REGDISP USER MANUAL

DRAFT

Stone Project ID 12-130

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1. INTRODUCTION

RegDisp predicts spray drift deposition from ground application of pesticides based upon regression equations constructed from data reported by Wolf and Caldwell (2001 and 2004), Wolf (2011), and the Spray Drift Task Force (1992 and 1993). The user can choose from these established deposition datasets by selecting study year, nozzle, boom height, sprayer speed, and wind speed.

RegDisp also includes functionality that allows users to input equations constructed from their own data sets. The user chooses the form of equation and the required parameters and then saves their equation with a name to the RegDisp database.

Once an established or custom deposition equation is selected, RegDisp estimates deposition as the fraction applied. Existing tools developed as part of the AGDISP interface allow the user to run the deposition and stream assessment tools.

RegDisp is a modification of AGDISP 8.26, a tool developed by the USDA Forest Service to predict spray drift from aerial applications of pesticides. RegDisp has been integrated with AGDISP so that the user can choose whether to run AGDISP or RegDisp.

2. INSTALLATION

The RegDisp application is installed in a Microsoft Windows environment. The application installation package will be provided as a compressed zip file. Copy the zip file to a folder on a local drive and extract the file. Double click the setup.exe file to install RegDisp. If a previous version of RegDisp is installed on the computer, that version should first be removed with Add or Remove Programs from the Control Panel.

3. PROGRAM OPERATION

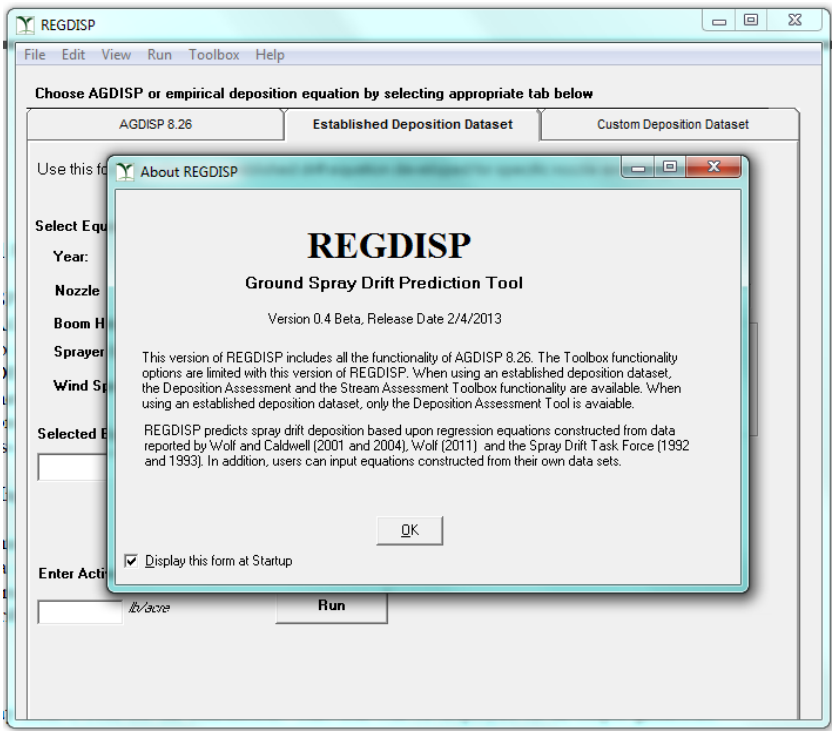
3.1. AGDISP

For use of all AGDISP functionality, please refer to the AGDISP User Manual which can be accessed from the Help Menu.

3.2. RegDisp

Once RegDisp is installed, it will be available from the Windows Start menu. When the user launches RegDisp, the “About RegDisp” informational screen is displayed. The user can choose to close it by selecting the OK button. To avoid displaying the “About” form in the future, the user can uncheck the “Display the form at Startup” button.

