Assessing Historical Delaware Estuary Data Against EPA's New Dissolved Oxygen Criteria

Water Quality Advisory Committee
December 4th, 2025

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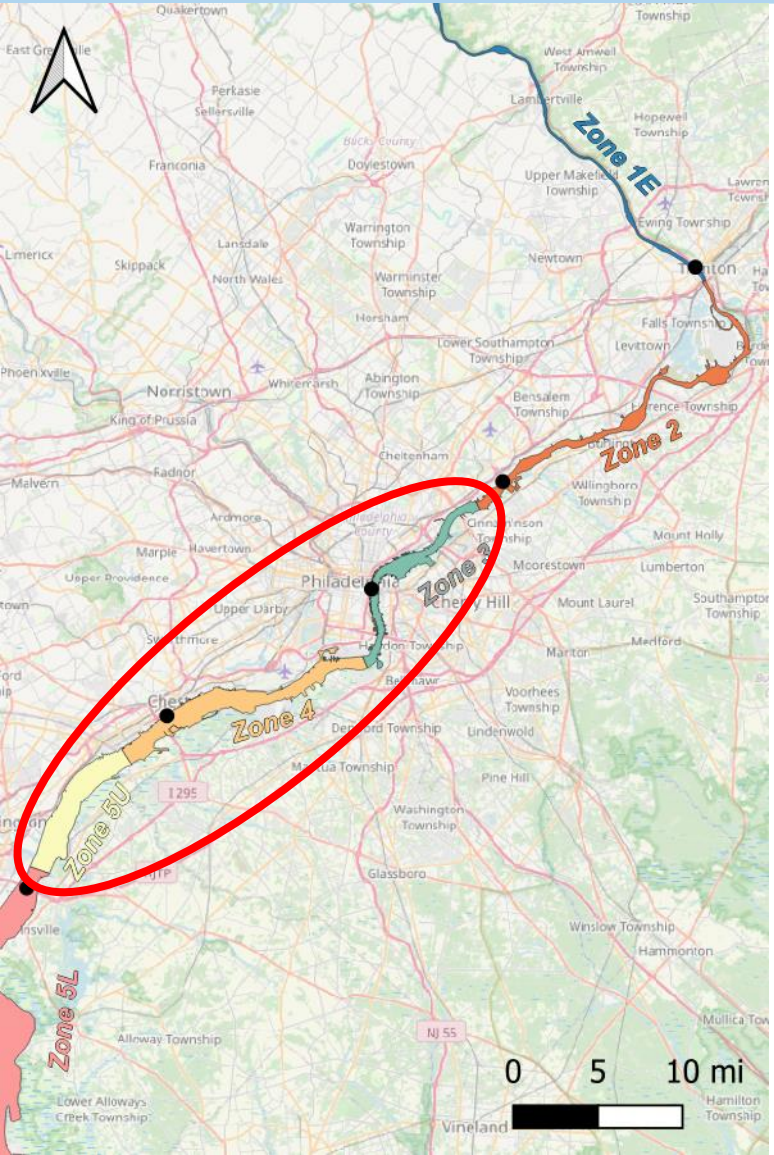
EPA's new dissolved oxygen criteria



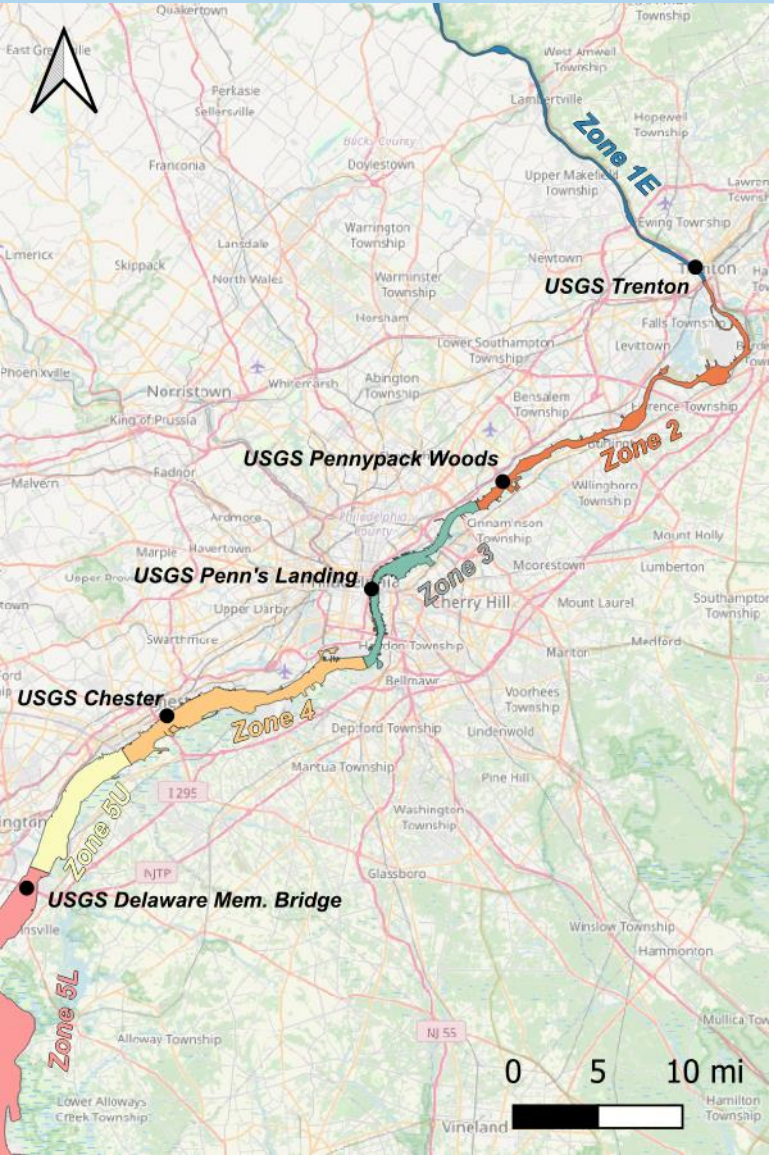
- In September 2025, EPA signed a final rule revising the aquatic life designated use and dissolved oxygen water quality criteria for Zone 3, Zone 4, and the upper portion of Zone 5 (Fish Maintenance Area or FMA)
- The basis for the criteria update was the protection of endangered Atlantic Sturgeon
- The new criteria will benefit all aquatic life in the Estuary

EPA DO criteria contain several components

- The criteria are applicable during three seasons:
  - **Spawning and Larval Development**: March 1 – June 30
  - **Juvenile Development**: July 1 – October 31
  - **Overwintering**: November 1 – February 28/29
- The criteria for each season consist of three components:
  - **Magnitude**: Minimum level of dissolved oxygen (percent oxygen saturation)
  - **Duration**: Averaging period
  - **Exceedance Frequency**: How often the magnitude can be exceeded while ensuring the use is protected

Magnitude	Duration	Exceedance Frequency	Applicable Seasons
66%	Daily Average	12 Days Cumulative (~10% of the season)	Spawning, Juvenile, Overwintering
74%		61 Days Cumulative (~ 50% of the season)	Juvenile

How were criteria assessed?



