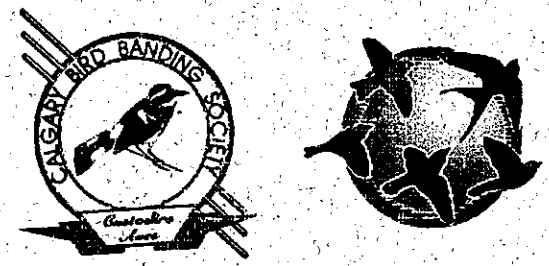
CALGARY BIRD BANDING SOCIETY

2002 ANNUAL TECHNICAL REPORT



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Custodire aves
Keep watch on birds

















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FRONTSPIECE

Select species banded at Las Caletas, Costa Rica during pilot migration monitoring 17 March – 12 April 2002. Left to right. Top row: **Streak-headed Woodcreeper** (U-U 17 Mar); **Orange-billed Sparrow** (U-U 11 Apr); **Red-capped Manakin** (U-M 18 Mar); **Barred Woodcreeper** (U-U 28 Mar); **Giant Antshrike** (U-M 23 Mar). Middle row: **Bicolored Antbird** (U-U 26 Mar); **Green Honeycreeper** (U-M 25 Mar); **Variable Seedeater** (pacific race U-M 7 Apr); **Barred Forest-Falcon** (U-U 22 Mar); **Long-billed Gnatwren** (U-U 18 Mar). Bottom row: **Dotted-winged Antwren** (U-F 25 Mar); **White-whiskered Puffbird** (U-M 19 Mar); **American Pygmy Kingfisher** (U-F 19 Mar); **Black-throated Trogon** (U-M 25 Mar); **Bay-headed Tanager** (U-U 7 Apr); **Orange-collared Manakin** (U-M 22 Mar); **Riverside Wren** (U-U 21 Mar).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

EXECUTIVE SUMMARY

The Calgary Bird Banding Society (CBBS) was incorporated in March 1995. The main objective of CBBS remains conducting migration monitoring and other banding-based studies at Inglewood Bird Sanctuary (IBS), a federal Migratory Bird Sanctuary. IBS has long been known as an important migration site for Neotropical migrants. Located within 80-km of the Rocky Mountains, the site is an integral component of the Canadian Migration Monitoring Network.

During 2002 CBBS received support from the James L. Baillie Memorial Fund, Petro-Canada Volunteer Grant Fund and the Canadian Wildlife Service.

Spring migration monitoring was undertaken at IBS for the first time in 2002. The 2002 fall migration monitoring program follows pilot programs in 1992 and 1994 and full fall programs in 1995 through 2001. Twelve mist-nets were operated for approximately 6 hours on 27 of the 38 days between 1 May and 7 June (1184 net-hrs) and 68 of the 72 days between 27 July and 6 October (4838 net-hrs). Total new bandings of 624 and 1466 were achieved for the spring and fall programs respectively. The IBS MAPS site was operated again in 2002, adding to previous data gathered since 1992. New bandings totaled 83 with increases in Gray Catbird and Baltimore Oriole.

2002 marked the first year of a pilot migration monitoring program at Las Caletas, Costa Rica on the Osa Peninsula along the Pacific coast. Migration monitoring methods used were similar to those at IBS. Spring migration monitoring was conducted from 17 March to 12 April. Mist-netting occurred on all 27 days for a total of 2041 net-hours. In total, 882 birds of at least 77 species were captured (excluding recaptures) of which 416 were new bandings and 466 released or otherwise unbanded. From a different perspective 420 were endemic or resident birds and 462 were migrants. Of the 462 migrants 439 (95%) were Swainson's Thrushes.

Interesting recaptures included a Hairy Woodpecker at least 8-years old, an 8-year old Eastern Kingbird and a Brown-headed Cowbird initially banded at Cominco Natural Area and recovered in 2002 at IBS. Although IBS and CNA are just 5-km apart along the Bow River there are few records of banded birds between the two sites. After no records during 2001 we had another record of a migrant returning to IBS one or more years after banding. A Swainson's Thrush was recovered for the second time since it was banded in 1999.

Trend analysis was undertaken on 27 species occurring as migrants at IBS and captured in sufficient quantity to allow analysis. Three species evidenced significant or nearly significant change over the evaluation period:

Warbling Vireo	- 2.0%/year (p=0.11)
Yellow Warbler	+ 3.8%/year (p=0.09)
Dark-eyed Junco	- 2.7%/year (p=0.04)
Baltimore Oriole	- 2.4%/year (p=0.03)

Volunteers and Banders-in-Charge contributed a total of 268 and 132 man-days respectively to the banding projects. Eleven mortalities occurred during the mist-netting of 4,060 birds (0.27%), 6 of which resulted from predation by weasels, deer and hawks. In addition 31 injuries were recorded, many of them wing abrasions and most minor.

INTRODUCTION

The Calgary Bird Banding Society (CBBS) was incorporated on 22 March 1995 with the following objectives:

- Quantify long-term population trends of Neotropical migratory birds using constant effort mist-netting at Inglewood Bird Sanctuary;
- Promote involvement and expertise in bird banding; and
- Promote conservation of Neotropical migratory birds by fostering public awareness and understanding of Neotropical migratory birds.

Although the primary project of the CBBS is monitoring of migratory birds at Inglewood Bird Sanctuary (IBS) in Calgary, other complimentary projects have also been undertaken:

- a Monitoring Avian Productivity and Survivorship (MAPS) station was established at IBS in 1992 and continued in 1993 and 1995-2002;
- spring banding was initiated in 1997 at Dunbow Road approximately 22-km SSE of the City of Calgary and continued in 1998 and 1999;
- spring and fall banding/migration monitoring was initiated at the Cominco Natural Area (CNA) in 2000 with spring banding continued in 2001;
- colour-banding and relocation of Red-tailed and Swainson's Hawks at Calgary International Airport was initiated in cooperation with the Calgary Airport Authority in 2000 and is ongoing;
- pilot spring migration monitoring was initiated at Las Caletas on the Osa Peninsula, CR in 2002; and
- a Northern Saw-whet Owl migration monitoring pilot program was carried out at Inglewood Bird Sanctuary in 2000 and subsequently discontinued.

As of 1998 the Calgary Bird Banding Society's Inglewood Bird Sanctuary site is a fully designated member of the Canadian Migration Monitoring Network coordinated and administered by Bird Studies Canada. Establishment of this formal association of migrant monitoring sites across Canada significantly underscores the value of the work conducted at each site.

FUNDING AND ACKNOWLEDGEMENTS

Primary funding proceeds during 2002 were:

- funds raised by the CBBS through participation in the Baillie Birdathon (approximately $3,200 net);
- a grant from Canadian Wildlife Service through Mr. Loney Dickson ($2,000); and
- a grant from the Petro-Canada Volunteer Grant Program ($500);

Funds were used to provide a per diem to Banders-in-Charge (BICs), cover in-country costs for the Costa Rica pilot project, purchase mist-nets, produce the annual technical report and cover migration monitoring miscellaneous costs (field data sheets, propane, batteries, film etc.).

Field data forms for migration monitoring were modified from forms designed for the Last Mountain Bird Observatory in Saskatchewan. CBBS acknowledges LMBO's spirit of cooperation in sharing digital copies of these forms for our use.

Data and photographs to support our study of Mourning and MacGillivray's Warbler morphometrics at Inglewood Bird Sanctuary were contributed by Mackenzie Bird Observatory.

MIGRATION MONITORING AT INGLEWOOD BIRD SANCTUARY

Background

Neotropical migrants are birds that breed in the Nearctic biogeographic realm and winter in the Neotropics. The Neotropical migratory bird system involves some 5-10 billion birds of over 150 species (Greenberg 1992). Trends in data from the Breeding Bird Survey (1978-1988) indicated that a majority of Neotropical migrants in eastern North America decreased in their population index (Sauer and Droege 1992). Although destruction of tropical forests on the wintering grounds has been implicated in this decline, increasing concern is being raised about the potential effect of accelerated land-use changes on breeding grounds.

Inglewood Bird Sanctuary (IBS) is a federal Migratory Bird Sanctuary known as an important site for migrating passerines. IBS is strategically located within 80-km of the Rocky Mountains (Figure 1) and is a unique and valuable addition to the Canadian Migration Monitoring Network coordinated and administered by Bird Studies Canada. IBS is located within Calgary which greatly facilitates the potential for volunteer involvement. Pilot Neotropical migrant monitoring covering only a portion of the fall migration season was undertaken in 1992 and 1994 while full fall migration monitoring has occurred since 1995. Monitoring songbird population change based on fall mist-netting has been shown to be an effective technique (Dunn *et al.* 1997).

Methods and Study Site

Both spring fall migration of Neotropical migrants was monitored in 2002 at Inglewood Bird Sanctuary (IBS). IBS' 35 hectares includes mature riverine balsam poplar forest known for its number and diversity of songbirds during fall migration. Constant effort mist-netting (i.e. constant number of nets in permanent locations for constant time period each day) and collection of associated morphometric and other data (e.g. age, sex, wing chord, weight, fat reserves, capture net, time of capture) from each bird captured was carried out each day, weather permitting, during fall migration. Twelve 12-m long 30-mm mesh mist-nets were operated in permanent net lanes for approximately 6-hours each day beginning at sunrise. A daily census was obtained when possible. A census was not attempted when the number of migrants or volunteer shortage would result in unacceptable risk to captured birds (e.g. excessive holding time).

Migration monitoring procedures have been developed for IBS based on standardizations outlined in McCracken *et al.* 1993 (A manual for monitoring bird migration), Hagan *et al.* 1994 (Recommended methods for monitoring bird migration) and Hussell and Ralph 1996 (Recommended methods for monitoring bird populations by counting and capture of migrants), modified to accommodate the specific requirements of the IBS site. Net locations and the daily census route are shown on Figure 2.

Monitoring Schedule and Coverage

Spring

Spring migration monitoring at IBS was conducted from 1 May to 6 June. This was the first full year of spring migration monitoring at IBS. In addition to standardized constant-effort mist-netting, a census route was surveyed 2-3 hours from the start of the netting. Coverage of 71% was achieved. That is, mist-netting occurred on 27 of the 38 target days for a total of 1884 net-hours (Table 1a, Figure 3a). Inclement weather resulted in 10 days of the monitoring period without banding while lack of volunteers precluded another.

Fall

Fall migration monitoring at IBS was conducted from 27 July to 6 October. In addition to standardized constant-effort mist-netting, a census route was surveyed 2-3 hours from the start of the netting. During 2002, coverage of 94% was achieved. That is, mist-netting occurred on 68 of the 72 target days for a total of 4838 net-hours (Table 1b, Figure 3b). Inclement weather resulted in 4 days of the monitoring period without banding or with curtailed banding.

New Bandings

Spring

A total of 624 new bands were placed on birds of 46 species (Table 2a, Appendix 1a). Days on which 40 or more new bandings occurred were 13, 14, 24, 28 May (Figure 3a). New banding totals by species at IBS from are presented in Table 2a. The top 20 banded species are identified in Appendix 2. Species monitored at IBS based on criteria developed by Bird Studies Canada appear in Appendix 3 along with those criteria.

Fall

A total of 1466 new bands were placed on birds of 66 species (Table 2b, Appendix 1b). Days on which 40 or more new bandings occurred were 10, 11, 15-19, 23 August and 11, 15 September. Approximately 59% of new bandings occurred in August and 34% in September (Figure 3b). New bandings at IBS from 1992-2002 are presented in Table 2b. The top 20 banded species over all years, and during 2002, are identified in Appendix 2. Species monitored at IBS based on a minimum of 10 captures/year on at least 5 different days are presented in Appendix 3.

General

Mist-netting can add another dimension to understanding the avifauna at a site particularly in detection of rare or elusive species. As in past years several species were banded at Inglewood that are infrequently reported by bird watchers; a Nashville Warbler on 15 September, a Connecticut Warbler on 9 September, single Swamp Sparrows on 26 September and 6 October, and a Fox Sparrow on 15 September.

The *Oporornis* warblers are often difficult to detect and identify by bird watching with binoculars. During 2002 migration monitoring at IBS one Connecticut Warbler, 7 Mourning Warblers and 4 MacGillivray's Warblers were banded. A study of differences between Mourning and MacGillivray's Warblers captured at IBS has been underway since 1996. All birds are photographed when initially captured and additional morphometric detail and plumage characteristics documented. Data from Mackenzie Bird Observatory was again obtained in 2002 to help investigate whether *Oporornis* warblers at IBS may be hybrids. DNA analysis offers another potential avenue of investigation into this issue. Appendix 6 provides additional details on this interesting work-in-progress. The cooperation of other migration monitoring sites in our study is greatly appreciated and CBBS looks forward to additional data and further insight in future years.

Other areas of research have involved, or have the potential to involve, data from IBS. Firstly, banding data were provided to Erica Dunn of CWS as part of a cooperative study on mass gain among migrating songbirds at Canadian stopover sites. Ms. Dunn's analysis provides insight into the quality of IBS as a refueling stop for Neotropical migrants. A copy of the pre-publication version of her paper appeared in Appendix 5 of the 2000 CBBS ATR. Secondly, techniques are being developed to identify the geographic origin of birds captured at CMMN sites using stable isotopes. This project offers the possibility of confirming the hypothesis that CMMN sites monitor birds from a wide area north of their respective locations. Preliminary results involving 1999 samples from Delta Marsh Bird Observatory and Atlantic Bird Observatory indeed indicated that CMMN stations are capturing birds from a broad area, not simply from a small region close to the station. CBBS is investigating the potential to collect and analyze stable isotope samples from IBS during 2003.

Recaptures

Recaptures at IBS during migration monitoring totaled 752 of 515 different birds of 48 species. Recapture rates were highest (>100%) in resident species (e.g. House Wren, Black-capped Chickadee, Downy Woodpecker). However some resident species evidenced a relatively low recapture rate suggesting that migrants swell the ranks (e.g. Yellow Warbler, American Robin, Cedar Waxwing). A few migrant species appear to use IBS for moulting or extended pre-migratory foraging (e.g. Mourning Warbler, Northern Waterthrush, White-throated Sparrow, Lincoln's Sparrow). Yet other migrant species do not appear to linger at IBS (e.g. Ruby-crowned Kinglet, Hermit Thrush, Least Flycatcher).

Species Recaptured at Inglewood Bird Sanctuary during MM 2002					
Species	Recap	Banded	Species	Recap	Banded
Solitary Sandpiper	1	13	Magnolia Warbler	5	9
Spotted Sandpiper	1	7	Yellow-rumped Warbler	120	497
Belted Kingfisher	2	7	Palm Warbler	1	4
Downy Woodpecker	23	18	Blackpoll Warbler	14	37
Hairy Woodpecker	2	1	American Redstart	10	29
Northern Flicker	2	5	Ovenbird	1	7
Western Wood-Pewee	5	19	Northern Waterthrush	24	41
Traill's Flycatcher	7	51	Mourning Warbler	7	7
Least Flycatcher	4	37	MacGillivray's Warbler	2	4
Eastern Kingbird	6	7	Common Yellowthroat	30	29
Warbling Vireo	10	13	Wilson's Warbler	35	149
Tree Swallow	5	19	Canada Warbler	1	2
Black-capped Chickadee	49	16	Chipping Sparrow	2	95
White-breasted Nuthatch	5	7	Caly-colored Sparrow	7	41
House Wren	105	85	Song Sparrow	8	16
Ruby-crowned Kinglet	2	14	Lincoln's Sparrow	46	107
Swainson's Thrush	7	67	White-throated Sparrow	41	56
Hermit Thrush	1	13	White-crowned Sparrow	17	36
American Robin	14	65	Dark-eyed Junco	2	7
Gray Catbird	18	21	Rose-breasted Grosbeak	2	4
Cedar Waxwing	2	30	Red-winged Blackbird	1	6
Tennessee Warbler	18	76	Brown-headed Cowbird	4	10
Orange-crowned Warbler	17	90	Baltimore Oriole	10	13
Yellow Warbler	55	152	American Goldfinch	1	3

Year-to-year recaptures from 1992-2002 are presented in Appendix 5. Most year-to-year recaptures occur in the year following banding. However in a few cases birds are recaptured in several subsequent years and occasionally show up for the first time a number of years after banding. Of note are:

- a Hairy Woodpecker banded in 1995 at IBS and recaptured for the second time this year;
- an Eastern Kingbird banded at IBS in 1998 and recaptured for the first time this year
- two Eastern Kingbirds banded at IBS in 1996 and 1997 and recaptured for the first time this year;
- a Warbling Vireo banded at IBS in 1999 and recaptured this year;
- a Swainson's Thrush banded at IBS in 1999 and recaptured in 2000 as well as this year (a rare recapture of a migrant year-to-year); and
- a Brown-headed Cowbird banded at Cominco Natural Area in 2001 and recaptured at IBS this year (the two sites are 5-km apart along the Bow River).

Daily Estimated Totals (DETs)

The daily estimated totals (DETs) represent the total number of birds, by species, detected at the IBS migration monitoring site each day. Each DET incorporates capture data as well as a standardized census and any casual observations made during banding operations. The DETs, after removal of probable and known stopovers (PKS), give an overall description of bird migration. DET is secondary, and inferior to, mist-netting as a monitoring measure at Inglewood. If high capture rates and/or personnel shortage create a risk to the welfare of the birds, a census (and therefore a DET) is not done. DET data is inputted into the CMMN-DET management program and provided to Bird Studies Canada for trend analysis and other CMMN cooperative projects.

MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS)

Background

The Monitoring Avian Productivity and Survivorship (MAPS) Program is a cooperative effort among public agencies, private organizations, and bird banders of North America (Appendix 4). It provides long-term data on population and demographic parameters for target landbird species throughout the continent. The 2002 field season was MAPS 14th year of North American operation.

MAPS utilizes standardized, constant-effort mist-netting during the breeding season at a continent-wide network of stations. Annual regional indices of adult population size and post-fledging productivity are estimated from capture data during the breeding season. Annual regional estimates are made of adult survivorship, adult population size and recruitment into the adult population from capture-recapture data.

North America is divided into eight major regions based on biogeographical and meteorological considerations, and each region has, within it, target species. IBS falls into the Northwest Region whose target species are:

Dusky Flycatcher	Yellow Warbler;
Western Flycatcher complex	MacGillivray's Warbler;
Swainson's Thrush	Wilson's Warbler;
American Robin	Song Sparrow;
Warbling Vireo	Lincoln's Sparrow;
Orange-crownedWarbler	"Oregon" Dark-eyed Junco

All of these species have been captured at IBS although only American Robin, Warbling Vireo, Yellow Warbler, Song Sparrow, and Lincoln's Sparrow are breeders. MAPS data is provided to the Institute for Bird Populations in Point Reyes, CA where it is integrated with data from the over 500 other North American stations.

Objectives

The overall objective of the MAPS Program is to contribute to an integrated avian population monitoring system for selected North American landbirds. The indices and estimates obtained:

- determine annual changes and, ultimately, longer-term trends in population and demographic parameters of target species in each region;
- relate these trends to readily-measured environmental co-variates such as climatic factors, habitat type, and management practice; and
- refine current population models and develop new ones.

Methods

The MAPS Program consists of standardized constant-effort mist netting during the breeding season. The breeding season is considered to extend from May through mid-August and is divided into 10 ten-day periods. Ten 30-mm mist-nets are operated for 6 hours from sunrise on one day in each of the ten-day periods. Mist-netting commences the first ten-day period during which the majority of breeding adults of the target species have established territories and migrant individuals of these species are no longer passing through the area. The operation of the mist-nests must continue for a minimum of three periods in the adult "super-period" and two periods in the young "super-period". At IBS, MAPS initiates during period 4 (31 May - 9 June) and coverage entails 7 of the 10 ten-day periods. In recent years period 10 has been operated during fall migration monitoring.

An additional requirement is to record the type and distribution of vegetation present at the MAPS station. Because changes in the vegetation at a station can cause changes in breeding populations and demographic parameters, the habitat is assessed every 5 years.

MAPS Schedule and Coverage

2002 marked the 10th year of the MAPS project at IBS since 1992. Unavailability of qualified personnel precluded gathering data in 1994. In 2002 a total of 362 net-hours were achieved over 6 periods. Period 4 was missed due to scheduling and weather problems. In fact Period 4 is no longer required at stations at the latitude of IBS but we have continued with it in most years out of tradition.

Results

The number of each species banded, by date, during 2002 are summarized in Table 3. The number of each species that were banded is summarized in Table 4 for 2002 as well as the nine previous years.

Discussion

As indicated in Table 4 the number of new bandings has fluctuated quite considerably from year to year. Highlights in 2002 included a noticeable drop in the banded House Wrens and a continued noticeable increase in banded Gray Catbirds and Baltimore Orioles.

The number of migrants detected during MAPS has also varied from year to year. Very few northbound warblers were detected in 2002 suggesting an early spring migration or high mortality due to the adverse weather during late May and the beginning of June. Also, the drop in Tennessee Warblers to baseline levels may suggest a decline in budworms or other resource.

MIGRATION MONITORING AT LAS CALETAS, COSTA RICA

Introduction

A migration monitoring site on the Osa Peninsula on the Pacific coast of Costa Rica was identified in 1998 and a pilot project was finally initiated in 2002 (Figure 4). CBBS is interested in the potential to monitor Neotropical migrants on their northward migration through Central America as a complement to the migration monitoring carried out at IBS. The purpose of the pilot program is to see whether in fact there is a significant movement of Neotropical migrants through the site and, if so, the optimum temporal window to monitor the migration using standardized mist-netting. During 2003 monitoring will take place between 13 April and 10 May. The final monitoring protocol and objectives will depend in large part on the results of the pilot work.

Study Site

The potential migration monitoring site is located on the Pacific coast of southwest Costa Rica, on the Osa Peninsula just north of Corcovado National Park in the vicinity of the Las Caletas ecotourism lodge. The lodge is located on the south coast of Drake Bay, a few kilometres southwest of the small village of Agujitas and is accessed by a 2 hour boat trip from the town of Sierpe, down the Sierpe River and southwest across Drake Bay. The lodge is on a hill looking north over the Pacific Ocean. The monitoring station is 200 metres further uphill south of the lodge.

