Tutorial for using WinTR-20 to develop design hydrographs based on Pond Standard 378

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Introduction

The general procedure to design a pond based on NRCS standard 378 (2011) is to use methods described in the Engineering Field Handbook Chapters 2, 6, and 11. Another acceptable procedure is to use SITES software. Since WinTR-20 has been enhanced to develop hydrographs based on TR-60 criteria, it is anticipated that some engineers will want to use WinTR-20 to develop design hydrographs for 378 ponds using WinTR-20. Hydrographs may be saved in a file in order to import them to the WinDAM program to analyze auxiliary spillway and dam overtopping erosion.

In addition, WinTR-20 may be used to route the hydrograph through the pond using the storage indication method based on the stage-discharge-storage data for the pond site (the hydrograph routing feature is not included in this tutorial).

Watershed data

A hypothetical pond site is located in Lawrence County in southern Indiana. The NOAA Atlas 14 rainfall values for this county are 10-year 24-hour 4.54", 25-year 24-hour 5.40", and 50-year 24-hour 6.11". Since the pond standard 378 calls for the 10-year, 25-year, and 50-year rainfalls based on proposed dam height and storage, all three storms will be run in WinTR-20. The NOAA Atlas 14 rainfall distribution B for use in the Ohio River Valley states was selected for use in Lawrence County.

The land use in the watershed is listed in the table below.

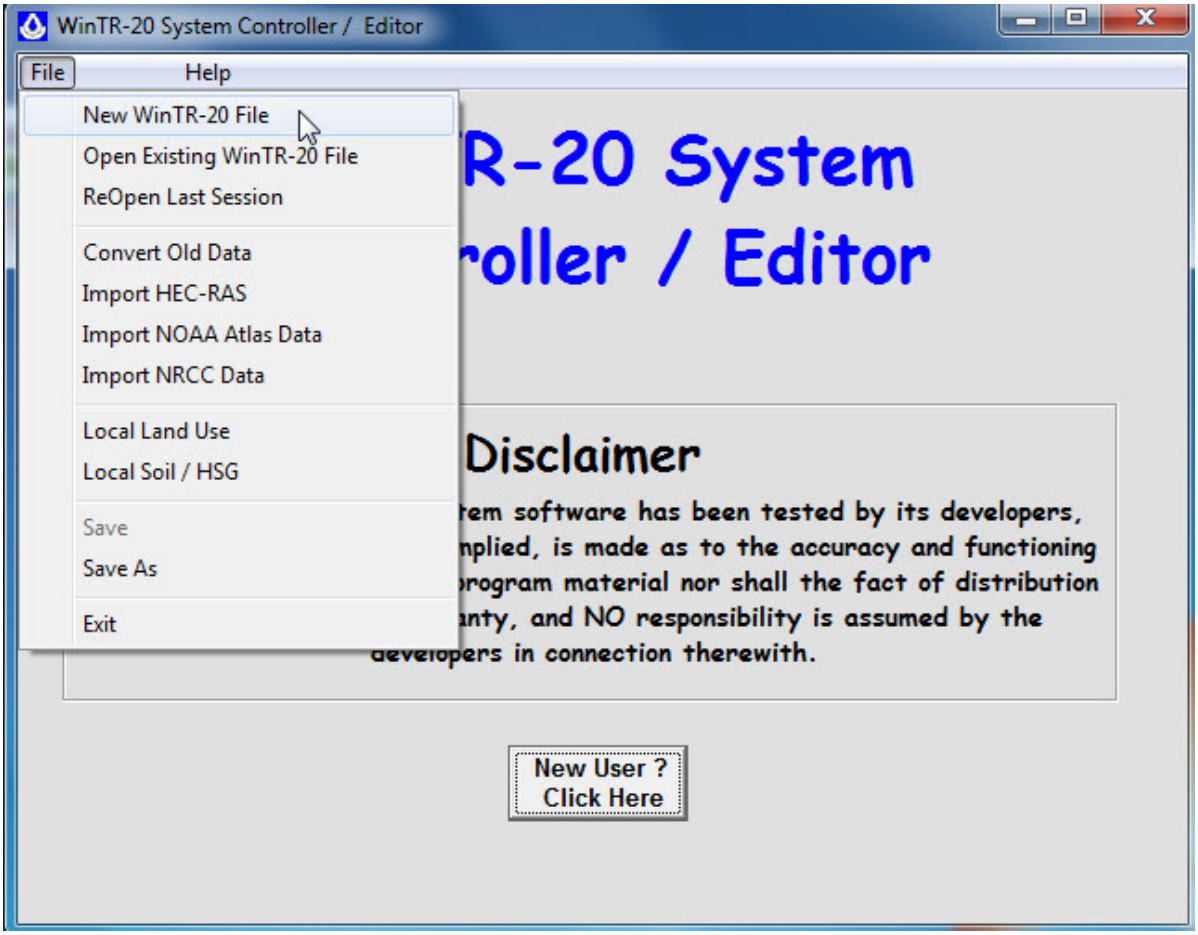
Land Use	Hydrologic Soil Group	Drainage area in sq miles
Row Crop (SR + CR – Good)	B	0.02
Small Grain (C & T + CR – Good)	C	0.02
Pasture (Good)	B	0.02
Pasture (Good)	C	0.02
Woods (Good)	C	0.02
Farmstead	B	0.01

The watershed length is 2500 feet and the average watershed slope is 4 percent.

