

Saint Andrews Bird Banding Station
Protocol for Migration Monitoring Program

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Acknowledgments

This document was adapted from the McGill Bird Observatory Field Protocol for Migration Monitoring Program by Marcel A. Gahbauer and Marie-Anne R. Hudson, January 2014. Station Protocols were adapted from the Banding Manual by Tracey Dean, station founder and coordinator (1989-2020), in 2020.

Introduction

Saint Andrews Bird Banding Station (StABBS; geographic coordinates: 45°05'07.7"N 67°04'50.3"W; see Figure 1) was founded by Tracey Dean in 1989, and the fall migration monitoring program (FMMP) started in 1991. The station is on the property of Huntsman Marine Sciences Centre and has been funded annually by both this institution and the New Brunswick Wildlife Trust Fund.

The purpose of the Migration Monitoring Program (MMP) at StABBS is to obtain data on neotropical migrant and other land bird species. This data will contribute to continent-wide efforts to monitor changes in population levels of these species, as well as conduct other scientific research. The MMP at StABBS focuses on fall migration, and consists of daily standardized banding, general observations of birds and the calculation of a standardized Daily Estimated Total (DET) for each species. Separate records are kept for non-standard data.

The written field protocol for StABBS is designed to guide the application of general principles and procedures of migration monitoring at the study site. A written field protocol is necessary to ensure that staff follow the same procedures from day to day and year to year. Since this protocol is intended to be a practical field manual, it places little stress on why particular approaches have been chosen. The purposes of migration monitoring, and recommended methods of running a standardized migration monitoring program, are explained in detail in Hussell and Ralph (1996).

The station focuses on Fall MMP, but additional programs may be added in future should coordination, funding, and staffing allow (e.g., Spring MMP, MAPS, Northern Saw-whet Owl banding, and Winter MP).

The station coordinator, Anna Tran Nguyen, can be contacted at at.ngth@gmail.com for further information.

Dates of Operation

The minimum standard coverage period for MMP includes the four weeks starting August 21, but the aim is to cover all days during the 9-week period from August 21 to October 23 of each year if possible.

Staffing

The MMP at StABBS is designed to be run by one person reasonably experienced with migration monitoring and with StABBS Protocol. This person must be a licensed bander, experienced with all aspects of the Station Protocol, and capable of acting as a Bander in Charge (BIC). The BIC may be the Station Coordinator (SC) or a second staff. 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 the BIC is not available on a particular day to run the full protocol (i.e., to run all nets), and if a licensed and qualified bander is available, as many nets as possible should be opened. Staff should spend their time making general observations no matter whether nets are opened or closed, if the station is open on a given day.

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

Currently, StABBS does not have the resources or objectives to train staff or volunteers. Training should not be anticipated and remains low in priority. The station may accept volunteers in the future, and training may be undertaken at the discretion of the BIC or SC when periods are not too busy and they do not expect a backlog of birds to band.

Volunteers and visitors unfamiliar with banding or the StABBS Protocol should be scheduled only when the BIC or SC is available to show them the site and explain the program. Prior to participation, staff and volunteers must familiarize themselves with this Protocol and the Bander's Code of Ethics (see Appendix A) and should not expect to handle nets or birds until proper training has occurred. The birds' safety always comes first.

Count Area

The count area (Figure 1) is delimited north by the end of the Wrightman Alpines Nursery field, east by the zone B forest east of the aquaculture dump, south by Huntsman Marine Science Centre, and west by Brandy Cove. For the purpose of general observations and DETs, all birds visible or audible from within this area are countable, no matter how far outside the area the bird is.



Figure 1. Map of count area (red line), areas for habitat assessment (white line; see Habitat Structure Assessment section and Appendix B), net locations (red labels for core nets and gray for non-standard nets; Table 1), and locations for point counts (blue squares, Appendix B).

