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AVIAN COMMUNITY ANALYSIS OF WALKER BRANCH WATERSHED

Stanley H. Anderson
Herman H. Shugart, Jr.

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AVIAN COMMUNITY ANALYSIS OF WALKER BRANCH WATERSHED

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ENVIRONMENTAL SCIENCES DIVISION

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INTRODUCTION

Bird population studies have typically examined individual populations with reference to specific interactions and intra-actions on groups of populations within a specific vegetation type (Root 1967; Kendeigh 1946). This latter form of research has continued with the development of specific variables which could be correlated with specific bird species (Wiens 1969; Shugart and Patten 1972).

The objectives of this study are to gather information on the behavior and population dynamics of the avian community, relate it to the vegetation making it useful in predicting the effects of habitat alteration, determine avian community interrelationships, and relate the avian community to other components of the ecosystem. In the course of the study a data base of an avian community in a deciduous forest was developed. These data are useful as a basis for predicting the effect of habitat alteration on the bird community. Information is available on species and community composition, activity, habitat utilization on a daily, seasonal and annual basis.

STUDY AREA

Walker Branch Watershed is located on the U.S. Atomic Energy Commission Oak Ridge Reservation in eastern Tennessee at latitude 35° 58' N, longitude 84° 17' W. The watershed covers 97.5 ha, ranges in elevation from 285 m to 375 m, and occupies an area of steeply sloping ridges and narrow valleys. Slopes of less than arctan 0.05 are typical of only 1% of the watershed, while about 45% of the area has slopes of greater than arctan 0.30.

Prior to 1942, approximately 25% of the watershed was cleared for agriculture. Succession has restored most of this area to closed canopy forest. Since 1942, two disturbances have taken place in the forest -- the establishment of a small (ca. 2.5 ha) loblolly pine (Pinus taeda) plantation in 1952 and a fire in 1967 which burned over one-third of the area (Auerbach et al. 1971). A dense shrub layer has now developed under the overstory canopy on the burned area.

Curlin and Nelson (1968) established 298 0.08-ha sample plots by a stratified random sampling scheme recognizing four classes of overstory composition, four density classes within each and four height classes within each density class. A combination of ordination and classification techniques (Grigal and Goldstein 1971) was used to investigate the structure of the watershed using the basal area of the 12 most common tree species as variables. A total of 131 of the 298 stands belong to the four distinguishable groups (forest types). These four types were designated as pine (predominately Pinus echinata), yellow poplar (dominated by Liriodendron tulipifera), oak-hickory (mixed Quercus sp., Carya sp.) and chestnut oak (typified by Quercus primus). Six study plots of each of the four types were selected on the basis of slope for intensive analysis. Biomass of each tree on these 24 plots was estimated allometrically for foliage, branch, bole (total trunk above surface of the ground) and stump (total trunk and roots to 60 cm away from trunk below surface of ground) (Harris et al. 1973). Understory, subcanopy and canopy strata were delineated on the following ranges of D.B.H.

1	1.2-8.4 cm dbh
2	8.5-22.8 cm dbh
3	>22.8 cm dbh

Additionally, the number of trees on each 0.08-ha plot in each of the size classes was tabulated.

Table 1 summarizes the 28 habitat variables from the intensively study plots used in the present study of avian habitat selection. The first nine variables describe the amount of biomass present. FOL1, BRA1 and BOL1 are the smaller trees which compose the biomass of the understory layer; FOL2, BRA2 and BOL2 compose the biomass of the subcanopy; while FOL3, BRA3 and BOL3 compose the biomass of the canopy. The 12 variables beginning with A describe biomass of foliage, branches, boles and stumps of the average tree on a plot.

METHODS

Avian population sampling was divided into three periods during 1972: breeding, May 30-July 20; fall, September 20-October 31; and winter, November 30-December 20. During each of the three periods, birds were observed on the 24 core plots. The daylight hours were divided into morning (0600-1000 hr EST), midday (1000-1700 hr) and evening (1700-2100 hr) for sampling purposes. Three 1-hr morning, two 1-hr midday and one 1-hr evening periods were used to observe birds on each of the 24 plots during each period. The observer, sitting near the edge of a core plot where he could view the entire plot recorded the total number of birds on the plot at the end of each 5-min interval. The following information was noted for each

Table 1. Habitat variables (all biomass data in dry weight)

Mnemonic	Description	Mean value for plots studied
FOL1	Foliage biomass of trees 1.2-8.4 cm dbh	1,077 kg/ha
FOL2	Foliage biomass of trees 8.5-22.8 cm dbh	2,043 kg/ha
FOL3	Foliage biomass of trees >22.8 cm dbh	2,206 kg/ha
BRA1	Branch biomass of trees 1.2-8.4 cm dbh	3,361 kg k ha
BRA2	Branch biomass of trees 8.5-22.8 cm dbh	11,500 kg/ha
BRA3	Branch biomass of trees >22.8 cm dbh	18,920 kg/ha
BOL1	Bole biomass of trees 1.2-8.4 cm dbh	8,509 kg/ha
BOL2	Bole biomass of trees 8.5-22.8 cm dbh	35,850 kg/ha
BOL3	Bole biomass of trees >22.8 cm dbh	68,620 kg/ha
NUM1	Number of trees 1.2-8.4 cm dbh	9,000/ha
NUM2	Number of trees 8.5-22.8 cm dbh	210/ha
NUM3	Number of trees >22.8 cm dbh	55/ha
AFO1	Foliage biomass of average tree 1.2-8.4 cm dbh	0.12 kg
AFO2	Foliage biomass of average tree 8.5-22.8 cm dbh	9.80 kg
AFO3	Foliage biomass of average tree >22.8 cm dbh	40.10 kg
ABR1	Branch biomass of average tree 1.2-8.4 cm dbh	0.37 kg
ABR2	Branch biomass of average tree 8.4-22.8 cm dbh	54.76 kg
ABR3	Branch biomass of average tree >22.8 cm dbh	344.00 kg
ABO1	Bole biomass of average tree 1.2-8.4 cm dbh	0.95 kg
ABO2	Bole biomass of average tree 8.4-22.8 cm dbh	170.70 kg
ABO3	Bole biomass of average tree >22.8 cm dbh	1247.64 kg
AST1	Stump biomass of average tree 1.2-8.4 cm dbh	0.40 kg
AST2	Stump biomass of average tree 8.4-22.8 cm dbh	35.4 kg
AST3	Stump biomass of average tree >22.8 cm dbh	80.6 kg
SLOP	Percent slope of plot	24°
SOLE	kcal of solar radiation reaching plot	281 kg cal/cm^2
RADI	Solar radiation reaching plot/expected solar radiation at this latitude	0.53%
SAPS	Number of saplings	8382/ha

individual: species, sex, age, height, activity. The time and weather condition (sun, rain, wind, high clouds) was recorded.

Habitat selection strategies were analyzed by means of a discriminant function analysis that provided an ordering of the variables according to their importance to each species. Variables which significantly distinguished situations in which a given species could be expected to be absent, present or present in numbers greater than one on a 0.08-ha circular plot were termed "selected variables". A "situation" as used in the above definition referred to a 0.08-ha plot and its associated habitat conditions. In our analysis, we viewed the problem of habitat selection as one of identifying variables which had the strongest ability to classify three groups of situations, namely, those in which a species was absent, present or present in large numbers. By viewing habitat selection from this perspective, we could use straightforward statistical techniques to analyze the variables. The numerical analysis statistically involved both univariate and multivariate procedures.

The one-way-fixed-effects model used for the multivariate analysis is familiar to most biologists and is of the form:

$$x_{ij} = \mu + \tau_i + e_{ij}, \quad i = 1,2,3$$

where

x_{ij} = an independent observation drawn from 3 normal populations with population means $\mu_1,\ldots,\mu_3$ and with an unknown variance σ^2.

μ = a "general-level parameter" common to all x_{ij} observations.

τ_i = an effect associated with the condition that a given bird species absent (τ_1), present (τ_2) or present in numbers greater than one (τ_3).

e_{ij} = a normal, independent, random variable with a mean = 0, and a variance = σ^2.

In multivariate analysis of variance in the analogous case, the model in matrix notation is of the form (Morrison 1967):

$$X = A \underline{\bar{\tau}} + \Sigma$$

where

X = the matrix of observations

A = a design matrix

$\underline{\bar{\tau}}$ = a matrix of unknown parameters

Σ = matrix of residual variates.

In this case,

$$\underline{\bar{\tau}} = \begin{bmatrix} \tau_{11} & \cdots & \tau_{1p} \\ \cdots & \cdots & \cdots \\ \\ \tau_{k1} & \cdots & \tau_{kp} \\ \mu_{1p} & \cdots & \mu_3 \end{bmatrix}$$

and the appropriate null hypothesis:

$$H_0 = \begin{bmatrix} \tau_{11} & & & & \tau_{k1} \\ \cdot & & & & \cdot \\ \cdot & = & \cdot\cdot\cdot & = & \cdot \\ \cdot & & & & \cdot \\ \tau_{1p} & & & & \tau_{kp} \end{bmatrix}$$

where k = the number of conditions (in this case k = 3) and p = the number of response variables (habitat measurements). For a more detailed development see Morrison (1967).

In testing the habitat variables for significance, multivariate analyses of variance account for the covariate relationships among the habitat variables. To gain insight into the classifactory strength of the variables for separating each species' abundance on plots, each habitat variable is correlated with the discriminant function. The discriminant function is the best linear artificial variable for separating the three groups (Rao 1952), and the size of the above-mentioned correlation coefficient is an index of the classifactory strength of the variable.

To compare community organization of the avian populations on the watershed, discriminant function analysis (Mahalanobis D^2) is used to construct an n-dimensional hypervolume of habitat variables in which each bird species is found. The position of each bird species "niche" in this hypervolume can be measured directly in terms of distances in the hyperspace. We concentrate on distances between species niches and seasonal changes in species habitat preferences in our analyses.

Height distribution curves were prepared for each species and for the total avian population on the watershed by tabulating the number of individuals recorded in each 5-foot interval. Temporal curves were prepared for each species and the total avian population by tabulating the number of individuals observed during each 5-min interval during the day. As the behavior of each individual was recorded for height-time, the following comparisons could be made: (1) variation in species composition with height; (2) variation in species behavior with height; (3) variation of species observed with time of day; (4) variation in species behavior with time of day. Since the 24 study plots consisted of four vegetation types, vertical, temporal and behavioral variations were examined for the whole study area and compared with each of the four vegetation types.

The Kolmogorv-Smirnov two-sample test (Siegel 1956) was used to determine if species or groups of species showed a significant difference within behavioral patterns at different heights and time periods or if species composition varied with height for time of day. The test indicated two independent samples had been drawn from the same population. It was sensitive to any kind of differences in distribution from which the two samples were drawn (central tendency, dispersion, skewness).

RESULTS

Seasonal Variation in Avifauna

The greatest avian abundance occurred in the breeding period. A large influx of migrants, primarily warblers (Table 2), greatly increased

Table 2. Seasonal variation in numbers of birds on Walker Branch Watershed

SPECIES		VARIABLE #	MNEMONIC	SEASONAL OCCURRENCE BREEDING	FALL	WINTER
Broad-winged Hawk	(*Buteo platypterus*)	005	BWHA	2		
Yellow-billed Cuckoo	(*Coccyzus americanus*)	007	YBCO	41	7	
Black-billed Cuckoo	(*Coccyzus erythropthalmus*)	008	BBCO		3	
Ruby-throated Hummingbird	(*Archilochus colubris*)	015	RTHB	5		
Yellow-shafted Flicker	(*Colaptes auratus*)	016	YSFL	8		
Pileated Woodpecker	(*Dryocopus pileatus*)	017	PIWD	2	8	3
Red-bellied Woodpecker	(*Centurus carolinus*)	018	RBWO	27	18	7
Hairy Woodpecker	(*Dendrocopos villosus*)	021	HWOO	5		2
Downy Woodpecker	(*Dendrocopos pubescens*)	022	DWOO	36	13	24
Great Crested Flycatcher	(*Myiarchus crinitus*)	023	GCFC	2		
Acadian Flycatcher	(*Empidonax virescens*)	025	AFLY	7		
Eastern Wood Pewee	(*Contopus virens*)	028	PEWE	90		
Blue Jay	(*Cyanocitta cristata*)	030	BJAY	55	28	
Common Raven	(*Corvus corax*)	031	CRAV	3	2	
Common Crow	(*Corvus brachyrhynchos*)	032	CROW	14	12	12
Carolina Chickadee	(*Parus carolinensis*)	033	CHIC	244	122	75
Tufted Titmouse	(*Parus bicolor*)	034	TITM	64	58	27
White-breasted Nuthatch	(*Sitta carolinensis*)	035	WBNH	24	22	24
Red-breasted Nuthatch	(*Sitta canadensis*)	036	RBNH			15
Brown Creeper	(*Certhia familiaris*)	037	CREP		12	20
Winter Wren	(*Troglodytes troglodytes*)	038	WINW		2	
Carolina Wren	(*Thryothorus ludovicianus*)	039	WREN	16	9	7
Brown Thrasher	(*Toxostoma rufum*)	042	BRTH	2	2	
Wood Thrush	(*Hylocichla mustelina*)	044	WOTH	15	9	
Eastern Bluebird	(*Sialia sialis*)	049	EABB		2	
Blue-gray Gnatcatcher	(*Polioptila caerulea*)	050	GNAT	25		
Golden-crowned Kinglet	(*Regulus satrapa*)	051	GCKI		45	120
Ruby-crowned Kinglet	(*Regulus calendula*)	052	RCKI	2	6	77
Cedar Waxwing	(*Bombycilla cedrorum*)	054	CEDW			5

Table 2 (continued)

SPECIES		VARIABLE #	MNEMONIC	SEASONAL OCCURRENCE BREEDING	FALL	WINTER
White-eyed Vireo	(*Vireo griseus*)	057	WEVI	6	23	
Yellow-throated Vireo	(*Vireo flavifrons*)	058	YTVI	4		
Red-eyed Vireo	(*Vireo olivaceus*)	059	REVI	139		
Slate-colored Junco	(*Junco hyemalis*)	060	JUNC		13	
Warbling Vireo	(*Vireo gilvus*)	061	WAVI	2		
Black and White Warbler	(*Mniotilta varia*)	062	BWWA		11	
Worm-eating Warbler	(*Helmitherous vermivorus*)	064	WEWA	4		
Black-throated Green Warbler	(*Dendroica virens*)	075	BTGW	2		
Cerulean Warbler	(*Dendroica cerulea*)	077	CERW	9		
Pine Warbler	(*Dendroica pinus*)	082	PINW	22	5	
Prairie Warbler	(*Dendroica discolor*)	083	PRAW	3	4	
Ovenbird	(*Seiurus aurocapillus*)	085	OVEN	5		
Yellowthroat	(*Geothlypis trichas*)	086	YTHR	2		
Yellow-breasted Chat	(*Icteria virens*)	087	YBCH	6		
Kentucky Warbler	(*Oporornis formosus*)	088	KENW	5		
Mourning Warbler	(*Oporornis philadelphia*)	089	MORN		4	
Hooded Warbler	(*Wilsonia citrina*)	090	HOOD	39	5	
Brown-headed Cowbird	(*Molothrus ater*)	093	BHCB	4		
Scarlet Tanager	(*Piranga olivacea*)	094	SCAT	21	4	
Summer Tanager	(*Piranga rubra*)	095	SUMT	15		
Cardinal	(*Richmondena cardinalis*)	096	CARD	20	14	
Indigo Bunting	(*Passerina cyanea*)	098	IBUN	7		
Rufous-sided Towhee	(*Pipilo erythrophthalmus*)	099	RSTO	3		
Chipping Sparrow	(*Spizella passerina*)	100	CHIP	4		
Total Species				43	28	14
Total Individuals				1011	463	418

the number of species present in this eastern deciduous forest. It should be emphasized that we were talking only about the species present on the watershed. Some species (e.g., Yellow-breasted Chat, Great Crested Flycatcher, and Chipping Sparrow) were occasionally seen on the study plots; yet they were more typically found in other habitats. Other species such as the Broad-winged Hawk and crow appeared in the watershed but could be found in many different habitats. A decrease in the total number of birds observed during the fall and winter periods was an indication of change in both habitat utilization (discussed later) and food availability. The watershed had very few species during the winter period. Most of those present were found in flocks.

Habitat Distribution

"Habitat distribution" refers to or describes a condition in which the habitats where a species appears to be absent are significantly different from habitats where the species appear to be present. In this context, all comments concerning habitat distribution are made relative to the habitat variables that are actually measured.

A simple correlation matrix is constructed for all habitat variables measured (Table 3). This matrix shows variables which have a high degree of correlation and might thus be eliminated from the analysis. For example, FOL1 and BRA1 are highly correlated (P = .99) as are FOL1 and BOL1 (P = .99) and FOL1 and NUM1 (P = .89).

Table 3. Matrix of simple correlation of habitat variables

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
FOL1	1.0000E 00	1.2611E-01	-5.2327E-01	9.9183E-01	8.6104E-02	-4.8332E-01	9.8551E-01	7.1668E-02	-4.6926E-01	8.8985E-01
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
FOL1	2.4621E-01	-6.1491E-01	1.4493E-01	-3.3993E-01	1.9095E-01	1.2202E-01	-3.3780E-01	1.8215E-01	1.1671E-01	-3.3732E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
FOL1	1.7820E-01	1.3705E-01	-3.4133E-01	1.8905E-01	-1.1683E-01	7.3421E-03	8.8600E-03	-5.8012E-02		
	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
FOL2	1.2611E-01	1.0000E 00	-6.2333E-01	1.3656E-01	9.9479E-01	-6.3450E-01	1.4004E-01	9.9040E-01	-6.3834E-01	7.0007E-02
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
FOL2	9.5252E-01	-5.4893E-01	-9.3320E-02	3.3217E-01	-4.0066E-01	-8.6779E-02	3.1616E-01	-4.1211E-01	-8.3933E-02	3.1009E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
FOL2	-4.1761E-01	-9.1544E-02	3.2741E-01	-4.0165E-01	-3.9003E-01	-1.6006E-01	-1.5516E-01	-2.3235E-01		
	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
FOL3	-5.2327E-01	-6.2333E-01	1.0000E 00	-5.2773E-01	-5.7930E-01	9.9212E-01	-5.2690E-01	-5.6226E-01	9.8554E-01	-4.5237E-01
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
FOL3	-7.1246E-01	9.2268E-01	1.9299E-02	2.3608E-01	2.7340E-01	1.1677E-02	2.5361E-01	2.6575E-01	1.0982E-02	2.5988E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
FOL3	2.6245E-01	1.6180E-02	2.4057E-01	2.7175E-01	4.0033E-01	-1.6796E-01	-1.6367E-01	1.8542E-01		
	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
BRA1	9.9183E-01	1.3656E-01	-5.2773E-01	1.0000E 00	9.6441E-02	-4.9180E-01	9.9909E-01	8.1937E-02	-4.7904E-01	8.2894E-01
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
BRA1	2.5600E-01	-6.0499E-01	2.1724E-01	-3.3690E-01	1.6128E-01	1.9898E-01	-3.3558E-01	1.5339E-01	1.9476E-01	-3.3542E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
BRA1	1.4973E-01	2.1099E-01	-3.3847E-01	1.5969E-01	-1.3165E-01	2.5508E-02	2.6703E-02	-7.8795E-02		
	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
BRA2	8.6104E-02	9.9479E-01	-5.7930E-01	9.6441E-02	1.0000E 00	-5.9311E-01	1.0003E-01	9.9933E-01	-5.9801E-01	3.5304E-02
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
BRA2	9.1688E-01	-5.0116E-01	-1.2427E-01	4.1811E-01	-3.9864E-01	-1.1458E-01	4.0328E-01	-4.1116E-01	-1.1096E-01	3.9762E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
BRA2	-4.1703E-01	-1.2143E-01	4.1399E-01	-3.9997E-01	-3.7739E-01	-1.4893E-01	-1.4419E-01	-2.4247E-01		
	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
BRA3	-4.8332E-01	-6.3450E-01	9.9212E-01	-4.9180E-01	-5.9311E-01	1.0000E 00	-4.9230E-01	-5.7695E-01	9.9900E-01	-3.9630E-01
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
BRA3	-7.1379E-01	8.6823E-01	-3.4198E-02	2.1473E-01	3.6956E-01	-4.4803E-02	2.3293E-01	3.6336E-01	-4.6006E-02	2.3947E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
BRA3	3.6064E-01	-3.8474E-02	2.1937E-01	3.6804E-01	4.3396E-01	-1.7141E-01	-1.6712E-01	1.4835E-01		
	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
BOL1	9.8551E-01	1.4004E-01	-5.2690E-01	9.9909E-01	1.0003E-01	-4.9230E-01	1.0000E 00	8.5558E-02	-4.7997E-01	8.0640E-01
	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
BOL1	2.5888E-01	-5.9950E-01	2.3987E-01	-3.3367E-01	1.5303E-01	2.2329E-01	-3.3285E-01	1.4524E-01	2.1949E-01	-3.3284E-01
	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS		
BOL1	1.4164E-01	2.3419E-01	-3.3537E-01	1.5146E-01	-1.3761E-01	3.5129E-02	3.6152E-02	-8.6275E-02		

Table 3 (continued)

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
BOL2	7.1668E-02	9.9040E-01	-5.6226E-01	8.1937E-02	9.9933E-01	-5.7695E-01	8.5558E-02	1.0000E 00	-5.8219E-01	2.2945E-02

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
BOL2	9.0184E-01	-4.8316E-01	-1.3531E-01	4.4701E-01	-3.9705E-01	-1.2451E-01	4.3284E-01	-4.0981E-01	-1.2061E-01	4.2740E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
BOL2	-4.1578E-01	-1.3209E-01	4.4319E-01	-3.9845E-01	-3.7199E-01	-1.4631E-01	-1.4162E-01	-2.4579E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
BOL3	-4.6926E-01	-6.3834E-01	9.8554E-01	-4.7904E-01	-5.9801E-01	9.9900E-01	-4.7997E-01	-5.8219E-01	1.0000E 00	-3.7680E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
BOL3	-7.1392E-01	8.4580E-01	-5.3184E-02	2.0419E-01	4.0060E-01	-6.4514E-02	2.2299E-01	3.9552E-01	-6.5814E-02	2.2971E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
BOL3	3.9320E-01	-5.7758E-02	2.0901E-01	3.9933E-01	4.4319E-01	-1.7634E-01	-1.7199E-01	1.3381E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
NUM1	8.8985E-01	7.0007E-02	-4.5237E-01	8.2894E-01	3.5304E-02	-3.9630E-01	8.0640E-01	2.2945E-02	-3.7680E-01	1.0000E 00

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
NUM1	1.7960E-01	-6.0036E-01	-1.5918E-01	-3.1957E-01	3.2261E-01	-1.8730E-01	-3.1241E-01	3.1473E-01	-1.9280E-01	-3.1018E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
NUM1	3.1131E-01	-1.6950E-01	-3.1949E-01	3.2066E-01	-1.2508E-01	-4.2180E-02	-4.0054E-02	-3.7035E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
NUM2	2.4621E-01	9.5252E-01	-7.1246E-01	2.5600E-01	9.1688E-01	-7.1379E-01	2.5888E-01	9.0184E-01	-7.1392E-01	1.7960E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
NUM2	1.0000E 00	-6.5905E-01	4.4312E-03	4.7720E-02	-3.6544E-01	8.2623E-04	3.0936E-02	-3.7361E-01	1.1665E-03	2.4556E-02

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
NUM2	-3.7797E-01	2.7474E-03	4.1824E-02	-3.6553E-01	-3.9690E-01	-1.7432E-01	-1.6930E-01	-1.8509E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
NUM3	-6.1491E-01	-5.4893E-01	9.2268E-01	-6.0499E-01	-5.0116E-01	8.6823E-01	-5.9950E-01	-4.8316E-01	8.4580E-01	-6.0036E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
NUM3	-5.5905E-01	1.0000E 00	1.9296E-01	2.7074E-01	-4.7774E-02	1.9860E-01	2.8320E-01	-5.4885E-02	2.0041E-01	2.8758E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
NUM3	-5.8284E-02	1.9481E-01	2.7391E-01	-4.8516E-02	2.5206E-01	-9.8960E-02	-9.5754E-02	2.7589E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
AFO1	1.4493E-01	-9.3320E-02	1.9299E-02	2.1724E-01	-1.2427E-01	-3.4198E-02	2.3987E-01	-1.3531E-01	-5.3184E-02	-1.5918E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
AFO1	4.4312E-03	1.9296E-01	1.0000E 00	-3.2730E-01	-2.5190E-01	9.9417E-01	-3.3380E-01	-2.5266E-01	9.9060E-01	-3.3625E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
AFO1	-2.5400E-01	9.9937E-01	-3.3153E-01	-2.5028E-01	-3.5571E-02	1.7077E-01	1.6994E-01	3.2338E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
AFO2	-3.3993E-01	3.3217E-01	2.3608E-01	-3.3690E-01	4.1811E-01	2.1473E-01	-3.3367E-01	4.4701E-01	2.0419E-01	-3.1957E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
AFO2	4.7720E-02	2.7074E-01	-3.2730E-01	1.0000E 00	-1.4629E-01	-3.0554E-01	9.9913E-01	-1.5430E-01	-2.9790E-01	9.9821E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
AFO2	-1.5957E-01	-3.2074E-01	9.9966E-01	-1.4507E-01	-2.9136E-02	-1.6359E-01	-1.5553E-01	-1.2848E-01

Table 3 (continued)

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
AFO3	1.9095E-01	-4.0066E-01	2.7340E-01	1.6128E-01	-3.9864E-01	3.6956E-01	1.5303E-01	-3.9705E-01	4.0060E-01	3.2261E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
AFO3	-3.6544E-01	-4.7774E-02	-2.5190E-01	-1.4629E-01	1.0000E 00	-2.7046E-01	-1.2991E-01	9.9850E-01	-2.7097E-01	-1.2466E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
AFO3	9.9653E-01	-2.6022E-01	-1.4494E-01	1.0001E 00	2.3819E-01	3.6865E-02	4.0858E-02	-7.4372E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
ABR1	1.2202E-01	-8.6779E-02	1.1677E-02	1.9898E-01	-1.1458E-01	-4.4803E-02	2.2329E-01	-1.2451E-01	-6.4514E-02	-1.8730E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
ABR1	3.2623E-04	1.9860E-01	9.9417E-01	-3.0554E-01	-2.7046E-01	1.0000E 00	-3.1183E-01	-2.6938E-01	9.9956E-01	-3.1425E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
ABR1	-2.6989E-01	9.9735E-01	-3.0936E-01	-2.6850E-01	-9.8848E-02	1.8202E-01	1.8061E-01	3.0935E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
ABR2	-3.3780E-01	3.1616E-01	2.5361E-01	-3.3558E-01	4.0328E-01	2.3293E-01	-3.3285E-01	4.3284E-01	2.2299E-01	-3.1241E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
ABR2	3.0936E-02	2.8320E-01	-3.3380E-01	9.9913E-01	-1.2991E-01	-3.1183E-01	1.0000E 00	-1.3879E-01	-3.0466E-01	9.9985E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
ABR2	-1.4383E-01	-3.2698E-01	1.0001E 00	-1.2974E-01	-2.0015E-02	-1.6323E-01	-1.5643E-01	-1.2628E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
ABR3	1.8215E-01	-4.1211E-01	2.6579E-01	1.5339E-01	-4.1116E-01	3.6336E-01	1.4524E-01	-4.0981E-01	3.9552E-01	3.1473E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
ABR3	-3.7361E-01	-5.4885E-02	-2.5268E-01	-1.5430E-01	9.9850E-01	-2.6938E-01	-1.3879E-01	1.0000E 00	-2.6993E-01	-1.3367E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
ABR3	9.9966E-01	-2.6018E-01	-1.5251E-01	9.9875E-01	2.3754E-01	5.3679E-02	5.6253E-02	-8.1374E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
ABO1	1.1671E-01	-8.3933E-02	1.0982E-02	1.9476E-01	-1.1096E-01	-4.6006E-02	2.1949E-01	-1.2061E-01	-6.5814E-02	-1.9280E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
ABO1	1.1665E-03	2.0041E-01	9.9060E-01	-2.9790E-01	-2.7097E-01	9.9956E-01	-3.0466E-01	-2.6993E-01	1.0000E 00	-3.0720E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
ABO1	-2.7035E-01	9.9478E-01	-3.0178E-01	-2.6912E-01	-1.1660E-01	1.9206E-01	1.9037E-01	3.0499E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
ABO2	-3.3732E-01	3.1009E-01	2.5988E-01	-3.3542E-01	3.9762E-01	2.3947E-01	-3.3284E-01	4.2740E-01	2.2971E-01	-3.1018E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
ABO2	2.4556E-02	2.8758E-01	-3.3625E-01	9.9821E-01	-1.2466E-01	-3.1425E-01	9.9985E-01	-1.3367E-01	-3.0720E-01	1.0000E 00

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
ABO2	-1.3865E-01	-3.2937E-01	9.9958E-01	-1.2472E-01	-1.6809E-02	-1.6518E-01	-1.5865E-01	-1.2594E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
ABO3	1.7820E-01	-4.1761E-01	2.6245E-01	1.4973E-01	-4.1703E-01	3.6064E-01	1.4164E-01	-4.1578E-01	3.9320E-01	3.1131E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
ABO3	-3.7797E-01	-5.8284E-02	-2.5400E-01	-1.5957E-01	9.9653E-01	-2.6989E-01	-1.4383E-01	9.9966E-01	-2.7035E-01	-1.3865E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
ABO3	1.0000E 00	-2.6119E-01	-1.5753E-01	9.9710E-01	2.3611E-01	5.3386E-02	5.5676E-02	-8.5066E-02

Table 3 (continued)

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
AST1	1.3705E-01	-9.1544E-02	1.6180E-02	2.1099E-01	-1.2143E-01	-3.8474E-02	2.3419E-01	-1.3205E-01	-5.7758E-02	-1.6950E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
AST1	2.7474E-03	1.9481E-01	9.9937E-01	-3.2074E-01	-2.6022E-01	9.9735E-01	-3.2698E-01	-2.6016E-01	9.9478E-01	-3.2937E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
AST1	-2.6119E-01	1.0000E 00	-3.2477E-01	-2.5841E-01	-5.5770E-02	1.7171E-01	1.7073E-01	3.1922E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
AST2	-3.4133E-01	3.2741E-01	2.4057E-01	-3.3847E-01	4.1399E-01	2.1937E-01	-3.3537E-01	4.4315E-01	2.0901E-01	-3.1949E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
AST2	4.1824E-02	2.7391E-01	-3.3153E-01	9.9966E-01	-1.4494E-01	-3.0936E-01	1.0001E 00	-1.5251E-01	-3.0178E-01	9.9958E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
AST2	-1.5753E-01	-3.2477E-01	1.0000E 00	-1.4381E-01	-2.8368E-02	-1.7424E-01	-1.6643E-01	-1.2960E-01

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
AST3	1.8905E-01	-4.0165E-01	2.7175E-01	1.5969E-01	-3.9997E-01	3.6804E-01	1.5146E-01	-3.9845E-01	3.9933E-01	3.2066E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
AST3	-3.6553E-01	-4.8516E-02	-2.5028E-01	-1.4507E-01	1.0001E 00	-2.6850E-01	-1.2974E-01	9.9875E-01	-2.6912E-01	-1.2472E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
AST3	9.9710E-01	-2.5841E-01	-1.4381E-01	1.0000E 00	2.3916E-01	5.1234E-02	5.4597E-02	-7.4713E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
SLOP	-1.1683E-01	-3.9003E-01	4.0033E-01	-1.3165E-01	-3.7739E-01	4.3396E-01	-1.3761E-01	-3.7195E-01	4.4319E-01	-1.2508E-01

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
SLOP	-3.9690E-01	2.5206E-01	-3.5571E-02	-2.9136E-02	2.3819E-01	-9.8848E-02	-2.0015E-02	2.3754E-01	-1.1660E-01	-1.6809E-02

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
SLOP	2.3611E-01	-5.5770E-02	-2.8368E-02	2.3916E-01	1.0000E 00	1.0281E-01	1.0409E-01	8.0315E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
SOLE	7.3421E-03	-1.6006E-01	-1.6796E-01	2.5508E-02	-1.4893E-01	-1.7141E-01	3.5129E-02	-1.4631E-01	-1.7634E-01	-4.2180E-02

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
SOLE	-1.7432E-01	-9.8960E-02	1.7077E-01	-1.6359E-01	3.6865E-02	1.8202E-01	-1.6323E-01	5.3679E-02	1.9206E-01	-1.6518E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
SOLE	5.3386E-02	1.7171E-01	-1.7424E-01	5.1234E-02	1.0281E-01	1.0000E 00	1.0001E 00	-3.9624E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
RADI	3.8600E-03	-1.5516E-01	-1.6367E-01	2.6703E-02	-1.4419E-01	-1.6712E-01	3.6152E-02	-1.4162E-01	-1.7199E-01	-4.0054E-02

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
RADI	-1.6930E-01	-9.5754E-02	1.6994E-01	-1.5553E-01	4.0858E-02	1.8061E-01	-1.5643E-01	5.6253E-02	1.9037E-01	-1.5865E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
RADI	5.5676E-02	1.7073E-01	-1.6643E-01	5.4597E-02	1.0409E-01	1.0001E 00	1.0000E 00	-3.7057E-02

	FOL1	FOL2	FOL3	BRA1	BRA2	BRA3	BOL1	BOL2	BOL3	NUM1
SAPS	-5.8012E-02	-2.3239E-01	1.8542E-01	-7.8799E-02	-2.4247E-01	1.4835E-01	-8.6279E-02	-2.4579E-01	1.3381E-01	-3.7035E-02

	NUM2	NUM3	AFO1	AFO2	AFO3	ABR1	ABR2	ABR3	ABO1	ABO2
SAPS	-1.8509E-01	2.7589E-01	3.2338E-01	-1.2848E-01	-7.4372E-02	3.0935E-01	-1.2628E-01	-8.1374E-02	3.0499E-01	-1.2594E-01

	ABO3	AST1	AST2	AST3	SLOP	SOLE	RADI	SAPS
SAPS	-8.5066E-02	3.1922E-01	-1.2960E-01	-7.4713E-02	8.0315E-02	-3.9624E-02	-3.7057E-02	1.0000E 00

UNIVARIATE ANALYSES: A standard procedure prior to using the multivariate analysis of variance is to perform a series of univariate analyses to eliminate unimportant variables. The univariate analysis in this case is a standard analysis of variance for each of the 28 variables testing for differences among plots in which a given species is found to be absent, present or present in numbers greater than 1. The results of univariate analysis for the three periods are summarized in Tables 4, 5, and 6.