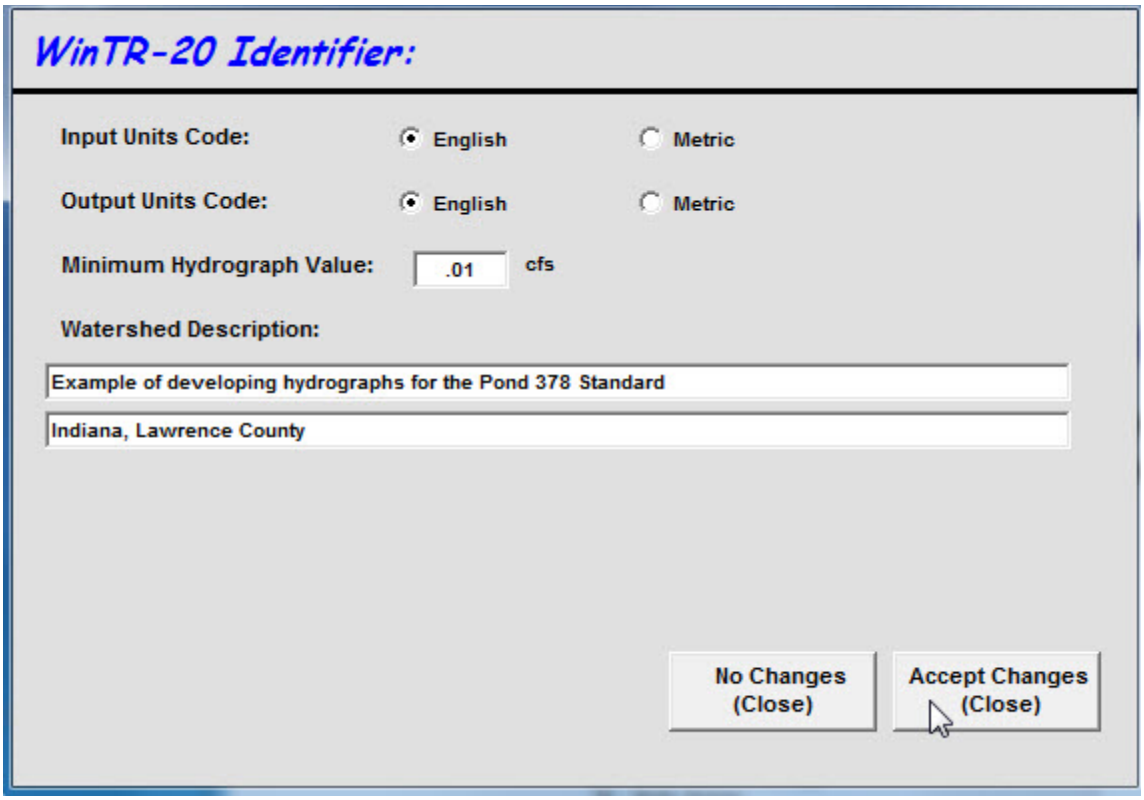
Input data to WinTR-20

Open WinTR-20 by clicking the desktop icon or opening All Programs, Engineering Applications and WinTR-20.

Select File and New WinTR-20 File from the pull-down menu.

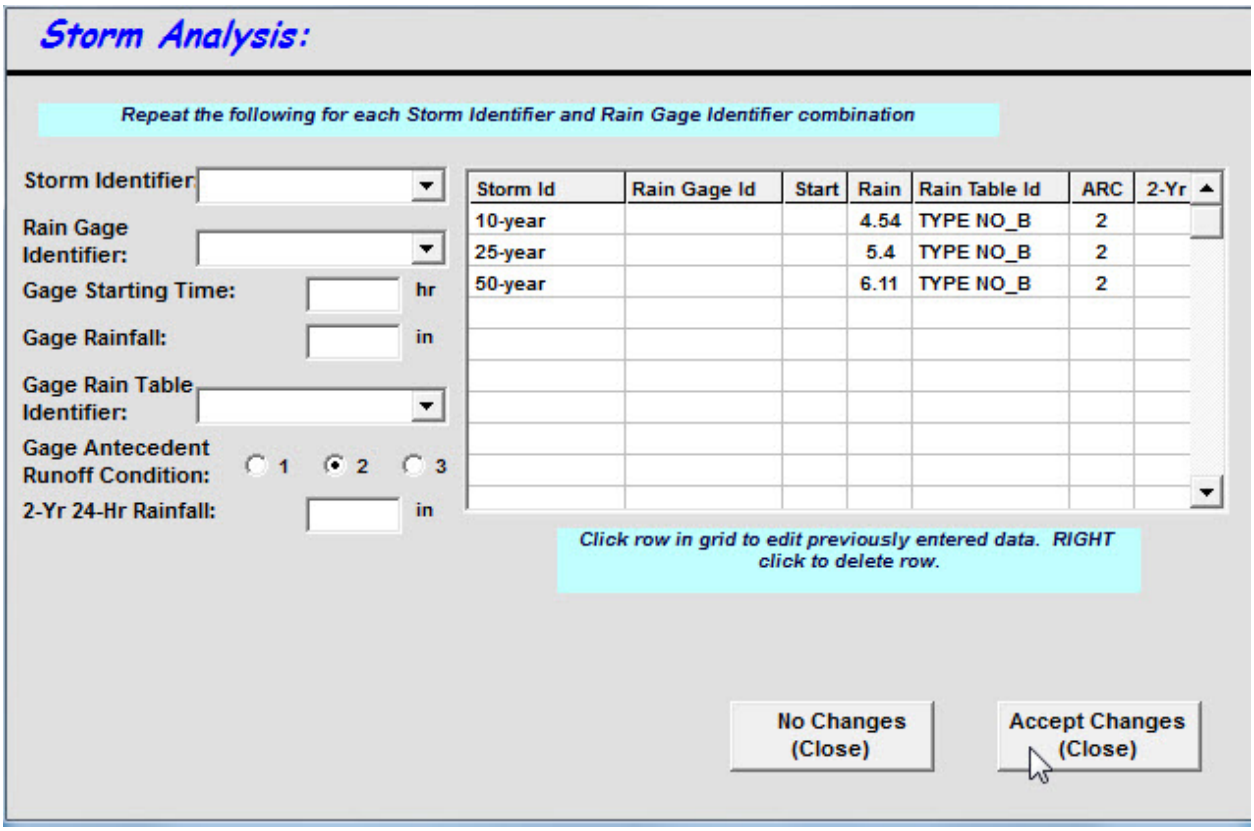


Enter a minimum hydrograph discharge and watershed description as shown in the following window.



