Birds of Ontario

Birds of Ontario: Habitat Requirements, Limiting Factors, and Status

AL SANDILANDS

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Habitat Requirements, Limiting Factors, and Status

NONPASSERINES: SHOREBIRDS THROUGH WOODPECKERS

With illustrations by Ross James

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Introduction

The purpose of this book is to summarize life history requirements of the nonpasserine birds of Ontario, from shorebirds through woodpeckers. This will conclude the treatment of nonpasserines, with volume 1 (Sandilands 2005) covering waterfowl through cranes. Two additional volumes are planned to deal with passerine species.

SCOPE AND SOURCES OF INFORMATION

This volume covers nonpasserines from shorebirds to woodpeckers that occur regularly in Ontario. Only species that are normally part of the ecology of the province are included in the accounts. Vagrants and extremely rare species are not discussed, as they are typically out of their normal range and habitat.

For this volume, I had some difficulty in deciding whether an account for certain species should be included. One of the general rules I have used is that an account is included for all species that have nested in the province. Hence, an account for the Black-necked Stilt has been included as a result of its single, extralimital nesting in 2004. I have violated this rule for the Passenger Pigeon, however, and have not included an account for it. Unfortunately, there is nothing new to add to existing literature for this extinct species.

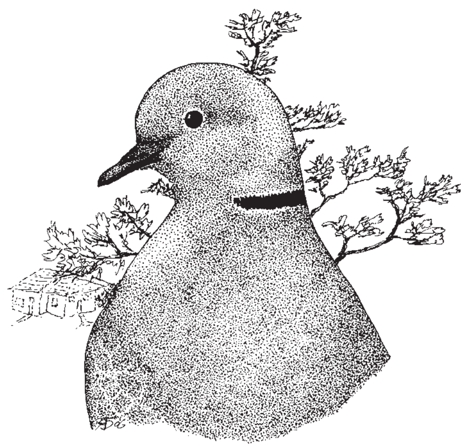
The shorebirds that occur only as migrants in the province presented the most difficulty as I debated whether or not to prepare an account. Many of these, such as the Black-bellied Plover, occur regularly in the province during migration, and accounts were prepared for all of these types of species. An account is presented for the Eskimo Curlew, as it was once a regular migrant in the province and hopefully is still with us.

The gulls also presented a problem. Several other species occur with some regularity, particularly in late autumn and winter in the Niagara River corridor and the lower Great Lakes. I have opted not to prepare species accounts for these, as there would be relatively little to discuss about their ecology while they are in the province. In addition, there appear to be no areas in Ontario that are critical to the life history of any of these species. For the jaegers, a species account is presented only for the Parasitic Jaeger, which breeds in the province. The Long-tailed and Pomarine jaegers are rare but relatively regular migrants along the Hudson Bay coast and in the lower Great Lakes, but other than providing principal dates of occurrence, there would be little to discuss about these species.

Through strict application of the breeding evidence rules for the Ontario Breeding Bird Atlas, some species that I have not included as breeding species are considered breeders by one or both of the atlases (Cadman et al. 1987, 2007). These include the Purple Sandpiper, Glaucous Gull, Eurasian Collared-Dove, and Snowy Owl. An account is presented for three of these species in this volume as they occur regularly during migration or winter, but no account is presented for the Eurasian Collared-Dove. There would be nothing that I could add to the species account in the atlas (Coady in Cadman et al. 2007). To date, there is no concrete evidence that any of these species has bred in Ontario, but it is probably inevitable that the collared-dove will become part of Ontario's breeding avifauna.

Three aspects of bird life histories are the focus in this book: habitat requirements, limiting factors, and status. Where applicable, each species is discussed during the breeding season, migration, and winter. A more detailed explanation of the format of the species accounts follows.

Many topics typically considered in life history accounts have been omitted. These include description and identification information, vocalizations, behaviour, parasites, and predators. Occasionally, the latter three topics are discussed if they have a direct bearing on habitat use, are a limiting factor, or may affect the status of the species.



Eurasian Collared-Dove

The information in the species accounts is derived almost entirely from published data. All pertinent North American literature has been consulted as well as relevant data from Eurasia and Scandinavia. The accounts, however, also contain my unpublished personal observations, those of reviewers, and those of individuals who have provided me with some of their personal knowledge.

FORMAT OF THE SPECIES ACCOUNTS

The order and nomenclature of the accounts follow the seventh edition of the American Ornithologists' Union (1998) *Check-list of North American Birds* and corrections and supplements to it (American Ornithologists' Union 1999, 2000; Banks et al. 2002, 2003, 2004, 2005, 2006, 2007, 2008). Scientific names of plants and animals mentioned in the text are provided in the appendix. Bird species for which species accounts are presented in this volume are not included in the appendix.

Definitions of the extent of southern and northern Ontario are identical to those presented by James (1991), and similar to the delineation used in the Ontario Breeding Bird Atlas (Cadman et al. 1987, 2007). The 47th parallel is used to distinguish between northern and southern portions of the province. Figures 1A and 1B show southern and northern Ontario, along with municipal boundaries and most localities mentioned in the text. Figure 2 indicates the extent of the Deciduous Forest, Great Lakes–St. Lawrence Forest, Boreal Forest, and Tundra; the southern limit of the Hudson Bay Lowland; the farming areas in the Clay Belt; and the southern edge of the Canadian Shield.

