

# Preliminary Attainment Results of CBP Scoping Scenarios (using 2005-2013 loadings) run through the VIMS Eutrophication Model

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Modeling Workgroup Quarterly Review

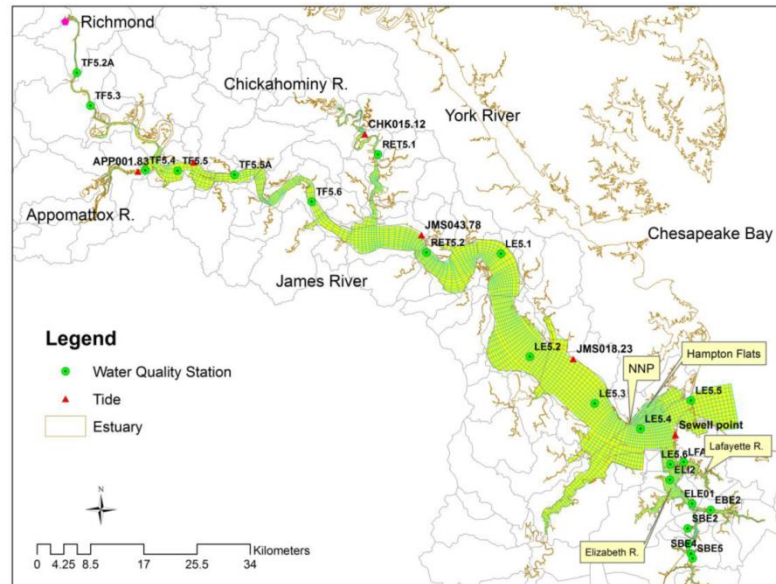
July 10, 2018





## VADEQ has...

- developed an alternative set of chlorophyll-a criteria for the James River estuary.
- developed an alternative assessment methodology for James R. chlorophyll-a criteria.
- contracted with VIMS to develop a water quality model specific to the James River that will help inform management decisions.



<b>Segment-Season</b>	<b>Current criteria</b>	<b>Recommended</b>
JMSTFU-spring	10	8
JMSTFU-summer	15	21
JMSTFL-spring	15	10
JMSTFL-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

# At the last Modeling Workgroup meeting...

VADEQ expressed its desired for the 2005-2013 scenario loadings estimated by the Bay Watershed Model.

