routes (Fig. 1).

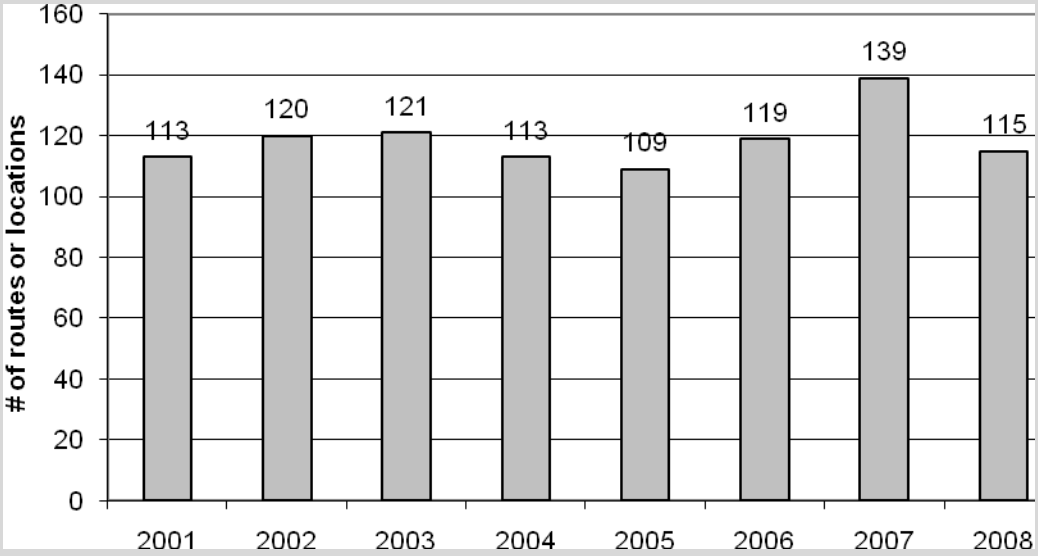

Figure 1. Mountain Birdwatch survey effort 2001-2008.

3. Survey Methods

Surveys were conducted under acceptable weather conditions (no precipitation, temperature >2 °C, wind speed <32 km/h) from 1 to 25 June. Surveys were conducted

between 04:30 and 08:00 EDT and most were completed by 06:30 EDT. Observers listened quietly for ten minutes at each of five stations.[1] They recorded the number of each focal species seen or heard during three time periods: 0-3 minutes, 3-5 minutes, and 5-10 minutes. If Bicknell's Thrush was not detected during or between point counts, surveyors returned to each point and broadcast a one-minute recording of the bird's vocalizations, followed by a two-minute listening period.[2] We used audio playbacks to elicit responses from present, but silent birds. Audio playbacks were discontinued upon detection of one or more individuals. If no Bicknell's Thrushes responded to the broadcasts, the status of the species was classified as unknown. Monitors who completed their surveys without encountering Bicknell's Thrush were asked to conduct follow-up, audio playback surveys at dusk or dawn before 15 July (after Atwood et al. 1996). If no observations of Bicknell's Thrush were made during the second visit, the species was presumed to be absent from that site.

4. Data analysis: avian distribution and abundance

To include data from as many routes as possible, we subsampled records of the five focal species from the first five minutes of each ten-minute count. Where two point count series were conducted, we used results from the first survey only. We measured frequency of occurrence and relative abundance for each of the focal species. To calculate frequency of occurrence, we divided the number of routes on which a species was detected during point counts (first five minutes only) by the total number of routes surveyed.

For between-year comparisons, we calculated the average number of individuals per point on a route by route basis. This correction was necessary because close to 30% of the routes surveyed in 2001 contained fewer than five stations (mean = 2.87 stations). These routes were extended below the original elevation threshold in 2002 to meet the 5-point standard. For each focal species, we averaged per-point values across routes to

[1] In 2003, we increased the 5-species point count length from five to ten minutes in order to gather more information and to achieve methodological consistency with the all-species protocols and with Canada's High-Elevation Landbird Program.

[2] Prior to 2003, the broadcast duration was three minutes.

produce an overall index of relative abundance for every year from 2001 to 2006. We did the same for the subset of routes that were surveyed in each of the six years (n = 31).