Methods

Migration monitoring methods used during spring 2002 were similar to those at IBS. Constant effort mist-netting and collection of associated morphometric and other data (e.g. age, sex, wing chord, weight, fat reserves, capture net, time of capture) from each bird captured was carried out on each day, weather permitting. Twenty different net lanes were tried with 15 in operation on any given day. The fifteen 12-m long 30-mm mesh mist-nets were operated for approximately 6 hours each day beginning at sunrise. USFWS aluminum bands were applied to migrants while CBBS-purchased bands were applied to endemic species resident in the area. Hummingbirds, captured incidentally, were released unbanded.

Monitoring Schedule and Coverage

Spring migration monitoring was conducted from 17 March to 12 April. Mist-netting occurred on all 27 days for a total of 2041 net-hours (Table 5).

New Bandings and Captures

In total, 882 birds of at least 77 species were captured (excluding recaptures) of which 416 (47%) were new bandings and 466 (53%) released or otherwise unbanded (Appendix 7).

From a different perspective 420 (48%) were endemic or resident birds and 462 (52%) were migrants. Of the 420 resident birds 94 (22%) were hummingbirds many of which were unspeciated contributing to the uncertainty in total number of species captured. Of the 462 migrants 439 (95%) were Swainson's Thrushes and of those 334 were unbanded primarily due to lack of appropriate size bands.

Recaptures

A minimum of 159 recaptures were recorded, primarily (95%) endemic or resident birds (30 species). Some captures of unbanded hummingbirds and Swainson's Thrushes undoubtedly occurred but, notwithstanding, recaptures likely numbered <200. Only 4 banded Swainson's Thrushes were recaptured, all same day. Certainly this species appeared to be moving through with purpose and not lingering. Similarly none of the 9 Yellow-green Vireos banded were recaptured suggesting that the species is not a local winter resident. On the other hand the warblers that were banded were recaptured frequently suggesting some, perhaps all, may be winter residents in the area. A Kentucky Warbler banded on 19 March was recaptured on 21 March and again on 7 April. A MacGillivray's Warbler banded on 22 March was recaptured on 5 April.

SIGNIFICANT RECAPTURES

Interesting recaptures of birds banded in previous years are listed below. All recaptures of birds banded prior to 2002 are indicated in Appendix 5. This is only the second year either of the Hairy Woodpeckers has been recaptured. The 5+ year old Eastern Kingbird is another example of how years can go by before a bird is recaptured. The initiation of spring banding at IBS will likely result in more recaptures of resident birds year-to-year. The 8-year old Eastern Kingbird is noteworthy as the longevity record on the USFWS web site is 9 years 11 months! After none last year the Swainson's Thrush recovery is a welcome addition to our set of year-to-year returning migrants. This is a rare phenomenon at banding sites. The Brown-headed Cowbird banded at Cominco and recovered at IBS is interesting. Only a handful of birds have moved between the two sites during CBBS research.

Hairy Woodpecker 962-90911 Banded as AHY-F by Grahame Booth at Inglewood Bird Sanctuary on 15 July 1995. Recaptured there on 28 September 2000 and 14 May 2002. At least 8-years old.

... 1152-38713 Banded as ASY-M by Grahame Booth at Inglewood Bird Sanctuary on 5 July 1998. Recaptured there on 24 September 2000 and 30 July 2002. 6-years old.

Eastern Kingbird 1461-31482 Banded as AHY-F by Stefan Jungkind on 17 August 1998. Recaptured there on 1 August 2002. At least 5-years old.

...1461-63719 Banded as ASY-M by ~~Stefan Jungkind~~ Dale Paton on 13 August 1996. Recaptured there on 5 June and 3 August 2002. ~~8-years old~~ At least 7

...1461-63750 Banded as AHY-M by Doug Collister on 1 August 1997. Recaptured there on 20 May 2002. At least 6-years old.

Warbling Vireo 3101-89999 Banded as AHY-U by Grahame Boothe at Inglewood Bird Sanctuary in Calgary, AB on 2 August 1999. Recaptured there on 29 May 2002. At least 4-years old.

Swainson's Thrush 1541-17673 Banded as AHY-U by Doug Collister at Inglewood Bird Sanctuary on 16 July 1999. Recaptured there on 3 and 26 August 2000 and 9 August 2002. At least 4-years old. A rare recovery of a migrant (does not breed in or near IBS) during following year subsequent to banding.

Caly-colored Sparrow 2160-19504 Banded as AHY-U by Grahame Booth at Inglewood Bird Sanctuary on 4 August 1999. Recaptured there on 4 August 2002. At least 4-years old.

Brown-headed Cowbird 1761-28100 Banded as ASY-F by Greg Meyer at Cominco on 28 May 2001. Recaptured at Inglewood Bird Sanctuary on 17 August 2002. At least 3-years old.

TREND ANALYSIS

Table 6 presents the results of trend analysis on those species that are monitored at IBS (Appendix 3). Monitored species are those for which at least 10 individuals are captured on at least 5 different days. Figure 7 illustrates graphically the trend to date for 4 warblers one of which, Yellow, is evidencing an almost statistically significant trend.

Trend analysis is based on total captures from 1995-2002 and represents the results of simple linear regression within Microsoft EXCEL. Daily captures were log-transformed, summed and normalized by dividing by the number of days monitored within the species' "window" of migration as inferred from the overall 1995-2002 capture data. Captures were left as 0 on days when monitoring did not occur. Actual confidence level (P) is indicated. Note that scientific investigation normally requires a P level of <0.05 and preferably <0.01 in order to consider results significant. Due to net-lane inconsistencies year-to-year several species could only be analyzed using a subset of the data.

Although the trends with low P values are likely real, the cause behind them is unclear. Only time and comparison to other CMMN stations will indicate whether significant trends are due to changes in regional populations or to other confounding variables such as weather or habitat change in and around IBS.

PERSONNEL

Volunteers

Volunteer participation in all of the CBBS projects continues to be the key to the success of research efforts. Banding at IBS is done in an area of the sanctuary designated "reserve" and off-limits to the public. A condition of operation is that no more than 3 people are in the reserve at one time, in order to minimize impact. Thus, on any given day, a Bander-in-Charge and up to 2 volunteers carry out the banding.

Without donated time, primarily by members of the Calgary Bird Banding Society, the high degree of success achieved would not have been possible. Sincere appreciation is extended to all of the volunteers listed in Table 7 who donated approximately 8 hours on each day indicated.

Banders-in-Charge (BIC)

No salaried staff are involved in any CBBS projects. However, a daily per diem and travel allowance (for out-of-town banders only) is offered to all Banders-in-Charge (BIC). This arrangement provides an incentive for qualified individuals to assume the BIC duties and imposes accountability on the BIC to complete field data sheets and input data to computer files. No per diems are paid until all duties of the BIC, including data entry, have been fully discharged. The per diem established by the general membership for the 2002 field season was $100/day.

MORTALITIES AND INJURIES

It continues to be a goal of the CBBS to achieve as low a rate of casualties as possible during all banding projects. Casualties here refer to all injuries, minor and serious, including fatalities. Our objective is to come as close to zero as possible.

Table 8 presents all casualties during the 2002 migration monitoring and MAPS projects. Note that the number captured, by species, is only given where that species experienced injury or mortality. Mortality rates for CBBS banding projects continues to remain low and is dominated by predation. The injury rate in 2002 dropped to 0.76% compared to 1.48% in 2000 and 0.85% in 2001. This improvement continues the decline since 1999 likely due to the increasing skill of volunteers.

Increases through 1997 were in part due to an increased awareness of banding personal to record even slight abrasions. In other words, the data pre-1998 likely underestimates the rate of injury. In spite of apparent improvement the CBBS continues to review each casualty to determine potential for reduction or avoidance of similar occurrences in the future.

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FIGURES

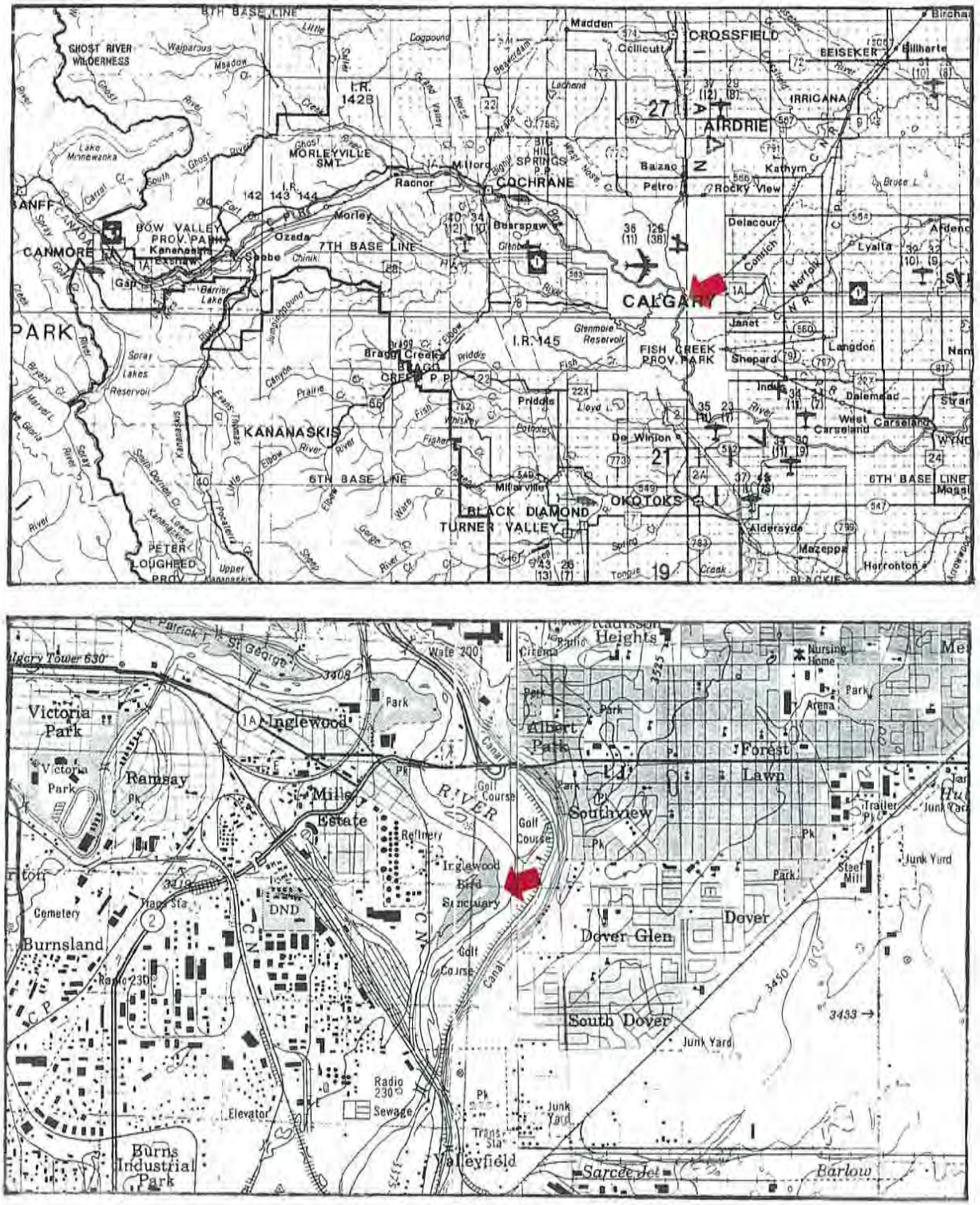

Figure 1. Topographic maps at 1:250,000 (top) and 1:50,000 (bottom) scales showing location of Inglewood Bird Sanctuary in southwestern Alberta. North is up.

