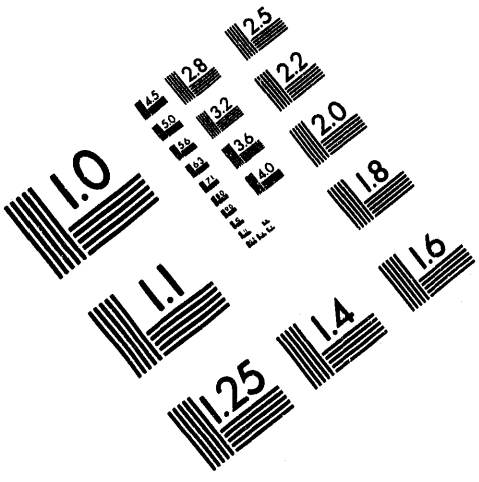

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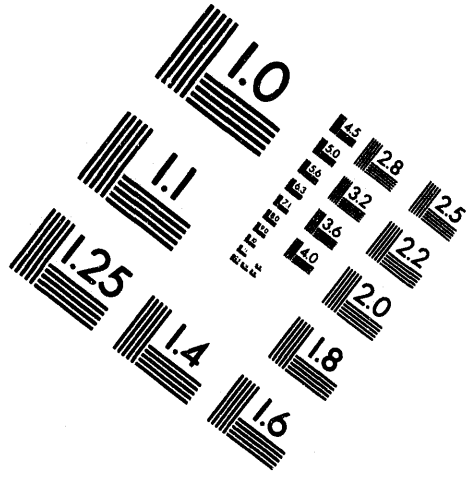

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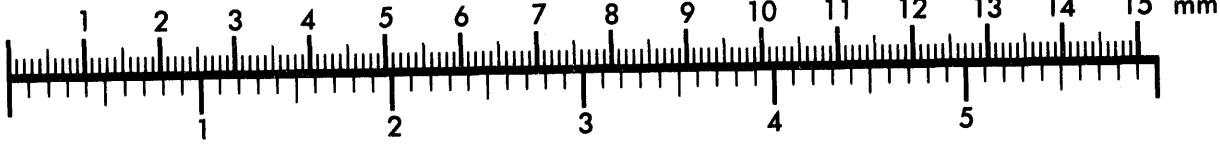

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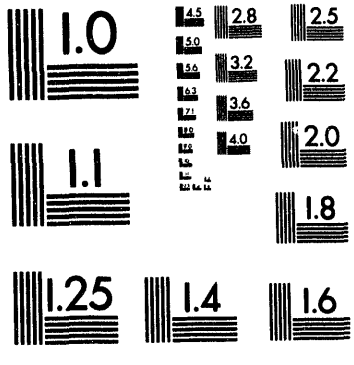

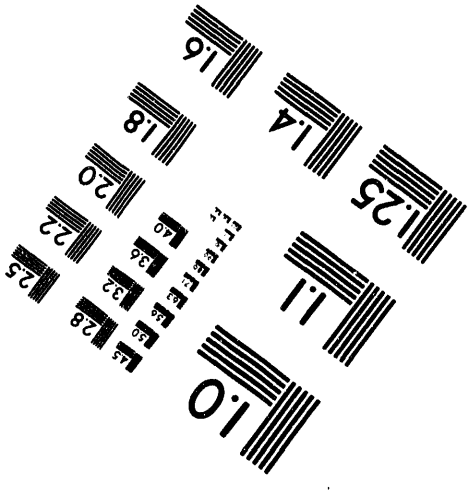

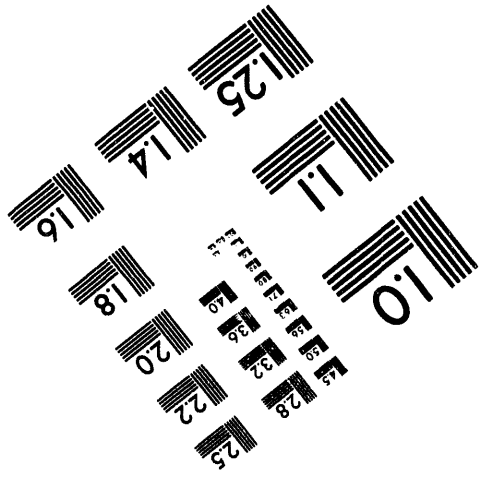

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User Instructions for the DESCARTES Environmental Accumulation Code

Hanford Environmental
Dose Reconstruction Project

T. B. Miley
P. W. Eslinger
W. E. Nichols
K. S. Lessor
S. J. Ouderkirk

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Battelle
Pacific Northwest Laboratories
Richland, Washington 99352

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PREFACE

In 1987, the U.S. Department of Energy (DOE) directed the Pacific Northwest Laboratory, which is operated by Battelle Memorial Institute, to conduct the Hanford Environmental Dose Reconstruction (HEDR) Project. The DOE directive to begin project work followed a recommendation by the Hanford Health Effects Review (HHER) Panel in 1986. The HHER Panel was formed to consider the potential health implications of past Hanford-Site releases of radioactive materials.

Members of a Technical Steering Panel (TSP) were selected to direct the HEDR Project work. The TSP consists of experts in the various technical fields relevant to HEDR Project work and representatives from the states of Washington, Oregon, and Idaho; Native American Tribes; and the public. The technical members on the panel were selected by the vice presidents for research at major universities in Washington and Oregon. The state representatives were selected by the respective state governments. The Native American tribes and public representatives were selected by the other panel members.

A December 1990 memorandum of understanding between the Secretaries of the DOE and the U.S. Department of Health and Human Services (DHHS) transferred responsibility for managing the DOE's dose reconstruction and exposure assessment studies to the DHHS. This transfer resulted in the current contract between Battelle, Pacific Northwest Laboratories (BNW) and the Centers for Disease Control and Prevention, an agency of the DHHS, to continue the project.

The purpose of the HEDR Project is to estimate the radiation dose that individuals could have received as a result of emissions since 1944 from the DOE's Hanford Site near Richland, Washington. The HEDR Project work is conducted under several technical and administrative tasks, among which is the Environmental Pathways and Dose Estimates Task. The staff on this task have developed a suite of computer codes which are used to estimate doses to individuals.

The purpose of this document is to provide user instructions for the DESCARTES environmental accumulation computer code. The document also provides user instructions for several utility codes used to build data libraries for DESCARTES. The DESCARTES code computes environmental concentrations of a radionuclide in various media. The environmental concentrations are aggregated into a single environmental accumulation database for use by the CIDER dose code.

SUMMARY

SCOPE OF WORK

This document provides user instructions for the DESCARTES (Dynamic Estimates of Concentrations and Accumulated Radionuclides in Terrestrial Environments) environmental accumulation computer code. The DESCARTES code computes environmental concentrations of a radionuclide in various media. The environmental concentrations are aggregated into a single environmental accumulation database for use by the CIDER (Calculation of Individual Doses from Environmental Radionuclides) dose code.

This document also provides user instructions for two air data preprocessors, three utility codes used to build data libraries for DESCARTES, and a postprocessor that reformats the DESCARTES output files for use in CIDER. The air preprocessors are SHUFFL and SHFMET, the utility codes are FROSTP, ADIETP and RECIPE, and the database postprocessor is AGGREGATE.

APPROACH TO MODELING UNCERTAINTIES

The DESCARTES suite of codes for modeling accumulation of ^{131}I in environmental media through air pathways was designed to provide estimates of uncertainty in the concentration estimates. The approach chosen consists of providing 100 concentration estimates (called realizations) rather than a single number. Each concentration estimate utilizes a different possible value for hundreds of random variables (for which values are not known with certainty). Some examples of random variables are: wind speed and direction, frost dates, plant growth parameters, animal eating habits, and food distribution networks.

DATA REQUIREMENTS

The DESCARTES codes rely on a set of atmospheric concentrations of ^{131}I produced by other HEDR computer codes. The air concentrations are produced by the RATCHET code. The DESCARTES codes rely on this 1.6 gigabyte set of data files as well as some related data libraries containing realizations of random parameters in order to produce environmental concentration estimates.

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1.0 INTRODUCTION

The purpose of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation dose that individuals could have received as a result of emissions since 1944 from the Hanford Site near Richland, Washington. The HEDR Project work is conducted under several technical and administrative tasks, among which is the Environmental Pathways and Dose Estimates task. The staff on this task have developed a suite of computer codes which are used to estimate doses to individuals in the public.

1.1 DOCUMENT SCOPE

This document contains the user instructions for the DESCARTES (Dynamic Estimates of Concentrations and Accumulated Radionuclides in Terrestrial Environments) suite of codes. In addition to the DESCARTES code, this includes two air data preprocessors, a database postprocessor, and several utility routines that are used to format input data needed for DESCARTES.

1.2 CODE DESCRIPTIONS

The DESCARTES code is nominally described as using air deposition data computed by the RATCHET code to produce environmental accumulation data for use by the CIDER code. In addition to the computations needed to produce the environmental accumulations data, it is necessary to reformat RATCHET data in a form DESCARTES can access and to transform DESCARTES output into a format that is optimized for CIDER operation. Also, utilities are needed for generation of secondary input files required by DESCARTES. The complete linkage between the four HEDRIC codes (STRM, RATCHET, DESCARTES, and CIDER) is depicted in Figure 1.1 with emphasis on the interfaces between DESCARTES and the other codes.

A short description of the major codes described in these user instructions is provided in this section. The codes are presented in the order in which they must be run to process an entire production run of the DESCARTES system of codes.

1.2.1 SHUFFL and SHFMET

RATCHET produces air concentration data and air deposition data and stores this information in a very large number of files. To avoid the burden of handling all of these files, a utility named SHUFFL is provided to resort this information into the format required by DESCARTES and store it in two large data files, one for air deposition and one for air concentration. It is only necessary to run SHUFFL once each time RATCHET is run to produce new air data.

The SHFMET code is used to extend the air deposition and air concentration files for the years 1950 through 1957. There is no meteorological data for these years, so SHFMET is used to simulate the air model and add to the existing air files reprocessed through SHUFFL.

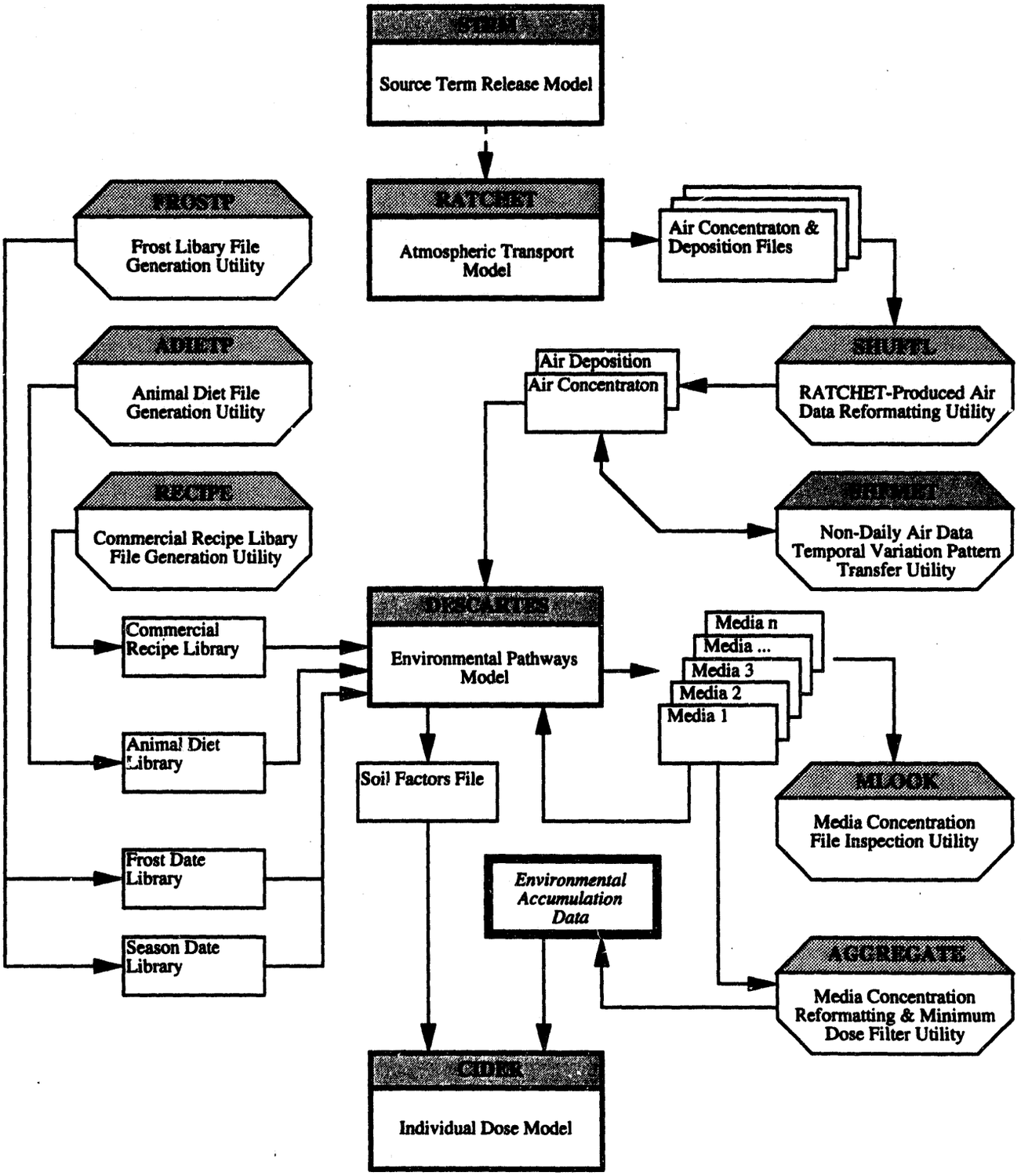


FIGURE 1.1. Interfaces of the HEDRIC System of Codes

1.2.2 DESCARTES Utilities

Three utilities, FROSTP, ADIETP, and RECIPE, are provided to aid in preparing the frost and season date, animal diet, and commercial recipe files. Each of these files is used directly by the DESCARTES code.

1.2.3 DESCARTES

DESCARTES produces a matched set of media concentration files which represent the environmental accumulations for the simulated times and nodes. These files are large, random-access binary files that cannot be directly read. The files are formatted this way because the DESCARTES code must have the ability to write to, or read from, a record for any given time and node. Often media concentration files written by one major module of DESCARTES are used by another major module (e.g., when the biomass and plant production module writes an alfalfa media file that is later read by the animal products module in computing cow milk concentrations). The MLOOK utility is provided to allow the user to examine the contents of a binary media concentration file. MLOOK is menu-driven and interactive, requesting user constraints on how much to extract from a media file and whether to record it to an ASCII file for display it on a screen.

1.2.4 AGGREGATE

When a complete set of media concentration files has been produced using DESCARTES, the AGGREGATE utility is used to restructure them into the form required by the CIDER code. It is only necessary to run AGGREGATE once after producing a complete set of media concentration files, and the output of AGGREGATE can then be used for any number of individual dose computations by CIDER based on the environmental accumulation data produced with DESCARTES.

There is a small file produced by DESCARTES termed the "soil factors file" which contains the ratio of upper soil layer mass loading to upper soil layer areal density which is passed to CIDER. The purpose of this file is to maintain stochastic consistency. These two parameters are the only stochastically-generated values produced in DESCARTES that are also used in CIDER.

1.3 SYSTEM REQUIREMENTS

The DESCARTES system runs on a HEDR Sun 4/690. The HEDR Sun has 4 processors, 256 megabytes of memory, and 27 gigabytes of disk space. The operating system is SunOS 4.1.2.

The DESCARTES code, the air preprocessors, and the DESCARTES utility routines are written in FORTRAN 77 and compiled with SC1.0 Fortran Version 1.4. The AGGREGATE postprocessor is written in C and compiled with SPARCompiler C++ version 3.0.1. The default compiler flags were used.

The SHUFFL program may need to have as many as 105 files open at one time for a run. Not all operating systems, operating system configurations,

or FORTRAN compilers will allow this. The current operating system on the HEDR Sun and the current FORTRAN compiler will allow it, but the limit on the number of file descriptors must be increased by the user before running SHUFFL.

1.4 SYSTEM-DEPENDENT FEATURES

There are two types of system dependent features used in the DESCARTES system: 1) time and date inquiry statements and 2) the INCLUDE statement. The implementation of these features is specific to the SUN environment and may require modification for other platforms.

In addition, binary and ASCII data files produced by the DESCARTES codes may not be compatible with other platforms. Caution should be exercised when porting files to new environments.

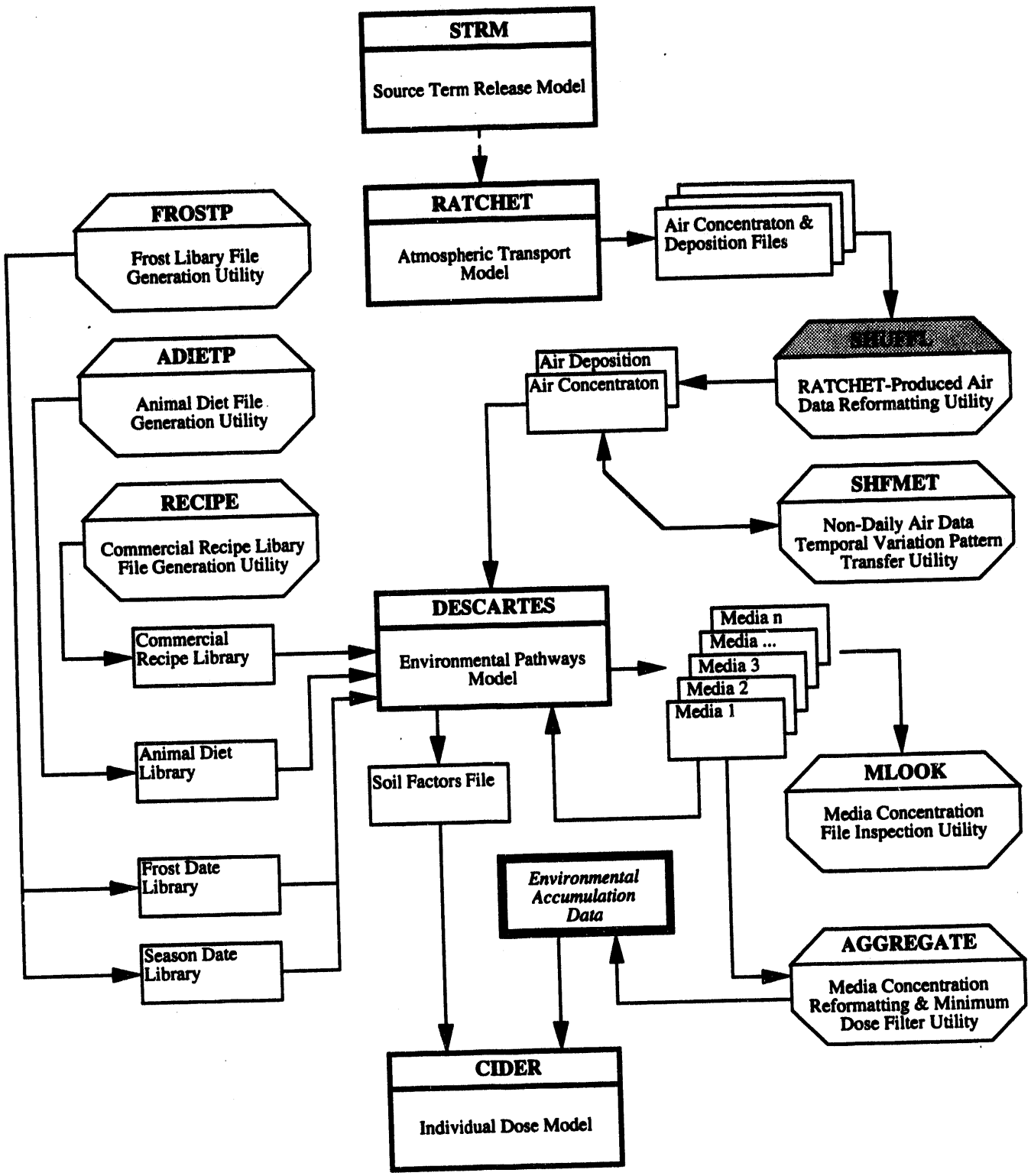
1.5 DATA SIZE REQUIREMENTS

The memory and disk space requirements for the DESCARTES system depend on the actual values of the program parameters at the time of code compilation. The estimates discussed here reflect the parameter values necessary for "production-scale" runs of the codes. Production-scale refers to the current use of DESCARTES, with 1102 geographical nodes, 100 realizations, and 13 years of simulation (December 26, 1944 to December 31, 1957). When compiled with minimum parameter values necessary to produce the CIDER database at production scale, the DESCARTES codes require 105 Mb of random access memory (105 Mb RAM).

The disk space requirements are driven by the size of the output files from the RATCHET atmospheric model that are input to SHUFFL, the size of the output files produced by DESCARTES. An estimate of necessary disk space for a production-scale run of the DESCARTES system is given in Table 1.1. The total disk space requirement is approximately 2.5 Gb.

TABLE 1.1. DESCARTES System Disk Space Requirements

File Type	Size in Megabytes
Code executable files	3.3
Keyword input files	1.7
Report files	13
RATCHET air concentration and deposition files	1,200
Frost, season, animal diet, and recipe library files	68
Soil factors file	<1
Media concentration files	1,600
Total Storage Required	2,486


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Libary File Generation Utility
Air Deposition
Air Concentraton
RATCHET-Produced Air Data Reformatting Utility
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Soil Factors File
Media n
Media ...
Media 3
Media 2
Media 1
MLOOK
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

2.0 SHUFFL USER INSTRUCTIONS

This section describes configuration management version 1.2 of the preprocessor program, SHUFFL, which reads air files written by RATCHET and writes air files in a format expected by DESCARTES.

2.1 DESIGN

The two major reasons SHUFFL was needed are 1) the two air files needed by DESCARTES use a different node numbering scheme than that used by RATCHET, and 2) DESCARTES reads two direct access air files, while RATCHET writes 1200 sequential access air files per year (for monthly RATCHET files and 100 realizations). A RATCHET air file contains both air deposition (surface concentration) values and air concentration (time-integrated concentration) values for a single month. A DESCARTES air file (written by SHUFFL) contains either air deposition values or air concentration values for the entire period of the simulation.

2.1.1 Program Options

SHUFFL can be run either to create new DESCARTES air deposition and air concentration files, or to add data to already existing DESCARTES air deposition and air concentration files. For runs of SHUFFL that add data to existing DESCARTES air deposition and air concentration files, checks will be performed to make sure that the user input for the run is consistent with the data in DESCARTES air files.

2.1.2 Node Numbering Scheme

The node numbering scheme used by RATCHET has 2091 nodes from a 41 by 51 grid where each node is the same size (6 miles by 6 miles). The nodes in the grid are numbered so that node 1 is in the southwest corner and node 2091 is in the northeast corner. For nodes which are not on the eastern border of the study area, the next higher numbered node is one grid unit to the east. For nodes which are on the eastern border of the study area, the next higher numbered node is on the western border of the study area one grid unit to the north.

The node numbering scheme used by DESCARTES has 1102 nodes from a 42 by 51 grid where nodes in the center are 6 miles by 6 miles, but nodes around the edges are 18 miles by 18 miles. There are two columns of large nodes along the west edge of the study area, two rows of large nodes along the south edge of the study area, three columns of large nodes along the east edge of the study area, and three rows of large nodes along the north edge of the study area. The large nodes are made up of 9 regular nodes in a square configuration. The 41 by 51 original study area has been extended to the east by 6 miles to make a 42 by 51 area so that a whole number of large nodes can be placed around the edges. Deposition and concentration values for the large nodes will be taken from the corresponding small nodes that are their centers. Deposition and concentration values for the other small nodes that make up a

large node will be ignored. The nodes in the grid are numbered so that node 1 is in the southwest corner, node 1102 is in the northeast corner, and nodes are in the same relative order as they were in the RATCHET numbering scheme.

2.2 PROGRAM EXECUTION

Before executing SHUFFL for a case with 60 or more realizations, a user must increase the number of file descriptors available from the default of 64 to at least the number of realizations plus five. C shell users may increase this limit for a 100 realization case using the command "limit descriptors 105".

A command to execute shuffl with user input read from file shuffl.inp and log file information appended to file shuffl.log is

```
shuffl <shuffl.inp >>shuffl.log
```

If SHUFFL is run without using the input redirection (<shuffl.inp), then input is expected from the keyboard, but no prompts are given. If SHUFFL is run without using the output redirection (>>shuffl.log), then log file output will go to the screen rather than being saved to a file. Running SHUFFL without input/output redirection is not recommended.

SHUFFL should take about an hour to run a 100-realization case for a year, less than ten minutes to run a 100 realization case for one month, and less than fifteen minutes to run a one realization case for a year, under most circumstances. SHUFFL and its functions and subroutines print an error message and stop as soon as they encounter any error.

SHUFFL and its functions and subroutines check for errors on read statements and open statements, compatibility (on number of realizations, number of nodes, nuclide, data type, starting date, and record length) between user input and existing DESCARTES air files, legal year values, legal day of the year values, legal month values, legal day of the month values, legal x and y grid coordinate values, legal record length values, legal number of realization values, legal number of node values, legal node number values, legal number of RATCHET file set values, adequate string length of parameters, and proper chronological ordering of RATCHET file set data.

2.3 INPUT AND OUTPUT FILES

SHUFFL requires a user input file to set the run parameters and a set of RATCHET air files to be reformatted. The SHUFFL output consists of a pair of DESCARTES-formatted files, one containing air concentrations and the other containing air deposition.

2.3.1 Input Files

SHUFFL reads user input from Fortran unit 5 which is "standard input". SHUFFL reads the RATCHET file set names, starting dates, and number of days of data from a RATCHET file set information file specified in the user input.

SHUFFL reads as many RATCHET output files as necessary for the number of realizations and time period requested in the user input.

User Input File

The user input is free format (with quotation marks around the character strings). The user input contains information shown in Table 2.1.

RATCHET File Set Information File

The RATCHET file set information file contains one record for each RATCHET air data file set. A RATCHET file set contains files for all realizations for a time period (typically a month). A RATCHET file set name can be made into a RATCHET air file name by appending a realization suffix. The RATCHET file set information file contains the names of all the RATCHET file sets, vector RATWOR, the year and day of the year of the first day of data in each of the RATCHET file sets, vectors DAY1YR and DY1DOY, and the number of days of data in each of the RATCHET file sets, vector RDAYS. The

TABLE 2.1. SHUFFL User Input Data Description

Variable	Range	Description
REALZ	1-MAXRLS	Number of realizations of air data to read and write
NAMFIL	NA	File name of RATCHET file set names and dates
DEPFIL	NA	Name of the air deposition file to write for DESCARTES
CONFIL	NA	Name of the air concentration file to write
BSYR	FSTYR-LSTYR	Base year for the DESCARTES air files
BSDOY	1-366	Base day of the year for the DESCARTES air files
YRB	FSTYR-LSTYR	Starting year of data to write for DESCARTES
DOYB	1-366	Starting day of the year of data to write for DESCARTES
YRE	FSTYR-LSTYR	Ending year of data to write for DESCARTES
DOYE	1-366	Ending day of the year of data to write for DESCARTES
NUC	NA	Nuclide the data represents
TITLE	NA	Title for the air deposition and concentration files

user input is free format (with quotation marks around the RATCHET file set names). All data must be included in the RATCHET file set name and date file in the correct order for all runs.

RATCHET Air Files

The format and content of the RATCHET output files is approximately as specified in "Regional Atmospheric Transport Code for Hanford Emission Tracking (RATCHET)", except that the daily header records are 22 characters long instead of 80 characters, the file header records are 98 characters long instead of 80 characters, and the TICI and SCI arrays are written in column major order not row major order.

2.3.2 Output Files

SHUFFL writes to one DESCARTES air deposition file and one DESCARTES air concentration file in each run; the air files have names specified in the input. SHUFFL writes a log file to Fortran unit 6 which is "standard output".

DESCARTES Concentration and Deposition Files

The DESCARTES air deposition and air concentration files are binary fixed record length files. The format of these files is given in the DESCARTES design description.[a] The record length for the DESCARTES air files, RECL, is MAX (3 * BYTIN2 + REALZS * BYTRL, MNRECL), where REALZS is the number of realizations to be written to the DESCARTES air files, BYTIN2 is the number of bytes required to hold an integer*2, BYTRL is the number of bytes required to hold a floating point value, and MNRECL is the minimum record length.

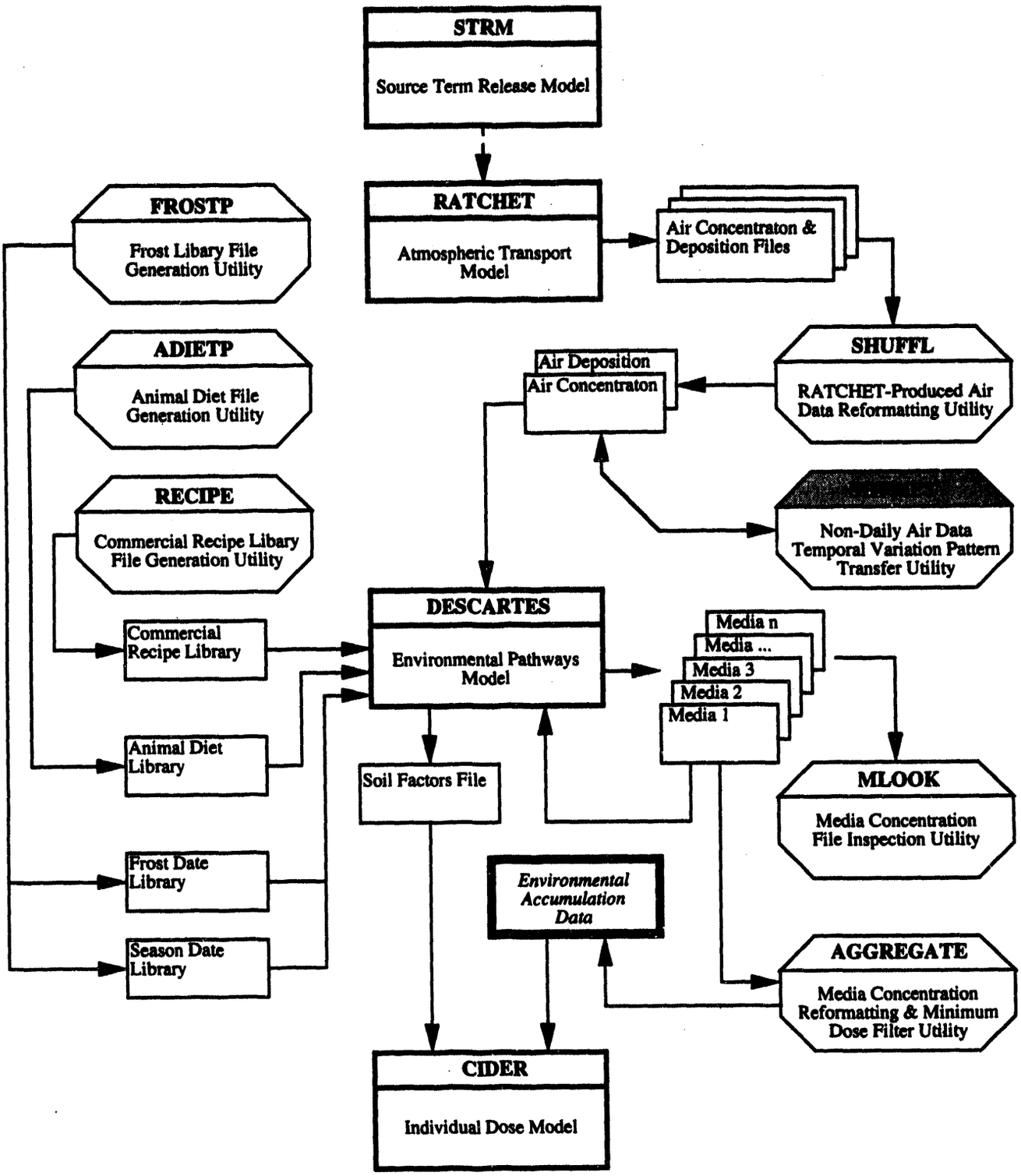
All runs of SHUFFL will write all DESCARTES nodes to the air deposition and air concentration files. Air deposition and air concentration data will be written on a daily time step for the period the user requests for a run. Each record in the air files will contain data for the number of realizations the user requested. The records in the air files will be ordered so that time (year and day) varies least rapidly and node varies most rapidly. If a run of SHUFFL is made for a period of time before all earlier periods have been run, there will be records in the DESCARTES air deposition and air concentration files that do not contain air deposition or air concentration data; these records will be identifiable because they will not have their "Node ID", "Year", or "Day of year" fields set.

The DESCARTES air files contain the data for a subset of the RATCHET grid nodes in a format that is convenient for DESCARTES. The air deposition values are in Ci / m^2 and the air concentration values are in Ci-s / m^3.

(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Eslinger, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BNW, January 1994.

The Log File

The log file contains the starting time for the run, the Source Code Control System (SCCS) file for the SHUFFL program, the version number of the SHUFFL program, the login ID of the user making the run, the record length of the DESCARTES air files, the number of DESCARTES nodes, all the user input, the names and modification dates for all the RATCHET files read for this run, and the ending time for this run. The log file is a sequential-access formatted file designed to provide Quality Assurance traceability of SHUFFL output.


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Libary File Generation Utility
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
Air Deposition
Air Concentraton
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Media n
Media ...
Media 3
Media 2
Media 1
Soil Factors File
MLOOK
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

3.0 SHFMET USER INSTRUCTIONS

This section describes a utility program (SHFMET) that uses source terms output by the STRM code along with output from the RATCHET code to simulate meteorological data for the years 1950 through 1957. This simulation is done because meteorological data are not available for 1950 through 1957.

3.1 DESIGN

The mathematical basis for the SHFMET algorithm is a concentration equation that is linear in terms of the initial concentration. The SHFMET algorithm consists of the two equations:

$$C_{to} = C_{ti} * R_{to}/R_{ti}$$

and

$$D_{to} = D_{ti} * R_{to}/R_{ti}$$

where

C_{to} = concentration (ci/m^3) at the time desired for output (year and day)

C_{ti} = concentration (ci/m^3) at the time desired for input (year and day)

D_{to} = deposition (ci/m^2) at the time desired for output (year and day)

D_{ti} = deposition (ci/m^2) at the time desired for input (year and day)

R_{to} = release of contaminant (ci) into the model domain at the time desired for output

R_{ti} = release of contaminant (ci) into the model domain at the time desired for input.

3.1.1 SHFMET Algorithm Considerations

The release values, R_{to} and R_{ti}, are monthly averages (arithmetic average) of the stochastic releases computed by the STRM code. Therefore, they change only on a monthly basis in the SHFMET code.

The concentration and deposition values (C_{to}, C_{ti}, D_{to}, and D_{ti}) all change on a daily time step. They also have 100 realizations for every time step. Nominally, C_{ti} and D_{ti} are defined for the years 1946 through 1949, and C_{to} and D_{to} are defined for the years 1950 through 1957.

Once an output year (to) is identified, a map is set up between the realizations in the output year and a randomly chosen realization from one of the input years. No input realization is used twice for the same output year. This relationship between input and output realizations is maintained throughout the entire input year. Maintaining this relationship maintains spatial and temporal correlations in the data.

After the realization map is established, the data is scaled on a day-for-day basis. For example, the output on January 15, 1952, could consist of scaled values from January 15 from the corresponding realizations of the source years 1946, 1947, 1948, and 1949.

This day-for-day scaling must also account for leap years (1948, 1952, and 1956). If the input year is a leap year and the output year is not a leap year, then the data for February 29th is discarded for the output year. If the input year is not a leap year, but the output year is a leap year, then the data for February 28th is duplicated and used for February 29th as well.

3.1.2 Relationship of SHFMET to Other HEDRIC Codes

The SHFMET code fits into a sequence of runs of computer codes. The sequence of code runs for a "production" data set are as follows:

1. Run the STRM code to obtain monthly releases (arithmetic average of realizations) of ^{131}I from December 1944 through December 1957.

2. Run the RATCHET code for December 1944 through December 1949 to get deposition and air concentration values (100 realizations) for the entire modeling grid.

3. Run the SHUFFL code to combine the thousands of RATCHET files into two files. One file contains deposition values and the other file contains concentration values.

4. Run the SHFMET code to simulate the air data for 1950 through 1957 and supplement the deposition and concentration files created by SHUFFL.

5. Run the DESCARTES code to calculate environmental concentrations using the deposition and air concentration files output by SHFMET.

3.2 SHFMET EXECUTION

The SHFMET program is executed by entering the program name. A single query is issued by the program to obtain the name of the keyword file. Once the keyword file is entered, all additional program actions are controlled by the keyword entries.

3.3 INPUT AND OUTPUT FILES

A large number of input and output files are used by the SHFMET code. These files are described in the following subsections.

3.3.1 Input Files

The SHFMET code uses five input files. These files are described in the following sections.

Keyword File

A single ASCII text file is used to control the SHFMET program. It contains command called keywords. The keywords are described in Section 3.4.

Source File

The source file is an ASCII text file containing some header information and the monthly releases for years that are to be considered as source years where data was processed through the RATCHET code (nominally 1946 through 1949). The data in this file must follow the order discussed in Table 3.1. The six header lines are read with alphabetic format, the remaining data is read free format. The only requirement for the free-format lines is that the proper number of data entries must be on each line. The file name for the source file is supplied on the FILE keyword record with the SOURCE modifier.

TABLE 3.1. Format for File of Monthly Releases

```
Title Line: 80 Characters
Program Name: 8 Characters
Program Version: 8 Characters
User Name: 16 Characters
Time: 8 Character time stamp when file was generated
Date: 8 Character time stamp when file was generated
YEAR, MONTH, VALUE : Integer year, month, real value
YEAR, MONTH, VALUE : Integer year, month, real value
...
YEAR, MONTH, VALUE : Integer year, month, real value
```

Target File

The target file is an ASCII text file containing some header information and the monthly releases for years that are to be considered as target (output) years where data were not processed through the RATCHET code (nominally 1950 through 1957). The data in this file must be in the same format as the data for the source file previously described. The file name is supplied on the FILE keyword record with the TARGET modifier.

Concentration File

The concentration file is a binary file output by the SHUFFL code that contains concentrations for the years selected as source years; for a nominal run it contains data from December 1944 through December 1949. See the description of the SHUFFL code for a description of the structure of this file. This file is used for both input and output. The file name is specified on the FILE keyword record with the CONCEN modifier.

Deposition File

The deposition file is a binary file output by the SHUFFL code that contains depositions for the years selected as source years; for a nominal run it contains data from December 1944 through December 1949. See the description of the SHUFFL code for a description of the structure of this file. This file is used for both input and output. The file name is specified on the FILE keyword record with the DEPOSIT modifier.

3.3.2 Output Files

The SHFMET code uses three output files. These files are described in the following sections.

Report File

A report file is written for every run of the code. The report file name must be specified as the first entry in the input keyword file (see the REPORT keyword description). The report file contains an echo of the problem description and a summary of the mapping of realizations for the data that were processed. An example report file is given in Appendix E.

Concentration File

The concentration file is a binary file that contains concentrations for both the years selected as source years (for a nominal run it contains data from December 1944 through December 1949) and the years selected as output years (nominally 1950 through 1957). See the DESCARTES design description[a] for a description of the structure of this file. This file is used for both input and output. The file name is specified on the FILE keyword record with the CONCEN modifier.

Deposition File

The deposition file is a binary file that contains depositions for both the years selected as source years (for a nominal run it contains data from December 1944 through December 1949) and the years selected as output years (nominally 1950 through 1957). See the description of the SHUFFL code for a description of the structure of this file. This file is used for both input and output. The file name is specified on the FILE keyword record with the DEPOSIT modifier.

3.4 SHFMET Keyword Command Descriptions

The SHFMET program is controlled through the use of keywords. This section describes the required keywords. The keywords are read from an ASCII

(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Esligner, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BMW, January 1994.

file that can be prepared with almost any editor (or word processor that has an option to write an ASCII file). A summary of the keywords is given in Table 3.2.

Every keyword is required in the keyword file. The REPORT keyword must be the first keyword in the file and the END keyword must be the last keyword in the file. No specific order of keyword records is required for other keywords. An example keyword file is given in Appendix E. General instructions on the use of keywords is given in Appendix A.

3.4.1 DEBUG Keyword

Purpose

The DEBUG keyword record controls the level of output to the report file. The use of this option will significantly increase the size of the report file.

Syntax

DEBUG

There are no modifiers or quote strings associated with this keyword.

3.4.2 END Keyword

Purpose

The END keyword record signifies the end of all keyword data. It must be the last keyword in the keyword file.

Syntax

END

There are no modifiers or quote strings associated with this keyword.

3.4.3 EXECUTE Keyword

Purpose

The EXECUTE keyword record is used to request problem execution. If this keyword is not entered, then only input error checking will be performed.

Syntax

EXECUTE

There are no modifiers or quote strings associated with this keyword.

TABLE 3.2. Summary of SHFMET Keywords

Keyword	Description
DEBUG	Provides for extended printing to the report file
END	Signifies the end of all keyword data
EXECUTE	Used to signal that program execution is desired as well as control data error checking
FILE	Used to define the file names for every file except the report file
NUCLIDE	Used to define the radionuclide being processed
OUTPUT	Used to define the set of desired output years
REALIZAT	Sets the number of realizations to compute
REPORT	Used to enter the name of the report file
SEED	Sets the seed for the random number generator
SOURCE	Used to define the set of years that can be used as source years.
TITLE	Used to input a title that will be placed in the diet file
USER	Used to set the name of the program user

3.4.4 FILE Keyword

Purpose

The FILE keyword record is used to enter the names of the source, target, concentration, and deposition files.

Syntax

FILE Modifier "quote"

The file name is entered in a quote string, and must be enclosed in double quotes. Pathnames up to 72 characters long are supported. The Modifier is one of the four words CONCEN, DEPOSIT, SOURCE, or TARGET.

Examples

Four FILE keywords are required for every run of the code. Example entries for the two keywords that define the concentration and deposition files are as follows:

```
FILE CONCEN  "/files4/apps/hedrdev/Production/conc.44-57"
FILE DEPOSIT "/files4/apps/hedrdev/Production/depo.44-57"
```

Example entries for the two keywords that define the source year and target year monthly data files are as follows:

```
FILE SOURCE "/files4/apps/hedrdev/Production/month.45-49"
FILE TARGET "/files4/apps/hedrdev/Production/month.50-57"
```

3.4.5 NUCLIDE Keyword

Purpose

The NUCLIDE keyword record is used to identify which nuclide is being processed. It will be matched against a character expression in the concentration and deposition files.

Syntax

```
NUCLIDE "quote"
```

The nuclide name is entered in a quote string, and must be enclosed in double quotes. Nuclide names up to 6 characters long are supported.

Example

The following record identifies ^{131}I as the nuclide being processed.

```
NUCLIDE "I131"
```

3.4.6 OUTPUT Keyword

Purpose

The OUTPUT keyword record is used to define the set of years for which data will be output to the concentration and deposition files.

Syntax

```
OUTPUT N1 ... Nn
```

The values for N1, ..., Nn are the integer year numbers identifying the output years. The value for each year must be in the range of 1950 to 1957.

Examples

The following example identifies the output years 1952 and 1954:

```
OUTPUT 1952 1954
```

The following example identifies the output years from 1950 through 1957:

```
OUTPUT 1950 1951 1952 1953 1954 1955 1956 1957
```

3.4.7 REALIZAT Keyword

Purpose

The REALIZAT keyword record defines the number of realizations to process. The value entered here must be the same as the number of realizations in the input concentration and deposition files from SHUFFL. The number of realizations is used to set the record length in the concentration and deposition files.

Syntax

```
REALIZAT N1
```

The integer N1 must have a minimum of 1. The value of 100 is the nominal value (value of the parameter MAXREL).

Example

This example keyword sets the number of realizations to 100:

```
REALIZAT 100
```

3.4.8 REPORT Keyword

Purpose

The REPORT keyword record is used to define the name of the report file. The REPORT keyword must be the first keyword in the keyword file.

Syntax

```
REPORT "quote"
```

The file name is entered in a quote string, and must be enclosed in double quotes. Pathnames up to 72 characters long are supported.

Example

The following entries are valid definitions of the REPORT keyword:

```
REPORT "/files4/apps/hedrdev/Production/shfmet.rpt"
REPORT "shfmet.rpt"
```

3.4.9 SEED Keyword

Purpose

The SEED keyword record sets the value for the seed for the random number generator.

