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ECOTOX

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## ECOTOXicology Database System

### A User's Guide

### Version 1.0

Prepared for

U.S. Environmental Protection Agency  
Office of Research and Development  
National Health and Environmental Effects Research Laboratory  
Mid-Continent Ecology Division (MED)  
Duluth, Minnesota

By

DynTel Corporation  
Duluth, Minnesota 55804  
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and

Ogden Professional Services  
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## **WARNING**

Researchers and managers using ECOTOX for analyses or summary projects should consult the original publication. This will ensure an understanding of the context of the data retrieved from ECOTOX.

Although the AQUIRE database is regularly updated, data updated to the PHYTOTOX and TERRETOX databases from publication year 1991 to present represent a limited number of publications. Researchers should conduct literature searches for relevant data published during this time period. Further information on data restrictions within each component of ECOTOX are described in the ECOTOX User's Guide.

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## **INTRODUCTION**

In the development and implementation of ecosystem management decisions there is the need to establish scientifically credible risk assessments for chemical stressors. Ecological assessments are required to characterize and diagnose the relative risk of chemical pollutants and to predict future risk as a function of environmental management options.

The ECOTOX software allows users to search across three existing U.S. EPA databases: AQUIRE, PHYTOTOX and TERRETOX, which contain ecotoxicological effects information for aquatic life, terrestrial plants, and terrestrial wildlife, respectively. The Office of Pesticide Program's Environmental Effects Database (EEDB) of toxic effects data for registered pesticides is also included within ECOTOX.

Development of the ECOTOX database ensures that high quality, properly reviewed, toxic effects data are readily available to the regulatory and research community for use in performing ecological risk assessments and evaluating results of environmental monitoring programs. The ECOTOX database provides a comprehensive and readily accessible repository of critical information on single chemical exposures to aquatic and terrestrial species.

AQUIRE, the aquatic toxicology database was developed in 1981 through efforts at the U.S. EPA's National Health and Environmental Effects Research Laboratory (NHEERL), Mid-Continent Ecology Division (MED). The AQUIRE database is a UNIX-based program containing over 149,000 toxicity tests from 10,000 references for more than 5,900 chemicals and 2,900 aquatic species. Data are available from the publication year 1915 through 1996.

The PHYTOTOX database was developed as a PC-based program through a joint effort by the University of Oklahoma and the U.S. EPA, NHEERL, Western Ecology Division (WED). The PHYTOTOX database contains over 49,000 toxicity tests on terrestrial plants from 2,560 references for more than 1,600 organic chemicals and 900 terrestrial plant species. Data are available from the publication years 1926 through 1991.

The TERRETOX database was developed as a PC-based system by the U.S. EPA, NHEERL, WED. The TERRETOX database contains 33,000 toxicity tests from 525 references for more than 1,200 chemicals and 253 terrestrial animal species. Data are available from the publication years 1969 through 1992.

ECOTOX includes the U.S. EPA, Office of Pesticide Programs, Ecological Effects Branch's Ecological Effects database (EEDB), a PC-based system that includes toxicity

data for aquatic and terrestrial species. These data have been reviewed and categorized as acceptable for fulfillment of pesticide registration and re-registration guideline requirements as explained under FIFRA Subdivision E, Parts 158.145 and 158.150.

**Researchers or managers using ECOTOX for analyses or summary projects should consult the original scientific paper to ensure an understanding of the context of the data retrieved from ECOTOX.**

For more information on the ECOTOX database contact:

Scientific Outreach Program  
U.S. Environmental Protection Agency  
Office of Research and Development  
National Health and Environmental Effects Research Laboratory  
Mid-Continent Ecology Division (MED)  
6201 Congdon Boulevard  
Duluth, Minnesota 55804  
Telephone: 218-720-5602  
FAX: 218-720-5539  
E-Mail Address: [outreach@du4500.dul.epa.gov](mailto:outreach@du4500.dul.epa.gov)

**ACCESS**

You may access the ECOTOX program in a variety of ways, depending upon your communications, hardware, and software capabilities. **Refer to Appendix A to determine the method best suited to your situation.** For example, those with Telnet software may connect by using the command:

**telnet ecotox.epa.gov 2323**

Review the requirements below, and if still unsure about your computer capabilities, contact the MED Scientific Outreach Program.

<b>CONNECTING TO EPA'S UNIX COMPUTER SUMMARY OF ACCESS OPTIONS*</b>	
<b>Hardware/Software</b>	<b>Connecting Via...</b>
<ul style="list-style-type: none"> <li>• DEC ANSI computer terminal (e.g. VT100, VT102, VT220)</li> <li>• Computer with software to emulate a DEC ANSI terminal (e.g. PC-KERMIT, CROSSTALK, PROCOMM)</li> </ul>	<ul style="list-style-type: none"> <li>• Modem and phones</li> <li>• Internet - Telnet</li> </ul>
<p>* For details see Appendix A "How to Access MED Ecotoxicology Data Systems"</p>	

**Connect and Login**

Regardless of the method you use to access the computer system, once you are successfully connected, you'll be greeted by a warning notice, system news, password prompt, and a welcome message, along with a prompt for your name and telephone number.

A sample login session via Telnet access is shown below.

```

*****
OSF/1 (perseus) (ttyp3)
Password: XXXXXXXX

If you need assistance or have questions, please call our Scientific
Outreach Program at: 218-720-5602
                    FAX number: 218-720-5539
                    Internet address: outreach@du4500.dul.epa.gov

Please enter your name and your complete telephone number. The phone
number will be used to give your work a unique identifier to distinguish it
from the work of others. Include the extension (if applicable), the area
code (if not 218), and any city and country codes (if not in the U.S.).
Enter both name and number as one line. The format is not important, but
the first character should be alphabetic. Here is an example:
Name and complete phone number: John Smith, (123) 456-7890 Ext. 1234

Name and complete phone number:
*****
    
```

**TOX Login Screen**

**Answering the Prompts**

As you can see from the above example, the login procedure requires a **Password** and your **name and telephone number**. Login information is used to establish your session work area, and is also used by the ECOTOX technical support staff so that they may better serve you. For the current password, contact the MED Scientific Outreach Program listed in Appendix A.

<b>Prompt</b>	<b>Response</b>
Password:	Current password and press <b>Enter</b> .
<b>IMPORTANT:</b>	<b>UNIX is case sensitive, therefore passwords, etc. must be typed in lowercase letters only.</b>
Name and telephone number	Your full name and complete telephone number (including extension)

The above instructions are also included on the access sheet shown in Appendix A. Updated access sheets are mailed quarterly via surface mail to all ECOTOX users to keep them informed of changes in access and system updates.

After you provide the correct responses to the 'login' prompts, the TOX account main menu will appear on the screen.

```

*****
+-----+
+ Attention TOX account users:
+ Additional data from 1989 to 1996 has been added to the ACQUIRE
+ database. Users can send messages to MED-Duluth by using the
+ COMMENTS feature.
+-----+
    
```

**Available options include**

- AQUIRE (AQUatic toxicity Information RETrieval)
- ASTER (ASsessment Tools for the Evaluation of Risk)
- CHEMNAME (CAS registry number and CHEMical NAME index)
- ECOTOX (ECOTOXicology Data Systems) Version 1.0
- SCOMMON (Species number and Species COMMON name index)
- SLATIN (Species number and Species LATIN name index)
  
- COMMENTS (We're interested in your comments and questions)
- LOGOUT (To leave)

You may abbreviate to as few as two characters.

Please enter your preference: **ECOTOX**

**TOX Main Menu**

In response to the prompt, "Please enter your preference:" type ECOTOX. Press **Enter**. You may abbreviate to as few as two characters.

After you provide the correct responses to the login prompts, the first display you'll see is ECOTOX news (example follows). ECOTOX news includes a summary of features about the database, phone numbers and E-mail address for the Scientific Outreach Program. New information is added to the news screen periodically.

```

*****
-----ECOTOX News (Press Ctrl-Z to exit window or ? for help)-----
    
```

ECOTOX VERSION 1.0

You have accessed the ECOTOX database. The goal of the ECOTOX system is to establish a single database containing ecotoxicological effects information for aquatic and terrestrial life that will be available for state, regional, national, and international governmental agencies. ECOTOX integrates three high quality U.S. EPA, Office of Research and Development (ORD), National Health and Environmental Effects Research Laboratory (NHEERL) ecotoxicology effects databases; ACQUIRE (aquatic organisms), TERRETOX (terrestrial wildlife) and PHYTOTOX (terrestrial plants).

For more information on the ECOTOX database contact the ORD, NHEERL, Mid-Continent Ecology Division, Scientific Outreach Program:

- Telephone: 218-720-5602
- Fax: 218-720-5539
- E-Mail: outreach@du4500.dul.epa.gov

**ECOTOX News Screen**

While in the ECOTOX news window, you may press "?" for online help on keystrokes to use while in that window. Press the Control key and the Z key simultaneously (Control-Z) to exit the news window. The ECOTOX main menu will be displayed.



## ONLINE HELP

Prior to using ECOTOX you should take some time to familiarize yourself with commands and help available within the ECOTOX database.

### ECOTOX General Help: Control-G

When you press the control and G keys simultaneously while working in any area within ECOTOX, except the data entry screens, a menu similar to the one shown below will appear on the screen. Press the letter of the subject that you want more information on. For example, press B for ACQUIRE documentation. To exit a help screen, press Control-Z.

```
*****
                          ECOTOX ONLINE HELP
                          (Press Control-Z to exit window or ? for help)

For information on any of the following topics, type the
corresponding letter:

OVERVIEW:
A.  ECOTOX project abstract           L.  Getting around in ECOTOX
B.  ACQUIRE documentation
C.  PHYTOTOX documentation
D.  TERRETOX documentation

MAIN MENU OPTIONS:
E.  CHEMICAL
F.  SPECIES
G.  DATABASES
H.  FOCUS
I.  OUTPUT
J.  RETRIEVE

USER FEEDBACK:
K.  ECOTOX COMMENT FORM
*****
```

**General Help Screen**

### Screen Specific Help: '?'

Pressing the '?' key will bring up help information specific to your current work area. For example, when interactively viewing a help file or a report, if you press '?', ECOTOX presents the following chart, explaining the keystrokes available to more effectively move through the document.

```

+-----+
| Partial Keys->Actions Index      (Press Ctrl-Z to exit window or ? for help) |
| Key(s)      | Action(s) Performed In Previous Window By Pressing These Keys |
+-----+
Ctrl-G        Display the general index of help files for this application
Ctrl-Z        Exit from (remove) the display of the current file
Ctrl-B        Exit from (remove) the display of the current stack of files
Ctrl-E        Email a copy of this file to a network address specified by
              user
!            Jump to the end and turn on forward scrolling to show any
              additions
Ctrl-I(HTab)  Go to the top of the current file
UP            Back up to the previous screen
Space Bar     Advance to the next screen
DOWN         Same as above
Ctrl-H (BS)   Back up to the previous line
LEFT         Same as above
Ctrl-J (LF)   Advance to the next line
Ctrl-M (CR)   Advance RIGHT
Ctrl-W        Repaint the entire screen
/            Toggle continuous output (on or off) in the backward direction
<            Same as above
.            Toggle continuous output (on or off) in the forward direction
  
```

**Specific Help Screen**

**Menus and Sub-menus**

ECOTOX menus and sub-menus are activated by moving the cursor to the desired option by using the directional arrow keys or by pressing the first letter of the option desired. (Only the Main menu requires that you press **Enter** after you've selected a Main menu option.)

Angle brackets <> (e.g. <Device Output Changes>) indicate that the option is a design feature that is presently under construction; i.e. not currently available.

To exit a sub-menu, and return to the previous menu, type Control-Z. Online instructions are usually displayed at the bottom of the screen in reverse video. If an invalid key is pressed, a warning bell is sounded. To exit a sub-menu and return to the ECOTOX Main Menu in one step, press Control-B (pressing B while holding down the Control key).

## Keyboard Conventions for Entry/Editing

Learning the following keyboard conventions will enable you to edit screens in ECOTOX with more efficiency and ease. A few commonly used commands are listed as follows.

**NOTE:** Key combinations, such as Control-Z, mean that you press the Control key and the Z key simultaneously.

Control-W	"Repaints" or refreshes the screen. Use this if a message clutters up the screen.
Control-S	Halts (freezes) activity (such as scrolling) on the screen.
Control-Q	Restarts (un-freezes) activity on the screen.

