Competing Water Needs: Modeling Klamath River Drought Allocations

Marshall Flug,
Research Hydrologist, USGS, Midcontinent Ecological Science Center (MESC), 4512 McMurry Ave., Fort Collins, CO 80525-3400; email: marshall_flug@usgs.gov; voice: 970-226-9391; fax: 970-226-9451;

Sharon G. Campbell,
Aquatic Ecologist, USGS, MESC, Ft. Collins, CO; email: sharon_g_campbell@usgs.gov; and

R. Blair Hanna
Research Associate, Johnson Control World Services, Inc., Ft. Collins, CO

Abstract. Water management on the Klamath River, OR and CA, requires operation decisions on reservoir storage for fish and hydropower, seasonal agriculture water allocations, and downstream flows for other endangered fish species. The Klamath River Basin has experienced drought conditions in three of the past ten years i.e., 1992, 1994, and 2001. A network flow model (MODSIM) for routing water is coupled with a water quality model (HEC5Q) and used to evaluate several reservoir and river parameters in the Klamath River. These two models are integrated and run as part of a broader Systems Impact Assessment Model (SIAM); a decision support system developed to evaluate alternative water operations on the simulated physical, chemical, and biologic parameters in the river. Parameters include minimum instream flows; water temperatures; and dissolved oxygen (DO) levels. Metrics include both *acute* and *chronic* levels for *temperature and dissolved oxygen*, but are expressed as four independent calculations of "*degree or DO days*" at various locations downstream of dams and reservoir controls. Hydrologic input and flows for 1992 hydrology were used as a surrogate for a series of management alternatives reducing water delivery and use for irrigation, power production, and Endangered Species in both the lake and riverine segments of the Basin. Resource managers in the Klamath Basin can use SIAM to determine the impacts of specific legal and institutional flow constraints during droughts and to identify potential adverse water quality consequences on endangered fish survival. Model simulations can help determine tradeoff impacts from changes in river operations on agriculture production and hydropower generation.