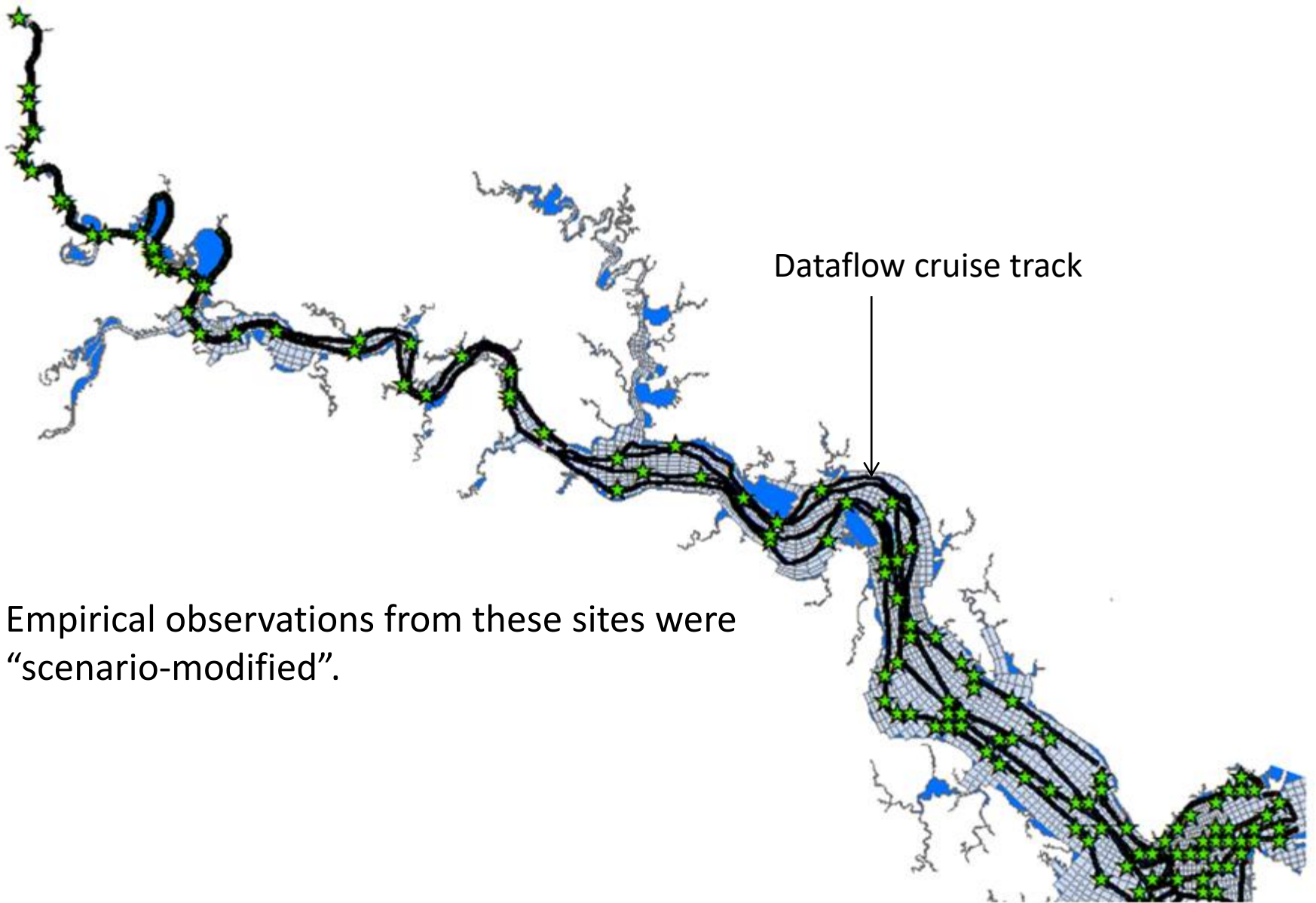


## Justification for using 2005-2013 loadings:

- The 2005-2013 monitoring data were used to derive alternative criteria. Most of these alternative criteria are developed to maintain *current* chlorophyll concentrations. The 2005-2013 period better reflects current chlorophyll concentrations than the 1991-2000 period.
- The 2005-2013 monitoring datasets are much more spatially and temporally intensive than the 1991-2000 datasets. Scenario-modifying the former produces more confident determinations of “attainability” than the latter.

The James River modeling team has shifted its focus to the 2005-2013 period.

- 2005-2013 base and scenario loadings
- 2005-2013 observations (fixed station and Dataflow) for “scenario-modification”



Dataflow cruise track

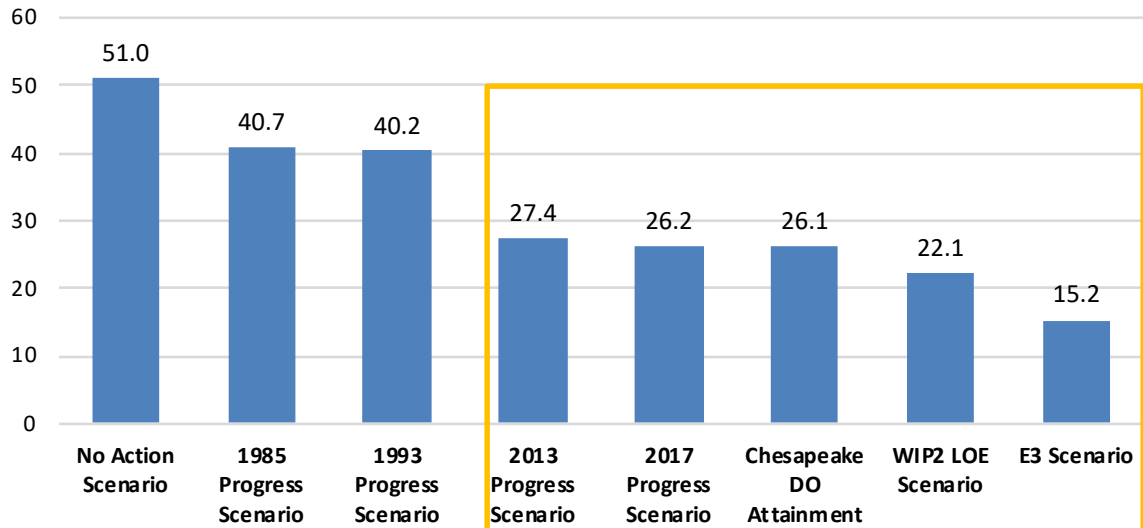
Empirical observations from these sites were “scenario-modified”.

