

Chesapeake Bay Model

Hydrologic base and critical periods

Communication of results

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This information is preliminary or provisional and is subject to revision. It is being provided to meet the need for timely best science. The information has not received final approval by the U.S. Geological Survey (USGS) and is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information.

Guiding Questions

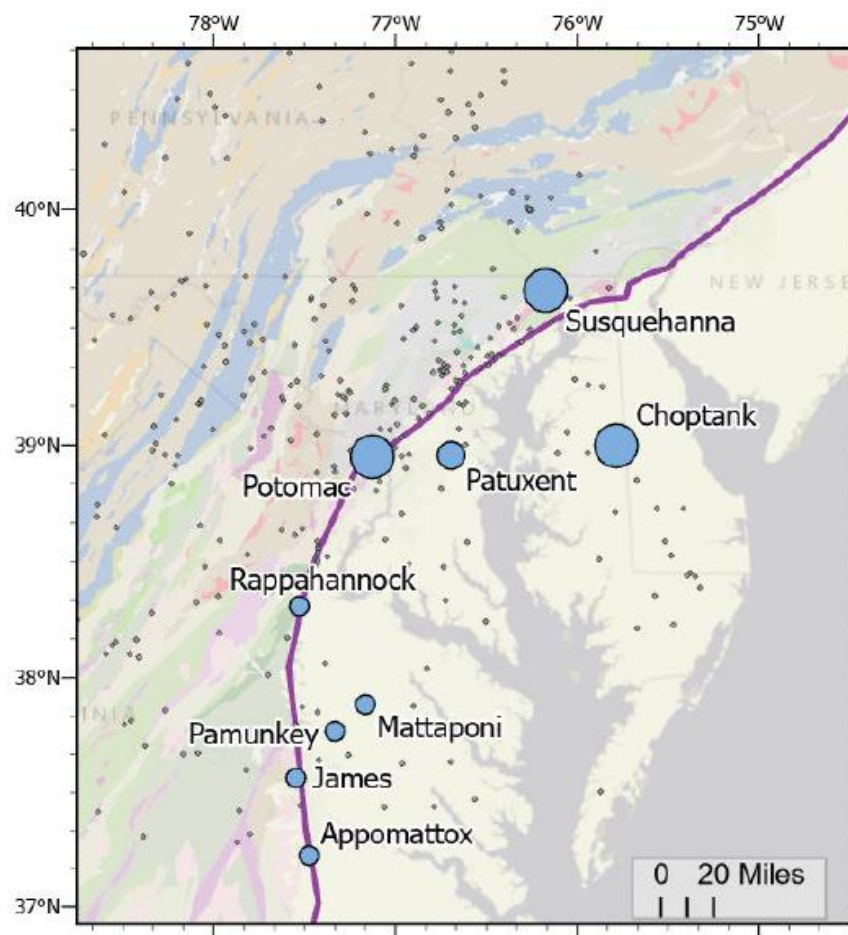
- What are the three proposed options?
 - Status Quo
 - Hybrid
 - New
- Why aren't more recent periods showing up as candidates?
- How have data and methods changed since the 2010 TMDL report?
- What would the three proposed options look like under the old methodologies?

Proposed options.

- Status Quo
 - Base period 1991-2000
 - Critical stress period 1993-1995
- Hybrid
 - Base period 1991-2000
 - Critical stress period 1996-1998
- New
 - Base period 1998-2007
 - Critical stress period 2004-2006

N-P effectiveness weights

(provided by the phase 6 model)



Not all freshwater inputs are equal.

