Entering Data, Running the Program and Interpreting Output

Tutorial # 1

Single Sub-area Watershed with Minimum Data Requirements

We'll now work through a *Demonstration Problem*.

Tutorial # 1

- A large lot subdivision is planned in the watershed drainage area shown on the upcoming topo map.

- There are no county level stormwater detention ordinances, but the county is interested in knowing how much increased runoff would occur because of the development.

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Modeling Single Sub-Area Watersheds

For this *Demonstration Problem***, a large lot subdivision is planned in the watershed drainage area shown on the upcoming topographic map and aerial photograph.**

There are currently no county level stormwater detention ordinance, but the county is interested in evaluating how much increased runoff would occur because of the proposed development.

Tutorial # 1

- The developer has been considering this project for a number of years and, using TR-55, previously determined the runoff curve number and time of concentration as shown on the following slide.

- Determine the runoff volume and peak discharge for the current (existing) watershed conditions.

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This development has been planned for a number of years and the developer previously utilized manual TR-55 to estimate a runoff curve number and time of concentration for the current conditions. That data is shown on the following slides.

The first step in making this analysis is to determine the runoff volume and peak discharges for the existing watershed conditions.

(Later we'll look at revising those values for the proposed development, but for now, we want to determine the current condition.)

Tutorial # 1

Drainage Area	24.5 acres
Runoff Curve Number	74
Time of Concentration	0.237 hours
Williamson County, Illinois	

Modeling Single Sub-Area Watersheds

This topographic map shows the delineated watershed boundary. The blue line shows the stream channel running from the watershed outlet to a county road downstream. We'll take a further look at what's happening at that county road when we get into modeling multiple sub-areas later in the training.
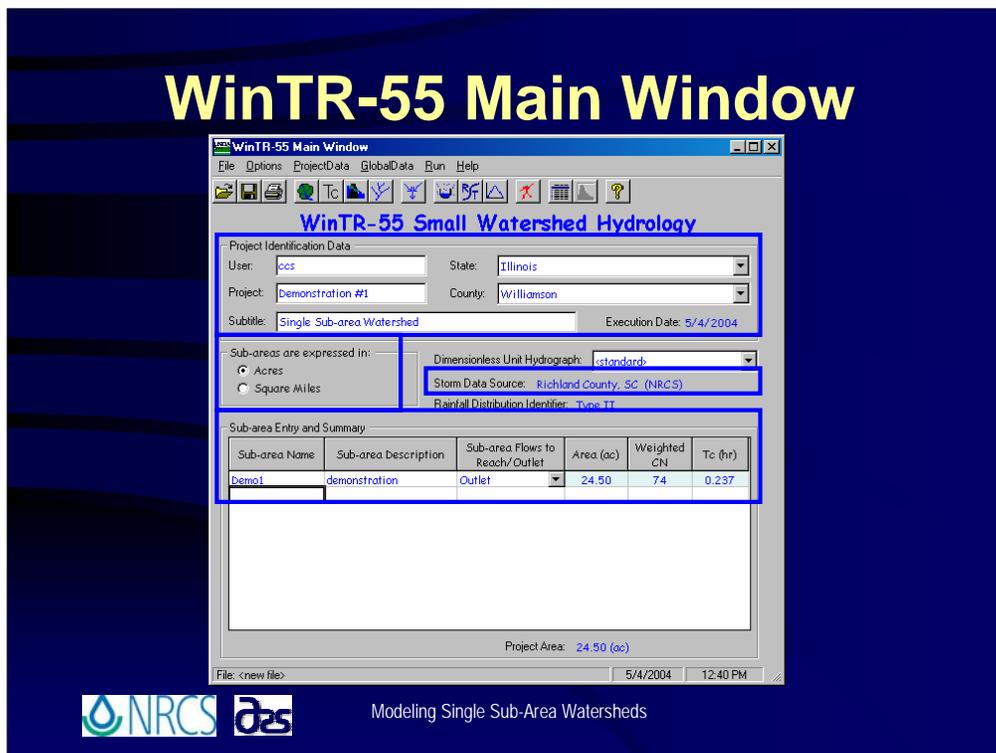
Since this is a single sub-area watershed and complete data are given for this problem (on the previous slide), you may enter this information directly onto the *WinTR-55 Main Window*.

🖰 **Here, is the** *Project Identification Data*: **User ID, Project Description, Subtitle, and State and County.**

🖰 **The** *Sub-area is expressed in* **acres.**

🖰 **And under the** *Sub-area Entry and Summary* **portion of the window is the Sub-area Name and Description; the location to which runoff from this Sub-area flows (the Outlet); and finally, the drainage Area; Curve Number and Time of Concentration.**

ALL watersheds, whether single or multiple sub-area MUST have OUTLET designated as the most downstream reach name for the most downstream sub-area. The word OUTLET is a key to the WinTR-55 program that this represents the most downstream end of the watershed.

