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A preliminary catalogue of bird census plot studies in Canada, Part 3

by Anthony J. Erskine¹**Introduction**

Bird census work in Canada is increasing rapidly. Parts 1 and 2 of the catalogue summarized data for 124 and 72 plots, respectively, from work done through 1971 (Erskine 1971, 1972). Part 3 includes another 128 plots, from more recent work, and a few earlier studies not already reported. The methods of study and mode of presentation are unchanged. Variations in methodology which arose from varying objectives of some studies are discussed.

Methods

Only plots studied by mapping censuses were included. The habitat groupings used in parts 1 and 2 were re-arranged to bring together all plots in the basic types—broad-leaved forests, coniferous forests, wetlands, other open lands, and urban areas, as shown in Table 1. Some plots did not fit existing habitat groupings. Two new groupings were added to include some of these: others were accommodated by expanding the scope of the most similar existing groupings. The system as used thus far gives no recognition to successional habitats, the middle stages of which, with shrubs and young trees, differ markedly in both appearance and avifauna from both open lands and forests. Usually these have been grouped with the open habitat from which they may have stemmed, until their woody vegetation reached a stage which allowed them to be grouped with a deciduous or coniferous forest type (roughly at age 15–20 years, with trees 20–30 ft tall).

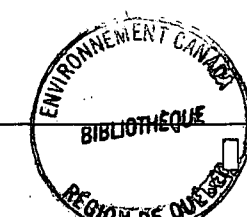
Discussion

Table 1 summarizes the distribution of plots in various habitats in this publication in comparison with those in parts 1 and 2. Coverage has increased greatly in the past few years, and we now include plots from Newfoundland and Yukon Territory; Prince Edward Island is still unreported. Nevertheless, many habitats are still poorly represented or unsampled, for example forests in Saskatchewan and Alberta, urban areas in the Maritimes and the prairies, and wetlands in most areas. The high numbers of plots in coniferous forests reflect both the ecological and economic importance of these forests in Canada. Much of the big increase in coverage, however, is in response to the need for studies of the environmental impacts of all kinds of development. More and more organizations are turning to census plots to obtain bird population data which can be compared from one area and year to another, even with different observers involved. Table 2 summarizes the affiliations of persons who have carried out the bird census studies reported here. Many of the entries could have been differently assigned, depending on whether

volunteers or university personnel had any outside financial support. Only wildlife and some forestry work was by regular employees, most of those working for other agencies having been temporary (summer) assistants. The largest body of new data in this publication came from work done by the Chemical Control Research Institute (C.C.R.I.) of the Canadian Forestry Service, while monitoring experimental and operational forest spray programs in 1973. Special mention may also be made of work by L.G.L. Limited and F.F. Slaney & Co. Ltd., consulting firms investigating the gas pipeline routes in the western Arctic for Canadian Arctic Gas Study Limited, and of several thesis and contract studies supported by the CWS and Parks Canada.

Questions of methodology have come to the fore recently with the increase in censuses by paid observers. Organizations paying for collection of bird population data are concerned to obtain the greatest possible return for their money, and the mapping census method involves a lot of time relative to the area sampled. No comprehensive summary of bird census methods has appeared in North America recently (since Ken-deigh 1944), and most new workers in the field have drawn upon very general instructions while evolving their own shortcuts. The International Standard for a Mapping Method in Bird Census Work (International Bird Census Committee 1970) is a useful outline of the basic principles and method, but gives no details and does not compare alternative methods. A number of studies have recommended the use of both census plots and strip counts or line transects, the former serving to evaluate more precisely the results from the latter, which draw samples from much greater areas (e.g. Frochot 1971, Richardson and Gollop 1974, Parks Canada, undated), and we have no quarrel with this conclusion. However, others have attempted to take shortcuts with the mapping method; for example, I have examined mapping data based on only two surveys done in the last week of July! An experienced census worker may be able to draw useful conclusions from data based on three or four surveys, if these are at suitable intervals and cover the height of the season, but he cannot count on doing so for all species. Data based on few surveys are more likely to be valid in open habitats (cf. Speirs and Orenstein 1967, Stewart and Kantrud 1972) than in forests. But any reduction in the number of surveys will reduce the reliability of population estimates, even when results are evaluated by an experienced worker. It is unfortunate that some results, stated to have been based on "the mapping method" and expressed as birds or pairs per unit area, involve so few surveys or such an abbreviated census period that they cannot be taken seriously as population estimates. Anyone using less than the recommended minimum of eight surveys or concentrating the coverage in a period of less than two weeks should be sure to qualify their statement on use of "the mapping method". There is no generally applicable shortcut to good bird census data.

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The collection of data by mapping methods is relatively standardized. However, the interpretation of the results is more of an art, and even experienced workers may disagree on the number of "clusters" shown on a given "species map" (S. Svensson, unpublished data). This problem can be minimized by having all species maps checked by the same (one or two) people, as is done in the Common Birds Census of the British Trust for Ornithology (Bailey 1967), but this is seldom possible with data presented here. I re-examined all the raw data and species maps from the C.C.R.I. studies, since their data were collected with a different objective—to assess the changes, if any, between counts before and after a spray operation, rather than to provide a comparable population estimate. From this material, my estimates were often little more than 50% of those contained in the operational reports. A field observer can usually obtain higher estimates from his data than another person, since he can draw on his familiarity with the area (cf. Best 1975). We may also add that the size of a plot and the number of surveys may markedly influence the numbers of species and the densities found (Oelke 1966, Erskine 1974), quite apart from affecting their reliability.

As noted in part 2 of this catalogue, data from strip counts may give bird density estimates comparable to those from plot censuses in some cases. They may also differ markedly, for some species, as shown in a recent comparative study (Richardson and Gollop 1974). Once again, we may re-affirm that data from adequate mapping censuses are more nearly comparable with those from other workers than are data collected by any of the "quick and dirty" methods tried as shortcuts.

As before, we list in appendices some additional studies of which the data are not yet available for inclusion in the catalogue, and some new studies planned to start in 1975.

