Environment and Climate Change Canada
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TECHNICAL GUIDANCE AND PROTOCOLS FOR MIGRATORY BIRD SURVEYS FOR EMERGENCY RESPONSE

Environment and Climate Change Canada, Canadian Wildlife Service

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EXECUTIVE SUMMARY

Environment and Climate Change Canada's Canadian Wildlife Service (ECCC-CWS) is responsible for the management and conservation of Migratory Bird populations and Species at Risk. As part of this mandate, ECCC-CWS provides recommendations on how government, industry, Response Organizations, and other stakeholders should conduct surveys to gather information on Migratory Birds and their habitats that have been or have the potential to be impacted by a pollution or a non-pollution incident. The *Technical guidance and protocols for migratory bird surveys for emergency response* outlines the rationale, objectives, and protocols to conduct surveys during pollution and non-pollution incidents. This document supports the standardization of the planning process and understanding of ECCC-CWS recommendations around various planning elements. The purpose of this document is to guide federal, provincial, territorial, and regional government, industry, Response Organizations, and other stakeholders in following surveys that consider aspects of planning throughout the full life cycle of an incident with regards to Migratory Birds specific to ECCC-CWS' mandate.

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LIST OF ACRONYMS

BBO	Bird Banding Office
CWA	Canada Wildlife Act
CWHC	Canadian Wildlife Health Co-operative
ECCC	Environment and Climate Change Canada
ECCC-CWS	Environment and Climate Change Canada – Canadian Wildlife Service
EPOD	Environmental Protection Operations Directorate
IC	Incident Command
ICS	Incident Command System
LA	Lead Agency
MBCA	*Migratory Birds Convention Act, 1994*
MBR	*Migratory Bird Regulations*
MBSR	*Migratory Bird Sanctuary Regulations*
RP	Responsible Party
SARA	*Species at Risk Act*
SCAT	Shoreline Cleanup and Assessment Technique
WED	Wildlife Enforcement Directorate
WRP	Wildlife Response Plan

DEFINITIONS

CWS Co-ordinator: A person who leads and implements regional Wildlife emergency preparedness and response on behalf of ECCC-CWS and represents ECCC-CWS's policies and interests when liaising and integrating with other federal and provincial/territorial government departments and other stakeholders involved in the response during Wildlife Emergencies. CWS Co-ordinators may also fulfill some of the on-site roles of responder.

CWS Responder: Emergency response personnel that provide on-site support on behalf of ECCC-CWS, as directed by the CWS Co-ordinator, during Wildlife Emergencies.

Lead Agency: The governmental authority that regulates or has legislative authority over the responsible parties' response and is responsible for overseeing the appropriateness of the response.

Migratory Bird: As defined in the *Migratory Birds Convention Act, 1994*, a migratory bird referred to in the Convention, and includes the sperm, eggs, embryos, tissue cultures and parts of the bird of species listed under Article 1 of the Convention (Government of Canada 2017).

National Environmental Emergencies Centre: Environment and Climate Change Canada's team of Environmental Emergencies Officers who assume the departmental co-ordination of incident information and, when required, the management of the incident.

Non-Pollution Incident: An uncontrolled or unexpected Wildlife injury or mortality event other than a pollution incident.

Pollution Incident: The release or deposit of a substance that is harmful to Wildlife into an area or waters that are frequented by Wildlife or into a place from which the harmful substance may enter an area or waters frequented by Wildlife.

Response Organization: Any qualified person or organization that has been certified and designated by the Minister of Transport to carry out emergency response activities (as per the revised *Canada Shipping Act* (2001)). In Canada, there are four Response Organizations (ROs) as follows: Atlantic Emergency Response Team, Eastern Canada Response Corporation Ltd., Western Canada Marine Response Corporation, and Point Tupper Marine Services Ltd.

Responsible Party: Any person or organization who might be responsible for the source or cause of an environmental emergency and/or a Wildlife Emergency.

Species at Risk: As defined in the *Species at Risk Act* (S.C. 2002, c.29), an extirpated, endangered or threatened species, or a species of special concern.

Wildlife: In this document, "Wildlife" means 1) all Migratory Birds; and/or 2) all individuals of Species at Risk listed in Schedule I of SARA that are under the jurisdiction of Minister of Environment (with the exception of individuals of Species at Risk that are located on lands administered by Parks Canada).

Wildlife Emergency: A Pollution or Non-pollution Incident that results or may result in an immediate and/or long-term harmful effect on the life or health of Wildlife and/or their habitat.

Wildlife Response Organization: Organizations that provide expertise, capabilities and trained personnel to undertake one or several aspects of response, including planning, implementation and reporting of activities related to Wildlife Emergencies. Wildlife Response Organizations (or representatives thereof) are authorized under applicable federal, provincial, and/or territorial legislation to capture, transport, clean, rehabilitate, euthanize, and release Wildlife.

Wildlife Response Plan: A document that outlines the initial and ongoing Wildlife-related strategies that are needed to support any Wildlife response objectives that may occur at the onset of a pollution or non-pollution incident.

1.0 INTRODUCTION

Environment and Climate Change Canada's Canadian Wildlife Service (ECCC-CWS) oversees and/or leads Wildlife Emergency response activities in association with ECCC responsibilities under the *Migratory Birds Convention Act, 1994* (MBCA), *Migratory Birds Regulations* (MBR), *Migratory Bird Sanctuary Regulations* (MBSR), *Species at Risk Act, 2003* (SARA), the *Canada Wildlife Act, 1985* (CWA), and *Wildlife Area Regulations*. Through these pieces of legislation, ECCC-CWS is responsible for management and conservation of all Migratory Birds and Species at Risk under its jurisdiction (hereafter "Wildlife") and how they are managed during a pollution or non-pollution incident. During an incident affecting Wildlife, ECCC–CWS has the responsibility for regulating activities that involve the handling or disturbing of Migratory Birds and Species at Risk under its jurisdiction, providing scientific advice on populations, setting Wildlife emergency response standards and guidelines, and setting response priorities for the Lead Agency (LA) and Responsible Party (RP) during the course of an emergency response.

This document provides technical guidance and protocols to guide how ECCC–CWS recommends marine surveys be conducted during pollution and non-pollution incidents. Although ECCC-CWS's definition of Wildlife includes Species at Risk other than birds (e.g., plants), the survey methods of this document focus solely on Migratory Birds (including those listed under SARA). However, in the case of carcass collection, all Wildlife species are considered. This document sets the standards to be used by CWS personnel, but serves also as a guidance for other agencies and the RP involved in an emergency response. During major or complex incidents, the planning and implementation of these surveys should be put in context with the development of a Wildlife Response Plan (WRP) as described in the *Guidelines for Effective Wildlife Response Plans* (ECCC-CWS, 2020a). While much of this document emphasizes approaches for response in marine environments, the concepts and some of the techniques are applicable to emergency response in freshwater and terrestrial environments. The aim of this document is to ensure consistency in national approaches for marine surveys, data collection during an emergency response, and the nature and detail of information required to assess damage incurred on Migratory Bird populations. These methods may be applicable to pre-spill surveys for preparedness planning in high-risk areas or sensitive habitats.

1.1 OBJECTIVES OF MIGRATORY BIRD SURVEYS

When ECCC–CWS receives a notification of an incident involving Migratory Birds, the first priority is to gather existing information on what species of Migratory Birds are potentially at risk of being affected in the area and to compile incoming information regarding affected Migratory Birds (e.g., query of existing databases, reports of location of affected birds, list of species; Figure 1). Initial reconnaissance surveys that take place in a timely manner on a larger geographic scale can also serve as a method to assess the outer geographic limits of the incident

and to obtain current information on impacted habitats, areas of special concern (e.g. colonial nesting areas) and the abundance and distribution of Migratory Birds within the general area (Table 1). This preliminary reconnaissance survey determines the most suitable approach for the surveillance phase of the response, which involves conducting systematic surveys to collect current information on Migratory Bird densities in the impacted area and quantifying the number of birds directly affected by the incident. Following initial reconnaissance surveys the method of survey should then switch to the more systematic surveillance survey phase. The reconnaissance and surveillance surveys may be conducted by utilizing different survey methods and at different scales depending on the size of the impacted area and the species involved. Surveillance surveys can be broadly grouped into the following two survey categories: 1) visual observation to quantify the abundance and distribution of Migratory Birds and 2) collection of affected Wildlife. One or both survey approaches may be considered and will depend on a wide variety of factors, but should be primarily based on the objectives of the survey phase (Table 1).

Table 1: Key objectives of Migratory Bird (including those listed under SARA) surveys conducted during an emergency response.

Survey Phase	Survey Type	Key Objectives
Reconnaissance	Visual observations	• Determine geographic scale of incident as related to Migratory Birds • Identify Migratory Birds and habitats that have already been impacted • Develop appropriate response strategies • Estimate abundance and distribution of Migratory Birds with potential to be impacted • Evaluate key habitats of importance to Migratory Birds with potential to be impacted • Inform mitigation activities to minimize further damage to Migratory Birds • Determine suitability of various surveys methods (e.g., shore, boat, or air-based surveys) for subsequent surveillance or monitoring for the duration of the incident. • Inform Incident Command (IC) on the status of known or potential Migratory Birds

Survey Phase	Survey Type	Key Objectives
Surveillance	Visual observations	• Refine the identification of Migratory Birds and habitats in the impacted area • Monitor and refine estimates of abundance and distribution of Migratory Birds in the impacted area • Monitor and estimate number of dead Migratory Birds affected by incident • Obtain estimates of Migratory Birds densities for damage assessment • Identify and monitor areas where Migratory Birds would be potentially at risk from further impacts • Inform IC on the status of known or potential Migratory Birds
	Collection of affected Wildlife [a]	• Collect dead or moribund Wildlife to: - determine cause if unknown - minimize damage to unaffected Migratory Birds (secondary exposure) - support appropriate response strategies to protect Migratory Birds - obtain minimum number of casualties for damage assessment - obtain specimens/samples for enforcement activities or reporting requirements - Inform IC

[a] Includes any species under ECCC-CWS's definition of Wildlife in this document. Could also apply to species under other jurisdictions.

In summary, information collected during Migratory Bird surveys will serve to:

- Identify and quantify Migratory Birds and their habitats known or potentially at risk of being affected by the incident.
- Help direct appropriate response strategies so as to minimize further damage to Migratory Birds or their habitat (i.e., deterring non-affected individuals from impacted areas),
- Facilitate the removal of affected Migratory Birds *if* this will minimize further damage or support appropriate response strategies (e.g., for the treatment of oil-affected Migratory Birds), and

- Conduct post-incident damage assessments on Migratory Bird populations and their habitat (Figure 1).

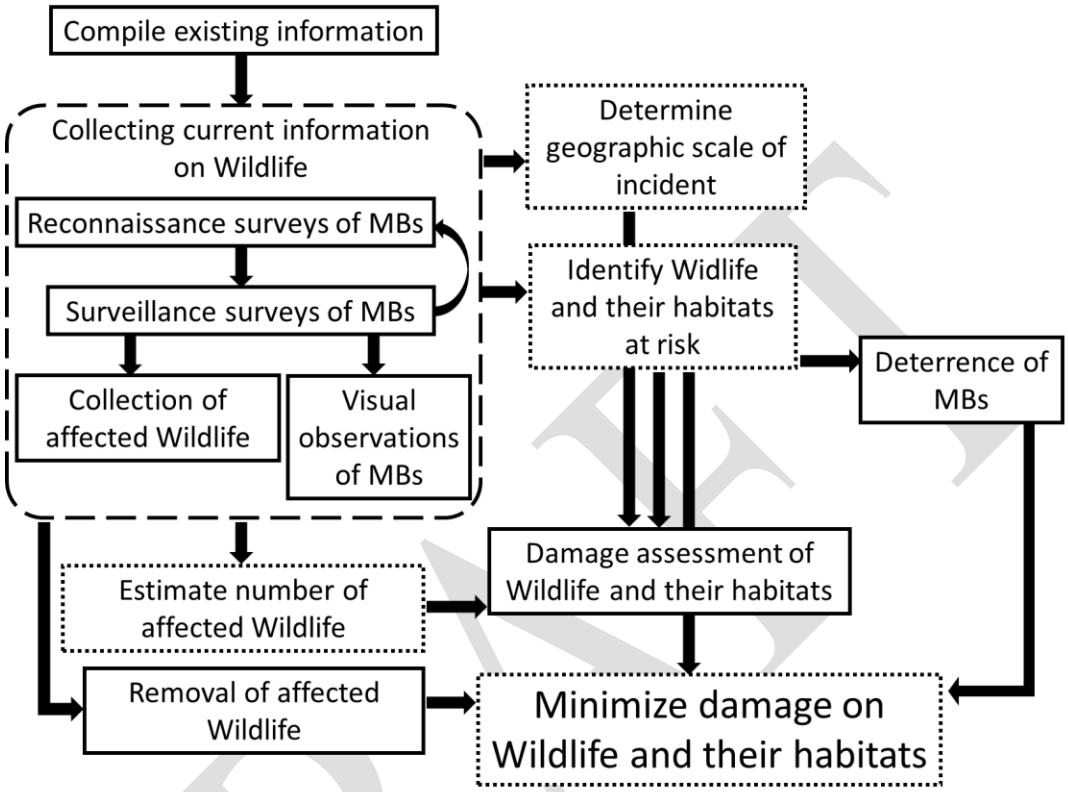

Figure 1: Intent of Migratory Birds (MBs) surveys (dashed outline) and other key activities (black outline) that generate information (dotted outline) that help minimizing further damage of a pollution or non-pollution incident on Migratory Bird populations and their habitat and feed into a Migratory Bird damage assessment. These activities form some components of emergency response, which should be outlined and contextualized in a Wildlife Response Plan. Surveys outlined in this document apply primarily to MBs but carcass collection is applicable to all Wildlife (as defined in this document).

1.2 GENERAL GUIDELINES ON CONDUCTING SURVEYS AND MANAGING DATA

1.2.1 Wildlife Response Plans

Depending on the scope and extent of a Wildlife Emergency, WRPs may be developed which should include details of surveys to be conducted. Strategic WRP may be developed in advance of incidents for activities which have risks of impacts to Wildlife. Such strategic WRP should contain details of theoretical survey design as well as practical details for initiating and implementing surveys (e.g. survey protocols, observer qualifications, numbers of vessels or aircraft, checklist of activities, reporting mechanisms). Once an incident occurs, incident-specific WRP should be developed (or modified from existing WRP) to more clearly outline the actual survey design within the scope and parameters of the incident (e.g. volume and extent of oil spill, results of reconnaissance surveys, trajectory modeling). For more details on developing WRP see ECCC-CWS *Guidelines for Effective Wildlife Response Plans* (ECCC-CWS, 2020a).

