Collection and Analysis of Vegetative Cover Data

**R. H. Sauer
S. L. Owzarski**

July 1979

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CONTENTS

INTRODUCTION	1
METHODS	1
DATA ANALYSIS WITH PROGRAM COVER	2
DATA LISTING	4
COVER STATISTICS	4
FREQUENCY	4
SPECIES DIVERSITY	4
CONCLUSIONS	5
ACKNOWLEDGMENTS	5
REFERENCES CITED	5
APPENDIX - PROGRAM COVER	9
PROGRAM FORTRAN LISTING	9
LISTING OF RAW DATA	15
PERCENT COVER BY SPECIES	17
SPECIES DIVERSITY	21
FREQUENCY OF OCCURRENCE	22

INTRODUCTION

This program was developed at Pacific Northwest Laboratory to facilitate the analysis of vegetative data using Daubenmire's (1959) canopy cover approach. It has been used in numerous research programs on the Hanford Site since the program's creation in 1975.

The assemblage of plant species (vegetation) of an area offers unique opportunities to recognize and evaluate changes in the environment. The quantity or persistence of a vegetative cover reflects the growth conditions of the immediate area. If a species cannot adapt to a change in its environment, its abundance will change. This change in abundance can be detected by vegetational analysis and can be used to pinpoint environmental changes. Vegetation then can be thought of as an integrator of the environmental factors that affect plant growth, and as such is a useful indicator of environmental change.

For a specific example let us consider the deposition of salt from a cooling tower. At some time, depending on rate of deposition, enough salt will be deposited on the soil to slow or stop the growth and reproduction of most plant species, and the vegetative cover will become thinner and consist of (probably) fewer and different species, compared to the initial condition. Periodic data collection and analysis will document the change and add to our understanding of the situation which will be useful in subsequent management activities.

The purpose of this document is to present the rationale, methods, and analytic tools that are commonly used to study changes in vegetation on the Hanford Site.

METHODS

The method of vegetation analysis that has been successful in the Columbia Basin in Washington State is Daubenmire's (1959) canopy cover approach. Canopy cover is the percent of ground surface covered by a vertical projection to the soil of the outer edges of a plant's live parts. Six classes are recognized (Table 1) in use. The percentage cover of each species present is estimated and placed in one of the six classes.

The advantage of placing the cover of a species into broad classes instead of making more accurate estimates is that it allows faster data collection. The error is reduced with many samples (usually 50) because the actual value in some samples will be less than the midpoint (Table 1), and others, greater than the midpoint. The midpoint value is used to calculate the statistics of canopy cover.

The typical procedure is to position a 50 meter tape (line) in the area to be sampled in such a way that it covers a representative portion of the area. Permanent markers at both ends (metal) fence posts are useful if

TABLE 1. Cover Classes

Cover Class	% Cover	Midpoint
1	0-5	2.5
2	>5-25	15.0
3	>25-50	37.5
4	>50-75	62.5
5	>75-95	85.0
6	>95-100	97.5

annual observations are to be made. A 0.1 m² rectangle (20 cm by 50 cm) is placed in the same position at each one-meter mark. In the first plot, at meter mark 1, the cover class of the canopy cover of each species present is recorded. The process is repeated for all fifty positions along the line. A data form, A-1500-096 (3-78), has been developed for recording COVER data (Figure 1). On this form the date is recorded in Columns 23-30 and the identification of the line (area etc.) is recorded in Columns 6-22. The species is recorded in Columns 1-4 as a 4 letter code. The first two letters are the first two of the genus, and the last two letters are the first two letters of the species (Garrison et al. 1976). For example, the code for cheatgrass or Bromus tectorum is BRTE. The cover class of the first species in the first plot is recorded in Column 31, and so on to Column 80 for plot 50. New species are added in Columns 1-4 as encountered. Blanks indicate the species was absent in that plot. A separate data form is used for each line. The number of lines necessary to sample an area depends on the heterogeneity of the area in question.

DATA ANALYSIS WITH PROGRAM COVER

The data are ready for analysis after keypunching onto data processing cards. A FORTRAN listing of the program and sample output, consisting of a data listing, frequency, cover statistics, and species diversity for each line is given in the Appendix. In order from the front of the deck are the UNIVAC system control cards, the COVER program described below, and the data arranged in "lines" and "groups." A "line" is the data taken from a single line. A "group" is a collection of "lines" that are to be analyzed together. A group can have between 2 and 10 lines with a maximum of 60 species. Lines within a group are separated by a 9999 card (9's in Columns 1-4). There is no 9999

Date 9-10-79

DAUBENMIRE'S METHOD

1 - 0.5%	4 - 50.75%
2 - 5.26%	5 - 75.96%
3 - 25.50%	6 - 95.100%

[illegible]

A 1500 096 (3 78)

FIGURE 1. Form for Recording Cover Data

card after the last line. Groups are preceded by a "number of plots card" on which the number of plots (usually 50) is punched in Columns 2-3. The second card is a "title card" which has 8 columns for a label for each line. For example, Columns 1-8 are for Line 1, etc. Groups are separated by \$\$\$\$ cards (\$ in Columns 1-4). There is no \$\$\$\$ card after the last group. A word of caution; the program will not operate if there are data cards with species that have no observations on any line. These cards should be removed before running the program.

DATA LISTING

The data for each group of lines is listed together to facilitate connection of output with input. In the listing, the blanks on the data form indicating that species' absence are printed as zeros.

COVER STATISTICS

Mean percent cover is listed for each species, identified by the four character code. Beneath each species code the standard deviation (SD), standard error (SE), the coefficient of variation (CV), the upper 95% confidence limit (95% V) and the lower limit (95% L) are given. Confidence intervals are calculated with the assumption of 50 plots per line. These statistics are for the 50 plots along the line named at the top of the column. The statistics of each line are calculated independently and are presented in a separate column labeled at the top with the name of the line. The last two columns, labeled "mean" and "SE", are the mean and standard error, respectively, of the various line statistics on the left. Lines are thus combined.

FREQUENCY

Frequency is a measure of how often a species occurs in the plots along a line. A low frequency indicates that the species is not uniformly distributed. The frequency results are arranged in the same way as the cover statistics.

SPECIES DIVERSITY

Three indices of species diversity are calculated (Hill, 1977):

- a) Richness or simply the number of species
- b) A modified Shannon-Weaver index which is numerically less than the number of species because it is weighted against rare species.
- c) A modified Simpson's index which is numerically less than the Shannon-Weaver index because it is further weighted against rare species.

The numerical values of the species diversity indices are termed the equivalent number of equally common species. These synthetic numbers are useful in theoretical considerations of vegetation structure and function. The modifications and a discussion of species diversity are presented by Hill (1973).

CONCLUSIONS

We think this method and program COVER are dependable and useful tools in vegetation description and analysis. While we can take no responsibility for program COVER, we ask that any problems and improvements be brought to our attention.

This version of COVER runs on a UNIVAC and was developed on a CYBER 70. We will provide, upon request, a deck of the program to interested parties.

ACKNOWLEDGMENTS

We gratefully acknowledge the assistance of all members of the Terrestrial Ecology Section and editors of the Ecological Sciences Department at Battelle-Northwest. To Dr. John Rottenberry we express in particular our appreciation for his many helpful suggestions and discussion on species diversity.

REFERENCES CITED

Daubemire, R. 1959. A Canopy-Coverage Method of Vegetation Analysis. Northwest Science 33:43-64.

Hill, M.O. 1973. Diversity and Evenness: A Unifying Notation and Its Consequences. Ecology 54:427-432.

