Methodologies for Evaluating Water Availability

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Broad River Basin Council
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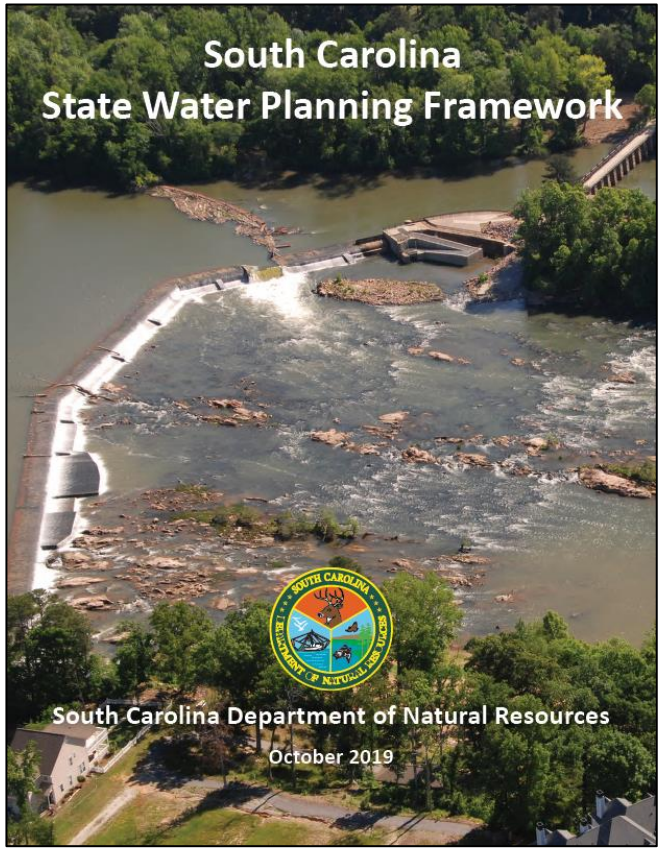
Methods for Evaluating Water Availability

- 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.

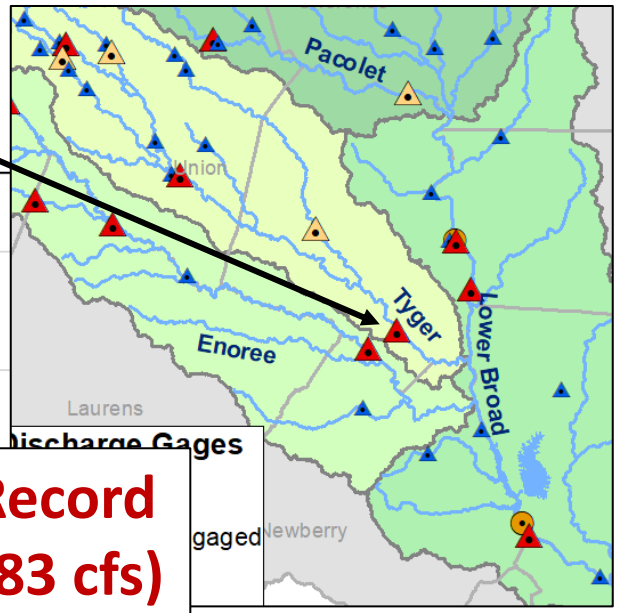
Surface Water Availability Terminology

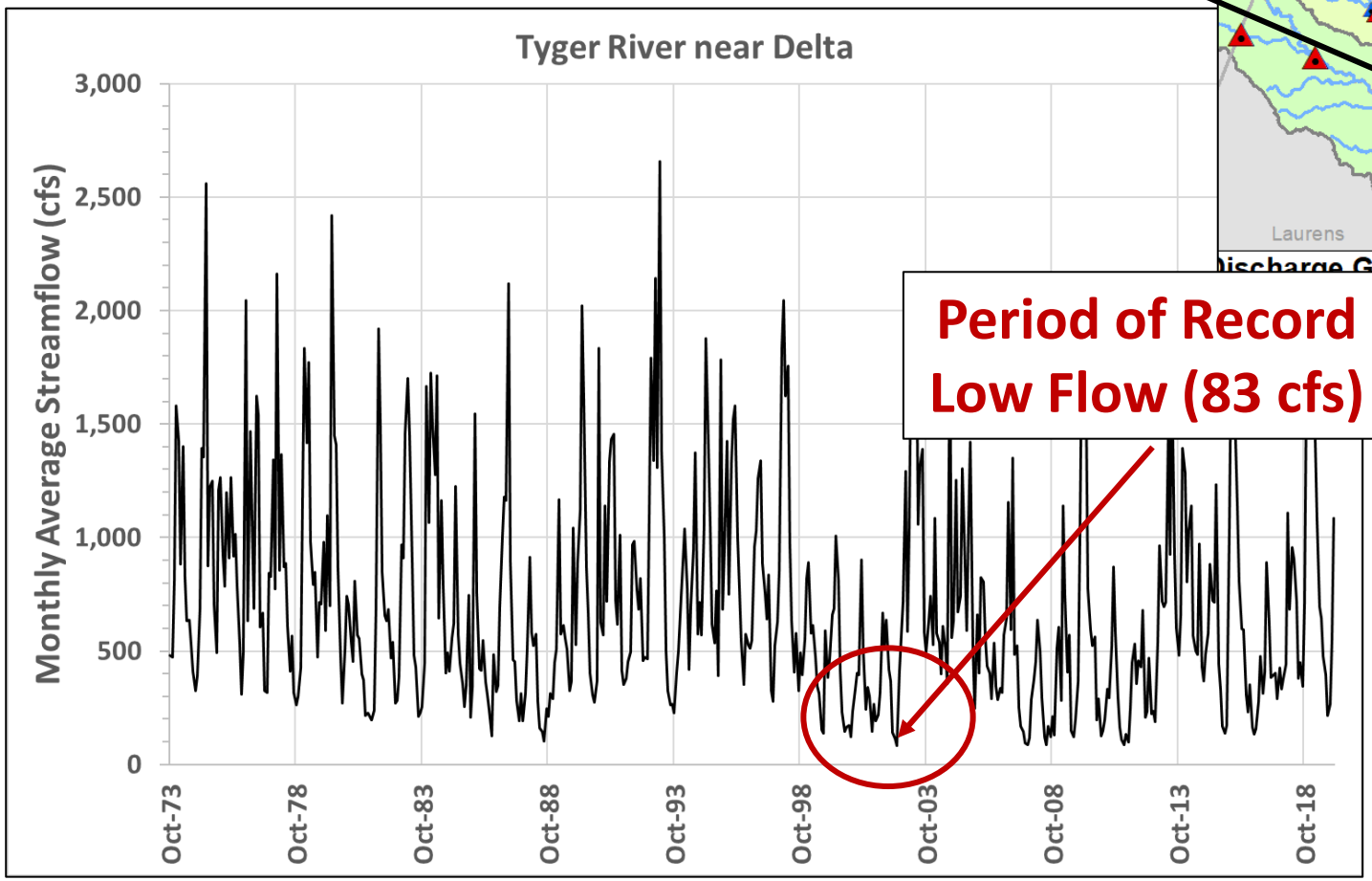
- Definitions:
  - **Physically Available Surface Water Supply** – maximum amount of water occurring 100% of the time at a location on a surface water body, with no defined conditions applied on the surface water body.
  - **Surface Water Condition** – a physical limitation on the amount of water that can be withdrawn from a surface water source and is independent of water demand.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.
  - **Reaches of Interest** – specific stream reaches that may have no identified Surface Water Shortage but experience undesired impacts, environmental or otherwise, determined from current or future water-demand scenarios or proposed water management strategies.

