McGill Bird Observatory
Field Protocol for Migration Monitoring Program

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August 2004
Revised March 2007

A project of the

MIGRATION RESEARCH FOUNDATION

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1. Caveat

This document was 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.

2. Introduction

The purpose of the Migration Monitoring Program (MMP) at the 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 indicate how generally accepted principles of migration monitoring are applied to 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.

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 make more or less continuous observations in the count zone.

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 figure 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 are excluded.

Priority A	**Priority B**	**Priority C**	**Priority D**
<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 †
American Pipit †	Bohemian Waxwing †	Bank Swallow †	American Robin *
Bay-breasted Warbler *	Boreal Chickadee †	Barn Swallow *	Belted Kingfisher †
Blackpoll Warbler *	Common Redpoll *	Black-and-white Warbler *	Black-capped Chickadee *
Cape-may Warbler *	Fox Sparrow *	Black-throated Green Warbler*	Brown Creeper *
Connecticut Warbler †	Hoary Redpoll †	Blue-headed Vireo *	Cedar Waxwing *
Grey-cheeked Thrush *	Lapland Longspur	Canada Warbler *	Common Grackle *
Lincoln's Sparrow *	Myrtle Warbler *	Chipping Sparrow *	Downy Woodpecker *
Magnolia Warbler *	Northern Shrike *	Clay-coloured Sparrow	Eastern Phoebe *
Northern Waterthrush *	Palm Warbler *	Cliff Swallow †	European Starling *
Orange-crowned Warbler*	Pine Grosbeak †	Common Nighthawk	Golden-crowned Kinglet*
Savannah Sparrow *	Ruby-crowned Kinglet *	Common Yellowthroat *	Hairy Woodpecker *
Swainson's Thrush *	Rusty Blackbird *	Eastern Kingbird *	Hermit Thrush *
Tennessee Warbler *	Slate-coloured Junco *	Least Flycatcher *	Horned Lark †
Wilson's Warbler *	Snow Bunting †	Mourning Warbler *	Pine Siskin *
Yellow-bellied Flycatcher*	Swamp Sparrow *	Olive-sided Flycatcher †	Purple Finch *
Yellow-bellied Sapsucker*	White-crowned Sparrow*	Ovenbird *	Red-breasted Nuthatch *
	White-throated Sparrow*	Philadelphia Vireo †	Red-winged Blackbird *
	White-winged Crossbill	Red-eyed Vireo *	Song Sparrow *
		Tree Swallow *	Vesper Sparrow
		Warbling Vireo *	Winter Wren *
		Yellow Warbler *	Yellow-shafted Flicker *

Asterisks (*) represent species banded at MBO.
Crosses (†) represent species observed at MBO but not yet banded.

Personnel will be assigned responsibilities by the BIC that do not exceed their skills, knowledge and experience. The BIC is, as the name implies, in charge and is therefore 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 should largely be done outside the MMP, although specific training opportunities which do not interfere with the protocol are likely to arise during the program. 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. The birds' safety always comes first. Volunteers new to banding should not expect to handle nets or birds until proper training has occurred.

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. 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.
c) Breeding MP: informal banding as weather and staff permit during the 8-week period from June 6 to July 31 of each year; potential exists to add a formal program, likely following MAPS (Monitoring Avian Productivity and Survival) methodology. Census conducted 2-3 times per week.
d) Winter MP: informal banding as weather (especially temperature) permits during the 22 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 40-night period from September 25 to November 4.

