

What we hope happens every time, everywhere

River mile 30

River mile 45

Pre-HFE



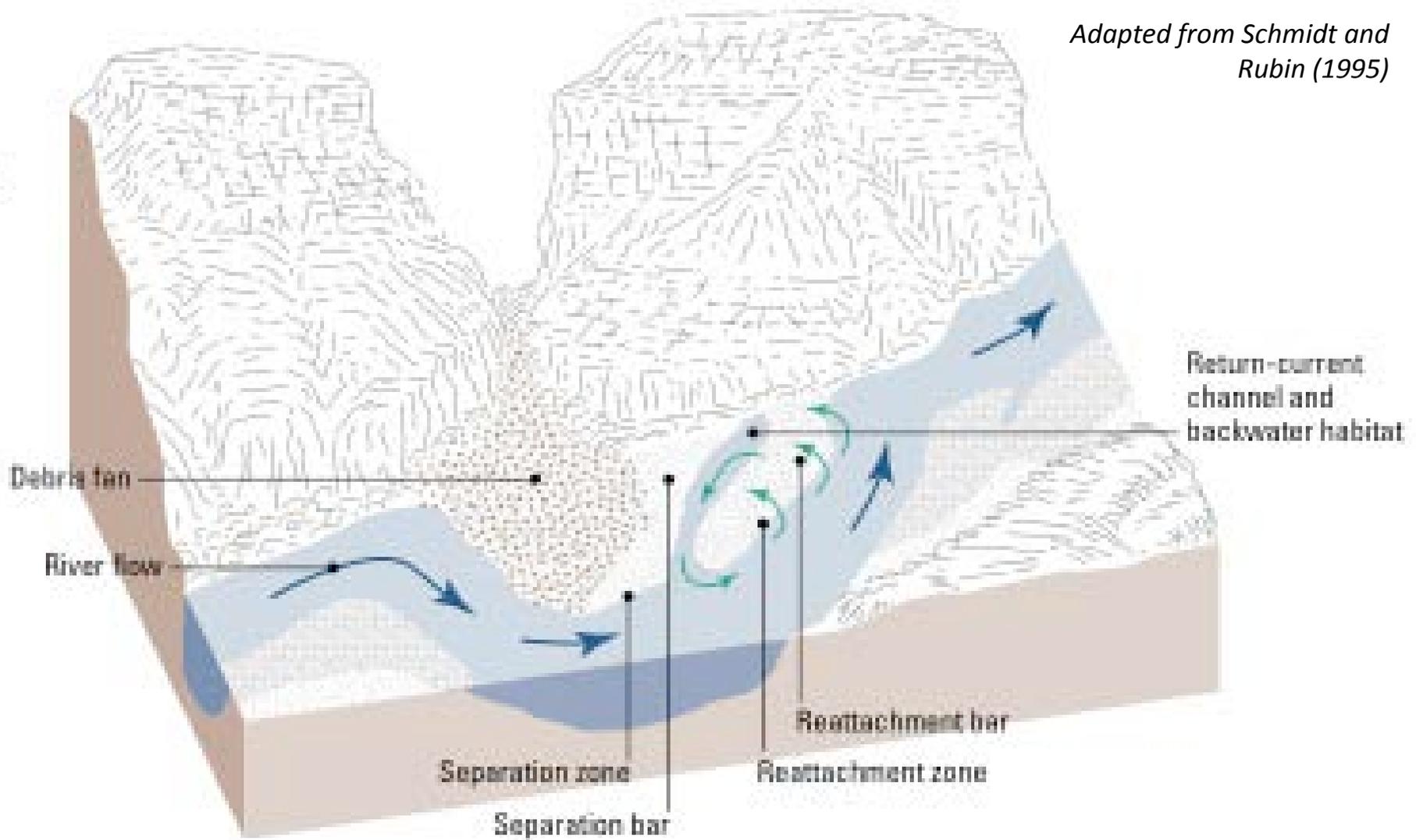
