North Carolina Water Harvesting Model
User's Manual

Last Modified: January 4, 2006

Overview

This Microsoft Excel worksheet is designed to assist the user in selecting an appropriate cistern size for a water harvesting system. The model is based upon a daily balance of water supply and demand and assessed over 30 years of rainfall data. It is important to realize that this model generates theoretical results and actual water harvesting system performance may vary from the model predictions.

Inputs

A simple color coding scheme is intended to assist the user in identifying input and output cells and is described below in Table 1.

Table 1: Model Color Scheme

Cell Color	Cell Type	Description
Blue	Standard Input	Input required for model calculations
Red	Advanced Input	Should only be changed if it appears incorrect
Green	Standard Output	Displays a result of model calculations

After you have read the information on the first page of the model, proceed to "Step2_InitialInput" by clicking the corresponding tab at the bottom of the screen. Follow the onscreen instructions to input your water supply and demand information. It is important to remember that the water demands used in this model are typical values and may not be accurate for your specific installation. For customized results, you should enter your specific water demands under the miscellaneous uses. A good way to estimate your water usage is through the use of a garden water meter, which is available from a number of online retailers for about $10.

After you have entered the requested information, proceed to "Step3_InitialOutput" by clicking the corresponding tab at the bottom of the screen. A table at the top of the page presents sample cistern sizes and their corresponding costs. In the requested boxes, enter a cistern size and the corresponding cost for a cistern that you think may best fit your needs. If you have a cistern size and cost that is not listed in the table, feel free to enter that information instead. Continue to adjust the cistern size and cost until you generate outputs appropriate for your needs. When you are satisfied with your results, proceed to "Step4_Printable Outputs" for a printable summary of your results.

Miscellaneous Water Uses

The table below contains guidance for typical usage calculations that can be processed by the model through the “Miscellaneous” input option.

Table 2: Typical usage volumes for other water harvesting applications

Application	Usage Volume (gallons/use)	Frequency (uses/month)	Monthly Volume (gallons)
Load of Laundry	40	X	=
Home Vehicle Washing	60	X	=
Pressurized Vehicle Washing	30	X	=

Outputs

Risk of an Empty Cistern
- Percentage of days where the system demand exceeded available supply

Risk of an Overflow
- Percentage of rainfall events greater than 0.25” that resulted in a cistern overflow

Savings per Month
- Average money that would be saved by using water from the cistern instead of city water

Payback Period
- Number of years it would take for water savings to equal the cost of the cistern

Avg. Annual Weight of a Mixture of Nitrate and Ammonium Removed
- Average lbs./yr. that would be removed from stormwater runoff by the cistern

Percent of First Flush Volume Captured
- Percentage of the first flush volume that would be captured without overflowing for all rainfall events exceeding the first flush depth

Frequency of Capturing Entire First Flush Volume
- Percentage of rainfall events exceeding the first flush depth where there was no overflow

Assumptions

This model makes a number of assumptions in order to provide cistern sizing guidance. These assumptions should be verified or considered before implementing a water harvesting system design.

- 80% of incoming rainfall is transferred from the roof to the cistern
- A factor of safety incorporated into the model increases demand by 20% for calculations
- Rainfall data is based on recorded observations at each city from Nov. 1, 1973 to Oct. 31, 2003
- Irrigation demands are based upon a theoretical moisture balance and could vary based upon actual irrigation scheduling
- For each daily balance, supply is assumed to occur before demand
- Cost estimates are based upon local city water costs from 2005
- Miscellaneous demand is treated as a constant daily demand