Daily Count Period

The daily count period begins around sunrise (rounding to the nearest half-hour as detailed below) and concludes 5.5 hours later. If weather conditions permit, nets start to be opened when the count period begins and start to be closed five hours later. The count period and net opening start at the o'clock or 30-minute mark before actual sunrise (e.g., start time is at 6:30 am if sunrise is between 6:30 and 6:59 am). Nets should generally be closed in the same order in which they were opened. Extension to the daily count period and net closing is at the discretion of the BIC, and usually when the volume of captured birds anticipated is relatively high, but birds banded in extended hours are considered non-standard banding (NSB) and should be recorded in the daily log as such (Figures 3 and 4).

The tally of DETs (see DET section) cannot begin until all birds captured in the closing net round have been processed, including any captured in extended net hours (NSB). No birds detected after the standard 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.

Nets

The StABBS regularly uses nets 12m long, 2.5m high and has a mesh size of 32mm. These nets are designed to catch small birds up to the size of a robin or jay. The life expectancy of these delicate nets is about three years. Deer running through the nets continues to be a serious issue and a few new nets need to be ordered each year.

Seven nets are designated as the core nets for MMP, with four additional nets (9, 10, 11 and 12) that are optionally opened at the discretion of the BIC or SC based on staff number or experiences (Figure 1). Coordinates of net sites are shown in Table 1, and orange flagging tape on pole strings left on site year-round facilitates set-up at the start of each season.

Net#	Coordinates	
	Latitude	Longitude
1	45°05'08.7"N	67°04'50.4"W
2	45°05'09.5"N	67°04'49.9"W
4	45°05'11.2"N	67°04'50.1"W
5	45°05'11.2"N	67°04'50.6"W
6	45°05'09.5"N	67°04'52.6"W
7	45°05'11.4"N	67°04'49.7"W
8	45°05'08.8"N	67°04'49.5"W
9	45°05'10.4"N	67°04'48.5"W
10	45°05'11.0"N	67°04'48.2"W
11	45°05'09.1"N	67°04'47.7"W
12	45°05'09.1"N	67°04'47.5"W

Table 1. Coordinates of the nets from the centre of nets.

All nets are to be opened and closed at the same time, unless wind or rain necessitates the delayed opening or closing of some nets. Opening and closing time are recorded on the log sheet before the first net is opened and after the last net is closed. Individual opening/closing times are recorded if there is at least a 15-minute gap between that net and other nets. If a predator is suspected to have frequented a net, the net should be closed for at least an hour to discourage the predator.

Nets are checked at least every 30 minutes (see Safety section), and the first net check of the day is also 30 minutes from net opening (i.e., the time from opening the first net to the first check). On every net round, the staff should complete a loop of all nets unless there is an assignment of different nets for multiple staff.

Banding Protocol

The standard references for identification are Pyle (1997) and Pyle (2008). Data routinely recorded for all captures include (see Figure 2):

- band number
- species common name
- species four-letter code
- age and how aged
- sex and how sexed
- amount of fat
- unflattened wing chord (mm)
- weight (g)
- date
- time bird was captured (rounded to the last net round, i.e., every half-hour or less)
- station name
- location of capture (“b” for Huntsman banding location + net number)
- additional comments (e.g., probable age or sex if uncertain, feather loss, ticks, etc.)

Banders should always attempt to age individuals if time allows, but not if doing so results in significantly longer handling time or visible bird stress. If in doubt, record age and/or sex as “U.” Relatively uncommon species should be documented by photography and in writing. In addition, if time permits and at the discretion of the BIC or SC, the following information may also be recorded.

- skull
- body moult
- flight feather moult
- flight feather wear
- juvenile plumage
- moult limit

For birds that are recaptures from a different day, the regular set of measurements will be taken unless doing so unacceptably delays the processing of new birds. A sheet similar to the banding data form (Figure 2) is used. Birds that are certain to have been caught already on the same day are released, preferably at the net, without any additional data being collected, but if there is any doubt bring the bird to the lab for checking.

Any casualties must be recorded, on a form similar to the banding data form (Figure 2). Report the band number (if applicable), species, cause of injury/death, date, and outcome (e.g., disposed of in the forest/donated to an institution, seen flying away).