When entering or editing information in an input field (e.g. specifying information to search on), these keystrokes usually apply:

Enter or Control-Z	Causes the program to accept any changes you've made and then exit the field. Control-Z also locates the cursor to a previous screen or menu. Press <b>Enter</b> to toggle between On/Off or for marking items in a menu.
Esc followed by R	Restores the former value.
Control-E	Moves the cursor to the end of data in a field (press again to return to the opposite end).
Control-A	Switches you from insert mode to overstrike mode and back. Overstrike replaces characters under the cursor with what you type. Insert mode inserts the characters you type as it shifts the existing information to the right.
Delete	Erases one or more characters to left of the cursor.
Control-U	Deletes one character only under the cursor.

Tab

Deletes everything to the right of the cursor. Using Tab at the left side of a field clears (deletes) to the end of the field.

### Marking and Unmarking

Marking and unmarking is used within chemical lists, species lists, taxonomical groups, and most customized database parameters (e.g., test media, site of application, effects, route of exposure, etc.) to identify selections for inclusion or exclusion in the retrieval process. Marking and unmarking allow you to define and refine your search.

Press **Enter** to mark one item. Control-A marks **all** items in a list. An asterisk (\*) before an item indicates it is marked. Press **Enter** again to "unmark" an item. To remove all marks, press Control-D. The asterisks will disappear.

## CONDUCTING SEARCHES IN ECOTOX

The ECOTOX main menu is designed to lead you through a search session. There are seven main menu options in the ECOTOX system: Chemical, Species, Databases, Focus, Output, Retrieve, and Exit. For more help on each of these, see "MAIN MENU OPTIONS" on the General Help Menu (Control-G).

```

*****
*          -----ECOTOX Main Menu-----          *
* |CHEMICAL  SPECIES  DATABASES  FOCUS  OUTPUT  RETRIEVE  EXIT| *
* ----- *
*                               +Database Status+ *
*                               ! On  AQUIRE  ! *
*                               ! On  PHYTOX  ! *
*                               ! On  TERRETOX ! *
*                               +-----+ *
*****
    
```

**ECOTOX Main Menu**

During a typical ECOTOX session, you'll use the Chemical and Species options to choose one or more chemicals or species or a combination of both. The Database option is used to specify which database(s) you want searched, and you'll use the Focus option to narrow or refine your search(es). The Output option is used to choose how you'd like the output (E-mail, view online, etc.) and you'll use Retrieve to activate the search strategy you've created. The Clear Selections command within Retrieve allows you to delete search strategies and begin new ones. Exit allows you to leave the program and either choose other options from the main menu or logout.

Each menu option is described in the following pages.

### Search Strategy

The searching strategy for ECOTOX includes two basic elements.

- Combine                      Unites the search commands, by retrieving all data records from two or more marked items.
  
- Intersect                    Retrieves only data that meet the criteria of ALL search items selected.

The Chemical, Species, and Databases menus are designed to combine all selected items **within** each specific menu. For example, species Latin and common names which have been entered are combined into one group for retrieval. Intersections of the data occur when you select items from more than one of these menus. If a species list

and a chemical list are both identified, the system will retrieve only the records that include a chemical and a species that appear on the lists.

Under the Focus menu, selections made under the "Search on Major Effects Groups" sub-menu are combined. Under the Focus menu's "Customize Search Parameters" sub-menu, searches are combined within each database specific element (e.g. for AQUIRE: effect, endpoint, study site, documentation code, test media, reference), and are intersected with other selected specific elements within the same database. For example, if under the AQUIRE "Customize Search Parameter" sub-menu, you select the endpoint option of LC50 and you select a documentation code of complete, ECOTOX will intersect these selections. If you select several endpoints (e.g., LC50, EC50), ECOTOX will combine these selections.

### Chemical Searching

The Chemical menu option allows you several ways to search for a single chemical or a list of chemicals using one method or a combination of methods. For example, you may search for a CAS number interactively, or from a pre-defined file. You may search by scientific or common chemical name and/or select chemical names from a priority list.

If you are unsure of a CAS number or chemical name, you may interactively use the CHEMNAME program, which is accessible through the "Review Chemical Names" option (see following example).

```

*****
+-----Chemical Selection-----+
! CAS Number                       !
! Chemical Name                     !
! Chemical Lists                    !
! User Defined File                 !
! Review Chemical Names             !
+(press ? for help)-----+
*****
    
```

**Chemical Selection Menu**

The Chemical Selection options are defined as:

- |               |   |
|---------------|---|
| CAS Number    | Enter the CAS numbers of up to ten chemicals. You may enter the CAS number with hyphens, leading zeros or just the numbers. |
| Chemical Name | Enter the names of up to ten chemicals. ECOTOX uses 9th Collective Index names for chemicals and                            |

does not currently have a synonym file. The entry is treated as a sub-string, therefore the search will find all chemical names that include the specified character string.

- Chemical Lists** Contains lists of chemicals important to the U.S. EPA, other federal agencies and regional and state offices; other lists can be appended upon request.
- User-Defined File** You may import an existing file with CAS numbers. CAS numbers can include hyphens and there is no limit to the number of chemicals. **You must have a personal account on the EPA system where ECOTOX resides (e.g., Valley server at RTP) and you must be accessing ECOTOX through that account in order to utilize this feature.**
- Review Chemical Names** Accesses the CHEMNAME program, which allows you to search CAS numbers and chemical names currently available in ECOTOX.

When you select a list from the "Chemical Lists" option you can select the entire list or certain components within the list. Press **Enter** to mark an item in the list. Control-A marks all items in a list. An asterisk (\*) before an item indicates it is marked. Press **Enter** again to "unmark" an item. To remove all marks, press Control-D. The asterisks will disappear. Following is a sample menu from the "Chemical List" option. If the list is more than one page the user can press Control-F to move forward to the next page or Control-R to move back one page.

```

*****
+-----Select a Chemical List-----+
! U.S. EPA Chemical Lists           !
! Metal Compounds                   !
! Organic Chemical Classes          !
! Lists of Regional Concern         !
+-----+
<-----

+-----Select Desired List-----+
! Aluminum compounds                !
! Antimony compounds                !
! Arsenic compounds                 !
! Beryllium compounds               !
! Cadmium compounds                 !
! Chromium compounds                !
! Cobalt compounds                  !
! Copper compounds                  !
! Lead compounds                    !
! Mercury compounds                 !
! Manganese compounds               !
! Nickel compounds                  !
! Organotin compounds               !
! Selenium compounds                !
! Zinc compounds                    !
+-----+
+-----Mercury compounds-----+
! 593748 Dimethyl mercury            !
! 517168 Ethyl(4-methyl-N-phenylbenzenesulfonamidato-N)me !
! 107277 Ethylmercuric chloride     !
! 1600277 Mercuric acetate           !
! 7487947 Mercuric chloride         !
! 592041 Mercuric cyanide           !
! 7774290 Mercuric iodide           !
! 592858 Mercuric thiocyanate       !
+-----+
+ (press ? for help) -----+
- press CTRL-F to advance one page -press CTRL-R to back up one page
- press RETURN to set selected items -press CTRL-A to mark all selections -
press CTRL-Z to exit menu           -press CTRL-D to DE-ACTIVATE selections
*****

```

**Chemical List Search Screen**

**Species Searching**

The Species menu options allows you to identify species on which to perform search(es). All species marked from any selection option are combined into one group for retrieval. The following is a sample of the Species Selection menu box.

```

*****
+-----Species Selection-----+
| Latin Name                       |
| Common Name                      |
| <Major Taxonomical Groupings>   |
| Species Number                   |
| <Species Lists>                  |
| User Defined File                 |
| Review Species Latin Names       |
| Review Species Common Names     |
+(press ? for help)-----+

```

**Species List Search Screen**

To review valid species Latin and common names, select the "Review Species Latin Names" and "Review Species Common Names" options defined below.

The Species Selection options are defined as:

- Latin Name**                      Enter up to ten species scientific names on which to search. The entry is treated as a sub-string, therefore the search will find all Latin names that include the specified character string.
- Common Name**                    Enter up to ten species common names on which to search. The entry is treated as a sub-string, therefore the search will find all common names that include the specified character string.
- Major Taxonomical Grouping**    User can select to search on taxonomical group(s) e.g. (Bird, Fish, Plants). <Feature not operational at this time.>
- Species Number**                Enter up to ten species numbers on which to search; species numbers can be obtained by using "Review Species Latin Names" or "Review Species Common Names" options.
- Species Lists**                   Contains lists of species important to the U.S. EPA, other federal agencies and regional and state offices. <Feature not operational at this time.>

User-Defined File

You may import an existing file with species Latin or common names. There is no limit to the number of entries. **You must have a personal account on the EPA system where ECOTOX resides (e.g., Valley server at RTP) and you must be accessing ECOTOX through that account in order to utilize this feature.**

Review Species Latin

Names and Review

Species Common Names Accesses the ECOTOX species Latin and common name files. These options identify species numbers.

**Databases (On/Off)**

The Databases menu option allows you to select the ECOTOX database(s) from which to extract data. By default all databases are active (selected) when ECOTOX is started (see the example box). You may select one, two or all three databases.

To eliminate (i.e., 'turn off') a currently selected database or to select (i.e., 'turn on') a database that is currently 'off', move the highlight bar to the desired database and press the **Enter** key. The status of the highlighted database will change from 'On' to 'Off.' The following is an example of the menu box that appears when the Database menu option is selected.

```

*****
+-Press Enter to turn databases off or on-+
! A On AQUIRE   Aquatic Plants & Animals  !
! P On PHYTOX  Terrestrial Plants         !
! T On TERRETOX Terrestrial Animal       !
+(press ? for help)-----+
*****
    
```



**Focus Searching**

The Focus menu option allows you to search by effect grouping for all active databases or to customize search parameters for a specific database.

```

*****
+-Search or Customize Databases--+
! Search on Major Effect Groups ! <----
! Customize Search Parameters !
! Search on Publication Year !
+(press ? for help)-----+
*****
    
```

**Focus Menu Screen**

The "Search on Major Effect Groupings" option allows you to search on major effect groupings across all databases that are selected, without having to use the "Customize Search Parameters" option to enter or select each effect within each database. For example, by selecting "Mortality" from the menu (see below), the ECOTOX system will retrieve all data from all selected databases with effects identified as mortality type effects (e.g., MOR in ACQUIRE, POP in TERRETOX, and KILL in PHYTOTOX). Selecting both Major Effect Groups and Effect Codes within each database will combine all selections for retrieval.

The Major Effect Groupings are Behavior, Bioconcentration, Growth/Development (Injury), Mortality (Lethal,Kill), Physio(logical)/Biochemical (Genetic/Hormone/Path(ology)), Population/Communities/Ecosystem and Reproduction (see following example). Press Control-Z to exit. Choose any of the Major Effect Groupings by moving the cursor to the desired item and pressing the **Enter** key.

```

*****
+-----Major Effect Grouping-----+
! Behavior !
! Bioconcentration !
! Growth/Development (Injury) !
! Mortality (Lethal/Kill) !
! Physio/Biochemical (Genetic/Hormone/Path) !
! Population/Communities/Ecosystem !
! Reproduction !
+(press ? for help)-----+
*****
    
```

**Major Effect Group Search Screen**

When you select the "Customize Search Parameters" options under the Focus menu, a menu box with the three database names will appear. When you select a database name, a menu box with the available search options for that database will be presented on the screen. Choose any of the options to further refine your search.

```
*****
+--Search or Customize Databases--+
| Search on Major Effect Groups    |
| Customize Search Parameters      | <-----
| Search on Publication Year        |
+(press ? for help)-----+
      +---Databases to Customize-----+
      | A AQUIRE  Aquatic Plants & Animals! <-----
      | P PHYTOX  Terrestrial Plants
      | T TERRETOX Terrestrial Animals
      +(press ? for help)-----+
*****
```

**Customize Search Parameters Database Selection Screen**

AQUIRE Customized Search Parameters

For AQUIRE, the options which appear are "Effect", "Endpoint", "Study Site", "Documentation Code", "Test Media" and "Reference." These options are defined below.

```
*****
+-----AQUIRE MED-Duluth-----+
| Effect (e.g. mortality)         |
| Endpoint (e.g. LC50)            |
| Study Site                      |
| Documentation Code              |
| Test Media                      |
| Reference                       |
+(press ? for help)-----+
*****
```

**AQUIRE Customize Search Screen**

Effect

A menu of major effect groups appears. Selecting one of these groups presents a menu of individual effect codes that can be selectively marked for the search process. For the purposes of the ECOTOX database, a toxicological effect is defined as "the observation of a response resulting from the action of a chemical stressor" (e.g., mortality). Appendix B contains a list of valid codes and definitions for this field.

