United States
Environmental Protection
Agency

User's Guide for the Wildlife Scenario Builder
(Version 1.0, Beta Test)

USER'S GUIDE FOR THE WILDLIFE SCENARIO BUILDER (VERSION 1.0, BETA TEST)

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Office of Research and Development
U.S. Environmental Protection Agency
Washington, DC 20460

DISCLAIMER

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use. This application is being released as a beta-test version.

ABSTRACT

This user's guide provides general guidance on how to use the Wildlife Scenario Builder (Version 1.0, Beta Test), a wildlife exposure application that generates adjusted intake rates itemized by diet component, with consideration of the metabolic requirements of each organism. The application can be used as a tool for estimating intake and assimilation for a variety of North American wildlife species. The user's guide gives step-by-step instructions for installing the program, working with the databases, starting a new project, using the model to create wildlife scenarios, calculating wildlife intake rates for completed wildlife scenarios, and printing the associated wildlife reports. It also includes troubleshooting recommendations and a list of commonly encountered known developer error messages.

CONTENTS

LIST OF FIGURES

LIST OF FIGURES (continued)

PREFACE

This document was prepared by the staff of the National Center for Environmental Assessment. Subcontracting support was provided by ICF Consulting, TN & Associates, and Menzie-Cura & Associates. The Wildlife Scenario Builder (WSB) user's guide provides background information on the application environment, introduces the components of the application, and provides stepwise instructions for accessing the database and setting up and running the application. Development of the guide coincides with the release of the beta-test version of the WSB.

The guide is intended to be used by any party employing this application and will allow any new user to operate the WSB without further instruction. The data provided in the WSB have undergone review as part of U.S. Environmental Protection Agency quality assurance procedures. However, there has been no attempt to evaluate the quality of the original studies and associated data; it is the user's responsibility to ensure that the literature and data are applied appropriately to meet their objectives. Users of the WSB, therefore, are strongly encouraged to retrieve the original literature and confirm input values for any studies that are important to the exposure assessment.

All WSB programming code has been evaluated and thoroughly checked using a variety of input data. Functionality tests show the application is stable and components and calculations function as designed. Compatibility tests show the application is compatible with the Windows 7 operating system (2012). A Usability review was conducted and errors found during the review were fixed or otherwise mentioned in this Guide. Any suspect errors and technical questions regarding the use of WSB should be e-mailed to wsb@epa.gov.

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This document was prepared by the National Center for Environmental Assessment (NCEA). The document and the program development and review were supported by three external project teams.

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The ICF Project Team extracted the Wildlife Scenario Builder from the larger application package developed by Environment Canada. ICF programmers modified the program to operate independently. ICF scientists conducted a quality assurance review of database entries. Finally, ICF personnel reviewed application operation.

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The TN&A Project Team updated the user's guide to reflect recent application updates and extraction from the larger original application. Project scientists updated the text, added tips to guide users around difficult steps, and inserted screen captures providing additional explanatory power.

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The Environment Canada Project Team developed a comprehensive wildlife exposure application and associated databases from which the Wildlife Scenario Builder was derived. This application included wildlife and chemical scenario builders.

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ACKNOWLEDGMENT

1. OVERVIEW OF THE USER'S GUIDE AND THE WILDLIFE SCENARIO BUILDER

1.1. USER'S GUIDE

This document provides general guidance on how to use the Wildlife Scenario Builder (WSB) (Version 1.0, Beta Test). It includes general background on the application and the larger context, a summary of the databases and instructions for searching and adding records, and a stepwise summary of WSB operation. Each narrative description is paired with the representative application interface screen to reinforce the instructions.

Throughout the guide, underlined text indicates a clickable function key in the application.

NOTE: Users of the application and databases described herein are cautioned regarding application of the data. Although the data have undergone review as part of U.S. Environmental Protection Agency quality assurance procedures, some values or studies included may be inaccurate. There has been no attempt to evaluate the quality of the original studies and associated data; it is the user's responsibility to ensure that the literature and data are applied appropriately to meet study objectives. Users of the WSB, therefore, are strongly encouraged to retrieve the original literature and confirm input values for any studies that are important to the exposure assessment.

1.1.1. Practice Scenarios

To facilitate learning how to use the WSB, practice scenarios, denoted by a ► and *italicized text,* are provided at the end of each application step to assist the new user in assembling a WSB scenario. The practice scenario (Mink – Mean Values) is presented to demonstrate application functionality. The data are adapted from a probabilistic risk assessment conducted by Moore et al. (1999). The assessment evaluated risks to mink and kingfishers from exposure to methylmercury and PCBs at a portion of the Department of Defense's Superfund site, East Fork Poplar Creek (EFPC) in Oak Ridge, TN. For the wildlife exposure parameters, the authors used data from EPA's *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993). To conduct a Monte Carlo assessment, they estimated value distributions for the parameters likely to substantially influence the results. For the remaining parameters, the authors used point estimates. The exposure results are reported as distributions (graphically) and as median, minimum, and maximum values. The advantage of using information from Moore et al. (1999) as a practice data set is that it provides an example of real-world data availability and assumptions used to address data gaps. To maximize utility, while reviewing the guide, the user

should open the WSB and enter the practice scenario data as instructed to illustrate each application step.

1.1.2. Tip Boxes

The WSB is offered in beta-test form to users. At certain steps in the application, the program may not perform as expected, or the user could benefit from additional information. Tip boxes are provided throughout the text for topics that require a more detailed description or for steps in the application that require a specific, sometimes non-intuitive approach. To continue to use the application when a problem is encountered, apply the suggested tip. In a case in which a solution has not been provided, save inputs, shut down the WSB, and restart the program.

1.2. WILDLIFE SCENARIO BUILDER

1.2.1. Background and Description

The WSB is a software product developed in Microsoft Visual Basic that provides an efficient, systematic, and transparent means of estimating wildlife exposure. The program was originally developed as part of a larger effort initiated by the Canadian Wildlife Service (CWS) of Environment Canada, with support from the U.S. Environmental Protection Agency (EPA), to facilitate and enhance wildlife risk assessment in North America. As presented in this guide, the WSB is a stand-alone application designed to calculate the intake rates and metabolic requirements for wildlife receptors. It provides the user with a tool for estimating intake and assimilation for a variety of North American wildlife species. The application is most useful for screening-level risk assessments, but it can be adapted to more detailed characterizations of risk.

The outputs from the WSB may be combined with chemical data to estimate wildlife exposures independent of the WSB. However, the WSB itself focuses exclusively on biological functions that impact intake, generating adjusted intake rates itemized by diet component, with a consideration of metabolic requirements of each organism. The application produces intake rates using the weights of diet items ingested, volume of water ingested, and volume of air inhaled. To utilize the intake rates generated by the WSB to estimate exposure to chemicals, the user can combine the WSB output with measured or estimated concentrations of chemicals in the different diet items, air, soil, sediment, or water. To normalize the exposure by organism weight (e.g., mg/kg-day), the same body weight is used as the one used to develop the intake rates.

In the WSB, the user selects a species, a body weight, a diet (in terms of both scope and relative abundance of diet items), and physiological intake rates for air, drinking water, food, soil, and sediments. Based on the data selected by the user, the WSB estimates the organism's daily requirements/intake as units of media taken in per day for air (m^3), drinking water (L), and

food (g). The application includes a comprehensive wildlife database from which the user may select inputs and a life history database that provides more detailed species information. Site- and user-specific data may also be entered.

The WSB includes a database of exposure parameters (i.e., allometric equations for estimating intake rates, assimilation efficiencies, gross energy values, body weights, diets, and intake information) and a separate life history database, which provides supplemental species- specific information.

1.2.2. Application Components

1.2.2.1. *Functional Components*

The WSB is divided into a number of functional components, including project organization, scenario development, calculation, and reporting, which are described briefly below. Figure 1 provides an overview of the components of the WSB.
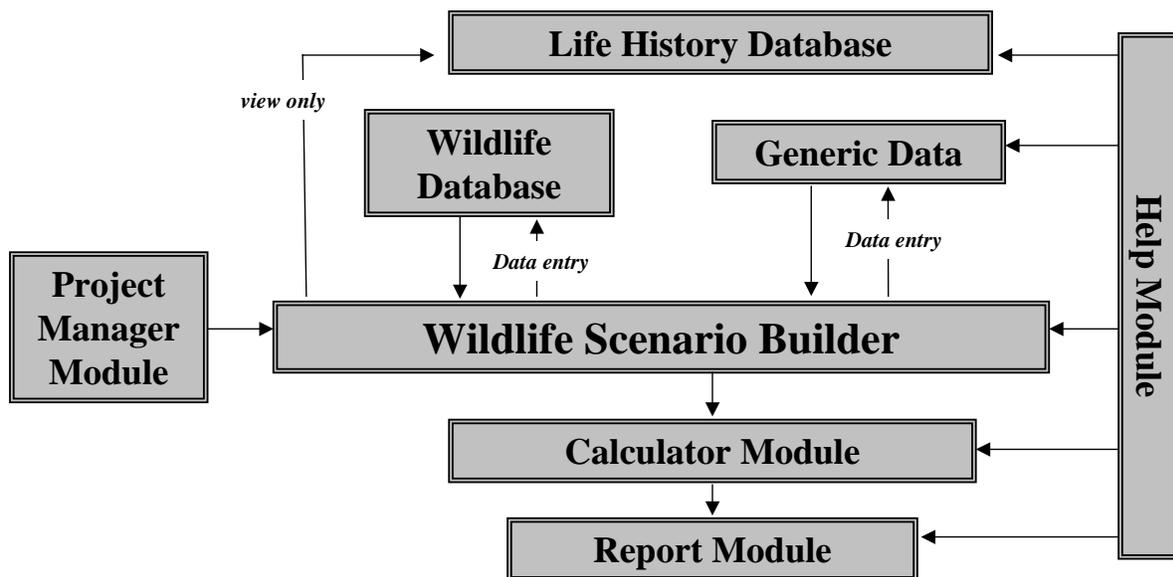
Figure 1. The organization of components of the wildlife scenario builder.

The **Project Manager** is used to document information about a project and to access (i.e., create, edit, link) relevant wildlife scenarios. A project consists of two key elements: (1) background information, including a general description of the project (e.g., its context, the purpose or circumstances of the project), its geographic location, potential contacts (e.g., author, author affiliation), and comments to facilitate the interpretation of exposure estimates; and (2) links to all wildlife scenarios required for the intake calculations of interest.

In the **Scenario Builder**, data for characterizing the wildlife organism are entered. The species, weight, and diet, as well as intake rates for air, water, food energy, soil, and sediments, are all entered when creating a scenario.

The **Calculator** executes and displays all calculations. This component performs calculations associated with the wildlife scenario, including (1) organism-specific daily requirements for air, water, and food and incidental ingestion of soil and sediments; and (2) conversion of calorie-based dietary requirements to weight-based dietary requirements based on the caloric content of the different diet items and their proportion in the diet on a wet-weight or dry-weight basis.

Reports can be generated after the calculations have been completed. The report module is the venue for obtaining hard-copy (printed) output from the WSB. Users can print directly to a printer, print in Portable Document Format (PDF) (if Adobe PDF Writer is loaded), or copy and paste the report pages to another program as image files.

1.2.2.2. *Databases*

The **life history database** and the **wildlife database** contain information on 49 North American species of wildlife, including 24 species of birds, 17 species of mammals, 3 species of amphibians, and 5 species of reptiles. The life history database contains natural history information (e.g., population dynamics distribution, habitat, diet, reproductive and other seasonal activities) and physiological data (body weight and intake requirements for air, water, and food/energy) that are most relevant to wildlife exposure assessment, as well as information on ecologically similar species of the same class. The database is a supplemental resource. It includes the data in the wildlife database and additional species-specific information and can be accessed outside of other WSB functions. The information in the database was extracted primarily from EPA's *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993). Existing records cannot be modified and new records cannot be added. The database has undergone a basic quality review by Environment Canada (Canadian Wildlife Service) personnel.

The wildlife database and the **generic data** comprise the principal input parameters used to calculate the diet. Species-specific data include body weights and diets. Generic values include allometric equations, assimilation efficiencies, and moisture and gross energy contents. The wildlife and generic databases are populated with base inputs. These data cannot be modified and are qualified on the basis of the review.

Data within each database are qualified with one of the following codes:

EPA-Vetted: EPA contractors and staff performed the final quality assurance review.
CWS-Vetted: Environment Canada staff performed a quality assurance review.

User-entered data can be modified and is qualified as User-Vetted, i.e., no external regulatory quality assurance review occurred. Each user is responsible for quality assurance. User-entered data are also listed as User-Defined and User-Modified in the WSB.

1.2.2.3. *Data Entry*

The WSB contains **data entry** options where the user can directly enter wildlife data or generic data. Data entry in this portion of the WSB directly supports application operation through the wildlife database. Two types of data entry are available. First, the user may enter data for specific species. For species-specific data entry, all input parameters (e.g., species name, weight, and diet [intake rates rely on allometric equations]) are entered in a wildlife database. Second, the user may enter generic data applicable to wildlife groups. These data are entered by category, such as allometric equation, assimilation efficiency, and gross energy.

1.2.2.4. *Help System*

The internal **help module** provides documentation and assistance, including definitions, explanations, and instructions for the WSB. Access to help is provided through the **help** header on the application screen or through issue-specific clickable help icons.

1.2.3. Input Data

To estimate intake and metabolism, the user begins by creating a **project** that includes the wildlife information needed to estimate exposures. General information about a project is saved in a project file identified as a "*.PWC" file in the project subdirectory of the WSB (e.g., program files\WSB\[USER]\Project). Data for each species scenario (i.e., combination of species exposure assumptions) for each project are saved in a separate file(s): the **wildlife scenario** builder file(s) or the "*.WSB" file. The wildlife scenario files are saved in the scenario subdirectory. Each project file identifies the wildlife scenario files that are associated with it. Two example projects and the variety of scenarios that might be assigned to a project are shown below.

Project 1. Mink Assessment	**Project 2. Aquatic-Based Wildlife**
Scenario 1. Mink Mean Values	Scenario 1. Mink
Scenario 2. Mink 95th Percentile Values	Scenario 2. Belted Kingfisher
Scenario 3. Mink Minimum Values	Scenario 3. Eastern Box Turtle

"Project 1, Scenario 1" is developed further in this guide, and practice data are integrated into each step.

Each of the wildlife scenario files (stored in *.WSB file) includes the following information:

> ***General Information***
> Species Name
> Body Weight for Scenario
> Scenario Description
>
> ***Intake Rates***
> Air intake rate (input or allometric equation)
> Drinking water intake rate (input or allometric equation)
> Food intake rate (input or allometric equation)
> Incidental soil ingestion (input or value from application)
> Incidental sediment ingestion (input only)
>
> ***Composition of Diet***
> *Basis of Estimate*
> Wet or dry weight
> Type of measurement (e.g., % volume)
> Material examined (e.g., stomach contents)
> *Diet, and for Each Diet Item:*
> Proportion in diet
> Moisture content
> Gross energy content
> Assimilation efficiency
> Trophic level

For a given project and wildlife scenario, only one value is input for each wildlife exposure parameter. In order to represent average characteristics of the local wildlife population and characteristics that might maximize exposure, separate wildlife scenarios must be created for the average values and the values that would maximize exposure.

