Background

- Climate change is anticipated to continue to increase the magnitude of flood flow (i.e., the monthly flow exceeded 10% of the time) at some locations and decrease it at others.¹
- Spring peak flows are expected to arrive earlier in areas with runoff from snowmelt.²
- Extreme peak flows can adversely affect river ecosystems.³
- Higher values suggest higher vulnerability relative to other watersheds.

Local vs. Cumulative

- Flow-based indicator values depend on where the flow originates.
- The vulnerability assessment tool uses two versions of this indicator:
  - Local (571L): Reflects flow generated within only one 4-digit hydrologic code (HUC-4) watershed.
  - Cumulative (571C): Reflects flow generated within a HUC-4 watershed and any upstream watersheds.

Data Sources

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Description</th>
<th>Spatial Resolution</th>
<th>Temporal Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupled Model Intercomparison Project (CMIP-5) output⁵</td>
<td>Local runoff within HUC-4 watersheds</td>
<td>HUC-4 watersheds</td>
<td>2035-2064 and 2070-2099</td>
</tr>
</tbody>
</table>

This Indicator Was Used to Assess the Vulnerability of One of USACE’s Eight Business Lines

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Business Line</th>
<th>Importance Weight (Varies from 1 to 2 for USACE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>571L</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>571C</td>
<td>Recreation</td>
<td>1</td>
</tr>
</tbody>
</table>

Calculation

- Use local runoff values from 47 CMIP-5 climate model traces specific to each future scenario.⁵
  - For indicator 571L, use local runoff values from each model trace.
  - For indicator 571C, use cumulative runoff values from each model trace.
- Find the monthly value of runoff that is exceeded 10 percent of the time to find the flood flow value for each model trace.
- Rank the climate model traces’ flood flow values from low to high, and select the 42nd value.

4 CMIP-5 output is available for download online at: [http://gdo-dcp.ucar.edu/downscaled_cmip5_projections/dcpinterface.html](http://gdo-dcp.ucar.edu/downscaled_cmip5_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).