LOWER SUSQUEHANNA RIVER WATERSHED ASSESSMENT
QUARTERLY TEAM MEETING

MDE Aqua Conference Room, Baltimore, Maryland
January 16, 2014

Meeting Agenda

		Lead
10:00	Welcome and Introductions	All
10:05	Review of Action Items from Prior Meetings Funding Update Communication and Coordination Updates for Situational Awareness	O'Neill
10:20	Conowingo Re-licensing Update	Michael
10:30	Stoplight Plot/TMDL Analysis	Linker
11:30	Report Discussion	Compton/All
12:30	Meeting Wrap-Up Schedule Ahead Action Items/Summary	O'Neill

Call-In Information: (877) 848-7030, access code = 5810421#, security code = 1234#

Expected Attendees:

MDE: Herb Sachs; Tim Fox, Matt Rowe
MDNR: Bruce Michael, Bob Sadzinski, Shawn Seaman
MGS: Rich Ortt
SRBC: John Balay, Andrew Gavin, Dave Ladd
USACE: Anna Compton, Bob Blama, Chris Spaur, Claire O'Neill, Tom Laczo, Dan Bierly, Kim Gross
ERDC: Carl Cerco, Steve Scott
TNC: Mark Bryer, Kathy Boomer
USEPA: Gary Shenk, Lewis Linker
USGS: Mike Langland, Joel Blomquist
NOAA: Chris Boelke
Exelon: Mary Helen Marsh, Kimberly Long, Gary LeMay
Lower Susquehanna Riverkeeper: Michael Helfrich
PA Agencies: Patricia Buckley, Raymond Zomok
MES: Jeff Halka

Action Items from August 15, 2013 Quarterly Meeting –

a. Chris Spaur will provide information summarizing the 2010/2011 LSRWA nutrient scoping to anyone that is interested, as well as copies of Jordan and others (2008) and a link to MGS report. This info also could be placed on the LSRWA website. Chris will also prepare a write-up on phosphorus biogeochemistry in the Bay for the LSRWA report. *Status: Completed.*
b. Claire O'Neill will provide to the group all of the factsheets/ back-up documentation to show how costs were developed for each representative sediment management alternative. *Status: Completed.*
c. Matt Rowe will look into Stancills quarry and their existing permits to see if they have any constraints or concerns with groundwater contamination. This may need to be marked as a limitation for this potential placement site.
d. Bruce Michael will be providing a write-up that lays out this watershed sediment management scenario in more detail in September.
e. Mike Langland will provide data to the group related to grain size and nutrients based on his analysis of the sediment core data.
f. Steve Scott will alter his graphs to depict areas of concern in red.
g. Carl Cerco will look into the suspended sediment and nutrient loads that Michael Helfrich has provided to determine if the loads need to be revised for his CBEMP modeling runs.
h. Anna Compton will work with the modelers to develop a summary table compiling all sediment management modeling scenarios and results. *Status: Mostly complete only updates required are Linker/stoplight numbers.*
i. Anna Compton will draft up notes for the group's review and then post to the project website. *Status Complete.*
j. Claire O'Neill will set up a doodle poll to determine the date for next quarterly meeting which will be sometime in November. *Status: Completed. Quarterly meeting scheduled for 16 January 2014.*

Ongoing Action Items from Previous Meetings:

A. Shawn Seaman will keep team posted on FERC relicensing of Conowingo dam status. *Status: Ongoing. Shawn noted that currently MD and PA are negotiating with Exelon. August 2nd was last MD meeting. MD and PA will have some joint and also some separate meetings with Exelon in regards to relicensing process and negotiations.*
B. Anna Compton will update PowerPoint slides after each quarterly meeting to be utilized by anyone on the team providing updates to other Chesapeake Bay groups. *Status: Ongoing.*
C. Anna Compton will send out an update via the large email distribution list that started with the original Sediment Task Force (includes academia, general public, federal, non-government organization (NGO), and state and counties representatives) notifying the group of updates from the quarterly meeting. *Status: Ongoing.*
D. Matt Rowe will keep team informed on innovative re-use committee findings to potentially incorporate ideas/innovative techniques into LSRWA strategies. *Status: Ongoing.*
E. Anna Compton will send out the spreadsheet tracking all stakeholder coordination to the group. Anyone making a presentation on LSRWA should let her know so the spreadsheet can be kept up to date; if any specific comments/concerns are raised, this should be noted as well. *Status: Ongoing.*
F. Bruce Michael will work with the Chesapeake Bay Program (CBP) on potential "no-till" acres available in the watershed and evaluate impacts to sediment loads if all no-till acres were implemented in the watershed via modeling as well as develop costs. *Status: Ongoing. See discussion under #6.*

G. Modeling efforts cannot predict impacts to SAV from physical burial by sediments. These impacts should be considered and described by other means, perhaps qualitatively, by the LSRWA agency group. *Status: Ongoing. Bruce Michael has provided the UMCES (Mike Kemp) SAV historical mapping and trends over last 10 years in Susquehanna Flats. This information will need to be incorporated into the assessment to provide a qualitative discussion of impacts. Bruce noted that in looking at what happened to SAV during TS Lee, high flows ripped up SAV from the periphery. It appears that there was damage from the physical impacts of the storm versus burial of SAV by scoured sediments. Mike Kemp is looking at other storm examples. Bruce will follow up with Mike Kemp and provide a write-up for report. Chris Spaur reminded the group that we don't have wave energy in our modeling. Chris can email past efforts on characterization of wave energy undertaken during the Chesapeake Bay Shoreline Erosion study.*

H. The LSRWA agency group needs to determine next steps for developing reservoir sediment management options. *Status: Complete. Sediment Management option development and process will be laid out in draft report.* J. The LSRWA agency group should quantify any habitat restored or enhanced downstream in the Bay or elsewhere (e.g., terrestrial) as a project benefit; considerations should be given on how to do this. *Status: Ongoing.*

I. Bruce Michael and Claire O'Neill will keep the LSRWA agency group updated on the Susquehanna policy group put together by Governor O'Malley. *Status: Ongoing. Bruce noted that the Conowingo policy group met in April. There are no more meetings planned until more results from LSRWA are available.*

J. Exelon will review and provide comments on SRBC's write-up of altering reservoir operations as a sediment management strategy. Exelon will comment on the write-up to make sure dam operations are adequately covered. *Status: Ongoing. John Balay will follow up with Exelon to ensure they have no further comments on reservoir operations section.*

K. The group will review the baseline and future conditions summary spreadsheet and provide comments back to Anna Compton and Carl Cerco. *Status: Complete only updates required are Linker/stoplight numbers.*

L. The LSRWA agency group will develop a screening process for reservoir sediment management options that are worth developing further. *Status: Complete. Sediment Management screening process will be laid out in draft report.*

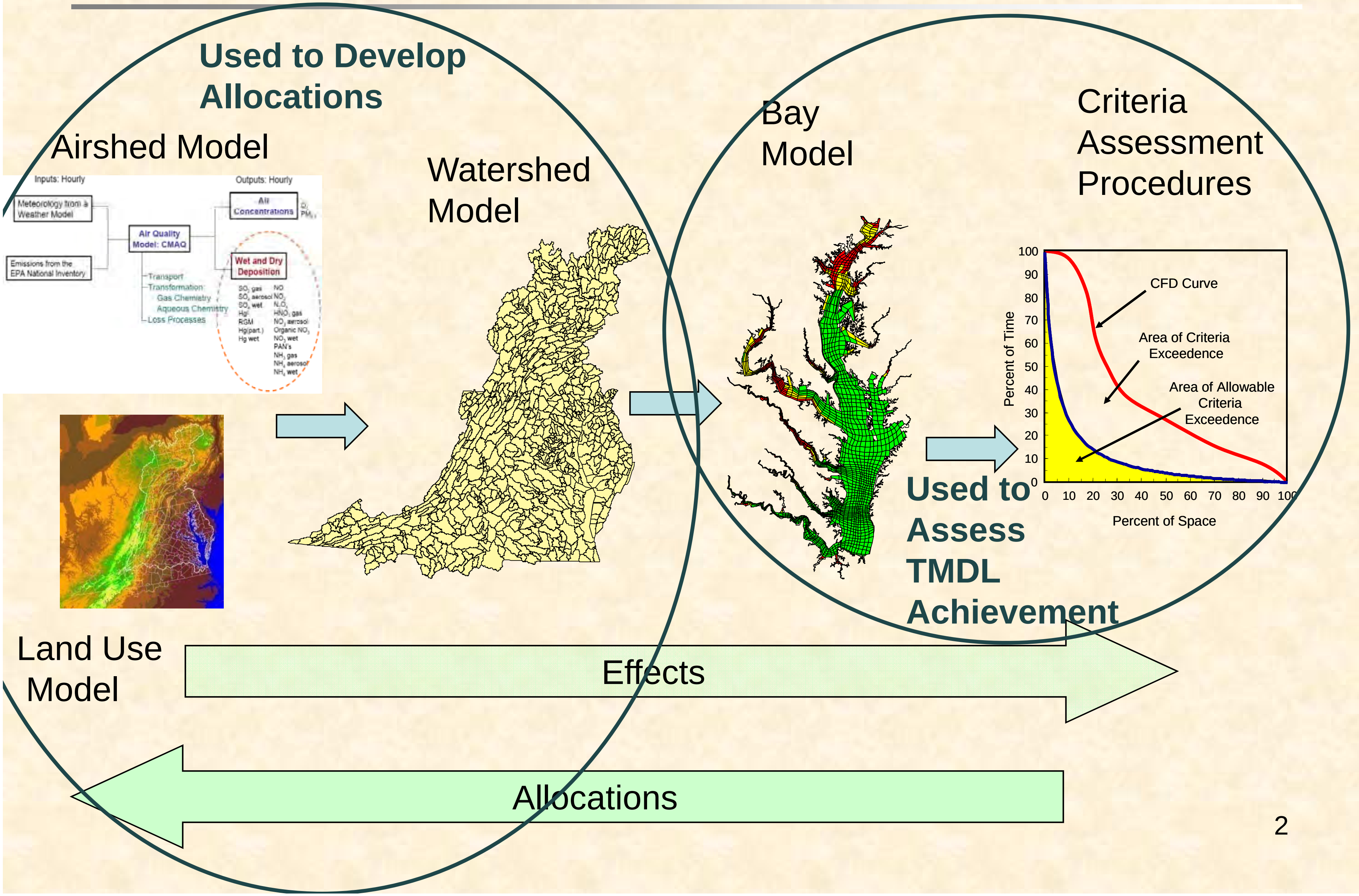
DO Water Quality Standard Attainment Analysis of the Estimated Influence of Conowingo Infill on Chesapeake DO Using Linked WSM, ADH, and WQSTM Simulations