During HFE



Post-HFE

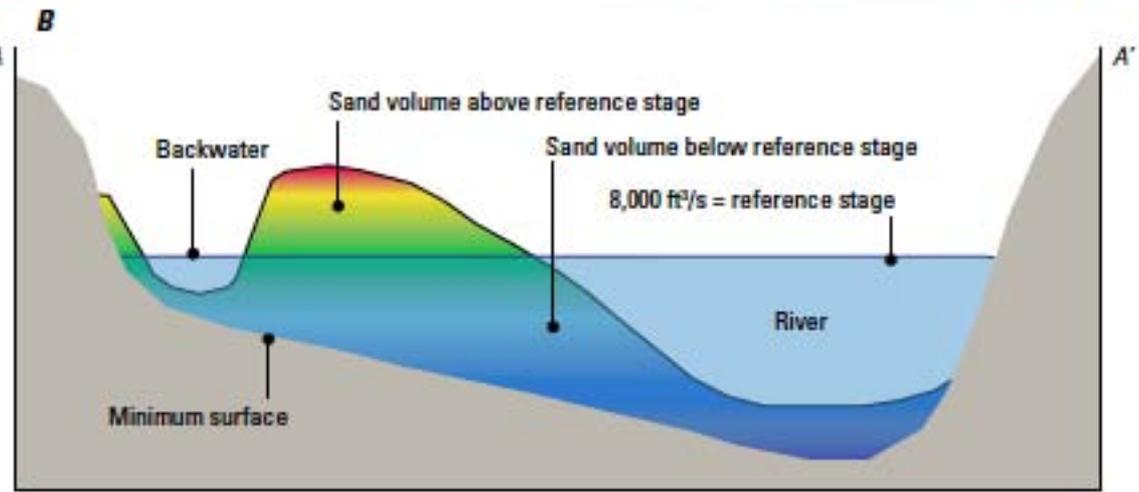
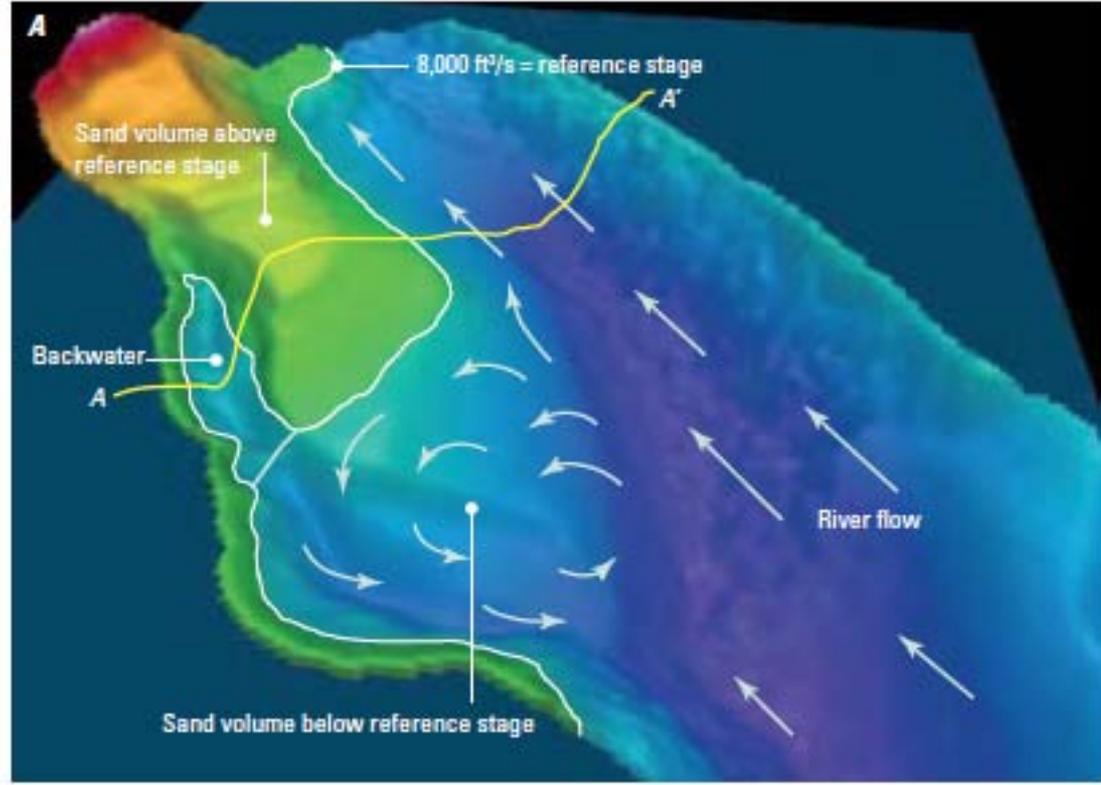