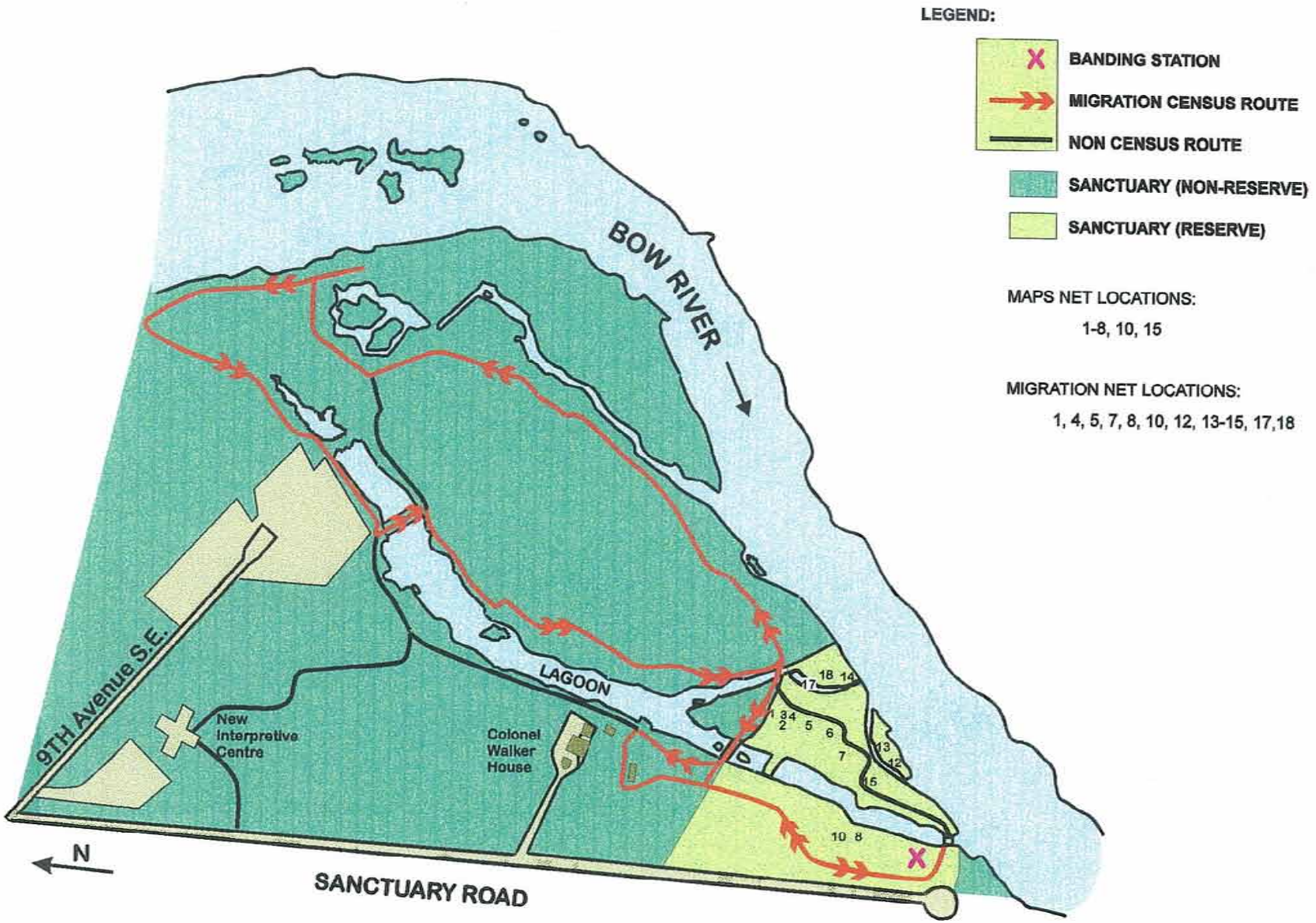

Figure 2. Schematic of Inglewood Bird Sanctuary migration monitoring station

Figure 3a. New Bandings at Inglewood Bird Sanctuary - Spring 2002

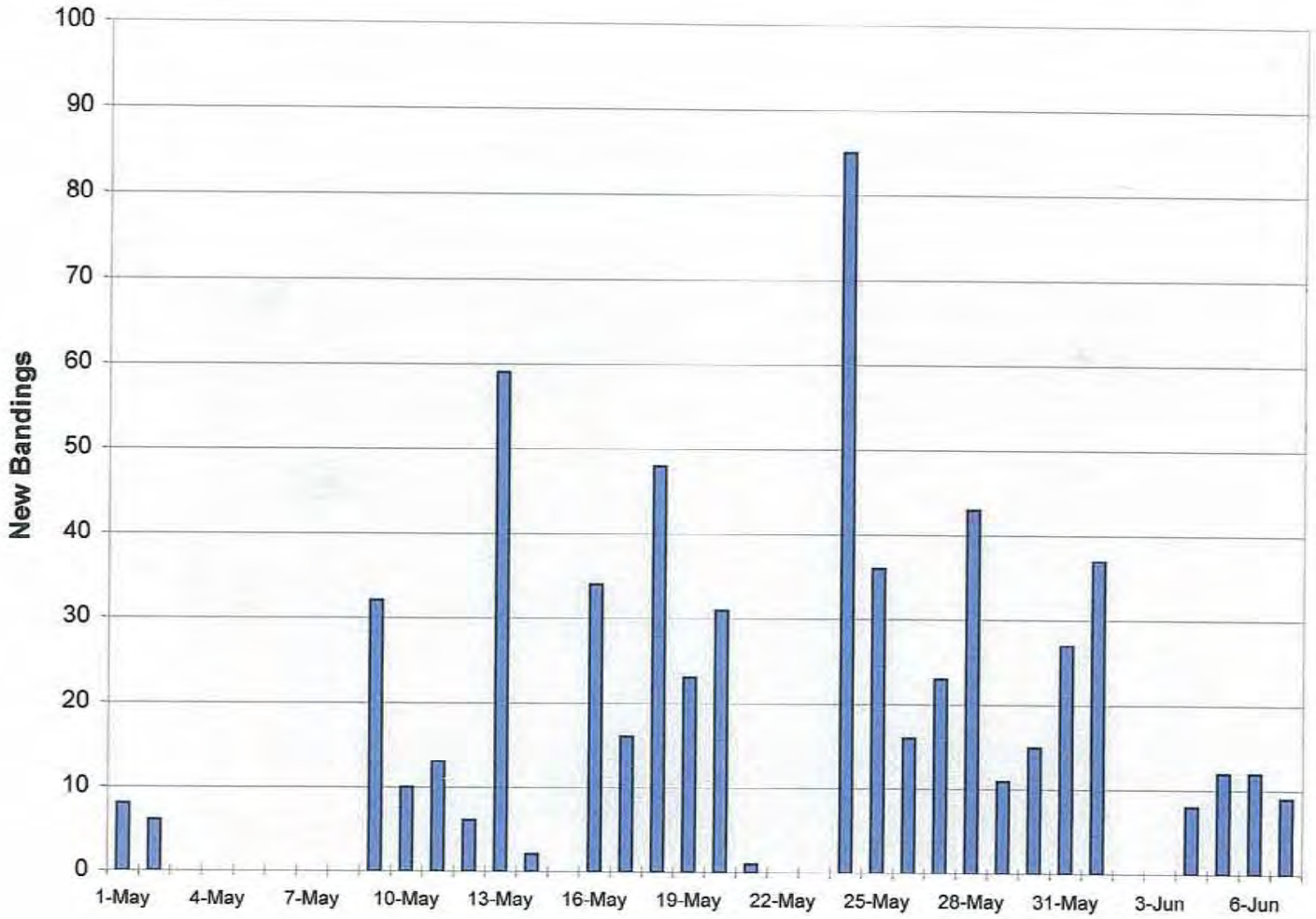

Figure 3b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

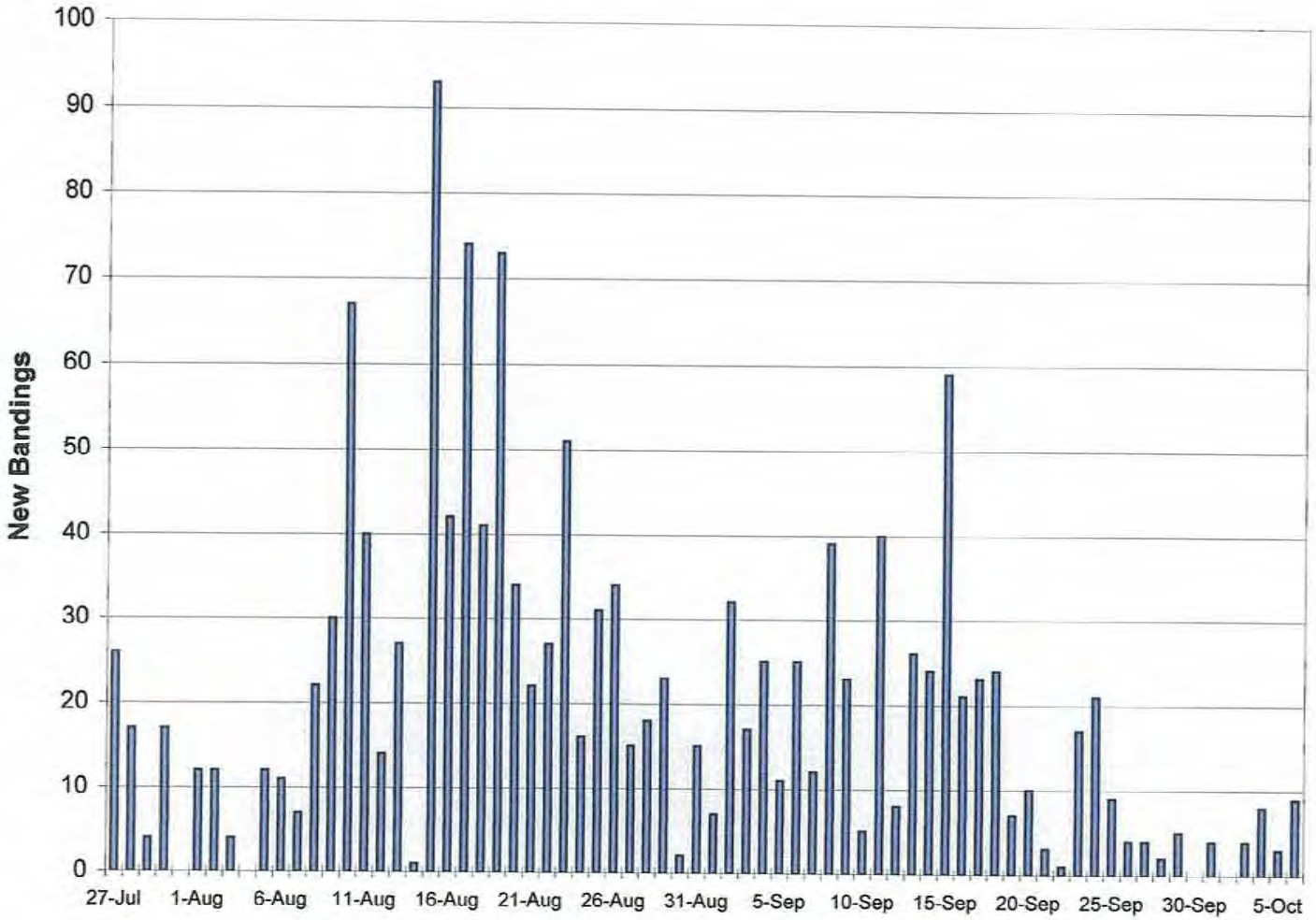

Figure 4. Location of CBBS Migration Monitoring Site at Las Caletas, Costa Rica

Figure 5. Captures (excluding recaps) at Las Caletas, CR - 2002

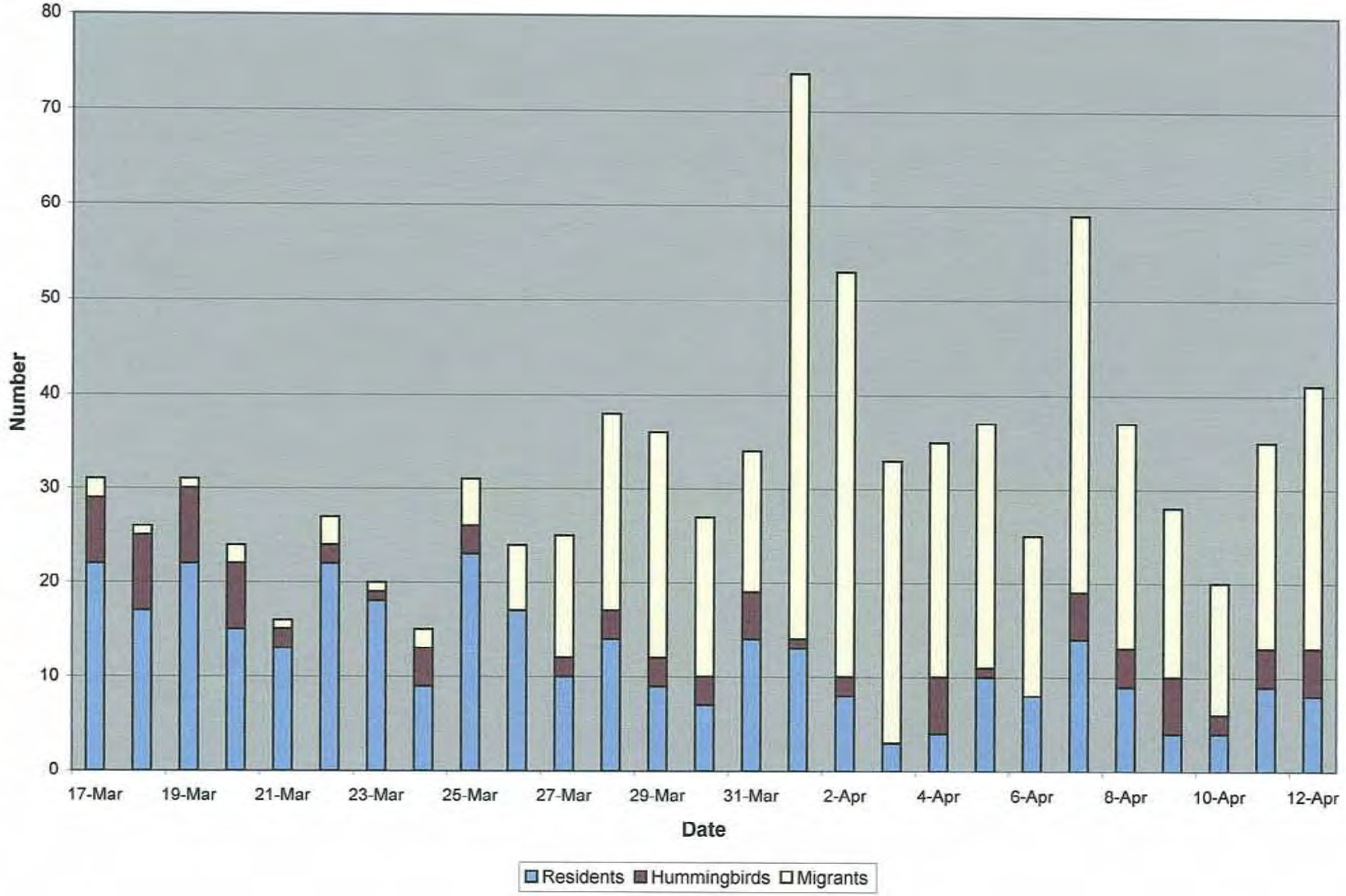

Figure 6. Relative location of Inglewood Bird Sanctuary (I) and Cominco Natural Area (C) 1:50,000 scale (1-cm = 500-m).

Figure 7. Trends in Select Species at Inglewood Bird Sanctuary

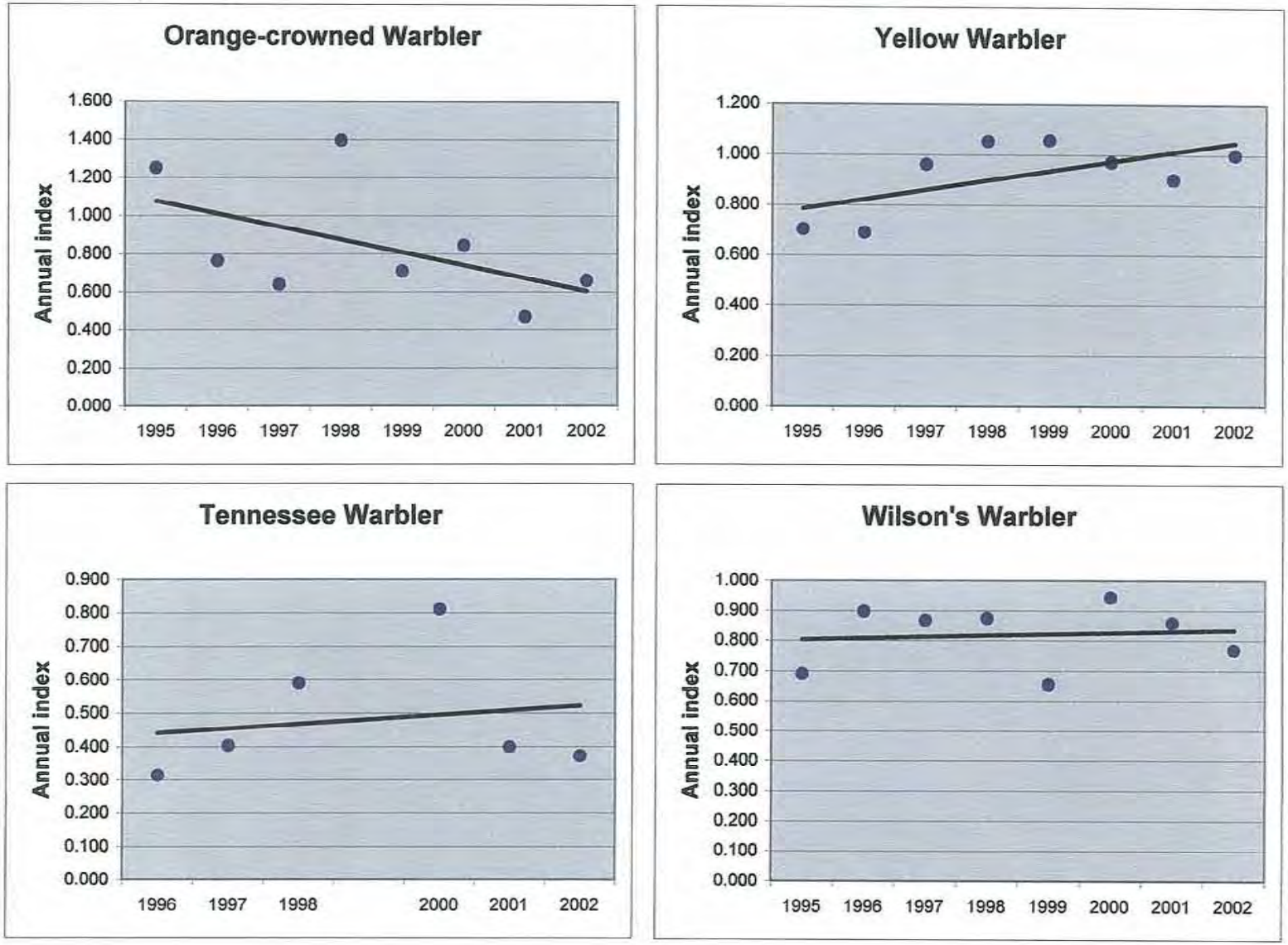

Figure 8. Casualty Rates for All Banding Projects

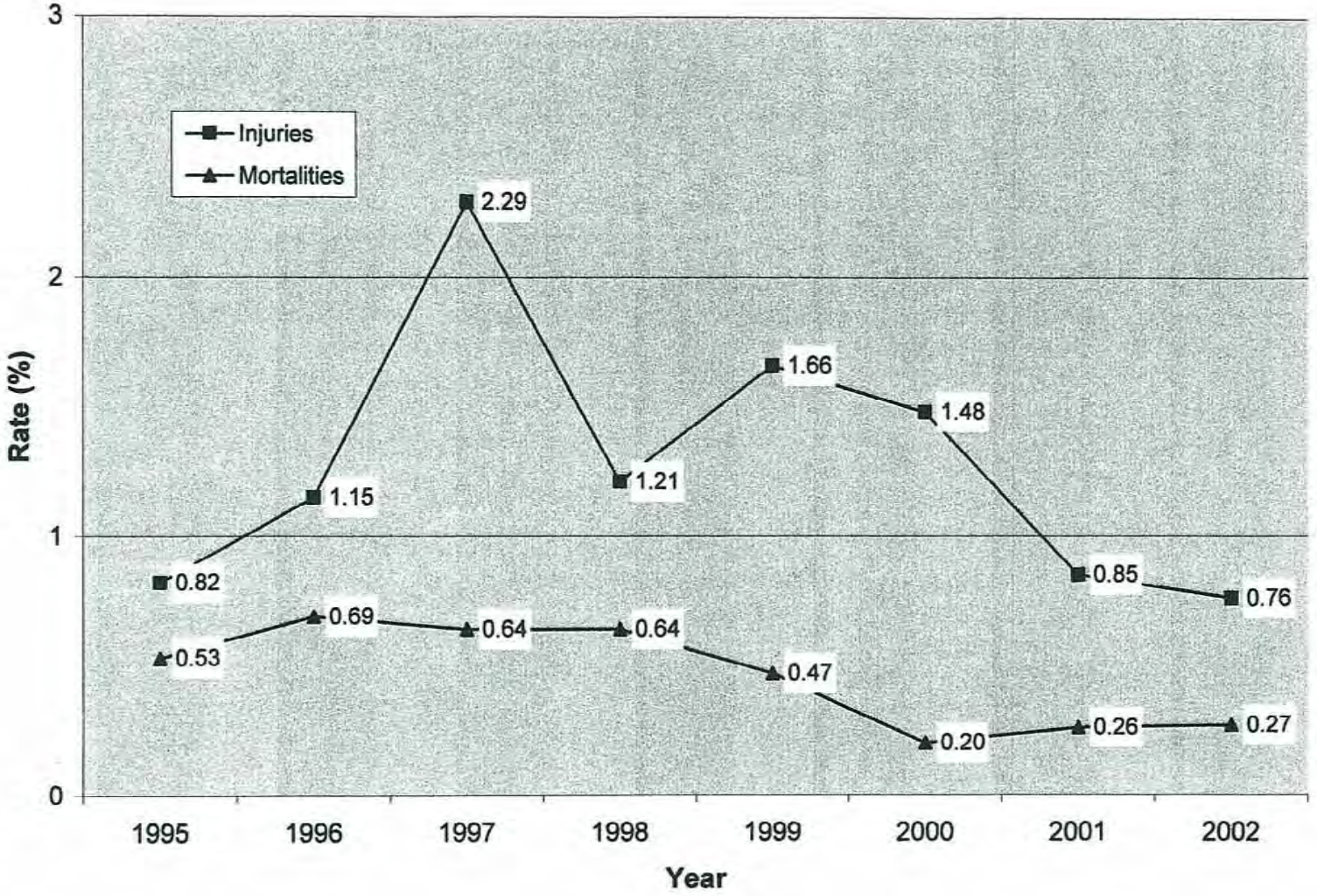

Table 1a. Coverage and Capture Rates During 2002 Spring MM at IBS

		Captures					
Date	Net-hours	New Bandings	Recaptures	Escapes	Mortalities	Total	Captures/100 Net-hours
01-May	72.9	8	2			10	14
02-May	72.5	6	1			7	10
03-May	weather					0	
04-May	weather					0	
05-May	weather					0	
06-May	weather					0	
07-May	weather					0	
08-May	weather					0	
09-May	73.4	32	6			38	52
10-May	73.4	10	4	1		15	20
11-May	79.6	13	4			17	21
12-May	72.3	6	3			9	12
13-May	84.0	59	9	2		70	83
14-May	72.0	2	1			3	4
15-May	weather					0	
16-May	73.3	34	14			48	65
17-May	66.7	16	8	1		25	37
18-May	75.0	48	7			55	73
19-May	72.0	23	10			33	46
20-May	73.2	31	8	2		41	56
21-May	5.2	1	1			2	38
22-May	weather					0	
23-May	weather					0	
24-May	80.3	85	18	1	1	105	131
25-May	74.5	37	20			57	77
26-May	72.5	16	9	1		26	36
27-May	73.2	23	9			32	44
28-May	72.5	43	11			54	74
29-May	77.9	11	7			18	23
30-May	72.8	15	7	1		23	32
31-May	58.2	27	14	1		42	72
01-Jun	75.5	37	8			45	60
02-Jun	weather					0	
03-Jun	no volunteers					0	
04-Jun	61.0	8	6	1		15	25
05-Jun	72.7	12	8			20	28
06-Jun	66.0	12	7			19	29
07-Jun	61.2	9	2		1	12	20
Total	**1884**	**624**	**204**	**11**	**2**	**841**	**45**

Table 1b. Coverage and Capture Rates During 2002 Fall MM at IBS

		Captures					
Date	Net-hours	New Bandings	Recaptures	Escapes	Mortalities	Total	Captures/100 Net-hours
27-Jul	76.7	26	4		0	30	39
28-Jul	73.9	17	7	0	0	24	32
29-Jul	74.4	4	1	0	0	5	7
30-Jul	73.1	17	12	0	0	29	40
31-Jul	weather					0	
01-Aug	75.4	12	15	2	0	29	38
02-Aug	73.3	12	18		0	30	41
03-Aug	75.5	4	11	0	0	15	20
04-Aug	35.9		3	0	0	3	8
05-Aug	74.9	12	7		0	19	25
06-Aug	73.6	11	2	0	0	13	18
07-Aug	72.5	7	3	0	0	10	14
08-Aug	73.0	22	5	3	0	30	41
09-Aug	75.4	30	10	2	0	42	56
10-Aug	71.4	67	7	0	0	74	104
11-Aug	79.2	40	25	3	0	68	86
12-Aug	72.1	14	6	0	0	20	28
13-Aug	74.2	27	9	1	0	37	50
14-Aug	0.5	1				1	200
15-Aug	74.9	93	22	2	0	117	156
16-Aug	53.6	42	11		0	53	99
17-Aug	74.9	74	24	3	0	101	135
18-Aug	74.6	41	24	3	0	68	91
19-Aug	77.1	73	16	2	0	91	118
20-Aug	72.9	34	18	1	1	54	74
21-Aug	72.7	22	20	3	0	45	62
22-Aug	73.8	27	6	1	0	34	46
23-Aug	76.7	51	26	0	0	77	100
24-Aug	73.9	16	10	1	0	27	37
25-Aug	70.8	31	18	2	0	51	72
26-Aug	72.8	34	10	2	0	46	63
27-Aug	73.5	15	2	0	0	17	23
28-Aug	72.9	18	11	1	0	30	41
29-Aug	73.4	23	6	1	0	30	41
30-Aug	73.0	2	5	1	0	8	11
31-Aug	72.0	15	5	2	1	23	32
01-Sep	26.2	7	1	0	0	8	31
02-Sep	72.2	32	11	0	0	43	60
03-Sep	74.4	17	4	0	2	23	31

Table 1b. Coverage and Capture Rates During 2002 Fall MM at IBS

		Captures					
Date	Net-hours	New Bandings	Recaptures	Escapes	Mortalities	Total	Captures/100 Net-hours
04-Sep	72.0	25	4	0	0	29	40
05-Sep	18.0	11	4	0	0	15	83
06-Sep	73.0	25	15	1	0	41	56
07-Sep	72.0	12	8	0	0	20	28
08-Sep	72.3	39	11	0	0	50	69
09-Sep	72.2	23	6	0	0	29	40
10-Sep	74.1	5	2	1	0	8	11
11-Sep	73.8	40	18	0	1	59	80
12-Sep	73.2	8	6	0	0	14	19
13-Sep	72.0	26	7	1	0	34	47
14-Sep	73.1	24	4	0	0	28	38
15-Sep	73.0	59	7	0	0	66	90
16-Sep	72.1	21	9	1	0	31	43
17-Sep	72.0	23	5	1	0	29	40
18-Sep	72.0	24	11	1	0	36	50
19-Sep	72.0	7	3	0	0	10	14
20-Sep	73.2	10	1	0	0	11	15
21-Sep	73.2	3	3	0	0	6	8
22-Sep	70.0	1	1	0	0	2	3
23-Sep	74.3	17	4	1	0	22	30
24-Sep	57.6	21	5	0	0	26	45
25-Sep	72.0	9	6		0	15	21
26-Sep	72.0	4	1	0	0	5	7
27-Sep	63.1	4	2	0	0	6	10
28-Sep	73.7	2	2	0	0	4	5
29-Sep	72.5	5	0	0	0	5	7
30-Sep	weather					0	
01-Oct	42.2	4	1	0	0	5	12
02-Oct	73.2	0	1	0	0	1	1
03-Oct	74.4	4	0	1	0	5	7
04-Oct	75.6	8	2	0	0	10	13
05-Oct	61.1	3	0	0	0	3	5
06-Oct	72.2	9	3	0	0	12	17
Total	**4838**	**1466**	**547**	**44**	**5**	**2062**	43

Table 2a. New Bandings at Inglewood Bird Sanctuary - Spring 2002

Year		2002
Start		01-May
Finish		07-Jun
# Days		27
Total		624
Species		46
Net-hours		1884
Bandings/100 Net-hours		33.1
American Kestrel		1
Solitary Sandpiper		1
Spotted Sandpiper		2
Belted Kingfisher		1
Downy Woodpecker		5
Northern Flicker		1
Western Wood-Pewee		5
Traill's Flycatcher*		6
Least Flycatcher		16
Eastern Phoebe		1
Blue-headed Vireo		2
Warbling Vireo		4
Tree Swallow		18
N Rough-winged Swallow		5
Barn Swallow		1
Black-capped Chickadee		3
Red-breasted Nuthatch		1
White-breasted Nuthatch		2
House Wren		13
Swainson's Thrush		54
Hermit Thrush		2
American Robin		28
Gray Catbird		13

Table 2a. New Bandings at Inglewood Bird Sanctuary - Spring 2002

Year		2002
Cedar Waxwing		3
Orange-crowned Warbler		19
Yellow Warbler		33
Yellow-rumped Warbler		249
Blackpoll Warbler		30
American Redstart		2
Northern Waterthrush		8
Common Yellowthroat		21
Wilson's Warbler		4
Western Tanager		1
Chipping Sparrow		3
Clay-coloured Sparrow		15
Savannah Sparrow		3
Song Sparrow		3
Lincoln's Sparrow		19
White-throated Sparrow		5
White-crowned Sparrow		6
Dark-eyed Junco		1
Rose-breasted Grosbeak		1
Red-winged Blackbird		3
Brown-headed Cowbird		5
Baltimore Oriole		4
American Goldfinch		1

*Note: Traill's Flycatcher includes both Willow and Alder

Table 2b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

Year	1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Start	03-Aug	18-Aug	01-Aug	31-Jul	31-Jul	25-Jul	26-Jul	01-Aug	25-Jul	27-Jul	all
Finish	22-Sep	09-Sep	30-Sep	12-Oct	15-Oct	02-Oct	08-Oct	30-Sep	06-Oct	06-Oct	years
# Days	26	20	54	70	65	61	68	55	73	68	
Total	841	466	1549	1121	1455	1898	1276	1262	1402	1466	12736
Species	52	48	61	59	64	64	66	68	64	66	97
Net-hours	934	1078	3456	4547	4608	4371	4426	3842	5152	4838	37254
Bandings/100 Net-hours	90.0	43.2	44.8	24.7	31.6	43.4	28.8	32.8	27.2	30.3	34.2
Wood Duck			1								1
Mallard							1				1
Sharp-shinned Hawk	2	2		1	5	4	3	1	1	3	22
Cooper's Hawk				1	1			1		1	4
Northern Goshawk				1							1
Broad-winged Hawk						1					1
Solitary Sandpiper	3	2	3	14	13	14	2	8	4	12	75
Spotted Sandpiper		1	2		3	3	2			5	16
Common Snipe								1		1	2
Belted Kingfisher	2	2	8	8	6	8	10	7	2	5	58
Yellow-bellied Sapsucker			1							1	2
Downy Woodpecker		1	2	3	5	7	3	9	9	13	52
Hairy Woodpecker								1		1	2
Northern Flicker	2	1	4	8	7	3	11	2		4	42