The species accounts deal with three biological seasons: breeding, migration, and winter. Due to the different "biological clocks" of various species, these seasons are only loosely related to the human calendar. For example, February is winter for most species, but breeding season for the Great Horned Owl and migration period for the Horned Lark.

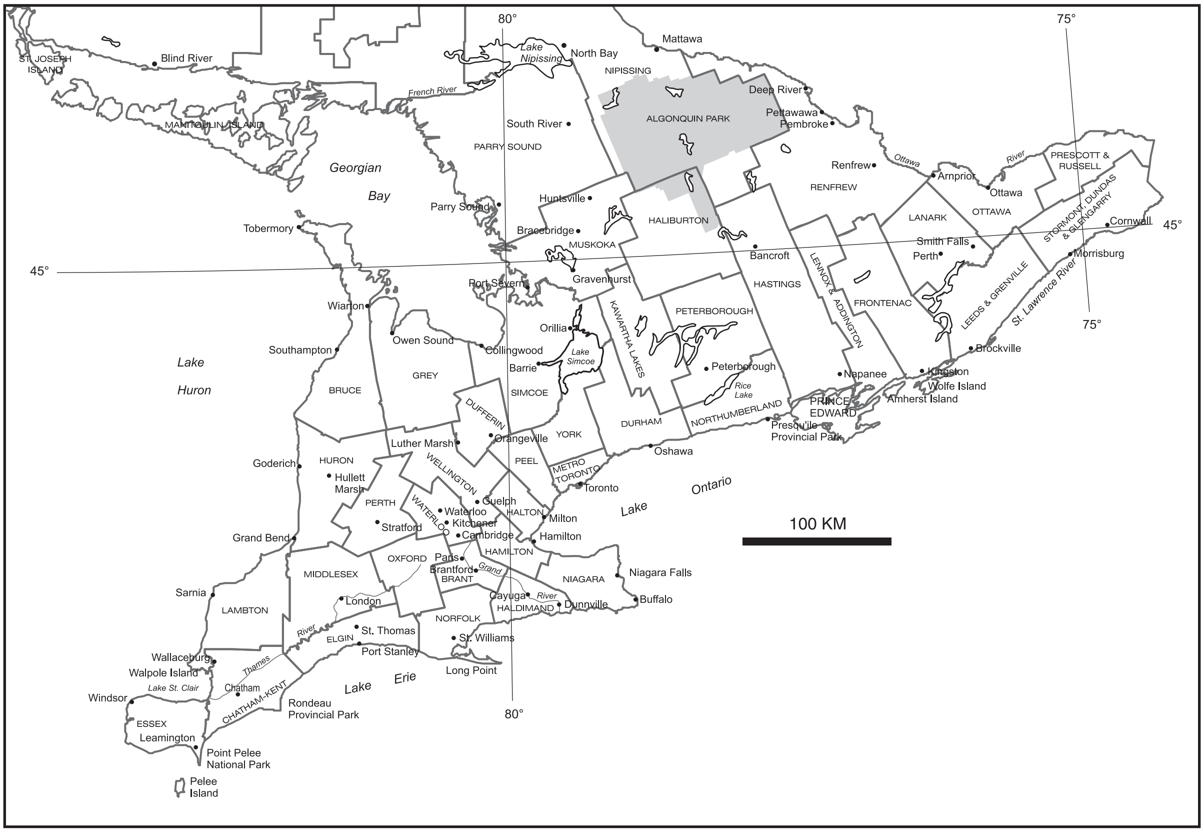


Figure 1A *Counties, regional municipalities, districts, urban centres, and other localities in southern Ontario.*

