

**STATUS OF THE PURPLE MARTIN  
IN BRITISH COLUMBIA**

by  
D.F. Fraser,  
C. Siddle,  
D. Copley  
and  
E. Walters



**BIODIVERSITY**

Wildlife Working Report No. WR-89

**March 1997**

*British Columbia, Canada's most westerly province, has a bounty of biological diversity. British Columbia's snowclad peaks, rain-drenched forests, arid grasslands, all sizes of rivers, lakes, and wetlands, and a long and rugged coast provide habitats for more species of living organisms than are found anywhere else in Canada. However, this very diversity means that there is much to be discovered about these organisms — their distribution, abundance, habitat requirements, and interrelationships with their environment. Increasing our knowledge of this biodiversity will help us with the complex task of sustainably managing our land and waters.*

*In 1992, the Provincial Government initiated a co-operative biodiversity research program with funding from the Corporate Resource Inventory Initiative, the British Columbia Ministries of Forests (Research Branch), Environment, Lands, and Parks (Wildlife and Habitat Protection Branches), and Tourism and Culture (Royal B.C. Museum); and the Forest Resource Development Agreement (FRDA II).*

*In 1995, the Ministry of Forests Research Branch and the Ministry of Environment, Lands and Parks developed a biodiversity research and extension strategy, with the assistance of the provincial research community. This strategy was presented to Forest Renewal BC (FRBC), who provided funding for a program beginning in 1995. The goal of the extension component of this program is to extend information to scientists, resource managers, and the public through biodiversity publications. These publications are intended to increase awareness and understanding of biodiversity, promote the concepts and importance of conserving biodiversity, and communicate provincial government initiatives related to biodiversity. We hope that they will be used as tools for the conservation of British Columbia's rich, living legacy.*

*For more information contact:*

B.C. Ministry of Environment, Lands and Parks, Wildlife Branch, 780 Blanshard St.,  
Victoria, BC V8V 1X4

*or*

B.C. Ministry of Forests Research Branch, P.O. Box 9519 Stn. Prov. Gov., Victoria, BC  
V8W 9C2

*or*

Royal B.C. Museum, P.O. Box 9815, Stn. Prov. Gov., Victoria, B.C. V8W 9W2

# STATUS OF THE PURPLE MARTIN IN BRITISH COLUMBIA

by  
D.F. Fraser,  
C. Siddle,  
D. Copley  
and  
E. Walters



Ministry of Environment, Lands and Parks  
Wildlife Branch  
Victoria, B.C.

Wildlife Working Report WR-89

March 1997

*“Wildlife Working Reports frequently contain preliminary data, so conclusions based on these may be subject to change. Working Reports receive little review. They may be cited in publications, but their manuscript status should be noted. Copies may be obtained, depending upon supply, from the Ministry of Environment, Lands and Parks, Wildlife Branch, 780 Blanshard Street, Victoria, BC V8V 1X4.”*

**Canadian Cataloguing in Publication Data**

Main entry under title:

Status of the Purple Martin in British Columbia

(Wildlife working report ; no. WR-89)

Includes bibliographical references

ISBN 0-7726-3181-6

1. Purple Martin - British Columbia.

I. Fraser, David Frank, 1956- .

II. BC Environment. Wildlife Branch.

III. Series

QL696.P247S72 1997 598.8'26 C97-960057-X

## **FOREWORD**

In cases where a Wildlife Working Report or Bulletin is also a species' status report, it may contain a status recommended by the author for the species. This recommended status is the opinion of the author and may not necessarily reflect that of the Wildlife Branch. Official status designation will be made by the Wildlife Branch in consultation with experts, and the data contained in the status report will be considered during the evaluation process.



## ABSTRACT

In North America, the Purple Martin (*Progne subis*) reaches the northwestern limit of its range in British Columbia. Two subspecies occur in British Columbia. Purple Martins forage aerially for insects. They nest in natural cavities and woodpecker holes in trees and snags, and in holes in buildings. In recent years they have been almost entirely restricted to nestboxes and artificial holes in pilings in estuaries, bays, and harbours. Martins have bred in Vancouver and the Lower Fraser Valley, and eastern Vancouver Island from Sooke to Campbell River, but they are now restricted to six sites on southeast Vancouver Island (Victoria Harbour, Esquimalt Harbour, Cowichan River Estuary, Nanaimo River Estuary, Newcastle Island, and Ladysmith Harbour) and one site (Maplewood Flats) in North Vancouver. There is no evidence of breeding by Purple Martins in northeastern British Columbia, despite numerous published range maps indicating that they breed there.

The martin's British Columbia population was reduced to fewer than 10 birds on southeastern Vancouver Island by 1983. Since 1986, an *ad hoc* nestbox program, operated by volunteers, has increased Purple Martin numbers so that by 1995 at least 55 pairs nested in the province, and nesting birds had returned to the Lower Fraser Valley. The probable primary cause of the species' decline in British Columbia, which is part of a wider decline along the west coast of North America, is a reduction in nesting sites and an increase in nest competitors such as the European Starling. Other limiting factors may include: climate and weather; nestbox parasites; interference from other bird species; and pesticide poisoning on the wintering grounds.

There is a high degree of public interest for viewing Purple Martins, as well as a high willingness to construct, erect, and monitor nestboxes. Of the species currently considered at risk in the province, the Purple Martin may be one of the most easily managed due to its apparent readiness to use nestboxes. A nestbox program in Washington is successfully increasing martin populations, particularly in south Puget Sound (Bock 1990). An active program of nestbox establishment and maintenance is recommended for British Columbia, as it is considered critical to the Purple Martin's survival in the province. A management plan for this purpose is laid out in Appendix 3. The Purple Martin is currently on the BC Environment Wildlife Branch Red List as a candidate for threatened or endangered status due to its small population size, its historical decline in numbers and range, and the continuing loss of its nesting habitat. It is recommended that it remain there and be considered for endangered status in British Columbia.





## ACKNOWLEDGEMENTS

The authors would like to thank Myke Chutter, James Quayle, Bill Munro, Tony Plath, Gail Harcombe, Chris Dodd, and Andrew Harcombe of B.C. Ministry of Environment, Lands and Parks, Wildlife Branch, for their help and guidance with this project. R. Wayne Campbell of the Royal British Columbia Museum was very helpful, lending us literature from his own personal library and allowing us to examine B.C. Nest Records cards and vertebrate record files at the museum. Bryan Gates of the Ministry of Environment generously loaned the authors all of his notes and research on the Purple Martin. Kelly McAllister, Dave Fehling, Thias Bock, and Dave Klaus generously and speedily sent the authors information about the Purple Martin in Washington.

This report would not have been possible without the support of the following people who helped in many ways: Barbara Begg, Dick Cannings, Gladys Craig, Neil Dawe (Canadian Wildlife Service), the Department of National Defense, R. Evans, Jeff Gaskin, Rick Ikona, Derrick Marven, Mike McGrenere (Ministry of Crown Lands), Rob MacKenzie-Grieve, Mike McNall (Royal B.C. Museum), Bill Merilees (Ministry of Parks), Ed Nygren (Canadian Wildlife Service), Colleen O'Brien, Calvor Palmateer, Harold Pollock, Leah Ramsay, Chris Sandham, Pam Stacey, Samantha Statton, Keith Taylor, Howard Telosky, Syd and Emily Watts, Bruce Whittington, and Neville Winchester (University of Victoria). Cam Finlay, Keith Kimmerle, James R. Hill III, and Kathy Neer helped to locate literature not readily available. David Stirling was very helpful in providing unpublished information about historical populations on Vancouver Island. Claudia Weiss assisted with the literature review in updating this paper. Ron Satterfield, Grahame E. Gillespie, Jeff Gaskin, Bruce Whittington, and Leah R. Ramsay provided information and field notes updating this report to 1994. Daniel Farr assisted with field work during the summer of 1994.

The production of the final report was made possible through the financial support of Forest Renewal British Columbia (FRBC) and the B.C. Ministry of Environment, Lands and Parks, Wildlife Branch. English editing was done by Ted Wagstaff, and project management, final editing, final figure production and typesetting were provided by Gail F. Harcombe.



# TABLE OF CONTENTS

1	INTRODUCTION .....	1
2	GENERAL BIOLOGY .....	1
2.1	Diet .....	1
2.2	Timing of Breeding .....	1
2.3	Breeding Age .....	2
2.4	Clutch Size .....	2
2.5	Incubation and Prefledging Care .....	3
2.6	Young .....	3
2.7	Colonial or Solitary Breeder .....	3
2.8	Plumage Changes .....	4
2.9	Species Movement and Winter Range .....	4
2.10	Feeding Movements .....	4
3	HABITAT .....	4
3.1	Description .....	4
3.2	Distribution by Ecoregion and Biogeoclimatic Zone .....	5
3.3	Trends in Quality and Quantity of Critical Habitat by Time .....	5
3.4	Rate of Habitat Change .....	6
4	DISTRIBUTION .....	6
4.1	Distribution in North America .....	6
4.2	Distribution in Canada .....	6
4.3	Distribution in British Columbia .....	7
5	POPULATION SIZE AND TRENDS IN BRITISH COLUMBIA .....	11
5.1	Current Population Size .....	11
5.2	Change in Status .....	11
6	LEGAL PROTECTION .....	11
7	LIMITING FACTORS .....	11
7.1	Competition with Other Species .....	11
7.2	Reduction in Available Nest Sites .....	12
7.3	Climate and Weather .....	13
7.4	Parasites and Diseases .....	13
7.5	Pesticide Poisoning .....	14
8	SPECIAL SIGNIFICANCE OF THE SPECIES .....	14
8.1	Degree of Public Interest .....	14
8.2	Species at Risk .....	14
9	RECOMMENDATIONS AND MANAGEMENT OPTIONS .....	14
9.1	Further Research Needs .....	14
9.2	Management Options .....	15

10	EVALUATION .....	15
11	REFERENCES .....	15
	11.1 Authorities on Species .....	15
	11.2 Periodicals Devoted to the Purple Martin .....	16
	11.2 Literature Cited .....	16
12	APPENDICES .....	23

## LIST OF TABLES

Table 1.	Minimum number of active Purple Martin nestboxes in British Columbia during the 1995 breeding season .....	9
----------	--	---

## LIST OF FIGURES

Figure 1.	Historic and currently active nesting sites for Purple Martin in British Columbia .....	7
-----------	---	---

## LIST OF APPENDICES

Appendix 1.	Clutch size and fledging success for the Purple Martin during the 1990 season at Cowichan Bay, Vancouver Island .....	23
Appendix 2.	Spring arrival dates in British Columbia for the Purple Martin, 1970-1990 .....	23
Appendix 3.	Proposed management plan for the Purple Martin in British Columbia .....	24

# 1 INTRODUCTION

This report is modified and updated from Siddle et al. (1991). It is part of an ongoing program by the British Columbia Ministry of Environment, Lands and Parks, Wildlife Branch to more effectively manage species at risk for long-term viability in the province.

Information on Purple Martins has been assembled from a variety of published and unpublished sources, including original fieldwork by the authors. Many field records were obtained from the Royal British Columbia Museum's Nest Records Scheme and Vertebrate Sightings card files, hereinafter referred to as RBCM vertebrate records files. This report contains a synthesis of available information on Purple Martins, including an overview of the species' biology, habitat requirements, limiting factors, distribution, status, and prognosis for the future. It also contains recommendations for management and research intended to help to maintain and enhance populations in British Columbia into the future.

## 2 GENERAL BIOLOGY

The Purple Martin (*Progne subis*) is the largest swallow in North America. The adult males are a dark, glossy, blue-black ("purple") colour on all dorsal and ventral surfaces, being darkest on the wings and tail. Adult females and all first-year young have light bellies and otherwise greyish underparts, with blue-black dorsal plumage that is duller than the males'. The adult female often has a faint collar across the lower nape. The martin is a cavity-nesting species, using natural cavities, woodpecker holes, and artificial structures. Much of the population in North America nests in nestboxes and birdhouses (Wiggins 1987). The martin is an aerial insect feeder. Throughout this description HY refers to a first-year bird in its first basic plumage and in its first calendar year. SY refers to birds in their second calendar year. ASY refers to "after second year," i.e., a Purple Martin in at least the year

following its first breeding season and second prebasic moult.

In British Columbia two subspecies occur. *Progne subis subis* is the "eastern" martin (Cannings, in press) and is casual in the Peace River area of British Columbia. *P.s. arboricola* is the subspecies breeding in the Georgia Depression of southwestern British Columbia (Cannings, in press).

### 2.1 Diet

There is no information on the diet of the Purple Martin in British Columbia. Walsh (1978) studied the diet in Alberta and found it varied with season, time of day, and age of nestlings. Beal (in Bent 1942) found that martin stomach contents contained Hymenoptera 23% (ants, wasps, and a few drone bees), Diptera 16% (flies, mosquitoes), Homoptera 15% (true bugs). Lepidoptera (moths and butterflies) and Odonata (dragonflies and damselflies) made up the bulk of the diet. Anecdotal observations indicate that birds feeding young in British Columbia make extensive use of dragonflies.