Example – Tyger River near Delta

Current Surface Water-Demand Scenario

Simulated Flow – Tyger River near Delta

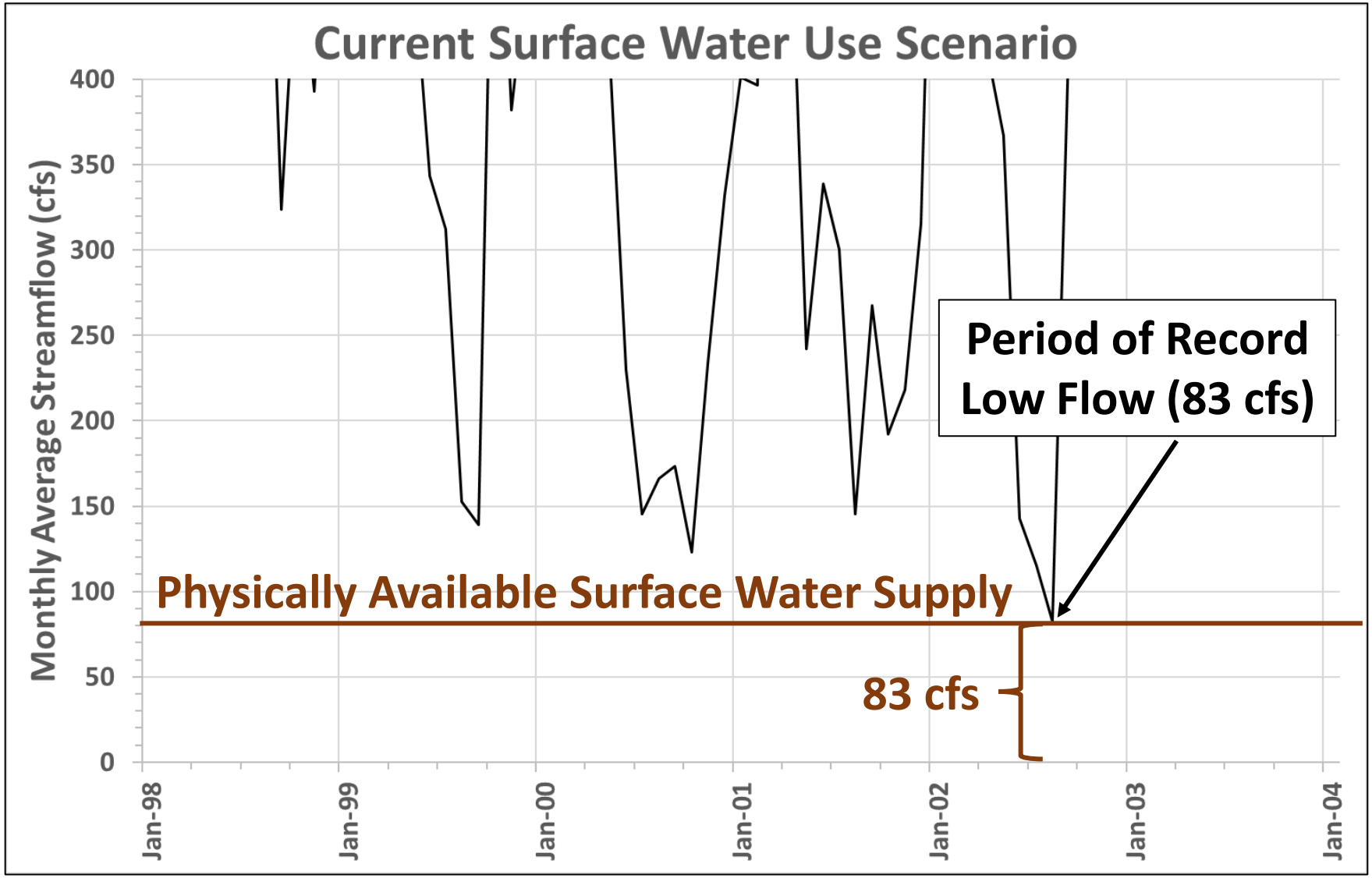




Surface water volumes highlighted in the following hydrographs are for illustrative purposes only.

