Urban Stream Assessment Procedure Getting Started Guide

The Urban Stream Assessment Procedure (USAP) is a comprehensive tool for evaluating the condition of streams across the Mile High Flood District (MHFD) service area and communicating those conditions to MHFD watershed managers, local government staff, practitioners, and community leaders.

Here you'll find guidance on how to plan and implement a USAP project based on the five elements (community values, hydrology, hydraulics, geomorphology, and vegetation) and supported by sixteen indicators for assessing stream conditions. These indicators can be used individually or in combination. USAP can be applied to reach-scale projects to broad-scale watershed assessments. Further information is provided in the USAP Overview and User Guidelines (still in development).

The Five Elements

Given that USAP evaluates stream character and behavior based on physical and social-ecological indicators and metrics, MHFD determined a series of five core elements at play in the urban setting to assess: community values, hydrologic processes, hydraulic characteristics, geomorphic forms and processes, and vegetation structure and function (Figure 1).

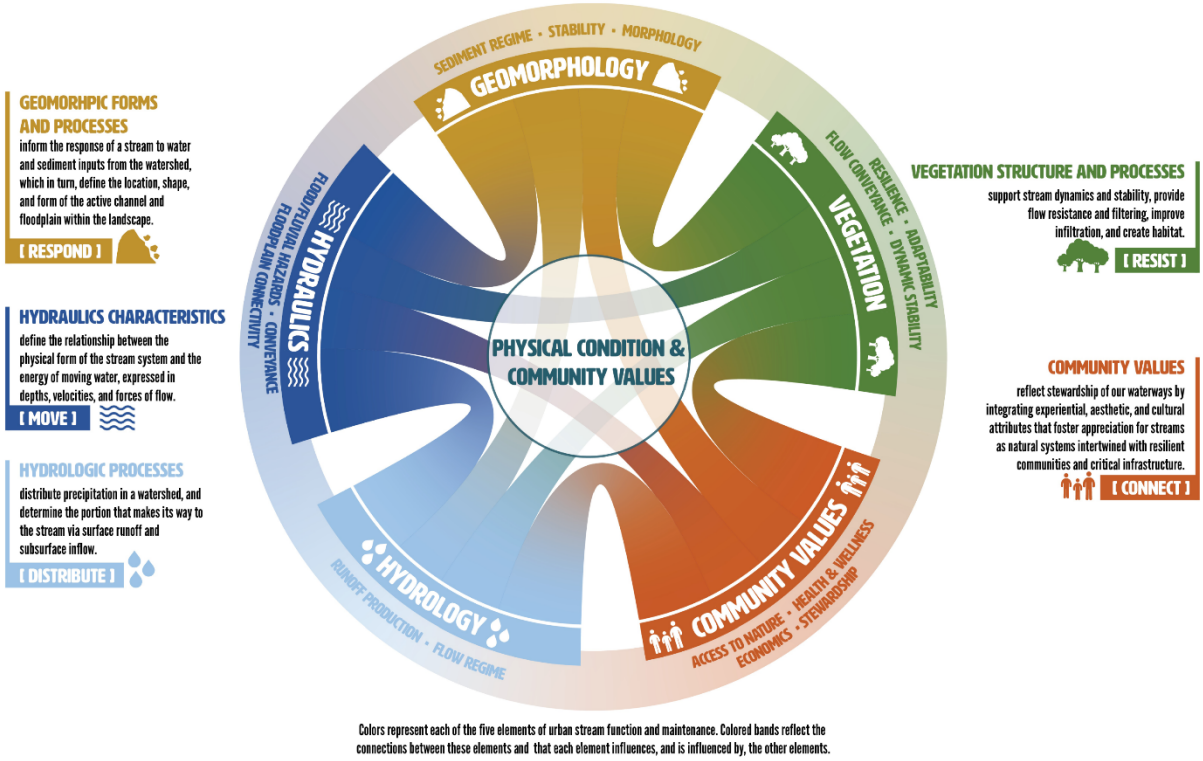

Figure 1: Five elements of the urban stream assessment procedure

These core elements provide insights into the processes occurring along the stream and the anthropogenic stressors influencing the physical condition of the stream. They guide the collection of data that informs the assessment across five key interconnected elements.

USAP Indicators

USAP includes 16 indicators that influence stream condition, which together cover the spectrum of USAP's five core elements (see Figure 2). The metrics associated with each indicator are measurable features or attributes that allow for a reasonable and practical means of identifying the presence or absence of a particular stream function or community value.