B. Mountain Birdwatch 2.0 protocol development

Two protocol options were piloted by volunteer observers, hired technicians, and staff in June 2008. One protocol consisted of monitoring all target species using repeated simple counts with a concurrent, time-of-detection protocol for monitoring Bicknell's Thrush. The second protocol consisted of "presence-absence" counts for all target species concurrent with a time-of-detection protocol for Bicknell's Thrush. For both protocols, detections of Bicknell's Thrush were recorded into one of three distance intervals: 0-25 m from the observer, 26-50 m, and > 50 m. Detections of all other focal species were placed into one of two intervals: ≤ 50 m from the observer, or > 50 m from the observer. The tradeoffs associated with each protocol were analyzed based on the survey results and feedback from observers. Results were analyzed using occupancy, time-of-detection, and distance estimation methods. Covariates included observer type, protocol, wind, elevation, time of day, date, and distance.

IV. Results

A. Mountain Birdwatch surveys

Bicknell's Thrush was detected during point counts on 86 of 139 routes (62%) surveyed in 2007 and 69 of 115 routes (60%) surveyed in 2008. In both 2007 and 2008, at the points where Bicknell's Thrush was detected, most (90%) detections occurred during the first five minutes. On the subset of routes surveyed every year since 2001, average counts of Bicknell's Thrush set a record high in 2008 (0.38 individuals per point count, standard error [se] = 0.08) (Fig. 2). Average counts of Bicknell's Thrush in 2007 (0.26 individuals per count, se=0.07) were similar to the 2001-2008 average (0.27 individuals per count). Across all routes, average counts of Bicknell's Thrush were higher in both 2007 (0.33 individuals per point count, standard error [se] = 0.03) and 2008 (0.31 individuals per point count, se = 0.04) than in any previous year of Mountain Birdwatch, excepting 2005 when 0.31 individuals were detected per count (Fig. 3). The average numbers of Bicknell's Thrush counted per point on

all routes in 2007 and 2008 were somewhat higher than the 2001-2008 average of 0.25 individuals per point count (se = 0.04).

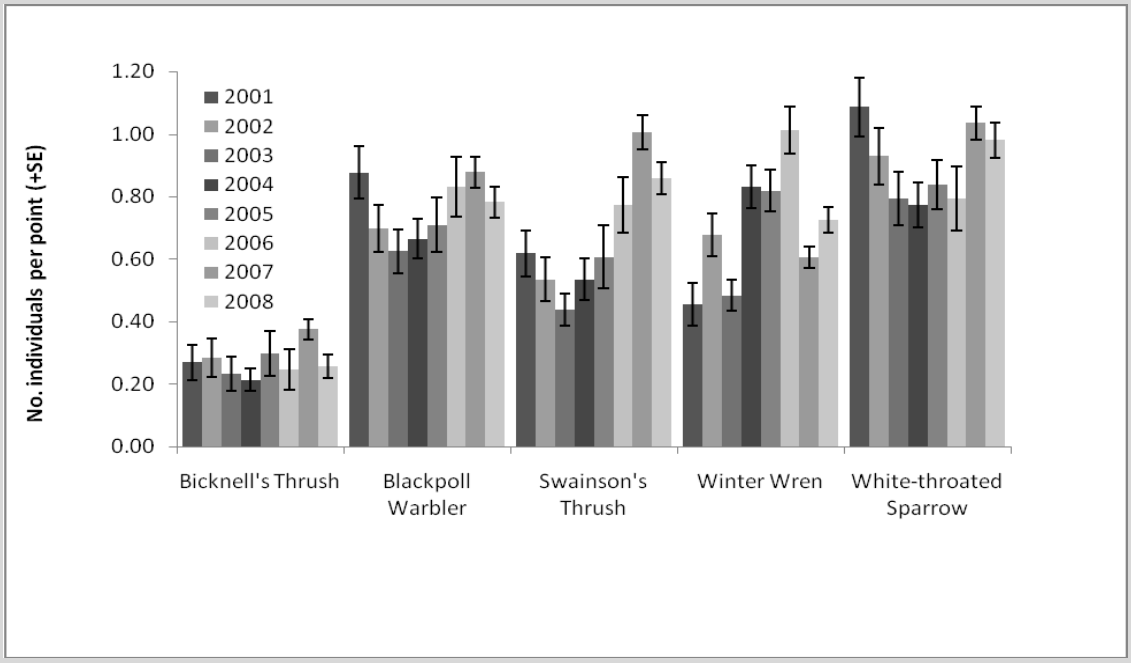

Figure 2. Relative abundance of focal species on 31 routes surveyed each year, 2001-2008.

