McGill Bird Observatory
Field Protocol for Migration Monitoring Program

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1. Credit

This document was originally adapted by Marcel Gahbauer and Marie-Anne Hudson from the Innis Point Bird Observatory Field Protocol for the Spring Migration Monitoring Program by Bill Murphy, November 1998. It was updated in 2009, 2011 and 2014.

2. Introduction

The purpose of the Migration Monitoring Program (MMP) at McGill Bird Observatory (MBO) is to obtain data on neotropical migrant and other landbird species, in a scientifically rigorous manner, in order to contribute to continent-wide efforts to monitor changes in population levels of these species, as well as conduct other scientific research while training future banders. High priority species for the MMP at MBO are listed in Figure 1.

Since this protocol is intended to be a practical field manual, it emphasizes what procedures should be followed and how, and places little stress on why particular approaches have been chosen. The purposes of migration monitoring generally, and recommended methods of running a migration monitoring program, are explained in detail in Blancher *et al.* (1994) and Hussell and Ralph (1996). Additional information about MBO programs and its participation in the Canadian Migration Monitoring Network are available on the MBO website, www.migrationresearch.org/mbo.html.

The written field protocol for MBO is designed to guide the application of generally accepted principles of migration monitoring at the study site, and to detail procedures that are specific to the monitoring program at MBO. A written field protocol is necessary to ensure that staff follow the same procedures from day to day and year to year despite changes in those involved. Additional details regarding the basic operation of MBO are summarized in the MBO Operations Manual (Gahbauer 2007).

The MMP consists of standardized banding, standardized census, general observations of birds and the calculation of a standardized Daily Estimated Total (DET) for each species for each day covered by the program.

3. Staffing

The MMP is designed to be run by 3 people reasonably experienced with migration monitoring and with MBO protocol. At least 1 of the 3 must be a licensed bander and capable of acting as a Bander in Charge (BIC). In addition, at least 1 staff member should be competent at identifying birds by sight and sound, and capable of running the standardized census. To achieve the most complete coverage (see section 9 – net locations), it is preferable that 3 reasonably competent birders be available, as well as at least 2 persons skilled in mist-net extractions. For further detail, see section 11 on Coverage Codes.

Additional staff will make it easier to run the program, and can help to obtain better coverage of the study site. Staff not essential to the banding program at any particular moment are encouraged to be outside observing. If insufficient staff are available on a particular day to run the full protocol (i.e. to run all net groups plus the census) the **top priority is the census** followed by as many net groups as possible with general observations being the lowest priority. When rain or high winds make banding impossible, staff should spend their time making general observations.

Figure 1. Priority species for Migration Monitoring at MBO

This table is based on Bird Studies Canada's priority rankings (see Blancher *et al.* (1994), with adjustments reported by Jon McCracken in May 3, 1998 memo to Canadian Migration Monitoring Network stations). Species not expected at MBO due to their geographic distribution or species that were on average observed on fewer than 10 occasions per year between 2006 and 2008 are excluded. All species listed have been banded at MBO except Belted Kingfisher, Cliff Swallow, and American Crow.

Priority A (15 species)	**Priority B (10 species)**	**Priority C (18 species)**	**Priority D (19 species)**
<50% of Canada-U.S. breeding range covered by Breeding Bird Survey (BBS) and <60% of winter range in Canada-U.S.	<50% of Canada-U.S. breeding range covered by BBS but >60% of winter range in Canada-U.S.	<60% of Canada-Alaska breeding range (but >50% Canada-U.S. range) covered by BBS, and <60% of winter range in Canada-U.S.	<60% of Canada-Alaska breeding range (but >50% Canada-U.S. range) covered by BBS, but >60% of winter range in Canada-U.S.; includes some irruptives and irregular migrants.
Alder Flycatcher	American Tree Sparrow	American Redstart	American Crow
Bay-breasted Warbler	Dark-eyed Junco	Barn Swallow	American Robin
Blackpoll Warbler	Fox Sparrow	Black-and-white Warbler	Belted Kingfisher
Cape May Warbler	Palm Warbler	Black-throated Green Warbler	Black-capped Chickadee
Grey-cheeked Thrush	Ruby-crowned Kinglet	Blue-headed Vireo	Brown Creeper
Lincoln's Sparrow	Rusty Blackbird	Canada Warbler	Cedar Waxwing
Magnolia Warbler	Swamp Sparrow	Chipping Sparrow	Common Grackle
Northern Waterthrush	White-crowned Sparrow	Cliff Swallow	Downy Woodpecker
Orange-crowned Warbler	White-throated Sparrow	Common Yellowthroat	Eastern Phoebe
Savannah Sparrow	Yellow-rumped Warbler	Eastern Kingbird	European Starling
Swainson's Thrush		Least Flycatcher	Golden-crowned Kinglet
Tennessee Warbler		Mourning Warbler	Hairy Woodpecker
Wilson's Warbler		Ovenbird	Hermit Thrush
Yellow-bellied Flycatcher		Philadelphia Vireo	Purple Finch
Yellow-bellied Sapsucker		Red-eyed Vireo	Red-breasted Nuthatch
		Tree Swallow	Red-winged Blackbird
		Warbling Vireo	Song Sparrow
		Yellow Warbler	Winter Wren
			Yellow-shafted Flicker

Personnel will be assigned responsibilities by the BIC that do not exceed their skills, knowledge and experience. As the title implies, the BIC is in charge, and responsible for the designation of tasks. All volunteers and staff must follow the BIC's directions.

Training to bring individuals up to required skill levels can be undertaken on an ongoing basis, although it may need to be suspended during particularly busy periods when the BIC is required to devote full attention to banding quickly to avoid a backlog of birds from accumulating. Specific training opportunities should be scheduled away from the peak of migration. Internships are best scheduled in spring when the pace of migration tends to be slower, but fall internships may also be arranged if they begin in August so that the participant has sufficient experience by mid-September to contribute to the peak of migration. Visitors unfamiliar with banding or the MBO Protocol should be scheduled only when sufficient fully trained staff are available to show them the site and explain the program.

Prior to participation, all staff and volunteers must familiarize themselves with this Protocol and the Bander's Code of Ethics (see Appendix). The birds' safety always comes first. ***Volunteers new to banding should not expect to handle nets or birds until proper training has occurred.***

Detailed descriptions of the BIC's role and the many jobs that volunteers carry out are found at: http://www.migrationresearch.org/mbo/job_descriptions.html

