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1:30 PM – 3:00 PM

SESSION 46: Instream Flows - Ecosystem Requirements

Investigating Ecosystem Services in the Arid Southwest - Nita Tallent-Halsell, U.S. Environmental Protection Agency, Las Vegas, NV (co-authors: Donald Ebert, Caroline Erickson, William Kepner, Ric Lopez, Yongping Yuan, Matt Weber)

The Southwest Ecosystem Services Project (SwESP) is an integrated, multi-disciplinary, multi-agency project focused on how to identify, characterize, and quantify the ecosystem services in the southwestern United States and northern Mexico. The southwestern landscape is highly diverse with substantial portions of shrub- and grass-lands, agriculture, urban, forest, and deserts (i.e., Great Basin, Mohave, Chihuahuan, Sonoran, and Colorado Plateau). Over the past 90 years, urban areas in the Southwest have increased in size by 1,500 percent, placing pressure on the region's ecosystem services. The provisioning of clean water is the dominant ecosystem service explored within SwESP. Due to prolonged drought, rapid human population growth, and economic destabilization, the continued availability of water is at risk. Reduced water availability will have significant negative impacts on natural and human-dominated landscapes. Other ecosystem services such as climate and water regulation, food, forage and fiber production, recreation and cultural lands provisioning will also be investigated. In the early stages of implementation, SwESP has focused on identifying and quantifying ecosystem services and their indicators drawing from past and current land cover, vegetation, soils, and other data. The project is evaluating two model frameworks to facilitate decision-making: 1) Ecosystem Portfolio Model framework – a geographic information system based multi-criteria decision support Internet-based tool and 2) the InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) Tool framework – a spatially explicit modeling tool that predicts the consequences of land-use and land-cover change on the production of multiple ecosystem services. SwESP is a starting point for developing a suite of procedures and tools to be used in the assessment of the benefits humans derive from ecosystem function and structure in arid environments.

Markets and Incentives for Restoring Water Quality in Puget Sound - Mark Buckley, ECONorthwest, Portland, OR (co-author: Ernie Niemi)

Ecosystem functions, water quality, and wildlife populations are all in decline in Puget Sound. The Puget Sound Partnership (PSP), created by the Washington State Legislature in 2007, is charged with the recovery of the Puget Sound ecosystem by 2020. In December, the PSP released an Action Agenda to achieve the recovery of the Puget Sound ecosystem by 2020 and beyond. This effort addresses a broad suite of ecosystem services and factors of ecosystem health, including water quality, water quantity, biodiversity, habitat and human health, and outlines strategies to protect and restore these ecosystem services via a broad-based approach that includes small loans for septic retrofits and low-impact development, to large-scale estuary acquisition and restoration projects. As part of the Action Agenda, we estimated the costs of implementing the strategies required to achieve the Agenda's goals. Our initial cost estimates for this effort range well beyond currently available financial resources, particularly given the current Washington State budget deficit. In light of this, we discuss market-based approaches to restoration, ranging from incentives to market-trades, that offer potential efficiency gains under the present state of funding availability, regulatory drivers, and property rights, to achieve large-scale ecosystem restoration. Existing market-based approaches have met with mixed success, and provide lessons for mechanism design and practical limitations. Management of risk, uncertainty, ignorance, and liability under market-based approaches requires careful mechanism design, particularly in light of current financial market failures. Use of water quantity markets to improve water quality also provides opportunities to overcome problems of weak demand in ecosystem service markets.

Generalizing ecological responses to hydrologic alteration for setting environmental flow standards – Christopher Konrad, The Nature Conservancy, Seattle, WA

Protection of in-stream flows has traditionally relied on the identification of flows required to support specific in-stream uses such as for fish, wildlife, or recreation. Recent policy and scientific developments have shifted the focus to determining the extent of hydrologic alteration that is acceptable for functioning freshwater ecosystems. Although this shift is arguably more of perspective than substance, it creates opportunities for the development of generalized ecological responses to hydrologic alteration and, then, application of these generalized responses in stakeholder or regulatory processes for setting environmental flows. Generalized flow-ecology responses have been developed by teams working in different regions of the US including Michigan, southeastern US and the western US by compiling site-specific information on distribution of fishes or invertebrates and associated streamflow conditions. The status of these efforts is reviewed and their potential application in water allocation decisions is discussed. Efforts to generalize ecological responses to hydrologic alteration face common challenges including identifying common ecological indicators with broad geographic relevancy, accounting for confounding factors and the conditional effects of flow that influence site-specific responses, and gaining acceptance of regional-scale information in local water management decisions. Nonetheless, a regional approach to assessing ecological responses to hydrologic alteration offers a potentially more robust and efficient alternative to site-specific investigations or heuristic determinations of environmental flow requirements in rivers.

Statewide Ecologically-Based Instream Flow Standards: Michigan versus Connecticut - Eloise Kendy, The Nature Conservancy, Helena, MT (co-author: Colin Apse, Richard Bowman, Mark P. Smith)

States governments are increasingly realizing the importance of natural streamflow patterns for sustaining healthy rivers. However, traditional site-based approaches for determining streamflow needs are too limited in scope to protect and restore waters statewide. To provide needed statewide protections, several states are successfully integrating ecologically-based instream flows into statewide water management programs. In many respects, Connecticut and Michigan represent the two “end members” of this movement. Connecticut regulates activities that alter streamflow; Michigan regulates only the registration and reporting of those activities. Connecticut’s draft standards are based on scientific literature regarding key seasonal aspects of the hydrologic regime; Michigan’s standards derive from 26 years of fish sampling from 1,720 sites. Connecticut’s draft standards are variable flows that depend on the season, the flow level, and the river condition goal; Michigan’s standard is a minimum flow that depends on the hydrology, temperature and river catchment size. Connecticut’s draft standard applies to both water withdrawals (>50,000 gallons per day) and reservoir operations; Michigan’s standard applies only to withdrawals (>100,000 gpd) and requires the use of an online Water Withdrawal Assessment Tool to determine the likelihood for withdrawals to cause an “adverse resource impact” as statutorily defined. Both state programs are designed to cover every river and stream in the state – not just the few that have been studied in detail – and both programs cover groundwater as well as surface-water withdrawals. These case studies illustrate the opportunities and challenges of implementing ecologically-based instream flow standards in other states.