GSA Data Repository for "Bedrock rivers are steep but not narrow: Hydrological and lithological controls on river geometry across the USA"

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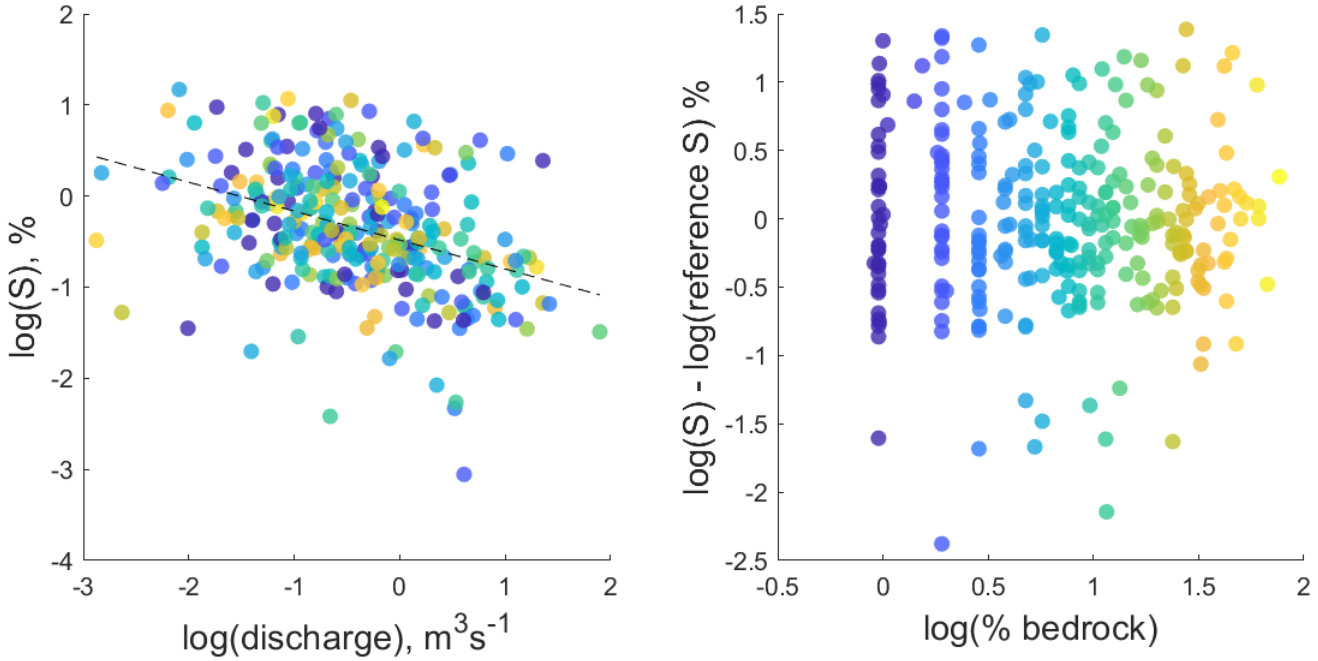
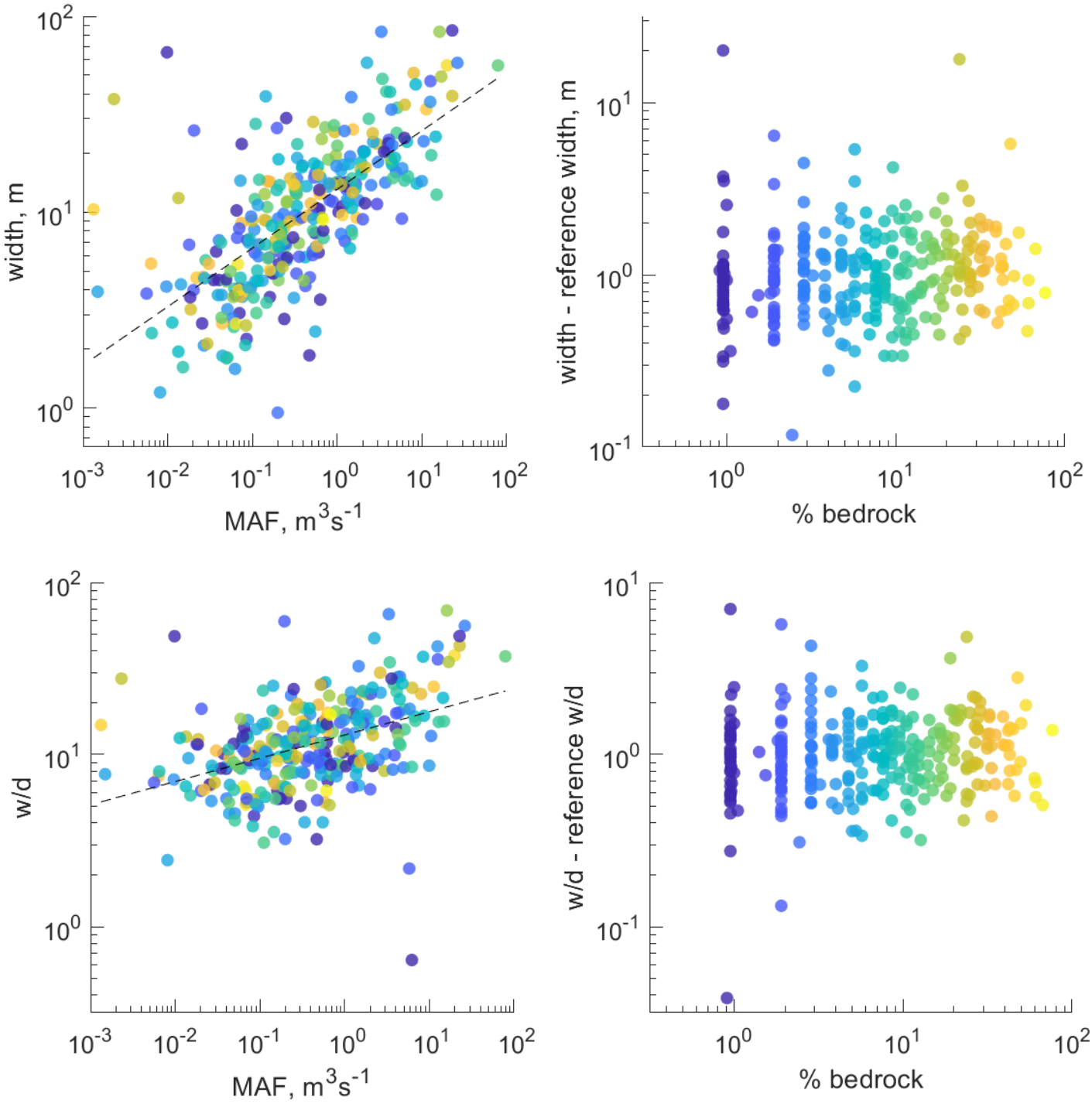