LSRWA Quarterly Meeting

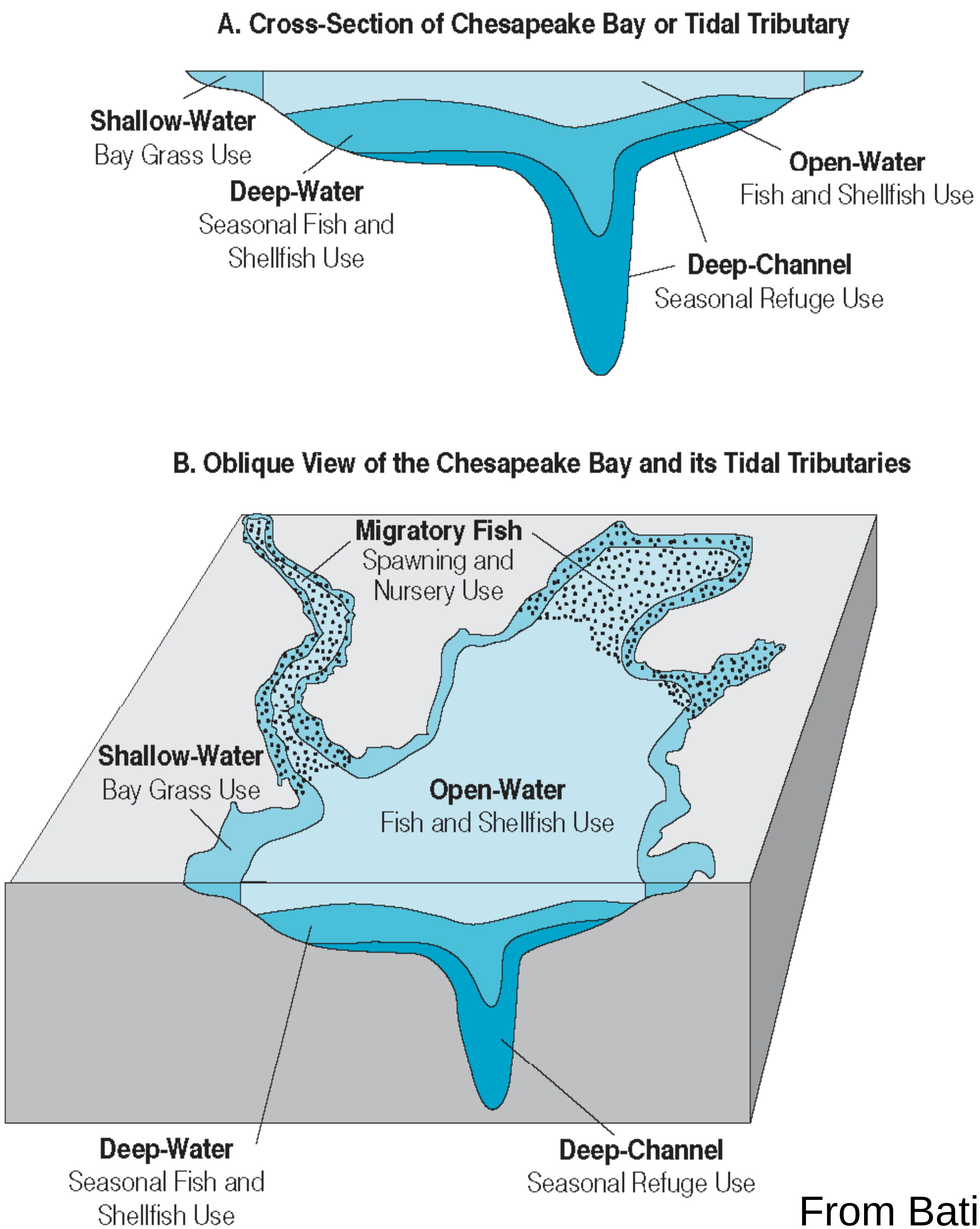
January 16, 2014

Lewis Linker and the CBP Modeling Team
linker.lewis@epa.gov

Nutrient Allocation Decision Support System

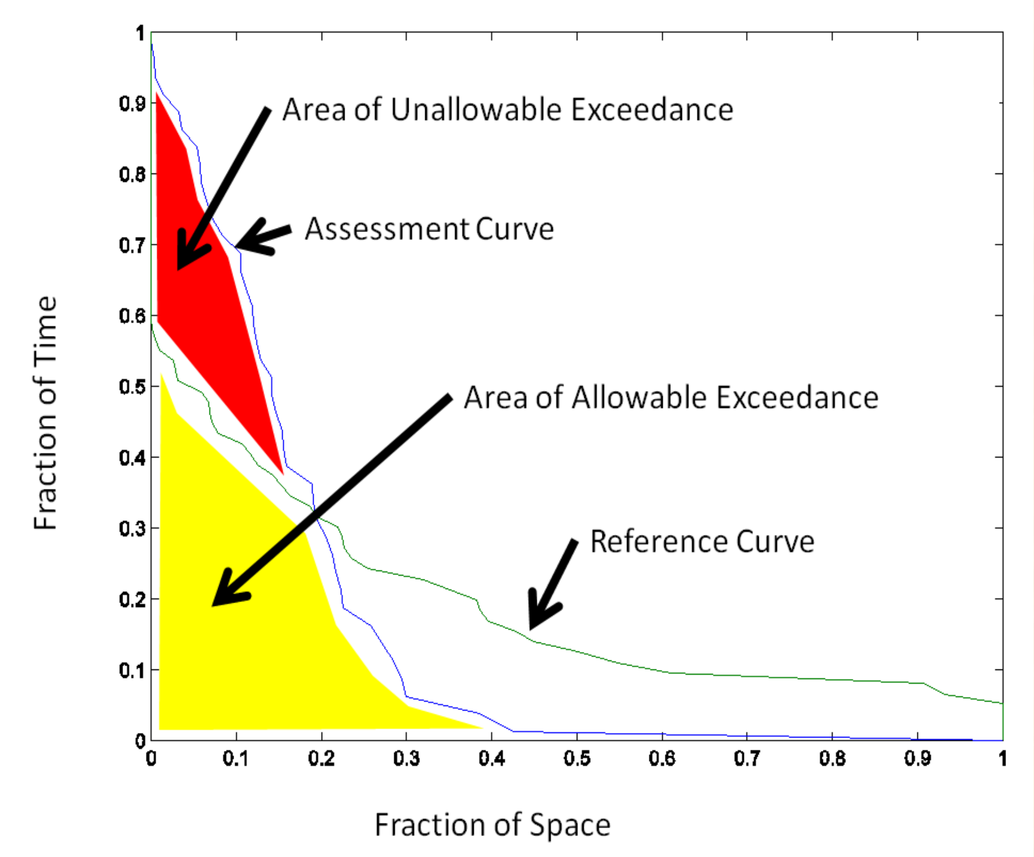


Water Quality Standards of Deep Water, Deep Channel, Open Water, and Shallow Water Dissolved Oxygen (DO) are key for protection of living resources. Chlorophyll and SAV/clarity standards are also designed to protect living resources.

