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ANALYSIS OF THE BREEDING BIRD SURVEY PROGRAM ON WISCONSIN NATURAL AND SCIENTIFIC AREAS, 1971-77, WITH FUTURE PROGRAM RECOMMENDATIONS

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ABSTRACT

During 1971-1977, volunteers ran 273 breeding bird surveys on a total of 71 designated and proposed state scientific areas. Two hundred five species were recorded, including 90% of Wisconsin's breeding species, and 28 of its 32 species of Endangered, Threatened, or Watch status. This paper characterizes each area by (1) its most common bird species, (2) the bird species which were more common in that area than in any other area, and (3) the areas which had the most similar avifaunas to those of that area. Forest avifaunas differed between southern and northern Wisconsin, and some southern conifer relics contained a mixture of northern and southern avifaunas. Edge, field, and marsh avifaunas were similar throughout the state. For several species, the patterns of abundance in the 71 survey areas are discussed in relation to habitat.

Suggestions are made to facilitate accomplishment of the objectives of inventorying and monitoring bird populations and evaluating potential Scientific Areas in this continuing survey. Cooperators are asked to (1) use a survey method of walk 5 min/stand 5 min when practicable, (2) keep surveys within the designated or proposed boundaries, and (3) provide accurate descriptions of routes and methods. The further study of habitat relationships would require additional refinements of survey methods.

CONTENTS

INTRODUCTION

The breeding bird survey program on state scientific areas and other natural areas was initiated in 1971 with the cooperation of the Wisconsin Society for Ornithology (WSO). The purpose of the program was to:

(1) Supply basic inventory information on the species and numbers of birds present

(2) Monitor breeding bird populations over the long term on natural areas which are now or are expected to be subjected to environmental stress

(3) Provide information permitting the correlation of bird species with habitat type

(4) Provide additional information on threatened and endangered species

(5) Aid the Scientific Areas Preservation Council (SAPC) in evaluating specific natural areas and setting preservation priorities.

The Scientific Areas staff knows of no state with a similar breeding bird survey program on natural areas. Since we are thus setting our own guidelines, an evaluation of the survey program was needed in order to determine how well the data satisfy the program objectives. This report is the result of that evaluation. It:

(1) Summarizes the first 7 years of survey data

(2) Analyzes these data in a preliminary manner

(3) Discusses the feasibility of program objectives

(4) Proposes changes in methods that will best achieve these objectives.

DESCRIPTION OF THE PROGRAM AND FIELD METHODS

The general goal of the Scientific Areas program is the preservation of sufficient natural areas in each region of the state to provide examples of all types of biotic communities and other significant natural features native to the region. Through December 1979, there have been 154 areas designated. These features include various terrestrial types, including forest, shrub, prairie, meadow, shore, and cliff areas, and numerous aquatic types. Each Scientific Area may contain one to several plant community types, although vegetational composition has been measured in detail on just a few areas. Areas vary greatly in size from 0.4 ha (1 acre) (Ripon Prairie) to 1,513 ha (3,740 acres) (Nelson-Trevino Bottoms), while the median size is 16 ha (40 acres). A thorough explanation of the Scientific Areas program with descriptions of the first 139 areas has been published (Germain et al. 1977).

During the summers of 1971 through 1977, 55 designated Scientific Areas were surveyed for breeding birds, along with 13 other natural areas in the state. One area (Buena Vista Marsh) was surveyed in two parts, and another (Cedarburg Bog) in three parts, giving a total of 71 surveyed areas. Each area was surveyed for 1-7 years during this period, resulting in 273 surveys or an average survey period of 3.9 years per area. The names of survey areas are listed alphabetically in Table 1 along with the years in which surveys occurred. The number given to each area in Table 1 will be used again in this report, and should not be confused with the usual Scientific Areas numbering scheme (Germain et al. 1977). Figure 1 gives the locations of these areas.

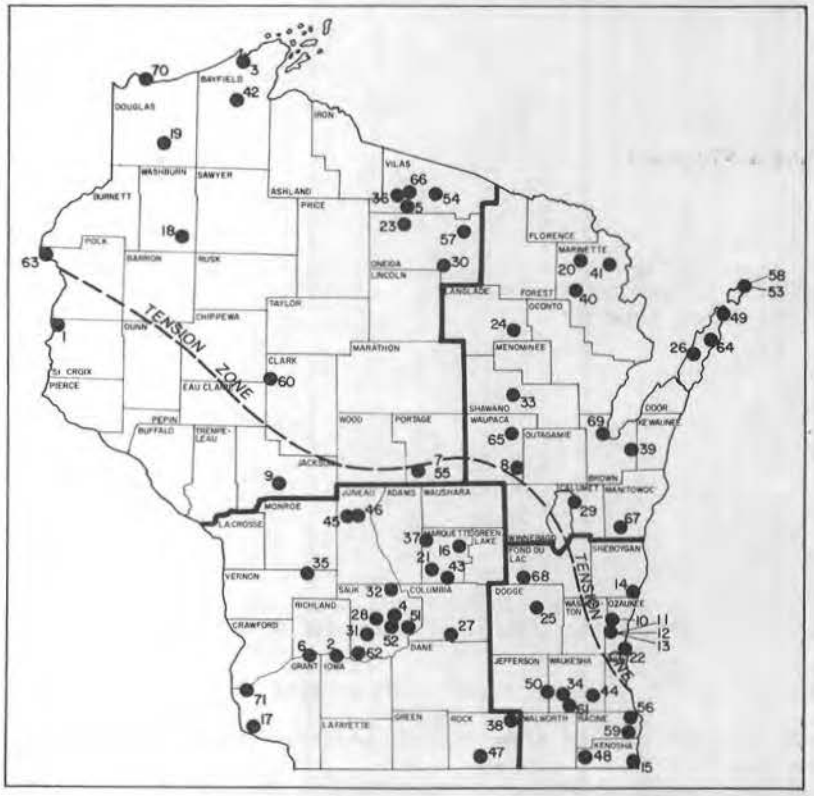


FIGURE 1. Location of 71 surveyed natural and Scientific areas. Numbers refer to areas as listed in Table 1.

TABLE 1. Years in which Wisconsin natural and scientific areas were surveyed.

	Area	Year Surveyed						
		71	72	73	74	75	76	77
1.	Apple River Canyon						X	X
2.	Avoca River Bottom Prairie	X	X			X	X	X
3.	Bark Bay						X	
4.	Baxter's Hollow	X		X	X	X	X	
5.	Black Tern Bog		X	X	X		X	X
6.	Blue River Cactus & Dunes					X	X	X
7.	Buena Vista Prairie & Meadow	X						
8.	Cactus Rock	X	X	X	X			
9.	Castle Mound Pine Forest		X		X		X	X
10.	Cedarburg Beech Woods		X	X	X	X	X	
11.	Cedarburg Bog (String Bog)	X	X		X	X	X	
12.	Cedarburg Bog (Shrub)	X	X			X	X	
13.	Cedarburg Bog (Conifer Swamp)	X	X		X	X	X	
14.	Cedar Grove Game Refuge	X			X			
15.	Chiwaukee Prairie	X	X	X	X	X	X	X
16.	Comstock Marsh							X
17.	Dewey Heights Prairie				X	X	X	
18.	Dory's Bog					X	X	
19.	Douglas Co. Grouse Area	X	X	X	X	X	X	
20.	Dunbar Sharptail Barrens					X	X	
21.	Endeavor Marsh		X	X	X		X	X
22.	Fairy Chasm	X	X	X	X	X	X	X
23.	Finnerud Pine Forest	X	X	X	X		X	X
24.	Flora Lake	X	X	X	X		X	X
25.	Fourmile Island	X	X	X	X	X	X	X
26.	Fuller Tract						X	X
27.	Goose Pond	X	X					X
28.	Hemlock Draw	X	X	X	X	X	X	X
29.	High Cliff State Park					X	X	X
30.	Holmboe Conifer Forest			X	X		X	X
31.	Honey Creek Natural Area	X	X	X	X	X	X	X
32.	Hulbert Creek			X				
33.	Jung Hemlock-Beech Forest							X
34.	Kettle Moraine Fen & Low Prairie	X	X	X	X	X	X	X
35.	Kickapoo River	X	X					
36.	Lac du Flambeau Pines							X
37.	Lawrence Creek		X	X	X	X	X	X
38.	Lima Bog	X	X	X	X	X		
39.	Lilly Lake						X	X
40.	Marinette Co. Beech Forest	X	X	X	X	X	X	
41.	Miscauno Cedar Swamp	X	X	X	X	X	X	
42.	Moquah Barrens	X	X	X	X	X	X	X
43.	Muir Park Natural Area					X		
44.	Muskego Park Hardwoods						X	
45.	Necedah Oak-Pine Natural Area		X	X				
46.	Necedah Oak-Pine Managed Area	X	X	X	X		X	
47.	Newark Road Prairie				X	X		
48.	New Munster Bog Island		X	X	X	X	X	X
49.	Newport Conifer-Hardwoods	X						
50.	Ottawa Lake Fen							X
51.	Pine Glen	X	X	X	X	X	X	X
52.	Pine Hollow						X	X
53.	Plum Island	X						
54.	Plum Lake-Star Lake Hemlocks						X	X
55.	Quarry Prairie (Buena Vista)	X		X				
56.	Renak-Polak Maple-Beech						X	
57.	Rice Lake-Thunder Lake Marsh	X		X				X
58.	Rock Island	X		X				
59.	Sander's Park Hardwoods	X	X	X	X	X	X	
60.	Schmidt Maple Woods	X	X	X	X	X	X	X
61.	Scuppernong Prairie	X	X	X	X	X	X	X
62.	Spring Green Reserve	X	X	X	X	X		X
63.	Sterling Barrens					X	X	X
64.	Toft Point	X	X	X			X	X
65.	Tellock's Hill Woods					X	X	X
66.	Trout Lake Conifer Swamp			X		X	X	X
67.	Vanderbloemen Bog			X		X	X	X
68.	Waupun Park Maple Forest	X	X	X	X	X	X	
69.	West Shore Wildlands	X	X	X	X	X	X	X
70.	Wisconsin Point	X					X	X
71.	Wyalusing Hardwood Forest					X	X	
	Totals (Σ=273)	38	36	37	33	38	51	40

TABLE 2. Bird survey methods used on Wisconsin natural areas and Scientific Areas, 1971-77.

Method	Number of Areas
Slow walk, sometimes with frequent stops	43
Observe at points only	9
Regular walk/stop intervals	7
Walk and drive in car	3
Walk and boat	3
Canoe	2
Canoe and drive in car	1
Methods uncertain	3
	71

TABLE 3. Regional distribution of Scientific Areas surveyed during 1971-77.

Wisconsin Region*	Scientific Areas	Sci. Areas Surveyed No.	Sci. Areas Surveyed Percent	Other Areas
Northeast	26	10	38	6
Northwest	39	14	36	3
Southwest	44	18	41	3
Southeast	34	14	41	1
Total	143	56	39	13

*Regions delineated in Figure 1.

All surveys were undertaken by volunteers, most of whom were initially contacted through the efforts of WSO's Evelyn Batchelor. Survey methods were left to the discretion of the individual cooperators. Most stands were surveyed in a similar manner each year, and usually by the same observer. However, survey methods varied greatly between observers, and some areas were done differently in different years. Table 2 lists the methods used on the 71 areas (when more than one method was used on an area, the most-used method was tabulated).

Cooperators submitted survey results on standard forms, along with time, temperature, wind/sky conditions, and names of cooperators. They sometimes included comments regarding evidence of breeding, survey problems, or unusual birds found. Although asked to accurately describe survey methods and routes, some did not do so, or gave unclear descriptions.

Most surveys were 1-4 hr in duration, the extremes being 35 min and 11 hr. Others involved repeated visits on two or more days; in such cases, the highest number of birds found on one day was recorded for each species. In general, cooperators recorded all birds seen or heard during the survey, but in a few cases the number of breeding pairs was estimated instead. Some cooperators indicated species that were known to be present during the breeding season but were not observed on the survey. Cedarburg Bog Scientific Area was the only tract regularly surveyed in separate parts, by habitat type. Most surveys were kept within the confines of the Scientific Area. However, 10% of all surveys are known to have extended substantially beyond these boundaries, and because of poor descriptions of survey routes, the true percentage may be as high as 40%. Eighty-six percent of reported survey dates were during the recommended period of 1 June-4 July. The remainder were mostly during the first half of July, although the earliest occurred on 30 May and the latest on 4 August. The Appendix summarizes information on habitat, observer, survey method, and survey date for each area.

The first 4 years of survey results were summarized in a previous report (Scientific Areas Preservation Council 1975).

METHODS OF ANALYSIS

For each species in each area, I computed the mean number of birds encountered per survey. These values were standarized by computer so that the sum of all bird values in a single area equaled 1. That is, the number of individuals of species X encountered in area Y was expressed as a percentage of the total number of individuals of all species encountered in area Y. Since species probably differ in their conspicuousness, this percentage is only an index and may not represent the true percentage of the bird community belonging to species X. By standardizing the data in this way, however, we could readily compare the importance of a given bird species in one area with its importance in another area regardless of differences between areas in such variables as extent of the survey or perceptiveness of the observer.

The standardized data were used to calculate an index of similarity between all areas based on bird community structure. The similarity of two areas was calculated by comparing the two area values for each bird species and summing the smaller of the two values, for all species. Two areas with identical bird communities thus received a similarity value of 1, while two areas with no species in common received a similarity value of 0. (This method is essentially the same as the 2w/a+b method used commonly in ecological studies and described by Curtis (1959:83).) The similarity index was then converted to a dissimilarity index by subtracting each similarity value from 1 and multiplying the remainder by 1,000, so that identical areas had a dissimilarity value of 0 and completely dissimilar areas a dissimilarity value of 1,000.

A second dissimilarity index was calculated by the same formula, but on species presence/absence data, and was used to construct an ordination of the 71 areas. Ordination is a technique which allows an investigator to reduce a complex data set to a more easily interpreted, but less accurate, diagram. In the present case, we wish to view the overall relationships between the bird communities of all areas at once, so that we can answer such questions as: Does the bird community of habitat Type A tend to be more similar to the bird community of habitat Type B or of habitat Type C? What are the relative roles of geographic location and habitat type in determining the composition of a bird community?

The first step in constructing an ordination is to reduce the information regarding the dissimilarity between two survey areas to a single figure, or distance value (the dissimilarity value). A distance value is computed for every survey pair (i.e., every survey area is compared to every other survey area), and the result for each pair is a distance (dissimilarity) value. These values are then used to arrange the survey areas, by a mathematical formula, on a two-dimensional diagram, such that the distances between areas in the ordination diagram are roughly representational of the dissimilarity index values of the pairs of areas. This method is somewhat like using a table of city-to-city distances from a Wisconsin highway map to construct a map of the state. The technique of ordination is further explained by Bray and Curtis (1957) and by Curtis (1959:482-485).

RESULTS AND DISCUSSION

Analysis of the First Seven Years' Data

The survey areas were well distributed geographically (the proportion of the total number of Scientific Areas in each region that was surveyed was roughly the same in all four regions) (Table 3), but habitat types were unequally represented (Table 4). In particular, the following vegetation types were poorly represented: southern dry forest, southern wet and wet-mesic (floodplain and lacustrine) forest, northern wet (tamarack-spruce) forest, dry prairie, cedar glade, beach, and lake dunes. Only 7 of the 11 Scientific Areas designated as bird species preserves were surveyed.

The 205 bird species recorded during the first 7 years of the program are listed in Table 5. The summary figures in Table 5 indicate the overall importance of a particular species in all areas, including the number of areas in which the species was found, and the number of birds that would be found in an average year if all 71 areas were surveyed.

TABLE 4. Habitat distribution of Scientific Areas surveyed during 1971-77.

Habitat Type*	Designated Scientific Areas*	Scientific Areas Surveyed	Habitat Type*	Designated Scientific Areas*	Scientific Areas Surveyed
Southern dry forest	5	1	Wet-mesic prairie	10	6
Southern dry-mesic forest	8	4	Wet prairie	1	0
Southern mesic forest	10	5	Bracken grassland	1	0
Southern wet-mesic forest	10	1	Sand barrens	1	1
Southern wet forest	4	0	Pine barrens	5	4
Northern dry forest	4	3	Oak barrens	2	2
Northern dry-mesic forest	10	6	Oak opening	2	1
Northern mesic forest	19	8	Cedar glade	5	0
Northern wet-mesic forest	11	6	Bog-muskeg	13	8
Northern wet forest	10	3	Alder thicket	8	5
Boreal forest	5	2	Shrub-carr	7	4
Dry prairie	9	1	Northern sedge meadow	2	2
Dry-mesic prairie	3	2	Southern sedge meadow	6	3
Mesic prairie	0	0	Fen	8	4
			Lake dunes	4	0
			Beach	5	1
			Flowing water aquatic types	20	7
			Lakes and ponds	33	12
			Ravines, gorges, dells	5	1
			Bird species preserves	11	7

*From Germain et al. 1977:14-17.

TABLE 5. List of 205 species of birds observed on 71 Wisconsin Natural and Scientific Areas during breeding seasons, 1971-77.

	1*	2**
common loon	4	3.7
horned grebe	1	0.2
pied-billed grebe	3	5.0
double-crested cormorant	2	1.3
great blue heron	26	861.0
green heron	23	23.9
great egret	2	260.9
black-crowned night heron	2	874.0
least bittern	5	2.5
American bittern	5	3.6
Canada goose	1	0.2
American black duck	4	4.0
mallard	26	151.6
gadwall	4	6.1
common pintail	3	9.5
green-winged teal	4	9.6
blue-winged teal	11	55.2
American widgeon	1	2.0
northern shoveler	1	11.0
wood duck	19	22.0
redhead	2	2.5
ring-necked duck	4	1.7
canvasback	1	3.0
lesser scaup	3	8.1
common goldeneye	2	6.2
oldsquaw	1	0.2
ruddy duck	1	18.0
hooded merganser	3	3.2
common merganser	2	1.4
red-breasted merganser	5	29.2
turkey vulture	4	7.1
sharp-shinned hawk	2	0.3
Cooper's hawk	1	0.5
red-tailed hawk	23	15.1
red-shouldered hawk	7	3.8
broad-winged hawk	11	6.5
bald eagle	2	0.5
northern harrier	4	0.9
osprey	1	0.2
American kestrel	10	6.3
ruffed grouse	23	33.8
prairie chicken	1	0.5
sharp-tailed grouse	1	0.3
common bobwhite	6	13.7
ring-necked pheasant	23	29.5
sandhill crane	5	7.8
king rail	1	0.2
Virginia rail	6	4.4
sora rail	7	8.3
common gallinule	1	1.0
American coot	6	29.9
semipalmated plover	1	0.5
piping plover	1	1.7
killdeer	25	96.1
American woodcock	18	11.8
common snipe	13	10.3
upland sandpiper	9	9.8
spotted sandpiper	17	32.5
solitary sandpiper	1	0.5
greater yellowlegs	1	0.2
lesser yellowlegs	3	16.1
pectoral sandpiper	2	4.3
least sandpiper	3	2.0
dowitcher sp.	1	2.1
sanderling	2	2.5
Wilson's phalarope	2	0.9
herring gull	11	841.5
ring-billed gull	7	182.5
Franklin's gull	1	0.1
Bonaparte's gull	3	28.2
Forster's tern	1	2.4
common tern	5	89.8
Caspian tern	3	4.7
black tern	10	73.8
rock dove	10	33.2
mourning dove	48	168.3
yellow-billed cuckoo	27	19.1
black-billed cuckoo	32	25.7
screech owl	2	0.8
great horned owl	7	2.8
barred owl	11	6.7
whip-poor-will	11	7.4
common nighthawk	6	4.5
chimney swift	23	56.0
ruby-throated hummingbird	20	12.9
belted kingfisher	25	25.7
common flicker	62	139.8
pileated woodpecker	20	12.0
red-bellied woodpecker	21	30.0
red-headed woodpecker	32	61.7
yellow-bellied sapsucker	13	12.7
hairy woodpecker	39	45.5
downy woodpecker	48	79.6
black-backed 3-toed woodpecker	1	1.0
eastern kingbird	46	76.4
great crested flycatcher	57	137.9
eastern phoebe	26	42.1
yellow-bellied flycatcher	2	0.6
Acadian flycatcher	12	31.7
Traill's flycatcher	27	48.6
least flycatcher	38	94.8
eastern pewee	53	194.9
olive-sided flycatcher	8	4.9
horned lark	3	2.5
tree swallow	39	463.4
bank swallow	10	54.2
rough-winged swallow	14	81.2
barn swallow	27	214.8
cliff swallow	9	488.2
purple martin	24	68.2
blue jay	65	346.8
northern raven	8	5.7
common crow	56	185.0
black-capped chickadee	59	213.9
tufted titmouse	10	9.3
white-breasted nuthatch	46	100.6
red-breasted nuthatch	16	31.0
brown creeper	10	8.9
northern house wren	42	158.7
winter wren	23	39.1
Carolina wren	1	1.1
marsh wren	11	33.0
sedge wren	14	29.5
gray catbird	57	193.5
brown thrasher	43	69.4
American robin	67	477.1
wood thrush	35	97.7
hermit thrush	16	19.8
veery	41	161.0
eastern bluebird	18	20.4
blue-gray gnatcatcher	9	20.4
golden-crowned kinglet	3	4.1
ruby-crowned kinglet	4	1.0
cedar waxwing	49	233.1
loggerhead shrike	1	0.3
European starling	38	221.3
white-eyed vireo	2	0.8
yellow-throated vireo	21	20.[illegible]
solitary vireo	4	2.[illegible]
red-eyed vireo	55	286.6
warbling vireo	22	23.4
black-and-white warbler	28	51.0
prothonotary warbler	1	0.5
golden-winged warbler	14	17.9
blue-winged warbler	12	30.6
Tennessee warbler	2	0.5
Nashville warbler	19	38.3
parula warbler	11	17.4
yellow warbler	41	88.7
magnolia warbler	4	2.8
black-throated blue warbler	1	0.3
yellow-rumped warbler	8	10.5
black throated green warbler	17	63.3
cerulean warbler	9	18.5
blackburnian warbler	16	22.3
chestnut-sided warbler	22	39.6
blackpoll warbler	1	0.2
pine warbler	9	27.1
palm warbler	1	0.1
ovenbird	43	244.6
northern waterthrush	8	44.3
Louisiana waterthrush	7	19.9
Kentucky warbler	4	2.9
Connecticut warbler	2	4.2
mourning warbler	19	29.1
common yellowthroat	56	280.0
yellow-breasted chat	2	0.9
Canada warbler	17	20.0
American redstart	32	232.7
house sparrow	9	58.[illegible]
bobolink	21	7[illegible]
eastern meadowlark	28	5[illegible]
western meadowlark	14	53.0
yellow-headed blackbird	5	24.2
red-winged blackbird	61	1151.8
northern oriole	51	96.6
Brewer's blackbird	7	42.1
common grackle	51	516.0
brown-headed cowbird	64	322.8
scarlet tanager	45	83.7
northern cardinal	37	104.0
rose-breasted grosbeak	61	197.7
indigo bunting	51	172.6
dickcissel	6	11.2
evening grosbeak	4	2.7
purple finch	15	24.7
pine siskin	3	1.3
American goldfinch	56	219.5
red crossbill	5	14.9
rufous-sided towhee	36	104.0
savannah sparrow	16	61.5
grasshopper sparrow	9	32.0
Henslow's sparrow	2	3.2
vesper sparrow	19	32.7
lark sparrow	2	8.3
northern junco	4	4.4
tree sparrow	2	1.0
chipping sparrow	38	111.6
clay-colored sparrow	8	40.1
field sparrow	31	90.3
white-throated sparrow	20	66.6
fox sparrow	1	0.2
Lincoln's sparrow	1	1.1
swamp sparrow	30	2[illegible]
song sparrow	66	4[illegible]