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Appendix 1

Summary of bird census plot studies in Canada not available for this compilation (Note: Plots listed in appendices of parts 1 and 2 of the catalogue are not repeated here, although some are still unreported).

Finlay, J.C. and others, Edmonton Parks Dept. Several plots in urban parklands, Edmonton, Alberta.

Richardson, W.J., and I.D. Thompson, L.G.L. Limited. Several plots in coniferous forests, Chick Lake, Mackenzie, 1973–74.

Savard, J.-P., University of Toronto. Several plots in urban areas, Toronto, Ontario, 1974–75.

White, M. One plot in ponderosa pine parkland, Kimberley, British Columbia, 1975.

Appendix 2

Bird census plot studies planned for 1975.

Canadian Wildlife Service. Several plots in various habitats, in all of the Rocky Mountain national parks.

Lamberton, R.D., Parks Canada. One or two plots in scrub forest, Gros Morne National Park, Newfoundland.

Table 1

Numbers of plots reported in various habitat groups, by province or territory*

Habitat group	Area	Plots reported in	
		parts 1 & 2	part 3
I. Broad-leaved forests, climax and successional: (a), (b), (q), (r), (t)	NS	2	3
	NB	1	
	Que.	6	7
	Ont.	15	12
	Man.	1	1
	Sask.		2
	Alta.		1
II. Coniferous forests: spruce-fir (c), (d), (e), (f), (g) pine (i) other conifer and mixed (h), (j), (k), (s)	BC	2	3
	NS	1	3
	NB	17†	1
	Que.	9‡	9‡
	Ont.	33	9
	Man.	5	16
	Sask.		2
III. Marsh and bog (l)	BC	11	14
	Mackenzie	6	1
	Nfld.		1
	NB	3	1
	Que.	2	
	Ont.	6	2
	Man.	1	4
IV. Open lands: fields, dunes, and early succession (m) prairie (n) tundra (o)	Sask.	1	1
	BC	1	
	Mackenzie	1	
	Que.	1	
	Ont.	21	13
	Man.	1	
	Sask.	9	
V. Urban (p)	Alta.	12	
	Yukon		6
	Mackenzie		3
	Keewatin	2	
	Franklin	9	
	Que.	1	
	Ont.	16	6
Man.		1	
BC	4	2	

*Numbers and letters used in the classification are explained in the following pages.

†Four plots counted twice, once with budworm important, and later when this food source had become unimportant.

‡Two plots reported in part 1 are repeated in part 3, as additional data had markedly changed the figures.

Table 2

Affiliation of persons involved in bird census studies carried out in Canada and reported in parts 1 to 3 of this catalogue

Province or territory	No. of plots censused by						Impact studies*	University*
	Volunteers	Wildlife*	Forestry*	Parks*	L.B.P.*			
Nfld.				1				
NS	2			7=				=7
NB		7	8	2				3
Que.	4	9	4	6=		5=		=11 + 5
Ont.	21 + 14=†	= 14 + 3	19	11				64
Man.	5	6	13					6
Sask.	2	5				7=		=7
Alta.	1							12
BC	2	12	7	3			3	13
Yukon							6	
Mackenzie		2					3	6
Keewatin	1							1
Franklin	3	4				1		1

*Wildlife includes USFWS as well as CWS. Forestry includes C.C.R.I. as well as research laboratories, and contract work for provincial forestry departments. Parks includes National and Provincial parks. I.B.P. = International Biological Programme. Impact studies includes gas pipeline studies and airport development. University includes thesis projects and work by faculty with student assistants.

†Groupings connected by "=" signs involved financial support by an agency for work done by volunteers or university students.

I. (a) Broad-leaved or predominantly broad-leaved forests, Great Lakes—St. Lawrence Forest Region

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			ha	acres	Males/100 ha	Year	
184	Red oak, sugar maple forest	Long Point, Ont. 43°	6.9	17	740	1973	House Wren 160 Eastern Wood Pewee 87 Red-winged Blackbird (Blue-winged Teal) 58 Eastern Kingbird Tree Swallow (Blue Jay) } 44 Yellowthroat Northern Oriole
160	Beech, maple forest (suburban park)	Kitchener, Ont. 43°	26.3	65	414	1974	Eastern Wood Pewee 53 Starling 53 Red-eyed Vireo 45 Common Flicker (Common Crow) 26 Song Sparrow 23 22
164	Wooded ravine and floodplain	Bronte Creek Provincial Park, Ont. 43°	10.2	25.3	627	1974	Song Sparrow 59 House Wren 52 Cardinal 39 Northern Oriole 38 Indigo Bunting 35
214	Maple forest	Morrisburg, Ont. 45°	10.1	25	722	1972	American Redstart 114 Eastern Wood Pewee 89 Red-eyed Vireo 89 Wood Thrush 49 American Robin 44
215	Ash, elm, cedar swamp	Alexandria, Ont. 45°	10.1	25	603	1972	Rose-breasted Grosbeak 69 Veery 49 Black-capped Chickadee Red-eyed Vireo (Cowbird) } 30 Eastern Wood Pewee 24
162	Laurentian maple stand	Ste.-Scholastique, Que. 45°	7.4	18.3	616	1972	Red-eyed Vireo 122 Least Flycatcher 102 Ovenbird 81 Eastern Wood Pewee 47 White-throated Sparrow 47
162	Laurentian maple stand	Ste.-Scholastique, Que. 45°	8.8	21.6	651	1972	Red-eyed Vireo 108 Ovenbird 103 Veery 57 Least Flycatcher 51 Wood Thrush 51

