SC DEPARTMENT of ENVIRONMENTAL SERVICES

Methods for Evaluating Water Availability

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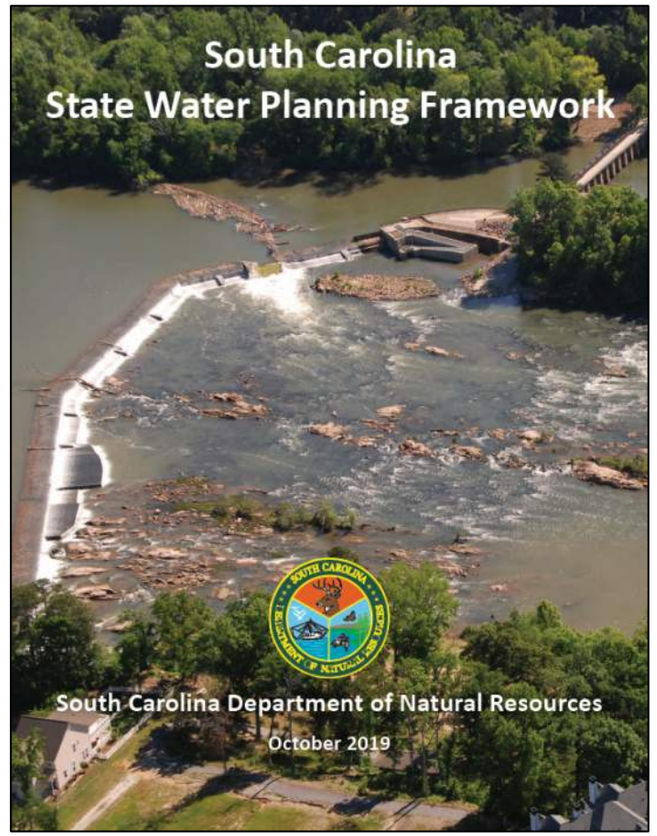
Methods for Evaluating Water Availability

- Formal approach described in Planning Framework (Section 4).
- Based, in part, on methodologies used in Texas for evaluating water availability.
- Provides consistency – designates a common set of definitions and processes to use across the State.

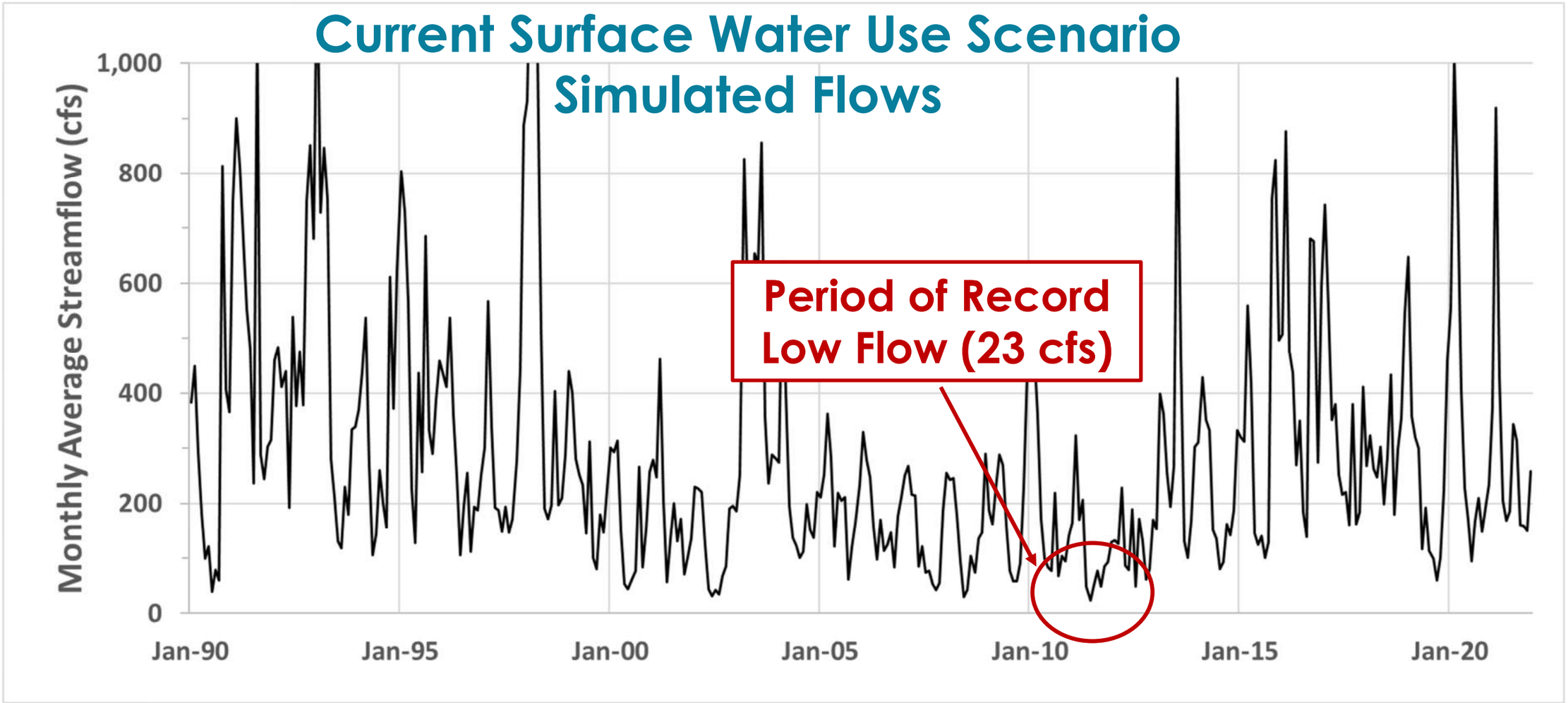


Big Picture – this is a gap analysis; the RBC will be determining where and when demand exceeds supply under varying demand scenarios and deciding how to manage water to close the gaps.

Methods for Evaluating Water Availability

- Definitions:
  - **Physically Available Surface Water Supply** – maximum amount of water occurring 100% of the time at a location on a surface water body, with no defined conditions applied on the surface water body.
  - **Surface Water Condition** – a physical limitation on the amount of water that can be withdrawn from a surface water source and is independent of water demand.
  - **Surface Water Supply** – maximum amount of water available for withdrawal 100% of the time at a location on a surface water body without violating any applied *Surface Water Conditions* on the surface water source and considering upstream demands.
  - **Surface Water Shortage** – occurs when the water demand exceeds the *Surface Water Supply* for any water user in the basin.
  - **Reach of Interest** – a specific stream reach that has no identified *Surface Water Shortage* but experiences undesired impacts, environmental or otherwise, determined from current or future water-demand scenarios or proposed water management strategies.