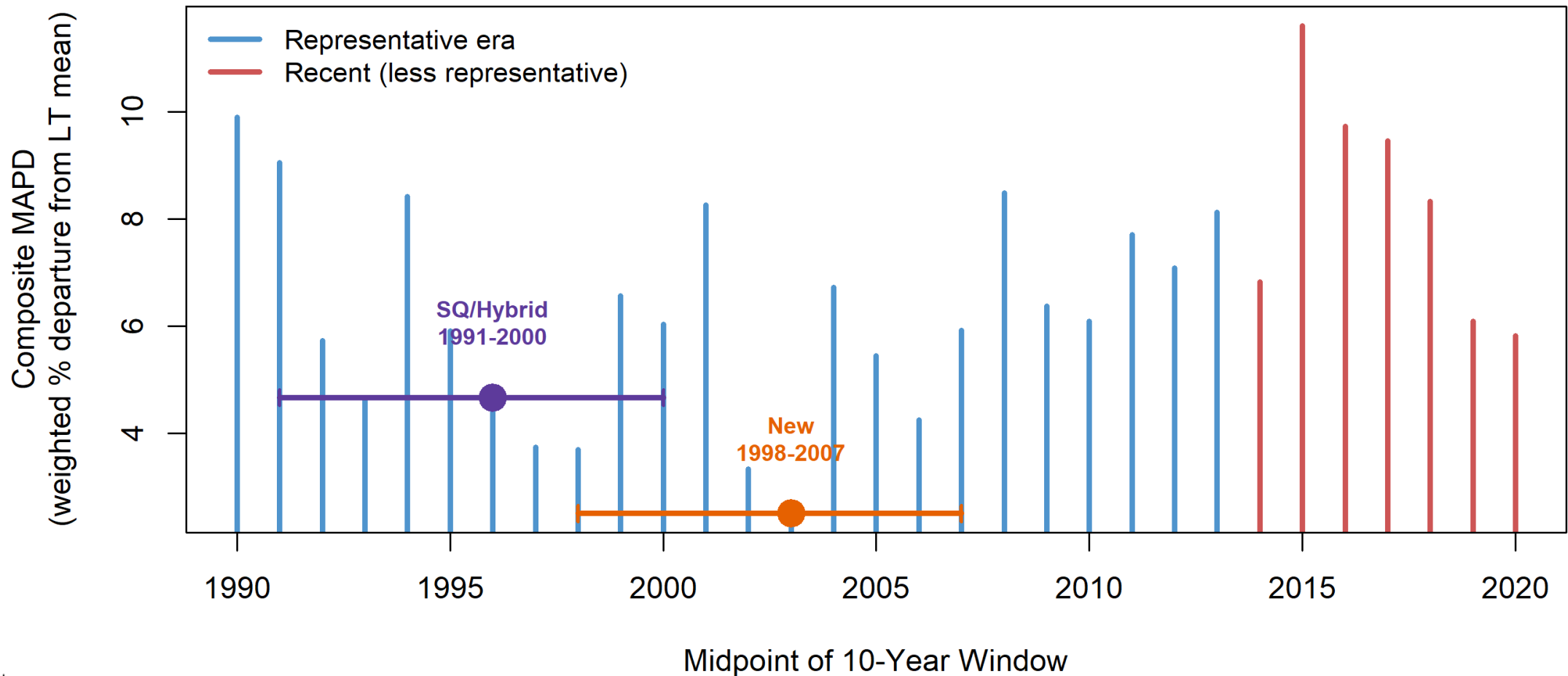
The nine RIM stations were weighted by how much each river's nitrogen and phosphorus affects Bay dissolved oxygen, not by flow volume alone.



U.S. Geological Survey
(USGS), Esri, HERE, Garmin,
USGS, EPA, NPS

Base period- why aren't we seeing more recent candidates?