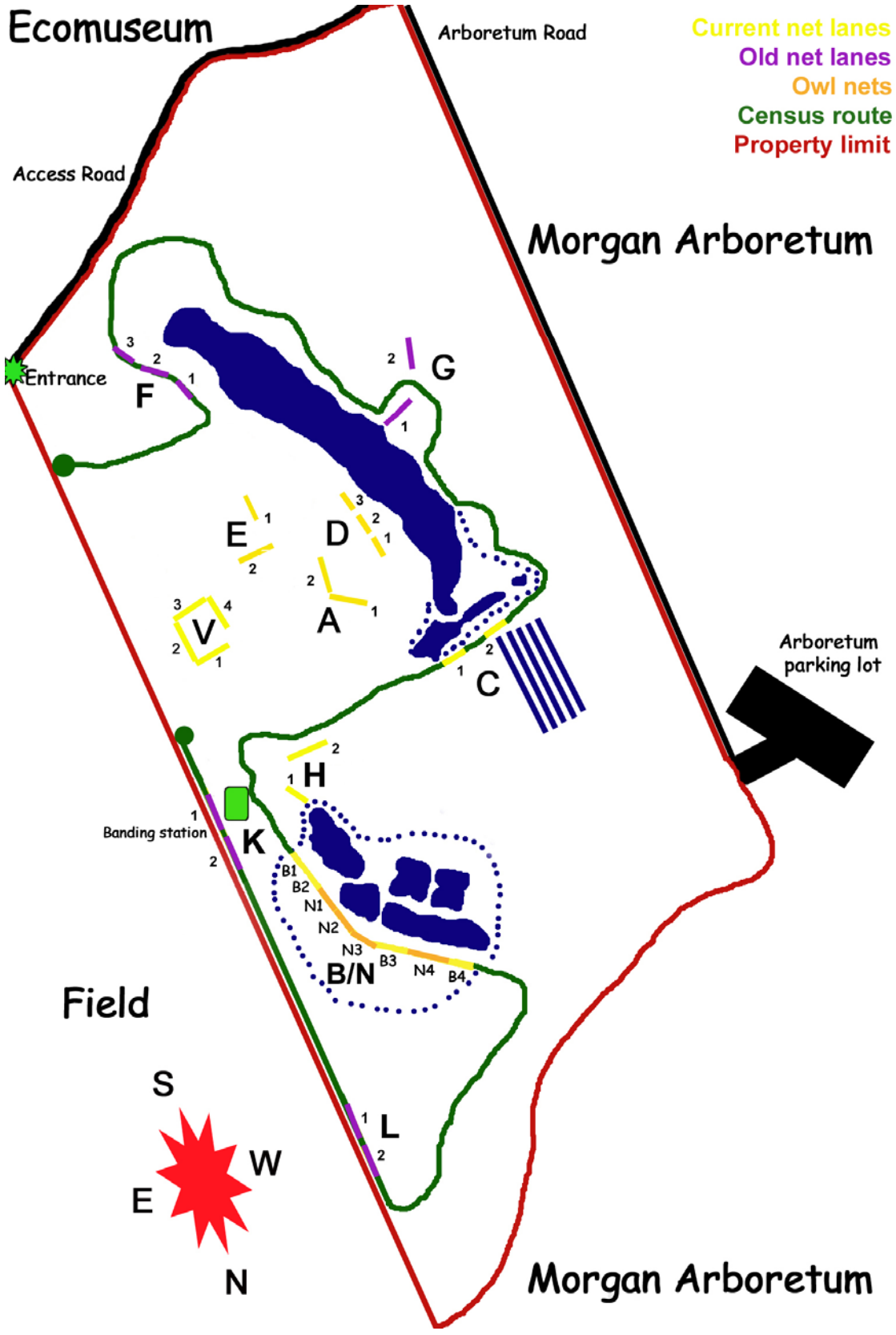
5. Count Area

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 purposes of the census, general observations and DETs, any and 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.

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 when there is no adverse weather.

Figure 2. Map of McGill Bird Observatory



The tally of DETs cannot begin until all birds captured in the closing net round have been processed. An 'extended banding period' applies when weather or other factors prevent banding throughout the first 5 hours but conditions are suitable for banding during the last hour of the count period (when nets would ordinarily be closed). In this case, nets may be left open beyond the usual end of the banding period to compensate for the lost time, up to a maximum of one hour. Figure 4 illustrates this with several examples. 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 banding 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

Figure 4. Summary of key events during count period for May 31, illustrating extended banding period

Event	Time	Example 1	Example 2	Example 3
Count period begins	0.5 hour before sunrise	4:50 am	4:50 am	4:50 am
Nets opened	Same as above	4:50 am	4:50 am	4:50 am
Sunrise	Sunrise	5:18 am	5:18 am	5:18 am
Census	60-120 minutes after sunrise	6:20-7:20 am	6:20-7:20 am	6:20-7:20 am
Nets closed due to rain		8:00-8:30 am	8:00-10:30 am	8:00 am through rest of count period
Usual net closing time	5 hours after sunrise	10:20 am	10:20 am	10:20 am
Modified net closing time	No later than end of count period	10:50 am	11:20 am	Not reopened
Count period ends	5.5 hours after sunrise	10:50 am	11:20 am	10:50 am