Although univariate results are preliminary to further analyses of relating bird species to habitat variables they provide considerable information. Clearly, the habitats of certain species are quite different from the habitats where the species are not found. Plots where the Eastern Wood Pewee occurs are significantly different for several of the habitat variables from those in which the species is absent (Table 4). In inspecting such a table, one should be aware that at the $\alpha = 0.05$ level there will be a significant difference indicated an average of 5 times out of 100 when in fact no such significant difference exists. Also, the variables are not independent. Multivariate analysis of variance will be used to account for the latter problem. Recognizing the limitations of a presentation such as Table 4, one can inspect the table for general patterns of habitat selection among the various species.

Picidae: Differences in habitat selection among the four common woodpecker species on the watershed during the breeding period are indicated by the univariate analysis (Table 4). Yellow-shafted Flickers are found in habitats where there are many large trees and a well-developed canopy and subcanopy. The distribution of Red-bellied

Table 4. Summary of results of 748 univariate, one-way analyses of variance testing for significant difference for 28 habitat variables on 3 abundance categories of breeding bird species on Walker Branch Watershed. Mnemonic codes for habitat variables from Table 1, and for bird species from Table 2.

	YBCO[1]	RTHB[2]	YSFL[2]	RBWO[1]	HWOO[2]	DWOO[1]	AFLY[2]	PEWE[1]	BJAY[1]	CROW[1]	CHIC[1]	TITM[1]	WBNH[1]	WREN[1]
FOL1	1.598	0.067	0.015	0.937	0.018	0.193	0.173	10.640	3.581	2.233	0.233	0.889	4.529	0.090
FOL2	0.881	0.059	0.180	0.213	1.889	1.967	1.454	5.265	1.862	0.875	0.075	1.330	0.064	5.660
FOL3	0.171	3.598	9.989	1.997	6.954	0.639	0.835	0.385	6.047	0.146	0.168	1.266	0.383	5.466
BRA1	1.953	0.085	0.017	1.192	0.005	0.216	0.204	11.580	3.941	1.616	0.293	1.125	4.798	0.258
BRA2	1.117	0.000	0.001	0.223	1.528	1.802	1.166	4.233	1.692	1.071	0.089	1.122	0.056	5.075
BRA3	0.077	3.210	9.648	1.689	6.415	0.504	0.722	0.263	6.883	0.095	0.131	1.318	0.226	5.501
BOL1	2.082	0.090	0.018	1.279	0.002	0.223	0.212	11.800	4.046	1.416	0.336	1.204	4.856	0.346
BOL2	1.202	0.001	0.002	0.227	1.395	1.733	1.062	3.900	1.621	1.139	0.098	1.049	0.056	4.847
BOL3	0.059	3.044	9.425	1.576	6.615	0.471	0.674	0.241	7.118	0.084	0.117	1.330	0.178	5.469
NUM1	1.082	0.000	0.016	0.287	0.015	0.155	0.044	6.124	1.828	3.500	0.775	0.204	2.512	0.024
NUM2	0.283	0.874	2.028	0.221	2.862	2.345	2.338	9.278	2.115	0.361	0.080	1.996	0.178	6.675
NUM3	0.920	3.815	8.393	2.558	6.837	1.217	0.882	1.174	2.952	0.458	0.248	0.933	0.874	4.281
AFO1	0.781	0.076	0.023	0.651	1.253	3.435	0.010	3.758	3.549	0.164	2.614	1.777	1.106	0.394
AFO2	1.445	5.099	1.227	2.107	0.763	0.725	1.488	9.019	0.664	1.359	0.248	0.325	0.603	1.597
AFO3	2.106	0.001	0.125	1.008	0.043	0.498	0.338	8.389	2.619	1.529	0.089	1.798	0.121	6.010
ABR1	0.677	0.038	0.002	0.781	1.245	3.620	0.005	3.071	4.154	0.246	3.219	2.178	1.398	0.631
ABR2	1.375	5.278	1.277	2.113	0.890	0.661	1.542	8.741	0.745	1.341	0.275	0.331	0.557	1.644
ABR3	2.042	0.018	0.076	1.124	0.019	0.476	0.291	8.362	2.460	1.607	0.156	1.765	0.144	5.577
ABO1	0.649	0.030	0.000	0.819	1.238	3.649	0.017	2.912	4.322	0.272	3.381	2.289	1.481	0.726
ABO2	1.346	5.340	1.294	2.116	0.938	0.638	1.560	8.614	0.773	1.327	0.287	0.332	0.541	1.661
ABO3	2.015	0.025	0.060	1.167	0.013	0.473	0.274	8.307	2.394	1.634	0.114	1.758	0.151	5.425
AST1	0.747	0.063	0.014	0.693	1.253	3.507	0.002	3.516	3.746	0.189	2.814	1.908	1.200	0.456
AST2	1.425	5.148	12.410	2.108	0.798	0.707	1.503	8.950	0.686	1.356	0.255	0.327	0.590	1.609
AST3	2.092	0.001	0.110	1.044	0.036	0.491	0.325	8.408	2.580	1.554	0.093	1.791	0.128	5.903
SLOP	0.826	0.000	0.568	0.075	0.759	0.823	0.769	4.828	5.155	0.207	2.319	0.388	1.582	2.389
SOLE	2.425	0.001	1.015	2.838	1.436	1.506	1.006	1.789	1.872	0.339	1.940	0.058	0.023	0.015
RAD1	2.407	0.001	0.994	2.795	1.411	1.482	0.988	1.775	1.833	0.331	1.920	0.056	0.023	0.014
SAPS	5.354	2.916	3.328	0.432	0.016	9.387	0.213	5.171	0.372	0.723	1.900	0.504	0.193	1.155

[1] α levels of significance: 0.05 = 3.00, 0.01 = 4.61, 0.001 = 6.91.

[2] 0.05 = 3.84, 0.01 = 6.63, 0.001 = 10.8.

Table 4 (continued)

	WOTH[2]	GNAT[1]	WEVI[1]	REVI[1]	CERW[1]	PINW[1]	OVEN[2]	YBCH[2]	KENW[2]	HOOD[1]	SCAT[1]	SUMT[2]	CARD[1]	INBU[2]	RSTO[2]
FOL1	1.305	6.018	1.857	2.505	1.500	5.311	4.236	7.922	0.070	4.084	2.385	0.340	3.266	0.624	1.282
FOL2	1.122	1.639	0.495	0.491	1.656	0.126	0.455	7.612	3.403	1.148	3.931	2.349	1.527	7.390	1.499
FOL3	2.320	1.429	1.194	8.928	0.141	2.988	5.652	1.088	5.302	1.009	7.882	0.065	0.140	6.954	3.504
BRA1	1.224	5.489	1.631	3.195	1.402	4.190	5.034	6.823	0.205	4.980	2.313	0.142	3.599	1.052	0.932
BRA2	1.243	1.612	0.646	0.248	1.696	0.145	0.171	7.641	2.718	1.123	4.472	2.213	1.382	6.191	1.495
BRA3	1.559	1.460	1.425	10.000	0.187	1.273	6.963	0.565	5.179	1.132	9.938	0.108	0.267	7.723	2.189
BOL1	1.196	5.267	1.545	3.422	1.362	3.840	5.237	6.478	0.276	5.268	2.285	0.102	3.730	1.250	0.828
BOL2	1.272	1.589	0.698	0.183	1.702	0.163	0.100	7.614	2.474	1.116	4.633	2.155	1.322	5.742	1.484
BOL3	1.309	1.469	1.496	10.290	0.206	0.847	7.423	0.408	5.093	1.183	10.570	0.125	0.331	7.935	1.792
NUM1	1.542	5.828	1.936	0.394	1.594	9.256	0.426	11.940	0.001	0.753	2.389	2.285	2.805	0.223	2.767
NUM2	0.524	1.414	0.119	1.980	1.438	0.354	1.904	6.967	5.153	1.180	2.023	2.735	1.630	9.908	1.371
NUM3	4.655	1.378	0.601	4.153	0.149	1.294	2.074	2.906	4.587	1.699	1.656	0.006	0.159	3.627	8.711
AFO1	0.955	0.003	0.505	3.674	0.122	20.990	8.833	0.372	0.280	2.714	3.185	3.923	1.117	0.091	12.940
AFO2	3.869	1.499	1.474	11.250	0.841	1.158	7.218	0.807	1.113	1.187	3.882	0.001	0.273	0.495	0.209
AFO3	3.582	4.247	3.247	0.863	1.889	5.741	3.186	5.340	4.905	1.057	11.060	0.020	4.388	13.040	1.297
ABR1	0.859	0.007	0.661	4.470	0.107	22.970	7.492	0.408	0.517	2.898	3.939	3.806	1.464	0.016	14.340
ABR2	3.475	1.419	1.428	11.050	0.856	1.217	7.730	0.806	1.210	1.270	3.727	0.000	0.195	0.645	0.205
ABR3	3.828	3.951	3.068	0.734	1.845	5.580	3.493	6.062	4.483	1.078	10.330	0.017	4.336	12.150	1.317
ABO1	0.826	0.009	0.704	4.686	0.103	23.480	7.091	0.412	0.606	2.951	4.121	3.731	1.576	0.004	14.710
ABO2	3.331	1.390	1.404	10.980	0.857	1.233	7.882	0.799	1.238	1.303	3.650	0.000	0.173	0.698	0.202
ABO3	3.916	3.833	2.990	0.690	1.826	5.519	3.608	6.357	4.334	1.097	10.020	0.017	4.317	11.830	1.322
AST1	0.928	0.004	0.556	3.938	0.117	21.650	8.424	0.387	0.344	2.777	3.441	3.911	1.221	0.063	13.410
AST2	3.755	1.475	1.463	11.190	0.847	1.176	7.372	0.809	1.142	1.210	3.845	0.000	0.249	0.537	0.208
AST3	3.656	4.175	3.208	0.823	1.881	5.714	3.276	5.540	4.798	1.060	10.890	0.019	4.387	12.820	1.307
SLOP	0.867	0.757	1.579	5.337	1.074	2.224	0.011	0.532	2.385	2.247	11.070	4.565	3.170	1.649	1.431
SOLE	6.052	2.029	1.274	8.464	1.423	2.103	2.939	0.546	0.045	0.368	4.305	0.010	1.496	0.012	0.000
RAD1	5.970	2.001	1.247	8.413	1.398	2.076	2.893	0.543	0.046	0.364	4.218	0.010	1.470	0.011	0.000
SAPS	0.018	0.725	0.027	1.475	0.342	3.976	0.623	0.281	0.545	0.973	0.570	0.709	0.837	4.061	5.711

Table 5. Summary of results of 748 univariate, one-way analyses of variance testing for significant difference for 28 habitat variables on 3 abundance categories of fall bird species on Walker Branch Watershed. Mnemonic codes for habitat variables from Table 1, and for bird species from Table 2.

	YBCO[1]	BBCO[2]	PIWD[2]	RBWO[1]	DWOO[1]	BJAY[1]	CROW[1]	CHIC[1]	TITM[1]	WBNH[1]
FOL1	1.563	0.009	6.054	1.660	0.717	1.420	1.173	3.016	0.146	1.067
FOL2	6.177	0.169	4.446	0.439	2.561	0.035	3.481	1.338	4.347	0.552
FOL3	1.542	2.039	1.103	2.492	2.284	0.276	0.329	2.138	3.105	1.495
BRA1	1.111	0.029	5.416	2.052	0.714	1.506	0.973	3.306	0.063	1.311
BRA2	6.410	0.058	4.548	0.331	2.218	0.031	3.595	1.085	3.716	0.644
BRA3	2.245	2.184	1.270	2.777	2.303	0.379	0.552	1.903	3.323	1.693
BOL1	0.979	0.037	5.199	2.181	0.707	1.549	0.903	3.397	0.055	1.401
BOL2	6.481	0.032	4.555	0.292	2.094	0.029	3.622	0.994	3.483	0.676
BOL3	2.566	2.223	13.220	2.848	2.299	0.420	0.659	1.796	3.387	1.771
NUM1	3.351	0.044	7.692	0.466	0.574	1.558	1.389	2.178	0.886	0.954
NUM2	5.524	0.790	3.726	0.698	3.440	0.051	2.943	1.938	5.747	0.300
NUM3	0.554	1.353	5.205	1.200	1.948	0.082	0.079	2.064	2.224	1.097
AFO1	1.488	0.038	0.294	2.554	0.032	0.066	0.560	1.990	0.092	0.700
AFO2	0.968	2.428	0.521	0.303	0.195	0.106	0.935	0.045	0.395	1.110
AFO3	0.997	0.325	3.381	1.801	2.057	0.538	0.694	0.520	1.126	1.404
ABR1	1.520	0.057	0.471	2.774	0.030	0.006	0.578	2.267	0.048	0.655
ABR2	1.337	2.547	0.562	0.380	0.206	0.094	1.031	0.086	0.515	1.076
ABR3	1.459	0.355	3.382	1.642	2.023	0.544	0.956	0.453	1.164	1.527
ABO1	1.521	0.063	0.520	2.811	0.031	0.006	0.578	2.333	0.039	0.633
ABO2	1.473	2.588	0.572	0.409	0.209	0.091	1.063	0.106	0.560	1.065
ABO3	1.655	0.366	3.371	1.581	2.008	0.548	1.067	0.432	1.174	1.576
AST1	1.502	0.044	0.350	2.640	0.030	0.039	0.568	2.084	0.076	1.756
AST2	1.069	2.460	0.534	0.324	0.198	0.102	0.962	0.055	0.427	1.099
AST3	1.117	0.344	3.388	1.759	2.051	0.539	0.762	0.500	1.139	1.437
SLOP	6.386	0.386	10.670	2.430	0.494	4.630	1.967	1.117	2.347	1.466
SOLE	7.743	0.328	0.010	1.199	0.374	0.022	3.828	1.971	0.645	0.631
RAD1	7.822	0.330	0.010	1.208	0.377	0.023	3.863	1.997	0.657	0.642
SAPS	0.209	0.625	0.016	2.081	15.117	0.061	0.157	0.334	1.200	1.300

[1] α levels of significance: 0.05 = 3.00, 0.01 = 4.61, 0.001 = 6.91.

[2] 0.05 = 3.84, 0.01 = 6.63, 0.001 = 10.8.

Table 5 (continued)

	CREP[1]	WREN[1]	BRTH[2]	WOTH[1]	GCKI[1]	RCKI[1]	WEVI[1]	BAWW[1]	HOOD[1]	CARD[1]
FOL1	1.475	1.859	0.818	3.263	4.364	0.157	0.783	2.538	0.846	1.128
FOL2	3.495	0.666	0.189	0.275	0.961	1.512	3.968	2.535	0.396	0.435
FOL3	1.422	0.391	1.879	1.168	6.786	0.999	0.047	0.360	5.245	1.020
BRA1	1.588	2.130	0.671	2.698	4.386	0.111	1.070	2.196	0.901	1.087
BRA2	3.575	0.561	0.118	0.359	0.900	1.519	4.240	2.537	0.503	0.554
BRA3	1.367	0.380	1.988	0.475	7.737	0.849	0.074	0.185	5.397	0.949
BOL1	1.663	2.175	0.609	2.515	4.379	0.111	1.187	2.088	0.918	1.054
BOL2	3.596	0.531	0.095	0.395	0.864	1.527	4.320	2.527	0.598	0.608
BOL3	1.348	0.377	2.012	0.318	7.977	0.802	0.085	0.132	5.406	0.921
NUM1	1.981	0.171	0.727	4.921	3.954	0.879	0.541	3.789	0.682	0.697
NUM2	3.240	1.101	0.429	0.215	0.805	1.685	2.913	2.328	0.475	0.350
NUM3	1.619	0.501	1.218	5.717	2.691	1.483	0.147	0.978	3.936	1.174
AFO1	1.681	5.785	0.025	8.070	4.411	0.866	0.939	0.116	3.503	0.097
AFO2	0.312	1.092	0.272	1.101	0.256	0.192	1.923	0.260	5.085	3.405
AFO3	0.007	0.125	2.423	3.455	2.100	1.135	0.013	1.857	0.600	0.925
ABR1	1.921	4.557	0.066	9.311	4.627	0.917	1.026	0.127	0.364	0.093
ABR2	0.265	1.134	0.300	1.086	0.161	0.188	1.975	0.259	5.324	3.496
ABR3	0.014	0.104	2.281	3.338	1.785	1.260	0.022	2.116	0.558	0.899
ABO1	1.996	4.208	0.084	9.654	4.655	0.924	1.056	0.129	0.366	0.098
ABO2	0.249	1.147	0.311	1.079	0.133	0.186	1.989	0.258	5.404	3.530
ABO3	0.022	0.097	2.227	3.288	1.668	1.305	0.032	2.220	0.541	0.882
AST1	1.756	5.397	0.036	8.472	4.497	0.887	3.965	0.121	0.356	0.093
AST2	0.298	1.104	0.279	1.097	0.226	0.191	1.938	0.260	5.150	3.428
AST3	0.006	0.119	2.386	3.428	2.014	1.171	0.012	1.927	0.589	0.921
SLOP	3.659	6.682	0.432	1.901	6.734	1.465	1.001	0.156	1.109	1.968
SOLE	3.369	0.187	0.002	0.543	1.657	3.081	2.902	0.208	3.107	0.145
RAD1	3.402	0.187	0.002	0.548	1.675	3.110	2.942	0.211	3.145	0.014
SAPS	0.839	1.776	2.670	1.959	0.576	1.620	0.091	0.104	1.354	0.965

Table 6. Summary of results of 748 univariate, one-way analyses of variance testing for significant difference for 28 habitat variables on 3 abundance categories of winter bird species on Walker Branch Watershed. Mnemonic codes for habitat variables from Table 1, and for bird species from Table 2.

	PIWD[2]	RBWO[1]	HWOO[2]	DWOO[1]	CROW[1]	CHIC[1]	TITM[1]	WBNH[1]	RBNH[1]	CREP[1]	WREN[2]	GCKI[1]	RCKI[1]	JUNC[1]
FOL1	1.784	0.179	0.494	1.819	1.399	4.157	4.936	5.950	7.267	0.407	0.677	0.959	6.255	1.147
FOL2	0.803	0.898	0.457	0.655	0.910	1.424	0.355	1.477	3.408	0.306	4.290	1.208	2.759	1.249
FOL3	0.139	0.790	14.390	1.319	0.664	0.008	0.297	1.145	0.199	0.520	1.339	0.966	0.604	2.416
BRA1	1.870	0.131	0.712	1.866	1.258	4.293	4.950	5.608	6.540	0.254	0.361	0.943	5.764	0.858
BRA2	1.182	0.930	0.177	0.469	1.203	1.958	0.645	2.158	4.953	0.568	4.727	1.671	3.567	1.292
BRA3	0.284	0.785	15.830	1.230	0.681	0.100	0.075	1.765	0.522	0.569	1.428	0.352	1.239	1.414
BOL1	1.892	0.123	0.870	1.859	1.210	4.322	4.930	5.494	6.295	0.203	0.277	0.947	5.605	0.771
BOL2	1.327	0.946	0.107	0.411	1.317	2.163	0.773	2.434	5.544	0.679	4.901	1.856	3.865	1.300
BOL3	0.347	0.779	16.190	1.191	0.690	0.201	0.038	2.017	0.696	0.581	1.459	0.236	1.599	1.125
NUM1	1.347	0.563	0.000	1.052	1.729	3.076	3.934	6.665	9.143	0.499	2.100	1.415	7.624	2.362
NUM2	0.068	0.901	1.905	1.277	0.410	0.299	0.167	0.705	0.525	0.022	3.460	0.385	0.807	1.006
NUM3	0.012	0.683	7.453	1.349	0.807	1.630	2.095	0.816	1.619	0.291	1.108	5.446	3.277	6.789
AFO1	3.137	0.301	1.181	3.235	0.486	1.181	2.560	3.166	4.257	0.920	0.560	15.450	4.378	11.210
AFO2	3.253	0.266	10.300	0.531	2.885	3.427	4.243	10.020	12.270	4.380	0.498	4.203	3.032	0.398
AFO3	1.236	0.110	1.857	0.153	1.295	6.135	3.357	7.291	8.765	0.287	0.253	1.370	9.775	1.390
ABR1	2.700	0.358	1.300	2.795	0.281	0.968	1.950	1.852	2.924	0.849	0.705	16.860	5.748	12.560
ABR2	3.152	0.331	10.920	0.639	2.887	3.525	4.297	9.950	12.050	4.347	0.585	4.303	2.965	0.397
ABR3	1.306	0.148	1.693	0.142	1.220	6.129	3.248	6.925	8.272	0.220	0.363	1.373	9.584	1.415
ABO1	2.591	0.371	1.325	2.663	0.238	0.921	1.826	1.607	2.638	0.822	0.741	17.230	6.912	12.920
ABO2	3.111	0.355	11.130	0.679	2.882	3.553	4.308	9.897	11.940	4.335	0.618	4.341	2.931	0.396
ABO3	1.328	0.164	1.629	0.137	1.191	6.115	3.199	6.782	8.083	0.198	0.406	1.378	9.499	1.420
AST1	2.989	0.321	1.225	3.100	0.410	1.105	2.334	2.661	3.770	0.901	0.609	15.920	4.779	11.660
AST2	3.225	0.284	10.470	0.561	2.885	3.456	4.259	10.000	12.210	4.366	0.522	4.222	3.016	0.397
AST3	1.258	0.121	1.814	0.150	1.275	6.144	3.333	7.199	8.638	0.267	0.283	1.370	9.736	1.400
SLOP	0.190	0.413	2.921	0.022	0.367	1.303	2.444	3.113	2.417	1.069	3.234	4.594	4.958	2.894
SOLE	0.182	5.296	12.550	3.339	1.234	7.211	1.561	1.143	2.322	3.898	10.930	5.667	4.797	0.006
RAD1	0.184	5.344	12.700	3.370	1.249	7.274	1.570	1.157	2.362	3.937	11.030	5.714	4.844	0.006
SAPS	0.151	2.520	0.408	1.372	2.218	0.734	2.973	0.691	4.942	4.642	2.955	15.760	1.333	5.523

[1] α levels of significance: 0.05 = 3.00, 0.01 = 4.61, 0.001 = 6.91.

[2] 0.05 = 3.84, 0.01 = 6.63, 0.001 = 10.8.

Woodpeckers are not strongly associated with any of the 28 habitat variables, and they are commonly found on all plots in the watershed. The Hairy Woodpecker shows a preference for plots with a large number of tall trees and associated high canopy biomass. Downy Woodpeckers select plots that have more than the average number of saplings. The areas where Yellow-shafted Flickers and Downy and Hairy Woodpeckers are found on the watershed are different in structure, but there are some areas of overlap possible.

Fall woodpecker populations show another variation in habitat selection. Pileated Woodpeckers (Table 5) utilize areas with well-developed understory (FOL1, BRA1, BOL1 and NUM1). Abundance of Red-bellied Woodpeckers does not correlate with any of the variables measured, while the presence of Downy Woodpeckers is highly correlated with areas that have a large number of saplings. Shifts in the distribution of these birds during the winter period can be detected. (Table 6). The Pileated Woodpecker is not associated with any of the variables. Distinction between the habitats of the Hairy and Downy Woodpeckers can be made in this period on the basis of layer selected. Hairy Woodpeckers prefer areas with dense overstory vegetative structure (Table 6), which is an indication of selection of larger trees (NUM3) during this period. The presence of Downy Woodpeckers does not correlate with saplings during this period but with high exposure to solar radiation.

Corvidae: The Common Crow and the Blue Jay select very different habitat variables during the breeding period (Table 4). The crow, which is not found in large numbers on the watershed, probably uses

the deciduous forest as part of its search area, viewing the habitat from a broader point of view than this study examines. The only variable which is of apparent significance in areas frequented by crows is the number of small trees. Blue Jays select areas with a dense understory and a well-developed canopy. Many such areas exist along the steeper slopes of the watershed where there is little disturbance, explaining the Blue Jay's selection for plots with steeper slopes. During the fall, the only variable correlated with Blue Jay abundance is slope (Table 5). The crow is observed on plots with a high incidence of solar radiation and medium-sized trees. In the winter no variables are correlated with crow abundance (Table 6).

Paridae and Parulidae: The new world warblers (Family Parulidae) as a group show a greater degree of habitat selection than do the chickadees and titmice (Family Paridae) in the breeding period (Table 4). Relative to the variables used in this study, the Cerulean Warbler habitat cannot be characterized by any one of the variables. However, this bird is consistently observed to feed in the uppermost canopy layers, indicating that it is best typified by vertical stratification rather than by horizontal (habitat) stratification. The Hooded Warbler selects for only 3 of the 28 habitat variables, each concerning the biomass of lower vegetation (FOL1, BRA1, BOL1). In each case the biomasses of the foliage, branches and boles of the vegetation in this layer are lower in the plots where Hooded Warblers occur. The Kentucky Warbler is somewhat more specialized and selects for plots which have a more open overstory and which generally have smaller understory plants.

As opposed to the less-selective new world warblers, the Pine Warbler, Yellow-breasted Chat, and Ovenbird select habitats to a much greater degree. The Pine Warbler selects for plots with an open overstory comprised of trees with larger than average canopy and with smaller than average trees in the lowest canopy layers. The Yellow-breasted Chat is found on plots with dense overstory vegetation and an open subcanopy layer; typically the understory plants are smaller than average. On Walker Branch Watershed, plots with these structural characteristics are often associated with areas that have been recently burned. The Ovenbird is found in habitats which have open canopy and subcanopy layers and dense understory. The trees in both the canopy and the subcanopy are larger than average.

The Carolina Chickadee and Tufted Titmouse (Table 4) are considerably less selective. The Tufted Titmouse habitat cannot be characterized by any of the variables used in this study, and the only unique characteristic of the Carolina Chickadee habitat is that the understory trees are smaller than average. Interestingly, these two species are common birds on the watershed. During the fall period chickadees show a correlation with the smallest tree size class (FOL1, BRA1, BOL3), while titmice are correlated with middle and larger tree size class (Table 5). The titmouse shifts its habitat in the winter, making it similar to the chickadee in its selection of small size class trees (Table 6). In addition, both species are associated with the average biomass in the middle and large tree size class. This shift appears to represent a broadening of the habitat utilized by these species during the winter.

Sittidae and Certhiidae: White-breasted Nuthatches are correlated with trees in the smaller size class during the breeding period (Table 4). No correlation with variables is found in the fall (Table 5), while a shift back to a correlation with small trees occurs in the winter. Brown Creepers, which arrive in the habitat in the fall, are found in areas with a high density of medium sized trees (8.5 - 22.8 cm dbh). This species shifts its position in the winter to overlap in part with the movement of the White-breasted Nuthatch in medium sized trees with average biomass. The Red-breasted Nuthatch is found on the watershed in the winter and overlaps in part with the White-breasted Nuthatch (Table 6).

Thraupidae: The Scarlet and Summer Tanagers, two congeneric species, are both relatively common and select for markedly different variables (Table 4). The Scarlet Tanager is distributed on sites with dense canopies as shown by a significant value at the 0.001 level for all measurements on trees greater than 22.4-cm dbh. The Summer Tanager has only three variables which are significant: average foliage and average stump size of trees under 8.4 cm in diameter, and slope. When the two species are compared, the Scarlet Tanager is distributed according to canopy density and the Summer Tanager is distributed according to understory vegetation density. Both tanager species are common only in the breeding period.

MULTIVARIATE ANALYSES: The preliminary univariate analyses provide insight into the underlying habitat selection of a given bird species, but the results are confounded by the lack of independence among the variables. Thus, the results of the univariate analyses should be

interpreted with caution. For the more abundant species found on Walker Branch Watershed a multivariate analysis of variance is used to eliminate the confounding effect of intercorrelations among the habitat variables. Here we use the discriminant function analysis as a final summarization. For each species, a discriminant function (in theory, the best single linear combination of all of the variables in separating categories) is calculated separating plots into categories in which that species is absent, present or present in numbers greater than 1. This discriminant function is then correlated with each of the variables to provide an ordering of the habitat variables according to their strength to classify. A tabulation of these correlations (Tables 7, 8, 9) allows comparison of different habitat selection strategies. A similar analysis in numerical taxonomy would serve to identify dependable characteristics for distinguishing one species from another. In the present case, the analysis identifies those habitat variables which are the most reliable in distinguishing 0.08-ha study plots in which a species is absent from those study plots in which it is present. In all cases reported, the discriminant function is significant at least at $\alpha \leq 0.5$.

Downy Woodpecker: The discriminant function for the abundance categories of Downy Woodpeckers is correlated with the biomass of the average trees in the understory size category in the breeding period (AFO1, ABR1, AST1; Table 7) and the density of the subcanopy foliage (FOL2). But there is high correlation between the discriminant function and the numbers of sapling trees on the plot (SAPS). Apparently the Downy Woodpecker selects habitats on the basis of understory vegetation.

Table 7. Simple correlations between habitat variables and discriminant function for 13 breeding bird species. Mnemonic code for habitat variables from Table 1, and for bird species from Table 2.

Variable	DWOO	PEWE	BJAY	CHIC	TITM	WBNH	WREN	GNAT	REVI	PINW	HOOD	SCAT	CARD
α =	0.05	0.01	0.05	0.05	0.025	0.05	0.01	0.05	0.01	0.01	0.01	0.01	0.01
FOL1			-0.391			0.670		0.594	-0.232	-0.332	-0.420	0.179	
FOL2	-0.328	0.247	-0.198		0.210		-0.512	-0.244			0.154	0.231	0.407
FOL3			0.400		-0.040		0.481	-0.155	0.511	0.250	0.010	-0.331	-0.226
BRA1		-0.257	-0.417		0.273	0.690		0.566	-0.272	-0.295	-0.467	0.176	
BRA2		0.212	-0.206		0.203		-0.481	-0.255	-0.081		0.168	0.250	0.427
BRA3			0.447		-0.040		0.484	-0.132	0.541	0.161	0.039	-0.375	-0.217
BOL1		-0.262	-0.425		0.284	0.694		0.555	-0.285	-0.282	-0.482	0.175	
BOL2		0.199	-0.207		0.204		-0.469	-0.257			0.174	0.255	0.435
BOL3			0.461		-0.040		0.483	-0.124	0.548		0.051	-0.389	-0.213
NUM1		-0.120	-0.274			0.496		0.586		-0.436		0.179	
NUM2		0.342	-0.160		0.234		-0.555	-0.191	-0.238		0.107	0.154	0.377
NUM3	0.312	0.058	0.188				0.421	-0.233	0.346	0.526		-0.137	-0.215
AFO1	0.485	0.066	-0.402	0.593	0.344	0.289			-0.309	0.662	-0.348	0.225	
AFO2		-0.270					0.016	-0.302	0.578	-0.043	0.215	0.261	0.142
AFO3		-0.259	0.329		-0.055		0.521	0.430		0.354	-0.003	-0.420	
ABR1	0.472	0.061	-0.438	0.664	0.381	0.338			-0.347	0.696	-0.361	0.251	0.449
ABR2		-0.268					0.315	-0.292	0.573	-0.044	0.221	0.257	0.192
ABR3		-0.258	0.319		-0.071		0.502	0.414		-0.348	0.029	-0.406	
ABO1	0.468	0.060	-0.447	0.682	0.392	0.350			-0.358	0.703	-0.365	0.256	0.450
ABO2		-0.267					0.366	-0.288	0.571	-0.044	0.223	0.255	0.208
ABO3		-0.258	0.315		-0.079		0.496	0.407		-0.347	0.040	-0.401	
AST1	0.482	0.063	-0.414	0.617	0.355	0.305			-0.321	0.674	-0.353	0.234	0.450
AST2		-0.270					0.201	-0.299	0.576	-0.043	0.217	0.261	0.157
AST3		-0.259	0.327		-0.062		0.516	0.426		-0.353	0.006	-0.417	
SLOP		-0.232	0.499	-0.531		-0.372	-0.295		0.391	-0.221	0.316	-0.414	0.450
SOLE	0.385	-0.105	-0.285	-0.471				0.218	0.504	0.202		0.261	-0.399
RAD1	0.382	-0.105	-0.282	-0.469				-0.202	-0.503	0.201		0.259	0.245
SAPS	1.00	-0.238		0.480			0.149		0.147	0.200			0.243

Table 8. Simple correlations between habitat variables and discriminant function for selected fall bird species. Mnemonic code for habitat variables from Table 1 and for bird species from Table 2.

