



---

# National Least Bittern Survey Protocol

---

Benoît Jobin, Ron Bazin, Laurie Maynard,  
Angela McConnell and Jennifer Stewart

---

Quebec Region

---

Canadian Wildlife Service  
Technical Report Series No. 519



## CANADIAN WILDLIFE SERVICE TECHNICAL REPORT SERIES

This series of reports, introduced in 1986, contains technical and scientific information on Canadian Wildlife Service projects. The reports are intended to make available material that is either of interest to a limited audience or is too extensive to be accommodated in scientific journals or in existing CWS series.

Demand for the Technical Reports is usually limited to specialists in the fields concerned. Consequently, they are produced regionally and in small quantities. They are numbered according to a national system but can be obtained only from the address given on the back of the title page. The recommended citation appears on the title page.

Technical Reports are available in CWS libraries and are listed in the catalogue of Library and Archives Canada, which is available in science libraries across the country. They are printed in the official language chosen by the author to meet the language preference of the likely audience, with an abstract in the second official language. **To determine whether there is sufficient demand to make the Reports available in the second official language, CWS invites users to specify their official language preference. Requests for Technical Reports in the second official language should be sent to the address on the back of the title page.**

## SÉRIE DE RAPPORTS TECHNIQUES DU SERVICE CANADIEN DE LA FAUNE

Cette série de rapports, créée en 1986, donne des informations scientifiques et techniques sur les projets du Service canadien de la faune (SCF). Elle vise à diffuser des études qui s'adressent à un public restreint ou sont trop volumineuses pour paraître dans une revue scientifique ou une autre série du SCF.

Ces rapports techniques ne sont habituellement demandés que par les spécialistes des sujets traités. C'est pourquoi ils sont produits à l'échelle régionale et en quantités limitées. Ils sont toutefois numérotés à l'échelle nationale. On ne peut les obtenir qu'à l'adresse indiquée au dos de la page titre. La référence recommandée figure à la page titre.

Les rapports techniques sont conservés dans les bibliothèques du SCF et figurent dans le catalogue de Bibliothèque et Archives Canada, que l'on retrouve dans les principales bibliothèques scientifiques du Canada. Ils sont publiés dans la langue officielle choisie par l'auteur, en fonction du public visé, accompagnés d'un résumé dans la deuxième langue officielle. **En vue de déterminer si la demande est suffisante pour publier ces rapports dans la deuxième langue officielle, le SCF invite les usagers à lui indiquer leur langue officielle préférée. Les demandes de rapports techniques dans la deuxième langue officielle doivent être envoyées à l'adresse indiquée au dos de la page titre.**

# NATIONAL LEAST BITTERN SURVEY PROTOCOL

**Benoît Jobin<sup>1</sup>, Ron Bazin<sup>2</sup>, Laurie Maynard<sup>3</sup>, Angela McConnell<sup>4</sup>  
and Jennifer Stewart<sup>5</sup>**

<sup>1</sup> Canadian Wildlife Service, Environment Canada  
801–1550 D’Estimauville Avenue  
Québec QC G1J 0C3

<sup>2</sup> Canadian Wildlife Service, Environment Canada, Union Station  
123 Main St., Suite 150  
Winnipeg MB R3C 4W2

<sup>3</sup> Canadian Wildlife Service, Environment Canada  
465 Gideon Dr., P.O. Box 490, Lambeth Station  
London ON N6P 1R1

<sup>4</sup> Canadian Wildlife Service, Environment Canada  
4905 Dufferin Street  
Toronto ON M3H 5T4

<sup>5</sup> Canadian Wildlife Service, Environment Canada  
17 Waterfowl Lane  
Sackville NB E4L 1G6

## **This report may be cited as follows:**

Jobin, B., R. Bazin, L. Maynard, A. McConnell and J. Stewart. 2011. National Least Bittern Survey Protocol. Technical Report Series No. 519, Environment Canada, Canadian Wildlife Service, Quebec Region, Quebec, 26 p.

## **A copy of this report can be obtained by contacting:**

Benoît Jobin  
Canadian Wildlife Service, Environment Canada  
801–1550 D’Estimauville Avenue  
Québec QC G1J 0C3  
Tel.: 418-649-6863  
Fax : 418-648-5511  
Email: [benoit.jobin@ec.gc.ca](mailto:benoit.jobin@ec.gc.ca)

## National Least Bittern Survey Protocol

Issued also in French under title:  
Protocole national d'inventaire du Petit Blongios

ISBN 978-1-100-19853-8  
Cat. No.: CW69-5/519E-PDF

Information contained in this publication or product may be reproduced, in part or in whole, and by any means, for personal or public non-commercial purposes, without charge or further permission, unless otherwise specified.

You are asked to:

- Exercise due diligence in ensuring the accuracy of the materials reproduced;
- Indicate both the complete title of the materials reproduced, as well as the author organization; and
- Indicate that the reproduction is a copy of an official work that is published by the Government of Canada and that the reproduction has not been produced in affiliation with or with the endorsement of the Government of Canada.

Commercial reproduction and distribution is prohibited except with written permission from the Government of Canada's copyright administrator, Public Works and Government Services of Canada (PWGSC). For more information, please contact PWGSC at 613-996-6886 or at [droitdauteur.copyright@tpsgc-pwgsc.gc.ca](mailto:droitdauteur.copyright@tpsgc-pwgsc.gc.ca).

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2011

Aussi disponible en français

## **Abstract**

The Least Bittern (*Ixobrychus exilis*) is listed as a threatened species in Canada under the *Species at Risk Act*. In Canada, it breeds in Manitoba, Ontario, Quebec, New Brunswick, and possibly in Nova Scotia. The Least Bittern generally inhabits freshwater marshes with dense, tall emergent vegetation (primarily cattails), but may also be found in shrubby swamps. The Canadian population of this inconspicuous and secretive species has not been intensely studied; hence there is a need for a reliable standardized field survey methodology to increase the detection probability of this marsh bird in order to effectively collect vital data on its population abundance, distribution and habitat preferences. This document presents a protocol specifically developed to survey the Least Bittern which uses the call-broadcast method to improve detection and which incorporates wetland-specific techniques to gather habitat information at multiple spatial scales.

General sections of the protocol include: 1) Pre-survey field procedures (site selection, landowner contacts, permits and volunteer agreements, positioning of survey routes and stations); 2) Field survey methods (timing and frequency of survey, call response broadcast details and habitat records measured at the centre of the survey station, within a 50-m radius around the station center, and at the wetland scale), 3) Surveyors and survey ethics; and 4) Reporting information. Widespread usage of this protocol will increase our knowledge of the Least Bittern distribution and abundance in Canada and on its associated habitat characteristics, and will allow direct comparisons of relative abundance amongst studies. This protocol is intended primarily for people willing to conduct thorough and intensive Least Bittern surveys in priority wetlands, but is also recommended for people interested in conducting occasional Least Bittern surveys.

## Résumé

Le Petit Blongios (*Ixobrychus exilis*) est désigné espèce menacée au Canada en vertu de la *Loi sur les espèces en péril*. Au Canada, il niche au Manitoba, en Ontario, au Québec, au Nouveau-Brunswick et possiblement en Nouvelle-Écosse. On trouve généralement le Petit Blongios dans des marais d'eau douce à végétation émergente dense et haute (principalement les marais à quenouilles), mais on peut également l'observer dans des marécages arbustifs. La population canadienne de cette espèce discrète n'a été que peu étudiée. Un protocole d'inventaire a donc été développé pour accroître la probabilité de détection du Petit Blongios par la diffusion d'enregistrements de son chant dans des milieux humides ciblés. Cette méthode devrait également permettre de recueillir des données essentielles sur les préférences en matière d'habitat de l'espèce à différentes échelles spatiales.

Les principales sections du protocole portent sur : 1) les procédures à suivre avant un inventaire (sélection des lieux d'inventaire, communication avec les propriétaires/gestionnaires des terres, obtention de permis et d'ententes de bénévolat, localisation des parcours et des stations d'inventaire); 2) les méthodes d'inventaire sur le terrain (moment et fréquence des inventaires, précisions sur la diffusion des enregistrements du chant, données sur l'habitat mesurées au centre des stations d'inventaire, dans un rayon de 50 m et à l'échelle du milieu humide); 3) les observateurs et le code de conduite; 4) la présentation des résultats. L'utilisation de ce protocole permettra d'améliorer les connaissances sur la répartition et l'abondance du Petit Blongios au Canada ainsi que sur les caractéristiques de son habitat, et d'établir des comparaisons directes de l'abondance relative estimée lors de différentes études. Ce protocole est d'abord destiné aux personnes qui désirent réaliser des inventaires complets et intensifs du Petit Blongios dans des milieux humides jugés prioritaires, mais il s'adresse également aux personnes qui effectuent des inventaires ponctuels du Petit Blongios.

## **Acknowledgments**

We thank Nick Bartok, Glenn Desy, Pierre Fradette, Christian Friis, Claudie Latendresse, Paul Messier, Shawn Meyer, Sarah Richer, Luc Robillard and Tracy Ruta-Fuchs for using the protocol and for providing very useful comments that greatly helped to enhance and refine it. We also thank Gerry Beyersbergen, François Bolduc, Courtney Conway, Jean-François Rail, François Shaffer and Barbara Slezak for contributing to earlier drafts of this document.

Our thanks also go to our colleagues on the National Least Bittern Recovery Team, both current and past members for their continued support: Valerie Blazeski (Parks Canada Agency), Ken DeSmet (Manitoba Conservation), Hillary Knack (Parks Canada Agency), Jon McCracken (Bird Studies Canada), Mark McGarrigle (New Brunswick Department of Natural Resources), Todd Norris (Ontario Ministry of Natural Resources), Gershon Rother (National Capital Commission), Paul Chamberland (Canadian Wildlife Service – Environment Canada), and Diane Amirault-Langlais (Canadian Wildlife Service – Environment Canada).

Finally, we graciously thank all surveyors, volunteers and land owners who reported their Least Bittern observations to the Canadian Wildlife Service, for granting access to their properties, and for their involvement in gathering essential information for the recovery of this species at risk in Canada.

## Table of Contents

Abstract.....	iii
Résumé.....	iv
Acknowledgments.....	v
<b>1 INTRODUCTION.....</b>	<b>1</b>
<b>1.1 Objectives.....</b>	<b>3</b>
<b>2 LEAST BITTERN SURVEY METHODOLOGY.....</b>	<b>4</b>
<b>2.1 Pre-survey Field Procedures.....</b>	<b>4</b>
2.1.1 Site Selection.....	4
2.1.2 Landowner/Land Manager Contact.....	5
2.1.3 Permits and Volunteer Agreements.....	5
2.1.4 Survey Routes and Stations.....	5
2.1.5 Practical Information.....	8
<b>2.2 Field Survey Methods.....</b>	<b>9</b>
2.2.1 Timing and Frequency of Survey.....	9
2.2.2 Call Response Broadcast.....	10
2.2.3 Habitat Records.....	15
2.2.3.1 Centre point.....	15
2.2.3.2 Survey station scale.....	16
2.2.3.3 Wetland scale.....	17
2.2.3.4 Water level fluctuation measurements.....	18
2.2.3.5 Field data for single visits.....	19
2.2.4 Surveyors.....	19
2.2.5 Nest Searches and Survey Ethics.....	19
<b>2.3 Reporting Records and Observations.....</b>	<b>20</b>
2.3.1 Survey Results.....	20
2.3.2 Incidental Observations.....	21
<b>3 SUMMARY STEPS TO FOLLOW FOR LEAST BITTERN STANDARDIZED SURVEYS.....</b>	<b>22</b>
<b>4 REFERENCES.....</b>	<b>24</b>
Appendix A: Canadian Wildlife Service, Environment Canada, Contacts 2010	
Appendix B: Field Equipment	
Appendix C: Health and Safety Issues	
Appendix D: Wetland Bird Species Commonly Found Across the Least Bittern Range in Canada (Waterfowl Species Excluded)	
Appendix E: Wetland Plants Commonly Found in Least Bittern Habitat	
Appendix F: Least Bittern Survey Data Sheet	
Appendix G: Sample Completed Least Bittern Survey Data Sheet	
Appendix H: Least Bittern Habitat Assessment Data Sheet	
Appendix I: Sample Completed Habitat Assessment Data Sheet	
Appendix J: Wetland Habitat Characteristics Data Sheet	
Appendix K: Sample Completed Wetland Habitat Characteristics Data Sheet	
Appendix L: Least Bittern Incidental Observation Data Card	
Appendix M: Sample Completed Least Bittern Incidental Observation Data Card	



# 1 INTRODUCTION

The Least Bittern (*Ixobrychus exilis*) is the smallest heron species in North America. It breeds from southern Canada through the United States and Mexico to Costa Rica (Poole et al. 2009). It is also known to breed and winter as far south as the Caribbean, Panama, and Colombia (COSEWIC 2009). In Canada, the species breeds in southern Manitoba, southern Ontario, southern Quebec, New Brunswick, and possibly in Nova Scotia (Austen et al. 1994; COSEWIC 2009; Figure 1). The Canadian population of the Least Bittern has been estimated at fewer than 1,500 pairs (COSEWIC 2009).

