



Northeast Temperate Network Breeding Landbird Monitoring Protocol

2011 Revision

Natural Resource Report NPS/NETN/NRR—2011/400



ON THE COVER

Rose-breasted Grosbeak (*Pheucticus ludovicianus*)

Photograph by: David Brezinski

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Steven D. Faccio

Vermont Center for Ecostudies
20 Palmer Court
White River Junction, VT 05001

Brian R. Mitchell

Northeast Temperate Network
Inventory and Monitoring Program
National Park Service
54 Elm Street
Woodstock, VT 05091

Penelope S. Pooler

Northeast Coastal Barrier Network
Inventory and Monitoring Program
National Park Service
1 Greenhouse Road
Kingston, Rhode Island 02892

May 2011

U.S. Department of the Interior
National Park Service
Natural Resource Program Center
Fort Collins, Colorado

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Please cite this publication as:

Faccio, S., B. R. Mitchell, and P. S. Pooler. 2011. Northeast Temperate Network breeding landbird monitoring protocol: 2011 revision. Natural Resource Report NPS/NETN/NRR—2011/400. National Park Service, Fort Collins, Colorado.

Revision History

Version numbers will be incremented by a whole number (e.g., Version 1.3 to 2.0) when a change is made that significantly affects requirements or procedures. Version numbers will be incremented by decimals (e.g., Version 1.06 to Version 1.07) when there are minor modifications that do not affect requirements or procedures included in the protocol. Add rows as needed for each change or set of changes tied to an updated version number.

Revision History Log

Version #	Date	Revised by	Changes
1.00	April 2006	Steve Faccio	Protocol narrative for the 2006 field season.
2.00	April 2007	Steve Faccio Brian Mitchell	- Protocol narrative for the 2007 field season (except that data entry was into the USGS point count database). - New sampling design for ACAD. - Considered adding grassland plots for MIMA; this was not done because of the small grassland area and the fact that grasslands are scattered across the park (and may be difficult to sample by one person as a single study site). This decision may be revisited at a future time.
3.00	April 2008	Steve Faccio Brian Mitchell	- Addition of SAIR to the monitoring program. - Insert text emphasizing compatibility with GLKN and USFWS protocols. - Minor edits throughout. - Revised monitoring objectives to meet new I&M program guidance. - Added information about new plot marking methods at ACAD. - Added information about end-of-season procedures
4.00	January 2009	Steve Faccio Brian Mitchell Penelope Pooler	- Revised Appendix A and added SAIR - Many sections significantly revised and updated; several sections added to comply with Oakley et al. standards. - Revised Objective 3, and added information to the Data Analysis section pertaining to this objective - Revised Data Management section to reflect use of USGS Point Count Database (since 2007). - Added Data Archiving section - Added section on Operational Requirements, including time, equipment, and budget. - Revised power analysis information. - Added Appendix B and renumbered appendices (A, B, C instead of I, II, III) to comply with NETN format. - Other minor edits.
4.01	March 2009	Steve Faccio Brian Mitchell Penelope Pooler	- Power analysis section revised. - Minor edits.
4.02	April 2009	Steve Faccio Brian Mitchell	Incorporated comments from 3 independent reviewers as well as several NETN park staff.
4.03	August 2009	Sarah Lupis	Formatted and minor edits.
4.04	December 2009	Steve Faccio Brian Mitchell	- Incorporated comments from 3 additional independent reviewers. - Removed Appendix B – reviewers of other protocols did not feel that the statistical summary was relevant.

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Introduction

Background & Objectives

This protocol has been developed for long-term monitoring of forest breeding bird populations within the National Park Service (NPS) Northeast Temperate Network (NETN) as part of the Inventory & Monitoring Program (IM). NETN consists of 13 parks, including the Appalachian National Scenic Trail (APPA). Excluding APPA, the parks total approximately 18,500 ha, with diverse cultural and natural resources. They range in size from just 4 ha at Saugus Iron Works National Historic Site (SAIR), located near densely populated Boston, Massachusetts, to over 15,800 ha at Maine's Acadia National Park (ACAD).

On a broad scale, most NETN parks are located within the temperate deciduous forest biome, and fall within two avifaunal biomes (the Eastern and Northern Forest) as defined by Partners in Flight (PIF) (Rich et al. 2004). At a finer scale, the parks range across four Bird Conservation Regions (BCRs) (Figure 1). BCRs, developed by the North American Bird Conservation Initiative (NABCI 2000), are ecologically defined units that provide a consistent spatial framework for bird conservation across North American landscapes. By employing broad scale units that are ecologically meaningful to bird populations, conservation efforts can be tailored to support groups of species throughout the heart of their ranges. Bird Conservation Regions are being used to help assign "conservation priority" scores for bird species. Each BCR has its own unique list of "priority" species ranked by conservation importance according to a standardized set of criteria determined by partners from Mexico, the U.S. and Canada.

Birds are an important component of park ecosystems, and their high body temperature, rapid metabolism, and prominent position in most food webs make them a good indicator of local and regional ecosystem change. It has been suggested that management activities aimed at preserving habitat for bird populations, such as for neotropical migrants, can have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991, Maurer 1993). Moreover, birds are a high profile taxa, and many parks provide information on the status and trends of the park's avian community through their interpretive materials and programs.

In developing comprehensive long-term monitoring plans, landbirds (a general term used to describe relatively small, terrestrial birds, excluding raptors and upland game birds) are among the best taxonomic groups to monitor because: 1) they are the most easily and inexpensively detected and identified vertebrate animals, 2) a single survey method is effective for many species, 3) accounting and managing for many species with different ecological requirements promotes conservation strategies at the landscape scale (Hutto and Young 2002), 4) many reference datasets and standard methods are available (Ralph et al. 1993, 1995), and 5) the response variables are fairly well understood.

In addition, birds are a useful biotic indicator of the effects of habitat loss and fragmentation. While direct loss of habitat due to development is a primary threat to landbird populations, Neotropical migrants appear to be particularly vulnerable to habitat fragmentation (Robinson and Wilcove 1994, Faaborg et al. 1995, Rosenberg et al. 1999). Forest fragmentation increases the prevalence of forest edges, resulting in higher rates of brood parasitism and nest predation within the remaining breeding habitat (Robinson et al. 1995). It is an ecological stressor that impacts all NETN parks due to the relatively small size of the parks and their land use histories. Although

the NPS has some management control over fragmentation within the parks, fragmentation and habitat loss outside park boundaries is widespread throughout much of the Northeastern region.

Although NETN contains 13 park units (including APPA), implementation of this landbird monitoring protocol will be limited to the following 11 parks: Acadia NP (ACAD); Marsh-Billings-Rockefeller NHP (MABI); Minute Man NHP (MIMA); Morristown NHP (MORR); Roosevelt-Vanderbilt NHS (ROVA - which contains Eleanor Roosevelt Mansion NHS, Home of Franklin D. Roosevelt NHS, and Vanderbilt Mansion NHS); Saint-Gaudens NHS (SAGA); Saugus Iron Works NHS (SAIR); Saratoga NHP (SARA); and Weir Farm NHS (WEFA) (Figure 1).

The Massachusetts Audubon Society will continue to monitor birds at Boston Harbor Islands National Park Area (BOHA), and a separate coastal breeding bird monitoring program was initiated by NETN in 2007 for BOHA. Monitoring the 2,175 mile Appalachian National Scenic Trail (APPA) is beyond the scope of this protocol. Ten of the 11 parks in the landbird monitoring program are National Historical Parks or Historic Sites, and thus have a primary mandate to maintain historical features, landscapes, or practices. This mandate may have a substantial impact on ecological resources within these parks, as they are frequently managed to maintain early successional habitats, or incorporate agriculture or forestry.

Developing a uniform protocol for monitoring landbirds across NETN parks will not only provide insights into the long-term trends of avian species composition and relative abundance, but will also provide a measure for assessing the ecological integrity of Northeastern temperate systems. Additionally, monitoring long-term patterns of bird composition and abundance relative to habitat change resulting from a variety of stressors (e.g., deer herbivory, invasive species, fragmentation, and silvicultural practices) will improve our understanding of their effects on bird populations and help guide management actions within NETN parks. This protocol will also contribute to greater understanding of bird population trends beyond NETN, since it is compatible with protocols developed by the Great Lakes Network (GLKN) and the U.S. Fish and Wildlife Service (USFWS; Knutson et al. 2008).

Monitoring Objectives

Because birds are an important natural resource and they are a robust indicator of ecosystem integrity, the overall goal of landbird monitoring is to track the status and trends of breeding landbirds within the dominant matrix forest habitat at each NETN park. Breeding landbird monitoring will also support and inform management decisions that may affect avian populations. Additional programmatic goals are to increase the visibility of the NETN Inventory & Monitoring Program (I&M) and to involve the public. Due to the small size of the majority of NETN parks, combined with the fact that this is a volunteer-based monitoring program, the ability to detect meaningful trends for individual species at each park will be limited. However, by aggregating data into species groupings, such as guilds or PIF priority species, the ability to detect trends will be increased. Additionally, NETN landbird monitoring will be partnering with the Vermont Center for Ecostudies (VCE) 'Vermont Forest Bird Monitoring Program', a regional landbird monitoring project initiated in 1989 (see Faccio et al. 1998). This will allow data from some Network parks (MABI, SAGA, and SARA) to be combined with data from the VCE's 28 Vermont study sites for more powerful estimates of population trends, thus providing an opportunity to make inferences related to changes beyond park boundaries.

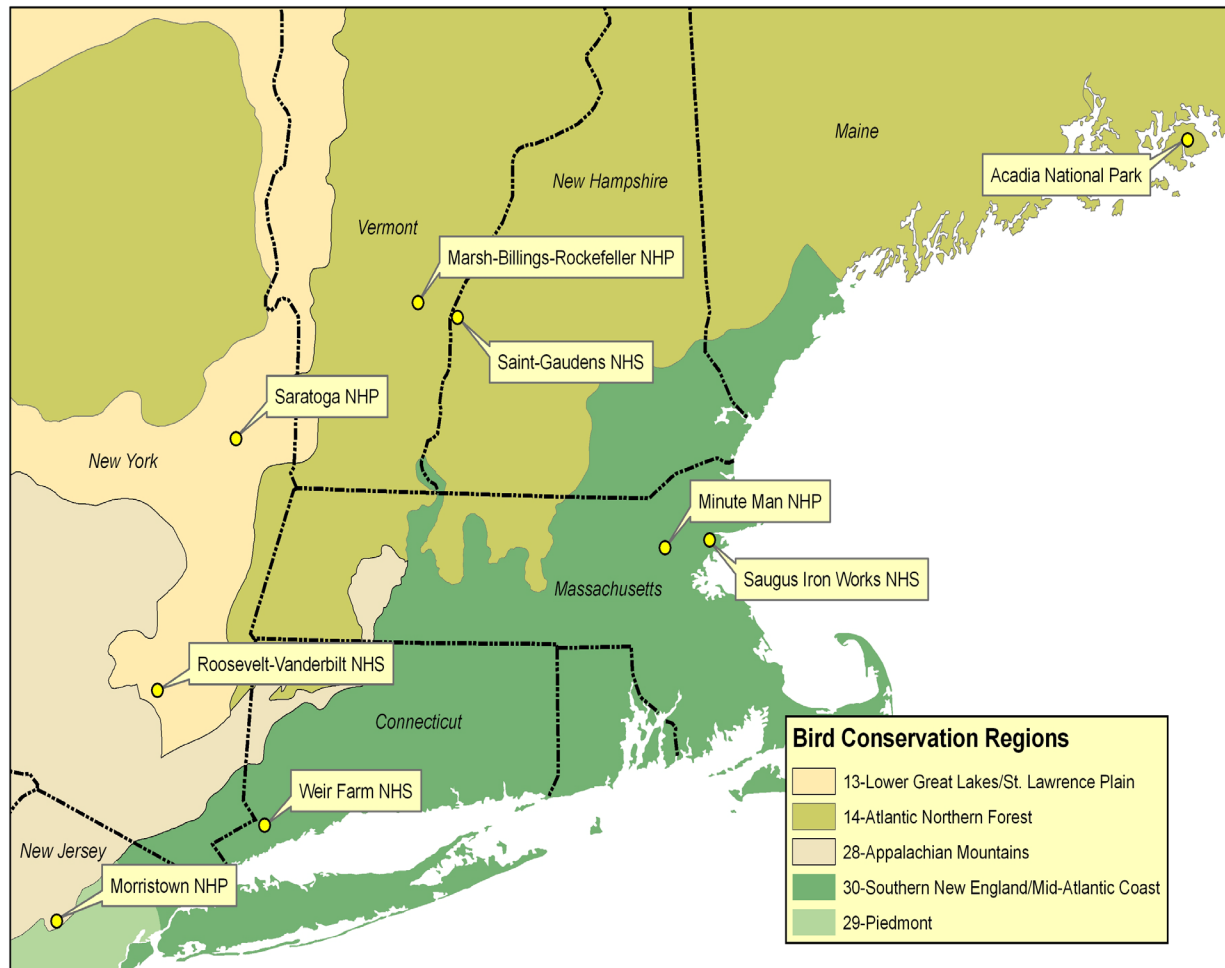


Figure 1. Distribution of National Park units in the Northeast Temperate Network where breeding landbird monitoring protocols will be implemented and their associated Bird Conservation Regions.

Data from NETN parks can also be compared with data collected by GLKN and the USFWS in order to explore regional trends. With that in mind, the protocol described here addresses the following specific, measurable monitoring objectives:

Objective 1: Determine long-term trends in species composition of native and non-native passerine species in dominant, forest matrix habitat during the breeding season at 11 NETN parks (listed above). The focus will be on forest and woodland sampling, except at SARA, where grasslands will also be sampled; potential species, listed by park, can be found in Appendix A.

Objective 2: Determine changes in relative abundance of:

- a) 10 most commonly detected species at each park;
- b) Combined suite of PIF Priority Species at each park, as determined by BCR.

For each of these species groups, the sampling objective is to detect a minimum 5% annual population change over 10 years with at least 50% power at each park.

Objective 3: Provide correlational data that will be used to improve our understanding of breeding bird/habitat relationships and the effects that management actions, such as silvicultural practices, mowing regimes, invasive plant controls, etc., may have on bird occupancy and relative abundance. Where sufficient data exist, periodic analyses will correlate changes in bird communities with site-specific information about park management activities (e.g., silvicultural treatments, timing of mowing, and exotic species management) and with changes in habitat metrics collected at co-located forest condition plots (see Data Analysis).

Sampling Design

Introduction

Numerous sampling approaches have been used to quantify the status and trends of bird populations, and many different monitoring programs are currently in place throughout North America to determine local, regional, or national trends in bird numbers. Most survey methods allow simultaneous collection of information about species that share a common life history or habitat type, but no single method will adequately sample either the diversity of habitats that birds occupy, or life history groups such as seabirds, songbirds, raptors, and shorebirds.

The sampling design described in this protocol involves a series of sampling stations laid out on a systematic grid that is sampled during 10-minute point counts. For landbirds, point counts are the most widely used quantitative method of monitoring bird populations (Ralph et al. 1995). This technique involves using a standardized methodology to record all birds seen or heard during a fixed amount of time at many widely spaced count locations. Recently, many papers have suggested that unadjusted point counts do not provide accurate estimates of abundance or density (see overview by Thompson 2002) because some birds may not be detected due to: 1) observer variability (experience, hearing); 2) environmental factors (wind, vegetation); and/or 3) physical and behavioral aspects of birds (plumage coloration, singing rate). As a result, several methods have been advocated as a means for incorporating detection probabilities in order to adjust occupancy and abundance (or density) estimates derived from point counts. These include occupancy modeling (MacKenzie et al. 2002, 2003), distance sampling (Buckland et al. 2001), removal models (Farnsworth et al. 2002), double observer sampling (Nichols et al. 2000), and double sampling (Bart and Earnst 2002).

Occupancy models are robust, but they generally only predict species presence or absence instead of abundance. The estimated probability of occupancy can be used as an index of abundance or (with some assumptions) to develop estimated abundances (Royle and Nichols 2003), but it is often preferable to attempt to estimate abundance directly. Of the methods available for estimating abundance, double sampling and double observer sampling are both labor intensive. Use of either methodology in a large-scale volunteer-based bird monitoring program would result in significantly reduced sample sizes. In addition, removal models present problems because the simplifying assumption of equal probability of detection throughout a 10-minute count is rarely met, and models without this assumption require much more data (Mitchell and Donovan, in prep).

The use of distance sampling also has its detractors, due to difficulty in meeting the assumptions of this method (e.g., Bart et al. 2004), and recent papers suggesting that most observers cannot estimate distance accurately (Alldredge et al. 2007, Simons et al. 2007). Since each method outlined above has its short-comings and detractors, there may not be a “best” method of calculating detection probabilities for purposes of avian monitoring in NETN parks. This protocol collects data in a way that allows for removal modeling, distance sampling, and occupancy modeling, while trying to keep the total amount of data collected reasonable for volunteer birders.

As a means of evaluating both removal and distance modeling to determine if one of these methods should be dropped from the protocol, we compared the abundance estimates and 95%

confidence intervals produced by both approaches using data from the first 2 years of monitoring at NETN parks (2006-2007). Results showed strong overlap in several of the 95% confidence intervals, improving our confidence that we have accurately estimated the number of individuals in the vicinity of our point count locations (Mitchell et al. 2008). Therefore, both modeling approaches will be used to adjust data for detection probability prior to testing for temporal trends in species abundance.

In distance sampling, the horizontal distance from the observer is estimated for each bird seen or heard during the count period. However, accurately estimating distance is difficult when neither the bird nor its location can be seen, which is common in forested habitats of the Northeast. Although training and experience help, the volume of sound produced by a singing bird is highly variable, and can be dramatically affected by the bird's singing position, as well as site-specific characteristics including vegetation density and topography. Thus, training at one or a few locations may lead to more accurate distance estimates at those sites, but not at others (Bart et al. 2004). Therefore, when the majority of detections are of unseen birds, it is preferable to collect data in distance groups or "bands" rather than estimating exact distances (Rosenstock et al. 2002). With distance bands, the assumption concerning measuring accuracy is relaxed and the observations need only to be placed into the correct distance band (Buckland et al. 1993), greatly increasing accuracy and consistency among and within observers (Rosenstock et al. 2002). For the protocol described here, bird detections will be placed into four distance bands; 0–10 m, 10–25 m, 25–50 m, and >50 m. Additionally, each 10-minute point count will be divided into 1-minute listening periods, and observers will record the minute in which they heard each bird. This will facilitate analysis by removal modeling using five 2-minute time intervals. Removal models use the decreasing numbers of new birds counted in each time interval to estimate the number of birds missed during the count (Moore et al. 2004). Collecting time of first detection data will also enable us to group the data for direct comparisons to other monitoring programs using 3-minute or 5-minute point counts, such as the North American Breeding Bird Survey (BBS).

In order to compute reliable detection probabilities and correct for the abilities of individual observers, 80–100 detections per observer for each species are needed (Bibby et al. 1998). It is possible to calculate estimates from smaller samples, but these will be less precise. Furthermore, while it is possible to pool data from multiple surveys to obtain adequate sample sizes for development of these detection functions, resulting estimates may still be an unreliable measure of differences in the actual number of birds present. However, it is still valuable to collect the data, and pooling of data over time or across observers with similar skill levels may allow certain limited analyses. Interpretation of survey data requires sensitivity to these extra-statistical limitations of the estimation procedures. Additionally, the distance categories will be important covariates in occupancy and removal modeling analyses, which does not require absolute accuracy in distance estimation.

Site Selection

Sampling locations are selected as described in SOP 3 - Establishing and Marking Sampling Points. In locating study plots, four basic criteria were established: 1) point counts should be spaced approximately 250 m apart to avoid duplicate sampling while permitting observers to move efficiently between points; 2) points should be located at least 50 m from forest edges in order to maximize sampling effort on focal species and avoid fragmentation effects; 3) points

should be located within the dominant, mature forest cover types found in each park; and 4) at least one long-term forest vegetation monitoring plot (see Tierney et al. 2009) per study site should be co-located within 50 m of a point count (and within the same broad vegetation type, such as deciduous forest) so that future changes in bird populations can be compared with broad changes to forest structure, composition, and other variables.

Precise co-location of bird and forest vegetation plots should be avoided to reduce trampling of vegetation due to multiple visits to the same point. In addition, point count stations should be located at least 15 m away from hiking trails and interpretive signs, and at least 50 m from park boundaries, roads, buildings, and other areas frequented by the public. To meet these criteria, sampling locations were selected in three ways; at nine parks (MABI, MIMA, MORR, ROVA sites, SAGA, SARA, and WEFA) a systematic grid was used, while at ACAD sites were required to have a central station within 50 m of a long-term forest monitoring plot, and randomly selected using the Generalized Random Tesselation Stratified (GRTS) algorithm (Stevens 1997, Stevens and Olsen 2004). The sites were selected to be accessible to volunteers (within 1.5 km of a road, with a slope less than 30%), and with all stations within the same large (> 100 ha) block of contiguous forest habitat (as defined by broad vegetation type on the Acadia National Park vegetation map). This approach at ACAD generates a cluster of sampling points near a central, randomly selected point that is co-located with a forest vegetation plot.

At SARA, study sites were also established within grasslands since this habitat type represents a significant component of the natural communities at that park. At SAIR, the small size of the park prevented us from using the methods describe above. Two point stations separated by 250 m were established along the Saugus River and within the park boundary in consultation with the park's resource manager. A third station was established between the two in order to provide a chance to record additional species, although most analyses will exclude this point due to the potential for double-counting individuals recorded at the two other points.

Systematic Grid Sampling Frame: Sampling locations for the nine parks listed above were selected by first overlaying a 250-m grid onto park boundaries, vegetation types, forest vegetation sampling plots, and other data layers in ArcGIS 9.2. Point counts were then selected at grid intersections that occurred within mature forest habitat. In some cases, points were moved slightly (ca. 10 - 50 m) in order to avoid park trails, boundaries, steep slopes, wetlands, and other sensitive or otherwise inaccessible habitat features, or to co-locate points within 50 m of long-term forest vegetation sampling plots. Groups of point counts were then stratified by general forest cover type into discrete sampling units (hereafter called *study sites*), each consisting of 5 - 12 points depending on park size and the spatial configuration of major habitats within each park. Smaller habitat patches that could not accommodate at least five point counts were excluded from the sampling frame.

ACAD Sampling Frame: A sampling frame based solely on a systematic grid was deemed inappropriate for ACAD due to the amount of forested habitat (ca. 13,000 ha) and excessively steep terrain which can be difficult and often dangerous for volunteers to access. Therefore, our sampling frame was defined in ArcGIS 9.2 by first identifying areas of the park within 1.5 km of roads and with slopes less than 30% (Figure 2). We then overlaid the long-term forest vegetation sampling plots (which were selected using the GRTS algorithm) and identified those that fell

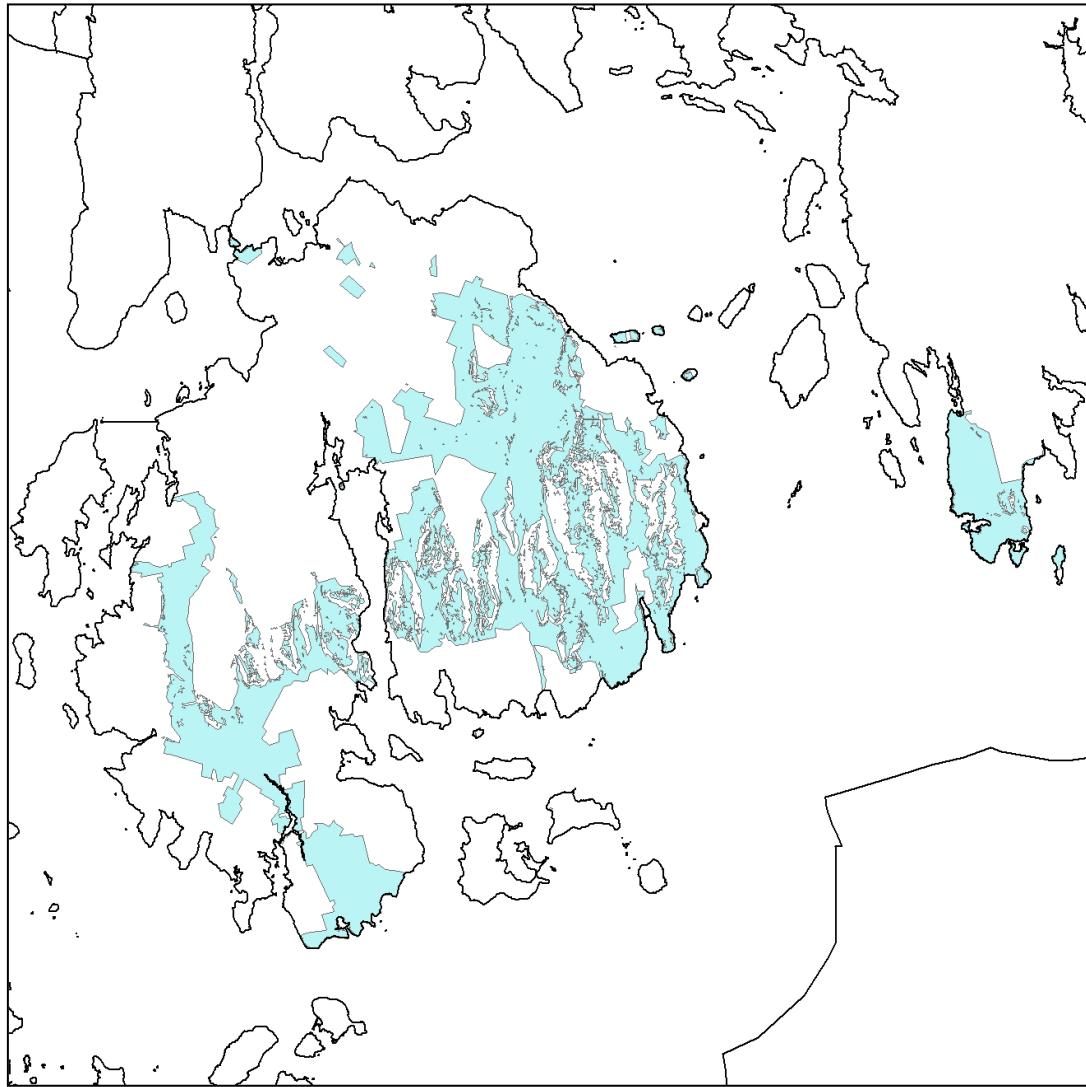


Figure 2. Sampling frame for Acadia NP; shaded areas are within 1.5 km of roads and have slopes less than 30%.

within large blocks (> 100 ha) of contiguous habitat. Habitat was contiguous if adjacent polygons were within the same broad habitat class (e.g., upland coniferous forest), based on the `phys_hydr` field on the park vegetation map. Beginning with the lowest-numbered site (as determined by the GRTS algorithm), we established point count stations around the forest vegetation plots. A central point count station was offset from the forest vegetation plot by 50 m towards the center of the forest patch (or in a direction to make it possible to establish four sites near the vegetation plot), and additional point count locations were placed on a regular 250-m grid to be as close as possible to the vegetation plot. A minimum of five point count stations and a maximum of 10 were established around at least one vegetation plot, and points were located > 15 m from a road or trail. Points that fell within a different habitat type (as defined by the `phys_hydr` field of the park vegetation map) were excluded.

Sample Sizes

Whenever possible, study sites will consist of 10 point counts in order to maximize the amount of data collected per volunteer visit. The number of point counts per park varies, primarily depending upon park size and amount of forested habitat (Table 1). Since survey coverage at each park will depend on the availability of skilled volunteer birders, additional points can be added at ACAD in the future should the pool of volunteers be larger than anticipated. Because this protocol relies on the participation of volunteers, it is likely that in some years not all study sites will be surveyed. The program manager will make every effort to ensure that sufficient numbers of volunteers are recruited and retained to meet the needs of the program, but it is important to recognize that reliance on volunteers will result in occasional data gaps if volunteers drop out of the program without surveying their assigned site.

Population Being Monitored

Sampling will be limited to the breeding season of migratory landbirds (mid - May through late - June, depending on latitude), and will include those species that may potentially breed in the park (see Appendix A). Thus, the population being sampled includes breeding bird species within the park boundary that use large blocks of forested habitat (plus grasslands at SARA) and are present during the time that the survey is being conducted. At ACAD, the sampled population is further limited to sites that are within 1.5 km of a road and that have slopes below 30%. At SAIR, the population being sampled is passerines, marsh birds, and water birds that can be detected from the three point count stations.

Table 1. Area of forested habitat (and grassland habitat at SARA), and number of point counts and study sites established at NETN parks. For ACAD, numbers in parenthesis indicated the target number of points and sites.

NETN Park	Forested Habitat (ha)	Number of Point Counts Established	Number of Study Sites Established
Acadia NP	12,876	44 (120)	6 (12-15)
Marsh-Billings-Rockefeller NHP	197	25	3
Minute Man NHP	194	27	3
Morristown NHP	465	30	3
Roosevelt-Vanderbilt NHP	192	30	3
Saint-Gaudens NHS	43	5	1
Saratoga NHP - Forest	860	30	3
- Grassland	325	25	3
- Total	1,185	55	6
Saugus Iron Works	--	3	1
Weir Farm NHS	21	5	1

Sampling Frequency and Replication

For reducing within-year variability, studies indicate that sampling multiple plots at a site is preferable to repeat visits to a single plot (Link et al. 1994, Carlson and Schmiegelow 2002). In addition, variability is further reduced by limiting the number of observers conducting surveys. Therefore, each study site will be surveyed at least once annually, and volunteer observers will be encouraged to survey two study sites each. In addition, one or two follow-up, replicate surveys within 2 weeks of the initial visit will be encouraged, but not required. The exception to this will be at the three smallest NETN parks (SAGA, SAIR and WEFA), which can only

accommodate one study site each. In order to reduce within-year variability at these parks, study sites will be surveyed twice annually, with replicates occurring about 7 - 14 days apart. In order to keep the effect of time of day consistent for each point, study sites will be surveyed in the same order each time (e.g., the order in which point counts are surveyed will not be reversed). While more repeat visits would clearly enhance this monitoring protocol, this sampling design does allow for estimation of the probability of detection for each species via removal, distance, and occupancy modeling approaches. Requiring volunteers to sample on more days, even with decreased numbers of points per sample, would make it harder to recruit and keep volunteers.

It is important to recognize the significance of maintaining observer consistency and continuity between survey years. The precision of population trends derived from data collected using this monitoring protocol will be increased if the same observer conducts the same survey(s) consistently each year for as many years as possible (Bart et al. 2004). Changes in observers or missed survey years reduce the precision, and therefore utility, of the data. In addition, because changes in observers are inevitable, NETN, GLKN, and the USFWS are actively supporting a web-based birder certification tool that should provide a consistent evaluation of observer skills.

To provide a degree of quality control (QC) on volunteer observers, a professional biologist highly skilled in both bird identification and point count protocols will accompany a volunteer observer and conduct a duplicate survey at a randomly selected park and site each year. This duplicate survey will be conducted using the independent double observer method in which two observers conduct point counts simultaneously but do not communicate or share observations until after the survey is completed. Depending on availability during the field season, QC surveys will be conducted by the Program Manager or a paid technician. Rotating this duplicate survey to a different park each year will provide QC data that will help reveal discrepancies between volunteer and professional observers, as well as provide an opportunity for the Program Manager to meet volunteers in-person and become more familiar with NETN parks.

Power of Monitoring Protocol to Detect Change

Due to the relatively small size of most NETN parks and limited number of volunteer observers available at larger parks such as ACAD, this protocol is not expected to have sufficient power to detect trends in population size for more than a few individual abundant species. However, by aggregating data into species groupings, such as guilds or PIF priority species, our goal is to detect a 5% population change at individual parks over 10 years with at least 50% power. We also intend to supplement the point count data collected through this protocol with additional data (e.g., eBird sightings within parks and data from Vermont's Forest Bird Monitoring Program) to gain a better understanding of trends for individual species.

Using the freeware program MONITOR (Gibbs 1995) and pilot data from the NETN 2006 and 2007 field seasons at 10 of the 11 parks (SAIR was not surveyed until 2008), we estimated the power of the monitoring protocol to detect -10%, -5%, 5%, and 10% population changes over five time periods (5, 10, 15, 20, and 25 years) for the 10 most abundant species in each park, as well as for any PIF priority species. The analysis was conducted assuming a linear trend and using 1000 iterations, a two-tailed test, and an alpha level of 0.10. In addition, we estimated the power of the monitoring program to detect changes in species composition using the Shannon diversity index, and for four groups of species: interior forest specialists, residents, single-brooded species, and PIF priority species. Because MONITOR requires multiple observations

within each year, for the Shannon diversity analysis, this requirement was met by using the multiple points at each park. Therefore, the mean Shannon index was the mean of the Shannon indices for each of the points within a park. At parks where there were multiple point groups, the power analyses were conducted in two ways: 1) treating the whole park as one site, and 2) treating each point group as its own site and weighting those data accordingly. This resulted in more precise estimates and lower CVs, so the analysis was conducted using alpha levels of both 0.05 and 0.10, and Shannon diversity changes of 1%, 2%, 3%, 5%, and 10% (both increases and decreases) over the same five time periods as above. For the species groupings, the analysis was conducted using an alpha level of 0.05 and the same population changes as the Shannon analysis over 10 and 20 years.

Power Analysis Results

Individual Species: As expected, the protocol's power to detect population declines of individual species was quite low. For many species with low and moderate to high CVs, the power to detect a 10% annual decline over 25 years was at least 40% (Figure 3). For all but the most abundant species with low CVs (e.g., Ovenbird, Red-eyed Vireo, etc.), the power to detect a 10% decline over 25 years was less than 80%. However, these results varied depending on the number of individuals detected and their variance between point counts within a park, sometimes resulting in reduced power, especially for species with relatively high CVs. It is important to note that for species detected at rates of 0.40 birds per point or less, results were unreliable (power decreased as time span increased), so power to detect population changes for rare species was not calculated.

Species Groups: The protocol's power to detect changes in groups or guilds of species, was significantly greater than for individual species. The goal stated above (detecting a 5% decline over 10 years with 50% power) was met for all guilds with the exception of two (PIF priority and interior forest species) at parks with 5-7 survey points, and PIF priority species at parks with 10-12 survey points (Figure 4). In these cases, mean birds per point was low and CVs were relatively high. After 20 years of monitoring, a 2% decline could be detected with at least 50% power for all guilds, with the exception of PIF priority species at parks with fewer than 12 points (Figure 4). At parks with 25-28 survey points, power for all guilds was quite high, with nearly 70% power to detect a 3% decline over 10 years.

Shannon diversity: The power to detect change in the Shannon diversity indices at each park was similar to that for species guilds. At each park, using an alpha of 0.05, a 5% decline in the Shannon index could be detected over 10 years with at least 40% power, while a 10% decline could be detected with at least 74% power (Table 2). Power to detect a 3% decline dropped off considerably, although it remained high for 10 forest point counts at SARA.

Because NETN park data are being incorporated into the Vermont FBMP, and the data is also compatible with GLKN and USFWS data, power to detect regional population trends can be improved in some cases. As an example, for three NETN parks in or near Vermont (MABI, SAGA, SARA), combining data with those from FBMP sites will increase sample sizes and reduce CVs for many species, thereby increasing power.

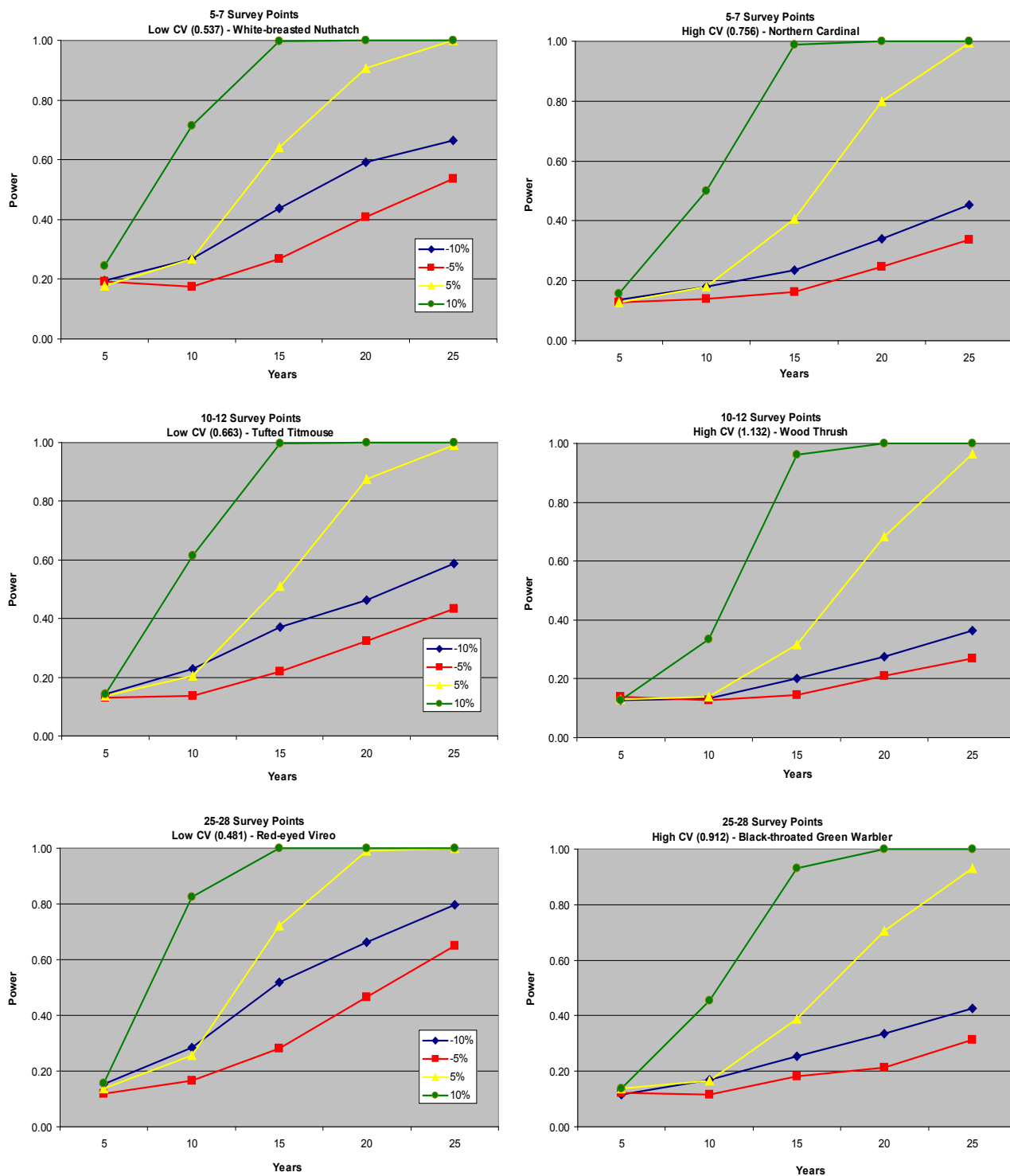


Figure 3. Power to detect 5% and 10% population increases and decreases over 25 years for species with low and high CVs at sites with 5 - 7 survey points (top), 10 - 12 survey points (middle), and 25 - 28 survey points (next page). Results based on 2006/2007 pilot data analyzed using program MONITOR. Note that power to detect a 10% population decline over 25 years was less than 70% in all cases, with the exception of study sites with 25 - 28 survey points and species with low CVs.

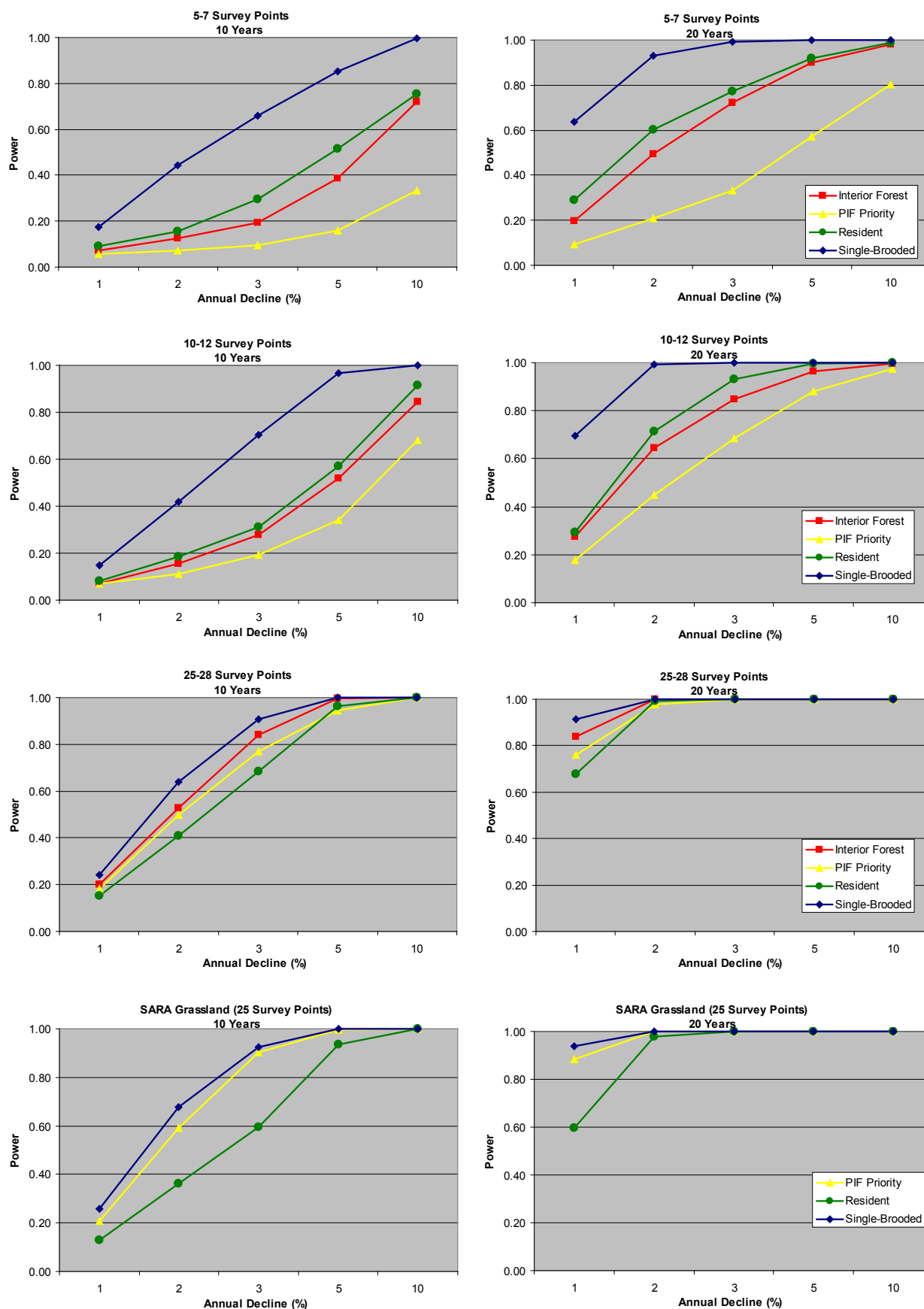


Figure 4. Power to detect 1 - 10% annual declines of four guilds based on number of survey points over two time periods (10 and 20 years). Results based on 2006/2007 pilot data analyzed using program MONITOR. Note that bottom charts are for grassland surveys at SARA.