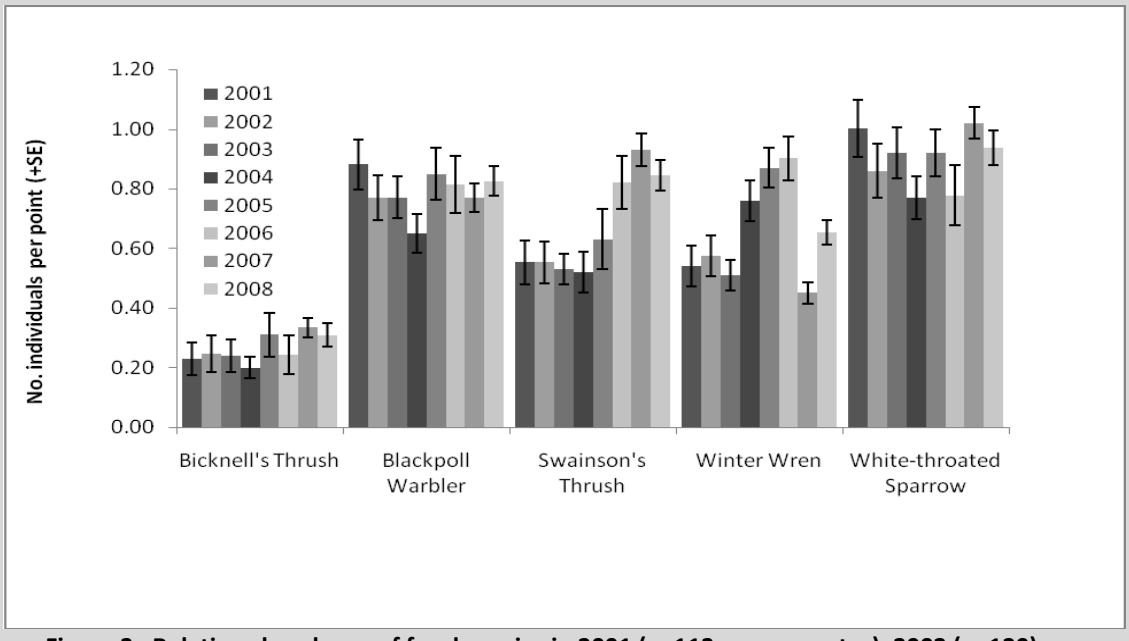

Figure 3. Relative abundance of focal species in 2001 (n=113 survey routes), 2002 (n=120), 2003(n=121), 2004 (n=113), 2005 (n=109), 2006 (n=119), 2007 (n=139), 2008 (n=115).

Average counts of Blackpoll Warbler in 2007 and 2008 were similar to counts recorded in previous years (Figs. 2 and 3). Swainson's Thrush continued to increase in numbers (Figs 2 and 3). Winter Wren showed a pronounced decline in 2007, a pattern also apparent in data collected by the Forest Bird Monitoring Program (S. D. Faccio, Vermont Center for Ecostudies, personal communication). The cause of this apparent decline is unknown, and Winter Wren numbers rebounded in 2008. White-throated Sparrow numbers were consistent with previous years, and this species continued as the most frequently encountered by Mountain Birdwatch volunteers.

B. Mountain Birdwatch 2.0 protocol development

Time-of-detection, repeated counts, repeated "presence-absence" surveys, and distance sampling yielded similar estimates of density for Bicknell's Thrush (Table 1).

Table 1. Density estimates for Bicknell's Thrush based on 2008 pilot data.

Field method	Density (BITH/ha)	95% CI
Time of detection	0.44	0.40-0.48
Repeated counts	0.33	0.29-0.38
Repeated p/a	0.39	0.37-0.42
Distance sampling	0.37	0.26-0.50
Composite range	0.33-0.44	0.26-0.50

Detectability estimates of all species were generally good (> 0.25 per 5-minute period). Bicknell's Thrush detectability was estimated at 0.91 using time-of-detection methods and 0.81 using distance-sampling. Occupancy for Bicknell's Thrush was dependent upon elevation, time of day, and observer category (that is, whether the observer was a technician or volunteer). The important covariates and occupancy estimates for all target species are presented in Table 2.