1.2.2 Implementing Surveys, Survey Design, and Observer Requirements

During an emergency response involving Wildlife, surveys can be implemented using a two-tiered approach: a reconnaissance phase followed by a surveillance phase. The initial reconnaissance surveys take place in a timely manner on a larger geographic scale to assess the outer geographic limits of the event and to obtain current information on the abundance and distribution of Migratory Birds within the general area. During this reconnaissance phase, information is collected to determine the spatial extent, species affected, habitats or sites of special concern, the most appropriate method for subsequent surveys, and whether mitigation is appropriate to prevent Migratory Birds from entering the impacted area (i.e., deterrence and dispersal of birds from the area). During the surveillance phase, surveys target the impacted area to quantify the number/density of affected Wildlife through visual observations and/or collection of affected Wildlife. Visual surveys of Migratory Birds and collection of affected Wildlife may occur in tandem, depending on the scale of the event, the species affected, and other variables

such as weather conditions during the response. Repeated surveys will also monitor the ongoing impact of the incident on Wildlife populations.

Surveys should be designed so that the data collected are representative of the impacted area and can effectively monitor changes in conditions due to the incident with the goal of preventing further damage to the Wildlife resource and secondly document damage to the resource. The approach used will be incident-specific and will depend on numerous factors, such as incident conditions (e.g., oil versus disease), species affected, type of landscape (e.g., marine versus terrestrial), location within landscape (e.g., inshore versus offshore), and available resources. An adaptive approach may be necessary during an emergency response to account for unforeseen changes, such as weather conditions. Ideally, the survey platform (e.g., vessel, aircraft) used to conduct Migratory Bird surveys is dedicated to this task during an emergency response, as this will allow observers to implement a survey design appropriate to the survey objectives. For responses that are managed using the Incident Command System (ICS), or other incident management structure, all surveys should be implemented within the approval, safety, and reporting requirements of the ICS structure.

To ensure high accuracy and reliability of data collected during an emergency response, observers conducting Migratory Bird surveys must be able to identify species that are seasonally present in the area of the incident, in varying plumages and weather conditions. Observers must be trained and experienced in all relevant survey protocols. Depending on the type of survey, formal training will be required by classroom and/or through field experience. Experienced observers, especially those with familiar with local or regional species, are essential for data reliability, particularly with respect to data used in damage assessments. Those conducting surveys need to be aware of any safety certification and training requirements to access certain survey platforms, which may be made available during an emergency response (e.g., underwater egress training is required for aerial surveys performed over water). It is difficult to outline training and experience standards which are applicable to all Wildlife emergencies. Industries and Response Organizations should therefore consult with regional ECCC-CWS staff for guidance on relevant standards. Wildlife Response Organizations may also have trained and experienced staff capable of undertaking different aspects of Wildlife surveillance.

ECCC-CWS staff should be familiar with relevant Safe Work Procedures and Task Hazard Analyses for surveys that might be expected in their regions. Other agencies and Response Organizations should be familiar with local, regional, or industry specific training that may also be required.

1.2.3 Data Collection and Management

During an emergency response, data quality is of paramount importance. Standardized data sheets (paper or electronic) prompt observers to record all required information, which are included in established protocols. Following each survey, data must be entered into a database to facilitate quick and accurate reporting and guide decision making during the response. Data need to be communicated with appropriate section(s) within the ICS structure. ECCC-CWS will oversee data quality control of surveys conducted by the RP, Response Organizations, and/or other groups to ensure that an adequate expertise is involved in the process. Standardized data entry and transfer to regulatory agencies is essential to ensure data quality. Following each incident or event, all data collected through all Wildlife response activities are consolidated and form the basis of the damage assessment on populations.

Standardized protocols have been developed for the purpose of conducting Wildlife surveys during an emergency response in Canada. The protocols herein are sufficiently generic to be applied in any incident but still facilitate consistent data collection for Wildlife impacted by pollution or non-pollution incidents. This document currently includes protocols on how to:

- collect affected Wildlife (Section 2),
- conduct reconnaissance Migratory Bird surveys (Section 3)
- conduct surveillance Migratory Bird surveys (Section 4) through visual observations from:
    - open water platforms (moving or stationary) (Section 4.1), and
    - aerial platforms (Section 4.2).

The approaches described here are based primarily from experience in marine and coastal environments, but could be applied to other contexts. Future documents, or subsequent versions of this document, may be developed to include approaches and methods for other landscapes (e.g., terrestrial, freshwater, riverine, intertidal, and wetlands) and to address species-specific needs (e.g., Species at Risk or species with localized distribution).

2.0 COLLECTING WILDLIFE DURING AN EMERGENCY RESPONSE

During an environmental emergency event involving Wildlife, ECCC–CWS may assist or provide advice on collecting live or dead Wildlife and/or samples and evaluate the incident's impact on Wildlife populations and sensitive habitats important to Wildlife. Incidents may be associated with the discharge of hydrocarbons, such as oil, in the marine or terrestrial environment that can cause widespread mortality to Wildlife. However, non-oil related mass mortalities involving Wildlife are also common in Canada along coastlines, lakes, rivers, and shorelines, caused by both natural (e.g., starvation due to severe weather and disease outbreaks) and human-related events (e.g., poisoning, collisions due to light attraction, and flaring), and

occasionally trigger a formal emergency response. The intent of this section is to provide technical guidance properly trained and authorized personnel who will be conducting Wildlife collection surveys during an emergency response involving Wildlife that may be related to either a pollution or non-pollution incident. Key objectives of these surveys are outlined in Table 1 and include: 1) determining the geographic scale of the incident, 2) collecting dead or moribund Wildlife to determine the cause of death if the source is unknown, minimize damage to unaffected Wildlife by removing affected Wildlife from the environment, support appropriate response strategies for the treatment of affected Wildlife, and obtain specimens/samples for enforcement activities, and 3) provide data to inform damage assessments estimating the numbers of Wildlife impacted by the incident.

These procedures/protocols are meant to be tailored to the specific needs of each region and/or landscape and to be used within the broader context of established contingency plans (Section 1.2.1), standard operating procedures, and within the ICS structure.

2.1 HUMAN HEALTH AND SAFETY CONSIDERATIONS

Health and safety are of primary importance in any Wildlife response effort. The earliest phases of a response are generally the most hazardous to human health and safety. Thus, safe practices during the field collection of Wildlife must be a priority. Wildlife response efforts will not be initiated unless personnel can conduct activities safely. Field collection and survey are to adhere to established safety requirements and thus operations may be limited or excluded from certain geographic locations. Furthermore, for safety reasons, the public may have to be excluded from the area where collection operations are being conducted. To reduce potential hazards encountered during a Wildlife mortality event, personnel employed by Response Organizations or other agencies should abide by their own established health and safety protocols, standard operating procedures (SOP), and incident-specific safety plans (e.g. safety plans developed under ICS managed responses). For more details on occupational health and safety in the context of Wildlife collection during an emergency response, consult the document entitled *Guidelines for the Capture, Transport, Cleaning, and Rehabilitation of Oiled Wildlife* (ECCC-CWS, 2020b).

2.2 COLLECTING WILDLIFE DURING A POLLUTION INCIDENT

When a deleterious substance such as oil is released into a waterbody, many Wildlife species that are affected in the water end up dying in the water and may never come ashore. However, some affected Wildlife come ashore voluntarily in an attempt to minimize heat loss (caused by being in direct contact with cold water). Other Wildlife species may die in the water and then wash ashore.

An emergency response is a joint effort from various government departments and organizations. In support of the LA, ECCC–CWS may assist with or coordinate the collection of dead and live

oiled Wildlife on accessible beaches, shorelines, or near shore areas through systematic surveys. The primary objectives of Wildlife collection surveys following a pollution incident can be found in Table 1.

ECCC–CWS will recommend to all agencies involved in a response the need to 1) monitor Wildlife impact through Wildlife collection surveys, 2) ensure that no undocumented Wildlife are removed from beaches or shorelines, and 3) ensure that everyone collecting Wildlife has valid authorization and training to do so under the MBCA, MBR, MBSR, SARA, CWA, and Wildlife Area Regulations (see Appendix I for contact information of ECCC–CWS regional permits offices). Protocols should be distributed to Responders prior to conducting Wildlife collection surveys. The following material provides example protocols for collecting and documenting dead, live oiled, and non-oiled Wildlife.

2.2.1 Guidance for Collecting Wildlife in a Pollution Incident

Wildlife collection surveys during an emergency response should also be conducted using a two-tiered approach, similar to that used for bird surveys. This entails an initial collection phase and follow-up phase. For complete information on the capture, handling, and transport of Wildlife, carcass collection, and record keeping, consult the document entitled *Guidelines for the Capture, Transport, Cleaning, and Rehabilitation of Oiled Wildlife* (ECCC-CWS, 2020b). The following summarize the previous guidance document on how to collect affected Wildlife during each phase:

- During the initial phase of the response, Responders quickly scan and collect dead Wildlife on beaches and shorelines where affected Wildlife have been sighted and where stranded Wildlife have been found (e.g., through beached Wildlife surveys or reports from Shoreline Cleanup and Assessment Technique (SCAT) surveys). This approach is useful to quickly assess the geographic extent and distribution of oiled Wildlife.

- Once the extent of the impacted area has been identified, follow-up Wildlife collection surveys should be more comprehensive (i.e., visiting other accessible beaches and shorelines in the area and searching the entire stretch of a beach). Each beach should be surveyed by walking one way along the wrack or flotsam line (i.e., the line of stranded seaweed and debris or high water mark) closest to the water, scanning on each side, and returning along the next wrack line higher up on the beach. Note also that fresh carcasses may be found close to the water line; older carcasses may be found at the extreme high tide. If a beach is particularly deep, several sweeps may be required. Alternatively, a zig-zag search pattern (between mid-beach and the high tide mark) may be the most efficient survey method. The area above the extreme high tide mark should always be thoroughly examined, especially if the incident involves waterfowl, as live oiled birds may seek

shelter in nearby vegetation or predators/scavengers may drag the birds under the protective cover. Beach surveys should include near shore emergent vegetation (e.g., reed beds and marsh areas) where affected Wildlife may have taken refuge. SCAT operations can also prove a valuable resource for identifying areas requiring further search effort.

- Carcasses and live oiled Wildlife may need to be retrieved from a boat if the shoreline does not allow natural deposition or safe wading operations.

- If feasible, do not to use contaminated nets to capture live Wildlife so as to avoid cross-contamination of samples and oil exposure in non-oiled Wildlife.

- All live Wildlife observed in the area should be inspected for evidence of oiling using binoculars or a spotting scope. Any behavioural abnormalities of Wildlife such as excessive preening, which might indicate oil, should be noted. This will aid in prioritizing areas for follow-up surveys.

- Banded or otherwise marked Wildlife should be kept separate from other carcasses. In the case of Migratory Birds, information should be provided to ECCC–CWS personnel to ensure prompt and accurate reporting to the Bird Banding Office (BBO).

- At the end of each day, or more frequently if possible, data on collected Wildlife should be transmitted to the ECCC–CWS Emergency Response Coordinator who will then feed information into ICS through the identified ECCC representative. Wildlife collection surveys should be repeated daily as long as is deemed necessary to effectively document the impacts of the incident. It is essential to document all surveys conducted including surveys resulting in zero capture or collection.

- Incident specific documentation may include, but not be limited to:
    - Carcass collection protocols (e.g. Appendix II)
    - Chain of Custody forms
    - Beach/shoreline survey data sheets
    - Electronic database maintaining records of surveys and results (see also Section 2.2.4 below)

2.2.2 Standardized Tools for the Field

Emergency response kits and protocols should be standardized to ensure that 1) Wildlife are collected in a safe manner and information is collected consistently and 2) when called upon,

samples are collected and stored appropriately for laboratory analysis and evidence. Inventory for these kits should include:

- Written authorization to handle Wildlife
- Laminated one-page protocol for collecting Wildlife tailored to the needs of each geographic region (see example for collecting birds in Atlantic Region in Appendix II)
- Personal Protective Equipment (see ECCC-CWS, 2020b)
- Waterproof notebook for documenting the search, or standardized data sheets developed for the incident
- Waterproof writing implements (i.e., permanent markers, pens, and pencils)
- Hip-waders
- GPS unit
- Camera
- Aluminum foil
- Plastic bags (small and large)
- Identification tags, labels, and/or data sheets
- Nets to capture live oiled Wildlife
- Cardboard boxes of various sizes or pet caddies lined with sorbent sheets for live Wildlife
- Coolers for storing and shipping samples
- Tape (to secure coolers)
- Disposable examination gloves
- Evidence bags
- Hazardous waste / biohazard bags
- Chain of custody forms
- Cervical dislocator
- First aid kit

2.2.3 The Fate of Collected Live Oiled Wildlife

During a pollution response, ECCC–CWS provides guidance as to appropriate response strategies for the treatment of live oil-affected Wildlife. Where possible, these strategies should be outlined in WRPs developed for the incident. If a Wildlife treatment facility, with valid operating permits, is in place, all live affected Wildlife must be transported to the facility for documentation, assessment, and treatment. For information on how to safely transport oiled Wildlife to a treatment facility, consult document entitled *Guidelines for the Capture, Transport, Cleaning, and Rehabilitation of Oiled Wildlife* (ECCC-CWS, 2020b). If no Wildlife treatment facility is in place or the facility cannot accept additional Wildlife because of capacity, then

ECCC-CWS personnel should be contacted for advice and/or procedures should be outlined in a WRP for the incident.

2.2.4 Post-Field Assessments

Upon return from the field, dead Wildlife are brought into a laboratory or suitable space to allow more detailed examination of all Wildlife collected. At a minimum, the following information must be collected:

- Date and location of where Wildlife were found,
- Degree of oiling,
- Species or lowest level of taxonomic classification, and
- Data associated with any Wildlife bands or other markers.

Additional information on individual Wildlife may be collected for scientific purposes; see Appendix III for an example data sheet. This information is vital as it will form the basis of what is communicated to the CWS Co-ordinator and subsequently to the ICS if in place as part of the monitoring and deterrence and dispersal (sometimes referred to as "hazing") efforts. Following the incident, all data collected on recovered oiled Wildlife are to be compiled into a database along with information received from all other oiled Wildlife sightings (from the public and Responders). This database along with other relevant information, such as waterbird abundance and distribution in the vicinity of the impacted area (using information from monitoring and previously existing data), drift block information (if available), and information pertaining to the distribution and persistence of the oil slick, forms the basis for the prevention of further damage to Wildlife and their habitats and the assessment of the incident's impact on Wildlife populations and their habitats.

Oiled carcasses are to be treated as hazardous waste and therefore require proper disposal, such as incineration. The procedure in the WRP put in place for the incident and/or developed within the ICS structure should be followed. Provincial representatives or EPOD should be contacted to inquire about disposal options in the region.