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I. (a) Broad-leaved or predominantly broad-leaved forests, Great Lakes—St. Lawrence Forest Region (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
162	Laurentian maple stand	Ste.-Scholastique, Que. 45°	7.5	18.5	506	1972	Ovenbird 120 Eastern Wood Pewee 93 Red-eyed Vireo 40 Wood Thrush 40 Eastern Phoebe 33 Yel-bellied Sapsucker 33
163	Maple, yellow birch stand	Parc Nat. La Mauricie, Que. 47°	9.3	23	554	1973	Black-thr. Blue Warbler 108 Red-eyed Vireo 97 American Redstart 64 Hermit Thrush 48 Ovenbird 43
163	White birch stand	Parc Nat. La Mauricie, Que. 47°	9.3	23	672	1972	Ovenbird 134 Veery 86 Hermit Thrush 75 Black-thr. Blue Warbler 64 Red-eyed Vireo 59
163	Mixed stand, mainly maple, beech, birch	Parc Nat. La Mauricie, Que. 47°	9.3	23	667	1973	Ovenbird 91 Red-eyed Vireo 81 Veery 64 Black-thr. Blue Warbler 54 Myrtle Warbler 32 American Redstart 32
157	Sugar maple, beech forest	Cap Tourmente NWA, Que. 47°	9.3	23	437	1973	Red-eyed Vireo 129 Least Flycatcher 97 Ovenbird 65 Veery 32 Eastern Wood Pewee } White-breasted Nuthatch } 22 Wood Thrush }
228	Mature maple, oak forest	Rama Twp., Ontario Co., Ont. 45°	10.2	25.6	693	1967	Red-eyed Vireo 95 Ovenbird 82 Cerulean Warbler 62 American Redstart 53 Veery 49
228	Mature beech, maple woodlot	Scugog Twp., Ontario Co., Ont. 44°	10.2	25.6	693*	1968	Starling 165 Red-eyed Vireo 65 Eastern Wood Pewee 53 Black-capped Chickadee 43 American Goldfinch 35
228	Maple forest with conifer edge	Reach Twp., Ontario Co., Ont. 44°	10.2	25.6	534	1968	Ovenbird 49 Red-eyed Vireo 44 Black-capped Chickadee 36 Song Sparrow 33 Eastern Wood Pewee 30

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I. (a) Broad-leaved or predominantly broad-leaved forests, Great Lakes—St. Lawrence Forest Region (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
228	Sugar maple, beech woodlot	East Whitby Twp., Ontario Co., Ont. 44°	10.2	25.6	757	1967	Starling 183 Ovenbird 78 Red-eyed Vireo 58 Common Flicker 47 American Robin 47
228	Young aspen, birch, balsam fir, cedar forest	Scott Twp., Ontario Co., Ont. 44°	10.2	25.6	639	1968	Veery 61 White-throated Sparrow 54 Ovenbird 51 (Blue Jay) 44 Rose-breasted Grosbeak 38 Black-and-white Warbler 35
228	Cedar, elm swamp forest	Thorah Twp., Ontario Co., Ont. 44°	10.2	25.6	653	1967	Starling 100 American Robin 73 Song Sparrow 37 American Goldfinch 36 (Common Crow) 30 Brown Creeper 28
228	Disturbed deciduous forest	Whitby Twp., Ontario Co., Ont. 44°	10.2	25.6	876	1967	House Wren 53 Rose-breasted Grosbeak 48 (Cowbird) 48 American Robin 44 Rufous-sided Towhee 40 Common Flicker 37

*Excluding a colony of Great Blue Herons (density 608 pr/100 ha).

I. (b) Broad-leaved or predominantly broad-leaved forests, Acadian Forest Region

196	Maple, birch forest	Kejimikujik Nat. Park, NS 44°	10.1	25	467	1972	American Redstart 124 Least Flycatcher 99 Red-eyed Vireo 74 Parula Warbler 64 Ovenbird 54
196	Ecotone from dry deciduous to wet coniferous forest	Kejimikujik Nat. Park, NS 44°	10.1	25	465	1972	Least Flycatcher 69 Ovenbird 54 Red-eyed Vireo } Black-and-white Warbler } 35 Parula Warbler }
194	Mixed forest, mainly broad-leaved, with bog	North of Lawrencetown, Annapolis Co., NS 45°	12	29.6	824	1973	American Robin 126 Black-thr. Green Warbler 109 American Redstart 109 Ovenbird 99 Red-eyed Vireo 74

I. (r) Predominantly broad-leaved forests, Boreal Forest Region

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
165	Mature poplar stand	Novra, Man. 53°	17.5	43.2	520	1972	American Redstart 197 Red-eyed Vireo 71 Ovenbird 57 Veery 43 Black-and-white Warbler 34
172	Young aspen forest	Mirasty Lake, Sask. 54°	17.6	43.5	224	1973	Ovenbird 79 Tennessee Warbler 71 Red-eyed Vireo 31 Swainson's Thrush 11 Black-and-white Warbler 11
171	Mature birch, poplar forest	Michel Point, Sask. 55°	17.5	43.2	388	1973	Red-eyed Vireo 126 Ovenbird 117 Least Flycatcher 37 Black-thr. Green Warbler 37 Tennessee Warbler 26
187	Mature poplar forest	Elk Island Nat. Park, Alta. 54°	10	24.7	250	1972	Least Flycatcher 100 House Wren } Red-eyed Vireo } 20 Ovenbird } Northern Oriole (Cowbird) }
177	Mature aspen stand	Poplar Hills, nr. Fort Nelson, BC 59°	19.3	47.6	156	1974	Ovenbird 60 Magnolia Warbler 29 Yel.-bellied Sapsucker 16 Swainson's Thrush 16 Red-eyed Vireo 10
161	Mixed stand, aspen, some spruce (South control)	Spruce Woods, nr. Carberry, Man. 50°	8.1	20	352	1973	Red-eyed Vireo 74 American Redstart 68 Chipping Sparrow 56 Chestnut-sided Warbler (Cowbird) 25 (Cedar Waxwing) 19

I. (t) Predominantly broad-leaved forests, Subboreal Forest Regions, British Columbia

221	Aspen, willow forest	Glentanna, nr. Smithers, BC 55°	19.2	47.5	471	1975	American Redstart 161 Warbling Vireo 88 Swainson's Thrush 55 Dusky Flycatcher 34 MacGillivray's Warbler 31
222	Black cottonwood floodplain forest	Tatlow, nr. Telkwa, BC 55°	16.2	40.1	686	1975	American Redstart 139 Warbling Vireo 111 Swainson's Thrush 52 Least Flycatcher 49 Northern Waterthrush 37