width, m
MAF, m3s-1
width - reference width, m
% bedrock
w/d
MAF, m3s-1
w/d - reference w/d
% bedrock

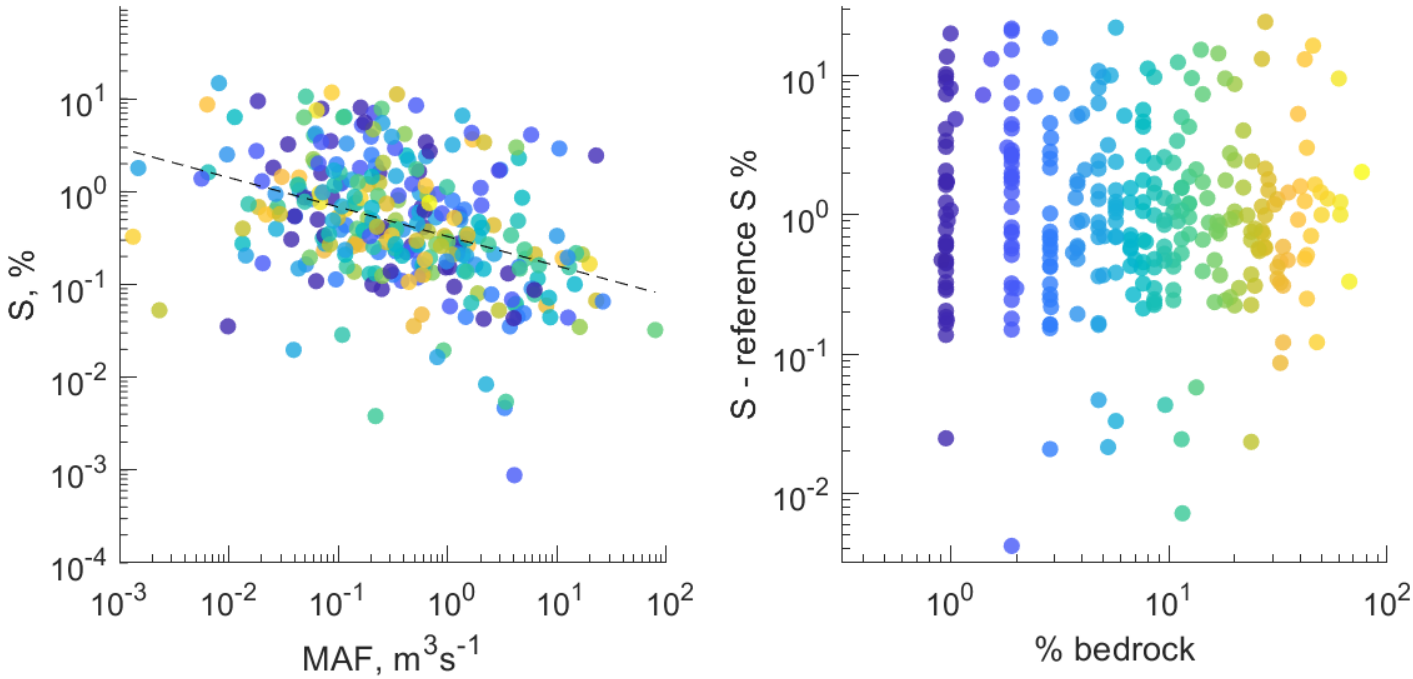
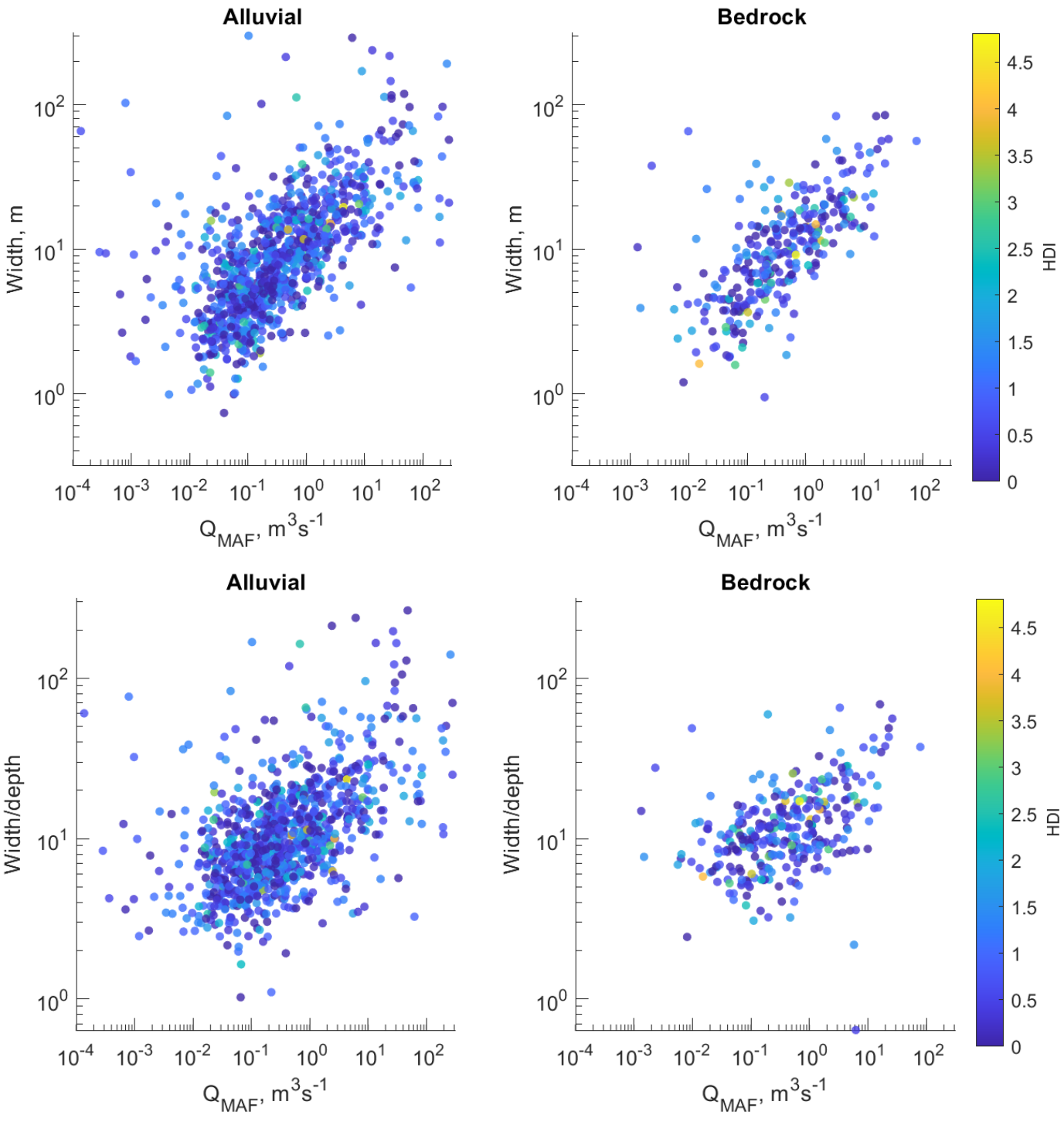