---

Endpoint	A menu of endpoint codes. For the purposes of ECOTOX an endpoint is defined as "the quantification of an observed effect obtained through statistics or other means of calculation for the express purpose of comparing equivalent effects" (e.g., LC50). Appendix C contains a list of valid codes and definitions for this field.
Study Site	A menu of study site options. Select to search on exposure location. The valid entries are LAB (laboratory), FIELD (field; artificial or natural) and NR (not reported by the author).
Documentation Code	A menu of documentation code options. The ECOTOX documentation code indicates the completeness of methods documentation and results presentation accompanying the data. Documentation code assignments range from Complete (C) to Moderate (M) to Incomplete (I).
Test Media	A menu of test media options. Freshwater tests (FW) include those conducted in freshwater, reconstituted water, distilled water, or tap water. Saltwater tests (SW) include those conducted in natural or artificial seawater, brackish water, or estuarine water. If a determination cannot be made regarding the use of either freshwater or saltwater, an NR (not reported) is recorded.
Reference Number	An input menu is displayed for you to customize reference inputs. You may enter the reference numbers with or without leading zeros (e.g. 488 may be entered as 0488, 00488).

PHYTOTOX Customized Search Parameters

PHYTOTOX options under the "Customize Search" parameters option include:

```

*****
+--PHYTOTOX WED-Corvallis--+
! Effect (e.g. mortality)!
! Plant Maintenance      !
! Method of Application  !
! Site of Application     !
! Documentation Code     !
! Reference Number       !
+(press ? for help)-----+
*****
    
```

**PHYTOTOX Customize Search Screen**

- |                       |  |
|-----------------------|--|
| Effect                | A menu of major effect groups appears. Selecting one of these groups presents a menu of individual effect codes that can be selectively marked for the search process. For the purposes of the ECOTOX database, a toxicological effect is defined as "the observation of a response resulting from the action of a chemical stressor" (e.g., mortality). Appendix D contains a list of valid codes and definitions for this field. |
| Plant Maintenance     | The plant maintenance code contains information describing the conditions under which the plant material was maintained during exposure to the chemical (e.g. cultivated field, greenhouse, wild, culture, flask, etc.). Refer to Appendix E for a listing of plant maintenance codes.   |
| Method of Application | The application method code contains information describing the method used to apply the chemical (e.g., painted, dipped, sprayed, etc.) Refer to Appendix F for a listing of application method codes.  |
| Site Application      | The application site code contains information identifying the location or part of a plant (e.g., bulb, bud, cotyledon, fruit, etc.) to which the chemical was applied. Appendix G contains a listing of site application codes.   |

- Documentation Code      A menu of documentation code options. The ECOTOX documentation codes indicates the type and completeness of methods documentation and results presentation in accompanying the data. Documentation code assignments range from Complete (C) to Moderate (M) to Incomplete (I).
  
- Reference Number        An input menu is displayed for you to customize reference inputs. You may enter the reference numbers with or without leading zeros (e.g. 488 may be entered as 0488, 00488).

TERRETOX Customized Search Parameters

TERRETOX options under the "Customize Search" parameters option include:

```

*****
+--TERRETOX WED-Corvallis--+
| Effect (e.g. mortality) |
| Endpoint (e.g. LC50)   |
| Study Site             |
| Route of Exposure      |
| Documentation Code     |
| Reference Number       |
+ (press ? for help) -----+
*****
    
```

**TERRETOX Customize Search Screen**

- Effect                    A menu of effect groups is displayed. Selecting one of these options then presents a toggle menu of effect codes that can be selectively marked for the search process. For the purposes of the ECOTOX database, a toxicological effect is defined as "the observation of a response resulting from the action of a chemical stressor" (e.g., mortality). Appendix H has a list of valid effect codes and definitions for this field.
  
- Endpoint                 A menu of endpoint codes. For the purposes of the ECOTOX database an endpoint is defined as "the quantification of an observed effect obtained through statistics or other means of calculation for the express purpose of comparing equivalent effects" (e.g., LD50). Appendix I contains a list of valid codes and definitions for this field.

Study Site	A menu of locations of exposures. The valid location codes are LAB (indoor laboratory), PEN (outdoor pen), and FIELD (outdoor larger than pens).
Route of Exposure	A menu of exposure codes describing the way the animal was exposed to the test chemical. Appendix J contains a list of valid codes and definitions for this field.
Documentation Code	A menu of documentation code options. The ECOTOX documentation codes indicates the type and completeness of methods documentation and results presentation in accompanying the data. Documentation code assignments range from Complete (C) to Moderate (M) to Incomplete (I).
Reference Number	An input menu is displayed for you to customize reference inputs. You may enter the reference numbers with or without leading zeros (e.g. 488 may be entered as 0488, 00488).

**Publication Year Search**

The "Search on Publication Year" menu option enables you to search by publication year(s) for all active databases. ACQUIRE contains data from publication years 1915 to 1996; PHYTOTOX contains data from publication years 1926-1991; TERRETOX contains data from publication years 1969-1992.

When you select "Search on Publication Year," the following screen will appear. You can enter up to ten publication years.

```

*****
+-----Enter Publication Year-----+
| 1. |
| 2. |
| 3. |
| 4. |
| 5. |
| 6. |
| 7. |
| 8. |
| 9. |
| 10. |
+-----+
*****
    
```

**Publication Year Search Screen**

## OUTPUT

The Output menu option enables you to sort the order of the report data, select the system device to write the report to, decide whether or not citation data will be included, and select output data fields. You may interactively view the report on your screen, send your report via the Internet to any valid E-mail address, or write the report to a UNIX file (**This last output option, 'writing to a file' will only be displayed for users with accounts on the Agency computer where ECOTOX resides.** When viewing your output please refer to Appendices A-K for definitions of codes used in ECOTOX outputs.

When you select Output from the main menu, the list of options shown below appears.

```

*****
+-----Output Options-----+
! Sort Sequence Changes      !
! Reference Output Changes   !
! Device Output Changes      !
! Output Field Selection     !
+(press ? for help)-----+
*****
    
```

### Output Options Screen

The Output options are described as:

- |                          |   |
|--------------------------|---|
| Sort Sequence Changes    | Allows you to change the sort order of the data; the default for each database is CAS number, species Latin name, endpoint and effect and exposure durations. You select a database to set the sort sequence. Follow the online instructions to create a new sort sequence. |
| Reference Output Changes | Decide if you do or do not want the references to be included in the report. The default is to download the citation for each publication cited in the ECOTOX report.   |
| Device Output            | Select how you want your compiled report to appear (interactively on your terminal screen, dump a file to the screen, a file sent to an E-mail address or a UNIX file). The default is set to interactively view the output on your terminal screen.                        |

**Output Field Selection**      Change the order of the output fields that appear in the report. The default varies for each database and is 80 characters wide. You select the database to change the output fields; follow the online instructions to change the order of the output fields. See Appendix L for a sample of the standard/default fields output.

If you choose "Sort Sequence Changes" and press **Enter**, the following box appears:

```

*****
+-----Databases to Select Sorting Order-----+
!   A   AQUIRE   Aquatic Plants and Animals   !
!   P   PHYTOX   Terrestrial Plants           !<-----
!   T   TERRETOX Terrestrial Animal           !
+-(press for help) -----+
*****
    
```

**Sort Sequence Database Selection Screen**

When you select a database, all data entry fields that can be sorted by ECOTOX will be displayed for selection. For example, if you select PHYTOX, a screen with sort sequence options for PHYTOX will appear. Follow the prompts at the bottom of the screen to change the sorting sequence of PHYTOX. **The default sort sequence options for the ECOTOX database is sorted by CAS registry number, Species Latin Name, Endpoint, Effect and Exposure Duration. This sort sequence should suffice for most users, so it may not be necessary to change the sort order. Remember, this does not change the data, it just changes the ORDER in which the data appears on the report.**

If you choose "Reference Output Changes," and then choose "References Not Included in the Report," references will not appear with your output. The default is to include citations for all publications used in the ECOTOX report. Bibliographic information will be presented with the appropriate database (e.g., AQUIRE references at the bottom of the AQUIRE output, PHYTOX references at the bottom of the PHYTOX output, etc.).

```

*****
+---Select Reference Output Status---+
! * References Included in Report   !
!   References NOT Included in Report !
+(press ? for help)-----+
    
```

**Reference Output Selection Screen**

If you move to the "Device Output Changes" option and press **Enter**, the "Select Output Device" menu box appears. The default is set to interactively view the output. Output devices are defined below.

```

*****
+-----Select Output Device-----+
! * Interactively view             !
!   Screen (Dump)                  !
!   Electronic Mail                 !
!   UNIX File                       !
+(press ? for help)-----+
*****
    
```

**Output Device Selection Screen**

- Interactively view      You will be able to view the report on your screen one page at a time. Use the arrow keys to scroll up and down while viewing your report.
- Screen (Dump)            Allows you to capture the report onto your computer with the aid of PC communications software. You may need to consult your local computer expert or the instruction manual of the communications software package you are using for more detailed information about capturing data to the computer. **NOTE:** Each communications program may refer to capture using different terminology.
- Electronic Mail        Enables you to mail the report to an Internet or U.S. EPA All-in-One mail address. You will be prompted for your E-mail address when you initiate the retrieval.
- UNIX File                To write your report to a UNIX file, specify the name of the output file in the space provided on the screen. **You must have a personal account on the EPA system where ECOTOX resides (e.g., Valley server at RTP) and you must be accessing ECOTOX through that account in order to utilize this feature.** If you select UNIX file as your output

options, you will be prompted for the file name after you have initiated the retrieval.

**RETRIEVE DATA**

The Retrieve menu option allows you to view the selection of data, start the retrieval of data, or clear previously selected search parameters. These options are described below.

```

*****
+--Select Retrieval Option--+
| Selection Summary          |
| Activate Retrieval         |
| Clear Selections           |
+(press ? for help)-----+
*****
    
```

**Retrieval Option Selection Screen**

- Selection Summary      Displays the search parameters you've chosen in the current data retrieval (see Appendix M).
- Activate Retrieval     Initiates the extraction of the data from the ECOTOX databases.
- Clear Selections       Clear (delete) one or more selected features. The "Clear Selections" command allows you to delete search strategies so you may begin a new one.

Once you have activated the retrieval, the system will respond with the number of records (also known as hits) located in each database. You may press Control-Z to go back and further refine your search, or press **Enter** to continue with the retrieval.

If you press **Enter**, and you have selected "Electronic Mail" or "UNIX File" as your output option, the system will prompt you for your E-mail address or the name of a UNIX file. After you have entered this information, press Control-Z and the system will begin to sort and transfer the data to your selected output option.

If you press **Enter**, and you have selected the "Interactive View" output option, the system will begin to sort the data. When it has completed sorting the data, the first page of the ECOTOX report will appear on the screen. Use the arrow keys to scroll up and down while viewing your report. See the Help section of this document for further instructions on how to move around in an ECOTOX report.

If you press **Enter**, and you have selected the "Screen (Dump)" output option, the system will give you a warning that the data are ready for display on your screen (see following example). At this point you should set the data capture option of your communications package **On**. Press **Enter**, and the system will pause while it sorts the

data. Once the data are sorted, the system will automatically begin scrolling the data on the screen. ECOTOX will prompt you when the retrieval is complete. At this time you should set your capture to the **Off** mode, and press any key to return the Retrieval menu.

```
*****
+-----+
! If you want to capture this report onto your computer, !
! turn capture (or logging) on following the instructions !
! for your communication software. Remember to turn it !
! off when the retrieval is complete !
+-----+
>>>> (Press any key when ready) <<<<
*-----*
```

\*\*\*\*\*  
**Screen (Dump) Output Option Warning Screen**

**EXIT FROM ECOTOX**

When you select Exit from the ECOTOX main menu, the program terminates and returns your cursor to the TOX account main menu. Choose another option, such as one of the other databases, or COMMENTS if you wish to leave a message.

```
*****
+-----+
+ Attention TOX account users:                                     +
+ Additional data from 1989 to 1996 has been added to the AQUIRE +
+ database. Users can send messages to MED-Duluth by using the   +
+ COMMENTS feature.                                             +
+-----+
*****
```

**Available options include**

```

AQUIRE   (AQUatic toxicity Information RETrieval)
ASTER     (ASsessment Tools for the Evaluation of Risk)
CHEMNAME  (CAS registry number and CHEMical NAME index)
ECOTOX    (ECOTOxicology Data Systems) Version 1.0
SCOMMON   (Species number and Species COMMON name index)
SLATIN    (Species number and Species LATIN name index)

COMMENTS  (We're interested in your comments and questions)
LOGOUT    (To leave)
```

You may abbreviate to as few as two characters

Please enter your preference:

```
*****
TOX Main Menu
```

Type **Logout** to exit the TOX account and return to your own local system control.