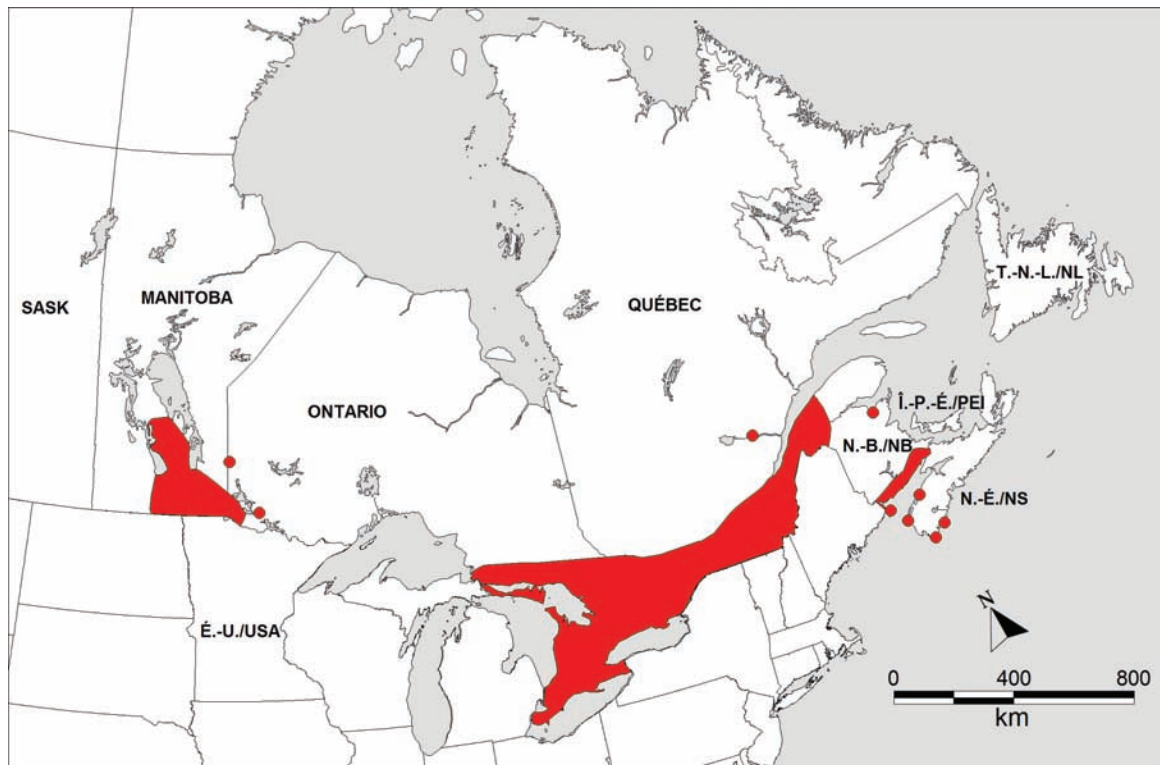


Figure 1. Known distribution of the Least Bittern in Canada as of 2008 (points indicate locations isolated from the known breeding range, but where birds have been found during the breeding season; Canadian Wildlife Service, unpublished data).

The Least Bittern was declared a nationally threatened species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2001 and this status remained following the 2009 revision (COSEWIC 2009). This designation was based on the apparent decline in Least Bittern populations across Canada and continued loss of suitable wetlands within its Canadian

range (James 1999). The Least Bittern is protected by the federal *Migratory Birds Convention Act, 1994* and the *Species at Risk Act*.

The Least Bittern is known to inhabit freshwater and brackish marshes with dense, tall, persistent emergent vegetation (primarily cattails [*Typha* spp.] in northern regions), interspersed with open water and clumps of shrubby vegetation, and having relatively low water level fluctuations associated with natural water regimes, at least during the breeding season (Poole et al. 2009; Jobin et al. 2011). They may also nest in fens, shrubby swamps, and in marshy areas along ditches and sluggish streams, and at the edges of ponds and lakes (COSEWIC 2009).

The Canadian population of this inconspicuous and secretive species has not been intensely studied; hence there exists only limited data on their current distribution and abundance within Canada. Secretive marsh birds, such as the Least Bittern, vocalize infrequently and their habitats are usually difficult to access, making them difficult to observe (Gibbs and Melvin 1993). Thus, they often remain undetected in large-scale surveys used to monitor trends in bird populations, such as the Breeding Bird Survey and the Marsh Monitoring Program (MMP) (Gibbs and Melvin 1993; Tozer 2002). Specifically, the short call-broadcast period (30 seconds) used in the multiple-species MMP program may not be sufficient to elicit a response from Least Bitterns (Bogner and Baldassarre 2002; Arnold 2005; Tozer et al. 2007). There is thus a need for a reliable standardized field survey methodology to increase the detection probability of this marsh bird in order to collect vital data on its population abundance, distribution and habitat preferences.

This document describes the methods for collecting information on the Least Bittern and, together with other sources such as breeding bird atlases, will provide a more accurate and detailed assessment of population distribution and abundance in Canada. This survey methodology was developed using a number of different information sources. The Ontario Forest Bird Monitoring Program, the King Rail Survey Protocol, the Ontario Marsh Monitoring Program and the Standardized North American Marsh Bird Monitoring Protocol (Conway 2008) were utilized as survey templates and information sources. An extensive literature review and background report were completed on Least Bittern breeding biology, and Least Bittern and

marsh bird survey methods (McConnell 2004a, 2004b). The methods described in this protocol have been field tested in Manitoba, Ontario and Quebec since 2004 and adjusted following each field season to improve their effectiveness. It is therefore strongly recommended that surveys for Least Bitterns follow the standard methods outlined in this document.

## **1.1 Objectives**

The goal of the Least Bittern survey protocol is to gather information on Least Bittern distribution and abundance across the Canadian range, and to document associated habitat characteristics.

The objectives of the Least Bittern survey protocol are to:

- Determine presence/non-detection of Least Bitterns in Canadian wetlands during the breeding season;
- Determine the distribution of Least Bitterns in Canada;
- Estimate species abundance within wetlands in Canada;
- Encourage regional population monitoring;
- Increase knowledge of Least Bittern breeding biology and behaviour;
- Identify important habitat features;
- Identify potential threats to the species and its habitat.

The protocol attempts to increase the detection probability for this secretive bird by utilizing call broadcasting and by conducting multiple surveys during the breeding season in suitable habitat within targeted wetlands. A standardized protocol that is utilized uniformly across the country will also allow direct comparisons of relative abundance and detection probability (Farnsworth et al. 2002; Rosenstock et al. 2002; Alldredge et al. 2007) amongst studies. A long term objective of this protocol is to use the information gathered to monitor Least Bittern population and distribution trends.

## **2 LEAST BITTERN SURVEY METHODOLOGY**

This protocol is intended for people willing to conduct thorough and intensive Least Bittern surveys in priority wetlands. People interested in conducting Least Bittern surveys, but who do not have the time, equipment, and knowledge required by the protocol may choose to exclude portions of it (e.g., repeated visits, habitat component). They should however conform at a minimum to the call response broadcast section and associated field datasheets. Finally, any incidental Least Bittern observations can be reported to the Canadian Wildlife Service (CWS) representative in your region (Appendix A) by filling out a “Least Bittern Incidental Observation Data Card” (see Appendix L).

### **2.1 Pre-survey Field Procedures**

#### **2.1.1 Site Selection**

Site selection and prioritization is essential so as to concentrate survey efforts in suitable marshes where basic information is needed and to maximize allocated resources and efforts towards key areas. Cattail marshes where open water and emergent vegetation stands form a well-defined mosaic (hemi-marsh) are the preferred breeding habitat of the Least Bittern and should be considered as primary sites for surveys. Other wetlands dominated by bulrush (*Scirpus* spp., *Schoenoplectus* spp.), bur-reed (*Sparganium* spp.), and common reed (*Phragmites australis*), should also be considered. Shrubby swamps dominated by buttonbush (*Cephalanthus occidentalis*) and willows (*Salix* spp.) are also known to be used by Least Bitterns and should be surveyed.

Sites with current or historical Least Bittern records should be targeted during site selection. Surveyors should contact the CWS representative in their region (Appendix A) to discuss key areas to be surveyed and to enquire on recent survey projects so as not to duplicate search efforts in the same wetlands.

Information on other potential marsh locations can be obtained via high resolution (~ 1: 15,000) air photos or orthophotos, topographic maps, satellite images (e.g., MapQuest – [www.mapquest.com](http://www.mapquest.com) or Google Earth – <http://maps.google.ca>), wetland atlases, checklist

programs, and local and traditional knowledge. Contact with regional agencies, birding clubs, conservation groups (e.g., Ducks Unlimited, Nature Conservancy, Conservation Authorities) and consultation of regional birding guides can also provide reliable information on suitable marsh locations and access.

### **2.1.2 Landowner/Land Manager Contact**

**Approval of landowners and/or land managers of all private and public lands, including approval from responsible authorities** for surveys on National Wildlife Areas, National Parks, First Nation lands and provincial crown lands, **must be obtained prior to the beginning of any surveys.** Surveyors must acquire this permission from landowners through direct communication, e-mail or letter. Surveyors should provide a written summary of the results of the survey specific to each property, even if there were no Least Bitterns detected.

### **2.1.3 Permits and Volunteer Agreements**

Various permits may be required to conduct Least Bittern surveys and research, including: CWS Migratory Bird Scientific Research Permit, Species at Risk Permit, Provincial Research Permit, and access permits into protected areas among others (see under Section 2.1.2). Information on permit requirements and acquisition can be obtained from CWS, Environment Canada (Appendix A), or corresponding provincial agencies (generally the Department of Natural Resources) prior to beginning surveys.

Depending on the ownership of the site or sponsoring organization, volunteer surveyors may be required to sign formal volunteer agreements. These agreements must be completed prior to initiating the surveys.

### **2.1.4 Survey Routes and Stations**

Ideally, all suitable habitats in a given wetland should be surveyed (more than one morning may be needed to cover the whole wetland). Hence, potential habitat, characterized as marshy areas with dense stands of emergent vegetation such as cattails or shrubs interspersed with open water, will be identified within study sites and targeted for surveys. Survey stations should be established along routes which run through all suitable habitats within the wetland therefore

reducing the likelihood of results being biased by any edge effect. Again, consideration of high resolution air photos or satellite images, and discussions with local knowledgeable individuals, will be highly valuable to determine the extent of suitable habitat and to identify access points and survey routes. Stations and routes can be established throughout the wetland and on roads, trails, and dikes. Several stations should be positioned in the deep-water portion of the wetland most suitable to Least Bitterns and not solely restricted to the wetland edge (Arnold 2005; Meyer et al. 2006). Additional stations should be positioned in open water areas later in the season if those areas become covered with non-persistent emergent vegetation such as bur-reed or flowering rush because recent surveys have shown that Least Bitterns may nest in those areas later in the season (Jobin et al. 2007; Meyer and Friis 2008). Stations could be positioned on lookouts (muskrat hut, fallen log) to maximize the area of the station that is visually scrutinized by observers as growth of the live vegetation greatly impairs the visual detection of Least Bitterns as the season progresses.

All survey stations and routes should be at least 250 metres apart. The 250 m distance between stations was determined to maximize the coverage of all suitable habitats taking into account the distance at which Least Bitterns are generally detected. All Least Bitterns detected by Gibbs and Melvin (1993) were within 100 m of the observers while surveys conducted in Quebec and Manitoba since 2004 have shown that over 90% of all Least Bitterns detected using the call-broadcast method were detected within 100 m of the observers (B. Jobin, R. Bazin, unpubl. data). On the other hand, Conway and Nadeau (2006) report that out of over 12,251 detections in the United States, 35%, 69% and 93% of Least Bitterns were detected within 50 m, 100 m, and 200 m, respectively. It is also acknowledged that hearing distance can be reduced as a result of weather conditions (especially wind). The 250 m distance is therefore a compromise to maximize the detection of most Least Bitterns in a given wetland while reducing the risk of double counting individual birds. The number of stations per route will depend on the size of the wetland and the time available for surveying. Survey routes and stations should be identified on a map and/or on air photos of the wetland.

Survey stations will consist of either full or semi-circular plot areas depending on their location in the marsh relative to the wetland edge. All Least Bitterns detected at a survey station are recorded regardless of their distance from surveyors. Special care must therefore be taken while conducting surveys so as not to double count the same individuals from adjacent stations. This can be done by carefully marking the distance and direction of all Least Bitterns detected, keeping in mind that stations are generally 250 m apart. Be conservative in your assessment as to whether you believe that a bird was previously detected and recorded (i.e. consider it already detected and recorded if in doubt). Birds detected in previous stations need to be noted accordingly (see more information under Section 2.2.2).