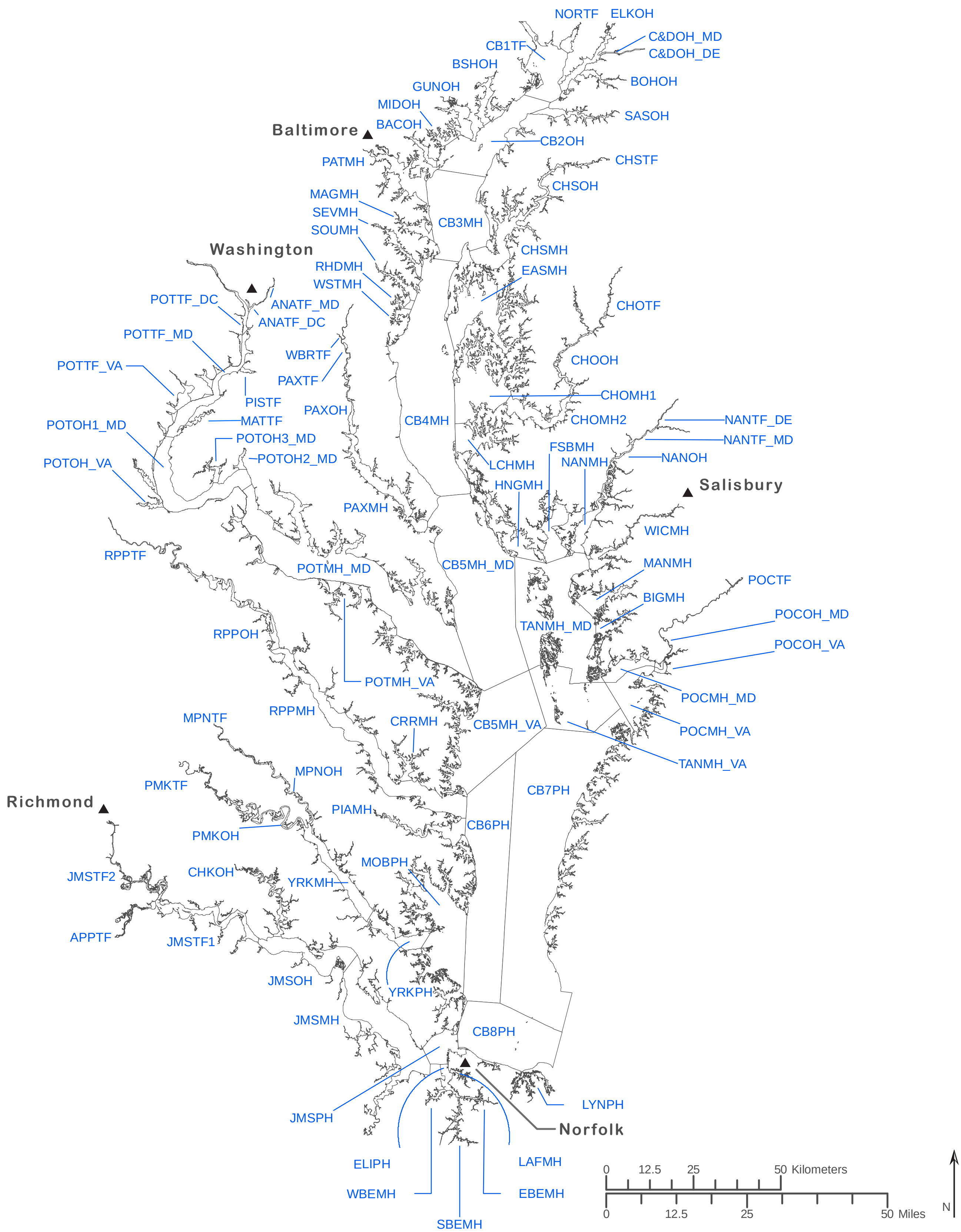


From Batiuk (2003)

The analysis applied for each TMDL CB segment to determine the percent time and space that the simulated Chesapeake Bay water quality results exceeded the allowable concentration.



The green reference curve represents the maximum allowable exceedance of the criterion concentration in space and time. The reference curve is based on observations of healthy ecosystem habitats for the assessed criterion where those observations exist with a default reference curve used in other areas. If any part of the blue assessment curve is above the reference curve, the segment is considered to be violation of the standard. The yellow area represents the fraction of space and time that are allowable exceedances of the criterion concentration. The red area represents unallowable exceedances and the unshaded area represents non-exceedances.


