

Avian surveys in Northeast Temperate Network Parks

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Design Considerations

Inference and parameter estimation

The goal of the surveys outlined in this document are to determine the spatial distribution and abundance of birds in 7 (i.e., Boston Harbor [BOHA], Minute Man [MIMA], Morristown [MORR], Roosevelt-Vanderbilt [ROVA], Saugus Iron Works [SAIR], Saratoga [SARA], and Weir Farm [WEFA]) of the national parks in the Northeast Temperate Network. We are interested in comparing vertebrate abundance among species, habitats, or sites within each park. To insure that we use a quantitative sampling technique that can eventually be used to assess changes in population sizes over space and time, we propose to use distance sampling techniques (Fancy and Sauer 2000). We propose to design an inventory to make inferences to the entire park. Past surveys in parks have often been habitat specific, with sampling often non-randomly located, which limited the spatial inferences that could be made from historical datasets.

We will attempt to quantify unbiased estimates of population and community parameters (e.g., population size) for a variety of birds. Therefore, we need to calculate the probability that species will be included in our surveys. We will calculate detection probabilities for each species in order to obtain unbiased estimates. In addition, it is vital to calculate variance estimates for population parameters in order to determine completeness of survey. Highly variable populations (or communities) will require greater sampling intensity to calculate meaningful population estimates with relatively small confidence intervals.

Sample Sizes

It is not possible to know how many surveys are needed to achieve the inventory goal of documenting 90% of the species occurring within the park. The number of surveys needed will depend on taxon, time of year, survey intensity, and variability of species occurrence. To maximize our sampling efficiency, we will analyze the first season's data using power analysis techniques (Gibbs 1995) to determine if an adequate number of surveys were conducted.

Survey Methods

No one survey technique will work for all species of birds (Bibby et al. 1992). Therefore, we have decided to focus survey efforts on breeding, diurnal landbirds, which account for the vast majority of breeding and migrant avian species in parks in the Northeast Temperate Network (including species of special concern, and Threatened and Endangered species). Parks in the Northeast Temperate Network tend to be dominated by forests, grasslands, or agricultural

habitats (Table 1), with only small percentages of some parks consisting of open water habitats. Given the habitats present in those parks, the fact that surveys are focused on breeding landbirds, and the types of birds that may be found, point counts are the most appropriate survey technique to inventory the avifauna within the Network (Ralph et al. 1995, Fancy and Sauer 2000). There are some species of birds which might require specialized surveys in certain parks (e.g., Cooper's Hawk *Accipiter cooperi* MORR, rails, marshbirds and migratory landbirds in ROVA), so some alternative survey techniques will be used to supplement point count surveys.

Point counts

The primary survey technique we will use to inventory birds in the 7 Northeast Temperate Network Parks will be point counts based on Variable Circular Plots (VCP; Reynolds 1980, Fancy and Sauer 2000). During VCP point counts, observers record the number of birds heard or seen from specific points, and the horizontal distance from the observer is also recorded. Advantages of VCP point counts are that they can be used to calculate density estimates and they can be compared to historical point count data (e.g., Breeding Bird Surveys). Point count stations are typically placed >250 m apart, with observers generally counting birds for ≤10 minutes, to minimize the probability of double-counting the same individual (Ralph et al. 1995). Observers can record detection distance as a categorical variable (e.g., 0-16 m, 17-32 m, 33-48 m etc), and there is no error as long as the estimated distance category to the bird is correct (Fancy and Sauer 2000).

To determine the location of point count stations within each Park in the Network, we propose to overlay a 125-m grid system over each park. Surveys will not be based on available habitats, unless there are some specialized habitats located within a park that resource managers suggest have to be sampled. We selected a 125 m grid system (1.56 ha or 3.9 acres per grid cell)

as bird sampling protocols generally suggest a minimum 250 m spacing between sampling locations to minimize double counting individuals (Reynolds 1980, Ralph et al. 1995b). Therefore, randomly selected adjacent grid cells would still be 250 m apart. Potential point count stations will be located in the center of each grid cell. Grid cells that are <25% inside park boundaries will not be considered for sampling. We will then determine the total number of grid cells (N) located within each park's boundaries, which based on the area of each park range from 2-883 grid cells (Table 1).

To ensure we randomly select grid points to be surveyed, we will associate a line segment (of length 1.0) with each grid point in each park and arrange these segments running from farthest north to farthest south. This will ensure sampling is spread over the park (McDonald 2000). Given budgetary and time constraints, we assume that we could survey all grid points at some parks (e.g., SAIR) and a maximum of 75 points at larger parks (15 points per day times 5 days of sampling, see below). Each grid cell will only be surveyed once, with the exception of smaller parks (e.g., SAIR) where each grid cell will be sampled on five separate days throughout the breeding season. For those parks where a subset of grid points will be sampled, we will use a randomization scheme outlined by McDonald (2000) to randomly select grid points distributed across each park unit.