1.2.4. Wildlife Scenario Builder Output

After a project and its associated wildlife scenario files have been created, the user initiates calculations. The calculations follow the approach described in the EPA's *Wildlife Exposure Factors Handbook* (U.S. EPA, 1993). The completed calculations are displayed on the monitor (user interface) and can be sent directly to a printer or saved as a file on a disk (e.g., PDF file if Adobe Acrobat PDF Writer is installed). Documentation of the data and models used to perform the calculations can also be printed or saved.

1.2.5. Flow Chart

The general steps for developing a project and its scenarios and to obtain the printed report are outlined in Figure 2.
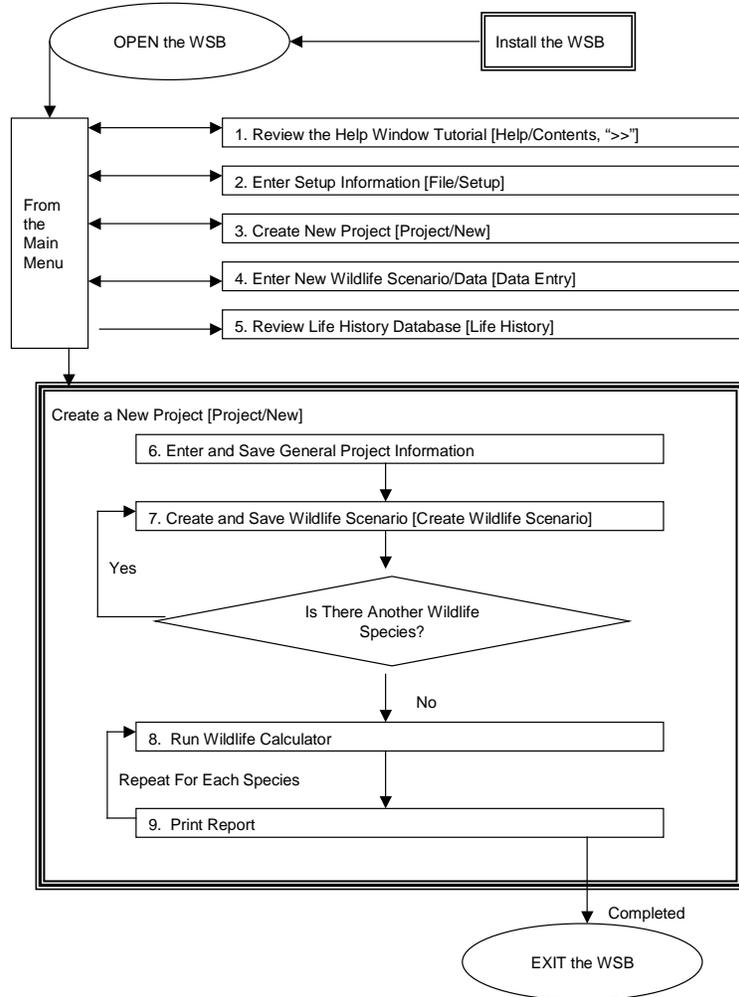

Figure 2. Overview of steps for using the Wildlife Scenario Builder (WSB), Version 1.0, Beta Test.

2. STEP-BY-STEP GUIDE TO USING WSB

This section provides a step-by-step guide to using WSB (Version 1.0, Beta Test). It covers installation (Section 2.1), database modification (Section 2.2), starting a new project (Section 2.3), creating a wildlife scenario (Section 2.4), running the calculator (Section 2.5), and printing out the results (Section 2.6). We highly recommend that new users work through the practice scenario that begins in Section 2.3.

2.1. INSTALLATION, SETUP, AND INTRODUCTION

2.1.1. Installation

Installation instructions are provided below. Although installation has not been tested on every computer configuration, it has been tested on a number of Microsoft Windows platforms. Installation suggestions are provided to ensure a smooth process.

Before installing the WSB, the user should verify that the target PC has the following specifications:

- Pentium 586 MHz (or equivalent) or faster processor;
- At least 50 MB of hard disk space;
- Microsoft Windows 98, 2000, XP, Vista, or Windows 7; and
- VGA or higher-resolution monitor set at 1024 × 768.

The WSB communicates with a Microsoft Access database. However, the program does not require Microsoft Access in order to function.

Before reinstalling WSB, complete a full uninstall and search for the C:\Program Files\WSB folder. If this folder is still present after uninstalling the program, manually delete the folder and contents. This ensures a clean installation. *NOTE: A new installation will erase any database additions created using the active WSB installation.*

To install the WSB:

1. Exit any applications that are running. Close programs that run in the background,

> **TIP: HELP FILES IN WINDOWS 7**
> The Help files were created in Windows Help format, which is not provided in Windows 7. Downloading WinHlp32.exe from the Microsoft Support Center will enable these files to be accessed.

> **TIP: RE-INSTALLATION**
> All entered data will be lost upon reinstallation. Save the database and project files for future use in a new folder before reinstalling the program.

such as Microsoft Office and electronic mail.

2. Move the installation files to the PC hard drive prior to launching setup.

3. Launch the Setup.exe file (Figure 3).

Figure 3. The WSB introductory setup pop-up window and warning regarding open applications.

4. Follow the instructions on the screen to install the WSB.

5. Click <u>OK</u>. *NOTE: If the user exits the setup process (by clicking <u>Exit Setup</u>) at any point in the process, the setup program will step through the removal of installed files up to the interruption point (Figure 4).*


Figure 4. A warning box appears when the user exits the setup program in progress.

6. To change the installation directory, click the <u>Change Directory</u> button. Otherwise, click the large desktop button (Figure 5).
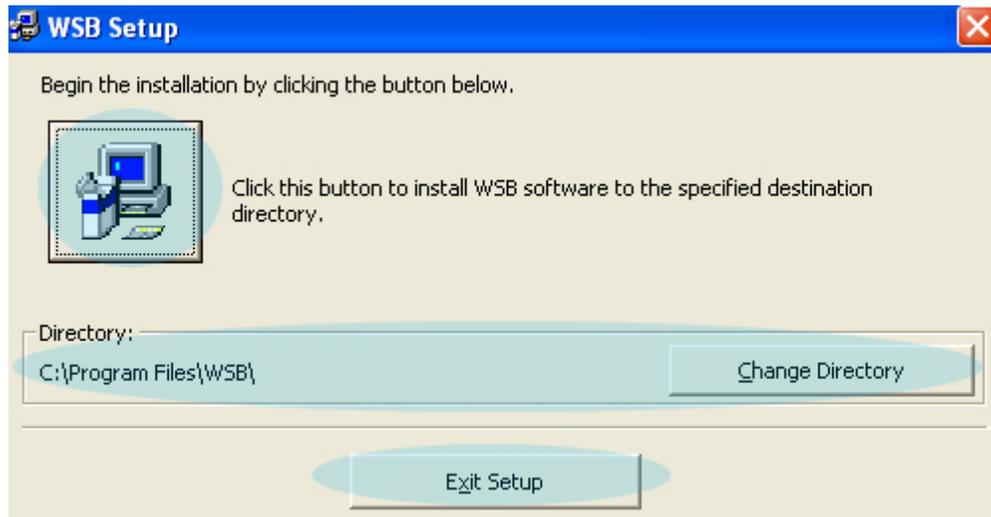
Figure 5. The user is offered three options during setup: (1) install the program in the default directory, (2) modify the target directory, or (3) exit setup.

The program may now be opened and accessed. The program is found under WSB under Programs and is WSB 1.0. To start the WSB, click on the desktop icon. The logo for the WSB appears in the center of the screen for a few seconds, followed by a gray window requesting completion of entry of setup information. Click <u>OK</u> (Figure 6).

2.1.2. Setup

General program setup screens appear when the WSB application is opened for the first time. These setup screens can also be accessed by clicking on File/Setup from the primary WSB screen. Four setup screens require user attention:

> **TIP: INSTALLATION**
> If updated program files have been provided, after completion of installation, click on C:\Program Files\WSB. Copy the new files into this folder and overwrite the existing files.

> **TIP: PROGRAM ERROR ON STARTUP**
> In some cases after installation, the MS Access database (wsb.mdb) is set to read-only. This will prevent the program from opening. Right-click with the mouse on the database file and deselect read only. Re-open the WSB.

Figure 6. When the installation process is complete, the user is prompted to set up the newly installed program.

- General setup information,
- Comments setup information,
- User setup, and
- Reports setup information.

Navigation from screen to screen is accomplished by clicking on the folder tabs. This form of navigation between screens is used throughout the WSB.

2.1.2.1. *General Setup*

The setup screens are presented below. In the first setup screen, the General Setup tab indicates where various files in the WSB are stored (i.e., drive and directory path) (Figure 7). The user may select where the project files are stored on the PC. By default, the WSB creates subfolders and establishes linkages for data storage within the WSB program file.

At a minimum, it is recommended that all files be stored on the PC used for the WSB application (not on a network or web-based storage). As general practice, accept the WSB default file locations. Although the WSB may be able to track new file locations, to ensure program and file stability, it is recommended that file locations set by the WSB remain unchanged. Moving project files will destabilize the WSB.
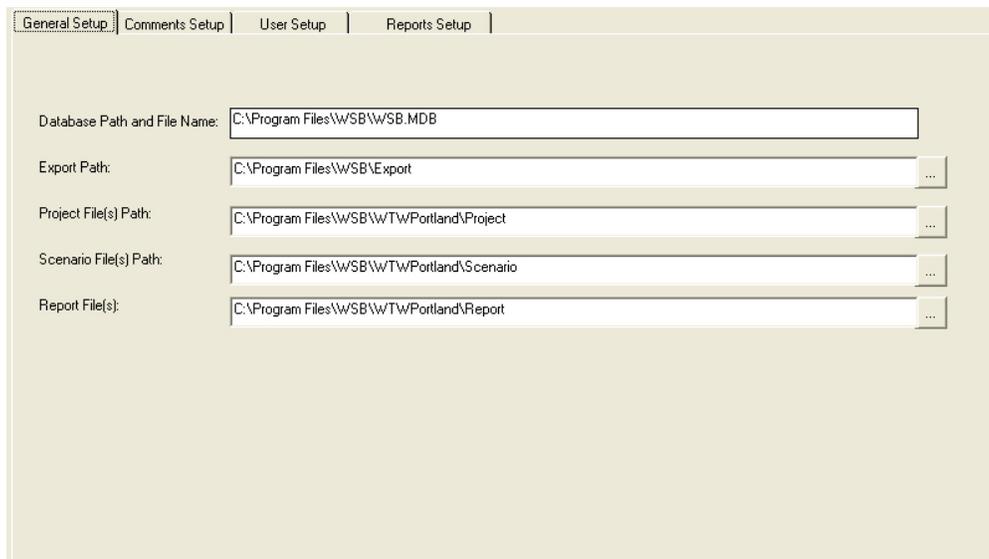
Figure 7. From the General Setup screen, the user can modify the program file storage locations. Accepting the default locations is recommended.

2.1.2.2. *Comments Setup*

In the second setup screen, Comments Setup, the user specifies the name of the different comment fields (Figure 8). Comments are tracked by the WSB. The default template for entering comments on the input data includes four subheaders:

- Rationale (for selecting/using that particular input value),
- Quality (for any data quality issues),
- Assumptions (for assumptions that accompany use of the input value), and
- Uncertainty (for the major uncertainties associated with using that value for a specific project).

Two lines of comment space are saved for each subheader. On this screen, the user can modify one of the default comment fields or add additional comment fields. Note that any field entered or modified on this screen will appear in all projects created using this WSB application installation. To edit a comment, click on an existing comment and type over it with the new name. To add a comment field, enter the name in the entry cell and click Add.

2.1.2.3. *User Setup*

On the user setup screen, enter name and business contact information (Figure 9). This information is not required to run the application, but entering this information is recommended.
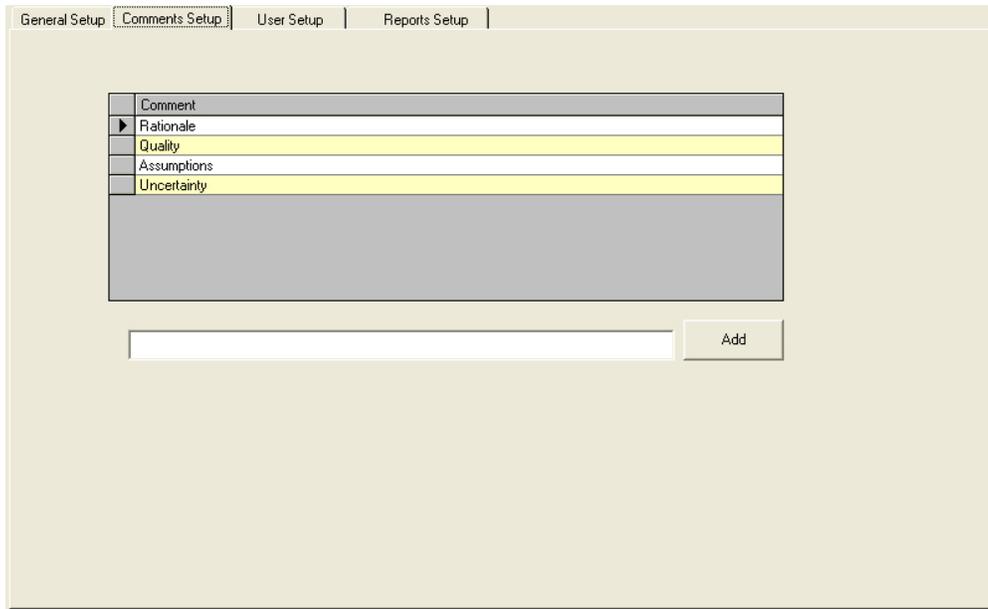
Figure 8. In the Comments Setup screen, the user can modify the comment headers that will appear in all files created from this installation.
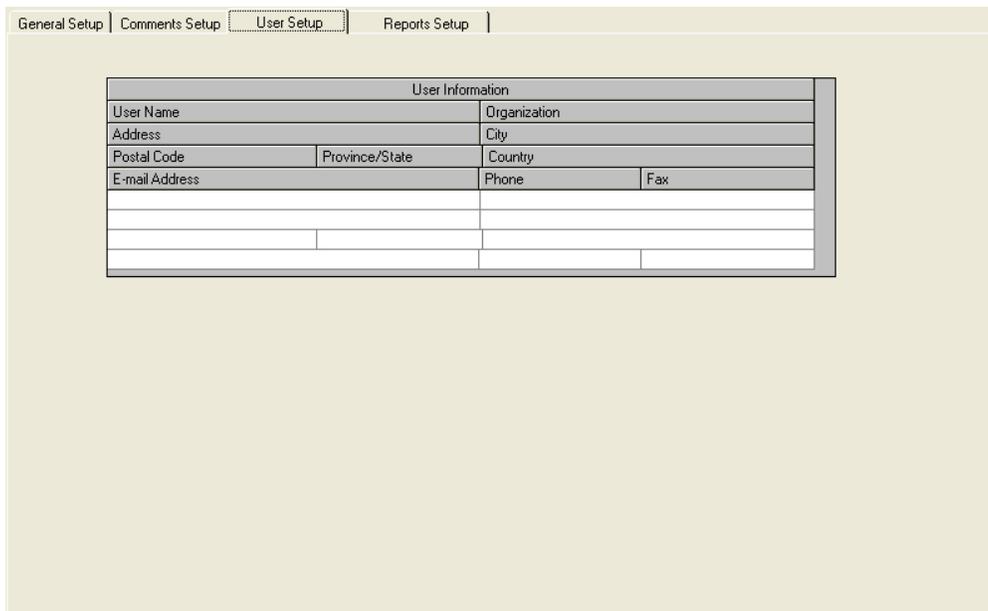
Figure 9. Enter user information (name, company, address, contact information) for the specific installation of the WSB.