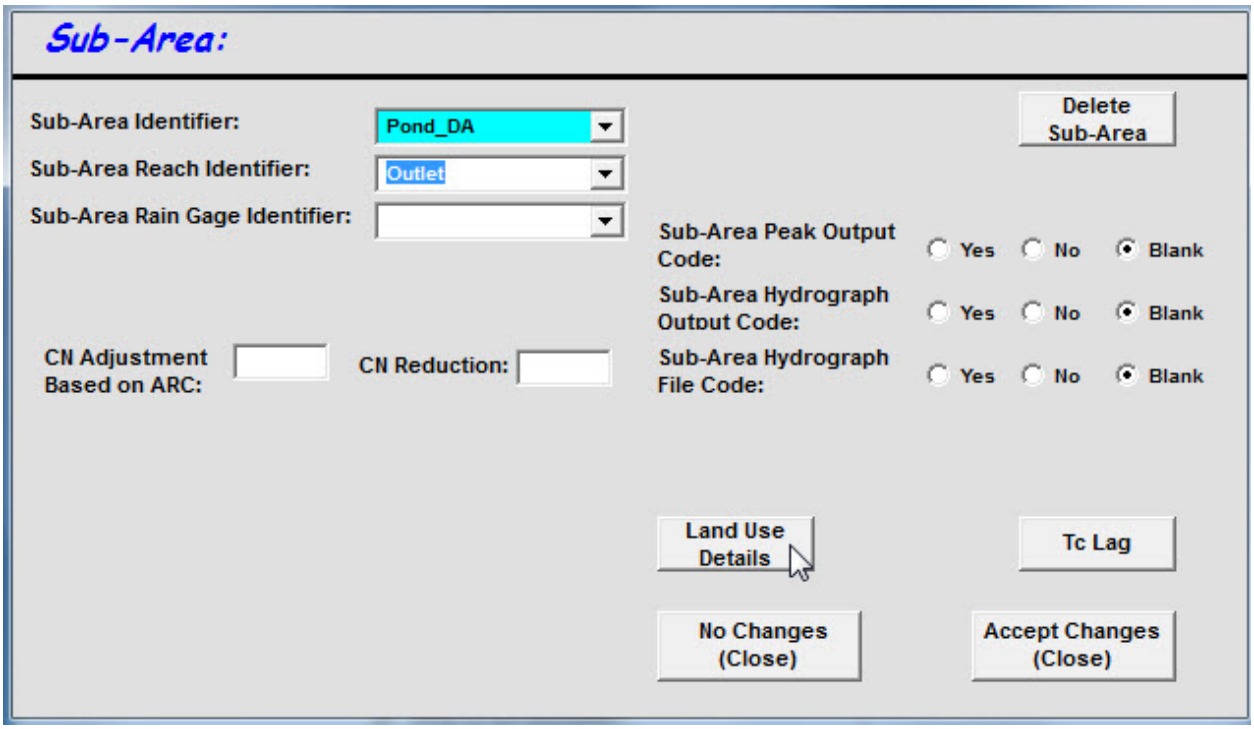
Click the Accept Changes Close button. From the main WinTR-20 window select Storm Analysis.

Enter storm data as shown in following window. Enter data on the left side of the window and it will be placed in the table on the right side of the window.

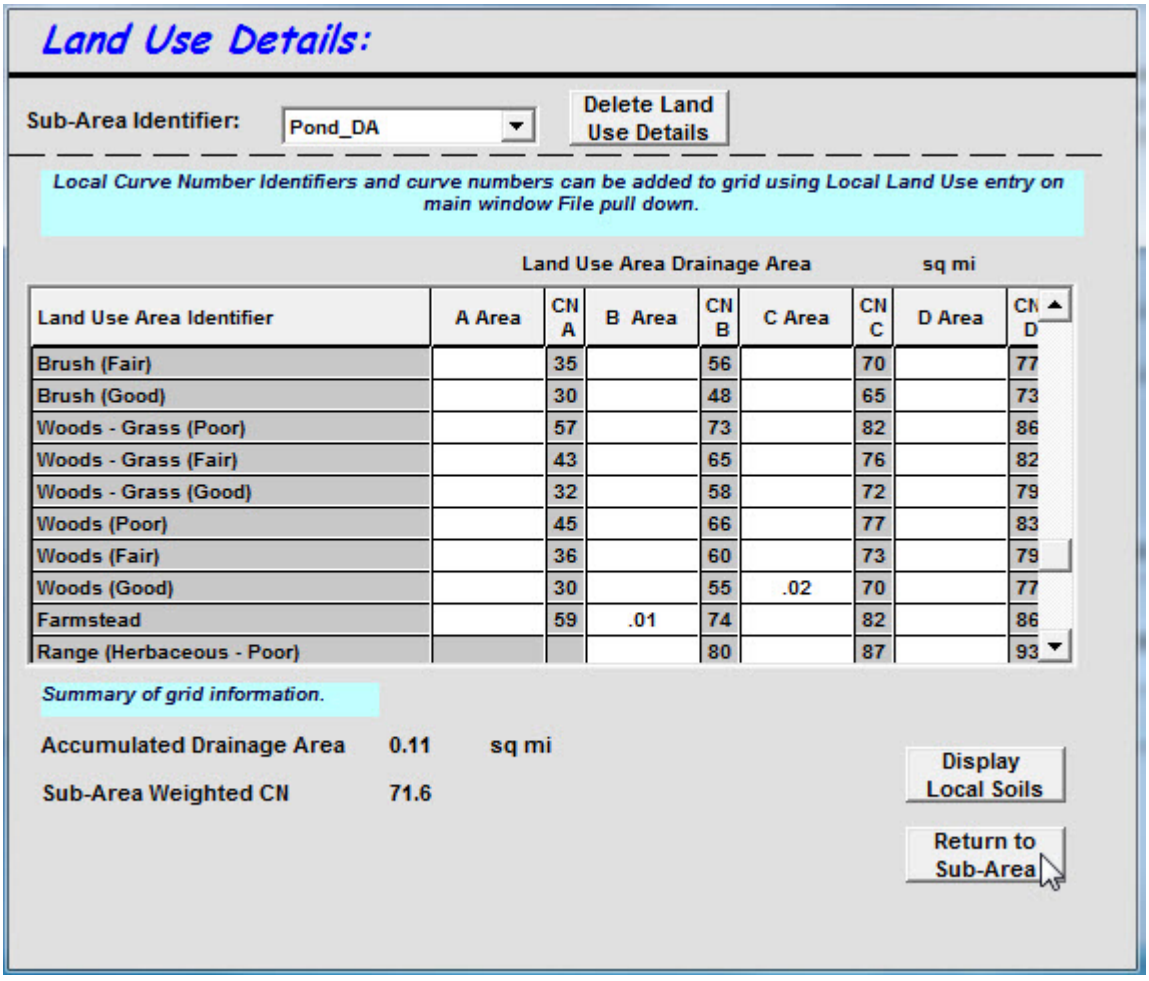


Click the Accept Changes Close button. From the main WinTR-20 window select Sub-Area.