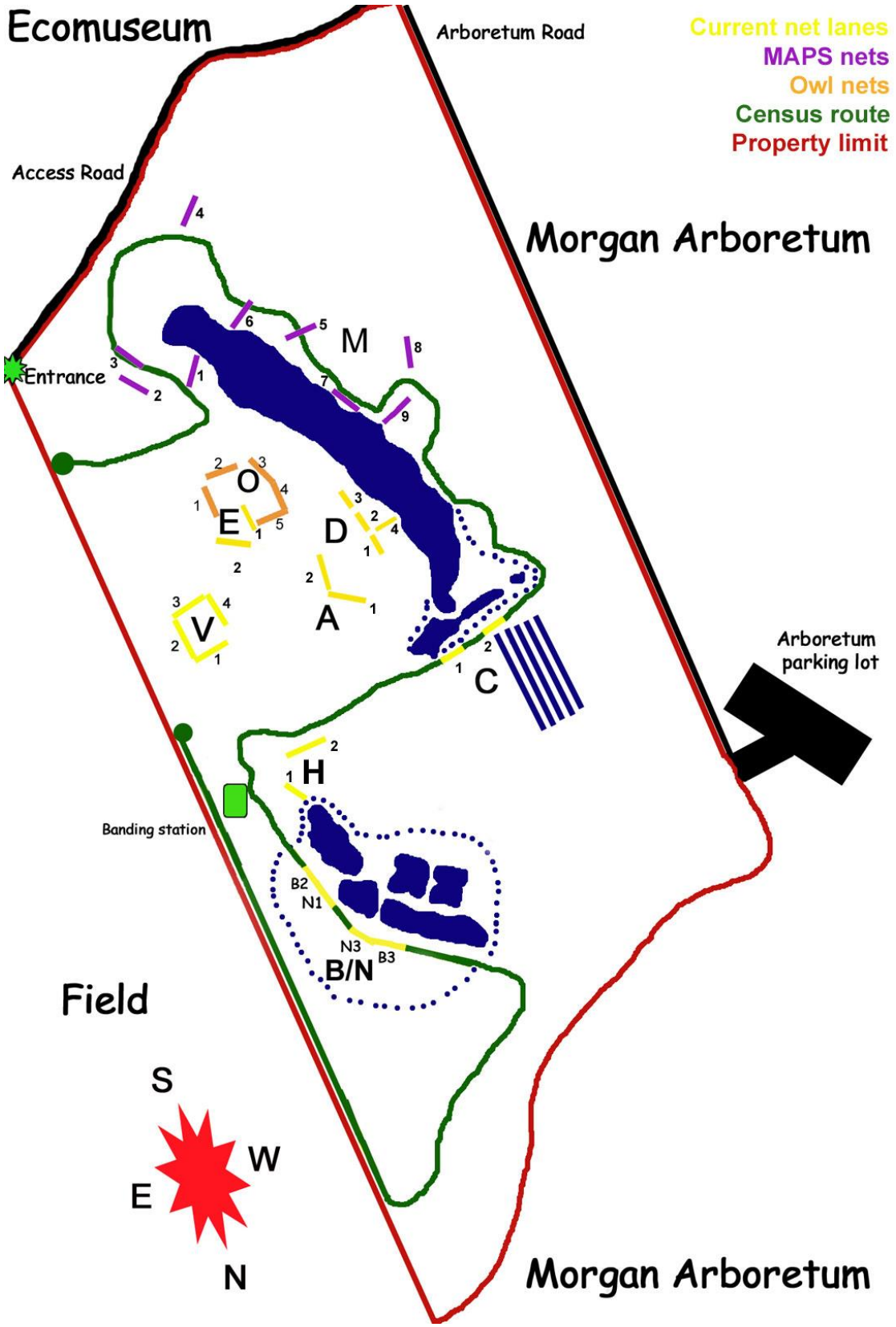
4. Programs

a) Spring MMP: the monitoring program will attempt to cover all days during the 10-week period from March 28 to June 5 of each year, or as many of those days as possible. Banding is limited to a 45-day period from April 18 to June 1, due to lingering snow and cold temperatures common during the first three weeks of the season, and breeding species beginning to dominate by June. No artificial food sources are to be provided during migration monitoring.
b) Fall MMP: the monitoring program will attempt to cover all days during the 13-week period from August 1 to October 30 of each year, or as many of those days as possible. Banding occurs daily throughout the season, unless limited by weather.
c) MAPS: Population monitoring during the breeding season, including banding on seven occasions (approximately ten days apart) between June 6 and July 31, and may be supplemented by census or informal observations.
d) Winter MP: informal banding as weather (especially temperature) and staffing permit during the 21 weeks from October 31 to March 27. Target species attracted by feeders: northern finches and resident species such as Black-capped Chickadees, woodpeckers, and nuthatches.
e) Northern Saw-whet Owl MMP: the monitoring program will attempt to cover all nights with favourable weather during the 42-night period from September 26 to November 6.

5. Count Area

The count area consists of all areas north of the access road, west of the fence running along the agricultural field, south of the Morgan Arboretum fenceline and east of the Morgan Arboretum road (Figure 2). For the purpose of the census, general observations and DETs, all birds visible or audible from within this area are countable, no matter how far outside the zone the bird is. If an observer is outside the count zone, no birds detected as being outside or inside the zone are countable.

Figure 2. Map of McGill Bird Observatory



6. Daily Count Period

The daily count period begins 30 minutes before sunrise and concludes 6 hours later. If weather conditions permit, nets start to be opened when the count period begins and start to be closed 5 hours later. Nets should generally be closed in the same order in which they were opened. Figure 3 summarizes the schedule of key events during the count period. Note that net opening hours are not to be extended even if cold, rain, wind, or other inclement weather prevents them from being open for part of the standard period.

The tally of DETs cannot begin until all birds captured in the closing net round have been processed. No birds detected after the count period ends may be included in DETs, though any of interest (i.e. not previously detected during that day's count period) should be noted on the daily log. Data collected outside the standard daily count period must be clearly distinguished from data collected during the count period. When such non-standard activity occurs the DET tally must be completed before it begins.

Figure 3. Summary of key events during count period in relation to sunrise

Event	Time	Example 1: May 31	Example 2: Sept. 18
Count period begins and nets start being opened	0.5 hour before sunrise (rounded to nearest 5 minutes)	4:50 am	6:00 am
Sunrise (all nets open)	Sunrise	5:18 am	6:30 am
Census starts	1 hour after sunrise	6:20 am	7:30 am
Census ends	2 hours after sunrise	7:20 am	8:30 am
Nets closed	5 hours after sunrise	10:20 am	11:30 am
Count period ends	5.5 hours after sunrise	10:50 am	12:00 pm

7. Banding Protocol

The standard references for identification are Pyle (1997) and Pyle (2008), supplemented for non-passerines by *North American Bird Banding Techniques* (Canadian Wildlife Service and U.S. Fish and Wildlife Service, 1991). Data routinely recorded for all captures include (see Figure 4):

- band number
- species
- age and how aged
- sex and how sexed
- unflattened wing chord
- presence and extent of fat
- weight
- date
- time of banding
- initials of bander
- location of capture (2-digit net code)
- probable age or sex if uncertain
- initials of scribe
- comments (any additional relevant information, e.g. feather loss, ticks, etc.)

Banders should routinely check for cloacal protuberance (CP) and brood patch (BP) during spring migration and the breeding season, and should always attempt to age individuals. Atypical moult patterns should be documented by photography and/or in writing.

