Overview of JR Chlorophyll Assessment Procedure and Proposed Modifications (as of today!)

Tish Robertson
August 12, 2015
CAP Workgroup

Excerpt from Virginia's Water Quality Standards

bb. The following site specific numerical chlorophyll a criteria apply March 1 through May 31 and July 1 through September 30 as seasonal means to the tidal James River (excludes tributaries) segments JMSTF2, JMSTF1, JMSOH, JMSMH, JMSPH and are implemented in accordance with subsection D of 9VAC25-260-185.

Designated Use	Chlorophyll a µ/l	Chesapeake Bay Program Segment	Temporal Application
Open Water	10	JMSTF2	March 1 - May 31
	15	JMSTF1	
	15	JMSOH	
	12	JMSMH	
	12	JMSPH	
	15	JMSTF2	July 1 - September 30
	23	JMSTF1	
	22	JMSOH	
	10	JMSMH	
	10	JMSPH	

Contains references to the "Criteria Assessment Protocols" technical addenda

James River Chlorophyll Assessment Webinar

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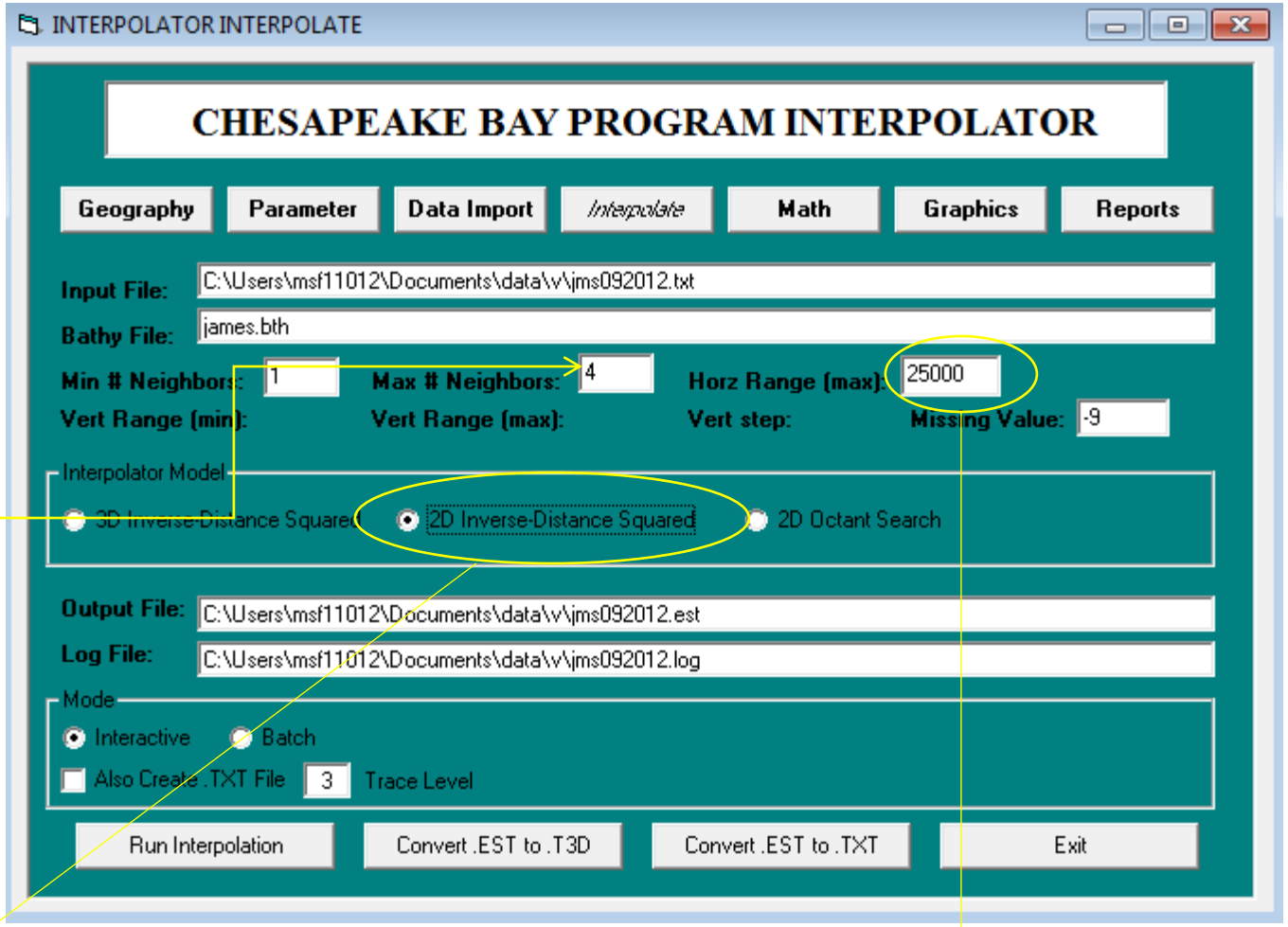
Office of Ecology—Monitoring and Assessment
Virginia DEQ, July 15, 2015

Three basic ingredients of JR chlorophyll assessment:

- Spatial Interpolation
- Spatial Exceedence Rate
- Cumulative Frequency Diagram (CFD)

