WinTR-55 for Plan Reviewers

Small Watershed Hydrology

Modeling Single Sub-area Watersheds

(Part 1)

Course Outline

- Overview
- Review of Hydrology Terms
- Modeling Single Sub-area Watersheds
- Modeling Single Sub-area Watersheds
- Multiple Sub-area Watersheds
- Modeling Structures
- Advanced Features of WinTR-55

NRCS d2s   Modeling Single Sub-Area Watersheds

We're now going to look at modeling single sub-area watersheds with WinTR-55. This lesson will covers the majority of the features of WinTR-55 and this level of training is beneficial to all users.

Lesson Objectives

Upon completion of this lesson, you will be able to:

- Start the WinTR-55 program and navigate through the various windows
- Develop input data for single sub-area watersheds
- Input sub-area data into WinTR-55
- Run WinTR-55
- Interpret Output

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The objectives for this lesson are for you to be able to:

Start WinTR-55 and navigate through the various windows;

Develop input data for single sub-area watersheds and understand what the minimum data requirements are to complete a run;

Input the data into the program;

Run the program; and

Interpret the output.

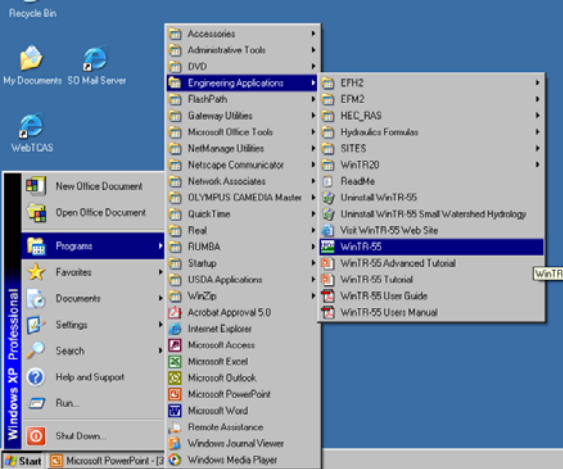**Starting WinTR-55
and
Program Windows**

We'll begin by looking at starting the program, then take a look at the *WinTR-55 Main Window*. Then we'll look at various other data input windows, and discuss the data input parameters along with some items to watch out for when developing input data for and running WinTR-55. Click along to start the program and navigate to the various windows as we discuss them.

(Note to Instructor: At this point, all students should have their computers ON and be starting the program and navigating to each of the various windows as they are discussed.)

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The standard method of starting the program is to click the *Start button* **located at the bottom left hand of the computer monitor, then navigate to** *Programs*, **then to** *Engineering Applications*, **and finally to** *WinTR-55*.

Of course, if you have a WinTR-55 shortcut located on your desktop, it is necessary only to click on the *WinTR-55 icon* **to start the program. A desktop shortcut is NOT created as part of the WinTR-55 installation. You will have to create your own desktop shortcut if you want one.**

Start the program now if you haven't already done so.

On first start up, the *Welcome to WinTR-55 window* **opens. Here you will find:**

🖱 **the** *Disclaimer*, **stating that you, as the user, hold ultimate responsibility for interpretation of any data generated through using this program;**

🖱 **a** *Start button* **which will take you to the** *WinTR-55 Main Window*;

🖱 **a** *New User? button* **which will open** *Help for Welcome to WinTR-55 window* **titled** *Help for a New User*;

🖱 **an** *Exit Program button* **which allows you to exit the program without doing anything else; and**

