Conservation Biology Research Grants Program
Division of Ecological Services
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BIRD MIGRATION IN THE ST. CROIX RIVER VALLEY

USE OF FRAGMENTED HABITATS BY MIGRATORY BIRDS

January 25, 1985

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SUMMARY REPORT ON RESEARCH FOR 1984

This report describes our field studies and examples of the preliminary findings of this research on birds and vegetation in several habitats on the Belwin Outdoor Education Laboratory site and adjacent properties in Afton, Washington County, Minnesota. This research has two main objectives: To determine at what level of fragmentation the dwindling natural habitats of the region begin to adversely affect the migrating birds that use these sites for refueling and the migratory birds that breed there. The second objective is to begin to construct a database of information on birds, bird migration, breeding bird species, the habitat preferences of each species, the kinds of plants and their relative numbers that make up the various habitats, etc. This database will be computerized so that the information will became instantly available to the staff and students who use the Belwin Outdoor Education Laboratory.

In 1984 the research concentrated on the following:

Patterns of Spring and Fall Bird Migration
Habitat Use by Migrating Birds
Breeding Populations of Birds
Vegetation Structure of Habitats Used by Migrating Birds

This report describes our first year of research into the use by birds of fragmented habitats near the St. Croix River. Data were obtained on population levels of both migrating birds and breeding birds in 8 habitat types. Analysis of vegetation using trees and shrubs was completed along 4 bird netting and breeding census transects which included 7 habitat types.

INTRODUCTION

It is currently recognized by most researchers that tropical habitats used by these migratory birds during the non-breeding seasons have been largely destroyed during the last 40 years. Very recently results of studies of breeding bird populations of these long distance migrants in fragmented habitats in eastern North America show fewer and fewer numbers breeding in relation to decreasing size of the fragmented habitats. The primary purpose of this study is to learn whether

these small fragmented habitat units that are inadequate for successful breeding by long distance migrants are also inadequate for use as stopover sites for replenishment of fat reserves during migration.

STUDY SITE DESCRIPTION

All of the study plots are in the valley of Valley Creek in Sections 10 and 15, R 20 W, T 28 N, Washington County, Minnesota. All plots are wooded, the following being brief descriptions that will suffice for this interim report. Each plot is identified by the mist net lanes that are marked on the air photo (Figure 1). The area of each plot is calculated from width and length measurements that are determined by points 30 meters out from all nets in the plot {also 30 meters apart}. The total area in which the birds and vegetation were sampled is about 106,000 square meters. Appendix A shows the configurations and orientations of the mist nets in each of the netting plots. Each mist net was oriented as nearly as possible in an east-west direction to maximize chances for capturing southward and northward moving migrant birds.

BIG WILLOWS--this unit measures about 210 x 90 meters which is an area of 18,900 square meters. It has 12 mist nets in 2 lines with the north 6 nets and the south 6 nets in different vegetation types, as follows:

Big Willow--9,450 square meters
Aspen-Buckthorn--9.450 square meters

SWAMP--this unit also measures about 210 x 90 meters and has an area of 18,900 square meters. It has 12 mist nets in 2 lines, and about half of the nets in one habitat type and half in another type:

Alder--9,450 square meters
Willow-Sedge--9,450 square meters

BUR OAK--this is a plot of 10 nets in 2 lines dominated by medium to large bur oaks, measuring 180 x 90 meters, with an area of 16,200 square meters.

FLOODPLAIN--this is a very heterogeneous plot of 18 nets in 3 lines, measuring 210 x 120 meters with as area of 25,200 square meters. The vegetation is a mixture of small to large willows, cottonwoods, aspen and alder with dogwoods, other shrubs, grasses and sedges as a dense ground cover.

UPLAND--this is a plot of 18 nets in 2 lines (one with 10 nets, the other with 8 nets). The plot measures 300 x 90

meters with an area of 27,000 square meters. The plot is composed of 2 vegetation types:

Oak Upland--this plot is dominated by large trees, mostly red oaks and some basswood and cherry; it has a very open understory. This habitat type is about 16,200 square meters.

Aspen-Upland--This habitat type is dominated by fairly mature aspen, small aspen, cherry and even a few red cedars. In 1938 this was a cultivated field. Six nets are entirely within this plot and 2 are partly in it. Its size is about 10,800 square meters.

The vegetation was surveyed, units and plots selected and net lines measured and cut during April, 1984. One hundred and forty net poles of 10 ft. conduit lengths were set up to support the 70 mist nets. Nets were opened for capturing birds on 24 days in May, 12 days in August and 24 days in September. Nets were closed during periods of high winds and low temperature. All birds captured were brought to the central site (a screen house) for processing. Data on date, time, net number, habitat type, body weight, wing length, sex, age, fat, molt were recorded for each individual of each species; then each bird was banded and released at the central processing site.

Breeding bird censuses were made in BIG WILLOWS, SWAMP, FLOODPLAIN and UPLAND units. Of the netting sites, only BUR OAK was not censused. Another site, named LONG TRAIL, was censused for breeding birds. (See Figure 1, air photo, for locations of all study sites.) The LONG TRAIL is centrally located in the eastern half of Belwin.

Vegetation analysis this first year of study was limited to analysis of the trees and shrubs of all of the habitat types in which birds were netted.

ACKNOWLEDGEMENTS:

The following persons were part of the team that contributed to this study during 1984. Each was at some point, or many, crucial to the success of the project. Some were paid, some were not paid at all, some were reimbursed for part of their expenses in getting to the site, others were not. To all we are most grateful for their assistance and companionship during long grueling hours of the work.

Lucretia Chamberlain
John Gerwin
Elizabeth Hansen
Richard Holzemer
Debra Johnson
Steven Kresl
Terrence Lee
Louise Miller
Sandra Miller
Karen Oberhauser

Deanna Pranke
Steven Stucker
Marie Ward
Margaret Weisbrod
Kevin Winker

We are grateful, too, for the financial and logistical support from the following:

The James Ford Bell Foundation
The James Ford Bell Museum of Natural History, University of Minnesota
The Director and Staff, Non-game Wildlife Division, Minnesota Department of Natural Resources
The Superintendent and Staff, St. Croix National Riverway, U. S. National Park Service

RESULTS:

The information obtained during this first year is being computerized so that the data may be completely analyzed. The results presented here, therefore, are summary results that show the scope of the project to date, the direction the research is taking, and some basic findings that may be of interest to readers of this report.

The species of birds captured and the numbers captured on the netting days are shown on Tables 1 and 2. Only first captures are shown because we have not yet retrieved the data on recaptures. Spring migrants captured totalled 2,600 individuals of 72 species. Late summer (August) and early fall (September) netting resulted in the capture of 3,175 individuals of 78 species. Total recaptures and birds captured in special nets at the screen house bring the total number of birds handled to approximately 7,500. Examination of the tables shows the different peak periods of migration in the higher numbers captured during certain periods. These peaks are particularly dramatic when they are viewed in graphic form as shown in Figure 2. Note that in some species about 90% of the individuals passed through Belwin in about 48 hours in spring migration in May. In fall these peak periods are not so sharply defined, largely due to the longer, more erratic migration of the young of the year.

The graphic display of the migration patterns is but one example of how results of these kinds of research can be of continuing use to anyone interested in the biota of the St. Croix Valley.

The breeding bird censuses resulted in some very interesting figures that basically show that breeding birds are not very numerous in either species or numbers of individuals. The following results are from line transect censuses made at the peak of the breeding season--in June. The numbers are expressed

as breeding pairs with + meaning a bird of that species was present but that a pair was not identified. The breeding bird numbers are from 4 censuses in all but SWAMP plot in which only 3 censuses were made.

BIG WILLOWS	No. of Breeding Pairs
White-breasted Nuthatch	+
Eastern Wood Pewee	1
House Wren	+
Blue Jay	+
Cardinal	+
Indigo Bunting	1
Downy Woodpecker	1

SWAMP	No. of Breeding Pairs
Common Yellothroat	3
Song Sparrow	2
Black-capped Chickadee	+
House Wren	1
Brown Thrasher	+
Gray Catbird	+
Eastern Phoebe	+
Hairy Woodpecker	1

FLOODPLAIN	No. of Breeding Pairs
Indigo Bunting	2
Common Yellowthroat	2
Black-capped Chickadee	1
Hairy Woodpecker	1
House Wren	1
White-breasted Nuthatch	+
"Empidonax" Flycatcher	+
Brown-headed Cowbird	+
Great Crested Flycatcher	1
Red-eyed Vireo	1
Gray Catbird	1
Song Sparrow	1
Blue-gray Gnatcatcher	1
Rufous-sided Towhee	+
Cardinal	1
Mourning Dove	+
American Robin	+
Ruffed Grouse	+
Cedar Waxwing	+
Downy Woodpecker	+

UPLAND	No. of Breeding Pairs
Scarlet Tanager	4
Blue-gray Gnatcatcher	2
Eastern Wood Pewee	3
White-breasted Nuthatch	1
Great Crested Flycatcher	1
Red-eyed Vireo	3
Cedar Waxwing	+
Black-capped Chickadee	3
American Robin	1
Blue Jay	+
Red-bellied Woodpecker	+
Ovenbird	2
Hairy Woodpecker	+
Downy Woodpecker	+
Northern Oriole	1
"Empidonax" Flycatcher	+
Rufous-sided Towhee	1
Brown-headed Cowbird	+
Blue-winged Warbler	1
Field Sparrow	1
Cardinal	1
Indigo Bunting	+
Rose-breasted Grosbeak	2
Gray Catbird	1
Ruffed Grouse	1

LONG TRAIL	No. of Breeding Pairs
Cardinal	4
Gray Catbird	3
Rose-breasted Grosbeak	3
Brown-headed Cowbird	3
Eastern Wood Pewee	6
Hairy Woodpecker	1
House Wren	2
Great Crested Flycatcher	3
Indigo Bunting	2
Chipping Sparrow	3
Eastern Bluebird	1
Black-capped Chickadee	6
Mourning Dove	1
Rufous-sided Towhee	2
Ovenbird	3
Red-eyed Vireo	4
Least Flycatcher	+
Blue Jay	+
Common Grackle	+
American Robin	3
Scarlet Tanager	1

Northern Oriole	1
Brown Thrasher	1
Yellow-bellied Flycatcher	+
Downy Woodpecker	1
Blue-gray Gnatcatcher	+
Red-tailed Hawk	+
Song Sparrow	2
Common Yellowthroat	4
American Goldfinch	+
Belted Kingfisher	+
Green-backed Heron	+
White-breasted Nuthatch	1
Cedar Waxwing	+
Field Sparrow	1
Red-winged Blackbird	1

VEGETATION ANALYSIS

In order to determine in a quantitative way just how the various habitats differ that are used or not used by the different migrating and breeding species of birds, we have so far used only the Point Quarter system for measuring the tree and shrub plants. This method will suffice to show that there are real and dramatic differences in the woody plants that are the dominant plants in all of the habitats in which birds were studied during 1984. The tabulated data on the trees and shrubs that follow is an abbreviated summary of the compiled data on each of the study plots.

BIG WILLOWS - TREES

	Relat.% Frequency(F)	Relat.% Density(D	Relat. Domin.(Do)	Importance Value
Black willow	16.36	15.00	54.03	85.39
American elm	14.55	15.00	3.32	32.87
Quaking aspen	21.82	28.00	15.84	65.66
Sugar maple	10.91	13.00	3.82	27.73
Red oak	5.45	4.00	9.15	18.60
Burr oak	1.82	2.00	4.61	8.43
Pin oak	1.82	1.00	.42	3.24
Big toothed aspen	1.82	1.00	.14	2.96
Choke cherry	10.91	11.00	5.89	27.80
Boxelder	10.91	8.00	2.34	21.25
Buckthorn	1.82	1.00	.12	2.94
Green ash	1.82	1.00	.33	3.15

BIG WILLOWS - SHRUBS

	Relat.% Frequency-F	Relat.% Density-D	Importance Value
Buckthorn	30.00	35.00	65.00
Gooseberry species	25.00	28.00	53.00
Cherry species	16.67	15.00	31.67
Elm species	6.67	7.00	13.67
Viburnum species	10.00	7.00	17.00
Boxelder	3.33	3.00	6.33
Quaking aspen	1.67	1.00	2.67
Bur oak	1.67	1.00	2.67
American hazelnut	1.67	1.00	2.67
Honeysuckle	1.67	1.00	2.67
Raspberry-blackberry	1.67	1.00	2.67

The above figures show that BIG WILLOWS is dominated by black willow and the introduced buckthorn, the Big Willow plot having nearly all of the large willows and the Aspen-Buckthorn plot having most of the buckthorn as shrubs.