We use the Interpolator settings described in the 2008 Technical Addendum

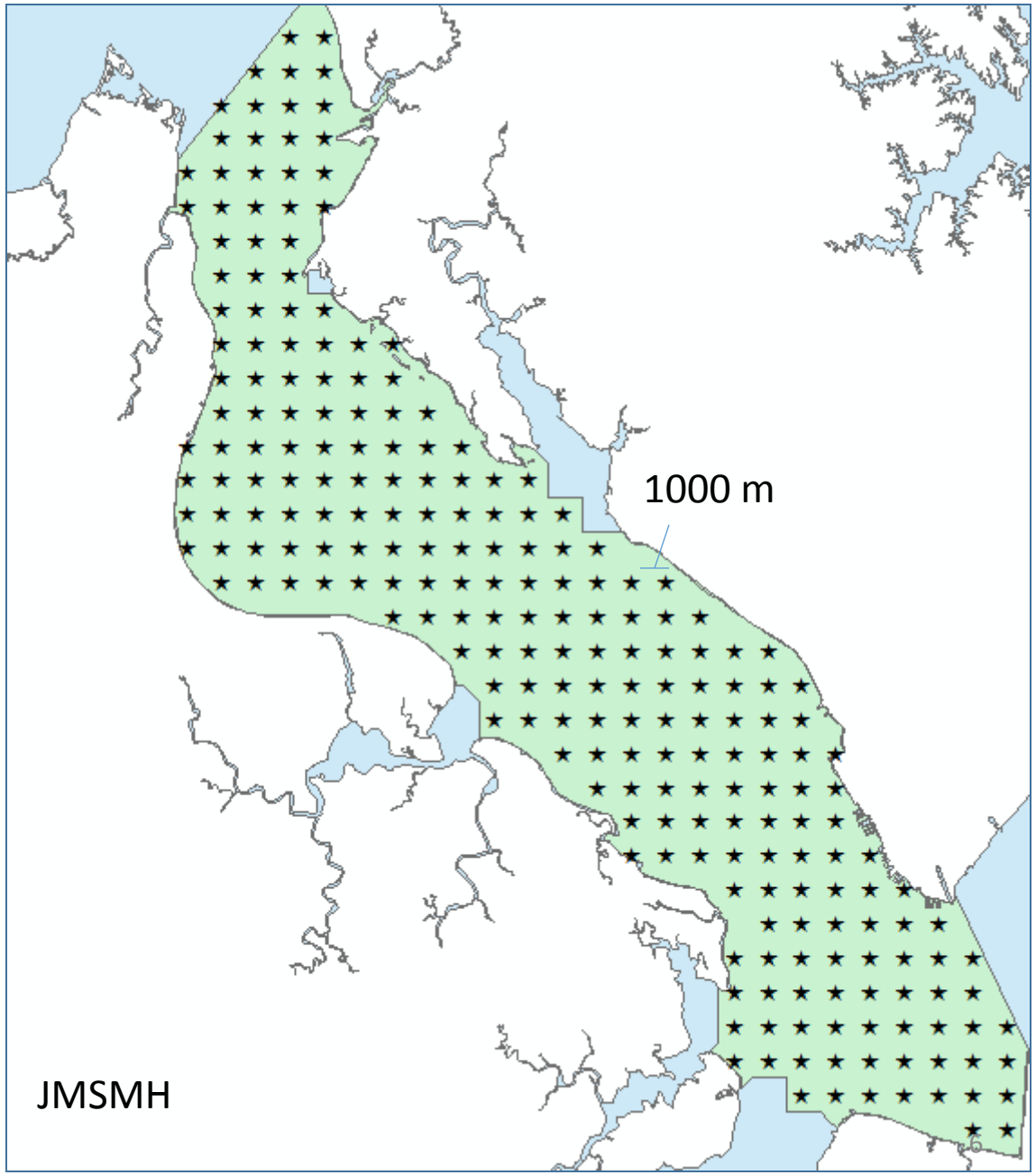


Maximum no. of data points used to generate an estimate

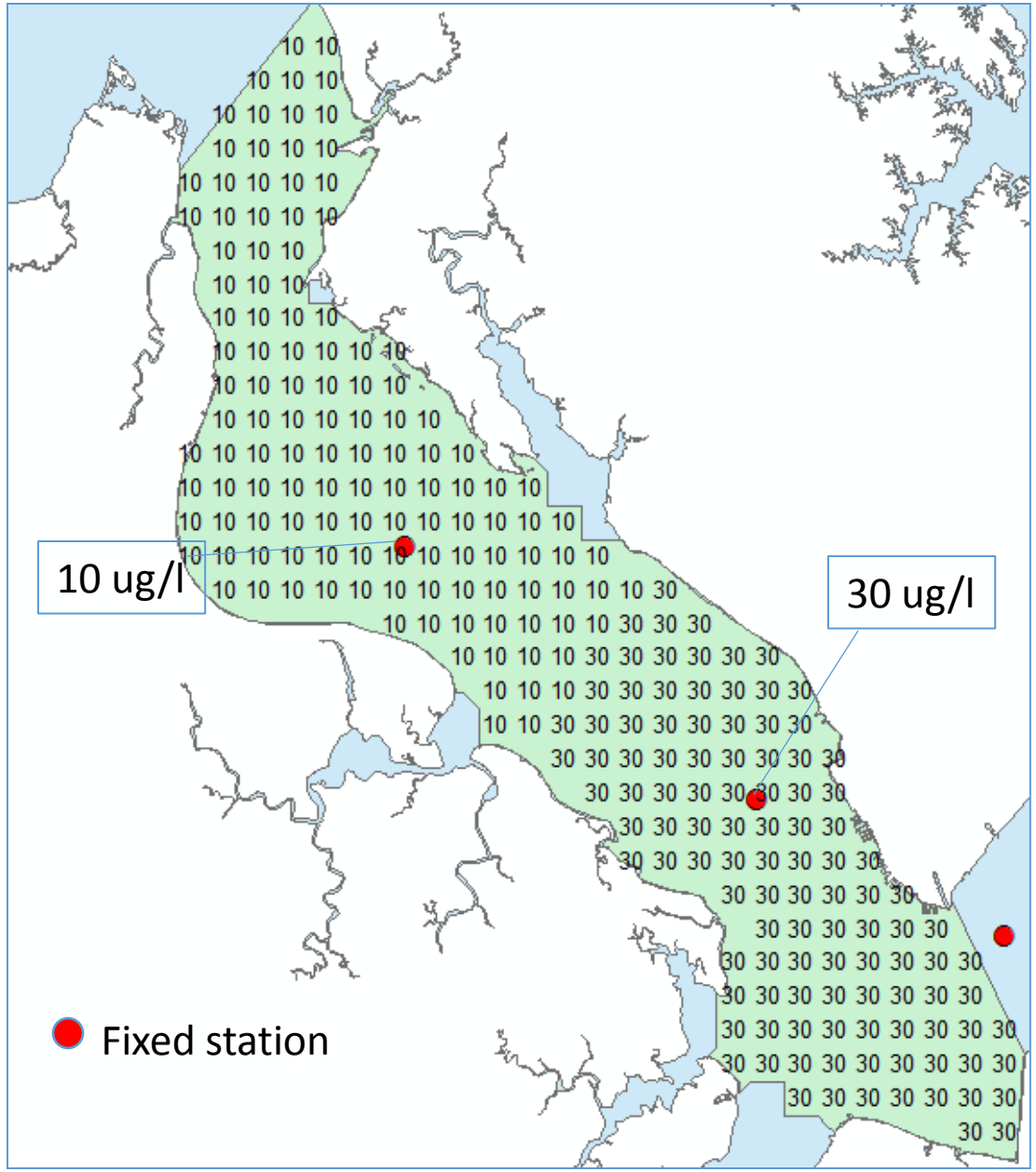
Search radius in meters