🖱 **a** *Check here to skip this introduction in the future box*. **If you check this box, the** *Welcome to WinTR-55 window* **will not show the next time you open WinTR-55. Instead, the program will open at the** *WinTR-55 Main Window*.
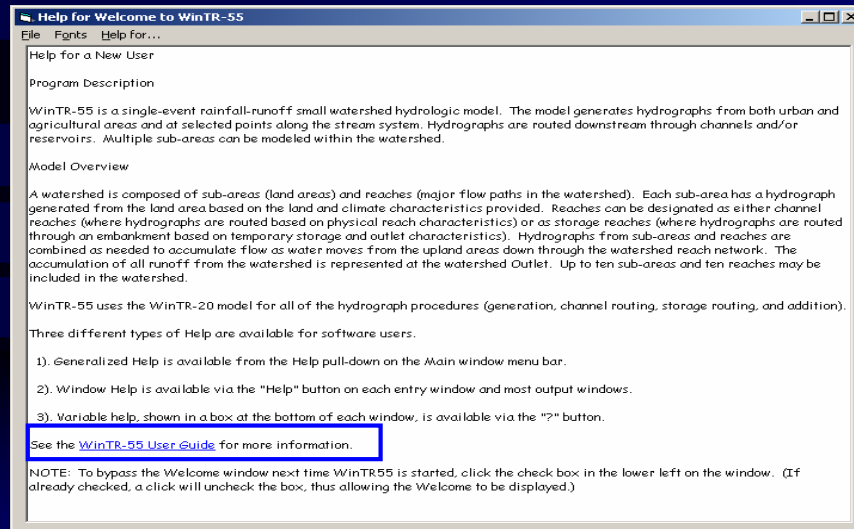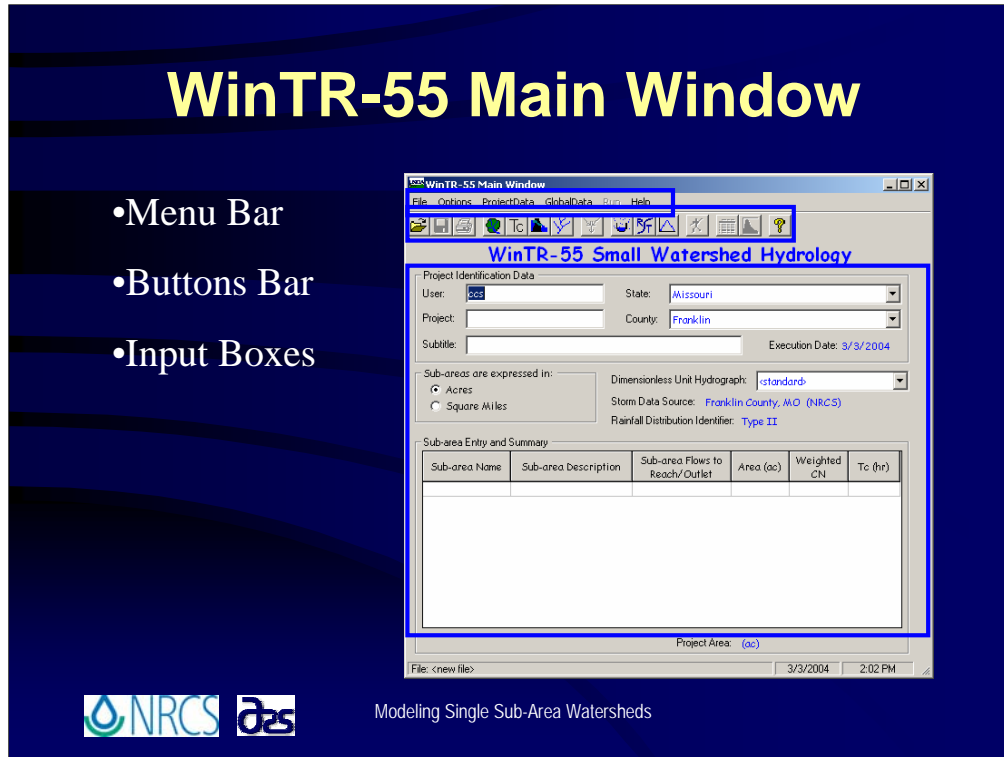
Clicking the *New User? button* **from the** *Welcome to WinTR-55 window*, **a opens the** *Help for Welcome to WinTR-55*.

Each WinTR-55 window has a help window associated with it, either through a menu item or a help button, depending upon which window you are working in. This is useful to know since no matter where you are in the program you can easily access help for that particular window.

A link to the *WinTR-55 User Guide* **is listed on all the Help windows. This is a hot-link and should open the** *WinTR-55 User Guide* **which is included with the WinTR-55 installation package.**

Clicking the *Start button* **from the welcome window opens the** *WinTR-55 Main Window.*

The *WinTR-55 Main Window* **looks pretty much like most computer programs written for the Windows operating system.**
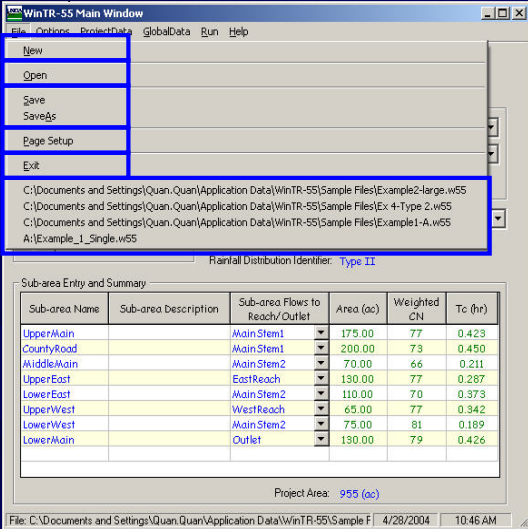
Features of this window are:

🖱 **the** *Menu Bar* **through which all options and features of the program are accessible;**

🖱 **the** *Button Bar* **which allows you to open new windows or perform other activities without having to search through the menu bar for the appropriate options; and**

🖱 *Data Input Boxes* **where you enter data by typing it in.**

Let's take a bit more of an in-depth look at these features.

