Methodologies For Evaluating Water Availability

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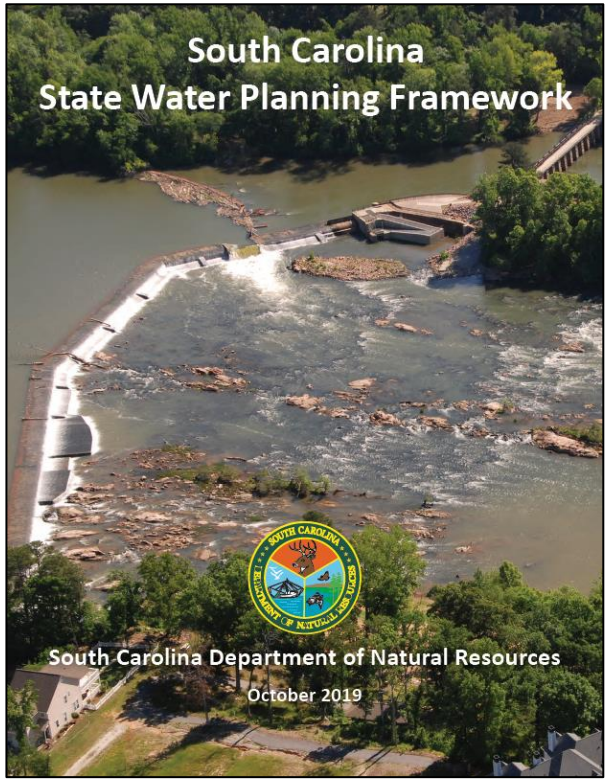
Methods for Evaluating Water Availability

- 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.



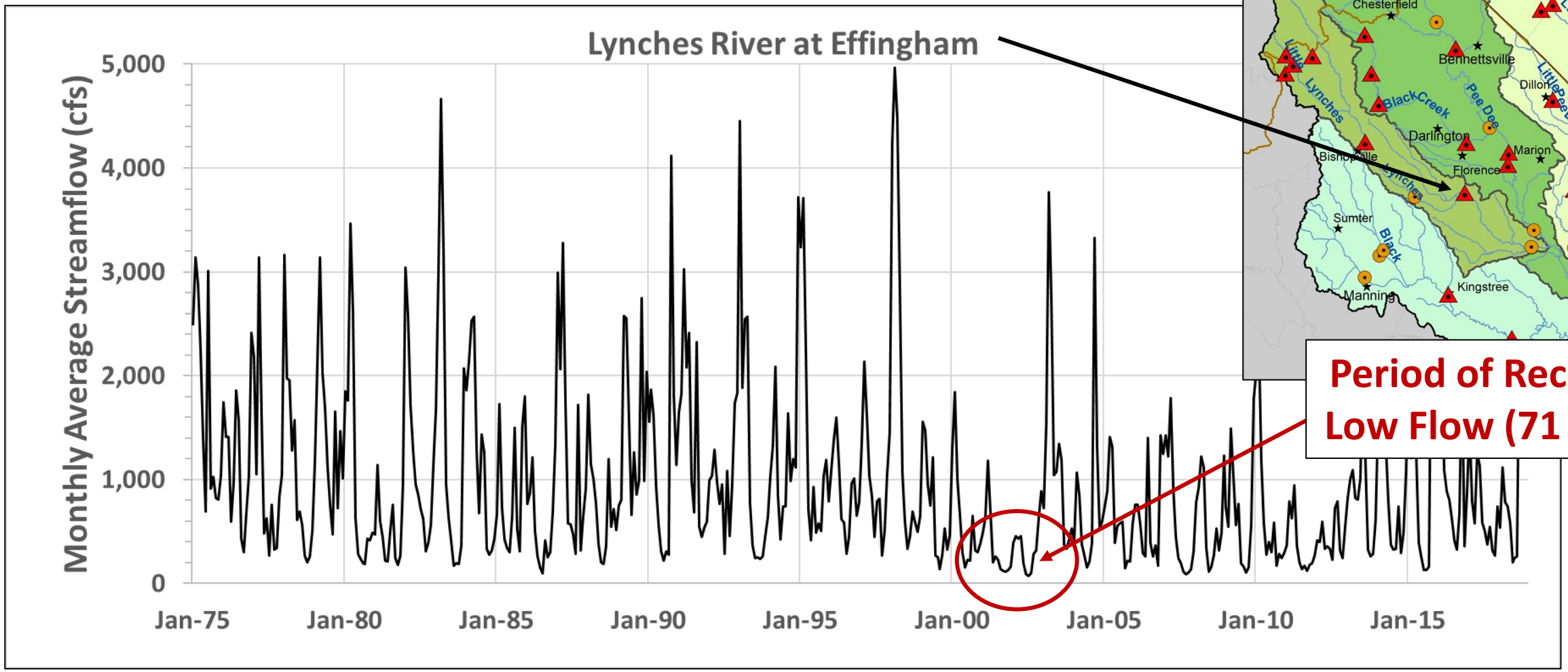
Big Picture – this is a gap analysis; the RBC will be determining where and when demand exceeds supply under varying demand scenarios and deciding how to manage water to close the gaps.