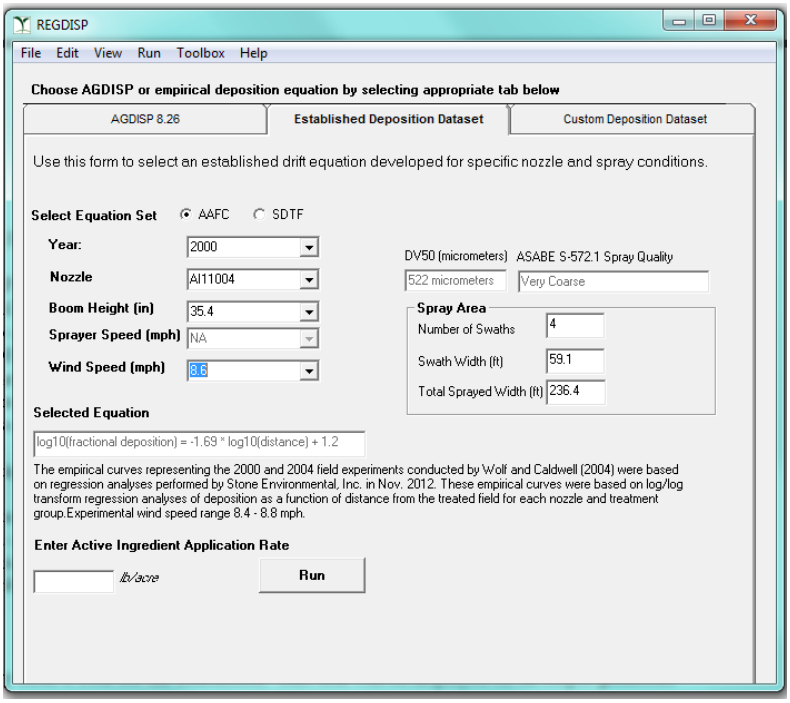
Figure 1. RegDisp About Screen.



3.3. Established Deposition Datasets

To use RegDisp established deposition datasets, select the second tab. Figure 2 illustrates the controls required for running RegDisp with an established dataset.

Figure 2. RegDisp Established Deposition Dataset Form.



3.3.1. Select Equation Dataset

The user can choose from either AAFC or SDTF deposition datasets. The 2000, 2004, and 2011 AAFC datasets are from Wolf and Caldwell (2001 and 2004) and Wolf (2011). The SDTF datasets are from 1992 and 1993 Spray Drift Task Forces studies. The selection at this point determines the options available in the subsequent combo boxes. When the user switches from AAFC to SDTF (or vice versa), any previous selections are cleared.

3.3.2. Select Year

The year available for selection depends on the years that studies were conducted for the chosen dataset. Once the user selects the year, the available nozzles and spray area characteristics are updated.

3.3.2.1. Spray Area

The spray area data is not editable. The information regarding the number of swaths and swath width is specific to the study selected. The effective swath width (in feet) is a calculation of the number of swaths times the swath width. This data is used in the stream assessment calculations.

3.3.3. Nozzle

Nozzle selection is dependent upon the dataset and year previously chosen. When the user selects nozzle, they are presented with the DV50 of the nozzle in micrometers and ASABE S-572.1 Spray Quality of the nozzle.

3.3.4. Boom Height

Once the user has selected the nozzle, they may have the option of choosing between a low or high boom height. Boom height data is presented in inches. Not all trials were conducted with multiple boom heights. If only one boom height option is available, the selection is made automatically.

3.3.5. Sprayer Speed

Sprayer speed data (in miles per hour) is only available for SDTF 1993 data. For the 8004-LP nozzle the user has the option of selecting a sprayer speed of either 5 or 14 mph.

3.3.6. Wind Speed

Wind speed (in miles per hour) is the final selection required by the user to select an equation. In some cases there is only one wind speed option. For some empirical equations, the wind speed represents the average of the wind speeds from multiple trials.

3.3.7. Selected Equation

The selected equation is displayed in the format

*Log10 (Fractional Deposition) = Slope * Log10 (Distance) + Y-Intercept*

The equation is not editable but is an opportunity for the user to verify their selected inputs.

