

Example of an Aquatic Ecological Assessment Based on a User-defined Water Concentration and User-defined Dose-Duration Data within WEAP (Example No. 3)

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Introduction

The U.S. Army Engineer Research and Development Center (ERDC) is developing the Army Risk Assessment Modeling System (ARAMS) to provide the Army with the capability to perform human and ecologically based risk/hazard assessments associated with past practice and current activities at military installations. The intent of the system is to provide a platform from which a variety of assessments can be performed. The system is envisioned to help a risk analyst visualize an assessment from source, through multiple environmental media (e.g., groundwater, surface water, air, and land), to sensitive receptors of concern (e.g., humans and ecological endpoints).

ARAMS uses the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES) developed by the Pacific Northwest National Laboratory (PNNL) for linking disparate objects, such as environmental fate/transport models, databases, spreadsheets, etc. FRAMES is a Windows-based software platform that provides an interactive user interface and, more importantly, specifications to allow a variety of DOS and Windows-based environmental codes to be integrated within a single framework.

This document is intended to serve as a tutorial for helping new users with the application of ARAMS/FRAMES and the components within this system. This example does not include the steps for project planning and the use of associated tools under the “File” menu. These tools help the user plan the risk assessment including development of the conceptual site model and the RAGS Part D Table 1 for human health risk assessment. There are several Help files within ARAMS that explain these tools.

Example Description

This case will use “measured” time-varying surface water concentrations with WEAP to determine the ecological impact on aquatic life. Dose-Response data will be entered directly into WEAP for use in impact assessment. The Aquatic Organism Selector module is used to select the aquatic organism to be used for impact assessment by WEAP. The measured values are entered into the FRAMES system using the User Defined Object with the Water Concentration File (WCF) Surface Water Module. This case calculates the percentage of time that an aquatic species is exposed to 1) acceptable impacts, 2) unacceptable impacts with less than 50 percent physiological effects, and 3) unacceptable impacts with equal to or greater than 50 percent physiological effects. The output also summarizes the probability of equaling or exceeding a concentration, based on exposure duration. The FRAMES working space will look like Figure 1 when completed.

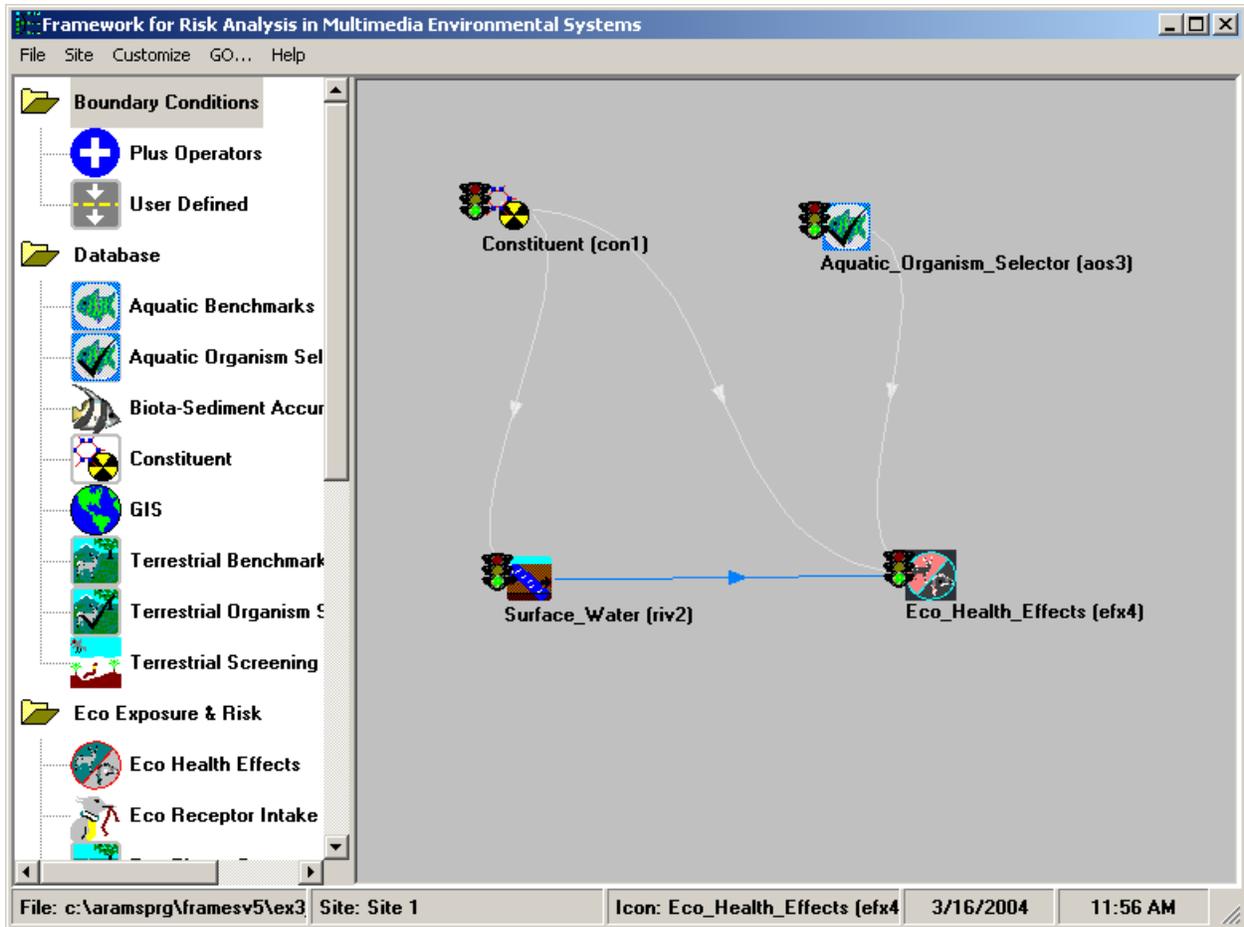


Figure 1. Object workspace for example application

Input Data

- Double-click on “ARAMS Icon” to open “ARAMS info and Disclaimer” window and then select “Accept” to continue.