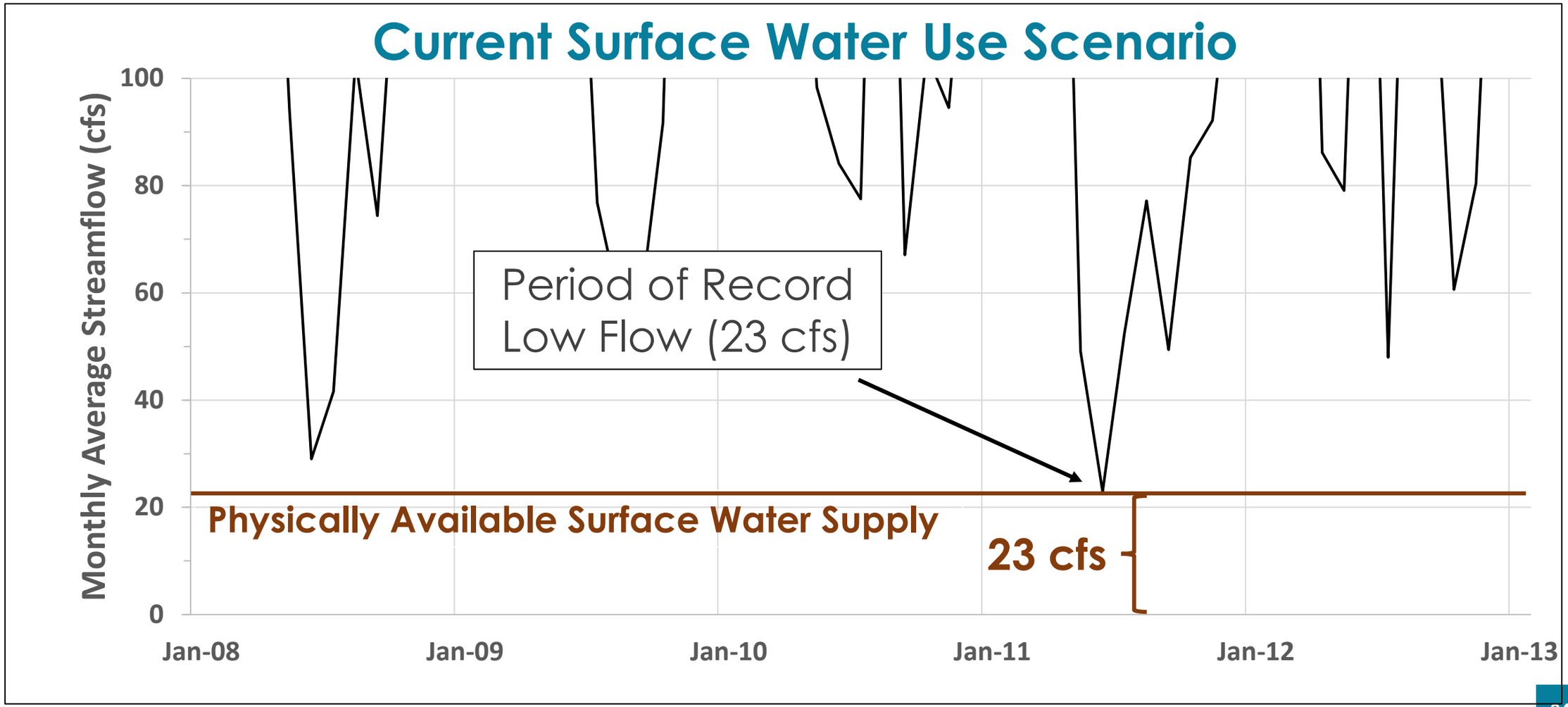
Example Hydrograph



Surface water volumes highlighted in the following hydrographs are for illustrative purposes only.

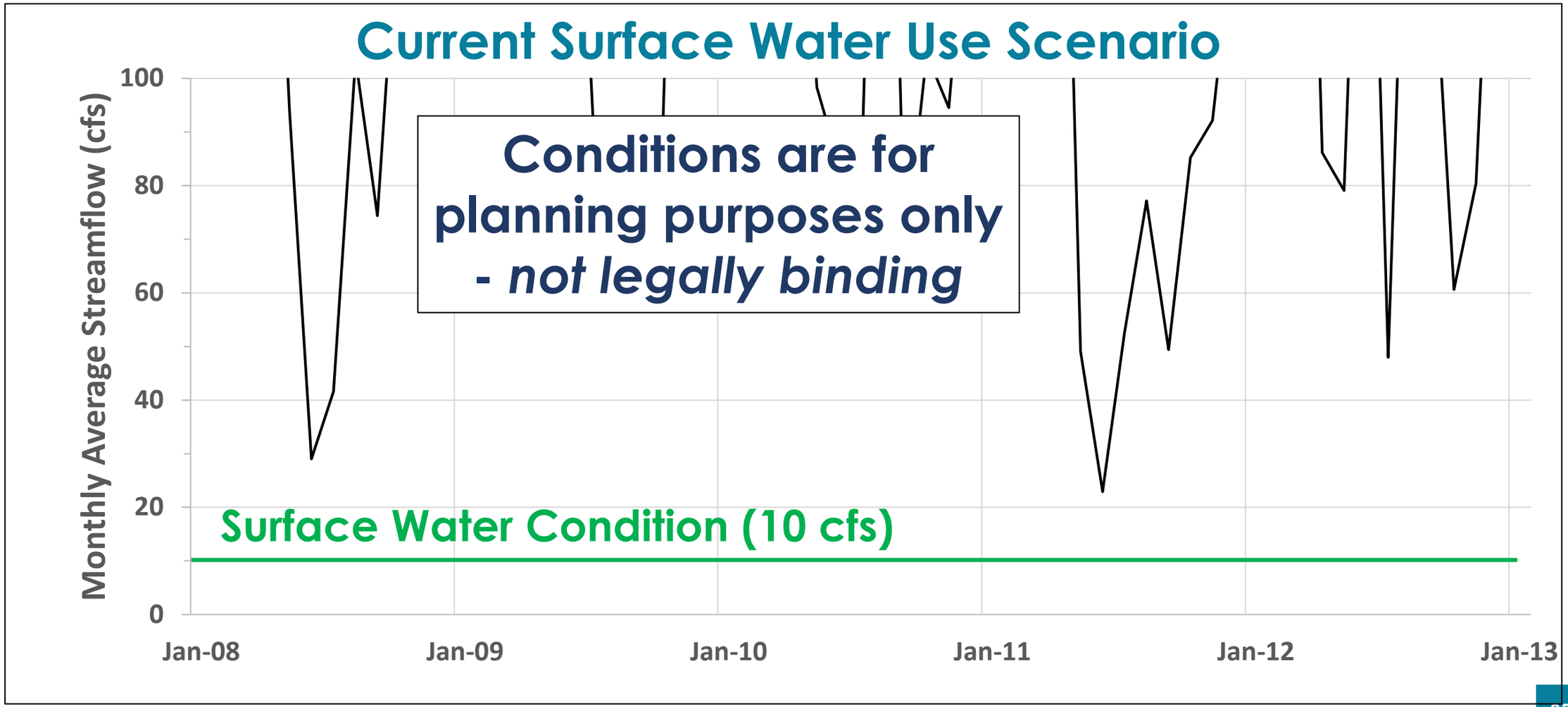
Physically Available Surface Water Supply

Maximum amount of water occurring 100% of the time at a location on a surface water body, with no defined conditions applied on the surface water body.



