



MEMORANDUM

To: All Users of Gleams-Driver
From: Patrick Durkin
Re: Revised Release Memo of Gleams-Driver 1.9.3.
Date: May 16, 2014

This memo is a revision to the original release memo for Gleams-Driver Version 1.9.3 dated November 6, 2011. This memo corrects a few minor typos and expands the discussion of running Gleams-Driver under Windows 7 and adds a discussion of running Gleams-Driver under Windows 8.1. See the Table of Contents below for details.

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The documentation for Gleams-Driver 1.8 (available at www.sera-inc.com) along with these release notes should be sufficient to allow you to use the most recent release of Gleams-Driver.

Note that GLEAMS-Driver is not being actively maintained by the Forest Service – i.e., there is no formal task for updating Gleams-Driver. Nonetheless, modifications to GLEAMS-Driver may be made to accommodate needs of risk assessments prepared by SERA Inc. for the Forest Service. You may want to check the SERA web site for updates to GLEAMS-Driver.

Installation Files

As illustrated in the screen shot below, two versions of the installation files for GLEAMS-Driver are available at <http://www.sera-inc.com/gleamsdriver.html>.

http://www.sera-inc.com/images/Version_1.9.3_Full_Install.zip

Download Intallation Package

The installation package is in a ZIP file that is about 9 Megabytes. You can download this file (using a left mouse click) and save it to a directorty on your PC. Then, just unzip the file and run **Setup.exe**.

Document Library

	Name	Description
	Version 1.9.3 Installation Zip File	Unzip and run Setup.exe to install
	Version 1.9.3 Release Memo	Describes changes since Version 1.8.

The installation file in the document library section – i.e., **Version 1.9.3 Install.zip**—is the Light Installation file which is discussed in the documentation for GLEAMS-Driver Version 1.8. Above the Download Installation Package section is a link to a much larger file, **Version_1.9.3_Full_Install.zip**. As the name implies, this zip file contains the Full Install of GLEAMS-Driver. The Light Installation file should be used only on PCs running Windows XP. Most Forest Service computers now appear to be running Windows 7. **As detailed below in the section labelled *Windows 7 and Windows 8.1*, PCs running either of these operating systems must use the Full Installation.**

To install the program, unzip the installation file (either the full install or the light install) and run the **setup.exe** program. Additional notes on installing GLEAMS-Driver on Windows 7 and Windows 8.1 are given below.

Gleams-Driver is not currently under direct support – i.e., there is no formal task for updating Gleams-Driver. Nonetheless, various minor changes may be made to Gleams-Driver as comments are received and as Gleams-Driver is applied to different Forest Service risk assessments. These changes are documented in this memo. The documentation for Gleams-Driver 1.8 along with these release notes should be sufficient to allow you to use the most recent release of Gleams-Driver. The major changes to Gleams-Driver since the Version 1.8 release involves streams (Version 1.9) and canopy cover (Version 1.9.2). These and other minor changes and issues are discussed below.

Windows 7 and Windows 8.1

Background

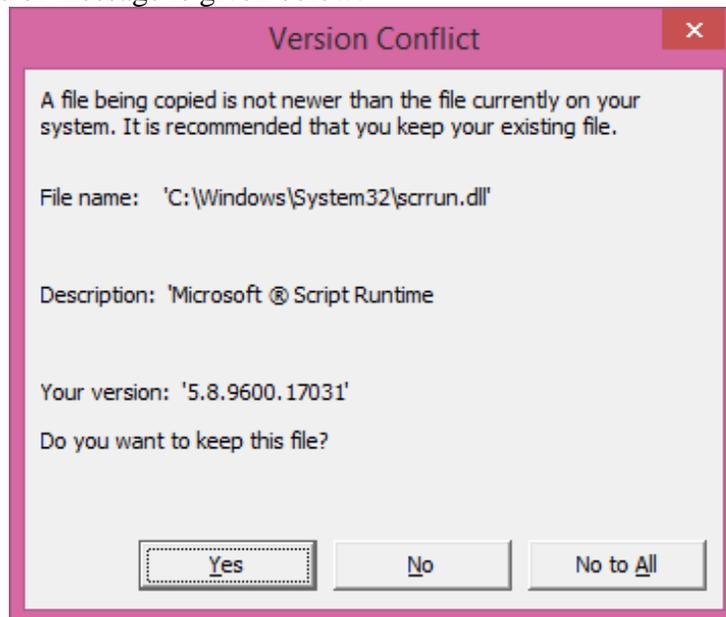
Gleams-Driver is a 16-bit program developed on a PC with Windows XP using Visual Basic 6. As most PC users should know, Microsoft has dropped support for Windows XP. Visual Basic 6