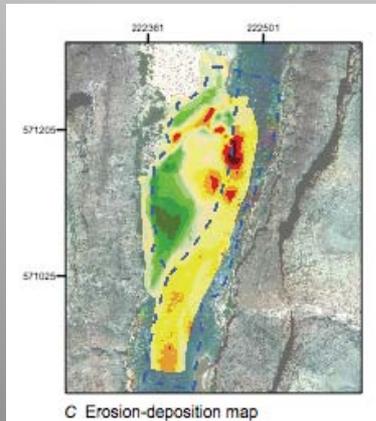
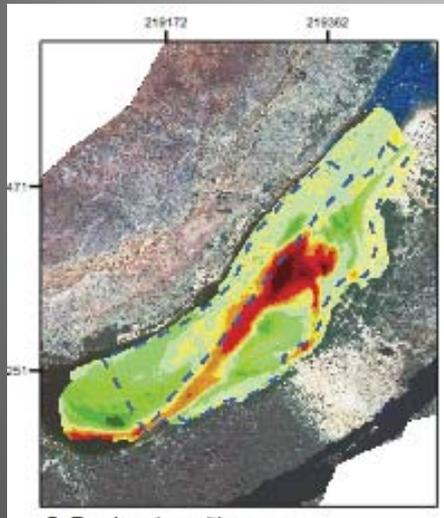
Adapted from Schmidt and Rubin (1995)



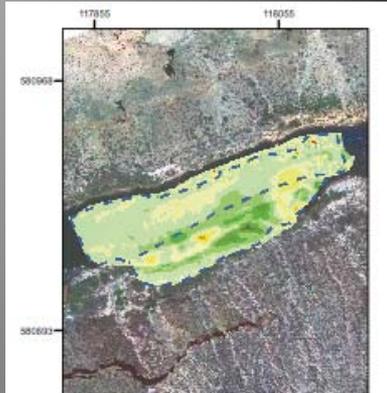
A fan-eddy complex includes (1) an area of ponded flow upstream from a debris fan, (2) a rapid opposite the debris fan, (3) an area where flow width expands and an eddy occurs, and (4) a gravel bar further downstream.