All the appropriate data is entered on the main window, so now you're all ready to execute a run, right?

(Allow students time to study the window and answer the question….)

🖰 **The answer is NO. In the case shown on the slides, the** *State* **and** *County* **indicated are Williamson County in Illinois, but under the** *Storm Data Source*, **the rainfall data for Richmond County, South Carolina is listed as the data that would be used in a run. You may see something different indicated, but whatever the case, if the** *State* **and** *County* **listing does not match the** *Storm Data Source* **listing, you must make a change through the** *Storm Data window* **before proceeding.**
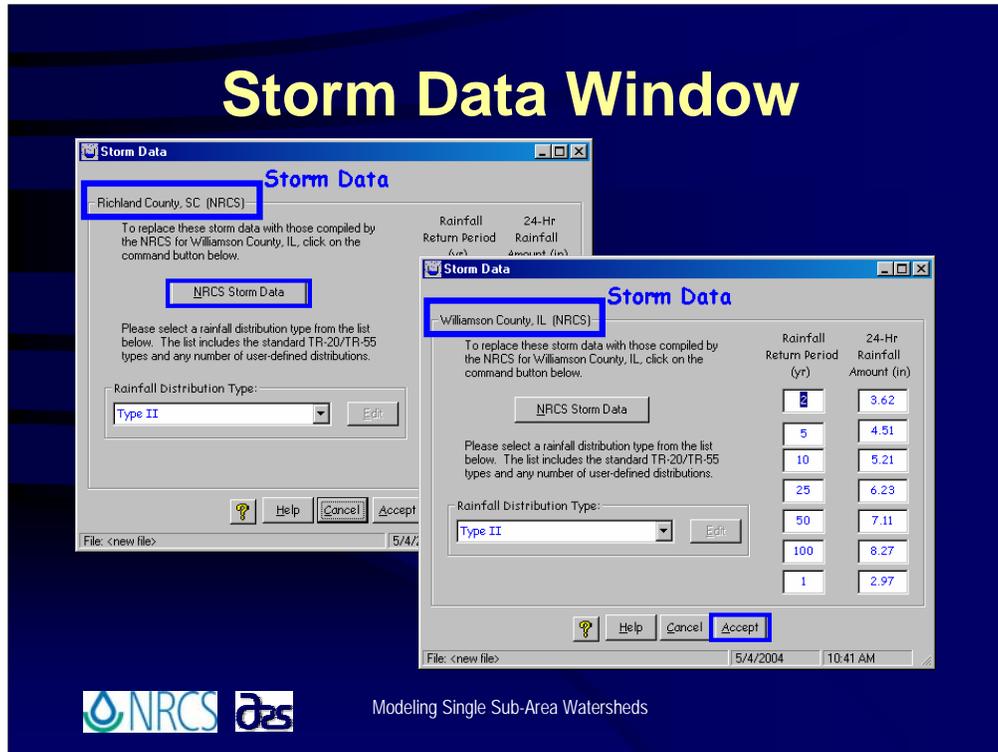
For the case illustrated in the slide, the Richland County, South Carolina data is the selected storm data. That needs to be changed to use the Williamson County, Illinois data.

🖑 **Click the** *NRCS StormData button* **to make the change.**

🖑 **At that point, whatever data is shown is replaced with the Williamson County, Illinois data.**

🖑 **Click the** *Accept button* **to accept the data and return to the Main Window.**

WinTR-55 Main Window

Modeling Single Sub-Area Watersheds

Now on the Main Window you should see that the *State* **and** *County* **matches the** *Storm Data Source*, **so the proper rainfall data will be used.**
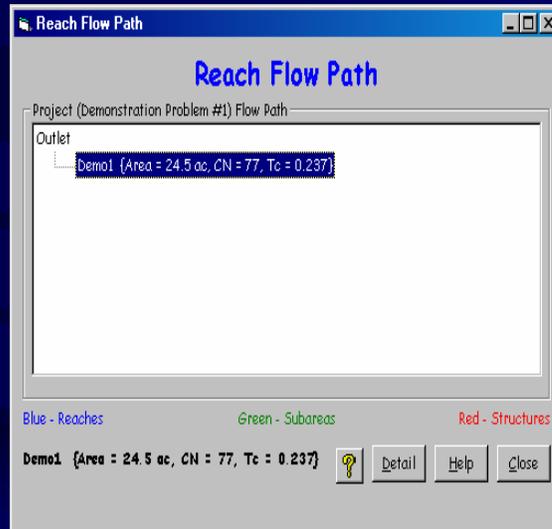
All the data is entered, so now you're ready to execute a run, right?