Syntax

SEED N1

The value for N1 must be an integer or real number in the range 1 to 999999. Even though the seed can take a larger value internal to SHFMET, the RDBLK routines may not correctly decode numerical entries that contain more than 10 digits.

Example

SEED 344443

3.4.10 SOURCE Keyword

Purpose

The SOURCE keyword record is used to define the set of years that can be used for meteorological data in the concentration and deposition files. These years must have data that have been computed by RATCHET and then processed by SHUFFL into the concentration and deposition files. If the year is identified, then every day in the year must have data in the file.

Syntax

SOURCE N1 ... Nn

The values for N1, ... Nn are the integer year numbers identifying the source years. The value for each year must be in the range 1945 to 1949.

Example

The following example identifies the source years as the years 1946 to 1949:

SOURCE 1946 1947 1948 1949

3.4.11 TITLE Keyword

Purpose

The TITLE keyword record is used to define a problem title. The problem title will be written to the concentration and deposition files for use by DESCARTES.

Syntax

TITLE "quote"

The title is entered in a quote string, and must be enclosed in double quotes. Titles up to 72 characters long are supported. The title must not contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

Example

The following example defines a title for a run of the SHFMET code:

TITLE "Example title for the SHFMET Users Guide."

3.4.12 USER Keyword

Purpose

The USER keyword record is used to identify the user of the SHFMET program. The user name will be written to the report file for logging purposes. If this record is not entered the user name is set to Anonymous User.

Syntax

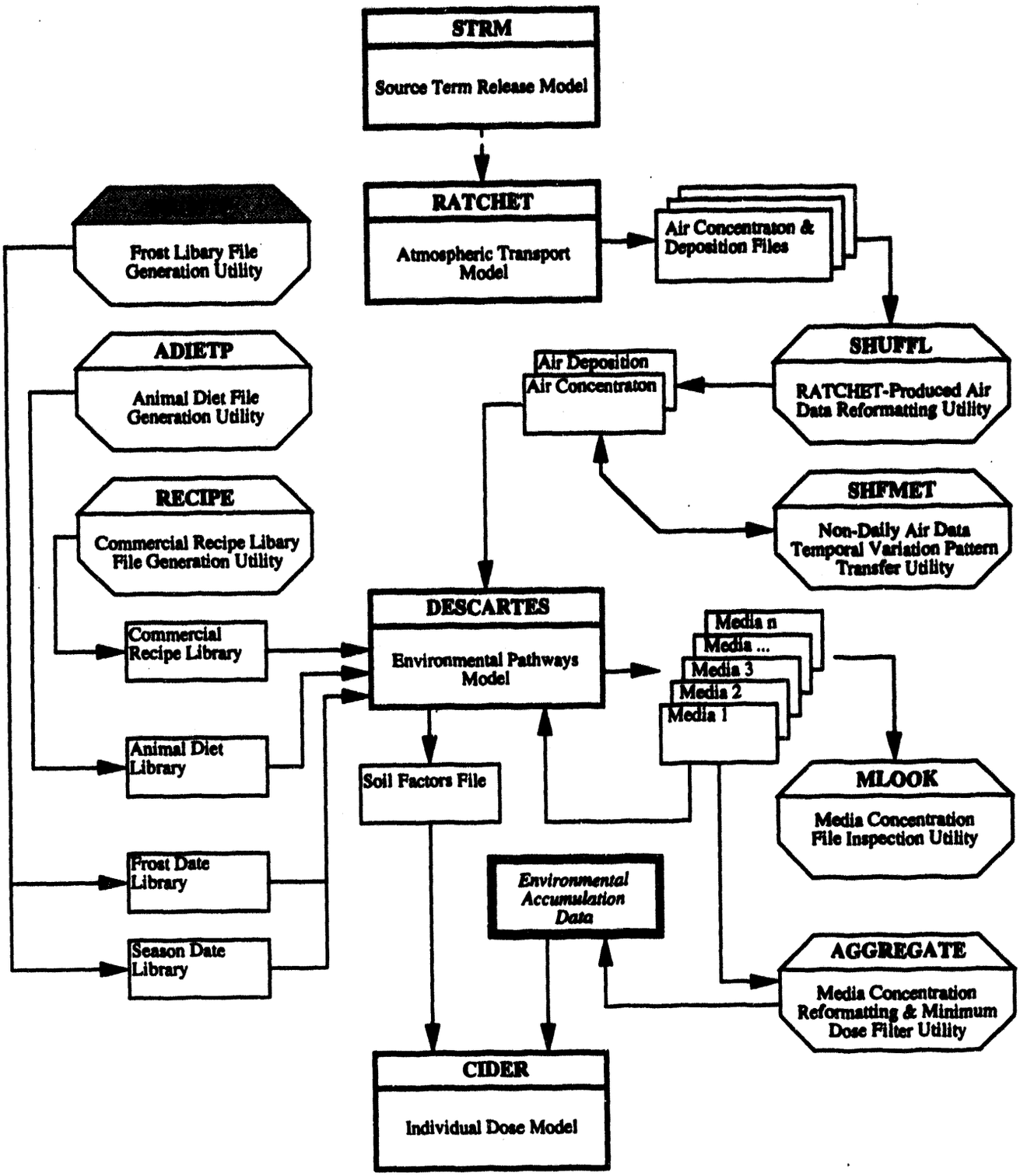
USER "quote"

The user name is entered in a quote string, and must be enclosed in double quotes. User names up to 16 characters long are supported.

Example

The following example defines Paul W. Eslinger as the user running the code.

USER "Paul W. Eslinger"


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Libary File Generation Utility
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
Air Deposition
Air Concentraton
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Media n
Media ...
Media 3
Media 2
Media 1
Soil Factors File
MLOOK
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

4.0 FROSTP USER INSTRUCTIONS

The DESCARTES code requires stochastic inputs for the last spring frost date and the first fall frost date. This section describes a utility program (FROSTP) that builds stochastic frost date and season date files for the DESCARTES code. This section provides user instructions and a brief description of the code.

4.1 DESIGN

Frost dates in DESCARTES depend on realization, spring or fall time, location, and year. Frost dates for each node are defined on input to FROSTP as a statistical distribution.

4.1.1 Links to DESCARTES

The FROSTP program writes a data file for use in DESCARTES (see Section 7.3). The subroutine WRTHED writes the header information to the file, and the subroutine WRTDAT writes the data to the file. If the structure of the frost or season date file changes, one or both of these subroutines must be modified.

In addition to writing a file for the DESCARTES code, this code makes use of many modules from the DESCARTES code. Where possible, DESCARTES routines were incorporated without modification. The design philosophy for FROSTP is consistent with that for the DESCARTES system of codes.

4.1.2 Generation of Frost Dates

The FROSTP program generates random realizations of frost date information for each node independently of the other nodes. The statistical distributions that can be used are listed in Table 4.1. Other distributions can be defined for the DESCARTES code, but the discrete uniform distribution is the only distribution allowed in this utility program.

TABLE 4.1. Statistical Distributions Available

Index	Distribution Name	Parameters Required
3	Discrete Uniform	Smallest integer, Largest integer

4.2 INPUT AND OUTPUT FILES

The FROSTP program is a small utility routine that has limited input and output file needs. The only input information required is the keyword input file that specifies run parameters. A report file and a data file are the only outputs.

4.2.1 Input Files

A single input file is used to drive the FROSTP program. It contains keywords that control program activities. The keywords are described in Section 4.4. General information on the use of keywords is provided in Appendix A.

4.2.2 Output Files

There are two output files for every run of the code. The two files are a report file, and a data file. The report file provides a summary record of the problem definition and the generated results. The data file is written in the format required by the DESCARTES code.

Report File

A report file is written for every run of the code. The input keyword file must identify the name of the report file as its first keyword entry (see the REPORT keyword description). The report file contains an echo of the problem description and summary statistics for the generated frost date data. An example report file is given in Appendix E.

Data File

A data file of frost or season dates is written for use in the DESCARTES code. The format for the data file is given in the DESCARTES design description.[a] The name of the output data file is specified in the input keyword file (see the FROST keyword description).

4.3 PROGRAM EXECUTION

The program is executed by entering the program name. A single query is issued by the program to obtain the name of the keyword file. Once the keyword file is entered, all additional program actions are controlled by the keyword entries.

4.4 KEYWORD DESCRIPTIONS

The FROSTP program is controlled through the use of keywords which are read from an input file. A summary of the keywords is given in Table 4.2. The only optional keyword is the ECHO keyword. All other keywords are required.

(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Eslinger, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BNW, January 1994.

TABLE 4.2. Summary of FROSTP Keywords

Keyword	Description
ECHO	Echos the statistical definition for each node to the report file
END	Signifies the end of all keyword data
FALL	Used to define the statistical distribution for the first fall frost date at each node
FROST	Used to define the file name for the output frost date library file.
REALIZAT	Sets the number of realizations to compute
REPORT	Used to enter the name of the report file
SEED	Sets the seed for the random number generator
SPRING	Used to define the statistical distribution for the last spring frost date at each node
TITLE	Used to input a title that will be placed in the frost date file
USER	Used to set the name of the program user

4.4.1 ECHO Keyword

Purpose

The ECHO keyword record is used to invoke writing the definitions of the statistical distribution for every node to the report file. If this keyword is not entered an abbreviated report file will be written.

Syntax

ECHO

There are no modifiers or quote strings associated with this keyword.

4.4.2 END Keyword

Purpose

The END keyword record signifies the end of all keyword data. It must be the last keyword in the keyword file. Any input keyword supplied after the END keyword record are ignored.

Syntax

END

There are no modifiers or quote strings associated with this keyword.

4.4.3 FALL Keyword

Purpose

The FALL keyword record is used to define the statistical distribution for the first frost date in the fall for a single node.

Syntax

FALL N1 N2 Statistical Parameters

The integer N1 gives the node number. The integer N2 gives the average number of days since the beginning of the year for the first fall frost date. There are three statistical parameters. The first statistical parameter is the number 3, denoting the discrete uniform distribution. The next two values give the spread (i.e., -10 days to + 10 days) about the mean value.

The FROSTP program does not require that FALL keywords be entered for every node. However, FALL and SPRING keyword entries must be entered in pairs.

Examples

The following examples define the fall frost dates for nodes 2 and 334:

```
FALL   2 245 3 -9 9
FALL 334 250 3 -7 7
```

4.4.4 FROST Keyword

Purpose

The FROST keyword record is used to enter the name of the output frost date file.

Syntax

FROST "quote"

The file name is entered in a quote string, and must be enclosed in double quotes. File names, including path specification, may be up to 72 characters long.

Example

FROST "/apps/hedrdev/descartes/frost.1945"

4.4.5 REALIZAT Keyword

Purpose

The REALIZAT keyword record defines the number of realizations to generate.

Syntax

REALIZAT N1

The integer N1 must be in the range 1 to 100 (100 is the current value of the parameter MAXREL).

Example

REALIZAT 100

This example keyword sets the number of realizations to 100.

4.4.6 REPORT Keyword

Purpose

The REPORT keyword record is used to define the name of the report file.

Syntax

REPORT "quote"

The file name is entered in a quote string, and must be enclosed in double quotes. File names, including path specification, may be up to 72 characters long.

The REPORT keyword must be the first keyword in the keyword file.

Example

REPORT "/apps/hedrdev/frost-report.1945"

4.4.7 SEED Keyword

Purpose

The SEED keyword record sets the value for the seed for the random number generator.

Syntax

SEED N1

The value for N1 must be an integer or real number in the range 1 to 999999. Even though the seed can take a larger value, the RDBLK routines cannot correctly decode numerical entries that contain more than 10 digits.

Example

SEED 344443

4.4.8 SPRING Keyword

Purpose

The SPRING keyword record is used to define the statistical distribution for the last frost date in the spring for a single node.

Syntax

SPRING N1 N2 Statistical Parameters

The integer N1 gives the node number. The integer N2 gives the average number of days since the beginning of the year for the last spring frost date. There are three statistical parameters. The first statistical parameter is the number 3, denoting the discrete uniform distribution. The next two values give the spread (i.e., -10 days to + 10 days) about the mean value.

The FROSTP program does not require that FALL keywords be entered for every node. However, FALL and SPRING keyword entries must be entered in pairs.

Examples

The following examples define the spring frost dates for nodes 2 and 334.

```
SPRING   2 120 3 -9 9
SPRING 334 120 3 -7 7
```

4.4.9 TITLE Keyword

Purpose

The TITLE keyword record is used to define a problem title. The problem title will be written to the output data file for use by DESCARTES.

Syntax

TITLE "quote"

The title is entered in a quote string, and must be enclosed in double quotes. Titles up to 72 characters long are supported. The title must not contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

Example

TITLE "Example title for the FROSTP Users Guide."

4.4.10 USER Keyword

Purpose

The USER keyword record is used to identify the user of the FROSTP program. The user name will be written to the output data file for use by DESCARTES.

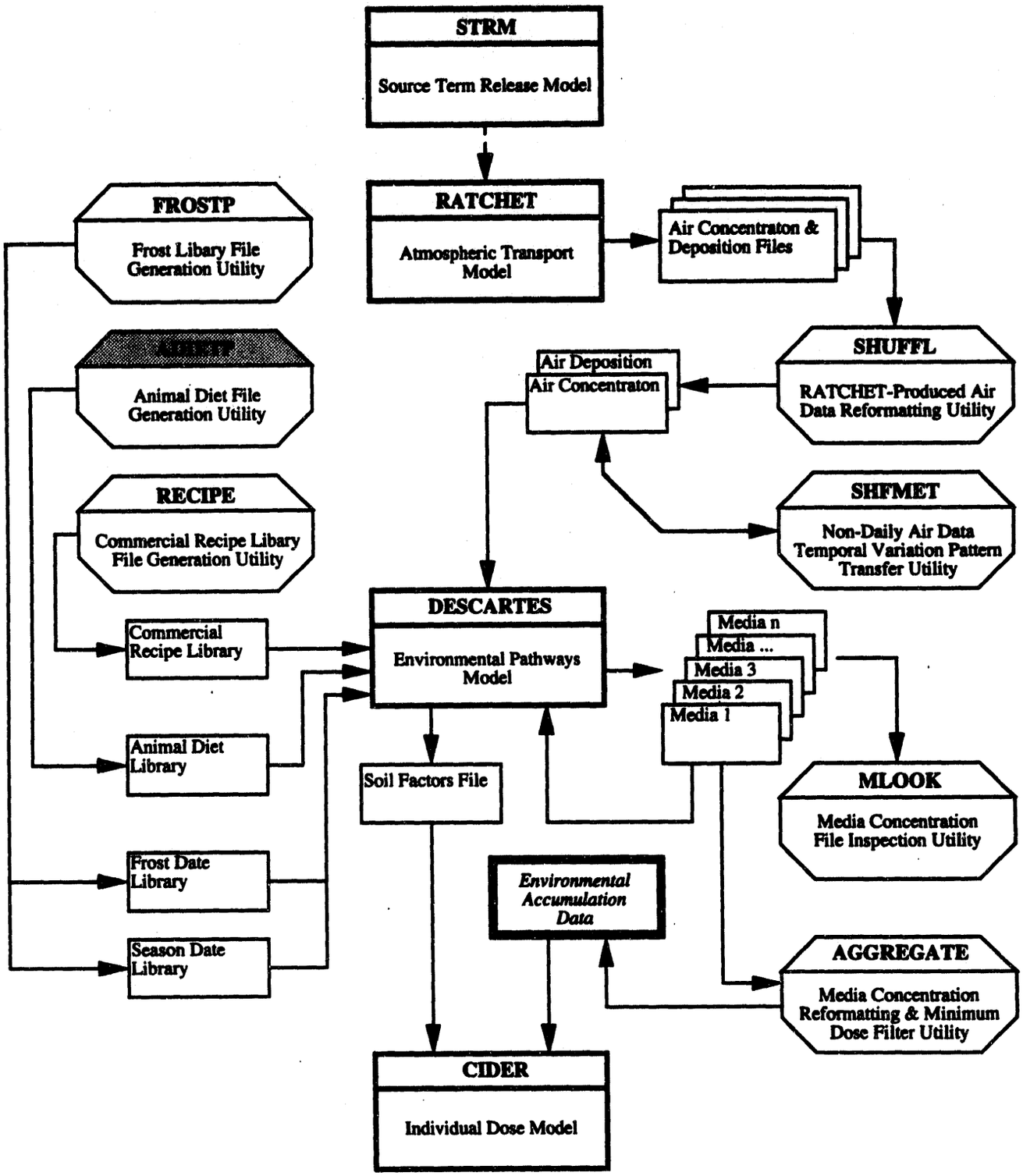
Syntax

USER "quote"

The user name is entered in a quote string, and must be enclosed in double quotes. User names up to 16 characters long are supported. The name must not contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

Example

USER "Paul W. Eslinger"


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Libary File Generation Utility
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
Air Deposition
Air Concentraton
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Soil Factors File
Media n
Media ...
Media 3
Media 2
Media 1
MLOOK
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

5.0 ADIETP USER INSTRUCTIONS

This section describes a utility program (ADIETP) that builds stochastic animal diet files for the DESCARTES code. Animal diet files are needed by DESCARTES to calculate animal product concentrations in the ANIMAL module. This section also provides user instructions and a brief description of the code.

5.1 DESIGN

The ADIETP program is a utility routine used to support creating input files necessary for running the DESCARTES code. This program uses statistical distributions for its input parameters to generate a random set of animal diet information. For more information about the ADIETP code design, see the DESCARTES design description.[a]

5.1.1 Links to DESCARTES

The ADIETP program writes a data file for use in DESCARTES (see Section 7.3). The subroutine WRTHED writes the header information to the file, and the subroutine WRTDAT writes the data to the file. If the structure of the diet file changes, one or both of these subroutines must be modified. If food types are added or deleted, changes must be made to several routines.

In addition to writing a file for the DESCARTES code, this code makes use of many modules from the DESCARTES code. Where possible, DESCARTES routines were incorporated without changes. Some routines were used with minor modifications, and some new code was written. The design philosophy for ADIETP is consistent with that for the entire DESCARTES system of codes.

5.1.2 Generation of Food Consumption Values

Food consumption by animals in DESCARTES is modeled using daily diets. Consumption amounts for each food are defined on input to ADIETP as a statistical distribution. ADIETP then generates the consumption values for each food independently from the other foods. Appendix D describes the use of statistical distributions and provides guidance on choosing types of distribution. The statistical distributions that can be used are listed in Table D.1. The food types are discussed in the section describing the FOOD keyword command.

5.1.3 Constrained Diets

Some of the animals modeled in DESCARTES, e.g., cows, have a constraint on "total" intake as well as having statistical distributions defined for each

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(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Eslinger, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BNW, January 1994.

food type. "Total" intake is defined to be the sum of intake for alfalfa, grain, grass hay, pasture, and silage.

The ADIETP code imposes the constraint on total intake by a two-step process. First, consumption values are generated for each food type. The total intake is then computed and compared to limits specified on a CONSTRAI keyword record. Only those realizations satisfying the stated constraints are retained for use in DESCARTES; all other realizations are discarded. Because the constraint is implemented using a rejection procedure, additional values may have to be generated until a complete set of realizations have been obtained.

5.2 INPUT AND OUTPUT FILES

The ADIETP program is a small utility routine that has limited input and output file needs. The only input information required is the keyword file that specifies run parameters. A report file and a data file are the only outputs.

5.2.1 Input Files

A single input keyword file is used to drive the ADIETP program. It contains keywords that control program activities. The keywords are described in Section 5.4. General information on the use of keywords is provided in Appendix A.

5.2.2 Output Files

There are two output files for every run of the code: a report file and a data file. The report file provides a summary record of the problem definition and the generated results. The data file contains the requested animal diet data in the format required by the DESCARTES code.

Report File

A report file is written for every run of the code. The input keyword file must identify the name of the report file in its first keyword entry (see the REPORT keyword description). The report file contains an echo of the problem description and summary statistics for the generated diet data. An example report file is given in Appendix E.

Data File

A data file of daily consumption values is written for use in the DESCARTES code. The format for the data file is given in the DESCARTES design description. The name of the output data file is specified in the input keyword file (see the DIET keyword description).

5.3 PROGRAM EXECUTION

The ADIETP program is executed by entering the program name. A single query is issued by the program to obtain the name of the keyword file. Once the keyword file is entered, all additional program actions are controlled by the keyword entries.

5.4 KEYWORD COMMAND DESCRIPTIONS

The ADIETP program is controlled through the use of keywords. Keywords are English-like commands used to control the program and enter data. A description of the general construction of keywords is given in Appendix A. The keywords are read from an ASCII file that may be prepared with any editor. A summary of the keywords available in ADIETP is given in Table 5.1. Every keyword is required in the keyword file except for the CONSTRAI keyword. An example keyword file is given in Appendix E.

5.4.1 CONSTRAI Keyword

Purpose

This CONSTRAI keyword record is used to enter the constraints on total intake for a diet. This information is in addition to the definition of consumption for each food type.

TABLE 5.1. Summary of ADIETP Keywords

Keyword	Description
CONSTRAI	Defines a constraint on a total diet in addition to the definition of consumption for each food individually
DIET	Used to enter the name of the output diet file
END	Signifies the end of all keyword data
FOOD	Used to define the statistical distribution for each food type during each season
FOODS	Gives the number of food categories for each season
REALIZAT	Sets the number of realizations to compute
REPORT	Used to enter the name of the report file
SEASONS	Gives the number of seasons in the diet
SEED	Sets the seed for the random number generator
TITLE	Used to input a title that will be placed in the diet file
USER	Used to set the name of the program user

Syntax

CONSTRAI "Season Name" N1 N2

The season name is entered in a quote string, and must be enclosed in double quotes. The season name must match exactly with one of the seasons defined for the FOOD keyword. The value N1 gives the minimum value for total intake, and the value N2 gives the maximum value for the total intake. Care must be taken to ensure that the individual food consumptions can yield a valid total consumption value. The constrained intake value is the sum of intake for the following foods: ALFALFA, GRAIN, GRASSHAY, PASTURE, and SILAGE; therefore the units for the data on the CONSTRAI record must be identical to the units for these separate values on the FOOD keyword.

One and only one CONSTRAI keyword can be entered for every season. If a CONSTRAI record is not entered for a season, consumption values are generated using the FOOD keyword entries with no further checks. If a CONSTRAI record is entered for a season, values generated for the different food categories are saved only if their sum lies within the values N1 and N2.

Example

The following keyword will constrain the intake of the animal for the Winter season to lie between 4 and 8 kg(wet)/day for every realization generated.

CONSTRAI "Winter" 4 8

5.4.2 DIET Keyword

Purpose

This keyword is used to enter the name of the output diet file.

Syntax

DIET "File Name"

The file name is entered in a quote string, and must be enclosed in double quotes. File names, including path specification, may be up to 72 characters long.

Example

DIET "/apps/hedrdev/descartes/test/goatdiet.1945"

5.4.3 END Keyword

Purpose

The END keyword record signifies the end of all keyword data. It should be the last keyword in the keyword file. Any keyword records following the END keyword record in the keyword file are ignored.

Syntax

```
END
```

There are no modifiers or quote strings associated with the END keyword.

5.4.4 FOOD Keyword

Purpose

The FOOD keyword record is used to define the statistical distribution for the food consumption for each food type for each season.

Syntax

```
FOOD "Season Name" "Food Name" Statistical Parameters
```

All animals must use the same seasons and foods. However, a food type can be defined as having no consumption (constant of 0) for an animal. A FOOD keyword must be entered for every season and every food type. Therefore, a total of 40 food keywords must be entered (5 seasons and 8 foods). The FOOD records can be entered in any order; however, it may be desirable to group the FOOD keywords by season for easier reading.

The season name must be one of the character strings given in Table 5.2. The food name must be one of the character strings given in Table 5.3. The character strings input to the code must match exactly (spelling, spacing, and capitalization) with those in Tables 5.2 and 5.3. The statistical distributions allowed, and their associated parameters, are described in Appendix D.

Examples

The following examples show records that define a combination of food types for several seasons. In each case, except the last, the consumption values are defined to come from a uniform distribution (type 2), with the associated lower and upper limits. The last record indicates no SILAGE consumption during the early fall season.

```
FOOD "Winter"     "ALFALFA"  2 1 3
FOOD "Spring"     "GRAIN"    2 2 4
FOOD "Summer"     "ALFALFA"  2 1 3
FOOD "Early Fall" "GRASSHAY" 2 4 6
FOOD "Early Fall" "SILAGE"   1 0
```

TABLE 5.2. Season Definitions

Season Name	Description
Winter	Season from January 1 to the start of the time animals can be put out on pasture
Spring	The short transition time (nominally 14 days) from winter feeding regimes to summer pasture
Summer	Summer pasture time
Early Fall	The short transition time (nominally 14 days) from summer pasture to late fall feeding regimes
Late Fall	Late fall feeding regime, including silage for some animals

TABLE 5.3. Foods Type Definitions

Name	Food Type
ALFALFA	Alfalfa hay consumption in (kg(wet)/day)
DIRT	Dirt (soil layer) consumption in (kg(wet)/day)
GRAIN	Grain consumption in (kg(wet)/day)
GRASSHAY	Grass hay consumption in (kg(wet)/day)
MANGER	Surface area of the feeding area that is exposed to fallout in addition to the contamination in the food stuff (m^2)
PASTURE	Pasture food consumption in (kg(wet)/day)
SILAGE	Silage consumption in (kg(wet)/day)
WATER	Water consumption in (L/day)

5.4.5 FOODS Keyword

Purpose

The FOODS keyword record defines the number of food categories to be used. The same food categories are defined for each season. At the present time, the number of food categories must be set to 8.

Syntax

FOODS N1

The value for N1 must be an integer giving the number of foods.

Example

FOODS 8

This example gives the only valid entry for the FOODS keyword.

5.4.6 REALIZAT Keyword

Purpose

The REALIZAT keyword record defines the number of realizations to generate.

Syntax

REALIZAT N1

The integer N1 must be in the range 1 to 100 (100 is the current value of the parameter MAXREL).

Example

REALIZAT 100

This example keyword sets the number of realizations to 100.

5.4.7 REPORT Keyword

Purpose

The REPORT keyword record is used to define the name of the report file.

Syntax

REPORT "File Name"

The file name is entered in a quote string, and must be enclosed in double quotes. Pathnames up to 72 characters long are supported.

The REPORT keyword must be the first keyword in the keyword file.

Example

REPORT "/apps/hedrdev/descartes/test/goatreport.1945"

5.4.8 SEASONS Keyword

Purpose

The SEASONS keyword record defines the number of seasons to be used. At the present time the number of seasons must be set to 5.

Syntax

SEASONS N1

The value for N1 must be an integer giving the number of seasons.

Example

SEASONS 5

This example gives the only valid entry for the SEASONS keyword.

5.4.9 SEED Keyword

Purpose

This keyword sets the value for the seed for the random number generator.

Syntax

SEED N1

The value for N1 must be an integer or real number in the range 1 to 999999. Even though the seed can take a larger value internal to ADIETP, the RDBLK routines may not correctly decode numerical entries that contain more than 10 digits. The value N1 is unitless.

Example

SEED 344443

5.4.10 TITLE Keyword

Purpose

This keyword is used to define a problem title. The problem title will be written to the output data file for use by DESCARTES.

Syntax

TITLE "Words Here"

The title is entered in a quote string, and must be enclosed in double quotes. Titles up to 72 characters long are supported. The title must not contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

Example

TITLE "Example title for the ADIETP Users Guide."

5.4.11 USER Keyword

Purpose

This keyword is used to identify the user of the ADIETP program. The user name will be written to the output data file for use by DESCARTES.

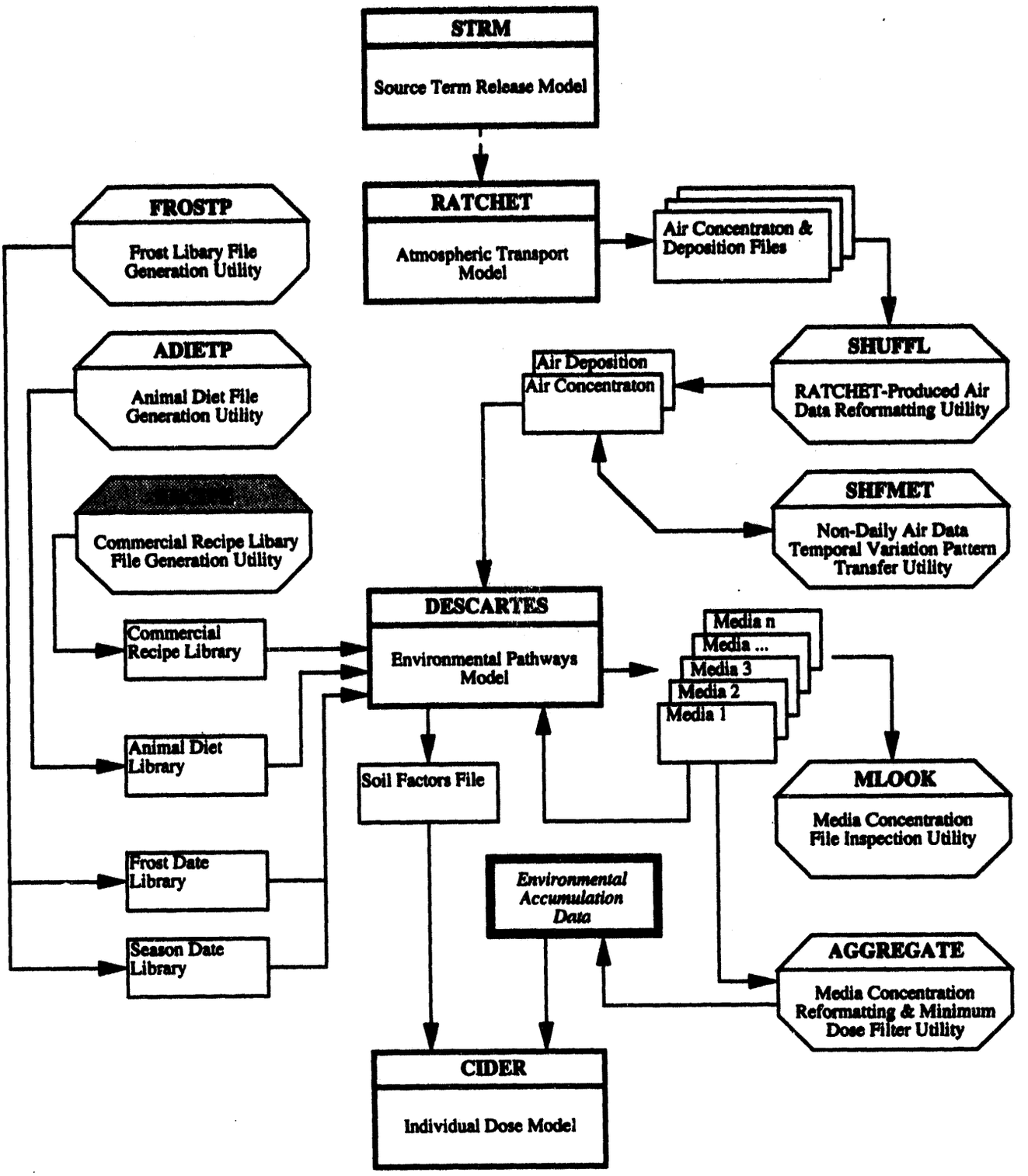
Syntax

USER "User Name"

The user name is entered in a quote string, and must be enclosed in double quotes. User names up to 16 characters long are supported. The name must not contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

Example

USER "Paul W. Eslinger"


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
Commercial Recipe Libary File Generation Utility
Air Deposition
Air Concentraton
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Media n
Media ...
Media 3
Media 2
Media 1
Soil Factors File
MLOOK
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

6.0 RECIPE USER INSTRUCTIONS

This section describes a utility program (RECIPE) that builds files containing commercial distribution and production information for the DESCARTES code. It also provides user instructions and a brief description of the code.

6.1 DESIGN

The RECIPE program is a utility routine used to support creating files containing mixing fraction information for use in the commercial product modules of DESCARTES. For more information about the RECIPE code design, see the DESCARTES design description.[a]

6.1.1 Generation of Production Fractions

Production fractions are entered in the DESCARTES code in the form of a library whose multiple entries have stochastic sampling embedded in them. Therefore, the fractions are defined on input to RECIPE as a statistical distribution. The RECIPE code then generates the required fractions and normalizes the sum over all contributors to unity.

6.1.2 Statistical Distributions Available

The production fractions are defined on input to the RECIPE program as statistical distributions. The statistical distributions that can be used are described in Appendix D.

6.1.3 Normalization of Production Fractions

The commercial distribution networks in the DESCARTES code are all implemented as linear combinations of source values. The algorithm requires that the entries (fractions) in the linear combination each be zero or greater and that the sum of the fractions must equal unity. Therefore, once the set of production fractions are generated from the specified distribution, they are normalized unity separately for each realization.

6.2 INPUT AND OUTPUT FILES

The RECIPE utility routine has limited input and output needs. A single keyword file is the input, and several related data files and a report file are output.

(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Eslinger, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BNW, January 1994.

6.2.1 Input Files

A single input file is used to drive the RECIPE program. It contains keywords that control program activities. The keywords are described in Section 6.4.

6.2.2 Output Files

There are four output files that can be created by the RECIPE program. Three of these files must be written with every program execution. These three files are a report file, a recipe index file, and a recipe data file. The report file provides a paper copy of the problem definition and generated results. The index and data files are written in the format required by the DESCARTES code. The optional fourth file is an ASCII version of the binary recipe data file.

Report File

A report file is written for every run of the code. The input keyword file must identify the name of the report file as the first keyword entry (see the REPORT keyword record description). The report file contains an echo of the problem description and summary statistics for the data that are generated. An example report file is given in Appendix E.

Recipe Index File

An index file for the recipe data is written for use in the DESCARTES code. This file is a formatted ASCII file. The format for the data file is given in the DESCARTES design description.

Recipe Binary Data File

A recipe data file is written for use in the DESCARTES code. This file is a binary direct-access file. The format for the data file is given in the DESCARTES design description.

Recipe ASCII Data File

An ASCII version of the recipe data file is optionally written for use by the user. This file is invoked through the use of the ASCII modifier on the FILE keyword. The format for the data file is as follows:

- The first record contains the character unique run identifier that is used to match the data file with the appropriate index file.

- The first record is followed by NITEM groups of records. Each group of records has NREAL lines, where NREAL is the number of realizations being generated. Each line contains the item number (I), the realization number, and NCONTR(I) fractions for the realization, where NCONTR(I) is the number of contributors to the item. The order of the contributors

in the output file is the same order that the FRACTION keywords are entered for the item.

6.3 PROGRAM EXECUTION

The program is executed by entering the program name. A single query is issued by the program to obtain the name of the keyword file. Once the keyword file is entered, all additional program actions are controlled by the keyword entries.

6.4 KEYWORD COMMAND DESCRIPTIONS

The RECIPE code reads the keywords from an ASCII file that can be prepared with almost any editor (or word processor that has an option to write an ASCII file). A summary of the keywords is given in Table 6.1. Every keyword is required in the keyword file. An example keyword file is given in Appendix E.

TABLE 6.1. Summary of RECIPE Keywords

Keyword	Description
END	Signifies the end of all keyword data
ENDHEAD	Signifies the end of the block of header information in the keyword file
ENDITEM	Signifies the end of the block of information defining the recipe for a single output item
FILE	Used to define the output file names for the index, binary data, and ASCII data files containing the recipe information
FRACTION	Defines the statistical distribution for a single contributor to an output item
ITEM	Used to define the beginning of the recipe information for a single item or a group of items
REALIZAT	Sets the number of realizations to compute
REPORT	Used to enter the name of the report file
SEED	Sets the seed for the random number generator
TITLE	Used to input a title that will be placed in the diet file
USER	Used to set the name of the program user

6.4.1 Grouping of Keyword Records

There are two keyword groups for the recipe keyword file: the header group and the item group. The header group is terminated by the ENDHEAD keyword. The item group is terminated by the ENDITEM keyword. Only one header group is allowed, and must be entered first. Multiple item groups can be entered.

Header Keyword Group

The first group of keywords in the keyword file is the header group. This group contains the following keywords: REPORT, FILE, TITLE, USER, SEED, REALIZAT, and ENDHEAD. This group contains identification and problem size information.

The REPORT keyword must be the first keyword entered in the file. The ENDHEAD keyword is the last keyword in the header group. The other keywords in this group can be entered in any order.

Item Keyword Group

There are an additional N groups in the keyword file, each with a similar structure. The value for N is obtained by scanning the keyword file and counting the number of ITEM keyword records present. The item groups identify the recipe for each output item. The three keywords—ITEM, FRACTION, and ENDITEM—are allowed in each item group.

Each item group starts with an ITEM record. This record identifies the identification number of the output item or items (i.e., creamery, or node number). The last entry in an item group is the ENDITEM record. Also contained in the item group is a separate FRACTION keyword for every contributor to this output item. The FRACTION keyword identifies the contributor identification number and the associated statistical distribution.

The item records (item keyword groups) do not have to be entered in increasing numerical order; they can be in any order. Also the fraction records within an item keyword group can be entered in any order.

6.4.2 END Keyword

Purpose

The END keyword signifies the end of all keyword data. It must be the last keyword in the keyword file. An error will occur if the END record is encountered within the header group or an item group. Any keyword records following the END record will be ignored.

Syntax

END

There are no modifiers or quote strings associated with this keyword.

6.4.3 ENDHEAD Keyword

Purpose

The ENDHEAD keyword signifies the end of the header-related keyword data. It must be the last keyword in the header keyword group.

Syntax

ENDHEAD

There are no modifiers or quote strings associated with this keyword.

6.4.4 ENDITEM Keyword

Purpose

The ENDITEM keyword signifies the end of each item-related keyword group. It must be the last keyword in the item keyword group.

Syntax

ENDITEM

There are no modifiers or quote strings associated with this keyword.

6.4.5 FILE Keyword

Purpose

The FILE keyword is used to enter the names of the recipe index, binary data, and ASCII data copy files. This keyword is part of the header keyword group.

Syntax

FILE Modifier "quote"

The file name is entered in a quote string, and must be enclosed in double quotes. File names, including path specifications, may be up to 72 characters long. The Modifier is one of the three words INDEX, DATA, or ASCII.

Example

Two FILE keywords are required for every run of the code. One is used to identify the recipe index file, and one is required to identify the recipe data file. Example entries are as follows:

```
FILE INDEX "/apps/hedrdev/descartes/test/lvcom-index.1945"
FILE DATA  "/apps/hedrdev/descartes/test/lvcom-data.1945"
```

An additional FILE keyword may be used. It is used to identify the ASCII copy of the data file. An example entry is

```
FILE ASCII "/apps/hedrdev/descartes/test/lvcom-ascii.1945"
```

If a FILE keyword with the ASCII modifier is used, then the ASCII copy of the data is written; otherwise the ASCII copy of the data is not output.

6.4.6 FRACTION Keyword

Purpose

The FRACTION keyword record is used to define the contributor identification number and the statistical distribution for each contributor to the recipe for an item. This keyword is entered as part as an item group of keywords.

Syntax

```
FRACTION N1 Statistical Parameters
```

The recipe for each output item (creamery, node, etc.) contains information for several contributors. The value for N1 is the integer contributor identification number (node number, creamery number, or feeding regime number). The value for N1 must be greater than 0.

A separate FRACTION keyword must be entered for each contributor. The separate FRACTION keywords do not have to entered in any specific order.

The statistical parameters include a statistical distribution index and associated defining parameters. The set of distributions allowed, and the associated parameters, are defined in Appendix D.

Examples

The following examples show FRACTION keywords for 5 contributors to an item:

```
FRACTION    2  distribution  2  0.1 0.3
FRACTION    1  distribution  2  0.1 0.3
FRACTION   10  distribution  6  0.1 0.2 0.3
FRACTION   11  distribution  1  0.1
FRACTION 1102  distribution  7  0.3 0.01 TRUNCATE 0.05 0.95
```

6.4.7 ITEM Keyword

Purpose

The ITEM keyword record is used to enter the identification number for an item. It also signifies the beginning of an item group of keywords. The

item records (item keyword groups) do not have to be entered in increasing numerical order; they can be in any order.

Syntax

ITEM N1 [N2 ... Nn]

The values N1 ... Nn gives the item identification numbers for the recipe item(s). The values for the item numbers is carried as an integer internally, and must be greater than 0. Only one value N1 is required, but up to MAXITM values can be entered. If multiple items are entered, then each item will be defined by the same statistical distribution (the collection of FRACTION keywords associated with this ITEM keyword); however, the generated values will be different.

Example

The following keyword identifies that a recipe is being entered for output node number 1102:

ITEM 1102

The following keyword identifies that a recipe is being entered for output node numbers 1, 200, 475, 598 and 1102:

ITEM 1 200 475 598 1102

6.4.8 REALIZAT Keyword

Purpose

The REALIZAT keyword record defines the number of realizations to generate. This keyword is part of the header keyword group.

Syntax

REALIZAT N1

The integer N1 must have a minimum of 1. The value of 100 is suggested (100 is the current value of the parameter MAXREL).

Example

REALIZAT 100

This example keyword sets the number of realizations to 100.

6.4.9 REPORT Keyword

Purpose

The REPORT keyword record is used to define the name of the report file. This keyword is part of the header keyword group.

Syntax

REPORT "quote"

The file name is entered in a quote string, and must be enclosed in double quotes. File names, including path specification, may be up to 72 characters long.

The REPORT keyword must be the first keyword in the keyword file.

Example

REPORT "/apps/hedrdev/descartes/test/lvcom-report.1945"

6.4.10 SEED Keyword

Purpose

The SEED keyword record sets the value for the seed for the random number generator. This keyword is part of the header keyword group.

Syntax

SEED N1

The value for N1 must be an integer or real number in the range 1 to 999999. Even though the seed can take a larger value internal to RECIPE, the RDBLK routines may not correctly decode numerical entries that contain more than 10 digits.

Example

SEED 344443

6.4.11 TITLE Keyword

Purpose

The TITLE keyword record is used to define a problem title. The problem title will be written to the recipe index file for use by DESCARTES. This keyword is part of the header keyword group.

Syntax

TITLE "quote"

The title is entered in a quote string, and must be enclosed in double quotes. Titles up to 72 characters long are supported. The title must not contain any embedded single apostrophes (′), as the characters after the apostrophe may be truncated.

Example

TITLE "Example title for the RECIPE Users Guide."

6.4.12 USER Keyword

Purpose

The USER keyword record is used to identify the user of the RECIPE program. The user name will be written to the recipe index file for use by DESCARTES. This keyword is part of the header keyword group.