Garrison, G. A., J. M. Skovlin, C. E. Poulton and A. H. Winward. 1976. Northwest Plant Names and Symbols for Ecosystem Inventory and Analysis. 4th Ed. Pacific Northwest Forest and Range Experiment Station. USDA Forest Service General Technical Report PNW-46. USDA, Forest Service, Portland, Oregon.

APPENDIX

PROGRAM COVER

PROGRAM FORTRAN LISTING

```

1. C
2. C      PROGRAM COVER
3. C
4. C      WRITTEN BY R. H. SAUER DECEMBER 1976
5. C      ADDITIONS BY S. L. UWZARSKI MAY 1979
6. C      FOR PACIFIC NORTHWEST LABORATORIES
7. C
8. C
9. C      RUN DECK AS OF MAY 25, 1979
10. C      FOR UNIVAC
11. C      ALL CARDS BEGIN IN COLUMN ONE EXCEPT FORTRAN PROGRAM
12. C      *RUN COVER,ACCT/USERID,PASSWD . NAME/ADDRESS
13. C      *IDENT . SALLY UWZARSKI/600 AREA 65521 BLDG. PNL
14. C      *PASSWD ALE
15. C      *FIN.S
16. C      PROGRAM DECK
17. C      *XUT
18. C      9999
19. C      050
20. C      TITLES IN 10AB FORMAT
21. C      DATA FOR ONE LINE
22. C      9999
23. C      DATA FOR ONE LINE
24. C      REPEAT PATTERN FOR UP TO 10 DATA GROUPS
25. C      $$$$
26. C      050
27. C      TITLES IN 10AB FORMAT
28. C      DATA FOR ONE LINE
29. C      9999
30. C      PATTERN CONTINUES FOR UP TO 10 LINES BUT THE LAST SET OF DATA
31. C      IS NOT FOLLOWED BY A 9999 CARD
32. C      *FIN
33. C
34. C
35. C      DESCRIPTION OF ARRAYS AND VARIABLES USED IN PROGRAM
36. C      ARRAY      DESCRIPTION
37. C      ARRAY      DESCRIPTION
38. C      C195L      CONFIDENCE INTERVAL LOWE
39. C      C195U      CONFIDENCE INTERVAL UPPER
40. C      CODE       MEAN PERCENT OF COVER
41. C      CV         COVARIANCE
42. C      SD         STANDARD DEVIATION
43. C      FREQ       FREQUENCY
44. C      SE         STANDARD ERROR
45. C      TOLIN      STORES TOTALS FOR LINES, SPECIES
46. C      COV        SPECIES BY LINES
47. C      SSXX       SUM X SQUARED FOR STATISTICS
48. C      SA        SUM OF X FOR STATISTICS
49. C
50. C
51. C      DIMENSION
52. C      * C195L(12), C195U(12), CODE(7), COV(60,12),
53. C      * CV(60,12), FREQ(60,12), KARU(50),

```

PROGRAM FORTRAN LISTING (Continued)

```

54.      *      SD(60,12),      SE(60,12),      SSAX(60,12),
55.      *      SSX(60,12),      TOLIN(50,12)
56.      CHARACTER*5 ISYM(2),ISTNM(7),KSP,NAME(60)
57.      CHARACTER*10 M,MM,MMM,TITLE(12)
58.      COMMON /A/
59.      *      LINES
60.      C      COVER CALCULATES SEVERAL STATISTICS ON EACH SPECIES AND
61.      C      LINE, AND DIVERSITY INDICES OF HILL ECUL. 1973. THE
62.      C      DATA ARE IN GROUPS OF LINES. THE NUMBER OF PLOTS PER
63.      C      LINE AND TITLES FOR EACH LINE PRECEED EACH GROUP. DATA FOR
64.      C      A LINE IS FOLLOWED BY A 9999 CARD, EXCEPT THE LAST. GROUPS
65.      C      ARE FOLLOWED BY A $$$ CARD, EXCEPT THE LAST.
66.      C
67.      C      1A. THE ARRAYS, 50 REFS THE SPECIES EXCEPT IN TOLIN WHERE
68.      C      50 REFS TO THE NUMBER OF PLOTS PER LINE.
69.      C      PLUS ONE FOR MEAN AND ONE FOR SE.
70.      C      12 REFS TO THE MAX NUMBER OF LINES PER GROUP (10)
71.      C
72.      C
73.      C
74.      DATA ISYM/5M9999 ,5H$$$$ /
75.      DATA CODE/0.,.2,.5,.15.,.37.5,.62.5,.85.,.97.5/
76.      DATA ISTNM/5HSUM X,5HS X*X,5HSD ,5HCV ,5HSE ,5H95% U,5H95% L
77.      *
78.      20 CONTINUE
79.      DO 30 I=1,50
80.      NAME(I)=5M
81.      DO 30 J=1,12
82.      COV(I,J)=0.
83.      FREQ(I,J)=0.
84.      SSX(I,J)=0.
85.      SSAX(I,J)=0.
86.      SD(I,J)=0.
87.      CV(I,J)=0.
88.      SE(I,J)=0.
89.      TOLIN(I,J)=0.
90.      30 CONTINUE
91.      NPTS=0
92.      C      READ THE NUMBER OF PLOTS IN EACH LINE IN CURRENT GROUP
93.      READ (5,40) NPLTS
94.      40 FORMAT (I3)
95.      WRITE (6,50) NPLTS
96.      50 FORMAT (I11,' THE NUMBER OF PLOTS IN THE CURRENT GROUP= ',I3)
97.      C      READ THE TITLES FOR EACH GROUP (8 CHARACTERS LONG)
98.      READ (5,60) (TITLE(I),I=1,10)
99.      60 FORMAT (10A8)
100.      IF (NPLTS.GT.50) WRITE (6,70) TITLE,NPLTS
101.      70 FORMAT (1H ,12A8,10X,'TOO MANY PLOTS',I5)
102.      IF (NPLTS.GT.50) STOP 'TOO MANY PLOTS'
103.      L=1
104.      80 READ(5,90,END=150) KSP,M,MM,MMM,KARD
105.      90 FORMAT (A5,A9,A10,A6,50I1)
106.      WRITE (6,100) KSP,M,MM,MMM,KARD
107.      100 FORMAT (1H ,A5,A9,A10,A6,50I1)
108.      IF (KSP.EQ.ISYM(2)) GO TO 150
109.      IF (KSP.EQ.ISTNM(1)) L=L+1
110.      IF (L.GT.10) STOP 'MORE THAN 10 TRANSECTS IN GROUP'