2.3 RECOVERING WILDLIFE DURING A NON-POLLUTION INCIDENT

In non-pollution incidents involving Wildlife (e.g., starvation and disease), all cases are treated similarly because of the time required to determine a diagnosis from the time the mortality is reported. ECCC–CWS's directions to Responders, other agencies, and the RP are based on information provided by agencies with expertise in human health issues, including the Public Health Agency of Canada.

Searching for Wildlife during an uncontrolled of unexpected mass mortality event should follow the same procedures as outlined in the previous section. However, unless the cause of death during the collection phase is known, it should be assumed that Wildlife may have a zoonotic (infectious) disease, and for this reason, the investigation would generally be led by Provincial and Territorial departments and/or the Canadian Wildlife Health Cooperative (CWHC). As such, it is imperative that Wildlife are collected in a manner that protects human health while enabling a complete post-mortem examination to determine the cause of death. When available and if applicable, freshest carcasses should be preferentially collected over older carcasses. The following collection guidelines were developed with input from experts from the CWHC, Provincial and Territorial departments.

1) While wearing disposable rubber gloves, place dead Wildlife in individual plastic bags (if feasible) and tie shut. Partial remains of Wildlife carcasses should also be collected and placed in a separate bag. Totes and drums may be used as collection points for incidents involving large numbers of Wildlife.

2) Record the date and location where Wildlife were found and contact information of the individual making the collection by either:
   - Writing directly on the bag with a permanent marker, or
   - Attaching a label to the bag with the above-mentioned information.

3) Place the labelled bag into a second plastic bag (i.e., double-bag) and tie shut.

4) After removing and disposing of gloves, thoroughly wash hands for 20 s with disinfecting soap, and any other items that may have been contaminated while handling the Wildlife.

5) During storage and shipping, store bag(s) in a cool area (e.g., outdoors during winter months or in a cooler with ice packs) that is sheltered from scavenging Wildlife. Freeze Wildlife if they are to be retained for more than several days. In the event of mass Wildlife casualties, it maybe necessary to consolidated collections in drums or totes.

6) Contact the CWHC or a provincial/territorial veterinarian to arrange for the collection of dead Wildlife, or to consult on issues such as carcass disposal.

It is important to note that detailed protocols on handling and collecting potentially diseased Wildlife may already exist for a region (e.g., for Migratory Birds: *Protocole de collecte des oiseaux sauvages morts ou moribonds dans le cadre de la surveillance intégrée du virus de l'influenza aviaire au Québec*, developed by provincial veterinarians in the Québec region;

MAPAQ et MRNF 2007). Prior to collecting Wildlife, it is critical to contact CWHC or a provincial/territorial veterinarian acting as the regional representative leading the investigation to ensure that region-specific protocols are being followed if these are already in place.

3.0 RECONNAISSANCE SURVEY METHODS OF MIGRATORY BIRDS DURING AN EMERGENCY RESPONSE

Reconnaissance surveys take place in a timely manner on a larger geographic scale and can also serve as a method to assess the spatial extent of the incident and to obtain current information on impacted habitats, areas of special concern (e.g. colonial nesting areas) and the abundance and distribution of Migratory Birds within the general area (Table 1). Reconnaissance surveys will be used to inform on the most appropriate methods for subsequent surveys, and whether mitigation to deter Migratory Birds from entering the impacted area is appropriate. The objectives of reconnaissance surveys are described in Table 1.

3.1 AERIAL SURVEYS

An aerial survey should be conducted as soon as possible after the incident and on a large geographic scale to assess the outer limits of the incident. Aerial surveys are the most efficient type of survey to quickly assess the extent of the incident. The survey could follow the standardized protocol developed for the purpose of conducting aerial Migratory Bird surveys during an emergency response (Section 4.2). The survey should make it possible to estimate:

- the number of birds likely to be contaminated;
- the species affected (especially Species at Risk and highly vulnerable species);
- their location with respect to the incident (i.e. pollutants);
- habitats that are or may be affected; and
- habitats to which the birds may be diverted or attracted to.

The deployment of the labour and equipment needed for the response plan will be completely different depending on whether hundreds, thousands, or tens of thousands of birds are considered to be at risk. A high abundance of species considered to be vulnerable may indicate a high probability of finding impacted birds in the days following the incident. If, in the hours following the incident, it seems possible that the pollutants could reach a large concentration of birds or habitats preferred by birds, the dispersal strategy must be deployed quickly.

3.2 GROUND SURVEYS

Ground surveys must also be carried out as soon as possible after the incident. The main objective of the ground surveys is to assess the number of impacted, or potentially impacted, birds. Ground surveys should also identify birds' preferred habitats that are likely to be impacted, where preventive deterrence and dispersal efforts should be concentrated. Specifically, ground observers must be able to provide:

- the number of birds that are or may be impacted, based on their specific behaviour (excessive preening, inability to fly);
- the exact location of impacted birds, to determine where efforts should be concentrated in the event that a decision is made to rehabilitate them;
- the number of birds in the impacted area, by species, to supplement the estimates from the aerial surveys; and
- the location of the birds' preferred habitats.

Surveys should be carried out on foot, or if applicable by truck or an all-terrain vehicle, along the entire shore by a two-person team communicating with the centre of operations by radio. If a systematic survey of the shoreline is not possible, observation points may be established at the most accessible sites or motorboats may be used. Cossette and Lehoux (1993) estimated that a single team can cover an area of up to 15 km per day. These surveys could be carried out, if necessary, in collaboration with the deterrence and dispersal teams. The extent of the impacted area to cover will be determined by the other surveys (aerial surveys, carcass collection, SCAT, etc.). Binoculars, a telescope, detailed 1:50,000 scale maps and GPS devices are required. Drones may also allow for surveillance of inaccessible areas. Ground surveys for reconnaissance purposes may be ad hoc in nature, but should record information on locations searched and may also collect carcasses as per section 2.2.

3.3 SURVEYS FROM MOVING PLATFORMS IN OPEN WATER

Boat-based reconnaissance surveys may also be carried out to complement the other surveys. The objectives of the survey are similar to those of aerial and ground surveys. Depending on the conditions, motorboats may be used to assess the situation if no aircraft are available or if the impacted area cannot be accessed from the shore. Boat-based surveys for reconnaissance purposes may be ad hoc in nature, but should record information on locations searched (preferably with routes tracked by GPS), and may also follow general principles from the standardized protocol established for Migratory Bird surveys from moving platforms (Section 4.1.3).

4.0 SURVEILLANCE SURVEY METHODS OF MIGRATORY BIRDS DURING AN EMERGENCY RESPONSE

4.1 CONDUCTING MIGRATORY BIRD SURVEYS FROM PLATFORMS IN OPEN WATER

Canada's marine and freshwater environments support millions of breeding birds congregated at colonies and foraging offshore, as well as migrants travelling from the southern hemisphere and across ocean basins. Threats to birds in their marine habitats include pollution (e.g., hydrocarbon release) as well as fishing activities, climate change, habitat loss and disease, some of which may cause mass mortality events. To adequately assess the number of birds impacted, surveys of impacted areas may be required.

The purpose of this section is to provide technical guidance through survey protocols to estimate bird densities in marine open water during an emergency response from both moving (vessel-based) and stationary platforms. The protocols are derived from the Eastern Canada Seabirds At Sea program (Gjerdrum et al. 2012) but are consistent with those used across regions (Pacific, Arctic, Gulf, and Atlantic) to ensure collection of comparable data. This section provides guidance on survey design, describes the general methods used to conduct surveys, and then defines each data field in detail. A series of appendices provide distance estimation equations, data field coding details, example surveys, and blank data sheets.

4.1.1 General Requirements for Bird Observers

To ensure the highest quality of data is collected, observers should have the following:

- Ability to rapidly identify birds (to the lowest taxonomic level possible) in all plumages, in various lighting conditions, reduced visibilities, and in rough sea conditions,
- Ability to accurately record data on data sheets or electronically in accordance with this protocol, including information on vessel, weather conditions, and birds, and
- Experience travelling in boats and an ability to work in rough sea conditions without getting seasick.

4.1.2 Survey Design for Bird Surveys from Moving Platforms in Open Water

To adequately quantify the abundance and distribution of birds potentially at risk during an incident and to estimate the number of dead and moribund birds affected, surveys must be designed so that the data collected are representative of the area and can effectively document the impact. However, the approach used to collect the data will vary greatly from response to response as it will depend on numerous and often unpredictable factors, such as mortality source, species affected, type of landscape, weather conditions, and available resources. Also, the approach may change as the response unfolds. Furthermore, the platform used to conduct the surveys should be dedicated to this task during an emergency response, as this will allow observers to design a vessel path to suit the objectives of the survey and allow observers to have control of changing the course of the pre-determined path if required. A grid that the vessel will search should be plotted prior to the survey.

Using information from reconnaissance surveys (Section 3.0) and other sources of information available during an incident (e.g. locations of impacted birds, oil spill tracker buoys, oil spill trajectory modelling, weather forecasts), vessel-based surveillance should be designed to overlap with impacted areas and adjacent un-impacted areas. For relatively small impacted areas (e.g. contained or limited dispersal of oil), a conceptual survey design should include surveys that extend (buffer) beyond the extent of the impacted area (Figure 2).

Grid transect length (t) and distance between transects (w) will be dependent on the shape and diameter (d) of the impacted area and should be determined at the time of an incident to meet survey objectives. Transects should extend beyond the impacted area to ensure Migratory Birds and Species at Risk potentially impacted by the incident are enumerated and dead or moribund individuals that may have drifted beyond the impacted area are identified. The spacing between lines should be such that transects are independent and not counting the same area twice (though surveys may be repeated on multiple days if necessary). To assess inter-line variability, at least 20 lines should be surveyed, and the total number of lines should be proportionate to the scope of the incident to collect representative samples over the impacted area.

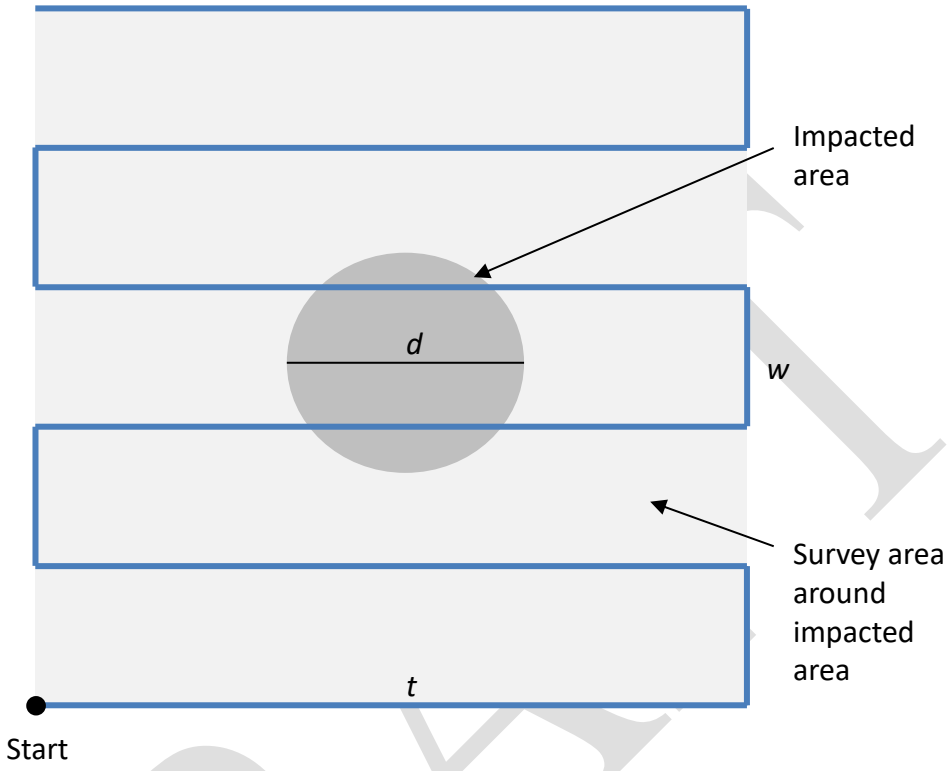

Figure 2: Conceptual survey design around an impacted area, where *d* is the diameter of the core impacted area, *w* is the distance between transects, and *t* is the transect length.

For larger incidents where impacts are dispersed or spreading (e.g. oil spill in open water), survey design may include a gridded approach to collect representative data over the impacted area (Figure 3). In this scenario, a gridded area provides a systematic approach, which can facilitate planning, execution and display/mapping of survey effort. Grid cells to be surveyed can then be prioritized daily with respect to changing parameters of the incident (e.g. observed oil, occurrence of impacted wildlife, weather, available resources), giving priority areas of greatest impact. The transect length (*t*) and distance between transects (*w*) will depend on the grid-cell size, which may vary with the scale of the incident and the number and types of vessels available.

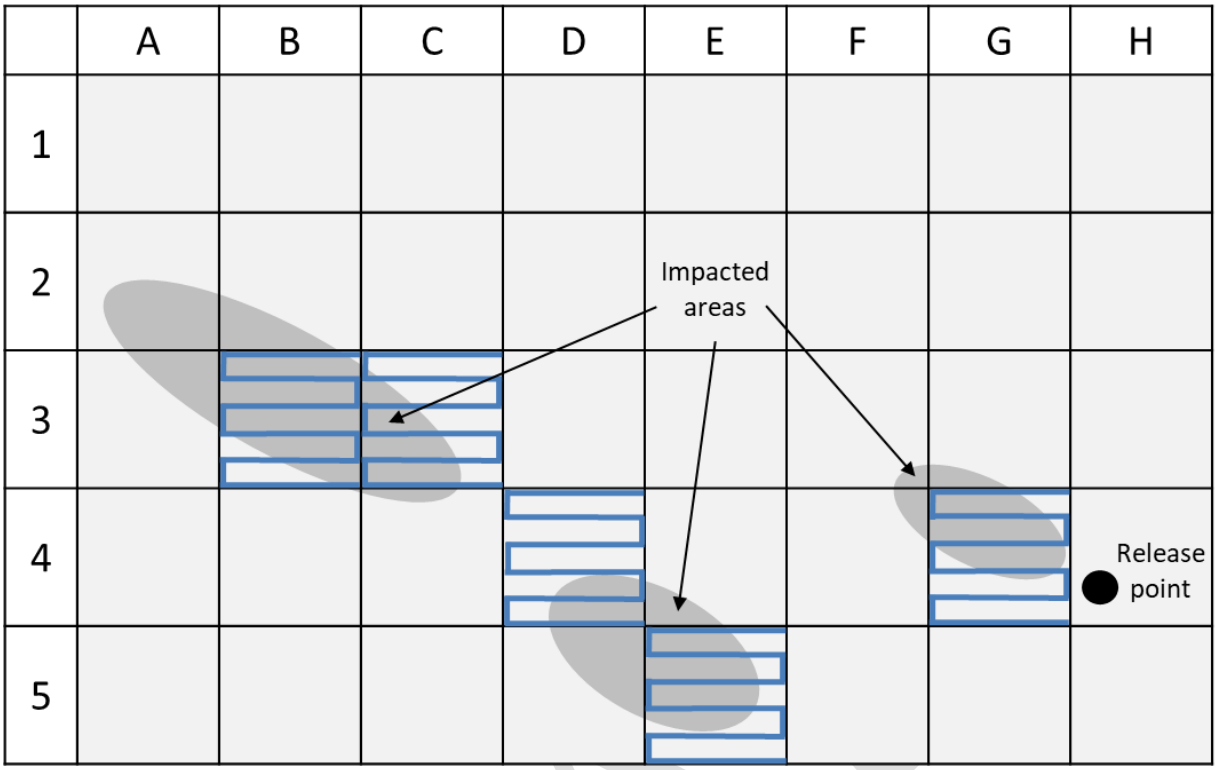

Figure 3: Conceptual survey design around impacted area for a dispersed or spreading oil spill. Area is divided into blocks (or grids) and surveys (blue lines) are conducted within blocks to collect representative samples of bird density and/or mortality.