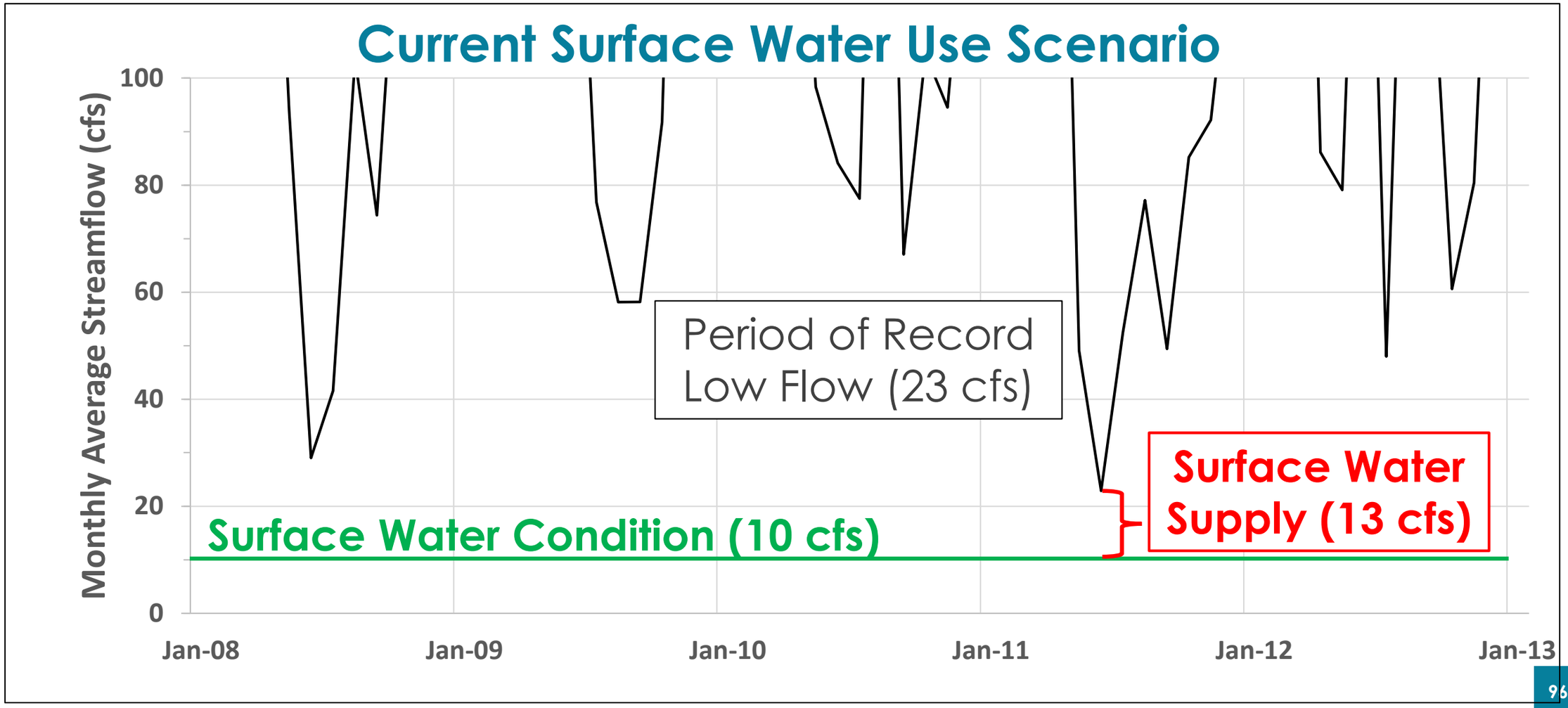
Surface Water Conditions

Conditions which physically limit the amount of water that can be withdrawn from a surface water source and are independent of water demand.

