

Fran James

Mon

6/21/80

Handout #3 for Field Ornithology

UMFBS 1980

A Quantitative Method of Habitat Description

Once you become familiar with the avifauna of an area, you learn where to expect certain species, and you can make predictions about the birds that occur in a certain habitat. Even within a habitat you can identify a configuration of vegetation where the same species is generally found. Thus in the mature deciduous forest of Bear Paw Point, you expect a Winter Wren in the old treefall with logs on the ground and tall conifers, the American Redstart in the sunlit deciduous second growth and the Ovenbird near the open forest floor.

In order to characterize the structure of the vegetation, we will take 0.1-acre circular samples. The equipment for this consists of:

1. a yardstick
2. a diameter stick for reading the diameter of a tree
3. an ocular tube for estimating percent ground cover and canopy cover

First, determine the density of trees by species and size class. Using the diameter stick appropriate for your arm length, classify each tree in a 0.1-acre (.04 hectare) circle by size class.

Estimate ground cover by recording + or - for the number of sightings of green vegetation on the ground in 20 randomized readings. Estimate shrubiness by recording + or - for whether any woody stems or branches were intercepted by outstretched arms in each of 20 readings, taken each two steps in a transect across the circle. Enter this information on the data sheet and then transfer it to the summary sheet. See James, F.C. and H. H. Shugart, 1970, Audubon Field Notes 24:727-736, for additional details.

To examine the differences between two study plots, or among the species-specific habitats of different species of birds, you might want to estimate their difference from a standard. Use the MAXDIFF sheet for these calculations. It will give you a value for the difference between your data and ovenbird habitat in Clearwater County, Minnesota.

Shrubs: 1237.5 → 495

Ground 597.5 → 239 ÷ 400 → 59.8%

Canopy 732.5 → 293 ÷ 400 → 73.3%

Summary Sheet A

Summary Sheet for Tenth-acre (0.4 hectare) Circles

Number of Circles =

Trees:

Density ¹										Total	Trees/acre (by species) ²	Relative Density (by species) ³
Species	Number of trees in all circles by size class											
	A 3-6	B 6-9	C 9-12	D 12-15	E 15-21	F 21-27	G 27-33	H 33				
1 Oak	1, 2 (3)	1, 3, 1 (6)	2, 3, 1 (7)	3, 4 (7)	1 (1)				26	52	15.8 %	
2 Birch	1, 2 (2)	1, 8, 9 (22)	4, 3 (7)	1 (1)					33	66	20.1 %	
3 Maple	1, 3, 1 (3)	1, 7, 4 (20)	2, 6, 3 (12)						45	90	27.4 %	
4 Red Pine						1 (1)	1 (1)		2	4	1.2 %	
5 Elm	4, 8, 2 (27)	1 (1)							28	56	17.1 %	
6 Aspen	1 (1)	5, 1 (2)	5, 1, 4 (7)	1 (1)	2 (2)				17	34	10.4 %	
7 Dead	1 (4)	3 (3)	1 (1)				1 (1)		9	18	5.5 %	
8 Basswood			2 (2)	2 (2)					4	8	2.4 %	
9												
10												
TOTAL									164	327	100%	
Trees/acre by size class	49	54	37	18	3	1	2		164	327	100%	
Relative Density by size class	29.9	32.9	22.6	11.0	3.4	1.2	2.4					

Shrubs: Percent of + readings for interception of woody vegetation $\frac{42}{100} \times 100 = 42\%$ Eg. total pluses (+) in 20 readings $\times 5$.

Ground Cover: Percent of plus + readings for green vegetation sighted in ocular tube. Eg. total pluses in 20 sightings $\times 5$. $\frac{88}{100} \times 100 = 88\%$ ground cover

Topy Cover: Percent of plus (+) readings. Eg. 46% ground cover. Eg. total pluses in 20 sightings $\times 5$. $\frac{46}{100} \times 100 = 46\%$ ground cover

Summary Sheet B

Summary Sheet for Tenth-acre (0.4 hectare) circles.