	RBWO	BJAY	CROW	TITM	CREP	WREN	WOTH
α =	0.05	0.01	0.01	0.025	0.01	0.01	0.01
FOL1	0.068	0.447	0.271				0.390
FOL2			0.522	0.590			
FOL3	0.309			-0.367			
BRA1	0.070	0.461				-0.361	
BRA2			0.532	0.537	0.131		
BRA3	0.335			-0.352			
BOL1	0.072	0.468			0.162		
BOL2			0.535	0.516	0.131		
BOL3	0.342			-0.346	-0.185		
NUM1		0.465			0.352		0.485
NUM2			0.313	0.695	0.154	-0.735	
NUM3	0.166		0.477	-0.381	-0.208		-0.542
AFO1	-0.373					-0.594	-0.614
AFO2						0.243	
AFO3	0.437			-0.240			0.404
ABR1	-0.375					-0.527	-0.671
ABR2			0.293				
ABR3	0.417			-0.242			
ABO1	-0.373				-0.149	-0.507	-0.686
ABO2			0.298				
ABO3	0.409		-0.280	-0.242			
AST1	-0.375						
AST2				-0.241			
AST3	0.432						
SLOP	-0.169	-0.809	-0.391	-0.136	0.444	-0.627	
SOLE	-0.341		-0.547		0.461		-0.163
RAD1	-0.343		-0.550		0.463		
SAPS	-0.456			0.270			

Table 9. Simple correlation between habitat variables and discriminant function for abundant winter bird species. Mnemonic code for habitat variables from Table 1, and for bird species from Table 2.

	RBWO	DWOO	CHIC	RBNH	GCKI	RCKI	JUNC
α =	0.01	0.05	0.01	0.01	0.01	0.01	0.01
FOL1			0.416	0.407		0.336	
FOL2				-0.270			
FOL3							
BRA1			0.426	0.387		0.322	
BRA2				-0.331		-0.247	
BRA3							
BOL1			0.428	0.379		0.317	
BOL2				-0.351		-0.258	
BOL3							
NUM1			0.347	0.454		0.367	
NUM2							
NUM3					0.368	-0.213	0.836
AFO1		0.639		0.190	0.647	-0.157	
AFO2			-0.357	-0.531	-0.335	-0.222	
AFO3			0.504	0.441		0.414	
ABR1					0.676	-0.223	
ABR2			-0.363	-0.526	-0.338	-0.220	
ABR3			0.501	0.428		0.411	
ABO1					0.683	-0.241	
ABO2			-0.365	-0.523	-0.339	-0.219	
ABO3			0.499	0.424		0.469	
AST1		0.627		0.168	0.657	-0.179	
AST2			-0.359	-0.530	-0.336	-0.222	
AST3			0.504	0.436		0.414	
SLOP					-0.352	0.300	
SOLE	1.000	-0.604	-0.558		-0.551	-0.289	
RAD1	1.000	-0.604	-0.560		-0.557	-0.290	
SAPS				0.327	0.639		0.751

This matches observations that the Downy Woodpecker is frequently seen feeding in the understory vegetation. Relative to the 28 variables used in this study, the Downy Woodpecker strongly selects only one of the variables (SAPS) and could be considered a specialist. This could be a direct effect or an effect of other factors such as greater understory or less overstory in areas with a larger number of saplings. The birds may select for the habitats with a high density of saplings, or the presence of saplings may indicate areas which are disturbed. Univariate analysis on the Hairy Woodpecker (Table 4) indicates that this congeniter of the Downy Woodpecker is most strongly influenced in its distribution by biomass of the upper canopy (FOL3, BRA3, BOL3, NUM3) and suggests that resource division within the genus Dendrocopos may be accomplished by vertical stratification. In the winter period (Table 9) the Downy Woodpecker again shows a strong selection for areas with saplings. In addition, the selection for areas with average biomass in the smaller size class is strong.

Eastern Wood Pewee: Distribution of the Eastern Wood Pewee is influenced by a number of habitat variables (Table 7), but none of these variables dominates in its ability to identify typical habitats. However, collectively these variables separate habitats in which pewees occur from plots in which they do not occur. The Eastern Wood Pewee and the Downy Woodpecker are representatives of those species whose distributions are alternatively influenced by either a number of variables (Eastern Wood Pewee) or only a few variables (Downy Woodpecker).

Carolina Chickadee and Tufted Titmouse: The distribution of the Carolina Chickadee on the watershed is strongly influenced by the average size of the understory vegetation during the breeding period

(AFO1, ABR1, ABO1, AST1; Table 7), whereas the Tufted Titmouse apparently responds to a large number of variables. Both species are abundant on the watershed in the spring with the small chickadees being found more frequently in areas with an open, sparse understory. The titmouse also selects areas with an open understory but seems to be influenced by the biomass of the subcanopy layers as well (FOL2, BRA2, BOL2). The two species are frequently found in mixed feeding flocks, especially toward the end of the breeding season. These flocks typically are found in areas with an open understory and a well-developed subcanopy. During the fall the titmouse does not shift dramatically in its selection strategies (Table 8). In the winter, the chickadee's abundance is correlated with the smaller trees and the average biomass of trees in the larger class (Table 9).

White-breasted Nuthatch: The most strongly selected habitat variables for the White-breasted Nuthatch in the breeding period are related to understory biomass (FOL1, BRA1, BOL1) and the number (NUM1) and average size of trees (AFO1, ABO1, AST1) in the lowest woody vegetative layer (Table 7). Actually, study plots on which the White-breasted Nuthatch is found typically have lower biomass in the understory layer with understory tree size smaller than average for the entire watershed. Thus, the nuthatch selects its habitats using similar criteria to that of an ecologically similar species, the Downy Woodpecker. The distinction is that the woodpecker is found in areas with a well-developed understory; the nuthatch in areas with a sparse understory.

Blue-gray Gnatcatcher: Gnatcatchers are usually observed in the upper canopy, but these birds select their habitats on criteria of

understory biomass (FOL1, BRA1, BOL2) and the average size of the canopy trees (AFO3, ABR3, ABO3, AST3). Areas in which gnatcatchers are most frequently found have open understories and large trees forming a canopy of about average biomass.

Red-eyed Vireo: The Red-eyed Vireo, like the Eastern Wood Pewee, selects its habitats using a multiple set of habitat variables. Canopy biomass (FOL3, BRA3, BOL3) and subcanopy tree size (AFO2, ABR2, ABO2, AST2) are the strongest variables. The Red-eyed Vireo is often found on plots in which the subcanopy vegetation is comprised of trees large enough to be immediately associated with a well-developed canopy. Such plots are characterized by dense vegetation above 65- to 80-foot heights.

Pine Warbler and Hooded Warbler: Although the Pine Warbler selects for several habitat variables (Table 7), the strongest habitat variables are related to the number of canopy trees (NUM3), average size of understory vegetation (AFO1, ABR1, ABO1, AST1) and average size of canopy vegetation (AFO3, ABR3, ABO3, AST3). This species is similar to the Blue-gray Gnatcatcher in terms of the variables that are indicated to be strong in identifying plots where the species is present. The Pine Warbler is also similar to the Blue-gray Gnatcatcher in that it typically feeds in the upper canopy. Gnatcatchers, however, are often found in deciduous trees which extend above a well-developed subcanopy, whereas Pine Warblers are most common in areas with a dense canopy and sparse understory. The Hooded Warbler is the most common warbler breeding in Walker Branch Watershed. Strongest variables categorizing the species distribution are associated with understory vegetation (FOL1, BRA1, BOL1, APO1, ABR1, ABO1, AST1). This matches

observations that Hooded Warblers are typically found in areas with dense shrub and understory cover.

Habitat Hypervolume

Many comparisons can be made using the Mahalanobis D^2 statistic. Viewing the total habitat of each bird population as a hypervolume of habitat variables, one can compare the distance between the different population centers (Appendix Table 1). Using the Carolina Chickadee (group 33) as an example, it is seen that the habitat hypervolume is 4.09 units (#33 under group 33). This value represents the index of dominance of the species. The larger the number when the species is compared within itself, the smaller the abundance of the species. To get the true distance between habitat hypervolume centers, the value of the species dominance should be subtracted from all comparisons. Other populations with small values when compared to the chickadee select habitat hypervolumes similar to that of the chickadee population. The Yellow-billed Cuckoo (7) is only 6.42 units away; the Tufted Titmouse (34), 6.21 units; the White-breasted Nuthatch (35), 6.17 units; and the Hooded Warbler (90), 5.61 units from the center of the chickadee hypervolume. Pileated Woodpecker (17) habitat is quite distant (21.61 units) from chickadee habitat as is the Black-throated Green Warbler (75) - 29.32 units - and the Yellow-breasted Chat (87) - 33.05 units.

The chickadee population can be compared during each of the three seasonal sampling periods. The fall habitat hypervolume (133) shifts slightly (5.85 units) from the breeding period, while the winter habitat (233) is even further removed (8.28 units). In all likelihood the

shift in the fall and winter represents an increase in the size of habitat used as the number of bird species decreases.

The habitat discriminant function can be reclassified to determine the number of birds that would be placed in the habitat hypervolume of the different species. Table 10 summarizes the results of a few species. Again using the Carolina Chickadee (33) as an example, it is seen that the largest number of chickadees (81) are placed in chickadee habitat. Twenty-four chickadees are placed in the Yellow-shafted Flicker's (16) habitat, 18 in the Brown Thrasher's (42), 33 in the Yellow-throated Vireo's (58) and 17 in Worm-eating Warbler's (64). The reclassification of habitat hypervolume is by no means an absolute measurement of a bird's location. An individual in a large hypervolume may be closer to the center of a bird population with a small hypervolume and thus classified in a different species habitat.

Behavioral Correlates

Plotting the cumulative percentage of birds observed by height in each of the four vegetation types during the breeding period (Fig. 1) reveals that total activity of the bird population occurs at different heights in three of the four vegetation types. A significant difference ($\alpha \leq 0.05$) exists between the pine and the yellow poplar curves. Likewise, the pine and yellow poplar plots are different ($\alpha \leq 0.05$) from the chestnut-oak and oak-hickory, while no difference is found between chestnut-oak and oak-hickory plots. When the data from all height observations on the watershed are plotted in a single plot (all plots, Fig. 1), it is seen that total activity of birds by height

Table 10. Sample results of species reclassification using habitat discriminant function of the total community.

	DWOO	CHIC	TITM	WREN	GNAT	CERW	SCAT
BWHA	0	0	0	0	0	0	0
YBCO	0	0	0	0	0	0	0
RTHB	0	0	0	0	0	0	0
YSFL	0	24	4	9	2	0	0
PIWD	0	0	3	0	0	0	0
RBWO	0	0	0	0	0	0	0
HWOO	0	0	0	0	0	0	0
DWOO	0	0	0	0	0	0	0
GCFC	0	0	0	0	0	0	0
AFLY	2	1	1	0	0	0	0
PEWE	6	19	0	0	2	1	3
BJAY	0	0	0	0	0	0	0
CRAV	0	7	0	0	0	0	0
CROW	0	0	0	0	0	0	0
CHIC	8	81	24	6	2	1	1
TITM	0	0	0	0	0	0	0
WBNH	0	0	0	0	0	0	0
WREN	0	0	0	0	0	0	0
BRTH	0	18	0	0	0	0	0
WOTH	0	3	0	0	2	0	0
GNAT	5	1	0	0	12	0	0
RCKI	0	0	0	0	0	0	0
WEVI	0	0	0	0	0	0	0
YTVI	0	33	7	0	3	0	0
REVI	0	0	0	0	0	1	0
WAVI	0	0	0	0	0	0	0
WEWA	1	17	2	0	0	0	0
BTGW	0	0	0	0	0	0	0
CERW	0	0	0	0	2	4	0
PINW	0	0	0	0	0	0	0
PRAW	0	12	8	0	0	0	0
OVEN	0	0	0	0	0	0	0
YTHR	0	0	0	0	0	0	0
YBCH	5	6	14	0	0	0	2
KENW	0	0	0	0	0	0	0
HOOD	0	0	0	0	0	0	0
BCHB	5	9	0	0	0	0	0
SCAT	1	6	1	0	0	2	15
SUMT	0	0	0	0	0	0	0
CARD	0	0	0	0	0	0	0
IBUN	0	1	0	1	0	0	0
RSTO	3	0	0	0	0	0	0
CHIP	0	6	0	0	0	0	0

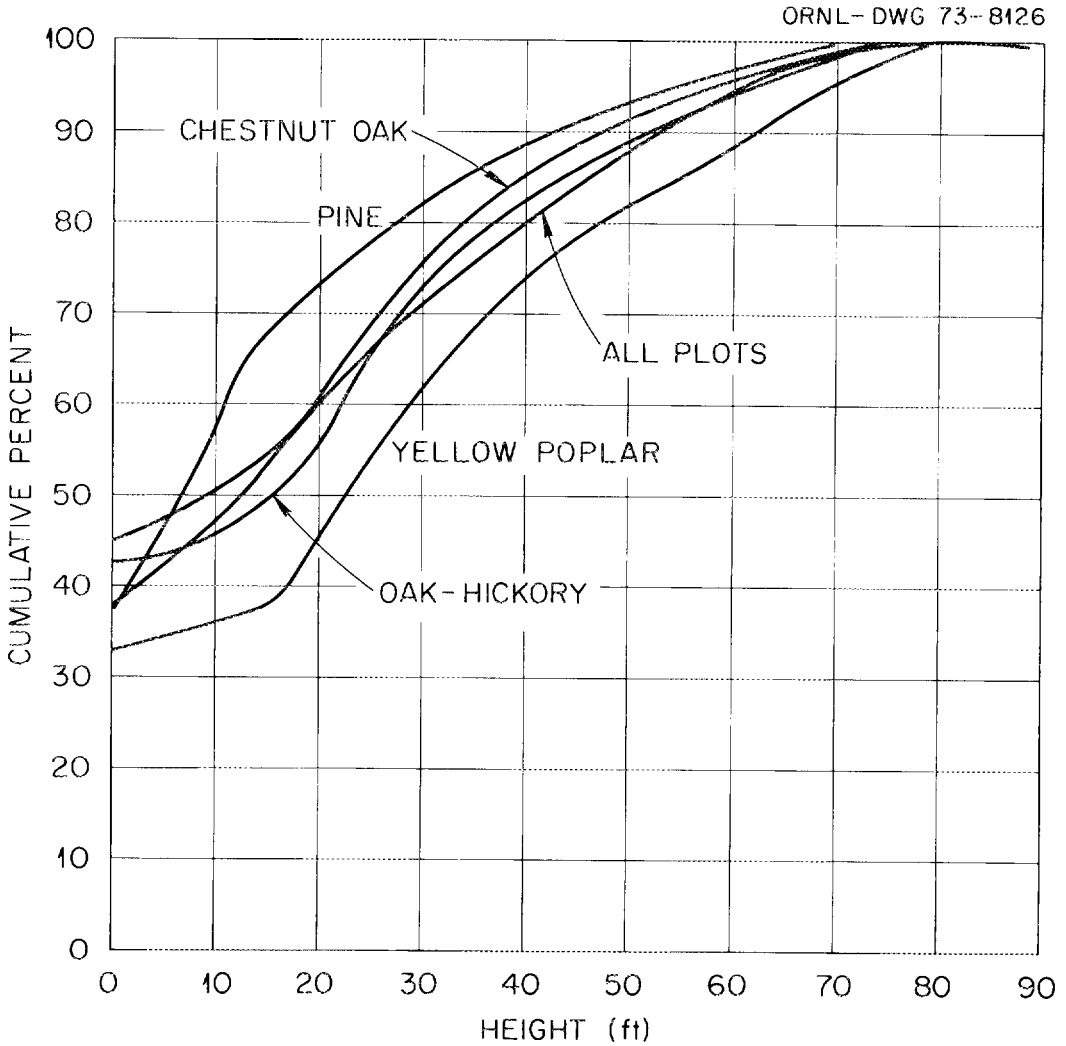

Figure 1. Cumulative frequence of breeding birds on all plots and four vegetation types.

is different ($\alpha \leq 0.01$) from the combined data plot in the pine and yellow poplar stands.

Height variation in habitat selection for each major bird species is determined from plots of the Kolmogorv-Smirnov test (Fig. 2). Only two species, the Carolina Wren and the Ovenbird, occupy a narrow vertical layer (<20 feet). Both are members of the group of species which are commonly found on the ground and shrub vegetation layer. Other members of this group are the Wood Thrush, Kentucky Warbler and Hooded Warbler; however, they are found up to 40 ft. The Cardinal spends a large part of its time in the shrub layer but also moves into the tree canopy (65 feet). A number of species (Yellow-billed Cuckoo, Blue Jay, Carolina Chickadee, Red-eyed Vireo and Scarlet Tanager) are seen at varying heights in the community. All of these species move vertically in the vegetation but concentrate activity in certain layers.

Distinct vertical boundaries are shown for the activities of groups of species (Fig. 2), corresponding in part to the vegetation layering (e.g., top of shrub layer, bottom of canopy, etc.). The lowest boundary is between 5 and 10 feet, and constitutes the lower limit for most birds that forage in the vegetation. Several species, including the Blue Jay and Carolina Chickadee, have their lower limits of activities at this boundary. Another boundary occurs around 17 feet where Yellow-billed Cuckoo, crow and White-breasted Nuthatch, have their lower limit of activity. Forty feet, which corresponds to the bottom of the canopy, is the upper limit for shrub-foraging birds and the lower limit for canopy-foraging species (Blue-gray Gnatcatcher, Cerulean Warbler and Pine Warbler). A boundary at 50-55 feet marks the upper

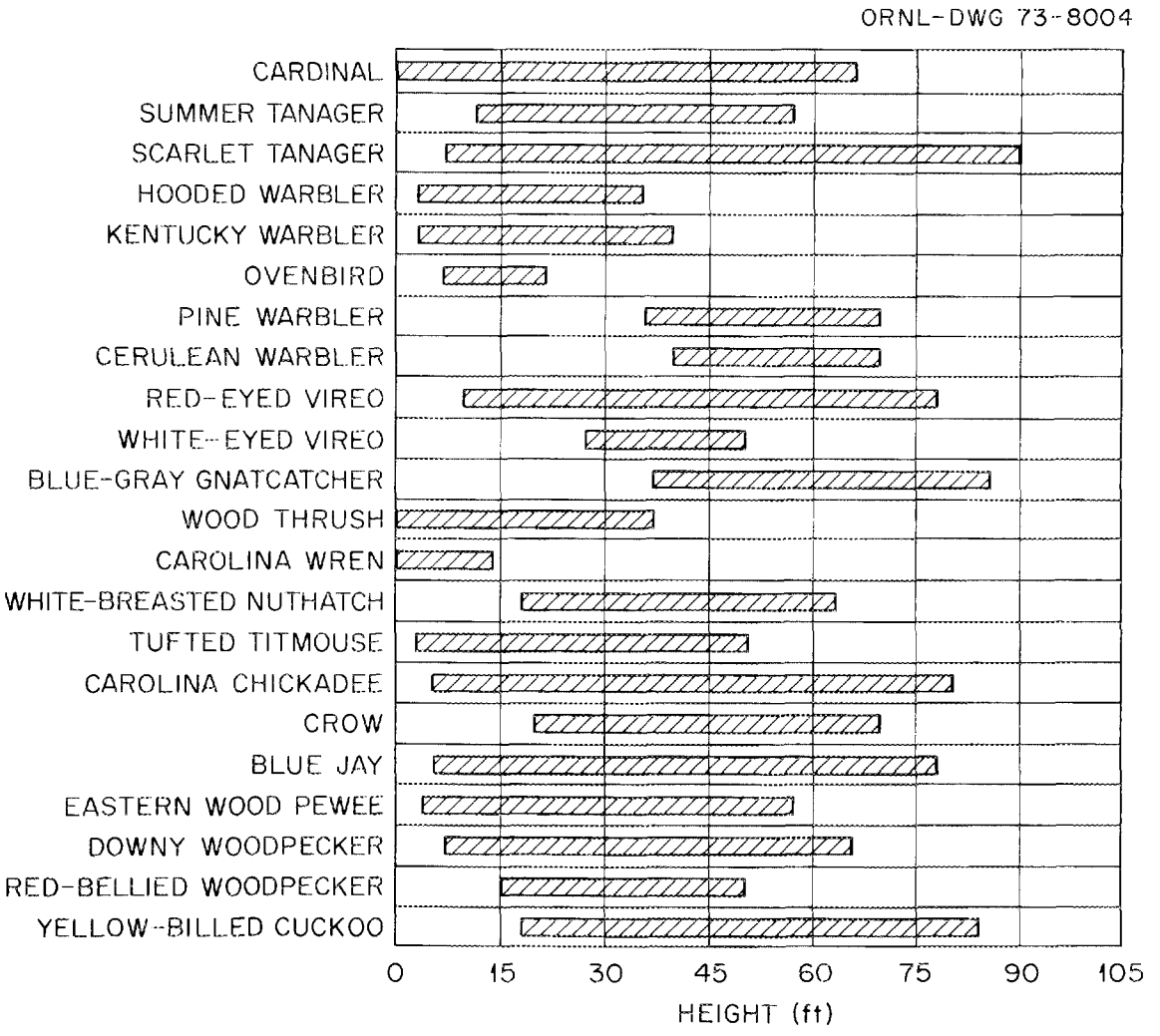

Figure 2. Vertical distribution of major breeding bird species on Walker Branch Watershed.

limit of the Red-bellied Woodpecker, Eastern Wood Pewee, Tufted Titmouse, White-eyed Vireo and Summer Tanager. This area appears to correspond to the top of the inner core (an area of openness around the trunk of the tree where no leafy vegetation grows).

The average total height of intermediate-sized trees (about 65 ft) provides the upper limit for the Downy Woodpecker, crow, Cerulean Warbler, Pine Warbler and Cardinal. The upper most boundary (85 ft) is the top of the canopy. Three species -- Yellow-billed Cuckoo, Carolina Chickadee and Blue-gray Gnatcatcher -- are observed up to this height.

Vertical stratification can be examined (Table 11) by comparing the distribution of each major species with the others by means of the Kolmogorv-Smirnov test. Bird species which concentrate their activity in one or two strata yet have a broad height range on Fig. 2 are distinct from many other species in Table 2. For example, the Yellow-billed Cuckoo ranges from 17 to 85 feet (Fig. 2), yet is significantly different in its vertical activity from all species except the crow, White-breasted Nuthatch and White-eyed Vireo.

The shrub-foraging birds, including Carolina Wren, Ovenbird, Wood Thrush, Kentucky Warbler and Hooded Warbler, form one group which does not show a significant difference in layering from one another (Table 11). Separation in this case might be by foraging or temporal behavior. The canopy-foraging guild (Blue-gray Gnatcatcher, Cerulean Warbler and Pine Warbler) also does not show vertical stratification; however, comparisons of all warbler species do reveal distinct differences among species. The bark-foraging guild (Red-bellied Woodpecker,

Table 11. Bird species showing a significant difference in vertical stratification (h) and a significant difference in time of activity (t) at $\alpha \leq 0.05$ level

	Yellow-billed Cuckoo	Red-bellied Woodpecker	Downy Woodpecker	Eastern Wood Pewee	Blue Jay	Common Crow	Carolina Chickadee	Tufted Titmouse	White-breasted Nuthatch	Carolina Wren	Wood Thrush	Blue-gray Gnatcatcher	White-eyed Vireo	Red-eyed Vireo	Cerulean Warbler	Pine Warbler	Ovenbird	Kentucky Warbler	Hooded Warbler	Scarlet Tanager	Summer Tanager	Cardinal
Yellow-billed Cuckoo		T		T	T		T		T	T	T		T		T	T			T	T	T	T
Red-bellied Woodpecker	H				T			T		T			T		T							
Downy Woodpecker	H	H		T	T		T			T	T		T		T				T	T		
Eastern Wood Pewee	H	H	H		T	T	T	T	T	T		T		T		T			T	T		T
Blue Jay	H					T	T	T	T	T		T		T		T			T		T	T
Common Crow		H	H	H	H						T		T		T			T	T	T		
Carolina Chickadee	H	H		H		H		T	T	T		T	T	T	T	T				T		
Tufted Titmouse	H	H	H	H	H		H		T	T	T	T	T	T	T	T	T	T	T	T	T	T
White-breasted Nuthatch		H	H			H				T	T		T		T			T	T	T		
Carolina Wren	H	H	H	H	H	H	H	H	H		T	T	T	T	T	T			T	T	T	T
Wood Thrush	H	H	H	H	H	H	H	H	H	H		T		T		T						
Blue-gray Gnatcatcher	H	H	H	H	H		H	H	H	H	H		T	T	T	T		T	T	T	T	
White-eyed Vireo		H	H	H						H	H	H		T		T	T				T	T
Red-eyed Vireo	H	H	H	H	H	H	H	H		H	H				T				T	T		T
Cerulean Warbler		H	H	H	H		H	H	H	H	H			H		T					T	T
Pine Warbler	H	H	H	H	H		H	H	H	H	H			H					T	T		
Ovenbird	H					H		H	H	H		H	H	H	H	H						
Kentucky Warbler	H					H						H	H		H	H				T		
Hooded Warbler	H	H	H	H	H	H	H	H	H	H		H	H	H	H	H						
Scarlet Tanager			H			H				H	H	H			H	H					T	T
Summer Tanager	H					H		H		H	H	H	H	H	H	H			H			
Cardinal	H			H		H		H	H	H	H	H	H	H	H				H	H		

Downy Woodpecker, and White-breasted Nuthatch) does show a significant difference from one another in vertical stratification.

Since activity sometimes varies with height, a comparison of the major activity patterns with height of observation is made to further examine habitat division by the bird species. Selected results of these analysis are shown in Fig. 3. A positive slope at any point on the curve indicates that a larger than average number of individuals are engaged in the behavior pattern, while a negative slope indicates a smaller than the mean number of individuals engage in the behavior pattern. Examination of four behavior patterns of the total breeding avian population on the watershed indicates that branch and foliage gleaning occurs regularly between 20 and 70 feet while trunk gleaning is concentrated between 20 and 50 feet. Singing is most common between 20 and 45 feet. Branch gleaning, foliage gleaning and singing all follow similar patterns in the study area and do not differ significantly among forest types. These activities are all part of the foliage feeding group, thus indicating the area of concentrated activity. Trunk gleaning is significantly different ($\alpha \leq 0.05$) from the other three activities and is part of the bark-foraging guild activity patterns.

The pine and yellow poplar plots differ from other vegetation types with respect to activity patterns. Branch gleaning occurs at a lower height in the pine plots than the other three areas. When compared with the curve for all 24 study plots, the pine plots have more than the average number of branch gleaners between 10 and 25 feet. This activity decreases at about 50 feet on the pine plots, but it does not decrease until 70 feet on the total plot curve.

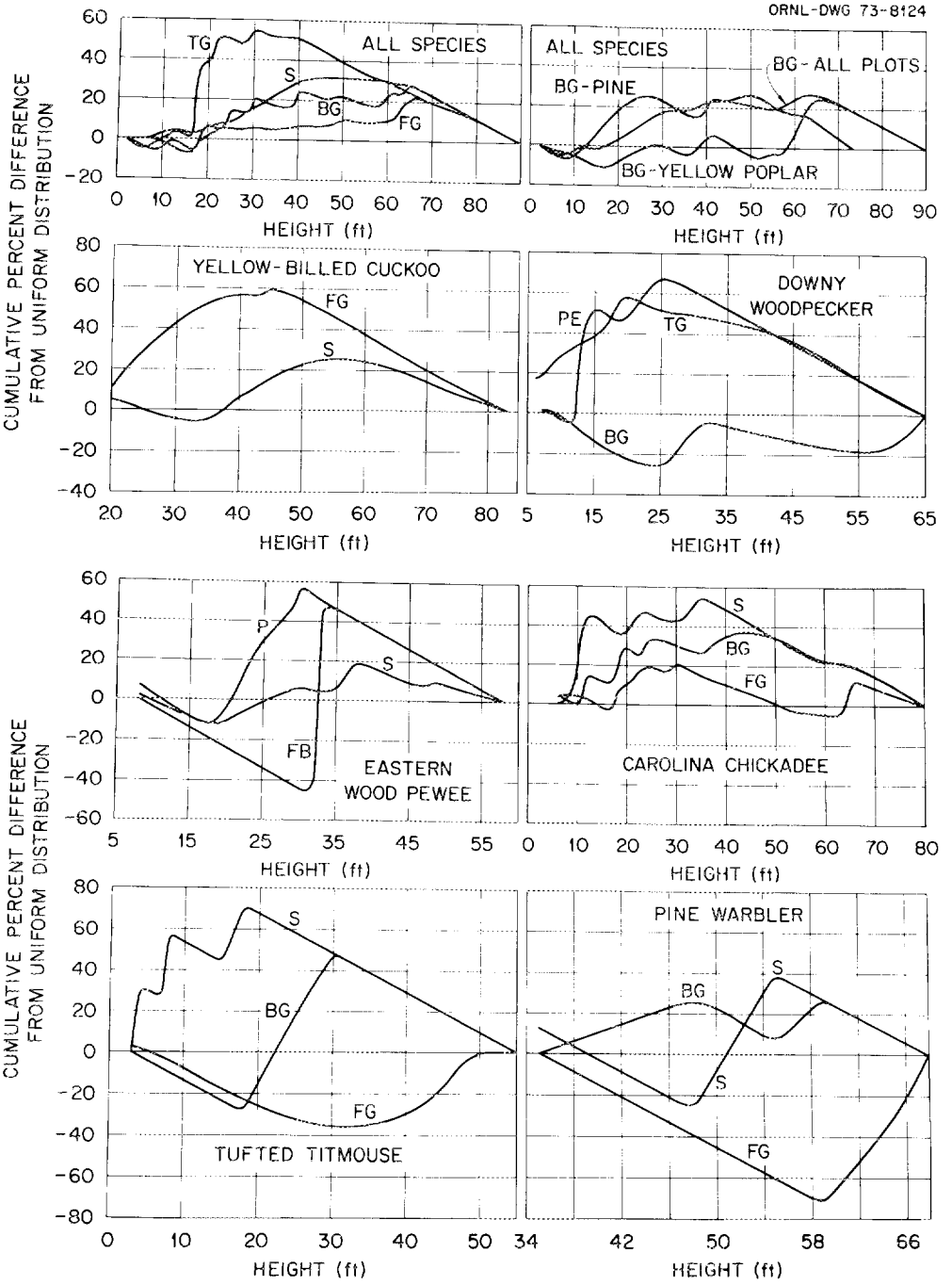

Figure 3. Vertical changes in behavior patterns of selected breeding bird species (FG = foliage gleaning, BG = branch gleaning, TG = trunk gleaning, PE = pecking, FB = flying between branches, P = perched, S = singing, H = hawking).

Branch gleaning is most common between 60 and 70 feet on the yellow poplar plots. Other behavior patterns examined show similar results.

By examining selected species which display behavioral differences with height, it is possible to show vertical stratification of behavior patterns. For example the Yellow-billed Cuckoo is observed in much of the central vegetation layer (Fig. 2). Singing is concentrated between 40 and 55 feet, while foliage gleaning occurs most commonly between 20 and 50 feet. Cuckoos engaged in singing and foliage gleaning are observed in different vertical layers. Other feeding behavior activities of the cuckoo are not significantly different from foliage gleaning, thus demonstrating the stratification of singing and foliage gleaning behavior in this species.

The Downy Woodpecker, a member of the bark-foraging guild, concentrates on trunk gleaning between 5 and 20 feet while branch gleaning occurs primarily between 25 and 35 feet in the lower levels of the canopy. Singing occurs commonly between 10 and 25 feet and does not differ significantly from trunk gleaning levels. The activities of this species conform to the form of vegetation present in each strata.

Flying between branches, perching and singing all occur in significantly different strata for the Eastern Wood Pewee (Fig. 3). This bird perches between 17 and 30 feet; it commonly flies in the very narrow 32-35 foot strata; and its singing occurs in the 20-40 foot area. The stratification of hawking behavior, as distinguished from flying, does not differ significantly from singing.

Examination of the behavior of the Carolina Chickadee, the most common species in the study area, shows a significant difference ($\alpha \leq 0.05$) in the height at which foliage gleaning and branch gleaning occur. Foliage gleaning is concentrated in the lower canopy (20-35 feet) and the upper canopy (62-67 feet), while branch gleaning is concentrated between 10 and 45 feet. These two behavior patterns change in the mid-canopy where fewer birds would be expected to foliage glean. Singing is common in all areas in which the species forage.