SWAMP - TREES

	Relat. % Frequency	/relat. % Density	Relat.% Dominance	Importance Value
American elm	66.67	66.67	17.83	151.17
Black willow	16.67	16.67	77.24	110.58
Other willow species	16.67	16.67	4.93	38.27

SWAMP - SHRUBS

	Relat. % Frequency	Relat.% Demnsity	Importance Value
Alder	22.73	28.00	50.73
Willow species #1	25.00	22.00	47.00
Viburnum species	11.36	13.00	24.36
American elm	11.36	9.00	20.36
Bog birch	9.09	7.00	16.09
Raspberry-blackberry	6.82	8.00	14.82
Dogwood species	4.55	7.00	11.55
Willow species #2	4.55	4.00	8.55
Boxelder	2.27	1.00	3.27
Amur maple	2.27	1.00	3/27

From the above tables of the trees and shrubs occurring in the SWAMP plot it is easy to visualize that this site is a

wetland with small willows, some elms and an abundance of alder. The presence of bog birch (and Sphagnum) indicate that this is a cold, boreal type bog. It is also the most used by far by migrating birds.

FLOODPLAIN - TREES

	Relat.% Frequency	Relat.% Density	Relat.% Dominance	Importance Value
Willow species #1	29.82	30.95	63.91	124.68
Willow species #2	7.02	7.14	2.80	16.96
Willow species #3	8.77	9.52	2.03	20.32
American elm	24.56	29.76	21.27	75.59
River maple	5.26	3.57	.79	9.62
Alder species	7.02	4.76	.89	12.67
Cottonwood	3.51	2.38	5.82	11.71
Boxelder	8.77	8.33	1.72	18.82
Amur maple	3.51	2.38	.51	6.40
Paper birch	1.75	1.19	.25	3.19

FLOODPLAIN - SHRUBS

	Relat.% Frequency	Relat.% Density	Importance Value
Buckthorn	33.33	42.42	75.75
Dogwood species	14.81	16.16	30.97
Viburnum species	16.67	15.15	31.82
Amur maple	14.81	14.14	28.95
Boxelder	3.70	2.02	5.72
Raspberry-blackberry	3.70	3.03	6.73
Willow species	5.56	3.03	8.59
Elm species	1.85	1.01	2.86
Alder species	3.70	2.02	5.72
Unknown species	1.85	1.01	2.86

BUR OAK - TREES

	Relat.% Frequency	Relat.% Density	Relat.% Dominance	Importance Value
Bur oak	30.77	33.90	37.63	102.30
Red oak	20.51	23.73	27.60	71.84
Black cherry	12.82	16.95	6.06	35.83
? Black maple	10.26	6.78	6.67	23.71
Red cedar	5.13	3.39	1.31	9.83
American elm	7.69	5.08	2.95	15.72
Cottonwood	2.56	1.69	1.15	5.40
Quaking aspen	5.13	5.08	6.72	16.93

Buckthorn	2.56	1.69	.25	4.50
Pin oak	2.56	1.69	9.66	13.91

BUR OAK - SHRUBS

	Relat.% Frequency	Relat.% Density	Importance Value
Buckthorn	31.58	38.33	69.91
Gooseberry species	28.95	33.33	62.68
Raspberry-blackberry	7.89	8.33	16.22
Viburnum species	10.53	6.67	17.20
Cherry species	13.16	8.33	21.49
American hazelnut	7.89	5.00	12.89

UPLAND - TREES

	Relat.% Frequency	Relat.% Density	Relat.% Dominance	Importance Value
Red oak	17.74	20.00	55.17	92.91
White oak	17.74	19.00	21.70	58.44
Quaking aspen	12.90	18.00	6.48	37.88
Paper birch	14.52	12.00	6.55	33.07
Basswood	12.90	9.00	3.59	25.49
Black cherry	8.06	6.00	3.66	17.72
Ironwood	6.45	8.00	1.00	15.45
American elm	6.45	6.00	1.36	13.81
Cottonwood	1.61	1.00	.39	3.00
Boxelder	1161	1.00	.11	2.72

UPLAND - SHRUBS

	Relat.% Frequency	Relat.% Density	Importance Value
Buckthorn	27.94	31.00	58.94
Basswood	23.53	23.00	46.53
Cherry species	17.65	14.00	31.65
Raspberry-blackberry	5.88	9.00	14.88
Gooseberry species	7.35	7.00	14.35
Boxelder	5.88	4.00	9.88
Viburnum species	2.94	5.00	7.94
Quaking aspen	4.41	3.00	7.41
Prickly ash	1.47	2.00	3.47
Dogwood species	1.47	1.00	2.47
American hazelnut	1.47	1.00	2.47

BREEDING BIRD TERRITORIES

In addition to giving us fairly accurate figures on most birds that are occupants of various habitats during the breeding season, the censuses that were done several times show distinct patterns of distribution of the birds. Males in particular sing and display at special sites and defend territories that can be mapped. Figures 3 through 13 show the locations of the central parts of the territories of the most obvious birds on which we obtained enough data during the breeding season in 1984.

PLANS FOR 1985

The entry into the IBM-XT computer of the remaining data from 1984 will be completed before the beginning of the 1985 field season. A special program for our data analysis needs is being developed using dBase3 as basic software. Field work will concentrate on duplicating the netting, measuring and banding and breeding census procedures of the first year but on a more fine tuned and intensified level. Vegetation analysis and plant surveys will be extended to include herbaceous plants in the wooded plots and to some prairie sites. During 1985 we will continue to explore the possibility of duplicating this research at another site about 100 miles north of the present site. The site tentatively selected is at Sand Rock Cliffs where Minn.State Highway 70 crosses the St. Croix River.

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Donald Gilbertson, Dir., Bell Museum of Natural History, U. of Minnesota

