

MIGRATION MONITORING STUDY PROTOCOL & FIELD MANUAL

Version 3 – April 2020



PELEE ISLAND BIRD OBSERVATORY

V.1 by Graham Gibson (2008), V.2 revised & updated by Sachi Schott and Sumiko Onishi

Migration Monitoring Study Protocol and Field Manual
Pelee Island Bird Observatory (PIBO)

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INTRODUCTION

This document describes the study methodology and field procedures for the Pelee Island Bird Observatory's Migration Monitoring Program (MMP). Each spring and fall, PIBO staff conduct daily visual migration counts and capture and band birds at Fish Point Provincial Nature Reserve (Ontario Parks), Pelee Island, Ontario, Canada, as part of a long-term population monitoring study. The data collection methods are highly standardized and close adherence to the guidelines described in this manual are required to ensure uniform day-to-day coverage at the field station and consistency from year-to-year.

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PIBO's *Daily Totals (DTs)* are available to researchers via the NatureCounts website (managed by Birds Canada). Summaries of each year's results are provided on the PIBO website (www.pibo.ca) in the annual Year-end Report. In addition, copies of all of PIBO's data (including banding data and each day's DTs) are stored onsite as physical copies and in digital form, and are available to researchers upon request.

Study Objectives

The Canadian Migration Monitoring Network (CMMN) – a group comprised of Birds Canada, the Canadian Wildlife Service, and network members like PIBO – is made up of more than twenty independent organizations established across the country that generate daily migration counts for a wide range of species. Monitoring stations are committed to collecting data that contributes to our understanding of the changes taking place in populations of migratory birds, as well as documenting regional migration patterns at the station, and many other important collaborative studies.

PIBO takes part in the CMMN's Trend Monitoring Program (TMP), an effective method for tracking changes in bird populations through the standardized daily counting and capture of migrants. CMMN's TMP data are used to detect population trends of small landbirds that migrate to and from their breeding and wintering grounds each year. Many songbirds summer in remote northern regions and winter in equally isolated areas, which makes it difficult to survey these species using other monitoring methods.

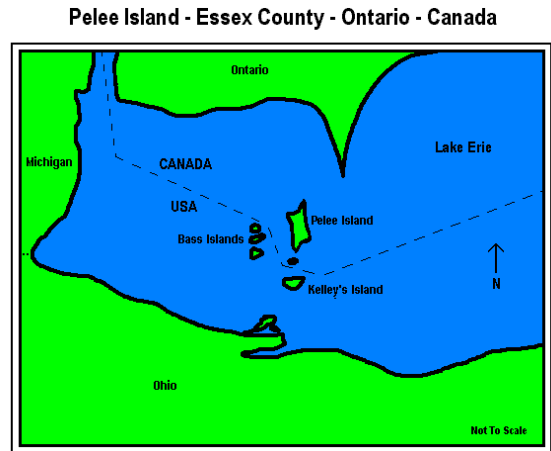
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Study Location

Pelee Island, Essex County, Ontario is the most southerly inhabited land mass in Canada. Situated in the western third of Lake Erie (41°45'00" N, 82°41'00" W), the island is approximately fifteen kilometers long, five kilometers wide, and lies between Leamington and Kingsville, Ontario on Erie's north shore and Sandusky, Ohio to the south.

The island is designated as a globally Important Bird Area (IBA) for migratory birds by the Canadian partners of Birdlife International (Birds Canada and Nature Canada). IBA's are described as "truly outstanding sites of significance nationally or internationally" and "sites that are exceptionally important for birds."

PIBO's Migration Monitoring Program is conducted at the 115 hectare Fish Point Provincial Nature Reserve (Ontario Parks). The point forms the distinct southern tip of Pelee Island. The main part of 'the Point' is a sand spit made up of low stabilized dune ridges covered in woodland. Common Hackberry is dominant in most vegetation associations.



1.0 SECTION ONE

Section One describes the specific methods used to generate standardized migration counts at the Fish Point study site and other important information about the migration program. Long-term population trends based on migration counts are only credible if based on count methods and effort levels that are consistent from day to day and year to year. The following operations protocol is central to the program and must be followed by all PIBO staff and volunteers.

1.1 Personnel

A minimum of three staff are required to conduct the project at the optimum level (see section 4.3), although a single person can accomplish partial coverage.

- One Field Supervisor/Bander-in-Charge (BIC): an experienced birder and bander. Must be eligible for a master banding permit/sub-permit.
- One experienced Field Assistant: able to identify > 90% of birds likely to occur in the Great Lakes region by sight and sound, such that he/she can conduct the Daily Census and Standard Observations, as well as assist with the mist-netting.
- One additional Field Assistant/Intern.

1.2 Seasonal Coverage Period

The Seasonal Coverage Period extends from April 1st to June 15th (76 days) in the spring and from August 1st to November 15th in the fall (107 days) for a combined total of 183 days. Daily coverage is required.

1.3 Daily Coverage Period

The Daily Coverage Period consists of six hours of fieldwork each morning starting one-half hour before sunrise. Field work components include the Daily Census, six hours of Standard and Non-standard Observations and six hours of Mist Netting/Bird Banding.

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All bird banding and visual bird counts that take place outside of the standard six-hour Daily Coverage Period must be recorded on the Daily Log Sheet as Non-standard Banding or Non-standard Observations, and are not included in the Daily Totals.

1.4 Coverage Area

The official Count Area consists of 2 areas: the census area and the banding area. The Count Area portion containing the Census route extends from the end of the tree line at the tip of Fish Point at its southern extent, to the mist-netting area approximately two hundred meters north of the Fish Point Provincial Nature Reserve (PNR) parking lot. The west boundary is defined by the Lake Erie shoreline. The majority of the east boundary is shoreline as well as the woodland trail leading to Fox Pond. The PNR parking lot is also the eastern extent of the Count Area, i.e., staff should not walk east along McCormick Road from the parking lot, although birds observed along the road from the parking lot should be recorded at the start and end of the Daily Census.