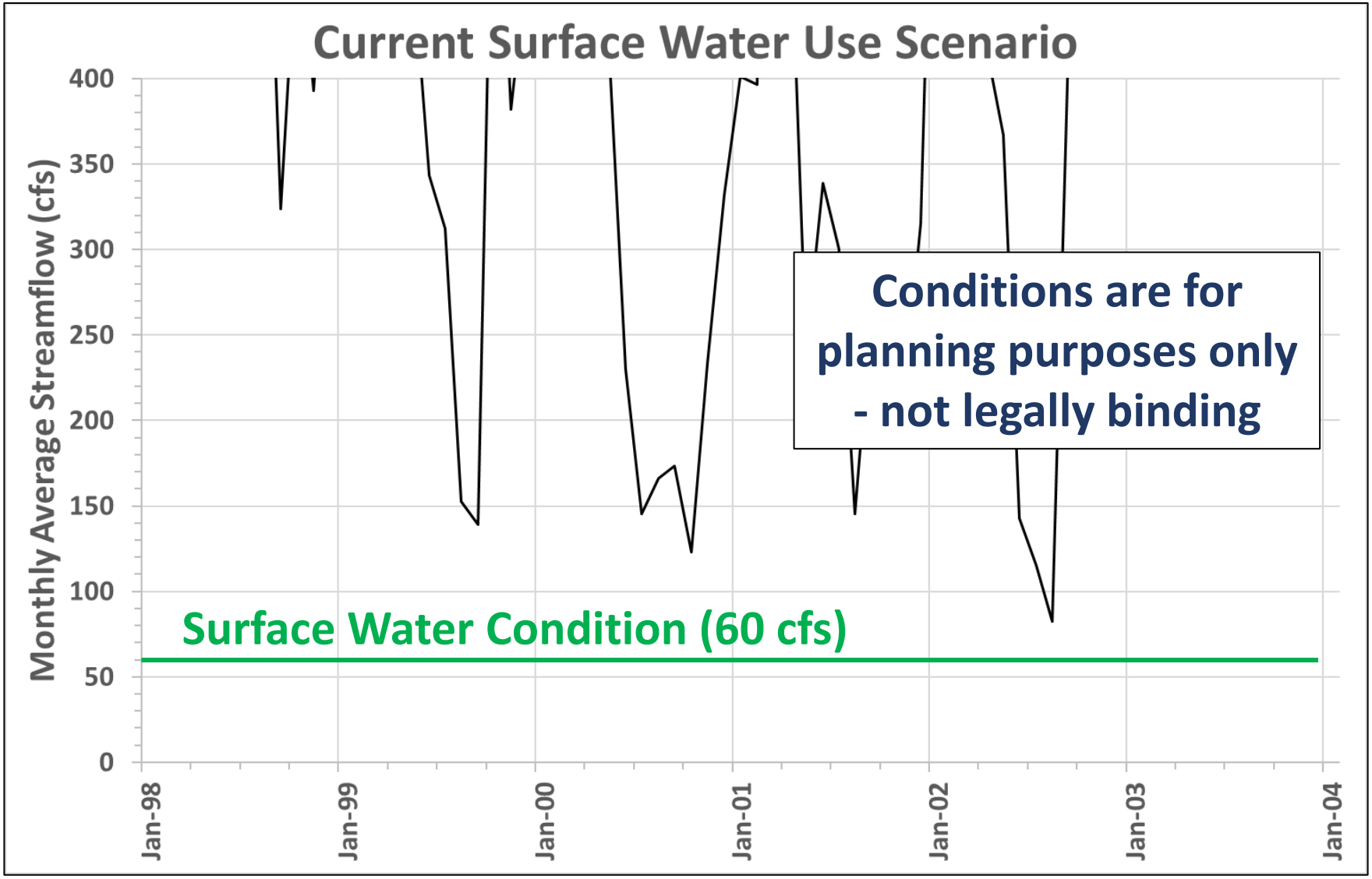
Physically Available Surface Water Supply

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.