(Give students a very brief moment to think about and answer the question…)

There is one other check that is suggested to be made. That is to look at the reach flow path window to make certain all the water from each sub-area or reach is flowing to the proper reach or outlet.

Reach Flow Path

- *ProjectData – Reach Flow Path* from main window menu bar or ⬇ button

Reach Flow Path

Project (Demonstration Problem #1) Flow Path

Outlet
  Demo1 {Area = 24.5 ac, CN = 77, Tc = 0.237}

Blue - Reaches   Green - Subareas   Red - Structures

Demo1 {Area = 24.5 ac, CN = 77, Tc = 0.237}

Modeling Single Sub-Area Watersheds

 The *Reach Flow Path window,* **accessible using the** *Reach Flow Path button* **or the** *ProjectData menu,* **allows you to view a very simplified watershed schematic.**

Watershed schematics are very good tools to use to help you make sure you get all your data entered in the proper order. I urge everyone to make simple hand drawn schematics as part of the data development phase just as a way for you to keep track of what's going where.

Checking the *Reach Flow Path window* **is a simple convenient way to check that all your data is entered correctly so far as making sure you have sub-areas flowing to the proper reaches, reaches flowing to the proper downstream reaches, and, of course, making sure that everything ends up at the watershed outlet.**

For our example problem schematic is very simple. One sub-area, Demo1, from which all runoff flows directly to the outlet.

Run WinTR-55 Window

Modeling Single Sub-Area Watersheds

  After all the watershed data is entered on the *WinTR-55 Main Window***, click** *Run* **from the main window menu bar or the** *Run button* **to select which storms to run.**

🖰 **In this case, the 2-year, 10-year and 100-year storm events were selected.**

🖰 **After selecting the storm events, click the** *Run button* **to execute the run and generate output.**

 Once the run is completed, WinTR-55 automatically opens the *File Display window* **and displays the** *Hydrograph Peak/Peak Time Table*. **From this table, you can see that the computed peak discharges are:**

🖱 **For the 2-year storm: 40 cfs**

🖱 **For the 10-year storm: 79 cfs**

🖱 **And for the 100-year storm: 159 cfs**

To find the runoff volume for this storm, you must go to the *WinTR-20 Printed Page File.*

🖱 For this analysis, you should see the runoff volume for this storm , the 2-year return interval event, was 1.372 inches.

🖱 You might observe that the runoff volume differs from the value you might obtain by actually computing the volume using the NRCS Runoff Equation.

WinTR-20 actually computes the runoff volume by summing the area under the hydrograph using the hydrograph ordinates as shown on the *WinTR-20 Printed Page File*. The hydrograph coordinate points are cut off at a minimum value of 0.05 cfs. Therefore, when summing the area under the hydrograph the tails of the hydrographs are cut off, and that area for points where discharges are less than 0.05 cfs are ignored.

This can be problematic on small watersheds, particularly those with low peak discharges. For this reason, you MUST EXERCISE GREAT CAUTION when using WinTR-55 on very small drainage areas.

As a result, the runoff volume as computed by WinTR-20 will be less than that estimated using the NRCS Runoff Equation. Neither WinTR-55 nor WinTR-20 actually compute the volume using the NRCS Runoff Equation. This will be rectified in a future version of WinTR-55.

Results

- Find the runoff volumes for the 10-year and 100-year storm events in the WinTR-20 printed page file.

	Peak Discharge	*Runoff Volume*
2-year	40 cfs	1.32 in
10-year	79 cfs	2.53 in
100-year	159 cfs	5.17 in

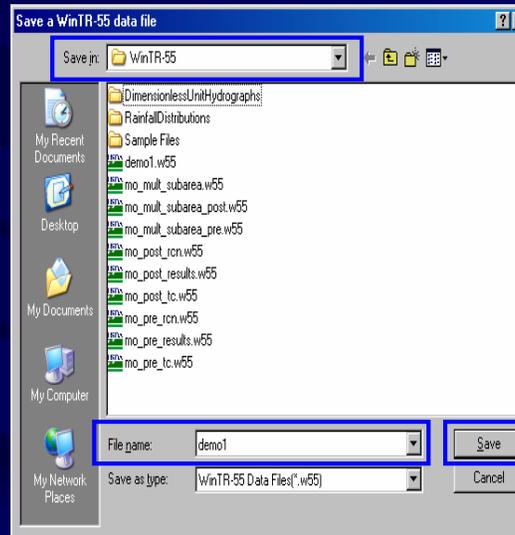**NRCS** **das**   Modeling Single Sub-Area Watersheds

Take a few moments now to determine the runoff volumes for the 10-year and the 100-year storm events.