Surveys will take place from dawn until a maximum of 4 hours after dawn (Ralph et al. 1995b). To maximize coverage of each park, we hope to sample as many points as is logistically feasible. Assuming that it is easy to travel between point count stations (e.g., <15 minutes between counting stations), we suggest observers should count birds for 5 minutes at each station. If travel conditions are difficult in some parks (e.g., >15 minutes between stations), we suggest observers count for 10 minutes at each station. If 5-minute point counts are used, data

will be separated into detections during first 3 minutes and those detected in last 2 minutes. For 10 minute point counts, data will be subdivided into 3, 2, and the final 5-minute period (Ralph et al. 1995b). We assume that a maximum of ~15 point count stations could be surveyed for each morning in the field. Therefore, in some small parks, we can survey all grid points within park boundaries (e.g., SAIR, WEFA), whereas only a subset of grid points could be sampled in larger parks (e.g., MORR). We feel that it is better to increase the number of sampling stations surveyed at each park, rather than repeat counts at a smaller subset of stations (Ralph et al. 1995b).

Observers will record the species, type of observation (i.e., calling, singing, visual detection), distance to the detection (each observer will be equipped with digital laser range finder accurate to within 1 m aid in distance determinations), and general habitat association of the bird. Data will be gathered primarily during the breeding season (May-early July), when birds are singing and detection probabilities are relatively high. Therefore, these data will be most useful in determining the current abundance and distribution of breeding birds in each park, and have limited value in determining which species of migrants use each park. Determining migrant use in each park is much more difficult because migrants tend to only call or are silent, therefore labor intensive techniques, such as mist netting, tend to be much more effective. Data will be entered into an Access database and analyzed using program DISTANCE (Buckland et al. 1993), therefore density estimates will be calculated for each species in each park.

Table 1. Physical descriptions of national parks in the Northeast Temperate Network.

Park	State	Ha	# grid cells ^a	Habitats
MORR	NJ	682	437	80% forest, 10% wetlands, 5% fields
SAIR	MA	4	2	Floodplain and wetland marsh, riparian woodlands, river
MIMA	MA	391	251	33% wetlands (forests, shrub swamp, emergent, riverine, etc)), 33% upland forest, 33% agriculture lands, meadow etc
ROVA	NY	202	129	55% forests, 30% wetlands (riverine, tidal freshwater marsh)
SARA	NY	1378	883	63% forests, 23% grasslands, 1% wetlands
BOHA	MA		? ^b	Drumling, islands
WEFA	CT	24	15	Forest, fields, wetlands (bog and 2 ponds)

^aApproximate number of 1.56 ha grid cells located within each park's boundaries.

^bDue to the large number islands in this park, the number of grid cells will be determine during the pilot study.

Specialized avian survey techniques

Cooper's Hawk

Morristown NHP has nesting Cooper's Hawks in the park, which are of particular interest to resource managers there. To incorporate Cooper's Hawks into the sampling scheme, we will use tape playback. After point counts are completed, observers will carry a portable tape recorder and play a 2 min recording of a Cooper's Hawk and then listen for 2 minutes (Kennedy, and Stahlecker. 1993). If any hawks are near the grid point, they should respond to the tape recording.

Grassland Birds

Saratoga NHP has extensive grassland habitat available, while Weir Farm has some grasslands available. There have been a number of years of surveys of grassland habitats in SARA and recent research suggests local extirpations of Henslow's Sparrow and Grasshopper

Sparrows in SARA. We are currently reviewing existing data and considering conducting more point counts in grasslands in SARA because we are not sure how surveys points were established during past surveys. We want to make existing data comparable across park units, therefore we may conduct more surveys of grasslands if our review of existing data deem it necessary and if Park resource managers feel that more intensive grassland surveys are required. Then, we will target more point count surveys within grasslands in the park.

Rails

Saugus Iron Works NHS, Roosevelt-Vanderbilt, and and Saratoga NHP have the potential to be breeding habitat for a number of rails and other marshbirds. At these parks in emergent wetlands, we will use tape playback techniques (Gibbs and Melvin 1993) to survey rails during early morning hours. We will also survey other species during these tape playback sessions.

Migratory landbirds, migratory waterfowl, and waders

Roosevelt-Vanderbilt has requested surveys of migratory landbirds and waterfowl. Surveys for migratory landbirds will be transects, stratified by habitat, located throughout the park. Surveys will take place weekly from August through October. Observers will walk transects at a fixed rate recording species, number of individuals, and distance from the observer to detection. We will then use program DISTANCE to calculate density estimates for migrants.