The following CBP scenarios that have been run through the VIMS eutrophication model:

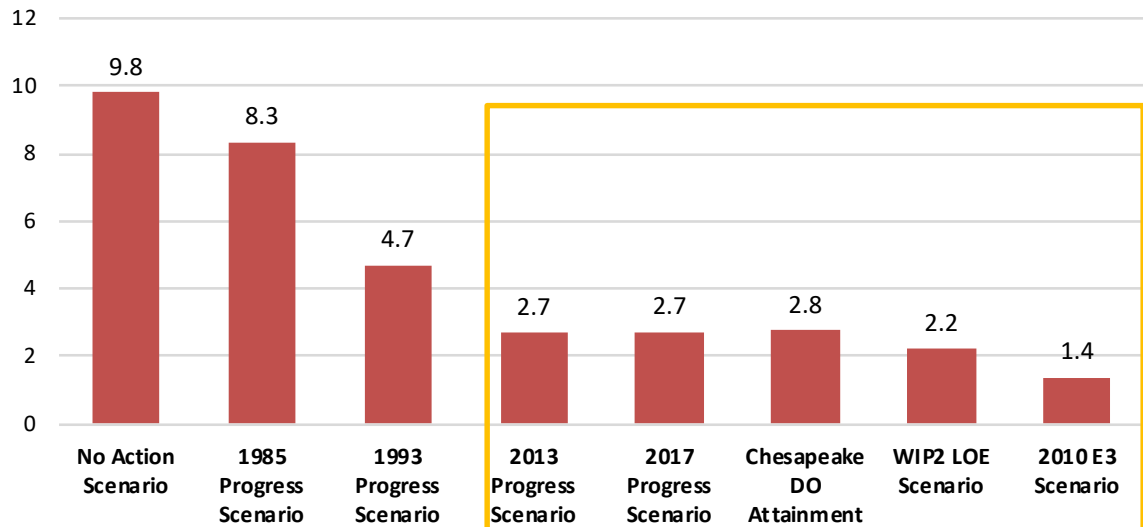
- 2013 Progress
- 2017 Progress
- DO Attainment
- WIP2
- E3

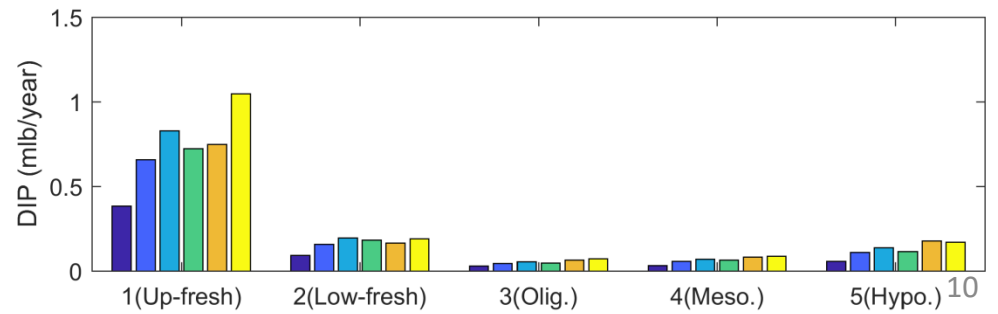
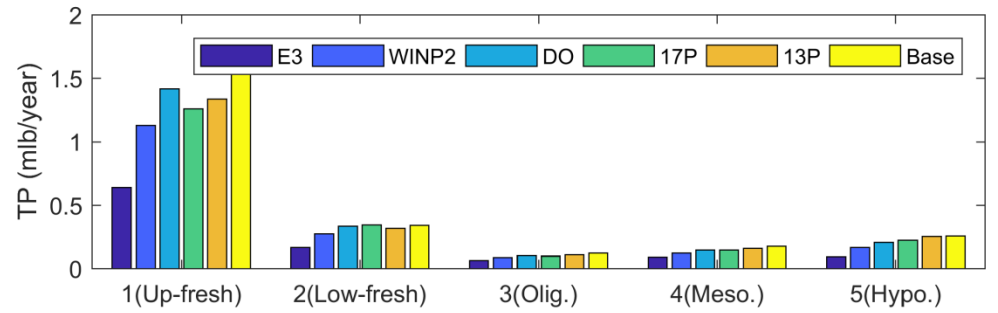
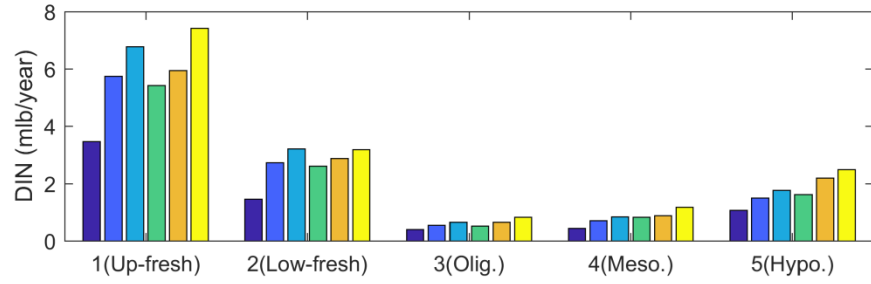
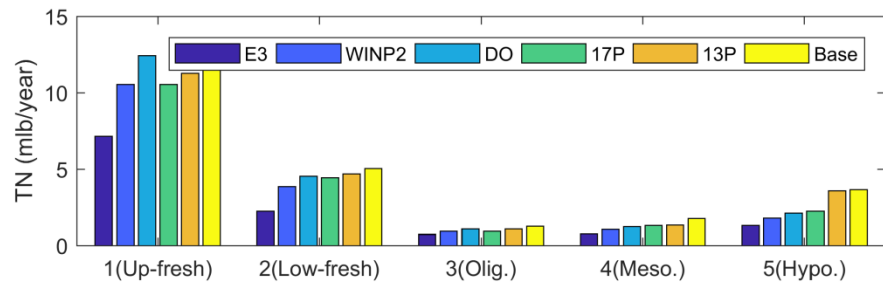