Table 2. Occupancy estimates and important covariates for all target species based on 2008 pilot data.

Species	Important covariates	Psi 95% CI
BCCH	Wind	0.02 – 0.07
BITH	Elevation, Time (+/- 5 AM), Observer	0.30 – 0.46
BLPW	Elevation, Observer	0.78 – 0.89
BOCH	Protocol, Observer, Time (+/- 5 AM)	0.07 – 0.14
FOSP	NONE	0.07 – 0.13
HETH	Elevation	0.07 – 0.19
SWTH	Protocol, Date, Time (+/- 5 AM)	0.85 – 0.98
WIWR	(Elevation), Time	0.69 – 0.84
WTSP	(Elevation), (Protocol), Time (+/- 6 AM)	0.79 – 0.87
YBFL	Observer, Time (+/- 5 and 7 AM), Wind	0.42 – 0.66

Observers in the U.S. also submitted an evaluation form with their piloting results. They ranked different aspects of the pilot protocols from 1 = agree to 5 = disagree (Table 3). There was a generally favorable response by volunteer observers and they were equally like to remain a Mountain Birdwatch volunteer despite differences in the complexity of the two protocols.

Table 3. Average ratings by observers from 2008 pilot surveys based on a scale from 1=agree to 5=disagree.

Question	Repeated Simple Counts (n=28)	Presence/Absence (n=25)
Rationale for creating a new protocol was clearly explained	1.92	1.52
Written instructions for conducting the protocol are clear	1.84	1.32
Video demonstration was clear and helpful	1.68	1.73
Field datasheets are easy to use	1.65	1.44
Home datasheets are well-organized and allowed for easy transcription	1.75	1.65
The additional five target species can be learned with reasonable effort	1.50	1.28
The target species bird survey is not so difficult as to reduce the accuracy of the observations	1.80	1.17
The Bicknell's Thrush protocol can be conducted concurrent with the target species bird survey without loss in the quality of data collected	1.76	1.73
The cone count protocol is straightforward and easy to conduct	2.12	2.00
I was able to maintain concentration for the full 20 minute period	2.12	1.88
The time to fill in field and home datasheets is reasonable	1.56	1.38
I will continue to participate in Mountain Birdwatch if these protocol changes are made	1.42	1.38

V. Discussion

A. Mountain Birdwatch surveys

Bird population levels change in response to a wide variety of natural and anthropogenic factors (Askins et al. 1990). Often, data gathered over brief periods belie long-term trends (Holmes and Sherry 2001). Furthermore, uncorrected counts, as presented in this report, may mask even strong trends in population size (e.g., Martin et al. 2007). As a result, it is difficult to interpret uncorrected counts conducted over a short

time frame. Reaching meaningful conclusions may require many years of continuous effort and a thorough assessment of factors that influence the detectability of individuals. These caveats aside, three notable patterns emerge from Mountain Birdwatch data collected from 2001 to 2008. First, although large annual fluctuations are common, most of the species, including Bicknell's Thrush, show no apparent trend in counts. Second, Swainson's Thrush represents an exception to this first pattern, evidencing a fairly strong positive trend in our index of abundance. As a potential competitor with Bicknell's Thrush, the continued increase in abundance of Swainson's Thrush in high-elevation forests warrants continued attention. Finally, Winter Wrens exhibited strong annual variation in abundance. Investigating the causes of these fluctuations using Mountain Birdwatch data may be a fruitful avenue for future research.

B. Mountain Birdwatch 2.0 protocol development

The different approaches tested in the field in 2008 generally yielded similar estimates of detectability and density. Furthermore, even though the protocols varied in complexity, feedback from volunteers indicated that most observers were able to cope with even the more complex of the two protocols. We found little evidence that volunteer participation would be affected by the protocol chosen for use in Mountain Birdwatch 2.0. A thorough evaluation of the statistical analyses and observer feedback based on the pilot season were weighed against the programmatic goals to come to agreement on the final protocol. The final protocol consists of a time-of-detection protocol for Bicknell's Thrush (each individual is tracked on minute-by-minute) during the first ten minutes of the survey, concurrent with four 5-min repeated counts for all species. A fourth distance band was added for detections of Bicknell's Thrush; observers in future years will place detections in one of the following intervals: 0-25 m, 26-50 m, 51-100 m, and >100 m. This is the same repeated simple count protocol piloted in 2008 with the addition of a fourth distance band for Bicknell's Thrush detections in the first ten minutes.