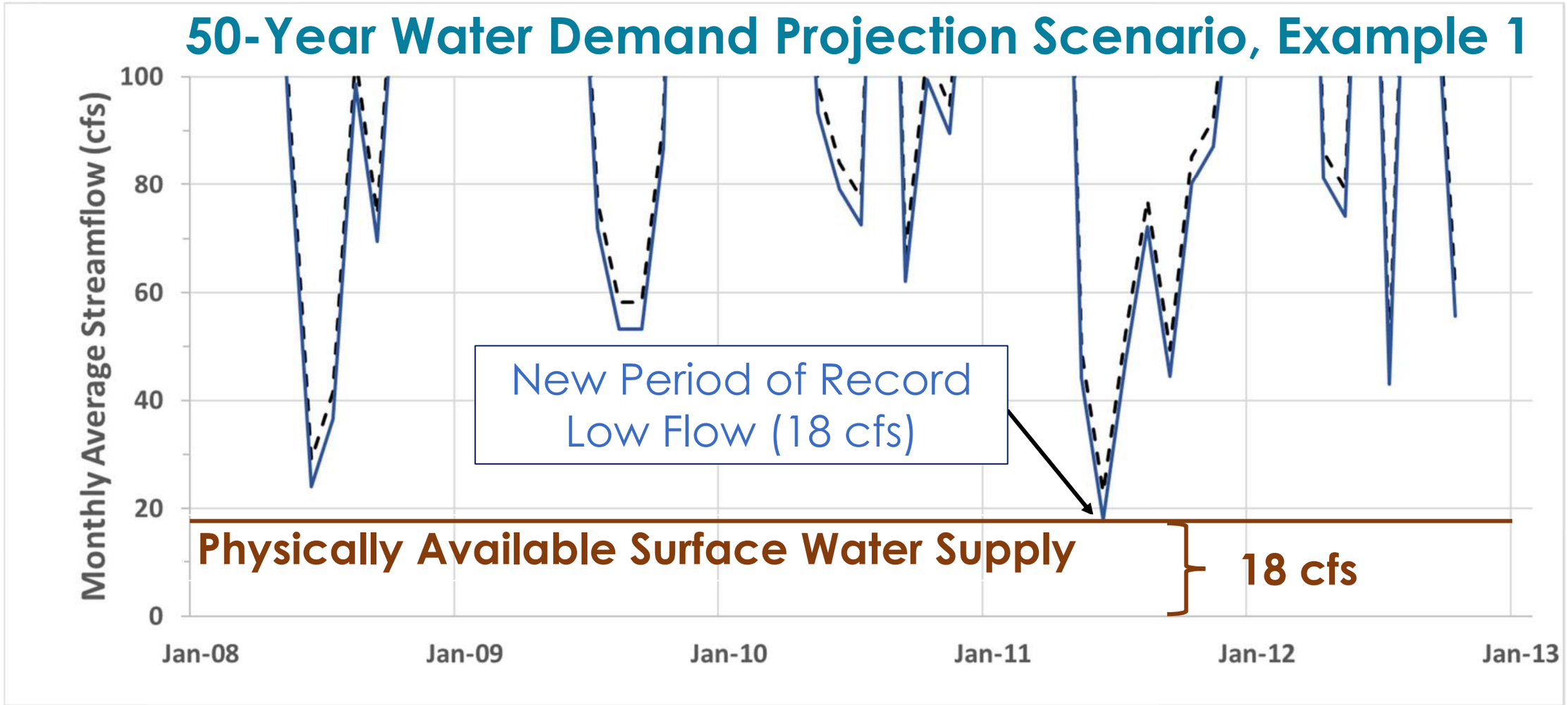


Surface Water Supply

Maximum amount of water available for withdrawal 100% of the time at a location on a surface water body without violating any applied Surface Water Conditions on the surface water source and considering upstream demands.

