

Adjusted Total Dissolved Gas Criteria in the Snake and Columbia Rivers

Water Quality Program
Washington Department of Ecology



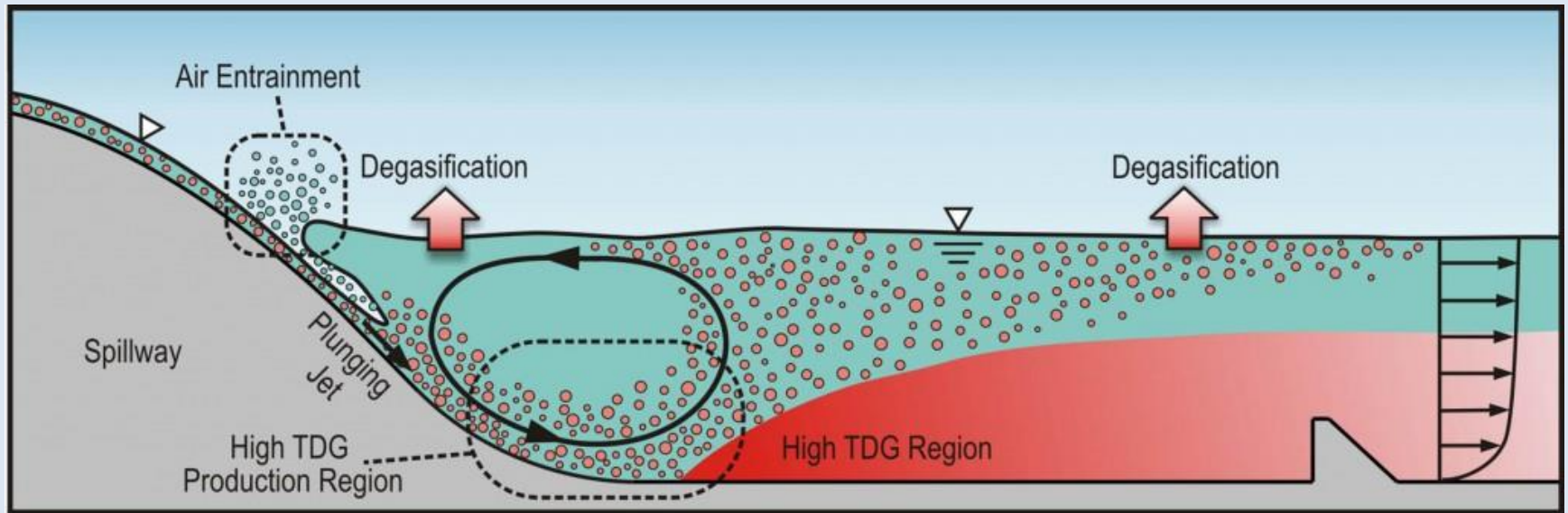
Overview

- What is **Total Dissolved Gas** or TDG?
- **Short-term Modifications** action in March 2019
- **Current Requests** to Modify Total Dissolved Gas (TDG) Criteria



What is TDG?

- Plunging water “entrains” or traps air in the river.
- The entrained gases (mostly nitrogen and oxygen) produce pressure.
- This pressure is measured as what is “above normal” in the water column.
- This is recorded as a percentage. 100% is normal or “in equilibrium” with the atmosphere. Anything above this is considered “supersaturation”
 - **Example: 110% TDG is creating 10% more pressure in the water column than normal.**



* Used with permission, from University of Iowa IIHR Hydroscience and Engineering, IIHR TDG home page: <https://www.iuhr.uiowa.edu/totaldissolvedgas/>



Why do we limit TDG?

- Fish and other aquatic life can be affected by high TDG pressure.
- Gas Bubbles can form in tissues and harm aquatic life.
- Some species can try to avoid areas of high TDG while others cannot.



So why increase spill at dams?



- Although spill increases TDG, studies demonstrate that the spillways are safer routes for fish migrating downstream.
- Fish that pass over the dam with spill waters have higher survival rates than those that pass through the turbines.