## ECOTOX DATA ELEMENTS

### Data Sources

The primary source of toxicity effect information in ECOTOX is the peer reviewed literature. Pertinent literature is identified through online computerized searches of the international literature. The computerized searches were initiated with the 1970 publication year and continue through to the present. A comprehensive search was designed to include the effect of nearly all toxic substances on aquatic and terrestrial organisms within the scope of the each ECOTOX database systems' guidelines. Commercial literature sources are continually evaluated for relevance to the ACQUIRE, PHYTOTOX and TERRETOX literature searches. The search strategy is evaluated regarding the success ratio of each search. Additional literature sources include abstract journals, review bibliographies, and the MED library collection.

The abstracts obtained through computerized searches of abstracting databases are screened to identify references applicable to ACQUIRE, PHYTOTOX or TERRETOX. Those references pertinent to one or more of the databases are acquired through a variety of literature acquisition procedures such as author reprint requests, inter-library loans, and commercial sources. As the publications are received, a reference number is assigned for storage and retrieval purposes, and a final check for applicability and duplication is made. A bibliographic sub-file stores the citations and a reprint of each publication is archived.

Publications used in ECOTOX must contain unique data. The bibliographic file and the main database files contain quality assurance checks for duplicate publications. If data are published in a dissertation, symposium proceeding, internal report or a book, and also in a peer-reviewed journal, only the journal publication is included in ECOTOX. If portions of the data are published in one source and the rest in a separate publication, both sources are reviewed with care so that each data point is included only once. Data reported in review papers are abstracted from the original publication. International publications are reviewed by ECOTOX staff if either an English abstract or a translated table of data is included. International cooperative efforts are underway with the Organization for Economic Cooperation and Development (OECD) and Russia (Borok Institute) to enhance the review of the international literature.

Data obtained from independently compiled data files must meet the minimum data requirements and quality assurance guidelines defined for each ECOTOX database component. The key data fields that must be included are: CAS number and chemical name, test organism, effect, and effect concentration. Documentation describing the test methods must be provided. If tests are missing key parameters, the data are rejected. During the incorporation of an electronic data file, a quality assurance check

of the CAS number, species Latin name, and reference citation is completed. Data files that have been included in AQUIRE are the MED fathead minnow acute toxicity database (Center for Lake Superior Studies; University of Wisconsin-Superior, 1984, 1985, 1986, 1988, and 1990), and data sets from France, Germany, the Netherlands and Russia. ECOTOX also includes the U.S. EPA, OPP's Ecological Effects Database (EEDB), with data incorporation into AQUIRE, PHYTOTOX and TERRETOX based on species habitat during the tested life stage. These data have been reviewed and categorized as acceptable for fulfillment of pesticide registration and re-registration guideline requirements as explained under FIFRA Subdivision E, Parts 158.145 and 158.150. Data for the EEDB are drawn from several sources. The major portion of the data is derived from actual Agency reviews of toxicological studies conducted by commercial laboratories and submitted by pesticide companies in support of their products. The U.S. EPA conducts audits of these laboratories on a periodic basis through the U.S. EPA Office of Compliance and Monitoring. A second major source of data entries is the numerous studies conducted by U.S. EPA, USDA, and USFWS laboratories over the last 25 years. A third, less utilized source is published data considered to meet our guideline criteria for acceptable data.

Quality assurance procedures begin with literature acquisition and cataloging, and continue through the chemical and species verification, the literature review process, data entry, and data retrieval. The ECOTOX literature is encoded by trained document abstractors. An intensive training period, a well-documented manual (U.S. EPA 1996), and close interaction with the data coordinator help to ensure a high level of accuracy and consistency in the reviewing process. Ten percent of the publications are independently reviewed by two different reviewers. These reviews are compared, differences (if any) are documented, discussed, and resolved by the data coordinator.

### **Access**

The ECOTOX database is located on a VAX computer at MED and a UNIX workstation at the EPA National Computer Center. The database can be accessed online by government offices using a variety of methods including by modem or via the Internet. There are several commercial vendors for access to ECOTOX data by the private sector. See Appendix N for a current listing of ECOTOX sources.

Magnetic tapes of ECOTOX may be purchased from the National Technical Information Service (NTIS). Two versions are available:

\* ECOTOX for VMS (PB97-500318) -- This version is specifically for VAX/VMS computers. It contains the data plus an executable copy of the AQUIRE and ECOTOX search and retrieval program that is used for online government access.

\* ECOTOX for Non-VMS (PB97-500292) -- This version is for all other types of computers. It contains the data files but no executable programs.

Both versions may be purchased in tape densities of 1600 or 6250 or as a 3480 cartridge.

For more information on details of access or for user support, please call the Scientific Outreach Program at (218)720-5602 for referral to the appropriate database staff person.

### **Chemical Verification**

A standardized identification number and name for each chemical recorded in the database is used for consistency. Toxicants included in the ECOTOX database are assigned a CAS registry number and are referred to by the Ninth Collective Index (9CI) standard nomenclature. The CAS number and name are stored in a file accessed by ECOTOX. The CAS number, verified name, synonyms, and verification sources are kept on card file for documentation purposes.

Retrieval is made by using the CAS number or the chemical name. A separate index file (CHEMNAME) is available for screening CAS numbers and chemical names used in ECOTOX. It is important to stress that you refer to the original publication to obtain additional test chemical information which may affect the context of toxicity information retrieved from ECOTOX.

### **Species Verification**

The test organism is identified by the current Latin name as verified in the taxonomic literature. For each species entry, the verified name, taxonomic code, nomenclature history, and verification sources are kept on file for documentation purposes. A species number can be located via two separate index files: SLATIN for Latin names and SCOMMON for common names. ECOTOX retains all species name synonyms that are no longer used for taxonomic classification. These synonyms are identified within the SLATIN file by a trailing 'S' after the name. You are able to search in ECOTOX using the species synonym name, however, your output will contain the currently accepted species name.

### **Endpoint**

Endpoint information is coded into ACQUIRE and TERRETOX if it is reported by the author. For the purposes of ECOTOX, an endpoint is defined as the quantification of an observed effect obtained through statistics or other means of calculation for the

express purpose of comparing equivalent effects (e.g., LC50). Appendices C and I identify the endpoint codes and definitions for the AQUIRE and TERRETOX databases, respectively. The endpoint field will be blank if the author does not report an endpoint.

### **Effect**

Effect information must be provided by the author in order for the test to be included in AQUIRE, PHYTOTOX or TERRETOX. For ECOTOX database purposes, effect is defined as the observation of a response resulting from the action of a chemical stressor (e.g., mortality). ECOTOX internally categorizes all observed effects under at least one of eight major effect group codes (behavior, bioconcentration, ecosystem, growth/development, lethal, physiological/biological, population community, and reproduction). Appendices B, D and H identify the three letter effect codes and major effect group for the AQUIRE, PHYTOTOX and TERRETOX databases, respectively.

### **Documentation Code**

The ECOTOX documentation code indicates the type and completeness of methods documentation and results presentation accompanying the data. Documentation code assignments range from detailed documentation to summary format. The documentation codes are summarized below. Although a documentation code of C does not signify that these test data are better than test data receiving a documentation code of I, it does give ECOTOX users a means of determining the level of confidence associated with that test record.

Documentation Code = C: Thorough methods and results documentation.

Documentation Code = M: Documentation is generally satisfactory, but one or more of the pieces of information are missing from either the methods or results section such as control information or chemical concentrations are unmeasured.

Documentation Code = I: Insufficient methods and results documentation.

### **Reference Citations**

Each publication is catalogued in a verified bibliographic citation data file. The author, publication year, title and source are provided for you to locate the publication using your library service.

**AQUIRE Data Elements**

The data elements for each test contained in AQUIRE are grouped by chemical, organism, exposure conditions, and effect endpoint. The test chemical parameters describe the toxicant, the associated CAS registry number, and the grade, purity and/or composition of the toxicant. The test organism parameters define the type of organism and the lifestage being tested. The test conditions identify the test water, test location, exposure type and duration, control parameters, and basic water chemistry. The effect endpoint parameters consist of a code to define the lethal, sublethal, or residue endpoint and the corresponding test chemical concentration. In addition to the preceding categories, AQUIRE incorporates the use of a documentation code which indicates the amount of documentation available for each piece of data in AQUIRE. When you press Control-G to view the ECOTOX online help, select item B for AQUIRE documentation. When you press this key combination, the following help menu for AQUIRE data elements will appear:

```

*****
+-----+
!   AQUIRE Online Help (Press Ctrl-Z to exit window or ? For help)   !
!   Type the letter corresponding to the help information that you want: !
!                                                                           !
!   A.  AQUIRE project abstract           K.  Endpoint code definitions      !
!   B.  AQUIRE retrieval tips             L.  Exposure duration              !
!   C.  Chemical analysis method          M.  Major/minor species codes      !
!   D.  Chemical name                     N.  Quality Assurance              !
!   E.  Control test codes                 O.  Test location & exposure type  !
!   F.  References and Data sets           P.  Test media                      !
!   G.  Documentation code                 Q.  Test organism & Life stage     !
!   H.  Effect code definitions            R.  Water chemistry                !
!   I.  Effect concentration & type        S.  AQUIRE Program Update History !
!   J.  Effect groups                      T.  Contact Information          !
!                                                                           !
!                                     ^Z Exit this screen                !
+-----+
*****

```

To obtain information about the AQUIRE help topic, press the letter of the listed topic. Press Control-Z to exit the help menu.

AQUIRE includes toxic effect results from exposures of single chemicals to aquatic organisms. Bioassays not included in AQUIRE are water chemistry effects (e.g., pH), complex effluents, sediment studies that do not report a water concentration and chemical mixtures. If a publication contains data for a single chemical besides one of the above categories of toxicants, the paper is retained and only the single chemical data are used in AQUIRE. Test organisms are limited to those that are exclusively aquatic. Amphibian data for purely aquatic life stages of the organism are included.

Terrestrial life stages are included in the TERRETOX database. Classes of organisms associated with the aquatic environment (e.g., birds, mammals, reptiles) and the microscopic communities (bacteria and virus) are omitted.

### **Phytotox Data Elements**

The PHYTOTOX database is a computerized information resource that permits the rapid retrieval and comparison of data pertaining to lethal and sublethal responses, excluding residue effects, of terrestrial plants to the application of chemicals. Both natural and synthetic organic compounds administered to native, crop, or weed species have been considered. The database DOES NOT contain information pertaining to algae, fungi, many tests for inorganic compounds, chemical mixtures, indirect effects sequential applications, or physical-chemical properties.

Several doses have been tested in a single investigation, ONLY selected doses are recorded in the database. These are the lowest dose necessary to elicit a plant response, the lowest dose required to gain the maximum response, and one or two additional doses to reveal the shape of the dose-response curve.

The effect record is a record containing data taken from a single publication describing the effect of applying one dose of a single chemical to one plant species. A record includes the CAS number, name of the chemical, dose concentration, plant response, experimental design, bibliographic number of source publication, and amount of documentation associated with the test record.

### **TERRETOX Data Elements**

TERRETOX is a terrestrial wildlife toxicity database established to provide data linking quantified chemical exposures with observed toxic effects, provide data to quantify the relationships between chemical concentrations in environmental media or wildlife foods and residues in wildlife tissues. TERRETOX includes results for lethal, sublethal and bioconcentration/bioaccumulation effects.