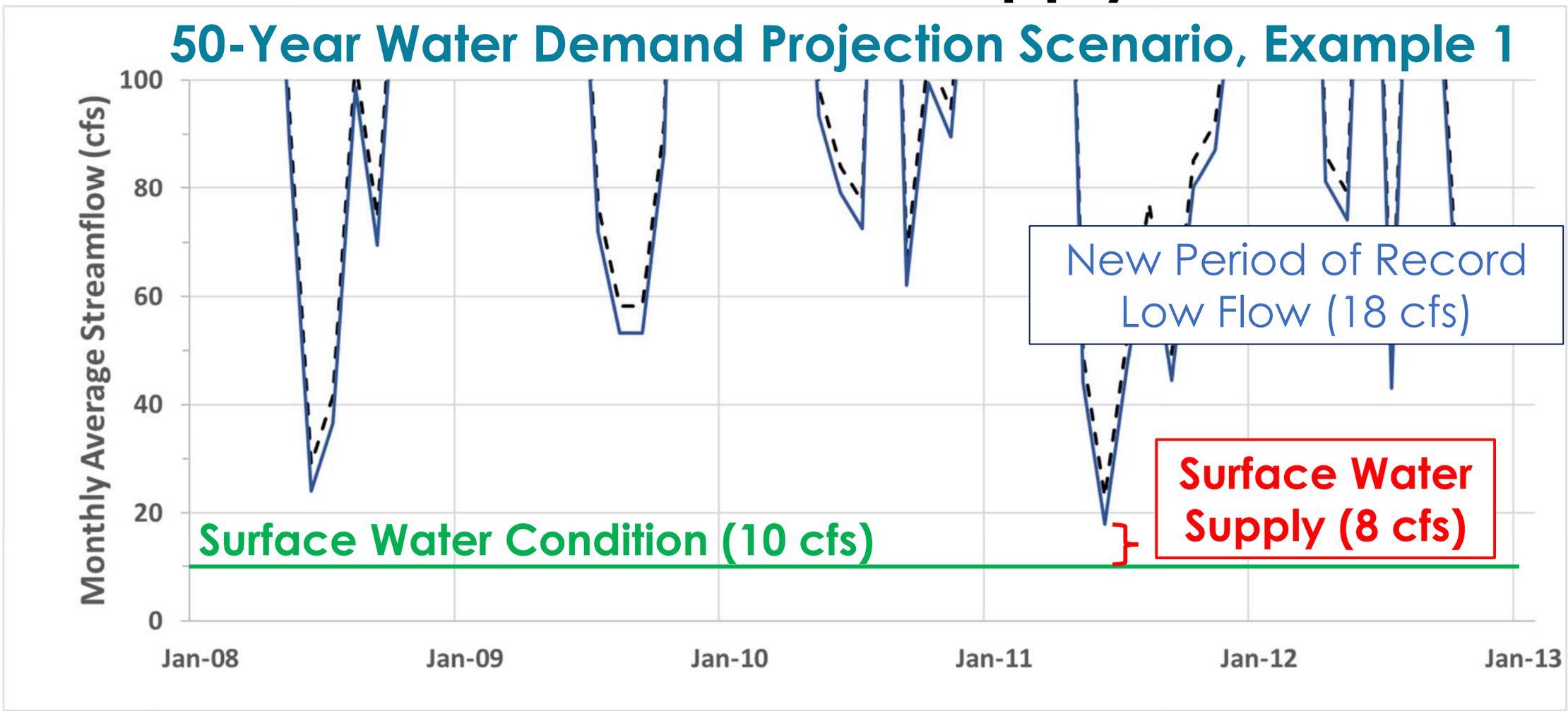


Increased Demand Reduces Physically Available Surface Water Supply



--- Current Demand —— 50-Year Projected Demand, Example 1

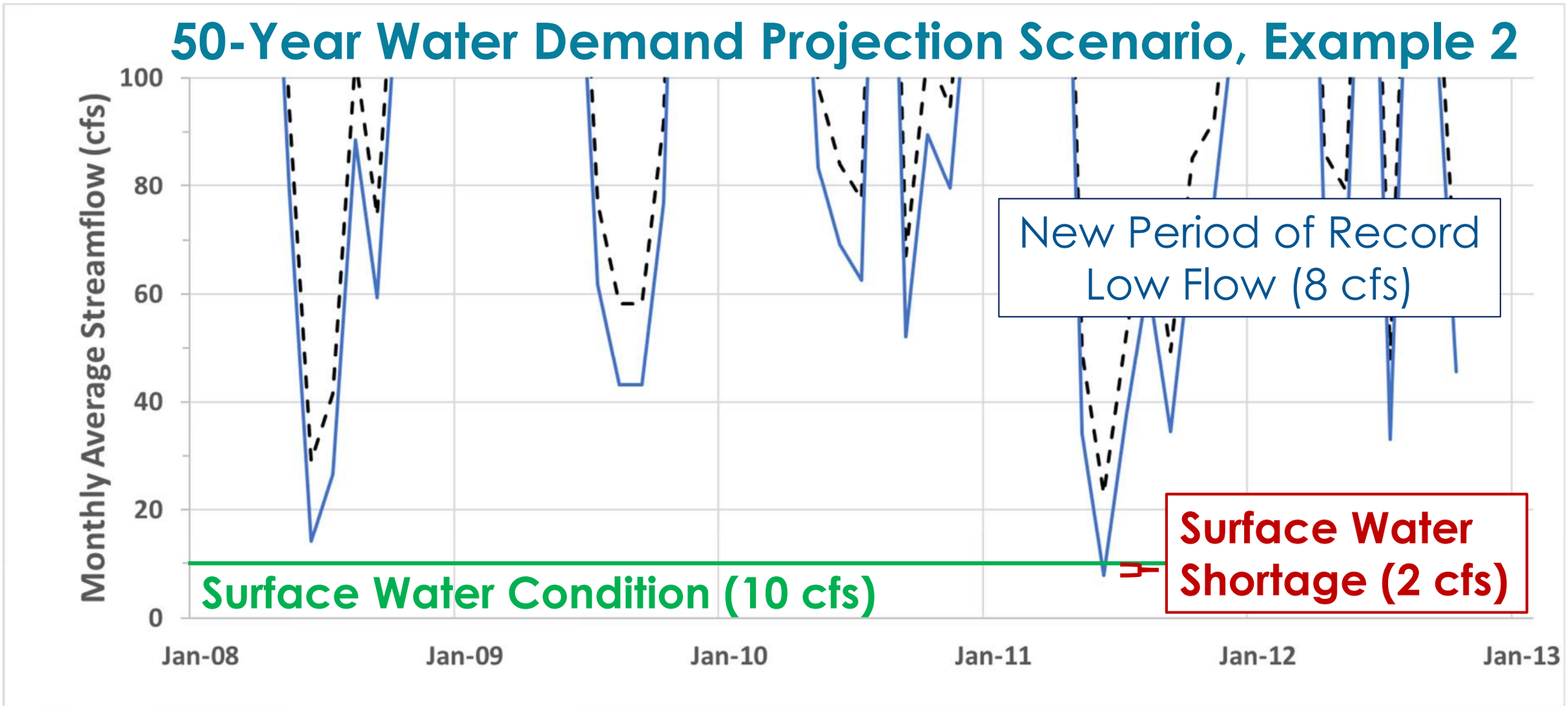
Increased Demand Reduces Available Surface Water Supply



--- Current Demand —— 50-Year Projected Demand, Example 1

Surface Water Shortage

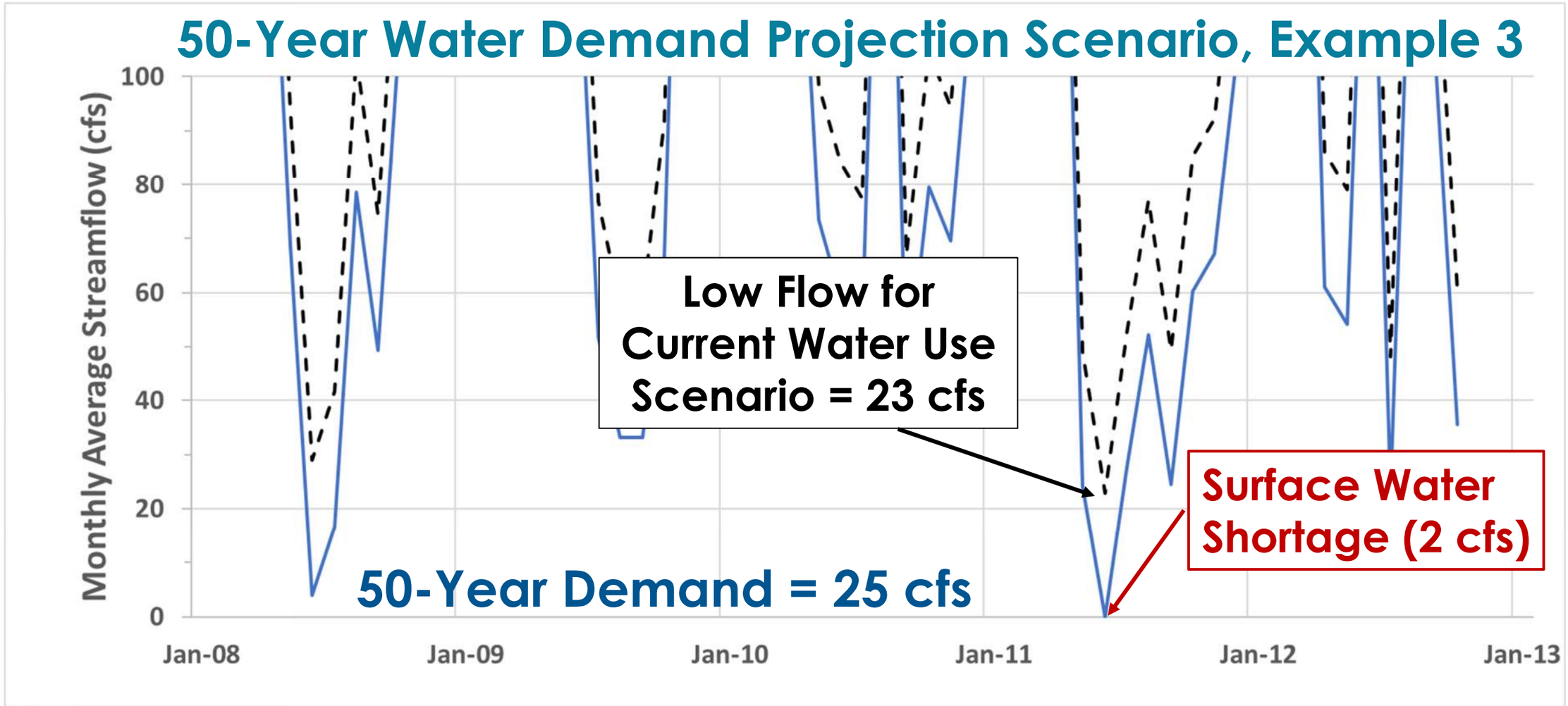
Occurs when the water demand exceeds the Surface Water Supply for any water user in the basin.