File Menu

- *New*
- *Open* or [button icon] button
- *Save/SaveAs* or [button icon] button
- *Page Setup*
- *Exit*
- List of recent files

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The *File menu* **looks like that of any windows operating system program. The menu choices here are**

🖰 *New* **(to clear out any data and start a complete new file), *click*** *Open* **or the** *Open button* **(to open an existing file),**

🖰 *Save* **(to save a data file) or** *Save as* **(to rename a data file to another name) or the** *Save File button***,**

🖰 *Page Setup* **(to format output printouts), and**

🖰 *Exit* **(to exit the program).**

🖰 **There is also a list of recently accessed files to provide quick access to those files.**

Options Menu

•*Units*
  ✓*English*
  ✓*Metric*
•*Clear Recent Files*

Note: If you switch units back and forth, accuracy will be lost !
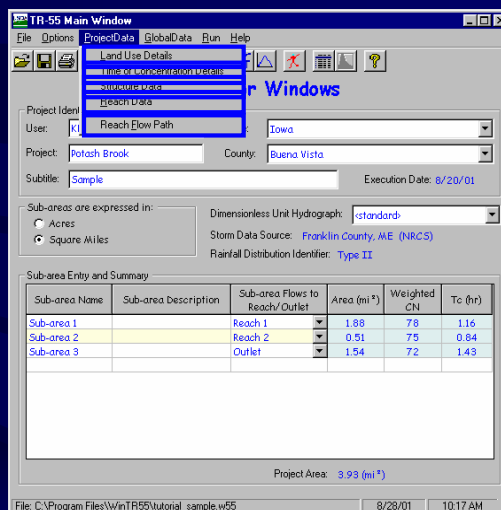
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(**Update screen captures.**)

The *Options menu* **allows you to specify the measurement system in which you are working.**

Both *English Units and SI Units* **are available. <u>One note of caution:</u> <u>All computations are done in English units. If you specify SI units, the program converts those to English units, performs the computations and converts the reported results back to SI units. So, if you switch units continually back and forth from English to SI Units, accuracy will be lost.</u>**

Clear Recent Files **clears the list of recently opened files at the bottom of the** *File menu***.**

To navigate to the *ProjectData menu* **input windows you can use either the drop-down menu from the menu bar or use the appropriate buttons from the button bar.**

🖰 *Land Use Details* **takes you to the window allowing you to compute runoff curve numbers.**

🖰 *Time of Concentration Details* **takes you to the window allowing you to compute times of concentration.**
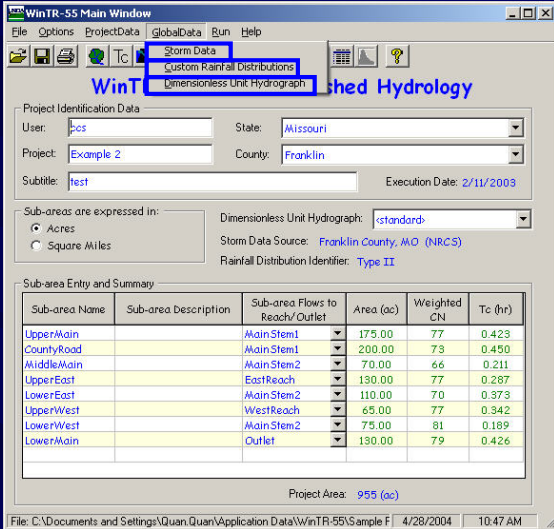
🖰 *Structure Data* **takes you to the window allowing you to enter data for a structure.**

🖰 *Reach Data* **takes you to the window allowing you to enter data for stream reaches.**

🖰 *Reach Flow Path* **opens a window showing a simple line drawing schematic of the watershed you are trying to model.**

GlobalData Menu

- *Storm Data* or button
- *Custom Rainfall Distributions* or button
- *Dimensionless Unit Hydrograph* or button

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Through the *GlobalData menu* **items or associated buttons, you can access the following windows and features:**

🖱 *Storm Data* **which allows you to view and edit the rainfall data used for your particular WinTR-55 evaluation.**

🖱 *Custom Rainfall Distributions* **which allows you to enter a custom rainfall distribution if you must deviate from the standard distributions built in to WinTR-55.**

🖱 *Dimensionless Unit Hydrograph* **which allows you to enter a custom dimensionless unit hydrograph if you need to utilize this feature.**

We'll look at each of these items in further detail shortly, but for now, this is how those windows are accessed from the Main Window.

Run Menu

- *Run* from menu bar or 🏃 button

- **Run WinTR-55** window

- Check storm(s) to evaluate

- Click ⬚Run button

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Until you have entered sufficient data to execute a run, the *Run Menu option* **and** *Run button* **will remain grayed out.**

🖱 **Once sufficient data has been entered, these items will go live and clicking** *Run from the menu bar* **or the** *Run button* **opens the** *Run WinTR-55 window.*
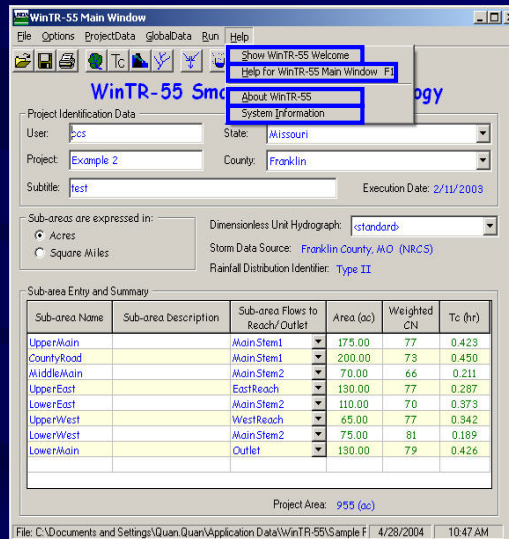
🖱 **On the** *Run WinTR-55 window* **you specify for which** *storm events* **you wish to execute runs.**

🖱 **Clicking the** *Run button* **will cause the program to execute a run.**

You'll see this slide again just a bit later when we talk about actually running the program.

