

**Summary table of USAP's indicators and metrics that are applied across multiple scales to assess stream physical conditions and community values**

Element	Indicators	Metrics	Scale	Assessment methods	Description	Example references
Community values	Access to nature	Gaps in natural space availability	Watershed	<ul style="list-style-type: none"> <li>Remote sensing: identification natural areas</li> </ul>	Identifying gaps in public park availability across the watershed or corridor using a demographic profile to identify gaps with the most urgent need for public parkland and natural space opportunities. Determining access to nature (parks, open space, river corridors, etc.) via multi-modal transit.	TPL 2017
		Natural space opportunities**	Corridor & reach	Field observations: proximity to natural areas		TPL 2017
		Universal access				TPL 2017
	Vitality (health, comfort, & wellbeing)	Safety and security	Watershed, corridor, & reach	<ul style="list-style-type: none"> <li>Remote sensing: identification and measurement of demographics and environmental and health hazards</li> <li>SVI and UHI indices data: Field observation</li> </ul>	Evaluating perceived safety considering health, birth, death, and crime data. Mapping locations of environmental and health hazards, social vulnerability index, and urban heat island (UHI) index data. Understanding aesthetic and experiential conditions.	COEPHT 2021
		Environmental and health hazards				COEPHT 2021
		Social vulnerability index**	Corridor & reach			CDC/ATSDR 2018
		Urban Heat Island Index				TPL 2018
	Economics	Maintenance costs**	Corridor & reach	<ul style="list-style-type: none"> <li>Desktop analysis, remote sensing-GIS, and database review</li> </ul>	Evaluating infrastructure operation and maintenance costs; supporting/recognizing local government economic plans and development goals	
		Community development				SDO 2021; DOLA 2021
	Stewardship of natural resources	Water quality compliance**	Watershed, corridor, & reach	<ul style="list-style-type: none"> <li>Desktop analysis, remote sensing, and databases</li> <li>Community interviews</li> <li>Field observations</li> </ul>	Compliance with local, state, and federal WQ standards; community involvement and activities that support watershed stewardship efforts and management; conservation/preservation measures to protect and enhance natural resources.	CDPHE 2020
		Community stewardship efforts				PPS 2012
		Watershed or stream protection				TPL 2017
Hydrologic processes	Runoff production	Land-use gradient	Watershed	<ul style="list-style-type: none"> <li>Remote sensing: hydrologic data and analyses</li> <li>Database of SCMs</li> </ul>	Refers to departure from historical LULC and the associated change in quantity of water supplied to urban streams from the surrounding landscape that is influenced by land use and stormwater control measures (SCMS).	Brown and Vivas 2005
		Flow alteration	Corridor			Poff et al. 2010
		Flow attenuation**	Reach			MHFD 2017
	Flow regime	Flow regime change**	Reach	<ul style="list-style-type: none"> <li>Hydrologic data and analyses</li> </ul>	Evaluation of changes in flow regime along the stream corridor under existing conditions. Evaluation of the pattern of peaks in the hydrograph and deviation of annual net rate, volume, and frequency using multi-spectrum flows (base flow, 2-year, 5-year, 10-year, 50-year, and 100-year). Flashiness considers impacts to the rate at which discharge varies over time while variability anticipates the seasonal changes in streamflow.	Poff et al. 2010
		Rate/magnitude				USGS 2019
		Volume				MHFD 2017
		Frequency				USGS 2019
		Flashiness (rate of change)				Baker et al. 2004
Flow variability (timing /seasonality)	Poff et al. 2010					
Hydraulic characteristics	Flood/fluviial hazards	Structures in broad floodplain	Watershed	<ul style="list-style-type: none"> <li>Remote sensing: flood and fluvial hazard data</li> <li>Hydraulic analyses</li> <li>FHZ protocol</li> </ul>	Refers to structures and infrastructure within the floodplain, stream management corridor, and fluvial hazard zone that has the potential to be harmed by the present flow regime.	MHFD 2021
		Structures in stream mgmt. corridor	Corridor			MHFD 2020
		Structures in regulatory floodplain**	Reach			MHFD 2021
		Structures in fluvial hazard zone**				Blazewicz et al. 2020
	Flow conveyance	Channel and floodplain capacity**	Reach	<ul style="list-style-type: none"> <li>Field observations</li> <li>Hydraulic data and analyses</li> </ul>	Evaluation of the capacity and space available for a channel and floodplain to convey the full spectrum of flows. Presence of crossing structures that restrict conveyance of flows.	MHFD 2017
		Crossing structure capacity				MHFD 2017
	Floodplain connectivity	Floodplain connectivity ratio**	Reach	<ul style="list-style-type: none"> <li>Remote sensing: hydraulic data and modeling</li> <li>Field survey</li> </ul>	Refers to the degree to which water inundates and activates the adjacent riparian corridor.	Macfarlane et al. 2018
		Overbank return interval				MHFD 2017
Entrenchment ratio		Rosgen 1994				