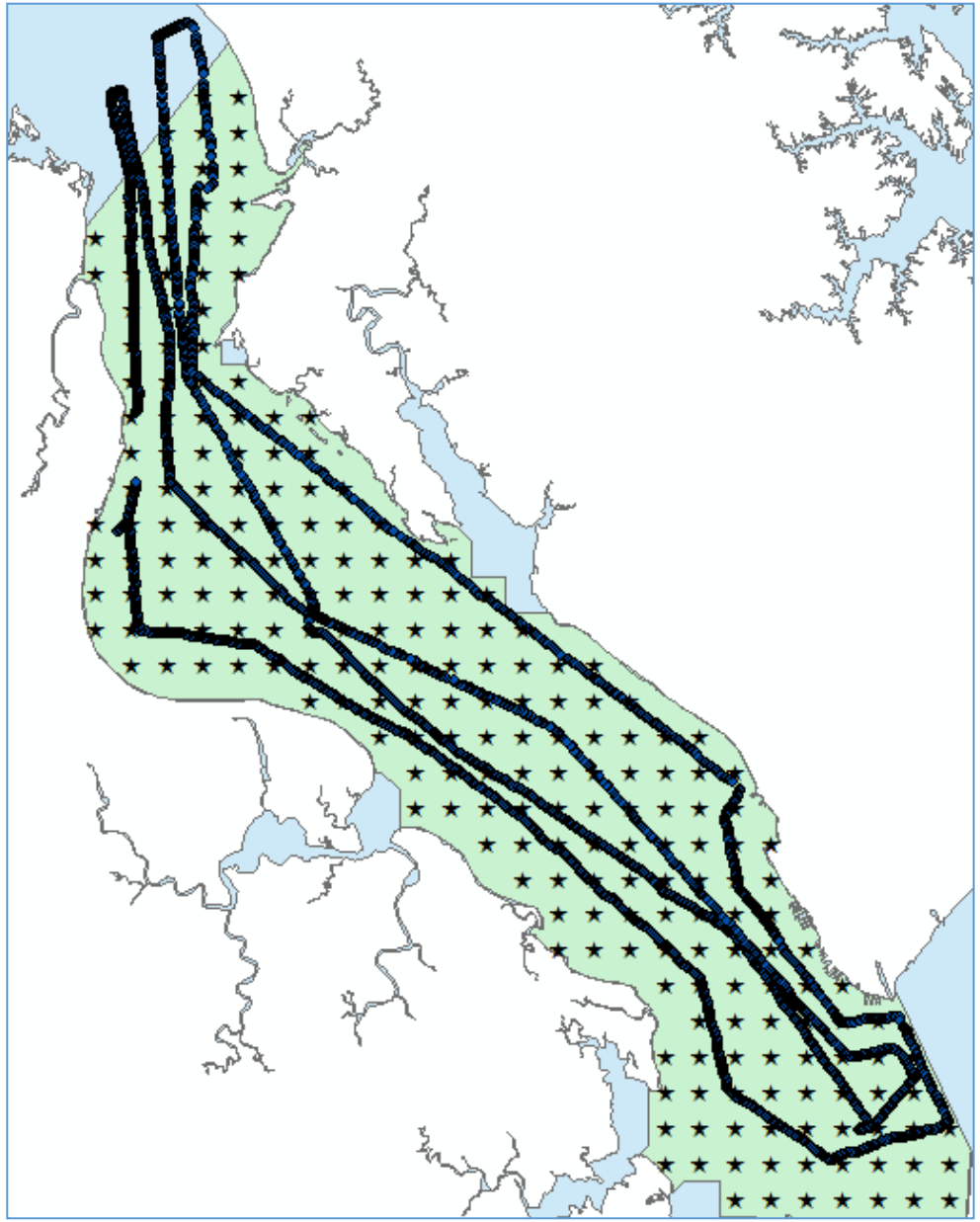
Specifies the interpolation model
(for chlorophyll, it's two-dimensional)

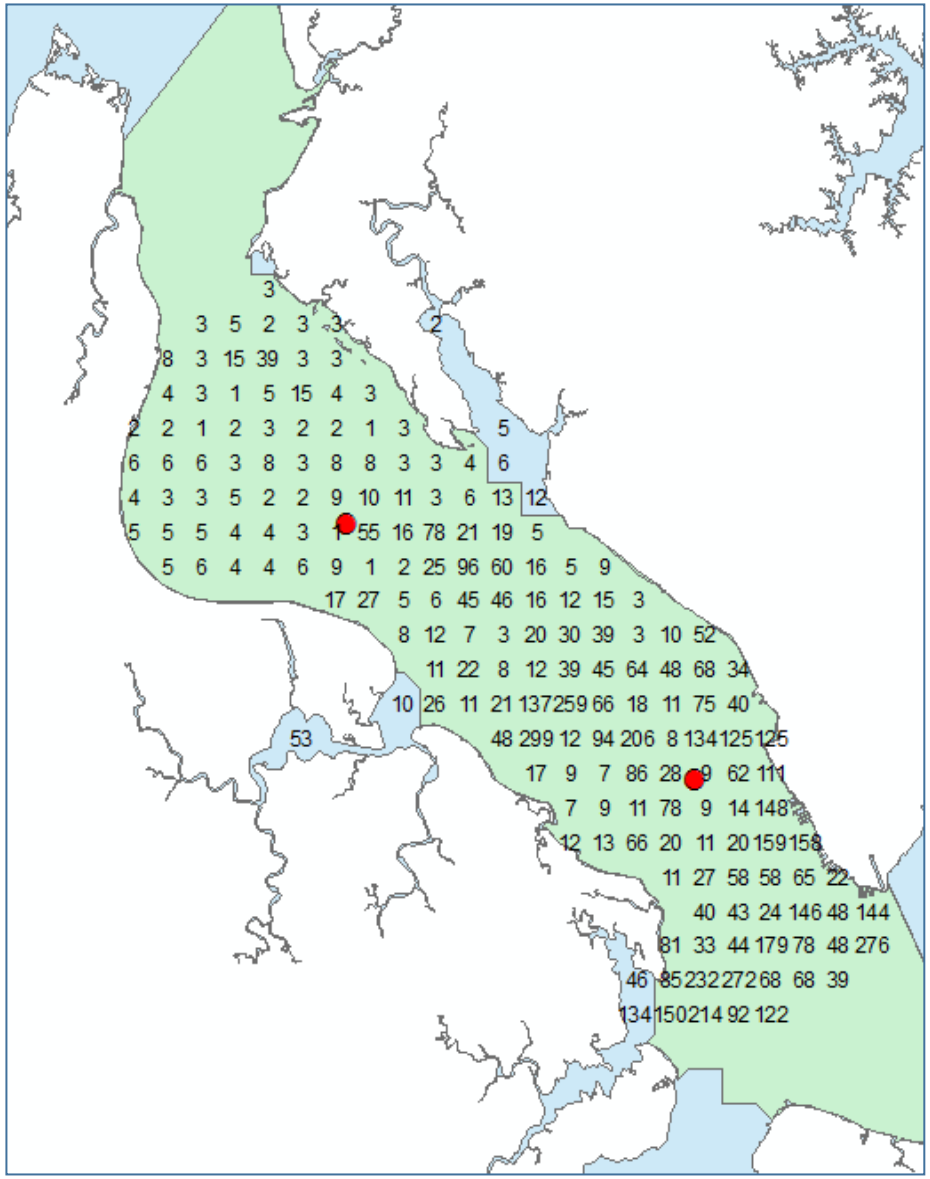
The Interpolator generates estimates at point locations (centroids) distributed evenly throughout a segment.



