Proposed James River Chlorophyll Criteria and Assessment Methodology

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VA DEQ-Office of Ecology
CAP Workgroup Meeting
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DEQ is proposing two sets of chlorophyll-a criteria for the tidal James River (last time I only presented one set!)

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Designated Use	Chlorophyll-*a* µg/l	Chesapeake Bay Program Segment	Temporal Application
Open water	8	JMSTF2	March 1 - May 31 (spring)
	10	JMSTF1	
	13	JMSOH	
	7	JMSMH	
	8	JMSPH	
	21	JMSTF2	July 1 - September 30 (summer)
	24	JMSTF1	
	11	JMSOH	
	7	JMSMH	
	7	JMSPH	

Proposed seasonal mean criteria

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	8	JMSPH	
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	24	JMSTF1	
	11	JMSOH	
	7	JMSMH	
	7	JMSPH	

Proposed seasonal mean criteria

Proposed short-duration criteria (summer only)

Chlorophyll-*a* µg/l	Chesapeake Bay Program Segment	Spatial Application	Duration
52	JMSTF2	River mile 95 to downstream boundary of JMSTF2	1-Month median
52	JMSTF1	Upstream boundary of JMSTF1 to river mile 67	1-Month median
34	JMSTF1	River mile 67 to downstream boundary of JMSTF1	1-Month median
--	JMSOH	Entire segment	--
59	JMSMH	Entire segment	1-Day median
20	JMSPH	Entire segment	1-Day median

Magnitude

PROPOSED SEASONAL MEAN CRITERIA

Designated Use	Chlorophyll-*a* µg/l	Chesapeake Bay Program Segment	Temporal Application
Open water	8	JMSTF2	March 1 - May 31 (spring)
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	11	JMSOH	
	7	JMSMH	
	7	JMSPH	

Duration

Frequency: No more than two exceedances every six years

James River segment-season	Existing Seasonal Mean Criteria (ug/L)	Proposed Seasonal Mean Criteria (ug/L)
JMSTF2 – spring	10	8
JMSTF2 – summer	15	21
JMSTF1 – spring	15	10
JMSTF1 - summer	23	24
JMSOH - spring	15	13
JMSOH – summer	22	11
JMSMH - spring	12	7
JMSMH – summer	10	7
JMSPH – spring	12	8
JMSPH - summer	10	7

EXAMPLE

	Criterion = 10	Criterion = 24
YEAR	**SPRING MEAN (µg/l)**	**SUMMER MEAN (µg/l)**
Year 1	**12**	23
Year 2	10	20
Year 3	8	**28**
Year 4	8	10
Year 5	**11**	18
Year 6	10	**29**

ATTAINMENT

EXAMPLE

	Criterion = 10	Criterion = 24
YEAR	**SPRING MEAN (µg/l)**	**SUMMER MEAN (µg/l)**
Year 1	10	**26**
Year 2	10	20
Year 3	8	**28**
Year 4	8	10
Year 5	9	18
Year 6	10	**29**