Representativeness Over Time — Recent Windows Score Poorly



Preliminary Information-Subject to Revision. Not for Citation or Distribution

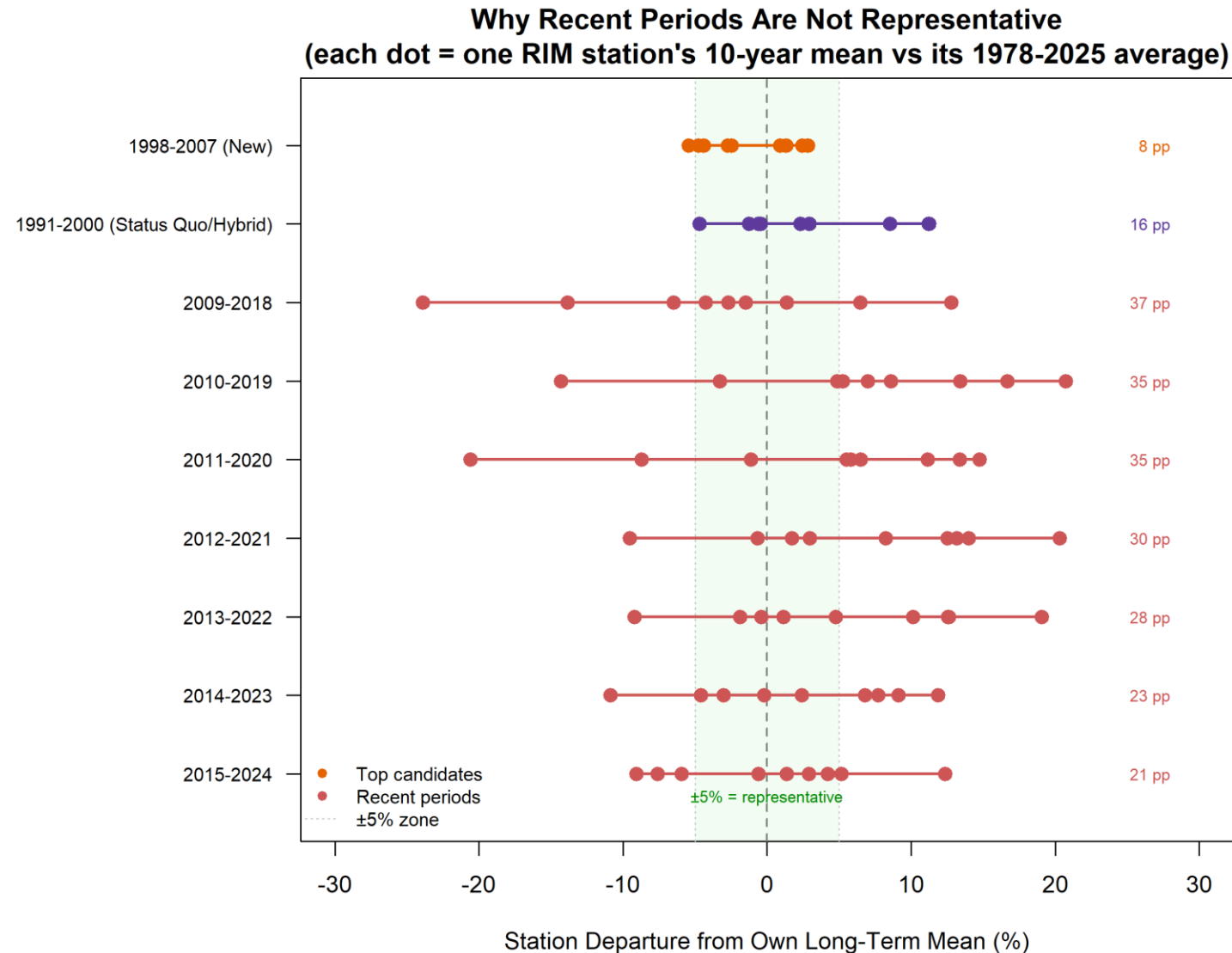


A closer look- station by station departures

This plot represents the mean annual flows of each of the 9 RIM stations in comparison with the reference mean.