### 2.2 Timing of Breeding

Purple Martins are migratory, arriving in southern British Columbia as early as mid-March (Campbell et al., in press), but more typically in April and May. Egg-laying does not take place until late May or early June. The two-month delay between arrival time and initiation of egg-laying is typical for the species (Rohwer and Niles 1979). Nest-building begins in late May and June (Guiguet 1978) and is carried out by the female. SY pairs initiate nesting later than ASY pairs. An SY pair that nested on Newcastle Island in the summer of 1995 first entered a newly constructed nestbox in the third week of June and were still feeding young on 26 August (D.F. Fraser, pers. obs.). Nesting is prolonged and interrupted sometimes for days at a time, particularly during inclement weather (Widmann 1922; Johnston and Hardy 1962).

## 2.3 Breeding Age

Some males breed near the end of their first year, in June or July (Morton et al. 1990). It is assumed that they usually pair with similarly-aged females. These males breed later and return later than older males. It has been suggested that SY males gain access to breeding and feeding areas, and preferred perches without being attacked by dominant males because the SY males lack the bright, violet-blue plumage of the older males and thereby resemble females (Brown 1978a; Rohwer and Niles 1979). Adult males not only tolerate SY males but sing a special “dawn song,” advertising the “extra” nest sites that they have defended from other ASY males. Brown (1984) reviews vocalizations in Purple Martins. The ASY males allow SY males to nest in those sites (Morton 1987). Once established, ASY males (usually three years or older) will force copulations with females paired to SY males (Morton 1987), increasing the ASY male’s paternity within the colony (Morton et al. 1990). Morton and Derrickson (1990) propose two possible hypotheses why martins should tolerate and actively attract younger birds to nest in colonies. In their study, older males gained an average of 3.6 additional offspring through forced extra-pair copulations with females paired with younger males. In addition, younger males took less desirable nests (lower-tiered nests in colonial houses experience higher predation pressures) and afforded some protection against predators.

## 2.4 Clutch Size

First clutch size ranges from two to eight eggs. SY pairs lay smaller clutches than ASY pairs (Lee 1967). In Kansas, ASY clutches averaged 5 eggs and SY clutches averaged 4 eggs ( $n =$  not given) (Johnston 1964). In Texas, the ASY mean clutch size was 4.97 and the SY was 4.11 ( $n = 156$ ) (Brown 1978b).

In British Columbia, average clutch size for all nests combined ( $n = 7$  nests) is 4.6 eggs and the SY

clutch size is 4.0 ( $n = 1$ ). It is not possible to calculate average clutch size for ASY pairs because pair age has not been recorded on most nests.

Copley and Walters (unpubl. data, Appendix 1) counted eggs in four nests at the Cowichan Estuary in 1990 (4E = 2, 5E = 2). Calvert Palmateer (pers. comm.) found two clutches, one of 5 and one of 4 (held at the Royal B.C. Museum) from two abandoned and presumed complete Esquimalt nests in 1988. Campbell et al. (in press) list a seventh clutch from B.C., also of 5 eggs. David Klaus (pers. comm.) reported similar average clutch sizes for Washington State (SY and ASY clutches combined).

Other average clutch sizes reported in the literature are similar and include: 4.6 eggs (Brown 1978b); 4.9 eggs (Widmann 1922), and Allen and Nice (1952); 4.2 eggs (Johnston 1964); and 4.8 eggs (Finlay 1971).

SY female martins may spend more time hunting, which may result in fewer eggs; however, there are no data to support this hypothesis (Brown 1978b). Finlay (1971) hypothesized that smaller clutches by younger martins result in a saving of one or two days of the time needed for the reproductive cycle, an important factor at higher latitudes where the martin’s breeding season is short.

If Purple Martins lose a clutch or a brood they often nest again (Stokes and Stokes 1989). Second clutches are smaller and range from 3-5 eggs (Allen and Nice 1952; Johnston 1964; Finlay 1971; Brown 1978b). In Brown’s (1978b) study, 30.2% of eggs ( $n = 156$ ) laid during second attempts were lost to predators, 0% failed to hatch, and 2.3% died, for a fledging percentage of 67.4%. Fledging success of second attempts may be lower than first attempts because most second attempts occur in vulnerable nests where the young or eggs suffered predation earlier. Also, second attempts often are made by parents that were responsible for the loss of their first nest (by failing to guard or neglecting to feed

adequately), and such behaviour may negatively influence the success of the second attempt. All martins that made second attempts were ASYs (Brown 1978b).

Second nesting attempts can be significant to the propagation of the species during seasons plagued by poor weather. In 1975, at Fern Ridge Reservoir, west of Eugene, Oregon, 68 pairs nested but 75% of the young from the first nesting failed to fledge. Approximately 40% of the pairs made second attempts with 90% success (Crowell and Nehls 1975).

Purple Martins usually raise a single brood. Two broods are rare (Audubon 1840; Forbush 1929; Baerg 1931; Peterson 1941; Sprunt 1942; Johnston and Hardy 1962; Brown 1973, 1978c; Harrison 1975) and has not been reported for British Columbia.

## 2.5 Incubation and Prefledging Care

Incubation is variable depending on the time of year the clutch is laid (Widmann 1922), earlier clutches laid during cooler weather requiring longer incubation times than later ones. Incubation is about 15-19 days and is accomplished by the female (Allen and Nice 1952). R. McKenzie-Grieve (cited in Davidson 1964) recorded a 21-day incubation period for Victoria. Most Purple Martins hatch between June and July in British Columbia (Campbell et al. in press). Widmann (1884, 1922) estimated that eight weeks were required from nest commencement to fledging: two weeks for nest building and egg-laying, two for incubation, and four for development of nestlings. He believed that an additional two weeks of parental care were required after fledging. In northern Alberta, Finlay (1971) found the mean duration of each stage of the breeding cycle to be: arrival, nest-cavity defense and pair-bond formation, 6.5 days; nest-building, 11.8 days; nest completion, 3.2 days; laying, 4.8 days; incubation, 16.6 days; nestling stage, 27.4

days, and post-breeding defense of nest cavity, 5.9 days.

## 2.6 Young

Young hatch asynchronously. Both parents feed the young, which fledge at about 28 days. Reported fledgling success for other parts of North America varied from over 80% (Texas, Allen and Nice 1952) to about 30% (Michigan, Brown 1978b). Brown's (1978e) data indicate a survival rate of over 90% for the first four to five days after fledging.

In 1990, two of us (Copley and Walters) monitored four nests at Cowichan Bay. Two nests had a clutch of four and two nests had a clutch of five. One of the four-egg clutches fledged two young, all the other nests fledged four. This gave an average fledging success rate of 77.7% (see Appendix 1). Campbell et al. (in press) show that broods from British Columbia range from one to five young. Nestling period in British Columbia is 31 days, and as much as eight days can separate nest departure of siblings (Campbell et al. in press).

Fledging may not occur until September for some birds; on 26 August 1995 a brood of at least two birds being raised by an SY pair on Newcastle Island were still several days from being able to fly (D.F. Fraser, pers. obs.).

## 2.7 Colonial or Solitary Breeder

Purple Martins are well known for colonial nesting, especially in multiple-apartment nestboxes in other parts of its range. While there are no records of Purple Martins using apartment-style boxes in B.C., most nesting martins are in clusters of boxes that can be regarded as a "colony" (Stutchbury 1991a). The largest currently active colonies in British Columbia have ranged up to 16 active nests at Esquimalt (1995 D. Copley, pers. obs.) and 14 active nests at Ladysmith (1995 D.F. Fraser, pers. obs.).

## 2.8 Plumage Changes

SY females are similar to adult females, having dull blue-black plumage dorsally with generally gray plumage below. SY Males are somewhat similar, but also develop small blue-black patches on the ventral surface, mostly under the wings. ASY males gain their characteristic “purple” (actually blue-black) plumage fully by August or September of their third year (Pyle et al. 1987). For more detailed information regarding moult sequences and ageing see Pyle et al. (1987) and Niles (1972). The blue-black patches on SY males have been used by researchers in identifying individual martins at colonies (e.g., Rohwer and Niles 1979; Morton and Derrickson 1990; Stutchbury 1991a).

## 2.9 Species Movement and Winter Range

The Purple Martin is highly migratory and winters in South America, east of the Andes from Columbia (rare) to northern Bolivia and southeastern Brazil (American Ornithologists' Union 1983). Wintering birds can concentrate in large numbers; Turner and Rose (1989) report one wintering roost site consisting of 5000 birds in Brazil. The exact winter range of the western subspecies is not known (Turner and Rose 1989). There have been no winter banding returns for Purple Martins banded in British Columbia. Three Oregon-banded birds have had bands turned in (one from Arizona, one from Sinaloa — both presumably on migration) and one return from southern Brazil, the most southerly band return reported to date (Hill and Dellinger 1995). If this pattern holds for other *P.s. arboricola* birds, our birds may have the longest migration routes for Purple Martins.

The Purple Martin migrates north through Central America and north along the west coast of the United States. Most arrive in Oregon and Washington in mid-April (Mattocks 1986; Milner 1987). Earliest arrival date for British Columbia is 16 March (Campbell et al., in press). April arrival dates are more common. Arrival date for years

1972-1990 (Appendix 2) averaged April 27, with the median date of April 28. Males older than three years old arrive first (Brown 1978d, Morton and Derrickson 1990). Adult females and three-year-old males arrive next. Finally, up to a month after the first birds arrive, the SY birds appear (Morton et al. 1990; Morton and Derrickson 1990).

There is no information on recruitment to the British Columbian breeding sites; however, other studies have indicated that most recruitment comes from young birds born outside the colony (Stutchbury 1991a; Morton and Derrickson 1990).

After breeding, Purple Martins gather into large flocks. In September of 1996, Fraser (pers. obs.) estimated that a group of “over 100” were gathered over Elk and Beaver lakes on the Saanich Peninsula. This concentration may represent almost all the British Columbia population gathered in one location, just prior to migration. Generally, however, numbers in British Columbia are so small that post-breeding gatherings have been noted only south of the province. Historically, flocks of 4000 and 12 500 were recorded for a Seattle, Washington, roost in the 1940s at Green Lake (Higman 1944; Hunn and Mattocks 1981; Larrison 1981; Merker 1988). The location of roost sites may vary from year to year (Anderson and Anderson 1946).

## 2.10 Feeding Movements

Foraging martins range over a wide area, as far as 48 km from a roost site (Brown and Wolfe 1979). Martins, presumably from the Cowichan Bay colony, have been seen over Cobble Hill, about 7 km away (D. Marven, pers. comm.).

# 3 HABITAT

## 3.1 Description

The Purple Martin is a bird of low elevations in extreme southwestern British Columbia. It is found in estuaries and harbours, usually near abandoned pilings. Deciduous second growth near ponds, lakes



estuaries, mudflats, powerline rights-of-way and farmland are also used where insects are plentiful and snags are available for nest sites (Campbell et al., in press).

Up until the late 1940s, Purple Martins in British Columbia also nested in the elaborate exteriors of tall, older buildings in the downtown cores of Vancouver and Victoria. Presumably foraging took place over nearby harbours, suburb gardens, parks, and shoreline. This was also the preferred habitat for martins in the cities around Puget Sound in Washington State (Jewett et al. 1953). Hoffman (1927) states that “in Washington they have become almost exclusively city dwellers and are found in all the large cities about Puget Sound.” Purple Martins continued to use wildlife trees until the 1970s (D. Stirling, pers. comm.) as well as pilings. Almost all recent (post-1985) nest sites in British Columbia have been on or near estuaries with extensive mudflats. A similar restriction in breeding habitat has been seen in Washington and Oregon (Fouts, in press). In 1995, all birds were nesting in artificial structures; in 1996 a pair used a cavity made by Northern Flickers in a piling at Ladysmith (G. Craig, pers. comm.) but all other nests were in nestboxes.

### **3.2 Distribution by Ecoregion and Biogeoclimatic Zone**

#### **Ecoprovinces**

The following discussion of habitat distribution of the Purple Martin is based on the delineation of ecoregions of British Columbia by Demarchi (1993). Abundance designations (uncommon, casual, etc.) follow the designations of Bull (1984) also used by Campbell et al. (1990). Status designations here follow Campbell et al. (1990).

1. **Georgia Depression Ecoprovince** — The Purple Martin is a very rare to fairly common migrant and summer visitant to the Nanaimo Lowland Ecoregion along the southeast coast of Vancouver Island. In the Strait of Georgia

(Gulf Islands) and the Fraser Lowland ecoregions, it is a very rare migrant. The species breeds in the Nanaimo and Fraser lowlands.

2. **Boreal Plains** — The Purple Martin is casual in the Peace River region of the Peace Lowlands and Halfway Plateau ecoregions.
3. **Other ecoprovinces** — The species is accidental elsewhere in the province.

#### **Biogeoclimatic Zones**

Delineation of zones is based on B.C. Ministry of Forests Research Branch, 1992, Biogeoclimatic zones map.

Purple Martins have been recorded nesting at coastal sites in suitable habitat within the Coastal Douglas Fir and Coastal Western Hemlock Biogeoclimatic Zones. A few records exist for the species in the Peace River area within the Boreal Black and White Spruce Biogeoclimatic Zone, but no confirmed breeding has taken place there.