Figure 2. Example of a banding data form. Similar sheets exist for birds recaptured, and for reporting casualties.

St Andrews Bird Banding Station

Band Size: 04 Year: 2020

Prefix: 0330

Number	Species	Species Code	Age	How Aged	Sex	How Sexed	Skull	CP	BP	Tail	Body Molt	FF Molt	FF Wear	Juv Plu	Molt Limit	Wing	Weight	Date		Time Capt	Station	Ment	Notes
																		Day	Mon				
01	Parula	N O P A	WT	0 1	U	0 1				0						57	7.9	24	May	2:33	17		
02			WT		U					1						57	7.9						
03			WT		U					1						57	7.9						
04	Nashville	N A W A	WT		U					0						57	7.9						
05	Parula	N O P A	WT		U					02						57	7.9						
06	Nashville	N A W A	WT		U					1						57	7.9						
07	Parula	N O P A	WT		U					1						57	7.9						
08			WT		U					0						57	7.9						
09	Nashville	N A W A	WT		U					0						57	7.9						
10	Redstart	A M R E	WT		U					1						57	7.9						
11			WT		U											57	7.9						
12	Redstart	A M R E	WT		U					0						57	7.9						
13	Redstart	A M R E	WT		U					1						57	7.9						
14	White-throated	B A W A	WT		U					1						57	7.9						
15	Parula	N O P A	WT		U					1						57	7.9						
16																							
17																							
18																							
19																							
20																							
21																							
22																							
23																							
24																							
25																							

General Observations

General observations include all birds detected from within the count zone other than those banded. Some birds detected during general observations are likely to include some of the same individuals seen during banding. However, the unduplicated total of birds observed by both methods is sorted out in the process of determining Daily Estimated Totals (DETs).

Beginning in 2022, when time allows, an observer with good birding skills should conduct a single 5-minute point count at each of three locations (Figure 1, Appendix B) to ensure a representative sampling of all species present in the Count Area. These do not have to be done one after the other, or all by the same person, and can be fit in between net rounds. They should be completed before 10:30 am if possible. Use binoculars but no scope, and record the start time and observer name for each location. These observations will be recorded separately from other General Observations (Table 2), but will also be included in DETs.

- Point count 1: the waters and Calais, Maine, US, (west of the banding shed), where waterfowl can be observed
- Point count 2: meadow overlooking the Wrightman Alpines Nursery (northwest of shed), for sparrows, finches and other birds of interest
- Point count 3: field uphill with aquaculture material (east of shed and nets), with more inland species like Eastern Wood-Pewee

Staff are encouraged to make additional observations throughout the count period, including with binoculars or scopes. More observations should be made when banding is slower or when extra observers are available. Additional observations are especially important when rain or wind precludes 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 net rounds.

Table 2. Table to record observations of three five-minute point counts.

	Point count 1 - Calais	Point count 2 – meadow	Point count 3 – uphill	Total Observations
Observer				
Start Time				
General observations (species and count)				

Daily Log Sheet

The MMP daily log sheet (Figure 3) 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.

Among other things, the daily log records the following:

- date
- observer(s)
- local weather conditions at the start and end of the count period, including temperature, cloud cover, wind direction and speed (Beaufort scale), and precipitation (e.g., continuous or intermittent, heavy or light, etc.) (Figure 4)
- times of net openings and closings written under standard banding (SB nets 1-7) or non-standard banding (NSB nets 9-12). If not all standard nets are opened, or any nets that were opened were temporarily closed, details are written in the comments section using the following format: “net(s) location + closed/opened @ HH:MM.”
- daily banded, recaptured and unbanded (e.g, hummingbirds or baby birds) numbers by bird species
- Comments: additional notes (e.g., any departure from normal MMP protocol and causes, unusual species occurrences, casualties or injuries, station maintenance, general highlights of the day)

Figure 3. Daily log of operations including weather conditions, nets opened, daily estimated totals (DETs) and grand totals (GTs).