Interpolation output
for a small dataset

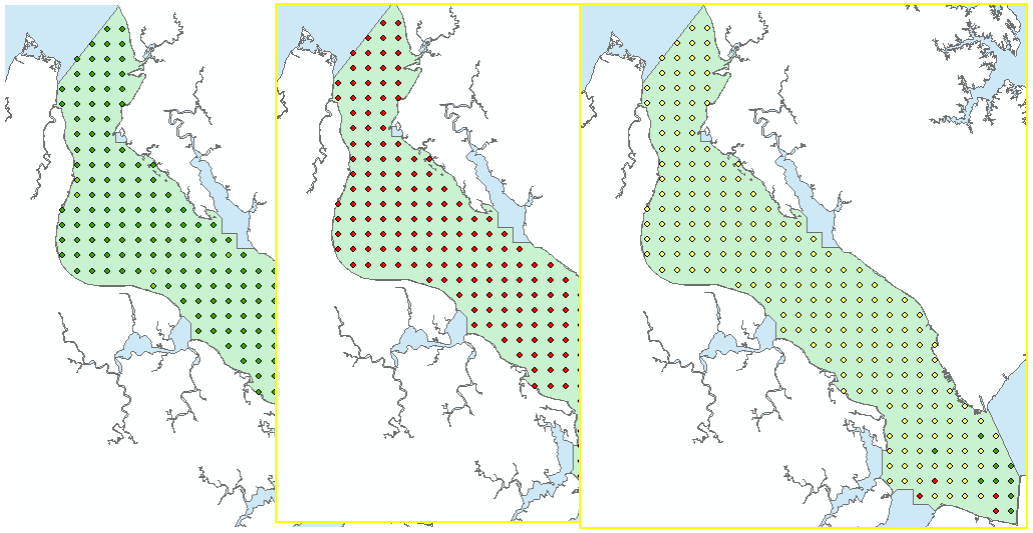






Interpolation output for a Dataflow cruise

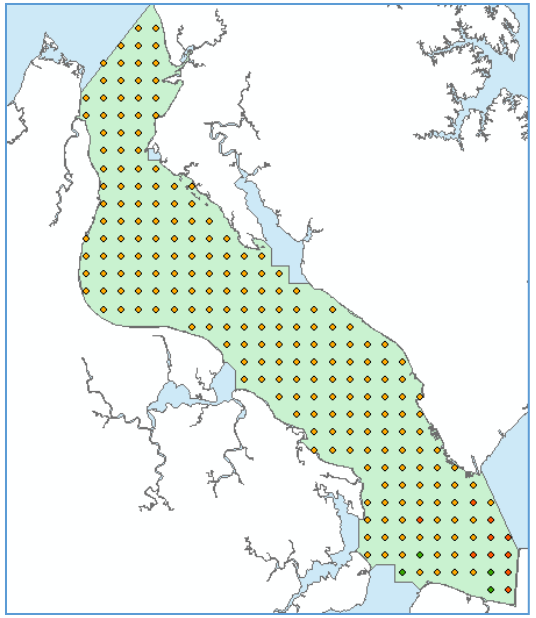
Calculation of Spatial Exceedence



July August September

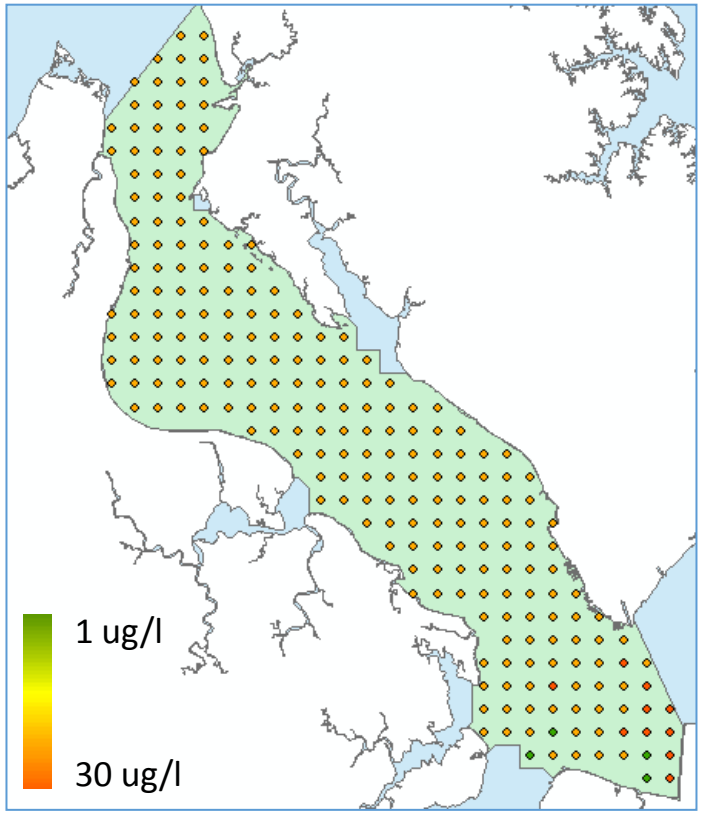
averaging

Season Geometric Mean



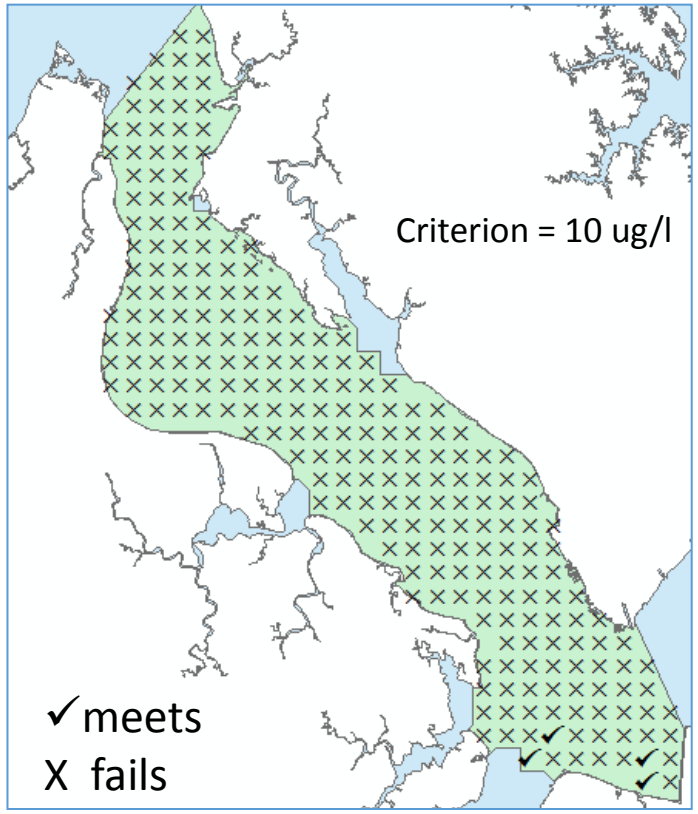
Create a seasonal “snapshot” by averaging all the interpolations.