```

PROGRAM FORTRAN LISTING (Continued)

```

111.      IF (KSP.EQ.ISYM(1)) GO TO 80
112. C      CATALOG SPECIES NUMBER IO OR DETERMINE IO NUMBER IF
113. C      SPECIES PREVIOUSLY CATALOGED
114.      IF (NSPS.EQ.0) GO TO 120
115.      DO 110 K=1,NSPS
116.      KP=K
117.      IF (KSP.EQ.NAME(K)) GO TO 130
118.      110 CONTINUE
119.      120 CONTINUE
120.      NSPS=NSPS+1
121.      IF (NSPS.GT.60) STOP 'TOO MANY SPECIES'
122.      NAME(NSPS)=KSP
123.      KP=NSPS
124.      130 CONTINUE
125.      SX=0.
126.      SXX=0.
127.      F=0.
128.      DO 140 K=1,NPLTS
129.      IF (KARD(K).EQ.0) KARD(K)=0
130.      I=KARD(K)+1
131.      IF (I.GT.1) F=F+1.
132.      TEMP=CODE(I)
133. C SUM ALL SPECIES IN PLOT K, LINE L INTO TOLIN(K,L)
134.      TOLIN(K,L)=TOLIN(K,L)+TEMP
135.      SX=SX+TEMP
136.      SXX=SXX+TEMP*TEMP
137.      140 CONTINUE
138.      FREQ(KP,L)=F*100./NPLTS
139.      COV(KP,L)=SX/NPLTS
140.      SSX(KP,L)=SX
141.      SSXX(KP,L)=SXX
142.      H=NPLTS
143.      TEMP=SXX-SX*SX/H
144.      SD(KP,L)=SQRT(TEMP/(H-1.))
145.      CV(KP,L)=SD(KP,L)/COV(KP,L)
146.      SE(KP,L)=SD(KP,L)/SQRT(H)
147.      GO TO 80
148.      150 CONTINUE
149.      LINES=L
150.      NAME(NSPS+1)=BHTOTAL
151.      NAME(NSPS+2)=SHN(0)
152.      NAME(NSPS+3)=SHN(1)
153.      NAME(NSPS+4)=SHN(2)
154.      TITLE(LINES+1)=BH MEAN
155.      TITLE(LINES+2)=BHSTAN ERR
156.      JJ=LINES+2
157.      I1=NSPS+1
158.      I2=NSPS+2
159.      I3=NSPS+3
160.      I4=NSPS+4
161. C      TOTAL COVER FOR EACH PLOT
162.      DO 170 L=1,LINES
163.      SX=0.
164.      SXX=0.
165.      DO 160 JKS=1,NPLTS
166.      TEMP=TOLIN(JKS,L)
167.      SX=SX+TEMP

```

PROGRAM FORTRAN LISTING (Continued)

```

168.      SXX=SXX+TEMP*TEMP
169.      160 CONTINUE
170.      SSX(I1,L)=SX
171.      SSXX(I1,L)=SAX
172.      H=NPLTS
173.      TEMP=SXX-SX*SX/H
174.      SD(I1,L)=SQRT(TEMP/(H-1.))
175.      CV(I1,L)=SD(I1,L)/(SX/H)
176.      170 SE(I1,L)=SD(I1,L)/SQRT(H)
177.      C      TOTAL ALL SPECIES IN A GROUP.
178.      DO 180 L=1,LINES
179.      DO 180 K=1,NSPS
180.      180 COV(I1,L)=COV(I1,L)+COV(K,L)
181.      C      CALCULATE MEAN AND STANDARD ERROR FOR PERCENT COVER FOR EACH SPEC
182.      CALL STER (COV,1,11)
183.      CALL STER (SSX,1,11)
184.      CALL STER (SSXX,1,11)
185.      CALL STER (SD,1,11)
186.      CALL STER (CV,1,11)
187.      CALL STER (SE,1,11)
188.      C      PRINT THE COVER PERCENTS
189.      WRITE (6,190) (TITLE(I),I=1,JJ)
190.      190 FORMAT (1H1,150,'PERCENT COVER BY SPECIES',/,10X,12A10)
191.      DO 230 K=1,11
192.      WRITE (6,200) NAME(K),(COV(K,L),L=1,JJ)
193.      200 FORMAT (1H ,A6,12F10.3)
194.      C      210 WRITE (6,210) ISNM(1),(SSX(K,L),L=1,JJ)
195.      210 FORMAT (2H ,A6,12F10.1)
196.      C      210 WRITE (6,210) ISNM(2),(SSXX(K,L),L=1,JJ)
197.      210 WRITE (6,220) ISNM(3),(SD(K,L),L=1,JJ)
198.      220 FORMAT (2H ,A6,12F10.3)
199.      210 WRITE (6,220) ISNM(4),(CV(K,L),L=1,JJ)
200.      210 WRITE (6,220) ISNM(5),(SE(K,L),L=1,JJ)
201.      DO 230 JK=1,JJ
202.      CI95U(JK)=COV(K,JK)+SE(K,JK)*1.910
203.      CI95L(JK)=COV(K,JK)-SE(K,JK)*1.910
204.      230 CONTINUE
205.      210 WRITE (6,220) ISNM(6),(CI95U(LL),LL=1,JJ)
206.      210 WRITE (6,220) ISNM(7),(CI95L(LL),LL=1,JJ)
207.      250 CONTINUE
208.      C      CHANGE % COVER TO RELATIVE COVER.
209.      DO 260 L=1,LINES
210.      DO 260 K=1,NSPS
211.      IF (COV(I1,L).GT.0.) COV(K,L)=COV(K,L)/COV(I1,L)
212.      260 CONTINUE
213.      C
214.      C      CALCULATE DIVERSITY INDICES ACCORDING TO HILL IN 1973 ECOLOGY.
215.      C      N(A) = (SUM OF P**A)**(1./(1.-A))
216.      C      A=0 IS NUMBER OF SPECIES.
217.      C      A = 1 IS EXP(SHANNONS ENTROPY)
218.      C      A = 2 IS 1/SIMPSON'S MODIFIED INDEX.
219.      C      A=0 OR N(0)
220.      A=0
221.      DO 280 L=1,LINES
222.      SUM=0
223.      DO 270 K=1,NSPS
224.      C      IF (COV(K,L).GT.0) SUM=SUM+COV(K,L)**A

```

PROGRAM FORTRAN LISTING (Continued)

```

225.      IF (COV(K,L).GT.0) SUM=SUM+1.
226.      270 CONTINUE
227. C 270 COV(I2,L)=SUM**((1./(1.-A))
228.      280 COV(I2,L)=SUM
229. C
230. C      ... N(1)
231.      A=1
232.      DO 300 L=1,LINES
233.          SUM=0.
234.          DO 290 K=1,NSPS
235.              TEMP=COV(K,L)
236.              IF (TEMP.GT.0) SUM=SUM+TEMP*ALOG(TEMP)
237.          290 CONTINUE
238.          300 COV(I3,L)=EXP(-SUM)
239. C
240. C      N(2)
241.      A=2.
242.      DO 320 L=1,LINES
243.          SUM=0.
244.          DO 310 K=1,NSPS
245.              TEMP=COV(K,L)
246.              IF (TEMP.GT.0) SUM=SUM+TEMP**A
247.          310 CONTINUE
248.          COV(I4,L)=0.
249.          IF (SUM.GT.0.) COV(I4,L)=SUM**((1./(1.-A))
250.      320 CONTINUE
251. C
252. C      CALCULATE MEAN AND STANDARD ERROR
253.      CALL STEM (COV,1,I4)
254. C      PRINT RESULTS
255.      WRITE (6,330) (TITLE(I),I=1,JJ)
256.      330 FORMAT(1H1,T50,'TOTAL COVER AND SPECIES DIVERSITY OF HILL IN ECOLO
257.      *GY, 1973',//,10X,12A10)
258. C      DO 330 K=1,I4
259.      DO 340 K=1,I4
260.      340 WRITE (6,200) NAME(K),(COV(K,L),L=1,JJ)
261. C
262. C
263. C      FREQUENCY
264. C      CALCULATE MEAN AND STANDARD ERROR FOR FREQUENCY
265.      CALL STEM (FREQ,1,NSPS)
266.      WRITE (6,370) (TITLE(I),I=1,JJ)
267.      370 FORMAT (1H1,T50,'FREQUENCY',//,10X,12A10)
268.      DO 380 K=1,NSPS
269.      380 WRITE (6,200) NAME(K),(FREQ(K,L),L=1,JJ)
270.      IF (KSP.EQ.ISYM(2)) GO TO 20
271.      END