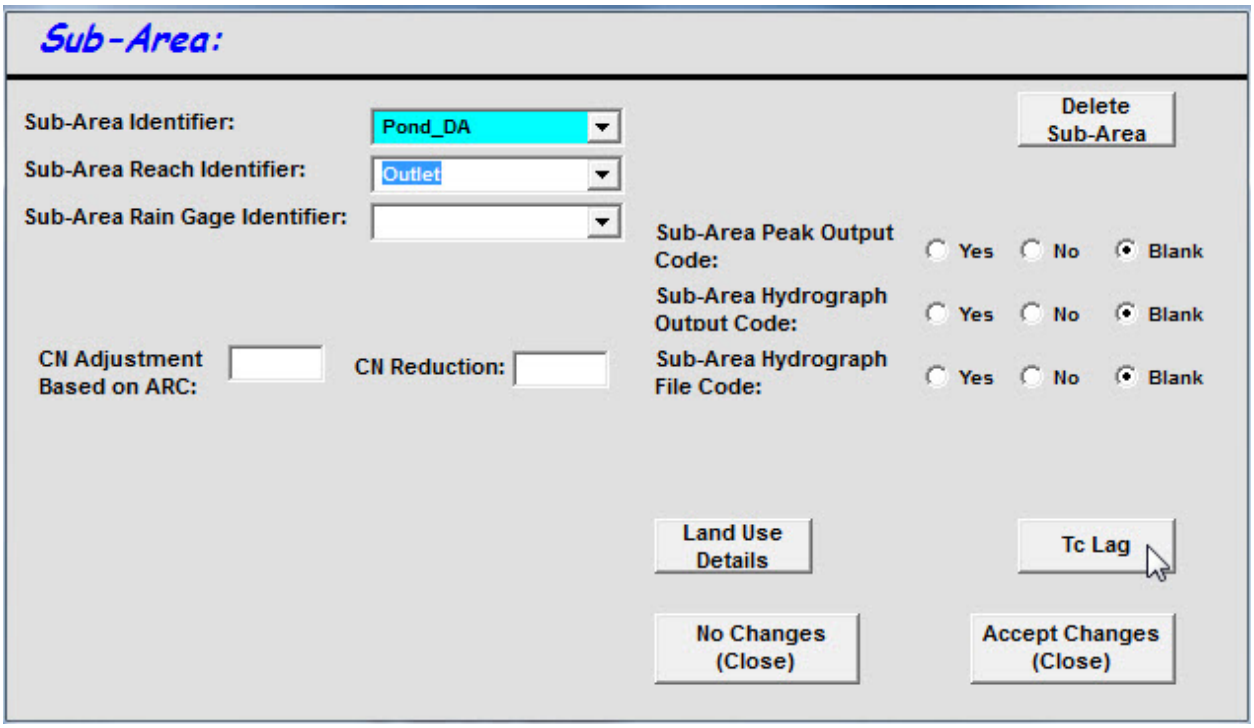
Enter Sub-Area Identifier and Sub-Area Reach Identifier as shown in following window.



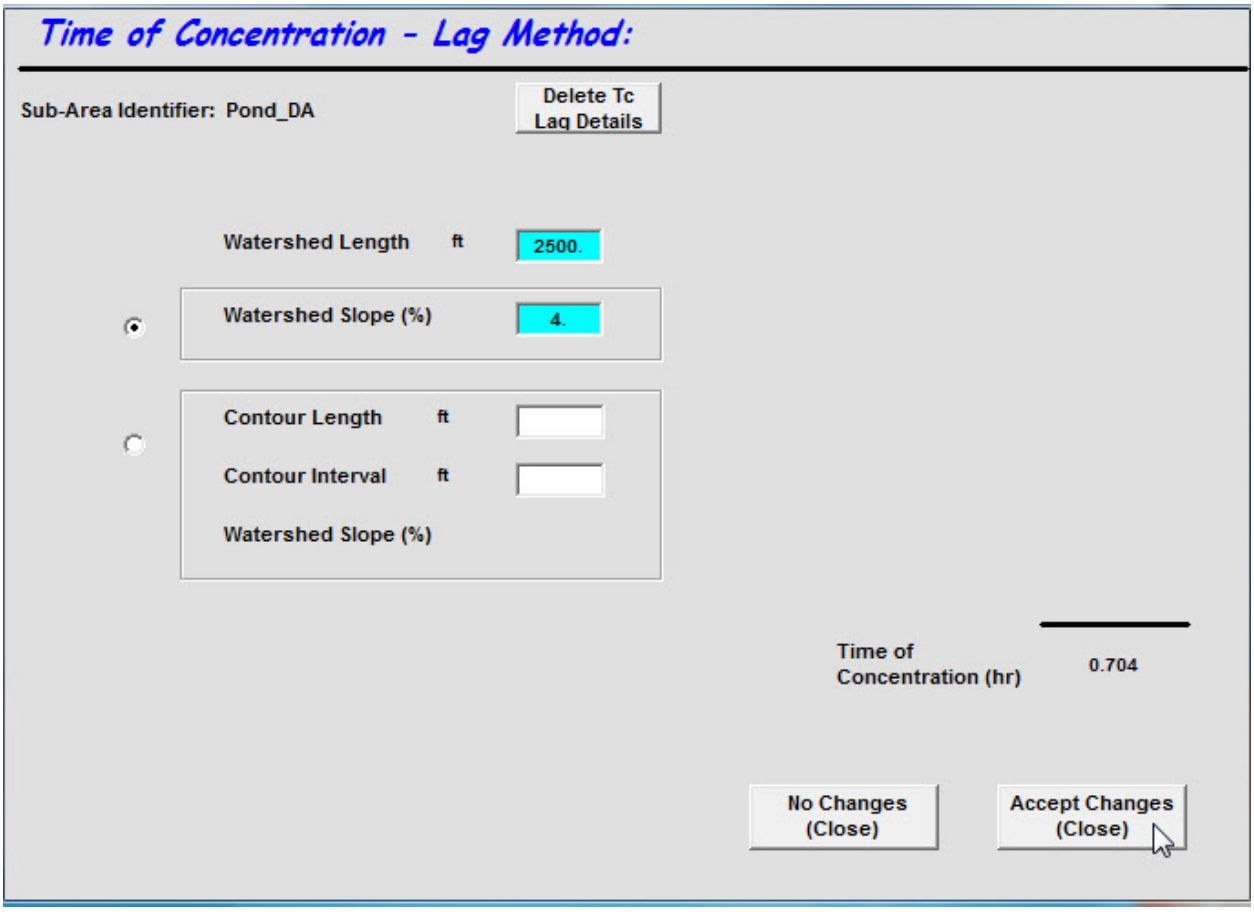
Click the Land Use Details button to open the land use / hydrologic soil group / CN table window. Enter the land uses and respective drainage areas within the watershed.



The Sub-Area accumulated drainage area and weighted CN are displayed. Click Return to Sub-Area when completed. Click the Tc Lag button.