7. Banding Protocol

The information routinely obtained for each bird captured during MMP is indicated below. The standard reference is Pyle (1997) supplemented for non-passerines not covered in Pyle by *North American Bird Banding Techniques* (Canadian Wildlife Service and U.S. Fish and Wildlife Service, 1991). Data routinely recorded for all newly-banded birds, recaptures, and foreign recoveries include (see Figure 5):

- 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 not 100% sure
- 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), and attempt to age where possible. Exceptional 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 if routinely 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)

For birds that are repeats (recaptured within 3 months of their previous encounter), 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 correct 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 of your arrival (450-458-2809).

Figure 5. 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 Nº	Prob. A	Prob. S	Scribe	Notes
51	WTSP	11	4	78	1	27.	1004	105	MAH	B3			MAG	
52	WTSP	21	4	69	0	21.	✓	110	MAG	B3			✓	
53	WTSP	01	4	69	0	23.	1006	075	MAG	D1	1		IJ	
54	SOSP	11	9	67	0	20.	✓	✓	✓	D3			✓	
55	WTSP	21	4	71	2	23.	✓	✓	✓	D3			✓	
56	WTSP	21	4	73	0	25.	✓	080	✓	✓			✓	
57	WTSP	11	4	77	2	27.	✓	✓	✓	E1			✓	
58	WTSP	21	4	75	1	25.	✓	083	MAH	D1			✓	
59	WTSP	21	5	67	1	23.	✓	✓	MAG	D3			✓	
60	WTSP	21	0	70	1	21.	✓	084	✓	D3			✓	
61	WTSP	01	4	73	1	28.	✓	✓	MAH	✓	2		✓	
62	WTSP	21	4	74	5	27.	✓	091	✓	C2			MAG	
63	SOSP	01	9	66	2	21.	1008	083	MAG	D1	1		SAC	
64	AETH	21	9	85	1	29.	1008	084	✓	B1			✓	
65	SOSP	01	9	63	0	20.	✓	089	✓	D2	2		✓	
66	WTSP	21	4	72	0	25.	✓	085	✓	D3			✓	
67	WTSP	21	4	73	5	29.	✓	✓	✓	D3			✓	
68	WTSP	21	4	72	4	26.	✓	✓	✓	D3			✓	
69	WTSP	21	4	74	3	26.	✓	090	✓	D1			✓	
70	AETH	21	9	86	1	29.	✓	091	✓	D2			✓	
71	WTSP	21	4	67	1	21.	✓	092	✓	D1			✓	
72	SOSP	21	9	66	1	20.	✓	✓	✓	C1			✓	
73	AETH	21	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. The census starts one hour after sunrise and is run each day regardless of weather conditions.

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.

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 (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 three 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 online at <www.migrationresearch.org/mbo.html>. Orange markers indicate the census route. A suggested time budget for census is as follows: 15 minutes to L, 5 minutes to B/N, 15 minutes to C, 10 minutes to G, 10 minutes to the evergreens past F 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 devices of any sort 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, he or she may use judgement to stop to remove birds requiring immediate attention. Any netted birds should be reported to the BIC by walkie-talkie. 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, if (s)he is qualified to do so. Birds seen in mist-nets are not counted on the census.

9. Net Locations

There are 23 nets allocated to groups A, B/N, C, D, E, H, and V (see yellow/orange bars in Figure 2). Of these, the V nets are used only in winter, and half of the 8 B/N nets are used only for owling. The remaining 15 nets constitute the standard array for migration monitoring, though H1 is usually flooded in spring, leaving 14 nets for the SMMP. 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 two nets among apples and hawthorns, a bit inland from Stoneycroft Pond. Group B/N consists of eight nets along the eastern ridge of the rear pond. Group C consists of two nets in the sumac grove running along the north edge of Stoneycroft Pond. Group D consists of three nets running along the edge of Stoneycroft pond. Group E consists of two nets along the edge of the centre field, one partly lined with conifers, and the other among hawthorns. Group H consists of two 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 a square of 4 nets surrounding a hawthorn thicket on the east edge of the centre field. Additional designated net locations that are not in regular use (see purple bars in Figure 2) are F (3 nets along path on the east side of Stoneycroft Pond at its south end), G (2 nets on the west side of Stoneycroft Pond, one perpendicular to the shore, and the other

upslope across the census path), K (2 nets behind the banding station), and L (2 nets along the census trail near the northeast corner of the property, just before it enters the woods).