Figure S1: Channel geometry and percentage bedrock for all bedrock channels. Left column shows relationships between channel width, width/depth and slope against discharge (mean annual flow), with points coloured by log of percentage bedrock (colour scale as in right column). Right column plots the difference between the geometry value for a channel and a reference value calculated from a linear fit to the logged dataset (dashed line in left column). Percentage bedrock is shown not to affect channel geometry.


Alluvial
Bedrock
Width, m
Width/depth
Q_{MAF}, m^3s^{-1}
HDI
10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2}
10^{0} 10^{1} 10^{2}
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5

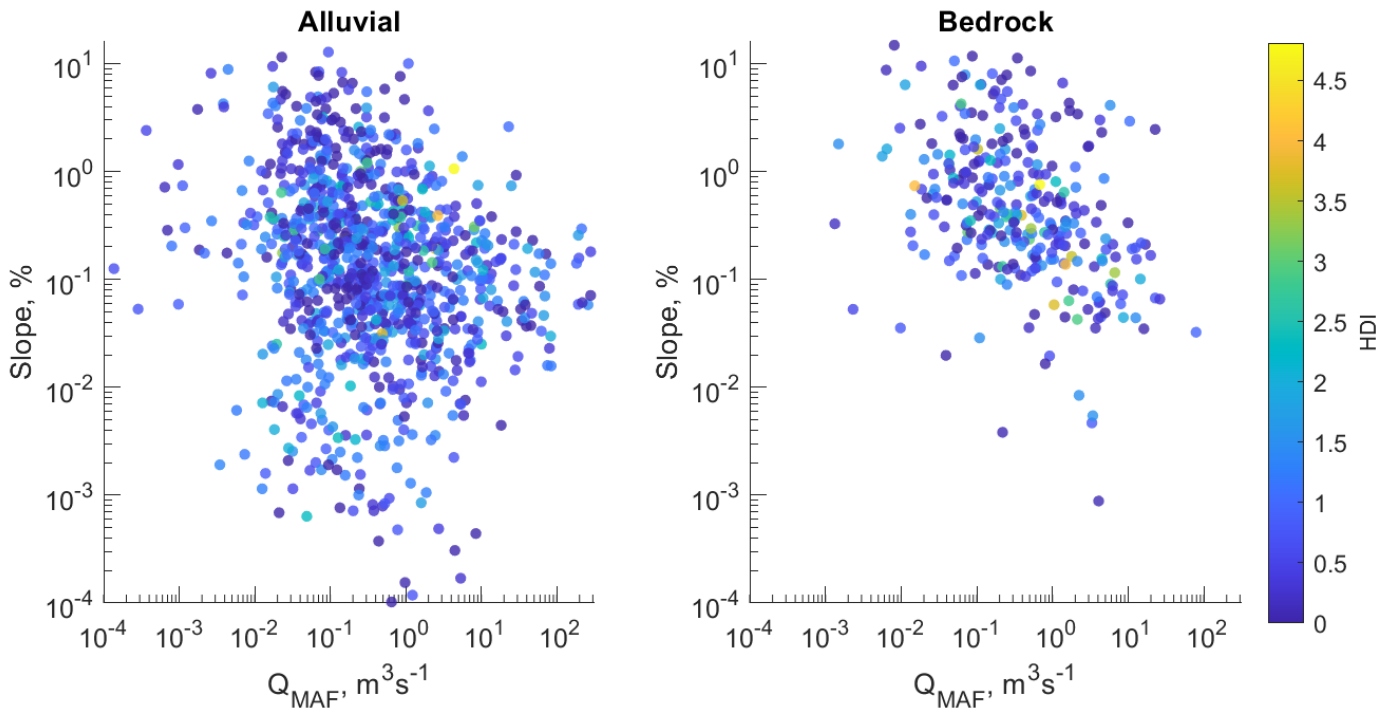
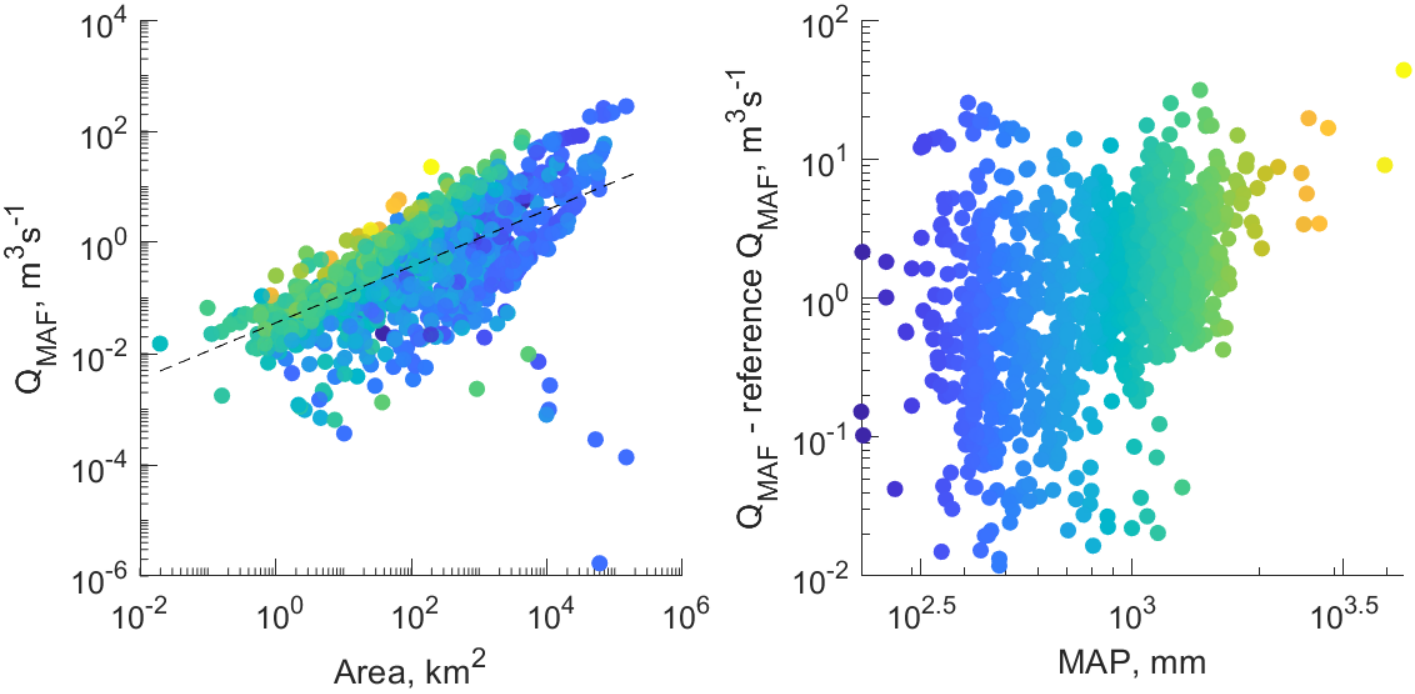


Figure S2: Channel geometry of bedrock and alluvial channels coloured by the Human Development Index (HDI). Q_{MAF} is the mean annual flow. Channel geometry is not affected by HDI.