The Tufted Titmouse concentrates its foliage gleaning between 35 and 50 feet and its branch gleaning between 17 and 30 feet. The activity curves for this species show that it sings at the lower levels in the forest (5-20 feet).

Pine Warblers show a distinct stratification in feeding behavior. Branch gleaning occurs commonly between 36 to 48 feet and 54 to 58 feet. Foliage gleaning is concentrated between 59 and 68 feet. Thus, the birds appear to prefer feeding in the upper canopy foliage and the bark at lower levels. Singing is most common in the 48-56 foot strata, indicating that the birds perch in the mid-canopy.

The temporal variation in activity is an integral component of the analysis of avian community organization. The periods of time when the common bird species are most active is summarized in Fig. 4. These data are obtained from all non-negative slopes of the Kolmogorv-Smirnov plots of species activity vs time. When the slope is negative, less than the mean number of individuals are engaged in the activity. Concentration of activity of all species in the morning hours is apparent.

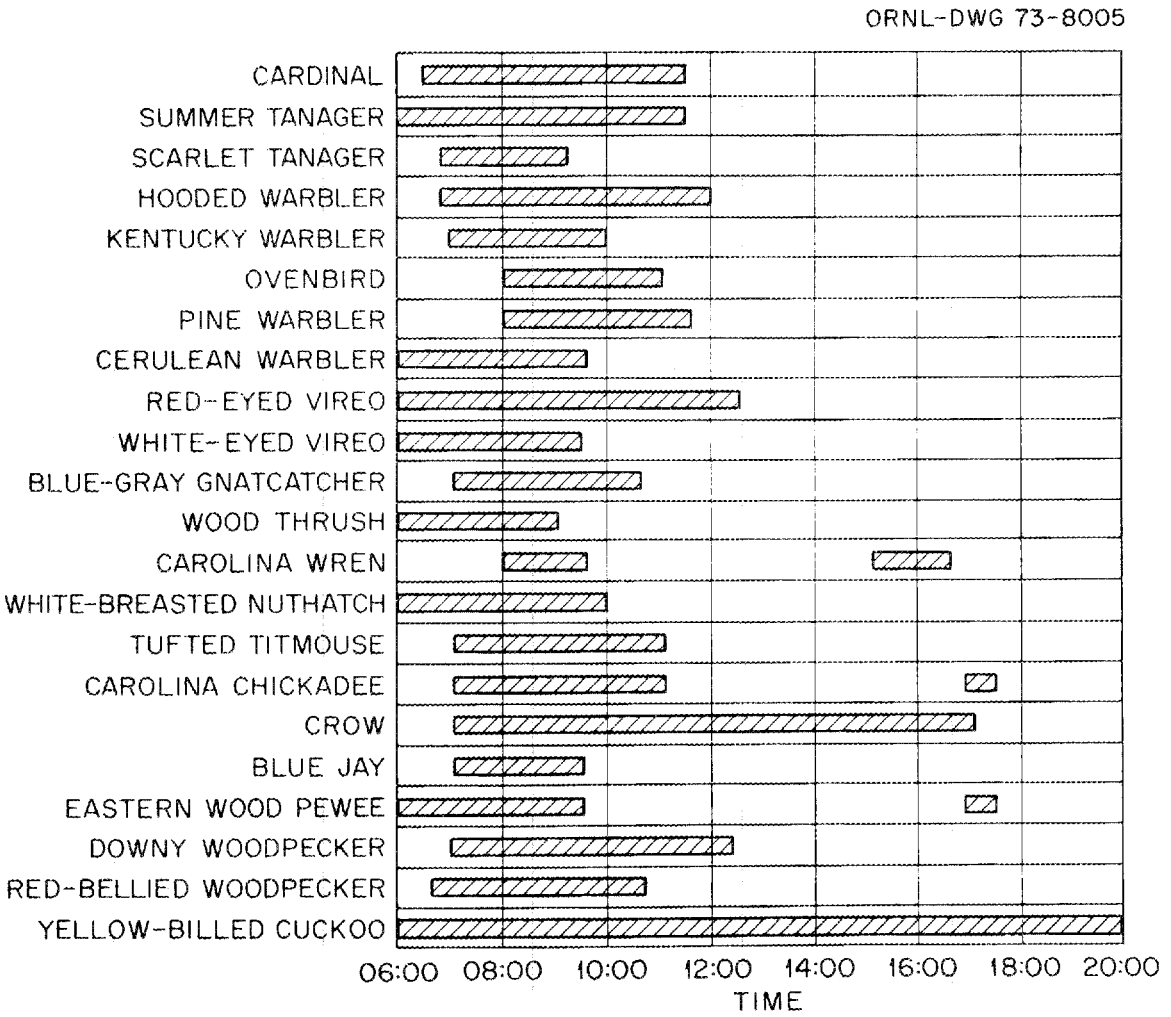

Figure 4. Temporal distribution of major breeding bird species on Walker Branch Watershed.

While some species become active very early, at sunrise, others do not become active until an hour to an hour and a half after sunrise. Most species are active until about 1100. Comparison of the difference in activity periods of the birds is summarized in Table 11. Species which display a significantly different ($\alpha \leq 0.05$) temporal activity from one another are designated with the symbol T. Shrub-foraging birds do not exhibit vertical or temporal stratification, while canopy-foraging birds are active at different times.

While total activity is concentrated in the morning hours, different forms of behavior predominate at different time periods (Fig. 5). The different feeding behavior patterns of the foliage birds - foliage gleaning and branch gleaning - do not differ at the $\alpha \leq 0.05$ level of significance. Foliage gleaning is common in the 0700-1030 period. Singing is more concentrated in the 1000-1030 period and differs from the time when feeding behavior patterns occur.

The bird community plot (Fig. 5) shows a difference of the $\alpha \leq 0.05$ level in the bark-foraging guild. Trunk gleaning dominates the 1000-1200 period; pecking is most common between 0600 and 0830. This may reflect a difference in insect activity as more insects have emerged and alighted on the bark in the later hours of the morning.

Comparison of the four vegetation types on the watershed shows that three types of vegetation are recognized by birds on a temporal as well as vertical basis. In the case of branch gleaning, for example, the composite plot curve shows that this activity occurs throughout the morning hours (Fig. 5). Branch gleaning is concentrated in the 1000-1100 period on yellow poplar plots but is more common in the 0800-0930 and 1100-1130 periods on the pine plots.

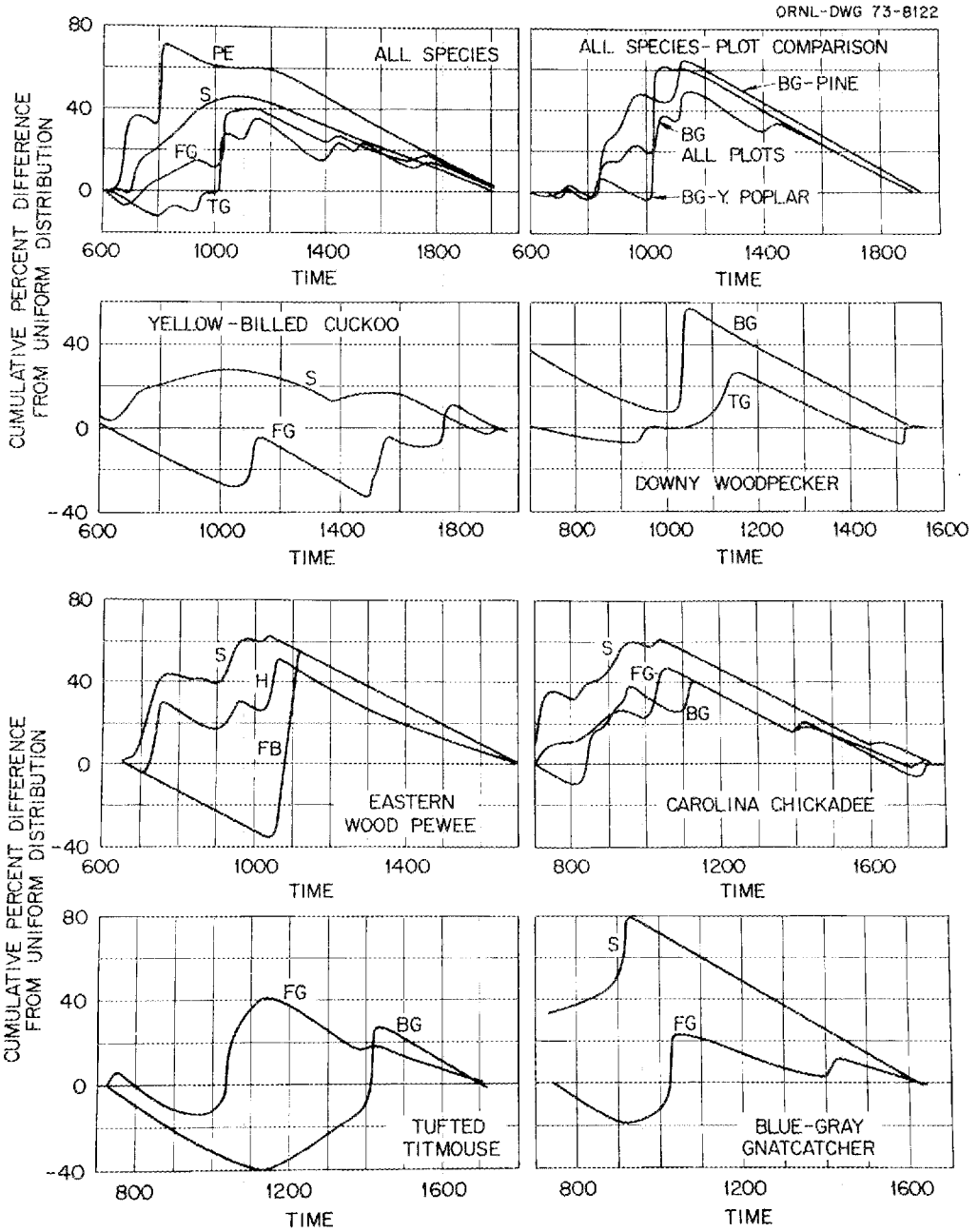

Figure 5. Temporal changes in behavior patterns of selected breeding bird species (code as in Fig. 3).

The Yellow-billed Cuckoo shows little temporal variation in feeding behavior (Fig. 5) as all feeding behavior patterns are similar to the plot of foliage gleaning. The feeding behavior patterns are significantly different ($\alpha \leq 0.05$) from singing, which occurs most commonly between 1000-1100 and 1500-1600. Trunk gleaning occurs at a different time period than bark gleaning in the Downy Woodpecker; the former is concentrated in the 1000-1030 period, while the latter is most common between 1030-1130.

The Eastern Wood Pewee both hawks and sings in the 0700-1030 period. This species appears to fly around the vegetation between 1030 and 1100. It is not observed defending its territory or feeding during that period.

There is no temporal stratification of feeding behavior in the Carolina Chickadee. Branch gleaning and foliage gleaning occur between 0800 and 1200 hours. Singing occurs during this time period but is significantly different from feeding behavior because it is concentrated between the 1000-1600 period. Another common bird in the study area, the Tufted Titmouse, does show a temporal difference in feeding behavior. Foliage gleaning is most common in the 1030-1130 period, while branch gleaning occurs later in the day.

The Blue-gray Gnatcatcher does not show a temporal difference in its feeding behavior. Feeding is concentrated in the 0800-1000 period. Most singing birds are heard following feeding in the 1030-1100 period.

DISCUSSION

Many methods exist to examine bird population data. Simple correlations with vegetation type are often presented. Descriptive studies of elm-maple or piedmont forest are found in the literature (Twomey 1945; Johnston and Odum 1956). Ordination studies show how bird populations vary along community gradients (Bond 1957). It is hoped that the data available in this study can be used to describe a species relation to its habitat and the interrelationships of the different species in a habitat.

One method of examining the data is to synthesize this information into a form that can be viewed simultaneously for all species. Principal components analysis (Seal 1964) on the mean habitat vector for each of the species in the breeding period is used to reduce the 28-dimensional space to a 3-dimensional space (Fig. 6) with a minimum loss of information. This principal components analysis accounts for 99% of the variation of the species mean habitat vectors. There is a rather straightforward analogy from Hutchinson's (1965) definition of the species niche as an n-dimensional hyperspace and principal components analysis of ecological variables associated with a species (Fujii 1969), but other methods provide greater analytical insights in this regard, e.g., canonical analysis or multiple discriminant function analysis (Seal 1964; Green 1971). We prefer to use principal components analysis.

The mean habitat vectors for the 28 bird species tend to cluster about the mean habitat vector for the watershed as a whole [coordinate point (0,0,0), Fig. 6]. Within a given taxonomic category (e.g., warblers) the distance between a species' mean habitat vector and this

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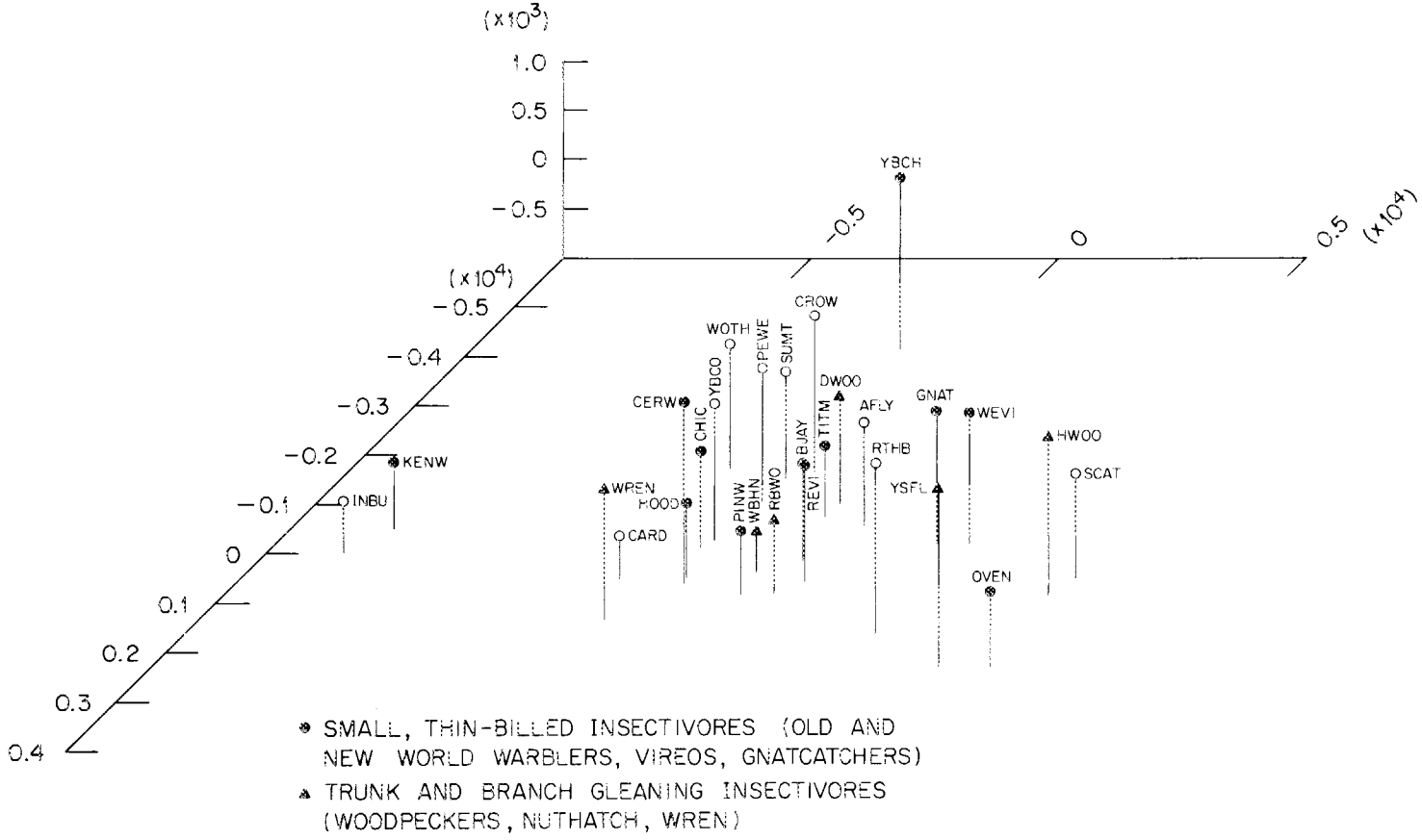

Figure 6. Mean habitat vectors of 28 breeding bird species displayed in a 3-dimensional principal components space. Each of the axes is an artificial variable composed of the original 28 habitat variables (Table 1). Mnemonic codes for species are from Table 2. Two larger groups of ecologically similar species are identified. Collectively the three principal components account for over 99% of the variance in species' mean habitat vectors.

center point (0,0,0) is inversely related to species density. Species that are similar in ecological function tend to be dispersed rather than adjacent on the diagram (Fig. 6). This dispersal of similar species indicates resource division among these species by habitat. When two or more similar species do have similar mean habitat vectors, there is ecological separation in the vertical strata occupied by these species. For example, the Cerulean Warbler, Carolina Chickadee and Hooded Warbler have similar mean habitat vectors (as indicated by the closeness of the points on Fig. 6). But the Cerulean Warbler spends most of its time in the canopy, the Carolina Chickadee feeds in the subcanopy and understory vegetation, and the Hooded Warbler is found on or near the ground. This is the only example of three-layer vertical resource division in this study, but the White-eyed Vireo, and Blue-gray Gnatcatcher, White-breasted Nuthatch and Red-bellied Woodpecker exhibit two-layer stratification. Any habitat alteration that moves the mean habitat vector (Fig. 6) toward a given bird species should be beneficial to that species, since the population would have more area of typical habitat available. Conversely, movement of the vector away from a species could be expected to reduce available habitat.

This information provides baseline data for managing forests to maximize available habitat for a given species, for optimizing habitat in a forest to support the highest diversity of species or for assessing the impact of habitat changes on species. Further methods may be used to assess forest perturbations and natural forest development on avian habitat.

Data gathered in this study also provides baseline information on bird populations on Walker Branch Watershed which can be used as part of the food chain and nutrient cycling projects that are currently a part of the total ecosystem analysis (Auerbach et al. 1973). The avian population is one of the animal exchange routes affecting input or output of the annual nutrient budgets and influencing the rate of circulation of nutrients in the system. Margalef (1968) postulates that migratory birds may be the most effective group of animals in removing or adding nutrients to an ecosystem. Sturges et al. (1974) shows as an example that birds remove up to 3.0 g/ha of calcium from New Hampshire hardwood forest. Birds redistribute nutrients between different communities and create an accumulation of nutrients in some areas (e.g., roost and nest sites).

Further studies of avian movement and food preference should help determine the impact of the avian population on the ecosystem. By assessing the type of food available and food selected by different species, it would be possible to define the avian population link in the ecosystem.

ACKNOWLEDGMENTS

We thank W. F. Harris for providing vegetation data. C. Gard and R. Strand were very helpful in developing computer programs used in the study.

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APPENDIX

Data Records

On file, IBP/EDFB Information Center.

A. Habitat and Bird Data. Tape # X12443

Format(80I1/20I1,2I3,I4,6F8.2/2F8.2,F9.2,F7.2,2F8.2,3I2,3F6.2,
F8.2/8F8.2,I2,F5.1,F6.4,I1)

Variables: 100 species counts, plot #, day, hour, 12 biomass variables (foliage - 3 DBH classes, branch - 3 DBH classes, bole - 3 DBH classes, stump - 3 DBH classes), 3 total individual count (one for each DBH class), 12 biomass means (the appropriate DBH class divided by the individual count in that class), slope, solar radiation, radiation index, number of saplings in 1970.

Tape is sorted by day, time, then plot.

Day 1 - 123 = breeding birds

Day 124 - 179 = fall birds

Day 180 - = winter birds

B. Behavioral Data (Kolmogorv-Smirnov Test)

Height-behavior comparison - Tape # X2638

Time-behavior comparison - Tape # X8668

Using a deck with the Kolmogorv-Smirnov test, use the following control cards:

1. ,(7I4)

A	B	C	D
3 = time 5 = height	4 = species 6 = behavior	# of plots (0 for all)	If second variable is 6, then # of species up to 25
_____,	_____,	_____,	_____,
I4	I4	I4	I4

E	F	G
Comparison species on behavior (limit 20)	Intervals height or time	1 for computer plots
_____,	_____,	_____,
I4	I4	I4

2. If intervals (F above) are used (e.g., behavioral comparisons between 30 and 50 feet), use one card for each interval (2I4).
3. If plot is not zero (C above) list plots to be compared (20I4).
4. If restricted to certain species (D above), list the species (25I4) use code on Table 2.
5. Use one card for each behavior comparison or species comparisons (from E above). Each card 2I4 - limit 20.
6. Seasonal comparison (breeding, fall and winter) can be made by coding behavior patterns.
7. Behavior Codes: TG = trunk gleaning; BG = branch gleaning; FG = foliage gleaning; H = hawking; PE = pecking; FB = flying between branch; FO = flying overhead; S = singing; P = perched; SN = sitting on nest.

Appendix Table 1. Distance between species habitat hypervolume using Mahalanobic D^2 statistic. Group number = species; see Table 2 for code. For fall species add 100 to species number to obtain group number. For winter species add 200 to species number to obtain group number.

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
5	13.70131137	29.55757684	44.10575953	42.38552020	45.34926403	32.70548175
	21	22	23	25	28	30
	32.76125572	30.79698736	30.45708310	37.97251029	35.01762457	32.78285930
	31	32	33	34	35	39
	45.94518193	35.45705394	31.65339135	34.56748994	33.76858474	39.44480689
	42	44	50	52	57	58
	45.34926403	21.93022282	33.42495462	54.31300980	38.65544822	54.31300975
	59	61	64	75	77	82
	31.59192913	54.31300980	53.59305934	51.53977200	50.50111453	24.88040232
	83	85	86	87	88	90
	34.14213305	39.34362527	42.06409635	58.76352720	30.61271173	33.12176615
	93	94	95	96	98	99
	40.26654444	42.18583133	36.18259491	33.99334361	36.27343992	26.87007862
	100	107	108	117	118	122
	37.07714100	53.34239375	37.93376146	37.83710655	30.73002418	28.21883661
	130	131	132	133	134	135
	32.06506973	31.90084274	28.80772963	28.50813873	31.17227479	31.52824667
	137	138	139	142	144	149
	40.96367336	42.06409635	36.95532446	43.58432047	27.15581706	54.31300980
	151	152	157	162	182	183
	26.77937809	30.69751100	44.38666270	58.76352720	53.10650961	45.58052776
	189	190	194	196	217	218
	45.94518187	42.74886555	84.45591804	37.36926022	34.98275929	36.82888243

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
5	59.35090637	24.01986671	43.98202205	30.35101367	30.44359583	34.17437282
	236	237	239	251	252	254
	35.54981777	22.43376464	38.68715501	27.08255314	26.67337005	58.76352720
	260					
	26.87007860					

	5	7	15	16	17	18
7	23.51672707	7.66046160	24.23813805	22.45144787	21.63141624	12.50348136
	21	22	23	25	28	30
	16.00682096	11.49827711	23.23804427	15.98708960	12.51070508	11.93805790
	31	32	33	34	35	39
	23.23714617	14.86328692	9.98866888	12.64861593	11.51825397	19.43351101
	42	44	50	52	57	58
	21.63141624	13.90295180	13.64551117	30.54241630	16.99323148	30.54241623
	59	61	64	75	77	82
	11.20715935	30.54241630	34.25723765	31.06553460	22.49649687	13.28209923
	83	85	86	87	88	90
	23.30015235	18.42410586	22.03901174	39.48528084	18.04847547	12.72761593
	93	94	95	96	98	99
	23.05089514	20.88307894	16.21237842	13.82047052	19.44503483	21.77100368
	100	107	108	117	118	122
	13.92732405	29.10795739	16.89062037	16.43924127	12.18667419	9.93757341
	130	131	132	133	134	135
	12.44699402	23.01001465	13.00729237	10.32833945	11.04789131	11.19049637

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
7	18.75654161	22.03901174	17.44273862	22.76337874	16.56400037	30.54241630
	151	152	157	162	182	183
	11.95413937	14.01107590	19.86306015	39.48528087	36.31675813	28.23681416
	189	190	194	196	217	218
	23.23714617	21.18172872	61.47226801	15.96653047	16.03559212	17.85892861
	221	222	232	233	234	235
	39.21757678	12.26010137	26.27114932	12.27701438	14.46689042	18.66935289
	236	237	239	251	252	254
	17.04923378	12.57746802	20.67930305	13.02221952	13.26165646	39.48528092
	260					
	21.77100373					
15	5	7	15	16	17	18
	42.27317807	28.44640635	11.86872991	12.53440542	44.36542324	25.45475938
	21	22	23	25	28	30
	20.08896804	28.93545722	38.92698877	31.86721417	30.74997168	29.05174186
	31	32	33	34	35	39
	40.54580007	32.85851764	23.72984986	27.82176802	29.18518264	16.20693593
	42	44	50	52	57	58
	44.36542324	32.74820064	31.29583681	48.46958903	35.93231799	48.46958898
	59	61	64	75	77	82
	26.67227485	48.46958903	37.57533335	49.98160947	46.88723633	29.48456972
	83	85	86	87	88	90
	44.11906998	34.85358325	35.60991957	56.53289922	33.35350505	22.24053059

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
15	39.52361862	39.23337025	30.75646834	28.13670867	33.25886837	26.52149978
	100	107	108	117	118	122
	32.85167970	48.85365325	35.18225188	30.58132396	26.61014675	28.53281267
	130	131	132	133	134	135
	22.39658548	38.19234232	34.41748133	24.74627198	27.81058133	29.28657608
	137	138	139	142	144	149
	38.99436098	35.60991957	29.52296915	38.84799373	34.50850826	48.46958903
	151	152	157	162	182	183
	28.59423810	32.71420960	41.33235279	56.53289921	52.42326103	44.66374196
	189	190	194	196	217	218
	40.54580007	39.33129306	79.83224274	16.45130624	32.64962025	33.47994349
	221	222	232	233	234	235
	54.31084609	27.54609282	43.08004516	28.15186106	25.74015387	34.96077784
	236	237	239	251	252	254
	35.58202434	30.34027946	30.55951041	29.92577291	30.31194645	56.53289914
	260					
	26.52149977					
16	5	7	15	16	17	18
	39.61293148	25.71970892	11.59439816	10.92872265	41.59481000	22.77373105
	21	22	23	25	28	30
	16.73256291	26.32422544	36.28622921	28.62148021	27.62756194	26.12345178
	31	32	33	34	35	39
	37.91623244	30.14019918	21.54672063	25.39849245	26.61774497	14.74012486

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
16	41.59481000	30.08901393	28.69154974	45.86380385	33.16264513	45.86380384
	59	61	64	75	77	82
	22.87516272	45.86380385	38.94794349	47.19541367	43.95600917	26.96472189
	83	85	86	87	88	90
	41.36214321	29.24298893	33.13929493	53.82295561	30.84159797	19.83865195
	93	94	95	96	98	99
	36.81815088	36.44870218	28.84049149	25.65129165	30.76355354	24.53050682
	100	107	108	117	118	122
	30.13148157	46.05538241	29.98817662	28.04474017	23.69817462	26.04105582
	130	131	132	133	134	135
	19.85908078	31.81977993	31.64041187	22.19125153	24.80085184	25.40433825
	137	138	139	142	144	149
	36.23972939	33.13929493	28.15302791	36.17369067	31.82386497	45.86380385
	151	152	157	162	182	183
	25.36627548	29.98997784	36.65060178	53.82295564	49.78519780	41.97938863
	189	190	194	196	217	218
	37.91623244	32.16204637	76.88868982	14.26492058	29.99895883	31.33150955
	221	222	232	233	234	235
	44.20917707	25.41513573	40.40494874	25.82840231	23.63903835	32.31868323
	236	237	239	251	252	254
	32.90174405	27.66492687	28.74019266	27.36339829	27.65113822	53.82295559
	260					
	24.53050677					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
17	45.34926403	27.67226601	46.19800470	44.36739872	13.70131137	35.06991118
	21	22	23	25	28	30
	38.47656673	34.88335776	42.04705242	39.37408102	36.40744608	35.01678325
	31	32	33	34	35	39
	47.29707386	38.35690018	31.21867856	34.86869550	32.67847876	41.30569329
	42	44	50	52	57	58
	13.70131137	37.46831198	39.07932757	55.11957445	41.45923339	55.11957451
	59	61	64	75	77	82
	34.08232088	55.11957445	53.64569172	55.05204562	51.90355913	22.04868381
	83	85	86	87	88	90
	48.23828186	40.13847197	42.97193151	63.18592009	39.75859194	34.37502999
	93	94	95	96	98	99
	43.95076825	45.20102581	38.59413792	34.67009259	40.07984754	41.86935680
	100	107	108	117	118	122
	39.47303424	53.89614823	28.92174303	40.27776861	32.59751243	32.75719082
	130	131	132	133	134	135
	34.10916118	42.59451663	24.73790511	29.77427033	35.45645343	24.76832913
	137	138	139	142	144	149
	43.68041216	42.97193151	38.00592867	45.28496876	26.46822899	55.11957445
	151	152	157	162	182	183
	30.18745127	23.50054988	46.95475546	63.18591989	55.08860494	49.17563298
	189	190	194	196	217	218
	47.29707386	30.20338727	85.86777860	39.08648653	37.29245648	39.88242068

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
17	59.54041078	33.05135477	46.34666207	30.27751600	34.98750725	38.91855196
	236	237	239	251	252	254
	25.28932635	35.01978120	41.63434139	33.96535033	30.55420005	63.18592012
	260					
	41.86935687					

	5	7	15	16	17	18
18	27.50010238	13.33895176	22.08196147	20.34094040	29.86453181	8.49593200
	21	22	23	25	28	30
	16.53288535	11.35676822	24.27551475	14.70904998	13.80671464	13.99075572
	31	32	33	34	35	39
	16.46784969	17.89059888	10.59166667	11.53789797	9.83797635	18.40088671
	42	44	50	52	57	58
	29.86453181	17.55622241	19.00020257	34.65117498	21.40724273	34.65117501
	59	61	64	75	77	82
	10.80361815	34.65117498	28.31408182	35.21940931	31.26625614	17.56559252
	83	85	86	87	88	90
	26.24434178	18.92900173	21.23371127	41.14344507	18.91771477	13.17575775
	93	94	95	96	98	99
	21.88347194	24.63331120	15.65576493	11.31603335	18.81182778	21.63409474
	100	107	108	117	118	122
	15.81668047	30.09088702	18.95960917	18.50794086	13.59647988	12.55231545
	130	131	132	133	134	135
	13.10012679	21.36753419	17.94625221	11.33450059	12.00965798	13.90663948

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
18	21.92123458	21.23371127	16.80981129	23.87921856	19.85821514	34.65117498
	151	152	157	162	182	183
	13.11142362	16.86024597	22.90650358	41.14344509	37.99234680	26.02965668
	189	190	194	196	217	218
	16.46784969	22.26438691	60.89685291	16.41390374	13.60197029	17.84421376
	221	222	232	233	234	235
	35.53326340	13.33029096	28.56630944	13.94349224	14.68024348	20.41308662
	236	237	239	251	252	254
	21.09735823	14.83068629	18.08096391	15.00240855	15.18399373	41.14344516
	260					
	21.63409472					

	5	7	15	16	17	18
21	30.92867426	20.21508927	20.08896804	17.67257017	36.64398527	19.90568326
	21	22	23	25	28	30
	11.86872991	21.32475415	27.33803448	24.89624434	23.20987222	20.52754135
	31	32	33	34	35	39
	34.31885865	24.00480978	18.72610170	22.51954612	22.80475393	18.92837254
	42	44	50	52	57	58
	36.64398527	25.63932631	23.56579890	42.30665678	25.01763822	42.30665678
	59	61	64	75	77	82
	18.33438273	42.30665678	41.73738928	42.04742470	36.76414697	21.24262184
	83	85	86	87	88	90
	37.32207301	23.44420049	29.95705285	49.11176006	27.37095792	18.53433887

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
21	31.34764264	30.59011432	24.45890152	22.29157667	26.21530537	19.34126789
	100	107	108	117	118	122
	25.98045455	42.10237480	23.97957946	25.11279331	18.31821179	22.01208066
	130	131	132	133	134	135
	18.57873791	21.26575244	27.21462482	18.34502061	20.16991456	19.87337153
	137	138	139	142	144	149
	26.41761714	29.95705285	26.03761422	32.13140756	23.36455158	42.30665678
	151	152	157	162	182	183
	19.43929699	23.57323357	30.69809352	49.11176005	44.63309203	36.68484799
	189	190	194	196	217	218
	34.31885865	25.16345382	72.92654931	17.03113725	25.31761876	27.25463211
	221	222	232	233	234	235
	35.84540593	22.37684203	35.25387217	20.93316765	20.15829574	26.40600780
	236	237	239	251	252	254
	27.45532983	21.18145131	26.77413471	19.46259190	20.73203392	49.11176005
	260					
	19.34126788					

	5	7	15	16	17	18
22	25.01624384	11.75838337	24.98729517	23.31607065	29.10261425	10.78140408
	21	22	23	25	28	30
	17.37659210	7.92056786	21.84021171	12.54446646	10.86696423	11.74244892
	31	32	33	34	35	39
	19.28769771	14.71627424	10.63500449	11.05245249	10.62102343	20.41766096

