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Programming Phase of Water Response Ecosystem Model III. Animal Submodel

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PROGRAMMING PHASE OF WATER RESPONSE ECOSYSTEM MODEL: III. ANIMAL SUBMODEL

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This report describes a portion of the Desert Biome Water Response Ecosystem Model. Five Research Memoranda comprise the full description: Introduction and support programs (RM 76-36); Abiotic submodels (RM 76-37); Animal submodel (RM 76-38); Perennial plant, nitrogen and decomposition submodels (RM 76-39); and Annual plant submodel (RM 76-40). The objectives of the Water Response Model, information on the arrangement of material distributed among the five Research Memoranda and descriptions of program MAIN and support programs F1, F3 and FTAVE are contained in Research Memorandum 76-36, **Programming phase of water response ecosystem model: I. Introduction and support programs.** The relationships between various sections of the model, their interactions and location in the report series are summarized in Table 1 of RM 76-36.

GENERAL DESCRIPTION OF THE ANML SUBMODEL

The animal submodel currently employed in the Water Response Model fulfills the role of a vegetation removal function. It simulates changes in animal numbers and food consumption with time, using data collected on the study site. Two animal organisms are presently represented in the submodel. These are the black-tailed jackrabbit (*Lepus californicus*) and the collective population of herbivorous insects found on the Curlew Valley site.

Jackrabbit population dynamics are modeled after nine years of data compiled by Gross et al. (1974). The population follows a 10-year sine wave with a mean density of 0.62/ha. During the breeding season population dynamics are driven by the birth and death rates characteristic of that period. Death rates during the remainder of the year are determined by the population level relative to a 10-year sine curve. The magnitude of the sine curve is determined from data collected on the site. Control of the population density to that of the reference density (sine wave) is accomplished by a logistic mechanism where the carrying capacity (K) is represented as the sine curve. The control equation used is given by Equation 1:

$$(dN/dt) = N(RC)\,(CK - N)/CK \qquad (1)$$

where

N = population density
RC = rate of return to reference
CK = reference population density (sine curve)

Typical yearly jackrabbit population dynamics are shown in Figure 1.

The calculation of vegetation consumption by jackrabbits is based on data collected by Westoby (1973) and varies both seasonally and with diet preferences. *Sitanion* and *Halogeton* make up a large portion of the diet.

Vegetation consumption by insects is estimated from the number of herbivorous insects observed on the site and the energy requirements for each species. Soil insects are not included in the estimate. Energy requirements are determined using Reichle's equation for vegetation consumption by forest floor insects (Reichle 1967) given in Equation 2:

$$Y = 0.063\,X^{.68} \qquad (2)$$

where

Y = milligrams consumed
X = milligrams dry body weight

Vegetation removal by insects was found to be negligible for the shrubs and is not mechanized in the submodel. An average consumption rate is used in simulating insect removal of annual plant material.

PROGRAM DESCRIPTION

Only the important segments of the code in the program listing are shown and described. Sequence numbers are shown to aid in reference to the full code listing which follows the program description. All comment cards, specification statements and bookkeeping sections have been left out. Almost all initialization has been deleted also. Definitions of variable names may be found in Table 1, which also appears at the beginning of the program listing.

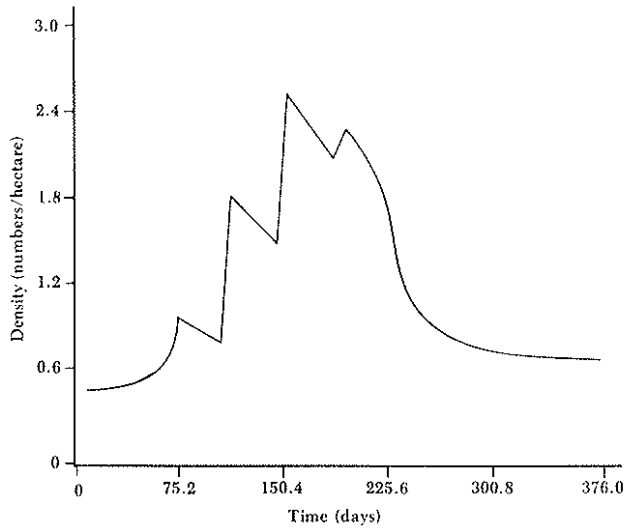

Figure 1. Typical yearly jackrabbit population dynamics.