Help for WinTR-55 is available through a variety of sources for each window. From the *Main WinTR-55 Window* **the** *Help menu* **offers access to:**

🖱 **the** *Show WinTR-55 Welcome Window***;**

🖱 *Help for WinTR-55 Main Window* **(also accessible by pressing the** *F1* **key);**

🖱 **the** *About WinTR-55 Window***; and**

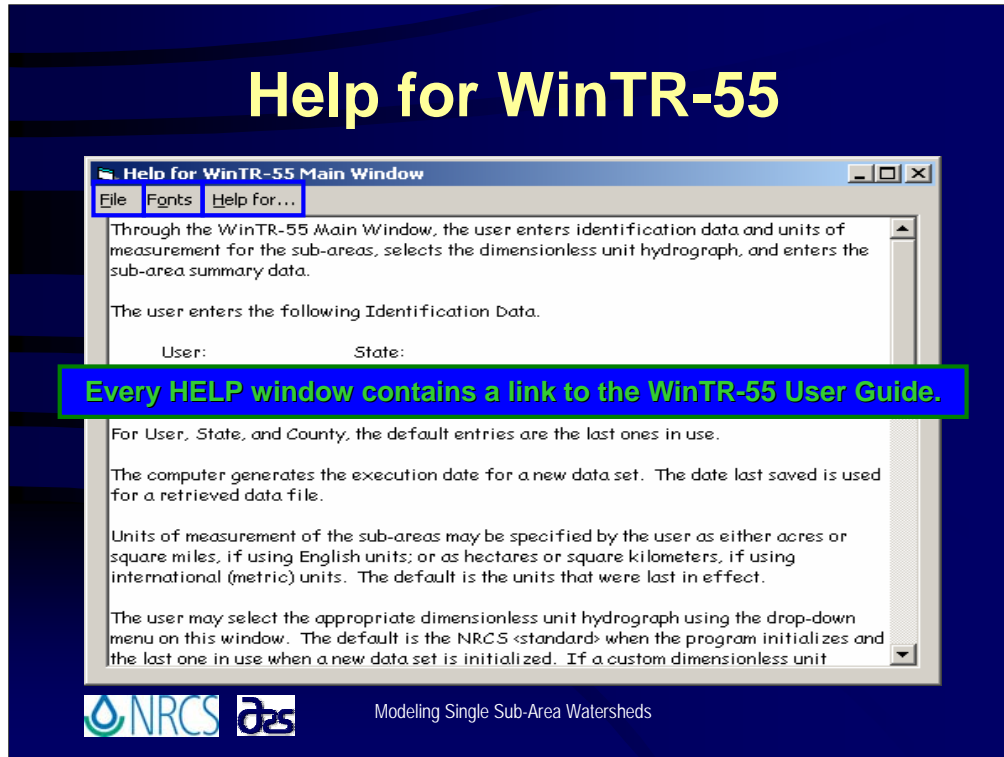🖱 **the** *System Information Window***.**

Show WinTR-55 Welcome

If you click on *Show WinTR-55 Welcome* **from the** *Help menu*, **the** *WinTR-55 Welcome window,* **that you saw earlier, opens. However, this time there is no** *Exit button* **available and the** *Start button* **is replaced with the** *Resume WinTR-55 button*.

You MUST click on the *Resume WinTR-55 button* **to continue.**

Clicking on *Help for WinTR-55 Main Window* **or** *F1* **opens the** *Help for WinTR-55 window.*

🖱 **Again, help for each of the WinTR-55 windows is accessible either through a** *Help menu* **item or a** *Help button***, depending upon the window you are using.**

🖱 **You have the option of printing the help information using the** *File menu* **item on the** *Help window***.**

🖱 **You may also change the appearance of the** *Help window* **by changing** *Fonts***.**

🖱 **Finally, help for any other window is available by clicking the** *Help for..* **menu item and selecting from the drop down menu.**