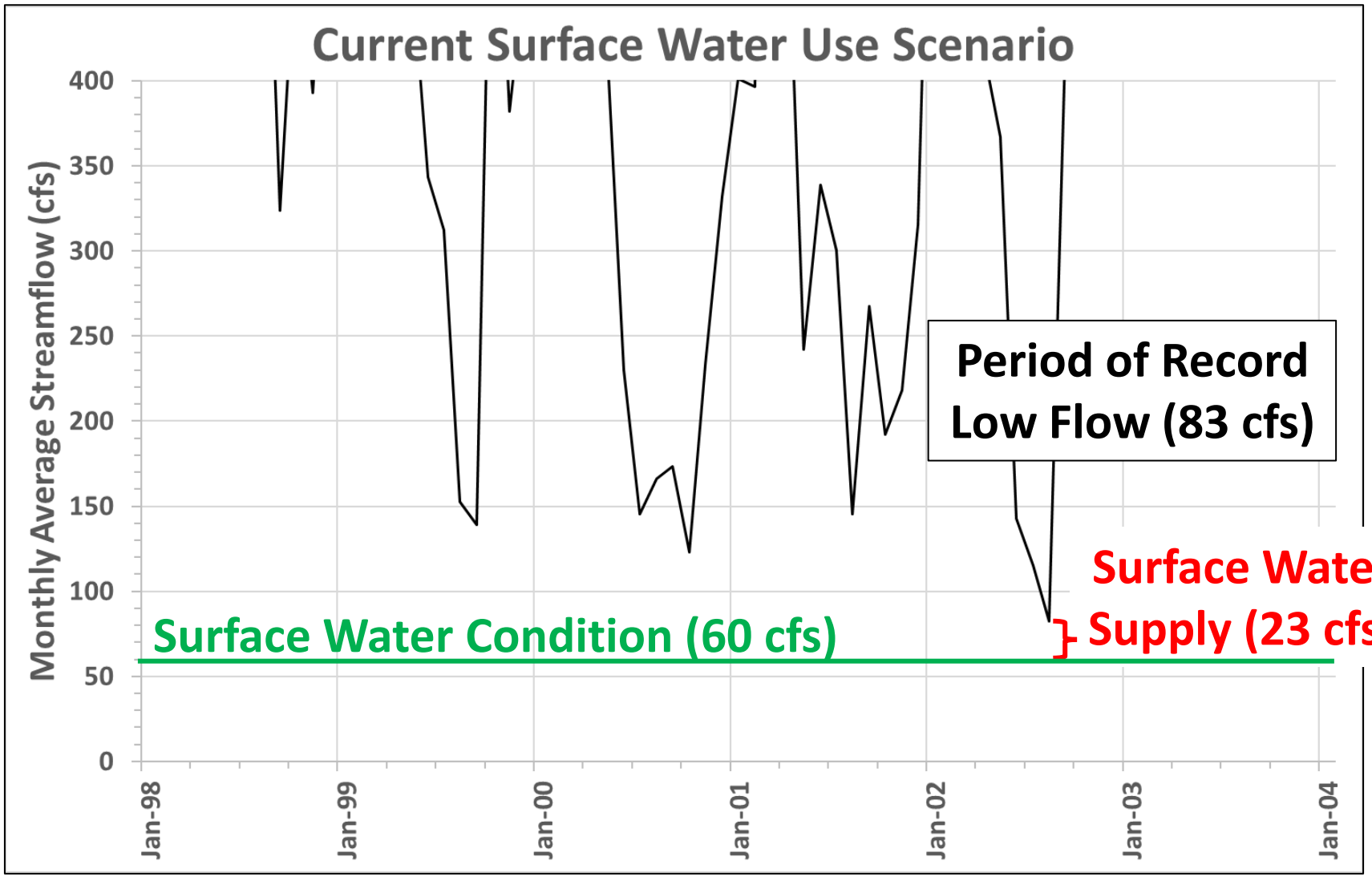
Surface Water Conditions

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

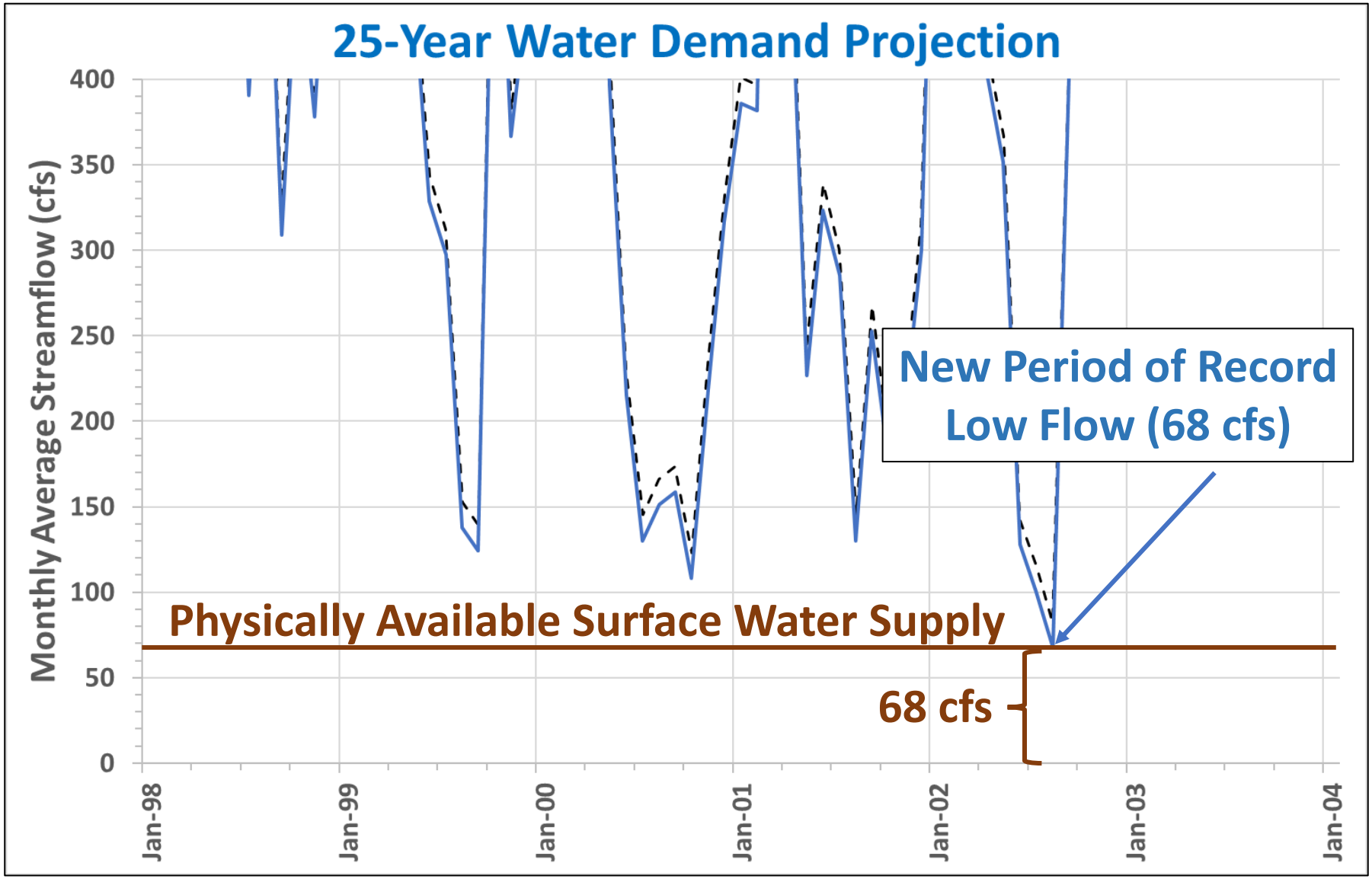


Surface Water Supply

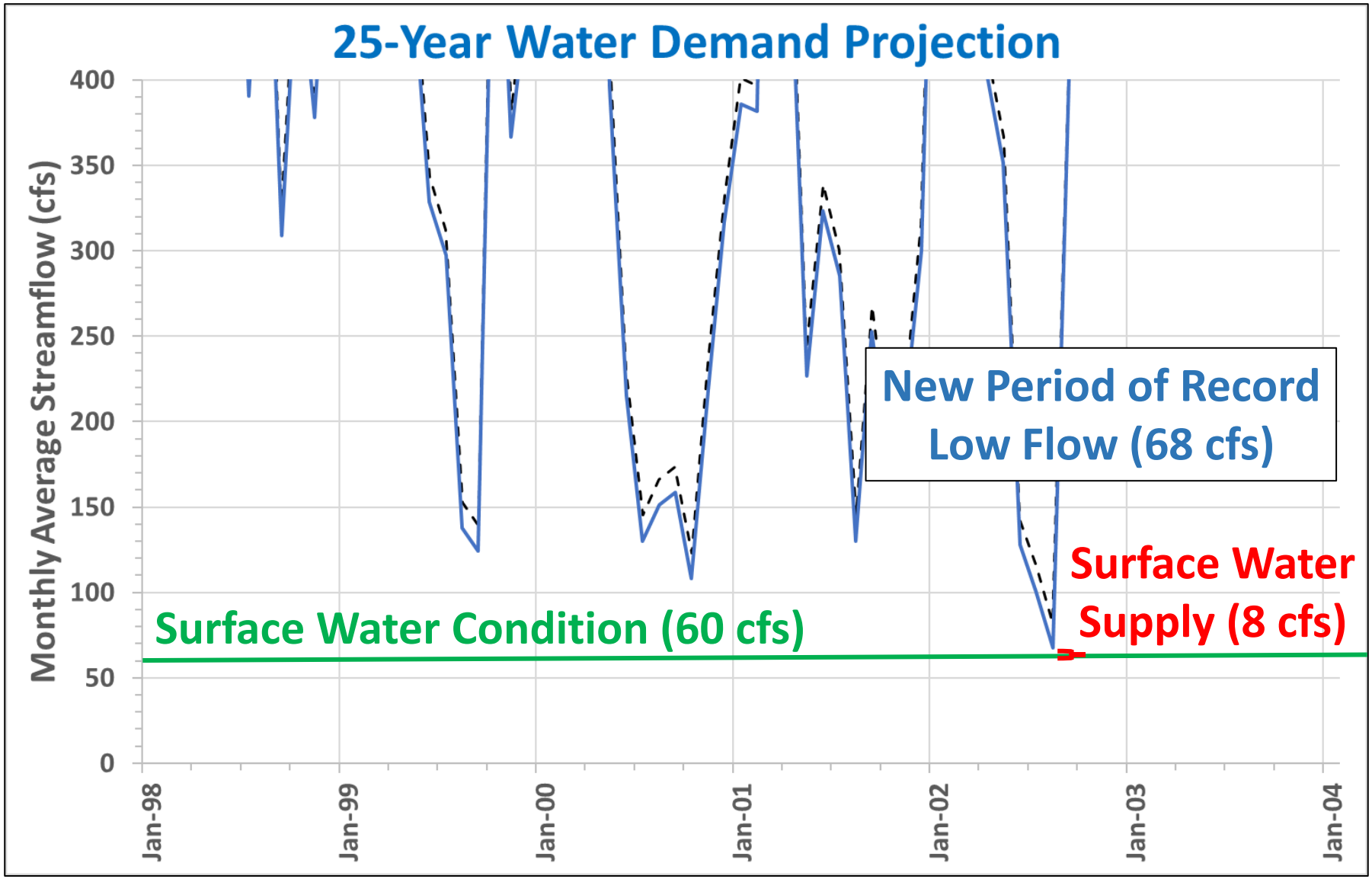
Maximum amount of water available for withdrawal 100% of the time at a location on a surface water body without violating any applied Surface Water Conditions on the surface water source and considering upstream demands.