**St. Andrews Banding Station
Daily Banding Log**

Dow:	Day:	Mon:	Year:
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Observers:

Weather	Opening	Closing	Closing NSB
Wind Direction			
Wind Speed			
Cloud Cover %			
Temp. (°C)			
Precipitation			

SB Nets	Opened	Closed	NSB Nets	Opened	Closed
1			9		
2			10		
4			11		
5			12		
6					
7					
8					

Point Counts	Start time	Observer
1		
2		
3		

Additional Notes	
Irregular net operations	(Note: regular SB = 7 nets x 5 hrs = 35 net hours) Net ___ opened @ ___, closed @ ___ = _____ net hours
Non-bird highlights	
Station maintenance	
Other	

Figure 4. Wind speed codes and sky condition codes

Wind Speed Codes

Beaufort Number	Wind Speed (kmph)	Wind Speed (mph)	Indicator of Wind Speed
0	<1.6	<1	Calm: smoke rises vertically
1	1.7 – 4.8	1 - 3	Light Air: rising smoke drifts
2	4.9 – 11.2	4 – 7	Light Breeze: leaves rustle, wind felt on face
3	11.3 – 19.2	7 – 12	Gentle Breeze: leaves and twigs move; light weight flags extend
4	19.3 – 28.8	13 – 18	Moderate breeze: thin branches move; dust and paper raised
5	28.9 – 38.4	19 – 24	Fresh Breeze: trees sway
6	38.5 – 49.6	25 - 31	Strong Breeze: large tree branches move; open wires “whistle”

Sky Condition Codes

0	Clear of a few clouds
1	Partly cloudy (scattered) or variable sky
2	Cloudy (broken) or overcast
3	
4	Fog or smoke
5	Drizzle
6	
7	Snow
8	Showers

Daily Estimated Total (DET) and Grand Total (GT)

Standard banding and observations

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. All available staff are to participate in the DET.

The DET includes only those birds observed from within the count area and within standard hours; any noteworthy observations made within the standard hours but outside the count area may be recorded as incidental sightings in the comments section of the daily log (Figure 3).

The DET coordinator will often be the BIC or SC, or else an experienced individual appointed by the BIC or SC. To facilitate a smooth DET tally, first fill in the data columns on the log sheet (Figure 3): the number of newly-banded birds ('Bnd,' including birds captured but released unbanded, and foreign recoveries), recaptures (from a previous day; 'RT'), and point count totals ('PC').

Starting with the first species on the DET list, the DET coordinator asks for general observations. Everyone present who saw or reliably heard individuals of the named species from the count area during the count period will state the maximum number of individuals they detected (exclusive of captures and point counts), and briefly discuss time, location, direction of movement (and if relevant, the behaviour) of the observed birds in order to eliminate probable duplicates. The DET coordinator records the result in the 'Obs' column. Only birds actually detected should be recorded (no extrapolation), and any estimates (e.g., of flock sizes) should be conservative.

Next, for the same species, the coordinator reads aloud the numbers of any individuals banded, recaptured, and recorded in point counts. Whenever a species is thought to have been detected by more

than one method, discussion among all observers will sort out the best collective estimate as to the most probable number of separate individuals. The resulting number is recorded in the DET column.

The DET number for a species cannot exceed the sum of banding (including recaps), general observations, and point counts. However, the DET will often be less than the sum of those numbers once probable duplicates have been removed.

Unidentified birds should be identified as closely as possible (e.g., unidentified warbler, or unidentified *Empidonax*), and written in the blank lines at the end of the species list. This provides additional information on level of migration activity on the day.

Non-standard banding and observations

Non-standard numbers are recorded on the log sheet (Figure 3) in a similar manner, including non-standard banding (NSBnd; birds banded and unbanded/extracted but not banded during a non-standard protocol), non-standard retraps (NSRet; birds recaptured during a non-standard protocol), and non-standard observations (NSObs; birds observed during a non-standard protocol). After the same procedure is used to remove probable duplicates among the non-standard columns, the non-standard totals are added to DET to derive a Grand Total (GT) for the day.