Each survey station and survey route **must** be visited prior to conducting the actual surveys to validate access and identify potential problems with station positioning. A fixed stake/marker (bamboo stick or other) marked with flagging tape, is placed at the centre of the survey station when stations are first positioned to ensure surveys are conducted in the exact same location during each visit. Geographic coordinates of the centre of the survey station are then recorded by GPS (ideally in decimal degrees or UTM [NAD 83]). The stake/marker must be located in or close to a vegetation clump representative of the vegetation within the survey station and where water is likely to be present at each visit. In the event that a survey station is on the edge of the marsh (e.g., along a dike or road) such that no water is flooding the vegetation stand at the centre point, the stake/marker must be placed near the marsh edge in an area where water is likely to be present at each visit. If possible, GPS mapping of survey routes should also be completed. Surveyors should be able to survey 7–8 stations per morning depending on access and ease of travel between survey stations, although up to 10–12 stations per morning can be accomplished in certain wetlands. If establishing survey routes through certain parts of the wetland is impossible, routes should follow the edge of the vegetation stand, either on the upland or open water sides. Surveys can be conducted on foot, by canoe, kayak, or small boat.

### **2.1.5 Practical Information**

Surveyors should have a good knowledge of the various songs and calls of the Least Bittern and other marsh bird species as well as dominant wetland plant species identification before conducting the surveys. Calls may be learned from numerous commercial bird song CDs and from the internet (e.g., [www.mbr-pwrc.usgs.gov](http://www.mbr-pwrc.usgs.gov); <http://www.birds.cornell.edu/AllAboutBirds/BirdGuide> ; [www.naturesongs.com](http://www.naturesongs.com)). Wetland bird and plant species commonly found across the Least Bittern range in Canada are listed in appendices D and E.

It will be necessary to estimate the distance of detected Least Bitterns by sight and by sound and to draw scaled maps of the habitat within a 50-m radius from the station centre point. Estimating distances accurately in wetlands by sight can be difficult because of poor visibility and because the habitat may be highly homogeneous with few easily recognisable landmarks. Surveyors should therefore practice estimating visual distances using a laser rangefinder or by measuring distances of landmarks using a GPS or a measuring tape prior to conducting the actual surveys. Estimating distances accurately by sound can be even more difficult because aural distance estimations vary with species, vegetation density, wind, background noise levels and bird orientation in relation to the observer. Surveyors should therefore also practice estimating distances of auditory cues. This can be done by broadcasting Least Bittern calls at known locations around a survey point and having observers practice estimating distances. Surveyors who do not have previous experience with Least Bittern surveys and marsh-habitat monitoring should contact the CWS representative in their region (Appendix A) for additional information on the protocol and on the possibility of participating in practice surveys and training sessions before actual field surveys are performed.



## **2.2 Field Survey Methods**

### **2.2.1 Timing and Frequency of Survey**

Surveys should generally be conducted from early May to mid-July. The date of the first survey should be around early May at southern latitudes (e.g., southern Ontario) and mid to late May for sites at northern latitudes (e.g., southern and Interlake regions of Manitoba). Because of its secretive nature, Least Bitterns may remain undetected even after one or two surveys in the same wetland (Bogner and Baldassarre 2002; Meyer et al. 2006; Jobin et al. 2007; Latendresse and Jobin 2007) so repeated visits should be made to enhance the species detection. In addition, Least Bitterns do not initiate nesting at the same time in a given region. In order to establish abundance and breeding density of male Least Bitterns in a wetland, three visits should be made to each station. Bogner and Baldassarre (2002) recommend that surveys should be conducted only once every ten days during the nest initiation period. This minimum 10-day period between site visits should allow for the detection of most males within a wetland, regardless of when they initiate nesting. It will also minimize the likelihood of double counting individuals since responsiveness during other nesting stages is less than during nest initiation. Repeated visits to a wetland within a short period of time may lead to double counting and inaccurate population estimates.

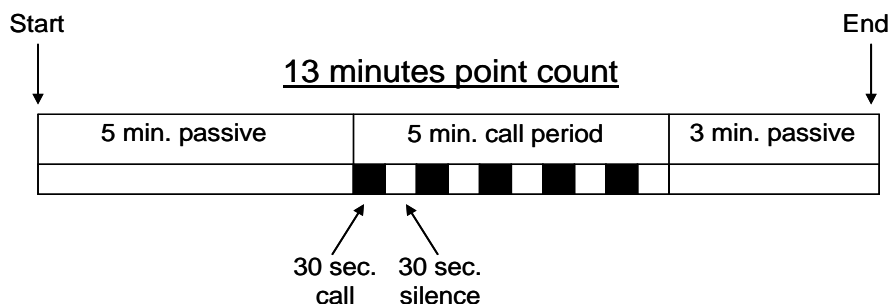
Recent surveys in Manitoba and Quebec, where up to four visits per survey station were conducted from late May to early July, have shown that the maximum number of calling males was observed during the first two weeks of June (Jobin et al. 2007; Latendresse and Jobin 2007; R. Bazin unpubl. data). However, the latter studies also indicated that sometimes the maximum number of individuals was observed in late June/early July due to the visual detection of females and young. These studies have also shown that Least Bitterns were only detected at some stations early in the season during the first or second visit, or late in the season during the third or fourth visit. Based on these observations, conducting three surveys throughout the breeding period should be sufficient to maximize the number of Least Bitterns detected within a wetland.

Although Least Bitterns may call all day long early in the season, surveys should be completed during morning hours from 30 minutes before sunrise to 10:00 AM. Morning surveys are recommended for several reasons: 1) Detection probability for the Least Bittern was found to be higher in morning versus evening surveys (Swift et al. 1988; Canadian Wildlife Service 2002; Nadeau et al. 2008); 2) They allow visual cues such as behaviour of calling birds to be noted more easily than in the evening; 3) They allow for longer survey periods which may increase the likelihood of detecting Least Bitterns (Nadeau et al. 2008); 4) Surveyors can complete habitat descriptions along a route after morning surveys are completed; and 5) For safety reasons as surveyors may face unexpected events working in and around water (e.g., equipment failure, canoe tipping, injuries etc.). Evening surveys (from 6:00 PM to sunset) could also be conducted should unpredictable events (weather, access, etc.) prevent surveys from being conducted in the morning; surveyors must however pay special attention to safety issues related to working late in the day (see under Section 2.2.4).

Surveys should not be conducted during adverse weather conditions; i.e., days with rain, fog, extreme heat (>30°C) or winds exceeding 19 km/h (maximum of 3 on the Beaufort scale) and the survey schedule should allow for additional survey days in the event that expected surveys are postponed. This also applies if ambient noise levels (e.g. car traffic, frog calls) significantly reduce the ability to detect calling birds although this may sometimes be inevitable.

### 2.2.2 Call Response Broadcast

Species specific call response broadcasts will be used within survey stations to detect Least Bittern presence throughout the study wetlands. Point counts are 13 minutes in length and consist of 5 minutes of passive listening, 5 minutes of call broadcasts (each minute is 30 seconds of the Least Bittern “coo-coo-coo” call followed by 30 seconds of silence), then 3 minutes of passive listening.



The first 5-min passive listening period allows surveyors to record birds already calling before the call broadcast period and is consistent with what is currently proposed for the North American Marsh Bird Monitoring Protocol (Conway 2008), thus ensuring that the data can be incorporated into this forthcoming continent-wide survey effort and corresponding centralized database. The second passive listening period is added because some Least Bitterns may respond solely after the call broadcast period has ended. Recent surveys in Manitoba, Ontario and Quebec have shown that nearly one third of all Least Bitterns were initially detected only after the call broadcast period (Jobin et al. 2007; Jobin et al. 2009; B. Jobin unpubl. data; R. Bazin unpubl. data, CWS-Ontario unpubl. data) and that 90% of these birds were detected within the three minutes of the second passive listening period. On some occasions, Least Bitterns may also be detected after the 13-min point count has ended. These birds must also be recorded on the data sheet.

Broadcasting of bird vocalizations have been employed in a variety of studies over the past few decades to elicit vocal and behavioural responses from birds (Marion et al. 1981). Call broadcast techniques have demonstrated advantages including: increasing the number of individuals detected, both per single census and per census area over time; reducing the number of survey stations without detections; and increasing overall detection probability while reducing temporal variation in detection probability (Johnson et al. 1981, Conway and Gibbs 2005). Studies have shown that broadcasts of conspecific vocalizations have increased the detection of Least Bitterns (Manci and Rusch 1988; Swift et al. 1988; Gibbs and Melvin 1993; Bogner and Baldassarre 2002; Arnold 2005; Hay 2006; Jobin et al. 2007; Rehm and Baldassarre 2007).

The Least Bittern “coo” call will be used and is taken from available recordings such as the 1) Bird Sounds of Canada vol. 1 CD 1 (by Monty Brigham); 2) Peterson’s Field Guide (Bird Songs, Eastern and Central North America); 3) Peterson’s Field Guide (More Birding by Ear: Eastern and Central); 4) Stokes Field Guide to Bird Songs; or 5) Cornell University Lab CD production. Calls should ideally be taken from a regional source (e.g., Peterson Eastern Calls for surveys conducted in eastern Canada) to reduce potential bias due to regional dialects. You can contact the CWS regional representative (Appendix A) to get the recording of the Least Bittern “coo” call from the Bird Sounds of Canada CD in MP3 format (copyright permission granted by

Monty Brigham). Calls may be broadcast either with a tape, CD or MP3 player. For circular survey stations, the speaker will be directed towards a portion of the station deemed most suitable for the Least Bittern whereas it will be directed towards the centre of the station for semi-circular stations. Speaker direction is fixed throughout the point count and recorded on field sheets to ensure repeatability among survey visits at the same station. For all survey stations the speaker should be placed <1 m above water level. The volume of the broadcast equipment should be set such that sound pressure is 80–90 dB, 1 m in front of the speaker (Conway 2008). Sound level can be measured using a portable sound-level meter available from electronic stores.

Surveyors record all Least Bitterns heard or seen during the entire survey period as well as the type of call. Bird detections must be noted during every 1-minute interval (Conway 2008) on the Least Bittern Survey Data Sheet (see Appendices F and G) and surveyors will note whether the bird is detected by sound and/or visually. Write “1” in each 1-minute interval on the data sheet in which the individual bird is detected by sound, an “s” when the individual is detected visually and “1s” when the individual is heard and seen. Each line on the data sheet represents an individual bird. The direction of each individual bird should be determined relative to the surveyor to keep track of all detected birds. This information can be written in the left-most column of the data sheet as an arrow pointing towards the bird location. The position and movements of every Least Bittern are also marked on the sketch map of the survey station (see under Section 2.2.3.2) to avoid double counting. Other information to be recorded includes: the sex of the bird, whether the bird was detected prior to the start of the point count, after the point count was completed, or when arriving or leaving the station.



Male Least Bittern: Note the black crown, neck, back and scapulars

© Canada Environment, 2011  
Photo: Luc Robillard, CWS



Female Least Bittern: The crown, neck, back and scapulars are chesnut-brown

© Canada Environment, 2011  
Photo: Benoît Jobin, CWS

The distance between the surveyor and a detected bird should be noted precisely; this distance can also be estimated within distance intervals (0–10 m; 10–25 m; 25–50 m; 50–100 m; >100 m) when in doubt. Estimate the distance to each new bird **when it is first detected** as marsh birds will often approach a call-broadcast (Robert and Laporte 1997; Legare et al. 1999; Jobin et al. 2007). If a bird is detected at a distance of more than 100 metres, the distance is recorded as >100m. If an individual detected at one survey station is thought to be the same individual that was recorded at a previous survey station, place a “y” in the “Detected at a previous station” column on the data sheet. Be conservative in your assessment (i.e. record “y” when in doubt). Finally, Least Bitterns detected while travelling between stations and not during actual station surveys should be noted accordingly on the data sheet; the coordinates of the observer and/or the birds should then be recorded with a GPS and clearly marked in field notes.

Other priority marsh bird species include King Rail, Yellow Rail, Virginia Rail, Sora, American Bittern and Pied-billed Grebe (see Appendix D for Latin names). These will be recorded in a similar fashion as Least Bittern observations (one line per individual, recorded at 1-minute intervals). All other bird species detected within 100 m of the centre of the station should be recorded on the bottom of the data sheet by marking the appropriate species code box and recording the absolute numbers (i.e. highest number observed) for the duration of the point count

(see Appendix D for a list of additional wetland-dependant birds). Birds detected farther than 100 m are also listed but not enumerated. However, if the surveyor feels that recording these other bird species both within and beyond the 100 m limit inhibits listening for priority marsh bird species, then only priority species detections should be recorded and the box stating that other species were not recorded should be checked. Birds flying high over the stations should not be recorded.

A minimum of two surveyors should be present during each survey to increase the probability of detection and to meet health and safety requirements for working in remote areas in and around water. During the survey, the primary observer handles the CD/MP3 player and speakers, and focuses on detecting Least Bitterns and other bird species. The primary observer dictates his/her observations to the secondary observer who records the information on the field data sheets. The secondary observer also concentrates on detecting Least Bitterns. Observers should look in opposite directions to visually cover the maximum extent of the survey stations as Least Bitterns are often detected visually while approaching towards the speaker. Each observer reports his/her Least Bittern detections to the other observer at the time of detection and all unique detections heard by any observer should be recorded on a single data sheet after discussing their respective observations, such that final data represent the combined effort of all observers.