*Number of areas in which species was found.
**Number of birds that would be found in an average year if all areas were surveyed.

TABLE 6. Distribution of 205 bird species in classes of abundance.

Mean No. Individuals Observed/Year*	No. Species	Cumulative Percentage
0-5	65	32
5-10	19	41
10-20	21	51
20-30	17	60
30-40	13	66
40-50	6	69
50-60	7	72
60-70	6	75
70-80	4	77
80-90	4	79
90-100	5	81
100-150	6	84
150-200	10	89
200-250	8	93
250-500	8	98
500-1,152	5	100
	205	

*Median = 19.9 birds/year.

TABLE 7. Distribution of 205 bird species in classes of frequency.

No. Areas Species Found*	No. Species	Cumulative Percentage
1-5	80	32
6-10	29	53
11-15	16	61
16-20	16	69
21-25	14	76
26-30	9	80
31-35	5	82
36-40	7	86
41-45	6	89
46-50	5	91
51-55	5	94
56-60	6	97
61-65	5	99
66-70	3	100

*Median = 8.9 areas.

TABLE 8. Most common species observed on 71 natural and Scientific areas.

	Species	Mean No. Individuals/Year		Species	Areas of Occurrence No.	Areas of Occurrence Percentage
1.	Red-winged blackbird	1,151.8	1.	American robin	67	94
2.	Black-crowned night heron	874.0	2.	Song sparrow	66	93
3.	Great blue heron	861.0	3.	Blue jay	65	92
4.	Herring gull	841.3	4.	Brown-headed cowbird	64	90
5.	Common grackle	516.0	5.	Common flicker	62	87
6.	Cliff swallow	488.2	6.	Red-winged blackbird	61	86
7.	American robin	477.1	7.	Northern cardinal	61	86
8.	Tree swallow	463.4	8.	Black-capped chickadee	59	83
9.	Song sparrow	456.4	9.	Gray catbird	57	80
10.	Blue jay	346.8	10.	Great crested flycatcher	57	80
11.	Brown-headed cowbird	322.8	11.	American goldfinch	56	79
12.	Red-eyed vireo	286.6	12.	Common yellowthroat	56	79
13.	Common yellowthroat	280.0	13.	Common crow	56	79
14.	Great egret	260.9	14.	Red-eyed vireo	55	77
15.	Ovenbird	244.6	15.	Eastern pewee	53	75
16.	Swamp sparrow	239.7	16.	Common grackle	51	72
17.	Cedar waxwing	233.1	17.	Indigo bunting	51	72
18.	American redstart	232.7	18.	Northern oriole	51	72
19.	Starling	221.3	19.	Cedar waxwing	49	69
20.	Great crested flycatcher	219.5	20.	Mourning dove	48	68
			21.	Downy woodpecker	48	68

These summary figures are more easily interpreted in conjunction with Tables 6 and 7. For example, the song sparrow is found in 66 of the 71 areas, and an average of 456.4 individuals/year was found for all areas combined (Table 5). It is thus one of the most abundant birds on the surveyed areas, for only 7% of the 205 bird species were represented by more than 250 individuals/year (Table 6). Table 7 indicates that 99% of all species were found on fewer areas than the song sparrow. Note that 32% of all species were found on 5 or fewer areas, and that half of the species were found on fewer than 9 areas (the median value). Also, a third of all species were represented by fewer than 5 individuals/year, and half of the species were represented by fewer than 19.9 individuals/year (Table 6).

The most common species, in terms of numbers of individuals/year and in terms of number of areas of occurrence, are listed in Table 8, and the bird species of Endangered, Threatened, and Watch status in Wisconsin in Table 9. Six of 8 endangered species, 5 of 5 threatened species, and 16 of 18 "watch" species have been observed on at least 1 of the 71 surveyed areas.

Of the 219 known breeding bird species listed for Wisconsin by Barger et al. (1975), only 31 species (14%) were not recorded in this survey program (Table 10). Twenty-six of these 31 species are considered "rare or casual" during the breeding season, and 5 species are considered "fairly common or uncommon".

The Appendix summarizes the important and unique features of the bird community in each area. Each Scientific or natural area is characterized by its most common bird species and by the bird species which were more common in that particular area than in any other area surveyed. An area's relationship with other survey areas is summarized by listing those other areas which have similar bird communities, based on the dissimilarity indexes described previously. In some cases, these relationships are clearly defined, such as in the low prairie and meadow areas. These areas include Avoca River Bottom Prairie, Endeavor Marsh, Kettle Moraine Fen and Low Prairie, Newark Road Prairie, and Scuppernong Prairie. The bird communities of these five areas are in general very similar to one another, and could be characterized by the following common "low prairie and meadow" bird species: red-winged blackbird, common yellowthroat, song sparrow, American goldfinch, and swamp sparrow.

There are few other cases where a well-defined group of bird species characterizes a set of areas of similar habitat type. For instance, Jung Hemlock-Beech Forest shows a high avifaunal similarity to another hemlock-beech-maple forest (Tellock's Hill Woods), but also to a shrubby, deciduous streamside woods (Lawrence Creek), a dry oak-pine stream gorge (Pine Glen), and two bogs (Black Tern and Vanderbloemen Bogs). Difficulty in finding ecological groupings of either bird species or habitat types from the Scientific and natural areas survey data was also apparent in the failure of certain statistical techniques, for example, cluster analysis, to elucidate any such relationships. Apparently, this difficulty is a result of the fact that most surveys were conducted on two or more distinct habitat types. For instance, the Jung Hemlock-Beech Forest Scientific Area includes northern mesic forest, small bogs, and abandoned cropland. Since most Scientific Areas contain more than one vegetational type, and since it is important to acquire survey data on the entire Scientific Area whenever possible, this problem will continue to exist unless a method is devised which will allow cooperators to segregate survey data by clearly recognizable habitat types.

Despite the difficulty in determining ecological associations of birds, the Appendix is a valuable summary for individual areas, and is useful in comparing areas. For example, the "dissimilarity" value given for each area is an average of the area's 70 dissimilarity values with all other areas, and thus is one measure of the area's uniqueness with respect to the total group of areas surveyed. The 71 areas are listed in Table 11 in order of decreasing mean dissimilarity values. The first area listed, Fourmile Island, contained the most unique bird community among the 71 areas by virtue of its heron and egret rookery. The last area, Vanderbloemen Bog, contained a bird community which was most similar to all areas considered as a whole, because: (1) nearly all common bird species were well represented in that area; (2) the species list for the area was fairly large; and (3) both northern and southern elements, and both forest and field elements, were present in the bird community. One must remember that this scale of the "uncommonness" of a bird community deals only with the community's relationship to the other 70 areas in this study, and not necessarily with its relationship to Wisconsin bird communities in general.

The ordination (Fig. 2) places the 71 areas in a spatial relationship such that the distance between every pair of areas in the ordination is proportional in roughly the same degree to the real dissimilarity between the avifaunas of these areas; ordination distances are rough representations of dissimilarity values. Such a diagram is always imperfect, especially when such a large number of variables (there were 205 bird species) is involved. The ordination helps to reveal patterns in the data and suggests some overall relationships between bird communities; it must be interpreted, however, in the light of the survey data and other results presented in this report. For instance, whereas the ordination shows overall inter-area similarity patterns, based on presence/absence data (i.e., species lists), the Appendix gives a precise listing of the five areas most similar to a given area, based on more information (i.e., quantitative survey data).

The ordination (Fig. 2a) indicates that areas north of Wisconsin's tension zone (as described by Curtis 1959:15) tend to have similar bird communities, and that southern areas tend to have similar bird communities. One edge of the ordination consists of southern prairie and marsh areas, characterized by the presence of various sparrow species, while the opposite side consists of northern mesic or wet-mesic forest areas characterized by an abundance of wood warblers (Fig. 2b). Between these two general types are found the southern forests, dry northern forests, and other community types. In general, the areas separate along a gradient on the ordination, from left to right, of increasing forest cover and increasing northern affinities.

TABLE 9. Bird species of special status in Wisconsin.

Endangered	Threatened	Watch
*Double-crested cormorant	*Prairie chicken	*Common loon
*Bald eagle	*Cooper's hawk	*Red-breasted merganser
*Osprey	*Red-shouldered hawk	*Great blue heron
Peregrine falcon	*Great egret	*Black-crowned night heron
*Common tern	*Loggerhead shrike	*Caspian tern
*Forster's tern		*Harrier
*Piping plover		*Upland sandpiper
Barn owl		*Bluebird
		*Black tern
		*Flicker
		*Dickcissel
		*Grasshopper sparrow
		*Vesper sparrow
		*Field sparrow
		Yellow rail
		*Sharp-tailed grouse
		Merlin
		*Black duck

*Species recorded on at least one survey.

TABLE 10. Wisconsin breeding birds not encountered in the natural and Scientific areas survey program, 1971-77.

Species	Summer Status*
1. Red-necked grebe	1 west, east
2. Eared grebe	1 irr.
3. American white pelican	1 irr.
4. Cattle egret	1 south, east
5. Yellow-crowned night heron	1 south, west
6. Northern goshawk	1 north
7. Peregrine falcon	1
8. Merlin	1 irr. north
9. Spruce grouse	1 north
10. Gray partridge	2 south, east
11. Wild turkey	1 central
12. Yellow rail	1 north
13. American avocet	1 irr.
14. Barn owl	1 southeast
15. Hawk-owl	1 irr. north
16. Long-eared owl	2
17. Short-eared owl	1 irr. central
18. Saw-whet owl	1 north, central
19. Western kingbird	1 west
20. Gray jay	1 north
21. Boreal chickadee	2 north
22. Bewick's wren	1 southwest, central
23. Northern mockingbird	1 south, central
24. Swainson's thrush	1 north
25. Bell's vireo	2 southwest
26. Cape May warbler	1 north
27. Orchard oriole	2 south, west
28. Rusty blackbird	1 irr.
29. Blue grosbeak	1 irr. south
30. White-winged crossbill	1 irr. north
31. Le Conte's sparrow	1 north, central

*From Barger et al. 1975. 1 = rare or casual; 2 = fairly common or uncommon; irr. = irregular.

TABLE 11. Mean dissimilarity values for 71 Wisconsin natural and Scientific areas based on standardized bird survey data.

	Area	Value		Area	Value
1.	Fourmile Island (25)	971	37.	Dewey Heights (17)	706
2.	Wisconsin Point (70)	856	38.	Moquah Barrens (42)	706
3.	Buena Vista Meadow (7)	842	39.	Douglas Grouse (19)	704
4.	Goose Pond (27)	836	40.	Flora Lake (24)	703
5.	Trout Lake Conifer (66)	830	41.	Blue River Cactus (6)	698
6.	Rice Lake (57)	817	42.	Cedarburg Bog Shrub (12)	695
7.	Spring Green (62)	816	43.	Finnerud Pine (23)	684
8.	West Shore (69)	793	44.	Lima Bog (38)	684
9.	Plum Lake (54)	784	45.	Kickapoo River (35)	680
10.	Pine Hollow (52)	782	46.	Necedah Managed (46)	680
11.	Quarry Prairie (55)	781	47.	Hulbert Creek (32)	678
12.	Necedah Natural (45)	773	48.	Dunbar Barrens (20)	677
13.	Cedarburg Bog String (11)	765	49.	Endeavor Marsh (21)	671
14.	Bark Bay (3)	763	50.	Newport Conifer (49)	669
15.	Marinette Beech (40)	763	51.	Sterling Barrens (63)	662
16.	Muskego Hardwoods (44)	763	52.	Dory's Bog (18)	658
17.	Muir Park (43)	762	53.	New Munster Bog (48)	657
18.	Plum Island (53)	759	54.	Black Tern Bog (5)	652
19.	Rock Island (58)	756	55.	Sander's Hardwoods (59)	646
20.	Comstock Marsh (16)	754	56.	Cedar Grove (14)	641
21.	Toft Point (64)	749	57.	Cactus Rock (8)	641
22.	Ottawa Lake Fen (50)	748	58.	Schmidt Maple (60)	637
23.	Lac du Flambeau (36)	742	59.	Fairy Chasm (22)	635
24.	Cedarburg Beech (10)	732	60.	Tellock's Hill (65)	635
25.	Newark Prairie (47)	732	61.	Kettle Moraine Fen (34)	634
26.	Cedarburg Bog Conifer (13)	723	62.	Fuller Tract (26)	631
27.	Renak-Polak (56)	721	63.	Hemlock Draw (28)	630
28.	Castle Mound (9)	719	64.	High Cliff (29)	628
29.	Chiwaukee Prairie (15)	718	65.	Jung Maple (33)	627
30.	Wyalusing Hardwoods (71)	718	66.	Pine Glen (51)	623
31.	Waupun Maple (68)	717	67.	Lilly Lake (39)	622
32.	Miscauno Cedar (41)	716	68.	Honey Creek (31)	620
33.	Avoca Prairie (2)	714	69.	Lawrence Creek (37)	612
34.	Scuppernong Prairie (61)	714	70.	Baxter's Hollow (4)	607
35.	Apple River (1)	708	71.	Vanderbloemen Bog (67)	586
36.	Holmboe Conifer (30)	707			

Several areas appear to be exceptions to this general rule (Fig. 2c). Area 52 is Pine Hollow, in Sauk County. It contains a hemlock relic on north slopes and cool drainages, surrounded by southern dry-mesic forest. Its "northern" position in the ordination can be explained by the presence of several northern bird species which are associated with the hemlocks (magnolia, blackburnian, and Canada warblers) and other northern species which are not directly associated with the hemlocks (winter wren, least flycatcher, and veery).

Area 59 (Fig. 2c) is Sander's Park Hardwoods in Racine County, 4 km (2-1/2 miles) from Lake Michigan. Its "northern" position can be explained by the presence of Canada, black-throated green, blackburnian, and parula warblers. However, this is a southern dry-mesic and wet forest, with no apparent northern vegetation affinities. Since all surveys were undertaken between 3 and 10 June, and since each of the northern species was found on only 2 of 6 years surveyed (usually as just a single individual), it may be that some or all of these birds were late migrants.

Baxter's Hollow (Area 4), Hemlock Draw (Area 28), Pine Glen (Area 51), and Honey Creek (Area 31) also contain northern plant community relics (Appendix) as well as some northern bird species such as Canada and blackburnian warblers and winter wrens. However, since all these surveys covered a wide variety of habitat types, most of which were southern, the relative importance of northern species is reduced in these areas, and overall southern affinities of the bird community are increased.

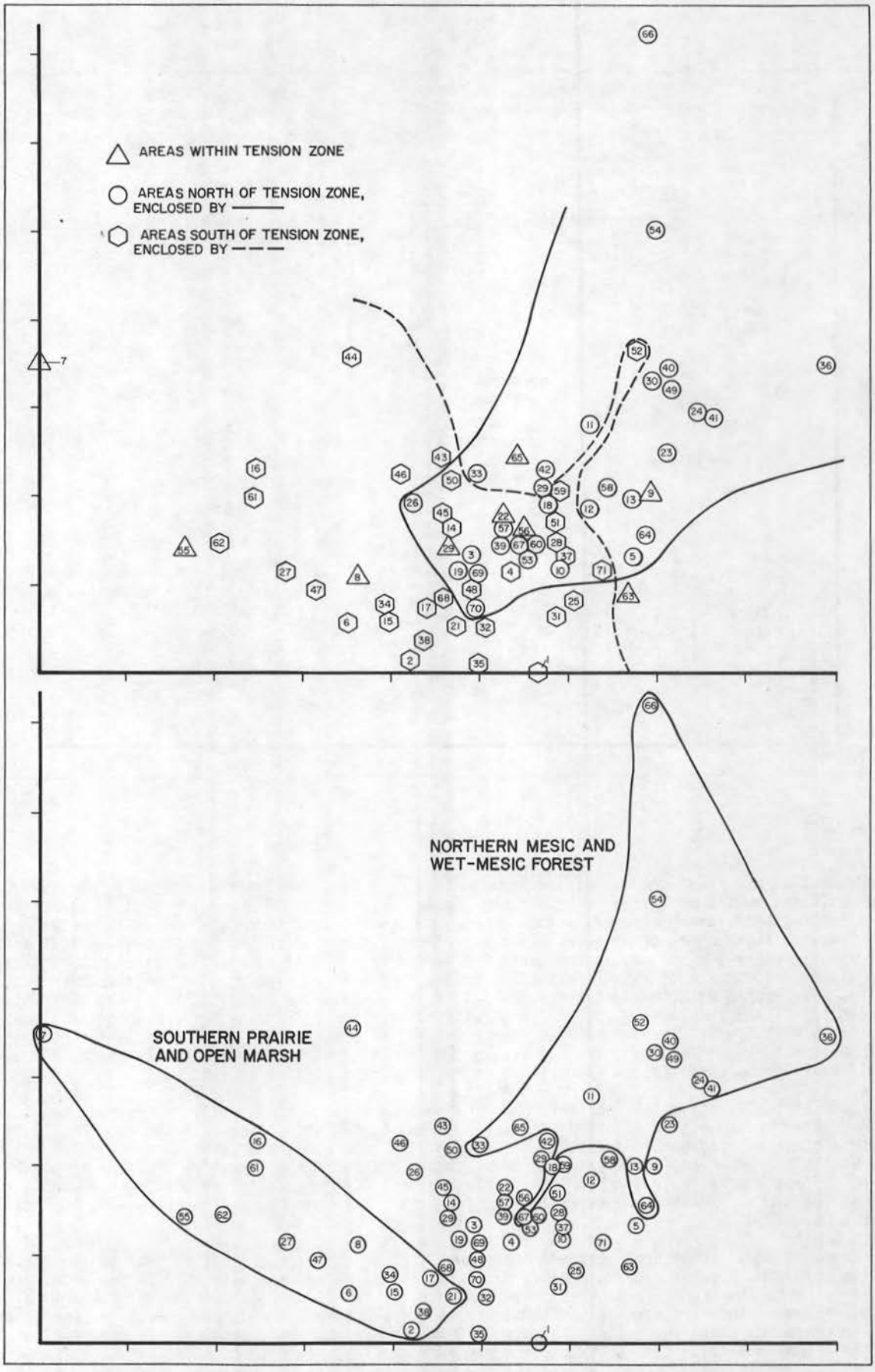


FIGURE 2. Ordination of 71 areas.