NON-ATTAINMENT

PROPOSED SHORT-DURATION CRITERIA

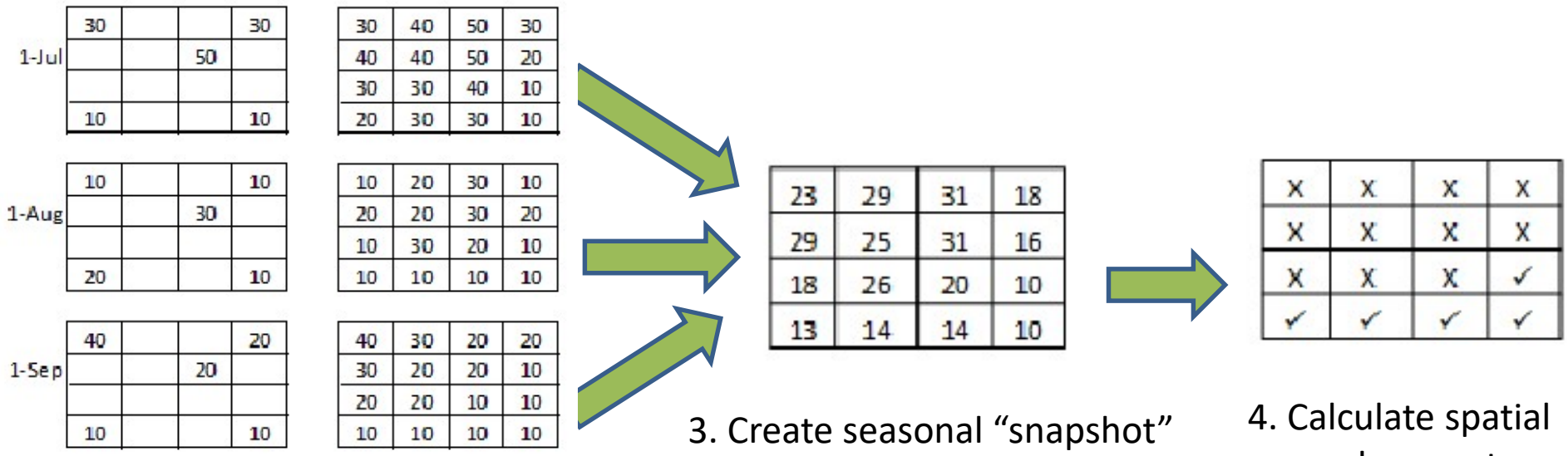
Magnitude

Chlorophyll-*a* µg/l	Chesapeake Bay Program Segment	Spatial Application	Duration
52	JMSTF2	River mile 95 to downstream boundary of JMSTF2	1-Month median
52	JMSTF1	Upstream boundary of JMSTF1 to river mile 67	1-Month median
34	JMSTF1	River mile 67 to downstream boundary of JMSTF1	1-Month median
--	JMSOH	Entire segment	--
59	JMSMH	Entire segment	1-Day median
20	JMSPH	Entire segment	1-Day median