II. (c) Spruce-fir forests, with budworm unimportant, Acadian Forest Region

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
196	Heterogeneous conifer forest, mostly spruce	Kejimikujik Nat. Park, NS 44°	10.1	25	341	1972	Magnolia Warbler 54 Ovenbird 32 Hermit Thrush } Myrtle Warbler } 30 Nashville Warbler }

II. (d) Spruce or spruce-fir forests, with budworm unimportant, Gt. Lakes-St. Lawrence Forest Region

163	Balsam fir stand	Parc Nat. La Mauricie, Que. 47°	9.3	23	785	1972	Ovenbird 102 Bay-breasted Warbler 81 Golden-cr. Kinglet 64 Magnolia Warbler } Black-thr. Green Warbler } 48 Blackburnian Warbler }
163	Red spruce stand	Parc. Nat. La Mauricie, Que. 47°	9.3	23	436	1973	Golden-cr. Kinglet 81 Blackburnian Warbler 54 Swainson's Thrush 38 Ovenbird 38 Bay-breasted Warbler 32
163	White spruce plantation	Parc Nat. La Mauricie, Que. 47°	9.3	23	662	1973	Golden-cr. Kinglet 75 Swainson's Thrush 70 Cape May Warbler 64 Nashville Warbler 54 Chipping Sparrow 48

II. (e) Spruce-fir forests, with budworm unimportant, Boreal Forest Region

161	Mixed spruce, aspen, with planted jack pine in openings	Spruce Woods, nr. Carberry, Man. 50°	8.1	20	279	1973	Chipping Sparrow 99 Cape May Warbler } Pine Siskin } 25 Red Crossbill (Cowbird) } 19 Canada Jay } Boreal Chickadee } Red-breasted Nuthatch } Golden-cr. Kinglet } 12 Ruby-cr. Kinglet } Myrtle Warbler } Junco }
168	Balsam fir stand, with aspen and birch	Steeprock Bay, Man. 53°	15.7	39	277	1972	Magnolia Warbler 57 Black-thr. Green Warbler 35 Canada Warbler 35 Swainson's Thrush 22 Solitary Vireo 19

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II. (e) Spruce-fir forests, with budworm unimportant, Boreal Forest Region (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
166	Black spruce stand	Mafeking, Man. 53°	17.5	43.2	174	1972	Ruby-cr. Kinglet 40 Nashville Warbler 23 Tennessee Warbler 20 Myrtle Warbler 20 Golden-cr. Kinglet 17
173	Balsam fir forest	Sled Lake, Sask. 54°	17.5	43.2	357	1973	Bay-breasted Warbler 63 Swainson's Thrush 51 Magnolia Warbler 49 Black-thr. Green Warbler 43 Tennessee Warbler 40
174	Black spruce stand with alder swales	Dore Lake, Sask. 55°	23.4	57.7	212	1973	Myrtle Warbler 45 Tennessee Warbler 39 Ruby-cr. Kinglet 21 Swainson's Thrush 17 Cape May Warbler 15
179	Bottomland white spruce forest	Kledo Creek, BC 59°	19.3	47.6	107	1974	Ruby-cr. Kinglet } Myrtle Warbler } 16 Bay-breasted Warbler } Chipping Sparrow } Ovenbird } 13
178	Black spruce stand on mountainside	Steamboat Mountain, BC 59°	17.3	42.6	128	1974	Swainson's Thrush 29 Myrtle Warbler 26 Chipping Sparrow 17 Golden-cr. Kinglet 15 Tennessee Warbler 12
191	Upland lichen woodland	Porter Lake, east of Great Slave Lake, Mackenzie 62°	20.2	50	207	1974	Myrtle Warbler 47 Swainson's Thrush 30 Junco 25 American Robin 22 Gray-cheeked Thrush 15

II. (h) Other conifer and mixed forests, Great Lakes-St. Lawrence Forest Region

162	Mixed forest, mainly hemlock	St.-Canut, Que. 45°	5.6	13.8	878	1972	Ovenbird 116 White-throated Sparrow 107 Black-thr. Green Warbler 99 Veery 81 Wood Thrush 54
162	Mixed forest, mainly hemlock	St.-Augustin, Que. 45°	9	22.2	539	1972	Ovenbird 133 Black-thr. Green Warbler 67 Hermit Thrush 55 Veery 50 White-throated Sparrow 44

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II. (h) Other conifer and mixed forests, Great Lakes-St. Lawrence Forest Region (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
182, 197	White cedar, white pine forest	Long Point, Ont. 43°	4	10	772, range 680-865	1973-74	House Wren 148 Chipping Sparrow 113 Rufous-sided Towhee 95 Eastern Wood Pewee 59 (Mallard) Gt. Crested Flycatcher } Common Yellowthroat } 52
201, 206	Tamarack, white cedar slough	Long Point, Ont. 43°	6	15	692, range 642-741	1973-74	Red-winged Blackbird 130 Yellow Warbler 58 House Wren 58 Common Grackle 49 Eastern Kingbird 45 Northern Oriole 45
161	Mixed stand, including balsam fir (control)	Algonquin Park, Ont. 46°	8.1	20	637	1973	Veery 92 Nashville Warbler 92 Chestnut-sided Warbler 86 Ovenbird 80 White-throated Sparrow 55
161	Mixed stand, including balsam fir (thuricide)	Algonquin Park, Ont. 46°	8.1	20	511	1973	Ovenbird 74 Nashville Warbler 62 Black-and-white Warbler 55 Magnolia Warbler 37 Veery 31
161	Mixed stand, including balsam fir (dipel plus chitinase)	Algonquin Park, Ont. 46°	8.1	20	375	1973	White-throated Sparrow 99 Nashville Warbler 80 Ovenbird 37 Swainson's Thrush } Black-and-white Warbler } 25 Chestnut-sided Warbler } Chipping Sparrow }
161	Mixed stand, including balsam fir (dipel only)	Algonquin Park, Ont. 46°	8.1	20	350	1973	Nashville Warbler 49 Black-and-white Warbler 43 Ovenbird 43 White-throated Sparrow 37 Chestnut-sided Warbler 31
161	Mixed stand, including balsam fir (thuricide plus chitinase)	Algonquin Park, Ont. 46°	8.1	20	652	1973	Veery 86 Chestnut-sided Warbler 69 White-throated Sparrow 68 Black-and-white Warbler 49 Nashville Warbler 43
161	Mixed stand, including balsam fir (chitinase)	Algonquin Park, Ont. 46°	8.1	20	500	1973	Nashville Warbler 68 Ovenbird 56 (Evening Grosbeak) 37 Winter Wren } Black-and-white Warbler } 31 Black-thr. Green Warbler }