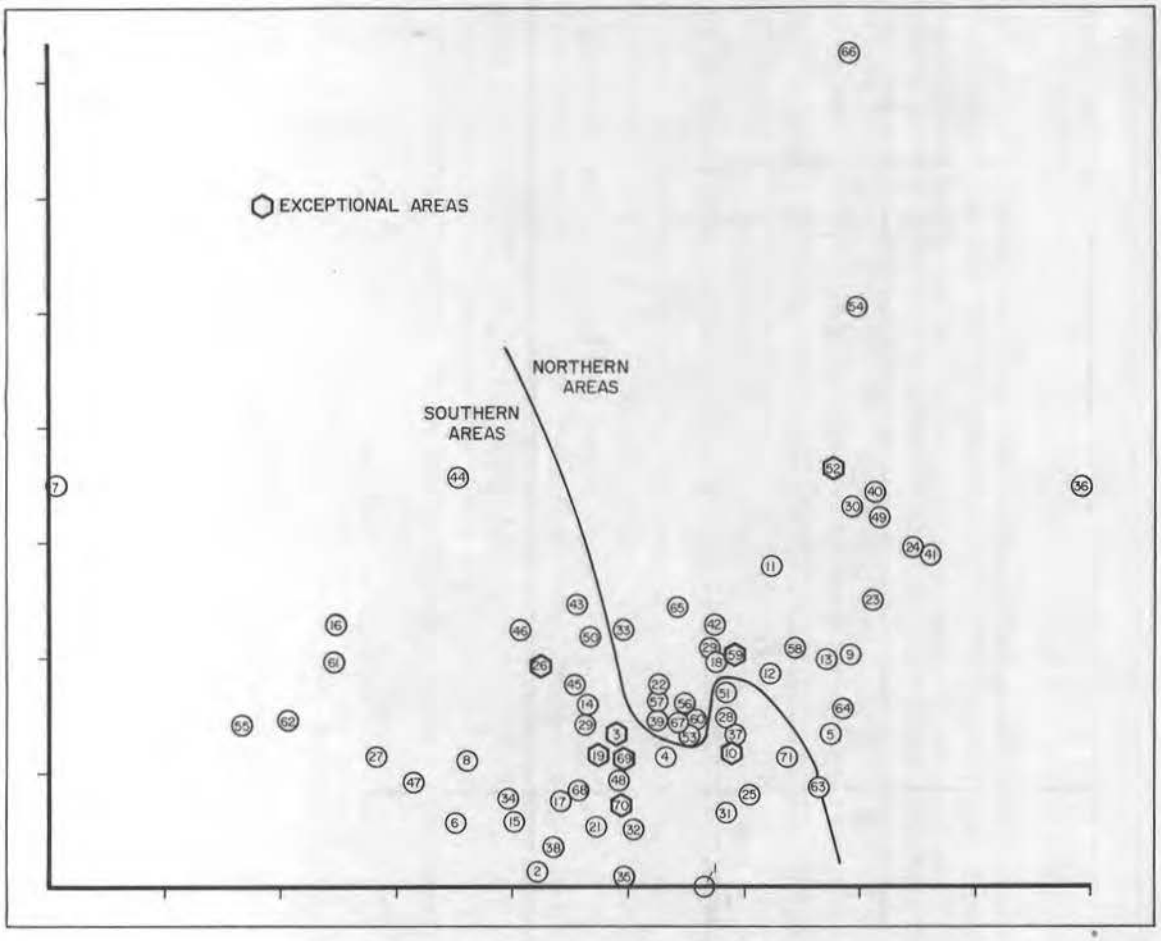


FIGURE 2. (Cont.)

Several areas that are located north of the tension zone or within the tension zone have relatively southern positions on the ordination (Fig. 2a,c). Cedarburg Beech Woods (Area 10) contains some northern species (red crossbill, brown creeper, winter wren), but most species there are common in southern forests, and some (Acadian flycatcher, cerulean warbler) are almost restricted to southern forests. This area is composed almost entirely of hardwoods and lacks the warbler fauna that most distinctively characterize the northern mixed deciduous-coniferous forests; the presence of such warbler species was the chief reason Pine Hollow was grouped with the northern areas. This circumstance is consistent with the observations of Kendeigh (1946) and Temple et al. (1979) that within the mixed deciduous-coniferous forest biome, breeding birds with southern ranges tend to choose patches of southern forest habitat, while northern species choose patches of more northern, generally coniferous habitat. The relatively southern position of Schmidt Maple Woods (Area 60) on the ordination can also be explained in this way.

The remainder of the "exceptional" northern and tension zone areas are basically unforested, or at least contain considerable amounts of open and edge area: Areas 3, 69, and 70 are lake shores; Area 19 is an open savanna of jack pine, oak, and aspen; Area 26 contains both woods and field; Area 53 is an island surveyed at its perimeter and including many edge, shore, and cliff species; Area 57 is an open inland marsh; Area 67 has a very large species list, including many field and edge species; Area 39 includes very few northern bird species, and several field and edge birds; and tension zone Areas 7, 55, and 8 are all prairie or meadow.

The bird communities of these open northern areas have greater southern affinities than do the bird communities of northern forest areas, because Wisconsin field, marsh, and edge bird faunas vary much less from south to north than forest avifaunas. For instance, of the 12 sparrow species which breed in Wisconsin (excluding the rare species), 6 (50%) are relatively common throughout the state (Barger et al. 1975). These are the savannah, vesper, chipping, field, swamp, and song sparrows. In contrast, only 7 (29%) of 24 breeding warbler species (excluding the rare species) occur throughout the state (Barger et al. 1975), and 5 of these (golden-winged, yellow, chestnut-sided, yellowthroat, and redstart) are basically edge species.

In summary, two gradients appear to be present in the ordination: one is dictated by the number of open-country species in a survey area (open-country species tend to be geographically ubiquitous); the other is dictated by the number of truly northern bird species in a survey area (truly northern bird species tend to be associated with closed coniferous or mixed forests). One representation of this double gradient is given in Figure 3.

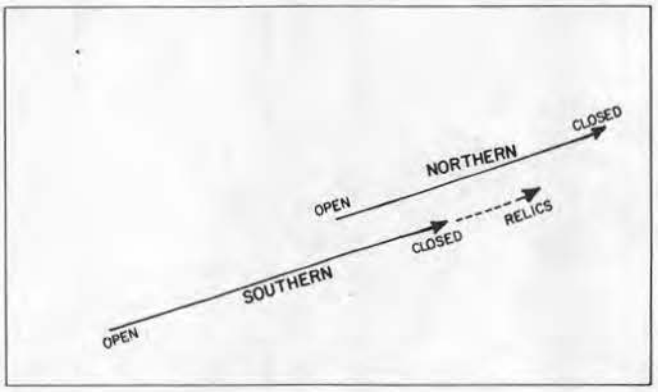


FIGURE 3. Habitat gradients in ordination.

Patterns of abundance for several species on the survey areas are illustrated in Figure 4. The graph for each species was constructed by plotting the species' standardized value for each survey area, in decreasing order of rank. For example, the eastern pewee's highest standardized value (Fig. 4a) was 9.2% (in Castle Mound Pine Forest), its second highest standardized value was 7.9% (in Cedarburg Beech Woods), its third highest value was 6.1% (in Pine Hollow), and so on to its 53d highest value, which was nearly zero. Since the pewee occurred on only 53 areas, its curve intersects the horizontal axis at 54. Curves with gentle slopes which extend far along the horizontal axis thus represent species which could be considered "habitat generalists": that is, species which are found on many areas, but which are generally not very abundant in any single area. The pewee and crested flycatcher both fit this description. Curves with steep slopes which do not extend far along the horizontal axis represent "habitat specialists": species which are found on only a few areas, but where found are sometimes abundant. The acadian flycatcher is an example of such a species.

The shapes of these curves are largely a function of the kinds of areas sampled. That is, if dry prairies had been surveyed, in place of many of the wooded areas surveyed, the western meadowlark (Fig. 4c) might have appeared to be more of a generalist and the pewee a specialist, rather than vice versa. We can only make interpretations with reference to the set of areas or habitats surveyed; the graphs do not enable us to make specific statewide bird species-habitat correlations. This limitation is one incentive for defining more clearly and specifically the set of survey areas. The graphs, and indeed this entire report, would be easier to interpret if they presented data from a stratified sample of all Wisconsin habitat types, or data from all designated state Scientific Areas.

Also, as suggested above, a literal interpretation of Figure 4 is warranted only to the extent that the species graphed together are of equal detectability. That is, one species might appear more abundant than another only because it is easier to detect in the field.

Despite these reservations, Figure 4 is a useful aid in discussing the ecological behavior of individual bird species. In the following discussion, after each species name is a list of the areas in which that species achieved its highest standardized values. These areas are listed in order of decreasing standardized value and correspond to the first several points on the curve for each species.

FLYCATCHERS (Fig. 4a)

Eastern pewee. (Castle Mound, Cedarburg Beech, Pine Hollow, Pine Glen, Wyalusing Hardwood, Lilly Lake, Schmidt Maple): This species occurred on almost all areas that included deciduous woodland habitat. It achieved its highest values in relatively mature oak-pine, oak, and maple-beech woods where surveys did not include open areas.

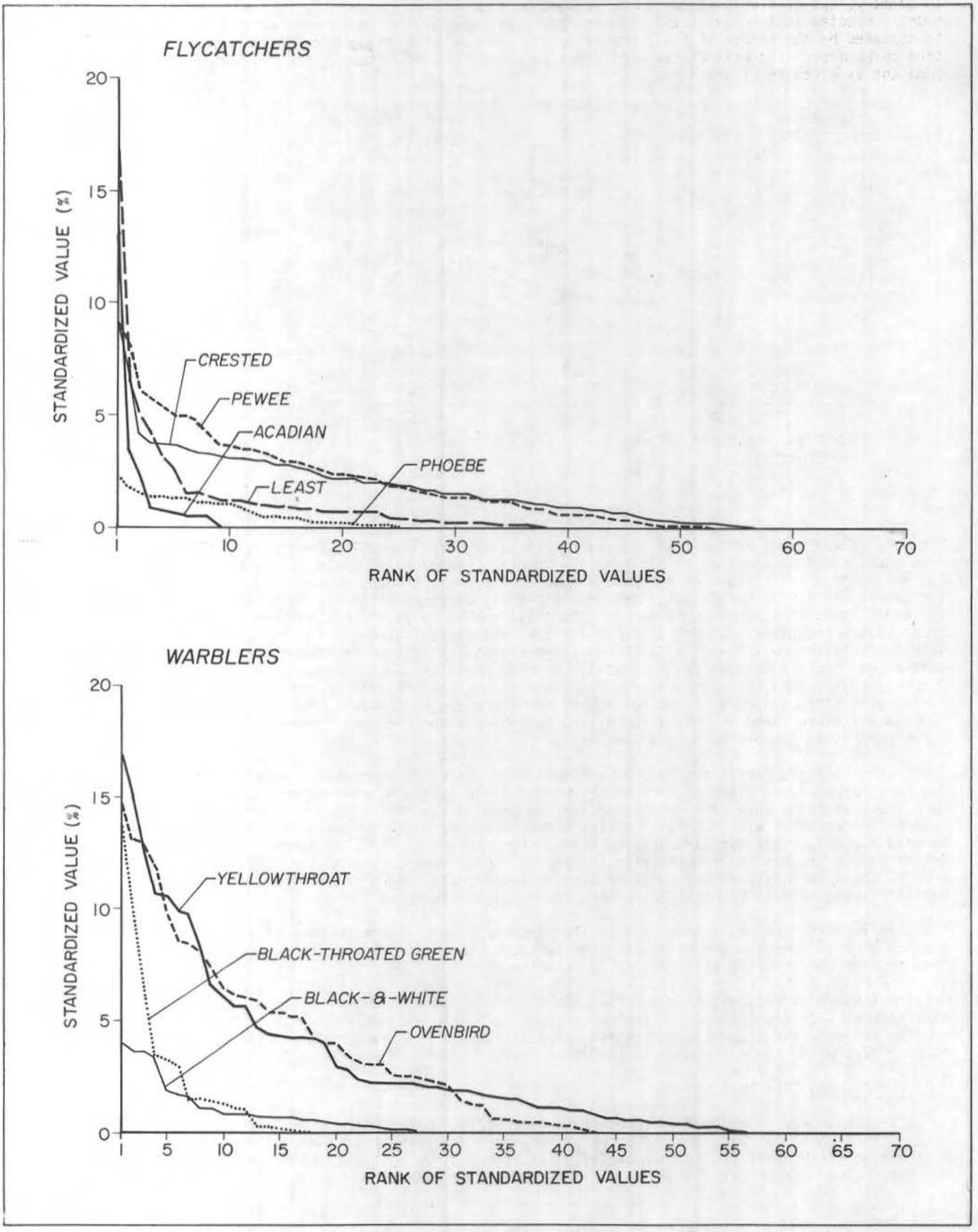
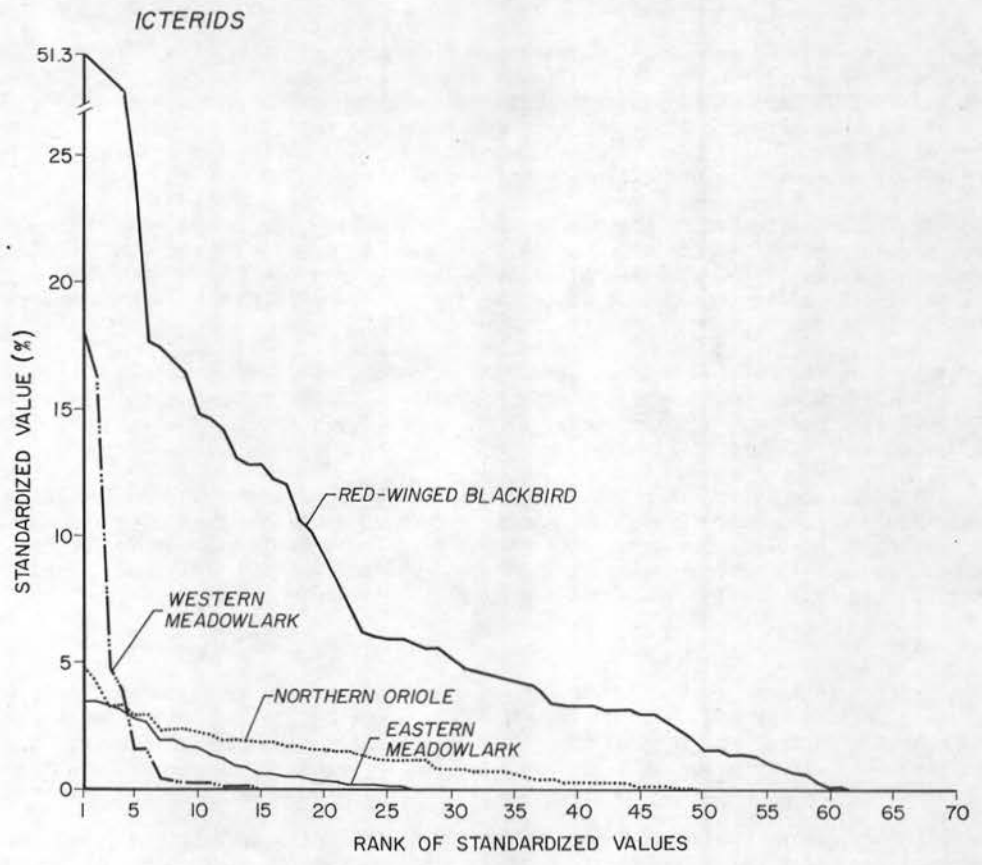


FIGURE 4. Patterns of abundance for several species on survey areas.



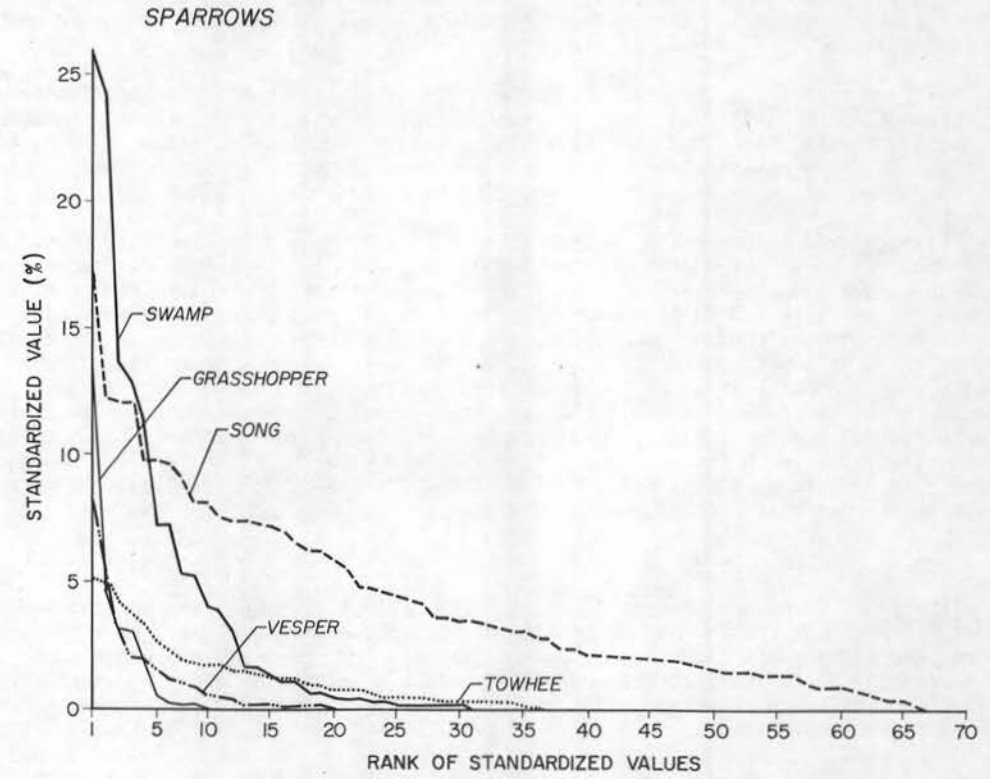


FIGURE 4 (Cont.)

Great crested flycatcher. (Renak-Polak, Necedah Oak-Pine Natural, Lilly Lake, Lawrence Creek, Cedarburg Beech, Sander's Park): The crested was found on more areas than the pewee, for it occurred not only in woodlands but also in more open areas, such as Cedarburg String Bog, Dewey Heights Prairie, and Kettle Moraine Fen and Low Prairie. Whereas this species often feeds in or above the canopy in forested areas, it also feeds in open areas from the wood's edge, and unlike the pewee it may even feed far out in unforested areas, perching on scattered saplings or trees.

Least flycatcher. (Marinette Beech, Holmboe Conifer, Pine Hollow, Moquah Barrens, Finnerud Pine Forest): The species was present on more than half of the areas surveyed, but was most abundant in stands of northern mesic forest. The actual habitat type used by this species in each area is not known, for each of the areas listed above includes at least two distinct forest types. In Pine Hollow the least flycatcher avoided hemlocks and occurred in oak-red maple forest.

Acadian flycatcher. (Pine Hollow, Hemlock Draw, Wyalusing Hardwood, Honey Creek, Baxter's Hollow, Kickapoo River): The acadian was most abundant in Baraboo Hills stream gorges (especially in stands of maple and hemlock) but also occurred in other areas of mesic deciduous forest, such as Cedarburg Beech Woods, Wyalusing Hardwood Forest, and Lilly Lake.

Eastern phoebe. (Kickapoo River, Pine Hollow, Necedah Oak-Pine Managed Area, Hemlock Draw, Trout Lake Conifer Swamp, Honey Creek, Pine Glen): The phoebe occurred mostly in areas with shaded sandstone cliffs, a common nesting substrate. Its occurrence in other areas is evidently due to the presence of nearby buildings or bridges. It never attained a high standardized value in this study, presumably because of its specialized nest site requirements and a relatively large territory size.

