



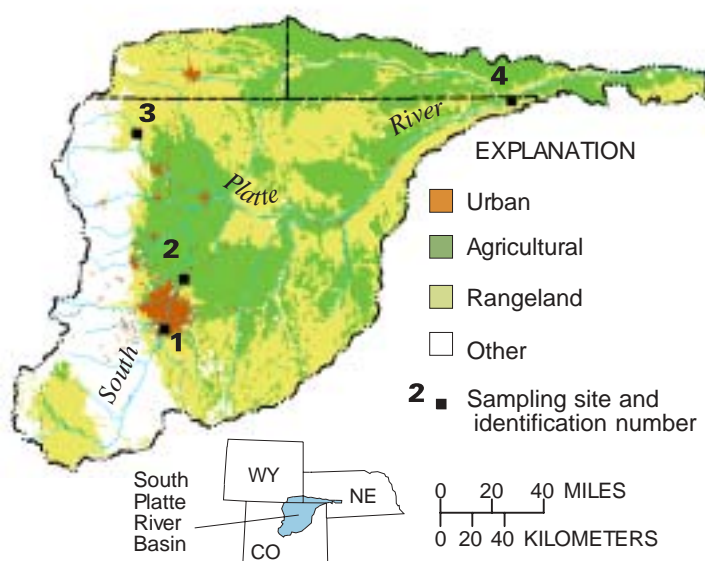
Review of Sediment Data in the South Platte River Basin, Colorado, 1980-92

Suspended-sediment transport and its relation to water quality are important issues in the South Platte River Basin. Most sediment enters the South Platte River during snowmelt runoff from March to June. The suspended sediment varies by particle size, concentration, and load. Suspended-sediment data in the South Platte River for water years 1980-92 are limited; therefore, only generalizations can be made concerning land use and its effects on suspended-sediment concentrations and loads in the South Platte River. More data are needed before detailed comparisons can be made.

Dirt from yards and construction sites, topsoil from fields, sand spread on roads during snowstorms, and material from unprotected streambanks and other sources contribute to the sediment in streams. The interaction between water and sediment in streams is important because it affects alluvial-channel hydraulics, bed and bank stability, and the stream pattern. In addition, the physical properties and volume of sediment transported and deposited by streams affect the ecology of aquatic and riparian habitats, the ability of channels to transport flood waters, the operation of impoundment and diversion structures, and the quality of water for municipal, agricultural, industrial, and recreational uses. For the South Platte River Basin, the suspended-sediment data were limited in their spatial and temporal resolution; however, the available data were used to determine that suspended sediment was a constituent of concern.

The U.S. Geological Survey's National Water-Quality Assessment (NAWQA) program used 12 years [water years 1980-92 (water year is October 1-September 30)] of suspended-sediment data as part of an analysis of the available water-quality data in the South Platte River Basin. Only five sites in the basin had enough suspended-sediment data for statistical analysis, and one of those sites was excluded because it had minimal coverage of the flow regime. The data provide information on sediment type, concentration, and loads; however, only general relations to land use can be determined.

Land use for a given site was determined by using existing land-use maps and site visits in which the predominant land use in the vicinity of the site was determined. The sites shown in the map represent four different land uses in the basin: urban land use is represented by site 1, South Platte River at Littleton, which is upstream from Denver and downstream from Chatfield Reservoir; mixed agricultural and urban land use is represented by site 2, South Platte River at Henderson, because the site is affected by upstream wastewater-treatment-plant effluent; rangeland land use is represented by site 3, North Fork Cache la Poudre River at Livermore; and agricultural land use is represented by site

