

Bird Censusing Standard Procedures

As part of the baseline resource inventory conducted by the CPSU for Craters of the Moon, bird populations were inventoried by Roger Hoffman in 1987. Birds were censused in each of 17 vegetation types. He recommended that annual monitoring of bird diversity be instituted as a means of monitoring the health of habitat communities. See Craters of the Moon National Monument Baseline Inventory and Monitoring (Wildlife) - Final Report by Roger Hoffman in the CRMO library or the RMVP Office for more details.

Preparation:

The person conducting the census should be familiar with birds of this area, including ability to identify each species by sight and sound.

The following learning aids are available:

- A cassette tape of the songs/calls of all species observed during the 1987 survey (two copies - in the RMVP office).
- 9 tapes of calls/songs for species observed at each specific vegetation type in the 1987 survey (one copy - in the RMVP office).
- The full Peterson tape series (two copies - one in the CRMO library and one in the RMVP office).
- A Peterson tape/book series entitled "Birding by Ear" designed to teach you how to learn bird songs (one copy - RMVP office).

It is important that the person conducting the census begins listening to the tapes early in the spring to be familiar with all the songs.

Several (or more!) dry runs of the census should be conducted before actual censusing begins in order to familiarize the observer with the techniques and forms, with the location of the census point, and with the birds present.

The spring is a very busy time of year at Craters of the Moon and the Resource Management Specialist is involved in many different projects at that time. Monitoring has been given priority by both the Chief Ranger and the Superintendent. This means MAKE THE TIME to start preparations EARLY and CONSISTENTLY. It takes a lot of time to learn the bird songs!

It has also been determined, in discussion with CPSU, CRMO, and regional personnel, that this bird censusing is merely a "snapshot" type of monitoring to give early indications of any need for in-depth studies. So, spend sufficient time in preparation for censusing and be as accurate as possible. But, it's okay if censusing data is not perfect.

Census Techniques:

Annual monitoring of bird diversity will be conducted beginning in 1990 using the station index technique which was used in the baseline inventory. Due to limitations on time and personnel, monitoring will not include all 17 vegetation types each year. Roger created a priority list based on sensitivity and significance of each vegetation type:

<u>Priority</u>	<u>Vegetation Type</u>
1.	26. Riparian
2.	25. Upland Quaking Aspen
3.	23. Limber Pine/Antelope Bitterbrush (high density Limber Pine)
4.	22. Limber Pine/Antelope Bitterbrush (high total cover)
5.	21. Pine/Antelope Bitterbrush (low total cover)
6.	24. Douglas Fir/Mountain Snowberry
7.	5. Mountain Big Sagebrush/Sandberg Bluegrass
8.	4. Mountain Big Sagebrush/Bluebunch Wheatgrass
9.	16. Antelope Bitterbrush
10.	6. Mountain Big Sagebrush/Needle Grass
11.	13. Low Sagebrush/Sandberg Bluegrass
12.	8. Mountain Big Sagebrush/Idaho Fescue
13.	17. Antelope Bitterbrush/Great Basin Wildrye
14.	11. Three-tip Sagebrush/Idaho Fescue
15.	3. Medium Density Lava Flows
16.	2. Low Density Lava Flows
17.	1. Cinder Gardens

Monitoring will be conducted in as many vegetation types as time permits each year. At least the first four priority vegetation types will be censused every year. Every effort should be made to monitor all 17 vegetation types at least every ten years. To that end, a system will be used in which the first four priority vegetation types plus two more of the remaining types will be censused each year. For example, one year priority 1-4 plus 5 and 6 will be censused; the following year priority 1-4 plus 7 and 8 will be censused; the next year priority 1-4 plus 9 and 10 will be censused; and so on.

Each vegetation type should be sampled at two points using the station index technique. The sample points are located on the attached map. The mapped point should be located as closely as possible in the field. Each point will be censused twice, beginning in early May and completed by June 15th. All censusing will be conducted between sunrise and two hours after sunrise. Weather conditions must be acceptable: wind speed of less than 8 mph and no precipitation. The two stations for any particular vegetation type will not be censused on the same day.

Censusing should not carry over the 2 hour after sunrise limit by more than a few minutes.