Spatial Range: Zone 1E – 5

Date Window: 2000 – 2025

Assessment methods:

1. Count of days below criteria

   # days below criteria vs. exceedance frequency

2. Proportional days below criteria

$$\frac{\#\ days\ below\ criteria}{\#\ days\ of\ available\ data}\ vs.\ \frac{exceedance\ frequency}{\#\ of\ days\ in\ complete\ season}$$

Outcome:

Meeting New EPA Criteria — Yes — No — Assessment Dependent

Evaluating historical DO against new EPA criteria

Season: Spawning, Mar-Jun

Magnitude: 66% Saturation

Frequency: 12 Days

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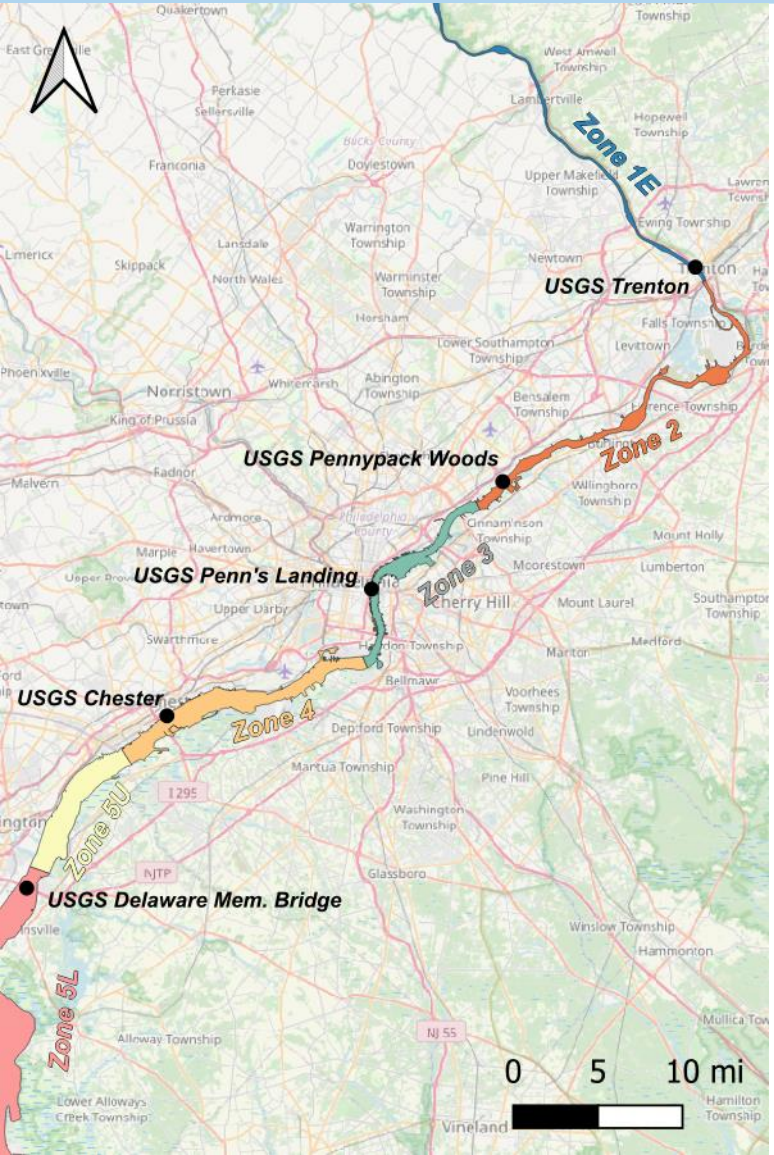