Fig. 1 AIR PHOTO SHOWING BIRD NETTING AND BREEDING CENSUS SITES

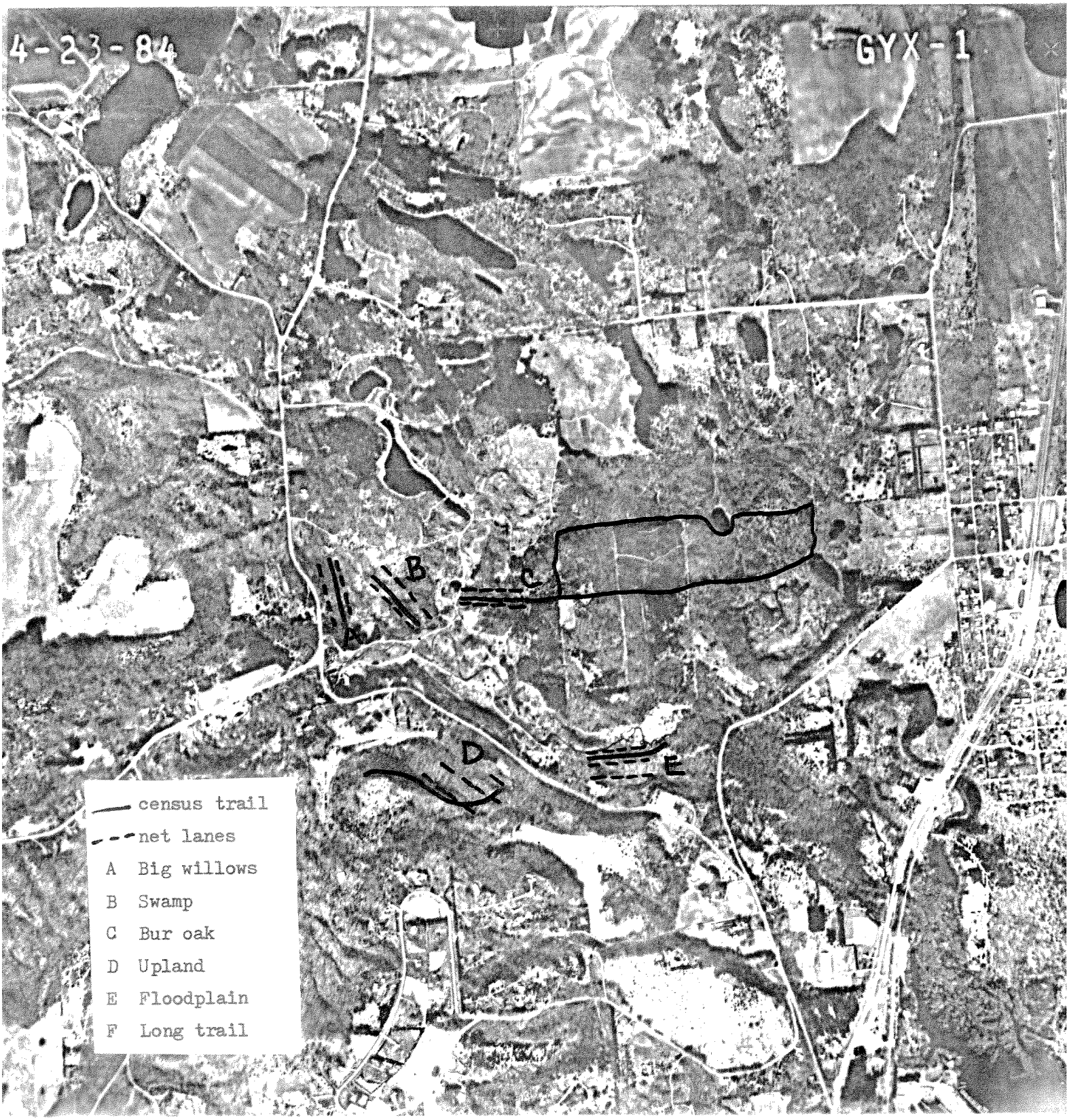


Fig. 2 GRAPHIC DISPLAY OF SELECTED SPECIES' MIGRATION PATTERNS DURING MAY 1984

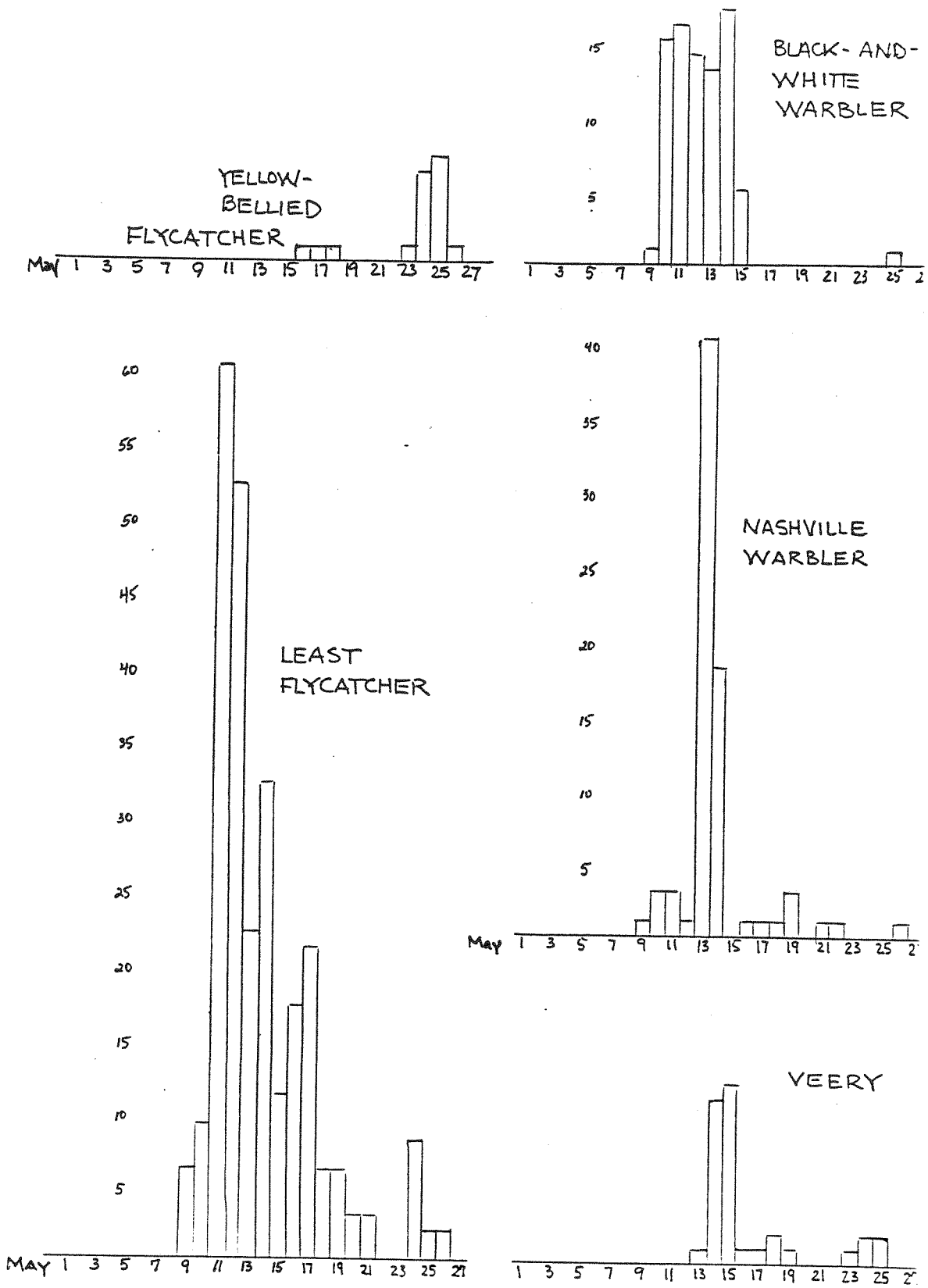
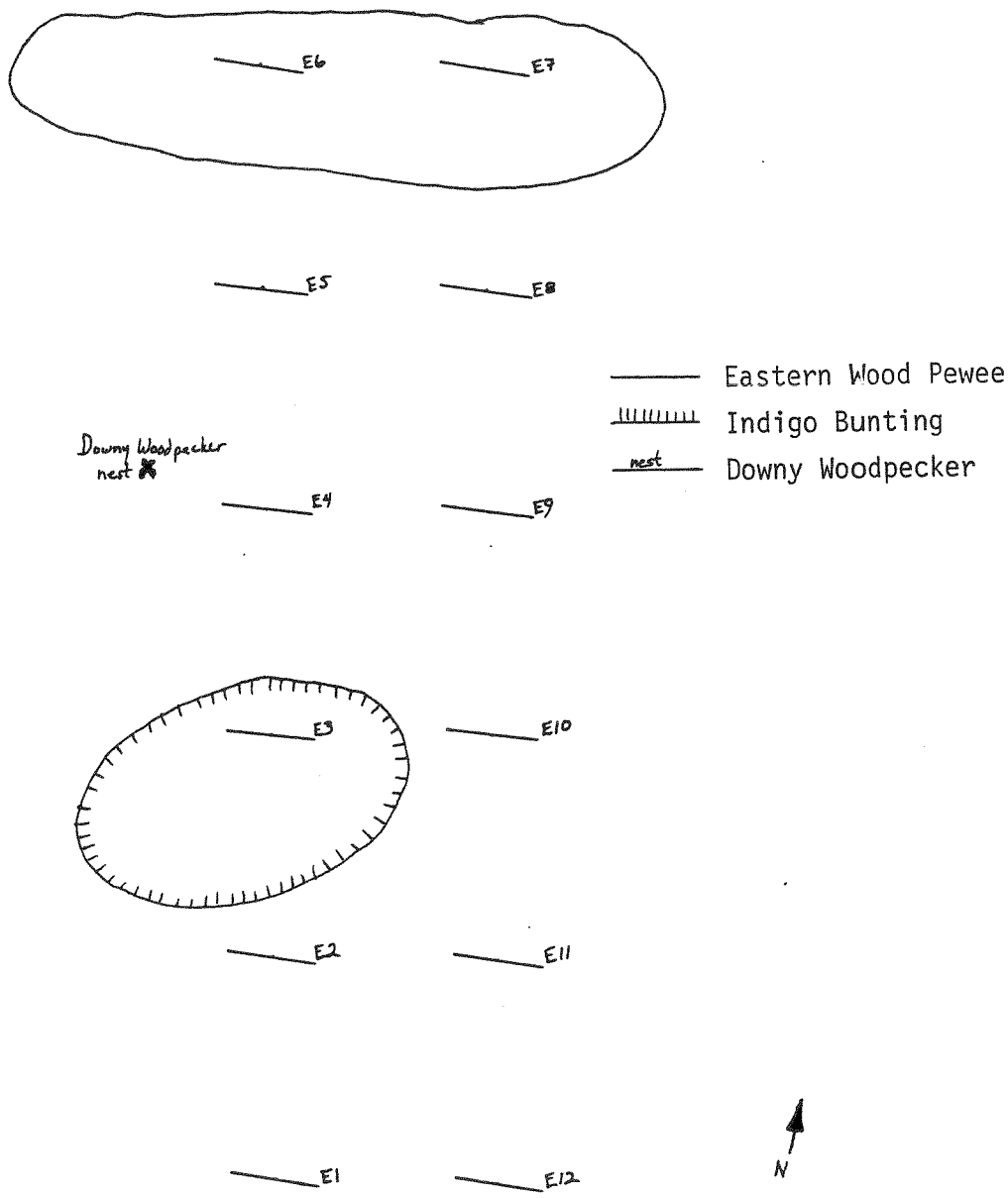


