Development of Water Use Management Alternatives For the Fenton River Near Storrs, CT

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As an institution relying completely on its own water systems, the University of Connecticut came to a crossroads in August of 2005. After years of steady growth in the student body and campus expansion, the river supplying the university faced a drought during the time of peak demand from August to September. At this point peak demand was roughly 1.6 million gallons per day (MGD). During these months, there was a 600 meter stretch of the river that was dry, found to be corresponding with the extraction of groundwater in the area for use by the University. The wells that supply the school are near the Fenton River, and have a sometimes-dramatic impact on stream flow in the river. The University saw the need at this point to reduce demand, especially during peak times to maintain a healthy stream flow. Glenn Warner, a professor at the University’s Department of Natural Resources and the Environment led a group based on this necessity to determine the exact interaction between ground water systems and the stream and offer ways of reducing demand.

Groundwater extraction is known to have very significant impacts on water resources in a local area. As we have seen in many parts of the world, groundwater extraction from agriculture or personal consumption has drastically reduced groundwater tables, making it more energy intensive and less cost effective to withdraw water. Water extraction through wells creates a cone of depression that brings water throughout the water recharge area to the cone of depression. This draws water away from certain areas towards the well, reducing the water table in the recharge area. In the case of the wells at the University of Connecticut, the wells were in very close proximity to rivers. These rivers’ flow was greatly reduced by groundwater extraction, which was made worse during the drought of 2005. Protecting ecological integrity of the recharge area is of greatest importance when maintaining wells. The Connecticut Department of Environmental Protection has established aquifer protection programs to maintain groundwater quality for ecological and human purposes.

Beginning with a field inventory that accounted for hydrologic and geologic systems as well as monitoring fisheries, the group found groundwater levels, stream discharge and levels and using ground-penetrating radar (GPR), could determine underground aspects of the watershed. All of these were viewed in the context of maintaining ecologically sound stream flow. After gathering this information, the group created a habitat simulation in order to test different interaction between the groundwater and stream water systems. Three types of scenarios categorized each simulation. Well A, which was closest to the portion of dry riverbed in the 2005 drought, could be moved to a deeper part of the aquifer. Deeper parts of the aquifer were determined using GPR. Reduced pumping scenarios were also considered for three different quantities. Spreading the pumping over different periods of time was also considered. Based on these three scenario types, the group could determine the ecological impacts and benefits of each. By doing so, they could find out which would be best, and by how much demand would have to be reduced.

Warner concluded by describing some of the steps taken by the University to reduce demand. Since the study, they have reduced average and peak demand by hundreds of thousands of gallons per day. Student dormitories have reduced their demand by 10 to 20 percent since the beginning of a water conservation initiative. Stream discharge gages were placed along the river to determine levels with better accuracy and speed. Weather-based irrigation controls have been put in place and the school has adopted a LEED silver green building code requirement. Closed loop cooling and water reuse at the co-generation power plant have also been considered. Steam system repairs to reduce leakage have also effectively reduced demand. The US Green Building Council that runs the LEED certification program has also been involved in pilot projects in both school and neighborhood developments. University of Connecticut can learn from both of these applications as it continues to strive for reduced water consumption on the campus. The LEED for schools model demonstrates sustainability as well as providing indirect benefits to students and faculty as they interact in a healthier environment. While this program applies mostly to k-12 schools, much can be learned in applications to individual buildings. Further, University of Connecticut can apply the new neighborhood development standards to the continued development of its campus. If the campus is considered as a neighborhood, infrastructure and buildings combine to create a more holistic approach to creating a sustainable campus. As LEED continues to develop its programs in schools and neighborhood development, University of Connecticut, and colleges and universities in general can thrive from adopting such standards.

Overall, the University has a long way to go, and the benefits of their water conservation measures will not be fully seen until a drought like the one in August and September of 2005. Their continued water conservation efforts must also act as a model for other institutions and municipalities dealing with drought exacerbation by groundwater extraction. Throughout Connecticut, over one million people rely on groundwater for drinking water purposes. As such, maintaining the ecological integrity of these recharge areas is of great importance locally. Increasing demand and the threat of climate change makes such efforts more important. As shown by Professor Warner, growth can continue while also decreasing water consumption.

References:

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