The *WinTR-55 User Guide* **is also accessible from the** *Help for.. menu **item** **and a link to the** *User Guide* **is provided within the** *Help window* **text.**
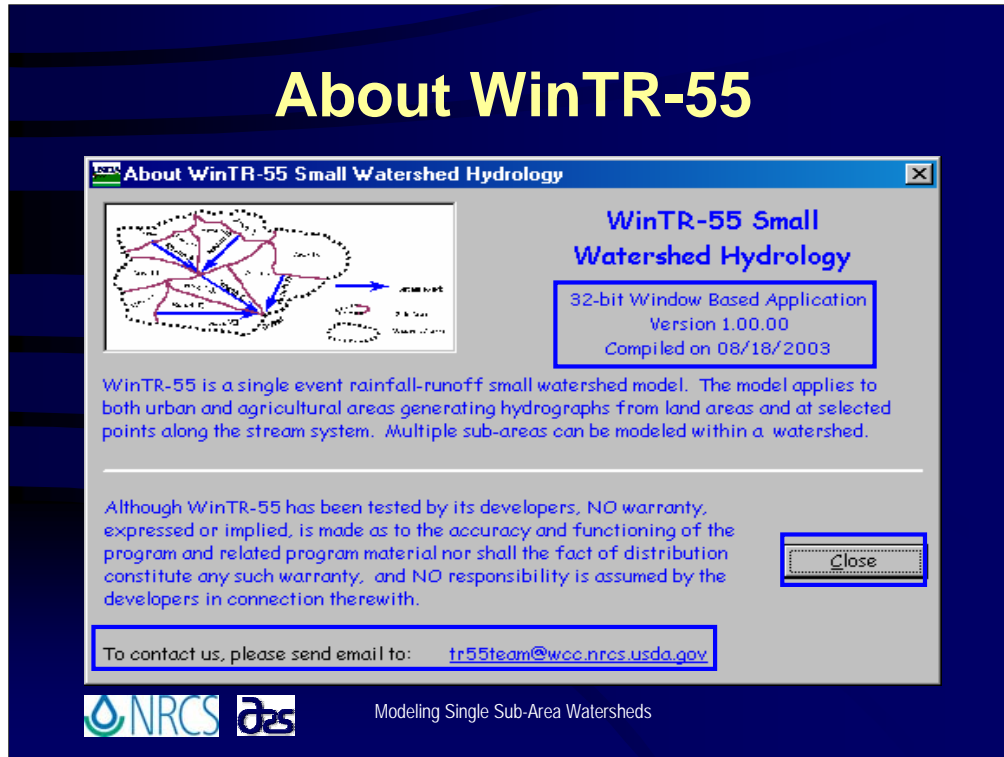
Clicking on *About WinTR-55* **from the** *Help menu* **opens the** *About WinTR-55 Small Watershed Hydrology window.*
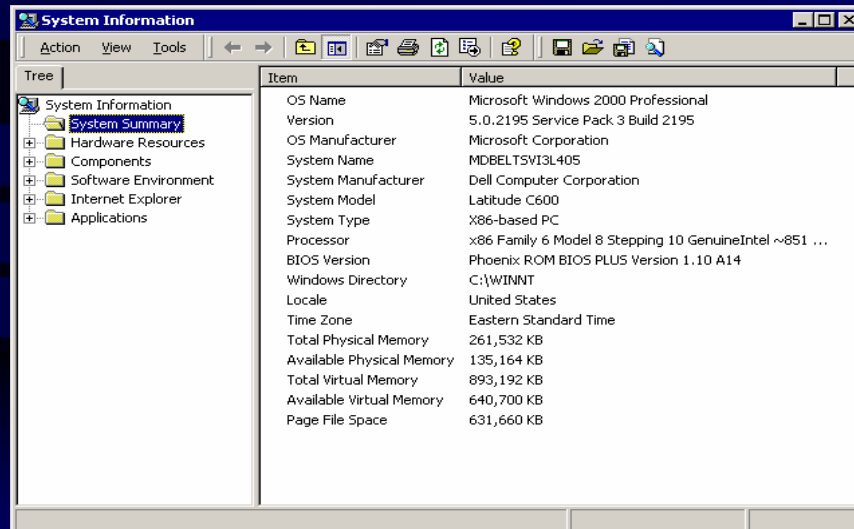
🖱 **This window contains information about the version of WinTR-55 installed on your computer.**

You will also see the disclaimer statement repeated here.

🖱 **Also included here is a hot-link** *e-mail address to the WinTR-55 development team* **should you need to e-mail them with any questions.**

🖱 **You MUST click the** *Close button* **to close this window and return to the** *WinTR-55 Main Window.*

Clicking *System Information* **from the** *Help menu* **opens the** *System Information window***. System information is technical information about your computer and is primarily information computer programmer's might be interested in.**

That's is for the menu items, so now a quick review of the buttons and we'll start looking at data inputs.

This slide shows a summary listing of all the Buttons from the button bar and the windows to which they link.

Project Identification Data

- User ID
- Project
- Subtitle
- State
- County
- Execution Date

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Now that we've looked at the menu bar and button bar, let's look at the data input boxes!

Under the *Project Identification Data* **portion of the** *WinTR-55 Main Window***, you enter general information about the project.**

�🖱 **First of all, a** *User* **id. Something to identify yourself as the person who performed the analysis. Typically people enter their initials.**

�🖱 **Secondly, a** *Project* **name. Something to identify the project.**

�🖱 **You may also enter a** *Subtitle* **to further identify the project.**

�🖱 **Finally, you must specify the location of the project, in this case,** *State* **and** *County.*

�🖱 **The last piece of information under the** *Project Identification Data* **is the** *Execution Date***. The execution date is generated automatically by the program. For new runs, it will be the current date. If you open an existing file, however, the date shown will be the last date on which that data set was saved. If you run that data, the date will be changed to the current date.**

Watersheds Outside the U.S.

State and **County** change to **Region** and **Locale**

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For watersheds outside the United States, you need only to type in the name of the country and locale.