WARBLERS (Fig. 4b)

Common yellowthroat. (Ottawa Lake Fen, Muir Park, Cedarburg String Bog, Endeavor Marsh, Avoca River Bottom Prairie, Kettle Moraine Fen and Low Prairie, Cedarburg Shrub Bog): The yellowthroat occurred on 56 areas. It was absent from dry prairies and from the forest interior. Although present in many open, shrubby, and edge areas, it was very abundant in most fens, shrub swamps, and low meadows and prairies. It was the most abundant and most ubiquitous of all the warblers in the areas surveyed (Table 8).

Ovenbird. (Cedarburg Beech, Marinette Beech, Castle Mound Pine Forest, Miscauno Cedar Swamp, Lac du Flambeau Pines, Plum-Star Lakes Hemlocks): The ovenbird was nearly as abundant as the yellowthroat overall (Tables 5, 8) but occurred in completely different habitat types. Like the pewee, it occurred in nearly all forested stands, but unlike the pewee it tended to achieve its highest values in beech forests and in northern forest types.

Black-throated green warbler. (Plum-Star Lakes Hemlocks, Marinette Beech, Newport Conifer-Hardwoods, Holmboe Conifer Forest, Toft Point): This species was an important constituent of the bird communities only of northern mesic forests with mixed hemlocks, beech, and/or sugar maple. It appears to be a characteristic species of this habitat type, as it was important in nearly all such areas surveyed. It was present in lower numbers in some northern wet-mesic forests and areas of large pines.

Black-and-white warbler. (Flora Lake, Cedarburg Shrub Bog, Cedarburg Conifer Bog, Trout Lake Conifer Swamp, Cedarburg String Bog, Miscauno Cedar Swamp, Dory's Bog): This species had a very apparent preference for northern wet and wet-mesic forest, although it was never recorded in high numbers even in those areas. It was recorded sporadically in northern mesic forest and various pine community types, and was often found in stream gorges containing conifer relics in the Baraboo Hills. Despite the observations of other authors (e.g., Robbins et al. 1966; Barger et al. 1975) that this species is a common breeder in deciduous forests of eastern North America, the Scientific Areas survey data strongly suggest that during the breeding season the black-and-white warbler is largely restricted to areas north of the tension zone and generally to conifer or conifer-hardwood forest types. The only birds recorded from purely deciduous forest types were 1 individual each from Lawrence Creek and Cedar Grove. De Jong (1976) found this species occasionally in lowland deciduous forests of southern Wisconsin, a habitat which deserves more intensive sampling in the Scientific Areas bird survey program.

ICTERIDS (Fig. 4c)

Red-winged blackbird. (Bark Bay, Newark Prairie, Avoca River Bottom Prairie, Scuppernong Prairie, Lima Bog, Comstock Marsh): The redwing may be considered the most abundant bird on the 71 survey areas. More redwings were recorded per year than any other species, and the species was present on 61 of the 71 areas (Table 8). Figure 8 indicates that the redwing tended to be either abundant or absent from individual areas, although the relative abundance of this species is certainly exaggerated somewhat because the redwing is very conspicuous.

This species reached its highest standardized values in low meadows and prairies, sedge-sphagnum bogs, and shrub carrs, especially in the southern part of the state and along the Great Lakes shores. In such areas it commonly composes more than 15% of all birds encountered, and may compose as much as 50%, e.g., at Bark Bay. The species also occurred in marshes, various open areas with scattered shrubs, and evidently woods edge.

Western meadowlark. (Spring Green, Buena Vista Prairie and Meadow, Renak-Polak Maple-Beech, Quarry Prairie, Blue River Cactus and Dunes, Scuppernong Prairie): This species attained its highest values in dry prairies, often where savannah, vesper, or grasshopper sparrows were present. It was also found in Dunbar Sharptail Barrens and evidently in surrounding fields or perhaps the woods edge on a few surveys of forested areas.

Eastern meadowlark. (Scuppernong Prairie, Cactus Rock, Fuller Tract, Avoca River Bottom Prairie, Newark Prairie, Chiwaukee Prairie): This species attained its highest values in low meadows and prairies, and unlike the western meadowlark tended to be found along with red-winged blackbirds, common yellowthroats, song sparrows, and bobolinks. It was also found in oldfield habitats, dry prairies, the small Dewey Heights goat prairie, and agricultural fields surrounding forested survey areas.

The eastern meadowlark thus appears more generalized than the western in its selection of habitats in Wisconsin. It occurred on twice as many areas, including all but 3 of the 14 areas that contained westerns. However, the western meadowlark achieved much higher maximum standardized values. This may be due to the fact that westerns tend to occur in drier, sparser vegetation with fewer shrubs than easterns. Such areas are generally less diverse and less productive than the habitats of eastern meadowlarks. Hence fewer individuals of other species are present, and the western meadowlark composes a higher proportion of the total number of birds occurring on these areas.

Northern oriole. (High Cliff Park, Tellock's Hill Woods, Dory's Bog, Necedah Oak-Pine Managed Area, Apple River Canyon, Lawrence Creek): The ecological distribution of this species among the survey areas is not clear, for the bird was almost equally important in a great variety of forest, forest edge, and open country areas. This diversity is probably best explained by the fact that the northern oriole appears to prefer mixtures of trees and open areas but will venture into woods, especially if the woods are relatively small, contain openings, or are on steep slopes. The choice of steep wooded slopes was noted in southern Wisconsin forests by Bond (1955) and may be a response to the increased "canopy edge" which occurs on such slopes. Of the 6 areas in which the northern oriole was most important, 3 contained rather steep slopes. It may also be significant that 4 of these 6 areas were adjacent to or included permanent streams or lakes.

SPARROWS (Fig. 4d)

Swamp sparrow. (Lima Bog, Ottawa Lake Fen, Rice-Thunder Lakes Marsh, Newark Road Prairie, Cedarburg String Bog, Cedarburg Shrub Bog, Kettle Moraine Fen and Low Prairie): This is a characteristic species of bogs, deep marshes, wet prairies, and fens. Only the redwing regularly achieves higher standardized values, and the redwing achieves them in these same types of habitat. In fact, the redwing achieves a high value in nearly every area in which the swamp sparrow does so. The Cedarburg Bog areas are an exception, indicating that whereas the redwing requires relatively large open areas for breeding, the swamp sparrow also uses small, relatively open, wet pockets amid shrub and tamarack swamp. Song sparrows and common yellowthroats are also usually abundant in areas where the swamp sparrow attains high values.

Song sparrow. (Kettle Moraine Fen and Low Prairie, Dory's Bog, Muir Park, Schmidt Maple Woods, Douglas County Grouse Area, Hulbert Creek, Cedarburg String Bog): The song sparrow was the second most ubiquitous species, occurring on 66 of the 71 survey areas (Table 8). It occurred whenever a survey included woods edge or areas with scattered shrubs or trees, although it attained low values or was absent when such areas were very dry, such as at Spring Green and Dewey Heights prairies. It was most abundant in bogs and wet areas with scattered shrubs; the common yellowthroat was a constant associate of the song sparrow in these habitats. Other species commonly attaining high values in these kinds of areas include the redwing, catbird, white-throated sparrow, Nashville warbler, and swamp sparrow.

Grasshopper sparrow. (Spring Green, Fuller Tract, Blue River Cactus and Dunes, Muir Park, Quarry Prairie): This species occurred on 9 areas and was most abundant in dry prairies. It also occurred sporadically in moister areas such as Muir Park and Chiwaukee Prairie, although the local habitat type where the bird was actually found is not known. In recent years the grasshopper sparrow has experienced a decline in numbers, both continent-wide (Arbib 1978) and in Wisconsin (Robbins 1977). Many observers appear to agree that the prime cause of this decrease is the destruction of grassland habitat (Arbib 1977), although the species' decline has not been investigated in Wisconsin. Continuing surveys on selected Scientific Areas where this species is common should be helpful to such an investigation by providing baseline data from relatively stable favorable habitats.

Vesper sparrow. (Blue River Cactus and Dunes, Necedah Oak-Pine Natural Area, Douglas County Grouse Area, Fuller Tract, Dunbar Sharptail Barrens, Spring Green): This species attained its highest standardized values on many of the same areas as did the grasshopper sparrow, but was more strongly associated with sand prairie or barrens areas than was the grasshopper. The vesper was also found on a larger number of areas, in part because it was sometimes recorded from agricultural fields adjacent to survey areas, or from woods edges bordering such fields. Common associates include the mourning dove, field sparrow, grasshopper sparrow, and clay-colored sparrow.

Robbins (1977) recognized a population decline in vesper, field, and grasshopper sparrows in Wisconsin. This recognition has resulted in their inclusion on the list of state "watch" species (Table 9). The fact that the three species tend to be abundant on the same areas (the field sparrow attained its highest values at Spring Green, Necedah Oak-Pine Natural Area, and Blue River) suggests that the destruction of breeding habitat may be an important cause of the three species' decline.

Rufous-sided towhee. (Necedah Oak-Pine Managed Area, Douglas County Grouse Area, Dunbar Sharptail Barrens, Cedar Grove Game Refuge, Moquah Barrens): This shrub- and edge-inhabiting species never achieved very high standardized values, although it was present on half of the survey areas. The towhee, perhaps more than any other common species, showed a distinct peak in relative abundance in jack pine-aspen savanna and barrens. Four of the 5 survey areas listed above are of this type. Common associates in these areas include the brown thrasher, clay-colored sparrow, bluebird, field sparrow, and chipping sparrow.

Anyone wishing to look more closely at the survey results may obtain a complete table of standardized values (205 species X 71 areas) from the Scientific Areas office in the Department of Natural Resources, Madison.

Adequacy of Methods in Attaining Program Objectives

The various objectives of this breeding bird survey program place a variety of demands on the operation of the program. These demands are sometimes conflicting, and some of them are more difficult to meet than others. Thus, the remainder of this report will discuss the adequacy of present field methods in attaining each objective and will suggest changes in methodology which might most increase the program's chances of attaining each objective. The relative merits of the program's objectives will also be discussed and recommendations made which should maximize the benefits of the program while minimizing the amount of effort involved in collecting, handling, and analyzing the survey data. Both inadequacies and strong points of the present program have been well demonstrated by the analysis of the first 7 years of data.

The first objective of the survey program is to supply basic inventory information. This is probably the easiest objective to accomplish. It will be facilitated by making surveys as thorough as possible, perhaps making more than one visit in a season, and by keeping surveys within the boundaries of the Scientific Areas or proposed Scientific Areas. Surveys might also be undertaken at other times of the year since some areas may have high value as wintering or migration habitat (e.g., wetlands). If a simple, standardized field technique is eventually adopted, cooperators should be encouraged to collect as much additional survey information as possible. Comments regarding evidence of breeding (e.g., nests, fledglings, adults carrying food or scolding the observer, etc.) are most important, as are comments regarding the probable breeding status (i.e., migrant or breeding) of unusual species.

Since only 55 of the present 154 (36%) designated Scientific Areas had been surveyed through 1977, the inventory is far from complete. However, the survey data provided in this report constitute important inventory information, although for some stands its value is reduced by two major factors: (1) surveying occurred beyond the Scientific Area boundaries; and (2) insufficient descriptions of survey methods and routes were supplied, to the extent that one cannot determine how thoroughly, on what date, or which part (if any) of the area has been surveyed.

The second objective, to monitor bird populations, requires that the same survey methods be used each year on any area. Thus the cooperator should record the method and route such that his or her successor can repeat it, and should take a potential successor along on a survey.

Surveys should be kept within the Scientific Area boundaries, and information on areas outside Scientific Area boundaries reported separately. Differences in survey results between different years can then be analyzed with respect to changes on the area itself. This constraint would also permit the evaluation of the effects on a Scientific Area (as represented by bird population changes) of changes in the surrounding environment. For the sake of analysis, it is best to consider Scientific Areas as discrete units in which data of all sorts can be collected and correlated.

Cooperators should comment on survey results that indicate a major change in bird diversity or abundance; that is, they should indicate whether or not they believe that the indicated change is real, and, if they do, state the possible reasons for this change. The significance of changes in survey results is more easily determined when large numbers of birds are involved. Thus it will help to use extensive, but easily repeatable, surveys, and repeat them each year, or as often as possible.

The value of these surveys in monitoring regional population trends is probably limited, because of the small numbers of birds encountered in the surveys and the difficulty of standardizing field methods. The U.S. Fish and Wildlife Service Cooperative Breeding Bird Survey program (Robbins 1977) is probably a much better monitor, although, since it relies on randomly sited roadside counts, it may provide insufficient data on deep woods species or other species with restricted distributions (e.g., acadian flycatcher,

blue-gray gnatcatcher, various waterfowl, gulls, and terns). If Scientific Area surveys are to be useful in monitoring regional population trends for species with restricted distributions, or in monitoring overall environmental changes in groups of Scientific Areas, some standardization of survey methods is desirable. Although standardization may be a temporary inconvenience to cooperators, it should be beneficial in the long run. This will be discussed again later.

No attempt was made in this program period to detect population trends, because of the short period (and consequently small numbers of birds) involved, but population trends could certainly be studied in the future with certain areas.

The third objective of the program is to correlate bird species with habitat type. To accomplish this objective it would be desirable, and maybe necessary, to quantify aspects of the vegetational structure and composition in any area, as well as to establish criteria for typing. In most cases this process would involve evaluating the vegetation of an area, separating the area into habitat types, and surveying each habitat type separately. The objective appears impracticable, because of the limited funding of the Scientific Areas program, the amount of time and effort required, and the extreme patchiness of some areas.

The data available, however, do indicate very general bird-habitat relationships. The data are also interesting regarding the presence of northern bird species in relics of northern vegetation south of the tension zone. A separate, well-planned study on Scientific and other natural areas could provide valuable information on habitat preferences of Wisconsin birds and ecological relationships between bird communities. For such a study, a well-coordinated network of volunteers might conduct the surveys. Unless such a study is undertaken, the survey program's efforts would probably be best spent in attaining other objectives.

The fourth objective, to provide additional information on endangered and threatened species, should be adequately achievable with the present methods. Cooperators must be given the most up-to-date lists of endangered, threatened and "watch" species as these lists change. Intensive surveys, surveys undertaken at other times of the year, and the inclusion of more Scientific Areas in the survey program will help meet this objective.

Breeding bird surveys could be used to a greater extent than they have been in evaluating natural areas--the fifth objective. If we assume that each native bird species is adapted to a certain set (or certain sets) of native environmental conditions, and given that the main goal of the SAPC is to preserve representatives of all types of native biotic communities in the state, then breeding bird data might be very useful in evaluating existing and potential Scientific Areas. Perhaps attention should be given to including breeding areas for as many native bird species as possible. (An example of how bird survey data can contribute to the evaluation of natural areas can be seen in the relics of coniferous forest found in southern Wisconsin. The presence of northern bird species in a relic such as Pine Hollow suggests a relatively "intact" northern forest ecosystem and may increase the area's preservation priority.) As a better understanding is gained of species' distributions, habitat requirements, and interactions, the value of survey data in evaluating sites will increase.

If the survey program is to be used to aid in evaluating natural areas, it is essential that:

(1) Surveys be kept strictly within the area boundaries. Data obtained outside these boundaries should be recorded separately, and can be compared with the data obtained within the boundaries, or used to evaluate adjacent areas as possible additions to the Scientific Area.

(2) All Scientific Areas be surveyed.

(3) Survey techniques be standardized as much as possible, to facilitate comparisons between areas.

(4) Areas be surveyed before acquisition or designation to aid in priority ranking.

(5) A method be developed by which survey data can be interpreted and used in an evaluation scheme.

The methods used to analyze and summarize data for this report could be used in an evaluation scheme. In evaluating an area, one might consider:

(1) The abundance of the constituent species within the state as a whole

(2) The abundance of the constituent species within the system of Scientific Areas

(3) The presence of species with populations that are declining statewide

(4) The bird species diversity

(5) The presence of non-native species

(6) The area's mean dissimilarity to other Scientific Areas (see Table 11), or its similarity to any particular area or set of areas

(7) The stability of the habitats within the area on which the bird species rely.

Recommended Adjustments in the Survey Program

In general, the Scientific Areas breeding bird survey program should de-emphasize the objective of detecting bird habitat preferences, unless some method is devised which allows observers to record survey data by clearly recognizable habitat types. An effort should be made to survey as many areas as possible at least once, and cooperators should be encouraged to keep the surveys within the confines of the natural area or designated Scientific Area. Data from outside these boundaries are desired also, but should be recorded separately.

Cooperators should be asked to use a standardized survey technique, when this is practicable. Ideally, such a technique would:

(1) Be simple, easy to follow, and roughly similar to methods used by most observers so far.

(2) Minimize observer differences, requiring no specific expertise such as the ability to estimate distances or angles to observed birds.

(3) Be flexible enough to be usable in all habitat types.

(4) Allow direct comparison of results from different surveys.

No technique will embody all of these points. Differences in the skill and capabilities of the many observers is a problem of any volunteer program, one which can best be minimized by choosing very competent observers. Encouraging observers to keep the same survey areas in successive years also increases their relative expertise on these areas. This advantage must be balanced with the need to obtain survey data from new areas.

A more important problem is that of devising a single technique which can be used on terrestrial, marshland, and lake or shore areas.

The following method seems to meet this criterion to the greatest degree possible. It is roughly the same method as that used by Bond (1957) in southern Wisconsin forests, by Beals (1960) in mixed conifer-hardwoods on the Apostle Islands, and by several of the cooperators in this program.

(1) The observer walks 5 minutes, recording all birds seen or heard, then stands 5 minutes, again recording all birds seen or heard. These walk/stand periods are repeated until the survey is complete.

(2) No individual bird should be counted more than once.

(3) Brief stops may be made during walking periods to look for a bird, record data, etc.

(4) The distance covered during each walking period will vary between observers and areas but should be 100-200 m (110-220 yd).

(5) The placement of transects is up to the observer. In large tracts, a single line or U-shaped path (returning the observer to near the starting place) may work best. In other areas, observers might choose parallel transects spaced so that an individual bird will not be likely to be encountered on adjacent transects. Transects should be spaced at least 180 m (200 yd) apart in forested areas and at least 250 m (275 yd) apart in open areas. Other observers may decide to follow roads or trails, although one should be careful not to oversample roadside habitat.

(6) If practicable, the entire Scientific Area should be surveyed. If not, transects should be placed so that the observer surveys a representative sample of the total habitat within the Scientific Area.

(7) The survey should be restricted to the period beginning 1/2 hour before sunrise and ending 4 hours after sunrise. The nearer to sunrise the survey is conducted, the better.

(8) The survey route should be marked clearly on the map provided and should include the locations of stops, and the method should be described. A route should be chosen that will be easy to duplicate.

(9) Surveys should be conducted between 1 June and 4 July (preferably between 5 June and 30 June).

(10) If birds are observed high overhead, and appear to be simply passing over the area, e.g., crows, geese, or blackbird flocks, record this observation in the comments rather than in the survey results. Observations of any swallows, hawks, or other birds that may actually be hunting or feeding over the area should be included in survey results.

(11) Young birds born during the current season should not be included in survey results, but the information should be included as a comment. If young of a species are found, but their probable parents are not, the young should be counted as one bird. This is particularly important with waterfowl and gallinaceous birds.

(12) Species observed on the area during the breeding season, but not during a survey, should be marked with an X on the survey form. The observation date should be included when possible.

(13) In the comments section of the survey form, any pertinent observations on unusual species should be noted, and evidence of breeding for any species, such as nests, adults carrying food, fledged young, etc., should be included. Any major changes in the survey results from previous years should be commented on.

The above method may be impracticable in areas where walking is very difficult (e.g., certain marshes, bogs, or wet forests) or for workers who must record data in a different manner for an ongoing project. Observers who wish to extend the survey period beyond 4 hours should perform a simple standard survey early in the morning, and record data separately during the remainder of the day. Data from long, thorough surveys are valuable, but it may be difficult for subsequent observers to reproduce such surveys.

CONCLUSION

The data summarized in this report are the result of many hours of volunteer field work by cooperators throughout the state, and are valuable in developing an understanding of bird community relationships within the Scientific Areas system. Some relationships have been elucidated in this report.

The analysis has revealed major shortcomings in some of the data: poor descriptions of survey methods and routes; surveying beyond the Scientific Area boundaries; lack of standardization of survey methods. As these problems are reduced or solved, and as more areas are surveyed, the ability of this program to inventory, monitor, and evaluate natural areas will increase. The program could be used in determining ecological associations of birds as well as the habitat preferences of individual species, although making the program serve these functions would require additional effort on the part of both the cooperators and the Scientific Areas staff. The program's importance as a tool for evaluating the quality of natural areas appears promising, and will be enhanced as criteria for and methods of evaluation are developed, and as information on bird distribution and habitat relationships from other studies is assimilated into this program.

The techniques used to summarize, analyze, and illustrate the survey results in this report provide a format for future work with Scientific Areas breeding bird survey data. These techniques, along with the suggested program changes and the continued cooperation of the many dedicated volunteers, could allow the Scientific Areas breeding bird survey program to become a focal point in developing an understanding of relationships among the breeding bird communities of Wisconsin.