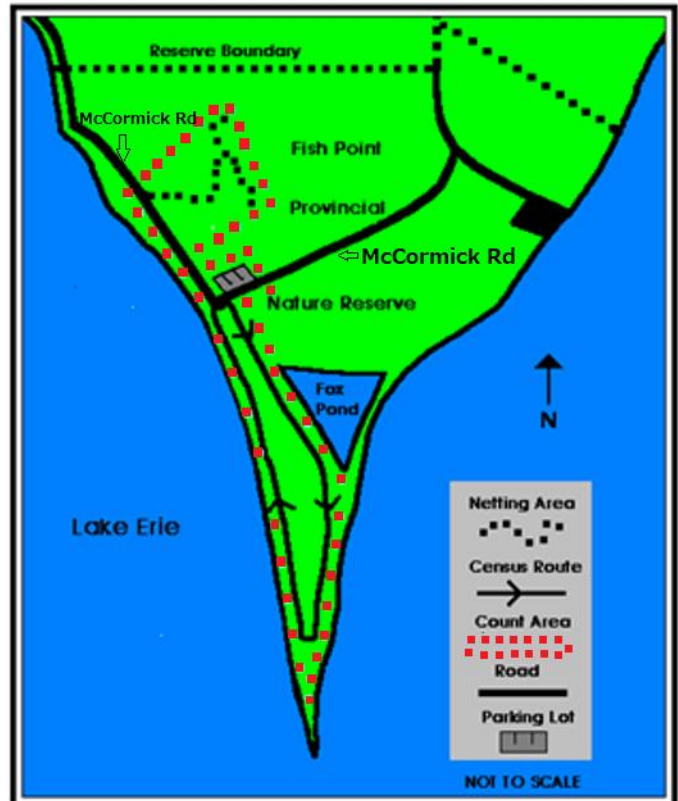
The same is true on McCormick Road at the northwest boundary of the Count Area – staff should not walk further north on the road from where the foot path leads into the netting area, although birds seen and heard outside the boundary should be counted. On the west beach, the path that leads to the PNR parking lot from the beach is the north boundary of the count area; i.e., do not walk further north on the beach, though birds observed on the beach north of the path to the parking lot should be counted on the Census.

The portion of the Count Area encompassing the mist-netting area is defined by the trails to and from the net lanes (see Table 4). All birds seen or heard by staff during operations in the mist-netting area during the Daily Coverage Period must be documented as Standard Observations.

NOTE: All birds that are outside the Count Area should be counted provided the observer is inside the Count Area. This is also true for birds on the lake up to any distance that can be identified, although unidentifiable species should be recorded as gull sp., waterfowl sp., etc.

In summary, the *Count Area* consists of 1) the *Daily Census* route 2) the road and trail leading from the PNR parking lot to the netting area 3) the netting area itself. All *Standard* and *Non-standard Observations* must be made while observers are on these trails, on the road, or the west beach. **PIBO staff must remain on these approved trails at all times.**

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2.0 SECTION TWO

2.1 Daily Census

The Daily Census commences one hour after sunrise and takes ninety minutes to complete. The route begins and ends at the Fish Point PNR parking lot (UTM 17T 0360709 4621970) and is approximately 2.2 km. **The Daily Census is the most important activity at the station** and takes precedence over all other activities if personnel are lacking for complete coverage. Thus, mist-nets must be closed or reduced in number if necessary to permit staff to conduct the census. The only exception is if there are large numbers of birds in nets, in which case staff will delay the Daily Census until nets are cleared. Do not conduct the census during intense lightning storms – postpone it until the storm has passed and document the later start on the Daily Log Sheet.

Responsibility for conducting the Daily Census should be rotated among all observers with the ability to identify 90% or more of all the birds that occur within the Great Lakes region. This will randomize the influence of the variable skill levels among observers, ensuring consistency of average skills across years.

Description of the Daily Census route:

Start at the Fish Point PNR parking lot and walk south along the established inner-woodland trail. Approximately two hundred meters along the path you come to a viewing platform at Fox Pond. Walk out to the viewing platform. Return to the woodland trail and continue walking south until you arrive at the south end of Fox Pond (200 m). A separate path diverges to the left (east). Follow this path until you arrive at the east beach (approx. 40 m). Do not walk further along the beach. Retrace your steps and return to the main woodland trail. Continue south on this trail (approx. 400 m) until it veers to the right (west) across a small boardwalk. The woodland trail ends on the west beach. From here, continue walking south down the west beach until you come to the end of the tree line (100 m). Next, retrace your steps and head north on the west beach past the entrance to the woodland trail and continue north (1 km) until you reach the small path through the woods that leads back to the Fish Point PNR parking lot.

Additional notes:

- Record birds on paper at regular intervals during the census rather than writing them down after the walk is completed.
- Conduct the census no matter how inclement the weather, with the exception of intense lightning storms (in this instance, conduct the census after the storm has passed and make a note in the Daily Log about the altered start and end time).
- Record the weather (see Weather Readings section) as usual, but determine the wind direction and strength, visibility, and cloud cover once you are at the south end of the census route (i.e. at the end of the tree line).
- Do not 'pish' for birds or play bird songs or calls on your phone or other device.
- Do not leave the census route or walk off the path.
- Do not walk further down the point from the tree line.
- Do not use a scope.
- Do not spend too much time trying to identify individual birds.
- Do not spend too much time observing non-passerines (i.e., gulls, waders, waterfowl, etc.).
- If flocks are too large to count individuals, estimate the flock size as best you can. Choose a single number (e.g., instead of a range, such as 500-700, put down 600).

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- Try not to vary the pace (rushing through on quiet mornings and going more slowly on busy mornings). Take the best count you can, recognizing that you are taking a standardized 'snapshot' of birds detected in 90 min rather than making an exact count.

2.2 Standard Observations

All bird detections in the mist-netting area during the official six-hour Count Period are documented as Standard Observations. The area extends from Nets 01 and 02 at the north end of the net array to Nets 08, 09, and 10 at the south end (see Map). The western boundary line is at the west end of Net 06 on the path leading to the netting location i.e. all birds seen and heard by staff when they are at Net 06 are Standard Observations but become Non-standard Observations once the observer walks west of the net on the trail to McCormick Road.

The following exceptions apply:

- 1) all birds seen and heard by staff in the area between the road and the netting location when they first walk into the netting area each morning before sunrise should be counted as Standard Observations.
- 2) When staff walk to and from the netting area to the PNR parking lot to conduct the Daily Census, they should include all bird sightings in this area (the trail from Net 06 to the road and the road to the parking lot) as Standard Observations.

2.3 Non-standard Observations

All birds documented by staff when outside the netting area (other than on exceptions noted above), or observations made outside the Standard Coverage Period, are considered Non-standard Observations. These are not included in the official Daily Totals (DTs), but staff and volunteers are asked to record them in the Daily Log in the Non-standard Observation column whenever they are in the Count Area (including afternoon visits).