Table 2. Power to detect 3%, 5%, and 10% declines in the Shannon diversity index at each NETN park over 10 years using an alpha of 0.05.

Park	Points Surveyed	Power		
		-10%	-5%	-3%
WEFA	5	0.994	0.785	0.446
VAMA	7	0.869	0.482	0.241
SAGA	8	0.743	0.411	0.241
SARA-Forest	10	1.000	0.993	0.821
ELRO	11	0.974	0.681	0.365
HOFR	12	0.879	0.482	0.250
MORR	19	0.995	0.809	0.469
MIMA	23	0.941	0.596	0.304
MABI	25	0.971	0.674	0.352
SARA-Grassland	25	0.975	0.662	0.348
ACAD	28	0.785	0.408	0.203

Field Methods

Field Schedule and Preparations

The monitoring described in this protocol is implemented annually during June, although late-May surveys are suitable at MORR and WEFA. The ability to successfully complete the annual monitoring will hinge on thorough advance preparation. Because this is a volunteer-based monitoring program, the most important preparation is ensuring that skilled volunteer personnel are trained and available to accomplish the field work. Volunteer recruitment and training will be coordinated by a VCE staff biologist/Director of FBMP with support from available staff at individual NETN parks, preferably a Natural Resource Manager or Park Ranger familiar with park resources and the local birding community. Volunteers will need to be recruited well in advance of the field season, and survey materials and protocols mailed during the month prior to the start of the field season. In addition, any research permits or clearances necessary to gain access to park grounds during early morning hours (ca. 0400 - 0430) should be arranged (see SOP 1 - Field Season Logistics).

Sampling Methods

Permanent sampling points will be located as identified above (see Site Selection) and marked with aluminum tree tags and blue flagging so they can be easily located by volunteer observers. Starting in 2007, several sites at ACAD were marked with aluminum trail markers and “fire tacks” to aid navigation by volunteer observers. These more permanent markings may be expanded to other parks in future years. SOP 3 - Establishing and Marking Sampling Points provides details about locating and marking sampling points, and SOP 4 - Conducting Variable Circular Plot Point Counts provides detailed instructions on the procedures for counting birds and examples of completed data sheets.

End of Season Procedures

After the field data is collected, the VCE staff biologist will follow up with volunteers to ensure they enter their data on-line in a timely manner. He or she will also perform quality assurance and quality control (QA/QC) checks of the data, comparing field mapping cards with data coding sheets, and data coding sheets with the database. The biologist will also follow up with volunteers and park staff to thank them for their support, and to provide summaries of data when they are available.

Data Management

Overview of Database Design

Bird monitoring data will be archived into the Bird Point Count Database at the USGS Patuxent Wildlife Research Center (<http://www.pwrc.usgs.gov/point/>). This web-based, publicly accessible, and searchable repository for point count data collected in North America is a collaborative project between the Patuxent Wildlife Research Center, the USFWS National Wildlife Refuge System, and the American Bird Conservancy. Requests for NETN bird monitoring data should be directed to either the Program Manager (sfaccio@vtecostudies.org) or the NETN Data Manager (Adam_Kozlowski@nps.gov). Each request will be reviewed on a case-by-case basis, and any data on sensitive species (as defined by each park's Resource Manager) will be removed before data are provided.

Data Entry and Verification

Data are entered into the Bird Point Count Database via an online data entry system that allows volunteer observers to enter data once they have logged-in with a username and password issued by the Project Manager. Only the Project Manager and NETN Data Manager have the ability to edit data once they have been entered. Data are coded as “unverified” in the database and will not show in the public search area until the Project Manager reviews data and marks them as “verified.” Data verification is necessary to ensure that values recorded on the field form and keyed into the database are correctly entered (i.e., the entered value is the “correct” value). Evaluating post-acquisition data is a potentially difficult but necessary task, regardless of the data source. Several steps are taken during and after data entry to verify that data are correct and logical, including:

- Visual review at data entry: At time of transcription, volunteers are asked to carefully compare the date, time, species, and observation codes recorded on the Field Mapping Card with those transcribed onto the Data Coding Sheet to make sure they are consistent. In addition, they are asked to verify each record after input into the database and immediately correct any errors;
- Visual review after data entry: Data entered into the database are compared visually to the original records; discrepancies are identified and reconciled by the Project Manager once the original data sheets have been received. Only then will data be marked as “verified” in the Bird Point Count Database.

Additionally, the database entry form itself has features that reduce data entry errors. These include dropdown menus for site name, observer, and species and observation codes. For more detailed information on data flow and data management roles and responsibilities, see SOP 5 - Data Management.

Data Archiving

After data QA/QC, completed data forms will be copied onto acid-free paper and sent to the NETN office each year, while originals will be maintained by VCE. NETN will maintain at least 5 years of data in the network office; older data sheets will be periodically archived at Acadia NP.

Data Analysis

Data Summaries and Statistical Analysis

For each park, annual summaries of bird monitoring data will consist of relatively simple statistical tabulations providing a “snapshot” of the avian community. At SARA, grassland and forested habitats will be summarized separately. Annual results will also be compared to the mean values of previous years in order to gauge whether they are above or below “normal.” Data summaries will consist of the following metrics: total abundance, species richness, species diversity (Shannon-Wiener index), relative abundance, and frequency of occurrence (Table 3). These metrics will be calculated for each study site and each park (at SARA, forest and grassland sites will be reported separately). Results for both total abundance and species richness metrics will also be broken down into native/non-native and resident/migrant categories. In addition, after 3 years of data collection, annual time series graphs of relative abundance by year will be plotted for the 10 most abundant species at each park and for PIF priority species as determined by BCR (see Appendix A).

Periodically, perhaps every 5-10 years depending on perceived need and funding, a more detailed analysis will be conducted that will include estimates of population densities and trends, focusing on the most abundant species and those of management or conservation concern. Such an analysis will involve more sophisticated statistical modeling, and may include procedures such as estimating equations (Link and Sauer 1994), repeated measures ANOVA, hierarchical modeling, and methods for detecting non-linearities in trend data (e.g., piece-wise linear regression or Bayesian change-point analysis). In addition, volunteer surveys will be compared with duplicate QC surveys conducted on a rotating basis at the same points by a professional biologist to identify discrepancies and model observer effects.

Table 3. Breeding landbird monitoring metrics and calculation from raw data.

Metric	Variable Type	Units	Calculation
Total Abundance	Index	Mean number of individuals/point	Total number of individuals of all species/total number of point counts surveyed
Species Richness	Index	Number of species	Sum of all species detected
Species Diversity (Shannon-Wiener)	Index	NA	$-\sum_{i=1}^n p_i \ln(p_i)$ where p_i = proportion of the total abundance for the i^{th} species, n = species richness, and $\ln$ = natural log.
Species Relative Abundance	Index	Number of individuals/point	Number of individuals of a given species/number of points surveyed
Frequency of Occurrence	Percent	% of points where the species was detected	Number of points on which species was detected/total number of points surveyed

Data will be adjusted for detection probabilities using occupancy modeling, removal modeling, distance sampling, or other appropriate methods. Population trend analyses will likely compare trends from NETN parks to those produced by the BBS or other regional programs such as the VT FBMP or USFWS bird monitoring efforts which use similar point count methodologies. Additionally, in order to produce more robust estimates of trend, species may be grouped into habitat/foraging guilds and Network parks may be grouped together by BCR, forest ecosystem,

or other biologically appropriate groupings. The specific analyses will vary by park, in order to make maximum use of the variations in sampling design across the network. In general, occupancy and removal analyses will use a “robust design” approach, where there are multiple seasons (or years) and multiple site visits during a season (site visits may be repeat visits to the same point count location or visits to multiple spatially distinct points within a site).

Estimates of population densities that adjust for detection probability will be derived from distance sampling methods using the program DISTANCE 5.0 (Thomas et al. 2005), and/or using removal modeling methods in the program MARK (Moore et al. 2004). Because a minimum of 80-100 detections of each species per observer are needed in order to calculate detection probabilities (and particular observer effect on detection probability) with sufficient precision, several years of data collection will be needed for all but the most common species. The tradeoff between precision of estimates and the ability to detect trends in a reasonable length of time will need to be carefully evaluated. Once these detection minimums have been accumulated, data will be input into DISTANCE and analyzed to estimate species density per unit area and effective detection radius (EDR). The EDR is the distance from the observer, beyond which the number of birds missed equals the number detected within the EDR. Comparisons of EDR values between species and habitats may justify combining data from different sites in order to increase sample size and produce more precise population estimates.

Explanatory variables for statistical modeling effort will come from a variety of sources, including long-term weather data from nearby meteorological stations, forest monitoring data, information provided by the parks on ongoing management activities, as well as landscape level data such as road density, forest fragmentation, etc. Table 4 includes metrics that could be useful in helping to explain bird/habitat relationships and how management activities at NETN parks may affect breeding bird populations. At NETN parks where any of these management activities are practiced or environmental sampling occurs, it would be useful to collect the metrics listed, document the procedures, and archive the data. NETN is developing an SOP to govern collection of ancillary data from the parks, which will be included or referenced in this protocol once developed.

This protocol is not designed to test for the effects of management activities or other variables occurring at a scale smaller than the park as a whole; the main objective is species and community trend information. The correlational analyses for Objective 3 will be park-wide at most NETN parks; we will use data from multiple vegetation plots in the same habitat type as the bird counts, and we will use data from multiple count locations to look broadly at whether trends in forest data are correlated with the bird data. Smith et al. (2008) discuss why it is impractical to sample a small vegetation plot near or at a point count location, since the birds are using a very different scale. Using a larger area that encompasses multiple forest plots and bird point count sites will produce a more reliable match of spatial scales, and may also allow us to incorporate spatial variability into the analysis (since many birds prefer habitat variation). Ideally, there would be 3 - 4 forest plots within every point count radius (about 200 m), but such an intensive vegetation monitoring effort is beyond NETN’s resources. We believe that having multiple forest plots within the radius of each site is a good compromise. The exception will be ACAD, where there is a much lower density of forest plots and very localized bird survey routes; in this case we acknowledge that any effort to correlate bird data with forest data will be somewhat weak.

Table 4. Specific metrics of various park management activities and explanatory variables that may be used in statistical modeling efforts to better understand effects on breeding bird populations.

Management Activity/Variable	Specific Metrics
Mowing/brush hogging	Locations, schedule, frequency, cutting height, whether hay is removed or left
Invasive plant control	Locations, methods used (including type of herbicide), schedule (when, how often), target species, intensity (a few plants or widespread), structural level (tree/shrub/herb)
Animal control	Removals of cats, rats, mesopredators, dogs, beavers, humans (limits on activities in certain areas), forest pests and pathogens, mosquito control
Controlled burns	Locations, schedule, frequency, intensity
Restoration activities	Locations, methods, dates
Toxic cleanups	Locations, methods, dates
Deer density estimates	Methods, sampling dates and area covered
Silvicultural treatments	Locations, methods, schedule, intensity of removal
Weather	Precipitation, low/high/mean temps, wind, humidity
Acid deposition	Wet deposition and soil sampling
Mercury data	Wet deposition, soil, and biological sampling
Invertebrate surveys	Index of prey abundance (especially lepidopteran larvae)
Landscape context	TBD: The national I&M program is developing a protocol that will provide NETN with landscape context data for such analyses

Data Reporting

Ecological Integrity Assessment and Scorecard

The NETN I&M program recognizes the importance of effective communication and reporting to transform field data into a format that is both useful and clearly understood by park managers, scientists, the public, and policy makers. This will be accomplished by developing standard statistical summaries of vital sign measurements (see Data Analysis), as well as developing an ecological integrity scorecard that provides basic interpretation of the status and trends for the breeding bird vital sign. Following each field season, an annual report will be prepared summarizing the year's work. This will include routine summaries for each measure at each sampled park and for the network as a whole. The measures will be presented in a general framework that reflects the underlying conceptual model that the vital signs and measures are based upon. Periodically, perhaps every 5 - 10 years depending on perceived need and funding, a more detailed analysis will be conducted that will include estimates of population densities and trends, focusing on the most abundant species and those of management or conservation concern.

Forest Bird Assessment

An assessment of the biotic integrity of the avian community based on an assemblage of behavioral and physiological response guilds, similar to O'Connell et al. (2000), will be utilized for forest birds (an assessment and scorecard ranking for the grassland bird community at SARA is discussed below). Such a biotic integrity scorecard will help elucidate changes in a broader, landscape context and indicate in which direction the park may be moving along a disturbance gradient from "highly disturbed" or "urban," to "pristine" or "natural." Croonquist and Brooks (1991) demonstrated that response guilds (groups of species that require similar habitat, food, or other elements for survival) are effective indicators of habitat disturbance. Changes in availability of specific resources are manifested as population responses in the species dependant on that resource. For example, the loss of snags in a forest stand can result in the decrease in the guild of bark-probing insectivores. As O'Connell et al. (2000) indicate, an assessment of response guilds functions like an index of biotic integrity (Karr 1991, Karr and Chu 1999), providing a system-specific framework in which species assemblages can be ranked on a qualitative scale. This type of avian integrity assessment provides a means to estimate condition that, unlike species richness or Shannon diversity, is not confounded by intermediate levels of disturbance as demonstrated by Blair (1996).

The guild-based avian integrity scorecard is based upon O'Connell et al. (2000) and consists of 13 guilds in eight guild categories (Table 5, SOP 7 - Data Reporting). Individual guilds were broadly categorized as "specialist" or "generalist." A specialist can be a species with a narrow range of habitat tolerances, or one that exhibits a low intrinsic rate of population increase. For our purposes, specialist guilds may be thought of as "guilds indicative of a high-integrity ecological condition" while generalist guilds are "guilds indicative of a low-integrity ecological condition." Guilds were selected to reflect different aspects of each species' life history traits. Therefore, species may belong to several guilds simultaneously, including both specialist and generalist guilds.

With species assigned to guilds (see SOP 7 - Data Reporting), the proportional species richness of each guild is calculated, resulting in a rank of Good, Caution, or Significant Concern (Table

6). “Good” represents acceptable or desired conditions; “Caution” indicates a problem may exist; “Significant concern” indicates undesired conditions in need of management correction. For example, a bird community at a given park in which 20% of the species are omnivores receives a rank of “good” for the omnivore guild (Table 6). The proportional species richness thresholds and ranks are largely based on those derived by O’Connell et al. (2000) for birds in forested habitats in the central Appalachians, as well as from those derived by Glennon and Porter (2005) for New York’s Adirondack Park. Considering the wide geographic range over which the Network parks are distributed, the threshold values listed in Table 6 may need to be adjusted by bioregion, forest type or BCR, rather than Network-wide. Additionally, these threshold values can be refined over time. The ratings threshold values also assume that all birds present in each park are detected; this assumption will not necessarily hold true when only one year of data is analyzed. Park resource managers should not be concerned about the results of the avian integrity analysis unless many guilds are rated “Significant Concern” for multiple years of data.

Some ecological integrity reporting efforts have developed point-based indices to aggregate information describing integrity of individual metrics into overall ecosystem scores (Karr 1981, O’Connell et al. 2000). The success of those efforts relies upon a subjective understanding of the relative importance of individual metrics in determining overall ecosystem integrity, and in some cases may obscure individual ecosystem components that are in need of attention. Thus, this avian integrity scorecard attempts to concisely convey information on each individual response guild metric, and provide summary information only on the number of metrics classified as “good”, “caution”, and “significant concern” in each park. We recognize that NPS may need to aggregate this information at higher levels (such as by Vital Sign) for reporting at the national level. For that reason, this scorecard adheres to NPS Vital Signs reporting conventions, and should provide NPS with the necessary information for aggregation. We also recognize that the scorecard is based on ecological criteria, and that park management goals may not seek to attain “ecological integrity”. It would be possible to develop a management scorecard in concert with park staff that reflects park progress towards avian and ecological management goals.

Table 5. Biotic integrity elements, guild categories, response guilds, and guild interpretations used in avian biotic integrity scorecard.

Biotic Integrity Element	Guild Category	Response Guild	Specialist	Generalist
Functional	Trophic	Omnivore		X
Functional	Insectivore forager	Bark prober	X	
Functional	Insectivore forager	Ground gleaner	X	
Functional	Insectivore forager	High Canopy forager	X	
Functional	Insectivore forager	Low Canopy forager	X	
Compositional	Origin	Exotic		X
Compositional	Migratory	Resident		X
Compositional	Number of broods	Single-brooded	X	
Compositional	Population limiting	Nest predator/brood parasite		X
Structural	Nest Placement	Canopy Nester	X	
Structural	Nest Placement	Shrub Nester		X
Structural	Nest Placement	Forest-ground Nester	X	
Structural	Primary habitat	Interior forest obligate	X	

Table 6. Avian ecological integrity thresholds for 13 response guilds (based on O’Connell et al. 2000, and Glennon and Porter 2005). Percentages are proportional species richness.

Biotic Integrity Element	Response Guild Metric	Ratings (% Species Richness)		
		Good	Caution	Significant Concern
Functional	Omnivore	< 30%	30-50%	> 50%
	Bark Prober	> 11%	4-11%	< 4%
	Ground Gleaner	> 9%	4-9%	< 4%
	High Canopy Forager	> 12%	7-12%	< 7%
	Low Canopy Forager	> 22%	14-22%	< 14%
Compositional	Exotic	0%	0.5-7%	> 7%
	Resident	< 28%	28-41%	> 41%
	Single Brooded	> 68%	50-68%	< 50%
	Nest Predator/Brood Parasite	< 10%	10-15%	> 15%
Structural	Canopy Nester	> 35%	29-35%	< 29%
	Shrub Nester	< 18%	18-24%	> 24%
	Forest-ground Nester	> 18%	5-18%	< 5%
	Interior Forest Obligate	> 35%	10-35%	< 10%

Grassland Bird Assessment

The integrity of the grassland bird community at SARA will be assessed with metrics based on the abundance and proportional richness of grassland obligate species, shrub-dependant species, edge generalist species, and exotics (Table 7). In addition, for both the grassland and shrubland groups, we will report the proportion of PIF priority species for BCR 13 that are detected out of the total number of PIF priority species for each group (e.g., the number of PIF Priority grassland species detected divided by the total number of PIF Priority grassland species). This will help us measure the overall value of grassland and early successional communities at SARA to rare or declining birds that are dependent on these habitats within the region (see Table 4 in SOP 7 - Data Reporting). The threshold values for these metrics were determined from Browder et al. (2002) and Coppedge et al. (2006), and using data from the pilot season of grassland surveys at SARA. These values may be refined over time as additional regional and park-specific data are accumulated and analyzed.

Table 7. Avian scorecard metrics for grassland bird surveys at SARA.

Metric	Good	Caution	Significant Concern
Abundance (birds/point)			
Edge generalist species	< 6.0	6.0-10.0	> 10.0
Shrub-dependant species	< 1.0	1.0-5.0	> 5.0
Grassland obligate species	> 4.0	1.5-4.0	< 1.5
Exotic species	0.0	0.1-1.0	> 1.0
Proportional Species Richness (%)			
Edge generalist species	< 20%	20-50%	> 50%
Shrub-dependant species	< 10%	10-25%	> 25%
Grassland obligate species	> 10%	5-10%	< 5%
Exotic species	0%	0.1-3%	> 3%
Proportion of PIF Priority Grassland Species for BCR 13 (see Table 7.4) (# detected/5)	> 80%	50-80%	< 50%
Proportion of PIF Priority Shrubland Species for BCR 13 (see Table 7.4) (# detected/4)	< 50%	50-75%	> 75%

Personnel Requirements and Training

Roles and Responsibilities

The VCE will coordinate the volunteer-based bird monitoring program. Coordination will involve contacting resource managers at NETN parks to discuss the role that they want to play in the program. The VCE Program Manager will take the lead in advertising and recruiting for volunteers, and will welcome support from park resource managers or volunteer coordinators with knowledge of potential participants. Other coordination activities will include evaluating volunteers to ensure they have the skill level needed to identify birds by sight and sound; providing training materials, data sheets, and other equipment (e.g., timers, clipboards); responding to volunteer concerns; and soliciting feedback from the volunteers on the protocol. The Program Manager will also be responsible for either conducting the annual duplicate QC survey if time allows, or hiring a qualified field technician to conduct the survey. The VCE and NETN will work together to ensure that there is sufficient follow-up with volunteers, including initiating a volunteer appreciation program. For additional information, see SOP 2 - Recruiting and Training Volunteers.

At each NETN park, the resource manager or other designated staff will provide support to volunteer observers on park-specific issues, such as access, trail or area closures, rare species documentation, etc. At ACAD, the NETN Plant Ecologist will also provide logistical support.

Volunteer Qualifications

Volunteer observers participating in the NETN Bird Monitoring Program must be capable of identifying the majority of birds ($\geq 80\%$) likely to be encountered by both sight and sound. This cannot be overemphasized. Various studies have shown that observer bias is one of the most noteworthy bias factors in trend analyses of songbird populations (Kepler and Scott 1981, Baker and Sauer 1995). The Network and VCE are actively pursuing tools for ensuring birder skills, including supporting the extension of a web-based birder certification program to the Northeast. Additionally, volunteers must be proficient at estimating abundance of birds detected and their horizontal distance from the observer. Volunteers must also be capable of hiking from 2 - 5 km over variable terrain (depending on park and transect route), and arriving at their study site(s) by 0500 hrs on survey mornings.

Training Procedures

As noted above, volunteer observers must already possess a high degree of skill in bird identification in order to participate. Therefore, little training is needed in this area, but volunteers will be provided with a list of bird species likely to be encountered at the park in which they will be surveying so they can familiarize themselves with the identification of any problematic species prior to the start of the survey period. Although observers will be experienced in the identification of birds, many will have little or no experience in estimating distances to vocalizing birds. Because it is not realistic to expect volunteers from all parks to be able to attend a training session on estimating distances to vocalizing birds, and it is not economically feasible to offer training sessions at each NETN park, volunteers will be provided with written training procedures and asked to practice distance estimation at their study site or in a habitat similar to the one in which they will be surveying birds. These procedures are outlined in SOP 2 - Recruiting and Training Volunteers.

Operational Requirements

Annual Workload and Field Schedule

Annual implementation of the landbird monitoring plan involves several people, including the Program Manager, NETN staff, park resource managers, and volunteers. Annual workload responsibilities vary widely, ranging from approximately 30 - 40% of one FTE for the Program Manager (who is responsible for the day-to-day operations of the project), to 10 - 20 hours for volunteers and most Park Resource Managers. This section details the annual workload and schedule by breaking them down into the following pertinent phases — Volunteer Recruitment, Volunteer Training, Field Season, Data Entry/QA/QC, and Reporting.

Volunteer Recruitment

Recruiting volunteer observers is the responsibility of the Program Manager (for details, see SOP 2 - Recruiting and Training Volunteers). However, assistance from park resource managers, who may have knowledge of local birders with the necessary skills to participate, is welcome. Volunteer recruitment should occur primarily in early spring (March - April), with the goal of filling any observer vacancies. This will involve prior communication with participating volunteers to determine the number and location of vacancies, as well as assessing the bird identification skills of interested observers. The time commitment for volunteer recruitment can range widely, from approximately 2 - 3 days up to 3 weeks annually, depending on the number of vacancies that need filling, and the amount of correspondence with volunteers and potential observers.

Volunteer Training

Volunteer training responsibilities are divided between the Program Manager, park and Network staff, and the volunteers themselves (for details, see SOP 2 - Recruiting and Training Volunteers).

The Program Manager is responsible for providing volunteers with the necessary training materials to prepare them for conducting point count surveys in the field, navigating by map and compass, and entering field data into the online database. The Volunteer Training Manual (available as a PDF on the VCE and NETN websites) and other materials should be distributed well in advance of the field season (March - April) in order to give volunteers enough time to familiarize themselves with the protocols and conduct training exercises in distance estimation. The estimated time commitment for providing these materials, keeping them updated and available for download on the VCE website, and communicating with volunteers is between 1 - 2 weeks annually.

Individual park and NETN staff are responsible for ensuring that volunteers are familiar with the proper use of navigation (GPS units) and communication (e.g., park radios or cell phones) equipment that are available for their use at most parks. Time commitment for this is expected to be less than 2 hours annually.

Volunteers are responsible for training themselves in distance estimation, point count survey methods, use of map and compass, and data entry procedures. In addition, new volunteers should familiarize themselves with the list of birds previously detected on their survey route or park

(provided by the Program Manager), and visit their study site to locate point count stations prior to conducting the survey. For new volunteers, the training process (including a field visit to locate point counts) may take 4 - 6 hours, but in subsequent years an annual review of the methodologies should be completed in an hour or less.

Field Season

Field Season responsibilities are divided between the Program Manager, individual park, and NETN staff, and volunteer observers (for details, see SOP 1 - Field Season Logistics).

The Program Manager is responsible for preparing a mailing to all volunteer observers that includes the necessary field equipment and materials needed to conduct their surveys, a cover letter, and any park permits (for complete list, see SOP 1 - Field Season Logistics). The mailing should go out by 10 May to ensure volunteers receive materials prior to the survey window of 1 to 30 June. The time commitment to prepare mailing and respond to field season-related questions is estimated to be between 10 - 40 hours annually. If a volunteer cannot be found to survey a given study site despite significant effort on the part of the Program Manager, NETN staff will be notified and the Program Manager will attempt to either conduct the monitoring himself/herself (if time allows), or hire an appropriately skilled sub-contractor, provided sufficient funds remain in the budget for this task.

Park staff are responsible for acquiring any necessary clearances for volunteers, notifying park security if need be, or otherwise ensuring that observers have access to park property during early morning hours (ca. 0400 - 0430 hours) in order to start surveys at approximately 0500 hours. NETN staff will be responsible for obtaining a research permit for each park. Most NETN parks have issued 10-year permits to cover monitoring activities, but the permit for ACAD must be renewed each year. This annual time commitment for both park and network staff is expected to be minimal (e.g., ≤ 1 hour annually). At ACAD, the NETN Plant Ecologist is available to provide logistical support to the Program Manager and volunteers. This may include marking sampling points and routes, providing GPS units and training on their use, or responding to volunteer inquiries specific to the park. In most years, the time commitment for these responsibilities should be minimal (1 - 2 hours), but could range up to 25 hours if new sampling points need to be established. Establishing and maintaining point counts at parks other than ACAD is the responsibility of the Program Manager, which will require periodic visits to parks (~ 5 - 10 days approximately every 5 years).

Volunteer observers are responsible for conducting bird surveys during the month of June (for details, see SOP 4 - Conducting Variable Circular Plot Point Counts). Depending on the number of points on a given route, surveys should take 2 - 2.5 hours to complete (not including travel time to and from park). Shortly after completing the survey (preferably the same day) observers should transcribe data from field cards to data coding sheets. This task takes less than an hour.

Data Entry and QA/QC

Data entry into the web-based, Bird Point Count Database is primarily the responsibility of the volunteer observer who collected the data in the field. The Program Manager will provide support and guidance as needed, responding to questions about the data entry website, establishing deadlines for completing data entry, and sending out periodic reminders to observers

who have not met the deadlines. Once data have been entered, volunteers should mail original data sheets to the Program Manager for QA/QC.

Quality assurance/quality control is primarily the responsibility of the Program Manager (see Data Entry and Verification, above). This time consuming job consists of comparing original field mapping and coding sheets with data entered online to look for discrepancies, and once corrected, marking records in the database as “verified.” Additionally, data should be error checked annually prior to conducting any analyses or preparing reports. This includes reviewing the current year’s raw data for unusual species that may have been entered incorrectly, checking species/subspecies with multiple common names (e.g., Slate-colored/Dark-eyed Junco, Yellow-rumped/Myrtle Warbler, etc.) to be sure the correct name (and alpha code) is used throughout, and generally reviewing fields for wildly incorrect data. Upon completion of QA/QC, completed field mapping cards and data coding sheets will be copied onto acid-free paper and sent to the NETN office each year, while originals will be maintained by the Program Manager at VCE.

The time required for each observer to complete data entry should be 30 - 60 minutes, depending on the number of point counts that were completed, speed of internet connection, and familiarity with web-based data entry forms. The time commitment for the Program Manager to provide data entry support and complete QA/QC responsibilities is approximately 2 - 3 weeks, annually.

Reporting

The Program Manager is responsible for preparing two different summary reports annually describing the year’s monitoring results. The first report, due in early October for the NETN annual administrative report and work plan, is a brief (approximately one page) summary of accomplishments for the previous fiscal year (1 Oct - 30 Sept), including public interest highlights and any significant findings. The second, more substantive report will contain summaries of birds found in each park, highlighting observations of birds of conservation concern (broken down into forest and grassland sites for SARA), comparisons with results from previous years, and will include the calculation (and explanation) of an index of biological integrity for birds, based on the collected data. The final report is due to the NETN Inventory and Monitoring Program Manager on 15 January each year. The time commitment for the Program Manager to complete and disseminate both reports is approximately 3 - 4 weeks.

Facility and Equipment Needs

Equipment needs are minimal and include supplies for volunteers to conduct surveys, and plot marking supplies. Volunteers are supplied with a count-down timer (Polder digital kitchen timer, Product No. 219442), data field cards, and data coding sheets (for examples, see SOP 4 - Conducting Variable Circular Plot Point Counts). At ACAD, it is important to maintain NETN GPS units available for volunteer use. Plot marking supplies include aluminum tree tags and nails (or aluminum “trail” signs such as those used at ACAD; see SOP 3 - Establishing and Marking Sampling Points), and flagging tape.

Startup Costs and Budget Considerations

Project startup costs are approximately \$2,000, and include the cost of printing field data cards, purchasing supplies for volunteers (digital timers, etc) and plot marking, and establishing study sites.

Example Annual Operating Budget

Program Manager Salary (400 hours)	\$9,600.00
Travel (Mileage, lodging, meals)	\$1,300.00
Supplies and Equipment	\$300.00
Field supplies for 20-40 volunteer observers (field cards, timers, etc., \$200)	
Shipping / postage (\$100.00)	
Volunteer appreciation	<u>\$300.00</u>
Total Direct Costs	\$11,500.00
Indirect and Other Costs	<u>\$2,500.00</u>
Grand Total	<u>\$14,000.00</u>

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Appendix A. List of potential species for each NETN park/BCR and their PIF Continental and/or Regional Importance Rank, and Conservation Action Priority. Data obtained from PIF Species Assessment Database (www.rmbo.org/pif/pifdb). Species in boldface are those of conservation concern in one or more BCR.

Common Name	Scientific Name	PIF Continental and/or Regional Importance ¹									PIF Action Priority ³
		BCR ² 28	BCR 30		BCR 13		BCR 14				
		MORR	WEFA	SAIR	MIMA	ROVA	SARA	MABI	SAGA	ACAD	
Mourning Dove	<i>Zenaida macroura</i>	X	X	X	X	X	X	X	X	X	
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	RC	RC	RC	RC	RC, RS	RC, RS	RC	RC	RC	II
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	X	X	X	X	X	X	X	X		
Chimney Swift	<i>Chaetura pelagica</i>	RC, RS	RC	RC	RC	X	X	X	X	X	II
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	X	X	X	X	X	X	X	X	X	
Belted Kingfisher	<i>Ceryle alcyon</i>	RC, RS	X	X	X	RC	RC	RC	RC	RC	II
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC				I
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	X	X	X	X	X	X				
Northern Flicker	<i>Colaptes auratus</i>	RC	RC	RC	RC	RC	RC	X	X	X	II
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	X	X	X	X	X	X	CS, RS	CS, RS	CS, RS	III
Downy Woodpecker	<i>Picoides pubescens</i>	RS	X	X	X	X	X	X	X	X	III
Hairy Woodpecker	<i>Picoides villosus</i>	X	X	X	X	X	X	X	X	X	
Black-backed Woodpecker	<i>Picoides arcticus</i>									X	
Pileated Woodpecker	<i>Dryocopus pileatus</i>	X	X	X	X	X	X	X	X	X	
Eastern Wood Pewee	<i>Contopus virens</i>	RC	RC	RC	RC	RC	RC	X	X	X	II
Olive-sided Flycatcher	<i>Contopus borealis</i>						X	CC, RC	CC, RC	CC, RC	II
Least Flycatcher	<i>Empidonax minimus</i>	X	X	X	X	X	X	X	X	X	
Acadian Flycatcher	<i>Empidonax virescens</i>	RC, CS, RS	X	X	X	X					II
Alder Flycatcher	<i>Empidonax alnorum</i>		X	X	X	X	X	X	X	X	
Willow Flycatcher	<i>Empidonax traillii</i>	CC	CC	CC	CC	CC	CC	CC	CC	CC	III
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>									X	
Eastern Phoebe	<i>Sayornis phoebe</i>	X	X	X	X	X	X	X	X	X	
Great Crested Flycatcher	<i>Miarchus crinitus</i>	X	X	X	X	X	X	X	X	X	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	X	RC	RC	RC	RC	RC	X	X	X	II
White-eyed Vireo	<i>Vireo griseus</i>	X	X								
Yellow-throated Vireo	<i>Vireo flavifrons</i>	RC, CS, RS	X	X	X	X	X		RC		II
Blue-headed Vireo	<i>Vireo solitarius</i>	X	X	X	X	X	X	CS	CS	CS	III
Warbling Vireo	<i>Vireo gilvus</i>	X	X	X	X	X	X	X	X	X	
Red-eyed Vireo	<i>Vireo olivaceus</i>	X	X	X	X	X	X	X	X	X	
Philadelphia Vireo	<i>Vireo philadelphicus</i>									X	
Blue Jay	<i>Cyanocitta cristata</i>	X	X	X	X	X	X	X	X	X	
Gray Jay	<i>Perisoreus canadensis</i>									X	

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Common Name	Scientific Name	PIF Continental and/or Regional Importance ¹									PIF Action Priority ³
		BCR ² 28 MORR	BCR 30				BCR 13		BCR 14		
			WEFA	SAIR	MIMA	ROVA	SARA	MABI	SAGA	ACAD	
Tree Swallow	<i>Tachycineta bicolor</i>	X	X	X	X	X	X	RS	RS	RS	III
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X	X	X	X	X	X	X	X		
Bank Swallow	<i>Riparia riparia</i>	X	X	X	X	X	X	X	X	X	
Cliff Swallow	<i>Hirundo pyrrhonota</i>	X	X	X	X	X	X	X	X	X	
Barn Swallow	<i>Hirundo rustica</i>	X	X	X	X	X	X	X	X	X	
Black-capped Chickadee	<i>Poecile atricapillus</i>	X	X	X	X	X	X	X	X	X	
Carolina Chickadee	<i>Poecile carolinensis</i>	RS									III
Boreal Chickadee	<i>Poecile hudsonicus</i>									RC	
Eastern Tufted Titmouse	<i>Baeolophus bicolor</i>	X	X	X	X	X	X	X	X		
Red-breasted Nuthatch	<i>Sitta canadensis</i>	X	X	X	X	X	X	X	X	X	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	X	X	X	X	X	X	X	X	X	
Brown Creeper	<i>Certhia americana</i>	X	X	X	X	X	X	X	X	X	
House Wren	<i>Troglodytes aedon</i>	X	X	X	X	X	X	X	X	X	
Winter Wren	<i>Troglodytes troglodytes</i>		X	X	X	X	X	X	X	X	
Carolina Wren	<i>Thryothorus ludovicianus</i>	X	X	X	X	X					
Sedge Wren	<i>Cistothorus platensis</i>						X				
Golden-crowned Kinglet	<i>Regulus satrapa</i>						X	X	X	X	
Ruby-crowned Kinglet	<i>Regulus calendula</i>									X	
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	X	X	X	X	X			X		
Eastern Bluebird	<i>Sialia sialis</i>	X	X	X	X	X	X	X	X	X	
Veery	<i>Catharus fuscescens</i>	X	RC	RC	RC	X	X	RS	RS	RS	III-14 II-30
Swainson's Thrush	<i>Catharus ustulatus</i>						X	X	X	X	
Hermit Thrush	<i>Catharus guttatus</i>	X	X	X	X	X	X	X	X	X	
Wood Thrush	<i>Hylocichla mustelina</i>	CC, RC, CS, RS	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	II
American Robin	<i>Turdus migratorius</i>	X	X	X	X	X	X	X	X	X	
Gray Catbird	<i>Dumetella carolinensis</i>	X	X	X	X	X	X	X	X	X	
Northern Mockingbird	<i>Mimus polyglottus</i>	X	X	X	X	X	X		X		
Brown Thrasher	<i>Toxostoma rufum</i>	RC	RC	RC	RC	RC	RC	X	X	X	II
European Starling	<i>Sternus vulgaris</i>	X	X	X	X	X	X	X	X	X	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X	X	X	X	X	X	X	X	X	
Blue-winged Warbler	<i>Vermivora pinus</i>	CC, CS, RS	CC, RC, CS, RS	CC, RC, CS, RS	CC, RC, CS, RS	X	X				III-28 II-30 I-28 II-30,13
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC				
Tennessee Warbler	<i>Vermivora peregrina</i>									X	
Nashville Warbler	<i>Vermivora ruficapilla</i>					X	X	X	X	X	
Northern Parula	<i>Parula americana</i>							RS	RS	RS	III
Yellow Warbler	<i>Dendroica petechia</i>	X	X	X	X	X	X	X	X	X	
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	X	X	X	X	X	X	X	X	X	
Cape May Warbler	<i>Dendroica tigrina</i>									X	
Magnolia Warbler	<i>Dendroica magnolia</i>						X	CS	CS	CS	III
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>						X	RS	RS	RS	III
Yellow-rumped Warbler	<i>Dendroica coronata</i>							X	X	X	
Black-throated Green Warbler	<i>Dendroica virens</i>						X	CS, RS	CS, RS	CS, RS	III

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Common Name	Scientific Name	BCR ² 28 MORR	PIF Continental and/or Regional Importnace ¹								PIF Action Priority ³
			BCR 30			BCR 13		BCR 14			
			WEFA	SAIR	MIMA	ROVA	SARA	MABI	SAGA	ACAD	
Blackburnian Warbler	<i>Dendroica fusca</i>							CS, RS	CS, RS	CS, RS	III
Prairie Warbler	<i>Dendroica discolor</i>	CC, RC	CC, RC	CC, RC	CC, RC	CC	CC				II-28, 30 III-13
Bay-breasted Warbler	<i>Dendroica castenea</i>									CC	III
Pine Warbler	<i>Dendroica pinus</i>		X	X	X			X	X	X	
Palm Warbler	<i>Dendroica palmarum</i>									X	
Blackpoll Warbler	<i>Dendroica striata</i>									RC	II
Cerulean Warbler	<i>Dendroica cerulea</i>	CC, RC, CS, RS				CC, RC	CC, RC				I-28 II-13
Black-and-White Warbler	<i>Mniotilta varia</i>	RC	RC	RC	RC	X	X	RS	RS	RS	II-28, 30 III-14
American Redstart	<i>Setophaga ruticilla</i>	X	X	X	X	X	X	RS	RS	RS	III
Worm-eating Warbler	<i>Helmitheros vermivorum</i>	CC, RC, CS, RS	X	X	X	X					II
Ovenbird	<i>Seiurus aurocapillus</i>	X	X	X	X	X	X	X	X	X	
Northern Waterthrush	<i>Seiurus noveboracensis</i>		X	X	X		X	X	X	X	
Louisiana Waterthrush	<i>Seiurus motacilla</i>	RC, CS, RS	X			X	X	X	X		II
Kentucky Warbler	<i>Oporornis formosus</i>	CC, RC, CS, RS									II
Mourning Warbler	<i>Oporornis philadelphia</i>							X	X	X	
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X	X	X	X	X	X	X	X	
Wilson's Warbler	<i>Wilsonia pusilla</i>									X	
Hooded Warbler	<i>Wilsonia citrina</i>	CS, RS	RC	RC	RC						II-30 III-28
Canada Warbler	<i>Wilsonia canadensis</i>			X	X	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	II
Yellow-breasted Chat	<i>Icteria virens</i>	RC	X								II
Scarlet Tanager	<i>Piranga olivacea</i>	RS	RC	RC	RC	X	X	X	X	X	II-30 III-28
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	RC, CS, RS	RC	RC	RC	RC	RC	RC	RC	RC	II
Chipping Sparrow	<i>Spizella passerina</i>	X	X	X	X	X	X	X	X	X	
Field Sparrow	<i>Spizella pusilla</i>	RC	RC	RC	RC	RC	RC	X	X	X	II
Vesper Sparrow	<i>Poocetes gramineus</i>						X				
Savannah Sparrow	<i>Passerculus sandwichensis</i>					RC	RC				II
Grasshopper Sparrow	<i>Ammodramus savannarum</i>						X				
Henslow's Sparrow	<i>Ammodramus henslowii</i>	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC	CC, RC				I
Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>									CC	III
Song Sparrow	<i>Melospiza melodia</i>	X	X	X	X	X	X	X	X	X	
Lincoln's Sparrow	<i>Melospiza lincolni</i>									X	
Swamp Sparrow	<i>Melospiza georgiana</i>	X	X	X	X	X	X	X	X	X	
White-throated Sparrow	<i>Zonotrichia albicollis</i>		X	X	X			CS, RS	CS, RS	CS, RS	III
Dark-eyed Junco	<i>Junco hyemalis</i>		X	X	X		X	X	X	X	
Northern Cardinal	<i>Cardinalis cardinalis</i>	X	X	X	X	X	X	X	X	X	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	X	RC	RC	RC	RS	RS	X	X	X	II-30 III-13

Appendix A. List of potential species for each NETN park/BCR and their PIF Continental and/or Regional Importance Rank, and Conservation Action Priority. Data obtained from PIF Species Assessment Database (www.rmbo.org/pif/pifdb). Species in boldface are those of conservation concern in one or more BCR (continued).