Fig. 3 BREEDING BIRD TERRITORIES
BIG WILLOWS



BIG WILLOWS

Fig. 4 BREEDING BIRD TERRITORIES
SWAMP

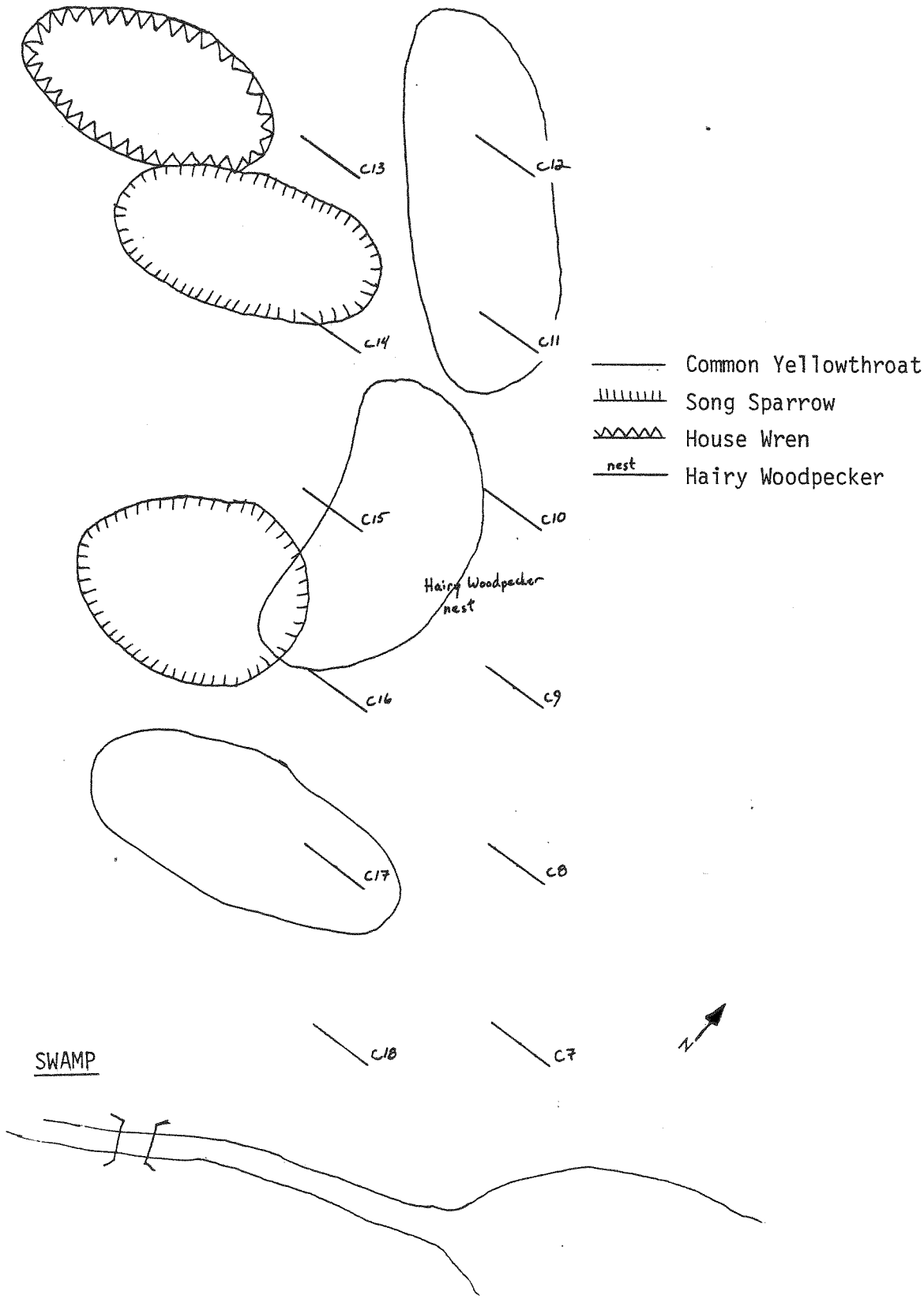


Fig. 5 BREEDING BIRD TERRITORIES
FLOODPLAIN

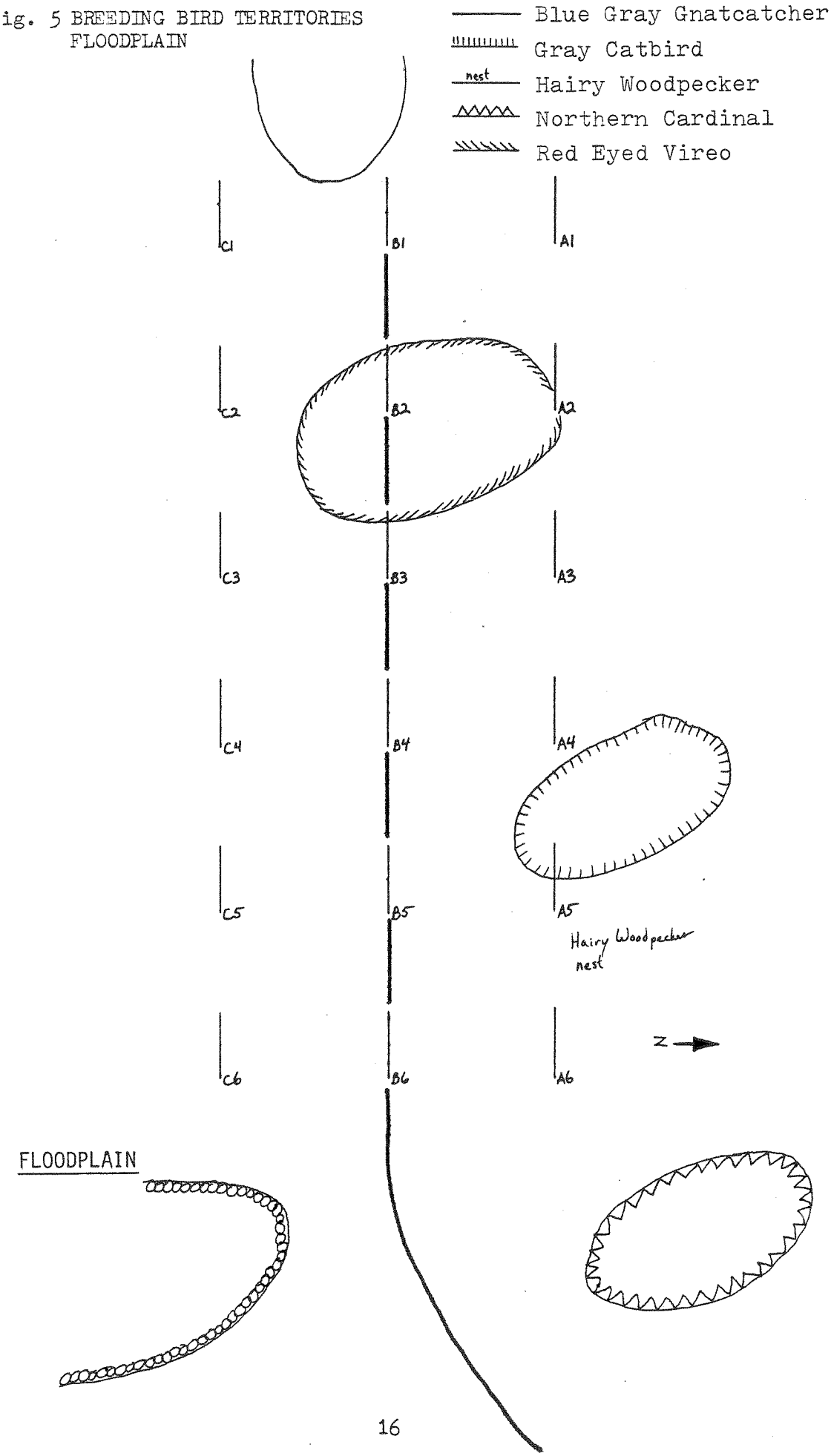


Fig. 6 BREEDING BIRD TERRITORIES
FLOODPLAIN

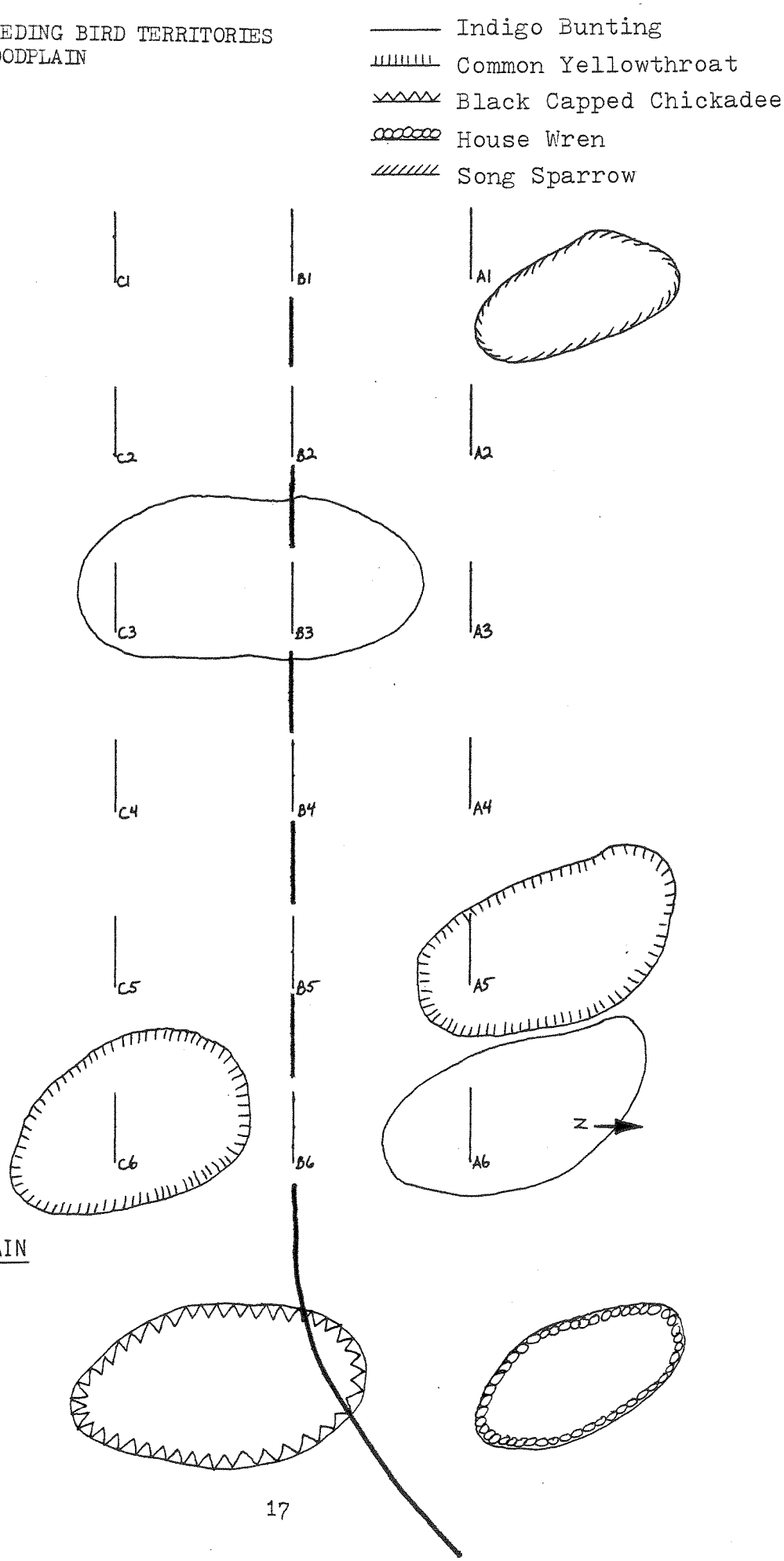


Fig. 7 BREEDING BIRD TERRITORIES

UPLAND

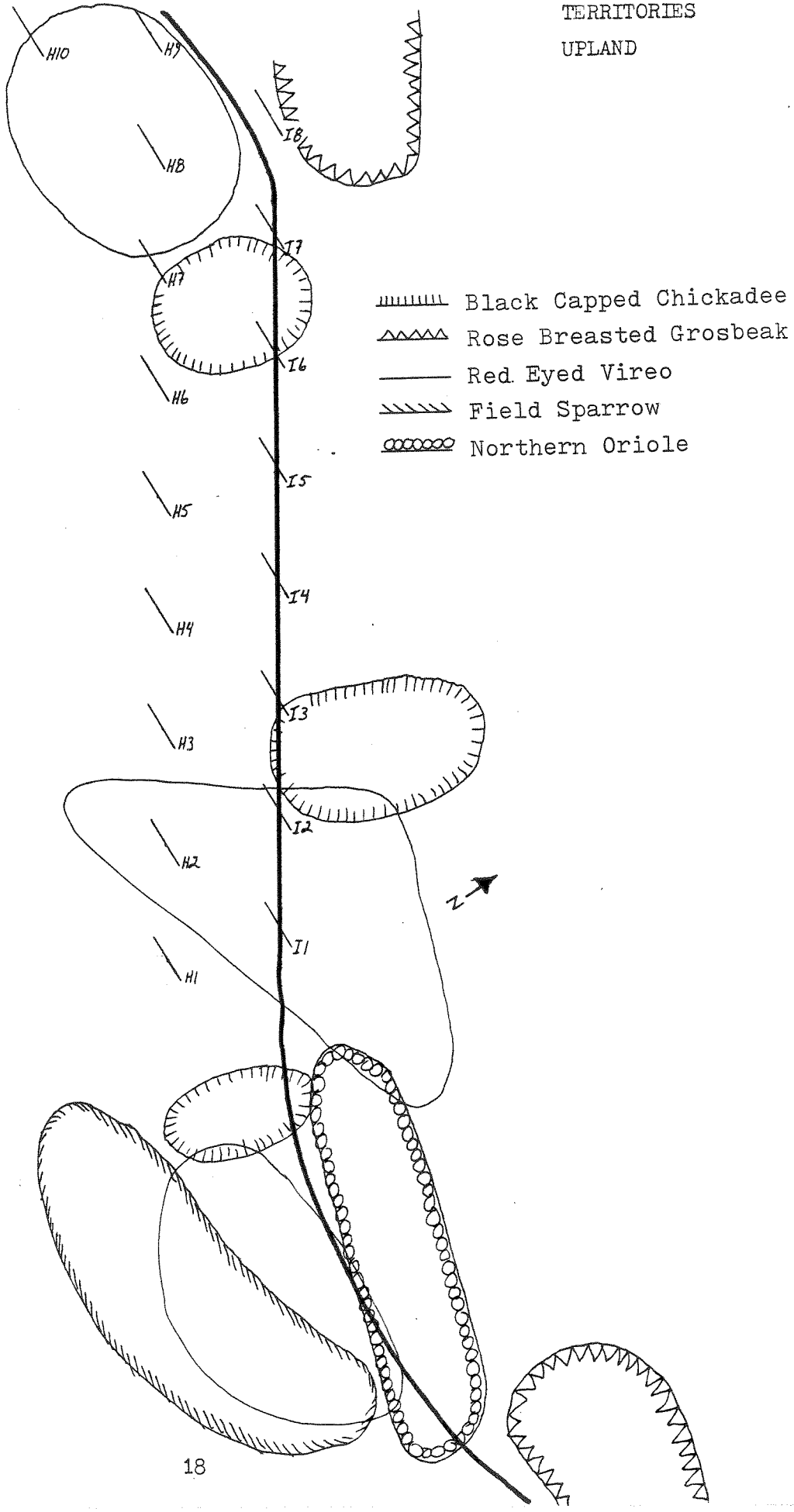


Fig. 8 BREEDING BIRD TERRITORIES

UPLAND

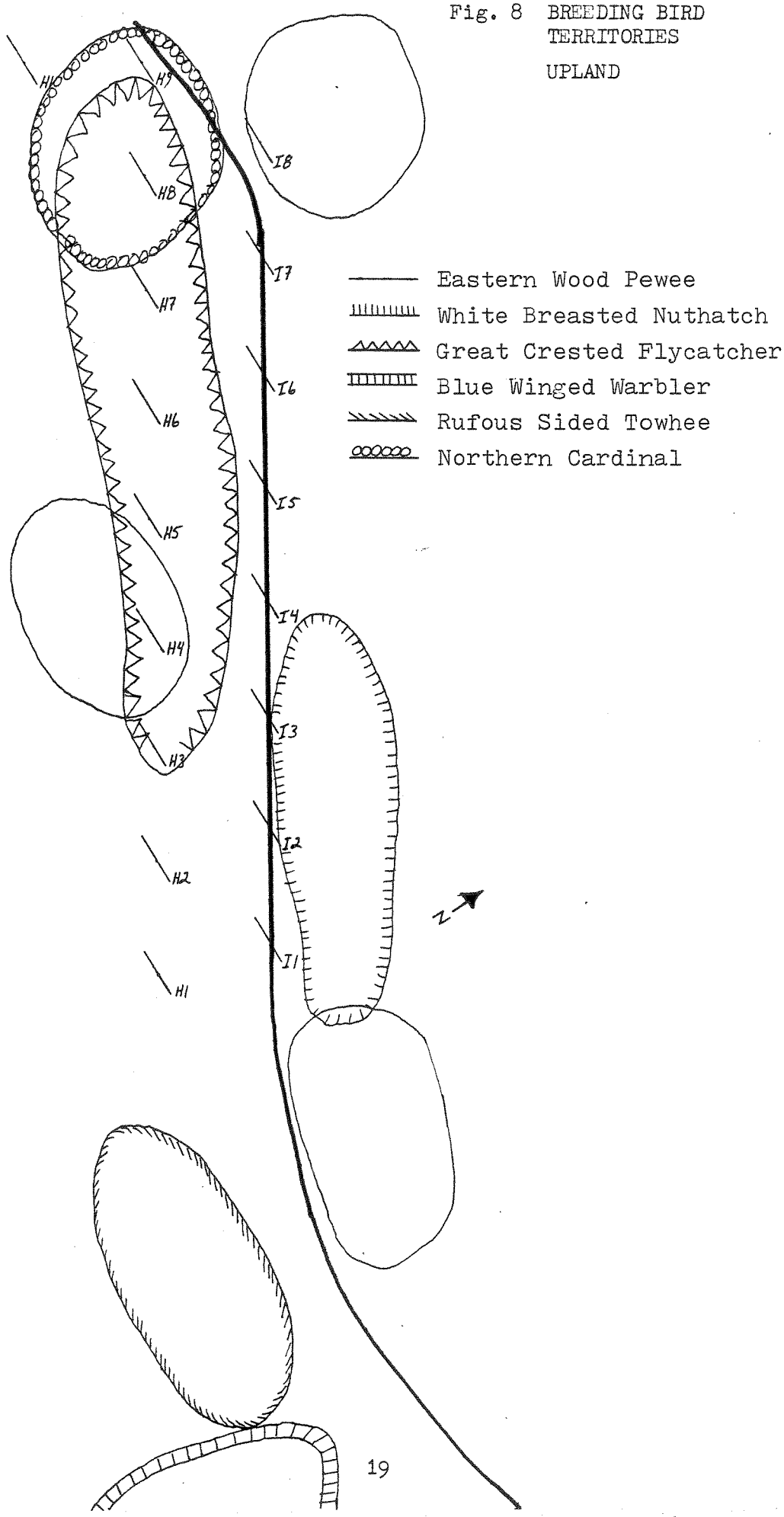


Fig. 9 BREEDING BIRD TERRITORIES

UPLAND

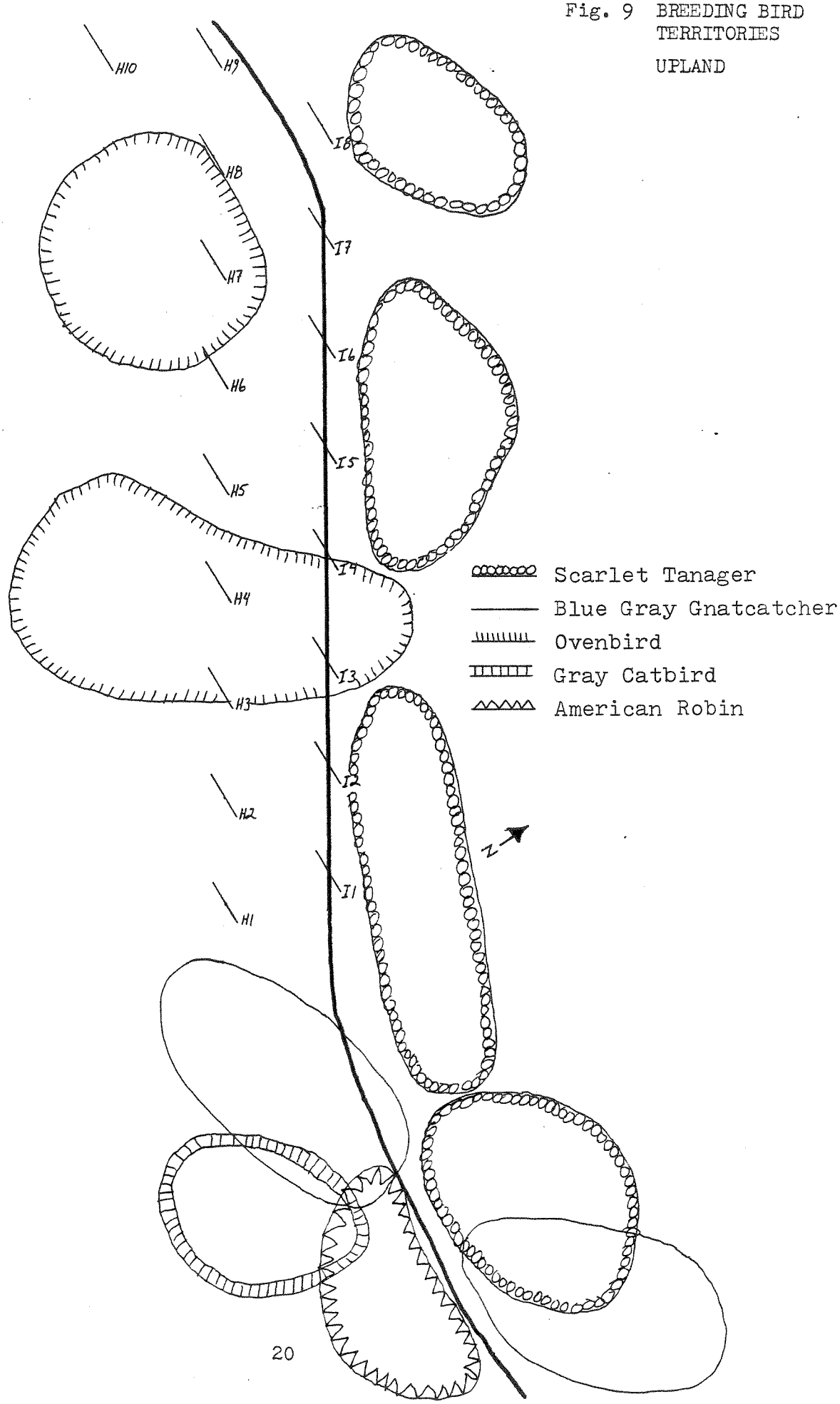


Fig. 10 BREEDING BIRD TERRITORIES
LONG TRAIL CENSUS

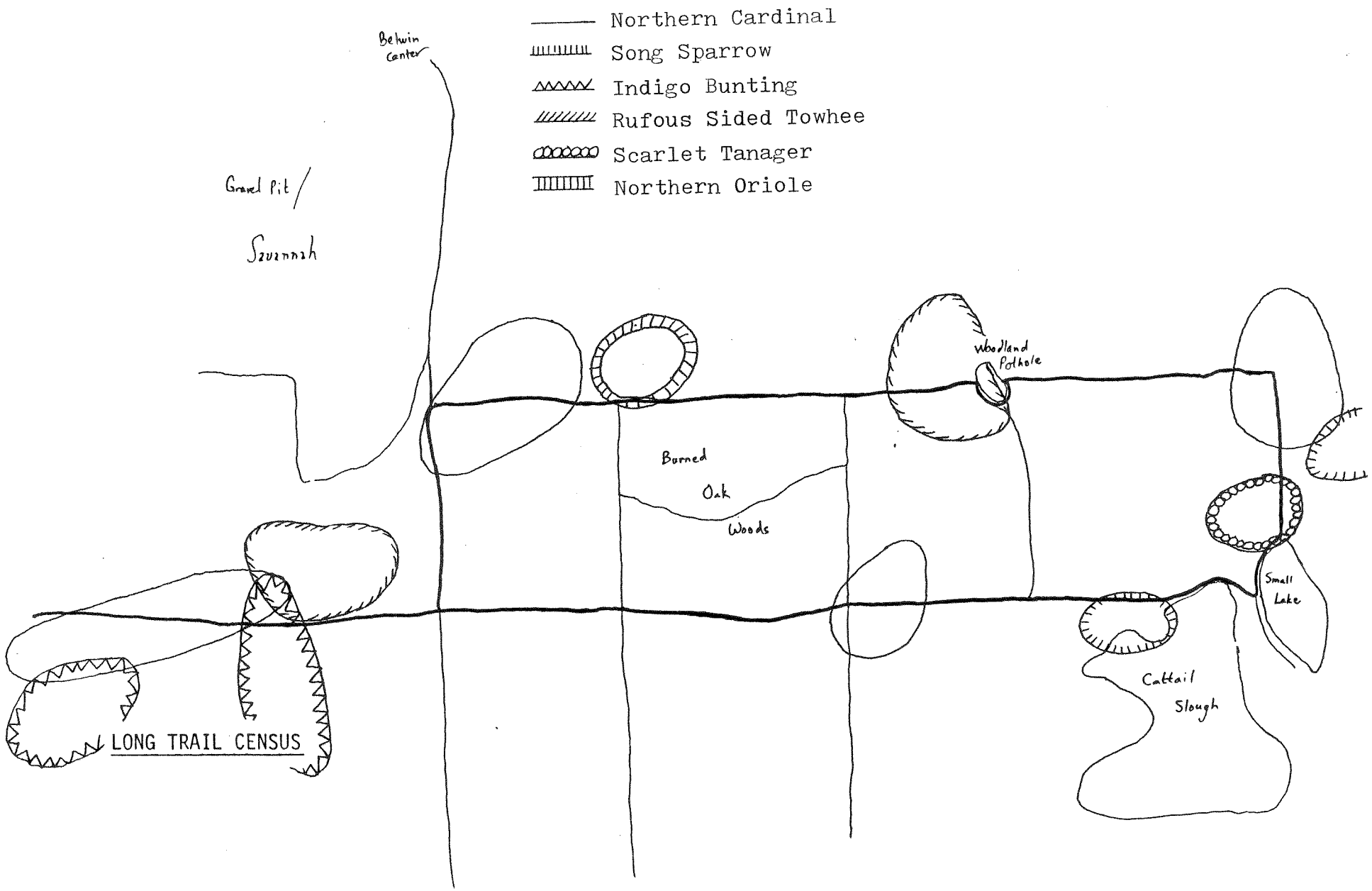


Fig. 11 BREEDING BIRD TERRITORIES
LONG TRAIL CENSUS

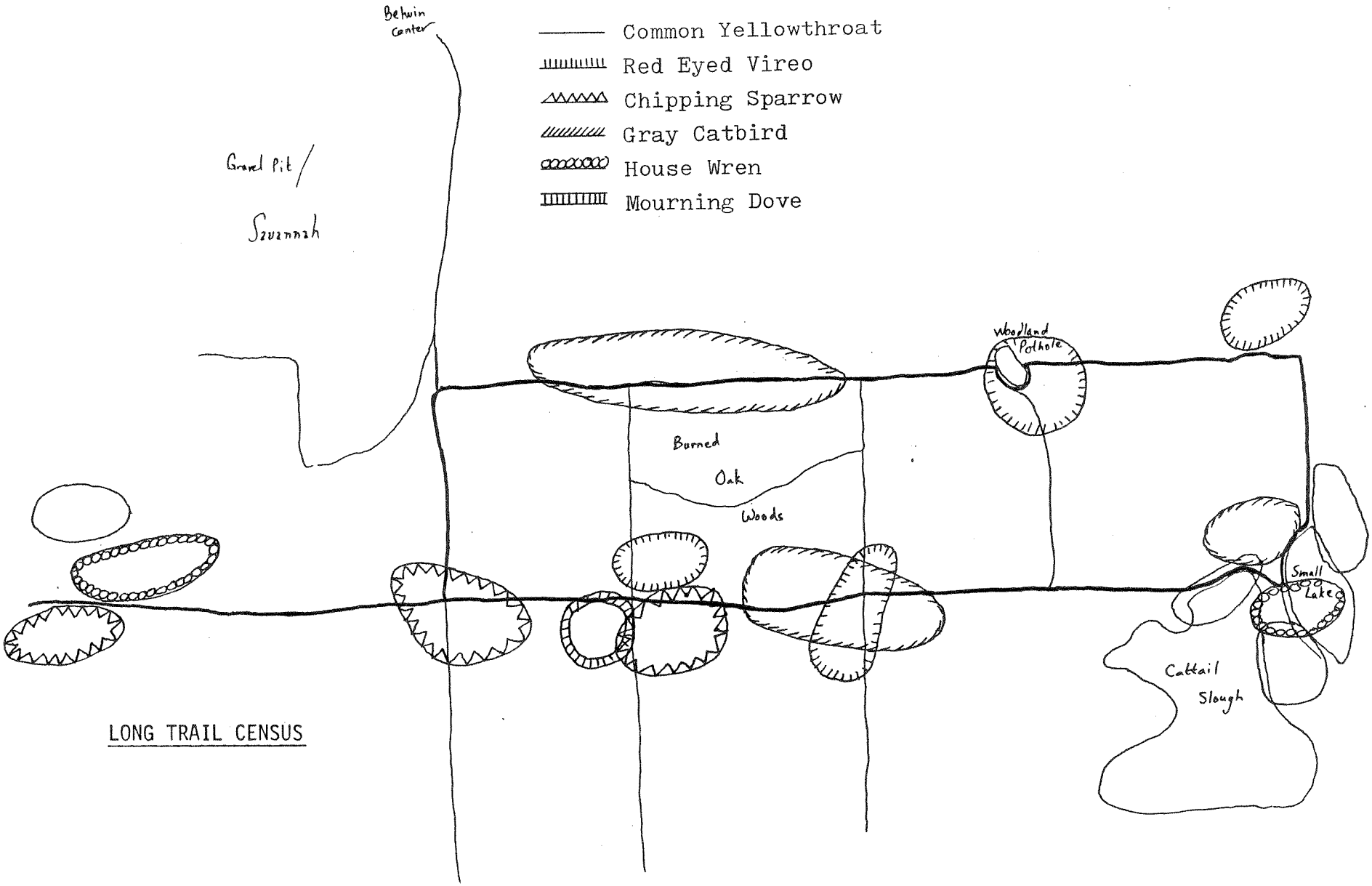


Fig. 12 BREEDING BIRD TERRITORIES
LONG TRAIL CENSUS

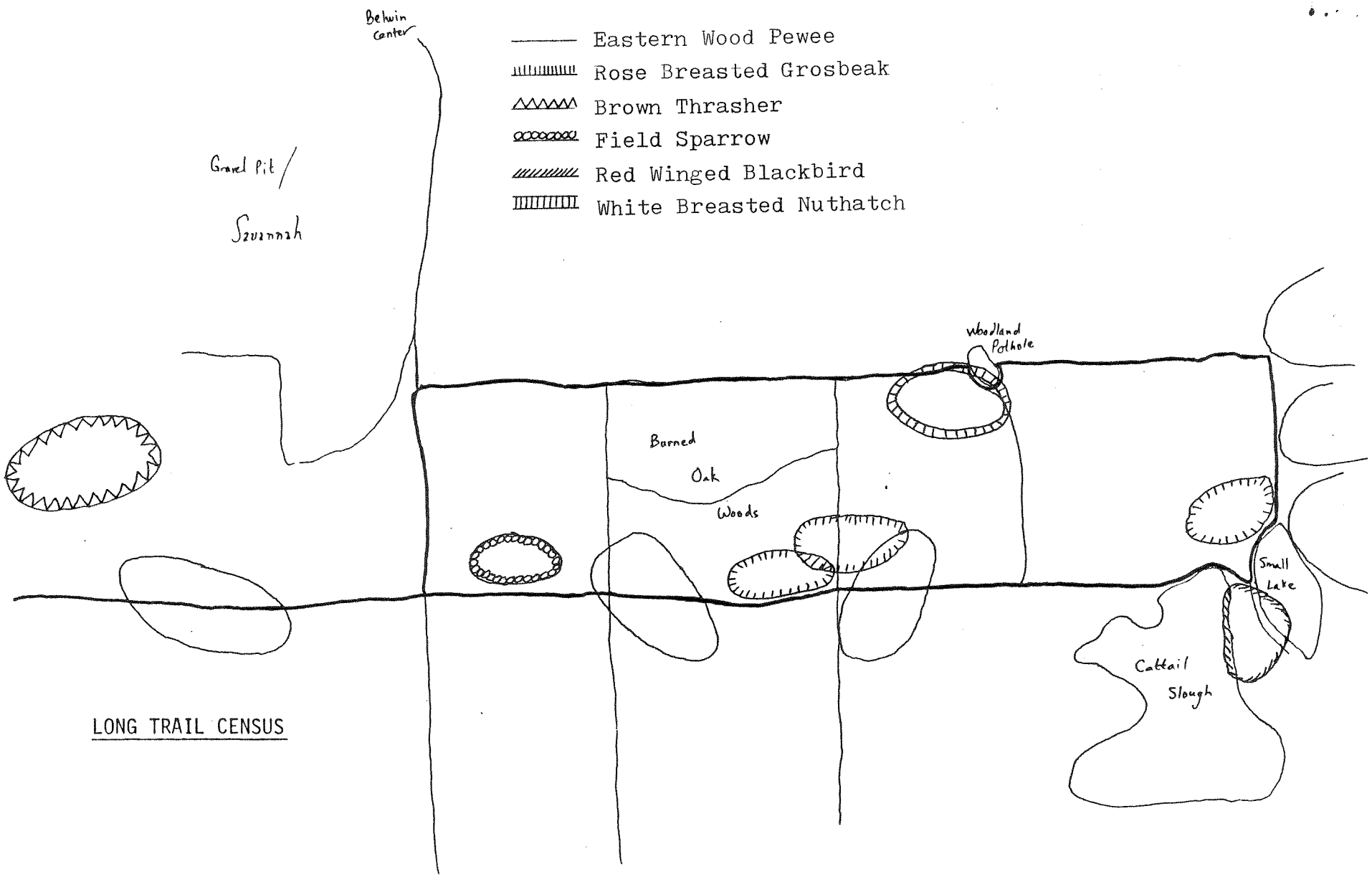


Fig. 13 BREEDING BIRD TERRITORIES
LONG TRAIL CENSUS

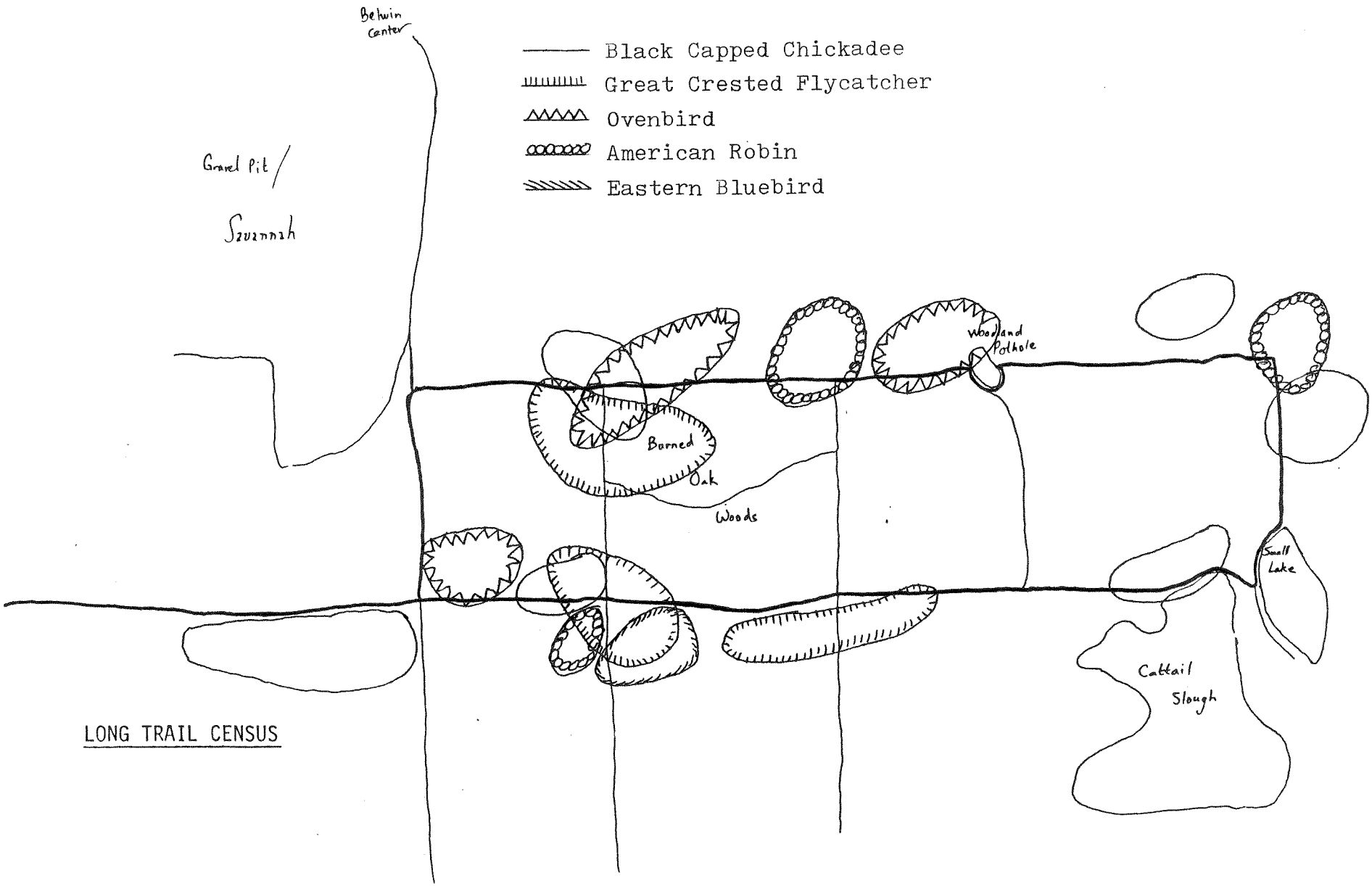


Table 1. BIRDS NETTED ON STUDY PLOTS
MAY 1984

MAY 1984

	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
Broad-Winged Hawk	1																							1				
American Woodcock	1											1																
Red-Bellied Woodpecker	1														1													
Yellow-Bellied Sapsacker	1													1														
Downy Woodpecker	24			3		2				1	4	3	1	1	3		2	2			1	1						
Hairy Woodpecker	12	1	1							2	3	2	1		2													
Flicker	1											1																
Pileated Woodpecker	1																				1							
Olive-Sided Flycatcher	1														1													
Eastern Wood-Pewee	4																							2	1	1		
Yellow-Bellied Flycatcher	18																1	1	1					1	6	7	1	
Acadian Flycatcher	13																3	3	1		1	1	3			1		
Traills Flycatcher	31											1		4	1		3	5		2		3	2	1	5	1	2	1
Least Flycatcher	260									6	9	60	52	22	32	11	17	21	6	6	3	3			8	2	2	
