Non-traditional concepts about large river reference conditions: Experience of the Upper Mississippi River.

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In 2004, the U. S. Army Corps of Engineers proposed a 50-year, $6 billion program of ecosystem restoration for the Upper Mississippi River to offset past and future commercial navigation system impacts. A science panel convened in 2003 reported on the need for a future adaptive river management process that included the development of ecosystem objectives at several spatial scales. While developing these objectives, some relatively new concepts were discussed. Given a "no suitable reference" (i.e., no natural analog) scenario for the river, a "virtual reference" approach was considered that would establish reference conditions by integrating information from multiple sources: historic; selected internal sites; and independent observations from less disturbed, but otherwise ecologically similar rivers. Unfortunately, this line of reasoning was not pursued. Instead, a broad set of goals and objectives, identified by stakeholders at public meetings and strongly influenced by habitat conditions, were collated and referred to by the Corps as the virtual reference condition, a pseudonym for "desired future conditions". This set of goals and objectives became the basis for estimating costs of ecosystem restoration alternatives. The phrase "virtual reference condition", in part because of confusion over its definition, has since slipped in popularity, and an explicit method for using multiple sources of information was never developed. A second concept, one that has received even less attention, might be called "collective minimal standards". This refers not to desired future conditions, but to undesirable levels of essential ecosystem characteristics that need to be avoided when establishing trade-offs among river uses. This seems to be a necessary element of a management system that is intended to balance different value systems for the benefit of the common good. This concept may become more attractive as scientists and managers begin accepting that economic, ecosystem, and social conditions and values are all co-dependent variables in a single equation that describes total river system well-being.

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