

## **USE OF THE TOTAL MAXIMUM DAILY LOAD (TMDL) PROCESS IN CONSERVATION OF FLUVIAL ARCTIC GRAYLING, A CANDIDATE FOR PROTECTION UNDER THE ENDANGERED SPECIES ACT (ESA)**

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Development of TMDL plans for impaired waters is a requirement of the Clean Water Act and supports the goal of restoring water quality to meet state standards and promote full support of beneficial uses. Among listed pollutants in the upper Big Hole River is temperature, which poses a considerable threat to a remnant population of fluvial Arctic grayling, a candidate for ESA listing. Factors contributing to warm water temperatures in the Big Hole River include chronic dewatering from irrigation withdrawals, removal of shade-producing willows, and associated changes in channel geometry. Targets included mean and maximum daily temperatures, shrub cover, stream flow, and width-to-depth ratios. Application of a thermal model indicated substantial decreases in mean and maximum daily temperatures were possible with target attainment. Allocations for thermal loading among the identified influential factors followed a performance-based approach that will provide adequate shading and flows, and suitable channel geometry to maintain cooler temperatures. Proposed restoration and monitoring activities build on agreements among federal and state agencies and landowners designed to promote grayling recovery in a working watershed. Specific restoration activities call for maintenance of flow targets, re-establishment of functioning shrub communities, channel restoration where warranted, and implementation of agricultural best management practices.