Agricultural Water: Potential Use and Management Program in Georgia

Ag WATER PUMPING

Fact Sheet 5 – Southwest Georgia

Typical and Drought-Year Irrigation Scenarios

How can we anticipate future water use over wide areas of the Flint?

While it may never be possible to predict how much irrigation an individual field will receive, the past provides a good prediction for average irrigation over large numbers of fields. Barring substantial changes in the mix of crops, significant improvements in irrigation scheduling and application, or other factors that alter water use by the majority of farmers, irrigation in 2005 to 2009 will be much like irrigation in 2000 to 2004. With farmers cooperation irrigation amounts were measured monthly in 800 farms in Georgia, half in southwest Georgia.

What is a typical year's irrigation scenario?

Average monthly irrigation applications are influenced by the proportion of wet and dry years. In the six years of observations in the Lower Flint, there were very dry summers in 1999, 2000, and 2002, a very wet summer in 2003, and more typical summers in 2001 and 2004. While we cannot predict whether a similar pattern of wet and dry years will occur in the future, the range of conditions provides a good mix from which a typical or average scenario can be calculated. These monthly averages are offered as the **typical irrigation scenario** for each sub-basin.

How do you plan for droughts?

The real challenge in water planning is retaining enough water for all needs in drought years. Irrigation application depths can increase and fields that wouldn't be irrigated in normal years will receive at least partial irrigation. It may be fortuitous that the Ag Water Pumping Study Period included most of the 1998 to 2002 drought. Within that drought, records for set or approached for low rainfall in several individual months. The combination of the drought and the water demands of the current mix of crops offered several peak irrigation months. By taking the maximum area-weighted monthly water application depth observed for each month, a series of worst case irrigation results, that is, every one of the driest months is assumed to occur in the same year. These maximum monthly values are offered as the **drought irrigation scenario** for each sub-basin.

How much irrigation could be expected from groundwater-supplied systems?

With access to the productive Floridan aquifer widely available throughout the Dougherty Plain region of the Lower Flint basin, farmers have made this the water source of choice for irrigation. With low salinity and little sand, it is ideal for high productivity drip systems, as well as the more common center pivot systems. The reliability of the wells allows farmers to irrigate high value crops and dependably supply water to other crops in a timely manner.

Randomly sampled systems that were monitored by the Ag Water Pumping studies of 1999 to 2004 provided many observations that can be used to estimate future water use in both typical and drought years. In the Lower-Flint sub-basin (HUC8), 106 irrigation systems were monitored. Similarly, 47, 25, 35, and 84 groundwater-supplied irrigation systems were monitored in the Ichawaynotchaway, Kinchafoonee-Muckalee, Middle Flint, and Spring Creek sub-basins, respectively. Table 1 shows **typical** and **drought**-year irrigation as observed in those Ag Water Pumping sites.

Table 1. For **groundwater-supplied systems**, typical and drought year irrigation application depths (inches) expected for monthly irrigation across all crop types in the sub-basins of the Lower Flint. Data were derived from observations of the Ag Water Pumping program of 1999 through 2004.

Scenario	Sub-basin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		in.											
Typical	Ichawaynoch.	0.0	0.0	0.1	0.3	1.1	1.3	1.7	1.7	0.6	0.2	0.1	0.1
	Kinch- Muck.	0.1	0.1	0.2	0.4	1.4	1.4	1.7	1.4	0.8	0.2	0.1	0.1
	Lower Flint	0.1	0.1	0.2	0.7	1.8	1.8	1.7	1.7	1.0	0.3	0.1	0.1
	Middle Flint	0.0	0.0	0.1	0.3	1.1	1.3	1.8	1.7	0.8	0.3	0.0	0.0
	Spring	0.0	0.0	0.1	0.4	1.5	1.6	1.5	1.2	0.6	0.2	0.1	0.1
	All sub-basins	0.0	0.0	0.1	0.5	1.5	1.6	1.6	1.5	0.8	0.2	0.1	0.1
Drought	Ichawaynoch.	0.1	0.1	0.2	0.4	1.6	2.1	2.7	3.3	1.2	0.3	0.2	0.1
	Kinch- Muck.	0.1	0.1	0.4	0.7	2.1	2.3	2.9	2.0	1.3	0.5	0.2	0.1
	Lower Flint	0.1	0.1	0.4	0.8	2.9	2.7	2.6	2.6	2.5	0.5	0.4	0.2
	Middle Flint	0.1	0.1	0.4	0.7	1.7	2.4	3.0	2.3	1.0	0.5	0.1	0.1
	Spring	0.0	0.0	0.2	0.5	2.7	3.1	2.4	1.9	1.0	0.3	0.2	0.2
	All sub-basins	0.1	0.1	0.3	0.6	2.4	2.6	2.5	1.9	1.6	0.4	0.2	0.1

How much irrigation could be expected from surface-water supplied systems?

There are few streams and runoff ponds in the Lower Flint, especially in the Dougherty Plain. Its karst topography – sinkholes and cracks – intercepts most surface water flows. Farmers use stream flows directly or construct runoff ponds for irrigation primarily in the northern parts of the Ichawaynotchaway and Kinchafoonee-Muckulee sub-basins. In other sub-basins, spring discharges, natural ponds, wetland depressions, and streams themselves offer some surface irrigation water supplies.

Random sampling for Ag Water Pumping resulted in 13 sites in the Ichawaynotchaway and 23 in the Kinchafoonee-Muckulee. Each of the others provided five or fewer sites to monitor. As a result reliable estimates for future irrigation are best provided by a

look at all 47 surface sites in the entire Lower Flint. Table 2 shows **typical** and **drought**-year irrigation as observed in those Ag Water Pumping sites.