- - - Current Demand ——— 50-Year Projected Demand, Example 2

Surface Water Shortage

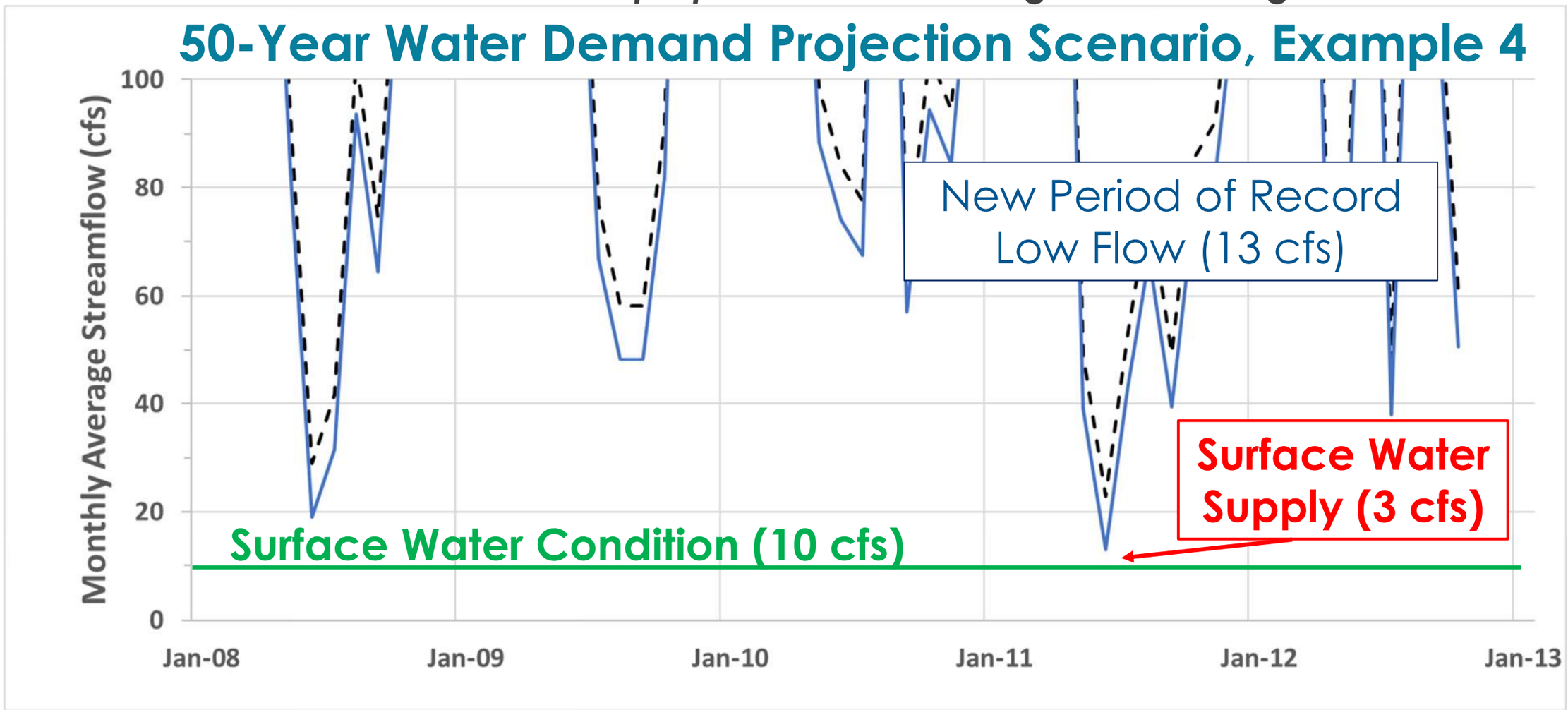
Occurs when the water demand exceeds the Surface Water Supply for any water user in the basin.



--- Current Demand ——— 50-Year Projected Demand, Example 3

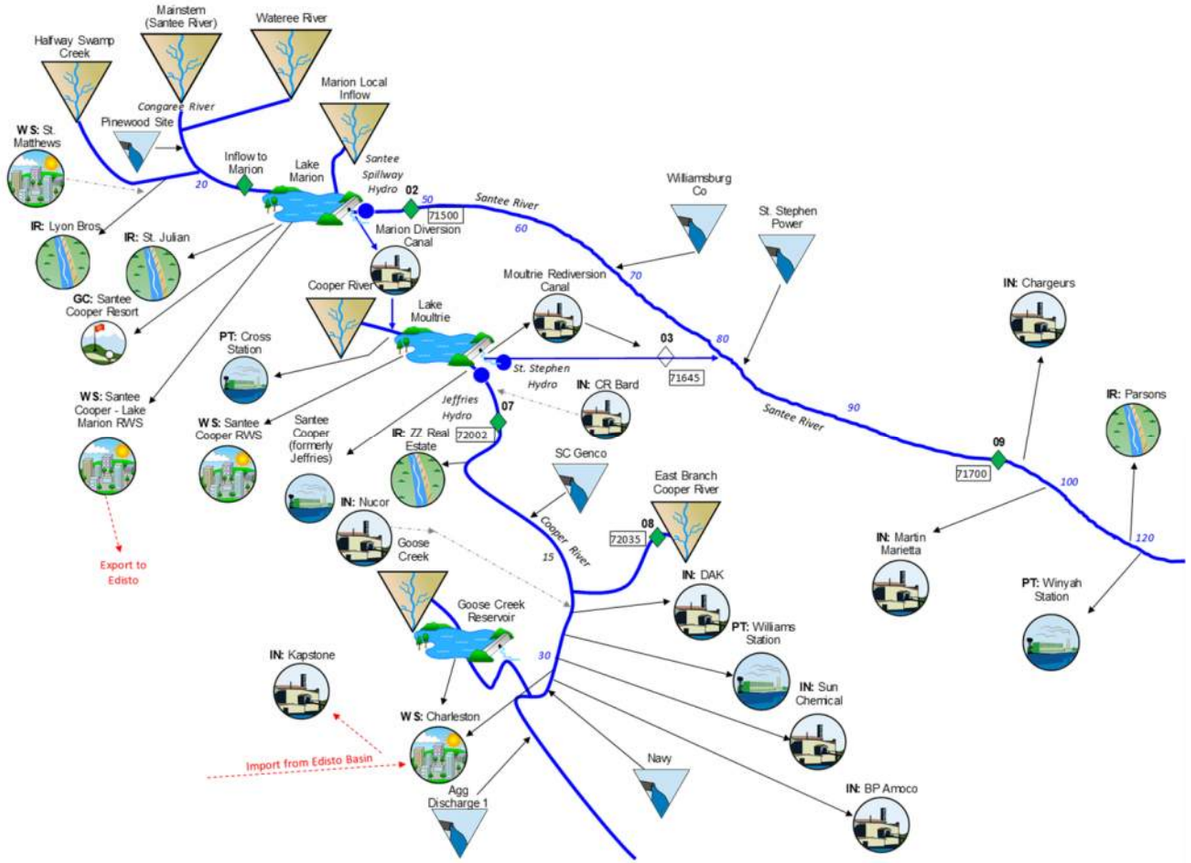
Reach of Interest

A specific stream reach that has no identified Surface Water Shortage but experiences undesired impacts, environmental or otherwise, determined from current or future water-demand scenarios or proposed water management strategies.