All nets are four-shelf tethered polyester nets with 30 mm mesh deployed to a height of about 2.5 m. Most nets in use are made by Spidertech, and a few by Avinet. Efforts should be made to remain consistent with the use of Spidertech when additional nets are purchased, as the capture rate varies by model. Except for 18-m nets at A1, D1, and G1, all nets are 12 metres long.

Opening and closing times are recorded on the log sheet for each net group. Mist-net 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, record the location as MN (mist-net).

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:

Full: (2-3 experienced extractors): All nets (CADE / BNH)
Regular: (1-2 experienced extractors): All nets except B/N (CADEH)
Basic: (1 experienced extractor): Only H and CAD, 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.

At the beginning of each morning, the BIC will 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 at all times.

The J-trap, situated between A and C, should be baited with corn or seeds when nets are opened, and checked regularly in conjunction with all net runs. Extreme care must be taken when flushing trapped birds into the containment box, especially when several are in the trap at the same time. It is best to use two people to empty the trap if many birds are present: one to flush and control birds into the containment box, the other to quickly and carefully extract birds from the box and place them in cotton bags for processing back at the station. Birds extracted from the J-trap should be appropriately marked so that the bander knows to mark JT in the net location box on the banding data sheet.

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 more or less continuous 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 about 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 observations made outside the count zone may be recorded in the appropriate section of the daily log but not on the DET sheet.

The DET coordinator will often be the BIC or at least 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 6 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.

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.

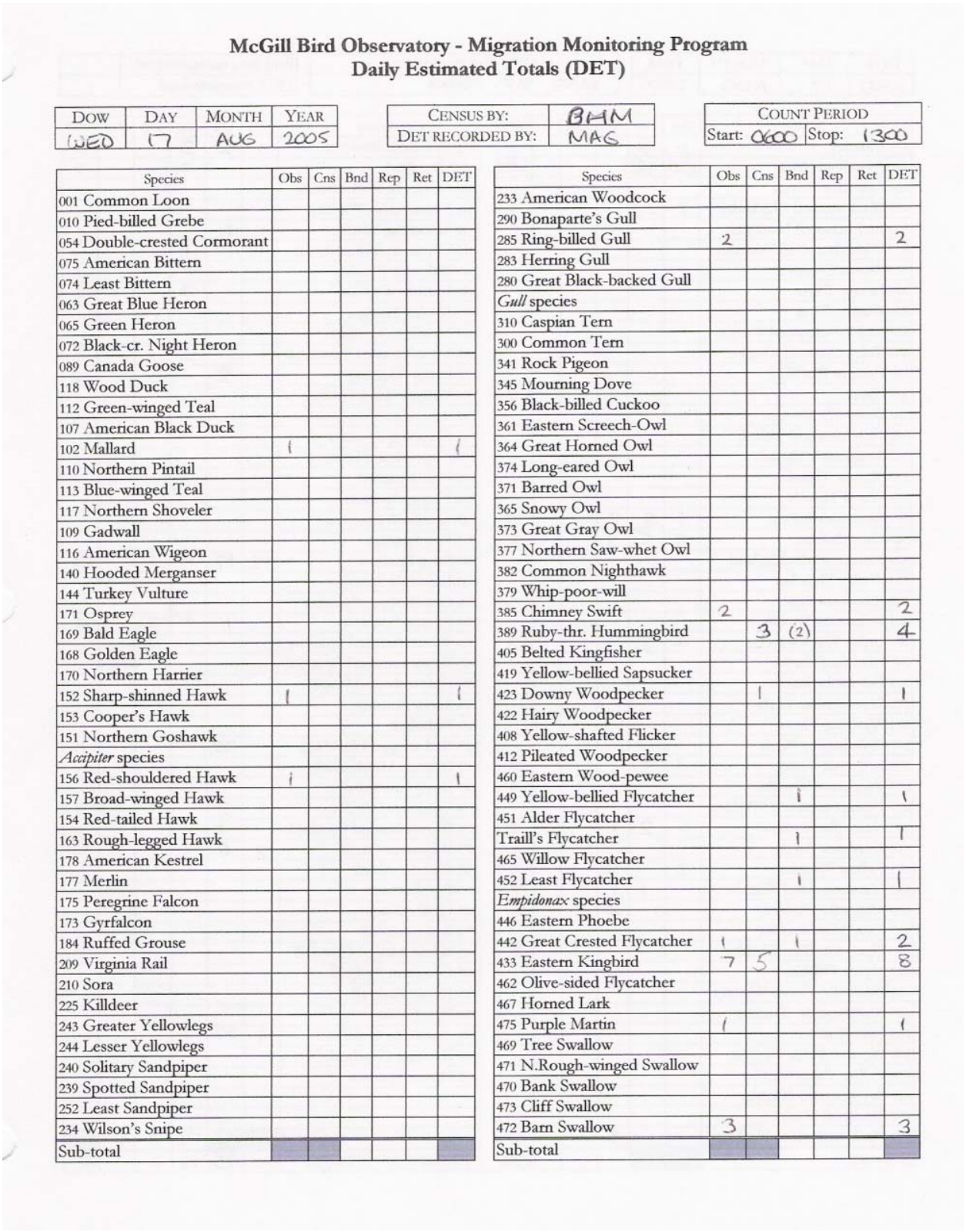
While the description of the DET tally may sound time consuming, staff quickly get used to providing information efficiently so that the average DET tally need take only about 10-15 minutes. It is the responsibility of all staff the make the DET as complete and accurate as possible, however, it is particularly 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.