Common Name	Scientific Name	BCR ² 28 MORR	PIF Continental and/or Regional Importance ¹								PIF Action Priority ³
			BCR 30			BCR 13		BCR 14			
			WEFA	SAIR	MIMA	ROVA	SARA	MABI	SAGA	ACAD	
Indigo Bunting	<i>Passerina cyanea</i>	CS, RS	X	X	X	X	X	X	X	X	III
Bobolink	<i>Dolichonyx oryzivorus</i>					RC, RS	RC, RS	RC, RS	RC, RS	RC, RS	II
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X	X	X	X	X	X	X	X	
Eastern Meadowlark	<i>Sturnella magna</i>					RC	RC				II
Common Grackle	<i>Quiscalus quiscula</i>	X	X	X	X	X	X	X	X	X	
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X	X	X	X	X	X	X	X	
Orchard Oriole	<i>Icterus spurius</i>	X	X				X				
Baltimore Oriole	<i>Icterus galbula</i>	X	RC, RS	RC, RS	RC, RS	RC, RS	RC, RS	X	X	X	II
Purple Finch	<i>Carpodacus purpureus</i>		RC	RC	RC	X	X	RS	RS	RS	II-30 III-14
House Finch	<i>Carpodacus mexicanus</i>	X	X	X	X	X	X	X	X	X	
Red Crossbill	<i>Loxia curvirostra</i>							X	X	X	
White-winged Crossbill	<i>Loxia leucoptera</i>							X	X	X	
Pine Siskin	<i>Carduelis pinus</i>							X	X	X	
American Goldfinch	<i>Carduelis tristis</i>	X	X	X	X	X	X	X	X	X	
Evening Grosbeak	<i>Coccothraustes vespertinus</i>							RS	RS	RS	III
House Sparrow	<i>Passer domesticus</i>	X	X	X	X	X	X	X	X	X	

¹ X – Species may be present but not of conservation concern

CC – Continental Concern Watch List Species are those which are most vulnerable at the continental scale

CS – Continental Stewardship Species are those which a given BCR has a high responsibility for, and which have a large proportion of their global range within the BCR

RC – Regional Concern Species are those which are vulnerable within the region or BCR

RS – Regional Stewardship Species are those for which a given BCR has a high responsibility

² BCR (Bird Conservation Region):

28 – Appalachian Mountains

30 – Southern New England/Mid-Atlantic Coast

13 – Lower Great Lakes/St. Lawrence Plain

14 – Atlantic Northern Forest

³ Action Priority Codes:

I – Immediate conservation action is needed to reverse or stabilize significant, long-term population declines

II – Management or other on-the-ground conservation actions are needed

III – Long-term planning actions are needed to ensure that sustainable populations are maintained

SOP 1 - Field Season Logistics

Northeast Temperate Network

Version 1.08

Overview

Because this is a volunteer-based monitoring program, the most important preparation prior to the field season is to ensure that skilled volunteer personnel are trained and available to accomplish the field work. Prior to the field season each year, preferably in March or April, the project manager should contact volunteer observers to determine the number participating and whether additional volunteers will need to be recruited (for volunteer recruitment & training, see SOP 2 - Recruiting and Training Volunteers). If suitable numbers of volunteers cannot be found and funding permits, the Vermont Center for Ecostudies (VCE) may offer some volunteers a small stipend to reimburse them for their time commitment.

By 10 May each year, the Program Manager will prepare a mailing to all volunteer observers that will include the following items:

- Volunteer Training Manual
- Field mapping cards and data coding sheets (for examples, see SOP 4 - Conducting Variable Circular Plot Point Counts) for the upcoming field season;
- List of point count stations and GPS waypoints assigned to each observer;
- Written directions, map, and compass bearings to locate point count stations;
- Blue flagging for updating route markings;
- Field season completion checklist (SOP 2 Appendix A);
- Any recent summaries or reports resulting from the bird monitoring program;
- Cover letter thanking them for participating in the bird monitoring program, reminding them of the monitoring window dates and starting times, and encouraging them to review the protocol, including relevant SOPs, prior to the field season. It is particularly important that observers review bird identification by sight and sound (SOP 2 - Recruiting and Training Volunteers), since misidentification of a species is perhaps the most serious error observers can make during a bird count. Misidentification is much more serious than errors in estimating distances or double-counting a bird.
- Copy of monitoring permit for their park, which volunteers must carry with them in the field.

National Park Service (NPS) staff at each park will also be responsible for acquiring any necessary clearances for volunteers, notifying park security if need be, or otherwise ensuring that observers have access to park property during early morning hours (ca. 0400 - 0430 hours) in order to arrive at their first point count station at approximately 0500 hours.

Northeast Temperate Network (NETN) staff will be responsible for obtaining a research permit at each park. Most NETN parks have issued 10-year permits to cover monitoring activities, but the permit for ACAD must be renewed each year.

Two weeks before the end of the monitoring window, the Program Manager will contact all of the volunteers to find out if they have been able to monitor their assigned route(s). If a volunteer is having difficulty finding time to monitor their route, the Program Manager will ask another nearby volunteer if they can monitor the route (in return for a stipend for their time), or will look into other alternatives for getting the route monitored.

Volunteers will be contacted again immediately after the monitoring window, to verify that routes were monitored and to remind volunteers that early data entry and submission of data sheets (completed by July 8) will earn them an appreciation gift (e.g., \$15 gift certificate).

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	January 2006	Steve Faccio	SOP used beginning with the 2006 field season.	
1.01	April 2006	Brian Mitchell	Added revision log.	
1.02	April 2008	Steve Faccio Brian Mitchell	VCE may offer some volunteers a stipend, if funding permits.	
			Added information about permits.	
1.03	December 2008	Steve Faccio Brian Mitchell	Minor editorial changes.	
1.04	February 2009	Steve Faccio	Added Field Season Completion Checklist as Appendix 1.1 and changed Revision Log to Appendix 1.2.	
1.05	April 2009	Steve Faccio	Incorporated reviewer comments into Field Season Checklist.	
1.06	August 2009	Sarah Lupis	Formatting, minor editorial changes.	
1.07	May 2010	Brian Mitchell	Move completion checklist to SOP 2	
1.08	March 2011	Brian Mitchell	Add mid-season and immediate post-season contact with volunteers.	Annual protocol review; improve volunteer management.

SOP 2 - Recruiting and Training Volunteers

Northeast Temperate Network

Version 2.02

Overview

This Standard Operating Procedure explains how to recruit volunteer observers and the training procedures that all observers should follow to learn to identify birds by sight and sound, and to estimate distances in the field.

Northeast Temperate Network (NETN) staff will be responsible for obtaining a research permit at each park. Most NETN parks have issued 10-year permits to cover monitoring activities, but the permit for ACAD must be renewed each year.

Recruiting Volunteer Observers

Volunteer observers will be recruited from a variety of local sources, including bird clubs, Audubon Chapters, birding listservs, and via state BBS coordinators. Verifying potential participants' bird identification skills is very important, but testing multiple applicants is difficult, time consuming, and therefore costly.

The Vermont Forest Bird Monitoring Program (FBMP) has relied on word-of-mouth recommendations of local birders, as well as self-evaluation based on a description of the necessary abilities. More recently, the FBMP has developed a simple, self-administered, online auditory Bird Identification Quiz to help determine if potential observers have the necessary skills to participate in the program (<http://www.vtecostudies.org/FBMP/birdquiz.html>).

Development of a more elaborate quiz that could be adjusted for geographic region within the NETN, as well as habitat being surveyed (e.g., forest, grassland), would be a cost-effective tool with which the project manager could evaluate participants' bird identification abilities. In addition, it would provide potential observers with a way to self-evaluate their own identification skills. The NETN and the Vermont Center for Ecostudies (VCE) are actively pursuing tools for ensuring birder skills, including supporting the extension of a web-based birder certification program to the northeast. This site (<http://www.birdercertification.org>) has been improved to the point that it is worth pilot testing as a tool for testing volunteers. Beginning in 2011, volunteers will be encouraged to take the tests on this site and obtain certification. Volunteers may be required to obtain certification through this site in the future, as the site becomes more complete and reliable.

Training Volunteer Observers

The most essential component for the collection of credible, high-quality bird data is well-trained and experienced observers. This cannot be overemphasized. In order to participate, volunteer observers must already possess a high degree of skill in bird identification. Therefore, little training is needed in this area. However, new volunteers will be provided with a list of bird species previously detected at the study site or park in which they will be surveying so they can familiarize themselves with the identification of any problematic species prior to the start of the

survey period. Although observers will be experienced in the identification of birds, many will have little or no experience in estimating distances to vocalizing birds. Because it is not realistic to expect volunteers from all parks to be able to attend a training session on estimating distances to vocalizing birds, and it is not economically feasible to offer training sessions at each Network park, volunteers will be provided with written training procedures and asked to practice distance estimation at their study site or in a habitat similar to the one in which they will be surveying birds. Volunteers will also be encouraged to use the NETN Google Earth portal (http://science.nature.nps.gov/im/units/NETN/googleMaps/parkMaps_GoogleEarth_flash.cfm) for gaining familiarity with their monitoring route.

To facilitate training, each volunteer will receive a Volunteer Training Manual (available on the VCE and NETN websites), which provides background on the project, including goals and objectives, sampling design, and survey assumptions, and outlines the procedures for conducting point counts, self-training in distance estimation, use of map and compass, and data entry procedures.

Observers will also be sent a checklist (Figure 1) that lists key training and data management steps. They will be asked to initial each step to certify that they have followed the recommended procedures.

Other Aspects of Training

Park or NETN staff will ensure that volunteers are provided with, and are comfortable using, equipment needed while they are in the field, including GPS navigation and emergency communication equipment (e.g., park radios or cell phones). Volunteers will be encouraged to practice using navigation equipment and will also be encouraged to locate their point count sites during the day before their official counts. This will allow them to gain familiarity with survey locations and save time when they are conducting their counts.

Name _____

Park _____

	Initials	Date	TASK	When to Accomplish
1			Read/review Volunteer Training Manual	Mid- to late-May
2			Practice distance estimation as outlined in Volunteer Training Manual	Mid- to late-May
3			Brush-up on bird songs in the field or with recordings	Mid- to late-May
4			Conduct first field survey (last week of May surveys are acceptable at MORR and WEFA)	1-15 June
5			Conduct second field survey (optional at some parks)	15-30 June
6			Transcribe data from Field Mapping Cards onto Data Coding Sheets	Within 1 day of conducting field survey
7			Make photocopies of Field Mapping Cards and Data Coding Sheets and mail originals to VCE (address below). Retain copies for use in data entry.	Within 3 days of conducting last field survey.
8			Enter field data into Bird Point Count Database and return this sheet to VCE (address below).	No later than 15 August*
9			Total up volunteer hours contributed to project this season and enter below.	No later than 15 August*
10			Complete and sign NPS <i>Agreement for Individual Voluntary Services</i> form and return to VCE with this sheet.	No later than 15 August*
* Enter data and mail your data sheets by July 8 to receive an early submission reward.				
TOTAL VOLUNTEER HOURS:				
Comments:				

Mail to: Steve Faccio
VCE
PO Box 420
Norwich, VT 05055

Figure 1. Field Season Completion Checklist. This checklist is an important part of our quality control procedures. Please initial and date each task as it is completed, and return this sheet once data entry is complete (by 15 August).

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	January 2006	Steve Faccio	SOP used beginning with the 2006 field season.	
1.01	April 2006	Brian Mitchell	Added revision log. Clairified reference to Appendix 1; now refers to protocol narrative.	
1.02	December 2008	Steve Faccio Brian Mitchell	Inserted section on Training Volunteers, moved section on estimating distances to Appendix 2.1, and changed Revision Log to Appendix 2.2.	
1.03	February 2009	Steve Faccio	Added Volunteer Training Manual as Appendix 2.2 and changed Revision Log to Appendix 2.3.	
1.04	August 2009	Sarah Lupis	Formatting, minor editorial changes.	
2.00	February 2010	Adam Kozlowski and Brian Mitchell	Significant revision to Volunteer Training Manual to reflect streamlined field procedures and updated data management procedures. Updated survey procedures and added mammal data coding sheet. Added volunteer data management responsibilities appendix.	Changes to reflect efforts to simplify field data collection and improve data management procedures.
2.01	March 2010	Steve Faccio	Minor editorial changes during review. Volunteer training manual is now a separate document, not an appendix.	
2.02	March 2011	Brian Mitchell	Updated information on birder certification web site and added reference to NETN Google Earth portal. Added note about early data submission reward to checklist.	Annual procedure review; ideas to improve volunteer training and management.

SOP 3 - Establishing and Marking Sampling Points

Northeast Temperate Network

Version 2.04

Overview

This SOP explains the procedure for establishing and marking sampling plots.

Procedures

Establishing Sampling Plots

In locating study plots, four basic criteria were established: 1) point counts should be spaced approximately 200-250 m apart to avoid duplicate sampling while permitting observers to move efficiently between points; 2) points should be located at least 50 m from forest edges in order to maximize sampling effort on focal species and avoid fragmentation effects; 3) points should be located within the dominant, mature forest cover types found in each park; and 4) at least one forest vegetation sampling plot per study site should be co-located within 50 m of a point count so that future changes in bird populations can be compared with broad changes to forest structure, composition, and other variables. In addition, point count stations should be located at least 15 m away from hiking trails and interpretive signing, and at least 50 m from park boundaries, roads, buildings, and other areas frequented by the public. To meet these criteria, sampling locations were selected in four ways:

1. A systematic grid was used at Marsh-Billings-Rockefeller NHP (MABI), Minute Man NHP (MIMA), Morristown NHP (MORR), Roosevelt-Vanderbilt park units (ROVA), Saint-Gaudens NHS (SAGA), Saratoga NHP (SARA), and Weir Farm NHS (WEFA).
2. At Acadia NP (ACAD) sites were required to have a central station within 50 m of a long-term forest monitoring plot, and randomly selected using the Generalized Random Tesselation Stratified (GRTS) algorithm (Stevens 1997, Stevens and Olsen 2004). The sites were selected to be accessible to volunteers (within 1.5 km of a road, with a slope less than 30%), and with all stations within the same large (> 100 ha) block of contiguous forest habitat (as defined by broad vegetation type on the Acadia National Park vegetation map).
3. At SARA, study sites were also established within grasslands since this habitat type represents a significant component of the natural communities at that park.
4. At SAIR, the small size of the park prevented us from using the methods describe above. Two point stations separated by 250 m were established along the Saugus River and within the park boundary in consultation with the park's resource manager. A third station was established between the two in order to provide a chance to record additional species, although most analyses will exclude this point due to the potential for double-counting individuals recorded at the two other points. Additional details of the sampling design are presented in the protocol narrative.

Marking Sampling Plots

It is critical that observers be able to move quickly from one point to the next in order to complete their survey before bird activity slows down at around 0900 hours. Therefore, each survey point must be identified with both a permanent (aluminum tree tag) and visible marker (flagging tape) in order to facilitate their timely location by volunteer observers (Figure 1). In addition, a small amount of flagging spaced every 25 to 100 m (depending on density of habitat and therefore an observer's ability to maintain a compass bearing) in between points will be necessary to help guide observers to the next listening station. This is especially important since GPS is not always reliable under the forest canopy in summer. Point count stations and flagging will be located at least 15 m away from hiking trails and interpretive signing, and at least 50 m from park roads, buildings, and other areas frequented by the public.

While it is possible that the flagging at each point count could be removed after surveys are completed, and re-flagged prior to conducting surveys the following year, that would require additional volunteer time. Such an expectation may not be feasible for all volunteers, especially if they live any distance from the park, and may reduce the pool of potential observers, which is already fairly small due to the high level of skill necessary to participate. Unless park staff are willing to commit to re-flagging each year, the preference is to leave flagging up year-round, and have volunteer observers replace it when necessary during the course of their surveys.

Sampling points in grassland habitat at SARA should be located using a GPS unit while conducting bird surveys. The high accuracy of GPS in open habitats eliminates the need for permanent marking of each point.

Beginning in 2008, point counts and routes in ACAD were permanently marked with metal trail signs and "fire tacks" (Figure 2). Fire tacks are small, but highly reflective, and should help volunteers navigate between point counts with a flashlight or headlamp in low light. Point counts were marked with metal signs and flagging, while routes between points were marked every 20-25 m with signs (no flagging).



Figure 1. Example of point count markers—aluminum tree tag and flagging tape.



Figure 2. Example of metal signs used at ACAD to mark point count stations. A reflective “fire tack” is visible at the left edge of the tree even with the top of the sign. Routes between point counts are marked similarly, but without flagging.

Plot Maps and Directions

Park maps indicating plot locations and plot ID numbers will be printed and mailed to each observer prior to the start of the field season to assist them in navigating from point to point. Observers will also be provided with specific instructions for surveying their route. Directions and maps (Figures 3-20) of NETN parks with bird point locations are included below, along with point count coordinates (UTM, NAD83) (Tables 1-9).

Acadia National Park Overview Map and Plot Coordinates

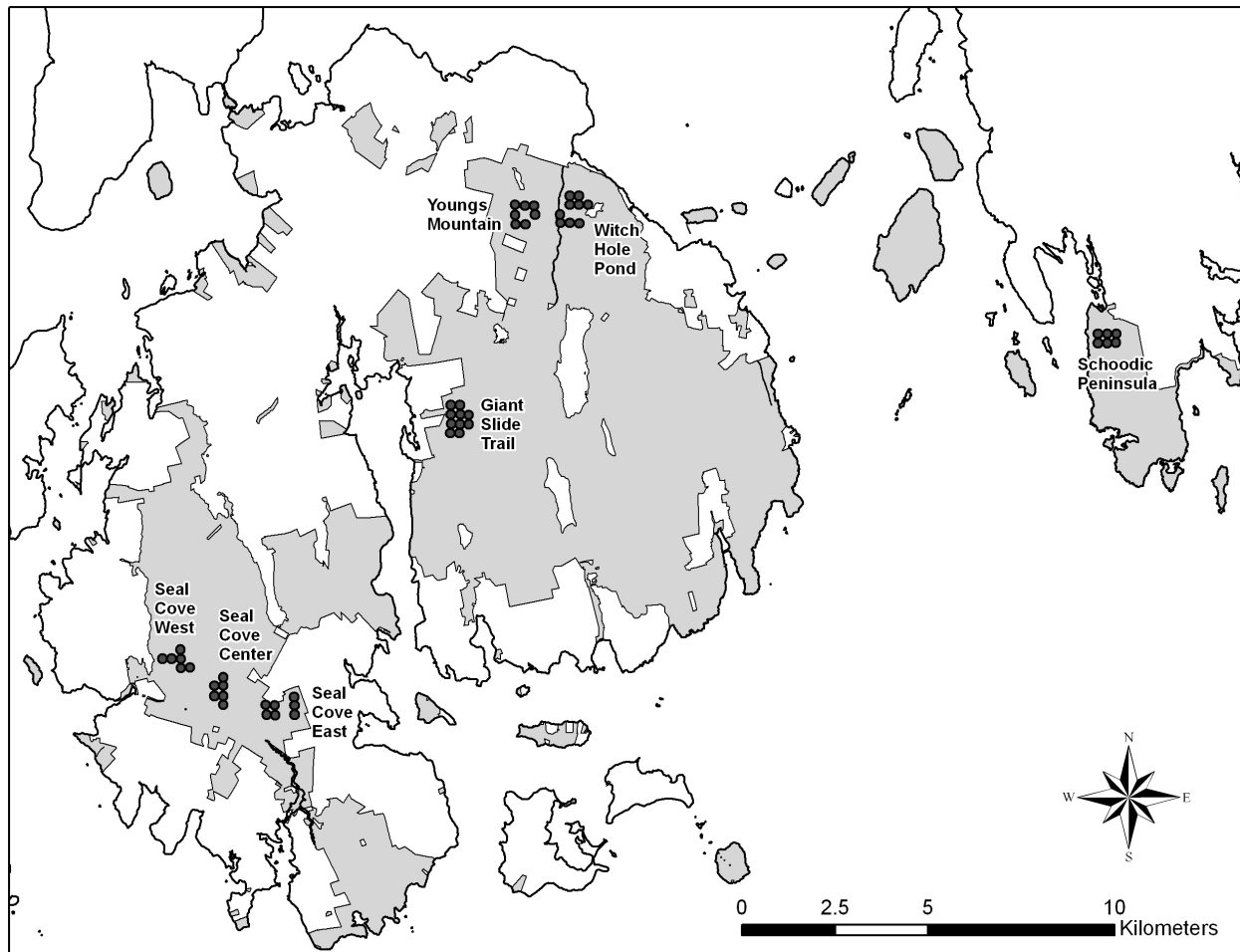


Figure 3. Overview of point count locations established at Acadia NP, Mount Desert Island and Schoodic Peninsula.

Table 1. UTM coordinates (NAD 1983, Zone 19) for point count locations and habitat at Acadia NP, Maine.

Study Site	Point Number	Point Code	UTM_N	UTM_E	Habitat	Parcel
Schoodic Peninsula	1	B47	4913260	573823	Upland Conifer Forest	Schoodic
Schoodic Peninsula	2	B48	4913259	574087	Upland Conifer Forest	Schoodic
Schoodic Peninsula	3	B49	4913262	574321	Upland Conifer Forest	Schoodic
Schoodic Peninsula	4	B50	4913028	574312	Upland Conifer Forest	Schoodic
Schoodic Peninsula	5	B51	4913020	574087	Upland Conifer Forest	Schoodic
Schoodic Peninsula	6	B52	4913015	573830	Upland Conifer Forest	Schoodic
Witch Hole Pond	1	B38	4916973	559870	Mixed Upland Forest	MDI
Witch Hole Pond	2	B39	4916974	559628	Mixed Upland Forest	MDI
Witch Hole Pond	3	B40	4916727	559620	Mixed Upland Forest	MDI
Witch Hole Pond	4	B41	4916730	559866	Mixed Upland Forest	MDI
Witch Hole Pond	5	B42	4916724	560122	Mixed Upland Forest	MDI
Witch Hole Pond	6	B43	4916230	559879	Mixed Upland Forest	MDI
Witch Hole Pond	7	B44	4916237	559619	Mixed Upland Forest	MDI
Witch Hole Pond	8	B45	4916238	559377	Mixed Upland Forest	MDI
Witch Hole Pond	9	B46	4916475	559363	Mixed Upland Forest	MDI
Giant Slide Trail	1	B1	4911092	556422	Mixed Upland Forest	MDI
Giant Slide Trail	2	B2	4911347	556424	Mixed Upland Forest	MDI
Giant Slide Trail	3	B3	4911352	556669	Mixed Upland Forest	MDI
Giant Slide Trail	4	B4	4911086	556678	Mixed Upland Forest	MDI
Giant Slide Trail	5	B5	4911081	556911	Mixed Upland Forest	MDI
Giant Slide Trail	6	B6	4910833	556909	Mixed Upland Forest	MDI
Giant Slide Trail	7	B7	4910829	556666	Mixed Upland Forest	MDI
Giant Slide Trail	8	B35	4910588	556659	Mixed Upland Forest	MDI
Giant Slide Trail	9	B36	4910597	556414	Mixed Upland Forest	MDI
Giant Slide Trail	10	B37	4910843	556438	Mixed Upland Forest	MDI
Seal Cove East	1	B20	4903497	552208	Mixed Upland Forest	MDI
Seal Cove East	2	B21	4903270	552223	Mixed Upland Forest	MDI
Seal Cove East	3	B22	4903024	552230	Mixed Upland Forest	MDI
Seal Cove East	4	B23	4903285	551452	Mixed Upland Forest	MDI
Seal Cove East	5	B24	4903028	551484	Mixed Upland Forest	MDI
Seal Cove East	6	B25	4903021	551709	Mixed Upland Forest	MDI
Seal Cove East	7	B27	4903274	551701	Mixed Upland Forest	MDI
Seal Cove Center	1	B13	4903282	550317	Mixed Upland Forest	MDI
Seal Cove Center	2	B12	4903537	550312	Mixed Upland Forest	MDI
Seal Cove Center	3	B8	4903802	550317	Mixed Upland Forest	MDI
Seal Cove Center	4	B9	4904038	550315	Mixed Upland Forest	MDI
Seal Cove Center	5	B11	4903536	550077	Mixed Upland Forest	MDI
Seal Cove Center	6	B10	4903799	550066	Mixed Upland Forest	MDI
Seal Cove West	1	B14	4904289	549418	Mixed Upland Forest	MDI
Seal Cove West	2	B16	4904276	549177	Mixed Upland Forest	MDI
Seal Cove West	3	B15	4904524	549172	Mixed Upland Forest	MDI
Seal Cove West	4	B17	4904532	548921	Mixed Upland Forest	MDI
Seal Cove West	5	B18	4904774	549170	Mixed Upland Forest	MDI
Seal Cove West	6	B19	4904529	548669	Mixed Upland Forest	MDI
Youngs Mountain	1	B28	4916470	558683	Mixed Upland Forest	MDI
Youngs Mountain	2	B29	4916207	558431	Mixed Upland Forest	MDI
Youngs Mountain	3	B30	4916200	558170	Mixed Upland Forest	MDI

Table 1. UTM coordinates (NAD 1983, Zone 19) for point count locations and habitat at Acadia NP, Maine (continued).

Study Site	Point Number	Point Code	UTM_N	UTM_E	Habitat	Parcel
Youngs Mountain	4	B31	4916457	558162	Mixed Upland Forest	MDI
Youngs Mountain	5	B32	4916725	558158	Mixed Upland Forest	MDI
Youngs Mountain	6	B33	4916700	558417	Mixed Upland Forest	MDI
Youngs Mountain	7	B34	4916696	558669	Mixed Upland Forest	MDI

Acadia National Park, Schoodic Peninsula

Site established May 18, 2007 and updated May 9, 2008 by Kate Miller

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. Listening stations are marked with an aluminum treetag, and an NPS Bird Study Sign labeled SCP-P#, where P# indicates the listening point number. Blue dashed lines on the map indicate routes marked with reflective tacks and white NPS Bird Study signs approximately every 25m (17 paces). Signs along the routes are labeled SCP-Route, P# to P#, indicating the survey site and the nearest listening stations. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.67m. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road.

Point 1 (NETN B47): Park at first NPS interpretive sign/ pulloff (1.4 miles from Rt.186) overlooking Mosquito Harbor (before road to Frazer Point). Begin at the fireroad/ powerline that is located across the road from the pulloff. Walk 610 m (440 paces) down the fireroad to "FR 1-3" (or 190 paces past the small utility shack on the fire road). Listening Point is 120 m (84 paces) at 270° from the fire road through carpet moss forest. First signed tree is a 6" diameter white cedar 10 m from fire road. Listening Point is a 12" diameter red spruce.

Point 2 (NETN B48): Listening Point is located 130 m (96 paces) at 90° from fireroad (FR 1-3). First signed tree is an 11" diameter red spruce. Route passes through a patch of dense spruce saplings and blow-downs. Walk around the south edge of the patch (marked through the patch). After ~15m the understory opens back up to carpet moss forest. Listening Point is a 4" diameter red spruce in carpet moss forest.

Point 3 (NETN B49): Listening Point is located 250 m (165 paces) at 90° from Point 3 (P3). Route passes through a patch of sheep laurel then varies between dense understory conifers and carpet moss forest. At ~130 m (91 paces), cross a small stream. Listening Point is a 7" diameter red spruce in relatively open carpet moss forest.

Point 4 (NETN B50): Listening Point is 250 m (170 paces) at 180° from P3. Route passes through large patches of dense understory red spruce and balsam fir. At 120 m (87 paces), cross a small stream. Listening Point is a 5" diameter balsam fir in a relatively clear understory.

NOTE: A moose calf was spotted within 10 m of this Listening Point in 2007, as well as lots of signs of activity (browse, scat, moose trails, etc.). Always be cautious when encountering park wildlife!

Point 5 (NETN B51): Listening Point is 250 m (176 paces) at 270° from P4. Route passes through spruce/fir dog-hair thickets and crosses over a small, seasonal stream. Listening Point is a 9" diameter red maple located in a clump of red maples.

NOTE: Fire road (FR 4-6) is 115 m (84 paces) from P4 at 270°. FR 4-6 is 30 m south of telephone pole #52 with grey electrical box.

Point 6 (NETN B52): Listening Point is 250 m at 270° from P5, and 135m at 270° from the fire road (FR 4-6). Listening Point is a 9" diameter red spruce in carpet moss forest.

NOTE: To get back to car, hike East back to fire road and head North.

GPS NOTES: The forest canopy in much of the area is very dense, and can cause difficulties with GPS units. You should be able to get a decent reading along the fire road to navigate to "Reference Points". However, within the forest, GPS navigation can be tough and you should rely more on compass bearings and pacing. The coordinates for Point 6 were estimated based on pacing and compass bearings, as GPS satellite coverage was non-existent at the time of point establishment. GPS points are projected in UTM NAD83.

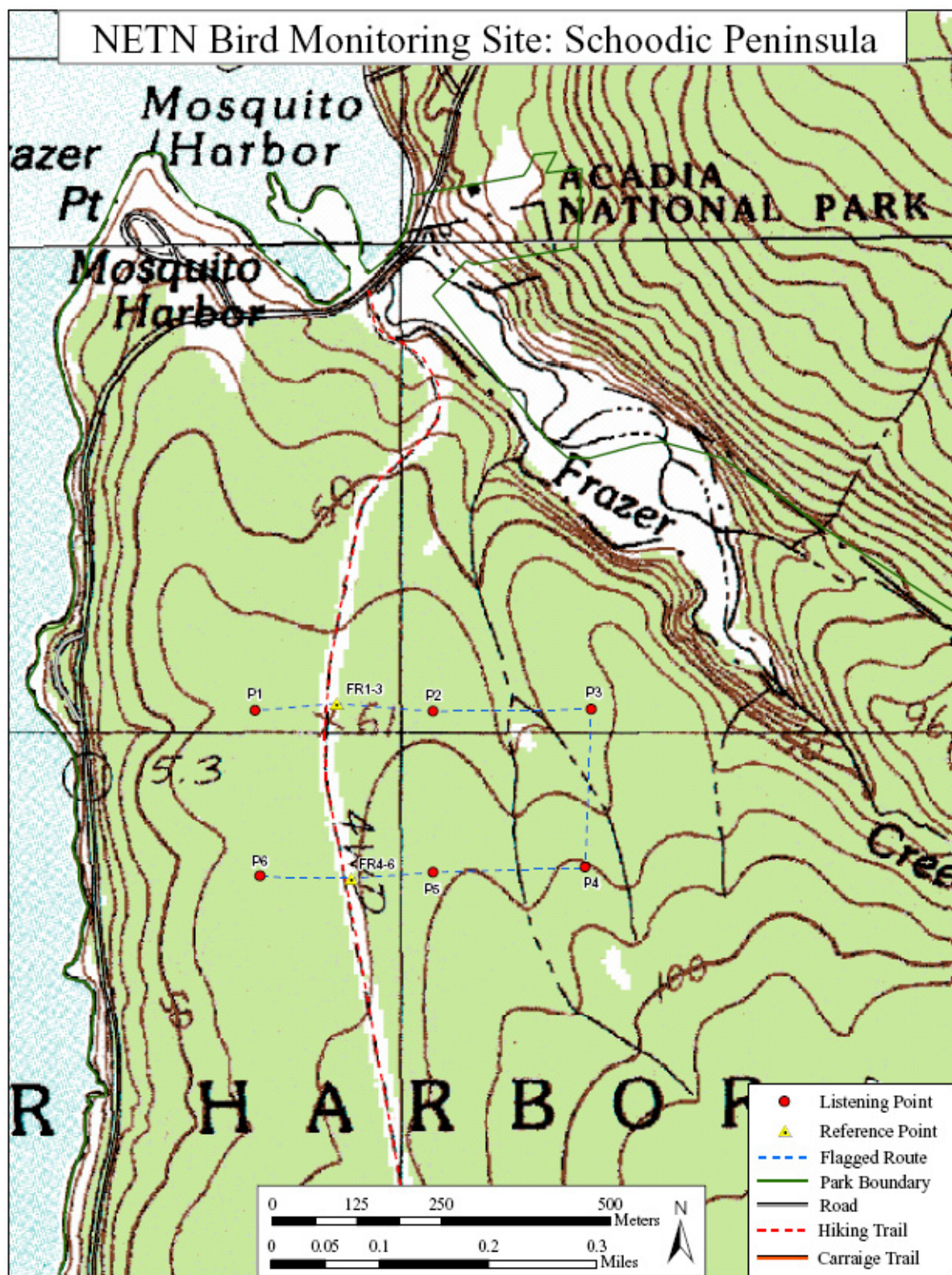


Figure 4. Point count locations at Acadia NP, Schoodic Peninsula, Winter Harbor, Maine.

Acadia National Park, Witch Hole Pond

Site established May 15, 2007 and updated April 25, 2008 by Kate Miller

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. Listening stations are marked with an aluminum tree tag, and an NPS Bird Study Sign labeled WHP-P#, where P# indicates the listening point number. Blue dashed lines on the map indicate routes marked with reflective tacks and white NPS Bird Study signs approximately every 25m (17 paces). Signs along the routes are labeled WHP-Route, P# to P#, indicating the survey site and the nearest listening stations. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.67 m. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road.

Point 1 (NETN B38): Begin at Carriage Trail from Hull's Cove Visitor Center Parking lot. Go about 450 m to intersection of Carriage Trails. Point is 150 m (97 paces) at 230° from red "Danger to Bicycles" sign at intersection. First signed tree is a clump of three large red oak (8-13" dbh) uphill from sign. At top of the lichen covered boulders (around second sign) change compass bearing to 250°. Continue at 250° to the first listening point, which is an 8" diameter white pine, in white pine/red pine dominated forest with moderately dense red spruce understory.

Point 2 (NETN B39): Listening point is located 250 m (182 paces) at 270° from Point 1 (P1). At 50 m from P1 you will come to a wetland. Follow the wetland edge North about 15m to a crossable path. After wetland, go uphill. Pass over several caribou lichen covered rocky areas. Listening Point is a 12" diameter white pine, and is 20 m west of lichen covered boulders.

Point 3 (NETN B40): Listening Point is located 250 m (182 paces) at 180° from P2. Forest varies between white pine/ red spruce forest to red oak/big tooth aspen forest with relatively dense red spruce understory. Pass over several areas of lichen covered boulders. Listening Point is a 3" diameter red spruce at edge of small understory clearing.

Point 4 (NETN B41): Listening Point is 240 m (170 paces) at 90° from P3. At 30 m (17 paces) from P3 cross a wetland by stepping hummock to hummock. Pass through several areas of lichen covered boulders. Listening Point is a 6" diameter gnarly red spruce, located in an area with relatively dense red spruce and white pine branches.

Point 5 (NETN B42): Listening Point is 245m (189 paces) at 90° from P4. Head downhill through hardwood dominated with sparse understory red spruce, passing area with several big tooth aspen snags. After ~80 m the understory consists of dense red spruce. At 140 m, cross a hummocky wetland and go uphill into a more conifer dominated forest. Listening Point is a 5" diameter white pine in a white pine/ red oak forest with relatively open understory. You can see Witch Hole Pond through trees, and the Carriage trail is 85m (60 paces) at 90°.

NOTE: To find marked path to P5 from Carriage trail (CT 5), walk 60 m (43 paces) South from Carriage trail intersection (Sign Post 2), and look for line of four paper birches just up slope from Carriage trail. Go upslope at 270° to find route.

Point 6 (NETN B43): Listening Point is ~650 m south on Carriage Trail from reference point CT 5, and is 12m from Carriage Trail (CT 6) at 320°. Look for area where pond southwest of Witch Hole is close to east side of Carriage Trail and rows of coping stones line both sides. Listening Point is about 10 m (7 paces) uphill, and is a large red oak (>20" diameter) that is forked at the base. Tag and sign are facing away from the trail, and no flagging is wrapped around the tree.

Point 7 (NETN B44): Listening Point is 250 m (170 paces) at 270° from P6. First 80 m (60 paces) are fairly easy walking, with sparse understory conifers. Last ~160 m (110 paces) are fairly dense spruce understory. Listening Point is a ~8" diameter big tooth aspen at the edge of an understory clearing.

Point 8 (NETN B45): Listening Point is 250 m (182 paces) at 270° from P7. Path dominated by dense spruce understory, with several open, lichen-covered boulder areas. At 40 m from P8, go down a steeper boulder area. Listening point is a ~8" diameter big tooth aspen forked at the base. The tree is located behind a large blown down white pine that is 20 m below steep boulder area.

Point 9 (NETN B46): Continue West from P8 about 40 m to Break Neck Fire Road (FR 8). Listening Point is 250 m north from FR 8 along Breakneck Fire Road to FR 9 near top of hill, before going downhill north to the stream. Look for patch of sheep laurel on west side of road, and lichen covered bedrock on the east side. Go 43m (30 paces) at 110° from Breakneck Fire Road through lichen covered bedrock. Listening Point is a 4" diameter White Pine.

NOTE: To get back to Hull's Cove VC Parking Lot, take Breakneck Fire Road south ~650 m to a social trail (FR-CT) that connects with the WHP Carriage Trail. There are no signs marking the social trail, but the path is well-worn and runs east to northeast. Take WHP Carriage Trail North, back to Parking Lot.

GPS NOTES: The forest canopy in much of the area is very dense, and can cause difficulties with GPS units. You should be able to get a decent reading along the fire road to navigate to "Reference Points". However, within the forest, GPS navigation can be tough and you should rely more on compass bearings and pacing. GPS points are projected in UTM NAD83.

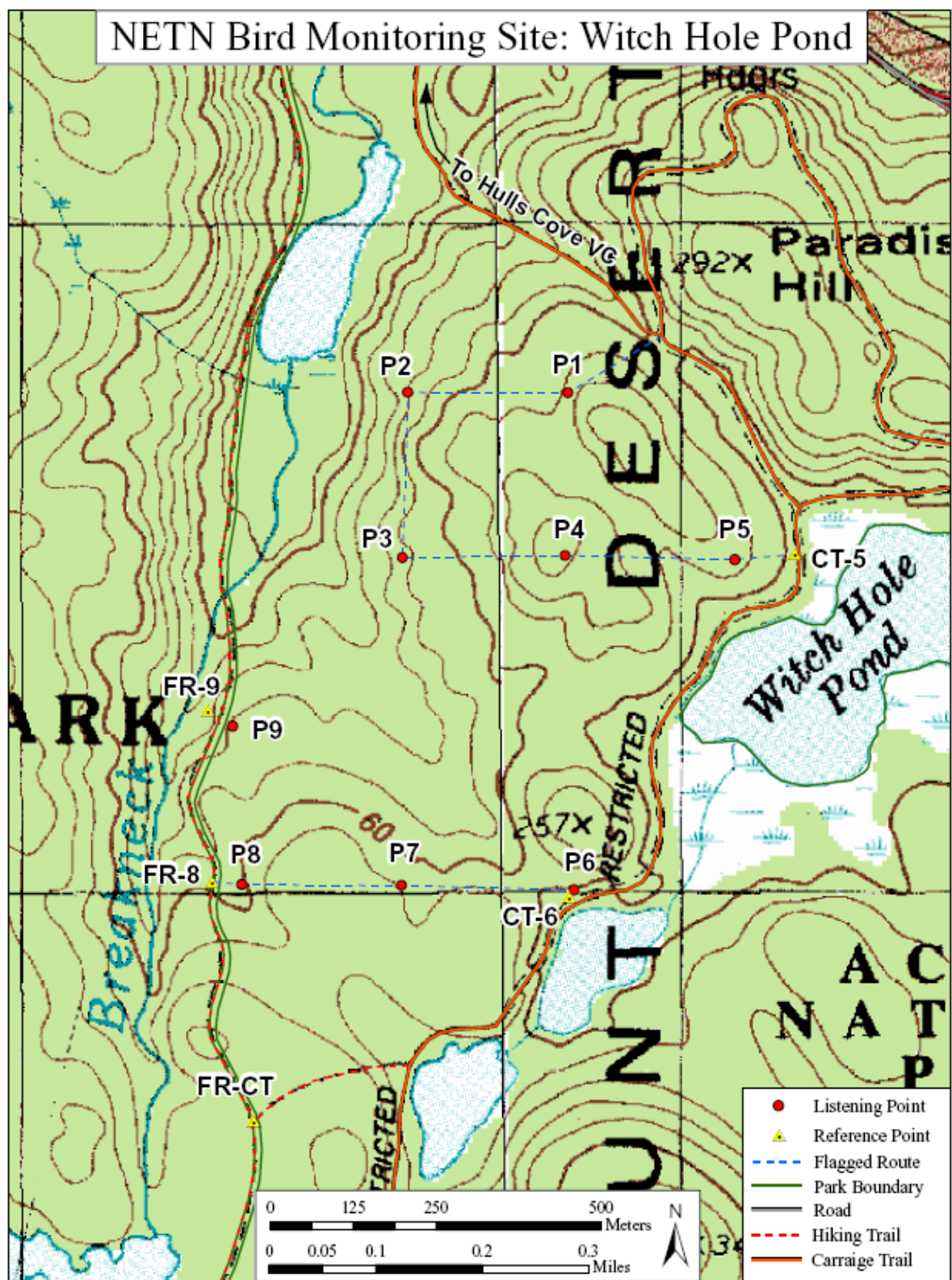


Figure 5. Point count locations at Acadia NP, Witch Hole Pond, Mount Desert Island, Maine.

Acadia National Park, Youngs Mountain

Site established 12 May, 2007 by Kate Miller

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. All listening stations are marked with double blue flagging and an aluminum tree tag, labeled "NETN B#", where # indicates the Point Number. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road. Routes marked in blue on the map are also flagged in the field. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.37m.

Point 1 (NETN B28): Begin at the north parking lot for Break Neck Pond Fire Road. Hike about 1.5 km south on Fire Road. Cross Break Neck Stream and begin going uphill. At reference point "FR 1" hike in 670 m (480 paces) at 270°. Cross Break Neck Stream again after 50 m (36 paces). Route is dominated by dense a red spruce understory (mostly dead branches), and also passes through blueberry balds, and rocky outcrops. Route is flagged often, making it easy to go around obstacles. Listening Point is a 6" diameter red spruce near a clump of six red maples.

Point 2 (NETN B29): Listening Point is 365m (280 paces) at 225° from P1. Route is dominated by dense a red spruce understory (mostly dead branches), and gradually increases uphill. Listening Point is a 3" diameter red spruce.

Point 3 (NETN B30): Listening Point is 257m (179 paces) at 270° from P2. Route is dominated by a dense red spruce understory (mostly dead branches), and follows the side slope of Youngs Mountain. Listening Point is a 7" diameter big tooth aspen surrounded by spruce branches.

Point 4 (NETN B31): Listening Point is 255m (210 paces) at 360° from P3. Route is dominated by a dense red spruce understory (mostly dead branches), and is on a gradual downhill slope. Listening Point is a 7" diameter red maple, and is located in a small understory opening.

Point 5 (NETN B32): Listening Point is 250 m (177 paces) at 360° from P4. Route passes through numerous patches of dense understory red spruce, with a red oak dominated canopy and crosses several small ravines. Listening Point is a 5" diameter red maple located in a clump of five red maple trees.

Point 6 (NETN B33): Listening Point is 250 m (169 paces) at 90° from P5. Route begins with a relatively open understory for the first 40 m. At 44m (29 paces) you will cross an old dirt road. At 100 m (74 paces) you will come to a wetland. Walk the wetland edge north to a crossable section. After crossing the wetland, head uphill. Listening point is a 10" diameter red oak, and is sparsely surrounded by balsam fir and red spruce saplings.