🖱 **As you can see, in this example, the user is making an analysis of a watershed in Durango, Mexico.**

As soon as you enter something other than the name of a state from the drop down list, *State* **changes to** *Region* **and** *County* **changes to** *Locale.*

NRCS supplies no rainfall data other than those in the built-in data base, so you are responsible for supplying the necessary rainfall data and rainfall distributions for areas outside of the United States.

Project Identification Data

- Sub-areas expressed in:
  - *Acres*
  - *Square Miles*

- Dimensionless Unit Hydrograph

- Storm Data Source

- Rainfall Distribution Identifier

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As you continue entering the *Project Identification Data*, **you will select in which units area is specified.** *Sub-areas are expressed in* **either acres or square miles if working in English units, or hectares or square kilometers if working in SI (metric) units.**

 You might select a *Dimensionless Unit Hydrograph* **from the drop down list to utilize one of the built-in unit hydrographs. However, the default setting is the** *<standard>* **dimensionless unit hydrograph and <u>unless you have a documented reason for using something other than standard, you should use the standard dimensionless unit hydrograph.</u>**

 This section of the window also lists the selected *Storm Data Source* **and**

 Rainfall Distribution Identifier **that will be used for this particular run.**

<u>It is very important that the</u> *Storm Data Source* **and** *Rainfall Distribution Identifier* **<u>listed here are appropriate data for the analysis being made. You MUST check this information to be certain it is correct. A very simple check is to look and see that the</u>** *State* **and** *County* **<u>listed are the same as the</u>** *Storm Data Source***<u>.</u>**

Project Identification Data

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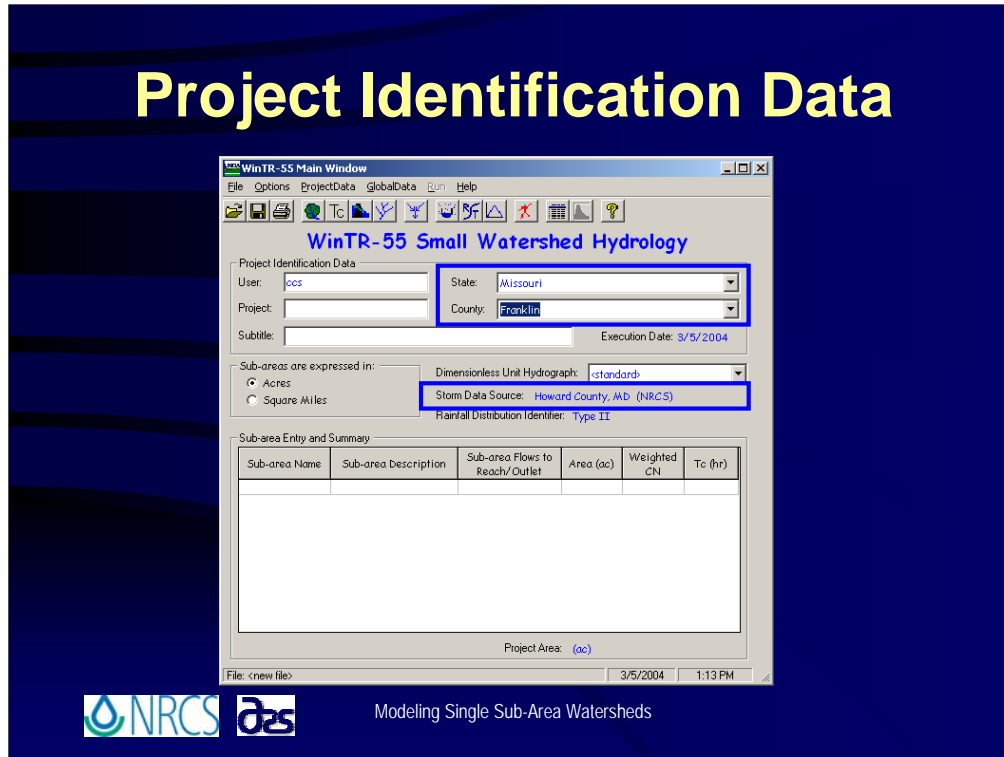
As illustrated on this screen capture, the *State* **and** *County* **specified are Franklin County, Missouri while the**
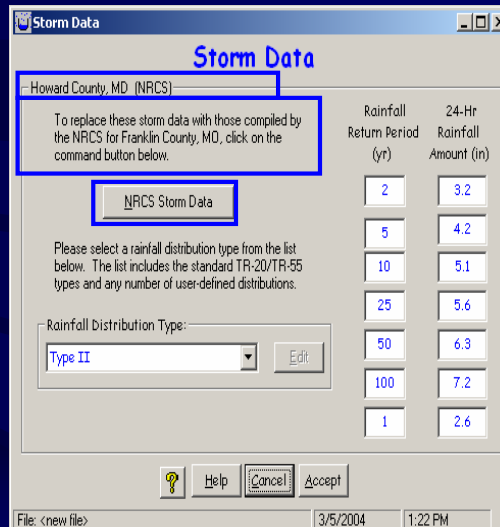
🖰 *Storm Data Source* **shown is for Howard County, Maryland. In this case, even though the user specified Franklin County, Missouri the rainfall data WinTR-55 would actually use in executing a run is that for Howard County, Maryland.**

A very simple check for you to make certain the proper information is used, is to make sure these two items are the same. **In this case, they need to both read Franklin County, Missouri.**

To make the proper change, you need to go to the *Storm Data Window.*

To access the Storm Data Window, click *Global Data menu item* and select *Storm Data* from the dropdown menu on the main window, or click the *Storm Data button* from the menu bar on the main window.