Total Dissolved Gas Criteria

State-wide

Magnitude	Duration/Averaging Period	Frequency
110%	Instantaneous	Not to be exceeded

Snake and Columbia Rivers

- Seasonal TDG criteria allowable during spill season
- TDG criteria is adjusted to aid in fish passage

Magnitude	Duration / Averaging Period	Frequency
115% forebay	Highest consecutive 12 hour avg. in a day	Not to be exceeded
120% tailrace	Highest consecutive 12 hour avg. in a day	
125% tailrace	1 hour average	



Total Dissolved Gas Criteria for Columbia & Snake Rivers

Tailrace-

Waters just downstream
of the dam



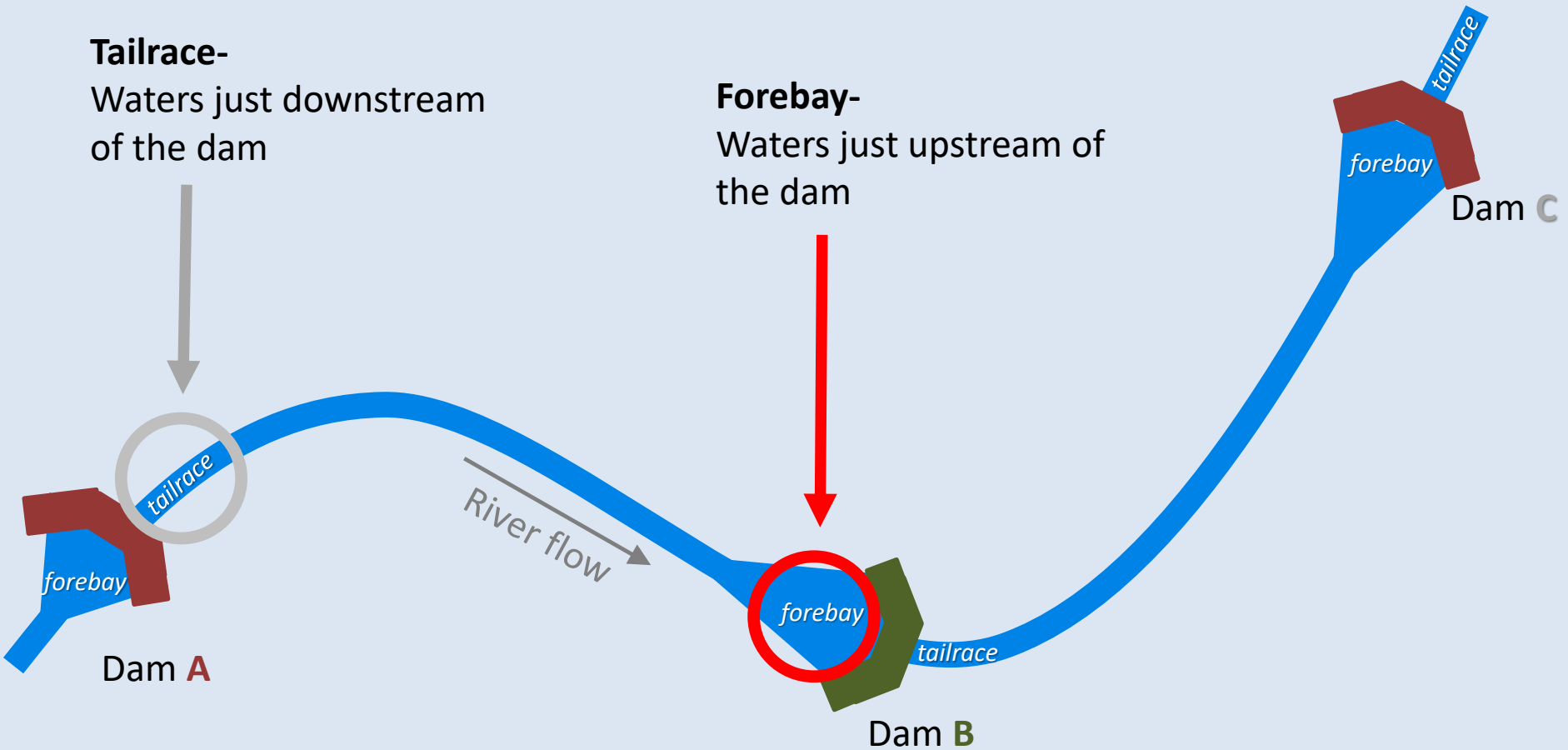
Total Dissolved Gas Criteria for Columbia & Snake Rivers