Reservoir Safe Yield

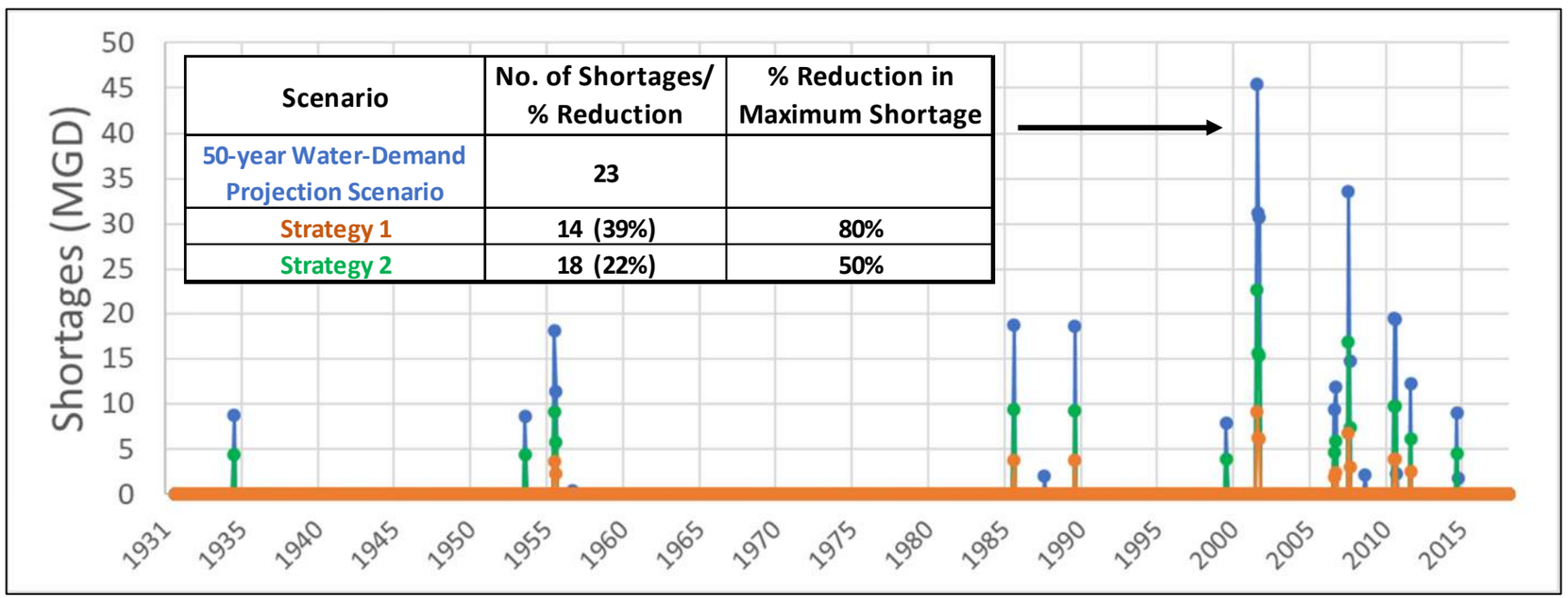
- Defined as "*the Surface Water Supply for a reservoir or system of reservoirs over the simulated hydrologic period of record*".
- Subject to requirements listed in Section 4.3.4 of Planning Framework:
  - Based on shallowest intake (Surface Water Condition) for an essential water use.
  - Based on current reservoir operating rules.
  - Should consider any historical safe yield studies.
- Reservoir Safe Yield should be estimated for Lake Marion and Lake Moultrie.



Performance Measures

To facilitate analyses, RBCs may also:

- Develop **Performance Measures** – quantitative measures of change in user-defined conditions used to assess the performance of a proposed water management strategy or combination of strategies or to compare two water use scenarios.
  - % Change in monthly minimum flow, 5th percentile flow, or 7Q10.
  - % Change in Surface Water Supply.
  - % Change in number and/or magnitude of Surface Water Shortages.

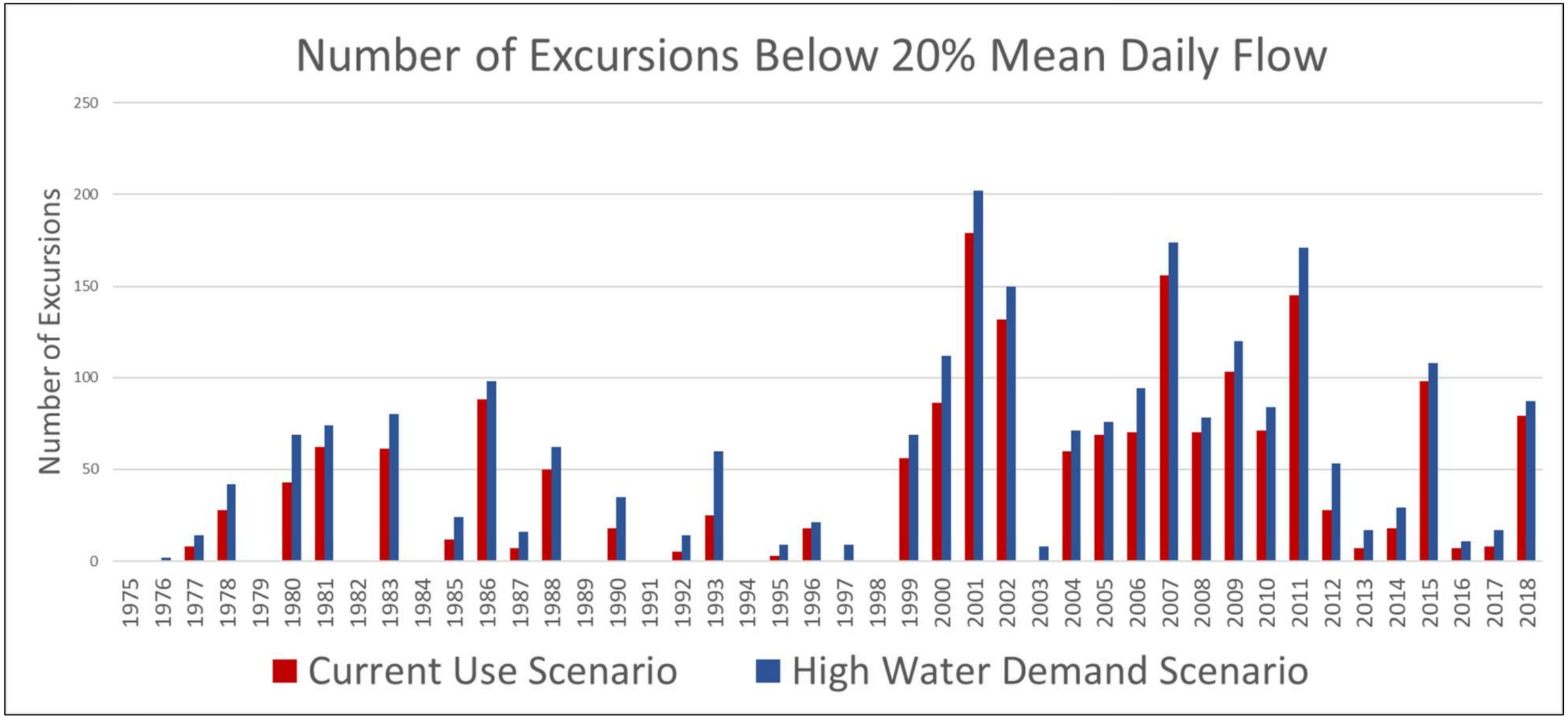


Scenario	No. of Shortages/ % Reduction	% Reduction in Maximum Shortage
50-year Water-Demand Projection Scenario	23	
Strategy 1	14 (39%)	80%
Strategy 2	18 (22%)	50%