Example of DET: The DET coordinator calls 'Red-winged Blackbird'. All staff who detected Red-winged Blackbirds on general observations report the maximum number they detected. Shawn says that he saw 30. Marcel reports that he saw 20 and Christina reports 5. A discussion of the time, place and movement of these birds results in agreement that there were likely 40 blackbirds involved. The DET coordinator records the general observations as 40. The coordinator reports that 3 were banded, there was 1 repeat and 10 were seen on the census. The persons who extracted or banded the blackbirds note that they were at Group D, whereas no other Red-winged Blackbirds were observed in that area today. The repeat Red-winged Blackbird from C however, was likely one of the pair that Shawn and Marcel saw there. Shawn, the censuser, decides that five of those he saw were not among those referred to during either general observations or banding. So, the consensus DET number for Red-winged Blackbird is 48 (40 + 3 + 5).

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. In some cases, (e.g. 'gull species') the DET sheet will include categories of this sort immediately at the end of the family in question. 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 6. Example of a completed DET sheet (page one)



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

DOW	DAY	MONTH	YEAR
WED	17	AUG	2005

CENSUS BY:	BHM
DET RECORDED BY:	MAS

COUNT PERIOD	
Start: 0600	Stop: 1300

Species	Obs	Cns	Bnd	Rep	Ret	DET
001 Common Loon						
010 Pied-billed Grebe						
054 Double-crested Cormorant						
075 American Bittern						
074 Least Bittern						
063 Great Blue Heron						
065 Green Heron						
072 Black-cr. Night Heron						
089 Canada Goose						
118 Wood Duck						
112 Green-winged Teal						
107 American Black Duck						
102 Mallard	1					1
110 Northern Pintail						
113 Blue-winged Teal						
117 Northern Shoveler						
109 Gadwall						
116 American Wigeon						
140 Hooded Merganser						
144 Turkey Vulture						
171 Osprey						
169 Bald Eagle						
168 Golden Eagle						
170 Northern Harrier						
152 Sharp-shinned Hawk	1					1
153 Cooper's Hawk						
151 Northern Goshawk						
Accipiter species						
156 Red-shouldered Hawk	1					1
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						
240 Solitary Sandpiper						
239 Spotted Sandpiper						
252 Least Sandpiper						
234 Wilson's Snipe						
Sub-total						

