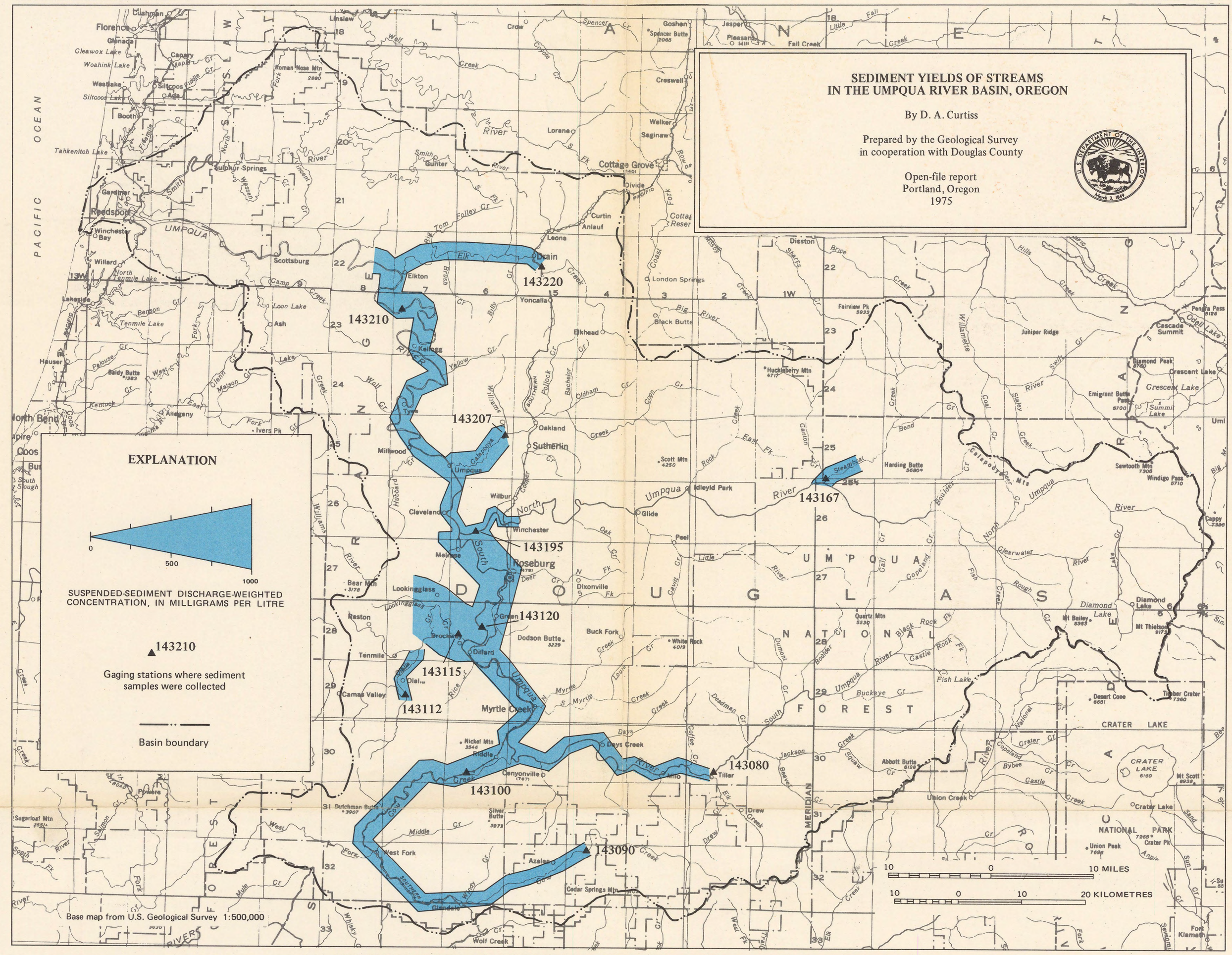
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
DOUGLAS COUNTY

OPEN-FILE REPORT



MAP SHOWING ESTIMATED SUSPENDED-SEDIMENT DISCHARGE-WEIGHTED CONCENTRATIONS IN THE UMPQUA RIVER BASIN, OREGON

SEDIMENT YIELDS OF STREAMS IN THE UMPQUA RIVER BASIN, OREGON

By D. A. Curtiss

This report summarizes sediment data collected at 11 sites in the Umpqua River basin from 1956 to 1973 and updates a report by C. A. Onions (1969) of estimated sediment yields in the basin from 1956-67. Onions' report points out that the suspended-sediment data, collected during the 1956-67 period, were insufficient to compute reliable sediment yields. Therefore, the U.S. Geological Survey, in cooperation with Douglas County, collected additional data from 1969 to 1973 to improve the water discharge-sediment discharge relationships at these sites. These data are published in "Water resources data for Oregon, Part 2, Water quality records," 1970 through 1973 water years. In addition to the 10 original sites, data were collected during this period from the Umpqua River near Elkton station, and a summary of the data for that station is included in table 1.

Data collected from 1956 to 1973 provide a basis from which to estimate the quantity of suspended sediment transported and the sediment yields from subbasins within the Umpqua River basin. The procedure used to compute annual suspended-sediment discharge consisted of relating observed suspended-sediment discharge to concurrent water discharge as described by Colby (1956), and to determine daily sediment discharge from daily streamflow, using the water discharge-sediment discharge relationship curves. Annual sediment discharge is obtained by accumulating the daily values.