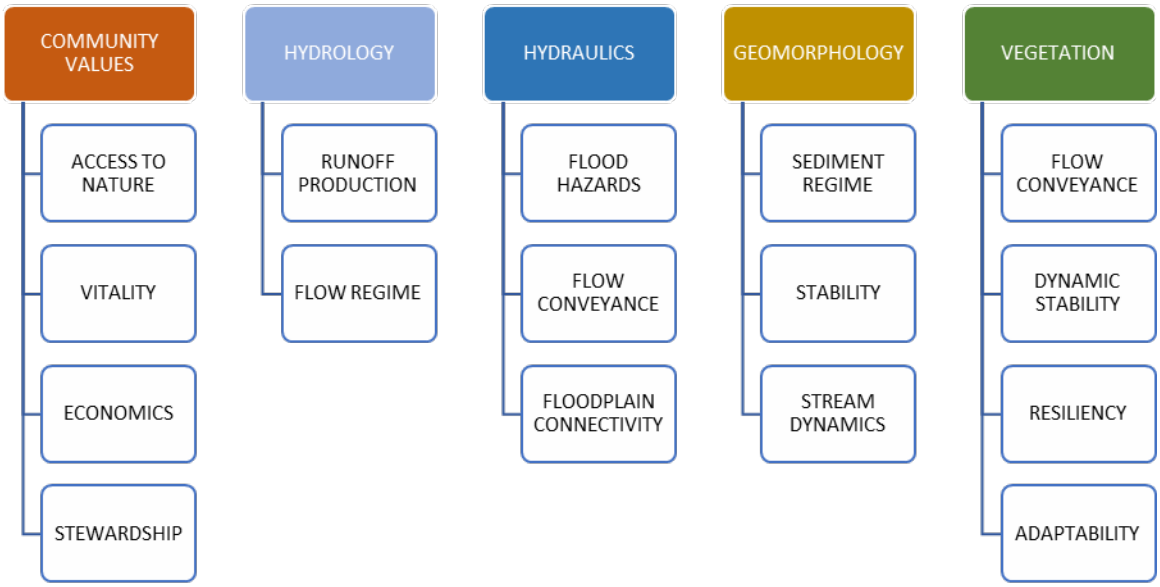

Figure 2: USAP elements and indicators

Planning and Implementation

In its simplest form, the roadmap to USAP's assessment framework can be subdivided into two sections: what is assessed (i.e., plan USAP) and how it is assessed (implement USAP). Thus, applying USAP across the watershed, corridor, or study reach, requires planning and implementing which are separated into eight steps, as shown below in Figure 3. Investing in careful planning during steps one through five is key to the successful implementation during steps six through eight.

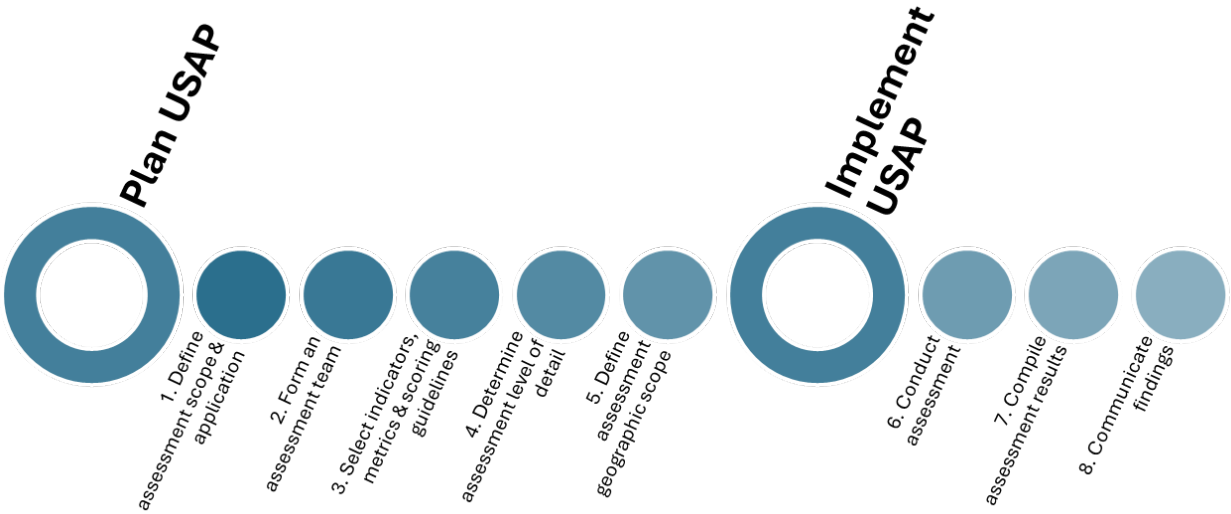

Figure 3: The eight steps to follow for planning and implementing an USAP project