Both example (Figures 2 and 3) are meant as a guide only. The exact pattern for survey transects will depend on the unique circumstances of each incident and the available resources and conditions at the time of the incident.

4.1.3 General Methods for Bird Surveys from Moving Platforms in Open Water

The following methods for conducting bird surveys from a moving platform in open water have been adapted from Gjerdrum et al. (2012).

Minimum requirements. Only conduct surveys when the platform is travelling at a minimum speed of 4 knots (7.4 km/h) and a maximum of 19 knots (35.2 km/h). If the platform is travelling less than 4 knots, conduct surveys using the protocol for *surveys from stationary platforms*.

Observer position. Conduct observations from a high position on board the ship (typically the bridge), facing the bow of the vessel, on either the port or starboard side depending on visibility, sun glare, or bridge activities.

Transect method. Conduct surveys while looking forward from the moving platform, scanning at a 90^{o} angle from either the port or starboard side. Priority is given to birds observed in transect (Figure 4). Birds outside of the transect are recorded if these observations do not interfere with in-transect observations.

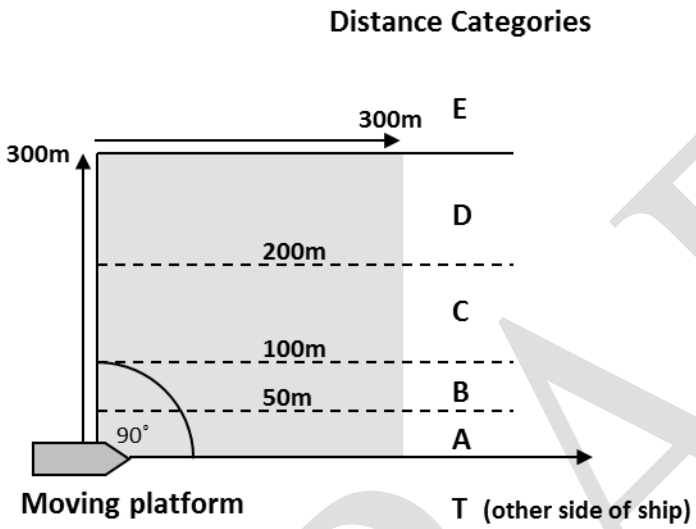

Figure 4: Illustration of a survey using a 90° scan, covering a 300 m transect from a moving platform. The perpendicular distance from the observer to the bird(s) is estimated (distance categories A–D). Birds observed outside the transect (distance categories E and T) are normally also recorded if this does not affect observations within the transect. The shaded area is considered the snapshot box, in which flying birds are considered in transect if observed during a snapshot interval.

Estimating transect width. Observers should practice estimating the width of the transect and *perpendicular* distance bands (A–D in Figure 4) prior to beginning observations. This can be accomplished with a distance gauge made from a transparent plastic ruler (see Appendix IV). This gauge should be kept close at hand to verify transect width and bird distances over the course of the surveys. For more accurate delineation of distance bands, strings can be placed on the window, which considers that bands converge at the vanishing point ahead on the horizon (Bolduc and Desbiens, 2011; see Appendix IV for a summary).

Five-minute periods. A survey consists of a series of 5-min observation periods, which are

exclusively dedicated to detecting birds. Conduct as many consecutive 5-min observation periods as possible, regardless of whether birds are present or not, and try to ensure consistent coverage throughout the day.

Poor visibility. When part of the 300 m transect is not visible due to fog, surveys should still be conducted but the new width of the transect must be recorded. Always record any weather that reduces visibility, such as fog, rain, seawater splashing on bridge windows, or snow.

Null observation periods. Record "No birds observed" when no birds were detected during a 5-min period, as this type of information is also important. On the contrary, during the snapshot, if no birds are observed, you do not need to record anything.

Recording birds on the water. All birds observed on the surface of the water are continuously recorded throughout the 5-min period and their *perpendicular* distance from the observer is estimated (distance categories A–D; Figure 4). When visibility is good, birds on the water may be seen up ahead of the platform, perhaps as far as 400 or 500 m. Because these individuals may dive or fly away as a result of the approaching vessel, they should be counted as in transect and their perpendicular distance recorded when they are first detected (unless the observation period will end before the ship reaches them, in which case they are recorded in the next period). If a bird appears to have been flushed off the water, count it as a "water" bird and be sure this same bird is not subsequently counted as a flying bird during a "snapshot" (see "recording birds in flight" below for description of snapshot).

Recording birds in flight. During the observation period, more birds will fly through the survey area than were present in that area at a single instant in time. The faster birds fly relative to the ship speed, the greater the number of birds passing through during a 5-min period. If these flying birds are counted continuously as they are encountered, their density will be overestimated. Therefore, flying birds are recorded using a series of instantaneous counts, or "snapshots", at regular intervals throughout the observation period. The time interval between snapshots depends on the speed of the ship and is chosen so that the ship moves roughly 300 m between snapshots (Table 2).

Table 2: Intervals at which instantaneous snapshot counts of flying birds should be conducted.

Platform speed (knots)	Interval between counts (min)
4.0–4.4	2.5
4.5–5.4	2.0
5.5–8.4	1.5
8.5–12.4	1.0
12.5–19.0	0.5

At the time of the snapshot, all flying birds within 300 m of the observer are counted (Figure 4 — shaded area is considered the snapshot box; see also Appendix XI) and their perpendicular distance estimated at the time of the snapshot (distance categories A–D). Flying birds are then ignored until the start of the next snapshot. In this way, the entire survey transect is covered by a series of instantaneous snapshots. During each snapshot, flying birds are recorded as in transect only if they are within the snapshot box. All other flying birds that are sighted outside the snapshot box or between snapshot intervals are recorded as not in transect. If no birds are observed during the snapshot, you do not need to record anything.

It is strongly recommended that a countdown timer is used to indicate snapshot intervals. If travelling at a speed of 10 knots, for example, the timer will be set to "beep" every minute, indicating that a count of flying birds is required.

Lines of flying birds. Some species (e.g., alcids, gannets, and waterfowl) may fly in long lines across the survey area. At the time of the snapshot, count the number of birds in the flock and estimate the distance to the centre of the flock. All birds are recorded as in transect if the centre of the flock is within the 300 m snapshot box. If the centre of the group is beyond 300 m, they are recorded as outside the transect, despite some individuals being in the transect.

Birds that are oiled or injured. Whenever a bird is observed with traces of oil on the body, it should be clearly recorded. In this case, the codes for associations and behaviours #16 "Associated with oil slick", #97 "Oiled birds contaminated with oil", #98 "Sick/unwell weakened individuals not behaving as normal, healthy birds, but without obvious injuries",

and/or #99 “Dead”, should be recoded (Codes for associations and behaviours; Appendix VII). All mentions of oiled birds, whether inside or outside of the transect, need to be recorded. If possible, a degree of contamination (***1*** to ***4***) should be associated with a bird observation (Appendices XI-XII). When possible, sick or dead birds should be picked up and the pickup location recorded on the Data sheet used to collect information on Migratory Birds collected during an emergency response (Appendix III) with GPS coordinates.

Birds that follow the ship. After recording a flying bird, subsequently ignore it if you think it is following the ship. Do not record the same bird on subsequent snapshots, even if it leaves and then re-enters the survey area. When dozens or more birds are following the vessel, it will be impossible to determine which individuals you have already recorded and those that have recently joined the ship. In this case, estimate the number of birds following the ship at regular intervals (i.e., once an hour) and note their association as ship followers. Ignore the ship followers at intervals between counts. If you can determine that there are new individuals joining the flock, these are recorded as you would for any flying bird.

4.1.4 General Methods for Bird Surveys from Stationary Platforms in Open Water

Minimum requirements. Use the stationary scan method when the platform is travelling less than 4 knots (7.4 km/h) or is stationary.

Observer position. Conduct surveys from a position outdoors whenever possible, as close to the edge of the platform as possible. Observers should scan from the same location each time to increase the comparability among scans.

Scan method. Conduct surveys by scanning a 180° arc, giving priority to birds within a 300 m semi-circle (Figure 5). Birds outside the semi-circle are recorded if these observations do not interfere with observations made within the semi-circle.

The area is visually swept only once per scan, from one side to the other, and all birds on the water and in flight are systematically recorded at that time. Binoculars and spotting scopes can be used to confirm species identification and other details as necessary.

Estimating distance to edge of semi-circle. Observers should practice estimating the 300 m edge of the semi-circle and distance bands (Figure 5) prior to beginning observations. This is best accomplished with a distance gauge made from a transparent plastic ruler (see Appendix IV).

Poor visibility. When a portion of the semi-circle is not visible due to fog, the scan should still be conducted but the distance to the edge of the semi-circle must be recorded. Always record any weather that reduces visibility, such as fog, rain, seawater splashing on bridge windows, or snow.

Null observation periods. Record "No birds observed" when no birds were detected during a scan, as this type of information is also important.

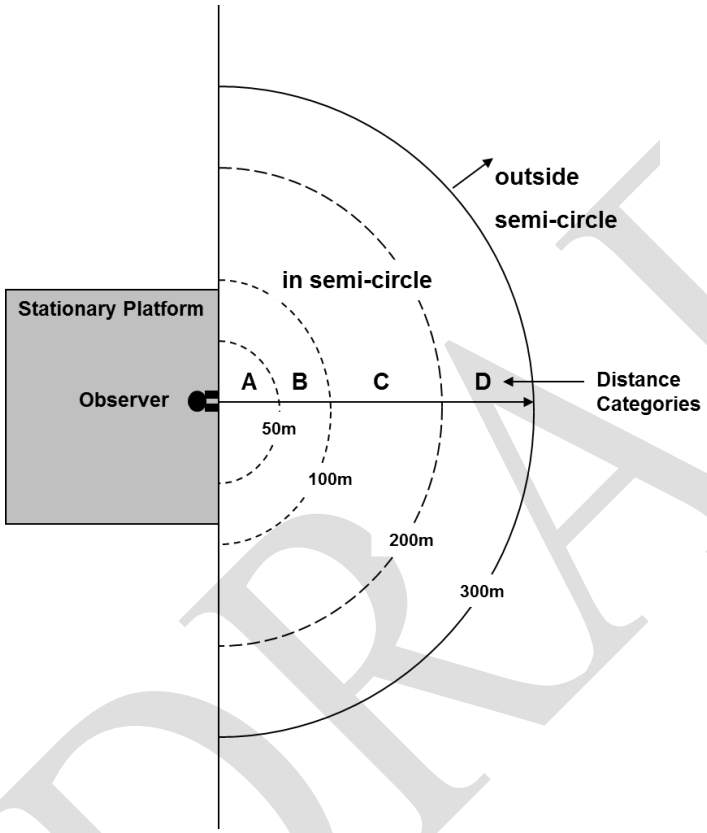

Figure 5: Illustration of a survey using a 180^{o} scan, surveying an area 300 m from an observer on a stationary platform.

4.1.5 Data Recording

4.1.5.1 Recording Observation Period Information

This section provides detailed information on recording information during each observation period for both moving and stationary platforms. See Appendix IX and X for examples on how survey information is recorded. Data sheets are found in Appendix XI.

Company/agency: Indicate here the company, agency, or organization that requested the surveys.

Platform name and type: Indicate the platform name. Platform type may include offshore supply vessel, fishing boat, research ship, or oil drilling platform.

Observer(s): Indicate the first and last name of the primary observer. If a second observer is assisting with the survey, also indicate the name of the secondary observer.

Date: Date that the observation period occurred. Use format DD-MMM-YYYY (e.g., 12-Apr-2008) to avoid ambiguity.

Time at start / time at end: Record the time (using 24 hour notation) at the start and end of the observation period. Use Universal Time (UTC) to standardize across regions. Note that the conversion from local time (L) to UTC will be influenced by daylight savings time. Circle ***UTC*** or ***L***. Stationary surveys are considered an instantaneous scan of the area and therefore only the start time is required.

Latitude at start / longitude at start: Indicate position of platform in either decimal degrees (e.g., 47.5185) or degree decimal minutes (e.g., 47˚ 31.11′) depending on which format is available to you.

Platform activity: Platform activity may influence observations and should therefore be noted. Activity could include steaming, skimming, on stand-by, etc.

Scan type (for stationary platforms only): Conduct a 180° scan for all stationary surveys. If part of the survey area is obstructed, indicate the scan angle used.

Scan direction (for stationary platforms only): Indicate the true (not magnetic) bearing in degrees (°) when looking straight ahead, at centre of semi-circle.

True platform speed (kn) and **True platform direction (°) (for moving platforms only):** If observations are from a moving platform, record the platform speed in knots and the true (not magnetic) platform direction in degrees. If the platform speed or direction changes significantly during an observation period, terminate the observation period and record the time and position of termination. Start a new observation period, recording the new speed and/or direction.

Observation side (for moving platforms only): Circle whether you are surveying from ***starboard*** or ***port*** side.

Height of eye (m): Indicate height of observer's eye above the water in metres. This measurement is important to calculate distance categories and may need to be measured with a

measuring tape or rope.

Outdoors or indoors: Circle ***Out*** when conducting observations from a position outdoors and ***In*** for indoor observations.

Snapshot used? (for moving platforms only): Indicate if snapshot method is being used for birds in flight by circling ***Yes*** or ***No***. Under normal circumstances, snapshots should always be used for birds in flight.

Visibility (km): Estimate visibility in kilometers by determining the greatest distance at which an observer can distinguish objects, ideally black, against the horizon sky with the unaided eye. Visibility will be considerably less during foggy conditions.