For this study, 18 years (1956-73) of streamflow data were used to estimate annual suspended-sediment discharge, and the average is presented in table 1. Using this great amount of data was possible because a computer was available to develop the "best-fit" curve for the water discharge-sediment discharge relation and to compute and accumulate daily sediment discharge.

As stated earlier, only 4 years of sediment data were available for the Umpqua River near Elkton station. However, examination of suspended-sediment data for the 10 other sites indicated that the water discharge-sediment discharge relation did not change appreciably during the 18 years of data collection. Therefore, the water discharge-sediment discharge relation for the Elkton station was used to estimate the 14 years of missing sediment-discharge data. This made the record for this station, reported in table 1, compatible with records for the 10 other long-term stations.

Some of the suspended-sediment data presented in table 1 differ significantly from similar data given in the earlier report by Onions (1969). The reasons for the differences are twofold: (1) A special effort was made to obtain sediment-discharge measurements during high-flow periods of 1969 to 1973 to better define the high-flow ends of the water discharge-sediment discharge relationship curves, and (2) the computation method used in this report of converting mean daily streamflow data to daily sediment discharge gives more weight to peak flows than do the streamflow-duration methods suggested by Miller (1951) and used by Onions (1969). Loads estimated by the technique used in the present report agree closely with loads computed at selected daily sediment stations in Oregon.

Bedload was estimated to be 3 percent of the mean annual suspended-sediment yield, except for the Cow Creek basin, where bedload was estimated to be 5 percent. The higher estimate for the Cow Creek sites was based on field evidence of greater bed movement in those streams. The staff of the Oregon District Water Resources Division selected these bedload values by comparing the sites in the Umpqua River basin with Flynn Creek, a small stream in the nearby Alsea River basin that has a measured bedload transport of about 2.5 percent of the annual suspended-sediment yield. These percentages are consistent with bedloads for other streams in western Oregon and Washington.

Sediment yield is defined as the sediment discharge from a unit of drainage area, and in this report it is expressed in tons per square mile.

The discharge-weighted mean concentration values were computed by dividing the mean annual suspended-sediment discharge by the mean annual water discharge and multiplying the result by a conversion factor to convert the units to milligrams per litre. The values are, of course, dependent on the estimated annual suspended-sediment discharge and provide a means of comparing the suspended-sediment concentrations or loads at the 11 sites.

The regionalized map provides a visual generalization of discharge-weighted concentrations in the Umpqua River basin and should be treated as such. No estimates were made for those subbasins where no data were available. Also, because of the wide variation in these concentrations, no attempt was made at extrapolation or interpretations from the map.

The results of computations indicate that the estimated mean annual suspended-sediment yields from the 11 sites in the Umpqua River basin ranged from 260 tons per square mile on Olalla Creek near Tenmile to 1,900 tons per square mile on Lookingglass Creek near Brockway. However, these values represent a long-term average and may differ greatly from year to year depending on hydrologic conditions in a given year.

REFERENCES

Colby, B. R., 1956, Relationship of sediment discharge to streamflow: U.S. Geol. Survey open-file rept.

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___1973, Water quality records, Part 2 of Water resources data for Oregon, 1972: Portland, Oreg., U.S. Geol. Survey, 137 p.

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Table 1. – Summary of water- and sediment-discharge data for streams in the Umpqua River basin, 1956-73 water years.

Gaging station number	Station name	Drainage area (mi^2)	Average stream discharge (ft^3/s)	Mean annual runoff (acre-ft)	Mean annual suspended sediment			Average annual total sediment yield ($tons/mi^2$)[1]	Maximum observed suspended sediment[2]	
					Discharge (tons/yr)	Discharge-weighted mean concentration (mg/l)[1]	Yield ($tons/mi^2$)[1]		Concentration (mg/l)	Discharge (tons/day)
143080	South Umpqua River at Tiller, Oreg.	449	1,064	770,400	140,000	120	310	320	1,260	65,100
143090	Cow Creek near Azalea, Oreg.	78.0	119	86,150	22,000	160	290	300	798	3,620
143100	Cow Creek near Riddle, Oreg.	456	931	674,700	370,000	370	820	860	1,360	64,600
143112	Olalla Creek near Tenmile, Oreg.[3]	61.3	102	74,030	16,000	150	260	270	3,600	3,040
143115	Lookingglass Creek at Brockway, Oreg.	158	297	215,000	310,000	890	1,900	2,000	2,600	35,100
143120	South Umpqua River near Brockway, Oreg.	1,670	3,064	2,220,000	1,700,000	500	1,000	1,000	1,800	208,000
143167	Steamboat Creek near Glide, Oreg.[3]	277	730	528,900	210,000	240	770	800	3,870	106,000
143195	North Umpqua River at Winchester, Oreg.	1,344	3,963	2,871,000	800,000	120	590	610	768	71,200
143207	Calapooya Creek near Oakland, Oreg.	210	495	358,600	190,000	360	890	920	756	8,780
143210	Umpqua River near Elkton, Oreg.	3,683	7,975	5,778,000	3,500,000	370	940	960	927	196,000
143220	Elk Creek near Drain, Oreg.	104	222	160,800	74,000	230	710	730	2,930	9,730

[1] Estimated.
[2] Maximum observed concentration and discharge do not necessarily occur simultaneously.
[3] For 1957-73 water years.