Table 1. Variable dictionary for ANML

A	MEAN JACKRABBIT POPULATION DENSITY
B	FREQUENCY FACTOR OF POPULATION CYCLE
C	DAY UPON WHICH REPRODUCTIVE SEASON COMENSES
CAAR(I,J)	BIOMASS OF A GIVEN PLANT PART OF A PARTICULAR FUNCTIONAL GROUP INGESTED BY JACKRABBITS
CADEST(I,J)	BIOMASS OF A GIVEN PLANT PART OF A PARTICULAR FUNCTIONAL GROUP WASTED BY JACKRABBITS
CI(I,J)	BIOMASS OF A GIVEN PLANT PART OF A PARTICULAR FUNCTIONAL GROUP CONSUMED BY INSECTS
CK	REFERENCE POPULATION LEVEL FOR JACKRABBITS
CON(I)	TOTAL CONSUMPTION OF A GIVEN FUNCTIONAL GROUP BY JACKRABBITS
CONI(I)	TOTAL CONSUMPTION OF A GIVEN FUNCTIONAL GROUP BY INSECTS
CR(I,J,K)	JACKRABBIT CONSUMPTION RATE/PLANT SPECIES/PLANT PART/ SEASON
DR	JACKRABBIT MORTALITY RATE
DT	TIME STEP
D	MAGNITUDE OF JACKRABBIT CYCLIC VARIATION
FF	FRACTION OF JACKRABBIT INTAKE CONVERTED TO FECES
RC	RATE OF RETURN TO EXPECTED JACKRABBIT FLUCTUATION
T	JULIAN DAY
R(K)	JACKRABBIT REPRODUCTIVE RATES
TCON	TOTAL CONSUMPTION BY JACKRABBITS
V	JACKRABBIT CYCLE YEAR AT START
W(I,J,K)	JACKRABBIT WASTAGE/PLANT SPECIES/PLANT PART/SEASON
X	JACKRABBIT POPULATION DENSITY
XFTS(1)	JACKRABBIT FECES
XR	JACKRABBIT POPULATION DENSITY DURING BREEDING SEASON
XVLITR(2,1)	LITTER CATEGARY FOR FECES
XVPLNT(I,J)	PLANT PART FOR A GIVEN FUNCTIONAL GROUP
YB	NUMBER OF YOUNG JACKRABBITS BORN

```
XR=XR-XR*DR*DT
```

ANML 107

Individuals that die during gestation are removed from the population. The number removed is determined by the relative mortality rate (DR) for this period.

```
YB=XR*R(K)
```

ANML 110

The number of young born (YB) to a given litter ($K = 1, 2, 3$ or 4 corresponding to the first, second, third and fourth litter of the breeding season) is determined by multiplying the population density (XR) by the relative birth rate ($R(K)$) for that litter.

```
X=X+YB-YB*DR*DT-X*DR*DT
```

ANML 115

The population is corrected for birth and death using the relative mortality rate (DR).

```
3 CK=A+D*SIN(B*V)
```

ANML 119

This equation generates the reference density to which the population is controlled. The reference density follows a 10-year sine curve with a mean value (A) of 62/km^2, a mean to peak amplitude (D) of 68/km^2 and a frequency factor (B) of 0.628. V is the cycle year.

```
X=X+X*DT*RC*(CK-X)/CK
```

ANML 121

Population density is controlled to the reference density during nonbreeding times of the year. This is accomplished using the logistic equation in difference form where

X = population density
RC = rate of return to the reference density
CK = reference density

```
CAAR(I,J)=X*.01*CR(I,J,L1)*DT
```

ANML 135

This equation calculates the biomass of a particular plant part of a given functional group ingested by jackrabbits. This is done by multiplying the population density (X) by the relative ingestion rate for the current season of the year (CR). The factor .01 converts kilometers to hectares.

```
CADEST(I,J)=X*.01*H(I,J,L1)*DT
```

ANML 136

This equation calculates the biomass of a particular plant part of a given functional group wasted by jackrabbits. The equation is the same form as that used for ingestion.

```
CON(I)=CON(I)+CAAR(I,J)+CADEST(I,J)                    ANML 137
```