Weather conditions (cloud cover, temperature, precipitation [e.g., drizzle], wind speed and direction) are recorded on the data sheet for each visit. The name of the wetland (site), station number, visit number, date, time of beginning and end of the point count, name of surveyors, speaker direction, and level of ambient noise are also noted at each visit.

Following the completion of the survey route, surveyors should remain attentive to the possible detection of Least Bitterns. Special attention should be given in areas where they were not detected earlier in the morning. Surveyors may wish to elicit Least Bittern responses by broadcasting the Least Bittern call without conducting the full survey protocol in an attempt to detect birds that remained undetected. In the event that new individuals are detected, clearly mark on the datasheet their locations and whether the birds were detected visually or audibly, always ensuring that the same individuals are not double counted.

### 2.2.3 Habitat Records

Concurrent with the information on the bird communities at each survey station, information on Least Bittern breeding habitat structure must also be collected on several occasions and at various spatial scales to evaluate the species' habitat requirements and to account for the annual variation in habitat characteristics. Least Bittern breeding habitat characteristics need to be collected at three spatial scales: 1) Centre point of the survey station; 2) Survey station (50-m radius); and 3) Wetland. Habitat characteristics at the Centre point and Survey station scales (Appendices F and H) should be taken when survey stations are positioned prior to the bird surveys and at every bird survey, for a total of four visits. These repeated measurements will allow to evaluate the annual variation in habitat characteristics during the breeding season. See Jobin et al. (2007) for an application of this methodology, associated data analysis and presentation of results.

#### 2.2.3.1 *Centre point*

To account for temporal variation, habitat characteristics need to be collected at the exact same locations during each visit and using the same method. Numerous measurements will be taken at every visit around the stake/marker placed at the centre of the survey station including:

- Water depth (average of five measurements taken within one meter of stake/marker).
- Length of the above water portion of the stake/marker.
- Height of the three dominant plant species within a 2-m radius of the stake/marker (live and dead measured separately). Plant heights are measured from the water level up.
- The dominant vegetation species within a 5-m radius of the stake/marker is noted; indicate if there are two species of equal dominance.
- Presence of floating vegetation and estimated cover, by species and % cover, relative to the open water area, within a 5-m radius of the stake/marker.
- Presence and species identification of submerged vegetation within a 5-m radius of the stake/marker.

Information collected at the centre point will be noted on the same data sheet as the one used to record bird species (see Appendices F and G). These measurements should be taken at all stations once the survey is completed.

### 2.2.3.2 *Survey station scale*

One very detailed habitat sketch is done on the first visit when survey stations are positioned. Vegetation stands, open water areas, and other landmarks (e.g., dike, muskrat hut, dead trees) are delineated from the centre point within a 50-m radius (surveyors should have a practical knowledge of distance estimation – see under Section 2.1.5). To help sketch vegetation and other station parameters at an appropriate scale, a concentric circle at 25-m is marked on the data sheet. Mixed vegetation communities are written as such (e.g., *Sparganium/Butomus/Sagittaria*) when specific vegetation stands cannot be delineated. Areas not visible from the centre point are marked with cross-hatches. The position of the stake/marker is marked on the centre of the sketch. Percent cover of each emergent vegetation species or mixed vegetation communities, open water, bare soil and areas not visible is estimated for the entire 50-m radius. The presence of invasive species is noted. At the bottom of the datasheet, visually estimate (to the nearest 5 cm) the average height of each dominant species or mixed vegetation community, both live and dead, within the 50-m radius using a metre stick as a guide. Density of each dominant species or mixed vegetation community within the 50-m radius is also estimated within relative categories which refer to the visual and physical obstruction that vegetation stands would provide if a human being was to walk, or if waterbirds were to be identified, through the vegetation. Make sure that the height and density of all emergent vegetation species or mixed vegetation communities present within the 50-m radius are measured as some communities may not occur at the centre point. Floating vegetation cover is also estimated (%) relative to open water areas (e.g. 75% of the open water area is covered by floating vegetation). Following each visit, a copy of the data sheet is made and this copy serves as the basis for noting changes to the height, density and distribution of dominant vegetation stands during subsequent visits.



The following survey station characteristics are measured from the centre point at every visit:

- Vegetation stands, open water and bare soil areas, and other landmarks are delineated (sketched) from the centre point within a 50-m radius.
- Percent cover of each emergent vegetation species or mixed vegetation community, open water, bare soil, areas not visible from the centre point, and other landmarks is estimated.
- Presence and identification of invasive species are noted.
- Height and density of each emergent vegetation species (*Typha*, *Sparganium*, *Cephalanthus*, etc.) or mixed vegetation community are estimated for the whole station. Live and dead vegetation stands are estimated separately.
- Floating vegetation cover relative to open water areas.

Information collected at the survey station scale will be noted on a separate survey station habitat assessment field data sheet (see Appendices H and I). These measurements should be taken at all stations once the survey is completed. The dry habitat components of stations located on dikes or on wetland edges should be generally described (grasses, dominant shrub species, major land cover classes – deciduous forest, hayfield, cornfield, urban area). Photographs of survey stations should be taken at the beginning and end of the field season to document changes to the structure and composition of vegetation communities.

### 2.2.3.3 *Wetland scale*

A general description of each surveyed wetland will allow for the identification of human influences and potential threats to the habitat, and help understand Least Bittern habitat selection at the landscape scale. The following wetland characteristics will be noted only once, preferably at the end of the field season (final visit) when the vegetation is fully developed and surrounding land use can be fully ascertained (Appendices J and K):

- Name, location and geographic coordinates of the wetland.
- Size (ha) of the whole wetland, size of all suitable habitat areas if applicable, type of wetland and type of open water (see Appendix J).
- Presence of water level management and type of management.

- Predominant adjacent land use (urban, agriculture, etc.) and percent of wetland edge.
- Percent cover of habitat components (vegetation type, open water, etc.).
- Presence of anthropogenic features and varied human influences.
- Identification and location of invasive species (see Appendix E).
- Additional information on human influences, predators and particular threats.

Noticeable changes to the habitat or water-level and direct observations of habitat modifications (e.g. infilling, riparian development) should be noted in field notebooks or directly on data sheets. Irregularities in structural aspects of impoundments (e.g., leaking dikes, clogged culverts) should also be reported. Photographs of the wetland should be taken at the beginning and end of the season, ideally in digital format, and noted on the data sheet. The size of the wetland and relative importance of adjacent land use may be estimated from current air photos and/or topographic maps. Some measurements may be difficult to estimate (e.g. size of the wetland, adjacent land use); surveyors should attempt to fill out the wetland description data sheet to the best of their knowledge and ability.

#### *2.2.3.4 Water level fluctuation measurements*

To assess water level fluctuations at the marsh level, fixed water gauges (1–2) need to be located or positioned during the first visit and the water level measured at every visit. The gauges should be located along trails or canoe paths likely to be followed during each visit (thereby avoiding detours to obtain measurements) and in areas with sufficient water depth to ensure that gauges do not become dry during the season. Both water depth and the emerging portion of the gauge will be recorded at every visit. Any mark on permanent structures (post, tree, bridge, blind, a prominent branch on a tree, a nail placed in a dead tree, etc.) can be used as long as this fixed mark is easily traceable. The height of the mark relative to the water level is then recorded. We recommend that two gauges or structures be located or positioned in each wetland to allow for unexpected events (tree falling, destruction, loss, etc.). Measurements taken at fixed water gauges will be recorded in field notebooks or on survey data sheets (and clearly marked as such).

### *2.2.3.5 Field data for single visits*

The habitat description and assessment method listed above applies to survey projects where repeated visits are performed. However, even for survey projects where only a single visit is planned, habitat characteristics need to be described. Measurements taken at the centre point, survey station and wetland scale are informative and should be measured even for single visits.

## **2.2.4 Surveyors**

As indicated earlier, a minimum of two trained surveyors should be present during each survey to increase the probability of detection and to meet health and safety requirements (see Appendix C). Surveyors must schedule their field days, outlining the prospective survey dates, location of surveys and estimation of total survey time per visit. Surveyors should ideally have first aid certification, canoe handling training/experience, and a valid “Pleasure Craft Operator Card” should powered watercrafts be used. Surveyors are also responsible for ensuring that they have the necessary field equipment and first aid kit (see Appendix B). Surveyors must have a good knowledge of the various songs and calls of the Least Bittern and other marsh bird species along with practical knowledge of wetland plant identification. They must maintain accurate field notes and records of all sightings, habitat information and survey times.

For safety reasons, surveyors working in a wetland, either on foot or in a canoe, must inform a contact person prior to entering the wetland with a “safety survey plan”. Key points of the “safety survey plan” include access point into the wetland (coordinates and/or location name), the survey area within the wetland and duration of the survey and/or the time when they expect to return. This type of safety plan is highly encouraged for all surveys.

## **2.2.5 Nest Searches and Survey Ethics**

Surveyors must minimize any disturbance to Least Bitterns, other bird species, and the wetland habitat. Surveyors should move through the study area quietly and carefully to minimize disruption to marsh fauna and bird nests.

**Nest searching and nest monitoring is not part of this standardized survey protocol.** Under the Migratory Birds Convention Act, it is illegal to knowingly and purposefully disturb the nest of a migratory bird. Nest searches and nest monitoring as part of a sound scientific study on the nesting biology of the Least Bittern may require special permits such as a *Species at Risk Act* (SARA) and/or a Migratory Bird Scientific Research permit among others (see under Section 2.1.3).

In the event that a nest is inadvertently found, the surveyor should minimize disturbance by not approaching the nest and by carefully moving away. The geographic coordinates of the nest should be recorded and the nest location marked on the sketch map of the survey station (Appendix H). Nests discovered outside station boundaries should be recorded on the incidental observation data card (Appendices L and M). All information on nests should be provided to the CWS representative in the region in which the nest is located (Appendix A).

## **2.3 Reporting Records and Observations**

### **2.3.1 Survey Results**

It is highly recommended that surveyors make copies of field data sheets after each visit and that they keep them in a different location than the original data sheets. This will ensure access to the raw data in the event that the original data sheets are lost, destroyed or damaged. Data stored in GPS units should be downloaded regularly during the field season. Reports of observations from each survey can be submitted to the CWS for compilation and analysis (Appendix A). The CWS regional representative can also provide you with a Microsoft Access or Microsoft Excel data shell template to digitize and secure your data. One report per study wetland should be provided in legible writing. The report should include all data collected during the surveys including copies of the data sheets, photos, maps, field notes, and GPS coordinates. Information collected from the surveys should be treated as confidential. The Least Bittern is a species listed under the SARA so information on the location of nests or birds should not be provided to birding hotlines or websites or made available to the general public.

### **2.3.2 Incidental Observations**

This protocol aims to maximize the detection probability of Least Bitterns by conducting intensive call-broadcast species-specific surveys at selected sites. Least Bitterns are nonetheless observed incidentally at various times of the year by birders and other people not using this or any other specific survey protocol. A “Least Bittern Incidental Observation Data Card” should be completed for every Least Bittern observation which has not been otherwise reported (see Appendices L and M).

### 3 SUMMARY STEPS TO FOLLOW FOR LEAST BITTERN STANDARDIZED SURVEYS

**You can print these summary steps as a guide to bring in the field**

#### **Pre-survey procedures**

- Select a wetland with high potential for breeding Least Bitterns: contact the Canadian Wildlife Service regional representative and conservation agencies, review maps and bird guides.
- Obtain landowner permission and necessary permits as required.
- Each survey station and survey route must be visited prior to conducting any actual surveys to validate access and travel lanes, and to position the survey stations (flags, stakes, GPS coordinates).
- Survey stations must be at least 250 m apart.

#### **Field survey methods**

##### *Bird surveys*

- Conduct field surveys three times from early May to mid-July (start period may vary regionally).
- Maintain a minimum 10-day period between visits.
- Surveys are completed during morning hours (30 minute before sunrise to 10:00 AM). Evening surveys (from 6:00 PM to sunset) could be conducted if unpredictable events prevent surveys from being conducted in the morning.
- Do not conduct surveys in adverse weather conditions (rain, fog, >30°C, strong winds).
- Surveys are conducted on foot, by canoe, kayak or small boat.
- Conduct 13-min call-broadcast surveys at every station.
- Record all Least Bitterns detected within a station regardless of their distance; record responses of other priority marsh birds and general bird species if possible.
- Record individual Least Bittern and priority marsh bird responses every minute.
- Record additional Least Bitterns detected while travelling between stations.

### *Habitat components*

- Record habitat information (vegetation, water depth) at the centre point of every station at every visit.
- Record habitat information and draw a sketch map of the station within a 50-m radius from the centre point of every station at every visit.
- Measure water depth at one or two fixed water gauges or the height of fixed mark relative to the water level at every visit to a wetland.
- Record habitat information at the wetland scale once during the season, preferably during the last visit to a wetland.