Performance Measures – 20/30/40 Example

- SCDNR Instream flow policy:
  - Based on studies completed in the 1980s by Water Resources Commission and updated by SCDNR in 2009.
  - Coastal Plain:
    - 20% Mean Daily Flow (MDF): July – November
    - 40% MDF: May, June, December
    - 60% MDF: January – April
  - Piedmont:
    - 20% Mean Daily Flow (MDF): July – November
    - 30% MDF: May, June, December
    - 40% MDF: January – April
- Minimum Instream Flow defined as the 20-30-40 MDF in Surface Water Withdrawal, Permitting, Use and Reporting Act (applies statewide).

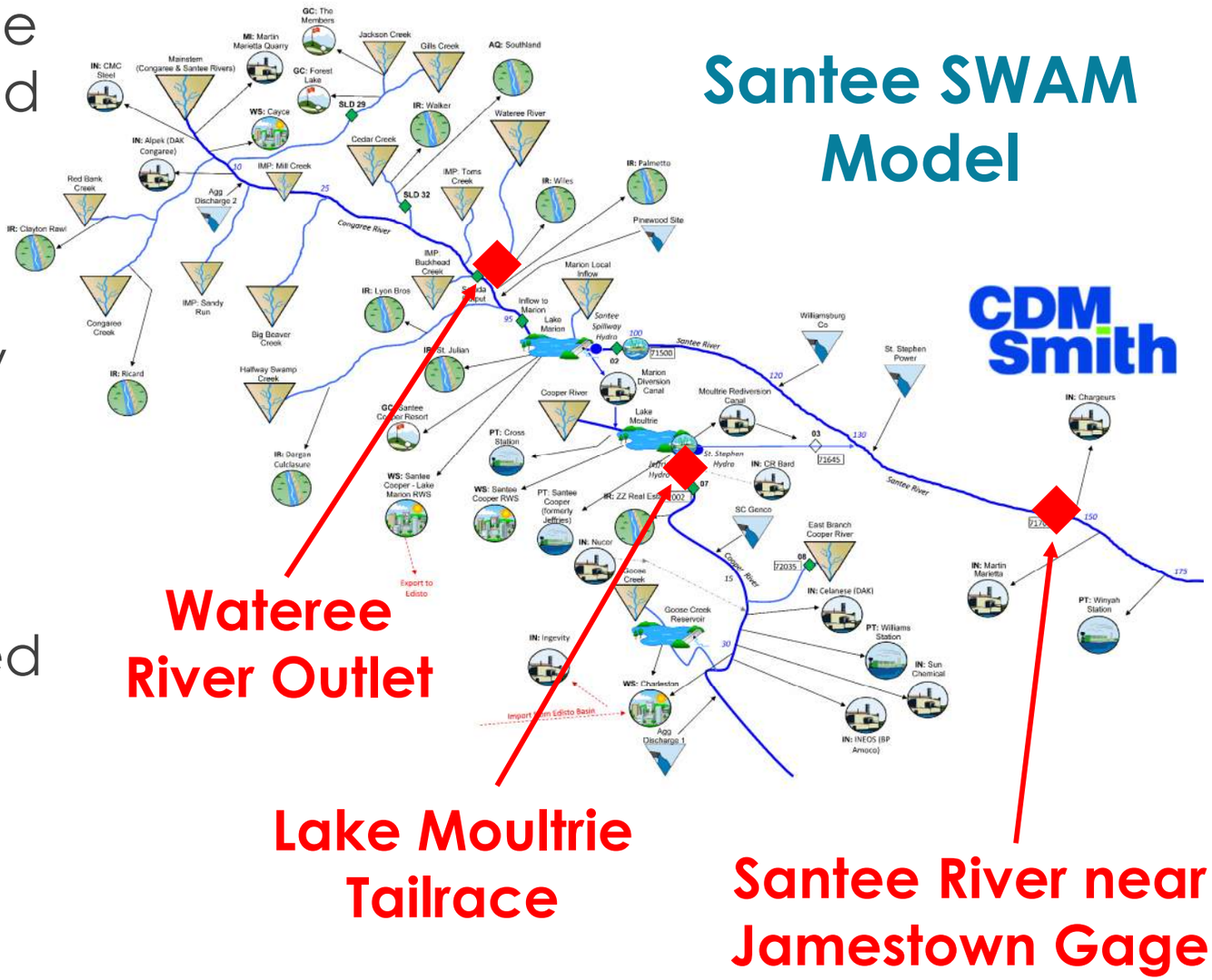
Performance Measures Example



Plot is for illustrative purposes only!

Strategic Nodes

- Definition: a location on a surface water body or aquifer designated to evaluate the cumulative impacts of water management strategies for a given model scenario and serves as a primary point of interest from which to evaluate a model scenario's *Performance Measures*.
- Designated by RBC and designed to facilitate analyses.
- Examples:
  - USGS streamflow gage locations
  - Outlets of tributaries of interest



Surface Water-Demand Scenarios

Surface Water-Demand Scenarios

- Planning Framework requires 4 scenarios to be reviewed by each RBC:
  1. Current Surface Water Use
  2. Permitted and Registered Water Use
  3. Moderate Water-Demand Projection
  4. High Water-Demand Projection
- Optional scenario – simulation of unimpaired surface water hydrology.
- Scenarios focus on "water-demand" side as opposed to "water-supply" side.
- RBC can recommend additional water-demand scenarios:
  - Based on different assumptions used in existing projections (more aggressive growth rates, for example).

Process for Evaluating Surface Water Availability

- With the support of CDM Smith, RBC will designate:
  - Surface Water Conditions, if any.
  - Performance Measures.
  - Strategic Nodes.
- For each future water use scenario, use the SWAM model to:
  - Determine Surface Water Supply at nodes of interest.
  - Identify Surface Water Shortages.
  - Designate Reaches of Interest, if any.
- Develop Surface Water Management Strategies and use the SWAM model to evaluate each strategy or combination of strategies.
  - **Surface Water Management Strategy** – any *water management strategy proposed to eliminate a Surface Water Shortage, reduce a Surface Water Shortage, or generally increase Surface Water Supply*.
    - Examples: conservation measures, new supplies, conjunctive use etc.
    - Effectiveness and feasibility of each strategy will be evaluated.

River Basin Plan will document Surface Water Supply, Shortages, Reaches of Interest, and recommended Surface Water Management Strategies.

Questions?

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