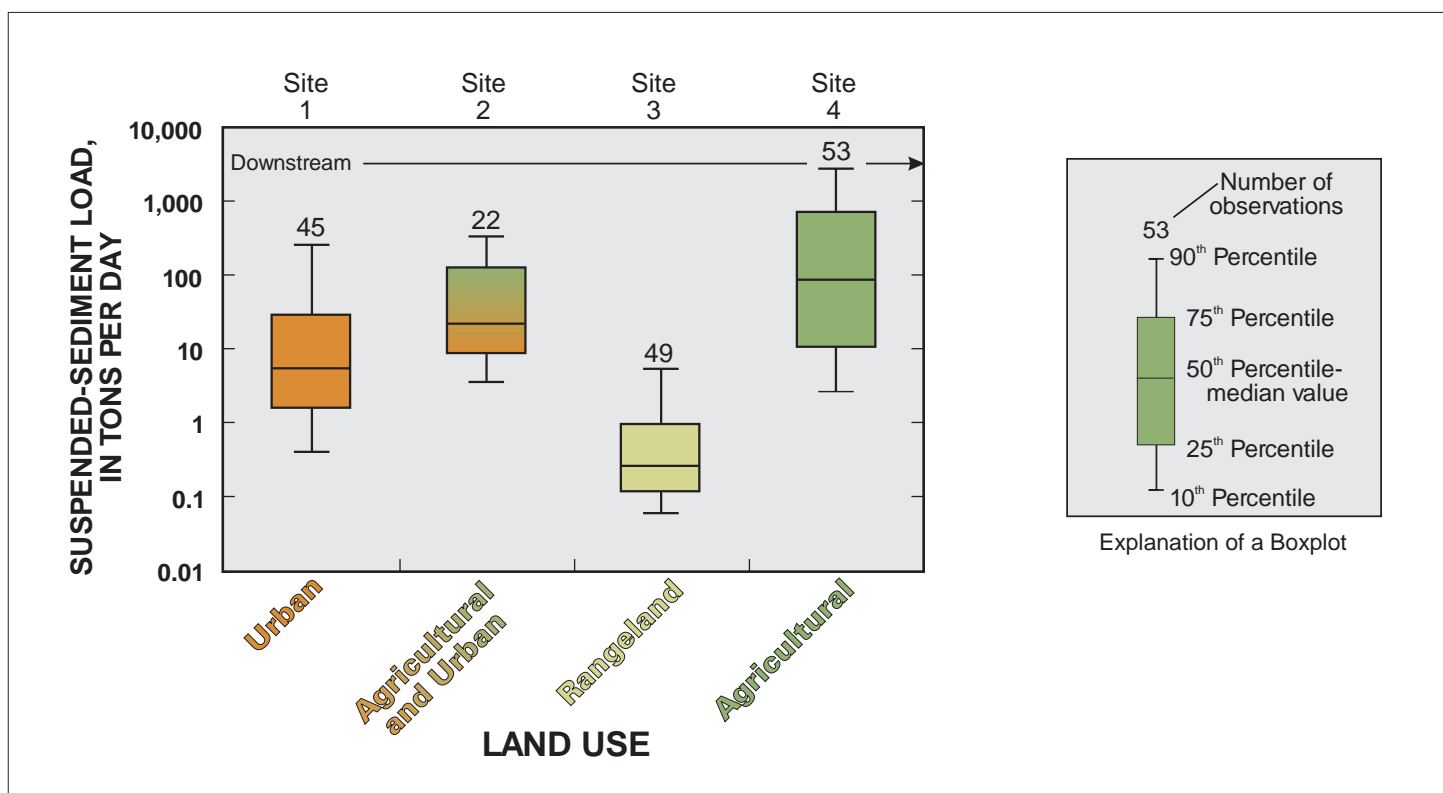


4, South Platte River at Julesburg. Three major tributaries enter the South Platte River along this reach.

Most sediment enters the South Platte River during March through June when the snow is melting and water is moving across the land surface, streets, and parking lots, transporting sediment with it. Periods of intense rainfall also cause sediment to enter the river, but the quantities are less than the quantities transported during snowmelt.

Existing suspended-sediment data indicate that suspended-sediment particle size and concentration differ according to land use. The size of the sediment particles carried in suspension increases downstream from Denver to the

Suspended sediment in urban land-use areas has more silt- and clay-sized particles than suspended sediment in agricultural areas, which has more sand-sized particles.



eastern plains. At site 1, the sediment consists mostly of silt and clay (72 percent); where the river flows through the agricultural areas, the sediment consists mostly of sand (only 47 percent silt and clay at site 4). This composition is, in part, a result of the size of the sediment available for transport in the South Platte River and also a result of irrigation ditches that remove fine-grained sediment with the water, leaving larger, sand-sized particles in the main channel. The composition of the suspended sediment is important in the assessment of water quality because fine-grained particles can transport toxic constituents in streamflow.

Suspended-sediment concentrations in the South Platte River increase downstream from site 1 (Littleton) to site 2 (Henderson) and to site 4 (Julesburg). In the agricultural areas, suspended-sediment concentrations increase rapidly with increasing streamflow, implying that there is more sediment available for mobilization. Explanations for sediment availability in agricultural areas include the erosion of streambanks, especially when caused by livestock, and agricultural practices, such as tillage and removal of fence rows and vegetation buffers, which leave topsoil susceptible to wind and rain erosion. Site 3 (Livermore) has low suspended-sediment concentrations. Most rangeland areas in the South Platte River Basin generally are semi-arid and have little or no surface runoff most of the year; therefore, there is little opportunity for sediment to be moved into the stream channel.

Because land use affects the concentration of suspended sediment in a stream, it affects the suspended-sediment load. Suspended-sediment load describes suspended-sediment movement through a basin and is calculated by multiplying streamflow by suspended-sediment concentration. Small amounts of suspended sediment move in the South Platte River through the urban area (site 1, Littleton) to Henderson (site 2). From site 2 to site 4 (Julesburg) there is an increase in suspended-sediment load. However,

Agricultural land-use areas have the highest suspended-sediment concentrations and loads in the South Platte River Basin.

because the data in the South Platte River Basin are limited to four sites, only broad generalizations can be made about loads.

To gain a more thorough understanding of the effects of suspended sediment in the South Platte River Basin and to increase the size of the data base for statistical analyses, more sampling needs to be done at more sites throughout the basin.

Modified from: Dennehy, K.F., Litke, D.W., McMahon, P.B., Heiny, J.S., and Tate, C.M., 1995, Water-quality assessment of the South Platte River Basin, Colorado, Nebraska, and Wyoming--Analysis of available nutrient, suspended-sediment, and pesticide data, water years 1980-92: U.S. Geological Survey Water-Resources Investigations Report 94-4095, 145 p.

Information on technical reports and hydrologic data related to NAWQA can be obtained from:

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