2.1.2.4. *Reports Setup*

The final setup is the reports setup (Figure 10). Report headings are generated automatically and provide the file name, date, and report type. This feature is not operational in Version 1.0, Beta Test of the WSB.

Figure 10. Enter standard report headers that will appear in all reports generated from the specific installation.

2.1.2.5. *Exit WSB Setup*

Once the setup information has been entered, click <u>Save</u> to return to the home screen for the WSB. The WSB automatically saves entered data as the user moves from one tab to the next. However, periodically click the ▣ button to confirm that all entries are saved.

To exit without saving changes made under a tab, click on the 📂 button (or the ✖ button in the upper right hand corner of the screen).

The information entered under <u>WSB Setup</u> will apply to all subsequent uses of this WSB installation. Thus, repeating this step is not necessary unless a change to existing setup information is required.

When the exit process is complete, the application returns to the primary WSB project screen.

2.1.3. WSB Introduction

To use this program for the first time, the user may click on the <u>Help</u> option (far right), then <u>Contents</u>. This will open the window entitled "Help in the WSB." Clicking on "Help Index" brings up a window entitled "Welcome to WSB 1.0." From this window, the user may proceed through a series of help records using the ">>" button on the help menu bar. *NOTE: clicking on "Help Topics" will bypass the ordered series of help records and open a specific index topic.*

For an organized tutorial on WSB use, the series of help windows includes the following:

- What is the WSB?
- How the WSB Works
- WSB Structure
- Getting Started
- Getting Help
- Contacts
- Development Team
- Project Funding
- Technical Details

In many of the help windows, there are links to additional help windows. The links are identified in underlined green text. Clicking on the <u>Back</u> button will display the previous window. If the font size in the help windows is too small, click on the Options selection on the help main menu bar and change.

Exit the help tutorial by clicking on the ✖ button in the upper right-hand corner of the help window.

Each screen in the WSB also contains a ? button for accessing a help page specific to the screen.

2.1.4. Control Buttons and Menu Icons

The main menu bar selection and the generic control buttons for the user screens for the WSB are shown below. The functioning of the main menu bar selections above the icons (i.e., File, Project, Data Entry, Life History, and Help) are discussed above. The functions of the icon buttons on the main toolbars are described in Figure 11.

2.2. ADDING DATA TO WSB DATABASES

The wildlife database contains wildlife exposure values and input parameters for the exposure calculations. The life history database includes expanded information on the life history of each species described in the wildlife database. The databases are available to the user on all data entry screens within a wildlife scenario through the <u>Select From Database</u> button. The user may enter new wildlife species and exposure parameters into the wildlife database; however, existing entries may not be modified. The new database entries will be available for use on any projects created with the specific WSB installation. As discussed above, data in the

distributed database have been reviewed. New entries or modifications of existing entries will be assigned the label "user-vetted" or "user-defined."

The two primary tool bars in the WSB include:

AND
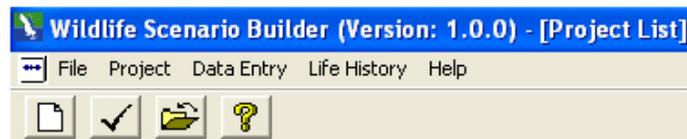
[New]	:	Create a new project, scenario, or other type of record (NOTE: in the life history database, it is also used to clear the search criteria
[Open]	:	Open an existing project, scenario, or other type of record
[Close]	:	Close the current project, scenario, or other type of record
[Save]	:	Save the entered data
[Check]	:	Select this item for the scenario
[Plus]	:	Perform the calculations (e.g., wildlifee intake calculations)
[Print]	:	Print the report
[Help]	:	View Help Index files

Figure 11. Functions of the icons on the main toolbars.

16

The two data entry options are <u>Wildlife Data Entry</u> (Figure 12) and <u>Generic Data Entry</u>. In addition, the <u>Life History</u> selection on the main menu bar provides a database query tool for reviewing supplemental data in the life history database; data entry into the life history database is not available.

<div style="border: 3px solid black; background-color: #ccffcc; padding: 10px;">

TIP: DATABASE UPDATES
The WSB databases are specific to the installed program. As a result, additions created in one version will be lost should the WSB require reinstallation. Remember to save any new additions as a Microsoft Access database under a new file name in a separate folder. Although this has not been thoroughly tested, it may be possible to save the database, reinstall the WSB, and then replace the new database with the old one. The databases are provided as read-only MS Access files. Before using the WSB, verify that the read-only checkbox has been deselected.

</div>

Figure 12. The primary wildlife database entry form includes three primary data inputs: species, weight, and diet. Intake allometric equations are entered in generic data entry.

2.2.1. Wildlife Data Entry

The WSB includes a comprehensive relational database, the wildlife database. This database contains input values that can be used within the WSB. However, some users may wish to add new species and data. From the main menu bar under Data Entry, select Wildlife Data Entry. This screen is dominated by a large table of existing species data. The user may sort by taxon or use the Browse Species Information button to apply more detailed sorting tools. To enter a new species, click on an empty row in the wildlife data entry table or click on the 🗋 (add new record) button. This will open a new data entry screen consisting of three input tabs: species, weight, and diet (Figure 12). Enter the information required under each of these tabs. Where available, the user may click on a button to select data from a list of inputs (e.g., Classification). As discussed above, entered data will be labeled as user-vetted, indicating the lack of EPA review.

> **TIP: NEW DATA FOR EXISTING SPECIES**
> Database functionality will not permit modification of EPA- and CWS-vetted data. However, users may enter additional diet and intake study data to an existing record. In addition, the user can enter a new record with a modified name, e.g., Robin2, and new data. Finally, the user may modify existing records within a wildlife scenario, but the modifications will not extend to the database and are therefore not permanent.

2.2.2. References

References may be included for all inputs. To select references, begin by clicking on Add References in the bottom right-hand corner of the main input screen. This displays the full list of

> **TIP: ADDED REFERENCE NOT IN LIST**
> If a newly added reference does not appear in the reference list, close the reference screen and reopen. The reference should now appear in the master list.

references already included in the database or added previously (Figure 13). If the applicable reference is already in the database, highlight it and click Select. The reference will appear in the lower half of the screen with four option check boxes. Check off which references apply to which input types (distribution, habitat, diet, or related). To add a new reference, click on the 🗋 button. A reference data entry screen will appear. Save and close this screen when reference entry is complete. Next, select the new reference

> **TIP: ALLOMETRIC EQUATIONS**
> The base allometric equation may not be modified. However, new inputs may be entered in Generic Data Entry.

from the reference list. Click the 📂 button to close and return to the data input tabs. New species information, once saved, will be part of the overall database for this specific WSB

installation. Clicking on the Reference button next to each species description will highlight the applicable references in the lower half of the screen.
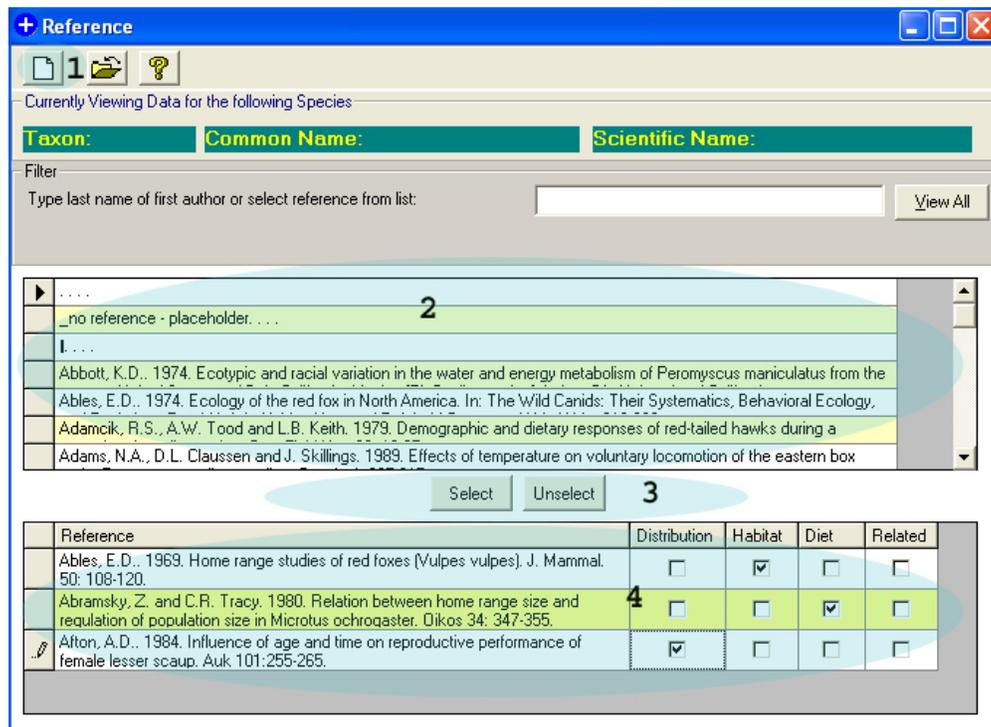

Figure 13. References are sorted (2), selected (3), and categorized (4), from this primary reference screen. New references may be added by clicking on the "add new record" button (1).

2.2.3. Generic Data Entry

In addition to entering new species exposure data, users may also enter exposure modeling data. These data generally do not apply to a single species, but rather to a group, such as mammals. Data entry, therefore, is separate from the species-specific data entry. Under Generic Data Entry, the user can enter data for allometric equations, assimilation efficiencies, gross energy, moisture, soil ingestion, and trophic level (Figure 14). Each option is accessed through Data Entry/Generic Data Entry on the main menu bar.

> **TIP: INACTIVE KEYS**
> On some pages, function keys and pull-down menus may appear to be active but will not perform any function. For example, on the data entry screen, the Data Source pull-down menu appears to be active. However, the user cannot modify the selection. Any function key that does not appear to function should be considered locked for that window/operation. Clicking on the inactive keys, though frustrating, will not corrupt the data or scenario.
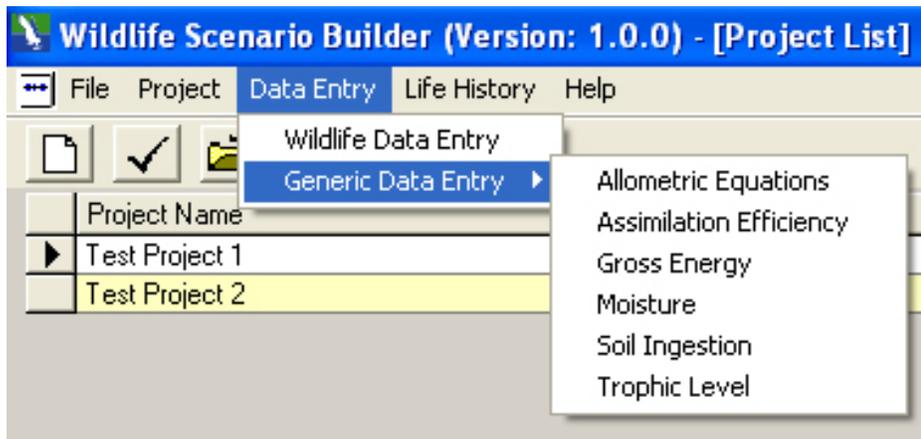
Figure 14. Access the generic data entry windows through the data entry tab on the main WSB.

When a data type is selected, a window opens with a table of existing data (similar to the reference section) (Figure 15). The user may click the button to create a new entry using a formatted data entry screen for the particular data type (Figure 16). When the data have been entered, click , then exit the screen. During application setup, the user may select this newly entered data for a particular scenario/project.

Figure 15. A sample of a generic data summary table of available inputs. In this case, a summary of assimilation efficiencies is displayed.

Figure 16. A blank generic data entry form.

2.2.4. Life History Database

The life history database can be accessed as a supplemental information source; however, it is independent of operations within a project/scenario file. This database may also be accessed from within the WSB using the Browse Species Information button. The life history database includes the data from the wildlife database as well as additional life history information. Data in this database are in both narrative and numeric formats. In contrast to the wildlife database, the data may not be drawn directly into the WSB from the life history database.

To access the life history database from the main menu bar, click on Life History. This opens a user-friendly database interface that allows the user to scroll through all species in the database and also provides sorting functionality (Figure 17). By entering a species name, selecting a taxon from the pull-down menu, or entering diet, habitat, or trophic levels and then clicking the ▶ button, the user can apply the entered criteria to sort the data.

> **TIP: ACCESSING LIFE HISTORY RECORDS**
> Once the species of interest is located in the list on the main life history database screen, open the record by double-clicking the mouse. Using the select ☑ button will result in a WSB program error, requiring a computer restart.
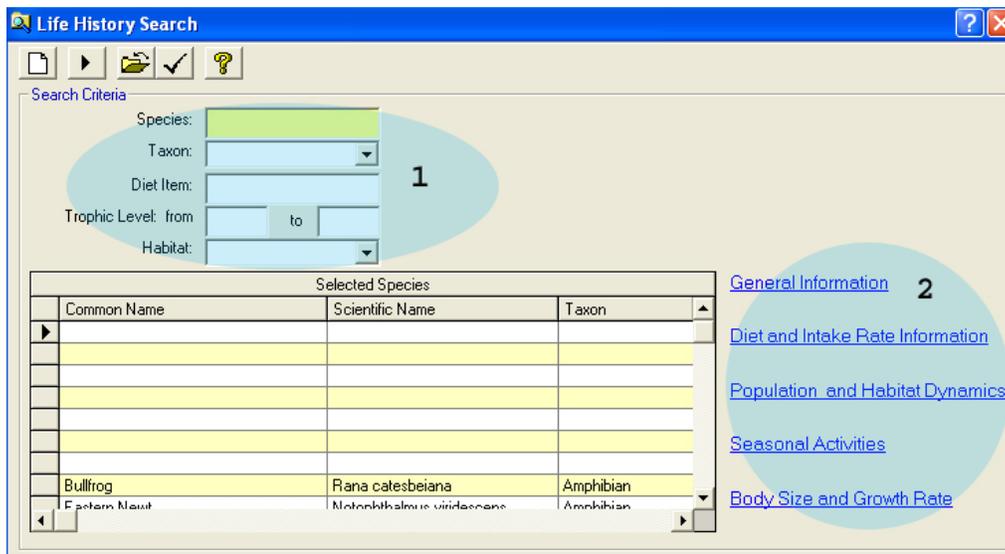
Figure 17. The search/filter tool within the life history database provides the user with multiple search options (1). Once a record is located, the user can select the information type to view (2).

2.2.4.1. *Using Search Criteria*

Five types of search criteria are available: species, taxon, diet item, trophic level ranges, and habitat (Figure 17). To locate a specific species, enter the species name in the field. A partial name may also work. After entering the name, click the search ▶ button. Taxa such as birds or mammals may be selected from the pull-down menu to narrow the options. For the user who is unsure which wildlife species to examine in a project, the remaining search criteria may be of assistance:

- Habitat: Select a habitat from among the drop-down list of options (▾ button).