Weather conditions code: Record the general weather conditions at the time of the survey using codes in Appendix V. Record the most prominent conditions within the survey area.

Glare conditions code: Light reflecting off the surface of the water can often influence bird detection. Record the glare conditions at the time of the survey using codes in Appendix V.

Sea state code: Sea state codes give an approximate description of current conditions on the surface of the water. Use codes from Appendix VI.

Wave height (m): Estimate wave height in meters from the highest point of a wave (peak) to the lowest point (trough).

True wind speed (kn) or Beaufort code: Indicate wind speed in knots. If observations are from a moving platform, be sure to record the TRUE wind speed, as this takes into account the apparent wind generated from the forward momentum of the vessel. If relative wind speed is the only measurement available, indicate that you are recording relative wind speed so that appropriate adjustments can be made later. If no measurements are available, estimate wind speed using Beaufort codes from Appendix VI.

True wind direction (°): If observations are from a moving platform, be sure to record the TRUE wind direction in degrees, as this takes into account the apparent wind generated from the forward momentum of the vessel. If relative wind direction is the only measurement available, indicate that you are recording relative wind direction so that appropriate adjustments can be made later. Use ***ND*** (No Direction) if the wind direction is variable or too light to indicate any particular direction.

Ice type and concentration codes: If ice is present during the survey, indicate the type and concentration using codes from Appendix VII. Indicate in the notes section whether the ice is present within or beyond the transect limits.

Temperature (°C): Record outdoor temperature in degree Celsius.

Notes: Make note of disturbances or relevant activities in the area, especially if there are large vessels or fishing activities nearby, or if your vessel is sounding the fog horn.

4.1.5.2 Recording Bird Information

Record all information possible for each bird as time allows. As a minimum, the species (which can be unknown), count, fly or water, and in transect (or in semi-circle, if conducting stationary surveys) fields must be filled in for each sighting. Note that some fields are only appropriate for certain species. For example, age and sex will only be recorded for species where this can be determined (e.g., ageing gulls or sexing waterfowl).

Give priority to birds that are in transect because these are the only ones that are used in density estimates. Birds recorded outside the transect are not used in density estimates, but they do give important information on distribution, timing of occurrence, and behaviour, and every effort should be made to record them if time permits.

Record all birds that are oiled (in the case of an oil spill) or in distress (in the case of other pollution incidents or non-pollution incidents) whether they are in transect or not.

Species: Identify each individual bird seen to species. If this is not possible, identify to genus or family. Record all unknowns, even if they are identified only as "unknown gull" or "unknown bird".

Count: Record the number of birds in each sighting in the count field. Record homogenous flocks on a single line. For example, a group of ten Common Murres close together on the water is recorded in a single row as a flock of ten and not in ten individual rows. If large numbers are present, estimate the number as accurately as possible.

In transect? (for moving platforms only) or semi-circle (for stationary platforms only)?: Indicate whether the bird observed is in (***Y***) or out (***N***) of the transect (moving surveys) or semi-circle (stationary surveys). Give priority to birds that are in the transect or semi-circle; record birds seen outside of the survey area if activity levels permit.

Distance: Record the distance to each bird or flock. This information is used to assess detectability and account for missed birds. For all birds, estimate the perpendicular distance between the bird(s) and the observer (Figure 4). Distance categories are as follows: ***A*** = 0-50 m, ***B*** = 51-100 m, ***C*** = 101-200 m, ***D*** = 201-300 m, and ***E*** = > 300 m. Record flocks of birds as a single unit by recording the distance to the ***centre*** of the flock. For example, if a group is straddling the 300 m boundary with the flock centre located in ***D*** (with some individuals inside

and some individuals outside the transect) record **the entire flock** as being in ***D*.** If the flock centre is outside the transect, record the entire flock as distance class ***E***. It is very important to record distance to birds within the 300 m strip, but if this is not possible (i.e., too busy), you may use ***3*** = within 300 m but no distance recorded. Distance ***T*** is used to indicate that the bird or flock was observed on the opposite side of the vessel (moving platforms only).

Fly or water?: Indicate whether the bird observed is in flight or on the water and whether it is feeding. Occasionally you will have a songbird that lands on the ship. These birds can be recorded in the notes section as on the ship. When surveying close to land, birds sitting on land may be recorded in the notes as on land.

Association and **Behaviour:** Record one or more association and/or behaviour codes with each bird when appropriate (see Appendix VII for association and behaviour codes). Codes #16 "Associated with oil slick", #97 "Oiled birds contaminated with oil", #98 "Sick/unwell weakened individuals not behaving as normal, healthy birds, but without obvious injuries", and/or #99 "Dead" are especially relevant in the context of a pollution or a non-pollution incident. If an oiled bird is recorded, refer to the "Degree of contamination" field.

Flight direction: Indicate true direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, ***or NW)*** birds in flight are heading if they are not associated with the platform. If birds are not flying in any particular direction, record as ***ND***.

Age: Age is based on plumage, where ***J***(uvenile) = first coat of true feathers acquired before leaving the nest and ***I***(mmature) = the first fall or winter plumage that replaces the juvenile plumage and may continue in a series that includes first-spring plumage, but is not the complete ***A***(dult) plumage.

Plumage: Adult plumage can be further categorized as ***B***(reeding) = spring and summer plumage and ***NB*** (non-breeding) = fall and winter plumage. ***M*** is used to indicate a bird with flight feather moult.

Sex: Sex can be determined for some individuals (i.e., waterfowl). Indicate whether the bird observed is ***M***(ale) or ***F***(emale).

Degree of contamination: In case of an oil spill, indicate the degree of contamination for each bird(s), where ***1*** = light, where ≤33% of oil covering the body, ***2*** = moderate where 33-66% of oil covering the body, ***3*** = heavy where 66-100% of oil covering the body, ***4*** = "possible" oil covering the body. A bird with soiled or discolored plumage is recorded as "light" oiling, while a thick, solid covering of oil would be recorded as "heavy." The code 4 (possible) includes cases

where oiling is apparent, but the observer cannot assess the degree of contamination. Record homogenous flocks on a single line. For example, if a group of ten Common Murres close together on the water is observed, but only one is moderately oiled, record nine birds as a flock in a single row and one bird in another row with code 16 under the field **Association**, code 97 under the field **Behaviour** and code 2 under the field **Degree of contamination**. Add any other useful information under the field **Comments**.

Comments: Space is provided to record other pertinent information such as color phase, unusual behaviours, any useful information with regards to the incident, etc. In case of an oil spill, behaviors such as excessive preening, excessive bathing, loss of buoyancy, problems with diving, inability or difficulty to fly, or a general sick appearance, can be recorded as possible indicators of oiling.

Recording heterogeneous groups of birds. Sometimes flocks of birds will contain multiple species or age classes and will require multiple rows on the data sheet (i.e., a flock containing both Great and Sooty Shearwaters or a flock of kittiwakes containing both adults and immatures or a flock with different degree of contamination). Subsets of the group that share the same morphological and behavioural characteristics are recorded in the same row (i.e., all adult kittiwakes in breeding plumage flying in the same direction). Other individuals from the group that have different characteristics (i.e., juveniles) are recorded in subsequent rows. Draw an arc on the data sheet linking all rows from the group to indicate that they were observed together.

4.1.5.3 For Moving Platform Surveys, When Are Birds Recorded In Transect?

Birds on water are considered in transect when they are within the 300 m *perpendicular* distance from the observer (Figure 4). When visibility is good, birds on the water may be seen up ahead of the platform (perhaps as far as 400 or 500 m), but still within the 300 m transect. Because these individuals may dive or fly away as a result of the approaching vessel, they should be counted as in transect and their perpendicular distance recorded when they are first detected (unless the observation period will end before the ship reaches them, in which case they are recorded in the next period).

Flying birds are only considered in transect when they are flying within the snapshot box (Figure 4) at the time of a snapshot.

4.2 CONDUCTING AERIAL MIGRATORY BIRD SURVEYS

The purpose of this section is to provide technical guidance through survey protocols to estimate bird abundance and distribution during an emergency response from aerial survey platforms. The protocols should be used consistently across regions to ensure collection of comparable data. This section describes the general methods used to conduct aerial surveys.

Initial reconnaissance surveys obtain current information on the abundance and distribution of Migratory Birds within the broader general area of the incident (Section 3). During the following surveillance phase, surveys target the impacted area to quantify the number and density of affected birds through visual observations. Repeated surveys will also monitor the ongoing impact of the incident on Migratory Bird populations as well as identify any influx of Migratory Birds to the area.

Prior to initiating an aerial survey response, it is necessary to confirm the objectives specific to the survey being undertaken. If the intent of the survey is to determine the abundance and distribution of birds potentially at risk as a result of a pollution incident or mass mortality event, then the survey should be designed such that extrapolated densities can be used to estimate numbers present in the area of interest. To accurately assess the number of oiled birds distributed singly or in small groups along the coastline, some measure of detection probability is warranted (see Section 4.2.4).

4.2.1 General Requirements for Bird Observers

To ensure the highest quality of data is collected, observers should have the following skill set:

- Ability to rapidly identify birds (to the lowest taxonomic level possible) in all plumages, in various lighting conditions, reduced visibilities, and in variable sea state,
- Ability to accurately record data on data sheets or electronically in accordance with this protocol, including information on weather conditions and birds, and
- Experience travelling in aircrafts and an ability to work in unstable flight conditions without getting airsick.

4.2.2 Survey Design for Aerial Bird Surveys

Surveys must be designed to adequately quantify the abundance and distribution of birds potentially at risk during an incident and meet the objectives of the assessment. If surveys are opportunistic (e.g., if the flight plan was designed for the purpose of another stakeholder

involved in the response), a transect method using distance bands can be selected as it will allow to estimate bird density. If more planning from ECCC-CWS is involved, grid transects can be used as described in bird surveys from platforms in open water (section 4.1.2; Figure 3). This approach also allows using distance bands to estimate bird density. Alternatively, if pre-determined plots can be thoroughly surveyed, bird density can be estimated using this method.

4.2.3 General Considerations for Aerial Surveys

Survey design. To ensure adequate survey coverage, flight track information and waypoints of the most recent Migratory Bird distributions and "haul out" locations (as in the case of Common Eiders) should be loaded onto a handheld GPS or on a laptop equipped with a GPS-voice recording software (e.g. PC-Mapper for Airborne Inventory) prior to take off. All other relevant modelling and environmental information should be considered prior to designing a route. This includes recent spill trajectory models, bathymetry of the region, ice coverage, water current data, oiled bird reports/coordinates, and any other information that may be deemed important.

Metadata and environmental data collection. Along with species identification (to the lowest taxonomic level possible) and number, information on environmental conditions and other metadata should be dictated into a voice recorder at the frequency at which it changes. This includes visibility, weather conditions, glare, sea state, wave height, wind speed and direction, ice type and concentrations, and temperature. In addition, observer name and position, speed, altitude, aircraft type, and any other variable that may affect detectability or may be relevant to the survey. Where possible affected Migratory Bird habitats should also be identified to help guide response operations (deterrence and dispersal, clean-up prioritization etc.).

Equipment and equipment settings. Observations on species distribution and abundance should be recorded as a digital voice file using either one of two methods: 1) dictated into a voice recorder capable of PC connectivity and time stamping of observation files or 2) using software installed on a laptop computer that can record voice observations and link the file to geo-referenced position information (e.g., PC-Mapper for airborne inventory). A GPS should be used to record flight track information to facilitate mapping survey coverage of the area, or if using PC-Mapper, the flight tracking option should be on. Other equipment required will vary depending on the equipment being used, but could include GPS-equipped laptops, flight helmets with dual microphones, digital Dictaphones, etc. This will ensure observations can easily be linked to locations derived from a GPS track file. GPS-enabled cameras ensure that photographs taken are linked to locations.

Photos of large aggregations (flocks) of birds should be taken using a digital single-lens reflex (DSLR) camera set to the highest resolution. A 70–300 mm image-stabilized lens with a low to medium ISO setting and a fast shutter speed should be used. The speed should be a minimum of

1/250th s, but preferably ≥ 1/1000th s (or higher, as photographic equipment allows). Images should be shot in JPG format. High resolution videos (i.e., 4K resolution) can also be used.

Flight track information set to a 1 second recording frequency should be collected on the GPS and/or computer. Times should be synced among the camera, GPS, and computer (or voice recorder), and the photographer should take a single photo of the GPS and computer with their set times displayed.

Data analysis/reporting. Voice recordings should be transcribed and entered into a spreadsheet or standardized database format (e.g., Microsoft Excel or Access) to facilitate data sharing and archiving. Photos or videos of large aggregations of birds should be analyzed and individuals should be counted using image editing/counting software. For pictures, the software CountEm could be used to quickly obtain an estimate of the total of individuals using a subset of transect (Cruz et al. 2015). This method is quick and accurate (coefficient of variation 5-10%; J. Lefebvre, ECCC-CWS, pers. comm. 2020). Abundance should be corrected where possible based on these photo counts. Tracks and observation waypoints should be mapped using mapping software.

Data collected using double observer methods should be analyzed using appropriate software and corrected abundances should be reported.

4.2.4 Protocol for Aerial Surveys of Flocked Migratory Birds

Survey design. Initial survey flights should be delivered at higher altitudes (1000–1200 feet [300–365 m]) and moderate speeds (120–150 knots [220–275 km/h]) to address two primary objectives: 1) to document and photograph large flock distributions and 2) to identify areas with potentially affected birds for further investigation. In areas that are heavily hunted, approach at 2500–3000 feet (750–1000 m) and descend on the area, identifying each flock as they flush. Secondary surveys, or additional passes over flocks, may require lower altitudes and/or slower speeds to facilitate species/guild identification and detection of oiled birds (see also Section 4.2.4)

Aircraft and personnel. Surveys should be conducted using a rotary-wing aircraft with floats, single-engine fixed-wing aircraft with floats, or twin-engine fixed-wing aircraft to minimize risk to the survey crew when flying over open water. Observers are designated certain roles during surveys as either the navigator/photographer, primary data recorder/estimator, or the secondary data recorder (if a third observer is available). The photographer is placed in the seat best suited to obtain a good photographic image of flocks, typically the front of the aircraft next to the pilot, and therefore the photographer tends to also be the navigator. The primary data recorder should be seated on the same side but behind the navigator; the secondary data recorder should be

positioned behind the pilot.

Data collection. Taking photographs of flocks allows the correction for observer biases in estimation of flock sizes (e.g., Bordage et al. 1998). If a camera port is available, this should be used to generate images that minimize distortion. To get good images, the flock may have to be circled so that the sun is behind the photographer.