Season Mean



Assessment

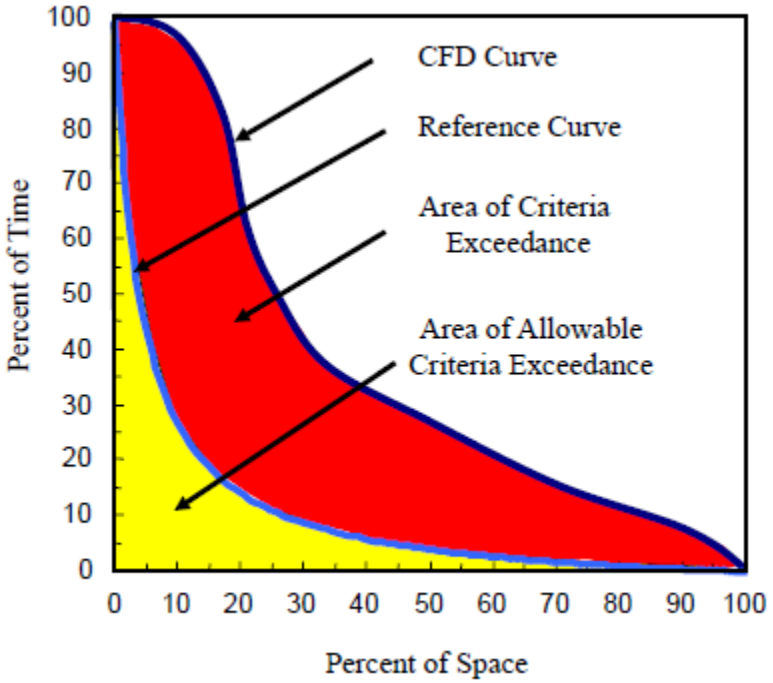
Season Assessment

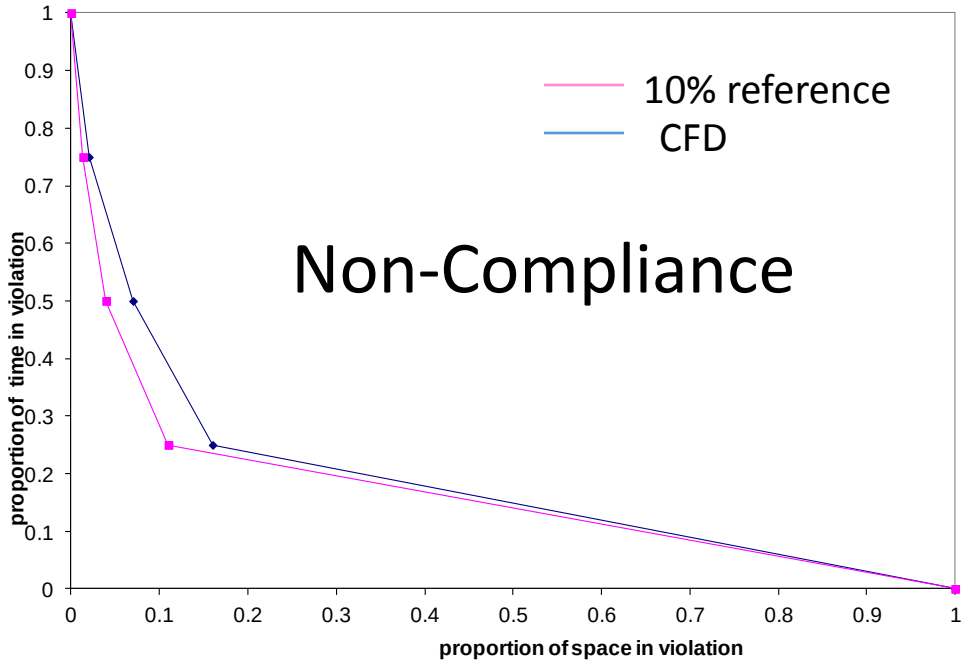


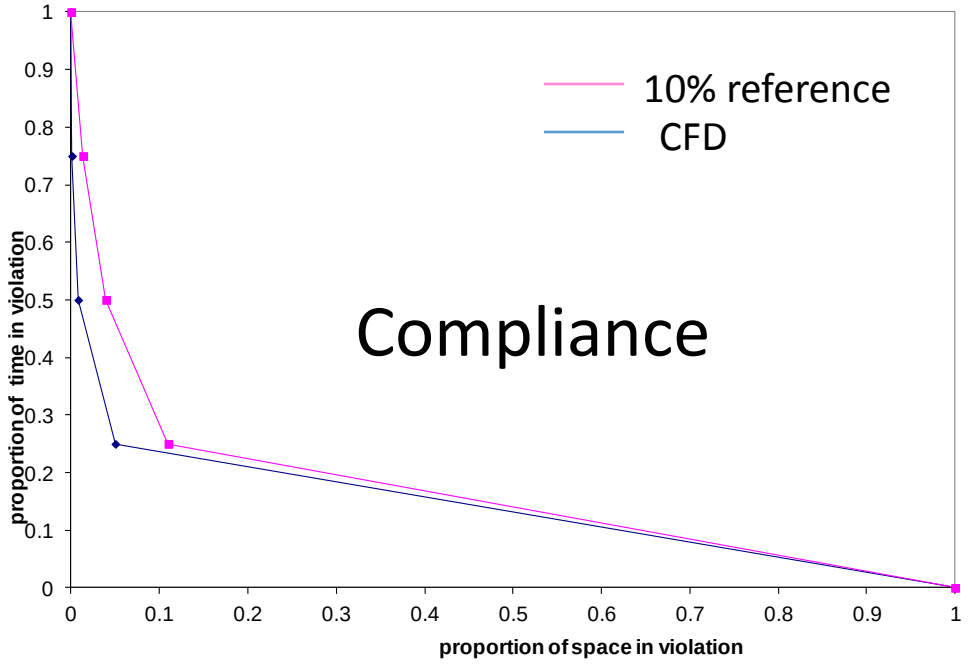
Then count how many of the resulting estimates fail the criterion.
Divide this into the total to calculate the spatial exceedence rate.

Cumulative Frequency Diagram (CFD)

- Used to determine if spatial exceedences are “excessive”




10% reference
CFD
Non-Compliance
proportion of time in violation
proportion of space in violation


10% reference
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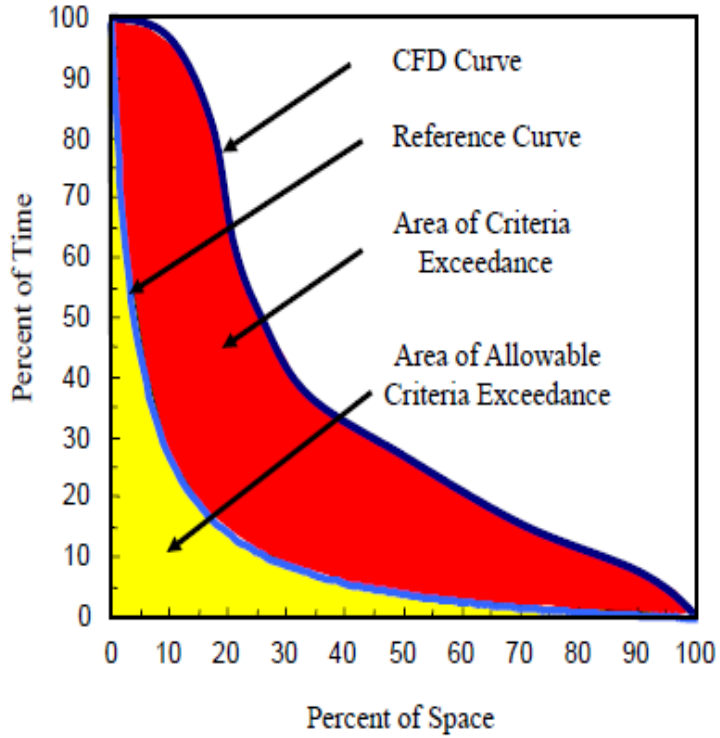
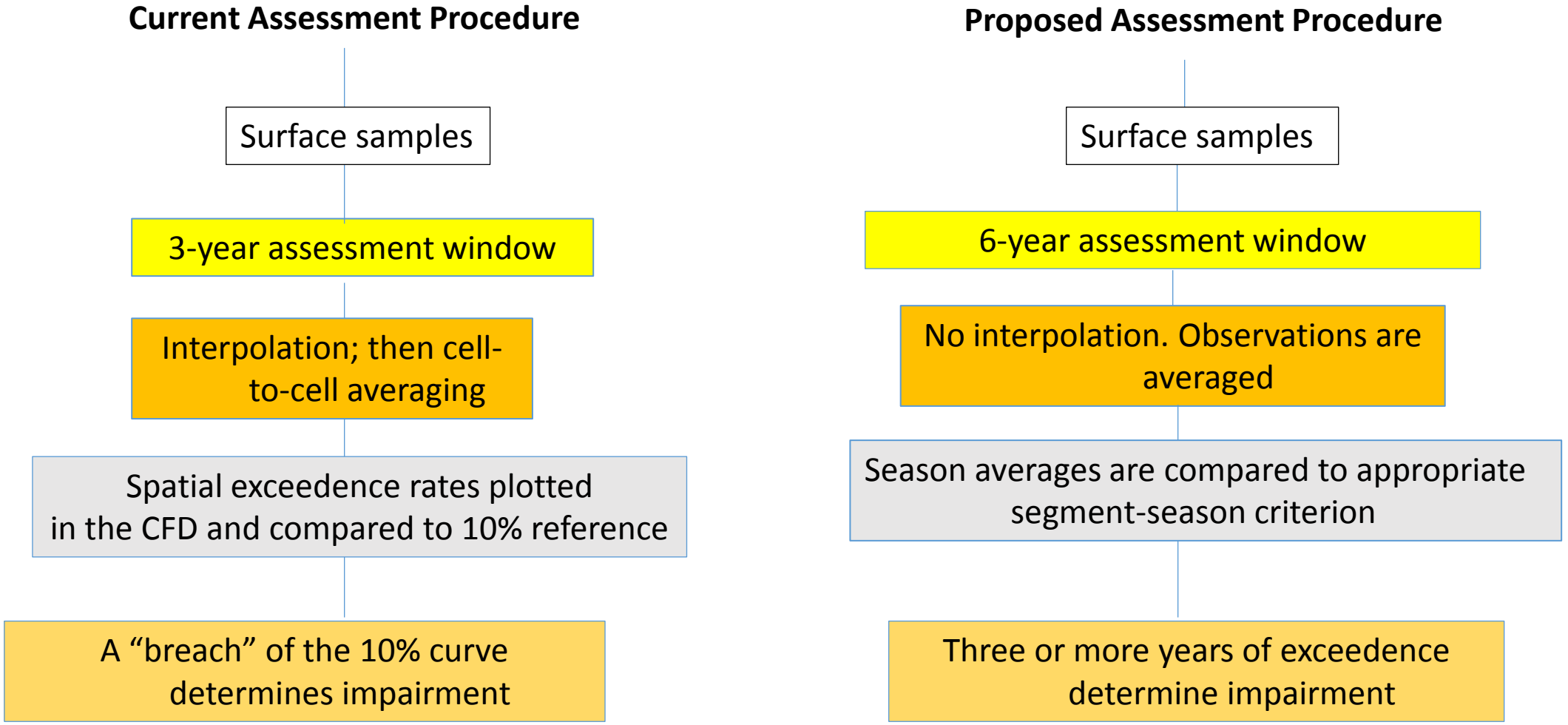

