570L & 570C

LOW FLOW (MONTHLY FLOW EXCEEDED 90 PERCENT OF TIME)

USACE CLIMATE PREPAREDNESS AND RESILIENCE

Background

- Climate change may cause local precipitation changes that affect the magnitude of low flows (i.e., the monthly flow exceeded 90% of the time). Changes in seasonal precipitation patterns may also shift the timing of low flows.[1]
- Lower flows may increase strain on dam operation. Lower flows may not sufficiently meet the demands of hydropower generation, navigation, and other established uses.[2]
- Areas where water consumption approaches or exceeds the minimum flow, such as the Western United States, may experience additional water resource challenges.[3]
- Lower values suggest higher vulnerability relative to other watersheds.

THIS INDICATOR MEASURES LOW RUNOFF, THE MONTHLY RUNOFF THAT IS EXCEEDED 90 PERCENT OF THE TIME.

Local vs. Cumulative

- Flow-based indicator values depend on where the flow originates.
- The vulnerability assessment tool uses two versions of this indicator:
  - Local (570L): Reflects flow generated only within one 4-digit hydrologic code (HUC-4) watershed.
  - Cumulative (570C): 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[4]	Local runoff within HUC-4 watersheds	HUC-4 watersheds	2035-2064 and 2070-2099

These Indicators Were Used to Assess the Vulnerability of Some of USACE's Eight Business Lines

Indicator	Business Line	Importance Weight (Varies from 1 to 2 for USACE)
570L	Navigation	1.25
	Recreation	1.5
570C	Nagivation	1.75

Calculation

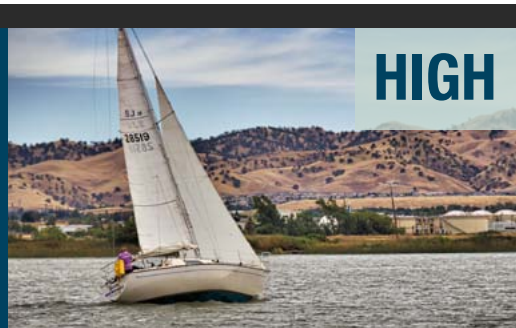
- Use local runoff values from 47 CMIP-5 climate model traces specific to each future scenario.[5]
  - For indicator 570L, use local runoff values from each model trace.
  - For indicator 570C, use cumulative runoff values from each model trace.
- Find the monthly value of runoff that is exceeded 90 percent of the time to obtain the low flow value for each model trace.
- Rank the climate model traces' low flow values from low to high, and select the 6th value.

[1] Arnell, N. W. 1999. The Effect of Climate Change on Hydrological Regimes in Europe: a Continental Perspective. Global Environmental Change. 9(1): 5-23.
[2] Lettenmaier, D. P., Wood, A. W., Palmer, R. N., Wood, E. F., and E. Z. Stakhiv. 1999. Water Resources Implications of Global Warming: A US Regional Perspective. Climatic Change. 43(3): 537-579.
[3] Alcamo, J., Flörke, M., and M. Märker. 2007. Future Long-Term Changes in Global Water Resources Driven by Socio-Economic and Climatic Changes. Hydrological Sciences Journal. 52(2): 247-275.
[4] CMIP-5 output is available for download online at: http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html
[5] Indicator values were calculated for two scenarios (a wet and a dry future) and two time periods (2035-2064 and 2070-2099).

New Orleans, LA - Courtesy of USACE

LOW INDICATOR VALUE
Barge traffic is congested due to low flows.

HIGH INDICATOR VALUE
Rivers remain navigable in areas with moderate flows.



California Delta, CA - Courtesy of USFWS