Number of Circles =

Pluses

Species	Basal Area ⁵								Total Basal Area (sq. feet)	Relative Dominance ⁷ (by species)	No. of circles in which the species occurred	Frequency
	Cross sectional area of the trunk at 4.5 feet from the ground (d.b.h.)											
	A (0.1)	B (0.3)	C (0.6)	D (1.0)	E (1.8)	F (3.1)	G (4.9)	H (005.4) ³³⁻⁴⁰²				
1 Oak	.3	1.8	4.2	9.0	1.8				17.1	21.5	5	100%
2 Birch	.2	6.6	4.8	1					18.6	15.8	4	80%
3 Maple	1.3	6.0	7.2						14.5	18.2	5	100%
4 Red Pine						3.1	4.9		8.0	10.0	1	20%
5 Elm	2.7	0.3							3.0	3.4	5	100%
6 Aspen		0.6	4.2	6.0	3.6				14.4	18.1	4	80
7 Dead	0.4	0.9	0.6				4.9		6.8	8.5	3	60
8 Basswood			1.2	2.0					3.2	4.0	2	40
9												
10												
TOTAL									79.6	100%		100%
Trees/acre by size class	4.9	16.2	22.2	18.0	5.4	3.1	9.8		79.6			
Relative Density by size class ⁸	6.2	20.3	27.9	22.6	6.8	3.9	12.3		100%			
Shrubs: Percent of + readings for interception of woody vegetation < 3" d.b.h. Eg. total pluses (+) in 20 readings x 5.												
Ground Cover: Percent of plus + readings for green vegetation sighted in ocular tube. Eg. total pluses in 20 sightings x 5.												
Canopy Cover: Percent of plus (+) readings. Eg. total pluses in 20 sightings x 5.												

no real dominant trees
mostly maple, birch & oak but oak a mixed hardwood forest
Oak, Aspen, Birch, Maple
Fruit down
oak

Basal Area
4.9/20.16

FOOTNOTES

¹ Number per unit area.

² Total trees counted x

$\left\{ \begin{array}{ll} 2 & \text{if 5 circles} \\ 1.6 & \text{if 6 circles} \\ 1.4 & \text{if 7 circles} \\ 1.3 & \text{if 8 circles} \\ 1.1 & \text{if 9 circles} \\ 1.0 & \text{if 10 circles} \end{array} \right.$

³ Relative density is the percent of the total number of trees that are the species in question:

$$\frac{\text{number of trees of the species}}{\text{total number of trees of all species}} \times 100$$

⁴ Give estimated diameter

⁵ Basal area is the cross sectional area of the trunk of a tree at 4.5 feet diameter breast height (d.b.h.)

⁶ Multiply the number of trees in all circles in size class A by 0.1 (average area in square feet for this size class). Area = $\frac{\pi d^2}{4}$.

$$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$$

⁸ Frequency indicates the evenness of distribution of a species

$$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$$

MAXDIF Analysis Sheet for Tenth-acre (0.4 hectare) Circles Compared with a Standard Forest¹

	GC	SH	3-6 A	6-9 B	9-12 C	12-15 D	15-21 E	21-27 F	27-33 G	> 33 H	TOTAL
Original data											
Cumulative distribution											
H = Relative cumulative distribution of habitat											1.000
S = Relative cumulative distribution of standard	0.111	0.222	0.327	0.549	0.740	0.876	1.00	1.00	1.00		1.000
D = H - S = difference between habitat and standard											
Sign of D											

Sum of positive values of D = $\sum D_+$ =

Sum of negative values of D = $\sum D_-$ =

Maximum absolute value of D with sign =

¹ Standard forest is average of 3 0.1 acre circles in ovenbird habitat in Clearwater Co., MN. (Original data: GC, 50; SH, 50; 3-6" diam. tree/acre, 47; 6-9, 107; 9-12, 86; 12-15, 61; 15-21, 56; > 21, 0)

² Number of pluses in 20 readings x 5 = frequency (or evenness) per unit ground area or shrubline.

³ Number of trees per acre.

Figure 1. The effect of the concentration of the polymer on the gelation time of the epoxy resin system.

STANDARD FOREST

Standard Forest in Minnesota									
	W	SH	3-6 (20+)	6-9 (56)	9-15 (144)	15-21 (324)	21-27 (576)	27-33 (900)	33-40 (1332)
Original data	14.6	7.8	47	107	147	56	0	0	
Estimate of foliage	2132	606	940	5992	21168	18144	-	-	
Relative distribution	2132	2740	3680	9672	30840	48984	-	-	
Relative distribution	.044	.056	.075	.197	.630	1.000	1.000	1.000	
									N ₁ = 48984