The new monitoring program will be named Mountain Birdwatch 2.0 (to distinguish it from the original Mountain Birdwatch coordinated by the VCE since 2000). The sample frame consists of all potential Bicknell's Thrush breeding habitat. Areas with access in the form of trails and logging roads will be selected for surveys using a Generalized Random Tessellation Sampling (GRTS) design.

In the long-term, this project will improve our ability to estimate abundance, produce habitat models, and conduct population viability analyses to advance conservation in this restricted and threatened habitat. The "Mountain Birdwatch: Protocol and Standard Operating Procedures for Monitoring High-elevation Landbirds in the Northern Appalachian and Laurentian Regions" is available for download here: http://www.vtecostudies.org/MBW/MBW2.html

C. Information Sharing

We responded to a variety of data requests in 2007 and 2008 (Appendix A). Mountain Birdwatch continues to be a critical source of information for a variety of stakeholders.

VI. Acknowledgments

We gratefully acknowledge the scores of volunteers who participate in Mountain Birdwatch. This dedicated group was recruited with assistance from the Adirondack Mountain Club, the Appalachian Mountain Club, the Appalachian Trail Conservancy, Audubon New York, Maine Audubon, the Maine Department of Inland Fisheries and Wildlife, and the Wildlife Conservation Society. We are thankful for permission to conduct surveys on lands owned and/or managed by: the American Ski Corporation, the Carthusian Monastery, Essex Timber Company, LLC, the Green Mountain Club, the Maine Department of Inland Fisheries and Wildlife, the National Park Service, the New York State Department of Environmental Conservation, the U.S. Forest Service, and the Vermont Agency of Natural Resources. Mountain Birdwatch is funded by the U.S. Fish

and Wildlife Service through a cooperative agreement administered by Assistant Nongame Bird Coordinator and Mountain Birdwatcher, Randy Dettmers.

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VIII. **Appendix A.** ***Data requests to Mountain Birdwatch during 2007-2008.***

Information Requested By	Purpose of Request
2007	
Western Mountain Alliance	Background information for a Bioblitz (ME)
New York State Dept of Environmental Conservation	Update the New York State Breeding Bird Atlas
John M. C. Peterson	Birding guide for Upstate New York
Saddleback Maine	Management recommendations for ski area development (ME)
New York Natural Heritage Bureau	Conservation guide to Bicknell's Thrush in New York State
Audubon New York	Global Important Bird Areas nominations (NY)
Brown University	Museum exhibit featuring Bicknell's Thrush (New England)
2008	
Audubon Society of New Hampshire	Global Important Bird Areas nominations (NH)
Audubon New York	Assessment of BITH status and trend for the Adirondacks
Darryl MacGrath	Research for a book on threatened species in New York State
SUNY Cortland	Research for a book on the interaction of the public with private lands in the Adirondacks
Sweet Water Trust	Reviewing land protection projects (VT)
Audubon Vermont	Global Important Bird Areas nominations (VT)
Vermont Center for Ecostudies	Update the Vermont Breeding Bird Atlas
The Nature Conservancy in Vermont	Evaluate programmatic overlap (VT)
Arrowwood Environmental	Permit consultations and devise conservation strategies (VT)
State University of New York--Albany	Produce GIS habitat model for coursework
2009	
Defenders of Wildlife	Develop resource materials for landscape & habitat subcommittee
Canadian Wildlife Service	Update COSEWIC status report for Bicknell's Thrush
Trust for Public Land	Evaluate potential conservation projects (VT)
Stone Environmental	Evaluate potential wind farm sites (VT)
Vermont Center for Geographic Information	Develop a wind farm siting map for Vermont
Vermont Land Trust	Evaluate potential conservation projects (VT)
Appalachian Corridor	Identify priority habitat units for conservation (QC)
Syracuse University	Assess potential field sites for research