NORTF
ELKOH
C&DOH_MD
C&DOH_DE
CB1TF
BSHOH
BOHOH
GUNOH
MIDOH
SASOH
BACOH
Baltimore
CB2OH
PATMH
CHSTF
CHSOH
MAGMH
SEVMH
CB3MH
SOUMH
Washington
CHSMH
RHDMH
EASMH
WSTMH
POTTF_DC
ANATF_MD
ANATF_DC
CHOTF
POTTF_MD
WBRTF
CHOOH
POTTF_VA
PAXTF
PISTF
CHOMH1
PAXOH
MATTF
CB4MH
CHOMH2
NANTF_DE
POTOH1_MD
POTOH3_MD
NANTF_MD
FSBMH
POTOH_VA
POTOH2_MD
NANMH
NANOH
LCHMH
HNGMH
Salisbury
PAXMH
WICMH
RPPTF
CB5MH_MD
MANMH
POTMH_MD
POCTF
BIGMH
RPPOH
TANMH_MD
POCOH_MD
POCOH_VA
POTMH_VA
POCMH_MD
MPNTF
RPPMH
CRRMH
CB5MH_VA
POCMH_VA
MPNOH
TANMH_VA
PMKTF
CB7PH
Richmond
PIAMH
CB6PH
PMKOH
MOBPH
CHKOH
JMSTF2
YRKMH
APPTF
JMSTF1
JMSOH
YRKPH
JMSMH
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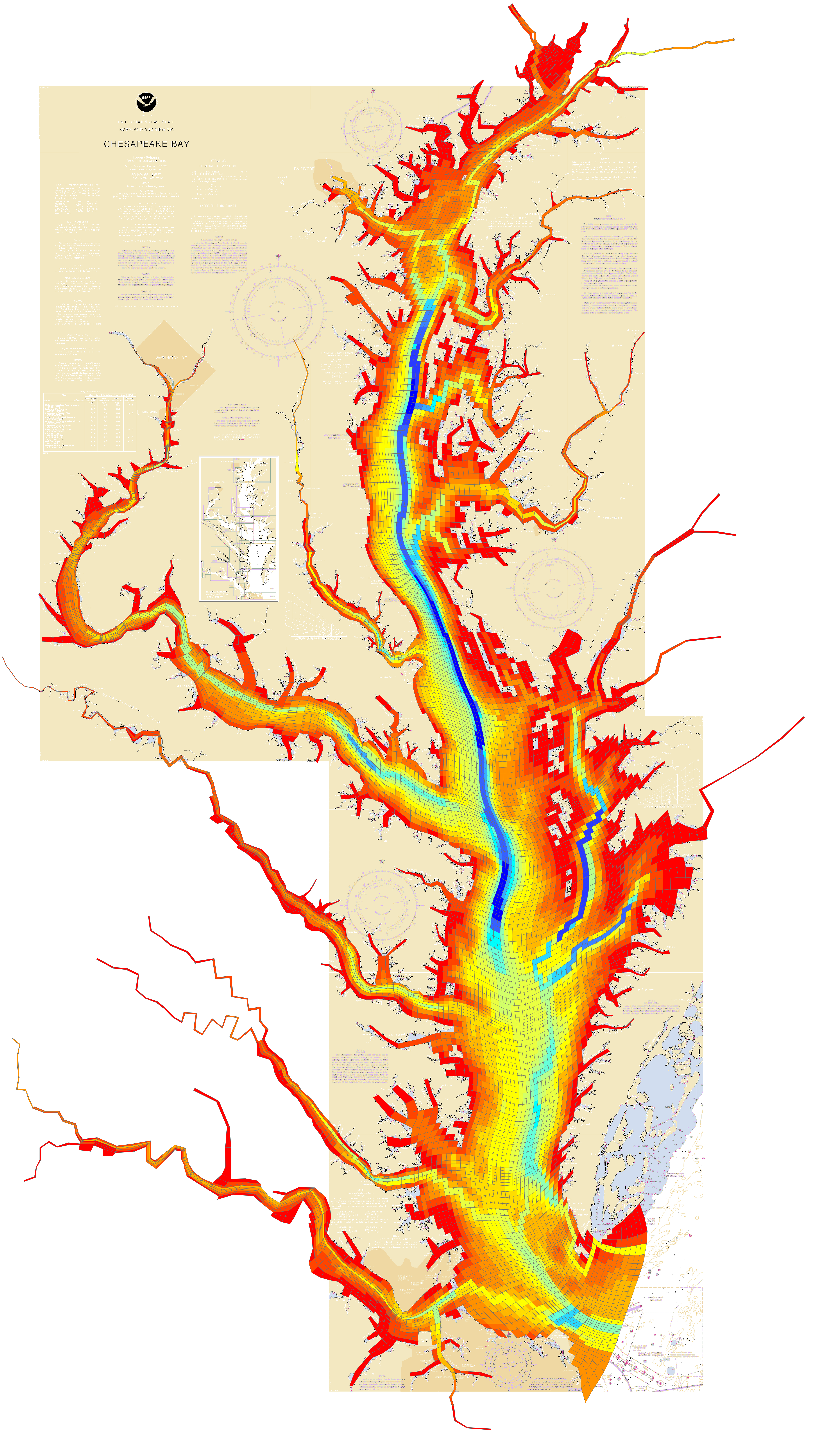
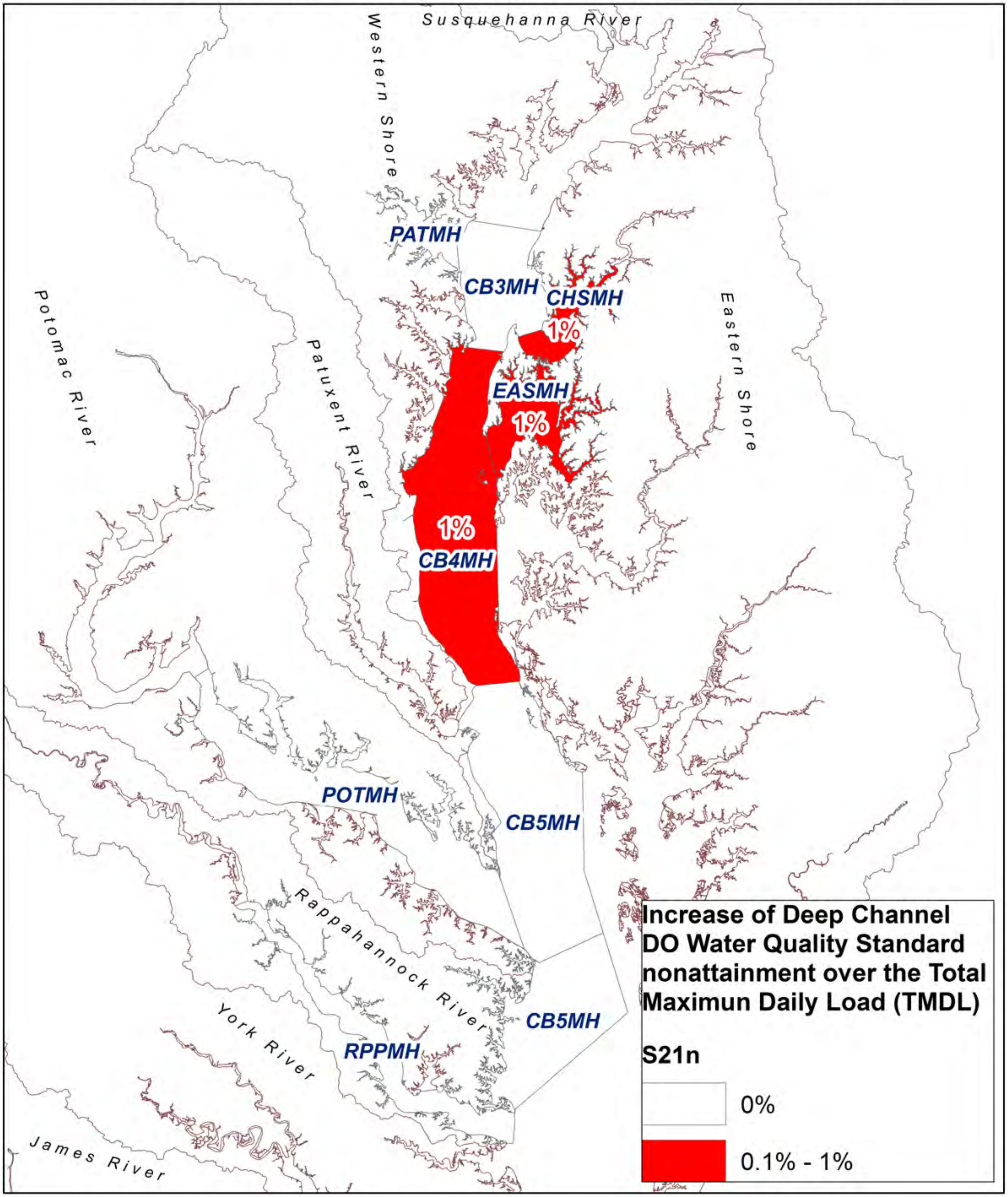
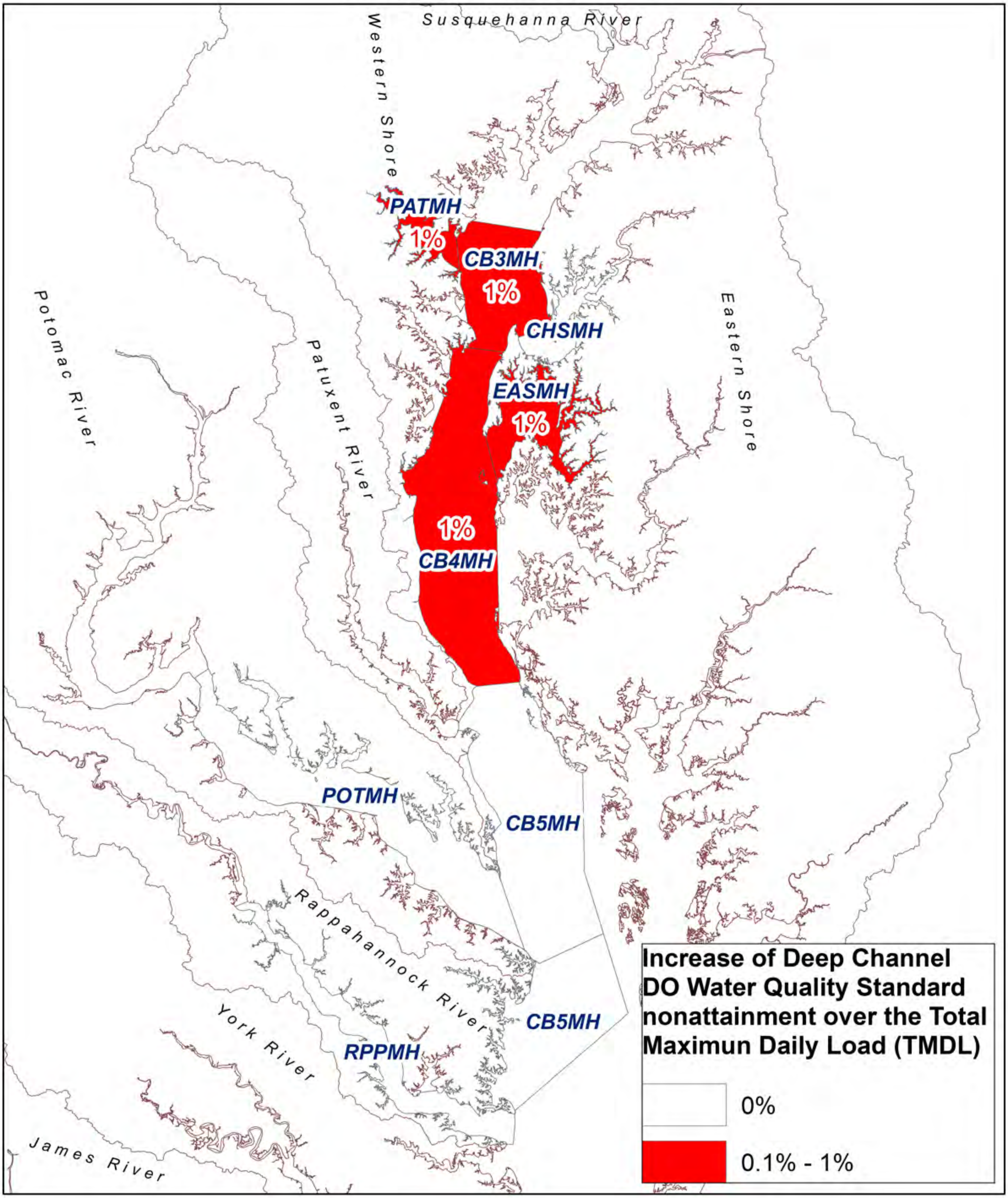

CHESAPEAKE BAY

	1. What is the system's current (existing) condition? **Scenario LSRWA-4**	2. What is the system's condition if the WIPs are in full effect and reservoirs are still trapping? Scenario **LSRWA-3**	3. What is the system's condition when WIPS are in full effect, reservoirs are still trapping sediments and a scour event occurs during winter? **Scenario LSRWA-21**	4. What is the system's condition when WIPS are not in effect, reservoirs are full and there is a winter scour event? Scenario **LSRWA-18**	5. What is the system's condition when WIPs are in full effect, the reservoirs are full and there is a winter scour event? **LSRWA-30**	6. What is the system's condition if WIPs are in full effect, reservoirs are full and a large scour event occurs during **(a) summer LSRWA-24 or (b) fall LSRWA-25 or (c) winter? LSRWA-3 (Need to use 1996-2008 period for these scenarios.)**
Deep Channel DO Water Quality Standard Achievement for Total Maximum Daily Load (TMDL)	Widespread nonattainment of TMDL of Deep Channel DO. Nonattainment of 23% in the CB4 mainstem, 14% in Eastern Bay, and 28% in the Lower Chester River was estimated. This and other areas of nonattainment in the Deep Channel amounted to more than half of the Deep Channel habitat.	Complete attainment of the Deep Channel DO standard was estimated to be attained.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, an estimated increase of 1% nonattainment over the Base TMDL Scenario (LSRWA-3) was estimated for CB4MH, EASMH, and CHSMH.	Using for comparison, the scenario of the systems current condition (LSRWA-4), an increase of 1% nonattainment for CB4MH, and PATMH was estimated.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, an estimated increase of 1% nonattainment over the Base TMDL Scenario (LSRWA-3) was estimated for CB4MH, EASMH, and CHSMH.	Generally, a June high flow storm event has the most detrimental influence on Deep Channel DO followed by a storm of the same magnitude in January and then October. A 'no large storm' condition has the highest level of Deep Channel DO attainment.