TERRETOX identifies sources of alternative data (domestic or laboratory animal toxicity and bioaccumulation information) when there is a paucity of information on wildlife species. Animals associated with the aquatic environment that do not breathe using gills (e.g., ducks, whales) are included in the TERRETOX database. Results from exposures of terrestrial life stages of amphibians are included in the TERRETOX database. Exposures to the aquatic life stages of amphibians are included in the AQUIRE database component of ECOTOX.

**REFERENCES**

U.S. Environmental Protection Agency. 1997. *AQUIRE User's Manual* (prepared by DynTel Corporation, GSA Contract No. GS04K95BFD0169, #Task CCA686461), Mid-Continent Ecology Division, Duluth, MN.

U.S. Environmental Protection Agency. 1996. *MED Ecotoxicology Standard Operating Procedures* (prepared by DynTel Corporation, Contract No. GS04K95BFD0169, Task #CCA686461), Mid-Continent Ecology Division, Duluth, MN.

U.S. Environmental Protection Agency, Environmental Research Laboratory-Corvallis, 200 SW 35th Street, Corvallis, OR 97333. 1995. *PHYTOTOX Database Standard Operating Procedures*, ECOTOX Database Project, Ecotoxicological Effects Information Integrated Database.

U.S. Environmental Protection Agency, Environmental Research Laboratory-Corvallis, 200 SW 35th Street, Corvallis, OR 97333. 1995. *TERRETOX Database Standard Operating Procedures*, ECOTOX Database Project, Ecotoxicological Effects Information Integrated Database.

**APPENDIX A**  
**"How to Access EPA MED's ECOTOXICOLOGY Database Systems"**

NOVEMBER 17, 1997

**STEP ONE: CONNECTING TO THE COMPUTER**

Choose the method best suited to your situation from those that follow. In all cases, it is best to use either a computer terminal that supports the DEC extended ANSI standard or a computer that runs software that emulates the behavior of a DEC ANSI terminal such as a VT100 or a VT102. Many communication programs (e.g. CROSSTALK, PROCOMM, PC-Kermit) allow you to select one of these kinds of terminals. **The Auto Wrap feature (or equivalent) should be turned off (e.g., long lines should not automatically wrap). Tab stops should be set at the standard of 8 columns apart, i.e., in columns 9, 17, 25, 33 and so on.** The ASCOM communications program is not recommended at this time.

In any of the methods below, if the alphabetic form of the host address "ecotox.rtpnc.epa.gov" does not work, use the numeric form of the address **134.67.208.119**. If neither address works, please give us a call.

**A. Personal Computers running Microsoft Windows\***

If you are running Windows, you should use Telnet. To configure this, single click the Telnet icon and select "Properties" from the Program Manager File menu. Edit the "command line" field to read as follows:

**telnet.exe ecotox.rtpnc.epa.gov 2323**

then, press "OK." Double-clicking this icon will now bring you directly to ECOTOX and the tox account.

- \* The above instructions are for Microsoft's version of telnet, and do not necessarily apply to every version of telnet that runs on Windows. To determine whether you are using a Microsoft version of telnet, you should choose "About telnet" from the "Help" menu. The information in the help menu should provide details about the author of the software (i.e. Microsoft).

If you are using a telnet application on Microsoft Windows other than the one supplied by Microsoft, the method of configuration may be different. The instructions below are general, and are not specific to any one telnet application. You may need to do some exploring of your telnet application, using the following instructions as a guide.

Telnet applications from different vendors do not always accept the command line host and host port information as Microsoft's version does. If you examine the instructions for using Microsoft telnet provided earlier in this section, you will see that we are specifying a host "ecotox.rtpnc.epa.gov" and a port "2323." In order to make your version of telnet work with these settings, you may need to examine the configuration menu in your telnet program. This menu may be called different names in different programs, such as "Options" or "Setup." To do this, run your telnet program WITHOUT changing the properties as described for the Microsoft version. Search through the options under the configuration menu for information referring to "Network" or "Transport" settings. Look for fields that refer to a "Remote System," "Host," "Host Name," or "Host Address." Place the host address "ecotox.rtpnc.epa.gov" in this field. Next, you should find a reference to a "Host Port" or simply a "Port" that is likely set to the value of 23, or "Default." You will need to change this value to "2323." Your configuration should be complete at this point. To prevent you from having to re-enter this information each time you wish to connect to a given system, most telnet applications will allow you to save this session information under a name of your choosing.

Once you have completed the above steps, you should be able to connect to the ECOTOX system by choosing "connect" or "open" option from your menus. **\*\*Special Note:** If you are not successful after experimenting with the above steps, please contact your system administrator for assistance.

**B. Macintosh Users (Instructions for Mac NCSA Telnet 2.7b4)**

Before you connect the first time, store the following settings. Start the NCSA Telnet application. Under the "Edit" menu, choose "Preferences" and then "Sessions." Click on "New."

In this box: enter this:

Alias (a simple name that is easy to associate with all of our applications)  
Hostname **ecotox.rtpnc.epa.gov**  
Port **2323**

These are the three necessary changes. Other settings can probably be left alone. When you are done, click on "OK" to save the settings. These steps only need to be completed once. After that, you can make a connection easily through "Open Special" under the "File" menu.

C. VAX/VMS Computers, UNIX Computers, Public Terminals, etc.

If you are logged onto a DEC VAX/VMS computer, you **MAY** be able to use the command:

**telnet ecotox.rtpnc.epa.gov /port=2323 /unix**

Otherwise, if your computer or terminal has a command line user interface, not a GUI (Graphical User Interface), enter the telnet command:

**telnet ecotox.rtpnc.epa.gov 2323**

D. Using Telnet from within your Web Browser (e.g. Netscape)

Many web browsers, such as Netscape Navigator, will start a telnet session for you if asked to open this "Location" or URL:  
**telnet://ecotox.rtpnc.epa.gov:2323**

Since you could also start your telnet application directly, using your web browser to start it is optional and a matter of preference. **In order to make this work, the web browser needs to be configured so that it knows where to find your telnet application.** To configure Netscape, do this: 1) run Netscape; 2) go to the "Options" menu and select "General Preferences." You will see a configuration screen with several labeled tabs across the top. Select "Apps" or "Applications." 3) There is a field on this screen called "Telnet application." If it already has something in it, your configuration has already been done. If the field is empty, you will need to provide a pathname that describes where Netscape can find the telnet application on your system. If you are running Netscape on UNIX, contact your system administrator for help with this. If you are using Windows or a Mac, proceed to the next step. 4-Win) Windows users can hit the "Browse" button next to this field and search for the telnet application. If you wish to use Microsoft's telnet application, change the directory to "c:\windows." Select "telnet.exe" and hit the "OK" button. Your configuration is complete. 4-Mac) Mac users can also use the "Browse" button to point to their telnet application, for example NCSA Telnet. If you're not sure where it is on your machine, ask your system administrator for help.

E. Everyone else (via modem to the EPA National Computer Center)

**If you are outside the Research Triangle Park (RTP) area in North Carolina, you may be able to connect using the toll-free number 800-445-2795.** If you are local to RTP or to some other location where this number is blocked, or if you want more information on how to connect and what type of equipment to use, call the EPA Network Control Facility telecommunications personnel at TEL: 800-334-2405 or 919-541-4506 or FAX: 919-541-3818. **Ask for instructions on how to access the ECOTOX computer at the NCC. If they ask for your three letter User ID, inform them that it is "tox".** They can help you determine the best method of access. If you need to use a modem to dial in, they will supply you with the best phone number for your location and modem speed. Before purchasing any modem, ask EPA NCF about their modem test results. Ask your local computer staff for instructions on how to use a modem at your site. Set the modem for 7 data bits, even parity, and 1 stop bit. When connecting, press ENTER a few times to allow detection of your modem's speed.

**SPECIAL NOTE:** If you have the call waiting feature on your phone, disable it before you begin.

You will see a menu. Respond by typing:

**IP [enter] [enter]  
connect ecotox port 2323 [enter]**

STEP TWO: LOGGING INTO THE ACCOUNT

Enter the current password following the password prompt  
If this fails, heed any message given. Press ENTER to try again.

**Password: \_\_\_\_\_**

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*For further information or assistance, please call the MED Scientific Outreach Program at:  
TEL: 218-529-5225 or FAX: 218-529-5003  
INTERNET ADDRESS: outreach@du4500.dul.epa.gov EPA's WAN ADDRESS: DU4500::OUTREACH*

## APPENDIX B - ACQUIRE EFFECT CODES BY MAJOR GROUP

<b>CODE Definition: BEHAVIOR [BEHAVI]</b>	
AVO	<b>Avoidance:</b> Avoidance or attraction to a chemical gradient.
BEH	<b>Behavior:</b> Quantifiable change in activity including trained behavior.
DET	<b>Detachment:</b> Change in ability of an organism to detach from or attach to a substrate.
EQU	<b>Equilibrium:</b> Change in ability to maintain balance.
FLT	<b>Filtration Rate:</b> Change in rate of filtration.
FOC	<b>Food Consumption:</b> Change in feeding behavior.
IMM	<b>Immobilization:</b> Change in the failure to respond or lack of movement after mechanical stimulation.
LOC	<b>Locomotor:</b> Quantifiable change in direct movement or activity.
MIG	<b>Migration:</b> Change in migration behavior.
PRB	<b>Predatory Behavior:</b> Change in ability to seek and capture prey.
PRV	<b>Predation Vulnerability:</b> Change in ability to avoid or escape capture.
PTR	<b>Phototactic Response:</b> Attraction to or avoidance of light.
STR	<b>Stress:</b> Observed physiological tension or irritation in animals or plants.
SVC	<b>Shell Valve Closure:</b> Change in the ability to open or close a shell valve upon mechanical stimulation and/or gaping response.
THL	<b>Thermal:</b> Change in tolerance to temperature change.
<b>CODE Definition: BIOCONCENTRATION [BIOCON]</b>	
RSD	<b>Residue:</b> Amount of test chemical remaining in tissue after exposure.
<b>CODE Definition: ECOSYSTEM [ECOSYS]</b>	
ASM	<b>Assimilation Efficiency:</b> Change in efficiency of trophic transfers between different levels in the food chain, e.g. between primary producers and grazers.
BGC	<b>Biogeochemical:</b> Changes in whole system biogeochemical processes, e.g. sulfate reduction, denitrification, methanogenesis, nitrification, ammonification, net N or P removal.
DEC	<b>Decomposition:</b> Change in rate of degradation of plant material.
DIV	<b>Species Diversity:</b> Change in number of species in a given area or index of species diversity (e.g. species richness, evenness).

GPR	<b>Gross Primary Productivity/Respiration:</b> Change in ratio of system-level gross primary productivity to respiration.
SPR	<b>Secondary Production:</b> Change in production of consumer level organisms (e.g. macroinvertebrates).
SRE	<b>System Respiration:</b> Change in rate of oxygen uptake by entire ecosystem, as opposed to individual or groups of organisms.
<b>CODE Definition: GROWTH/DEVELOPMENT [GRODEV]</b>	
ABN	<b>Abnormality:</b> Physical malformation due to toxicant exposure (e.g. vertebral).
CAL	<b>Case Leaving:</b> Change in number of organisms emerging from a casing.
DVP	<b>Development:</b> Change in ability to grow to a more mature life stage and in time between separate life stages.
EMR	<b>Emergence:</b> Change in the emergence from larval stage into the adult stage.
GRO	<b>Growth:</b> Measurable change in length and/or weight of test organism.
GSI	<b>Gonadosomatic Index:</b> Change in gonad to body weight ratios.
HPS	<b>Hepatosomatic Index:</b> Change in liver to body weight ratios.
PUP	<b>Pupation:</b> Change in percent pupation or pupation duration.
RGN	<b>Regeneration:</b> Change in ability to regenerate a body part.
SHD	<b>Shell Deposition:</b> Change in the ability to grow a shell.
<b>CODE Definition: LETHAL [LETHAL]</b>	
HAT	<b>Hatchability:</b> Change in percent hatch, time to hatch or number of eggs hatched.
IMM	<b>Immobilization:</b> Change in the failure to respond or lack of movement after mechanical stimulation.
MOR	<b>Mortality:</b> Effect expressed as % death or % survival.
<b>CODE Definition: PHYSIOLOGICAL/BIOCHEMICAL [PHYBIO]</b>	
BIO	<b>Biochemical:</b> Change in physiochemical process including glycogen uptake, cholesterol levels and lipid analysis.
CEL	<b>Cellular:</b> Change in organelle structure.
CLR	<b>Chlorophyll:</b> Measurable change in chlorophyll content including chlorophyll a content, chlorosis.
CYT	<b>Cytogenetic:</b> Changes in the genetic processes of cell (e.g. RNA, DNA).