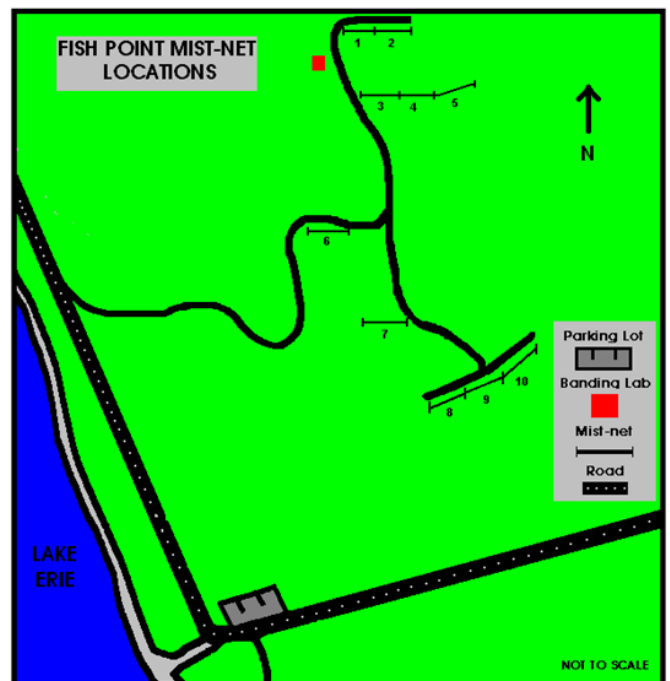
3.0 SECTION THREE

3.1 Mist-netting

The mist-netting/bird banding operation commences one half-hour before sunrise and runs for six hours, weather permitting. Ten 30-mm mesh, 2.6 m high, 9 m long, four-panel polyester passerine mist-nets are erected and checked every 30 minutes under typical conditions. All captured birds are placed in cloth bags, returned to the banding lab, and placed on hooks marked from 1 to 10, depending on which net the bird was extracted from.

Mist net locations are permanent; see Table 4 for UTM coordinates of exact locations.

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If at least two bird banders with experience extracting birds are present at the PIBO banding station, then the staff and volunteers will split up into two groups for the net-checks. Group A will begin checking nets at Net 01 and proceed in numerical order from there (to Net 02, Net 03, etc); Group B will proceed directly to nets 08, 09 and 10, and then check the nets in descending numerical order (i.e., from Net 10 to nets 09, 08, 07, etc). The path to nets 08, 09 and 10 goes past Net 07: if Net 07 has many birds in it, or if staff observe a bird in distress, it is acceptable to check and clear Net 07 before proceeding to nets 08, 09 and 10. If there are only a small number of birds in Net 07, it is best to proceed directly to nets 08, 09 and 10 and clear them first.

The two groups must continue checking each net until they encounter the other group. It is not enough for Group A to check nets 01 to 05 and then head back to the banding station – they **MUST** continue along the net lanes until they meet up with Group B. If they do not, there is the risk that one group will be left to deal with an exorbitant number of birds or a particularly difficult extraction without sufficient assistance. The two groups **MUST COMMUNICATE** before one or both return to the banding station and begin banding birds.

If the banding station has only one staff member or volunteer who is able to extract birds without supervision, then all of the personnel at the banding station will check the nets together in numerical order, beginning with Net 01.

3.2 Banding

Species Identification – all birds must be identified to species *before* being banded and must be released unbanded if ID is not 100%. Take photos, measurements, and notes for unidentified, unbanded birds, if time permits.

Certain species are always released unbanded but should nonetheless be recorded as ‘captured’ in the Daily Log sheets. These are Ruby-throated Hummingbirds, Blue-gray Gnatcatchers, and Northern Cardinals (which require special bands), and Downy Woodpeckers (because we observed their legs getting injured by the bands).

Biometrics – Except as noted in section 3.4, the following information must be recorded for all banded birds: species; age and how aged; sex and how sexed; wing measure; weight; fat content; and extent of skull ossification (in the fall).

Ageing & Sexing – all captured birds must be aged and sexed when possible using criterion accepted by the Bird Banding Office – Environment Canada, and following the methods outlined in Peter Pyle’s, *Identification Guide to North American Birds*. While staff must try to age and sex all individuals, it is important not to record an age/sex if the bander is not extremely confident (95% certain) of the bird’s status. Record age/sex as *Unknown* (Numerical Code 0) if there is any uncertainty.

Wing Measurement – relaxed wing cord measure

Fat – 0-7 numerical scoring system (Appendix 4)

Skull Ossification – scoring system ranges from 1 (trace skull), to 6 (fully-ossified skull). See Appendix 5.

Weight – mass to the nearest 0.5 gram.

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The following additional information must also be recorded on the banding sheets: time trapped; the net number the bird was extracted from; the bander's initials, and the day, month and year the bird was captured (Appendix 2). Additional information can be written in the "Comments" column.

Time Trapped – Local time, to the nearest ten-minute interval. Use 24-hour clock, and three-digit code i.e. 6:00 am is 060, 11:25 am is 112, 1:40 pm is 134.

Net Number – extractors must keep track of which net birds were removed from (the nets are numbered from 01-10) and place the bird bags on the appropriately numbered hooks at the banding lab.

Bander's Initials – initials should be included for each banded bird and the bander's full name should be written at the top of each banding sheet.

Day and Month – numerical code – day (dd) and then month (mm) i.e. April 16th is 16/04.

3.3 Recaptures

Most recaptures are birds recently banded at the station that have remained in the area, although a few are recaptured from season-to-season and year-to-year. Foreign encounters – are birds caught at Fish Point that were originally banded at another location.

Data for recaptured birds are recorded on a separate Recapture Sheet (Appendix 3). All recaptures are processed the first time they are captured on a given day. If recaptured again the same day, enter the comment "SDR" (same day retrap) next to the data from the earlier recapture.

A small group of local breeding birds (primarily Yellow Warblers) have territories near the netting operation and are recaptured consistently in late-May and early June. Once these birds have become familiar to staff, bands should be read at the net and, if the bird is one of the regulars, it can be released immediately. Such recaptures should still be recorded on the Recapture Sheet, with the code 'RAN' (released at net) in the comment space.

3.4 Bird Handling

Handling Time – birds must not be held for more than one hour from the time they are extracted from nets. All measurements should be taken for birds that are banded rather than omitting information in order to process more birds, but if necessary for the safety of the birds to begin omitting data (i.e., too many birds are backed up for banding), then the data that absolutely must be recorded are **band number, species, age and sex, and capture time**. Wing measurement, fat, skull ossification and weight may all be omitted. Birds held more than one hour should be released unbanded, after recording the species and number of individuals for recording in the Capture column on the Daily Log Sheet. Whenever capture volume prevents collection of all data, the BIC must take steps to close some or all of the mist nets so that the capture rate declines to a rate that allows all measurements to be taken on every bird.

