INDICATORS OF LONG TERM HYDROLOGIC CHANGE IN THE FLINT RIVER

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Abstract. The occurrence of three substantial climatic and hydrologic droughts since 1998 has raised concerns about water supply and stream flow throughout Georgia. This concern is acute in the Flint River Basin where low flows of unusual duration and magnitude were observed. The Flint River is essentially unregulated, originating just south of Atlanta and joining the Chattahoochee River to form Lake Seminole in southwestern Georgia. In addition to being an important water supply, the Flint River is noted for its biological and habitat diversity. For our analyses we used long term daily flow records from four stations (USGS: 02344478 – Griffin, 02347500 – Carsonville, 0234750 – Montezuma, 02353000 – Newton) to examine potential changes in hydrologic characteristics. We compared the period of 1940-1974 to 1975-2010, with the later period representing extensive development and population growth in the upper basin, and expansion of irrigated agriculture in the lower basin. Trends in rainfall were compared over the same intervals. No long term changes in annual rainfall were observed. Cycles of above and below average rainfall were observed as were periodic multi-year droughts. Annual water yields (annual CFS/watershed area at the station) ranged from 1.0 to 1.6 CFS/mi2 at all stations during most years. A declining tendency was observed at each station during the 1975-2010 interval, but was only significant at the Montezuma Station ($p = 0.04$). Winter yields showed similar declines only being significantly lower at the Griffin Station ($p = 0.05$). Summer yields were lower at all sites and significant declines were observed at Griffin, Carsonville, and Newton ($p < 0.05$). Calculation of 32 hydrologic indicators showed that the frequencies of low June-September median monthly flows, 1-day, 3-day, 7-day, and 30-day low flows were more common in the 1975-2010 interval at all stations. Our results indicate that human water use is causing increased severity and duration of low flows during the spring and summer seasons throughout the Flint River. These tendencies are pronounced during seasonal and extended droughts. Increased demand is the result of population expansion in the upper basin and irrigation expansion in the lower basin. Current rates of water use are likely unsustainable and pose a significant threat to stream health and the unique biological diversity characteristic of the Flint River.