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Application of Regional Flow-ecology to Inform Management Decision in the San Diego River Watershed

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EXECUTIVE SUMMARY

Changes to instream flow are known to be one of the major factors that affect the health of biological communities. Regulatory, monitoring, and management programs are increasingly using biological community composition, particularly benthic invertebrates, as one measure of instream conditions, stormwater project performance, or regulatory compliance. Understanding the relationship between changes in flow and changes in benthic invertebrate communities is, therefore, critical to informing decisions about ecosystem vulnerability, causes of stream and watershed degradation, and priorities for future watershed management.

Taking advantage of large, robust regional monitoring data sets and recently completed regional watershed models, the Southern California Coastal Water Research Project (SCCWRP) has developed a set of "flow–ecology" relationships for southern California that relate changes in specific flow metrics to changes in benthic invertebrate indices that have been shown to be indicative of stream health. These relationships are based on the Ecological Limits of Hydrologic Alteration (ELOHA) framework, which uses a variety of hydrologic and biologic tools to determine and implement environmental flows at the regional scale. Results of the ELOHA analysis can inform management decisions, such as release rates from dams, reservoirs or basins; diversion volumes for irrigation or water re-use, or flows associated with stream restoration.

The goal of this project is to demonstrate how regionally derived flow–ecology relationships can be implemented at a watershed scale to inform management decisions. Regional relationships allow us to describe general patterns of response in biological communities to changes in hydrology. Local case studies are critical to determine how these relationships can be applied to site-specific decisions, and to identify areas where the regional relationships may need to be refined to better support local application.

Our case study focused on the San Diego River Watershed in southern California, where the potential effects of urban growth and water/runoff management on stream flow and biological condition are currently being considered. We worked with a group of local watershed stakeholders to identify three questions that that would both inform local management decisions (along with other planning considerations) and demonstrate the utility of the regional flow–ecology relationships. Close coordination with the stakeholder group enhanced the relevancy of the analysis and helps to determine how the technical approach to establishing targets may be applied in other areas. The case study focused on the following management questions:

1. How will future land use changes affect flow conditions and impact biological endpoints in the San Diego River watershed? This involves a comparison of the current hydrologic conditions to modeled conditions based on San Diego County's 2050 land use projection. Future scenarios did not include any assumptions about best management practices, low impact development or hydromodification, which would be expected to reduce potential effects of future hydrologic alteration.

2. How can we use our understanding of current and expected future hydrologic conditions along with the regional flow–ecology relationships to prioritize regions of the watershed where flow management may be most critical to maintain or improve future stream health?

3. What are the biological implications of two future management decisions that will affect instream flow conditions:

4. What would be the effects of reduced discharge from Santee Lakes Reservoir due to increased capture and storage to meet demand for reclaimed water?

5. What would be the effect of disconnecting imperviousness and implementing stormwater capture strategies in a currently developed portion of the watershed?

These local management questions were addressed using regional flow-ecology relationships that relate changes in stream health to changes in hydrology. Stream health was assessed using the California Stream Condition Index (CSCI), a statewide index of benthic macroinvertebrates community composition. Hydrologic alteration was assessed based on the following hydrologic metrics, which were shown to have strong statistical and ecological relationships with the CSCI (Table ES-1; See Mazor et al. in review). Metrics were also selected to ensure representation of different components of the flow regime (e.g. duration, magnitude, etc.) and different climate conditions (e.g. wet vs. dry vs. average years).

Full text:
http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/948_ApplOfSanDiegoRivWatershedFlowEcolToInformMangDec.pdf