Seated directly behind the photographer/navigator is the primary data recorder, or "estimator". It is their responsibility to make flock size estimates and document the proportion of males and females where possible. This seating allows good communication between the photographer/navigator and estimator to ensure coordination of photographs and visual estimates of flocks. This can be a challenge if there are several flocks in succession. To control for this, select one or two flocks to photograph and record their shapes for reconciliation later.

A third observer (the secondary data recorder), if available, will be positioned behind the pilot. This observer scans for flocks on this side of the aircraft, runs the computer, edits the white board (see below), and coordinates the photographer/navigator and estimator making sure the data are recorded. If a third observer is not present on the aircraft, the pilot can be used to scan that side of the aircraft and identify flocks for subsequent enumeration. Computer operating and white board editing would then become the task of the estimator.

Each flock that is photographed gets a unique reference id (the sequence starts with "F1" for flock 1, "F2" for flock 2, etc.) that gets recorded with the visual estimate. A hand-held white board can be employed, with the date and unique flock reference written on it. The white board is photographed sequentially during a survey — at the start of the survey and every time after a new flock and estimate is recorded. The third observer or the estimator is responsible for changing the flock identifier in between photographs/flocks. Notes can also be written on the white board to help sort out the flocks later. For example, if there are two flocks in a row, and there is no time to shoot a new white board image in between, shoot the white board with the second flock id after the flock was photographed and an arrow pointing back to indicate the flock is before the identifier.

4.2.5 Oiled Bird Assessment Using Aerial Surveys

Survey design. This survey is an attempt to assess the prevalence of oiled birds and is flown at lower altitudes (150–300 feet [45–90 m]) and speeds (< 100 knots [185 km/h] if aircraft type allows) to assess oiling incidents and investigate areas identified in the reconnaissance survey. In the case of Common Eiders, this will be accomplished by assessing the number of birds that have grouped together on land or ice to avoid hypothermia effects. In the winter there will be some ice rind on the rocks and the islands may be covered in snow. It will be important during surveys to

search these areas as well as the intertidal areas.

Aircraft and personnel. Surveys should be conducted using a rotary-wing aircraft with floats, single-engine fixed-wing aircraft with floats, or twin-engine fixed-wing aircraft to minimize risk to the survey crew when flying over open water. The navigator, observer, and photographer positions will be as outlined in Section 4.2.3.

Data collection. Where applicable, data can be collected using the independent double-observer methods outlined below to assess the probability of detecting birds, though this may not be useful in all situations, depending on the location and distribution of oiled birds (Robertson et al. 2014). If possible, data on the geographical extent of the spill (e.g., sheen) should be documented and geo-referenced (GPS waypoints) by the aerial survey crew. If staff experience permit, data can be collected using independent double-observer methods similar to those outlined in Koneff et al. (2008). In this case, independent observations are recorded by both the front and rear observer on the same side of the aircraft. A visual barrier (e.g., cloth) can be put in place to keep the rear observer from being influenced by the front observer's actions. Communication must be disabled between observers during an observation. Reconciliation of observations is to be initiated by either the rear observer immediately following an observation or by the front observer after enough time has elapsed for the bird(s) to pass out of the field of view of the rear observer. During reconciliation, the two observers discuss whether they both made the same observation. If they observed the same bird or group of birds, the rear observer records that the observations should be reconciled. If there is a discrepancy between the front and rear observer's observations, additional discussion is necessary to determine whether the same group was seen and to form an agreement on the species and number in the group. If no agreement can be formed but it can be determined that the same group of birds was seen, the front observer's observations should be used in the final reconciliation and should be noted by the rear observer. In this way, each observation will be reconciled and given one of three categorizations: 1) seen by the front observer and by the rear observer (data recorded as "1 1"), 2) seen by the front observer and missed by the rear observer ("1 0"), and 3) missed by the front observer and seen by the rear observer ("0 1"). If the density of birds and frequency of observations is too high to allow time for reconciliation, this should be noted by the rear observer and these observations will be excluded from the estimation of detection rates.

4.3 INDICATOR SPECIES

When the incident involves oil, detecting contaminated birds is difficult especially for aquatic birds with dark plumage that constantly remain on the water and far from shore. In those conditions, detecting oiled birds can be virtually impossible, even with a telescope. It is therefore recommended that a probable rate of bird contamination be established using indicator species such as gulls. The four advantages of using these species are:

- cosmopolitan distribution across Canada,
- predominantly white plumage, which contrasts with oil color,
- year-round presence in some regions, and
- propensity to gather on dry land (especially when they are contaminated), thus making them easier to observe.

The contamination percentage determined for gulls only provides an indication of the contamination percentage for the other species in the impacted area. This assessment should underestimate the actual contamination rate of the most vulnerable aquatic species, such as sea ducks, and overestimate the contamination of the more coastal species, such as geese and dabbling ducks (Lehoux and Bordage 1999). To provide an indication of the contamination risks for birds and the types of problems that the response team will face, a systematic count of all gulls present in the ground survey area should be performed to obtain the percentage of contaminated birds and the degree of contamination. The degree of contamination should be assessed according to the following system:

- ***1*** = "light" where ≤33% of oil is covering the body,
- ***2*** = moderate where 33-66% of oil is covering the body,
- ***3*** = high where 66-100% of oil is covering the body,
- ***4*** = "possible" oil covering the body.

The assessment of indicator species should be done during other surveys (e.g., surveys from stationary platforms). Appendix XI shows a sample observation sheet.

4.4 SURVEY REPORTING AND DATA ARCHIVING

4.4.1 Survey reporting

Timely, concise and accurate reporting is essential to ensuring effective response during emergencies. Brief reports should be written after the completion of each survey to ensure that pertinent information is transmitted to relevant agencies and the response operations (e.g. Incident Command). Timely reporting ensures that information from Migratory Bird surveys and Wildlife collection can inform response actions for subsequent operational periods. More

comprehensive reports, including data analysis, may follow in subsequent days, weeks, or months, as needed, to provide overview of incident response and/or impacts (i.e. damage assessment).

Incidents should develop reporting needs and standards early in a response. These could include templates for individual survey reports and/or daily summaries.

Individual survey reports – Reports should be brief (1-5 pages), depending on the scope of the survey, to allow for timely communication to the response operation. Relevant details for individual surveys:

1) Aircraft/Vessel and Personnel
2) Purpose of Survey
3) Methods (with the following sub-headings)
    - Data Collection Methods
    - Survey Design (description or maps of proposed surveys)
4) Results
    - Flight/vessel path, duration, distance, observation conditions/weather
    - Species counts, bird distribution, oiled bird observations
    - Supporting maps
5) Recommendations
    - Describe how surveys results can inform response activities. This may include recommendations for deterrence and dispersal, priority areas for ground surveys, priorities for pollution containment/cleanup, and survey priorities for subsequent days.

Daily Wildlife summary reports - For large and/or on-going incidents, daily summary reports may be required to summarize most recent activities and cumulative efforts. Report length may vary (1 to 15 pages, excluding appendices) depending on the scope of the incident and response. Relevant factors for reporting surveys during a Wildlife Emergency include:

1) Introduction/Summary
    - Purpose of surveys
    - Overview of Wildlife response activities
2) Summary of Wildlife Observations
    - Current day and cumulative total(s) of
        i. Survey effort (number of vessels/aircraft/teams)
        ii. Wildlife observed (by species and/or species groups)
    - Maps of completed surveys

3) Impacted Wildlife
    - Current day and cumulative total(s) of observed and/or collected impacted Wildlife
4) Summary of other activities related to the response (as appropriate)
    - New reconnaissance surveys for Wildlife or pollution
    - Updated oil spill trajectory models
    - Rehabilitation facilities and progress
5) Planned surveys for subsequent days
    - Maps of completed and planned surveys, presented in context of other operational activities (observed or modeled pollution, resources in the field)
6) Appendices
    - Raw data
    - Weather forecasts
    - Activity schedules

4.4.2 Data Archiving

In addition to reporting, record keeping and data archiving is essential to preserve the results of the surveys which may form a record of the response and be use for purposes of damage assessment. Needs and standards for data archiving should be developed in Wildlife Response Plans and/or early in the response. Factors for consideration are:

- Needs of relevant agencies.
- Use of existing, applicable databases, where available.
- Developing standardized templates, spreadsheets, and databases.
- Developing standardized file naming conventions and unique identifiers for collected Wildlife
- Archive of relevant spatial data, including:
    - Flight/vessel track lines
    - Waypoints of observed birds
    - Polygons of pollution extent
- Developing systems for efficient data entry and transfer

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APPENDIX I: CONTACT INFORMATION FOR CANADIAN WILDLIFE SERVICE REGIONAL PERMITS OFFICES

Region	Address	Contact
Atlantic (Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick)	17 Waterfowl Lane P.O. Box 6277 Sackville, NB E4L 1G6	• Telephone: (506)364-5068 • Fax: (506)364-5062 • Email: ec.scfatlpermis-cwsatlpermits.ec@canada.ca **For SARA permits:** • Phone: (506)364-5044 • Fax: (506)364-5062 • E-mail: ec.permislepatl-sarapermittingatl.ec@canada.ca
Quebec	801-1550 avenue d'Estimauville Québec, QC G1J 0C3	• Telephone: (418)649-6129 • Fax: (418)648-4871 • Email: ec.permisscfquebec-cwsquebecpermit.ec@canada.ca **For SARA permits:** • Phone: (418)648-4663 Fax: (418)684-7045 • Email: ec.permislepqc-sarapermittingqc.ec@canada.ca
Ontario	335 River Road Ottawa, ON K1V 1C7	• Telephone: (613)990-8355 • Fax: (613)990-8400 • Email: ec.faune.ontario-wildlife.ontario.ec@canada.ca **For SARA permits:** • Phone: (613)990-8355 • Fax: (613)990-8400 • E-mail: ec.permislepatl-sarapermittingatl.ec@canada.ca
Prairie (Alberta, Saskatchewan and Manitoba)	115 Perimeter Road Saskatoon, SK S7N 0X4	• Telephone: (306)975-4090 • Fax: (306)975-4089 • Email: ec.prpermisscf-cwspermitpr.ec@canada.ca **For SARA permits:** Same as above.

Region	Address	Contact
British Columbia	5421 Robertson Road Delta, BC V4K 3N2	• Telephone: (604)350-1950 • Fax: (604)946-7022 • Email: ec.scfpacpermitscwspacpermits.ec@canada.ca **For SARA permits:** • Phone: (604)350-1950 / (604)350-1900 • Fax: (604)946-7022 • E-mail: ec.sarapermitting.ec@canada.ca
Northern (Northwest Territories, Nunavut & Yukon)	P.O. Box 1870 Suite 301-933 Mivvik Street Iqualuit, NU X0A 0H0	• Telephone: (867)669-4754 • Fax: (867)873-6776 • Email: ec.tnopermisscf-cwspermitnwt.ec@canada.ca or ec.nupermisscf-cwspermitnu.ec@canada.ca **For SARA permits:** • Email: ec.permislepatl-sarapermittingatl.ec@canada.ca

DRAFT – 13 March 2020

APPENDIX II: EXAMPLE TWO-PAGE PROTOCOL FOR COLLECTING BIRDS DURING A POLLUTION INCIDENT IN THE ATLANTIC REGION

ATLANTIC REGION PROTOCOL FOR COLLECTING BIRDS DURING AN OIL POLLUTION RESPONSE

Anyone collecting dead or live migratory birds must be authorized to do so

Collection of dead birds

1) Every time a beach is swept, select two oiled birds to be retained as possible evidence, preferably from different parts of the beach. For each of these two birds:
   - Individually wrap the bird in aluminum foil,
   - Place the wrapped bird in its own evidence bag,
   - Completely fill out a chain of custody form,
   - Write on the bag the date and location, and record that bird was found dead, and
   - Place evidence bag in a secure place until retrieved by appropriate Environment Canada personnel.

2) To avoid oil cross-contamination, it is vital that:
   - Clean gloves are used prior to handling each bird, and
   - Birds are wrapped in foil as soon as they are found.

3) Place each remaining bird found on the beach in its own generic plastic bag, and:
   - Write on the bag the date and location, and record that the bird was found dead,
   - Record on the bag whether the bird was OILED or NOT OILED, and
   - Treat bird parts the same as whole birds.

4) If it is not feasible to individually bag all birds found on the beach:
   - Put remaining oiled birds in one or more large bags,
   - Put remaining un-oiled birds in separate large bag(s) from oiled birds,
   - Write on each bag the date and location, and record that birds were found dead,
   - Record on the bags contain OILED or NOT OILED birds, and
   - Keep birds from different beaches in separate bags.

5) Make arrangements to retrieve all oiled and un-oiled birds with:
   - CWS personnel if a wildlife treatment facility is NOT in place, or
   - A federally authorized wildlife rehabilitator if a wildlife treatment facility is in place.

Additional important information:

- ***Always wear disposable gloves when handling wildlife,***
- ***Keep a vigilant eye out for banded or otherwise marked birds; if collected, keep separate from other carcasses and hand over to CWS personnel.***

Environment Canada Environnement Canada

September 2014

Collection of live birds

A. If a federally authorized wildlife treatment facility is NOT in place:
   1. If you are authorized to humanely euthanise oiled birds, do so following the standard procedures and:
      - Individually wrap two carcasses in aluminum foil,
      - Place each wrapped carcass in its own evidence bag,
      - Completely fill out a chain of custody form,
      - Write on the bag the date and location, and record that bird was found alive, and
      - Place evidence bag in a secure place until retrieved by appropriate Environment Canada personnel.

   2. Record and bag remainder of euthanised oiled birds as outlined in points 3, 4 and 5 on reverse side of this form.

   3. If you are not authorized to euthanise oiled birds, do not feel comfortable doing so, or have found a bird listed under COSEWIC (e.g., Roseate Tern, Ivory Gull):
      - Place the oiled bird in a cardboard box,
      - Label box with date and location where bird was recovered, and
      - Place in warm, quiet area until handed over to CWS personnel for humane treatment.

B. If federally authorized wildlife treatment facility is in place:
   1. Place the oiled bird in a cardboard box,
   2. Label box with date and location where bird was recovered, and
   3. Place in warm, quiet area until handed over to wildlife rehabilitator for humane treatment.

Important information when interacting with live birds:

- Handle birds with gloves, preferably disposable ones,
- Lid and walls of box must have sufficient holes to allow proper ventilation,
- Keep a vigilant eye out for banded or otherwise marked birds; if collected or observed, hand over or relay sighting information to CWS personnel.