🖱 For the example we've been discussing, we read here that the *Storm Data* listed is for Howard County, Maryland.

🖱 Reading the text tells us *"To replace these storm data with those compiled by the NRCS for Franklin County, MO, click on the command button below."*

🖱 So, to make the change for Franklin County, Missouri simply click on the *NRCS Storm Data button.*
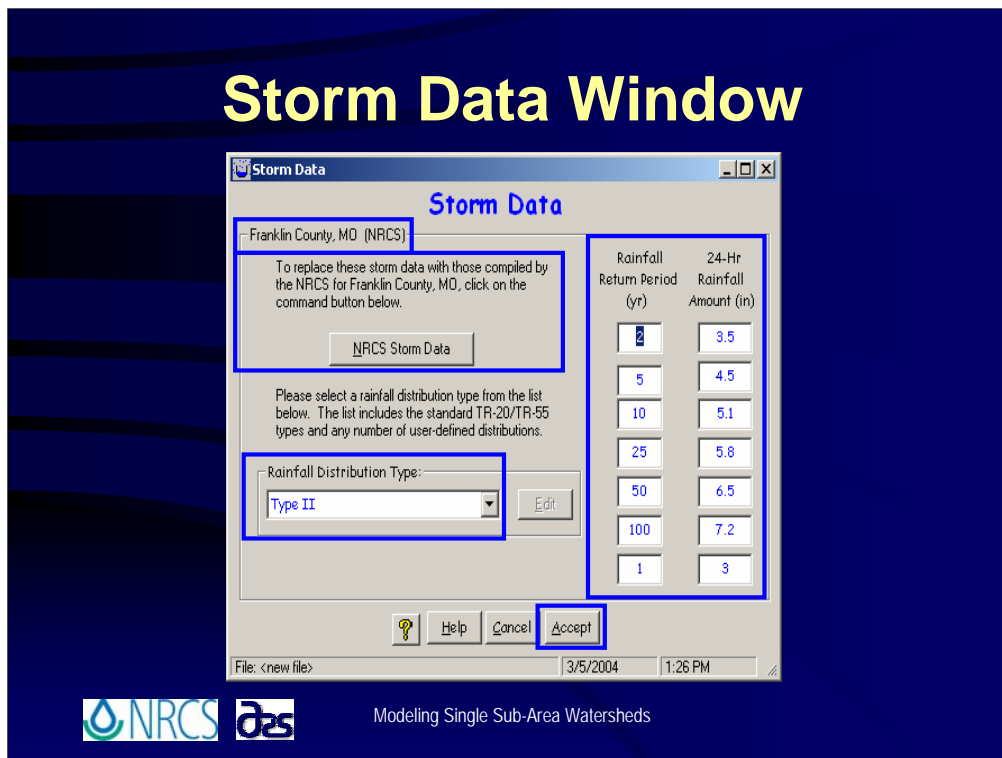
After clicking the *NRCS Storm Data button* **we now see that the data listed are for Franklin County, Missouri. Double check that by reading the** *"To replace.."* **paragraph and observe that it also reads Franklin County, MO.**

🖱 **There is a built in** *Storm Data* **database that includes** *24-hour Rainfall Amount by Rainfall Return Period* **for almost every county in the United States. Each state was asked to submit data for the database, but some chose not to submit data because of large variations of rainfall across small areas. If you are in one of those locations (primarily in the western states), you will need to develop and enter your own rainfall data. You do have the option of doing some limited editing of the data, however any editing you might do is NOT saved in the program database. You can save the data with your current project file and keep recalling that project file when you need to access that rainfall data, but you cannot make changes to the built-in database.**

🖱 **An associated** *Rainfall Distribution Type* **has also been included into the database. There are several standard rainfall distributions built-in to WinTR-55, but occasionally it is necessary to deviate and use something else. If you need to utilize a different rainfall distribution, development of custom distributions is covered in Advanced WinTR-55 Training. However, unless you have a documented reason for utilizing some other rainfall distribution, you should use whichever distribution is specified for the area in which you are working.**

🖱 **To accept changes as specified, click the** *Accept button* **to return to the** *WinTR-55 Main Window***.**

Don't forget to click *Accept***! If you don't, WinTR-55 will NOT register the change and whatever the previous data was is the data that will be used!**

Upon returning to the main window that the project location (*State* and *County*) and *Storm Data Source* are the same, in this instance, Franklin County, Missouri.

