

ABSTRACT

**PARTNERSHIPS IN RESTORATION: TMDL WATER QUALITY
IMPROVEMENT ON FOREST SERVICE LANDS IN THE UPPER KLAMATH BASIN**

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The Upper Klamath Lake Drainage had 20 streams on the 1998 303(d) list for exceeding temperature standards. All streams were listed based on the 64°F stream temperature criteria. With a few exceptions, such as in cases where violations were due to natural causes, the Oregon Department of Environmental Quality (ODEQ) must establish a Total Maximum Daily Load or TMDL for any water body designated as water quality limited. Load allocations in the TMDL were determined using effective shade as a surrogate measure for solar radiation loading capacity in the Upper Klamath Lake TMDL instead of actual loading values. Effective shade was defined as the percent reduction of solar radiation delivered to the stream surface. Site-specific effective shade was determined to help translate nonpoint source solar radiation loadings. For the TMDL, target values for effective shade were developed using a data-intensive modeling and analysis process, which included traditional numerical temperature models, statistical analysis, and GIS-based watershed-scaled surface water modeling. Resource experts from State, Tribal, and Federal agencies were consulted with to refine effective shade targets for streams based on site-specific information. Target values for effective shade included shade provided by improved channel morphology, and improved vegetation characteristics and abundance. Target values for effective shade were reached when streams and riparian areas were at system potential. This was defined as the combination of near-stream or riparian land cover and channel morphology conditions that meet the temperature standard by increasing effective shade.

Achieving TMDL target effective shade for US Forest Service streams in the Klamath Basin is a high priority for the Fremont-Winema National Forests. Effective shade targets were developed for all 303(d) listed streams in the Upper Klamath Basin on the National Forests. To address the effective shade targets, the Forest Service, in partnership with ODEQ completed a Water Quality Restoration Plan (WQRP) that outlines a plan for meeting stream temperature standards on 303(d) listed streams. The Forest Service restoration strategy includes both passive and active restoration strategies over shorter and longer time scales, and activities that improve channel and riparian conditions, as well as upland conditions. Examples include riparian fencing, planting riparian vegetation, channel restoration, hydrologically disconnecting roads, ditch and diversion improvements, and upland vegetation treatments.