### Total Nitrogen Loads of the James Basin (million lbs/year)



### Total Phosphorus Loads of the James Basin (million lbs/year)





**Baseline Current Criteria,  
Current Assessment Procedure**

Values are excessive space-time  
exceedence rates%

Red indicates nonattainment

SPRING		Baseline			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	1.4	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	10.1	0.0	0.0
2008-2010	0.0	0.0	10.1	0.0	2.4
2009-2011	0.0	0.0	10.1	0.0	2.4
2010-2012	0.0	8.0	0.0	0.0	2.4
2011-2013	0.0	8.0	0.0	2.7	0.0
SUMMER		Baseline			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	7.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	3.9	1.5
2007-2009	20.5	7.4	0.0	8.5	5.6
2008-2010	38.2	21.1	0.0	12.1	5.8
2009-2011	51.9	45.9	0.0	5.7	1.7
2010-2012	37.7	52.5	0.0	0.9	0.0
2011-2013	19.1	52.6	0.0	0.0	0.0

**Proposed Criteria,  
Proposed Assessment Procedure**

Values are seasonal chl means (ug/l)

Red indicates proposed criteria exceedences

SPRING		Baseline			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	2	4	11	8	11
2006	6	8	10	6	5
2007	5	6	4	4	7
2008	3	4	7	6	5
2009	7	7	26	6	6
2010	4	4	7	5	10
2011	7	8	6	4	6
2012	10	13	2	5	4
2013	5	5	5	8	5
SUMMER		Baseline			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	14	13	9	10	9
2006	9	10	8	6	6
2007	8	11	4	5	7
2008	12	15	8	9	8
2009	26	22	7	6	8
2010	30	25	10	4	3
2011	20	33	7	4	4
2012	15	29	2	3	8
2013	20	22	5	4	6