Here ingestion and wastage are summed over plant parts.

```
13 TCON=TCON+CAAR(I,J)                                 ANML 138
```

Total plant material ingested by jackrabbits is obtained by summing ingestion over all plant parts and functional groups.

```
XVLITR(2,1)=XVLITR(2,1)+FF*TCON                        ANML 140
```

Feces, calculated by multiplying the fraction of intake converted to feces by the total material ingested, is added to the proper litter category.

```
CONI(I)=CONI(I)+CI(I,J)*XVPLNT(I,J)*DT                 ANML 156
```

Insect consumption for each plant is determined by summing consumption of each plant part. Plant part consumption is calculated by multiplying plant part biomass by the insect consumption rate (*CI*). Here *CI* represents a fraction of the biomass removed during each time-step.

```
16 CAAR(I,J)=CI(I,J)*XVPLNT(I,J)*DT+CAAR(I,J)          ANML 159
```

Here insect consumption is added to jackrabbit ingestion to determine the total plant material removed through animal ingestion.

```
ENTRY AINIT                                            ANML 166
```

ANML Initialization Section

Initial data are read in and written here.

```
READ(5,850)RCHECK                                      ANML 186
WRITE(6,851)RCHECK                                     ANML 187
WRITE(6,852)                                           ANML 188
```

These statements are used to read and write comments (the variable RCHECK is used only to read and write comments). These particular statements read and write the comment BEGIN ANML INITIALIZATION.

```
      READ(5,850)RCHECK                                                 ANML 191
      WRITE(6,851)RCHECK                                                ANML 192
      READ(5,/)X                                                        ANML 193
      WRITE(6,/)X                                                       ANML 194
      WRITE(6,852)                                                      ANML 195
```

These statements read and write the comments NUMBER OF JACKRABBITS/SQUARE KM followed by reading and writing the values of the variable.

A similar procedure is utilized for reading and writing *R*, *DR*, *A*, *B*, *V*, *C*, *D*, *RC*, *FF*, *CR*, *W* AND *CI*.

```
      READ(5,850)RCHECK                                                 ANML 282
      WRITE(6,851)RCHECK                                                ANML 283
      WRITE(6,852)                                                      ANML 284
```

These statements read and write the comment END ANML INITIALIZATION.