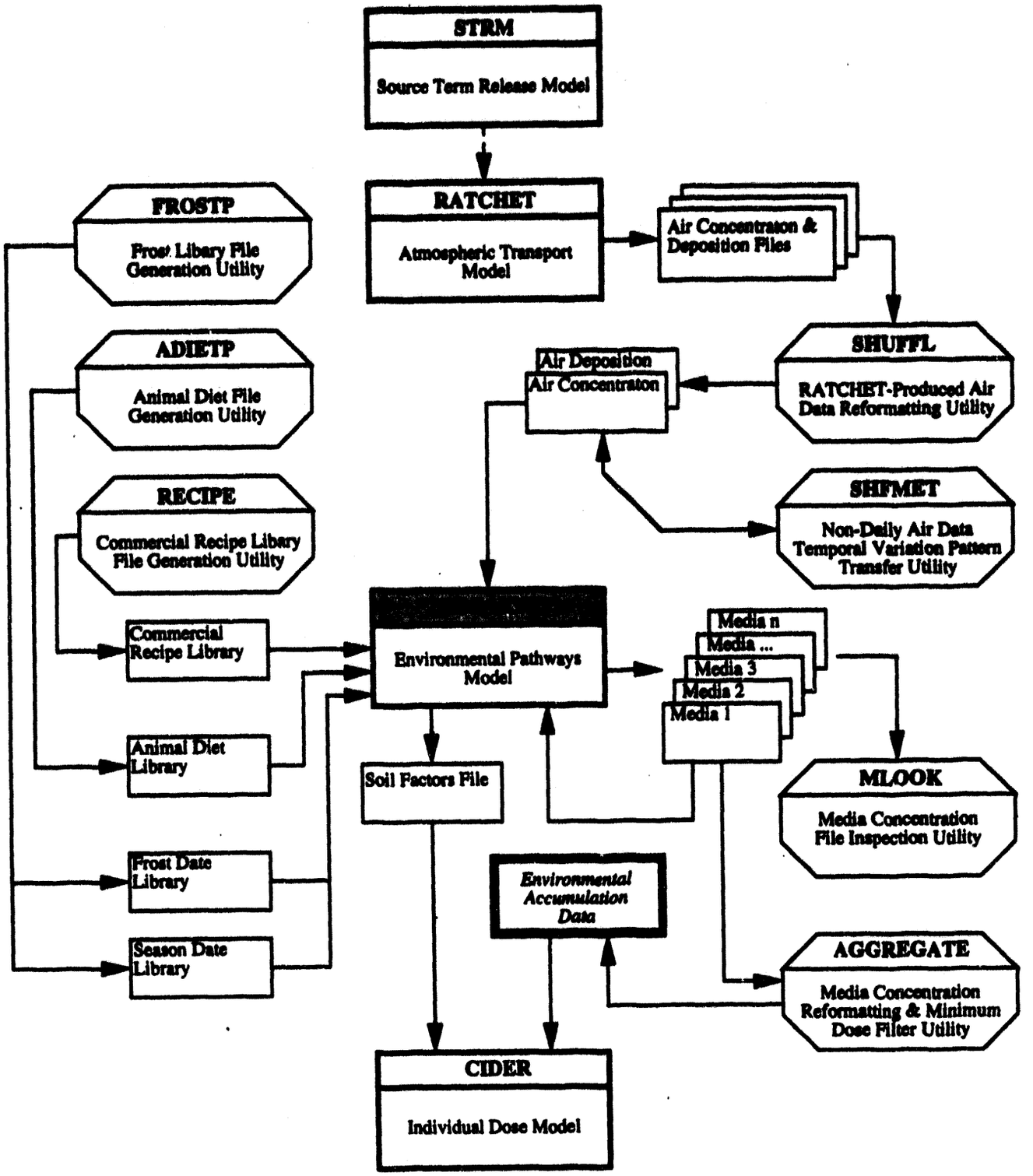
Syntax

USER "quote"

The user name is entered in a quote string, and must be enclosed in double quotes. User names up to 16 characters long are supported. The name must not contain any embedded single apostrophes (′), as the characters after the apostrophe may be truncated.

Example

USER "Paul W. Eslinger"


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Library File Generation Utility
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
Air Deposition
Air Concentraton
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
Commercial Recipe Library
Environmental Pathways Model
Media n
Media ...
Media 3
Media 2
Media 1
Animal Diet Library
Soil Factors File
MLOOK
Media Concentration File Inspection Utility
Frost Date Library
Environmental Accumulation Data
Season Date Library
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

7.0 DESCARTES USER INSTRUCTIONS

This section provides user instructions for executing the DESCARTES code. Information is provided to identify all needed input files, and the information flow between modules is described. It is necessary to understand the interrelations of the modules in DESCARTES to produce a meaningful set of output media files that can be used as input to the CIDER code.

7.1 CODE DESIGN

The DESCARTES code was designed to meet the requirements set forth for the project as documented by Eslinger (1993). The DESCARTES code design is documented by Nichols et al.[a] A brief overview of the design is given in this section, including a description of the DESCARTES modules and subroutines and a calling hierarchy for the code.

7.1.1 Module Description

The DESCARTES code comprises an executive module and five central, independent modules that share control information and several utility functions and routines, and is dipicted in Figure 7.1. The six major modules are as follows:

- DESCRT - the executive module
- BPLANT - the biomass and plant products accumulation module
- ANIMAL - the animal products accumulation module
- CREAM - the creamery milk mixing module
- GRMILK - the grocery milk mixing module
- COMMLV - the commercial leafy vegetable mixing module.

The Executive Module

The DESCRT module is the main program that controls DESCARTES execution. This module is invoked when DESCARTES is executed and is the top level module throughout the subsequent execution. The DESCRT module is responsible for determining which main modules of the DESCARTES code are to be invoked in a code execution. This executive module reads the control input, initializes global variables, performs the logic tests necessary to determine which main modules are to be invoked, and calls those that are.

(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Eslinger, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BWW, January 1994.

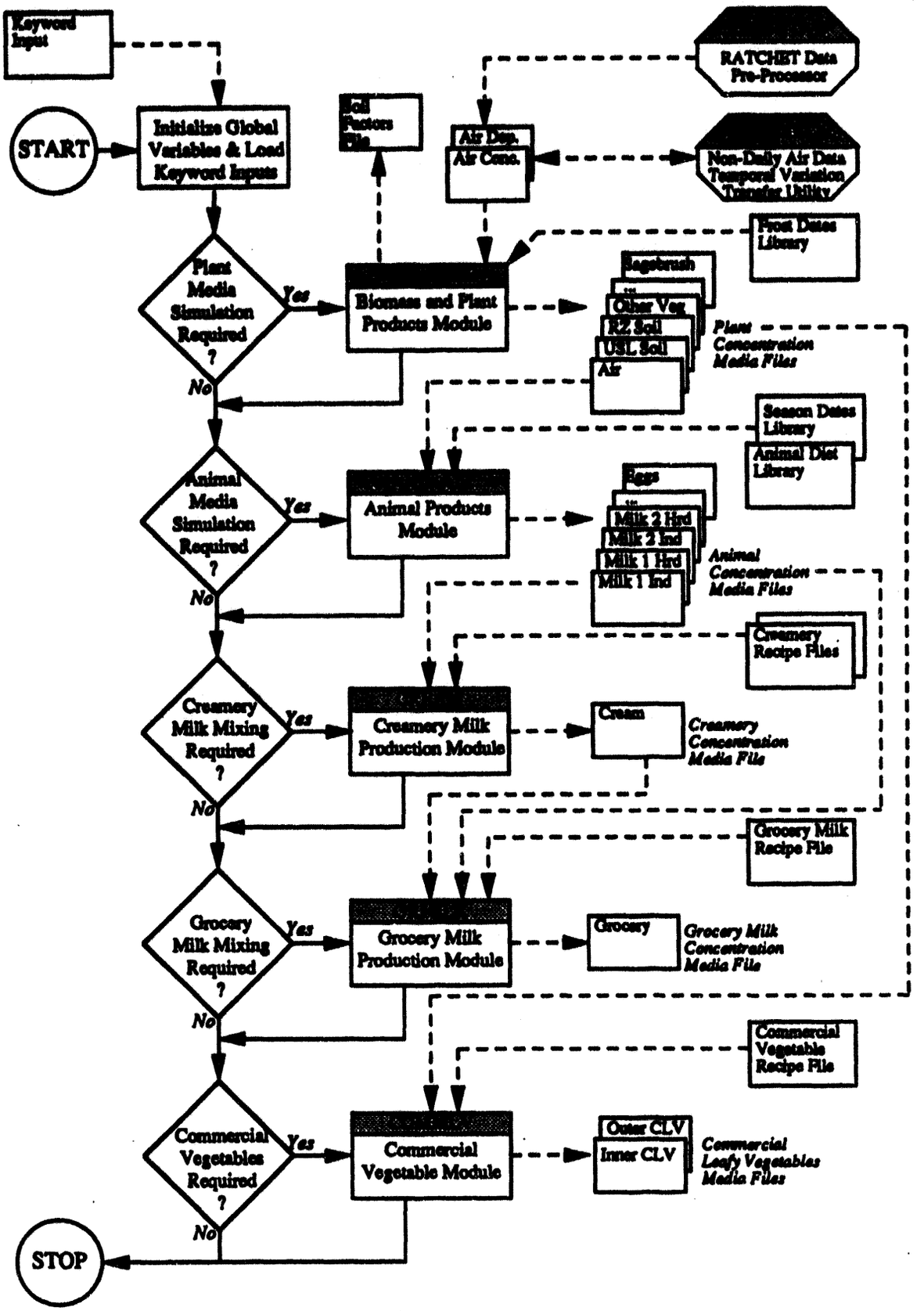


FIGURE 7.1. DESCARTES Executive Model Flow Chart

The Biomass and Plant Products Module

The BPLANT module computes and records in plant media files the radionuclide accumulation in all plant media, except commercially distributed leafy vegetables. This includes local leafy vegetables, other vegetables, fruit, grain, alfalfa, pasture, grass hay, silage, sagebrush, upper soil compartment, and root zone soil compartment. All plant types will have both inner and outer compartments computed, but they will be reported separately only for leafy vegetables and fruit. The air concentration and deposition will also be integrated to the appropriate time scale and recorded by BPLANT for use by the CIDER dose calculation code. The BPLANT module implements equations DES-1 through DES-15 in Snyder et al. (1992) to compute biomass and plant radionuclide accumulation.

The Animal Products Module

The ANIMAL module computes and records in animal media files the radionuclide accumulation in all animal media except commercially distributed milk (creamery or grocery milk). This includes goat milk; individual cow milk from feeding regimes 1, 2, 3, and 4; herd cow milk from feeding regimes 1, 2, 3, and 4; beef; eggs; and poultry. The concentrations in animal feed are computed by the BPLANT module. The ANIMAL module implements equations DES-16 and DES-17 in Snyder et al. (1992) to compute animal product concentrations.

The Creamery Milk Module

The CREAM module computes the concentrations in creamery milk resulting from mixing herd cow milk produced from the various feeding regimes computed in the ANIMAL module. The herd cow milk is mixed at specified nodes according to a feeding regime "recipe" supplied in a separate file. The mixed herd cow milk from the nodes is then mixed at a creamery according to distribution information specified in a separate creamery recipe file.

The Grocery Milk Module

The GRMILK module computes the concentrations in grocery milk resulting from mixing creamery milk (computed by the CREAM module) according to distribution information specified in a separate input file. The distribution information specifies what fraction of grocery milk at any node is provided by a given creamery. If a creamery is specified to be outside of the study domain, a zero concentration is allocated to its recipe fraction. If a creamery is specified to be in the study domain but unknown, regime 1 herd milk is allocated to its recipe fraction. If no recipe for mixing creamery milk is supplied for a node, regime 1 herd cow milk is used for grocery milk at that node.

The Commercial Leafy Vegetables Module

The COMMLV module computes the concentrations in commercially distributed leafy vegetables resulting from mixing vegetables for which local leafy vegetable concentrations were computed in the BPLANT module. The

proportions of leafy vegetables available at any node from the various production nodes are specified in a separate input file.

Common Utility Routines

In addition to the major modules, a number of utility routines that may be used by one or more of the major modules are a part of the DESCARTES code. These include routines for stochastic variable generation, date handling, input/output control, keyword handling, and quality assurance.

7.1.2 Calling Hierarchy for the DESCARTES Code

The major modules of the DESCARTES code operate independently and in succession in a normal run of the code.

7.2 DESCARTES EXECUTION

This section describes the steps necessary to execute the DESCARTES code. This includes the identification of all data needed for simulation of any of the individual media in DESCARTES and the order of computations that must be observed in executing DESCARTES.

7.2.1 General Considerations

It is the user's responsibility to compile all the necessary data for executing DESCARTES. The names of all files and values for all parameters required to run the program are to be supplied in an input keyword file. General information on the use of keyword files is given in Appendix A. Instructions for preparing a DESCARTES keyword file are given in Section 7.4. As indicated in the instructions, the first record provided in the keyword file must be the REPORT record, which will establish the name of the report file to be written.

Caution must be exercised in making successive runs of the DESCARTES software package. No checking is done to see whether the media files to be created do not already exist. This could mean that existing files will be partially overwritten with information from the new run.

A great deal of error checking is done within the code, but it is difficult to perform some of the "reality checks" on input data that should be made. It is the user's responsibility to ensure that input parameters and other data are valid for the desired run of DESCARTES.

7.2.2 Order of Computations

As indicated in Figure 7.1, the data interfaces of the DESCARTES code require that the modules be executed in sequence. The output of one module frequently serves as input to the next module.

The DESCARTES computations begin with the biomass and plant products module, BPLANT. This module requires the air deposition file as input and calculates the radionuclide concentration in plant products.

The next module in the hierarchy is the animal products module, ANIMAL. ANIMAL requires several of the media files generated by BPLANT as input. The animal media simulated in ANIMAL consume plant products simulated in BPLANT.

The commercial leafy vegetables module, COMMLV, requires that inner and outer leafy vegetable media were previously calculated by BPLANT.

The creamery milk module, CREAM, requires the herd cow milk files for feeding regimes 1 through 4 as input. These files are produced in ANIMAL. The grocery milk module, GRMILK, requires the feeding regime 1 herd cow milk file and the creamery milk file produced in CREAM as input.

7.2.3 Executing the Program

The program is executed by entering the program name, DESCRT, without any quotation marks. An initial screen is displayed and a query is issued by the program to obtain the name of the keyword file. The keyword file name should be entered with no quotation marks, but should contain the complete path, if necessary. Once the keyword file is entered, all additional program actions are controlled by the entries in the keyword file.

The prompt that appears on the screen when the program is initiated is given in Figure 7.2. If the keyword file is not found or an error occurs on opening the keyword file, a message is written to the screen.

7.2.4 Restart Capabilities

This program does not have true restart capabilities, but single media calculations are possible. This allows a single (or several) media to be rerun without changing the media that are correct. So if a run was aborted for some reason before completing it, the keyword file can be edited so that the computations begin with the first uncompleted media.

```
                    DESCARTES

          Environmental Accumulation Analysis
     Hanford Environmental Dose Reconstruction Project
          Battelle, Pacific Northwest Laboratories
                   Richland, Washington

-----------------------------------------------

DESCRT   1.0          Last Modified: 25 May 1993

              Enter the keyword file name >
```

FIGURE 7.2. Opening Screen from DESCARTES

Also, if parameters or other data changes occur that affect only a few media, a keyword file can be constructed to run only these media. For example, if it is determined that a creamery recipe for one of the desired years was supplied incorrectly, a run can be made that computes only the creamery concentrations. Note that all years of the original simulation must be rerun so that the entire creamery media file is rewritten.

7.2.5 Problem Size Limits

The insert block "param.ins" contains some parameters that limit the size of simulations to be run in DESCARTES. These parameters are used in the code to dimension arrays. These may be modified, but larger values may indicate the need for significantly more disk space or memory to perform the computations. The current values for these parameters are given in Table 7.1.

7.3 DATA FILES

The files used by the DESCARTES code are described in this section. Several input files are required to run the code, and a number of output files are written, including a report file.

7.3.1 Input Files

Several input files are required to execute DESCARTES. The first file needed is a keyword file that describes the run and sets up run parameters. Additional files needed are the frost date files, the season date files, the animal diet files, and any necessary recipes for computing commercial products.

Keyword File

The keyword file is the file that controls the program execution. This file sets the nodes to be used, the time for which concentrations are to be computed, the media to be computed, and many other options for a run of DESCARTES. All file names to be used are also specified in the keyword file. The keyword records that may be used in this file and their function are described in Section 7.4.

Frost Date Files

Several environmental processes modeled in DESCARTES are keyed to the last spring frost and the first fall frost dates. A frost library file is used by the BPLANT module, which requires this information. An external user utility (FROSTP) is provided to assist in developing frost data files of the format needed in DESCARTES. FROSTP is described in Section 4.0.

TABLE 7.1. DESCARTES Parameters

Parameter Name	Description	Value
MAXCR	Maximum number of creameries	175
MAXCRN	Maximum number of contributor nodes in creamery network	200
MAXDRL	Maximum number of realizations in an animal diet file	100
MAXDAY	Maximum number of days in any single aggregation period	31
MAXFN	Maximum number of characters in a file name	72
MAXFOD	Maximum number of foods consumed in any animal diet	8
MAXFR	Maximum number of cow feeding regimes	4
MAXGR	Maximum number of distribution nodes in the grocery milk network	1102
MAXGRN	Maximum number of contributors in the grocery milk network	MAXCR+2
MAXLV	Maximum number of distribution nodes in a leafy vegetable network	800
MAXLVN	Maximum number of contributor nodes in a leafy vegetable network	4
MAXNOD	Maximum number of nodes DESCARTES may process	1102
MAXREL	Maximum number of realizations DESCARTES may process	100
MAXSEA	Maximum number of seasons in all diet files	5
MAXYR	Maximum number of calendar years DESCARTES may process	14
MXRRCR	Maximum number of realizations in a creamery milk recipe file	100
MXRRFR	Maximum number of realizations in a feeding regime recipe file	100
MXRRGR	Maximum number of realizations in a grocery milk recipe file	100
MXRRLV	Maximum number of realizations in a leafy vegetable recipe file	100
NUMSKP	Number of records in SHUFFL-produced air data file headers	14

Season Date Files

Several environmental processes modeled in DESCARTES are keyed to the start dates for the spring and early fall seasons. A season library file is used by the ANIMAL module, which requires this information. An external user utility (FROSTP) is provided to assist in developing season data files of the format needed in DESCARTES. FROSTP is described in Section 4.0.

Animal Diet Files

To provide a stochastic description of animal feed intake, the animal diet file provides a number of realizations of animal diets from which to choose. ANIMAL will randomly choose a starting diet from the file (any diet between one and the total number of diets less the number of realizations in the current run) and then sequentially read as many diets from the animal diet file as there are realizations. A separate diet file must be specified for each year (it may be the same file), permitting the user to modify the animal diet annually. An external routine (ADIETP) is provided to the user to assist in developing animal diet library files in the proper format. ADIETP is described in Section 5.0.

Commercial Recipe Files

The three commercial product modules, CREAM, GRMILK, and COMMLV, require one or more recipes to describe the mixing of resources provided through media files created by the BPLANT and ANIMAL modules. A recipe consists of two files—an ASCII index file containing a map to the data and a binary data file containing the fractional contributions to the mixture. An external program (RECIPE) is provided to assist the user in developing recipe index and data files in the proper format. RECIPE is described in Section 6.0. Recipes may change annually. Recipe index and data file names are provided through FILE records in the keyword input file.

7.3.2 Output Files

The DESCARTES code output consists of four types of files. They are 1) a report file which documents the run, 2) media concentration files, 3) files containing the stochastic parameters used in BPLANT and ANIMAL, and 4) a special file needed to pass soil parameters to CIDER. The names of all output files are provided through FILE records in the input keyword file.

The Report File

The report file written by DESCARTES is a comprehensive description of the code run. The DESCRT executive module writes an echo of the entire problem definition to the report file. An entry and an exit message are written to the report file by every module that is requested in the current run of DESCARTES. Summary statistics for all stochastic variables generated during code execution are also written to the report file. An example report file is given in Appendix E.

Media Files

Media files are written by all five of the major computational modules of DESCARTES. Media files were designed to have a 17-line header that is common to all media files. This header contains the record length for the file, the name and version of the program that created the file, the name of the user who created the file, a title, the date and time the file was created, the desired run start and stop time stamps for the DESCARTES run that created the file, the name of the media, season begin and end dates for the media, the nuclide name, the number of realizations of data in the file, and the number of items (nodes or creameries) contained in the file. The format of the data contained in the media file varies for plant products that have discrete harvests. The format of the media files is described in the DESCARTES design description.

The media file header contains all of the information necessary to ensure that all media files were produced for the same DESCARTES run parameters. Because media files output by a DESCARTES module may be input to another module, this allows error checking to see whether the input media file was produced under the same run parameters as the current run, even when the media file was generated by a separate code run.

There are 31 media files generated in a full run of the DESCARTES code. The names of the media and the module that writes them is given in Table 7.2. In addition, any media that must be calculated under the same run parameters, prior to calculating the given media, are listed. The prerequisite media files could be created in the same DESCARTES run or in a previous run.

Soil Factors File

To calculate inhalation doses compatible with the data in the environmental database passed to CIDER, an additional file is written in BPLANT. This is a small ASCII file which is input directly into CIDER. The file contains one entry per realization of the ratio of mass loading to the density of the upper soil layer.

Plant Product Stochastic Parameters File

The stochastic parameters generated in the BPLANT module are written to a small ASCII file. The parameters in this file pertaining to the upper and root zone soil layer densities are used by the ANIMAL module.

Animal Product Stochastic Parameters File

The stochastic parameters generated in the ANIMAL module are written to a small ASCII file.

7.4 KEYWORD COMMAND DESCRIPTIONS

The DESCARTES program is controlled through the use of keywords. Keywords are English-like commands that allow free-format entry of data.

TABLE 7.2. DESCARTES Media Files Generated

Media Name	Creating Module	Prerequisite Media Files
LVEGIN	BPLANT	None
LVEGOT	BPLANT	None
LVEGINCM	COMMLV	LVEGIN
LVEGOTCM	COMMLV	LVEGOT
VEGOTH	BPLANT	None
FRUITIN	BPLANT	None
FRUITOT	BPLANT	None
GRAIN	BPLANT	None
ALFALFA	BPLANT	None
PASTURE	BPLANT	None
GRASSHAY	BPLANT	None
SILAGE	BPLANT	None
SAGEBRUS	BPLANT	None
GOAT	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MILKGROC	GRMILK	MREG1HRD, CREAM
CREAM	CREAM	MREG1HRD, MREG2HRD, MREG3HRD, MREG4HRD
MREG1IND	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG1HRD	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG2IND	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG2HRD	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG3IND	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG3HRD	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG4IND	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
MREG4HRD	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
EGGS	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY

TABLE 7.2. (contd)

Media Name	Creating Module	Prerequisite Media Files
BEEF	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
POULTRY	ANIMAL	ALFALFA, PASTURE, SILAGE, GRAIN, GRASSHAY
AIRCON	BPLANT	None
AIRDEP	BPLANT	None
SOILUP	BPLANT	None
SOILROOT	BPLANT	None

A description of the general construction of keywords is given in Appendix A. The keywords are read from an ASCII file that may be prepared with any editor. A summary of the keywords available in DESCARTES is given in Table 7.3. A set of example keyword files is given in Appendix E.

7.4.1 General Considerations

The code structure in DESCARTES allows all media to be run at the same time, or a subset of the media may be computed. If a subset of the media are computed, all media that are required as input for the desired media must have already have been computed. For example, computation of the radionuclide concentration in cow milk requires previous computation of the concentrations in all of the food products (grain, grass hay, alfalfa, air deposition, silage, pasture, upper layer soil and root zone soil) eaten by the cow.

Some restrictions apply to the control information for DESCARTES if a data set for CIDER is being composed from the outputs of several runs of DESCARTES. The restrictions are as follows: 1) exactly the same set of nodes must be active in every run, 2) exactly the same time interval must be simulated, 3) the same nuclide must be used, 4) exactly the same number of realizations must be used, 5) the same season dates must be used for theharvest season of plants, and 6) the same time step (day, week, or month) must be used. These restrictions are enforced in the DESCARTES code through utility routines that handle reading and writing media files.

In general, there are no default values for data in DESCARTES. All applicable keywords must be entered if the concentrations in a media are being computed.

The REPORT keyword must be the first entry in the keyword file (it can be preceded by comment lines). If the report file is successfully opened, all error messages on program information will be output to the report file.

TABLE 7.3. Summary of DESCARTES Keywords

Keyword	Module(s)	Description
AIR	BPLANT	Controls entering file names for the air-related data from RATCHET as preprocessed by SHUFFL
COMPUTE	BPLANT ANIMAL CREAM GRMILK COMMLV	Controls which media will be computed
CREAMERY	GRMILK	Controls which creameries are defined
DEBUG	BPLANT ANIMAL CREAM GRMILK COMMLV	Permits optional output of intermediate calculations for specific media
DIET	ANIMAL	Controls entering file names for the animal diet files
DIRT	ANIMAL	Controls the fraction of dirt consumption by soil layer for animals.
END	DESCRT	Signifies the end of all keyword data
EXECUTE	DESCRT	Directs DESCARTES to execute the problem in addition to checking input data
FILE	BPLANT ANIMAL CREAM GRMILK COMMLV	Controls entering of file names for the input (and/or output) files for each media
FROST	BPLANT	Controls entry of file names for the frost date library files
GROCERY	GRMILK	Controls entry of identifiers for creameries that are unknown or are outside the study domain
HARVEST	BPLANT	Controls entry of harvest dates
NODE	DESCRT	Controls which nodes are selected for computation for a run of the code

TABLE 7.3. (contd)

Keyword	Module(s)	Description
NUCLIDE	DESCRT	Identifies the radionuclide name and decay constant value
REALIZAT	DESCRT	Controls the number of realizations to compute
RECIPE	CREAM GRMILK COMMLV	Controls entering of file names for the commercial production and distribution files
REPORT	DESCRT	Controls entering the name of the report file
SDATE	ANIMAL	Controls entry of file names for the animal feeding season library files
SEED	BPLANT ANIMAL CREAM GRMILK COMMLV	Controls entering of the starting seeds for the random number generator
SHUFFLE	BPLANT	Controls entering the record length of files passed from SHUFFLE or SHFMET
STEP	DESCRT	Controls the time step used for output of media concentration results
STOCHAST	BPLANT ANIMAL	Controls entering of the definition of statistical distributions for stochastic variables
TIME	DESCRT	Controls entering of the start and stop times for a run
TITLE	DESCRT	Controls entering a descriptive title for output labeling purposes
TRANSIT	ANIMAL	Controls entering the length of the spring and early fall feeding seasons for animals
USER	DESCRT	Controls entering a user name for output labeling purposes

Several keyword require a year indicator. All of these keywords must be preceded by a TIME keyword record. If keywords are entered with a year identifier outside the year range identified on the TIME record, that information will be discarded.

7.4.2 AIR Keyword

Purpose

The AIR keyword record controls entry of the file names for the files containing the air concentration and deposition data. The files contain the air data that was produced by the RATCHET code, preprocessed by the SHUFFL code, and if necessary, supplemented by the SHFMET code.

Syntax

The following is the general form for the AIR record:

AIR Modifier "File_Name"

where Modifier is one of the following:

DEPOSIT = air deposition
CONCEN = air concentration

and File_Name denotes a file name. The file name must be enclosed in double quote marks, fit on a single input line, and not contain any embedded single quote marks. A file name, including the path name, may be up to 72 characters long.

Two air records may be required for a run of the code—one with modifier DEPOSIT (for the file containing the deposition data) and one with modifier CONCEN (for the file containing concentration data). If plant concentrations are to be calculated in BPLANT, the air concentration file name must be supplied on an AIR record with the CONCEN modifier. If air deposition is to be calculated in BPLANT (and perhaps used later in ANIMAL), the air deposition file name must be supplied on an AIR record with the DEPOSIT modifier. Only one file name can be entered for each entry of the AIR record.

Example

Suppose that a run of DESCARTES requires access to both the air deposition and air concentration data. The two AIR records that would be required could have the following form:

```
AIR DEPOSIT "/tmp/i-131/air-dep.dat"
AIR CONCEN  "/tmp/i-131/air-con.dat"
```

7.4.3 COMPUTE Keyword

Purpose

The COMPUTE keyword record is used to initiate computation of the output concentration values for all media. Radionuclide concentrations for a media will only be computed and output if a COMPUTE record is entered requesting that media.

Syntax

The following is the general form for the COMPUTE record:

```
COMPUTE Modifier [Modifier ... Modifier]
```

Modifiers for plant media are as follows:

```
ALFALFA  = alfalfa hay
FRUIT    = fruit
GRAIN    = grain
GRASSHAY = grass hay
LVEG     = leafy vegetables - local
LVEGCM   = inner leafy vegetables - commercial
PASTURE  = pasture
SAGEBRUS = sagebrush
SILAGE   = silage
VEGOTH   = other vegetables
```

Modifiers for animal media are as follows:

```
BEEF     = beef
EGGS     = eggs
CREAM    = creamery cow milk
GOAT     = backyard goat milk
MILKGROC = grocery cow milk
MREG1IND = cow feeding regime 1 milk, individual transfer factor
MREG1HRD = cow feeding regime 1 milk, herd transfer factor
MREG2IND = cow feeding regime 2 milk, individual transfer factor
MREG2HRD = cow feeding regime 2 milk, herd transfer factor
MREG3IND = cow feeding regime 3 milk, individual transfer factor
MREG3HRD = cow feeding regime 3 milk, herd transfer factor
MREG4IND = cow feeding regime 4 milk, individual transfer factor
MREG4HRD = cow feeding regime 4 milk, herd transfer factor
POULTRY  = poultry
```

Modifiers for other media are as follows:

```
AIRCON   = air concentration
AIRDEP   = air deposition
SOILROOT = soil root zone
SOILUP   = upper soil layer
```

The COMPUTE record can contain one or more modifiers. More than one COMPUTE record can be entered for the same run of the code. At least one COMPUTE record must be entered for a run of DESCARTES to successfully complete.

Examples

Entry of the three following keyword records will turn on computation of three separate media (alfalfa, beef, and eggs):

```
COMPUTE ALFALFA
COMPUTE BEEF
COMPUTE EGGS
```

The following single keyword record will have the same effect as the above three records:

```
COMPUTE BEEF EGGS ALFALFA
```

7.4.4 CREAMERY Keyword

Purpose

The CREAMERY keyword record identifies the creameries to be processed in each year of the current DESCARTES run. Multiple CREAMERY records are allowed. The definition of the desired creameries builds sequentially with each CREAMERY record entered for a given year. Upon program entry, no creameries are active. The user must ensure that creamery identification numbers used are consistent with the creamery identification numbers used in creamery and grocery milk recipe files (see the RECIPE record description). Zero concentration data will be written to the CREAM media file for all creameries not active during a particular year.

Syntax

There are five options for the CREAMERY record, one of which must be present on each CREAMERY record. For every option, Year is a year (e.g., 1945) in the time frame of the current DESCARTES run. As for any keyword record with a Year modifier, a TIME record must precede all CREAMERY keyword records. A CREAMERY keyword record (or set of records) must be entered for every year of the DESCARTES run.

ALL option: Entry of the record

```
CREAMERY Year ALL
```

turns on computation of all creameries (creamery numbers from 1 to 175 as defined by the parameter MAXCR) for the year specified by Year.

RANGE option: Entry of the record

```
CREAMERY Year RANGE N1 N2
```

will activate computations for all creameries in the range N1 to N2 for Year. For example, the CREAMERY record entered as

CREAMERY 1946 RANGE 12 45

will activate all 34 creameries in the range of creamery numbers from 12 to 45 inclusive for the year 1946.

<u>NOT RANGE option</u>: Entry of the record

CREAMERY Year NOT RANGE N1 N2

will deactivate computations for all creameries in the range N1 to N2, inclusive, for the year specified by Year. For example, entry of the record

CREAMERY 1945 NOT RANGE 12 45

will deactivate computations for all 34 creameries in the range 12 to 45, inclusive, for the year 1945.

<u>LIST option</u>: Entry of the record

CREAMERY Year LIST N1 N2 N3 ... Nn

will activate computations for the creameries N1, N2, ... Nn for the year specified by Year. At least one creamery identification number must be entered. Any number of creameries can be identified using the LIST modifier. For example, entry of the record

CREAMERY 1946 LIST 12 45 53

will activate computations for the three creameries 12, 45 and 53 for 1946.

<u>NOT LIST option</u>: Entry of the record

CREAMERY Year NOT LIST N1 N2 N3 ... Nn

will deactivate computations for the creameries N1, N2, ... Nn for the year specified by Year. At least one creamery identification number must be entered. For example, entry of the record

CREAMERY 1945 NOT LIST 12 45 53

will deactivate computations for the three creameries 12, 45 and 53 for the year 1945. Any number of creameries can be identified using the NOT LIST modifiers.

Other Examples

Suppose that the following creameries are desired for 1947: 1-10, 20-24, 28-40, and 42. The following two sequences of CREAMERY records would each achieve this objective:

```
CREAMERY 1947 RANGE 1 10
CREAMERY 1947 RANGE 20 24
CREAMERY 1947 RANGE 28 40
CREAMERY 1947 LIST 42
CREAMERY 1947 RANGE 1 42
CREAMERY 1947 NOT RANGE 11 19
CREAMERY 1947 NOT RANGE 25 27
CREAMERY 1947 NOT LIST 41
```

7.4.5 DEBUG Keyword

Purpose

The DEBUG keyword record controls the level of output to the report file for the current run of the DESCARTES code.

WARNING: Using this option will greatly increase the size of the report file and indiscriminate use may cause disk storage requirements to exceed the capacity of the host system. The intent of the DEBUG option is to provide very detailed output for development and testing purposes. The output it provides is probably not useful for a user who does not have access to the source code.

Syntax

The general form for this record is

```
DEBUG Modifier [Modifier ... Modifier]
```

where Modifier is one of the modifiers associated with the COMPUTE record. Multiple modifiers may be entered on a single DEBUG keyword record. More than one DEBUG record can be entered for a single run of the DESCARTES code.

Example

Entry of the three following keyword records will turn the debug option on for three separate media:

```
DEBUG ALFALFA
DEBUG BEEF
DEBUG EGGS
```

The following single keyword record will have the same effect as the above three records:

DEBUG BEEF EGGS ALFALFA

7.4.6 DIET Keyword

Purpose

The DIET keyword record controls entry of the file names for the animal diet files. An animal diet file is a library of representative (randomized) daily consumption amounts for all food products ingested by the animal. These consumption amounts are used in the ANIMAL when computing the daily radionuclide intake for each animal. The utility program ADIETP can be used to generate the diet files for all animals in the proper format for the DESCARTES code.

Syntax

The general form for the DIET record is

DIET Modifier Year "File_Name"

where Year is a year (e.g., 1944) in the time frame of the run of the code and Modifier is one of the following:

BEEF = consumption amounts for a beef cow
GOAT = consumption amounts for a backyard goat
MILKREG1 = consumption amounts for a cow on feeding regime 1
MILKREG2 = consumption amounts for a cow on feeding regime 2
MILKREG3 = consumption amounts for a cow on feeding regime 3
MILKREG4 = consumption amounts for a cow on feeding regime 4
POULTRY = consumption amounts for free range poultry

The file name must be enclosed in double quotes, fit on a single input line, and not contain any embedded single quotes. File names, including path specification, may be up to 72 characters long.

Animal feeding regimes are allowed to change on an annual basis. Therefore, a separate DIET record must be entered for every animal for every year in the run. However, the same file can be used for more than one year. Because the definition of animal diets depends on the year, a TIME record must precede all DIET records.

Example

The set of DIET records for a goat diet for a run of DESCARTES spanning the years 1944 through 1947 could have the following form:

```
DIET GOAT 1944 "/tmp/i-131/goatdiet.44"
DIET GOAT 1945 "/tmp/i-131/goatdiet.44"
DIET GOAT 1946 "/tmp/i-131/goatdiet.46"
DIET GOAT 1947 "/tmp/i-131/goatdiet.46"
```

Note the use of the same file for more than one year.

7.4.7 DIRT Keyword

Purpose

The simulation of animal diets in DESCARTES allows each animal to eat contaminated dirt. The DIRT keyword record controls the fraction of the total dirt consumption assumed to come from each soil layer. Dirt can be consumed from two soil layers—the upper soil layer (nominally 1-mm thick) and the root zone soil layer (nominally 14.99-cm thick).

The fractions for dirt consumption are treated as constants in the DESCARTES code. In addition, the same fractions apply to all animals who eat dirt.

Syntax

The general form for the DIRT record is

```
DIRT N1 N2
```

where

N1 = fraction of the dirt consumption that comes from the upper soil layer compartment

N2 = fraction of the dirt consumption that comes from the root zone soil compartment.

The two values N1 and N2 must sum to 1, and both are on the range [0,1].

Example

The DIRT record can take the following form

```
DIRT 0.1 0.9
```

if dirt is consumed from both layers or

```
DIRT 1.0 0.0
```

if all the dirt consumed comes from the upper soil layer.

7.4.8 END Keyword

Purpose

The END keyword record signifies the end of all keyword data. No more keyword records are read after the END keyword is encountered, so it should be the last keyword in the keyword file.

Syntax

The general form for the END record is

```
END
```

There are no modifiers or quote strings associated with this keyword.

7.4.9 EXECUTE Keyword

Purpose

The EXECUTE keyword record signifies that the DESCARTES code is to execute the problem defined in the keyword file. If this record is not entered, the code will perform error checking on the input problem definition, but it will not attempt to compute any media concentrations. This option is useful in setting up the problem definition for a run that may take several hours to several days to complete. It may be useful to run DESCARTES without the EXECUTE keyword record until all other applicable keyword records are appropriately defined.

Syntax

The general form for the EXECUTE record is

```
EXECUTE
```

There are no modifiers or quote strings associated with this keyword.

7.4.10 FILE Keyword

Purpose

The FILE keyword record controls entry of the file names for the various output media files. In addition, it controls entry of the file name for the soil factors file output for use directly by the CIDER code and stochastic information generated in the BPLANT and ANIMAL modules.

Syntax

The general form for the FILE record is

```
FILE Modifier "File_Name"
```

Modifiers for plant media are

ALFALFA = alfalfa hay
FRUITIN = inner fruit
FRUITOT = outer fruit
GRAIN = grain
GRASSHAY = grass hay
LVEGIN = inner leafy vegetables - local
LVEGOT = outer leafy vegetables - local
LVEGINCM = inner leafy vegetables - commercial
LVEGOTCM = outer leafy vegetables - commercial
PASTURE = pasture
PLANTS = stochastic information generated in the BPLANT module
SAGEBRUS = sagebrush
SILAGE = silage
VEGOTH = other vegetables

Modifiers for animal media are

ANIMAL = stochastic information generated in the ANIMAL module
BEEF = beef
EGGS = eggs
CREAM = creamery cow milk
GOAT = backyard goat milk
MILKGROC = grocery cow milk
MREG1IND = cow feeding regime 1 milk, individual transfer factor
MREG1HRD = cow feeding regime 1 milk, herd transfer factor
MREG2IND = cow feeding regime 2 milk, individual transfer factor
MREG2HRD = cow feeding regime 2 milk, herd transfer factor
MREG3IND = cow feeding regime 3 milk, individual transfer factor
MREG3HRD = cow feeding regime 3 milk, herd transfer factor
MREG4IND = cow feeding regime 4 milk, individual transfer factor
MREG4HRD = cow feeding regime 4 milk, herd transfer factor
POULTRY = poultry

Modifiers for other media are

AIRCON = air concentration
AIRDEP = air deposition
SOILROOT = soil root zone
SOILUP = upper soil layer
USLRATIO = soil factors for use in CIDER

FILE keyword records are required whenever triggered by a COMPUTE record. FILE and COMPUTE records have a direct relationship for most output media files. The exceptions to this are as follows:

1. When a COMPUTE record is entered with the modifier FRUIT, FILE records are required for the two output media files FRUITIN and FRUITOT.

2. When a COMPUTE record is entered with the modifier LVEG, FILE records are required for the two output media files LVEGIN and LVEGOT.

3. When a COMPUTE record is entered with the modifier LVEGCM, FILE records are required for the two output media files LVEGINCM and LVEGOTCM.

4. When a COMPUTE record is entered for any of the media computed in the BPLANT module, a FILE record must be entered with the PLANTS modifier.

5. When a COMPUTE record is entered for any of the media computed in the ANIMAL module, FILE records must be entered with the PLANTS and ANIMAL modifiers.

6. A FILE record must always be entered with the USLRATIO modifier.

The file name must be enclosed in double quotes, must fit on a single input line, and not contain any embedded single quotes. File names, including path specification, may be up to 72 characters long. A separate FILE record is required for each output media file.

Examples

FILE records for the alfalfa (ALFALFA), poultry (POULTRY), grain (GRAIN), and air concentration (AIRCON) media could take the following form:

```
FILE ALFALFA "/tmp/i-131/alfalfa.med"
FILE POULTRY "/tmp/i-131/poultry.med"
FILE GRAIN   "grain.med"
FILE AIRCON  "/tmp/i-131/airconc.dat"
```

File Size

The size of a media file depends on several of the variables defined through other keyword records. The formula for file size is

(20 + 4 * # realizations) (# nodes) ($ output steps + 17)

The number of realizations is supplied on the REALIZAT record, the number of nodes is derived from information provided ont he NODE record, and the number of steps is derived from information provided on the TIME and STEP records.

File Size Example

For a problem that has

1102 nodes, 1 year, 100 realizations

The file size, depending on the STEP Modifier chosen, is

Daily: 176804880 bytes
Weekly: 31935960 bytes
Monthly: 13422360 bytes

7.4.11 FROST Keyword

Purpose

The FROST keyword record controls entry of the file names for the frost date library files. Frost dates are used in computing concentrations in plants (BPLANT module). The frost date library contains stochastic realizations of the frost dates at all nodes being computed. The utility program FROSTP can be used to generate frost date libraries in the proper format for the DESCARTES code.

Syntax

The general form for the FROST record is

```
FROST Year "File_Name"
```

where Year is a year (e.g., 1946) in the time frame of the run. The file name must be enclosed in double quotes, must fit on a single input line, and not contain any embedded single quotes. File names, including path specifications, may be up to 72 characters long.

As for any keyword record with a Year modifier, a TIME record must precede all FROST keyword records, and a FROST keyword record must be entered for every year of the DESCARTES run. However, the same file name may be specified for more than one year.

The frost date library must contain at least as many realizations as are being run in the DESCARTES code. If additional realizations are present they will be discarded.

Example

The FROST records for a run spanning the years 1944 to 1949 could have the following form:

```
FROST 1944 "/tmp/i-131/frost.44"
FROST 1945 "/tmp/i-131/frost.45"
FROST 1946 "/tmp/i-131/frost.46"
FROST 1947 "/tmp/i-131/frost.46"
FROST 1948 "/tmp/i-131/frost.48"
FROST 1949 "/tmp/i-131/frost.49"
```

7.4.12 GROCERY Keyword

Purpose

The GROCERY keyword record is used to enter optional creamery designations when grocery milk recipes call for an unknown creamery or a creamery outside of the study area.

Syntax

There are two different options for the GROCERY keyword record.

UNKNOWN Option:

The syntax for specifying an unknown creamery is

GROCERY UNKNOWN N

where N is the number assigned by the grocery milk recipes to the portion of milk that comes from a creamery whose identity is not known. N must be less than or equal to MAXCR+2 (see Table 7.1, DESCARTES Parameters), and must not match with a creamery being computed. If the creamery with identification number N is accessed in a recipe when grocery milk is being computed from creamery milk (in subroutine GRMILK), then the radionuclide concentration in the locally produced milk (cow on feeding regime 1, herd cow transfer) is used in place of the radionuclide concentration from a known creamery.

OUTSIDE Option

The syntax for specifying a creamery outside the study area is

GROCERY OUTSIDE M

where M is the number assigned by the grocery milk recipes to the portion of milk that comes from a creamery outside of the model domain. M must be less than or equal to MAXCR+2 (Table 7.1), must not match with a creamery being computed, and must not match with N above. If the creamery with identification number M is accessed in a recipe when grocery milk is being computed from creamery milk (in subroutine GRMILK), then a zero radionuclide concentration is used in place of the radionuclide concentration from a creamery.

Examples

The following keyword records would define creameries to be used in computing grocery milk when part of the milk comes from an unknown creamery and part of the milk comes from outside the model domain:

```
GROCERY UNKNOWN 174
GROCERY OUTSIDE 175
```

7.4.13 HARVEST Keyword

Purpose

The HARVEST keyword record is used to define information related to the harvesting of plants that is date-dependent. There are three separate functions for the HARVEST record: 1) set the beginning and end dates of the harvest season for those plants having a harvest season, 2) define the stochastic dates of harvest for those plants having distinct harvest dates, or 3) define the transition period between harvest of silage and the first fall frost date.

Syntax

There are three different definitions for the HARVEST keyword record which depend on the media being computed.

Seasonally-Harvested Media

The HARVEST record syntax for plants having a harvest season is

HARVEST Modifier Day_1 Day_2

The modifiers for this record are

VEGLEAFY = leafy vegetables
VEGOTHER = other vegetables
FRUIT = fruit

where Day_1 is the day of the beginning of the harvest season and Day_2 is the day of the end of the harvest season. The values for Day_1 and Day_2 are entered using a Julian calendar convention where day 1 corresponds to January 1st. These (constant) harvest season days apply for all nodes and all realizations. The two harvest days Day_1 and Day_2 must satisfy the relationship $1 \leq Day_1 \leq Day_2 \leq 366$.

Discretely-Harvested Media

The HARVEST record syntax for crops having discrete harvest dates (except silage) is

HARVEST Modifier Day_1 *Stochastic_Parameters*

The modifiers for this record are

ALFALFA1 = alfalfa first cutting of alfalfa
ALFALFA2 = alfalfa second cutting of alfalfa
ALFALFA3 = alfalfa third cutting of alfalfa
GRAIN = grain
GRASSHAY = grass hay

where Day_1 is the mean number of days after last spring frost that the first (or only) harvest occurs. These discrete harvest dates are stochastic across nodes and realizations. The set of stochastic parameters is explained in the description of the STOCHAST record. However, the user should choose from one of the following distributions: constant, uniform, discrete uniform, triangular, or normal. The stochastic concept for this record is that the harvest dates can be represented by a central value (Day_1) with some additive zero-mean noise about the central value. An alternative definition is to enter the value 0 for Day_1 and then enter a distribution definition with the appropriate mean value.