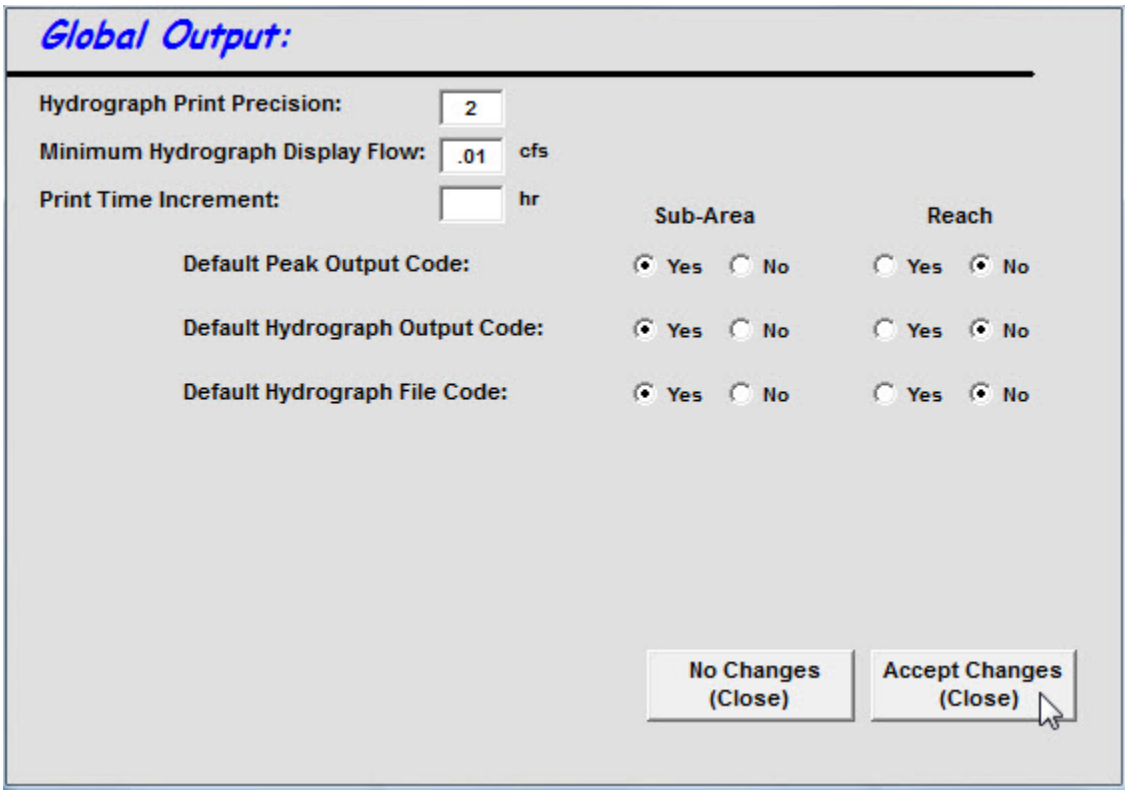


Enter the watershed length and slope as shown in the following window.

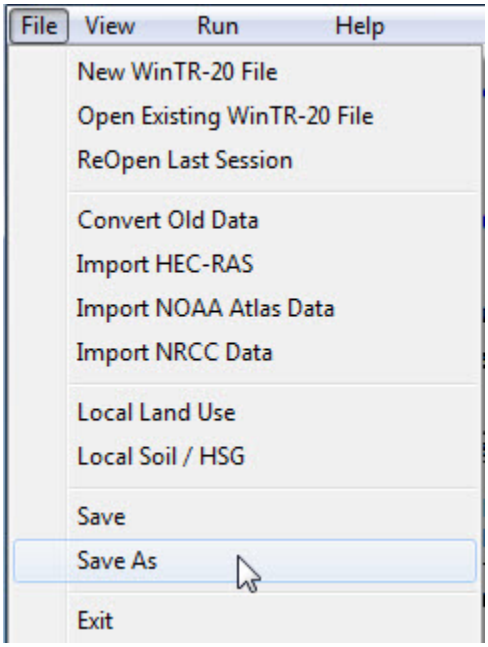


Click the Accept Changes Close button. From the Sub-Area data window click Accept Changes Close. From the main WinTR-20 window select Global Output.

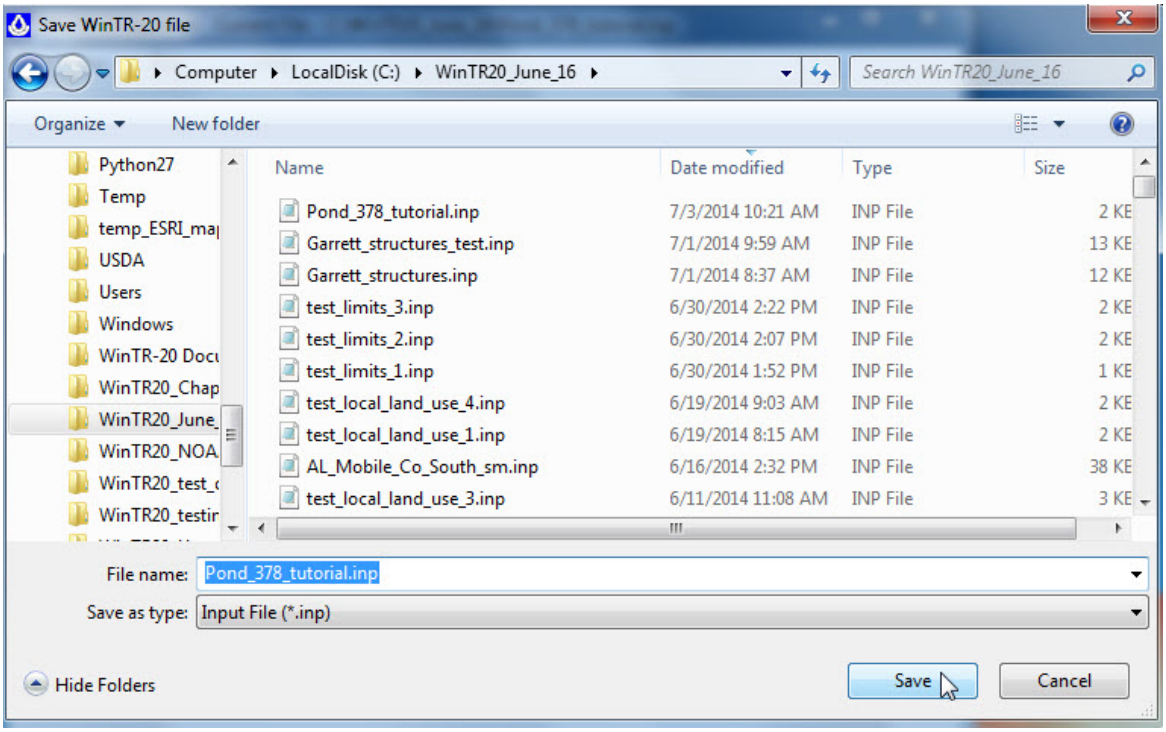
Enter Global Output data as shown in following window.



Click the Accept Changes Close button. From the main WinTR-20 window select File and Save As.



Browse to a directory and enter a file name.