Great-Crested Flycatcher	8														1	1	1	1		2					1	1		
Tree Swallow	1	1																										
Blue Jay	10											1		1	1	1				3		1	1				1	
Black-Capped Chickadee	58	13	2	8		9				3	3	7	5		2		1	1			1	1	1				1	
19																												
White-breasted Nuthatch	9					1				1		1	4								1							
Brown Creeper	9	2	1			2				1		1	1	1														
House Wren	28											1	3	2	3	3	2	2	4	2	3	1	1				1	
Ruby-crowned Kinglet	150	40	10	12		6				23	1	20	12	20	5				1									
Veery	34													1	11	12	1	1	2	1				1	2	2		
Gray-checked Thrush	92			1							20	18	14	4	5		3	3	12	4	2	1	1		1	1	1	1
Swainson's Thrush	218			1							12	16	11	1	13	2	12	13	27	33	13	14	5	5	10	12	14	4
Hermit Thrush	5		1			1				2					1													
Wood thrush	26										5	2	2		2	1	2	2	2		3	2		1			2	
American Robin	9	1								1	1	1			1							1					3	
Gray catbird	107									1			1	2	5	13	14	15	10	12	6	9	9	3	3	1	2	1
		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

Table 1. cont'd

Page two MAY 1984	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
Cedar waxwing	3																							2		1		
Solitary vireo	93	1								2	16	17	11	16	15	5	2	4	2	1					1			
Warbling Vireo	9											1	1					1		4			1			1		
Philadelphia Vireo	8														2		1	2		2					1			
Red-eyed vireo	19																2	2			3			3	2	2	4	1
Blue-Winged Warbler	3																					1			2			
Golden-Winged Warbler	7															2	2	2		1								
Tennessee Warbler	9													3	1				1		2		1	1				
Orange-Crowned Warbler	19		1			2				1	5		1	7	29													
Nashville Warbler	75									1	3	3	1	40	18		1	1	1	3		1	1				1	
Yellow Warbler	20									1		1	1	1	7		4	4		1								
Chestnut-sided Warbler	9												1		3		1	1		2		1						
Magnolia Warbler	66										9	4		8	5	1	8	11		7	1	3	2	2	3	1	1	
Yellow-rumped Warbler	54			1		7				5	8	13	9	8	3													
Black-throated Green Warbler	5											1	1		3													
