

GCDAMP Knowledge Assessment: Status & Trend

Resource Topic:	Sediment
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Resource Characteristic	Specific Measure	Status	Trend	Confidence	Rationale: Status/Trend	Rationale: Confidence	Recommendations
Sandbar volume since 2002, Marble Canyon	median sand volume above 8,000 cfs stage	Good Condition	Improving	High	On average, sand volume in long-term monitoring sites has increased relative to 2002 reference. There is site-to-site variability and not all sites increased, but Increases in bar volume were more common than decreases in reference period.	The monitoring data are robust for the long-term monitoring sites. Results are consistent with observations from other sources.	HFE's continue to result in substantial deposition at a majority of monitoring sites, although some sites erode or are unaffected. Although most bars erode substantially in the months following each HFE, there is some evidence for cumulative increases since 2012.
Sandbar volume since 2002, Grand Canyon	median sand volume above 8,000 cfs stage	Good Condition	Improving	High	On average, sand volume in long-term monitoring sites has increased relative to 2002 reference. There is site-to-site variability and not all sites increased, but Increases in bar volume were more common than decreases in reference period.	The monitoring data are robust for the long-term monitoring sites. Results are consistent with observations from other sources.	HFE's continue to result in substantial deposition at a majority of monitoring sites, although some sites erode or are unaffected. Although most bars erode substantially in the months following each HFE, there is some evidence for cumulative increases since 2012.
Sandbar volume during HFE protocol, Marble Canyon	median sand volume above 8,000 cfs stage	Good Condition	Improving	High	On average, sand volume in long-term monitoring sites has increased relative to 2012 reference. There is site-to-site variability and not all sites increased, but Increases in bar volume were more common than decreases in reference period.	The monitoring data are robust for the long-term monitoring sites. Results are consistent with observations from other sources.	HFE's continue to result in substantial deposition at a majority of monitoring sites, although some sites erode or are unaffected. Although most bars erode substantially in the months following each HFE, there is some evidence for cumulative increases since 2012.
Sandbar volume during HFE protocol, Grand Canyon	median sand volume above 8,000 cfs stage	Good Condition	Improving	High	On average, sand volume in long-term monitoring sites has increased relative to 2012 reference. There is site-to-site variability and not all sites increased, but Increases in bar volume were more common than decreases in reference period.	The monitoring data are robust for the long-term monitoring sites. Results are consistent with observations from other sources.	HFE's continue to result in substantial deposition at a majority of monitoring sites, although some sites erode or are unaffected. Although most bars erode substantially in the months following each HFE, there is some evidence for cumulative increases since 2012.
Supply of sand available for rebuilding sandbars, upper Marble Canyon	Change in mass of sand in active channel since 2002	Moderate Concern	Improving	Low	Substantial monitoring data are available on suspended sediment but the accumulated uncertainty is large.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years, and the accumulated uncertainty is much larger than any change that may have occurred. Large change, either positive and negative, could have occurred within the uncertainty bounds.	To date, sand storage has possibly been maintained while implementing the HFE protocol. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Supply of sand available for rebuilding sandbars, upper Marble Canyon	Change in mass of sand in active channel since 2012 (during HFE protocol)	Good Condition	Improving	High	Status is above 2012 reference, indicating it is likely that sand has accumulated in this reach. However, accumulation is only likely and not definite because the accumulated uncertainty is slightly larger than the change.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years.	Since 2012, sand storage has increased while implementing the HFE protocol. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.