Point 7 (NETN B34): Listening Point is 245m (177 paces) at 90° from P6. At 35m (25 paces) cross a sphagnum moss dominated wetland by walking across a down white cedar to the south. At 160 m (115 paces) cross another old dirt road. Listening Point is in a clump of three red oak stems, and is a 5" red oak.

NOTES: To get back to car, go 630 m (440 paces) at 90° from P7 to Break Neck Fire Road. Then head north 1.25 km to parking lot.

GPS NOTES: The forest canopy in much of the area is very dense, and can cause difficulties with GPS units. You should be able to get a decent reading along the fire road to navigate to "Reference Points". However, within the forest, GPS navigation can be tough and you should rely more on compass bearings and pacing. GPS points are projected in UTM NAD83.

Figure 6. Point count locations at Acadia NP, Youngs Mountain, Mount Desert Island, Maine.

Acadia National Park, Giant Slide Trail

Site established May 14, 2007 and updated April 22, 2008 by Kate Miller

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. Listening stations are marked with an NPS Bird Study Sign labeled GST-P#, where P# indicates the listening point number. Blue dashed lines on the map indicate routes marked with reflective tacks and white NPS Bird Study signs approximately every 25m (17 paces). Signs along the routes are labeled GST-Route, P# to P#, indicating the survey site and the nearest listening stations. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.67m. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road.

Point 1: Begin at trail head of new Giant Slide Trail on hwy 3/198. The first Listening Point is located 775m up the trail, 3m past the intersection of the old Giant Slide Trail with the new trail. Look for the several down logs at the intersection placed to deter using the old trail. The Listening Point is a 6" diameter red maple behind a large red spruce, and is 3m south of the trail. The tree is not double flagged, and is tagged away from the trail with an NPS Bird Study sign.

Point 2: Take Giant Slide Trail another 200 m to Carriage Trail intersection. Go North on Carriage Trail about 185m (132 paces), where there is a stream and culvert (CT 2-3). First signed tree along route is a 2" red spruce that is 20 m (15 paces) due west of a large white pine near Carriage Trail. This large white pine is 15m (10 paces) south of the first coping stone marking the stream culvert. Go about 120 m (88 paces) from Carriage Trail at 270°. Listening Point is a 9" diameter red maple with flaky bark, and is in a small understory opening with white pine saplings. Several boulders are 5-7m from tree.

Point 3: Listening Point is 220 m from P2 at 90°, and is 100 m (73 paces) from "CT 2-3" at 90°. Route goes uphill through patches of dense understory spruce. First signed tree is 35m (25 paces) uphill from CT 2-3, and is a 5" yellow birch that is 6m at 70° from a large white pine snag (snag visible from Carriage Trail). At 70 m (52 paces) from CT 2-3, cross a small stream. Listening Point is a 7" diameter red oak.

Point 4: To get to Listening Point, walk Carriage Trail back to where it intersects Giant Slide Trail. Go east on Giant Slide Trail about 120 m (80 paces) to "TR 4" where there are large boulders on the East side of the trail. From here go 30 m at 60° behind the boulders to P4. First signed tree is a 5" white cedar down slope from boulders. Walk down small ravine, past a down white pine, then go up other side of ravine. Listening Point is a 7" diameter white cedar near a 12" diameter white cedar.

Point 5 (NETN B5): Listening Point is 260 m (195 paces) from P4 at 90°. Pass through patches of dense understory spruce, several blown down trees, and huckleberries. At 100 m (75 paces), cross a small stream. At 200 m (157 paces) pass more boulders- the climb becomes a bit steeper. Listening Point is a 9" diameter balsam fir next to a large white pine, and about 15m uphill from a group of boulders.

Point 6 (NETN B6): Listening Point is 250 m (197 paces) from P5 at 180°. Route follows the side slope and varies between red spruce/white pine dominated forests and red oak/stripped maple forests. Listening Point is an 8" diameter serviceberry (shadbush) tree. View through trees is of Somes Sound.

Point 7 (NETN B7): Listening Point is 227m (167 paces) from P6 at 270°, and 84m (60 paces) at 270° from intersection of Giant Slide Trail and stream (TR 6-7). Marking is sparse right around Trail, but continues at E-W bearing. Listening Point is a 13" diameter white pine in a forest with relatively large red spruce, white pine and red oak.

Point 8 (NETN B35): Listening Point is 235m (196 paces) from P7 at 180°. Route passes through patches of dense understory spruce. At 190 m (163 paces) from P8, go up a steep rocky slope with a down red spruce. Listening Point is a >15" diameter gnarly/branchy red spruce.

Point 9 (NETN B36): Listening Point is 220 m (180 paces) from P8 at 270°. Route dominated by dense understory spruce, and goes downslope. Listening Point is a 14" diameter red maple.

Point 10 (NETN B37): Listening Point is 250 m (180 paces) from P9 at 360°, and is 40 m (28 paces) from the Carriage Trail (CT-10). Route from P9 follows a side slope, and passes through patchy dense understory spruce. At 90 m (66 paces), and 130 m (92 paces) from P9 cross small seasonal streams. At 20 m from Listening Point 10, route bearing changes to 50° (PT10 Rte) and is labeled DC-50 on the first sign where bearing changes. Starting at "PT10-Rte", signs are up every 5m to help mark the change in direction. Listening Point is a 5" diameter red maple near a large red spruce snag.

If finding P10 from "CT 10", go 400 m (280 paces) from Giant Slide Trail intersection with Carriage Trail, or 90 m (63 paces) from a large, cedar-lined stream along the Carriage Trail. P10 is 40 m from "CT-10" at 310°.

NOTE: To get back to car, walk Carriage Trail East/North back to Giant Slide Trail, and head West back to trail head/pulloff.

GPS NOTES: The forest canopy in much of the area is very dense, and may cause difficulties with GPS units. You should be able to get a decent reading along the Carriage Road to navigate to "Reference Points". However, within the forest, GPS navigation may be tough and you should rely more on compass bearings and pacing. GPS points are projected in UTM NAD83.

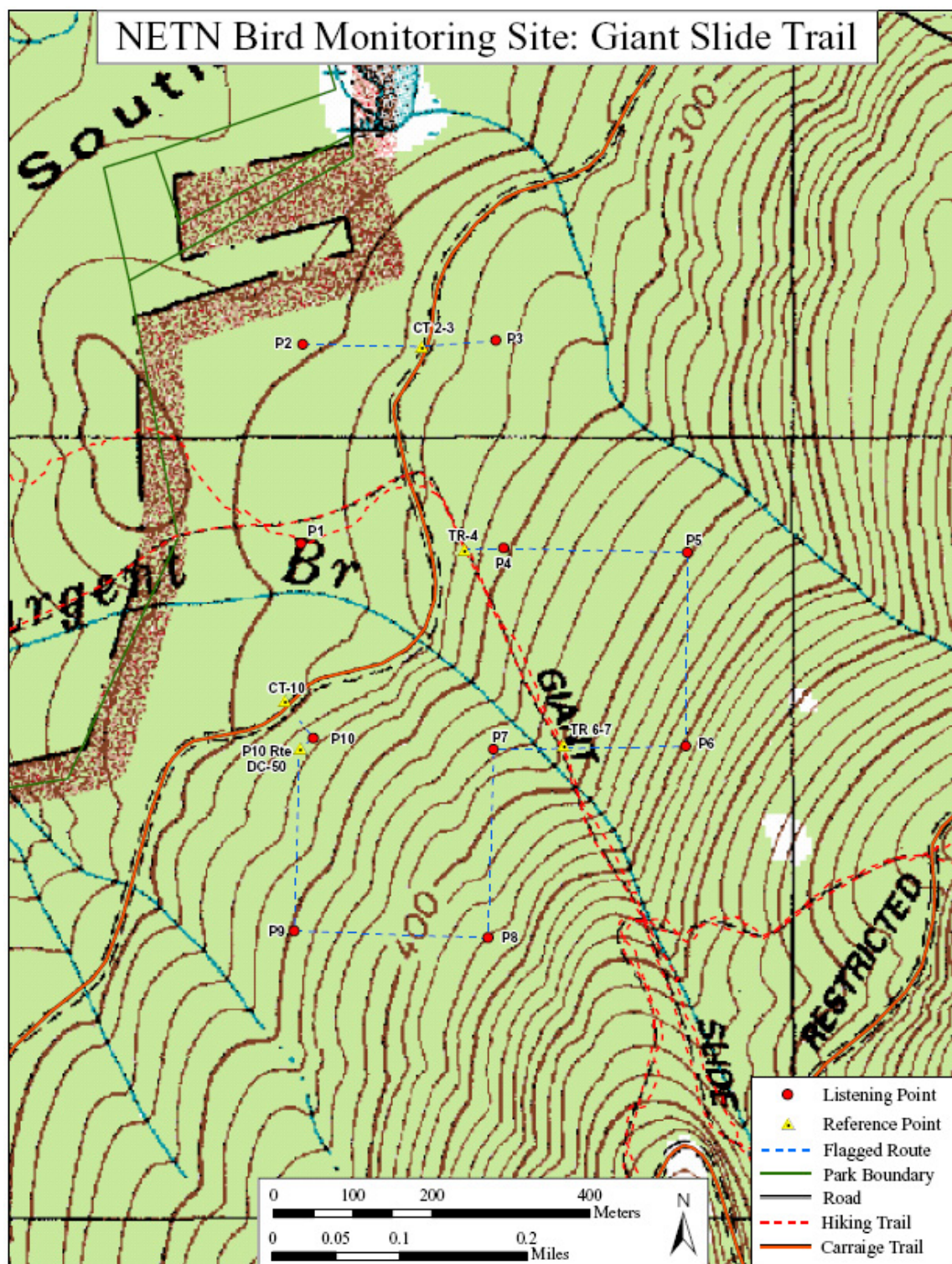


Figure 7. Point count locations at Acadia NP, Giant Slide Trail, Mount Desert Island, Maine.

Acadia National Park, Seal Cove Road – East

Site established 10 May, 2007 and updated 16 May, 2008 by Kate Miller.

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. Listening stations are marked with an aluminum treetag, and an NPS Bird Study Sign labeled SCE-P#, where P# indicates the listening point number. Blue dashed lines on the map indicate routes marked with reflective tacks and white NPS Bird Study signs approximately every 25m (17 paces). Signs along the routes are labeled SCE-Route, P# to P#, indicating the survey site and the nearest listening stations. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.67m. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road.

Point 1 (NETN B20): Park at gate of fire road that heads south from Seal Cove Road just after the park boundary. Walk 310 m (210 paces) down the fire road to reference point "FR 1". Road will start to curve to the east, and there is a large hemlock on the NE side of the fire road, and a large red spruce on the SW side of the fire road. Listening Point is 155m (117 paces) at 270° from fire road (FR 1). First signed tree is a 7" diameter red spruce about 15m from the fire road. Route passes through conifer forest with large white pine and red spruce trees. Last 15m (10 paces) of route is at a 290° bearing. Listening Point is a 15" diameter paper birch.

Point 2 (NETN B21): Go back to Fire Road from P1, and continue south 250 m (175 paces) to reference point "FR 2" at an S-shaped curve in the road. To the southwest will be a small drop off and carpet moss forest. Listening Point is 213m (142 paces) at 270° from fire road. Route varies between dense understory spruce and carpet moss forest. Listening Point is a 9" diameter red maple covered with lungwort lichen. A group of 4+ down trees is just south of P2.

Point 3 (NETN B22): Go back to Fire Road from P2, and continue south 250 m (185 paces) to where private trail head meets the fire road (a blue t-shirt was laying in the trail at the time of site establishment.). First sign is 10 m from fire road on a 1.5" red spruce near a 12" diameter red maple. Listening Point is 240 m (172 paces) at 270° from fire road/ trail head. Route follows a side slope that slopes down to the north, and varies between dense understory spruce and carpet moss forest. At 240 m (172 paces), cross a wet spot with ferns. Listening Point is about 10 m beyond the wet ferny spot, and is a tall 11" diameter red spruce with thick roots growing over moss covered rocks.

NOTE: Head East back to fire road, then north back to gate.

Point 4 (NETN B23): Park at the fire road pull off at the Seal Cove Road park gate just past White Birches Campground (reference point "FR"). Walk 15m (10 paces) West of "...commercial vehicles..." sign (reference point "RD 4"), and go 30 m (21 paces) at 310°. Listening Point is a 4" diameter red spruce.

Point 5 (NETN B24): Begin at same point (RD 4) on Seal Cove Road as for P4. Listening Point is 215m (~165 paces) from road at 180°. First signed tree is a 4" diameter red spruce near a forked red maple, and is 20 m (15 paces) from the road. Route varies between dense understory spruce with mixed conifer/hardwoods, and relatively open spruce/fir forest. Listening Point is a

6" diameter red maple in a clump of three red maples at the edge of a small wet sphagnum moss area.

Point 6 (NETN B25): Listening Point is 245m (160 paces) at 90° from P5. Route passes through several dense understory spruce patches. At 150 m (110paces) pass near a sphagnum moss dominated wetland. Listening Point is a 8" diameter balsam fir at the edge of a dense understory spruce patch.

Point 7 (NETN B27): Listening Point is 250 m (176 paces) at 360° from P6. Route passes through several dense understory spruce patches. At 150 m (106 paces) can see an opening and a structure through trees. At 210 m (152 paces), cross a trail (reference point "TR") that empties into an opening with several gravel piles. Listening Point is a 6" diameter red maple.

NOTE: To get back to car, walk south 30 m back to the trail (TR) and follow it to the opening. Across the opening will be another fire road, which will take you northwest to where you parked (FR).

GPS NOTES: The forest canopy in much of the area is very dense, and can cause difficulties with GPS units. You should be able to get a decent reading along the fire road to navigate to "Reference Points". However, within the forest, GPS navigation can be tough and you should rely more on compass bearings and pacing. GPS points are projected in UTM NAD83.

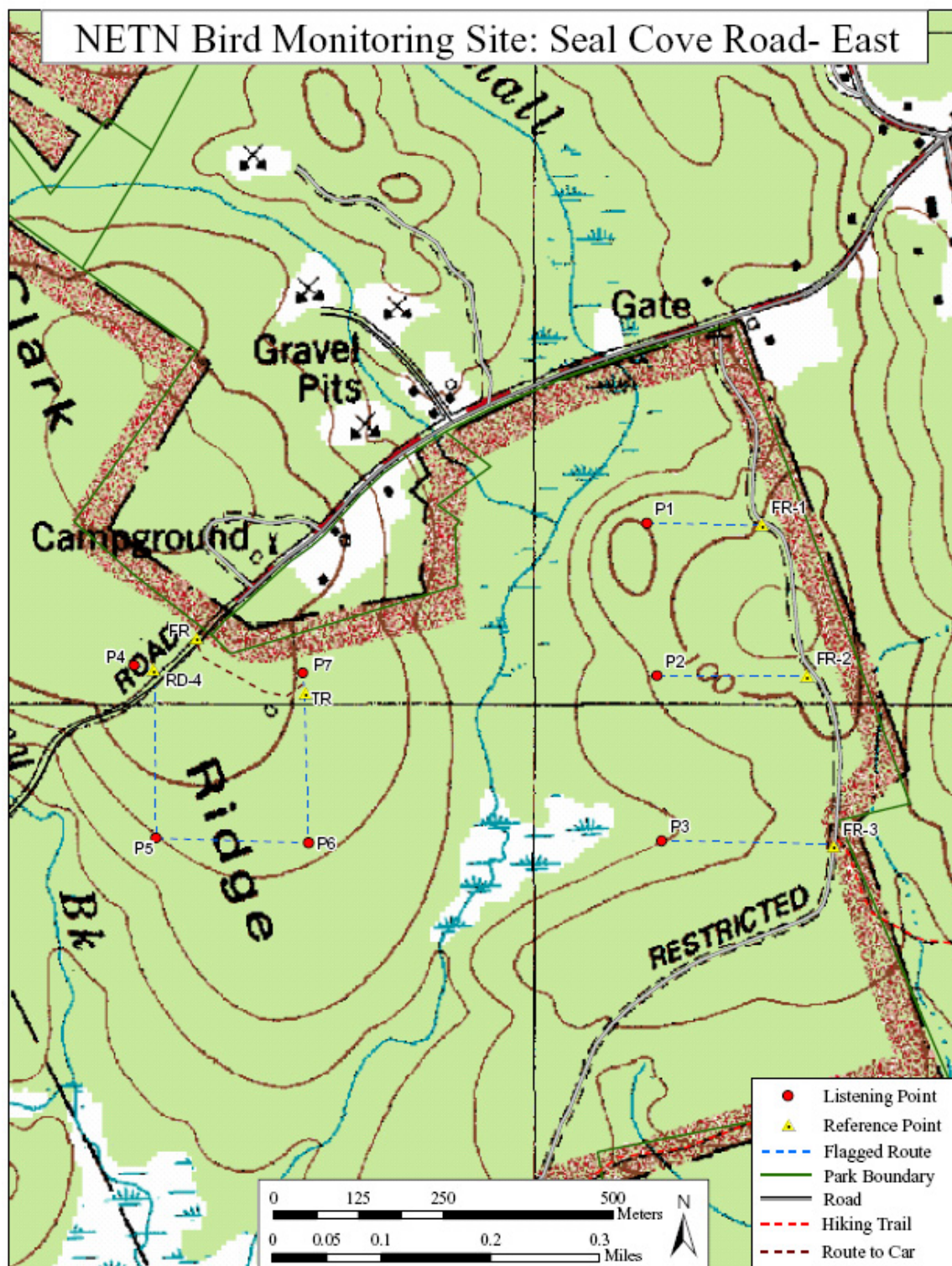


Figure 8. Point count locations at Acadia NP, Seal Cove East, Mount Desert Island, Maine.

Acadia National Park, Seal Cove Road – Center

Site established May 10, 2007 and updated May 16, 2008 by Kate Miller

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. Listening stations are marked with an aluminum treetag, and an NPS Bird Study Sign labeled SCC-P#, where P# indicates the listening point number. Blue dashed lines on the map indicate routes marked with reflective tacks and white NPS Bird Study signs approximately every 25m (17 paces). Signs along the routes are labeled SCC-Route, P# to P#, indicating the survey site and the nearest listening stations. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.67m. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road.

Point 1 (NETN B13): Marked route to Listening Point starts 15m from the connector road between Seal Cove Road and Western Mountain Road (reference point "RD 1"), and is 0.2 miles from Seal Cove Rd. Look for a clump of five paper birch stems that have been cut at the base and one red spruce (live) on the west side of the road. First signed tree is a 4" diameter red spruce. Listening Point is 210 m (150 paces) at 270° from the road. Continue uphill and across the small knoll where the route passes through a carpet moss forest, a dense red spruce forest, a big tooth aspen mixed forest, and then red spruce/white cedar forest on the back side of the knoll. Listening Point is an 8" diameter lichen covered red maple about 15m from a large boulder.

NOTE: For remainder of listening points, the best pull-off along the Western Mountain Rd. is PO2-6.

Point 2 (NETN B12): Listening Point is 130 m (91 paces) at 180° from reference point "RD 2", which is west of a small culvert and at a clump of three red maple and one red spruce right on the south side of the road. First signed tree is a uniquely forked red maple (two trees growing together in two spots with an opening in between). Route starts out with dense understory spruce and eventually opens up to a carpet moss forest with red spruce/ white cedar and small patches of dense understory spruce. Listening Point is a tall, straight 20" diameter red spruce.

Point 3 (NETN B8): Listening Point is 120 m (86 paces) at 360° from reference point "RD 2". First signed tree is 15m from road and consists of two, 4" diameter red maple trees growing together. Listening Point is a 15" diameter red spruce, and is 20 m north of a small sphagnum moss wet area.

Point 4 (NETN B9): Listening Point is 250 m (170 paces) at 360° from P3. Route is upslope and varies from gradual incline to fairly steep. Route is relatively rocky and has patchy understory red spruce. Listening Point is a 10" diameter red spruce at the edge of a dense understory spruce patch. A large red oak is just north of Listening Point.

Point 5 (NETN B11): Listening Point is 115m (84 paces) at 180° from reference point "RD 5", which is near a clump of three red maple in the ditch on south side of road. First signed tree is a 4" diameter red maple. Route starts out with a patch of dense understory spruce, then is dominated by carpet moss forest. Listening Point is a 10" diameter red spruce at the edge of carpet moss forest, and in an area with several down trees.

Point 6 (NETN B10): Listening Point is 130 m (93 paces) at 360° from reference point "RD 5". First signed tree is 6" diameter white cedar ~15m from road. Route passes several lichen covered rocky outcrops and boulders. Listening Point is a 4" diameter red spruce. A lichen covered outcrop is just north of Listening Point.

NOTE: To get back to car, walk south 130 m back to the Western Mountain Road and head east back to pulloff (PO 2-6).

GPS NOTES: The forest canopy in much of the area is very dense, and can cause difficulties with GPS units. You should be able to get a decent reading along the fire road to navigate to "Reference Points". However, within the forest, GPS navigation can be tough and you should rely more on compass bearings and pacing. GPS points are projected in UTM NAD83.

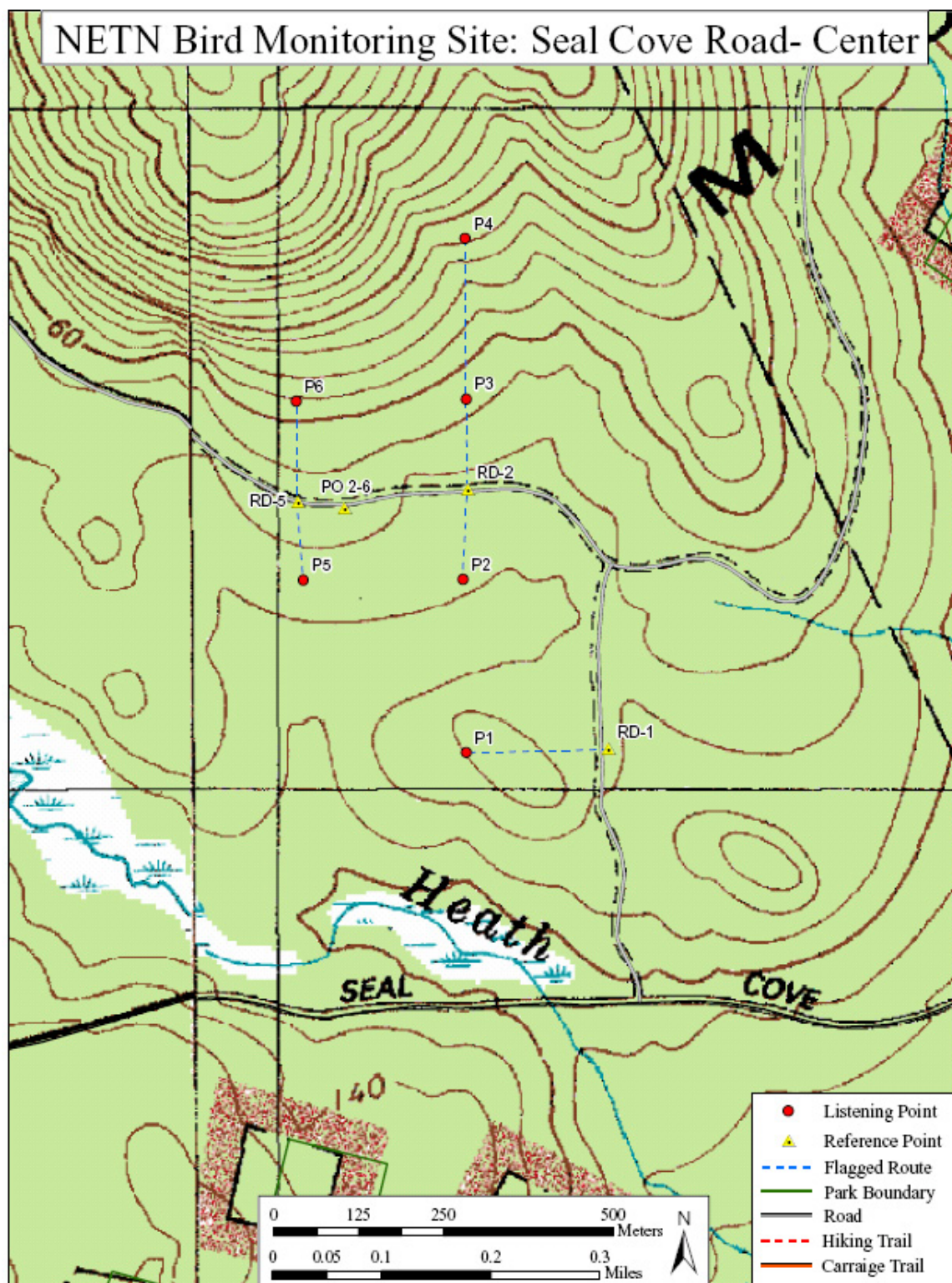


Figure 9. Point count locations at Acadia NP, Seal Cove Center, Mount Desert Island, Maine.

Acadia National Park, Seal Cove Road – West

Site established May 10, 2007 and updated May 16, 2008 by Kate Miller

NOTE: All bearings are based on true North; your compass should be adjusted for 17° West declination. Listening stations are marked with an aluminum treetag, and an NPS Bird Study Sign labeled SCW-P#, where P# indicates the listening point number. Blue dashed lines on the map indicate routes marked with reflective tacks and white NPS Bird Study signs approximately every 25m (17 paces). Signs along the routes are labeled SCW-Route, P# to P#, indicating the survey site and the nearest listening stations. Estimated pace counts are given for distances, and average 1.4m per two steps. Tree diameters were estimated at a height of 1.67m. Using a GPS is highly recommended, especially for finding the beginning of the route from a trail/road.

Point 1 (NETN B14): Park at pulloff that is across from intersection of Oak Hill Rd. and Western Mountain Rd (WMR). Listening Point is 44m (31 paces) at 30° from the pulloff. First signed tree is a 3" diameter balsam fir ~15m from road. Listening Point is a 10" diameter white cedar, and is ~4m beyond a small trash pile.

NOTE: There are no usable pulloffs on WMR until the trail head to Bald Mountain (PO 4), so park on side of road for Points 2 and 3 (reference point "RD 2-3").

Point 2 (NETN B16): Listening Point is 105m (76 paces) at 180° from reference point "RD 2-3", which is near a clump of eight red maples, and west of a large big tooth aspen. Listening Point is a 5" diameter red spruce near a moderately large, straight white pine.

Point 3 (NETN B15): Listening Point is 145m (103 paces) at 360° from reference point "RD 2-3". First signed tree is ~20 m from the road in a clump of seven red maple stems. Route varies between mixed/ hardwood forest and red spruce forest with dense understory spruce, and crosses patches of huckleberry. At 100 m (74 paces) look for a forest monitoring plot (fiberglass stakes mark the corners and center, and the tree tags are on black zip ties); please walk the flagged edge of the plot, rather than across the plot. Listening Point is a 3" diameter red spruce near three paper birch snags.

Point 4 (NETN B17): Listening Point is 2m south of Bald Mtn. Trail, and is 33m from the trail head- 10 m before a rock escarpment with a blue trail paint mark. Listening Point is a 5" diameter balsam fir snag. The tree is not double flagged because of proximity to the trail, but is tagged away from the trail.

Point 5 (NETN B18): Continue on the Bald Mtn. Trail about 500 m (380 paces) to reference point "TR 5", where trail bends northeast back into closed forest. Look for a red spruce with three large curved stems, and a large straight white pine on the west side of the trail. Listening Point is 43m (30 paces) at 120° from the trail. First signed tree is a 3" diameter white pine ~15m off the trail. Route passes through several blueberry/huckleberry patches. Listening Point is a 12" diameter white pine.

Point 6 (NETN B19): Park at pullout "PO 6". Listening Point is 50 m (35 paces) at 10° from pullout. Forest is dominated mostly by hardwoods. Listening Point is a 4" diameter red maple in a hummock with two paper birch and two red maple trees. Christmas fern is near the point.

NOTE: To get back to car hike 50 m downhill at 190° to pulloff.

GPS NOTES: The forest canopy in much of the area is very dense, and can cause difficulties with GPS units. You should be able to get a decent reading along the fire road to navigate to "Reference Points". However, within the forest, GPS navigation can be tough and you should rely more on compass bearings and pacing. GPS points are projected in UTM NAD83.

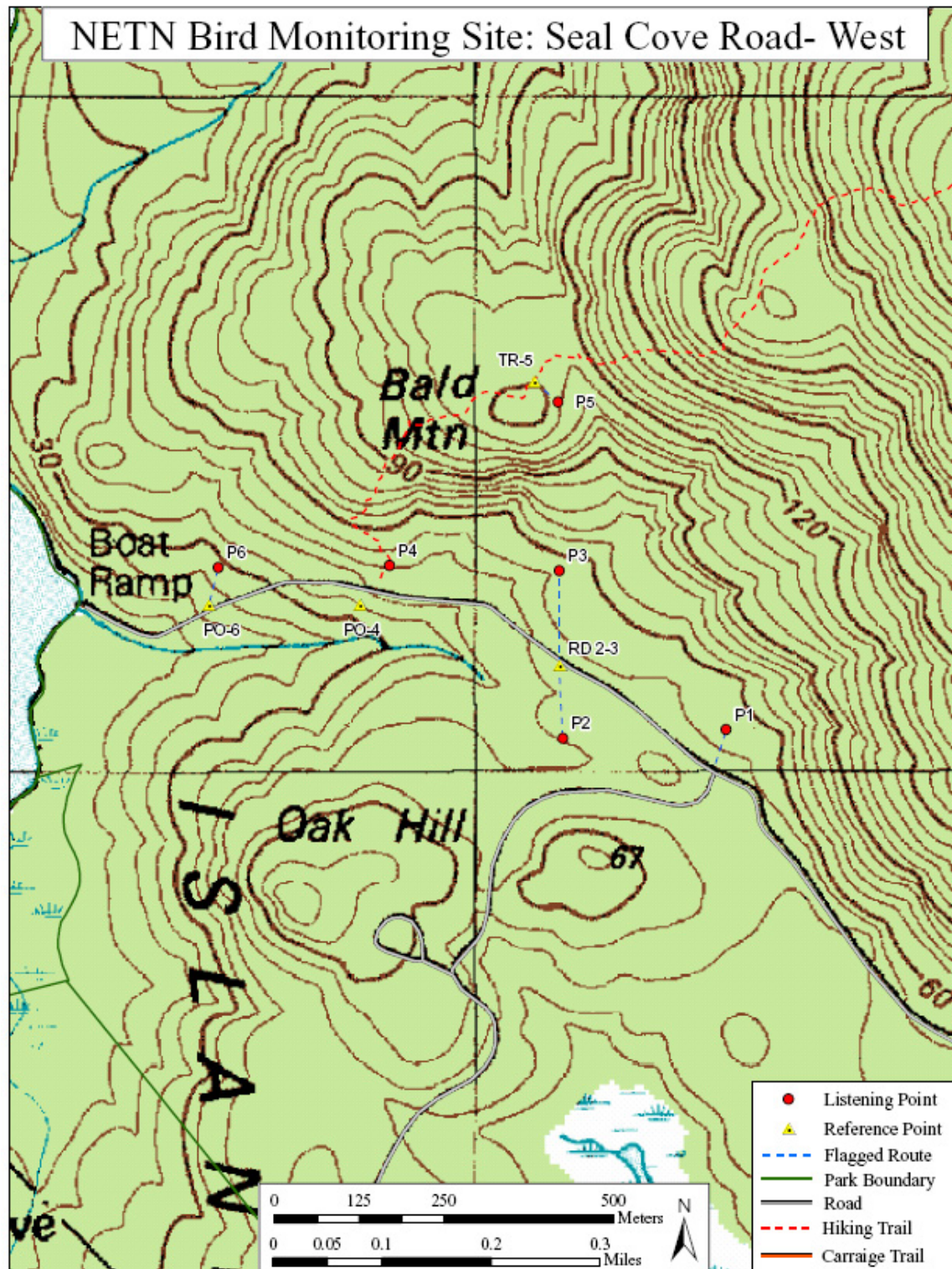


Figure 10. Point count locations at Acadia NP, Seal Cove West, Mount Desert Island, Maine.

Marsh-Billings-Rockefeller National Historical Park Overview Map and Plot Coordinates

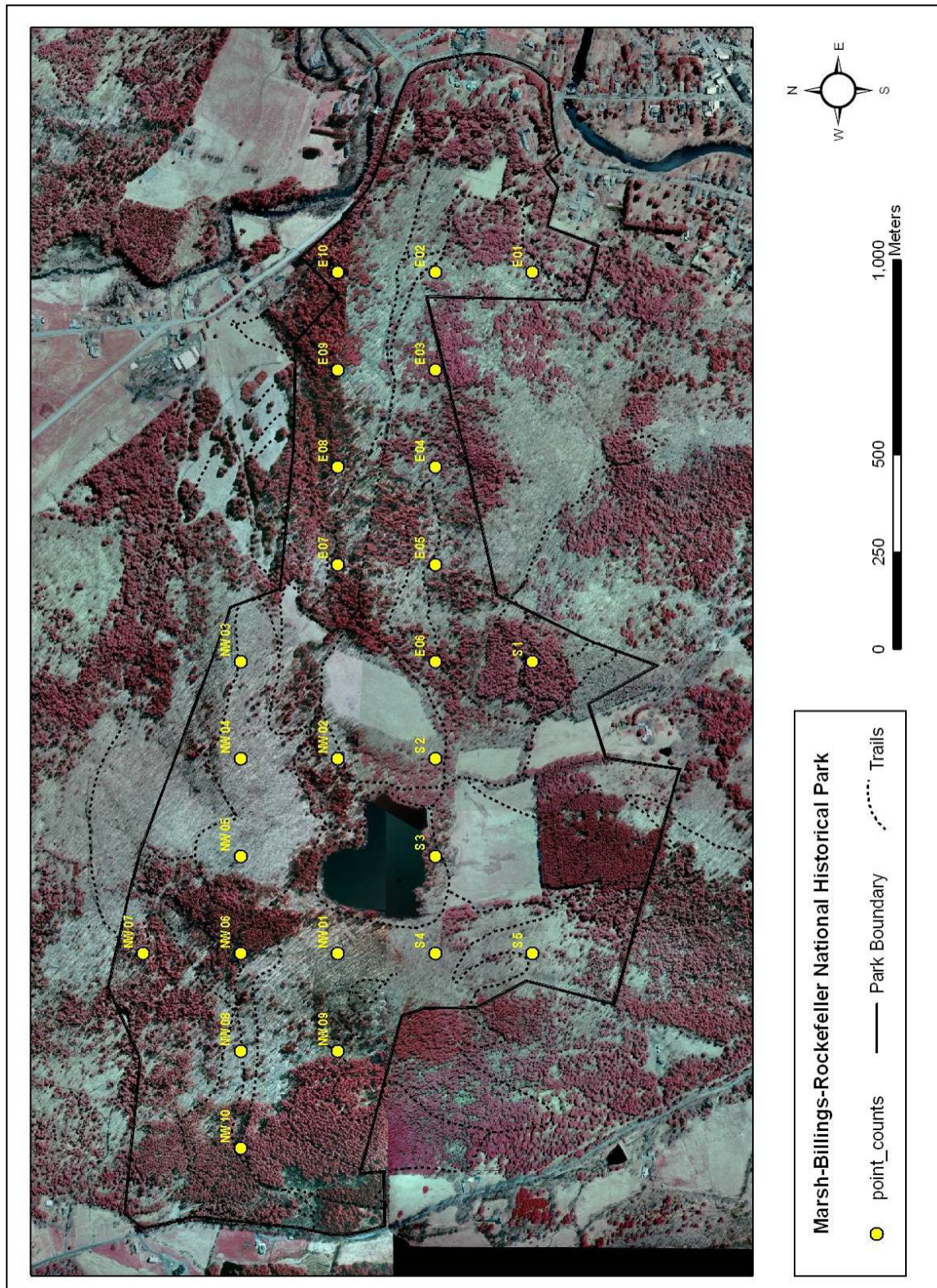


Figure 11. Point count locations at Marsh-Billings-Rockefeller NHP, Woodstock, Vermont.

Table 2. UTM coordinates (NAD 1983, Zone 18) for point count locations and habitat at Marsh-Billings-Rockefeller NHP, Woodstock, Vermont.

Point Number	UTM_N	UTM_E	Habitat
E 01	4833750	699750	N. Hardwoods
E 02	4834000	699750	N. Hardwoods
E 03	4834000	699500	Hemlock-hardwoods
E 04	4834000	699250	Hemlock-hardwoods
E 05	4834000	699000	Hemlock-hardwoods
E 06	4834000	698750	Hemlock-hardwoods
E 07	4834250	699000	Hemlock-hardwoods
E 08	4834250	699250	Hemlock-hardwoods
E 09	4834250	699500	Hemlock-hardwoods
E 10	4834250	699750	Hemlock-hardwoods
NW 01	4834250	698000	N. Hardwoods
NW 02	4834250	698500	Hemlock-hardwoods
NW 03	4834500	698750	N. Hardwoods
NW 04	4834500	698500	N. Hardwoods
NW 05	4834500	698250	N. Hardwoods
NW 06	4834500	698000	Hemlock-hardwoods
NW 07	4834750	698000	Hemlock-hardwoods
NW 08	4834500	697750	N. Hardwoods
NW 09	4834250	697750	Hemlock-hardwoods
NW 10	4834500	697500	Hemlock-hardwoods
S 1	4833750	698750	Hemlock-hardwoods
S 2	4834000	698500	Hemlock-hardwoods
S 3	4834000	698250	Hemlock-hardwoods
S 4	4834000	698000	N. Hardwoods
S 5	4833750	698000	N. Hardwoods

Marsh-Billings-Rockefeller National Historical Park, MABI – East

POINT 1 – on 5” sugar maple, ~20 m NW of trail.

POINT 2 – on 5” elm, ~ 10 m above carriage road.

POINT 3 – on 5” sugar maple next to several 24” hemlocks and a 30” red oak.

POINT 4 – on 4” white ash, south of (uphill from) trail (yellow blazes).

POINT 5 – on 2” American beech, ~10 m uphill from trail

POINT 6 – on 3” sugar maple on N side of trail.

POINT 7 – Point on SOUTH side of stream, marked on 16” sugar maple.

POINT 8 –on 8” sugar maple just East of small tributary to stream.

POINT 9 –on 5” sugar maple, ~10 m west of huge (36”) white pine.

POINT 10 –on 6” hemlock, 5m south of stream and about 50 m upstream from bridge.

Marsh-Billings-Rockefeller National Historical Park, MABI – Northwest

NOTE: bearings are True North (magnetic north plus 15°), all points are located at least 250 m apart and marked with aluminum tree tags and blue flagging

Park at the upper (southern) lot on Prosper Rd. (be sure not to block the green gate which allows emergency vehicle access to trails). Proceed through gate and follow trail for approximately 1,000 m to bend in trail at rocky outcropping.

POINT 1 – From rocky outcropping, take bearing of due South and follow for ~175 m to Point 1 on steep, east-facing slope. Point is on 6” sugar maple above several white ash blowdowns.

POINT 2 – Located on 5” beech on SE edge of trail.

POINT 3 – Located on 6” white ash, 5 m south of trail.

POINT 4 – Located on 12” sugar maple.

POINT 5 – Located at summit of hill, on 10” white ash (flagging also on 3” hophornbeam).

NOTE: contours on map are slightly off – point is located at summit, not south of hilltop.

POINT 6 – Located on 4” sugar maple between trails.

POINT 7 – Due north from point 6, located on a 14” Scotch pine just west of trail.

POINT 8 – on 6” beech on north edge of trail

POINT 9 – Located on west side of trail, marked on a 5” hemlock next to a 10” black cherry

POINT 10 – Located on a 12” red pine between trails.

Marsh-Billings-Rockefeller National Historical Park, MABI – South

POINT 1 – on 6” striped maple next to 20” twin white birches and large spruce blowdown.

POINT 2 – on 5” yellow birch in open woods, just N of carriage rd.

POINT 3 – on 5” beech between Pogue and trail (20 m west of huge hemlock snag on trail).

POINT 4 – on 12” red maple, near edge of white pine stand.

POINT 5 – on 8” sugar maple just below hairpin turn with bench and overlook.

Minute Man National Historical Park Overview Map and Plot Coordinates

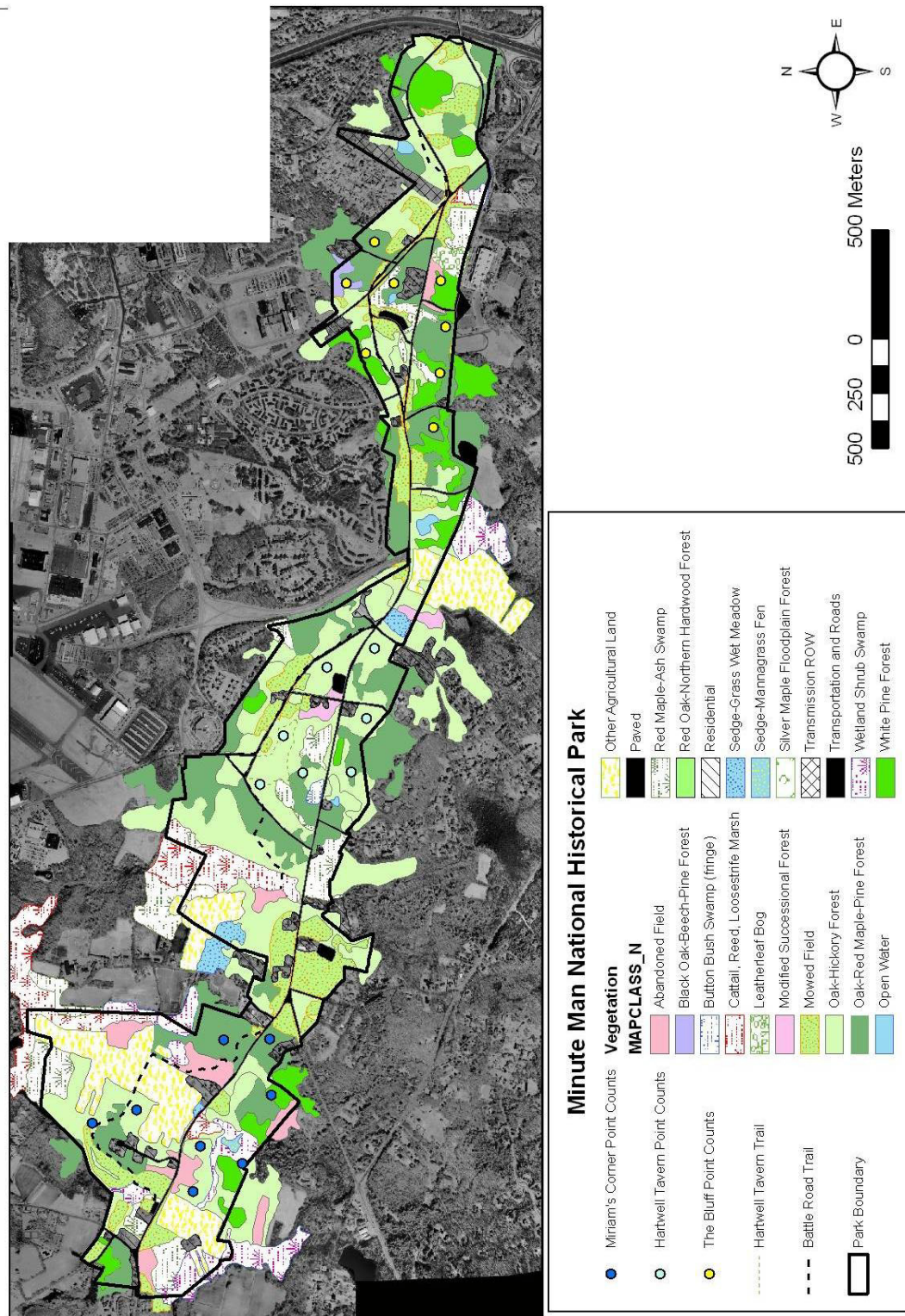


Figure 12. Point count locations at Minute Man NHP, Lexington and Concord, Massachusetts

Table 3. UTM coordinates (NAD 1983, Zone 19) for point count locations and habitat at Minute Man NHP, Lexington/Concord, Massachusetts.