```

PROGRAM FORTRAN LISTING (Continued)

```

272.      SUBROUTINE STER (DATA,N1,N2)
273.      COMMON /A/
274.      *   LINES
275.      DIMENSION
276.      *   DATA(60,12)
277.      DO 30 K=N1,N2
278.      SUMX=0.
279.      SUMXX=0.
280.      DO 20 L=1,LINES
281.      TEMP=DATA(K,L)
282.      SUMX=SUMX+TEMP
283.      20 SUMXX=SUMXX+TEMP*TEMP
284.      SE2=(SUMXX-(SUMX*SUMX)/LINES)/(LINES*(LINES-1))
285.      SE=SQRT(SE2)
286.      AVE=SUMX/LINES
287.      DATA(K,LINES+1)=AVE
288.      DATA(K,LINES+2)=SE
289.      30 CONTINUE
290.      RETURN
291.      END

```


LISTING OF RAW DATA

THE NUMBER OF PLOTS IN THE CURRENT GROUP= 50

```

AGSP 1 1200FT 57BURN 04-10-7923420012004120502052304400032030321010420320250203
POSA 1 1200FT 57BURN 04-10-79432332333432332312322323423215112334232024312022
BITE 1 1200FT 57BURN 04-10-79201111110110001110110111101110000110010111000000
LOMA 1 1200FT 57BURN 04-10-791001000010101002000000000000000000000000000000000000
PHLU 1 1200FT 57BURN 04-10-79123222022112222102110132222333021122201220020114
LULA 1 1200FT 57BURN 04-10-790100000000000000000000000000000000000000000000000000
FEUC 1 1200FT 57BURN 04-10-7901101101101100000000000000000000000000000000000000
ASLY 1 1200FT 57BURN 04-10-7900001011000000000000000000000000000000000000000000
DEPU 1 1200FT 57BURN 04-10-7900000100000000000000000000000000000000000000000000
SAKA 1 1200FT 57BURN 04-10-7900000010000000000000000000000000000000000000000000
LASE 1 1200FT 57BURN 04-10-7900000001000000001000000001000000000000000000000000
QNHV 1 1200FT 57BURN 04-10-7900000000200000000000000000000000000000000000000000
CAMA 1 1200FT 57BURN 04-10-7900000000000000000000000000000000000000000000000000
ARTN 1 1200FT 57BURN 04-10-7900000000000000000000000000000000000000000000000000
ARTKS 1 1200FT 57BURN 04-10-7900000000000000000000000000000000000000000000000000
9999 00000000000000000000000000000000000000000000000000000000000000000000000
PHLU 2 1200FT 73BURN 04-10-7921011201001002001112020212022122210112001220000010
POSA 2 1200FT 73BURN 04-10-793222102122133222212223122412232322221212212124323
DEPI 2 1200FT 73BURN 04-10-79100000000000011000000201102011000000001000000001000
LOMA 2 1200FT 73BURN 04-10-7901000000000000001010000000000000000000000000000000
AGSP 2 1200FT 73BURN 04-10-7902031003001012201010001103002320201513030103200302
BITE 2 1200FT 73BURN 04-10-7900001000000000000100000000000000000000000000000000
SIAL 2 1200FT 73BURN 04-10-7900000100001000000000001001000000000000000000000000
CAMA 2 1200FT 73BURN 04-10-7900000000010000000000000000000000000000000000000000
AGOS 2 1200FT 73BURN 04-10-7900000000000000000100000000000000000000000000000000
ALSY 2 1200FT 73BURN 04-10-7900000000000000000000000000000000000000000000000000
9999 00000000000000000000000000000000000000000000000000000000000000000000000
AGSP 3 UNBURN WNT-FAT04-10-7900000000303200000000000000000000000000000000000000
POSA 3 UNBURN WNT-FAT04-10-793203222132232224023333224233334115322222323302333
CELA 3 UNBURN WNT-FAT04-10-7934124340030230231033232003030415031620022232350301
BITE 3 UNBURN WNT-FAT04-10-791221121212111311211102112211212121212121221122041
FRPU 3 UNBURN WNT-FAT04-10-7900100000000000000000000000000000000000000000000000
LOMA 3 UNBURN WNT-FAT04-10-7900011003000000020211000000000000000000000000000000
ALSY 3 UNBURN WNT-FAT04-10-7900000001000000000000100100003000000000000000000001
STTH 3 UNBURN WNT-FAT04-10-7900000000000002300000000000000000000000000000000000
SAKA 3 UNBURN WNT-FAT04-10-7900000000000001000000000000000000000000000000000000
SIAL 3 UNBURN WNT-FAT04-10-7900000000000000100000000000000000000000000000000000
BKUD 3 UNBURN WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
BACA 3 UNBURN WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
HEUN 3 UNBURN WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
STCO 3 UNBURN WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
AGOS 3 UNBURN WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
9999 00000000000000000000000000000000000000000000000000000000000000000000000
POSA 4-BURNED WNT-FAT04-10-79222222011100232202100111222122211222230211321212
BITE 4-BURNED WNT-FAT04-10-7912100010110120021110102011222000020102101010000112
DEPI 4-BURNED WNT-FAT04-10-7911021011020101110101211001001000001001100011001000
SIAL 4-BURNED WNT-FAT04-10-79010100001000000000000010000000000001000000000000000
ALSY 4-BURNED WNT-FAT04-10-7901000000000000000000000000000000000000000000000000
CELA 4-BURNED WNT-FAT04-10-79000100000020000000010000200010000001000000000000000
BKUD 4-BURNED WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
CAMA 4-BURNED WNT-FAT04-10-7900000000000000000000000000000000000000000000000000
9999 00000000000000000000000000000000000000000000000000000000000000000000000
UNKI 5 500FT UNBURNED04-10-792212222123211112221222222224222323202222222122
SIAL 5 500FT UNBURNED04-10-792221222122202201111110101121120001002211010122222
DEPI 5 500FT UNBURNED04-10-7910200000000001000000000000000100011000000000000000
BITE 5 500FT UNBURNED04-10-7910110000001100001000211101010111000110011100101000

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LISTING OF RAW DATA (Continued)