Duration

Frequency: No more than 10% exceedance frequency over six years

Current assessment methodology

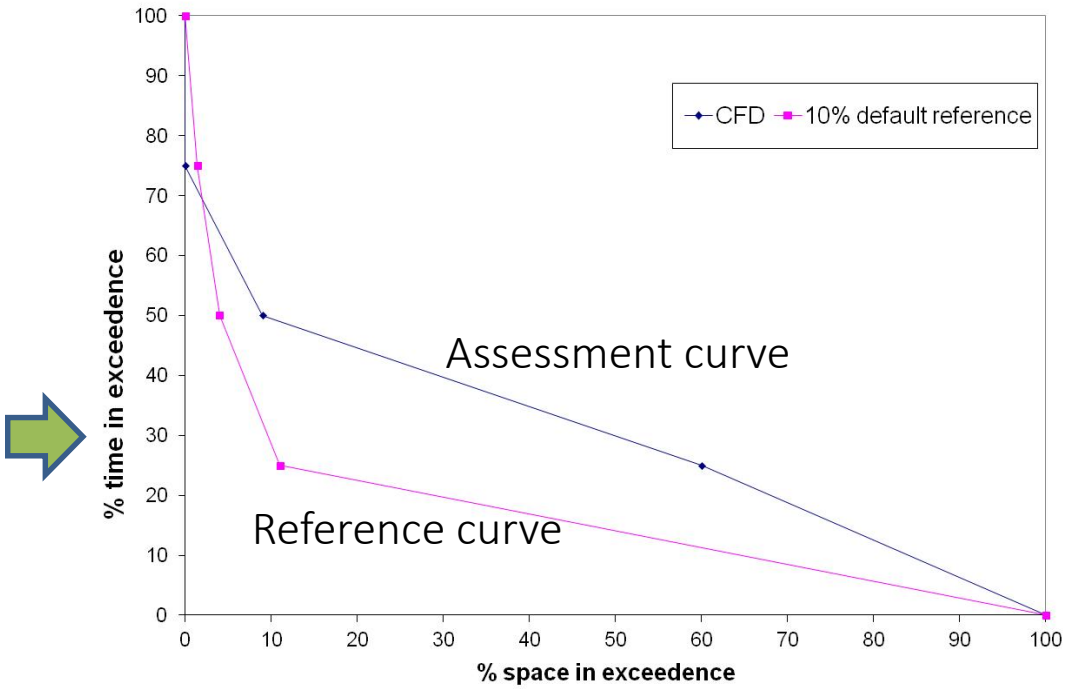


1. Conduct monthly monitoring runs
2. Interpolate each monitoring run using the Bay Interpolator
3. Create seasonal "snapshot"
4. Calculate spatial exceedence rate

Perform the above steps for each season in the assessment period

Current assessment methodology

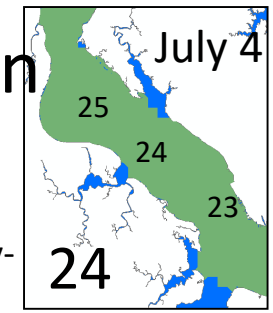
Season-Year	Ranked Spatial Exceedence Rate	Temporal Exceedence Rate
	100%	0%
Spring Year2	33%	25%
Spring Year1	25%	50%
Spring Year3	10%	75%
	0%	100%

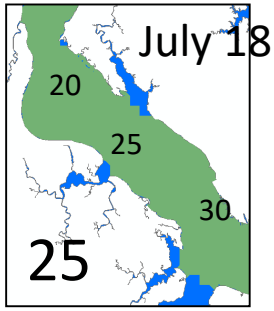


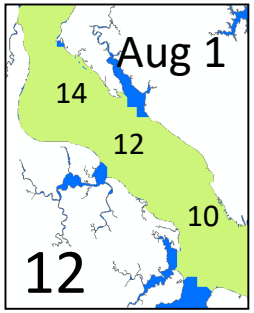
Proposed assessment methodology

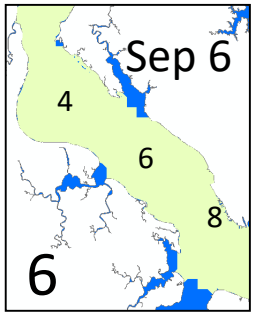
1-Day Median Criteria

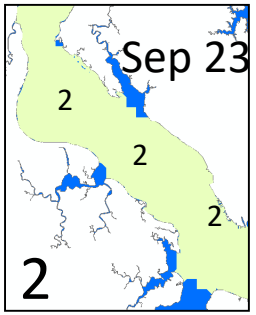
(Samples pooled over a day-MEDIAN)