### **Additional key points to remember**

- Two observers should be present during surveys to increase detection and for safety reasons.
- Surveyors must comply with basic safety measures (communication, life jackets, etc.).
- Surveyors must minimize disturbance to Least Bitterns, other birds, and wetland habitat.
- No nest searches are to be conducted.
- If a nest is located inadvertently, the surveyor should carefully move away and record the geographic coordinates of the nest location (GPS and/or on a map of the wetland) and inform the regional Canadian Wildlife Service representative.
- Make copies of the original data sheets after each visit and back-up of GPS data.
- Reports of Least Bittern and other species at risk observations from each survey should be submitted to the Canadian Wildlife Service.

*For any questions or further comments about the Least Bittern survey protocol, please contact the Canadian Wildlife Service representative in your region!*

*Thank you for your involvement in the recovery of Least Bitterns.*

## 4 REFERENCES

- Allredge, M.W., K.H. Pollock, T.R. Simons, J.A. Collazo, and S.A. Shriner. 2007. Time-of-detection method for estimating abundance from point-count surveys. *Auk* 124: 653–664.
- Arnold, K.E. 2005. The Breeding Ecology of Least Bitterns (*Ixobrychus exilis*) at Agassiz and Mingo National Wildlife Refuges. MSc thesis, South Dakota State University, Brookings, South Dakota.
- Austen, M.J.W, M.D. Cadman, and R.D. James. 1994. Ontario birds at risk, status and conservation needs. Federation of Ontario Naturalists, Ontario.
- Bogner, H.E. and G.A. Baldassarre. 2002. The effectiveness of call-response surveys for detecting least bitterns. *Journal of Wildlife Management* 66: 967–984.
- Canadian Wildlife Service. 2002. Wetland Birds at Risk in Simcoe County 2002. Survey Report. Canadian Wildlife Service, Environment Canada. Unpublished report.
- Conway, C.J. 2008. Standardized North American Marsh Bird Monitoring Protocols. Wildlife Research Report #2008-01, U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.
- Conway, C.J. and J.P. Gibbs. 2005. Effectiveness of call-broadcast surveys for monitoring marsh birds. *Auk* 122: 26–35.
- Conway, C.J. and C.P. Nadeau. 2006. Development and Field testing of Survey Methods for a Continental Marsh Bird Monitoring Program in North America Wildlife Research Report No. 2005–11. USGS Arizona Cooperative Fish and Wildlife Research Unit, Tucson, Arizona.
- COSEWIC. 2009. COSEWIC assessment and update status report on the Least Bittern *Ixobrychus exilis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. [www.sararegistry.gc.ca](http://www.sararegistry.gc.ca), accessed 19 February 2010.
- Farnsworth, G.L., K.H. Pollock, J.D. Nichols, T.R. Simons, J.E. Hines, and J.R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. *Auk* 119: 414–425.
- Gibbs, J.P. and S.M. Melvin. 1993. Call response surveys for monitoring breeding waterbirds. *Journal of Wildlife Management* 57: 27–34.
- Hay, S. 2006. Distribution and Habitat of the Least Bittern and Other Marsh Bird Species in Southern Manitoba. Masters of Natural Resource Management thesis, University of Manitoba, Winnipeg, Manitoba.



- James, R.D. 1999. Update COSEWIC status report on Least Bittern (*Ixobrychus exilis*). Committee on the Status of Endangered Wildlife in Canada.
- Jobin, B., P. Fradette, and S. Labrecque. 2011. Habitat use by Least Bitterns (*Ixobrychus exilis*) in Quebec. *Waterbirds* 34: 143–150.
- Jobin, B., C. Latendresse, and L. Robillard. 2007. Habitats et inventaires du Petit Blongios sur les terres du ministère de la Défense nationale à Nicolet, Quebec, étés 2004, 2005 et 2006. Série de rapports techniques no 482, Service canadien de la faune, région du Quebec, Environnement Canada, Sainte-Foy, Quebec, 85 p. et annexes.
- Jobin, B., L. Robillard, and C. Latendresse. 2009. Response of a Least Bittern (*Ixobrychus exilis*) population to interannual water level fluctuations. *Waterbirds* 32: 73–80.
- Johnson, R.R., B.T. Brown, L.T. Haight, and J.M. Simpson. 1981. Playback recordings as a special avian census technique. Pp. 68–75 in *Estimating Numbers of Terrestrial Birds* (C. J. Ralph and J. M. Scot , Eds.). *Studies in Avian Biology*, no. 6.
- Latendresse, C. and B. Jobin. 2007. Inventaire du Petit Blongios à la baie McLaurin et au marais aux Massettes, région de l’Outaouais, été 2006. Environnement Canada, Service canadien de la faune, région du Quebec, Sainte-Foy. Rapport inédit. 40 p. et annexes.
- Legare, M.L., W.R. Eddleman, P.A. Buckley, and C. Kelly. 1999. The effectiveness of tape playback in estimating Black Rail density. *Journal of Wildlife Management* 63: 116–125.
- Manci, K.M. and D.H. Rusch. 1988. Indices to distribution and abundance of some inconspicuous waterbirds on Horicon marsh. *Journal of Field Ornithology* 59: 67–75.
- Marion, W.R., T.E. O’Meara, and D.S. Maehr. 1981. Use of playback recordings in sampling elusive or secretive birds. Pp. 81-85 in *Estimating Numbers of Terrestrial Birds* (C. J. Ralph and J. M. Scot , Eds.). *Studies in Avian Biology* No.6.
- McConnell, A. 2004a. Least Bittern Annotated Literature Review. Canadian Wildlife Service, Environment Canada, Ontario Region. Unpublished report.
- McConnell, A. 2004b. Draft Ontario Least Bittern Survey Method. Canadian Wildlife Service, Environment Canada, Ontario Region. Unpublished report.
- Meyer, S.W. and C.A. Friis. 2008. Occurrence and habitat of breeding Least Bitterns at St. Clair National Wildlife Area. *Ontario Birds* 26: 146–164.
- Meyer, S.W., J.W. Ingram, and G.P. Grabas. 2006. The Marsh Monitoring Program: Evaluating marsh bird survey protocol modifications to assess Lake Ontario coastal wetlands at a site-level. Technical Report Series 465. Canadian Wildlife Service, Ontario region, Ontario.

- Nadeau, C.P., C.J. Conway, B.S. Smith, and T.E. Lewis. 2008. Maximizing detection probability of wetland-dependant birds during point-count surveys in Northwestern Florida. *Wilson Journal of Ornithology* 120: 513–518.
- Poole, A.F., P. Lowther, J.P. Gibbs, F.A. Reid and S.M. Melvin. 2009. Least Bittern (*Ixobrychus exilis*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the *Birds of North America Online*. <http://bna.birds.cornell.edu/bna/species/017>, accessed 21 October 2011.
- Rehm, E.M. and G.A. Baldassarre. 2007. Temporal variation in detection of marsh birds during broadcast of conspecific calls. *Journal of Field Ornithology* 78: 56–63.
- Robert, M. and P. Laporte. 1997. Field techniques for studying breeding Yellow Rails. *Journal of Field Ornithology* 68: 56–63.
- Rosenstock, S.S., D.R. Anderson, K.M. Giesen, T. Leukering, and M.F. Carter. 2002. Landbird counting techniques : current practices and an alternative. *Auk* 119: 46–53.
- Swift, B.L, S.R. Orman, and S.W. Ozard. 1988. Response of Least Bitterns to tape-recorded calls. *Wilson Bulletin*. 100: 496–499.
- Tozer, D.C. 2002. Point count efficiency and nesting success in marsh nesting birds. MSc Thesis. Trent University, Peterborough, Ontario, Canada.
- Tozer, D.C., K.F. Abraham, and E. Nol. 2007. Short call-broadcasts fail to detect nesting Least Bitterns (*Ixobrychus exilis*). *Northeastern Naturalist* 14: 637–642.

## **Appendix A: Canadian Wildlife Service, Environment Canada, Contacts 2010**

---

To obtain CD or MP3 recordings of the standardized Least Bittern call-broadcast protocol, additional information, or for questions regarding any aspect of the survey methodology, please contact:

### **Manitoba**

Ron Bazin  
Canadian Wildlife Service  
Environment Canada – Prairie and Northern  
Region  
Union Station  
123 Main St., Suite 150  
Winnipeg MB  
R3C 4W2  
Tel.: 204-984-0863  
Email: [ron.bazin@ec.gc.ca](mailto:ron.bazin@ec.gc.ca)

### **Ontario**

Dave Moore  
Canadian Wildlife Service  
Environment Canada – Ontario Region  
867 Lakeshore Road  
Burlington ON  
L7R 4A6  
Tel.: 905-315-5234  
Email: [dave.moore@ec.gc.ca](mailto:dave.moore@ec.gc.ca)

### **Quebec**

Vincent Carignan  
Canadian Wildlife Service  
Environment Canada – Quebec Region  
105 McGill, 7th floor  
Montréal QC  
H2Y 2E7  
Tel.: 514-496-3936  
Email: [vincent.carignan@ec.gc.ca](mailto:vincent.carignan@ec.gc.ca)

### **New Brunswick and Nova Scotia**

Samara Eaton  
Canadian Wildlife Service  
Environment Canada – Atlantic Region  
17 Waterfowl Lane,  
Sackville NB  
E4L 1G6  
Tel.: 506-364-5060  
Email: [samara.eaton@ec.gc.ca](mailto:samara.eaton@ec.gc.ca)

## **Appendix B: Field Equipment**

---

### **Survey Equipment**

- Call broadcast equipment (portable CD or MP3 players; sets of speakers; broadcast CDs; extra batteries). Two sets of equipment are highly recommended in the event of equipment failure.
- Canoe/kayak equipped with extra paddle, throw line, **life jackets**, bailer, whistle
- Chest waders or rubber boots
- Waterproof GPS unit
- Waterproof case and bags
- Flagging tape
- Compass
- Watch
- Wooden stakes, bamboo sticks, or other devices for markers
- Topographic maps and/or copies of air photos of the survey area
- Laser Range Finder (optional)
- Flashlight or headlamp (optional)

### **Record Keeping/Identification Equipment**

- Field notebook (write-in-rain), pencils, clipboard
- Data sheets
- Copy of survey protocol
- Permits
- Field guides: Birds and Wetland plants
- Digital Camera
- Binoculars
- Vegetation sampling bags (optional)

### **Measuring Equipment**

- Metre stick
- Thermometer
- Wind gauge (optional)
- Sound meter (optional)

### **Health and Safety Equipment**

- Cell phone
- Hat, sunscreen, sunglasses, cool but protective clothing
- Food/Water
- Mosquito repellent
- First Aid kit

## **Appendix C: Health and Safety Issues**

---

The following issues should be considered prior to the commencement of field work. These issues may not be relevant in all regions where Least Bitterns occur.

- A minimum of two surveyors should be present during each visit, especially if conducting overwater surveys. This increases the level of safety while working within wetland habitats.
- Surveyors must always carry a first aid kit while working in the field.
- A cell phone (or satellite phone) should be carried while conducting surveys in case of emergency (check for cell coverage in the wetland area).
- A list of emergency contact numbers in the local area should be carried by surveyors to provide rapid assistance in case of an emergency.
- Canoes must be equipped with safety equipment as required by law (lifejackets, bailer, throw line, and whistle) in order to be used during surveys.
- Surveyors must be comfortable wearing and walking with chest waders and must bear in mind the dangers of falling in deep water wearing chest waders. Surveyors should consider wearing a life jacket at all times.
- Water, food, hat, sunscreen, insect repellent, and cool but protective clothing are also essential for surveyors. These will help maintain the physical well-being of surveyors in summer heat.
- Survey plan/schedule and survey access points should be provided to knowledgeable emergency contacts.
- Surveyors should ideally have first aid certification, canoe handling training/experience, and a valid “Pleasure Craft Operator Card” if needed.

