Wireless Connectivity Summary for the Baltimore Ecosystem Study

Jonathan Walsh, August, 2007

The Baltimore Ecosystem Study (BES) is situated along an urban-rural gradient of land and water. We have several computerized instrumentation sites including wireless sensor networks, meteorological stations, stream sampling and soil sampling.

We would like to increase the bandwidth of our meteorological stations by improving their connection to the collection database. Currently that connection is wired and that limits our connectivity both in terms of distance and speed. The meteorology stations are typically 100 to 500 meters from the computer that collects the data. Those computers have internet connectivity and are spread about the study site typically 10 km from the university.

We would like to increase the amount of simultaneous measurements over wider areas at higher sampling rates and process these data in real time to better facilitate modeling and forecasting. We would like to couple this action with some redundancy of sensors. Given the increasing affordability of sensors and wireless infrastructure, this increase in resolution can, to a point, increase the quality of data and metadata. This increase in resolution can also provide a means to deal with missing or outlying readings. Our stream and soil sampling sites are located along the urban-rural gradient of the Gwynns Falls watershed at distances ranging from 5 km to 30 km from the university.

The BES Urban Flux Tower --- the only one of its kind --- would be improved by the addition of the capability to deliver streaming data in real time. The tower is approximately 8 km from the University.

Lastly, we would like to use wireless technology with the educational component of BES. We envision using our existing network of schools and educators at the high school level to create a network of sensors at schools along the urban-rural gradient. This network would be designed, in large part, by the students. These sampling stations would be equipped with wireless cameras and other devices for real-time comparisons along the urban-rural gradient. The photographs would be stored in a database to record and measure change. In addition to the aforementioned cameras, the station could be equipped with flash cameras with motion sensors which would capture nocturnal wildlife that would be normally unseen by these students. This provides the students a scale broader than a local community but close enough to their lives to be accessible to them. We would also like to improve the internet connections at the schools where the existing wired connection is insufficient to support telecommunication.

We would also like to enable cameras at the remaining sampling sites - in particular, the more forested ones - so urban students can see things taking place there.

The aforementioned educational components and experiments would enable the students to gain experience in handling and quantifying large datasets. It would also provide them

with the opportunity to develop the associated logical tools, such as change detection software. It would also enable the students to become adept at the newer wireless technologies, which will increasingly prove to be integral to ecological research.

Any knowledge and expertise gained by BES as a result of these improvements would be passed along to the remaining LTER sites.

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