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CHLE 5 500FT UNERODED04-10-790110111121111102110001000001000101132101011111221
ORVE 5 500FT UNERODED04-10-79001010000010000000111100111101111120112111101011
POSA 5 500FT UNERODED04-10-7900000010000000000100101000000000200232000000000
SAKA 5 500FT UNERODED04-10-7900000000001000000000000000010000000000000000000
9999 00000000000000000000000000000000000000000000000000000000000000000000
BATE 6 HOPSAGE UNBURN04-11-7945555455222454533024232231223221135534614235542325
ATSP 6 HOPSAGE UNBURN04-11-792200050001000000005000600410020000300000000001200
UNNU 6 HOPSAGE UNBURN04-11-7901101000010212111101010020000000000000101120230002
MIGH 6 HOPSAGE UNBURN04-11-79001000010010000001000001001100100010000000000000
DEPI 6 HOPSAGE UNBURN04-11-7900011000000000000000000000000000000000000000000
AMLY 6 HOPSAGE UNBURN04-11-7900001001002232200100132320222221222333263332103522
ORVE 6 HOPSAGE UNBURN04-11-7900001000000000000000000000000000000000000000000
POSA 6 HOPSAGE UNBURN04-11-790000000000000000030200010210000000000000000000000
SIAL 6 HOPSAGE UNBURN04-11-79000000000000000000000000000000000000000000011010
9999 00000000000000000000000000000000000000000000000000000000000000000000
BATE 7 HOPSAGE 7BURN04-11-79223222224330022210013210110152212322221344234322
UNNU 7 HOPSAGE 7BURN04-11-79001010101011011011010000000010100010111110111010201
SIAL 7 HOPSAGE 7BURN04-11-7900001000000010110100100000000000000000101000000000
MELN 7 HOPSAGE 7BURN04-11-790000020000000000000000000000000000000000000000000
POSE 7 HOPSAGE 7BURN04-11-79000000000000000000220000000000001120000000001000000
MIGH 7 HOPSAGE 7BURN04-11-7900000000000000000000000000000000000000000001100000
AMLY 7 HOPSAGE 7BURN04-11-7900000000000000000000000000000000000000000001000000
9999 00000000000000000000000000000000000000000000000000000000000000000000
BATE 8 600FT CONTROL 04-11-792112121111225211112210221111221110101111201112111
ANTR 8 600FT CONTROL 04-11-7932011211012013111121111111001111121112111111111
SIAL 8 600FT CONTROL 04-11-791001111101000000010000110001011000201000000000000
GIMI 8 600FT CONTROL 04-11-7911210110000001111111002200100210000021101110000
POSA 8 600FT CONTROL 04-11-7900022201020200000022000020002000010000000000220
ARTR 8 600FT CONTROL 04-11-7900000005332600030000026001600000000300040000006245
FEOL 8 600FT CONTROL 04-11-790000001000000000000001000000000000010001001100000
CYTE 8 600FT CONTROL 04-11-7900000000200000002000200002000200002000120303041402
AMLY 8 600FT CONTROL 04-11-790000000000000000000100000000000000000000000000000
CIMI 8 600FT CONTROL 04-11-7900000000000000000000000000000000000000000002000
9999 00000000000000000000000000000000000000000000000000000000000000000000
BATE 9 600FT ERODED 7804-11-790000000000000000000000000000000000000000000000000
CHLE 9 600FT ERODED 7804-11-792111112021111101212211121111112211111101111100110
SIAL 9 600FT ERODED 7804-11-79111220000212120101011212221111211122220222210131
DEPI 9 600FT ERODED 7804-11-7900000010000000000001011000000000000000010001010000
POSA 9 600FT ERODED 7804-11-7900000000000000000000000100000000000000132000021200
AMLY 9 600FT ERODED 7804-11-79000000000000000000000000000000000000000000010000000000

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PERCENT COVER BY SPECIES

	1 57BURN	2 73BURN	3 UNBURN	4 BURNWF	5 UNEROD	6 UNBURN	7 78BURN	8 CONTRL	9 ERODED	MEAN	STAN ERR
AGSP	20.400	10.600	2.450	.000	.000	.000	.000	.000	.000	3.717	2.387
SD	25.938	17.332	8.073	.000	.000	.000	.000	.000	.000	5.705	3.218
CV	1.271	1.635	3.295	.000	.000	.000	.000	.000	.000	.689	.389
SE	3.668	2.451	1.142	.000	.000	.000	.000	.000	.000	.807	.455
95% U	27.406	15.282	4.631	.000	.000	.000	.000	.000	.000	5.258	3.256
95% L	13.394	5.918	.269	.000	.000	.000	.000	.000	.000	2.176	1.518
POSA	27.850	17.700	26.600	10.250	1.850	1.450	.000	3.400	1.800	10.100	3.734
SD	19.575	14.275	18.188	9.546	6.284	5.999	.000	6.243	6.249	9.600	2.152
CV	.703	.807	.684	.931	3.397	4.137	.000	1.836	3.494	1.777	.504
SE	2.768	2.019	2.572	1.350	.889	.848	.000	.883	.869	1.358	.304
95% U	33.137	21.556	31.513	12.829	3.547	3.071	.000	5.086	3.499	12.693	4.315
95% L	22.563	13.844	21.687	7.671	.153	-.171	.000	1.714	.101	7.507	3.152
GRTE	1.700	.100	9.050	3.900	1.350	45.200	20.000	7.450	.050	9.867	4.894
SD	2.283	.495	10.749	5.718	2.326	31.418	19.859	12.612	.354	9.535	3.499
CV	1.343	4.949	1.188	1.466	1.723	.695	.993	1.693	7.071	2.347	.723
SE	.323	.070	1.520	.809	.329	4.443	2.809	1.784	.050	1.348	.495
95% U	2.317	.234	11.953	5.444	1.978	53.686	25.364	10.057	.145	12.442	5.839
95% L	1.083	-.034	6.147	2.356	.722	38.714	14.836	4.043	-.045	7.291	3.949
LOMA	.950	.250	1.950	.000	.000	.000	.000	.000	.000	.350	.226
SD	3.026	.758	6.274	.000	.000	.000	.000	.000	.000	1.117	.725
CV	3.145	3.030	3.217	.000	.000	.000	.000	.000	.000	1.048	.524
SE	.428	.107	.887	.000	.000	.000	.000	.000	.000	.158	.103
95% U	1.767	.455	3.645	.000	.000	.000	.000	.000	.000	.652	.421
95% L	.133	.045	.255	.000	.000	.000	.000	.000	.000	.048	.030
PHLU	13.250	5.250	.000	.000	.000	.000	.000	.000	.000	2.056	1.514
SD	13.413	6.532	.000	.000	.000	.000	.000	.000	.000	2.216	1.574
CV	1.012	1.244	.000	.000	.000	.000	.000	.000	.000	.251	.167
SE	1.897	.924	.000	.000	.000	.000	.000	.000	.000	.313	.223