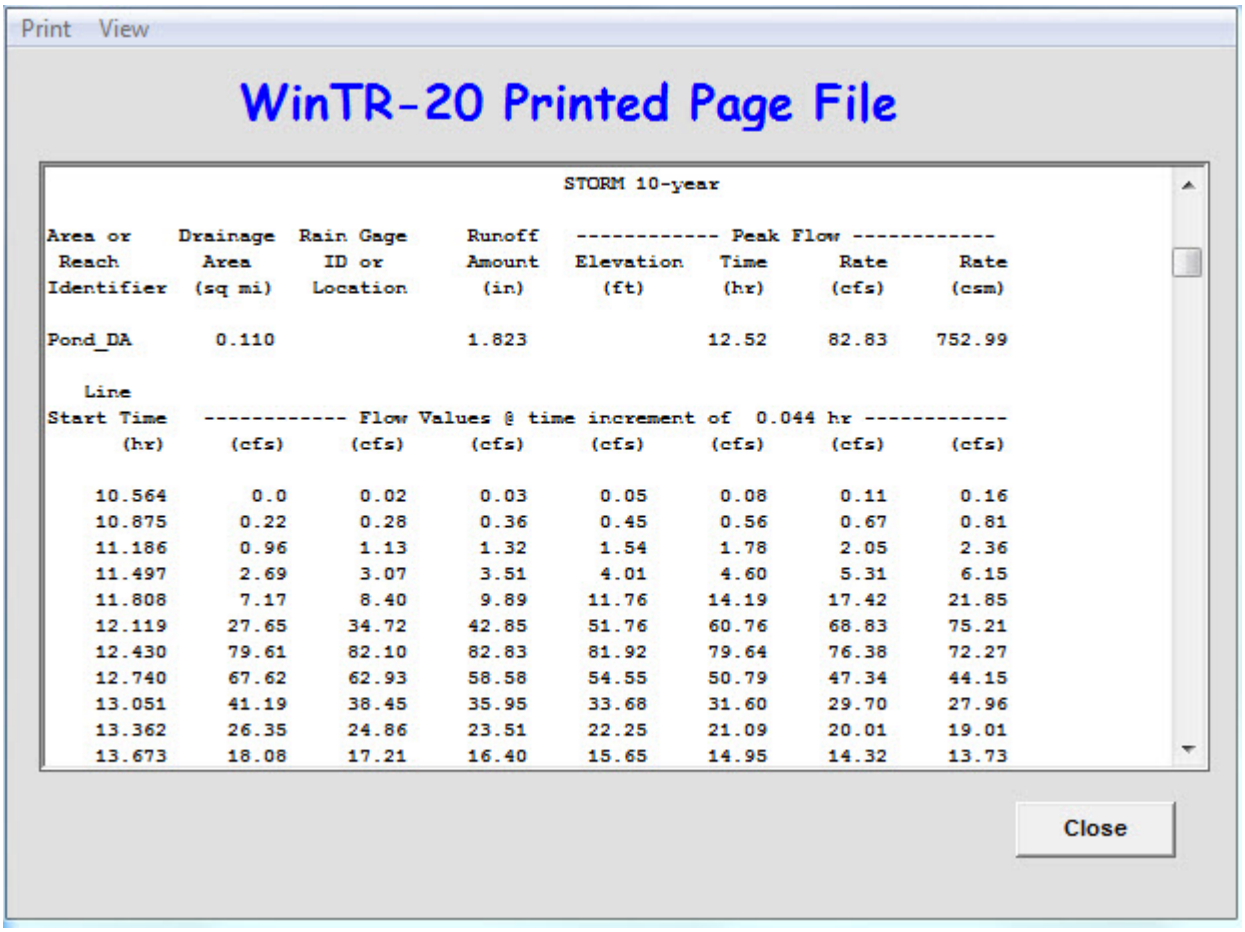


Click Save.

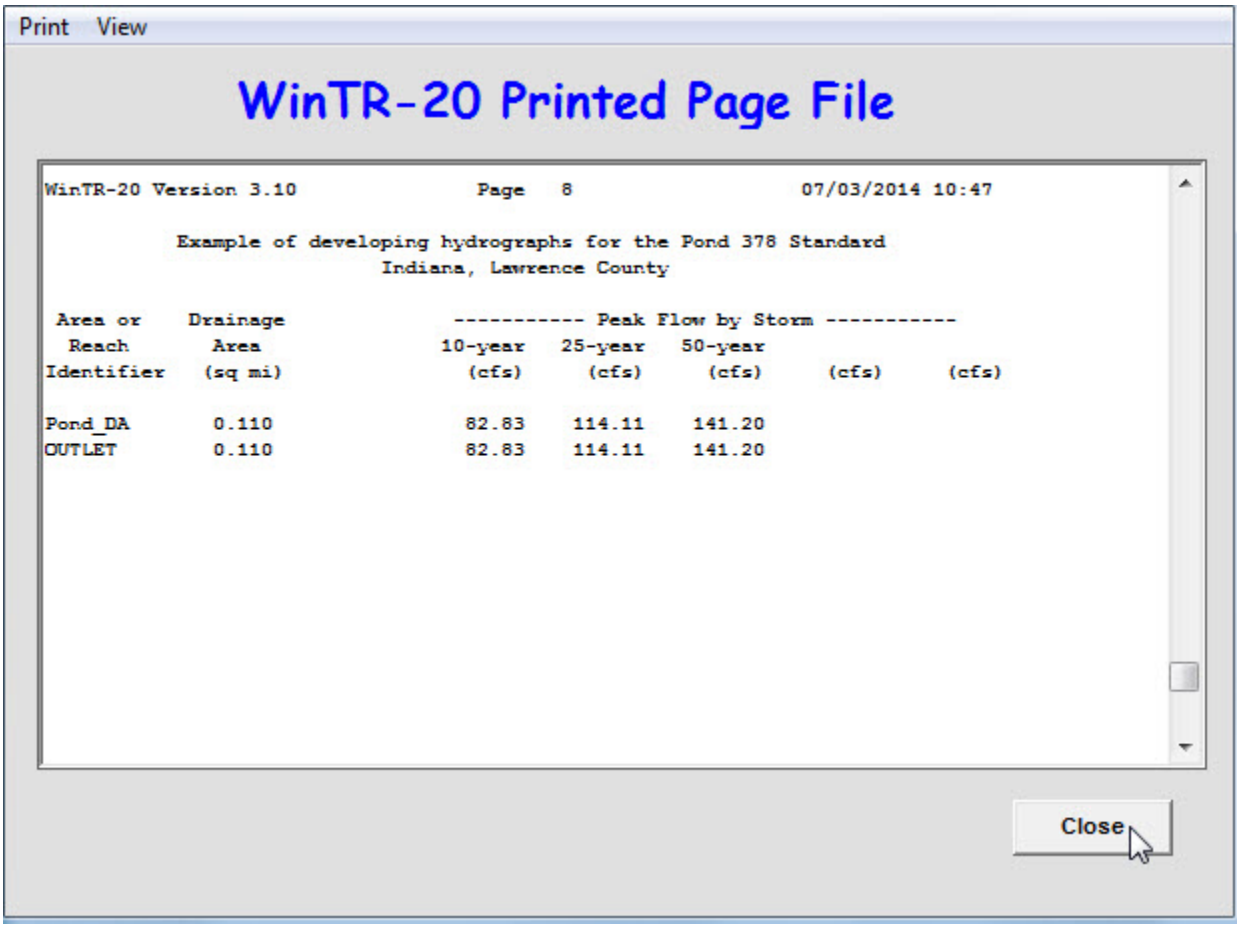
Run WinTR-20 and view output

From the main WinTR-20 window click the Run command in the top menu bar.