Species	Obs	Cns	Bnd	Rep	Ret	DET
233 American Woodcock						
290 Bonaparte's Gull						
285 Ring-billed Gull	2					2
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						
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	2					2
389 Ruby-thr. Hummingbird		3	(2)			4
405 Belted Kingfisher						
419 Yellow-bellied Sapsucker						
423 Downy Woodpecker		1				1
422 Hairy Woodpecker						
408 Yellow-shafted Flicker						
412 Pileated Woodpecker						
460 Eastern Wood-pewee						
449 Yellow-bellied Flycatcher			1			1
451 Alder Flycatcher						
Traill's Flycatcher			1			1
465 Willow Flycatcher						
452 Least Flycatcher			1			1
Empidonax species						
446 Eastern Phoebe						
442 Great Crested Flycatcher	1		1			2
433 Eastern Kingbird	7	5				8
462 Olive-sided Flycatcher						
467 Horned Lark						
475 Purple Martin	1					1
469 Tree Swallow						
471 N.Rough-winged Swallow						
470 Bank Swallow						
473 Cliff Swallow						
472 Barn Swallow	3					3
Sub-total						

Figure 6. Example of a completed DET sheet (page two)

DOW	DAY	MONTH	YEAR
WED	17	AUG	2005

DET PARTICIPANTS:
MAG, BF, BHM

Bnd data computerized:	
DET computerized:	

Species	Obs	Cns	Bnd	Rep	Ret	DET
478 Blue Jay	6	8				12
488 American Crow	130	18				140
486 Common Raven						
495 Black-capped Chickadee	8	10			1	15
510 Red-breasted Nuthatch	1					1
509 White-breasted Nuthatch						
513 Brown Creeper						
519 House Wren						
520 Winter Wren						
557 Golden-crowned Kinglet						
558 Ruby-crowned Kinglet		1				1
546 Eastern Bluebird						
545 Veery			2			2
538 Bicknell's Thrush						
544 Gray-cheeked Thrush						
543 Swainson's Thrush						
542 Hermit Thrush						
541 Wood Thrush						
539 American Robin	4	9	2			12
529 Gray Catbird	3	5	3			8
528 Northern Mockingbird						
530 Brown Thrasher						
562 American Pipit						
564 Bohemian Waxwing						
565 Cedar Waxwing	4	2				6
567 Northern Shrike						
569 European Starling						
579 Blue-headed Vireo						
584 Warbling Vireo						
583 Philadelphia Vireo						
582 Red-eyed Vireo	1	3				3
606 Tennessee Warbler				1		1
607 Orange-crowned Warbler						
608 Nashville Warbler	1	2	1			4
612 Northern Parula						
615 Yellow Warbler	2		2	1		5
630 Chestnut-sided Warbler		1	1			2
616 Magnolia Warbler			4			4
617 Cape May Warbler						
618 Black-thr. Blue Warbler		1		1		2
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						
597 Black-and-white Warbler			2			2
Sub-total						

Species	Obs	Cns	Bnd	Rep	Ret	DET
651 American Redstart	1	2	3			5
637 Ovenbird			2			2
638 Northern Waterthrush						
641 Connecticut Warbler						
642 Mourning Warbler		1				1
644 Common Yellowthroat	1	1	1			3
649 Wilson's Warbler			1			1
650 Canada Warbler			4			4
683 Scarlet Tanager						
687 Northern Cardinal						
689 Rose-breasted Grosbeak	1		2			3
692 Indigo Bunting		2				2
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	12	19	11	1		25
768 Lincoln's Sparrow						
726 Grasshopper Sparrow						
769 Swamp Sparrow		1	1	2		4
764 White-throated Sparrow						
760 White-crowned Sparrow						
744 Slate-coloured Junco						
776 Snow Bunting						
661 Bobolink						
665 Red-winged Blackbird		32				32
662 Eastern Meadowlark						
675 Rusty Blackbird						
678 Common Grackle	1	3				3
679 Brown-headed Cowbird		1				1
673 Baltimore Oriole	8	6	5	1		12
703 Pine Grosbeak						
699 Purple Finch						
701 House Finch						
714 Red Crossbill						
715 White-winged Crossbill						
709 Common Redpoll						
708 Hoary Redpoll						
710 Pine Siskin						
711 American Goldfinch	8	19	1			22
698 Evening Grosbeak						
655 House Sparrow						
Sub-total			52	7	1	
NUMBER OF SPECIES	26	25	22	6	1	46

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 means that observers running the census must deduct 1 hour from their observation hours. The maximum coverage code for a census-only day 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.