- Choose “FRAMES” in the ARAMS toolbar to launch FRAMES. (Note: If this is the first time you have used ARAMS, you will need to configure it for FRAMES by selecting “File” “***Must Configure Path to FRAMES***” and supplying the path to the “fui.exe” file).
- While ARAMS/FRAMES is running, click “File” and choose “New” and a window titled “Global Input Data Open New” will appear (see Figure 2). In the “File Name” box, type the project name (type: “Sample3,” maximum of 8 characters) and click “Open” (see Figure 3). **Do not name the new file “Example3” because it will write over the existing “Example3” file that was dis-**

tributed with the tutorial. A window titled “Create New Site” will appear. Type the project site name (type: Site 1) and click “OK” (see Figure 4).

The workspace’s color may change. Double-Click on the **Constituent** icon so that the icon appears on the upper left corner of the main screen. Repeat this operation to place the following additional icons into the workspace:

“Aquatic Organism Selector”
“User Defined”
“Eco Health Effects”

Click on and drag each icon to its respective position on the workspace. Connect the Constituent icon with the User Defined icon by holding down SHIFT, left-clicking on the Constituent icon, dragging the cursor to the User Defined icon, and releasing the mouse button (Note: To remove this line, repeat the steps used to connect it. To remove an icon from the screen, right-click and a menu will appear with various options. Click “Delete” and the icon will be taken out.).

In the same fashion, connect the following pairs of icons:

<i>Constituent</i>	→	<i>User Defined (already done)</i>
<i>Constituent</i>	→	<i>Eco Health Effects</i>
<i>User Defined</i>	→	<i>Eco Health Effects</i>
<i>Aquatic Organism Selector</i>	→	<i>Eco Health Effects</i>

FRAMES should now look something like Figure 1.

CONSTITUENT DATABASE MODULE

Right-click the Constituent icon and choose General Info (see Figure 5). When the General Info screen opens, enter “Constituent” in the “User Label” text box and select “FRAMES Default Chemical Database Selection” in the “Select from applicable models” text box (see Figure 6). Click OK at the bottom of the screen to return to the workspace area. The status light attached to the constituent icon will change from black to red. Right-click on the constituent icon in the main screen and choose User Input. The Constituent Selection screen will open (see Figure 7). The constituent used in this case is 4-Nitrophenol. Scroll to select the constituent from the constituents list or use the “Find” option to search for it. Click the “Add >>>” button to add the constituent to the selected constituent s list. Click “File” and choose “Save and Exit” to return to the workspace screen. The Constituent icon’s status light will change from red to green.