Habitat and Net Management

Vegetation must be trimmed 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 should be avoided since it can increase the visibility of nets to birds and differentially affect capture rates over time. Distance from the net to the nearest branch is preferably between 1 and 2 m.

Any hole in nets big enough to potentially affect bird safety or capture rate should be repaired when time allows outside of the daily count period. Staff should only repair nets after consulting with the BIC or SC, and experience is confirmed or training is given. There is an abundance of deer at the station and they can create big holes, particularly to the bottom panels. Should the panel be so damaged (e.g., the hole fills over 50% of the panel) that repair is impractical, the BIC or SC may decide to remove that panel or replace the net depending on net condition.

Habitat Assessment

Photograph records

Photographs of StABBS's mist nets and of certain locations along the point-count areas are taken at least once every five years beginning in 2019. Photographs are repeated sooner if drastic changes have occurred to the Count Area. In order to properly illustrate the conditions that most migrants experience, photographs should be taken in October.

Locations from which to take the photographs necessary for habitat assessment should be constant throughout time. To this end, descriptions of where to take photos of net, habitat and point-count areas are outlined in Appendix B.

Habitat Structure Assessment (HSA)

A formal habitat assessment is carried out at least once every 5 years beginning in 2019. Photographs are repeated sooner if drastic changes have occurred to the Count Area. Habitat assessments are to be carried

out in mid-to-end August (depending on staff availability), at the start of the fall migration monitoring program. Details of the assessment, including habitat description and data records, are in Appendix B.

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, mist nets should not be operated below 0°C, or above 25°C (actual or ‘feel like’), nor within a half-hour of a sub-zero turned zero+. E.g., -1°C or below at 6 am, and 0°C or above starting at 7:30 am, means nets are opened at 8 am. The within half-hour rule is only effective once a day as temperatures are assumed to increase after sunrise. Should the temperature remain borderline, either birds are processed promptly based on priority, or nets remain closed, at the discretion of the bander.

Extra care should be taken near either of these temperature extremes – i.e., more frequent than usual net checks (e.g., every 10-15 minutes). The cutoff temperature should be higher when there is wind (i.e., the wind chill temperature should be used as a guideline). Nets in full sun should be closed or monitored almost continuously when the temperature rises above 20°C.

ii) Baby birds

It is important to keep young birds with the family group as they are still dependent on them for food. Very young birds should be released at the net and species recorded as “unbanded” in the Daily Log. The net number should also be recorded.

iii) 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 conduct them without supervision. Extraction is not for everyone, and it is up to the BIC or SC to decide if a particular individual should focus on observations or scribing instead of extracting.

iv) Carrying birds

Once extracted from the net, each bird must be gently and safely secured in a cotton bag and carried back to the station. Care must be taken to ensure that the birds are safe throughout this time. Specifically, any bag with a bird should either be hung on the hand or arm, or on a peg at the station. The bag should not be placed on the floor or table, or hung from a branch due to the risk of being forgotten. 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. It is strongly recommended that birds in bags be carried by hands and 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.

Generally, the net from which a bird is extracted is recorded from memory. However, clothespins can be used to help keep track of net numbers, especially on busy days. The clothespins labelled with net numbers should be on pole-anchoring strings on corresponding nets, and used to identify bird bags when needed. Once back at the station, bags with birds are hung on pegs labelled with net numbers. Clothespins are returned to net strings at a later net round.

v) Frequency and thoroughness of net checks

Each net should be checked at least every 30 minutes. If weather conditions are at all unpleasant (windy, humid, particularly cool or warm), the frequency should be no less than every 20 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.

vi) Bird processing times and abilities

Birds should be processed as quickly as possible and within the 30-minute round. However, birds can remain healthy in shaded bags for up to one hour, given that they are not subjected to excessive heat or cold, and are not already showing signs of stress before being put in bags. If it is estimated that processing times or abilities will be significantly challenged, the BIC and/or SC may request either only the species name, or only the most important information be recorded (ordered by most used by researchers), i.e., species name, wing length, weight, age, and sex.