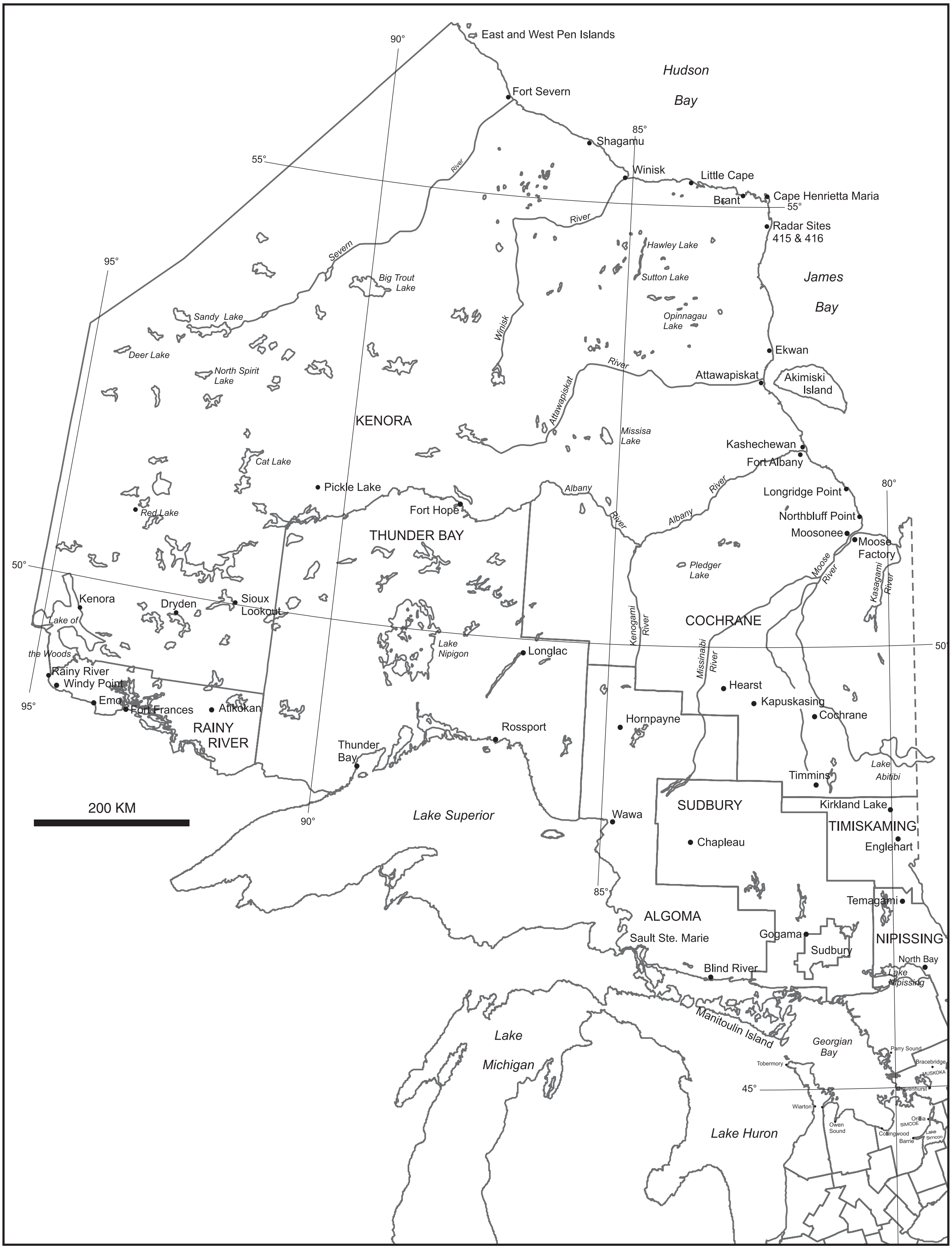


Figure 1B *Districts, urban centres, and other localities in northern Ontario.*

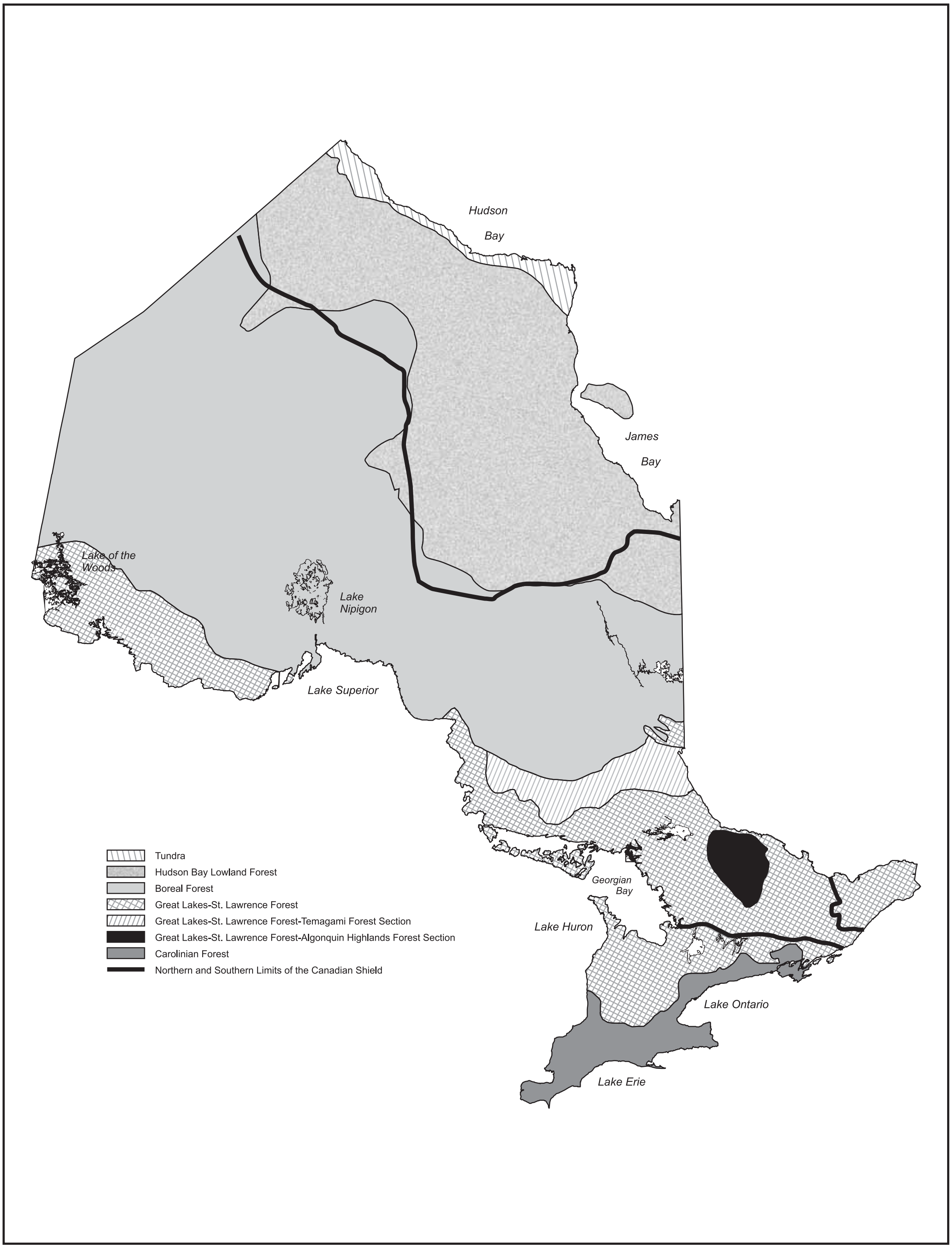


Figure 2 *Physiographic and forest regions, and selected forest sections of Ontario.*

For each species, approximate dates of major life history events have been identified. In many cases, different dates are relevant to northern and southern portions of the province. Ranges of dates of occurrence are often presented, and usually extremes are given along with periods of peak occurrence.

Winter species generally include only birds that normally occur in the months of January and February. December birds and those reported on Christmas Bird Counts are considered late autumn species.

Not all species are present during all three biological seasons. When a species is consistently absent in a season, or very rare and sporadic, this season is not mentioned in the species account. Breeding requirements are discussed for all species that have nested even only occasionally in the province, except for the Passenger Pigeon, as previously discussed.

The following sections describe topics that are usually addressed during the three seasons. If no information is presented, it is because I could not find any. Although I have undoubtedly overlooked some publications, lack of discussion usually means that no information is available. In cases where information is obviously lacking, this is stated. Perhaps this will stimulate research.

I continued to wrestle with how to present references in species accounts. One option that was originally considered for the first volume was to list references at the end of the account. But this would make it difficult for someone who was interested in looking up a reference for a particular topic. References were therefore included for each paragraph, usually at the end. The disadvantage of this is that it increases the length of species accounts and may detract from readability. In some cases, the list of references at the end of a paragraph is very long, mostly on topics related to diet. When this occurred in the first volume, I occasionally omitted general references such as Bent's life histories and *The Birds of North America* species accounts that researchers would probably refer to in any case.

The style of presenting references in this volume is essentially the same as in the first volume. An exception is that I have not left out general references such as Bent and *The Birds of North America* accounts, even when the reference list is long at the end of a paragraph.

The presentation of references within species accounts is still a compromise. To some, the references within the text will continue to be a source of annoyance, but for others the references are one of the more important components of the book. For those who wish to attribute a single sentence within a paragraph to a particular citation, the current method of presenting references makes this difficult. In many cases, a researcher may have to look up several of the references cited at the end of a paragraph to find the relevant one. Having since used the first volume, I have personally found this to be annoying.