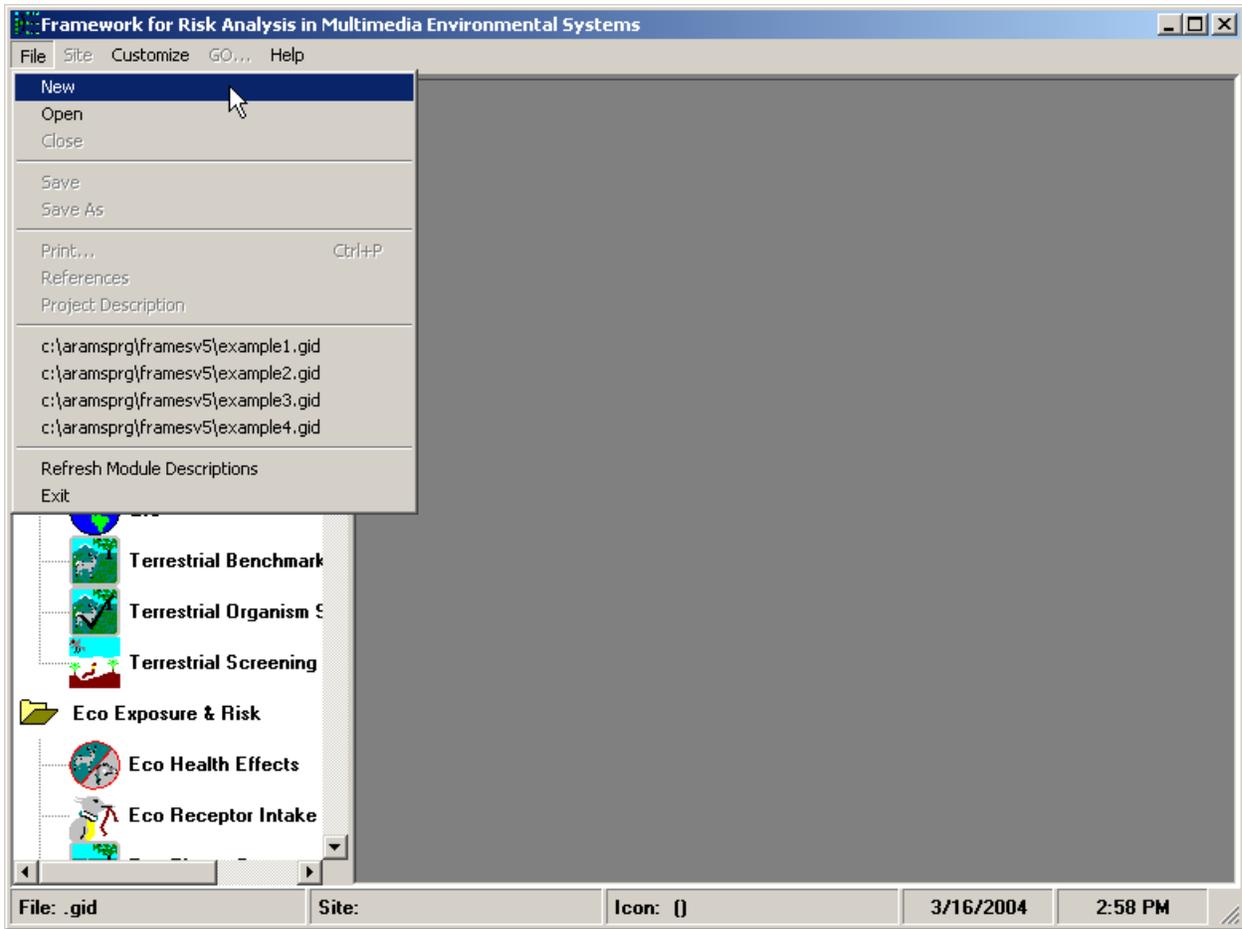


Figure 2. Opening a new file

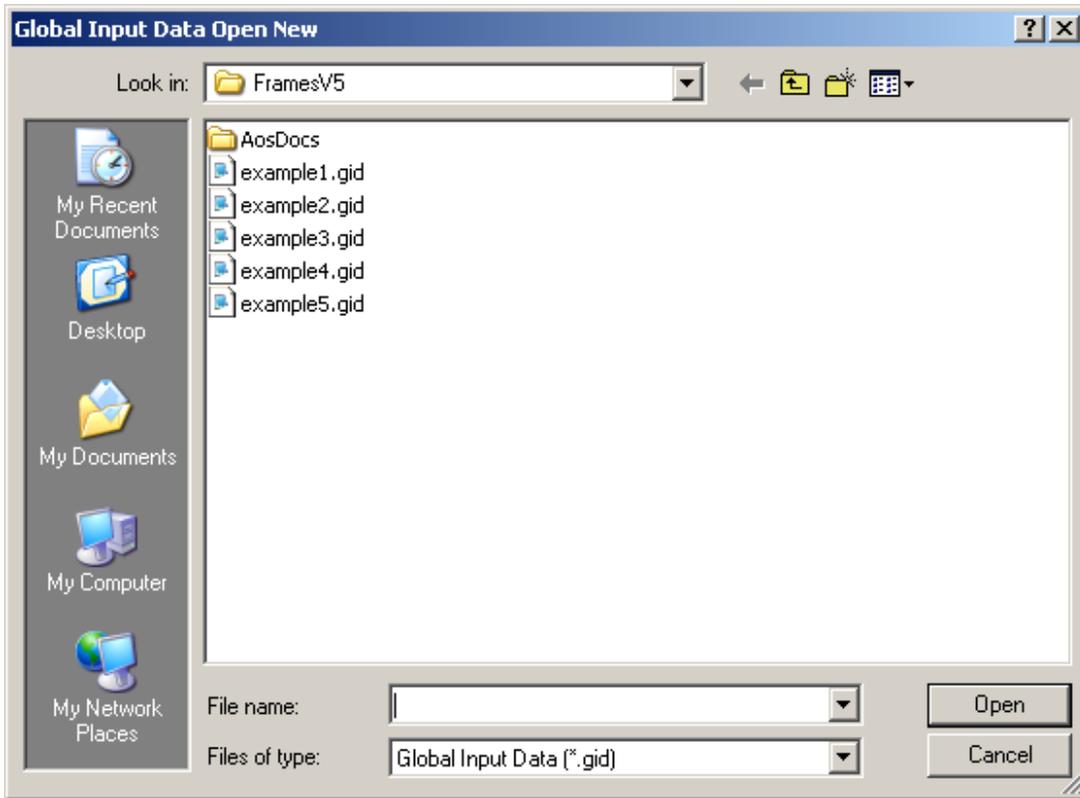


Figure 3. Global Input Data Open New screen (new file window)



Figure 4. Create New Site screen (input “Site name” box)