ENZ	<b>Enzyme:</b> Change in enzyme activity or enzyme protein levels.
HEM	<b>Hematological:</b> Change in various blood parameters such as red blood cell count, hematocrit, and serum osmolarity.
HIS	<b>Histology:</b> Presence of physical damage to tissues or cells.
HMG	<b>Hemorrhage:</b> Change or presence of hemorrhaging.
HRM	<b>Hormone:</b> Change in hormone concentrations.
NFX	<b>Nitrogen Fixation:</b> Change in ability of aquatic plants to fix nitrogen.
OXC	<b>Oxygen Consumption:</b> Quantifiable change in oxygen uptake by the test organism.
PHY	<b>Physiological:</b> Change in the organic processes or functions of an organism. Effects include metabolic stress, caloric content, membrane permeability, osmoregulation, cough frequency, urine frequency, heartbeat, parasitic infection, water volume, granule or concretion formation, ventilatory rate.
PIG	<b>Pigment:</b> Change in the pigment, e.g. melanization. Does not include chlorophyll (see CLR).
PSE	<b>Photosynthesis:</b> Change in plant productivity indicated by change in $^{14}\text{C}$ or $\text{CO}_2$ uptake or oxygen production.
RES	<b>Respiration:</b> Change in $\text{O}_2$ uptake in animals.
TMR	<b>Tumor:</b> Presence of a mass of abnormal tissue.
VTE	<b>Vertebral:</b> Physical change in vertebral structure and/or composition leading to scoliosis, lordosis, etc.
<b>CODE Definition: POPULATION COMMUNITY [POPCOM]</b>	
ABD	<b>Abundance:</b> Number of individuals of a taxon per unit area equivalent to density. Comparison to controls; not related to time.
BMS	<b>Biomass:</b> Productivity measurement equivalent to yield and standing crop. Total mass or weight of a living organism per area or volume measured either directly through dry weight/ash-free dry weight or indirectly through ATP, chlorophyll a, absorbance, total carbon, or caloric content.
CLN	<b>Rate of Colonization:</b> Change in ability to colonize an uninhibited substrate under toxicant stress.
DRF	<b>Drift:</b> Change in the number of larval aquatic insects to travel a given distance in a stream.
PCC	<b>Population Carrying Capacity:</b> Change in the carrying capacity of the population.

PGR	<b>Population Growth:</b> Rate of growth. Equivalent to intrinsic rate of increase and maximum possible rate of growth for species. Calculated by relating biomass or abundance to time. Life table data are also included.
POP	<b>Population:</b> Change in number of species groups.
PRP	<b>Primary Productivity:</b> Change in net or gross system-level primary production (e.g., CO <sub>2</sub> uptake, O <sub>2</sub> release).
PSR	<b>Population Size Reduction:</b> Quantifiable reduction in the population size.
<b>CODE Definition:                    <i>REPRODUCTION [REPROD]</i></b>	
GSI	<b>Gonadosomatic Index:</b> Change in gonad to body weight ratios.
HAT	<b>Hatchability:</b> Change in percent hatch, time to hatch or number of eggs hatched.
REP	<b>Reproduction:</b> Change in male and/or female reproductive ability. Includes vegetation reproductive processes.
TER	<b>Teratogenesis:</b> Quantifiable occurrence of abnormal offspring.
<b>CODE Definition:                    <i>NO GROUP CODE</i></b>	
MUL	<b>Multiple Effect:</b> Change in more than one effect when data were reported as one result.
NR	<b>Not Reported:</b> The author reported an endpoint, but not a specific effect.
~XXX	<b>Delayed Effect:</b> Any effect (xxx) reported after the organisms are transferred to toxicant-free test chambers.

## APPENDIX C - ACQUIRE ENDPOINT CODES

CODE	ENDPOINT NAME:	ENDPOINT DEFINITION
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**BCF Bioconcentration factor:** A unitless value describing the degree to which a chemical can be concentrated in the tissues of an organism in the aquatic environment. At apparent equilibrium during the uptake phase of a bioconcentration test, the BCF is the concentration of a chemical in one or more tissues of the aquatic organism divided by the average concentration in the water.

$$BCF = \frac{\text{g/kg chemical in organism tissue}}{\text{g/L chemical in H}_2\text{O}}$$

or it is calculated from a ratio of rate constants, if at steady state,

$$BCF = \frac{K1 \text{ (uptake)}}{K2 \text{ (elimination)}}$$

**BCFD BCF dry-weight:** Bioconcentration factor derived using dry weight.

**EC50 Median Effective Concentration:** Effective concentration for 50% of the organisms tested. Used when an effect other than death is the observed endpoint.

**ECxx xx% Effective Concentration:** Effective concentration for xx% of tested organisms.

**ED50 Median Effective Dose:** Effective dose for 50% of the organisms tested. Used when an effect other than death is the observed endpoint.

**ET50 Median Effective Time:** Median time to effect or estimated mean survival time.

**ICxx xx% Inhibition Concentration:** Statistically or graphically estimated concentration of test material, under specified concentrations, is expected to cause a xx% inhibition of a biological process for which the data are dichotomous.

**IC50 Median Inhibition Concentration:** Statistically or graphically estimated concentration of test material, under specified concentrations, is expected to cause a 50% inhibition of a biological process for which the data are dichotomous.

CODE	ENDPOINT NAME:	ENDPOINT DEFINITION
LC50	<b>Median Lethal Concentration:</b>	Statistically estimated concentration that is expected to be lethal to 50% of a group of organisms tested. Death may be defined by the effect codes MOR, IMM, EQU, HAT. TLms and TL50s with death as the measured endpoint are reported as LC50*. All synonyms are coded in EE_REMARKS.
LDxx	<b>xx% Lethal Concentration:</b>	Lethal concentration for xx% of the tested organisms.
LD50	<b>Median Lethal Dose:</b>	A statistically estimated dose that is expected to be lethal to 50% of a group of organisms.
LDxx	<b>xx% Lethal Dose:</b>	A statistically estimated dose that is expected to be lethal to xx% of a group of organisms.
LOEC	<b>Lowest Observed Effect Concentration:</b>	Lowest concentration or level (LOEL) that has a statistically significant adverse effect on the tested organisms. The term MEC (Minimum Effective Concentration) is coded as LOEC.
LT50	<b>Mean Survival Time:</b>	Represents time until death of 50% of the tested organisms.
LTCN	<b>Lethal Threshold Concentration:</b>	Toxicity curve asymptotic concentration indicating an incipient LC50 value. Acute lethal action has essentially ceased.
LTxx	<b>xx% Death Time:</b>	Time until xx% test organisms are dead.
MATC	<b>Maximum Acceptable Toxicant Concentration:</b>	Hypothetical threshold concentration that is the geometric mean between the NOEC and LOEC concentration. The term Chronic Value (ChV) is encoded as MATC.
NOEC	<b>No Observed Effect Concentration:</b>	Highest concentration or level (NOEL) that has no statistically significant adverse effect on the tested organisms. The terms NOLC and NOEL are coded as NOEC.
NR-LETH		<b>Lethal:</b> 100% mortality or 0% survival including algicidal and herbicidal effects. (No statistically derived endpoint reported).
NR-ZERO		<b>Zero Mortality:</b> 0% mortality or 100% survival of organisms. (No statistically derived endpoint reported).

## APPENDIX D

### PHYTOTOX EFFECT CODES

NON No observed effect=

#### Biochemical effects

AA	Abscisic acid
AM	Amino acid
ANG	Mangane (Mn) concentration
ARN	Acetylene reduction rate/plan roots nodulated
CA	Carotene
CAA	Carotene/leaf area basis
CAD	Carotene/dry weight basis
CAL	Carotene/per leaf basis
CAS	Carotenoid concentration
CAT	Carotenoid content
CC	Calcium (Ca) concentration
CLA	Chlorophyll 'a' concentration
CLB	Chlorophyll 'b' concentration
CP	Chlorophyll
CPA	Chlorophyll/leaf area basis
CPD	Chlorophyll/dry weight basis
CPL	Chlorophyll/per leaf basis
CPM	Chlorophyll mutation/albina mutants
CUP	Copper (Cu) concentration
CY	Cytokinin
DDG	Digalactosyl diglyceride (glycolipid) content
DN	DNA synthesis rate
DNC	DNA concentration
EAC	Enzyme activity change
EN	Energy compound
ET	Ethylene
EZ	Enzyme activity
FE	Iron (Fe) concentration
GA	Gibberellin
KK	Potassium (K) concentration
MDG	Monogalactosyl diglyceride (glycolipid) content
MG	Magnesium (Mg) concentration
NSC	Nutrient status change
NT	Nitrogen (N) concentration
NTC	Nitrogen (N) content
PCH	Phosphatidyl choline (phospholipid) content
PET	Phosphatidyl ethanolamine (phospholipid) content
PGL	Phosphatidyl glycerol (phospholipid) content
PHC	Phosphorus (P) content
PIG	Pigmentation abnormal

PIN	Phosphatidyl inositol (phospholipid) content
PMS	Plasmolysis
PR	Protein synthesis
PT	Protein content
PTC	Protein concentration
RBC	Riboflavin content
RN	RNA synthesis rate
RNC	RNA concentration
SC	Sugar content
SCP	Total 9B,19-cyclopropylsterols
SDE	Total (delta)8-sterols
SDF	Total (delta)5-sterols
SEZ	SOD enzyme activity
SFA	Total 4a-methylsterols
SFF	Total 4,4-Dimethylsterols
SFT	Total 4-Dimethylsterols
SH	Starch content
SM	Secondary metabolism
SOD	Sodium (Na) concentration
TGL	Total glycolipid content
TLP	Total lipid content
TPH	Total phospholipid content
ZN	Zinc (Zn) concentration

### Genetic effects

BCM	Mitotic abnormalities, Binucleate cell
BMN	Mitotic abnormalities, Micronuclei
BRM	Mitotic abnormalities, Bridge
CE	Number of cells
CHR	Chromosomal damage
CLM	Mitotic abnormalities, Clumping
CPM	Chlorophyll mutation/albina mutants
CPP	Chromosomal polyploidy
CYM	Mitotic abnormalities, Cytomixis
DC	Dividing cells (number of)
DCP	Dividing cells (%)
DN	DNA synthesis rate
DPM	Mitotic abnormalities, Disturbed polarity
ESM	Mitotic abnormalities, Early separation
EXM	Mitotic abnormalities, Exclusion
FGM	Mitotic abnormalities, Fragment
ICA	Mitotic abnormalities, interphase cells
LC	Cell length
LGM	Mitotic abnormalities, laggard
MAA	Mitotic abnormalities, ana-telophase
MAB	Meiotic abnormality
MDM	Meiotic abnormalities, diakinesis and 1st metaphase

ME	Meiosis rate
MEA	Meiotic abnormalities, 1st anaphase
MEE	Meiotic abnormalities, 2nd anaphase
MI	Mitotic index (no. mitoses/total cells)
MIM	Meiotic abnormalities, 1st metaphase
MMA	Mitotic abnormalities, metaphase
MMM	Meiotic abnormalities, 2nd metaphase
MNI	Micronuclei increase
MPA	Mitotic abnormalities, prophase
MR	Mitotic rate
MTA	Mitotic abnormalities
MU	Mutation
NAB	Nuclear abnormality
NCM	Mitotic abnormalities, Nuclear budding
NFM	Mitotic abnormalities, Nuclear fusion
PC	Parthenocarpy
RN	RNA synthesis rate
SEX	Sex expression change
SKM	Mitotic abnormalities, Stickiness
ST	Sterility

#### **Growth/development effects**

AR	Area
CO	Fruit color
CV	Cover
DEF	Deformation
DM	Dry mass
DNO	Dry mass/plant roots nodulated
DO	Dormancy induction
DOB	Dormancy break increase
DUN	Dry mass/plant roots non-nodulated
FI	Fruit firmness
FL	Floral induction
FLN	Inflorescences (number of)
FM	Fresh mass
GR	Germination
GRD	Germination decrease
HT	Height
HY	Harvest yield
LE	Length
MA	Maturation
MS	Mass
NDN	Nodules (number of)/nodulated plant roots
NU	Number
PF	Percent fruit harvested
PHI	Post harvest character influenced
PN	Pods, number of