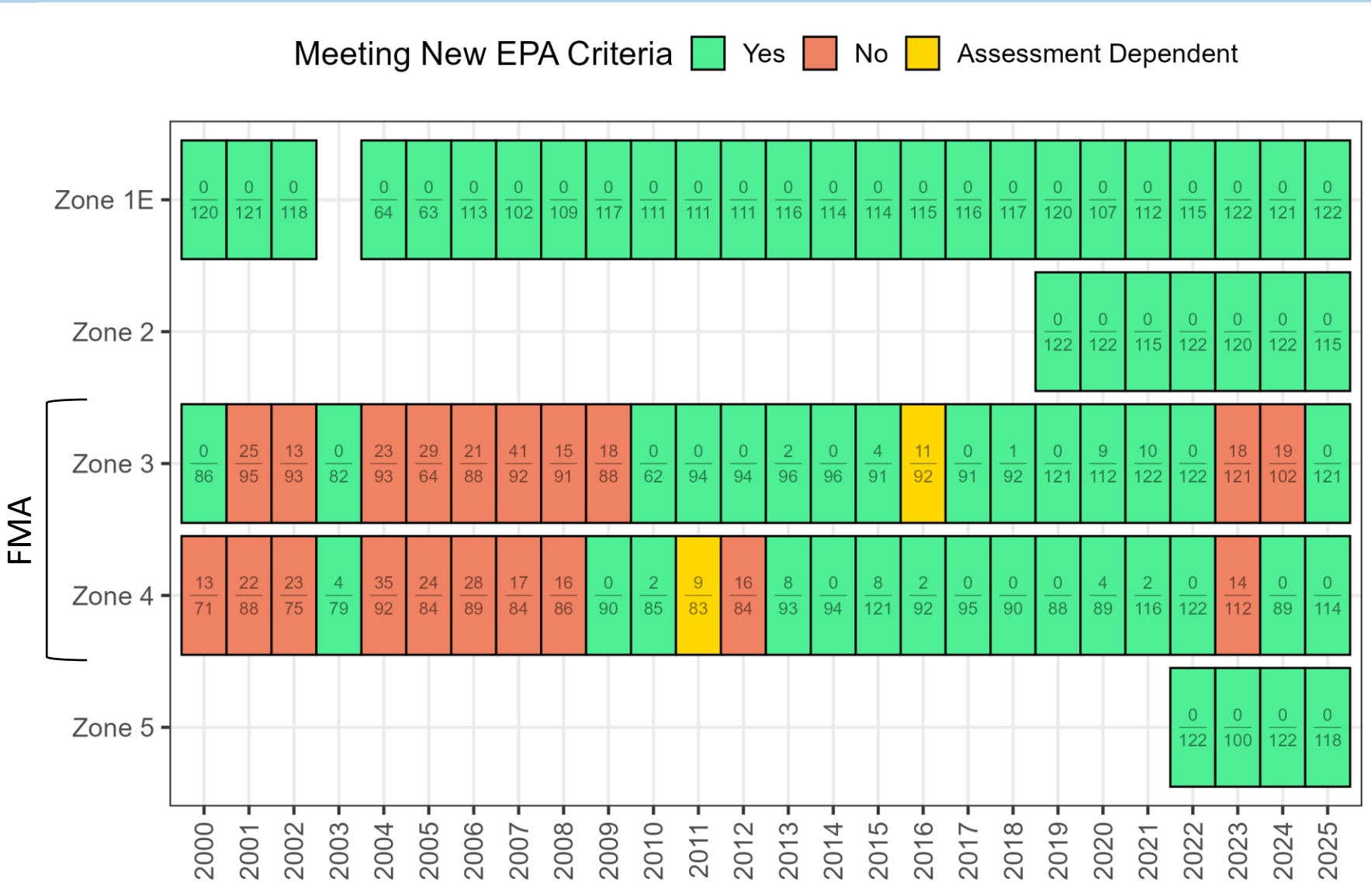

Evaluating historical DO against new EPA criteria

Season: Juvenile, Jul-Oct

Magnitude: 66% Saturation

Frequency: 12 Days

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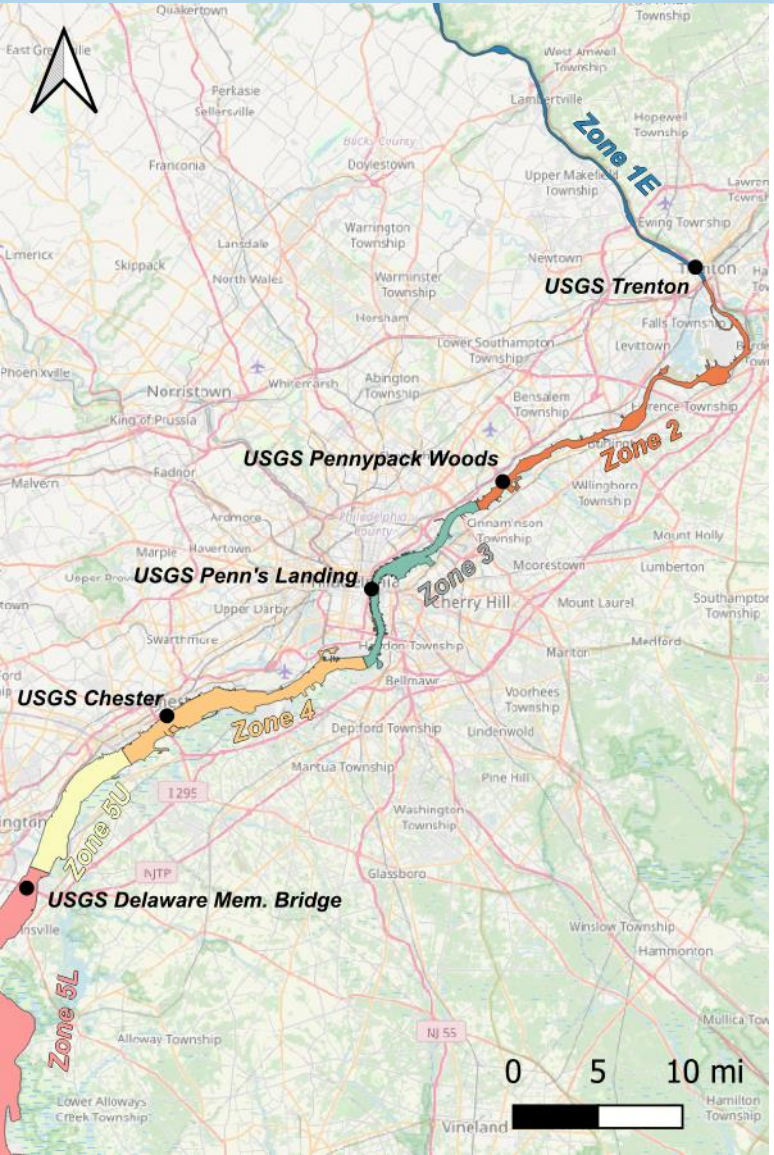