Table 2b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

Year		1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Olive-sided Flycatcher		3		3		5	2		2		2	17
Western Wood-Pewee		6	4	11	2	33	8	10	7	14	14	109
Yellow-bellied Flycatcher				1				1				2
Traill's Flycatcher*		24	16	29	25	50	36	24	40	46	45	335
Least Flycatcher		16	5	16	9	30	14	11	21	20	21	163
Dusky Flycatcher				2	1							3
Pacific-slope Flycatcher				1		1						2
Eastern Phoebe			1						1			2
Great-crested Flycatcher										1		1
Eastern Kingbird		1	2	7	18	17	19	2	7	17	7	97
Blue-headed Vireo		1		1	1	2			1		2	8
Warbling Vireo		8	15	13	18	27	18	8	7	12	9	135
Philadelphia Vireo		1							1	1		3
Red-eyed Vireo		3	1	2	4	3	12	2	4	2	2	35
Blue Jay					1				1			2
Black-billed Magpie				2	1	8	2	2	1	3	1	20
Tree Swallow											1	1
N Rough-winged Swallow						2						2
Black-capped Chickadee		9	12	7	17	5	19	10	19	14	13	125
Red-breasted Nuthatch			3		2		4	2	20	7	1	39
White-breasted Nuthatch		1	1	6		4	4	4	5	5	5	35
Brown Creeper		1						1	1			3
House Wren		3	3	50	45	52	49	33	57	59	72	423

Table 2b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

Year		1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Winter Wren									1			1
Golden-crowned Kinglet		2		2	1	1	1	2	1		2	12
Ruby-crowned Kinglet		3	1	10	18	20	14	5	11	15	14	111
Townsend's Solitaire					1					1		2
Veery		2					1					3
Gray-cheeked Thrush		1					1		1			3
Swainson's Thrush		34	13	17	52	10	28	19	13	30	13	229
Hermit Thrush		4		3	14	6	9	9	4	11	11	71
American Robin		5	11	114	81	81	31	60	32	105	37	557
Varied Thrush										1		1
Gray Catbird			1		5	7	6	5	4	14	8	50
Brown Thrasher						3						3
European Starling				2						4		6
Bohemian Waxwing								1				1
Cedar Waxwing		12	1	42	14	67	11	25	26	49	27	274
Tennessee Warbler		43	5	33	30	52	74	106	167	46	76	632
Orange-crowned Warbler		24	36	177	116	86	207	91	84	58	71	950
Nashville Warbler					1	2	1	1	2	1	1	9
Yellow Warbler		56	19	44	62	137	91	138	89	101	119	856
Chestnut-sided Warbler		1						1				2
Magnolia Warbler		9	4	2	2	4	4	2	2	1	9	39
Yellow-rumped Warbler		293	171	496	92	191	638	195	200	246	248	2770
Black-throated Green Warbler						1	1	1				3

Table 2b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

Year		1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Townsend's Warbler		1				1	2	3	1	2	2	12
Palm Warbler			3	7	4	3	8	7	1	6	4	43
Bay-breasted Warbler				1				1	1			3
Blackpoll Warbler		17	5	17	8	6	30	5	8	11	7	114
Black-and-white Warbler		4	1	1	2		3			2	3	16
American Redstart		19	4	3	6	4	20	5	3	16	27	107
Ovenbird		22	6	10	30	11	38	11	11	24	7	170
Northern Waterthrush		22	8	23	56	46	26	41	34	44	33	333
Connecticut Warbler		2	2	4	4	1	3	3	3	4	1	27
Mourning Warbler		4	2	5	10	3	9	1	4	5	7	50
MacGillivray's Warbler		2		3	8	10	6	2	5	4	4	44
Common Yellowthroat			1	6	1	8	10	8	4	12	8	58
Wilson's Warbler		121	68	102	175	119	113	100	167	152	145	1262
Canada Warbler		1			2	1	3	1	1	1	2	12
Western Tanager		1	1	12	1	3	2	4	1	5	6	36
American Tree Sparrow				10	3	3	7	2	1	1	2	29
Chipping Sparrow		4	1	29	14	151	27	83	50	47	92	498
Clay-coloured Sparrow			1	1	6	21	37	26	9	30	26	157
Brewer's Sparrow								1				1
Savannah Sparrow			1			2			1	1		5
Fox Sparrow		1	1	1			2	1		2	1	9
Song Sparrow			1	9	9	15	18	21	9	3	13	98
Lincoln's Sparrow		9	7	53	28	13	59	48	30	39	88	374

Table 2b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

Year		1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Swamp Sparrow					2		7	3		1	2	15
White-throated Sparrow		13	11	73	28	39	77	54	18	35	51	399
Harris' Sparrow				1						1		2
White-crowned Sparrow		5	4	20	24	22	21	22	23	27	30	198
Dark-eyed Junco		5	3	15	15	3	10	8	6	1	6	72
Rose-breasted Grosbeak		6				1	3	2	3	1	3	19
Red-winged Blackbird				4				2			3	9
Common Grackle				3								3
Brown-headed Cowbird				1	2	2	1		2	4	5	17
Baltimore Oriole		4		21	12	12	8	5	1	8	9	80
Purple Finch			1			2	1	1	2	6		13
Pine Siskin						2						2
American Goldfinch		3			2	4	2	2	1	4	2	20
House Sparrow										3		3

*Note: Traill's Flycatcher includes both Willow and Alder

Table 3. Inglewood Bird Sanctuary MAPS New Bandings - 2002

	Jun 12	Jun 26	Jul 07	Jul 13	Jul 20	Aug 05	Total
Traill's Flycatcher	1						1
Least Flycatcher	1						1
Eastern Kingbird				1			1
Warbling Vireo			2		2		4
Black-capped Chickadee				1	1		2
White-breasted Nuthatch				1			1
House Wren		1	1				2
Swainson's Thrush	1						1
American Robin		1	2	6	10		19
Gray Catbird	7	2	3	3	1		16
Cedar Waxwing	3	2	4	1	1	2	13
Tennessee Warbler						1	1
Yellow Warbler	2	1			3	1	7
White-throated Sparrow	1						1
Common Grackle					1		1
Brown-headed Cowbird		1		1			2
Baltimore Oriole	2		1	1	5		9
American Goldfinch				1			1
Total birds	18	8	13	16	24	4	83
Total species	8	6	6	9	8	3	18

Table 4. Inglewood Bird Sanctuary MAPS Summary - 1992-2002

	New Bandings										
	1992	1993	1995	1996	1997	1998	1999	2000	2001	2002	Total
American Kestrel			1								1
Downy Woodpecker	1	3	1	5	4	1			1		16
Hairy Woodpecker	1	1	1			1					4
Yellow-shafted Flicker	1	1	1								3
Flicker Intergrade			2				2				4
Northern Flicker				2							2
Western Wood-Pewee	6	1	1	1	1	2		1	3		16
Traill's Flycatcher				3	3		1	1	4	1	13
Least Flycatcher	14	8	3	2	3	4	2	1	2	1	40
Eastern Kingbird	2	1			3	1	3		2	1	13
Warbling Vireo	7	7	1	4	2		2	2	1	4	30
Red-eyed Vireo	1										1
Black-billed Magpie				1	2						3
Tree Swallow	3						2				5
Bank Swallow	1										1
Black-capped Chickadee	5	7	5	9	2	3	5	4	4	2	46
White-breasted Nuthatch	3	4		2						1	10
House Wren	5	11	9	9	13	8	9	18	11	2	95
Veery	2					1					3
Swainson's Thrush	10	8	6	4	3	1	4		3	1	40
Hermit Thrush								1			1
American Robin	21	6	26	25	23	10	8	14	20	19	172
Gray Catbird	3			1	1	4	8	1	6	16	40
European Starling			1								1
Cedar Waxwing	27	8		6	1	9	5	7	5	13	81
Tennessee Warbler	1	6		7	1	3	4	22	1	1	46

Table 4. Inglewood Bird Sanctuary MAPS Summary - 1992-2002

	New Bandings										
	1992	1993	1995	1996	1997	1998	1999	2000	2001	2002	Total
Orange-crowned Warbler						1					1
Yellow Warbler	20	14	7	2	6	9	24	13	4	7	106
Myrtle Warbler	10					2		2	1		15
American Redstart		1									1
Ovenbird	3			1		1					5
Northern Waterthrush						1	1		1		3
Mourning Warbler	1										1
Wilson's Warbler				2		1	1				4
Western Tanager		1	3	1	2		4				11
Chipping Sparrow		7			1						8
Clay-coloured Sparrow		1				6	17	1	2		27
Song Sparrow		1		1		1	4				7
Lincoln's Sparrow		3	1	2	5	2		1			14
White-throated Sparrow				2						1	3
Rose-breasted Grosbeak				1							1
Common Grackle			1		2					1	4
Brown-headed Cowbird	6				3			1	1	2	13
Baltimore Oriole	3	7	2	8	9	1	2	1	5	9	47
Purple Finch		1						1			2
American Goldfinch	2	2		1						1	6
House Sparrow	2					2					4
Total	**161**	**110**	**72**	**102**	**90**	**75**	**108**	**92**	**77**	**83**	**970**
Species	**27**	**24**	**18**	**25**	**21**	**24**	**20**	**18**	**19**	**18**	**47**

Table 5. Captures at Las Caletas, Costa Rica 2002

		Endemics						Migrants						Hummingbirds	Total	Captures/
Date	Net hours	New bandings	Recaptures	Released unbanded	Escapes	Mortalities	Total	New bandings	Recaptures	Released unbanded	Escapes	Mortalities	Total	Released unbanded	captures	net-hour
17-Mar	49.00	21		8			29	2					2	7	31	0.63
18-Mar	60.00	15	1	10			26	1					1	8	27	0.45
19-Mar	64.00	21	4	9			34	1					1	6	35	0.55
20-Mar	72.00	14	7	8			29	2					2	7	31	0.43
21-Mar	74.00	12	2	3			17	1	1				2	2	19	0.26
22-Mar	78.00	19	4	2	2	1	28	3					3	2	31	0.40
23-Mar	76.00	17	1	2			20	1	1				2	1	22	0.29
24-Mar	76.00	9	3	4			16	2					2	4	18	0.24
25-Mar	100.00	20	4	5	1		30	5					5	3	35	0.35
26-Mar	70.00	17	8				25	7					7		32	0.46
27-Mar	81.00	9	8	3			20	13					13	2	33	0.41
28-Mar	100.50	13	12	4			29	20	2		1		23	3	52	0.52
29-Mar	74.00	6	7	4	2		19	23	1		1		25	3	44	0.59
30-Mar	75.00	4	6	3	1	2	16	17					17	3	33	0.44
31-Mar	81.00	11	12	8			31	14	1			1	16	5	47	0.58
01-Apr	74.20	12	5	2			19	7		53			60	1	79	1.06
02-Apr	73.75	7	4	3			14			43			43	2	57	0.77
03-Apr	74.75	3	8				11	1		29			30		41	0.55
04-Apr	72.50	4	8	6			18			25			25	6	43	0.59
05-Apr	70.70	10	4	1			15	2	1	24			27	1	42	0.59
06-Apr	73.00	6	3	2			11	1		16			17		28	0.38
07-Apr	70.50	10	3	8	1		22	1	1	39			41	5	63	0.89
08-Apr	74.50	9	10	4			23			23	1		24	4	47	0.63
09-Apr	79.25	3	5	7			15			18			18	6	33	0.42
10-Apr	68.00	3	2	3			8			14			14	2	22	0.32
11-Apr	85.50	9	11	4			24	2		20			22	4	46	0.54
12-Apr	93.50	6	9	6	1		22			28			28	5	50	0.53
Total	2040.65	290	151	119	8	3	571	128	8	332	3	1	470	94	1041	0.51

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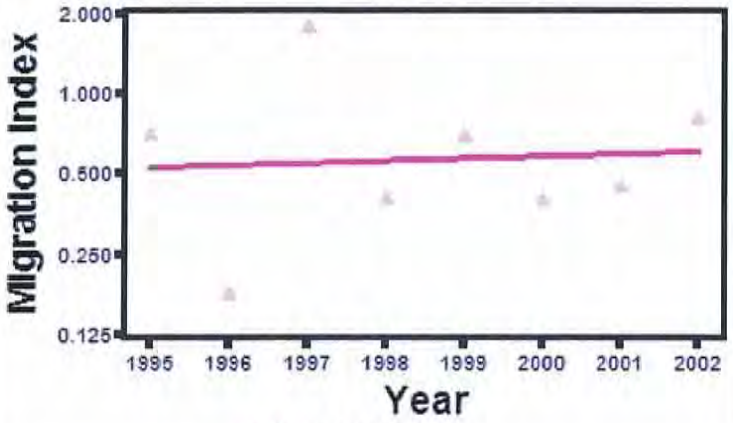
Bird Population Indices

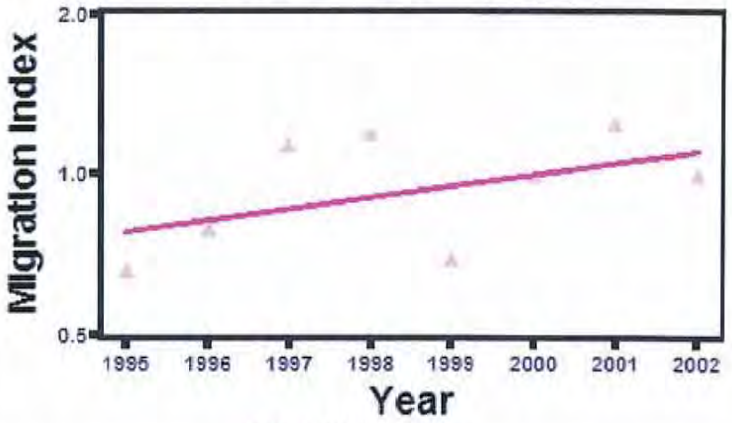
CANADIAN MIGRATION MONITORING NETWORK

Western Wood-Pewee
Inglewood Bird Sanctuary



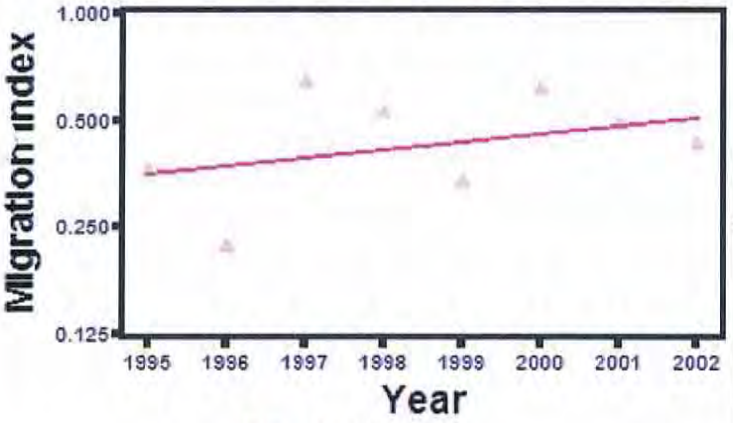
Fall: + 2.07%/year n.s.

Traill's Flycatcher
Inglewood Bird Sanctuary



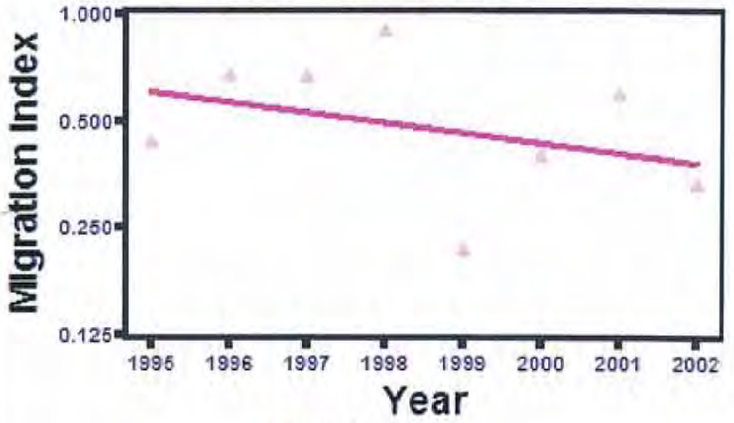
Fall: + 5.11%/year n.s.

Least Flycatcher
Inglewood Bird Sanctuary



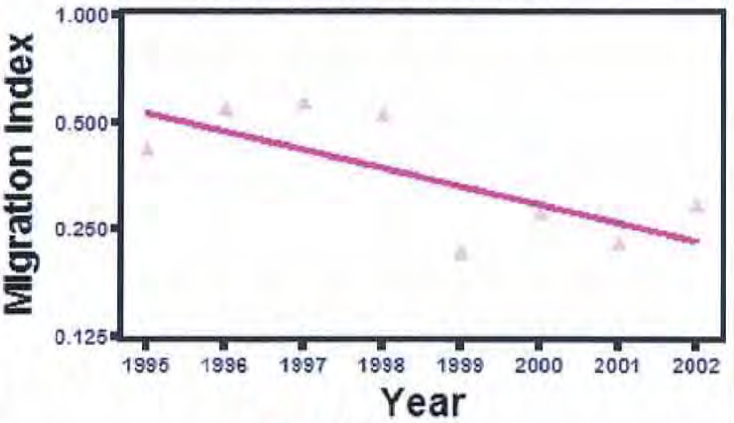
Fall: + 5.34%/year n.s.

Eastern Kingbird
Inglewood Bird Sanctuary



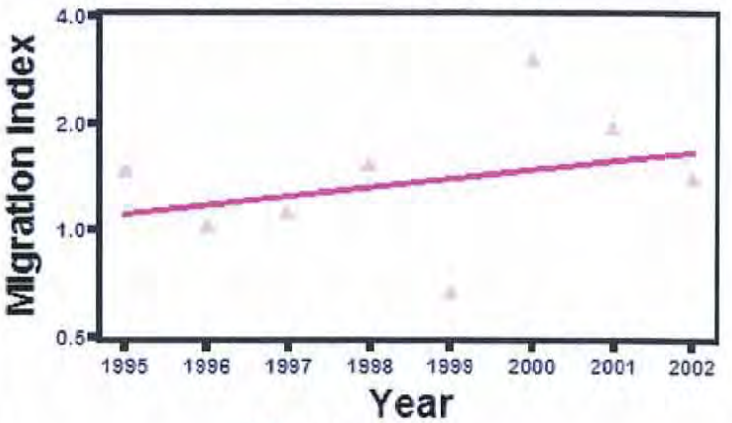
Fall: -6.3%/year n.s.

Warbling Vireo
Inglewood Bird Sanctuary



Fall: -10.97%/year *

House Wren
Inglewood Bird Sanctuary



Fall: + 5.88%/year n.s.

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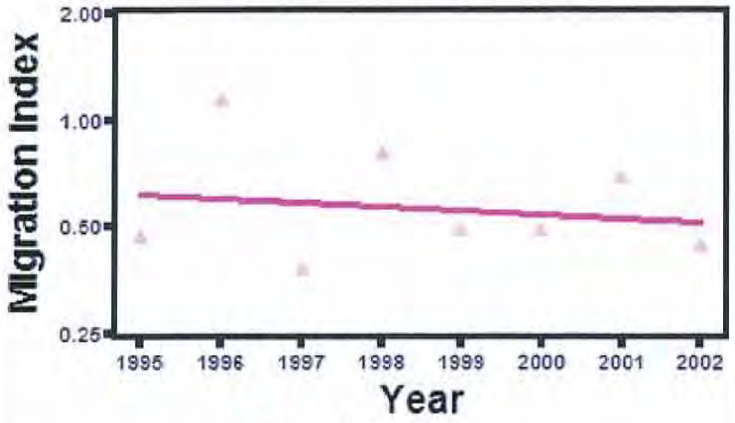
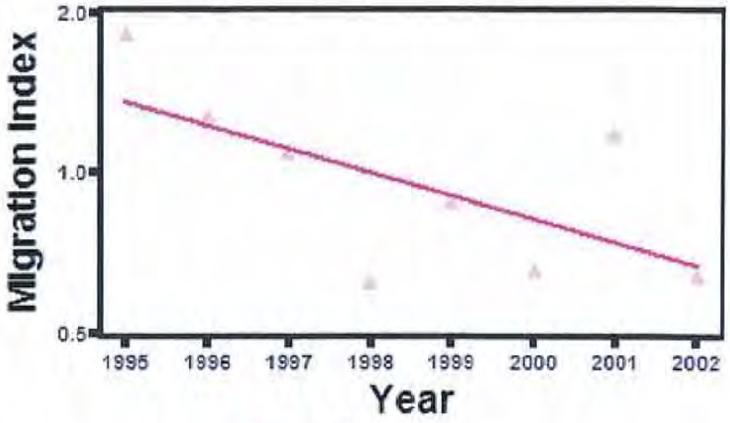
Swainson's Thrush
Inglewood Bird Sanctuary



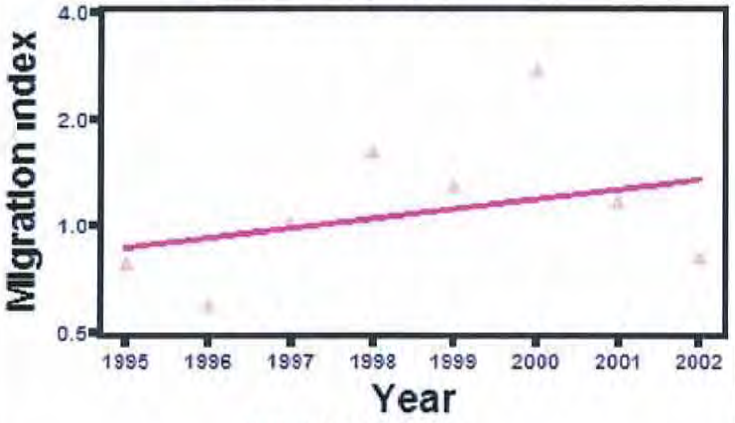
Fall: -2.52%/year n.s.

