AVIAN CENSUS TECHNIQUES

The knowledge of the size or density of a population of birds is potentially a very valuable piece of information. This information is essential for studies of avian population biology, community ecology, and conservation. Many techniques exist for acquiring estimates or relative indices of bird population sizes. In this laboratory, you will conduct two distinct census techniques to arrive at estimates of bird population sizes for a mixed deciduous oak woodland community. The same techniques, with slight modifications, can be used for bird censuses in other community types.

The class will perform both methods on the same day in the same areas so that population estimates by the two methods will be directly comparable. A period of at least 15 minutes will be allowed between separate sampling techniques to allow the birds in the area to recover from disturbance associated with censusing techniques. Because censuses are conducted during pre-migration wintering season, when populations are fairly stable, the requirement for sampling identical areas on the same day are valid.

The two census techniques to be used in this laboratory are the **Point Count** (i.e., Circular-plot Method) and the **Transect Method**. Both methods are described below. Censuses should be conducted slowly and methodically. Censuses are most valuable early in the morning when birds are most vocal. These census techniques can focus all avian species, or can focus on one or many focal species.

POINT COUNT (CIRCULAR-PLOT METHOD)

Description of Method

For this method, several stations are established within a chosen habitat at intervals (200 meters for this laboratory) along a transect. A fixed time period for observation, by a stationary observer, at the center of each station is established depending on the complexity of the plant community (increasing complexity requires increasing observation times; we will use 10 min sampling periods in this laboratory).

Each focal bird seen or heard is counted and the horizonal straight-line distance from the station center to the bird is estimated. No maximum distance restrictions apply for this method. Count only those birds which are actively using the study area; do not count birds flying overhead unless they may actively use the area (e.g., do not count a Turkey Vulture). Birds that are flushed while approaching the station are counted and their distance from the station center is estimated. **Raw data will consist of a list of individual birds observed and their distance from the station center.**

Analysis of Data - also see Appendix 1

The first step in the analysis is calculate the inflection point, which is the distance at which detectability declines. To do this, plot (for all focal species combined) the density (birds/m^2) within concentric bands (10 m width for this laboratory) vs.

the distance from the station center. The point on this plot where the number of birds detected begins to decline is the inflection point.

To calculate where the inflection point lays, the area in the concentric bands must be calculated so that the number of birds by area (density) can be used in a plot. Because the concentric bands do not possess the same area, the comparison of absolute bird numbers may lead to incorrect inflection point determination. In other words, do NOT simply plot numbers of birds vs. distance for this method. *Areas for the concentric 10 m bands are as follows: 0-10m = 314m², 10-20m = 943m², 20-30m = 1570m², 30-40m = 2200m², 40-50m = 2827m², 50-60m = 3456m², 60-75m = 6361m².*

The population density for each species in the habitat (birds/m^2) is then estimated by summing the densities inside of the inflection point (both the number of individuals <u>and</u> the areas must be summed; *be sure to include areas of all bands inside the inflection point, even if there were no birds observed in that particular band*). If greater than one station is used, the density estimate for all stations must be divided by the number of stations censused - to provide a density estimate for the habitat as a whole.

See Appendix 1 for a sample calculation.

TRANSECT METHOD

<u>Description of Method</u>

For this method, a linear transect of a predetermined distance (0.6 km for this laboratory) is established. The observers walk this transect at a slow speed (approx. 1 km/h). **Each focal bird seen or heard is counted and its <u>horizonal</u> distance from the transect line estimated**. Again, no maximum distance restrictions apply for this method. Birds flying overhead should be counted according to instructions above. **Raw data will consist of a list of individual birds observed and their distance from the transect line.**

<u>Analysis of Data</u> - also see Appendix 1

The first step in the analysis is to plot (for all focal species combined) the number of individuals observed in successive strips (5 m divisions on each side of the transect line, 10 m total width) extending outward from either side of the transect line. The point on this plot where the number of birds detected begins to decline is the inflection point.

The population density for each species in the area is then calculated by summing the densities for all strips inside the inflection point. Strip area is determined by multiplying the total strip width by the transect length (10 m X 600 m = 6000 m^2= 0.006 km^2 for each strip in this example). *Remember that each 5m strip extends to <u>both</u> sides of the transect line, so each strip is 10 m in width, not 5m.*

APPENDIX 1

CALCULATION FOR POINT COUNT (CIRCULAR PLOT METHOD)

Example: Species = Warbling Vireo (Raw Data)

Station	Species (# individuals)	Distance
1	Warbling Vireo (1)	8m
2	Warbling Vireo (1)	15m
"	Warbling Vireo (1)	45m
3	Warbling Vireo (2)	25m

Step 1:Calculation of inflection point

A. List the number of birds observed in each 10 m concentric circle

0-10m = 1
10-20m = 1
20-30m = 2
30-40m = 0
40-50m = 1

B. Calculate the density for each concentric band

0-10m = 1 bird/314 m^2 = 0.0032 birds/m^2
10-20m = 1 bird/943 m^2 = 0.0011 birds/m^2
20-30m = 2 birds/1570 m^2 = 0.0013 birds/m^2
40-50m = 1 bird/2827 m^2 = 0.00035 birds/m^2

C. Plot Density vs. Distance from the Station Center

As you will see, the density of birds observed begins to decline after 30 m. Thus, 30 m is the inflection point. We will use this as our distance cutoff, and habitat density calculations will include only birds inside 30 m.

Step 2:Habitat Density Calculations

A. Sum the number of birds and the areas for each 10 m band inside the inflection point.

1/314 + 1/943 + 2/1570 = 4 birds/2827 m^2 = 0.001415 birds/m^2

B. Convert birds/m^2 to birds/km^2

0.001415 X 1,000,000 m^2/km^2 = 1415 birds/km^2

C. Divide the density estimate by the number of stations censused

1415/3 stations = 472 birds/km^2

For the **TRANSECT METHOD**, the calculations are similar except that the inflection point graph will plot numbers of birds observed vs. distance, since all strips will have the same area (10 m X 600 m). Also, you do not need to divide by the total number of stations since you are walking only 1 line.

EXPECTATIONS (submit via GoogleDrive)
Although this activity will be done in a large group, each student will be responsible for the following:

--Collect survey data in the catalog of your field notebook (also your journal should describe the field activity).

<u>In a team of two, do this as homework:</u>
--Calculate density estimates for each of three focal species using both census methods (6 calculations).

--Reflect on the similarity/difference of these census sampling methods. Why do you think the results might be similar/different? When do you think one method would be better than the other - are there constraints specific to each method? Might an accurate estimate of the population depend on what/when samples are taken (season, species, habitat type, habitat fragmentation, etc.)? **Write 3-4 (short)paragraphs addressing these reflections. Make sure to conduct a literature search and include information on other researchers' thoughts on these survey methods. Cite at least 5 papers.**

(the last two items will be submitted in a single doc to the GoogleDrive)

(this exercise was modified from the original created by Dr. David Swanson)