Monitoring framework

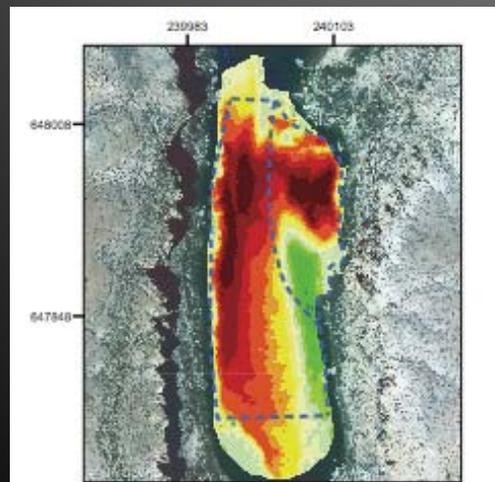




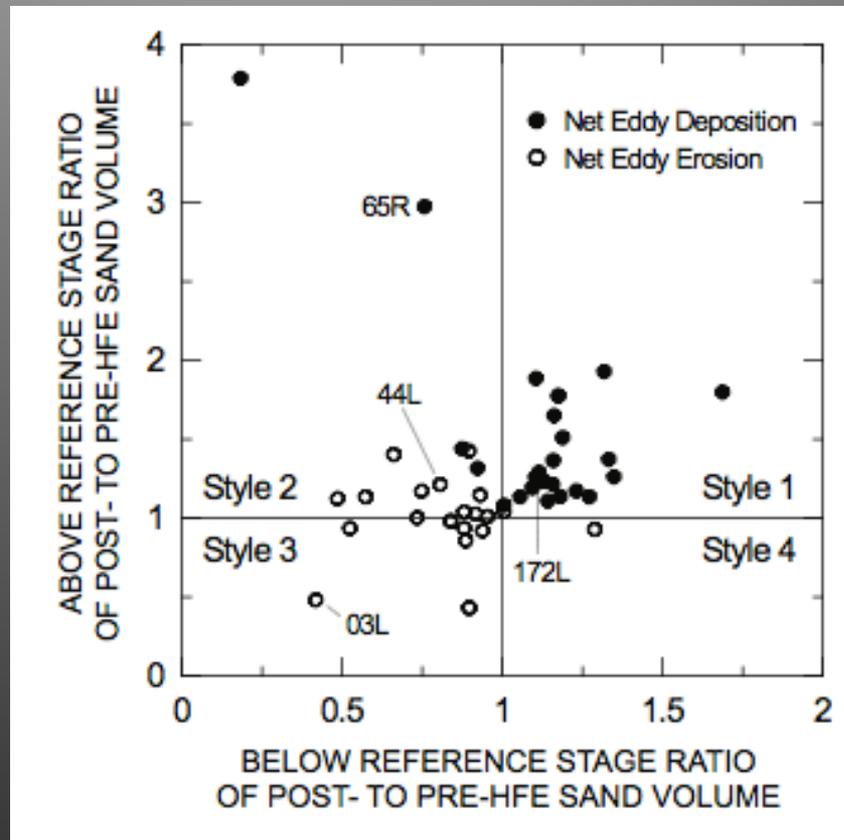
C Erosion-deposition map



C Erosion-deposition map



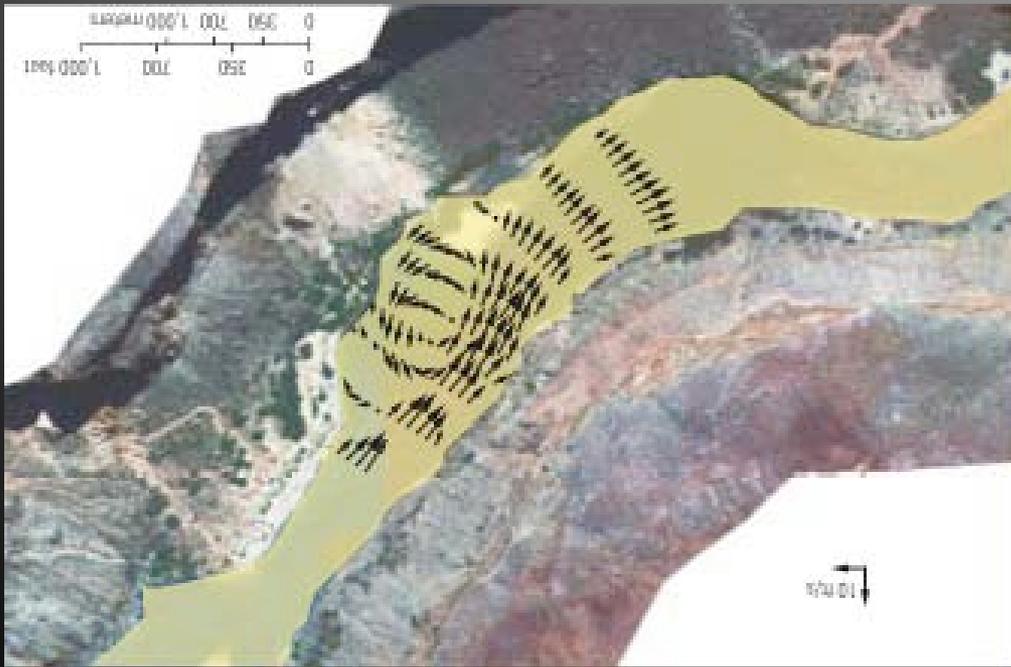
C Erosion-deposition map



There are different styles of topographic change caused by HFEs. Each fan-eddy complex does not respond the same way.

Eddies occur adjacent to rapids and the flow in the eddy is related to the flow characteristics in the rapid. Sand bars were typically larger before the dam.