II. (s) Other conifer and mixed forests, Acadian Forest Region

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
196	Hemlock forest	Kejimikujik Nat. Park, NS 44°	10.1	25	519	1972	Blackburnian Warbler 94 Black-thr. Green Warbler 59 Bay-breasted Warbler 52 Swainson's Thrush } 40 Solitary Vireo } Magnolia Warbler }
196	Young mixed forest, mainly coniferous	Kejimikujik Nat. Park, NS 44°	10.1	25	437	1972	Magnolia Warbler 94 Black-thr. Green Warbler 54 Veery 54 Ovenbird 49 Swainson's Thrush 40
218	White cedar, balsam fir swamp forest	Kouchibouguac Nat. Park, NB 47°	9.3	23	1157	1973	Canada Warbler 124 White-throated Sparrow 102 Tennessee Warbler } 91 Parula Warbler } Bay-breasted Warbler }

II. (j) Other coniferous and mixed forests, Boreal Forest Region

159, 161	Tamarack bog (wooded), with alder	Redrock Lake nr. Rennie, Man. 50°	5.7	14	mean 445, range 264-662	1957-68	Nashville Warbler 101 White-throated Sparrow 65 Tennessee Warbler 54 Common Yellowthroat (Cedar Waxwing) 45 Red-eyed Vireo 21
159, 161	Tamarack bog (wooded), with edge	Seddon's Corner, Man. 50°	3.5	8.6	mean 302, range 186-387	1962-68	Nashville Warbler 108 (Cedar Waxwing) 43 Connecticut Warbler 40 Myrtle Warbler 22 Least Flycatcher } 18 Common Yellowthroat } Chipping Sparrow }
161	Tamarack bog (wooded), with edge	Pine Falls, Man. 51°	5.8	14.4	275, range 257-292	1962-63	Tennessee Warbler 64 White-throated Sparrow 34 Myrtle Warbler 30 Least Flycatcher } 17 (Cedar Waxwing) } Red-eyed Vireo }
161	Tamarack bog (wooded), with edge	Telford, Man. 50°	4	9.8	245, range 214-276	1962-64	Nashville Warbler 82 Myrtle Warbler 38 Lincoln's Sparrow 31 Common Yellowthroat 19 Tennessee Warbler 13 Clay-coloured Sparrow 13

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II. (j) Other coniferous and mixed forests, Boreal Forest Region (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
161	Tamarack bog (wooded), with edge	Darwin, Man. 50°	5.7	14	318	1965	Nashville Warbler 79 Swainson's Thrush 35 Common Yellowthroat 35 Black-capped Chickadee } Ruby-cr. Kinglet } 18 (Cedar Waxwing) Black-and-white Warbler Tennessee Warbler Magnolia Warbler Myrtle Warbler White-throated Sparrow
161	Tamarack bog (wooded), with edge	Riverton, Man. 51°	6.1	15.2	263	1966	Red-eyed Vireo 57 Black-and-white Warbler 32 Nashville Warbler 32 Tennessee Warbler 24 Canada Warbler 24
161	Tamarack bog (wooded), with edge	Hodgson, Man. 50°	5.7	14	242, range 150-335	1967-68	Red-eyed Vireo 48 White-throated Sparrow 44 Nashville Warbler 40 (Cedar Waxwing) 31 Ovenbird 26
161	Mixed stand, aspen, oak, spruce, with openings (Fen. West)	Spruce Woods nr. Carberry, Man. 50°	8.1	20	252	1973	Chipping Sparrow 80 Vesper Sparrow 37 Orange-crowned Warbler 31 (Cowbird) 25 Red-eyed Vireo 19 Black-capped Chickadee 12 House Wren 12
161	Mixed stand, oak, aspen, spruce, with planted jack pine in openings (BT West)	Spruce Woods nr. Carberry, Man. 50°	8.1	20	179	1973	Chipping Sparrow 86 Orange-crowned Warbler 19 (Cowbird) 19 Mourning Dove } 12 Black-capped Chickadee } Red-eyed Vireo } Cape May Warbler }
161	Mixed stand, aspen, oak, spruce, (dipel control)	Spruce Woods nr. Carberry, Man. 50°	8.1	20	198	1973	Chipping Sparrow 86 Orange-crowned Warbler 25 (Cowbird) 25 Mourning Dove } 12 (Cedar Waxwing) (Pine Siskin) Junco

(Cont'd next page)

II. (j) Other coniferous and mixed forests, Boreal Forest Region (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
161	Mixed stand, aspen, oak, spruce, with openings (Sevin 4 oil)	Spruce Woods nr. Carberry, Man. 50°	8.1	20	279	1973	Chipping Sparrow 68 Orange-crowned Warbler 31 Vesper Sparrow 31 (Cedar Waxwing) (Cowbird) (Pine Siskin) } 25 Clay-coloured Sparrow
161	Mixed stand, aspen, oak, spruce, with openings (Fen. East)	Spruce Woods nr. Carberry, Man. 50°	8.1	20	171	1973	Chipping Sparrow 68 Orange-crowned Warbler 25 (Cowbird) (Pine Siskin) } 19 Vesper Sparrow Red-eyed Vireo } 12 Ovenbird Clay-coloured Sparrow
190	Mature poplar and spruce on island	Fort St. John, BC 56°	19.2	47.6	301	1974	Red-eyed Vireo 31 Chipping Sparrow 31 American Redstart 26 Swainson's Thrush 21 Junco 21
176	Balsam poplar, spruce bottomland succession	Muskwa River nr. Kledo Creek, BC 59°	13.3	32.8	212	1974	Ovenbird 30 Swainson's Thrush 23 Warbling Vireo 23 Myrtle Warbler 19 Yel.-bellied Flycatcher 15 Magnolia Warbler 15