COMPLETE PROGRAM LISTING

```
$ RESET FREE                                                                ANML 001
$SET OWN                                                                    ANML 002
$ SET SEPARATE                                                              ANML 003
C                                                                           ANML 004
C                                                                           ANML 005
      SUBROUTINE ANML                                                       ANML 006
C                                                                           ANML 007
C     VEGETATION REMOVAL FUCNTION OF DESERT BIOME WATER RESPONSE MODEL      ANML 008
C                                                                           ANML 009
C      MARCH 1976.          WRITTEN BY:     JOHN E. HEASLEY                ANML 010
C                                           WILDLIFE SCIENCE,UMC 52        ANML 011
C                                           UTAH STATE UNIVERSITY          ANML 012
C                                           LOGAN,UTAH 84322               ANML 013
C                                                                          ANML 014
C                                                                          ANML 015
CVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVANML 016
CVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVANML 017
C                                                                          ANML 018
C                      VARIABLE DICTIONARY FOR ANML                        ANML 019
C                                                                          ANML 020
C                                                                          ANML 021
C     A              MEAN JACKRABBIT POPULATION DENSITY                    ANML 022
C                                                                          ANML 023
C     B              FREQUENCY FACTOR OF POPULATION CYCLE                  ANML 024
C                                                                          ANML 025
C     C              DAY UPON WHICH REPRODUCTIVE SEASON COMENSES           ANML 026
C                                                                          ANML 027
C     CHAR(I,J)      BIOMASS OF A GIVEN PLANT PART OF A PARTICULAR         ANML 028
C                    FUNCTIONAL GROUP INGESTED BY JACKRABBITS              ANML 029
C                                                                          ANML 030
C     CHDEST(I,J)    BIOMASS OF A GIVEN PLANT PART OF A PARTICULAR         ANML 031
C                    FUNCTIONAL GROUP WASTED BY JACKRABBITS                ANML 032
C                                                                          ANML 033
C     CI(I,J)        BIOMASS OF A GIVEN PLANT PART OF A PARTICULAR         ANML 034
C                    FUNCTIONAL GROUP CONSUMED BY INSECTS                  ANML 035
C                                                                          ANML 036
C     CK             REFERENCE POPULATION LEVEL FOR JACKRABBITS            ANML 037
C                                                                          ANML 038
C     CON(I)         TOTAL CONSUMPTION OF A GIVEN FUNCTIONAL GROUP BY      ANML 039
C                    JACKRABBITS                                           ANML 040
C                                                                          ANML 041
C     CONI(I)        TOTAL CONSUMPTION OF A GIVEN FUNCTIONAL GROUP BY      ANML 042
C                    INSECTS                                               ANML 043
C                                                                          ANML 044
C     CR(I,J,K)      JACKRABBIT CONSUMPTION RATE/PLANT SPECIES/PLANT PART/ANML 045
C                    SEASON                                                ANML 046
C                                                                          ANML 047
C     DR             JACKRABBIT MORTALITY RATE                             ANML 048
C                                                                          ANML 049
C     DT             TIME STEP                                             ANML 050
C                                                                          ANML 051
C     D              MAGNITUDE OF JACKRABBIT CYCLIC VARIATION              ANML 052
```

```
C                                                                       ANML 053
C     FF            FRACTION OF JACKRABBIT INTAKE CONVERTED TO FECES    ANML 054
C                                                                       ANML 055
C     RC            RATE OF RETURN TO EXPECTED JACKRABBIT FLUCTUATION   ANML 056
C                                                                       ANML 057
C     T             JULIAN DAY                                          ANML 058
C                                                                       ANML 059
C     R(K)          JACKRABBIT REPRODUCTIVE RATES                       ANML 060
C                                                                       ANML 061
C     TCON          TOTAL CONSUMPTION BY JACKRABBITS                    ANML 062
C                                                                       ANML 063
C     V             JACKRABBYT CYCLE YEAR AT START                      ANML 064
C                                                                       ANML 065
C     W(I,J,K)      JACKRABBIT WASTAGE/PLANT SPECIES/PLANT PART/SEASON  ANML 066
C                                                                       ANML 067
C     X             JACKRABBIT POPULATION DENSITY                       ANML 068
C                                                                       ANML 069
C     XWFTS(1)      JACKRABBIT FECES                                    ANML 070
C                                                                       ANML 071
