CSREES National Water Quality Program

**Title:** Best Management Practices for Se Prevention

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**Organization:** Colorado State University

**State:** CO **Region:** Northern Plains and Mountains **Year of Funding:** 2001

**Theme:** Pollution Assessment and Prevention

**Situation:** Wildlife deaths and deformities caused by selenium (Se) from drainage flows in the Kesterson National Wildlife Refuge provided the link between geology, irrigation return flows, and Se toxicity levels. Investigations found high levels of Se in the water, bottom sediment and biota throughout the Lower Gunnison and River Basin. Watershed-wide Se budgets indicate that about 61% of the Se delivered to Lake Powell via the Colorado River comes from drainage waters in the Gunnison River Basin and in the Grand Valley. The Gunnison Tunnel provides water to irrigate about 150,000 acres in the Uncompahgre and Grand Valleys. Impaired waters from irrigation seepage, return flows; drainage, and natural underground flows carry Se to the Upper Colorado River. Currently, commercial and residential development in the Lower Gunnison Basin is rapidly converting marginal lands to ranchettes, rural residential, and urban subdivisions. The availability of inexpensive water has the potential to mobilize Se. The Colorado State Non Point Source Management Protocol identified hydrologic impacts due to urbanization as a significant source of water quality impairment. Improper water management associated with new development on higher-Se soils has the potential to increase Se loading to the river. Water quality standards for the protection of wildlife vary between 2 µg/L and 4.6 g/L in the Colorado River system. There is increased regulatory pressure to apply a Total Maximum Daily Load (TMDL) requirement, which highlights the need to quantify and manage pollutant loadings from both agricultural and municipal sources.

**Objectives**: The project's environmental goal is to prevent the contribution of "new" Se sources associated with land use changes. The programmatic goals include the development of irrigation management and water conservation Best Management Practices (BMP) guidelines specifically to benefit the small acreage residents and commercial property developers. The educational program on irrigation management includes BMP demonstration projects. The objectives of the project are to provide research, education and outreach support to Se task forces, to develop water conservation guidance documents, to demonstrate efficient irrigation and water conservation systems, to provide cost/benefit estimates of Se mitigation and remediation techniques, to coordinate linkages between Federal, State Agencies and water users, and to facilitate discussions on research, remediation measures and management practices.

**Methods**: Public education and outreach is conducted through Se task force meetings and through informational and educational presentations at Reclamation's National Irrigation Water Quality Program (NIWQP) tours, Colorado Salinity Control Program interstate meetings, NRCS field demonstration through their Environmental Quality Incentive Program (EQIP), CSU workshops, seminars, field tours and demonstrations. Contacts are maintained with Uncompahgre Water Users Association, Montrose Home Owners Association, Montrose and Olathe city water supply utilities and their Parks and Recreation personnel on the design and adoption of water conservation measures. Land use planning personnel of the Montrose, Mesa, Delta and Ouray County governments are also encouraged to employ BMP guidelines in their land use planning. The Montrose Arroyo demonstration was a cooperative project between the Uncompahgre Valley Water Users Association and the Colorado River Salinity Program. Based on the success of this project, PVC pipes and synthetic liners will be installed on the AM lateral this year. Technical support: A BMP coordinator has been hired to assist the Task Forces to help design, develop and deliver educational programs on irrigation and water management BMP guidelines for residential, commercial water users, pond and septic system design and construction, and water conservation demonstration sites at Olathe Park and Montrose Botanical Garden.

**Partnerships**: An EPA 319 grant is being used to complement the activities of the current USDA project. NRCS EQIP program has been refocused to give top priority to on-farm conservation measures that will reduce salt loadings. The Task Force continues to attract participation from the concerned citizens, county officials, and conservation groups. Workshops, seminars, field tours conducted by CSU Cooperative Extension continue to attract concerned citizens. A private-public partnership to design and install sprinkler and drip irrigation systems in agricultural and residential settings have increased awareness of drought tolerant plants and their water relations.

**Research**: Colorado State University (CSU), in support of the Gunnison Basin and Grand Valley Se Task Forces, is developing BMPs for irrigation and water conservation management for agricultural, commercial and residential water users. CSU is also cooperating with EPA, BOR, USGS, the Colorado Department of Water Resources, and the Colorado Water Quality Control Commission to develop modeling tools, refine monitoring efforts, and evaluate management alternatives. CSU Experimental Stations assistance to develop and demonstrate alternative irrigation and water conservation management strategies have been accelerated. CSU has facilitated the implementation and evaluation of four separate 319 funded mini-projects to study phytoremediation measures. Preliminary results indicate that the remediation is valued if the effort is accompanied with education and public participation. The Colorado Salinity Control Forum has been encouraged to support the Se Task Forces in their education effort to prevent new sources of Se loading in conjunction with salinity programs.

**Resources**: The 319 EPA grant contributed $ 103K with a matching local participation of $74 K to the BMP project. An allocation of $ 667K to fund lateral lining works for the year 2003 is expected this fall.

**Results**: The design, construction and installation of several sprinkler and micro-irrigation systems in both agricultural and residential settings have been firmed up. The demonstration sites will be ready for public viewing in the summer of 2004. A joint CSU and USGS sampling plan to assist a sub-basin regression model and the Uncompahgre loading model development is well underway. An economic analysis of the remediation measures is also being prepared. Structural remediation steadily measures have progressed with funding for lateral lining as part of a 10 year, $15 M program. The design and development of the irrigation and water conservation BMP guidelines and handbooks are under preparation and the products will be presented in the spring of 2004.