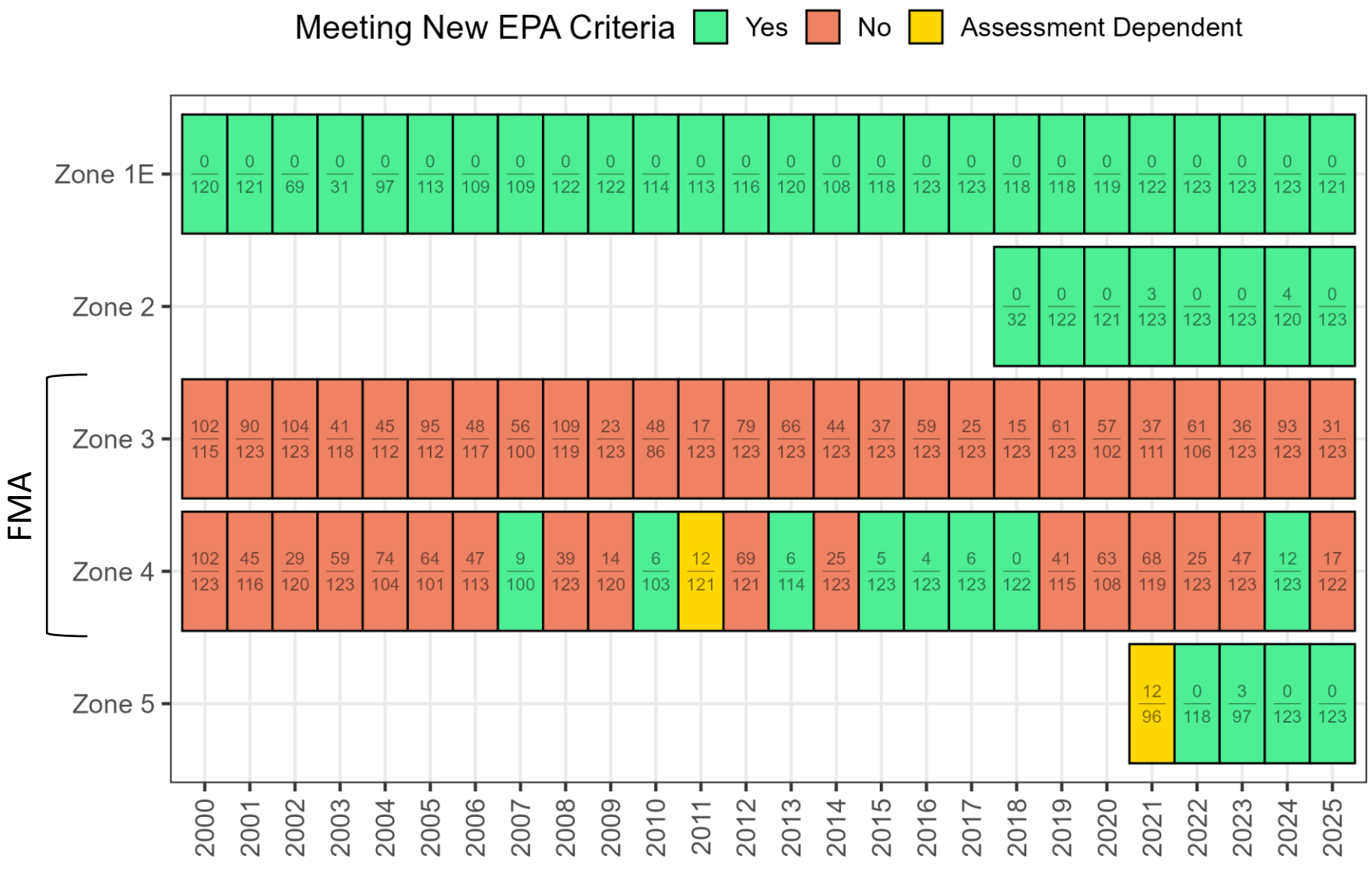

Evaluating historical DO against new EPA criteria

Season: Juvenile, Jul-Oct

Magnitude: 74% Saturation

Frequency: 61 Days

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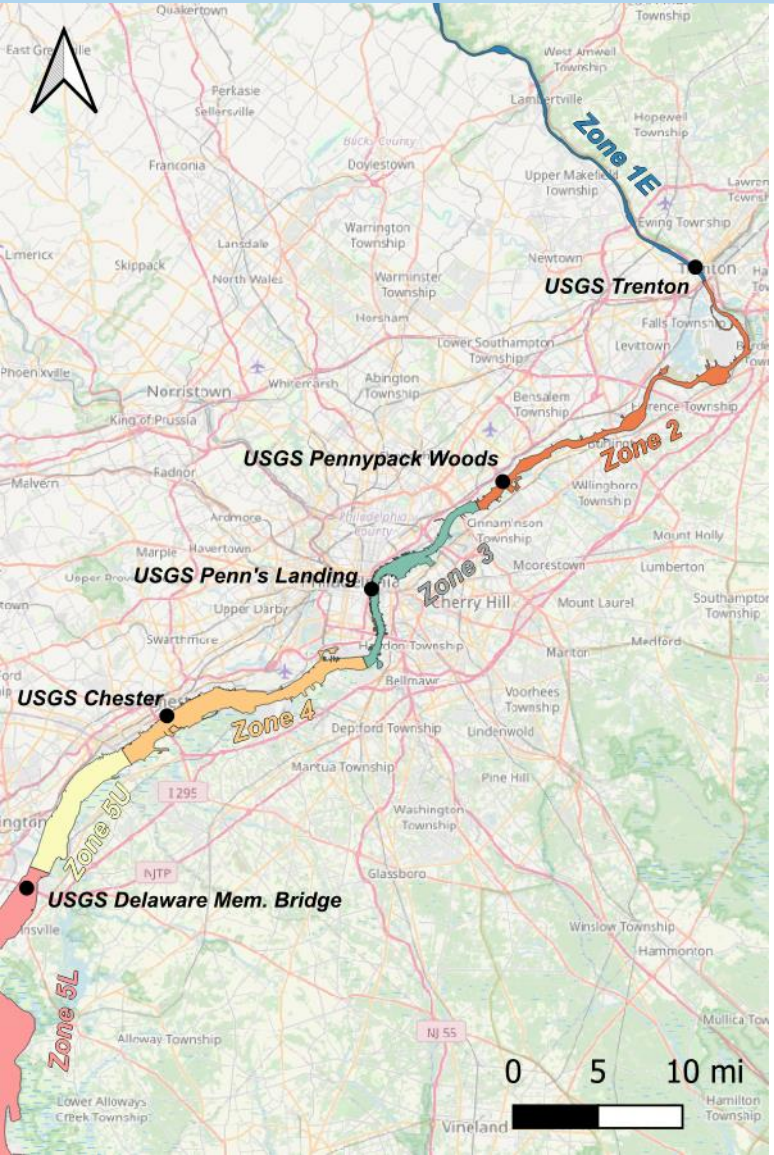