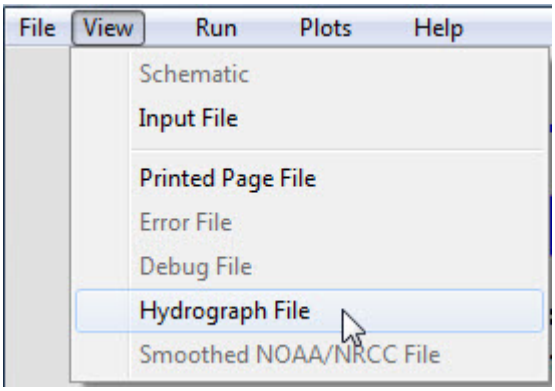
The WinTR-20 Printed Page File opens if there were no errors during execution. The peak discharge and runoff volume in inches is included with each hydrograph table in the Printed Page File. Scroll down to the 10-year storm. The peak discharge is 82 cfs and the runoff volume is 1.82 inches.



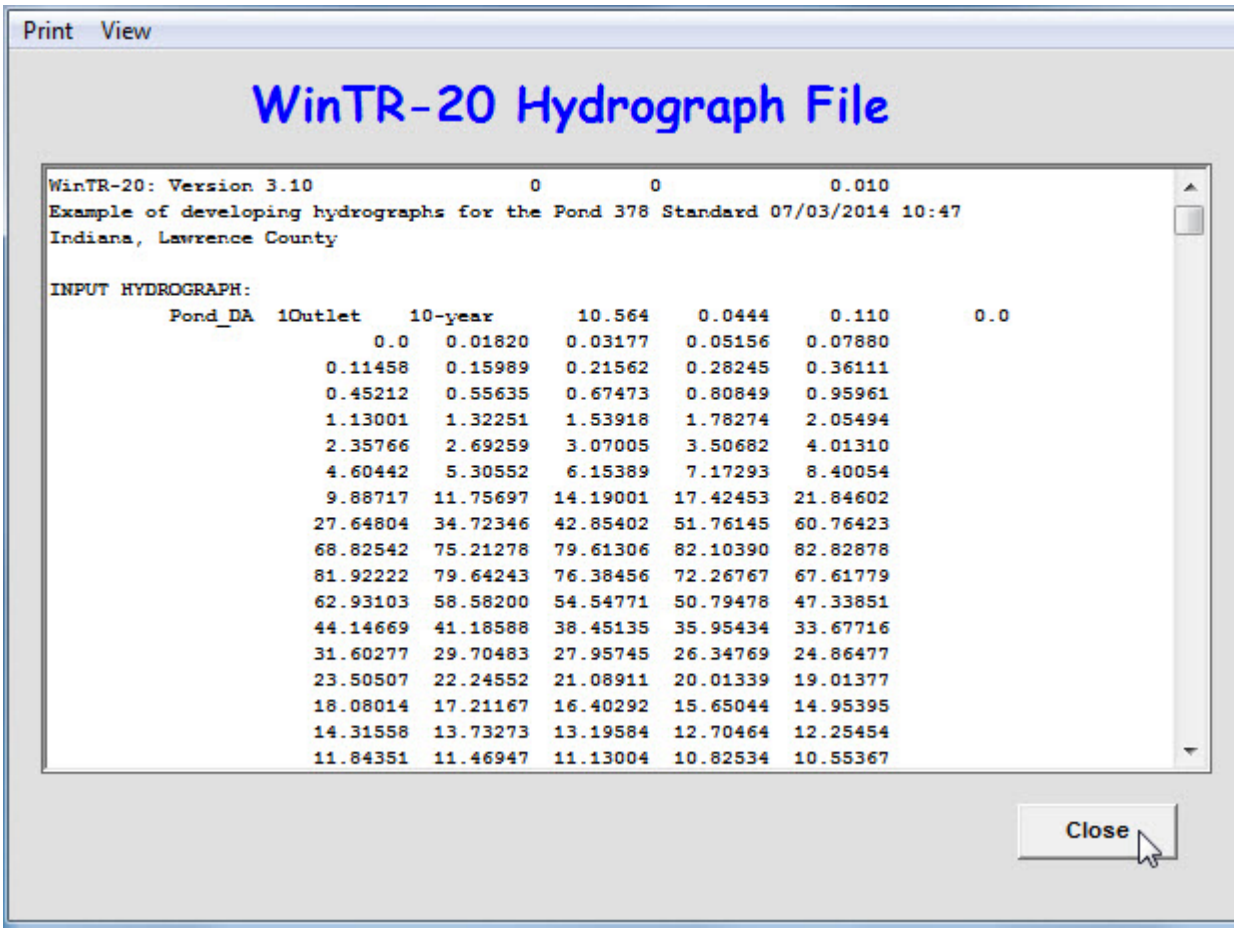
Scroll to the bottom of the file to view the peak discharge summary.



The peak discharge for the 10-year storm is 82 cfs, 25-year is 114 cfs, and 50-year is 141 cfs. Close the printed page file. Select View and Hydrograph File to open it.