Point Number	UTM_N	UTM_E	Habitat
HT 1	4702505	311560	Hardwoods
HT 2	4702280	311645	Hardwoods
HT 3	4702320	311325	Hardwoods
HT 4	4702390	311080	Conifer-hardwoods
HT 5	4702616	311076	Conifer-hardwoods
HT 6	4702818	311021	Hardwoods
HT 7	4702710	311246	Hardwoods
MC 1	4703135	309150	Hardwoods
MC 2	4703100	309356	Hardwoods
MC 3	4702901	309276	Conifer-hardwoods
MC 4	4702765	309590	Conifer-hardwoods
MC 5	4702775	309850	Hardwoods
MC 6	4702988	309845	Hardwoods
MC 7	4703400	309525	Hardwoods
MC 8	4703606	309463	Hardwoods
TB 1	4702190	313325	Hardwoods
TB 2	4701969	313338	Conifer-hardwoods
TB 3	4701948	313125	Hardwoods
TB 4	4701975	312914	Conifer-hardwoods
TB 5	4702005	312661	Hardwoods
TB 6	4702322	313002	Conifer-hardwoods
TB 7	4702415	313325	Hardwoods
TB 8	4702281	313514	Hardwoods

Minute Man National Historical Park, Hartwell Tavern

Site established 30 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled “VINS HT#”, where # indicates the Point Number.

Park at the Hartwell Tavern Parking Area off Route 2A.

PT 1 – To reach PT 1, go to the NE corner of Parking Lot and follow a bearing of 60° for 50 m to PT on 8” twin-trunked red maple next to flat boulder.

PT 2 – Follow a bearing of 172° for 200 m across RT 2A. Point is 40 m from RT 2A on 8” red maple at SE edge of fern glade.

PT 3 – Follow bearing of 298° for 340 m, up through ferns and greenbriar to top of hill, into mature open forest along deer trail. Sixty meters before reaching the point, cross a well-used trail. PT is on 6” sugar maple in open woods 40 m behind house.

PT 4 – Follow bearing of 300° for 250 m to PT on 3” black birch about 50 m S of SW corner of white pine stand by RT 2A.

PT 5 – Go N, cross RT 2A and head W along road about 50 m. Just beyond the “Do Not Pass” sign enter forest on stonewall perpendicular to road, following a bearing of 190° for 50 m to PT on 6” red oak in open woods shortly after crossing second stonewall.

PT 6 – Follow a bearing of 345° for ~50 m to trail. Turn right on trail and follow it across boardwalk. About 30 m after boardwalk ends, look for two 6” white birch trees on left side of trail. From here, find PT on 4” black birch 10 m W of twin birches.

PT 7 – Continue along trail to intersection with Battle Road Trail, staying on foot trail uphill heading NE (parallel to Battle Road Trail). Follow the foot trail (called the Vernal Pool Trail) where it bends to the right (SE) into the forest. After ~50 m, the trail will bend around to the NE again, and 20 m further, locate a 6” red spruce on left side of trail. From here, follow bearing of 160° for 20 m to PT on 6” red maple.

Continue on trail and out to Battle Road Trail, turning right. At next intersection (at Hartwell Tavern), turn right and follow trail to parking lot.

Minute Man National Historical Park, Miriam’s Corner

Site established 30 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled “VINS MC#”, where # indicates the Point Number .

Park at Miriam’s Corner Parking Lot off Lexington Rd. at the western end of park.

PT 1 – Head E down Lexington Rd. and cross to the NE corner of field on opposite side. From here, follow a bearing of 194° for 80 m to PT 1 on 10” red maple.

PT 2 – Go back out to Lexington Rd., and continue E about 75m to small dirt road on right. Go down dirt road. ~50 m to PT on 10” oak on right side of road.

PT 3 – Continue down dirt road ~200 m to PT on 10” red maple in fern glade on right.

PT 4 – Go out to Lexington Rd and head E past farm stand to “Entering Lincoln” sign. At sign, turn right onto trail. After 50 m cross a large, flat-stone bridge, and 50 m beyond bridge locate a snag on right with “NPS Boundary” sign on it. From here, follow bearing of 315° for 60 m to PT on 3” white ash at edge of white pine stand.

PT 5 – Go back out to Lexington Rd. and continue E to where Battle Road Trail intersects on left. From here, follow bearing of 215° for 30 m into forest to PT on 3” red oak between road and house.

PT 6 – Go back out to Lexington Rd and cross, turning left onto Battle Road Trail. After ~50 m, look for small blue flagging on right side of trail, just before trail bends left downhill. From here, follow bearing of 25° for 30 m to PT on 5” sugar maple.

PT 7 – Return to Battle Road Trail and continue NW across boardwalk and historic farm fields. Shortly after trails makes a 90-degree bend to the left, trail will enter woods. About 50 m into woods, at wooden grate across trail, follow bearing of 215° for 25m to PT on 10” white ash.

PT 8 – Continue NNW along trail ~200 m to point where it bends 90-degrees to the left. From square boulder on right, PT is 25m at 90° (due E) on 4” American elm.

Continue W along trail to parking lot.

Minute Man National Historical Park, The Bluff

Site established 30 May 2006 by Steve Faccio

*NOTE: All bearings are Magnetic North, do not adjust your compass for declination.
All listening stations are marked with blue flagging and an aluminum tree tag, labeled “VINS TB#”, where # indicates the Point Number .*

Park at the Visitor Center Parking Lot off Route 2A. Walk toward the Visitor Center, down the boardwalk, past pond on the left. Just after pond, at break in split rail fence, follow a compass bearing of 80° for 30 m, across lawn and into woods. Point 1 is located on an 8” red maple at N end of small pond.

PT 2 – To reach Point 2, follow a compass bearing of 189° for 200 m. Pass just W of the Visitor Center and cross RT 2A. The PT is ~35m into the woods on an 8” red oak in an open white pine/hardwood stand.

PT 3 – Follow bearing of 285° for 200 m. Point is 30 m after crossing high school entrance road on an 8” red maple at the edge of stream.

PT 4 – Either cross stream following a bearing of 295° for 200 m, OR, go back out to school entrance road and go W on RT 2A to Visitor Center entrance. From here, take a bearing of 244° and go 160 m to PT on 4” red oak before reaching survey line (NPS Boundary) marked with orange stakes.

PT 5 – Follow bearing of 290° along survey line for 250 m. Point is ~40 m W of road crossing on 10” red oak.

PT 6 – Go back to road and RT 2A, cross 2A and take Battle Road Trail E ~100 m, past large boulder. At the Josiah Nelson House Site interpretive sign, walk up trail to old home site. PT is 20 m at 70° on 4" red oak next to stone wall.

PT 7 – Continue E down Battle Road Trail past Visitor Center Parking. After crossing road, take bearing of 25° and follow 80 m to PT on 4" beech next to two other large (30") beeches.

PT 8 – Go back out to Battle Road Trail and continue SE to Private Drive on left. Go up Private Drive ~50 m to small trail on right just before road turns to the right and where there is a break in stone wall. From here, follow bearing of 140° for 40 m to PT on 6" black oak near small grassy opening.

Retrace steps NW up the Battle Road Trail to the Visitor Center Parking Lot.

Morristown National Historical Park Overview Map and Plot Coordinates

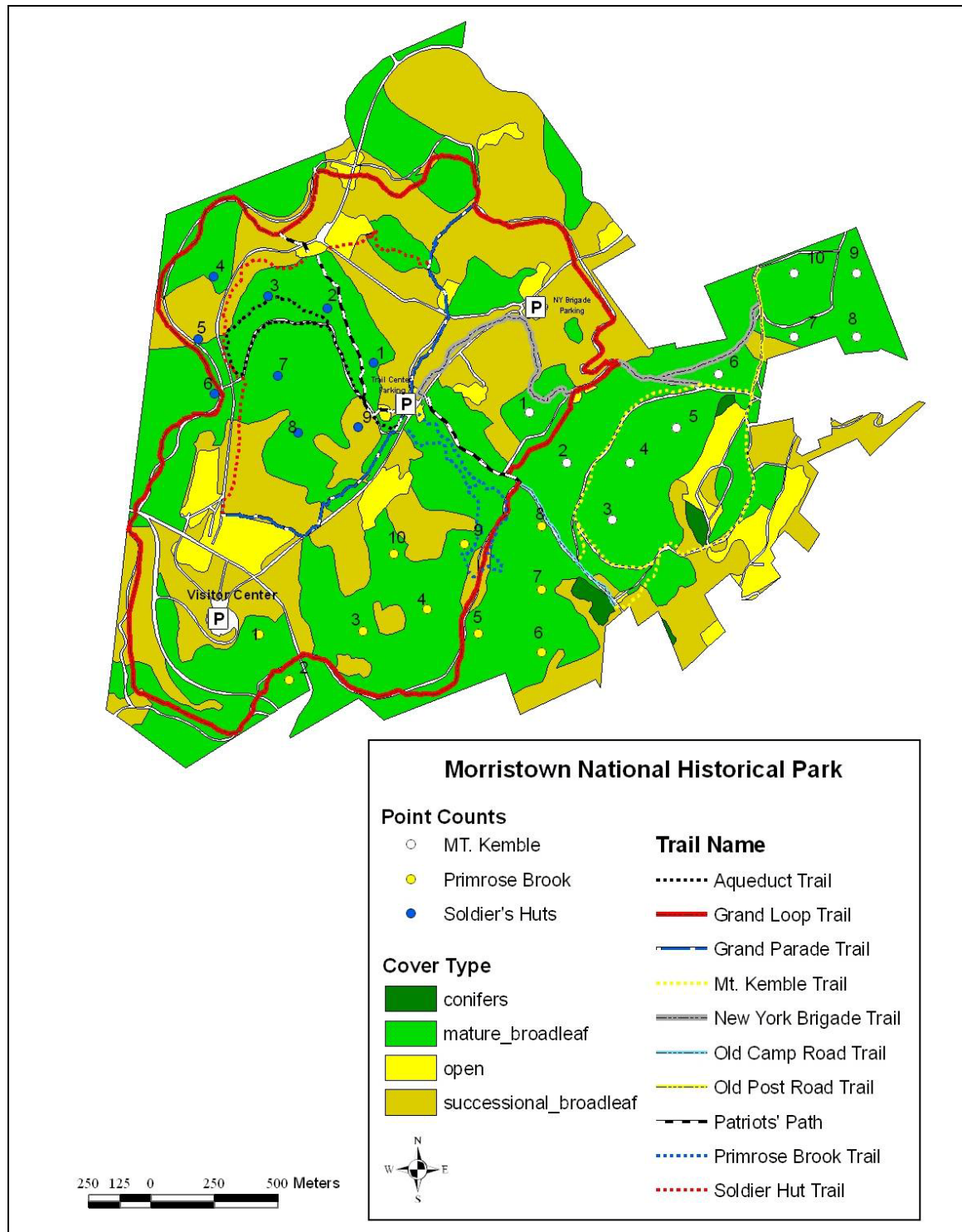


Figure 13. Point count locations at Morristown NHP, Morristown, New Jersey.

Table 4. UTM coordinates (NAD 1983, Zone 18) for point count locations and forest cover at Morristown NHP, Morristown, New Jersey.

Site Name	Point Number	UTM_N	UTM_E	Habitat
Mt. Kemble	MK 01	4513200	539815	Hardwoods
Mt. Kemble	MK 02	4513000	539965	Hardwoods
Mt. Kemble	MK 03	4512775	540145	Hardwoods
Mt. Kemble	MK 04	4513000	540215	Hardwoods
Mt. Kemble	MK 05	4513140	540400	Hardwoods
Mt. Kemble	MK 06	4513350	540565	Hardwoods
Mt. Kemble	MK 07	4513500	540865	Hardwoods
Mt. Kemble	MK 08	4513500	541115	Hardwoods
Mt. Kemble	MK 09	4513750	541115	Hardwoods
Mt. Kemble	MK 10	4513750	540865	Hardwoods
Primrose Brook	PB 01	4512320	538745	Hardwoods
Primrose Brook	PB 02	4512140	538865	Hardwoods
Primrose Brook	PB 03	4512335	539155	Hardwoods
Primrose Brook	PB 04	4512420	539410	Hardwoods
Primrose Brook	PB 05	4512323	539612	Hardwoods
Primrose Brook	PB 06	4512250	539865	Hardwoods
Primrose Brook	PB 07	4512500	539865	Hardwoods
Primrose Brook	PB 08	4512750	539865	Hardwoods
Primrose Brook	PB 09	4512680	539559	Hardwoods
Primrose Brook	PB 10	4512640	539280	Hardwoods
Soldier's Huts	SH 01	4513395	539199	Hardwoods
Soldier's Huts	SH 02	4513613	539015	Hardwoods
Soldier's Huts	SH 03	4513660	538780	Hardwoods
Soldier's Huts	SH 04	4513739	538563	Hardwoods
Soldier's Huts	SH 05	4513488	538502	Hardwoods
Soldier's Huts	SH 06	4513275	538567	Hardwoods
Soldier's Huts	SH 07	4513345	538820	Hardwoods
Soldier's Huts	SH 08	4513119	538899	Hardwoods
Soldier's Huts	SH 09	4513141	539138	Hardwoods

Morristown National Historical Park, Mount Kemble

Site established 2 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS MK #", where # indicates the Point Number .

Park in the NY Brigade Lot near junction of Jockey Hollow and Grand Parade Roads. Proceed SSE down the NY Brigade Trail (blue blazes) about 200 m to the point where trail begins to bend to the NE. From here, take a bearing of 240° and go 80 m to PT 1 on a 4" red maple.

PT 2 – To reach PT 2, follow a bearing of 162° for 225m. You will cross the Patriot's Path Trail and a stream and proceed uphill to PT on a 10" sugar maple just S of a forest vegetation plot with many tagged trees (check the tree tag carefully to be sure you are at the correct point).

PT 3 – Change bearings to 156° and follow it across the MT Kemble Loop Trail into a mixed oak-beech stand on a west-facing slope. The PT is on a 4" sugar maple.

PT 4 – Change bearings again to 50° and proceed ~210 m to PT on a 4" red maple just before a 16" black birch and 10 m beyond a large (18") woodpecker snag.

PT 5 – Follow a bearing of 65° for ~200 m onto the NNW-facing side of MT Kemble to PT on a 6" black birch.

PT 6 – Follow a bearing of 52° for ~250 m downslope. PT is 50 m beyond where you cross the MT Kemble Loop Trail on a 6" red maple.

PT 7 – Return to the MT Kemble Loop Trail and turn left heading East. At gated T intersection turn Left and follow ~100 m to a gated trail. At gate, take a bearing of 68° and go 150 m to PT on a 5" red maple next to a large twin-trunked black oak.

PT 8 – Follow bearing of 100° ~250 m over a small rise to E-facing slope above private homes. PT is on a 4" red maple 3m beyond an 18" red oak.

PT 9 – Take bearing of 08° and follow for 250 m to flat bench above homes on an 8" black birch.

PT 10 – Change bearings again to 283° and go ~200 m across flat and down gentle NW-facing slope to PT on 4" red maple south of natural-sided home.

Continue due W to trail which leads back to parking area.

Morristown National Historical Park, Primrose Brook

Site established 2 May 2006 by Steve Faccio and Randy Little

NOTE: All bearings are Magnetic North, do not adjust your compass for declination.

All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS PB #", where # indicates the Point Number.

Park in Visitor Center Parking Lot off Tempe Wick Rd. From East end of parking lot, follow a bearing of 140° for 50 m into the forest. PT 1 is located on a 5" red maple.

PT 2 – To reach PT 2, follow a bearing of 162° for 200 m. 40 m after crossing the Patriot's Path trail, PT 2 is on an 8" black birch.

PT 3 – Change bearings to 70° and follow it for ~340 m. PT 3 is on a 10” ash on a SW-facing slope with lots of barberry. PT is adjacent to a vegetation survey plot with many tagged trees so be sure you are at the correct tree.

PT 4 – Follow a bearing of 87° for 250 m up and over hill and down into area thick with barberry. PT 4 is on a 10” tulip poplar.

PT 5 – Follow bearing of 138° for 275m downslope. You will reach PT 4 on a bench above Primrose Brook, 20 m after crossing the Patriot’s Path trail. PT is on a 5” sugar maple.

PT 6 – Follow 110° for 250 m, across stream and up rocky hillside nearly to summit. PT is on 4” black birch.

PT 7 – Follow 08° for 290 m downslope into open forest. PT is on 6” black birch 5m beyond a large twin-trunked black birch. NOTE: 20 m beyond PT is a 4’x4’ concrete water cistern along drainage.

PT 8 – Continue on bearing of 08° for 245m across stream and gentle grade to PT on 4” American beech just 5m SW of Old Camp Rd. Trail (blue blazes).

PT 9 – Go up to trail and turn left, proceed downhill and make left turn (SW) onto the Patriot’s Path Trail. Continue up trail. Just before second bridge crossing take a bearing of 310° and go 65m to PT on 6” American beech, 15m after crossing the small Primrose Brook Loop Trail.

PT 10 – Change bearings to 276° and follow it 290 m across small stream and upslope to level area. PT is on an 8” black birch just S of small drainage dense with skunk cabbage.

Head NW to reach Jockey Hollow Rd and turn left to return to parking area.

Morristown National Historical Park, Soldier’s Huts

Site established 2 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled “VINS SH #”, where # indicates the Point Number .

Park in the Trail Center Parking Area off Jockey Hollow Rd. Take the Grand Parade Trail (yellow blazes) NE from parking lot. Go about 50 m to a 10” American beech on the right with a yellow blaze. From here take bearing of 310° and go up to top of hill and 25m beyond to PT 1 on a 6” red maple a few meters from a 36” tulip poplar.

PT 2 – To reach PT 2, follow a bearing of 334° for 280 m. At 250 m you will cross the Soldier Hut Trail (not shown on map) before reaching the PT on a 5” red maple next to 25” triple-trunked tulip poplar on the N side of the stream.

PT 3 – Change bearing to 290° and follow it across the stream where you will pick-up a spur of the Soldier Hut Trail. Take the trail NW to interpretive post “K”. Look for the PT about 20 m N just across the stream on a 5” American beech.

PT 4 – Follow a bearing of 307° for 220 m. After 150 m cross a trail, then Cemetery Road. Continue 50 m uphill through barberry hell to PT near top of hill on a 5” red maple.

PT 5 – Go back down to Cemetery Rd and turn right. Go 200 m to large (20”) twin-trunked white ash on the right side of the road. From here, take a bearing of 280° and go 30 m to PT on 4” sugar maple next to large, fenced-in deer enclosure.

PT 6 – Return to the road and follow it ~200 m to trail on right. Go up trail to T intersection with the Grand Loop Trail and take bearing of 230° . PT is 30 m in on 5” red maple.

PT 7 – Go back to Cemetery Rd and cross to Aqueduct Loop Trail on the opposite side of the road. At the intersection with the Soldier Hut Trail, take a bearing of 93° and go 180 m to PT on 4” black birch among barberry just W of forest vegetation plot with many tagged trees (NOTE: be sure you’re at the correct tree tag).

PT 8 – Follow bearing of 185° across flat then downhill through barberry to bottom of slope. PT is on 6” red maple.

PT 9 – Follow bearing of 93° for 225m, up and over hill to PT on 4” red maple about 70 m upslope from trail.

Head downslope and turn right onto the Aqueduct Loop Trail back to vehicle.

Roosevelt-Vanderbilt National Historic Sites Overview Maps and Plot Coordinates

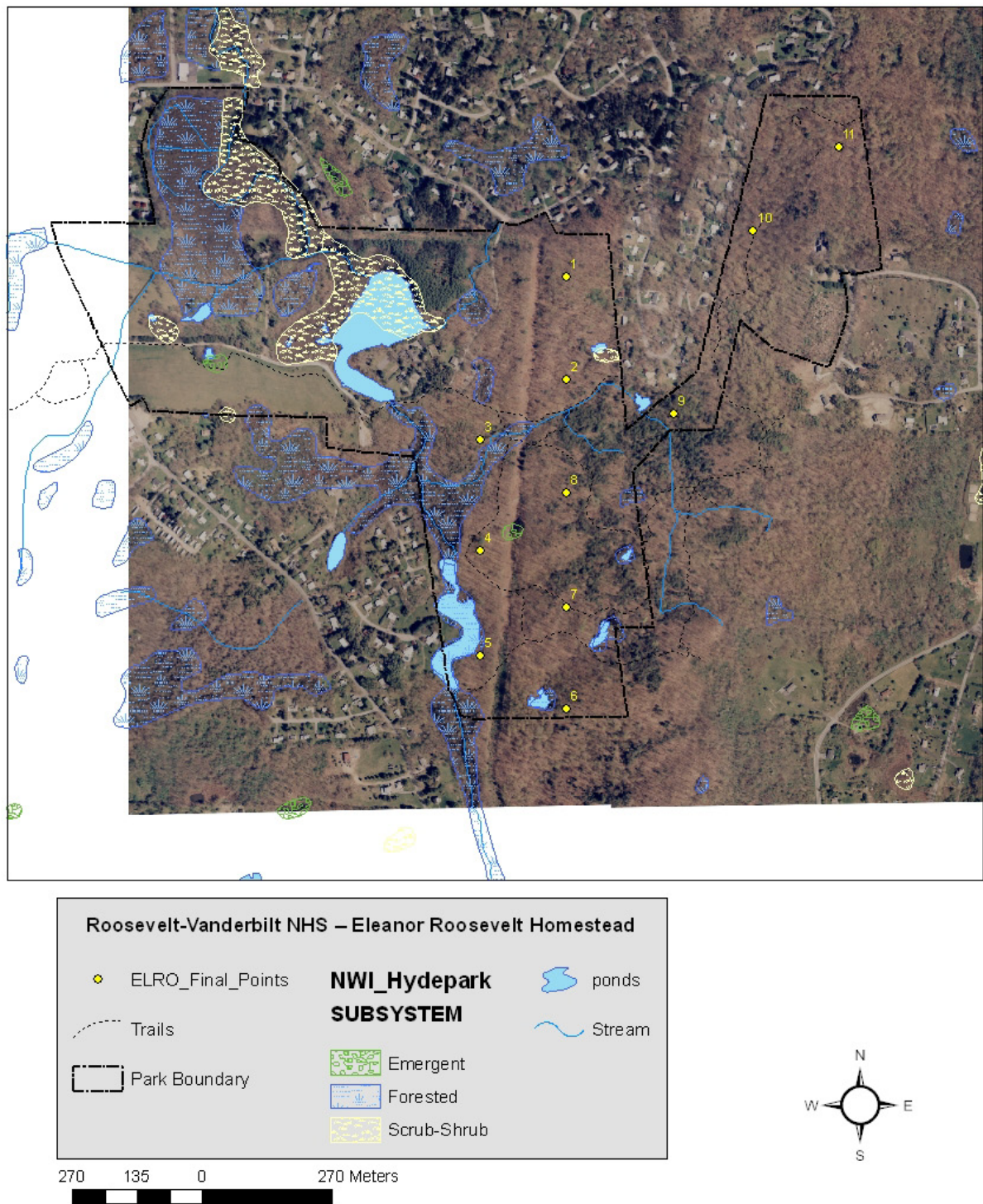


Figure 14. Point count locations at Eleanor Roosevelt NHS, Roosevelt-Vanderbilt NHS, Hyde Park, New York.



Figure 15. Point count locations at Home of Franklin D. Roosevelt NHS, Roosevelt-Vanderbilt NHS, Hyde Park, New York.

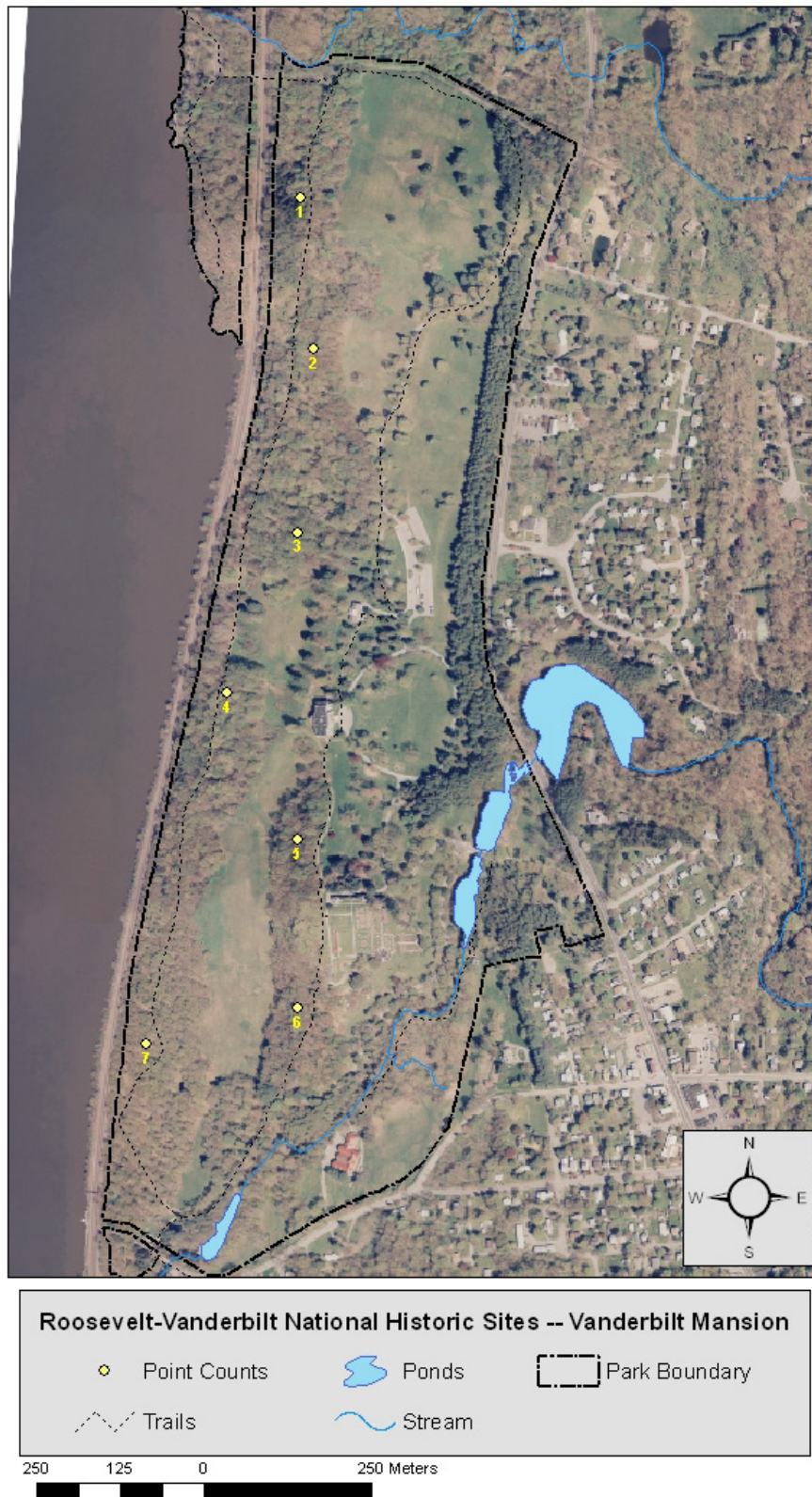


Figure 16. Point count locations at Vanderbilt Mansion NHS, Roosevelt-Vanderbilt NHS, Hyde Park, New York.

Table 5. UTM coordinates (NAD 1983, Zone 18) for point count locations and forest cover at Roosevelt-Vanderbilt NHS, Hyde Park, New York.

Park Unit	Point Number	UTM_N	UTM_E	Habitat
ELRO	1	4624230	591830	oak-hickory
ELRO	2	4624015	591830	oak-hickory
ELRO	3	4623890	591650	oak-hickory
ELRO	4	4623660	591650	hemlock-hardwood
ELRO	5	4623440	591650	oak-hickory
ELRO	6	4623330	591830	hemlock-hardwood
ELRO	7	4623540	591830	oak-hickory
ELRO	8	4623780	591830	oak-hickory
ELRO	9	4623890	592020	oak-hickory
ELRO	10	4624325	592220	oak-hickory
ELRO	11	4624500	592400	oak-hickory
HOFR	1	4625010	588025	oak-hickory
HOFR	2	4624750	587700	oak-hickory
HOFR	3	4624500	587775	hemlock-hardwood
HOFR	4	4624560	587999	hemlock-hardwood
HOFR	5	4624750	587934	hemlock-hardwood
HOFR	6	4624821	588147	hemlock-hardwood
HOFR	7	4624640	588330	oak-hickory
HOFR	8	4624442	588192	hemlock-hardwood
HOFR	9	4624300	587985	hemlock-hardwood
HOFR	10	4624040	588100	hemlock-hardwood
HOFR	11	4623950	588330	oak-hickory
HOFR	12	4623720	588332	oak-hickory
VAMA	1	4628490	587830	oak-hickory
VAMA	2	4628265	587850	oak-hickory
VAMA	3	4627990	587825	oak-hickory
VAMA	4	4627750	587720	oak-hickory
VAMA	5	4627530	587825	oak-hickory
VAMA	6	4627280	587825	oak-hickory
VAMA	7	4627225	587600	oak-hickory

Eleanor Roosevelt National Historic Site

NOTE: All listening stations are marked with flagging and an aluminum tree tag, labeled “VINS ELRO #”, where # indicates the Point Number.

STARTING POINT is the trailhead for Top Cottage Trail and Eleanor’s Walk Trail. Park either in main visitor lot or staff parking area right next to trailhead.

1st Station (labeled Point 3) – From trailhead, proceed 250 feet to first fork/signpost – bear RIGHT onto Eleanor’s Walk (red blazes)

Proceed 50 feet – look for pink ribbon leading to blue ribbon at **Site #3**.

2nd Station (Point 4) – Return to Eleanor’s Walk, proceed to next fork/sign – bear RIGHT

Continue about 900 feet – look for podcast marker “Old Beaver Dam”. Fifty feet ahead look for pink ribbon on LEFT – follow in to blue-marked **Site #4**.

3rd Station (Point 5) – Return to trail. Continue about 250 feet – look for pink markers on RIGHT (before crossing the power lines). Follow pink ribbons about 500 feet in to blue marked **Site # 5**. Return to Eleanor’s Walk.

4th Station (Point 6) – Back on Eleanor’s Walk, continue 130 feet to low wooden post. Bear RIGHT onto an unmarked trail. Follow pink ribbons up hill. At top of hill, turn left following pink ribbons. Look for a pond on LEFT. Follow pink ribbons that go to the RIGHT uphill about 500 feet to blue-marked **Site # 6** (Usually Worm-eating Warbler up here).

5th Station (Point 7) – Return to the unmarked trail, follow pink ribbons around the pond, keeping the pond on RIGHT. Eventually you will reach the red-blazed Eleanor’s Walk Trail. Turn LEFT (downhill) about 160 feet. Pink ribbon on LEFT to blue-marked **Site #7** (visible from trail).

6th Station (Point 8) – Return to trail – go RIGHT (uphill), continue on trail about 1900 feet. Look for pink flags on the LEFT, just before trail starts going downhill. Follow pink ribbons in to blue-marked **Site #8**. Return to trail.

7th Station (Point 2) – Continue downhill on trail. At first signpost bear RIGHT the way you came. At next signpost turn RIGHT onto Top Cottage Trail (tulip-tree markers). Continue 550 feet, crossing power lines and reaching a signpost with a footbridge on RIGHT. Follow pink ribbons on the LEFT to blue-marked **Site #2**. Return to trail.

8th Station (Point 9) – Continue on Top Cottage Trail about 1000 feet (5 minute walk). Look for a signpost pointing to *Top Cottage* with a left arrow, *Val-Kill* with a right arrow, without any mileage listed. Follow pink ribbons in about 75 feet to blue-marked **Site # 9**.

9th Station (Point 10) – Continue on Top Cottage Trail, about 1600 feet to pink ribbon. Follow pink ribbons in to blue-marked **Site #10** about 75 feet in on the LEFT.

10th Station (Point 11) – Continue on Top Cottage Trail about 800 feet to sign post, turn RIGHT (uphill). In about 300 feet there will be an unmarked trail to the LEFT. Follow pink ribbon in about 75 feet, leave unmarked trail and continue following pink ribbon another 125 feet to blue-marked **Site #11**.

11th Station (Point 1) – Return back to vehicle. Drive along the rear park service road which leads to Roosevelt Road. Pull off on the grassy shoulder under the power lines. Look for a white

birch about 300 feet in from the park gate. Follow pink ribbon uphill about 300 feet to the power lines; cross power lines and continue another 300 feet to blue-marked **Site # 1**.

Alternate: park on Val-Kill Drive and walk down Top Cottage Trail to sites 11, 10 and 9. **DONOT** park on the Top Cottage driveway, only on the shoulder of the public road.

Home of Franklin D. Roosevelt National Historic Site

Directions for this route are pending.

Vanderbilt Mansion National Historic Site

Site established 1 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS VAMA #", where # indicates the Point Number.

Drive to north end of park where the Hyde Park Trail meets the road. Park near gated entrance to Hyde Park Trail (do not block gate).

PT 1 – To reach the first Point, head south on trail about 200 m, Point 1 is on an 8" sugar maple, 10 m off right (west) side of trail just before reaching a spruce plantation.

PT 2 – Continue south along trail for 220 m. After crossing a small drainage filled with skunk cabbage, PT 2 is 30m east of trail on a 6" sugar maple next to a huge (5-foot diameter) sycamore.

PT 3 – Continue south along trail for 150 m. Ten meters after crossing a small stream, take a compass bearing of 140° and follow it ~80 m uphill, staying about 5 m south of small ravine. Point is located on 3" ash or hickory among several large (2-foot diameter) tulip poplars. Note: Do not proceed as far as the grassy area on the left side of the trail, which is 30 m beyond stream crossing.

PT 4 – Return to trail and continue south for ~220 m. Point is 20 m left (east) of trail on a 6" sugar maple behind a large (2-foot diameter) twin-trunked red maple.

PT 5 – Continue south and bear left at fork in trail in to field. Where trail bends north toward mansion take a bearing of 120° and go 80 m across field and into woods. Point 5 is on 4" twin-trunked sugar maple about 20 m from field edge.

PT 6 – Take a compass bearing of 192° and follow it ~200 m keeping field on right. Upon entering a hemlock stand, point is on a 3" hickory downhill from a huge (4-foot diameter) red oak.

PT 7 – Follow a compass bearing of 272° and follow it across field and into woods to trail. Point is 20 m west of trail on a 6" black birch at the top of a small knoll.

To return to car, go back to trail and head north.

Saint-Gaudens National Historic Site Overview Map and Plot Coordinates

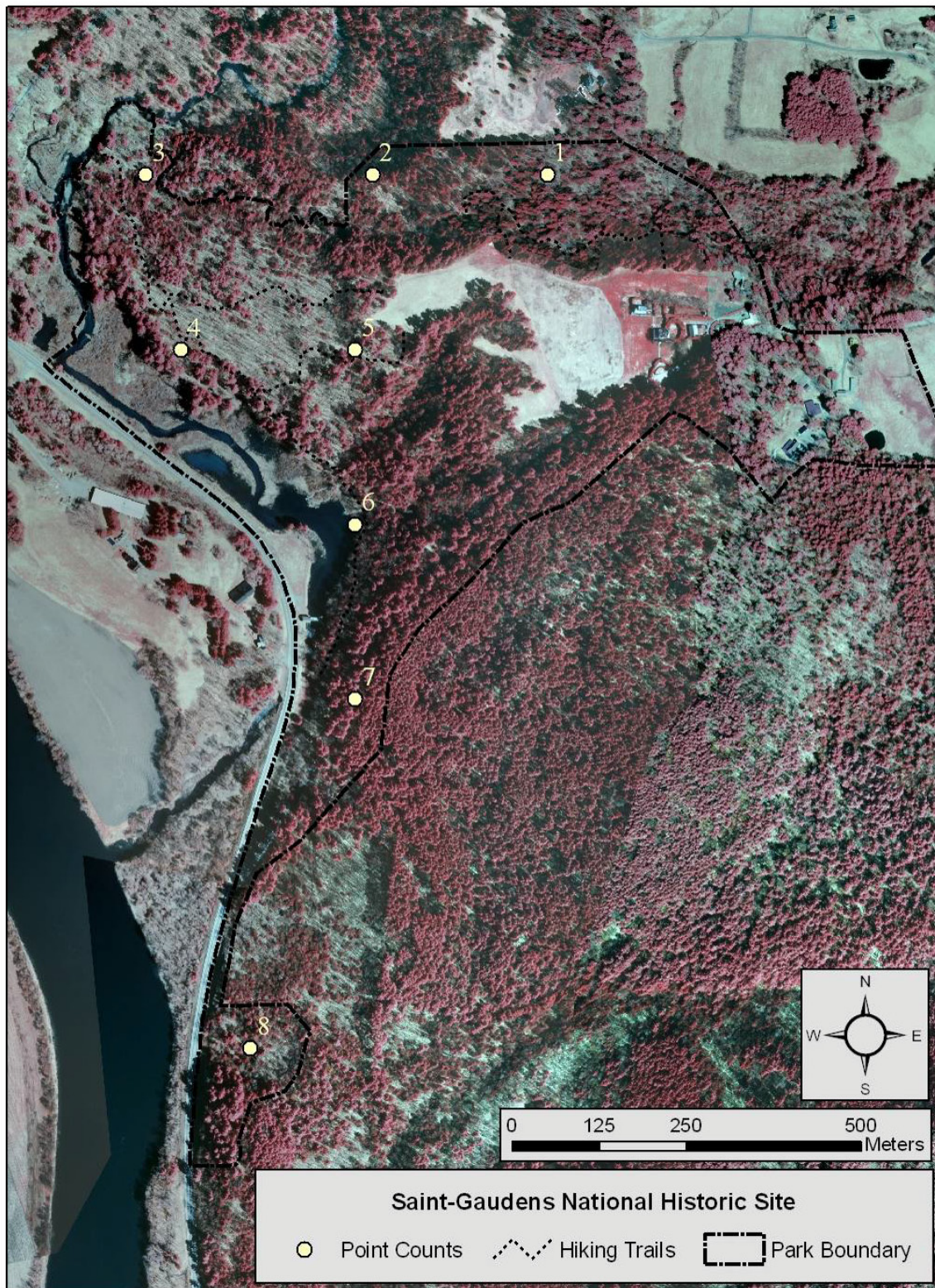


Figure 17. Point count locations at Saint-Gaudens NHS, Cornish, New Hampshire.

Table 6. UTM coordinates (NAD 1983, Zone 18) for point count locations and habitat at Saint-Gaudens NHS, Cornish, New Hampshire.

Point Number	UTM_N	UTM_E	Habitat
1	4820000	712525	N. hardwood/hemlock
2	4820000	712275	N. hardwood/hemlock
3	4820000	711950	N. hardwood/hemlock
4	4819750	712000	N. hardwood/hemlock
5	4819750	712250	N. hardwood/hemlock
6	4819500	712250	White pine/hemlock
7	4819250	712250	N. hardwood/hemlock
8	4818750	712100	hardwoods

Saint-Gaudens National Historic Site

Site originally established 20 April 2001 by Steve Faccio and Sebastian Lousada

NOTE: All bearings are Magnetic North. If your compass is adjusted for declination, subtract 15° to the bearings indicated. All listening stations are marked with blue flagging and an aluminum tree tag, labeled “VINS SG #”, where “#” indicates the point count station number.

POINT 1 – Park in the main lot near the Museum Buildings. Proceed left down the road for about 50 m to the mowed trail across the field. Take the Ravine Trail into the woods and descend to the bridge. After crossing the stream, follow a bearing of 80° for 80 m. Point 1 is located on an 8” black birch.

POINT 2 – To reach Point 2, follow a bearing of 285° to the “knife-edge” that follows the park’s northern border. Continue along the knife edge to a dead white birch snag in the middle of the “trail.” The point is 3 m to the left of the trail on a 5” twin-trunked red maple.

POINT 3 – To reach Point 3, continue west along the knife-edge until it drops down to the stream. Cross stream on large fallen log at hairpin turn (I know, there are a lot of hairpin turns!). Continue uphill ~30 m to point on 4” hemlock, 20 m east of mushroom interpretive sign.

POINT 4 – Go out to trail and head south (left), taking right fork onto the Loop Trail. Point is on 6” red maple next to 10” hemlock, just 10 m west of trail.

POINT 5 – Continue south on trail, taking left onto the Return Trail and follow for ~100 m. About 30 m beyond the wildflower interpretive sign is a large white pine snag on your right. Point 5 is about 20 m left of trail on 3” American beech next to a 3-foot diameter white pine.

POINT 6 – Retrace your steps back down the Return Trail and take a left onto the Blow-Me-Down Trail. Shortly after crossing a wooden platform bridge cross a small stream, Point is ~20 m beyond stream on 12” basswood 5 m west of trail.

POINT 7 – Continue down the trail to powerline cut, then angle uphill to road. The point is on a 4” sugar maple, ~15 m south (uphill) of the park road. It is about 50 m up the road signs and directly uphill from stone work on Blow-Me-Down Dam.

POINT 8 – Go down park road past road signs and turn left onto old woods road. Take this road to top of hill and follow a bearing of 240° for 120 m. Point is located on a 6” sugar maple in a west-facing bowl, just below several ~30” red oaks.