cannot be run readily under Windows 7 or Windows 8. Consideration has been given to porting the code for GLEAMS-Driver to Microsoft .NET Framework Version 4 but it does not appear that this will be done in the foreseeable future. In addition, it is not clear that porting GLEAMS-Driver to Microsoft .NET Framework Version 4 would be worth the effort. As a historical note, GLEAMS-Driver was developed initially during the period from 2005 to 2006. At that time, .NET Framework was in Version 1.1 and most Forest Service computers did not have .NET Framework. Thus, the decision was made to develop GLEAMS-Driver in Version Basic 6.

Installation on PCs with Windows 7 or 8.1

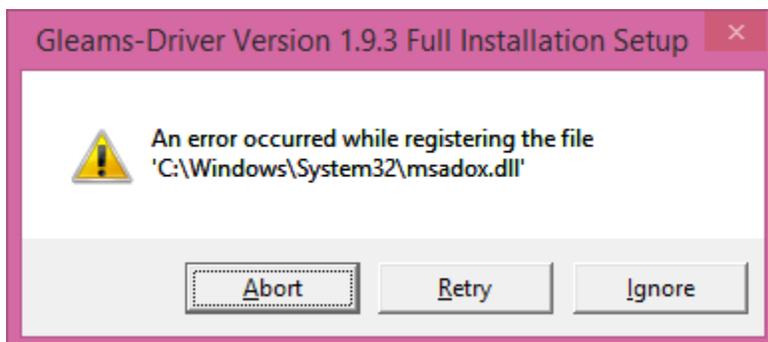
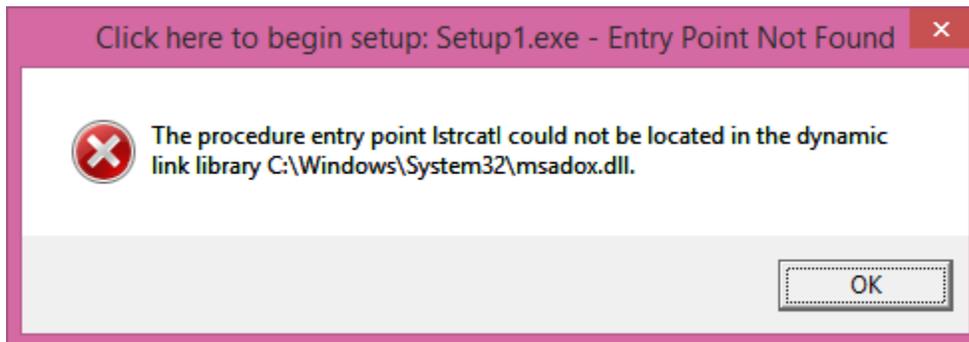
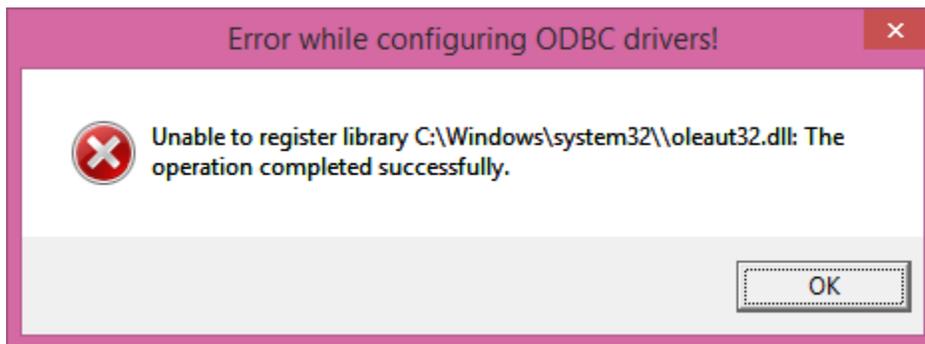
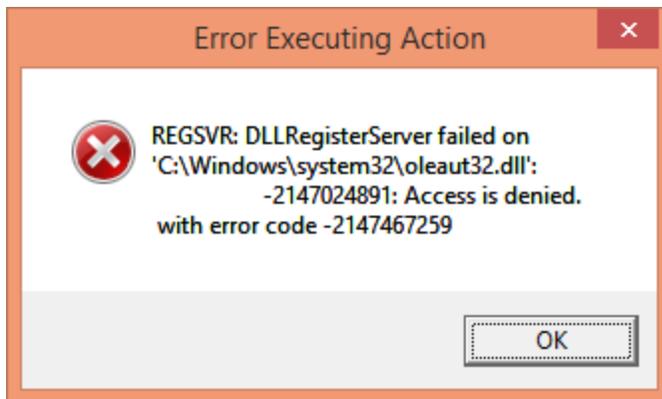
Currently (May, 2014), the Forest Service appears to be using Windows 7. Gleams-Driver 1.9.3 has been tested and will run on a 64-bit PC running the 64-bit version of Windows 7. Gleams-Driver 1.9.3 will also run under Windows 8.1 but has not been used extensively on this operating system. No attempt has been made to run GLEAMS-Driver under Windows 8.0 but the discussion below probably would apply to Windows 8.0.