Surface Water Availability Terminology

- 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  - **Surface Water Condition** – a physical limitation on the amount of water that can be withdrawn from a surface water source and is independent of water demand.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 – Lynches River at Effingham

Current Surface Water Use Scenario – Simulated Flows

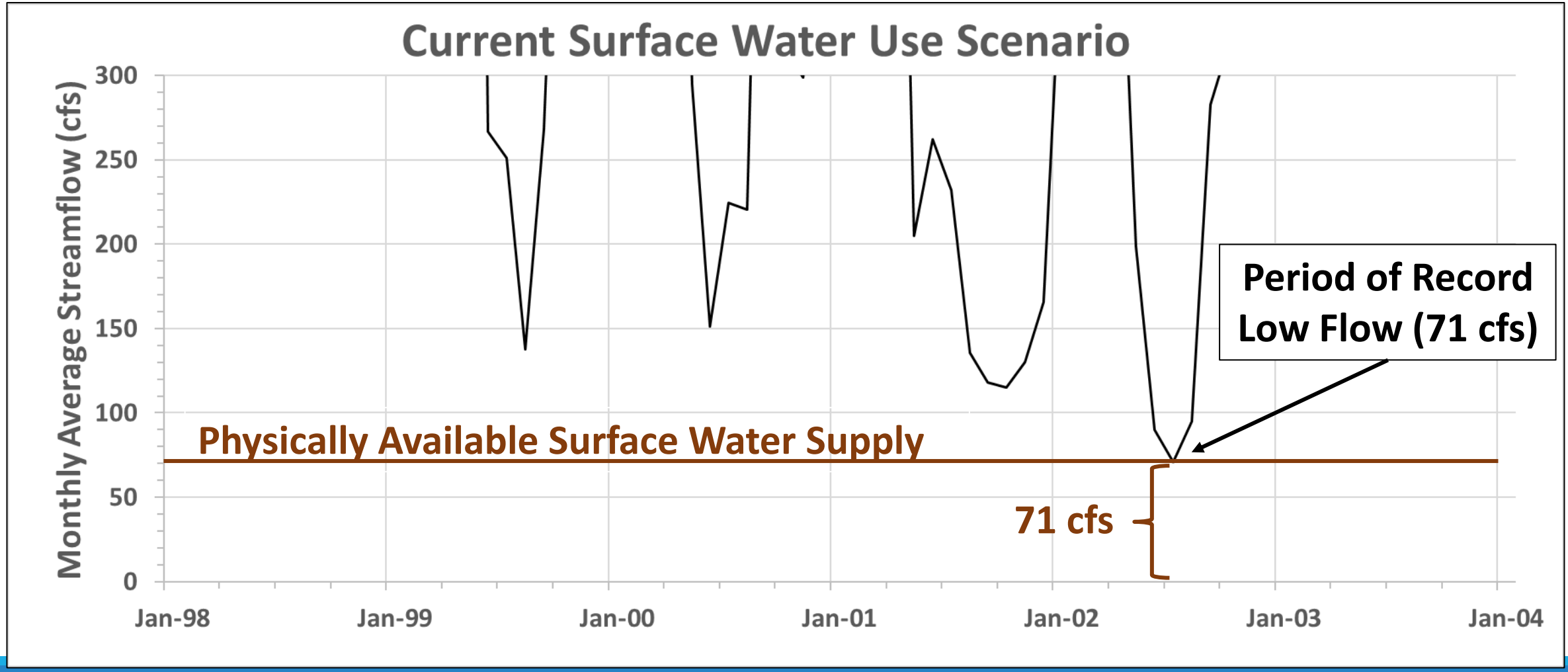


Period of Record Low Flow (71 cfs)

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

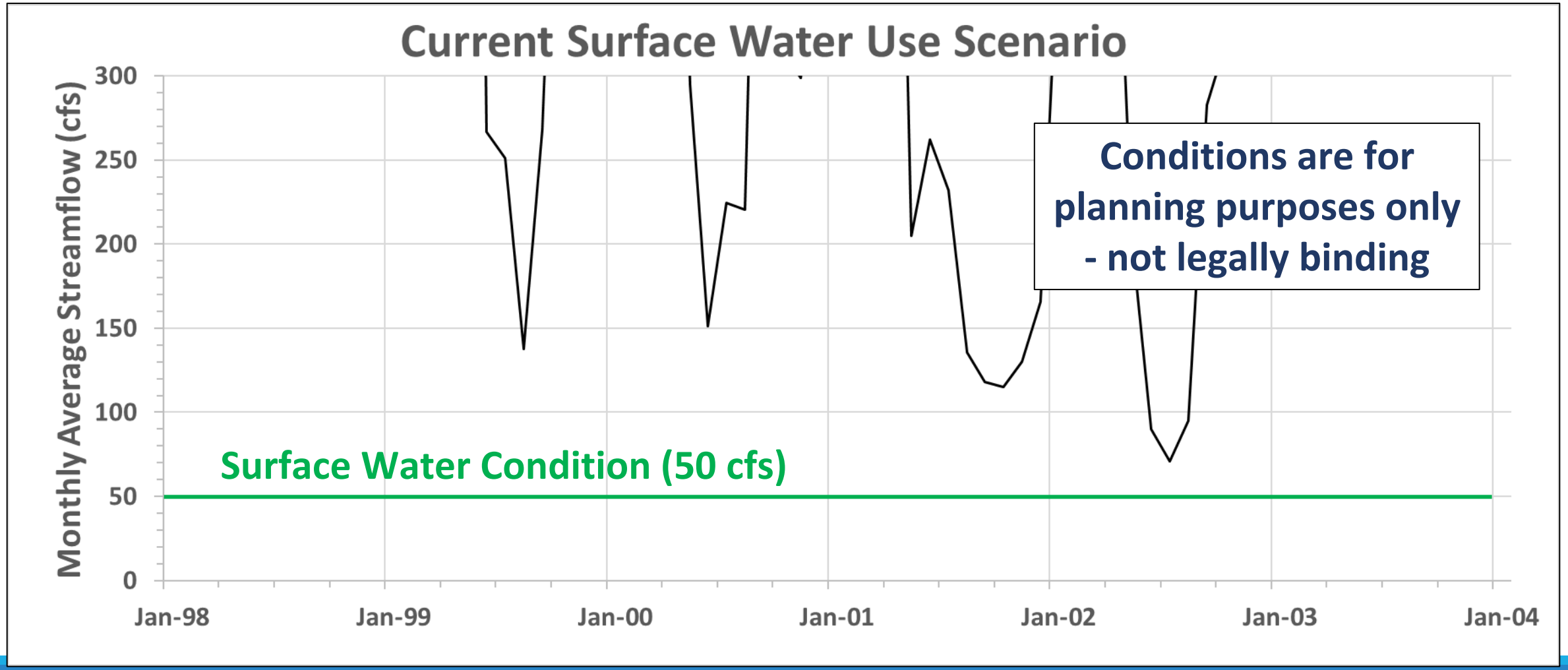
Physically Available Surface Water Supply

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

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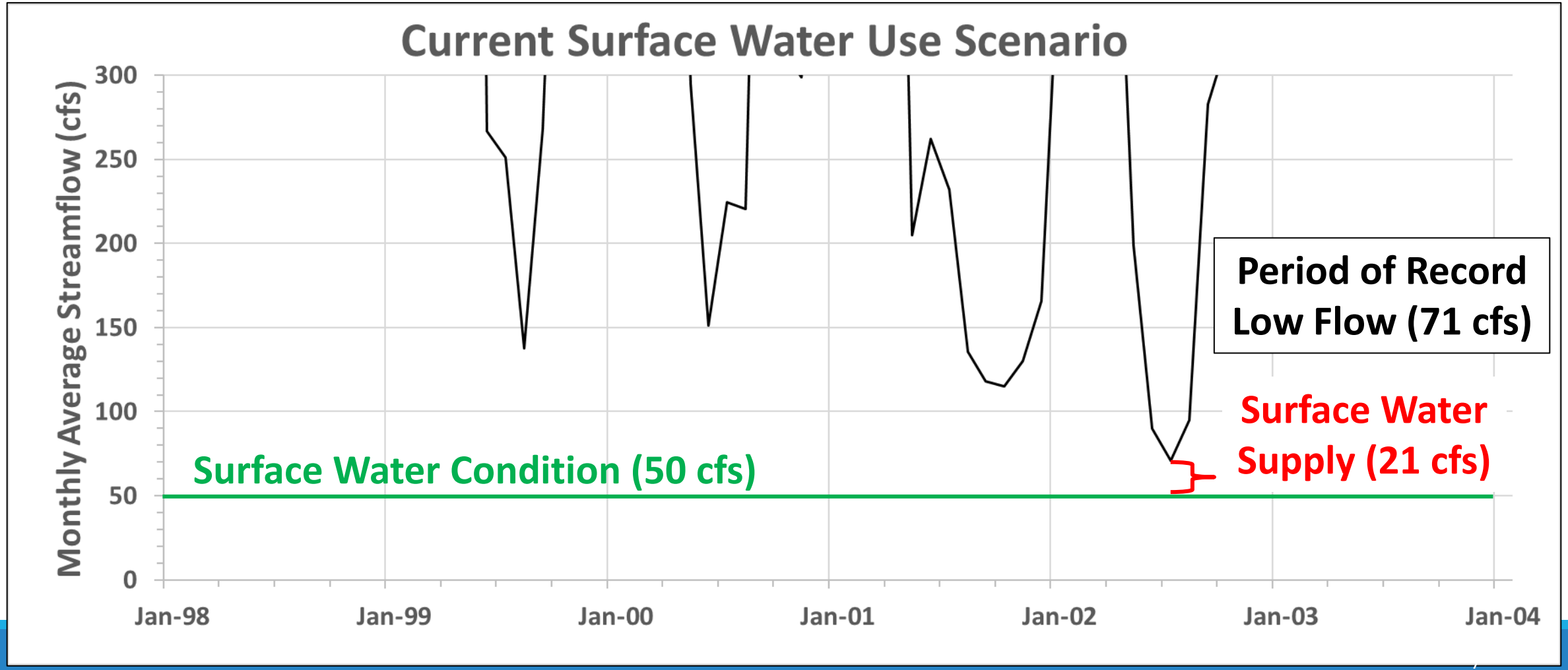
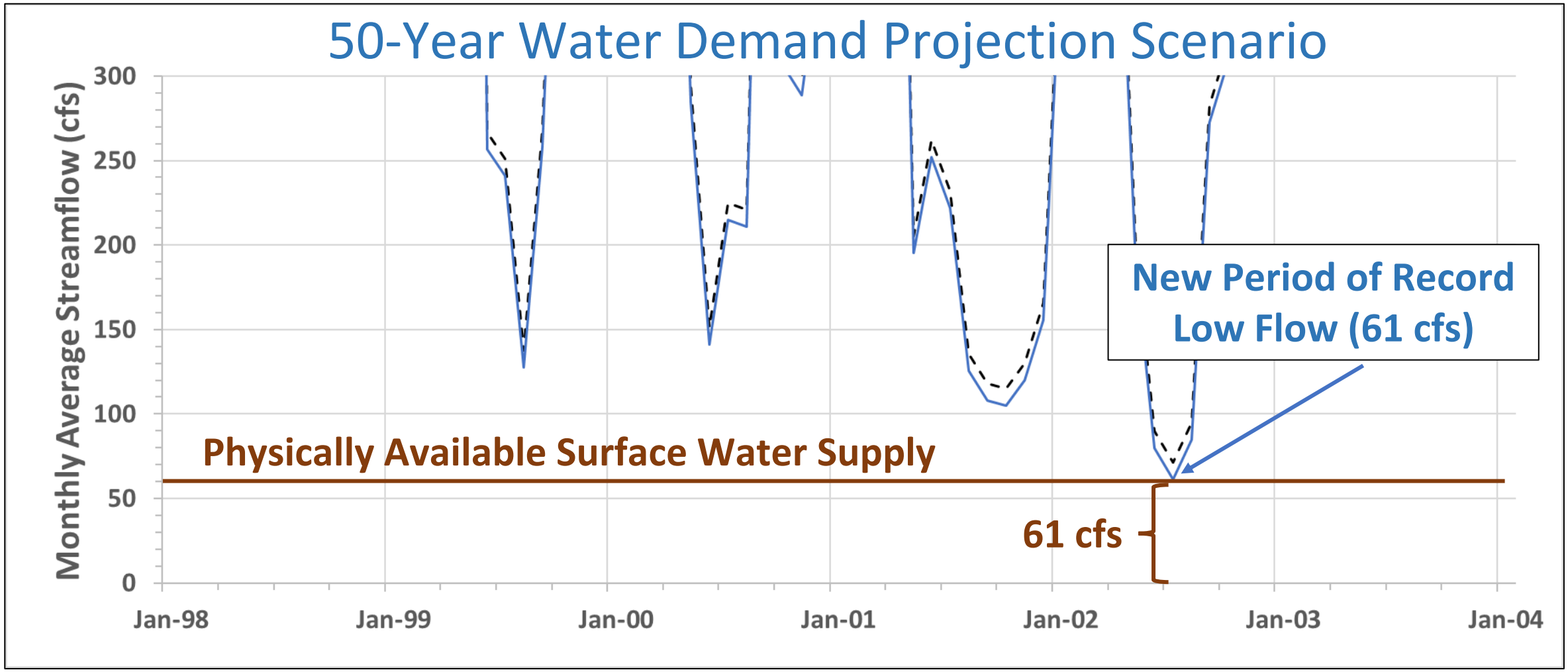
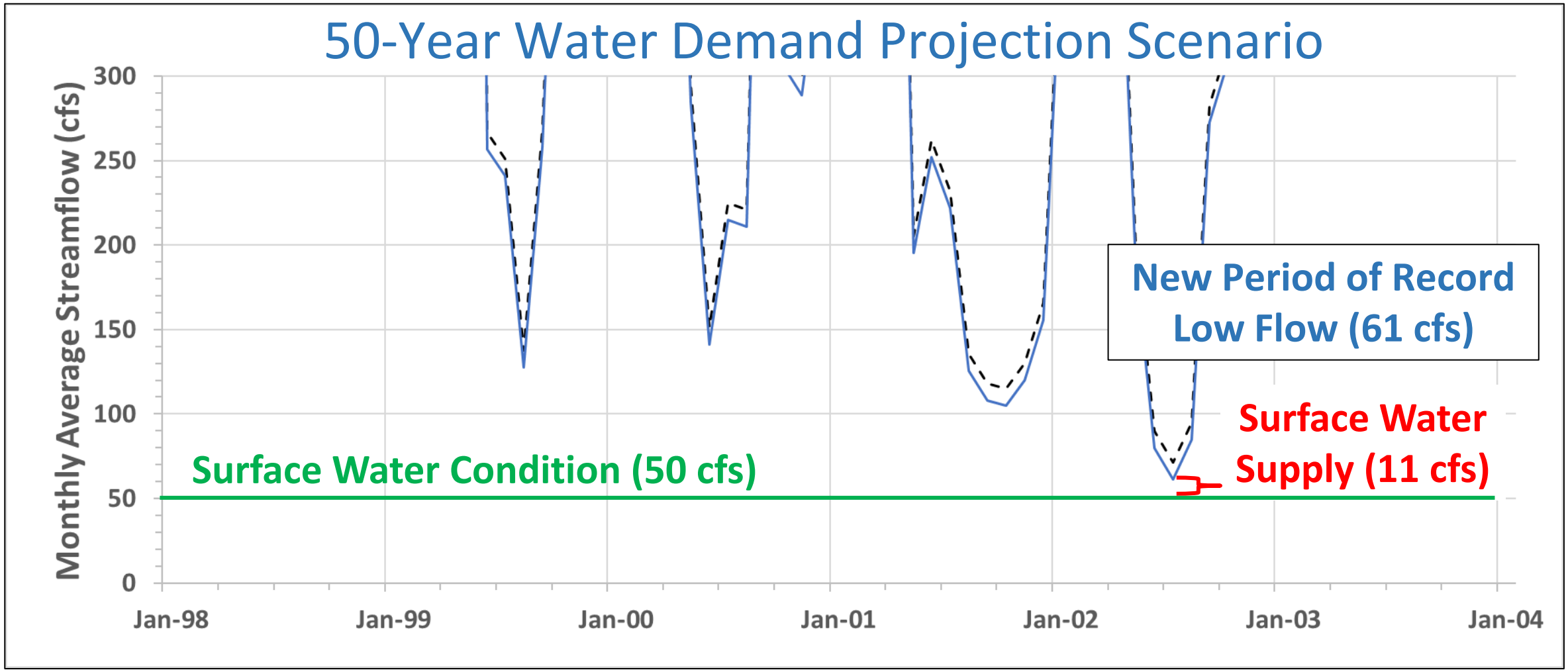


Increased Demand Reduces Physically Available Surface Water Supply



- - - - Current Surface Water Demand ——— 50-Year Projected Demand

Increased Demand Reduces Surface Water Supply



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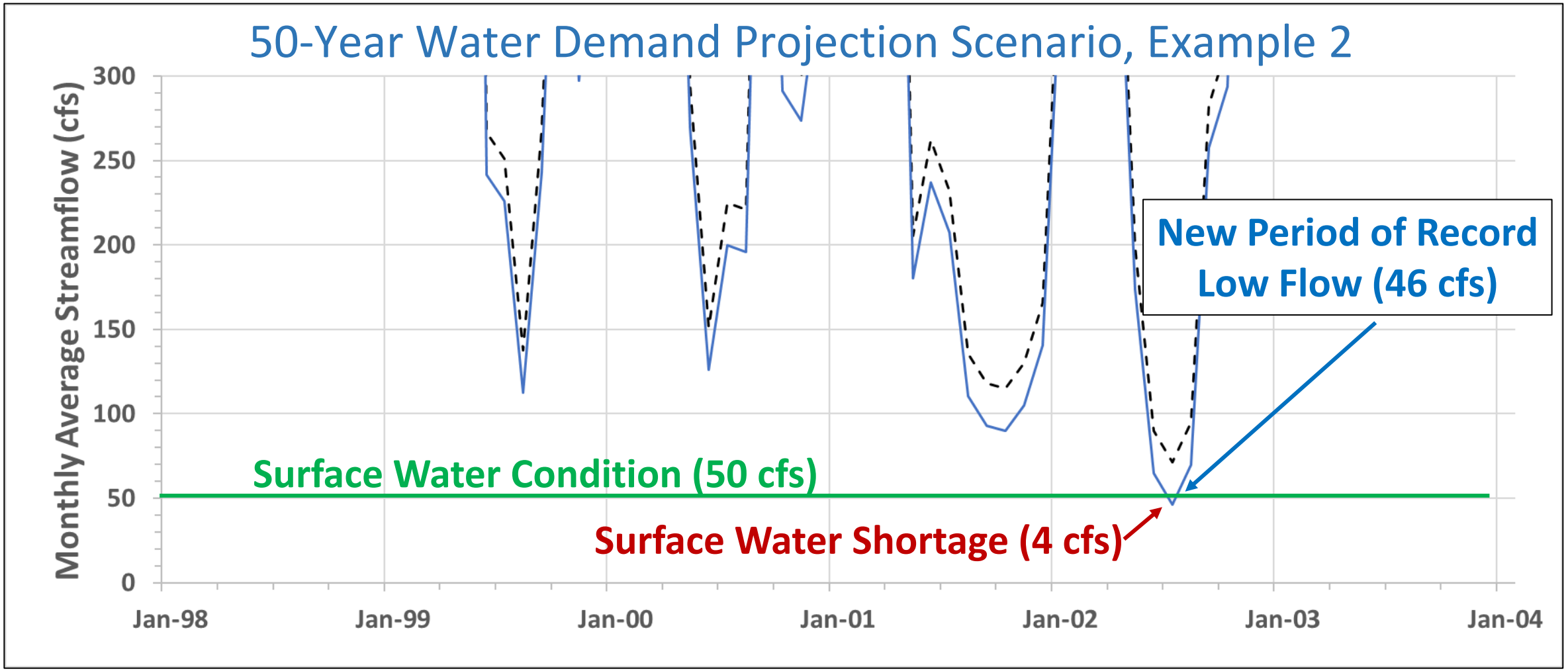
Surface Water Shortage

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



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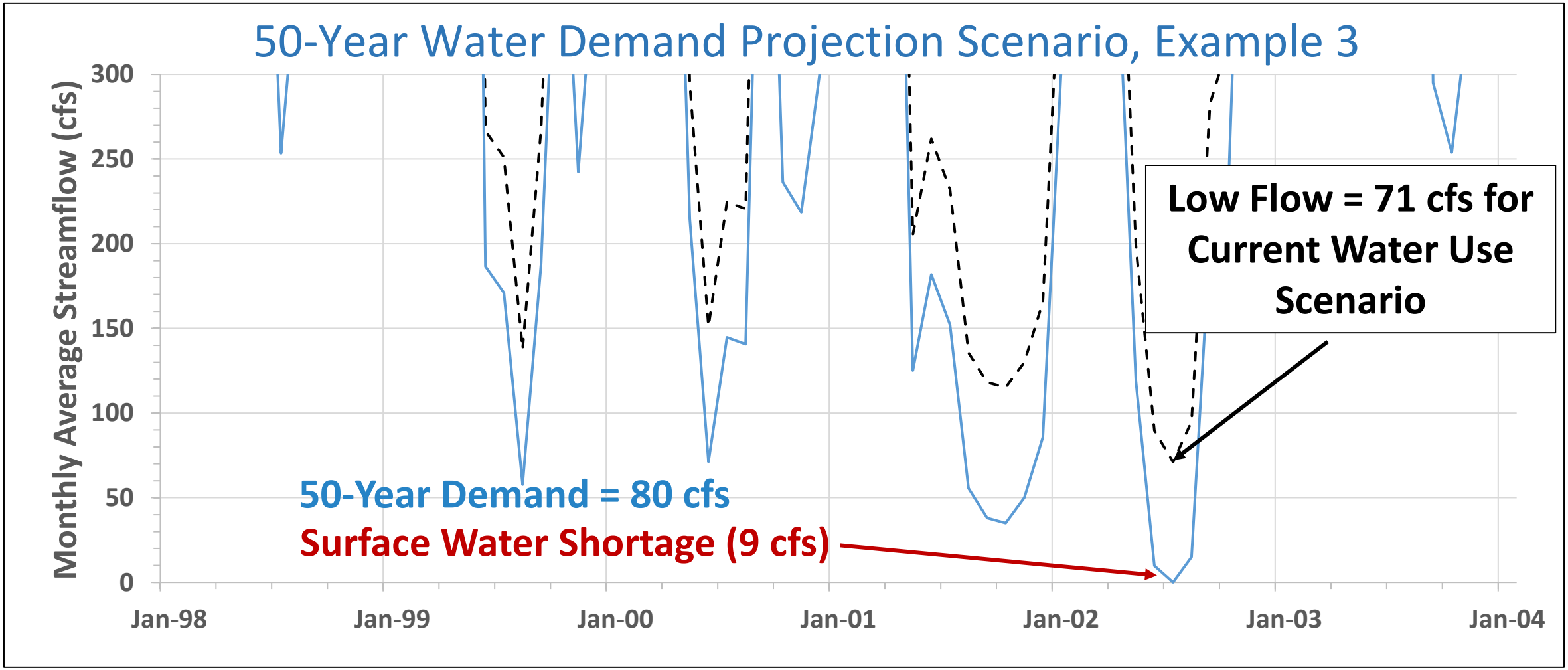
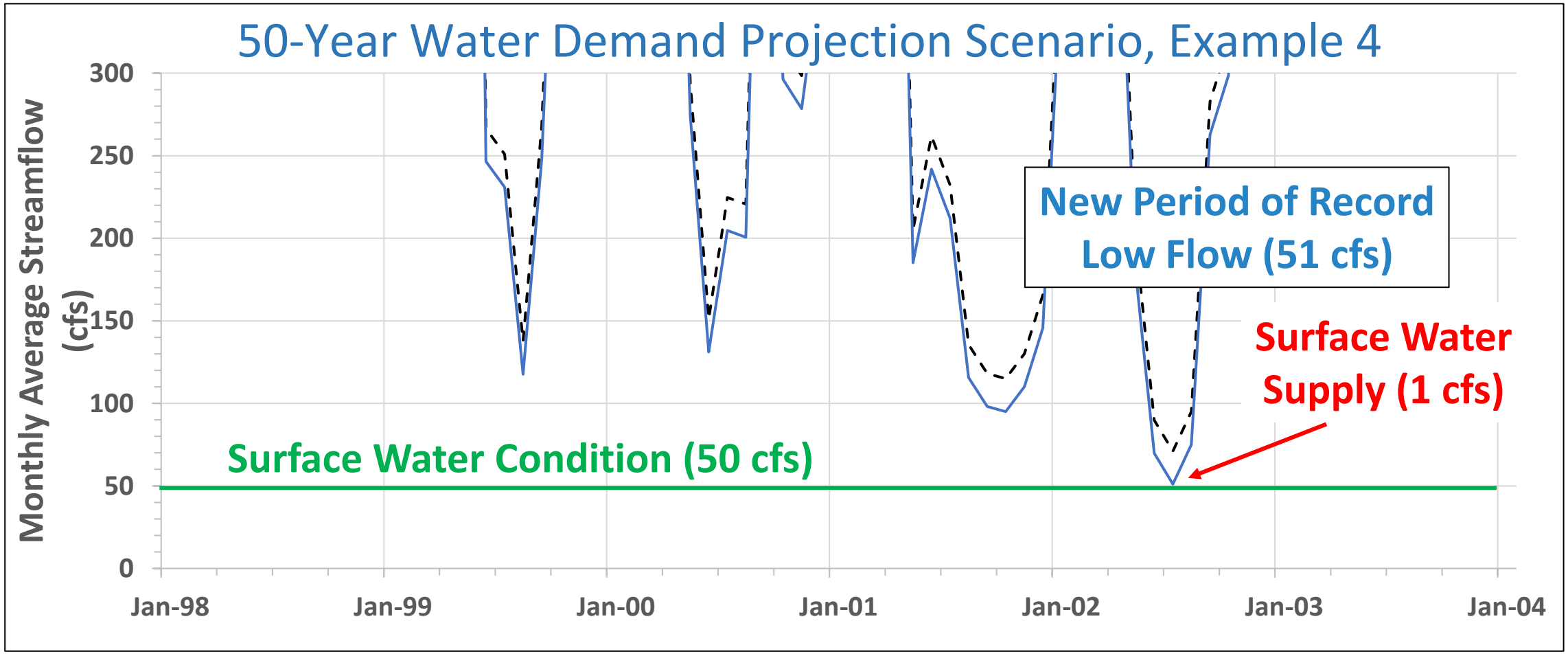


Reach of Interest

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.

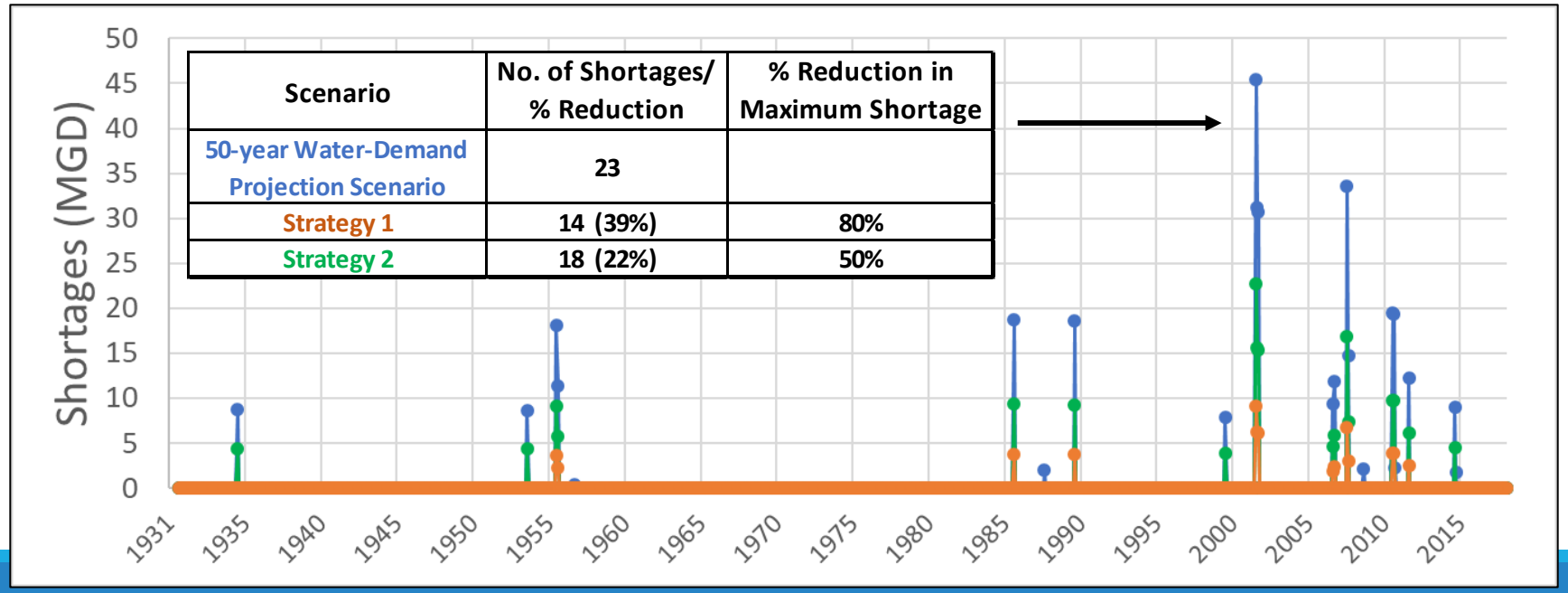


Current Surface Water Demand — 50-Year Projected Demand, Example 4

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 or 5th percentile flow.
  - % Change in Surface Water Supply.
  - % Change in number and/or magnitude of Surface Water Shortages.
  - Impacts on Regulatory Minimum Instream Flow (20-30-40% MDF).

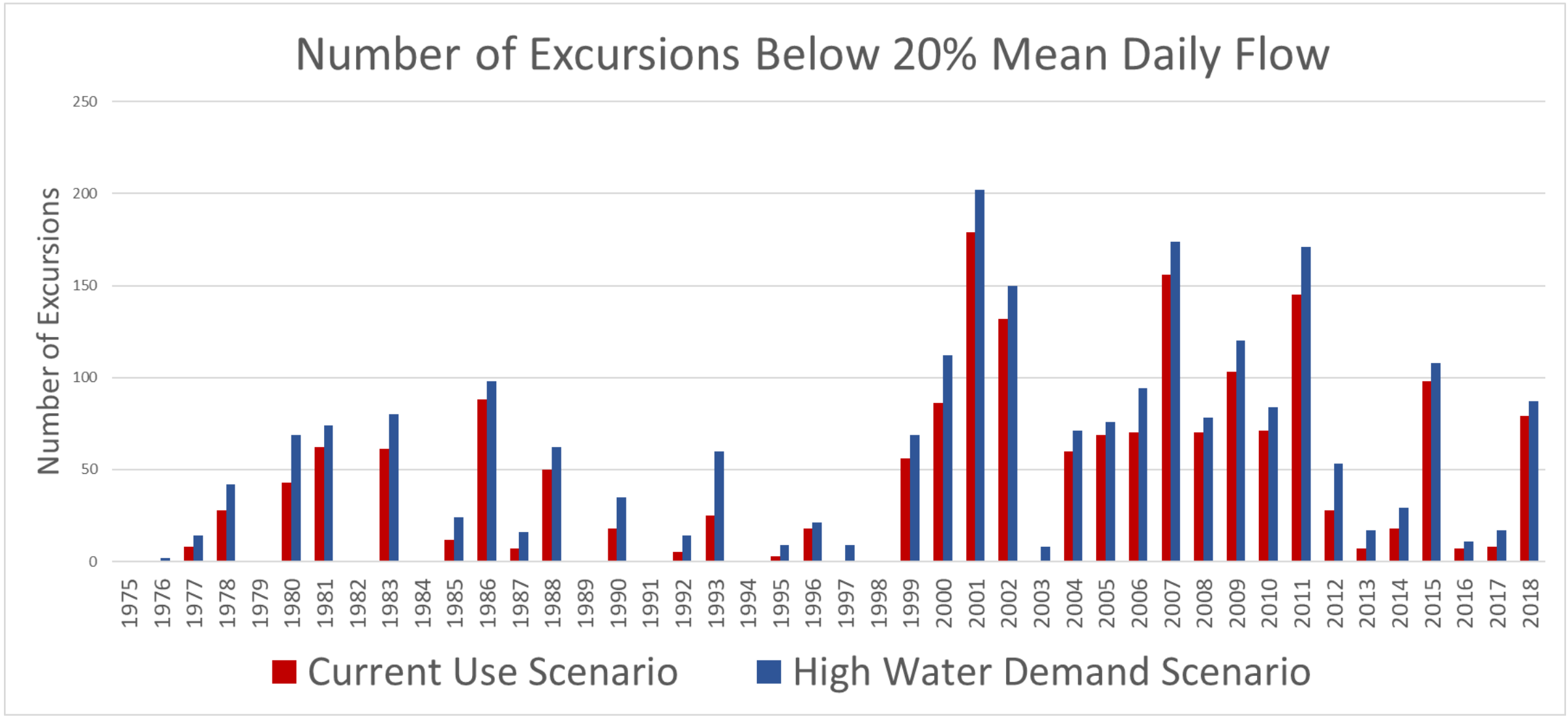


Scenario	No. of Shortages/ % Reduction	% Reduction in Maximum Shortage
50-year Water-Demand Projection Scenario	23	
Strategy 1	14 (39%)	80%
Strategy 2	18 (22%)	50%

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).

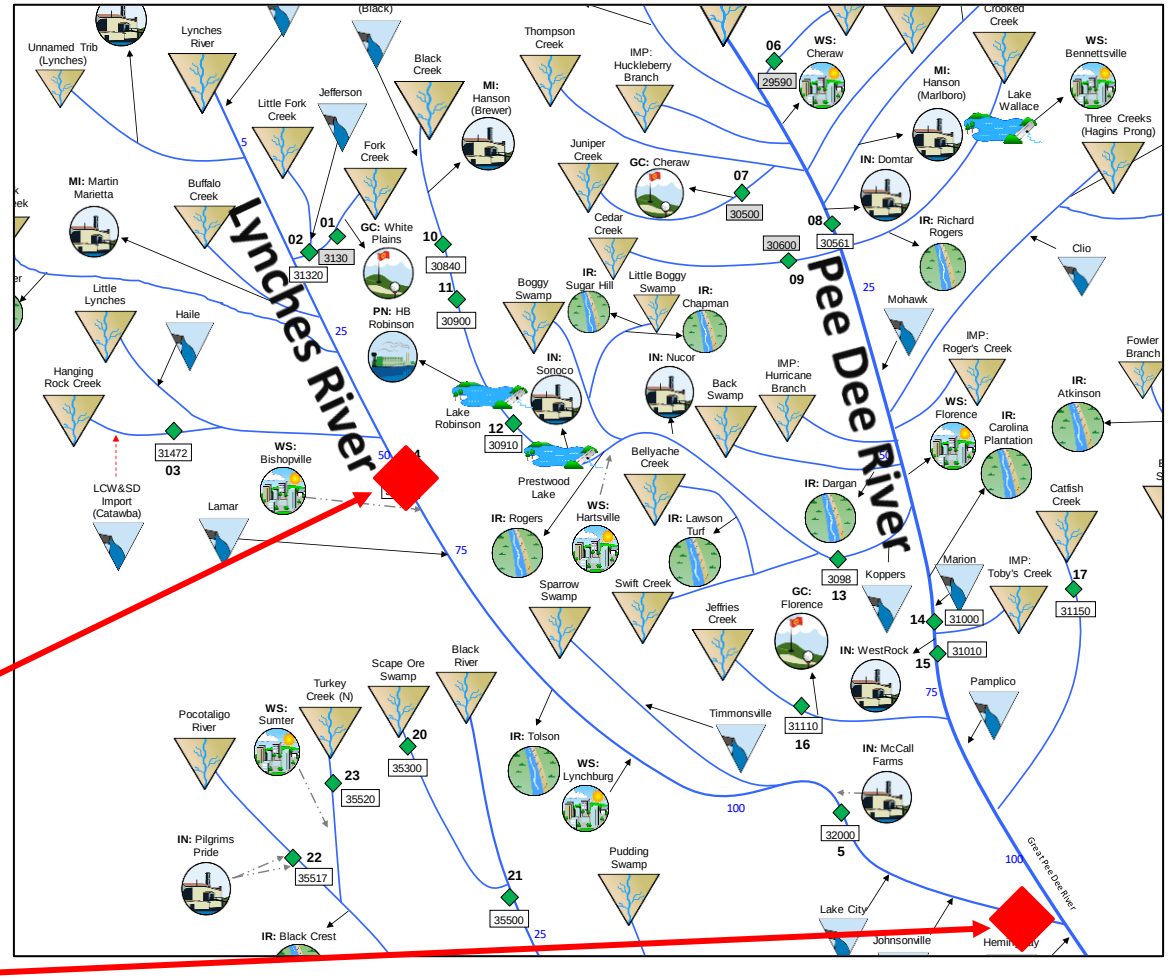
Minimum Instream Flow Performance Measure



Plot is for illustrative purposes only!

Strategic Nodes

- Designated by RBC and designed to facilitate analyses.
- 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*.
- Examples:
  - USGS streamflow gage locations.
  - Outlets of tributaries of interest.



Lynches River at Effingham Gage

Lynches River Outlet

Surface Water Demand Scenarios

Surface Water Demand Scenarios

- Planning Framework requires four scenarios to be reviewed by each RBC:
  1. Current Surface Water Use.
  2. Permitted and Registered Water Use Scenario.
  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.
- Additional water demand scenarios can be recommended by the RBC:
  - Based on different assumptions used in existing projections (more aggressive growth rates, for example).
  - New water-demand projection scenarios must be submitted to SCDNR in writing by the RBC for consideration.

Current Surface Water Use Scenario

- Demand based on “current” water use defined as recent 10-year average (2010-2019) of reported water use.
- Simulates Surface Water Supply and Shortages resulting from a repeat of the historic drought of record under current withdrawals.
- Shortages would highlight the need for *short-term planning*.

Permitted and Registered Water Use Scenario

- Water demand based on maximum legally allowable water use for surface water permits and registrations.
- Identifies shortages that would occur under a repeat of the drought of record under maximum legally allowable withdrawals.
- Addresses whether surface water source is currently over-allocated.
- Surface Water Supply estimated under this scenario denotes unallocated available water.

Water Demand Projection Scenarios

- Provide information on when and where shortages are likely to occur.
  - 50-year Planning Horizon.
  - Simulations completed in 5- to 10-year intervals.
- Two Scenarios:
  - **Moderate Water-Demand Projection Scenario** – demand based on projection of water use assuming normal climate and moderate population and economic growth.
  - **High Water-Demand Projection Scenario** – demand based on projection of water use assuming drier conditions and high population and economic growth.
- High Water-Demand Scenario – **Planning Scenario**:
  - Set of water use data for the Planning Horizon used to develop management strategies.
  - Defines Surface Water Supply when no Surface Water Shortages are identified.
  - RBC must consider shortages under this scenario when developing Surface Water Management Strategies.

Process for Evaluating Surface Water Availability

- With the support CDM Smith (SW Technical Support Contractor), RBC will designate:
  - Surface Water Conditions, if any
  - Performance Measures
  - Strategic Nodes
- For each future water use scenario, run the SWAM model with support from CDM Smith 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.

Summary

- Reviewed key terms and definitions associated with surface water availability analyses:
  - Physically Available Surface Water Supply
  - Surface Water Condition
  - Surface Water Supply
  - Surface Water Shortage
  - Reaches of Interest
- As part of water availability analysis, RBCs will need to determine:
  - Surface Water Conditions, if any
  - Performance Measures
  - Locations of Strategic Nodes
- Four future water use scenarios will be evaluated by the RBC:
  - Current Water Use
  - Permitted and Registered Water Use
  - Moderate Water Demand Projection
  - High Water Demand Projection

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