1 Define assessment scope and application

The first step is to consider the assessment's goals, objectives, audiences, data needs, and uses. Potential uses include:

- Documenting baseline conditions to monitor and track stream conditions and community values over space and time;
- Evaluating changes in stream conditions and community values following natural disasters like floods or wildfire;
- Prioritizing restoration, protection, and management efforts throughout a watershed;
- Assessing and documenting outcomes following project implementation; and
- Engaging with stakeholders to foster a sense of stewardship among local communities

A well-defined scope for a specific application will determine the stream condition and community values indicators that should be included in the assessment, the required resources, and the assessment's effort, cost, timeline, and complexity.

2 Form an assessment team

Based on the scope developed in Step 1, build a multi-disciplinary team to complete the assessment. While a single practitioner could evaluate a small reach with minor problems (minimal bank erosion, invasive vegetation, etc.) a detailed assessment of a single reach or multiple reaches with complex problems requires an interdisciplinary team. Potential team members might include an ecologist, civil engineer, hydrologist, fluvial geomorphologist, landscape architect, water quality specialist, and other relevant professionals.

Forming a multi-disciplinary team is important for detailed and broad-scale stream assessments due to the complex nature of stream ecosystems and the interaction of watershed topography, geology, and land cover that contribute to stream conditions, and the social, political, and needs that drive community values. This diverse expertise and knowledge inform a holistic understanding of stream conditions.

3 Select indicators, metrics, and scoring criteria

USAP offers 14 stream condition indicators and associated indicator-specific metrics for assessing stream conditions across the five elements at three different scales – watershed, corridor, and reach. Indicators and metrics have scoring guidelines that provide standardized quantitative and qualitative criteria for evaluating, categorizing, and communicating the condition of a watershed, corridor, or reach.

A more generalized, non-numerical assessment involves qualitative criteria such as descriptions, narratives, and observations, as well as potential stressors. Quantitative assessment requires field-based numerical data collection to: (1) characterize existing reach-scale stream conditions typically for a design project; and (2) to monitor changes in those conditions or following project implementation. USAP can also use a mixture of qualitative and quantitative criteria that can be combined for a stream condition and community values scores.

Scores convey various levels of watershed or stream function. Scoring is based on functional characteristics and follows a simple scoring scheme of “fully functional” (3 points), “functional” (2 points), “partly functional” (1 point), or “not functional” (0 points) condition. The scoring scheme for the community values element is similar, although functional qualities and values are scored, rather than condition.

4 Determine assessment level of detail

USAP includes three "levels of detail" or tiers that are associated with differing levels of effort to gather information for each level tier through a multi-disciplinary approach. The information allows the user to proceed to the level of specificity needed for any area. The process can be cumulative or independent at each tier; however, each tier builds on the previous one and provides a basic framework of knowledge about a given Element.

The various levels of assessment are displayed and characterized in Figure 4 and corresponds loosely to the watershed, corridor, and reach spatial scales, with smaller spatial scales generally (but not always) requiring more intensive and field-based data collection, and larger spatial scales generally requiring more desktop-based data collection.