Measured depth averaged horizontal velocities at peak flow during 2008 HFE



(Wright and Kaplinski, 2010)

1935



1952



1956



1973

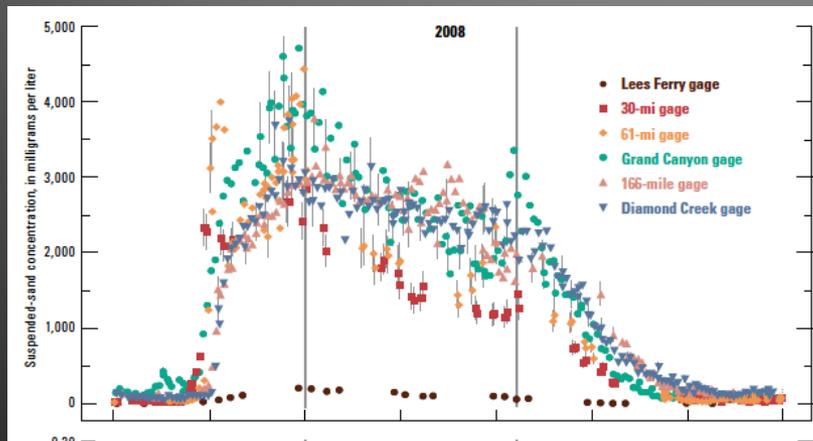
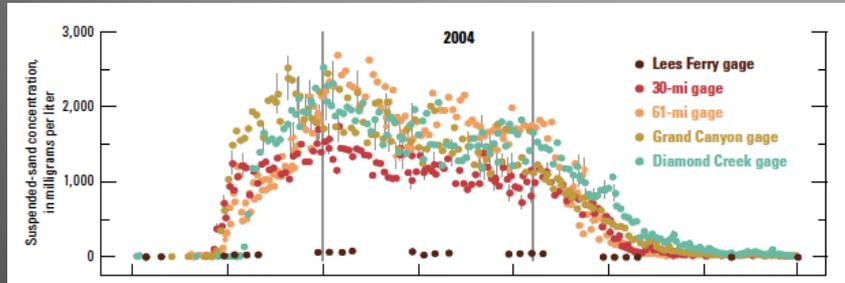
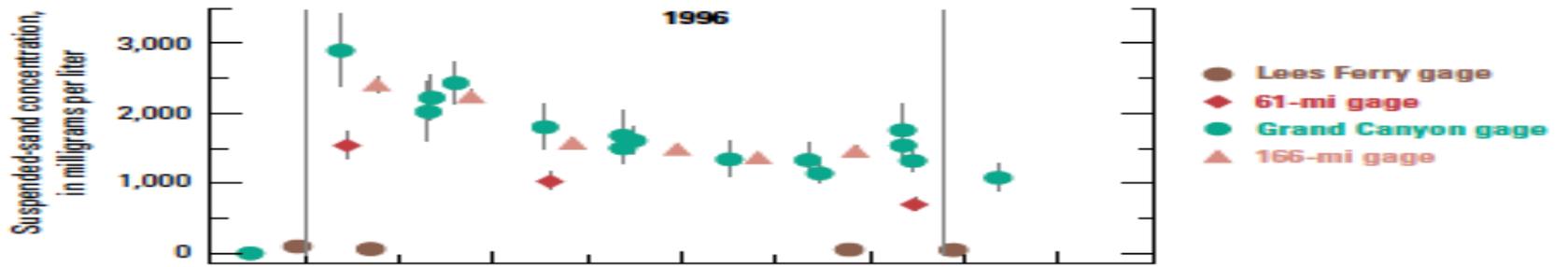