II. (k) Coniferous forests, Montane, Subalpine, Coast, & Columbia Forest Regions (BC)

158	Young western hemlock stand with alder (plot 7)	Keogh Lake nr. Port Alice, BC 50°	8.1	20	291	1973	Swainson's Thrush 62 Winter Wren 43 Orange-crowned Warbler 37 Western Flycatcher 31 Rufous Hummingbird (Steller's Jay) Varied Thrush } 19 Oregon Junco
158	Young western hemlock stand (plot 7a)	Keogh Lake nr. Port Alice, BC 50°	8.1	20	277	1973	Swainson's Thrush 49 Western Flycatcher 31 Golden-cr. Kinglet 25 Oregon Junco 25 Winter Wren Orange-crowned Warbler } 19 Fox Sparrow

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II. (k) Coniferous forests, Montane, Subalpine, Coast, & Columbia Forest Regions (BC) (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
158	Young western hemlock stand (plot 7b)	Keogh Lake nr. Port Alice, BC 50°	8.1	20	346	1973	Swainson's Thrush 68 Winter Wren 37 Fox Sparrow 37 Chestn.-backed Chickadee 31 Western Flycatcher Orange-crowned Warbler } 25 Oregon Junco
158	Young western hemlock stand (plot 12)	O'Connor Lake nr. Port McNeill, BC 50°	8.1	20	229	1973	Swainson's Thrush 62 Orange-crowned Warbler 31 Wilson's Warbler 31 Winter Wren 25 Oregon Junco 25
158	Mature western hemlock stand with cedar, fir (plot 8)	Three Lakes Ck. nr. Port Alice, BC 50°	8.1	20	253	1973	Winter Wren 55 Swainson's Thrush 37 Chestn.-backed Chickadee Western Flycatcher } 31 Wilson's Warbler
158	Mature western hemlock stand with cedar, fir (plot 9)	Benson Lake nr. Port Alice, BC 50°	8.1	20	198	1973	Western Flycatcher 74 Winter Wren 37 Chestn.-backed Chickadee 25 Golden-cr. Kinglet 25 Varied Thrush 19
158	Mature western hemlock stand with cedar, fir (plot 12a)	O'Connor Lake nr. Port McNeill, BC 50°	8.1	20	185	1973	Western Flycatcher 37 Winter Wren 31 Chestn.-backed Chickadee 25 Rufous Hummingbird 19 Oregon Junco 19
223	Disturbed white spruce stand with willow swales	Round Lake, nr. Telkwa, BC 55°	18	44.5	430	1975	Ruby-cr. Kinglet 72 Swainson's Thrush 44 Western Wood Pewee 31 Golden-cr. Kinglet 28 Warbling Vireo 25 American Redstart 25
224	Subalpine conifer forest	E of Smithers, BC 55°	18.2	45	134	1975	Townsend's Warbler 30 Ruby-cr. Kinglet 25 Golden-cr. Kinglet 16 Blackpoll Warbler Pine Siskin } 11 Oregon Junco

II. (i) Pine forests, Acadian, Boreal, and Great Lakes—St. Lawrence Forest Regions

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
200	Jack pine forest, with sawfly	West of La Tuque, Que. 48°	13.1	32.4	mean 188, range 122–267	1968–72	Junco 34 Myrtle Warbler 32 White-throated Sparrow 29 Hermit Thrush 20 Nashville Warbler 12
200	Jack pine forest, with sawfly	West of La Tuque, Que. 48°	13.1	32.4	99	1966	Junco 38 Ruby-cr. Kinglet 23 Hermit Thrush } Swainson's Thrush } 15 Magnolia Warbler } Myrtle Warbler } Common Yellowthroat }
200	Jack pine forest, with sawfly (revised from part 1)	West of La Tuque, Que. 47°	13.1	32.4	mean 101, range 46–152	1965–72	Junco 48 Hermit Thrush 17 White-throated Sparrow 16 Myrtle Warbler 10 Ruby-cr. Kinglet 5
200	Jack pine forest, with sawfly (revised from part 1)	West of La Tuque, Que. 47°	13.1	32.4	mean 119, range 46–191	1964–72	Junco 51 Hermit Thrush 16 Myrtle Warbler 15 White-throated Sparrow 14 Solitary Vireo 6
167	Jack pine stand	Bellsite, Man. 53°	29.3	72.3	101	1972	Chipping Sparrow 29 Myrtle Warbler 22 Hermit Thrush 14 Junco 14 Solitary Vireo 7
228	Mature red pine plantation	Uxbridge Twp., Ontario Co., Ont. 44°	10.2	25.6	256	1966	Black-thr. Green Warbler 67 Ovenbird 46 Chipping Sparrow 42 (Cowbird) 37 Red-breasted Nuthatch 25 (Blue Jay) 21 Black-capped Chickadee 20
225	Lodgepole pine forest	Telkwa, BC 55°	29.2	72.3	80	1975	Swainson's Thrush 34 Oregon Junco 19 Audubon's Warbler 14 Pine Siskin 5 American Robin 3 Hermit Thrush 3