Increased Demand Reduces Physically Available Surface Water Supply

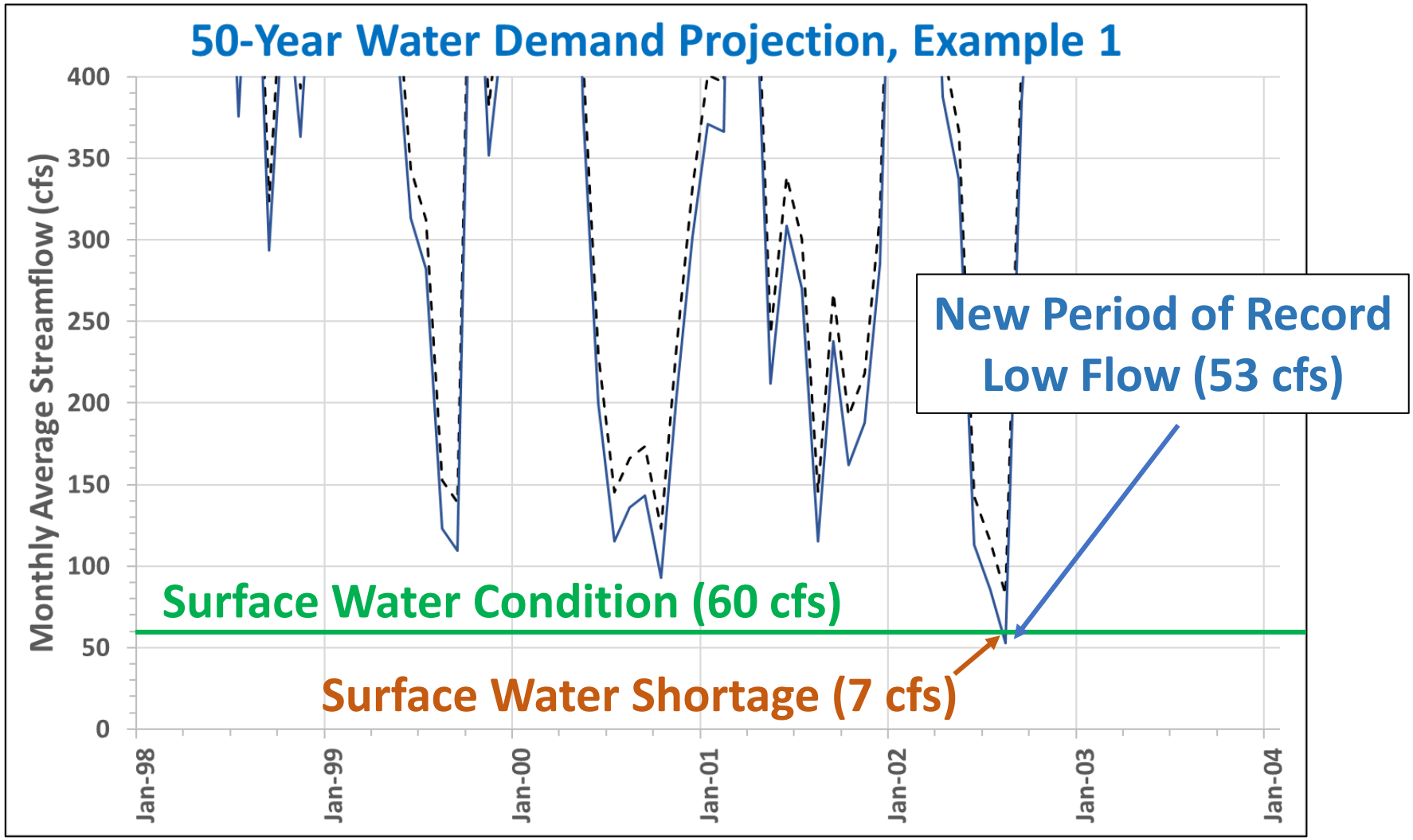


Increased Demand Reduces Surface Water Supply



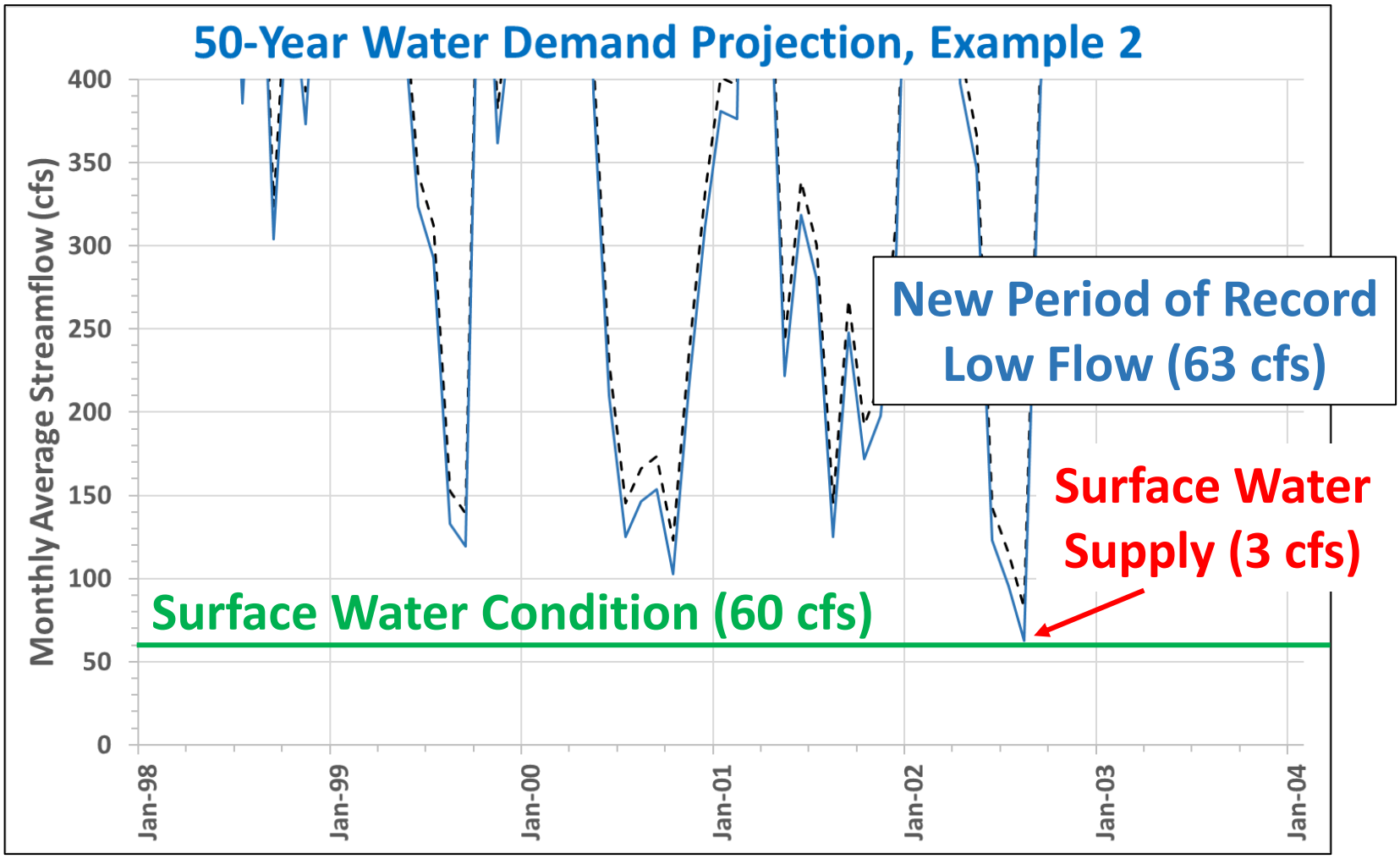
Surface Water Shortage

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



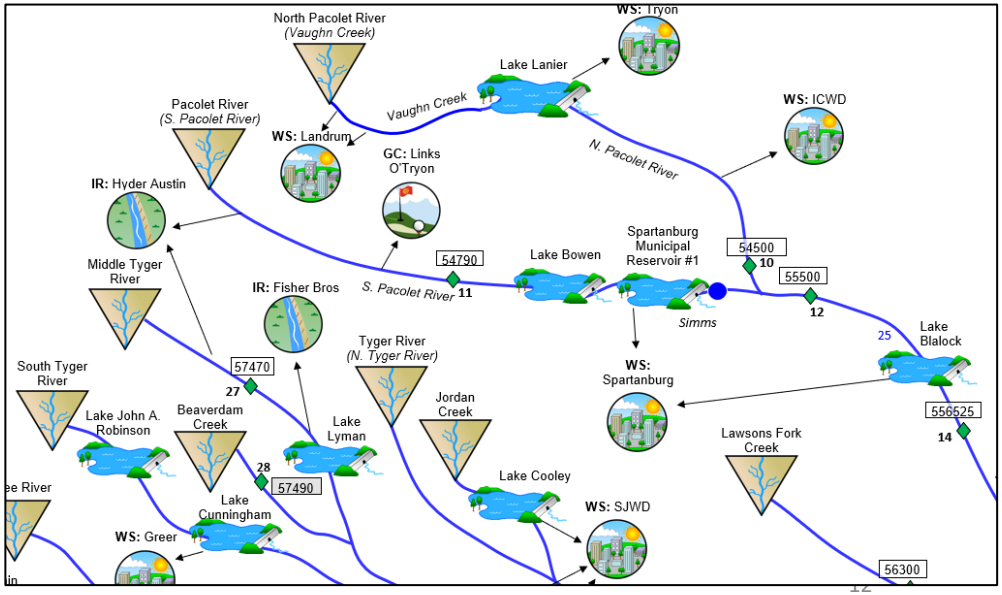
Reaches of Interest

Specific stream reaches that may have no identified Surface