Although a highly academic publication should have references to support each statement that is not a personal opinion, I have continued to put most of the references at the end of paragraphs. The rationale for this is twofold. First, if references were included for each sentence, this would greatly increase the length of species accounts and would probably decrease readability. Second, a statement frequently cannot be attributed to a single paper, as I often synthesize results from several papers. One fault that reviewers may find is that statements may not exactly reflect what any author said. In addition, some fairly simple statements may combine results from several studies; for example, "full clutches of 3-10 eggs have been reported, with most containing 5-7 eggs." Typically, the maximum and minimum clutch sizes are from different studies and the most frequent clutch sizes may be from one or two other studies. To fully and properly reference this short sentence, a minimum of three to four references would have to be cited. In reality, even more may be necessary. For instance, if five studies concluded that most clutches contained 5-7 eggs, I reference all five studies, as this provides stronger evidence for this conclusion.

Breeding Season

Under habitat requirements, three topics are discussed in all accounts: nesting habitat, a description of the nest and where it is likely to be situated, and the territory and/or home range size. Additional information that may be presented includes homing to territories, brood habitat, moulting areas, staging areas prior to migration, and special habitat requirements such as roosts.

Under limiting factors, information is always provided on the time of key events in the nesting period, the annual reproductive effort, mating systems, and diet. Topics discussed about timing include when nesting is usually initiated, the egg-laying interval and the time required to complete a clutch, incubation period, fledging age, and period of dependence on adults. Factors considered under reproductive effort are number of broods raised, whether renesting occurs, and clutch size. Under mating systems are age at first breeding, breeding periodicity if breeding does not always occur every year, whether or not the species is monogamous, and mate fidelity. The discussion of diet emphasizes the breeding season. However, diet in other seasons is occasionally included here if there are no significant differences among seasons, or if the entire diet can be summarized briefly. Besides a description of food items, information on food-size preferences may be presented, and it is noted whether feeding territories are defended. Feeding techniques and substrate are also described.