- Trophic Level: Select a range of trophic levels (e.g., 3.5 to 5.5 for top carnivores). The trophic level must be entered as a range and not a single value. A single value will return a null set. The ranges are selected to include a range of species. Trophic level refers to the position of an organism (either predator or prey) in the food chain. Organisms at the lowest trophic level are plants, which, by definition, derive their energy from the sun. Organisms at the second trophic level are herbivores (animals that consume plants). Organisms at the third trophic level are primary

> **TIP: HABITAT SEARCH CRITERION**
> Once a habitat is selected as a search criterion, habitat must be used in all future searches, i.e., there is no option to deselect habitat. To initiate a search without habitat, close the search tool and reopen.

22

carnivores (animals that consume herbivores) or omnivores (animals that consume plants and herbivores). Organisms at higher trophic levels are secondary carnivores (animals that consume carnivores) or omnivores (animals that consume plants, herbivores, and carnivores).

- Diet Item: Type in the name of a diet item of interest (e.g., fish).

2.2.4.2. *Viewing Life History Information*

Once a species has been selected from the list, the user can view a range of life history information. To open a record, highlight the species name on the main menu bar of the database and double-click the mouse to open the record. Five categories of life history information are provided in the database as indicated in the blue underlined text at the right-hand side of the window. Highlight one of the species in the species list and then click on a category of information to view. Once entries matching the sort criteria are highlighted, the user may choose to view general information, diet and intake rate information, population and habitat dynamics data, seasonal activities data, or body size and growth rate data. Functionality is read-only.

> **TIP: LIFE HISTORY DATA VIEWING**
> If the user clicks on a specific information type to view from the Life History Search screen (e.g. diet and intake rate information) before selecting a species on the Search screen, WSB may generate an error message and the program may close, requiring the user to restart. Always load a species in the search screen prior to viewing detailed information.

2.3. STARTING A NEW PROJECT

The WSB operates on a file called a project. A project may represent a site or a portion of a site, but it is the unit of operation for the application. Each project is divided into scenarios. A scenario represents an application run for a single species and set of inputs.

To create a new project, start by selecting Project/New from the main menu bar (Figure 18) to display the data entry window titled [Project]. Later, Project/Open may be used to access an existing project from the subdirectory C:\WSB, which will display the information saved under the project file name in the [Project] form window. A project must be created before any scenarios can be developed.
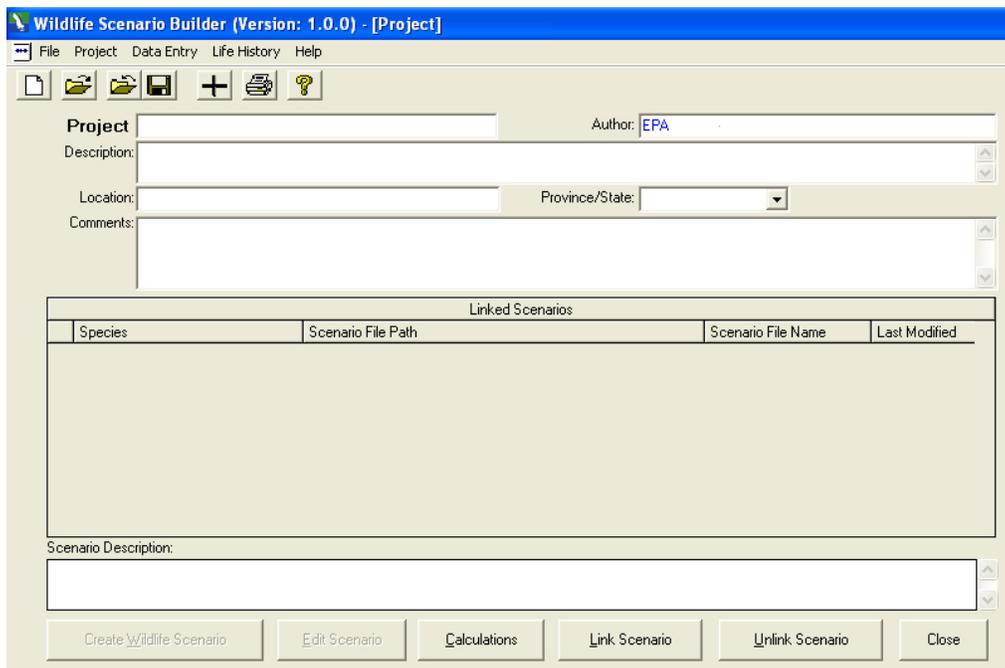
Figure 18. The project setup screen summarizes overall project information and serves as the entry point for creating and editing wildlife scenarios.

During project creation, provide a project name. After entering the project name, enter other project information, including author name, description, location/state, and additional comments (Figure 19). Project documentation is an important component of project setup, though not required. The fields for documenting a project include "Description" and "Comments." They are valuable for summarizing key assumptions or providing other users with project/site details that may not be apparent from the entered data in the other screens.

TIP: AUTHOR NAME
The author name listed in the project information screen does not appear on the project reports. Instead, the name that appears on the reports is the name entered under Program Setup (General Information). Also, the names "created by" and "modified by" do not appear on the scenario or species reports. To associate printed reports with scenarios, use a descriptive scenario file name (e.g. mink – mean – j smith). The file name will be printed in every report header.

24
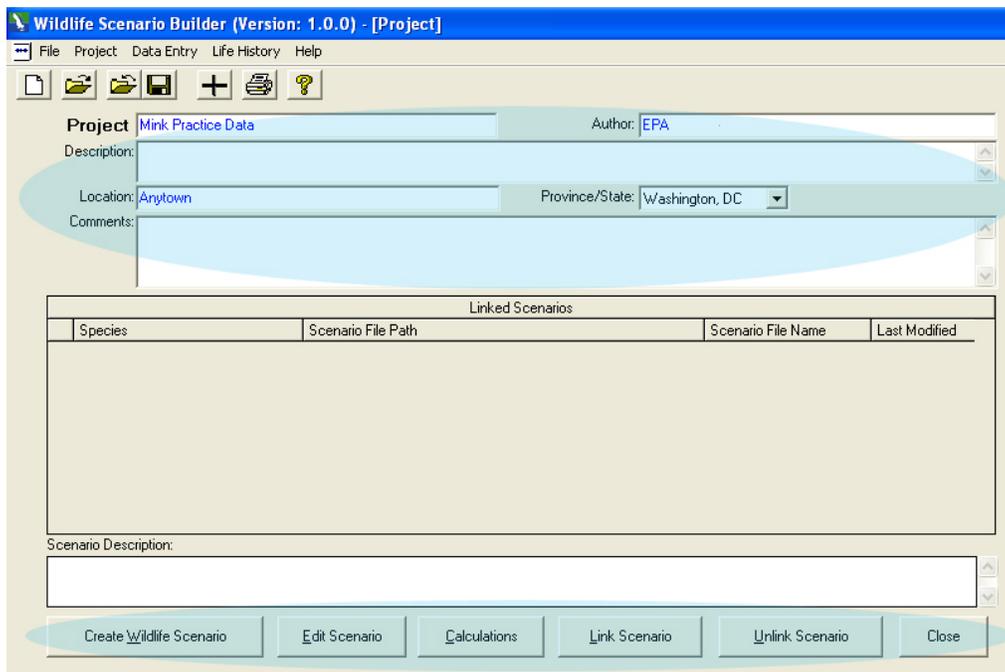
Figure 19. The highlighted areas require user input and offer wildlife scenario function keys.

Click 🖫 to save the project and provide a file name. Once the project is saved, the scenario editing buttons become active. After a project has been created and saved, the user may delete the project by highlighting the project row and pressing the delete key on the keyboard.

► *PRACTICE SCENARIO – Create A New Project. Either click on the* 🗋 *button or click Project, then New. Enter a project name (e.g., Mink Practice Project). Next, enter the author name, a description of the project that includes date and time, location, and any other comments. Click the* 🖫 *button and enter a file name for the project (e.g., Mink Test Case). After saving the project by clicking OK, the scenario building tools will be active. (NOTE: The user cannot enter comments*

TIP: LINK AND UNLINK
Scenarios, when developed, are assigned/linked to the open project. Although an unlink button and a link button are available, these buttons have limited functionality in this version of the WSB. This unlink button may be used to delete/remove a scenario from a project. To move scenarios between computers and projects, replicate the path/folders on the destination folder and copy and paste the target scenario in Windows Explorer.

in the scenario description field at the bottom of this window. That field shows the descriptions of the wildlife scenario after they have been created.) To exit the project, click on the close

25

folder ⬚ *button or the* ⬚ *button in the upper right-hand corner. To continue building the project, do not exit this window. Instead, click on the* <u>*Create Wildlife Scenario*</u> *button at the bottom of the window.*

2.4. CREATING A WILDLIFE SCENARIO

To create a new wildlife scenario, open the project window. Click on <u>Create Wildlife Scenario</u> at the bottom of the project window. Once created, the scenario inputs may be revisited and edited (<u>Edit Scenario</u>) as needed.

> **TIP: DELETING A WILDLIFE SCENARIO**
> To remove a wildlife scenario from a project, highlight the scenario and click <u>Unlink</u>. To delete a scenario permanently, locate the following folder C:\Program Files\WSB\ [USER NAME]\Scenario. Locate the scenario file [name].WSB and delete.

2.4.1. Overview of Creating a Wildlife Scenario

A wildlife scenario consists of species taxonomic information, body weight data, diet composition, and intake rates. These inputs are either selected from the existing database or drawn from user-supplied data sources. Throughout the scenario-building process, when a required input is not entered, the WSB will provide a warning. The input screens are organized by tabs, and navigation between tabs is accomplished by clicking on the tab, name. Additional input and informational screens are nested

> **TIP: FILE SAVING**
> Once the initial project and scenario files are created and saved, the WSB saves all data entry when a screen is closed. However, to ensure data retention, it is recommended that users periodically and manually save inputs, using the ⬚ button.

within each tabbed sheet. Specific details for each input are provided in the next section.

For each tab, the user is offered two options for data entry: <u>Select from Database</u> or <u>Enter</u> <u>Hypothetical Data</u>. *NOTE: For the species tab only,* <u>*Select from Database*</u> *is the only option available because new species are entered directly into the database.*

► *PRACTICE SCENARIO – Create A Wildlife Scenario. With the Mink Practice project open, create a wildlife scenario. In this case, click on* <u>*Create Wildlife Scenario*</u> *at the bottom of the project window (Figure 20). This will open the tabbed scenario input screens (Figure 21).*
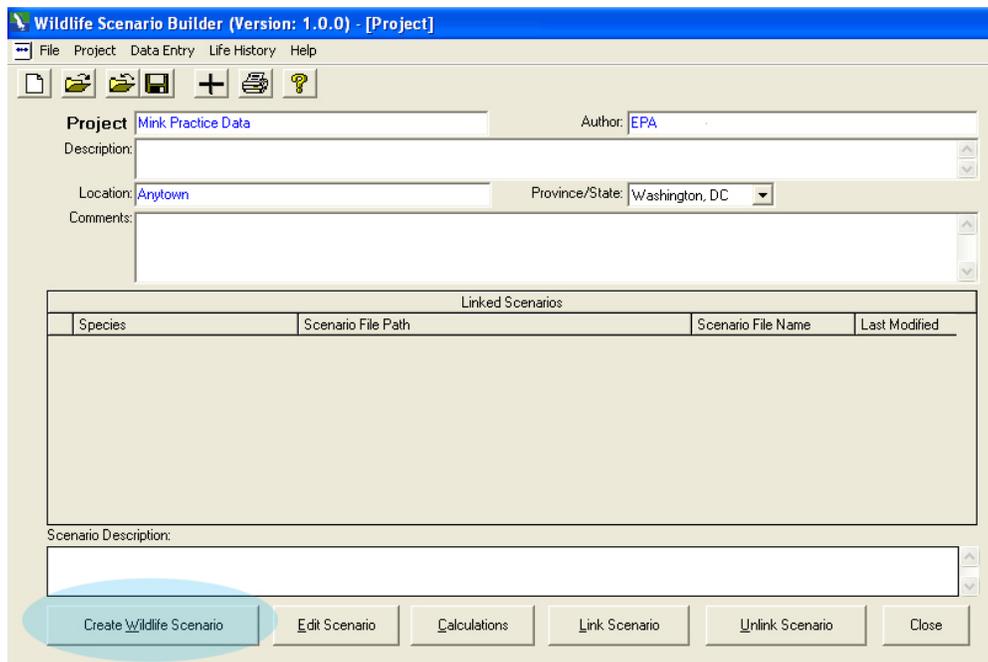
Figure 20. The first step in creating a wildlife scenario is to click <u>Create Wildlife Scenario</u> from the project window.
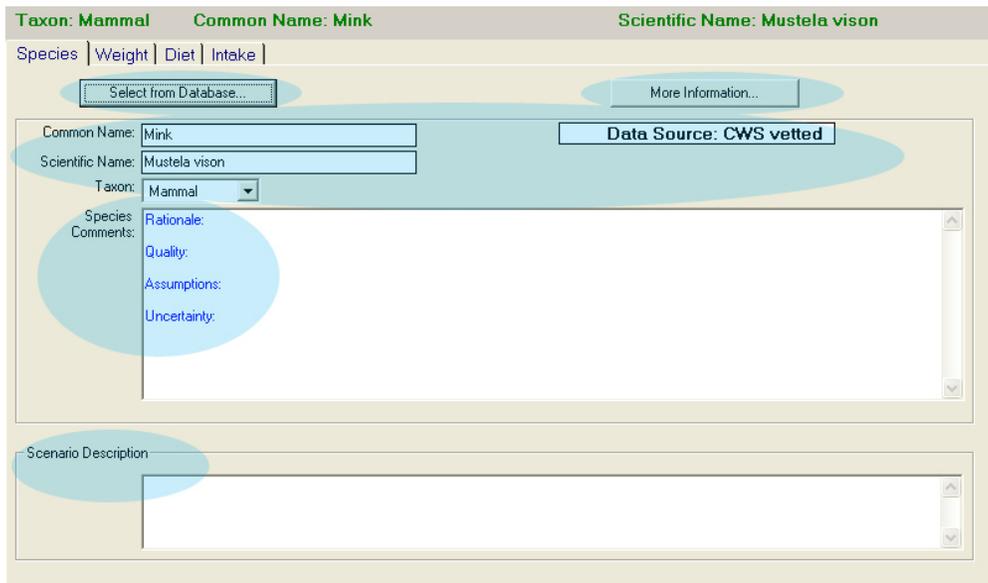
Figure 21. The first step in wildlife scenario setup is the selection of a wildlife species. All species are derived from the database, i.e. <u>Select from Database</u>. Enter new species in the database before this step. <u>More Information</u> provides a view of the entire species record.

2.4.2. Steps in Creating a Wildlife Scenario

Creating a wildlife scenario requires the selection of (1) species, (2) body weight, (3) diet, and (4) intake rates for different environmental media (Figure 21). These data entry windows are presented as four tabs in the Create Wildlife Scenario form window. Input values that can be used to practice creating a wildlife scenario are provided at the end of each subsection.

2.4.2.1. *Step 1: Select a Species*

Under the Species tab, click on the button Select from Database (Figure 21). A drop-down list of all of the species in the wildlife database will appear. The radio buttons are used to filter the list by the desired taxon (e.g., to see just the bird species in the list). If the specific species is known, highlight (click on) the species name and click the ☑ button to select that species. The WSB will then prompt the user to enter a file name for the scenario.