American Robin
Inglewood Bird Sanctuary



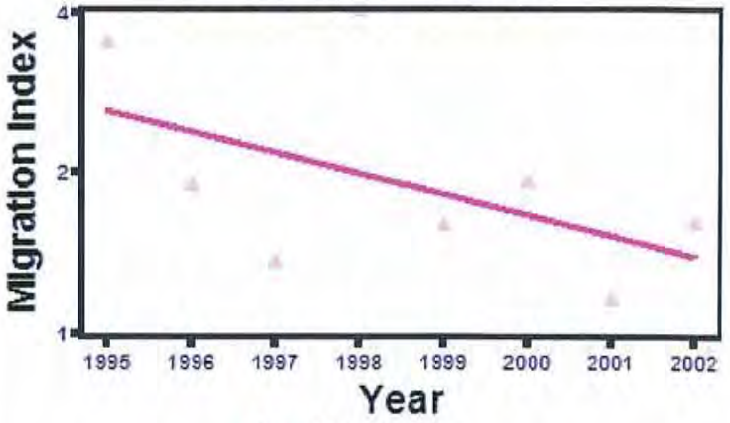
Fall: -9.55%/year n.s.

Tennessee Warbler
Inglewood Bird Sanctuary



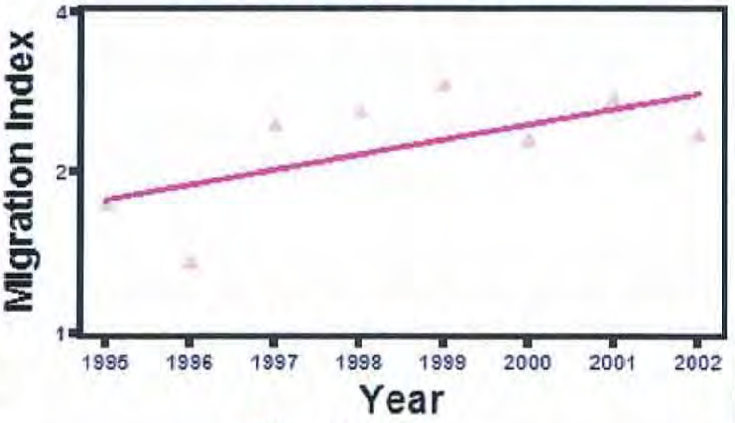
Fall: + 6.53%/year n.s.

Orange-crowned Warbler
Inglewood Bird Sanctuary



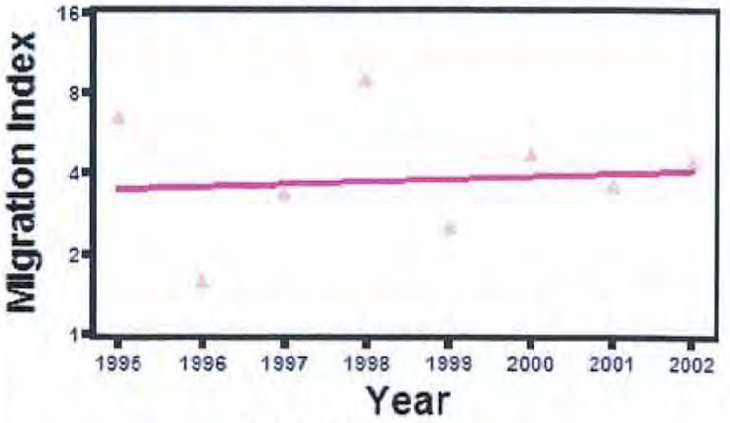
Fall: -8.53%/year n.s.

Yellow Warbler
Inglewood Bird Sanctuary



Fall: + 6.81%/year n.s.

Yellow-rumped (Myrtle) Warbler
Inglewood Bird Sanctuary



Fall: + 2.43%/year n.s.

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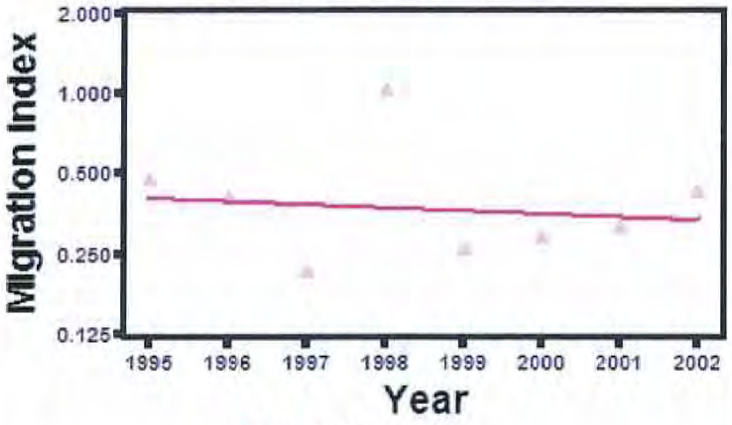
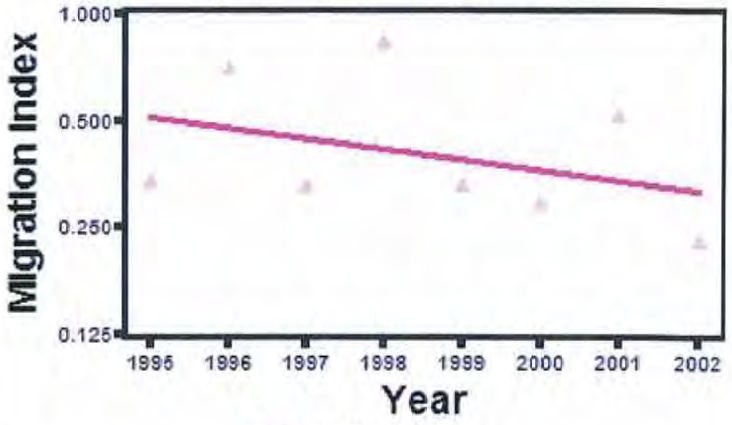
Blackpoll Warbler
Inglewood Bird Sanctuary



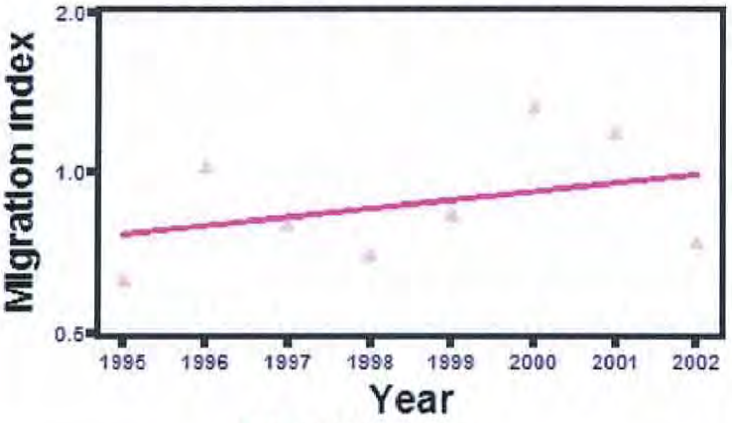
Fall: -2.43%/year n.s.

Ovenbird
Inglewood Bird Sanctuary



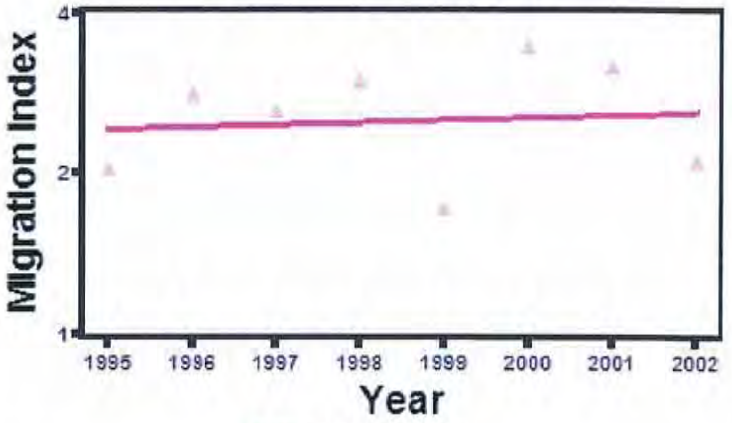
Fall: -6.54%/year n.s.

Northern Waterthrush
Inglewood Bird Sanctuary



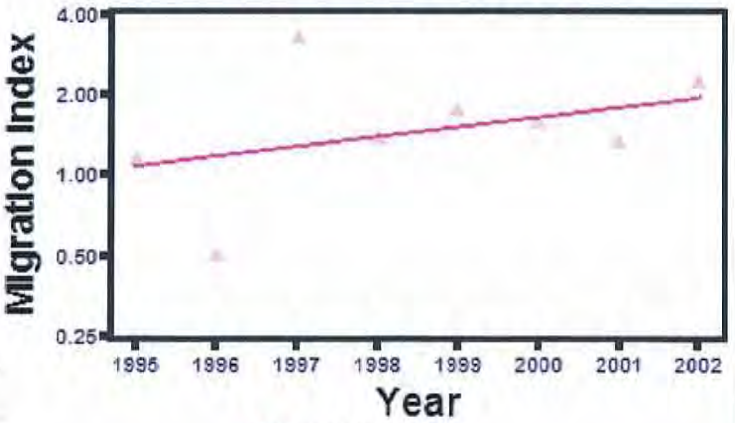
Fall: + 3.76%/year n.s.

Wilson's Warbler
Inglewood Bird Sanctuary



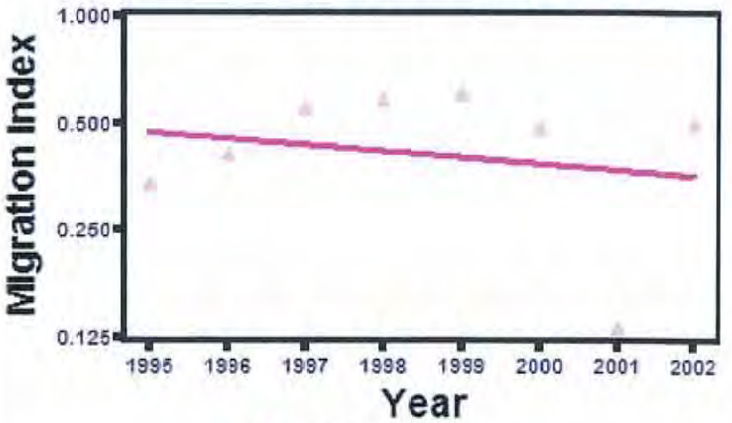
Fall: + 1.1%/year n.s.

Chipping Sparrow
Inglewood Bird Sanctuary



Fall: + 8.97%/year n.s.

Song Sparrow
Inglewood Bird Sanctuary



Fall: -3.89%/year n.s.

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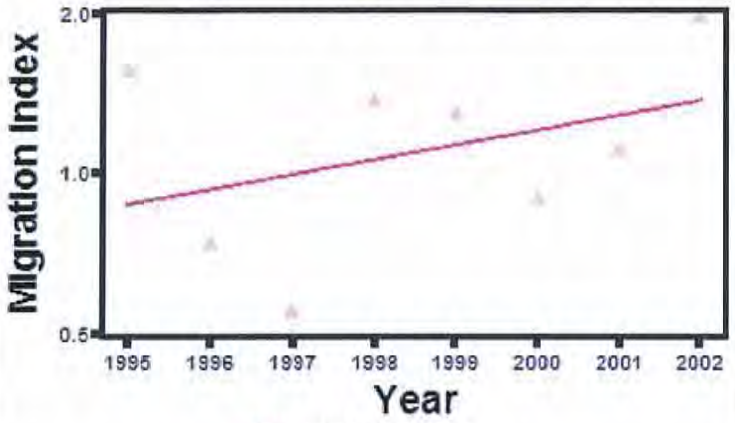
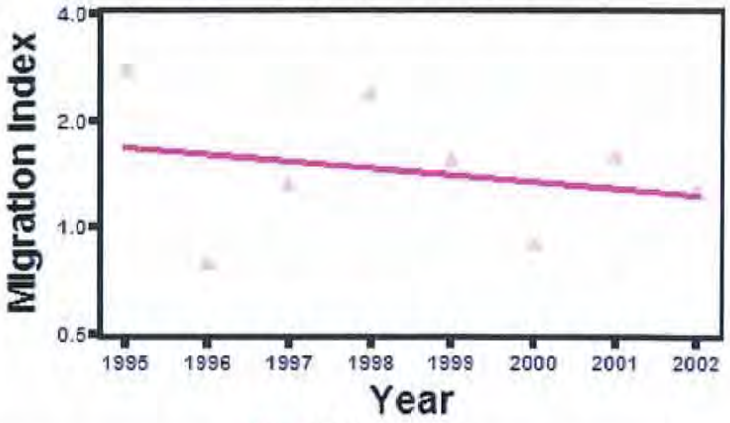
CANADIAN MIGRATION MONITORING NETWORK

Lincoln's Sparrow
Inglewood Bird Sanctuary



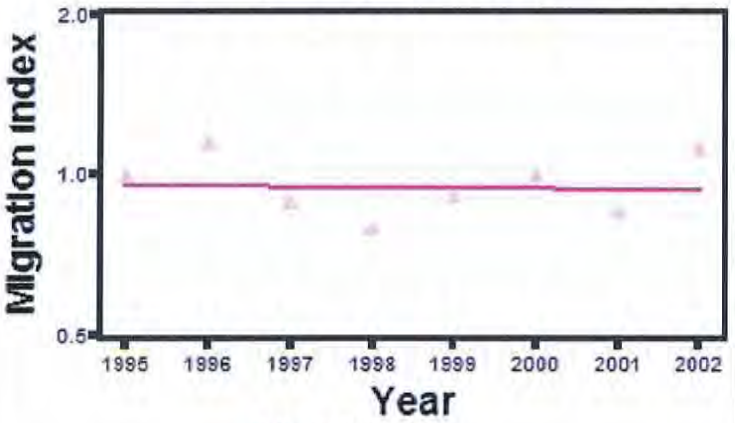
Fall: + 6.69%/year n.s.

White-throated Sparrow
Inglewood Bird Sanctuary



Fall: -4.25%/year n.s.

White-crowned Sparrow
Inglewood Bird Sanctuary



Fall: -0.19%/year n.s.

Legend: Station names: **ATBP**: Atlantic Bird Observatory - Bon Portage Island (NB); **ATSI**: Atlantic Bird Observatory - Seal Island (NB); **BBO**: Beaverhill Bird Observatory (AB); **DMBO**: Delta Marsh Bird Observatory (MB); **SELK**: Haldimand Bird Observatory - Selkirk (ON); **IBS**: Inglewood Bird Sanctuary (AB); **LMBO**: Last Mountain Bird Observatory (SK); **LSLBO**: Lesser Slave Lake Bird Observatory (AB); **LPBO**: Long Point Bird Observatory (ON); **MNO**: Mackenzie Nature Observatory (BC); **PEPBO**: Prince Edward Point Bird Observatory (ON); **TCBO**: Thunder Cape Bird Observatory (ON); Trend values were calculated using Spring ● or Fall ▲ migration data and trends are presented in percent change per year. A negative value indicates a population decline and a positive value a population increase over the period covered at the respective station. Significance level of the trends is indicated by: *** $P < 0.005$; ** $P < 0.01$; * $P < 0.05$; n.s. $P > 0.05$.

first page | << previous page | close window

Table 6. Trend Analysis of Monitored Species at Inglewood Bird Sanctuary 1995-2001 2002

Species	Analysis Interval	Trend % per year	P value
Solitary Sandpiper	1996-1998, 2000-2002	-1.6	0.18
Western Wood-Pewee	1996-2002	0.5	0.85
Traill's Flycatcher	1995-2002	1.9	0.23
Least Flycatcher	1995-2002	0.3	0.80
Eastern Kingbird	1995-1998, 2000-2002	-0.6	0.72
Warbling Vireo	1995-2002	-2.0	0.11
House Wren	1995-2002	1.0	0.50
Ruby-crowned Kinglet	1995-2002	-0.5	0.74
Swainson's Thrush	1995-2002	-2.0	0.26
American Robin	1995-2002	-3.6	0.20
Cedar Waxwing	1995-1998, 2000-2002	-0.3	0.93
Tennessee Warbler	1996-1998, 2000-2002	1.2	0.77
Orange-crowned Warbler	1995-2002	-6.6	0.19
Yellow Warbler	1995-2002	3.8	**0.09**
Yellow-rumped Warbler	1996-2002	5.1	0.62
Blackpoll Warbler	1996-2002	0.0	0.98
Ovenbird	1996-2002	-3.2	0.24
Northern Waterthrush	1996-1998, 2000-2002	-1.6	0.20
Wilson's Warbler	1995-2002	0.4	0.81
Chipping Sparrow	1996-1998, 2000-2002	2.2	0.71
Clay-coloured Sparrow	1996-1998, 2000-2002	2.5	0.42
Song Sparrow	1995-1998, 2000-2002	-0.7	0.51
Lincoln's Sparrow	1995-2002	1.4	0.61
White-throated Sparrow	1995-2002	-4.4	0.23
White-crowned Sparrow	1995-2002	0.5	0.30
Dark-eyed Junco	1995-2002	-2.7	**0.04**
Baltimore Oriole	1995-2002	-2.4	**0.03**

Table 7. Bander-in-Charge and Volunteer Effort 2002

	Bander-in-Charge				Vounteer			
	Inglewood			CR	Inglewood			CR
	Spring MM	MAPS	Fall MM	Spring MM	Spring MM	MAPS	Fall MM	Spring MM
Yousif Attia					2		2	
Christine Bennett					1	1	6	
Grahame Booth			6					
Judy Crawford-Parr							5	
Ross Dickson		1	46					
Dick Flynn							2	
Lenora Flynn					2		2	
Fenella Hood					8		13	
Garry Hornbeck					1			
Jennifer Lane					2			
Steve Lane	9	2	6	27	1	1	9	
Arlette Malcolm							1	
Shonna McLeod	7	1	12			1	6	
Greg Meyer	11	2	2		1		6	
Pat Mitchell					5		11	14
Mike Mulligan					1		4	
Alexandra Oakwood					4	1	6	
El Peterson					3		7	14
Mark Raymond							8	
Carl Savignac							1	
Gwen Smiley					2			14
Ena Spalding							2	
Don Stiles					2		6	
Bill Taylor					5	1	8	
Barry Trakalo					4		4	14
Catherine Watson						1	7	27
Catherine Watson-MacDonald					3	2	6	
Linda Wiggins					1		2	
Bruce Wilson							5	

Table 8. Injuries and Mortalities Sustained During CBBS 2002 Research

Species	Number Captured	Injuries		Mortalities	
		Number	Type	Number	Cause
Solitary Sandpiper	14	1	Leg abrasion		
Spotted Sandpiper	8	1	Wing abrasion		
Downy Woodpecker	43	1	Wing abrasion		
		1	Leg abrasion		
Hairy Woodpecker	3	1	Cut foot		
Northern Flicker	7	1	Wing abrasion		
Yellow-bellied Flycatcher	1	1	Wing abrasion		
Traill's Flycatcher	60			1	Died in bag
Least Flycatcher	43	1	Broken leg		
House Wren	214			1	Shock
Swainson's Thrush	519	3	Wing abrasion	1	Raptor predation
		1	Cut tongue		
American Robin	104	1	Wing abrasion & cut tongue		
Gray Catbird	61	3	Cut tongue		
		1	Broken leg		
Yellow Warbler	221			1	Deer predation
Yellow-rumped Warbler	624	1	Shock	1	Least Weasel predation
		1	Broken leg		
		1	Neck abrasion		
Northern Waterthrush	67			1	Weasel predation
Common Yellowthroat	61			1	Raptor predation
Wilson's Warbler	186	1	Broken leg	1	Weasel predation
		1	Pinched leg		
Chipping Sparrow	103	1	Broken leg		
		1	Shock		
White-throated Sparrow	98	1	Broken leg		
Red-winged Blackbird	8	1	Cut tongue		
Bananaquit	12			1	Died in net
Blue-black Grosbeak	4	1	Cut tongue		
Bright-rumped Attila	8	1	Wing abrasion		
Orange-collared Manakin	48	1	Cut foot		
Red-capped Manakin	26	1	Cut leg	1	Died in net
Scaly-throated Leaftosser	6	1	Cut tongue		
White-tipped Sicklebill	2			1	Died in net
Total	4060	31	(0.76%)	11	(0.27%)

APPENDIX 1

Appendix 1a. New Bandings at Inglewood Bird Sanctuary - Spring 2002

	May																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
American Kestrel																				
Solitary Sandpiper																				
Spotted Sandpiper																				
Belted Kingfisher																			1	
Downy Woodpecker		3											2							
Northern Flicker												1								
Western Wood-Pewee																				
Alder Flycatcher																				1
Least Flycatcher																				1
Eastern Phoebe									1											
Blue-headed Vireo																				
Warbling Vireo											1								1	
Tree Swallow													2				1	2		3
N Rough-winged Swallow																		2		
Barn Swallow																				
Black-capped Chickadee	2									1										
Red-breasted Nuthatch																			1	
White-breasted Nuthatch	1												1							
House Wren																			1	4
Swainson's Thrush																1	1	3		1
Hermit Thrush																				1
American Robin	2	2							1	1	2		1							
Gray Catbird																				1
Cedar Waxwing																				
Orange-crowned Warbler	1								4	3	1	2	1						2	
Yellow Warbler																		1	1	3
Yellow-rumped Warbler		1							24	2	7	2	49	1		29	11	26	10	7
Blackpoll Warbler																				1
American Redstart																				
Northern Waterthrush																		2		1
Common Yellowthroat																		4	1	
Wilson's Warbler																				
Western Tanager																				
Chipping Sparrow																		1		1
Clay-coloured Sparrow																		1	1	6
Savannah Sparrow	1									1			1							
Song Sparrow																				
Lincoln's Sparrow									1	2		1	2	1		1	3	4	3	
White-throated Sparrow																		1		
White-crowned Sparrow									1		2					1		1		
Dark-eyed Junco	1																			
Rose-breasted Grosbeak																				
Red-winged Blackbird																1				
Brown-headed Cowbird																1			1	
Baltimore Oriole																				
American Goldfinch																				