What is the system's condition when WIPS are in full effect, reservoirs are still trapping sediments and a scour event occurs during winter? Scenario LSRWA-21



What is the system's condition when WIPS are not in effect, reservoirs are full and there is a winter scour event?
Scenario LSRWA-18



	1. What is the system's current (existing) condition? **Scenario LSRWA-4**	2. What is the system's condition if the WIPs are in full effect and reservoirs are still trapping? Scenario **LSRWA-3**	3. What is the system's condition when WIPS are in full effect, reservoirs are still trapping sediments and a scour event occurs during winter? **Scenario LSRWA-21**	4. What is the system's condition when WIPS are not in effect, reservoirs are full and there is a winter scour event? Scenario **LSRWA-18**	5. What is the system's condition when WIPs are in full effect, the reservoirs are full and there is a winter scour event? **LSRWA-30**	6. What is the system's condition if WIPs are in full effect, reservoirs are full and a large scour event occurs during **(a) summer LSRWA-24 or (b) fall LSRWA-25 or (c) winter? LSRWA-3 (Need to use 1996-2008 period for these scenarios.)**
Deep Water DO Water Quality Standard Achievement for TMDL	Widespread nonattainment of TMDL of Deep Water DO. Estimated nonattainment of 11% in the CB4 mainstem, 2% in Eastern Bay, and 11% in the Lower Chester River.	Complete attainment of the Deep Water DO standard was estimated to be attained.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, an estimated increase of 1% nonattainment over the Base TMDL Scenario (LSRWA-3) was estimated for CB4MH and CB5MH.	Using for comparison, the scenario of the systems current condition (LSRWA-4), an increase of 1% nonattainment for CB3MH and PAXMH was estimated.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, an estimated increase of 1% nonattainment over the Base TMDL Scenario (LSRWA-3) was estimated for CB4MH and CB5MH.	Generally, a June high flow storm event has the most detrimental influence on Deep Channel DO followed by a storm of the same magnitude in January and then October. A 'no large storm" condition has the highest level of Deep Channel DO attainment.
Open Water DO Water Quality Standard Achievement for TMDL	Widespread, but not complete attainment of the Open Water DO standard was estimated to be attained.	Complete attainment of the Open Water DO standard was estimated.	Complete attainment of the Open Water DO standard was estimated.	Complete attainment of the Open Water DO standard was estimated.	Complete attainment of the Open Water DO standard was estimated.	Complete attainment of the Open Water DO standard was estimated.

Scenarios Examined in January 2014 Analysis

- What are the effects of strategic dredging? **LSRWA-28**

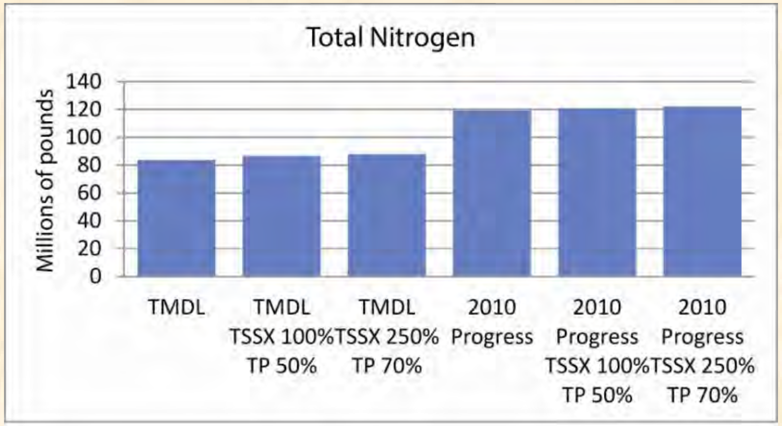
- What are the effects of passing sediment downstream for 3 winter months, over-time for a period of 10 years? **LSRWA-29**

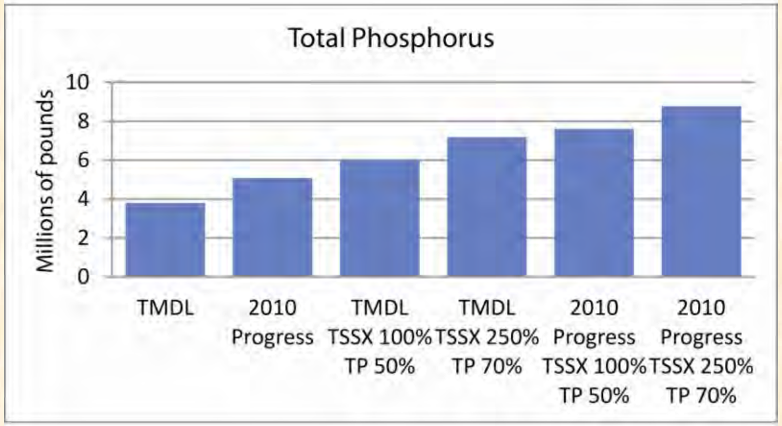
- What are the effects of extreme long-term removal out of system) restoring to 1996 bathymetry? **LSRWA-13**

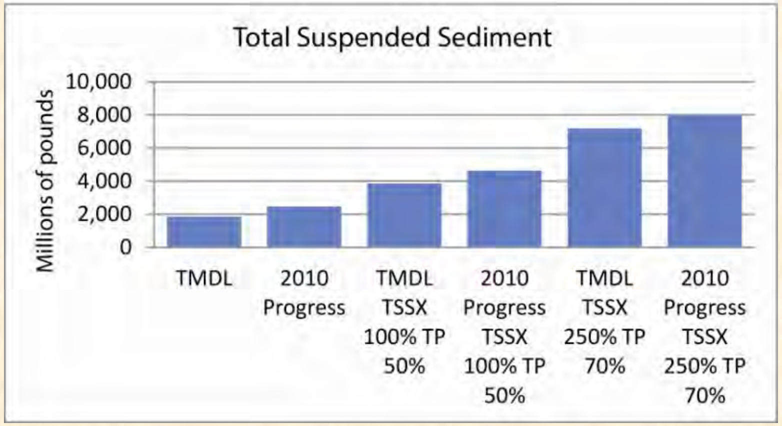
	1. What are the effects of agitation dredging? **No WQSTM Run**	2. What are the effects of strategic dredging? **LSRWA-28**	3a. What are the effects of passing sediment downstream for 3 winter months, one time? **No WQSTM Run**	3b. What are the effects of passing sediment downstream for 3 winter months, over-time for a period of 10 years? **LSRWA-29**	4. What are the effects of passing sediment downstream for 9 months? **No WQSTM Run**	5. What are the effects of extreme long-term removal out of system) restoring to 1996 bathymetry? **LSRWA-13**	6. What are the effects of long-term strategic dredging over time for a period of 10 years? **No WQSTM Run**	7. What are the effects of moving sediment from scour areas to depositional areas? **No WQSTM Run**	8. What are the effects of increasing Best management practices in the watershed above that required to meet TMDL? **No WQSTM Run**
Deep Channel DO Water Quality Standard Achievement for Total Maximum Daily Load (TMDL)	Not determined.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, an estimated decrease of 1% nonattainment over the Base TMDL **(LSRWA-21)** Scenario was estimated for CB4MH.	Not determined.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, estimated increases of 4%, 5% , 3%,4%, and 2% nonattainment over the Base TMDL **(LSRWA-21)** Scenario were estimated for CB3MH, CB4MH, CHSMH, EASMH, and PATMH respectively.	Not determined.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, an estimated decrease of 1% nonattainment over the Base TMDL **(LSRWA-21)** Scenario was estimated for CB4MH.	Not determined.	Not determined.	Not determined.

	1. What are the effects of agitation dredging? **No WQSTM Run**	2. What are the effects of strategic dredging? **LSRWA-28**	3a. What are the effects of passing sediment downstream for 3 winter months, one time? **No WQSTM Run**	3b. What are the effects of passing sediment downstream for 3 winter months, over-time for a period of 10 years? **LSRWA-29**	4. What are the effects of passing sediment downstream for 9 months? **No WQSTM Run**	5. What are the effects of extreme long-term removal out of system) restoring to 1996 bathymetry? **LSRWA-13**	6. What are the effects of long-term strategic dredging over time for a period of 10 years? **No WQSTM Run**	7. What are the effects of moving sediment from scour areas to depositional areas? **No WQSTM Run**	8. What are the effects of increasing Best management practices in the watershed above that required to meet TMDL? **No WQSTM Run**
Deep Water DO Water Quality Standard Achievement for TMDL	Not determined.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, nonattainment was estimated to be unchanged over the Base TMDL Scenario (**LSRWA-21)**	Not determined.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, estimated increases of 2%, nonattainment in CB4MH and 1% nonattainment in CSHMH, EASMH, MD5MH, and PATMH over the Base TMDL (**LSRWA-21)**	Not determined.	Using the 1996-1988 period to capture the January 1996 "Big Melt" event, nonattainment was estimated to be reduced by 1 % in CB4MH over the Base TMDL Scenario (**LSRWA-21)**	Not determined.	Not determined.	Not determined.
Open Water DO Water Quality Standard	Not determined.	Complete attainment of the Open	Not determined.	Complete attainment of the Open	Not determined.	Complete attainment of the Open	Not determined.	Not determined.	Not determined.