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
22	29.10261425	14.40272447	14.69328444	34.33467056	18.62397012	34.33467057
	59	61	64	75	77	82
	11.21620843	34.33467056	30.10217322	28.21827717	28.99679565	16.28788699
	83	85	86	87	88	90
	27.51287298	19.60517274	21.74893834	32.61016314	18.95121313	13.41036509
	93	94	95	96	98	99
	20.41877365	21.29430841	12.60528878	12.53011531	18.81426511	20.64610925
	100	107	108	117	118	122
	16.77314730	32.28369304	16.82957093	17.86956199	13.02288788	11.87959585
	130	131	132	133	134	135
	13.13818618	21.28292640	17.82539756	11.11955686	13.37601837	12.74750721
	137	138	139	142	144	149
	20.12155976	21.74893834	16.56791441	20.97854350	17.83870789	34.33467056
	151	152	157	162	182	183
	12.27642488	15.43234378	24.85854099	32.61016322	36.19604099	24.47313275
	189	190	194	196	217	218
	19.28769771	23.70267077	57.97429417	16.54841429	13.42430974	14.43208856
	221	222	232	233	234	235
	38.43834829	12.19809679	25.46879696	11.41180384	13.41626790	17.71181578
	236	237	239	251	252	254
	19.78371327	12.24994694	17.67955186	12.07621487	12.88067669	32.61016314
	260					
	20.64610925					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
23	30.45708310	29.27889405	40.75957023	39.05881793	42.04705242	29.48089412
	21	22	23	25	28	30
	29.17061595	27.62095523	13.70131137	34.29857936	27.79695256	28.55755748
	31	32	33	34	35	39
	43.10560340	33.06579063	28.84902900	32.07014421	30.80942150	36.06252581
	42	44	50	52	57	58
	42.04705242	30.92154234	33.23851234	51.63509494	35.53480437	51.63509493
	59	61	64	75	77	82
	28.61407233	51.63509494	47.97607591	48.07017055	46.80449509	21.53810507
	83	85	86	87	88	90
	44.87338227	30.78829674	37.90551340	58.38953281	34.93657650	29.25441343
	93	94	95	96	98	99
	37.72882033	39.50406746	31.47706314	30.53358344	32.03149550	22.78250635
	100	107	108	117	118	122
	34.72864437	50.40427614	35.26646256	35.10505805	27.06731654	29.56416219
	130	131	132	133	134	135
	30.15317192	27.36694057	33.87442998	25.17536566	28.86421891	28.11279935
	137	138	139	142	144	149
	37.99956951	37.90551340	26.91520267	39.29202561	17.55426755	51.63509494
	151	152	157	162	182	183
	26.54777979	27.51541810	41.70444489	58.38953286	24.33707876	43.11559525
	189	190	194	196	217	218
	43.10560340	38.83256620	80.91431489	33.60604149	23.62477842	33.48308428

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
23	55.02521508	25.52224389	21.53754869	22.80636752	18.78853262	17.07662567
	236	237	239	251	252	254
	20.20981896	27.46452017	35.72713513	23.06670353	19.18589834	58.38953284
	260					
	22.78250634					

	5	7	15	16	17	18
25	35.46698436	19.52241343	31.19426970	28.88854299	36.86855509	17.40890341
	21	22	23	25	28	30
	24.22329987	15.81968403	31.79305343	11.19578544	16.79658108	18.69150149
	31	32	33	34	35	39
	28.17645132	22.43435987	18.51004655	17.79788298	17.20453329	28.09848838
	42	44	50	52	57	58
	36.86855509	22.89462318	25.52452883	41.66134859	26.53496935	41.66134859
	59	61	64	75	77	82
	17.17302987	41.66134859	34.75613748	41.70382123	38.34700009	25.20373504
	83	85	86	87	88	90
	35.92365107	24.34981674	30.82553793	36.41894431	28.08384425	19.99978278
	93	94	95	96	98	99
	31.49565097	28.69585107	19.21710330	21.40030281	28.24345377	30.54100053
	100	107	108	117	118	122
	24.31919739	40.19823049	20.80596224	26.25162161	21.58811776	21.05615912
	130	131	132	133	134	135
	17.18963209	27.23251408	23.45970199	18.96592622	20.61294557	20.21525338

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
25	31.37615930	30.82553793	23.53909978	31.44841931	27.41633412	41.66134859
	151	152	157	162	182	183
	20.42567974	25.13194660	31.34341521	36.41894429	44.55700099	36.69279968
	189	190	194	196	217	218
	28.17645132	27.02171832	40.72669495	23.39100583	23.24743649	26.11345952
	221	222	232	233	234	235
	38.79280022	21.30360646	35.11090307	21.02017811	22.53422038	27.31370351
	236	237	239	251	252	254
	28.16662283	22.43539146	28.01491265	21.56402596	22.50644034	36.41894430
	260					
	30.54100053					
28	5	7	15	16	17	18
	27.40429959	10.93822988	24.96922816	22.78682569	28.79412110	11.39876903
	21	22	23	25	28	30
	17.42912871	9.03438277	20.18362758	11.68878204	6.08798639	11.73258231
	31	32	33	34	35	39
	21.71875984	16.14916809	10.88651986	12.46662467	11.29816864	20.83215359
	42	44	50	52	57	58
	28.79412110	15.23704438	17.23402994	34.46773895	17.36914159	34.46773895
	59	61	64	75	77	82
	10.00717918	34.46773895	34.04465710	33.29197813	29.74972498	16.17819474
	83	85	86	87	88	90
	25.05372355	17.59150050	23.99261299	37.76822877	21.14799532	13.78594168

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
29	22.24962856	20.41340454	15.71106877	14.42977715	21.13268627	22.15464060
	100	107	108	117	118	122
	16.55991579	28.13871583	17.73702343	16.77698665	14.30428427	13.60158595
	130	131	132	133	134	135
	12.09941505	21.60276852	16.21999475	11.69492988	12.85157829	12.93230092
	137	138	139	142	144	149
	22.82240928	23.99261299	16.94649307	16.52808342	17.61448378	34.46773895
	151	152	157	162	182	183
	13.22560118	16.45322836	24.45243910	37.76822877	30.11597348	27.15647010
	189	190	194	196	217	218
	21.71875984	22.30294453	53.21580458	15.11375367	13.10242048	18.31974550
	221	222	232	233	234	235
	36.31113316	12.49499930	22.17717156	12.72836782	12.83609010	15.68776208
	236	237	239	251	252	254
	17.15698645	14.01905274	20.01540411	12.37721398	12.89624747	37.76822880
	260					
	22.15464060					
30	5	7	15	16	17	18
	26.15448730	11.35053566	24.25595131	22.26766849	28.38841124	12.56776308
	21	22	23	25	28	30
	15.73175080	10.89482043	21.92918547	14.56865542	12.71753528	7.07293936
	31	32	33	34	35	39
	25.30226307	13.30495625	10.41309568	12.47363665	12.97001016	18.11927533

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
30	28.38841124	14.74957815	15.43621926	32.11452754	10.87930500	32.11452754
	59	61	64	75	77	82
	10.40688572	32.11452754	31.75777944	30.95989828	25.73246389	16.20196361
	83	85	86	87	88	90
	26.40613550	17.50159898	18.20301870	34.72165070	16.14840262	11.69281433
	93	94	95	96	98	99
	21.65818786	12.29949791	13.21219215	12.87006204	16.07588542	21.60798881
	100	107	108	117	118	122
	13.36078902	28.92878947	16.60388740	11.10262121	9.79771096	12.25934834
	130	131	132	133	134	135
	10.41055132	21.29918883	17.24478786	9.32457933	10.72011801	11.88454322
	137	138	139	142	144	149
	20.59895522	18.20301870	14.67977352	21.69940402	18.10837523	32.11452754
	151	152	157	162	182	183
	10.15750252	15.76500094	23.80980636	34.72165075	34.26712859	27.58987176
	189	190	194	196	217	218
	25.30226307	22.17238856	59.92051486	15.52698632	15.82510713	17.17932947
	221	222	232	233	234	235
	36.36401317	13.74209762	24.70751801	11.83395200	12.29339813	17.00987309
	236	237	239	251	252	254
	18.50193256	12.49585219	19.95258328	11.59797705	12.32893779	34.72165071
	260					
	21.60798879					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
31	45.13425171	28.46706573	41.56745132	39.87789095	46.48614365	20.86229884
	21	22	23	25	28	30
	35.34050990	24.25751101	42.29467319	29.87104704	28.52115460	31.11970486
	31	32	33	34	35	39
	12.89038116	34.53178182	24.49484071	22.06485686	20.04169962	36.64185823
	42	44	50	52	57	58
	46.48614365	34.27323943	35.73981283	49.66318912	38.24727316	49.66318912
	59	61	64	75	77	82
	26.92736898	49.66318912	48.77827091	52.42838914	48.11070268	35.09722657
	83	85	86	87	88	90
	43.99573263	36.50242793	38.18916977	56.88189950	35.74208835	30.05558748
	93	94	95	96	98	99
	42.10693719	41.42099961	30.08688195	20.27600330	36.05482993	40.69320916
	100	107	108	117	118	122
	27.87903006	48.40620145	36.54180625	36.35582641	30.87414527	27.95826063
	130	131	132	133	134	135
	31.08553870	41.04492870	35.30928810	28.86731193	29.86135675	31.31209684
	137	138	139	142	144	149
	41.02469586	38.18916977	34.43345784	40.05802653	37.62243713	49.66318912
	151	152	157	162	182	183
	31.70001661	35.38648735	43.22612400	56.88189950	55.06239962	47.02524161
	189	190	194	196	217	218
	12.89038116	41.14494667	80.00948781	34.31602052	25.09802667	37.14105430

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
31	55.91978845	27.40164645	45.67109393	31.89209639	33.00509326	37.65431041
	236	237	239	251	252	254
	38.10694239	32.60867975	38.74995372	32.87405018	32.99817655	56.88189944
	260					
	40.69320915					
	5	7	15	16	17	18
32	31.56523364	17.01231639	30.79927880	29.02096761	34.46507988	19.20415796
	21	22	23	25	28	30
	21.94557094	16.60519746	29.17397033	21.04806551	19.87067277	16.04150796
	31	32	33	34	35	39
	31.45089174	9.80949108	15.83291561	16.16204141	18.07967435	25.67928899
	42	44	50	52	57	58
	34.46507988	19.84255745	18.68509951	29.83980056	20.52968006	29.83980056
	59	61	64	75	77	82
	16.98406326	29.83980056	35.93624631	33.75890589	33.22594929	22.57578270
	83	85	86	87	88	90
	29.85238059	21.07524548	26.31006669	33.93901202	23.56769512	17.17999620
	93	94	95	96	98	99
	24.18525825	27.59979000	17.13812131	20.51992173	23.90381557	28.08831835
	100	107	108	117	118	122
	24.30981154	34.15718113	20.71545400	22.84679536	17.03871253	17.70982598
	130	131	132	133	134	135
	17.72945315	27.89613520	22.47396417	15.41286553	18.92552272	15.35090690

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
32	26.54007002	26.31006669	20.00051087	28.60775374	24.72121866	29.83980056
	151	152	157	162	182	183
	18.72451515	19.42142650	30.39562744	33.93901200	42.60347532	35.27628139
	189	190	194	196	217	218
	31.45089174	28.82745775	70.06336600	23.15261040	23.21556852	22.27000356
	221	222	232	233	234	235
	43.40468289	19.44711017	31.65952993	17.87968738	20.25167930	24.21762030
	236	237	239	251	252	254
	25.77357984	16.20963041	27.05902006	15.40357262	18.94553287	33.93901201
	260					
	28.08831835					
	5	7	15	16	17	18
33	22.04534926	6.42147657	15.95438923	14.71126727	21.61063647	6.18900395
	21	22	23	25	28	30
	10.95064107	6.80770592	19.24098691	11.40753039	8.89180275	7.43142560
	31	32	33	34	35	39
	15.69772883	10.11669382	4.09326928	6.20940280	6.16737235	11.04705105
	42	44	50	52	57	58
	21.61063647	10.68519388	11.97910549	22.59923846	14.09855821	22.59923848
	59	61	64	75	77	82
	6.79346881	22.59923846	25.53379865	29.32209892	25.51290260	10.99043849
	83	85	86	87	88	90
	21.62454500	12.78879464	13.37916551	33.05173593	11.33484956	5.60859009

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
33	18.08237960	17.27881966	10.29251776	6.52814145	11.44887954	16.37038791
	100	107	108	117	118	122
	9.56416468	25.91680198	13.35416274	12.41539554	6.21565800	6.38799157
	130	131	132	133	134	135
	7.12730553	18.92548523	12.06158523	5.84745995	7.33087895	7.24215644
	137	138	139	142	144	149
	17.12641617	13.37916551	10.89716234	15.98404930	13.88860148	22.59923846
	151	152	157	162	182	183
	8.09895631	11.14176749	20.67566273	33.05173580	32.33665400	22.94729649
	189	190	194	196	217	218
	15.69772883	18.68038791	59.10292146	9.62712432	10.43257901	13.59860024
	221	222	232	233	234	235
	35.06252857	8.39397744	22.85021223	8.28248923	9.24232836	14.50269601
	236	237	239	251	252	254
	14.33861624	8.85371572	14.48718119	9.23995928	9.75033375	33.05173591
	260					
	16.37038786					
34	5	7	15	16	17	18
	27.63601813	11.75799389	22.72287768	21.23960937	27.93722370	9.81180553
	21	22	23	25	28	30
	17.42065578	9.90172420	25.13867240	13.37193712	13.14847784	12.17053686
	31	32	33	34	35	39
	15.94431527	13.12238990	8.88597309	6.76983957	9.38649273	17.99244336

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
34	27.93722370	14.89282952	18.06568452	28.48463846	20.56696767	28.48463846
	59	61	64	75	77	82
	11.15648654	28.48463846	30.09824328	35.67662334	29.78484480	17.14605894
	83	85	86	87	88	90
	22.32677593	17.78083114	19.84356311	26.53875423	17.52331910	11.41268907
	93	94	95	96	98	99
	25.40746700	22.40464003	10.90993192	10.52158655	17.86073154	22.87460754
	100	107	108	117	118	122
	15.74158796	25.56025477	14.54046310	16.97157171	12.53268986	12.44457949
	130	131	132	133	134	135
	12.52392101	23.84642292	15.47744450	11.57569051	13.82880093	12.68196768
	137	138	139	142	144	149
	24.15616918	19.84356311	15.85036403	22.84389825	19.97345290	28.48463846
	151	152	157	162	182	183
	14.07727369	17.83705768	26.78097563	26.53875425	38.03544526	30.64130671
	189	190	194	196	217	218
	15.94431527	23.45820001	62.25274696	16.09844849	14.97904157	20.27146432
	221	222	232	233	234	235
	38.80782424	13.31667185	28.71293679	14.46435595	15.50489066	20.44750830
	236	237	239	251	252	254
	20.36608550	14.67664714	21.68060916	15.13724303	15.67522894	26.53875421
	260					
	22.87460753					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
35	28.79877144	12.58929044	26.04795081	24.42052039	27.70866546	10.07354242
	21	22	23	25	28	30
	19.66752209	11.43195365	25.83960820	14.74024592	13.94168032	14.62856887
	31	32	33	34	35	39
	15.88281654	17.00168135	10.80560114	11.34815123	8.73149807	21.62118730
	42	44	50	52	57	58
	27.70866546	18.02633519	17.41632445	29.55014481	22.30329925	29.55014482
	59	61	64	75	77	82
	11.88919071	29.55014481	31.83692041	32.41103031	31.59993834	17.82990873
	83	85	86	87	88	90
	25.80567763	18.87849025	23.35282752	42.47494818	20.63548298	13.51538699
	93	94	95	96	98	99
	23.75844010	25.68823955	16.69678329	12.21441357	20.98320777	24.64966188
	100	107	108	117	118	122
	17.01901345	29.66288126	20.23586785	19.13247719	14.50353590	12.62797206
	130	131	132	133	134	135
	14.15073565	24.93658478	16.46070547	12.74830738	14.28660014	13.81670158
	137	138	139	142	144	149
	23.27567506	23.35282752	17.14268254	25.17410526	20.38695952	29.55014481
	151	152	157	162	182	183
	14.51533059	17.24429339	25.29433902	42.47494821	38.63557138	28.12851853
	189	190	194	196	217	218
	15.88281654	24.19392392	56.58265114	19.22254015	14.32098814	18.04339763

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
35	40.18640265	13.69381470	28.34663314	14.09144265	16.25515882	21.00293888
	236	237	239	251	252	254
	20.84212173	15.78797279	20.66581020	16.21205642	16.06778119	42.47494821
	260					
	24.64966187					
	5	7	15	16	17	18
39	35.28592381	21.31547770	13.88063431	13.35383049	37.14681020	19.44738300
	21	22	23	25	28	30
	16.60207092	22.03952139	31.90364273	26.44513123	24.28659549	20.58876426
	31	32	33	34	35	39
	33.29390536	25.41222620	16.49621006	20.76503209	22.43211752	9.54242829
	42	44	50	52	57	58
	37.14681020	24.30264385	24.87511918	41.09713425	28.60866797	41.09713423
	59	61	64	75	77	82
	19.82582836	41.09713425	41.73729688	42.68659514	40.05927506	23.16135250
	83	85	86	87	88	90
	37.35330820	27.91469223	18.48111553	48.59854346	18.25614963	13.98882450
	93	94	95	96	98	99
	32.27908364	31.74786834	25.69177547	17.36401661	17.57661495	22.34433073
	100	107	108	117	118	122
	22.74005790	42.04818788	27.98029545	24.35749125	16.03269419	20.27034760
	130	131	132	133	134	135
	14.62725106	31.46441774	27.43771621	17.70973550	19.53840857	20.94507348

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
39	32.00816434	18.48111553	26.26063037	26.81169716	27.42460607	41.09713425
	151	152	157	162	182	183
	22.47029407	25.50182204	34.08683571	48.59854340	45.37951748	37.51664029
	189	190	194	196	217	218
	33.29390539	32.57210735	72.84075425	11.66546118	25.50204029	27.88503139
	221	222	232	233	234	235
	47.85794528	22.16418342	35.97348388	20.93633331	19.73124203	26.47240185
	236	237	239	251	252	254
	27.79871518	21.67346877	26.25963104	22.91909305	23.19196823	48.59854341
	260					
	22.34433071					
42	5	7	15	16	17	18
	45.34926403	27.67226601	46.19800470	44.36739872	13.70131137	35.06991118
	21	22	23	25	28	30
	38.47656673	34.88335776	42.04705242	39.37408102	36.40744608	35.01678325
	31	32	33	34	35	39
	47.29707386	38.35690018	31.21867856	34.86869550	32.67847876	41.30569329
	42	44	50	52	57	58
	13.70131137	37.46831198	39.07932757	55.11957445	41.45923339	55.11957451
	59	61	64	75	77	82
	34.08232088	55.11957445	53.64569172	55.05204562	51.90355913	22.04868381
	83	85	86	87	88	90
	48.23828186	40.13847197	42.97193151	63.18592009	39.75859194	34.37502999

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
42	43.95076825	45.20102581	38.59413792	34.67009259	40.07984754	41.86935680
	100	107	108	117	118	122
	39.47303424	53.89614823	28.92174303	40.27776861	32.59751243	32.75719082
	130	131	132	133	134	135
	34.10916118	42.59451663	24.73790511	29.77427033	35.45645343	24.76832913
	137	138	139	142	144	149
	43.68041216	42.97193151	38.03592867	45.28496876	26.46822899	55.11957445
	151	152	157	162	182	183
	30.18745127	23.50054988	46.95475546	63.18591989	55.08860494	49.17563298
	189	190	194	196	217	218
	47.29707386	30.20338727	85.86777860	39.08644653	37.29245648	39.88242068
	221	222	232	233	234	235
	59.54041078	33.05135477	46.34666207	30.27751600	34.98750725	38.91855196
	236	237	239	251	252	254
	25.28932635	35.01978120	41.63434139	33.96535033	30.55420005	63.18592012
	260					
	41.86935687					

	5	7	15	16	17	18
44	17.90041678	15.91399553	30.55097606	28.83179661	33.43850594	18.73179574
	21	22	23	25	28	30
	23.44210173	16.15366195	26.89173630	21.37034307	18.82056332	17.34814412
	31	32	33	34	35	39
	31.05436361	19.70457171	16.26342993	17.79449529	18.96634245	24.43172090

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
44	33.43850594	9.67150533	20.30474937	36.65478340	24.30592281	36.65478340
	59	61	64	75	77	82
	17.58377284	36.65478340	39.36874863	38.78953786	35.91841479	18.92520568
	83	85	86	87	88	90
	24.57179534	23.79117693	24.96084463	35.92481609	17.09916099	17.71729082
	93	94	95	96	98	99
	24.89507011	26.79701621	19.27631075	19.64065294	22.69250362	27.44291605
	100	107	108	117	118	122
	22.47995973	38.76741475	21.72358212	24.19734298	17.83737306	14.72627585
	130	131	132	133	134	135
	17.89375170	28.73678659	18.32092552	15.78359662	18.25050208	18.04469050
	137	138	139	142	144	149
	25.54214817	24.96084463	22.13575920	28.15277878	23.27940086	36.65478340
	151	152	157	162	182	183
	15.64289073	20.39178130	31.15366323	35.92481616	38.42285865	28.85793598
	189	190	194	196	217	218
	31.05436361	29.65592084	69.87479909	21.47235283	19.55040527	22.16562669
	221	222	232	233	234	235
	45.46983708	13.18252989	29.78172537	17.80753948	18.44327549	22.28676490
	236	237	239	251	252	254
	23.29645779	12.53669974	22.79791586	18.98513722	17.56655698	35.92481612
	260					
	27.44291607					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
50	28.37349733	14.63490365	28.07696099	26.41268118	34.02787028	19.15412465
	21	22	23	25	28	30
	20.34692308	15.42257067	28.18705505	22.97859748	19.79589763	17.01313398
	31	32	33	34	35	39
	31.49928576	17.52546251	16.53569029	19.94569904	17.33468046	23.98254497
	42	44	50	52	57	58
	34.02787028	19.28309812	8.64985409	34.13442542	23.31689446	34.13442543
	59	61	64	75	77	82
	16.45743501	34.13442542	38.57925890	16.20683686	27.29681678	21.16066477
	83	85	86	87	88	90
	31.69404046	22.82376305	27.65648798	46.27241605	23.44453176	17.88747776
	93	94	95	96	98	99
	28.36429158	27.83144118	20.66423130	20.79364459	25.00332360	26.47912073
	100	107	108	117	118	122
	23.31318794	38.98263990	24.97171843	21.18502457	16.71154006	14.53866923
	130	131	132	133	134	135
	18.80897214	28.14144906	22.83235278	15.64497503	17.97995534	16.82545333
	137	138	139	142	144	149
	23.15265509	27.65648798	21.78205159	29.52722248	24.05197065	34.13442542
	151	152	157	162	182	183
	18.08021398	22.03509458	22.00595874	46.27241607	41.01161584	33.52857772
	189	190	194	196	217	218
	31.49928576	29.17613329	70.10937112	20.94112628	22.11851236	14.37624558

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
50	44.27728180	15.87985673	26.07761807	13.25181635	17.84997606	20.89623893
	236	237	239	251	252	254
	24.92012503	15.88774070	25.60771192	17.81454778	18.65926465	46.27241602
	260					
	26.47912073					
	5	7	15	16	17	18
52	54.31300980	36.58326607	50.30217050	48.63639257	55.11957445	39.85655435
	21	22	23	25	28	30
	44.13923824	40.11541408	51.63509494	44.16687453	42.08106393	38.74289955
	31	32	33	34	35	39
	50.47411934	33.73162086	32.20728055	35.41611027	34.51995811	45.25601734
	42	44	50	52	57	58
	55.11957445	40.68458944	39.18588271	13.70131137	47.16375121	13.70131137
	59	61	64	75	77	82
	37.99862929	13.70131137	59.04024942	60.91106849	57.56577300	44.02415072
	83	85	86	87	88	90
	54.36881681	27.88367257	47.13922770	66.24665161	44.72802139	29.41668192
	93	94	95	96	98	99
	51.08077537	50.49569044	43.32575169	40.63589222	45.04460542	49.62956571
	100	107	108	117	118	122
	43.82317238	59.07512316	45.77073687	45.56549894	34.77067686	35.24504128
	130	131	132	133	134	135
	40.36754151	50.50327440	44.99938996	38.28945306	40.04414001	34.91655127

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
52	50.08651982	47.13922770	34.12979032	50.03022880	46.70223111	13.70131137
	151	152	157	162	182	183
	39.60616245	44.22187780	52.55008896	66.24665161	64.51516066	56.30221646
	189	190	194	196	217	218
	50.47411934	50.41148418	91.13318776	43.44331023	43.86918468	46.21833150
	221	222	232	233	234	235
	65.60839720	41.42243554	54.88133458	40.99726782	42.16554902	46.93465050
	236	237	239	251	252	254
	47.18347923	41.64650114	48.03563328	42.07148764	42.29089435	66.24665161
	260					
	49.62956570					
57	5	7	15	16	17	18
	36.45822364	20.83685667	35.56767488	33.73800927	39.26200881	24.41539753
	21	22	23	25	28	30
	24.65299510	22.20748906	33.33757980	26.84327071	22.78524199	15.31045243
	31	32	33	34	35	39
	36.86097880	22.22427578	21.50937572	25.30121489	25.07588798	30.57032648
	42	44	50	52	57	58
	39.26200881	26.13850428	26.17112717	44.96652663	11.50408680	44.96652664
	59	61	64	75	77	82
	22.32444994	44.96652663	42.97822424	44.29466499	31.45382094	27.12416006
	83	85	86	87	88	90
	38.29705594	30.20145582	32.08958037	51.06046348	29.36083725	24.11493418

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
57	29.87598436	14.47341920	26.39216383	24.65819427	29.42030199	32.11386754
	100	107	108	117	118	122
	22.50062013	39.69610990	29.85303152	17.28125787	20.36898836	24.07919827
	130	131	132	133	134	135
	20.65534177	32.61247301	28.93185131	19.49934347	20.48190561	23.09044565
	137	138	139	142	144	149
	28.32743648	32.08958037	27.86554981	33.71511118	29.04587106	44.96652663
	151	152	157	162	182	183
	19.29969766	24.85494308	35.17883697	51.06046357	46.99237070	38.65197370
	189	190	194	196	217	218
	36.86097880	34.04284062	74.52965414	26.14767261	27.60712698	29.23805107
	221	222	232	233	234	235
	48.89903512	25.26660300	37.58514121	23.81891591	23.33145942	29.24641209
	236	237	239	251	252	254
	30.38835854	22.49527300	31.07622592	19.34781859	23.34404700	51.06046350
	260					
	32.11386754					
58	5	7	15	16	17	18
	52.92671539	35.19697164	48.91587608	47.25009820	53.73328014	38.47026002
	21	22	23	25	28	30
	42.75294388	38.72911972	50.24880057	42.78058017	40.69476957	37.35660519
	31	32	33	34	35	39
	49.08782497	32.34532649	30.82098621	34.02981590	33.13366375	43.86972295

DISCRIM PASS - FULL BLOHN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
58	53.73328014	39.29829508	37.79958835	12.31501701	45.77745685	12.31501701
	59	61	64	75	77	82
	36.61233497	12.31501701	57.65395505	59.52477413	56.17947863	42.63785635
	83	85	86	87	88	90
	52.98252250	26.49737820	45.75293361	64.86035724	43.34172697	28.03038752
	93	94	95	96	98	99
	49.69448110	49.10939607	41.93945733	39.24959788	43.65831103	48.24327135
	100	107	108	117	118	122
	42.43687801	57.68882879	44.38444251	44.17920457	33.38438247	33.85874685
	130	131	132	133	134	135
	38.98124712	49.11698004	43.61309559	36.90315864	38.65784572	33.53025695
	137	138	139	142	144	149
	48.70022544	45.75293361	32.74349592	48.64393446	45.31593674	12.31501701
	151	152	157	162	182	183
	38.21986815	42.83558348	51.16379452	64.86035724	63.12886630	54.91592217
	189	190	194	196	217	218
	49.08782497	49.02518984	89.74689340	42.05701583	42.48289031	44.83203719
	221	222	232	233	234	235
	64.22210287	40.03614118	53.49504023	39.61097345	40.77925463	45.54835619
	236	237	239	251	252	254
	45.79718488	40.26020678	46.64933898	40.68519328	40.90459996	64.86035725
	260					
	48.24327134					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
59	23.10927562	8.76535561	20.02220281	17.16509793	25.59966738	7.52634401
	21	22	23	25	28	30
	11.68431069	8.51429844	20.13141883	11.19590230	9.13785066	8.55260423
	31	32	33	34	35	39
	19.25564569	12.39323005	7.91885739	9.60530484	8.37635050	15.50205794
	42	44	50	52	57	58
	25.59966738	13.13092537	13.02623879	29.51597579	16.03902102	29.51597582
	59	61	64	75	77	82
	5.21865787	29.51597579	30.28880438	28.15248904	26.58128400	13.46594032
	83	85	86	87	88	90
	21.52808820	12.27759388	18.55287564	36.31689997	15.66550132	9.59434325
	93	94	95	96	98	99
	19.91658957	19.55433810	11.75467948	10.58645874	16.05055034	18.44868297
	100	107	108	117	118	122
	12.98175992	25.70472808	12.93874312	13.72964662	9.45612078	9.41429665
	130	131	132	133	134	135
	8.97023567	15.25997579	13.36433628	7.42059053	7.94005378	8.66133586
	137	138	139	142	144	149
	19.34918899	18.55287564	12.10804563	18.71845003	15.87390033	29.51597579
	151	152	157	162	182	183
	8.98111050	13.62228597	16.93109429	36.31689994	32.94808304	25.30277808
	189	190	194	196	217	218
	19.25564569	15.17572801	56.12915554	12.37414522	12.60752147	14.78611745

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
59	26.56207485	10.28553967	23.01638154	9.85773690	11.20993376	15.62816394
	236	237	239	251	252	254
	16.64243842	10.65795372	17.40552814	10.59655856	10.05202498	36.31689992
	260					
	18.44868292					

	5	7	15	16	17	18
61	54.31300980	36.58326607	50.30217050	48.63639257	55.11957445	39.85655435
	21	22	23	25	28	30
	44.13923824	40.11541408	51.63509494	44.16687453	42.08106393	38.74289955
	31	32	33	34	35	39
	50.47411934	33.73162086	32.20728055	35.41611027	34.51995811	45.25601734
	42	44	50	52	57	58
	55.11957445	40.68458944	39.18588271	13.70131137	47.16375121	13.70131137
	59	61	64	75	77	82
	37.99862929	13.70131137	59.04024942	60.91106849	57.56577300	44.02415072
	83	85	86	87	88	90
	54.36881681	27.88367257	47.13922770	66.24665161	44.72802139	29.41668192
	93	94	95	96	98	99
	51.08077537	50.49569044	43.32575169	40.63589222	45.04460542	49.62956571
	100	107	108	117	118	122
	43.82317238	59.07512316	45.77073687	45.56549894	34.77067686	35.24504128
	130	131	132	133	134	135
	40.36754151	50.50327440	44.99938996	38.28945306	40.04414001	34.91655127

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
61	50.08651982	47.13922770	34.12979032	50.03022880	46.70223111	13.70131137
	151	152	157	162	182	183
	39.60616245	44.22187780	52.55008896	66.24665161	64.51516066	56.30221646
	189	190	194	196	217	218
	50.47411934	50.41148418	91.13318776	43.44331023	43.86918468	46.21833150
	221	222	232	233	234	235
	65.60839720	41.42243554	54.88133458	40.99726782	42.16554902	46.93465050
	236	237	239	251	252	254
	47.18347923	41.64650114	48.03563328	42.07148764	42.29089435	66.24665161
	260					
	49.62956570					

	5	7	15	16	17	18
64	53.59305934	40.29808742	39.40791482	41.72053221	53.64569172	33.51946119
	21	22	23	25	28	30
	43.56997074	35.88291673	47.97607591	37.26166342	41.65798208	38.38615145
	31	32	33	34	35	39
	49.58920112	39.82806661	35.14184074	37.02971508	36.80673371	45.89617996
	42	44	50	52	57	58
	53.64569172	43.39855467	43.63071619	59.04024942	45.17544881	59.04024942
	59	61	64	75	77	82
	38.77145789	59.04024942	13.70131137	56.53739368	60.85970972	41.90679624
	83	85	86	87	88	90
	58.22836432	46.82321968	51.53785162	56.15636355	48.74229395	39.80913093