**Appendix D: Wetland Bird Species Commonly Found Across the Least Bittern Range in  
Canada (Waterfowl Species Excluded)**

English name	French name	Latin name	Province with likely occurrence				
			MB	ON	QC	NB	NS
American Bittern	Butor d'Amérique	<i>Botaurus lentiginosus</i>	✓	✓	✓	✓	✓
American Coot	Foulque d'Amérique	<i>Fulica americana</i>	✓	✓	✓	✓	✓
Belted Kingfisher	Martin-pêcheur d'Amérique	<i>Ceryle alcyon</i>	✓	✓	✓	✓	✓
Black Tern	Guifette noire	<i>Chlidonias niger</i>	✓	✓	✓	✓	✓
Black-crowned Night-Heron	Bihoreau gris	<i>Nycticorax nycticorax</i>	✓	✓	✓	✓	✓
Cattle Egret	Héron garde-boeufs	<i>Bubulcus ibis</i>	✓	✓			
Common Grackle	Quiscale bronzé	<i>Quiscalus quiscula</i>	✓	✓	✓	✓	✓
Common Loon	Plongeon huard	<i>Gavia immer</i>	✓	✓	✓	✓	✓
Common Moorhen	Gallinule poule-d'eau	<i>Gallinula chloropus</i>		✓	✓	✓	✓
Common Yellowthroat	Paruline masquée	<i>Geothlypis trichas</i>	✓	✓	✓	✓	✓
Eastern Kingbird	Tyrann tritri	<i>Tyrannus tyrannus</i>	✓	✓	✓	✓	✓
Forster's Tern*	Sterne de Forster	<i>Sterna forsteri</i>	✓	✓			
Great Blue Heron	Grand Héron	<i>Ardea herodias</i>	✓	✓	✓	✓	✓
Great Egret	Grande Aigrette	<i>Ardea alba</i>	✓	✓	✓		
Green Heron	Héron vert	<i>Butorides virescens</i>		✓	✓	✓	✓
Horned Grebe	Grèbe esclavon	<i>Podiceps auritus</i>	✓				
King Rail*	Râle élégant	<i>Rallus elegans</i>		✓			
Least Bittern*	Petit Blongios	<i>Ixobrychus exilis</i>	✓	✓	✓	✓	✓
Marsh Wren	Troglodyte des marais	<i>Cistothorus palustris</i>	✓	✓	✓	✓	✓
Northern Harrier	Busard Saint-Martin	<i>Circus cyaneus</i>	✓	✓	✓	✓	✓
Pied-billed Grebe	Grèbe à bec bigarré	<i>Podilymbus podiceps</i>	✓	✓	✓	✓	✓
Red-necked Grebe	Grèbe jougris	<i>Podiceps grisegena</i>	✓	✓			
Red-winged Blackbird	Carouge à épaulettes	<i>Agelaius phoeniceus</i>	✓	✓	✓	✓	✓
Rusty Blackbird*	Quiscale rouilleux	<i>Euphagus carolinus</i>	✓	✓	✓	✓	✓
Sandhill Crane	Grue du Canada	<i>Grus canadensis</i>	✓	✓	✓		
Sedge Wren	Troglodyte à bec court	<i>Cistothorus platensis</i>	✓	✓	✓	✓	
Short-eared Owl*	Hibou des marais	<i>Asio flammeus</i>	✓	✓	✓	✓	✓
Sora	Marouette de Caroline	<i>Porzana carolina</i>	✓	✓	✓	✓	✓
Swamp Sparrow	Bruant des marais	<i>Melospiza georgiana</i>	✓	✓	✓	✓	✓
Tree Swallow	Hirondelle bicolor	<i>Tachycineta bicolor</i>	✓	✓	✓	✓	✓
Trumpeter Swan	Cygne trompette	<i>Cygnus buccinator</i>	✓	✓			
Virginia Rail	Râle de Virginie	<i>Rallus limicola</i>	✓	✓	✓	✓	✓
Wilson's Phalarope	Phalarope de Wilson	<i>Phalaropus tricolor</i>	✓	✓	✓	✓	✓
Wilson's Snipe	Bécassine des marais	<i>Gallinago delicata</i>	✓	✓	✓	✓	✓
Yellow Rail*	Râle jaune	<i>Coturnicops noveboracensis</i>	✓	✓	✓	✓	✓
Yellow Warbler	Paruline jaune	<i>Dendroica petechia</i>	✓	✓	✓	✓	✓
Yellow-headed Blackbird	Carouge à tête jaune	<i>Xanthocephalus xanthocephalus</i>	✓	✓			

\* COSEWIC listed species

## **Appendix E: Wetland Plants Commonly Found in Least Bittern Habitat**

<b>Emergent plant (herbaceous)</b>			<b>Floating plants</b>		
English name	French name	Latin name	English name	French name	Latin name
Arrowhead	Sagittaire	<i>Sagittaria</i> sp.	Duckweed	Lentilles	<i>Lemna</i> sp.; <i>Spirodela</i> sp.
Bulrushes	Scirpe	<i>Scirpus</i> sp.	European frogbit*	Hydrocharide grenouillette	<i>Hydrocharis morsus-ranae</i>
Bur-reed	Rubanier	<i>Sparganium</i> sp.	Floating bur-reed	Rubanier flottant	<i>Sparganium</i> sp.
Cattail	Quenouille	<i>Typha</i> sp.	Pond lily	Nénuphar	<i>Nuphar</i> sp.
Common reed*	Roseau commun	<i>Phragmites australis</i>	Pondweed	Potamot	<i>Potamogeton</i> sp.
Flowering rush*	Butome à ombelles	<i>Butomus umbellatus</i>	Smartweed	Renouée	<i>Polygonum</i> sp.
Iris/Blueflag	Iris	<i>Iris</i> sp.	Water-lily	Nymphée	<i>Nymphaea</i> sp.
Marsh cinquefoil	Potentille des marais	<i>Potentilla palustris</i>	Watershield	Brasénie de Schreber	<i>Brasenia schreberi</i>
Pickernelweed	Pontédérie cordée	<i>Pontederia cordata</i>			
Purple loosestrife*	Salicaire pourpre	<i>Lythrum salicaria</i>	<b>Submerged (underwater) plants</b>		
Rushes	Jonc	<i>Juncus</i> sp.	English name	French name	Latin name
Sedges	Laïches/Carex	<i>Carex</i> sp.	Bladderwort	Utriculaire	<i>Utricularia</i> sp.
Touch-me-not	Impatiente	<i>Impatiens</i> sp.	Hornwort/Coon's tail	Cornifle	<i>Ceratophyllum</i> sp.
Wild rice	Riz sauvage	<i>Zizania aquatica</i>	Tape-grass	Vallisnérie	<i>Vallisneria</i> sp.
			Water millfoil*	Myriophylle	<i>Myriophyllum</i> sp.
			Waterweed	Élodée	<i>Elodea</i> sp.
<b>Emergent plants (shrubs)</b>					
English name	French name	Latin name			
Alder	Aulne	<i>Alnus</i> sp.			
Buttonbush	Céphalanthe	<i>Cephalanthus</i> sp.			
Swamp loosestrife	Décodon	<i>Decodon</i> sp.			
Sweet gale	Myrique	<i>Myrica</i> sp.			
Willow	Saule	<i>Salix</i> sp.			

\*Species marked with an asterisk are invasive

### **Websites for wetland plant identification:**

<http://plants.usda.gov>

<http://aquat1.ifas.ufl.edu>

[www.uwgb.edu/BIODIVERSITY/herbarium/wetland\\_plants/wetland\\_plants01.htm](http://www.uwgb.edu/BIODIVERSITY/herbarium/wetland_plants/wetland_plants01.htm)

[www.npwrc.usgs.gov/resource/plants/floramw/species.htm](http://www.npwrc.usgs.gov/resource/plants/floramw/species.htm)

### **Field guides:**

Fleurbec 1987. Plantes sauvages des lacs, rivières et tourbières. Guide d'identification Fleurbec. Saint-Augustin, Quebec. 400 p.

Lahring, H. 2001. A Field Guide to Water and Wetland Plants of the Prairie Provinces. Red Deer Press. Calgary, Alberta.

Marie-Victorin, F. 1964. Flore laurentienne. Les Presses de l'Université de Montréal, Montréal. 925 p.

Newmaster, S.G., A.G. Harris, and L.J. Kershaw. 1997. Wetland Plants of Ontario. Lone Pine Publishing. Edmonton, AB. 240 p.

Niering, W.A. 1988. Wetlands. The Audubon Society Nature Guides. Random House of Canada Limited, Toronto. 638 p.







# Appendix G: Sample Completed Least Bittern Survey Data Sheet

## Canadian Wildlife Service ~ Least Bittern Call Response Survey Field Data Sheet

Site: RAT RIVER Station #: RR03 Site visit #: 2  
 Date: 17 JUNE 2007 Start time: 7:03 End time: 7:16  
 Wind - Beaufort: 1 Cloud cover (%): 25 Temperature: 17  
 Wind - Direction: SW Precipitation: NIL Speaker direction: S  
 Observer 1): R. BAZIN Lat. N: 49-13.5503  
 Observer 2): J. HOPKINS Long. W: 96-43.7197  
 Ambient noise level (see back of sheet for codes): 1

Water depth (cm): 49 Length of stake above water (cm): 159  
 Live veg. ht. (cm): Cattail spp1: Cattail 70  
 Dead veg. ht. (cm): butyrush spp2: butyrush 25  
 (2 m radius) spp3: ---  
 Dom. vegetation (5m radius): Cattail  
 Float. vegetation (5m radius): present  spp. and %  
 Sub. vegetation (5m radius): present  spp. V. tricolor + Myrica phyllosum

Direction of bird <sup>1</sup>	Species	Sex	Det. before 1st min <sup>2</sup>	Passive <sup>2</sup>										Det. after 13 min <sup>2</sup>	Call Type(s) (see back)	Distance (m) (0-10, 10-25, 25-50, 50-100, >100)	Detected at a previous station	Comments			
				1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min	9 min	10 min						11 min	12 min	13 min
↗	LEBI	M	✓	1	1	1	1	1	1	1	1	1	1	1	15	1	✓	COO	25-50		approach open all
↘	VIRA			1	1	1	1	1	1	1	1	1	1	1	1	1	✓	grunt	10-15		
↙	PBGR		✓	1	1	1	1	1	1	1	1	1	1	1	1	1	✓	graca-a	700	Yes	
↘	LEBI	F		1	1	1	1	1	1	1	1	1	1	1	1	1	✓	KAK	0-10		very close
↘	SORA			1	1	1	1	1	1	1	1	1	1	1	1	1	✓	whimpy	50-100		

<sup>1</sup>Use arrow to mark direction of bird

<sup>2</sup>Mark 1 for heard, s for seen and fs for heard/seen

\* Record number of LEBI detected outside of survey period between previous, current or next station

- Other species not recorded
- ABDU
  - AMCO
  - AMCR
  - AMGO
  - BBCU
  - BCNH
  - BLTE
  - BWTE
  - CAGO
  - COGR
  - COMO
  - CORA
  - COYE
  - EAKI
  - GADW
  - GTBH
  - MALL
  - MAWR
  - NSHO
  - RWBL
  - SACR
  - SEWR
  - SWSP
  - TRES
  - W/SH
  - YHBL
  - Other

(NOTE: count only new birds not recorded during station surveys)

Miscellaneous notes:  
brassy station suit all birds recorded properly  
 Contact info of primary observer:  
(w) 204-984-0863

List species detected beyond 100 m AMRO, REVI, CA 60

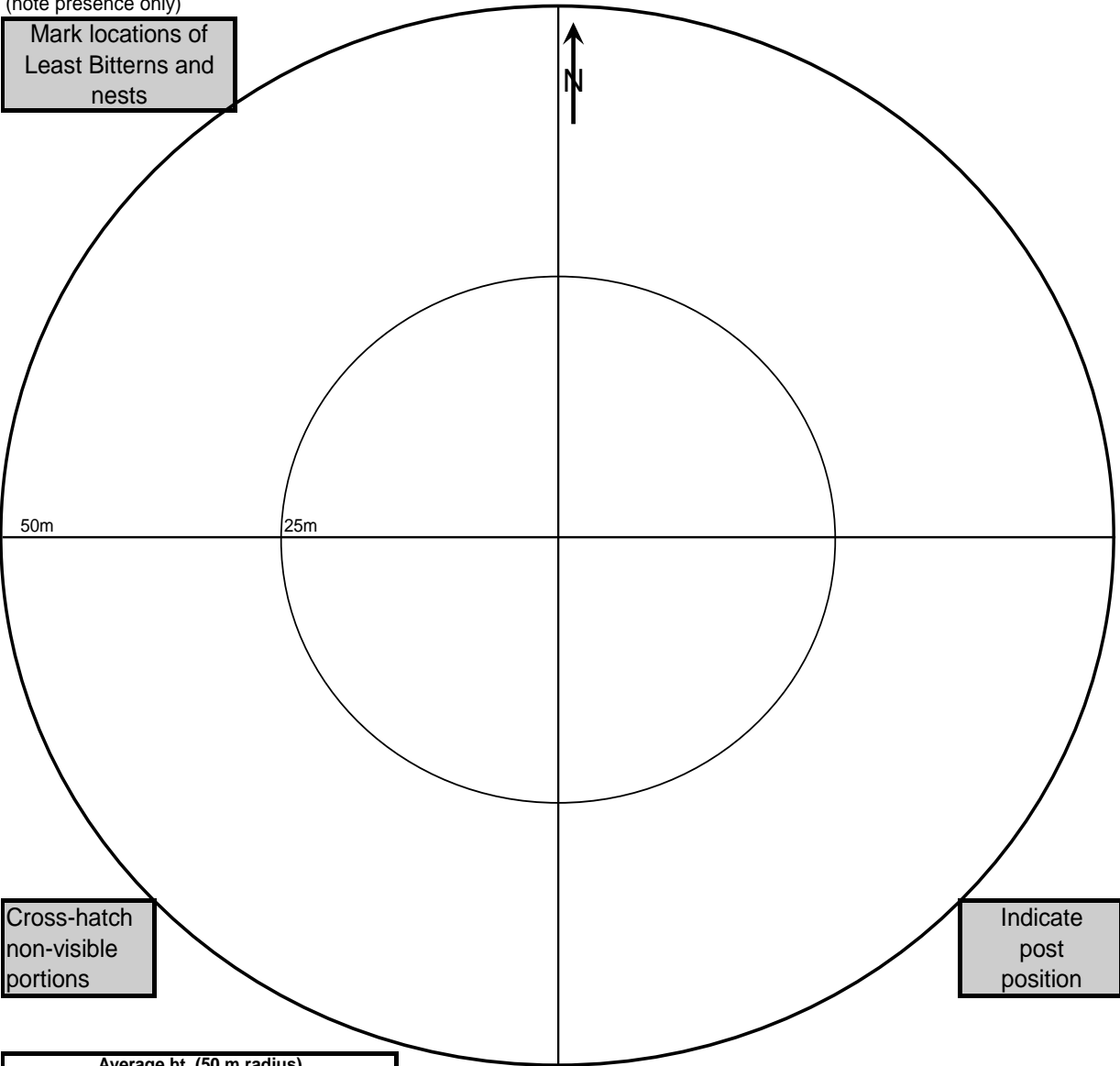
**Appendix H: Least Bittern Habitat Assessment Data Sheet**