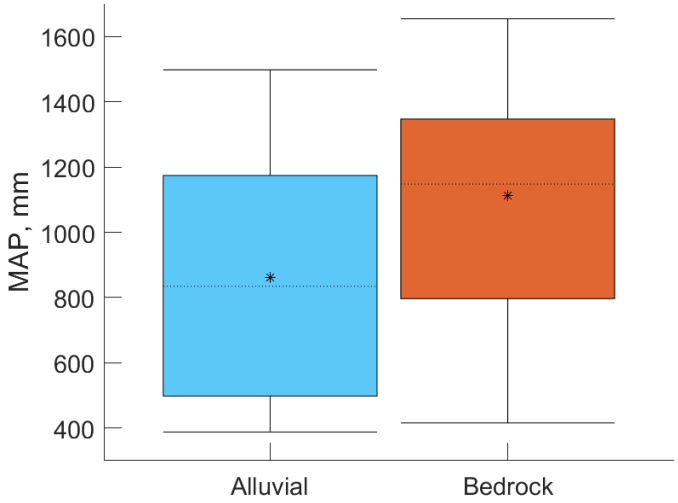


Figure S3: Top row: Relationships between mean annual flow (Q_{MAF}), catchment area and catchment-weighted mean annual precipitation (MAP). Points are coloured by MAP, as in top right panel. Top right shows the difference between Q_{MAF} for a channel and a reference Q_{MAF} value calculated from a linear fit to the logged dataset (dashed line in top left). Bottom row: distributions of MAP for bedrock and alluvial channels. MAP is calculated from the latest 30-year PRISM normal (4km resolution), using the National Rivers and Streams Assessment 2008 catchment shapefiles. The extracted precipitation values cover the average annual precipitation over the period 1991-2020. Further detail on the data is available here: https://prism.oregonstate.edu/normals/ Dataset creation date: PRISM_DATASET_CREATE_DATE: 20221129-1507.