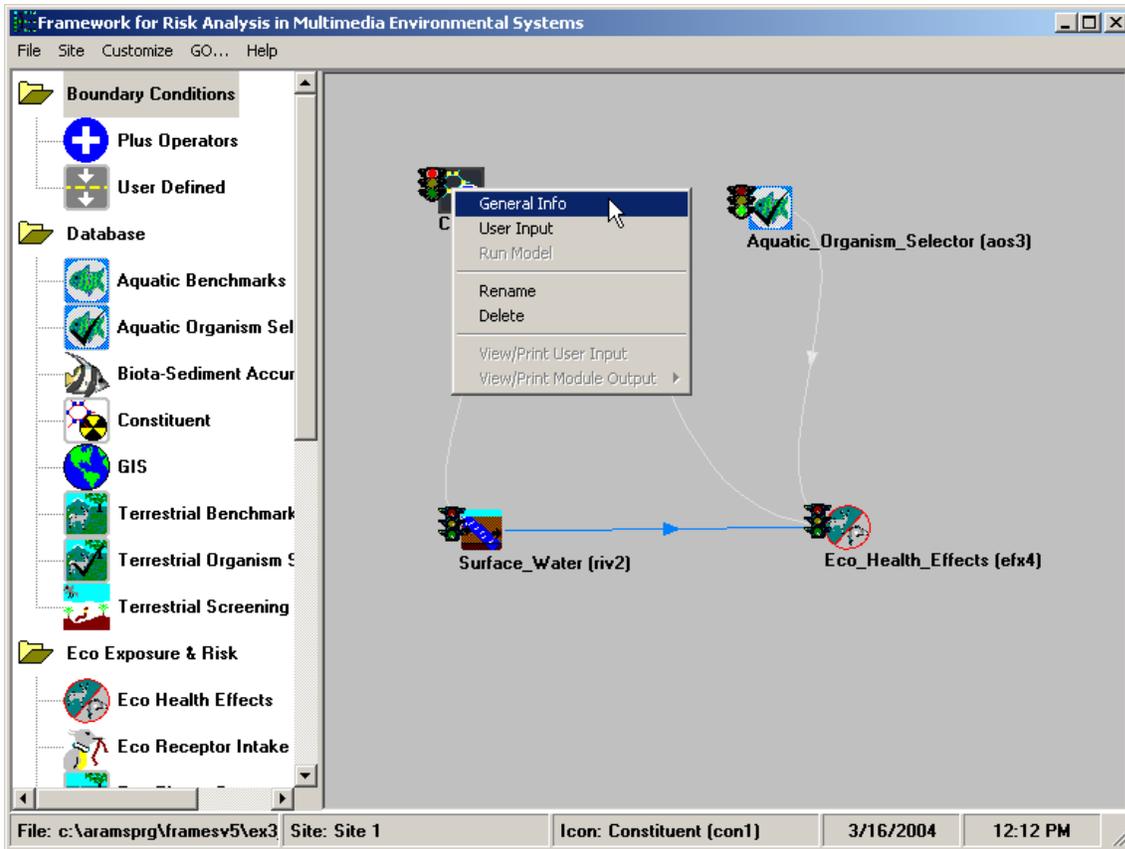


Figure 5. Workspace screen (right-click on the Constituent icon)

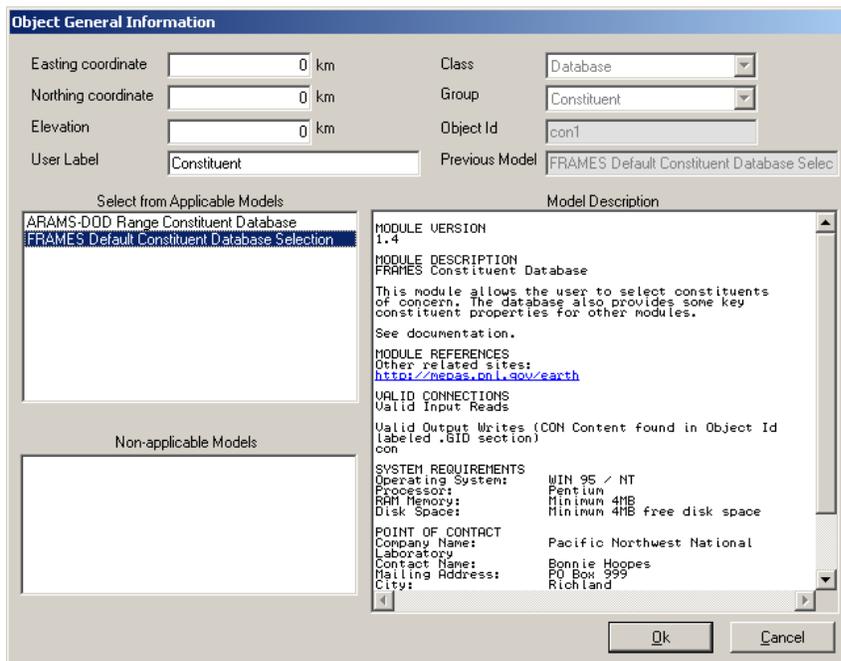


Figure 6. Object General Information screen

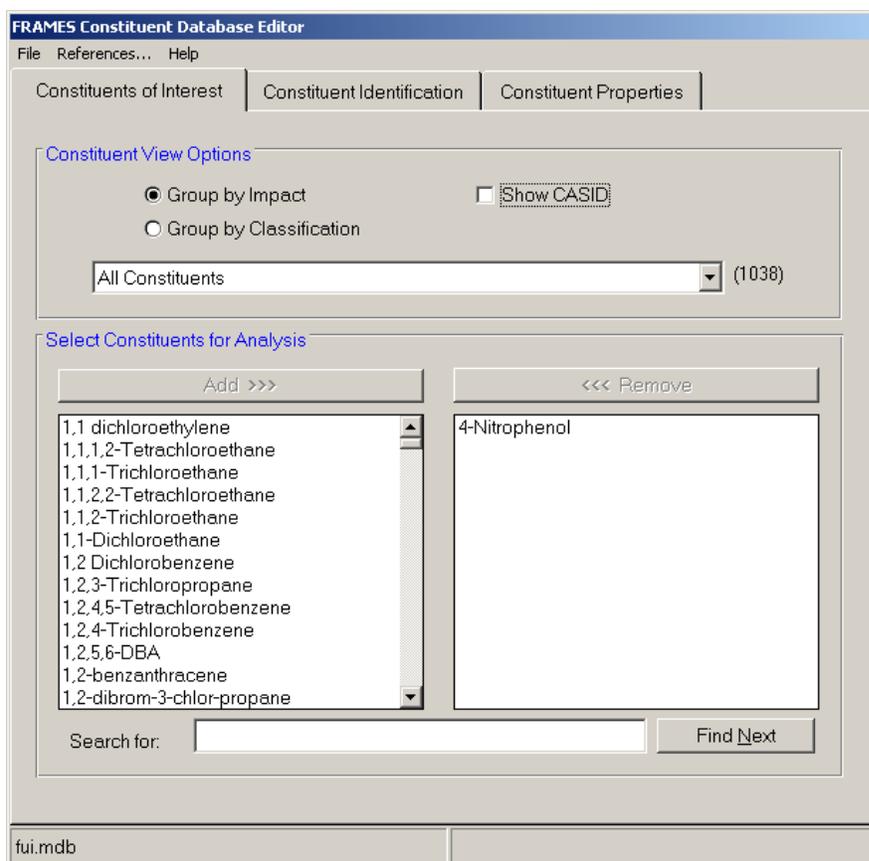


Figure 7. FRAMES Constituent Selection screen (“Constituents of Interest” tab)

The following is a listing of all data input required by the remaining modules used in this example. *Names of object icons* are in bold, italics, and underlined headings. *Menu items* (displayed by right-clicking on the icon) are shown below the module in bold and indented to the right of the icon names. *Explanations* of data required by each menu item are indented further to the right. To save information for a scenario, select “File” and then “Save” from the main FRAMES menu.

USER DEFINED

General Info

A window titled “Object General Information” will appear. In the Label text box, input “Surface_Water.” In “Select from Applicable Models,” choose “WCF Surface Water Module” and click “Ok.” The status light next to the Surface Water icon should turn red.