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Geomorphic forms & processes	Sediment regime	Sediment delivery potential	Watershed	<ul style="list-style-type: none"> <li>Remote sensing, geospatial analyses</li> <li>Field survey</li> <li>Database of CS structures</li> <li>Modeling</li> </ul>	Refers to the timing, and magnitude, of sediment entering and moving through the fluvial system.	NRCS 2008
		Sediment supply (land-use gradient)				Brown and Vivas 2005
		Corridor sources	Corridor			Fryirs 2017
		Sediment continuity				USACE 2021
		Sediment transport capacity**	Reach	Stroth et al. 2017		
	Stability	Resilience	Watershed	<ul style="list-style-type: none"> <li>Remote sensing, database of stressors</li> </ul>	Refers to balance between fluvial processes and channel form. Identifying stressors that would impede the physical movement/ adjustment of the stream or the recovery of critical components. Patterns, levels, and rates of dynamic processes considering landscape setting, including lateral migration and bank stability.	Parsons & Thoms 2018
		Stream power gradient	Corridor	<ul style="list-style-type: none"> <li>Modeling</li> </ul>		Yochum et al. 2017
		Lateral migration		<ul style="list-style-type: none"> <li>Field survey</li> </ul>		O'Brien et al. 2019
		Channel stability index**	Reach	<ul style="list-style-type: none"> <li>Field survey</li> </ul>		Simon and Downs 1995
	Stream Dynamics (Morphology)	Floodplain fragmentation	Corridor	<ul style="list-style-type: none"> <li>Geospatial analyses</li> <li>Historical long. profiles</li> </ul>	The geologic and topographic influences and anthropogenic stressors from the watershed. Define and evaluate process domains that influence stream shape at the watershed scale. Evaluation of the existing physical template both within the channel margins and the channel corridor.	Macfarlane et al. 2018
		Profile		USGS 1998		
		Geomorphic functionality (continuity, bed forms, cross-section)	Reach	<ul style="list-style-type: none"> <li>Field survey</li> <li>Historical cross sections</li> </ul>		Rinaldi et al. 2013
Artificiality (bank protection, stream planform, levees/embankments)**		<ul style="list-style-type: none"> <li>As-built plans, database of structures</li> </ul>		Rinaldi et al. 2013		
	Channel adjustments (pattern, width, bed, SEM stage)**		<ul style="list-style-type: none"> <li>Historical information, cross sections, pebble counts</li> </ul>	Rinaldi et al. 2013; Cluer & Thorne 2014		
Vegetation structure & processes	Flow conveyance	Riparian zone woody cover	Watershed	<ul style="list-style-type: none"> <li>Remote sensing</li> </ul>	Vegetative encroachment that could adversely raise surface water elevations during flood events. Defines the composition, cover, and structure of vegetation that can impede conveyance within the channel and under infrastructure (culverts, etc.) potentially resulting in large increases in water surface elevations within the riparian corridor during flood events.	DRCOG
		Clogging of crossing structures	Corridor & reach	<ul style="list-style-type: none"> <li>Field survey and/or observations</li> <li>Hydraulic data</li> </ul>		RESPEC 2021;
		Floodplain roughness value consistency		USGS 1998		
		Vegetation cover in the channel**				
	Dynamic stability	Vegetation cover	Watershed	<ul style="list-style-type: none"> <li>Remote sensing</li> <li>Field survey and/or observations</li> </ul>	Vegetation composition and cover along streambanks influence erosional processes and sediment supplies. Characterize existing vegetation communities and cover to illustrate the balance between channel and floodplain processes.	
		Riparian extent				
		Vegetation cover**	Corridor & Reach			
		Woody vegetation cover**				
		Wetland community cover				
		Vegetation vigor				
		Bank stability				
	Streamside buffer width					
	Riparian extent**					
	Resiliency	Noxious weed cover**	Corridor & Reach	<ul style="list-style-type: none"> <li>Remote sensing</li> <li>Field survey and/or observations</li> </ul>	Changes in flow regimes and surrounding land use can lead to shifts in plant communities and upland plant encroachment into riparian zones. Identify areas with sparse or stressed vegetation that may lack erosion resistance.	
		Riparian functional traits				
		Riparian plant richness				
Wetland plant richness						
Adaptability	Number of plant communities**	Corridor & Reach	<ul style="list-style-type: none"> <li>Remote sensing</li> <li>Field survey and/or observations</li> </ul>	The ability of riparian ecosystems to adapt to changing environmental conditions. Determine areas of vegetation not dominated by native, riparian-adapted communities.		
	Number of structural layers					
	Riparian woody recruitment**					

\*\* Indicates core metrics that should be quantified for reach-scale assessments