The suggested approach is to enter the mean number of days after the last spring frost for Day_1 and then use a discrete uniform distribution on ±10 days. For example, use the following record:

```
HARVEST GRASSHAY 72 3 -10 10
```

<u>Silage Media</u>

The HARVEST record syntax for the silage media is

HARVEST Modifier Day_1

The only modifier for this form of the HARVEST record is

SILAGE = silage media

and Day_1 is the number of days <u>before</u> first fall frost that harvest occurs.

<u>Examples</u>

Example HARVEST records for the leafy vegetables and fruit media are

```
HARVEST VEGLEAFY 90 290
HARVEST FRUIT    95 285
```

Example HARVEST records for the three alfalfa cuttings are

```
HARVEST ALFALFA1  100  3  -7  7
HARVEST ALFALFA2  145  3  -6  6
HARVEST ALFALFA3  190  3  -8  8
```

Example HARVEST record for the silage media is

```
HARVEST SILAGE 14
```

7.4.14 NODE Keyword

Purpose

The NODE keyword record identifies the nodes to be processed in the current DESCARTES run. Multiple NODE records are allowed. The definition of the desired nodes builds sequentially with each NODE record. Upon program entry, no output nodes are active.

Syntax

There are five options for the NODE record, one of which must be specified on every NODE record.

ALL option

Entry of the record

```
NODE ALL
```

turns on computation of all nodes (node numbers from 1 to 1102 as defined by the parameter MAXNOD - see Table 7.1).

RANGE option

Entry of the record

```
NODE RANGE N1 N2
```

will activate computations for all nodes in the range N1 to N2. For example, the NODE record entered as

```
NODE RANGE 12 45
```

will activate all 34 nodes in the range of node numbers from 12 to 45 inclusive.

NOT RANGE option

Entry of the record

```
NODE NOT RANGE N1 N2
```

will deactivate computations for all nodes in the range N1 to N2, inclusive. The range of active nodes will be those nodes numbered 1 through MAXNOD (Table 7.1) that are not in the inclusive range stated. For example, entry of the record

```
NODE NOT RANGE 12 45
```

will deactivate computations for all 34 nodes in the range 12 to 45, inclusive.

LIST option

Entry of the record

NODE LIST N1 [N2 N3 ... Nn]

will activate computations for the nodes N1, N2, ..., N3. For example, entry of the record

NODE LIST 12 45 53

will activate computations for the three nodes 12, 45 and 53. Any number of nodes can be identified using the LIST modifier.

NOT LIST option

Entry of the record

NODE NOT LIST N1 [N2 ... Nn]

will deactivate computations for the nodes N1, N2, ..., Nn. For example, entry of the record

NODE NOT LIST 12 45 53

will deactivate computations for the three nodes 12, 45 and 53. The list of active nodes will be those nodes numbered 1 through MAXNOD (Table 7.1) that are not in the list stated. Any number of nodes can be identified using the NOT LIST modifiers.

More Examples

Suppose that the following nodes are desired: 1-100, 200-275, 280-1100, and 1102. The following three sequences of NODE records would each achieve this objective:

```
NODE RANGE 1 100
NODE RANGE 200 275
NODE RANGE 280 1100
NODE LIST 1102

NODE RANGE 1 100
NODE RANGE 200 1100
NODE NOT RANGE 276 279
NODE LIST 1102

NODE ALL
NODE NOT RANGE 101 199
```

```
NODE NOT RANGE 276 279
NODE NOT LIST 1101
```

7.4.15 NUCLIDE Keyword

Purpose

The NUCLIDE keyword record is used to enter the name and radioactive decay constant for the radionuclide being processed. The nuclide name is embedded in all media files to ensure that all files are derived from data for the same nuclide.

Syntax

The general form for the NUCLIDE record is

```
NUCLIDE "Name" N1
```

where "Name" is the name of the radionuclide and N1 is the radioactive decay constant of the radionuclide in units of day^{-1}. The Name is entered as a quote string and must be enclosed in double quotes and contain a maximum of 6 characters. The convention for the radionuclide is to enter the element abbreviation in upper case followed by atomic mass number, without any separators.

Example

An example record for specifying the isotope ^{131}I is

```
NUCLIDE "I131" 0.08625
```

7.4.16 REALIZAT Keyword

Purpose

The REALIZAT keyword record defines the number of realizations to generate. The numerical value entered on the record gives the number of realizations to be performed and will be the number of realizations in all output media files.

The record length for the output media files is directly related to the number of realizations being run. The record length is 20 plus 4 times the number of realizations.

Syntax

```
REALIZAT N1
```

The integer N1 must be in the range 1 to 100 (100 is the current value of the parameter MAXREL - see Table 7.1).

Example

This example keyword sets the number of realizations to 100.

```
REALIZAT 100
```

7.4.17 RECIPE Keyword

Purpose

The RECIPE keyword record controls entry of file names for the various commercial production and distribution files. A recipe consists of two files, an index file and a data file; and a set of RECIPE records must be entered for each desired recipe. There are four possible sets of files required in a single run of the code. These files contain information for the following computations:

1. concentrations in commercial leafy vegetables as computed from the concentrations in local leafy vegetables

2. concentrations in cow grocery milk as computed from concentrations in creamery milk

3. combination of cow milk based on the four cow feeding regimes to compute the concentrations in (herd) cow milk at each node, and

4. concentrations in creamery milk as a combination of concentrations in herd cow milk from all contributing nodes.

Because some of the recipe data files can be very large, they are stored as binary files. The utility program RECIPE has been provided for use in constructing the desired index and data files.

Syntax

The general form for the RECIPE record is

```
RECIPE Modifier SubModifier Year "File_Name"
```

Where Modifier is one of the following:

```
LEAFVEG  = Commercial leafy vegetable distribution
MILKDSTR = Milk distribution from creameries to groceries
MILKPROD = Milk production and transfer of milk from nodes to creameries
MILKFEED = Milk feeding regime information at all nodes
```

SubModifier is one of the following:

```
INDEX = index file
DATA  = data file
```

Year is the year, e.g., 1946, and File_Name is a file name. The file name must be enclosed in double quotes, must fit on a single input line, and not contain any embedded single quotes. File names, including path specification, may be up to 72 characters long.

Separate RECIPE records must be entered for both the index and data files for every year in the run of the code. However, the same file name can be used for more than one year. The INDEX files are ASCII files, but the DATA files are stored in binary format. As for any keyword record with a Year modifier, a TIME record must precede all RECIPE keyword records.

Example

The set of RECIPE records for a commercial leafy vegetable run spanning the years 1944 through 1947 could have the form:

```
RECIPE LEAFVEG INDEX 1944 "/tmp/i-131/lfvgidx.44"
RECIPE LEAFVEG DATA  1944 "/tmp/i-131/lfvgdat.44"
RECIPE LEAFVEG INDEX 1945 "/tmp/i-131/lfvgidx.44"
RECIPE LEAFVEG DATA  1945 "/tmp/i-131/lfvgdat.44"
RECIPE LEAFVEG INDEX 1946 "/tmp/i-131/lfvgidx.44"
RECIPE LEAFVEG DATA  1946 "/tmp/i-131/lfvgdat.44"
RECIPE LEAFVEG INDEX 1947 "/tmp/i-131/lfvgidx.47"
RECIPE LEAFVEG DATA  1947 "/tmp/i-131/lfvgdat.47"
```

7.4.18 REPORT Keyword

Purpose

The REPORT keyword record controls entering the name of the file used for reporting (logging) purposes. The REPORT keyword must be the first keyword in the input keyword file. Once the REPORT keyword has been processed, the report file is opened and all further messages are sent to the report file.

Syntax

The report record has the format

```
REPORT "File_Name"
```

where File_name is the name of the file to which all run time messages will be written. The file name is entered in a quote string, and must be enclosed in double quotes. File names, including path specification, may be up to 72 characters long.

Example

The report file could be defined by entering the following record:

```
REPORT "/hedr/descartes/I131/production.rpt"
```

Association for Information and Image Management
1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

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7.4.19 SDATE Keyword

Purpose

The SDATE keyword record controls entry of the file names for the season date library files. Season dates are used in computing concentrations in animal products (ANIMAL module). The season date library contains stochastic realizations of the spring and fall dates at all nodes being computed. The utility program FROSTP can be used to generate season date libraries in the proper format for the DESCARTES code.

Syntax

The general form for the SDATE record is

```
SDATE Year "File_Name"
```

where Year is a year (e.g., 1946) in the time frame of the run. The file name must be enclosed in double quotes, must fit on a single input line, and not contain any embedded single quotes. File names, including path specifications, may be up to 72 characters long.

As for any keyword record with a Year modifier, a TIME record must precede all SDATE keyword records and an SDATE keyword record must be entered for every year of the DESCARTES run. However, the same file name may be specified for more than one year.

The season date library must contain at least as many realizations as are being run in the DESCARTES code. If additional realizations are present, they will be discarded.

Example

The SDATE records for a run spanning the years 1944 to 1949 could have the following form:

```
SDATE 1944 "/tmp/i-131/season.44"
SDATE 1945 "/tmp/i-131/season.45"
SDATE 1946 "/tmp/i-131/season.46"
SDATE 1947 "/tmp/i-131/season.46"
SDATE 1948 "/tmp/i-131/season.48"
SDATE 1949 "/tmp/i-131/season.49"
```

7.4.20 SEED Keyword

Purpose

The SEED keyword record controls entry of the seeds for the random number generator. A seed is required for every media that is computed and also for a few stochastic calculations that are not associated with a single

media. Entry of multiple seed values allows the user to add or modify a single media without changing the stochastic inputs to other media.

Syntax

The general form for the SEED record is

SEED Modifier N1

The value for N1 must be a number in the range 1 to 999999. Even though the seed can take a larger value internal to DESCARTES, the RDBLK routines may not correctly decode numerical entries that contain more than 10 digits. The value N1 is unitless.

Modifiers for plant media are

ALFALFA = alfalfa hay
FRUIT = fruit
GRAIN = grain
GRASSHAY = grass hay
LVEG = local leafy vegetables
LVEGCM = commercial leafy vegetables
PASTURE = pasture
PLANTS = stochastic items common to several plant media
SILAGE = silage
SAGEBRUS = sagebrush
VEGOTH = other vegetables

Modifiers for animal media are

ANIMAL = stochastic items common to several animal media
BEEF = beef
CREAM = creamery milk from cows
EGGS = eggs
GOAT = backyard goat milk
MILKGROC = grocery milk from cows
MREG1 = cow milk from feeding regime 1
MREG2 = cow milk from feeding regime 2
MREG3 = cow milk from feeding regime 3
MREG4 = cow milk from feeding regime 4
POULTRY = poultry
TFCWIN = transfer factor for individual cow milk
TFCWHD = transfer factor for herd cow milk

Modifiers for other media are

SOILROOT = soil root zone
SOILUP = upper soil layer

A separate SEED record is required for each modifier. The seed value does not have to be unique; the same seed could be entered on every SEED record.

Examples

SEED records for the alfalfa (ALFALFA), poultry (POULTRY), grain (GRAIN), and air concentration (AIRCON) media could have the following form:

```
SEED ALFALFA  123
SEED POULTRY    2
SEED GRAIN   1234
SEED AIRCON  1234
```

7.4.21 SHUFFLE Keyword

Purpose

The SHUFFLE keyword record is used to input the record length of the air data files written by the SHUFFLE program (and possibly modified by the SHFMET program) for use in DESCARTES. The log file from the SHUFFLE code can be consulted to obtain the proper value. In general, the value can be computed as 6+4N, where N is the number of realizations output by the SHUFFLE code. If this number (6+4N) is less than 16, the record length is 16.

Syntax

The general form for the SHUFFLE record is

```
SHUFFLE N1
```

The value for N1 must be an integer greater than or equal to 16.

Example

A keyword record valid for a run of the SHUFFLE code that output 100 realizations is

```
SHUFFLE 406
```

7.4.22 STEP Keyword

Purpose

The STEP keyword record identifies the time-stepping interval for outputs from DESCARTES. DESCARTES is designed to output data on a daily, weekly, or monthly time step. The smaller the time step, the greater the disk space requirements for writing the media files. When weekly or monthly time steps are used, the output concentrations are the average of daily concentrations over the entire interval.

Syntax

The general form for the STEP record is

STEP Modifier

Exactly one of the three modifiers DAY, WEEK, or MONTH must be present.

Examples

To perform calculations that are output on a monthly time step enter the following record:

STEP MONTH

To perform calculations that are output on a weekly time step enter the following record:

STEP WEEK

To perform calculations that are output on a daily time step enter the following record:

STEP DAY

7.4.23 STOCHAST Keyword

Purpose

The STOCHAST keyword record is used to enter the definition of a statistical distribution for stochastic variables. Up to 54 stochastic variables are required for a run of the DESCARTES code.

Syntax

The general form of the STOCHAST record is

STOCHAST Modifier Submodifier Dist_Index Parameters [TRUNCATE U1 U2]

A Modifier is required on all STOCHAST records. Some Modifiers require Submodifiers. Modifiers (and Submodifiers) for the STOCHAST record variables are as follows:

ALPHA = Foliar interception
BMAX = Maximum potential biomass, with Submodifiers:
- ALFALFA = Alfalfa
- FRUIT = Tree fruit
- GRAIN = Grain
- GRASSHAY = Grass hay
- LEAFYVEG = Leafy vegetables
- OTHERVEG = Other vegetables

PASTURE = Pasture
SAGEBRUS = Sagebrush
SILAGE = Silage

BMIN = Minimum (winter) biomass, with Submodifiers:
ALFALFA = Alfalfa
FRUIT = Tree fruit
GRAIN = Grain
GRASSHAY = Grass hay
LEAFYVEG = Leafy vegetables
OTHERVEG = Other vegetables
PASTURE = Pasture
SAGEBRUS = Sagebrush
SILAGE = Silage

CR = Plant-to-soil concentration ratio

FTRANS = Translocation fraction

KG = Growth rate constant, with submodifiers:
ALFALFA = Alfalfa
FRUIT = Tree fruit
GRAIN = Grain
GRASSHAY = Grass hay
LEAFYVEG = Leafy vegetables
OTHERVEG = Other vegetables
PASTURE = Pasture
SAGEBRUS = Sagebrush
SILAGE = Silage

KS = Senescence rate constant, with submodifiers:
ALFALFA = Alfalfa
FRUIT = Tree fruit
GRAIN = Grain
GRASSHAY = Grass hay
LEAFYVEG = Leafy vegetables
OTHERVEG = Other vegetables
PASTURE = Pasture
SAGEBRUS = Sagebrush
SILAGE = Silage

LAMLEACH = Soil leaching rate

LAMPERC = Percolation rate

LAMSPLSH = Rainsplash rate constant

LAMWEATH = Weathering rate

ML = Mass loading

RHORZ = Root zone soil density

RHOUSL = Upper soil layer density

TFBEEF = Transfer factor for beef

TFEGGS = Transfer factor for eggs

TFGOAT = Transfer factor for goat milk

TFMILKHD = Transfer factor for milk, herd cow

TFMILKIN = Transfer factor for milk, individual cow

TFPOUL = Transfer factor for poultry

VDEPOS = Deposition velocity of resuspension

WATER = Water dilution factor for animal consumption of water

Dist_Index must be an integer in the range 1 to 10 that identifies the index of a statistical distribution. The allowable statistical distributions are given in Appendix D. General information about the use of statistical distributions is also given in Appendix D.

The word Parameters indicates the numerical values of parameters required for defining the statistical distribution. The number and meaning of the parameters for each distribution are given in Table 7.1.

The additional modifier TRUNCATE can be used for all distribution types, except 1, 3, and 10. If TRUNCATE is entered, it must be followed by two values in the interval 0 to 1, inclusive. The lower value must be less than the upper value. These two values specify the tail probabilities at which to impose range truncation for the distribution, and must be entered after all of the parameters that define the distribution.

Examples

An example STOCHAST record for the foliar interception parameter using a triangular distribution with a minimum of 2, mode of 4 and maximum of 5.7 is

```
STOCHAST ALPHA 6 2 4 5.7
```

An example STOCHAST record for the same parameter, but using a normal distribution with a mean of 5 and standard deviation of 1, is

```
STOCHAST ALPHA 7 5 1
```

The STOCHAST record for the same parameter and same normal distribution, but with the tails truncated at the probability levels of 0.01 and 0.99, is:

```
STOCHAST ALPHA 7 5 1 TRUNCATE 0.01 0.99
```

An example STOCHAST record for the maximum biomass for sagebrush using the same triangular distribution as above is

```
STOCHAST BMAX SAGEBRUS 6 2 4 5.7
```

7.4.24 TIME Keyword

Purpose

The TIME keyword record identifies the start and stop time of the run of the code. Multiple runs of DESCARTES used in defining a complete data set for the CIDER code must all be run using identical TIME records.

Syntax

The general form of the TIME record is

```
TIME N1 N2 N3 N4 N5 N6
```

The entries N1, N2, and N3 contain the month, day, and year for the desired start of the run. The entries N4, N5, N6 contain the month, day, and year for the desired end of the run.

The TIME keyword record must precede all keyword records that contain a Year specification.

Examples

The following four example TIME records each specify a run from December 20, 1944 through January 15, 1951. The records all yield the same result because the characters ":" and "," all are separators between numerical values for the RDBLK keyword decoding routines:

```
TIME 12:20:1944 1:15:1951
TIME 12,20,1944 1,15,1951
TIME 12 20 1944 1 15 1951
```

Note that "/" is not a separator. This means that a date may NOT be entered in the form 12/20/1944.

7.4.25 TITLE Keyword

Purpose

The TITLE keyword record is used to enter a one-line descriptive title for the run. The problem title is written to the report file and all media files.

Syntax

The general form of the TITLE record is

```
TITLE "Words Here"
```

The title is entered in a quote string, and must be enclosed in double quote marks. Titles up to 72 characters long are supported. The title must not contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

The default title is

"User did not enter a TITLE record."

A TITLE record is not required, but provides traceability to the report file and the media files.

Example

An example TITLE record is

TITLE "Example TITLE record for a test run of DESCARTES."

7.4.26 TRANSIT Keyword

Purpose

The TRANSIT keyword record is used to enter the length of the spring and early fall feeding seasons. The simulation of animal diets in DESCARTES is based on five feeding seasons. The spring and early fall feeding seasons start at times specified in the season library file and last for user-specified periods of time. This record controls the number of days the spring and early fall feeding seasons are active. The spring feeding season is nominally a transition between the winter feeding regime and the summer feeding regime. The early fall feeding season is nominally a transition between the summer feeding regime and the fall feeding regime. The (constant) season lengths defined with the TRANSIT record apply to all animals.

Syntax

The general form for the TRANSIT record is

TRANSIT N1 N2

where N1 is the number of days the spring feeding season is active (nominally 14 days) and N2 is the number of days the early fall feeding season is active.

Example

The TRANSIT record can take the form

TRANSIT 14 14

7.4.27 USER Keyword

Purpose

The USER keyword record is used to identify the person making the run of the code. The user name is written to the report file.

Syntax

The general form of the USER record is

USER "User Name"

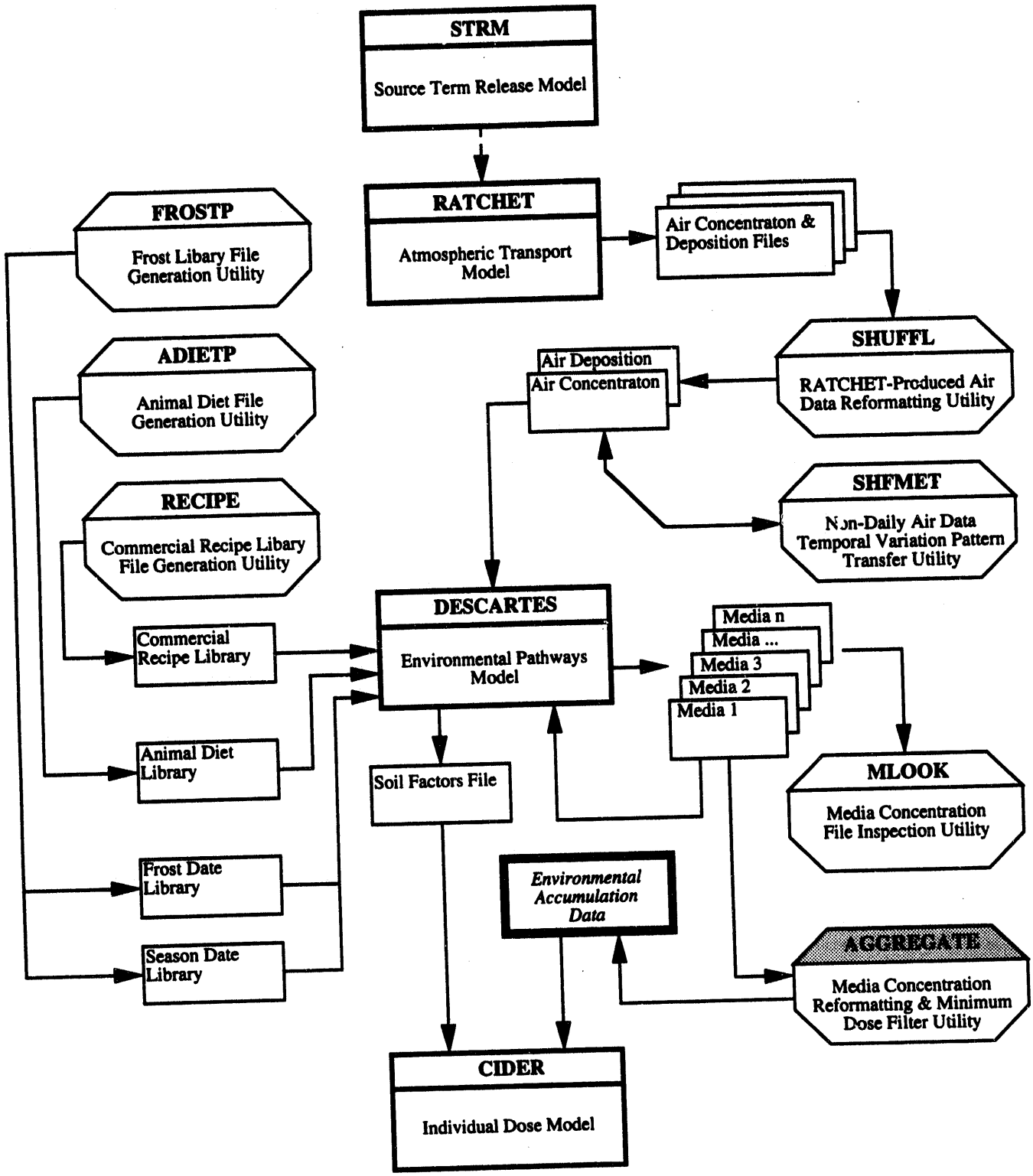
The user name is entered as a quote string, and must be enclosed in double quotes. User names up to 16 characters long are supported. The name must not

contain any embedded single apostrophes ('), as the characters after the apostrophe may be truncated.

The default user name is "Anonymous User". A USER record is not required, but provides traceability of the results to a specific user.

Example

USER "John Q. Public"


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Libary File Generation Utility
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
Air Deposition
Air Concentraton
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Soil Factors File
Media n
Media ...
Media 3
Media 2
Media 1
MLOOK
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

8.0 AGGREGATE USER INSTRUCTIONS

The section provides instructions for executing the AGGREGATE code. Information is provided to assist in preparing the necessary input files, and a short description of the code is provided.

8.1 DESIGN

The Aggregate code acts as an interface between the DESCARTES code and the CIDER code. The following are the functions performed by the Aggregate code:

- Aggregate all node-based or creamery-based media environmental accumulations generated by DESCARTES (that are requested by the analyst) into one or more files in the format required by CIDER.
- Filter all the environmental accumulation data (both node-based and creamery-based) to remove those accumulations that will result in a maximum possible dose from each media that is less than a threshold value provided by the analyst.
- Generate an index file for the node-based or creamery-based environmental accumulation files for CIDER.

For more information on the design of the AGGREGATE code, see the DESCARTES design description.[a] Several parameters are used within the Aggregate code to validate the data selected in the scenario file. If the user requires a parameter to exceed the ranges specified here, the Aggregate code will need to be recompiled with the new range. The parameters are given in Table 8.1.

8.2 AGGREGATE EXECUTION

Before running the Aggregate code, the analyst must create a command file called the scenario file (see Section 8.3.1).

The AGGREGATE code is executed by entering the program name together with the scenario file name and the log file name (e.g., "aggregat scenario.dat runlog.dat"). If the name of the scenario file or runlog file is omitted, the analyst will be prompted for the information. Normally, the Aggregate code must be run twice to generate the input required by CIDER; once for node-based media and once for creameries.

Upon conclusion of the run, the number of errors and warnings encountered is written to the screen. If any errors or warnings are reported,

---

(a) Software Documentation (HEDR Project Document No. 02940142), "Software Design Description for the DESCARTES Environmental Accumulation Computer Code," by W. E. Nichols, P. W. Esligner, T. B. Miley, K. S. Lessor, S. J. Ouderkirk, BNW, January 1994.

TABLE 8.1. AGGREGATE Parameter Definitions

Parameter	Value	Description
FIRSTYEAR	1944-1951	The first year that data exists. This is used as the key to derive the IYEAR range value from actual year values.
IYEAR	0-7	An integer in the range 0 to 7 where year 0 refers to FIRSTYEAR (e.g., 1944).
MEDIA	0-21	The number of the media containing the contamination.
REALIZATION	0-99	The number of realizations of stochastic data.

the runlog file should be examined to ascertain the cause of the problem. The index files should always be examined after a run to verify that they are complete.

8.3 INPUT AND OUTPUT FILES

The input and output files necessary to run the AGGREGATE code are described in this section.

8.3.1 Input Files

The following is an overview of the input files used by the Aggregate code.

The Scenario File

The scenario file contains all information needed to define the names and locations of the input and output files required by the code. The name and location of the scenario file are provided on the command line when starting Aggregate or are prompted for at run time if omitted from the command line. The file is a keyword-based file that is always required. A description of the keywords to be used in the scenario file is given in Section 8.4. A general description of the use of tokens is provided in Appendix B.

The Media Concentration Files

The media concentration files contain the temporal-based radionuclide concentrations. Each media is stored in a separate file. These files are generated by the DESCARTES code. The files are in FORTRAN binary direct access format. At least one media concentration file is required. Media files may be examined using the MLOOK utility code (see Appendix C).

Just as DESCARTES processes only one radionuclide per execution, Aggregate will only aggregate DESCARTES data for one radionuclide, as identified by data in the file headers. It is required that, if multiple media files are specified, they all have the same number of realizations, start and end dates, and time block intervals.

The creamery media file is a special case which must be run separately from the other media files (creamery data is based on creamery identification numbers, the other media is based on node identification numbers).

The Threshold File

The threshold file contains information needed to screen the environmental data for concentrations that will yield doses below which there is no perceived danger (this data will not be output to CIDER to save space). The threshold file is required.

The Soil Factors File

The soil factors file contains the ratio of mass loading to soil density that was used in the DESCARTES code to generate the media concentration estimates. This file is generated by DESCARTES. When creating the set of node-based and creamery-based files required by CIDER, the same version of the soil factors file must be specified or an error will be generated when running CIDER. Aggregate opens this file to extract the version token and writes the version token to the index file. The soil factors file is in text format and is required. The soil factors file structure is given in the DESCARTES design description.

Threshold File

The threshold file contains the concentrations by media that are to be considered effectively zero. The file is in text format and is required. Table 8.2 defines the structure of the threshold file.

8.3.2 Output Files

The following is an overview of the files written by the Aggregate code.

The Node Concentration File

The node concentration file(s) contain the temporal contaminant concentrations for a specific radionuclide and all media except creameries and custom milk. The name and location of the node exposure file are identified by the "CIDER_CON" keyword in the scenario file with a "node" modifier. The file is in binary format.

The Creamery Concentration File

The creamery concentration file contains the temporal radionuclide concentrations for a specific radionuclide and all creameries. The name and

TABLE 8.2. Threshold File Format

Record	Field	Type	Description
1	1	Token	File type = "threshold"
	2	Real	Threshold dose basis in mREM (e.g., 1.0)
	3	Token	Threshold dose time basis (month)
2	1	Token	Record type = "DATA"
	2	Token	Data type = "threshold"
*** The following record is repeated for each media ***			
3	1	Real	Threshold concentration for this media
	2	Token	CIDER media symbol (e.g., lil_veg)

location of the creamery exposure file is identified by the "CIDER_CON" keyword in the scenario file with a "creamery" modifier. The file is in binary format.

The Index File

The index file contains the information need to locate data for a given year and node/creamery in the concentration data file(s). The index file name and location is provided after the "INDEX" keyword in the scenario file. The file is in text format. Note that all exposure files that are placed into a single index must use the same threshold value, time basis, and the same nuclide.

The Log File

The run log is a text file that contains the following: information needed to recreate the results of the Aggregate run, error messages, warning messages, and debug messages. The name and location is either provided on the command line or is prompted for at run time. The contents of the run log file are as follows:

- Echo of the scenario file
- Listing of the names and locations of all input files
- Name, location, and version (date and time stamp) of the executable used to generate the results
- Run date/time stamp (also written to the index file)

- Listing of all errors and warnings encountered during the run
- Listing of any debug messages generated.

8.4 KEYWORD COMMAND DESCRIPTIONS

Table 8.3 summarizes the keywords available for the scenario file. The "Required" column indicates whether the keyword must be provided. The "Default" column indicates whether there is a default and, if so, the value of the default.

TABLE 8.3. Scenario Keyword Summary

Keyword	Required	Default	Description
CIDER_CON	Yes	None	Specify name and type of concentration file.
DEBUG	No	None	Permit optional output of intermediate calculations.
FINISH	No	Finish time in media file	Specify end year and day for the data to be aggregated.
INDEX	Yes	None	Specify name and location of the index file to be generated.
MEDIA_CON	Yes	None	Identify media symbol to be used for a DESCARTES media.
REALIZATIONS	No	Number of realizations in media file	Set number of realizations to process.
SOIL_FACTOR	Yes	Name and path of the soil factors file	Specify the name of the soil factors file.
START	No	Start time in the media file	Specify the start year and day for the data to be aggregated.
THRESHOLD	Yes	None	Specify the name and location of the threshold file.

8.4.1 CIDER_CON Keyword

Purpose

The CIDER_CON keyword record is used to specify the name and type of concentration file to be generated. This record is required.

Syntax

CIDER_CON File_name Modifier;

File_name is the name, including path specification, of the file environmental concentration file to be generated by the Aggregate code. The Modifier may be either "node" or "creamery", and indicates the type of file to be generated.

Example

CIDER_CON /data1/creamery.dat creamery;

8.4.2 DEBUG Keyword

Purpose

The DEBUG keyword record is used to force the reporting to the run log file of intermediate calculations and timing stamps to assist the user in identifying possible errors. The use of this record is optional.

Syntax

DEBUG;

There are no modifiers or character strings associated with this keyword.

8.4.3 FINISH Keyword

Purpose

The FINISH keyword record specifies the ending year and day of year (inclusive) to aggregate data from the media concentration files. This record is optional; if it is omitted, the finish time will default to the finish time in the media data files.

Syntax

FINISH Year Day;

Year is the year in which the data to be aggregated ends. Day is the day within year on which the data to be aggregated ends.

Example

```
FINISH 1951 365;
```

This record indicates that the data to be aggregated runs through December 31, 1951.

8.4.4 INDEX Keyword

Purpose

The INDEX keyword record specifies the name and location of the index file to be generated by the Aggregate code. This record is required; for example,

Syntax

The general form of the INDEX keyword record is

```
INDEX   File_name;
```

File_name is the name, including path specification, of the index file to be generated by the Aggregate code.

Example

```
INDEX /data/index.out;
```

8.4.5 MEDIA_CON Keyword

Purpose

The MEDIA_CON keyword record is used to identify media concentration file generated by DESCARTES to be loaded and the CIDER media symbol to be mapped to that media. This record is required for each media to be loaded.

Syntax

The general form of the MEDIA_CON keyword record is

```
MEDIA_CON  File_name  Symbol_name;
```

File_name is the name, including path specification, of the DESCARTES media concentration file to be loaded. Symbol_name is the CIDER media symbol to be mapped to that media. Media symbols are defined in Table 8.4.

Examples

```
MEDIA_CON /datal/leafy.dat    lil_veg;
MEDIA_CON /datal/other_v.dat  o_veg;
```

TABLE 8.4. Media Symbol Definitions

Media	Symbol	Description
0	air	Air
1	u-soil	Upper soil layer
2	rz_soil	Root zone soil
3	lil_veg	Local inner leafy vegetables
4	lol_veg	Local outer leafy vegetables
5	dil_veg	Distributed inner leafy vegetables
6	dol_veg	Distributed outer leafy vegetables
7	o_veg	Other vegetables
8	i_fruit	Inner fruit
9	o_fruit	Outer fruit
10	grain	Grain
11	eggs	Eggs
12	beef	Beef
13	poultry	Poultry
14	goat_milk	Goat's milk
15	grocer_milk	Grocery milk
16	cream_milk	Creamery milk
17	milk_1	Cow feeding regime 1 milk
18	milk_2	Cow feeding regime 2 milk
19	milk_3	Cow feeding regime 3 milk
20	milk_4	Cow feeding regime 4 milk
21	custom_milk	Milk from a custom cow diet

8.4.6 REALIZATIONS Keyword

Purpose

The REALIZATIONS keyword record indicated the number of realizations of environmental concentrations to load. This record must be less than or equal to the number of realizations provided in the media concentrations. If this record is not provided, it will default to the number contained in the MEDIA_CON files.

Syntax

The general form of the REALIZATIONS keyword record is

```
REALIZATIONS N1;
```

where N1 is the number of realizations to be loaded from the environmental concentrations media file.

Example

```
REALIZATIONS 10;
```

8.4.7 SOIL_FACTOR Keyword

Purpose

The SOIL_FACTOR keyword record indicates the name and path to the soil factors file. This record must be provided. This file is generated by DESCARTES to provide CIDER with the same basis for mass loading as was used to generate the concentration data in DESCARTES.

Syntax

The general form of the SOIL_FACTOR keyword record is

```
SOIL_FACTOR File_name;
```

where File_name is the name, including path specification, of the soil factors file generated by DESCARTES. Note that both the node and creamery based output must use the same soil factor file version or CIDER will generate an error.

Example

```
SOIL_FACTOR /data1/basis/soil.dat;
```

8.4.8 START Keyword

Purpose

The START keyword record specifies the starting year and day of year (inclusive) to aggregate data from the media concentration files. This record is optional; if it is omitted, the start time will default to the start time in the media data files.

Syntax

The general form of the START record is

START Year Day;

Year is the year in which the data to be aggregated begins. Day is the day within Year on which the data to be aggregated begins.

Example

START 1945 110;

This record indicated that the data to be aggregated begins on the 110th day of 1945.

8.4.9 THRESHOLD Keyword

Purpose

The THRESHOLD keyword record is used to enter the name and location of the threshold file. This record is required.

Syntax

The general format of the THRESHOLD keyword record is

THRESHOLD File_name;

File_name is the name, including path specification, of the threshold file to be read.

Example

THRESHOLD /data1/threshd.dat;

9.0 REFERENCES

Eslinger, P. W. 1993. Software Requirements Specification for the Hanford Environmental Dose Reconstruction Project Air Pathway Environmental Accumulation and Dose Models. BN-SA-3676 HEDR, Battelle, Pacific Northwest Laboratories, Richland, Washington.

Snyder, S. F., W. T. Farris, B. A. Napier, T. A. Ikenberry, and R. O. Gilbert. 1992. Parameters used in the Environmental Pathways (DESCARTES) and Radiological Dose (CIDER) Modules of the Hanford Environmental Dose Reconstruction Integrated Codes (HEDRIC) for Air Pathway. PNWD-2023 HEDR, Battelle, Pacific Northwest Laboratories, Richland, Washington.

APPENDIX A

CONSTRUCTION OF KEYWORDS

APPENDIX A

CONSTRUCTION OF KEYWORDS

Instructions in this appendix apply to keywords being constructed for the DESCARTES system of codes. See Appendix B for questions concerning keywords for the AGGREGATE code.

Each line of a keyword data file is parsed into numeric and character data. These are interpreted by the calling software to set up control information and define input parameters. A line can contain up to 80 characters of information. Lines longer than 80 characters are truncated to 80 characters.

Every line of the input data file is considered a keyword record, continuation record, or a comment record. Keyword records contain a keyword beginning in column 1. The keyword is used to determine the purpose of the subsequent data. Continuation records are used when a keyword record requires too much data to be placed on one line. Comment lines are ignored but are useful for annotating the input file.

The information from each keyword record, and subsequent continuation lines, is moved into storage arrays. Data that can be deciphered as numeric values are placed into a numeric array. Other data are classified either as "secondary keywords" (or "modifiers"), or "quote strings". Secondary keywords are stored as character images in a array. All such keywords or modifiers read from the input file are changed to upper case before being stored. Quote strings are text strings which are enclosed in double quotes. These are stored exactly as they are read from the file.

A.1 Keyword Lines

Keyword records start in column 1 with any letter from A to Z, in either upper or lower case. The first eight letters of a keyword are stored in a variable and are used by the modeling software to determine the actions desired by the program user. All subsequent lines of text that do not have an alphabetic character or comment character in column 1 are treated as continuation lines. An example keyword entry (where SOIL starts in column 1) is

```
SOIL 3 4.0 5.0
```

The word SOIL becomes the keyword. The number 3, 4.0, and 5.0, become numerical data.

A.2 Continuation Lines

Continuation lines start with any valid separator character (except a double quote). These are treated as additional data to the previous keyword record. Section B.5 of Appendix B identifies valid separator characters. The combined data on a keyword line, and the subsequent continuation line(s), are treated as a single block of information. All numeric values and character strings on those lines are used as input data relevant on the keyword of the keyword line. The two following keyword entries contain the same information:

```
SOIL 3 4.0 5.0

SOIL 3
  4.0 5.0
```

A.3 Comment Lines

Any line with the characters $, !, /, or * in column 1 will be treated as a comment record. Comment lines start with characters $, *, !, or /. These lines are ignored by the input data record reader. Both the $ and the ! can be used to signify in-line comments (not in column 1). Any information will be ignored which follows a $ or a ! character anywhere on an input line. The * and / characters indicate a comment only if they are the first characters on the input line. The * character is also be used as a repetition factor on the input. Some examples of comment lines are as follows:

```
$This is a comment line
/This is a comment line
!This is a comment line
*This is a comment line
```

Some examples of in-line comments are as follows:

```
SOIL 3 4.0 5.0 !Trailing information is ignored after the !
SOIL 3 4.0 5.0 $Trailing information is ignored after the $
```

A.4 Input Data Handling

Each line of the input is read and parsed into numeric and character values. All numeric values are converted to real numbers (as opposed to FORTRAN integer). Any data that cannot be interpreted as numeric information is stored as character values.

Numeric data may include a leading sign (+ or -), integer characters 0 through 9, a decimal point, and an exponent indication ('E' or 'e'). The FORTRAN 'double precision' exponent indicator 'D' is not valid. A maximum of 10 digits is allowed when entering numeric data.

Secondary keywords, or modifiers, are character strings that could not be interpreted as numeric values. These are converted to upper case, where necessary, and stored in an array. The number of secondary keywords that are moved into the array is stored for internal use.

Only the first eight characters of any keyword are significant. Keywords less than eight characters long are left justified and blank filled.

A.5 Quote Strings

Quote strings are strings of literal text that must be saved exactly as given in the input line. They are enclosed by double quote characters and are typically used for passing file names into a program. Only the first 72 characters of a quote string are saved. Each quote string must begin and end on a single line of the input file. When an unclosed quote is encountered, an implied quote is created at the end of that line. An example of quote string usage is

```
FILE "/files4/apps/Production/test.dat"
```

A.6 Data Repetition Factors

The * character can be used as a repetition factor within an input data block. It must be immediately preceded by a positive integer and immediately followed by a valid number or character string. That number or character string is moved into the corresponding output array repetitively (the number of times specified by the preceding integer). The repetition factor cannot be used with quote strings. As an example of use of the repetition factor, the following two records can be used to input the same numerical information:

```
SOIL 3 5.0 5.0 5.0 5.0
SOIL 3 4*5.0
```

The following two records can be used to input the same character information:

```
SOIL TIME TIME TIME
SOIL 3*TIME
```

A.7 Data Separators

Keywords, numeric data, and secondary keywords must be separated by any one of the following data 'separators':

	Space character
,	Comma
=	Equal sign
:	Colon
;	Semi colon
(	Left parenthesis
)	Right parenthesis

'	Single quote
"	Double quote
	Tab Character

Also, any character with a ASCII character storage code of less than 10 is treated as a separator character. This is used mainly to identify the ASCII tab character as a data separator. Double quote characters are used differently than the other separators. They indicate text strings that are stored without conversion by the program. Double quote characters may not be used as the first character of a continuation line. As an illustration of the use of separator characters, the following keyword records all contain the same information:

```
SOIL 3 4.5 5.6 6.7
SOIL 3 (4.5,5.6,6.7)
SOIL 3 ( 4.5=5.6'6.7 )
SOIL 3:4.5  5.6:6.7
SOIL 3;4.5(5.6)(6.7)
```

APPENDIX B

TEXT DATA FILE STRUCTURE

APPENDIX B

TEXT DATA FILE STRUCTURE

Instructions in this appendix apply to keywords for the AGGREGATE code. See Appendix A for questions concerning keywords for other codes.

The AGGREGATE code uses a set of utility routines to load most of the text-based data files. A text data file has the general form that begins with one or more file header records followed by parameter, range, and data records. The following syntax rules apply to the files:

- Each record is terminated by a semicolon (;).
- A record may cover one or more lines but no more than one record per line is allowed.
- Comments may be placed anywhere in the file between a semicolon (;) and an end of line (<eol>).
- Case is not significant for keywords.
- Fields are delimited by any non-valid token character (i.e., space, comma, tab, etc.; see the glossary).
- Unless noted, leading and trailing white space is acceptable.
- Length of a line is limited only by the operating system.
- A token is no longer than 80 characters.

The first header record in a text file consists of the file name and the file version. Some files will have a second record that indicates the nuclide for which the data apply.

B.1 Parameter Record

A parameter record is a variable dimension that has symbolic equivalents to each cell. The name of the parameter and the symbolic elements must be identical to those specified as parameter symbols. The form of a parameter record is the keyword "parameter" followed by a parameter name and a record terminator (;). The following records consist of a numeric equivalent (beginning with one (1) and incremented up to the dimension value for that parameter) followed by the symbolic name for that number. The names may be in any order and may be a subset of the parameters specified in the code. The parameter record is terminated by any record that has a non-numeric first

element. A parameter record may be repeated multiple times and appear anywhere after the file header. Examples of parameter records are as follows:

```
parameter bool;
1 true;
2 false;

parameter season;  no data for spring
1 winter;
2 fall;
3 summer;
```

B.2 Parameter_def Record

A parameter_def record is the same as the parameter record except that it allows new parameter symbols to be added to the list of symbols (e.g., DIET_ID). The number of elements added through the parameter_def must not exceed the dimension for that parameter. Example parameter_def records are as follows:

```
parameter_def diet_id;
1 ref_1;
2 ref_2;
3 ref_3_sample;
```

B.3 Range Record

A range record is a parameter that has no symbolic equivalents for each cell. The name of the range must be identical to those specified in the parameters section. The form of a range record is the keyword "range" followed by a range name, the low range value, the high range value, and a record terminator (;). The range value (high or low) is an integer between one (1) and the dimension value for that range. A range record may be repeated multiple times and appear anywhere after the file header; for examples,

```
range i_year 1 8;
range timestep 1 366;
range realization 1 100;
```

B.4 Data Header Record

A data record consists of two parts—a data header record and one or more data specification records. The data header record consists of the keyword "data" followed by a variable name and the names of each of the subscripts that apply to that variable (if any). Each of the subscript names must be the name of a parameter or range defined earlier in the data file (if defined multiple times the most recent will be used). Each subscript name may optionally be followed by a subscript range specification with the form " / int - int / " or " / int / " where "int" is an integer within the range for that parameter. If a subscript range specification is provided, the data spec

record will provide one data item for each element in the range. If multiple range specs are specified, they are processed left to right (i.e., the right most is the inner loop).