**Canadian Wildlife Service ~ Least Bittern Survey Station Habitat Assessment**

Percent station cover (50m radius)      Site \_\_\_\_\_      Station # \_\_\_\_\_      Date \_\_\_\_\_  
 Typha \_\_\_\_\_ Scirpus \_\_\_\_\_ Shrubs \_\_\_\_\_ Visit # \_\_\_\_\_  
 Carex \_\_\_\_\_ Grasses \_\_\_\_\_ Trees \_\_\_\_\_  
 Sparganium \_\_\_\_\_ Phragmites \_\_\_\_\_ Bare soil/mud \_\_\_\_\_ Observer 1) \_\_\_\_\_  
 % not visible \_\_\_\_\_ Others \_\_\_\_\_ Open water \_\_\_\_\_ name 2) \_\_\_\_\_

---

Invasive species      Phragmites \_\_\_\_\_      P. loosestrife \_\_\_\_\_      Others \_\_\_\_\_  
 (note presence only)



Average ht. (50 m radius)												
Species or group	Visit 1 date:			Visit 2 date:			Visit 3 date:			Visit 4 date:		
	Live	Dead	Dens. <sup>1</sup>	Live	Dead	Dens. <sup>1</sup>	Live	Dead	Dens. <sup>1</sup>	Live	Dead	Dens. <sup>1</sup>
% floating veg (relative to open water)												

<sup>1</sup>**High** : Difficult to walk through the vegetation; dabbling waterbirds may be detected but not seen; **Medium** : Walking through the vegetation is possible but damage to standing vegetation occurs; dabbling waterbirds can be seen but not identified to species; **Low** : Easy to walk through the vegetation with reduced or no damage; dabbling waterbirds can be identified

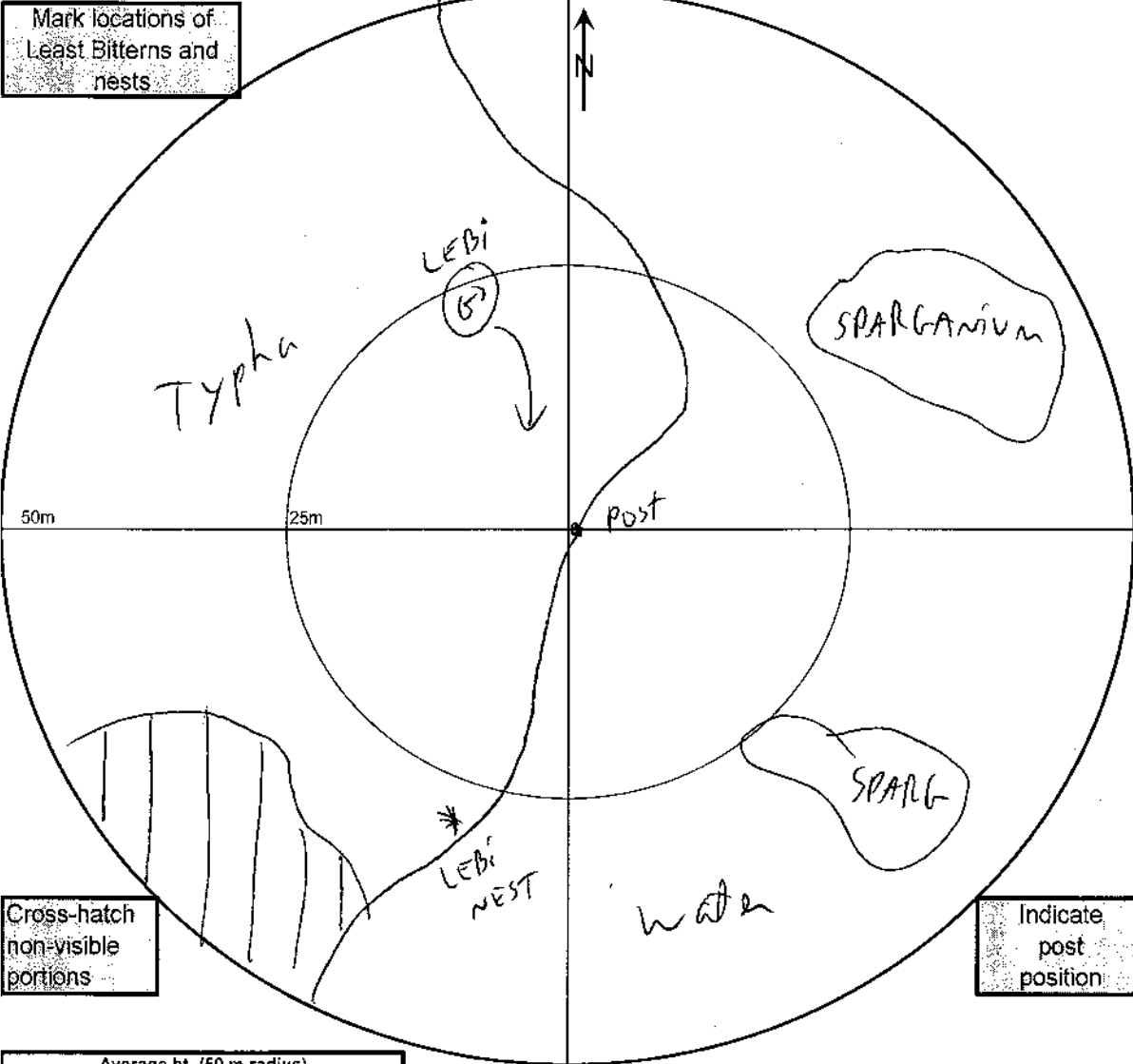
**Appendix I: Sample Completed Habitat Assessment Data Sheet**

**Canadian Wildlife Service ~ Least Bittern Survey Station Habitat Assessment**

Percent station cover (50m radius)      Site Nicut      Station # PB-012      Date 10 JUNE 2007  
 Typha 30      Scirpus \_\_\_\_\_      Shrubs \_\_\_\_\_      Visit # 2  
 Carex \_\_\_\_\_      Grasses \_\_\_\_\_      Trees \_\_\_\_\_  
 Sparganium 15      Phragmites \_\_\_\_\_      Bare soil/mud \_\_\_\_\_      Observer 1) B. Dobson  
 % not visible 15      Others \_\_\_\_\_      Open water 40      name 2) L. Robitland

---

Invasive species      Phragmites \_\_\_\_\_      P. loosestrife X      Others \_\_\_\_\_  
 (note presence only)



Average ht. (50 m radius)												
Species or group	Visit 1 date: <u>30 MAY 07</u>			Visit 2 date: <u>10 JUNE 07</u>			Visit 3 date:			Visit 4 date:		
	Live	Dead	Dens.	Live	Dead	Dens.	Live	Dead	Dens.	Live	Dead	Dens.
Typha	10	70	M	60	70	H						
SPARGANIUM				20		L						
% floating veg (relative to open water)	10			40								

<sup>1</sup>High : Difficult to walk through the vegetation; dabbling waterbirds may be detected but not seen; Medium : Walking through the vegetation is possible but damage to standing vegetation occurs; dabbling waterbirds can be seen but not identified to species; Low : Easy to walk through the vegetation with reduced or no damage; dabbling waterbirds can be identified

**Appendix J: Wetland Habitat Characteristics Data Sheet**

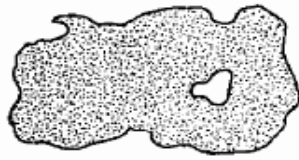
<b>Canadian Wildlife Service ~ Least Bittern Survey Wetland Habitat Features</b>				
Wetland name: _____	Date: _____			
Nearest town/city: _____	Observers: _____			
County/municip.: _____	Contact info: _____			
Protected area: No <input type="checkbox"/> Yes <input type="checkbox"/> _____	email: _____			
Geographic coordinates of wetland access point: UTMnorth: _____	Lat: _____	Long: _____	NAD: _____	
	UTMeast: _____	UTM zone: _____		
Water level management No <input type="checkbox"/> Yes <input type="checkbox"/>	Size of wetland (ha): _____			
If yes, then: Impoundment: <input type="checkbox"/>	Size of suitable habitat (ha): _____			
Other: <input type="checkbox"/> Beaver pond: <input type="checkbox"/>	Open water types (1 to 8) <small>(see reverse of sheet)</small>			
Wetland type (%):	Marsh: _____	Bog: _____	Swamp: _____	Fen: _____
Adjacent land-use: _____	Urban _____	Native grassland _____		
(% of edge)	Cropland _____	Forest/shrubland _____		
	Pasture _____	Other _____		
	Open water _____	Other _____		
% cover of habitat components within suitable habitat	Standing emerg. _____	Floating plant cover in open water areas:	Dense <input type="checkbox"/>	
	Shrubs _____		Moderate <input type="checkbox"/>	
	Open water _____		Slight <input type="checkbox"/>	
	Mud flats _____		None <input type="checkbox"/>	
	Trees _____		Not Applic. <input type="checkbox"/>	
	Other (spp) _____			
Human influence:	Dyke <input type="checkbox"/>	Sewage lagoon <input type="checkbox"/>	Noise <input type="checkbox"/>	
	Artificial channels <input type="checkbox"/>	Sign of pollution <input type="checkbox"/>	Recreation <input type="checkbox"/>	
	Roads <input type="checkbox"/>	Burning/fire <input type="checkbox"/>	Boat traffic <input type="checkbox"/>	
	Railways <input type="checkbox"/>	Control dams <input type="checkbox"/>	Drainage <input type="checkbox"/>	
	Trails (bike, ATV) <input type="checkbox"/>	Water pumps <input type="checkbox"/>	Other _____	
	Infilling <input type="checkbox"/>	Garbage/dump <input type="checkbox"/>	Other _____	
<u>Invasive species presence:</u>	Phragmites _____	Flower. rush _____		
(W: widespread; Pa: patchy)	P. loosestrife _____	Other _____		
Pr: Presence only)	Phalaris _____	Other _____		
Additional threats (pollution, siltation, other invasive spp); predators (observed, signs, tracks)				
Other remarks/notes				

## Appendix J: Wetland Habitat Characteristics Data Sheet (reverse side)

### Open Water Types

White areas indicate open water (including floating and submerged plants).  
Stippled areas indicate emergents, shrubs and trees.

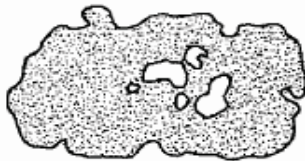
Type 1



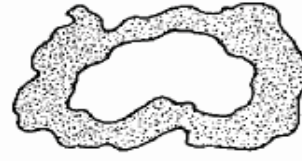
Type 2



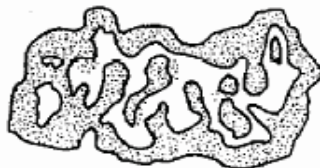
Type 3



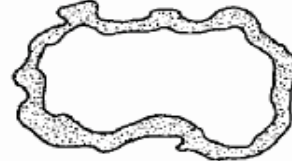
Type 4



Type 5



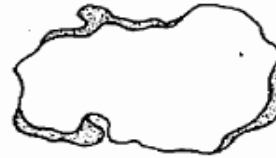
Type 6



Type 7



Type 8



Type 1. Open water occupies less than 5% of the wetland area.

Type 2. Open water occupies 5-25% of the wetland area, occurring in a central area.

Type 3. Open water occupies 5-25% of the wetland area, occurring in ponds of various sizes; vegetation occurs in dense patches or diffuse open stands.

Type 4. Open water occupies 26-75% of the wetland area, occurring over a central area.

Type 5. Open water occupies 26-75% of the wetland area, occurring in a pattern where small ponds and embayments are common.

Type 6. Open water occupies 76-95% of the wetland area, occurring in a large central area; vegetation is peripheral.

Type 7. Open water occupies 76-95% of the wetland area; vegetation occurs in patches or diffuse, open stands.

Type 8. Open water occupies more than 95% of the wetland area.