The section on breeding season limiting factors is frequently the most extensive portion of a species account. In addition to the material that is always addressed, habitat loss and fragmentation, human disturbance, environmental contaminants, effects of water-level fluctuations, logging impacts, nest parasitism, water and air quality, nest-site availability, interspecific competition, and many other factors may be discussed. When no additional information is provided, it is because there is no evidence to suggest that adverse effects are occurring or because no information is available.

For status, a historical perspective of changes since the late 19th century to the present is given. In some instances, the future status of species has been predicted. Occasionally, a distinction is made between status in the northern and southern portions of the province.

The status section is the weakest in the book, simply because status is so dynamic and because it varies so much across the province. In addition, many bird species are not routinely monitored throughout the province by any survey program, and there is simply no reliable information on the status of many species. For status, I have identified differences in abundance over large geographic areas, such as on and south of the Canadian Shield, but I have seldom discussed differing abundance levels within smaller regions. There are numerous excellent publications on birds in different regions of the province and these should be consulted for more detailed information on local status.

The Ontario Breeding Bird Atlas program is an important analysis of breeding bird distribution and status in the province. Two atlases have been completed to date. Fieldwork for the first atlas was completed from 1981 to 1985 and results were summarized by Cadman et al. (1987). Fieldwork for the second atlas was conducted from 2001 to 2005 and results were summarized by Cadman et al. (2007). Throughout this and subsequent volumes, I refer simply to the "first atlas" and the "second atlas," and these are the publications by Cadman et al. (1987) and Cadman et al. (2007), respectively.

Ontario Breeding Bird Atlas Estimates of Abundance and Trends

The second atlas (Cadman et al. 2007) presented status for bird species in three different manners: changes in probability of observation since the first atlas, relative abundance in different areas of the province based on point counts, and population estimates, also based on point counts. A brief summary of how these data were calculated is presented here so that readers will understand what these terms mean when used in the species accounts.

Probability of Observation

The probability of observation is essentially the percentage of squares that a species could be expected to be found in during 20 hours of atlassing effort within the province and the five regions that were used in analyzing atlas data. For a full discussion of the methods of calculating the changes in the probability of observation, Cadman et al. (2007) should be consulted. To compare the results of the two atlases, a data set of squares was selected that had at least 10 hours of atlassing effort in each of the atlases. For each square, the atlas that had the lower amount of effort (in atlasser hours) was identified and data from the other atlas were selected to match the effort level as closely as possible. This meant including only the species detected within a number of hours that came close to the hours in the other atlas period. Squares in southern Ontario without close matches were excluded from the analysis. One potential problem with this method is the difference in how effort was reported during the two atlases. During the first atlas, volunteers simply provided information on dates when atlassing occurred and the effort expended, but no record was maintained of when each species was documented. During the second atlas, the visit during which a species was first observed was recorded, thereby giving a better indication of the effort required to find each species.

Logistic regression was applied to the matched-effort data set to calculate the probability of finding breeding evidence for a given species according to the amount of effort. This allowed determination of the probability that a species would be found in an atlas square after 20 hours of effort. The result was a standardized measure of the probability of observation of a given species adjusted to 20 hours of effort, which permitted comparisons between the first and second atlases.

For northern Ontario, where there was less consistent coverage, logistic regressions to estimate probability of observation in 20 hours were conducted using all squares with at least 10 hours of effort in either atlas, without matching squares.

Measures of habitat and latitude and longitude were included in regressions for both northern and southern Ontario to ensure that the probability of finding a species was representative of the entire region.

The methods used were scientifically rigorous yet potentially introduce some sources of error. Perhaps one of the largest potential sources of error is the skill of the observer. If the same square were surveyed by an expert birder during one atlas and a novice during the other, there would undoubtedly be differences in the probability of observation of species that were unrelated to the abundance of the species. The habitat characterizations used in the atlas were very general, such as forest, grassland, and wetlands, so it is uncertain how useful these were in predicting where species might occur in areas that were not sampled. The analysis may also have underestimated the probability of observation in that data from unpaired squares in the south were not used. Also, if a species was not observed until 21 hours of effort, it was considered absent for the purposes of the analysis.

In calculating the significance of changes in probability of observation of species, proportional changes were used. For instance, if a species was observed in 5% of squares during the first atlas and 3% during the second atlas, this was considered a 40% decline rather than a 2% decline. A value of $p < .1$ was considered to indicate a statistically significant difference between atlases. In most scientific works, statistical significance is determined at the $p < .05$ level. Unfortunately, the second atlas did not identify the level of statistical significance (.1, .05, .01, or .001) of identified changes in probability of observation.

In general, the information on changes in probability of observation of species reported by Cadman et al. (2007) is very useful. There are occasions, however, when the statistics do not make biological sense. In many cases, a species was found in more squares during the second atlas than during the first, but is identified as significantly declining based on the statistical analysis of the probability of observation. In these instances, I have also provided information on the number of squares that the species was detected in.