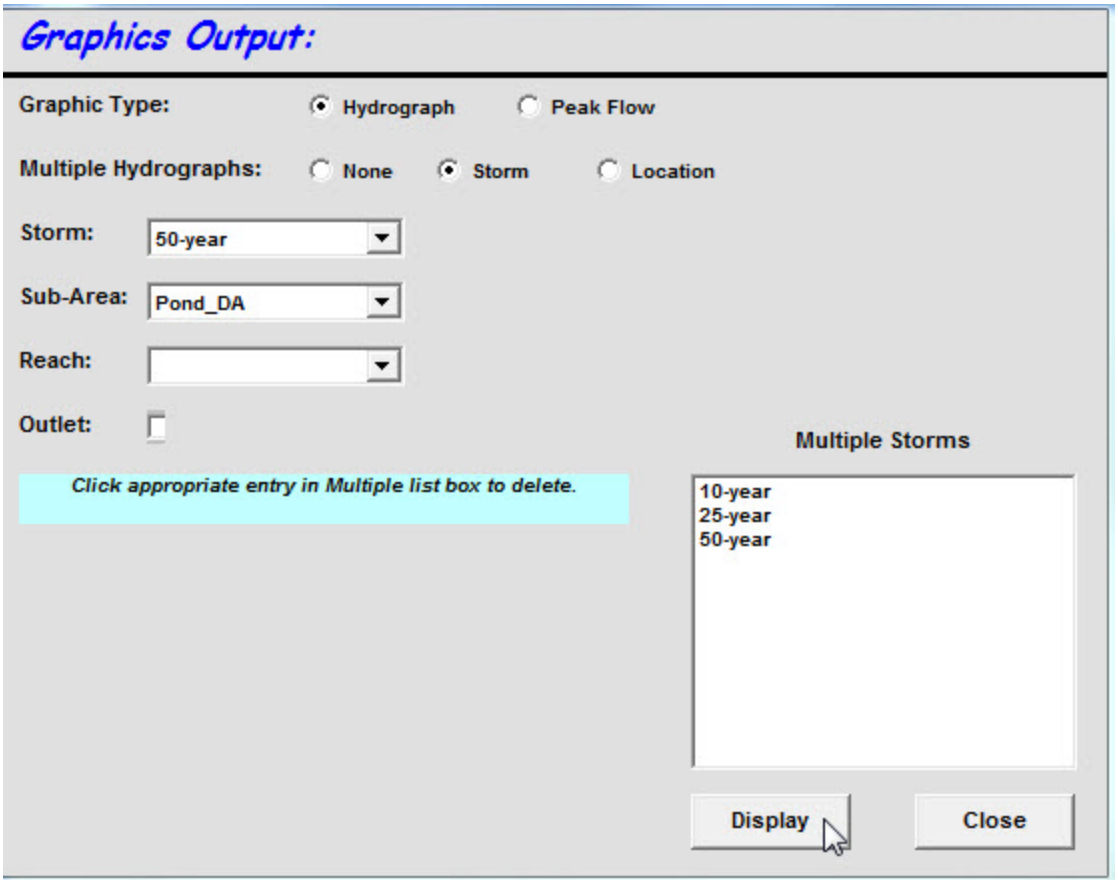


The hydrograph file is saved as a file with the same name as the input file but with the extension .hyd. It includes those hydrographs selected for output plus the hydrograph at the watershed outlet. Hydrographs from this file may be imported to the WinDAM computer program.

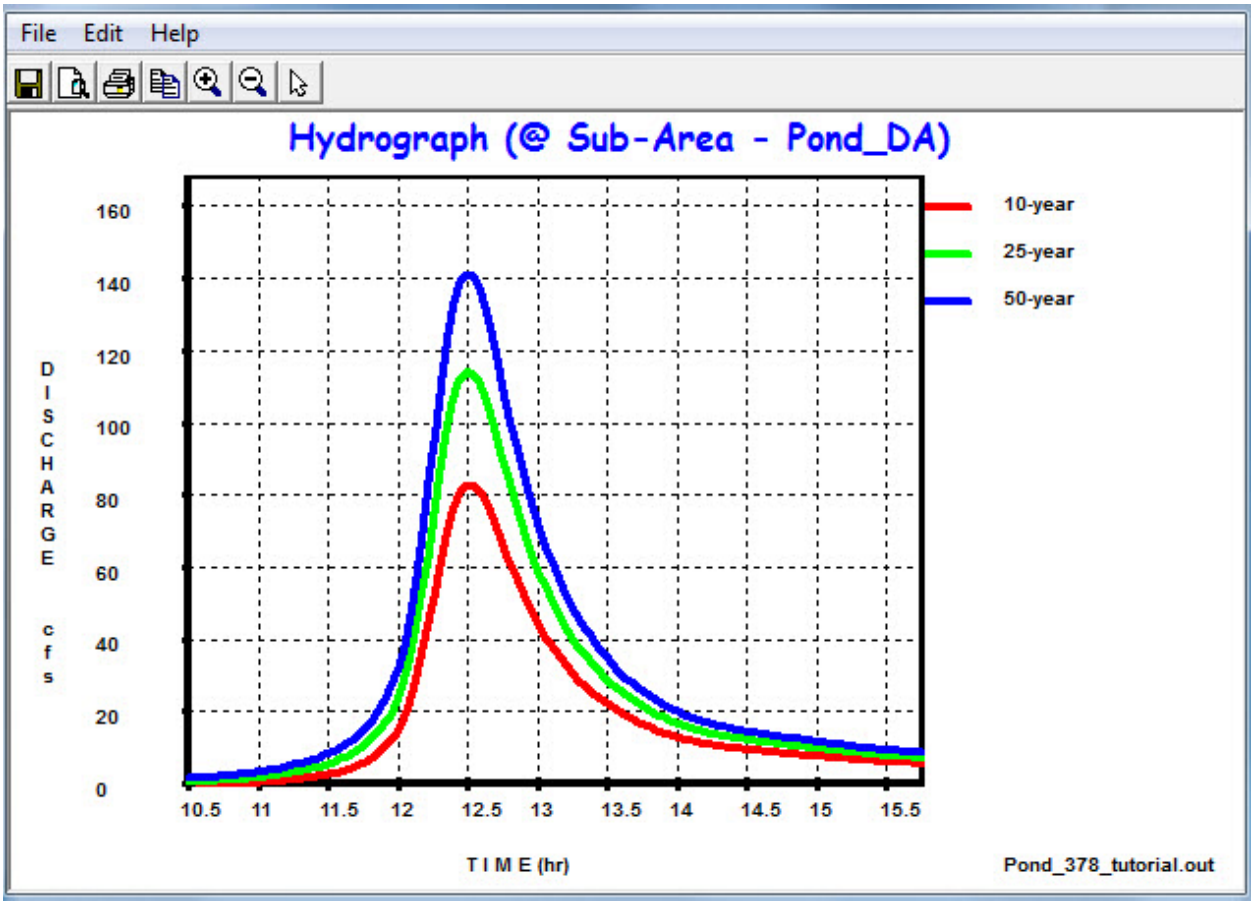


Close the hydrograph file. Click the Plots command in the menu bar at the top of the main WinTR-20 window.

Select Multiple Hydrographs Storm, select three storms, and one sub-area to plot. Then click the Display button.



The plot below has been zoomed in using the zoom tool on the menu bar. The Edit menu has been used to show the hydrographs as lines and to display the horizontal-vertical grid lines.



Close the plot window, graphics output window, and WinTR-20 main window when completed.

No matter what procedure is used to design the pond, the peak discharge is one of the more important items. A simplified design method does not need the hydrograph values but only a peak discharge and runoff volume. A more complicated design procedure utilizes the hydrograph and routes it through the pond using the storage indication method.

References

TR-60

NRCS Conservation Practice Standard, POND, Code 378, May 2011.

SITES

WinDAM