175L & 175C

ANNUAL CV OF UNREGULATED RUNOFF

USACE CLIMATE PREPAREDNESS AND RESILIENCE

Background

- This indicator measures the year-to-year variability of runoff within a watershed.
- It suggests how vulnerable a watershed may be to small changes in hydrology.[1]
  - High values indicate less reliable natural water availability.
  - Low values indicate more reliable natural water availability.
- Values are affected by changes in annual runoff extremes.[2]
- Higher values represent greater year-to-year variability in runoff and suggest higher vulnerability relative to other watersheds.

THIS INDICATOR MEASURES LONG-TERM VARIABILITY OF HYDROLOGY.

Local vs. Cumulative

- Flow-based indicator values depend on where the flow originates.
- The vulnerability assessment tool uses two versions of this indicator:
  - Local (175L): Reflects flow generated within only one 4-digit hydrologic code (HUC-4) watershed.
  - Cumulative (175C): Reflects flow generated within a HUC-4 watershed and any upstream watersheds.

Data Sources

Data Source	Description	Spatial Resolution	Temporal Resolution
Coupled Model Intercomparison Project (CMIP-5) output[3]	Local runoff within HUC-4 watersheds	HUC-4 watersheds	2035-2064 and 2070-2099

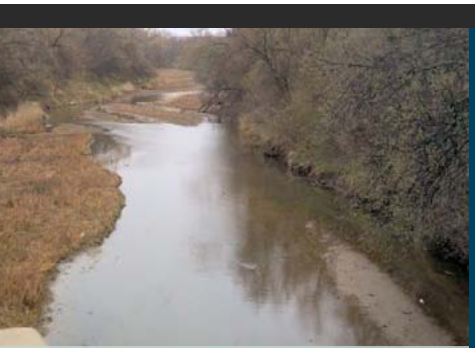
This Indicator Was Used to Assess the Vulnerability of Five of USACE's Eight Business Lines

Indicator	Business Line	Importance Weight (Varies from 1 to 2 for USACE)
175L	None	N/A
175C	Flood Risk	1.25
	Hydropower	1.5
	Water Supply	1.5
	Regulatory	1.7
	Emergency Management	1.3

Calculation

- Use local runoff values from 47 CMIP-5 climate model traces specific to each future scenario.[4]
  - For indicator 175L, use local runoff values from each model trace.
  - For indicator 175C, use cumulative runoff values from each model trace.
- For each model trace, calculate the mean monthly runoff for each year in the time period.
- Find the standard deviation and the mean of the yearly mean runoff values for each model trace. Divide the standard deviation by the mean to calculate the coefficient of variation (CV) for each model trace.
- Rank the coefficient of variations from low to high, and select the 36th value.

[1] Hurd, B., et al. 1999. Relative Regional Vulnerability of Water Resources to Climate Change. Journal of the American Water Resources Association. 35(6): 1399-1409.
[2] Arnell, N. W. 1999. Effects of IPCC SRES Emissions Scenarios on River Runoff: a Global Perspective. Hydrology and Earth System Sciences. 7(5): 619-641.
[3] CMIP-5 output is available for download online at: http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html
[4] Indicator values were calculated for two scenarios (a wet and a dry future) and two time periods (2035-2064 and 2070-2099).



Smoky Hill River, April

HIGH INDICATOR VALUE

HUC 1026's value for this indicator is among the top 5% of such values for the nation. Water bodies within this HUC-4 watershed exhibit large variability in runoff over time.

The two photos represent the same location at Smoky Hill River, Kansas, at different times of the year.

Courtesy of USGS

Smoky Hill River, July