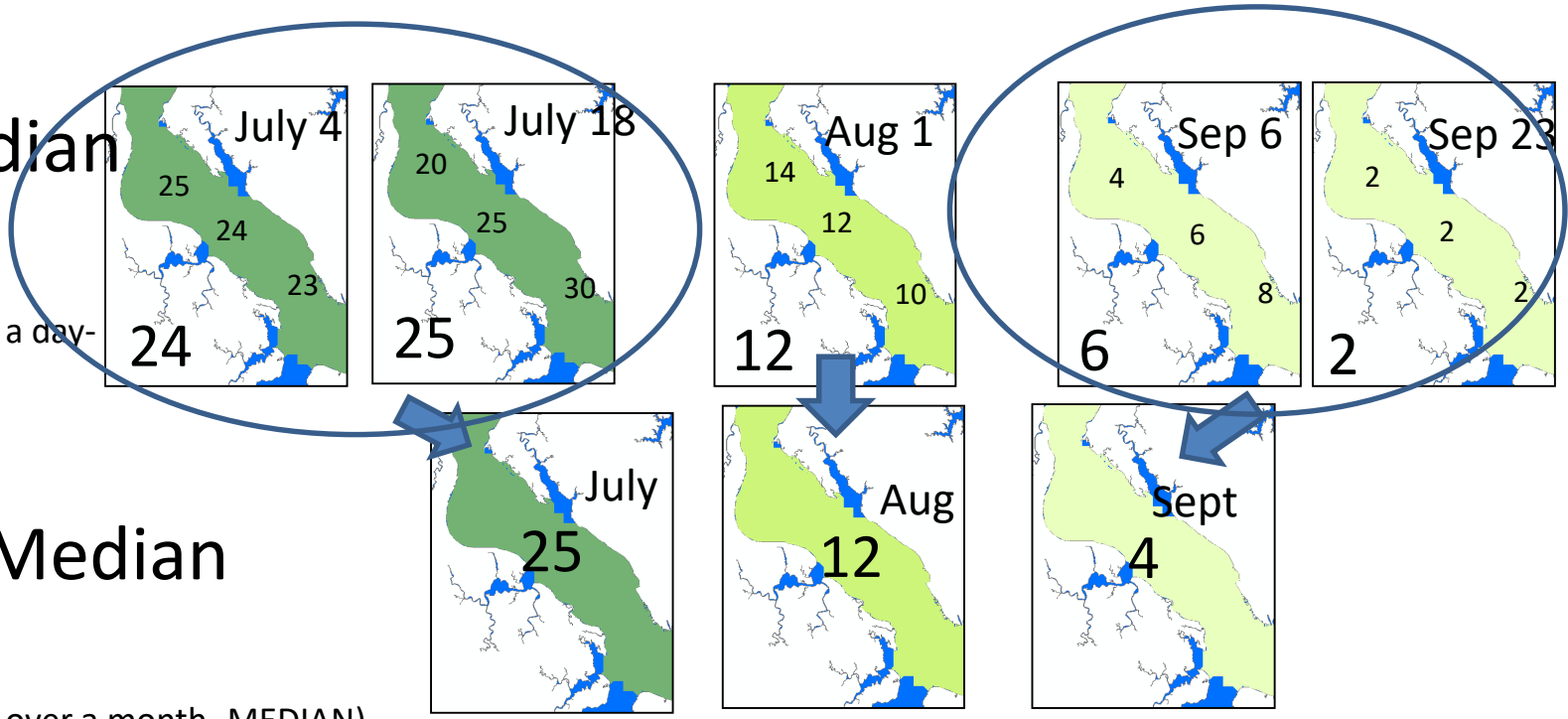
Proposed assessment methodology

1-Day Median Criteria

(Samples pooled over a day-MEDIAN)

1-Month Median Criteria

(Daily values pooled over a month -MEDIAN)