3.3.7.1. Metadata

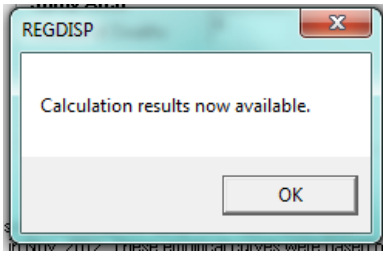
The metadata for the selected equation is displayed below the equation.

3.3.8. Active Ingredient Application Rate

Before running the model, the user is required to enter the active ingredient application rate in units of pounds per acre.

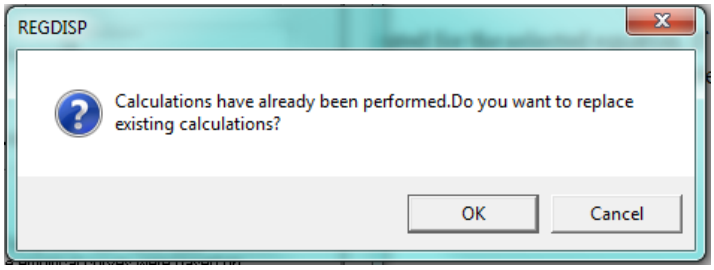
3.3.9. Run Button

The run button is enabled once the user has selected all necessary inputs. When the user selects the "Run" button, the model is executed for the selected equation. If the model executes successfully, the user is presented with a message box "**Calculation Results Now Available**." Users can access the results by running the Toolbox Deposition Assessment or Stream Assessment (Sections 3.5 and 3.6).



If the user attempts to run the model before entering values for all required inputs, the following message appears: “Before running the equation, complete selection of all parameters.” If the user simply neglects to enter an application rate, the message will prompt the user to first enter an application rate.

If the user has previously run a model and changes their input selection, they will be presented with the following message:



The user can view results by running the ***Pond Deposition*** or ***Stream Assessment*** from the Toolbox menu. Sections 3.5 and 3.6 of this user manual contain instructions for running these tools.

3.4. Custom Deposition Datasets

To use RegDisp with a custom deposition datasets, select the third tab. The custom deposition dataset option requires that you have independently fit an equation to your own experimental data. Use this form to input your custom drift equation or select a previously defined equation. Figure 3 illustrates the controls required for this option.

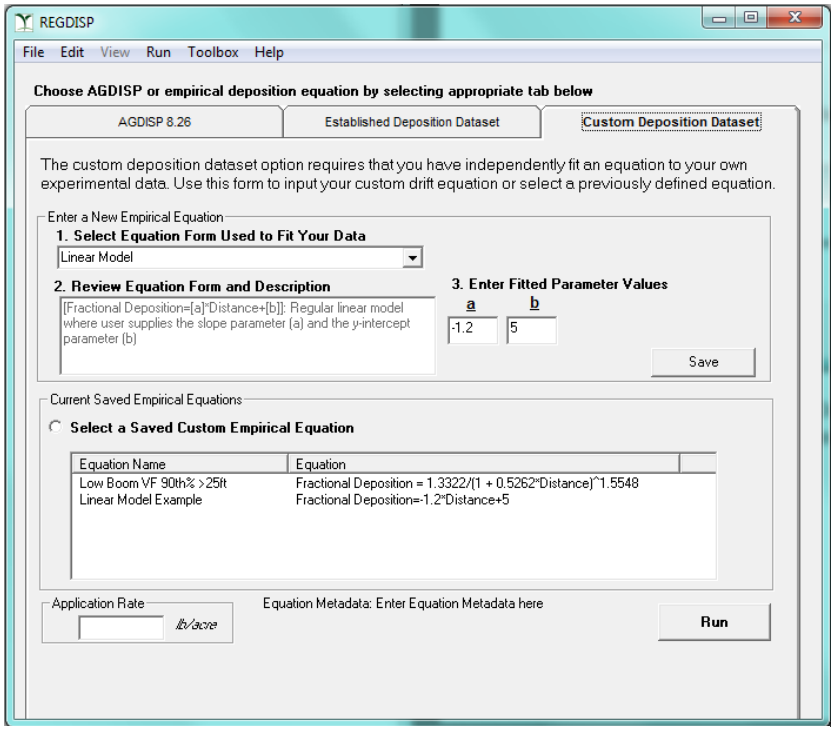


Figure 3. RegDisp Custom Deposition Dataset Form.