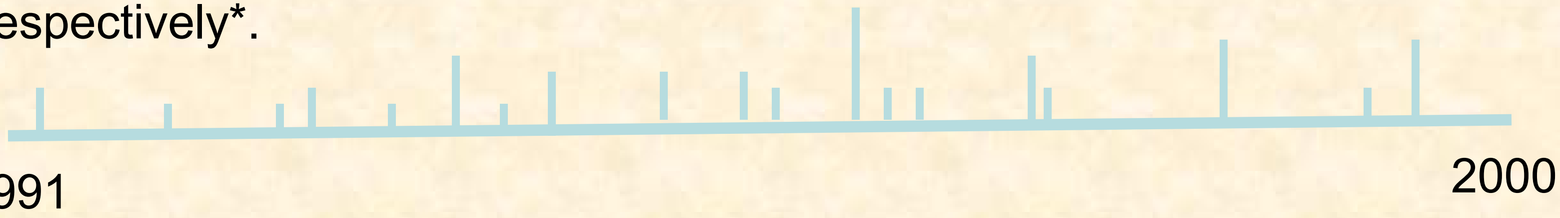
In separate work being done by the CBP Modeling Workgroup scenarios were developed to represent the Conowingo loads calculated by Hirsch (2012). Two types of scenarios were developed where sediment and phosphorus loads were increased from the Conowingo Pool representing current infill and complete infill conditions. The scenarios were created by recalibrating the river simulation only at the Conowingo segment and adjusting parameters that would increase sediment and phosphorus loads. The parameters used and modified were copied from the WSM Phase 5.3.2 calibration.



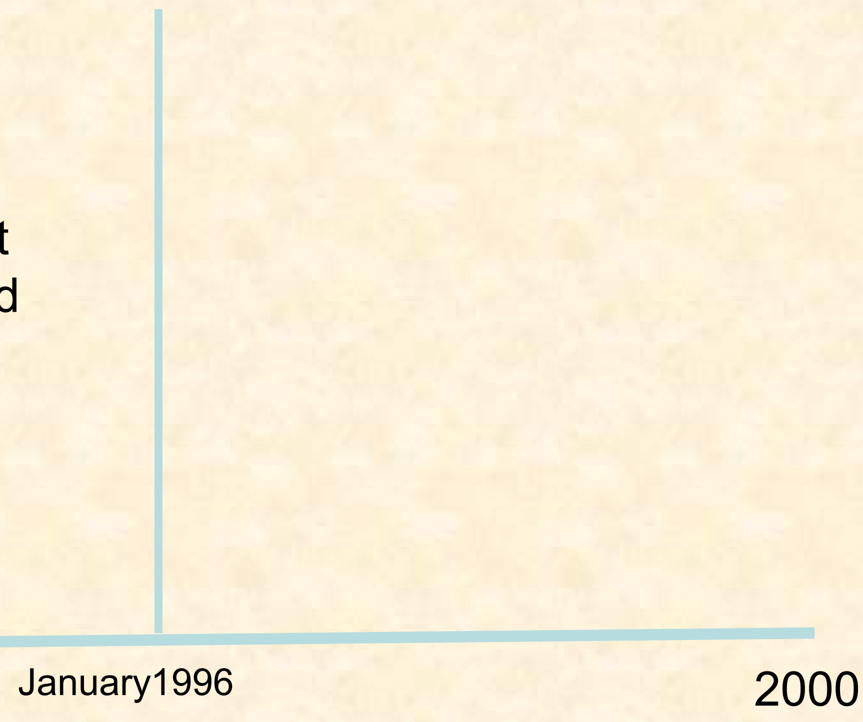




Scenarios developed for the CBP Modeling Workgroup used the Watershed Model to represent scour from the current infill state of the Conowingo with loads load increases from the Conowingo Pool of 100%, 50%, and 0% above Conowingo base to represent loads at the estimated current level of Conowingo infill for TSS, TP, and TN respectively*.



Scenarios developed for the LSRWA provide an estimate of the influence Conowingo infill has on Chesapeake water quality from the high flow event of the January 1996 Big Melt. A linked simulation of the WSM and ADH was used to represent the episodic scour that occurs at high flow events.



*Source: Hirsch, R.M., 2012, Flux of nitrogen, phosphorus, and suspended sediment from the Susquehanna River Basin to the Chesapeake Bay during Tropical Storm Lee, September 2011, as an indicator of the effects of reservoir sedimentation on water quality: U.S. Geological Survey Scientific Investigations Report 2012–5185, 17 p.

DO Stoplight Decision Rules:

- Applied standard Phase I & II Allocation decision rules of rounding to the nearest whole number of nonattainment and allowing 1% nonattainment for uncertainties in overall analysis procedure.
- A CB4MH and PATMH Deep Water variance of 7%.
- A CB4MH and EASMH Deep Channel variance of 2%.
- A CHSMH Deep Chanel variance of 16%.

Deep Channel DO

Cbseg	Scenario → Year → State	2010 No Action N-Based Scenario 371 TN, 37.6 TP, 10630TSS '93-'95 DO Deep Channel	1985 Scenario 353 TN, 24.6 TP, 10100 TSS '93-'95 DO Deep Channel	'91 -'00 Base Scenario 318 TN, 20.3 TP, 9440 TSS '93-'95 DO Deep Channel	2007 Scenario 269 TN, 19.5 TP, 8770 TSS '93-'95 DO Deep Channel	2009 Scenario 266 TN, 19.1 TP, 8520 TSS '93-'95 DO Deep Channel	2010 Scenario 263 TN 19.4 TP 8360 TSS '93-'95 DO Deep Channel	2010 No Conowingo 272 TN 20 TP 9263 TSS '93-'95 DO Deep Channel	2010 scour100% '93-'95 DO Deep Channel	TMDL Scenario 191 TN 15 TP 6675 TSS '93-'95 DO Deep Channel	TMDL scour100% '93-'95 DO Deep Channel	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS '93-'95 DO Deep Channel	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS '93-'95 DO Deep Channel
CB3MH	MD	22%	17%	14%	12%	11%	5%	7%	8%	0%	0%	0%	0%
CB4MH	MD	54%	49%	46%	40%	38%	23%	26%	30%	1.49%	3.39%	0%	0%
CB5MH	both	22%	17%	15%	10%	9%	0%	1%	2%	0%	0%	0%	0%
CHSMH	MD	45%	39%	39%	36%	36%	28%	34%	31%	15.01%	15.66%	5%	0%
EASMH	MD	38%	29%	27%	24%	24%	14%	15%	17%	1.09%	3.73%	0%	0%
MD5MH	MD	31%	25%	24%	19%	17%	2%	4%	8%	0%	0%	0%	0%
PATMH	MD	46%	42%	28%	25%	25%	18%	24%	23%	0%	0%	0%	0%
POMMH	MD	27%	20%	20%	13%	10%	0%	0%	0%	0%	0%	0%	0%
POTMH	both	27%	20%	20%	13%	10%	0%	0%	0%	0%	0%	0%	0%
RPPMH	VA	29%	23%	19%	6%	4%	0%	0%	0%	0%	0%	0%	0%

Deep Water DO

Cbseg	Scenario → Year → State	2010 No Action N-Based Scenario 371 TN, 37.6 TP, 10630TSS '93-'95 DO Deep Water	1985 Scenario 353 TN, 24.6 TP, 10100 TSS '93-'95 DO Deep Water	'91 -'00 Base Scenario 318 TN, 20.3 TP, 9440 TSS '93-'95 DO Deep Water	2007 Scenario 269 TN, 19.5 TP, 8770 TSS '93-'95 DO Deep Water	2009 Scenario 266 TN, 19.1 TP, 8520 TSS '93-'95 DO Deep Water	2010 Scenario 263 TN 19.4 TP 8360 TSS '93-'95 DO Deep Water	2010 No Conowingo 272 TN 20 TP 9263 TSS '93-'95 DO Deep Water	2010 scour100% '93-'95 DO Deep Water	TMDL Scenario 191 TN 15 TP 6675 TSS '93-'95 DO Deep Water	TMDL scour100% '93-'95 DO Deep Water	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS '93-'95 DO Deep Water	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS '93-'95 DO Deep Water
CB3MH	MD	4%	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%
CB4MH	MD	28%	22%	20%	17%	16%	11%	11%	12%	4.7%	5.7%	3%	0%
CB5MH	both	7%	5%	4%	3%	3%	2%	2%	2%	0%	0%	0%	0%
CB6PH	VA	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
CHSMH	MD	39%	32%	26%	21%	19%	11%	13%	13%	0%	3.3%	1%	0%
EASMH	MD	34%	14%	6%	4%	4%	2%	2%	2%	0.90%	1.1%	0%	0%
PATMH	MD	31%	21%	13%	11%	11%	6%	9%	7%	0%	1.0%	0%	0%
PAXMH	MD	23%	12%	7%	4%	3%	0%	1%	4%	0%	0%	0%	0%
POMMH	MD	10%	5%	4%	2%	2%	0%	1%	1%	0%	0%	0%	0%
POTMH	both	9%	5%	4%	2%	2%	0%	1%	1%	0%	0%	0%	0%
RPPMH	VA	13%	8%	6%	3%	1%	0%	0%	1%	0%	0%	0%	0%
SBEMH	VA	5%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
VA5MH	VA	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
YRKPH	VA	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

