



Estimation of Short-Duration Volume-Frequency Relationships in Arid/Semi-Arid Watersheds

- Products**
1. A database containing high temporal resolution streamflow records for ephemeral streams in the Las Vegas, Albuquerque, and Phoenix regions.
 2. Regional volume-frequency relationships based on high temporal resolution streamflow data.
- Benefits**
- This project will enable the U.S. Army Corps of Engineers and flood-control districts in three arid/semi-arid metropolitan areas to design flood-control facilities based on the statistics of local streamflow data rather than indirect estimation of streamflow through rainfall runoff modeling.
- Issue**
- There is a great need for a better understanding of the short-duration volume-frequency relationships for both planning and design studies aimed at urban flood mitigation and channel restoration projects in arid and semi-arid regions of the United States. Large runoff events in these areas are generally a result of intense, short-duration (less than 24 hours) precipitation events that frequently result in considerable property damage and loss of life. Currently, the short duration volume frequency relationships for these watersheds are derived from precipitation characteristics (depth-area-duration) in the course of performing rainfall-runoff analyses, rather than directly from observed streamflow data as is standard practice for longer durations (>1-day). Hence, planning and design of flood-control facilities in these areas could be significantly under- or oversized depending on the shape, volume, and peaks of short duration streamflow hydrographs. There is a need to determine the hydrologic characteristics of these short duration flood events from observed data instead of continuing to rely on short-duration high-intensity precipitation relationships to estimate the short-duration volume frequency relationships needed for planning and design.
- A major obstacle to improving our understanding of short-duration volume-frequency relationships is the lack readily available high temporal resolution streamflow records. The USGS generally only publishes daily (24-hour) average streamflow values for surface water stations in the western U.S. In many cases, the original high temporal resolution records are archived as strip charts or punch tapes and are not available electronically. Extracting a high temporal resolution streamflow record and evaluating the quality of the information from the archived records often requires a significant amount of human effort.
- Description**
- Task 1:** Inventory existing and historic U.S. Geological Survey (USGS) gauging stations for each of the study regions. Determine the suitability of the data for statistical frequency analysis based on data quality, streamflow record length, and data stationarity (streamflow characteristics unchanged over time due to urbanization, diversions, etc).
- Task 2:** Digitize historical records available from the USGS offices in each of the study areas.
- Task 3:** Determine peak flows, volume, and duration of flash flood events from historical records.

Task 4: Where possible, perform regional short-duration volume frequency analyses for streams in each of the study areas.

Sponsor

Urban Flood Damage Reduction and Channel Restoration Demonstration Program for Arid and Semi-Arid Regions (UFDP).

Points of Contact

Douglas Boyle, Desert Research Institute,
Email: Douglas.Boyle@dri.edu
Phone: 775-673-7441

Rina Schumer, Desert Research Institute,
Email: Rina.Schumer@dri.edu
Phone: 775-673-7441

Lisa Hubbard, Program Manager, ERDC, Coastal and Hydraulics Laboratory
Email: Lisa.C.Hubbard@usace.army.mil
Phone: 601-634-4150