SCCWRP #566

Estimating the variability and confidence of land use and imperviousness relationships at a regional scale

Drew Ackerman and Eric Stein

ABSTRACT

Impervious cover is a commonly used metric to help explain or predict anthropogenic impacts on aquatic resources; often it is used as a surrogate for intensity of human impacts when evaluating effects on aquatic resources. The most common way to estimate imperviousness is based on relationships with land use. Few studies have evaluated how the relationship between impervious surface and land use varies among geographies with different levels of development and between types of imagery used to assign land use type. In this study, we assess variability in estimates of imperviousness based on two locally available land use datasets: one based on aerial imagery (2-m resolution) and another based on satellite imagery (30-m resolution). The ranges and variability in imperviousness within land use categories were assessed at several spatial scales, including within counties, between counties, and between watersheds. Results indicate that there was considerable variability for all developed land use types. Estimated impervious cover often varied over a range of 20-40% points within a land use category. Furthermore, there were clear spatial patterns both between and within counties, with impervious cover for a given land use type being higher near the urban centers and lower at the margins of development. Estimates of imperviousness for 12 study watersheds indicated that variability increased with increasing watershed development, making it difficult to confidently set management or regulatory targets based on impervious cover. This study suggests that locally derived, high resolution satellite or aerial imagery should be used to estimate imperviousness when a high level of accuracy and precision is required for regulatory or management decisions. Furthermore, the error associated with impervious land use relationships should be accounted for when using impervious cover in runoff or water quality models, or when making management decisions regarding stream health.