Abundance Maps

Abundance maps were presented in the second atlas for species that were detected on sufficient point counts. In general, these were excellent in defining areas of the province where a species was most abundant. Results were shown in six categories of abundance and reported as number of birds observed per 25 point counts. These maps have to be interpreted with caution for two reasons. The first is that the highest level of abundance for some species is quite low. For example, the highest categories of abundance for the Ruby-throated Hummingbird and Belted Kingfisher were 0.87-1.73 and 0.57-3.56 birds per 25 point counts, respectively. Consequently, simply detecting one of these birds on one of the 25 point counts in a square automatically makes that an area of high abundance. In addition, point counts are not particularly effective for detecting either of these species, and the kingfisher may feed several kilometres from its nesting area.

The second reason to view the abundance maps with caution is that kriging was used to present the data on the maps. Kriging smooths out data from individual squares and interpolates among neighbouring squares, creating an averaged surface. In this case, a single high count in one square can result in a large area being mapped as having high abundance. In some cases, the breeding evidence map shows a particular species as not having been detected in an area that is shown to have the highest relative abundance on the abundance map.

Although there are some caveats to consider when interpreting the abundance maps in the atlas, they are generally very helpful in determining a species' local abundance within the province. I have used this information throughout this book, although abundance maps were generated in the atlas for relatively few of the species covered here.

Atlas Population Estimates

The second atlas also provided population estimates for bird species detected on sufficient point counts, and estimates were provided for the entire province as well as the five regions used for data analysis in the atlas. Population size was considered equal to (count average)/(area per count × region area × detection adjustments). The count average was determined from the kriged abundance maps that were presented in the atlas species accounts. As noted above, the kriging can introduce errors through the interpolation process. The count average was divided by the area sampled per point count to give an approximate measure of density of birds. The area sampled depended upon factors such as how far away a bird can be heard and how active birds are during five-minute point counts on June mornings. Species were assigned to six detection-distance categories ranging from 80 m for small, relatively quiet birds to 400 m for large, loud, or active flying birds, and the Turkey Vulture was assigned a detection distance of 800 m.

Adjustments to results were also made for birds that were considered "not detected" or missed during the five-minute point count. A species-specific "time of day" adjustment was used to increase the count average for birds that have a peak of activity during part of the morning and reduced detection at other times. The example provided in the atlas is the Wood Thrush, which is apparently detected 2.3 times more often at dawn than during the remainder of the day; the count average for the Wood Thrush was therefore multiplied by 2.3 to account for undetected birds later in the day. A pair adjustment of 2 was also applied to all species, with the assumption that each bird detected was a male that represented a pair.

The methods used in the atlas to calculate population numbers were the same as those used for the Partners in Flight landbird conservation program. Thogmartin et al. (2006a) highlighted several limitations of these methods. The most significant is uncertainty in detection distances, and this was the factor for which there was the least information. Population estimates vary inversely with the square of detection distance, so the effect of halving the detection distance is a fourfold increase in the population estimate. Consequently, ascribing the wrong detection-distance factor to a species would result in the population estimate being very inaccurate. Thogmartin et al. (2006a) also noted that there are nonbreeding floater males in the populations of many species, so doubling the count may result in an overestimate. There are also likely errors introduced due to the time of day detection adjustments. In addition, the point counts were undertaken in June and probably underestimated the numbers of earlier-breeding species such as grouse, shorebirds, and some woodpeckers.

In addition to the above limitations and potential sources of error in the population estimates acknowledged in the atlas and by Thogmartin et al. (2006a), there may be other errors associated with the pair adjustment factor of 2. First, it is likely that some females or pairs were detected on some point counts. This would result in an overestimate of the population. Perhaps more important, many species are polygynous, especially those that inhabit grasslands and marshes. A male Red-winged Blackbird may have as many as 15 females nesting within his territory. The population size of species that are regularly polygynous was probably underestimated, and possibly by a considerable factor for some species.

Confer et al. (2008) field-tested the method for converting point count data into abundance estimates for 29 species where territories of most breeding birds were known. They found that detection efficiency during the point count was only 3-49%. The Partners in Flight method assumes a 100% detection rate, and Confer et al. (2008) found that the detection distances assumed by the method were much too high. The method underestimated abundance of individual species in their study area by 2-30 times. They recommended that this method not be used to derive population estimates.

Because of all the inherent difficulties in calculating numerical population sizes for common species in an area as vast as Ontario, I have not referenced the population estimates calculated from point count data that are presented in Cadman et al. 2007. For rare species, relatively accurate estimates of the number of breeding pairs in the province are occasionally given. These figures are usually based on the results of the breeding bird atlas or specific studies.

Breeding abundance has been defined slightly differently than for migration and winter. During the breeding season, species maintain territories or home ranges that disperse birds throughout suitable habitat. For most species, territorial boundaries dissolve in other seasons, allowing concentrations of birds in preferred habitats.

Abundance is admittedly difficult to define, and has been done in several ways historically. The most frequently used technique is based on how many breeding pairs could potentially be recorded daily. This definition works well for common and abundant species that are readily observed and use widespread habitats. Species that are difficult to detect, have large territories, or have specialized habitat requirements may not be adequately defined by these criteria.

Abundance of species can be greatly affected by the size of their territory and the availability of their preferred habitats. Some raptors have extremely large home ranges and would not be plentiful even if the entire province were suitable habitat. The Peregrine Falcon, in addition to having large area requirements, is limited by the availability of nest sites such as cliffs or skyscrapers. Thus, even under ideal conditions, it would not be a common species in the province.