Blackburnian Warbler	2														1	1												
Palm Warbler	5										1	2	1		1													
Blackpoll Warbler	10														3	1	3	3										
Black & White Warbler	82									1	15	16	14	13	17	5										1		
American Redstart	60										5	2				2	8	13	3	5	3	1	3	1	9	2	3	
Prothonotary Warbler	1																							1				
Ovenbird	82		1	1		1						9	8	3	19	6	8	10	3	1	7	1			3			1
Northern Waterthrush	191	2		5		4				10	14	16	11	34	30	16	17	17	4	5	2	2	1		1			
Connecticut Warbler	2																						1			1		
Mourning Warbler	40																6	5	6	6	2	1	3	2	5		4	
Common Yellowthroat	126					1					2	4	7	2	1	16	16	17	10	15	4	6	6	7	4	3	2	3
Wilson's Warbler	87										5	7	8	3	10	5	10	16	3	7	1	2	1		5	3	1	
Canada Warbler	26																3	3	2	7		1	2	1	1	3	2	1
Scarlet Tanager	13																1			7					1	1	1	2
Northern Cardinal	15		1	1		1					2	1	1	2	2					1								
		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

Table 1. cont'd

Page three	MAY 1984 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
Rose-breasted Grosbeak	30										2	2	1	2	2	3	1	1		2	4		4	5			1	
Indigo Bunting	14															1	1	2			1	5		1	1		2	
Rufous-Sided Towhee	3										1	1				1												
Chipping Sparrow	8					2						1					2	2						1				
Field Sparrow	1					1																						
Song Sparrow	15	2	1	2		2					1	2					1	1				1			1		1	
Lincoln's Sparrow	14					1					1	3	5	2	1					1								
Swamp Sparrow	89	11	1	19		8				14	12	7	4	1	4	5			2							1		
White-throated Sparrow	113	16	6	21		7				6	3	20	17	5	4	4		1	1		2							
Brown-Headed Cowbird	2									1			1															
Orchard Oriole	1																							1				
Northern Oriole	8														1		1	1				2		2	1			
Pine Siskin	8													1		2	2	2							1			
American Goldfinch	20					1									1		2	2		5	2		3		2	1	1	
		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