### **3.3 Trends in Quality and Quantity of Critical Habitat by Time**

The Purple Martin’s limited breeding range in British Columbia coincides with the most densely developed areas in the province. Their continued existence here is largely dependent on the maintenance of nestboxes, and the pilings on which they are placed, in a handful of locations. Continuation and enhancement of these sites will improve the species’ chances of maintaining its foothold in British Columbia, whilst any loss of this habitat will seriously impede the martin’s ability to do so. Recent attempts to increase the number of nestboxes available have been responsible for maintaining existing sites and returning breeding birds to areas used in the past. Some sites are threatened by removal or loss of old pilings as part of area “clean-up” efforts. Several sites have been abandoned as pilings have decayed and fallen.

Localized reduction of potential natural habitat is occurring with the drainage of wetlands, loss of wildlife trees in urban settings, logging of riparian corridors, and urban expansion.

### 3.4 Rate of Habitat Change

Purple Martins use the part of the province most densely settled by humans. Loss of habitat, especially lakeshore, coastal, and estuarine areas, to development pressures can happen quickly in the heavily populated southwestern parts of the province. Decisions to remove old pilings providing actual or potential martin nesting sites could reduce the B.C. breeding population substantially, virtually overnight, if mitigation or management plans are not in place. On the other hand, a large nestbox building and maintenance program in suitable areas could increase the population in a few years.

## 4 DISTRIBUTION

### 4.1 Distribution in North America

The Purple Martin breeds from extreme southwestern British Columbia, western Washington, western Oregon, northern California, northern Arizona, central Utah, eastern Idaho, central Alberta, central Saskatchewan, southern Manitoba, western and southern Ontario, southern Quebec, New Brunswick, Prince Edward Island (possibly), and central Nova Scotia, south to southern Baja California and Isla Tiburon (off Sonora), in the Mexican highlands to Michoacan, Guanajuato and San Luis Potosi, and to southern Texas, the Gulf Coast and southern Florida (except the Florida Keys). The species largely avoids desert regions although isolated groups nest in saguaro cactus in Arizona (American Ornithologists' Union 1983, Stutchbury 1991b). Formerly the species nested as far north as Great Bear Lake, Northwest Territories (Wilson and Bonaparte 1832), and the North American range may have extended further north and been much larger than it is today (K. Kimmerle, pers. comm.).

Population declines were widely reported in the late 1970s from Texas, Oklahoma, Missouri, and Kentucky, and very serious declines were reported from New Hampshire and Rhode Island (Tate and Tate 1982). The species was reported as no longer nesting in the forests of central California and the populations in western Washington, western Oregon, and southwestern British Columbia were in serious decline (Sharp 1986; Lewis and Sharpe 1987).

### 4.2 Distribution in Canada

Kimmerle (pers. comm.) is gathering information that indicates that the Purple Martin may have been more widespread and northerly in distribution in North America than current, sparse historic records indicate. Current ranges are (adapted from A.O.U. 1983, except where noted):

**The Prairie Provinces** — Occurs in west-central Alberta (Camrose and Edmonton) east and south from Calgary to the Saskatchewan border. Occurs in a broad band across central Saskatchewan and the southern third of Manitoba. (Salt and Salt 1976). The Purple Martin has probably increased its distribution in the Prairie provinces due to nestboxes (Finlay 1975). Macoun (1904) reports “several in the dead woods north of Peace River, near White Mud River, Lat. 56 (degrees) 20 (minutes) in June 1903. This is less than 300 km from the British Columbia border.”

**Ontario** — Occurs along the southern border from the southwestern border with the U.S. and Manitoba, through the southern Great Lakes, and from Ottawa southwards (Godfrey 1986).

**Quebec** — Occurs along the St. Lawrence and south to the U.S. border (Godfrey 1986).

**The Maritimes** — Occurs in southern New Brunswick and central Nova Scotia where it is local and rare. Possibly breeds in Prince Edward Island (Godfrey 1986; Tufts 1986).

**Northwest Territories** — Formerly bred as far north as Great Bear Lake (65°N) (Wilson and Bonaparte 1823), Yukon Territory - accidental in southern Yukon (Godfrey 1986). No longer found in the Northwest Territories (A.O.U. 1983).

### 4.3 Distribution in British Columbia

The Purple Martin currently breeds in only seven sites in British Columbia, six on southeastern Vancouver Island (Esquimalt Harbour, Victoria Harbour, Cowichan River estuary, Ladysmith Harbour, Newcastle Island, and Nanaimo River estuary), and since 1994, it also breeds at Maplewood Flats, North Vancouver (see Section 6.1 and Figure 1). In 1996 a nesting attempt in boxes at Sooke was abandoned before eggs were produced (M. Bruno, pers. comm.).

Historically, Purple Martins occurred in extreme southwestern British Columbia around Vancouver (possibly New Westminster and the Lower Fraser Valley), Victoria and Sooke, and north along the southeast coast of Vancouver Island as far as Campbell River. The species has been recorded north to Alaska (Kenyon and Phillips 1965, Kessell and Gibson 1978). In addition, it has also been recorded in the Peace River area of northeastern British Columbia.

The Purple Martin was formerly a more widespread and numerous breeding bird in the **Fraser Lowlands**. It had been reported from Vancouver, Lynn Creek, Seymour Creek, Ladner, Lulu Island, New Westminster, Port Coquitlam, Crescent Beach, Surrey, and Mission (Campbell et al., in press). Up until the 1940s, breeding Purple Martins nested in

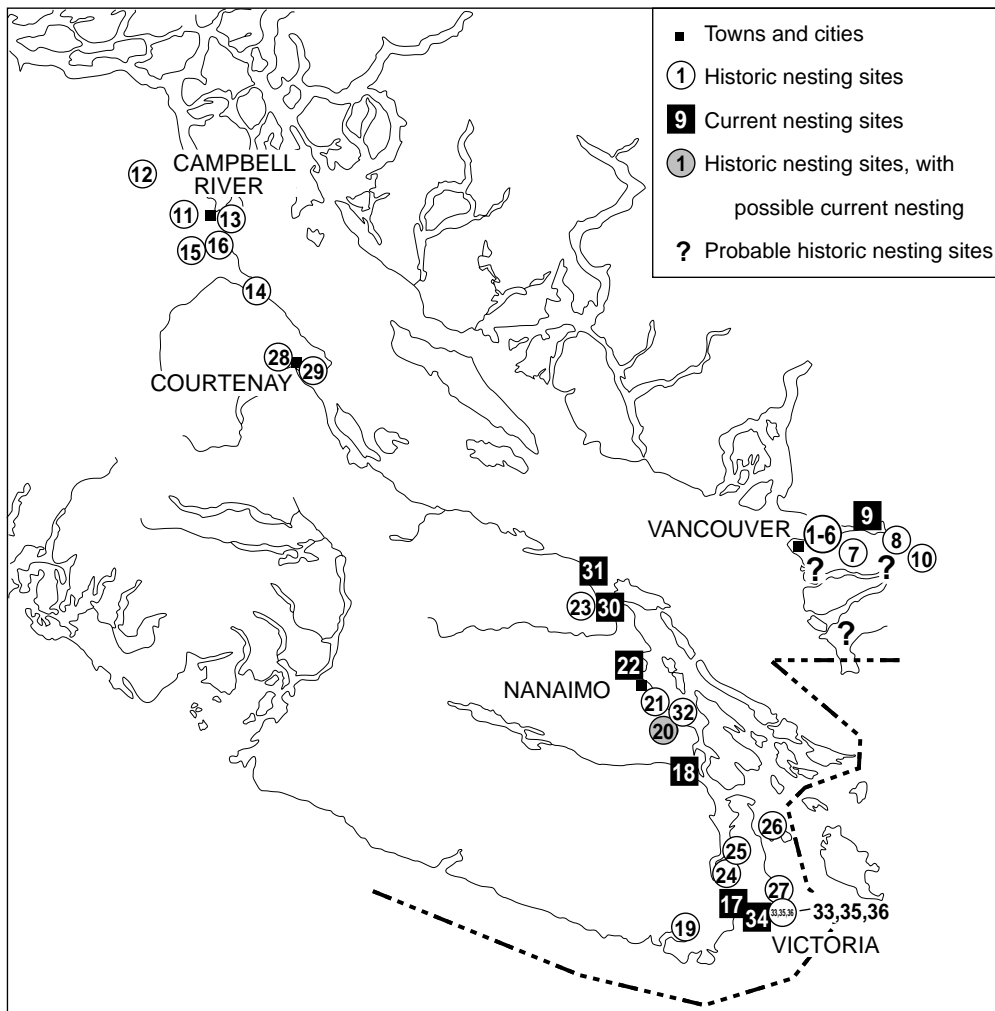


Figure 1. Historic and currently active nesting sites for Purple Martin in British Columbia. See legend for sources of data (page 28).

crevices and openings in buildings in downtown **Vancouver**. Single pairs and small colonies bred in the Orpheum Theatre, Canadian Pacific Railway Station, Hudson's Bay Building, Bank of Montreal, the old Hotel Vancouver, the Hastings Street Post Office, and "an old men's home" in the East End (RBCM vertebrate record file). White (cited in Macoun 1904) reported them as common in the vicinity of Vancouver, and breeding in numbers in 1894. The species last bred in downtown Vancouver in 1948 (Campbell et al., in press).

In **Victoria** several pairs nested in the 1950s and 1960s in the Times Building on Fort Street, in pilings at a marina, the McKay Cormak docks (RBCM vertebrate record file), and at a building at the corner of View and Government streets (D. Stirling, pers. comm.). Sometime after 1969, martins stopped nesting though the pilings remained and martins were occasionally seen in small numbers in the spring and fall. Two nestboxes were erected in the harbour in 1986, and 12 were put in place in May 1990. No martins nested in 1990 (Siddle et al. 1991), but 3 pairs used the boxes in the breeding season of 1994.

In **Saanich**, Stirling (pers. comm.) reports that snags at what is now the University of Victoria campus had six to eight pairs routinely seen here during the period between 1956 to sometime in the 1970s.

In **Esquimalt Harbour**, a small colony is situated on Department of National Defence property at the Canadian Forces Base Esquimalt Diving Units. There are currently 18 single nestboxes, three PVC pipe-nest cylinders, and three fourplex boxes. Formerly, martins nested in drainage holes and portholes aboard the decommissioned ship, the *Chaudiere*. Calvert Palmateer (pers. comm.) reports that in 1987, six pairs nested in portholes in the ship, and that when the ship was towed from the west side of the harbour to the east side, the birds followed the ship and resumed nesting. In 1990, two pairs of martins nested in portholes, one pair nested in a box in a fourplex nestbox, and one pair

nested in a PVC pipe (Siddle et al. 1991). Martins nested around the harbour and in the *Chaudiere* from about 1985-91. The *Chaudiere* was removed from Esquimalt Harbour in 1992. Following removal of the ship, all of the martins nested in the artificial nests at the site. In 1994, eight nests had martin activity, with at least seven young seen in nestboxes (J. Gaskin, pers. comm.). Copley estimated that by 1995, at least 16 boxes were being used by martins at this site.

There is one nest record from **Sooke Harbour**: an adult pair that fledged four young from a piling southwest of Goodridge Road between Cooper Cove and Sooke Basin in 1985 (RBCM vertebrate record files). In April 1990, 18 boxes were put on two snags and four pilings near Harrison Point, Hill Head, and Goodridge Peninsula (Siddle et al.). No martins have been reported since from this area; however, it may not have been monitored in 1993, 1994, and 1995. Marilyn Bruno (pers. comm.) reports attracting a pair of SY martins to nestboxes on pilings near Sooke in the spring of 1996 using a tape recording of a "dawn song," but the birds abandoned the site before laying eggs.

A freshwater pond, known as "Purple Martin Pond," located near Francis-King Regional Park, **Saanich**, used to support two to four pairs of breeding martins (D. Stirling, pers. comm.). From the fragmentary records, martins nested here in drowned snags from about 1975 to 1982 or 1983 (RBCM vertebrate record file). There are records thereafter, but they do not mention breeding. Twelve boxes were erected on May 1, 1990 (Siddle et al. 1991). Seven older boxes were already in place. No recent nesting reports were found for this location. The Purple Martin may once have nested in snags in clearings and burns in the **Highlands west of Victoria** (Davidson 1966), although this reference could be to "Purple Martin Pond." Stirling (pers. comm.) says that martins were seen at snags in the Highlands in "several locations in the '60s and '70s" and at least at one location (Purple Martin Pond) in the early 1980s.