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
64	45.57088295	46.95663533	30.53768061	41.42358764	48.25531651	46.25735923
	100	107	108	117	118	122
	41.12909213	62.30702672	43.15286831	43.53012336	40.42493556	36.38851168
	130	131	132	133	134	135
	40.78222867	50.40017350	46.24775727	33.09683441	36.25887526	39.55092393
	137	138	139	142	144	149
	48.32243963	51.53785162	28.58806328	52.11687890	43.71431334	59.04024942
	151	152	157	162	182	183
	35.08475228	40.55957626	50.15408845	56.15636355	61.11388945	50.46613350
	189	190	194	196	217	218
	49.58920113	52.04827039	90.90599468	44.52111776	40.49509395	35.36572990
	221	222	232	233	234	235
	69.31896257	35.18939646	51.23696254	35.03719684	35.63315056	44.82189114
	236	237	239	251	252	254
	45.03879000	39.93279625	37.06385630	37.49968381	39.51773475	56.15636351
	260					
	46.25735925					

	5	7	15	16	17	18
75	51.53977200	37.10638437	51.81419094	49.96800239	55.05204562	40.42478868
	21	22	23	25	28	30
	43.88000617	33.99902069	48.07017055	44.20934717	40.90530311	37.58827028
	31	32	33	34	35	39
	53.23931936	37.65072619	38.93014101	42.60809515	37.38084360	46.84547823

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
75	55.05204562	42.81934390	21.25829415	60.91106849	46.49188956	60.91106849
	59	61	64	75	77	82
	36.63514254	60.91106849	56.53739368	13.70131137	53.89898624	42.61734499
	83	85	86	87	88	90
	53.83818379	45.14431420	47.53775932	70.78268137	44.51574128	40.82948400
	93	94	95	96	98	99
	49.75689838	50.78044269	40.79809847	41.89814063	44.97321119	48.54084607
	100	107	108	117	118	122
	45.52467848	59.58494244	46.61400277	40.30062719	37.21427735	34.91511989
	130	131	132	133	134	135
	40.73266515	48.08844822	44.59373387	36.08885272	40.45217717	36.40435683
	137	138	139	142	144	149
	47.65921502	47.53775932	42.21456940	49.83656210	44.45287746	60.91106849
	151	152	157	162	182	183
	39.58617045	43.14411485	42.47718308	70.78268135	60.27626079	54.95239710
	189	190	194	196	217	218
	53.23931936	49.22125080	91.06235441	44.12938032	42.92801173	25.04953366
	221	222	232	233	234	235
	63.66969411	35.08044085	39.89972041	27.91883394	36.68719934	37.49869264
	236	237	239	251	252	254
	45.01215329	35.88314500	47.07331698	38.12186464	38.63488896	70.78268136
	260					
	48.54084607					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
77	47.49295974	25.52919185	45.71166300	43.72044310	48.89540433	33.46348072
	21	22	23	25	28	30
	35.58857364	31.76938437	43.79634029	37.84437123	34.35489517	29.35268111
	31	32	33	34	35	39
	45.91347810	34.10961480	32.11278990	33.70816181	33.56159685	41.21000335
	42	44	50	52	57	58
	48.89540433	36.94006604	29.34011928	54.55761821	30.64289072	54.55761819
	59	61	64	75	77	82
	32.05578271	54.55761821	57.85155492	50.89083145	10.69315658	37.21191638
	83	85	86	87	88	90
	45.82746245	40.62483355	44.88671684	56.02463930	41.92938778	34.68007916
	93	94	95	96	98	99
	41.47410994	32.58706517	36.10133393	35.87285333	41.87717126	42.04459546
	100	107	108	117	118	122
	33.41059515	47.30994143	38.45763032	30.83600298	32.70758673	29.20261720
	130	131	132	133	134	135
	33.17346247	43.42821838	37.80087004	29.77341070	26.95304140	33.95666106
	137	138	139	142	144	149
	25.78753958	44.88671684	40.16297742	45.66151483	39.21984445	54.55761821
	151	152	157	162	182	183
	31.67361498	36.06096974	21.15059494	56.02463929	57.49462604	46.70405716
	189	190	194	196	217	218
	45.91347810	44.62593396	84.97232656	37.60392873	36.80940632	37.64063387

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
77	60.11526004	35.59787452	47.11087432	33.76496110	34.36385454	39.76863320
	236	237	239	251	252	254
	40.69026268	33.84001710	40.23271155	30.95585579	34.65818889	56.02463930
	260					
	42.04459545					
	5	7	15	16	17	18
82	20.08461178	14.52715846	26.52136064	24.94152007	17.25289326	17.97518134
	21	22	23	25	28	30
	18.27941276	17.27283996	16.74231453	22.91347043	18.99572918	18.03454508
	31	32	33	34	35	39
	31.11236624	21.67181245	15.80269004	19.28174020	18.00393148	22.52444504
	42	44	50	52	57	58
	17.25289326	18.15922118	21.41633152	39.22836017	24.52559409	39.22836017
	59	61	64	75	77	82
	17.15280328	39.22836017	37.11100570	37.82155444	35.42428063	8.90552083
	83	85	86	87	88	90
	30.11354040	22.68077841	26.35182153	46.47405174	21.81714713	17.21601760
	93	94	95	96	98	99
	26.93118552	28.31217100	21.46176519	18.49108301	21.93367905	16.84696565
	100	107	108	117	118	122
	22.93517256	38.12887627	19.16846705	23.20847126	15.73721144	16.55261587
	130	131	132	133	134	135
	17.18531660	20.89348554	15.20062636	13.63572032	17.82836268	13.39942661

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
82	26.91409825	26.35182153	19.97745212	28.37653937	10.33831278	39.22836017
	151	152	157	162	182	183
	14.24926996	12.79802087	30.29977829	46.47405168	31.78164887	32.24017572
	189	190	194	196	217	218
	31.11236624	21.96429481	69.46339408	20.52580993	18.48341623	22.87777328
	221	222	232	233	234	235
	43.44086891	14.72050809	24.55882228	13.86130748	14.38015876	17.16995276
	236	237	239	251	252	254
	12.90520440	15.78541667	24.25232635	14.66161458	12.20145296	46.47405174
	260					
	16.84696566					
83	5	7	15	16	17	18
	33.33120283	28.53007191	45.14072122	43.32380171	47.42735165	30.63879093
	21	22	23	25	28	30
	38.34372426	32.48268628	44.06245206	37.61824679	31.85611831	32.22357729
	31	32	33	34	35	39
	43.99573263	32.93327067	30.42165688	28.44731752	29.96456072	40.70126106
	42	44	50	52	57	58
	47.42735165	27.79067117	35.93456754	53.55788659	39.68335030	53.55788664
	59	61	64	75	77	82
	29.19981149	53.55788659	57.41743410	53.02725358	48.02468702	34.09840073
	83	85	86	87	88	90
	12.89038116	40.49297894	44.50192221	55.09548670	35.76169460	34.36963854

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
83	42.74274987	41.99045788	36.38602181	35.46238318	41.68674499	42.49339782
	100	107	108	117	118	122
	36.52073562	19.13458072	37.95585262	27.99258511	34.59362511	30.75131170
	130	131	132	133	134	135
	30.58911454	44.36204290	20.69087604	31.41575560	32.46482958	33.83632490
	137	138	139	142	144	149
	43.45717774	44.50192221	39.61339249	44.99844877	39.06560494	53.55788659
	151	152	157	162	182	183
	31.64784860	36.25259580	44.80466997	55.09548669	57.05107169	47.83869570
	189	190	194	196	217	218
	43.99573263	44.57383629	82.61110677	38.46732932	36.40051970	38.98049998
	221	222	232	233	234	235
	61.00713211	28.77807687	47.31231503	34.44891542	35.41261702	40.18919715
	236	237	239	251	252	254
	39.93544886	29.19004716	40.89470099	34.85550886	34.50992194	55.09548669
	260					
	42.49339782					
85	5	7	15	16	17	18
	37.51104381	22.63237416	34.85358325	30.18299619	38.30589051	22.30179963
	21	22	23	25	28	30
	23.44420049	23.55333479	28.95571528	25.02276122	23.37224401	22.29738952
	31	32	33	34	35	39
	35.48077668	23.13448431	20.56425526	22.87972148	22.01572209	30.24099385

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
85	38.30589051	25.98840151	26.04263888	26.05109110	30.56609893	26.05109110
	59	61	64	75	77	82
	18.92766592	26.05109110	44.99063822	43.31173273	41.80040688	25.64398749
	83	85	86	87	88	90
	39.47132769	11.86872991	33.13131432	49.09774192	30.43283083	19.45832918
	93	94	95	96	98	99
	33.59128146	33.58916058	26.52886181	25.63221972	30.44358955	32.25703390
	100	107	108	117	118	122
	27.69729884	44.06994305	21.52068146	29.08889098	20.98240697	22.14470967
	130	131	132	133	134	135
	23.86039489	22.02967205	29.12022391	20.85473544	22.37653912	18.22707928
	137	138	139	142	144	149
	33.52037564	33.13131432	22.33078757	34.64980580	26.98247161	26.05109110
	151	152	157	162	182	183
	20.97733386	26.89882206	29.82179829	49.09774197	37.31603320	38.75026189
	189	190	194	196	217	218
	35.48077668	20.41346715	74.35711356	26.45536342	23.95437651	29.14640550
	221	222	232	233	234	235
	26.82082459	23.72413524	30.08215513	22.85396889	22.24474874	24.84092421
	236	237	239	251	252	254
	25.62057666	25.19829713	31.23453095	24.92563318	23.31854063	49.09774188
	260					
	32.25703387					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
86	42.06409635	28.07986151	37.44250104	35.91188366	42.97193151	26.43909064
	21	22	23	25	28	30
	31.78963431	27.52968186	37.90551340	33.33106386	31.60593797	24.83139071
	31	32	33	34	35	39
	39.00009999	30.20188698	22.98720760	26.77503492	28.32264082	22.63999861
	42	44	50	52	57	58
	42.97193151	28.99065067	32.70794527	47.13922770	34.28680495	47.13922797
	59	61	64	75	77	82
	27.03552915	47.13922770	51.53785162	47.53775932	47.89487163	31.14761208
	83	85	86	87	88	90
	45.31285243	34.96389578	13.70131137	50.39945095	15.91491235	21.14978992
	93	94	95	96	98	99
	37.03169682	36.72938161	31.23295457	19.90744677	14.35725640	35.44060589
	100	107	108	117	118	122
	24.52324992	49.74585413	33.40587254	32.64078645	18.99683180	24.29547601
	130	131	132	133	134	135
	22.67102961	38.86142679	34.38957313	23.47012114	23.74153273	25.64279083
	137	138	139	142	144	149
	38.14747425	13.70131137	33.88894103	27.72470927	33.39899232	47.13922770
	151	152	157	162	182	183
	28.80614021	30.87372903	39.72998067	50.39945096	51.23994374	42.31581578
	189	190	194	196	217	218
	39.00009994	40.09257721	79.53436965	26.65792301	30.95730576	33.42097038

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
86	56.50864769	29.82461339	41.58159457	25.99562152	27.30864169	30.85167099
	236	237	239	251	252	254
	32.95453000	25.73698704	34.94514919	28.46822813	29.11996564	50.39945094
	260					
	35.44060578					
	5	7	15	16	17	18
87	56.56630262	43.32890603	56.16825610	54.39831976	60.98869551	44.15159987
	21	22	23	25	28	30
	48.74711695	36.19368208	56.19230823	36.72724567	43.18432918	39.15279814
	31	32	33	34	35	39
	55.49560514	35.63360774	40.46255345	31.27300146	45.24753691	50.56020197
	42	44	50	52	57	58
	60.98869551	37.75739755	49.12664876	64.04942703	51.06046348	64.04942703
	59	61	64	75	77	82
	42.60232889	64.04942703	53.95913898	68.58545679	56.83556952	49.07261771
	83	85	86	87	88	90
	53.70919234	48.73309880	48.20222638	11.50408680	45.54334465	42.92721389
	93	94	95	96	98	99
	58.49701089	49.42897454	25.47698536	44.34369258	46.62460032	55.61850510
	100	107	108	117	118	122
	51.34498436	59.20593405	29.33266221	50.53779822	43.29576110	44.96052235
	130	131	132	133	134	135
	44.04028281	52.62386795	47.35639395	41.95331765	47.20462523	42.16985042

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
87	54.39802351	48.20222638	44.32981513	51.91024888	51.72446986	64.04942703
	151	152	157	162	182	183
	44.51979545	50.54685805	59.16412186	11.50408680	68.94762087	64.20955515
	189	190	194	196	217	218
	55.49560514	52.49466465	94.28274492	47.26957947	49.65627957	52.17034179
	221	222	232	233	234	235
	65.16761752	44.64039399	60.12427656	45.42795117	46.92559343	51.02424928
	236	237	239	251	252	254
	51.98260669	42.65961614	54.18684329	44.26497794	45.98022585	11.50408680
	260					
	55.61850510					
88	5	7	15	16	17	18
	28.78013027	22.25674378	33.35350505	31.78160523	37.92601048	22.29051268
	21	22	23	25	28	30
	27.37095792	22.89937518	33.10399503	28.75678873	26.92873883	20.94419316
	31	32	33	34	35	39
	34.72043710	25.62693395	19.11031019	22.62220944	23.77271482	20.58245125
	42	44	50	52	57	58
	37.92601048	19.29638557	26.66340758	42.89543993	29.72548037	42.89543987
	59	61	64	75	77	82
	22.31557336	42.89543993	46.90971248	42.68315982	43.10496111	24.78035621
	83	85	86	87	88	90
	34.74004336	30.43283083	14.08233089	45.90798777	11.86872991	18.14028941

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
88	32.14379559	32.22581225	26.64521434	17.43478022	13.99628137	30.91390722
	100	107	108	117	118	122
	21.34028876	44.83993599	28.66380188	28.06869906	16.35375981	18.64008152
	130	131	132	133	134	135
	18.80499395	34.11054134	26.06480169	18.96138521	19.79835548	21.50231201
	137	138	139	142	144	149
	33.24663034	14.08233089	29.27345918	25.60497558	28.51346774	42.89543993
	151	152	157	162	182	183
	22.57188340	25.95045651	35.04873009	45.90798772	46.44984931	37.33773752
	189	190	194	196	217	218
	34.72043714	35.26091236	74.92547800	23.41739511	26.27469391	28.54580304
	221	222	232	233	234	235
	51.81982009	21.39164635	36.77537391	21.77245450	23.04215736	26.79144926
	236	237	239	251	252	254
	28.40532267	18.32927803	30.16332903	23.89824863	23.94757484	45.90798777
	260					
	30.91390725					
90	5	7	15	16	17	18
	27.18093722	12.82763678	18.13228312	16.67041174	28.43420106	12.44030819
	21	22	23	25	28	30
	14.42609140	13.25027967	23.31358450	16.56447979	15.45843773	12.38035741
	31	32	33	34	35	39
	24.92568876	15.13098757	9.27580325	12.40333194	12.54437136	12.20687865

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
90	28.43420106	15.80626793	16.99810612	23.47585299	20.37132983	23.47585295
	59	61	64	75	77	82
	12.13616782	23.47585299	33.86830200	34.88865507	31.74740502	16.07097921
	83	85	86	87	88	90
	29.23973983	15.35008171	15.20896099	39.18360954	14.03204194	7.76048244
	93	94	95	96	98	99
	23.20542122	23.22922465	17.11435655	11.80185313	13.60361795	19.31956566
	100	107	108	117	118	122
	15.97556530	33.84278826	18.84137657	17.99865258	9.47598029	11.80997697
	130	131	132	133	134	135
	10.23615470	22.73078479	18.59570547	10.90835888	12.69268601	11.85581790
	137	138	139	142	144	149
	23.07224473	15.20896099	15.89167314	21.09579866	18.88525429	23.47585299
	151	152	157	162	182	183
	13.51205002	16.77138257	26.14290779	39.18360953	36.37745341	28.01027158
	189	190	194	196	217	218
	24.92568876	23.51353571	59.79809775	12.19784149	16.54315717	19.34475693
	221	222	232	233	234	235
	38.56873201	14.68256086	27.27245080	13.29017832	13.40622512	18.61978113
	236	237	239	251	252	254
	19.34936113	14.02229268	19.38548412	14.76286755	14.80393167	39.18360959
	260					
	19.31956559					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
93	38.88025008	27.70545055	39.96990572	38.20444524	42.56447389	25.70255695
	21	22	23	25	28	30
	31.79392974	24.81322281	36.34252597	32.61488254	28.47665918	26.90026551
	31	32	33	34	35	39
	41.53157304	26.69078419	26.30412732	30.95264444	27.34195904	35.05167236
	42	44	50	52	57	58
	42.56447389	27.53858179	32.02945450	49.69448101	30.68691458	49.69448110
	59	61	64	75	77	82
	27.01294871	49.69448101	44.18458859	48.37060402	43.09597037	30.34068170
	83	85	86	87	88	90
	42.16738573	34.03756856	35.64540246	59.30794111	32.59008270	27.75995579
	93	94	95	96	98	99
	12.31501701	38.32634457	32.15544046	29.94426040	32.88545160	35.79500934
	100	107	108	117	118	122
	33.56767295	47.91744813	34.80899177	33.89451465	27.70899336	23.85585675
	130	131	132	133	134	135
	27.39762675	35.73199914	32.60399474	23.49653091	26.29640323	25.41311269
	137	138	139	142	144	149
	20.31276916	35.64540246	30.67400490	37.71458100	32.13136090	49.69448101
	151	152	157	162	182	183
	21.47568753	19.26163616	39.99757427	59.30794144	50.08114917	15.94187612
	189	190	194	196	217	218
	41.53157301	37.35458974	79.66327514	32.46687168	22.62355201	21.42432084

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
93	52.21697344	27.03166753	40.92070988	24.54748742	25.55520161	32.97626242
	236	237	239	251	252	254
	33.58257023	20.94725313	15.77009347	22.97628802	23.62735598	59.30794107
	260					
	35.79500940					
94	5	7	15	16	17	18
	37.48308082	22.22117820	36.36320120	34.51854039	40.49827530	25.13594005
	21	22	23	25	28	30
	27.71994527	22.37230141	34.80131695	26.49862649	23.32397900	14.22511941
	31	32	33	34	35	39
	37.52917931	26.78885978	22.18411123	24.63336132	25.95530234	31.20400091
	42	44	50	52	57	58
	40.49827530	26.12407173	28.18014795	45.79293992	11.96789326	45.79293992
	59	61	64	75	77	82
	23.33424109	45.79293992	42.25388481	46.07769218	30.89246945	28.40521103
	83	85	86	87	88	90
	38.09863758	30.71899153	32.02663110	46.92344860	29.35564320	24.46730307
	93	94	95	96	98	99
	35.00988842	8.99856086	25.91936199	24.71223648	29.62690046	33.72162257
	100	107	108	117	118	122
	21.30785807	38.20181579	28.85799270	13.55003319	20.60348851	25.03220056
	130	131	132	133	134	135
	21.22522406	33.48223202	29.40811363	20.63920893	21.25489958	24.87467063

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
94	32.21884861	32.02663110	28.08619264	34.25144510	30.51381793	45.79293992
	151	152	157	162	182	183
	18.94146070	28.47924801	36.48100338	46.92344860	48.09595894	40.54416080
	189	190	194	196	217	218
	37.52917932	34.48672642	75.12717952	26.85946667	28.82845221	30.70966561
	221	222	232	233	234	235
	48.81466694	26.03191515	38.85858919	25.11009238	23.71150979	30.36266562
	236	237	239	251	252	254
	31.51526877	25.16817303	32.49223839	22.43684124	25.25064659	46.92344860
	260					
	33.72162256					

	5	7	15	16	17	18
95	32.15278887	18.22342215	28.55924377	27.58327417	34.56433188	16.83133826
	21	22	23	25	28	30
	22.26167694	14.35622625	27.44725710	17.69282320	19.29458771	15.81075812
	31	32	33	34	35	39
	26.86800612	17.00013557	15.87075381	13.81159768	17.63679055	25.82085251
	42	44	50	52	57	58
	34.56433188	19.27631075	21.68588255	39.29594565	24.55958236	39.29594565
	59	61	64	75	77	82
	16.20752694	39.29594565	26.50787457	36.76829243	35.07968268	22.22774970
	83	85	86	87	88	90
	33.16714599	24.33163724	27.20314853	23.64440390	24.44798976	19.02537944

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
95	29.51192878	26.59230646	9.67150533	19.02969501	24.71873774	28.17131087
	100	107	108	117	118	122
	22.95121385	38.02247843	17.51184519	24.16280945	18.70900199	18.18385195
	130	131	132	133	134	135
	19.82308299	28.36138219	24.02147137	15.61406200	19.03643022	18.37457985
	137	138	139	142	144	149
	27.07433116	27.20314853	15.46797163	29.25038802	24.06375556	39.29594565
	151	152	157	162	182	183
	17.67576768	22.86571778	31.03187267	23.64440384	38.80408460	34.78916461
	189	190	194	196	217	218
	26.86800612	29.21787645	69.81041137	23.32295078	20.25910429	22.00406598
	221	222	232	233	234	235
	43.98921263	17.49673011	29.56233356	17.19203274	18.50064027	22.86964649
	236	237	239	251	252	254
	24.12283489	18.60601274	25.30089062	18.50295724	17.77688708	23.64440389
	260					
	28.17131088					

	5	7	15	16	17	18
96	29.38817342	15.25615011	25.36411995	23.81871018	30.06492241	11.91624253
	21	22	23	25	28	30
	19.51898795	13.70568864	25.92841326	19.30065856	17.43793195	14.89326387
	31	32	33	34	35	39
	16.48176333	19.80657185	11.53101336	12.84788817	12.57905669	16.91772950

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
96	30.06492241	19.06528879	21.23993170	36.03072203	22.25024866	36.03072206
	59	61	64	75	77	82
	14.46394206	36.03072203	36.81841745	37.29297044	34.27583793	18.68170337
	83	85	86	87	88	90
	31.66814321	22.85963099	15.30227658	41.93574697	14.66219150	13.13751187
	93	94	95	96	98	99
	26.72538458	24.80981681	18.45433087	9.09614119	13.91745798	23.17831261
	100	107	108	117	118	122
	14.48837619	35.93476480	21.77655250	20.46077312	12.30034225	13.96060094
	130	131	132	133	134	135
	13.95959994	25.76061278	21.21863069	13.17173940	14.23358143	15.33864087
	137	138	139	142	144	149
	26.57177588	15.30227658	21.08329295	22.19158947	20.95474908	36.03072203
	151	152	157	162	182	183
	16.51263904	19.21854522	28.74870908	41.93574693	39.97012405	31.89735817
	189	190	194	196	217	218
	16.48176333	26.81942561	67.18790807	17.26186915	16.22176778	22.46251720
	221	222	232	233	234	235
	42.99140090	15.97052645	30.56803261	15.86662374	16.74051346	21.22053659
	236	237	239	251	252	254
	21.79358281	16.39772886	23.76945781	16.99101411	17.38049172	41.93574687
	260					
	23.17831254					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
98	33.76791399	22.98035866	32.58592390	31.03061633	37.57432160	21.51168121
	21	22	23	25	28	30
	25.54236089	22.08948268	29.52596956	28.24345377	26.24048531	20.19873149
	31	32	33	34	35	39
	34.36023421	25.29010993	18.55139570	22.28667741	23.44749514	19.22997209
	42	44	50	52	57	58
	37.57432160	24.21678373	27.54925495	42.53907948	29.11200063	42.53907946
	59	61	64	75	77	82
	22.02767791	42.53907948	45.74979057	42.46768525	42.37980011	24.22394366
	83	85	86	87	88	90
	39.99214927	29.77064508	11.85173046	46.31629896	13.32333689	17.03892095
	93	94	95	96	98	99
	31.76622003	31.82412503	26.24301785	16.01710223	11.19578544	26.54416257
	100	107	108	117	118	122
	20.70254265	44.59658748	28.40567164	27.71014881	14.55600429	19.77492682
	130	131	132	133	134	135
	18.43541813	30.58510034	29.05994915	18.44900338	19.00008006	20.60075763
	137	138	139	142	144	149
	32.77162837	11.85173046	28.38074650	24.08904537	25.42381145	42.53907948
	151	152	157	162	182	183
	22.99902898	24.65892728	34.72313465	46.31629923	45.51366721	37.12328397
	189	190	194	196	217	218
	34.36023416	34.62162897	74.55151475	22.35189091	25.77108100	28.19584500

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
98	50.98880696	24.50858522	36.01936871	20.57549026	21.57075488	25.02009565
	236	237	239	251	252	254
	27.26439754	20.40335312	29.74880255	21.65551511	22.43442629	46.31629888
	260					
	26.54416253					
	5	7	15	16	17	18
99	26.05914840	27.00092324	27.54315102	26.49216533	41.05842659	26.02854390
	21	22	23	25	28	30
	20.36291913	25.61592255	21.97157613	32.23559626	28.95703536	27.42543061
	31	32	33	34	35	39
	40.69320916	31.16920843	25.16749979	28.99514912	28.80854496	25.69228360
	42	44	50	52	57	58
	41.05842659	30.66179188	30.71964780	48.81863550	33.50016190	48.81863549
	59	61	64	75	77	82
	26.12040626	48.81863550	45.44642902	47.72991586	44.24182004	20.83182598
	83	85	86	87	88	90
	42.49339782	33.27868514	34.62967567	57.00479946	31.93555847	24.44946438
	93	94	95	96	98	99
	36.37037348	37.61344287	31.39018670	26.97255258	28.23875829	12.89038116
	100	107	108	117	118	122
	32.36384134	47.88162819	33.58370933	31.44979060	23.24370846	27.54158311
	130	131	132	133	134	135
	24.86542424	22.58242461	32.12564075	23.35194168	25.85127858	26.05673473

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
99	36.14934909	34.62967567	30.39081755	36.94449827	19.36836967	48.81863550
	151	152	157	162	182	183
	24.67897743	25.41523359	39.74787858	57.00479947	47.77174010	41.96731009
	189	190	194	196	217	218
	40.69320916	36.83217552	79.04172547	24.40594973	30.24943891	32.48376049
	221	222	232	233	234	235
	52.35031480	27.20423314	39.02848087	24.43084364	22.76879040	27.76979573
	236	237	239	251	252	254
	30.07254580	25.16594919	32.27582293	20.11445626	21.13515949	57.00479948
	260					
	12.89038116					
100	5	7	15	16	17	18
	35.69084664	18.58187946	33.29796680	31.51777593	38.08673987	19.63576548
	21	22	23	25	28	30
	26.42674166	21.16759646	33.34235001	25.43842897	22.78694641	18.60286667
	31	32	33	34	35	39
	27.30366592	26.81533748	17.78591241	21.28676540	20.60253239	25.51264663
	42	44	50	52	57	58
	38.08673987	25.12347141	26.97835087	42.43687802	23.31155035	42.43687801
	59	61	64	75	77	82
	20.07811906	42.43687802	39.74279777	44.13838412	35.03245559	26.34466874
	83	85	86	87	88	90
	35.94537147	28.14358594	23.13695556	52.15591458	21.78657586	20.53009987

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
100	33.56767295	24.62431422	25.59472553	17.70725201	21.82177422	31.78847719
	100	107	108	117	118	122
	12.31501701	39.23259760	29.04083577	22.25298315	18.47121878	17.24920067
	130	131	132	133	134	135
	19.93493753	31.69711526	27.17562684	18.36941177	16.18383292	22.17673240
	137	138	139	142	144	149
	31.70801495	23.13695556	25.81002318	28.95402348	28.77313573	42.43687802
	151	152	157	162	182	183
	20.84911475	26.72442702	30.81571115	52.15591459	46.47585722	38.85496391
	189	190	194	196	217	218
	27.30366594	32.15867142	73.28146845	24.48603110	24.31684828	28.79586554
	221	222	232	233	234	235
	46.54226552	22.55447899	37.15868594	22.59944066	22.96177254	28.06957091
	236	237	239	251	252	254
	29.11543991	22.99766677	30.46926105	22.99265375	23.92251109	52.15591461
	260					
	31.78847713					
107	5	7	15	16	17	18
	50.83686781	32.64328123	48.18070877	46.32244519	51.39062230	32.79074045
	21	22	23	25	28	30
	41.42943033	35.55891061	47.89875020	40.19823049	33.24651487	33.05163554
	31	32	33	34	35	39
	46.71160572	35.54347549	33.01931813	29.98620064	32.12716862	43.70154503

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
107	51.39062230	40.29169486	41.52857125	56.56959722	39.38780854	56.56959721
	59	61	64	75	77	82
	31.68185565	56.56959722	59.80150079	57.07941650	47.81257029	40.41914088
	83	85	86	87	88	90
	17.43998500	43.39699858	47.24032820	58.89763269	44.16699152	37.27809126
	93	94	95	96	98	99
	46.79821655	40.39904037	39.54675853	38.03440905	44.59658748	46.18703247
	100	107	108	117	118	122
	38.11336603	11.19578544	41.33808289	25.07188727	36.96984160	37.04676599
	130	131	132	133	134	135
	32.98635628	47.52191421	26.11986978	35.05132153	35.09505190	37.20267518
	137	138	139	142	144	149
	46.97147600	47.24032820	42.49929339	47.64338123	42.96693155	56.56959722
	151	152	157	162	182	183
	36.31868915	40.22622114	48.03558707	58.89763270	60.78520112	52.07863967
	189	190	194	196	217	218
	46.71160572	47.58790907	85.03831552	41.23808587	39.96383493	42.87484093
	221	222	232	233	234	235
	63.38840666	38.24877421	51.12595176	38.04078825	38.44344110	43.76941759
	236	237	239	251	252	254
	43.70847538	38.26535855	44.72152337	37.79520168	38.85867447	58.89763269
	260					
	46.18703246					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
108	37.12283124	22.12053992	36.20390312	31.94983512	28.11081281	23.35405833
	21	22	23	25	28	30
	25.00123071	21.79938423	34.45553234	22.50055796	24.53941819	22.42132920
	31	32	33	34	35	39
	36.54180625	23.79634408	22.15127461	20.66100469	24.39475093	31.32824831
	42	44	50	52	57	58
	28.11081281	24.94245794	29.21224550	44.95980666	31.23932588	44.95980666
	59	61	64	75	77	82
	20.61046641	44.95980666	42.34193810	45.80307255	40.65485490	23.15332738
	83	85	86	87	88	90
	37.95585262	22.54233271	32.59494232	30.71895657	29.68545312	23.97127528
	93	94	95	96	98	99
	35.38435592	32.74981300	20.73072101	25.57079246	30.10026736	33.58370933
	100	107	108	117	118	122
	29.61619991	43.03267861	12.89038116	30.12680016	22.97227270	24.34870025
	130	131	132	133	134	135
	24.08019792	23.77864111	24.33738089	21.00358592	24.47325025	17.70026905
	137	138	139	142	144	149
	34.16718786	32.59494232	27.74450339	34.69500331	26.20958120	44.95980666
	151	152	157	162	182	183
	21.17494042	23.89740903	32.40328990	30.71895657	47.50069143	40.75902654
	189	190	194	196	217	218
	36.54180625	17.94521343	74.92433302	27.38431097	28.37252736	30.69663594

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
108	29.50378697	24.93787230	38.34348377	23.83803539	26.19753628	30.49971965
	236	237	239	251	252	254
	26.31395956	24.73829825	32.62670206	24.74861331	24.32152698	30.71895657
	260					
	33.58370937					
	5	7	15	16	17	18
117	35.06451783	19.70750232	29.64131670	28.04474017	37.50517989	20.94073151
	21	22	23	25	28	30
	24.17278605	20.87771678	32.33246933	25.98455882	21.61772291	14.95840450
	31	32	33	34	35	39
	34.39416790	23.96602694	19.25084890	21.13045480	21.32970177	25.74378561
	42	44	50	52	57	58
	37.50517989	25.45456030	23.46389314	42.79291021	16.70589373	42.79291020
	59	61	64	75	77	82
	19.43971140	42.79291021	40.75753464	37.52803847	31.07156905	25.23167309
	83	85	86	87	88	90
	26.03092661	28.14888372	29.86819772	49.96243407	27.12869180	21.16689279
	93	94	95	96	98	99
	32.50822029	15.48019498	25.42002677	22.29335458	27.44308602	29.48813209
	100	107	108	117	118	122
	20.86668879	24.80482449	28.16514166	10.92872265	18.93456070	21.76841821
	130	131	132	133	134	135
	17.92538072	31.25195962	22.37220053	18.44988153	19.46231514	22.06112858

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2\{I|J\} = \{\bar{X}_I - \bar{X}_J\}' \, COV^{-1} \, \{\bar{X}_I - \bar{X}_J\} - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
117	31.18193476	29.86819772	25.94750186	32.09541062	27.89971991	42.79291021
	151	152	157	162	182	183
	18.37864134	25.83377483	32.69388396	49.96243406	45.49436538	37.91422432
	189	190	194	196	217	218
	34.39416790	32.01482231	72.29564166	23.46994134	26.03960514	25.70464843
	221	222	232	233	234	235
	46.69022388	22.52575652	34.76998060	21.28731359	20.92951919	27.41177635
	236	237	239	251	252	254
	28.80431789	22.70128573	29.25305264	21.24166188	23.20532708	49.96243407
	260					
	29.48813210					
118	5	7	15	16	17	18
	26.33557503	13.83307481	24.04827906	22.07631419	28.20306328	14.40741010
	21	22	23	25	28	30
	15.75634410	14.40918224	22.67286738	19.69919454	17.52316010	12.03163381
	31	32	33	34	35	39
	27.29062633	16.53608367	11.42925093	15.06971251	15.07890005	15.79712812
	42	44	50	52	57	58
	28.20306328	17.47272995	17.36854820	30.37622770	18.17176378	30.37622768
	59	61	64	75	77	82
	13.54432513	30.37622770	36.03048640	32.81982819	31.32129236	16.13855283
	83	85	86	87	88	90
	31.01010617	18.42053928	14.60238265	41.09853652	13.79189212	11.02236007