As noted above under the section named *Installation Files*, the full install package must be used for PCs running under Windows 7 or Windows 8.1. During the installation, several messages may appear in error windows. One particularly important error window involves an attempt by the installation program to install a file that is older than a corresponding file on your PC. An example of this type of message is given below:



Respond with “Yes”. You never want to allow an installation of any program to replace a file on your PC with an older file of the same name.

A number of other error windows may appear. Some examples are given below.



While these all appear to be dreadful, you can ignore these messages.

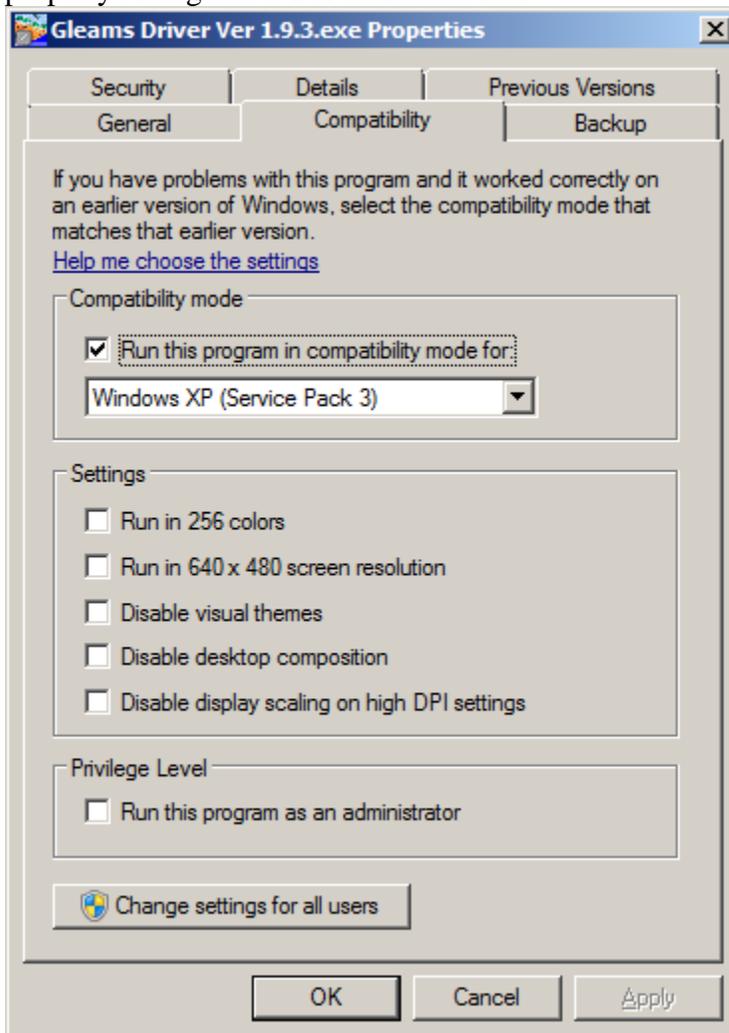
While there is only limited experience with installations on Windows 8.1, it appears that NTVDM needs to be installed on PCs running Windows 8.1. NTVDM (NT **V**irtual **D**OS

Machine) is a utility that appears to be installed by default on Windows 7 but not on Windows 8.1. Early in the installation of GLEAMS-Driver on a PC running Windows 8.1, you may see a message box indicating that NTVDM must be installed. Just click OK and proceed with the installation. NTVDM is an “on demand” program. If you do not see a message about installing NTVDM, this program may have already been installed on your PC as part of the installation of some other legacy application.