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APPENDIX

Description of habitat, survey methods and bird communities of 71 Wisconsin Scientific and natural areas surveyed during 1971-77.

For each area, the Appendix provides the following information: (1) a brief, qualitative habitat description; (2) the 5 most similar areas to that area based on the dissimilarity index; (3) the 5 most common bird species in the area, based on standardized values; (4) those species which attained higher standardized values in this area than in any other area; (5) the average dissimilarity value between this area and all 70 others; (6) the average number of individual birds recorded per survey; (7) a brief description of survey methods, including date, duration, number of species recorded, and names of observers for each survey; and (8) additional comments on breeding activities or unusual observations.

KEY

S.A.	=	Designated State Scientific Area.
MOST SIMILAR AREAS	=	5 most similar areas according to dissimilarity index based on quantitative data. Number in parentheses represents the area numbers; the 71 areas are numbered alphabetically. Number following this is the dissimilarity index value (possible range of values = 0-1,000).
MOST COMMON SPECIES	=	5 most common species, according to their standardized values. Numbers are the respective values for each species, expressed as a percentage of the total number of individuals of all bird species found on the area.
SPECIES REACHING MAXIMUM	=	Those species which made up a higher proportion of the bird community (i.e., attained a higher standardized value) in this area than in any other area. Numbers are the respective values for each species, expressed as a percentage of the total number of individuals of all bird species in that area.
DISSIMILARITY	=	The mean dissimilarity value between this area and all 70 others, based on quantitative data.
INDIVIDUAL BIRDS/SURVEY	=	Mean number of individual birds recorded on survey.
HOURS	=	Total time spent on survey, expressed in hours and minutes.
SPECIES	=	Total number of species recorded on survey.
COMMENTS	=	These generally regard bird-habitat relationships and evidence of breeding.

1 m = 3.3 ft
1 ha = 2.47 acres

AREA 1 = APPLE RIVER CANYON S.A.

St. Croix County T31N R19W Sec. 21, 28

Mile-long gorge, 50 m wide and 30-45 m deep. Cut in sandstone, dolomite and shale. Oak forest on upland to north, belt of prairie on tops of slopes, lichens and mosses on cliffs, northern mesic forest on north facing talus, and floodplain forest in bottom. 22 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Lawrence (37)	494	rough-winged swallow	22.6	Cooper's hawk	0.3
Baxters (4)	510	gray catbird	7.2	rough-winged swallow	22.6
Honey Creek (31)	535	American goldfinch	6.3		
Hemlock Draw (28)	557	ovenbird	3.4		
Vanderbloemen (67)	558	great crested flycatcher	3.4		

DISSIMILARITY = 708 INDIVIDUAL BIRDS/SURVEY = 167.0

COMMENTS: Has noted increase in northern oriole numbers in area.

METHODS: Walk in a zigzag manner down the stream. Count all birds heard/seen within 45 m to either side.

DATE	HOURS	SPECIES	OBSERVERS
9 June 1976	1:15	34	Craig Faanes
15 June 1977	1:30	51	" "

AREA 2 = AVOCA RIVER BOTTOM PRAIRIE S.A.

Iowa County T8N R2E Sec. 6

Expansive sandy terrace along Wisconsin River. Dry to moist, sandy prairie, interspersed with small linear wetlands, provides the most significant habitat of its type in a several state region. Floodplain forest on north part. 129 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Scuppernong (61)	300	red-winged blackbird	31.0	white-eyed vireo	0.3
Newark (47)	323	common yellowthroat	10.6		
Endeavor (21)	353	American goldfinch	8.4		
Lima Bog (38)	444	song sparrow	6.2		
Kettle M. (34)	454	bobolink	4.8		

DISSIMILARITY = 714 INDIVIDUAL BIRDS/SURVEY = 221.2

COMMENTS: Believes bobolinks decreased between 1972 and 1975, due to increased shrubbiness.

METHODS: Slow walk, partly outside scientific area. Follow trails some years and make zigzag route other years. Includes some woods.

DATE	HOURS	SPECIES	OBSERVERS
21 June, 6 July 1971	--	49	E. Batchelor, B. Vogelsang, M. Jaeger, C. Werner, D. Zerwick
24 June 1972	--	38	" "
20 June 1975	3:00	22	B. Vogelsang, E. Batchelor, C. Harper, R. Nilles
16 June 1976	3:08	24	" "
21 June 1977	2:50	24	" "

AREA 3 = BARK BAY S.A.

Bayfield County T51N R7W Sec. 35

Part of large wetland slough and frontal barrier beach on Lake Superior. Slough contains sedge-sphagnum bog, tamarack-spruce islands, mud flats, and fringing shrub thickets. 45 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Avoca (2)	458	red-winged blackbird	51.3	red-winged blackbird	51.3
Newark (47)	474	robin	6.6		
Scuppernong (61)	492	song sparrow	5.8		
Black Tern (5)	531	yellow warbler	4.3		
Lima Bog (38)	563	tree swallow	4.1		

DISSIMILARITY = 763 INDIVIDUAL BIRDS/SURVEY = 394.0

COMMENTS: Robin nests, redstart nest, mallard brood.

METHODS: Canoe sloughs. Make six 3-min stops in car along Highway 13.

DATE	HOURS	SPECIES	OBSERVERS
23 June 1976	4:05	42	W. Bielenberg, D. Verch, K. Patzoldt

AREA 4 = BAXTERS HOLLOW

Sauk County T11N R6E Sec. 29, 32, 33

Includes: Baraboo Hills gorge with northern dry-mesic forest; pasture and campground with shrubs and forest edge; southern dry-mesic forest; dense shrubby area logged in 1970.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Honey Creek (31)	288	gray catbird	6.0	turkey vulture	1.2
Hemlock Draw (28)	317	red-winged blackbird	5.1	golden-winged warbler	1.9
Vanderbloemen (67)	371	American redstart	5.1	blue-winged warbler	2.5
Pine Glen (51)	385	American goldfinch	4.0	yellow-breasted chat	0.1
Lawrence (37)	438	rose-breasted grosbeak	3.6		

DISSIMILARITY = 607 INDIVIDUAL BIRDS/SURVEY = 434.2

COMMENTS:

METHODS: Drive along road making regular stops, and walk through woods, pasture and campground. Includes part of Baxters Hollow Scientific Area.

DATE	HOURS	SPECIES	OBSERVERS
29 June 1971	2:00	60	W. Hilsenhoff
14 June 1973	2:30	62	"
26 June 1974	--	59	"
30 June 1975	3:40	61	"
9 June 1976	3:00	63	"

AREA 5 = BLACK TERN BOG S.A.

Vilas County T40N R6E Sec. 11

Typical quaking sphagnum bog with open water, surrounded by aspen, white birch and red pine on rolling uplands. 10 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Jung (33)	460	red-winged blackbird	14.7	gadwall	0.9
Hulbert (32)	499	black tern	11.7	black tern	11.7
Dory's (18)	514	song sparrow	8.0	pine siskin	0.3
Kettle Moraine (34)	514	American robin	5.5		
Newport (49)	518	veery	5.2		

DISSIMILARITY = 652 INDIVIDUAL BIRDS/SURVEY = 65.1

COMMENTS:

METHODS: Slow walk around bog.

DATE	HOURS	SPECIES	OBSERVERS
Various dates 1972	--	34	J. Capelli, M. Donald
26 June, 5 July 1973	--	39	" " , B. Larkin, M. Decker
12 July 1974	--	24	" , B. Thatcher
10 July 1976	3:00	13	" , J. Zappieri
5 July 1977	3:30	16	"

AREA 6 = BLUE RIVER CACTUS AND DUNES S.A.

Grant County T8N R1W Sec. 6

Flat sand prairie, large blow-outs with dune formations, and oak barrens. Bordered by Wisconsin River slough. 52 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cactus (8)	462	mourning dove	12.9	green heron	2.2
Vanderbloemen (67)	502	vesper sparrow	8.7	mourning dove	12.9
Fuller (26)	507	field sparrow	7.2	horned lark	1.2
Fairy Chasm (22)	526	blue jay	7.2	vesper sparrow	8.7
Necedah N. (45)	531	red-winged blackbird	5.6		

DISSIMILARITY = 698 INDIVIDUAL BIRDS/SURVEY = 106.4

COMMENTS:

METHODS: Walk through center of area.

DATE	HOURS	SPECIES	OBSERVERS
18 June 1975	1:10	34	W. Smith, R. Read
19 July 1976	2:10	30	M. Jaunzems, M. Meyers
18 July 1977	3:15	25	C. Cowles, M. Jaunzems

AREA 7 = BUENA VISTA PRAIRIE AND MEADOW S.A.

Portage County T22N R7E Sec. 26

Previously cultivated, flat to undulating grass meadow. Minor depressions with sedges, willows, bulrushes and introduced grasses. Quarry prairie part of S.A. surveyed separately (Stand 55). 32 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Quarry Prairie (55)	477	Savannah sparrow	17.9	kestrel	0.9
Kettle Moraine (34)	719	bobolink	16.2	rock dove	5.1
Scuppernong (61)	726	western meadowlark	16.2	bobolink	16.2
Chiwaukee (15)	726	brown-headed cowbird	8.5	western meadowlark	16.2
Spring Green (62)	743	barn swallow	6.8	Henslow's sparrow	2.6

DISSIMILARITY = 842 INDIVIDUAL BIRDS/SURVEY = 117.0

COMMENTS: Robin, rock dove, phoebe, catbird and starling associated with old schoolhouse and nearby trees.

METHODS: Walk a zig-zag through prairie, also parallel to road.

DATE	HOURS	SPECIES	OBSERVERS
9 June 1971	2:00	19	J. Hart

AREA 8 = CACTUS ROCK S.A.

Waupaca County T22N R14E Sec. 26

5-ha outcrop of granite, surrounded by croplands and some woods. Rock supports lichens, mosses, Opuntia, bluestems and other dry site pioneers. 8 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Vanderbloemen (67)	409	great blue heron	9.9	eastern meadowlark	3.4
Fuller (26)	420	blue jay	8.0		
High Cliff (29)	437	mourning dove	5.6		
Fairy Chasm (22)	458	brown-headed cowbird	5.6		
Blue River (6)	462	robin	5.2		
		common crow	5.2		

DISSIMILARITY = 641 INDIVIDUAL BIRDS/SURVEY = 53.3

COMMENTS:

METHODS: Walk along top of rock and part way up on rock, through middle of scientific area. Included birds not using scientific area, but seen or heard in adjacent areas or overhead.

DATE	HOURS	SPECIES	OBSERVERS
14 June 1971	1:40	30	K. Rill
11 June 1972	1:50	22	"
24 June 1973	2:00	30	"
11 June 1974	--	26	"

AREA 9 = CASTLE MOUND PINE FOREST S.A.

Jackson County T21N R4W Sec. 23, 24

180-ft. sandstone butte with northern dry mesic forest on NE slope (white and red pine with hardwoods), and northern dry forest on the SW slope (jack pine and oak). 32 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Miscauno (41)	398	ovenbird	13.3	hairy woodpecker	3.6
Pine Glen (51)	482	blue jay	12.1	eastern pewee	9.2
Hem Draw (28)	507	eastern pewee	9.2	pine warbler	8.5
Finnerud (23)	536	pine warbler	8.5		
Flambeau (36)	543	American robin	6.8		

DISSIMILARITY = 719

INDIVIDUAL BIRDS/SURVEY = 41.3

COMMENTS: Ruffed grouse broods.

METHODS: Walk along trail below mound, then to summit.

DATE	HOURS	SPECIES	OBSERVERS
13 June 1972	0:40	18	S. Robbins
14 June 1974	--	13	"
9 June 1976	0:40	18	"
14 June 1977	1:10	18	"

AREA 10 = CEDARBURG BEECH WOODS S.A.

Ozaukee County T11N R21E Sec. 30

Southern mesic forest of sugar maple, beech, white ash, red oak and basswood on irregular morainal topography. Northeast part grades into a pocket of yellow birch, tamarack, swamp hardwoods and white cedar. 24 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Pine Glen (51)	461	red-eyed vireo	15.6	red-shouldered hawk	0.7
Wyalusing (71)	516	ovenbird	15.0	downy woodpecker	3.3
Tellocks (65)	525	eastern pewee	7.9	red-eyed vireo	15.6
Hem Draw (28)	538	wood thrush	4.9	ovenbird	15.0
Sanders (59)	539	scarlet tanager	4.9	scarlet tanager	4.9
		black-capped chickadee	4.9		

DISSIMILARITY = 732

INDIVIDUAL BIRDS/SURVEY = 152.4

COMMENTS:

METHODS: Slow walk along parallel transects.

DATE	HOURS	SPECIES	OBSERVERS
28 June, 3 July 1972	9:00	31	D. Gustafson
2 June, 18 June 1973	8:00	36	"
12, 22, 29 June 1974	--	42	C. Wiese
20, 25, 28 June 1975	--	30	"
15, 29 June, 3 July 1976	--	34	"

AREA 11 = CEDARBURG BOG S.A. (STRING BOG)

Ozaukee County T11N R21E Sec. 29, 32

Interdigitation of marsh, shrub and coniferous tree vegetation - sedges, bog-mat herbs, stunted and large tamarack and white cedar, with some black spruce. Total S.A. is 573 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cedarburg Shrub (12)	408	white-throated sparrow	23.7	yellow-bellied flycatcher	0.3
Dory's Bog (18)	455	common yellowthroat	12.4	Nashville warbler	7.4
Kettle Moraine (34)	558	swamp sparrow	11.0	white-throated sparrow	23.7
Ottawa (50)	574	song sparrow	9.7		
Endeavor (21)	592	Nashville warbler	7.4		

DISSIMILARITY = 765

INDIVIDUAL BIRDS/SURVEY = 125.4

COMMENTS:

METHODS: Stand at survey point for 10 minutes, recording birds within 500 ft. 12-20 points each year.

DATE	HOURS	SPECIES	OBSERVERS
8, 10 June 1971	--	20	C. Wiese
19, 22, 26 June 1972	--	22	"
1, 15, 22 June 1974	--	22	"
? 1975	--	22	"
? 1976	--	26	"

AREA 12 = CEDARBURG BOG S.A. (SHRUB)

Ozaukee County T11N R21E Sec. 29, 32

Dead tamaracks and cedars now covered with dense thicket of bog shrubs, young cedar and tamarack. Total S.A. is 573 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cedarburg Conifer (13)	337	common yellowthroat	9.7	yellow-bellied flycatcher	0.3
Cedarburg String (12)	408	black-capped chickadee	9.5		
Dory's Bog (18)	468	song sparrow	7.4		
Kettle Moraine (34)	479	swamp sparrow	7.2		
Endeavor (21)	496	veery	5.6		
		rose-breasted grosbeak	5.6		

DISSIMILARITY = 695

INDIVIDUAL BIRDS/SURVEY = 77.8

COMMENTS:

METHODS: Stand at survey point for 10 minutes, recording birds within 500 ft. 7-15 points each year.

DATE	HOURS	SPECIES	OBSERVERS
8, 10, 26 June 1971	--	27	C. Wiese
4, 6, 19 June 1972	--	26	"
" 1975	--	29	"
" 1976	--	29	"

AREA 13 = CEDARBURG BOG S.A. (CONIFER SWAMP)

Ozaukee County T11N R21E Sec. 29, 32

Closed-canopy northern wet forest of tamarack and white cedar, with white birch, yellow birch, silver maple, black ash and elm. Total S.A. is 573 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cedarburg Shrub (12)	337	black-capped chickadee	14.1	brown creeper	2.6
Cedarburg Beech (10)	548	northern waterthrush	10.5	veery	8.9
Dory's Bog (18)	553	veery	8.9		
Lawrence (37)	566	blue jay	6.8		
Vanderbloemen (67)	591	rose-breasted grosbeak	6.4		

DISSIMILARITY = 723

INDIVIDUAL BIRDS/SURVEY = 137.4

COMMENTS:

METHODS: Stand at survey point for 10 minutes, recording birds within 500 ft. 13-20 points each year.

DATE	HOURS	SPECIES	OBSERVERS
10, 26 June, 3 July 1971	--	32	C. Wiese
4, 6, 19 June 1972	--	32	"
1, 12, 15, 19, 22 June 1974	--	39	"
? 1975	--	23	"
? 1976	--	37	"

AREA 14 = CEDAR GROVE GAME REFUGE S.A.

Sheboygan County T13N R23E Sec. 30

Hawk banding station 200 m. from Lake Michigan. Alders, willow and cottonwood along creek with aspen, dogwood, etc. on remainder. Trapping and netting area used during spring and fall migration, maintained in an open condition. 12 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
New Munster (48)	399	common grackle	16.6	mourning warbler	2.1
Vanderbloemen (67)	417	red-winged blackbird	4.8		
Fuller (26)	451	song sparrow	4.6		
Fairy Chasm (22)	459	mourning dove	4.0		
Lilly Lake (39)	459	house wren	4.0		
Baxters (4)	459				

DISSIMILARITY = 641

INDIVIDUAL BIRDS/SURVEY = 187.0

COMMENTS:

METHODS: Walk along creek, to banding shelter, over hill, through cemetery and down path to gate at Marine Drive.

DATE	HOURS	SPECIES	OBSERVERS
3 July 1971	1:44	40	M. Donald, M. Simmons
25 June 1974	--	39	"

AREA 15 = CHIWAUKEE PRAIRIE S.A.

Kenosha County T1N R23E Sec. 31, 32

Series of ridges and swales with sedge meadow and wet to mesic prairie. Bordered by RR tracks to west, housing development to east and north. 33 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
New Munster (48)	349	common grackle	16.1	sora rail	0.5
Scuppernong (61)	491	red-winged blackbird	12.8		
Avoca (2)	499	bobolink	6.2		
Cedar Grove (14)	509	tree swallow	5.0		
West Shore (69)	520	bank swallow	4.5		

DISSIMILARITY = 718

INDIVIDUAL BIRDS/SURVEY = 336.8

COMMENTS: Robin nest. Tree swallow nest in bluebird box.

METHODS: Not recorded by J. H. Walk with long stops by R. H. Screech owl observed in 1976 was responding to tape recording.

DATE	HOURS	SPECIES	OBSERVERS
28 June 1971	7:00	52	J. Hamers
4 June 1972	5:00	32	"
28 June 1973	5:00	24	"
24 June 1974	--	26	"
28 June 1975	7:00	53	"
7 July 1976	10:00	76	R. Hoffman
11 July 1977	10:00	52	"

AREA 16 = COMSTOCK MARSH S.A.

Marquette County T16N R10E Sec. 10, 11, 14, 15

Part of 400-ha wetland complex. Quaking sedge bog toward south, grading into sedge meadow toward northeast. 8 ha of tamaracks. 97 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Kettle Moraine (34)	552	red-winged blackbird	17.6	sandhill crane	2.4
Endeavor (21)	553	starling	17.6	belted kingfisher	1.2
Chiwaukee (15)	572	barn swallow	14.1	starling	17.6
New Munster (48)	574	common crow	7.1	barn swallow	14.1
Avoca (2)	575	tree swallow	4.7		
		gray catbird	4.7		
		common yellowthroat	4.7		

DISSIMILARITY = 754

INDIVIDUAL BIRDS/SURVEY = 85.0

COMMENTS:

METHODS: Look thru binoculars and scope from SE corner. Walk short distance along east and south boundaries, and into center of marsh.

DATE	HOURS	SPECIES	OBSERVERS
29 June 1977	1:00	22	B. Fiehweg

AREA 17 = DEWEY HEIGHTS PRAIRIE S.A.

Grant County T3N R6W Sec. 13

Dry limy prairie on Mississippi River Bluff facing SW. Bluestem, grama, june, Indian, needle and panic grasses, composites. Bounded by lowland and upland forest and contains a wooded ravine. 2 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cactus (8)	463	brown-headed cowbird	13.9	common nighthawk	1.3
Fuller (26)	517	cedar waxwing	8.5	tufted titmouse	1.8
Dunbar (20)	519	lark sparrow	7.8	cedar waxwing	8.5
Fairy Chasm (22)	530	common grackle	7.2	lark sparrow	7.8
Cedar Grove (14)	533	field sparrow	5.4		

DISSIMILARITY = 706 INDIVIDUAL BIRDS/SURVEY = 55.2

COMMENTS: Lark sparrow nests.

METHODS: Slow, zigzag walk through prairie, with stops.

DATE	HOURS	SPECIES	OBSERVERS
19 June 1974	--	37	W. Smith
25 June 1975	1:10	29	" , G. Tyser
9 July 1976	1:00	12	" , R. Read

AREA 18 = DORY'S BOG S.A.