vi) Priority birds

Priority should be given to brooding females (unlikely found during Fall MMP), newly-fledged and any birds that appear to be experiencing undue stress of any kind, including those for which extraction was unusually complicated or prolonged. Then, birds should be processed in ascending body size (e.g., kinglets first, followed by warblers, finches, thrushes, etc.). At the discretion of the extractor, birds experiencing undue stress may be released near the net without being processed; a note is made of the species for records.

vii) Closing nets if busy

If too many birds are captured to process within a reasonable time period, the BIC should close one to several nets, strongly considering the ones that captured an overwhelming number of birds, until processing times fall within a safe margin.

viii) Bird care or euthanasia

If birds require additional help, care must be given as much as possible. If a bird, for example a hummingbird accidentally captured, would benefit from sugar water, mix pieces of a sugar cube (available in the tool box) with water and feed the bird. If the bird has minor wounds, iodine may be used as antiseptic before releasing the bird. If the bird is immobile from stress and/or cold, try to leave it in a quiet and open yet sheltered area. If the bird is badly injured and has minimal chances of survival in the wild, cervical dislocation may be performed by the BIC or SC as a form of euthanasia.

b) People safety

i) First aid

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

ii) Sanitation

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

iii) Issues

Deer, fire ants, and ticks are all present at the station. It is recommended that you wear rubber boots or tuck your pants inside your socks, and do daily tick checks.

iv) Facilities Maintenance

Prior to and after every Fall MMP season, the shed should be well swept and cleaned, and important equipment should be stored properly.

Bird Bags

Small and medium-sized birds are placed in cotton bags, with drawstrings that can slide and be tied/untied easily, for transport from the nets to the station. Size can vary somewhat, with smaller bags being better for little birds such as kinglets and warblers, and larger ones for thrushes and blackbirds. If the volume of captured birds is low and there are sufficient bags, using larger bags for any bird size is preferable for bird comfort. 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.

Changes to Protocol

Important interruptions to operations should be recorded here, such as flooding or lack of personnel that reduced effort for periods of a week or more. Also to be recorded is any permanent changes to data collection methods. Although operational changes are sometimes necessary (as when a netting location is destroyed), changes in data collection are not to be made unless absolutely necessary, and must first be discussed with CMMN advisors.

Instructions for record keeping

If any standardized operational change or interruption occurs, enter details into the table below, underneath any previous entries. Refer to parts of the text that were changed (e.g., section number, altered locations on a map, new GPS points). Revise the “latest version” date on page 1 of this protocol. If changes have been made to the protocol other than adding to the table below, submit a copy of the entire revised protocol to Birds Canada along with year-end data submission; otherwise, send only a copy of the table.

Table 3. Changes to protocol.

Date	Description of change and justification (if applicable)
2022	Standard StABBS station protocol created in collaboration with CMMN, initiated by Tracey Dean in 2019 and adapted from her banding manual. Important changes include the following: (i) Fall MMP from 21 August to 23 October (instead of changing dates) (ii) Nets are opened for five hours from sunrise daily (standard protocol) for the entire season. In the past, the number of hours was more flexible as it did not distinguish between standard and non-standard hours (iii) Added optional five-minute point counts at three locations less covered by standard nets (iv) Seven nets are now standard, with four optional nets (the number of net areas and nets had changed over the years)
2023	(i) Added details under section Safety > i) Temperature and other weather limitations. Bottom temperature changed from -5°C to 0°C, with details on when banding operations can occur. (ii) Antiseptic changed under section Safety > viii) Bird care or euthanasia. Hydrogen peroxide changed to iodine.