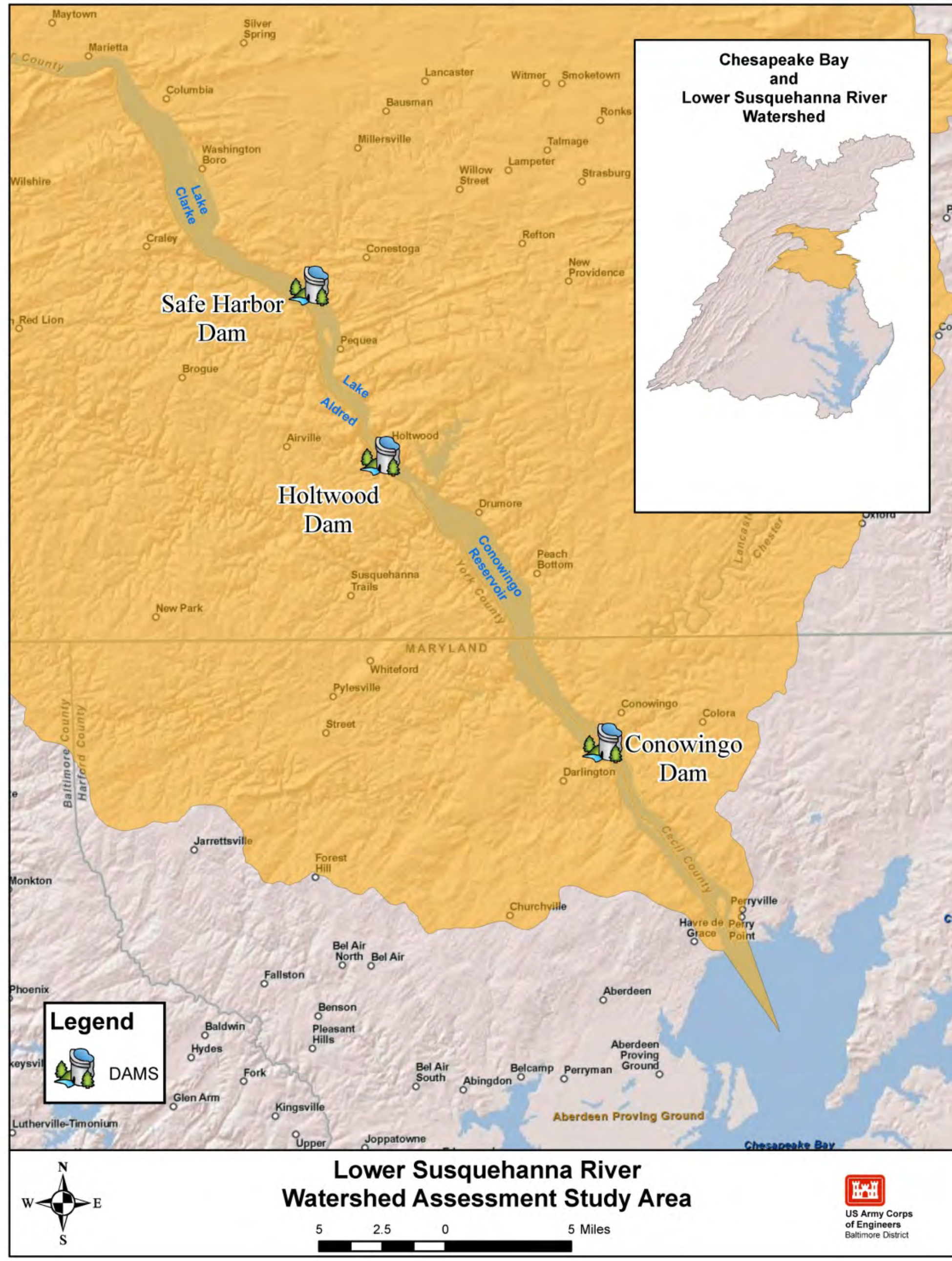
Lower Susquehanna River Watershed Assessment

Update

Anna Compton

USACE

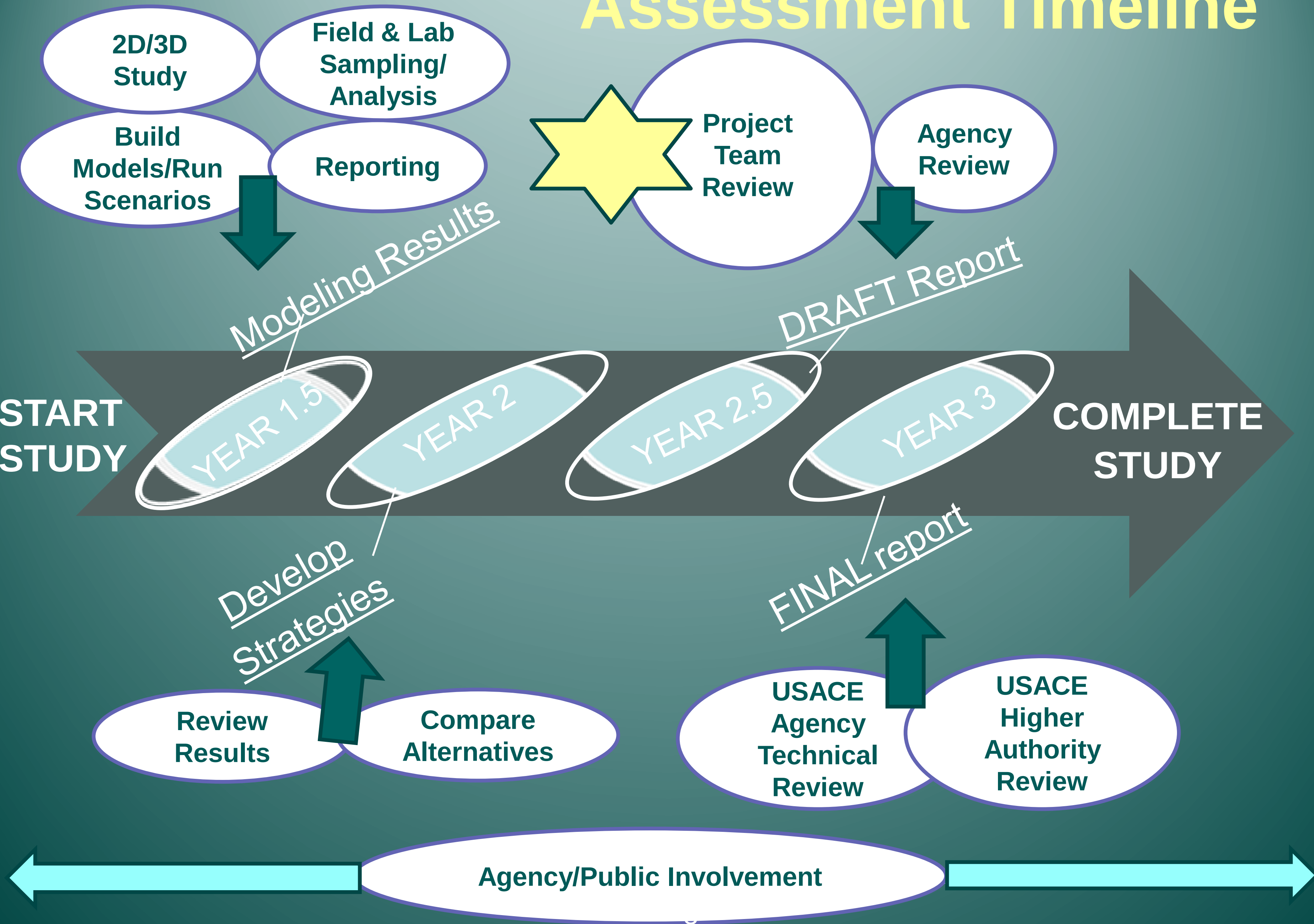
January 16, 2014



Presentation Overview

- Recent tasks
- Upcoming tasks
  - Report Specifics and Review
  - Big Picture, Preliminary Findings
  - Future Needs/Actions

Assessment Timeline



Recent Activities

✓ LSRWA Quarterly Meeting	Aug. 2013
✓ ADH (S. Scott) wrap up/draft report	Oct. 2013
✓ HEC-RAS (M. Langland) wrap up/draft report	Oct. 2013
✓ CBEMP (C. Cerco) wrap up/draft report	Oct. 2013
✓ Stoplight Analysis (L. Linker) wrap up/draft report	Dec. 2013
✓ Internal Draft Report Drafted and Compiled	Dec 2013

Schedule of Upcoming Activities

Project Team/Management Reviews	Jan-Feb 2014
USACE Agency Technical review team set up	Jan 2014
***<u>USACE Agency Technical Review and Legal/ Quarterly group review</u>**	**<u>Feb 28 2014 - Mar 27 2014</u>**
USACE Policy Compliance Review	May-Jun 2014
PUBLIC Release of Report and Review	Jul-Aug 2014
Report Submitted to USACE Higher Authority	Sep 2014
Final Report	Dec 2014

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-STAC Review???	TBD

*<u>DISCLAIMER</u>: Report is preliminary draft and is subject to change. It is being distributed solely for the purpose of peer review. It should not be disclosed or released by reviewers. It is not the official findings of LSRWA Project Team.