Tailrace-

Waters just downstream
of the dam

Forebay-

Waters just upstream of
the dam



Total Dissolved Gas Criteria for Columbia & Snake Rivers

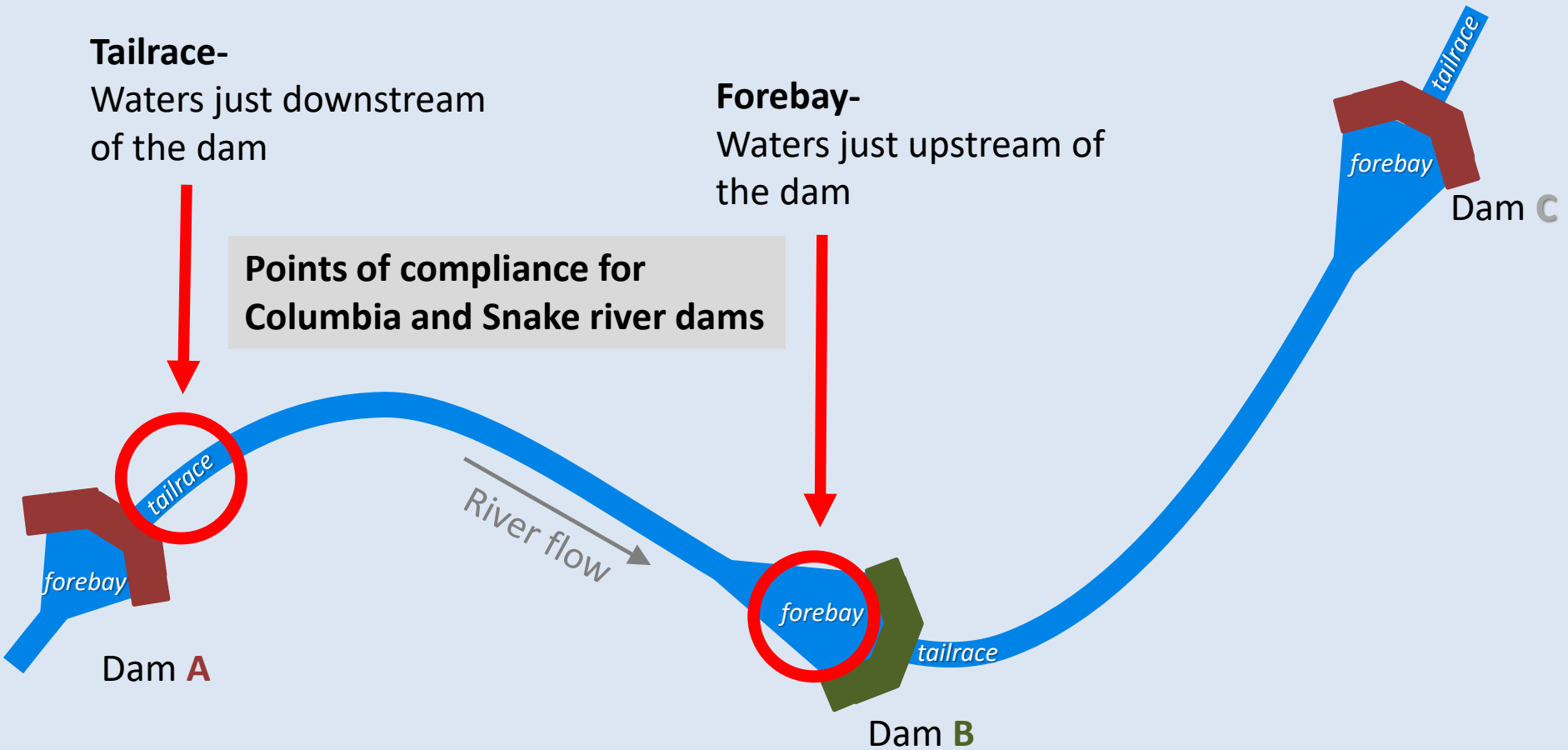
Tailrace-

Waters just downstream
of the dam

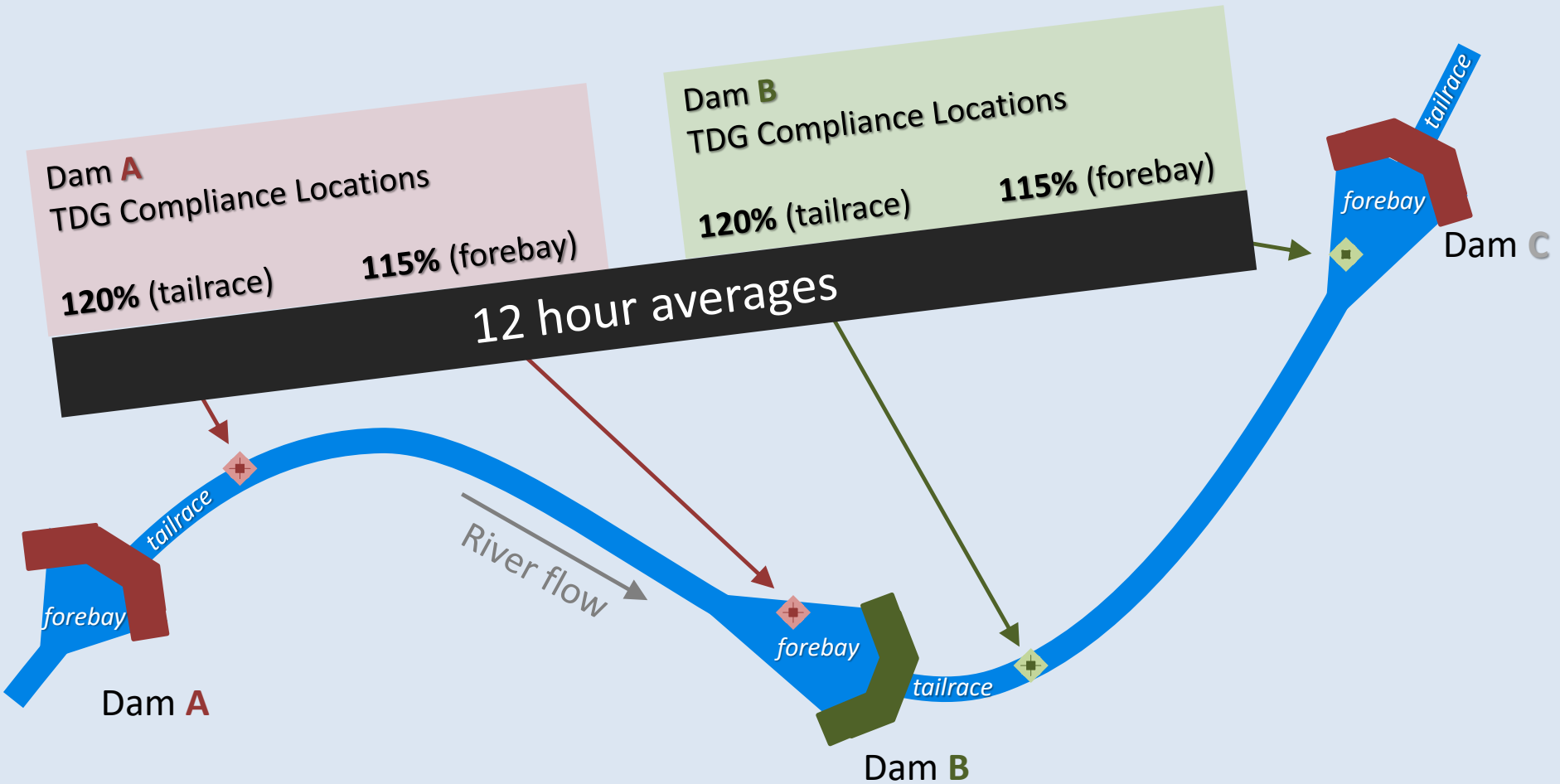