(Give the students a few moments to scroll through the data and find the output.)

🖱 **The results you should have gotten are shown here. Did anyone get anything different?**

Let's save the file before moving on.

🖱 **To save a file, click the** *Save Button* **(or** *File-Save menu item***) to open the** *Save a WinTR-55 data file window***.**

🖱 **Use the drop-down menu to select in which directory you wish to save the file.**

🖱 **Enter an appropriate filename.**

🖱 **And click the** *Save button* **to save the file and return to the main window.**

Review - Minimum Data Requirements

Modeling Single Sub-Area Watersheds
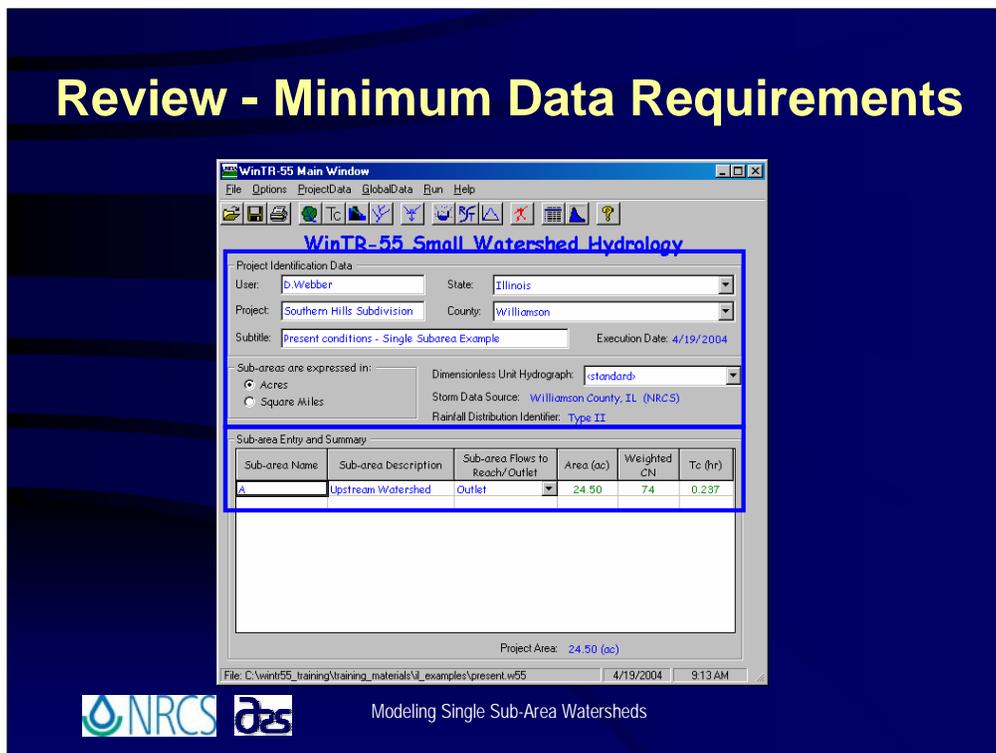
A quick review before we move on to an example problem you will work yourself.

From the demonstration problem just completed, you should have observed what are the minimum data requirements for executing a WinTR-55 run.

🖰 **In the** *Project Identification***, you should specify some sort of** *User* **identification, a** *Project* **name, and if desired a** *Subtitle.* **You will also enter** *State* **and** *County* **where your project is located and specify in which units** *Sub-areas are expressed as.* **The last portion of the** *Project Identification* **information should be a check to make certain the** *Dimensionless Unit Hydrograph, Storm Data Source***, and** *Rainfall Distribution Identifier* **are appropriate for the watershed which you are analyzing.**

🖰 *Sub-area Entry and Summary* **data may be entered directly on the Main Window without going out to any other windows. Here you will list** *Sub-area Name***, give a** *Sub-area Description***, specify whether the** *Sub-area Flows to a Reach* **or directly to the** *Outlet.* **For each sub-area you will list the** *Area* **in appropriate units, the** *Weighted* **Runoff Curve Number (***CN***), and time of concentration (***Tc).* **IF you have CN and Tc calculated from another source, there is no need to go to any other windows. Those values may be input directly into the main window.**

One final note on minimum data requirements. ALL watersheds, whether single or multiple sub-area MUST have OUTLET designated as the most downstream reach name for the most downstream sub-area. The word OUTLET is a key to the WinTR-55 program that this represents the most downstream end of the watershed.

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Questions?

Note to Instructor:

Take time here to answer any questions that may have arisen and then move on to the next section.