References

- Dean, T. 2020. Banding Manual. St. Andrews Bird Banding Station. Request a copy by emailing at.ngth@gmail.com.
- Hussell, D.J. and C.J. Ralph. 1996. Recommended methods for monitoring bird populations by counting and capture of migrants. Report for the Intensive Sites Technical Committee of the Migration Monitoring Council. <http://www.rsl.psw.fs.fed.us/pif/migmon.html>
- Pyle, P. 1997. Identification guide to North American birds. Part I. Slate Creek Press, Bolinas, California, U.S.
- Pyle, P. 2008. Identification guide to North American birds. Part II. Slate Creek Press, Bolinas, California, U.S.

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
- trainees must be 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.

Appendix B. Habitat Structure Assessment

Photographic records

Nets

Photos are aimed at the entire net from pole to pole when possible:

(1) 2 m and 45° to the right of the net pole closest to the main trail (example picture below) when doing a counter-clockwise round

(2) same to the left

(3) same to the left of the net pole at the other end.

Sample photographs are available upon request, one of which is net 8 (see below).



Habitat and point-count areas

Table 4. Instructions for habitat photographs of general habitat and point-count areas.

Location Identification	Coordinates		Direction to point camera
	Latitude	Longitude	
Habitat 1/Point count 1a - pond	45°05'08.0"N	67°04'50.3"W	Standing north of shed, west end of pond to east end
Point count 1b - waters west of shed	45°05'07.2"N	67°04'51.0"W	Standing north of shed, west towards Calais
Point count 2a - field between nets 5&6	45°05'11.1"N	67°04'51.1"W	45° left from net 5 pole
Point count 2b - field between nets 5&6	45°05'11.1"N	67°04'51.1"W	45° right from net 5 pole
Point count 3a - field east from net 2	45°05'10.5"N	67°04'48.7"W	45° SE from net 10 entrance, into the field
Point count 3b - field east from net 2	45°05'10.5"N	67°04'48.7"W	45° SW from net 10 entrance, into the field

The file name for each photo follows this convention:

- Nets: HMb_Net_lane_net#_DD_MMM_YYYY_photo#, e.g., a photograph taken on October 16th, 2019 of Net 12 would be labelled "HMb_NetLane_12_16_OCT_2019_1".
- Habitat: HMb_*type*_DD_MMM_YYYY_photo#, e.g., HMb_settlingPond_16_OCT_2019_1
- Point count: HMb_pointCount#_DD_MMM_YYYY, e.g., HMb_pointCount2a_16_OCT_2019

Habitat Structure Assessment Protocol

Station description

Bordered on the southwest by Brandy Cove, part of the St Croix River. On the southeast of the station is the Huntsman Science Center that is comprised of multiple buildings as well as mowed areas. The northwest area of the station is part of the Wrightman Alpines Nursery that comprises a few buildings and a field with a few short shrubs. At the east of the station is an expansive coniferous dominated mature forest

Habitat types

- A: Artificially created fields of Graminoids and Asteraceae with some low shrubs.
- B: Heterogeneous riparian mixed forest dominated with poplar, spruce and birch.
- C: Shrubland with a dominance of alders and buckthorn with some mature spruce and cedar spread throughout.
- D: Man-made structures, gravel, and grass.

Habitat structure assessment

Each time assessment is repeated, the area must be carefully considered anew. Addition of new habitat types will require new maps. Once the habitats have been defined and delineated (e.g., Figure 1), a Habitat Structure Assessment (HSA) Form is created for each of the defined habitats. If any of these

features is subject to change, the change is described in the Changes to protocol section of this document, as well as on the habitat assessment form.

Hard copies of “Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol” and all relevant data sheets are in a folder at Huntsman Marine Science Centre. Digitalized copies are kept in the “habitat” folder on Google Drive, accessible by Huntsman Marine Science Centre. Within that folder, there are the habitat photographs (labelled according to the conventions above) and scanned copies of the Habitat Structure Assessment Forms (HSA).” Each habitat has its own HSA form: each one is “Habitat#_DD_MMM_YYYY,” Another copy will be submitted to Birds Canada along with year-end submission of bird data when applicable.