Appendix 1a. New Bandings at Inglewood Bird Sanctuary - Spring 2002

	May											June							Total
	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	
American Kestrel					1														1
Solitary Sandpiper								1											1
Spotted Sandpiper									2										2
Belted Kingfisher																			1
Downy Woodpecker																			5
Northern Flicker																			1
Western Wood-Pewee				1	1											2		1	5
Alder Flycatcher				1	1						1	1					1		6
Least Flycatcher				1		1				1	1	8			1		1	1	16
Eastern Phoebe																			1
Blue-headed Vireo						1						1							2
Warbling Vireo								2											4
Tree Swallow				3		1	1	1	2	1	1								18
N Rough-winged Swallow				2					1										5
Barn Swallow				1															1
Black-capped Chickadee																			3
Red-breasted Nuthatch																			1
White-breasted Nuthatch																			2
House Wren					3		1					2					1	1	13
Swainson's Thrush	1			5	3	6	2	6	2	1	6	10			1	3	2		54
Hermit Thrush				1															2
American Robin				1	2	2	2	4	1	1	2	2				1	1		28
Gray Catbird					2	1				1		1			1		4	2	13
Cedar Waxwing								2								1			3
Orange-crowned Warbler				4	1														19
Yellow Warbler				5	3			3	1		2	6			4	2	1	1	33
Yellow-rumped Warbler				46	8	3	10	7		3	2	1							249
Blackpoll Warbler				2	5		2	12		5	3								30
American Redstart											1						1		2
Northern Waterthrush					2		1	1		1									8
Common Yellowthroat				7	1		1					4				1		2	21
Wilson's Warbler								1			2							1	4
Western Tanager									1										1
Chipping Sparrow				1															3
Clay-coloured Sparrow				2			1	2	1			1							15
Savannah Sparrow																			3
Song Sparrow					3														3
Lincoln's Sparrow										1									19
White-throated Sparrow				1	1		1				1								5
White-crowned Sparrow				1															6
Dark-eyed Junco																			1
Rose-breasted Grosbeak															1				1
Red-winged Blackbird						1	1												3
Brown-headed Cowbird											3								5
Baltimore Oriole								1			2					1			4
American Goldfinch																1			1

Appendix 1b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

	July					August																															
	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Sharp-shinned Hawk																																				
Cooper's Hawk																																				
Solitary Sandpiper	1							1								2	1	4			1	1	1													
Spotted Sandpiper		1								1	1		1											1												
Common Snipe																																				
Belted Kingfisher	1	1				1	1							1																						
Yellow-bellied Sapsucker																																				
Downy Woodpecker	1		1										1	1	1			1		3			2	1			1									
Hairy Woodpecker							1																													
Northern Flicker	1										1			1			1																			
Olive-sided Flycatcher																				2																
Western Wood-Pewee	1		1				1	2			1				1	2	1			1	3															
Alder Flycatcher													1			3	1	1	1	4	4	2	1	2	3	1	7	1		1		2		1		
Least Flycatcher															1	2	1	1		5	4	2							1		2					
Eastern Kingbird	1									1							1			2						1		1								
Blue-headed Vireo																							1													
Warbling Vireo		1									1			1	1								1	1			1		2							
Red-eyed Vireo																					1															
Black-billed Magpie																																				
Tree Swallow				1																																
Black-capped Chickadee		1				2					1			1				1		1													3			
Red-breasted Nuthatch																				1																
White-breasted Nuthatch																											2									
House Wren	10	3	1	2		2	1				2	3	3	5	6		2	2						3	2		4	4	2	1	2	1		1		
Golden-crowned Kinglet																																				
Ruby-crowned Kinglet																																				
Swainson's Thrush		1																																1		
Hermit Thrush																																				
American Robin	3	3		5		3		1			2		1	2						3		4		1	1		2	1	2			1				
Gray Catbird														2				1		1						1					1		1			
Cedar Waxwing	1	2					1			4					3					12			1						1			1			1
Tennessee Warbler	2			1			2			1				1	29	2		1		9	9	8	1	3					2	5					
Orange-crowned Warbler																												1								
Nashville Warbler																																				
Yellow Warbler		3	1	2			1			1	1	1	2	1	8	12		2		19	2	20	9	5	5	2	3	3	2	7	2		2	1		1

Appendix 1b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

	September																													October						Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	
Sharp-shinned Hawk																1				1														1			3
Cooper's Hawk																													1								1
Solitary Sandpiper																																					12
Spotted Sandpiper			1																																		5
Common Snipe																	1																				1
Belted Kingfisher																																					5
Yellow-bellied Sapsucker																																					1
Downy Woodpecker																																					13
Hairy Woodpecker																																					1
Northern Flicker																																					4
Olive-sided Flycatcher																																					2
Western Wood-Pewee																																					14
Alder Flycatcher	2	3	1			2						1																									45
Least Flycatcher		1		1																																	21
Eastern Kingbird																																					7
Blue-headed Vireo									1																												2
Warbling Vireo																																					9
Red-eyed Vireo						1																															2
Black-billed Magpie						1																															1
Tree Swallow																																					1
Black-capped Chickadee																				3																	13
Red-breasted Nuthatch																																					1
White-breasted Nuthatch											1							1									1										5
House Wren		1	1	1		2					2			1			1							1													72
Golden-crowned Kinglet															1		1																				2
Ruby-crowned Kinglet											1		3			1	1			1	1	1		2	1								1			1	14
Swainson's Thrush						2	5				1	1						1						1													13
Hermit Thrush													1					1											1		3			3	1	1	11
American Robin																									1			1									37
Gray Catbird						1																															8
Cedar Waxwing																																					27
Tennessee Warbler																																					76
Orange-crowned Warbler		1	3	4	1	3	2	1	3		3	2	3	7	6	5	5	4		2			1	5	5						1			2		1	71
Nashville Warbler															1																					1
Yellow Warbler						1																															119

Appendix 1b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

	July					August																														
	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Magnolia Warbler																							1					2			3				1	1
Yellow-rumped Warbler				1		1								4	3	5		3		11	4	27	9	9	4	10	7	14	5	8	9	1	4	7		1
Townsend's Warbler																																				
Palm Warbler																																				
Blackpoll Warbler																											1	1	1		2		1			
Black-and-white Warbler																1							1													
American Redstart																				3			1		1	1		4	1	4	4	2	1			1
Ovenbird																														1		1				1
Northern Waterthrush										1		1	1	2	1	2	1	1		2	1		5	2		1		3	1		2	1		1		1
Connecticut Warbler																																				
Mourning Warbler																							1					1				2				
MacGillivray's Warbler																								1						1						
Common Yellowthroat																																		1		
Wilson's Warbler															2			3		3		2	1	20	10	2		1		2	2	2		1		1
Canada Warbler																						1				1										
Western Tanager				1		1										1									1			2								
American Tree Sparrow																																				
Chipping Sparrow			1										12	2	3	3	3	5		3	12	6	5	22	3			9		1						
Clay-coloured Sparrow						1	2					1		1	5	2				4	1			1		2					1			1		
Fox Sparrow																																				
Song Sparrow															3	3	2	1		1		1						1								
Lincoln's Sparrow							1				1			2											1		1	1			2	5	5	1	4
Swamp Sparrow																																				
White-throated Sparrow																				1				1									2		3
White-crowned Sparrow																																				
Dark-eyed Junco																																				
Rose-breasted Grosbeak																									3											
Red-winged Blackbird										1				2																						
Brown-headed Cowbird							1					1		1						2																
Baltimore Oriole		4			4		1																													
American Goldfinch										2																										

Appendix 1b. New Bandings at Inglewood Bird Sanctuary - Fall 2002

	September																													October						Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	
Magnolia Warbler																1																					9
Yellow-rumped Warbler	2	2	2	11		2			2		6		10	2	24	5	7	7	1				11	3									1		1	2	248
Townsend's Warbler		1									1																										2
Palm Warbler																3																			1		4
Blackpoll Warbler													1																								7
Black-and-white Warbler						1																															3
American Redstart		1			1								1		1																						27
Ovenbird			1		2		1																														7
Northern Waterthrush		1					1								1																						33
Connecticut Warbler									1																												1
Mourning Warbler	1			2																																	7
MacGillivray's Warbler						1																		1													4
Common Yellowthroat								1					1		2			1	1								1										8
Wilson's Warbler		17	3			1	2	32	16	4	8	2		2	1	1					1			2				1								145
Canada Warbler																																					2
Western Tanager																																					6
American Tree Sparrow																		1											1								2
Chipping Sparrow												1				1																					92
Clay-coloured Sparrow					1						1		1	1																							26
Fox Sparrow															1																						1
Song Sparrow																				1																	13
Lincoln's Sparrow		2	2	2	4	6	1	1			10	1	3	4	7		3	4	2	2	1			5	2	1							1				88
Swamp Sparrow																										1										1	2
White-throated Sparrow	2	1	3	2				1			3			5	8	1	3	2	1				1	1		1	2	1					1	2		3	51
White-crowned Sparrow		1		2	2	1		3			1		2	2	5	2		2	2				4			1											30
Dark-eyed Junco										1	2				1		1											1									6
Rose-breasted Grosbeak																																					3
Red-winged Blackbird																																					3
Brown-headed Cowbird																																					5
Baltimore Oriole																																					9
American Goldfinch																																					2

APPENDIX 2

Appendix 2. Top 20 New Bandings at Inglewood Bird Sanctuary

Fall				
	Total		2002	
Species	Rank	Number	Rank	Number
Yellow-rumped Warbler	1	2306	1	248
Wilson's Warbler	2	1073	2	145
Orange-crowned Warbler	3	890	8	71
Yellow Warbler	4	781	3	119
Tennessee Warbler	5	584	6	76
American Robin	6	541	11	37
Chipping Sparrow	7	493	4	92
House Wren	8	419	7	72
White-throated Sparrow	9	375	9	51
Lincoln's Sparrow	10	358	5	88
Northern Waterthrush	11	303	12	33
Traill's Flycatcher	12	295	10	45
Cedar Waxwing	13	261	14	27
White-crowned Sparrow	14	189	13	30
Swainson's Thrush	15	182	20	13
Clay-colored Sparrow	16	156	16	26
Least Flycatcher	17	142	17	21
Ovenbird	17	142		7
Warbling Vireo	19	112		9
Ruby-crowned Kinglet	20	107	18	14
American Redstart		84	15	27
Western Wood-Pewee		99	19	14

Spring		
	2002	
Species	Rank	Number
Yellow-rumped Warbler	1	249
Swainson's Thrush	2	54
Yellow Warbler	3	33
Blackpoll Warbler	4	30
American Robin	5	28
Common Yellowthroat	6	21
Orange-crowned Warbler	7	19
Lincoln's Sparrow	7	19
Tree Swallow	7	18
Least Flycatcher	10	16
Clay-coloured Sparrow	11	15
House Wren	12	13
Gray Catbird	12	13
Northern Waterthrush	14	8
Alder Flycatcher	15	6
White-crowned Sparrow	15	6
Downy Woodpecker	17	5
Western Wood-Pewee	17	5
N Rough-winged Swallow	17	5
White-throated Sparrow	17	5

APPENDIX 3

Appendix 3. Monitored Species at Inglewood Bird Sanctuary

	Spring		Fall		
	2002		1995-2002		BSC
	Mean		Multi-year Mean		priority
	Number	Frequency	Number	Frequency	
Solitary Sandpiper			9	7	
Western Wood-Pewee			12	8	C
Traill's Flycatcher	6	6	37	20	A
Least Flycatcher	16	9	18	14	C
Eastern Kingbird			12	9	C
Warbling Vireo			14	10	C
Tree Swallow	18	11			C
House Wren	13	7	52	25	E
Ruby-crowned Kinglet			13	10	B
Swainson's Thrush	54	17	23	14	A
American Robin			68	23	D
Gray Catbird	13	8			E
Cedar Waxwing			33	11	D
Tennesee Warbler			73	23	A
Orange-crowned Warbler	19	9	111	27	A
Yellow Warbler	33	13	98	24	C
Yellow-rumped Warbler	249	20	288	37	B
Blackpoll Warbler	30	7	12	8	A
Ovenbird			18	12	C
Northern Waterthrush	8	6	38	19	A
Common Yellowthroat	21	8			C
Wilson's Warbler			134	32	A
Chipping Sparrow			62	16	C
Clay-colored Sparrow	15	8	20	13	C
Song Sparrow			12	10	D
Lincoln's Sparrow	19	10	45	24	A
White-throated Sparrow			47	18	B
White-crowned Sparrow			24	13	B
Dark-eyed Junco			8	5	B
Baltimore Oriole			9	4	E

CRITERIA USED TO DEFINE AND PRIORITIZE MONITORED SPECIES
(From Bird Studies Canada)

Monitored Species

Mean number banded each year ≥10, and mean number of days each year on which individuals banded ≥5.

Priority for Migration Monitoring

A Those species that have <50% of Canadian and Alaskan breeding range covered by the Breeding Bird Survey and <60% of winter range within Canada and U.S.

B Those species that have <50% of Canadian and Alaskan breeding range covered by the Breeding Bird Survey but 60% of their winter range is within Canada and U.S.

C Those species with <60% coverage of Canadian and Alaskan breeding range (but 50% of NA range) covered by the Breeding Bird Survey and have <60% of wintering range in Canada and U.S.

D Those species with <60% coverage of Canadian and Alaskan breeding range covered by the Breeding Bird Survey but have >60% of their wintering range in Canada and U.S.

E Those species with >60% coverage of Canadian and Alaskan breeding range covered by the Breeding Bird Survey but have <60% of their wintering range in Canada and U.S.

F Those species with >60% coverage of Canadian and Alaskan breeding range covered by the Breeding Bird Survey and have >60% of their wintering range in Canada and U.S.

APPENDIX 4

AN OVERVIEW OF THE NORTH AMERICAN MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM

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I. WHY MONITOR VITAL RATES?

There are three important reasons why monitoring vital rates (primary demographic parameters such as productivity and survivorship) must be a component of any integrated avian population monitoring scheme (Baillie 1990). First, environmental stressors and management actions affect vital rates directly and usually without the time lags that so often occur with population size (Temple and Wiens 1989, DeSante and George 1994). Second, vital rates provide crucial information about the stage of the life cycle at which population change is being effected (DeSante 1992). This information is particularly important for migratory birds that winter in tropical latitudes, because it can determine whether management actions should be directed toward a species' temperate breeding grounds, tropical wintering grounds, or both. Third, monitoring vital rates provides crucial information about the viability of the population being monitored and about the quality of the habitat or landscape in which the population occurs (DeSante and Rosenberg 1998). Because of the vagility of most bird species, local variations in population size may often be masked or accentuated by recruitment or lack thereof from a wider region (DeSante 1990, George et al. 1992). Thus, density of a species in a given area may not be indicative of population viability due to source-sink dynamics (Van Horne 1983, Pulliam 1988, Donovan et al. 1995).

Estimating primary demographic parameters is critical for understanding population dynamics and is directly applicable to population models that can be used to assess land-management practices by examining the effects of the landscapes they produce on vital rates (Noon and Sauer 1992). Although several studies have investigated relationships between regional landscape patterns and population trends (Sauer et al. 1996, Flather and Sauer 1996), a particular need remains to examine relationships between landscape configuration and vital rates, using standardized methods for collecting vital rate data, at various spatial scales (Villard et al. 1999). To be successful, management actions must be designed to influence the key primary demographic parameter responsible for population decline in a specific target species (DeSante 1995). Such an approach will have a much higher likelihood of success than one based on correlations with presence/absence or relative abundance data (DeSante and Rosenberg 1998, Villard et al. 1999). These considerations necessitate the continued collection of demographic monitoring data,

indicate the direction in which analyses of such data should proceed, and emphasize the importance of an integrated approach to monitoring and adaptive management.

II. OVERVIEW OF THE MAPS PROGRAM

The Monitoring Avian Productivity and Survivorship (MAPS) program is a cooperative effort among public agencies, private organizations, and individual bird ringers in North America to operate a network of over 500 constant-effort mist netting and ringing stations during the breeding season (DeSante et al. 1995). MAPS was established in 1989 by The Institute for Bird Populations (IBP) and was patterned to a large extent after the British Constant Effort Sites (CES) scheme operated by the British Trust for Ornithology (Baillie et al. 1986, Peach et al. 1996, 1998). MAPS utilizes a standardized constant-effort mist-netting protocol at a network of stations. Each station typically consists of about ten permanent net-sites located opportunistically, but rather uniformly, within the interior eight ha of a 20-ha study area (DeSante et al. 2001a). Typically, one 12-m, 36-mm-mesh mist net is operated at each net site for six morning hours per day, for one day during each of six to ten consecutive 10-day periods. Starting dates vary between May 1 and June 10 (later at more northerly latitudes and higher elevations) and operation continues through the ten-day period ending August 8. All birds captured during the program are identified to species, age, and sex using criteria in Pyle (1997) and, if unmarked, are ringed with a uniquely numbered aluminum ring provided by the U.S. Geological Survey/Biological Resources Division (USGS/BRD) Bird Banding Laboratory or the Canadian Wildlife Service/Bird Banding Office.

Following Peach et al. (1996), productivity indices are calculated as the proportion of young in the catch (number of young individuals captured/total number of aged individuals captured). Annual adult survival rates and adult capture probabilities are estimated from modified Cormack-Jolly-Seber mark-recapture models (Clobert et al. 1987, Pollock et al. 1990, Lebreton et al. 1992) that include a between- and within-year length-of-stay transient model (Pradel et al. 1997, Nott and DeSante in press). These modifications permit estimation of the proportion of residents among newly captured birds and provide survival rate estimates that are unbiased with respect to transient individuals (Pradel et al. 1997).

MAPS protocol (DeSante et al. 2001a) also requires station operators to record the probable breeding status of all avian species seen, heard, or captured at each station on every day of operation using methods similar to those employed in breeding bird atlas projects; and to assign a composite breeding status for every species at the end of the season based on those records. In addition, a station map and standardized quantitative habitat descriptions are prepared each year for each major habitat type contained in the station by means of the MAPS Habitat Structure Assessment protocol (Nott 2000). Finally, MAPS operators are able to enter or import, verify, edit, and submit all their data to IBP by means of MAPSPROG Version 3 (Froehlich et al. 2000, Michel et al. 2000), a specially designed Windows-based computer program distributed free of charge for that purpose by IBP. MAPSPROG has four modules that deal, respectively, with ringing, effort, breeding status, and habitat assessment data. The program includes within- and between-record verification algorithms that substantially improve the quality of the ringing data, particularly age and sex determinations. Importantly, it allows the persons who

actually collect the data to also verify and edit them. Moreover, this process can be carried out during the field season, thereby allowing station operators to learn from their errors in a very timely manner.

During its first three years (1989-1991), MAPS was comprised of an IBP-sponsored feasibility study, during which time the program grew from 16 to 66 stations and the protocol became standardized. The Program was endorsed in 1991 by the Monitoring Working Group of the Neotropical Migratory Bird Conservation Initiative, "Partners in Flight" (PIF), and the Bird Banding Laboratory, and a four-year pilot project (1992-1995) was approved and funded by the U.S. Department of the Interior (USDI) to evaluate the utility and effectiveness of the Program for monitoring demographic parameters of landbirds. During the ensuing four-year pilot study, the program grew from 178 to 391 stations. A general evaluation of the pilot project (DeSante 1996, 2000, DeSante et al. 1999) and an evaluation of the statistical properties of the data (Rosenberg 1996, Rosenberg et al. 1999, 2000) were completed in 1996. A review of the Program and of the evaluations of the pilot project was completed by a panel assembled by USGS/BRD (Geissler 1996). The review concluded that: (1) MAPS is technically sound and is based on the best available biological and statistical methods; (2) it complements other landbird monitoring programs such as the North American Breeding Bird Survey (BBS) by providing useful information on landbird demographics that is not available elsewhere; and (3) it is the most important project in the nongame bird monitoring arena since the creation of the BBS.

MAPS thus became an "established" monitoring program in 1996 and continued to grow from 424 stations in 1996 to about 507 stations in 2000, the ninth year of standardized operation. The substantial growth of the Program was caused in part by its endorsement by PIF and the involvement of various federal agencies in PIF, including the USDA Forest Service; the USDI National Park Service, Fish and Wildlife Service, and Bureau of Land Management; and the USDoD Department of the Navy, Department of the Army, and Texas Army National Guard. During 2000, for example, 151 "agency" stations were operated by IBP personnel under federal contracts. Support for the operation of the remaining 356 "independent" stations (those not operated by IBP personnel) has come from a wide variety of federal, state, and private sources.

III. GOALS AND OBJECTIVES OF MAPS

MAPS is organized to fulfill three tiers of goals and objectives: monitoring, research, and management.

- The specific monitoring goals of MAPS are to provide, for over 100 target species, including Neotropical-wintering migrants, temperate-wintering migrants, and permanent residents:

  (A) indices of adult population size and post-fledging productivity from data on the numbers and proportions of young and adult birds captured; and
  (B) estimates of adult population size, adult survival rates, proportions of residents, and recruitment into the adult population from mark-recapture data on adult birds.

- The specific research goals of MAPS are to identify and describe:

  (1) temporal and spatial patterns in these demographic indices and estimates at a variety of spatial scales ranging from the local landscape to the entire continent; and
  (2) relationships between these patterns and ecological characteristics of the target species, population trends of the target species, station-specific and landscape-level habitat characteristics, and spatially-explicit weather variables.

- The specific management goals of MAPS are to use these patterns and relationships, at the appropriate spatial scales, to:

  (a) determine the proximate demographic cause(s) of population change;
  (b) suggest management actions and conservation strategies to reverse population declines and maintain stable or increasing populations; and
  (c) evaluate the effectiveness of the management actions and conservation strategies actually implemented through an adaptive management framework.

IV. RECENT IMPORTANT RESULTS FROM THE MAPS PROGRAM

For the past nine years, IBP has been publishing monitoring results from MAPS (DeSante 1992, DeSante and Burton 1994, DeSante et al. 1993, 1996, 1998, 2000). These papers have documented pronounced annual variation in regional productivity indices as well as the pattern that increases or decreases in productivity in a given year are typically followed by respective increases or decreases in population size the following year (DeSante et al. 1996, 1998). More recently, MAPS data have yielded interesting research and management related results. Several of the more important of these are described below.