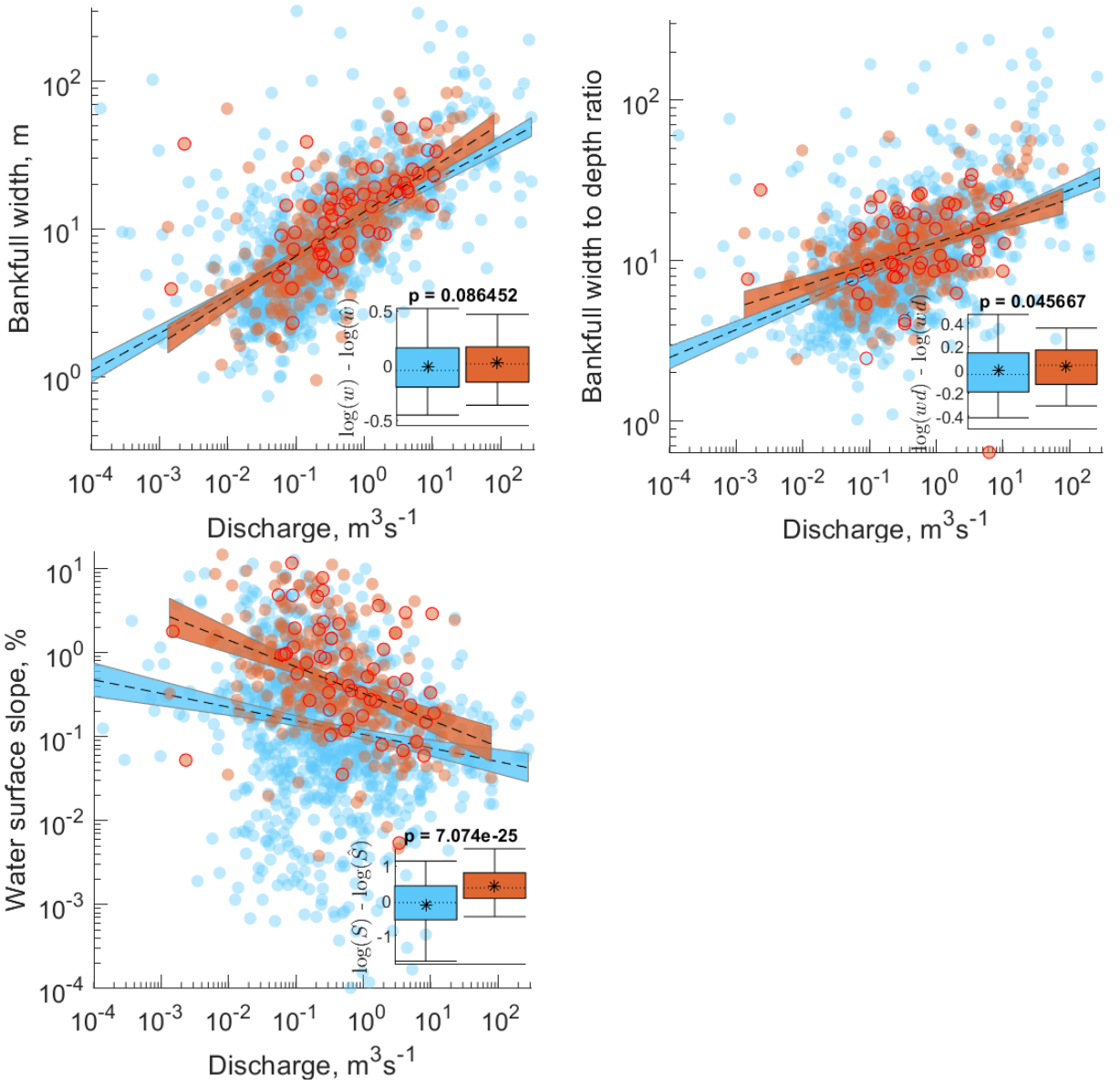


Figure S4: Channel geometry figures as in Figure 2, but with 56 bedrock and alluvial points with bedrock constraints highlighted with red circles. Bedrock constraints do not affect the channel geometry. Bedrock constrains are defined as bedrock that would prevent the channel moving laterally, present on one or both sides of the channel. For the 56 sites, bedrock constraints are present at one or both banks along a median of 95% of the length of the surveyed channel, with a range from 5 to 100%.

Field methods

Field sites were selected across the 48 contiguous states according to a Generalized Random Tessellation Stratified survey design. Stratification occurred by state and between different sizes of streams (wadable and non-wadable). For further information see section 2 in the NRSA 2008-2009 Technical Report.

Variable name	Variable description
MAFLOWU	Mean Annual Flow in cubic feet per second (cfs) at bottom of flowline as computed by Unit Runoff Method
LAT_DD83	Nominal latitude in decimal degrees
LON_DD83	Nominal longitude in decimal degrees
BFWD_RAT	Bankfull Width/Depth Ratio
CONFEATURES	Constraining features
LSUB_DMM_NOR	Log10(Dgm--Geometric Mean Bed Surface Particle Diameter, exclude Bedrock + hardpan--mm)
PCT_BDRK	Bed Surface % Bedrock
W1_HALL	Human Disturbance Index (distance-wtd tally of types and presence)
XBKF_W	Mean Bankfull Width (m)
XSLOPE	Mean Slope of water surface (%)
WSAREA_NARS	NARS watershed area used in indicator analyses for NRSA 2008-9

Table S1: Names and descriptions of variables used from the National Rivers and Streams Assessment 2008-2009 data. The complete dataset, including lithological and precipitation data, is available at on Zenodo at DOI 10.5281/zenodo.8210986.

Bankfull channel width and depth were estimated from multiple pieces of evidence. Published USGS rating curves from the region that related bankfull channel dimensions to drainage area were used to produce an initial estimate. This was then checked in the field by looking for an obvious break in slope of the banks, a change in vegetation type, and a change from sorted sediments to soil. In the absence of clear evidence, then evidence of the previous year's flooding was also considered. For further information see Section 5.2.8.3 in the NRSA 0809 Field Operations Manual.

Mean annual flow is derived from the National Hydrography Dataset (NHD), in particular NHD-Plus (see Moore and Dewald, 2016). The unit runoff method starts by using a water balance approach to estimate runoff, which takes into account precipitation, potential evapotranspiration, evapotranspiration, and soil moisture storage into account.

Data Acknowledgement
The National Rivers and Streams Assessment 2008-2009 data were a result of the collective efforts of dedicated field crews, laboratory staff, data management and quality control staff, analysts and many others from EPA, states, tribes, federal agencies, universities, and other organizations. Please contact nars-hq@epa.gov with any questions.

References

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Moore RB, Dewald TG. 2016. The Road to NHD Plus — Advancements in Digital Stream Networks and Associated Catchments. JAWRA Journal of the American Water Resources Association 52 : 890–900. DOI: 10.1111/1752-1688.12389

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