C     XR            JACKRABBIT POPULATION DENSITY DURING BREEDING SEASON ANML 072
C                                                                       ANML 073
C     XVLITR(2,1)   LITTER CATEGARY FOR FECES                           ANML 074
C                                                                       ANML 075
C     XVPLNT(I,J)   PLANT PART FOR A GIVEN FUNCTIONAL GROUP             ANML 076
C                                                                       ANML 077
C     YB            NUMBER OF YOUNG JACKRABBITS BORN                    ANML 078
C                                                                       ANML 079
C                                                                       ANML 080
CVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVANML 081
CVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVVANML 082
C                                                                       ANML 083
C                                                                       ANML 084
      T=PHJDAT                                                          ANML 085
C SET BOOKKEEPING CONSTANTS EQUAL TO THE NUMBER OF TIME CONSTANTS IN THEANML 086
C BREEDING SEASON (IL) AND THE NUMBER OF TIME CONSTANTS DURING GESTATIONANML 087
C (JL)                                                                  ANML 088
      M=DT                                                              ANML 089
      IL=160/M                                                          ANML 090
      JL=40/M                                                           ANML 091
      IF(T.LE.365)GO TO 7                                               ANML 092
C INCREMENT THE JACKRABBIT POPULATION CYCLE                             ANML 093
      V=V+1                                                             ANML 094
    7 IF(T-C)3,2,2                                                      ANML 095
C STATEMENTS 2 TO 3 INCLUDE CALCULATIONS FOR POPULATION CHANGE DURING   ANML 096
C THE BREEDING SEASON                                                   ANML 097
    2 IB=IB+1                                                           ANML 098
      JB=JB+1                                                           ANML 099
      IF(IB.GT.IL)GO TO 3                                               ANML 100
      IF(IB.EQ.1)XR=X                                                   ANML 101
      IF(IB.EQ.1)JB=0                                                   ANML 102
      IF(JB.EQ.JL)JB=0                                                  ANML 103
C K EQUALS THE LITTER NUMBER OF THE BREEDING SEASON                     ANML 104
      IF(JB.EQ.0)K=K+1                                                  ANML 105
C INDIVIDUALS THAT DIED DURING GESTATION ARE REMOVED FROM THE POPULATIONANML 106
      XR=XR-XR*DR*DT                                                    ANML 107
      IF(JB.GT.0)GO TO 5                                                ANML 108
C THE NUMBER OF YOUNG BORN ARE CALCULAED NEXT                           ANML 109
      YB=XR*R(K)                                                        ANML 110
      GO TO 8                                                           ANML 111
    5 YB=0.                                                             ANML 112
    8 CONTINUE                                                          ANML 113
C THE POPULATION IS NOW CORRECTED FOR BIRTH AND DEATH                   ANML 114
      X=X+YB-YB*DR*DT-X*CR*DT                                           ANML 115
      GO TO 9                                                           ANML 116
C CALCULATE THE REFERENCE POPULATION DENSITY CHARACTERISTIC TO THE       ANML 117
C SPECIES                                                               ANML 118
    3 CK=A+D*SIN(B*V)                                                   ANML 119
C ADJUST POPULATION DENSITY TOWARD THE REFERENCE VALUE                  ANML 120
      X=X+X*DT*RC*(CK-X)/CK                                             ANML 121
      IF(T.LT.C)IB=0                                                    ANML 122
      IF(T.LT.C)JB=0                                                    ANML 123
      IF(T.LT.C)K=0                                                     ANML 124
    9 CONTINUE                                                          ANML 125
C THE FOLLOWING "IF" STATEMENTS SET THE CONSUMPTION RATES CORRESPONDING ANML 126
C TO THE CURRENT SEASON                                                 ANML 127
      IF(T.GE.0.AND.T.LT.32.OR.T.GE.305.AND.T.LE.365)L1=1               ANML 128
      IF(T.GE.32.AND.T.LE.120)L1=2                                      ANML 129
      IF(T.GE.121.AND.T.LE.211)L1=3                                     ANML 130
      IF(T.GE.212.AND.T.LE.304)L1=4                                     ANML 131
C CALCULATE JACKRABBIT INGESTION AND WASTAGE                            ANML 132
      DO 13 I=1,6                                                       ANML 133
      DO 13 J=1,6                                                       ANML 134
      CAAR(I,J)=X*.01*CR(I,J,L1)*DT                                     ANML 135
      CAGEST(I,J)=X*.01*A(I,J,L1)*DT                                    ANML 136
      CON(I)=CON(I)+CAAR(I,J)+CAGEST(I,J)                               ANML 137
   13 TCON=TCON+CAAR(I,J)                                               ANML 138
C ADD FECES TO LITTER                                                   ANML 139
      XVLITR(2,1)=XVLITR(2,1)+FF*TCON                                   ANML 140
      XWFTS(1)=FF*TCON                                                  ANML 141
      TCON=0.                                                           ANML 142
```

```
C THE FOLLOWING FIVE EQUATIONS SET UP VARIABLES FOR PLOTTING                ANML 143
      XANUMB(I,1)=X*.01                                                    ANML 144