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
118	24.70083857	20.91178987	18.34435888	12.51106328	12.66708107	19.66018952
	100	107	108	117	118	122
	15.46306399	35.08091838	19.38875377	17.31270027	9.30686222	13.04897523
	130	131	132	133	134	135
	12.38360925	21.25181163	20.04750554	11.34337474	12.68184969	12.45509896
	137	138	139	142	144	149
	23.38799085	14.60238265	18.75274452	21.42851843	17.87538112	30.37622770
	151	152	157	162	182	183
	13.49362354	16.83989260	25.82831443	41.09853651	38.01230772	30.05249362
	189	190	194	196	217	218
	27.29062633	23.39608599	66.66121859	15.88133135	18.55716188	19.64223832
	221	222	232	233	234	235
	38.52707415	16.18399968	27.98138492	13.30472625	14.31879121	18.76381385
	236	237	239	251	252	254
	19.78498037	14.02621486	22.13230459	13.90427149	14.84655353	41.09853655
	260					
	19.66018948					

	5	7	15	16	17	18
122	23.71625301	11.47583959	25.86281054	24.31106095	28.25460723	13.25511123
	21	22	23	25	28	30
	19.34207853	13.15775577	25.06157859	19.05910146	16.71232733	14.38513675
	31	32	33	34	35	39
	24.26660725	17.09906268	11.49345006	14.87346770	13.09520176	19.92664709

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
122	28.25460723	14.25349829	15.08754292	30.74245768	21.77383925	30.74245762
	59	61	64	75	77	82
	13.39436656	30.74245768	31.88592809	30.41253629	27.70818840	16.84582282
	83	85	86	87	88	90
	27.05965832	19.47470754	19.79289241	42.65516333	15.97007938	13.24822231
	93	94	95	96	98	99
	20.73956751	25.23236747	17.71107439	14.06318753	17.77786916	23.84992973
	100	107	108	117	118	122
	14.13291144	35.04970833	20.65704687	20.03842333	12.94084078	9.19872778
	130	131	132	133	134	135
	14.67673970	24.66639536	17.78869285	11.41733634	11.93143180	13.37917441
	137	138	139	142	144	149
	19.32308561	19.79289241	17.37046173	23.90543624	19.98364707	30.74245768
	151	152	157	162	182	183
	12.84376959	15.99120136	21.86970399	42.65516340	38.15727156	24.48522003
	189	190	194	196	217	218
	24.26660725	24.73472876	66.57948365	18.60937034	15.74171889	15.63248775
	221	222	232	233	234	235
	40.72378282	12.64658984	27.48828472	12.83231218	14.99839134	19.85618007
	236	237	239	251	252	254
	20.52811218	12.31584883	18.03564436	15.20302343	14.94386947	42.65516034
	260					
	23.84992984					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
130	26.78695507	13.20972914	18.95105229	17.35355484	28.83104652	13.02739150
	21	22	23	25	28	30
	15.13320472	13.64081503	24.87505726	14.41704336	14.43462537	11.76080867
	31	32	33	34	35	39
	26.61835426	16.34315879	11.45723296	14.17727815	13.84243429	13.50801948
	42	44	50	52	57	58
	28.83104652	16.64544309	18.58231477	35.08942685	17.57445169	35.08942682
	59	61	64	75	77	82
	12.17477452	35.08942685	35.50411401	35.45455049	30.90350260	16.70299248
	83	85	86	87	88	90
	26.12193009	20.41486169	17.39291495	40.95939273	15.35946075	10.89886897
	93	94	95	96	98	99
	23.50580645	20.64985992	18.57477437	13.28665546	15.66282941	20.39823979
	100	107	108	117	118	122
	16.04311723	30.21376756	19.61301348	15.41985478	11.49994375	13.90120863
	130	131	132	133	134	135
	8.42319671	23.45730426	16.29900397	11.26056249	12.82145488	13.47412576
	137	138	139	142	144	149
	24.72483058	17.39291495	19.58744529	22.22814100	20.00280338	35.08942685
	151	152	157	162	182	183
	13.91328111	16.97255130	26.34676713	40.95939282	38.18964184	30.20708698
	189	190	194	196	217	218
	26.61835425	23.75764312	50.32320667	12.69850252	18.44371371	20.76246330

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
130	38.71101397	15.22767150	28.77306606	14.36334639	14.54050650	20.08583240
	236	237	239	251	252	254
	20.58676811	14.15378056	21.27611239	14.37633808	15.61178472	40.95939270
	260					
	20.39823976					
	5	7	15	16	17	18
131	31.90084274	29.05086442	40.02492378	34.59236865	42.59451663	26.57291356
	21	22	23	25	28	30
	23.09833390	27.06366992	27.36694057	29.73804002	29.21609350	27.92756084
	31	32	33	34	35	39
	41.85585891	31.78795550	28.53352732	30.77789473	29.90639808	35.62330082
	42	48	50	52	57	58
	42.59451663	32.76659263	33.19290635	50.50327440	34.80969758	50.50327440
	59	61	64	75	77	82
	23.74262929	50.50327440	50.40017350	48.08844822	46.43637318	25.68927609
	83	85	86	87	88	90
	45.17297312	23.86225352	38.86142679	54.82109253	35.94312280	28.67161372
	93	94	95	96	98	99
	37.11829350	38.18498254	32.39118823	30.36578297	33.09062628	23.39335482
	100	107	108	117	118	122
	33.08340963	50.02748015	24.58957133	34.02454834	25.64626079	29.16897896
	130	131	132	133	134	135
	28.73541892	13.70131137	34.17899404	24.98170288	25.83398783	23.43456216

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
131	37.64880991	38.86142679	33.29364198	39.76139643	24.18335502	50.50327440
	151	152	157	162	182	183
	23.66593757	27.68643734	33.06549512	54.82109252	49.98989816	42.60896157
	189	190	194	196	217	218
	41.85585890	21.64573334	79.81740037	31.33527207	31.59025880	33.62008840
	221	222	232	233	234	235
	26.01551774	30.04611185	40.78173269	27.11064018	27.09044024	30.97247038
	236	237	239	251	252	254
	32.57574370	27.64749263	35.49379170	23.57634389	24.55464209	54.82109254
	260					
	23.39335482					
	5	7	15	16	17	18
132	24.20255945	14.44297196	31.64489261	29.80783040	20.13273492	18.54646140
	21	22	23	25	28	30
	24.44203610	19.00097089	29.26925980	21.36005774	19.22814955	19.26798968
	31	32	33	34	35	39
	31.51504813	21.76061429	17.06445713	17.80374612	16.82534859	26.99142911
	42	44	50	52	57	58
	20.13273492	17.74556138	23.27863988	40.39421977	26.52390570	40.39421977
	59	61	64	75	77	82
	17.24181960	40.39421977	41.64258709	39.98856368	36.20385464	15.39124672
	83	85	86	87	88	90
	16.89663607	26.34763519	29.78440294	44.94844834	23.29221297	19.93136421

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
132	29.38511892	29.50569396	23.44610723	21.21863069	26.96030490	28.33140078
	100	107	108	117	118	122
	23.95675101	24.02022553	20.54314092	20.53961907	19.83678450	17.68610626
	130	131	132	133	134	135
	16.97194845	29.57382385	9.09614119	16.87306928	19.92770135	16.29556673
	137	138	139	142	144	149
	29.63552548	29.78440294	24.90035104	30.99919421	20.10821186	40.39421977
	151	152	157	162	182	183
	17.14108131	17.30749159	31.83598261	44.94844832	42.24464656	34.53484558
	189	190	194	196	217	218
	31.51504813	24.77810157	59.55274396	24.68831489	22.87019931	25.43729022
	221	222	232	233	234	235
	46.21065253	16.54456313	32.94782265	18.64964402	21.28778903	25.66678108
	236	237	239	251	252	254
	20.14143808	17.61702730	27.29181905	20.45864054	18.95154689	44.94844832
	260					
	28.33140079					

	5	7	15	16	17	18
133	20.05447124	7.91552174	18.12518596	16.51017276	21.32060284	8.08621247
	21	22	23	25	28	30
	11.72393459	8.44663288	16.72169817	13.01778467	10.85458737	7.49928384
	31	32	33	34	35	39
	21.22457466	10.85101834	7.00183455	10.05349483	9.26445319	13.41495110

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
133	21.32060284	11.35973517	12.24276483	29.83578557	13.24290056	29.83578551
	59	61	64	75	77	82
	7.44957654	29.83578557	24.64316692	27.63518523	24.32789800	9.97784337
	83	85	86	87	88	90
	23.77301832	14.23364941	15.01645365	35.69687474	12.34029918	8.39552032
	93	94	95	96	98	99
	16.42915778	16.88829195	11.19020055	9.32324210	12.50086182	15.70920440
	100	107	108	117	118	122
	11.30203864	29.10317998	13.36084864	12.76880277	7.28415641	7.46625244
	130	131	132	133	134	135
	8.08500966	16.52803539	13.02457198	5.24764388	6.93266165	7.40499128
	137	138	139	142	144	149
	16.94427389	15.01645365	10.89472657	18.65138424	12.12560588	29.83578557
	151	152	157	162	182	183
	7.13462165	9.68169380	18.01356156	35.69687470	29.75792868	22.63995130
	189	190	194	196	217	218
	21.22457465	17.16334594	60.98574496	11.82779393	11.31283750	12.61668479
	221	222	232	233	234	235
	32.72748105	8.59607808	20.49443983	7.42998490	8.23440430	12.91533478
	236	237	239	251	252	254
	12.96435998	8.20627628	14.55986642	7.96224672	8.09260751	35.69687477
	260					
	15.70920433					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
134	24.36988003	10.28634632	22.84076803	20.77104580	28.65405867	10.41264258
	21	22	23	25	28	30
	15.20010126	12.35436712	22.06182414	16.31607675	13.66250850	10.54609525
	31	32	33	34	35	39
	23.86989221	16.01494825	10.13652627	13.95787797	12.45401867	16.89489689
	42	44	50	52	57	58
	28.65405867	15.47791336	16.22901786	33.24174525	15.87673542	33.24174532
	59	61	64	75	77	82
	9.62031253	33.24174525	29.45648049	33.64978241	23.15880143	15.82175846
	83	85	86	87	88	90
	26.47336503	17.40672582	16.93913797	42.59945504	14.82854218	11.83112018
	93	94	95	96	98	99
	20.88030282	19.15525533	16.26384150	12.03635685	14.70321123	19.85981403
	100	107	108	117	118	122
	10.76773251	30.79818308	18.48178570	15.43250910	10.27390408	9.63162063
	130	131	132	133	134	135
	11.29717478	19.03159306	17.73047677	8.58393438	6.89891661	11.96036397
	137	138	139	142	144	149
	19.12062223	16.93913797	15.43993675	21.12747246	17.80577824	33.24174525
	151	152	157	162	182	183
	10.85875455	15.24166688	15.56506867	42.59945486	36.55784067	26.51868614
	189	190	194	196	217	218
	23.86989221	20.77279351	64.18417051	14.92368620	15.75415892	17.54430041

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
134	33.85425661	13.48086995	27.09802307	12.46235760	13.06951743	18.22272059
	236	237	239	251	252	254
	19.45790285	12.47302740	18.68817162	11.96006536	12.77556742	42.59945505
	260					
	19.85981408					

	5	7	15	16	17	18
135	26.47678938	12.17988885	26.06770025	23.12546968	19.71687184	14.06056156
	21	22	23	25	28	30
	16.65449570	13.47679344	23.06134206	17.66932203	15.49416861	13.46145794
	31	32	33	34	35	39
	27.07156977	14.19126991	11.79874124	14.56198219	13.73505759	20.05249927
	42	44	50	52	57	58
	19.71687184	17.02303926	16.82545333	29.86509398	20.23621294	29.86509403
	59	61	64	75	77	82
	12.09253207	29.86509398	34.49946664	31.35289954	31.91335857	13.14375987
	83	85	86	87	88	90
	29.59579782	15.00820345	20.59133354	39.31561771	18.28343619	12.74518954
	93	94	95	96	98	99
	21.74794976	24.52596385	17.35292860	14.89235377	18.05482627	21.81620766
	100	107	108	117	118	122
	18.51156948	34.65674383	13.45974198	19.78226001	11.79809083	12.83030071
	130	131	132	133	134	135
	13.70078313	18.38310487	15.84927962	10.80720148	13.71130145	8.64985409

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
135	23.17239335	20.59133354	17.58699395	22.24267463	15.61497524	29.86509398
	151	152	157	162	182	183
	12.09748089	12.30444231	23.80007648	39.31561773	37.00874554	28.28639714
	189	190	194	196	217	218
	27.07156977	15.49085443	65.73715513	17.80047191	17.56092341	18.03793902
	221	222	232	233	234	235
	31.00914930	14.66388961	26.86198100	12.37173411	15.00872942	19.07611652
	236	237	239	251	252	254
	16.44013887	13.56528075	21.06738021	13.07755891	13.45936118	39.31561768
	260					
	21.81620760					

	5	7	15	16	17	18
137	37.38015442	21.21387244	37.24342351	35.42879917	40.09689322	23.54309501
	21	22	23	25	28	30
	24.66667967	22.31878433	34.41605057	30.29816630	26.85221532	23.64380829
	31	32	33	34	35	39
	38.25210714	26.84837138	23.15093933	27.50412205	24.66196942	32.58352848
	42	44	50	52	57	58
	40.09689322	25.98843527	24.62059344	46.50300088	26.94114212	46.50300087
	59	61	64	75	77	82
	24.24832356	46.50300088	44.73892070	44.07569609	25.21217544	28.12636985
	83	85	86	87	88	90
	40.68458901	31.76943816	34.56395531	53.01172915	31.49569287	25.42955472

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
137	18.11554458	33.33808018	27.52061827	27.59342713	31.69363536	33.37676037
	100	107	108	117	118	122
	29.51079037	45.89348300	31.39459914	30.37100455	24.19892106	20.24215027
	130	131	132	133	134	135
	26.41942630	34.06529097	30.65717673	21.81442244	22.33949806	24.64033170
	137	138	139	142	144	149
	10.11779244	34.56395531	29.52291010	36.24686645	30.04061592	46.50300088
	151	152	157	162	182	183
	19.65993994	21.25472309	27.87440389	53.01172920	48.08222888	18.16593897
	189	190	194	196	217	218
	38.25210714	35.47992596	77.31108441	30.13928384	21.60544425	20.61600607
	221	222	232	233	234	235
	50.73758754	25.16804878	38.34779265	22.36201380	23.80770165	30.84811094
	236	237	239	251	252	254
	31.46700997	20.37073226	16.93123070	22.15980147	22.84275955	53.01172918
	260					
	33.37676021					

	5	7	15	16	17	18
138	42.06409635	28.07986151	37.44250104	35.91188366	42.97193151	26.43909064
	21	22	23	25	28	30
	31.78963431	27.52968186	37.90551340	33.33106386	31.60593797	24.83139071
	31	32	33	34	35	39
	39.00009999	30.20188698	22.98720760	26.77503492	28.32264082	22.63999861

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
138	42.97193151	28.99065067	32.70794527	47.13922770	34.28680495	47.13922797
	59	61	64	75	77	82
	27.03552915	47.13922770	51.53785162	47.53775932	47.89487163	31.14761208
	83	85	86	87	88	90
	45.31285243	34.96389578	13.70131137	50.39945095	15.91491235	21.14978992
	93	94	95	96	98	99
	37.03169682	36.72938161	31.23295457	19.90744677	14.35725640	35.44060589
	100	107	108	117	118	122
	24.52324992	49.74585413	33.40587254	32.64078645	18.99683180	24.29547601
	130	131	132	133	134	135
	22.67102961	38.86142679	34.38957313	23.47012114	23.74153273	25.64279083
	137	138	139	142	144	149
	38.14747425	13.70131137	33.88894103	27.72470927	33.39899232	47.13922770
	151	152	157	162	182	183
	28.80614021	30.87372903	39.72998067	50.39945096	51.23994374	42.31581578
	189	190	194	196	217	218
	39.00009994	40.09257721	79.53436965	26.65792301	30.95730576	33.42097038
	221	222	232	233	234	235
	56.50864769	29.82461339	41.58159457	25.99562152	27.30864169	30.85167099
	236	237	239	251	252	254
	32.95453000	25.73698704	34.94514919	28.46822813	29.11996564	50.39945094
	260					
	35.44060578					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
139	33.94716967	20.47543359	28.34739582	27.91746183	34.99777388	19.00703586
	21	22	23	25	28	30
	24.86204089	19.34050313	23.90704787	23.03647092	21.55166326	18.29999074
	31	32	33	34	35	39
	32.23623326	20.88417637	17.49704964	19.77368105	19.10434105	27.41135866
	42	44	50	52	57	58
	34.99777388	23.15741044	23.82535409	31.12163552	27.05461959	31.12163549
	59	61	64	75	77	82
	17.58254434	31.12163552	25.57990849	39.20641461	40.16297742	21.76508787
	83	85	86	87	88	90
	37.41616791	21.15521424	30.88078623	43.51888491	28.09788585	18.82434728
	93	94	95	96	98	99
	29.05214446	29.78078837	16.48962287	22.68030834	27.87811764	28.19359297
	100	107	108	117	118	122
	24.18816275	41.99666453	25.54727881	25.71193579	20.13903888	18.86489054
	130	131	132	133	134	135
	21.85740516	30.28548719	26.49736643	16.34023926	19.23417672	19.63029644
	137	138	139	142	144	149
	30.09827424	30.88078623	10.69315658	32.20301019	22.64588372	31.12163552
	151	152	157	162	182	183
	18.00664998	22.85885415	32.19197811	43.51888490	31.67383398	34.12807721
	189	190	194	196	217	218
	32.23623326	31.67028001	71.94553141	25.44209971	19.45140072	22.63308584

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
139	47.78759048	18.26656901	24.82417610	17.25390641	16.57228615	20.25470325
	236	237	239	251	252	254
	21.21725928	21.56250135	24.69143039	20.22548346	16.50020298	43.51888484
	260					
	28.19359283					
	5	7	15	16	17	18
142	43.58432047	28.80422851	40.68057519	38.94627939	45.28496876	29.08459793
	21	22	23	25	28	30
	33.96398902	26.75928701	39.29202561	33.95394525	24.14140840	28.32777603
	31	32	33	34	35	39
	40.86895675	32.49957404	25.59209139	29.77537006	30.14391856	30.97058024
	42	44	50	52	57	58
	45.28496876	32.18258482	34.57867977	50.03022880	35.91233575	50.03022883
	59	61	64	75	77	82
	27.20110354	50.03022880	52.11687890	49.83656210	48.66966962	33.17232992
	83	85	86	87	88	90
	45.80937899	36.48238726	27.72470927	54.10747345	27.43755704	27.03662759
	93	94	95	96	98	99
	39.10087536	38.95419562	33.28019406	26.79675966	26.59457130	37.75542848
	100	107	108	117	118	122
	30.34031784	50.14890717	35.50593352	34.86799934	25.82296759	28.40801983
	130	131	132	133	134	135
	27.50625566	39.76139643	35.60436440	27.10505173	27.92986722	27.29413192

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
142	39.83038539	27.72470927	35.21116498	13.70131137	35.12419161	50.03022880
	151	152	157	162	182	183
	30.58882308	32.92983718	41.79315757	54.10747341	52.49215148	44.53123642
	189	190	194	196	217	218
	40.86895675	41.18526631	79.43594924	31.23185940	32.73613420	35.43835588
	221	222	232	233	234	235
	56.78777112	29.13341789	43.09545121	29.16637060	30.21105769	33.96716232
	236	237	239	251	252	254
	35.50038955	27.27771387	37.16785865	26.38902534	30.86864140	54.10747344
	260					
	37.75542851					
144	5	7	15	16	17	18
	24.14766226	19.59669535	33.33293493	31.58829890	23.46007420	22.05543971
	21	22	23	25	28	30
	22.18897825	20.61129661	14.54611276	26.91370526	22.21965396	21.72859245
	31	32	33	34	35	39
	35.42521255	25.60488416	20.48848877	23.89676992	22.34861803	28.57533436
	42	44	50	52	57	58
	23.46007420	24.30105210	26.09527314	43.69407632	28.23494085	43.69407630
	59	61	64	75	77	82
	21.34839904	43.69407632	40.70615855	41.44472267	39.21984445	12.12594853
	83	85	86	87	88	90
	36.86838036	25.80689828	30.39083753	50.91353964	27.33789441	21.81792843

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
144	30.50950046	32.20841366	25.08540680	22.55176447	24.92118259	17.17114509
	100	107	108	117	118	122
	27.15127530	42.46430269	24.01235662	27.66415384	19.26167548	21.47807587
	130	131	132	133	134	135
	22.27276325	21.17520023	21.70522725	17.57111858	21.60001821	17.65827774
	137	138	139	142	144	149
	30.61598006	30.39083753	22.64588372	32.11603681	10.69315658	43.69407632
	151	152	157	162	182	183
	18.28193285	16.30830609	34.27970705	50.91353955	30.71081617	35.93296275
	189	190	194	196	217	218
	35.42521255	26.77816716	73.56006301	26.24290013	20.79501646	26.52677590
	221	222	232	233	234	235
	47.32586885	19.77100799	24.66148982	16.62651351	16.20830206	17.39940514
	236	237	239	251	252	254
	14.93618456	20.35463577	28.49157887	16.35472657	13.83553033	50.91353962
	260					
	17.17114507					
149	5	7	15	16	17	18
	54.31300980	36.58326607	50.30217050	48.63639257	55.11957445	39.85655435
	21	22	23	25	28	30
	44.13923824	40.11541408	51.63509494	44.16687453	42.08106393	38.74289955
	31	32	33	34	35	39
	50.47411934	33.73162086	32.20728055	35.41611027	34.51995811	45.25601734

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
149	55.11957445	40.68458944	39.18588271	13.70131137	47.16375121	13.70131137
	59	61	64	75	77	82
	37.99862929	13.70131137	59.04024942	60.91106849	57.56577300	44.02415072
	83	85	86	87	88	90
	54.36881681	27.88367257	47.13922770	66.24665161	44.72802139	29.41668192
	93	94	95	96	98	99
	51.08077537	50.49569044	43.32575169	40.63589222	45.04460542	49.62956571
	100	107	108	117	118	122
	43.82317238	59.07512316	45.77073687	45.56549894	34.77067686	35.24504128
	130	131	132	133	134	135
	40.36754151	50.50327440	44.99938996	38.28945306	40.04414001	34.91655127
	137	138	139	142	144	149
	50.08651982	47.13922770	34.12979032	50.03022880	46.70223111	13.70131137
	151	152	157	162	182	183
	39.60616245	44.22187780	52.55008896	66.24665161	64.51516066	56.30221646
	189	190	194	196	217	218
	50.47411934	50.41148418	91.13318776	43.44331023	43.86918468	46.21833150
	221	222	232	233	234	235
	65.60839720	41.42243554	54.88133458	40.99726782	42.16554902	46.93465050
	236	237	239	251	252	254
	47.18347923	41.64650114	48.03563328	42.07148764	42.29089435	66.24665161
	260					
	49.62956570					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I,J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
151	19.69745944	10.91307050	23.34490092	21.05694556	23.10553262	11.23488435
	21	22	23	25	28	30
	14.18995981	10.97524975	19.46586114	15.84928703	13.75700751	9.70395588
	31	32	33	34	35	39
	25.42902818	15.53441680	10.62507975	13.92682684	12.40322525	19.54725851
	42	44	50	52	57	58
	23.10553262	12.59077813	16.04975263	32.52424380	14.41500359	32.52424386
	59	61	64	75	77	82
	10.38184536	32.52424380	28.00283364	32.50425180	27.59985112	11.96314186
	83	85	86	87	88	90
	25.37686017	15.72799667	21.72422156	39.63510138	17.32254622	12.37096030
	93	94	95	96	98	99
	15.78006325	16.56229257	14.62365508	14.03589058	18.42263627	18.40798900
	100	107	108	117	118	122
	15.15349047	31.74229644	14.90395198	14.06931141	10.80615405	10.26443454
	130	131	132	133	134	135
	12.10947712	16.58401893	14.66433285	8.50637049	10.57923066	10.06701954
	137	138	139	142	144	149
	16.16154023	21.72422156	13.93288613	23.50690443	14.20816900	32.52424380
	151	152	157	162	182	183
	6.61939273	10.69427892	22.64832110	39.63510129	34.04044135	19.12990858
	189	190	194	196	217	218
	25.42902818	17.22101008	63.98626469	16.76032805	12.97181191	13.67907590

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
151	31.63363470	10.88507274	24.92359087	10.49483110	11.06776640	17.14707573
	236	237	239	251	252	254
	16.20440985	9.91683887	13.34474918	10.59880266	10.00080012	39.63510135
	260					
	18.40798903					
	5	7	15	16	17	18
152	26.95390664	16.30832132	30.80318671	29.01896221	19.75694552	18.32202099
	21	22	23	25	28	30
	21.66221068	17.46948294	23.77181374	23.89386818	20.32294898	18.64976859
	31	32	33	34	35	39
	32.45381321	19.56964244	17.00620522	21.02492513	18.47050233	25.91710077
	42	44	50	52	57	58
	19.75694552	20.67798298	23.34294751	40.47827345	23.30856331	40.47827348
	59	61	64	75	77	82
	18.36133512	40.47827345	36.81597191	39.40051050	35.32552018	13.85020707
	83	85	86	87	88	90
	33.31992166	24.98779917	27.13012468	49.00047827	24.03943362	18.96860715
	93	94	95	96	98	99
	16.90432617	29.43839417	23.15191947	20.08011105	23.42084886	22.48255945
	100	107	108	117	118	122
	24.36711703	38.98814272	20.96473489	24.86275920	17.49073740	16.75018060
	130	131	132	133	134	135
	18.50706160	23.94283298	18.16905742	14.39175694	18.30045729	13.61229525

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
152	21.09463768	27.13012468	22.12340459	29.18623282	15.57285653	40.47827345
	151	152	157	162	182	183
	14.03259321	9.95770702	31.28004972	49.00047823	40.10027701	22.59527870
	189	190	194	196	217	218
	32.45381316	23.18091050	70.70367303	23.52786051	18.48847554	19.37879370
	221	222	232	233	234	235
	43.79919355	18.20202082	31.19253234	15.34217872	17.48184711	22.70561278
	236	237	239	251	252	254
	18.22342986	15.35402076	18.09611511	14.33567698	14.01086351	49.00047817
	260					
	22.48255944					
157	5	7	15	16	17	18
	39.50196863	21.01921585	38.28024018	34.53849643	42.07006139	23.22718888
	21	22	23	25	28	30
	27.64598091	25.75459043	36.81975082	28.96424707	27.18107001	25.55348430
	31	32	33	34	35	39
	39.15236014	29.40275367	25.39901075	28.82775337	25.37945825	33.36102472
	42	44	50	52	57	58
	42.07006139	30.29877520	22.17272196	47.66539489	32.49136748	47.66539481
	59	61	64	75	77	82
	20.52905373	47.66539489	45.26939438	37.59248901	19.27405566	30.21087477
	83	85	86	87	88	90
	40.73090611	26.76968568	34.84528660	56.47665237	31.99661748	27.19904265

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
157	36.49917456	36.29905983	30.17698464	28.46918519	32.34396652	35.67411473
	100	107	108	117	118	122
	27.31731144	45.65641894	28.32952604	30.58177861	25.33806952	21.48759352
	130	131	132	133	134	135
	26.74018772	28.18080105	31.55645873	21.58253498	17.48276937	23.96683970
	137	138	139	142	144	149
	26.57322876	34.84528660	30.31543883	36.90846350	32.40316777	47.66539489
	151	152	157	162	182	183
	24.84554567	30.13896000	8.81661730	56.47665223	50.02529896	41.75016983
	189	190	194	196	217	218
	39.15236013	27.48920717	77.51315414	29.73519525	30.41462890	28.02079826
	221	222	232	233	234	235
	36.10427754	26.82940203	38.18429347	24.75284886	27.45413443	31.38893099
	236	237	239	251	252	254
	33.37275406	26.76420602	34.01909218	26.09394237	27.40952086	56.47665235
	260					
	35.67411467					

	5	7	15	16	17	18
162	55.35403101	42.11663445	54.95598449	53.18604817	59.77642370	42.93932828
	21	22	23	25	28	30
	47.53484533	34.98141055	54.98003667	35.51497404	41.97205757	37.94052657
	31	32	33	34	35	39
	54.28333353	34.42133611	39.25028170	30.06072987	44.03526532	49.34793030

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
162	59.77642370	36.54512602	47.91437717	62.83715542	49.84819196	62.83715542
	59	61	64	75	77	82
	41.39005726	62.83715542	52.74686736	67.37318517	55.62329790	47.86034604
	83	85	86	87	88	90
	52.49692072	47.52082725	46.98995477	10.29181519	44.33107300	41.71494227
	93	94	95	96	98	99
	57.28473962	48.21670293	24.26471370	43.13142093	45.41232898	54.40623351
	100	107	108	117	118	122
	50.13271277	57.99366245	28.12039060	49.32552659	42.08348948	43.74825081
	130	131	132	133	134	135
	42.82801130	51.41159634	46.14412232	40.74104601	45.99235344	40.95757884
	137	138	139	142	144	149
	53.18575195	46.98995477	43.11754351	50.69797723	50.51219816	62.83715542
	151	152	157	162	182	183
	43.30752376	49.33458640	57.95185012	10.29181519	67.73534919	62.99728371
	189	190	194	196	217	218
	54.28333347	51.28239307	93.07047333	46.05730785	48.44400797	50.95807012
	221	222	232	233	234	235
	63.95534594	43.42812246	58.91200488	44.21567953	45.71332185	49.81197768
	236	237	239	251	252	254
	50.77033533	41.44734450	52.97457195	43.05270637	44.76795419	10.29181519
	260					
	54.40623348					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
182	51.27392815	40.52502644	52.42326103	50.72520506	53.25602348	41.36514471
	21	22	23	25	28	30
	44.63309203	40.14420304	22.50449730	45.22994546	35.89671700	39.06291913
	31	32	33	34	35	39
	54.04074838	44.66271415	40.11211463	43.13433560	41.77280321	47.70581910
	42	44	50	52	57	58
	53.25602348	40.62008323	44.23049166	62.68257920	47.35701381	62.68257920
	59	61	64	75	77	82
	39.59815508	62.68257920	59.28130798	58.44367932	58.67019937	34.74485795
	83	85	86	87	88	90
	56.02942045	37.31603320	49.40736227	69.31226398	46.44984931	40.48570087
	93	94	95	96	98	99
	49.63486206	50.96612799	41.00130918	42.74271277	46.18661169	46.75008886
	100	107	108	117	118	122
	46.02957011	61.45814559	46.47904018	46.43437263	40.57417541	40.82727369
	130	131	132	133	134	135
	41.63517503	48.15731669	45.01723528	36.37901471	41.52765397	40.22762136
	137	138	139	142	144	149
	49.83316636	49.40736227	32.84940731	50.65957002	31.88638950	62.68257920
	151	152	157	162	182	183
	39.28977853	42.01129990	53.07741157	69.31226391	11.86872991	54.61367782
	189	190	194	196	217	218
	54.04074835	50.21977339	91.52482422	45.04696533	26.94640460	44.47165661

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
182	66.53124667	32.78265193	14.77966426	31.90861335	24.78421231	18.47318775
	236	237	239	251	252	254
	21.64661585	40.87807197	47.23412809	39.70475043	30.40118724	69.31226397
	260					
	46.75008889					
	5	7	15	16	17	18
183	44.19423340	32.89136957	45.11002906	43.36568299	47.78933861	29.84874169
	21	22	23	25	28	30
	37.13113510	28.86758191	41.72930088	37.81203126	33.38350072	32.83194941
	31	32	33	34	35	39
	46.44987746	37.78180733	31.16904422	36.18648415	31.71203746	40.28922902
	42	44	50	52	57	58
	47.78933861	31.50144766	37.19374065	54.91592210	39.46290391	54.91592217
	59	61	64	75	77	82
	32.39913722	54.91592210	49.07983914	53.56610274	48.32591760	35.64967191
	83	85	86	87	88	90
	47.26333156	39.19654899	40.92952142	65.02048536	37.78402462	32.56480615
	93	94	95	96	98	99
	15.94187612	43.86061695	37.43267629	35.11623400	38.24251555	41.39194594
	100	107	108	117	118	122
	38.85496391	53.19787124	40.18366240	39.30051868	33.06064841	27.60150927
	130	131	132	133	134	135
	34.09890728	41.22266721	37.75372140	29.70732443	31.93478654	31.95156006