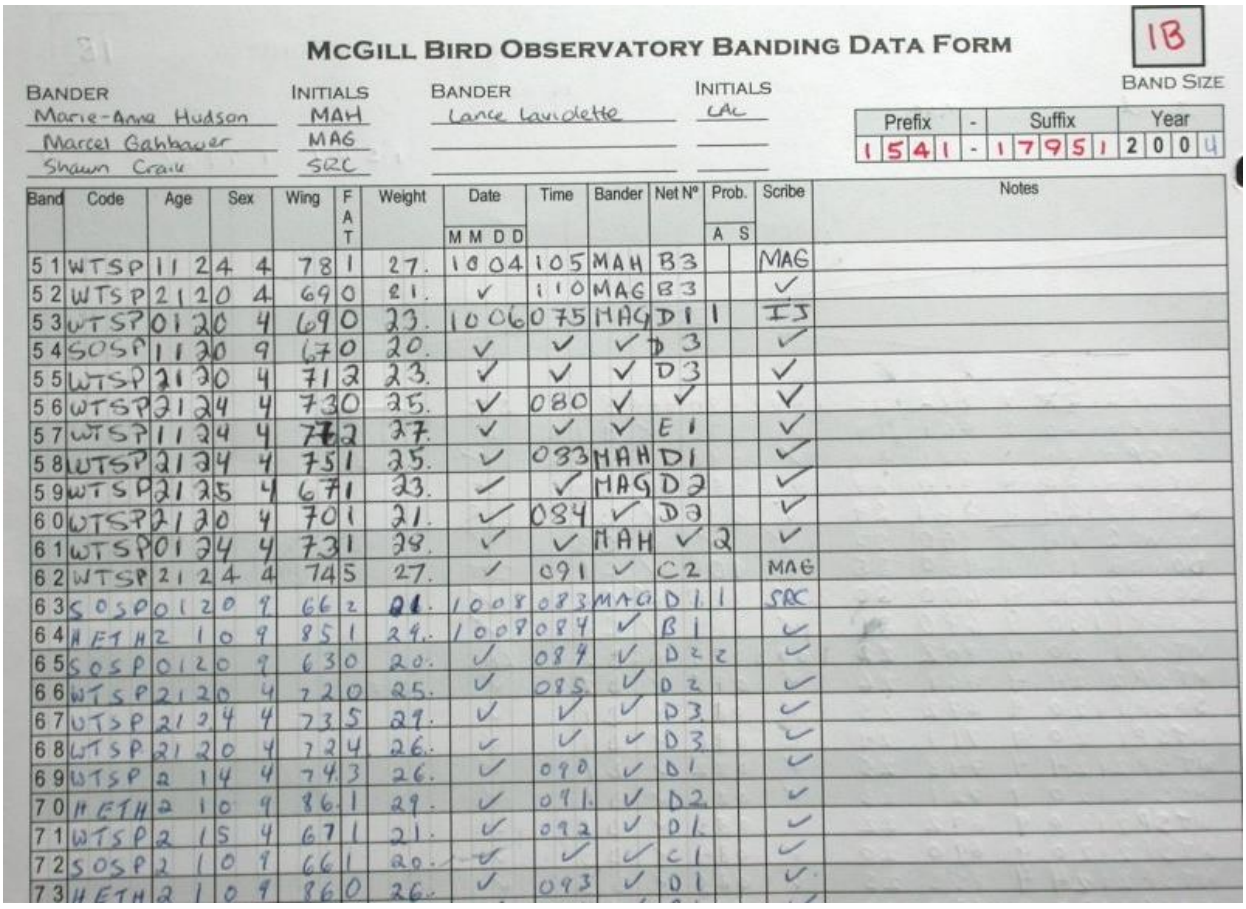
In addition, if time permits and at the discretion of the BIC, the following information may be recorded. However, this supplementary information should not be recorded routinely if doing so would require other elements of the protocol to be scaled back.

- presence and nature of parasites
- any additional species-specific measurements (e.g. flattened wing chord of Tree Swallows; mouth lining colour of Black-capped Chickadees)

For birds that are recaptures, the regular set of measurements will be taken unless doing so unacceptably delays the processing of new birds. Birds that are recaptured for a second or additional time on the same day are released without any additional data being collected unless the bander wishes to revise or supplement data taken earlier. Net location and time of capture are noted next to the original capture information.

If a bird is injured during banding and neither recovers immediately nor seems to require euthanasia, it should be taken to Le Nichoir after calling to notify them in advance (450-458-2809).

Figure 4. Example of a banding data form



McGILL BIRD OBSERVATORY BANDING DATA FORM

1B (BAND SIZE)

BANDER	INITIALS	BANDER	INITIALS
Marie-Anne Hudson	MAH	Lance Lavidette	LAL
Marcel Gahbauer	MAG		
Shawn Craik	SRC		

Prefix	-	Suffix	Year
1541	-	17951	2004

Band	Code	Age	Sex	Wing	FAT	Weight	Date (MMDD)	Time	Bander	Net N°	Prob.	Scribe	Notes
51	WTSP	11	4 4	78	1	27.	1004	105	MAH	B3		MAG	
52	WTSP	21	20 4	69	0	21.	✓	110	MAG	B3		✓	
53	WTSP	01	20 4	69	0	23.	1006	075	MAG	D1	1	IS	
54	SOSP	11	30 9	67	0	20.	✓	✓	✓	D3		✓	
55	WTSP	21	30 4	71	2	23.	✓	✓	✓	D3		✓	
56	WTSP	21	24 4	73	0	25.	✓	080	✓	✓		✓	
57	WTSP	11	24 4	77	2	27.	✓	✓	✓	E1		✓	
58	WTSP	21	34 4	75	1	25.	✓	083	MAH	D1		✓	
59	WTSP	21	25 4	67	1	23.	✓	✓	MAG	D2		✓	
60	WTSP	21	20 4	70	1	21.	✓	084	✓	D3		✓	
61	WTSP	01	24 4	73	1	28.	✓	✓	MAH	✓	2	✓	
62	WTSP	21	24 4	74	5	27.	✓	091	✓	C2		MAG	
63	SOSP	01	20 9	66	2	21.	1008	083	MAG	D1	1	SRC	
64	HETH	21	0 9	85	1	29.	1008	084	✓	B1		✓	
65	SOSP	01	20 9	63	0	20.	✓	089	✓	D2	2	✓	
66	WTSP	21	20 4	72	0	25.	✓	085	✓	D3		✓	
67	WTSP	21	24 4	73	5	29.	✓	✓	✓	D3		✓	
68	WTSP	21	20 4	72	4	26.	✓	✓	✓	D3		✓	
69	WTSP	21	4 4	74	3	26.	✓	090	✓	D1		✓	
70	HETH	21	0 9	86	1	29.	✓	091	✓	D2		✓	
71	WTSP	21	5 4	67	1	21.	✓	092	✓	D1		✓	
72	SOSP	21	0 9	66	1	20.	✓	✓	✓	C1		✓	
73	HETH	21	0 9	86	0	26.	✓	093	✓	D1		✓	

8. Census

The purpose of the census is to obtain the best possible standardized estimate of the unduplicated number of each species in the count area during a standard time period each day. The census is run every day during the MMP for 60 minutes along a fixed route (Figure 2). The census starts one hour after sunrise and is run each day regardless of weather conditions. During summer and winter, census follows the same route, but the time and duration may be flexible in relation to weather conditions and staff availability.