Injuries – Birds should be released immediately at the net in poor weather conditions or after a difficult extraction if they show signs of heat exhaustion, torpor, or undue stress (e.g., eyes closed, head wagging, feathers very fluffed). Place the bird back in a bag if it does not fly and take steps to assist in its recovery. On cold days, place the bag containing the bird inside another bag containing a hand warmer (i.e. avoid direct contact between the bird and the hand warmer). On hot days, place the bird in its bag in a cool, shady spot. In either case, the bird should be kept in a quiet location. In the case of captured hummingbirds that are observed to be in distress, carefully administer sugar water via an eyedropper. Check the bird at least once every hour, being careful not to disturb it more than necessary, and if it is observed to have recovered (eyes

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are open, bird is active and moving well), release it. If the bird has not recovered well enough to fly after a few hours, place it slightly off the ground in a location some distance from the netting area.

Any bird that is held for reasons of stress or injury must be recorded in the Casualty Log (Appendix 6), along with details of its condition, the steps taken for its recovery, and its condition upon release. This also applies to birds that are released at the net – for example, if a bird is badly tongued and is bleeding, the extractor may decide to release it rather than subjecting it to the additional stress of being banded. Such a bird should be counted as a Capture and the details of the case recorded in the Casualty Log; in addition, the BIC must be informed so that the situation may be discussed with other staff and volunteers, and any necessary steps to prevent or alleviate such injuries in the future can be carried out.

3.5 Closing Nets

Nets must be closed whenever conditions are such that undue stress to birds and injury are likely to result from leaving them open.

Rain – rain and other forms of precipitation have a very negative impact on birds caught in mist-nets and nets must never be opened during even light precipitation if there are many birds in the area. Furthermore, the BIC must always err on the side of caution if rain appears imminent i.e. closing nets in advance of rain, particularly on busy bird days.

Wind – although the netting area is generally well protected, some or all nets must be closed if the force of the wind is great enough to cause undue stress or injury to birds.

Temperature – extremes of heat and cold also have a dramatic and harmful impact on birds and so nets must not be opened if conditions are poor. Although the BIC must consider other factors such as wind strength on cold days, the number and level of experience of staff, the volume of bird activity, relative humidity, etc., caution must be taken whenever the temperature drops below 0° C or rises above 30° C. Example – mist-netting on a dry, wind-free, morning at 0° C when there are not many birds in the area and a number of experienced staff on-hand is preferable to opening nets on a morning at 5° C if it is damp, there are lots of birds in the area and not many experienced staff at the station.

Predation –The Fish Point study site is occasionally visited by raccoons, foxes, coyotes, and (very rarely) deer, though no predations by these animals have been confirmed and only a small number are suspected. In the case of foxes, coyotes, and deer, the animals should be chased away when sighted, and the banding station is equipped with shakers (plastic jars with loose pennies inside) for this purpose. As raccoons generally respond to pursuit by climbing a tree and climbing down after the pursuer has gone away, a better course of action is to close the nearest nets (or delay opening them first thing in the morning) and open them once the raccoon has left of its own accord. The netting area is also relatively free of avian predators, although Sharp-shinned Hawks frequent the site in the fall and occasionally strike birds in the nets. Blue Jays can be quite numerous, but have never been observed to attack birds. When either mammalian or avian predators are in the area, the frequency of net checks should be increased, and a field assistant should be stationed close to the far nets (i.e. nets 07 to 10) to respond quickly to attempted predations either by pursuing the predator or closing nets, as appropriate. **All predation of birds must be documented in the Casualty Log** (Appendix 6) with details about the circumstances and probable predator. Depending on the severity, the nets in the immediate area where the predation occurred must be closed for the remainder of the day and the BIC, at their discretion, can terminate the entire operation for the day. Repetitive predations over a period of days must be reported to the PIBO Board.

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Bird volume – perhaps the most common cause of bird injury and mortality during a mist-netting operation is when too many birds are captured in nets at one time relative to the number and experience of staff at the station. Extremely large numbers of birds can appear very suddenly at Fish Point at any time of the day. As such, the BIC has an obligation to ensure every possible measure is taken in advance to prevent this situation from occurring (i.e. closing some or most of the nets when there are a lot of birds in the area).

If a partial closure of the mist nets is needed, nets 08, 09 and 10 should be closed first, followed by net 07 and, if necessary, net 06. These are the mist nets that are the most distant from the banding station, and closing them considerably reduces the time needed to complete a net check. If the banding station is still overwhelmed with birds, the remaining nets that are capturing the majority of the birds should be closed until all of the birds currently held at the banding station have been banded or released.

While PIBO encourages staff and volunteers to safely band as many birds as possible at the station, the observatory has a zero-tolerance policy in cases where banders willfully leave nets open in an effort to increase the catch when they know too many birds will be captured to handle safely.

4.0 SECTION FOUR

4.1 Daily Totals

The total number of individuals of each species documented within the Count Area during the six-hour Daily Coverage Period represents the Daily Total (DT) for that species. The DT is calculated by adding the results of the Daily Census, Standard Mist-netting, and Standard Observations, adjusting as needed to eliminate duplicate counts. For example, if 6 American Robins are counted on the Daily Census, 3 are banded during netting observations, and 5 additional birds are recorded within the netting area during the Standard Observation period, the DT for robins would be 14.

If some individuals were likely double counted, the total should be adjusted accordingly. For example, if a Louisiana Waterthrush is seen and heard singing in the netting area during the Daily Coverage Period, and is likely the same bird that is captured and banded, it will be recorded as a Standard Observation as well as a newly-banded bird, but will only be counted as one bird for the purposes of Daily Totals. DTs should be calculated with input from all personnel participating in the day's activities, so as to minimize duplication.

Daily Census is conducted outside the netting area, so double counting between observations during census and those made in the netting area will be rare, but there can be exceptions. On mornings with heavy diurnal migration, some birds counted on census may also visit the banding area, especially fly-overs. Another less common occurrence is when a very unusual bird is seen both on Census and at a different time of day in the mist-netting area; the rarity of the species suggesting that only one individual was present.

All staff that contribute observations to the DTs must be identified on the Daily Log Sheet along with the number of hours they spend in the field and their Observer Experience Code. Interesting or unusual observations by visitors and non-PIBO staff can be recorded in the Daily Narrative but are never included in the official DTs. Furthermore, all PIBO records (i.e. firsts for the station, record-high DTs, etc.) must also be documented by PIBO staff in the Daily Log Book in order to be included in the observatory's official records. Please also make sure that all of your interesting and unusual bird sightings on the entire island are recorded in the Daily Log Book during your stay at PIBO.

4.2 Daily Log Sheet

The Daily Log Sheet is a six-page form used to document and record all data collected at the migration station (Appendix 1). The columns 'Band,' 'Recapture,' 'Capture,' and 'Obs.' are for recording, respectively, the numbers of birds banded, recaptured, captured but released unbanded, and observed in the netting area during the standard mist netting period. The column 'DT' is daily total, constructed as described above. The log must be completed at the end of each day (including a Narrative) and, as the only source of original data until the information is entered on computer, must be guarded with utmost care. The same is equally true for the original banding records.