Saugus Iron Works National Historic Site Overview Map and Plot Coordinates

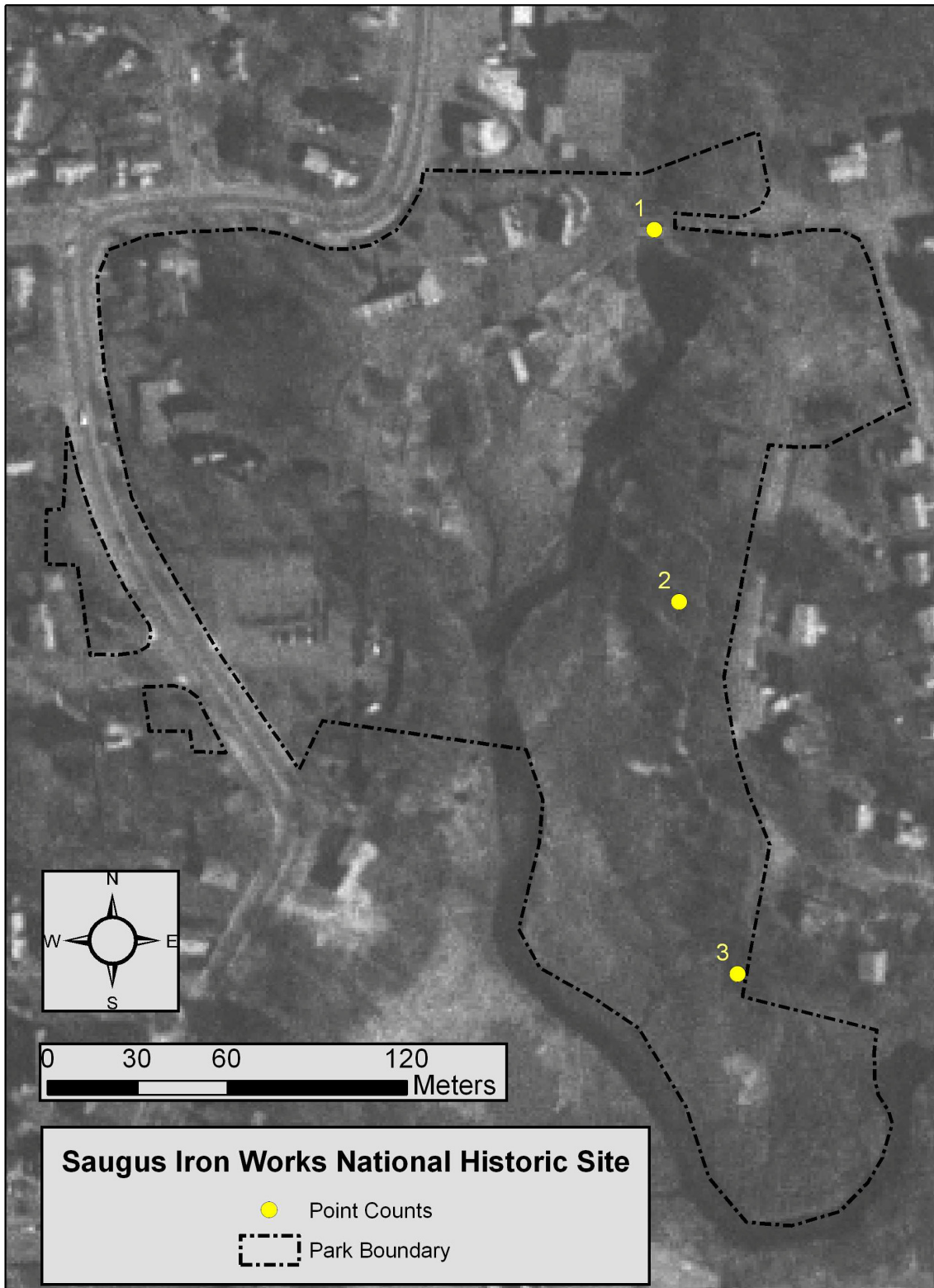


Figure 18. Point count locations at Saugus Iron Works NHS, Saugus, Massachusetts.

Table 7. UTM coordinates (NAD 1983, Zone 19) for point count locations and habitat at Saugus Iron Works NHS, Saugus, Massachusetts.

Point Number	UTM_N	UTM_E	Habitat
1	4703839	334996	N. hardwood/hemlock
2	4703714	335005	N. hardwood/hemlock
3	4703590	335024	N. hardwood/hemlock

Saugus Iron Works National Historic Site

Directions for this route are pending.

Saratoga National Historical Park Overview Map and Plot Coordinates

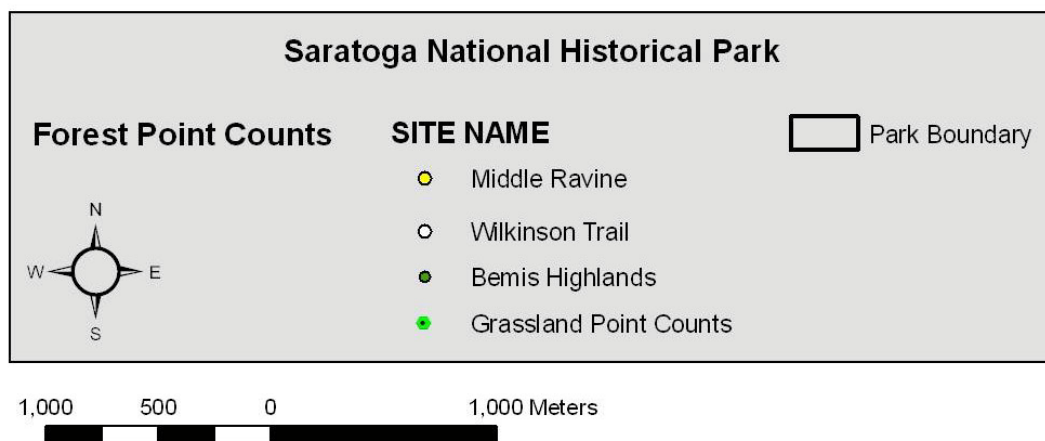
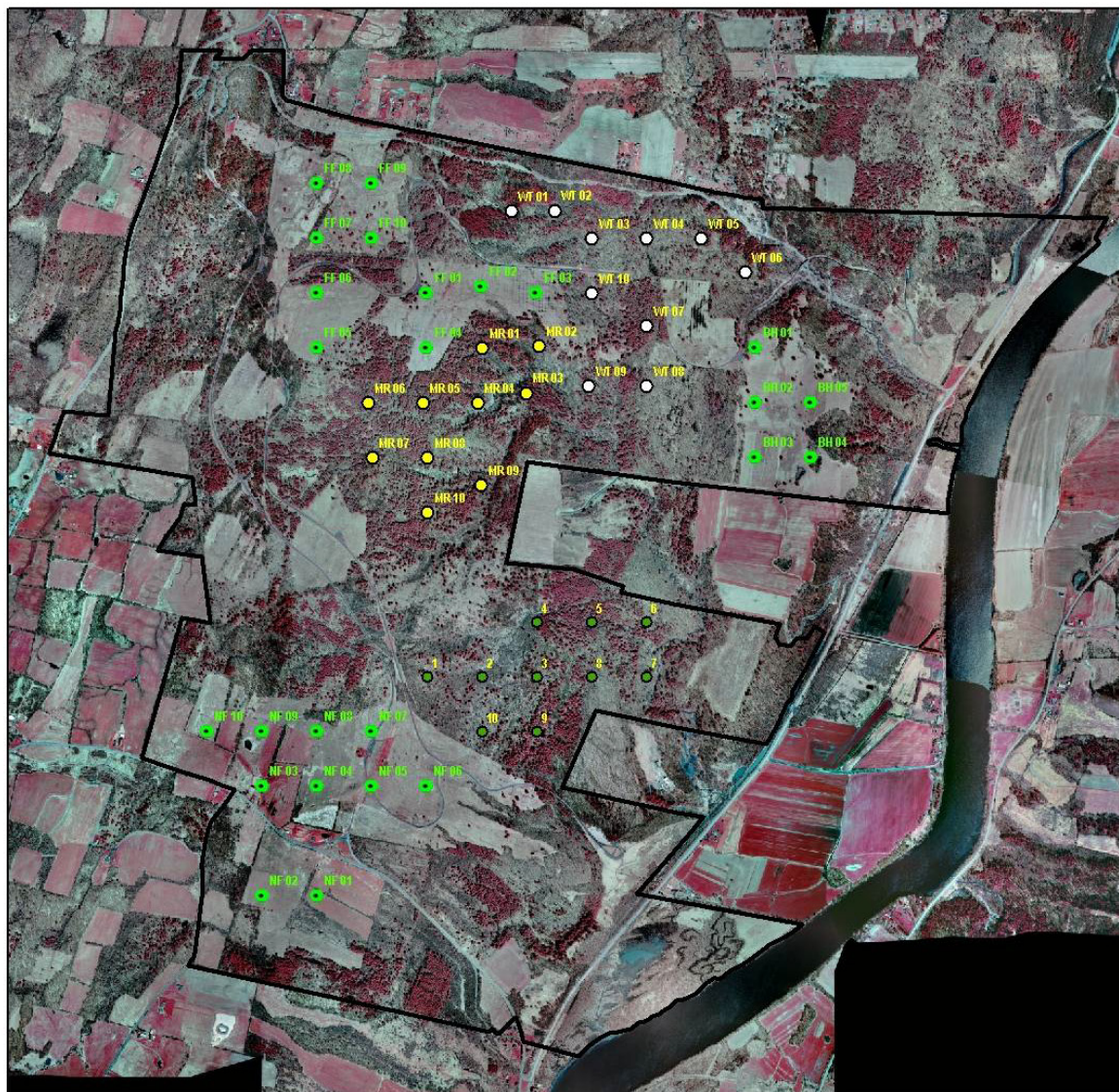


Figure 19. Point count locations at Saratoga NHP, Saratoga, New York.

Table 8. UTM coordinates (NAD 1983, Zone 18) for point count locations and habitat at Saratoga NHP, Saratoga, New York.

Site Name	Point Number	UTM_N	UTM_E	Habitat
Middle Ravine	MR 01	4762000	611250	White Pine
Middle Ravine	MR 02	4762010	611510	N. Hardwood
Middle Ravine	MR 03	4761795	611450	Hemlock-N. Hardwood
Middle Ravine	MR 04	4761750	611230	Hemlock-N. Hardwood
Middle Ravine	MR 05	4761750	610980	Hemlock-N. Hardwood
Middle Ravine	MR 06	4761750	610730	Hemlock-N. Hardwood
Middle Ravine	MR 07	4761500	610750	Hemlock-N. Hardwood
Middle Ravine	MR 08	4761500	611000	Hemlock-N. Hardwood
Middle Ravine	MR 09	4761375	611245	Hemlock-N. Hardwood
Middle Ravine	MR 10	4761250	611000	Hemlock-N. Hardwood
Wilkinson Trail	WT 01	4762622	611382	Mixed forest
Wilkinson Trail	WT 02	4762625	611580	Mixed forest
Wilkinson Trail	WT 03	4762500	611750	Mixed forest
Wilkinson Trail	WT 04	4762500	612000	N. Hardwood
Wilkinson Trail	WT 05	4762500	612250	Mixed forest
Wilkinson Trail	WT 06	4762345	612450	N. Hardwood
Wilkinson Trail	WT 07	4762100	612000	Mixed forest
Wilkinson Trail	WT 08	4761825	612000	Mixed forest
Wilkinson Trail	WT 09	4761825	611735	Mixed forest
Wilkinson Trail	WT 10	4762250	611750	N. Hardwood
Bemis Highlands	1	4760500	611000	N. Hardwoods
Bemis Highlands	2	4760500	611250	Hemlock-N. Hardwoods
Bemis Highlands	3	4760500	611500	Hemlock-N. Hardwoods
Bemis Highlands	4	4760750	611500	Hemlock-N. Hardwoods
Bemis Highlands	5	4760750	611750	N. Hardwoods
Bemis Highlands	6	4760750	612000	N. Hardwoods
Burgoyne's HQ	BH 01	4762000	612500	Grassland
Burgoyne's HQ	BH 02	4761750	612500	Grassland
Burgoyne's HQ	BH 03	4761500	612500	Grassland
Burgoyne's HQ	BH 04	4761500	612750	Grassland
Burgoyne's HQ	BH 05	4761750	612750	Grassland
Freeman Farm	FF 01	4762250	611000	Grassland
Freeman Farm	FF 02	4762280	611250	Grassland
Freeman Farm	FF 03	4762250	611500	Grassland
Freeman Farm	FF 04	4762000	611000	Grassland
Freeman Farm	FF 05	4762000	610500	Grassland
Freeman Farm	FF 06	4762250	610500	Grassland
Freeman Farm	FF 07	4762500	610500	Grassland
Freeman Farm	FF 08	4762750	610500	Grassland
Freeman Farm	FF 09	4762750	610750	Grassland
Freeman Farm	FF 10	4762500	610750	Grassland
Neilson Farm	NF 01	4759500	610500	Grassland
Neilson Farm	NF 02	4759500	610250	Grassland
Neilson Farm	NF 03	4760000	610250	Grassland
Neilson Farm	NF 04	4760000	610500	Grassland
Neilson Farm	NF 05	4760000	610750	Grassland
Neilson Farm	NF 06	4760000	611000	Grassland
Neilson Farm	NF 07	4760250	610750	Grassland
Neilson Farm	NF 08	4760250	610500	Grassland
Neilson Farm	NF 09	4760250	610250	Grassland
Neilson Farm	NF 10	4760250	610000	Grassland

Saratoga National Historical Park, Bemis Heights

Site established 14 May 2007 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. If your compass is adjusted for declination, subtract 15° to the bearings indicated. All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS BH #", where # indicates the Point Number .

Enter the park and proceed to the Visitor Center at the NE corner. Continue on the Park Tour Rd south about 3 miles to a STOP sign at a T intersection. Turn RIGHT and go about 200 m, park in the flat grassy area on the right.

POINT 1 – From parking area, walk EAST down the road about 50 m to a cement culvert cover on the LEFT (North) side of the road. From here, follow a bearing of 45° for about 300 m to PT 1 on a 4" DBH hawthorn in white pine stand.

POINT 2 – To reach PT 2, follow a bearing of 19° for 250 m to an 8" hickory in a small opening 10 m east of a white pine stand.

POINT 3 – Change bearing to 59° and follow it for 350 m to PT 3 located on a flat shoulder just west of stream on a 6" white pine in open hickory-pine-ash stand.

POINT 4 – Change compass bearing to 107° and follow it for 250 m across the stream and up the slope to flat ridge. Point is on 4" white ash in open, mixed woods.

POINT 5 – Follow bearing of 201° for 250 m downhill, across stream, and up east facing slope to PT on 8" triple-trunked red maple next to large (16") double-trunked white oak.

POINT 6 – To reach the last station, follow a bearing of 280° for 250 m up slope, crossing two intermittent stream swales to point located on 8" white oak near white pine-poplar stand.

To return to parking area, follow a bearing of 220° for about 600 m.

Saratoga National Historical Park, Burgoyne's HQ

Directions for this route are pending.

Saratoga National Historical Park, Freeman Farm

Directions for this route are pending.

Saratoga National Historical Park, Middle Ravine

Site established 4 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. If your compass is adjusted for declination, subtract 15° to the bearings indicated. All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS MR #", where # indicates the Point Number .

Enter the park and proceed to the Visitor Center at the NE corner. Continue on the Park Tour Rd about ½ mile. Just beyond Tour Stop 1, turn left onto a short gravel service road, then another left back onto the Tour Road. Continue about ½ mile and park at Tour Stop 6 on right.

PT 1 – To reach the first Point, follow the paved path E past cannons, then S to bench and interpretive sign about the Battle of Sept. 19, 1777. From here (marked "Start" on map), take a bearing of 145° and follow it for 200 m to PT 1 on a 5" white pine just across seep/shrub wetland.

PT 2 – Follow a bearing of 106° for 250 m across flat and down slope to PT on triple-trunked 6" hophornbeam in flat area just S of stream.

PT 3 – Follow a bearing of 210° for 200 m uphill and across drainage to PT on 8"rRed maple near top of slope on S side of stream.

PT 4 – Follow bearing of 279° along deer trail, across drainage and uphill to flat bench above stream. PT is on 4" white ash, 10 m beyond a large dead white pine.

PT 5 – Follow bearing of 285° for 250 m across flat to PT on 5" white pine.

PT 6 – Continue on same bearing for another 250 m across small drainage to mowed trail. Go left on trail for 50 m crossing small wetland. Just before crossing second small wetland, follow bearing of 330° for 50 m through honeysuckle hell, to PT on 6" white pine.

PT 7 – Return to mowed trail and head S, bearing left at fork. 40 m beyond where trail crosses stream follow a bearing of 285° for 60 m to PT on 3" hophornbeam upslope from huge downed sugar maple and broken-topped pine.

PT 8 – Follow bearing of 108° for 230 m back across trail, down slope and across stream to PT on 5" white pine on SW-facing hillside.

PT 9 – Follow bearing of 132° for 275m up hill and across stream to PT on east facing side of hill above stream, marked on a 4" hickory.

PT 10 – Follow bearing of 259° for 250 m along bench above ravine to PT on 8" twin-trunked red maple on north facing slope above stream.

Continue on same bearing to field at Stop 4 (Chatfield Farm). From here go right (NNE) on grassy, mowed trail back to Stop 6 and parking area.

Saratoga National Historical Park, Neilson Farm

Directions for this route are pending.

Saratoga National Historical Park, Wilkinson Trail

Site established 4 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS WT #", where # indicates the Point Number .

Enter the park and proceed to the Visitor Center at the NE corner. Continue on the one-way Park Tour Rd about ½ mile. Just beyond Tour Stop 1, turn left onto a short gravel service road, then another left back onto the Tour Road. Continue about 1 mile and park at Tour Stop 7 on left.

PT 1 – To reach the first Point, walk SE down the Tour Road ~150 m and turn left (east) onto the Wilkinson Trail. Continue on the WT about 100 m to interpretive post "E". From here, take a bearing of 340° and go 50 m to PT 1 on a 4" sugar maple 10 m from stream edge.

PT 2 – Return to the WT and head E ~80 m to a large, 6-trunked white pine on the left (north) side of the trail with blue flagging on a sapling nearby. From here, take a bearing of 25° and go 80 m to PT 2 on a 4" white ash at the bottom of hill on edge of wetland.

PT 3 – Return to trail and go about 180 m to large, 4-trunked red maple on the right side of trail. From here, take bearing of 242° and go 50 m to PT on 6" elm part-way down slope.

PT 4 – Return to trail and continue east ~180 m to an open, mixed forest with many ferns and a small hophornbeam flagged with blue. PT is 40 m N of trail on a 6" hickory.

PT 5 – Continue east on the trail for ~75m to where it bends south. From here, take a bearing of 82° and go 140 m to PT on 8" red maple.

PT 6 – Follow a bearing of 150° for 250 m across 2 small drainages to PT on 4" hophornbeam in an area with abundant mayapple.

PT 7 – Go 30 m south to trail and head west, then turn left onto trail heading south through field. Continue past interpretive marker to next bend in between two large maples and take a bearing of 270°. Follow it across the field and park road to PT 75m from road on a 6" white pine.

PT 8 – Return to road and head south, making a right onto the Wilkinson Trail. Go down trail about 175m to PT, just 5m west of trail on a 6" red maple.

PT 9 – Continue south on WT across drainage and uphill along flat bench. PT is on 4" elm, 5 m west of trail, just before trail bends to the west.

PT 10 – Continue up WT to field and interpretive post “J”. Take a bearing of 28° and follow it across the field and downslope along deer trail to PT in open, flat streamside area. PT is marked on a 14” white ash 5 m NW of huge (40”) willow.

Head NNW along drainage to park road and follow it west to return to vehicle.

Weir Farm National Historic Site Overview Map and Plot Coordinates

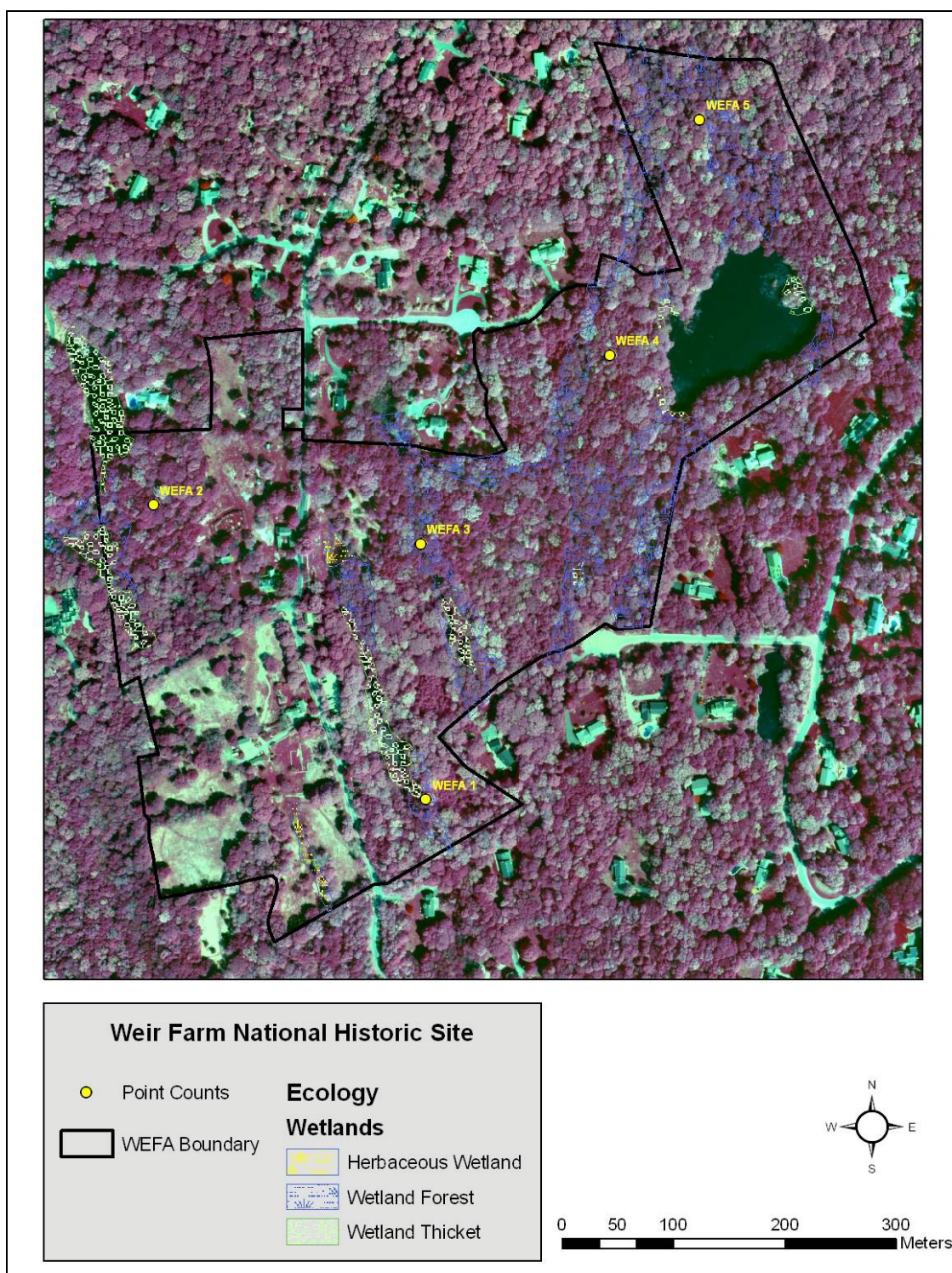


Figure 20. Point count locations at Weir Farm NHS, Wilton, Connecticut.

Table 9. UTM coordinates (NAD 1983, Zone 18) for point count locations and forest cover at Weir Farm NHS, Wilton, Connecticut.

Point Number	UTM_N	UTM_E	Habitat
WEFA 1	4568300	629430	Hardwoods
WEFA 2	4568565	629185	Hardwoods
WEFA 3	4568530	629425	Hardwoods
WEFA 4	4568700	629595	Hardwoods
WEFA 5	4568912	629676	Hardwoods

Saratoga National Historical Park, Wilkinson Trail

Site established 14 May 2006 by Steve Faccio

NOTE: All bearings are Magnetic North, do not adjust your compass for declination. All listening stations are marked with blue flagging and an aluminum tree tag, labeled "VINS WEFA #", where # indicates the Point Number .

Park in the main Parking lot for the Weir Farm NHS and walk south across mowed, grassy area, parallel to road. At SE corner, descend down old road to bottom of hill. From here, head east about 50 m crossing 2 small streams. After crossing second stream, POINT 1 is 10 m north on 3" elm near large (14") white ash on E side of wetland.

POINT 2 – To reach Point 2, go back to Nod Hill Rd. and head N past Pelham Lane. At entrance to Pond Trail, go west, following mowed path through field. Where path turns S toward house/barns, continue on a 250° bearing for 50 m into woods. Point 2 is on 8" red maple, 10 m east of swamp.

POINT 3 – Return to Pond Trail entrance on Nod Hill Rd. and take Pond Trail. At bridge crossing, Point is 15m at 170° on a 3" black birch.

POINT 4 – Go back to Trail and continue across bridge for another 200 m to a fork in the trail. PT is 15m on left (340°) on a 3" black birch.

POINT 5 – Continue on north fork of Pond Trail to the pond and take Pond Trail around the north side of the pond edge. Just before crossing the stream at the dam, follow a bearing of 350° for 100 m, crossing a small stream, to Point 5 located on a 5" tulip tree just beyond rocky outcrop.

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	January 2006	Steve Faccio	SOP used beginning with the 2006 field season.	
2.00	April 2007	Steve Faccio Brian Mitchell	SOP used beginning with the 2007 field season Added revision log. Sites and stations for ACAD are completely new, based on revised sampling design. Additional sites added Sampling design section clarified, and information about ACAD design added. Reference to narrative added, in regards to additional information on sampling design.	
2.01	May 2008	Steve Faccio Brian Mitchell	SOP used beginning with the 2008 field season Added information about site selection at SAIR, plus SAIR map and coordinates Added information about new route marking methods at ACAD Added updated ACAD maps and coordinates	
2.02	August 2009	Sarah Lupis	Formatting, minor editorial changes.	
2.03	May 2010	Brian Mitchell	Addition of ACAD Youngs Mountain map and point locations; correction of a location error for one ACAD point	
2.04	May 2011	Brian Mitchell	Addition of directions for most routes	

SOP 4 - Conducting Variable Circular Plot Point Counts

Northeast Temperate Network

Version 2.01

Overview

This SOP provides step-by-step instructions for conducting the recommended 10 minute variable circular plot point count. For each bird observed, the time (minute of the count) and distance band (0-10 m, 10-25 m, 25-50 m, and > 50 m) will be recorded. The methodology is largely based on songbird monitoring protocols developed for the Lower Mississippi Valley Joint Venture, available at www.lmvjv.org/population_monitoring. In addition, other than differences in distance bands, the procedures described below are compatible with methods used by the Great Lakes Network (GLKN) and the United States Fish and Wildlife Service (USFWS) in the Northeast and Midwest. The other programs do not use the 0-10-m band, but do use a 50-100 m band. The Northeast Temperate Network (NETN) does not use this larger distance band due to the inability of observers to accurately estimate distances beyond 50 m. The 0-10 m band is used due to the recommendation of Buckland et al. (1993), who suggest that the size of the distance bands should increase as they move away from the observer rather than be equal. NETN, USFWS, and GLKN data are comparable for distance analysis using 0-25, 25-50, and 50 m + bands.

Each volunteer observer will receive a Volunteer Training Manual (available for download on the VCE and NETN websites) outlining the point count procedures in this SOP, as well as training methods for distance estimation, and how to navigate by map and compass.

The data being collected during point counts (Table 1) will be analyzed with two different methods (distance sampling and removal models), each of which is an independent approach to estimating abundance by correcting for the probability of detecting an individual. If we can accurately estimate this probability (which can vary by habitat, observer, and other factors), we can estimate the number of birds that were NOT seen or heard during the point count, and derive a better estimate of bird abundance than we would get using only birds actually seen or heard. It is important to understand the assumptions of these methods, and to work to meet these assumptions. Both approaches assume that birds are correctly identified to species, and that each individual is only recorded once. The distance sampling approach further assumes that all birds at the center point are always detected, and that the distance band recorded is the correct distance band. The removal modeling approach assumes that the time recorded for the individual bird is the time it was first heard or seen, and the approach works better with the simplifying assumption that observers are equally likely to hear a bird of a given species during every minute (in other words, the observer is just as likely to hear or see a Brown Creeper at minute one as he or she is at minute five).

When observers are collecting data, they should keep in mind that the most important assumptions are that birds are correctly identified to species, and that each individual is recorded only once. The next most important assumption is that distance estimates are correct. The removal modeling assumptions are less important, and all other data that are collected (e.g., sex,

nest location, and whether the bird is singing, calling, or seen) are secondary to the primary goals of getting accurate species and distance information. If observers feel that they are unable to meet the assumptions of the distance sampling or the removal modeling approaches, they should provide a written comment with as much detail as possible when they submit their data forms. This will be a tremendous help to the data analysis phase of the project.

Table 1. Description of variables recorded at point count locations during Northeast Temperate Network breeding landbird monitoring.

Variable	Description
State	State
Park	Name of park where site is located.
Site	Name of site
Coordinates	Location of the site in Lat/Long
Observer	Observer identification (e.g., initials).
Date	MM/DD/YYYY
Temp °F	Temperature in degrees Fahrenheit.
Sky	Sky condition, combining cloud cover and precipitation (see Table 2).
Wind	Wind speed from Beaufort scale and direction (see Table 3).
Start Time	Time of day; 2400 hour clock (e.g., 0732).
Point #	Number of the point within the study site.
Species	Species of birds and squirrels observed.
Time Period	Minute (9-0) during which a species was observed.
Observation Code	Code indicating type of observation (e.g., visual, song, call, active nest, etc.).
Distance Band	Distance category from observer that a species was detected within.
Flyovers	Birds observed flying over the plot.
Comments	Notes and specific remarks about the count.

Survey Procedures

1. **Count Conditions.** Counts should be conducted early in the morning and during proper survey conditions. We recommend a 0500 hrs start time. Winds should be calm to light (< 7 mph; Code 2 or less on the Beaufort Scale, Table 2). Acceptable weather conditions for counting birds include a sky condition of 5 or less (although fog should not interfere with visual identification of birds; Table 3). Clear conditions or slightly damp are ideal. Counts should not be conducted in rain, unless it is very light. The rule is to conduct surveys only in weather that is unlikely to reduce count numbers. Generally, the more calm and clear the weather, the better the count. It is advisable to listen to the forecast the night before the survey and plan accordingly.

Prior to the first point count, fill in the site name, date, and observer name on the field mapping card (Figure 1). Then, upon arriving at each sampling point, record the point number, wind speed (Table 2), wind direction (Table 3), sky conditions (Table 4), and temperature (degrees Fahrenheit). Prior to beginning the count, orient the field mapping card (Figure 2) to a fixed direction, record the direction in the box at the top of the count circle, and record the start time.

2. **Use Count-down Timer.** Begin the count by starting the National Park Service (NPS)-issued count-down timer to keep track of time.

Note: Although the data will be transcribed to coding sheets later, the field mapping card is the only true record of what was detected during the survey. Even during the rush of a busy point count survey, remember to record data clearly and in a firm hand. When filling out the mapping cards make notations in a consistent manner and use the standardized symbols and codes as defined on the field forms.

Table 2. Codes and descriptions for wind speeds (Beaufort Scale)¹

Code #	km/h	mph	Description
0	<2	<1	Smoke rises vertically
1	2 to 5	1 to 3	Wind direction shown by smoke drift
2	6 to 11	4 to 7	Wind felt on face; leaves rustle
3	12 to 20	8 to 12	Leaves, small twigs in constant motion; light flag extended
4	21 to 32	13 to 18	Small branches are moved
5	33 to 30	19 to 24	Small trees begin to sway

¹ These are the same codes used in the Breeding Bird Survey. Acceptable conditions for counting birds include a wind speed of code 2 or less.

Table 3. Codes and descriptions for wind direction

Code	Description
N	North
NE	Northeast
E	East
SE	Southeast
S	South
SW	Southwest
W	West
NW	Northwest

Table 4. Codes and descriptions for sky conditions¹.

Code	Description
0	Clear or a few clouds
1	Scattered clouds (partly cloudy)
2	Broken clouds or overcast
4	Fog
5	Drizzle or light rain
6	Rain
7	Snow
8	Showers

¹ These are the same codes used in the Breeding Bird Survey. Acceptable conditions for counting birds include a sky condition of 5 or less (although fog should not interfere with visual identification of birds).

FOREST BIRD MONITORING PROGRAM – FIELD CARD

PARK: MINUTE MAN NHP SITE: HARTWELL TAVERN

OBSERVER: BOB G. LINK

DATE: 6 JUN 2009

Wind Speeds:	Wind Directions:	Sky Codes:
0 = calm, smoke rises vertically	N = north	0 = clear or a few clouds
1 = (1-3 mph) Light Air; rising smoke drifts	NE = northeast	1 = scattered clouds (partly cloudy)
2 = (4-7 mph) Light Breeze; leaves rustle, can feel wind on face	E = east	2 = broken clouds or overcast
3 = (8-12 mph) Gentle Breeze; leaves & twigs move	SE = southeast	4 = fog
4 = (13-18 mph) Moderate Breeze; moves thin branches, raises loose paper	S = south	5 = drizzle or light rain
5 = (>18 mph) Fresh Breeze; trees sway	SW = southwest	6 = rain – NO SURVEY
ONLY CONDUCT SURVEYS WHEN 2 OR LESS	W = west	7 = snow – NO SURVEY
	NW = northwest	8 = showers – NO SURVEY

MAPPING SYMBOLS

MAWA position of visually located magnolia warbler

 position of calling or singing magnolia warbler

MAWA → MAWA

Known change in position

MAWA --- → MAWA

Assumed change in position

If you use different symbols, describe them in the comments.

Survey Comments

POINT & HAND TO FIND...
COULD USE MORE FLAGGING.

All codes on the field maps are correct, and data has been transcribed to the bird and mammal coding sheets.

____ (Signature)

Mail to:

Steve Faccio
VT Center for Ecostudies
PO Box 420
Norwich, VT 05055

Figure 1. Example cover page of a field mapping card, including standardized symbols used to record observations made while conducting point counts.

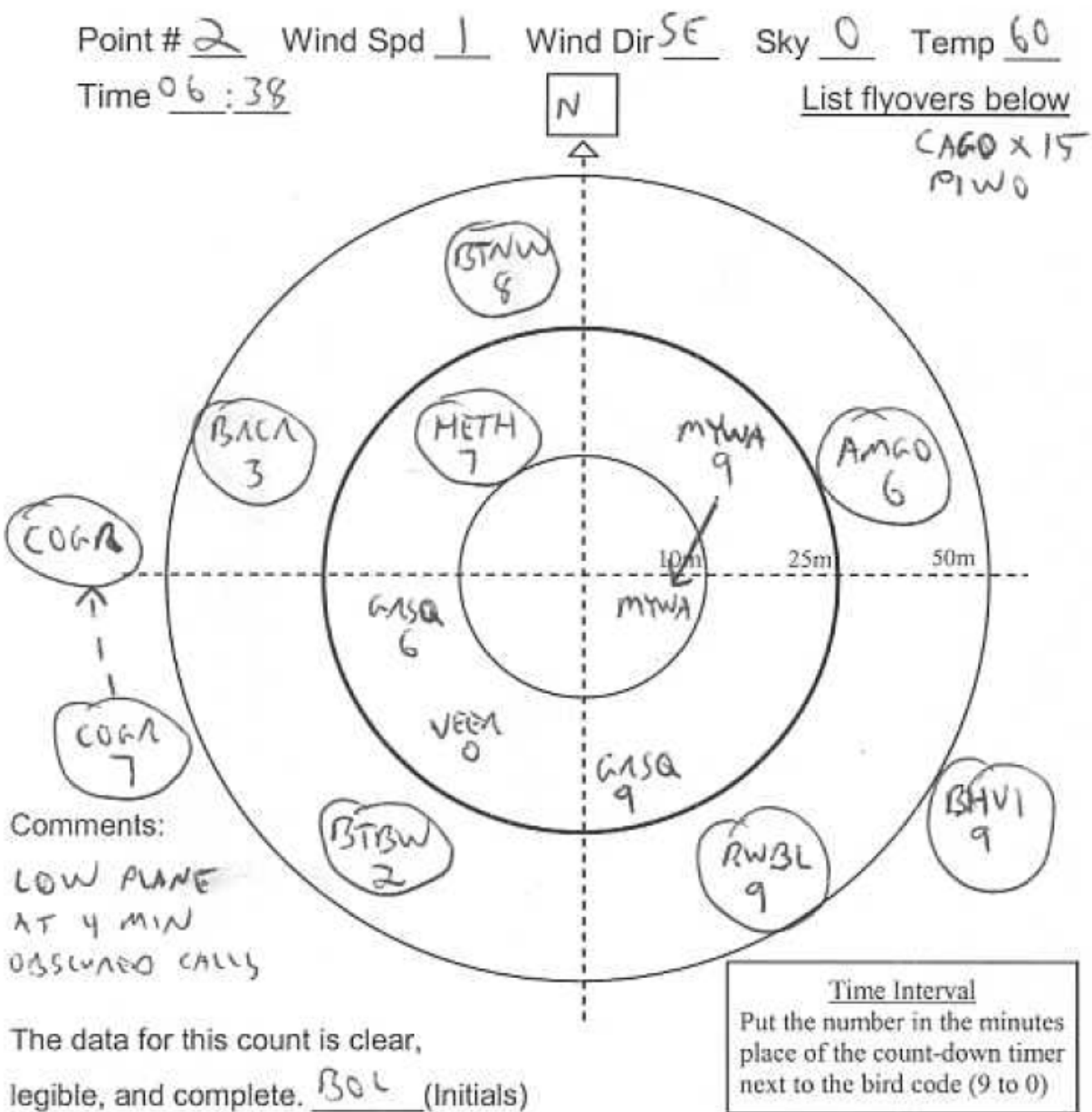


Figure 2. Example field mapping card

1. **Navigate to Point.** Use a GPS or map and compass to navigate to your points. The forest routes have been marked with blue flagging every 25 to 100 m (depending on the density of the vegetation). If any of the flagging is worn out, please collect it and replace it with fresh flagging.
2. **Count (record) All Birds and Squirrels.** All birds and squirrels (see box below) seen and heard during the 10-minute sampling period should be counted and recorded on the NPS-issued field mapping card. Be sure to note in which minute birds are first encountered. This will require close attention to your count-down timer. For each bird detected, record on the field map its four letter code (SOP 4 Appendix A) followed by the minute during which it was first encountered (i.e., 9 for birds encountered during the first minute counting down to 0 for encounters during the last minute of the 10-minute survey period). See Figure 2 for a sample field card. Remember that the crucial information is species identification, distance band, and time of first detection (in that order). No other information is required, although recording type of detection (i.e. visual versus calling or singing) may help you track the individuals. For flocks, estimate the number of individuals (don't try to mark each individual down). Birds that fly through or over the point count location and do not stay within the area of the point count do not meet the assumptions of distance or removal models. For these birds, record the species code in the top-right corner of the map (these observations are still valuable for telling us that the species is in the area).

Red squirrels, gray squirrels, and eastern chipmunks are known to be effective nest predators. We want to monitor their populations as well as those of forest breeding birds. Follow the same recording procedures for these mammals as you would for birds, using the following four-letter codes:

- RESQ—red squirrel
- GRSQ—gray squirrel
- CHIP—Eastern chipmunk

3. **Map Observations.** Counting is done by mapping all observations (both visual and auditory) on the field mapping cards provided, keeping track of movements as best you can. Mapping (marking the location and noting movements) is the best way to reduce duplicate records. Mark birds on the field card in the appropriate distance band and approximate spatial location. The recorded distance should be the horizontal distance between the location a bird was first detected and the plot center. Imagine dropping a plumb-bob down from a bird's location and estimating its distance from the plot center. For species that occur in flocks, record the flock (e.g., species) and flock size in the appropriate distance band. There is no need to record each bird in a flock individually. Different symbols can be used to record the status of each bird observation (i.e. visual observation, calling or singing, etc., Figure 1 and Figure 2). Use standard species AOU codes to identify species observed (four-letter codes can be found in SOP 4 Appendix A, or downloaded at <http://www.vtecostudies.org/FBMP/materials.html>).

4. **Orientation.** Holding the field mapping card in a fixed position, spend part of the time facing in each of the cardinal directions in order to better detect birds.
5. **Count Individuals Once.** Do not record any birds believed to have been counted at previous stations. All birds should only be counted once.
6. **When to Stop.** At the end of 10 minutes, stop recording bird observations. Do not record any new birds seen or heard after the 10 minutes have passed. Before leaving the point, check over the field mapping card thoroughly to make sure it is complete and legible. Remember, this is the only record of what happened during the survey. Take the time to clarify anything illegible or out of the ordinary, and then initial the card.
7. **Sampling Frequency.** Each site should be sampled at least once during the breeding season, but one or two follow-up, replicate surveys within two weeks of the initial visit will be encouraged. The exception to this will be at NETN's three smallest parks (Saint-Gaudens NHS, Saugus Iron Works NHS, and Weir Farm NHS), which, due to their small sizes, can only accommodate a few point count locations each. In order to reduce between-year variability at these three parks, study sites will be surveyed twice annually, with replicates occurring about 7-14 days apart. In order to reduce within- or between-site bias due to time of day, each study site will be surveyed in the same order each time (e.g., the order in which point counts are surveyed will not be reversed).
8. **Data Transcription.** Bird and mammal data from the field mapping card(s) should be transcribed to separate data coding sheets (Figures 3 and 4) before they are entered into their respective databases. Remember, only transcribe the record of a bird or mammal the first time you saw or heard it. Each individual you encounter should only be recorded once on the summary data coding sheets. After completing each coding sheet, conduct a 100% check to look for transcription errors. If you need to correct information on the mapping card or data coding sheet (for example, you used the wrong bird code), draw a single line through the incorrect data and then enter the correct data next to the original data, along with your initials and the date. Sign the data coding sheet indicating the 100% data transcription check has been completed.
9. **Using the Online Database.** Once proofed, bird data recorded on data coding sheets should be entered into the USGS Bird Point Count Database (<http://www.pwrc.usgs.gov/point/>). Verify each row of bird data as it is entered into the database and conduct a complete check of all data after finishing each data coding sheet. Sign the data coding sheet indicating that the 100% data entry check has been completed. Mammal data coding sheets are not entered in to the USGS database (its purpose is to store bird data only), but are sent on to the project manager after being proofed.
10. **Mail Data.** After bird data have been entered into the online database and proofed, mail the field mapping cards, the bird data coding sheets and the mammal data coding sheets to:

Forest Bird Monitoring Program
Vermont Center for Ecostudies
PO Box 420
Norwich, VT 05055



Park Name: MINUTE MAN NHP

Site Name: HARTWELL TAVERN

Observer: BOB O. LINK

Initials: BOB

Date: 6 JUN 2009

Did you observe small mammals during your survey? ☒ YES ☐ NO (If yes, fill out the Mammal Data Code Sheet)

Start Time	Point #	Species	Time Period	Obs Code	Distance Band	Flyovers/# in flock	Start Time	Point #	Species	Time Period	Obs Code	Distance Band	Flyovers/# in flock
0605	1	1. RBWO	9	C	3				26.				
	1	2. ETT1	9	C	1				27.				
	1	3. AMCA	6	C	4				28.				
	1	4. BCOH	1	C	2				29.				
0638	2	5. MYWA	9	I	2				30.				
	2	6. AMGO	6	C	3				31.				
	2	7. RWBL	9	C	3				32.				
	2	8. BHVI	9	C	4				33.				
	2	9. VEER	0	I	2				34.				
	2	10. BTBW	2	C	3				35.				
	2	11. COGR	7	C	4				36.				
	2	12. HETH	7	C	2				37.				
	2	13. BACA	3	C	3				38.				
	2	14. BTBW	8	C	3				39.				
	2	15. CAGO	6	FL		X/15			40.				
	2	16. PIWO	2	FL (6/6/09)		X			41.				
0702	3	17. ETT1	9	C	1				42.				
	3	18. AMGO	8	C	2				43.				
	3	19. OVEN	6	C	3				44.				
	3	20. WOTH	1	C	3				45.				
		21.							46.				
		22.							47.				
		23.							48.				
		24.							49.				
		25.							50.				