The start of the census may be delayed by up to one hour if required by weather or in order to process captured birds safely. It may be further delayed by an electrical storm. If the census must be interrupted for any reason, it should be resumed from the place it was halted as soon as possible and the departure from the protocol noted on the daily log sheet. If necessary due to a shortage of staff, the BIC may conduct the census in parts with a net round in between, but the delay should be no more than one hour, and it should be described in the daily log.

The censuser must take along binoculars and should have a notebook and pencil to record observations as they occur. At the beginning of census, local weather conditions should be noted, including temperature, wind, and cloud cover. The censuser is strongly encouraged to record observations as he or she proceeds with the census particularly if the person has been or will be making general observations as well. At a minimum, it is essential that the census results be written down (in a notebook or the daily log) as soon as the census is complete. A spotting scope should not be used on census. In addition, the censuser should carry a walkie-talkie to alert the BIC of birds in any nets along the census route.

The census should be rotated among all staff familiar with the majority of species likely to be encountered. The same person should not do the census every day. If additional staff are available, a second person could join in the census but one is fully adequate and more than 3 is usually counter-productive.

The census route begins just outside the banding station and follows the route indicated in Figure 2. The route covers most of the Observatory's area. A visual representation of all habitats covered by the census route is available on the MBO website at www.migrationresearch.org/mbo/census.html. A suggested time budget for census is as follows: 15 minutes to the northern end of the fence, 5 minutes to B/N, 15 minutes to C, 10 minutes to the start of the M nets, 10 minutes to the end of the M nets and 5 minutes to the end of the census trail. On a given day, the censuser may spend more time than usual at spots on the route that are 'busy' that day but to compensate must spend less time at other spots. All parts of the route must be given at least some attention and the full length of the route should be covered in as close to one hour as possible.

The censuser may step off the path to see a bird more clearly, may retrace his or her steps for up to 10 m and may 'pish' to attract birds. However, the use of any recorded sounds or other lures is forbidden. 'Pishing' in the immediate vicinity of open nets (i.e. within about 10 m) is also prohibited. At a few points on the census, the route passes sections of net lines. The censuser should move through these areas quickly and quietly and leave netted birds alone. However, (s)he may use judgement to stop to remove birds requiring immediate attention, IF qualified as an extractor. Any netted birds should be reported to the BIC by walkie-talkie or cell phone. If there is an unanticipated flood of birds at a net and available staff are unlikely to be adequate, the censuser may temporarily halt the census to help with extraction, again only if (s)he is qualified to do so. Birds seen in nets are not counted on the census.

9. Net Locations

There are 34 nets allocated to groups A, B/N, C, D, E, H, M, O, and V (see yellow/orange bars in Figure 2). Of these, the M nets are used only for MAPS, the O nets only for owling, and the V nets only in winter. The remaining 16 nets constitute the standard array for migration monitoring.

Generally all nets in a group are to be opened and closed at the same time, unless wind necessitates the closing of some nets while others remain unaffected. Group A consists of 2 nets among apples and hawthorns, a bit inland from Stoneycroft Pond. Group B/N consists of 4 nets along the eastern ridge of the rear pond. Group C consists of 2 nets in the sumac grove running along the north edge of Stoneycroft Pond. Group D consists of 4 nets running along the edge of Stoneycroft pond, three parallel and one perpendicular to the shore. Group E consists of 2 nets along the edge of the centre field, one partly lined with conifers, and the other among hawthorns. Group H consists of 2 nets near the banding station, with one perpendicular to the south end of the rear pond, and the other near the windmill, parallel to the main trail toward Stoneycroft Pond. Group V consists of 3 nets surrounding a hawthorn thicket on the east edge of the centre field.

Two additional sets of nets were added in 2009. Group M consists of 9 nets used for the MAPS program, scattered around the south half of Stoneycroft Pond. It includes the former G nets and two of the former F nets. Group O consists of 5 nets used for Northern Saw-whet Owl banding through and around the spruce/fir grove east of Stoneycroft Pond and south of Group E.

All nets are four-shelf tethered polyester nets with 30 mm mesh deployed to a height of about 2.5 m. All nets in use are made by Manomet. The net manufacturer was changed from Spidertech to Manomet in 2012 because of a shortage of nets; the Manomet nets were selected for being the most similar in design to Spidertech. Efforts should be made to remain consistent with the use of Manomet when additional nets are purchased, as the capture rate varies by model. All nets are 12 metres long.

Opening and closing times are recorded on the log sheet for each net group. Captures are recorded on the data sheets by specific net, not by group. If the capture location for a particular bird has been forgotten or confused, the location is recorded as MN (mist-net). Location for any birds captured in nest boxes is recorded as BX, with the box number noted in the comments.

The BIC is responsible every morning for determining which nets are to be used. For migration monitoring, this should generally correspond to one of the following 3 options, with the choice dependent on both the number of experienced extractors and the volume of birds expected:

Full: All nets (CADE / BNH)
Basic: All nets except B/N (i.e., CADEH) – typically on windy days
Limited: Only H and CAE, or even fewer as necessary

Net groups should be closed due to wind as necessary and must be noted in the log. Partial opening may in some cases also be prudent if bad weather is expected but is not imminent, or if the BIC feels that the volume of birds may overwhelm the capabilities of the team of extractors available on a given day. If a predator is be frequenting a net, the net should be raised to alleviate the threat; otherwise it should be closed to discourage the predator. Net closings must be noted in the log.

When the volume of birds is high, the BIC can assign each extractor a set of nets for which they are responsible, according to the full/regular/basic protocol as described above. On every net round, each extractor (and their assistants) should complete a loop of all nets within their assigned sector. One person within each team must carry a walkie-talkie or cellular phone at all times and report back to the BIC after their sector is checked.

The J-trap, formerly situated between A and C, is no longer in operation and was removed in 2013.

10. General Observations

General observations refer to the documentation of birds in the count zone apart from banding and the census. Birds detected during general observations may include some of the same individuals seen during banding or the census, however, the unduplicated total of birds observed by all methods is sorted out in the process of determining DETs, not by adjusting general observations.

Staff are encouraged to make observations throughout the count period. More observations can and should be made when banding is slower and when extra observers are available. Additional observations are especially important when rain or wind preclude banding. Conversely, when banding is very busy, there may be limited time for general observations. Effort should be made to specifically target areas poorly covered by census and net rounds.

'Pishing' may be used to attract birds for observation however, as with the census, no recorded sounds or other devices may be used and there should be no 'pishing' within 10 m of open mist nets.

Staff are encouraged to record all observations in notebooks. If they must leave the site before the DETs are tallied, they must give their observations to the BIC or any other available staff member.

11. Daily Estimated Total (DET)

DETs are tallied by all staff available at the end of the daily count period. As one of the key sets of data captured by the MMP, DETs must be done in a consistent manner. The DET applies only to the count zone; any noteworthy observations made outside the count zone may be recorded as incidental sightings in the appropriate section of the daily log but not on the DET sheet.

The DET coordinator will often be the BIC, or else an experienced individual appointed by the BIC. To facilitate a smooth DET tally, the totals of newly-banded birds, repeats and returns, and results of the census should be entered on the DET sheet before the tally begins. The rare occurrence of a foreign recovery should be recorded on the DET sheet as a return with an asterisk accompanied by an explanatory footnote. Figure 5 shows an example of a completed DET sheet. All available staff are to participate in the DET. To help avoid duplication of census observations with banding and general observations, it is particularly desirable that the censuser be available for DET compilation.