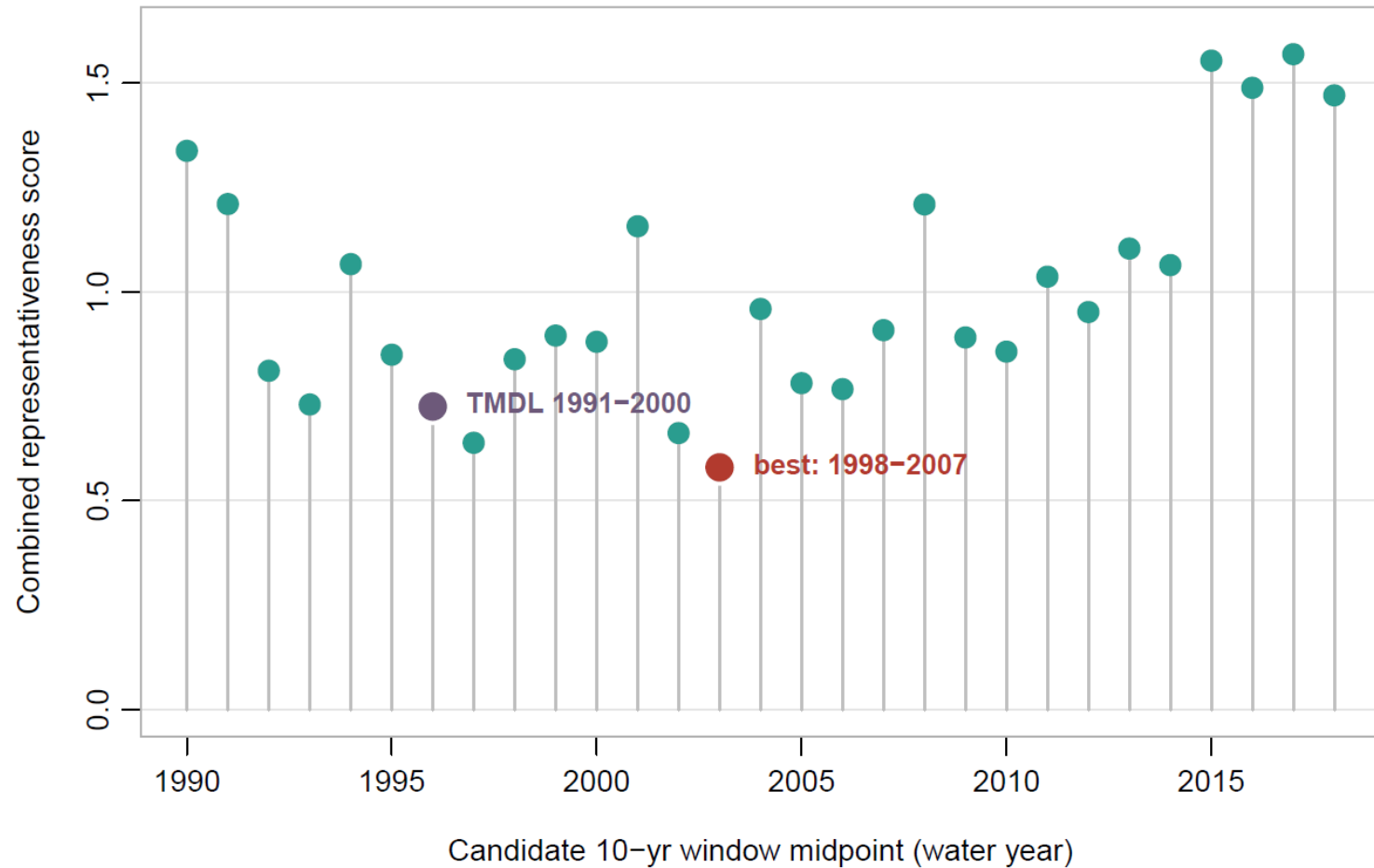
The more recent spans (in red) show more variable responses by watershed

The NEW and STATUS QUO/HYBRID base periods show the most similar response across stations

