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Closing the Water Budget in an Experimental Urban Watershed: A Comparative Assessment of Methods for Measuring Evapotranspiration

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Closing the Water Budget in an Experimental Urban Watershed: A Comparative Assessment of Methods for Measuring Evapotranspiration

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The Yale Experimental Watershed (YEW) has an area of 7.8 ha and is located on the Yale campus in New Haven. A seasonal stream drains the watershed. Woodland occupies the central portion of the property, surrounded by homes, streets, and university buildings. The site has been used for research and teaching for the past 5 years, and extensive baseline data have been collected.

My research at the YEW compares methods for measuring evapotranspiration (ET) in urban environments. Three independent measurements of ET (mm/day) will be produced for the 2016-growing season using the following methods:

- a. Micrometeorological: Shuttleworth-Wallace heat budget
- b. Hydrological: Soil moisture profiles
- c. Physical: Pan evaporation

These techniques sense various environmental data. The aim of the project is to determine how the signals differ from one another. Furthermore, the research seeks to recommend a method for the measurement of ET in cities.

Data collection is continuous for all methods, occurring at scales as fine as 5-minute intervals (generating 100,000 data points/year) and as coarse as 1-hour. This volume of data requires careful organization and interpretation. Furthermore, site-specific configurations of research equipment have required somewhat novel interpretations of data to estimate ET.

Historical data is also being utilized to produce a water budget for the site. These include stream flow, groundwater level, and precipitation data. The water budget should illuminate physical characteristics of the groundwater watershed, which has received little attention at the site, and also allow for an estimation of ET by difference ($ET = \text{Precipitation} - \text{Outflow} - \text{Storage}$).