Proposed assessment methodology

1-Day Median Criteria

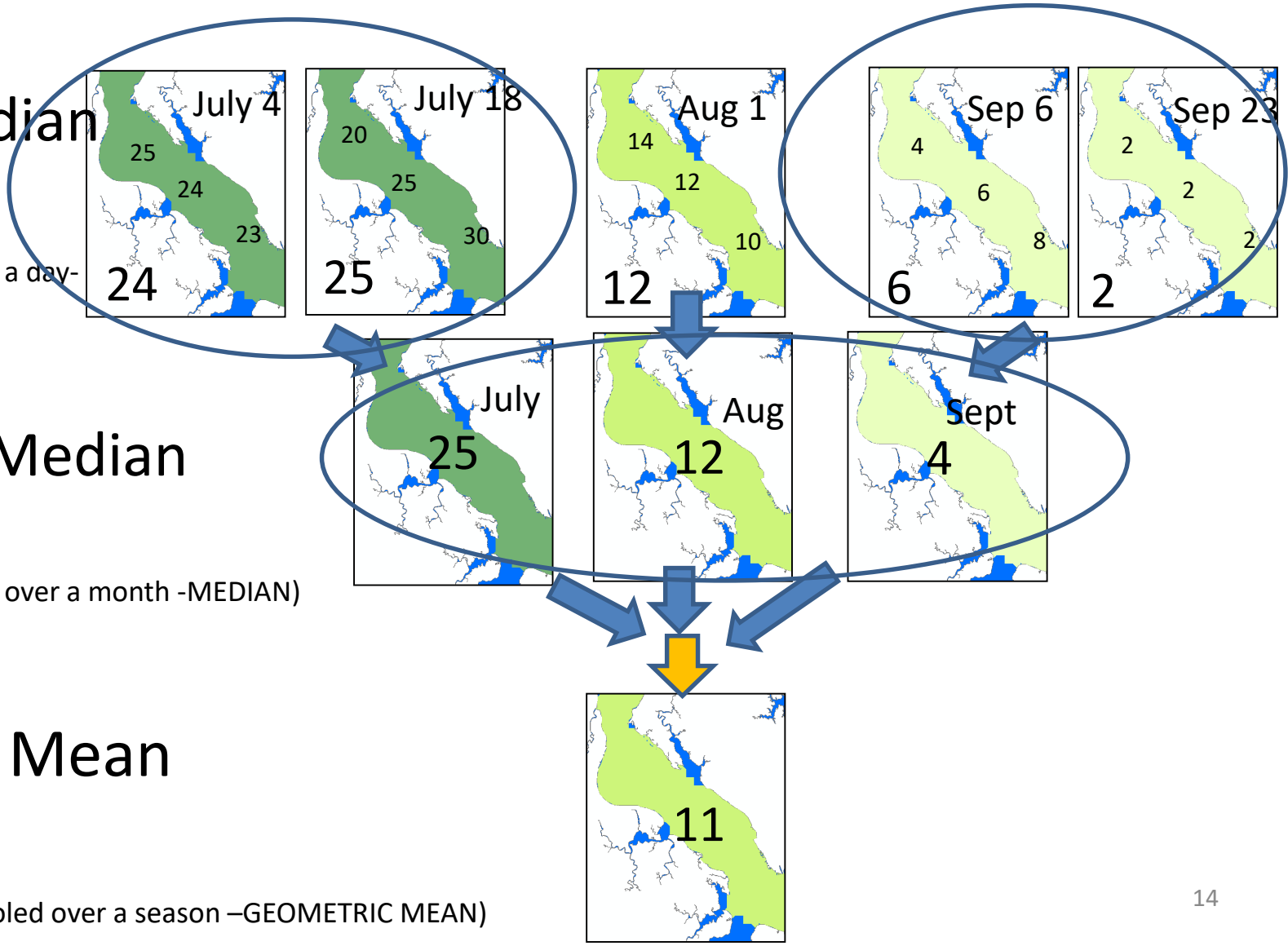
(Samples pooled over a day-MEDIAN)

1-Month Median Criteria

(Daily values pooled over a month -MEDIAN)