Compatibility Mode

After following the above guidelines for installation, you will need to set the Compatibility Mode for GLEAMS-Driver. To do this, locate **GLEAMS-Driver 1.9.3.exe** on your PC. On a Windows 7 PC, the program will probably be in the **C:\Program Files (x86)** directory. On a Windows 8 PC, the program will probably be in the **C:\Program Files** directory.

Right click on the exe file and select **Properties** (which will probably be at or near the bottom of the list of options). Under the **Compatibility** tab, check the box labelled “Run this program in compatibility mode for:”. In the dropdown list, select Windows XP (Service Pack 3). A properly configured PC is illustrated below:



The above Compatibility tab above is from Windows 7 but the tab in Windows 8.1 is virtually identical.

Once the above step is completed, GLEAMS-Driver should run under Windows 7 or Windows 8.1.

Residual Issues

Reports from users have indicated that a minor screen conflict when Gleams-Driver is run under Windows 7. On some Windows 7 PCs, the graphic with the flying eagle does not update as the simulation proceeds. On other Windows 7 PCs, the large text box on the opening screen (generated internally as a bit map) may not be visible or appears as a black box. On some PCs, the general text box on the main screen is blacked out. This text box contains only general information about Gleams-Driver and does not impact how the program runs.

Some users have reported that the QuickRun screen is too large to display correctly. If this occurs, increase the resolution on the screen.

In general, the above video issues appear to occur on PCs with older graphics cards.

Version 1.9, Sediment Binding in Streams

Gleams-Driver has always considered sediment binding in ponds. Sediment binding in ponds was considered by having the user specify a sediment depth and an initial water depth. These were used to calculate the volume of sediment (V_S) and the volume of water (V_W). As discussed on p. 58 of the documentation for Gleams-Driver Version 1.8, the amount of the chemical in sediment (A_S) was calculated from the total amount of the chemical (A_{Tot}) in the sediment-water system as:

$$A_S = \frac{A_{Tot} \times K_d \times V_S}{(K_d \times V_S) + V_W} \quad (\text{Eq. 1})$$

and the amount the chemical in water was calculated as $A_{Tot} - A_S$. The concentrations in water and sediment were then calculated as the amount in water or sediment divided by the volume of water or sediment.

As discussed in Section 7.5 of the Version 1.8 documentation, the stream in Gleams-Driver does not have an explicit water depth. The flow rate is expressed as simply the flow volume (L/day) and the concentration in water is calculated as the chemical input (mg/L) divided by the flow rate (L/day). As a simplification, sediment binding in streams was not considered in Version 1.8. Up until recently, this did not make a great deal of difference because the K_{oc} s for most pesticides that we have covered is relatively low.

With the risk assessment on lambda-cyhalothrin (SERA TR-052-21-03a dated February 25, 2010), however, sediment binding in streams could not be ignored because of the very high K_{oc} for lambda-cyhalothrin.

Sediment binding in streams can be handled in several different ways. I elected not to specify a stream depth because the depth of streams will vary with the flow rate. As an alternative, sediment binding is considered by the specifying a volume of sediment relative to the volume of water.

In other words, the relative sediment volume (V_{SRel}) is defined as:

$$V_{SRel} = \frac{V_S}{V_W} \quad (\text{Eq. 2})$$

Dividing the numerator and the denominator of Equation 1 by V_W yields:

$$A_S = \frac{A_{Tot} \times K_d \times \frac{V_S}{V_W}}{(K_d \times \frac{V_S}{V_W}) + \frac{V_W}{V_W}} \quad (\text{Eq. 3})$$

Substituting Equation 2 into Equation 3 and simplifying yields:

$$A_S = \frac{A_{Tot} \times K_d \times V_{SRel}}{(K_d \times V_{SRel}) + 1} \quad (\text{Eq. 4})$$

Equation 4 is now used in Gleams-Driver 1.9 for both ponds and streams.

This memo is released with PDF versions of two Mathematica check files: [Preliminary Notes on Streams and Sediment.pdf](#) and [Version 1.9 Sediment Binding Check.nb](#). The former check file just goes through the algebra of sediment binding in detail. The latter check file just demonstrates that Equation 1 and Equation 4 are identical.

While the identity of Equation 1 and Equation 4 are obvious, note that the algorithms within Gleams-Driver Versions 1.8 and 1.9 yield somewhat different results. That this difference is true may not be obvious. In Version 1.8, the user specified a starting depth of sediment. This was used to calculate the sediment volume, which remained static throughout the simulation. In other words, the sediment volume stayed the same but the volume of water in the pond varied over the course of the simulation. In Version 1.9, the volume of sediment will vary in proportion to the volume of water in the pond.