**Table 1. Minimum number of active Purple Martin nestboxes in British Columbia during the 1995 breeding season.**

Site	Minimum Number of Active Nests in 1995	Source
Esquimalt (DND land)	16	D. Copley (pers. comm.)
Victoria Harbour	7	D. Copley (pers. comm.)
Cowichan Estuary	10	D. Marven <i>fide</i> B. Begg
Ladysmith docks	14	D.F. Fraser (pers. obs.)
Nanaimo Estuary	5	D.F. Fraser (pers. obs.)
Newcastle Island Provincial Marine Park	1	D.F. Fraser (pers. obs.)
Maplewood Flats, North Vancouver	2	T. Plath (pers. comm.)
Total	55	

Purple Martins have nested at the Cowichan River Estuary for at least the last 25 years. The earliest recorded nesting was in 1972 (Tatum 1973), but no numbers of pairs were given. Siddle et al. (1991) listed several records from 1985 through 1990 of 2-5 pairs nesting on pilings on both sides of Cowichan Bay. Originally, the birds nested in natural cavities in pilings on both sides of the bay, but took to nestboxes once they were erected in 1987 (B. Gates, pers. comm.), and again in 1990 (Siddle et al. 1991). By 1990, there were 56 nestboxes available at Cowichan Bay and five pairs were recorded using them (Siddle et al. 1991; Copley and Walters, unpubl. data). In 1995, at least 10 nestboxes were active at this site (Table 1).

The Ladysmith harbour site is centred around a small, quiet marina in a shallow, muddy bay. Many old pilings stand around the wharf, some containing woodpecker cavities. It is not known how long this colony has existed, though it was first “discovered” in 1989 (Siddle et al. 1991). In 1990, Siddle et al. (1991) reported that four ASY males and four ASY females were present and produced at least five young. At least 14 active nests were present in 1995 (Table 1). This is the only site in B.C. where Purple Martins use natural cavities.

There are nest records from **Crofton Lake** for 1970 to 1975. The exact number of pairs is not known, but in 1975, S.W. Baker noted two pairs and

commented that each year the number decreased. The birds were nesting in drowned snags around the shore of the lake (RBCM vertebrate record file). Unconfirmed reports from this area were received in 1996.

There is one breeding record from a piling in the MacMillan-Bloedel log boom area in **Chemainus Bay** in 1983 (RBCM vertebrate records file).

Swarth (1912) noted martins “in considerable numbers” circling over the city of **Nanaimo**. He guessed that they were breeding in buildings. In the 40 years prior to 1990, there were only six records of martins from Nanaimo submitted to the Royal British Columbia Museum (RBCM vertebrate record file), including one breeding record for Duke Point south of Nanaimo in 1983. Two sight records included a pair of SY birds at Newcastle Island on July 5, 1989 (B. Merilees, pers. comm.) and 4 or 5 birds in Nanaimo for about two weeks in May-June 1989 (C. Palmateer, pers. comm.). Nest boxes were erected by the Nanaimo Naturalists in the Nanaimo Estuary in the early 1990s and 2 pairs nested there in 1994. In 1995, D.F. Fraser (pers. obs.) recorded 5 nestboxes being used by breeding martins. In 1995 park naturalists mounted nestboxes at the wharves on Newcastle Island after watching a pair of SY birds trying to enter an occupied Violet-green Swallow box. These boxes were also used by a pair in 1996.

Pearce (1946) first noted Purple Martins in 1941 or 1942 at **Comox Bay**. Meugens (1947) reported that Purple Martins had returned after an absence of 4 or 5 years. D. Stirling (pers. comm.) reports that pilings at Comox slough had martins in the 1960s. He notes that these pilings have rotted and fallen.

There are two nest records for **Courtenay**, both for 1972 (RBCM vertebrate record file). The martins, presumably two pairs, were nesting in pilings in a lake. Stirling (pers. comm.) found martins associated with snags after a fire in the vicinity of Northy Lake and Wolf Hill northwest of Courtenay in the 1960s.

During 1959, eight Purple Martin families were found nesting at **Fry Lake** (the upper sections of lower Campbell Lake) (RBCM vertebrate record file). Sid Watts (pers. comm.) recalled seeing Purple Martins at **Mohun Lake** near **Campbell River** nesting in snags in a flooded area, in about 1970. Ed Nygren (pers. comm.) saw martins at the **Campbell River estuary** (Tyee Spit) in 1986 (2 adults) and 1988 (4 adults and 4 young) near the B.C. Forest Products restoration project. Since then, pilings have been removed and martins are seen no longer. Stirling (1961) notes that martins nest at **Oyster Bay** and in the **Quinsam Lake** area west of Campbell River. The Oyster Bay site had at least 12 martins that were nesting in an old beached ship and in pilings in the 1960s and 1970s (D. Stirling, pers. comm.). He also noted martins in the 1960s in snags bordering an extensive marsh along a powerline right-of-way north of Oyster River between Oyster Bay and Campbell River. Martins were reported flying around an old boat during the summer of 1990 at Oyster Bay (D. Copley and E. Walters, pers. obs.).

Other locations where martins may have bred include:

**Prospect Lake, Victoria** — even birds were counted on July 18, 1970 (RBCM vertebrate record file).

**Sidney** — The Victoria Bird Report for 1970 reports Purple Martins here without comment.

**Sidney Spit** — Jack Todd (pers. comm.) reports martins nesting in the pilings on Sidney Spit, Sidney Island, date unknown.

**The Fraser Valley** — Martins may once have bred in the western parts of the Fraser Valley, particularly around New Westminster. There are no definite nesting records, but martins were reported to frequent mills in New Westminster (RBCM vertebrate records file). Campbell et al. (in press) list breeding at the mouth of the Alouette River in 1959, and young being fed by parents at the mouth of the Coquitlam River in 1961.

**Saltspring Island** — Martins are seen occasionally over Saltspring Island, especially the Burgoyne Valley; these are probably birds from the Cowichan estuary. In June of 1995, four martins were seen repeatedly trying to enter a Violet-green Swallow nestbox at the edge of Southey Bay, at the northern tip of Saltspring Island (D.P. Fraser, pers. comm.).

**Northeastern British Columbia** — The species has not been recorded breeding in the Peace River district despite published range maps and descriptions indicating the Boreal Plains of British Columbia has part of the breeding range (e.g., American Ornithologists' Union 1983; Godfrey 1986, all modern field guides). The inclusion of this area is presumably based on a record of two birds collected from a flock of eight on 12 June 1938 at Charlie Lake. One of these was a female with an egg in her oviduct (Cowan 1939). There are only two other records from this area (Erskine and Davidson 1976, RBCM vertebrate record file), despite extensive observer effort by Siddle (1982) over a 14-year period. Macoun (1904) however, reports birds from the White Mud River, Alberta, less than 300 km from the British Columbia/Alberta border.

## 5 POPULATION SIZE AND TRENDS IN BRITISH COLUMBIA

### 5.1 Current Population Size

The breeding population in 1995 was at least 55 pairs (Table 1). In addition a small, but undetermined number of birds that were seen at these sites were not observed entering nestboxes, carrying fecal sacks, or feeding young. Since none of the sites were observed over a sustained period, it is likely that some of these birds were also breeding, so the figures presented in Table 1 are minimum estimates. This was probably the highest breeding population since the 1960s or possibly earlier.

### 5.2 Change in Status

Siddle et al. (1991) estimate the historic population at 300-600 birds. Campbell et al. (in press) estimate the maximum historical high population at 150 pairs. They document fluctuation in the numbers of Purple Martins in British Columbia since 1890 and maintain the species has traditionally fluctuated in numbers in southwestern British Columbia.

Numbers declined in the Lower Mainland through the 1940s, with the last Vancouver nesting record occurring in 1948 (Campbell et al., in press) until nesting occurred at Maplewood Flats, North Vancouver in 1994 in response to a nestbox program (Plath 1994).

Stirling (pers. comm.) recalls Purple Martins nesting in a number of locations on Vancouver Island during the 1960s and 1970s where they are now absent. These sites include the land that is now the University of Victoria campus where they nested in wildlife trees; a building at the corner of View and Government streets in Victoria; at several locations in the Victoria Highlands; at Northy Lake and Wolf Hill northwest of Courtenay; at the hydro right-of-way north of the Oyster River between Oyster Bay and Campbell River; Comox Slough; and at Oyster Bay. With the exception of the University of Victoria site, most of these sites are adjacent to water.

In 1986, Bryan Gates began to organize naturalists to erect nestboxes at known martin sites on southern Vancouver Island. These efforts probably saved the Purple Martin from extirpation in British Columbia. In 1989, a survey found 39 martins in B.C., all on Vancouver Island (Walters et al. 1990). Fieldwork in 1990 (Sidle et al. 1991) found 30 martins (9 at Esquimalt, 13 at Cowichan Bay and 8 at Ladysmith). These 30 birds fledged 25+ martins in 1990. In 1995 at least 55 active nests at 7 sites were found (Table 1).

## 6 LEGAL PROTECTION

The Purple Martin is protected under the *Migratory Birds Convention Act* (1994) and the provincial *British Columbia Wildlife Act* (1982). Provisions under the *Forest Practices Code of British Columbia Act* may address some of the habitat requirements of this species.

## 7 LIMITING FACTORS

### 7.1 Competition with Other Species

European Starlings (*Sturnus vulgaris*) are competitors with Purple Martins for nest sites (Brown 1981). European Starlings chase Purple Martins from nest cavities, occupy cavities that could have been occupied by martins, and are known to cause martins to desert a cavity during the early stages of nesting. Brown (1981) showed that martin production dropped in colonies where European Starlings were not controlled.

In British Columbia, starlings begin nesting as early as March, before martins arrive. Many cavities are already occupied before martins begin nesting in the spring. The impact of starlings on the B.C. colonies is not clear. In 1991, two pairs of starlings (D. Copley and E. Walters, pers. obs.) nested among the Cowichan Bay colony. One pair nested prior to the martins; however, after the young starlings fledged, an SY martin pair successfully used the same nestbox. The other starling pair nested at the same time as the martins and was only 15 cm away from the nearest occupied martin nest.

In 1990, at Ladysmith, a pair of starlings was observed nesting at the same time as the martins, with their nest cavities only two metres apart (Siddle et al. 1991). One of these nest cavities contained two dead, nearly-fledged, starlings. In 1989, an SY pair nesting in Esquimalt Harbour was evicted by starlings that took the box over as a roost (C. Palmateer, pers. comm.). The impact of starlings on Purple Martins in British Columbia needs to be investigated.

House Sparrows (*Passer domesticus*) can adversely affect martins by clogging potential nest holes with bulky nests (Brown 1977, 1981). Kermode (1923 cited in Campbell et al., in press) noted that the Purple Martin was a common species in Victoria in the late 1890s, but that it was now (1920s) quite rare. He stated that since the House Sparrow's arrival, the martins had steadily declined in numbers. However, Alford (1928) did not believe that the House Sparrow was "sufficiently common to menace this or any other species."

House Finches (*Carpodacus mexicanus*) have been reported as nest usurpers (Hill 1988) and are common throughout the martin's range in B.C.

Brown-headed Cowbirds (*Molothrus ater*) parasitism of martin nests has not been recorded in British Columbia (Campbell et al., in press). Friedmann (1963) notes one instance from Detroit, Michigan where the martins removed the cowbird egg.

Tree Swallows (*Tachycineta bicolor*) are documented as nest competitors, even driving away all birds from adjacent nestboxes within 75 feet of their own nest. Kuerzi (1941) found that Tree Swallows will allow four other species of swallows to enter into their bounds to feed or gather nesting materials; however, Purple Martins were not tolerated. Richmond (1953) believes that in areas where Tree Swallows are abundant they excluded martins. Tree Swallows, however, are not an abundant breeding species in the current range of the Purple Martin in British Columbia.

Violet-green Swallows (*Tachycineta thalassina*), however, are an abundant breeding species in the martin's British Columbia range and are potential cavity competitors. Brown et al. (1992) does not indicate any published records of Violet-green Swallow-Purple Martin interactions. In 1995, Purple Martins were observed trying to enter nestboxes occupied by Violet-green Swallows at Newcastle Island (D.F. Fraser and D. Copley, pers. obs.) and at Southey Bay, Saltspring Island (D.P. Fraser, pers. comm.). The openings in these boxes were too small to allow the martins to enter. The swallows defended the nestboxes by repeatedly diving at the martins.

It is interesting to note that of the five species of nest competitors that have been recorded for Purple Martins, four of them have arrived on Vancouver Island since the 1900s. The European Starling arrived in the 1950s (Myres 1958; Cabe 1993), the Brown-headed Cowbird in 1955 (Davidson 1966), the House Finch in the 1930s (Cowan 1939) and House Sparrows in the 1910s (Lowther and Clark 1992). Since their arrival, Purple Martins have abandoned nesting in wildlife trees and downtown buildings, and largely moved to nesting over water in pilings. We can find no literature that indicates that these potential nest competitors do not compete as effectively over water, but the trend is suggestive.