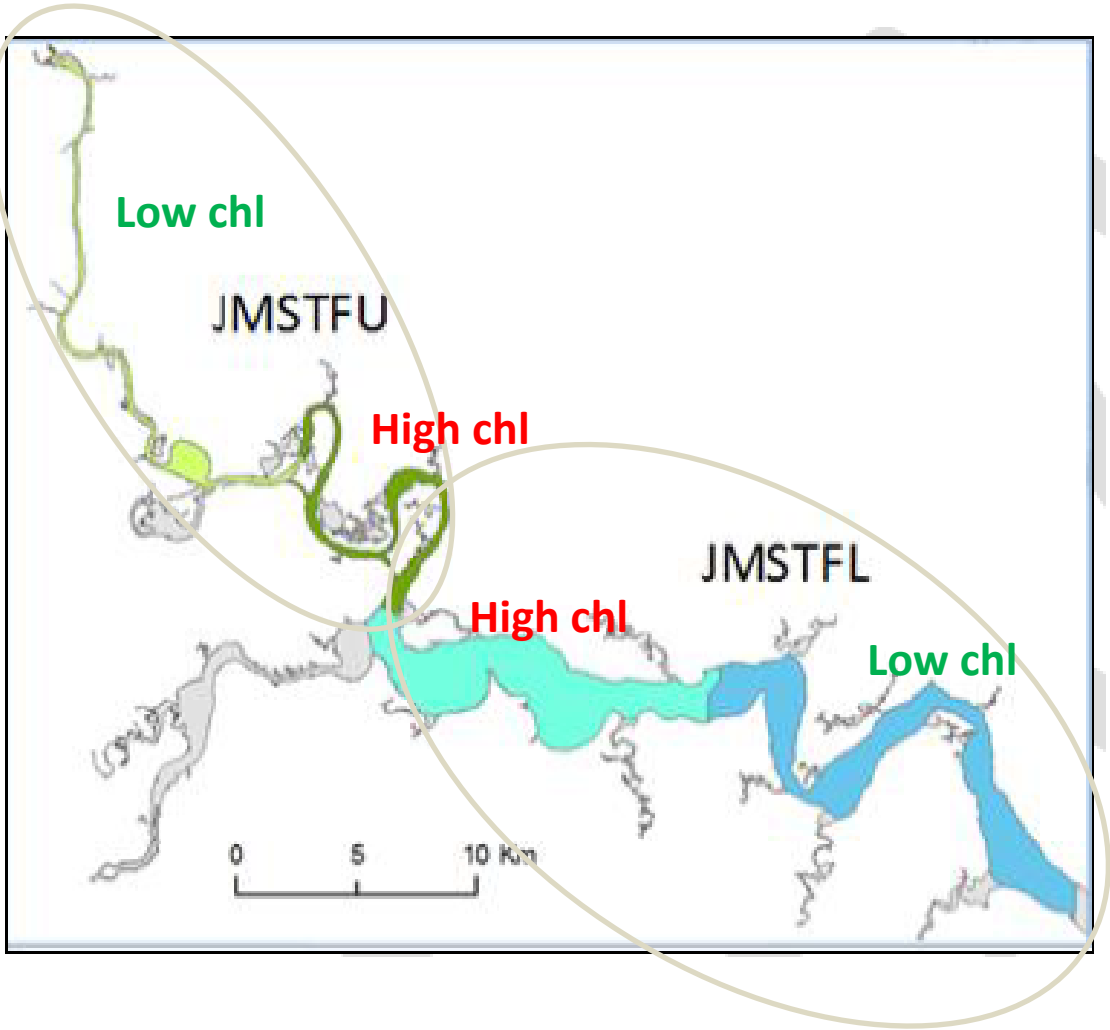
Seasonal Mean Criteria

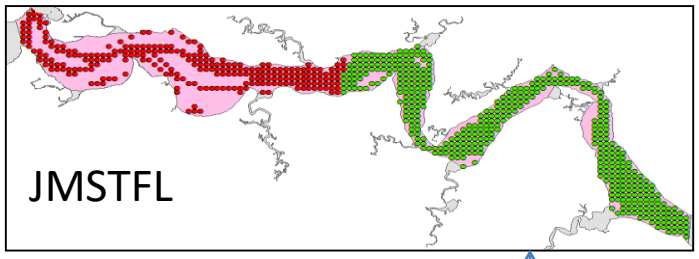
(Monthly values pooled over a season –GEOMETRIC MEAN)

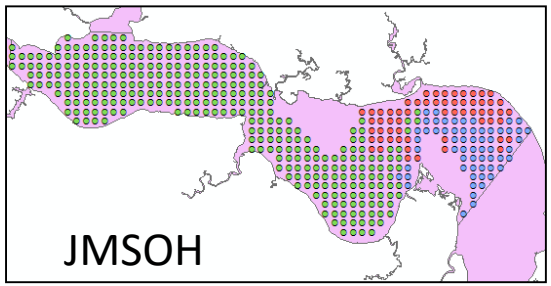


Proposed assessment methodology

Proposed criteria (and assessment methodology) take into account the non-uniformity in chlorophyll expression in the two tidal fresh segments.