A. Patterns of productivity as a function of nest location and migration strategy

DeSante (2000) described patterns of productivity indices at two spatial scales: all of eastern North America and the Sierra Nevada physiographic stratum. Productivity indices for species groups at both spatial scales varied as a function of nest location (in descending order: cavity, ground, open-cup tree, and open-cup shrub nesters) and migration strategy (again in descending order: permanent residents, temperate-wintering migrants, and Neotropical-wintering migrants). These patterns agree with those found by direct nest monitoring and those predicted from theoretical considerations, are robust with respect to time and space, and thus apparently reflect real population processes at multiple spatial scales.

B. The development and utilization of transient models in MAPS mark-recapture analyses

Not all individual adult birds captured as part of MAPS protocol are resident in the study area during the breeding season. Some, such as floaters, failed breeders, and post-breeding dispersing individuals, may be merely passing through the study area and have essentially zero probability of being recaptured there at a later date. The inclusion of such transient individuals in standard mark-recapture analyses violates the basic assumption that all individuals have an equal probability of recapture and causes substantial underestimation of survival-rates. This problem can be overcome by use of a transient model (Pradel et al. 1997, Nott and DeSante in press) that utilizes both between- and within-year information to estimate the proportion of residents among newly captured adults and the survival rate of those resident adults.

Figure 1 shows that survival rate estimates in the range of 0.4 to 0.5 obtained for target species from the standard CJS non-transient model were increased by 12% to 20% through the use of the transient model. Moreover, the precision of the survival rate estimates from the transient model averaged 7.5% higher than the precision of the estimates obtained from the standard CJS non-transient model (Nott and DeSante in press). These transient models are now being employed in all mark-recapture analyses of MAPS data. Nevertheless, survival rate estimates from MAPS and virtually all mark-recapture experiments on landbirds, including estimates obtained from use of the transient model, are confounded by emigration of breeding individuals and, therefore, are actually estimates of apparent survival.

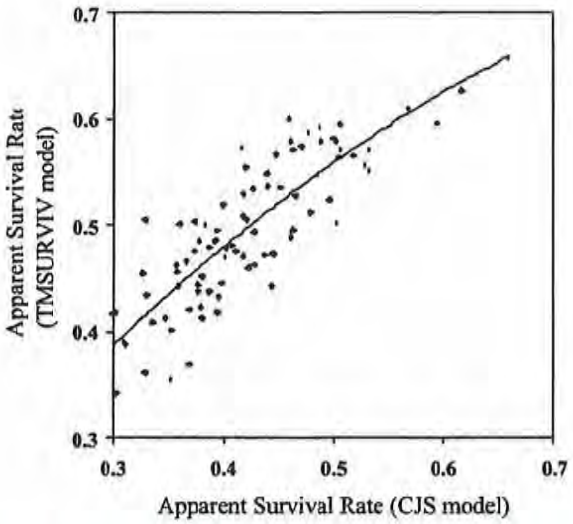

Figure 1. Relationship between 1992-1998 MAPS continent-wide, time-constant annual adult survival rates from use of the within- and between-year transient model (TMSURVIV) versus use of the standard Cormack-Jolly-Seber (CJS) non-transient model for 89 species. Adapted from Nott and DeSante in press.

C. Relationships between adult survival rate estimates from MAPS and body mass and migration strategy

Although previous researchers have made broad inferences about variation in avian survivorship, they generally have done so by comparing survival rates of two or more populations of a single species (e.g., Greenberg 1980) or by aggregating multi-species data from many disparate sources (e.g., Martin 1995). The latter studies have been hampered by the fact that the survivorship values from different studies were derived from many different field methods and analytical models, each of which has its own unique biases. In contrast, survival rate estimates from MAPS are derived from modified Cormack-Jolly-Seber mark-recapture analyses that include a between- and within-year transient model and are applied to continent-wide data generated by a standardized mark-recapture methodology. As a result, ecological and geographical correlates of adult survival rates can be examined with much greater rigor than ever before.

Figure 2 shows time-constant 1992-1998 annual adult survival rates plotted against the natural logarithm of mean body mass (Dunning 1992, Sibley 2000) for 89 target species and for

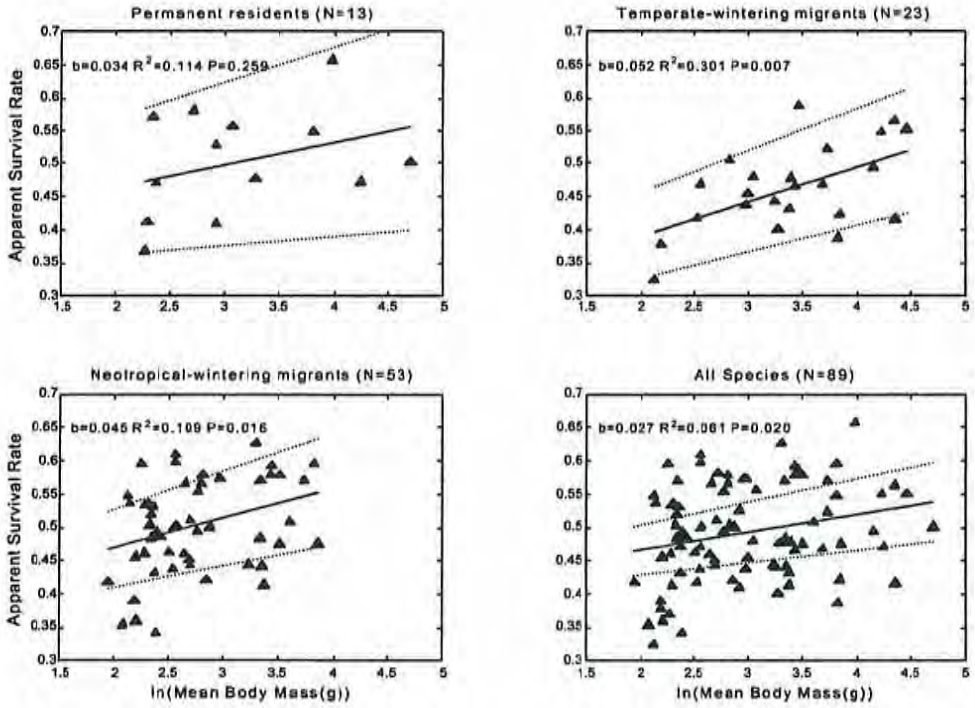

Figure 2. Relationships between time-constant annual adult survival rates from 1992-98 continent-wide MAPS data and the logarithm of the mean body mass for each of three migratory-strategy species groups (permanent residents, temperate-wintering migrants, and Neotropical-wintering migrants) and for all species. IBP unpublished data.

three groupings of these species classified according to migration strategy (permanent residents; temperate-wintering migrants; Neotropical-wintering migrants). Positive linear relationships were found between adult survival rates and ln (body mass) for each species group and were significant ($P<0.05$) for all groups except permanent residents. An analysis of co-variance (ANCOVA), which took body mass into consideration, showed significant ($P=0.01$) variation in annual adult survival rates among the three migration-strategy species groups, with both permanent residents and Neotropical-wintering migrants having higher survivorship than temperate-wintering migrants. Interestingly, the species group with the lowest average survival rate, temperate-wintering migrants, also had the steepest slope for its survival rate versus body mass relationship, suggesting that the low survival rates for species in this group were especially pronounced among species with small body mass. This may suggest that species with small body mass are better off either by migrating to tropical latitudes where overwintering climates are predictably benign, or by adapting to predictably harsh climatic conditions and foregoing migration. The poorest strategy (at least as regards adult survivorship) may to be that of migrating to areas where overwintering climate may sometimes be unpredictably harsh, such that costs of migration are always incurred without always reaping the benefits.

D. Measures of productivity and survival from MAPS are consistent with observed population trends

DeSante (1995) showed that reproductive indices based on the ratio of young to adult captures can provide unbiased estimators of actual productivity if the capture probabilities of young and adult birds are equal. This is unlikely to be the case, however, because the young captured by the MAPS protocol are primarily juveniles dispersing from the surrounding landscape, while the numbers of dispersing adults are inflated by captures of the breeding adults that are resident at the station during much of the MAPS season (DeSante 1995). Thus we might expect MAPS reproductive indices to underestimate actual productivity.

Considerable evidence is accumulating, however, to indicate that measures of productivity and survival from MAPS are generally capable of producing modeled population growth rates for multiple species that correlate with observed population trends for those species (DeSante et al. 1999). Moreover, such relationships have been demonstrated at multiple spatial scales, ranging from the smaller scale of a single national forest, national park or military installation, through the larger scale of groups of national forests or military installations within different geographic areas, and finally to the largest scale of the entire continent. These demonstrations indicate that although MAPS productivity indices may indeed be biased low, the biases remain relatively consistent over time and space and among various species, including those with widely different nest locations and migration strategies.

An example of such a relationship for multiple species on a single national forest is shown in Figure 3. Here we see that trends in adult captures for eight target species were significantly positively related to modeled population changes obtained from data pooled from six MAPS stations operated from 1992 through 1995 on Wenatchee National Forest (DeSante et al. 1999). Similar relationships have

been obtained for a number of other national forests and parks including Flathead, Umatilla, Willamette, and Siuslaw National Forests and Denali, Yosemite, and Shenandoah National Parks (DeSante et al. 1999).

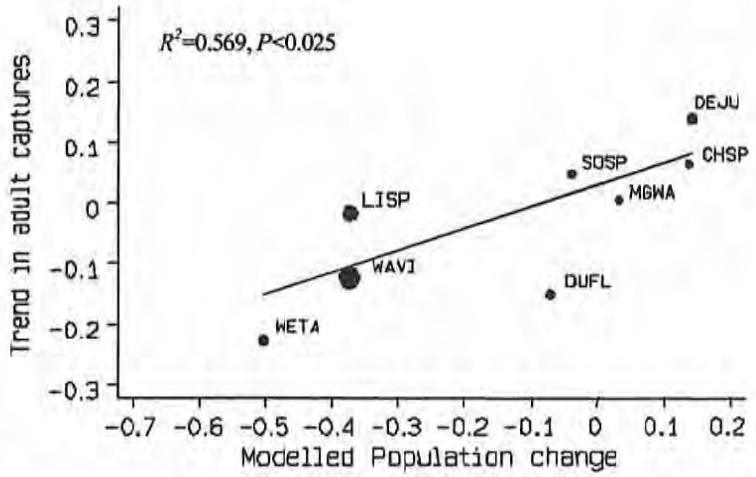

Figure 3. Relationship between trends in adult captures and modeled population changes calculated from reproductive indices and survival estimates from 1992-1995 MAPS data for eight species on Wenatchee National Forest. Trends in adult captures were weighted by the reciprocal of their standard errors and the size of each point reflects the relative weight of each species. From DeSante et al. 1999.

E. MAPS productivity indices and survival rate estimates can be used to identify the proximate demographic cause(s) of population decline

DeSante et al. (2001b) recently described and evaluated a technique for identifying the proximate demographic cause(s) of population change. The approach involves modeling spatial variation in vital rates (productivity and survivorship) both as a function and not as a function of spatial variation in population trends, and using Akaike's Information Criteria (AIC) to select the appropriate (area-dependent or area-independent) model (Burnham and Anderson 1992).

We conducted these analyses at two spatial scales. At the larger scale, we examined 1992-1998 BBS and MAPS data for Gray Catbird. We modeled productivity and survival rates from MAPS stations located in BBS physiographic strata where catbirds were significantly (P<0.01) increasing, as well as strata where they were significantly decreasing. We found that catbird productivity was best modeled as independent of area, while adult survival rates for catbirds were best modeled as area dependent. Moreover, differences in adult survival rates were of the magnitude needed to cause the observed differences in population trends. We concluded that low adult survival rate, rather than low productivity, was the proximate demographic cause of population decline for Gray Catbirds in the physiographic strata where they were declining.

At the smaller scale, we examined six years (1994-1999) of MAPS data from stations on military installations in both the western and eastern Midwest. We conducted analyses on five target species that showed significant negative or positive trends in adult captures on installations in either the western or eastern Midwest, and trends with the opposite sign on installations in the other area. For all five species, we found that low productivity on the installations where the species was declining was a cause of population decline. Low adult survival was an additional cause of decline for Gray Catbird and Yellow-breasted Chat. These are important results because they confirm that MAPS data can be used to identify the vital rate(s) responsible for population declines and, thus, the vital rate(s) toward which management actions should be directed.

F. MAPS productivity indices, coupled with landscape-level habitat data, can be used to identify management strategies for reversing population declines

A critical management goal of MAPS is to identify management actions and conservation strategies to reverse population declines by quantifying relationships between reproductive indices and landscape-level habitat characteristics (Askins and Philbrick 1987). Ideally, habitat variables should be measured in the landscape surrounding the station that includes the area from within which the dispersing juveniles captured by MAPS protocol have originated. The size of this area undoubtedly varies from species to species, and possibly varies geographically and among habitats for a given species. Although the size of this area is unknown for virtually all species, radio telemetry data demonstrate that dispersing juvenile and post-breeding adult Wood Thrushes generally disperse less than four km from their nests and often to edge locations that have dense shrub cover and an abundance of fruit (Anders 1996, Anders et al. 1997).

Using funding supplied by the DoD Legacy Resources Management Program, we have begun to investigate relationships between bird captures and landscape characteristics within four-km-radius areas surrounding MAPS stations on military installations. For example, for each of the nine most common target species on Jefferson Proving Ground, Indiana, we established logarithmic relationships between bird captures and various landscape metrics based upon 30-m resolution Multi-Resolution Land Characterization (MRLC) Consortium remote-sensed data (Bara 1994). Then, from these fitted logarithmic curves, we calculated the relationships between reproductive indices (young/adult) and landscape metrics (Fig. 4).

Figure 4a shows these results for four target species (Ovenbird, Acadian Flycatcher, Wood Thrush, Kentucky Warbler) as a function of mean forest patch size, the single landscape metric that showed the strongest correlation with number of adults captured for each of the four species. These four species are generally considered to be forest interior species and, for each of them, numbers of both adults and young were significantly ($P<0.05$) positively correlated with mean forest patch size at the six stations. Even more interesting were the relationships between reproductive index and mean forest patch

size (Fig. 4b). For each species, a threshold patch size (the patch size associated with the 45 degree inflection point of the relationship) was found, below which reproductive indices increased rapidly with increasing forest patch size and above which increases in forest patch size produced relatively small increases in reproductive indices.

Both the threshold patch size and the sharpness of the threshold varied among species. Of the four, the reproductive index for Ovenbird was the most sensitive to mean forest patch size; that is, its threshold patch size was highest (about 30 ha) and its threshold was least sharp of the four species. This is in accordance with recent literature on Ovenbirds (Porneluzi et al. 1993, Burke and Nol 1998). Acadian Flycatcher showed the least sensitive response of reproductive index to mean forest patch size; its threshold patch size was lowest and its threshold was sharpest with very little increase above 20 ha. Reproductive indices for Wood Thrush and Kentucky Warbler showed intermediate sensitivity to mean forest patch size. These tolerances to forest fragmentation are also similar to those previously reported (Gibbs and Faaborg 1990, Robinson

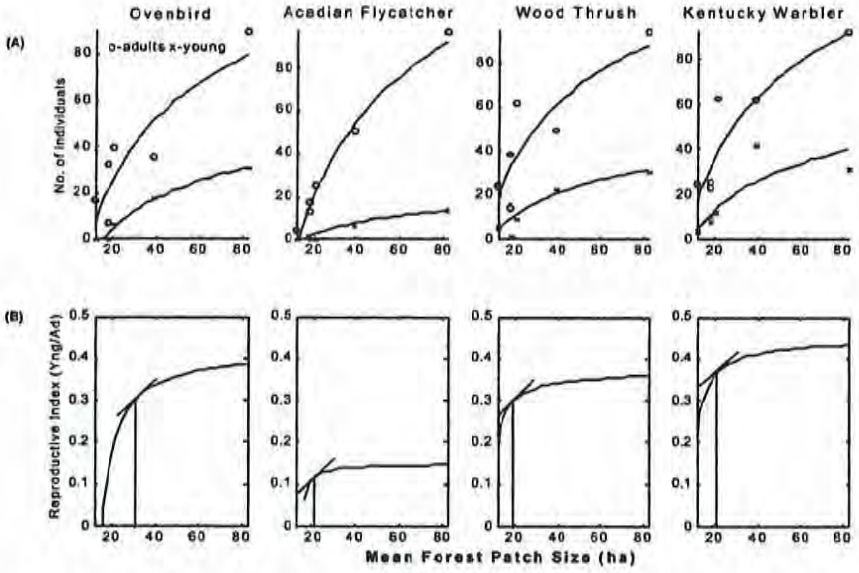

Figure 4. (A) Numbers of individual adult (o) and young (x) birds of four forest interior species captured per 3600 net-hours at six MAPS stations operated during 1994-1999 on Jefferson Proving Ground, Indiana, as a function of mean forest patch size in the 4-km-radius area surrounding each station. (B) Relationship between reproductive index (young/adult) and mean forest patch size at Jefferson Proving Ground for these four species (obtained from the fitted curves in A). IBP unpublished data.

et al. 1995), but here, for the first time, we are able to relate the vital rate actually causing the area sensitivity to habitat conditions in the local landscape.

These results have profound management implications. When these types of analyses become fully developed, it should be possible to calculate, from MAPS survivorship and population trend data,

the critical values of productivity needed to reverse population declines and produce positive population trends. It should then be possible to predict the values of various landscape metrics that would be needed to produce such reproductive indices. The development of such landscape-level management strategies is one of the ultimate goals of the MAPS Program.

V. MAPS FIVE-YEAR PLAN AND OBJECTIVES FOR THE NEXT THREE YEARS

With the completion of ten years (1992-2001) of standardized data collection, MAPS will have matured to the point where it can begin to achieve its major research and management goals, as well as provide meaningful summaries of monitoring results. Here I present our overall five-year plan and a plan for achieving a specific set of monitoring, research, and management objectives over the next three years (2001-2003).

The major monitoring objective for these three years is the production of a ten-year summary of regional patterns and trends in productivity indices and estimates of adult population size, adult survival rate, recruitment rate into the adult population, and population growth rate for about 100 target species, and a comparison of these data to population trend data from the BBS and other sources. This will represent the first ever comprehensive summary and regional analysis of the vital rates of 100 or so of the more common landbird species over an entire continent.

These monitoring results will provide the basis for achieving the two major research objectives that are to be addressed during the next three years: (1) to identify *spatial* patterns in the relationship between a major climate variable (standardized El Nino Southern Oscillation [ENSO] Index) and productivity indices from the MAPS Program; and (2) to identify *spatial* patterns in the relationships between vital rates (productivity, recruitment, and survival) and species-specific demographic and ecological correlates and life history traits, including population growth rate, body mass, migration strategy, nest location, foraging strategy, and habitat preference. Achieving these two research objectives also paves the way for reaching the major research goal for the final two years of this five-year plan: to describe *temporal* patterns in the vital rates of target landbird species and to relate them to demographic and ecological correlates. All of these research objectives address critical areas of current scientific investigation that have profoundly important practical applications. Understanding the manner in which global climate variables affect bird demographics, and the manner in which bird demographics affect and are constrained by life history strategies, are fundamental for projecting the effects of human-induced climate change upon avian diversity across north America.

Fulfilling these research objectives will, in turn, provide the basis for achieving the major management objective of these three years: identification of the proximate demographic cause(s) of population change for some 40 or more target species. We will accomplish this objective by modeling spatial variation in vital rates as a function of spatial variation in population trends and ecological characteristics. Identification of the demographic cause(s) of population decline is crucial for assuring that the most appropriate species-specific management actions are being implemented to reverse the declines,

and that management efforts are not being directed towards inappropriate stages in the life cycles of the species.

The application to MAPS data of two recently developed analytical techniques is necessary for achieving the research and management results proposed above. These are: (1) extension of a method for adjusting indices of adult population size and productivity to account for missed effort during operation of MAPS stations (Peach et al. 1998); and (2) the use of temporal symmetry models that permit direct estimation of recruitment and population growth rates from mark-recapture data (Pradel 1996, Nichols and Hines in press). Application of these new methods to MAPS data provides the final two objectives to be addressed during the first three years of this five-year plan.

Completing the three-year objectives discussed above will set the stage for fulfilling the major management goal for the final two years of this plan: formulation of landscape-level management actions and conservation strategies for 40 or more target species to reverse population declines and maintain stable or increasing populations. We will achieve this goal by establishing relationships between productivity indices and recruitment estimates obtained from 12 years (1992-2003) of MAPS data and station-specific and landscape-level habitat characteristics.

The objectives proposed here have been achieved for very few species anywhere, and for virtually no landbird species in North America, save a few that are critically endangered because of outright habitat destruction. Still, we believe that we can meet these objectives, given the increasingly powerful mark-recapture models that have recently been developed and more than ten years of data from the network of over 500 MAPS stations all utilizing a standardized protocol. We are confident that we can fulfill these objectives, because we have already completed successful pilot studies on all of them at one or more spatial scales.

Completion of the objectives outlined in this five-year plan will allow the information derived from 12 years of MAPS data to be applied to the development and implementation of landscape-level management plans in a scientifically rigorous manner. The management goal for MAPS subsequent to these five years will be to evaluate, through an adaptive management framework, the effectiveness of the management actions and conservation strategies that are actually implemented. Under this approach, we will utilize hypothesis-driven sampling strategies for siting new stations, such that existing stations will serve as controls and will be paired with new experimental stations in areas where management strategies designed specifically to increase productivity are being implemented. If the goal is to manage for increased productivity, then the adaptive management process demands that productivity, and not simply population size, be monitored. Before reaching that stage of the program, however, we need first to identify those species whose population declines can be reversed by increasing their productivity, and then to formulate appropriate management strategies for them. That is the goal of our five-year plan.