The user should first choose the module for each object before entering any data; thus, enter the “General Info” on each remaining module and make a selection before selecting the “User Input.” After selecting modules, User Input should be performed, and the modules run, starting with the modules at the upper end of the chain and working down the chain.

User Input

A window titled “FRAMES User Defined Module” will appear. Enter the following data into the spreadsheet at the bottom of the window:

Table 1. Surface Water Concentrations	
Time (yr)	Concentration (g/ml)
0	0
0.0274	0.0001
0.0329	0.000005
0.0821	0.00009
0.1095	0.00006
0.1232	0.000085
0.1369	0.00003
0.1643	0.000075
0.1916	0.00001
0.219	0.000015
0.2464	0.000005
0.2601	0.000095
0.2738	0.00002

Click “File” and choose “Save and Exit” to return to the work screen. The status light next to the Surface Water icon should turn yellow.

Run Model

The model runs in the background. The status light next to the Surface Water icon should turn green.

View/Print Module output

A second menu will appear (see Figure 8). Select “WCF Text View” to view a screen output like Figure 9. Choose “WCF Graphical View” to view a screen output in Excel format (see Figure 10).

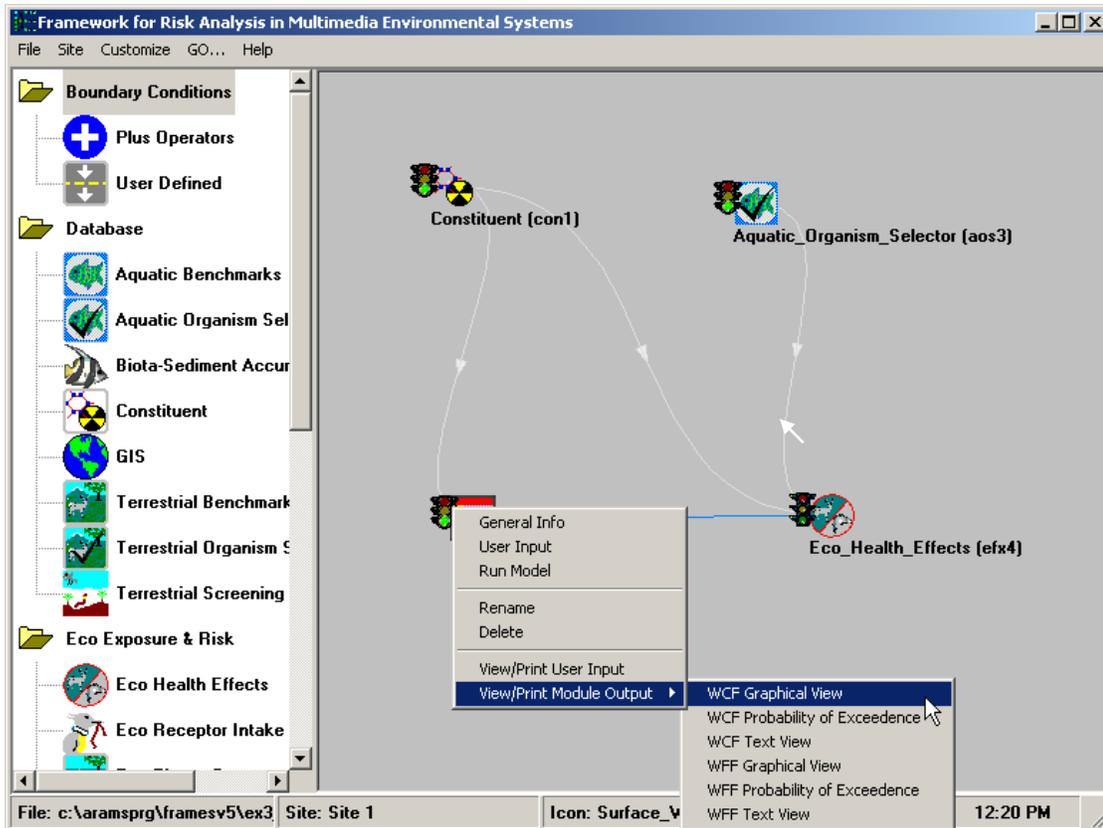


Figure 8. Selecting the output display format

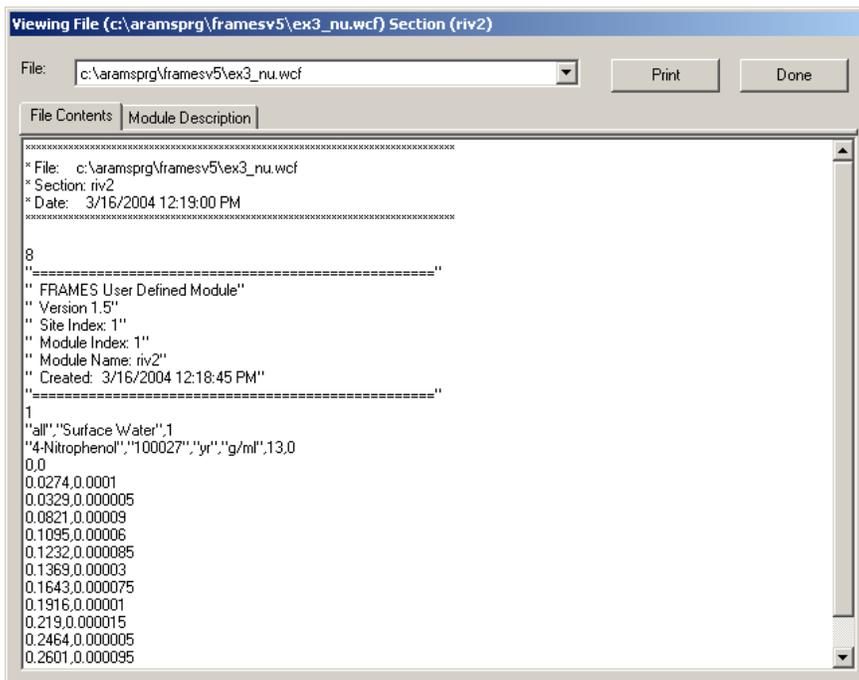


Figure 9. WCF text view

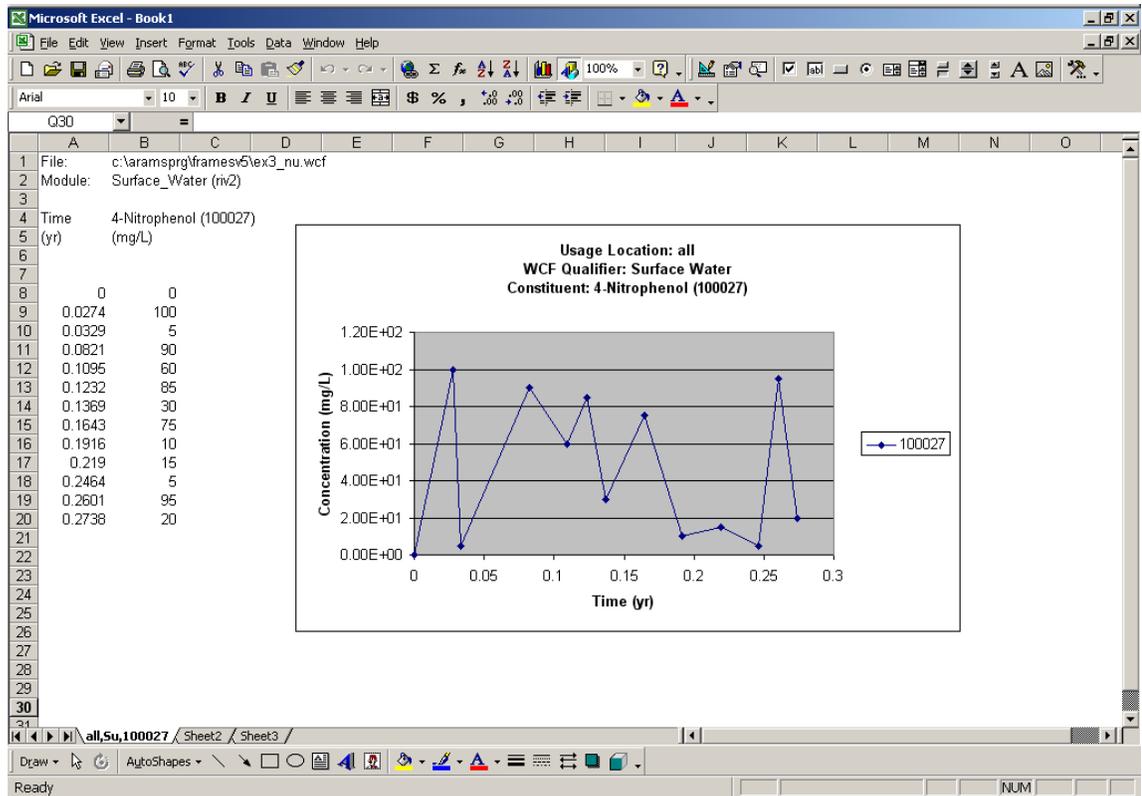


Figure 10. Surface Water Icon Output (Excel format view)

AQUATIC ORGANISM SELECTOR

General Info

A window titled “Object General Information” will appear. In the Label text box, input “Aquatic Organism Selector.” In “Select from Applicable Models,” choose “Aquatic Organism Selector” and click “Ok.” The status light next to the Aquatic Organism Selector icon should turn red.

User Input

A window titled “ARAMS Aquatic Organism Selector” will appear. Select “Oncorhynchus mykiss” as shown in Figure 11. Choose “Save and Exit” from the File menu. The status light next to the Aquatic Organism Selector icon should turn green.

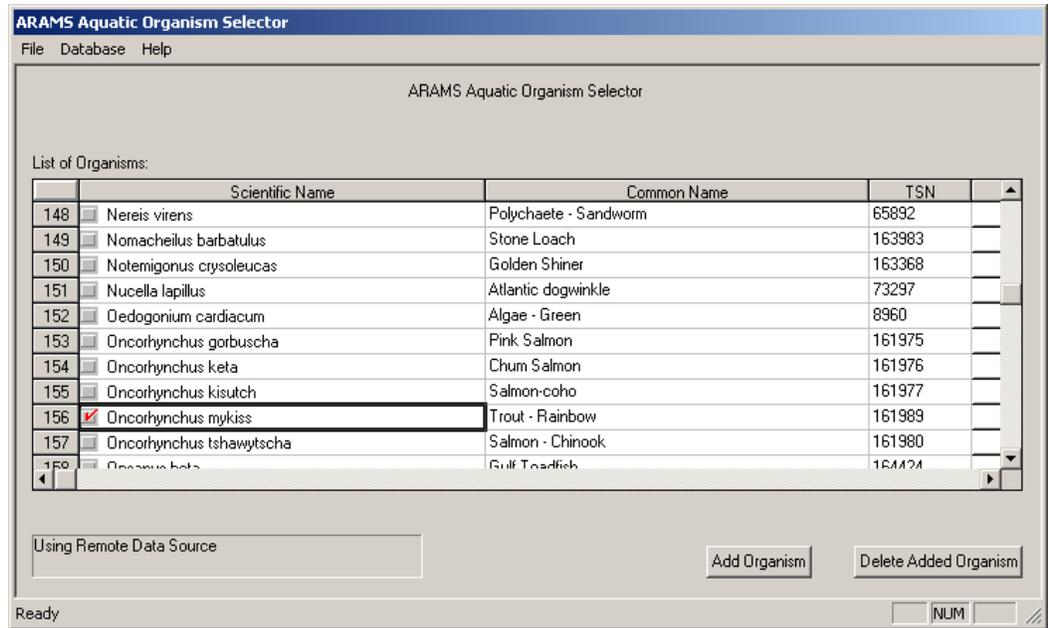


Figure 11. Aquatic Organism Select screen

ECO HEALTH EFFECTS

General Info

A window titled “Object General Information” will appear. In the Label text box, input “Eco Health Effects.” In “Select from Applicable Models,” choose “Wildlife Ecological Assessment Program” and click “Ok.” The status light next to the Eco Health Effects icon should turn red.