III. (l) Marsh and bog habitats, Acadian, Great Lakes—St. Lawrence, Forest, & Coast Forest Regions

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
195	Treeless raised bog	Baker's Brook, Gros Morne Nat. Park, Nfld. 50°	40	99	24	1974	Savannah Sparrow 16 Common Snipe } Common Yellowthroat } 2 Swamp Sparrow }
219	Open sphagnum bog	Kouchibouguac Nat. Park, NB 47°	40	99	62	1973	Savannah Sparrow 22 Common Yellowthroat 19 Song Sparrow 11 Lincoln's Sparrow 8 Palm Warbler 3
203, 207	Sedge, rush swale between dunes	Long Point, Ont. 43°	10.3	25.5	44 range 34–53	1973–74	Red-winged Blackbird 29 (Mallard) 10 Eastern Kingbird 5
169	Shrubby marsh—sedge, willows, sweet gale	Mafeking, Man. 53°	18	44.4	523	1972	Short-b. Marsh Wren 294 Swamp Sparrow 94 Common Yellowthroat 89 LeConte's Sparrow 25 Alder Flycatcher } (Tree Swallow) } 6 (American Goldfinch) }
193	Burned reeds (<i>Phragmites</i>)	Delta, Man. 50°	5	12.5	732	1973	(Yel.-headed Blackbird) 227 (Red-winged Blackbird) 128 Wilson's Phalarope 99 Common Yellowthroat 69 Song Sparrow 59 (Cowbird) 39 (Blue-winged Teal) 30
193	Unburned reeds (<i>Phragmites</i>)	Delta, Man. 50°	6.5	16	1396	1973	(Yel.-headed Blackbird) 617 Long-b. Marsh Wren 247 (Red-winged Blackbird) 154 Common Yellowthroat 85 Short-b. Marsh Wren 77 Song Sparrow 46 (Blue-winged Teal) 31
192	Sprangle-top meadow	Delta, Man. 50°	35.7	88.2	366	1972	Savannah Sparrow 80 (Yel.-headed Blackbird) 56 Short-b. Marsh Wren 39 Clay-coloured Sparrow 39 Red-winged Blackbird 25 Common Yellowthroat 25
175	Tamarack, dwarf birch, sedge bog	South of Dore Lake, Sask. 55°	21	52	86	1973	Rusty Blackbird 14 Lincoln's Sparrow 12 Common Snipe 10 Chipping Sparrow 10 Greater Yellowlegs 7

III. (l) Marsh and bog habitats, Acadian, Great Lakes—St. Lawrence, Boreal, and Coast Forest Regions (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
180	Stunted black spruce on raised bog	Steamboat Creek, BC 59°	35	86.5	34	1974	Palm Warbler 14 Chipping Sparrow 6 Junco 6 Hermit Thrush 4 Lincoln's Sparrow 3
228	Black spruce, tamarack, cedar bog	Brock Twp., Ontario Co., Ont. 44°	10.2	25.6	614	1968	White-throated Sparrow 53 Nashville Warbler 42 American Robin 41 Veery 35 (Cowbird) 32 Black-and-white Warbler 30

IV. (m) Fields, dunes, and early succession, Great Lakes—St. Lawrence and Boreal Forest Regions

204, 209	Blue grass, milk weed grassland	Long Point, Ont. 43°	6.7	16.5	138	1973—74	Red-winged Blackbird 52 Eastern Meadowlark 29 Field Sparrow 15 (Mallard) 12 (Black Duck) } (Marsh Hawk) } 7 Eastern Kingbird } (Tree Swallow) }
202	Dune grass ridge with cottonwoods	Long Point, Ont. 43°	12.1	30	17	1974	(Mallard) 7 Spotted Sandpiper 5 Red-winged Blackbird 5 Eastern Kingbird trace
183, 199	Juniper, cottonwood savannah on dry sand dunes	Long Point, Ont. 43°	8.3	20.5	262	1973—74	Common Grackle 54 Red-winged Blackbird 48 Field Sparrow 27 (Mallard) 24 Brown Thrasher 24
198, 208	Dry sand dune with cottonwoods	Long Point, Ont. 43°	10.5	26	17	1973—74	Red-winged Blackbird 10 (Mallard) 5 Eastern Kingbird 2
205	Recreational dune area	Long Point, Ont. 43°	8.6	21	123	1973—74	Eastern Kingbird 17 Common Grackle 17 Mourning Dove } Brown Thrasher } 12 Red-winged Blackbird }
164	Old fields with hedgerows	Bronte Creek Provincial Park, Ont. 43°	25.3	62.5	304	1974	Savannah Sparrow 77 Red-winged Blackbird 44 Song Sparrow 39 Bobolink 22 Grasshopper Sparrow 15

IV. (m) Fields, dunes, and early succession, Great Lakes—St. Lawrence and Boreal Forest Regions (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
164	Old fields, few trees	Bronte Creek Provincial Park, Ont. 43°	25.3	62.5	301	1974	Savannah Sparrow 99 Red-winged Blackbird 75 Bobolink 29 Song Sparrow 15 American Robin 6
164	Old fields and dry woodlots (Wildlife Mgt. area)	Bronte Creek Provincial Park, Ont. 43°	25.3	62.5	378	1974	Song Sparrow 117 Red-winged Blackbird 59 Starling 30 Northern Oriole 18 Gray Catbird 15
216	Old field with hedgerows	Ingleside, Ont. 45°	10.1	25	573	1972	Red-winged Blackbird 163 Bobolink 138 Song Sparrow 99 Common Yellowthroat 40 Yellow Warbler 20
217	Field with hedgerows	nr. Maxville, Ont. 45°	10.1	25	450	1972	Red-winged Blackbird 94 American Robin 49 Bobolink 49 Eastern Meadowlark 40 Savannah Sparrow 35 Song Sparrow 35
189	Abandoned field with shrubs	Clayhurst, BC 56°	14.7	36.2	477	1974	Clay-coloured Sparrow 204 White-throated Sparrow 61 Lincoln's Sparrow 61 Chipping Sparrow 27 Eastern Phoebe 20 Song Sparrow 20
188	Willows on gravel island	Clayhurst, BC 56°	15.2	37.5	145	1974	Song Sparrow 105 Spotted Sandpiper 20 Yellow Warbler 12 Lincoln's Sparrow 7 5 others each trace
228	Shrubby area with small planted pines	Mara Twp., Ontario Co., Ont. 45°	10.2	25.6	443	1966	Common Yellowthroat 82 Alder Flycatcher 59 Field Sparrow 58 Yellow Warbler 54 American Goldfinch 51
228	Shrubby area with small trees	Pickering Twp., Ontario Co., Ont. 44°	10.2	25.6	484	1966	Song Sparrow 80 Savannah Sparrow 79 Yellow Warbler 69 American Goldfinch 42 Willow Flycatcher 36