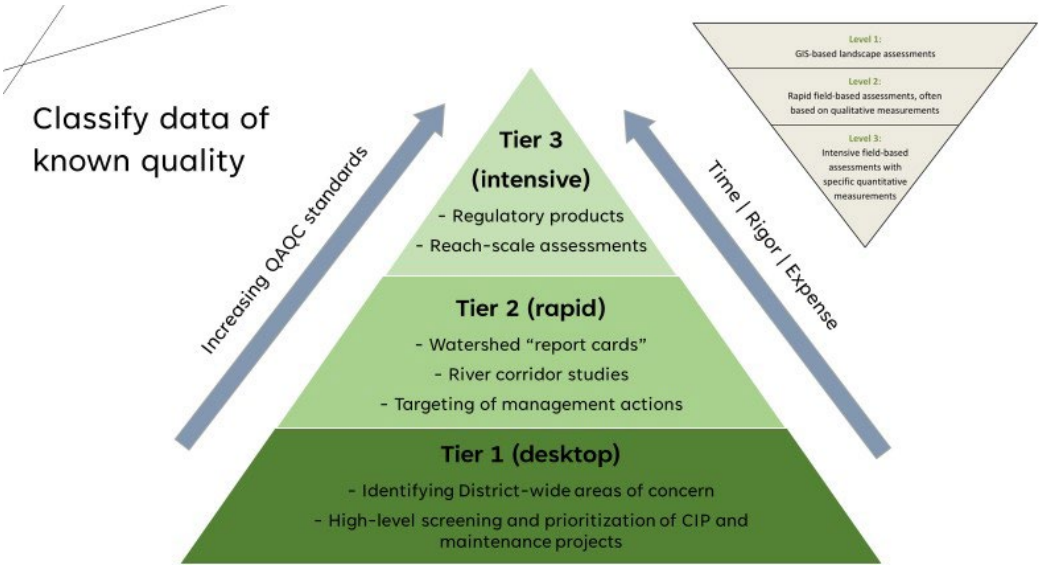

Figure 4: USAP tiers of data collection and level of effort

Tier 1 is a desktop procedure that begins by assembling and interpreting existing maps, publicly data, and stream classification information. Tier 2 is a rapid field procedure that identifies and maps observable physical features using qualitative measures. Physical features are delineated on the basis of easily identifiable characteristics. Tier 3 involves more intensive, site-specific field data collection to address specific questions, issues, or needs.

5 Define assessment spatial scale and area of interest

Scale and the area of interest are the specific reaches, corridors/segments, polygons, or zones that will be assessed depending on the assessment's goals, objectives, and purpose. Dividing large spatial areas into smaller units makes the data collection more efficient and the overall assessment more manageable.

A variety of existing boundaries can be used to delineate an area of interest, including:

- Confluences with tributaries or changes in stream hydrology, morphology, topography, or geology.
- Transportation or water infrastructure such as bridges, roads, water diversion structures, or stormwater outfalls.
- Regulatory or jurisdictional boundaries from existing management or monitoring efforts, such as the stream segments used by the Colorado Department of Public Health and Environment Water Quality Control Division.

The area of interest and scale may also vary depending on the indicators and metrics being evaluated. Geomorphic features or transportation infrastructure may delineate the reach breaks

within an area or interest for the flow regime or floodplain connectivity indicators, for example, while the area of interest for sediment regime or access to nature may be based on sub-watershed or neighborhood boundaries.

6 Conduct the assessment

Implement the assessment (data collection and evaluation) on a watershed, corridor, and/or stream reach(es), including the application of indicators, metrics, and scoring guidelines. As discussed in Step 4, measurement of metrics is based on an integration of GIS and field data field (including rapid or detailed methods). The data should be stored in relational databases that allow for the application of classification, prioritization, and monitoring screening tools. After conducting the assessment, data should be reviewed for quality assurance and control.

7 Compile assessment results

Once the assessment is complete, the data are synthesized and interpreted in tables and geospatially in order to score the physical conditions and community values (see Figure 5). Assessment results should be compiled across standardized and equivalent spatial scales or areas of interest (e.g., reaches, corridors, sub-watersheds) ensure consistency in the stream conditions and community values scoring.