## 7.2 Reduction in Available Nest Sites

Formerly, Purple Martins nested in cavities in one of three types of nest sites. These sites were: (1) the elaborate exteriors of old-fashioned buildings; (2) snags around ponds and marshes; (3) pilings in marinas, harbours, and estuaries. Coincident with the sudden increase of European Starlings, the martin's most serious nest competitor, was a rapid decline in nesting sites as older buildings were torn down. Until recently, forestry practices did not consider retention of snags. Much of the Purple Martin habitat in British Columbia is under private control and wildlife trees are in short supply on



urban, suburban, and industrial lands. Currently in Washington and British Columbia, most martins nest in cavities in, or nestboxes on, pilings around harbours and estuaries. Those pilings, which were usually left over from earlier commercial practices, are not being maintained and are rotting and falling down. It is likely that lack of this type of nesting site has been a limiting factor for the Purple Martin. Fortunately, this limiting factor can be mitigated with a management program that provides martins with artificial nestboxes on newer, better-maintained pilings. Nest boxes on pilings on public docks are readily used by martins.

All but one (in a flicker cavity in a piling at Ladysmith) of the nesting martins in 1994, 1995 and 1996 were in nestboxes, indicating that the species either prefers nestboxes or there are insufficient natural cavities.

### 7.3 Climate and Weather

Brown (1976) indicates that martins cannot successfully forage at 6°C or lower and that mortality occurred in adult martins exposed to 4 days or more of such cool temperatures. Martins may enter a semi-comatose state in their nestboxes and, if unfavourable weather persists, they begin to starve and seek food by unorthodox methods such as ground-foraging (Benton and Tucker 1968). Many authors have reported cases of martin deaths resulting from extreme weather (Kimball 1889; Horton 1903; Forbush 1904). Wind with rain may drench the nests and chill the eggs, killing the embryos (Klimkiewicz and Jung 1977). Drowning of nestlings can occur during downpours (Lee 1961). Martins can survive two or three days of severe cold (-12°C) and snow (Schafer 1921; Nolan 1956). Females may survive adverse weather conditions better than males (Benton and Tucker 1968).

Martins are also affected by high temperatures. Temperatures as high as 37.5°C have been recorded in nesting gourds, and nestlings have been seen

panting with heads and necks extended from the gourd entrance (Jackson and Schardien 1981). A nine-day heat wave with temperatures reaching 41°C. killed all the nestlings in one colony (Jackson and Schardien 1981). The U.S. Fish and Wildlife Service (1985) reported that heat prostration of nestlings may be a consequence of nestboxes that are too small.

Since British Columbian Purple Martins are at the extreme northwestern limit of their range, it is unlikely that overheating is a problem with local birds; however, unseasonably cool or wet summers could have a negative impact upon nesting success.

### 7.4 Parasites and Diseases

Purple Martins, their nests and their nestlings, harbour a wide variety of external and internal parasites, some of which could possibly limit breeding success (Moss 1972). Parasites include Mallophaga, Hemiptera, Diptera, Siphonaptera, Acari, Trematoda (Brown and Brown 1988), and blood parasites. Diseases include pneumonia and intestinal infections. Field work conducted in 1990 (Siddle et al. 1991) uncovered large quantities of nestbox parasites from all three breeding sites during September. The boxes that were monitored had a high fledgling success (Appendix 1), but the effect of parasites on subsequent survival or fitness was not investigated. Blood parasites have been shown to decrease female martin fecundity (Davidar and Morton 1993).

The most abundant parasite was a flea (Family Ceratophyllidae, Subfamily Ceratophyllidae) found in both adult and larval forms in all three colonies checked in 1990. The second most abundant parasite was an unidentified mite (Order Acari) that was also present at all three colonies. Also present in more moderate numbers, although not parasites, were booklice (Order Psocoptera, Suborder Eupsocida). Four chalcid wasp cocoons were found in a Cowichan nestbox (D. Copley and E. Walters, pers. obs.).

## 7.5 Pesticide Poisoning

Wade (1987) provides examples of martins dying due to chemicals applied for tree diseases. Washington Dept. of Wildlife (1990) recommends that insecticides should not be used within at least 12 km of martin colonies in order to maintain a food base and avoid chemical contamination. Poisoning of Purple Martins at wintering sites in South America has been reported, with 50 000 wintering martins killed in one poisoning incident in Brazil (Anon. 1989).

## 8 SPECIAL SIGNIFICANCE OF THE SPECIES

The Purple Martin is only member of its genus in British Columbia. It reaches the northwestern limit of its continental range around southeastern Vancouver Island. It is the largest swallow in North America and is tolerant of human activity.

### 8.1 Degree of Public Interest

The Purple Martin is a popular backyard bird over much of its breeding range. In North America, over one million nestboxes for the martin have been erected (Nelson 1990). Like the Eastern Bluebird (*Sialia sialis*), the Purple Martin has responded to human attempts to attract it to accepting backyard bird boxes. In the west, the martin has not widely accepted martin apartment houses, but it will nest in single boxes and is not shy of human activity. It is the only single bird species in North America to have a magazine, The Purple Martin Update, devoted entirely to its welfare.

### 8.2 Species at Risk

The Purple Martin was Blue-listed by American Birds from 1975 to 1981, and was placed on the list of species of Special Concern from 1982 onwards (Tate 1981, 1986; Tate and Tate 1982).

The bird's decline in the east was largely believed to be due to nestsite competition from European

Starlings, whose numbers are still on the increase in North America, though Campbell et al. (in press) suggest that they may have levelled off in B.C. Fortunately, since most eastern populations of the Purple Martin nest in human-provided nestboxes and apartments, starling competition can be largely eliminated (Brown 1981) by human management, such as adjusting the entrance of the nestbox to discourage use by starlings.

In the western United States, recovery plans for Purple Martins were implemented later than in the east; however, the species is proving to be easily managed and is beginning to make a comeback in Oregon and western Washington (Milner 1987; Fouts in press).

The Purple Martin is on the BC Environment Wildlife Branch Red list (Harper et al. 1994, BC Environment, Wildlife Branch 1996), and is a candidate for management activities (Fraser et al. 1990) in the province.

## 9 RECOMMENDATIONS AND MANAGEMENT OPTIONS

### 9.1 Further Research Needs

- Conduct research on Purple Martin biology and ecology in British Columbia.
- Determine reproductive rates in B.C. colonies.
- Identify rate of decay and reduction in active colony sites.
- Investigate the degree of competition with other cavity nesters, particularly European Starling, and conduct research on colony and nestbox design and location that reduces competition.
- Investigate different nestbox design, especially with regard to starling competition, and martin nesting success. Trial gourd nests.

- Conduct banding studies to determine the species' movements, the source of recruitment, and identify the wintering grounds for the B.C. population.

## 9.2 Management Options

The future of the Purple Martin in British Columbia will depend on proper management of the existing colonies and encouraging the colonization of new areas. We recommend that the B.C. Ministry of Environment, Lands and Parks becomes the lead agency to co-ordinate ministry personnel and volunteer organizations (naturalists' clubs, scouting groups, school classes) in a managed nestbox program and annual census.

**Proposed Management Plan** — The Washington Department of Wildlife (1990) created a management plan for the Purple Martin that enlists the help of several other agencies, organizations, and volunteers. Through the establishment of a nestbox program, this plan has been successful in increasing martin populations in western parts of the state (Milner 1988). A management plan based upon the Washington activities, but created specifically for British Columbia is presented in Appendix 3.

The objectives of this plan are:

- To establish within 10 years in southwestern British Columbia a Purple Martin breeding population of at least 75 pairs spread among 10 sites.
- To monitor and manage each martin colony annually.
- To extend martin populations into protected areas (e.g., Qualicum National Wildlife Area, Sidney Spit Provincial Marine Park, Boundary Bay, George C. Reifel Bird Sanctuary, Alaksen National Wildlife Area, Serpentine Fen, Pitt-Addington Wildlife Management Area).
- To raise the profile of the Purple Martin's status in British Columbia and foster nestbox programs operated by volunteers.

- Increase the range of the Purple Martin, especially on the lower mainland and further north on Vancouver Island to Campbell River.

**Identified Wildlife** — We recommend that Purple Martins should be added to the Identified Wildlife under the *Forest Practices Code of British Columbia Act*, so that provision can be made to create Wildlife Habitat Areas if Purple Martins are found nesting on Crown land.

**Public Education Programs** — The Ministry of Environment should utilize the enthusiasm and interest of the naturalist community to “advertise” the vulnerable nature of the Purple Martin in British Columbia. School classes, civic clubs, community groups, and private land owners should be targeted in a public information campaign. This species would be an ideal candidate for a “Species at Risk” brochure that could include martin house-plans, a source of martin boxes, information on Project Martinwatch (Hill and Dellinger 1995) in addition to the usual information presented in these brochures.

## 10 EVALUATION

We recommend maintaining the Purple Martin on the province's Red List and that the species be considered for listing as an endangered species in B.C. Historical declines, the small size of the remnant breeding population (fewer than 200), reliance on a precarious *ad hoc* nestbox program, narrowing of the breeding niche, and the continuing loss of nesting habitat justifies such a listing.

## 11 REFERENCES

### 11.1 Authorities on species

The following experts sit on the scientific advisory board for the Purple Martin Conservation Association.

Erik J. Bitterbaum  
Missouri Southern State University

John W. Hardy  
Florida Museum of Natural History

J. Cam Finlay  
270 Trevlac Place,  
R.R. 3, Victoria, B.C.  
V8X 3X1

Richard F. Johnston  
University of Kansas

Charles R. Brown  
Associate professor  
Department of Biological Sciences  
University of Tulsa  
600 S. College Avenue  
Tulsa, OK. 74104-3189  
Phone (918) 631-3943  
Fax: (918) 631-2762

James R. Hill, III  
Purple Martin Conservation Association  
Edinboro University of Pennsylvania,  
Edinboro, PA 16444 U.S.A.  
Phone 814 734-4220  
Fax 814 734-5803  
jhill@vax.ednboro.edu

Kathleen Klimliewicz  
National Biological Service

Jerome Jackson  
Mississippi State University

Richard F. Johnston  
University of Kansas

Eugene S. Morton  
Smithsonian Institution

Bridget J. Stutchbury  
York University  
Canada

Rishard A. Woliniski  
Michigan State non-game biologist

Dalgas Frisch  
Brazilian Association for the Preservation of  
Wildlife

Eugene Morton  
Smithsonian Institute

Luiz D. Vozotto  
Universidade Estadual Paulista, Brazil

## 11.2 Periodicals Devoted to the Purple Martin

Purple Martin Update  
Purple Martin Conservation Association  
Edinboro University of Pennsylvania  
Edinboro, PA 16444

The Nature Society News  
Purple Martin Junction  
Griggsville, Illinois 62340

## 11.3 Literature Cited

Alford, C.E. 1928. Field notes on the birds of Vancouver Island. *Ibis* (Ser. 12) 4(2):181-210.

Allen, R.W., and M.M. Nice. 1952. A study of the breeding biology of the Purple Martin (*Progne subis*). *Am. Midland Nat.* 47:606-665.

American Ornithologists' Union. 1983. Check-list of North American Birds. Sixth ed. Am. Ornithol. Union, Baltimore, MD. Allen Press Inc. Lawrence, KS. 877pp.

Anderson, A.H., and A. Anderson. 1946. Notes on the Purple Martin roost at Tucson, Arizona. *Condor* 48:140-141.

Audubon, J.J. 1840. *The Birds of America*. Vol. 1. New York, NY. 317pp.

Anon. 1989. [Pesticide poisoning of Purple Martins in Brazil]. *Nat. Can.* Unpaginated insert. Summer 1987, 16(3).

Baerg, W.J. 1931. *Birds of Arkansas*. Agric. Exp. Stn. Univ. Vermont Bull. 258:1-196.

Bent, A.C. 1942. *Life Histories of North American Flycatchers, Larks, Swallows, and their allies*. U.S. Natl. Mus. Bull. No. 179. 555pp.