IV. (m) Fields, dunes, and early succession, Great Lakes—St. Lawrence & Boreal Forest Regions (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
227	Fields, orchard, & small marsh (on farm)	Lucknow, Ont. 44°	19.5	48.2	269	1975	Red-winged Blackbird } 92 Eastern Kingbird } 25 American Robin } Song Sparrow } Baltimore Oriole } 20

IV. (o) Arctic tundra

212	Hilly upland, with alder and cottongrass	Parsons Lake, edge of Mackenzie delta, Mackenzie 69°	25	62	168	1973	Tree Sparrow } 56 Yellow Warbler } 36 Savannah Sparrow } 20 Gray-cheeked Thrush } 16 Fox Sparrow } 3
212	River escarpment with floodplain and upland	Mackenzie delta, Mackenzie 69°	25	62	207	1973	Savannah Sparrow } 64 Tree Sparrow } 56 Redpoll (sp.?) } 28 Northern Phalarope } 16 Fox Sparrow } 12 Lapland Longspur } 12
212	River floodplain with sedge and low willows	Mackenzie delta, Mackenzie 69°	25	62	119	1973	Savannah Sparrow } 40 Common Redpoll } 16 Pectoral Sandpiper } 16 Tree Sparrow } 12 Lapland Longspur } 8 Common Snipe } 8
185	Sedge marsh near coast (control)	Firth River, Yukon Ty. 70°	31.6	78	127	1972	Lapland Longspur } 91 Willow Ptarmigan } 13 Rock Ptarmigan } 13 Golden Plover } 6 Buff-breasted Sandpiper } 3
185	Tussock heath on dry ridge (aircraft)	Firth River, Yukon Ty. 70°	31.6	78	111	1972	Lapland Longspur } 73 Golden Plover } 19 Willow Ptarmigan } 13 Rock Ptarmigan } 6
185	Tussock heath on dry ridge (human)	Firth River, Yukon Ty. 70°	31.6	78	142	1972	Lapland Longspur } 76 Golden Plover } Semipal. Sandpiper } 13 Willow Ptarmigan } Rock Ptarmigan } Buff-breasted Sandpiper } Savannah Sparrow } 6

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IV. (o) Arctic tundra (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities
			Size		Males/100 ha	Year	
			ha	acres			
186	Sedge, grass marsh (control)	Babbage River, Yukon Ty. 69°	31.6	78	155	1972	Lapland Longspur } 94 Northern Phalarope } 19 Willow Ptarmigan } 13 Golden Plover } 6 Parasitic Jaeger } 6
186	Tussock heath and sedge marsh (noise)	Babbage River, Yukon Ty. 69°	37	91	155	1972	Lapland Longspur } 86 Willow Ptarmigan } 27 Golden Plover } Northern Phalarope } Savannah Sparrow } 11
213	Dry sedge, herbs on ridges (6 equal plots combined)	Babbage River, Yukon Ty. 69°	40	99	198	1973	Lapland Longspur } 141 Savannah Sparrow } 20 Willow Ptarmigan } 12 Golden Plover } 5 Redpoll (sp.?) } 4

V. (p) Urban habitats

160	Downtown area, commercial and residential	Waterloo, Ont. 43°	25.1	62	779	1974	House Sparrow } 398 Starling } 243 Rock Dove } 68 American Robin } 33 Common Grackle } 15
160	Residential area, 20–50 years old (Hemlock)	Waterloo, Ont. 43°	25.1	62	733	1974	House Sparrow } 364 American Robin } 119 Starling } 71 Chipping Sparrow } 47 Common Grackle } 31
160	Residential area, new suburb with many trees (Beechwood)	Waterloo, Ont. 43°	25.5	63	1051	1974	House Sparrow } 270 American Robin } 223 Starling } 94 Chipping Sparrow } 90 Cardinal } 54
160	Urban park with no undergrowth (Victoria Park)	Kitchener, Ont. 43°	23.9	59	628	1974	Starling } 171 Common Grackle } 87 American Robin } 75 House Sparrow } 75 (Mallard) } 58 Chipping Sparrow } 46
170	Downtown area, commercial and residential	Swan River, Man. 52°	17.5	43.2	609	1972	House Sparrow } 412 American Robin } 63 Chipping Sparrow } 54 House Wren } 40 Yellow Warbler } 9

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V. (p) Urban habitats (cont.)

Ref. no.	Description	Location	Area		Density		Five commonest species with densities	
			Size		Males/ 100 ac	Year		
			ha	acres				
181	Small town residential area with wooded vacant lots	Fort Nelson, BC 59°	33.2	82	184	1974	Tree Swallow American Robin Chipping Sparrow House Wren Yellow Warbler	30 27 21 18 18
220	Suburban residential area	Pickering Beach, Ont. 44°	14.6	36	mean 1964–762 range 637–862	66	American Robin Common Grackle House Sparrow Starling Song Sparrow	188 144 94 75 71
220	Village residential area	Cannington,* Ont. 44°	19	47	984	1973	American Robin Starling House Sparrow Chipping Sparrow Song Sparrow	258 200 89 68 68
226	Urban area, commercial and residential	Smithers, BC 55°	27	66.7	411	1975	Violet-gr. Swallow Pine Siskin (Cliff Swallow) House Sparrow Chipping Sparrow Starling	96 89 81 37 24 22

*Probably including most or all of the area previously reported (Prog. Note No. 30, ref. 148) by a different observer.

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