Segment-wide averaging in space  
and time

# Historical Seasonal Chlorophyll Means (ug/l)

1991-2000

SPRING	Baseline				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
1991	<b>10</b>	<b>12</b>	<b>14</b>	<b>17</b>	<b>9</b>
1992	<b>9</b>	<b>11</b>	10	<b>12</b>	<b>11</b>
1993	3	3	3	4	<b>13</b>
1994	8	9	3	5	8
1995	<b>12</b>	<b>12</b>	6	7	5
1996	<b>9</b>	<b>11</b>	<b>18</b>	<b>10</b>	<b>20</b>
1997	<b>13</b>	<b>15</b>	<b>15</b>	<b>13</b>	<b>9</b>
1998	8	8	<b>14</b>	4	6
1999	<b>10</b>	<b>17</b>	13	<b>12</b>	<b>9</b>
2000	8	<b>12</b>	12	6	7
SUMMER	Baseline				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
1991	21	<b>26</b>	<b>14</b>	5	7
1992	<b>24</b>	<b>27</b>	<b>16</b>	6	<b>8</b>
1993	<b>41</b>	<b>48</b>	<b>13</b>	7	7
1994	20	24	10	3	7
1995	13	11	5	4	<b>9</b>
1996	7	8	6	5	<b>12</b>
1997	<b>53</b>	<b>58</b>	<b>15</b>	<b>10</b>	<b>8</b>
1998	<b>30</b>	<b>31</b>	10	6	<b>9</b>
1999	17	16	<b>14</b>	<b>11</b>	<b>17</b>
2000	<b>24</b>	<b>29</b>	8	5	<b>11</b>

2005-2013

SPRING	Baseline				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	2	4	11	<b>8</b>	<b>11</b>
2006	6	8	10	6	5
2007	5	6	4	4	7
2008	3	4	7	6	5
2009	7	7	<b>26</b>	6	6
2010	4	4	7	5	<b>10</b>
2011	7	8	6	4	6
2012	<b>10</b>	<b>13</b>	2	5	4
2013	5	5	5	<b>8</b>	5
SUMMER	Baseline				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	14	13	9	<b>10</b>	<b>9</b>
2006	9	10	8	6	6
2007	8	11	4	5	7
2008	12	15	8	<b>9</b>	<b>8</b>
2009	<b>26</b>	22	7	6	<b>8</b>
2010	<b>30</b>	<b>25</b>	10	4	3
2011	20	<b>33</b>	7	4	4
2012	15	<b>29</b>	2	3	<b>8</b>
2013	20	22	5	4	6

**Baseline Current Criteria,  
Current Assessment Procedure**

Values are excessive space-time  
exceedence rates%

Red indicates nonattainment

SPRING		Baseline			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	1.4	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	10.1	0.0	0.0
2008-2010	0.0	0.0	10.1	0.0	2.4
2009-2011	0.0	0.0	10.1	0.0	2.4
2010-2012	0.0	8.0	0.0	0.0	2.4
2011-2013	0.0	8.0	0.0	2.7	0.0

SUMMER		Baseline			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	7.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	3.9	1.5
2007-2009	20.5	7.4	0.0	8.5	5.6
2008-2010	38.2	21.1	0.0	12.1	5.8
2009-2011	51.9	45.9	0.0	5.7	1.7
2010-2012	37.7	52.5	0.0	0.9	0.0
2011-2013	19.1	52.6	0.0	0.0	0.0

**Proposed Criteria,  
Proposed Assessment Procedure**

Values are seasonal chl means (ug/l)

Red indicates proposed criteria exceedences

Red blocks are **3-year** periods in nonattainment

SPRING		Baseline			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	2	4	11	8	11
2006	6	8	10	6	5
2007	5	6	4	4	7
2008	3	4	7	6	5
2009	7	7	26	6	6
2010	4	4	7	5	10
2011	7	8	6	4	6
2012	10	13	2	5	4
2013	5	5	5	8	5

SUMMER		Baseline			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	14	13	9	10	9
2006	9	10	8	6	6
2007	8	11	4	5	7
2008	12	15	8	9	8
2009	26	22	7	6	8
2010	30	25	10	4	3
2011	20	33	7	4	4
2012	15	29	2	3	8
2013	20	22	5	4	6

Segment-wide averaging in space  
and time

**Baseline Current Criteria,  
Current Assessment Procedure**

Values are excessive space-time  
exceedence rates%

Red indicates nonattainment

SPRING		Baseline			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	1.4	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	10.1	0.0	0.0
2008-2010	0.0	0.0	10.1	0.0	2.4
2009-2011	0.0	0.0	10.1	0.0	2.4
2010-2012	0.0	8.0	0.0	0.0	2.4
2011-2013	0.0	8.0	0.0	2.7	0.0

SUMMER		Baseline			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	7.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	3.9	1.5
2007-2009	20.5	7.4	0.0	8.5	5.6
2008-2010	38.2	21.1	0.0	12.1	5.8
2009-2011	51.9	45.9	0.0	5.7	1.7
2010-2012	37.7	52.5	0.0	0.9	0.0
2011-2013	19.1	52.6	0.0	0.0	0.0