Washburn County T38N R11W Sec. 34

Small bog with concentric successional stages including sedge mat, ericaceous shrub zone, tamarack-black spruce zone and wet-mesic northern hardwoods of maples, birches and scattered white pine. Surrounded by upland hardwoods. 16 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cedarburg String (11)	455	song sparrow	12.2	hooded merganser	1.6
Cedarburg Shrub (12)	468	black-capped chickadee	7.3		
Schmidt (60)	478	Nashville warbler	6.5		
Lawrence (37)	480	common yellowthroat	5.7		
Black Tern (5)	514	white-throated sparrow	4.9		
		blue jay	4.9		

DISSIMILARITY = 658 INDIVIDUAL BIRDS/SURVEY = 61.5

COMMENTS:

METHODS: Slow walk around bog, with stops.

DATE	HOURS	SPECIES	OBSERVERS
25 June 1975	1:00	18	S. Robbins
30 June, 8 July 1976	4:00	35	T. Sordahl

AREA 19 = DOUGLAS COUNTY GROUSE AREA S.A.

Douglas County T44N R21W Sec. 11

Open barrens with some savanna of jack pine, Hill's oak, red pine and aspen on outwash sands. Understory includes sweet fern, blueberry, dewberry, little bluestem, rose, etc. 97 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Kettle Moraine (34)	472	clay-colored sparrow	16.3	ring-necked duck	0.2
Vanderbloemen (67)	539	song sparrow	9.8	sharp-tailed grouse	0.2
Fuller (26)	548	common yellowthroat	8.4	warbling vireo	1.9
Endeavor (21)	559	red-winged blackbird	6.2	clay-colored sparrow	16.3
Hulbert (32)	566	rufous-sided towhee	5.0		

DISSIMILARITY = 704 INDIVIDUAL BIRDS/SURVEY = 121.0

COMMENTS: Tree swallow nest in hollow stump. Oriole carries nest material.

METHODS: Walk circular route through area. Only east and south parts surveyed in 1975.

DATE	HOURS	SPECIES	OBSERVERS
16 June 1971	1:15	29	S. Robbins (Survey also by J. Hailman)
26 June 1972	1:30	26	"
6 June 1973	1:30	27	J. Hailman
25 June 1974	--	33	?
27 June 1975	0:50	21	S. Robbins
17 June 1976	1:30	37	"

AREA 20 = DUNBAR SHARPTAIL BARRENS S.A.

Marinette County T37N R18E Sec. 21

Part of 350-ha open barrens surrounded by aspen, oak and jack pine. S.A. includes edge of woods. Mostly rhizomatous grasses and sedges, lichens, bearberry, blueberry, willow, sweet gale, etc. 97 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Moquah (42)	454	cedar waxwing	7.7	upland sandpiper	1.6
Sterling (63)	472	ovenbird	5.3	bluebird	3.2
Fuller (26)	482	indigo bunting	5.3		
Baxters (4)	485	field sparrow	4.5		
Pine Glen (51)	491	rufous-sided towhee	4.3		

DISSIMILARITY = 677 INDIVIDUAL BIRDS/SURVEY = 187.5

COMMENTS: Open area species (noted in 1975) include: sandpiper, flicker, kingbird, crow, catbird, thrasher, robin (woods also), bluebird, goldfinch, towhee and vesper, chipping, clay-colored, field and song sparrows.

METHODS: Drive around area, with frequent stops and short walks (14 June 1975). Walk around area on same route (30 June 1975). 1976 methods unknown. Most species recorded in wooded area.

DATE	HOURS	SPECIES	OBSERVERS
14, 30 June 1975	6:15	40	Mr. & Mrs. E. Mathis
9, 29 June, 3 July 1976	9:30	50	" " " " "

AREA 21 = ENDEAVOR MARSH S.A.

Marquette County T15N R8E Sec. 26

Part of 101-ha sedge meadow, fen, tamarack swamp and shrub carr, with an upland oak island. 16 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Kettle Moraine (34)	321	red-winged blackbird	14.2	--
Avoca (2)	353	common yellowthroat	10.7	
Ottawa (50)	423	song sparrow	6.6	
Newark (47)	424	American goldfinch	6.3	
Scuppernong (61)	447	brown-headed cowbird	5.8	

DISSIMILARITY = 671

INDIVIDUAL BIRDS/SURVEY = 140.6

COMMENTS:

METHODS: Nine 5-min stops spaced throughout area. Ten stops in 1977.

DATE	HOURS	SPECIES	OBSERVERS
11 June 1972	1:30	33	B. Fiehweg
9 June 1973	1:45	35	" , M. Jaeger, E. Batchelor, B. Werner
30 June 1974	--	32	"
-- 1976	--	--	?
29 June 1977	1:30	29	B. Fiehweg

AREA 22 = FAIRY CHASM S.A.

Ozaukee County T9N R22E Sec. 33

35-40 m-deep wooded ravine, cut thru unconsolidated till. White pine, yellow birch and white cedar on north facing slopes, xeric hardwoods on south slopes. Chasm bounded by residential area and Lake Michigan. 8 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Sanders (59)	344	common grackle	10.9	Carolina wren	0.9
Vanderbloemen (67)	391	robin	8.7	pine siskin	0.3
High Cliff (29)	418	blue jay	5.5		
Waupun (68)	434	mourning dove	5.0		
Pine Glen (51)	450	black-capped chickadee	4.4		

DISSIMILARITY = 635

INDIVIDUAL BIRDS/SURVEY - 124.4

COMMENTS:

METHODS: Most data from bird feeders near S.A.

DATE	HOURS	SPECIES	OBSERVERS
22 June 1971	3:00	25	H. Bauers
17 June 1972	2:00	19	H. & H. Liebherr
2 July 1973	1:30	39	H. Liebherr, M. Donald
23 June 1974	--	35	H. & H. Liebherr
10 June-3 July 1975	--	42	H. Liebherr
June-3 July 1976	--	31	H. & "
June-July 1977	--	37	" "

AREA 23 = FINNERUD PINE FOREST S.A.

Oneida County T39N R6E Sec. 21

130-year-old red pine stand, mixed with white pine, red oak, paper birch, red maple and aspen (northern dry-mesic forest), understory of Rubus and beaked hazel. On edge of lake, with some black spruce-tamarack-sphagnum bog. 48 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Flambeau (36)	482	pine warbler	7.9	solitary vireo	0.8
Holmboe (30)	493	red-eyed vireo	7.7	Tennessee warbler	0.2
Flora Lake (24)	515	ovenbird	6.5	evening grosbeak	0.7
Schmidt (60)	525	black-capped chickadee	6.0	purple finch	3.7
Dory's Bog (18)	528	song sparrow	5.2	Lincoln's sparrow	0.9

DISSIMILARITY = 684

INDIVIDUAL BIRDS/SURVEY = 117.9

COMMENTS:

METHODS: Drive with frequent stops, and walk with stops, including bog (1972). 5 min walk/5 min stand, also recording birds encountered later while walking back and measuring vegetation, bog not included (1977).

DATE	HOURS	SPECIES	OBSERVERS
-- 1971	--	57	J. Zimmerman
18 June 1972	2:30	31	M. Donald
26 June 1973	2:00	33	"
30 June 1974	--	36	"
4 July 1976	1:30	23	L. Thomas
17 June 1977	--	32	L. Wood

AREA 24 = FLORA LAKE S.A.

Langlade County T31N R13E Sec. 1

Spring pond lake surrounded by white cedar, black and white spruce and hemlock, also a small tamarack-spruce bog. Hardwoods on uplands around S.A. 16 ha + 48-ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Finnerud (23)	515	ovenbird	6.1	horned grebe	0.2
Sterling (63)	521	robin	4.6	sharp-shinned hawk	0.2
Newport (49)	526	cedar waxwing	4.6	broad-winged hawk	1.6
Plum Lake (54)	544	mallard	4.5	osprey	0.2
Holmboe (30)	547	blue jay	4.3	belted kingfisher	1.2
		rose-breasted grosbeak	4.3	yellow-bellied sapsucker	2.7
				black-and-white warbler	4.0

DISSIMILARITY = 703

INDIVIDUAL BIRDS/SURVEY = 82.3

COMMENTS: Young mallards observed.

METHODS: Walk along paths. Use boat also in 1976.

DATE	HOURS	SPECIES	OBSERVERS
22 June 1971	3:30	35	L. Schimmels
22 June 1972	2:40	27	" , M. & C. Rudy
3 July 1973	3:00	34	" "
9 June 1974	--	38	"
26 June 1976	3:45	37	"
27 June 1977	3:20	39	"

AREA 25 = FOURMILE ISLAND S.A.

Dodge County T12N R16E Sec. 19

Island in Horicon Marsh with large oaks, basswood, elm, aspen and cottonwood, containing a heron and egret rookery.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Cactus (8)	869	black-crowned night heron	42.7	great blue heron	40.6
West Shore (69)	955	great blue heron	40.6	great egret	12.8
Dewey Hts. (17)	956	great egret	12.8	black-crowned night heron	42.7
New Munster (48)	958	red-winged blackbird	0.7	Canada goose	0.0+
Flora Lake (24)	960	common grackle	0.4		
Schmidt (60)	960				

DISSIMILARITY = 971

INDIVIDUAL BIRDS/SURVEY = 2,040.5

COMMENTS: Counts of great blue herons, great egrets and black-crowned night herons are of nests. Nest of great horned owls in 1976. 1976 data not included in analysis.

METHODS: Slow walk around island. 1971-1974.

DATE	HOURS	SPECIES	OBSERVERS
9 June 1971	3:10	26	H. Mathiak
7 June 1972	4:15	29	"
6 June 1973	3:25	27	"
13 June 1974	--	18	"
18 July 1975	2:00	13	R. Johnson, S. Cristie
9 July 1976	2:30	(heron nests only)	"
23 June 1977	2:00	14	"

AREA 26 = FULLER TRACT

Door County T30N R27E Sec. 27

Half is open grassland, the other half mixed hardwood over white cedar, and some willow thicket. Intermittent stream with thick shrub growth on banks, and a shallow pond. Ca. 63 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Cactus (8)	420	red-winged blackbird	10.6	--
Vanderbloemen (67)	428	common crow	7.3	
Lilly Lake (39)	433	indigo bunting	5.3	
Cedar Grove (14)	451	grasshopper sparrow	4.7	
High Cliff (29)	476	common grackle	4.7	

DISSIMILARITY = 631

INDIVIDUAL BIRDS/SURVEY = 150.5

COMMENTS:

METHODS: Count birds during eight 5-min counts.

DATE	HOURS	SPECIES	OBSERVERS
22 June, 4 July 1976	3:05	45	J. Trick
2, 12 July 1977	2:30	41	"

AREA 27 = GOOSE POND S.A.

Columbia County T1ON R9E Sec. 25

Pothole in marshy basin of ground moraine, surrounded by cropland. Mudflats sometimes exposed. 16 ha.

MOST SIMILAR AREAS	
Chiwaukee (15)	571
Cedar Grove (14)	605
New Munster (48)	627
West Shore (69)	679
Fairy Chasm (22)	702

MOST COMMON SPECIES	
common grackle	15.9
mallard	13.3
killdeer	7.6
blue-winged teal	7.3
mourning dove	5.8

SPECIES REACHING MAXIMUM	
pied-billed grebe	0.9
mallard	13.3
pintail	1.6
green-wing teal	1.6
blue-winged teal	7.3
American widgeon	0.4
shoveller	2.3
redhead	0.3
ring-necked duck	0.2
lesser scaup	0.2
ruddy duck	3.8
coot	5.3
semipalmated plover	0.1
killdeer	7.6
solitary sandpiper	0.1
lesser yellowlegs	2.5
pectoral sandpiper	0.8
least sandpiper	0.2
sanderling	0.3
Wilson's phalarope	0.1

DISSIMILARITY = 836

INDIVIDUAL BIRDS/SURVEY = 474.5

COMMENTS: Broods observed for the following species: blue-winged teal, shoveler, mallard, pintail, coot, pied-billed grebe, green-winged teal. Other species "known to have nested" in 1971: pheasant, killdeer, spotted sandpiper, mourning dove, flicker, Traill's flycatcher, least flycatcher, sedge wren, catbird, robin, warbling vireo, yellowthroat, house sparrow, western meadowlark, red-winged blackbird, grackle, swamp sparrow, song sparrow, marsh wren.

METHODS: Almost daily visits in 1971.

DATE	HOURS	SPECIES	OBSERVERS
All of June 1971	--	34	M. Jaeger, E. Batchelor
25 June, 6 July 1972	--	36	E. Batchelor
12-18 June 1977	--	61	L. Erickson, K. Wood

AREA 28 = HEMLOCK DRAW

Sauk County T10N R5E Sec. 5, 6, 7

Sandstone gorge. Hemlock and yellow birch near cliffs and cool drainages; southern dry-mesic and dry forest; a brushy opening. Ca. 160 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Honey Creek (31)	263	ovenbird	5.4	palm warbler	0.1
Pine Glen (51)	279	eastern pewee	4.1		
Baxters (4)	317	wood thrush	4.1		
Schmidt (60)	423	indigo bunting	3.8		
Tellocks (65)	434	blue jay	3.8		

DISSIMILARITY = 630

INDIVIDUAL BIRDS/SURVEY = 195.5

COMMENTS: Palm warbler certainly a migrant.

METHODS: Slow walk along hiking trail, with random stopping. Partly outside area. Early June survey E. Batchelor et al., late survey by Lange.

DATE	HOUR	SPECIES	OBSERVERS
?, 28 June 1971	--	55	E. Batchelor et al.; K. Lange
3, 24 June 1972	9:10	58	" "
?, 25 June 1973	--	58	" "
? 1974	--	59	" "
9, 26 June 1975	8:50	59	" "
7, 24 June 1976	7:50	66	" "
23 June 1977	3:30	46	K. Lange

AREA 29 = HIGH CLIFF STATE PARK

Calumet County T19N R18E Sec. 1, 2

Niagara escarpment on east shore of Lake Winnebago. Southern wet-mesic forest on slope (maple, basswood, ash, elm) with cottonwood and willow along lake. Shrubs dense beneath dead elms. Cropland, woods and campground nearby. 50 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Vanderbloemen (67)	365	red-winged blackbird	10.2	chimney swift	2.5
Sanders (59)	416	starling	7.7	Tennessee warbler	0.2
Fairy Chasm (22)	418	robin	6.5	northern oriole	4.8
Cactus Rock (8)	437	brown-headed cowbird	5.7		
Tellocks (65)	452	rose-breasted grosbeak	5.2		

DISSIMILARITY = 628

INDIVIDUAL BIRDS/SURVEY = 159.2

COMMENTS: Oriole nest.

METHODS: Walk above and below cliff. Includes fields near cliff.

DATE	HOURS	SPECIES	OBSERVERS
17 June 1975	3:20	37	K. Rill, B. Jansen
15 June 1976	2:35	35	" "
9 June 1977	3:30	45	" , T. Ziebell

AREA 30 = HOLMBOE CONIFER FOREST S.A.

Oneida County T36N R9E Sec. 7

Abrupt morainal topography with hemlock on north slopes and drainages, white pine, red pine, white birch and northern hardwoods on drier sites, and a black spruce-tamarack closed bog. Adjacent to Pelican River. 12 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Newport (49)	470	red-eyed vireo	11.4	ruby-crowned kinglet	0.6
Finnerud (23)	493	ovenbird	8.4	chestnut-sided warbler	3.5
Marinette (40)	498	starling	7.3		
Sterling (63)	532	American robin	6.9		
Flora Lake (24)	547	least flycatcher	6.5		

DISSIMILARITY = 707

INDIVIDUAL BIRDS/SURVEY = 51.0

COMMENTS:

METHODS: Walk thru area, on existing trails when possible.

DATE	HOURS	SPECIES	OBSERVERS
18 June 1973	0:55	18	P. Vanderschaegen
19 June 1974	--	--	"
3 June 1976	1:30	25	" , L. Almond, J. Moulton
14 June 1977	1:00	29	" "

AREA 31 = HONEY CREEK NATURAL AREA S.A.

Sauk County T10N R4E Sec. 11, 12, 14

Creek bottoms, boggy areas, steep slopes, cliffs and upland ridges. Includes open water, sedge meadow, cattails, alder thicket and shrub-carr, tamarack-hardwood swamp, lowland hardwood forest, hemlock-yellow birch, upland oak forest, and prairie remnants. Adjacent pasture. 52 ha + 29 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Hemlock Draw (28)	263	gray catbird	7.3	yellow-throated vireo	1.3
Baxters (4)	288	song sparrow	7.1		
Pine Glen (51)	349	brown-headed cowbird	4.1		
Lawrence (37)	390	common grackle	3.9		
Vanderbloemen (67)	390	eastern pewee	3.4		

DISSIMILARITY = 620

INDIVIDUAL BIRDS/SURVEY = 261.0

COMMENTS:

METHODS: Slow walk along trail to waterfall, and return. Do not include area south of road.

DATE	HOURS	SPECIES	OBSERVERS
29 June 1971	5:25	56	K. Lange
25 June 1972	5:20	60	"
18 June 1973	5:15	62	"
19 June 1974	--	64	"
25 June 1975	4:45	59	"
20 June 1976	5:15	57	"
19 June 1977	4:15	64	"

AREA 32 = HULBERT CREEK

Sauk County T13N R6E Sec. 5, 6, 7, 8

Open sedge marsh and alder thicket near trout stream. Oak forest with some pines on valley slopes. Ca. 160 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Kettle Moraine (34)	485	cliff swallow	21.3	--
Honey Creek (31)	497	red-winged blackbird	12.8	
Black Tern (5)	499	song sparrow	9.8	
Baxter's (4)	517	gray catbird	6.0	
Jung (33)	520	common yellowthroat	4.3	
Kickapoo (35)	**520**			

DISSIMILARITY = 678 INDIVIDUAL BIRDS/SURVEY = 235.0

COMMENTS:

METHODS: Slow walk with random stopping thru marsh and ravines.

DATE	HOURS	SPECIES	OBSERVERS
19 June 1973	4:15	51	K. Lange

AREA 33 = JUNG HEMLOCK-BEECH FOREST S.A.

Shawano County T27N R14E Sec. 23

26 ha of old growth hemlock, beech and sugar maple with yellow birch and small clusters of white pine. Also small sedge-sphagnum bogs and 4 ha of abandoned cropland with white pine invading. 32 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Lawrence (37)	358	red-winged blackbird	17.4	--
Tellocks (65)	454	blue jay	11.6	
Pine Glen (51)	457	song sparrow	8.1	
Black Tern (5)	460	wood thrush	5.8	
Vanderbloemen (67)	471	rose-breasted grosbeak	4.7	
		red-eyed vireo	4.7	
		white-breasted nuthatch	4.7	

DISSIMILARITY = 627 INDIVIDUAL BIRDS/SURVEY = 86.0

COMMENTS: Most birds found around bog and fields rather than in forest. Bird locations indicated on map.

METHODS: Walk with occasional stops thru area.

DATE	HOURS	SPECIES	OBSERVERS
24 June 1977	1:25	28	S. Robbins

AREA 34 = KETTLE MORAINE FEN AND LOW PRAIRIE S.A.

Waukesha County T5N R17E Sec. 9

Low prairie, sedge meadow and fen on edge of Scuppernong Marsh. 20 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Endeavor (21)	321	red-winged blackbird	13.1	harrier	0.6
Scuppernong (61)	413	common yellowthroat	9.9		
Lima Bog (38)	432	song sparrow	7.4		
Vanderbloemen (67)	446	swamp sparrow	7.2		
Avoca (2)	454	savannah sparrow	5.7		

DISSIMILARITY = 634 INDIVIDUAL BIRDS/SURVEY = 54.4

COMMENTS:

METHODS: Slow walk on looping path thru prairie and fen.

DATE	HOURS	SPECIES	OBSERVERS
26 June 1971	2:15	30	E. Peartree
3 June 1972	2:15	26	"
10 June 1973	1:30	21	"
2 June 1974	--	26	"
28 June 1975	1:30	20	"
5 June 1976	1:30	23	"
4 June 1977	1:30	19	"

AREA 35 = KICKAPOO RIVER

Vernon County T13-14N R2W

A reach of the Kickapoo along sandstone cliffs, low grassy meadows, wet forest elements (elm, willow, silver maple) and upland oak woods. Hemlock, white pine and yellow birch also present near steep slopes. 15 km.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Honey Creek (31)	424	song sparrow	17.0	belted kingfisher	1.2
Baxters (4)	449	indigo bunting	8.0	eastern phoebe	2.3
Hemlock Draw (28)	488	American redstart	6.8	yellow-throated vireo	1.3
Schmidt (60)	490	rough-winged swallow	4.5	American redstart	6.8
Lawrence (37)	517	common yellowthroat	4.4	song sparrow	17.0

DISSIMILARITY = 680 INDIVIDUAL BIRDS/SURVEY = 454.0

COMMENTS: Wood duck brood, rough-winged swallow nests, oriole nest.