B.5 Data Specification Record

The data specification record consists of subscript indices for each of the subscripts that have not had a subscript range spec provided followed by as many data items as required by the subscript range specs. If a zero subscript range value is provided, the data item will apply to the entire range of the subscript as defined in the file header (the same value is used in all cells). A data item may be repeated by preceding it with a " / int / " where "int" is an integer value that is the repeat count; for example,

A single data value would be specified as follows:

```
data i_data; an integer variable
1;
data x_data.n_year; a short integer in a structure
1945;
data af_data season / 1 /; a float value mapped to cell 1 in an array
3.453;
```

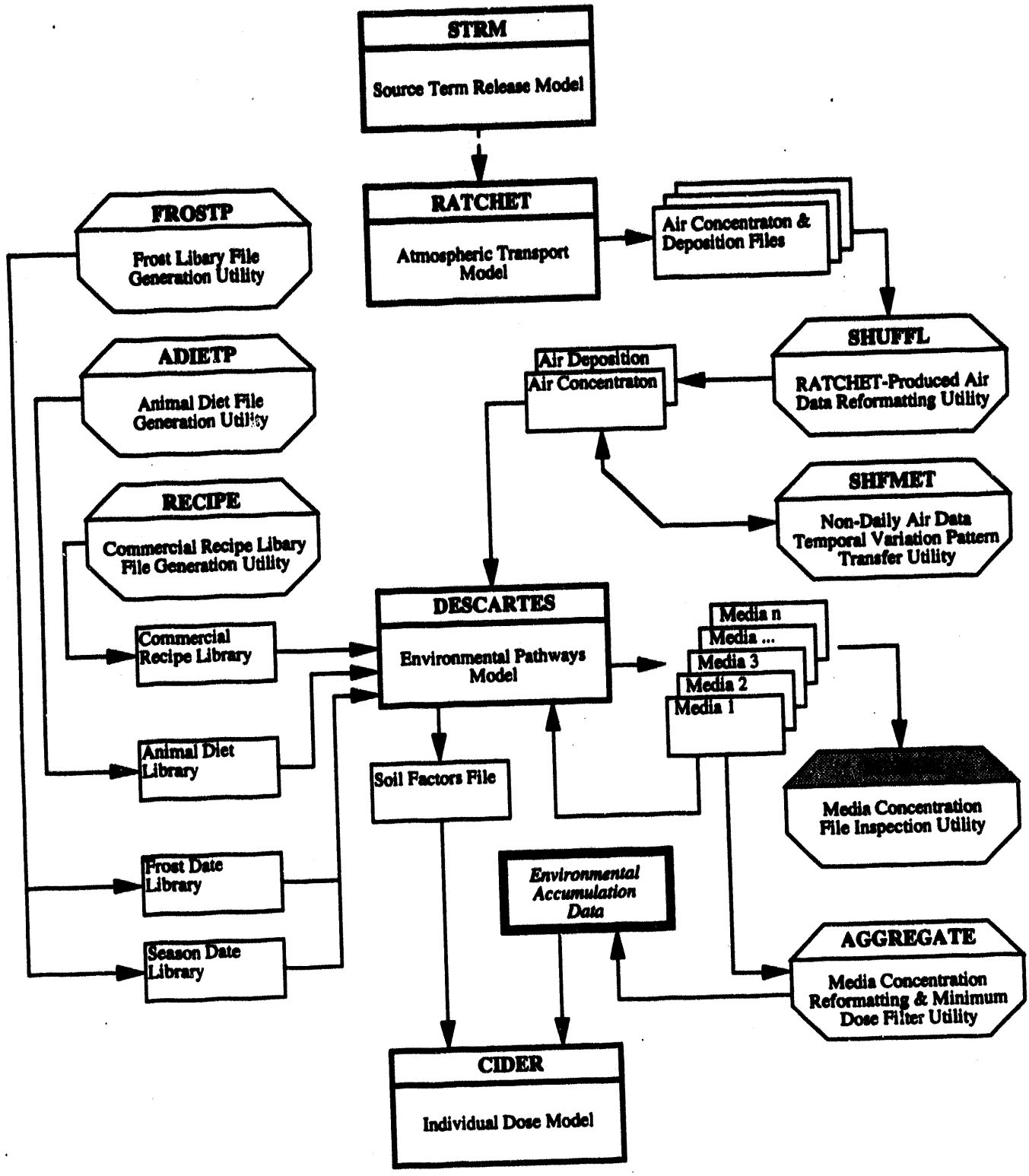
Multiple values may be specified as follows:

```
data af_data month  day; an array of floats
1 12 23.1; the first value is the month index
2 12 45.2; the second value is the day index
3 12 23.3; the third value is the data for that month/day
1 13 23.4;
2 13 45.5;
3 13 23.6;
1 14 23.7;
2 14 45.8;
3 14 23.9;
data af_data month / 1 - 3 /  day;  same as above
12 23.1 45.2 23.3;
13 23.4 45.5 23.6;
14 23.7 45.8 23.9;
data af_data month / 1 - 3 /  day / 12 - 14 /;  same as above
23.1 23.4 23.7 45.2 45.5 45.8 23.3 23.6 23.9;

data af_data month / 1 - 3 /  day / 12 - 14 /;  initialize all cells to zero
/ 9 / 0.0;
data af_data month day; initialize all cells to zero
0 0 0.0;
data af_data month day; initialize all cells to zero
0 12 0.0;
0 13 0.0;
0 14 0.0;
```

APPENDIX C

MLOOK DOCUMENTATION


STRM
Source Term Release Model
RATCHET
Atmospheric Transport Model
Air Concentraton & Deposition Files
FROSTP
Frost Libary File Generation Utility
ADIETP
Animal Diet File Generation Utility
RECIPE
Commercial Recipe Libary File Generation Utility
SHUFFL
RATCHET-Produced Air Data Reformatting Utility
Air Deposition
Air Concentraton
SHFMET
Non-Daily Air Data Temporal Variation Pattern Transfer Utility
DESCARTES
Environmental Pathways Model
Commercial Recipe Library
Animal Diet Library
Frost Date Library
Season Date Library
Soil Factors File
Media n
Media ...
Media 3
Media 2
Media 1
Media Concentration File Inspection Utility
Environmental Accumulation Data
AGGREGATE
Media Concentration Reformatting & Minimum Dose Filter Utility
CIDER
Individual Dose Model

APPENDIX C

MLOOK DOCUMENTATION

The utility program MLOOK was written to allow extraction of data in ASCII format from binary media files written by the DESCARTES code. The MLOOK program is an interactive program, receiving its control information from the user through screen inputs.

Major Options

Retrieved data can be output in one of two ways: they can be viewed on the screen or they can be output to a file. The retrieved data can be output in either or both of two forms: as an ASCII dump of all realizations of raw data or as summary statistics on each set of realizations.

The user must realize that the media file can be a large file. The beef media file used for an example in this appendix contains 100 realizations of data for 1102 nodes for the years 1944 through 1957. This results in a file size of 72.67 Mb. Care must be taken in selecting output options that the ASCII dump of the data does not grow too large. As a rule of thumb, the output ASCII dump is 5 times the size of the media file.

Program Execution

The program description that follows shows queries issued by MLOOK in bold characters. This example run accesses a media file containing concentrations of ^{131}I in beef. The program is invoked by entering the program name. The following opening screen appears:

```
                    Media File Look
     Environmental Accumulation Analysis Program
  Hanford Environmental Dose Reconstruction Project
      Battelle, Pacific Northwest Laboratories
                 Richland, Washington
-------------------------------------------------
  MLOOK    1.1          Modified on: 17 Jan 1994
```

Enter the media file name >>

The user must enter the file name of one of the binary media files written by DESCARTES. The file name may include a pathname up to 72 characters in length. In this case, the file beef.med was chosen.

Enter the number of realizations in the media file >>

The user is must enter the number of realizations. Entering the correct number of realizations is crucial. This value is used to set the record length that will be read from the media file. This number can be obtained from the DESCARTES report file.

```
Enter your name >>
```

Users can enter to 16 characters for their name. User names will be written to all output files.

```
Summary of Header Information from the Media File.
File: beef.med
Title: DESCARTES Production for 1944-1957 : Beef and Goat Products
Created with DESCRT Version 1.2 by Paul W. Eslinger
File created at 17:11:54 on 11-01-93
Media label = BEEF      Nuclide = I131
100 realizations for a total of 1102 nodes
Start  year is 1944 and start  day is 361
Ending year is 1957 and ending day is 365
Season start day is   1 and end day is 366
```

The user is provided a display of information from the media file header. This display is followed immediately by an option selection message:

```
Enter a number code for an action
  0 = Exit from the program
  1 = View information on the screen
  2 = Write all information to file >>
```

Three action options are displayed. The user can exit or continue with the program. If continuing, data can be displayed on the screen or written to files. If the user continues, the following information is displayed:

```
Enter a number code for an action
  0 = Exit from the program
  1 = Output ASCII dump of the data
  2 = Output statistical summary
  3 = Output both ASCII data and statistical summary
```

For this example the user chose to write all information to file and to output both ASCII data and the statistical summary. The output options cannot be changed once selected. If another output option is desired, then the program must be exited and restarted. The user must then select two distinct file names for the two output data files. The file names may include pathnames up to 72 characters long. For this example, the two files beef.uga and beef.ugs were entered.

```
Enter the file name for the ASCII data >>
Enter the output file name for statistics >>
```

Data can be extracted for a sequential selection of nodes and a sequential time selection. For example, data for nodes 1 through 20 could be output for the years 1946 through 1949. The user is provided a series of messages that are similar to the following message to assist in the data selection. Entering the number 4 to select the "Done setting options" action starts processing the request. Multiple segments of data from the same media file can be processed if desired before exiting MLOOK.

```
* * * * * * * * * * * * * * * * *

Node and time viewing options selected
  Start node =    1 and stop node = 1102
  Dates ...      File   Select
  Start year :  1944    1944
  Start day  :   361     361
  End year   :  1957    1957
  End day    :   365     365

Enter a number code for an action
  0 = Exit from the program
  1 = Set a new time range
  2 = Set a new node range
  3 = List the entire file
  4 = Done setting options >>
```

If DESCARTES is run in a weekly or monthly time stepping mode, then each record will have a day range associated with it. For this media file being examined, DESCARTES was started on day 361 of 1944 and was run on a monthly time step, so the first set of realizations for every node are associated with the days 361 through 366. For this example, action 1 "Set a new time range" was selected, desiring to output data for days 361 through 366 of 1944. The following four questions appear and are answered by the four entries 1944, 1944, 361, and 366:

```
Enter a new starting year between 1944 and 1957 >>
Enter a new ending year between 1944 and 1957 >>
Enter a new starting day between 1 and 366 >>
Enter a new ending day between 1 and 366 >>
```

The following modified message then appears. It incorporated the new time selections just entered.

```
* * * * * * * * * * * * * * * * *

Node and time viewing options selected
  Start node =    1 and stop node = 1102
  Dates ...      File   Select
  Start year :  1944    1944
  Start day  :   361     361
  End year   :  1957    1944
  End day    :   365     366
```

```
Enter a number code for an action
  0 = Exit from the program
  1 = Set a new time range
  2 = Set a new node range
  3 = List the entire file
  4 = Done setting options >>
```

For this example, action 2 "Set a new node range" was then selected, desiring to output data for only node 469. The following two questions appear and are answered by the two entries 469 and 469.

```
Enter a new starting node between 1 and 1102 >>
Enter a new ending node between  469 and 1102 >>
```

The following modified message then appears. Because the date and node selections now match the desired values, action 4 "Done setting options" is entered to start data processing.

```
* * * * * * * * * * * * * * * * *

Node and time viewing options selected
  Start node =  469 and stop node =  469
  Dates ...     File   Select
  Start year :  1944    1944
  Start day  :   361     361
  End year   :  1957    1944
  End day    :   365     366

Enter a number code for an action
  0 = Exit from the program
  1 = Set a new time range
  2 = Set a new node range
  3 = List the entire file
  4 = Done setting options >>
```

Once data processing is complete, the following message appears:

```
* * * * * * * * * * * * * * * * *

Node and time viewing options selected
  Start node =  469 and stop node =  469
  Dates ...     File   Select
  Start year :  1944    1944
  Start day  :   361     361
  End year   :  1957    1957
  End day    :   365     365

Enter a number code for an action
  0 = Exit from the program
  1 = Set a new time range
  2 = Set a new node range
```

3 = List the entire file
4 = Done setting options >>

For this example, action 0 is selected and the program is terminated. If desired, other options could have been selected and another data segment output.

Example Output Data Files

The above example execution of MLOOK resulted in the production of the two data files beef.uga and beef.ugs. Copies of these two files are shown in Figures XX? and XY?

Figure XX?: beef.uga

```
*****************************************************************************
*

MM      MM  LL            0000        0000     KK      KK
MMM    MMM  LL          00    00    00    00   KR    KKK
MMMM  MMMM  LL         00      00  00      00  KR  KKK
MM  MM  MM  LL         00      00  00      00  KKKK
MM      MM  LL         00      00  00      00  KK  KKK
MM      MM  LL          00    00    00    00   KK    KKK
MM      MM  LLLLLLLLLL    0000        0000     KK      KK

                    MLOOK    1.1
              Last Modified on 17 Jan 1994


                  Media File Look
       Environmental Accumulation Analysis Program
     Hanford Environmental Dose Reconstruction Project
          Battelle, Pacific Northwest Laboratories
                   Richland, Washington


     Current Run ID = 940117142831   User Name = Paul W. Eslinger

     System Date = 01-17-94   System Time = 14:28:31


*****************************************************************************
*
```

The software used to generate this output has been
formally tested and peer reviewed according to
Battelle software control procedures.
Document Number: HEDR QA Files Release Date: 1/17/94

Review Signatures

Reviewed By: _____ Date: _____

Summary of Header Information from the Media File.
File: beef.med
Title: DESCARTES Production for 1944-1957 : Beef and Goat Products
Created with DESCRT Version 1.2 by Paul W. Eslinger
File created at 17:11:54 on 11-01-93
Media label = BEEF Nuclide = I131
100 realizations for a total of 1102 nodes
Start year is 1944 and start day is 361
Ending year is 1957 and ending day is 365
Season start day is 1 and end day is 366

Data for node 469 for year 1944 and day 361 through day 366

1	5.87923E-10
2	3.28832E-09
3	2.98849E-09
4	6.79242E-10
5	3.54897E-10
6	6.74159E-10
7	7.56723E-09
8	2.92540E-09
9	1.23678E-08
10	3.02565E-09
11	2.62424E-09
12	2.59696E-09
13	9.34490E-10
14	5.47958E-09
15	2.87972E-08
16	1.74321E-09
17	3.32670E-09
18	6.76074E-10
19	2.66318E-09
20	1.39164E-09
21	3.73244E-08
22	9.47700E-10
23	1.29002E-08
24	2.03351E-09
25	3.96900E-09
26	1.58382E-08
27	1.67607E-09

28	1.04608E-08
29	2.78322E-09
30	1.79263E-09
31	1.77983E-08
32	2.68804E-09
33	4.59190E-09
34	6.78410E-09
35	3.73456E-09
36	1.53710E-09
37	6.73121E-09
38	9.36542E-09
39	4.90962E-10
40	2.54581E-09
41	3.04957E-09
42	3.11902E-09
43	3.19080E-09
44	9.63910E-10
45	6.99945E-09
46	9.86589E-09
47	1.36356E-09
48	6.42615E-09
49	2.76945E-08
50	3.05263E-09
51	3.25325E-09
52	7.74624E-09
53	2.01118E-09
54	6.48684E-09
55	5.63245E-09
56	4.21900E-09
57	8.21618E-10
58	9.49593E-09
59	1.34875E-09
60	4.45943E-09
61	7.26768E-09
62	1.71670E-09
63	1.83559E-09
64	1.23039E-08
65	4.94744E-10
66	8.52724E-10
67	8.11864E-10
68	2.24284E-09
69	1.86058E-09
70	3.49287E-09
71	8.61565E-10
72	1.74217E-09
73	7.22314E-09
74	9.82069E-10
75	1.54816E-08
76	3.16253E-08
77	1.07198E-09
78	2.00519E-09

79	5.62720E-09
80	6.25433E-09
81	7.79567E-09
82	9.96686E-09
83	5.26875E-09
84	6.83856E-09
85	6.68340E-09
86	3.32407E-09
87	1.09106E-08
88	9.30863E-10
89	1.57638E-09
90	2.97591E-09
91	5.94002E-09
92	1.83509E-08
93	3.68161E-09
94	2.82969E-09
95	5.16742E-09
96	2.02122E-09
97	1.24873E-09
98	1.13750E-08
99	9.25677E-09
100	2.22740E-09

Figure XY?: beef.ugs

```
*****************************************************************************
*

MM      MM  LL            0000        0000     KK      KK
MMM    MMM  LL          00    00    00    00   KR    KKK
MMMM  MMMM  LL         00      00  00      00  KR  KKK
MM  MM  MM  LL         00      00  00      00  KKKK
MM      MM  LL         00      00  00      00  KK  KKK
MM      MM  LL          00    00    00    00   KK    KKK
MM      MM  LLLLLLLLLL    0000        0000     KK      KK

                    MLOOK    1.1
                Last Modified on 17 Jan 1994


                    Media File Look
          Environmental Accumulation Analysis Program
        Hanford Environmental Dose Reconstruction Project
            Battelle, Pacific Northwest Laboratories
                     Richland, Washington


     Current Run ID = 940117142831   User Name = Paul W. Eslinger

          System Date = 01-17-94   System Time = 14:28:31


*****************************************************************************
*
        The software used to generate this output has been
          formally tested and peer reviewed according to
               Battelle software control procedures.
     Document Number: HEDR QA Files     Release Date: 1/17/94


                     Review Signatures

 Reviewed By: ____________________________        Date: ________________
```

Summary of Header Information from the Media File.
File: beef.med
Title: DESCARTES Production for 1944-1957 : Beef and Goat Products
Created with DESCRT Version 1.2 by Paul W. Eslinger
File created at 17:11:54 on 11-01-93
Media label = BEEF Nuclide = I131
100 realizations for a total of 1102 nodes
Start year is 1944 and start day is 361
Ending year is 1957 and ending day is 365
Season start day is 1 and end day is 366

Year	Node	Day1	Day2	Mean	St.Dev.	Minimum	25% Level	Median	75% Level	Maximum
1944	469	361	366	5.660E-09	6.661E-09	3.549E-10	1.717E-09	3.155E-09	6.839E-09	3.732E-08

APPENDIX D

STATISTICAL DISTRIBUTIONS FOR PARAMETERS

APPENDIX D

STATISTICAL DISTRIBUTIONS FOR PARAMETERS

Probability density functions (pdf's) must be chosen for some uncertain parameters in the utility codes. The pdf's that can be chosen for use in the utility codes are displayed in Table D.1. Graphical representations of the shapes of the pdf's are shown in Figure D.1. Mathematical definitions of these pdf's are provided in Iman and Shortencarier (1984).

Table D.1. Statistical Distributions Available

Index	Distribution Name	Truncate	Parameters Required
1	Constant	No	Single value
2	Uniform	Yes	Lower limit, upper limit
3	Discrete Uniform	No	Smallest integer, Largest integer
4	Loguniform (base 10)	Yes	Lower limit, upper limit
5	Loguniform (base e)	Yes	Lower limit, upper limit
6	Triangular	Yes	Lower limit, mode, upper limit
7	Normal	Yes	Mean, standard deviation
8	Lognormal (base 10)	Yes	Mean, standard deviation of logarithms
9	Lognormal (base e)	Yes	Mean, standard deviation of logarithms
10	Piecewise Uniform	No	Number of pairs, data for pairs of values (X_i, Prob(X_i))

The column labeled truncate in Table D.1 indicates whether truncation limits can be imposed on a statistical distribution. Truncation is performed by eliminating sample values from the tails of the distribution. Example entries to define truncation are given in Section D.2.

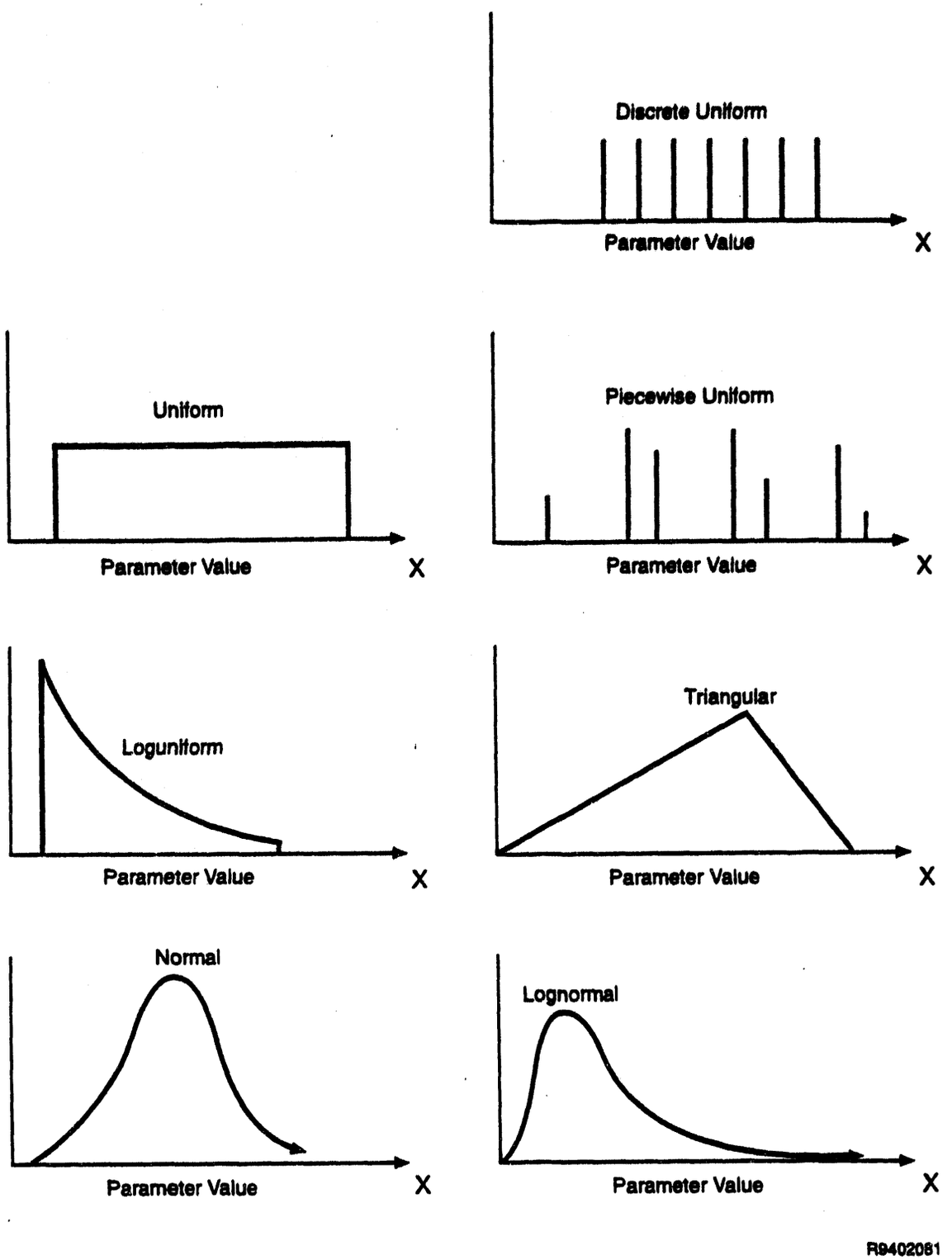


FIGURE D.1. Potential Distribution Shapes for Statistical Parameters

D.1 Criteria for Selection

General criteria for the selection of each of these distributions for use in the codes are as follows:

- The *uniform pdf*, which assigns equal probability to each possible value of the model parameter between the minimum and maximum values, is often selected if minimal information (actual measurements or subjective opinions of experts) is available about the parameter. The uniform pdf is often used as a default pdf; it is also used whenever it is impossible to defend the assertion that a more complex distribution is appropriate.

- The *piecewise uniform pdf* describes the situation where the allowable values for the model parameter are a set of discrete values that can have different probability levels. This pdf is often selected when data come from a mixture of sources and each source has a small amount of variability.

- The *discrete uniform pdf* describes the situation where the values of the model parameter can be represented as a series of contiguous integers. An equal probability is assigned to all values of the parameter within the range of integers. This pdf is often selected when a range of dates are a possibility for a time-dependent parameter.

- The *loguniform pdf*, which assigns equal probability of occurrence to the logarithm of each possible value of the model parameter, is often selected if 1) the minimum and maximum values span a distance of several orders of magnitude, 2) there is some reason to believe that a uniform distribution of the logarithms is a plausible model, and 3) insufficient information is available to defend the assertion that a more complex distribution is appropriate.

- The *triangular pdf* assigns probabilities of occurrence to the possible model parameter values such that the pdf is in the form of a triangle. This pdf is selected if 1) the available information indicates that one value of the parameter is more likely to occur than any other single value and 2) insufficient information is available to defend the assertion that a pdf shape more complex than a triangle is appropriate. The most likely parameter value need not be located at the center of the range. It may be located near the maximum or minimum value.

- The *normal (Gaussian) pdf* assigns probability of occurrence to the possible model parameter values such that the pdf is symmetric and bell-shaped. This distribution is used when sufficient data, statistical analyses, or other information exist to defend the assertion that the normal distribution is a more accurate model than a symmetric triangular distribution.

- The *lognormal pdf* assigns probabilities of occurrence to the logarithms of the possible model parameter values such that the pdf of those logarithms is symmetric and bell-shaped. The lognormal pdf is used when sufficient data, statistical analyses, or other information exist to defend the assertion that the normal distribution of the logarithms is a more accurate model than a symmetric triangular distribution of the logarithms.

D.2 Examples

The following example keyword entries define statistical distributions for the thyroid dose conversion factor for a nursing child. The data entered here are for illustration purposes only and do not represent current knowledge on this model parameter. When the TRUNCATE modifier is used, two probability values must be entered. These two probabilities define how much of the distribution is to be truncated. Only the probability fraction between the two limits will be used.

<u>Constant Value</u>

```
NURSING "thyroid" 1 5.0E-6
```

<u>Uniform</u>

The following entries define a uniform distribution on the range 5.0E-6 to 1.0E-5. The first two entries define the same distribution, in that truncation to the probability range 0 to 1 uses the entire probability range. The third entry eliminates the lower 1% and upper 1% of the data range.

```
NURSING "thyroid" 2 5.0E-6 1.E-5
NURSING "thyroid" 2 5.0E-6 1.E-5 TRUNCATE 0.0 1.0
NURSING "thyroid" 2 5.0E-6 1.E-5 TRUNCATE 0.01 0.99
```

<u>Discrete Uniform</u>

The following defines a discrete uniform distribution on the integers 14 through 21. No range truncation can be performed for this distribution.

```
NURSING "thyroid" 3 14 21
```

<u>Loguniform - Base 10</u>

The following entries define a loguniform (base 10) distribution on the range 5.0E-6 to 1.0E-5. The first two entries define the same distribution. The third entry eliminates the lower 2% and upper 1% of the data range.

```
NURSING "thyroid" 4 5.0E-6 1.E-5
NURSING "thyroid" 4 5.0E-6 1.E-5 TRUNCATE 0 1
NURSING "thyroid" 4 5.0E-6 1.E-5 TRUNCATE 0.02 0.99
```

Loguniform - Base e

The following entries define a loguniform (base e) distribution on the range 5.0E-6 to 1.0E-5. The second entry eliminates the lower 1% and upper 2% of the data range.

```
NURSING "thyroid" 5 5.0E-6 1.E-5
NURSING "thyroid" 5 5.0E-6 1.E-5 TRUNCATE 0.01 0.98
```

Triangular

The following entries define a triangular distribution with minimum 1.0E-6, mode 5.0E-6, and maximum 1.0E-5. The second entry eliminates the lower 5% and upper 0.1% of the data range.

```
NURSING "thyroid" 6 1.0E-6 5E-6 1.0E-5
NURSING "thyroid" 6 1.0E-6 5E-6 1.0E-5 TRUNCATE 0.05 0.999
```

Normal

The following entries define a normal distribution with mean 5.0E-6 and standard deviation 1.0E-7. The second entry eliminates the lower 5% and upper 5% of the data range.

```
NURSING "thyroid" 7 5.0E-6 1.E-7
NURSING "thyroid" 7 5.0E-6 1.E-7 TRUNCATE 0.05 0.95
```

Lognormal - Base 10

The following entries define a lognormal distribution (base 10) where the mean of the logarithms of the data is 5.0E-6 and the standard deviation of the logarithms of the data is 1.0E-7. The second entry eliminates the lower 5% and upper 6% of the data range.

```
NURSING "thyroid" 8 5.0E-6 1.E-7
NURSING "thyroid" 8 5.0E-6 1.E-7 TRUNCATE 0.05 0.94
```

Lognormal - Base e

The following entries define a lognormal distribution (base e) where the mean of the logarithms of the data is 5.0E-6 and the standard deviation of the logarithms of the data is 1.0E-7. The second entry eliminates the lower 5% and upper 6% of the data range.

```
NURSING "thyroid" 8 5.0E-6 1.E-7
NURSING "thyroid" 8 5.0E-6 1.E-7 TRUNCATE 0.05 0.94
```

Piecewise Uniform

The following entry defines a piecewise uniform distribution where the value lies between 2 and 4 with probability 0.4, between 4 and 7 with probability 0.5, and between 7 and 11 with probability 0.1.

```
NURSING "thyroid" 10 4
  2.0     0.0
  4.0     0.4
  7.0     0.5
 11.0     0.1
```

Keyword construction allows the use of additional words (but not numbers) in the definition of an entry. The following entry defines the same distribution as the one above:

```
NURSING "thyroid", distribution type 10 with 4 pairs of numbers
  (2.0,0.0), (4.0,0.4), (7.0,0.5), and (11.0,0.1)
```

D.3 Reference

Iman, R. L., and M. J. Shortencarier. 1984. A FORTRAN 77 Program and User's Guide for the Generation of Latin Hypercube and Random Samples for Use With Computer Models. NUREG/CR-3624, Sandia National Laboratories, Albuquerque, New Mexico.

APPENDIX E

EXAMPLE RUN

APPENDIX E

EXAMPLE RUN

Production runs of the DESCARTES suite of codes were run in logical segments of calculations, adhering to the order of calculations that it is necessary to follow. The following pages are example keyword files and report files for a production run of DESCARTES. The examples are divided into a run of SHUFFL, SHFMET, FROSTP, ADIETP, RECIPE, DESCARTES, and AGGREGATE. When necessary to save space, redundant portions of report files were deleted.

SHUFFL

```
/* SHUFFL.INPUT

100
'shuffl.ratchet.files'
'depo.44-57'
'conc.44-57'
1944
361
1944
361
1949
365
'I131'
'Production Runs for SHUFFL Using 1944 - 1949 RATCHET outputs'
```

```
/* SHUFFL.RATCHET.FILES

'/files4/home/d33296/htds_ex/ex_dec44' 1944 361   6
'/files4/home/d33296/htds_ex/ex_jan45' 1945   1  31
'/files4/home/d33296/htds_ex/ex_feb45' 1945  32  28
'/files4/home/d33296/htds_ex/ex_mar45' 1945  60  31
'/files4/home/d33296/htds_ex/ex_apr45' 1945  91  30
'/files4/home/d33296/htds_ex/ex_may45' 1945 121  31
'/files4/home/d33296/htds_ex/ex_jun45' 1945 152  30
'/files4/home/d33296/htds_ex/ex_jul45' 1945 182  31
'/files4/home/d33296/htds_ex/ex_aug45' 1945 213  31
'/files4/home/d33296/htds_ex/ex_sep45' 1945 244  30
'/files4/home/d33296/htds_ex/ex_oct45' 1945 274  31
'/files4/home/d33296/htds_ex/ex_nov45' 1945 305  30
'/files4/home/d33296/htds_ex/ex_dec45' 1945 335  31
'/files4/home/d33296/htds_ex/ex_jan46' 1946   1  31
'/files4/home/d33296/htds_ex/ex_feb46' 1946  32  28
'/files4/home/d33296/htds_ex/ex_mar46' 1946  60  31
'/files4/home/d33296/htds_ex/ex_apr46' 1946  91  30
'/files4/home/d33296/htds_ex/ex_may46' 1946 121  31
'/files4/home/d33296/htds_ex/ex_jun46' 1946 152  30
'/files4/home/d33296/htds_ex/ex_jul46' 1946 182  31
'/files4/home/d33296/htds_ex/ex_aug46' 1946 213  31
'/files4/home/d33296/htds_ex/ex_sep46' 1946 244  30
'/files4/home/d33296/htds_ex/ex_oct46' 1946 274  31
'/files4/home/d33296/htds_ex/ex_nov46' 1946 305  30
'/files4/home/d33296/htds_ex/ex_dec46' 1946 335  31
'/files4/home/d33296/htds_ex/ex_jan47' 1947   1  31
'/files4/home/d33296/htds_ex/ex_feb47' 1947  32  28
'/files4/home/d33296/htds_ex/ex_mar47' 1947  60  31
'/files4/home/d33296/htds_ex/ex_apr47' 1947  91  30
'/files4/home/d33296/htds_ex/ex_may47' 1947 121  31
'/files4/home/d33296/htds_ex/ex_jun47' 1947 152  30
'/files4/home/d33296/htds_ex/ex_jul47' 1947 182  31
'/files4/home/d33296/htds_ex/ex_aug47' 1947 213  31
'/files4/home/d33296/htds_ex/ex_sep47' 1947 244  30
'/files4/home/d33296/htds_ex/ex_oct47' 1947 274  31
'/files4/home/d33296/htds_ex/ex_nov47' 1947 305  30
'/files4/home/d33296/htds_ex/ex_dec47' 1947 335  31
'/files4/home/d33296/htds_ex/ex_jan48' 1948   1  31
'/files4/home/d33296/htds_ex/ex_feb48' 1948  32  29
'/files4/home/d33296/htds_ex/ex_mar48' 1948  61  31
'/files4/home/d33296/htds_ex/ex_apr48' 1948  92  30
'/files4/home/d33296/htds_ex/ex_may48' 1948 122  31
'/files4/home/d33296/htds_ex/ex_jun48' 1948 153  30
'/files4/home/d33296/htds_ex/ex_jul48' 1948 183  31
'/files4/home/d33296/htds_ex/ex_aug48' 1948 214  31
'/files4/home/d33296/htds_ex/ex_sep48' 1948 245  30
'/files4/home/d33296/htds_ex/ex_oct48' 1948 275  31
'/files4/home/d33296/htds_ex/ex_nov48' 1948 306  30
'/files4/home/d33296/htds_ex/ex_dec48' 1948 336  31
'/files4/home/d33296/htds_ex/ex_jan49' 1949   1  31
'/files4/home/d33296/htds_ex/ex_feb49' 1949  32  28
'/files4/home/d33296/htds_ex/ex_mar49' 1949  60  31
'/files4/home/d33296/htds_ex/ex_apr49' 1949  91  30
'/files4/home/d33296/htds_ex/ex_may49' 1949 121  31
'/files4/home/d33296/htds_ex/ex_jun49' 1949 152  30
'/files4/home/d33296/htds_ex/ex_jul49' 1949 182  31
'/files4/home/d33296/htds_ex/ex_aug49' 1949 213  31
'/files4/home/d33296/htds_ex/ex_sep49' 1949 244  30
'/files4/home/d33296/htds_ex/ex_oct49' 1949 274  31
'/files4/home/d33296/htds_ex/ex_nov49' 1949 305  30
'/files4/home/d33296/htds_ex/ex_dec49' 1949 335  31
```

```
/*SHUFFL.LOG

Starting time is Mon Oct 25 13:42:12 1993
Program sccs file is /files4/apps/hedrdev/shuffl/SCCS/s.shuffl.f
Program version is 1.42
User is d37279
Record length of the air files is   406
Number of DESCARTES nodes is   1102
Number of realizations is   100
The RATCHET file set name and date file is shuffl.ratchet.files
The air deposition file is depo.44-57
The air concentration file is conc.44-57
The base year is   1944
The base day of the year is   361
The starting year is   1944
The starting day of the year is   361
The ending year is   1949
The ending day of the year is   365
The nuclide is I131
The title is "Production Runs for SHUFFL Using 1944 - 1949 RATCHET outputs"
RATCHET files and modification dates:
/files4/home/d33296/htds_ex/ex_dec44.001 Fri Oct 22 16:46:37 1993
/files4/home/d33296/htds_ex/ex_dec44.002 Fri Oct 22 20:13:36 1993
/files4/home/d33296/htds_ex/ex_dec44.003 Sat Oct 23 00:00:13 1993
/files4/home/d33296/htds_ex/ex_dec44.004 Sat Oct 23 03:38:26 1993
/files4/home/d33296/htds_ex/ex_dec44.005 Sat Oct 23 06:37:26 1993
/files4/home/d33296/htds_ex/ex_dec44.006 Sat Oct 23 09:32:10 1993
/files4/home/d33296/htds_ex/ex_dec44.007 Sat Oct 23 12:21:58 1993
/files4/home/d33296/htds_ex/ex_dec44.008 Sat Oct 23 15:15:50 1993
/files4/home/d33296/htds_ex/ex_dec44.009 Sat Oct 23 18:08:59 1993
/files4/home/d33296/htds_ex/ex_dec44.010 Sat Oct 23 21:07:39 1993
/files4/home/d33296/htds_ex/ex_dec44.011 Sun Oct 24 00:07:18 1993
/files4/home/d33296/htds_ex/ex_dec44.012 Sun Oct 24 03:33:50 1993
/files4/home/d33296/htds_ex/ex_dec44.013 Sun Oct 24 06:36:56 1993
/files4/home/d33296/htds_ex/ex_dec44.014 Sun Oct 24 09:31:48 1993
/files4/home/d33296/htds_ex/ex_dec44.015 Sun Oct 24 12:34:51 1993
/files4/home/d33296/htds_ex/ex_dec44.016 Sun Oct 24 15:31:39 1993
/files4/home/d33296/htds_ex/ex_dec44.017 Sun Oct 24 18:45:37 1993
/files4/home/d33296/htds_ex/ex_dec44.018 Sun Oct 24 21:29:20 1993
/files4/home/d33296/htds_ex/ex_dec44.019 Mon Oct 25 00:35:16 1993
/files4/home/d33296/htds_ex/ex_dec44.020 Mon Oct 25 03:47:40 1993
/files4/home/d33296/htds_ex/ex_dec44.021 Mon Oct 25 06:13:55 1993
/files4/home/d33296/htds_ex/ex_dec44.022 Fri Oct 22 16:50:23 1993
/files4/home/d33296/htds_ex/ex_dec44.023 Fri Oct 22 19:49:58 1993
/files4/home/d33296/htds_ex/ex_dec44.024 Fri Oct 22 22:52:03 1993
/files4/home/d33296/htds_ex/ex_dec44.025 Sat Oct 23 02:09:00 1993
/files4/home/d33296/htds_ex/ex_dec44.026 Sat Oct 23 05:14:35 1993
/files4/home/d33296/htds_ex/ex_dec44.027 Sat Oct 23 07:55:40 1993
/files4/home/d33296/htds_ex/ex_dec44.028 Sat Oct 23 11:22:29 1993
/files4/home/d33296/htds_ex/ex_dec44.029 Sat Oct 23 14:20:54 1993
/files4/home/d33296/htds_ex/ex_dec44.030 Sat Oct 23 17:27:26 1993
/files4/home/d33296/htds_ex/ex_dec44.031 Sat Oct 23 20:31:16 1993
/files4/home/d33296/htds_ex/ex_dec44.032 Sat Oct 23 23:37:42 1993
/files4/home/d33296/htds_ex/ex_dec44.033 Sun Oct 24 02:54:15 1993
/files4/home/d33296/htds_ex/ex_dec44.034 Sun Oct 24 05:45:38 1993
/files4/home/d33296/htds_ex/ex_dec44.035 Sun Oct 24 08:40:28 1993
/files4/home/d33296/htds_ex/ex_dec44.036 Sun Oct 24 11:31:52 1993
/files4/home/d33296/htds_ex/ex_dec44.037 Sun Oct 24 14:24:41 1993
/files4/home/d33296/htds_ex/ex_dec44.038 Sun Oct 24 17:44:08 1993
/files4/home/d33296/htds_ex/ex_dec44.039 Sun Oct 24 20:28:49 1993
/files4/home/d33296/htds_ex/ex_dec44.040 Sun Oct 24 23:04:31 1993
/files4/home/d33296/htds_ex/ex_dec44.041 Mon Oct 25 01:53:20 1993
/files4/home/d33296/htds_ex/ex_dec44.042 Mon Oct 25 05:05:20 1993
/files4/home/d33296/htds_ex/ex_dec44.043 Fri Oct 22 17:18:12 1993
/files4/home/d33296/htds_ex/ex_dec44.044 Fri Oct 22 20:14:14 1993
/files4/home/d33296/htds_ex/ex_dec44.045 Fri Oct 22 22:57:50 1993
/files4/home/d33296/htds_ex/ex_dec44.046 Sat Oct 23 02:07:44 1993
/files4/home/d33296/htds_ex/ex_dec44.047 Sat Oct 23 04:59:53 1993
/files4/home/d33296/htds_ex/ex_dec44.048 Sat Oct 23 07:54:46 1993
```

```
/files4/home/d33296/htds_ex/ex_dec44.049 Sat Oct 23 10:49:51 1993
/files4/home/d33296/htds_ex/ex_dec44.050 Sat Oct 23 13:15:38 1993
/files4/home/d33296/htds_ex/ex_dec44.051 Sat Oct 23 16:10:41 1993
/files4/home/d33296/htds_ex/ex_dec44.052 Sat Oct 23 19:28:09 1993
/files4/home/d33296/htds_ex/ex_dec44.053 Sat Oct 23 22:10:40 1993
/files4/home/d33296/htds_ex/ex_dec44.054 Sun Oct 24 00:55:30 1993
/files4/home/d33296/htds_ex/ex_dec44.055 Sun Oct 24 03:46:12 1993
/files4/home/d33296/htds_ex/ex_dec44.056 Sun Oct 24 06:19:33 1993
/files4/home/d33296/htds_ex/ex_dec44.057 Sun Oct 24 09:16:27 1993
/files4/home/d33296/htds_ex/ex_dec44.058 Sun Oct 24 12:15:48 1993
/files4/home/d33296/htds_ex/ex_dec44.059 Sun Oct 24 15:00:50 1993
/files4/home/d33296/htds_ex/ex_dec44.060 Sun Oct 24 17:58:32 1993
/files4/home/d33296/htds_ex/ex_dec44.061 Sun Oct 24 20:39:35 1993
/files4/home/d33296/htds_ex/ex_dec44.062 Sun Oct 24 23:26:51 1993
/files4/home/d33296/htds_ex/ex_dec44.063 Fri Oct 22 17:42:44 1993
/files4/home/d33296/htds_ex/ex_dec44.064 Fri Oct 22 20:26:31 1993
/files4/home/d33296/htds_ex/ex_dec44.065 Fri Oct 22 23:02:05 1993
/files4/home/d33296/htds_ex/ex_dec44.066 Sat Oct 23 02:37:21 1993
/files4/home/d33296/htds_ex/ex_dec44.067 Sat Oct 23 05:48:00 1993
/files4/home/d33296/htds_ex/ex_dec44.068 Sat Oct 23 08:44:42 1993
/files4/home/d33296/htds_ex/ex_dec44.069 Sat Oct 23 11:38:06 1993
/files4/home/d33296/htds_ex/ex_dec44.070 Sat Oct 23 14:27:52 1993
/files4/home/d33296/htds_ex/ex_dec44.071 Sat Oct 23 17:30:54 1993
/files4/home/d33296/htds_ex/ex_dec44.072 Sat Oct 23 20:32:17 1993
/files4/home/d33296/htds_ex/ex_dec44.073 Sat Oct 23 23:37:58 1993
/files4/home/d33296/htds_ex/ex_dec44.074 Sun Oct 24 02:38:03 1993
/files4/home/d33296/htds_ex/ex_dec44.075 Sun Oct 24 05:47:41 1993
/files4/home/d33296/htds_ex/ex_dec44.076 Sun Oct 24 08:43:15 1993
/files4/home/d33296/htds_ex/ex_dec44.077 Sun Oct 24 11:16:35 1993
/files4/home/d33296/htds_ex/ex_dec44.078 Sun Oct 24 14:20:12 1993
/files4/home/d33296/htds_ex/ex_dec44.079 Sun Oct 24 17:17:57 1993
/files4/home/d33296/htds_ex/ex_dec44.080 Sun Oct 24 20:33:21 1993
/files4/home/d33296/htds_ex/ex_dec44.081 Sun Oct 24 23:27:35 1993
/files4/home/d33296/htds_ex/ex_dec44.082 Mon Oct 25 02:10:38 1993
/files4/home/d33296/htds_ex/ex_dec44.083 Fri Oct 22 17:43:13 1993
/files4/home/d33296/htds_ex/ex_dec44.084 Fri Oct 22 21:02:27 1993
/files4/home/d33296/htds_ex/ex_dec44.085 Fri Oct 22 23:36:52 1993
/files4/home/d33296/htds_ex/ex_dec44.086 Sat Oct 23 02:40:55 1993
/files4/home/d33296/htds_ex/ex_dec44.087 Sat Oct 23 05:44:29 1993
/files4/home/d33296/htds_ex/ex_dec44.088 Sat Oct 23 08:38:28 1993
/files4/home/d33296/htds_ex/ex_dec44.089 Sat Oct 23 11:11:04 1993
/files4/home/d33296/htds_ex/ex_dec44.090 Sat Oct 23 14:06:28 1993
/files4/home/d33296/htds_ex/ex_dec44.091 Sat Oct 23 16:47:41 1993
/files4/home/d33296/htds_ex/ex_dec44.092 Sat Oct 23 19:33:02 1993
/files4/home/d33296/htds_ex/ex_dec44.093 Sat Oct 23 22:04:57 1993
/files4/home/d33296/htds_ex/ex_dec44.094 Sun Oct 24 00:51:35 1993
/files4/home/d33296/htds_ex/ex_dec44.095 Sun Oct 24 03:41:51 1993
/files4/home/d33296/htds_ex/ex_dec44.096 Sun Oct 24 06:45:20 1993
/files4/home/d33296/htds_ex/ex_dec44.097 Sun Oct 24 09:22:40 1993
/files4/home/d33296/htds_ex/ex_dec44.098 Sun Oct 24 12:19:06 1993
/files4/home/d33296/htds_ex/ex_dec44.099 Sun Oct 24 15:18:14 1993
/files4/home/d33296/htds_ex/ex_dec44.100 Sun Oct 24 18:20:43 1993
/files4/home/d33296/htds_ex/ex_jan45.001 Fri Oct 22 16:47:40 1993
/files4/home/d33296/htds_ex/ex_jan45.002 Fri Oct 22 20:14:28 1993
/files4/home/d33296/htds_ex/ex_jan45.003 Sat Oct 23 00:01:05 1993
/files4/home/d33296/htds_ex/ex_jan45.004 Sat Oct 23 03:39:09 1993
/files4/home/d33296/htds_ex/ex_jan45.005 Sat Oct 23 06:38:14 1993
/files4/home/d33296/htds_ex/ex_jan45.006 Sat Oct 23 09:32:53 1993
/files4/home/d33296/htds_ex/ex_jan45.007 Sat Oct 23 12:22:52 1993
/files4/home/d33296/htds_ex/ex_jan45.008 Sat Oct 23 15:16:45 1993
/files4/home/d33296/htds_ex/ex_jan45.009 Sat Oct 23 18:09:49 1993
/files4/home/d33296/htds_ex/ex_jan45.010 Sat Oct 23 21:08:32 1993

...

/files4/home/d33296/htds_ex/ex_dec49.085 Sat Oct 23 02:39:49 1993
/files4/home/d33296/htds_ex/ex_dec49.086 Sat Oct 23 05:43:54 1993
/files4/home/d33296/htds_ex/ex_dec49.087 Sat Oct 23 08:37:52 1993
/files4/home/d33296/htds_ex/ex_dec49.088 Sat Oct 23 11:10:27 1993
```

```
/files4/home/d33296/htds_ex/ex_dec49.089 Sat Oct 23 14:05:54 1993
/files4/home/d33296/htds_ex/ex_dec49.090 Sat Oct 23 16:47:08 1993
/files4/home/d33296/htds_ex/ex_dec49.091 Sat Oct 23 19:32:30 1993
/files4/home/d33296/htds_ex/ex_dec49.092 Sat Oct 23 22:04:24 1993
/files4/home/d33296/htds_ex/ex_dec49.093 Sun Oct 24 00:51:03 1993
/files4/home/d33296/htds_ex/ex_dec49.094 Sun Oct 24 03:41:14 1993
/files4/home/d33296/htds_ex/ex_dec49.095 Sun Oct 24 06:44:45 1993
/files4/home/d33296/htds_ex/ex_dec49.096 Sun Oct 24 09:22:06 1993
/files4/home/d33296/htds_ex/ex_dec49.097 Sun Oct 24 12:18:28 1993
/files4/home/d33296/htds_ex/ex_dec49.098 Sun Oct 24 15:17:39 1993
/files4/home/d33296/htds_ex/ex_dec49.099 Sun Oct 24 18:20:07 1993
/files4/home/d33296/htds_ex/ex_dec49.100 Sun Oct 24 21:07:08 1993
Ending time is Mon Oct 25 23:15:50 1993
```