Number of places in 20 readings

Number of trees per acre

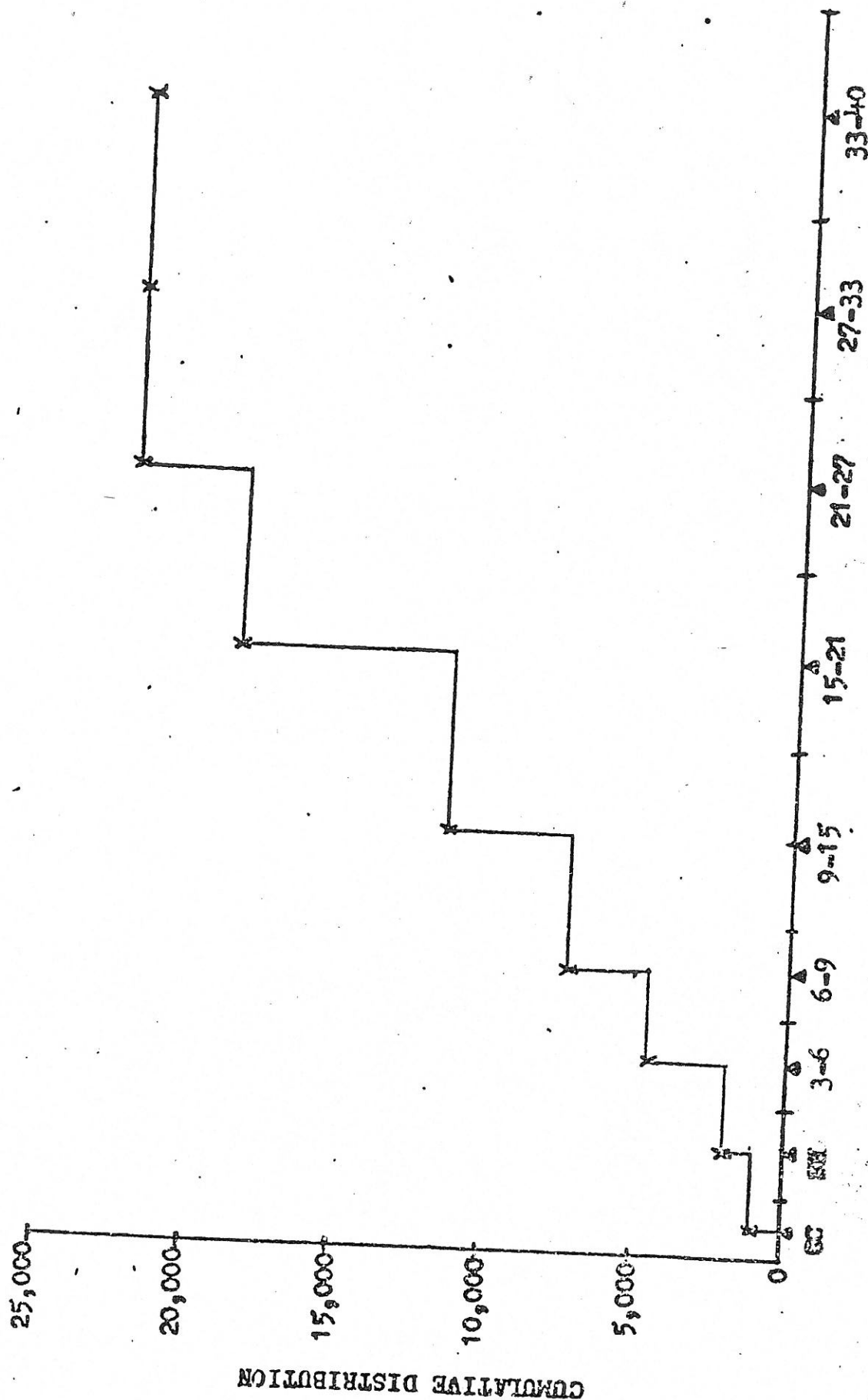
Number observed/acre/average diameter of the size class)

Average diameter of the size class)

Number of places in 20 readings) ² x 10

Quantitative vegetation data for standard forest. It is an estimate of ground cover, the number of sightings of each vegetation on the ground in 20 randomized readings. SH is an estimate of shrubiness, the number of times shrubs were intercepted by cut-reached area in 20 plus or minus readings taken each two steps; size classes are for diameter (largest height of tree in 0.1-acre circular samples extrapolated to trees per acre (James, F.C. and H. H. Shugart, Jr. 1970. A quantitative method of habitat description. Audubon Field Notes 24:127-136). Original data for this standard forest taken from three 0.1-acre circles in Overbird habitat in Clearwater County, Minnesota, obtained by Scott Collins.

CUMULATIVE DISTRIBUTION OF ESTIMATED FOLIAGE VOLUME IN THE STANDARD FOREST
Data from James & Shugart, 1970



FIELD IDENTIFICATION
EBB 5834
SUMMER I
1978