Details about how to fill out the specific data fields on the Daily Log Sheet are explained below:

4.3 Daily Coverage Code

The Daily Coverage Code indicates the level of coverage achieved at the station each day. Level 5 represents 100% coverage (i.e. two experienced birders/banders and one intern/scribe conducting the Daily Census, recording Standardized Observations for six hours and operating mist-nets for six hours). The code should be entered in the appropriate box on page one of the Daily Log Sheet, based on the following criteria:

Table 2 – Daily Coverage Codes

Code	Description
0	No coverage. Use of this code should occur only rarely.
1	Casual observations and/or casual banding only (no census or DTs).
2	Census only (no DTs). No other observations or banding
3	Fair coverage, including census and DTs, the latter based on 6 hours of observation within the netting area and possibly some banding. Use this code if there is only one qualified observer and banding has to be interrupted to do the census, or if weather interrupts banding for more than an hour.
4	Good coverage, Full standardized coverage: census, 6 hr of banding as weather permits, two experienced observers. This is the code most frequently used.
5	Excellent coverage, including census/DTs, 6 hr of banding, and 3+ experienced birders.

When filling in daily net-hours on the Log Sheet, note that net-hours are based on 12 m nets. PIBO's mist nets are 9m long, so each mist net therefore counts as 0.75 of a net, and the total snet hours must be adjusted accordingly; for example, on a day with full coverage, with 10 mist-nets open during the entire six-hour count period, the total net hours = $0.75(10 \times 6) = 45$ hours.

4.4 Observer Experience Code

The Observer Experience Code provides general information about the experience level of field staff and their ability to identify birds by sight and sound. The code enables data analysts to factor in the different skill levels of observers, along with many other variables, when deriving population indices from the Daily Totals. The code should be entered in the appropriate box beside each participant's name on page one of the Daily Log Sheet, based on the following criteria:

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Table 1 – Observer Experience Codes

Code	Description
1	Able to identify greater than 95% of all birds that regularly occur in the Great Lakes region by sight and sound. Very experienced field birder.
2	Able to identify 75-95% of the above. Experienced field birder.
3	Able to identify 50-75% of the above.
4	Able to identify less than 50% of the above.

4.5 Weather Data

Weather readings are recorded at the start of the Daily Census, and entered in the appropriate field on page one of the Daily Log Sheet. Recording weather at other times of day is optional. The following information is recorded:

Table 2 – Weather Data

Data	Description
Temperature	° C.
Wind Direction	N, S, E, W, NE, ENE, etc.
Wind Strength	Beaufort Scale – see Appendix 7
Visibility	In kilometers – upper limit 40 km
Cloud Cover	0 – 10. Zero = no cloud, 10 = completely overcast
Precipitation	Light rain, sleet, snow, heavy thunderstorms, etc.

Temperature should be taken from the thermometer at the banding station. **Wind Direction** indicates the direction the wind is originating from rather than the direction it is blowing. **Wind Strength** is calculated using the marine-based Beaufort Scale (Appendix 7). **Visibility** readings are an estimate of horizontal visibility based on familiar landmarks (i.e. Middle Island, at the south tip of Fish Point, is approximately 4-5 km distant; Kelley’s Island, visible behind Middle Island, is app. 10-12 kms, and the Bass Islands are 12-15 km). Estimates should be rounded to five km intervals (e.g., 5, 10, 15, 30, 35 km). Perfect visibility is recorded as 40 km. Heavy fog conditions should be recorded as very low visibility (e.g., 0.5 km, 0.25 km, or <0.01 km). **Cloud Cover** info above. **Precipitation** should be recorded in the appropriate field on the Daily Log Sheet and more specific information (i.e. duration, start and end-time, intensity, etc.) can be included in the Weather Synopsis field.

Although first-hand readings are preferred, weather conditions can also be checked by going online to the NOAA weather station situated on Middle Bass Island (app. 15 km from the migration field station): http://seaboard.ndbc.noaa.gov/station_page.php?station=sbio1

4.6 Data Entry

In addition to the fieldwork, staff and long-term volunteers are responsible for entering data from the Daily Log Sheets and bird banding records onto computer. The station's DT data are entered into the CMMN DT program and PIBO banding records are entered in Excel before being transferred to the Bandit program. The BIC or other PIBO staff will familiarize long-term volunteers with the data entry process. A few hours at the computer each week is usually enough to keep on top of the work. Long-term volunteers are also asked to help with proofing the totals once they have been entered.

5.0 SECTION FIVE

5.1 Habitat Monitoring

Monitoring vegetation and documenting site conditions generate important background information on bird-habitat associations and habitat changes that may alter the numbers and species of birds present at a given site. An initial habitat assessment was completed as part of the pilot year of PIBO's migration monitoring program, but was not repeated. Beginning in 2020, PIBO will institute a standardized habitat assessment program that follows the requirements set out by the CMMN and is modeled on the Monitoring Avian Productivity and Survivorship (MAPS) habitat assessment protocol.

Habitat monitoring, including making photographic records of site conditions, is to be carried out once every five years, beginning in 2020.

5.2 Station Map

A station map made using Google Earth and indicating the exact locations of mist-nets, trails, roads, the PIBO banding station, habitat assessment photograph locations, and designated habitats will be completed and appended to this study manual in 2020, before it is sent to BSC along with the rest of the year's habitat assessment results and the year-end submission of bird data.

5.3 Photographic records

Photographs of PIBO's mist-nets and of certain locations along the census route will be taken twice a year, at least once every 5 years, beginning in 2020. Photographs will be 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 both in May and October.

The following table gives the locations from which to take the photographs that are necessary for habitat assessment. Beginning at the UTM coordinates for each mist-net given in Table 1 (i.e. begin from the net pole closest to the path, or the easternmost net pole in the case of net 10), face the direction given and proceed for the relevant distance, then aim the camera in the required direction to take the photograph. Because of the dense vegetation and narrow net lanes it is not always possible to get the entire mist-net in frame, but as much of the net as possible should be in the photograph. Sample photographs are available on the PIBO laptop.