- Benton, A.H., and H. Tucker. 1968. Weather and Purple Martin mortality in western New York. *Kingbird* 18:71-75.
- Bock, T. 1990. Purple Martins - known nesting sites around Tacoma, Washington, Commencement Bay and Fort Lewis Military Base. Unpubl. rep. 1 page.
- British Columbia Ministry of Forests. 1992. Biogeoclimatic zones of British Columbia. Map. B.C. Minist. For., Victoria, BC.
- British Columbia Ministry of Environment, Lands and Parks. 1996. Birds, mammals, reptiles and amphibians at risk in British Columbia. Red and Blue Lists. B.C. Minist. Environ., Lands and Parks, Victoria, BC. 5pp.
- Brown, C.R. 1973. A second brood attempt by the Purple Martin. *Auk* 90(2):442.
- . 1976. Minimum temperature for feeding by Purple Martins. *Wilson Bull.* 88(4):672-673.
- . 1977. A record of intraspecific injury in the Purple Martin. *Bird-Banding* 48(3):273.
- . 1978a. A reinterpretation of the stooped submissive posture in the Purple martin. *Bull. Texas Ornithol. Soc.* 11(2):47-48M
- . 1978b. Clutch size and reproductive success of adult and subadult Purple Martins. *Southwestern Nat.* 23(4):597-603.
- . 1978c. Double-broodedness in Purple Martins in Texas. *Wilson Bull.* 90(2):239-247.
- . 1978d. On early spring arrival of Purple Martins. *Bird-Banding* 49(2):130-133.
- . 1978e. Post-fledging behavior of Purple Martins. *Wilson Bull.* 90(3):376-385.
- . 1978f. Inadequacies in the design of Purple Martin houses. *Bird-Banding* 49(4):321-325.
- . 1981. The impact of starlings on Purple Martin populations in unmanaged colonies. *Am. Birds* 35(3):266-268.
- . 1984. Vocalizations of the Purple Martin. *The Condor* (86):433-42.
- Brown, C.R., and M.B. Brown. 1988. A new form of reproductive parasitism in Cliff Swallows. *Nature* 331:66-68.
- Brown, C.R., M. Knott, and E.J. Damrose. 1992. Violet-green Swallow. *In* The Birds of North America, No. 14. A. Poole and F. Gill, eds. Philadelphia: The Acad. Nat. Sci.: Washington, DC: the Am. Ornithol. Union. 12pp.
- Brown, C.R., and S.P. Wolfe III. 1979. Post-breeding movements of purple martins in the Lake Texoma area. *Bull. of the Texas Ornithol. Soc.* 11(1):22-23.
- Bull, J. 1974. *Birds of New York state.* Doubleday - Nat. Hist. Press, Garden City, NY. 655pp.
- Bunch, C.H. 1964. Nesting of the western Purple Martin. *Murrelet* 45(1):10-11.
- Cabe, P.R. 1983. European Starling. *In* The Birds of North America. No. 48. A. Poole and F. Gill, eds. Philadelphia: The Acad. Nat. Sci.: Washington, DC: the Am. Ornithol. Union. 24pp.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, M.C.E. McNall. 1990. The Birds of British Columbia. Vol. 1. Royal B.C. Mus., Victoria, BC. Pp. 1-516.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, M.C.E. McNall. In press. The Birds of British Columbia. Vol. 3. Royal B.C. Mus., Victoria, BC.
- Cannings, R.J. In press. The Birds of British Columbia - A Taxonomic Catalogue. B.C. Minist. Environ., Lands and Parks, Wildl. Branch, Victoria, BC.
- Copley, D.R., and E.L. Walters. 1991. Rewards of being a volunteer! - Purple Martin nestbox programme summary- 1990. *Victoria Nat.* 47(4):8-9.
- Cowan, I.McT. 1939. The vertebrate fauna of the Peace River district of British Columbia. B.C.

- Prov. Mus. Occas. Pap. No. 1. Victoria, BC. 102pp.
- Crowell, J.B., Jr., and H.B. Nehls. 1975. Northern Pacific Coast Region. *Am. Birds* 29(5):1020-1025.
- Davidar, P., and E.S. Morton. 1993. Living with parasites: prevalence of a blood parasite and its effects on survivorship in the Purple Martin. *The Auk* 110(1):109-116.
- Davidson, A.R. 1964. The Purple Martin. *Victoria Nat.* 21(2):21.
- . 1966. Annotated list of birds of southern Vancouver Island. *Victoria Nat. Hist. Soc., Victoria, BC.* 23pp.
- Demarchi, D.A. 1993. Ecoregions of British Columbia. Map. Third ed. B.C. Minist. Environ., Lands and Parks, Wildl. Branch, Victoria, BC.
- Erskine, A.J., and G.S. Davidson. 1976. Birds in the Fort Nelson lowlands of northeastern British Columbia. *Syesis* 9:1-11.
- Finlay, J.C. 1971. Breeding biology of Purple Martins at the northern limit of their range. *Wilson Bull.* 83(3):255-269.
- . 1975. Nesting of Purple Martins in natural cavities and in man-made structures in Alberta. *Can. Field-Nat.* 89:454-455.
- Forbush, E.H. 1904. The destruction of birds by the elements in 1903-1904. *Ann. Rep. of the Mass. State Board of Agric.* 51:457-503.
- . 1929. *Birds of Massachusetts and other New England states.* Norwood Press. Norwood, MA. Vol. 3. 137-143.
- Fouts, D. In press. Helping Purple Martins become a going concern in the Pacific Northwest. *Purple Martin Update.*
- Fraser, D.F., E.L. Walters, and C. Siddle. 1990. Species management plan for the red and blue listed forest and grassland birds of British Columbia. Unpubl. rep. for the Wildl. Branch, B.C. Minist. Environ., Lands and Parks, Victoria, BC. 87pp.
- Friedmann, H. 1963. Host relations of the parasitic cowbirds. *U.S. Natl. Mus. Bull. No.* 233.
- Godfrey, W.E. 1986. *The birds of Canada,* revised ed. *Natl. Mus. Can., Ottawa, ON.* 595pp.
- Guiguet, C.J. 1978. The birds of British Columbia (10) goatsuckers, swifts, hummingbirds, and swallows. *B.C. Prov. Mus. Handb. No. 37,* Victoria, BC. 58pp.
- Harper, B., S. Cannings, D.F. Fraser and W.T. Munro. 1994. Provincial Lists of Species at Risk. Pages 16-23 *in* L.E. Harding and E. McCullum, eds. 1994. *Biodiversity in British Columbia.* Environ. Can., Can. Wildl. Serv.
- Harrison, H.H. 1975. *A field guide to birds' nests.* Houghton Mifflin Co., Boston, MA. 279pp.
- Higman, H.W. 1944. Autumn roosting of Purple Martins within the city limits of Seattle, Washington. *Murrelet* 25:43-44.
- Hill, J.R., III. 1995. The eastern House Finch nesting in Purple Martin houses and gourds. *Am. Birds* 42(1):36-38.
- Hill, J.R., III and D.T.B. Dellinger 1995. Purple Martin recoveries south of the border. *Purple Martin Update.* Purple Martin Conserv. Assoc. Edinboro Univ., PA. 7:25-26.
- Hoffman, R. 1927. *Birds of the Pacific States.* Houghton-Mifflin Co. Boston, MA. 351pp.
- Horton, F.B. 1903. Mortality of Purple Martins (*Progne subis*) at Brattleboro, Vermont. *Auk* 20:435-436.
- Hunn, E., and P. Mattocks, Jr. 1981. [Fall Migration] North Pacific Coast Region. *Am. Birds* 35:208-211.
- Jackson, J.A., and B.J. Schardien. 1981. Belly-soaking as a possible thermoregulatory mechanism in nesting Purple Martins. *North Am. Bird Bander* 6(1):12-13.

- Jewett, S.G., W.T. Taylor, W.T. Shaw, and J.W. Aldrich. 1953. Birds of Washington State. Univ. Washington State, Seattle, WA. 767pp.
- Johnston, R.F. 1964. The breeding birds of Kansas. Univ. Kansas Publ., Mus. Nat. Hist. 12:575-655.
- Johnston, R.F., and J.W. Hardy. 1962. Behavior of the Purple Martin. Wilson Bull. 74(3):243-262.
- Kenyon, K.W., and R.E. Phillips. 1965. Birds from the Pribilof Islands and vicinity. Auk 82:624-635.
- Kessell, B., and D.D. Gibson. 1978. Status and distribution of Alaska birds. Stud. in Avian Biol. 1:1-100.
- Kimball, F.H. 1889. Mortality among eave swallows. Auk 6(4):338-339.
- Klimkiewicz, M.K., and P.D. Jung. 1977. A new banding technique for nesting adult Purple Martins. North Am. Bird Bander 2:3-6.
- Kuerzi, R.G. 1941. Life history studies of the tree swallow. Proc. Linnaean Soc., NY. 52:1-52.
- Larrison, E.J. 1981. Birds of the Pacific Northwest, Washington, Oregon, Idaho and British Columbia. The Univ. Idaho, Moscow, ID. 337pp.
- Lee, J.A. 1967. Relative reproductive efficiency of adult and subadult Purple Martins. Chat 31:1-2.
- Lewis, M.G., and F.A. Sharpe. 1987. Birding in the San Juan Islands. The Mountaineers, Seattle, WA. 219pp.
- Lowther, P.E., and C.L. Cink. 1992. House Sparrow. In The Birds of North America, No. 12. A. Poole, and F. Gill, eds. Philadelphia: The Acad. Nat. Sci.: Washington, DC: the Am. Ornithol. Union. 20pp.
- Macoun, J. 1904. Catalogue of Canadian birds. Part 11. Sparrows, swallows, vireos, warblers, wrens, titmice and thrushes. Geol. Survey of Can. Ottawa, ON. Pp 537-539.
- Mattocks, P.W., Jr. 1986. Northern Pacific Coast Region. Am. Birds 40(3):514-518.
- Merker, C. No date. Purple Martin preference of nestbox designs. Unpubl. rep. Wash. Dep. Wildl. Olympia, WA. 4pp.
- . 1988. Results of the 1987 survey of Purple Martin (*Progne subis*) in Region 6 of the Washington Department of Wildlife. Unpubl. rep. Wash. Dep. Wildl. Olympia, WA. 16 pp.
- Meugens, A.L. 1947. Western Martin (*Progne subis hesperia*). Victoria Nat. 3(8):102-103.
- Milner, R. 1987. Status of the Purple Martin (*Progne subis*) in southwestern Washington: results of the 1987 survey. Unpubl. rep. Wash. Dep. Wildl. Olympia, WA. 28 pp.
- . 1988. Guidelines for establishing and maintaining a Purple Martin nest colony. Unpubl. rep. Wash. Dep. Wildl. Olympia, WA. 20 pp.
- Morton, E.S. 1987. Variation in mate guarding intensity by male Purple Martins. Behaviour 101(1-3):211-224.
- Morton, E.S., and K.C. Derrickson. 1990. The biological significance of age-specific return schedules in breeding Purple Martins. Condor 92:1040-1050.
- Morton, E.S., L. Forman, and M. Braun. 1990. Extra pair fertilizations and the evolution of colonial breeding in Purple Martins. Auk 107:275-283.
- Morton, E.S., and R.L. Patterson. 1983. Kin association, spacing, and composition of a post-breeding roost of Purple Martins. J. Field Ornithol. 54:36-41.
- Moss, W.W. 1972. Some ecological relationships of Purple Martins and their acarine ectoparasites. J. Med. Entomol. 9 (6):599.
- Moss, W.W., and J.H. Camin. 1970. Nest parasitism, productivity, and clutch size in purple martins. Science 168:1000-1003.

- Myres, M.T. 1958. The European Starling in British Columbia:1947-1957. B.C. Prov. Mus., Occas. Pap. No. 11. 59pp.
- Nelson, C. 1990. Bird Bonding. Nat. Can. Winter 1990:46-47.
- Niles, D.M. 1972. Determining age and sex of Purple Martins. Bird-Banding 43:137-138.
- Nolan, V. Jr. 1956. Spring migration. Middlewestern prairie region. Audubon Field Notes 10(4):336-338.
- Pearse, T. 1946. Notes on changes in bird populations in the vicinity of Comox, Vancouver Island - 1917 to 1944. Murrelet 27(1):4-9.
- Peterson, R.T. 1941. The Purple Martin. Leaflet No. 13. Natl. Audubon Soc. Washington, DC. Unpaginated.
- Plath, T. 1994. Purple Martins nest at Maplewood Flats. Pacific Estuaries Notes 2(2):4.
- Pyle, P., S.N.G. Howell, R.P. Ynick, and D.F. DeSante. 1987. Identification Guide to North American Passerines. Slate Creek Press, Bolinas, CA. 278 pp.
- Richmond, S.M. 1953. The attraction of Purple Martins to an urban location in western Oregon. Condor 55(5):225-249.
- Rohwer, S., and D.M. Niles. 1979. The subadult plumage of male purple martins: variability, female mimicry, and recent evolution. Zeitschrift Tierpsychology 51:282-300.
- Royal British Columbia Museum. Nest Records File card files. Royal B.C. Mus., 675 Belleville St., Victoria, BC.
- Royal British Columbia Museum. Vertebrate Sighting card files. Royal B.C. Mus., 675 Belleville St., Victoria, BC.
- Salt, W.R., and J.R. Salt. 1976. The Birds of Alberta. Hurtig, Edmonton, AB.
- Schafer, J.J. 1921. Port Byron. Audubon Bull. Fall 1921:39-41.
- Sharp, B. 1986. Guidelines for the management of the Purple Martin, Pacific Coast population. Sialia 8(1):9-13.
- Siddle, C., D.R. Copley and E. Walters. 1991. Status of Purple Martin in British Columbia. Unpubl. rep. for the Wildl. Branch, B.C. Minist. Environ. Lands and Parks. 85pp
- Siddle, C.R. 1982. The status of birds in the Peace River area of British Columbia. B.C. Prov. Mus. Unpubl. rep., Victoria, BC. 319pp.
- Sprunt, A., Jr. 1942. Purple Martin. In A.C. Bent. 1942. Life Histories of North American Flycatchers, Larks, Swallows, and their allies. U.S. Natl. Mus. Bull. No. 179. 555pp.
- Stirling, D. 1961. Purple martins. Victoria Nat. 18(3):33-34.
- Stokes, D.W., and L. Stokes. 1989. A guide to bird behavior, Vol. 3. Little, Brown and Co. (Can.), Toronto, ON. 397pp.
- Stutchbury, B.J. 1991a. Floater behaviour and territory acquisition in male purple martins. Animal Behav. 42:435-443.
- . 1991b. Coloniality and breeding biology of Purple Martins (*Progne subis hesperia*) in saguaro cacti. The Condor (93):666-675.
- Swarth, H.S. 1912. Report on a collection of birds and mammals from Vancouver Island. Univ. Calif. Publ. in Zool. 10:1-124.
- Tate, J., Jr. 1981. The Blue List for 1981: the first decade. Am. Birds 35:3-10.
- . 1986. The blue list for 1986. Am. Birds 40:227-236.
- Tate, J., Jr., and D.J. Tate. 1982. The blue list for 1982. Am. Birds 36:3-10.