Even species that do not have specialized habitat requirements are limited by the abundance of their general habitat needs. Southern Ontario species that nest in urban areas, pastures, or old fields are likely to be more common than those that require bogs, simply because the former habitats are much more common.

Among species inhabiting a particular vegetation type, there are usually generalists and specialists. This has been well documented for forests but probably applies to wetlands and grasslands also, and limited research supports this hypothesis. In forest habitats, the generalists are edge species that occur around the periphery of woodlots, and they often use adjacent open habitats for foraging, displaying, or even nesting. When openings are created in forests, these species are able to exploit microhabitats within the woodlot. Specialists may avoid edges or require specific microhabitats within the forest. Thus, within any given forest or any other habitat, generalist species are more abundant than specialists.

An attempt has been made to take all of the above factors into account when assigning a status designation to a species. When one or more factors affect abundance, this is usually stated under both limiting factors and status.

A reasonable estimate of abundance is whether the existing habitat is being used to its carrying capacity. A species could be considered common to abundant if all suitable habitat was defended in nesting territories. Although there are some obvious microhabitat preferences, Savannah, Grasshopper, and Henslow's sparrows occupy similar habitats, and may nest together in the same field. Based on their occupancy or utilization of available habitat within their normal geographic range, they would be classified as abundant, uncommon, and rare, respectively.

With all of the caveats mentioned above, I have used a combination of two techniques to define breeding abundance when actual numbers cannot be estimated: (1) amount of available habitat used, and (2) numbers of birds that could be observed in a single day.

The usage of available habitat is difficult to determine for many species because information on their requirements is deficient. For those species for which an appropriate judgment could be made, I used the following definitions:

Abundant	Virtually all suitable habitat is incorporated into a breeding territory or home range. It is certain that the species will be observed in suitable habitat.
Common	Almost all suitable habitat is incorporated into a breeding territory or home range. It is highly probable that the species will be observed in suitable habitat.
Uncommon	Less than 50% of suitable habitat is used. It is unlikely that the species will occur in any given area, but it can usually be found by searching several areas of suitable habitat.
Rare	Less than 10% of suitable habitat is used. It is highly unlikely that the species will occur in any given area. It is present in isolated portions over a wide geographic range of suitable habitat.

The numerical rating is identical to that used by James (1991). These definitions are based on the number of birds that could be observed during the breeding season away from the periphery of the normal range. The definitions assume that the observer is looking in appropriate habitat and concentrating on that species only.

The following two examples indicate how designations of abundance have been tempered. The Savannah Sparrow (to be covered in volume 4) is considered abundant. In a long day, starting slightly before dawn and ending at nightfall, one could probably find 500 individuals of this species. Admittedly, it would not be easy and the observer might not achieve this, depending on the distance between suitable habitats and the amount of time consumed by walking. On the other hand, if a single suitable habitat patch 500-1,000 ha in area were visited, 500 birds could easily be recorded. The important factors are that whenever suitable habitat is visited, birds will be observed, and that suitable habitat is abundant.

The Lesser Yellowlegs is considered common, which means numerically that one should be able to see between 25 and 500 birds in a day. This species nests in the Hudson Bay Lowland and the northern Boreal Forest Region. The area is relatively inaccessible, but it is likely that 25 could be observed with the aid of a helicopter. The fact that this species is a widespread breeder in the available habitat lends credence to the fact that it is common. Wherever one sets down in a helicopter in suitable habitat, there is a moderate probability of observing a Lesser Yellowlegs.

Following are the numerical definitions of abundance:

Abundant	More than 500 can be seen in one day.
Common	Can always be found (well distributed). More than 25 a day is usual, but seldom more than 500.
Uncommon	Can usually be found but numbers seen are likely to be small (6 to 25 a day).
Rare	Usually seen singly (seldom more than 5) and difficult to find on any particular outing (unless a specific location is known).

James (1991) presented definitions of frequency based on the rate of annual occurrence. Frequency generally has not been a concern, because I have focused on those species that are of regular or occasional occurrence in the province. Regular species are usually present every year, while occasional species occur most years and at least once a decade.

Vagrant species have been ignored in this work, except for species that have been documented breeding in the province. From a breeding perspective, the Black-necked Stilt could be considered a vagrant, yet it is included because breeding has been confirmed.

Migration

In addition to habitat requirements, limiting factors, and status, migration routes and timing are discussed for spring and autumn. For species that have general northward and southward movements over a broad front, no information is provided on routes. Some species, however, have distinct routes that may differ between spring and autumn. In these cases, patterns and frequency of movements throughout the province are presented. This discussion is most relevant to some species of shorebirds. Important staging areas are identified when these are relevant.

Approximate dates of migration are given for each species. This usually includes extreme dates during which migrants may be observed, as well as when the peak migration period is. Dates are provided for different areas of the province when they are available.

For most species, the discussion of habitat requirements during migration is brief. Many species do not have very specific needs during migration; others, however, are limited by their microhabitat requirements. In these instances, more detailed discussion is presented on features such as preferred forest types, water depths, wetland types, and other environmental factors.

No limiting factors are apparent for some species during migration. For others, degradation and loss of habitat, diet (if significantly different from the breeding season), territoriality, hunting, and other factors may be discussed.