Table 3 - Locations for habitat photographs of PIBO mist-nets

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Net I.D.	Direction*	Distance*	Direction to point camera
Net 01	305 ⁰	2.75 m from 'Net 01'	125 ⁰
Net 02	315 ⁰	2.10 m from 'Net 02'	135 ⁰
Net 03	285 ⁰	2.35 m from 'Net 03'	100 ⁰
Net 04	295 ⁰	2.20 m from 'Net 04'	105 ⁰
Net 05	345 ⁰	1.35 m from 'Net 05'	160 ⁰
Net 06	55 ⁰	2.75 m from 'Net 06'	235 ⁰
Net 07	95 ⁰	2.25 m from 'Net 07'	275 ⁰
Net 08	55 ⁰	1.65 m from 'Net 08'	235 ⁰
Net 09	95 ⁰	2.20 m from 'Net 09'	275 ⁰
Net 10	35 ⁰	2.05 m from 'Net 10'	215 ⁰

***Describes direction & distance from UTM coordinates for the mist-net (see Table #)**

For the habitat assessment to be as detailed and accurate as possible, three other photographs should be taken in the netting area: one of the banding station, and two more along the path between nets 06 and 07. Photographs should also be taken along the path to the banding station and on the Daily Census route, at the following locations:

Table 4- Locations for other PIBO habitat photographs		
Location I.D.	UTM 17T coordinates	Direction to point camera
Banding station	0360709 4621970	255°
Net Area 01 (Path to banding station)	0360614 4621843	105°
Net Area 02A (Between nets 06 and 07)*	0360684 4621852	90°
Net Area 02B (Between nets 06 and 07)*	0360684 4621852	260°
Census 01 (Fox Pond)	0360849 4621496	90°
Census 02 (East trail)	0360900 4621392	240°
Census 03 (South beach)	0361017 4621212	110°
Census 04 (South boardwalk)	0360912 4620799	270°
Census 05 (Tip)	0360879 4620749	225°
Census 06 (West beach)	0360819 4621031	0°

***Photographs at Net Area 02A and B are to be taken at the same location: only the direction in which the camera is pointed is different**

When the image files are downloaded, rename them to define the location and date. The file name for each photo should follow this convention: '[DD] [MONTH] [YEAR] – [LOCATION NAME] - PIBO', e.g., a photograph taken on October 16th, 2020 of Net 03 would be labelled '16 Oct 2020 – Net 03 – PIBO'. The names for the locations photographed along the census route are provided in the table above.

Each set of photos from a given year should all be kept in one folder named 'Site photos [YEAR] PIBO'. A copy of this folder is to be saved to the PIBO laptop and on PIBO's external hard drive, and another copy is to be sent to BSC along with the data submission for the year.

5.4 Assessment of habitat structure

A formal habitat assessment following the MAPS protocol will be carried out once every 5 years beginning in 2020, and whenever there has been a significant change to the Count Area. Habitat assessments are to be carried out in July, between the spring and fall migration monitoring season.

The habitat in PIBO's Count Area has no slope, and is located on a plain. There are no ridges, and therefore no aspect. The habitat in the Count Area has not been logged or experienced other disturbances in the time since PIBO began migration monitoring in 2003; it is occasionally subjected to some minor management from Ontario Parks, who clear the paths of fallen logs and other debris approximately once a year. It is poorly-drained, and experiences variable flooding in the spring. In the spring of 2019, the entire netting area was covered with water from April until migration monitoring ended for the season at the end of June; the census area was largely left dry, except for the west beach, which was impassable due to high lake levels. The route for the Daily Census was therefore changed slightly to pass through the forested area on the west side of the point, though the census-taker kept as close to the beach as possible.

A station map depicting the exact location of the station mist-nets, trails and banding station, along with McCormick Road and the Daily Census route, should be prepared each year that a habitat assessment is carried out. On the map, clearly mark up to five different habitat types within the Count Area. Anything smaller than 2.5 acres in area should not be considered a separate habitat. In general, the Count Area is fairly uniform in habitat: however, it is important to remember to NOT base the current year's habitat assessment on the results of past assessments: each time, the area must be carefully considered anew. If more than one observer is available to carry out the habitat assessment, they should each complete a separate assessment and then collaborate on a consensus opinion that can be submitted to BSC. On the map, designate the dominant habitat as A, the sub-dominant habitat as B, the first minor habitat as C (if applicable), and so on.

Once the habitats have been defined and delineated, complete a PIBO Habitat Structure Assessment (HSA) Form (Appendix 10) for each habitat. PIBO's HSA is based off of the MAPS HAS form H1, but as some of the sections on that form are specific to MAPS stations and not a permanent banding station, a modified version of the form has been created for PIBO. This form includes descriptions of permanent or semi-permanent non-vegetative features (specifically, the gravel road running from the path to the netting area to the parking lot at Fish Point PNR) – if any of these features is subject to change, describe the change in this study protocol and on the data form. Copies of 'Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol: describing vertical and horizontal spatial habitat patterns at MAPS stations' (Dr. Philip Nott, Dr. David F. Desante, and Nicole Michel, The Institute for Bird Populations, 2003) and the relevant data sheets will be kept with the hard copy of this study protocol at the PIBO field house. They are also available at: <https://www.birdpop.org/pages/mapsDataForms.php>. Please refer to these materials for instructions on how to properly complete the datasheet.

The habitat assessment results are to be saved in a folder labelled 'Habitat assessment [YEAR] PIBO'. Within that folder, save the habitat photographs (labelled according to the conventions above) and scanned copies of the PIBO Habitat Structure Assessment Form (HSA). Each habitat will have its own HSA form: save each one as 'Habitat Structure Assessment form [YEAR] [HABITAT DESIGNATION] PIBO, e.g. for the dominant habitat in 2020, the file name will be 'Habitat Structure Assessment form 2020 A PIBO'.

A copy of the habitat assessment folder is to be saved on the PIBO laptop and on PIBO's external hard drive. Another copy will be submitted to BSC along with year-end submission of bird data.

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5.5 Instructions for habitat maintenance

Ongoing habitat maintenance should be carried out as needed in the netting area during both the spring and fall migration monitoring seasons. As PIBO's Count Area is on Ontario Parks property, it is forbidden for PIBO staff to use chainsaws or any other such motorized or powered equipment to clear net lanes or trim vegetation; however, the use of hand tools is permitted. Pruning saws and hand saws can be used to cut up trees and large branches that have fallen across the net lanes or foot paths – as PIBO staff and volunteers MUST stay on the paths at all times, it is preferable to remove such debris as quickly as possible rather than walk around it and cause greater disruption to the habitat than is necessary.

Around the nets, vegetation should be trimmed back approximately two or three feet from the nets, to the height of the nets (just over 2.6 m). In strong winds, the nets should be able to billow straight out without catching on any twigs, branches, or leaves. Of course in very strong winds the nets will be closed: but remember, weather conditions can change unexpectedly, and rather than expecting that you will be able to anticipate and forestall any wind-related damage, it is better to take steps in advance to remove any potential sources of possible injury to mist-nets and birds.