Neither the Version 1.8 nor 1.9 approaches are necessarily *correct* approximations of reality. The volume of sediment involved in binding will vary with all sorts of physical changes in the pond as well as the nature of the sediment. Nonetheless, I think that the Version 1.9 approach is better. As water is added to a pond by runoff or percolate, the surface area of the pond (and hence the surface area of the pond sediment) will vary along with the volume of water. Consequently, I think that the variable sediment volume will better reflect reality than the static sediment volume in Version 1.8.

Note also that Gleams-Driver Version 1.9 will allow the user to consider or ignore sediment binding for either a pond or stream. The Water Body section of the Quick Run screen has been modified, removing the text field for specifying the sediment depth. In place of this is a check box labeled **Consider Sediment Binding**. If this check box is checked, the relative sediment volume is set to 0.01. If the check box is not set (i.e., unchecked), sediment binding is ignored for either the pond or stream. In general, I think that most users will (and should) consider

sediment binding, particularly for lipophilic pesticides. Lastly, the 0.01 relative sediment volume cannot be changed in the Quick Run. If the user wants to have a different relative sediment volume (V_{SRel}), they must make the change using the Full Run utility by editing the input file. I do not think this limitation will bother most Quick Run users. Individuals who are comfortable with the Full Run utility will not have any problems setting V_{SRel} using either Full Run utility or making the change directly in MS Access.

Version 1.9, Ephemeral Streams

Gleams-Driver Version 1.8 required a minimum stream flow, which by default was set to 710,000 L/day (a value carried over from the pre-Gleams-Driver program used in older Forest Service risk assessments). Gleams-Driver Version 1.8 did not allow the stream to dry up – i.e., the program did not accommodate an ephemeral/intermittent/transient stream. While there are many different ways to classify streams, I believe that ephemeral streams are referred to as Class III streams in some Forest Service literature.

Gleams-Driver Version 1.9 accommodates an ephemeral stream. In the Quick Run screen, the user can now enter a zero in the field labeled Min. Flow Rate (L/day). When the minimum flow rate is set to zero, there is no water in the stream except on days in which runoff or percolated enter the stream based on output from GLEAMS. On these days, the *sediment* on the stream bed is treated as soil and the pesticide degrades based on the soil half-life used in the GLEAMS run. On all other days – i.e., days with water flow – the pesticide degrades in sediment based on the sediment half-life in the input file.

In a full run, stream flow rate can also be influenced by reservoirs, as discussed in Section 7.4.2.1 of the documentation for Gleams-Driver Version 1.8. No changes to reservoirs have been made in Version 1.9. This has no effect in Quick Runs because reservoirs can be set only in Full Runs.

The capacity to consider ephemeral streams will allow Forest Service users to address concerns that the minimum flow rate may underestimate concentrations of the pesticide in streams – i.e., the *ditch analysis* issue. While this is not a substantial concern (especially with the default minimum flow of 710,000 L/day), this type of flexibility may be useful in some instances, particularly with site-specific modeling of a Class III stream in which the user may want to calibrate the model using monitored data on stream flow rates.

The Quick Run has been modified so that no run is allowed if the user sets the minimum flow rate to zero and un-checks the Consider Water Balance checkbox. Doing both of these would prevent any water from getting into the stream – i.e., there would be no stream.

Version 1.9.3 Canopy Cover

Gleams-Driver Version 1.9.3 is a minor correction to Version 1.9.2 in which the input parameters BEGGRO and ENDGRO had been inadvertently shift one input field to the right on Card 29 of the hydrology file. The error had no impact on Quick Runs. As discussed below, the error would have impacted only Full Runs using canopy cover.

A peer reviewer of a recent risk assessment noted that Gleams-Driver Version 1.9 (as well as all previous releases of Gleams-Driver) did not consider canopy cover. Ignoring canopy cover will ignore canopy interception of rainfall and crop uptake of the pesticide. This, in turn, will lead to higher estimates of off-field transport to either an adjacent (nontarget) field or to an adjacent body of water. For the generic applications of Gleams-Driver in Forest Service risk assessments, this conservative approach is most often justified. Ignoring canopy cover may not be reasonable

if you are using Gleams-Driver at a specific site that has substantial canopy cover or for a field in which an annual crop is being grown.