Some authors have used average arrival and departure times of species in different periods as an indicator of responses to climate change. In an earlier draft, I included references to Wilson et al. (2000), who related spring arrival dates in Maine in 1899-1911 and 1994-97 to possible adaptations to climate change. One of the reviewers pointed out that there were some flaws with this study and that results for some species were contrary to those experienced in Ontario (Curry 2006; Tozer, in press).

I have decided to omit reference to these types of data in the species accounts, as the entire concept of comparing arrival and departure dates during different time periods and considering them an indicator of climate change is flawed. There is no standardization of methods. Current birders are more numerous and mobile than their predecessors and have better optical equipment. These factors alone make it more likely that a species will be detected earlier in spring or later in autumn now than 20 or 50 years ago. Also, the concept of average spring arrival date may not be particularly relevant. What is more important is when the peak of migration occurs. If there is a change in the period when 50% or more of birds pass through, this would be a significant result; if the first bird seen in spring is detected a few days earlier than in a previous period, this may not be a significant finding.

For status, the numerical definitions of abundance presented in the section on breeding season are used.

Some species are year-round residents in the province. A few of these exhibit some southward movement in autumn, while others disperse from breeding grounds to intermediate habitat prior to going to wintering areas. For resident species that do not remain within the home range all year, habitat requirements and limiting factors are discussed under the heading of autumn. Spring is not treated as a season for these species; most move directly from wintering areas to breeding habitat.

Winter

The winter portion of the account for most species is brief, and is frequently summarized in a few sentences. For a few species, the winter season is significant, with very particular habitat preferences. Limiting factors may include habitat availability, snow depth and other weather variables, and food. Winter status is defined numerically.

Mapping

A map is included for most species. There are, however, seven species of shorebirds for which no maps are presented. These are all species that occur in the province only during migration. No areas of the province appear to be especially important staging habitat for them, there are no known migration corridors, and they typically occur in small numbers when they are present. The seven species for which a map is not presented are the Willet, Western Sandpiper, Baird's Sandpiper, Purple Sandpiper, Buff-breasted Sandpiper, Ruff, and Long-billed Dowitcher.

For the breeding season, the normal breeding range is shown and extralimital or marginal breeding areas may be indicated. For migration, major flyways and staging areas are shown when these exist and are known. Normal wintering areas and extralimital or marginal wintering areas are depicted.

Extralimital habitat includes areas that are outside of the species' normal range, where the species may not occur again. An example is the Black-necked Stilt breeding record for Jarvis.

Marginal habitat is part of the range that is frequently used, but where the species occurs in much lower than normal density because habitat conditions are less than ideal. For instance, many woodpecker species nest sparingly throughout the Hudson Bay Lowland because most trees are too small to support a nesting cavity. I have tried not to confuse low abundance of a species in an area and marginal habitat, but may not have succeeded in some cases. Marginal habitat is habitat that is less than ideal for a species, while low abundance of a species may potentially occur in good as well as marginal habitat.

The range maps are general of necessity. Thus, a species may be locally absent in some areas where the range map indicates that it is present, and isolated records of a species may occur outside of the indicated range. Distribution during the breeding season is relatively well known for most species. The winter range, however, is not well defined for many species, including some very common birds. Christmas Bird Counts are typically completed before winter arrives and Project FeederWatch is the only program that monitors birds over the winter. The northern extent of the winter range of many species has not been determined adequately.

FUTURE RESEARCH

One goal of this book is to stimulate further research. I hope people will see where there are gaps in information and try to fill them.

Like every work of this type, it will become out of date rapidly. I welcome that, because it means that additional research is being undertaken. Some of the facts presented here will be found to be fallacies, but others have been demonstrated to be true over and over again.

Birds change their habitat preferences and distributions over time as well. When I first started birdwatching, I never saw a Mourning Dove in the winter and crows were very rare in winter; Wild Turkeys did not occur in the province, and it was a great day if one managed to see a Double-crested Cormorant. Some species appeared to adapt to human disturbance and habitat fragmentation, with the Pileated Woodpecker being a classic example. My sense is that many species are adapting but others are not. The latter will become the species of conservation concern in the future. In the 1980s and 1990s, forest birds susceptible to habitat fragmentation were the greatest concern. Although many of these are still at risk, others have adapted and are starting to increase their populations, and conservation efforts are underway for many of them. Conversely, several species dependent upon grasslands are now declining significantly, and birds that forage aerially on insects appear to be in significant decline. The shorebirds, in particular, appear to be most at risk as a group. This is because many of them use traditional migration staging areas and wintering areas where a large proportion of the population congregates in one area. This makes them highly vulnerable to factors such as human disturbance and habitat loss and degradation. In addition, some of them depend on one or two species of prey at migration stopover areas, and decline of the prey base may affect the fitness of the birds and their ability to complete their migration or to lay eggs. There is a good possibility that the Eskimo Curlew is already extinct and other shorebird species are highly at risk. The status of many of Ontario's species of birds will change depending on how much habitat remains available to them and how they adapt to changes.

I hope the information provided here will be kept up-to-date, either by an individual who takes on that task or by several people who publish new findings.