95% U	10.873	7.014	.000	.000	.000	.000	.000	.000	.000	2.654	1.939
95% L	9.627	3.486	.000	.000	.000	.000	.000	.000	.000	1.457	1.089
LULA	.050	.000	.000	.000	.000	.000	.000	.000	.000	.006	.006
SD	.354	.000	.000	.000	.000	.000	.000	.000	.000	.039	.039
CV	7.071	.000	.000	.000	.000	.000	.000	.000	.000	.786	.786
SE	.050	.000	.000	.000	.000	.000	.000	.000	.000	.006	.006
95% U	.145	.000	.000	.000	.000	.000	.000	.000	.000	.016	.016
95% L	-.045	.000	.000	.000	.000	.000	.000	.000	.000	-.005	-.005
FEUC	.600	.000	.000	.000	.000	.000	.000	.350	.000	.106	.073
SD	1.079	.000	.000	.000	.000	.000	.000	.876	.000	.217	.145
CV	1.798	.000	.000	.000	.000	.000	.000	2.504	.000	.478	.322
SE	.153	.000	.000	.000	.000	.000	.000	.124	.000	.031	.020
95% U	.841	.000	.000	.000	.000	.000	.000	.587	.000	.164	.112
95% L	.309	.000	.000	.000	.000	.000	.000	.113	.000	.047	.034
ASLY	2.100	.000	.000	.000	.000	.000	.000	.000	.000	.233	.233
SD	6.554	.000	.000	.000	.000	.000	.000	.000	.000	.728	.728
CV	3.121	.000	.000	.000	.000	.000	.000	.000	.000	.347	.347
SE	.927	.000	.000	.000	.000	.000	.000	.000	.000	.103	.103
95% U	3.870	.000	.000	.000	.000	.000	.000	.000	.000	.430	.430
95% L	.330	.000	.000	.000	.000	.000	.000	.000	.000	.037	.037
DEPU	.100	.000	.000	.000	.000	.000	.000	.000	.000	.011	.011
SD	.495	.000	.000	.000	.000	.000	.000	.000	.000	.055	.055
CV	4.949	.000	.000	.000	.000	.000	.000	.000	.000	.550	.550
SE	.070	.000	.000	.000	.000	.000	.000	.000	.000	.008	.008
95% U	.234	.000	.000	.000	.000	.000	.000	.000	.000	.026	.026
95% L	-.034	.000	.000	.000	.000	.000	.000	.000	.000	-.004	-.004

PERCENT COVER BY SPECIES (Continued)

SAMA	.050	.000	.050	.000	.100	.000	.000	.000	.000	.022	.012
SD	.354	.000	.354	.000	.495	.000	.000	.000	.000	.134	.068
CV	7.071	.000	7.071	.000	4.949	.000	.000	.000	.000	2.121	1.080
SE	.050	.000	.050	.000	.070	.000	.000	.000	.000	.019	.010
Y5% U	.145	.000	.145	.000	.234	.000	.000	.000	.000	.058	.031
Y5% L	-.045	.000	-.045	.000	-.034	.000	.000	.000	.000	-.014	-.006
LASE	.150	.000	.000	.000	.000	.000	.000	.000	.000	.017	.017
SD	.000	.000	.000	.000	.000	.000	.000	.000	.000	.067	.067
CV	3.998	.000	.000	.000	.000	.000	.000	.000	.000	.444	.444
SE	.085	.000	.000	.000	.000	.000	.000	.000	.000	.009	.009
Y5% U	.312	.000	.000	.000	.000	.000	.000	.000	.000	.035	.035
Y5% L	-.012	.000	.000	.000	.000	.000	.000	.000	.000	-.001	-.001
OKHY	.300	.000	.000	.000	.000	.000	.000	.000	.000	.033	.033
SD	2.121	.000	.000	.000	.000	.000	.000	.000	.000	.236	.236
CV	7.071	.000	.000	.000	.000	.000	.000	.000	.000	.786	.786
SE	.300	.000	.000	.000	.000	.000	.000	.000	.000	.033	.033
Y5% U	.873	.000	.000	.000	.000	.000	.000	.000	.000	.097	.097
Y5% L	-.273	.000	.000	.000	.000	.000	.000	.000	.000	-.030	-.030
CAMA	.050	.100	.000	.050	.000	.000	.000	.000	.000	.022	.012
SD	.354	.495	.000	.354	.000	.000	.000	.000	.000	.134	.068
CV	7.071	4.949	.000	7.071	.000	.000	.000	.000	.000	2.121	1.080
SE	.050	.070	.000	.050	.000	.000	.000	.000	.000	.019	.010
Y5% U	.145	.234	.000	.145	.000	.000	.000	.000	.000	.058	.031
Y5% L	-.045	-.034	.000	-.045	.000	.000	.000	.000	.000	-.014	-.006
ARTH	.300	.000	.000	.000	.000	.000	.000	23.500	.000	2.644	2.607
SD	2.121	.000	.000	.000	.000	.000	.000	37.115	.000	4.360	4.101
CV	7.071	.000	.000	.000	.000	.000	.000	1.579	.000	.961	.783
SE	.300	.000	.000	.000	.000	.000	.000	5.249	.000	.617	.580
Y5% U	.873	.000	.000	.000	.000	.000	.000	33.525	.000	3.822	3.715
Y5% L	-.273	.000	.000	.000	.000	.000	.000	13.475	.000	1.467	1.499
ARTHS	.050	.000	.000	.000	.000	.000	.000	5.150	.000	.578	.572
SD	.354	.000	.000	.000	.000	.000	.000	7.912	.000	.918	.875
CV	7.071	.000	.000	.000	.000	.000	.000	1.536	.000	.956	.783
SE	.050	.000	.000	.000	.000	.000	.000	1.119	.000	.130	.124
Y5% U	.145	.000	.000	.000	.000	.000	.000	7.287	.000	.826	.808
Y5% L	-.045	.000	.000	.000	.000	.000	.000	3.013	.000	.330	.335
DEPI	.000	1.050	.000	1.950	.700	.100	.000	.000	.350	.461	.224
SD	.000	3.034	.000	3.546	2.261	.495	.000	.000	.876	1.135	.476
CV	.000	2.890	.000	1.818	3.230	4.949	.000	.000	2.504	1.710	.607
SE	.000	.429	.000	.501	.320	.070	.000	.000	.124	.160	.067
Y5% U	.000	1.870	.000	2.908	1.311	.234	.000	.000	.987	.768	.353
Y5% L	.000	.230	.000	.992	.089	-.034	.000	.000	.113	.155	.095
SIAL	.000	.250	.050	.250	6.700	.150	.450	1.050	8.200	1.900	1.061
SD	.000	.758	.354	.758	6.632	.600	.970	2.320	8.865	2.362	1.056
CV	.000	3.030	7.071	3.030	.990	3.998	2.156	2.209	1.081	2.618	.696
SE	.000	.107	.050	.107	.938	.085	.137	.328	1.254	.334	.149
Y5% U	.000	.455	.145	.455	8.492	.312	.712	1.677	10.594	2.538	1.347
Y5% L	.000	.045	-.045	.045	4.908	-.012	.188	.423	5.806	1.262	.776
AGUS	.000	.050	.350	.000	.000	.000	.000	.000	.000	.044	.039
SD	.000	.354	2.143	.000	.000	.000	.000	.000	.000	.277	.236
CV	.000	7.071	6.124	.000	.000	.000	.000	.000	.000	1.466	.973
SE	.000	.650	.303	.000	.000	.000	.000	.000	.000	.039	.033
Y5% U	.000	.145	.929	.000	.000	.000	.000	.000	.000	.119	.102
Y5% L	.000	-.045	-.229	.000	.000	.000	.000	.000	.000	-.030	-.025
ALSY	.000	.050	.950	.150	.000	.000	.000	.000	.000	.128	.104
SD	.000	.354	5.319	.600	.000	.000	.000	.000	.000	.697	.582
CV	.000	7.071	5.599	3.998	.000	.000	.000	.000	.000	1.852	.961

PERCENT COVER BY SPECIES (Continued)

