Wekiva Area Water Budget, Summary of Final Report

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WEKIVA AREA: WATER BUDGET

PROBLEM STATEMENT

The Wekiva area of central Florida consists of a combination of more than 20 springs which are tributary to the Wekiva River. The Wekiva River drains into the Saint Johns River, a major River system in Florida. There is uncertainty or a lack of science and engineering knowledge regarding spring flow in the Wekiva area. A decrease in spring flow could alter the economic base and the environmental values of the region. It is the wish to those constructing roadway systems in the area that the roads be constructed without decreasing spring flow.

OBJECTIVES

The major questions to be answered are:

1) Is the springflow decreasing?
2) If so, how can the springflow be maintained, and
3) How do you build a road in the area that will maintain the spring flow?

FINDINGS AND CONCLUSIONS

There are 15 findings of fact:

1. Springflow to the Wekiva River is decreasing.
2. Springflow is affected by the groundwater level in the Wekiva Springshed.
3. The groundwater level is affected by precipitation, well extraction, and directly connected impervious areas of development.
4. At least 58 percent of Wekiva River flow originates from the Springs.
5. Wekiva River flow has remained relatively constant over the past sixty years and Little Wekiva River flow has decreased over the past thirty years.
6. The Springshed area for the Springs is approximately 450 square miles.
7. Over half of Lake Apopka provides a source of recharge to the Springs.
8. The Wekiva study area is approximately 60 percent of the estimated Springshed area of 450 square miles.
9. Approximately 60 to 65 percent of the estimated Springshed area of 450 square miles is estimated to have a recharge rate equal to or exceeding 8 in/year.
10. The 450 square miles contributes at least 7 inches of Springflow during the average year.

11. For Rock Springs, approximately 70 percent of the discharge comes from a springshed within an 8 mile radius of the Spring. In addition, 95 percent of the discharge comes from a springshed within a 14 mile radius of the Spring.
12. The Volume of water percolating into the aquifer from rainfall affects the pressure head and storage volume which in turn affects Springflow.
13. Urbanization of 20 percent of the Rock Springs Springshed area with no replacement of infiltration (no stormwater management) causes approximately 10 to 15 percent decrease in the discharge at Rock Springs. Discharge at Springs adjacent to Rock Springs also decreases.
14. A post equal pre yearly volume water budget is an approach for maintaining post equal pre infiltration and discharge volumes.
15. Stormwater Management using regional irrigation ponds near the Parkway and operation by local utilities is an option to maintain the balance.

BENEFITS

The modeling presented in this report can be used to define flow patterns of groundwater to springs. The modeling will aid in defining springsheds for other areas. Stormwater management within these areas can be better defined with the use of the yearly water budget and thus spring flow can be better protected in terms of quantity and quality. The design of roads within watersheds can follow the water budget method. The construction of regional ponds for irrigation will result in maintenance of the water budget for an area. The water budget maintenance will protect springflow, ground water resources, and lower pollutant mass discharges to surface water bodies. The water budget method has also influenced the local water management district in their development of a rule that is based on the engineering principles of the recommended water budget approach.

This research project was conducted by Marty Wanielista and Gour Yeh of the Stormwater Management Academy at the University of Central Florida. For more information, contact Rick Renna of the FDOT, Project Manager, at 850.414.4351, or email at rick.renna@dot.state.fl.us. To view the full report or to “download” it, go to www.stormwater.ucf.edu.