**Proposed Criteria,  
Proposed Assessment Procedure**

Values are seasonal chl means (ug/l)

Red indicates proposed criteria exceedences

Red blocks are **6-year** periods in nonattainment

SPRING		Baseline			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	2	4	11	8	11
2006	6	8	10	6	5
2007	5	6	4	4	7
2008	3	4	7	6	5
2009	7	7	26	6	6
2010	4	4	7	5	10
2011	7	8	6	4	6
2012	10	13	2	5	4
2013	5	5	5	8	5

SUMMER		Baseline			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	14	13	9	10	9
2006	9	10	8	6	6
2007	8	11	4	5	7
2008	12	15	8	9	8
2009	26	22	7	6	8
2010	30	25	10	4	3
2011	20	33	7	4	4
2012	15	29	2	3	8
2013	20	22	5	4	6

Segment-wide averaging in space  
and time

2013 Progress

**Current Criteria,  
Current Assessment Procedure**  
Values are excessive space-time  
exceedence rates%  
Red indicates nonattainment

**Proposed Criteria,  
Proposed Assessment Procedure**  
Values are seasonal chl means (ug/l)  
Red indicates criteria exceedences

SPRING		2013 Progress			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.8	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	0.0	0.0	0.0
2008-2010	0.0	0.0	0.0	0.0	0.0
2009-2011	0.0	0.0	0.0	0.0	0.0
2010-2012	0.0	0.0	0.0	0.0	0.0
2011-2013	0.0	0.0	0.0	0.5	0.0



SUMMER		2013 Progress			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	15.4	4.6	0.0	0.0	0.0
2008-2010	20.8	15.9	0.0	0.4	0.0
2009-2011	32.2	40.7	0.0	0.0	0.0
2010-2012	21.2	50.0	0.0	0.0	0.0
2011-2013	15.4	52.2	0.0	0.0	0.0

SPRING		2013 Progress			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	1	3	8	7	11
2006	3	5	8	5	4
2007	3	5	3	4	6
2008	2	4	5	6	5
2009	4	5	22	5	6
2010	4	3	5	4	10
2011	5	6	5	3	6
2012	9	11	2	5	4
2013	4	5	4	7	5

SUMMER		2013 Progress			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	9	11	7	8	8
2006	5	8	7	5	6
2007	6	10	3	4	6
2008	7	14	7	7	8
2009	20	19	5	5	7
2010	21	20	8	3	3
2011	18	31	6	4	4
2012	13	28	2	3	8
2013	18	20	5	4	6

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 Three-year nonattainment  
 Six-year nonattainment (none predicted)

2017  
Progress

**Current Criteria,  
Current Assessment Procedure**

Values are excessive space-time  
exceedence rates%  
Red indicates nonattainment

SPRING		2017 Progress			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.8	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	0.0	0.0	0.0
2008-2010	0.0	0.0	0.0	0.0	0.0
2009-2011	0.0	0.0	0.0	0.0	0.0
2010-2012	0.0	0.0	0.0	0.0	0.0
2011-2013	0.0	0.0	0.0	0.0	0.0

SUMMER		2017 Progress			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	6.8	9.1	0.0	0.0	0.0
2008-2010	10.7	17.8	0.0	0.0	0.0
2009-2011	20.5	42.7	0.0	0.0	0.0
2010-2012	16.6	45.8	0.0	0.0	0.0
2011-2013	12.1	46.9	0.0	0.0	0.0



**Proposed Criteria,  
Proposed Assessment Procedure**

Values are seasonal chl means (ug/l)  
Red indicates criteria exceedences

SPRING		2017 Progress			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	1	3	7	6	10
2006	3	5	8	4	4
2007	2	4	3	4	6
2008	2	3	5	5	4
2009	4	4	22	5	6
2010	3	3	5	4	9
2011	4	6	4	3	5
2012	8	10	2	4	3
2013	4	5	4	7	5

SUMMER		2017 Progress			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	9	12	7	7	7
2006	4	7	6	5	5
2007	5	9	2	3	5
2008	6	14	7	7	7
2009	20	20	5	4	7
2010	18	18	8	3	3
2011	16	29	6	4	4
2012	12	27	2	2	7
2013	17	20	4	4	5