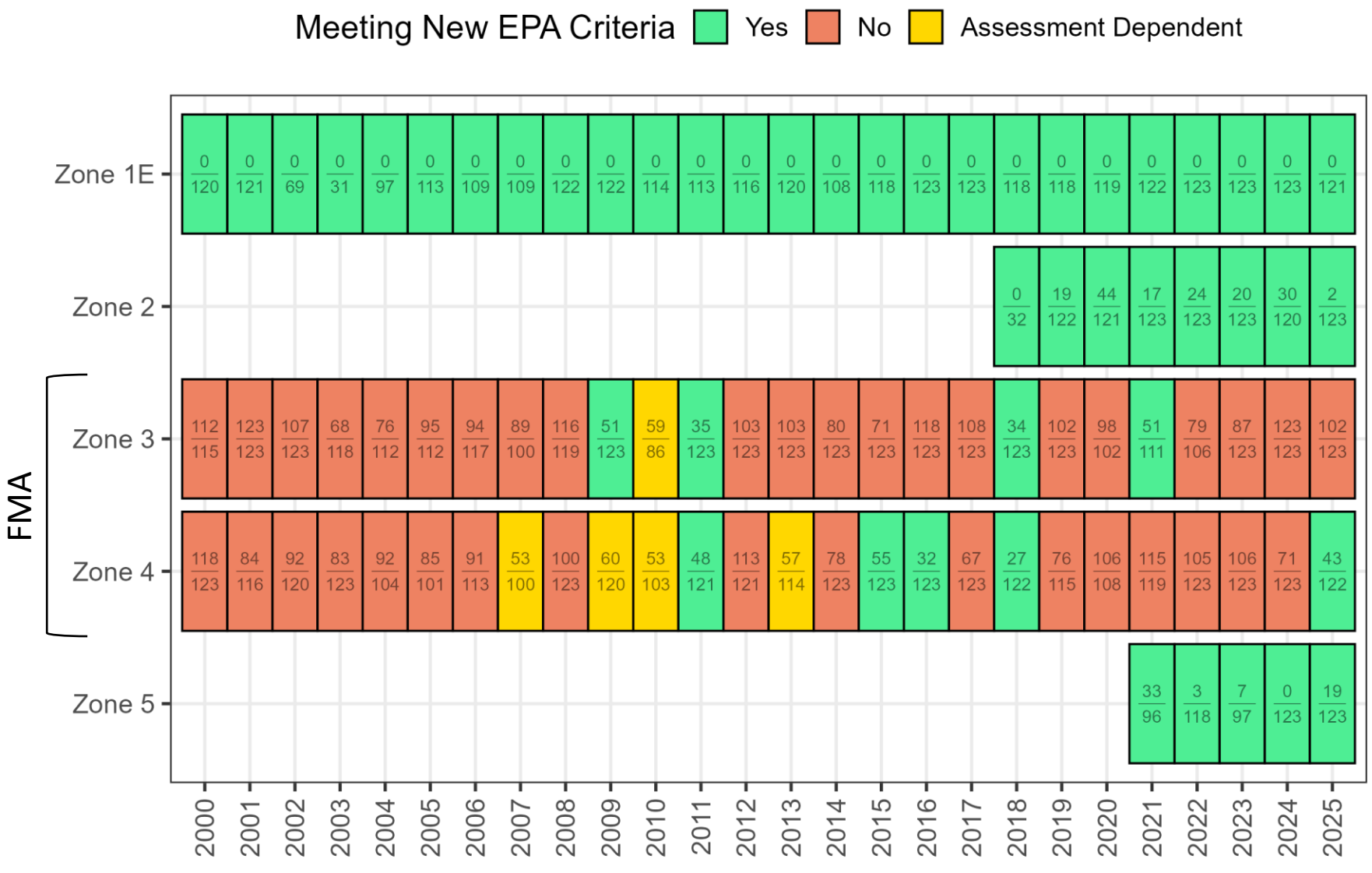

Evaluating historical DO against new EPA criteria

Season:
Juvenile
Jul-Oct

Magnitude:
66% OR
74% Saturation

Frequency:
12 days
61 days

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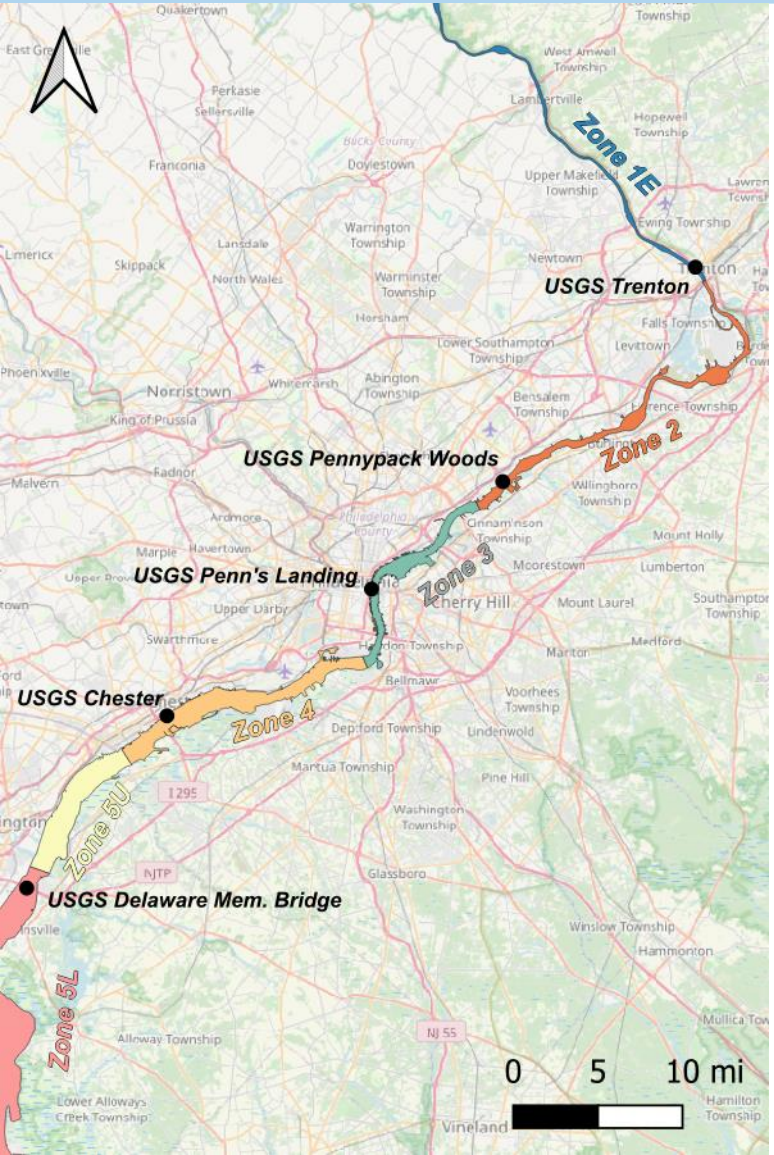