**Appendix K: Sample Completed Wetland Habitat Characteristics Data Sheet**

Canadian Wildlife Service ~ Least Bittern Survey Wetland Habitat Features				
Wetland name:	LE GRAND MARAIS		Date:	15 JUNE 2008
Nearest town/city:	OSLO		Observers:	L BITTER
County/municipip.:	TORONTO		Contact info:	911-872-4102
Protected area:	No <input checked="" type="checkbox"/> Yes <input type="checkbox"/>		email:	NONE
Geographic coordinates of wetland access point:	Lat: _____	Long: _____	NAD: _____	
	UTMnorth: 5210334	UTMeast: 784127	UTM zone: 17	
Water level management	No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>	Size of wetland (ha):	35	
If yes, then:	Impoundment: <input checked="" type="checkbox"/>	Size of suitable habitat (ha):	20	
Other: <input type="checkbox"/>	Beaver pond: <input type="checkbox"/>	Open water types (1 to 8) (see reverse of sheet)	3	
Wetland type (%):	Marsh: _____	Bog: _____	Swamp: _____	Fen: _____
Adjacent land-use: (% of edge)	Urban: 40	Native grassland: _____		
	Cropland: 10	Forest/shrubland: 40		
	Pasture: 10	Other: _____		
	Open water: _____	Other: _____		
% cover of habitat components within suitable habitat	Standing emerg.: 80	Floating plant cover in open water areas:	Dense <input type="checkbox"/>	
	Shrubs: _____		Moderate <input type="checkbox"/>	
	Open water: 20		Slight <input checked="" type="checkbox"/>	
	Mud flats: _____		None <input type="checkbox"/>	
	Trees: _____		Not Applic. <input type="checkbox"/>	
	Other (spp): _____			
Human influence:	Dyke <input checked="" type="checkbox"/>	Sewage lagoon <input type="checkbox"/>	Noise <input type="checkbox"/>	
	Artificial channels <input checked="" type="checkbox"/>	Sign of pollution <input type="checkbox"/>	Recreation <input type="checkbox"/>	
	Roads <input checked="" type="checkbox"/>	Burning/fire <input type="checkbox"/>	Boat traffic <input type="checkbox"/>	
	Railways <input type="checkbox"/>	Control dams <input checked="" type="checkbox"/>	Drainage <input type="checkbox"/>	
	Trails (bike, ATV) <input type="checkbox"/>	Water pumps <input checked="" type="checkbox"/>	Other _____	
	Infilling <input type="checkbox"/>	Garbage/dump <input type="checkbox"/>	Other _____	
Invasive species presence:	Phragmites: Pa	Flower. rush: _____		
(W: widespread; Pa: patchy)	P. loosestrife: Pa	Other: _____		
Pr: Presence only)	Phalaris: _____	Other: _____		
Additional threats (pollution, siltation, other invasive spp); predators (observed, signs, tracks)				
cornfields, hawks, marsh wrens				
Other remarks/notes DU wetland - Land owner very receptive. Farmers are spraying chemicals				

## **Appendix L: Least Bittern Incidental Observation Data Card (continued)**

Least Bitterns are observed incidentally at various times of the year by birders and other people not using this or any other specific survey protocol. Any information on Least Bittern locations is highly valuable as it increases our knowledge of the species distribution and abundance as well as behavioural responses, potential threats to the birds and their habitat, and habitat use throughout the Canadian range. This “Least Bittern Incidental Observation Data Card” should be completed for every Least Bittern observation which has not been otherwise reported, using the following data sheet. **Please report your observation to your Canadian Wildlife Service regional office.**

Information to be recorded includes:

- Name, postal address, email address, and telephone number of observer(s).
- Location, date and time of the observation.
- Number of adults (males, females, undetermined sex), type of detection and response calls observed.
- Information on nesting activities (nest, eggs, young, fledglings).
- Bird detected using broadcast call or not, if the bird was detected before, during or after the broadcast call and if the bird approached towards the surveyor.
- Behavioural observations.
- Dominant vegetation communities within the observation area.
- Presence of invasive plant species within the wetland.
- Presence of other marshland-dependant bird species.
- Human activities possibly influencing the wetland and breeding birds.

A sketch map of the site location and the position of Least Bitterns and/or nests should be drawn to ensure that surveyors can be directed to the exact same location in future field visits.

Surveyors in Quebec are also encouraged to report their observations via the internet on the “Regroupement QuebecOiseaux” website: [www.quebecoiseaux.org](http://www.quebecoiseaux.org) and those in Ontario are encouraged to do so on the “Natural Heritage Information Center” of the Ontario Ministry of Natural Resources website: [http://nhic.mnr.gov.on.ca/nhic\\_.cfm](http://nhic.mnr.gov.on.ca/nhic_.cfm).



**Appendix L: Least Bittern Incidental Observation Data Card (continued)**

<b>Canadian Wildlife Service ~ Least Bittern Incidental Observation Data Card</b>									
<b>Observer information</b>									
Last Name: _____		Phone: (____) _____		First Name: _____		email: _____			
Address: _____		City/Town: _____ Additional observers: _____							
Postal Code: _____		Province: _____		_____					
<b>Observation record</b>									
Location name: _____				Protected area: No <input type="checkbox"/> Yes <input type="checkbox"/>					
(for ex. name of the wetland)				City/Municipality: _____ If yes, name: _____					
Geographic coordinates:		Lat: _____		Long: _____		NAD: _____			
		UTMnorth: _____		UTMeast: _____		UTM Zone: _____			
Date: _____		Start hour: _____		End hour: _____					
(day/month/year)		(hr:min)		(hr:min)					
LEBI	Sex	Detection		Type of call			Number of:		
1)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/>	Sound <input type="checkbox"/>	Coo <input type="checkbox"/>	Ank <input type="checkbox"/>	Kak <input type="checkbox"/>	Other _____	nests _____	
2)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/>	Sound <input type="checkbox"/>	Coo <input type="checkbox"/>	Ank <input type="checkbox"/>	Kak <input type="checkbox"/>	Other _____	eggs _____	
3)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/>	Sound <input type="checkbox"/>	Coo <input type="checkbox"/>	Ank <input type="checkbox"/>	Kak <input type="checkbox"/>	Other _____	young _____	
4)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/>	Sound <input type="checkbox"/>	Coo <input type="checkbox"/>	Ank <input type="checkbox"/>	Kak <input type="checkbox"/>	Other _____	fledglings _____	
Coo-coo-coo (territorial); Ank (in flight); Kak: (alarm call)									
Playback used:		Yes <input type="checkbox"/>		Bird detection relative to playback			Bird approaching the surveyor		
		No <input type="checkbox"/>		Before <input type="checkbox"/>	During <input type="checkbox"/>	After <input type="checkbox"/>	Yes <input type="checkbox"/>		
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No <input type="checkbox"/>		
Dominant vegetation					Behaviour observed				
Cattail <input type="checkbox"/>		Willow <input type="checkbox"/>		Pair seen <input type="checkbox"/>		Feeding <input type="checkbox"/>			
Sedge <input type="checkbox"/>		Bulrush <input type="checkbox"/>		Alarm call <input type="checkbox"/>		Resting <input type="checkbox"/>			
Buttonbush <input type="checkbox"/>		Bur-reed <input type="checkbox"/>		Flying <input type="checkbox"/>		Other _____			
Phragmites <input type="checkbox"/>		<input type="checkbox"/>		Invasive plants					
Other _____		<input type="checkbox"/>		Phragmites <input type="checkbox"/>		P. loosestrife <input type="checkbox"/>			
		<input type="checkbox"/>		Phalaris <input type="checkbox"/>		Flower. rush <input type="checkbox"/>			
Other marshland bird species					Human influence				
Pied-billed Grebe <input type="checkbox"/>		Black Tern <input type="checkbox"/>		Dykes/dams <input type="checkbox"/>		Recreation <input type="checkbox"/>			
Virginia Rail <input type="checkbox"/>		Marsh Wren <input type="checkbox"/>		Roads/rails <input type="checkbox"/>		Boat traffic <input type="checkbox"/>			
Sora <input type="checkbox"/>		American Coot <input type="checkbox"/>		Infilling <input type="checkbox"/>		Burning/fire <input type="checkbox"/>			
King Rail <input type="checkbox"/>		Common Gallinule <input type="checkbox"/>		Garbage <input type="checkbox"/>		Pollution <input type="checkbox"/>			
Yellow Rail <input type="checkbox"/>		American Bittern <input type="checkbox"/>		Other _____					
Map/note on the site location						Mark Least Bittern and nest locations			
(use additional page if required)									
Is this your first detection at this site? Yes <input type="checkbox"/> No <input type="checkbox"/>									
Remarks/notes _____									

*Please report your observation to your Canadian Wildlife Service regional office*

**Appendix M: Sample Completed Least Bittern Incidental Observation Data Card**

<b>Canadian Wildlife Service ~ Least Bittern Incidental Observation Data Card</b>									
<b>Observer information</b>									
Last Name:		Jobin			Phone:		(418) 644-6863		
First Name:		Benoit			email:		benoit-jobin@cc.gc.ca		
Address: <u>CWS - Quebec</u>									
City/Town:					Additional observers: <u>D. Beland</u>				
Postal Code: _____ Province: <u>QC</u>									
<b>Observation record</b>									
Location name: <u>marais Provender</u>					Protected area: No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>				
(for ex. name of the wetland)									
City/Municipality: <u>Nouvelle</u>					If yes, name: <u>marais provender</u>				
Geographic coordinates:									
Lat: <u>46,72022</u>		Long: <u>-71.53859</u>		NAD: <u>83</u>					
UTMnorth: _____		UTMeast: _____		UTM Zone: _____					
Date: <u>24 JUNE 2006</u>		Start hour: <u>6:10</u>		End hour: <u>8:25</u>					
(day/month/year) (hr:min) (hr:min)									
LEBI Sex Detection Type of call Number of:									
1)	M <input checked="" type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/> Sound <input checked="" type="checkbox"/>	Coo <input checked="" type="checkbox"/> Ank <input type="checkbox"/> Kak <input type="checkbox"/> Other _____	nests <u>1</u>					
2)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/> Sound <input type="checkbox"/>	Coo <input type="checkbox"/> Ank <input type="checkbox"/> Kak <input type="checkbox"/> Other _____	eggs <u>4</u>					
3)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/> Sound <input type="checkbox"/>	Coo <input type="checkbox"/> Ank <input type="checkbox"/> Kak <input type="checkbox"/> Other _____	young _____					
4)	M <input type="checkbox"/> F <input type="checkbox"/>	Sight <input type="checkbox"/> Sound <input type="checkbox"/>	Coo <input type="checkbox"/> Ank <input type="checkbox"/> Kak <input type="checkbox"/> Other _____	fledglings _____					
Coo-coo-coo (territorial); Ank (in flight); Kak: (alarm call)									
<b>Bird detection relative to playback</b>									
Playback used:		Yes <input type="checkbox"/>		Before <input type="checkbox"/>		During <input type="checkbox"/>		After <input type="checkbox"/>	
		No <input checked="" type="checkbox"/>							
<b>Bird approaching the surveyor</b>									
					Yes <input type="checkbox"/>		No <input type="checkbox"/>		
<b>Dominant vegetation</b>									
Cattail <input checked="" type="checkbox"/>		Willow <input type="checkbox"/>		Pair seen <input type="checkbox"/>		Feeding <input type="checkbox"/>			
Sedge <input type="checkbox"/>		Bulrush <input type="checkbox"/>		Alarm call <input type="checkbox"/>		Resting <input type="checkbox"/>			
Buttonbush <input type="checkbox"/>		Bur-reed <input type="checkbox"/>		Flying <input checked="" type="checkbox"/>		Other _____			
Phragmites <input type="checkbox"/>									
Other _____									
<b>Behaviour observed</b>									
<b>Invasive plants</b>									
Phragmites <input checked="" type="checkbox"/>		P. loosestrife <input type="checkbox"/>							
Phalaris <input type="checkbox"/>		Flower. rush <input checked="" type="checkbox"/>							
<b>Other marshland bird species</b>									
Pied-billed Grebe <input checked="" type="checkbox"/>		Black Tern <input type="checkbox"/>		Dykes/dams <input checked="" type="checkbox"/>		Recreation <input type="checkbox"/>			
Virginia Rail <input type="checkbox"/>		Marsh Wren <input checked="" type="checkbox"/>		Roads/rails <input checked="" type="checkbox"/>		Boat traffic <input type="checkbox"/>			
Sora <input checked="" type="checkbox"/>		American Coot <input type="checkbox"/>		Infilling <input type="checkbox"/>		Burning/fire <input type="checkbox"/>			
King Rail <input type="checkbox"/>		Common Gallinule <input checked="" type="checkbox"/>		Garbage <input type="checkbox"/>		Pollution <input type="checkbox"/>			
Yellow Rail <input type="checkbox"/>		American Bittern <input type="checkbox"/>		Other _____					
<b>Human influence</b>									
<b>Map/note on the site location</b>									
ST. Lawrence River					Mark Least Bittern and nest locations				
Is this your first detection at this site? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>									
Remarks/notes <u>nest on the east side, edge of cattail patch. windy.</u>									

Please report your observation to your Canadian Wildlife Service regional office



**[www.ec.gc.ca](http://www.ec.gc.ca)**

Additional information can be obtained at:

Environment Canada

Inquiry Centre

10 Wellington Street, 23rd Floor

Gatineau QC K1A 0H3

Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800

Fax: 819-994-1412

TTY: 819-994-0736

Email: [enviroinfo@ec.gc.ca](mailto:enviroinfo@ec.gc.ca)