Supply of sand available for rebuilding sandbars, lower Marble Canyon	Change in mass of sand in active channel since 2002	Moderate Concern	Unchanging	Low	Substantial monitoring data are available on suspended sediment but the accumulated uncertainty is large.	The status and trend are based on robust monitoring of suspended sediment and, for portions of the record, the trend is confirmed by independent measurements of the change in storage by channel mapping. However, there is large uncertainty in sand budgets computed over many years.	To date, sand storage has been maintained.
Supply of sand available for rebuilding sandbars, lower Marble Canyon	Change in mass of sand in active channel since 2012 (during HFE protocol)	Moderate Concern	Improving	Medium	Status is above 2012 reference, indicating it is likely that sand has accumulated in this reach. However, accumulation is only likely and not definite because the accumulated uncertainty is slightly larger than the change. Trend is increasing, because sand storage has increased 3 years out of the 4-year period.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years.	Since 2012, sand storage has likely increased while implementing the HFE protocol. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Supply of sand available for rebuilding sandbars, eastern Grand Canyon	Change in mass of sand in active channel since 2002	Moderate Concern	Deteriorating	Low	Substantial monitoring data are available on suspended sediment but the accumulated uncertainty is large.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years. Large change, either positive and negative, could have occurred within the uncertainty bounds.	To date, sand storage has possibly been maintained while implementing the HFE protocol. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Supply of sand available for rebuilding sandbars, eastern Grand Canyon	Change in mass of sand in active channel since 2012 (during HFE protocol)	Significant Concern	Deteriorating	High	Status is below 2012 reference, indicating it is likely that sand has eroded from this reach. Erosion is only likely and not definite because the accumulated uncertainty is slightly larger than the change. Trend is decreasing because sand storage has declined 3 years out of the 4-year period.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years.	Sand storage has likely declined in this segment during the period of the HFE protocol, possibly as a result of much lower than average LCR sand inputs. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Supply of sand available for rebuilding sandbars, east central Grand Canyon	Change in mass of sand in active channel since 2007	Moderate Concern	Improving	Low	Substantial monitoring data are available on suspended sediment but the accumulated uncertainty is large.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years, and for this metric the accumulated uncertainty is much larger than the change. Large change, either positive and negative, could have occurred within the uncertainty bounds.	To date, sand storage has possibly been maintained. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Supply of sand available for rebuilding sandbars, east central Grand Canyon	Change in mass of sand in active channel since 2012 (during HFE protocol)	Good Condition	Improving	Medium	Status above 2012 reference, indicating that sand has accumulated in this reach. Accumulation is definite because the accumulated uncertainty is smaller than the change. Trend is increasing, because sand storage has increased 3 years out of the 4-year period.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years.	Since 2012, sand storage has increased while implementing the HFE protocol. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Supply of sand available for rebuilding sandbars, west central Grand Canyon	Change in mass of sand in active channel since 2007	Good Condition	Improving	Medium	Status above 2007 reference, indicating that sand has accumulated in this reach. Accumulation is definite because the accumulated uncertainty is smaller than the change, although the number of years of increase in sand storage is approximately balanced by the number of years of decrease or no change in sand storage.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years.	Since 2007, sand storage has increased. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.

Supply of sand available for rebuilding sandbars, west central Grand Canyon	Change in mass of sand in active channel since 2012 (during HFE protocol)	Moderate Concern	Deteriorating	Low	Substantial monitoring data are available on suspended sediment but the accumulated uncertainty is large.	The status and trend are based on robust monitoring of suspended sediment. There is, however, large uncertainty in sand budgets computed over many years, and the accumulated uncertainty is much larger than the change. Large change, either positive and negative, could have occurred within the uncertainty bounds.	To date, sand storage has possibly been maintained. Confidence in trend will improve as results from independent measurements of change in sand storage from channel mapping become available.
Availability of sand for aeolian transport in support of archeological site preservation	Classifications of the potential for aeolian transport of sand from sandbars to upland settings containing archaeological sites	Significant Concern	Deteriorating	High	The area of bare sand exposed and available for transport by wind has decreased. This decrease has been caused by vegetation encroachment, sandbar erosion, and high baseflows that result in less exposed sand. Although HFEs may be resulting in a maintenance or increase of sandbar area, vegetation encroachment continues.	We have high confidence in the methods for classifying sites and interpreting the data, and results have been peer reviewed by scientists and stakeholders and published.	Large increases in river-derived aeolian sand transport to upland sites likely requires large (>45,000 cfs) sediment rich floods and/or vegetation management. Ongoing monitoring will track changes in site classification relative to the most recent 2012/14 baseline and current HFE protocol.
Amount of topographic change indicative of archaeological site stability and preservation potential	Volume of sediment gained and/or eroded at a sample of archaeological sites during the current HFE protocol	Unknown	Unknown	Medium	Repeat topographic surveys show both sediment gains and losses during the HFE protocol. Status and Trend are unknown because the current topographic monitoring includes only 8 archeological sites that are situated within aeolian sand deposits.	We have high confidence in the methods for determining site topographic changes and inferring the geomorphic mechanism(s) responsible for the changes. However the small sample size currently limits our ability to determine status and trends	Ongoing monitoring will increase the sample size and temporal resolution of the data, thereby hopefully increasing confidence in status and trend determinations in the future. Despite the small sample size, current monitoring results can be used to make recommendations for site-specific experimental vegetation removal in order to increase aeolian sand transport to upland settings.