Counts will begin 10 minutes after arrival at the station to allow birds to readjust to the observer's presence. Each station will be sampled for 30 minutes. Record all species detected and the estimated number of individuals of each species detected. Only birds within the habitat being censused will be counted. In areas of high visibility, no sightings further than 400 m from the station will be included. The attached data form will be used.

For most vegetation types, the observer should be standing within the vegetation being sampled. In the riparian vegetation type, it is much easier to stand on the hillside immediately above the census point to eliminate some of the water and wind noise. For the purposes of these censuses, it is alright for the observer to move during the census period as long as he remains within the vegetation type being sampled.

Data will be analyzed using the Shannon-Weaver estimate of species diversity. A sample calculation is attached. Using this estimate, a larger Shannon-Weaver value indicates more diversity.

A graph will be made for each vegetation type, plotting the species diversity index vs time (years). The graphs will be checked visually over a 3-5 year time period. If diversity visually appears to be declining, test the regression to see if the slope is actually negative.

Census information should also be entered into the wildlife observation database.

Schedule to sample first four priority vegetation types:

Day 1: 26.1 and 25.2

Day 2: 26.2

Day 3: 25.1 and 23.2

Day 4: 22.2 (could possibly do on Day 3)

Day 5: 22.1 and 23.1

Schedule to sample first six priority vegetation types:

Day 1: 26.2 and 24.2

Day 2: 26.1 and 25.2

Day 3: 24.1 and 21.1

Day 4: 22.1 and 21.2

Day 5: 23.1

Day 6: 23.2 and 25.1

Day 7: 22.2 (could possibly do on Day 6)

Bird Census Form

Date _____ Observer _____

Station Number _____ Starting Time _____

Weather _____

[illegible]

Date entered in database _____

Habitat Type: _____ Priority # _____

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

total # of indivials (all # in all columns)=

Habitat Type: _____ Priority # _____

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

total # of indivials (all # in all columns)=

APPENDIX

CALCULATION OF THE SHANNON-WEAVER ESTIMATE OF DIVERSITY

Consider the following sample results of censuses in one vegetation type:

	station 1			station 2		
	day 1	day 2	day 3	day 1	day 2	day 3
Mourning Dove	<u>10</u>	8	9	6	6	4
Vesper sparrow	4	6	5	<u>8</u>	7	7
Brewer's sparrow	3	2	2	3	<u>4</u>	4
Rufous-sided towhee	2	2	3	<u>4</u>	3	4
Green-tailed towhee	<u>2</u>	1	2	0	0	0

Choose largest # individuals for each species

The formula for the Shannon-Weaver estimate of diversity is:

$$H' = - \sum_{i=1}^S p_i \ln p_i$$

Where: H' is the Shannon-Weaver estimate of diversity.
 S is the number of species.
 p_i is the proportion of the total number of individuals consisting of the i th species.

p_i is intended to be the true proportion of each species in the population, however in practice, p_i is estimated by n_i/N where N is the total number of individuals detected and n_i is the number of individuals of species i .

The combined species list and maximum counts of each species from both stations over all three days was used to calculate the diversity for each vegetation type sampled. The following species list and totals would be used in the calculations:

i	Species	n_i	p_i
1:	Mourning Dove	<u>10</u>	10/28 = 0.357
2:	Vesper sparrow	<u>8</u>	8/28 = 0.286
3:	Brewer's sparrow	<u>4</u>	4/28 = 0.143
4:	Rufous-sided towhee	<u>4</u>	4/28 = 0.143
5:	Green-tailed towhee	<u>2</u>	2/28 = 0.071
	total: $N =$	28	

Therefore, the equation takes the form:

$$H' = - (0.357 \ln 0.357) + (0.286 \ln 0.286) + (0.143 \ln 0.143) + (0.143 \ln 0.143) + (0.071 \ln 0.071)$$

$$H' = 1.470$$

Calculating Bird Census Data

Step 1

Put all the bird census forms in order by priority number and by date,
ie:

Priority #	1	Habitat Type #	26.1	Date:	06/01/92
Priority #	1	Habitat Type #	26.1	Date:	06/22/92
Priority #	1	Habitat Type #	26.2	Date:	06/05/92
Priority #	1	Habitat Type #	26.2	Date:	06/21/92
Priority #	2	Habitat Type #	25.1	Date:	06/01/92

etc., etc.