> **TIP: REPEATING TEXT**
> Occasionally, when adding a new species to a scenario with existing species, the Species Comments text from the previous scenario will be copied into the new scenario. Delete this text for the new scenario.

The More Information button provides access to the full database entry for the species selected. This option may be useful for screening the available data prior to selecting the remaining inputs in subsequent steps. Also, as discussed in Section 3.2.4, the searchable relational life history database is a valuable tool for researching species (click Browse Species Information to access the life history database). If the species of interest is not in the wildlife database, use the Data Entry functions described in Section 3.2.1 to enter the new species into the wildlife database, or click directly on the 🗋 button to enter a new species from the "Select from database," "Select existing species" database screen. After the species is entered, click "close the current project" icon to add that species to the wildlife database. After the new species is entered into the database, click return to select/add that species to the scenario. The WSB will then

> **TIP: SPECIES SELECTION**
> A species must be selected before the WSB will allow the scenario to be saved. Clicking the Weight, Diet or Intake tabs before selecting a species will bring up a warning about selecting a species.

prompt the user to save the file and enter a file name for the scenario. The remainder of data entry on this screen involves adding species comments, such as a rationale for selection, quality of the data, assumptions, uncertainties, and any other comment that provides insight into the selection of this species. Also, the user may enter scenario descriptions at the bottom of the

species tab. This entry area provides data that other users might need to fully understand the site and assessment goals for the specific scenario/site. The WSB automatically saves data entries when moving between tabs. However, as an extra precaution, periodically save data using the 🖫 button as well.

► *PRACTICE SCENARIO – Species Selection. The first step in scenario development is selection of the species. In this case, click on Select From Database. Using the scroll bar and the sorting keys (initial sort to mammals), locate the mink. Select the mink by highlighting it in the list and then clicking the ☑ button. This will activate the scenario file-saving prompt. Save the file as mink-practice scenario. After saving the file, the Wildlife Scenario Builder - Documentation window will be active. All of the species taxonomic information will automatically be loaded from the database.*

Enter species comments such as rationale for selection, quality, assumptions, uncertainties, or any other comments. A scenario description may also be entered. The species selected has now been saved to this scenario file. Note that from this point forward, every movement between tabs activates the saving functionality. The data are automatically saved; however, it is recommended that manual saves also be included in the process.

2.4.2.2. *Step 2: Select a Body Weight*

        Under the Weight tab, the user is offered two options: Select from

Database (to select a body weight from the WSB wildlife database) or Enter Hypothetical Data (Figure 22). (NOTE: When Select from Database is selected, the More Information tab is highlighted to provide additional detail regarding the body weight selected).

Figure 22. Under the "Weight" tab, after the <u>Select From Database</u> button is clicked, all body weight records for the selected species are displayed.

2.4.2.2.1. *Select from database.*

Click on the <u>Select from Database</u> button to see the list of measured body weights that are included in the WSB for the species selected (e.g., mink) (Figure 22). In this tool, there are a number of filtering options (Figure 23). The user can filter by status, gender, and type of estimator to select the body weight most appropriate for the species at the study site. For many mammalian species in particular, the average body weight of a population tends to vary by latitude and longitude. To select one of the records, highlight the record and click on the select ☑ button.

Figure 23. The body weight records can be filtered using the radio button sorting criteria.

When a body weight has been selected, the <u>More Information</u> button opens the full database entry for the selected study. To exit the "Currently viewing data for the Following Species" screen, click on the 📂 button to close the folder.

> **TIP: FILTERING TOOLS**
> In general, the filtering tools function only if the database data are amenable to the given filter. In most cases, the status and gender filters are operable. However, the estimator filter is not available for all entries in the database.

► *PRACTICE SCENARIO –Body Weight Selection: Click on the <u>Weight</u> tab. In this case, click on <u>Select From Database</u> and locate the "body weight = 586 grams" (data from Mitchell, 1961) from the database. This body weight can also be entered manually. Once located, highlight the row and click the ☑ button. This will populate the <u>Weight</u> tab. Enter weight comments below. For more information on the study underlying the weight value, click on <u>More Information</u>. Click to the Diet tab to save the data entries.*

2.4.2.2.2. _Entry of hypothetical body weight._

In some cases, the user may have actual site data or data from a source not included in the database. In this case, the user may enter a study under <u>Wildlife Data Entry</u> or enter the data by clicking on <u>Hypothetical Data</u>. This button opens a blank body-weight entry screen, which includes cells for the body weight, gender of the species in the study, and space to include the rationale, quality,

> **TIP: DIET UNITS**
> It is important to remember that dietary composition based on scat analysis does not reflect dietary composition of the food ingested on a wet-weight basis. Consider carefully the "Material Examined" field when selecting a diet from the WSB. It is the user's responsibility to understand the strengths and weaknesses of the dietary measure associated with a selected diet.

assumptions, uncertainty, and any other comments about the study. Hypothetical data are available only in the respective scenario and are not available in additional scenarios or the database. When the body-weight selection or entry has been completed, the data should be

saved. To save the entry and move on to select a diet, click on the <u>Diet</u> tab. The data entered in the <u>Weight</u> tab screen are automatically saved when transitioning to another tab.

Body weights selected from the wildlife database will be fully documented. <u>Hypothetical Values</u> require user documentation. Note that the hypothetical information is displayed in red text to distinguish it from data included in the WSB wildlife database.

2.4.2.3. *Step 3: Select a Diet*

As with body weight, the user with site-specific diet data or diet data from studies not included in the database can enter the information directly. In addition, users can select diet data directly from the supplied <u>wildlife database</u>.

To enter a diet not included in the WSB wildlife database, as in the case of the practice scenario, create the diet by selecting <u>Enter Hypothetical Data</u> or edit an existing diet record using <u>Select from Database</u> (Figure 24). The latter option is more efficient if the study of interest is available.

Under the <u>Diet</u> tab, there are two subtabs: <u>Diet</u>, and <u>Diet Items</u>. The <u>Diet</u> tab provides general information about a diet study (e.g., season, gender, habitat), whereas the <u>Diet Items</u> tab summarizes the input data by diet item (e.g., wet and dry weight proportion in diet, gross energy, assimilation efficiency). To begin, click on the <u>Select from Database</u> button to see the first in the series of diet composition records that are included in the WSB for the species selected (e.g., mink). If multiple records are available for the selected species, a small scroll bar will be visible on the bottom of the screen (Figure 25). Navigate through the records using the forward and backward arrows until the record of interest is in the active window.

> **TIP: ENTERING DIET DATA**
> Creating a diet can be very time-consuming. In general, it is more efficient to select an existing diet and modify that diet to meet site-specific conditions.

Once the record of interest is located on the screen, click on the [✓] select button. To view all of the information in the database associated with the diet record, click on the <u>More Information</u> button. To exit the "Currently viewing data for the following species" screen, click on the 📂 icon.

Taxon: Mammal   Common Name: Mink   Scientific Name: Mustela vison

Species | Weight | Diet | Intake |

[Select from Database]   Enter Hypothetical Data   More Information...

Diet | Diet Items

[Add Diet Item]   [Modify Current Diet Item]   [Sum Proportions to 1.0]

Diet Item	Prop of Diet (0-1) wet	Gross Energy (Kcal / g wet wt)	Prop of Diet (0-1) dry	Gross Energy (Kcal / g dry wt)	H20 %	Gross Energy Food Type	Assignment Category for GE	Assim. Eff. %	Predator-Prey Relationship for AE	LifeSta
ground squirrels	.235	1.94	.232	5.355	64.4	mammal, rat	small	91	rabbit	not rep
insect	.005	1.64	.007	5.3	51.8		insects	83	crickets	not rep
muskrat	.565	1.6	.568	4.687	63.8	mammal,	small	91	rabbit	not rep
small mammals	.099	1.37	.098	4.28	64.4	mammal, vole	small	91	rabbit	not rep
unknown mammals	.096	1.37	.095	4.28	64.4	mammal, vole	small	91	rabbit	not rep

Figure 24. The options for diet entry include <u>Select From Database</u> and <u>Enter Hypothetical Data</u>. This figure is a screen-shot of the <u>Diet Items</u> tab, accessed after pressing <u>Select From Database</u>. After a diet is selected, the user can add and modify diet item records within that diet.

Select Diet

✓ 📂 ❓

Diet | Diet Items

Data Source [EPA-vetted ▼]

Diet Item Information

Diet Item	Prop of Diet (0-1) wet	Gross Energy (Kcal / g wet wt)	Prop of Diet (0-1) dry	Gross Energy (Kcal / g dry wt)	H20 %	Gross Energy Food Type	Assignment Category for GE	Assim. Eff. %	Predator-Prey Relationship for AE
ground squirrels	.235	1.94	.232	5.355	64.4	mammal, rat	small	91	rabbit
insect	.005	1.64	.007	5.3	51.8		insects	83	crickets
muskrat	.565	1.6	.568	4.687	63.8	mammal,	small	91	rabbit
small mammals	.099	1.37	.098	4.28	64.4	mammal, vole	small	91	rabbit
unknown mammals	.096	1.37	.095	4.28	64.4	mammal, vole	small	91	rabbit

Current Diet Item Reference:

Arnold, T.W. and E.K. Fritzell. 1987. Food habits of prairie mink during the waterfowl breeding season. Can. J. Zool. 65:2322-2324.

|◀ ◀ Record: 1 of 19 ▶ ▶|

Figure 25. Use the record scroll bar to view multiple diet records, if available.

The diets may be modified from the diet displayed in the database. To modify the parameters for one of the diet items in the diet selected from the database in the previous step, highlight the diet item of interest and click Modify Current Diet Item. The next window displays data for that record and allows the user to modify the inputs (Figure 26). Each characteristic of the diet may be modified by clicking on the appropriate selection, i.e., classification, moisture content, trophic level, gross energy, or assimilation efficiency. However, if the record selected is from the database, these values should be reasonable. At the bottom of the screen, the user may modify the proportion of the selected item in the overall diet. Enter either wet weight or dry weight proportion in the diet. The WSB does not convert from one to the other at this point. When the calculations are initiated, the user selects either wet or dry, and at that time the WSB makes the necessary conversions.

> **TIP: WET VS. DRY WEIGHT**
> When modifying a diet item percentage, the user may specify a new percentage in either wet or dry weight. In this version, an entry in one of the fields (wet or dry) does not result in a corresponding change in the other field. The proportions in the other field will be recalculated as needed when the user clicks Sum Proportion to 1 on the main diet item interface. When entering new diet information, modify all of the proportions for all diet items in a given diet using only the wet weight or only the dry weight fields. When clicking Sum Proportion to 1, highlight wet weight if wet proportions were selected or input. This will modify the dry proportions appropriately.

NOTE: When manually entering proportions of diet items for every item, clicking Sum Proportions to 1 will result in an error. Click OK and continue working with the WSB. The correct calculations have been recorded.

The user may also add diet items to an existing, database-selected diet. Click Add Diet Item to add a new row. Enter the required inputs for the new diet item. For all database selections, locate the entry of interest and click [✓] to select the input.

To delete a highlighted diet item, highlight the specific row and press the [Delete] key. The program will ask the user to confirm the delete request. *NOTE: Once a CWS/EPA-vetted diet record is modified, the "Data Source" for the diet changes from*

> **TIP: SUM DIET PROPORTION TO 1**
> To obtain a desired proportion for each diet item, enter each one manually, ensuring the total sums to 1. The user should click Sum Proportions to 1 after the modifications and select wet or dry weight, as appropriate to the given scenario. NOTE: when manually entering proportions of diet items for every item, clicking Sum Proportions to 1 will result in an error. Click OK and continue working with the WSB. The correct calculations have been recorded. The WSB does not hold user-specified proportions constant when the Sum Proportions to 1 function is used to generate wet from dry weight proportions or vice-versa. Because of rounding errors, diet proportions may change slightly if the user iteratively sums proportions to 1 based on wet and dry weight.

34

Figure 26. In most cases, when modifying a current diet item, the user will modify the proportion of that item in the diet. However, the user can also modify parameters such as assimilation efficiency and gross energy.

Once all diet item proportions have been modified in either the wet-weight or the dry-weight column proportion field, the Sum Proportions to 1.0 button may be used to accomplish the following tasks. First, the WSB recalculates all of the proportions for the *selected* column (e.g., either wet weight or dry weight) so that they sum to 1.0. The

> **TIP: BLANK DATA ENTRY FIELDS**
> In many of the data entry windows, there are data fields that are blank and cannot be filled, even after clicking NEW. These are data entry windows that must first be filled via another data entry window before the data appear in the field.

calculation algorithm maintains the original relative proportions among all of the diet items in the selected column. Second, the WSB recalculates all of the proportions for the *other* column (i.e., dry or wet) so that they reflect the proportions for the selected column and the water content of each diet item. Finally, the proportions for the other column are adjusted to a sum of 1 on the basis of the new proportions. Therefore, if the user selects wet weight for the calculations and clicks on Sum Proportions to 1/Wet Weight (indicating that the user is running the calculations with wet weights), then the dry weight proportions will be modified to reflect the wet weight proportions (however, rounding may result in different percentages).

The user may also Enter Hypothetical Data. Click on Enter Hypothetical Data and the WSB will ask if the data are wet weight. A warning about overwriting existing data will appear.

Finally, a blank Diet Items screen (or Diet tab) will appear. Click Add Diet Item to begin assembling the customized diet.

► *PRACTICE SCENARIO - Modifying An Existing Diet. Click on the Diet tab. Click Select from Database. Use the database navigation keys at the bottom of the window to locate Record 7 (data from Sealander, 1943). Select this record. Click on the Diet Items tab. Click on a row to highlight the target food item, then click the delete key to delete the diet item. Repeat this process in order to delete all existing diet items EXCEPT crayfish, fish, and small mammals. Using the Modify Current Diet Item key, modify the listed parameters to the values specified below. In some cases, the modification will require the user to select a different study from the database. For these parameters (assimilation efficiency and gross*

> **TIP: FORMAT OF PROPORTION DATA IN THE WSB**
> When entering data into a WSB project/scenario, carefully confirm the units. Often percentage or proportion data formats vary. In some cases the model might use decimals (0.00–0.99) for percentages, while in other parts of the model data with percentage units are used.

energy content) click on the button to open the database selection tool. The parameters for each of these items should be modified as needed to reflect the following:

Dietary Information

For Invertebrates (crayfish)
Proportion of Diet (0–1) = 0.07 (wet) (enter directly)
Assimilation Efficiency (0–1) = 87% (choose lesser scaup with mean AE of 87% from database)
Gross Energy Content (kcal/g wet wt) = 0.80 (choose Bivalves (no shell))

For Fish
Proportion of Diet (0–1) = 0.52 (wet) (enter directly)
Assimilation Efficiency (0–100) = 85% (choose white ibis eating sardines, 85%)
Gross Energy Content (kcal/g wet wt) = 1.19 (choose blue gill (wet), 1.19)

For Mammals
Proportion of Diet (0–1) = 0.41 (enter directly)
Assimilation Efficiency (0–1) = 84% (choose mammals eating small birds, mammal, 84%)
Gross Energy Content (kcal/g wet wt) = 1.7 (small mammal wet, 1.7)

Optional: Click on Sum Proportion to 1 , select Wet Weight, close error box (See Tip Box: Sum
    Diet Proportion to 1)
Click to the Intake tab.