Probable/Known Stopover (PKS) refers to the number of individuals of a given species deemed to have been present on the site for more than one day. The purpose of PKS is to allow for migrants to be distinguished from resident birds, or birds that are lingering on site. Situations where PKS is determined include: repeats, rarities which linger for longer than a day,

birds with distinctive vocal or physical characteristics and birds showing local breeding evidence (e.g. early migrant Tennessee Warbler with a brood patch is not considered a local breeder). Since it is arbitrary and subjective to attempt to determine a migrant Common Yellowthroat from a resident, all returns are excluded from PKS. Any bird encountered twice in a 3-month period is a PKS (repeat). A foreign recovery cannot be considered a PKS unless it is captured more than once in 3 months. Personnel must be convinced that given birds have been recorded on previous days in order to call them PKS. When conducting DETs, personnel should tally all "repeats", report any lingering rare birds, birds with undeniable individual characteristics (e.g. unusual song, damaged wing or leg, etc.) and birds with pronounced local breeding evidence for the PKS column. Determining PKS does not involve guesswork or estimation -- concrete evidence must be the criteria.

Starting with the first species on the DET list, the DET coordinator asks for general observations. Anyone present who saw or reliably heard individuals of the named species from the count zone during the count period will state the maximum number of individuals they detected. Other persons that observed this species join in with their reports. A brief discussion focuses on the time, location, direction of movement (and if relevant, the behaviour) of the observed birds in order to arrive at a consensus estimate. The DET coordinator records the result. In general, estimates should be conservative, but not overly so. Birds which staff 'know' are in the area but were not actually detected on that day are not counted.

Next, for the same species, the coordinator reads aloud the numbers, if any, of individuals banded, repeats, returns and census. Whenever a species is detected by more than one method, discussion among all observers will sort out the best collective estimate as to the number of individuals involved. The resulting number is recorded in the DET column.

While the description of the DET tally may sound time consuming, staff quickly get used to providing information efficiently so that the average DET tally need take only about 10-15 minutes. It is the responsibility of all staff the make the DET as complete and accurate as possible; however, it is particularly important that the coordinator leading the DET tally encourages the staff to provide concise and accurate observations. Off-topic discussion should be limited as it can distract the coordinator and make the DET needlessly long to complete.

The DET number for a species cannot exceed the sum of general observations, banding and census. However, the DET will often be less than the sum of those numbers to avoid double counting. The minimum DET number for a species is the highest among those for census, general observations and the sum of banding retraps and returns. Once the DET total has been established, the PKS is determined by following the guidelines above. These individuals are thus flagged as being already counted at some point during the season.

If a single bird or small number of individuals of some group (e.g. a single owl or 3 sparrows) is unidentified as to species, they can be written in the blank lines at the end of the species list. These data will generally not be used in subsequent analysis. Therefore, staff are strongly encouraged to identify birds at the species level whenever possible. Nevertheless, it is more useful to know that a non-trivial number of birds remained unidentified than to have them left off the DET sheet altogether.

Figure 5. Example of a completed DET sheet

McGill Bird Observatory - Migration Monitoring Program
Daily Estimated Totals (DET)

DOW	DAY	MONTH	YEAR
Mon	10	Sep	2007

CENSUS BY:	CMM
DET RECORDED BY:	MAH

COUNT PERIOD	
Start: 0600	Stop: 1200

Species	Obs	Cns	Bnd	Rep	Ret	PKS	DET
001 Common Loon							
010 Pied-billed Grebe							
054 Double-crest. Cormorant							
075 American Bittern							
074 Least Bittern							
063 Great Blue Heron							
065 Green Heron							
072 Black-cr. Night Heron							
089 Canada Goose	1						1
859 Cackling Goose							
096 Greater Snow Goose							
118 Wood Duck							
112 Green-winged Teal							
107 American Black Duck							
102 Mallard							
110 Northern Pintail							
113 Blue-winged Teal							
117 Northern Shoveler							
109 Gadwall							
116 American Wigeon							
141 Common Merganser							
142 Red-breasted Merganser							
140 Hooded Merganser							
144 Turkey Vulture							
171 Osprey							
169 Bald Eagle							
168 Golden Eagle							
170 Northern Harrier							
152 Sharp-shinned Hawk	1	1					2
153 Cooper's Hawk							
151 Northern Goshawk							
Accipiter species							
156 Red-shouldered Hawk							
157 Broad-winged Hawk							
154 Red-tailed Hawk							
163 Rough-legged Hawk							
178 American Kestrel							
177 Merlin							
175 Peregrine Falcon							
173 Gyrfalcon							
184 Ruffed Grouse							
209 Virginia Rail							
210 Sora							
225 Killdeer							
243 Greater Yellowlegs							
244 Lesser Yellowlegs							
Yellowlegs species							
240 Solitary Sandpiper	1					1	0
239 Spotted Sandpiper							

Species	Obs	Cns	Bnd	Rep	Ret	PKS	DET
252 Least Sandpiper							
234 Wilson's Snipe							
233 American Woodcock							
290 Bonaparte's Gull							
285 Ring-billed Gull							
283 Herring Gull							
280 Great Black-backed Gull							
Gull species							
310 Caspian Tern							
300 Common Tern							
341 Rock Pigeon							
345 Mourning Dove							
356 Black-billed Cuckoo							
355 Yellow-billed Cuckoo							
361 Eastern Screech-Owl							
364 Great Horned Owl							
374 Long-eared Owl							
371 Barred Owl							
365 Snowy Owl							
373 Great Gray Owl							
377 Northern Saw-whet Owl							
382 Common Nighthawk							
379 Whip-poor-will							
385 Chimney Swift							
389 Ruby-thr. Hummingbird	1						1
405 Belted Kingfisher							
419 Yellow-bellied Sapsucker							
423 Downy Woodpecker	2	2					3
422 Hairy Woodpecker		1					1
408 Yellow-shafted Flicker	2	1					3
412 Pileated Woodpecker		2					2
460 Eastern Wood-pewee							
449 Yellow-bellied Flycatcher							
451 Alder Flycatcher							
Traill's Flycatcher							
465 Willow Flycatcher							
452 Least Flycatcher							
Empidonax species							
446 Eastern Phoebe							
442 Great Crested Flycatcher							
433 Eastern Kingbird							
462 Olive-sided Flycatcher							
467 Horned Lark							
475 Purple Martin							
469 Tree Swallow							
471 N.Rough-winged Swallow							
470 Bank Swallow							
473 Cliff Swallow							
472 Barn Swallow							

DOW	DAY	MONTH	YEAR
Mon	10	Sept	2007

DET PARTICIPANTS:
MAH, GEG

Bnd data computerized:	
DET computerized:	

