UNIVERSITY OF MISSOURI Extension

Division of Food Systems and Bioengineering
231 Agricultural Engineering Building
1406 East Rollins Street
University of Missouri
Columbia, Mo 65211-5200
Phone: (573) 882-0868
Fax: (573) 884-5650
E-mail: ZulovichJ@missouri.edu

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Estimating Surface Water Storage Requirements in Missouri

Joseph M. Zulovich, Ph.D., P.E.
Extension Agricultural Engineer
Commercial Agriculture Program

A number of Missouri operations depend upon surface water sources as their source for fresh water. This handout briefly discusses a quick estimation procedure to determine surface water supply requirements. A method to estimate the total size of surface water storage system is presented below along with a method to estimate of the number of watershed acres that should be available to refill the surface water storage(s). The estimated storage requirement can be provided by one or more than one water impoundment structure. The watershed acres must be such that all the available runoff from the watershed can be captured and stored in the water impoundment structures.

Step 1: Estimate the daily water usage in gallons per day. Various sources of information are available to provide estimates of water needs for various functions and uses.

Step 2: Multiply the daily use by 365 to determine an annual estimated water usage need in gallons per year. The constant 365 converts the daily use to an annual use.

Step 3: Divide the annual gallons per year by 325,828.8 to obtain the annual water need into the volumetric measure of acre-feet of water. The constant 325,828.8 converts gallons of water to acre-feet of water

Step 4: Multiply the annual water need in acre-feet by 4 to obtain the estimated water impoundment storage capacity. The constant 4 is derived as follows. A surface water system should be able to supply 2 years worth of water need without any significant runoff from the watershed due to dry weather. In Missouri, about half the water stored in a given impoundment is lost due to evaporation and seepage losses.

Step 5: Multiply the total acre-feet of water storage by 2.4 to estimate the number of acres needed in the watershed to refill the water impoundments. The size of the watershed to refill the water impoundments should be large enough to refill all the water storage capacity in a normal year. In a normal year, about 5 to 6 inches of runoff can be expected from typical rural watersheds. The 2.4 constant is derived from 12 divided by 5. The “5” is the depth in inches of runoff from an acre and the “12” converts inches to feet.