The Agricultural Water Pumping Program (AWP) was a research and extension effort of the University of Georgia and the Georgia Cooperative Extension Service conducted with the cooperation of Georgia farmers and other irrigators. The program was supported by grants from the Georgia Environmental Protection Division ("Statewide Irrigation Monitoring", EPD project # 764-890147 and "Automated Monitoring for Transient Flow" EPD Project # 701-090094) and state appropriations for the Agricultural Experiment Station and Cooperative Extension Service. The objective of the AWP program was accurate measurement of the amount water used for irrigation in Georgia during a 6-year study period, 1999 to 2004.

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Table 2. For **surface water-supplied systems**, typical and drought year irrigation application depths (inches) expected for monthly irrigation across all crop types for all sub-basins of the Lower Flint. Data were derived from observations of the Ag Water Pumping program of 1999 through 2004.

Scenario	Sub-basin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		----------					in.						----------
Typical	Ichawaynoch.	0.0	0.0	0.1	0.1	0.7	0.8	1.0	1.1	0.6	0.0	0.0	0.0
	Kinch- Muck.	0.0	0.0	0.1	0.3	0.7	0.9	1.5	1.4	0.6	0.0	0.0	0.1
	Lower Flint	0.1	0.0	0.1	0.4	1.2	0.9	0.5	0.4	0.4	0.2	0.3	0.1
	Middle Flint	0.0	0.0	0.0	0.2	0.9	0.9	2.2	2.0	0.3	0.0	0.0	0.0
	Spring	0.0	0.0	0.0	0.2	0.6	0.8	1.1	1.4	0.5	0.1	0.0	0.0
	All sub-basins	0.0	0.0	0.1	0.2	0.7	0.8	1.3	1.2	0.5	0.0	0.0	0.1
Drought	Ichawaynoch.	0.0	0.1	0.1	0.3	1.0	1.8	1.8	1.9	2.0	0.1	0.0	0.0
	Kinch- Muck.	0.0	0.1	0.5	1.0	1.0	1.5	2.1	2.3	1.0	0.1	0.2	0.4
	Lower Flint	0.3	0.0	0.3	0.6	1.6	1.5	0.8	0.7	1.0	0.4	1.2	0.3
	Middle Flint	0.0	0.1	0.1	0.4	1.5	1.6	2.9	3.7	0.9	0.0	0.0	0.1
	Spring	0.0	0.1	0.2	0.4	1.5	1.5	1.9	2.3	1.7	0.7	0.1	0.0
	All sub-basins	0.0	0.1	0.2	0.5	1.0	1.6	1.8	2.1	1.1	0.1	0.1	0.2

How much irrigation could be expected from well-to-pond systems?

Water withdrawals from ponds that are refilled by wells affect both surface flow and groundwater levels. Most well-to-pond (W2P) withdrawals are typical farm ponds that rely on runoff for refill. The dry periods that create a demand for irrigation are also periods with insufficient runoff to refill ponds. To make these ponds more reliable for irrigation, farmers pump from nearby wells to refill the pond in advance of the next irrigation. Farmers hope rainfall (free) will be available rather than pumped (expensive) groundwater.

The W2P systems are not very common in several of these sub-basins because the Dougherty Plain area in the southern two-thirds of the Lower Flint has few sites suitable for construction of farm ponds. Random sampling only created 3 to 11 monitoring sites each in four sub-basins and none in one. As a result reliable estimates for future irrigation are best provided by a look at all 23 sites in the entire Lower Flint. Table 3 shows **typical** and **drought**-year irrigation as observed in those Ag Water Pumping sites.

In most W2P systems, the original source of the water applied to the fields cannot be determined. In low rainfall years, more water typically will originate from groundwater in any given W2P system. However, varying sizes of pond storage and runoff catchments makes it difficult to predict how any single system will be managed. Initially we estimate that 67% of W2P applied water is surface and 33% originates from groundwater.

Table 3. For **well-to-pond systems**, typical and drought year irrigation application depths (inches) expected for monthly irrigation across all crop types for all sub-basins of the Lower Flint. Data were derived from observations of the Ag Water Pumping program of 1999 through 2004.

Scenario	Sub-basin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		----------					in.						----------
Typical	Ichawaynoch.	0.0	0.0	0.0	0.1	0.7	1.2	1.5	1.5	0.7	0.1	0.0	0.0
	Kinch- Muck.	0.0	0.1	0.3	0.8	1.6	1.9	1.7	1.4	0.7	0.2	0.1	0.1
	Lower Flint												
	Middle Flint	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.6	0.3	0.0	0.0	0.0
	Spring	0.0	0.0	0.2	0.3	1.4	1.1	1.8	1.2	0.3	0.0	0.0	0.0
	All sub-basins	0.0	0.0	0.1	0.3	1.0	1.0	1.4	1.1	0.4	0.1	0.0	0.0
Drought	Ichawaynoch.	0.0	0.0	0.1	0.3	1.6	2.0	1.9	2.5	1.9	0.3	0.0	0.0
	Kinch- Muck.	0.0	0.4	0.7	1.1	2.7	3.5	2.6	2.2	1.3	0.6	0.5	0.5
	Lower Flint												
	Middle Flint	0.0	0.0	0.0	0.3	0.9	1.3	0.9	0.8	0.9	0.1	0.0	0.0
	Spring	0.0	0.2	0.5	0.7	1.8	2.0	3.3	1.9	0.6	0.1	0.0	0.0
	All sub-basins	0.0	0.2	0.4	0.5	1.4	1.9	2.1	1.6	0.7	0.1	0.0	0.0