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A tool for determining the sensitivity of rivers to abstraction for use by the Environment Agency, UK

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Sensitivity of river biota and their habitats to altered river flow regimes is a key concept in assessing the likely magnitude of change in a river ecosystem when altered by an abstraction or impoundment. As the environmental regulator within England, it is important for the Environment Agency to determine how much water may be taken or impounded from a river or catchment without causing any detrimental impacts to the resident biota. At a waterbody or site scale, approaches such as PHABSIM have been used in the past; however these methods require considerable investment in time and resources, and produce only site-specific results. To help to assess river sensitivity to flow alteration at a catchment scale, the Environment Agency has developed the RAPHSA (Rapid Assessment of Physical Habitat Sensitivity to Abstraction) model.

RAPHSA defines sensitivity to flow reduction as the change in physically based river system variables (typically depth, velocity and wetted bed width) with changes in river discharge. These changes are then linked to particular species and life stages of instream biota as a function of useable habitat area for the target species. However, unlike previous methods, RAPHSA uses a suite of catchment wide tools which can be adopted on a risk-based approach according to the level of confidence and resource availability which are deemed necessary.
Central to the RAPHSA approach is the regression analysis from a number of UK sites to determine the general response of physical variables to discharge. The results demonstrated that estimates of sensitivity to flow change based solely on catchment variables (e.g. slope, drainage area and geology) were relatively uncertain, however the addition of site data (e.g. width and depth measurements) from a single rapid survey provided considerably higher model certainty. By quantifying the degree of confidence in the model results, and identifying the primary physical variables which drive the relationship between habitat availability and discharge, RAPHSA allows the user to determine the acceptable level of confidence which could be applied to the results.

Our poster will outline the development and application of the RAPHSA model by the Environment Agency for determining the physical sensitivity of rivers to flow changes, enabling decisions to be made on the impact of abstraction pressure on rivers.