1984



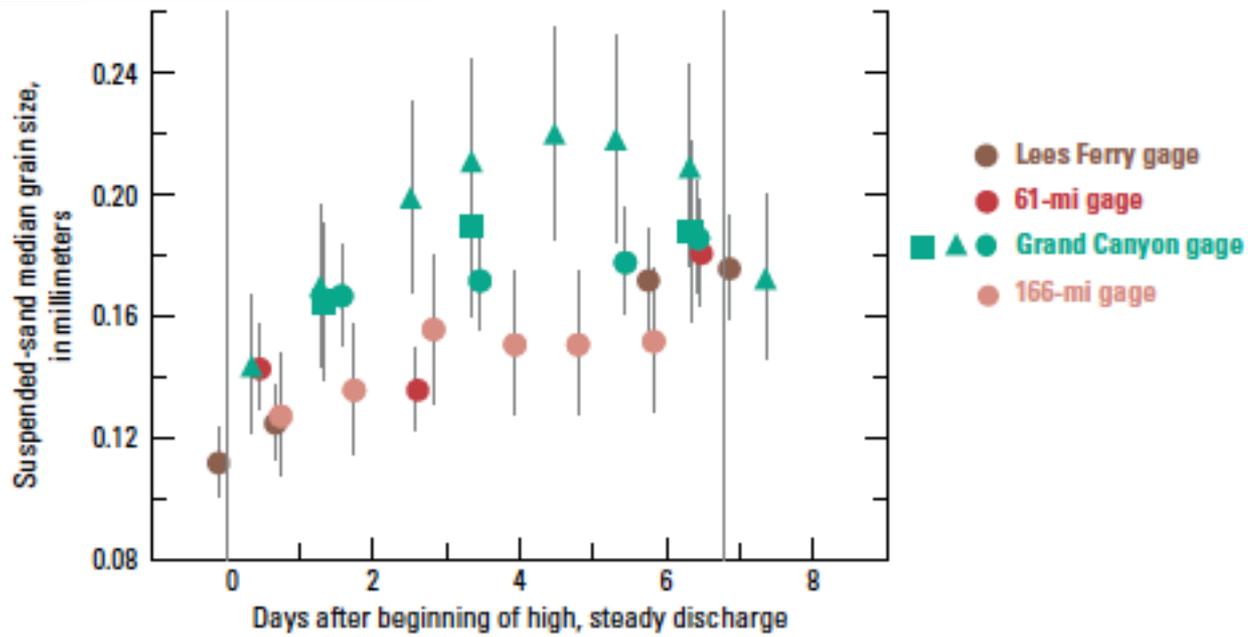
st, 2000





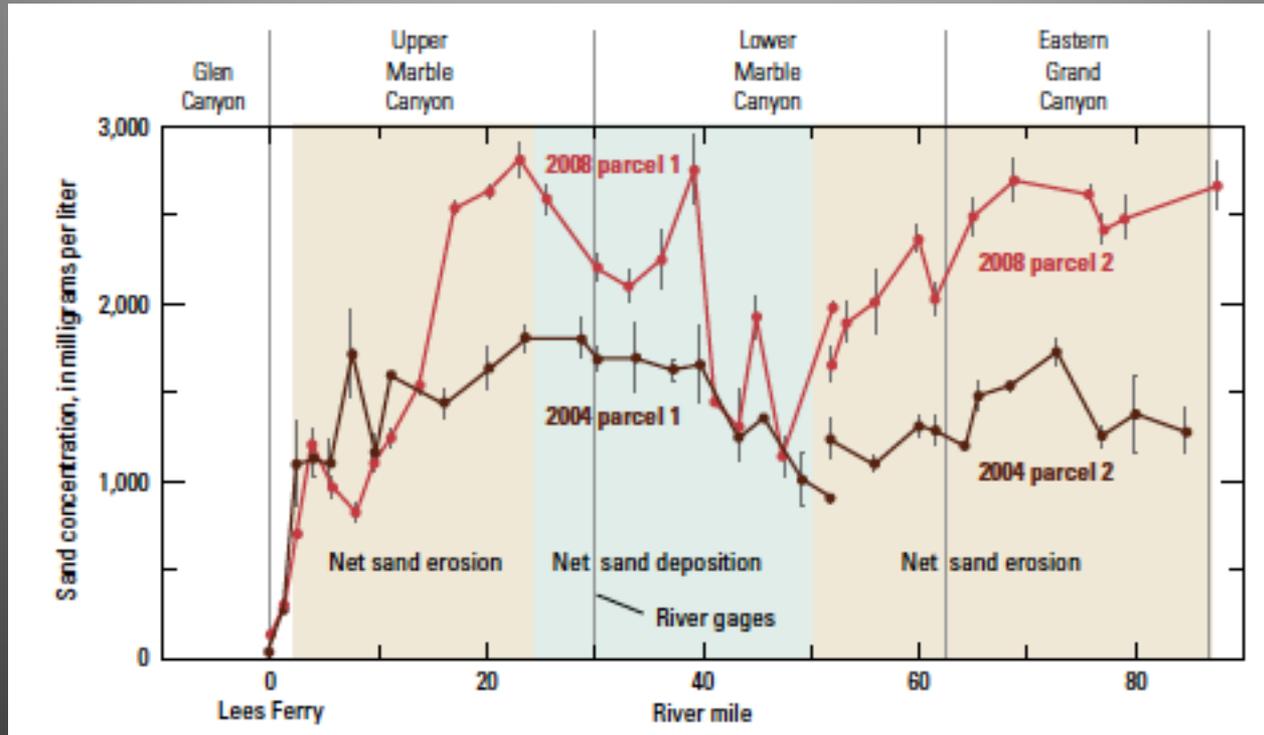
Deposition rates of sand in eddies is partly determined by the concentration of sand transported by the river. Concentrations change with time.