In the past PIBO staff used to trim the vegetation around the net lane each season. However, as the vegetation matured it has become necessary to conduct larger-scale maintenance, using more manpower and sometimes powered equipment.

6.0 SECTION SIX

6.1 Record of changes or major interruptions in standardized data collection

This section documents changes that altered the consistency of standardized data collection. It is the basis for telling researchers to interpret data with care, because bird counts may have changed without any actual change in numbers present. Important interruptions to operations should be noted (e.g. flooding or lack of personnel that reduced effort for periods of a week or more), as well as 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, revised map, GPS points). Revise the 'latest version' date on page 1. If changes have been made to the protocol other than adding to the table below, submit a copy of the new protocol to Birds Canada along with year-end data submission; otherwise, send only a copy of the table.

Date	Description of change and justification (if applicable)

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APPENDIX 1 – DAILY LOG SHEET (sample)

Date: 10 / 10 / 2008 (dd-mm-yyyy)

Personnel	Start	Finish	Hours	Code
Sumiko Onishi	705	1305	6	2
Adam Pinch	705	1305	6	1
Emilie Germain	705	1305	6	2
Claire Sanders	830	1130	3	2
Graeme Gibson	830	1130	3	1

Coverage Code	5
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Banded/Season	1908
----------------------	------

Species/Season	151
-----------------------	-----

Weather	Dawn	Census	Noon	Dusk	Synopsis
Time		835			Cool and clear.
Wind Dir./Strength		NW1			
Visibility		30			
Cloud Cover		0			
Temperature		10			
Precipitation		-			

Census		Non-Standard Obs.	Start	Finish	Dur.	Init.	Column
Start	835	Visible Migration Count					
Finish	1005	Lake Watch					
Duration	90	Hawk Watch					
Initials	AP	Other					
Notes: 1 monarch							

Standard Banding		Open	Close	Hrs.
Net	1	705	1305	6
	2	705	1305	6
	3	705	1305	6
	4	705	1305	6
	5	705	1305	6
	6	705	1305	6
	7	705	1305	6
	8	705	1305	6
	9	705	1305	6
	10	705	1305	6
Total Net-Hours				45 *
Notes: 6 hrs x 10 nets x 0.75 = 45				
*PIBO use 9m long mist nets compare to Standard 12 m net				

Non-Standard		Open	Close	Hrs.
Net	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
Total Net-Hours				
Notes:				

Daily Summary	Band	Recapture	Capture	Census	Obs.	DT			
Individuals	82	0	0						
Species	14	0	0	33	32	48			

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APPENDIX 1 – DAILY LOG SHEET (sample continued)

Date: 10/10/2008 (dd-mm-yy)

Narrative	
<p>It was an active morning with lots of <u>Myrtle Warblers</u> and <u>Hermit Thrushes</u> in the area along with a good variety of late-fall migrants including small numbers of <u>Blue-headed Vireo</u>, <u>Winter Wren</u>, both kinglet species, 5 warbler spp., and the first <u>Fox Sparrow</u> of fall.</p> <p><u>Yellow-rumps</u> and <u>Hermit Thrushes</u> were numerous in the netting area with 40 and 22 individuals banded, respectively, as well as ones-and-twos of twelve other species.</p> <p>A Great Horned Owl was heard calling first this this-morning in the netting area.</p> <p>Two Greater Yellowlegs were noted on the census.</p>	
Visitors	Notes:
Netting Area: 0	
Census: 3	
Noon: 0	
Other Flora & Fauna	
Notes:	

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APPENDIX 1 – DAILY LOG SHEET (samples of first and last pages of data columns)

[NOTE: Data in last 3 columns are no longer recorded and should be left blank. Columns will be dropped when forms next printed.]

DATE: 10/10/2008 (dd-mm-yyyy)

Species	Band	Recapture	Capture	Census	Obs.	DT	Non-standard Obs.			
Common Loon										
Horned Grebe										
Red-necked Grebe										
Double-crested Cormorant				9		9				
Great Blue Heron				2		2				
Great Egret										
Turkey Vulture					2	2				
Canada Goose				9		9				
Wood Duck										
American Black Duck										
Mallard										
Green-winged Teal										
Greater Scaup										
Sanderling										
Dunlin										

DATE: 10/10/2008 (dd-mm-yyyy)

Species	Band	Recapture	Capture	Census	Obs.	DT	Non-standard Obs.			
Red-winged Blackbird				111	12	123				
Rusty Blackbird				9	1	10				
Common Grackle					3	3				
Baltimore Oriole										
Orchard Oriole										
Evening Grosbeak										
Purple Finch										
House Finch										
Common Redpoll										
Pine Siskin										
American Goldfinch				34	8	42				
House Sparrow										
Additional Species										
Blackbird spp				(70)						
Gull spp				(120)						

Total	Band	Recapture	Capture	Census	Obs.	DT	Non-standard Obs.			
Individuals	82	0	0							
Species	14	0	0	33	32	48				



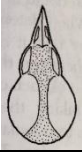
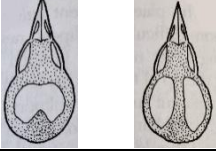
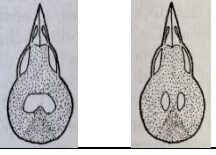

APPENDIX 4 – FAT SCORE CODES

The following numeric codes should be used to record fat content.

Code	Description
1	No fat in the furculum or anywhere on the body
2	The bottom of the furculum is completely covered but the furcular hollow is less than a third full
3	The furcular hollow is between one-third and two-thirds full
4	The furcular hollow is between two-thirds full and full
5	The furculum is more than full with fat bulging slightly from the hollow
6	Fat is bulging greatly above the furculum. Large amounts of fat are found under the wing and on the abdomen
7	Excessive fat is bulging from the furculum, under-wing and abdomen, so the entire ventral surface of the body is covered

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APPENDIX 5 – Code for Skulling

Numeric Code	Stage of Pneumaticization	
1	Trace (less than 5%)	
2	Less than 1/3 but greater than 5%	
3	Half (1/3 to 2/3)	
4	Greater than 2/3 but less than 95%	
5	Almost complete	
6	Complete	

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APPENDIX 7 – BEAUFORT WIND SCALE

Beaufort Force	Windspeed Knots	Description	Sea Condition
0	0	Calm	Sea like a mirror
1	1 - 3	Light Air	Ripples but without foam crests
2	4 - 6	Light Breeze	Small wavelets. Crests do not break
3	7 - 10	Gentle Breeze	Large wavelets. Perhaps scattered white horses
4	11 - 16	Moderate Breeze	Small waves. Fairly frequent white horses.
5	17 - 21	Fresh Breeze	Moderate waves, many white horses
6	22 - 27	Strong Breeze	Large waves begin to form; white foam crests, probably spray
7	28 - 33	Near Gale	Sea heaps up and white foam blown in streaks along the direction of the wind
8	34 - 40	Gale	Moderately high waves, crests begin to break into spindrift
9	41 - 47	Strong Gale	High waves. Dense foam along the direction of the wind. Crests of waves begin to roll over. Spray may affect visibility
10	48 - 55	Storm	Very high waves with long overhanging crests. The surface of the sea takes a white appearance. The tumbling of the sea becomes heavy and shock like. Visibility affected
11	56 - 63	Violent Storm	Exceptionally high waves. The sea is completely covered with long white patches of foam lying in the direction of the wind. Visibility affected
12	64+	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray. Visibility very seriously affected.