Waterfowl (Anseriformes) use of ROVA lands will be assessed by establishing a series of fixed points along the Hudson River. These points will be sampled every two weeks throughout the year to quantify waterfowl use of ROVA lands. ROVA staff were also interested in

quantifying wading bird (Ciconiiformes) use of the park. We will continue to monitor the same fixed census points used for waterfowl surveys during the spring and summer to assess wading bird use of the area. All surveys will be conducted using a spotting scope, with each point surveyed for a maximum of 10 minutes.

DATA MANAGEMENT:

A major emphasis of the inventory and monitoring efforts is to make information more readily available to decision makers and the public and to integrate natural resources information with other park operations such as interpretation and maintenance. Microsoft Access is the NPS standard for distributed databases, and the Northeast Region is developing relational databases in MS Access to enter, store, display, summarize, and produce reports for natural resources data. This I & M database can be used as a standalone application in MS Access to enter, edit, display, summarize, and generate reports for inventory or monitoring datasets, or it can be used in conjunction with the GIS Theme Manager to zoom in on an area of the park, identify where sampling has occurred, and view the actual data for those sampling locations that are stored in Access tables.

PRODUCTS

As a result of these surveys, we would create:

- (1) a GIS map for each park in ARCVIEW format, including map of point count stations and general habitat types,
- (2) entry to Data Set Catalog for each electronic data set,
- (3) relational database in Microsoft Access that contains NPSpecies database and other data specific to bird surveys (see Appendix of fields to be included in NPSpecies database),

(4) Metadata of the spatial distribution and abundance of birds in each park, which will conform to current NPS guidelines.

(5) NRBIB citation.

Literature Cited

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Appendix A. Details of park-specific study plans.

-The following tables detail the study plans and budgets for completing bird inventories at parks in the Northeast Temperate Network. We will survey for two consecutive years at each park, all parks will be surveyed in 2001 and 2002.

We will hire local birders to conduct bird surveys at each park

Sampling will take place during the breeding season (May-early July).

When point count stations are initially established, each grid point would be located with GPS for future spatial analyses.

Technicians \$120/day or \$15/hr.

We assume it will take from 1-4 days, in small to large parks, respectively, to establish point count stations.

Morristown (MORR) NHP-Birds (2001 and 2002)

Category	Item	Number	Person days	Cost
Point Count	Establish point counts		4	\$480
	Grid points	75		
	Days to complete study	10	10	\$1200
		(5 annually)		
Hawk survey	Done between point count station, no extra time	75		
Other	Transportation	2000 miles		\$650
	Vehicle miles @	(1000		
	0.325/mile	annually)		
	Transportation time (hrs)	36 hrs)		\$540
		(18/yr)		
	Totals for MORR		14	\$2,870

Saugus Iron Works (SAIR) NHS-Birds (2001 and 2002)

Category	Item	Number	Person days	Cost
Point Count	Establish point counts		1	\$120
	Grid points	2		
	Days to complete study	10	2 hours per	\$300
		(5 annually)	day	
Rail surveys	30 min tape playback	6	3 hours	\$90
		(3 annual)	(30 min/day)	
Other	Transportation	1600		\$520
	Vehicle miles @	(800 annually)		
	0.325/mile			
	Travel time (hrs)	28		\$420
		(14 annually)		
	Totals for SAIR			\$1,450

Minute Man (MIMA) NHP-Birds (2001 and 2002)

Category	Item	Number	Person days	Cost
Point Count	Establish point counts		4	\$480
	Grid points	75		
	Days to complete study	10	10	\$1200
		(5 annually)		
Other	Transportation	2000		\$650
	Vehicle miles @	(1000 annually)		
	0.325/mile			
	Travel time (hrs)	36		\$540
		(18 annually)		
	Totals for MIMA		14	\$2,870

Roosevelt-Vanderbilt Headquarter (ROVA) NHP-Birds (2001 and 2002)

Category	Item	Number	Person days	Cost
Point Count	Establish point counts		4	\$480
during	Grid points	75		
breeding	Days to complete study	10	10	\$1200
season	(5 annually)			
Waterfowl/	Establish survey stations		1	\$120
Wading bird	Conduct bi-weekly	26 annually (6	26 days X 3/4	\$2340
surveys	surveys throughout the	hours per	time	
	year	survey)		
Migratory	Establish transects		1	\$120
landbirds	Census transects weekly	12 days	24	\$2,880
	from Aug-Oct for 2 yrs	annually for 2		
		yrs		
Other	Transportation	8000		\$2,600
	Vehicle miles @	(4000 annually)		
	0.325/mile			
	Travel time (hrs)	80		\$1,200
		(40 annually)		
	Totals for ROVA		1	\$10,940.00