-  Three-year nonattainment
-  Six-year nonattainment (none predicted)

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# DO Attainment

## Current Criteria, Current Assessment Procedure

Values are excessive space-time  
exceedence rates%

Red indicates nonattainment

SPRING		DO Attainment			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	1.1	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	1.0	0.0	0.0
2008-2010	0.0	0.0	1.0	0.0	0.0
2009-2011	0.0	0.0	1.0	0.0	0.0
2010-2012	0.0	0.0	0.0	0.0	0.0
2011-2013	0.0	0.0	0.0	0.6	0.0

SUMMER		DO Attainment			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	1.8	4.2	0.0	0.0	0.0
2008-2010	5.9	16.3	0.0	0.0	0.0
2009-2011	15.1	41.1	0.0	0.0	0.0
2010-2012	17.5	53.3	0.0	0.0	0.0
2011-2013	12.9	53.5	0.0	0.0	0.0

## Proposed Criteria, Proposed Assessment Procedure

Values are seasonal chl means (ug/l)

Red indicates criteria exceedences

SPRING	DO Attainment				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	1	3	8	7	9
2006	3	6	8	4	3
2007	3	4	3	4	5
2008	2	3	5	5	5
2009	5	5	24	5	5
2010	4	4	6	5	8
2011	5	6	5	3	5
2012	9	11	2	5	3
2013	4	5	4	7	4

SUMMER	DO Attainment				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	9	11	8	7	7
2006	4	7	6	5	5
2007	6	9	3	3	5
2008	7	15	7	7	6
2009	18	19	7	5	6
2010	22	22	9	3	2
2011	17	31	7	4	4
2012	13	30	2	3	7
2013	17	20	5	4	5



Three-year nonattainment



Six-year nonattainment (none predicted)

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# WIP2

## Current Criteria, Current Assessment Procedure

Values are excessive space-time  
exceedence rates%

Red indicates nonattainment

SPRING		WIP2			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.8	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	0.0	0.0	0.0
2008-2010	0.0	0.0	0.0	0.0	0.0
2009-2011	0.0	0.0	0.0	0.0	0.0
2010-2012	0.0	0.0	0.0	0.0	0.0
2011-2013	0.0	0.0	0.0	0.0	0.0
SUMMER		WIP2			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.9	2.5	0.0	0.0	0.0
2008-2010	4.7	14.3	0.0	0.0	0.0
2009-2011	13.7	39.1	0.0	0.0	0.0
2010-2012	15.1	49.0	0.0	0.0	0.0
2011-2013	10.7	40.9	0.0	0.0	0.0

## Proposed Criteria, Proposed Assessment Procedure

Values are seasonal chl means (ug/l)

Red indicates criteria exceedences

SPRING		WIP2			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	1	3	7	6	8
2006	3	5	8	4	3
2007	2	4	3	3	5
2008	2	3	5	4	5
2009	4	5	21	5	5
2010	4	3	5	4	8
2011	5	6	4	3	4
2012	8	10	2	4	3
2013	4	5	4	6	4
SUMMER		WIP2			
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	8	10	7	7	6
2006	4	6	6	4	5
2007	6	8	2	3	5
2008	6	14	6	6	6
2009	16	17	5	4	6
2010	20	19	7	2	2
2011	15	28	6	3	4
2012	12	26	1	2	7
2013	15	17	4	3	4

DRAFT



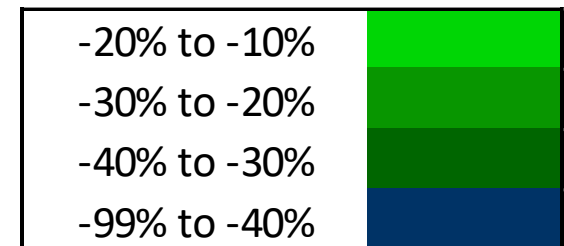
Three-year nonattainment

Six-year nonattainment (none predicted)

How much do chlorophyll observations change under the WIP2 scenario, on average?