Time Period – Enter the time code (minute of the count when the bird was first observed). This is the digit displaying in the minutes place of your count-down timer (9 through 0; e.g. birds seen during the first minute of observation get a 9).

Codes used for bird occurrence – Place the appropriate code from the list below in the “Obs Code” field in the table above
Calling or singing = C Individual seen = I Flock = FL

Distance Band – use the following codes to denote distance – 1 = 0-10m 2 = 10-25m 3 = 25-50m 4 = >50m

Flyovers/# in flock – place an X in column to denote flyovers, and/or a number to denote individuals observed in flocks.

I proofed the transcription from the Field Mapping Cards: Signature: M. A. [Signature]

I proofed data entered into database: Signature: M. A. [Signature]

Figure 3. Example bird data coding sheet.



Park Name: MINUTE MAN NHP

Site Name: HALTWELL TAVERN

Observer: BOB O. LINK

Initials: BOB

Date: 6 JUN 2009

Point #	Species	Time Period	Obs Code	Distance Band
1	1. CHIP	3	1	2
2	2. GASQ	9	1	2
2	3. GASQ	6	1	2
3	4. CHIP	8	1	1
3	5. RESQ	9	C	3
	6.			
	7.			
	8.			
	9.			
	10.			
	11.			
	12.			
	13.			
	14.			
	15.			
	16.			
	17.			
	18.			
	19.			
	20.			
	21.			
	22.			
	23.			
	24.			
	25.			

Point #	Species	Time Period	Obs Code	Distance Band
	26.			
	27.			
	28.			
	29.			
	30.			
	31.			
	32.			
	33.			
	34.			
	35.			
	36.			
	37.			
	38.			
	39.			
	40.			
	41.			
	42.			
	43.			
	44.			
	45.			
	46.			
	47.			
	48.			
	49.			
	50.			

Time Period – Enter the time code (minute of the count when the bird was first observed). This is the digit displaying in the minutes place of your count-down timer (9 through 0; e.g. birds seen during the first minute of observation get a 9).

Codes used for bird occurrence – Place the appropriate code from the list below in the “Obs Code” field in the table above:
Calling = C Individual seen = I

Distance Band – use the following codes to denote distance – 1 = 0-10m 2 = 10-25m 3 = 25-50m 4 = >50m

I proofed the transcription from the Field Mapping Cards: Signature: M. R. Anderson

Figure 4. Example mammal data coding sheet.

SOP 4 Appendix A. Alphabetical list of Vermont Forest Bird Monitoring Program species and associated four-letter codes.

Common Name	Code	Common Name	Code
Alder flycatcher	ALFL	Common yellowthroat	COYE
American crow	AMCR	Cooper's hawk	COHA
American goldfinch	AMGO	Downy woodpecker	DOWO
American kestrel	AMKE	Eastern bluebird	EABL
American redstart	AMRE	Eastern chipmunk	CHIP
American robin	AMRO	Eastern kingbird	EAKI
Baltimore oriole	BAOR	Eastern meadowlark	EAME
Bank swallow	BANS	Eastern phoebe	EAPH
Barn swallow	BARS	Eastern screech-owl	EASO
Barred owl	BDOW	Eastern towhee	EATO
Bay-breasted warbler	BBWA	Eastern tufted titmouse	ETTI
Belted kingfisher	BEKI	Eastern wood-pewee	EAWP
Bicknell's thrush	BITH	European starling	EUST
Black-and-white warbler	BAWW	Evening grosbeak	EVGR
Black-backed woodpecker	BBWO	Field sparrow	FISP
Black-billed cuckoo	BBCU	Fish crow	FICR
Blackburnian warbler	BLBW	Golden-crowned kinglet	GCKI
Black-capped chickadee	BCCH	Golden-winged warbler	GWWA
Blackpoll warbler	BLPW	Grasshopper sparrow	GRSP
Black-throated blue warbler	BTBW	Gray catbird	GRCA
Black-throated green warbler	BTNW	Gray jay	GRAJ
Blue jay	BLJA	Gray squirrel	GRSQ
Blue-gray gnatcatcher	BGGN	Great horned owl	GHOW
Blue-winged warbler	BWWA	Great-crested flycatcher	GCFL
Blue-winged/golden-winged warbler complex	BWGW	Hairy woodpecker	HAWO
Bobolink	BOBO	Henslow's sparrow	HESP
Boreal chickadee	BOCH	Hermit thrush	HETH
Broad-winged hawk	BWHA	Hooded warbler	HOWA
Brown creeper	BRCR	House finch	HOFI
Brown thrasher	BRTH	House sparrow	HOSP
Brown-headed cowbird	BHCO	House wren	HOWR
Canada warbler	CAWA	Indigo bunting	INBU
Cape may warbler	CMWA	Least flycatcher	LEFL
Carolina wren	CARW	Lincoln's sparrow	LISP
Cedar waxwing	CEDW	Louisiana waterthrush	LOWA
Cerulean warbler	CERW	Magnolia warbler	MAWA
Chestnut-sided warbler	CSWA	Marsh wren	MAWR
Chimney swift	CHSW	Mourning dove	MODO
Chipping sparrow	CHSP	Mourning warbler	MOWA
Cliff swallow	CLSW	Myrtle warbler	MYWA
Common grackle	COGR	Nashville warbler	NAWA
Common nighthawk	CONI	Northern cardinal	NOCA
Common raven	CORA	Northern goshawk	NOGO

SOP 4 Appendix A. Alphabetical list of Vermont Forest Bird Monitoring Program species and associated four-letter codes (continued).

Common Name	Code	Common Name	Code
Northern harrier	NOHA	Warbling vireo	WAVI
Northern mockingbird	NOMO	Whip-poor-will	WPWI
Northern parula	NOPA	White-breasted nuthatch	WBNU
Northern rough-winged swallow	NRWS	White-throated sparrow	WTSP
Northern saw-whet owl	NSWO	White-winged crossbill	WWCR
Northern waterthrush	NOWA	Wild turkey	WITU
Olive-sided flycatcher	OSFL	Willow flycatcher	WIFL
Orchard oriole	OROR	Wilson's warbler	WIWA
Ovenbird	OVEN	Winter wren	WIWR
Philadelphia vireo	PHVI	Wood thrush	WOTH
Pileated woodpecker	PIWO	Worm-eating warbler	WEWA
Pine siskin	PISI	Yellow palm warbler	YPWA
Pine warbler	PIWA	Yellow warbler	YWAR
Prairie warbler	PRAW	Yellow-bellied flycatcher	YBFL
Prothonotary warbler	PROW	Yellow-bellied sapsucker	YBSA
Purple finch	PUFI	Yellow-billed cuckoo	YBCU
Purple martin	PUMA	Yellow-shafted flicker	YSFL
Red crossbill	RECR	Yellow-throated vireo	YTVI
Red squirrel	RESQ		
Red-bellied woodpecker	RBWO		
Red-breasted nuthatch	RBNU		
Red-eyed vireo	REVI		
Red-headed woodpecker	RHWO		
Red-shouldered hawk	RSHA		
Red-tailed hawk	RTHA		
Red-winged blackbird	RWBL		
Rose-breasted grosbeak	RBGR		
Ruby-crowned kinglet	RCKI		
Ruby-throated hummingbird	RTHU		
Ruffed grouse	RUGR		
Rusty blackbird	RUBL		
Savannah sparrow	SAVS		
Scarlet tanager	SCTA		
Sedge wren	SEWR		
Sharp-shinned hawk	SSHA		
Slate-colored junco	SCJU		
Solitary vireo	SOVI		
Song sparrow	SOSP		
Swainson's thrush	SWTH		
Swamp sparrow	SWSP		
Tennessee warbler	TEWA		
Three-toed woodpecker	TTWO		
Tree swallow	TRES		
Turkey vulture	TUVU		
Veery	VEER		
Vesper sparrow	VESP		

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	January 2006	Steve Faccio	SOP used beginning with the 2006 field season.	
1.01	May 2007	Steve Faccio Brian Mitchell	SOP used beginning with the 2007 field season. Added revision log. Clarified distance sampling assumptions	Need to detect all birds at center point, not necessarily all in first band.
1.02	May 2008	Steve Faccio Brian Mitchell	Maximum wind speed changed to code 2 from code 3. SOP used beginning with the 2008 field season Added information about compatibility of this SOP with GLKN and USFWS Added SAIR to the small parks that are surveyed twice Changed on-line database reference to the USGS point count database	
1.03	August 2009	Sarah Lupis	Updated website and mailing addresses Formatting, minor editorial changes.	
1.04	December 2009	Brian Mitchell	Added rationale for not matching USFWS and GLKN distance bands	
2.00	February 2010	Adam Kozlowski and Brian Mitchell	Updated survey procedures and added mammal data coding sheet. In particular, streamlined the data forms to remove extraneous codes and ensure that the correct data is collected at each point count. Observation codes are now just C (calling/singing), I (individual seen), or FL (flock seen or heard). Observers no longer need to record distance or time of detection for flyovers; these observations violate distance and removal model assumptions. Added wind direction codes. Updated sky codes so that they match the point count database. New data forms ask observers to certify data with signatures.	Modify field procedures and forms to reduce data errors
2.01	March 2010	Steve Faccio	Minor editorial changes	

SOP 5 - Data Management

Northeast Temperate Network

Version 4.01

Overview of SOP

Careful, accurate collection of data as directed in these SOP's is critical to the success of Vital Signs monitoring. This SOP explains the procedure for proper transcription, verification and stewardship of breeding landbird monitoring data once they have been collected. Data management responsibilities are divided between volunteer observers, the project manager (PM), and the network data manager (DM). The roles and responsibilities detailed here are also presented in graphical form in Figures 1 through 3.

Data Collection

Breeding landbird point count data will be collected on Field Mapping Cards. The Field Mapping Cards will clearly identify all required information, using examples where needed to ensure that proper data are recorded. Observers should record both their bird and mammal observations in a clear and firm handwriting using the standardized symbols defined on the Field Mapping Cards. Before leaving the point, observers will check over the Field Mapping Card thoroughly to make sure it is complete and legible, taking the time to clarify anything illegible or out of the ordinary. Observers will initial the Field Mapping Card in the space allotted to signify that the data is complete and legible to the best of their ability.

Data Transcription and Verification

As soon as possible after leaving the field (preferably within 24 hours), observers will verify that they used the correct bird codes on their field mapping cards. Incorrect codes will be crossed out with a single line, corrected by the observer, initialed, and dated. Observers will sign the field mapping card cover page to signify that they have checked their bird codes (valid codes can be found in SOP 4 Appendix A). Next, observers will transcribe their point count data from the Field Mapping Cards to Data Coding Sheets. Bird and mammal data are each copied to their own Data Coding Sheets. Mapped data are transcribed to the Data Coding Sheets to reorganize it into a tabular format that can be easily and accurately transcribed into the project's database. To minimize the possibility of carrying errors forward, the observer is required to conduct a 100% check of the original Field Mapping Card data against completed bird and mammal Data Coding Sheet(s). Any errors discovered during this data verification step should be corrected immediately by crossing out the error with a single line, entering the correct value next to the error, and initialing and dating the correction. The observer will sign the Data Coding Sheet in the place provided, signifying that the data verification process has been completed.

Online Data Entry and Verification

Once the Data Coding Sheets have been verified, observers will enter the bird monitoring data into the Bird Point Count Database at the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center (<http://www.pwrc.usgs.gov/point/>). This web-based, publicly accessible, searchable, repository for point count data collected in North America is a collaborative project

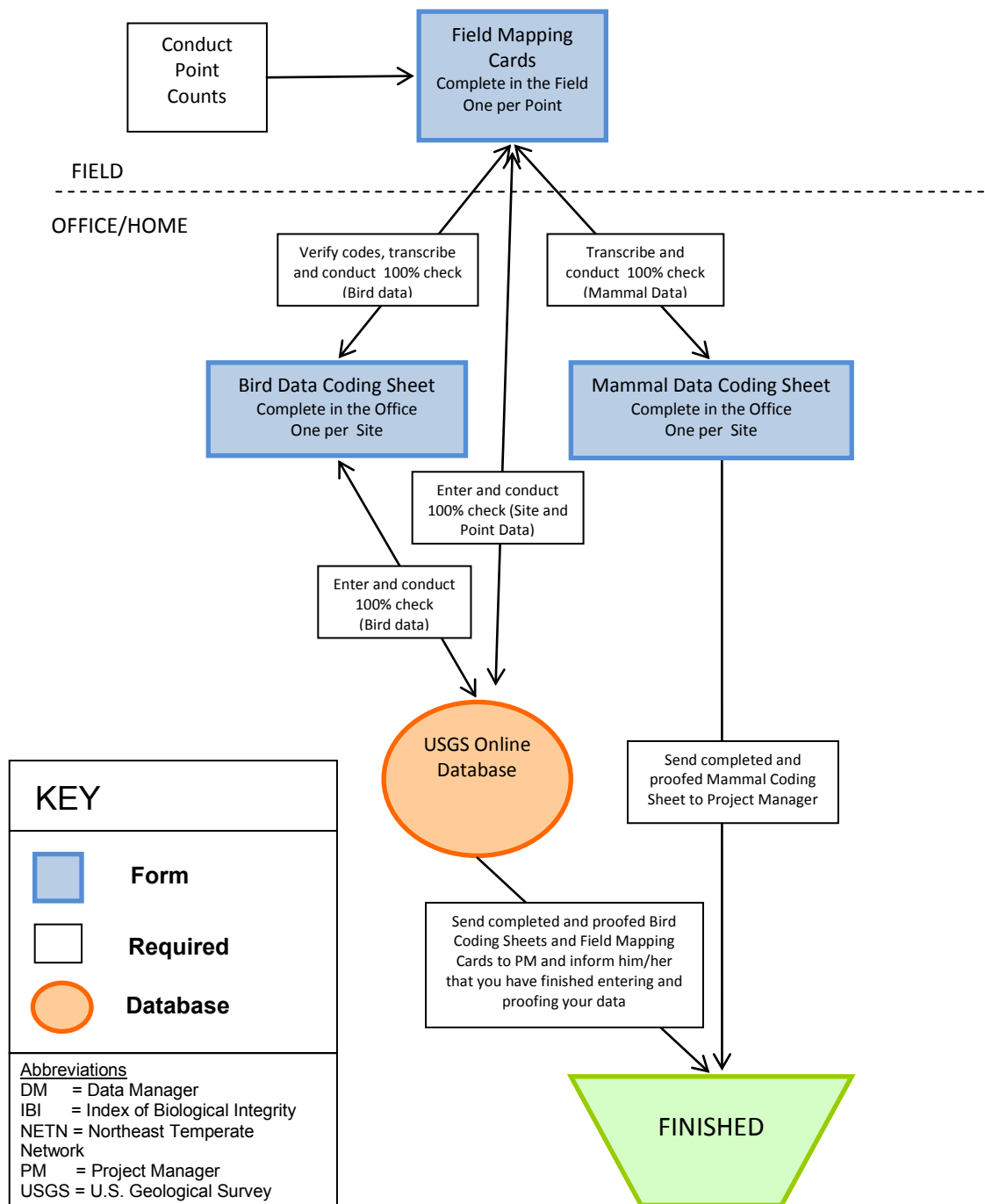


Figure 1: Flow diagram for breeding landbird monitoring protocol data management responsibilities: Volunteer Observers.

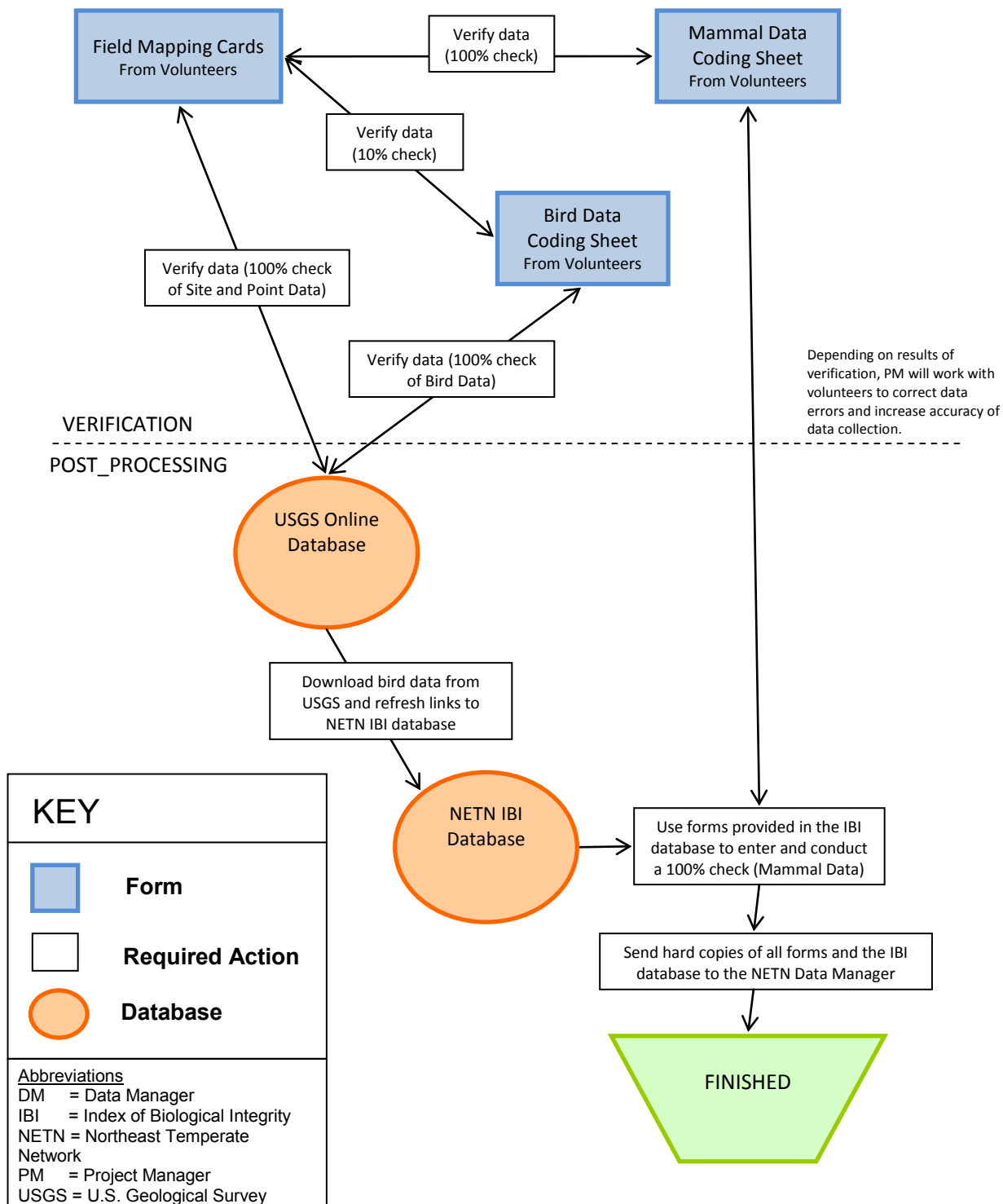


Figure 2: Flow diagram for breeding landbird monitoring protocol data management responsibilities: Project Manager.

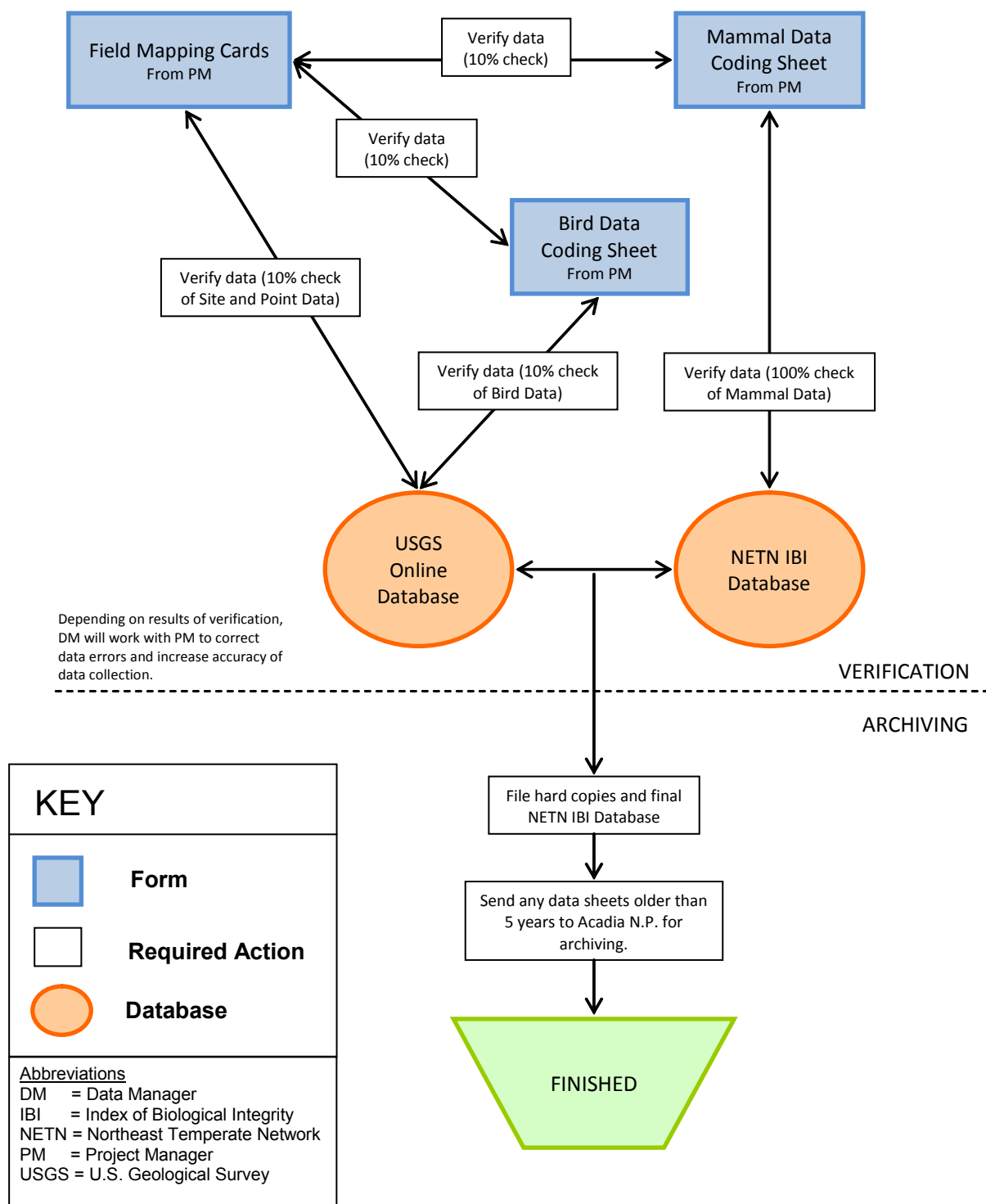


Figure 3: Flow diagram for breeding landbird monitoring protocol data management responsibilities: Network Data Manager.

between the Patuxent Wildlife Research Center, the U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuge System, and the American Bird Conservancy.

The goals of this point count repository are to:

- Provide easy data entry and access to everyone, while providing appropriate security controls.
- Accommodate count data from multiple sources, allowing for small differences in protocols, such as:
 - Counts at different times of year: breeding, winter, or migration counts.
 - Counts differing in time intervals (3 vs. 5 minutes, for example) or radii.
 - Counts designed to adjust for detection probability, such as distance sampling.
- Store vegetation information associated with points.
- Enforce data quality control through validation routines and through distributed responsibility.

Bird Data entry should be conducted within 24 hours of leaving the field to ensure observers' ability to clearly recall events in case of a discrepancy. Data are entered into the Bird Point Count Database via an online data entry system that allows volunteer observers to enter data once they have logged-in with a username and password issued by the project manager (SOP 5 Appendix A). To help reduce data entry errors the database entry form has dropdown menus for site name, observer, and species and observation codes. Additionally, upon entering each row of data, observers are asked to carefully compare the date, time, species, and observation codes recorded on the Field Mapping Card with those transcribed onto the Data Coding Sheet to make sure they are consistent. Any errors that are found should be corrected immediately. Once data entry and checking are complete, the observer will sign the Bird Data Coding Sheet and mail the following items to the project manager so that s/he can review them:

- Completed and initialed Field Mapping Cards
- Completed and signed as verified Mammal Data Coding Sheets.
- Completed, signed as verified, entered into the database, and signed as checked Bird Data Coding Sheets

Post-acquisition Data Entry and Verification

After receiving the Field Mapping Cards and Data Coding Sheets from the observer, the project manager will initiate further verification of the data. Evaluating post-acquisition data is a difficult but necessary task that requires close communication with the observers to resolve discrepancies. The project manager will make copies of all the original data sheets on acid-free paper and conduct: a 10% check of data transcription from Field Mapping Cards to Data Coding Sheets, and a 100% check of Bird Data Coding Sheets against the records in the online database. In addition to his/her data verification responsibilities, the PM is also responsible for entering the mammal data into the Northeast Temperate Network (NETN) IBI database.

A 10% check is conducted by reviewing data corresponding to one randomly selected point count per study site (including the site-level data – park, site, date, and observer – and point-level data – weather and start time), so that some data is reviewed from each observer. If an error is

discovered at any point during the 10% check, an additional point count from the same observer and site will be randomly selected and reviewed. If an additional error is detected, a 100% check of all the observer's data will be required. For all errors found during the 10% check or 100% check, the PM will work with the observer to resolve any data conflicts identified and provide additional guidance to prevent those errors from occurring in future surveys. Changes made to the data will only be made on the copies. Changes will be initialed clearly to signify who, why, and when the change was made. Errors repeated across many observers may signify a problem with the protocol or datasheet and should be addressed as soon as possible in consultation with the NETN data manager.

Once the 10% check of the Bird Data Coding Sheets is completed the PM will conduct a 100% check of all the bird data entered into the online database. Data are coded as "unverified" in the database and will not show in the public search area until the PM reviews data and marks them as "verified." The 100% check is conducted by checking every database record against its Data Coding Sheet record. Only the PM and DM have the ability to edit data once they have been entered. Data verification is necessary to ensure that values recorded on the field form and keyed into the database are correctly entered (i.e., the entered value is the "correct" value). The PM will note any changes made to the database on copies of the Data Coding Sheets (date, reason, initials) and if necessary provide guidance to observers who need extra help. Once the PM is satisfied that the data is clean s/he will mark them in the database as verified.

At least once annually, the PM will enter all the mammal data summarized on Mammal Data Coding Sheets using a form found in the NETN IBI database. Because mammal data is associated with established bird point counts, the PM must download and link to the IBI database the latest version of the USGS database prior to entering any new mammal data (SOP 5 Appendix B, Linking the Databases).

Following completion of his/her data management responsibilities each year, the PM will mail all copies of the completed and verified Field Mapping Cards, Data Coding Sheets, and the latest version of the NETN IBI database to the NETN office.

As data are received the Network data manager will conduct an additional 10% check of the data transcription from Field Mapping Cards to Data Coding Sheets (using the procedures outlined above), a 10% check of the Bird Data Coding Sheets against the records in the online database, and a 100% check of the Mammal Data Coding Sheets against the records in the NETN IBI database. A greater than 2% error rate in any of the 10% checks will require that the data be returned to the PM so that a 100% check can be conducted. The DM will document and make corrections when the error rate does not exceed 2% or in the case of all discrepancies found in the mammal data.

Note that the USGS database does not enforce the preference of one species synonym over another (e.g., YRWA and MYWA are both acceptable codes). Rather than correcting the USGS database for synonyms, NETN uses a query in its Bird IBI database to convert data to preferred synonyms; use of synonyms should not be considered a data error. See SOP 5 Appendix B for details.

Data Archiving

Original data forms will be maintained by the Vermont Center for Ecostudies (VCE), but copies made on acid-free paper will be sent annually to the NETN office. The NETN will maintain at least 5 years of data in the network office; older data sheets will be periodically archived at Acadia NP. The USGS is responsible for performing periodic backups of all data residing in the central database. Each year, after all bird and mammal data for the survey year has been entered and verified, the PM will download all NETN data residing in the master database and store as an archived copy. A duplicate copy will be sent to the NETN office.

Data Requests

Requests for NETN bird monitoring data should be directed to either the PM (sfaccio@vtecostudies.org) or the NETN data manager (Adam_Kozlowski@nps.gov). Each request will be reviewed on a case-by-case basis, and any data on sensitive species (as defined by each park's Resource Manager) will be removed before data are provided.

SOP 5 Appendix A. Online data entry instructions

These instructions describe the steps required to enter data found on the Bird Data Coding Sheets into the online Bird Point Count Database. The database is designed to only store bird data. Mammal data (i.e., squirrels and chipmunks) collected during point count surveys should be transcribed to a Mammal Data Coding Sheet, checked for transcription errors, and sent to the Program Manager.

- 1) Before entering bird data into the online database, please verify that the bird coding data sheet has been checked against the original Field Mapping Cards to catch any transcription errors. If this has been completed the verification statement on the bottom of the coding sheet will have been signed and you can proceed to enter the data into the online database. If the statement hasn't been signed, please conduct a 100% check of the data before proceeding.
- 2) Navigate your web browser to the Bird Point Count Database website (<http://www.pwrc.usgs.gov/point/>). On the right side of the screen, sign-in using the username and password that you should have received via a separate email from Mark Wimer at the Bird Point Count Database. If you cannot locate your sign-in info, click on "Forgot Password" located below the sign-in section of the webpage. If you did not receive your sign-in info contact the Project Manager and he/she will get it to you ASAP.
- 3) Once you have successfully signed-in, click on "**Bird Surveys**" under My Point Counts.
- 4) Then, on the next screen, click on "**Add New Bird Survey**" on the right side of the screen.
- 5) On the next screen, select the study that you are participating in (in this case, "National Park surveys"), then select the name of your study site from the second drop down menu. Select the point count number for which you want to enter data and proceed down the list filling in the necessary info. After "**Weather Conditions,**" select, "**Enter Species Using Blank Form** (for now, ignore the last box that says, "**Or (faster) enter codes here:**"). Any additional information such as precipitation and flock information is to be included in the survey notes field. If a flock was present include the time period and name of the species and quantity. When all the fields are accurately filled out proceed to click the button "**NEXT.**"
- 6) Now you can enter data for the first point by typing in the species code in the left-hand box. An alphabetical list of species will appear as you begin typing—you can either choose the highlighted species name from the list or simply type in the correct four-letter code (please note that squirrels and chipmunks are not included in this list, so for now do not enter any that you recorded). Then from the three dropdown menus select the appropriate Time Period, ObsCode, and Distance Band. For flyovers, you can enter "not recorded" for Time Period, ObsCode, and Distance. If you get to the bottom of the screen and still have more birds to enter, click on "**Add Row**" and continue until you have entered all the individuals from the first point. Then select "**SAVE.**"

SOP 5 Appendix A. Online data entry instructions (continued).

- 7) On the next screen, you can select “**Repeat Values**” to the right of the Point Number dropdown to fill-in the previous Survey data. Change the **point number** and **start-time**, and change the other values (if needed) to reflect the weather conditions during the count.
- 8) Continue until you have entered all the data. When completed, click on “**Sign out**” in the upper right hand corner of the screen.
- 9) Send an email to the Program Manager to let him or her know you have completed data entry. Mail completed data sheets and field cards to the Program Manager.

SOP 5 Appendix B: NPS Bird IBI Database Procedures

The databases used for analyzing and reporting data for this protocol are the downloaded version of the USGS Point Count Database (obtained by the PM annually or prior to entering any mammal data), and an analytical database (NPS Bird IBI.mdb) developed by NETN staff. The procedures described in this appendix cover linking the databases and using the NPS Bird IBI database to generate the assessments described in SOP 7 - Data Reporting. These procedures are written for Microsoft Access 2003.

Linking the Databases

- 1) Open "NPS Bird IBI.mdb"
- 2) Choose Tools... Database Utilities... Linked Table Manager
- 3) Click "Select All," "Always prompt for new location" and then "OK"
- 4) Navigate to the latest version of the data downloaded from the USGS, and double-click on the file
- 5) The message "All selected linked tables were successfully refreshed" should display.
- 6) You will not need to re-link the databases again unless the USGS database is moved or its name changed, or a new version of the NPS Bird IBI database is received. If the USGS database is replaced with an updated database that has the same name, there is no need to re-link the databases unless the table names changed.

Using the NPS Bird IBI Database

- 1) The database will open to the Main Switchboard.
- 2) If this is your first use of the database for the reporting year, make sure to follow the procedures for "Annual Update to the IBI Database", below. In particular, new observers need to be added correctly for their data to be viewable, and the report forms need to be updated to show the current year's data.
- 3) If there have been any change to the data in the USGS point count database, it is essential to click "Update Tables" to ensure that the tables in the NPS Bird IBI database are correctly populated. The update will take a few minutes and a progress bar will display; when the cursor changes back to a pointer instead of an hourglass, the update is finished.
- 4) There will not normally be a need to work with the queries and tables in the NPS Bird IBI database; to view the database, press F11.
- 5) From the main switchboard, clicking on the Add Mammal Data button will open a customized data entry form. Select the location, date, observer, and point for the survey to which mammal data will be added. It is essential that the bird data for that survey already be entered in order for the data to link properly. If the point count in the mammal form's dropdown list isn't visible, verify that the most recent version/copy of the USGS database is linked to the IBI database. If so, check online to insure the bird data from that survey has already been entered.
- 6) Park and Site summary reports and charts (frequency of 10 most abundant species) can be viewed and exported using "Park and Site Summary Reports and Export". Reports can be viewed by park or site and the data can be exported to Excel (spreadsheets will export to c:\temp; make sure this directory exists on your computer).
 - a. The column in the exported spreadsheet that contains the average number of birds of each species per site (or park) does not always contain the correct value. If a species was not seen at the site or park in one or more years, the value will be overestimated.

SOP 5 Appendix B: NPS Bird IBI Database Procedures (continued).

- The values in the report are correct.
- b. Charts will not export to Excel or Word; they can be printed to pdf if Adobe Acrobat is installed, or captured with a screen capture utility and inserted into a document as images.
 - c. Park and site summaries and charts are based only on the first visit to each point in each year to help make comparisons between years more consistent. The IBI reports, trend reports, and statistical modeling use all data collected, and repeat visits are particularly helpful for the statistical modeling.
- 7) Forest IBI reports can be viewed and exported using the “Forest IBI Reports and Export.” Reports can be viewed by park or site and the data exported to Excel (spreadsheets will export to c:\temp; make sure this directory exists on your computer). These reports use all data collected for a given point, including repeat visits. From the switchboard the multi-year IBI form can be opened, which generates IBI reports using multiple years of data.
- 8) Grassland IBI data can be viewed and exported using the “Grassland IBI Reports and Export.” The spreadsheets will export to c:\temp. These reports also use all data collected for a given point, including repeat visits. From the switchboard the multi-year IBI form can be opened, which generates IBI reports using multiple years of data.
- 9) The other reports that are available include:
- a. A list of all detections, with year, park, site, species, time, and distance. This may be useful for QC. The same button also opens queries listing the number of individual detections by site and by park for each year. These queries include all detections, including those from repeat visits of the same point.
 - b. A list of species that were detected on second and later surveys that were not detected during the first survey of each route.
 - c. Partners in Flight (PIF) Regional Concern and Continental Concern detections—numbers of individuals of each PIF species seen at each park. This query includes all detections, including those from repeat visits of the same point.
 - d. Connect the Dots Summary—this includes the calculation of the Shannon index by park, species richness by park, and PIF species seen in each park. The Shannon index is based only on the first visit to each point each year; the other data is based on all detections.
 - e. Sites Not Surveyed—Lists the sites that were not sampled each year.
 - f. There are also two reports listing the species in each guild.

Annual Update to the IBI Database

- 1) Every year, the observer tables will need to be synchronized because NETN stores some additional information about observers in the IBI database that is not saved in the USGS database. If all NETN observers in the IBI database are not correctly matched (using the field pwrc_ObsID) to the USGS database, then data for observers that are not in the NETN database or with incorrect pwrc_ObsID values will not be reported. This process is needed so that surveys from poor observers (skill level of 1) can be automatically excluded from reports.
- a. On the main switchboard, click on “Update and Verify Observers”. A dialog box will open, either with a warning that some observers don’t have matching

SOP 5 Appendix B: NPS Bird IBI Database Procedures (continued).

- pwr ObsID values, or a notice to update observer information and then press the “Update and Verify Observers” button again.
- b. If a warning is displayed, two tables and two queries will open after clicking OK. The first query lists records where the pwr ObsID in the NETN table does not match any values in the USGS table. The second lists records where either the first or last names do not match across the two tables. The two tables are t_Observers (from the USGS database, read only) and tbl_NETN_Observers (from the IBI database, editable). Use the queries to help correct the information in tbl_NETN_Observers. Once the information is updated, close both tables and both queries and click on “Update and Verify Observers” again to see if the corrections worked.
 - c. If a notice is received, two tables will open after clicking OK to the message: t_Observers (read only, from the USGS database) and tbl_NETN_Observers (editable). Review the table to add any notes about observers (whether they are active or not, and update their skill level and observer notes with any new information. In addition, add any new observers to the table, and get their correct pwr ObsID off of t_observers. If a record is not added for each new observer, their monitoring data will not be reported by the IBI database.
 - d. After making any changes to tbl_NETN_Observers, click on “Update and Verify Observers” again to ensure that the warning does not display.
- 2) If there is a new site added to the program:
 - a. Adding a new site will require adding a new query: “Qry_Site_Summary_Report_2N”, where N is the next available letter and the new site name is used to limit the query.
 - b. Then the macro mac_Switchboard.UpdateTables will need a new row to include the new site in the intermediate table tbl_Site_Summary_Report_Intermediate
 - 3) If there is a new park added to the program:
 - a. Adding a new park will require adding a new query: “Qry_Park_Summary_Report_2N”, where N is the next available letter and the new park name is used to limit the query.
 - b. Then the union query “Qry_Park_Summary_Report_2” will need a new UNION ALL statement for the added query.
 - 4) The Park Summary Report will need to be updated every year:
 - a. Update the report’s data source to include the new year for both the total number of points and for Shannon diversity (add the fields using the query builder). Add these new fields to the report.
 - b. Copy a set of fields from an earlier year and paste them into a clear spot on the report. Separate out the overlapping fields and name them correctly: the bottom field (control source will be =[YYYY]) should be named YYYY. The field with no formatting is YYYYDefault; the italicized field is YYYYCommon; the bold field is YYYYPIF; and the bold/italics field is YYYYPIF_Common. Edit the data source for each field to refer to the correct year in each formula.
 - i. Conditional formatting could have been used to display the appropriate formatting for report data, but unfortunately conditional formatting does

SOP 5 Appendix B: NPS Bird IBI Database Procedures (continued).

not export from Access.

- c. Add text box to calculate richness, named YYYY_Richness
 - d. Add text box to calculate birds per point, named YYYY_BPP
- 5) The Site Summary Report will also need an annual update. Follow 3A through 3D.
NOTE: New fields from the Park Summary Report can be copied and pasted to the Site Summary Report; pasted items will have the same names and formulas as in the original.
- 6) Verify that no bird codes corresponding to birds in an IBI guild have changed. Use a query to link the guild list table with the species lookup table, and use a join to determine whether there are species in the IBI guild table that lack a corresponding code in the lookup table. Correct any mismatched codes.

Other Updates to the IBI Database

- 1) Unknown Species and Synonyms. The IBI database removes codes for unknown species (currently UNKN, UNWO, and UNGU) prior to reporting, and also converts synonyms to preferred codes (currently DEJU to SCJU, YRWA to MYWA, NOFL to YSFL, and SOVI to BHVI). The corrected table of species records is actually a query, "t_PointCounts_dist," and the corrections are made by the query "Qry_t_Point_Counts_dist." To change the unknown species exclusions or synonym conversion, modify the information in the third column of the query. To excluder a new Unknown code , add another "And <>" statement followed by the four letter code (in quotes). For a new synonym conversion, add a new nested IIF statement. Note that this query also limits the records used to the NETN surveys (since the USGS also provides the VCE FBMP data) and to observers with skill level greater than "1".

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	January 2006	Steve Faccio	SOP used beginning with the 2006 field season.	
1.01	April 2006	Brian Mitchell	Added revision log.	
2.00	October 2008	Steve Faccio	Major revision to reflect use of the USGS Point Count Database.	
			Added Appendix 5.1: Data Entry Instructions.	
			Moved revision log to Appendix 5.2.	
3.00	March 2009	Brian Mitchell	Moved revision log to Appendix 5.3.	
			Added Appendix 5.2: NPS Bird IBI Database Procedures.	
3.01	April 2009	Brian Mitchell	Updated Appendix 5.2 to reflect addition of park and site summary reports and charts, grassland IBI reports, and some database maintenance tasks that will be needed each year.	
3.02	August 2009	Sarah Lupis	Formatting, minor editorial changes.	
3.03	December 2009	Steve Faccio and Brian Mitchell	Minor revision in response to reviewers comments; updated Appendix B to reflect changes in the database.	
4.00	February 2010	Adam Kozlowski	Major revisions to body of document to flesh out specific QAQC procedures. Added Figures 1 through 3. Added instructions on handling mammal data.	
4.01	May 2011	Brian Mitchell and Kevin Morris	Update online data entry instructions, including procedures for entering flock data.	Refined procedures.
			Update IBI database instructions to include management of volunteer information.	Need to eliminate data from poor observers.

SOP 6 - Data Analysis

Northeast Temperate Network

Version 1.02

Overview

This SOP discusses analytical procedures for bird data collected using point counts.