3.4.1. Fit Equation to Experimental Data in Excel

One of the most common methods for performing a regression on experimental spray drift data is to log transform the distance and fractional deposition and perform a linear regression on the log transformed data. All of the regressions on the Established Deposition Datasets in RegDisp (Tab 2) were developed using a linear regression on log transformed data. Below is an example of how to get custom data prepared for RegDisp.

Enter experimental data into an Excel spreadsheet in the format distance (x-values), and fractional deposition, y-values (Figure 4). **The values of distance MUST by in meters**. If your data is in feet, first convert feet to meters by multiplying by 0.3048 and if your deposition data are in percent of applied, first divide by 100 to convert to fractional deposition.

Figure 4. Experimental data entered into Excel

	A	B	C	D
1	Distance	Deposition	Log10 Distance	Log10 Deposition
2	(meters)	(fraction)	(meters)	(fraction)
3	1	0.105	0	-0.979544189
4	2	0.025	0.301029996	-1.608093017
5	5	0.011	0.698970004	-1.943585362
6	10	0.004	1	-2.353586153
7	20	0.001	1.301029996	-2.886449792
8	40	0.001	1.602059991	-2.826255134
9	80	0.001	1.903089987	-2.97153008
10	120	0.000	2.079181246	-3.480561271

To fit a linear equation to your log transformed data, calculate the slope using the Excel slope function as shown below in the format: *Slope(y-values, x-values)* (Figure 5). Calculate the intercept for the equation using the Excel intercept function: *Intercept(y-values, x-values)*. You can also evaluate the fit of your equation by computing the r^2 value using the Excel r-square function: *RSQ(y-values, x-values)*.

Figure 5. Calculate equation parameter values using Excel functions.

E3 f_x =SLOPE(D3:D10,C3:C10)

	A	B	C	D	E	F	G
1	Distance	Deposition	Log10 Distance	Log10 Deposition	Slope	Intercept	r^2
2	(meters)	(fraction)	(meters)	(fraction)	(param a)	(param b)	
3	1	0.105	0	-0.979544189	-1.0763448	-1.1857365	0.9517263
4	2	0.025	0.301029996	-1.608093017			
5	5	0.011	0.698970004	-1.943585362			
6	10	0.004	1	-2.353586153			
7	20	0.001	1.301029996	-2.886449792			
8	40	0.001	1.602059991	-2.826255134			
9	80	0.001	1.903089987	-2.97153008			
10	120	0.000	2.079181246	-3.480561271			

The data is now ready to use in RegDisp in the format:

*log10(Fractional Deposition)=[Slope]*log10(Distance)+[Intercept]*

3.4.2. Select Equation Form

Using the above dataset, the user would choose the equation form: *Linear Model with log10/log10 transformation* from the dropdown options in Step 1. The user may choose from several different equation forms to fit their custom deposition data when appropriate. This version of RegDisp does not automatically fit an equation to the data. Table 1 below lists the forms available, the required format, and a description.

Table 1. Equation forms available for fitting custom deposition data.