Place only one murre, seaduck, or other large bird per box

Two small birds, such as dovekies, may be placed together in box if both are only slightly oiled (i.e., <25% of body covered)

APPENDIX III: EXAMPLE OF DATA SHEET USED TO COLLECT INFORMATION ON MIGRATORY BIRDS COLLECTED DURING AN EMERGENCY RESPONSE

RECOVERY INFORMATION Specimen No. _____

Species _____ Location of recovery _____

Examined by _____ Date of recovery _____

Date examined _____ Method of recovery _____

Name (and contact) of person who collected bird _____

Condition of bird (tick all appropriate boxes) Found dead ☐ Found alive ☐ Oiled ☐ Scavenged ☐

Is bird banded or otherwise marked? ☐ Yes ☐ No
If yes, provide information (number, colour, any codes or code colour, body part, etc.):

BIOMETRICS (as applicable)

Mass _____ g Culmen (total length) _____ mm Tarsus bone _____ mm

Wing _____ mm Culmen (midline) _____ mm Tarsus total _____ mm

Gonys _____ mm Nostril _____ mm E.I.W _____ mm

Other _____ Head length _____ mm I.I.W _____ mm

Age ☐ First year ☐ Second year ☐ Adult ☐ Unknown

Sex ☐ Male ☐ Female ☐ Unknown

Ovaries ☐ Differentiated ☐ Undifferentiated

Bill process ☐ Rounded ☐ Pointed ☐ Narrow ☐ Wide

Other observations/remarks:

DEGREE OF OILING, SCAVENGING, AND DECOMPOSITION

☐ Clean: no traces of oil
☐ Superficial oiling: smudges of oil that does not completely penetrate the breast feathers or coat the wing
☐ Penetrated oiling: oil penetrates to base of feathers and/or saturates wing

If penetrated oiling, proportion of body affected:

☐ < 10%
☐ 10-25%
☐ 25-50%
☐ 50-75%
☐ 75-100%

Degree of scavenging (dead birds):

☐ None
☐ Punctured
☐ Breast gone
☐ Less than half of body remaining
☐ Skeleton and feathers remaining
☐ Wings only

Degree of decomposition (dead birds):

☐ Fresh
☐ Decomposed
☐ Skeletal

APPENDIX IV: ESTIMATING DISTANCE

Estimating distance bands using a ruler

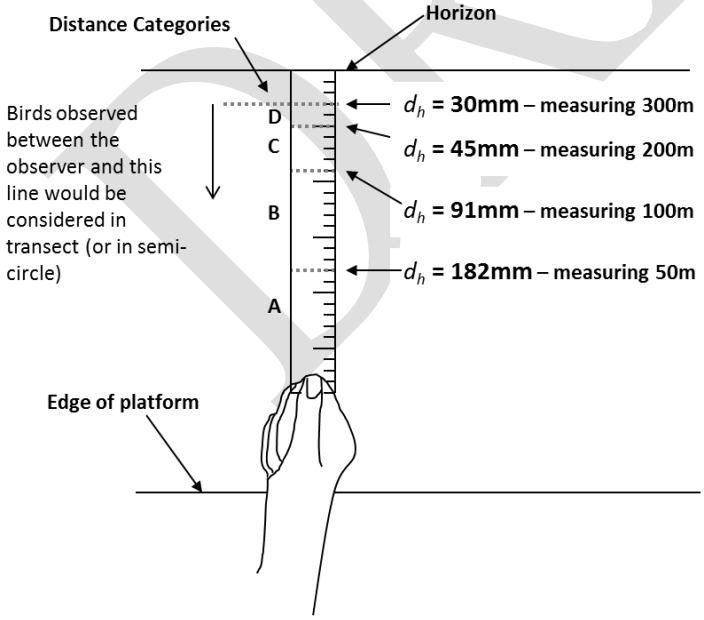
Distance can be estimated using the following equation[†]:

$$d_h = 1000\frac{(ah3838\sqrt{h}) - ahd}{h^2 + 3838d\sqrt{h}}$$

e.g., if a = 0.73 m, h = 12.5 m, and d = 300 m
then d_h = 30.0 mm

where:
d_h = distance down from horizon (mm)
a = distance between the observer's eye and the ruler when observer's arm is fully out-stretched (m)
h = height of the observer's eye above the water at the observation point (m)
d = distance to be estimated (300 m; the edge of the transect or semi-circle)

Distances are easily estimated using a gauge made from a transparent plastic ruler. A different ruler will be required for each combination of observer arm length (a) and platform height (h). Calculate d_h for the boundary of each distance class (A, B, C, and D) and mark it on the ruler (dashed lines in figure). To use the gauge, extend the arm fully and keep the line on the ruler indicating 0 mm aligned with the horizon. The dashed lines now demark the distance class boundaries on the ocean surface. Keep the gauge nearby during surveys to quickly check bird distances when in doubt.



[†] Formula derived by J. Chardine, based on Heinemann, D. 1981. A range finder for pelagic bird censusing. Journal of Wildlife Management 45: 489-493.

Estimating distance bands using strings in the window

INCLUDE A SUMMARY OF BOLDUC AND DESBIENS

APPENDIX V: CODES FOR GENERAL WEATHER CONDITIONS AND GLARE

Code	Description
Weather conditions	
0	< 50% cloud cover (with no fog, rain, or snow)
1	> 50% cloud cover (with no fog, rain, or snow)
2	Patchy fog
3	Solid fog
4	Mist / light rain
5	Medium to heavy rain
6	Fog and rain
7	Snow
Glare conditions	
0	None
1	Slight/grey
2	Bright on the observer's side of vessel
3	Bright and forward of vessel

APPENDIX VI: CODES FOR SEA STATE AND BEAUFORT WIND FORCE

Wind speed (knots)	Sea state code and description	Beaufort wind force code and description
0	**0** Calm, mirror-like	**0** Calm
01–03	**0** Ripples with appearance of scales but crests do not foam	**1** Light air
04–06	**1** Small wavelets, short but pronounced; crests do not break	**2** Light breeze
07–10	**2** Large wavelets, crests begin to break; foam of glassy appearance; perhaps scattered white caps	**3** Gentle breeze
11–16	**3** Small waves, becoming longer; fairly frequent white caps	**4** Moderate breeze
17–21	**4** Moderate waves with more pronounced form; many white caps; chance of some spray	**5** Fresh breeze
22–27	**5** Large waves formed; white foam crests more extensive; probably some spray	**6** Strong breeze
28–33	**6** Sea heaps up; white foam from breaking waves blows in streaks in direction of wind	**7** Near gale
34–40	**6** Moderately high long waves; edge crests break into spindrift; foam blown in well-marked streaks in direction of wind	**8** Gale
41–47	**6** High waves; dense streaks of foam in direction of wind; crests of waves topple and roll over; spray may affect visibility	**9** Strong gale
48–55	**7** Very high waves with long overhanging crests; dense foam streaks blown in direction of wind; surface of sea has a white appearance; tumbling of sea is heavy; visibility affected	**10** Storm
56– 63	**8** Exceptionally high waves; sea is completely covered with white patches of foam blown in direction of wind; edges blown into froth; visibility affected	**11** Violent storm
64+	**9** Air filled with foam and spray; sea completely white with driving spray; visibility seriously affected	**12** Hurricane

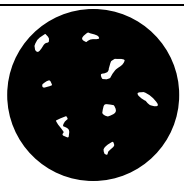
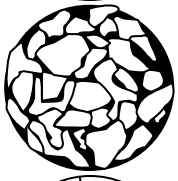
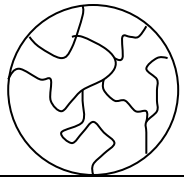
APPENDIX VII: CODES FOR ICE CONDITIONS

(Adapted from NOAA: Observers Guide to Sea Ice)

Sea Ice Forms

Code	Name	Description
0	New	Small, thin, newly formed, dinner plate-sized pieces
1	Pancake	Rounded floes 30 cm **–** 3 m across with ridged rims
2	Brash	Broken pieces < 2 m across
3	Ice Cake	Level piece 2**–**20 m across
4	Small Floe	Level piece 20**–**100 m across
5	Medium Floe	Level piece 100**–**-500 m across
6	Big Floe	Level, continuous piece 500 m **–** 2 km across
7	Vast Floe	Level, continuous piece 2**–**10 km across
8	Giant Floe	Level, continuous piece > 10 km across
9	Strip	A linear accumulation of sea ice < 1 km wide
10	Belt	A linear accumulation of sea ice from 1 km to over 100 km wide
11	Beach Ice or Stamakhas	Irregular, sediment-laden blocks that are grounded on tidelands, repeatedly submerged, and floated free by spring tides
12	Fast Ice	Ice formed and remaining attached to shore

Sea Ice Concentration

Code	Concentration	Description	
0	< One tenth	"Open water"	
1	Two to three tenths	"Very open drift"	
2	Four tenths	"Open drift"	
3	Five tenths	"Open drift"	
4	Six tenths	"Open drift"	
5	Seven to eight tenths	"Close pack"	
6	Nine tenths	"Very close pack"	
7	Ten tenths	"Compact"	

APPENDIX VII: CODES FOR ASSOCIATIONS AND BEHAVIOURS

From Camphuysen and Garthe (2004). Choose one or more as applicable.

Code	Description
Association	
10	Associated with fish shoal
11	Associated with cetaceans
13	Associated with front (often indicated by distinct lines separating two water masses or concentrations of flotsam)
14	Sitting on or near floating wood
15	Associated with floating litter (includes plastic bags, balloons, or any garbage from human source)
16	Associated with oil slick
17	Associated with sea weed
18	Associated with observation platform
19	Sitting on observation platform
20	Approaching observation platform
21	Associated with other vessel (excluding fishing vessel; see code 26)
22	Associated with or on a buoy
23	Associated with offshore platform
24	Sitting on offshore platform
26	Associated with fishing vessel
27	Associated with or on sea ice
28	Associated with land (e.g., colony)
50	Associated with other species feeding in same location

Code	Description	Explanation
Foraging behaviour		
30	Holding or carrying fish	carrying fish towards colony
32	Feeding young at sea	adult presenting prey to attended chicks (e.g., auks) or juveniles (e.g., terns)
33	Feeding	method unspecified (see behaviour codes 39,40,41,45)
36	Aerial pursuit	kleptoparisitizing in the air
39	Pattering	low flight over the water, tapping the surface with feet while still airborne (e.g., storm-petrels)
40	Scavenging	swimming at the surface, handling carrion
41	Scavenging at fishing vessel	foraging at fishing vessel, deploying any method to obtain discarded fish and offal; storm-petrels in the wake of trawlers picking up small morsels should be excluded
44	Surface pecking	swimming birds pecking at small prey (e.g., fulmar, phalaropes, skuas, gulls)
45	Deep plunging	aerial seabirds diving under water (e.g., gannets, terns, shearwaters)
49	Actively searching	persistently circling aerial seairds (usually peering down), or swimming birds frequently peering (and undisturbed by observation platform) underwater for prey
General behaviour		
60	Resting or apparently sleeping	reserved for sleeping seabirds at sea
64	Carrying nest material	flying with seaweed or other material; not to be confused with entangled birds
65	Guarding chick	reserved for auks attending recently fledged chicks at sea
66	Preening or bathing	birds actively preening feathers or bathing
Distress or mortality		
71	Escape from ship (by flying)	escaping from approaching observation platform
90	Under attack by kleptoparasite	bird under attack by kleptoparasite in an aerial pursuit, or when handling prey at the surface
93	Escape from ship (by diving)	escaping from approaching observation platform
95	Injured	birds with clear injuries such as broken wings or bleeding wounds
96	Entangled in fishing gear or rope	birds entangled with rope, line, netting or other material (even if still able to fly or swim)
97	Oiled	birds contaminated with oil
98	Sick/unwell	weakened individuals not behaving as normal, healthy birds, but without obvious injuries
99	Dead	bird is dead

APPENDIX VIII: CHECKLIST OF REQUIRED MATERIALS WHILE CONDUCTING SEABIRD SURVEYS

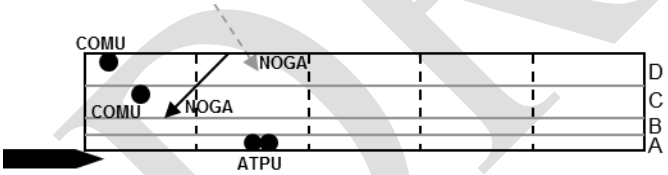
- ☐ Multiple pens or sharp pencils
- ☐ Multiple copies of blank recording sheets and clipboard
- ☐ Binoculars
- ☐ Watch or clock — with countdown timer that can beep on snapshot intervals
- ☐ Global Positioning System (GPS) to determine vessel position, speed, and direction plus extra batteries
- ☐ Copy of protocol
- ☐ Seabird identification guide
- ☐ Transparent ruler to determine distances
- ☐ Notebook

APPENDIX IX: EXAMPLE 5-MINUTE SURVEY FROM A MOVING PLATFORM

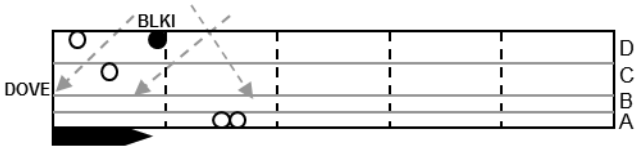
Hydrocarbons have been released approximately 150 km offshore from a ship that has come loose from its tow line and is now sinking. Seabird surveys are required to get an estimate of mortality. It is 12 July 2014 and our position at 08:00 (the beginning of our first 5-min survey) is 48.26 degrees latitude and -50.95 degrees longitude. The ship we are on is travelling east at 10 knots; based on the speed of the vessel, we will conduct a snapshot for flying birds every minute (see Table 2), or 5 times during the survey. Flying birds detected between snapshots are recorded as NOT in transect. It is a clear day, no clouds, 5 knot northwest winds, with half metre swells.

In the diagrams that follow, birds on the water are represented by circles (full circles are in transect, open circles are outside transect) and flying birds by arrows (birds are at the position of the arrowhead; solid lines are in transect, dashed lines are outside transect). The dashed vertical line represents the 300 m distance ahead of the observer, providing an outline of the area in which flying birds are considered in transect. The survey begins with a snapshot of flying birds.

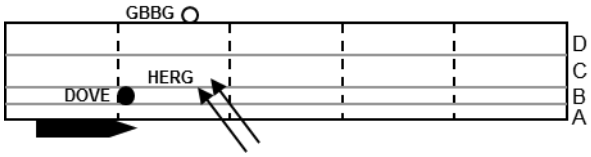
a) We begin the observation period at 08:00 with a count of the flying birds as well as those birds we see on the water. We see 2 separate adult Northern Gannets (NOGA) flying, although we only count one as in transect (at distance C), as the other is more than 300 m in front of the vessel. We also see 2 Common Murres (COMU) on the water to the port side of the vessel, at distances C and D. These are recorded as in transect. We see 2 Atlantic Puffins (ATPU) together on the water, more than 300 m in front of the vessel (distance A). We will also count these as in transect, although we will be careful not to count them again as we get closer.