User Input

A window titled “Wildlife Ecological Assessment Program” will appear. In the data tree on the left, click on “Trout-Rainbow” (*Trout-Rainbow* is the common name of *Oncorhynchus mykiss*) and a panel labeled “Time vs. Location for Trout-Rainbow” will appear at right. Fill it in according to Figure 12.

Double-click on “Trout-Rainbow.” An item called “4-Nitrophenol” will appear in the data tree. Click “4-Nitrophenol.” A panel labeled “4-Nitrophenol” will appear at the right; fill it in according to Figure 13.

Click “File,” and choose “Save and Exit” to return to the workspace screen. The Eco Health Effects icon’s status light will change from red to yellow.

Run Model

The model runs in the background. The status light next to the Eco Health Effects icon should turn green.

View/Print Module Output

A second menu will appear. Select “EXF Text View” to view a screen output like Figure 14. Choose “EXF Graphical View” to view a screen output like Figure 15 (in Excel format).

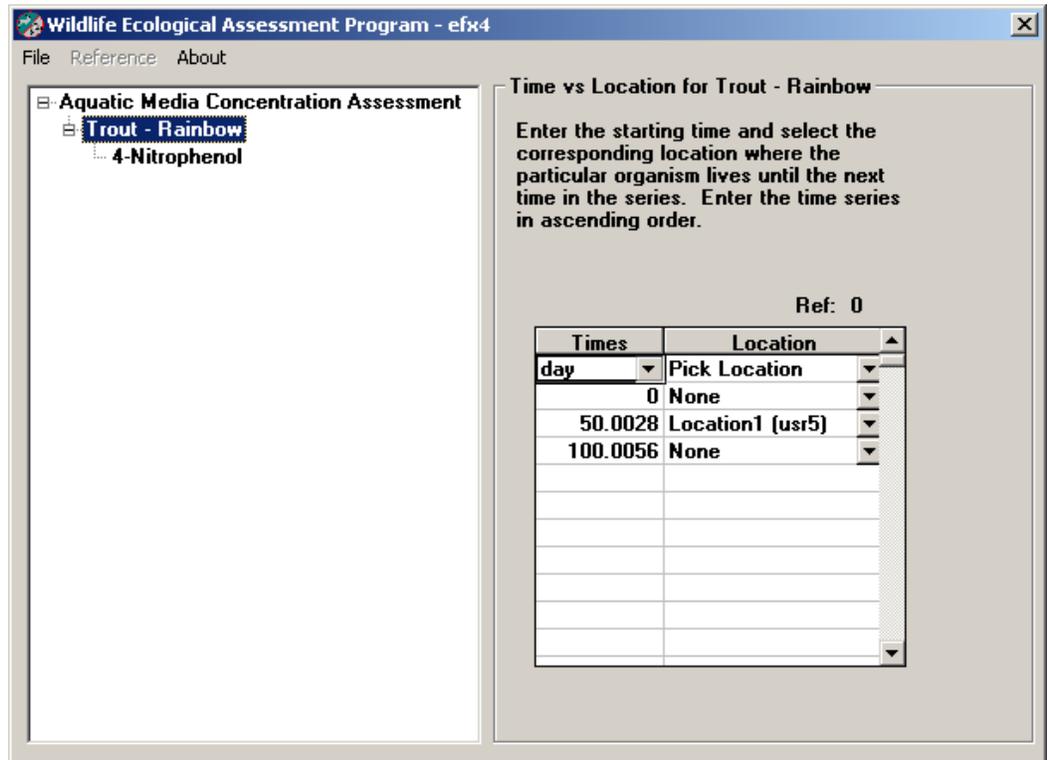


Figure 12. Wildlife Ecological Assessment Program (Trout – Rainbow)