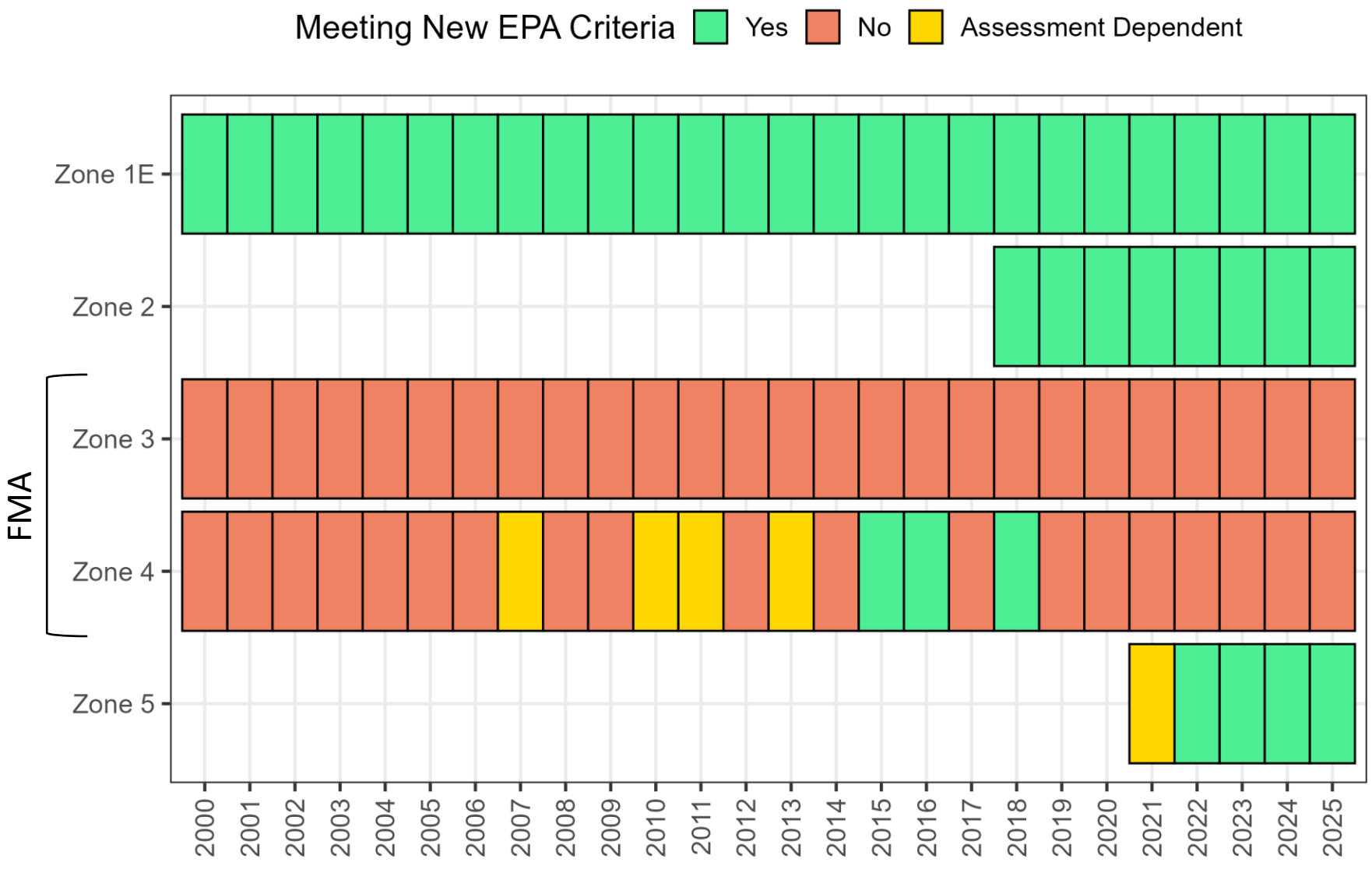

Evaluating historical DO against new EPA criteria

Season: Overwintering, Nov-Feb

Magnitude: 66% Saturation

Frequency: 12 Days