Total Species = 72
Total birds (recaptures not included) = 2,600

Table 2. BIRDS NETTED ON STUDY PLOTS
AUGUST, SEPTEMBER 1984

		AUGUST													SEPTEMBER																							
	TOTAL	9	13	20	22	23	24	25	26	27	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
Sharp-shinned Hawk	1																																		1		
Broad-winged Hawk	1																1																				
Common Snipe	2																														1					1	
American Woodcock	2													1								1															
Black-billed Cuckoo	3		1			1	1																														
Ruby-throated Hummingbird	116			1	12	6	4	3	4	6	7	6	8	1	2	11	6	3	4	3	3	13	5	3		1	2			1		1					
Red-bellied Woodpecker	2																																			2	
Yellow-bellied Sapsucker	4															1																		1	2		
Downy Woodpecker	33	1	2		2	1	3	4		4	1	3	1		1	1	2	1	1	1				1						1	1		1				
Hairy Woodpecker	6							2					1										1				1				1						
Northern Flicker	3							1																					1				1				
Eastern Wood Pewee	31				1	1	1	1		5			1							1																	
Olive-sided Flycatcher	15				3		4	1		2	4			3	1	1	1			2	1	1	1					2	1		1						
Yellow-bellied Flycatcher	37			7	9		3		2				1	1	2	4		1		2				1			1	1				1					
Alder-Willow Flycatcher	46			1	3	1	5	2		5	12	1	2	4	3		1			2	1		5	1			2					1	1				
Least Flycatcher	32				5	1	1				6			2	3	1	3	1			2	2		1		1					1		1	1			
Eastern Phoebe	6															1		1					1									2	1				
Great-crested Flycatcher	2																	1											1								
Blue Jay	8				1												1						1			1		1			1					2	
Black-capped Chickadee	115	9	4	9	8	1	7	6	6		2	5	6	9	5	4	2	2	6	3	2	1	1	1		1	1	1	1	1	1	2	4	3		1	
White-breasted Nuthatch	13		1		1			3		2			1	1		2				1							1										
Brown Creeper	7																												1				1		3	2	
House Wren	39		2		2	2	2			2	4	5	4	2		2		4	3			1		1		1			1		1						
Winter Wren	14																											1		1	1	1	4		1	4	1
Golden-crowned Kinglet	2																																2				
Ruby-crowned Kinglet	33																										3	2	1		1	9	3	7	6	1	
Veery	4												1	1														1								1	
Gray-cheeked Thrush	6											1				1													1			1		2			
Swainson's Thrush	101						1				2	3	7	1	3	4	4	7	5		3	1		3	1	2	5	21	5	6	4	4	3	2	3	1	
Hermit Thrush	1																																1				
Wood Thrush	18						1	1	1	2		1			1							1		2		3	1				1	1	1		1		
American Robin	20						1			3		2	1					4													2		1		6		
Gray Catbird	144	2	2	2	12	9	1	5	5	4	2	5	6	7	2	8	8	5	5	1	5	9	3	4	1	2	2	4			2	6	6	2	5	1	1
Cedar Waxwing	37			2			5	7		3	4	1		3		1	3	1		3	1		1	2													
Solitary Vireo	43												2	2								4	9	2			13	2	1	2	1	3	1			1	
Yellow-throated Vireo	1																											1									
Philadelphia Vireo	46															1	7	5	3	1			6			3	11	3				1	3		2		
Red-eyed Vireo	106				2		1	1		2	2	2	5	7	3	5	9	3	6	4	1	3	22	2	1	2	5	4	2			5	1	1	3	2	
Warbling Vireo	6												3		1					1			1														
Blue-winged Warbler	2					1													1																		
		9	13	20	22	23	24	25	26	27	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

Table 2. cont'd

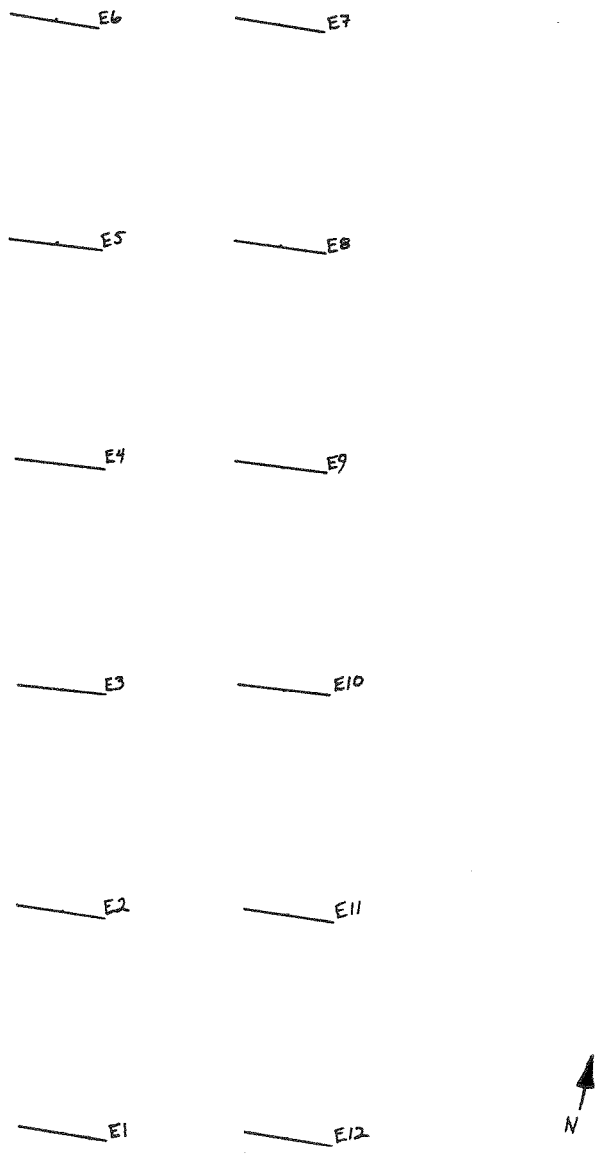
		AUGUST												SEPTEMBER																					
	TOTAL	9	13	20	22	23	24	25	26	27	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Golden-winged Warbler	16						1				1		2	1	1	1		1	2	1		1					2	1	1								
Tennessee Warbler	83				4	7	3		1		17	2	2	2	3		1	6	6	1		3	1				5	4	1		1	3	7	1	2		
Orange-crowned Warbler	8																										1					1	5				1
Nashville Warbler	225						1		1		1		16	4	3	4	7	7	6	14	3	10	19		2	1	40	10	4	1	4	14	20	8	15	6	4
Northern Parula	8												1				1	1	1	2	1	1															
Yellow Warbler	1												1																								
Chestnut-sided Warbler	87				4	2	2			5			10	14	3	1	9	2	4	3	1	1	9	1			4	4	2		1	3	1			1	
Magnolia Warbler	126				1		3		1		3		4	7	7	8	23	14	8	7	4	3	5			1	3	7	2		1	1	6	1	4	2	
Black-throated Blue Warbler	3																				1		1							1							
Yellow-rumped Warbler	5																															1	4				
Black throated green warbler	26												4	4		1	3	2		7	2		1				1						1				
Blackburnian Warbler	11				1						5			1	1	1								1									1				
Bay-breasted Warbler	33			1			2						1	4	3	2	3		5	5	1		3				1								2		
Black and White Warbler	40			1	2					1	1		2	10		4	2	1	1	2	1	1	2	1		1	1	3	1				1				1
American Redstart	123			1	6		1		2		3	6	9	19	6	4	15	16	13	8	3		1			1	1	1	1	1	1	1	1	1		1	
Ovenbird	148			2	1		1	2		1	1	5	9	5	3	8	13	8	2	3		7	13	5		1	12	14	8	2	2	7	4	4	4	2	
Northern Waterthrush	76				2	2	2	1			7	8	8	3	1	3	8	5	2	1	2		5	1	1	1	7	1	1				1	2			1
Kentucky Warbler	1														1																						
Connecticut Warbler	10													1		1	3	1	2									2									
Mourning Warbler	26				2	3	2	2			2		6	2		4						1								1			1				
Common Yellowthroat	98	5	2	2	6	6	6	8	2	1	2	6	4	3		8	6		3	1	1	2	5	1	1	3	5	1	1			2	3	1		1	
Wilson's Warbler	38				1		1			1		1	6	13	3	1			2	2	1	2		1	1		1						1				
Canada Warbler	42			2	5	2			1		4	1	4	4	2	2	2	3	2		1	1	1	2			1	1							1		
Scarlet Tanager	11									2	1			4	1																					1	2
Northern Cardinal	7								1		1								2	1			1										1				
Rose-breasted Grosbeak	89		1	1	14	6	6	1		3	4	1		6	5	1	3	4	4	3		1	5	1		2	4	1	1	2	3	3			1	1	1
Indigo Bunting	32		2	10	5	1	1	1	2				1				1	1		2			1						1				2	1			
Field Sparrow	9				1						1									1												1	3		1	1	
Fox Sparrow	1																																1				
Song Sparrow	52	1	1	1	6	9	6	3	2	2	2	1	1	2			1	2	1	1		1	1	1	1		1	2				2	1				
Lincoln's Sparrow	13																						2	2				1				2	2			2		2
Swamp Sparrow	3																						1											2				
White-throated Sparrow	47																										3	2	3	1	5	2	11	3	10	3	1	3
White-crowned Sparrow	1																	1																			
Dark-eyed Junco	2																																2				
Northern Oriole	7									7																											
Purple Finch	6															1	1	1		1								1					1				
American Goldfinch	563		2	1	6	4	25	27	16	2	64	13	20	18	8	44	10	33	83	40			5	8		7		61	7		2	24	23	8	1		1
		9	13	20	22	23	24	25	26	27	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