Water Shortage but experience 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*".
- Reservoir Safe Yield computations 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 Bowen and Lake Blalock.
  - Estimates for smaller reservoirs may considered as well but will depend on available streamflow gage data.



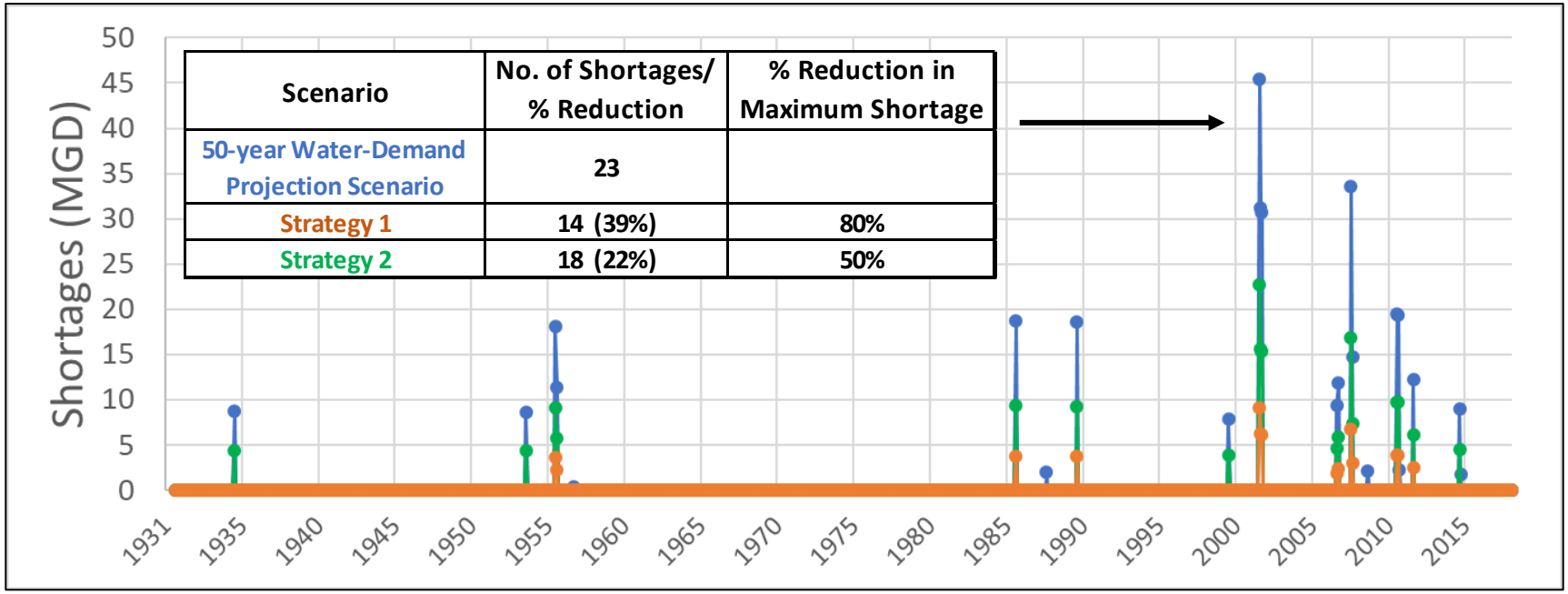
Methods for Evaluating Surface Water Availability