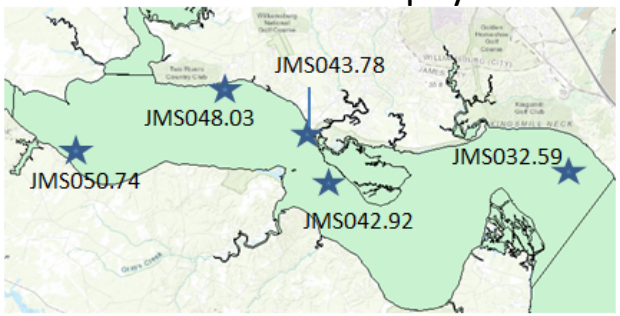




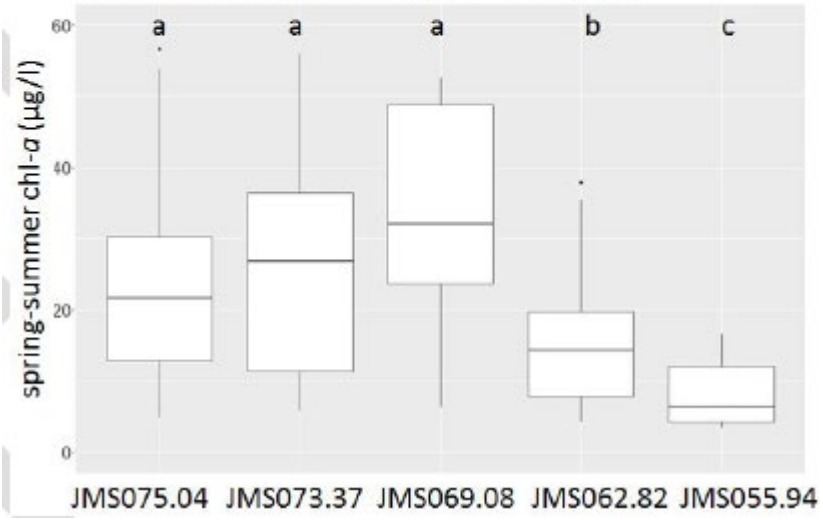


ArcMap's suggested "zonation" based on Dataflow chlorophyll

JMSTFL

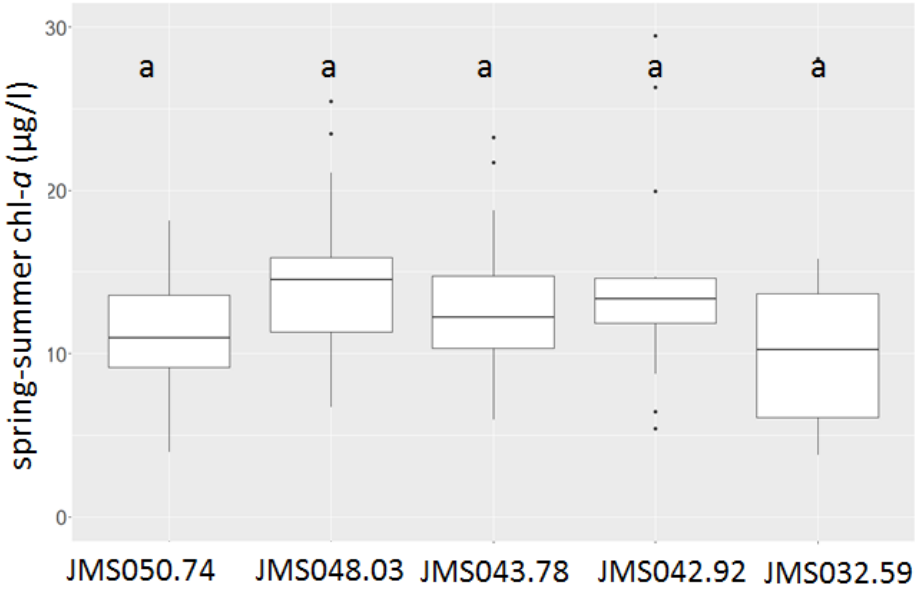


JMSOH

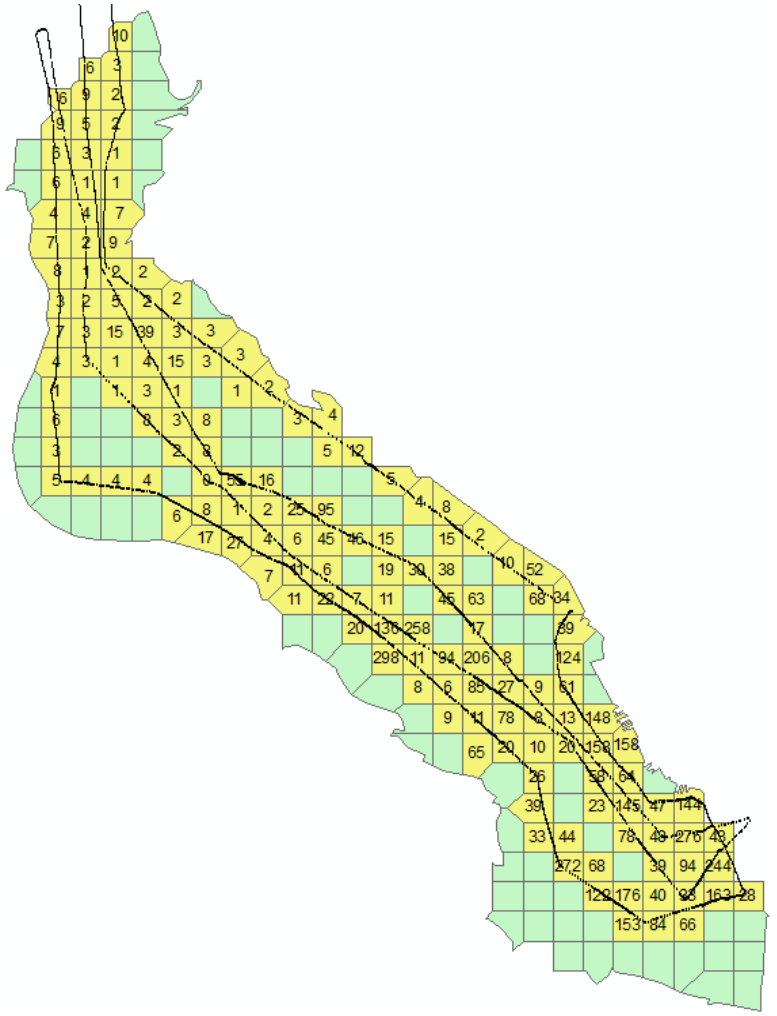


Upper zone

Lower zone



Proposed assessment methodology



Instead of doing a shoreline-to-shoreline interpolation of all monitoring datasets, regardless of the spatial "intensiveness" of the datasets…

VA will use the Interpolator grid only to aggregate Dataflow data and only in "monitored" grid cells

Comparison of Current and Proposed Criteria

Element	Current Criteria	Proposed Criteria
Magnitude	Mostly higher	Mostly lower
Duration	3-Month	3-Month & 1-month or 1-Day
Frequency	10% space-time CFD Three-year interval	Seasonal: 33% Short-duration: 10% Six-year interval
Assessment Methodology	Spatial interpolation to grid. Criteria evaluated at each grid cell, not the entire segment	Grid is only used to simplify Dataflow. Monitoring data are pooled spatially and temporally, where appropriate.


Credit: George Tolton

Questions?


Credit: George Tolton


Credit: Tony Silvia