SUMMER	WIP2				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	Dark Blue	Light Green	Light Green	Dark Green	Light Green
2006	Dark Blue	Dark Green	Light Green	Dark Green	Light Green
2007	Dark Green	Light Green	Dark Green	Dark Blue	Dark Green
2008	Dark Blue	Light Green	Light Green	Dark Green	Light Green
2009	Dark Blue	Dark Green	Light Green	Light Green	Light Green
2010	Dark Blue	Light Green	Dark Green	Dark Green	Dark Green
2011	Dark Green	Light Green	Light Green	Light Green	Light Green
2012	Dark Green	Light Green	Light Green	Light Green	Light Green
2013	Dark Blue	Light Green	Light Green	Light Green	Light Green

Median % change relative to baseline



E3

### Current Criteria, Current Assessment Procedure

Values are excessive space-time  
exceedence rates%

Red indicates nonattainment

SPRING		E3			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.7	21.8
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	0.0	0.0	0.0	0.0
2008-2010	0.0	0.0	0.0	0.0	0.0
2009-2011	0.0	0.0	0.0	0.0	0.0
2010-2012	0.0	0.0	0.0	0.0	0.0
2011-2013	0.0	0.0	0.0	0.0	0.0

SUMMER		E3			
period	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005-2007	0.0	0.0	0.0	0.0	10.5
2006-2008	0.0	0.0	0.0	0.0	0.0
2007-2009	0.0	1.1	0.0	0.0	0.0
2008-2010	0.0	4.7	0.0	0.0	0.0
2009-2011	0.0	17.0	0.0	0.0	0.0
2010-2012	0.0	15.0	0.0	0.0	0.0
2011-2013	0.0	10.9	0.0	0.0	0.0

### Proposed Criteria, Proposed Assessment Procedure

Values are seasonal chl means (ug/l)

Red indicates criteria exceedences

SPRING	E3				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	1	2	4	4	7
2006	2	4	7	3	3
2007	1	2	1	2	4
2008	1	2	2	4	4
2009	1	1	16	4	4
2010	1	2	2	2	6
2011	2	3	2	1	4
2012	4	5	1	3	3
2013	1	2	1	4	4

SUMMER	E3				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH
2005	5	8	4	5	6
2006	2	3	4	3	4
2007	3	6	1	2	4
2008	4	12	4	4	5
2009	13	13	3	3	5
2010	13	12	4	2	2
2011	9	18	3	2	3
2012	7	17	1	1	6
2013	9	10	2	3	4

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- Three-year nonattainment (none predicted)
- Six-year nonattainment (none predicted)

## Most recent sensitivity runs

### Half-Saturation Constants (mg/l)

	<u>TN</u>	<u>TP</u>	
Run C	0.015	0.0015	Shen et al.
Run E	0.025	0.025	Median of lit. values (draft EPA, 2017)

## Proposed Criteria, Proposed Assessment Procedure

Values are seasonal chl means (ug/l)  
Red indicates criteria exceedences

Half-Saturation Constants  
(mg/l)

	<u>TN</u>	<u>TP</u>
Run C	0.015	0.0015
Run E	0.025	0.025

### Run C

SPRING		WIP2 Run C				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH	
2005	1	3	7	5	9	
2006	3	5	6	3	3	
2007	3	3	3	3	5	
2008	2	3	5	4	5	
2009	4	5	23	5	5	
2010	4	3	5	4	8	
2011	5	6	5	3	5	
2012	8	10	3	4	3	
2013	4	4	4	7	5	
SUMMER		WIP2 Run C				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH	
2005	8	9	6	6	6	
2006	4	7	6	4	5	
2007	6	7	2	3	5	
2008	7	14	6	6	6	
2009	17	18	5	4	6	
2010	21	20	7	3	3	
2011	18	29	6	3	4	
2012	14	29	2	2	6	
2013	16	18	5	3	5	

### Run E

SPRING		WIP2 Run E				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH	
2005	1	3	6	5	9	
2006	3	6	8	3	3	
2007	2	4	3	3	5	
2008	2	3	5	4	5	
2009	4	4	22	5	5	
2010	4	3	4	4	8	
2011	5	6	4	2	5	
2012	8	10	3	4	3	
2013	4	4	3	6	5	
SUMMER		WIP2 Run E				
Year	JMSTFU	JMSTFL	JMSOH	JMSMH	JMSPH	
2005	7	10	6	6	6	
2006	4	6	6	4	5	
2007	5	8	2	3	5	
2008	7	14	6	6	6	
2009	16	16	5	4	6	
2010	19	19	7	3	3	
2011	17	28	6	3	4	
2012	13	28	1	2	7	
2013	16	17	4	3	5	

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Questions?