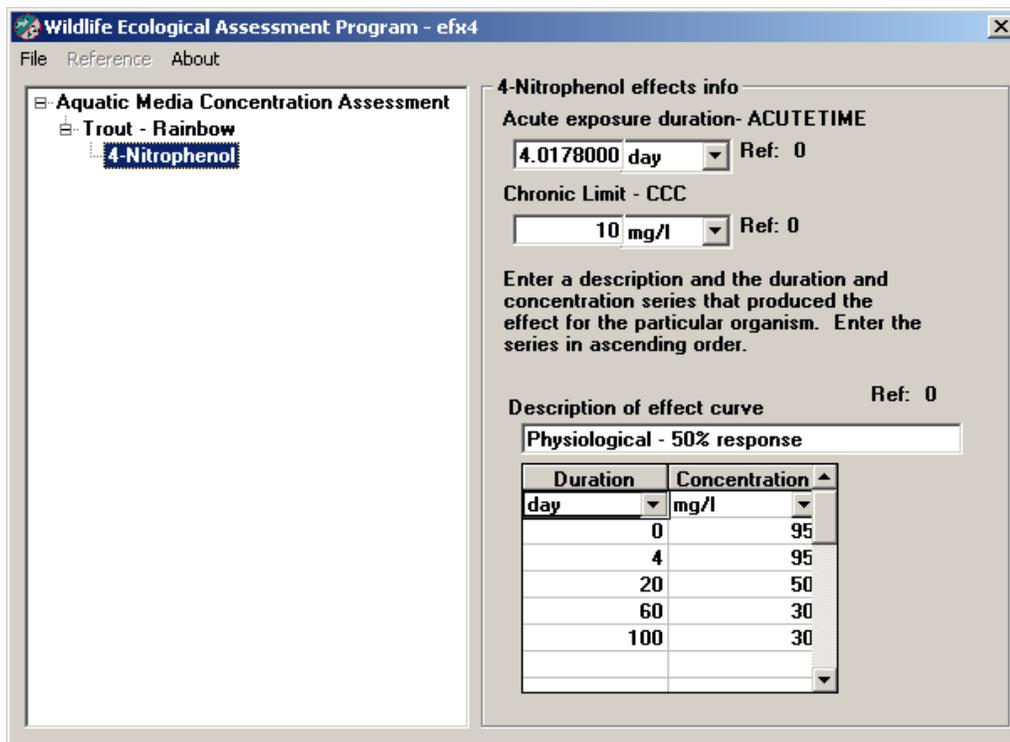


Figure 13. Wildlife Ecological Assessment Program (4-Nitrophenol)

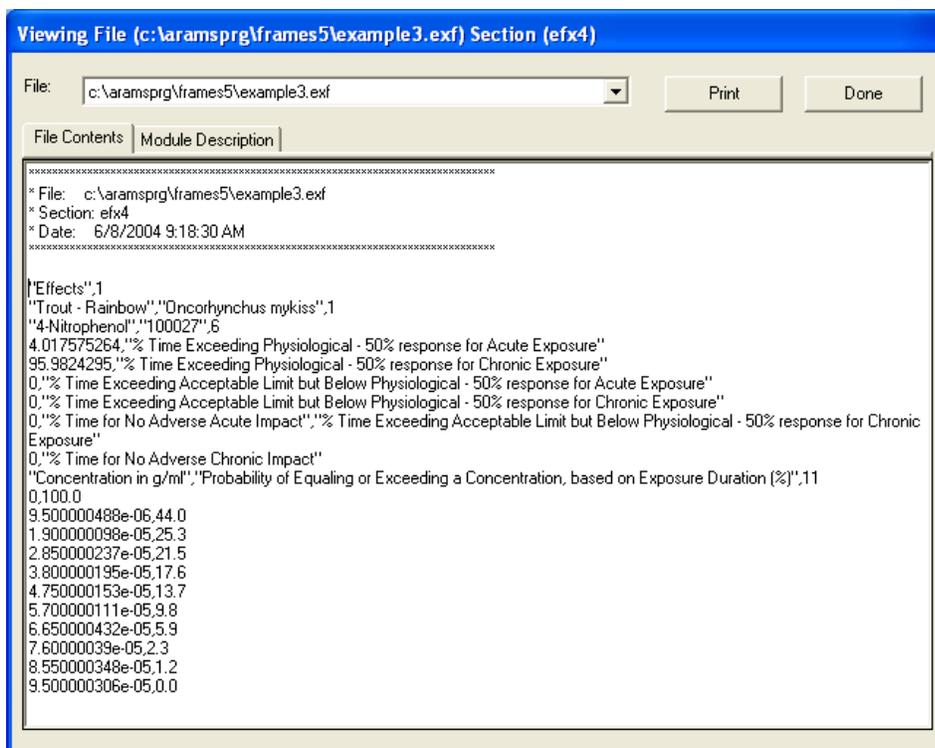


Figure 14. Eco Health Effects Output (text view)

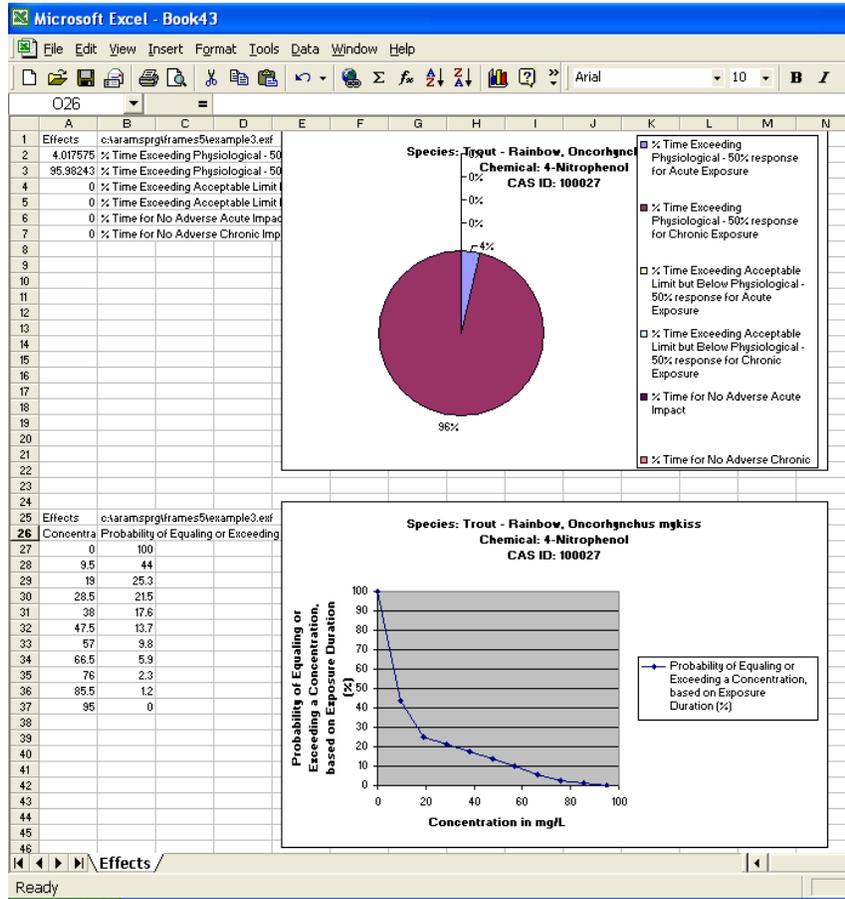


Figure 15. Eco Health Effects Output (Excel format)