- Tufts, R. 1986. Birds of Nova Scotia. Third ed. Nova Scotia Mus. - Nimbus Publishing, Halifax, NS. 478pp.
- Turner, A., and C. Rose. 1989. Purple Martin, *Progne subis*, Swallows and Martins. An identification guide and handbook. Houghton Mifflin, Boston, MA. Pp. 123-126.
- United States Fish and Wildlife Service. 1985. Guidelines for the management of the Purple Martin, Pacific Coast population. Unpubl. rep. U.S. Fish and Wildl. Serv., Portland, OR. Unpaginated.
- Wade, J.L. 1987. Attracting Purple Martins. The Nat. Soc., Purple Martin Junction, Griggsville, IL, 62340. 224pp.
- Walsh, H. 1978. Food of nestling Purple Martins. Wilson Bull. 90(2):248-260.
- Walters, E.L., D. Copley, and S.J. Statton. 1990. Purple Martin update - report finds fewer than 50 birds left in B.C. Victoria Nat. 47(1):4.
- Washington Department of Wildlife. 1990. Purple Martin - Management Recommendations for Priority Species. Olympia, WA.
- Widmann, O. 1884. Where the martins roost. Forest and Stream 23:183-184.
- . 1922. Extracts from the diary of Otto Widmann. Trans. Acad. Sci. of St. Louis 24(3):1-77.
- Wiggins, D.A. 1987. Purple Martin. Can. Wildl. Serv. Hinterland's Who's Who. Ottawa, ON. World wide web version. <http://www.doe.ca/envcan/docs/pmartin/pmartin.html>.
- Wilson, A., and C.L. Bonaparte. 1832. American Ornithology; or the Natural History of the Birds of the United States. Porter and Coates, Philadelphia, PA. 426pp.



**Appendix 1. Clutch size and fledging success for Purple Martin during the 1990 season at Cowichan Bay, Vancouver Island (Copley and Walters, unpublished data)**

Nest Box #	# of eggs	# fledglings	Success Rate (%)
90-53	4	4	100
25	5	4	80
90-52	5	4	80
21	4	2	50

**Appendix 2. Spring arrival dates in British Columbia for the Purple Martin, 1970-1990. Data on file at the Royal British Columbia Museum (RBCM vertebrate records file).**

Earliest reported date	Number	Location
April 8 1972	?	B.C.
April 17 1973	1m	Beaver Lake
April 27 1974	1 unaged	Campbell River
May 4 1975	1m	Island View Beach, Central Saanich
May 5 1976	3m 1f	Purple Martin Pond, Highlands
April 10 1978	1m	Lake Cowichan
May 1 1979	5 unsexed	Purple Martin Pond, Highlands
April 23 1980	3 unaged	Munn Road, Highlands
May 16 1982	4m	Clover Pt., Victoria
May 15 1883	1m	Purple Martin Pond, Highlands
May 3 1986	1m	Purple Martin Pond, Highlands
April 28 1987	6 unaged	Esquimalt Harbour
May 5 1990	?	Cowichan Bay

### Appendix 3. Proposed management plan for the Purple Martin in British Columbia.

#### Nest Box Program

- a. Where pilings are being used by martins and the pilings are decaying or are about to be removed, attempt to relocate by providing nestboxes. This strategy worked well at Ladysmith where decaying pilings that contained nest sites were removed and replaced with nestboxes on sound pilings. The population there increased from 4 pairs in 1990 to 10 pairs in 1994. Bunch (1964) indicates that in a similar situation in Washington State the birds nested in a nestbox (350 feet away) once the original nest site was removed from the previous year.
- b. Make the present breeding areas more attractive to martins and easier to monitor and manage by providing roosts; making nestboxes inaccessible to predators that may learn to prey on young martin nestlings; and by orienting boxes for easier viewing.
- c. Repair and maintain nestboxes.
- d. New boxes should be placed in existing colonies until a surplus of boxes exists, and then locate new boxes within 16 km of existing colonies.
- e. Seek co-operation of naturalist groups and erect at least five nestboxes on five suitable sites (e.g., pilings) within the areas listed below to increase present populations, expand these populations into new areas, and possibly attract new birds (as Washington populations grow, so will the number of recruits and SY birds seeking to start new colonies).

Suggested areas include:

#### **Vancouver Island and Area:**

Campbell Lakes  
Campbell River  
Chemainus  
Comox  
Courtenay  
Cowichan Lake  
Cowichan Bay  
Crofton Bay  
Crofton Lake  
Esquimalt Lagoon  
Esquimalt Harbour  
Fanny Bay  
Florence Lake  
Fulford Harbour, Saltspring Island  
Walker's Hook, Saltspring Island  
Goldstream Estuary  
Ladysmith Harbour  
Montague Harbour  
Nanaimo Harbour  
Nanoose Bay  
Oyster River

Purple Martin Pond, Highlands  
Sidney and Sidney Spit  
Sooke Basin and Sooke Hills  
The Gorge, View Royal

#### **Lower Mainland:**

Alaksen National Wildlife Area  
Blackie Spit  
Boundary Bay  
Howe Sound  
Iona Island  
Pitt-Addington Wildlife Management Area  
Port Moody  
Reifel Island Refuge  
Sechelt  
Serpentine Fen  
Vancouver Harbour

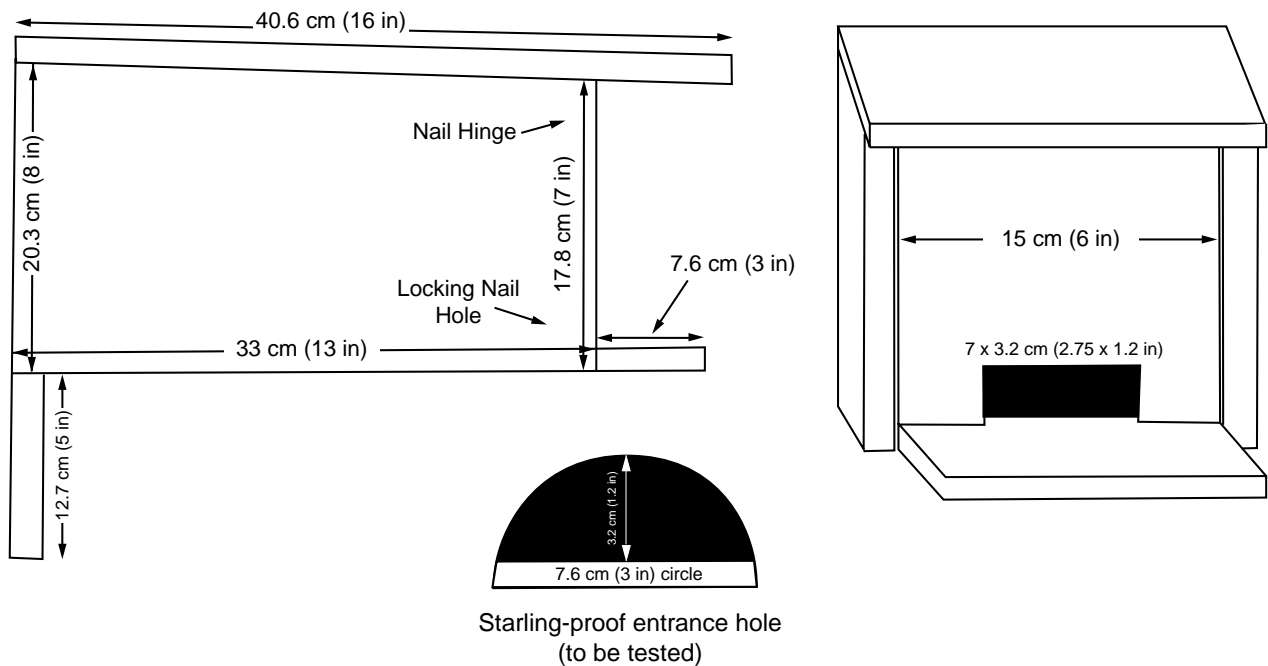
f. Monitor the nestbox program and document the use of boxes by Purple Martins and other nest competitors and numbers of birds fledged. Encourage all personnel and volunteers to collect data and submit it to both the Conservation Data Centre at the Ministry of Environment, Lands and Parks and to the B.C. Nest Records Scheme.

a. Boxes should be designed to discourage starlings with the front recessed in a “walled porch.” Single boxes should measure 23 x 23 cm, and be least 33 cm deep. The front wall is recessed about 7.6 cm. The entrance hole should be 3.2 cm high x 7 cm wide without a threshold (i.e., continuous with the porch floor). This is the minimum size acceptable to martins (a female martin was seen struggling to escape through an opening this size) and may prevent starling access (Merker no date). Openings measuring 3.5 cm high x 7 cm wide are possibly preferred by martins, but allow some starlings to gain access (Merker no date). The top of the opening should be sanded smooth. The porch should be 7.6 cm wide and its floor should be roughened to provide traction. The interior of the box should be painted white as this may dissuade starlings.

### Nestbox Design

A number of nestbox designs have been used in British Columbia. While there is considerable literature discussing the design of apartment-style boxes used by eastern Purple Martins (e.g., Brown 1978f; Peterson 1941; Wiggins 1987), there is less information on nestboxes more suitable for western populations. The following recommendations should be regarded as interim until more research reveals which box designs result in the highest fledgling rates and reduced starling competition.

Western Purple Martin Nestbox Plans  
successfully used on Vancouver Island



- b. All nestboxes should be made of decay-resistant, rough cedar boards, fastened together with galvanized nails. Mark the boxes on the outside with a number that indicates the year the box was erected, as well as an individual box number to make monitoring easier. Each piling on which nestboxes are erected should carry a sign explaining the box's function.
  - c. Boxes should have a 6 mm drain hole in each floor corner, and ventilation holes should be provided (2-3 per side near the top). Vent holes must be drilled to angle upwards towards the inside to prevent rain from entering.
  - d. One side or the roof should be hinged for better access during management activities. The side that opens should be locked with common galvanized locking nails. A hole can be drilled so that the nail locks snug with its head protruding at least 6 mm for easy handling.
  - e. Purple Martin gourds may be a low-cost alternative to nestboxes and should be tested in British Columbia (J.R. Hill, III., pers. comm.). They are available from the Purple Martin Conservation Association, Edinboro University of Pennsylvania, Edinboro, PA 16444, USA. If successful, local nature shops should be able to provide gourds for the general public.
- Estuaries, small bays, marinas, harbours, marshes, and lakes are the best locations.
- d. Locate boxes with minimum clear air space of 5 m (preferably 30 m) for circling and foraging about the nest. Erect houses 3 m or more above the ground or high-tide mark (Washington Department of Wildlife 1990).
  - e. Orient boxes so that the entrance is visible from an easily accessible viewing point to allow monitoring of nest. Martins in British Columbia seem to show no preference for hole orientation.
  - f. Ideally find a cluster of 2-3 pilings, relatively close to shore (30-50 m), and space 5-6 boxes around them. If possible, orient the boxes for maximum visibility of common air space (box entrances should be oriented in the same direction to prevent starlings from entering boxes without being observed by martins). Martins in numbers tend to intimidate competitors.
  - g. Find or provide a communal roosting site (telephone wires, masts, dead tree, etc.) and possibly a living deciduous tree as a source for green leaves for nest lining within 60 m of the colony.
  - h. Place a roost structure or a cone atop the pilings to prevent large birds from perching and depositing guano on the boxes. This will also prevent possible predation by herons. Roosts can be made of 0.6-1.3 cm wooden dowelling about 1 m long and stained with linseed oil.

### **Nestbox Placement**

- a. Erect new boxes in existing colonies first. Locate additional boxes within 16 km of existing colonies (Washington Department of Wildlife 1990).
- b. Use single-compartment nestboxes placed in clusters of 2 to 4 per piling. Trials should be made with apartment boxes with large compartments (see Wade 1987).
- c. Locate the boxes near bodies of water with large, forested areas nearby for foraging.

### **Nestbox Management and Maintenance**

- a. Nest boxes should be kept closed until just before the martins return. April 10 is a good date for opening. Keeping them closed until then will prevent starlings from using the nests for winter roosts and from starting to nest prior to the martins' return. New boxes may be erected

around April 10. Gourds can be sealed with commercially available plastic caps.

- b. Where European Starlings and House Sparrows are problems, steps must be taken to deter them. If starlings or House Sparrows are found to be using a martin nestbox early in the season, they should be trapped and the nest removed. Consideration might be given to killing the adults in order to prevent re-establishment

Later in the season, when eggs or young are present, do not remove sparrow nests as the adults are liable to wander into martin nests and destroy their young. If killing the adult sparrows is not an acceptable option, then the eggs or young should be removed, but the nest should be left to prevent the sparrows from taking over adjacent martin nests.