SE	.000	.050	.752	.085	.000	.000	.000	.000	.000	.099	.082
YSA U	.000	.145	2.387	.312	.000	.000	.000	.000	.000	.316	.261
YSA L	.000	-.045	-.487	-.012	.000	.000	.000	.000	.000	-.060	-.053
CELA	.000	.000	24.550	.800	.000	.000	.000	.000	.000	2.817	2.718
SU	.000	.000	25.792	3.007	.000	.000	.000	.000	.000	3.200	2.843
CV	.000	.000	1.051	3.758	.000	.000	.000	.000	.000	.534	.419
SE	.000	.000	3.648	.425	.000	.000	.000	.000	.000	.453	.402
YSA U	.000	.000	31.517	1.612	.000	.000	.000	.000	.000	3.681	3.486
YSA L	.000	.000	17.583	-.012	.000	.000	.000	.000	.000	1.952	1.950
FRPU	.000	.000	.050	.000	.000	.000	.000	.000	.000	.006	.006
SU	.000	.000	.354	.000	.000	.000	.000	.000	.000	.039	.039
CV	.000	.000	7.071	.000	.000	.000	.000	.000	.000	.786	.786
SE	.000	.000	.050	.000	.000	.000	.000	.000	.000	.006	.006
YSA U	.000	.000	.145	.000	.000	.000	.000	.000	.000	.016	.016
YSA L	.000	.000	-.045	.000	.000	.000	.000	.000	.000	-.005	-.005
STIM	.000	.000	1.050	.000	.000	.000	.000	.000	.000	.183	.183
SU	.000	.000	6.301	.000	.000	.000	.000	.000	.000	.700	.700
CV	.000	.000	3.818	.000	.000	.000	.000	.000	.000	.424	.424
SE	.000	.000	.891	.000	.000	.000	.000	.000	.000	.099	.099
YSA U	.000	.000	3.352	.000	.000	.000	.000	.000	.000	.372	.372
YSA L	.000	.000	-.052	.000	.000	.000	.000	.000	.000	-.005	-.005
HRUD	.000	.000	.700	.050	.000	.000	.000	.000	.000	.083	.077
SU	.000	.000	2.990	.354	.000	.000	.000	.000	.000	.371	.330
CV	.000	.000	4.271	7.071	.000	.000	.000	.000	.000	1.200	.866
SE	.000	.000	.423	.050	.000	.000	.000	.000	.000	.053	.047
YSA U	.000	.000	1.508	.145	.000	.000	.000	.000	.000	.184	.166
YSA L	.000	.000	-.108	-.045	.000	.000	.000	.000	.000	-.017	-.012
BACA	.000	.000	.050	.000	.000	.000	.000	.000	.000	.006	.006
SU	.000	.000	.354	.000	.000	.000	.000	.000	.000	.039	.039
CV	.000	.000	7.071	.000	.000	.000	.000	.000	.000	.786	.786
SE	.000	.000	.050	.000	.000	.000	.000	.000	.000	.006	.006
YSA U	.000	.000	.145	.000	.000	.000	.000	.000	.000	.016	.016
YSA L	.000	.000	-.045	.000	.000	.000	.000	.000	.000	-.005	-.005
HEUN	.000	.000	1.300	.000	.000	.000	.300	.000	.000	.178	.144
SU	.000	.000	8.839	.000	.000	.000	2.121	.000	.000	1.218	.981
CV	.000	.000	6.799	.000	.000	.000	7.071	.000	.000	1.541	1.020
SE	.000	.000	1.250	.000	.000	.000	.300	.000	.000	.172	.139
YSA U	.000	.000	3.687	.000	.000	.000	.873	.000	.000	.507	.409
YSA L	.000	.000	-1.087	.000	.000	.000	-.273	.000	.000	-.151	-.121
STCU	.000	.000	.300	.000	.000	.000	.000	.000	.000	.033	.033
SU	.000	.000	2.121	.060	.000	.000	.000	.000	.000	.236	.236
CV	.000	.000	7.071	.000	.000	.000	.000	.000	.000	.786	.786
SE	.000	.000	.300	.000	.000	.000	.000	.000	.000	.033	.033
YSA U	.000	.000	.873	.000	.000	.000	.000	.000	.000	.097	.097
YSA L	.000	.000	-.273	.000	.000	.000	.000	.000	.000	-.030	-.030
UKX1	.000	.000	.000	.000	15.650	.000	1.450	.000	.000	1.900	1.726
SU	.000	.000	.000	.000	11.426	.000	2.320	.000	.000	1.527	1.264
CV	.000	.000	.000	.000	.730	.000	1.600	.000	.000	.259	.186
SE	.000	.000	.000	.000	1.616	.000	.328	.000	.000	.216	.179
YSA U	.000	.000	.000	.000	18.736	.000	2.077	.000	.000	2.313	2.067
YSA L	.000	.000	.000	.000	12.564	.000	.823	.000	.000	1.487	1.385
CHLE	.000	.000	.000	.000	3.600	.000	.000	.000	4.450	.894	.596
SU	.000	.000	.006	.000	6.471	.000	.000	.000	5.058	1.281	.655
CV	.000	.000	.000	.000	1.798	.000	.000	.000	1.137	.326	.223
SE	.000	.000	.000	.000	.915	.000	.000	.000	.715	.181	.121
YSA U	.000	.000	.000	.000	5.348	.000	.000	.000	5.816	1.240	.827
YSA L	.000	.000	.000	.000	1.852	.000	.000	.000	3.084	.548	.365

PERCENT COVER BY SPECIES (Continued)

DRVE	.000	.000	.000	.000	1.950	.050	.000	.000	.000	.222	.216
SU	.000	.000	.000	.000	2.958	.354	.000	.000	.000	.368	.326
CV	.000	.000	.000	.000	1.517	7.071	.000	.000	.000	.954	.783
SE	.000	.000	.000	.000	.418	.050	.000	.000	.000	.052	.046
95% U	.000	.000	.000	.000	2.749	.145	.000	.000	.000	.322	.304
95% L	.000	.000	.000	.000	1.151	-.045	.000	.000	.000	.123	.128
ATSP	.000	.000	.000	.000	.000	11.350	.000	.000	.000	1.261	1.261
SD	.000	.000	.000	.000	.000	26.593	.000	.000	.000	2.955	2.955
CV	.000	.000	.000	.000	.000	2.343	.000	.000	.000	.260	.260
SE	.000	.000	.000	.000	.000	3.751	.000	.000	.000	.418	.418
95% U	.000	.000	.000	.000	.000	18.533	.000	.000	.000	2.059	2.059
95% L	.000	.000	.000	.000	.000	4.167	.000	.000	.000	.463	.463
UNAU	.000	.000	.000	.000	.000	3.250	.000	.000	.000	.361	.361
SD	.000	.000	.000	.000	.000	6.874	.000	.000	.000	.764	.764
CV	.000	.000	.000	.000	.000	2.115	.000	.000	.000	.235	.235
SE	.000	.000	.000	.000	.000	.972	.000	.000	.000	.108	.108
95% U	.000	.000	.000	.000	.000	5.107	.000	.000	.000	.567	.567
95% L	.000	.000	.000	.000	.000	1.393	.000	.000	.000	.155	.155
MIGH	.000	.000	.000	.000	.000	.450	.150	.000	.000	.067	.051
SU	.000	.000	.000	.000	.000	.970	.000	.000	.000	.174	.119
CV	.000	.000	.000	.000	.000	2.156	3.998	.000	.000	.684	.478
SE	.000	.000	.000	.000	.000	.137	.085	.000	.000	.025	.017
95% U	.000	.000	.000	.000	.000	.712	.312	.000	.000	.114	.083
95% L	.000	.000	.000	.000	.000	.188	-.012	.000	.000	.020	.018
AMLY	.000	.000	.000	.000	.000	16.850	.050	.050	.050	1.889	1.870
SD	.000	.000	.000	.000	.000	20.546	.354	.354	.354	2.401	2.269
CV	.000	.000	.000	.000	.000	1.219	7.071	7.071	7.071	2.493	1.152