For additional practice, the user may want to try to enter the same data using the Enter
Hypothetical Data tab.

       To exit the diet inputs, click on the Intake tab. The information entered on the diet will
be saved when a new tab is selected. For those more comfortable with the manual saves, click
on the 🖫 button to save the data prior to moving to the next tab.

2.4.2.4. *Step 4: Select Intake Rates*

       Under the Intake tab, there are five
subtabs: Air, Drinking Water, Assimilated
Food Requirement, Soil, and Sediment
(Figure 27). For each of these (except
Sediment), the user may either Enter
Hypothetical Data or Select from Database.
Sediment data are entered directly by the

> **TIP: INTAKE RATE UNITS**
> Prior to entering any data into the intake tabs,
> the default units in each tab should be
> ignored (e.g., under the drinking water tab,
> the units are listed as m^3/day when the units
> should be L/day). The units are corrected
> when the media-specific intake rates are
> selected.

user because no database values are available. The database provides allometric equations or
values from the WSB wildlife database. As discussed above, the user can enter new allometric
equation parameters by using the data entry/generic data entry functionality. *NOTE: The user*
cannot edit existing database entries.
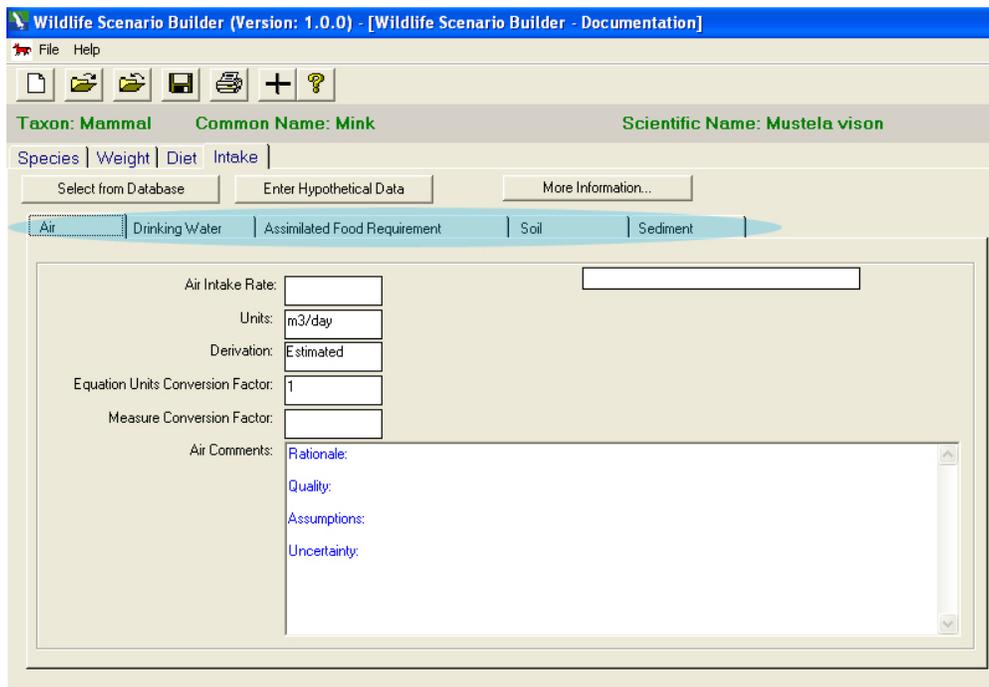
Figure 27. The five intake rate entry windows are arranged as tabs.

Each intake tab is discussed briefly below. All of the intake screens have the same general format: intake rate, units, derivation, conversion factors, comments, and data source.

Air. Click on the Air tab and then the Select from Database button. A limited number of values are contained in the database. There are only two allometric equations for birds (passerines and non-passerines) and one allometric equation for mammals. The WSB filters the displayed allometric equation such that only the appropriate equation for the species of interest will be displayed (e.g., for the mink practice scenario, only the one mammalian allometric model will be seen). In this case the options are limited, but the appropriate approach can be selected by clicking the ☑ button. The user can also enter hypothetical values specific to the site of interest. A default "Measure Correction Factor" of 2.5 is applied to the allometric equation to convert from an inhalation rate associated with a "standard metabolic rate" to an inhalation rate for a free-living animal (see U.S. EPA,

> **TIP: ZERO AIR INTAKE**
> Even though air is necessary for life, the user may enter "0" for air intake if assessment of this route is judged to be unnecessary.

> **TIP: MODIFYING ALLOMETRIC EQUATIONS**
> The allometric equations distributed with the WSB model cannot be modified. However, the user may enter user-defined allometric equations and specific inputs and correction factors.

38

1993, Sections 3.3 and 3.5). The correction factors in the allometric equations included in the database cannot be modified. However, the user may enter a user-defined allometric equation and specify a user-defined correction factor.

Drinking Water. Click on the Drinking Water tab and then the Select from Database button. Again, only two allometric equations are available at this time for drinking water ingestion: one for birds and one for mammals (for the mink practice scenario, only the one mammalian allometric model will be seen).

<div style="border:2px solid;">

TIP: INTAKE RATE EDITS
The WSB will allow the user to enter "0" for drinking water and food intakes during initial scenario creation. However, if either of these intakes is initially not equal to zero, neither can be modified to "0" in a future edit. The default value will be the previous nonzero

</div>

When a species is selected, only the applicable allometric equation will be available for selection for the intake calculation. To select the appropriate allometric equation from the database, click the ✓ button. Click on the Enter Hypothetical Data button and then enter the species-specific drinking water intake (Figure 28). Click the Select button to use the entered data in the current scenario.

Figure 28. The drinking water intake tab after the user has elected to enter hypothetical data.

Food. Click on Select from Database under the Assimilated Food Requirement tab. For diet intake, there are several allometric equations. To view the different options by species group, click the ▼ button (Figure 29). In Version 1.0, Beta Test of the WSB, all of the metabolic equations are from Nagy (1987) and Nagy et al. (1999), and they predict free-living

metabolic rates (FMRs) on the basis of body weight. Click the ✓ button to select the allometric model for the project. If database-supplied allometric equations are not used, click Hypothetical Data Entry to enter project-specific diet intake information, or enter new allometric equation inputs through Data Entry/Generic Data Entry/Allometric Equations from the main screen in the WSB.

     Soil. Click on Select from Database under the Soil tab. A table of measured soil ingestion rates will open, organized by taxon and species (Figure 30). The WSB database contains estimated values of soil intake in percentage of soil in diet (dry weight). This will be converted into grams per day by the WSB using final calculated Total Daily Intakes (TDI) for an organism. The user may also enter a hypothetical value by selecting a unit (% or g/day) and typing in the intake in the cell. In the WSB, the proportion of soil in the diet is based on a dry-weight diet because soil concentrations are consistently measured in dry weight. Exposure from a wet-weight diet item cannot be compared with exposure from soil in dry weight. If soil intake is evaluated, dry weights should be used for all other diet items and inputs.
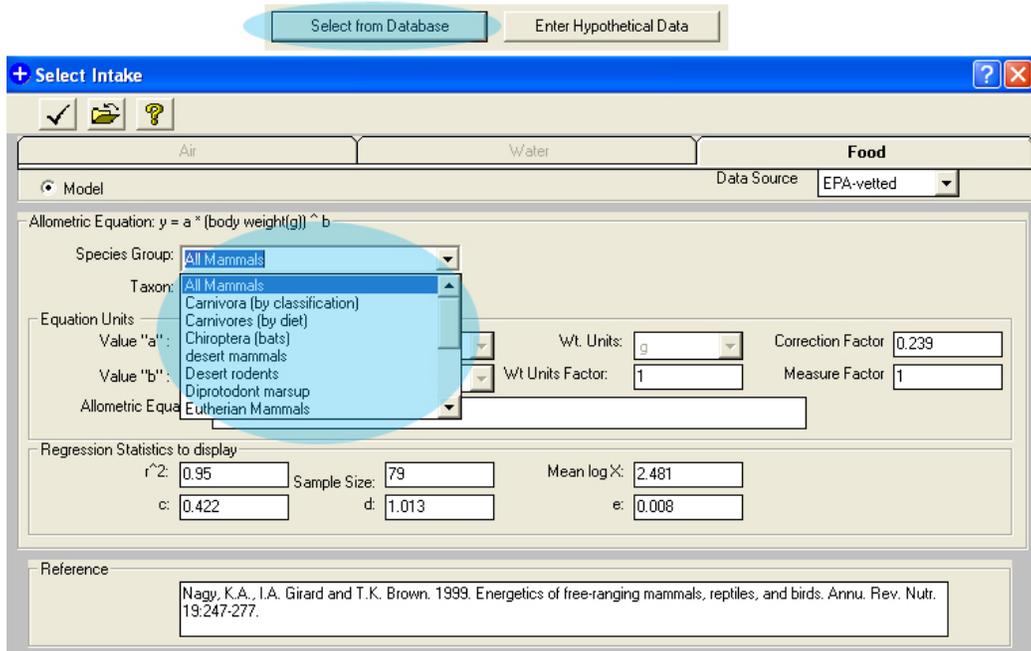
Figure 29. Depending on the species group, the user can select from a number of allometric equations that can be used to estimate food intake rates.

Figure 30. Soil ingestion rates (expressed as a percent soil in the diet) are available for a number of species in the database.

Once a soil intake rate has been selected [✓] from the database, the More Information key may be used to view all of the information in the database for that soil intake.

Sediment. The user may enter only hypothetical intake values for incidental ingestion of sediments. A database of sediment intake values is not available.

> **TIP: SITE-SPECIFIC DATA ENTRY— FILE-SAVING**
> Remember, hypothetical data are only saved within a scenario. Data entered through Data Entry will become part of the installation-specific database and will be available for all projects and scenarios.

Sediment intakes are not included in the practice scenario. Enter an intake value in g/day, derivation, any correction factor, and comments. When completed, click the 🖫 button.

► *PRACTICE SCENARIO – Enter Intake Rate Data. Click on the Intake tab. The three intake routes that apply to the practice scenario include Air, Water and Assimilated Food Requirement. Begin by selecting the Air tab. Click Enter Hypothetical Data. For air intake, enter 1.07 m³/day. Next, click on the Drinking Water tab. Click Enter Hypothetical Data. For drinking water intake, enter 0.184 L/day. Finally, click on the Assimilated Food Requirement tab. Click Enter Hypothetical Data. For Assimilated Food Requirement, enter 145 kcal/day.*

2.4.2.5. *Step 5: Save and Exit*

To save the wildlife scenario, click on the 🖬 button or move to another tab to save the data entered in the last tab (e.g., the <u>Sediment</u> tab in the example above). The wildlife scenario can now be closed and all data saved. To exit the *Wildlife Scenario Builder - Documentation* window, click on the 📂 button or the ✖ button in the upper right-hand corner of that window. The project screen will return and users may create another wildlife scenario or choose to run the calculator.

► *PRACTICE SCENARIO – Saving Scenario and Project Data. Click through the tabs to save, or manually save by clicking the* 🖬 *button.*

2.5. RUNNING THE WSB CALCULATOR

The calculator [➕] performs and displays all calculations related to a project and scenario. In the project window, click on (highlight) one of the linked wildlife scenarios, then click the ➕ button to run the calculator.

The calculator estimates organism-specific daily requirements for air, water, and energy, and converts caloric-based dietary requirements to organism- and diet item-specific, weight-based dietary requirements (Figure 31). The application also generates media-specific intake rates, adjusted on the basis of the dietary requirements (Figure 32). The outputs are the dietary requirements conversion table and the intake rates table. The data in both tables may be printed as reports, as discussed in the sections that follow.

2.5.1. Calculations for a Wildlife Scenario

To run a calculation, first select a wildlife scenario listed in the project window. Then click on the calculations button [➕] on the top icon bar or click on the [Calculations] button at the bottom of the screen. The button opens a small screen that asks whether the calculations should be performed on a wet-weight or dry-weight basis. If soil is an intake route, select <u>Dry Weight</u>.

> **TIP: SELECTING CALCULATION TYPE – WET VS. DRY**
> The WSB offers the user the option of working in wet or dry weight. There is no correct or incorrect choice. The user may match the choice with the measurements used in the original diet study (which can be found in the diet record under <u>Diet Type</u>). Alternatively, if the output of the WSB will be combined with estimated or measured concentrations in diet items, the user may match the mode in which the chemical concentrations are reported. Finally, if soil ingestion is being incorporated into the scenario, dry weight measurements are used.

The calculation buttons launch the calculator for the selected wildlife scenario. The *Wildlife Scenario - Calculations* screen displays medium-specific Dietary Requirements and Intake Rates under those two tabs. The results are specific to the highlighted wildlife scenario only. The selection of a wet weight-based or dry weight-based calculation is displayed in the bold red text on the right-hand side of the screen (Figure 33).

The tab Dietary Requirements-Conversion shows the intake rate for individual diet items and lists gross energy (GE in kcal/g) for each item, assimilation efficiency (AE as a percent), metabolizable energy (ME in kcal/g diet item), and proportion of the diet (Figure 34). The Dietary Requirements tab also displays the average metabolizable energy (averaged across the different diet items, with each item weighted according to its proportional representation in the diet), FMR (in kcal/day), and total daily intake (TDI in g/day). If wet-weight calculations are conducted, the GE and ME values will be on a wet-weight basis. If dry-weight calculations are conducted, the GE and ME values will be on a dry-weight basis.
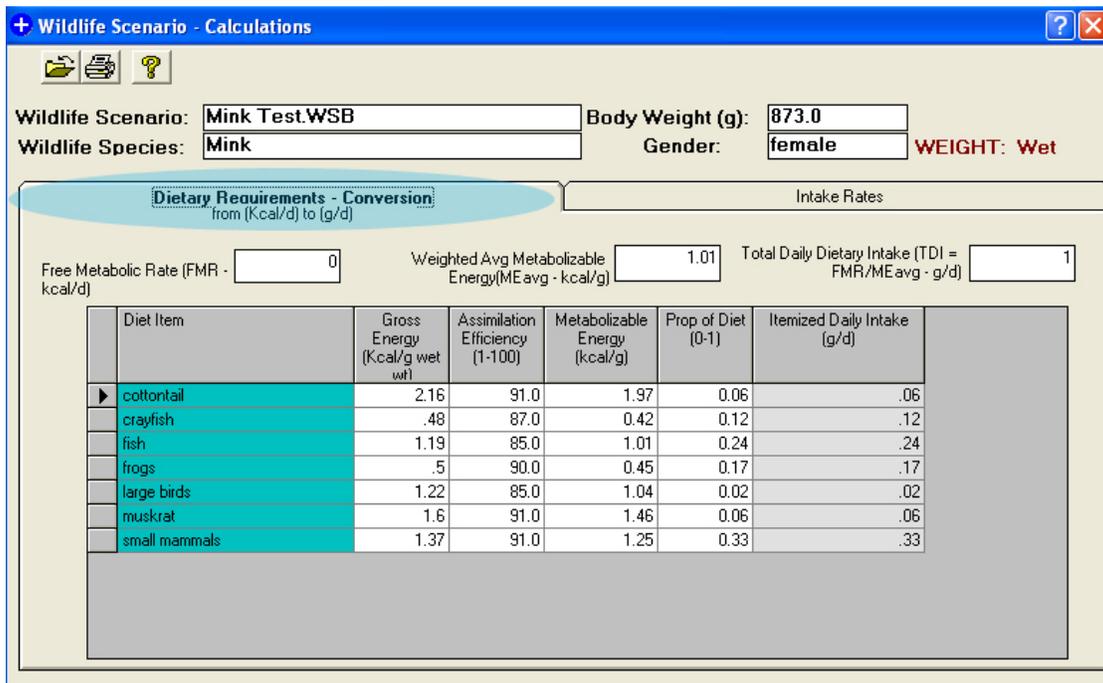
Figure 31. Two on-screen calculation summary tables are generated when the calculation is initiated. One of the tabs, the Dietary Requirements – Conversion tab (shown here), presents itemized dietary intake rates.

