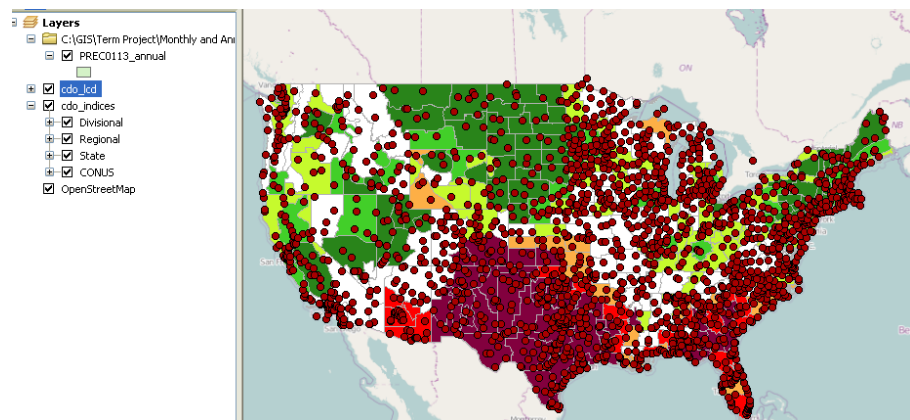# Project Update: Rainwater Harvesting Sizing and Feasibility Study

by

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As of 24 October 2011, the majority of the effort toward this project has been to identify a data source that would be of most use to individuals considering rainwater harvesting in their area. This project will be focused on the individual who wants to live completely "off the grid" in terms of their water resources and utilize rainwater as their primary means of water. Therefore the data set that I have located that will be most useful is the National Climatic Data Center http://gis.ncdc.noaa.gov/web/ which has monthly precipitation data for the country. With this data I will also be able to project values spatially to defined climate areas for each state.

I have modified the project to now encompass a way for individuals first get an idea of the easiest areas to harvest rainwater. This will be accomplished by assuming a two person household using 3,000 gallons of water per month with a 2000 ft^2 catchment area. Using ArcMap I will then create a raster projection of the United States that will represent the year-end storage available. This value will assume a limitless tank. Based on this, those areas will be then described as amenable to rainwater harvesting, and not well suited for rainwater harvesting.

Next the user will choose an area of the country and then be instructed on how to gain data for that specific area that they would like to live using HydroDesktop. They will also complete the true rainwater demand spreadsheet to find a more accurate assessment of their rainwater needs. They will lastly input all of their assumptions into the Excel program, which will be modeled directly from the *Texas Manual for Rainwater Harvesting* with the additional

input of the roof catchment they believe they would like to have (how big of a house) and the calculated monthly usage.

Lastly, if the individuals would like to look at the feasibility of a rainwater catchment at their current residence, the ability to measure that catchment area will also be explained using ArcMap's basic area tool. An example of the spreadsheet to assist in the sizing of a cistern is below. The individuals would need to input values highlighted and monthly average rainfall.

Refined Rainwater Harvesting Sizing				
Inputs				
Roof area:	2500	ft^2		
Initial Storage:	1000	gallons		
Demand:	3000	gallons		
Month	Monthly Average Rainfall	Rainfall Collected (gallons)	EOM Storage	
January	1.97	2,610	610	
February	2.4	3,179	789	
March	2.91	3,855	1,644	
April	3.81	5,047	3,692	
May	5.01	6,637	7,329	
June	3.12	4,133	8,462	
July	2.04	2,703	8,164	
August	2.07	2,742	7,907	
September	2.67	3,537	8,444	
October	3.76	4,981	10,425	
November	2.7	3,577	11,002	
December	2.64	3,497	11,499	
Year End Totals	35.1	46,499	10,499	

*p. 39 Texas Manual on Rainwater Harvesting

The primary difficulties that need to be addressed as this project continues on are:

1. How to properly integrate the data and project that data as a raster for applicable calculations.
2. How to produce the raster that can be interpreted as a spline, etc. that will indicate year-end storage availability to assist in feasibility and storage sizing.
3. How to compile all of the above processes, including the two inputs of consumption use and catchment area as inputs that produce the desired output.

Because of the non-steady state flow of rainwater, utilization of monthly averages is a necessity and an simple equation cannot be derived that solves for cistern size without a multitude of variables. Thus the year-end storage technique will be used such that an individual can gain a perspective of the rainfall available in an area of the country and then decide for themselves if they would like to catch as much as possible or design for minimum

cost of the system. However, collection of daily values will be adequately explained in the report so that a user can access that histogram in HydroDesktop for reference of past rainfall to prepare for possible low/no water situations in their geographic location.