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 7. 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 8 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, can be filled in based on online weather station data, but some, such as cloud cover and wind speed/direction, 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
- 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 9). This refers solely to birding skills, not banding skills.

Figure 8. Example of a completed daily log sheet (page one)

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

DOW	Day	Month	Year	Day #	BIC	Census by:	Daily Log by:	Actual coverage code	3
WED	17	AUG	2005	17	MAG	BHM	MAG	Max. coverage code	5

	Start	Stop
Count Period	0600	1300
Census	0655	0755

Weather Summary:
Weak cold front last night, but enough to make this the coolest day in weeks

	Start of Opening Round	Census	End of Count Period
Time	0600	0655	1300
Wind Direction	NW	NW	NW
Wind Strength	1	1-2	2-3
Cloud Cover %	40	30	10
Temp. °C	17	18	23
Precipitation	—	-	-

Observer Initials	Observer Name	Begin Time	End Time	Hours Observing	Class
MAG	Marcel Gahbauer	0600	1300	2.0	1
BF	Barbara Frei	0600	1300	1.5	1
ATH	Alain Theriault	0600	0930	1.5	2
BHM	Betsy McFarlane	0655	1000	2.0	1

	Species	Indiv.
Banded	22	52
Repeats	6	7
Returns	1	1
Census	25	
General Obs.	26	
DET	46	
Total net hours		53.75
Birds / 100 net hours		96.7
MMP Cumulative Totals		
Banded	41	329
Returns	4	5
DET	91	
Total net hours		318
Birds / 100 net hours		103.5

Net Group	Open	Closed	Hours	Net hours
A	0610	1140	5.5	5.5
B	0645	1045	4.0	16
C	0615	1130	5.25	10.5
D	0615	1145	5.5	16.5
E				
F				
G	0620	11[illegible]	5.25	5.25

Visitors and Others:
Ecomuseum kids camp present in back pond 10 AM - noon

Deviations from Protocol:
E left closed. B closed early due to kids

Figure 8. Example of a completed daily log sheet (page two)

MBO Migration Monitoring Program
Daily Banding Log – Page Two

DOW	Day	Month	Year	Daily log by:
WED	17	AUG	2005	MAG

Station Notes:

Narrative:

Another great morning! Over the 50/20 (birds/species) banded mark again, and this time with a nice easy morning full of easy extractions. Amazingly the warblers banded in greatest numbers today were Canada + Magnolia! 6 very quiet today, but A was back in business, especially early. Fruit of all sorts ripening (apples, hawthorns, grapes, honeysuckles, buckthorns, etc) Side-by-side comparison of juv SOSP and SWSP revealed more similarities than differences - SWSP is overall smaller and darker (esp. on head), has smaller and darker bill, rustier edging to secondaries, less "cheeky" face.

Bird Migration:

Noticeable influx of BAOR. Flycatchers (empids + EAWI) also on the move, plus MAWA, CAWA.

Newly-arrived and Unusual Species:

RCKI near BA – very early

Other Flora and Fauna:

Fox seen not far from D Chipmunk ran inside cabin briefly.
A few Green Frogs heard

Station Management:

Small table brought in by Christina.

Injuries and Casualties:

—

Activity Outside Count Period:

—

Figure 9. 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 10), 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 10. Beaufort scale

Force Number	Description	Signs	km/hr
0	Calm	Smoke rises	0-2
1	Light air	Smoke drifts but no wind vane movement	3-5
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	12-20
4	Moderate breeze	Dust and loose paper are raised; small branches are moved	21-29
5	Fresh breeze	Small trees and leaves begin to sway	30-39
6	Strong breeze	Large branches in motion; whistling in wires	40-50
7	High wind	Whole tree in motion	51-61

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.

15. 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 regarding long term site management protocols.

16. Acknowledgements

We would like to thank Bill Murphy for writing the Innis Point Spring Migration Monitoring Program Protocol upon which this document is largely based.

17. References

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