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APPENDIX 8 – SUNRISE/SUNSET TABLE

The chart below is a sample of a monthly sunrise/sunset chart for Sandusky, Ohio that can be sourced online at: www.sunrisesunset.com/custom_srss_calendar.asp. Staff should print off charts for each month at the beginning of the Seasonal Coverage Period and keep them in a handy location in the Daily Log book or Bird Banding binder. Be sure to adjust the sunrise times to allow for seasonal time changes i.e. to daylight savings time, etc.

Round off net opening times to the nearest five-minute interval i.e. open nets at 6:30 a.m. (half-an-hour before sunrise) when sunrise is between 6:58 and 7:02 a.m.

April 2006

Sandusky, Ohio

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Sun Rise: 6:14 Sun Set: 18:54
2 DST Begins Sun Rise: 7:13 Sun Set: 19:56	3 Sun Rise: 7:11 Sun Set: 19:57	4 Sun Rise: 7:09 Sun Set: 19:58	5  Sun Rise: 7:08 Sun Set: 19:59 First Qtr: 7:01am	6 Sun Rise: 7:06 Sun Set: 20:00	7 Sun Rise: 7:04 Sun Set: 20:01	8 Sun Rise: 7:03 Sun Set: 20:02
9 Sun Rise: 7:01 Sun Set: 20:03	10 Sun Rise: 6:59 Sun Set: 20:04	11 Sun Rise: 6:58 Sun Set: 20:05	12 Sun Rise: 6:56 Sun Set: 20:06	13  Sun Rise: 6:55 Sun Set: 20:07 Full Moon: 11:41am	14 Sun Rise: 6:53 Sun Set: 20:09	15 Sun Rise: 6:51 Sun Set: 20:10
16 Sun Rise: 6:50 Sun Set: 20:11	17 Sun Rise: 6:48 Sun Set: 20:12	18 Sun Rise: 6:47 Sun Set: 20:13	19 Sun Rise: 6:45 Sun Set: 20:14	20  Sun Rise: 6:44 Sun Set: 20:15 Last Qtr: 10:29pm	21 Sun Rise: 6:42 Sun Set: 20:16	22 Sun Rise: 6:41 Sun Set: 20:17
23 Sun Rise: 6:39 Sun Set: 20:18	24 Sun Rise: 6:38 Sun Set: 20:19	25 Sun Rise: 6:36 Sun Set: 20:20	26 Sun Rise: 6:35 Sun Set: 20:22	27  Sun Rise: 6:33 Sun Set: 20:23 New Moon: 2:44pm	28 Sun Rise: 6:32 Sun Set: 20:24	29 Sun Rise: 6:31 Sun Set: 20:25
30 Sun Rise: 6:29 Sun Set: 20:26						

APPENDIX 9 – 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 10 – PIBO HABITAT STRUCTURE ASSESSMENT FORM

PIBO HABITAT ASSESSMENT FORM

Date:

Surveyed by:

Habitat dominance code (circle one): A - dominant, B - sub-dominant, C - minor 1, D - minor 2, E - minor 3

Describe habitat type:

Successional stage of habitat type (circle one): Late, Mid, Early

Percentage of station comprised of this habitat type (from station map):

Pattern code of this habitat type (1 to 12):

Average height of tree canopy:

Average height of shrubs:

Average height of herbaceous vegetation:

			Vegetation types within each layer (sum equals 100%)					
Vegetative layers	% Cover	Pattern (1 to 12)	# of species	Conifer	Broad-leaf	Forbes & ferns	Grass-like	Main species (scientific names)
Upperstory (>15 m)							N/A	
Midstory (5 - 15 m)							N/A	
Understory (0.5 to 5 m)								
Ground cover (<0.5 m) (must total 100%)				Woody	Nonvascular	Forbes & ferns	Grass-like	Comments
Live vegetation				Leaves	Twigs	Old logs	Recent treefall	
Dead vegetation				Rock	Stones/gravel	Water	Human-made	
Total non-vegetative		N/A						

Descriptions of non-vegetative features:

Standing water Is seasonal flooding present? (Circle one) YES / NO

Is seasonal flooding (circle one): <50 m² / >50 m²

Human-made corridors Gravel road extends from southwestern-most boundary of Count Area to the parking lot at Fish Point PNR (see map)

Human-made structure Small screened banding station within Count Area (see map)

Number of snags (>1m tall, >10 cm diameter; circle one): 0, <5, 5-15, >15

(Based on MAPS Habitat Structure Assessment (HSA) form H1)

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APPENDIX 11 – PIBO NET LOCATIONS

The UTM coordinates are for the end of each net that is closest to the path (with the exception of Net 10, whose coordinates were taken from the easternmost end of the net). The angle of orientation gives the direction from one end of the net to the other, i.e. from one net pole to the next. Further notes about the standard positioning of each net are given in the 'Notes' column.

Table 1 - Fish Point mist nets: coordinates & orientation			
Net I.D.	UTM 17T coordinates	Angle of orientation	Notes
Net 01	0360730, 4621971	160 ⁰	Contiguous with Net 02
Net 02	0360734, 4621962	160 ⁰	Contiguous with Net 01
Net 03	0360693, 4621954	145 ⁰	Contiguous with Net 04
Net 04	0360703, 4621949	145 ⁰	Contiguous with Net 03
Net 05	0360711, 4621939	140 ⁰	Free-standing
Net 06	0360671, 4621887	265 ⁰	Free-standing
Net 07	0360689, 4621817	230 ⁰	Free-standing
Net 08	0360694, 4621787	260 ⁰	Contiguous with Net 09 & Net 10
Net 09	0360706, 4621789	250 ⁰	Contiguous with Net 08 & Net 10
Net 10	0360711, 4621792	245 ⁰	Contiguous with Net 08 & Net 09 (free-standing)

UTM coordinates are for the end of the net closest to the trail (with the exception of Net 10, where the coordinates are for the easternmost end of the net); angle of orientation is the direction to the other end of the net (i.e., from one net pole to the other)