SE	.000	.000	.000	.000	.000	2.906	.050	.050	.050	.340	.321
95% U	.000	.000	.000	.000	.000	22.400	.145	.145	.145	2.537	2.483
95% L	.000	.000	.000	.000	.000	11.380	-.045	-.045	-.045	1.240	1.257
POSE	.000	.000	.000	.000	.000	.000	1.050	.000	.000	.117	.117
SU	.000	.000	.000	.000	.000	.000	3.610	.000	.000	.401	.401
CV	.000	.000	.000	.000	.000	.000	3.438	.000	.000	.382	.382
SE	.000	.000	.000	.000	.000	.000	.511	.000	.000	.057	.057
95% U	.000	.000	.000	.000	.000	.000	2.025	.000	.000	.225	.225
95% L	.000	.000	.000	.000	.000	.000	.075	.000	.000	.008	.008
GIMI	.000	.000	.000	.000	.000	.000	.000	2.550	.000	.283	.283
SD	.000	.000	.000	.000	.000	.000	.000	4.359	.000	.484	.484
CV	.000	.000	.000	.000	.000	.000	.000	1.709	.000	.190	.190
SE	.000	.000	.000	.000	.000	.000	.000	.616	.000	.068	.068
95% U	.000	.000	.000	.000	.000	.000	.000	3.727	.000	.414	.414
95% L	.000	.000	.000	.000	.000	.000	.000	1.373	.000	.153	.153
CYTE	.000	.000	.000	.000	.000	.000	.000	6.500	.000	.722	.722
SU	.000	.000	.000	.000	.000	.000	.000	14.516	.000	1.613	1.613
CV	.000	.000	.000	.000	.000	.000	.000	2.233	.000	.248	.248
SE	.000	.000	.000	.000	.000	.000	.000	2.053	.000	.228	.228
95% U	.000	.000	.000	.000	.000	.000	.000	10.421	.000	1.158	1.158
95% L	.000	.000	.000	.000	.000	.000	.000	2.579	.000	.287	.287
CIMY	.000	.000	.000	.000	.000	.000	.000	.300	.000	.033	.033
SU	.000	.000	.000	.000	.000	.000	.000	2.121	.000	.236	.236
CV	.000	.000	.000	.000	.000	.000	.000	7.071	.000	.786	.786
SE	.000	.000	.000	.000	.000	.000	.000	.300	.000	.033	.033
95% U	.000	.000	.000	.000	.000	.000	.000	.875	.000	.097	.097
95% L	.000	.000	.000	.000	.000	.000	.000	-.273	.000	-.030	-.030
TOTAL	67.900	35.400	70.050	17.400	31.900	78.850	23.450	50.300	14.900	43.350	8.077
SU	31.588	25.104	28.160	11.042	15.888	36.335	20.509	36.473	10.582	23.965	3.354
CV	.465	.709	.402	.635	.498	.461	.875	.725	.710	.609	.053
SE	4.467	3.550	3.982	1.562	2.247	5.138	2.900	5.158	1.497	3.389	.474
95% U	76.432	42.181	77.656	20.383	36.192	88.665	28.990	60.152	17.758	49.823	8.983
95% L	59.368	28.619	62.444	14.417	27.608	69.035	17.910	40.448	12.042	36.877	7.171

SPECIES DIVERSITY

TOTAL COVER AND SPECIES DIVERSITY OF HILL IN ECOLOGY, 1973

	1 SBURN	2 TBURN	3UNBURN	4 BURNWF	5 UNEROD	6 UNBURN	7 TBURN	8 CORNHL	9 ERODED	MEAN	STAN ERR
TOTAL	67.900	35.400	70.050	17.400	31.900	78.850	23.450	50.300	14.900	43.350	8.077
N(0)	15.000	10.000	15.000	8.000	8.000	9.000	7.000	10.000	6.000	9.778	1.077
N(1)	4.216	3.376	4.729	3.220	4.459	3.278	1.866	5.064	2.919	3.681	.338
N(2)	3.350	2.757	3.485	2.426	3.258	2.518	1.363	3.636	2.456	2.405	.238

FREQUENCY OF OCCURRENCE

	1 STBURN	2 73BURN	3UNBURN	4 BURNWF	5 UNEROD	6 UNBURN	7 78BURN	8 CONTRL	9 ERODED	MEAN	STAN ERR
AGSP	62.000	54.000	12.000	.000	.000	.000	.000	.000	.000	14.222	8.403
POSA	96.000	98.000	94.000	86.000	16.000	10.000	.000	26.000	14.000	48.889	14.322
URTE	58.000	4.000	96.000	56.000	44.000	98.000	88.000	92.000	2.000	59.778	12.541
LOMA	18.000	10.000	20.000	.000	.000	.000	.000	.000	.000	5.333	2.809
PHLO	84.000	60.000	.000	.000	.000	.000	.000	.000	.000	16.000	10.770
LULA	2.000	.000	.000	.000	.000	.000	.000	.000	.000	.222	.222
FEUC	24.000	.000	.000	.000	.000	.000	.000	14.000	.000	4.222	2.914
ASLY	16.000	.000	.000	.000	.000	.000	.000	.000	.000	1.778	1.778
DEPU	4.000	.000	.000	.000	.000	.000	.000	.000	.000	.444	.444
SARA	2.000	.000	2.000	.000	4.000	.000	.000	.000	.000	.889	.484
LASE	6.000	.000	.000	.000	.000	.000	.000	.000	.000	.667	.667
UNMY	2.000	.000	.000	.000	.000	.000	.000	.000	.000	.222	.222
CAMA	2.000	4.000	.000	2.000	.000	.000	.000	.000	.000	.889	.484
ANTR	2.000	.000	.000	.000	.000	.000	.000	38.000	.000	4.444	4.200
ANTR8	2.000	.000	.000	.000	.000	.000	.000	90.000	.000	10.222	9.975
DEPI	.000	22.000	.000	48.000	18.000	4.000	.000	.000	14.000	11.778	5.369
SIAL	.000	10.000	2.000	10.000	78.000	6.000	18.000	32.000	82.000	26.444	10.608
AGUS	.000	2.000	4.000	.000	.000	.000	.000	.000	.000	.667	.471
ALSY	.000	2.000	10.000	6.000	.000	.000	.000	.000	.000	2.000	1.202
CELA	.000	.000	72.000	12.000	.000	.000	.000	.000	.000	9.333	7.944
FRPU	.000	.000	2.000	.000	.000	.000	.000	.000	.000	.222	.222
STTH	.000	.000	8.000	.000	.000	.000	.000	.000	.000	.889	.889
BRUD	.000	.000	8.000	2.000	.000	.000	.000	.000	.000	1.111	.889
BACA	.000	.000	2.000	.000	.000	.000	.000	.000	.000	.222	.222
HEUN	.000	.000	4.000	.000	.000	.000	2.000	.000	.000	.667	.471
STCO	.000	.000	2.000	.000	.000	.000	.000	.000	.000	.222	.222
UNMI	.000	.000	.000	.000	98.000	.000	48.000	.000	.000	16.222	11.511
CHLE	.000	.000	.000	.000	66.000	.000	.000	.000	88.000	17.111	11.465
UNVE	.000	.000	.000	.000	58.000	2.000	.000	.000	.000	6.667	6.420
ATSP	.000	.000	.000	.000	.000	26.000	.000	.000	.000	2.889	2.889
UNAU	.000	.000	.000	.000	.000	42.000	.000	.000	.000	4.667	4.667
HIGH	.000	.000	.000	.000	.000	18.000	6.000	.000	.000	2.667	2.028
EMLY	.000	.000	.000	.000	.000	72.000	2.000	2.000	2.000	8.667	7.923
POSE	.000	.000	.000	.000	.000	.000	12.000	.000	.000	1.333	1.333
GIMI	.000	.000	.000	.000	.000	.000	.000	52.000	.000	5.778	5.778
CYTE	.000	.000	.000	.000	.000	.000	.000	28.000	.000	3.111	3.111
CIMY	.000	.000	.000	.000	.000	.000	.000	2.000	.000	.222	.222

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