METHODS: Survey by Canoe between Ontario and LaFarge.

DATE	HOURS	SPECIES	OBSERVERS
13, 14 June 1971	?	76	J. & E. Zimmerman
24 June 1972	--	59	"

AREA 36 = LAC DU FLAMBEAU PINES

Vilas County T41N R6E Sec. 20

Groves of large red and white pines separated by thinly wooded swamp of tamarack and black spruce. Some very recent cutting; borders Trout River.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Finnerud (23)	482	ovenbird	11.9	common loon	1.5
Castle (9)	543	blackburnian warbler	7.4	black-backed 3-toed woodpecker	0.7
Dory's Bog (18)	573	blue jay	7.4	olive-sided flycatcher	1.5
Miscauno (41)	577	pine warbler	5.9	blackburnian warbler	7.4
Plum Lake (54)	577	Nashville warbler	5.9	Connecticut warbler	3.0
		red-eyed vireo	5.9		

DISSIMILARITY = 742

INDIVIDUAL BIRDS/SURVEY = 135.0

COMMENTS: Young ruffed grouse

METHODS: Walk 5 minutes/stand 5 minutes, for 1:35 hours, then record new species while measuring vegetation.

DATE	HOURS	SPECIES	OBSERVERS
25 June 1977	?	34	L. Wood

AREA 37 = LAWRENCE CREEK S.A.

Marquette County T17N R8E Sec. 31

Natural brook trout stream bounded by oaks, basswood, alder and willow. Adjacent area includes open marsh, old field, upland forest, shrub zones and pine plantation. 10 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Jung (33)	358	song sparrow	8.9	white-breasted nuthatch	6.7
Honey Creek (31)	390	white-breasted nuthatch	6.7		
Pine Glen (51)	416	blue jay	6.7		
Tellock's (65)	436	gray catbird	6.3		
Baxters (4)	438	common flicker	5.9		

DISSIMILARITY = 612

INDIVIDUAL BIRDS/SURVEY = 52.6

COMMENTS:

METHODS: Six 10-min stands, ca. 175 yards apart, evenly spaced thru S.A.

DATE	HOURS	SPECIES	OBSERVERS
15 June 1972	2:00	24	H. Bauers
14 June 1973	1:55	21	"
12 June 1974	--	23	"
16 June 1975	2:00	25	"
9 June 1976	1:30	23	"
17 June 1977	1:30	26	"

AREA 38 = LIMA BOG

Rock County T4N R14E Sec. 9, 16

Shallow bog lake surrounded by 40 ha. of tamarack and swamp shrubs. The tamaracks are surrounded by open marsh. Ca. 50 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Ottawa (50)	364	swamp sparrow	25.8	swamp sparrow	25.8
Newark (47)	376	red-winged blackbird	24.2		
Scuppernong (61)	397	common yellowthroat	6.6		
Kettle Moraine (34)	432	American robin	3.9		
Avoca (2)	444	song sparrow	3.7		

DISSIMILARITY = 684 INDIVIDUAL BIRDS/SURVEY = 320.9

COMMENTS:

METHODS: In 1971, walk 5 min/stand 5 min, not penetrating tamarack-shrub zone. Bog penetrated some other years. In 1975, data recorded by habitat (bog, oak woods and field).

DATE	HOURS	SPECIES	OBSERVERS
9 July 1971	3:15	27	C. Welty
25 June 1972	3:00	37	T. Ellis
17 June 1973	--	31	"
30 June 1974	--	45	"
26 June 1975	3:15	44	"

AREA 39 = LILLY LAKE

Brown County T23N R22E Sec. 32

Ca. 18-ha lake surrounded by maple-beech, aspen, cedar, swamp hardwood, and birch forests. Ca. 50 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Schmidt (60)	403	common grackle	9.0	great horned owl	0.5
Vanderbloemen (67)	431	common crow	7.7	common crow	7.7
Fuller (26)	433	red-eyed vireo	5.9		
Sanders (59)	438	ovenbird	5.9		
Tellock's (65)	451	red-winged blackbird	5.9		

DISSIMILARITY = 622 INDIVIDUAL BIRDS/SURVEY = 110.5

COMMENTS:

METHODS: Eight 5-min stands, in several vegetation types, near SE side of lake.

DATE	HOURS	SPECIES	OBSERVERS
2, 3 July 1976	2:45	43	J. Trick
22, 25 June 1977	2:40	41	"

AREA 40 = MARINETTE COUNTY BEECH FOREST S.A.

Marinette County T34N R17E Sec. 11

Northern mesic forest, mostly beech. Also aspen stand on ¼ of area. 16 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Miscauno (41)	463	least flycatcher	17.4	least flycatcher	17.4
Plum Lake (54)	486	ovenbird	14.9		
Holmboe (30)	498	red-eyed vireo	11.0		
Castle (9)	547	black-thr. green warbler	9.6		
Finnerud (23)	554	rose-breasted grosbeak	8.1		

DISSIMILARITY = 763

INDIVIDUAL BIRDS/SURVEY = 59.1

COMMENTS: Hermit thrush on nest. 1976.

METHODS: Slow walk thru S.A. and around edge, with occasional stops.

DATE	HOURS	SPECIES	OBSERVERS
18 July 1971	3:30	13	Mr. & Mrs. E. Mathis
17, 26 June 1972	7:30	25	"
13, 26 June 1973	6:00	12	"
13 June 1974	--	14	"
13 June, 1 July 1975	4:00	14	"
8, 28 June 1976	5:30	22	"

AREA 41 = MISCAUNO CEDAR SWAMP S.A.

Marinette County T36N R20E Sec. 14, 23

Northern wet-mesic forest of white cedar, balsam fir and black spruce, with some black ash and elm near stream, and ground layer of mosses, lichens and wet forest herbs. Surrounding upland is aspen-oak and pine cutover forest. 62 ha + 194 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Castle (9)	398			raven	3.4
Marinette (40)	463	ovenbird	13.0		
Pine Glen (51)	474	blue jay	12.0		
Tellock's (65)	494	robin	9.2		
Schmidt (60)	523	wood thrush	7.9		

DISSIMILARITY = 716

INDIVIDUAL BIRDS/SURVEY = 29.2

COMMENTS:

METHODS: Walk thru S.A., stopping ca. every 50 yards.

DATE	HOURS	SPECIES	OBSERVERS
4 Aug. 1971	--	17	H. Lindberg
10 June 1972	3:15	14	"
13 June 1973	2:30	10	"
27 June 1974	--	15	"
5 July 1975	3:00	12	"
28 June 1976	3:30	16	"

AREA 42 = MOQUAH BARRENS S.A.

Bayfield County T48N R7W Sec. 23

Vegetation on sandy outwash varies from large openings with blueberry, bearberry, sweet fern and grasses to dense stands of jack pine and aspen. Some Hill's oak and hazel.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Dunbar (20)	454	brown-headed cowbird	12.7	red crossbill	5.5
Sterling (63)	476	chipping sparrow	7.6	dark-eyed junco	1.5
Holmboe (30)	552	veery	7.2		
Pine Glen (51)	555	American robin	6.2		
Baxter's(4)	559	red crossbill	5.5		

DISSIMILARITY = 706 INDIVIDUAL BIRDS/SURVEY = 208.8

COMMENTS: Young ruffed grouse.

METHODS: Walk along road thru middle of S.A.

DATE	HOURS	SPECIES	OBSERVERS
21 June 1971	2:05	36	D. Bratley
24 June 1972	4:00	43	"
20 June 1973	3:00	40	"
13 July 1974	--	33	A. Roy, Jr.
8 July 1975	3:15	41	D. Bratley
26 June 1976	2:30	35	R. Verch
25 June 1977	2:45	33	"

AREA 43 = MUIR PARK NATURAL AREA S.A.

Marquette County T14N R9E Sec. 14, 23

12 ha lake surrounded by fen, meadow, bog, shrub-carr, low prairie and oak woods. 26 ha + 28 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Endeavor (21)	562	common yellowthroat	15.2	gray catbird	9.1
Kettle Moraine (34)	588	song sparrow	12.1	rose-breasted grosbeak	9.1
Lawrence (37)	588	brown-headed cowbird	12.1	American goldfinch	9.1
Honey Creek (31)	602	rose-breasted grosbeak	9.1		
Cedarburg Bog Shrub (12)	612	American goldfinch	9.1		
		gray catbird	9.1		

DISSIMILARITY = 762 INDIVIDUAL BIRDS/SURVEY = 33.0

COMMENTS: Sandhill cranes heard within 1 km.

METHODS: Six 5-min stands, at each stand recording birds within ca. 50 m in similar habitat.

DATE	HOURS	SPECIES	OBSERVERS
20 June 1975	1:25	15	M. Jaeger, B. Bedford

AREA 44 = MUSKEGO PARK HARDWOODS

Waukesha County T5N R20E Sec. 17

Primarily southern dry-mesic forest. White and red oaks with sugar maple, yellowbud and shagbark hickories, butternut, etc. Elms and hackberry in low part, a few small woodland ponds, and a section of marsh. 24 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Sander's (59)	537	American robin	17.9	black-billed cuckoo	3.6
New Munster (48)	540	common grackle	17.9	common flicker	10.7
Jung (33)	578	wood thrush	14.3	eastern kingbird	3.6
Lilly Lake (39)	599	common flicker	10.7	American robin	17.9
Cedar Grove (14)	624	red-eyed vireo	7.1	wood thrush	14.3
		red-winged blackbird	7.1		

DISSIMILARITY = 763 INDIVIDUAL BIRDS/SURVEY = 28.0

COMMENTS:

METHODS: Walk 3 min/stand 5 min, along perimeter trail and to small pond.

DATE	HOURS	SPECIES	OBSERVERS
18 June 1976	0:50	13	G. Kratzat

AREA 45 = NECEDAH OAK-PINE NATURAL AREA S.A.

Juneau County T19N R3E Sec. 34

Relatively closed forest of mature Hill's oak with jack pine and ground cover of remnant prairie species. Management precludes fire maintenance. 40 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Blue River (6)	531	chipping sparrow	17.9	chipping sparrow	17.9
Cactus Rock (8)	554	field sparrow	12.5		
Sterling (63)	588	blue jay	8.9		
Spring Green (62)	626	great crested flycatcher	7.1		
Fairy Chasm (22)	633	common flicker	7.1		
		mourning dove	7.1		
		American robin	7.1		

DISSIMILARITY = 773 INDIVIDUAL BIRDS/SURVEY = 28.0

COMMENTS:

METHODS: Walk circular route thru southern half of S.A., drive north along east boundary.

DATE	HOURS	SPECIES	OBSERVERS
17 June 1972	0:35	14	S. Robbins
11 June 1973	0:40	13	"

AREA 46 = NECEDAH OAK-PINE MANAGED AREA S.A.

Juneau County T19N R2E Sec. 12

Jack pine and oak, with more open oak forest on uplands, and lowland brush, aspen and small pockets of open marsh on the lowlands. Grassland openings are scattered and include patches of blueberry. Periodically burned. 97 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Lawrence (37)	468	blue jay	14.1	whip-poor-will	0.6
Cactus Rock (8)	499	brown-headed cowbird	11.7	blue jay	14.1
Pine Glen (51)	511	brown thrasher	6.6	brown thrasher	6.6
Vanderbloemen (67)	520	common crow	6.0	rufous-sided towhee	5.1
Jung (33)	525	common yellowthroat	5.7	tree sparrow	0.3

DISSIMILARITY = 680

INDIVIDUAL BIRDS/SURVEY = 66.8

COMMENTS:

METHODS: Walk 3 min/stand 5 min, for 25 stops, along a zigzag path and straight transect (from 1974 summary).

DATE	HOURS	SPECIES	OBSERVERS
1 July 1971	1:45	21	V. Rudolph
6 July 1972	2:00	14	B. Ehlers, G. Updike
22 June 1973	2:00	18	" "
? June 1974	--	20	?
5 June 1976	2:00	23	D. Strom

AREA 47 = NEWARK ROAD PRAIRIE S.A.

Rock County T1N R11E Sec. 13

Remnant low prairie, grading from mesic on the west to wet prairie-sedge meadow on the east. Some mixed oak forest present. Surrounded by cropland. 9 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Avoca (2)	323	red-winged blackbird	35.2	bobwhite	4.3
Lima Bog (38)	376	swamp sparrow	12.8	Traill's flycatcher	5.6
Scuppernong (61)	377	Traill's flycatcher	5.6		
Endeavor (21)	424	song sparrow	4.7		
Ottawa (50)	431	bobwhite	4.3		

DISSIMILARITY = 732

INDIVIDUAL BIRDS/SURVEY = 223.0

COMMENTS:

METHODS: Walk along perimeter. 1975 data separated by habitat (prairie, woods, edge).

DATE	HOURS	SPECIES	OBSERVERS
20 June 1974	--	27	T. Ellis
20 June 1975	1:38	36	"

AREA 48 = NEW MUNSTER BOG ISLAND S.A.

Kenosha County T1N R19E Sec. 2, 3, 10, 11

Tamarack and extensive shrub carr with 6-ha sandy knoll of red and white oak, basswood and juneberry. Yellow birch on east edge of island. 22 ha.

MOST SIMILAR AREAS	
Chiwaukee (15)	349
Cedar Grove (14)	399
Fairy Chasm (22)	462
Lima Bog (38)	474
Vanderbloemen (67)	481

MOST COMMON SPECIES	
common grackle	18.3
red-winged blackbird	16.5
American robin	8.6
American goldfinch	3.7
gray catbird	3.1

SPECIES REACHING MAXIMUM	
American bittern	0.3
king rail	0.0
woodcock	0.7
greater yellowlegs	0.0
screech owl	0.1
loggerhead shrike	0.0
prothonotary warbler	0.1
yellow-breasted chat	0.1
common grackle	18.3
fox sparrow	0.0

DISSIMILARITY = 657

INDIVIDUAL BIRDS/SURVEY = 705.6

COMMENTS: Virginia rail chick.

METHODS: Day-long walk throughout S.A., with very little from outside boundaries. Gives pleasant account of day's experiences.

DATE	HOURS	SPECIES	OBSERVERS
2 July 1972	5:00	63	R. Hoffman
24 June 1973	7:00	58	"
23 June 1974	--	76	"
21 June 1975	10:30	64	"
30 June 1976	10:00	79	"
26 June 1977	11:00	79	"

AREA 49 = NEWPORT CONIFER-HARDWOODS S.A.

Door County T32N R29E Sec. 28, 29

24-ha northern mesic forest of sugar maple, beech, white birch and ash; 8 ha hemlock-hardwood, balsam-cedar-spruce and swamp hardwoods; ½ km beach zone on Lake Michigan. 56 ha.

MOST SIMILAR AREAS	
Holmboe (30)	470
Flora Lake (24)	526
High Cliff (29)	540
Rock Island (58)	548
Tellock's (65)	551

MOST COMMON SPECIES	
red-winged blackbird	12.0
herring gull	7.6
red-eyed vireo	7.2
American robin	6.5
ovenbird	6.0

SPECIES REACHING MAXIMUM	
black duck	0.5
red-breasted merganser	3.0

DISSIMILARITY = 669

INDIVIDUAL BIRDS/SURVEY = 433.0

COMMENTS:

METHODS: Walk thru S.A. on trails and by compass. Includes beach on edge of S.A.

DATE	HOURS	SPECIES	OBSERVERS
9 July 1971	5:00	49	L. Erickson

AREA 50 = OTTAWA LAKE FEN S.A.

Waukesha County T6N R17E Sec. 34

Lake edge and 1 ha lake separated by fen-marl flats and deep marsh. Also southern sedge meadow, shrub carr, tamarack swamp. 20 ha + 2 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Lima (38)	364	swamp sparrow	24.1	least bittern	1.2
Endeavor (21)	423	common yellowthroat	16.9	common yellowthroat	16.9
Newark (47)	431	red-winged blackbird	16.9		
Kettle Moraine (34)	445	Traill's flycatcher	6.0		
Avoca (2)	503	gray catbird	4.8		
		yellow warbler	4.8		
		song sparrow	4.8		

DISSIMILARITY = 748 INDIVIDUAL BIRDS/SURVEY = 83.0

COMMENTS: Least bittern restricted to marsh/fen; willow flycatcher restricted to shrub swamps; jay, chickadee, house wren, golden-winged warbler, grosbeak and bunting restricted to tamarack/aspen. Green herons have nested in the tamaracks.

METHODS: Walk throughout S.A., and canoe along lake shore on S.A. border.

DATE	HOURS	SPECIES	OBSERVERS
22 June 1977	3:40	22	J. Bielefeldt

AREA 51 = PINE GLEN S.A.

Sauk County T11N R6E Sec. 35

Deep rocky quartzite gorge, containing and surrounded by southern dry-mesic forest. slopes and gorge bottom, white and black oaks on southern exposures. Mountain maple and red elderberry common. 48 ha + 16 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Hemlock Draw (28)	279	wood thrush	5.7	--
Tellock's (65)	334	eastern pewee	5.7	
Honey Creek (31)	349	rose-breasted grosbeak	5.4	
Baxters Hollow (4)	385	blue jay	5.4	
Lawrence (37)	416	ovenbird	5.3	

DISSIMILARITY = 623 INDIVIDUAL BIRDS/SURVEY = 75.6

COMMENTS:

METHODS: Slow walk with occasional stops, thru gorge, and also along road in dry-mesic woods outside of S.A.

DATE	HOURS	SPECIES	OBSERVERS
26 June 1971	2:00	37	K. Lange
21 June 1972	2:00	37	"
14 June 1973	2:30	37	"
13 June 1974	--	38	"
16 June 1975	2:30	34	"
14 June 1976	2:30	40	"
13 June 1977	2:20	34	"

AREA 52 = PINE HOLLOW S.A.

Sauk County T10N R5E Sec. 4

Sandstone gorge, containing southern dry-mesic forest in upper end, hemlocks on protected slopes, and yellow birch-sugar maple-hemlock in gorge bottom. 40 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Hemlock Draw (28)	478	acadian flycatcher	14.7	ruby-throated hummingbird	1.2
Pine Glen (51)	492	ovenbird	8.6	acadian flycatcher	14.7
Wyalusing (71)	543	red-eyed vireo	7.3	magnolia warbler	2.4
Marinette (40)	571	eastern pewee	6.1	Louisiana waterthrush	3.7
Honey Creek (31)	607	wood thrush	5.5	Canada warbler	3.7
Schmidt (60)	607				

DISSIMILARITY = 782

INDIVIDUAL BIRDS/SURVEY = 81.7

COMMENTS: Nests or young observed for the following species: hummingbird, phoebe, acadian and least flycatchers, pewee, chickadee, winter wren, wood thrush, gnatcatcher, yellow-throated and red-eyed vireos, ovenbird, waterthrush, cowbird.

METHODS: Slow walk along stream thru S.A., with occasional stops. In 1976, record only those birds within ca. 50 m.

DATE	HOURS	SPECIES	OBSERVERS
16 June 1976	3:30	30	K. Lange, M. Mossman
24 June 1977	2:30	26	M. Mossman

AREA 53 = PLUM ISLAND

Door County T34N R30E Sec. 23 etc.

Undeveloped island off Door Peninsula. Mature sugar maple-basswood forest and wide beaches. 107 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Rock Island (58)	295	cliff swallow	21.5	cliff swallow	21.5
Newport (49)	576	herring gull	17.0		
Holmboe (30)	589	starling	7.1		
High Cliff (29)	617	tree swallow	5.6		
Hulbert Creek (32)	622	American redstart	5.1		

DISSIMILARITY = 759

INDIVIDUAL BIRDS/SURVEY = 1,009.0

COMMENTS:

METHODS: Walk along trail around perimeter, and across island via road and telephone line.

DATE	HOURS	SPECIES	OBSERVERS
30 June 1971	5:00	49	L. Erickson

AREA 54 = PLUM LAKE-STAR LAKE HEMLOCK FOREST S.A.

Vilas County T41N R8E Sec. 21, 22

Old growth northern mesic forest of hemlock, sugar maple, yellow birch and basswood. Depauperate ground layer. 81 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Marinette (40)	486	black-thr. green warbler	13.8	hermit thrush	3.8
Flora Lake (24)	544	red-eyed vireo	13.1	golden-crowned kinglet	5.4
Holmboe (30)	551	ovenbird	10.0	solitary vireo	0.8
Finnerud (23)	559	golden-crowned kinglet	5.4	parula warbler	4.6
Trout Lake (66)	570	parula warbler	4.6	yellow-rumped warbler	3.8
		winter wren	4.6	black-thr. green warbler	13.8

DISSIMILARITY = 784

INDIVIDUAL BIRDS/SURVEY = 65.0

COMMENTS: Pileated woodpecker drillings.

METHODS: Slow walk thru western ¼ of S.A., with occassional stops. 1977 census route includes less forest and more edge of Plum Lake.