CFD Curve
Reference Curve
Area of Criteria Exceedance
Area of Allowable Criteria Exceedance
Percent of Time
Percent of Space

Big Weakness #1

The current assessment method is not appropriate for sparse datasets generated from monthly site visits. (Elgin Perry)

Big Weakness #2

The 10% curve, especially when combined with a small number of points (e.g., 3), likely DOES NOT accurately predict “reference” chlorophyll exceedence rates. (Claire Buchanan)

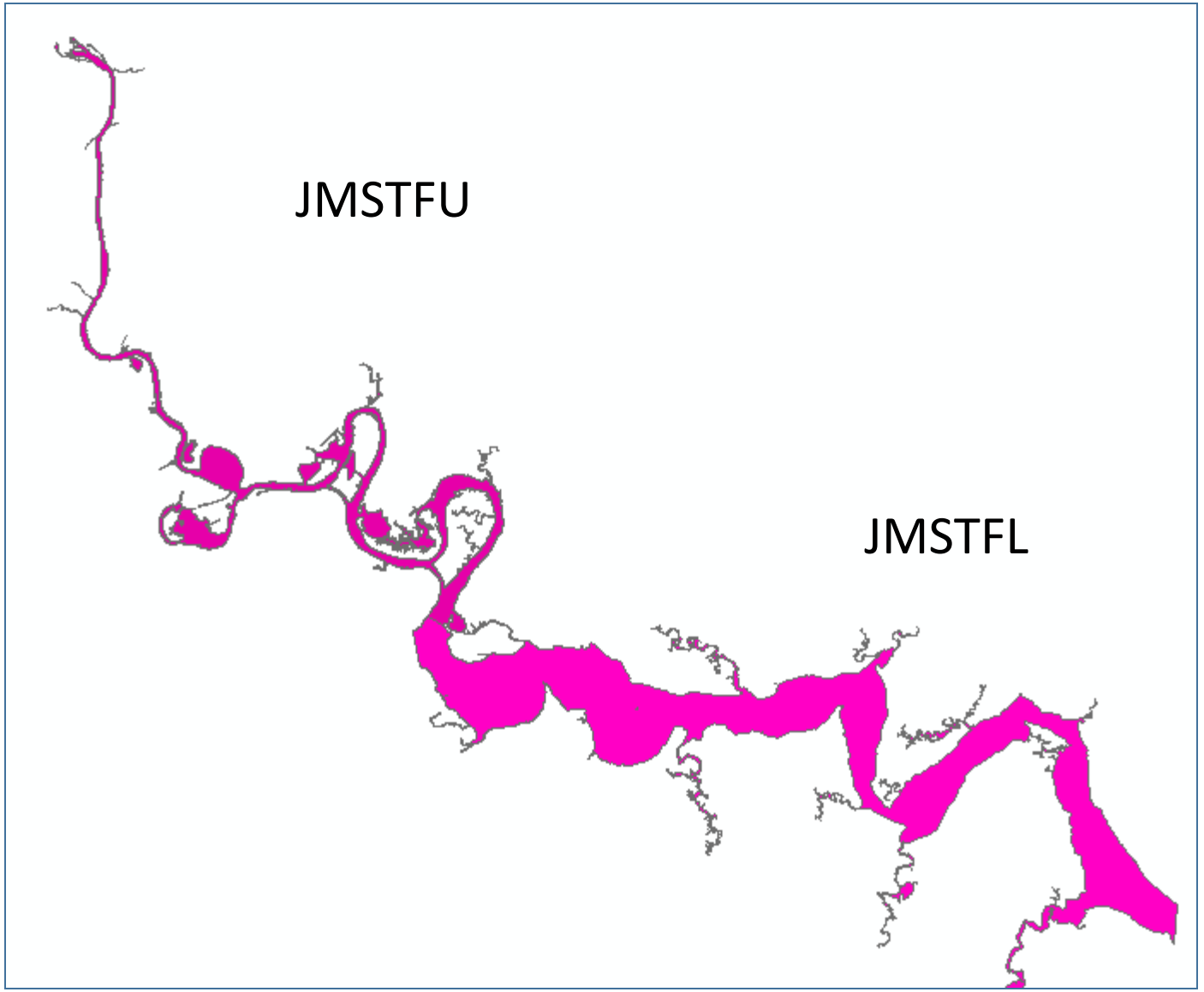

Current Assessment Procedure
Surface samples
3-year assessment window
Interpolation; then cell-to-cell averaging
Spatial exceedence rates plotted in the CFD and compared to 10% reference
A “breach” of the 10% curve determines impairment
Proposed Assessment Procedure
Surface samples
6-year assessment window
No interpolation. Observations are averaged
Season averages are compared to appropriate segment-season criterion
Three or more years of exceedence determine impairment