      XAANT(1)=CON(1)                                                      ANML 145
      XAANT(2)=CON(2)                                                      ANML 146
      XAANT(3)=CON(3)                                                      ANML 147
      XAANT(4)=CON(6)                                                      ANML 148
      DO 14 I=1,6                                                          ANML 149
   14 CON(I)=0.                                                            ANML 150
      IF(PMJDAT.GE.90.AND.PMJDAT.LE.304) GO TO 17                          ANML 151
      GO TO 15                                                             ANML 152
C CALCULATE INSECT CONSUMPTION                                             ANML 153
   17 DO 16 I=1,6                                                          ANML 154
      DO 16 J=1,6                                                          ANML 155
      CON(I)=CON(I)+CI(I,J)*XVPLNT(I,J)*DT                                 ANML 156
C ADD INSECT CONSUMPTION TO JACKRABBIT CONSUMPTION TO GET TOTAL ANIMAL     ANML 157
C CONSUMPTION                                                              ANML 158
   16 CAAR(I,J)=CI(I,J)*XVPLNT(I,J)*DT+CAAR(I,J)                           ANML 159
      DO 19 I=1,6                                                          ANML 160
   19 XANUMB(2,I)=CON(I)                                                   ANML 161
      DO 16 I=1,6                                                          ANML 162
   18 CON(I)=0.                                                            ANML 163
   15 CONTINUE                                                             ANML 164
      RETURN                                                               ANML 165
      ENTRY AINIT                                                          ANML 166
C IN THIS SECTION ARE THE READING AND WRITING OF DATA INPUT TO THE         ANML 167
C SUBROUTINE                                                               ANML 168
      COMMON TIME,TSTART,TEND,DT,DTPR,DTPL,                                ANML 169
     1CAAR(6,8),CADEST(6,8),CADETH,CAUWST,CDDL(12,4),CHD(10),CHDX(10),     ANML 170
     2CHDXX(10),CNFIX,CNSOF,CNSDS,CNSOMF,CNSOMS,CNSUP,CVDETH(12,4),        ANML 171
     3CVLTFR(11,4),CVPHEN(6,8),CVPHS(6),CVRDST(6,10),CVTSPR(6,8),CVVCOV,   ANML 172
     4CWINF,CWPSI(10),PMDT,PMDTPL,PMDTPR,PMFGPS,PMJDAT,PMN,PMNCCH,PMNSP,   ANML 173
     5PMX(109,XAA(4),XAAVHT(4,8),XAAWT(4),XAFTS(4),XAFWT(4),XANUMB(4,8),   ANML 174
     6XASA(4),XASAWT(4),XAYNG(4),XAYWT(4),XHSOLT(10),XNMN,XNSOMF,XNSOMS,   ANML 175
     7XVFG(6,5),XVLITR(12,4),XVPLNT(6,8),XVTOTL,XWTHTA(10),XWSTND,ZAIRT,   ANML 176
     8ZFWAP,ZESUM,ZPHPC,ZRAIN,ZRSUM,ZRH,ZRINT,ZRISUM,ZSUN,ZTMAX,ZTMIN,     ANML 177
     9ZWIND                                                                ANML 178
      DIMENSION R(4),CR(6,6,4),CON(6),W(6,6,4),RCHECK(20),CI(6,6),CONI(6   ANML 179
     1)                                                                    ANML 180
C                                                                          ANML 181
  850 FORMAT(20A4)                                                         ANML 182
  851 FORMAT(' ',20A4)                                                     ANML 183
  852 FORMAT(' ')                                                          ANML 184
C READ IN INITIALIZATION HEADING                                           ANML 185
      READ(5,850)RCHECK                                                    ANML 186
      WRITE(6,851)RCHECK                                                   ANML 187
      WRITE(6,852)                                                         ANML 188
C                                                                          ANML 189
C READ IN INITIAL JACKRABBIT POPULATION DENSITY                            ANML 190
      READ(5,850)RCHECK                                                    ANML 191
      WRITE(6,851)RCHECK                                                   ANML 192
      READ(5,*)X                                                           ANML 193
      WRITE(6,*)X                                                          ANML 194
      WRITE(6,852)                                                         ANML 195
C                                                                          ANML 196
C READ IN JACKRABBIT REPRODUCTIVE RATES                                    ANML 197
      READ(5,850)RCHECK                                                    ANML 198
      WRITE(6,851)RCHECK                                                   ANML 199
      READ(5,*)(R(K),K=1,4)                                                ANML 200
      WRITE(6,*)(R(K),K=1,4)                                               ANML 201
      WRITE(6,852)                                                         ANML 202
C                                                                          ANML 203
C READ IN JACKRABBIT MARTALITY RATE                                        ANML 204
      READ(5,850)RCHECK                                                    ANML 205
      WRITE(6,851)RCHECK                                                   ANML 206
      READ(5,*)DR                                                          ANML 207
      WRITE(6,*)DR                                                         ANML 208
      WRITE(6,852)                                                         ANML 209
C                                                                          ANML 210
C READ IN MEAN JACKRABBIT DENSITY                                          ANML 211
      READ(5,850)RCHECK                                                    ANML 212
      WRITE(6,851)RCHECK                                                   ANML 213
      READ(5,*)A                                                           ANML 214
      WRITE(6,*)A                                                          ANML 215