Species	Obs	Cns	Bnd	Rep	Ret	PKS	DET
478 Blue Jay	5	3					8
488 American Crow	22	27					40
486 Common Raven							
495 Black-capped Chickadee	12	19		2		2	21
510 Red-breasted Nuthatch	1						1
509 White-breasted Nuthatch							
513 Brown Creeper							
519 House Wren	1	2	1	1		1	4
520 Winter Wren							
524 Marsh Wren							
557 Golden-crowned Kinglet							
558 Ruby-crowned Kinglet			1				1
546 Eastern Bluebird							
545 Veery							
538 Bicknell's Thrush							
544 Gray-cheeked Thrush							
543 Swainson's Thrush							
542 Hermit Thrush							
541 Wood Thrush							
539 American Robin	4	1					5
529 Gray Catbird	4	4	1	1		1	5
528 Northern Mockingbird							
530 Brown Thrasher							
562 American Pipit							
564 Bohemian Waxwing							
565 Cedar Waxwing	13	2					15
567 Northern Shrike							
569 European Starling		35					35
579 Blue-headed Vireo							
584 Warbling Vireo							
583 Philadelphia Vireo							
582 Red-eyed Vireo		2	2				4
606 Tennessee Warbler							
607 Orange-crowned Warbler							
608 Nashville Warbler							
612 Northern Parula							
615 Yellow Warbler							
630 Chestnut-sided Warbler							
616 Magnolia Warbler				1		1	0
617 Cape May Warbler			1				1
618 Black-thr. Blue Warbler							
619 Myrtle Warbler							
623 Black-thr. Green Warbler							
627 Blackburnian Warbler							
633 Pine Warbler							
636 Western Palm Warbler							
636 Yellow Palm Warbler							
631 Bay-breasted Warbler							
632 Blackpoll Warbler		1					1
597 Black-and-white Warbler							

Species	Obs	Cns	Bnd	Rep	Ret	PKS	DET
651 American Redstart			1	1		1	1
637 Ovenbird			1				1
638 Northern Waterthrush			1				1
641 Connecticut Warbler							
642 Mourning Warbler							
644 Common Yellowthroat	4	4	3				7
649 Wilson's Warbler		1					1
650 Canada Warbler							
683 Scarlet Tanager							
687 Northern Cardinal	2	2					4
689 Rose-breasted Grosbeak	1						1
692 Indigo Bunting							
718 Rufous-sided Towhee							
752 American Tree Sparrow							
753 Chipping Sparrow							
754 Clay-colored Sparrow							
756 Field Sparrow							
734 Vesper Sparrow							
725 Savannah Sparrow							
767 Fox Sparrow							
770 Song Sparrow	3	6	2	2		2	11
768 Lincoln's Sparrow			2				2
726 Grasshopper Sparrow							
769 Swamp Sparrow							
764 White-throated Sparrow	14	5	3	3		3	15
760 White-crowned Sparrow							
744 Slate-coloured Junco							
776 Snow Bunting							
661 Bobolink							
665 Red-winged Blackbird							
662 Eastern Meadowlark							
675 Rusty Blackbird							
678 Common Grackle	2	10					12
679 Brown-headed Cowbird							
673 Baltimore Oriole							
703 Pine Grosbeak							
699 Purple Finch	1						1
701 House Finch							
714 Red Crossbill							
715 White-winged Crossbill							
709 Common Redpoll							
708 Hoary Redpoll							
710 Pine Siskin							
711 American Goldfinch	7	21					25
698 Evening Grosbeak							
655 House Sparrow							
# OF INDIVIDUALS			19	11	-		
# OF SPECIES	22	22	12	7	-	7	33

12. Coverage Codes

Recording an accurate coverage code facilitates subsequent analysis of the data. Each day, the objective is to achieve the highest coverage code possible given weather conditions. Coverage code applies to the count period as a whole including the extended banding period referred to in section 6. The coverage code is not affected by any observations outside the count period.

The coverage code is the sum of three factors, representing census, banding, and general observations. Record the actual coverage code according to the guidelines below. To distinguish coverage loss due to weather from that loss due to understaffing, record also the maximum coverage code that would have been attained if unlimited Class 1 observers had been available. The concept of observer class is explained in section 13. Census is a stand-alone component and is not included in observer hours. For example, if 3 people run the census and no banding or additional observation occurs that day, the coverage code is 1. This also means that observers running the census must deduct 1 hour from their observation hours. The maximum coverage code for a day without banding would be coded as a 3, since an unlimited number of Class 1 observers conducting additional observations would score a 2, and census scores a 1.

Census – 1 point if conducted, 0 if not

Banding – 0.5 points for 1 to 24.9 net hours
1 point for 25 to 49.9 net hours
1.5 points for 50 to 74.9 net hours
2 points for 75+ net hours (standard maximum should be 80)

Observations – 0.5 points for 0.5 to 2.9 hours*
1 point for 3 to 5.9 hours*
1.5 points for 6 to 8.9 hours*
2 points for 9+ hours*

* Observer hours are calculated as the sum of Class 1 observer hours plus 50% of Class 2 observer hours. While Class 3 observers are encouraged to also observe, and may record numerous birds, it is relatively infrequent that they spot birds not also noted by Class 1 and/or 2 observers, and therefore their hours do not contribute to this total, to prevent it from being artificially inflated.

Example 1: there is full banding coverage today, and the census was completed. Three observers each spent 3 hours observing; there was one each of Class 1, 2, and 3. The actual coverage code is 4 (1 for census, 2 for banding, and 1 for observations, based on a total of 4.5 hours = 3 x 1 + 3.x 0.5). The maximum coverage code is 5 because that level could have been achieved with extra observers.

Example 2: the nets were all shut down after one hour today due to rain and could not be reopened. However, census was done, and there were three Class 1 birders on hand all day, each spending four hours observing. Both the actual and maximum coverage codes are 3.5 (1 for census, 0.5 for banding based on 16 net hours, and 2 for observations based on 12 observer hours).

Figure 6. Coverage codes

Code	Term	Description
0	None	No bird coverage at all during the count period
1	Casual	Census only, or other limited casual observations
2	Poor	Census plus limited observations and/or banding
3	Fair	Census plus moderate coverage through banding and/or observations
4	Good	Census and good coverage through banding and/or observations, with either a full score for banding or observations, or a ¾ score for both
5	Excellent	Census and excellent coverage through banding and observations

13. Daily Log Sheet

The MMP daily log sheet must be filled out every day. Data must be collected and recorded carefully throughout the count period. The BIC must ensure that the daily log is completed. However, it is the responsibility of all participants to provide information for the log and to record it as the day progresses and time permits. Figure 7 shows an example of a completed daily log sheet.

Among other things, the daily log records:

- date
- local weather conditions at the start of the count period, at the start of census, and at the end of the count period (some of this information, such as barometric pressure and temperature, should be filled in based on online weather station data from the last 24 hours at P.E. Trudeau Airport (http://www.theweathernetwork.com/weather/CAQC0023), but cloud cover must be measured on-site)
- times of net openings and closings
- actual and maximum coverage codes
- staff present, including for what time periods
- observer class for each staff member, and hours of active general observations by each staff member (excluding time on extractions, banding and census)
- the names of the BIC and censuser
- unusual species occurrences
- early and late records
- evidence of migration
- casualties or injuries
- notes about station maintenance
- general highlights of the day
- any additional relevant information

It is particularly important that any departure from normal MMP protocol and its causes be recorded on the log. Informative narratives are encouraged.