SHFMET

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$
$ Production keyword file for the SHFMET program
$ Prepared by: Paul W. Eslinger
$ October 25, 1993
$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$
REPORT "shfmet.rpt"
TITLE "Production run for 1944-1957 using RATCHET (SHUFFL) data for 1946-1949"
USER "Paul W. Eslinger"
$
EXECUTE
$
$ SHUFFL-processed concentration and deposition files
$
FILE CONCEN  "conc.44-57"
FILE DEPOSIT "depo.44-57"
$
$ Files containing monthly Iodine-131 release values for
$ the input SHUFFL files and the new target times
$
FILE SOURCE "month.45-49"
FILE TARGET "month.50-57"
$
$ Radionuclide being processed
$
NUCLIDE "I131"
$
$ Number of realizations in the SHUFFL files
$
REALIZATION 100
$
$ Seed for the random number generator
$
SEED 213415
$
$ Years that can be used as sources for the meterological data
$
SOURCE 1946 1947 1948 1949
$
$ Output years desired
$
OUTPUT 1950 1951 1952 1953 1954 1955 1956 1957
$
END
```

```
 SSSSS   H     H  FFFFFFF  M     M  EEEEEEE  TTTTTTT
S     S  H     H  F        MM   MM  E           T
 S       H     H  F        M MMM M  E           T
  SSS    HHHHHHH  FFFFF    M  M  M  EEEE        T
     S   H     H  F        M     M  E           T
S     S  H     H  F        M     M  E           T
 SSSSS   H     H  F        M     M  EEEEEEE     T
```

SHFMET 1.0
Last Modified on 25 Oct 1993

Release Terms and Meterological Shuffle Program
Hanford Environmental Dose Reconstruction Project
Battelle, Pacific Northwest Laboratories
Richland, Washington

Current Run ID = 931025231553 User Name = Paul W. Eslinger

System Date = 10-25-93 System Time = 23:15:53

The software used to generate this output has been
formally tested and peer reviewed according to
Battelle software control procedures.
Document Number: HEDR Task 2 File Release Date: 10/25/93

Review Signatures

Input Prepared By: _____ Date: _____

Input Reviewed By: _____ Date: _____

========== Echo of the Problem Definition ==========

Title: Production run for 1944-1957 using RATCHET (SHUFFL) data for 1946-1949

Keyword File: shfmet.key

The nuclide being processed is I131

The run will process 100 realizations.

Execution of the run has been requested.

Air Deposition file from SHUFFL
Name: depo.44-57

Air Concentration file from SHUFFL
Name: conc.44-57

File of monthly source terms for data in SHUFFL file

```
Name: month.45-49

File of monthly source terms for new output times
Name: month.50-57

There are   8 new output years
 Years: 1950 1951 1952 1953 1954 1955 1956 1957

There are   4 source years
 Years: 1946 1947 1948 1949

The random seed is:  2.134150E+05


======================== End of the Problem Definition ========================


Daily air deposition file opened by GETSHF:
  Fixed Record Length          :   406
  Realizations in Record       :   100
  Nodes in Record              :  1102
  First Year in Record         :  1944
  First Julian Date in Record  :   361
  Last Year in Record          :  1949
  Last Julian Date in Record   :   365
  Nuclide Record Pertains to   : I131
  Data type in air record      : depositi
  Title of Record              : Production Runs for SHUFFL Using 1944 - 1949 RATCHET outputs
  Name of Record Originator    : /files4/apps/hedrdev/shuffl/SCCS/s.shuffl.f
  Version of Record Originator : 1.42
  Number of header records     :    14


Daily air concentration file opened by GETSHF:
  Fixed Record Length          :   406
  Realizations in Record       :   100
  Nodes in Record              :  1102
  First Year in Record         :  1944
  First Julian Date in Record  :   361
  Last Year in Record          :  1949
  Last Julian Date in Record   :   365
  Nuclide Record Pertains to   : I131
  Data type in air record      : concentr
  Title of Record              : Production Runs for SHUFFL Using 1944 - 1949 RATCHET outputs
  Name of Record Originator    : /files4/apps/hedrdev/shuffl/SCCS/s.shuffl.f
  Version of Record Originator : 1.42
  Number of header records     :    14


Source release value file opened by SORCER:
  Title of Record              : Average I-131 Monthly Releases (Ci) : From Cal Heeb's (DOS) fi
  Name of Generating Program   : HandCalc
  Version of Generating Program: 1.000
  User Generating the Data     : Paul W. Eslinger
  Time When Data was Generated : 13:43:30
  Date When Data was Generated : 10/13/93


Release data for SHUFFL processed times
File: month.45-49
Year  Month    Release
 1946     1  1.18857E+04
 1946     2  7.32203E+03
 1946     3  7.94421E+03
 1946     4  1.17227E+04
 1946     5  1.32165E+04
 1946     6  4.63705E+03
 1946     7  5.56032E+03
```

1946	8	8.62179E+03
1946	9	7.69694E+03
1946	10	4.78834E+03
1946	11	5.51391E+03
1946	12	7.44380E+03
1947	1	6.09889E+03
1947	2	3.83020E+03
1947	3	5.62527E+03
1947	4	4.82844E+03
1947	5	4.01254E+03
1947	6	1.63174E+03
1947	7	2.30366E+03
1947	8	1.24468E+03
1947	9	1.20901E+03
1947	10	4.86740E+02
1947	11	2.76310E+02
1947	12	2.91130E+02
1948	1	2.18560E+02
1948	2	2.80060E+02
1948	3	1.68320E+02
1948	4	2.21400E+02
1948	5	3.10400E+01
1948	6	4.32400E+01
1948	7	1.35340E+02
1948	8	1.44560E+02
1948	9	1.19370E+02
1948	10	1.70150E+02
1948	11	1.53090E+02
1948	12	1.56490E+02
1949	1	1.96420E+02
1949	2	1.02780E+02
1949	3	2.41000E+02
1949	4	1.29960E+02
1949	5	1.40370E+02
1949	6	7.88100E+01
1949	7	9.43900E+01
1949	8	8.62700E+01
1949	9	1.39920E+02
1949	10	1.42010E+02
1949	11	1.01010E+02
1949	12	7.24091E+03

New output release value file opened by SORCEN:

```
  Title of Record                : I-131 Releases (Ci) : Cal Heeb on 10/15/93 : File 5057I2.B15 (
  Name of Generating Program     : HandCalc
  Version of Generating Program: 1.000
  User Generating the Data       : Paul W. Eslinger
  Time When Data was Generated : 16:23:07
  Date When Data was Generated : 10-15-93
```

Release data for new output times

File: month.50-57

Year	Month	Release
1950	1	9.18000E+01
1950	2	8.21000E+01
1950	3	1.20000E+02
1950	4	1.05400E+02
1950	5	1.24600E+02
1950	6	1.01300E+02
1950	7	2.41000E+02
1950	8	1.54000E+03
1950	9	1.29600E+03
1950	10	8.54000E+02
1950	11	2.54900E+02
1950	12	5.68200E+02
1951	1	7.68000E+01
1951	2	8.69000E+01
1951	3	3.46000E+02

1951	4	2.39000E+03
1951	5	9.74000E+03
1951	6	6.62000E+03
1951	7	4.07000E+03
1951	8	9.22000E+02
1951	9	6.52000E+02
1951	10	9.03000E+02
1951	11	9.74000E+02
1951	12	6.16000E+02
1952	1	1.09210E+03
1952	2	7.56000E+02
1952	3	9.25000E+02
1952	4	8.45600E+02
1952	5	5.68660E+02
1952	6	2.24680E+02
1952	7	1.09500E+02
1952	8	2.17400E+02
1952	9	1.23640E+02
1952	10	4.09800E+01
1952	11	8.57000E+01
1952	12	1.19200E+02
1953	1	8.05700E+01
1953	2	2.05800E+01
1953	3	5.08100E+01
1953	4	1.64500E+02
1953	5	1.31500E+02
1953	6	1.78100E+02
1953	7	3.89000E+02
1953	8	1.57100E+02
1953	9	1.11300E+02
1953	10	2.56000E+02
1953	11	7.17700E+01
1953	12	1.35800E+02
1954	1	1.96000E+02
1954	2	4.48000E+01
1954	3	6.48400E+01
1954	4	4.83200E+01
1954	5	1.13500E+02
1954	6	6.71000E+01
1954	7	2.83000E+01
1954	8	3.68000E+01
1954	9	6.86000E+01
1954	10	9.83500E+01
1954	11	2.11500E+01
1954	12	3.92000E+01
1955	1	2.53000E+01
1955	2	9.50000E+01
1955	3	2.15280E+02
1955	4	3.50300E+01
1955	5	2.95000E+01
1955	6	3.93000E+01
1955	7	3.48800E+01
1955	8	1.97000E+01
1955	9	7.75000E+01
1955	10	6.90000E+01
1955	11	2.75000E+00
1955	12	2.78800E+01
1956	1	5.92000E+00
1956	2	1.63100E+01
1956	3	3.71000E+00
1956	4	5.50000E+00
1956	5	2.34600E+01
1956	6	2.73000E+01
1956	7	1.85000E+00
1956	8	1.68000E+00
1956	9	3.35000E+00
1956	10	2.06000E+00
1956	11	7.64000E+00
1956	12	1.94100E+01

```
1957     1  5.62000E+00
1957     2  7.21000E+00
1957     3  3.70000E+00
1957     4  1.14900E+01
1957     5  9.26000E+00
1957     6  6.29000E+00
1957     7  1.49900E+01
1957     8  1.94500E+01
1957     9  2.27400E+01
1957    10  3.36000E+01
1957    11  5.04000E+01
1957    12  8.94000E+01

New header values for the deposition file:
  Fixed Record Length           :   406
  Realizations in Record        :   100
  Nodes in Record               :  1102
  First Year in Record          :  1944
  First Julian Date in Record   :   361
  Last Year in Record           :  1957
  Last Julian Date in Record    :   365
  Nuclide Record Pertains to    : I131
  Data type in air record       : DEPOSITI
  Title of Record               : Production run for 1944-1957 using RATCHET (SHUFFL) data for 1
  Name of Record Originator     : SHFMET   25 Oct 1993
  Version of Record Originator  : 1.0
  Number of header records      :    14


New header values for the concentration file
  Fixed Record Length           :   406
  Realizations in Record        :   100
  Nodes in Record               :  1102
  First Year in Record          :  1944
  First Julian Date in Record   :   361
  Last Year in Record           :  1957
  Last Julian Date in Record    :   365
  Nuclide Record Pertains to    : I131
  Data type in air record       : CONCENTR
  Title of Record               : Production run for 1944-1957 using RATCHET (SHUFFL) data for 1
  Name of Record Originator     : SHFMET   25 Oct 1993
  Version of Record Originator  : 1.0
  Number of header records      :    14


1950: Map of use of source years for output
     1946 Is used for meterological data
     1947 Is used for meterological data
     1948 Is used for meterological data
     1949 Is used for meterological data

1950: Map of realizations into source year data

       Source Source
Real.   Year   Real.
   1    1948     43
   2    1948     98
   3    1948     33
   4    1946     66
   5    1946     12
   6    1946     18
   7    1947     14
   8    1948     76
   9    1947     26
  10    1948     60
  11    1949     28
  12    1947     55
  13    1948     10
  14    1948      1
```

15	1948	63
16	1946	48
17	1947	35
18	1949	54
19	1948	3
20	1946	77
21	1949	40
22	1948	7
23	1949	61
24	1947	93
25	1947	27
26	1947	6
27	1948	23
28	1948	92
29	1946	47
30	1948	29
31	1948	79
32	1947	75
33	1946	30
34	1946	19
35	1946	37
36	1947	59
37	1947	89
38	1946	62
39	1946	95
40	1948	68
41	1948	90
42	1947	32
43	1949	84
44	1947	22
45	1947	50
46	1947	78
47	1949	5
48	1948	16
49	1946	67
50	1947	13
51	1948	70
52	1947	94
53	1946	64
54	1947	96
55	1948	71
56	1947	51
57	1948	15
58	1946	11
59	1949	87
60	1949	45
61	1948	17
62	1946	91
63	1949	86
64	1947	83
65	1949	82
66	1946	39
67	1949	46
68	1948	42
69	1946	81
70	1947	36
71	1946	65
72	1949	38
73	1946	53
74	1947	57
75	1948	25
76	1946	20
77	1949	31
78	1948	69
79	1947	34
80	1946	72
81	1946	24
82	1947	100
83	1948	44

84	1949	52
85	1949	2
86	1948	80
87	1946	88
88	1946	41
89	1946	74
90	1948	56
91	1948	97
92	1949	58
93	1946	9
94	1946	4
95	1948	99
96	1947	73
97	1946	85
98	1947	8
99	1946	21
100	1948	49

1951: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1951: Map of realizations into source year data

Real.	Source Year	Source Real.
1	1949	85
2	1948	80
3	1948	95
4	1948	21
5	1947	32
6	1949	84
7	1949	20
8	1949	41
9	1948	60
10	1947	98
11	1947	33
12	1946	4
13	1946	19
14	1948	34
15	1949	7
16	1947	71
17	1948	61
18	1949	63
19	1949	29
20	1946	76
21	1946	11
22	1947	22
23	1946	89
24	1947	27
25	1948	46
26	1949	90
27	1949	49
28	1947	86
29	1948	42
30	1949	9
31	1947	6
32	1946	40
33	1946	17
34	1947	78
35	1948	23
36	1946	36
37	1948	16
38	1946	38
39	1949	82
40	1947	12
41	1948	91

42	1946	65
43	1949	53
44	1948	97
45	1948	25
46	1947	3
47	1948	15
48	1948	73
49	1948	1
50	1947	64
51	1948	52
52	1948	2
53	1947	94
54	1949	37
55	1946	83
56	1946	100
57	1949	58
58	1949	24
59	1946	28
60	1948	14
61	1946	96
62	1949	69
63	1949	30
64	1947	75
65	1949	59
66	1949	26
67	1949	39
68	1947	77
69	1947	56
70	1947	10
71	1949	99
72	1948	92
73	1948	47
74	1948	57
75	1948	81
76	1948	62
77	1946	31
78	1947	35
79	1946	88
80	1946	51
81	1949	18
82	1947	50
83	1948	55
84	1947	13
85	1948	8
86	1946	70
87	1948	79
88	1946	44
89	1948	66
90	1947	43
91	1946	93
92	1949	5
93	1946	67
94	1949	74
95	1949	45
96	1946	48
97	1949	72
98	1947	54
99	1948	87
100	1948	68

1952: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1952: Map of realizations into source year data

Source Source

Real.	Year	Real.
1	1949	62
2	1949	20
3	1947	75
4	1946	71
5	1947	40
6	1949	83
7	1948	15
8	1948	90
9	1948	78
10	1946	94
11	1947	4
12	1946	49
13	1948	32
14	1947	70
15	1947	89
16	1948	69
17	1946	60
18	1949	92
19	1947	81
20	1949	99
21	1949	59
22	1948	73
23	1949	52
24	1948	88
25	1948	14
26	1947	79
27	1946	50
28	1946	85
29	1946	8
30	1949	98
31	1948	12
32	1947	55
33	1949	51
34	1948	31
35	1946	22
36	1946	56
37	1947	48
38	1947	84
39	1946	34
40	1949	53
41	1946	57
42	1948	28
43	1946	45
44	1946	43
45	1947	2
46	1949	67
47	1947	7
48	1946	64
49	1947	82
50	1948	29
51	1949	86
52	1949	46
53	1947	37
54	1946	42
55	1949	39
56	1946	91
57	1947	77
58	1948	25
59	1948	80
60	1946	11
61	1946	1
62	1947	74
63	1946	58
64	1946	17
65	1946	36
66	1949	30
67	1947	41
68	1948	72

69	1948	54
70	1947	47
71	1947	16
72	1949	61
73	1948	5
74	1948	38
75	1946	97
76	1948	18
77	1947	13
78	1948	35
79	1947	68
80	1946	100
81	1948	95
82	1949	23
83	1949	65
84	1949	33
85	1947	87
86	1949	9
87	1948	3
88	1949	21
89	1947	24
90	1949	44
91	1949	6
92	1946	19
93	1946	63
94	1948	76
95	1946	66
96	1948	96
97	1946	26
98	1949	93
99	1949	10
100	1949	27

1953: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1953: Map of realizations into source year data

Real.	Source Year	Source Real.
1	1947	73
2	1948	10
3	1947	8
4	1948	18
5	1949	23
6	1948	95
7	1948	100
8	1949	78
9	1948	62
10	1947	15
11	1947	81
12	1946	3
13	1948	47
14	1948	60
15	1947	40
16	1949	56
17	1947	2
18	1949	16
19	1949	89
20	1946	13
21	1948	33
22	1946	30
23	1946	34
24	1948	57
25	1946	45
26	1949	41

27	1949	27
28	1949	17
29	1949	38
30	1946	74
31	1949	52
32	1946	96
33	1949	11
34	1948	79
35	1947	4
36	1947	49
37	1946	46
38	1946	67
39	1949	63
40	1947	5
41	1946	90
42	1947	70
43	1948	98
44	1949	68
45	1948	6
46	1948	97
47	1948	88
48	1949	94
49	1949	7
50	1948	69
51	1948	99
52	1946	92
53	1948	43
54	1949	44
55	1946	24
56	1949	93
57	1949	77
58	1946	19
59	1946	50
60	1948	48
61	1948	37
62	1948	72
63	1946	29
64	1948	22
65	1949	25
66	1946	66
67	1949	39
68	1948	42
69	1947	26
70	1949	71
71	1947	59
72	1947	87
73	1949	31
74	1947	65
75	1947	84
76	1948	28
77	1947	91
78	1948	35
79	1949	20
80	1946	1
81	1949	76
82	1946	83
83	1948	85
84	1949	14
85	1946	36
86	1946	82
87	1947	86
88	1948	51
89	1948	61
90	1948	53
91	1948	21
92	1949	32
93	1949	80
94	1949	58
95	1949	9

96	1948	54
97	1948	75
98	1947	55
99	1947	64
100	1948	12

1954: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1954: Map of realizations into source year data

Real.	Source Year	Source Real.
1	1947	49
2	1946	94
3	1946	59
4	1946	72
5	1949	58
6	1947	25
7	1949	55
8	1947	96
9	1946	51
10	1947	98
11	1949	53
12	1949	18
13	1946	3
14	1947	80
15	1949	34
16	1947	65
17	1947	9
18	1947	36
19	1949	77
20	1949	2
21	1946	66
22	1949	52
23	1947	60
24	1946	95
25	1946	41
26	1946	82
27	1949	28
28	1949	32
29	1946	74
30	1948	10
31	1946	6
32	1947	30
33	1948	85
34	1946	15
35	1947	45
36	1949	43
37	1947	46
38	1946	20
39	1949	1
40	1948	93
41	1946	54
42	1949	42
43	1946	64
44	1949	69
45	1948	99
46	1948	86
47	1947	8
48	1948	67
49	1949	50
50	1946	7
51	1946	78
52	1946	90
53	1949	11

54	1947	57
55	1946	14
56	1948	92
57	1949	38
58	1949	13
59	1948	91
60	1949	24
61	1949	100
62	1947	62
63	1949	26
64	1949	4
65	1948	17
66	1949	63
67	1947	5
68	1949	76
69	1947	22
70	1949	29
71	1948	44
72	1948	39
73	1947	83
74	1949	70
75	1946	48
76	1949	31
77	1947	79
78	1949	81
79	1948	27
80	1949	88
81	1947	35
82	1948	56
83	1949	61
84	1947	19
85	1946	71
86	1948	73
87	1946	97
88	1948	23
89	1948	75
90	1948	89
91	1948	21
92	1949	33
93	1949	68
94	1949	47
95	1947	37
96	1946	84
97	1947	40
98	1946	16
99	1947	87
100	1947	12

1955: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1955: Map of realizations into source year data

Real.	Source Year	Source Real.
1	1946	57
2	1947	56
3	1948	22
4	1948	7
5	1947	15
6	1948	66
7	1949	94
8	1946	69
9	1948	45
10	1947	13
11	1946	29

12	1947	32
13	1946	59
14	1949	36
15	1948	33
16	1948	19
17	1948	80
18	1946	87
19	1947	8
20	1947	10
21	1949	61
22	1947	30
23	1947	53
24	1948	81
25	1947	68
26	1947	35
27	1949	93
28	1948	70
29	1948	88
30	1949	4
31	1949	40
32	1948	3
33	1947	14
34	1947	5
35	1949	24
36	1946	75
37	1948	84
38	1946	96
39	1948	95
40	1948	23
41	1949	21
42	1948	12
43	1949	76
44	1946	49
45	1947	9
46	1948	18
47	1946	50
48	1949	47
49	1948	17
50	1948	98
51	1947	54
52	1949	46
53	1949	37
54	1948	27
55	1946	86
56	1948	44
57	1946	77
58	1948	60
59	1946	73
60	1946	71
61	1947	48
62	1948	41
63	1946	83
64	1948	63
65	1948	25
66	1948	82
67	1947	72
68	1946	1
69	1947	20
70	1949	90
71	1948	16
72	1946	85
73	1948	31
74	1948	55
75	1946	64
76	1947	34
77	1949	78
78	1946	11
79	1946	6
80	1946	91

81	1946	58
82	1948	65
83	1946	28
84	1946	62
85	1949	38
86	1947	42
87	1947	99
88	1946	74
89	1946	97
90	1946	2
91	1946	26
92	1947	52
93	1947	100
94	1949	92
95	1948	51
96	1947	67
97	1947	89
98	1946	43
99	1946	39
100	1948	79

1956: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1956: Map of realizations into source year data

Real.	Source Year	Source Real.
1	1946	3
2	1946	44
3	1947	96
4	1949	52
5	1949	74
6	1946	24
7	1946	17
8	1946	91
9	1949	71
10	1947	60
11	1947	43
12	1949	4
13	1946	5
14	1948	40
15	1946	9
16	1946	37
17	1949	45
18	1947	27
19	1946	92
20	1947	50
21	1949	22
22	1947	12
23	1946	32
24	1948	56
25	1949	63
26	1948	69
27	1946	55
28	1948	41
29	1946	95
30	1946	89
31	1946	29
32	1948	13
33	1947	93
34	1947	28
35	1946	35
36	1948	14
37	1948	86
38	1948	49

39	1948	15
40	1946	18
41	1948	8
42	1948	98
43	1949	2
44	1949	65
45	1947	79
46	1946	94
47	1947	10
48	1949	90
49	1947	84
50	1949	62
51	1949	23
52	1949	38
53	1946	39
54	1949	46
55	1949	31
56	1949	36
57	1946	48
58	1946	16
59	1948	25
60	1946	70
61	1949	58
62	1948	51
63	1949	21
64	1949	42
65	1948	75
66	1946	88
67	1948	76
68	1949	47
69	1947	66
70	1948	67
71	1947	26
72	1948	1
73	1949	6
74	1948	34
75	1946	73
76	1948	20
77	1948	100
78	1947	82
79	1946	99
80	1947	19
81	1946	57
82	1948	87
83	1949	83
84	1947	7
85	1947	61
86	1946	80
87	1948	33
88	1949	64
89	1946	59
90	1949	11
91	1948	30
92	1946	72
93	1947	77
94	1946	85
95	1949	78
96	1947	54
97	1946	97
98	1946	81
99	1946	68
100	1946	53

1957: Map of use of source years for output
1946 Is used for meterological data
1947 Is used for meterological data
1948 Is used for meterological data
1949 Is used for meterological data

1957: Map of realizations into source year data

Real.	Source Year	Source Real.
1	1949	35
2	1949	48
3	1947	24
4	1946	38
5	1949	81
6	1948	92
7	1946	34
8	1947	56
9	1947	74
10	1948	55
11	1947	96
12	1947	86
13	1946	59
14	1947	61
15	1948	80
16	1947	19
17	1947	68
18	1949	85
19	1949	23
20	1948	75
21	1949	60
22	1949	49
23	1948	54
24	1947	63
25	1947	22
26	1948	82
27	1947	97
28	1946	79
29	1948	84
30	1946	31
31	1947	11
32	1946	7
33	1949	27
34	1948	39
35	1946	46
36	1947	62
37	1948	41
38	1947	28
39	1948	2
40	1947	33
41	1946	30
42	1949	3
43	1949	65
44	1949	71
45	1948	43
46	1946	99
47	1948	17
48	1946	13
49	1949	44
50	1948	64
51	1947	9
52	1948	16
53	1947	45
54	1948	67
55	1946	90
56	1946	47
57	1949	89
58	1946	20
59	1948	52
60	1947	6
61	1949	72
62	1947	69
63	1947	87
64	1946	95
65	1949	12

66	1949	66
67	1947	76
68	1947	40
69	1948	100
70	1948	26
71	1949	53
72	1949	42
73	1946	32
74	1947	8
75	1948	36
76	1947	70
77	1947	25
78	1948	4
79	1946	77
80	1949	50
81	1946	18
82	1947	57
83	1946	73
84	1946	51
85	1947	14
86	1947	93
87	1949	29
88	1947	88
89	1947	98
90	1948	5
91	1947	10
92	1949	37
93	1946	58
94	1949	78
95	1947	1
96	1947	83
97	1949	91
98	1949	94
99	1946	15
100	1946	21

```
SHFMET - normal program termination
  Exit time : 10:47:21
  Exit date : 10-27-93
```

FROSTP

```
$
$ 1945 Frost Date Data From Bruce Napier (DOS file FROST45.TXT)
$ Iodine-131 Production runs for DESCARTES
$ File prepared by: Paul W. Eslinger
$
REPORT "frost45.rpt"
FROST  "frost45.dat"
TITLE "DESCARTES Production Frost Date Library for 1945"
USER "Paul W. Eslinger"
$
SEED 1945
REALIZATIONS 100
ECHO
$
$Season   Node  Date Distribution
$
SPRING       1   166 3 -7 7
FALL         1   252 3 -7 7
SPRING       2   166 3 -7 7
FALL         2   252 3 -7 7
SPRING       3   166 3 -7 7
FALL         3   252 3 -7 7
SPRING       4   166 3 -7 7
FALL         4   252 3 -7 7
SPRING       5   166 3 -7 7
FALL         5   252 3 -7 7
SPRING       6   106 3 -7 7
FALL         6   291 3 -7 7
SPRING       7   106 3 -7 7
FALL         7   291 3 -7 7
SPRING       8   116 3 -7 7
FALL         8   262 3 -7 7
SPRING       9   116 3 -7 7
FALL         9   262 3 -7 7
SPRING      10   116 3 -7 7
FALL        10   262 3 -7 7

...

FALL      1094   251 3 -7 7
SPRING    1095   126 3 -7 7
FALL      1095   251 3 -7 7
SPRING    1096   126 3 -7 7
FALL      1096   251 3 -7 7
SPRING    1097   118 3 -7 7
FALL      1097   270 3 -7 7
SPRING    1098   118 3 -7 7
FALL      1098   270 3 -7 7
SPRING    1099   118 3 -7 7
FALL      1099   270 3 -7 7
SPRING    1100   118 3 -7 7
FALL      1100   270 3 -7 7
SPRING    1101   118 3 -7 7
FALL      1101   270 3 -7 7
SPRING    1102   118 3 -7 7
FALL      1102   262 3 -7 7
END
```

```
**********************************************************************************

FFFFFFFF  RRRRRRR     OOOO     SSSSSS   TTTTTTTT  PPPPPPP
FF        RR    RR   OO  OO   SS    SS     TT     PP    PP
FF        RR    RR  OO    OO   SS          TT     PP    PP
FFFFF     RRRRRRR   OO    OO     SS        TT     PPPPPPP
FF        RR  RR    OO    OO       SS      TT     PP
FF        RR   RR    OO  OO   SS    SS     TT     PP
FF        RR    RR    OOOO     SSSSSS      TT     RP

                    FROSTP   1.1
              Last Modified on 12 Aug 1993


          Frost Date Library File Generation Program
       Hanford Environmental Dose Reconstruction Project
           Battelle, Pacific Northwest Laboratories
                     Richland, Washington


     Current Run ID = 931014170837   User Name = Paul W. Eslinger

        System Date = 10-14-93   System Time = 17:08:37


**********************************************************************************

     The software used to generate this output is experimental
       and has not been formally tested or peer reviewed.


                        Review Signatures

 Input Prepared By: ____________________________      Date: ______________

 Input Reviewed By: ____________________________      Date: ______________


**********************************************************************************
                          Problem definition
**********************************************************************************

 Title: DESCARTES Production Frost Date Library for 1945

  100 Realizations are being generated

 Definition for variable NODE_0001_SPRING
    The distribution type is Discrete Uniform
    The lower limit is       -7
    The upper limit is        7
    The imposed mean is   1.6600E+02

 Definition for variable NODE_0001_FALL
    The distribution type is Discrete Uniform
    The lower limit is       -7
```

```
   The upper limit is        7
   The imposed mean is    2.5200E+02

Definition for variable NODE_0002_SPRING
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    1.6600E+02

Definition for variable NODE_0002_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    2.5200E+02

Definition for variable NODE_0003_SPRING
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    1.6600E+02

Definition for variable NODE_0003_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    2.5200E+02

Definition for variable NODE_0004_SPRING
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    1.6600E+02

Definition for variable NODE_0004_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    2.5200E+02

Definition for variable NODE_0005_SPRING
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    1.6600E+02

Definition for variable NODE_0005_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    2.5200E+02

...

Definition for variable NODE_1100_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    2.7000E+02

Definition for variable NODE_1101_SPRING
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is    1.1800E+02

Definition for variable NODE_1101_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
```

```
   The upper limit is        7
   The imposed mean is   2.7000E+02

Definition for variable NODE_1102_SPRING
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is   1.1800E+02

Definition for variable NODE_1102_FALL
   The distribution type is Discrete Uniform
   The lower limit is       -7
   The upper limit is        7
   The imposed mean is   2.6200E+02
```

****

Summary statistics for Frost Dates

****

Node	Time	Average	St. Dev.	Minimum	Median	Maximum
1	Spring	1.6601E+02	4.3116E+00	1.5900E+02	1.6600E+02	1.7300E+02
1	Fall	2.5199E+02	4.3301E+00	2.4500E+02	2.5200E+02	2.5900E+02
2	Spring	1.6602E+02	4.3174E+00	1.5900E+02	1.6600E+02	1.7300E+02
2	Fall	2.5200E+02	4.3543E+00	2.4500E+02	2.5200E+02	2.5900E+02
3	Spring	1.6600E+02	4.3012E+00	1.5900E+02	1.6600E+02	1.7300E+02
3	Fall	2.5201E+02	4.3046E+00	2.4500E+02	2.5200E+02	2.5900E+02
4	Spring	1.6599E+02	4.3463E+00	1.5900E+02	1.6600E+02	1.7300E+02
4	Fall	2.5199E+02	4.3347E+00	2.4500E+02	2.5200E+02	2.5900E+02
5	Spring	1.6601E+02	4.3186E+00	1.5900E+02	1.6600E+02	1.7300E+02
5	Fall	2.5200E+02	4.3359E+00	2.4500E+02	2.5200E+02	2.5900E+02
6	Spring	1.0599E+02	4.3232E+00	9.9000E+01	1.0600E+02	1.1300E+02
6	Fall	2.9100E+02	4.3128E+00	2.8400E+02	2.9100E+02	2.9800E+02
7	Spring	1.0601E+02	4.3070E+00	9.9000E+01	1.0600E+02	1.1300E+02
7	Fall	2.9100E+02	4.3058E+00	2.8400E+02	2.9100E+02	2.9800E+02
8	Spring	1.1600E+02	4.3267E+00	1.0900E+02	1.1600E+02	1.2300E+02
8	Fall	2.6200E+02	4.3081E+00	2.5500E+02	2.6200E+02	2.6900E+02
9	Spring	1.1599E+02	4.3393E+00	1.0900E+02	1.1600E+02	1.2300E+02
9	Fall	2.6199E+02	4.3347E+00	2.5500E+02	2.6200E+02	2.6900E+02
10	Spring	1.1602E+02	4.3359E+00	1.0900E+02	1.1600E+02	1.2300E+02
10	Fall	2.6200E+02	4.2919E+00	2.5500E+02	2.6200E+02	2.6900E+02

...

1086	Spring	1.1800E+02	4.2942E+00	1.1100E+02	1.1800E+02	1.2500E+02
1086	Fall	2.7001E+02	4.3116E+00	2.6300E+02	2.7000E+02	2.7700E+02
1087	Spring	1.1797E+02	4.3185E+00	1.1100E+02	1.1800E+02	1.2500E+02
1087	Fall	2.6200E+02	4.3336E+00	2.5500E+02	2.6200E+02	2.6900E+02
1088	Spring	1.1802E+02	4.3474E+00	1.1100E+02	1.1800E+02	1.2500E+02
1088	Fall	2.6200E+02	4.3151E+00	2.5500E+02	2.6200E+02	2.6900E+02
1089	Spring	1.0299E+02	4.3370E+00	9.6000E+01	1.0300E+02	1.1000E+02
1089	Fall	2.9101E+02	4.3278E+00	2.8400E+02	2.9100E+02	2.9800E+02
1090	Spring	1.0301E+02	4.3139E+00	9.6000E+01	1.0300E+02	1.1000E+02
1090	Fall	2.9103E+02	4.2999E+00	2.8400E+02	2.9100E+02	2.9800E+02
1091	Spring	1.0301E+02	4.3347E+00	9.6000E+01	1.0300E+02	1.1000E+02
1091	Fall	2.9099E+02	4.3416E+00	2.8400E+02	2.9100E+02	2.9800E+02
1092	Spring	1.0600E+02	4.3174E+00	9.9000E+01	1.0600E+02	1.1300E+02
1092	Fall	2.9100E+02	4.3012E+00	2.8400E+02	2.9100E+02	2.9800E+02
1093	Spring	1.0601E+02	4.3070E+00	9.9000E+01	1.0600E+02	1.1300E+02
1093	Fall	2.9099E+02	4.3416E+00	2.8400E+02	2.9100E+02	2.9800E+02
1094	Spring	1.2602E+02	4.2918E+00	1.1900E+02	1.2600E+02	1.3300E+02
1094	Fall	2.5099E+02	4.3301E+00	2.4400E+02	2.5100E+02	2.5800E+02
1095	Spring	1.2599E+02	4.3139E+00	1.1900E+02	1.2600E+02	1.3300E+02
1095	Fall	2.5100E+02	4.3058E+00	2.4400E+02	2.5100E+02	2.5800E+02
1096	Spring	1.2600E+02	4.3243E+00	1.1900E+02	1.2600E+02	1.3300E+02
1096	Fall	2.5102E+02	4.3174E+00	2.4400E+02	2.5100E+02	2.5800E+02
1097	Spring	1.1798E+02	4.3543E+00	1.1100E+02	1.1800E+02	1.2500E+02
1097	Fall	2.7002E+02	4.3243E+00	2.6300E+02	2.7000E+02	2.7700E+02
1098	Spring	1.1801E+02	4.3232E+00	1.1100E+02	1.1800E+02	1.2500E+02

1098	Fall	2.6999E+02	4.2883E+00	2.6300E+02	2.7000E+02	2.7700E+02
1099	Spring	1.1798E+02	4.2988E+00	1.1100E+02	1.1800E+02	1.2500E+02
1099	Fall	2.6999E+02	4.3416E+00	2.6300E+02	2.7000E+02	2.7700E+02
1100	Spring	1.1799E+02	4.3093E+00	1.1100E+02	1.1800E+02	1.2500E+02
1100	Fall	2.6999E+02	4.3070E+00	2.6300E+02	2.7000E+02	2.7700E+02
1101	Spring	1.1798E+02	4.3220E+00	1.1100E+02	1.1800E+02	1.2500E+02
1101	Fall	2.7001E+02	4.3278E+00	2.6300E+02	2.7000E+02	2.7700E+02
1102	Spring	1.1802E+02	4.3289E+00	1.1100E+02	1.1800E+02	1.2500E+02
1102	Fall	2.6200E+02	4.3405E+00	2.5500E+02	2.6200E+02	2.6900E+02

ADIETP

```
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ $ $ $
$
$ KEYWORD File for Milk Cow Feeding Regime:  Commercial Cow 1
$
$ This regime is for a commercial dairy  cow in the Yakima area using the
$ expert derived regime (Yakima) Irrigated-1.
$
$ W.T. Farris
$
$ October 19, 1993
$
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ $ $ $
$
REPORT "cowc1.rpt"
DIET   "cowc1.diet"
$
TITLE "KEYWORD File for Milk Cow Feeding Regime: Commercial Cow 1"
USER "Paul W. Eslinger"
$
SEED 5353
FOODS 8
SEASONS 5
REALIZAT 100
$
$ WINTER
FOOD "Winter" "ALFALFA"  6  8.0 9.5 11
FOOD "Winter" "GRAIN"    6  0.4 1.5 2.6
FOOD "Winter" "GRASSHAY" 1  0
FOOD "Winter" "MANGER"   2  0 2
FOOD "Winter" "PASTURE"  1  0
FOOD "Winter" "SILAGE"   1  0
FOOD "Winter" "WATER"    6  22 61 122
FOOD "Winter" "DIRT"     6  1 2 4
CONSTRAIN "Winter"      10  12
$
$ SPRING
FOOD "Spring" "ALFALFA"  6  1.8 2.9 4.0
FOOD "Spring" "GRAIN"    6  0.4 1.5 2.6
FOOD "Spring" "GRASSHAY" 1  0
FOOD "Spring" "MANGER"   2  0 1
FOOD "Spring" "PASTURE"  6  5.5 6.6 7.7
FOOD "Spring" "SILAGE"   1  0
FOOD "Spring" "WATER"    6  25 68 136
FOOD "Spring" "DIRT"     6  0.5 1 1.5
CONSTRAIN "Spring"      10  12
$
$ SUMMER
FOOD "Summer" "ALFALFA"  6 0.6  1.2  1.8
FOOD "Summer" "GRAIN"    6 0.4  1.5  2.6
FOOD "Summer" "GRASSHAY" 1 0
FOOD "Summer" "MANGER"   2  0  1
FOOD "Summer" "PASTURE"  6 7.2  8.3  9.4
FOOD "Summer" "SILAGE"   1 0
FOOD "Summer" "WATER"    6 28 75 149
FOOD "Summer" "DIRT"     6 0.25 0.5 1
CONSTRAIN "Summer"      10  12
$
$Early Fall
FOOD "Early Fall" "ALFALFA"  6  1.8 2.9 4.0
FOOD "Early Fall" "GRAIN"    6  0.4 1.5 2.6
FOOD "Early Fall" "GRASSHAY" 1  0
FOOD "Early Fall" "MANGER"   2  0 1.5
FOOD "Early Fall" "PASTURE"  6  5.5 6.6 7.7
FOOD "Early Fall" "SILAGE"   1  0
FOOD "Early Fall" "WATER"    6  25 68 136
FOOD "Early Fall" "DIRT"     6  0.5 1 1.5
CONSTRAIN "Early Fall"      10  12
```

```
$
$ Late Fall
FOOD "Late Fall" "ALFALFA"  6  3.6  4.7  5.8
FOOD "Late Fall" "GRAIN"    6  0.4 1.5 2.6
FOOD "Late Fall" "GRASSHAY" 1  0
FOOD "Late Fall" "MANGER"   2  0 2
FOOD "Late Fall" "PASTURE"  1  0
FOOD "Late Fall" "SILAGE"   6  3.6  4.7  5.8
FOOD "Late Fall" "WATER"    6  22 61 122
FOOD "Late Fall" "DIRT"     6  1 2 4
CONSTRAIN "Late Fall"      10  12
$
END
```

