

Modeling stakeholder decisions with fuzzy set theory for environmental flows management

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Abstract. “Environmental flows” is a science-based discipline where the decision problem is how much of a streamflow regime in a river system needs to be allocated for desired ecological and societal objectives. As our understanding of the science of environmental flows and its importance for integrated river management has improved, the lack of broadly applicable and flexible tools for holistic decision-making persists. We developed a decision support framework that navigates a multi-objective flow management problem towards improving the quality of making flow management decisions. Steps of this framework require the application of quantitative techniques that can prioritize among multiple flow management options. In Colorado, legislation calls for the negotiation of water resource management in locally-driven and collaborative decision contexts. To facilitate this statewide objective, we performed an iteration of our framework as a case study in the Yampa-White Basin. We demonstrate the usefulness and flexibility of quantitative methods for multi-criteria decision analysis that use fuzzy set theory to model stakeholder decisions in the basin. With ongoing support from the stakeholder group, we are facilitating the prioritization of future environmental flows management decisions.