To help determine coverage codes, the daily log records the observer class for all staff present (Figure 8). This refers solely to birding skills, not banding skills.

Figure 7. Example of a completed daily log sheet (page one)

McGill Bird Observatory (MBO) Fall Migration Monitoring Program
Daily Banding Log – Page One

DOW	Day	Month	Year	Day #	BIC	Census by:	Daily Log by:	Actual coverage code	4.5
Mon	10	Sept	2007	41	MAH	CMM	MAH	Max. coverage code	5

	Start	Stop
Count Period	0600	1200
Census	0725	0825

Weather Summary:
Cold weather yesterday and largely overcast.
Cold overnight but warming in AM and sunny.

	Start of Opening Round	Census	End of Count Period
Time	0600	0725	1200
Wind Direction	N	N	E
Wind Strength	1	1	1
Cloud Cover %	5	20	5
Temp. ◦C	10	14	19
Precipitation	-	-	-

Obs Initials	Observer Name	Begin Time	End Time	Hours Obs	Class	Total Obs	
MAH	Marie-Anne Hudson	0600	1200	3.5	1	x 1 =	3.5
GEG	Gay Gruner	0600	1200	3.5	1	x 1 =	3.5
CMM	Chris Murphy	0725	0825	-	1	x - =	
						x =	
						x =	
						x =	
						x =	
						x =	
						x =	
						x =	
						x =	
						x =	
* Total Obs hours = (Class 1 x 1) + (Class 2 x 0.5)					**Total Observer Hours**		7

	Species	Indiv.
Banded	12	19
Repeats	7	11
Returns	-	-
Census	22	
General Obs.	22	
DET	35	
Total net hours		75
Birds/ 100 net hours		25.3
SMMP Cumulative Totals		
Banded	58	813
Returns	11	37
DET	113	
Total net hours		2634.3
Birds / 100 net hours		30

Net Group	Open	Closed	Net hours		
A	0605	1105	5	x 2.0 =	10
B/N	0600	1100	5	x 4.0 =	20
C	0600	1100	5	x 2.0 =	10
D	0615	1115	5	x 4.0 =	15
E	0610	1110	5	x 2.0 =	10
H	0610	1115	5	x 2.0 =	10
				x =	
				x =	
J-trap	-	-	**Trap hours = 0**		

Visitors and Others:
Short visit from Jeff Webster from the EcoMuseum.

Deviations from Protocol:

MBO Migration Monitoring Program
Daily Banding Log – Page Two

DOW	Day	Month	Year	Daily log by:
Mon	10	Sept	2007	MAH

Station Notes:

Narrative:
Not too much to report. Most of the birds arrived during the 1st round, leaving the rest of the
Morning feeling decidedly quiet. Despite it being warm, fall is here, announced by the 1st RCKI
in the nets! No sign of yesterday's SCJU though.
GEG practiced banding and skulling – Is getting much better at finding those windows!

Bird Migration:
WTSP flocks

Newly-arrived and Unusual Species:		
Year obs:	Year band:	Year rep:
Season obs: **RCKI**	Season band: **RCKI**	Season rep:
Year ret:	Season ret:	

Other Flora and Fauna:
Cicada removed from E2
Garter snake along path from D

Station Management:
Tidied up white board in station.

Injuries and Casualties:
N/A

Birds Released at Nets:
N/A

Figure 8. Observer classes

Observer Class	Criteria
1	Can correctly identify >75% of species likely to be encountered at MBO based on a good view for 5-10 seconds without recourse to a field guide
2	Can correctly identify 50-75% of species likely to be encountered at MBO based on a good view for 5-10 seconds
3	All other active observers

Weather data: Key weather information should be recorded 3 times each day, once at the start of the opening round (or if nets are not opened immediately, at the time the opening round would start), once at the start of the census, and once at the end of the closing round. The key variables are temperature, wind direction, wind strength (according to the Beaufort Scale, Figure 9), percentage of cloud cover and precipitation (including whether continuous or intermittent, heavy or light, etc.). There should also be a general summary of the weather during the count period and preceding 12 hours. If the weather has made it necessary to deviate from the protocol, the log must describe why, how and for how long.

Figure 9. Beaufort scale

Force Number	Description	Signs	km/hr
0	Calm	Smoke rises	0-1
1	Light air	Smoke drifts but no wind vane movement	2-5
2	Slight breeze	Wind felt on face; leaves rustle	6-11
3	Gentle breeze	Leaves and twigs in constant motion; wind extends a light flag	12-19
4	Moderate breeze	Dust and loose paper are raised; small branches are moved	20-28
5	Fresh breeze	Small trees and leaves begin to sway	29-38
6	Strong breeze	Large branches in motion; whistling in wires	39-49
7	High wind	Whole tree in motion	50-61

14. Habitat Management

Basic vegetation management is required immediately below and adjacent to all nets. In addition, for a standardized migration monitoring program, vegetation around the net lanes must be kept at the same general height over time. However, excessive trimming around net lines, including in the course of routine net line maintenance, should be avoided since it can increase the visibility of nets to birds and differentially affect capture rates over time.

Photographs of the vegetation surrounding each MMP net were taken in late summer 2004 to serve as a reference point for future years. The object is to ensure that habitat is kept to the extent possible at similar stages in the future. Photos are to be taken at least once each fall from both ends of each net lane.

Periodically (every two to three years to date) the cattails in Stoneycroft Pond need to be manually thinned out during the summer when the water levels are low to ensure that they do not overtake the pond.

15. Safety

a) Bird Safety

All banding activities must be operated with the welfare of the birds as the top priority. In addition to ensuring that they are handled with care, special consideration should be given to the following aspects:

i) Temperature and other weather limitations

As a general rule, the mist nets should not be operated below -5°C, or above 25°C. Extra care should be taken near either of these temperature extremes – i.e. more frequent than usual net checks (every 10 minutes in winter and every 15 minutes in summer). In winter, the cutoff temperature should be even higher when there is wind (i.e. the wind chill temperature should be used as a guideline), and in summer, nets in full sun should be closed or monitored almost continuously when the temperature rises above 20°C.

ii) Extraction

The greatest potential for injury to birds occurs during extraction, and for this reason only those who have demonstrated a consistent high level of competence with extractions should be permitted to conduct them without supervision. Extraction is not for everyone, and it is up to the BIC and/or MBO Director to decide if a particular volunteer should be encouraged to focus on observation or scribing instead of training as an extractor. Those who do have such experience should be encouraged to assist with training newer volunteers who show a potential aptitude. New volunteers with previous extraction experience will need to demonstrate their skills before they are allowed to extract. A detailed set of instructions and tips for extractors is posted on the website at www.migrationresearch.org/mbo/extraction.html

iii) Carrying birds

Once extracted from the net, each bird must be gently and safely secured in a cotton bag and carried back to the banding station. Care must be taken to ensure that the birds are safe throughout this time. Specifically, those carrying birds must make efforts to minimize jostling of bags as they carry them, and to keep large and/or jumpy birds separated from others as much as possible. Bird bags may be clipped to shoulder bags or belts, but if so, extra care is required to ensure the birds are not brushed against vegetation while walking. While this may be easier for the carrier, the best/safest way to carry birds in bags is in the hand (which is extended out perpendicularly, in front of the body), with the bag strings looped over the wrist or fingers. This ensures that the carrier knows where the bags are at all times, and permits easy maneuvering around obstacles.