```
 AAAAAA   DDDDDD    IIIIIIII  EEEEEEEE  TTTTTTTT  PPPPPPP
AA    AA  DD   DD      II     EE           TT     PP    PP
AA    AA  DD    DD     II     EE           TT     PP    PP
AAAAAAAA  DD    DD     II     EEEE         TT     PPPPPPP
AA    AA  DD    DD     II     EE           TT     PP
AA    AA  DD   DD      II     EE           TT     PP
AA    AA  DDDDDD    IIIIIIII  EEEEEEEE     TT     RP
```

ADIETP 1.0
Last Modified on 28 Jul 1993

Animal Diet File Generation Program
Hanford Environmental Dose Reconstruction Project
Battelle, Pacific Northwest Laboratories
Richland, Washington

Current Run ID = 931021085308 User Name = Paul W. Eslinger

System Date = 10-21-93 System Time = 08:53:08

****

The software used to generate this output is experimental
and has not been formally tested or peer reviewed.

Review Signatures

Input Prepared By: _____ Date: _____

Input Reviewed By: _____ Date: _____

****
Problem definition
****

Title: KEYWORD File for Milk Cow Feeding Regime: Commercial Cow 1

Data has been defined for:
5 Seasons
8 Foods
100 Realizations

****
Food definitions for season: Winter
****

Definition for variable SEASON1_ALFALFA

```
   The distribution type is Triangular
   The minimum is  8.0000E+00
   The mode is     9.5000E+00
   The maximum is  1.1000E+01

Definition for variable SEASON1_DIRT
   The distribution type is Triangular
   The minimum is  1.0000E+00
   The mode is     2.0000E+00
   The maximum is  4.0000E+00

Definition for variable SEASON1_GRAIN
   The distribution type is Triangular
   The minimum is  4.0000E-01
   The mode is     1.5000E+00
   The maximum is  2.6000E+00

Definition for variable SEASON1_GRASSHAY
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON1_MANGER
   The distribution type is Uniform
   The lower limit is  0.0000E+00
   The upper limit is  2.0000E+00

Definition for variable SEASON1_PASTURE
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON1_SILAGE
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON1_WATER
   The distribution type is Triangular
   The minimum is  2.2000E+01
   The mode is     6.1000E+01
   The maximum is  1.2200E+02

Consumption constrained between  1.000E+01 and  1.200E+01
Summed over ALFALFA, GRAIN, GRASSHAY, PASTURE, and SILAGE


*******************************************************************************
                    Food definitions for season: Spring
*******************************************************************************

Definition for variable SEASON2_ALFALFA
   The distribution type is Triangular
   The minimum is  1.8000E+00
   The mode is     2.9000E+00
   The maximum is  4.0000E+00

Definition for variable SEASON2_DIRT
   The distribution type is Triangular
   The minimum is  5.0000E-01
   The mode is     1.0000E+00
   The maximum is  1.5000E+00

Definition for variable SEASON2_GRAIN
   The distribution type is Triangular
   The minimum is  4.0000E-01
   The mode is     1.5000E+00
   The maximum is  2.6000E+00

Definition for variable SEASON2_GRASSHAY
   The distribution type is Constant
   The constant value is  0.0000E+00
```

```
Definition for variable SEASON2_MANGER
   The distribution type is Uniform
   The lower limit is  0.0000E+00
   The upper limit is  1.0000E+00

Definition for variable SEASON2_PASTURE
   The distribution type is Triangular
   The minimum is  5.5000E+00
   The mode is     6.6000E+00
   The maximum is  7.7000E+00

Definition for variable SEASON2_SILAGE
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON2_WATER
   The distribution type is Triangular
   The minimum is  2.5000E+01
   The mode is     6.8000E+01
   The maximum is  1.3600E+02

Consumption constrained between  1.000E+01 and  1.200E+01
Summed over ALFALFA, GRAIN, GRASSHAY, PASTURE, and SILAGE


*******************************************************************************
                    Food definitions for season: Summer
*******************************************************************************

Definition for variable SEASON3_ALFALFA
   The distribution type is Triangular
   The minimum is  6.0000E-01
   The mode is     1.2000E+00
   The maximum is  1.8000E+00

Definition for variable SEASON3_DIRT
   The distribution type is Triangular
   The minimum is  2.5000E-01
   The mode is     5.0000E-01
   The maximum is  1.0000E+00

Definition for variable SEASON3_GRAIN
   The distribution type is Triangular
   The minimum is  4.0000E-01
   The mode is     1.5000E+00
   The maximum is  2.6000E+00

Definition for variable SEASON3_GRASSHAY
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON3_MANGER
   The distribution type is Uniform
   The lower limit is  0.0000E+00
   The upper limit is  1.0000E+00

Definition for variable SEASON3_PASTURE
   The distribution type is Triangular
   The minimum is  7.2000E+00
   The mode is     8.3000E+00
   The maximum is  9.4000E+00

Definition for variable SEASON3_SILAGE
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON3_WATER
   The distribution type is Triangular
```

```
   The minimum is  2.8000E+01
   The mode is     7.5000E+01
   The maximum is  1.4900E+02

Consumption constrained between  1.000E+01 and  1.200E+01
Summed over ALFALFA, GRAIN, GRASSHAY, PASTURE, and SILAGE


*******************************************************************************
                    Food definitions for season: Early Fall
*******************************************************************************

Definition for variable SEASON4_ALFALFA
   The distribution type is Triangular
   The minimum is  1.8000E+00
   The mode is     2.9000E+00
   The maximum is  4.0000E+00

Definition for variable SEASON4_DIRT
   The distribution type is Triangular
   The minimum is  5.0000E-01
   The mode is     1.0000E+00
   The maximum is  1.5000E+00

Definition for variable SEASON4_GRAIN
   The distribution type is Triangular
   The minimum is  4.0000E-01
   The mode is     1.5000E+00
   The maximum is  2.6000E+00

Definition for variable SEASON4_GRASSHAY
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON4_MANGER
   The distribution type is Uniform
   The lower limit is  0.0000E+00
   The upper limit is  1.5000E+00

Definition for variable SEASON4_PASTURE
   The distribution type is Triangular
   The minimum is  5.5000E+00
   The mode is     6.6000E+00
   The maximum is  7.7000E+00

Definition for variable SEASON4_SILAGE
   The distribution type is Constant
   The constant value is  0.0000E+00

Definition for variable SEASON4_WATER
   The distribution type is Triangular
   The minimum is  2.5000E+01
   The mode is     6.8000E+01
   The maximum is  1.3600E+02

Consumption constrained between  1.000E+01 and  1.200E+01
Summed over ALFALFA, GRAIN, GRASSHAY, PASTURE, and SILAGE


*******************************************************************************
                    Food definitions for season: Late Fall
*******************************************************************************

Definition for variable SEASON5_ALFALFA
   The distribution type is Triangular
   The minimum is  3.6000E+00
   The mode is     4.7000E+00
   The maximum is  5.8000E+00
```

Definition for variable SEASON5_DIRT
The distribution type is Triangular
The minimum is 1.0000E+00
The mode is 2.0000E+00
The maximum is 4.0000E+00

Definition for variable SEASON5_GRAIN
The distribution type is Triangular
The minimum is 4.0000E-01
The mode is 1.5000E+00
The maximum is 2.6000E+00

Definition for variable SEASON5_GRASSHAY
The distribution type is Constant
The constant value is 0.0000E+00

Definition for variable SEASON5_MANGER
The distribution type is Uniform
The lower limit is 0.0000E+00
The upper limit is 2.0000E+00

Definition for variable SEASON5_PASTURE
The distribution type is Constant
The constant value is 0.0000E+00

Definition for variable SEASON5_SILAGE
The distribution type is Triangular
The minimum is 3.6000E+00
The mode is 4.7000E+00
The maximum is 5.8000E+00

Definition for variable SEASON5_WATER
The distribution type is Triangular
The minimum is 2.2000E+01
The mode is 6.1000E+01
The maximum is 1.2200E+02

Consumption constrained between 1.000E+01 and 1.200E+01
Summed over ALFALFA, GRAIN, GRASSHAY, PASTURE, and SILAGE

****
Summary statistics for season: Winter
****

Food	Average	St. Dev.	Minimum	Median	Maximum
ALFALFA	9.4484E+00	5.0559E-01	8.0920E+00	9.4528E+00	1.0755E+01
DIRT	2.3266E+00	6.1648E-01	1.1721E+00	2.2678E+00	3.7974E+00
GRAIN	1.4985E+00	4.1303E-01	6.9959E-01	1.4670E+00	2.5356E+00
GRASSHAY	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MANGER	9.7215E-01	5.4959E-01	5.5746E-03	9.2972E-01	1.9656E+00
PASTURE	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SILAGE	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
WATER	6.9222E+01	2.1340E+01	2.8232E+01	6.7337E+01	1.1501E+02
Sum	1.0947E+01	5.2883E-01	1.0002E+01	1.0981E+01	1.1957E+01

****
Summary statistics for season: Spring
****

Food	Average	St. Dev.	Minimum	Median	Maximum
ALFALFA	2.8736E+00	3.9235E-01	2.0493E+00	2.8667E+00	3.7322E+00
DIRT	1.0134E+00	2.0988E-01	5.5422E-01	1.0092E+00	1.4687E+00
GRAIN	1.5405E+00	4.5744E-01	5.0795E-01	1.5464E+00	2.5781E+00
GRASSHAY	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MANGER	4.7566E-01	2.8621E-01	9.3674E-03	4.6314E-01	9.9718E-01
PASTURE	6.6105E+00	4.0968E-01	5.5601E+00	6.6337E+00	7.5296E+00
SILAGE	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

WATER	7.8477E+01	2.2733E+01	3.3974E+01	7.7368E+01	1.2805E+02
Sum	1.1025E+01	5.1974E-01	1.0001E+01	1.0998E+01	1.1965E+01

****

Summary statistics for season: Summer

****

Food	Average	St. Dev.	Minimum	Median	Maximum
ALFALFA	1.2028E+00	2.3523E-01	6.7957E-01	1.1946E+00	1.7175E+00
DIRT	5.7931E-01	1.5099E-01	2.8522E-01	5.6821E-01	9.1906E-01
GRAIN	1.4903E+00	4.0930E-01	5.4275E-01	1.4918E+00	2.3746E+00
GRASSHAY	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MANGER	5.2180E-01	2.8906E-01	1.7083E-02	5.3694E-01	9.9720E-01
PASTURE	8.2848E+00	4.2001E-01	7.2672E+00	8.2784E+00	9.1928E+00
SILAGE	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
WATER	8.4216E+01	2.4188E+01	3.3504E+01	8.3133E+01	1.3987E+02
Sum	1.0978E+01	5.0406E-01	1.0038E+01	1.0931E+01	1.1973E+01

****

Summary statistics for season: Early Fall

****

Food	Average	St. Dev.	Minimum	Median	Maximum
ALFALFA	2.9491E+00	4.2693E-01	2.0253E+00	2.9173E+00	3.8631E+00
DIRT	9.7893E-01	2.1109E-01	5.2962E-01	9.8998E-01	1.4441E+00
GRAIN	1.5152E+00	4.3067E-01	5.2936E-01	1.5344E+00	2.5412E+00
GRASSHAY	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MANGER	7.7418E-01	4.4842E-01	9.9449E-04	7.4148E-01	1.4995E+00
PASTURE	6.5797E+00	3.9577E-01	5.6612E+00	6.5784E+00	7.6461E+00
SILAGE	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
WATER	7.9690E+01	2.3072E+01	3.0610E+01	7.7885E+01	1.3232E+02
Sum	1.1044E+01	5.1454E-01	1.0014E+01	1.1048E+01	1.1982E+01

****

Summary statistics for season: Late Fall

****

Food	Average	St. Dev.	Minimum	Median	Maximum
ALFALFA	4.7106E+00	3.8227E-01	3.9799E+00	4.7210E+00	5.5833E+00
DIRT	2.3594E+00	5.8622E-01	1.2388E+00	2.2988E+00	3.7846E+00
GRAIN	1.5104E+00	4.0955E-01	6.5938E-01	1.5026E+00	2.4777E+00
GRASSHAY	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
MANGER	9.5546E-01	5.9250E-01	1.2681E-02	9.7236E-01	1.9882E+00
PASTURE	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
SILAGE	4.6665E+00	3.9242E-01	3.6301E+00	4.6166E+00	5.5384E+00
WATER	6.9392E+01	2.0905E+01	2.6492E+01	6.8203E+01	1.1779E+02
Sum	1.0887E+01	5.0451E-01	1.0010E+01	1.0898E+01	1.1853E+01

RECIPE

```
$
$ Based on the file VEGDAT.45 dated 8/31/93
$ This data file contains "best estimates" of the distribution
$ system of commercial fresh leafy vegetables in the 19-county
$ HEDR region
$
REPORT     "vegdat45.rpt"
FILE INDEX "vegdat45.idx"
FILE DATA  "vegdat45.dat"
FILE ASCII "vegdat45.asc"
TITLE "Commercial leafy vegetable distribution for 1945"
USER "Paul W. Eslinger"
$
SEED 5555
REALIZAT 100
ENDHEAD
$
$================== ADAMS COUNTY
$
ITEM  614  615  616  617  618  619  620  621  622
      641  642  643  644  645  646  647  648  649
      650  673  674  675  676  677  678  679  680
      703  704  705  706  707  708  709  710  730
      731  732  733  734  735  736  737  759  760
      761  762  763  764  765  766
FRACTION 914 2 .95 1.0
ENDITEM
$
$================== ASOTIN COUNTY
$
ITEM  398  399  427  428  429  457  458  484  485
      513  514  515
FRACTION 389 2 .85 1.0
ENDITEM
$
$================== BENTON COUNTY
$
ITEM  322  352  353  354  355  356  357  379  380
      381  382  383  384  385  408  409  410  411
      412  413  414  438  439  440  441  442  465
      466  467  468  494  495  496  497  524  525
      526  527  551  552  553  554  580  581  582
      583
FRACTION 438 2 .25 .55
FRACTION 444 2 .25 .55
FRACTION 389 2 .0  .45
ENDITEM
$
$================== COLUMBIA COUNTY
$
ITEM  394  395  396  423  424  425  452  453  454  455
      478  479  480  481  482  507  508  509  510  537
      538  539  540  564  565  566
FRACTION 389 2 .95 1.0
ENDITEM
$
$================== DOUGLAS COUNTY
$ Consumers likely obtained Lettuce and Spinach from
$ outside the HEDR study area in 1945.
$
$================== FRANKLIN COUNTY
$
ITEM  443  444  469  470  471  472  498  499  500  501
      502  528  529  530  531  532  533  555  556  557
      558  559  560  584  585  586  587  588  589  590
      591  592
FRACTION 438 2 .40 .55
FRACTION 444 2 .40 .55
FRACTION 389 2 .0  .15
```

```
ENDITEM
$
$================== GARFIELD COUNTY
$
ITEM  397  426  456  483  511  512  541  542  543  544
      567  568  569  570  596  597  598
FRACTION 389 2 .90 1.0
ENDITEM
$
$================== GRANT COUNTY
$
ITEM  609  610  611  612  613  636  637  638  639  640
      665  666  667  668  669  670  671  672  695  696
      697  698  699  700  701  702  722  723  724  725
      726  727  728  729  751  752  753  754  755  756
      757  758  781  782  783  784  785  786  787  788
      808  809  810  811  812  813  814  815  840  841
      842  843  844  871  872  873  874  899  900  901
      928  929  930  959  960  986  987
FRACTION 914 2 .90 1.0
ENDITEM
$
$================== KITTITAS COUNTY
$ Consumers likely obtained Lettuce and Spinach from
$ outside the HEDR study area in 1945.
$
$================== KLICKITAT COUNTY
$
ITEM  228  287  288  289  290  314  315  316  317  318
      319  320  321  346  347  348  349  350  351
FRACTION 228 1 1.0
ENDITEM
$
$================== LINCOLN COUNTY
$
ITEM  789  790  791  792  793  794  795  796  797  816
      817  818  819  820  821  822  823  824  845  846
      847  848  849  850  851  852  853  875  876  877
      878  879  880  881  882  883  902  903  904  905
      906  907  908  909  910  931  932  933  934  935
      936  937  938  939  961  962  963  964  965  966
      967  968  969  988  989  990  991  993
FRACTION 914 2 .95 1.0
ENDITEM
$
$================== SPOKANE COUNTY
$
ITEM  798  799  800  801  802  825  826  827  828  829
      854  855  856  857  858  859  884  885  886  887
      888  911  912  913  914  915  940  941  942  943
      944  945  970  971  972  973  974  999 1000 1001
     1028 1029 1030 1031 1058 1059 1060
FRACTION 914 1 1.0
ENDITEM
$
$================== WALLA WALLA COUNTY
$
ITEM  386  387  388  389  390  391  392  393  415  416
      417  418  419  420  421  422  445  446  447  448
      449  450  451  473  474  475  476  477  503  504
      505  506  534  535  536  561  562  563
FRACTION 389 1 1.0
ENDITEM
$
$================== WHITMAN COUNTY
$
ITEM  571  593  594  595  599  600  601  623  624  625
      626  627  628  629  630  651  652  653  654  655
      656  657  681  682  683  684  685  686  687  711
```

Association for Information and Image Management
1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIIM STANDARDS
BY APPLIED IMAGE, INC.

3 of 3

```
      712  713  714  715  716  738  739  740  741  742
      743  767  768  769  770  771  772  773
FRACTION 914 2 .95 1.0
ENDITEM
$
$================== YAKIMA COUNTY
$
ITEM  373  374  375  376  377  378  400  401  402  403
      404  405  406  407  432  433  434  435  436  437
      459  460  461  462  463  464  486  487  488  489
      490  491  492  493  518  519  520  521  522  523
      545  546  547  548  549  550  572  573  574  575
      576  577  578  579  604  605  606  607  608  631
      658  659
FRACTION  438 2  .00 .55
FRACTION  437 2  .00 .55
ENDITEM
$
$================== GILLIAM COUNTY
$
ITEM   58   59   60   61   62   63   89   90   91   92
       93  115  116  117  118  119  144  145  146  147
      148  175  176  177  178  202  203  204  205  231
      232  233  234  260  261  262  263  264  291
FRACTION 228 2 .90 1.0
ENDITEM
$
$================== MORROW COUNTY
$
ITEM   35   36   37   38   39   64   65   66   67   68
       94   95   96   97   98  120  121  122  123  124
      125  149  150  151  152  153  154  179  180  181
      182  183  184  206  207  208  209  210  211  235
      236  237  238  265  266  267  268  292  293  294
      295  323  324
FRACTION 389 2 .90 1.0
ENDITEM
$
$================== SHERMAN COUNTY
$
ITEM   57   88  143  174  201  229  230
FRACTION 228 2 .95 1.0
ENDITEM
$
$================== UMATILLA COUNTY
$
ITEM   40   41   42   43   44   69   70   71   72   73
       99  100  101  102  103  126  127  128  129  155
      156  157  158  159  160  185  186  187  188  189
      190  191  192  212  213  214  215  216  217  218
      219  220  239  240  241  242  243  244  245  246
      247  248  249  269  270  271  272  273  274  275
      276  277  278  279  296  297  298  299  300  301
      302  303  304  305  306  325  326  327  328  329
      330  331  332  333  334  335  336  358  359  360
      361  362  363  364  365  366
FRACTION 389 2 .95 1.0
ENDITEM
$
END
```

```
RRRRRRR   EEEEEEEE   CCCCCC   IIIIIIII  PPPPPPP   EEEEEEEE
RR    RR  EE        CC    CC     II     PP    PP  EE
RR    RR  EE        CC           II     PP    PP  EE
RRRRRRR   EEEE      CC           II     PPPPPPP   EEEEEE
RR  RR    EE        CC           II     PP        EE
RR   RR   EE        CC    CC     II     PP        EE
RR    RR  EEEEEEEE   CCCCCC   IIIIIIII  PP        EEEEEEEE
```

RECIPE 1.1
Last Modified on 13 Oct 1993

Recipe File Generation Program
Hanford Environmental Dose Reconstruction Project
Battelle, Pacific Northwest Laboratories
Richland, Washington

Current Run ID = 931013165204 User Name = Paul W. Eslinger

System Date = 10-13-93 System Time = 16:52:04

The software used to generate this output has been formally tested and peer reviewed according to Battelle software control procedures.
Document Number: Task 2 Files Release Date: 10/12/93

Review Signatures

Input Prepared By: _____ Date: _____

Input Reviewed By: _____ Date: _____

Problem Definition

Title: Commercial leafy vegetable distribution for 1945

Keyword File: vegdat45.key
Report File : vegdat45.rpt
Data File : vegdat45.dat
Index File : vegdat45.idx
ASCII File : vegdat45.idx

Data definition for:
738 Total number of items in this recipe
3 Maximum number of contributors to any item
100 Realizations to generate

```
*******************************************************************************
                        Information for item number  614
*******************************************************************************

Definition for variable Contributor_0914
   The distribution type is Uniform
   The lower limit is  9.5000E-01
   The upper limit is  1.0000E+00

Summary statistics for item:  614

 Contrib.   Average     St. Dev.      Minimum       Median       Maximum
    914   1.0000E+00   0.0000E+00   1.0000E+00   1.0000E+00   1.0000E+00


*******************************************************************************
                        Information for item number  615
*******************************************************************************

Definition for variable Contributor_0914
   The distribution type is Uniform
   The lower limit is  9.5000E-01
   The upper limit is  1.0000E+00

Summary statistics for item:  615

 Contrib.   Average     St. Dev.      Minimum       Median       Maximum
    914   1.0000E+00   0.0000E+00   1.0000E+00   1.0000E+00   1.0000E+00


*******************
Pages deleted here
*******************

*******************************************************************************
                        Information for item number  443
*******************************************************************************

Definition for variable Contributor_0438
   The distribution type is Uniform
   The lower limit is  4.0000E-01
   The upper limit is  5.5000E-01

Definition for variable Contributor_0444
   The distribution type is Uniform
   The lower limit is  4.0000E-01
   The upper limit is  5.5000E-01

Definition for variable Contributor_0389
   The distribution type is Uniform
   The lower limit is  0.0000E+00
   The upper limit is  1.5000E-01

Summary statistics for item:  443

 Contrib.   Average     St. Dev.      Minimum       Median       Maximum
    438   4.6403E-01   3.5311E-02   3.8911E-01   4.6227E-01   5.5200E-01
    444   4.6418E-01   3.6845E-02   3.8239E-01   4.6624E-01   5.6161E-01
    389   7.1787E-02   3.9659E-02   8.4323E-04   7.3632E-02   1.3320E-01


*******************************************************************************
                        Information for item number  444
*******************************************************************************

Definition for variable Contributor_0438
```

The distribution type is Uniform
The lower limit is 4.0000E-01
The upper limit is 5.5000E-01

Definition for variable Contributor_0444
The distribution type is Uniform
The lower limit is 4.0000E-01
The upper limit is 5.5000E-01

Definition for variable Contributor_0389
The distribution type is Uniform
The lower limit is 0.0000E+00
The upper limit is 1.5000E-01

Summary statistics for item: 444

Contrib.	Average	St. Dev.	Minimum	Median	Maximum
438	4.6397E-01	3.3317E-02	4.0347E-01	4.6337E-01	5.4150E-01
444	4.6412E-01	3.5658E-02	3.9655E-01	4.6347E-01	5.7627E-01
389	7.1910E-02	4.0174E-02	4.0461E-04	7.5290E-02	1.4752E-01

****
Information for item number 469
****

Definition for variable Contributor_0438
The distribution type is Uniform
The lower limit is 4.0000E-01
The upper limit is 5.5000E-01

Definition for variable Contributor_0444
The distribution type is Uniform
The lower limit is 4.0000E-01
The upper limit is 5.5000E-01

Definition for variable Contributor_0389
The distribution type is Uniform
The lower limit is 0.0000E+00
The upper limit is 1.5000E-01

Summary statistics for item: 469

Contrib.	Average	St. Dev.	Minimum	Median	Maximum
438	4.6434E-01	4.0048E-02	3.8481E-01	4.6249E-01	5.5625E-01
444	4.6390E-01	3.4707E-02	3.9432E-01	4.6149E-01	5.5750E-01
389	7.1765E-02	3.9803E-02	3.2768E-04	7.1368E-02	1.4836E-01

****
Pages deleted here
****

****
Information for item number 364
****

Definition for variable Contributor_0389
The distribution type is Uniform
The lower limit is 9.5000E-01
The upper limit is 1.0000E+00

Summary statistics for item: 364

Contrib.	Average	St. Dev.	Minimum	Median	Maximum
389	1.0000E+00	0.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

****

Information for item number 365

****

Definition for variable Contributor_0389
The distribution type is Uniform
The lower limit is 9.5000E-01
The upper limit is 1.0000E+00

Summary statistics for item: 365

Contrib.	Average	St. Dev.	Minimum	Median	Maximum
389	1.0000E+00	0.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

****

Information for item number 366

****

Definition for variable Contributor_0389
The distribution type is Uniform
The lower limit is 9.5000E-01
The upper limit is 1.0000E+00

Summary statistics for item: 366

Contrib.	Average	St. Dev.	Minimum	Median	Maximum
389	1.0000E+00	0.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

DESCARTES

```
$$$$$$$$$$$$$$$$$$$$$$$$ Comments Secion
$
$ DESCARTES Keyword File for the Users Guide
$
$$$$$$$$$$$$$$$$$$$$$$$$ Control Logic Section
$
REPORT "full.rpt"
$
TITLE "Example Problem for the DESCARTES Users Guide"
USER "John Q. Public"
$
/EXECUTE
$
$ Nuclide definition
$
NUCLIDE "I131" 0.08625
$
$ Number of realizations
$
REALIZATIONS 100
$
$ Fixed record length of SHUFFL-processed air data files
$
SHUFFLE 406 $ Use maximum of 16 and 6+4*(Number of realizations)
$
$ Run time and time step control
$
STEP MONTH
TIME 12:26:1944 12:31:1957
$
$ Nodes to include in the simulation
$
NODE ALL
$
$$$$$$$$$$$$$$$$$$$$$$$$ Biomass and Plant Product Section
$
$ Input files from RATCHET via SHUFFLE
$
AIR DEPOSIT "depo.44-57"
AIR CONCEN  "conc.44-57"
$
$ Frost Date Files by year
$
FROST 1944 "frost44.dat"
FROST 1945 "frost45.dat"
FROST 1946 "frost46.dat"
FROST 1947 "frost47.dat"
FROST 1948 "frost48.dat"
FROST 1949 "frost49.dat"
FROST 1950 "frost50.dat"
FROST 1951 "frost51.dat"
```

```
FROST 1952 "frost52.dat"
FROST 1953 "frost53.dat"
FROST 1954 "frost54.dat"
FROST 1955 "frost55.dat"
FROST 1956 "frost56.dat"
FROST 1957 "frost57.dat"
$
$ Files for sensitivity analysis
$
FILE PLANTS "plants.dat"
$
$ Stochastic parameters for plants
$
STOCHASTIC ALPHA     2  1.0    4.0
STOCHASTIC LAMLEACH  2  4E-6   5E-3
STOCHASTIC LAMPERC   2  0.14   0.91375
STOCHASTIC LAMSPLSH  1  0
STOCHASTIC LAMWEATH  6  0.0347 0.0495 0.0866
STOCHASTIC CR        4  0.01   0.25
STOCHASTIC FTRANS    4  0.01   0.2
STOCHASTIC ML        8 -7.155  0.301 TRUNCATE 0.01 0.99
STOCHASTIC VDEPOS    2  8.64E+1   2.59E+3
$
SEED PLANTS 110564
$
$ Air deposition media
$
COMPUTE AIRDEP
FILE AIRDEP "deposit.med"
$
$ Air concentration media
$
COMPUTE AIRCON
FILE AIRCON "concen.med"
$
$ Stochastic parameters for soil
$
STOCHASTIC RHOUSL 2 1.10 1.45
STOCHASTIC RHORZ  2 186  230
$
$ Soil media: Upper layer
$
COMPUTE SOILUP
FILE SOILUP "soilup.med"
SEED SOILUP 10000
$
FILE USLRATIO "ciderusl.dat"
$
$ Soil media: Root zone media
$
COMPUTE SOILROOT
```

```
FILE SOILROOT "soilroot.med"
SEED SOILROOT 10000
$
$ Sagebrush media
$
COMPUTE SAGEBRUS
FILE SAGEBRUS "sagebrush.med"
STOCHASTIC KS   SAGEBRUS 1 0.09
STOCHASTIC KG   SAGEBRUS 1 0.15
STOCHASTIC BMIN SAGEBRUS 1 0.008
STOCHASTIC BMAX SAGEBRUS 6 0.008  0.01  0.052
SEED SAGEBRUS 10000
$
$ Alfalfa media
$
COMPUTE ALFALFA
FILE ALFALFA "alfalfa.med"
SEED ALFALFA 10000
HARVEST ALFALFA1  66 3 -7 7 $ Beck, et al, Page 60
HARVEST ALFALFA2 111 3 -7 7
HARVEST ALFALFA3 156 3 -7 7
STOCHASTIC KS   ALFALFA 1 0.15
STOCHASTIC KG   ALFALFA 1 0.27
STOCHASTIC BMIN ALFALFA 1 0.01
STOCHASTIC BMAX ALFALFA 6 0.07  0.2  0.4
$
$ Grain media
$
COMPUTE GRAIN
FILE GRAIN "grain.med"
HARVEST GRAIN 116 3 -30 30 $ Average date near August 1
STOCHASTIC KS   GRAIN 1 0.08
STOCHASTIC KG   GRAIN 1 0.12
STOCHASTIC BMIN GRAIN 1 0.01
STOCHASTIC BMAX GRAIN 6 0.09  0.14  0.3
SEED GRAIN 10000
$
$ Grasshay media
$
COMPUTE GRASSHAY
FILE GRASSHAY "grasshay.med"
HARVEST GRASSHAY 100 3 -7 7 $ Beck, et al, Page 62
STOCHASTIC KS   GRASSHAY 1 0.09
STOCHASTIC KG   GRASSHAY 1 0.12
STOCHASTIC BMIN GRASSHAY 1 0.03
STOCHASTIC BMAX GRASSHAY 6 0.1  0.3  0.6
SEED GRASSHAY 10000
$
$ Pasture media
$
COMPUTE PASTURE
```

```
FILE PASTURE "pasture.med"
STOCHASTIC KS   PASTURE 1 0.09
STOCHASTIC KG   PASTURE 1 0.12
STOCHASTIC BMIN PASTURE 1 0.04
STOCHASTIC BMAX PASTURE 6 0.1  0.3  0.7
SEED PASTURE 10000
$
$ Silage media
$
COMPUTE SILAGE
FILE SILAGE "silage.med"
HARVEST SILAGE 14 $ Beck, et at, Page 62
STOCHASTIC KS   SILAGE 1 0.09
STOCHASTIC KG   SILAGE 1 0.12
STOCHASTIC BMIN SILAGE 1 0.01
STOCHASTIC BMAX SILAGE 6 0.1  0.3  0.6
SEED SILAGE 10000
$
$ Fruit media
$
COMPUTE FRUIT
FILE FRUITIN "fruitin.med"
FILE FRUITOT "fruitot.med"
STOCHASTIC KS   FRUIT 1 0.07
STOCHASTIC KG   FRUIT 1 0.09
STOCHASTIC BMIN FRUIT 1 0.27
STOCHASTIC BMAX FRUIT 6 0.3  0.54  2.0
HARVEST FRUIT 152 304 $ Season is June 1 to October 31
SEED FRUIT 10000
$
$ Vegetables: Leafy (inner and outer) media
$
COMPUTE LVEG
FILE LVEGIN "lvegin.med"
FILE LVEGOT "lvegot.med"
HARVEST VEGLEAFY 121 288 $ Season is May 1 to October 15
STOCHASTIC KS LEAFYVEG   1 0.07
STOCHASTIC KG LEAFYVEG   1 0.11
STOCHASTIC BMIN LEAFYVEG 1 0.01
STOCHASTIC BMAX LEAFYVEG 6 0.07  0.2  0.6
SEED LVEG 10000
$
$ Vegetables: Other media
$
COMPUTE VEGOTH
FILE VEGOTH "otherveg.med"
HARVEST VEGOTHER 135 288 $ Season is May 15 through October 15
STOCHASTIC KS   OTHERVEG 1 0.08
STOCHASTIC KG   OTHERVEG 1 0.09
STOCHASTIC BMIN OTHERVEG 1 0.01
STOCHASTIC BMAX OTHERVEG 6 0.17  0.5  1.2
```

```
SEED VEGOTH 10000
$
$$$$$$$$$$$$$$$$$$$$$$$$ Animal Products Section
$
$ Files for sensitivity analysis
$
FILE ANIMAL "animal.dat"
$
$ Season Date Files for triggering Animal Feeding Seasons
$
SDATE 1944 "season.dat"
SDATE 1945 "season.dat"
SDATE 1946 "season.dat"
SDATE 1947 "season.dat"
SDATE 1948 "season.dat"
SDATE 1949 "season.dat"
SDATE 1950 "season.dat"
SDATE 1951 "season.dat"
SDATE 1952 "season.dat"
SDATE 1953 "season.dat"
SDATE 1954 "season.dat"
SDATE 1955 "season.dat"
SDATE 1956 "season.dat"
SDATE 1957 "season.dat"
$
$ Water dilution factors - common to all animals
$
STOCHASTIC WATER 6 0.6 1.0 5.0
DIRT fractions: 0.1 upper soil layer, 0.9 from root zone
TRANSIT season dates are 14 and 14 days long
$
$ Random seed for nonspecific media stochastics
$
SEED ANIMAL 666
$
$ Poultry media
$
COMPUTE POULTRY
FILE POULTRY "poultry.med"
DIET POULTRY 1944 "poultrydiet.diet"
DIET POULTRY 1945 "poultrydiet.diet"
DIET POULTRY 1946 "poultrydiet.diet"
DIET POULTRY 1947 "poultrydiet.diet"
DIET POULTRY 1948 "poultrydiet.diet"
DIET POULTRY 1949 "poultrydiet.diet"
DIET POULTRY 1950 "poultrydiet.diet"
DIET POULTRY 1951 "poultrydiet.diet"
DIET POULTRY 1952 "poultrydiet.diet"
DIET POULTRY 1953 "poultrydiet.diet"
DIET POULTRY 1954 "poultrydiet.diet"
DIET POULTRY 1955 "poultrydiet.diet"
```

```
DIET POULTRY 1956 "poultrydiet.diet"
DIET POULTRY 1957 "poultrydiet.diet"
STOCHASTIC TFPOUL 2 0.004 0.094
SEED POULTRY 123456
$
$ Eggs media (uses poultry diet files)
$
COMPUTE EGGS
FILE EGGS "eggs.med"
STOCHASTIC TFEGGS 2 1.5 6
SEED EGGS 441144
$
$ Beef media
$
COMPUTE BEEF
FILE BEEF "beef.med"
DIET BEEF 1944 "beefdiet.diet"
DIET BEEF 1945 "beefdiet.diet"
DIET BEEF 1946 "beefdiet.diet"
DIET BEEF 1947 "beefdiet.diet"
DIET BEEF 1948 "beefdiet.diet"
DIET BEEF 1949 "beefdiet.diet"
DIET BEEF 1950 "beefdiet.diet"
DIET BEEF 1951 "beefdiet.diet"
DIET BEEF 1952 "beefdiet.diet"
DIET BEEF 1953 "beefdiet.diet"
DIET BEEF 1954 "beefdiet.diet"
DIET BEEF 1955 "beefdiet.diet"
DIET BEEF 1956 "beefdiet.diet"
DIET BEEF 1957 "beefdiet.diet"
STOCHASTIC TFBEEF 2 0.004 0.054
SEED BEEF 12345
$
$ Goat milk media
$
COMPUTE GOAT
FILE GOAT "goat.med"
DIET GOAT 1944 "goatdiet.diet"
DIET GOAT 1945 "goatdiet.diet"
DIET GOAT 1946 "goatdiet.diet"
DIET GOAT 1947 "goatdiet.diet"
DIET GOAT 1948 "goatdiet.diet"
DIET GOAT 1949 "goatdiet.diet"
DIET GOAT 1950 "goatdiet.diet"
DIET GOAT 1951 "goatdiet.diet"
DIET GOAT 1952 "goatdiet.diet"
DIET GOAT 1953 "goatdiet.diet"
DIET GOAT 1954 "goatdiet.diet"
DIET GOAT 1955 "goatdiet.diet"
DIET GOAT 1956 "goatdiet.diet"
DIET GOAT 1957 "goatdiet.diet"
```

```
STOCHASTIC TFGOAT 8 -0.699 0.32222 TRUNCATE 0.01 0.99
SEED GOAT 5225
$
$ Individual cow milk transfer coefficient
$
STOCHASTIC TFMILKIN 9 -4.68855 0.74157 TRUNCATE 0.01 0.99
SEED TFCWIN 9009
$
$ Milk media for individual cow on backyard feeding regime 1
$
COMPUTE MREG1IND
FILE MREG1IND "milkli.med"
SEED MREG1 154412
$
DIET MILKREG1 1944 "cowby1.diet"
DIET MILKREG1 1945 "cowby1.diet"
DIET MILKREG1 1946 "cowby1.diet"
DIET MILKREG1 1947 "cowby1.diet"
DIET MILKREG1 1948 "cowby1.diet"
DIET MILKREG1 1949 "cowby1.diet"
DIET MILKREG1 1950 "cowby1.diet"
DIET MILKREG1 1951 "cowby1.diet"
DIET MILKREG1 1952 "cowby1.diet"
DIET MILKREG1 1953 "cowby1.diet"
DIET MILKREG1 1954 "cowby1.diet"
DIET MILKREG1 1955 "cowby1.diet"
DIET MILKREG1 1956 "cowby1.diet"
DIET MILKREG1 1957 "cowby1.diet"
$
$ Milk media for individual cow on backyard feeding regime 2
$
COMPUTE MREG2IND
FILE MREG2IND "milk2i.med"
SEED MREG2 254412
$
DIET MILKREG2 1944 "cowby2.diet"
DIET MILKREG2 1945 "cowby2.diet"
DIET MILKREG2 1946 "cowby2.diet"
DIET MILKREG2 1947 "cowby2.diet"
DIET MILKREG2 1948 "cowby2.diet"
DIET MILKREG2 1949 "cowby2.diet"
DIET MILKREG2 1950 "cowby2.diet"
DIET MILKREG2 1951 "cowby2.diet"
DIET MILKREG2 1952 "cowby2.diet"
DIET MILKREG2 1953 "cowby2.diet"
DIET MILKREG2 1954 "cowby2.diet"
DIET MILKREG2 1955 "cowby2.diet"
DIET MILKREG2 1956 "cowby2.diet"
DIET MILKREG2 1957 "cowby2.diet"
$
$ Milk media for individual cow on backyard feeding regime 3
```

```
$
COMPUTE MREG3IND
FILE MREG3IND "milk3i.med"
SEED MREG3 354413
$
DIET MILKREG3 1944 "cowby3.diet"
DIET MILKREG3 1945 "cowby3.diet"
DIET MILKREG3 1946 "cowby3.diet"
DIET MILKREG3 1947 "cowby3.diet"
DIET MILKREG3 1948 "cowby3.diet"
DIET MILKREG3 1949 "cowby3.diet"
DIET MILKREG3 1950 "cowby3.diet"
DIET MILKREG3 1951 "cowby3.diet"
DIET MILKREG3 1952 "cowby3.diet"
DIET MILKREG3 1953 "cowby3.diet"
DIET MILKREG3 1954 "cowby3.diet"
DIET MILKREG3 1955 "cowby3.diet"
DIET MILKREG3 1956 "cowby3.diet"
DIET MILKREG3 1957 "cowby3.diet"
$
$ Milk media for individual cow on backyard feeding regime 4
$
COMPUTE MREG4IND
FILE MREG4IND "milk4i.med"
SEED MREG4 454414
$
DIET MILKREG4 1944 "cowby4.diet"
DIET MILKREG4 1945 "cowby4.diet"
DIET MILKREG4 1946 "cowby4.diet"
DIET MILKREG4 1947 "cowby4.diet"
DIET MILKREG4 1948 "cowby4.diet"
DIET MILKREG4 1949 "cowby4.diet"
DIET MILKREG4 1950 "cowby4.diet"
DIET MILKREG4 1951 "cowby4.diet"
DIET MILKREG4 1952 "cowby4.diet"
DIET MILKREG4 1953 "cowby4.diet"
DIET MILKREG4 1954 "cowby4.diet"
DIET MILKREG4 1955 "cowby4.diet"
DIET MILKREG4 1956 "cowby4.diet"
DIET MILKREG4 1957 "cowby4.diet"
$
$ Distribution for herd cow milk transfer coefficients
$
STOCHASTIC TFMILKHD 7 0.012 0.002 TRUNCATE 0.01 0.99
SEED TFCWHD 9009
$
$ Milk media for herd cow on commercial feeding regime 1
$
COMPUTE MREG1HRD
FILE MREG1HRD "milk1h.med"
SEED MREG1 154412
```