A wide variety of appropriate analytical methods may be used with point count data, depending on the objectives of the monitoring program, as well as those of the various parks within the Northeast Temperate Network (NETN). Analyses will include annual summaries that consist of relatively simple statistical tabulations, and periodically more complex methods that may include estimates of population densities, trends, and species habitat associations. In some cases, these more complex analyses may require the assistance of a professional biostatistician.

With minor exceptions, our data analysis procedures and recommendations will follow those described in SOP #9 of the U.S. Fish and Wildlife Service (USFWS) Landbird Monitoring Protocol (Knutson et al. 2008). That document provides recommendations about which analyses should occur annually, and which should occur on a periodic basis (e.g., every 3-5 years). We will work with the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center to streamline some common data summaries and analyses to enhance the usefulness of the Bird Point Count Database. Below we describe the two primary ways that our data analysis methods will differ from Knutson et al. (2008).

1. In the USFWS protocols, vegetation data are collected in association with bird point counts (see SOP #6 in Knutson et al. 2008), and recommendations are made in SOP #9 on how to summarize and analyze these data annually and periodically. Although we are not collecting habitat data at each avian point count, forest vegetation sampling is being conducted within NETN parks, and we will attempt to associate vegetation data from nearby forest monitoring plots that are in the same habitat type using appropriate statistical methods.
2. We will assess the biological integrity of the avian community as described in SOP #7, rather than using methods based on Howe et al. (2007a, 2007b) as described in SOP #9 of the USFWS protocol.

Beginning by 2011, NETN will develop additional analyses that may become standardized for trend reporting. If standardized analyses are possible (e.g., for occupancy modeling), details will be added to this SOP.

Literature Cited

- Howe, R. W., R. R. Regal, J. Hanowski, G. J. Niemi, N. P. Danz, and C. R. Smith. 2007a. An index of ecological condition based on bird assemblages in Great Lakes coastal wetlands. *Journal of Great Lakes Research* 33:93-105.
- Howe, R. W., R. R. Regal, G. J. Niemi, N. P. Danz, and J. Hanowski. 2007b. Probability-based indicator of ecological condition. *Ecological Indicators* 7:793-806.
- Knutson, M. G., N. P. Danz, T. W. Sutherland, and B. R. Gray. 2008. Landbird Monitoring Protocol for the U.S. Fish and Wildlife Service, Midwest and Northeast Regions, Version 1. Biological Monitoring Team Technical Report BMT-2008-01. U.S. Fish and Wildlife Service, La Crosse, Wisconsin.

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	April 2009	Steve Faccio	SOP written.	
1.01	August 2009	Sarah Lupis	Revision History Log added Formatting, minor editorial changes.	
1.02	December 2009	Brian Mitchell	Removed reference to Appendix 2 and added statement that additional details will be provided as standardized analyses are developed.	

SOP 7 - Data Reporting

Northeast Temperate Network

Version 2.02

Overview

This SOP explains the procedure for data reporting.

Effective communication and reporting is essential for transforming field data into a format that is both useful and clearly understandable by park managers, scientists, the public, and policy makers. This will be accomplished by developing standard statistical summaries of vital sign measurements, as well as developing a biological integrity scorecard that provides basic interpretation of the status and trends for this vital sign. Refer to SOP 6 - Data Analysis for a description of how to summarize and analyze the data.

Several different types of reports summarizing and interpreting bird survey data may be presented, including annual reports, analysis and synthesis reports (e.g., population trends and habitat relationships), protocol review reports, scientific journal articles, and symposia, meetings, and workshops. At a minimum, two different interim (annual) reports will be produced at the close of each season's fieldwork: the Northeast Temperate Network (NETN) Fiscal Year Report, and an Annual Data Summary Report.

NETN Fiscal Year Report

Due annually in October, this consists of a brief (< 1-page) report summarizing any highlights and significant findings, including any publications, reports, and presentations, that have come out of the work over the course of the fiscal year. The NETN Program Manager will provide guidance and examples of previous reports as needed.

Annual Data Summary Report

This report summarizes results from the field season by park, and describes patterns of bird composition, distribution, and change, as well as assessing the biotic integrity of the avian community (see below). This report is due by March/April each year following a survey and is submitted to the NETN Program Manager, to each NETN park, and to all volunteer participants.

Forest Bird Assessment

An assessment of the biotic integrity of the avian community based on an assemblage of behavioral and physiological response guilds, similar to O'Connell et al. (2000), will be utilized for forest birds (an assessment and scorecard ranking for the grassland bird community at Saratoga NHP is discussed below). Such a biotic integrity scorecard will help elucidate changes in a broader, landscape context and indicate in which direction the park may be moving along a disturbance gradient from "highly disturbed" or "urban," to "pristine" or "natural." Croonquist and Brooks (1991) demonstrated that response guilds, which are groups of species that require similar habitat, food, or other elements for survival, are effective indicators of habitat disturbance. Changes in availability of specific resources are manifested as population responses in the species dependant on that resource. For example, the loss of snags in a forest stand can

result in a decrease in the guild of bark-probing insectivores. As O'Connell et al. (2000) indicate, an assessment of response guilds functions like an index of biotic integrity (Karr 1991, Karr and Chu 1999), providing a system-specific framework in which species assemblages can be ranked on a qualitative scale. This type of avian integrity assessment provides a means to estimate condition that, unlike species richness or Shannon diversity, is not confounded by intermediate levels of disturbance as demonstrated by Blair (1996).

The guild-based avian integrity scorecard is based upon O'Connell et al. (2000) and consists of 13 guilds in eight guild categories (Table 1). Individual guilds were broadly categorized as "specialist" or "generalist" based on each guild's relationship to specific elements of ecosystem structure, function, and composition (Noss 1990). A specialist can be a species with a narrow range of habitat tolerances, or one that exhibits a low intrinsic rate of population increase. For our purposes, specialist guilds may be thought of as "guilds indicative of a high-integrity condition" while generalist guilds are "guilds indicative of a low-integrity condition." For example, the Nest Placement guilds relate directly to the availability of appropriate nesting substrate (a structural element). Therefore, birds that only nest in the forest canopy (specialists) indicate high integrity condition because they are largely restricted to mature forests native to the region, while shrub nesters (generalists) also encounter appropriate nesting substrate in regenerating forests, agricultural hedgerows, and suburban areas. Functional elements of the ecosystem reflect trophic organization. For example, insectivores are limited to areas of high insect availability (specialists), while omnivores can exploit the range of food resources found in varied habitats (generalists). Ecosystem composition reflects organization induced by factors other than structure and function (e.g., interspecific dynamics). For example, species in the nest predator/brood parasite guild can affect the abundance and distribution of other species. We consider nest predators and brood parasites to be generalists due to their relatively indiscriminate exploitation of other species as sources of food or surrogate parents, while many single-brooded species (specialists) are restricted to large habitat patches that are relatively free from nest predators and brood parasites.

It is important to keep in mind that guilds were selected to reflect different aspects of each species' life history traits. Therefore, species may belong to several guilds simultaneously, including both specialist and generalist guilds.

With species assigned to guilds (see SOP 7 Appendix A), the proportional species richness of each guild is calculated. Proportional species richness is the number of guild members detected, divided by the total number of species detected. This value is used to determine a rank of "Good", "Caution", or "Significant Concern" (Table 2). "Good" represents acceptable or desired conditions (a high level of ecological function); "Caution" indicates a problem may exist; "Significant Concern" indicates undesired conditions (hampered ecological function) that may benefit from management action.

Table 1. Biotic integrity elements, guild categories, response guilds, and guild interpretations used in avian biotic integrity scorecard.

Biotic Integrity Element	Guild Category	Response Guild	Specialist	Generalist
Functional	Trophic	Omnivore		X
Functional	Insectivore forager	Bark prober	X	
Functional	Insectivore forager	Ground gleaner	X	
Functional	Insectivore forager	High Canopy forager	X	
Functional	Insectivore forager	Low Canopy forager	X	
Compositional	Origin	Exotic		X
Compositional	Migratory	Resident		X
Compositional	Number of broods	Single-brooded	X	
Compositional	Population limiting	Nest predator/brood parasite		X
Structural	Nest Placement	Canopy Nester	X	
Structural	Nest Placement	Shrub Nester		X
Structural	Nest Placement	Forest-ground Nester	X	
Structural	Primary habitat	Interior forest obligate	X	

Table 2. Avian Integrity Ranks for 13 response guilds and proportional species richness thresholds (based on O’Connell et al. 2000, and Glennon and Porter 2005).

Biotic Integrity Element	Response Guild Metric (Proportional Species Richness)	Ratings		
		Good	Caution	Significant Concern
Functional	Omnivore	<30%	30-50%	>50%
	Bark Prober	>11%	4-11%	<4%
	Ground Gleaner	>9%	4-9%	<4%
	High Canopy Forager	>12%	7-12%	<7%
	Low Canopy Forager	>22%	14-22%	<14%
Compositional	Exotic Species	0%	0.5-7%	>7%
	Residents	<28%	28-41%	>41%
	Single Brooded	>68%	50-68%	<50%
	Nest Predators/Brood Parasite	<10%	10-15%	>15%
Structural	Canopy Nester	>35%	29-35%	<29%
	Shrub Nester	<18%	18-24%	>24%
	Forest-ground Nester	>18%	5-18%	<5%
	Interior Forest Obligate	>35%	10-35%	<10%

For example, if the bird community at a given site contains a total of 10 species, two of which are omnivores, then 20% of the species at that site are in the omnivore guild, and the site receives a rank of “Good” for that guild (Table 2). The proportional species richness thresholds and ranks are largely based on those derived by O’Connell et al. (2000) for birds in forested habitats in the central Appalachians, as well as from those derived by Glennon and Porter (2005) for New York’s Adirondack Park. Considering the wide geographic range over which the 11 NETN parks are distributed, the threshold values listed in Table 2 may need to be adjusted by bioregion, forest type or Bird Conservation Region (BCR), rather than Network-wide. Additionally, these threshold values can be refined over time as new information about their ecological relevance is obtained.

Some ecological integrity reporting efforts have developed point-based indices to aggregate information describing integrity of individual metrics into overall ecosystem scores (Karr 1981,

O’Connell et al. 2000). The success of those efforts relies upon a subjective understanding of the relative importance of individual metrics in determining overall ecosystem integrity, and in some cases may obscure individual ecosystem components that are in need of attention. Thus, this avian integrity scorecard attempts to concisely convey information on each individual response guild metric, and provide summary information only on the number of metrics classified as “Good,” “Caution,” and “Significant Concern” in each park. We recognize that the National Park Service (NPS) will need to aggregate this information at higher levels (such as by Vital Sign) for reporting at the national level. For that reason, this scorecard adheres to NPS Vital Signs reporting conventions, and should provide NPS with the necessary information for aggregation.

The following section provides an overview, justification, and scaling rationale for each metric.

Functional Guilds

Omnivores

Overview: This metric evaluates the proportion of omnivorous species within the avian community.

Metric Justification: Omnivores can exploit a wide range of food resources found in varied habitats, and therefore are considered generalists that do not require high integrity or specialized habitats. This large guild consists of 44 species, including American Crow (*Corvus brachyrhynchos*), Blue Jay (*Cyanocitta cristata*), American Robin (*Turdus migratorius*), Brown-headed Cowbird (*Molothrus ater*), and sparrow species.

Scaling Rationale: O’Connell et al. (2000) found that as you move along a gradient from high-integrity to low-integrity the proportion of omnivores in the bird community increased from roughly 25% to > 50% of the species. This was less dramatic in the Adirondacks, with Glennon and Porter (2005) reporting about 29% in wilderness areas to 38% in low-density village areas.

Good = < 30%

Caution = 30-50%

Sig. Concern = > 50%

Bark Probers

Overview: This metric evaluates the proportion of species within the avian community that forage primarily by bark probing.

Metric Justification: Bark probers are insectivores that require specialized foraging opportunities, including standing snags, large diameter coarse woody debris (CWD), and/or mature to old-growth trees with deeply furrowed or flaking bark providing substrates that support abundant insect populations. Examples of bark probers include Black-and-White Warbler (*Mniotilta varia*), Brown Creeper (*Certhia americana*), Red- and White-breasted nuthatches (*Sitta canadensis*, *Sitta carolinensis*), as well as woodpecker species.

Scaling Rationale: At high-integrity sites, O’Connell et al. (2000) found that bark probers made up roughly 12% of the species in the community, but declined to 4% at low-integrity sites.

Good = > 11%
Caution = 4-11%
Sig. Concern = < 4%

Ground Gleaners

Overview: This metric evaluates the proportion of species within the avian community that forage primarily by gleaning insects from the ground.

Metric Justification: Ground gleaners are specialized insectivores that forage primarily by picking up invertebrates directly from the ground surface or leaf litter. This guild consists of seven species; Northern Flicker (*Colaptes auratus*), Hermit Thrush (*Catharus guttatus*), Kentucky Warbler (*Oporornis formosus*), Worm-eating Warbler (*Helmitheros vermivorus*), Mourning Warbler (*Oporornis philadelphia*), Ovenbird (*Seiurus aurocapillus*), and Winter Wren (*Troglodytes troglodytes*).

Scaling Rationale: Similar to bark probers, O'Connell et al. (2000) found that the proportion of ground gleaners in the community decreased as you move from high-to-low integrity sites, presumably as specialized foraging opportunities and/or insect biomass declines.

Good = > 10%
Caution = 4-10%
Sig. Concern = < 4%

High Canopy Foragers

Overview: This metric evaluates the proportion of species within the avian community that forages primarily in the high canopy.

Metric Justification: High canopy foragers specialize in feeding high in the forest canopy. These species are typically restricted to mature forests and many are considered forest interior obligates. The vast majority of the 15 species in this guild are insectivores, including Blackburnian Warbler (*Dendroica fusca*), Cape May Warbler (*Dendroica tigrina*), and Bay-breasted Warbler (*Dendroica castanea*), Blue-gray Gnatcatcher (*Polioptila caerulea*), and Red-eyed Vireo (*Vireo olivaceus*). However, both Red (*Loxia curvirostra*) and White-winged (*Loxia leucoptera*) crossbills, which specialize in feeding on conifer seeds, are also included this category.

Scaling Rationale: The proportion of species in a community that forage in the high canopy declines from about 13% to 6% as you move along a gradient from high- to low-integrity (O'Connell et al. 2000).

Good = > 12%
Caution = 7-12%
Sig. Concern = < 7%

Low Canopy Foragers

Overview: This metric evaluates the proportion of species within the avian community that forage primarily in the low canopy.

Metric Justification: Primarily insectivores that specialize in feeding in the understory of forests, forest edges, or in early successional stands, this guild consists of 28 species, including Black-capped (*Poecile atricapillus*), Boreal (*Poecile hudsonicus*), and Carolina (*Poecile carolinensis*) chickadees, Black-billed (*Coccyzus erythrophthalmus*) and Yellow-billed (*Coccyzus americanus*) cuckoos, and 15 species of warblers.

Scaling Rational: Low canopy foragers were relatively well-represented in all integrity categories (O'Connell et al. 2000), although a decline in proportional species richness is clearly evident along a gradient from high- to low-integrity sites. At high-integrity sites roughly 23% of the species in the community were low canopy foragers, while 13% of this guild was found at low-integrity sites.

Good = > 22%

Caution = 14-22%

Sig. Concern = < 14%

Compositional Guilds

Exotic Species

Overview: This metric evaluates the proportion of species within the avian community that are exotics.

Metric Justification: The effects of exotic species on the structure, composition and function of natural systems have become a chief concern of ecologists and land managers over the last 20 years (Drake et al. 1989). The introduction of exotic bird species has resulted in a variety of ecological problems ranging from the extinction of indigenous species and the disruption of natural communities (Temple 1992), to increased competition for nest sites (Kerpez and Smith 1990). This guild consists of four species; European Starling (*Sturnus vulgaris*), House Finch (*Carpodacus mexicanus*), House Sparrow (*Passer domesticus*), and Rock Dove (*Columba livia*).

Scaling Rationale: O'Connell et al. (2000) found that the proportion of exotics increased from 0% in high-integrity communities to roughly 16% at low-integrity urban sites. In New York State's Adirondack Park, Glennon and Porter (2005) found the proportion of exotic birds averaged about 0.1% in wilderness sites, to 2.2% at low-density rural sites, and 5.2% in low-density village areas.

Good = 0%

Caution = 0.5-7%

Sig. Concern = > 7%

Resident Species

Overview: This metric evaluates the proportion of species within the avian community that are resident in the study area year-round.

Metric Justification: The non-migratory resident guild is made up of 31 species that exploit a variety of habitats and food resources. Most of these species occupy edge habitats, are tolerant of human disturbance, relatively early breeders, opportunistic foragers, and some may produce

multiple broods in a season. This guild includes the corvids, chickadees, nuthatches, and all four exotics listed above.

Scaling Rationale: The proportion of non-migratory resident species in the community ranged from 28% at high-integrity sites, to 42% at low-integrity rural sites, to roughly 70% at low-integrity urban sites (O'Connell et al. 2000, Schmiegelow et al. 1997).

Good = < 28%

Caution = 28-41%

Sig. Concern = > 41%

Single Brooded

Overview: This metric evaluates the proportion of species within the avian community that are single-brooded (e.g., do not produce a second clutch of eggs after successfully fledging young).

Metric Justification: Many single-brooded species are restricted to interior forest habitat, and are absent from smaller forest fragments due to increased competition and higher rates of predation and nest parasitism associated with edge habitats (Freemark and Collins 1992). This large guild contains 72 species, the vast majority of which are long-distance, neotropical migrants, including flycatchers, warblers, orioles, vireos and others.

Scaling Rationale: At high-integrity sites, O'Connell et al. (2000) found that nearly 75% of the bird community was comprised of single-brooded species, while at low-integrity sites the proportion dropped to <40%. In the Adirondack Park, Glennon and Porter (2005) found that in wilderness areas, single-brooded species made up nearly 79% of the bird community, but dropped to 61% in forest stands within developed areas of the park.

Good = > 68%

Caution = 50-68%

Sig. Concern = < 50%

Nest Predators/Brood Parasites

Overview: This metric evaluates the proportion of species within the avian community that are nest predators or brood parasites.

Metric Justification: Nest predators and brood parasites have been shown to negatively affect the distribution, abundance, and nest success of other bird species, particularly neotropical migrants (Wilcove 1985, Robinson et al. 1993), and these effects increase significantly in fragmented and edge habitats (Robinson et al. 1995). This guild consists of seven species, six of which are nest predators (including five corvids and the European Starling), and the Brown-headed Cowbird, a brood parasite.

Scaling Rationale: O'Connell et al. (2000) found this guild increases from < 10% of the species in the community at high-integrity sites, to > 20% at low-integrity urban sites.

Good = < 10%
Caution = 10-15%
Sig. Concern = > 15%

Structural Guilds

Canopy Nesters

Overview: This metric evaluates the proportion of species within the avian community that nest in the canopy.

Metric Justification: Tree canopy nesters are considered specialists indicative of high integrity because they typically require mature forests native to the region. This guild consists of 33 species ranging from American (*Corvus brachyrhynchos*) and Fish crow (*Corvus ossifragus*), to Eastern Wood-Pewee (*Contopus virens*), Baltimore (*Icterus galbula*) and Orchard orioles (*Icterus spurius*), and several warblers.

Scaling Justification: O'Connell et al. (2000) found canopy nesters decreasing from 37% of the community in high-integrity sites, to about 25% in lower-integrity sites.

Good = > 35%
Caution = 29-35%
Sig. Concern = < 29%

Shrub Nesters

Overview: This metric evaluates the proportion of species within the avian community that nest in the shrub layer, including forest understory, agricultural hedgerows, early successional habitats, and suburban areas.

Metric Justification: Shrub nesters, considered generalists, typically do not require specialized habitats such as mature forests, but encounter suitable nesting substrate in a variety of areas, from regenerating forests, to hedgerows, ornamental plantings, and forest edges. This guild contains 26 species ranging from American Goldfinch (*Carduelis tristis*), to Indigo Bunting (*Passerina cyanea*), Gray Catbird (*Dumetella carolinensis*) and several warblers.

Scaling Rationale: In the Adirondack Park, Glennon and Porter (2005) found the proportion of shrub nesters in the community increased from 16% in wilderness areas to about 21% in more developed regions of the park. In the central Appalachians, O'Connell et al. (2000) found this guild represented about 21% of high-integrity communities, and increased to 29% at low-integrity sites.

Good = < 18%
Caution = 18-24%
Sig. Concern = > 24%

Forest-ground Nesters

Overview: This metric evaluates the proportion of species within the avian community that nest on the ground within forested habitat.

Metric Justification: This guild consists of 16 species, 10 of which are warblers that require specific habitat characteristics for nesting. It includes species that nest in mature forest stands as well as in early successional or regenerating forests. Studies have demonstrated that overbrowse associated with high densities of White-tailed Deer in forests of eastern North America have significant effects on the abundance and diversity of understory and ground nesting forest birds (McShea and Rappole 2000), and may be contributing to long-term declines associated with several species.

Scaling Rationale: O'Connell et al. (2000) found that forest-ground nesters comprised 20% of the bird community at high-integrity sites, and declined to 3% at low-integrity rural sites, and 0% in low-integrity urban sites.

Good = > 18%

Caution = 5-18%

Sig. Concern = < 5%

Interior Forest Obligates

Overview: This metric evaluates the proportion of species within the avian community that requires larger blocks of interior forests.

Metric Justification: Smaller forest fragments (<10ha) tend to support few, if any, area-sensitive or forest-interior birds (Robbins et al. 1989, Freemark and Collins 1992). In the latter study, sites with the greatest overall forest cover supported the highest numbers of area-sensitive species, and the numbers of forest-interior species increased most rapidly with forest size. Also, both O'Connell et al. (2000) and Glennon and Porter (2005) demonstrated that the interior forest guild declined with increasing human disturbance.

Scaling Rationale: In the central Appalachians, O'Connell et al. (2000) found that interior forest obligates accounted for nearly 50% of the bird community at high-integrity sites, but declined rapidly to about 5% at low-integrity urban sites. In the Adirondacks, Glennon and Porter (2005) found that interior forest birds represented about 26% of the bird community in wilderness and wild forest lands, compared to 15% in low density developed areas of the park.

Good = > 35%

Caution = 10-35%

Sig. Concern = < 10%

Grassland Bird Assessment—Draft

The integrity of the grassland bird community at Saratoga NHP (SARA) will be assessed with metrics based on the abundance and proportional richness of grassland obligate species, shrub-dependant species, edge generalist species, and exotics (Tables 3 and 4). In addition, for both the grassland and shrubland groups, we will report the proportion of PIF priority species for BCR 13 that are detected out of the total number of PIF priority species for each group (e.g., the number

of PIF Priority grassland species detected divided by the total number of PIF Priority grassland species). This will help us measure the overall value of grassland and early successional communities at SARA to rare or declining birds that are dependent on these habitats within the region (Table 4). The threshold values for these metrics were determined from Browder et al. (2002) and Coppedge et al. (2006), and using data from the pilot season of grassland surveys at SARA. These values may be refined over time as additional regional and park-specific data are accumulated and analyzed.

Table 3. Avian scorecard metrics for grassland bird surveys at Saratoga NHP, Saratoga, New York.

Metric	Good	Caution	Significant Concern
Abundance (birds/point)			
Edge generalist species	< 6.0	6.0-10.0	> 10.0
Shrub-dependant species	< 1.0	1.0-5.0	> 5.0
Grassland obligate species	> 4.0	1.5-4.0	< 1.5
Exotic species	0.0	0.1-1.0	> 1.0
Proportional Species Richness (%)			
Edge generalist species	< 20%	20-50%	> 50%
Shrub-dependant species	< 10%	10-25%	> 25%
Grassland obligate species	> 10%	5-10%	< 5%
Exotic species	0%	0.1-3%	> 3%
Proportion of PIF Priority Grassland Species for BCR 13 (see Table 7.4) (# detected/5)	> 80%	50-80%	< 50%
Proportion of PIF Priority Shrubland Species for BCR 13 (see Table 7.4) (# detected/4)	< 50%	50-75%	> 75%

Edge Generalist Species

Overview: This metric evaluates the abundance and proportion of species within the avian community that use a variety of habitat edges adjacent to grassland habitats such as forest edges, wetlands, roadside and agricultural hedgerows, and early successional shrublands.

Metric Justification: Edge species are habitat generalists that do not respond to the presence of the large, contiguous grassland habitat being surveyed, and are just as likely to be found in suburban parks, residential developments, and powerline rights-of-way. This guild contains 28 species ranging from American and Fish Crows, to Mourning Dove, Song Sparrow, and Eastern Bluebird (*Sialia sialis*). Two (7%) of the species in this guild, Baltimore Oriole (*Icterus galbula*) and Eastern Kingbird (*Tyrannus tyrannus*) are listed as conservation priorities for BCR 13 by PIF (Table 4).

Scaling Rationale: Pilot data from the 25 grassland point counts surveyed at SARA in 2006, resulted in an edge species abundance of 7.9 individuals per point. In addition, 28% of the species detected consisted of edge species. Making an assumption that the SARA grassland habitats are somewhere in the middle along an ecological integrity gradient due to the relative size of the fields, as well as their proximity to roads, and impacts from human disturbance and other factors, we adjusted the thresholds accordingly.

Abundance (individuals/point)

Good = < 6.0

Caution = 6.0-10.0

Sig. Concern = > 10.0

Table 4. Species assignments within grassland obligate, shrub-dependant, and edge generalist guilds, and PIF priority codes for BCR 13.

Guild	Species	PIF Priority Code¹ (BCR 13)
Grassland Obligate	Bobolink	RC, RS
	Eastern Meadowlark	RC
	Grasshopper Sparrow	
	Henslow's Sparrow	CC, RC
	Savannah Sparrow	RC
	Vesper Sparrow	
Shrub-dependant	Blue-winged Warbler	
	Brown Thrasher	RC
	Chestnut-sided Warbler	
	Common Yellowthroat	
	Eastern Towhee	RC
	Field Sparrow	RC
	Golden-winged Warbler	CC, RC
	Indigo Bunting	
	Mourning Warbler	
	Prairie Warbler	CC
Edge Generalist	Yellow Warbler	
	American Crow	
	American Goldfinch	
	American Robin	
	Baltimore Oriole	RC, RS
	Bank Swallow	
	Barn Swallow	
	Brown-headed Cowbird	
	Cedar Waxwing	
	Chipping Sparrow	
	Cliff Swallow	
	Common Raven	
	Eastern Bluebird	
	Eastern Kingbird	RC
	European Starling	
	Fish Crow	
	House Finch	
	House Sparrow	
	House Wren	
	Least Flycatcher	
	Mourning Dove	
	Northern Mockingbird	
	Northern Rough-winged Swallow	
	Orchard Oriole	
	Rock Dove	
	Song Sparrow	
	Tree Swallow	
	Warbling Vireo	
	White-throated Sparrow	

¹ CC – Continental Concern Watch List Species are those which are most vulnerable at the continental scale;

RC – Regional Concern Species are those which are vulnerable within the region or BCR;

RS – Regional Stewardship Species are those for which a given BCR has a high responsibility.

Proportional Species Richness

Good = < 20%

Caution = 20-50%

Sig. Concern = > 50%

Shrub-dependant Species

Overview: This metric evaluates the abundance and proportion of species within the community that depend upon early successional forest and old field/shrub habitats. Generally these habitats are maintained through management practices such as periodic (biennial) brush hogging and timbers harvests, but in some cases—such as shrub wetlands—occur naturally. Shrub-dependant species prefer habitats, such as old fields, that have a mix of young, woody plants and grasses, but are not found in grasslands that are mowed annually or grazed by livestock.

Metric Justification: This guild consists of 11 habitat specialists that depend upon early successional/shrub habitats for nesting. Three species—Brown Thrasher (*Toxostoma rufum*), Eastern Towhee (*Toxostoma rufum*), Field Sparrow (*Spizella pusilla*)—in this guild are showing long-term declines based on BBS data from BCR 13 (Sauer et al. 2005), while four are showing increasing trends. In addition, five (45%) of the species are listed by PIF as conservation priorities for the region (Table 4).

Scaling Rationale: Results from the pilot season of grassland surveys at SARA resulted in an abundance of 3.0 individuals per point for shrub-dependant species. In addition, 16% of the species detected were shrubland species. Making an assumption that the SARA grassland habitats are somewhere in the middle along an ecological integrity gradient due to the relative size of the fields, as well as their proximity to roads, and impacts from human disturbance and other factors, we adjusted the thresholds accordingly.

Abundance (individuals/point)

Good = < 1.0

Caution = 1.0-5.0

Sig. Concern = > 5.0

Proportional Species Richness

Good = < 10%

Caution = 10-25%

Sig. Concern = > 25%

Grassland Obligate Species

Overview: This metric evaluates the abundance and proportion of species that are dependant on grassland habitat. Birds in this guild prefer large open fields with a variety of grass species and little if any woody vegetation. Most often these habitats are maintained through annual late-season mowing or livestock grazing.

Metric Justification: The presence of many grassland species, combined with the absence of those species associated with woody vegetation, human-made structures, or cropland, can predict

a measure of grassland integrity (Browder et al. 2002). The majority of the species in this guild are found more frequently in relatively large grasslands than smaller fragments. This guild consists of six species, all of which show long-term population declines on BBS routes from BCR 13 between 1966 and 2005 (Sauer et al. 2005). In addition, all six species are listed as conservation priorities in BCR 13 by PIF (Table 4).

Scaling Rationale: Using results from the pilot season of grassland surveys at SARA, we found that the abundance of grassland obligates was 2.4 individuals per point. In addition, 8.2% of the species detected were grassland obligates. Assuming that the SARA grassland habitats are somewhere in the middle along an ecological integrity gradient due to the relative size of the fields, as well as their proximity to roads, and impacts from human disturbance and other factors, we adjusted the thresholds accordingly.

Abundance (individuals/point)

Good = > 4.0

Caution = 1.5-4.0

Sig. Concern = < 1.5

Proportional Species Richness

Good = > 10%

Caution = 5-10%

Sig. Concern = < 5%

Exotic Species

Overview: This metric evaluates the proportion of species within the avian grassland community that are exotics.

Metric Justification: The effects of exotic species on the structure, composition and function of natural systems have become a chief concern of ecologists and land managers over the last 20 years (Drake et al. 1989). The introduction of exotic bird species has resulted in a variety of ecological problems ranging from the extinction of indigenous species and the disruption of natural communities (Temple 1992), to increased competition for nest sites (Kerpez and Smith 1990). This guild consists of four species; European Starling, House Finch, House Sparrow, and Rock Dove.

Scaling Rationale: O'Connell et al. (2000) found that the proportion of exotics increased from 0% in high-integrity communities to roughly 16% at low-integrity urban sites. In New York State's Adirondack Park, Glennon and Porter (2005) found the proportion of exotic birds averaged about 0.1% in wilderness sites, to 2.2% at low-density rural sites, and 5.2% in low-density village areas. Results from the pilot season of data collection showed that grassland habitats at SARA supported 0.6 individual exotics per point, and the only non-native observed was European Starling, representing 1.6% of the species detected.

Abundance (individuals/point)

Good = 0

Caution = 0.1-1.0

Sig. Concern = > 1.0

Proportional Species Richness

Good = 0

Caution = 0.1-3%

Sig. Concern = > 3%

PIF Priority Grassland Species

Overview: This metric evaluates the proportion of grassland species detected that are listed as conservation priorities for BCR 13 by PIF.

Metric Justification: All five of the species included in the grassland obligate guild are listed as PIF priority species for BCR 13 (Table 4). The proportion that occurs on SARA grasslands is a measure of the value of these habitats for rare and/or declining species in the region.

Scaling Justification: Results from the pilot season of data collection showed that grassland habitats at SARA supported four grassland obligate landbirds, representing 80% of the PIF-listed priorities. In addition, a Northern Harrier (*Circus cyaneus*) was detected during SARA grassland surveys in 2006. While this raptor is also a PIF-listed grassland obligate species, it is not part of our target population of landbirds and therefore was not included in the grassland guild assignments.

Proportional Species Richness

Good = > 80%

Caution = 50-80%

Sig. Concern = < 50%

PIF Priority Shrubland Species

Overview: This metric evaluates the proportion of shrubland species detected that are listed as conservation priorities for BCR 13 by PIF.

Metric Justification: Five (45.5%) of the 11 species included in the shrubland guild are listed as PIF priority species for BCR 13 (Table 4). The proportion that detected during SARA grassland surveys is a measure of the value of the park for rare and/or declining shrubland species in the region.

Scaling Rationale: Results from the pilot season of data collection showed that shrubland habitats at SARA supported four (80%) of the five shrubland species listed as PIF priorities.

Proportional Species Richness

Good = > 75%

Caution = 50-75%

Sig. Concern = < 50%

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SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild.

Integrity Element	Response Guild	Species
Functional	Omnivore	American Crow
		American Goldfinch
		American Robin
		Baltimore Oriole
		Blue Jay
		Bobolink
		Brown Thrasher
		Brown-headed Cowbird
		Chipping Sparrow
		Common Grackle
		Common Raven
		Dark-eyed Junco
		Eastern Bluebird
		Eastern Meadowlark
		Eastern Towhee
		European Starling
		Evening Grosbeak
		Field Sparrow
		Fish Crow
		Grasshopper Sparrow
		Gray Catbird
		Gray Jay
		Henslow's Sparrow
		Indigo Bunting
		Lincoln's Sparrow
		Nelson's Sharp-tailed Sparrow
		Northern Cardinal
		Northern Mockingbird
		Orchard Oriole
		Pine Siskin
		Red-winged Blackbird
		Rock Dove
		Rose-breasted Grosbeak
		Ruby-throated Hummingbird
		Savannah Sparrow
		Song Sparrow
		Swainson's Thrush
		Swamp Sparrow
		Veery
		Vesper Sparrow
		White-throated Sparrow
		Wood Thrush
		Yellow-bellied Sapsucker
		Yellow-breasted Chat
	Bark Prober	Black-and-White Warbler
		Black-backed Woodpecker
		Brown Creeper
		Downy Woodpecker
		Hairy Woodpecker
		Pileated Woodpecker
		Pine Warbler

SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild (continued).

Integrity Element	Response Guild	Species
		Red-bellied Woodpecker
		Red-breasted Nuthatch
		Red-headed Woodpecker
		White-breasted Nuthatch
	Ground Gleaner	Hermit Thrush
		Kentucky Warbler
		Mourning Warbler
		Northern Flicker
		Ovenbird
		Winter Wren
	Low Canopy Forager	Worm-eating Warbler
		American Redstart
		Black-billed Cuckoo
		Black-capped Chickadee
		Blackpoll Warbler
		Black-throated Blue Warbler
		Blue-headed Vireo
		Blue-winged Warbler
		Boreal Chickadee
		Canada Warbler
		Carolina Chickadee
		Carolina Wren
		Chestnut-sided Warbler
		Common Yellowthroat
		Eastern Tufted Titmouse
		Golden-crowned Kinglet
		Golden-winged Warbler
		Hooded Warbler
		House Wren
		Magnolia Warbler
		Nashville Warbler
		Palm Warbler
		Prairie Warbler
		Ruby-crowned Kinglet
		White-eyed Vireo
		Wilson's Warbler
		Yellow Warbler
		Yellow-billed Cuckoo
		Yellow-rumped Warbler
	High Canopy Forager	Bay-breasted Warbler
		Blackburnian Warbler
		Black-throated Green Warbler
		Blue-gray Gnatcatcher
		Cape May Warbler
		Cerulean Warbler
		Northern Parula
		Philadelphia Vireo
		Red Crossbill
		Red-eyed Vireo
		Scarlet Tanager
		Tennessee Warbler
		Warbling Vireo

SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild (continued).

Integrity Element	Response Guild	Species
Compositional	Nest Predator/ Brood Parasite	White-winged Crossbill
		Yellow-throated Vireo
		American Crow
		Blue Jay
		Brown-headed Cowbird
		Common Raven
		European Starling
		Fish Crow
		Gray Jay
	Resident	American Crow
		American Goldfinch
		Black-backed Woodpecker
		Black-capped Chickadee
		Blue Jay
		Boreal Chickadee
		Brown Creeper
		Carolina Chickadee
		Carolina Wren
		Cedar Waxwing
		Common Raven
		Downy Woodpecker
		Eastern Tufted Titmouse
		European Starling
		Evening Grosbeak
		Fish Crow
		Gray Jay
		Hairy Woodpecker
		House Finch
		House Sparrow
		Mourning Dove
		Northern Cardinal
		Northern Mockingbird
	Resident (cont.)	Pileated Woodpecker
		Pine Siskin
		Purple Finch
		Red Crossbill
		Red-bellied Woodpecker
		Red-breasted Nuthatch
		Rock Dove
		White-breasted Nuthatch
	Single Brooded	White-winged Crossbill
		American Crow
		American Goldfinch
		Acadian Flycatcher
		Alder Flycatcher
		American Redstart
		Baltimore Oriole
		Bank Swallow
		Barn Swallow
		Bay-breasted Warbler
		Black-capped Chickadee

SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild (continued).

Integrity Element	Response Guild	Species
		Black-and-White Warbler
		Blackburnian Warbler
		Blackpoll Warbler
		Black-throated Blue Warbler
		Black-throated Green Warbler
		Blue-gray Gnatcatcher
		Blue-headed Vireo
		Blue-winged Warbler
		Bobolink
		Boreal Chickadee
		Brown Creeper
		Canada Warbler
		Cape May Warbler
		Carolina Chickadee
		Cedar Waxwing
		Cerulean Warbler
		Chestnut-sided Warbler
		Chimney Swift
		Cliff Swallow
		Common Raven
		Eastern Kingbird
		Eastern Tufted Titmouse
		Eastern Wood Pewee
		Fish Crow
		Golden-winged Warbler
		Great Crested Flycatcher
		Hooded Warbler
		Kentucky Warbler
	Single Brooded (cont.)	Least Flycatcher
		Louisiana Waterthrush
		Magnolia Warbler
		Mourning Warbler
		Nashville Warbler
		Northern Parula
		Northern Rough-winged Swallow
		Northern Waterthrush
		Olive-sided Flycatcher
		Orchard Oriole
		Ovenbird
		Palm Warbler
		Philadelphia Vireo
		Pine Siskin
		Pine Warbler
		Prairie Warbler
		Red-breasted Nuthatch
		Red-eyed Vireo
		Rose-breasted Grosbeak
		Scarlet Tanager
		Swainson's Thrush
		Tennessee Warbler
		Tree Swallow
		Veery
		Warbling Vireo

SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild (continued).

Integrity Element	Response Guild	Species
Structural	Exotic	White-breasted Nuthatch
		White-eyed Vireo
		Willow Flycatcher
		Wilson's Warbler
		Winter Wren
		Wood Thrush
		Worm-eating Warbler
		Yellow Warbler
		Yellow-bellied Flycatcher
		Yellow-throated Vireo
	Canopy Nester	European Starling
		House Finch
		House Sparrow
		Rock Dove
		Acadian Flycatcher
		American Crow
		American Redstart
		Bay-breasted Warbler
		Baltimore Oriole
		Blackburnian Warbler
	Canopy Nester (cont.)	Blue-gray Gnatcatcher
		Blue-headed Vireo
		Blue Jay
		Black-throated Green Warbler
		Cape May Warbler
		Cedar Waxwing
		Cerulean Warbler
		Common Raven
		Eastern Kingbird
		Eastern Wood Pewee
		Fish Crow
		Golden-crowned Kinglet
		Least Flycatcher
		Mourning Dove
		Northern Parula
		Orchard Oriole
		Pine Warbler
	Shrub Nester	Purple Finch
		Red Crossbill
		Rose-breasted Grosbeak
		Ruby-crowned Kinglet
		Ruby-throated Hummingbird
		Scarlet Tanager
		Warbling Vireo
		White-winged Crossbill
		Yellow-rumped Warbler
		Yellow-throated Vireo
		Alder Flycatcher
		American Goldfinch
		American Robin
		Black-billed Cuckoo
		Blackpoll Warbler
		Brown Thrasher

SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild (continued).

Integrity Element	Response Guild	Species
		Black-throated Blue Warbler
		Chipping Sparrow
		Common Yellowthroat
		Chestnut-sided Warbler
		Gray Catbird
		Hooded Warbler
		Indigo Bunting
		Magnolia Warbler
		Northern Cardinal
		Northern Mockingbird
		Prairie Warbler
		Red-eyed Vireo
		Red-winged Blackbird
		Swainson's Thrush
		White-eyed Vireo
	Shrub Nester (cont.)	Willow Flycatcher
		Wood Thrush
		Yellow-breasted Chat
		Yellow-billed Cuckoo
		Yellow Warbler
	Forest-ground Nester	Black-and-white Warbler
		Canada Warbler
		Dark-eyed Junco
		Eastern Towhee
		Hermit Thrush
		Kentucky Warbler
		Louisiana Waterthrush
		Mourning Warbler
		Nashville Warbler
		Northern Waterthrush
		Ovenbird
		Veery
		Worm-eating Warbler
		Wilson's Warbler
		White-throated Sparrow
		Yellow-bellied Flycatcher
	Interior Forest Obligate	Acadian Flycatcher
		American Redstart
		Black-and-White Warbler
		Black-backed Woodpecker
		Blackburnian Warbler
		Blackpoll Warbler
		Black-throated Blue Warbler
		Black-throated Green Warbler
		Blue-headed Vireo
		Brown Creeper
		Canada Warbler
		Cerulean Warbler
		Golden-crowned Kinglet
		Hairy Woodpecker
		Hermit Thrush
		Hooded Warbler
		Kentucky Warbler

SOP 7 Appendix A. Species assignments in the 13 response guilds included in the biotic integrity scorecard. Species listed alphabetically within each guild (continued).

Integrity Element	Response Guild	Species
		Louisiana Waterthrush
		Magnolia Warbler
		Northern Parula
		Northern Waterthrush
		Olive-sided Flycatcher
		Ovenbird
		Pileated Woodpecker
		Pine Warbler
	Interior Forest	Red Crossbill
	Obligate (cont.)	Red-breasted Nuthatch
		Ruby-crowned Kinglet
		Scarlet Tanager
		Swainson's Thrush
		Veery
		White-breasted Nuthatch
		White-winged Crossbill
		Winter Wren
		Worm-eating Warbler
		Yellow-bellied Flycatcher

Revision History Log

Version	Date	Revised By	Changes	Justification
1.00	May 2007	Steve Faccio	SOP used beginning with the 2007 field season.	
2.00	December 2008	Steve Faccio	Added information about biotic integrity elements and guild categories	
2.01	January 2009	Steve Faccio	Removed integrity rank numbers in favor of “Good”, “Caution”, and “Significant” Added information about annual <i>Fiscal Year</i> and <i>Data Summary</i> reports.	
2.02	August 2009	Sarah Lupis	Formatting, minor editorial changes.	

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Natural Resource Program Center
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov