# Methodologies For Evaluating Water Availability

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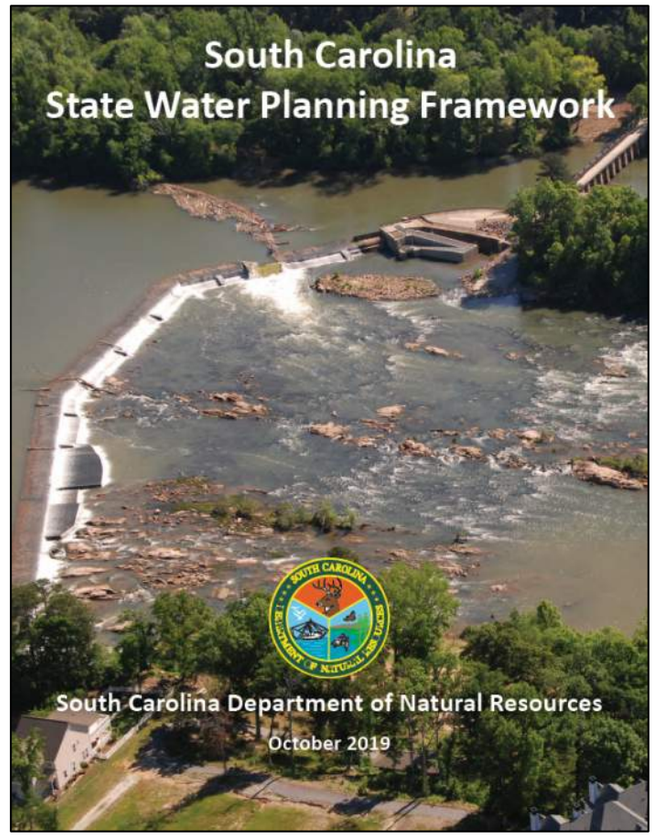
# Methods for Evaluating Water Availability

- 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.

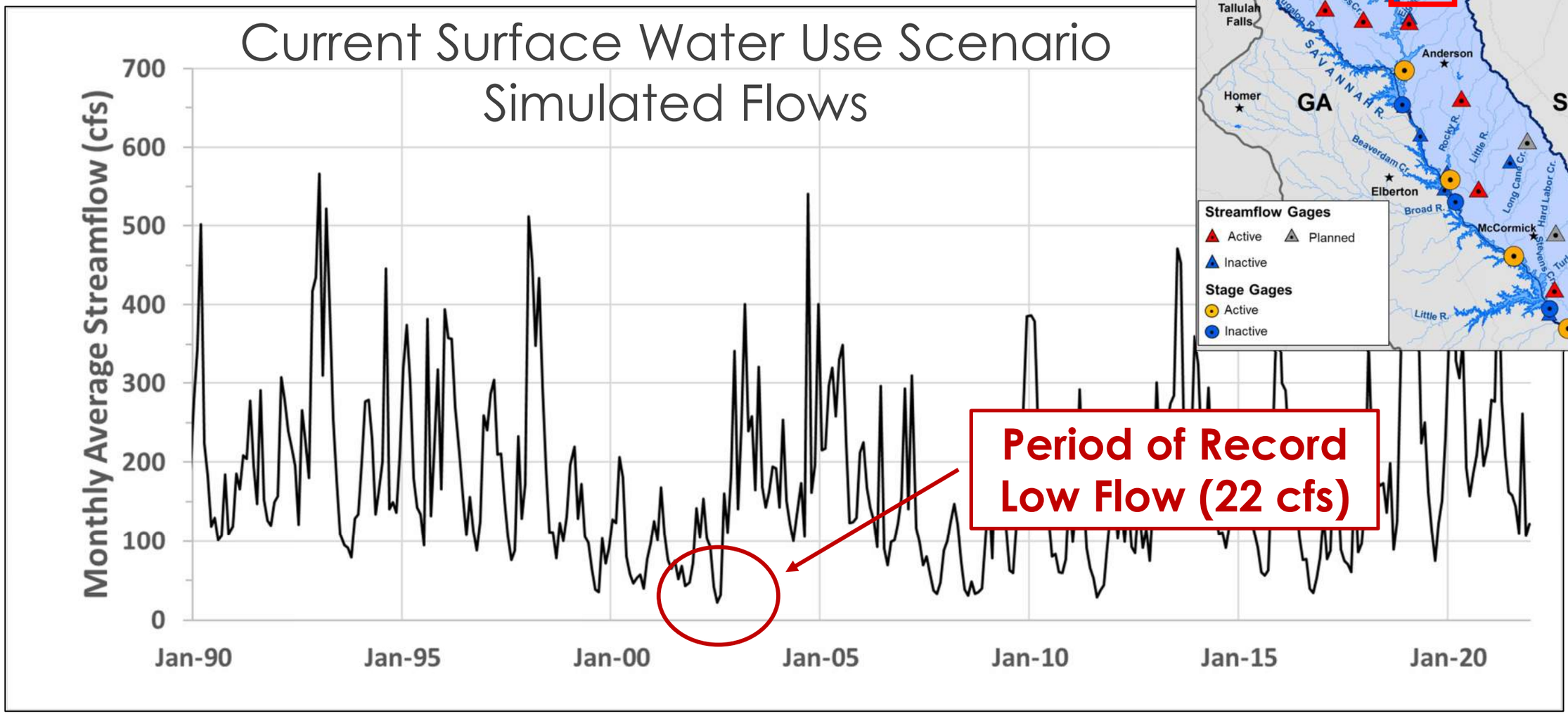



*Big Picture – this is a gap analysis; the RBC will be determining where and when demand exceeds supply under varying demand scenarios and deciding how to manage water to close the gaps.*

# 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  - **Surface Water Condition** – a physical limitation on the amount of water that can be withdrawn from a surface water source and is independent of water demand.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 – Twelvemile Creek Near Liberty







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

# Physically Available Surface Water Supply

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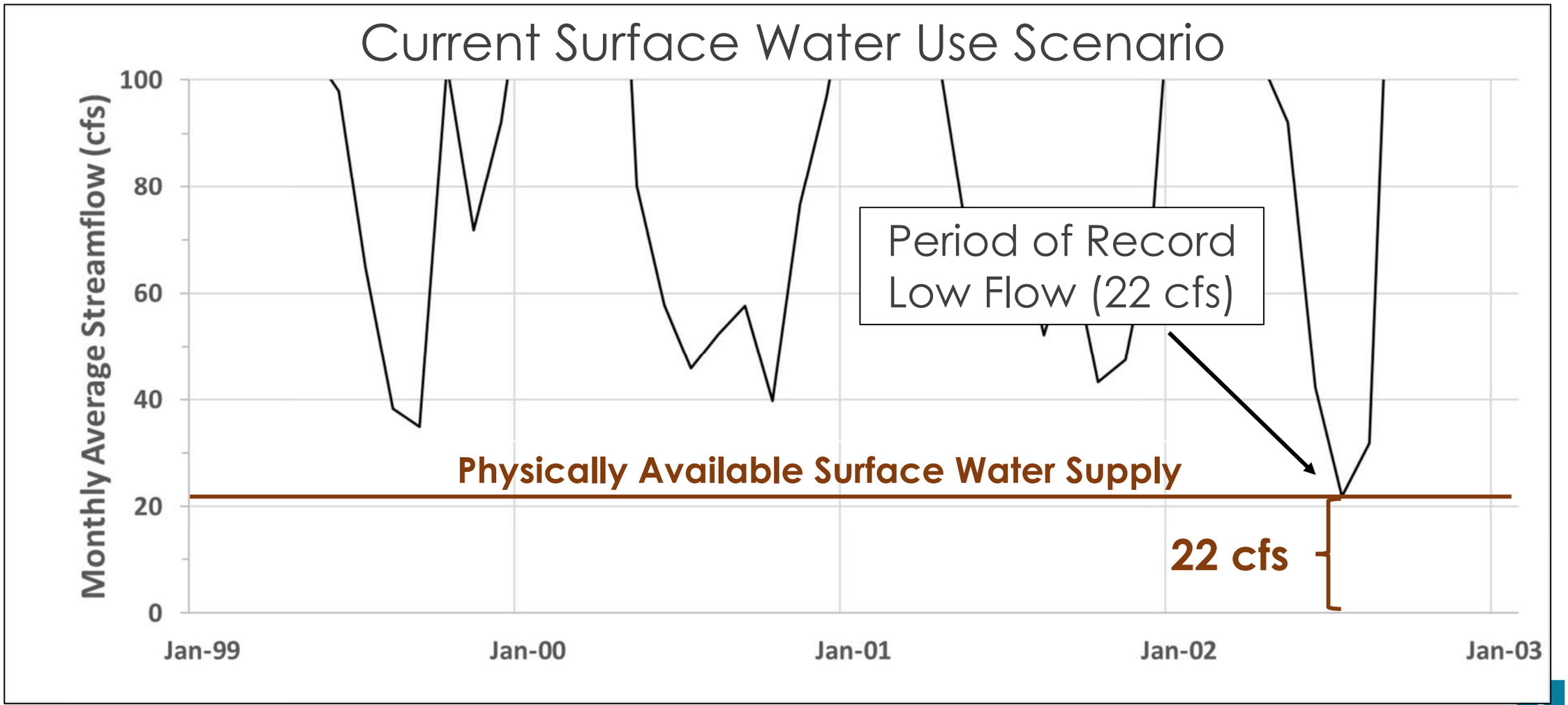
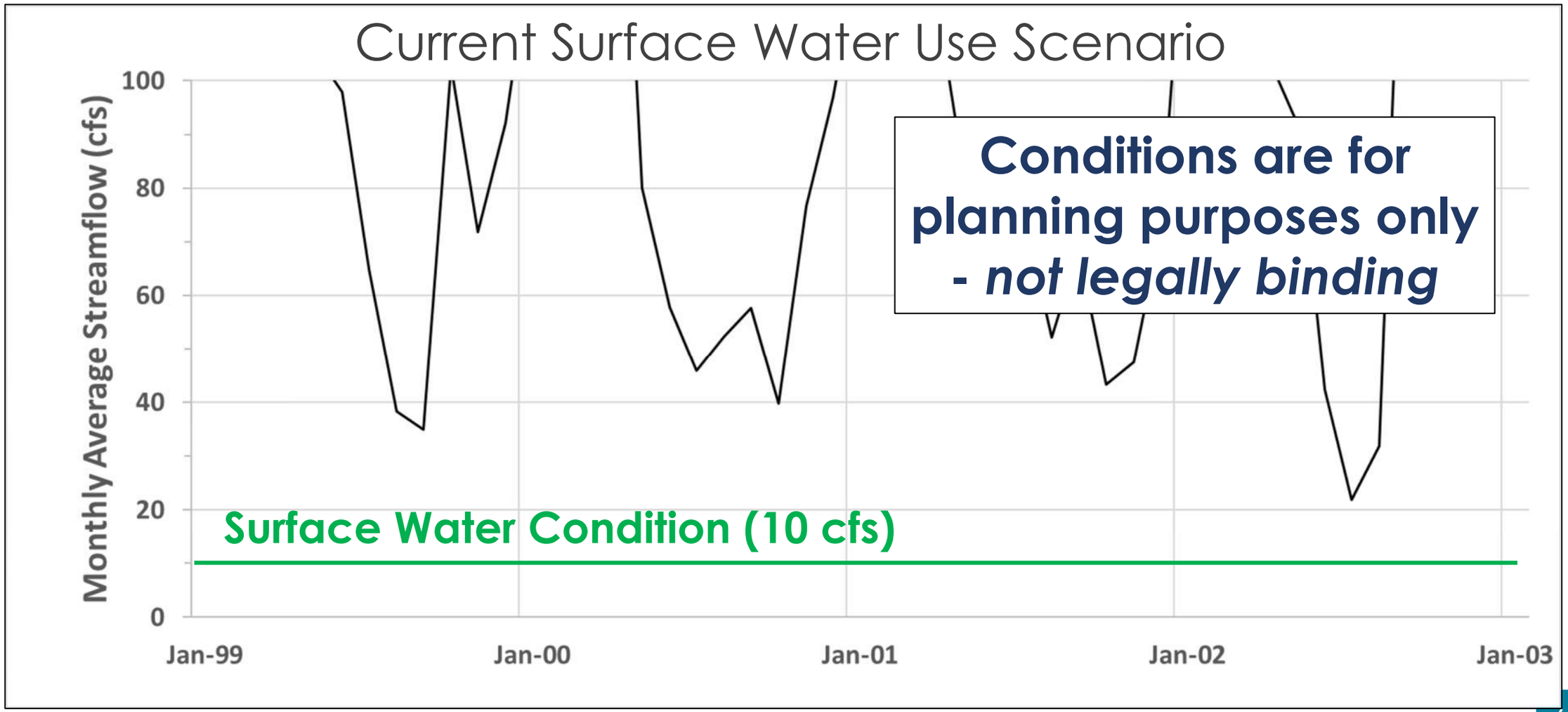


# Surface Water Conditions

***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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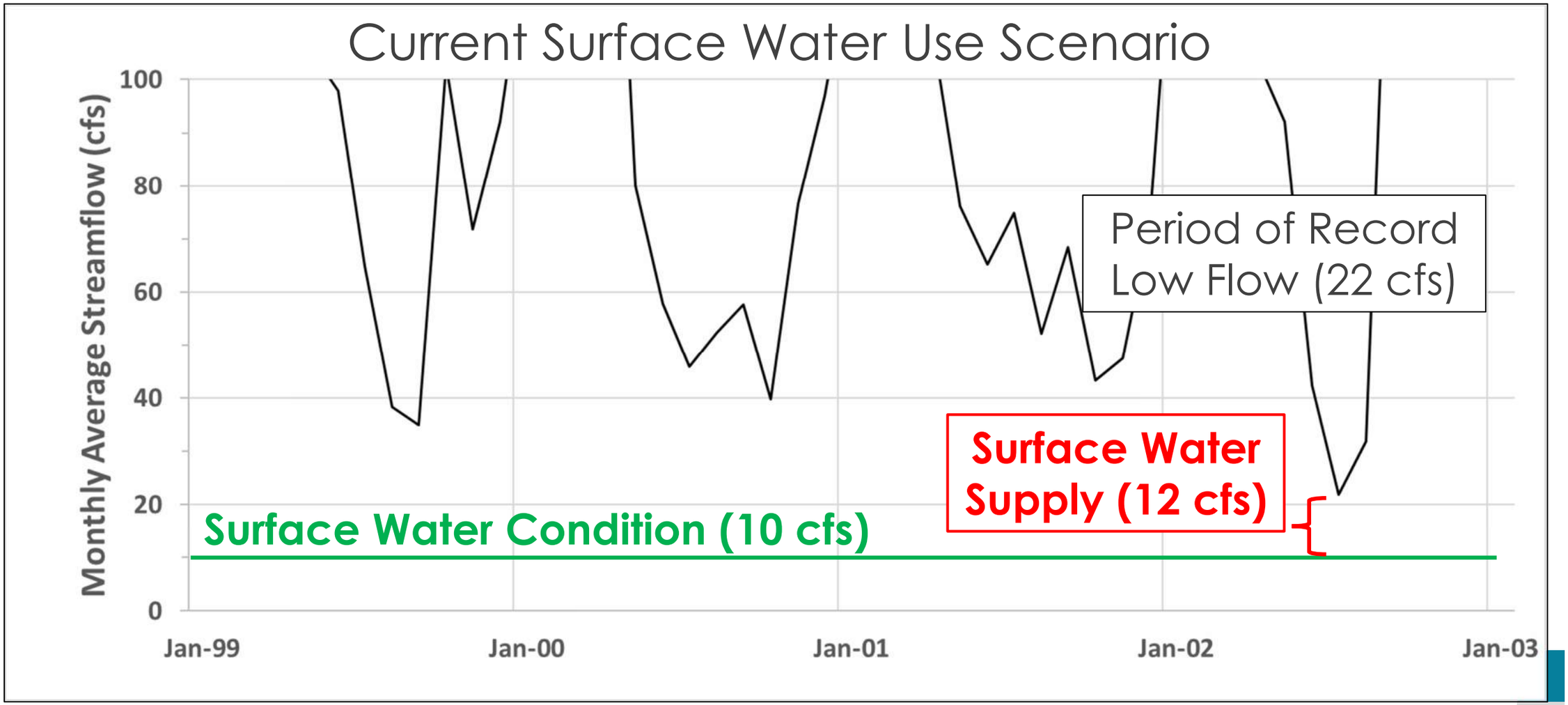
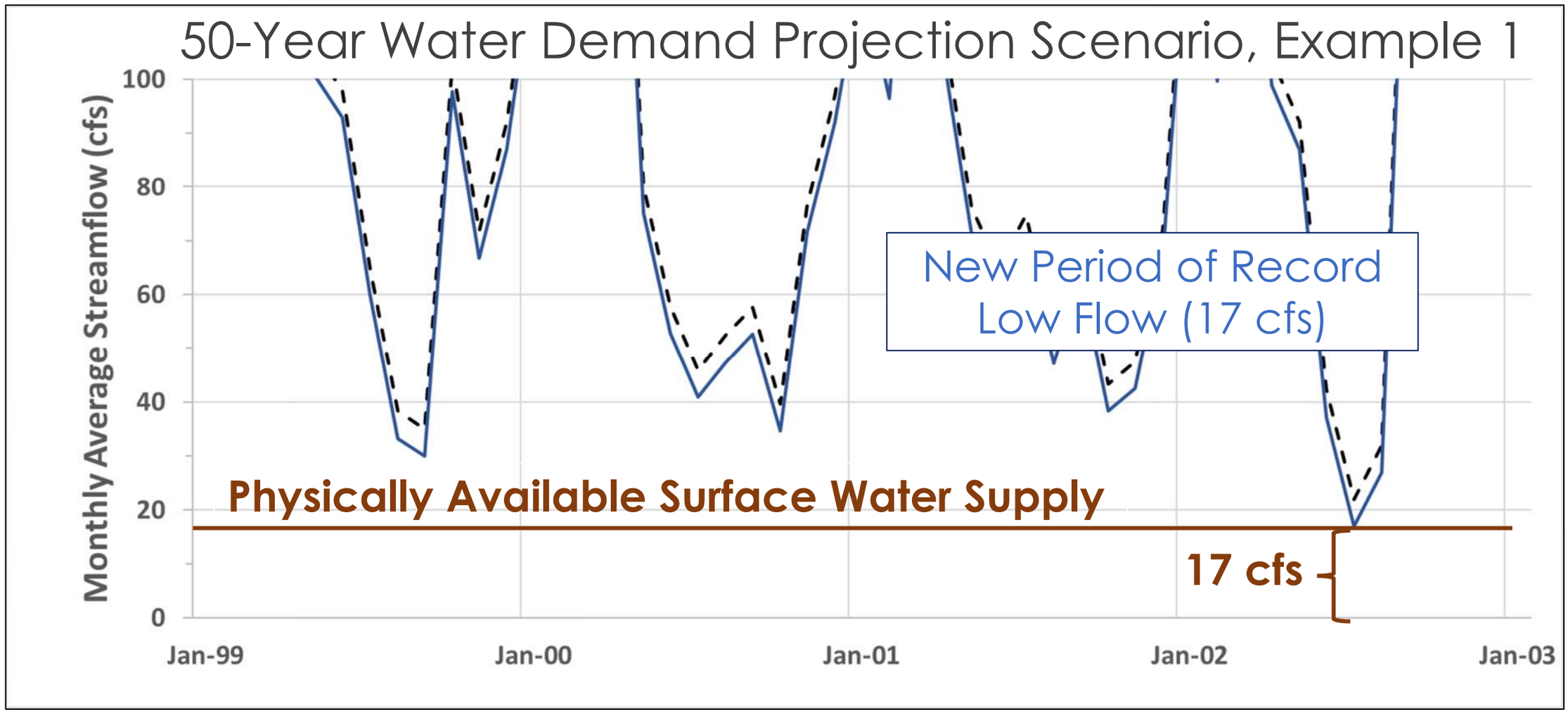
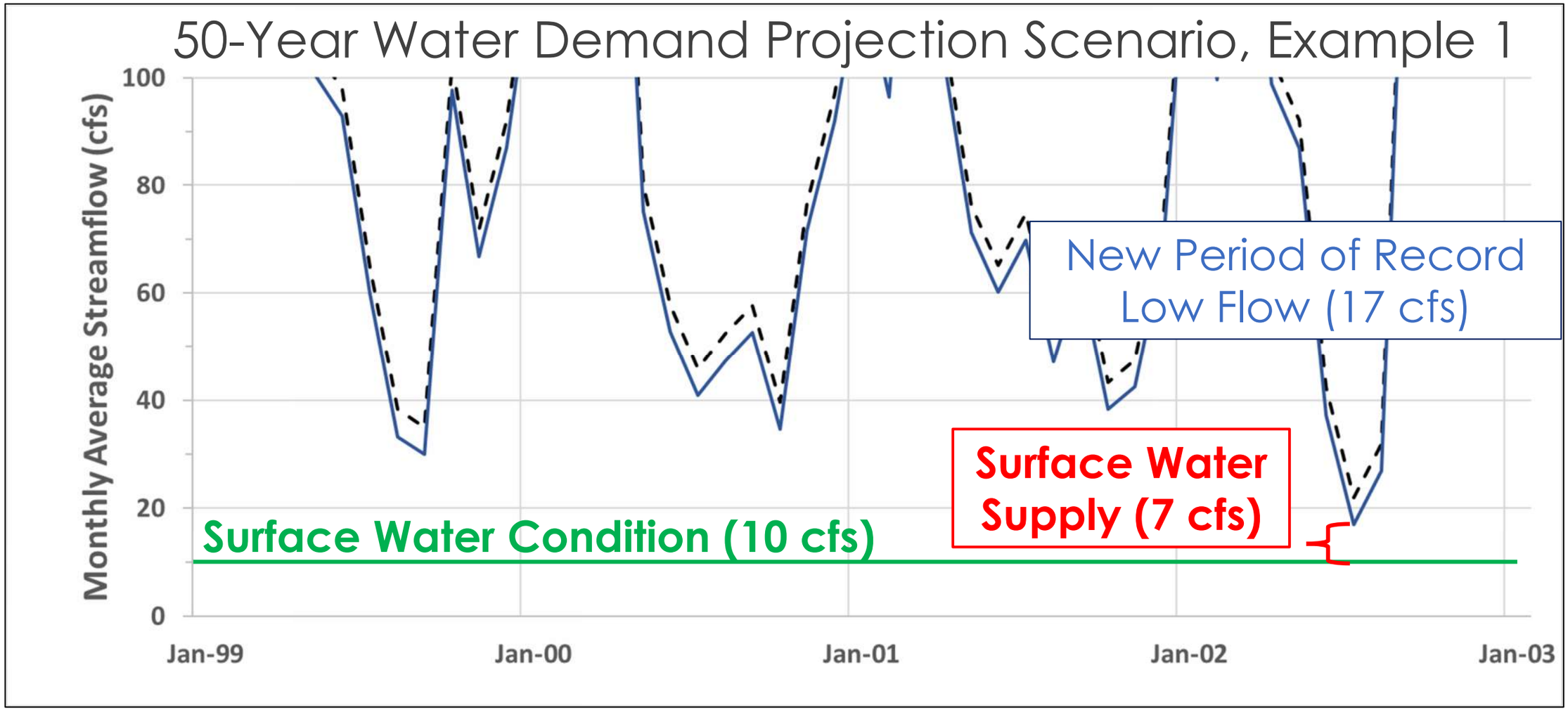


# Increased Demand Reduces Physically Available Surface Water Supply




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

# Increased Demand Reduces Surface Water Supply




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

# Surface Water Shortage

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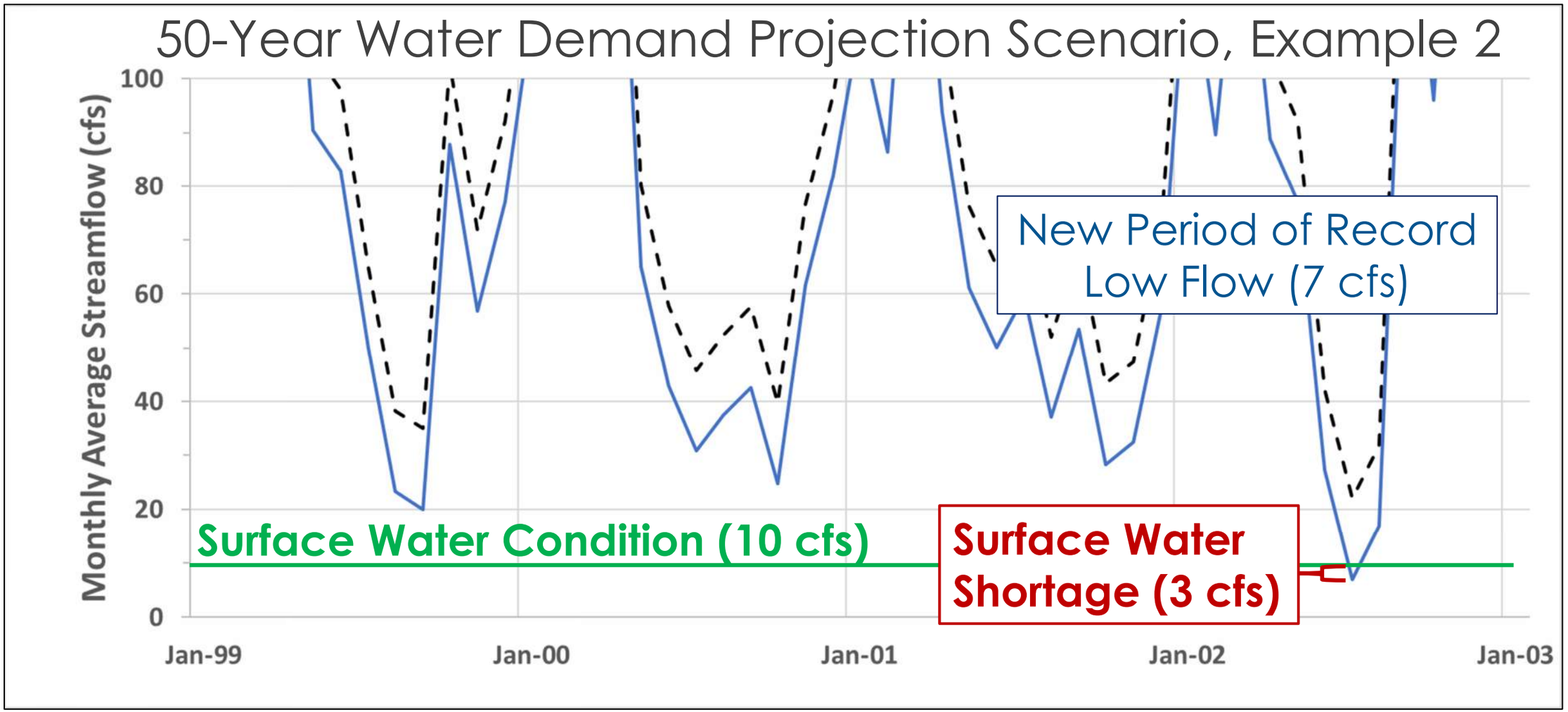

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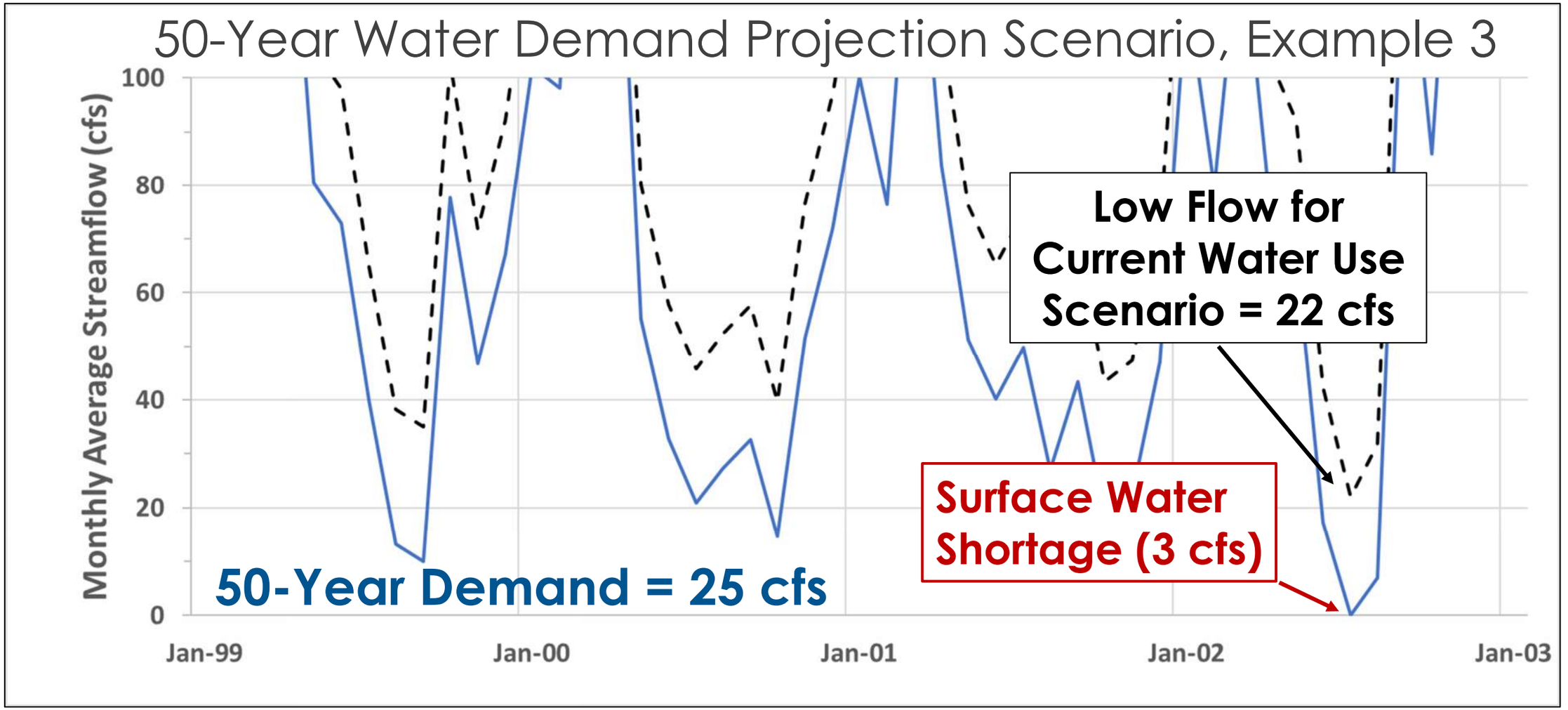

# Reach of Interest

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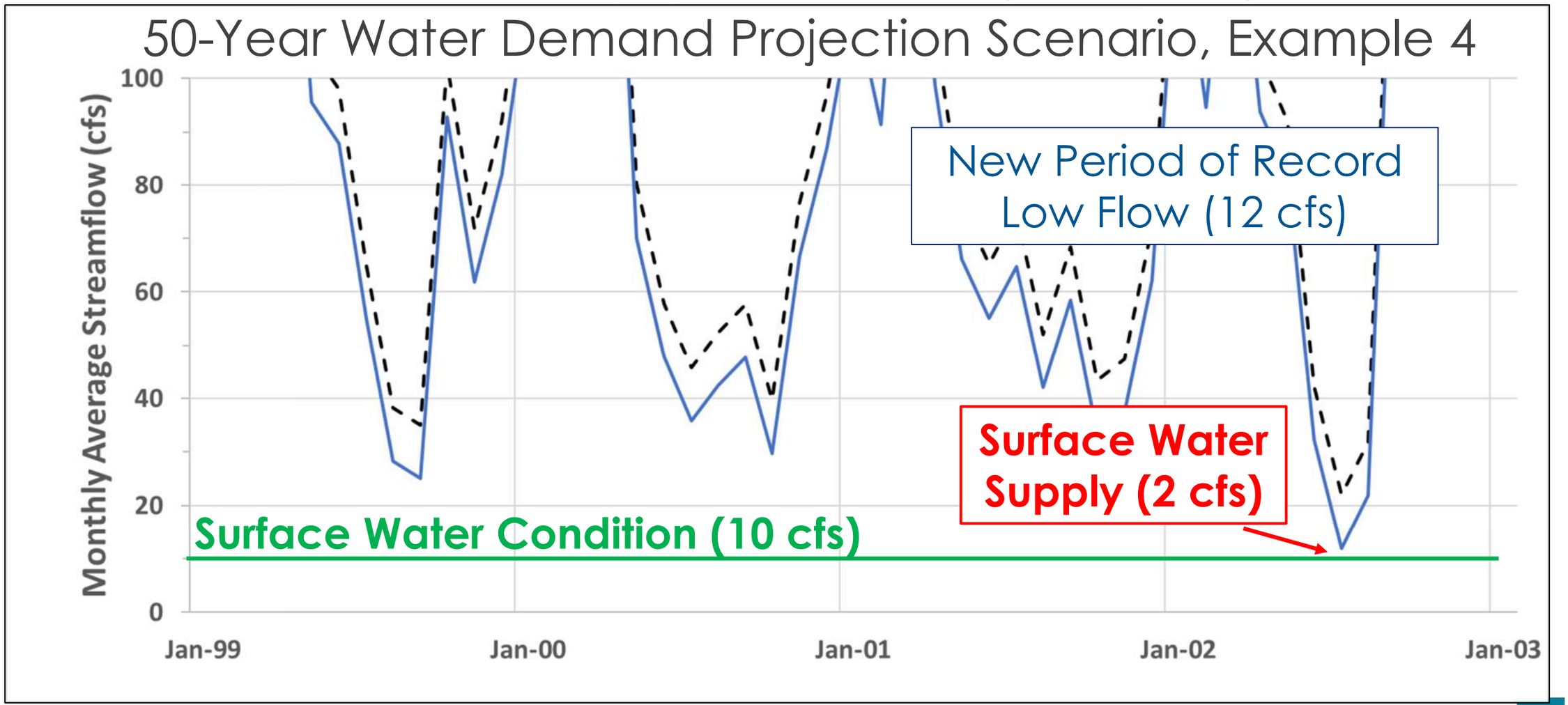
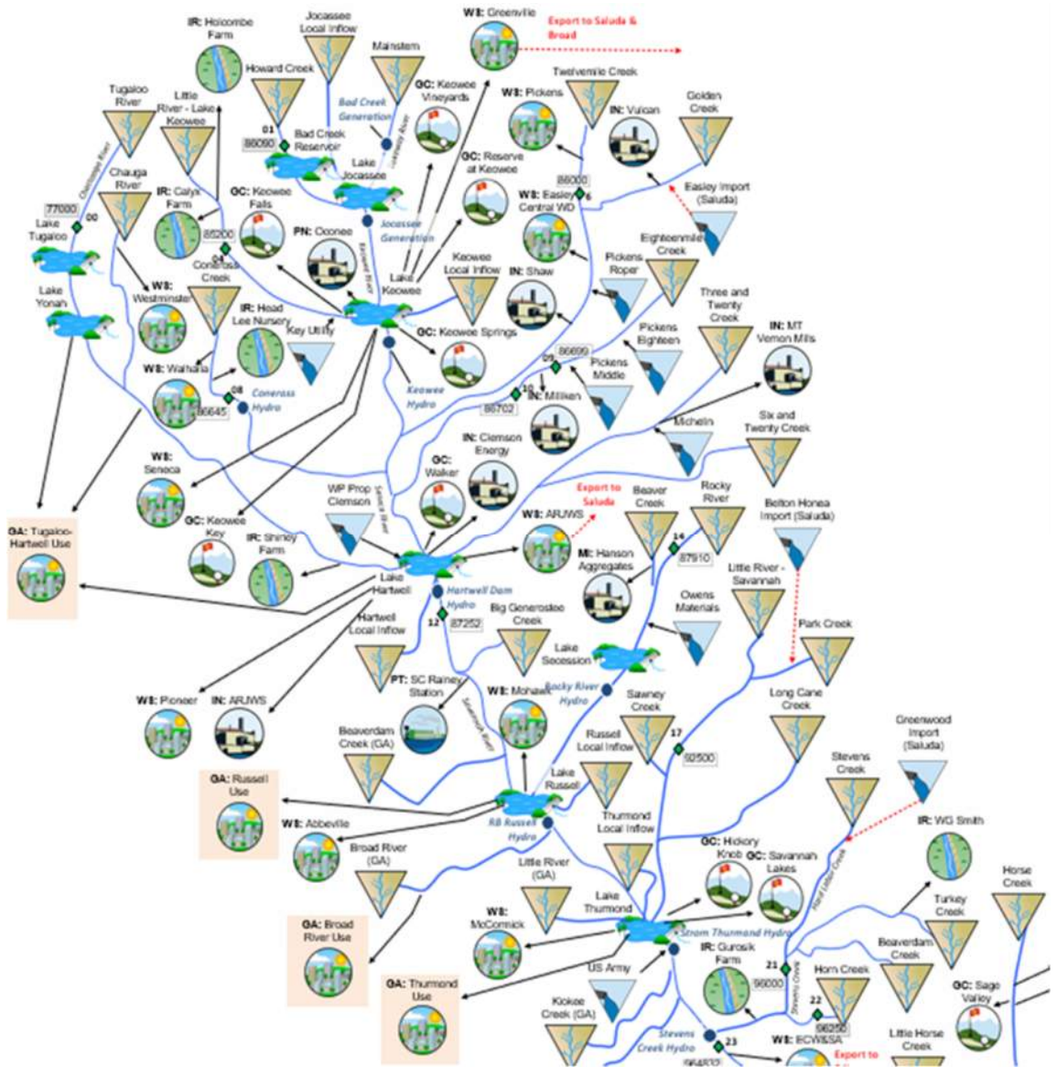


# Reservoir Safe Yield

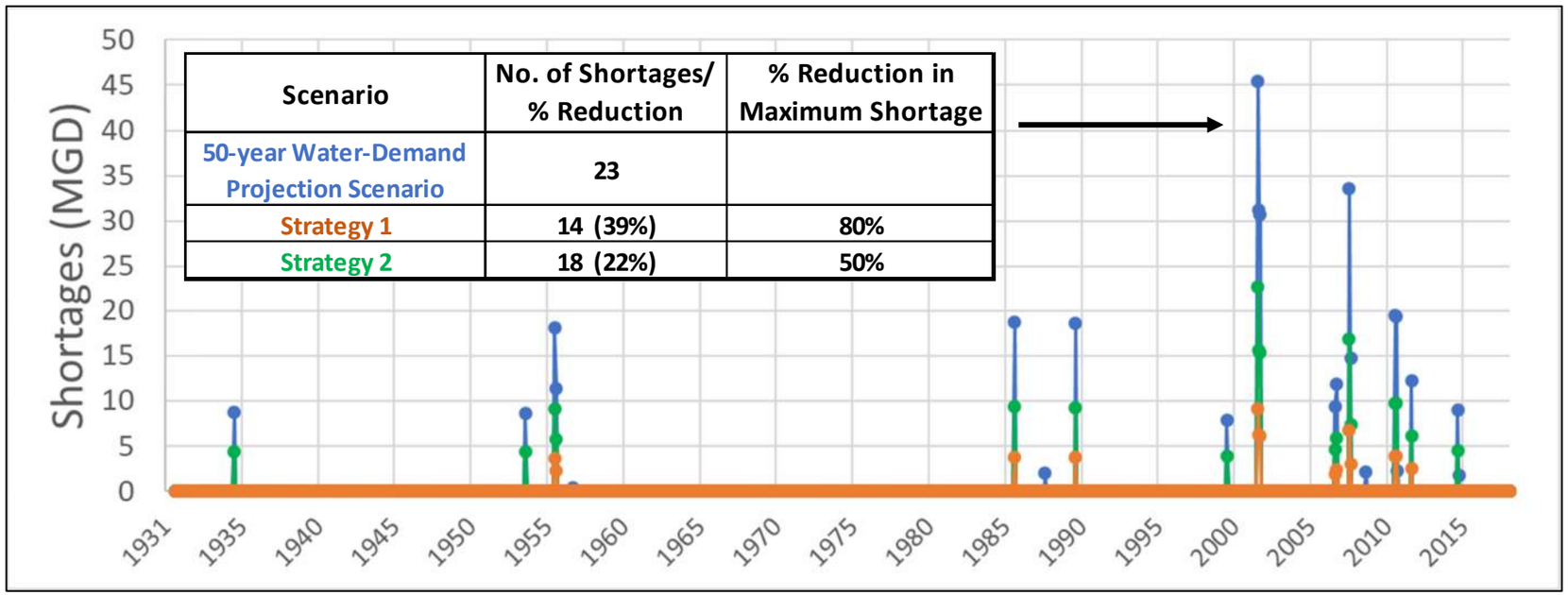
- Defined as "*the Surface Water Supply for a reservoir or system of reservoirs over the simulated hydrologic period of record*".
- Subject to requirements listed in Section 4.3.4 of Planning Framework:
  - Based on shallowest intake (Surface Water Condition) for an essential water use.
  - Based on current reservoir operating rules.
  - Should consider any historical safe yield studies.
- Reservoir Safe Yield should be estimated for Jocassee, Keowee, Hartwell, and Thurmond.
  - Estimates for smaller reservoirs may considered as well but will depend on available streamflow gage data.



# 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)

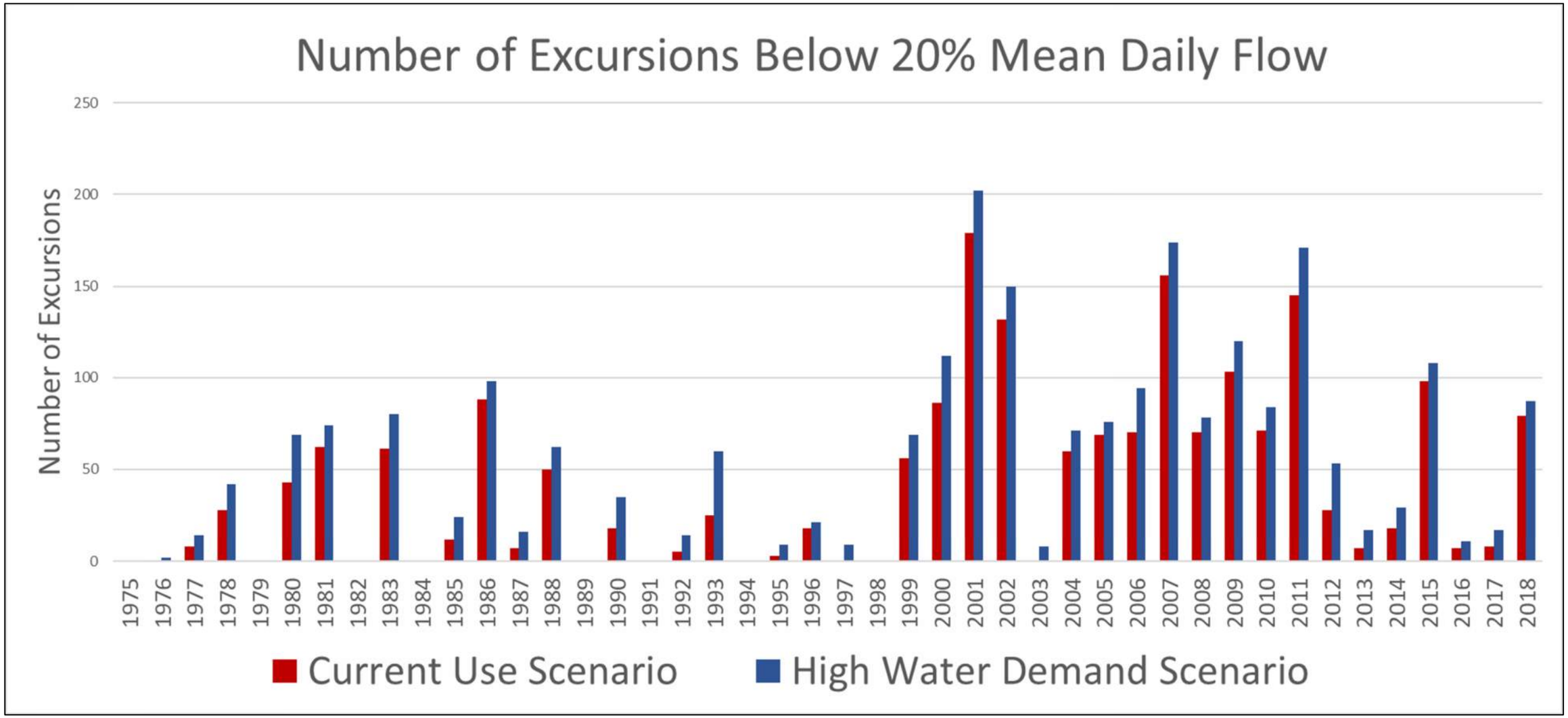



| Scenario | No. of Shortages/ % Reduction | % Reduction in Maximum Shortage |
|---|---|---|
| 50-year Water-Demand Projection Scenario | 23 | |
| Strategy 1 | 14 (39%) | 80% |
| Strategy 2 | 18 (22%) | 50% |

# 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).

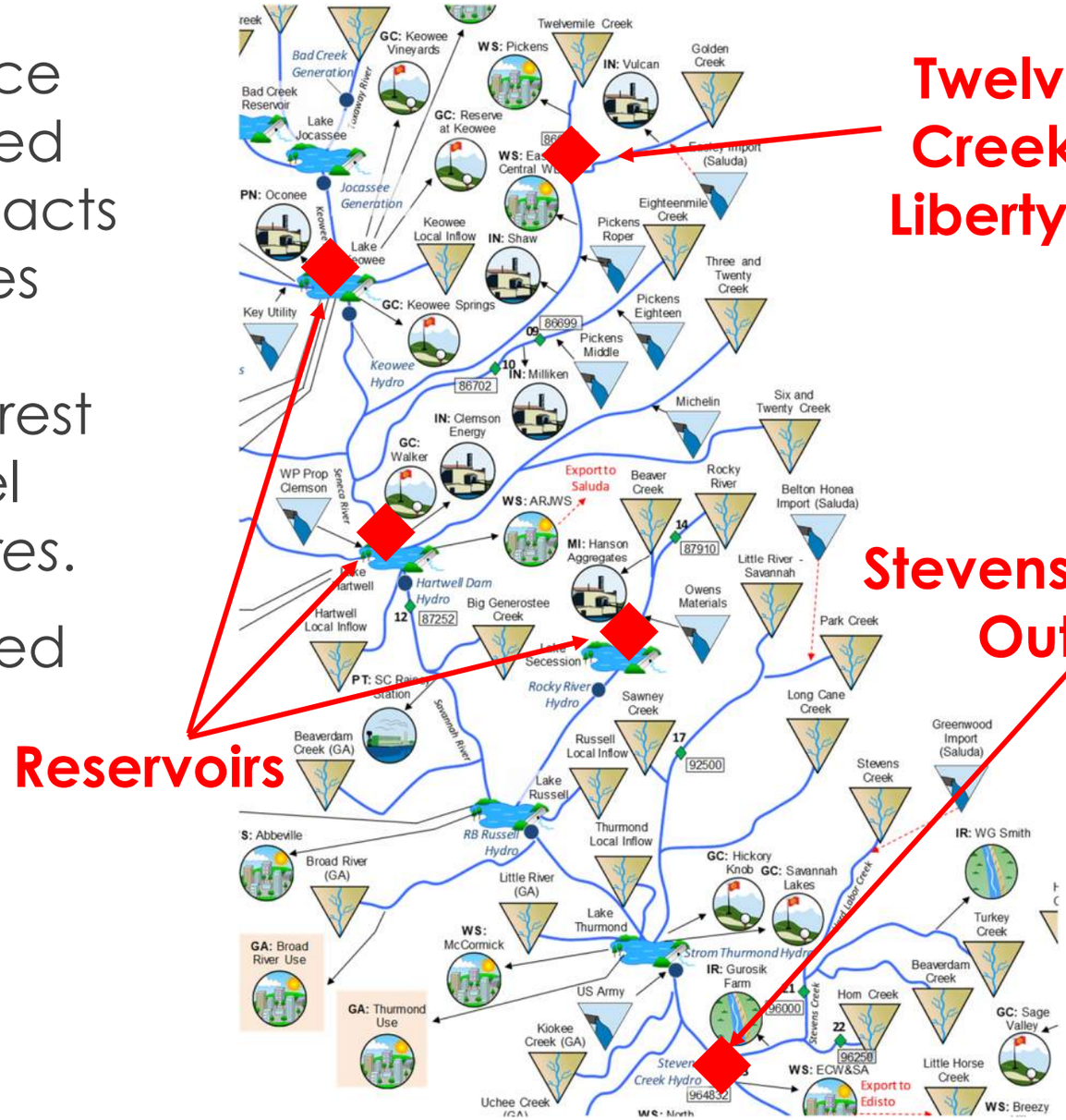
# Performance Measures Example




*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
  - Reservoirs



# Surface Water-Demand Scenarios

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- 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).

# Current Surface Water Use Scenario

- Demand based on "current" water use defined as recent 10-year average (2012-2021) 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 withdrawals 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 of 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 and major reservoirs (Reservoir Safe Yield)
  - 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
  - Identify shortages, quantify surface water supply, and designate reaches of interest
- 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

Questions?
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