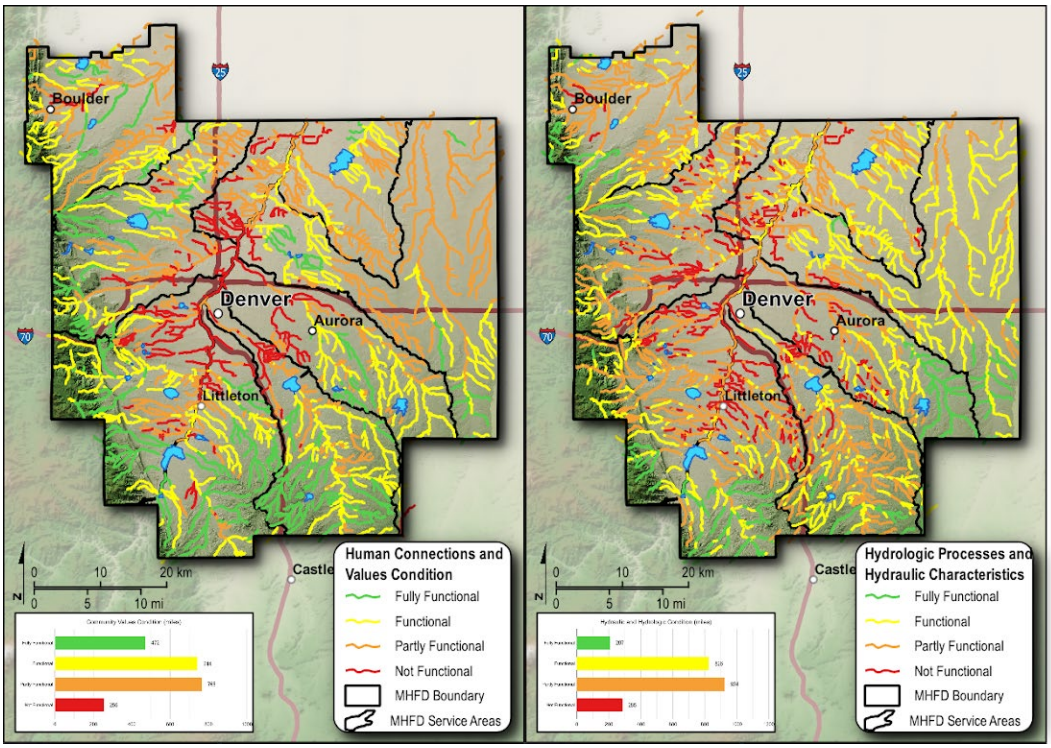

Figure 5: Example results from USAP watershed-scale metrics applied across MHFD's service area boundary.

8 Communicate fundings

Assessment results can be shared with stakeholders, decision makers, and the public. Findings should be clearly explained, including potential management implications, and recommendations. Communications can include a technical report, a “report” card, and/or an online mapping tool (see Figure 6).

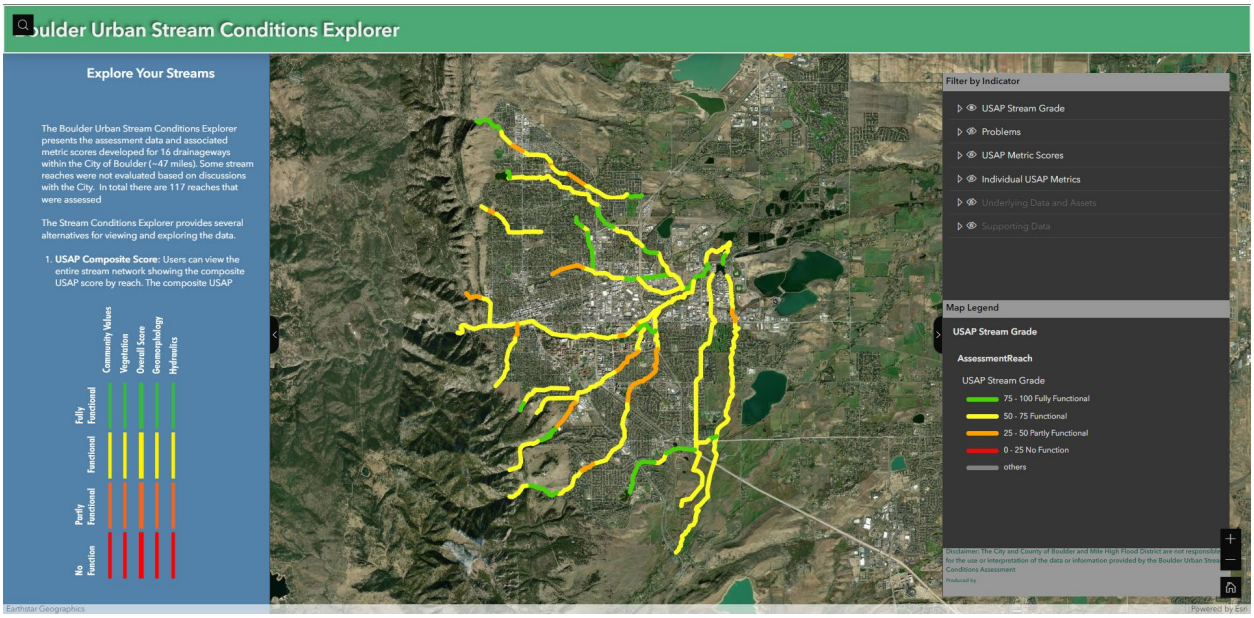

Figure 6: Example web-based explorer from the Boulder Urban Stream Conditions Assessment.