      WRITE(6,852)                                                         ANML 216
C                                                                          ANML 217
C READ IN FREQUENCY FACTOR OF JACKRABBIT POPULATION CYCLE                  ANML 218
      READ(5,850)RCHECK                                                    ANML 219
      WRITE(6,851)RCHECK                                                   ANML 220
      READ(5,*)B                                                           ANML 221
      WRITE(6,*)B                                                          ANML 222
      WRITE(6,852)                                                         ANML 223
C                                                                          ANML 224
C READ IN JACKRABBIT CYCLE YEAR AT START                                   ANML 225
      READ(5,850)RCHECK                                                    ANML 226
      WRITE(6,851)RCHECK                                                   ANML 227
      READ(5,*)V                                                           ANML 228
      WRITE(6,*)V                                                          ANML 229
      WRITE(6,852)                                                         ANML 230
C                                                                          ANML 231
```

```
C READ IN DAY UPON WHICH REPRODUCTIVE SEASON COMENSES                    ANML 232
      READ(5,850)RCHECK                                                  ANML 233
      WRITE(6,851)RCHECK                                                 ANML 234
      READ(5,*)C                                                         ANML 235
      WRITE(6,*)C                                                        ANML 236
      WRITE(6,852)                                                       ANML 237
C                                                                        ANML 238
C READ IN MAGNITUDE OF CYCLIC VARIATION                                  ANML 239
      READ(5,850)RCHECK                                                  ANML 240
      WRITE(6,851)RCHECK                                                 ANML 241
      READ(5,*)D                                                         ANML 242
      WRITE(6,*)D                                                        ANML 243
      WRITE(6,852)                                                       ANML 244
C                                                                        ANML 245
C READ IN RATE OF RETURN TO EXPECTED JACKRABBIT FLUCTIATION              ANML 246
      READ(5,850)RCHECK                                                  ANML 247
      WRITE(6,851)RCHECK                                                 ANML 248
      READ(5,*)RC                                                        ANML 249
      WRITE(6,*)RC                                                       ANML 250
      WRITE(6,852)                                                       ANML 251
C                                                                        ANML 252
C READ IN FRACTION OF JACKRABBIT INTAKE CONVERTED TO FECES               ANML 253
      READ(5,850)RCHECK                                                  ANML 254
      WRITE(6,851)RCHECK                                                 ANML 255
      READ(5,*)FF                                                        ANML 256
      WRITE(6,*)FF                                                       ANML 257
      WRITE(6,852)                                                       ANML 258
C                                                                        ANML 259
C READ IN JACKRABBIT INGESTION RATES                                     ANML 260
      READ(5,850)RCHECK                                                  ANML 261
      WRITE(6,851)RCHECK                                                 ANML 262
      READ(5,*)(((CR(I,J,K),K=1,4),J=1,6),I=1,6)                         ANML 263
      WRITE(6,*)(((CR(I,J,K),K=1,4),J=1,6),I=1,6)                        ANML 264
      WRITE(6,852)                                                       ANML 265
C                                                                        ANML 266
C READ IN JACKRABBIT WASTAGE RATES                                       ANML 267
      READ(5,850)RCHECK                                                  ANML 268
      WRITE(6,851)RCHECK                                                 ANML 269
      READ(5,*)(((W(I,J,K),K=1,4),J=1,6),I=1,6)                          ANML 270
      WRITE(6,*)(((W(I,J,K),K=1,4),J=1,6),I=1,6)                         ANML 271
      WRITE(6,852)                                                       ANML 272
C                                                                        ANML 273
C READ IN INSECT CONSUMPTION RATES                                       ANML 274
      READ(5,850)RCHECK                                                  ANML 275
      WRITE(6,851)RCHECK                                                 ANML 276
      READ(5,*)((CI(I,J),J=1,6),I=1,6)                                   ANML 277
      WRITE(6,*)((CI(I,J),J=1,6),I=1,6)                                  ANML 278
      WRITE(6,852)                                                       ANML 279
C                                                                        ANML 280
C READ IN INITIALIZATION COMPLETE                                        ANML 281
      READ(5,850)RCHECK                                                  ANML 282
      WRITE(6,851)RCHECK                                                 ANML 283
      WRITE(6,852)                                                       ANML 284
      RETURN                                                             ANML 285
      END                                                                ANML 286
```

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