

Sediment Production and Delivery from Unpaved Roads and Off-Highway Vehicle (OHV) Trails in the Upper South Platte River Watershed, Colorado

Matthew J. Welsh and Lee H. MacDonald

Watershed Science Program, Department of Forest, Rangeland, and Watershed Stewardship, Colorado State University, Fort Collins, CO

Abstract. The Upper South Platte River (USPR) watershed is the primary source of drinking water for Denver, has a high-value fishery, and a high density of roads (0.6 km km^{-2}) and off-highway vehicle (OHV) trails (0.2 km km^{-2}). Sediment production and delivery data are urgently needed to develop TMDLs and assess cumulative watershed effects. The goal of this project is to quantify the sediment production and delivery from unpaved roads, OHV trails, and undisturbed hillslopes in the USPR watershed. Rainfall, site characteristics, and sediment production have been measured from 14-26 road segments and 13-40 undisturbed swales since summer 2001. These measurements also have been made from 5-10 OHV segments since August 2005. Detailed surveys along 17 km of unpaved roads and 10 km of OHV trails were used to assess sediment delivery.

Summer rainstorms with intensities greater than 10 mm hr^{-1} generally produce sediment from the road and OHV segments while no sediment is generated from the undisturbed swales. The overall mean sediment production from the unpaved road segments has ranged from 4 to $67 \text{ Mg ha}^{-1} \text{ yr}^{-1}$, and this variation is largely due to differences in the amount and intensity of summer convective storms. In 2006 the overall mean sediment production from OHV segments was $185 \text{ Mg ha}^{-1} \text{ yr}^{-1}$, or more than six times the mean value from unpaved road segments. Fourteen percent of the roads and 24% of the OHV trails were connected to the stream network. Multiplying the mean sediment production times the density and percent connected indicates that the unpaved roads are delivering approximately $0.9 \text{ Mg km}^{-2} \text{ yr}^{-1}$ of sediment to the stream network, while the OHV trails are delivering approximately $1.9 \text{ Mg km}^{-2} \text{ yr}^{-1}$. These results suggest that unpaved roads and OHV trails are important and chronic sources of sediment in the USPR watershed.