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In the *Sub-area Entry and Summary* **portion of the main window you will specify:**

🖱 **a** *Sub-area Name* **for each sub-area being analyzed,**

🖱 **a** *Sub-area Description***, and**

🖱 **the location to which the water leaving that sub-area flows in the** *Sub-area Flows to Reach/Outlet* **column.**
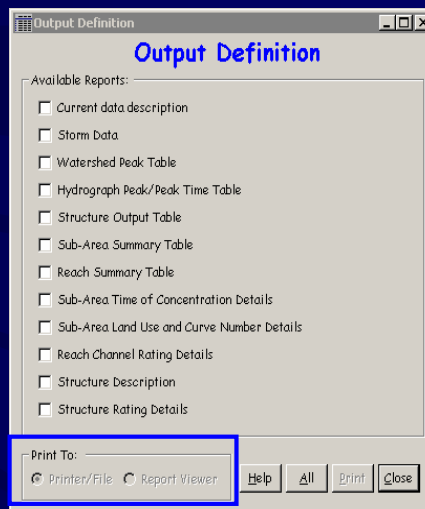
You may directly enter the

🖱 *Area***,**

🖱 *Weighted CN* **(Runoff Curve Number), and**

🖱 *Tc* **(Time of Concentration) in hours if you already have this information from another source. If you plan to use WinTR-55 to compute the runoff curve number and time of concentration these columns will be filled as you work through the appropriate windows.**

The total *Project Area* **is tallied at the bottom of this portion of the main window.**

Bear in mind that the *Sub-area Entry and Summary* **portion of the** *WinTR-55 Main Window* **contains information ONLY about the watershed sub-areas. Stream reaches and structures are treated separately, and other than to tell the program that runoff enters a particular stream reach or structure, no further information is given about stream reaches or structures.**

You have the option of specifying the type of output you would like to view upon successful completion of a run. You may, at anytime open the *Output Definition* window to specify available reports. However, available reports are dependent upon the data entered, whether or not a run has been executed, and the type of analysis being made. Until certain reports are available, some of the listed items will be grayed out.

🖱 **You may specify whether to send the requested reports directly to a printer or file by selecting** *Printer/File;* **or to view the reports on the computer monitor by selecting the** *Report Viewer***.**

As shown, there are a wide array of reports available. Rather than go through and try to describe each report individually at this time, we'll work through a demonstration problem and view some of the reports at that time.

Until you have entered sufficient data to execute a run, the *Run menu option* **and** *Run button* **will remain grayed out.**

🖱 **Once sufficient data has been entered, the menu option and run button will go live and clicking** *Run from the menu bar* **or the** *Run button* **opens the** *Run WinTR-55 window.*

🖱 **On the** *Run WinTR-55 window* **you specify for which** *storm events* **you wish to execute runs.**

🖱 **Clicking the** *Run button* **will cause the program to execute a run.**

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Upon successful completion of a run, the *File Display window* **is opened to the** *Hydrograph Peak/Peak Time Table*.
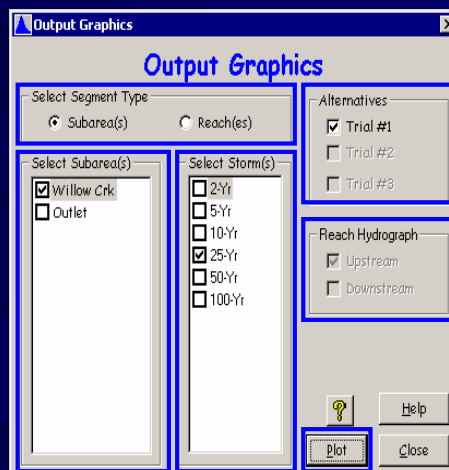
This, of course is only one of the many output reports that can be viewed.

🖱 **The option exists of looking at several** *WinTR-20 Reports*.

🖱 **You may also access all available** *WinTR-55 Reports* **from this window even though none may have been specified on the** *Output Definition Window.*

Plotting and viewing hydrographs is done through the *Output Graphics window,* **accessible through the** *Hydrographs button* **from the** *WinTR-55 Main Window***.**

🖱 **From the** *Output Graphics window* **specify the segment type,**

🖱 **sub-areas or reaches,**

🖱 **selected storms, and**

🖱 **selected alternatives for which you wish to view the hydrographs.**

🖱 **If you select reaches as the segment type, you will also need to specify whether you want to view upstream or downstream reach hydrographs.**

🖱 **Once your selections are completed, click the Plot button to view the hydrographs.**

We have not discussed all these terms yet, so don't worry if you're feeling a bit confused. We will discuss what all these things mean as we progress through the training.
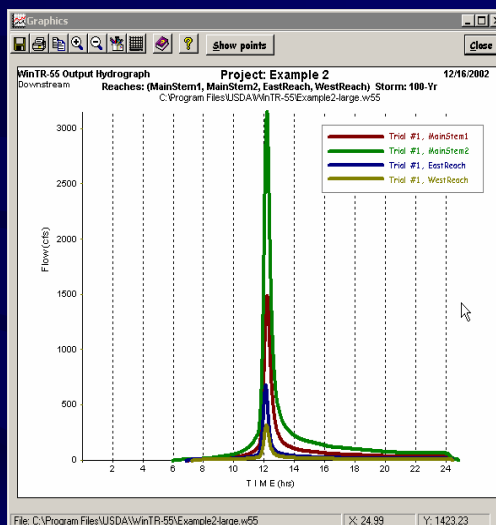
There are several options within the *Graphics window* **for customizing the appearance of the plotted hydrographs. You may also print the plot and save the plot as a bitmap image.**