POG	Pollen germination
SD	Seed mass
SE	Seedling emergence
SEN	Senescence induced/accelerated
SN	Seed number
SNR	Senescence retarded
STU	Stunting
SY	Seed yield
SZ	Size

### **Hormone effects**

AA	Absciscic acid
AB	Abscission
AU	Auxin
CU	Curvature
CY	Cytokinin
ET	Ethylene
FL	Floral induction
GA	Gibberellin
NAS	Nastic movements
PC	Parthenocarpy

### **Injury effects**

CHL	Chlorosis
CU	Curvature
DEF	Deformation
DES	Desiccation
INJ	Injury
MDS	Mutational double (twin) spots (per leaf)
MEM	Membrane damage
MGS	Mutational dark green spots (per leaf)
MNC	Necrosis, marginal
MU	Mutation
MYS	Mutational yellow spots (per leaf)
NC	Necrosis
NEC	Necrotic lesions
PIG	Pigmentation abnormal
SEN	Senescence induced/accelerated
SSI	Symptom severity index
STU	Stunting
SWL	Swelling
TMS	Total mutational spots
TUI	Tumor induction
TXC	Texture change
VAS	Vascular disruption
WIL	Wilt

## **Kill effects**

CV	Cover
KIL	Kill
NU	Number

## **Physiological effects**

AB	Abscission
APO	Abnormal pollen
CH	Cold hardiness
CHL	Chlorosis
DES	Desiccation
DO	Dormancy induction
DOB	Dormancy break increase
FL	Floral induction
IU	Ion uptake
MA	Maturation
MDS	Mutational double (twin) spots (per leaf)
MEM	Membrane damage
MGS	Mutational dark green spots (per leaf)
MNC	Necrosis, marginal
MU	Mutation
MYS	Mutational yellow spots (per leaf)
MZC	Mycorrhizal colonization
NAS	Nastic movements
NC	Necrosis
NEC	Necrotic lesions
NPR	Net photosynthetic rate
PIG	Pigmentation abnormal
PS	Photosynthesis
PST	Photosystem II (PSII) electron transport activity
RS	Respiration
SA	Stomatal aperture
SEN	Senescence induced/accelerated
SNR	Senescence retarded
SRL	Spectral reflectance shift to longer wavelengths
SRS	Spectral reflectance shift to shorter wavelengths
SSI	Symptom severity index
SWL	Swelling
TMS	Total mutational spots (per leaf)
TR	Transpiration
TUI	Tumor induction
TXC	Texture change
VAS	Vascular disruption
WA	Water content
WIL	Wilt

## Reproductive effects

APO	Abnormal pollen
CO	Fruit color
DO	Dormancy induction
DOB	Dormancy break increase
FI	Fruit firmness
FL	Floral induction
FLN	Inflorescences (number of)
GR	Germination
GRN	Germination decrease
PC	Parthenocarpy
PF	Percent fruit harvested
PN	Pods, number of
POG	Pollen germination
PV	Pollen viability
SD	Seed mass
SE	Seedling emergence
SEX	Sex expression change
SN	Seed number
SS	Seed set (no. seeds/no. florets)
ST	Sterility
SY	Seed yield

## APPENDIX E

### PHYTOTOX PLANT MAINTENANCE CODES

CB	Combination of Conditions
CV	Field, cultivated
DC	Tissue culture, dark
EC	Environmental chamber, etc.
ED	Environmental chamber/ in dark
GH	Greenhouse
HY	Hydroponic solution
LC	Tissue culture/ in light
LH	Lath House
NS	Not specified
OF	Field, non-cultivated, disturbed
PD	Culture flask, petri dish, tube
PE	Potted, outdoors
WD	Field, non-cultivated, wild

## APPENDIX F

### PHYTOTOX APPLICATION METHOD CODES

AN	Added to growth medium, sand
AX	Added to growth medium, sand/repeated applications
CM	Added to culture medium
CS	Contaminated soil added to growth medium
CX	Added to culture medium/repeated applications
DR	Dropwise application
DU	Dusted
FU	Fumigation
GL	Added to growth medium, CEC < 10 meq
GM	Added to growth medium, CEC > 10 meq
GR	Added to growth medium, unknown CEC
GX	Added to growth medium, unknown CEC/repeated applications
HS	Added to hydroponic solution
HX	Added to hydroponic solution/repeated applications
IJ	Injected
LO	Added to growth medium, low CEC o.m.
ME	Added to growth medium moderate CEC o.m.
MI	Misted
MX	Misted/repeated applications
NS	Not specified
OM	Added to growth medium, high CEC o.m.
OX	Dipped or soaked/repeated applications
PR	Present in soil
PT	Painted
SO	Dipped or soaked
SP	Sprayed
SX	Sprayed/repeated applications

## APPENDIX G

### PHYTOTOX SITE APPLICATION CODES

BB	Bulb
BD	Bud
CL	Cell
CN	Cotyledon
CO	Corm
CP	Coleoptile
CU	Tissue culture callus
EM	Embryo
EZ	Enzyme
FB	Flower Bud
FL	Flower/inflorescence
FR	Fruit
GS	Germinated seed
HC	Hypocotyl callus cells
HY	Hypocotyl
LF	Leaf
ME	Meristem (apical or axillary)
NS	Not specified
OR	Organelle
PL	Entire plant
RH	Rhizome
RT	Root
SD	Seed
SH	Shoot
SL	Seedling
SR	Strobilus (mega-, micro-, etc.)
ST	Stem
TU	Tuber
XX	Multiple sites/repeated applications

## APPENDIX H

### TERRETOX EFFECT CODES

#### ACCUMULATION

ACCUM uptake  
RESDU residue

#### BEHAVIOR

ACTIV general activity  
APOCH approach +response  
AVOID avoidance  
BEHAV general or nonspecified behavior  
FDBEH feeding behavior  
JBEH juvenile behavioral changes  
LOCB locomotion behavior  
PCAR parental care behavioral changes  
RECB recognition behavior  
VCLIF visual cliff behavior

#### BIOCHEMICAL

BCHEM biochemical effects  
CELL cellular chemistry changes  
CHEM blood or organ chemistry changes  
ENZ enzyme function changes  
HRM hormone changes  
IMMUN immunological changes  
SECFL secretory fluid changes

#### GROWTH

GROW weight changes  
ORG organ weights

#### MORPHOLOGY

MHIST histological changes  
MPH morphological changes

## MORTALITY

MORT percent mortality, number died...  
MPOP population changes

## PATHOLOGY

INTOX signs of intoxication  
HISTO histological changes  
PARST parasite infestation

## PHYSIOLOGY

PHYS physiological changes  
PHYSC physical condition

## POPULATION

BMS total population biomass or weight  
POP number of animals/population

## REPRODUCTION

BEHA behavioral changes in offspring of exposed adults  
BROOD brood size  
EMB embryonic  
FERT fertility  
FLEDG fledging success  
GROW growth of neonates  
HATCH hatching or litter success  
IJUS initial juvenile survival-within first critical life stage of a given species  
MORT neonate mortality  
NOBAL number born alive  
REPRO reproductive success (general code for other types of repro. effects)  
SHELL eggshell thickness, strength, etc.  
WEAN number or percent weaned

## APPENDIX I

### TERRETOX ENDPOINT CODES

#### Definitions:

IS0	concentration of the inhibitor required to give 50% inhibition of enzyme activity under specific conditions.
LC50 LCXX	concentration lethal to 50% of test animals (or population of animals)
LD50 LDXX	dose lethal to 50% of test animals
LOEL	Lowest-Observable-Effect Level: lowest dose (concentration) producing effects that were significantly different (as reported by authors) from responses of controls.
NOEL	No-Observable-Effect-Level: highest dose (concentration) producing effects that were not significantly different from responses of controls according to author's reported statistical test.
ST50	medium survival time (time required for 50% of a population to die from a given dose).
STXX	medium survival time (time required for 90% of a population to die from a given dose).
T <sub>1/2</sub>	time required for one-half of ingested dose to be
TD50	dose required to produce ataxia in 50% of the animals.
TDXX	dose required to produce ataxia in 90% of the animals.

## APPENDIX J

### TERRETOX EXPOSURE ROUTE AND EXPOSURE TECHNIQUE CODES

#### Terretox Exposure Routes:

DERM	Dermal exposure
ENV	Environment
GIT	Gastrointestinal
IC	Intercutaneous
ID	Intradermal
IG	Intragastrical
IM	Intramuscular (injection)
INH	Inhalation
IP	Intraperitoneal (injection)
IPR	Intrapostomial
IS	Intrasegmentally (insects)
IT	Intratracheal
ITES	Intratesticular
IV	Intravenous (injection)
MULT	Multiple (field spray exp.)
NA	Not applicable
NR	Not reported
OCUL	Ocular
ORAL	Oral exposure
PLACT	Placenta
SHELL	Eggshell
SQ	Subcutaneous (injection)
YOLK	Yolk

#### EXPOSURE TECHNIQUES

AERIAL	Arial spray application
CAP	capsule
DIET	chemical incorporated into the food
DRINK	chemical incorporated into the water
FIELD	field application
GAV	gavage
IMM	immerse in solution
INC	inhalation chamber
INJ	injection
SOAK	soak in chemical
SPRAY	ground spray
TOP	topical application

## APPENDIX K

### ECOTOX CONCENTRATION UNITS

Bq	becquerels
Bq/g	becquerels per gram
Bq/kg	becquerels per kilogram
Bq/L	becquerels per liter
Bq/mg	becquerels per milligram
Bq/ml	becquerels per milliliter
BEES/D	bees per day
CAL/D	calories per day
C°	centigrade
cm	centimeters
cm <sup>2</sup>	centimeters squared
cm <sup>2</sup> /100a	centimeters squared per 100 animals
cpm	counts per minute
cpm/L	counts per minute per liter
cpm/mg	counts per minute per milligram
mm <sup>3</sup>	cubic millimeters
Ci/l	curies per liter
Ci/mol	curies per mole
D	days
dm <sup>2</sup>	decimeter squared
dpm/mg	degradations per minute per milligram
dpb/g	disintegrations (radioactivity) per minute per gram of tissue
dpm	disintegrations per minute
dpm/mg	disintegrations per minute per milligram
dpm/ml	disintegrations per minute per milliliter
gal/acre	gallons per acre
g	grams
g/100g	grams per 100 grams
g/ac/ha	grams per active compound per hectare
g ai/ha	grams per active ingredient per hectare
g/a	grams per animal
g/b/day	grams per bird per day
g/m <sup>3</sup>	grams per cubic meter
g/d	grams per day
g/ft <sup>2</sup>	grams per feet squared
g/fish	grams per fish
g/4m <sup>2</sup>	grams per four square meters
g/gbdwt	grams per grams of body weight
g/ha	grams per hectare
g/h	grams per hour

g/kg	grams per kilogram
g/L	grams per liter
g/l/ha	grams per liter per hectare
g/ $\mu$ g	grams per microgram
g/m <sup>2</sup>	grams per square meter
gai/l	grams per active ingredient per liter
IU	international units
IU/L	international units per liter
kBq/dm <sup>3</sup>	kiloBecquerels per cubic decimeter
kBq/L	kiloBecquerels per liter
kBq/ml	kiloBecquerels per milliliter
kg	kilograms
kg/ha	kilograms per hectare
kg/l	kilograms per liter
Kg/ ai/ha	kilograms per active ingredient per hectare
l/ha	liters per hectare
lsi	liver somatic index
log	logarithm
m/ha	meters per hectare
$\mu$ Ci	microCuries
$\mu$ Ci/3.6mg	microCuries per 3.6 milligrams
$\mu$ Ci/30mg	microCuries per 30 milligrams
$\mu$ Ci/kg	microCuries per kilogram
$\mu$ Ci/L	microCuries per liter
$\mu$ Ci/ $\mu$ l	microCuries per microliter
$\mu$ Ci/mg	microCuries per milligram
$\mu$ Ci/ml	microCuries per milliliter
$\mu$ Ci/org	microCuries per organism
$\mu$ eq/g	microequivalents per gram
$\mu$ eq/L	microequivalents per liter
$\mu$ g	micrograms
$\mu$ g/24hr/b	micrograms/24 hours/bird
$\mu$ g/100g	micrograms per 100 grams
$\mu$ g/100g/d	micrograms per 100 grams per day
$\mu$ g/50 $\mu$ l	micrograms per 50 microliters
$\mu$ g/a	micrograms per animal
$\mu$ g/cell	micrograms per cell
$\mu$ g/cm <sup>2</sup>	micrograms per centimeter squared
$\mu$ g/d	micrograms per day
$\mu$ g/dl	micrograms per deciliter
$\mu$ g/egg	micrograms per egg
$\mu$ g/fish	micrograms per fish
$\mu$ g/g	micrograms per gram
$\mu$ g/g soil	micrograms per gram of soil
$\mu$ g/g/d	micrograms per gram per day
$\mu$ g/kg	micrograms per kilogram
$\mu$ g/kg/d	micrograms per kilogram per day
$\mu$ g/leaf	micrograms per leaf