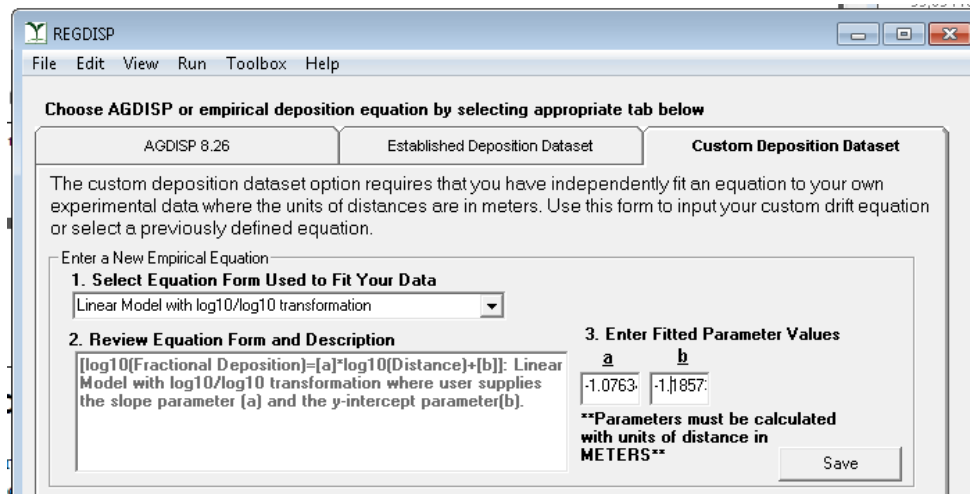
Equation Name	Equation Format	Equation Description
Linear Model	Fractional Deposition=[a]*Distance+[b]	Regular linear model where user supplies the slope parameter (a) and the y-intercept parameter (b)
Linear Model with log10/log10 transformation	log10(Fractional Deposition)=[a]*log10(Distance)+[b]	Linear Model with log10/log10 transformation where user supplies the slope parameter (a) and the y-intercept parameter(b).
Linear Model with natural log/natural log transformation	ln(Fractional Deposition)=[a]*ln(Distance)+[b]	Linear Model with natural log/natural log transformation where user supplies the slope parameter (a) and the y-intercept parameter(b).
SDTF groundspray low boom model and orchard airblast model	Fractional Deposition = [c]/(1 + [a]*Distance)^[b]	The user supplies coefficient shape parameters a, b, and c based on fractional deposition.
SDTF groundspray high boom model	Fractional Deposition = [c]/(1 +[a]*Distance)^[b] * (1 + A exp(-B*Distance))	The user supplies coefficient shape parameters A, B, a, b, and c based on fractional deposition.
PMRA Approach (log10)	log10(Fractional Deposition) = a*Distance + b	Linear models developed for Ganzelmeir airblast data.
PMRA Approach (ln)	ln(Fractional Deposition) = a*Distance + b	Linear models developed for Ganzelmeir airblast data
Negative Exponential	Fractional Deposition = b*EXP(- ln(Distance)*a)	This is the formula used to fit Wolf data where b is a scale parameter and a is the rate of deposition.

In Step 2 the user reviews the equation form and description before entering the required equation parameters.

3.4.3. Enter Fitted Parameter Values

Depending on the equation form chosen in Step 1, the user then enters the equation parameters for their dataset. Only the parameters required for the chosen dataset are displayed. As explained, the user needs to determine these values outside of RegDisp. Using the example dataset in 3.4.1 the user enters the slope as **parameter a** and the intercept as **parameter b** (Figure 6).

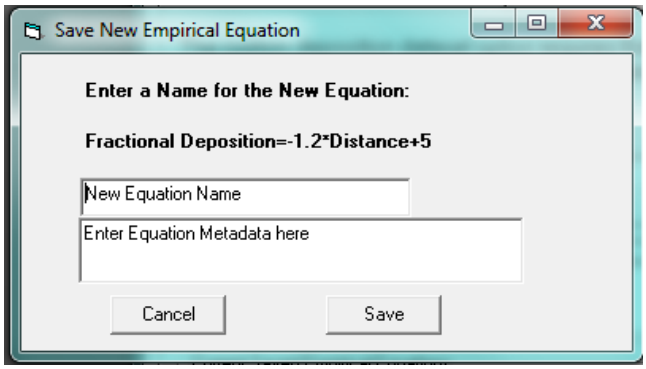
Figure 6. Enter Parameter Values into RegDisp



3.4.4. Save the Equation

Select the Save button to open the form and save the equation (Figure 7).