Saratoga (SARA) NHP-Birds (2001 and 2002)

Category	Item	Number	Person days	Cost
Point Count	Establish grid points		4	\$480
	Days to complete study	75		
		10	10	\$1200
		(5 annually)		
Other	Transportation	2000		\$650
	Vehicle miles @	(1000 annually)		
	0.325/mile			
	Travel time (hrs)	36		\$540
		(18 annually)		
	Totals for SARA		1	\$2870

Weir Farm (WEFA) NHP-Birds (2001 and 2002)

Category	Item	Number	Person days	Cost
Point Count	Establish grid points		4	\$480
	Days to complete study	75		
		10	10	\$1200
		(5 annually)		
Other	Transportation	2000		\$650
	Vehicle miles @	(1000 annually)		
	0.325/mile			
	Travel time (hrs)	36		\$540
		(18 annually)		
	Totals for WEFA		1	\$2870

Boston Harbor (BOHA)

The logistic of conducting fieldwork in Boston Harbor are uncertain. Therefore we suggest a pilot study for two years to determine how to survey birds in the park, and which species to focus efforts.

These surveys will be used to assess habitats available in the park, location of colonial waterbird colonies (e.g. wading birds, gulls, terns), feasibility of conducting point counts and transect counts during the breeding season and fall migration on islands in the park. During this pilot study, we will gather data on the species detected to generate a preliminary inventory for birds in the park. Most importantly, this pilot data will be used to assess the most efficient means to determine how to inventory birds in BOHA.

Based on 5 trips annually for two years:

1 observer at \$120/day X 10 days = \$1,200

Mileage: 160 miles/trip X 10 @ \$0.325/mile = \$520

Boat time to travel to islands \$1000

Summary budget

Item	Cost
GIS analysis to establish grid system at each Park and subsequent analyses for each park after 2 year of data collection	\$4000
Inventory MORR for 2 years	\$2,807
Inventory SAIR for 2 years	\$1,450
Inventory MIMA for 2 years	\$2,870
Inventory ROVA for 2 years	\$10,940
Inventory SARA for 2 years	\$2,870
Inventory WEFA for 2 years	\$2,870
Pilot study in BOHA for 2 years	\$2,720
Part-time assistant, would be responsible for data entry for all parks, coordinate all surveyors and logistics, assist with data analysis, and assist with report writing, work from April-September at \$2,000/mth for 2 years	\$24,000
PI salary, 1 month summer salary (\$4,500) for two years	\$9,000
SubTotal	\$63,527.00
URI overhead (25%)	\$15,882.00
Total	\$79,409.00

Appendix B. Fields to be included in NPSSpecies Database

Species information

Park code	4-character park code
Latin name	The scientific name recognized by IT IS.
Common Name	The preferred alternate scientific name or common name of a species in addition to accepted ITIS. We will use the 7 th edition of the AOU checklist for common names.
Park Status	Status of each species in the Park, either Present, Historic, Probably Present, Unconfirmed, of False Report.
Park Status Details	Additional details for park status
Abundance	Either Abundant (seen daily in suitable habitat and season in large numbers); Common (seen daily in suitable habitat, but not in large numbers); Uncommon (seen monthly in appropriate habitat, may be locally common); Rare (present, but seen only a few times per year); Occasional (Occurs in the park only a few times each year); Unknown (abundance unknown)
Abundance details	Additional details for abundance
Residency	Current residency status for each species Breeder (reproduces in park), Resident (occurs in park for over two months, but not known to breed there), Migratory (occurs ≤ 2 months annuals, but does not breed there), Vagrant (Park is outside species usual range), Unknown (residency status is unknown)

Residency details	Additional details for residency
Nativity	Native (Endemic or indigenous), Non-native (neither endemic nor indigenous), Unknown (nativity status is unknown)
Nativity details	Additional details of origin
Data Source	The source of any data fields, which will be my study, the observer, and the date.
Comments	General comments regarding this species in the Park.

Observation Information

Park Code	4-character Park Code
Documented Name	Latin or common name
Date	Date of observation
Time	Time of observation (24-hour clock)
Observer	name of observer
Habitat	Description of habitat where observation was made
Elevation	Elevation where observation was made
Elevation units	Feet
Location Description	Concise description of observation site within the park
Latitude	Latitude in decimal degrees
Longitude	Longitude in decimal degrees
UTM X	UTM X coordinate (easting)
UTM Y	UTM Y coordinate (northing)
UTM Zone	UTM zone of X and Y coordinates
UTM Datum	NAD27

Coordinate Error (meters) Estimated accuracy of location coordinates

Comments General comments about record

Data Source The source of voucher or observation data, in this case my study.