Grain size changes



The size of the sand in suspension also may change with time.

Longitudinal changes in sand concentration tell us about the locations of deposition and evacuation zones



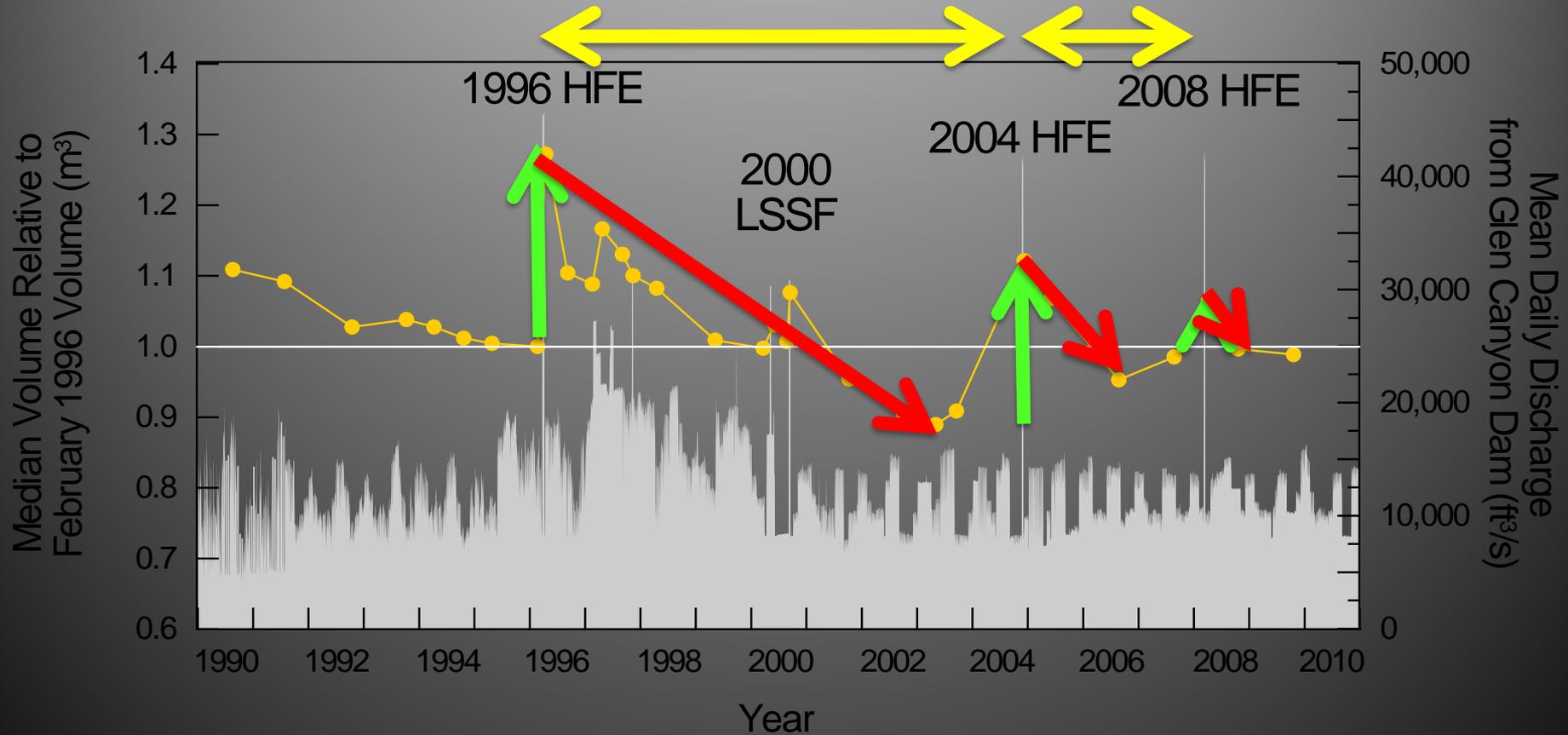
What controls the concentration of suspended sand and its longitudinal gradient?