Figure 7. Save Custom Deposition Equation Form.



The save form displays the equation with the user specified parameters. The user then provides an equation name and equation metadata. By selecting the “Save” button the new equation is saved in the RegDisp database. The “Save” button also updates the Saved Equation list box on the third tab of the main form with the new equation.

3.4.5. Run a Saved Custom Deposition Equation

The user can choose to run the equation just saved or run a previously saved equation. The user must first select the option from the 3rd tab, “Select a Saved Custom Empirical Equation.” This selection then enables the

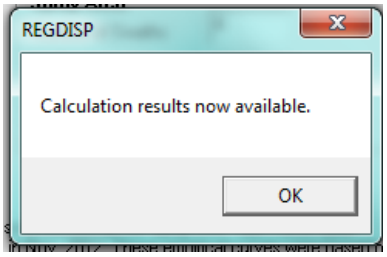
list box containing the saved equations. The user can then select the equation to run from the list box. The metadata for the selected equation is displayed below the list box.

3.4.6. Active Ingredient Application Rate

Before running the selected model, the user must enter an active ingredient application rate in pounds per acre.

3.4.7. Run Button

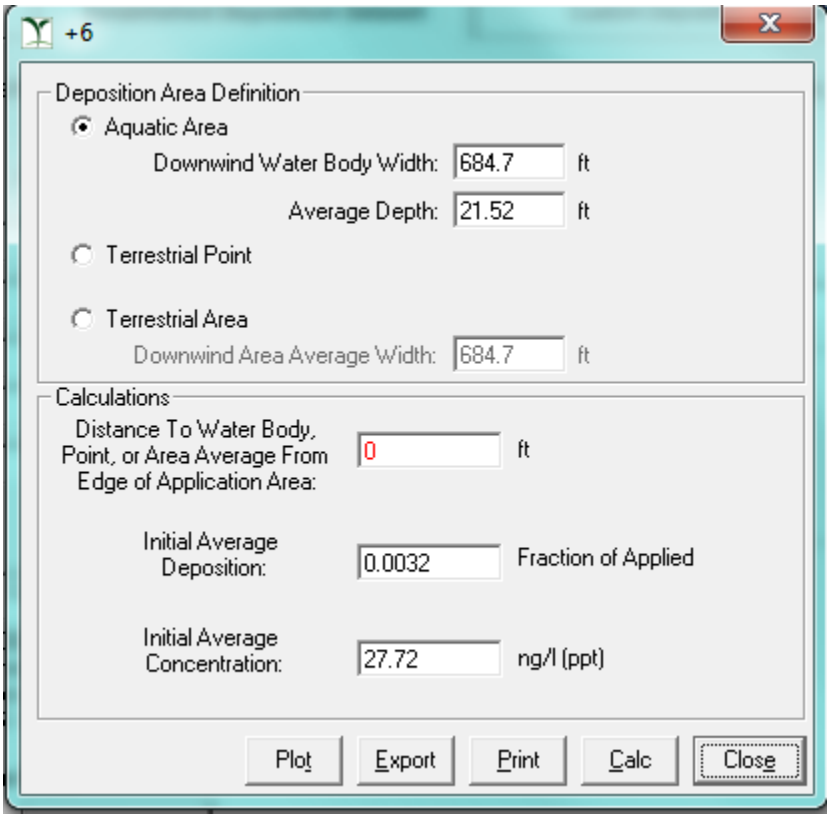
When the user selects the “Run” button, the model is executed for the selected equation. If the model executes successfully, the user is presented with a message box “Calculation Results Now Available.”



3.5. Deposition Assessment Tool

The Deposition Assessment tool is available from the Toolbox Menu. The user can choose to run this tool after executing an established or custom empirical equation. This tool has not been modified from the AGDISP version and uses the calculated fractional deposition to evaluate the current deposition profile. Figure 8 illustrates the deposition assessment form.

Figure 8. Deposition Assessment Form.