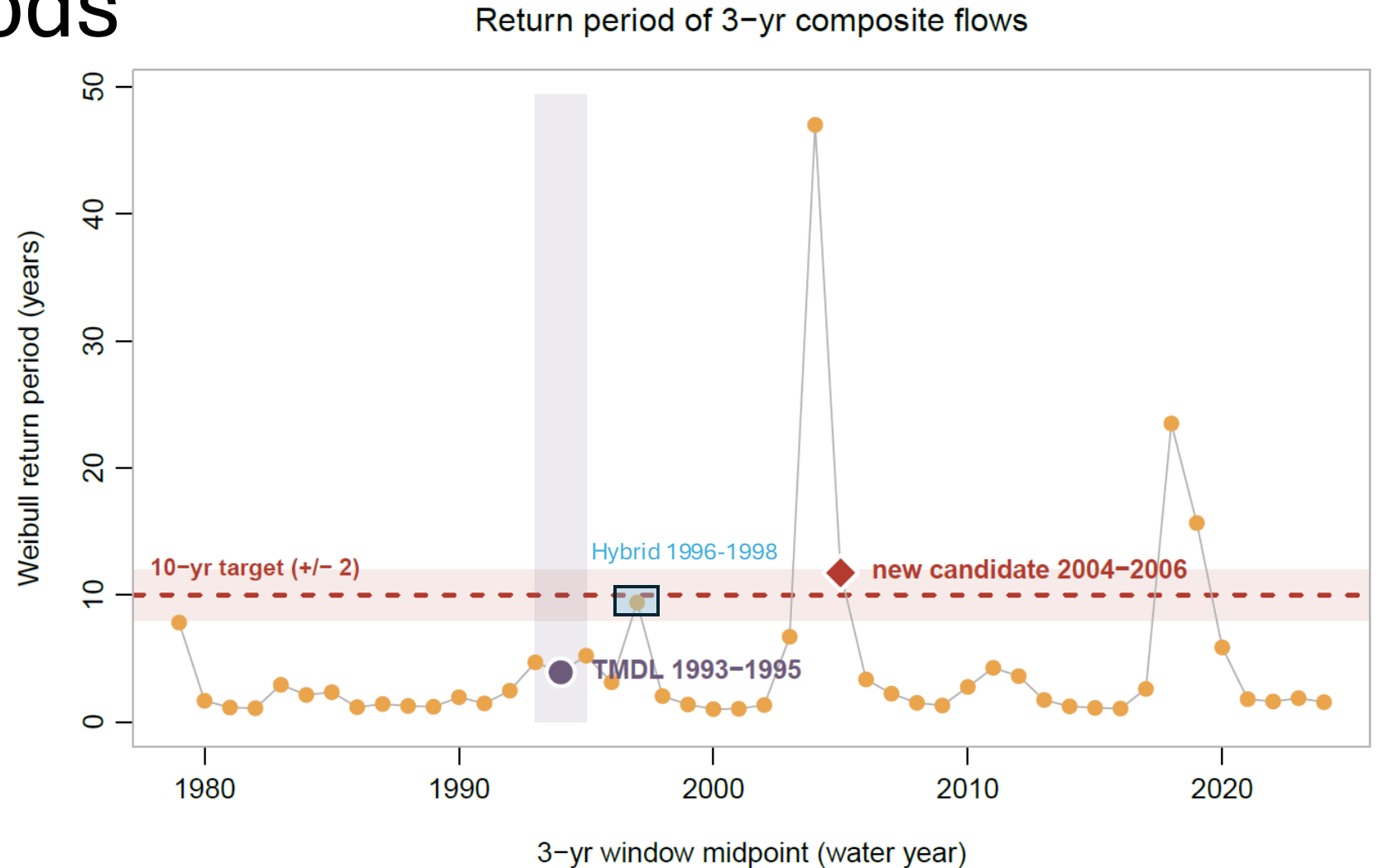


Adding the shape of the distribution: combined score

Base-period candidates: lower = more typical

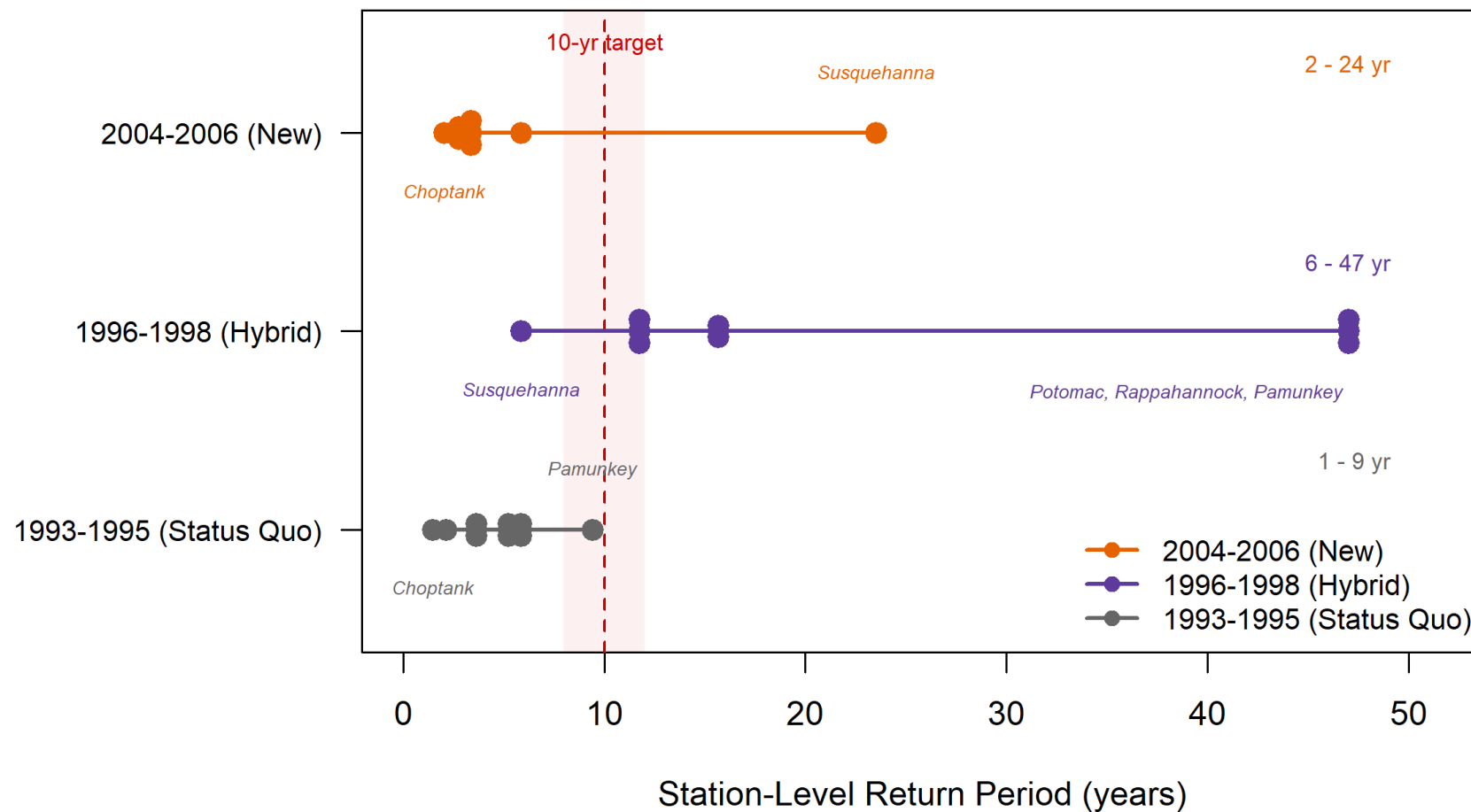


3 year overlapping windows: Average flow return periods



Critical period- individual basin responses

How Extreme is Each Critical Period for Individual Rivers?
(each dot = one RIM station's 3-year flow return period)



Critical period- changes in data and methods.