```
$
DIET MILKREG1 1944 "cowc1.diet"
DIET MILKREG1 1945 "cowc1.diet"
DIET MILKREG1 1946 "cowc1.diet"
DIET MILKREG1 1947 "cowc1.diet"
DIET MILKREG1 1948 "cowc1.diet"
DIET MILKREG1 1949 "cowc1.diet"
DIET MILKREG1 1950 "cowc1.diet"
DIET MILKREG1 1951 "cowc1.diet"
DIET MILKREG1 1952 "cowc1.diet"
DIET MILKREG1 1953 "cowc1.diet"
DIET MILKREG1 1954 "cowc1.diet"
DIET MILKREG1 1955 "cowc1.diet"
DIET MILKREG1 1956 "cowc1.diet"
DIET MILKREG1 1957 "cowc1.diet"
$
$ Milk media for herd cow on commercial feeding regime 2
$
COMPUTE MREG2HRD
FILE MREG2HRD "milk2h.med"
SEED MREG2 254412
$
DIET MILKREG2 1944 "cowc2.diet"
DIET MILKREG2 1945 "cowc2.diet"
DIET MILKREG2 1946 "cowc2.diet"
DIET MILKREG2 1947 "cowc2.diet"
DIET MILKREG2 1948 "cowc2.diet"
DIET MILKREG2 1949 "cowc2.diet"
DIET MILKREG2 1950 "cowc2.diet"
DIET MILKREG2 1951 "cowc2.diet"
DIET MILKREG2 1952 "cowc2.diet"
DIET MILKREG2 1953 "cowc2.diet"
DIET MILKREG2 1954 "cowc2.diet"
DIET MILKREG2 1955 "cowc2.diet"
DIET MILKREG2 1956 "cowc2.diet"
DIET MILKREG2 1957 "cowc2.diet"
$
$ Milk media for herd cow on commercial feeding regime 3
$
COMPUTE MREG3HRD
FILE MREG3HRD "milk3h.med"
SEED MREG3 354413
$
DIET MILKREG3 1944 "cowc3.diet"
DIET MILKREG3 1945 "cowc3.diet"
DIET MILKREG3 1946 "cowc3.diet"
DIET MILKREG3 1947 "cowc3.diet"
DIET MILKREG3 1948 "cowc3.diet"
DIET MILKREG3 1949 "cowc3.diet"
DIET MILKREG3 1950 "cowc3.diet"
DIET MILKREG3 1951 "cowc3.diet"
```

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DIET MILKREG3 1952 "cowc3.diet"
DIET MILKREG3 1953 "cowc3.diet"
DIET MILKREG3 1954 "cowc3.diet"
DIET MILKREG3 1955 "cowc3.diet"
DIET MILKREG3 1956 "cowc3.diet"
DIET MILKREG3 1957 "cowc3.diet"
$
$ Milk media for herd cow on commercial feeding regime 4
$
COMPUTE MREG4HRD
FILE MREG4HRD "milk4h.med"
SEED MREG4 454414
$
DIET MILKREG4 1944 "cowc4.diet"
DIET MILKREG4 1945 "cowc4.diet"
DIET MILKREG4 1946 "cowc4.diet"
DIET MILKREG4 1947 "cowc4.diet"
DIET MILKREG4 1948 "cowc4.diet"
DIET MILKREG4 1949 "cowc4.diet"
DIET MILKREG4 1950 "cowc4.diet"
DIET MILKREG4 1951 "cowc4.diet"
DIET MILKREG4 1952 "cowc4.diet"
DIET MILKREG4 1953 "cowc4.diet"
DIET MILKREG4 1954 "cowc4.diet"
DIET MILKREG4 1955 "cowc4.diet"
DIET MILKREG4 1956 "cowc4.diet"
DIET MILKREG4 1957 "cowc4.diet"
$
$$$$$$$$$$$$$$$$$$$$$$$$ Creamery Milk Section
$
$ Creameries active by year
$
CREAMERY 1944 RANGE 1 164
CREAMERY 1945 RANGE 1 164
CREAMERY 1946 RANGE 1 164
CREAMERY 1947 RANGE 1 164
CREAMERY 1948 RANGE 1 164
CREAMERY 1949 RANGE 1 164
CREAMERY 1950 RANGE 1 164
CREAMERY 1951 RANGE 1 164
CREAMERY 1952 RANGE 1 164
CREAMERY 1953 RANGE 1 164
CREAMERY 1954 RANGE 1 164
CREAMERY 1955 RANGE 1 164
CREAMERY 1956 RANGE 1 164
CREAMERY 1957 RANGE 1 164
$
$ Creamery ID's assigned to unknown local creamery and the
$ milk from outside the HEDR domain
$
GROCERY UNKNOWN 165
```

```
GROCERY OUTSIDE 166
$
$ Cream Media Section
$
COMPUTE CREAM
SEED CREAM 8767.
FILE CREAM "creamery.med"
$
$ Set of recipes (by year) for the creameries that were active
$
RECIPE MILKPROD INDEX 1944 "cmprodat44.idx"
RECIPE MILKPROD DATA  1944 "cmprodat44.dat"
$
RECIPE MILKPROD INDEX 1945 "cmprodat45.idx"
RECIPE MILKPROD DATA  1945 "cmprodat45.dat"
$
RECIPE MILKPROD INDEX 1946 "cmprodat46.idx"
RECIPE MILKPROD DATA  1946 "cmprodat46.dat"
$
RECIPE MILKPROD INDEX 1947 "cmprodat47.idx"
RECIPE MILKPROD DATA  1947 "cmprodat47.dat"
$
RECIPE MILKPROD INDEX 1948 "cmprodat48.idx"
RECIPE MILKPROD DATA  1948 "cmprodat48.dat"
$
RECIPE MILKPROD INDEX 1949 "cmprodat49.idx"
RECIPE MILKPROD DATA  1949 "cmprodat49.dat"
$
RECIPE MILKPROD INDEX 1950 "cmprodat50.idx"
RECIPE MILKPROD DATA  1950 "cmprodat50.dat"
$
RECIPE MILKPROD INDEX 1951 "cmprodat51.idx"
RECIPE MILKPROD DATA  1951 "cmprodat51.dat"
$
RECIPE MILKPROD INDEX 1952 "cmprodat51.idx"
RECIPE MILKPROD DATA  1952 "cmprodat51.dat"
$
RECIPE MILKPROD INDEX 1953 "cmprodat51.idx"
RECIPE MILKPROD DATA  1953 "cmprodat51.dat"
$
RECIPE MILKPROD INDEX 1954 "cmprodat51.idx"
RECIPE MILKPROD DATA  1954 "cmprodat51.dat"
$
RECIPE MILKPROD INDEX 1955 "cmprodat51.idx"
RECIPE MILKPROD DATA  1955 "cmprodat51.dat"
$
RECIPE MILKPROD INDEX 1956 "cmprodat51.idx"
RECIPE MILKPROD DATA  1956 "cmprodat51.dat"
$
RECIPE MILKPROD INDEX 1957 "cmprodat51.idx"
RECIPE MILKPROD DATA  1957 "cmprodat51.dat"
```

```
$
$ Set of files for which feeding regimes were active at
$ commercial milk production nodes
$
RECIPE MILKFEED INDEX 1944 "fregimes.idx"
RECIPE MILKFEED DATA  1944 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1945 "fregimes.idx"
RECIPE MILKFEED DATA  1945 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1946 "fregimes.idx"
RECIPE MILKFEED DATA  1946 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1947 "fregimes.idx"
RECIPE MILKFEED DATA  1947 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1948 "fregimes.idx"
RECIPE MILKFEED DATA  1948 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1949 "fregimes.idx"
RECIPE MILKFEED DATA  1949 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1950 "fregimes.idx"
RECIPE MILKFEED DATA  1950 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1951 "fregimes.idx"
RECIPE MILKFEED DATA  1951 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1952 "fregimes.idx"
RECIPE MILKFEED DATA  1952 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1953 "fregimes.idx"
RECIPE MILKFEED DATA  1953 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1954 "fregimes.idx"
RECIPE MILKFEED DATA  1954 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1955 "fregimes.idx"
RECIPE MILKFEED DATA  1955 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1956 "fregimes.idx"
RECIPE MILKFEED DATA  1956 "fregimes.dat"
$
RECIPE MILKFEED INDEX 1957 "fregimes.idx"
RECIPE MILKFEED DATA  1957 "fregimes.dat"
$
$$$$$$$$$$$$$$$$$$$$$$$$$ Grocery Milk Section
$
COMPUTE MILKGROC
SEED MILKGROC 3429.
FILE MILKGROC "grocery.med"
```

```
$
$ Set of recipes for the creameries that make up grocery milk
$
RECIPE MILKDSTR INDEX 1944 "cmdat44.idx"
RECIPE MILKDSTR DATA  1944 "cmdat44.dat"
$
RECIPE MILKDSTR INDEX 1945 "cmdat45.idx"
RECIPE MILKDSTR DATA  1945 "cmdat45.dat"
$
RECIPE MILKDSTR INDEX 1946 "cmdat46.idx"
RECIPE MILKDSTR DATA  1946 "cmdat46.dat"
$
RECIPE MILKDSTR INDEX 1947 "cmdat47.idx"
RECIPE MILKDSTR DATA  1947 "cmdat47.dat"
$
RECIPE MILKDSTR INDEX 1948 "cmdat48.idx"
RECIPE MILKDSTR DATA  1948 "cmdat48.dat"
$
RECIPE MILKDSTR INDEX 1949 "cmdat49.idx"
RECIPE MILKDSTR DATA  1949 "cmdat49.dat"
$
RECIPE MILKDSTR INDEX 1950 "cmdat50.idx"
RECIPE MILKDSTR DATA  1950 "cmdat50.dat"
$
RECIPE MILKDSTR INDEX 1951 "cmdat51.idx"
RECIPE MILKDSTR DATA  1951 "cmdat51.dat"
$
RECIPE MILKDSTR INDEX 1952 "cmdat51.idx"
RECIPE MILKDSTR DATA  1952 "cmdat51.dat"
$
RECIPE MILKDSTR INDEX 1953 "cmdat51.idx"
RECIPE MILKDSTR DATA  1953 "cmdat51.dat"
$
RECIPE MILKDSTR INDEX 1954 "cmdat51.idx"
RECIPE MILKDSTR DATA  1954 "cmdat51.dat"
$
RECIPE MILKDSTR INDEX 1955 "cmdat51.idx"
RECIPE MILKDSTR DATA  1955 "cmdat51.dat"
$
RECIPE MILKDSTR INDEX 1956 "cmdat51.idx"
RECIPE MILKDSTR DATA  1956 "cmdat51.dat"
$
RECIPE MILKDSTR INDEX 1957 "cmdat51.idx"
RECIPE MILKDSTR DATA  1957 "cmdat51.dat"
$
$$$$$$$$$$$$$$$$$$$$$$$$$ Commercial leafy Vegetables
$
$ Commercial leafy vegetables media
$
COMPUTE LVEGCM
FILE LVEGINCM "lveginc.med"
```

```
FILE LVEGOTCM "lvegotc.med"
$
SEED LVEGCM 10000
$
$ Recipe files for the commercial distribution system
$
RECIPE LEAFYVEG INDEX 1944 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1944 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1945 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1945 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1946 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1946 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1947 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1947 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1948 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1948 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1949 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1949 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1950 "vegdat45.idx"
RECIPE LEAFYVEG DATA  1950 "vegdat45.dat"
$
RECIPE LEAFYVEG INDEX 1951 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1951 "vegdat51.dat"
$
RECIPE LEAFYVEG INDEX 1952 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1952 "vegdat51.dat"
$
RECIPE LEAFYVEG INDEX 1953 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1953 "vegdat51.dat"
$
RECIPE LEAFYVEG INDEX 1954 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1954 "vegdat51.dat"
$
RECIPE LEAFYVEG INDEX 1955 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1955 "vegdat51.dat"
$
RECIPE LEAFYVEG INDEX 1956 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1956 "vegdat51.dat"
$
RECIPE LEAFYVEG INDEX 1957 "vegdat51.idx"
RECIPE LEAFYVEG DATA  1957 "vegdat51.dat"
$
END
```

```
**********************************************************************************

DDDDD   EEEEEEE  SSSSS    CCCC    AAA   RRRRRR  TTTTTTT EEEEEEE  SSSSS
D    D  E       S     S  C    C  A   A  R     R    T    E       S     S
D     D E        S      C        A     A R    R     T    E        S
D     D EEEE      SSS   C        AAAAAAA RRRR       T    EEEE      SSS
D     D E            S  C        A     A R   R      T    E            S
D    D  E       S     S  C    C  A     A R    R     T    E       S     S
DDDDD   EEEEEEE  SSSSS    CCCC   A     A R     R    T    EEEEEEE  SSSSS
```

DESCRT 1.3
Last Modified on 11 Jan 1994

Environmental Accumulation Analysis Program
Hanford Environmental Dose Reconstruction Project
Battelle, Pacific Northwest Laboratories
Richland, Washington

Current Run ID = 940125144537 User Name = John Q. Public

System Date = 01-25-94 System Time = 14:45:37

****

The software used to generate this output has been
formally tested and peer reviewed according to
Battelle software control procedures.
Document Number: Task 8 Files Release Date: 1/11/94

Review Signatures

Input Prepared By: _____ Date: _____

Input Reviewed By: _____ Date: _____

========== Echo of the Problem Definition
==========

Title: Example Problem for the DESCARTES Users Guide

The run starts on day 361 of 1944 and stops on day 365 of 1957

Time stepping increment is: MONTH

The nuclide being processed is I131 with decay constant 8.62500E-02

The run will process 100 realizations.

Only input error checking has been requested.

A total of 1102 nodes have been requested.

A map of node activations (true/false) is:

1- 20	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
21- 40	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
41- 60	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
61- 80	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
81- 100	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
101- 120	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
121- 140	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
141- 160	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
161- 180	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
181- 200	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
201- 220	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
221- 240	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
241- 260	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
261- 280	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
281- 300	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
301- 320	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
321- 340	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
341- 360	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
361- 380	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
381- 400	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
401- 420	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
421- 440	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
441- 460	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
461- 480	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
481- 500	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
501- 520	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
521- 540	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
541- 560	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
561- 580	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
581- 600	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
601- 620	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
621- 640	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
641- 660	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
661- 680	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
681- 700	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
701- 720	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
721- 740	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
741- 760	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
761- 780	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
781- 800	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
801- 820	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
821- 840	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
841- 860	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
861- 880	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
881- 900	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
901- 920	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
921- 940	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
941- 960	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
961- 980	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
981-1000	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
1001-1020	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T

1021-1040	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
1041-1060	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
1061-1080	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
1081-1100	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
1101-1102	T	T																		

Plant Growth and Nuclide Information

Stochastic information

Random seed for media independent calculations: 110564.

Definition for variable ALPHA
The distribution type is Uniform
The lower limit is 1.0000E+00
The upper limit is 4.0000E+00

Definition for variable LAMLEACH
The distribution type is Uniform
The lower limit is 4.0000E-06
The upper limit is 5.0000E-03

Definition for variable LAMPERC
The distribution type is Uniform
The lower limit is 1.4000E-01
The upper limit is 9.1375E-01

Definition for variable LAMSPLSH
The distribution type is Constant
The constant value is 0.0000E+00

Definition for variable LAMWEATH
The distribution type is Triangular
The minimum is 3.4700E-02
The mode is 4.9500E-02
The maximum is 8.6600E-02

Definition for variable CR
The distribution type is Loguniform (10)
The lower limit is 1.0000E-02
The upper limit is 2.5000E-01

Definition for variable FTRANS
The distribution type is Loguniform (10)
The lower limit is 1.0000E-02
The upper limit is 2.0000E-01

Definition for variable ML
The distribution type is Lognormal (10)
The mean is -7.1550E+00
The standard deviation is 3.0100E-01
The lower probability truncation limit is 1.0000E-02
The upper probability truncation limit is 9.9000E-01

Definition for variable VDEPOS

The distribution type is Uniform
The lower limit is 8.6400E+01
The upper limit is 2.5900E+03

File containing plant stochastic information
Name: plants.dat

Frost Date Information

Frost date library files
1944 : frost44.dat
1945 : frost45.dat
1946 : frost46.dat
1947 : frost47.dat
1948 : frost48.dat
1949 : frost49.dat
1950 : frost50.dat
1951 : frost51.dat
1952 : frost52.dat
1953 : frost53.dat
1954 : frost54.dat
1955 : frost55.dat
1956 : frost56.dat
1957 : frost57.dat

Air Deposition Data

SHUFFL air deposition file: depo.44-57
Media File: deposit.med
Upper Soil Layer Ratio File: ciderusl.dat

Air Concentration Media

SHUFFL air concentration file: conc.44-57
Media file: concen.med

Alfalfa Media

Media file: alfalfa.med
Random seed : 10000.

```
Definition for variable BMAXALFALFA
   The distribution type is Triangular
   The minimum is  7.0000E-02
   The mode is     2.0000E-01
   The maximum is  4.0000E-01

Definition for variable BMINALFALFA
   The distribution type is Constant
   The constant value is  1.0000E-02

Definition for variable KGALFALFA
   The distribution type is Constant
   The constant value is  2.7000E-01

Definition for variable KSALFALFA
   The distribution type is Constant
   The constant value is  1.5000E-01

The first alfalfa harvest is  66 days after frost with distribution

Definition for variable HARVESTALFALFA1
   The distribution type is Discrete Uniform
   The lower limit is      -7
   The upper limit is       7

The second alfalfa harvest is 111 days after frost with distribution

Definition for variable HARVESTALFALFA2
   The distribution type is Discrete Uniform
   The lower limit is      -7
   The upper limit is       7

The third alfalfa harvest is 156 days after frost with distribution

Definition for variable HARVESTALFALFA3
   The distribution type is Discrete Uniform
   The lower limit is      -7
   The upper limit is       7
```

Beef Media

```
Media file: beef.med
Random seed :      12345.

Definition for variable TFBEEF
   The distribution type is Uniform
   The lower limit is  4.0000E-03
   The upper limit is  5.4000E-02

Beef diet library files
   1944 : beefdiet.diet
   1945 : beefdiet.diet
   1946 : beefdiet.diet
   1947 : beefdiet.diet
   1948 : beefdiet.diet
```

```
   1949 : beefdiet.diet
   1950 : beefdiet.diet
   1951 : beefdiet.diet
   1952 : beefdiet.diet
   1953 : beefdiet.diet
   1954 : beefdiet.diet
   1955 : beefdiet.diet
   1956 : beefdiet.diet
   1957 : beefdiet.diet
```

Eggs and Poultry Media

```
Eggs media file: eggs.med

Random seed :     441144.

Definition for variable TFEGGS
   The distribution type is Uniform
   The lower limit is  1.5000E+00
   The upper limit is  6.0000E+00

Poultry media file: poultry.med


Random seed :     123456.

Definition for variable TFPOUL
   The distribution type is Uniform
   The lower limit is  4.0000E-03
   The upper limit is  9.4000E-02

Poultry diet library files
   1944 : poultrydiet.diet
   1945 : poultrydiet.diet
   1946 : poultrydiet.diet
   1947 : poultrydiet.diet
   1948 : poultrydiet.diet
   1949 : poultrydiet.diet
   1950 : poultrydiet.diet
   1951 : poultrydiet.diet
   1952 : poultrydiet.diet
   1953 : poultrydiet.diet
   1954 : poultrydiet.diet
   1955 : poultrydiet.diet
   1956 : poultrydiet.diet
   1957 : poultrydiet.diet
```

Fruit Media

```
Inner Fruit Media File: fruitin.med
```

Outer Fruit Media File: fruitot.med
Random seed : 10000.
Harvest season is from day 152 to day 304

Definition for variable BMAXFRUIT
The distribution type is Triangular
The minimum is 3.0000E-01
The mode is 5.4000E-01
The maximum is 2.0000E+00

Definition for variable BMINFRUIT
The distribution type is Constant
The constant value is 2.7000E-01

Definition for variable KGFRUIT
The distribution type is Constant
The constant value is 9.0000E-02

Definition for variable KSFRUIT
The distribution type is Constant
The constant value is 7.0000E-02

Goat Milk Media

Media file: goat.med

Random seed : 5225.

Definition for variable TFGOAT
The distribution type is Lognormal (10)
The mean is -6.9900E-01
The standard deviation is 3.2222E-01
The lower probability truncation limit is 1.0000E-02
The upper probability truncation limit is 9.9000E-01

Goat diet library files
1944 : goatdiet.diet
1945 : goatdiet.diet
1946 : goatdiet.diet
1947 : goatdiet.diet
1948 : goatdiet.diet
1949 : goatdiet.diet
1950 : goatdiet.diet
1951 : goatdiet.diet
1952 : goatdiet.diet
1953 : goatdiet.diet
1954 : goatdiet.diet
1955 : goatdiet.diet
1956 : goatdiet.diet
1957 : goatdiet.diet

Grain Media

Media file: grain.med

Random seed : 10000.

The grain harvest is 116 days after frost with distribution

Definition for variable HARVESTGRAIN
The distribution type is Discrete Uniform
The lower limit is -30
The upper limit is 30

Definition for variable BMAXGRAIN
The distribution type is Triangular
The minimum is 9.0000E-02
The mode is 1.4000E-01
The maximum is 3.0000E-01

Definition for variable BMINGRAIN
The distribution type is Constant
The constant value is 1.0000E-02

Definition for variable KGGRAIN
The distribution type is Constant
The constant value is 1.2000E-01

Definition for variable KSGRAIN
The distribution type is Constant
The constant value is 8.0000E-02

Grass Hay Media

Media file: grasshay.med
Random seed : 10000.

The grass hay harvest is 100 days after frost with distribution

Definition for variable HARVESTGRASSHAY
The distribution type is Discrete Uniform
The lower limit is -7
The upper limit is 7

Definition for variable BMAXGRASSHAY
The distribution type is Triangular
The minimum is 1.0000E-01
The mode is 3.0000E-01
The maximum is 6.0000E-01

Definition for variable BMINGRASSHAY
The distribution type is Constant
The constant value is 3.0000E-02

Definition for variable KGGRASSHAY

```
   The distribution type is Constant
   The constant value is  1.2000E-01

Definition for variable KSGRASSHAY
   The distribution type is Constant
   The constant value is  9.0000E-02


-----------------------------------------------------------------------------
..
                              Leafy Vegetable Media
-----------------------------------------------------------------------------
..

Inner Leafy Vegetables Media File: lvegin.med
Outer Leafy Vegetables Media File: lvegot.med
Random seed :       10000.
Harvest season is from day 121 to day 288

Definition for variable BMAXLEAFYVEG
   The distribution type is Triangular
   The minimum is  7.0000E-02
   The mode is     2.0000E-01
   The maximum is  6.0000E-01

Definition for variable BMINLEAFYVEG
   The distribution type is Constant
   The constant value is  1.0000E-02

Definition for variable KGLEAFYVEG
   The distribution type is Constant
   The constant value is  1.1000E-01

Definition for variable KSLEAFYVEG
   The distribution type is Constant
   The constant value is  7.0000E-02


-----------------------------------------------------------------------------
..
                        Commercial Leafy Vegetables Media
-----------------------------------------------------------------------------
..

Media file - Commercial - Inner: lveginc.med
Media file - Commercial - Outer: lvegotc.med
Media file - Inner: lvegin.med
Media file - Outer: lvegot.med
Random seed :       10000.

Commercial leafy vegetable recipe library files
   1944 : Index : vegdat45.idx
   1944 : Data  : vegdat45.dat
   1945 : Index : vegdat45.idx
   1945 : Data  : vegdat45.dat
   1946 : Index : vegdat45.idx
   1946 : Data  : vegdat45.dat
   1947 : Index : vegdat45.idx
   1947 : Data  : vegdat45.dat
   1948 : Index : vegdat45.idx
```

```
1948 : Data  : vegdat45.dat
1949 : Index : vegdat45.idx
1949 : Data  : vegdat45.dat
1950 : Index : vegdat45.idx
1950 : Data  : vegdat45.dat
1951 : Index : vegdat51.idx
1951 : Data  : vegdat51.dat
1952 : Index : vegdat51.idx
1952 : Data  : vegdat51.dat
1953 : Index : vegdat51.idx
1953 : Data  : vegdat51.dat
1954 : Index : vegdat51.idx
1954 : Data  : vegdat51.dat
1955 : Index : vegdat51.idx
1955 : Data  : vegdat51.dat
1956 : Index : vegdat51.idx
1956 : Data  : vegdat51.dat
1957 : Index : vegdat51.idx
1957 : Data  : vegdat51.dat
```

Cream Media

```
Media file: creamery.med
Random seed :        8767.

Cream recipe library files
   1944 : Milk Production Index : cmprodat44.idx
   1944 : Milk Production Data  : cmprodat44.dat
   1944 : Milk Feed Index : fregimes.idx
   1944 : Milk Feed Data  : fregimes.dat
   1945 : Milk Production Index : cmprodat45.idx
   1945 : Milk Production Data  : cmprodat45.dat
   1945 : Milk Feed Index : fregimes.idx
   1945 : Milk Feed Data  : fregimes.dat
   1946 : Milk Production Index : cmprodat46.idx
   1946 : Milk Production Data  : cmprodat46.dat
   1946 : Milk Feed Index : fregimes.idx
   1946 : Milk Feed Data  : fregimes.dat
   1947 : Milk Production Index : cmprodat47.idx
   1947 : Milk Production Data  : cmprodat47.dat
   1947 : Milk Feed Index : fregimes.idx
   1947 : Milk Feed Data  : fregimes.dat
   1948 : Milk Production Index : cmprodat48.idx
   1948 : Milk Production Data  : cmprodat48.dat
   1948 : Milk Feed Index : fregimes.idx
   1948 : Milk Feed Data  : fregimes.dat
   1949 : Milk Production Index : cmprodat49.idx
   1949 : Milk Production Data  : cmprodat49.dat
   1949 : Milk Feed Index : fregimes.idx
   1949 : Milk Feed Data  : fregimes.dat
   1950 : Milk Production Index : cmprodat50.idx
   1950 : Milk Production Data  : cmprodat50.dat
   1950 : Milk Feed Index : fregimes.idx
   1950 : Milk Feed Data  : fregimes.dat
   1951 : Milk Production Index : cmprodat51.idx
```

```
1951 : Milk Production Data  : cmprodat51.dat
1951 : Milk Feed Index : fregimes.idx
1951 : Milk Feed Data  : fregimes.dat
1952 : Milk Production Index : cmprodat51.idx
1952 : Milk Production Data  : cmprodat51.dat
1952 : Milk Feed Index : fregimes.idx
1952 : Milk Feed Data  : fregimes.dat
1953 : Milk Production Index : cmprodat51.idx
1953 : Milk Production Data  : cmprodat51.dat
1953 : Milk Feed Index : fregimes.idx
1953 : Milk Feed Data  : fregimes.dat
1954 : Milk Production Index : cmprodat51.idx
1954 : Milk Production Data  : cmprodat51.dat
1954 : Milk Feed Index : fregimes.idx
1954 : Milk Feed Data  : fregimes.dat
1955 : Milk Production Index : cmprodat51.idx
1955 : Milk Production Data  : cmprodat51.dat
1955 : Milk Feed Index : fregimes.idx
1955 : Milk Feed Data  : fregimes.dat
1956 : Milk Production Index : cmprodat51.idx
1956 : Milk Production Data  : cmprodat51.dat
1956 : Milk Feed Index : fregimes.idx
1956 : Milk Feed Data  : fregimes.dat
1957 : Milk Production Index : cmprodat51.idx
1957 : Milk Production Data  : cmprodat51.dat
1957 : Milk Feed Index : fregimes.idx
1957 : Milk Feed Data  : fregimes.dat
```

Grocery Milk Media

```
Media file: grocery.med
Random seed :        3429.

Grocery milk library files
   1944 : Milk Distribution Index : cmdat44.idx
   1944 : Milk Distribution Data  : cmdat44.dat
   1945 : Milk Distribution Index : cmdat45.idx
   1945 : Milk Distribution Data  : cmdat45.dat
   1946 : Milk Distribution Index : cmdat46.idx
   1946 : Milk Distribution Data  : cmdat46.dat
   1947 : Milk Distribution Index : cmdat47.idx
   1947 : Milk Distribution Data  : cmdat47.dat
   1948 : Milk Distribution Index : cmdat48.idx
   1948 : Milk Distribution Data  : cmdat48.dat
   1949 : Milk Distribution Index : cmdat49.idx
   1949 : Milk Distribution Data  : cmdat49.dat
   1950 : Milk Distribution Index : cmdat50.idx
   1950 : Milk Distribution Data  : cmdat50.dat
   1951 : Milk Distribution Index : cmdat51.idx
   1951 : Milk Distribution Data  : cmdat51.dat
   1952 : Milk Distribution Index : cmdat51.idx
   1952 : Milk Distribution Data  : cmdat51.dat
   1953 : Milk Distribution Index : cmdat51.idx
   1953 : Milk Distribution Data  : cmdat51.dat
   1954 : Milk Distribution Index : cmdat51.idx
```

```
1954 : Milk Distribution Data  : cmdat51.dat
1955 : Milk Distribution Index : cmdat51.idx
1955 : Milk Distribution Data  : cmdat51.dat
1956 : Milk Distribution Index : cmdat51.idx
1956 : Milk Distribution Data  : cmdat51.dat
1957 : Milk Distribution Index : cmdat51.idx
1957 : Milk Distribution Data  : cmdat51.dat
```

Creamery number 165 in the grocery recipe
is mapped to local cows milk (herd cow)
File: milk1h.med

Creamery number 166 in the grocery recipe
is mapped to zero concentration because it
is outside the DESCARTES model domain

A total of 164 creameries have been requested at some time during the run.

Creamery activations for 1944 are:

```
    1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
 16
   17  18  19  20  21  22  23  24  25  26  27  28  29  30  31
 32
   33  34  35  36  37  38  39  40  41  42  43  44  45  46  47
 48
   49  50  51  52  53  54  55  56  57  58  59  60  61  62  63
 64
   65  66  67  68  69  70  71  72  73  74  75  76  77  78  79
 80
   81  82  83  84  85  86  87  88  89  90  91  92  93  94  95
 96
   97  98  99 100 101 102 103 104 105 106 107 108 109 110 111
112
  113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
  129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
  145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
  161 162 163 164
```

Creamery activations for 1945 are:

```
    1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
 16
   17  18  19  20  21  22  23  24  25  26  27  28  29  30  31
 32
   33  34  35  36  37  38  39  40  41  42  43  44  45  46  47
 48
   49  50  51  52  53  54  55  56  57  58  59  60  61  62  63
 64
   65  66  67  68  69  70  71  72  73  74  75  76  77  78  79
 80
   81  82  83  84  85  86  87  88  89  90  91  92  93  94  95
 96
   97  98  99 100 101 102 103 104 105 106 107 108 109 110 111
112
  113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
  129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
```

144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1946 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1947 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1948 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1949 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1950 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143

144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1951 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1952 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1953 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1954 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1955 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143

144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1956 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Creamery activations for 1957 are:
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
64
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
112
113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
144
145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160
161 162 163 164

Cow Milk Transfer Factors

```
Herd cow transfer - Random seed :        9009.

Definition for variable TFMILKHD
   The distribution type is Normal
   The mean is                    1.2000E-02
   The standard deviation is  2.0000E-03
   The lower probability truncation limit is  1.0000E-02
   The upper probability truncation limit is  9.9000E-01
Individual cow transfer - Random seed :        9009.

Definition for variable TFMILKIN
   The distribution type is Lognormal (e)
   The mean is                   -4.6885E+00
   The standard deviation is  7.4157E-01
   The lower probability truncation limit is  1.0000E-02
   The upper probability truncation limit is  9.9000E-01


-----------------------------------------------------------------------------
-
                        Cow Milk - Feeding Regime 1 - Media
-----------------------------------------------------------------------------
-

Media file - Herd Milk: milk1h.med
Media file - Individual Milk: milk1i.med
Random seed :      154412.

Milk cow feeding regime 1 diet library files
   1944 : cowc1.diet
   1945 : cowc1.diet
   1946 : cowc1.diet
   1947 : cowc1.diet
   1948 : cowc1.diet
   1949 : cowc1.diet
   1950 : cowc1.diet
   1951 : cowc1.diet
   1952 : cowc1.diet
   1953 : cowc1.diet
   1954 : cowc1.diet
   1955 : cowc1.diet
   1956 : cowc1.diet
   1957 : cowc1.diet


-----------------------------------------------------------------------------
-
                        Cow Milk - Feeding Regime 2 - Media
-----------------------------------------------------------------------------
-

Media file - Herd Milk: milk2h.med
Media file - Individual Milk: milk2i.med
Random seed :      254412.

Milk cow feeding regime 2 diet library files
   1944 : cowc2.diet
   1945 : cowc2.diet
   1946 : cowc2.diet
   1947 : cowc2.diet
```

```
1948 : cowc2.diet
1949 : cowc2.diet
1950 : cowc2.diet
1951 : cowc2.diet
1952 : cowc2.diet
1953 : cowc2.diet
1954 : cowc2.diet
1955 : cowc2.diet
1956 : cowc2.diet
1957 : cowc2.diet
```

Cow Milk - Feeding Regime 3 - Media

```
Media file - Herd Milk: milk3h.med
Media file - Individual Milk: milk3i.med
Random seed :      354413.

Milk cow feeding regime 3 diet library files
   1944 : cowc3.diet
   1945 : cowc3.diet
   1946 : cowc3.diet
   1947 : cowc3.diet
   1948 : cowc3.diet
   1949 : cowc3.diet
   1950 : cowc3.diet
   1951 : cowc3.diet
   1952 : cowc3.diet
   1953 : cowc3.diet
   1954 : cowc3.diet
   1955 : cowc3.diet
   1956 : cowc3.diet
   1957 : cowc3.diet
```

Cow Milk - Feeding Regime 4 - Media

```
Media file - Herd Milk: milk4h.med
Media file - Individual Milk: milk4i.med
Random seed :      454414.

Milk cow feeding regime 4 diet library files
   1944 : cowc4.diet
   1945 : cowc4.diet
   1946 : cowc4.diet
   1947 : cowc4.diet
   1948 : cowc4.diet
   1949 : cowc4.diet
   1950 : cowc4.diet
   1951 : cowc4.diet
   1952 : cowc4.diet
   1953 : cowc4.diet
```

```
1954 : cowc4.diet
1955 : cowc4.diet
1956 : cowc4.diet
1957 : cowc4.diet
```

Other Vegetables Media

```
Media file: otherveg.med
Random seed :       10000.
Harvest season is from day 135 to day 288

Definition for variable BMAXOTHERVEG
   The distribution type is Triangular
   The minimum is  1.7000E-01
   The mode is     5.0000E-01
   The maximum is  1.2000E+00

Definition for variable BMINOTHERVEG
   The distribution type is Constant
   The constant value is  1.0000E-02

Definition for variable KGOTHERVEG
   The distribution type is Constant
   The constant value is  9.0000E-02

Definition for variable KSOTHERVEG
   The distribution type is Constant
   The constant value is  8.0000E-02
```

Pasture Media

```
Media file: pasture.med
Random seed :       10000.

Definition for variable BMAXPASTURE
   The distribution type is Triangular
   The minimum is  1.0000E-01
   The mode is     3.0000E-01
   The maximum is  7.0000E-01

Definition for variable BMINPASTURE
   The distribution type is Constant
   The constant value is  4.0000E-02

Definition for variable KGPASTURE
   The distribution type is Constant
   The constant value is  1.2000E-01

Definition for variable KSPASTURE
   The distribution type is Constant
```

The constant value is 9.0000E-02

Root Soil Zone Media

Media file: soilroot.med
Random seed : 10000.

Definition for variable RHORZ
The distribution type is Uniform
The lower limit is 1.8600E+02
The upper limit is 2.3000E+02

Sagebrush Media

Media file: sagebrush.med
Random seed : 10000.

Definition for variable BMAXSAGEBRUS
The distribution type is Triangular
The minimum is 8.0000E-03
The mode is 1.0000E-02
The maximum is 5.2000E-02

Definition for variable BMINSAGEBRUS
The distribution type is Constant
The constant value is 8.0000E-03

Definition for variable KGSAGEBRUS
The distribution type is Constant
The constant value is 1.5000E-01

Definition for variable KSSAGEBRUS
The distribution type is Constant
The constant value is 9.0000E-02

Silage Media

Media file: silage.med
Random seed : 10000.

The silage harvest is 14 days before first fall frost

Definition for variable BMAXSILAGE
The distribution type is Triangular
The minimum is 1.0000E-01

The mode is 3.0000E-01
The maximum is 6.0000E-01

Definition for variable BMINSILAGE
The distribution type is Constant
The constant value is 1.0000E-02

Definition for variable KGSILAGE
The distribution type is Constant
The constant value is 1.2000E-01

Definition for variable KSSILAGE
The distribution type is Constant
The constant value is 9.0000E-02

Upper Soil Layer Media

Media file: soilup.med
Random seed : 10000.

File passed to CIDER with upper soil layer ratios
File: ciderusl.dat

Definition for variable RHOUSL
The distribution type is Uniform
The lower limit is 1.1000E+00
The upper limit is 1.4500E+00

Animal Data - Not Media Specific

Mixture of dirt concentrations for animal consumption
0.1000 : Fraction from the upper soil layer
0.9000 : Fraction from the root zone layer

Definition for variable WATER
The distribution type is Triangular
The minimum is 6.0000E-01
The mode is 1.0000E+00
The maximum is 5.0000E+00

Output file containing animal stochastic information
Name: animal.dat

File containing plant stochastic information
Including soil densities for ANIMAL computations
Name: plants.dat

Feeding Regime Date Information

The spring feeding season is 14 days long
The early winter feeding season is 14 days long

Feeding regime date library files
1944 : season.dat
1945 : season.dat
1946 : season.dat
1947 : season.dat
1948 : season.dat
1949 : season.dat
1950 : season.dat
1951 : season.dat
1952 : season.dat
1953 : season.dat
1954 : season.dat
1955 : season.dat
1956 : season.dat
1957 : season.dat

========== End of the Problem Definition
==========

Error number 0 encountered in routine DESCRT
Message: Execution not requested (use the EXECUTE card)

AGGREGATE

```
; real Aggregate scenario file
analyst   sj_ouderkirk;
cider_con concen.dat     node;

media_con ../../descartes/real/concen.new.med      air;
media_con ../../descartes/real/soilup.new.med      u_soil;
media_con ../../descartes/real/soilroot.new.med    rz_soil;
media_con ../../descartes/real/beef.new.med        beef;
media_con ../../descartes/real/eggs.new.med        eggs;
media_con ../../descartes/real/fruitin.new.med     i_fruit;
media_con ../../descartes/real/fruitot.new.med     o_fruit;
media_con ../../descartes/real/goat.new.med        goat_milk;
media_con ../../descartes/real/grain.new.med       grain;
media_con ../../descartes/real/grocery.new.med     grocer_milk;
media_con ../../descartes/real/lvegin-c.new.med    dil_veg;
media_con ../../descartes/real/lvegin.new.med      lil_veg;
media_con ../../descartes/real/lvegot-c.new.med    dol_veg;
media_con ../../descartes/real/lvegot.new.med      lol_veg;
media_con ../../descartes/real/milk1i.new.med      milk_1;
media_con ../../descartes/real/milk2i.new.med      milk_2;
media_con ../../descartes/real/milk3i.new.med      milk_3;
media_con ../../descartes/real/milk4i.new.med      milk_4;
media_con ../../descartes/real/otherveg.new.med    o_veg;
media_con ../../descartes/real/poultry.new.med     poultry;

threshold threshold.dat;

index index.dat;

soil_factor new.ciderusl;
```

```
;
; Threshold data for aggregate production runs for 1944-1957
; Paul W. Eslinger
; November 8, 1993
;
THRESHOLD 1.0 month;
data threshold;
8.0e-16  air;          Ci-day/m3
2.5e-10  u_soil;       Ci/kg (wet)
2.4e-12  rz_soil;      Ci/kg (wet)
3.5e-12  lil_veg;      Ci/kg (dry)
3.5e-12  lol_veg;      Ci/kg (dry)
3.5e-12  dil_veg;      Ci/kg (dry)
3.5e-12  dol_veg;      Ci/kg (dry)
1.5e-13  o_veg;        Ci/kg (dry)
5.9e-14  i_fruit;      Ci/kg (dry)
5.9e-14  o_fruit;      Ci/kg (dry)
2.4e-14  grain;        Ci/kg (dry)
1.4e-13  eggs;         Ci/kg (wet)
1.2e-13  beef;         Ci/kg (wet)
7.3e-13  poultry;      Ci/kg (wet)
2.6e-15  goat_milk;    Ci/L (wet)
2.6e-15  grocer_milk;  Ci/L (wet)
2.6e-15  cream_milk;   Ci/L (wet)
2.6e-15  milk_1;       Ci/L (wet)
2.6e-15  milk_2;       Ci/L (wet)
2.6e-15  milk_3;       Ci/L (wet)
2.6e-15  milk_4;       Ci/L (wet)
```

```
NODE_INDEX 6/24/93_17:40:26 i131 1.0 month;
new.ciderusl 06-08-93_16:58:05;
1 1102 2;
1 concen.dat node_exp 6/24/93_17:40:26;
1944 1 440 1;
1945 1 5316 1;
1944 2 70512 1;
1945 2 75388 1;
1944 3 140988 1;
1945 3 145864 1;
1944 4 213080 1;
1945 4 214724 1;
1944 5 280324 1;
1945 5 280756 1;
1945 6 345940 1;
1945 7 412740 1;
1945 8 478316 1;
1945 9 542680 1;
1945 10 606640 1;
1945 11 670196 1;
1945 12 732944 1;
1945 13 795692 1;
1945 14 857632 1;
1944 15 919976 1;
1945 15 924852 1;
1944 16 992876 1;
1945 16 997752 1;
1944 17 1067392 1;
1945 17 1072268 1;
1944 18 1141100 1;
1945 18 1145976 1;
1944 19 1214404 1;
1945 19 1216452 1;
1944 20 1284072 1;
1945 20 1284908 1;
1944 21 1352112 1;
1945 21 1352544 1;
1944 22 1418940 1;
1945 22 1419372 1;
1945 23 1484152 1;
1945 24 1548932 1;
1945 25 1611680 1;
1945 26 1676044 1;
1945 27 1739196 1;
1945 28 1801944 1;
1944 29 1865500 1;
1945 29 1870376 1;
1944 30 1939612 1;
1945 30 1944488 1;
1944 31 2013320 1;
1945 31 2018196 1;
1944 32 2088240 1;
1945 32 2093116 1;
1944 33 2165180 1;
1945 33 2170056 1;
1944 34 2241716 1;
1945 34 2246592 1;
1944 35 2316636 1;
1945 35 2321512 1;
1944 36 2391152 1;
1945 36 2396028 1;
1944 37 2465264 1;
1945 37 2468120 1;
1944 38 2536952 1;
1945 38 2539808 1;
1944 39 2607428 1;
1945 39 2610284 1;
1944 40 2677904 1;
1945 40 2680760 1;
```

```
1945 1084 83460172 1;
1944 1085 83538296 1;
1945 1085 83543172 1;
1944 1086 83621296 1;
1945 1086 83626172 1;
1944 1087 83704296 1;
1945 1087 83708364 1;
1944 1088 83786488 1;
1945 1088 83789344 1;
1944 1089 83867064 1;
1945 1089 83867496 1;
1944 1090 83929460 1;
1945 1090 83930296 1;
1944 1091 83993068 1;
1945 1091 83994712 1;
1944 1092 84062736 1;
1945 1092 84064380 1;
1944 1093 84135636 1;
1945 1093 84137280 1;
1944 1094 84211768 1;
1945 1094 84214220 1;
1944 1095 84292344 1;
1945 1095 84296816 1;
1944 1096 84374940 1;
1945 1096 84379816 1;
1944 1097 84457940 1;
1945 1097 84462816 1;
1944 1098 84540940 1;
1945 1098 84545816 1;
1944 1099 84623940 1;
1945 1099 84628816 1;
1944 1100 84706940 1;
1945 1100 84711816 1;
1944 1101 84789940 1;
1945 1101 84794412 1;
1944 1102 84872536 1;
1945 1102 84875392 1;
```

```
ECHO of the SCENARIO FILE
-; real Aggregate scenario file
-analyst   sj_ouderkirk;
-cider_con concen.dat     node;
-
-media_con ../../descartes/real/concen.new.med      air;
-media_con ../../descartes/real/soilup.new.med      u_soil;
-media_con ../../descartes/real/soilroot.new.med    rz_soil;
-media_con ../../descartes/real/beef.new.med        beef;
-media_con ../../descartes/real/eggs.new.med        eggs;
-media_con ../../descartes/real/fruitin.new.med     i_fruit;
-media_con ../../descartes/real/fruitot.new.med     o_fruit;
-media_con ../../descartes/real/goat.new.med        goat_milk;
-media_con ../../descartes/real/grain.new.med       grain;
-media_con ../../descartes/real/grocery.new.med     grocer_milk;
-media_con ../../descartes/real/lvegin-c.new.med    dil_veg;
-media_con ../../descartes/real/lvegin.new.med      lil_veg;
-media_con ../../descartes/real/lvegot-c.new.med    dol_veg;
-media_con ../../descartes/real/lvegot.new.med      lol_veg;
-media_con ../../descartes/real/milk1i.new.med      milk_1;
-media_con ../../descartes/real/milk2i.new.med      milk_2;
-media_con ../../descartes/real/milk3i.new.med      milk_3;
-media_con ../../descartes/real/milk4i.new.med      milk_4;
-media_con ../../descartes/real/otherveg.new.med    o_veg;
-media_con ../../descartes/real/poultry.new.med     poultry;
-
-threshold threshold.dat;
-
-index index.dat;
-
-soil_factor new.ciderusl;
END of SCENARIO FILE
LISTING of SOURCE FILES
-../../descartes/real/grain.new.med, 06-08-93_16:58:05, grain
-../../descartes/real/concen.new.med, 06-08-93_16:58:05, air
-../../descartes/real/soilup.new.med, 06-08-93_16:58:05, u_soil
-../../descartes/real/soilroot.new.med, 06-08-93_16:58:05, rz_soil
-../../descartes/real/lvegin.new.med, 06-08-93_16:58:05, lil_veg
-../../descartes/real/lvegot.new.med, 06-08-93_16:58:05, lol_veg
-../../descartes/real/lvegin-c.new.med, 06-09-93_16:21:44, dil_veg
-../../descartes/real/lvegot-c.new.med, 06-09-93_16:21:44, dol_veg
-../../descartes/real/otherveg.new.med, 06-08-93_16:58:05, o_veg
-../../descartes/real/fruitin.new.med, 06-08-93_16:58:05, i_fruit
-../../descartes/real/fruitot.new.med, 06-08-93_16:58:05, o_fruit
-../../descartes/real/eggs.new.med, 06-09-93_08:33:21, eggs
-../../descartes/real/beef.new.med, 06-09-93_08:33:21, beef
-../../descartes/real/poultry.new.med, 06-09-93_08:33:21, poultry
-../../descartes/real/goat.new.med, 06-09-93_08:33:21, goat_milk
-../../descartes/real/grocery.new.med, 06-09-93_16:21:44, grocer_milk
-../../descartes/real/milk1i.new.med, 06-09-93_08:33:21, milk_1
-../../descartes/real/milk2i.new.med, 06-09-93_08:33:21, milk_2
-../../descartes/real/milk3i.new.med, 06-09-93_08:33:21, milk_3
-../../descartes/real/milk4i.new.med, 06-09-93_08:33:21, milk_4
END LISTING of SOURCE FILES
Executable = aggregat, Thu Jun 24 17:40:26 1993

Version for this data = 6/24/93_17:40:26
Run completed with no errors
Number of warnings generated = 0
```

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