Figure 32. The <u>Intake Rates</u> tab presents the adjusted intake rates, sorted by medium.
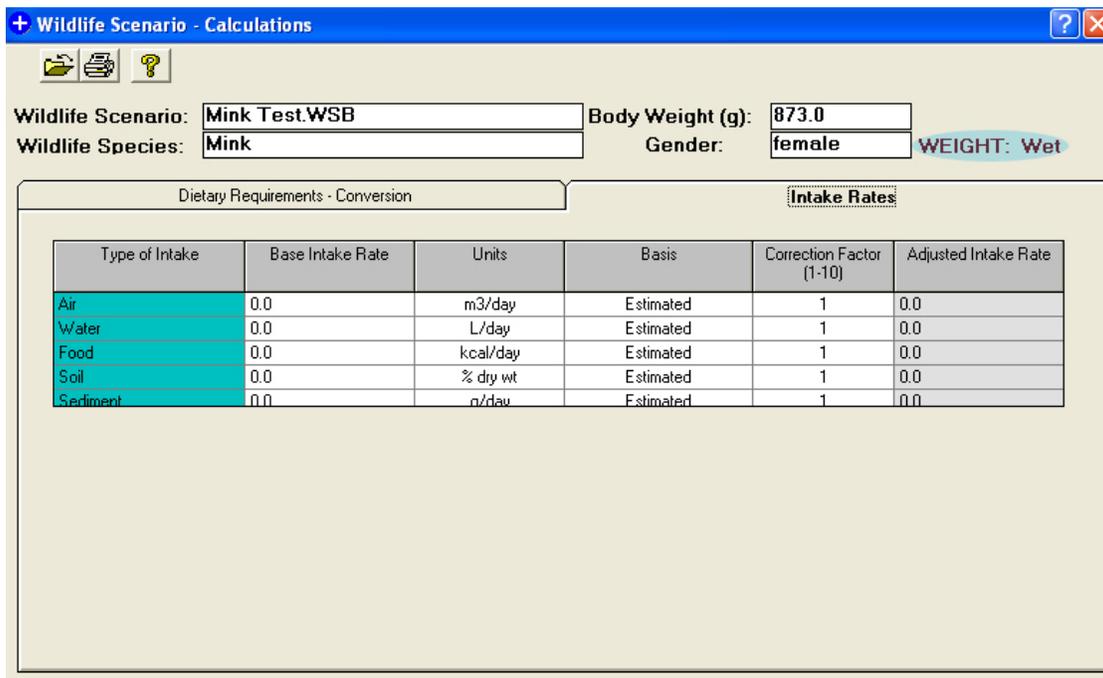
Figure 33. The on-screen calculations page labels the results as either wet or dry weight, depending on user preference.

44
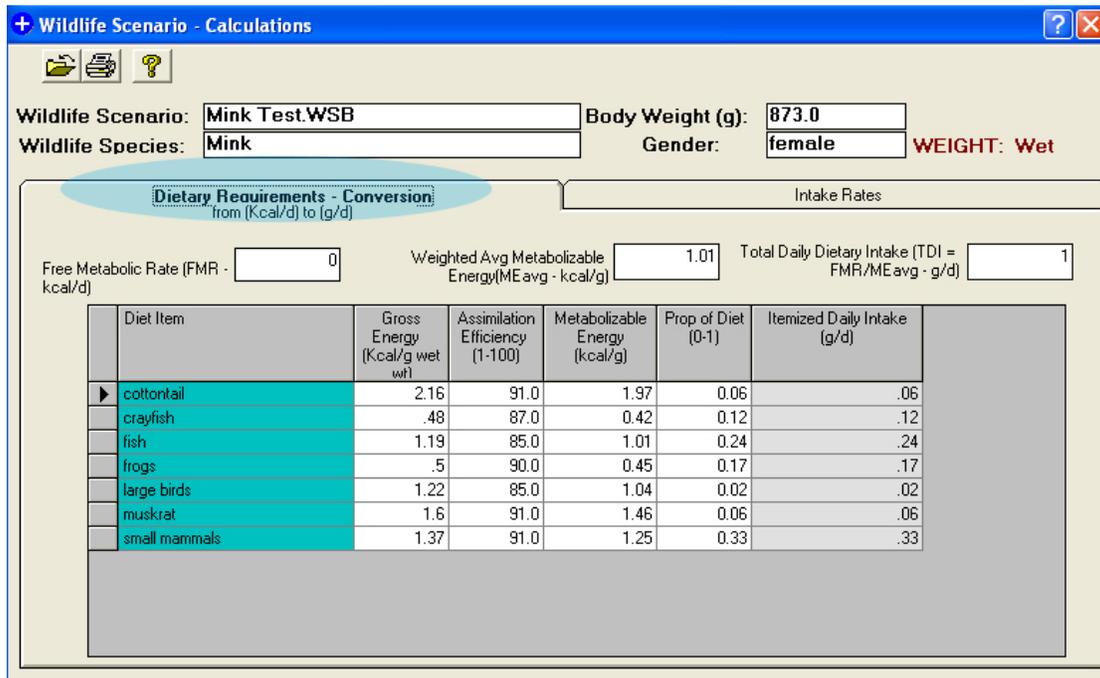
Figure 34. The Dietary Requirements-Conversion page.

The tab Intake Rates shows the intake rate for each environmental medium. The base intake rate is the output of an allometric equation or the measured value for the type of metabolism measured in the study (e.g., basal, standard, free living). The derivation/basis of the intake is also shown. *NOTE: The WSB labels any user input, measured or modeled, as "estimated."* Any applicable measure correction factor is also shown. For example, if the base intake rate was based on an estimate of basal or standard metabolic rate, a correction factor of 2 to 3 is used to develop an estimate of FMR. Finally, the tab presents the adjusted intake rate, which equals the base intake rate multiplied by the measure correction factor (Figure 35). For food, the intake rate is still in units of kcal/day.

2.6. PRINTING THE RESULTS

The ⊟ (Print) button is used to print specific reports that summarize the results for the scenario (for a selected scenario), as well as the project details (from the project window).

When the ⊟ button is clicked on the calculation results screen, the WSB print screen opens. From this screen, the user has the option of selecting a specific wildlife scenario (only wildlife scenarios that have been run through the calculation step will appear here) and the type of report to be printed (Figure 36). Print options are also selected for each report.

Figure 35. The intake rates summary page.
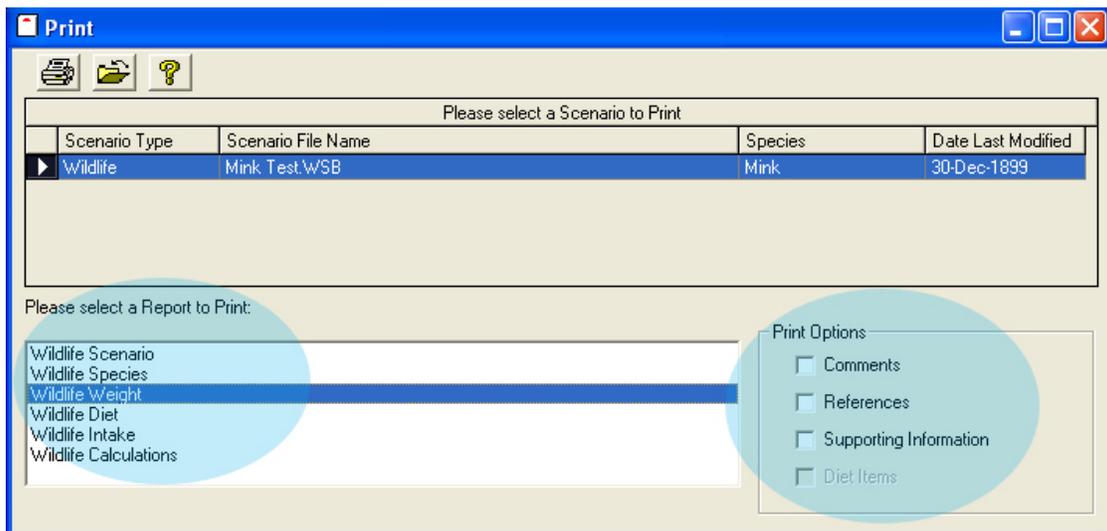
Figure 36. The options page for report generation, including the selection of the scenario, the report type, and the report options.

To generate the detailed reports from this screen, begin by highlighting the wildlife scenario, then highlight the report type and select the applicable Print Options. Click the 🖶 button to preview the report. This report may be printed to paper, printed to PDF (if the user has

Adobe PDF Writer) or copied and pasted as an image file to any program that accepts image file pasting. *NOTE: The reports can only be printed one at a time.*

2.6.1. Project Summary Report

The project summary report is generated by clicking the 🖨 icon from the project home page. This report is not printable from within the calculation function. The printout includes the project name, description, location information, author, comments, and associated scenarios. It also shows the file names for the linked scenarios and the description entered for each wildlife scenario, as well as project and scenario dates (Figure 37).

2.6.2. Wildlife Scenario Reports

From the Wildlife Scenario - Calculations window (i.e., the result of clicking the ➕ button when highlighting a wildlife scenario in the project window), click on the print button (🖨) on the upper toolbar of the wildlife scenario-calculations window.

The print function allows the printing of one report at a time. In this case, there are six report options: wildlife scenario, wildlife species, wildlife weight, wildlife diet, wildlife intake, and wildlife calculations. Highlight the report of interest. All of the reports except the wildlife scenario report require further user selection of subcategories for inclusion on the report. The print options include displaying comments, references, supporting information, and, for the diet summary, diet items. Selecting all options is recommended.

> **TIP: REPORT HEADERS**
> Each report includes a header that presents the dates, disk file names, the report type, and author initials. However, the scenario and species reports do not include the author initials. In order to be able to track the reports, create scenario file names that include the author initials, species type, and any other scenario-specific information because the file name appears on all reports.

2.6.2.1. *Report Type: Wildlife Scenario - Overview*

This report prints the scenario description, if the user entered one (Figure 38). It also includes the disk file name and dates.

Figure 37. The project summary report printed from the project window. This report provides general information about the project and the associated wildlife scenarios.

Figure 38. The overview report presents a general scenario description.

2.6.2.2. *Report Type: Wildlife Scenario - Species*

In this report, the species common and scientific names appear. Check all of the boxes for parameters to be printed. This provides the supporting information (i.e., distribution, habitat,

general diet, and related species) and all references for that species included in the WSB (Figure 39).

2.6.2.3. *Report Type: Wildlife Scenario - Weight*

The selected body weight value (and its corresponding estimator), reference, and supporting information regarding the sample size, variance, and sampling region and location are printed (Figure 40). The options for estimator include mean, min, max, mean + variance, and mean – variance. The option is selected during data entry under the weight tab.

2.6.2.4. *Report Type: Wildlife Scenario - Diet*

This report prints general information about the diet selected or entered, including information on season, habitat, location, measure term (e.g., % wet weight), basis of measurement (a description of the measure term), material examined (e.g., scats, contents of digestive tract), method of analysis (generic description of material analyzed), the estimated average trophic level of the diet, and the reference for the original diet that was used as-is or as modified by the user (Figure 41). Note that the estimated average trophic level of the diet does not distinguish terrestrial from aquatic components of the diet and that the trophic levels assigned to the various diet items are sometimes based on minimal data. As a result, the estimated average trophic level of the diet should be used only as a general indication of the trophic position of the wildlife species (which would equal the trophic level of the diet plus 1.0). The diet report also prints information about the individual diet items for that study and wildlife scenario.

2.6.2.5. *Report Type: Wildlife Scenario - Intake*

This report summarizes the intake rate values used for each environmental medium. The food intake is expressed as assimilated energy in kcal/day. The detailed printout includes the allometric equation(s) used and the associated species category (e.g., mammals) (Figure 42). Detailed supporting information allows users to understand the calculations and assumptions underlying the calculations.

2.6.2.6. *Report Type: Wildlife Scenario - Calculations*

The calculation summary page is a table of the itemized (by diet item) daily intakes, as well as the total daily intake (Figure 43). The summary table includes the gross energy, assimilation efficiency, metabolizable energy, and proportion of each item in the diet.

Wildlife Scenario

Report Type: SPECIES

Disk File: C:\Program Files\WSB\WTWPortland\Scenario\Mink Practice.WSB

Created by:	Printed on:	June 21, 2005
Modified by:	Last Saved:	June 21, 2005

Species

Common Name:	Mink	Scientific Name: Mustela vison
Source:	CWS vetted	
Comments:	Rationale:	
	Quality:	
	Assumptions:	
	Uncertainty:	

Supporting Information

Distribution:	Canada except extreme north
Habitat:	Wetlands, lakes, rivers, streams, coastal marshes, shrubland, and forest, riparian, woodland
General Diet:	Mammals, fish, amphibians, crayfish, birds, reptiles, and insects/invertebrates, earthworms, meadow vole, muskrat, shrew, cottontail, frogs, salamanders
Related Species	Long-tailed weasel (Mustela frenata), Least weasel (Mustela nivalis), Ermine (Mustela erminea), and River otter (Lutra canadensis)

Reference(s)

Ballard, W.B., J.S. Whitman, and C.L. Gardner. 1987. Ecology of an exploited wolf population in south-central Alaska. Wildl. Monogr. 98:32-34.

Figure 39. The species summary report provides background information on the selected species from the database.

Wildlife Scenario

Report Type: WEIGHT

Disk File:	Mink Practice.WSB

Created by:	not found	**Printed on:**	June 21, 2005
Modified by:	not found	**Last Saved:**	June 21, 2005

Weight

Wildlife Species:	Mink	**Location:**	
Estimator:	Mean	**Region:**	Madison River, Montana
Body Weight(g):	586.0	**Sample Size:**	14
Status:		**Variance Type:**	Not applicable
Source:	EPA-vetted	**Variance value:**	
Notes:			
Comments:	Rationale:		
	Quality:		
	Assumptions:		
	Uncertainty:		

Supporting Information

Gender:	female
Season:	september october
Habitat:	River, stream, creek, rapidly-flowing water; aquatic or semi-aquatic predators only
Lifestage:	adult

Reference(s)

Mitchell, J.L.. 1961. Mink movements and populations on a Montana river. J. Wildl. Manage. 25(1):48-54.

Figure 40. The weight summary report provides the weight selected for the scenario and background information about the underlying study.