Total species = 78

Total birds (recaptures not included) = 3,175

APPENDIX A. MIST NET ORIENTATION

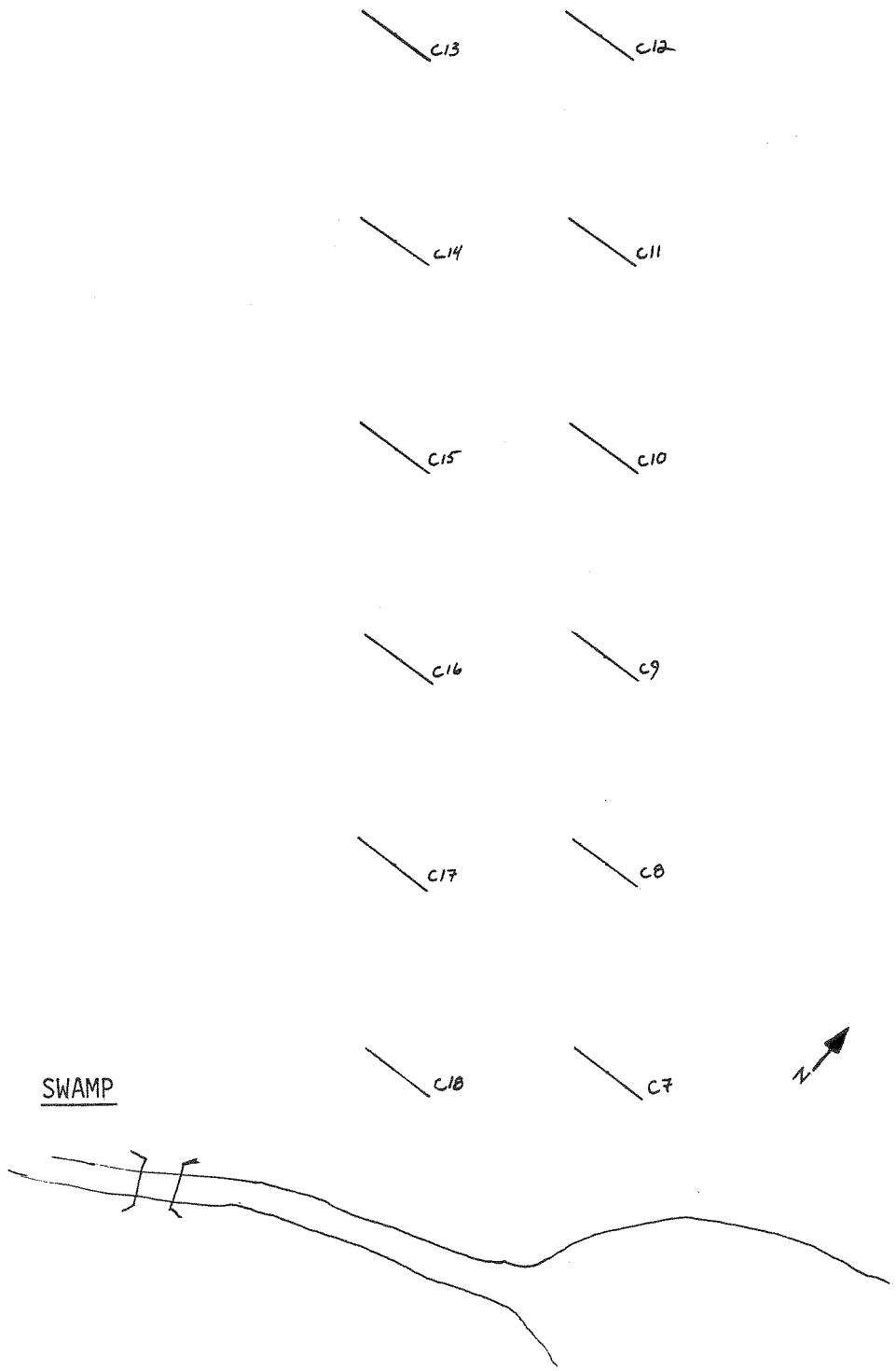
Fig. A1 Big Willows



BIG WILLOWS

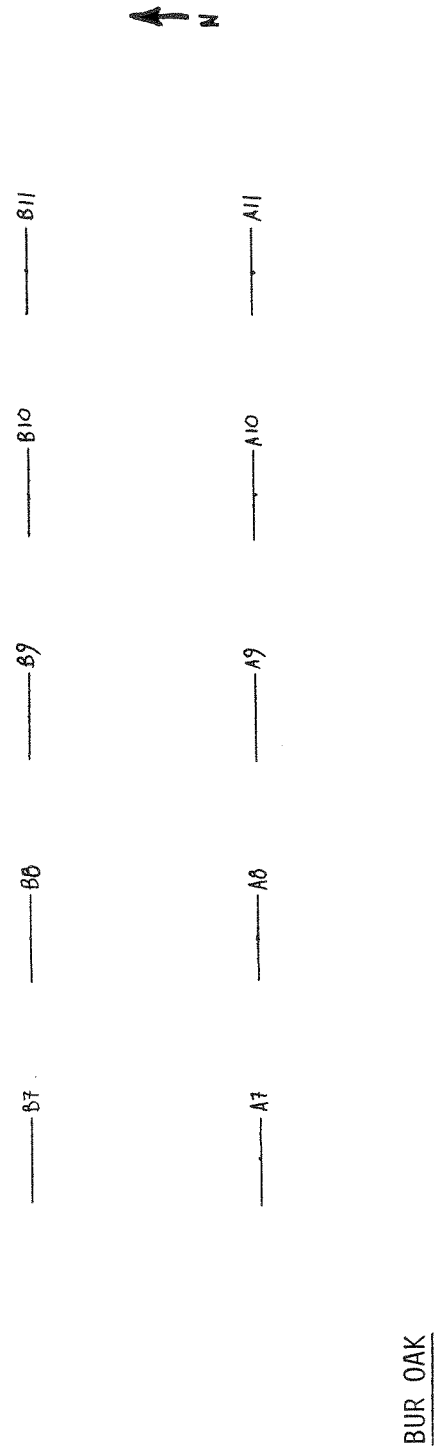
APPENDIX A. cont'd

Fig. A2 Swamp



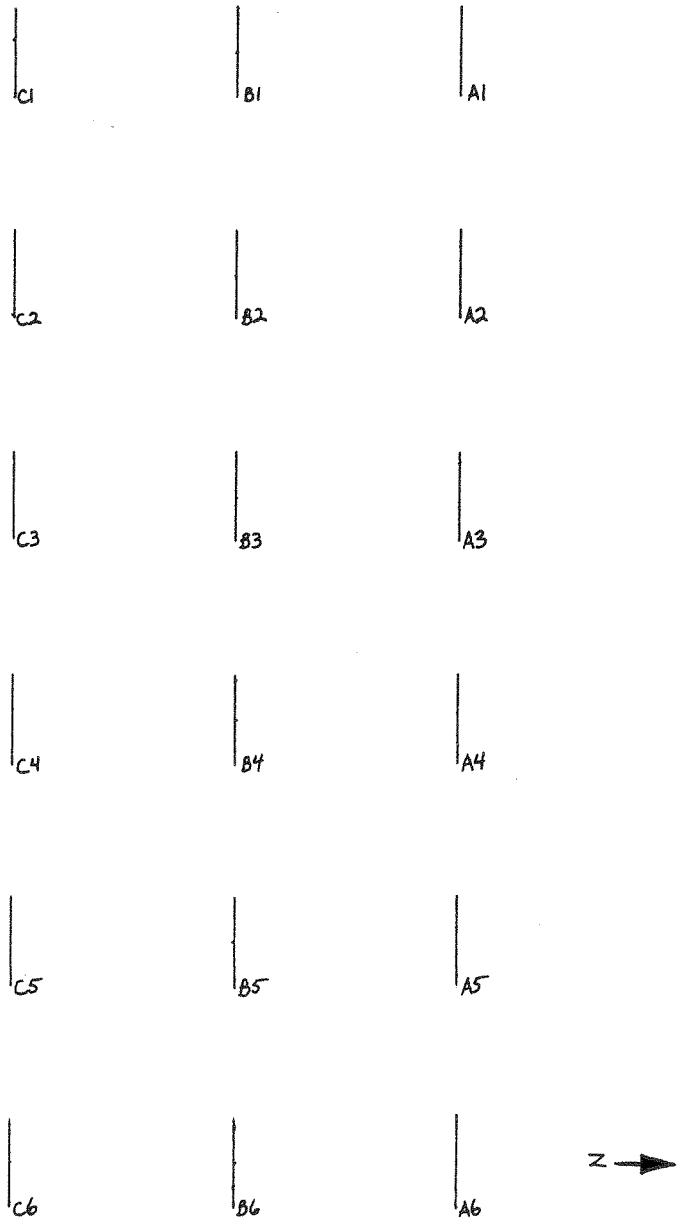
APPENDIX A. cont'd

Fig. A3 Bur Oak

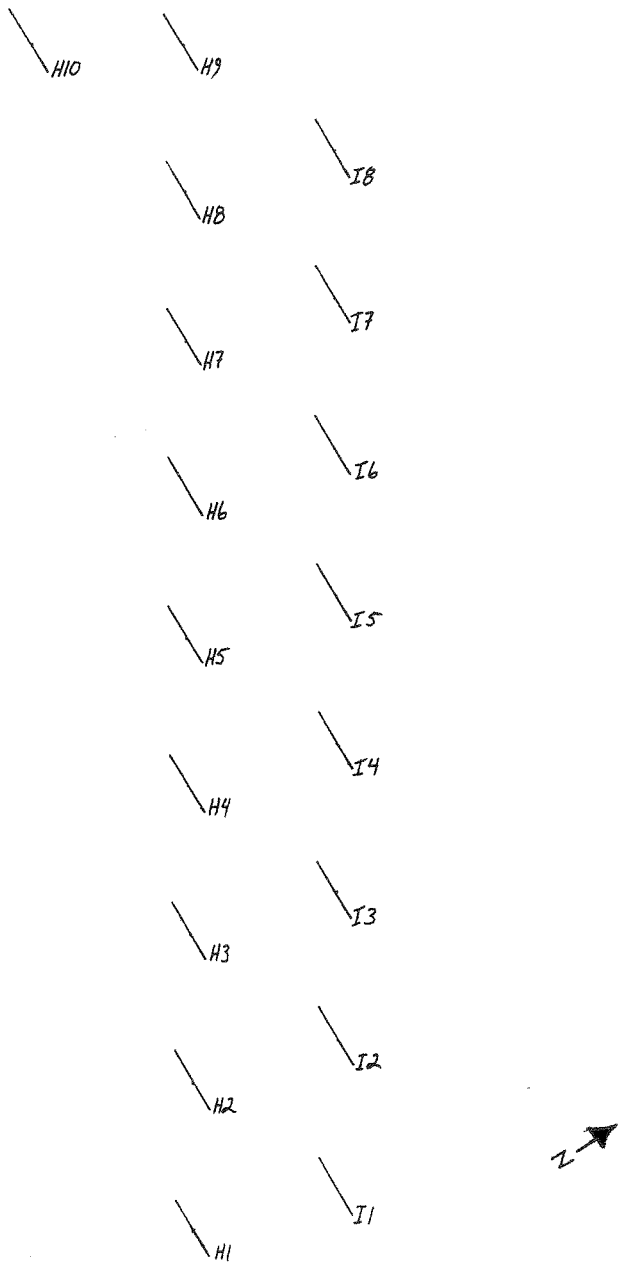


APPENDIX A. cont'd

Fig. A4 Floodplain



FLOODPLAIN



UPLAND

APPENDIX A. cont'd

Fig. A5 Upland

APPENDIX A. cont'd

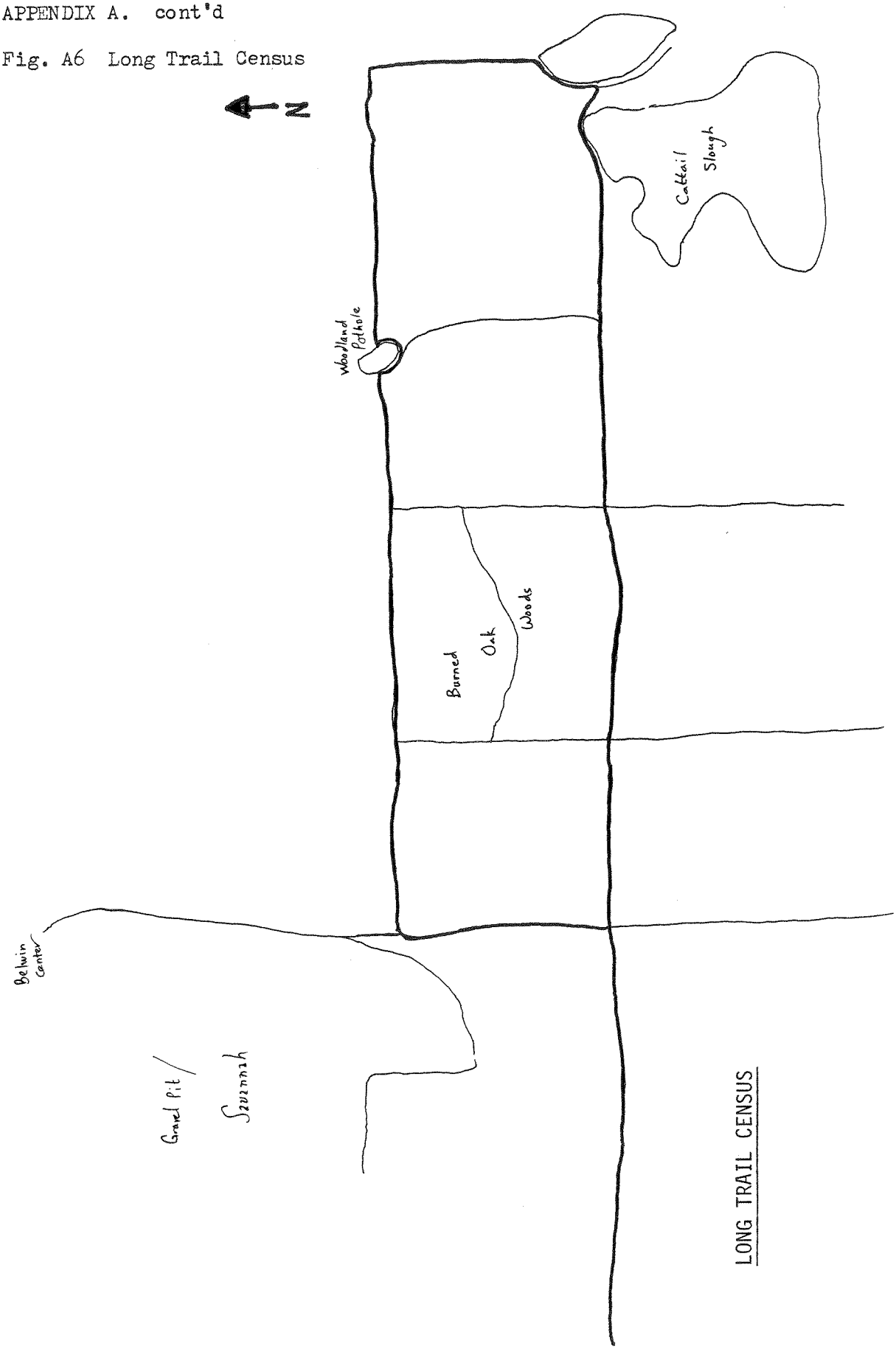



Fig. A6 Long Trail Census