- c. Cedar nestboxes should be replaced about every four years.
- d. Clean out old nesting material in the spring and where possible, place the contents in a dry place beneath the nest. This is to allow for the

emergence of chalcid wasps which help to control *Protocalliphora*, a nestling parasite. The wasp larvae live in nesting materials and will return to martin boxes if old nests are left nearby.

- e. If research shows that parasite loads are having an impact on the British Columbia population, a parasite control program should be considered. Morton and Patterson (1983) used Sevin (carbaryl) to rid martin houses of Acarine parasites. Moss and Camin (1970) used a mixture of two acaricidal dusts, Dri-Die 67 and Dibrom. The mite populations were never completely eradicated from treated colonies, but they were greatly reduced.

Other common insecticides for martin houses are sulphur, rotenone, pyrethrins, malathion, and diatomaceous earth (Wade 1987). Wade recommends treating the nests twice each season, once at the beginning and again just after the eggs hatch. He recommends using two tablespoons of either diatomaceous earth or sulphur, applied to the floor and later dusted on top and around the edges.

## Map Legend

Historic Breeding Sites for Purple Martin in B.C.

Location from Campbell et al. except where otherwise noted. \* indicates active at least 2 years 1990-1996.

### Lower Mainland

1. Orpheum Theatre
2. CPR Station
3. Hudson's Bay Building
4. Bank of Montreal Building
5. old Vancouver Hotel
6. Hastings Street Post Office
7. "old mans home, East End, Vancouver"
8. Coquitlam River mouth
9. Maplewood Flats, N. Vancouver \*
10. piling, near mouth of Alouette River

### Vancouver Island

11. Fry Lake, Lower Campbell Lake (RBCM sightings file)
12. Mohoun Lake, near Campbell River (Syd Watts, pers. comm.)
13. Campbell River Estuary (E. Nygren, pers. comm.)
14. Oyster Bay (D. Stirling, pers. comm., pers. obs.)
15. Quinsam Lake (D. Stirling, pers. comm.)
16. powerline rights-of-way between Oyster River and Campbell River (David Stirling, pers. comm.)
17. Esquimalt Harbour\*
18. Cowichan Bay\*
19. Sooke
20. Crofton Lake
21. Chemainus Bay
22. Ladysmith Harbour\*
23. Nanaimo
24. Saanich # 1 "Purple Martin Pond"
25. Saanich # 2 highlands "several other locations in the highlands" (Stirling, pers. comm.)
26. Sidney Spit, Sidney Island (J. Todd, pers. comm.)
27. Gordon Head (now UVIC campus) (D. Stirling, pers. comm.)
28. Courtenay
29. Comox Slough (D. Stirling, pers. comm.)
30. Nanaimo Estuary\* (D.F. Fraser, pers. obs.)
31. Newcastle Island\* (D.F. Fraser, pers. obs.)
32. Crofton
33. Times Building on Fort Street
34. West Bay Marina\*
35. McKay Cormick Docks
36. View and Government streets



Wildlife Working Reports may be cited, but the preliminary nature of the data they contain should be noted. Working Reports 1-15 (and others) are presently out of print, but photocopies may be available through the Wildlife Branch, Ministry of Environment, Lands and Parks.

- WR-26 Quesnel Highlands wolf control project. D. Hebert. January 1987. 10pp.
- WR-27 Muskwa Wolf Management Project of northeastern B.C. 1986-87 annual report. J.P. Elliott. April 1987. 20pp.
- WR-28 Vancouver Island wolf control project. Year 1 progress report. D. Janz. July 1987. 11pp.
- WR-29 Habitat survey of the Mackenzie Heritage Trail corridor. V. Hignett. June 1987. 21pp + 5 maps.
- WR-30 A proposal to manage coyote and cougar populations of the Junction Wildlife Management Area. D. Hebert. September 1987. 11pp.
- WR-31 Wildlife habitat suitability of the Mackenzie Heritage Trail corridor. V. Hignett. May 1988. 16pp + 6 maps.
- WR-32 Research priorities for furbearers in British Columbia. D. Blood. June 1988. 49pp.
- WR-33 Electrically triggered drop net to capture wild sheep. J.W. Hirsch. January 1988. 18pp.
- WR-34 A lynx management strategy for British Columbia. D.F. Hatler. July 1988. 121pp.
- WR-35 Causes of bighorn sheep mortality and dieoffs - literature review. H.M. Schwantje. April 1988. 54pp.
- WR-36 Explanatory legend for vegetation maps of the Kamloops Lake bio-physical study area. E.C. Lea. December 1988. 78pp.
- WR-37 Bio-physical habitat units and interpretations for moose use of the upper Cariboo River Wildlife Management Area. E.C. Lea, T. Vold, J. Young, M. Beets, D. Blower, J. Youds, A. Roberts. December 1988. 24pp.
- WR-38 Grizzly bear habitat of the Flathead River area: expanded legend. E.C. Lea, B.L. Fuhr, and L.E.H. Lacelle. December 1988. 24pp.
- WR-39 Managing habitat through guidelines: How far can you go? M. Fenger and V. Stevens, eds. February 1989. 48pp.
- WR-40 Wolf-prey dynamics. Proceedings of a symposium sponsored by B.C. Ministry of Environment, Wildlife Branch, Faculty of Forestry, University of British Columbia and the Northwest Wildlife Preservation Society. February 1989. 188pp.
- WR-41 Caribou research and management in B.C.: proceedings of a workshop. R. Page, ed. November 1988. 275pp. (Also printed as WHR-27)
- WR-42 Trapping in British Columbia - a survey. R. Reid. January 1989. 55pp.
- WR-43 Biophysical habitat units of the Lower Halfway study area: expanded legend. E.C. Lea and L.E.H. Lacelle. December 1989. 33pp.
- WR-44 Long range habitat planning: proceedings. M. Fenger and V. Stevens, eds. March 1990. 49pp.
- WR-45 Biophysical habitat units of the Mosley Creek study area: expanded legend and interpretations. E.C. Lea and R.C. Kowall. March 1990. 33pp.
- WR-46 Habitat Management Section. Annual General Meeting. Yellowpoint Lodge - 1989 April 25-27. Wildlife and Recreational Fisheries Branches, Ministry of Environment. July 1990. 107pp.
- WR-47 Working plan — Khutzeymateen Valley grizzly bear study. A.N. Hamilton and J.A. Nagy. September 1990. 35pp. (Also printed as WHR-28).
- WR-48 Khutzeymateen Valley grizzly bear study. Annual progress report - year 1 (1989/90), annual working plan - year 2 (1990/91). J.A. Nagy and A.G. MacHutchon. January 1991. 44pp. (Also printed as WHR-29).
- WR-49 Fort Nelson and area average winter maximum snowpack mapping. R. Chilton. July 1990. 12pp.
- WR-50 Marten habitat suitability research project - working plan. E.C. Lofroth and V. Banci. January 1991. 31pp.
- WR-51 Khutzeymateen Valley grizzly bear study. Annual progress report - year 2 (1990/91), annual working plan - year 3 (1991/92). A.G. MacHutchon and S. Himmer. March 1992. 36pp. (Also printed as WHR-30)
- WR-52 Abundance, Distribution and Conservation of Birds in the Vicinity of Boundary Bay, B.C. R.W. Butler, ed. 1992. 132pp. (Also printed as Technical Report Series No. 155, Pacific and Yukon Region, Can. Wildlife Service).
- WR-53 Status of the Clouded Salamander in British Columbia. T.M. Davis and P.T. Gregory. March 1993. 19pp.
- WR-54 Status of the Northern Pacific Rattlesnake in British Columbia. M.B. Charland, K.J. Nelson, P.T. Gregory. March 1993. 23 pp.
- WR-55 Status of the Shrew-mole in British Columbia. L. Kremsater, L. Andrusiak, F.L. Bunnell. March 1993. 26 pp.
- WR-56 Status of the Nuttall's Cottontail in British Columbia. D.W. Carter, A. Harestad, F.L. Bunnell. March 1993. 33 pp.
- WR-57 Status of the Sharp-tailed Snake in British Columbia. D.J. Spalding. March 1993. 15pp.
- WR-58 Guidelines for Technical Publications of the Wildlife Program. E. Stanlake. March 1993. 57pp.
- WR-59 Status of Keen's Long-eared Myotis in British Columbia. M. Firman, M. Getty, and R.M.B. Barclay. March 1993. 29pp.

Continued from inside back cover:

- WR-60 Biophysical Habitat Units for the Tatlayoko Lake Study Area: expanded legend and interpretations. E.C. Lea and R.C. Kowall. March 1993. 22pp.
- WR-61 Status of the Pallid Bat in British Columbia. K. Chapman, K. Mc Guinness, R.M. Brigham. February 1994. 32pp.
- WR-62 Status of the Bald Eagle in British Columbia. D.A. Blood and G. G. Anweiler. February 1994. 92pp
- WR-63 A Survey of the Bat Fauna of the Dry Interior of British Columbia. S.L. Holroyd, R.M.R. Barclay, L.M. Merk, and R.M. Brigham. March 1994. 80pp.
- WR-64 Distribution and Abundance of Four Species of Small Mammals At Risk in a Fragmented Landscape. G.A. Zuleta and C. Galindo-Leal. March 1994. 80pp.
- WR-65 Problem Analysis of Integrated Resource Management of Riparian Areas in British Columbia. S.L. Rautio, P. Bunnell. March 1994. 26pp. (Also RRP3003-HQ Minist. of For. Res. Br.)
- WR-66 A Bibliography of Selected Literature on Wildlife Trees with Annotations and Abstracts. Wildlife Tree Committee. December 1994. 90pp.
- WR-67 Status of the Vaux's Swift in British Columbia. K. Summers and M. Gebauer. March 1995. 24pp.
- WR-68 Status of the White-throated Swift in British Columbia. K. Summers. March 1995. 24pp.
- WR-69 Status of the Williamson's Sapsucker in British Columbia. J.M. Cooper. March 1995. 24pp.
- WR-70 Status of the Sharp-tailed Grouse in British Columbia. R. Ritcey. March 1995. 52pp.
- WR-71 Status of the Western Harvest Mouse in British Columbia. D.W. Nagorsen. March 1995. 32pp.
- WR-72 Status of the Badger in British Columbia. A.H. Rahme, A.S. Harestad and F.L. Bunnell. March 1995. 64pp.
- WR-73 Status of the Fringed Myotis in British Columbia. S.A. Rasheed, P.F.J. Garcia, and S.L. Holroyd. October 1995. 28pp.
- WR-74 Status of the Western Small-footed Myotis in British Columbia. P.F.J. Garcia, S.A. Rasheed, and S.L. Holroyd. October 1995. 24pp.
- WR-75 Status of the Spotted Bat in British Columbia. P.F.J. Garcia, S.A. Rasheed, and S.L. Holroyd. October 1995. 24pp.
- WR-76 The Distribution, Abundance, and Habitat Requirements of Selected Passerine Birds of the Boreal and Taiga Plains of British Columbia. K.A. Enns and C. Siddle. March 1996. 54pp.
- WR-77 Status of the Brewer's Sparrow (*breweri* subspecies) in British Columbia. M.J. Sarell and K.P. McGuinness. March 1996. 22pp.
- WR-78 Status of the Green Heron in British Columbia. D.F. Fraser and L.R. Ramsay. March 1996. 28pp.
- WR-79 Status of the Bay-breasted Warbler in British Columbia. J.M. Cooper, K.A. Enns, and M.G. Shepard. February 1997. 36pp.
- WR-80 Status of the Black-throated Warbler in British Columbia. J.M. Cooper, K.A. Enns, and M.G. Shepard. February 1997. 36pp.
- WR-81 Status of the Canada Warbler in British Columbia. J.M. Cooper, K.A. Enns, and M.G. Shepard. February 1997. 36pp.
- WR-82 Status of the Cape May Warbler in British Columbia. J.M. Cooper, K.A. Enns, and M.G. Shepard. February 1997. 34pp.
- WR-83 Status of the Connecticut Warbler in British Columbia. J.M. Cooper, K.A. Enns, and M.G. Shepard. February 1997. 32pp.
- WR-84 Status of the Philadelphia Vireo in British Columbia. J.M. Cooper, K.A. Enns, and M.G. Shepard. February 1997. 32pp.
- WR-85 Status of the Prairie Falcon in the Chilcotin-Cariboo region, British Columbia. T.D. Hooper. March 1997. 22pp.
- WR-86 Status of the Upland Sandpiper in the Chilcotin-Cariboo region, British Columbia. T.D. Hooper. March 1997. 26pp.
- WR-87 Status of the Western Grebe in British Columbia. A.E. Burger. March 1997. 40pp.
- WR-88 Status of the Sprague's Pipit in British Columbia. T.D. Hooper. March 1997. 20pp.
- WR-89 Status of the Purple Martin in British Columbia. D.F. Fraser, C. Siddle, D. Copley, and E. Walters. March 1997. 38pp.