Forebay-

Waters just upstream of
the dam

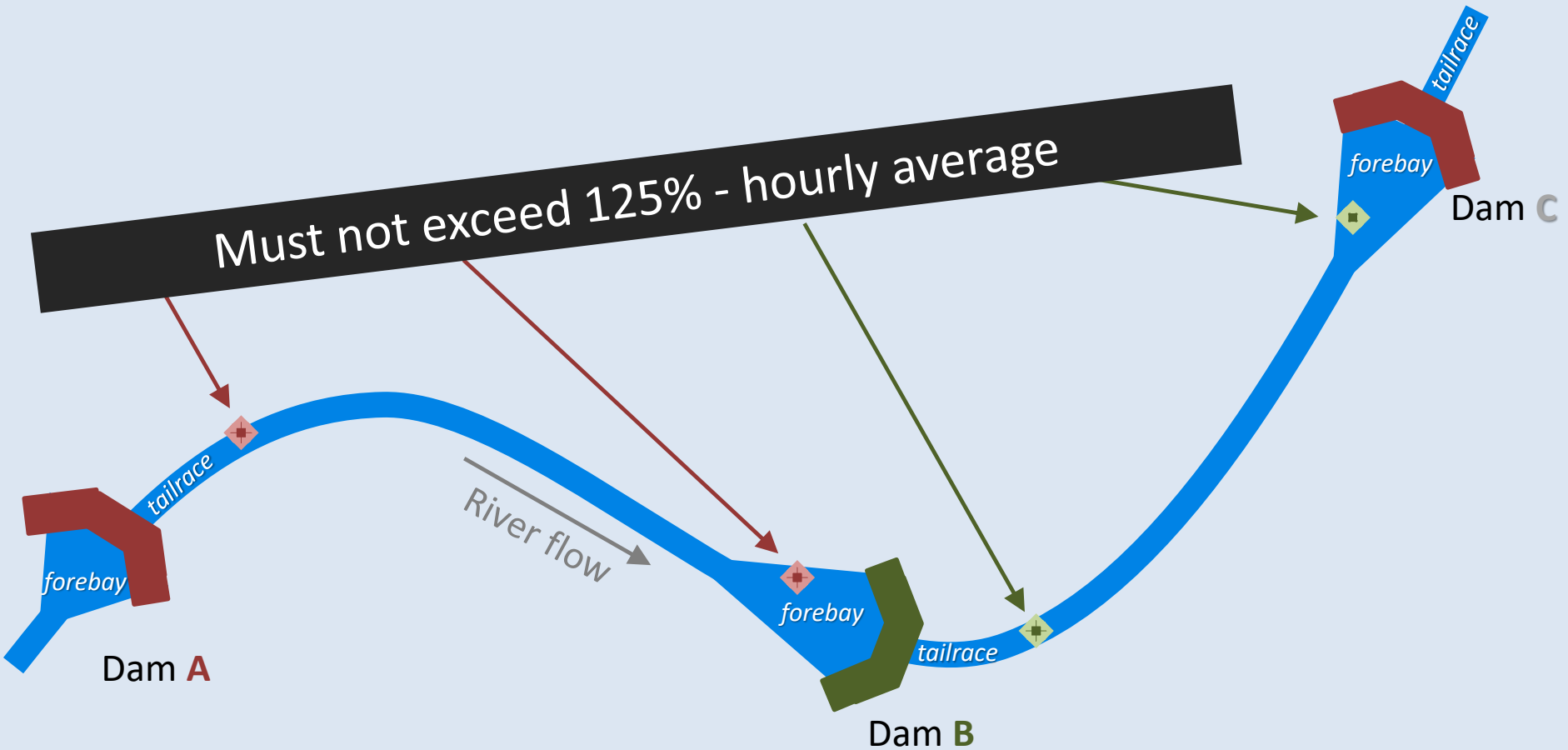
Points of compliance for
Columbia and Snake river dams