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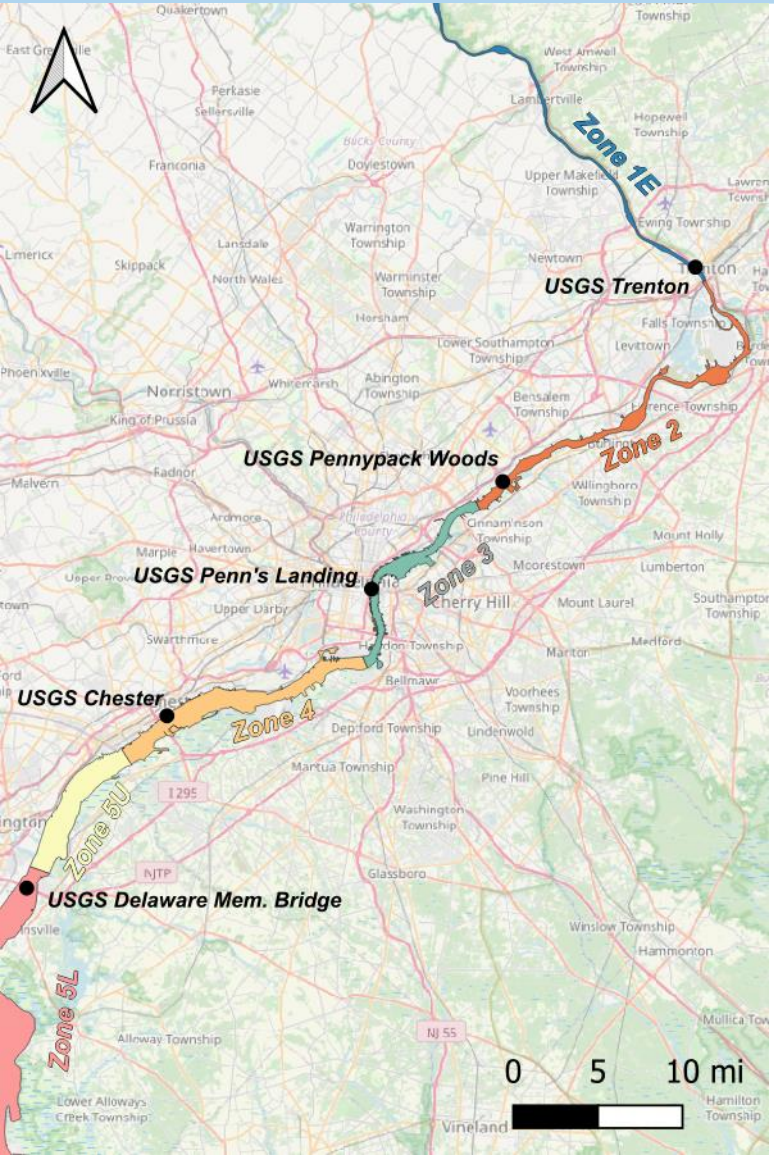
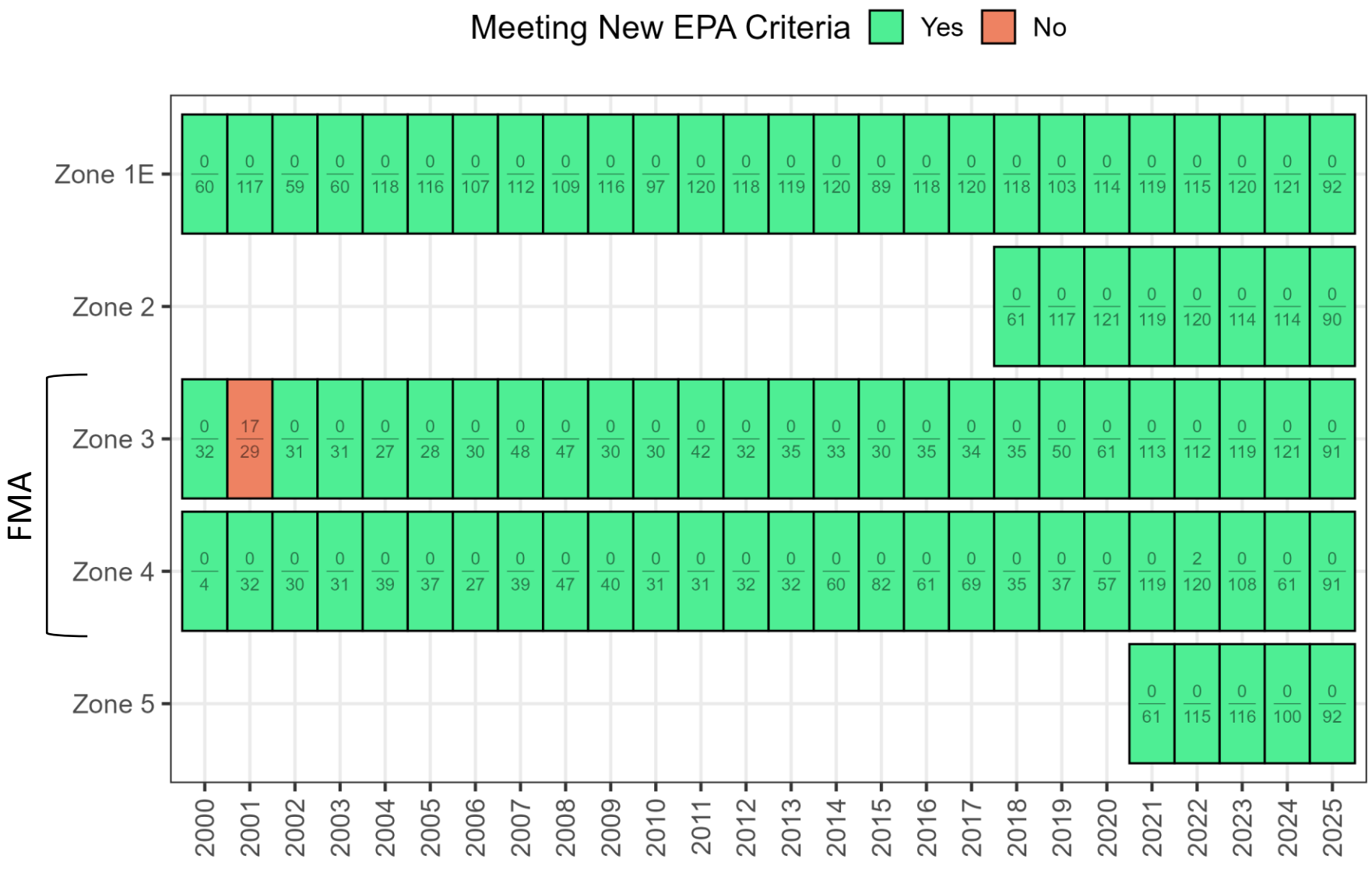
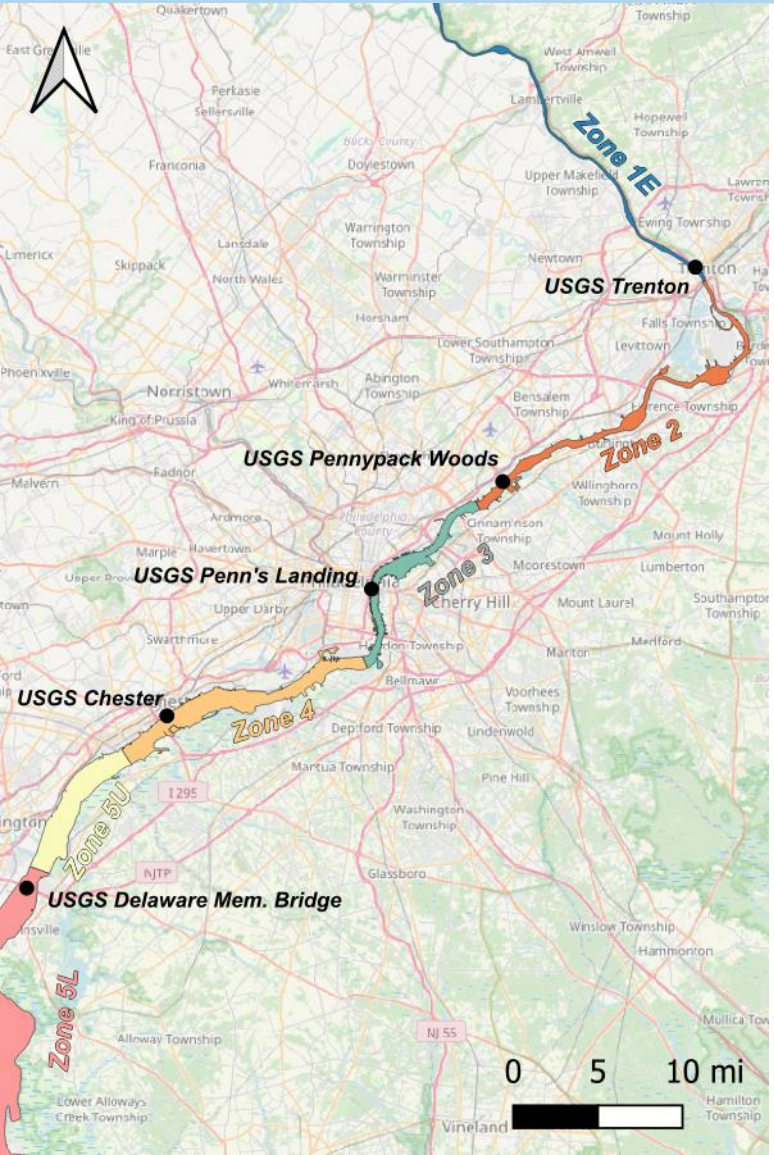