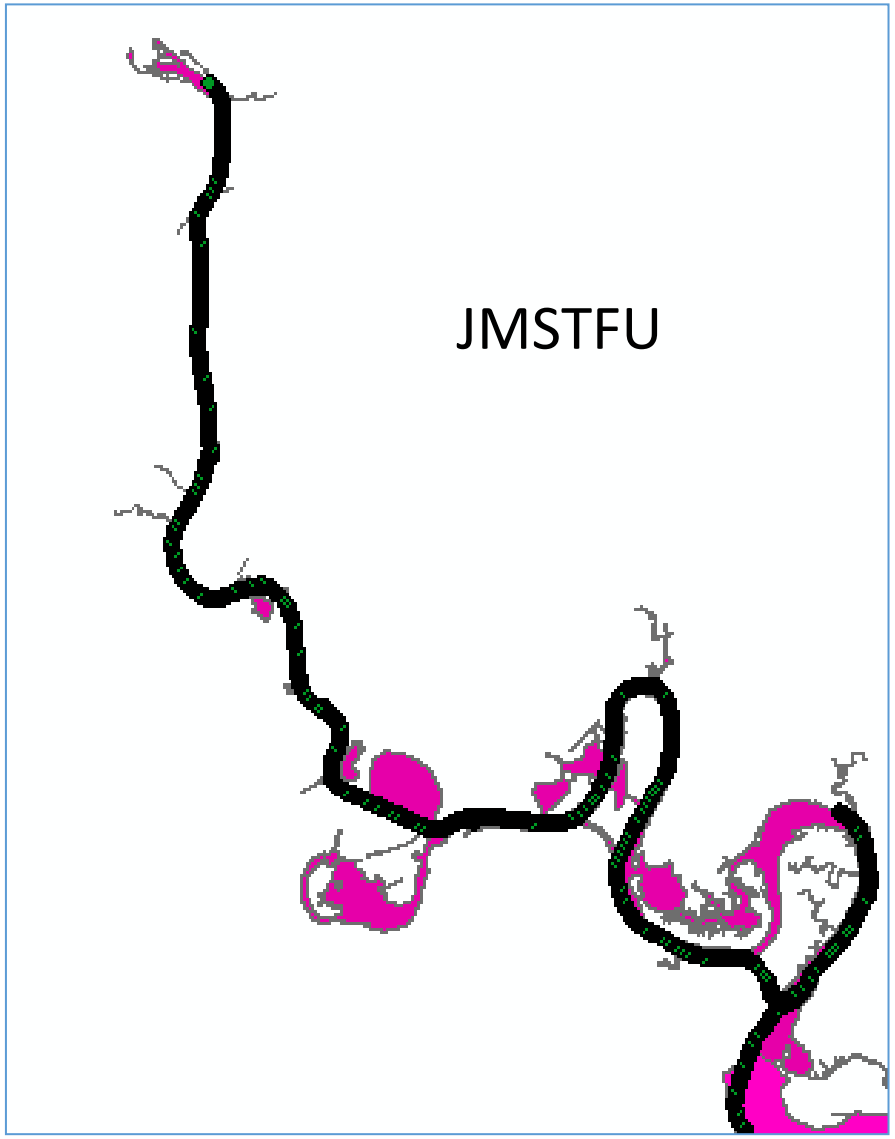
Current Assessment Procedure

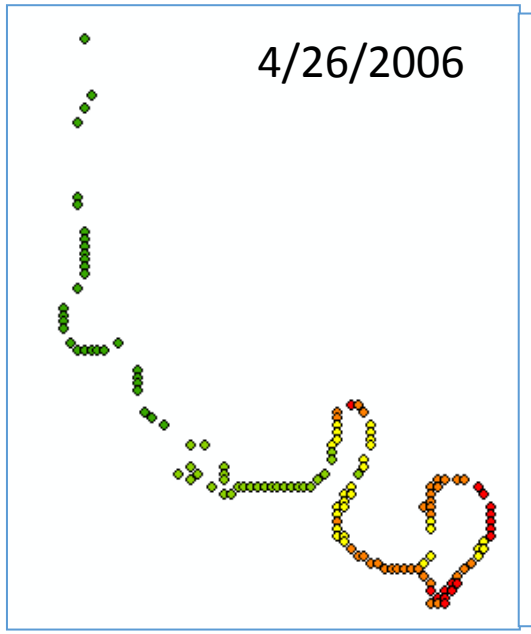
Interpolation; then cell-to-cell averaging

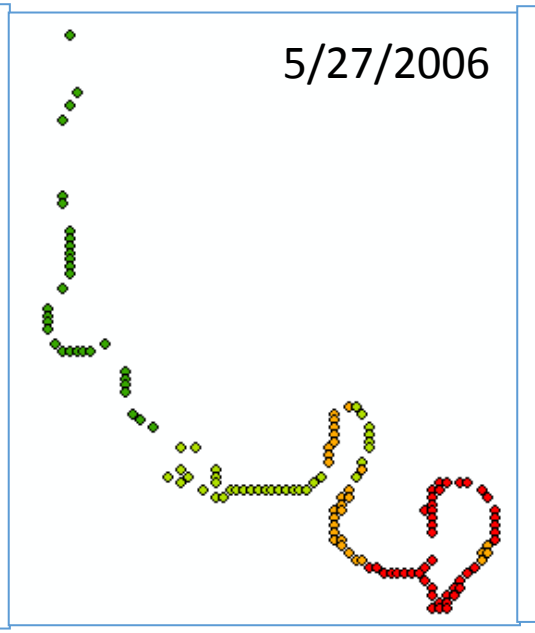
Proposed Assessment Procedure

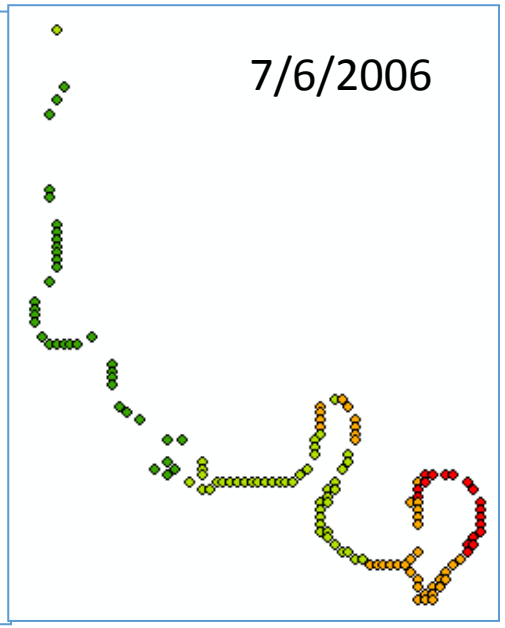
No interpolation. Observations are averaged