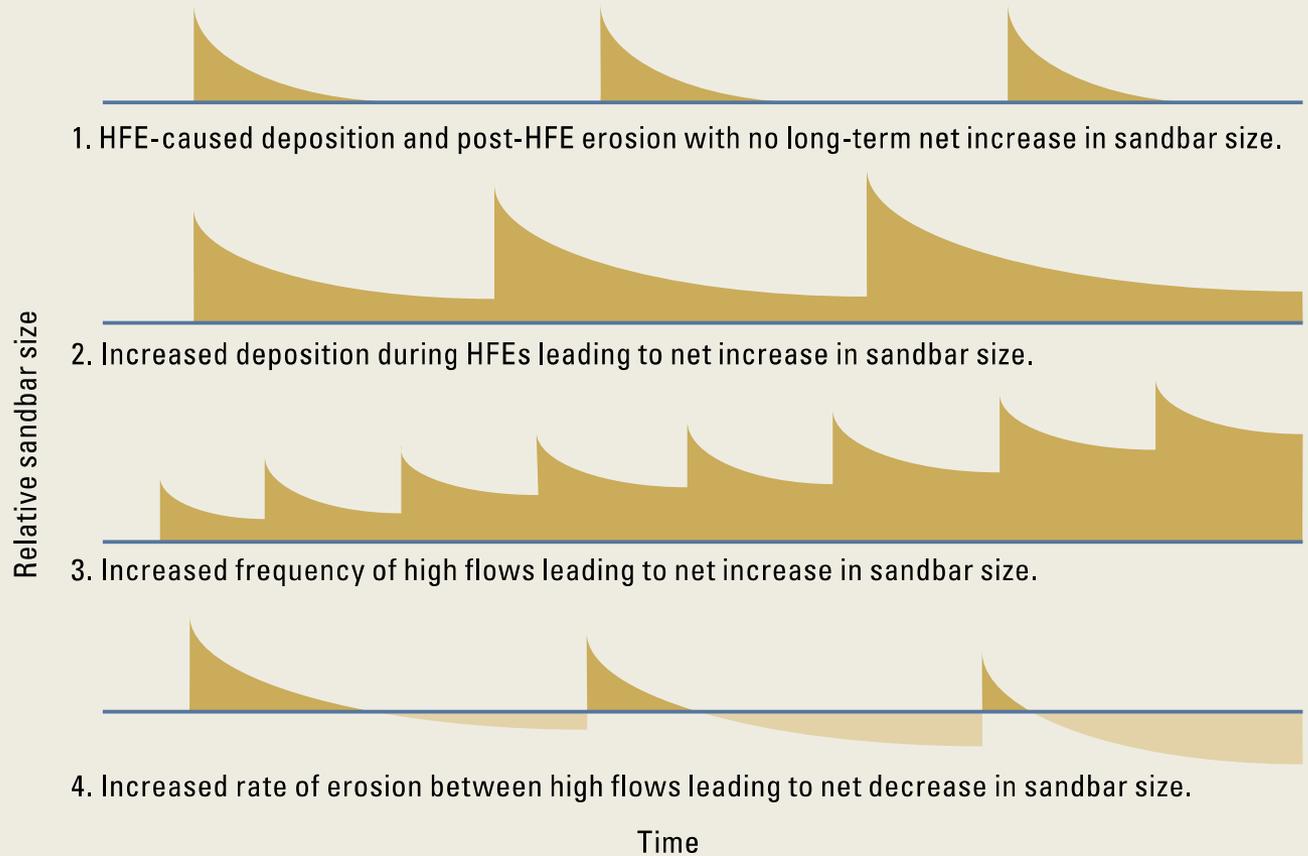
how much sand?

sand grain size

longitudinal changes in turbulent forces

Long-term average size of sand deposits along the channel margin depends on **how much deposition occurs during each flood**, **how much erosion occurs between each flood**, and **how frequently the floods occur**





These are all hypothetical trajectories of long-term sand bar change. We are hoping for the best, which can be accomplished by any scenario where the aggregate amount to sand deposited by floods exceeds the aggregate amount of erosion that occurs in the intervening times.