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APPENDIX 5

Appendix 5. Year-to-Year Recaptures at Inglewood Bird Sanctuary, Dunbow Road and Cominco Natural Area

Species	Band	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belted Kingfisher	1363-70918	IBS			B	r							
Yellow-bellied Sapsucker	8051-65119	Dunbow						B	r				
Red-naped Sapsucker	8041-54901	Dunbow							B	r			
Downy Woodpecker	1451-67033	IBS				B	r	r				r	
Downy Woodpecker	1461-02314	IBS					B	r	r	r			
Downy Woodpecker	1461-05307	Dunbow						B		r			
Downy Woodpecker	1461-50837	Cominco									B	r	
Downy Woodpecker	1461-63690	IBS			B	r							
Downy Woodpecker	1461-84563	Cominco									B	r	
Downy Woodpecker	1761-28014	Cominco									B	r	
Downy Woodpecker	1791-28131	IBS										B	r
Hairy Woodpecker	0962-90911	IBS				B					r		r
Hairy Woodpecker	1152-38713	IBS							B		r		r
Northern Flicker	1383-76804	IBS							B			r	
Northern Flicker	1453-31301	IBS				B	r						
Western Wood-Pewee	2160-19068	IBS							B			r	
Western Wood-Pewee	2160-19487	IBS								B		r	
Western Wood-Pewee	2190-10406	IBS										B	r
Western Wood-Pewee	2200-47351	IBS										B	r
Least Flycatcher	2050-70767	Dunbow						B		r			
Eastern Kingbird	1451-38640	IBS	B			r							
Eastern Kingbird	1461-31482	IBS							B				r
Eastern Kingbird	1461-50853	Cominco									B	r	
Eastern Kingbird	1461-50898	Cominco									B	r	
Eastern Kingbird	1461-50899	Cominco									B	r	
Eastern Kingbird	1461-63719	IBS					B	r		r			r
Eastern Kingbird	1461-63750	IBS						B	r	r			r
Eastern Kingbird	1761-28292	IBS										B	r
Warbling Vireo	1910-52290	IBS	B			r	r						
Warbling Vireo	1950-45045	IBS			B	r							
Warbling Vireo	1950-45076	IBS			B		r	r	r				
Warbling Vireo	1950-48110	IBS		B		r							
Warbling Vireo	1990-57936	IBS									B		r
Warbling Vireo	2050-70837	IBS						B	r				
Warbling Vireo	2050-70961	IBS					B		r				
Warbling Vireo	2161-14605	IBS				B			r				
Warbling Vireo	2171-56330	Cominco									B	r	
Warbling Vireo	2190-10445	IBS										B	r
Warbling Vireo	2220-34455	Cominco									B	r	
Warbling Vireo	3101-45254	IBS								B	r		
Warbling Vireo	3101-89999	IBS								B			r
Warbling Vireo	3121-21265	Cominco									B	r	
Black-capped Chickadee	1950-45065	IBS			B	r							
Black-capped Chickadee	1950-45186	IBS			B	r	r	r					
Black-capped Chickadee	1950-45254	IBS			B	r	r			r	r	r	
Black-capped Chickadee	1950-45255	IBS			B						r	r	
Black-capped Chickadee	1950-45256	IBS			B	r	r						
Black-capped Chickadee	1950-45258	IBS			B	r	r	r	r				

Appendix 5. Year-to-Year Recaptures at Inglewood Bird Sanctuary, Dunbow Road and Cominco Natural Area

Species	Band	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Black-capped Chickadee	1950-45786	IBS					B	r					
Black-capped Chickadee	1980-79991	IBS				B	r	r	r	r	r	r	
Black-capped Chickadee	1990-57154	IBS						B	r				
Black-capped Chickadee	2050-70142	IBS				B		r					
Black-capped Chickadee	2050-70427	IBS					B	r					
Black-capped Chickadee	2050-70849	IBS						B	r				
Black-capped Chickadee	2120-00102	Dunbow						B	r	r			
Black-capped Chickadee	2120-00103	Dunbow						B	r				
Black-capped Chickadee	2120-00105	Dunbow						B	r	r			
Black-capped Chickadee	2120-00107	Dunbow						B	r	r			
Black-capped Chickadee	2120-00109	Dunbow						B	r	r			
Black-capped Chickadee	2120-00110	Dunbow						B	r				
Black-capped Chickadee	2120-00113	Dunbow						B	r				
Black-capped Chickadee	2120-00114	Dunbow						B	r				
Black-capped Chickadee	2120-00117	Dunbow						B	r	r			
Black-capped Chickadee	2120-00124	Dunbow						B		r			
Black-capped Chickadee	2120-00125	Dunbow						B	r				
Black-capped Chickadee	2120-00128	Dunbow						B	r				
Black-capped Chickadee	2120-00197	Dunbow						B	r				
Black-capped Chickadee	2160-18085	Dunbow							B	r			
Black-capped Chickadee	2160-18180	IBS						B	r				
Black-capped Chickadee	2160-18704	IBS							B	r			
Black-capped Chickadee	2160-19059	IBS							B	r			
Black-capped Chickadee	2160-19120	IBS							B	r	r	r	r
Black-capped Chickadee	2160-19174	IBS							B	r			
Black-capped Chickadee	2160-19522	IBS								B	r	r	r
Black-capped Chickadee	2190-10126	IBS									B	r	r
Black-capped Chickadee	2200-47365	IBS										B	r
Black-capped Chickadee	2220-34017	Cominco									B	r	
Black-capped Chickadee	2220-34132	Cominco									B	r	
Black-capped Chickadee	2220-34593	Cominco									B	r	
Black-capped Chickadee	2390-30780	IBS										B	r
Black-capped Chickadee	3500-89670	Dunbow						B	r	r			
White-breasted Nuthatch	1461-31479	IBS							B	r	r		
White-breasted Nuthatch	1461-84757	IBS				B	r		r				
White-breasted Nuthatch	1791-28150	IBS										B	r
House Wren	1910-52261	IBS	B	r		r	r	r	r				
House Wren	1950-45790	IBS					B	r					
House Wren	1950-45886	IBS					B	r					
House Wren	1950-48126	IBS		B		r							
House Wren	1990-57803	Cominco									B	r	
House Wren	1990-57943	IBS									B	r	
House Wren	1990-57981	IBS									B	r	r
House Wren	2060-28447	IBS						B	r				
House Wren	2160-18063	Dunbow							B	r			
House Wren	2160-18082	Dunbow							B	r			
House Wren	2160-19002	Dunbow							B	r			
House Wren	2190-10308	IBS									B	r	

Appendix 5. Year-to-Year Recaptures at Inglewood Bird Sanctuary, Dunbow Road and Cominco Natural Area

Species	Band	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
House Wren	2190-10325	IBS										B	r
House Wren	2200-47352	IBS										B	r
House Wren	2200-47377	IBS										B	r
Swainson's Thrush	1451-67159	IBS					B		r				
Swainson's Thrush	1461-63572	IBS						B	r				
Swainson's Thrush	1461-63682	IBS			B		r						
Swainson's Thrush	1461-63692	IBS			B			r					
Swainson's Thrush	1461-63741	IBS					B	r					
Swainson's Thrush	1461-69595	IBS					B	r					
Swainson's Thrush	1541-17673	IBS								B	r		r
American Robin	0962-90991	IBS				B		r					
American Robin	0972-30082	IBS										B	r
American Robin	0972-30083	IBS										B	r
American Robin	0972-30466	IBS				B		r					
American Robin	1142-49046	IBS						B	r				
American Robin	1142-49201	Dunbow						B	r				
American Robin	1142-49212	Dunbow						B		r			
American Robin	1142-49217	Dunbow						B	r				
American Robin	1142-49221	Dunbow						B	r				
American Robin	1142-55013	IBS										B	r
American Robin	1152-38703	Dunbow							B	r			
American Robin	1152-38740	IBS							B	r		r	
American Robin	1152-38887	IBS									B	r	
Gray Catbird	1681-67028	Cominco									B	r	
Gray Catbird	1681-67080	IBS										B	r
Gray Catbird	1681-67087	IBS										B	r
Gray Catbird	8041-54948	IBS							B	r			
Gray Catbird	8041-54987	IBS							B			r	
Gray Catbird	8041-83021	Cominco									B	r	
Gray Catbird	8041-83028	Cominco									B	r	
Gray Catbird	8041-83041	Cominco									B	r	
Cedar Waxwing	1461-50802	Cominco									B	r	
Cedar Waxwing	1461-63733	IBS					B	r					
Orange-crowned Warbler	2160-18542	IBS							B	r			
Yellow Warbler	1910-52230	IBS	B			r							
Yellow Warbler	1950-45519	IBS				B	r		r				
Yellow Warbler	1950-45878	IBS					B	r	r				
Yellow Warbler	1950-48086	IBS		B		r							
Yellow Warbler	1950-48129	IBS		B		r	r						
Yellow Warbler	1950-48133	IBS		B		r							
Yellow Warbler	1980-79983	IBS				B	r	r	r	r			
Yellow Warbler	1990-57104	Dunbow						B	r				
Yellow Warbler	1990-57734	Cominco									B	r	
Yellow Warbler	1990-57738	Cominco									B	r	
Yellow Warbler	1990-57802	Cominco									B	r	
Yellow Warbler	1990-57864	Cominco									B	r	
Yellow Warbler	1990-57898	Cominco									B	r	
Yellow Warbler	1990-57916	Cominco									B	r	

Appendix 5. Year-to-Year Recaptures at Inglewood Bird Sanctuary, Dunbow Road and Cominco Natural Area

Species	Band	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Yellow Warbler	1990-57935	IBS									B		r
Yellow Warbler	2050-70144	IBS				B	r						
Yellow Warbler	2070-42756	IBS						B	r				
Yellow Warbler	2120-00181	Dunbow						B	r				
Yellow Warbler	2160-19158	IBS							B	r			
Yellow Warbler	2160-18045	Dunbow							B	r			
Yellow Warbler	2160-18068	Dunbow							B	r			
Yellow Warbler	2160-18077	Dunbow							B	r			
Yellow Warbler	2160-19059	IBS							B	r			
Yellow Warbler	2160-19576	IBS								B		r	
Yellow Warbler	2160-19766	IBS								B	r	r	
Yellow Warbler	2200-47400	IBS										B	r
Yellow Warbler	2220-34098	Cominco									B	r	
Yellow Warbler	2220-34171	Cominco									B	r	
Yellow Warbler	2220-34293	Cominco									B	r	
Yellow Warbler	2220-34320	Cominco									B	r	
Yellow Warbler	2220-34423	Cominco									B	r	
Yellow Warbler	2220-34438	Cominco									B	r	
Yellow Warbler	2390-30570	IBS										B	r
Yellow Warbler	3500-89667	Dunbow						B		r			
Yellow-rumped Warbler	1910-52603	IBS	B	r									
Yellow-rumped Warbler	2220-34592	Cominco									B	r	
Clay-coloured Sparrow	2050-70675	Dunbow						B		r			
Clay-coloured Sparrow	2120-00157	Dunbow						B	r	r			
Clay-coloured Sparrow	2120-00170	Dunbow						B		r			
Clay-coloured Sparrow	2120-00176	Dunbow						B	r				
Clay-coloured Sparrow	2160-18022	Dunbow							B	r			
Clay-coloured Sparrow	2160-18028	Dunbow							B	r			
Clay-coloured Sparrow	2160-18030	Dunbow							B	r			
Clay-coloured Sparrow	2160-19504	IBS								B			r
Clay-coloured Sparrow	2220-34456	Cominco									B	r	
Clay-coloured Sparrow	2220-34615	Cominco									B	r	
Vesper Sparrow	1461-05331	Dunbow						B	r				
Vesper Sparrow	1461-31412	Dunbow							B	r			
Savannah Sparrow	2171-56304	Cominco									B	r	
Song Sparrow	1541-17836	Cominco									B	r	
Song Sparrow	1541-17895	Cominco									B	r	
Lincoln's Sparrow	2161-14607	IBS				B	r						
Lincoln's Sparrow	3121-21261	Cominco									B	r	
Red-winged Blackbird	8041-83032	Cominco									B	r	
Brown-headed Cowbird	1461-05333	Dunbow						B	r				
Brown-headed Cowbird	1461-31414	Dunbow							B	r			
Brown-headed Cowbird	1541-17842	Cominco									B	r	
Brown-headed Cowbird	1761-28100	Cominco										B	r
Brown-headed Cowbird	1761-28251	IBS										B	r
Brown-headed Cowbird	8041-54991	Cominco									B	r	
Brown-headed Cowbird	8041-54992	Cominco									B	r	
Brown-headed Cowbird	8041-83003	Cominco									B	r	

Appendix 5. Year-to-Year Recaptures at Inglewood Bird Sanctuary, Dunbow Road and Cominco Natural Area

Species	Band	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Brown-headed Cowbird	8041-83005	Cominco									B	r	
Brown-headed Cowbird	8041-83019	Cominco									B	r	
Baltimore Oriole	8041-54908	IBS							B	r			
Baltimore Oriole	8041-83030	Cominco									B	r	
Baltimore Oriole	8051-65131	IBS						B	r				
American Goldfinch	1990-57875	Cominco									B	r	
American Goldfinch	2120-00188	Dunbow						B		r			
American Goldfinch	2220-34131	Cominco									B	r	
American Goldfinch	2220-34245	Cominco									B	r	

B year banded
r recaptured
banding location different than recapture location

APPENDIX 6

Appendix 6. Mourning/MacGillivray's Warbler Research

Since 1995 the CBBS has been gathering additional morphometric and plumage data on Mourning and MacGillivray's Warblers. Immatures and females of these two species can be very difficult to identify. Birds of these two species captured at IBS exhibit considerable overlap in the flat wing minus tail measurement and plumage characteristics typically used to identify the two species. Geographically, IBS is situated near the overlap zone of these two species and attracts sufficient numbers of each to fuel a research project. CBBS may be capturing hybrid Mourning/MacGillivray Warblers.

An example of the data sheet created by CBBS to gather additional data on these species is included in this appendix. With the assistance of other CMMN stations particularly MacKenzie Bird Observatory but also Last Mountain Bird Observatory and Delta Marsh Bird Observatory, as well as data personally gathered by Douglas M. Collister in Manitoba and Alberta, CBBS is compiling data of known pure Mourning Warblers and MacGillivray's Warblers. It is hoped that with sufficient data, CBBS can determine whether captured birds at IBS likely represent hybrids or are simply a reflection of the identification problems between these two species.

Below is a summary through the 2002 banding season of data gathered:

CMMN Station	Mourning Warbler	MacGillivray's Warbler
Calgary Bird Banding Society	40	42
MacKenzie Bird Observatory	1	61
Douglas Collister (Manitoba)	10	
Last Mountain Bird Observatory	5	
Delta Marsh Bird Observatory	3	
Douglas Collister (Alberta)	1	1

MacGillivray's-Mourning Warbler Complex

Band Number:_____ **Date:**_____

Location:_____ **Bander:**_____

Species:_____ **Photo #'s:**_____

	New band	Recapture

Age:	HY	AHY	SY	ASY	U

Sex:	M	F	U

Wing Chord:_____	mm	**Flat Wing:**_____	mm	**Tail:**_____	mm

Eye Ring:	complete	broken	almost full	
	narrow	wide		
	tapered ends	ends abruptly		
	white	whitish	buffy	yellow

Throat:	yellow	buffy yellow	grayish white

Breast:	grayish	gray with black
	appearance of complete breast band	
	breast band broken allowing throat colour to continue into the breast uninterrupted	

Flanks:	bright yellow	greenish suffusion

Undertail Coverts:	relatively pale yellow	relatively bright yellow

Notes:

1. Take 1 or 2 photographs of every new banding (assume recaps were previously photographed)
2. Circle or check only 1 characteristic per line
3. Measure the tail between the central retrices from the tip to the point the feathers enter the body
4. Draw a sketch of the eye to the right of the eye ring descriptors

APPENDIX 7

Appendix 7. New Bandings and Other Captures at Las Caletas, CR - 2002

			March															April											
	Total		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12
American Pygmy Kingfisher	2				1			1																					
Bananaquit	9		2				1	1								1	2					1							1
Barred Woodcreeper	2													1							1								
Bay-headed Tanager	2																						2						
Bicolored Antbird	2											1						1											
Black-cheeked Ant-Tanager	5		1				2																		2				
Black-faced Ant Thrush	2				1							1																	
Black-hooded Antshrike	8				1	2		4	1																				
Black-striped Sparrow	1				1																								
Black-striped Woodcreeper	1																									1			
Black-throated Trogon	1										1																		
Blue-black Grassquit	2			2																									
Blue-black Grosbeak	4			1	2												1												
Blue-crowned Manakin	7		2		1		1				1		1					1											
Bright-rumped Atilla	7					1					1			1						1		1	1		1				
Buff-throated Foliage Gleaner	4		1	1	1																	1							
Buff-throated Saltator	7				1		1				1	1			1						1	1							
Chestnut-backed Antbird	8		2	1					3														1						1
Chestnut-sided Warbler[1]	2											1											1						
Dotted-winged Antwren	15							1	1		1	2		1	1				1		1			3	1			2	
Dusky-capped Flycatcher	4										1			2									1						
Eye-ringed Flatbill	1											1																	
Golden-crowned Spadebill	2								1	1																			
Gray-headed Tanager	4							1	2				1																
Great Antshrike	1								1																				
Great-crested Flycatcher	2		1					1																					
Green Honeycreeper	5										2	2													1				
House Wren	1																			1									
Kentucky Warbler	3				1										1									1					
Long-billed Gnatwren	12			1		2	1	1		1		1		1		2		1							1				
Long-tailed Woodcreeper	1							1																					
MacGillivray's Warbler	1							1																					
Mourning Warbler	1															1													
Northern Bentbill	4		2								2																		

Appendix 7. New Bandings and Other Captures at Las Caletas, CR - 2002

			March															April											
	Total		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12
Northern Waterthrush	1																1												
Ochre-bellied Flycatcher	21		1		1	2		2			1	1	1	1	2		2	2	1			1			1			1	1
Olivaceous Piculet	3								1															1				1	
Orange-billed Sparrow	12		2	1	1	2		1				1										2			1			1	
Orange-collared Manakin	26		2	3	1	2		2	2		1	1	2	3	1		1				2		1				1		1
Plain Xenops	5			1					1		2		1																
Red-capped Manakin	21			1	5	1	1		2	3			1	1			2	2	1										1
Red-eyed Vireo	1														1														
Riverside Wren	6						1					2					1		1			1							
Ruddy Foliage-gleaner	1										1																		
Ruddy-tailed Flycatcher	2						1																	1					
Russet Antshrike	1														1														
Scaly-throated Leaf Tosser	1						1																						
Scarlet-rumped Tanager	7		2							1	2											1		1					
Spotted-crowned Euphonia	1											1																	
Streak-chested Antpitta	1																1												
Streak-headed Woodcreeper	4		1	1						1													1						
Sulphur-rumped Flycatcher	1																	1											
Swainson's Thrush	105			1		2	1	1	1	2	5	6	12	20	21	15	12	6											
Tawny-crowned Greenlet	2		1		1																								
Tawny-winged Woodcreeper	5											1	1	1				1										1	
Thick-billed Seed-Finch	6						1	2	1	1																		1	
Thrushlike Manakin	1										1																		
Thrushlike Mourner	1																										1		
Variable Seedeater	15					1		1			1		1	1		1	1	1		1			1		2	1		1	1
Wedge-billed Woodcreeper	16		2	2	2	1	1			1	1							2	2					2					
White-shouldered Tanager	4							1				1										1						1	
White-whiskered Puffbird	2				1				1																				
Worm-eating Warbler	1		1																										
Yellow-bellied Flycatcher	1																		1										
Yellow-green Vireo	9												1			1	1	1		1		2						2	
Total banded	416		23	16	22	16	13	22	18	11	25	24	22	33	29	21	25	19	7	4	5	12	7	11	8	3	3	11	6

Appendix 7. New Bandings and Other Captures at Las Caletas, CR - 2002

			March															April											
	Total		17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12
Bananaquit	1															1													
Band-tailed Barbthroat	1									1																			
Barred Forest-Falcon	2								1								1												
Black-throated Trogon	1																				1								
Blue-crowned Motmot	1			1																									
Buff-throated Saltator	1														1														
Chestnut-backed Antbird	1																												1
Dotted-winged Antwren	1																							1					
Dove sp.	1							1																					
Gray-chested Dove	5												1	1									2	1					
Gray-headed Tanager	1							1																					
House Wren	1										1																		
Hummingbird sp.	89		7	8	7	6	2	2	1	2	3		2	2	3	3	5	1	2		6	1		5	4	6	2	4	5
Long-billed Gnatwren	1															1													
Long-tailed Hermit	2									1				1															
Louisiana Waterthrush	1																								1				
Northern Bentbill	1																		1										
Orange-collared Manakin	2														1									1					
Pigeon sp.	1										1																		
Red-capped Manakin	2															1													1
Scarlet Tanager	1																									1			
Swainson's Thrush	334													1	1		1	53	43	29	25	24	16	39	23	17	14	20	28
Tiny Hawk	1				1																								
Unknown sp.	9		1	1		1	1				1						2							1		1			
White-necked Jacobin	1				1																								
White-tipped Dove	1																	1											
White-tipped Sicklebill	2					1		1																					
Woodcreeper sp.	1														1														
Total unbanded, escaped etc.	466		8	10	9	8	3	5	2	4	6	0	3	5	7	6	9	55	46	29	32	25	18	48	28	25	16	24	35
[1] migrants																													

APPENDIX 8

CALGARY BIRD BANDING SOCIETY
2002 MEMBERSHIP LIST

Peter Achuff
Yousif Attia
Christine Bennett
Grahame Booth
Doug Collister
Judy Crawford-Parr
Amara DePalma
Ross Dickson
Rainer Ebel
Lenora Flynn
Dick Flynn
Ami Gemmel
Dick Graham
Fenella Hood
Garry Hornbeck
Jennifer Lane
Stephen Lane
Arlette Malcolm
Shonna McLeod
Greg Meyer
Pat Mitchell
Mike Mulligan
Alexandra Oakwood
El Peterson
Mike Preston
Mark Raymond
Carl Savignac
Gwen Smiley
Cyndi Smith
Ena Spalding
Don Stiles
Bill Taylor
Barry Trakalo
Catherine Watson
Catherine Watson-McDonald
Linda Wiggins
Bruce Wilson
Scott Wilson

Executive

President - Shonna McLeod
Vice President – Pat Mitchell
Treasurer - El Peterson
Secretary – Fenella Hood/Gwen Smiley
Director at Large – Gwen Smiley
Annual Report - Doug Collister