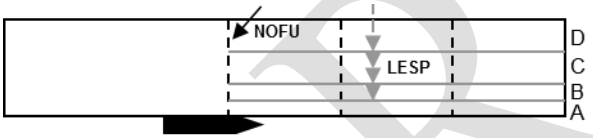
b) We are about 30 s into the 5-min observation period, **in between snapshot counts**. We have already counted the 2 murres and 2 puffins on the water (shown in the figure as open circles), but an adult Black-legged Kittiwake (BLKI) has appeared on the water at distance D, and we add this to our list of birds in transect. Despite the appearance of a flying Dovekie (DOVE) at distance C, we do not count it as in transect because we are between snapshots. We add the Dovekie to our list but indicate that it is NOT in transect.



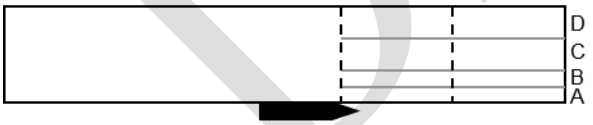
c) At minute 1, we take another snapshot count of flying birds. A flock of Herring Gulls (HERG) is observed travelling NW. The centre of the flock is at distance B. We also see 1 Dovekie (DOVE) on the water at distance B and 1 Great Black-backed Gull (GBBG) outside the 300 m transect (distance E). With the exception of the gull outside the 300 m transect, these new birds are in transect.



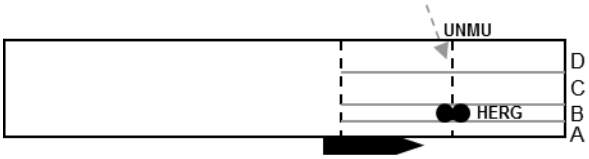
d) At minute 2, we perform another snapshot and count 1 flying Northern Fulmar (NOFU) in transect at distance D travelling SW. We record the flock of 4 Leach's Storm-Petrels (LESP) flying south ahead of the vessel, but do NOT count them as in transect, as they are beyond 300 m in front of us (i.e., not in the snapshot box). We see no new birds on the water over the next minute.



e) At minute 3, we conduct another snapshot. No new birds are observed, so nothing new is written on our data sheet.

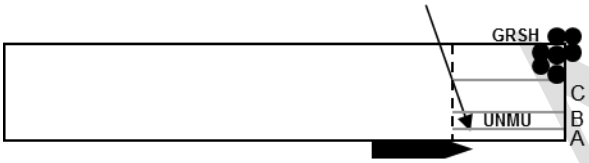


f) At 3:42 into our survey, a murre of unknown species (UNMU) is observed flying but we DO NOT count it as in transect because **we are between snapshots**. We will record it as NOT in transect. We record the 2 Herring Gulls (HERG) feeding up ahead on the water, both in transect at distance B. Since one is a juvenile and one is an adult, we enter them on the data sheet in 2 rows, linking the 2 with a line in the left margin.

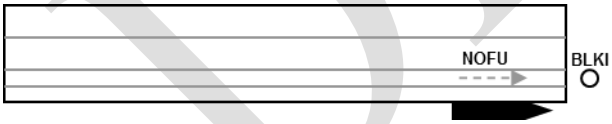


g) At minute 4, our next snapshot takes place, and we see that the unknown murre (UNMU) we saw flying earlier (see frame f) can now be recorded as in transect at distance B, as it is within the snapshot box AND observed during the snapshot. If we know for certain that this is the same individual we previously recorded as NOT in transect, we can cross the previous observation out. If we are not certain that this is the same individual we do not cross anything out.

There is also a large flock of 200 Great Shearwaters (GRSH) on the water near the edge of the 300 m transect. Since the centre of the flock is within the transect, at distance D, we count ALL the shearwaters as in transect (if the centre of the flock had been beyond 300 m, we would have recorded them as outside the transect, despite some individuals being in the transect).



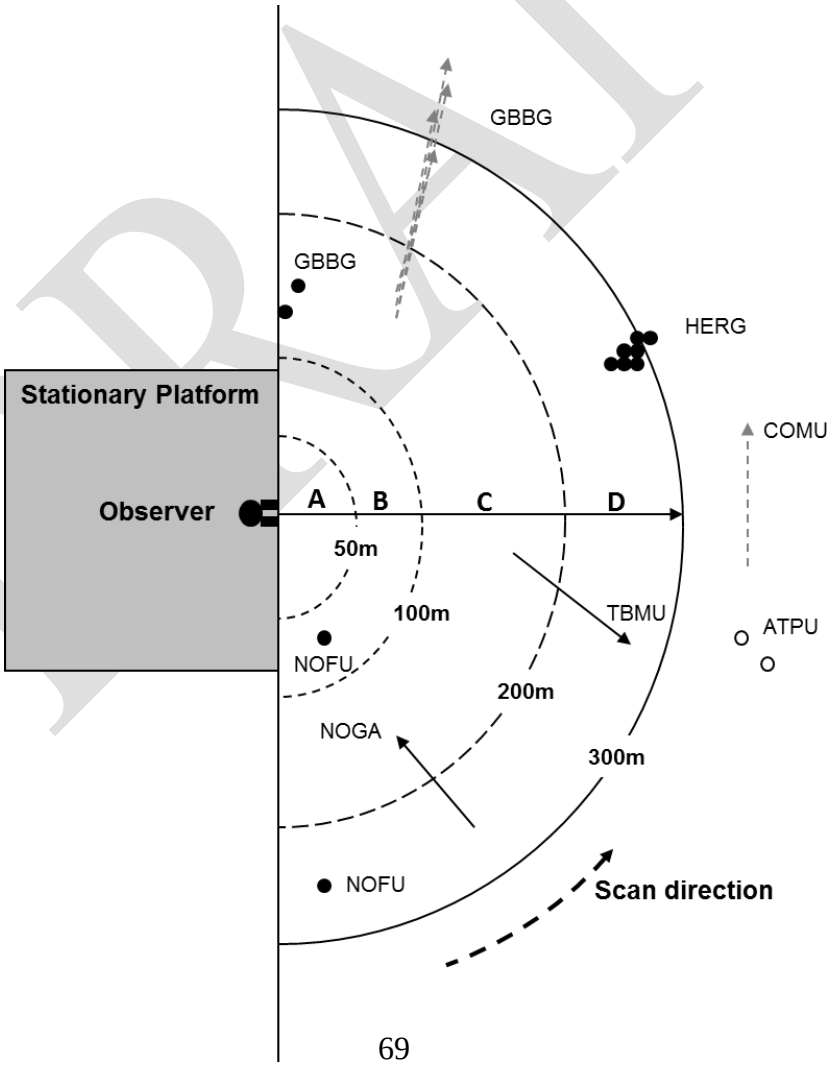
h) As we approach the end of the 5-min observation period, we record a Northern Fulmar (NOFU) that is following us (at distance B), but has not been previously recorded. We record it as NOT in transect since we are not at a snapshot point. We do not record the Black-legged Kittiwake (BLKI) we can see ahead of the vessel because by the time we reach it, the 5-min observation period will be over, and the bird will likely be counted in the next period.



APPENDIX X: EXAMPLE SURVEY FROM A STATIONARY PLATFORM

Before we begin the scan, we record the required Scan Information at the top of the data sheet. We are facing east and about to conduct our first survey of the day from an offshore oil platform. We have estimated the distance from where we are standing out to 50, 100, 200, and 300 m using our ruler gauge created with the formula outlined in Appendix IV. We will now visually scan a 180^{o} arc, counting all birds observed. It is a clear day, no clouds, 5 knot northwest winds, with half metre swells.

The survey begins on the right hand side of the semi-circle. In the diagram that follows, birds on water are represented by circles (full circles are in transect, open circles are outside transect) and flying birds by arrows (birds are at the position of the arrowhead; solid lines are in transect, dashed lines are outside transect).



a) Two separate Northern Fulmar (NOFU) sit on the water, one at distance B and another at distance D. We add both of these to the data sheet as in semi-circle, on separate lines.

b) An adult Northern Gannet (NOGA) is flying toward us at distance C and we record it as in semi-circle.

c) We observe a flying Thick-billed Murre (TBMU) travelling southeast, and we record it as in semi-circle at distance D.

d) Two Atlantic Puffins (ATPU) beyond 300 m are sitting on the water. We record them on the data sheet at distance E but note that they are NOT in the semi-circle.

e) We also see a Common Murre (COMU) flying north beyond 300 m and record it as NOT in semi-circle at distance E.

f) A flock of 7 Herring Gulls (HERG) is observed at the edge of the 300 m semi-circle. Because the centre of the group is within the semi-circle, at distance D, we count ALL the gulls as in the semi-circle (if the centre of the group had been beyond 300 m, we would have recorded them as outside the semi-circle at distance E, despite some individuals being in the semi-circle).

g) Four Great Black-backed Gulls (GBBG) are flying north, away from the platform. Since the centre of the flock is outside the semi-circle, these individuals are ALL recorded as outside the semi-circle at distance E.

h) Two additional Great Black-backed Gulls (GBBG) are sitting in the water feeding at distance C. Because one is an immature and one is an adult, we enter them in 2 data sheet rows, linking the 2 rows with an arc in the left margin.

APPENDIX XI: BLANK RECORD SHEETS FOR MOVING AND STATIONARY PLATFORMS

Record sheet for a moving platform

Observation Period Information:

Company/agency		Visibility (km)	
Platform name and type		Weather conditions code	
Observer(s)		Glare conditions code	
Date	D D – M M M – Y Y Y Y	Sea state code	
Time at start (UTC or L)		Wave height (m)	
Time at end (UTC or L)		True wind speed (kn) or Beaufort code	
Latitude at start / end	/	True wind direction (°)	
Longitude at start / end	/	Ice type code	
Platform activity		Ice concentration code	
True platform speed (kn)		Temperature (°C)	
True platform direction (°)			
Observation side	Starboard Port		
Height of eye (m)			
Outdoors or Indoors	Out or In		
Snapshot Used?	Yes or No		

Notes:

Bird Information:* this field must be completed for each record

*Species	*Count	*In transect?	*Distance[1]	*Fly or water?	Assoc.[2]	Behav.[2]	Flight direc.[3]	Age[4]	Plum.[5]	Sex	Degree of contam.[6]	Comments

[1]***A*** = 0–50 m, ***B*** = 51–100 m, ***C*** = 101–200 m, ***D*** = 201–300 m, ***E*** = > 300 m, and ***3*** = within 300 m but no distance recorded.

[2]See Codes for association (e.g. 16 = with oil slick, 18 = with obs. platform) and behaviours (e.g. 97 = oiled, 98 sick/unwell, 99 = dead)

[3]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction.

[4]***J***(uvenile), ***I***(mmature), or ***A***(dult).

[5]***B***(reeding), ***NB***(non-breeding), or ***M***(oult)

[6] If association/behaviour codes imply oiling, include a degree of contamination: ***1*** = light where ≤33% of oil is covering the body, ***2*** = moderate where 33-66% of oil is covering the body, ***3*** = high where 66-100% of oil is covering the body, ***4*** = “possible” oil covering the body.

Record sheet for a stationary platform
Scan Information:

Company/agency		Visibility (km)	
Platform name and type		Weather conditions code	
Observer(s)		Glare conditions code	
Date	D D – M M M – Y Y Y Y	Sea state code	
Time at start (UTC or L)		Wave height (m)	
Latitude		True wind speed (kn) or Beaufort code	
Longitude		True wind direction (°)	
Platform activity		Ice type code	
Scan type	180º or other (specify:)	Ice concentration code	
Scan direction		Temperature (°C)	
Height of eye (m)			
Outdoors or Indoors	Out or In		

Notes:

Bird Information:*this field must be completed for each record

*Species	*Count	*In transect?	*Distance[1]	*Fly or water?	Assoc.[2]	Behav.[2]	Flight direc.[3]	Age[4]	Plum.[5]	Sex	Degree of contam.[6]	Comments

[1]***A*** = 0–50 m, ***B*** = 51–100 m, ***C*** = 101–200 m, ***D*** = 201–300 m, ***E*** = > 300 m, and ***3*** = within 300 m but no distance recorded.

[2]See Codes for association (e.g. 16 = with oil slick, 18 = with obs. platform) and behaviours (e.g. 97 = oiled, 98 sick/unwell, 99 = dead)

[3]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction.

[4]***J***(uvenile), ***I***(mmature), or ***A***(dult).

[5]***B***(reeding), ***NB***(non-breeding), or ***M***(oult)

[6] If association/behaviour codes imply oiling, include a degree of contamination: ***1*** = light where ≤33% of oil is covering the body, ***2*** = moderate where 33-66% of oil is covering the body, ***3*** = high where 66-100% of oil is covering the body, ***4*** = “possible” oil covering the body.

APPENDIX XII: BLANK RECORD SHEETS FOR AERIAL SURVEYS

Record sheet for an aerial survey of oiled Migratory Birds
Observation Period Information:

Company/agency		Visibility (km)	
Aircraft name and type		Weather conditions code	
Observer(s)		Glare conditions code	
Date (DD-MMM-YYYY)	D D – M M M – Y Y Y Y	Sea state code	
Time at start (UTC or L)		Wave height (m)	
Time at end (UTC or L)		True wind speed (kn) or Beaufort code	
Latitude at start / end	/	True wind direction (°)	
Longitude at start / end	/	Ice type code	
True platform speed (kn)		Ice concentration code	
True platform direction (°)		Temperature (°C)	
Altitude (m)			
Recorder type		Aircraft team	**Front of aircr**
Camera model			Name Role
Altitude (m or ft)			
Route tracked by GPS?	Yes or No		Name Role
			Rear of aircra

Notes:

Bird Information:* this field must be completed for each record

*Species	*Count	*In transect?	*Distance[1]	*Fly or water?	Assoc.[2]	Behav.[2]	Flight direc.[3]	Age[4]	Plum.[5]

[1]***A*** = 0–50 m, ***B*** = 51–100 m, ***C*** = 101–200 m, ***D*** = 201–300 m, ***E*** = > 300 m, and ***3*** = within 300 m but no distance recorded.

[2]See Codes for association (e.g. 16 = with oil slick, 18 = with obs. platform) and behaviours (e.g. 97 = oiled, 98 sick/unwell, 99 = dead)

[3]Indicate flight direction (***N***, ***NE***, ***E***, ***SE***, ***S***, ***SW***, ***W***, or ***NW***); ***ND*** = no apparent direction.

[4]***J***(uvenile), ***I***(mmature), or ***A***(dult).

[5]***B***(reeding), ***NB***(non-breeding), or ***M***(oult)

[6] If association/behaviour codes imply oiling, include a degree of contamination: ***1*** = light where ≤33% of oil is covering the body, ***2*** = moderate where 33-66% of oil is covering the body, ***3*** = high where 66-100% of oil is covering the body, ***4*** = “possible” oil covering the body.