

CRWA creates a water budget

By **Nigel Pickering**/ Special To The Tab

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Charles River Watershed Association is finding a way to meet human water demands while preserving water resources.

CRWA was selected to perform a statewide water budget analysis for the Executive Office of Environmental Affairs for 351 towns in Massachusetts. Our ground-breaking work in water budgeting began in the Charles River watershed, but is applicable in other watersheds as well. A water budget, comparable to balancing a checkbook, accounts for the amount of water that enters or leaves a watershed while quantifying the human impact on streamflow. This project, which commenced in November 2005 and will continue until June 2007, dovetails with CRWA's flow trading efforts. Statewide maps of streamflow stress will aid in prioritizing restoration efforts and could form the basis for initiating a trading program using water banking.

For several years CRWA scientists have calculated water use patterns for all the months and all sub-watersheds ranging in size from one to five square miles. This water budget approach includes water lost from well withdrawals, transfers via water supply and wastewater pipes, and evaporation from irrigation. Also accounted for is reduced recharge from impervious surfaces (roads, parking lots, buildings) as well as flows returned to the ground from septic systems. CRWA scientists compare these water losses against data on natural streamflow in each sub-watershed to determine the level of human impact on rivers and streams. CRWA maps these results, which graphically depict river flow variations from month-to-month and the magnitude and timing of the human impact on all the sub-watersheds.

CRWA applied this specialized methodology to the Town of Blackstone to help prioritize recharge sites since the Blackstone River sub-watershed is impacted by water withdrawals, a large amount of impervious area, and wastewater losses. The town's water budget calculation identified the Lower Mill River and the Quick River as the most stressed sub-watersheds in the town, primarily because the public water wells are in, or near, their sub-watersheds. The impacts of impervious surfaces and sewerage were greatest in the spring since high groundwater levels aid infiltration into sewer pipes, and runoff from impervious surfaces is not absorbed by adjacent soil. The impacts of pumping and irrigation peak in the summer. Streamflow impacts were greater in the summer when streamflows are naturally low. But with more development there will be more withdrawals, irrigation losses, impervious areas, and sewerage areas, which will further reduce streamflows in the town.

Newton is different from Blackstone in a number of ways. Newton does not have any public water supply wells so there is no direct local impact in any sub-basin

from a public water withdrawal well. There are a number of small golf course wells but their cumulative withdrawal volume is small. The impact of the evaporation losses from irrigated lawns is likely to be somewhat larger because, even though both communities have similar summer-to-winter ratios of water use, there are many more residential lots in Newton. Newton is on the MWRA water supply and sewer system so more water leaves as wastewater than is supplied. This apparent anomaly is because groundwater and stormwater leak into the sewer system and augment the outgoing wastewater flow. The net amount of water lost could be fairly large because of Newton's large population. Newton is also more highly paved than Blackstone so more recharge is blocked from entering the groundwater.

In summary, most of Newton is likely to have a negative water budget or a net deficit of water, thus contributing to lower streamflows during the dry periods. More exact analysis of Newton's water budget will be performed by CRWA in the next year under EOE's new Statewide Water Budgets Analysis program.

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