JMSTFU
JMSTFL



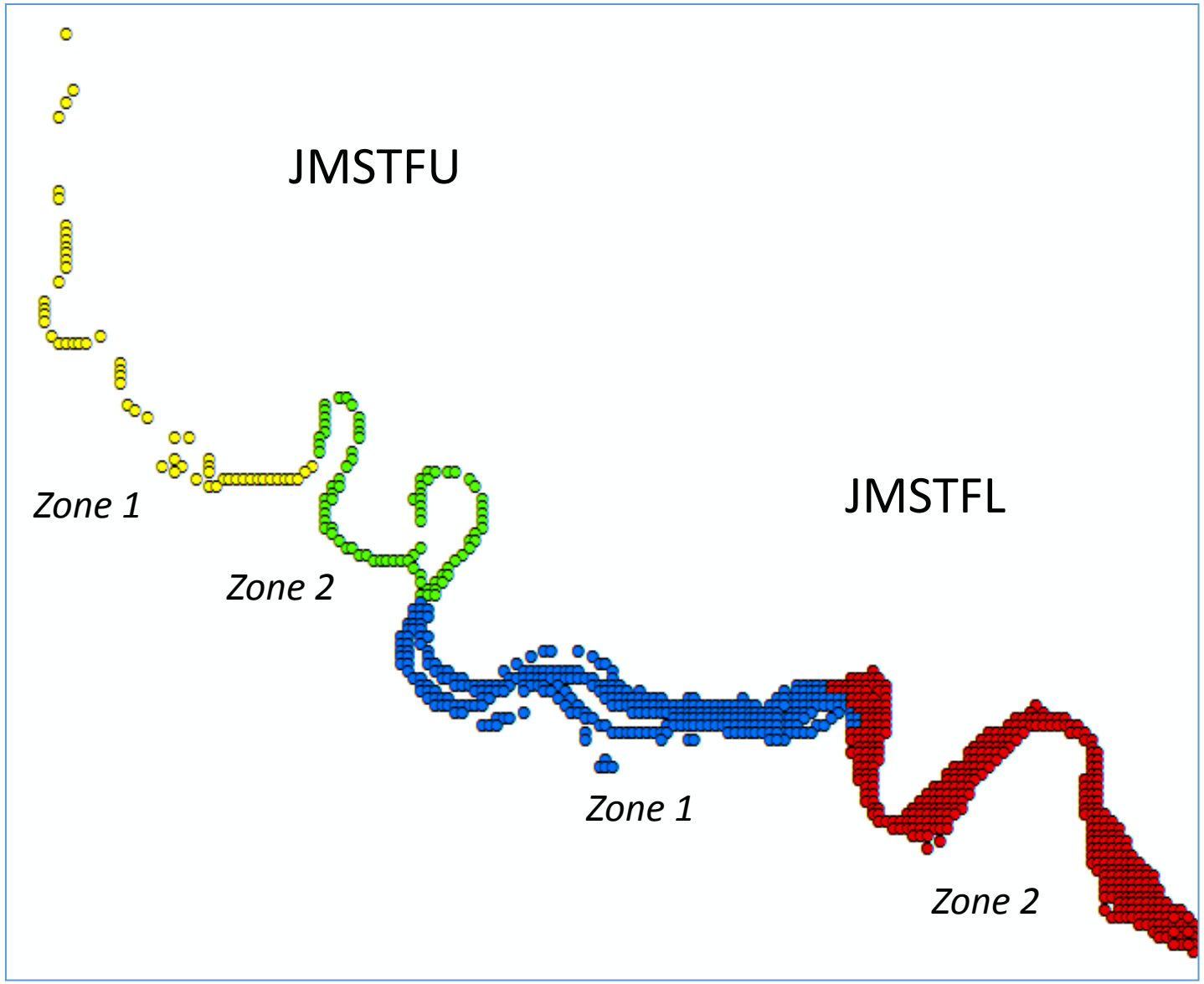


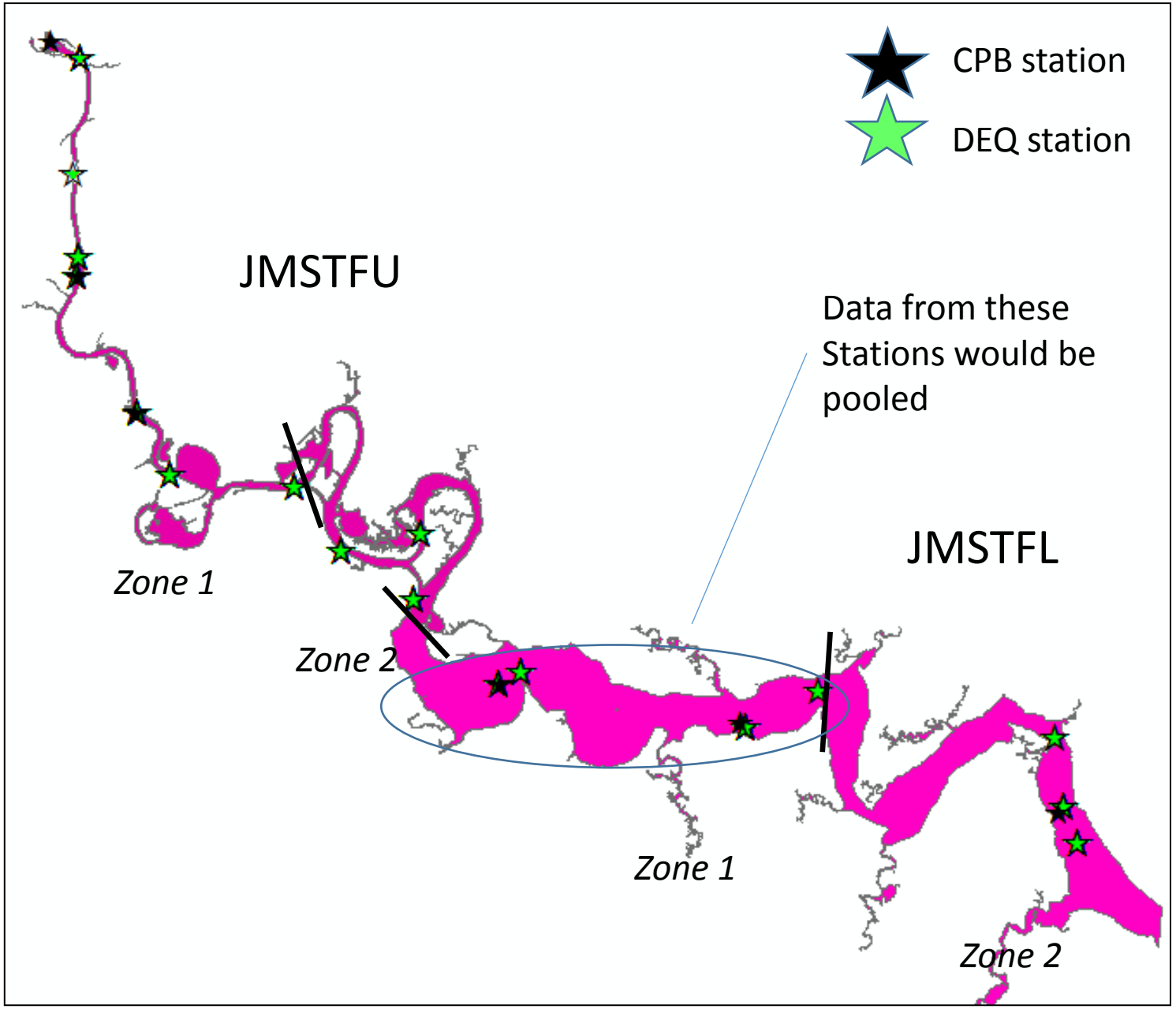




A total of 15 Dataflow cruises were interpolated for both JMSTFU and JMSTFL. Kriging estimates were generated for cach Interpolator cell.

ArcMap's Grouping Analysis Tool was used to identify regions of relatively similarity in each segment




CPB station
DEQ station
JMSTFU
Data from these Stations would be pooled
JMSTFL
Zone 1
Zone 2
Zone 1
Zone 2