Full water year versus monthly subsetting

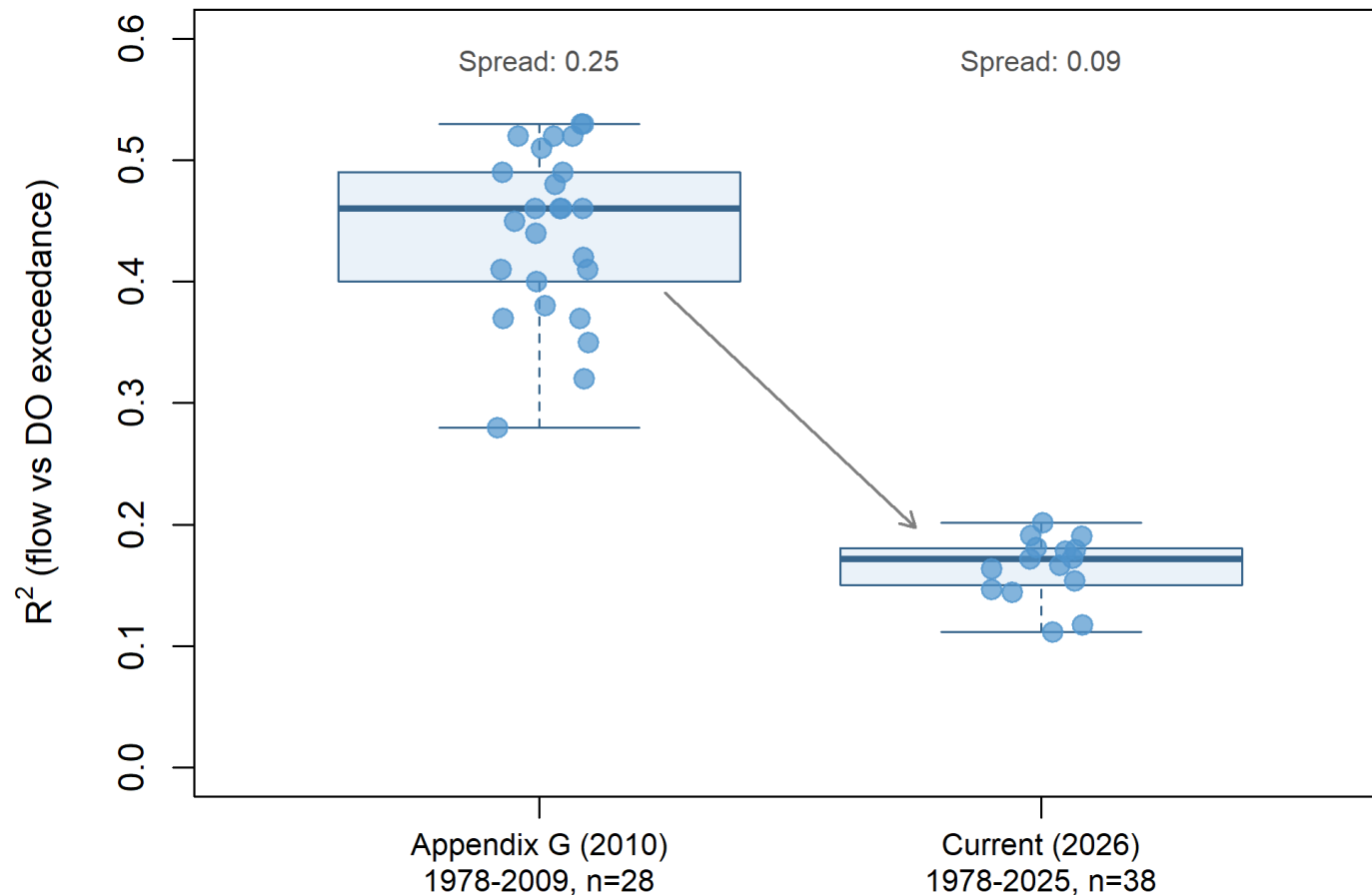
The 2010 TMDL analysis used multiple monthly subsets (for example December to June) instead of the whole water year.

That decision was based on the highly variable correlations between monthly subsets and DO exceedances in the Bay.

Re-running this correlation analysis, we see very little variability across subsets in relation to DO exceedances.

- Monthly subsetting was not necessary given the following:
- New flow data, new N-P weights, new DO Exceedance data, no detrending or record extension necessary.

Monthly Interval Correlations: Previous vs Current Analysis



Critical period- results under different methodologies

- 1993-1995 (Status Quo) falls short of the 10-year target under all methods tested: original and current.
- 1996-1998 (Hybrid) exceeded the target under the old methodology but lands at 9.4 years under current methods: closest to the 10-year goal.
- 2004-2006 (New) meets the target at 11.75 years under current methods.
- Both replacement candidates are scientifically defensible.