iv) Frequency and thoroughness of net checks

Each net should be checked at least every 45 minutes. If weather conditions are at all unpleasant (windy, humid, particularly cool or warm), the frequency should be no less than every 30 minutes, and there is no harm in checking this often under any conditions. On each check, every net should be inspected carefully from end to end, paying particular attention to the lower and upper panels where birds may be easier to miss, to ensure that no small birds are overlooked.

v) Holding Times

Birds should be processed as quickly as possible, preferably within 60 minutes; ensure that birds are kept in shaded bags away from heat or cold, and are not overly crowded (aggressive species should be held separately). Brooding females should be processed right away. See item **vi** below.

vi) Priority birds

Priority should be given to brooding females, juveniles, and any birds that appear to be experiencing undue stress of any kind, including those for which extraction was unusually complicated or prolonged. Such birds should have a green peg attached to the cord of their bird bag to notify the BIC that they are to be processed first (or at the discretion of the extractor and/or BIC be released near the net without being processed).

vii) Priority if busy

If too many birds are captured to process within a reasonable time period, the BIC should close two to four nets until processing and holding times fall within a safe margin.

viii) Radio communication

In addition to a cellular phone, at least 3 two-way radios should be kept on site for communication among volunteers. One is to be kept by the BIC at all times. A second should be taken by the censuser, to report any birds in nets along the census route, or any other important sightings of immediate interest. The third should be carried by the lead extractor, to report to the BIC any need for assistance at the nets.

b) People Safety

i) First aid

A basic first aid kit (bandages, alcohol, etc.) should be kept in an easily accessible place within the banding station at all times. The Director and BIC are responsible for ensuring that supplies are maintained.

ii) Sanitation

Working with wild animals of any kind requires that some basic sanitary precautions be taken. At a minimum, all participants who handle birds or bird bags should ensure that they wash their hands prior to touching any food. A disinfectant hand gel and/or disinfectant hand-wipes should be kept at the banding station.

iii) Campus Security

The BIC should have the telephone number of Campus Security on his/her telephone. The number is also displayed on the white board in the cabin (514-398-7770).

iv) Facilities Maintenance

Prior to the start of each MMP season, the cabin should be cleaned. The chimney of the wood stove should be cleaned a minimum of once a year. Storage containers, which should labelled with their contents, should be checked to see if there has been rodent or other damage. The wiring between the solar panel and battery should also be verified.

v) Fire Extinguisher

A fire extinguisher is hung in a visible and accessible location at the cabin. It is the responsibility of the BIC or Director to ensure that it is verified once a year. In the event of an uncontrolled blaze, 911 should be called as well as Campus Security (514-398-7770).

16. Bird Bags

Small and medium-sized birds are placed in cotton bags for transport from the nets to the banding station. Hawks and other large birds, or birds that may be tricky to remove from the bag, should not be bagged and instead brought directly to the banding station.

The key requirements of bird bags are that they are made of cotton, do not have any loose seams in which birds can get tangled, and have a drawstring that slides easily to facilitate quick and reliable opening and closing. Size can vary somewhat, with smaller bags being preferable for little birds such as kinglets and warblers, and larger ones required for thrushes and blackbirds. Guidelines for the design of bird bags are posted on the website at www.migrationresearch.org/birdbags.pdf.

To minimize the risk of spreading disease between birds, bags should be used only twice (once, then turned inside out and used again) and then washed in hot, soapy water.

17. Changes to the Protocol Between Years

Changes to the protocol between years should be kept to an absolute minimum (preferably there should be none). However, some may be unavoidable. If so, the change, its rationale and its timing should be carefully recorded so that possible impacts can be assessed when analyses are conducted. The potential effects on the value of data for population monitoring should be carefully considered before optional changes are introduced. The best way to mitigate negative effects may be to phase in the changes over 2 to 3 years. Ideally, the new and old protocols should be run simultaneously or on alternate days during a phase-in period. This will enable the effects of the 2 protocols to be detected and corrected for in the analysis. See the McGill Bird Observatory Operations Manual (Gahbauer 2007) for additional discussion of long term site management.

There have been a few key changes to the protocol since its creation in 2004: 1) in fall 2006, the census route was slightly shortened at the end to allow it to be comfortably walked in 60 minutes; 2) prior to fall 2006, the two 18-m nets at A1 and D1 were phased out and replaced with 12-m nets; 3) the experimental nets (F, G, K, and L) were used at most for 1 season; 4) A2, D4, E2, and H were added between 2006 and 2008 to replace the more distant experimental net groups; 5) the list of target species was reduced from 80 to 62 in 2008 by limiting it to those observed on at least 10 days annually between 2006 and 2008; 6) the Probable/Known Stopover (PKS) field was added to the DET sheet in 2008 to document individuals that were already counted during the season; previous records (2004-2008) were then revisited to ensure adherence to the PKS system to avoid double-counting of individuals (e.g. repeats and rarities shifted to PKS and excluded from multi-day DETs); 7) the winter net array was reduced to three nets prior to winter 2012-13; 8) the standard owling season was adjusted to 42 days from 45 beginning in 2012; 9) the standard for nets was switched from Spidertech to Manomet prior to spring 2012; and 10) the limited net array was adjusted from HCAD to HCAE in 2012.

18. Acknowledgements

We would like to thank Bill Murphy for writing the Innis Point Spring Migration Monitoring Program Protocol upon which the initial version of this document was largely based. Dick Cannings from Vaseux Lake Bird Observatory provided an excellent summary of the PKS issue, for which we are grateful.

19. References

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Appendix A. Bander's Code of Ethics

1. More than anything else, banders are responsible for the safety and welfare of the birds they study. This means that stress and risks of injury or death need to be minimized. Some basic rules are as follows:

- handle each bird carefully, gently, quietly, and with respect
- capture and process only as many birds as you can safely handle
- close traps or nets when there are known predators in the area
- do not band in inclement weather
- frequently assess the condition of traps and nets and repair them quickly
- ensure trainees are properly trained and supervised
- check nets every 20 to 30 minutes
- check traps as often as is recommended for each trap type
- properly close all traps and nets at the end of the banding day
- do not leave traps or nets set and untended
- only double-bag non-aggressive birds of the same size and species
- use the correct band size and banding pliers for each bird
- treat all bird injuries in the most humane way

2. Banders must continually assess their own work to ensure that it is beyond reproach.

- reassess methods and your approach whenever an injury or mortality occurs
- accept constructive criticism from other banders

3. Banders must offer honest and constructive assessment of others' work to help maintain the highest standards possible.

- publish innovations in banding, capture and handling techniques
- educate prospective banders and trainers
- provide feedback of any instances of mistreatment of birds to the bander
- if there is no improvement, then file a report with the Banding Office

4. Banders must ensure that the data gathered are accurate and complete.

5. Banders must obtain permission to band on private property.