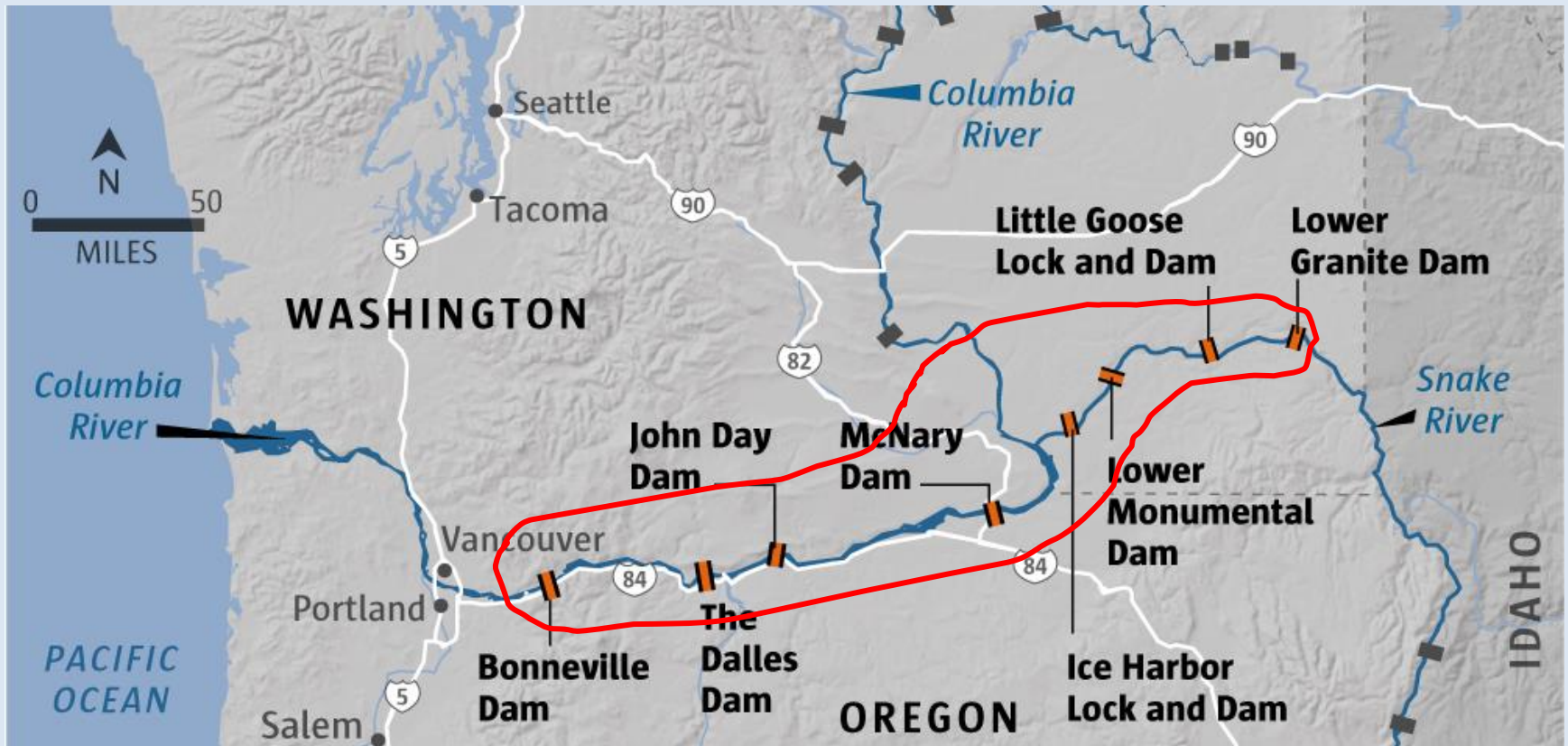
Total Dissolved Gas Criteria for Columbia & Snake Rivers



Total Dissolved Gas Criteria for Columbia & Snake Rivers



Geographical Scope



Sources: Esri, Northwest Power Planning and Conservation Council

MARK NOWLIN / THE SEATTLE TIMES



Requirements for Applying the Adjusted TDG Criteria

- Gas abatement plan (approved by Ecology)
 - Long-term strategy to incorporate structural and operational measures to continue to reduce a TDG production during spill
- Fisheries management plan
 - Approach for reducing and eliminating negative impacts to salmon and steelhead
- Physical and biological monitoring plans
 - Plans that outline monitoring program for water quality and the biological health of aquatic life



Reasons to further allow increases to TDG limits

- Formal requests to remove 115% forebay criterion:
 - The Washington Department of Fish and Wildlife
 - Columbia River Inter-Tribal Fish Commission
 - Northwest Sportfishing Industry Association
 - Columbia Riverkeepers
 - Save Our Wild Salmon
 - *Several letters were signed by other organizations.*
- Flexible Spill Agreement
 - Regional agreement signed by: US Army Corps of Engineers, US Bureau of Reclamation, Bonneville Power Administration, Nez Perce Tribe, Washington State, and Oregon. (supported by other organizations)
 - Dependent on removal of 115% forebay criterion for 2019 spill season
 - Also dependent on Oregon and Washington considering a further modification to allow spill up to 125%.
- Orca Task Force Recommendations
 - Include allowing more spill over dams for fish passage in an effort to increase prey salmon for Southern Resident Killer Whale population.