Evaluating historical DO against new EPA criteria

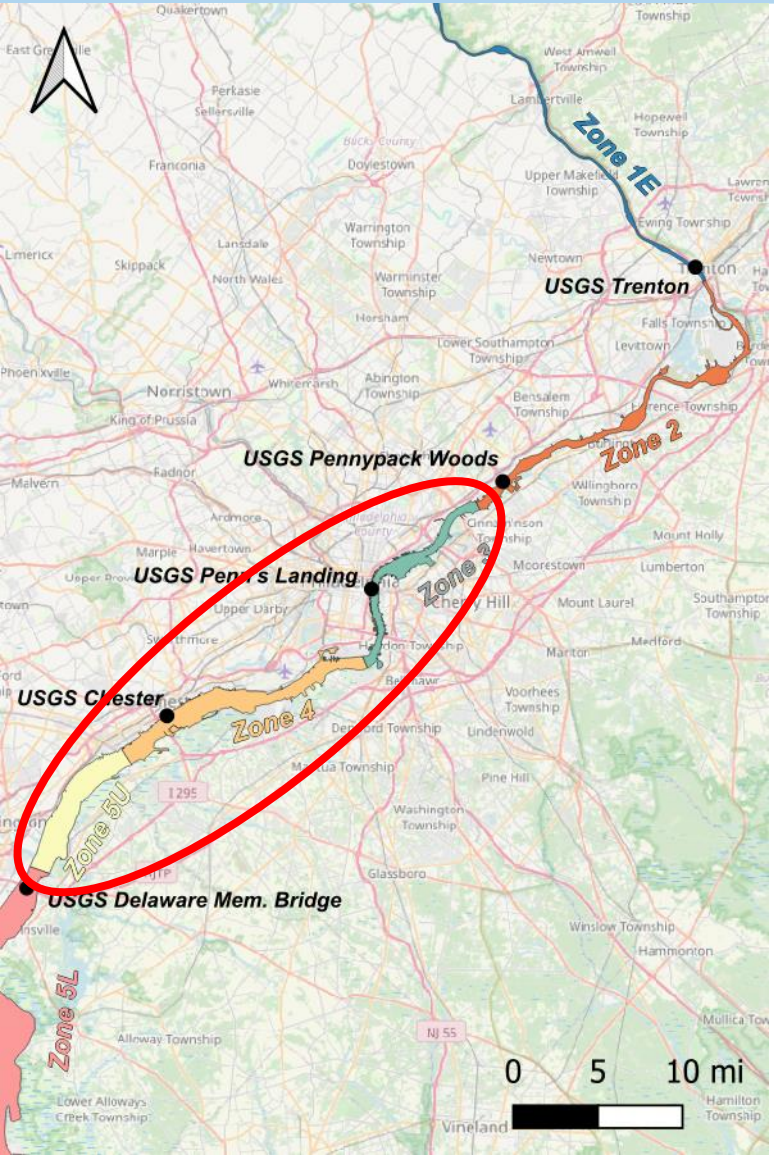


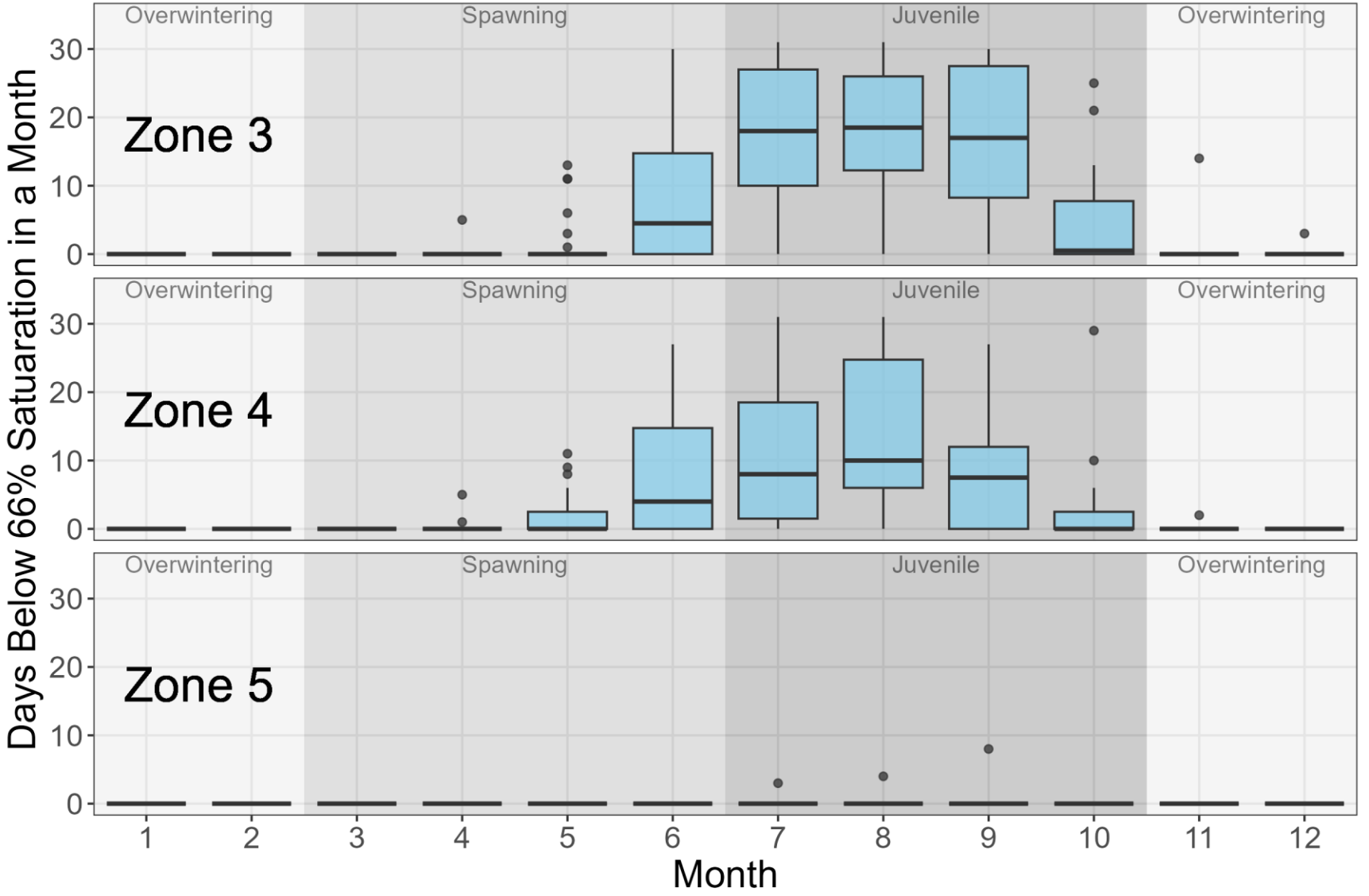
Number of Seasons Meeting EPA's New DO Criteria (2000 - 2025)

Zone	Spawning	Juvenile	Overwintering
1E	25 / 25	26 / 26	26 / 26
2	7 / 7	8 / 8	8 / 8
3	15 / 26 *	0 / 26	25 / 26
4	15 / 26 *	3 / 26*	26 / 26
5	4 / 4	4 / 5*	5 / 5

* *Dependent on assessment methodology*

Most days below criteria occur between June and October





Days below criteria in May have been rare in the past decade

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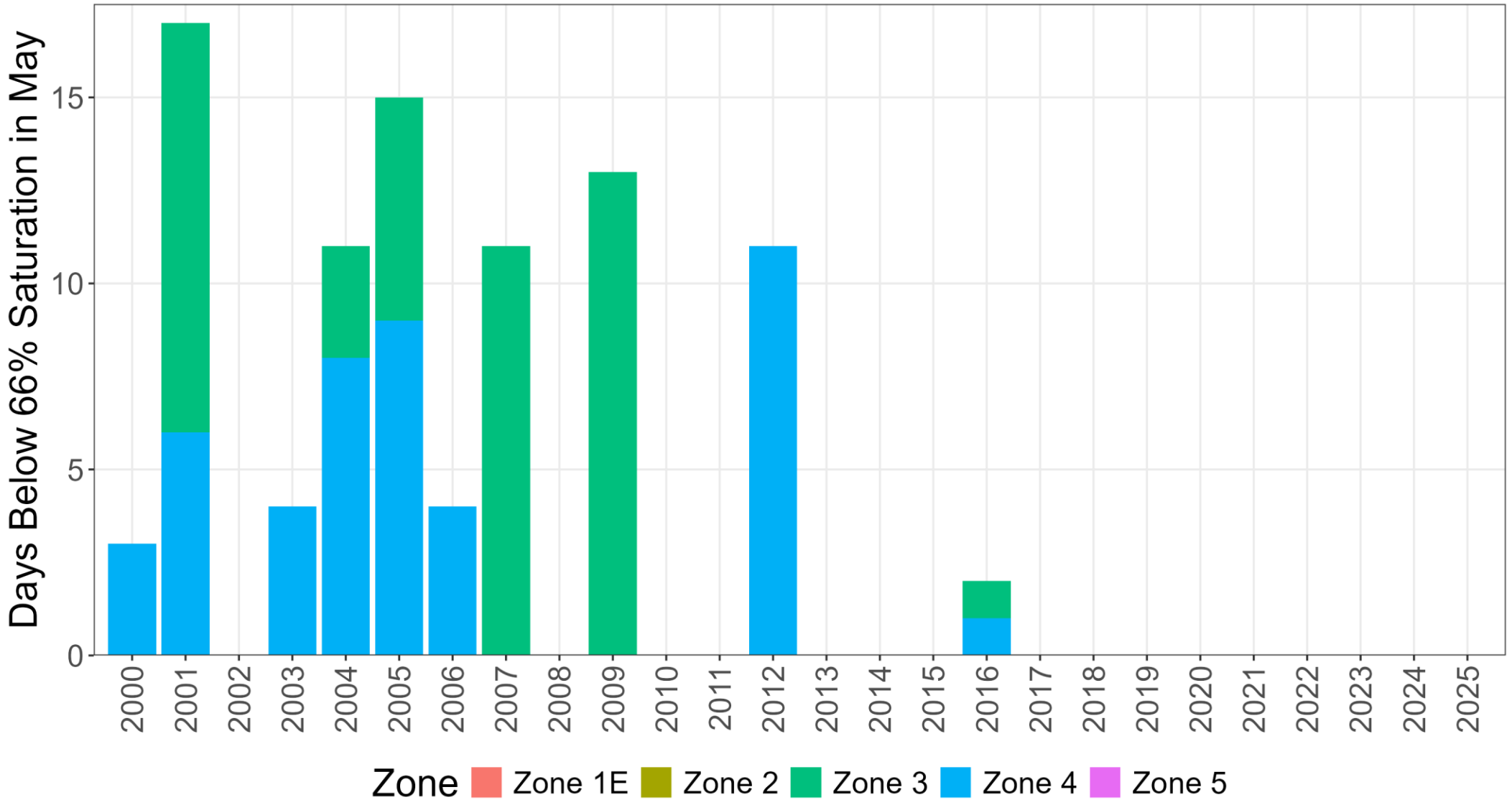

Summary

- Assessment of historical data against EPA's new dissolved oxygen criteria reveals….
  - Upstream of the FMA would have met criteria
  - Downstream of the FMA would generally have met criteria
  - FMA routinely would have routinely violated criteria
    - ~ 40% of spawning seasons (improvement post-2010)
    - Almost all juvenile development seasons
    - DO values below criteria generally appear in June and can be present until October
  - Overwinter period would have met criteria at all locations

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Questions?