51

Wildlife Scenario
Report Type: DIET

Disk File:	Mink Test.WSB

Created by:	not found	Printed on:	June 20, 2005
Last Modified by:	not found	Last Saved:	June 20, 2005

Diet

Wildlife Species:	Mink	*Wet*	
Season:	december - december	Habitat:	Not reported
Source:	EPA-vetted	Gender:	female
Notes:	Stomach values had less margin of error than the intestinal volumetric measurements as the intestinal contents could not be separated as easily as the contents of the stomach.		
	It is suggested that the rate of passage through the digestive tract is different from one food item to another.		
	Traces of small birds were found.		
	The number of intestines analyzed is not reported.		
Comments:	Rationale:		
	Quality:		
	Assumptions:		
	Uncertainty:		

Supporting Information

Location:	Allegan, Barry, Berrien, Branch, Calhoun, Cass, Clinton, Eaton, Genesee, Hillsdale, Ingham, Ionia, J
State/Province:	Michigan
Region:	Southern Michigan
Measure Term:	% estimated ww volume
Basis of Measurement:	assumption if only 'volume' specified (might reflect visual estimates of relative volume in fresh sample)
Material Analyzed:	intestine content
Estimated Average Trophic Level of Diet:	2.97

Reference(s)

Sealander, J.A. 1943. Winter food habits of mink in southern Michigan. J. Wildl. Manage. 7(4):411-417.

Diet Item:

Name:	cottontail	Kingdom:	Animalia
Diet Proportion:	0.060	Subkingdom:	vertebrates
Trophic Level:	2	Phylum:	Chordata
Component:	not reported	Class:	Mammalia
Lifestage:	not reported	Order:	Lagomorpha
		Family:	Leporidae

Notes:

Moisture Content (% H2O):	64.4	% H2O Type:	mammal, rabbit/hare
% H2O Source:	EPA-vetted		
% H2O Reference:	Gorecki, A. 1975. Calorimetry in ecological studies. In Grodzinski, W., R.Z. Klekowski, A.Duncan, eds. IPB Handbook no. 24: Methods for Ecological Energetics. Oxford, London, Edinburgh, Melbourne: Blackwell Scientific Publications: pp. 275-281.		
Gross Energy (GE, kcal/g):	2.16	GE Assignment:	small mammals
GE Source:	EPA-vetted		
GE Reference:	Gorecki, A. 1975. Calorimetry in ecological studies. In Grodzinski, W., R.Z. Klekowski, A.Duncan, eds. IPB Handbook no. 24: Methods for Ecological Energetics. Oxford, London, Edinburgh, Melbourne: Blackwell Scientific Publications: pp. 275-281.		
Assimilation Efficiency (AE%):	91	AE Consumer:	fox
AE Source:	EPA-vetted	AE Food Item:	rabbit
AE Reference:	Vogtsberger, L.M. and G.W. Barrett. 1973. Bioenergetics of captive red foxes. J.Wildl.Manage. 37(4): 495-500.		

Figure 41. The diet summary report presents the selected diet and background information from the underling study.

Disk File: Mink Test.WSB

Created By: not found

Last Modified not found

Printed on: 6/20/2005

Last Saved: 6/20/2005

Intake Rates

Wildlife Species: Mink   **Body Weight(g):** 873.0   **Sex:** female

Type of Intake	Base Intake Rate	Units	Source	Estimator	Basis	Correction Factor (1-10)	Adjusted Intake Rate	Notes
Air	0.00	m3/day	User	Mean	Estimated	1	0.00	
Water	0.00	L/day	User	Mean	Estimated	1	0.00	
Food	0.00	kcal/day	User	Mean	Estimated	1	0.00	
Soil	0.00	% dry wt	User	Mean	Estimated	1	0.00	
Sediment	0.00	g/day	User	Mean	Estimated	1	0.00	
Soil:		g/day	Calculated		Calculated	1		

1   Base Intake Rate: For air, water, and food, this value may be basal intake rate, a laboratory setting intake rate or a free-living intake rate.

2   Basis: This indicates whether the value of the Base Intake Rate was estimated using an allometric equation, measured directly in a study, or was entered as a hypothetical value.

3   Correction Factor: This is used to convert the Base Intake Rate to a Free Living Intake Rate.

4   The units of kcal/day for food represent assimilated kcal/day.

Supporting Information

Air Allometric Equation: Inhalation:

   Species Group: **Weight Units Correction Factor:**
   Units Correction Factor: 1   **Measure Correction Factor:**   1
   Reference: . . . .

Water Allometric Equation: Water Intake:

   Species Group: **Weight Units Correction Factor:**
   Units Correction Factor: 1   **Measure Correction Factor:**   1

      Reference: . . . .

   Metabolic Rate Allometric Equation: Free-living Metabolic Rate:

      Species Group: **Weight Units Correction Factor:**
      Units Correction Factor: 1   **Measure Correction Factor:**   1
      r^2:   **Sample Size:**
      c: **d:**
      e: **Mean Log Weight**
      Lower 95% CI (kcal/day):   **Upper 95% CI (kcal/day):**
      FMR 95% CI Equation: 95% CI for log_FMR_species_x = log_FMR_speices_x +/- c * [d + e *
                                     (log_Wt_species_x - mean_log_Wt_model_species^2)]^0.5   where Wt is in grams
                                     and FMR is in KJoules/day. Results converted to kcal/day.

      Reference: . . . .

   Soil: Proportion Dry Diet (f_soil):

      Species Group: **Sample Size:**
      Reference:

   Soil: Intake in g/day, calculated:

      Daily Dry-weight Diet (DD):   **(Average Percent Water:)**

Figure 42. The intake summary report presents a table of the intakes and adjusted intakes and supporting information from the underlying studies.

Disk File: Mink Test.WSB

Created By: not found   Printed on: 6/20/2005
Last Modified by: not found   Last Saved: 6/20/2005

Dietary Requirements - Conversion from (kcal/d) to (g/d) [1]   Wet Weight

Average Trophic Level of Diet: 2.97

Diet Item	Component	Life Stage	Gross Energy (kcal/g)	Assimilation Efficiency (0-100)	Metabolizable Energy (kcal/g)	Proportion of Diet (0-1)	Itemized Daily Intake (g/d)
cottontail	not reported	not reported	2.16	91.0	1.97	0.06	0.06
crayfish	not reported	not reported	0.48	87.0	0.42	0.12	0.12
fish	not reported	not reported	1.19	85.0	1.01	0.24	0.24
frogs	not reported	not reported	0.5	89.8	0.45	0.17	0.17
large birds	not reported	not reported	1.22	85.0	1.04	0.02	0.02
muskrat	not reported	not reported	1.6	91.0	1.46	0.06	0.06
small mammals	not reported	not reported	1.37	91.0	1.25	0.33	0.33
Total						1.00	1.00

1 Caloric-based dietary requirements (kcal / d) are calculated from an allometric equation and body weight, or are measured directly in a study. Weight-based dietary requirements (g / d) are calculated from Caloric requirements and diet composition (i.e., the scope and relative abundance of ingested diet items).

2 Metabolizable Energy of Diet Item$k$ {ME_k (kcal / g)} = Gross Energy$_k$ (kcal / g) * Assimilation Efficiency$_k$ (unitless).

3 Weighted Average Metabolizable Energy {ME_{Avg} (kcal / g)}

$= \Sigma$ p_k * ME_k where p_k = Proportion of Diet represented by diet item$k$ (unitless), calculated as the wet weight of that item, relative to the combined wet weight of all diet items in the diet and k = each diet item

= 1.01 kcal / g wet weight.

F Free Metabolic Rate {FMR (kcal / d)} = 0. kcal / d where FMR is the food energy requirement selected or entered by the WSB User.

5 Total Dietary Intake Rate {TDI (g / d)} = FMR (kcal / d) / ME_{Avg} (kcal / g) = 1. g /d.

6 Itemized Daily Intake (IDI, g/d) for Diet Item k = Total DIetary Intake (TDI, g/d) x p_k.

Figure 43. The calculations report presents the calculated itemized daily intake rates and supporting information.

2.6.3. Saving the Results

In addition to printing results directly from the WSB, the user can save the report results to a PDF file if Adobe Acrobat PDF Writer is installed. By using the copy function on the print screen, the user may copy the report and paste it into any program that accepts image files. The document cannot be edited directly; however, it could be pasted into a report as an image file (Figure 44). Result export capabilities to Excel or other programs are not available.

Figure 44. The user can copy a report output and paste the output as an image into another file.

3. TROUBLESHOOTING

As is the case with any program, the user will periodically experience error messages. The operation of the WSB has been reviewed and the data and equations used by the application have been quality assured. However, users are likely to encounter developer error messages when running the application.   These developer error messages do not affect the calculations performed by the application and will not produce erroneous results. In most cases, users can click "OK" within the message box and continue with the application.

The purpose of this section is to describe known error messages and other issues with the application. Common developer error messages are described Section 3.1. Common pitfalls and recommendations for bypassing the pitfalls are described in Section 3.2.

3.1. FREQUENTLY ENCOUNTERED DEVELOPER ERROR MESSAGES

One common system developer error message is "Field '[FIELD NAME]' cannot be a zero-length string, Error found in routine SaveSpecies" (Figure 45). This error message appears during data entry, for example when a new entry is selected and saved before any actual data are entered. It also occurs when a new species is added to the database with incomplete information, for example, by entering a common name without the scientific name. The error will not crash the program. The user may click <u>OK</u> to close the message and return to data entry.
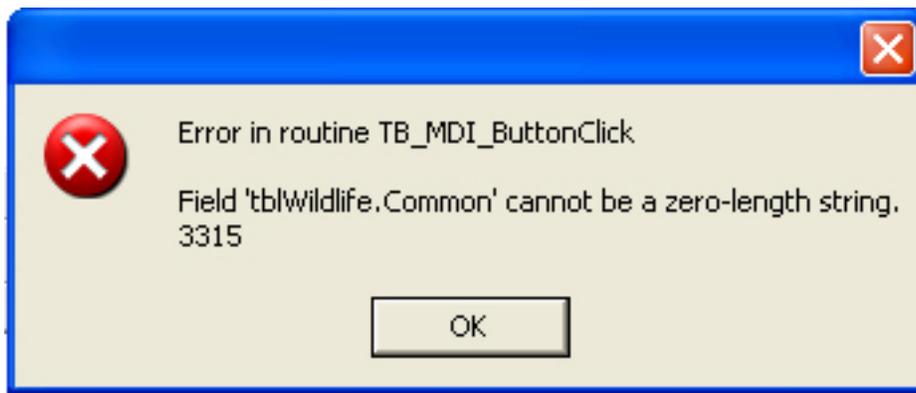
Figure 45. When input data are missing and a user initiates an action, this error may occur. Click <u>OK</u> and continue with application operation entering the missing data.

A number of variants of these errors will occur when a user has not completed (or even started) data entry. For example, if prior to creating any scenario the user clicks on <u>Edit Scenario</u>, an error message will appear (Figure 46). In general, error messages may be clicked

through without affecting the calculations. An error message often indicates that input data are missing where they are required.
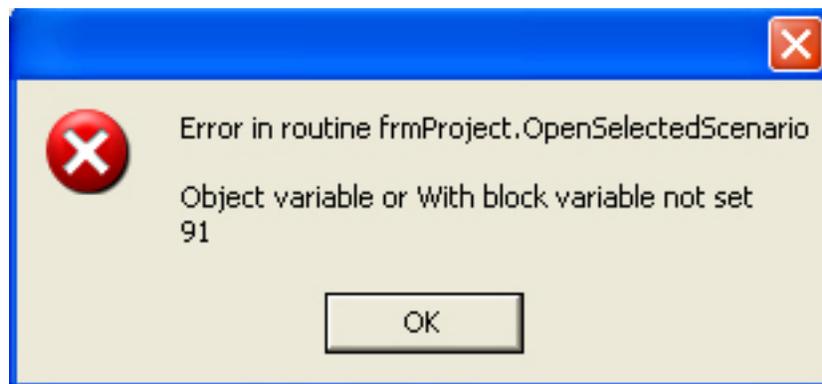
Figure 46. This is another variant of a missing data error window.

Another error message occurs when the user begins with a diet drawn from the database, deletes diet items, and enters manual proportions in the diet. When the user clicks Sum Proportions to 1, this error box appears (Figure 47). The error message is a reminder that the user cannot modify database entries permanently. Database edits within the input screens apply only to the active scenario and do not result in permanent database changes. In this case, click OK and continue using the WSB.

Using the Link Scenario button on the Project Manager screen to link a scenario from one project to another, results in an error message (Figure 48). Click OK to complete the link. Note that if a linked scenario is changed in one project it will also be changed in the linked scenario. Linking has led to a number of program crashes. The user is advised against linking scenarios.
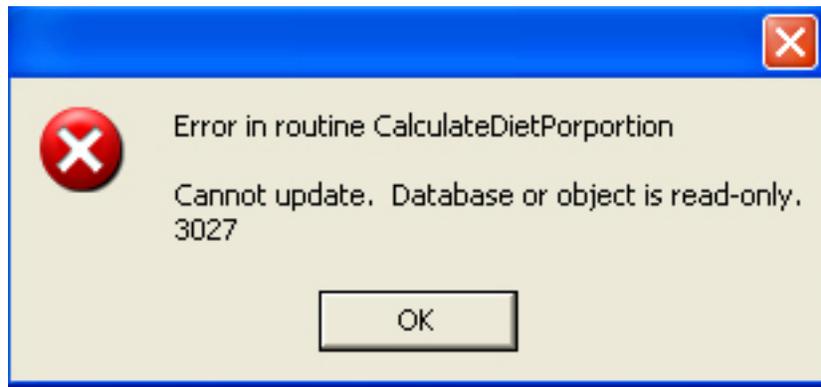
**Figure 47. This error window appears when a user clicks <u>Sum Proportion to 1</u> for a mixed diet (some items from the database and others that the user entered).**

Figure 48. When linking scenarios, this error box may open.

When reviewing records in the life history database, an error message is generated if no record is loaded when the user begins to explore detailed information screens such as general information, diet and intake rate information, population and habitat dynamics, seasonal activities, body size, and growth rates. The error message will close the program and require the user to restart the WSB. To avoid this error message, load a record in the Life History search window before opening the detailed information screens.

Do not use the <u>Select</u> button ☑ within the life history database. Using the <u>Select</u> button to open a life history database record triggers a file save request pop-up that will result in program failure. Instead, double-click the mouse over the record of interest to browse it. If the error box appears, close the WSB and restart.

If an error occurs that is not mentioned in this guide, please save the current project/scenario, exit the WSB, and restart the program.

3.2. RECOMMENDATIONS FOR AVOIDING COMMON PITFALLS

First, the WSB relies on a fixed file location. Although recent updates have increased the file saving flexibility, they have not been fully tested. To maintain stability, save all project files/scenarios/reports in the default folders within the WSB program folder. Moving files/folders from one PC to another or on networks has shown some instability and is not recommended. If files are moved, replicate the same file structure on the destination computer as that found on the source machine.

Second, in some cases, a change may not appear on a screen until the user first clicks to the previous/next screen/tab. For example, if the user decides to modify the description of a project that has been created and contains a completed scenario, it will be necessary to return to the home screen to activate the change. Often, when a change is made on one page and printing is initiated, the change will not appear in the report. However, if the user closes the edited page, then reopens the page and prints, the change will be visible.

Finally, a coding error in the WSB reverses the save options when changing a species in an active scenario. To change a species, click on a scenario from the Project window, then click Select from Database. After selecting the new species, a pop-up menu will ask whether you want to overwrite the current record. Clicking No will overwrite the file. Click Yes to bring up a box that will ask for a new scenario name.

4. REFERENCES

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Wildlife Scenario Builder

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