DATE	HOURS	SPECIES	OBSERVERS
5 July 1976	3:30	24	J. Capelli, C. Paskowski, B. Thatcher
13 June 1977	2:30	21	" " , J. Zappieri

AREA 55 = QUARRY PRAIRIE (BUENA VISTA PRAIRIE AND MEADOW S.A.)

Portage County T21N R7E Sec. 2

Naturally reestablishing dry to dry-mesic prairie occupying a sandstone outcrop once quarried. Part of tract once disturbed by agriculture. Dominant grass is little bluestem. Some shrubs and Hill's oak. 16 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Buena Vista (7)	477	savannah sparrow	22.7	prairie chicken	0.5
Scuppernong (61)	613	brown-headed cowbird	16.9	Virginia rail	0.5
Endeavor (21)	616	red-winged blackbird	8.2	spotted sandpiper	2.4
Douglas Co. (19)	620	song sparrow	7.2	brown-headed cowbird	16.9
Kettle Moraine (34)	624	clay-colored sparrow	5.8	savannah sparrow	22.7

DISSIMILARITY = 781

INDIVIDUAL BIRDS/SURVEY = 103.5

COMMENTS:

METHODS: Walk between oak and shrub pockets and grassy areas.

DATE	HOURS	SPECIES	OBSERVERS
10 June 1971	2:00	29	J. Hart, I. Chapman
21 June, 12 July 1973	--	12	" , C. Munn

AREA 56 = RENAK-POLAK MAPLE-BEECH WOODS S.A.

Racine County T4N R22E Sec. 14

Southern mesic forest with sugar maple, red oak, white ash, beech and basswood. Level topography with an intermittent stream. 18 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Sanders (59)	536	great crested flycatcher	9.3	ring-necked pheasant	4.7
Lilly Lake (39)	556	common grackle	9.3	great crested flycatcher	9.3
Jung (33)	581	indigo bunting	9.3	indigo bunting	9.3
Vanderbloemen (67)	583	red-winged blackbird	9.3		
Endeavor (21)	593	American goldfinch	7.0		
		common flicker	7.0		
		song sparrow	7.0		
		brown-headed cowbird	7.0		

DISSIMILARITY = 721

INDIVIDUAL BIRDS/SURVEY = 43.0

COMMENTS:

METHODS: Uncertain. Evidently largely outside of maple woods.

DATE	HOURS	SPECIES	OBSERVERS
5 June 1976	1:30	19	M. Campbell, D. Frister

AREA 57 = RICE LAKE-THUNDER LAKE MARSH S.A.

Oneida County T38-39N R10E Sec. 3, 34

Shallow, soft-water drainage lake with wild rice. Surrounded by northern sedge meadow of blue joint grass, sedges, cattail and scattered shrubs. 101 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Newark (47)	554	red-winged blackbird	14.8	wood duck	7.5
Ottawa Fen (50)	558	swamp sparrow	13.5	bald eagle	0.4
Lima Bog (38)	576	marsh wren	13.1	marsh wren	13.1
Endeavor (21)	585	wood duck	7.5	sedge wren	6.6
Kettle Moraine (34)	611	sedge wren	6.6	yellow warbler	6.2
		yellow-headed blackbird	6.2	yellow-headed blackbird	6.6

DISSIMILARITY = 817

INDIVIDUAL BIRDS/SURVEY = 76.1

COMMENTS: Pair of sandhill cranes with one young observed on 11 June, 1977.

METHODS: Canoe perimeter of lake.

DATE	HOURS	SPECIES	OBSERVERS
30 May 1971	1:30	14	M. & D. Tomlinson
18 July 1973	1:00	10	P. Vanderschaegen
13 June 1977	1:30	21	" , J. Baughman

AREA 58 = ROCK ISLAND STATE PARK

Door County T34N R30E

Cliffs, beach, terraces with white cedar and white birch. Interior is northern mesic forest of sugar maple, yellow birch, beech and basswood (no hemlock). Understory of beech, elder and maple. 360 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Plum Island (53)	295	cliff swallow	20.0	--
Newport (49)	548	herring gull	11.8	
Baxter'sHollow (4)	601	barn swallow	9.6	
Hulbert Creek (32)	602	tree swallow	5.7	
Holmboe (30)	614	American robin	4.4	

DISSIMILARITY = 756

INDIVIDUAL BIRDS/SURVEY = 1,059.5

COMMENTS:

METHODS: Walk trail near perimeter of island. Count swallow nests on and in boathouse.

DATE	HOURS	SPECIES	OBSERVERS
1 July 1971	6:00	64	L. Erickson
4 July 1973	--	60	"

AREA 59 = SANDER'S PARK HARDWOODS S.A.

Racine County T3N R22E Sec. 36

Southern dry-mesic forest on two low ridges separated by forest of cottonwood and elm. 12 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Tellocks (65)	399	American robin	14.5	--
High Cliff (29)	416	blue jay	6.7	
Lilly Lake (39)	438	starling	6.3	
Cactus Rock (8)	474	indigo bunting	5.0	
Schmidt (60)	482	red-headed woodpecker	4.5	

DISSIMILARITY = 646

INDIVIDUAL BIRDS/SURVEY = 94.6

COMMENTS: Immature scarlet tanager. Increased human use of S.A. noted in 1977.

METHODS: Walk on road along perimeter and along paths thru S.A.

DATE	HOURS	SPECIES	OBSERVERS
6 June 1971	3:30	29	M. Campbell, D. Frister
10 June 1972	4:15	33	" , Mr. & Mrs. C. Frister, J. Campbell
9 June 1973	5:30	32	J. & M. Campbell
8 June 1974	--	25	--
3, 7 June 1975	5:00	31	J. & M. Campbell
5, 10 June 1976	9:00	35	M. Campbell, D. Frister

AREA 60 = SCHMIDT MAPLE WOODS

Clark County T28N R4W Sec. 18

Southern mesic forest of sugar maple, red oak, basswood, elm and ironwood. Surrounded on three sides by cropland. 16 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM
Tellock's (65)	399	song sparrow	12.1	--
Lilly Lake (39)	403	red-eyed vireo	10.3	
Pine Glen (51)	419	ovenbird	7.3	
Hemlock Draw (28)	423	common crow	5.5	
Honey Creek (31)	446	rose-breasted grosbeak	5.3	

DISSIMILARITY = 637

INDIVIDUAL BIRDS/SURVEY = 53.5

COMMENTS: Great blue heron nest.

METHODS: Walk slowly around perimeter, stopping occasionally, then walk to clearing by buildings.

DATE	HOURS	SPECIES	OBSERVERS
9 June 1971	1:00	25	S. Robbins
8 June 1972	1:10	28	"
20 June 1973	1:00	19	"
5 June 1974	--	22	"
2 June 1975	1:00	23	"
10 June 1976	0:55	20	"
15 June 1977	0:55	26	"

AREA 61 = SCUPPERNONG PRAIRIE S.A.

Waukesha County T5N R17E Sec. 16, 17

Wet-mesic prairie on east side of 1,400-ha Scuppernong Marsh. Scattered young bur oaks on small rise. 10 ha + 8 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Avoca (2)	300	red-winged blackbird	28.1	common snipe	2.4
Newark (47)	377	song sparrow	7.7	eastern meadowlark	3.4
Lima Bog (38)	397	common yellowthroat	6.1		
Kettle Moraine (34)	413	American goldfinch	5.6		
Endeavor (21)	447	savannah sparrow	5.0		
		American robin	5.0		
		bobolink	5.0		
		mourning dove	5.0		
		swamp sparrow	5.0		

DISSIMILARITY = 714

INDIVIDUAL BIRDS/SURVEY = 37.7

COMMENTS: Bobolink nest.

METHODS: Slow walk along highway on north edge, and along loop thru S.A.

DATE	HOURS	SPECIES	OBSERVERS
12 June 1971	1:20	13	E. Peartree
3 June 1973	1:00	14	"
10 June 1973	0:50	12	"
2 June 1974	--	19	"
28 June 1975	0:50	15	"
5 June 1976	1:15	18	"
4 June 1977	1:00	13	"

AREA 62 = SPRING GREEN RESERVE S.A.

Sauk County T8-9N R4E Sec. 5, 32

Surveyed area has south-facing limestone bluffs with prairie remnants, a thick grove of red cedars, and some hardwoods. This grades to a sandy plain of the Wisconsin River with sand prairie, blow-outs. Scientific Area is 56 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Blue River (6)	543	western meadowlark	18.0	dickcissel	5.2
Necedah N. (45)	626	field sparrow	16.3	grasshopper sparrow	14.6
Dewey Hts. (17)	638	grasshopper sparrow	14.6	field sparrow	16.3
Cactus Rock (8)	639	mourning dove	5.7		
Fuller (26)	645	brown thrasher	4.7		

DISSIMILARITY = 816 INDIVIDUAL BIRDS/SURVEY - 118.1

COMMENTS: Chipping sparrows feed young. Lark sparrows copulate.

METHODS: Walk 2 min/stand 5 min for 17 stops (1971-1974), for 16 stops in 1975, when birds counted only within 50 meters radius. Census done on Davies/Paull property (the juniper, sand barrens and prairie to west of S.A.). 1977 methods uncertain.

DATE	HOURS	SPECIES	OBSERVERS
17 June 1971	2:00	21	R. Hine
20 June 1972	2:15	21	"
30 June 1973	1:55	16	"
29 June 1974	--	17	"
21 June 1975	2:25	15	M. Jaeger, B. Bedford
20 June 1977	2:10	26	C. Cowles, M. Jaunzems

AREA 63 = STERLING BARRENS S.A.

Polk County T36N R20W Sec. 34

Jack pine barrens with sand prairie and few oaks. Strip of bottomland hardwoods (elm, black ash) along St. Croix River. 73 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Dunbar (20)	472	chipping sparrow	8.9	red-tailed hawk	1.2
Moquah (42)	476	cedar waxwing	6.6	ruffed grouse	5.4
Flora Lake (24)	521	tree swallow	5.8		
Lawrence (37)	521	ruffed grouse	5.4		
Hemlock Draw (28)	525	ovenbird	5.4		

DISSIMILARITY = 662 INDIVIDUAL BIRDS/SURVEY = 86.4

COMMENTS: Ruffed grouse brood.

METHODS: Slow walk thru S.A.

DATE	HOURS	SPECIES	OBSERVERS
7 June 1975	0:35	22	C. Faanes
22 June 1976	1:05	31	"
10 June 1977	2:15	36	"

AREA 64 = TOFT POINT S.A.

Door County T30N R28E Sec. 15, 16

Part of peninsula jutting into Lake Michigan. Northern mesic forest with large hemlock and white pine, rocky shore with dolomitic cliffs, old fields and white cedar-spruce lowlands. 137 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Blue River (6)	543	ring-billed gull	34.9	goldeneye	1.3
Newport (49)	559	black-capped chickadee	4.5	old squaw	0.0
Finnerud (23)	600	American robin	4.1	common merganser	0.3
Flora Lake (24)	614	black-thr. green warbler	3.4	ring-billed gull	34.9
Cactus Rock (8)	639	American redstart	3.1	Caspian tern	0.4
		ovenbird	3.1	blackpoll warbler	0.0

DISSIMILARITY = 749

INDIVIDUAL BIRDS/SURVEY = 407.6

COMMENTS: Common goldeneye broods.

METHODS: Extensive coverage, mostly on upland trails, 1971-1973. Eight 5-minutes stands (done twice--some outside S.A.), including mostly forest, but some shore, 1976-1977.

DATE	HOURS	SPECIES	OBSERVERS
6, 7, 29, 30 June, 1 July 1971	--	72	L. Erickson, L. Severson, E. Batchelor
27, 28, 29 June 1972	--	58	B. Vogelsang, " "
27, 29 June 1973	--	65	" " " , B. Werner, E. Toft
8, 11 July 1976	4:20	61	J. Trick
9, 10 July 1977	4:00	42	"

AREA 65 = TELLOCK'S HILL WOODS S.A.

Waupaca County T24N R13E Sec. 13

Mature northern mesic forest of sugar maple, beech, basswood and hemlock, on north slope. Many glacial erratics on forest floor. Bordered by cropland and woods. 12 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Pine Glen (51)	334	red-headed woodpecker	6.5	pileated woodpecker	2.2
Schmidt (60)	399	blue jay	6.5	red-headed woodpecker	6.5
Vanderbloemen (67)	414	rose-breasted grosbeak	6.5		
Sander's (59)	424	red-winged blackbird	5.8		
Hemlock Draw (28)	434	eastern pewee	5.0		
		house wren	5.0		
		American robin	5.0		

DISSIMILARITY = 635

INDIVIDUAL BIRDS/SURVEY = 46.2

COMMENTS: Red-headed woodpecker nest. Oriole fledgling. Edge species are song sparrow, thrasher, bunting.

METHODS: Walk with frequent stops, thru S.A. Count only birds within S.A., and distinguish edge birds.

DATE	HOURS	SPECIES	OBSERVERS
24 June 1975	2:30	27	K. Rill, A. Carpenter
23 June 1976	2:00	23	K. Rill
15 June 1977	2:30	25	K. Rill

AREA 66 = TROUT LAKE CONIFER SWAMP S.A.

Vilas County T41N R7E Sec. 19

Old-growth swamp with white cedar, black spruce, tamarack and balsam fir. Springs, sphagnum moss carpet. Surrounded by forest and conifer swamp. 100 m from Trout Lake. 6 ha + 4-ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Plum Lake (54)	570	black-capped chickadee	36.7	barred owl	1.4
Flora Lake (24)	584	blue jay	11.0	red-breasted nuthatch	3.3
Miscauno (41)	589	ovenbird	8.1	winter wren	4.8
Flambeau (36)	633	red-eyed vireo	6.2	black-capped chickadee	36.7
Finnerud (23)	640	winter wren	4.8		

DISSIMILARITY = 830

INDIVIDUAL BIRDS/SURVEY = 21.0

COMMENTS: Winter wren nest.

METHODS: Slow walk thru S.A., with frequent stops.

DATE	HOURS	SPECIES	OBSERVERS
2, 8 July 1973	6:30	9	J. Capelli (not used in analysis)
9 July 1975	0:45	5	L. Thomas
1 July 1976	4:45	9	J. Capelli, B. Thatcher
7 July 1977	4:30	17	"

AREA 67 = VANDERBLOEMEN BOG S.A.

Manitowoc County T18N R22E Sec. 32

Ca. 1 ha open mat bog surrounded by tamarack, black spruce and white pine swamp forest. These conifers grade into black ash, red maple and white birch farther from the bog. 9 ha + 8 ha buffer.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
High Cliff (29)	365	house wren	8.1	black-throated blue warbler	0.1
Baxter's Hollow (4)	371	American robin	5.8	tree sparrow	0.3
Honey Creek (31)	390	starling	4.5		
Fairy Chasm (22)	391	American goldfinch	4.5		
Cactus Rock (8)	409	blue jay	4.2		

DISSIMILARITY = 586

INDIVIDUAL BIRDS/SURVEY = 231.3

COMMENTS:

METHODS: Walk 5 min/stand 5 min along 4-6 parallel transects.

DATE	HOURS	SPECIES	OBSERVERS
7 July 1973	5:15	45	V. Osterhaut et al.
21 June 1975	6:00	41	"
3 July 1976	4:30	40	"
5 July 1977	6:15	40	"

AREA 68 = WAUPUN PARK MAPLE FOREST S.A.

Fond du Lac County T14N R15E Sec. 31

Ca. 2/3 is southern mesic forest with sugar maple, basswood, red oak and ash. Remainder is drier, more open, and with more oaks and fewer maples. Agriculture on 3 sides, wooded recreation area on other side. 16 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Sander's (59)	369	starling	15.2	house wren	8.8
Fairy Chasm (22)	434	American robin	10.4	house sparrow	7.9
Vanderbloemen (67)	462	house wren	8.8		
Tellock's (65)	468	house sparrow	7.9		
High Cliff (29)	524	common grackle	6.9		

DISSIMILARITY = 717

INDIVIDUAL BIRDS/SURVEY = 130.0

COMMENTS:

METHODS: Cover S.A. extensively, on trails and along perimeter, and walk thru recreation area outside perimeter (habitat similar).

DATE	HOURS	SPECIES	OBSERVERS
3 July 1971	2:00	23	C. Gilmore
24 June 1972	2:00	30	"
1 July 1973	2:00	30	"
23 June 1974	--	23	"
22 June 1975	1:30	23	"
27 June 1976	1:20	23	"

AREA 69 = WEST SHORE WILDLANDS

Brown County T24N R20E

On Green Bay. Marsh, deltas and sandbars; white birch, cottonwood, aspen and ash, red-osier dogwood and willow; on drier sites, aspen, red maple, elm, hazel and chokecherry.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Chiwaukee (15)	520	red-winged blackbird	12.2	double-crested cormorant	0.4
Black Tern (5)	587	tree swallow	11.6	American bittern	0.3
New Munster (48)	613	black tern	10.5	purple martin	3.9
High Cliff (29)	658	bank swallow	7.0	common gallinule	0.4
Wis. Point (70)	661	yellow-headed blackbird	6.2	dowitcher sp.	0.8
				Wilson's phalarope	0.1
				Franklin's gull	0.0
				Forster's tern	0.9
				bank swallow	7.0
				purple martin	3.9
				brewer's blackbird	5.6

DISSIMILARITY = 793

INDIVIDUAL BIRDS/SURVEY = 276.4

COMMENTS: Forster's ferns do not nest in marsh, but in nearby areas.

METHODS: Walk 2 land routes, and canoe along edge of emergent vegetation.

DATE	HOURS	SPECIES	OBSERVERS
14, 21 June 1971	7:00	40	R. Cook, J. Trick
1 July 1972	3:00	38	R. Cook, D. Kush
2 July 1973	1:15	33	J. Trick
1, 3 July 1974	--	40	"
9 July 1975	1:45	31	"
6 July 1976	1:30	50	"
4, 5 July 1977	2:55	46	"

AREA 70 = WISCONSIN POINT

Douglas County T49N R13W Sec. 27, 28, 34, 35

Long narrow sand spit in Lake Superior, with broad beaches. Central area forested with red pine and white pine. Marsh at base of peninsula and bordering Allouez Bay. >100 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Plum Island (53)	626	herring gull	43.9	canvasback	0.3
West Shore (69)	661	tree swallow	17.2	piping plover	0.2
Rock Island (58)	716	common tern	7.3	herring gull	43.9
Newport (49)	741	red-winged blackbird	5.6	Bonaparte's gull	2.4
Chiwaukee (15)	744	black tern	2.6	common tern	7.3
				tree swallow	17.2

DISSIMILARITY = 856 INDIVIDUAL BIRDS/SURVEY = 1,119.8

COMMENTS: Black tern and common tern nests. Canvasback brood. Piping plovers appear to have nested. Landfill discontinued between 1976 and 1977 counts, evidently causing drop in herring gull numbers.

METHODS: Drive length of point, making 8 stops (1971). Drive along road, stopping at .35-.5 mile intervals, walk a section of beach; census some new area on second visit (1976). Cover area from landfill to old lighthouse, stopping every .4-.5 mile, counting on both beach and bay sides (1977).

DATE	HOURS	SPECIES	OBSERVERS
16 June 1971	3:00	57	D. Bratley, H. Mathiak
10, 18 July 1976	7:30	50	W. Bielenberg, R. Johnson
6 July 1977	3:30	39	R. Johnson

AREA 71 = WYALUSING HARDWOOD FOREST S.A.

Grant County T6N R6W Sec. 16

On steep sides and top of 125-m tall ridge. Forest types surveyed (all southern) include lowland hardwood, mesic, dry-mesic with basswood and red oak, and dry-mesic with red oak. Surrounded by forest, adjacent to Wisconsin River at its confluence with Mississippi River. 75 ha.

MOST SIMILAR AREAS		MOST COMMON SPECIES		SPECIES REACHING MAXIMUM	
Hemlock Draw (28)	469	red-eyed vireo	7.0	yellow-billed cuckoo	1.6
Honey Creek (31)	469	cerulean warbler	7.0	red-bellied woodpecker	4.3
Pine Glen (51)	469	white-breasted nuthatch	5.8	blue-gray gnatcatcher	3.1
Tellock's (65)	479	eastern pewee	5.4	cerulean warbler	7.0
Cedarburg Beech (10)	516	blue jay	5.4	Kentucky warbler	0.8
		northern cardinal	5.4	northern cardinal	5.4

DISSIMILARITY = 718 INDIVIDUAL BIRDS/SURVEY = 128.5

COMMENTS:

METHODS: Walk thru S.A., from NW corner to midway along south boundary (1975).

DATE	HOURS	SPECIES	OBSERVERS
19 June 1975	2:30	38	W. Smith, J. Hodgson
8 July 1976	3:15	38	" , R. Read

100-C04745-80