Towards national mapping of aquatic condition (II): Predicting the probable biological condition of USA streams and rivers

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The US EPA's National River and Stream Assessment (NRSA) uses spatially balanced sampling to estimate the proportion of streams within the conterminous US (CONUS) that deviate from least-disturbed biological condition (BC). These assessments do not infer BC at un-sampled streams, nor the anthropogenic stressors that degrade BC. A national map of probable (pr) BC could provide an important tool for prioritizing monitoring and restoration of streams. We used random forest modeling and data from 1,883 NRSA sample sites that were previously determined to have 'good' or 'poor' BC to predict prBC for ~5.4 million km of stream. The NRSA sites were linked to the Stream-Catchment (StreamCat) Dataset, which contains >100 natural and anthropogenic landscape metrics for ~2.7 million watersheds across the CONUS. prBC was best predicted (70% correctly classified) by 3 natural (elevation, air temperature, and sand content of soils) and 4 human-altered (% riparian naturalness, population density, and % of watershed composed of forest cover or agriculture) landscape metrics. We applied the model to the StreamCat dataset to predict prBC nationally. The national map of prBC provided a unique assessment of model performance. Specifically, lower prBC was consistent with large-scale patterns of human-related land use. However, maps of local prBC were sometimes unrealistic, suggesting that predictions could be improved with regional, rather than national, models. Future work will seek to improve the national map of prBC for streams. In addition, our data and modeling framework will soon be extended to 356,044 lakes.

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