Step 2

Transfer data for each of the habitat types onto the Craters of the Moon NM Bird Census Statistics Worksheet.

List each species observed and the number observed during both of the censuses at each of the two stations (four censuses total for each habitat type). Fill out a worksheet for each of the habitat types visited.

Step 3

BIRD CENSUS STATISTICS WORKSHEET

A. Choose the greatest # of individuals observed during the four habitat type censuses for each species listed on the statistics worksheet.
ie:

Habitat Type: 25 Priority # 2

Species	Station 1 visit		Station 2 visit	
	1	2	1	2
MODO	<u>10</u>	8	6	6
VESP	4	6	<u>8</u>	7
BRSP	3	2	3	<u>4</u>
RSTO	2	2	<u>4</u>	3
GTTO	<u>2</u>	1	0	0

B. At the bottom of the worksheet, write in the total number of species observed in the space marked S = and the sum of all the numbers circled (the largest sighting of a single species) in the space marked N = .

In the above example, S = 5 and N = 28; the sum of highest count of each of the 5 species above ($10 + 8 + 4 + 4 + 2 = 28$)

C. In the Ratio column of the worksheet, divide n_i by N , where n_i = the largest sighting of a single species (ie MODO = 10, VESP = 8, etc.). The resulting figure is = p_i , ie.

	n_i/N	= p_i
MODO	10/28	=0.357
VESP	8/28	=0.286
BRSP	4/28	=0.143
RSTO	4/28	=0.143
GTTO	2/28	=0.071

D. To calculate $p_i \ln p_i$ using a calculator:

- punch in the first p_i number (ie .357)
- punch the $\ln$ key
- press the multiply (X) key
- press the same p_i used in the first step (ie .357)
- record this number in the $\ln p_i \times p_i$ column of the worksheet
- to save time and effort, count the total number of figures with the same n_i number (ie. in the example above there are 2 with an n_i number of 4, all the others are equal to 1) and write that number in parenthesis in the column next to the number in the previous step ie: result = ~~0.143~~ $p_i = 0.143 (2)$, $0.357 (1)$
- continue to figure the $\ln p_i \times p_i$ number for the rest of the p_i numbers that are different

Step 4

CALCULATION OF THE SHANNON-WEAVER ESTIMATE OF DIVERSITY

$$H' = - \sum_{i=1}^S p_i \ln p_i$$

Where:

- H' = the Shannon-Weaver estimate of diversity
- S = the number of species
- p_i = the proportion of the total number of individuals consisting of the i th species.
- $\ln$ = the natural log rhythm

A. Multiply the numbers in the $\ln p_i \times p_i$ column of the statistics worksheet by the number written in parenthesis (the number of times that same figure appeared for the different species).

B. Add all the resulting figures together to achieve the H' estimate of diversity, and convert to a positive number

EXAMPLE

Craters of the Moon National Monument Bird Census Statistics Worksheet

Habitat Type: 26

Priority # 1

Species	Station 1 visit		Station 2 visit		Ratio ($n_i/n = p_i$)	$\ln p_i \times p_i$	
	1	2	1	2			
BRBL	①	-	1	-	.033 (10x)	- .113 (-1.13)	+
YEWA	①	1	-	-	.033		
LABV	1	②	1	2	.066 (7x)	- .180 (-1.80)	+
RSTD	-	②	2	1	.066		
DVFL	-	①	1	1	.033		
BHCO	-	③	1	2	.100 (2x)	- .230 (-.460)	+
MDCH	-	①	-	-	.033		
AMCR	-	①	-	-	.033		
NOFL	-	1	②	-	.066		
WAWI	-	①	-	-	.033		
NHWR	-	-	③	-	.100		
GTIO	-	-	①	1	.033		
FOSP	-	-	②	-	.066		
AMRD	-	-	②	1	.066		
GOEA	-	-	①	-	.033		
WIWA	-	-	①	1	.033		
SOSP	-	-	②	-	.066		
MAWA	-	-	1	②	.066		
BHGR	-	-	-	①	.033		

S = 19
total # species

N = 30
total of the greatest
of each species

H = 2.850 ←
Shannon-Weaver
diversity figure

total # of individuals (all # in all columns) = 49

Mailing list - Bird census

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