Gleams-Driver Version 1.9.2 will accommodate canopy cover as well as annual crops if you use the Full Run utility (or modify the input file directly in Access. To handle canopy cover and crops, you need to add the following records to the **Site** data table:

ValueCode	Comment
ICROP	In the corresponding Value field, enter a crop number from Table N-2 of the documentation for GLEAMS (Knisel and Davis 2000, pp 157-159). Most Forest Service users will enter values of 69 (conifers), 70 (hardwood), or 71 (mixed hardwood and conifer).
DPLANT	The year of the rotation cycle (typically “1” in Gleams-Driver runs) and the Julian day that the crop (annual) is planted, i.e. 1135.
DHRVST	The year of the rotation cycle (typically “1” in Gleams-Driver runs) and the Julian day that the crop (annual) is harvested, i.e. 1276.
DTRUNC	If the annual crop is plowed under prior to maturity (DHRVST) enter the rotation cycle and Julian day. Note, the value must be less than DHRVST but greater than DPLANT . If the crop is not plowed under, leave the value column blank, i.e. 1224.
CCRD	The rooting depth of the annual crop in inches. Use the CCRD value in Table N-2 of GLEAMS documentation, pp 157-159 (Knisel and Davis, 2000). Leaving CCRD blank results in CCRD = RD (rooting depth).
CRPHTX	In the corresponding Value field, enter the height of the maximum height of the canopy cover (for a forest) or crop cover (for an agricultural field) in feet.
BEGGRO	In the corresponding Value field, enter the Julian day for beginning of growth for hardwood or pine-hardwood mixture (or crop if you are doing an agricultural application), i.e. 075.
ENDGRO	In the corresponding Value field, enter the Julian day for end of growth for hardwood or pine-hardwood mixture (or crop if you are making an application for a perennial agricultural crop), i.e. 290.

All of the above parameters are used in Card 29 of the Hydrology File of GLEAMS. See the GLEAMS documentation for additional details (Knisel and Davis, 2000, p. 18 with additional discussion on p. 33 ff).

Note on Rotation Cycles:

Unless you are doing a Full Run and have made substantial changes to Gleams-Driver input files from a Quick Run, Gleams-Driver will always be modeling repeated annual applications. Thus, the year of the rotation cycle that you will enter will always be “1” – i.e., the digit one.

Note on Julian Day:

In GLEAMS and Gleams-Driver runs, the term Julian Date simply refers to the ordinal date – i.e., January 1 is Julian day 001, January 2 is Julian day 002, and so on. In a Quick Run, Gleams-Driver allows you to enter the normal calendar date (e.g., June 15, 2011) and the program handles the conversion to the Julian date. In the above discussion of the Full Run in Gleams-Driver, you need to manually make the conversion and enter the Julian date. There are sites on the Internet that will make this conversion for you (e.g., <http://mistupid.com/calendar/dayofyear.htm>). You should not, however, use days from a web site that give you the more formal Julian day – i.e., the number of days since January 1, 4713 BC.

Metabolites

Gleams-Driver has always handled metabolites, although to do this you must use the Full Run utility. In a recent application, however, an annoying (and embarrassing) characteristic was noted. So long as the chemical codes for the parent compound and the metabolites are ordered alphabetically, everything is fine. For example, **Chem1** → **Chem2** → **Chem3** gives the expected results where **Chem1** is the parent, **Chem2** is the metabolite of the parent, and **Chem3** is the metabolite of **Chem2**. This, in fact, is the way that the metabolite capabilities of Gleams-Driver were checked. If, however, the chemical codes do not sort alphabetically (e.g., **Parent** → **Metabolite** → **HydroxyMetab**), Gleams-Driver will model (or try to model) the pathway with an alphabetical sorting (e.g., **HydroxyMetab** → **Metabolite** → **Parent**). Assuming that the specific inputs were correct, this will just cause Gleams-Driver to crash. This is annoying.

Correcting this error is not hard but it is not trivial and will require some testing. This will not be done until Gleams-Driver Version 2 is developed. In the meantime, just be certain that the parent and metabolites have chemical codes are alphabetically sorted in a manner that the linear pathway is correct.

QuickRun Screen

Version 1.9/1.9.1 also fixes some minor bugs/annoyances in Version 1.8. The most notable bug/interface issue in Version 1.8 was noted by R6 in March of 2008 and concerned a lack of clarity in the Quick Run screen concerning the *Driver File*. This term has been eliminated. The Quick Run screen now indicates that the user must specify the *Input File*, a much more descriptive term. My apologies to R6 for taking so long to get this done but a lot of work goes into even a minor release of a program like Gleams-Driver and I felt it best to wait until more substantial revisions needed to be made.