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
183	20.36316354	40.92952142	35.74993764	43.14494206	37.55482318	54.91592210
	151	152	157	162	182	183
	24.82553287	24.95258869	45.24856954	65.02048553	55.05996493	12.31501701
	189	190	194	196	217	218
	46.44987757	42.55649671	84.91270668	37.67785588	24.71363908	22.79591640
	221	222	232	233	234	235
	57.40357519	31.56398670	45.95369634	28.72392787	29.71064967	38.15523881
	236	237	239	251	252	254
	38.73455367	26.44852851	14.62185012	30.92551247	28.65514919	65.02048577
	260					
	41.39194598					
189	5	7	15	16	17	18
	44.55888751	27.89170158	40.99208717	39.30252680	45.91077950	20.28693470
	21	22	23	25	28	30
	34.76514576	23.68214686	41.71930904	29.29568290	27.94579046	30.54434072
	31	32	33	34	35	39
	12.31501701	33.95641767	23.91947656	21.48949272	19.46633548	36.06649411
	42	44	50	52	57	58
	45.91077950	33.69787529	35.16444869	49.08782498	37.67190902	49.08782497
	59	61	64	75	77	82
	26.35200483	49.08782498	48.20290677	51.85302500	47.53533853	34.52186242
	83	85	86	87	88	90
	43.42036848	35.92706378	37.61380557	56.30653536	35.16672424	29.48022333

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
189	41.53157301	40.84563547	29.51151780	19.70063916	35.47946574	40.11784502
	100	107	108	117	118	122
	27.30366594	47.83083730	35.96644210	35.78046226	30.29878112	27.38289649
	130	131	132	133	134	135
	30.51017455	40.46956454	34.73392396	28.29194778	29.28599261	30.73673269
	137	138	139	142	144	149
	40.44933172	37.61380557	33.85809369	39.48266239	37.04707298	49.08782498
	151	152	157	162	182	183
	31.12465247	34.81112315	42.65075984	56.30653529	54.48703545	46.44987757
	189	190	194	196	217	218
	12.31501701	40.56958255	79.43412366	33.74065637	24.52266253	36.56569016
	221	222	232	233	234	235
	55.34442430	26.82628231	45.09572979	31.31673224	32.42972912	37.07894626
	236	237	239	251	252	254
	37.53157825	32.03331561	38.17458958	32.29868604	32.42281240	56.30653533
	260					
	40.11784501					

	5	7	15	16	17	18
190	40.91628408	25.38999703	39.33129306	33.10205363	28.37080580	25.63718481
	21	22	23	25	28	30
	25.16345382	27.65083282	36.99998473	27.69466280	28.08368805	26.96817911
	31	32	33	34	35	39
	40.12329543	30.88669659	26.45584854	28.55709035	27.33115576	34.89840897

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
190	28.37080580	31.85314542	32.39500912	48.57890271	34.40748374	48.57890274
	59	61	64	75	77	82
	21.82580005	48.57890271	50.21568892	47.38866934	45.80150729	24.92750389
	83	85	86	87	88	90
	43.55218504	20.41346715	38.25999575	52.85930776	35.26091236	27.62178318
	93	94	95	96	98	99
	36.90830264	37.35689547	31.41510103	29.59201433	35.29457344	35.81052427
	100	107	108	117	118	122
	31.71238432	48.26085354	16.92356218	32.95482957	25.95795368	27.40473089
	130	131	132	133	134	135
	27.20317631	19.81315188	27.55069029	23.78443197	25.74260681	18.70973025
	137	138	139	142	144	149
	37.23086344	38.25999575	32.84585334	39.35268484	27.95374049	48.57890271
	151	152	157	162	182	183
	22.47034722	25.09193339	30.54131978	52.85930779	50.21977339	42.11020961
	189	190	194	196	217	218
	40.12329545	11.86872991	78.22541867	30.21754481	30.92311214	33.08007751
	221	222	232	233	234	235
	19.20298584	28.59848483	40.77919446	26.70101186	29.10752979	33.60605747
	236	237	239	251	252	254
	28.22252011	29.03403293	34.99391167	28.30026919	27.18459509	52.85930781
	260					
	35.81052428					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
194	83.06962368	66.12682342	80.27852984	78.27498418	84.48148424	64.71593792
	21	22	23	25	28	30
	73.37283642	62.36874332	79.52802052	41.84592653	59.44283520	65.16259251
	31	32	33	34	35	39
	79.43412366	72.56889194	67.32466919	67.79792440	60.16617008	75.61334297
	42	44	50	52	57	58
	84.48148424	72.51831077	73.77453404	89.74689340	75.34058436	89.74689340
	59	61	64	75	77	82
	63.22551468	89.74689340	89.51970032	89.67606005	86.59418699	72.87289027
	83	85	86	87	88	90
	82.03574263	74.80340067	78.14807529	95.09367514	75.37176510	64.35263232
	93	94	95	96	98	99
	79.66327514	78.44363568	72.45392305	70.40678389	75.67074633	78.46636133
	100	107	108	117	118	122
	73.28146845	86.15754709	74.34896887	73.68193602	69.66937339	69.69577289
	130	131	132	133	134	135
	54.21502697	78.43110601	62.77161979	68.05311809	69.60027091	69.40231806
	137	138	139	142	144	149
	79.50830899	78.14807529	73.56739184	78.04965488	75.18192345	89.74689340
	151	152	157	162	182	183
	69.68188897	73.06098302	81.01155385	95.09367515	91.97111132	84.91270668
	189	190	194	196	217	218
	79.43412366	78.67170577	12.31501701	72.46036764	72.21133308	75.16203106

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
194	93.13416006	70.16260500	82.66454541	68.17999222	70.83660306	75.12056198
	236	237	239	251	252	254
	75.69693669	70.64034303	77.09027445	69.31967674	70.62864181	95.09367517
	260					
	78.46636133					
	5	7	15	16	17	18
196	33.47743992	18.11555994	14.39206741	13.14568900	35.19462623	17.72746281
	21	22	23	25	28	30
	14.97189842	18.43733751	29.71422119	22.00471147	18.83525835	18.26353803
	31	32	33	34	35	39
	31.23513044	23.15261040	15.34334611	19.13810000	20.30053316	11.93252396
	42	44	50	52	57	58
	35.19462623	21.61033857	22.10076327	39.55148993	24.45307689	39.55148989
	59	61	64	75	77	82
	16.96497843	39.55148993	40.62929746	40.23756002	36.72026322	21.42978017
	83	85	86	87	88	90
	35.38643924	24.39612458	22.76610271	45.57498374	21.35815627	14.24685013
	93	94	95	96	98	99
	29.96134574	27.67039689	23.46093652	17.97521904	20.96559655	21.32505964
	100	107	108	117	118	122
	21.98050516	39.85179151	24.30342089	22.35070977	16.38396021	19.22013364
	130	131	132	133	134	135
	14.08479688	27.44345177	25.40166478	16.38964112	17.83426066	18.96010890

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
196	29.83098248	22.76610271	24.55843421	27.34003910	25.35923463	39.55148993
	151	152	157	162	182	183
	19.95042640	23.37964456	30.72806903	45.57498374	42.98772649	35.17232994
	189	190	194	196	217	218
	31.23513043	28.15830597	69.95484170	9.80949108	23.23708152	25.67245487
	221	222	232	233	234	235
	41.80306554	20.29785361	33.56738185	19.38875102	18.40928023	24.57578748
	236	237	239	251	252	254
	26.05486806	20.44429202	24.55773673	20.52837569	20.62394646	45.57498371
	260					
	21.32505950					
217	5	7	15	16	17	18
	34.17182907	21.26551167	33.67127150	31.96061733	36.48152626	17.99641944
	21	22	23	25	28	30
	26.33927001	18.39412304	22.81384820	24.94203222	19.90481524	21.64254892
	31	32	33	34	35	39
	25.09802667	26.29645860	19.22969088	21.09958315	18.47987122	28.84999316
	42	44	50	52	57	58
	36.48152626	22.76928109	26.35903943	43.05825446	28.99342134	43.05825445
	59	61	64	75	77	82
	20.27924476	43.05825446	39.68416373	42.11708152	39.00663090	22.46827656
	83	85	86	87	88	90
	36.40051970	24.97602776	30.14637554	51.04257393	27.29634516	21.67305589

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
217	23.19891615	32.72027251	23.47798011	20.01600775	27.46567673	30.24943891
	100	107	108	117	118	122
	24.89221242	41.65843065	28.37252736	28.00126364	22.14068081	19.43337227
	130	131	132	133	134	135
	22.91089815	30.77932859	26.66443928	18.95557477	21.74562347	21.80145049
	137	138	139	142	144	149
	24.37803297	30.14637554	21.64862530	31.92520398	22.99224103	43.05825446
	151	152	157	162	182	183
	19.24280035	21.42114968	34.48839276	51.04257394	27.96805585	25.28900322
	189	190	194	196	217	218
	25.09802667	31.94476338	72.78669723	26.31797160	12.89038116	22.10723347
	221	222	232	233	234	235
	47.25589457	17.88711944	22.77250921	18.14590359	16.47100947	18.73193665
	236	237	239	251	252	254
	20.13372835	20.61611778	20.83966835	21.80579541	17.98919538	51.04257395
	260					
	30.24943891					
218	5	7	15	16	17	18
	34.32335650	21.39425245	32.80699901	31.59857234	37.37689474	20.54406720
	21	22	23	25	28	30
	26.58168764	17.70730614	30.97755834	26.11345952	23.42754454	21.30217554
	31	32	33	34	35	39
	35.44645858	23.65629792	20.70111639	24.69741019	20.50768499	29.53838854

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
218	37.37689474	23.68990680	16.92217694	43.71280557	28.92974971	43.71280561
	59	61	64	75	77	82
	20.76324502	43.71280557	32.86020396	22.54400773	38.14326273	25.16803788
	83	85	86	87	88	90
	37.28590426	28.47346103	30.91544445	51.86204043	27.87285857	22.78005993
	93	94	95	96	98	99
	20.30508926	32.90689018	23.52834609	24.56216144	28.19584500	30.78916477
	100	107	108	117	118	122
	27.67663396	42.87484093	29.00204022	25.97171122	21.53116153	17.62954541
	130	131	132	133	134	135
	23.53505202	31.11456246	27.53693447	18.56482634	21.84116924	20.58387038
	137	138	139	142	144	149
	21.69399908	30.91544445	23.13571469	32.93282994	27.02940476	43.71280557
	151	152	157	162	182	183
	18.25546861	20.61687211	30.39996639	51.86204037	43.79871213	21.67668483
	189	190	194	196	217	218
	35.44645858	32.40713304	74.04279948	27.05874923	20.41263775	11.19578544
	221	222	232	233	234	235
	47.42959839	19.22729961	29.75223301	14.91912868	19.18501659	24.46458621
	236	237	239	251	252	254
	27.96390417	18.05660496	17.37396802	20.58717620	20.12232394	51.86204051
	260					
	30.78916473					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
221	59.35090637	45.25842655	56.14342756	46.98176579	59.54041078	40.73864277
	21	22	23	25	28	30
	37.67798739	44.21909181	55.02521508	41.29832616	43.92445814	42.99238518
	31	32	33	34	35	39
	56.73071866	47.29650319	44.67057066	45.73929605	45.15621595	52.01682836
	42	44	50	52	57	58
	59.54041078	49.49964312	49.32873908	65.60839720	51.09625970	65.60839723
	59	61	64	75	77	82
	35.04472836	65.60839720	69.31896257	63.66969411	63.12341484	48.23665945
	83	85	86	87	88	90
	61.81806233	28.65340606	56.50864769	67.36484210	53.65240155	44.50956094
	93	94	95	96	98	99
	53.60326780	53.51741745	48.01901867	47.59657109	53.49433290	53.16124502
	100	107	108	117	118	122
	47.92855988	65.89393260	30.31471718	49.46281260	42.92152331	45.22636642
	130	131	132	133	134	135
	43.98912863	26.01551774	50.81582272	41.18114854	40.65665137	36.06060659
	137	138	139	142	144	149
	54.32110648	56.50864769	50.79574527	56.78777112	50.33402364	65.60839720
	151	152	157	162	182	183
	38.71555335	47.54279791	40.98897161	67.36484213	68.36382814	58.78986955
	189	190	194	196	217	218
	56.73071866	21.03556730	94.52045442	45.69488584	48.06682479	49.93512432

DISCRIM PASS - FULL SLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
221	13.70131137	47.01984713	58.45749149	45.70661803	46.57748695	51.45433656
	236	237	239	251	252	254
	51.56792480	46.43347619	51.95690063	45.91349052	46.32813392	67.36484207
	260					
	53.16124506					
	5	7	15	16	17	18
222	19.62541755	13.90650198	24.98422513	23.79327530	28.65690561	14.14122118
	21	22	23	25	28	30
	19.81497434	13.58439116	21.12779473	19.41468325	15.71387513	15.97602047
	31	32	33	34	35	39
	23.81812751	18.94448131	13.60757038	15.85369450	14.26917884	21.92861735
	42	44	50	52	57	58
	28.65690561	12.81788678	16.53686487	37.02798638	23.06937843	37.02798638
	59	61	64	75	77	82
	14.37374402	37.02798638	30.79494731	30.68599170	34.21158016	15.12184948
	83	85	86	87	88	90
	25.19455793	21.16226755	25.43016424	42.44316941	18.82977865	16.22894064
	93	94	95	96	98	99
	24.02351273	26.34021651	17.13208700	16.18124748	22.61966200	23.62071421
	100	107	108	117	118	122
	19.54632419	36.35985099	21.35435336	20.90389609	16.18399968	12.75472429
	130	131	132	133	134	135
	16.11133701	25.65166270	16.75528416	12.65529642	15.88881556	15.32089775

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
222	24.35711856	25.43016424	16.88027465	24.73896873	18.38471363	37.02798638
	151	152	157	162	182	183
	13.57254223	17.55117602	27.31964695	42.44316949	30.22078423	28.55583191
	189	190	194	196	217	218
	23.81812751	26.03661714	67.15445021	19.79522475	14.30360050	17.33837639
	221	222	232	233	234	235
	42.62539797	9.30686222	21.60428306	12.87230179	13.33839095	16.60982567
	236	237	239	251	252	254
	17.36575017	12.34521178	20.66944299	15.87693378	14.24841988	42.44316947
	260					
	23.62071418					

	5	7	15	16	17	18
232	42.59572769	30.92570473	43.52633226	41.79124310	44.96036771	32.38539445
	21	22	23	25	28	30
	35.70015927	29.86324611	20.15125433	36.23013465	28.40420218	29.94959566
	31	32	33	34	35	39
	45.09572979	34.16505586	31.07195996	34.25811424	31.93015208	38.74607260
	42	44	50	52	57	58
	44.96036771	32.42523705	29.74278100	53.49504022	38.39607143	53.49504023
	59	61	64	75	77	82
	30.11274068	53.49504022	49.85066818	38.51342605	48.73273475	27.96831847
	83	85	86	87	88	90
	46.73695089	30.52844223	40.19530021	60.93520678	37.22166102	31.82698537

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
232	40.92070988	42.17504535	32.20584524	33.78690843	37.13860028	38.45311673
	100	107	108	117	118	122
	37.15868594	52.24518334	37.76811963	36.15627496	30.98953971	30.60457395
	130	131	132	133	134	135
	32.66488636	39.39543833	36.16669848	27.56181296	32.51412347	30.52714393
	137	138	139	142	144	149
	40.54501723	40.19530021	26.44603653	41.70915684	26.28335025	53.49504022
	151	152	157	162	182	183
	30.61921516	33.54984233	41.68269318	60.93520670	15.22595136	45.95369634
	189	190	194	196	217	218
	45.09572979	41.22548157	82.66454541	36.07290779	22.19714507	30.87146459
	221	222	232	233	234	235
	57.07119713	24.61243785	12.31501701	22.16650719	19.01529780	14.48490266
	236	237	239	251	252	254
	18.74333892	30.88467893	38.44926405	30.56436765	23.71495136	60.93520675
	260					
	38.45311672					

	5	7	15	16	17	18
233	23.54861891	11.51546939	23.18204776	21.79859627	23.47512124	12.34647684
	21	22	23	25	28	30
	15.96335435	10.39015259	16.00397275	16.72330928	13.53929804	11.65992924
	31	32	33	34	35	39
	25.90063184	14.96911292	11.08813655	14.59343299	12.25886118	18.29282163

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
233	23.47512124	15.03495076	11.50087888	34.19487306	19.21374573	34.19487305
	59	61	64	75	77	82
	11.53799564	34.19487306	28.23480208	21.11643917	29.97072113	11.85470326
	83	85	86	87	88	90
	28.45745088	17.88415559	19.19322676	40.82278098	16.80264120	12.42861249
	93	94	95	96	98	99
	19.13138702	23.01044814	14.41944402	13.66939916	16.27862143	18.43937909
	100	107	108	117	118	122
	17.18334025	33.74391943	17.84657085	17.25750755	10.89678064	10.53250102
	130	131	132	133	134	135
	12.83906628	20.30824541	16.45241944	9.08125762	12.46235760	10.62079664
	137	138	139	142	144	149
	19.14313798	19.19322676	13.45966644	22.36397584	12.83227354	34.19487306
	151	152	157	162	182	183
	10.77435499	12.28338831	22.83514817	40.82278095	26.93880005	23.30782747
	189	190	194	196	217	218
	25.90063184	21.73119856	62.76389182	16.47817656	12.15443905	10.62225985
	221	222	232	233	234	235
	38.90422327	10.46435618	16.75040679	6.89891661	8.90035352	11.43565563
	236	237	239	251	252	254
	12.88127067	11.01254589	16.32474993	11.17859747	9.53320536	40.82278096
	260					
	18.43937907					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
234	25.39213854	15.45628290	22.52127805	21.36016979	29.93604996	14.83416557
	21	22	23	25	28	30
	16.93941991	14.14555412	13.73707533	19.98828903	15.39795779	13.87031285
	31	32	33	34	35	39
	28.76456619	19.09204230	13.79891316	17.38490518	16.17351483	18.83866783
	42	44	50	52	57	58
	29.93604996	17.42162424	17.84997606	37.11409173	20.47722671	37.11409170
	59	61	64	75	77	82
	14.64112998	37.11409173	30.58169327	31.63574205	32.32055204	14.12449202
	83	85	86	87	88	90
	31.17208995	19.02587291	22.25718440	44.07136072	19.82328154	14.29559676
	93	94	95	96	98	99
	21.89003868	23.36280302	17.47898902	16.29422636	19.02482353	18.52826332
	100	107	108	117	118	122
	19.29660961	35.89750975	21.95700921	18.65065062	13.66178307	14.44951765
	130	131	132	133	134	135
	14.76716387	22.03898295	20.84150193	11.63661450	14.82045491	15.00872942
	137	138	139	142	144	149
	22.33976330	22.25718440	14.52898365	25.15960040	14.16499956	37.11409173
	151	152	157	162	182	183
	13.09822776	16.17399417	27.28737121	44.07136074	21.56533649	26.04548674
	189	190	194	196	217	218
	28.76456620	25.88865397	67.17144013	17.24964324	12.23048239	16.63908523

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
234	41.52602966	12.68138281	15.35013488	10.65129099	8.64985409	10.82228605
	236	237	239	251	252	254
	13.21826759	14.50821037	18.41367881	13.68742630	11.15277709	44.07136068
	260					
	18.52826333					

	5	7	15	16	17	18
235	29.47162231	20.00745215	32.09060879	30.38852144	34.21580145	20.91571548
	21	22	23	25	28	30
	23.53583875	18.78980878	12.37387516	25.11647893	18.59833655	18.93549459
	31	32	33	34	35	39
	33.76249011	23.40669008	19.40798758	22.67622960	21.27000167	25.92853442
	42	44	50	52	57	58
	34.21580145	21.61382043	21.24494571	42.23189999	26.74088615	42.23190004
	59	61	64	75	77	82
	19.40806693	42.23189999	40.11914062	32.79594212	38.07403748	17.26299279
	83	85	86	87	88	90
	36.29737685	21.97075516	26.14892047	48.51872334	23.92128021	19.85785955
	93	94	95	96	98	99
	29.65980627	30.36266562	22.19670201	21.12295626	22.82287108	23.87797543
	100	107	108	117	118	122
	24.75311476	41.57219301	26.60789935	25.48161456	18.45551249	19.65601315
	130	131	132	133	134	135
	20.66119655	26.26971986	25.56920075	16.66625176	20.32236484	19.42482330

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
235	29.72887936	26.14892047	18.56010753	29.26441181	15.70480942	42.23189999
	151	152	157	162	182	183
	19.52624386	21.74646661	31.57087455	48.51872335	15.60301870	34.83878265
	189	190	194	196	217	218
	33.76249011	30.73588842	71.80410583	23.76485726	14.84011635	22.26736163
	221	222	232	233	234	235
	46.75158605	16.30152431	11.16844651	13.53529988	11.17099283	8.99856086
	236	237	239	251	252	254
	12.62293013	19.45133327	27.42528284	18.34469281	13.84411422	48.51872337
	260					
	23.87797540					
236	5	7	15	16	17	18
	31.52001173	19.06027751	33.38479976	31.64452673	21.25952031	22.27293156
	21	22	23	25	28	30
	25.25810525	21.53464774	16.18001292	26.64234272	20.74050539	21.10049853
	31	32	33	34	35	39
	34.88806657	25.63559410	19.91685229	23.26775127	21.78212899	27.92779223
	42	44	50	52	57	58
	21.25952031	23.29645779	25.94177628	43.15367319	28.55577707	43.15367320
	59	61	64	75	77	82
	21.09528589	43.15367319	41.00898395	40.98234725	39.66861144	13.67118890
	83	85	86	87	88	90
	36.71657303	23.42335209	28.92472396	50.15002522	26.20809810	21.26038402

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
236	30.93905855	32.18821324	24.12283489	22.36894696	25.74011743	26.85366997
	100	107	108	117	118	122
	26.47192823	42.18419528	23.09508373	27.54710057	20.14962349	21.00088974
	130	131	132	133	134	135
	21.83507673	28.54593766	20.71680222	17.38822143	22.23049157	17.46179012
	137	138	139	142	144	149
	31.02072287	28.92472396	20.19560804	31.47058351	13.91453331	43.15367319
	151	152	157	162	182	183
	19.25652245	17.93722817	34.22764209	50.15002547	19.44939128	36.09104199
	189	190	194	196	217	218
	34.88806657	26.02529554	73.05342501	25.91688231	16.91485252	26.43962407
	221	222	232	233	234	235
	47.53811876	17.73039328	16.09982724	15.65385939	14.23991884	13.29587460
	236	237	239	251	252	254
	9.67150533	21.74239364	28.64619967	20.44699998	14.88712301	50.15002518
	260					
	26.85366992					
237	5	7	15	16	17	18
	17.82859445	14.01314760	27.56769074	25.83234540	30.41461102	15.43089547
	21	22	23	25	28	30
	18.40886259	13.42552027	22.85934999	20.33574721	17.02720753	14.51905401
	31	32	33	34	35	39
	28.81443978	15.49628052	13.85658762	17.00294876	16.15261590	21.22718167

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
237	30.41461102	11.96133560	16.33402781	37.04133096	20.08732739	37.04133096
	59	61	64	75	77	82
	14.53543704	37.04133096	35.32762606	31.27797482	32.24300170	15.97603703
	83	85	86	87	88	90
	25.39580719	22.42570841	21.13181686	40.25167053	15.55668931	15.35795143
	93	94	95	96	98	99
	17.72837731	25.26575336	18.03064859	16.39772886	18.30370887	21.37170922
	100	107	108	117	118	122
	19.77879094	36.16571431	20.94405829	20.86870427	13.81549382	12.21326224
	130	131	132	133	134	135
	14.82672503	23.04232244	17.61702730	12.05477359	14.67025198	14.01156786
	137	138	139	142	144	149
	19.34908101	21.13181686	19.96548596	22.67254368	18.75762038	37.04133096
	151	152	157	162	182	183
	12.39358733	14.49245493	27.04372990	40.25167050	38.10548324	23.22965269
	189	190	194	196	217	218
	28.81443978	26.26144420	67.42146720	19.73094213	16.82187781	15.95696071
	221	222	232	233	234	235
	41.82830601	12.13449075	27.66580310	13.20977047	14.95449747	19.54891360
	236	237	239	251	252	254
	21.16702950	9.09614119	17.81200650	12.53858409	13.58008956	40.25167048
	260					
	21.37170922					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

$$\text{WHERE: } D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
239	36.18162907	24.21462689	29.88656593	29.00725545	39.12881545	20.78081735
	21	22	23	25	28	30
	26.10119023	20.95476944	33.22160920	28.01491265	25.12320315	24.07542935
	31	32	33	34	35	39
	37.05535800	28.44531442	21.58969734	26.10655503	23.13009756	27.91298818
	42	44	50	52	57	58
	39.12881545	24.32219597	28.15364327	45.53010734	30.76792456	45.53010741
	59	61	64	75	77	82
	23.38265570	45.53010734	34.55833037	44.56779104	40.73534041	26.54259096
	83	85	86	87	88	90
	39.20010527	30.56158648	32.43962325	53.87854193	29.49038456	22.82078712
	93	94	95	96	98	99
	14.65086190	34.68946297	26.82517073	25.86910206	29.74880255	30.58122721
	100	107	108	117	118	122
	29.35002947	44.72152337	30.93210634	29.52011542	24.02122780	20.03270202
	130	131	132	133	134	135
	24.04870111	32.98826576	29.39146329	20.50800798	22.98504045	23.61331156
	137	138	139	142	144	149
	18.00922370	32.43962325	25.19405925	34.66233271	28.99420773	45.53010734
	151	152	157	162	182	183
	17.92114189	19.33419353	36.39826031	53.87854220	46.56118362	13.50261854
	189	190	194	196	217	218
	37.05535800	34.32096720	75.97104287	25.94403109	19.14507263	17.37396802

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
239	49.45137470	22.55836621	37.33003247	20.62161876	20.95961016	29.62250742
	236	237	239	251	252	254
	30.17047978	19.91165075	11.19578544	22.77478699	21.43827825	53.87854188
	260					
	30.58122718					

	5	7	15	16	17	18
251	19.34015112	11.32066727	24.01595235	22.39358499	26.22294831	12.46538590
	21	22	23	25	28	30
	13.55277134	10.11455636	15.32430150	16.32714987	12.24813694	10.48394703
	31	32	33	34	35	39
	25.94257838	11.55299089	11.10559935	14.32631281	13.43946770	19.33557411
	42	44	50	52	57	58
	26.22294831	15.27254124	15.12360305	34.32908562	13.80264115	34.32908562
	59	61	64	75	77	82
	11.33681004	34.32908562	29.75728178	30.37946262	26.22160856	11.71500311
	83	85	86	87	88	90
	27.92403706	19.01581262	20.72582611	38.71980050	17.98842807	12.96129446
	93	94	95	96	98	99
	16.62018036	19.39718973	14.79036126	13.85378227	16.41863902	13.18298446
	100	107	108	117	118	122
	16.63654609	32.55832559	17.81714150	16.27184858	10.55631862	11.96320500
	130	131	132	133	134	135
	11.91205071	15.83394186	17.32140870	8.67351218	11.02005810	10.38661418

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	137	138	139	142	144	149
251	18.00091839	20.72582611	15.49123623	18.64662332	11.62047934	34.32908562
	151	152	157	162	182	183
	9.93831928	10.33687932	23.23623442	38.71980053	33.79492987	24.56940481
	189	190	194	196	217	218
	25.94257838	22.39044864	62.96356907	16.67779396	14.87432360	15.35030011
	221	222	232	233	234	235
	38.17108850	12.52898092	24.20825999	10.23859021	10.99648157	15.30504131
	236	237	239	251	252	254
	16.73440400	9.40135226	17.53791091	5.95890935	8.94780725	38.71980054
	260					
	13.18298445					
252	5	7	15	16	17	18
	19.56267392	12.19181011	25.03383179	23.31303082	23.44350393	13.27867698
	21	22	23	25	28	30
	15.45391926	11.55072408	12.07520221	17.90127015	13.39887632	11.84661368
	31	32	33	34	35	39
	26.69841064	15.72665705	12.24767971	15.49600462	13.92689837	20.24015519
	42	44	50	52	57	58
	23.44350393	14.48566690	16.60002581	35.18019823	18.43057546	35.18019820
	59	61	64	75	77	82
	11.42398236	35.18019823	32.40703862	31.52419284	30.55564756	9.88654739
	83	85	86	87	88	90
	28.21015604	18.04042597	22.00926952	41.06675431	18.66946018	13.63406448

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	93	94	95	96	98	99
252	17.90295421	22.84270098	14.69599700	14.87496578	17.82925610	14.83539358
	100	107	108	117	118	122
	18.19810933	34.25350429	18.02176107	18.86721968	12.13030657	12.33575695
	130	131	132	133	134	135
	13.77920326	17.44394597	16.44602095	9.43557888	12.46726606	11.40012234
	137	138	139	142	144	149
	19.31558237	22.00926952	12.39766165	23.75794528	9.73298900	35.18019823
	151	152	157	162	182	183
	9.97202265	10.64377174	25.18351881	41.06675425	25.12307258	22.93074743
	189	190	194	196	217	218
	26.69841064	21.90648043	64.90424005	17.40507063	11.68942947	15.51715375
	221	222	232	233	234	235
	39.21743780	11.53217291	17.99054960	9.22490401	9.09353825	11.43616861
	236	237	239	251	252	254
	11.80623293	11.07456363	16.83310806	9.57951315	6.59061525	41.06675431
	260					
	14.83539361					

	5	7	15	16	17	18
254	56.93094573	43.69354923	56.53289914	54.76296285	61.35333865	44.51624306
	21	22	23	25	28	30
	49.11176005	36.55832519	56.55695137	37.09188878	43.54897232	39.51744125
	31	32	33	34	35	39
	55.86024820	35.99825085	40.82719654	31.63764456	45.61218005	50.92484503

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	42	44	50	52	57	58
254	61.35333865	38.12204069	49.49129184	64.41407015	51.42510661	64.41407015
	59	61	64	75	77	82
	42.96697196	64.41407015	54.32378204	68.95009990	57.20021263	49.43726082
	83	85	86	87	88	90
	54.07383545	49.09774188	48.56686948	11.86872991	45.90798777	43.29185706
	93	94	95	96	98	99
	58.86165397	49.79361765	25.84162847	44.70833559	46.98924335	55.98314823
	100	107	108	117	118	122
	51.70962751	59.57057717	29.69730532	50.90244133	43.66040424	45.32516545
	130	131	132	133	134	135
	44.40492589	52.98851108	47.72103705	42.31796079	47.56926835	42.53449351
	137	138	139	142	144	149
	54.76266666	48.56686948	44.69445817	52.27489197	52.08911295	64.41407015
	151	152	157	162	182	183
	44.88443854	50.91150106	59.52876495	11.86872991	69.31226397	64.57419866
	189	190	194	196	217	218
	55.86024822	52.85930781	94.64738807	47.63422255	50.02092271	52.53498498
	221	222	232	233	234	235
	65.53226061	45.00503716	60.48891965	45.79259426	47.29023650	51.38889242
	236	237	239	251	252	254
	52.34724975	43.02425920	54.55148635	44.62962109	46.34486897	11.86872991
	260					
	55.98314821					

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	5	7	15	16	17	18
260	23.28655966	24.22833457	24.77056229	23.71957655	38.28583793	23.25595515
	21	22	23	25	28	30
	17.59033041	22.84333382	19.19898741	29.46300752	26.18444664	24.65284186
	31	32	33	34	35	39
	37.92062043	28.39661971	22.39491101	26.22256040	26.03595623	22.91969486
	42	44	50	52	57	58
	38.28583793	27.88920317	27.94705908	46.04604676	30.72757317	46.04604676
	59	61	64	75	77	82
	23.34781749	46.04604676	42.67384032	44.95732713	41.46923131	18.05923727
	83	85	86	87	88	90
	39.72080910	30.50609639	31.85708684	54.23221074	29.16296977	21.67687558
	93	94	95	96	98	99
	33.59778482	34.84085414	28.61759798	24.19996379	25.46616953	10.11779244
	100	107	108	117	118	122
	29.59125255	45.10903946	30.81112065	28.67720188	20.47111969	24.76899450
	130	131	132	133	134	135
	22.09283548	19.80983589	29.35305204	20.57935288	23.07868990	23.28414595
	137	138	139	142	144	149
	33.37676021	31.85708684	27.61822868	34.17190957	16.59578092	46.04604676
	151	152	157	162	182	183
	21.90638874	22.64264486	36.97528980	54.23221073	44.99915142	39.19472140
	189	190	194	196	217	218
	37.92062043	34.05958681	76.26913675	21.63336086	27.47685019	29.71117173

DISCRIM PASS - FULL BLOWN MODEL TO CONSUME COMPUTER

DISCRIMINANT ANALYSIS PAIRWISE SQUARED GENERALIZED DISTANCES BETWEEN GROUPS

WHERE: $D^2(I|J) = (\bar{X}_I - \bar{X}_J)' \, COV^{-1} \, (\bar{X}_I - \bar{X}_J) - 2 \, LN \, PRIOR_J$

GENERALIZED SQUARED DISTANCE TO GROUP

FROM GROUP	221	222	232	233	234	235
260	49.57772612	24.43164440	36.25589215	21.65825490	19.99620168	24.99720698
	235	237	239	251	252	254
	27.29995702	22.39336047	29.50323418	17.34186753	18.36257080	54.23221073
	260					
	10.11779244					