NOTE: There are no more planned quarterly agency meetings.

Report Specifics

- Report will be distributed via FTP site.
- Main Report
  - ~ 130 pages
  - Summary of all technical work and findings
  - Drafted for a non-technical audience
  - Introduction/Existing Conditions & ongoing management activities
  - Problem Identification and Sediment Management Strategy Development
  - Stakeholder Involvement
  - Findings/Conclusions
  - Future Needs of the Watershed (i.e. “Recommendations”) –

Report Specifics Continued

- Consolidated Appendices
  - Appended to main report
  - ~ 1500+ pages
  - Detailed technical work.
  - Drafted for a technical audience.
  - Appendix A –Main Report with 3 Attachments
    - “Sediment Reservoir Transport Simulation of Three Reservoirs in the Lower Susquehanna River Basin, Pennsylvania using HEC-RAS” -Langland/USGS report.
  - Appendix B-Main Report and Four Attachments
    - “Sediment Transport Characteristics of Conowingo Reservoir” – Scott/ERDC report

Report Specifics Continued

- Consolidated Appendices
  - Appendix C – Main Report and 1 Attachment
    - “Application of the Chesapeake Bay Environmental Model Package to Examine the Impacts of Sediment Scour in Conowingo Reservoir on Water Quality in the Chesapeake Bay.”- Cerco/ERDC report.
    - Available upon request: Individual Results for each Chesapeake Bay Environmental Model Package Scenario.
  - Appendix D -
    - Application of the DO Water Quality Standard Stoplight Analysis of the Estimated Influence of Conowingo Infill on Chesapeake DO Using Linked WSM, ADH, and WQSTM Simulations” – Liner/EPA report

Report Specifics Continued

- Consolidated Appendices cont'd
  - Appendix E - MGS Susquehanna Flats (2012) Sampling Results.
  - Appendix F - USGS Conowingo Outflow Suspended Sediment Data Report (2011 sampling).
  - Appendix G - Exelon Conowingo Bathymetry Surveys (2011).
  - Appendix H - Literature Search Findings Report.
  - Appendix I - Stakeholder Involvement: (Press releases, letters, quarterly meeting summaries, etc).
  - Appendix J – Plan Formulation.
    - Descriptions of sediment management strategies evaluation and costs.
    - Summary Table of Major (14) Modeling Scenarios and Results.

Goals and Objectives

1. Evaluate strategies to manage sediment and associated nutrient delivery to the Chesapeake Bay.
   - Strategies will incorporate input from Maryland, New York, and Pennsylvania Total Maximum Daily Load (TMDL) Watershed Implementation Plans.
   - Strategies will incorporate evaluations of sediment storage capacity at the three hydroelectric dams on the Lower Susquehanna River.
   - Strategies will evaluate types of sediment delivered and associated effects on the Chesapeake Bay.

2. Evaluate strategies to manage sediment and associated nutrients available for transport during high flow storm events to reduce impacts to the Chesapeake Bay.

3. Determine the effects to the Chesapeake Bay due to the loss of sediment and nutrient storage behind the hydroelectric dams on the Lower Susquehanna River.

Big Picture, Preliminary Findings

1. Current and Future State of the Reservoirs: Results from modeling.

   - Trapping capacity for all reservoirs is limited and greatly reduced in comparison to historical records.
   - Each reservoir will reach an end state of sediment storage capacity defined as "dynamic equilibrium." Due to episodic flood (scouring) events, storage capacity will be temporarily increased, allowing for more deposition in the short term. This state is a periodic "cycle" with an increase in load to the Bay from scour also resulting in an increase in storage volume, followed by reduced loads transported to the Chesapeake Bay due to reservoir deposition.
   - Lake Clarke and Aldred will still trap, deposit and scour as does Conowingo in a similar manner as observed today.
   - Conowingo is currently in a state of "dynamic–equilibrium" in which the net change in sedimentation (deposition during low flows and scour during floods) will remain relatively constant in the future.

Big Picture, Preliminary Findings

2. <u>Effects to Chesapeake Bay: Results from Modeling.</u>

- WIP implementation has a significantly larger influence on the Bay meeting water quality standards in comparison to the influence of trapping capacity and scouring dynamics of the reservoirs.

- With full implementation of WIPs, it is estimated that three regions of the Bay (segments) will NOT be in water quality attainment (i.e., meet standards) for dissolved oxygen due to increased nutrients when the most current state of the reservoir system is taken into account and there is a scour event.

- Generally during a flow event large enough to generate scour the majority of sediment originates from the watershed and upstream dams in comparison to Conowingo scour.

- After a scour event, there is short-term impact on suspended solids concentration, chlorophyll concentration and dissolved oxygen concentration. Solids settle quickly, but oxygen impacts could persist for multiple seasons with diminishing magnitude due to <u>nutrient storage</u> in bed sediments and recycling between the bed sediments and water column.

Big Picture, Preliminary Findings

3. Nutrient and Sediment Management Strategy Observations

- Management strategies focused on how to reduce the amount of sediment available for a future scour event and increase the storm scour threshold (i.e., the flow required to mobilize bed sediment out of the reservoir into the Bay) because this is when water quality impacts appeared to be most influenced by reservoir system. Impacts from lower and more frequent flow events were not assessed.

- Three major management categories, evaluated ~42 “big picture” strategies (e.g., agricultural BMPs, bypassing, dredging and quarry placement) within those three major categories.

- Minimizing Sediment Deposition. One example was sediment by-passing (dredging and placing sediment downstream) – low cost, high environmental (water quality) impacts.

- Reducing sediment from the watershed. Additional sediment management watershed measures beyond the WIPs-high cost (remaining BMP’s available are expensive) and ultimately a low influence on reducing amount of sediment available for a storm event.

Big Picture, Preliminary Findings

3. Nutrient and Sediment Management Strategy Observations continued:

- Spent much of our time on the sediment management category that appeared to be the most feasible though this study's evaluation: increasing or recovering storage volume of reservoirs.

- Many combinations of implementation: vary where material is removed from, placed, how it is placed, how often, i.e., "representative alternatives" developed.

- There are upland placement sites available within a feasible distance and capacity to implement this type of strategy.

- Beneficial use involving habitat restoration appears difficult and high cost due to current regulations and distance of appropriate sites. Sites are downstream meaning double and triple handling to "get around" dam.

- Beneficial use involving light weight aggregate or construction materials has not been successfully implemented in this region and would require more investigation to implement.

Big Picture, Preliminary Findings

3. Nutrient and Sediment Management Strategy Observations continued:

- This is an active system with large volumes of sediment depositing annually. Any removal would most likely be required annually to achieve influence on Bay water quality.

- Observed influence of sediment management strategies were minimized due to loads from the watershed during a scour event (i.e., must remove a lot and often to observe an influence).

- When sediment is strategically removed from the reservoirs there is an observed influence on scour load (reduction) and deposition (increase) and an observed reduction in impacts on water quality for a future similar storm event.

- One representative alternative example:
  - Hydraulic dredge and direct pump to Stancills quarry for dewatering and permanent placement.
  - Estimated to cost $22-34/cubic yard.
  - Removal of 3 mcy
  - $66 – $102 million annually.
- Estimated cost range for suite of Representative Alternatives: $5-89/cubic yard;
  $15 - $267 million annually.

Big Picture, Preliminary Findings

4. Modeling Tools

- Like all mathematical models applied to simulate complex physical processes, the modeling tools used in this effort have uncertainties, but they represent the best tools currently available for evaluating sediment and nutrient dynamics and management strategies in the lower Susquehanna River watershed and Bay as a system and informing management decisions.

- The Bay watershed model and the Bay water quality model are the same peer-reviewed models as were used to set the Bay-wide TMDL requirements.

- Model documentation will be going through many iterations of review.

- Major scour events are infrequent and each has unique characteristics. Application of these models to multiple events is desirable and would reduce uncertainty. However, the availability of complete data sets describing additional scour events is limited.

Future Needs of the Watershed

- Last Section of the report- Future Actions
- Watershed Study
  - Big picture, management document
  - Not Intended to lead to construction, No NEPA.
  - Focused on sediments and impacts from major storm events.
- Potential future activities: additional monitoring, enhance assessment on nutrient contribution and Bay impacts, assess impacts of lower flow events, or actual implementation recommendations.
- Politically challenging problem.
  - Solutions: High cost and long-term.
  - Problem: Sediments and nutrients originate throughout the watershed
  - Implementation: What entities have the resources, abilities, purview to implement?