$\mu\text{g/l}$	micrograms per liter
$\mu\text{g/L/d}$	micrograms per liter per day
$\mu\text{g}/\mu\text{l}$	micrograms per microliter
$\mu\text{g}/\text{mg}$	micrograms per milligram
$\mu\text{g}/\text{ml}$	micrograms per milliliter
$\mu\text{g}/\text{organism}$	micrograms per organism
$\mu\text{g}/\text{plant}$	micrograms per plant
$\mu\text{g}/\text{tank}/\text{wk}$	micrograms per tank per week
$\mu\text{l}/100\text{ml}$	microliters per 100 milliliters
$\mu\text{l}/20\text{ml}$	microliters per 20 milliliters
$\mu\text{l}/\text{cm}^2$	microliters per centimeter squared
$\mu\text{l}/\text{g}$	microliters per gram
$\mu\text{l}/\text{kg}$	microliters per kilogram
$\mu\text{l}/\text{l}$	microliters per liter
$\mu\text{l}/\text{ml}$	microliters per milliliter
$\mu\text{l}/\text{organism}$	microliters per organism
$\mu\text{L}$	microliters
$\mu\text{M}$	microMolar (micromoles per liter)
$\mu\text{M}/\text{kg}$	microMolar per kilogram
$\mu\text{M}/\text{L}$	microMolar per liter
$\mu\text{mol}$	micromoles
$\mu\text{mol}/100\text{ g}$	micromoles per 100 grams
$\mu\text{mol}/\text{dm}^3$	micromoles per cubic decimeter
$\mu\text{mol}/\text{g}$	micromoles per gram
$\mu\text{mol}/\text{kg}$	micromoles per kilogram
$\mu\text{mol}/\text{L}$	micromoles per liter
$\mu\text{mol}/\text{min}$	micromoles per minute
$\mu\text{U}/\text{ml}$	microunits per milliliter
mBq	milliBecquerels
mBq/ml	milliBecquerels per milliliter
mCi	milliCuries
mCi/ml	milliCuries per milliliter
mCi/mmol	milliCuries per millimole
meq/L	milliequivalents per liter
mg	milligrams
mg/ae/L	milligrams acid equivalent per liter
mg/ai/m <sup>2</sup>	milligrams of active ingredient per meter squared
mg/kgb	milligrams of toxicant per kilogram body mass
mg/100g	milligrams per 100 grams
mg/100ml	milligrams per 100 milliliters
mg/70g	milligrams per 70 grams
mg/dm <sup>3</sup>	milligrams per cubic decimeter
mg/d	milligrams per day
mg/dl	milligrams per deciliter
mg/dose	milligrams per dose
mg/fish	milligrams per fish
mg/g	milligrams per gram
mg/g clay	milligrams per gram clay

mg/kg	milligrams per kilogram
mg/kg/d	milligrams per kilogram per day
mg/kg/fish	milligrams per kilogram per fish
mg/kg/wk	milligrams per kilogram per week
mg/L	milligrams per liter
mg/m <sup>2</sup>	milligrams per meter squared
mg/ml	milligrams per milliliter
mg/organism	milligrams per organism
mg/plant	milligrams per plant
ml	milliliters
ml/100g	milliliters per 100 grams
ml/body/wt	milliliters per body weight
ml/kg	milliliters per kilogram
ml/L	milliliters per liter
ml/m <sup>2</sup>	milliliters per square meter
mM	milliMolar (millimoles per liter)
mmol	millimoles
mmol/m <sup>3</sup>	millimoles per cubic meter
mmol/kg	millimoles per kilogram
mmol/L	millimoles per liter
mU/l	milliUnits/milliliter
min	minutes
M	Molar (moles per liter)
mol	moles
mol/m <sup>3</sup>	moles per cubic meter
mol/L	moles per liter
nCi	nanoCuries
nCi/L	nanoCuries per liter
ng	nanograms
ng/a	nanograms per animal
ng/fish	nanograms per fish
ng/g	nanograms per gram
ng/kg	nanograms per kilogram
ng/mg	nanograms per milligram
ng/organisms	nanograms per organism
nM/g	nanoMolar per gram
nMm	nanoMolar (nanomoles per liter)
nmol	nanomoles
nmol/kg	nanomoles per kilogram
nmol/L	nanomoles per liter
nmol/ml	nanomoles per milliliter
N	Normal (equivalents per liter)
NS	not specified
n/m <sup>2</sup>	number of animals per meter squared
n/mm <sup>2</sup>	number of animals per millimeter squared
oz	ounce
oz ai/a	ounces of active ingredient per acre
oz/100 gal	ounces per 100 gallons

oz/100 gal/a	ounces per 100 gallons per acre
oz/acre	ounces per acre
oz/a	ounces per acre
oz/bu	ounces per bushel
oz/bu(sd)	ounces per bushel of seed
oz/min	ounces per minute
oz/lb (seed)	ounces per pound per seed
ppb	parts per billion
ppb/gal	parts per billion per gallon
ppm	parts per million
ppm/ml	parts per million per milliliter
ppm/organism	parts per million per organism
ppt	parts per thousand
%	percent
% g	percent grams
% mg	percent milligrams
% sat	percent saturation
% v/v	percent volume per volume
%inhib	percent inhibition
pCi/L	picoCuries per liter
pCi/ml	picoCuries per milliliter
pg/g	picograms per gram
pimol	picomoles
pmol/L	picomoles per liter
pmol/ml	picomoles per milliliter
pt/ga	pints per gallon
lb/100 gal	pounds per 100 gallons
lb/100 gal/a	pounds per 100 gallons per acre
lb/a	pounds per acre
lb/acre	pounds per acre
lb/gal	pounds per gallon
lb/cwt sd	pounds per hundred weight seed
lbai/a	pounds active ingredient per acre
sec	seconds
t/km <sup>3</sup>	tons per cubic kilometer
u/l	units per liter
wk	weeks

## APPENDIX L

### SAMPLE OUTPUT (AQUIRE, PHYTOTOX, AND TERRETOX)

(Please note... The output is truncated for example purposes)

ECOTOX  
ECOLOGICAL TOXICITY DATABASE  
29-MAR-96

U.S. Environmental Protection Agency  
National Health and Environmental Effects Research Laboratory  
Mid-Continent Ecology Division  
(formerly Environmental Research Laboratory-Duluth)  
and  
Western Ecology Division  
(formerly Environmental Research Laboratory-Corvallis)

Contact: Scientific Outreach Program  
Telephone: 218-529-5225  
FAX: 218-529-5003  
outreach@du4500.dul.epa.gov

\*\*\*\*ATTENTION\*\*\*\*

- \* Researchers and managers using ECOTOX for analysis or summary \*
- \* projects should consult with the original scientific paper to \*
- \* ensure an understanding of the content of the data retrieved \*
- \* from ECOTOX. \*

#### Aquatic Toxicity Effects Data (AQUIRE)

Species Latin Name Species Common Name	Duratio (days)	Endpoint Effect	Conc Type	Conc (ug/L)	D C	Ref No.
-----						
59858 (4-Carboxyphenyl)chloromercury						
Asterionella japonica Diatom	7.00	NR	BIO	0.2 uM	I	5312
Oncorhynchus kisutch Coho salmon, silver salmon	1.00		MOR	5000	I	15148
Oncorhynchus kisutch Coho salmon, silver salmon	1.00		MOR	10000	I	15148

#### REFERENCES:

REFERENCE NUMBER: 5312

Jones, G.J., P.D. Nichols, R.B. Johns, and J.D. Smith  
1987  
The Effect of Mercury and Cadmium on the Fatty Acid and  
Sterol Composition of the Marine Diatom *Asterionella  
glacialis*  
Phytochemistry 26(5):1343-1348

#### Terrestrial Plant Effects Data (PHYTOTOX)

Species Latin Name Species Common Name	Obs Time (days)	Eff	Site	Resp %	Dose	Unit	Ref No
---	--------------------	-----	------	-----------	------	------	-----------

62384 (Acetato-o)phenylmercury

Arachis hypogaea Gober	28.00	DM	PL	0	0.20 %	R06973
Arachis hypogaea Gober	28.00	DM	PL	-23	0.20 %	R06973
Arachis hypogaea Gober	28.00	DM	PL	0	0.20 %	R06973

REFERENCES:

REFERENCE NUMBER: R06973  
 MISRA, K.C.  
 1974  
 INFLUENCE OF SIMAZINE, LINDANE AND CERESAN ON DIFFERENT  
 PARAMETERS OF NITROGEN FIXATION BY GROUNDNUT  
 I J AGR SCI 44:837-840

Terrestrial Animal Effects Data (TERRETOX)

Species Latin Name Species Common Name	Dur (days)	Endpoint & Effect	Dosage	Unit	Exp Route	Exp Tech	Ref No
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115093 Chloromethylmercury

Anas platyrhynchos Mallard duck	84.00	CELL ORG	0.50	PPM	ORAL	DIET	000051
Anas platyrhynchos Mallard duck	84.00	CELL ORG	5.00	PPM	ORAL	DIET	000051
Anas platyrhynchos	84.00	LOEL MPH	13.43	PPM	ORAL	DIET	000013

REFERENCES:

REFERENCE NUMBER: 000051  
 BALACHANDRAN, A., M.K. BHATNAGAR, AND H.D. GEISSINGER  
 1985  
 SCANNING AND TRANSMISSION ELECTRON MICROSCOPIC STUDIES  
 ON THE OVIDUCTS OF PEKIN DUCKS FED METHYL MERCURY  
 CONTAINING DIETS  
 SCANNING ELECTRON MICROSCOPY, Vol. 1, pp. 311-322

## APPENDIX M

### ECOTOX SUMMARY SCREEN

-----ECOTOX VERSION 1.0-----  
--Retrieval Selection Summary (Press Ctrl-Z to exit window or ? for help)--

Chemical Name(s): MERCURY

\*\*\*\* Data Source: On AQUIRE      Aquatic Plants & Animals  
   Whole Lethal Effect Group

\*\*\*\* Data Source: On PHYTOX      Terrestrial Plants  
   Whole Kill Effect Group

\*\*\*\* Data Source: On TERRETOX    Terrestrial Animal  
   Whole Mortality Effect Group

End of Summary.

**APPENDIX N**  
**GENERAL ACCESS INFORMATION SHEET**  
March, 1997

MED-Duluth is currently aware of the following commercial sources of AQUIRE and/or ECOTOX:

1. Online access for government agencies is routed through the U.S. EPA National Computer Center. For AQUIRE, ASTER and ECOTOX access information, please contact:

SCIENTIFIC OUTREACH PROGRAM:	Phone:	218-720-5602
	Fax:	218-720-5539
	E-Mail:	outreach@du4500.dul.epa.gov

2. AQUIRE on-line access for the private sector is available from the following commercial vendors:

Chemical Information Systems, Inc.	Phone:	800-CIS-USER
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Technical Database Services, Inc.	Phone:	212-245-0044
	E-Mail:	inquiries@tds-tds.com

3. AQUIRE and ECOTOX VAX VMS and non-VMS data tapes are available through the National Technical Information Service (NTIS). For additional information, please contact:

National Technical Information Service	Phone:	703-487-4763
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4. AQUIRE database retrieval service providing ASCII and microcomputer database files is available from:

Spectrum Research, Inc.	Phone:	218-525-5322
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5. AQUIRE database in microcomputer format is available from:

Ascl Corporation	Phone:	703-847-0001
Spectrum Research, Inc.	Phone:	218-525-5322

6. AQUIRE VAX VMS and UNIX based software for on-site use:

Daylight Chemical Information Systems Inc.	Phone:	714-476-0451
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