- RBCs will determine (Phase II):
  - Surface Water Conditions, if any.
  - Surface Water Supply at nodes of interest and major reservoirs.
  - All Surface Water Shortages.
  - Reaches of Interest.
- Surface Water Management Strategies will be developed and evaluated (Phase III):
  - **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, etc.
    - Effectiveness and feasibility of each strategy will be evaluated.
    - Impacts of strategies on Reaches of Interest will be evaluated.
- *River Basin Plan will document Surface Water Supply, Shortages, Reaches of Interest, and recommended Surface Water Management Strategies.*

Performance Measures

To facilitate analyses, RBCs may also:

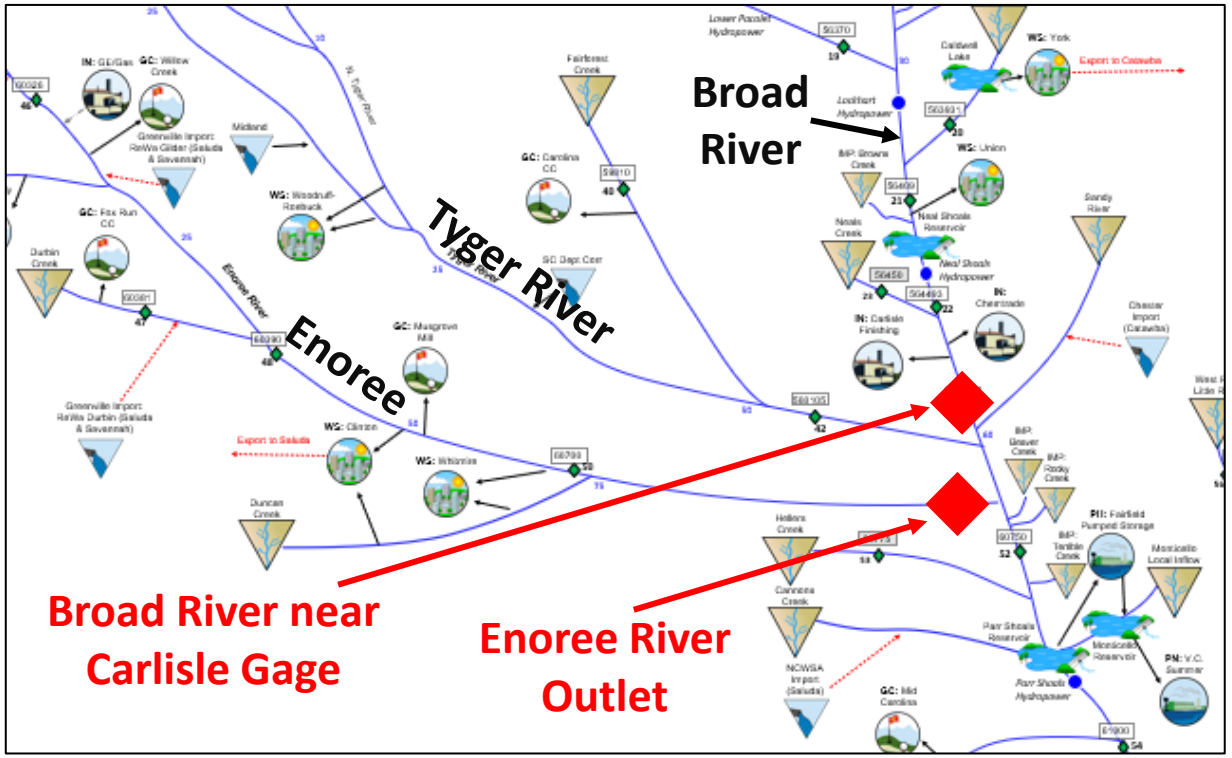
- Develop **Performance Measures** – quantitative measures of change in user-defined conditions used to assess the performance of a proposed water management strategy or combination of strategies or to compare two water use scenarios.
  - % Change in monthly minimum flow or 5th percentile flow.
  - % 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%

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.



Surface Water Demand Scenarios

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Surface Water-Demand Scenarios

- Planning Framework requires four scenarios to be reviewed by each River Basin Council:
  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.

Surface Water Demand Scenarios

1. **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*.

Surface Water Demand Scenarios

2. 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 legally available water.

Surface Water Demand Scenarios

- Two Water-Demand Projection Scenarios:
  3. **Moderate Water-Demand Projection Scenario** – demand based on projection of water use assuming normal climate and moderate population and economic growth.
  4. **High Water-Demand Projection Scenario** – demand based on projection of water use assuming drier conditions and high population and economic growth.
- Provide information on when and where shortages are likely to occur:
  - 50-year Planning Horizon.
  - Simulations completed in 5- to 10- year intervals.
- **High Water-Demand Scenario – Planning Scenario**:
  - Set of water use data for the Planning Horizon used to develop water 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.