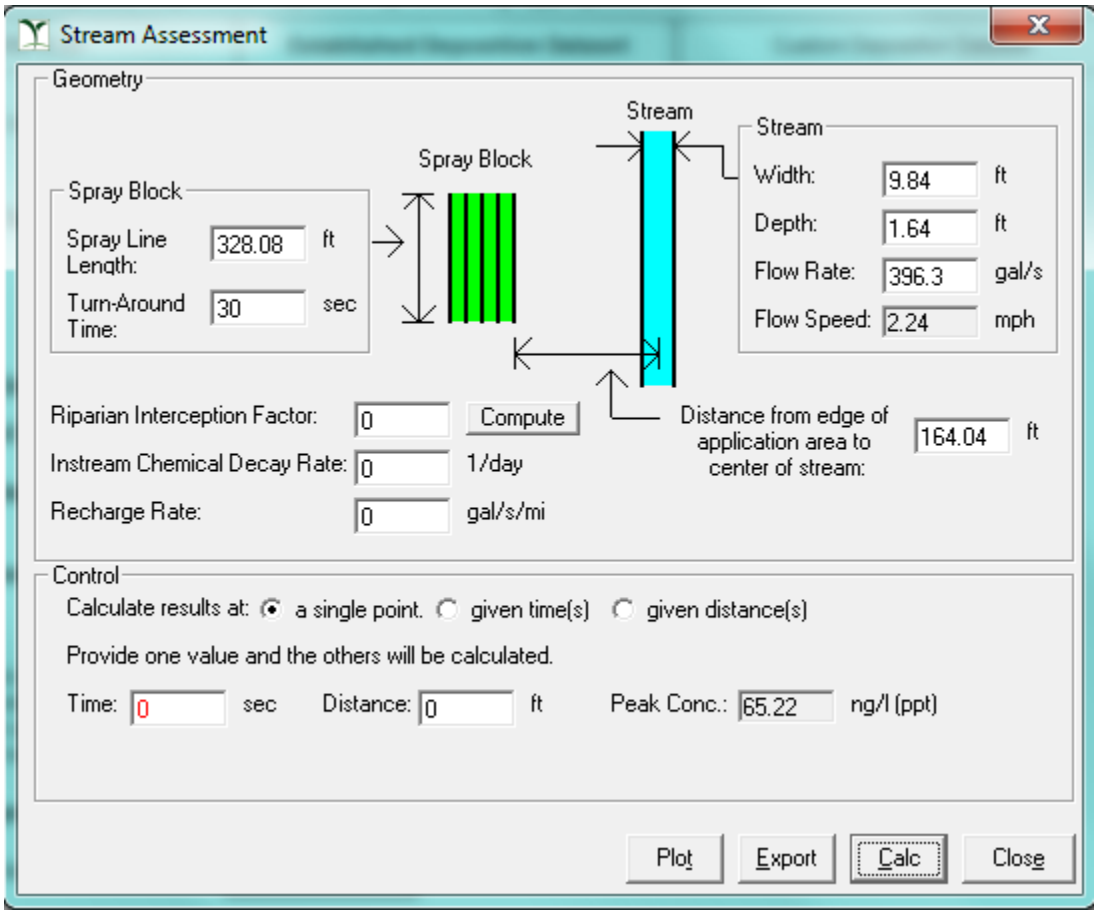


Please refer to the AGDISP user manual for detailed instructions on use of this tool. The AGDISP user manual can be accessed from the Help menu.

3.6. Stream Assessment Tool

The Stream Assessment tool is available from the Toolbox Menu. The user can choose to run this tool after executing an established empirical equation. This tool is not available for custom empirical equations with this version of RegDisp. This tool has not been modified from the AGDISP version and uses the calculated fractional deposition and effective swath width to evaluate the impacts of deposition on a downwind stream. profile. Figure 9 illustrates the stream assessment form.

Figure 9. Stream Assessment Form.



Please refer to the AGDISP user manual for detailed instructions on use of this tool. The AGDISP user manual can be accessed from the Help menu.

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4. REFERENCES

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