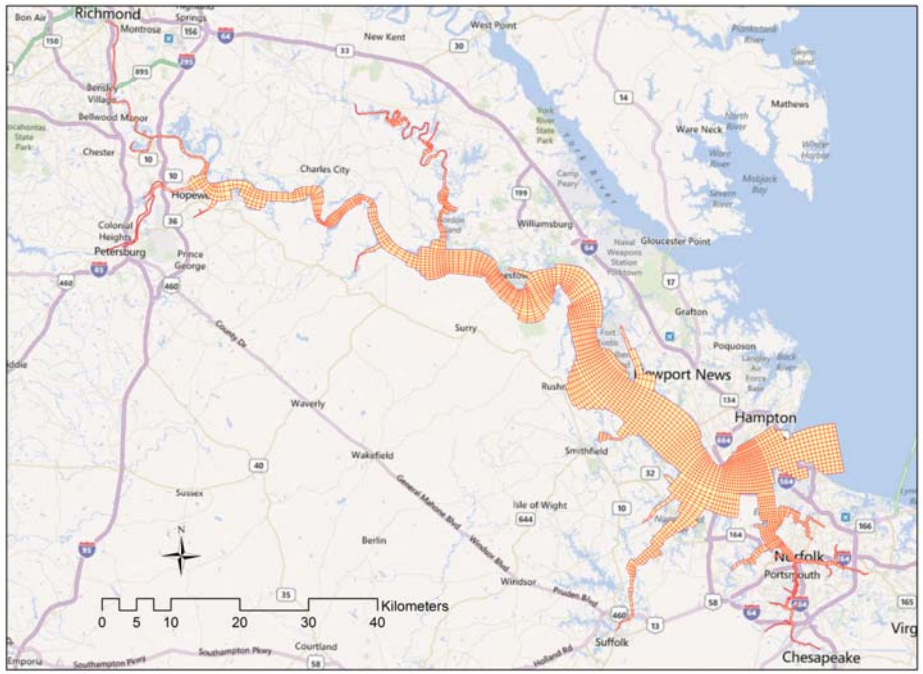
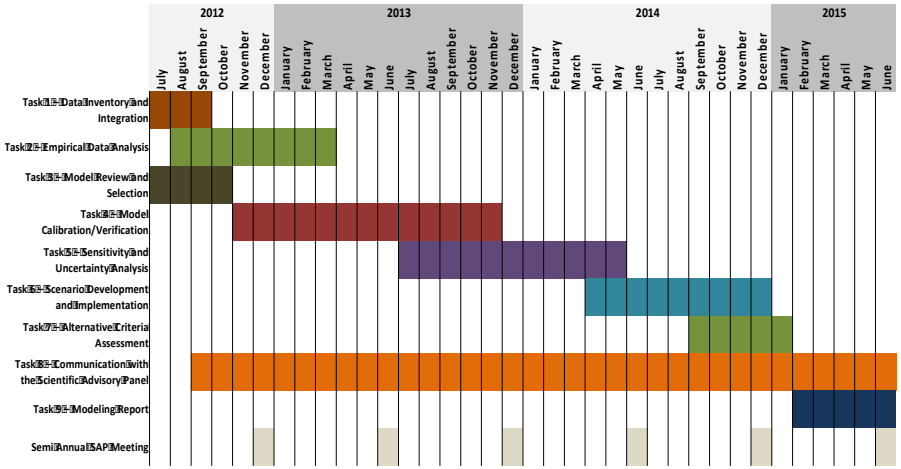
VA's James River Chlorophyll Study

CBP Modeling Workgroup

January 8, 2014

Modeling Project and Model Scenario Development

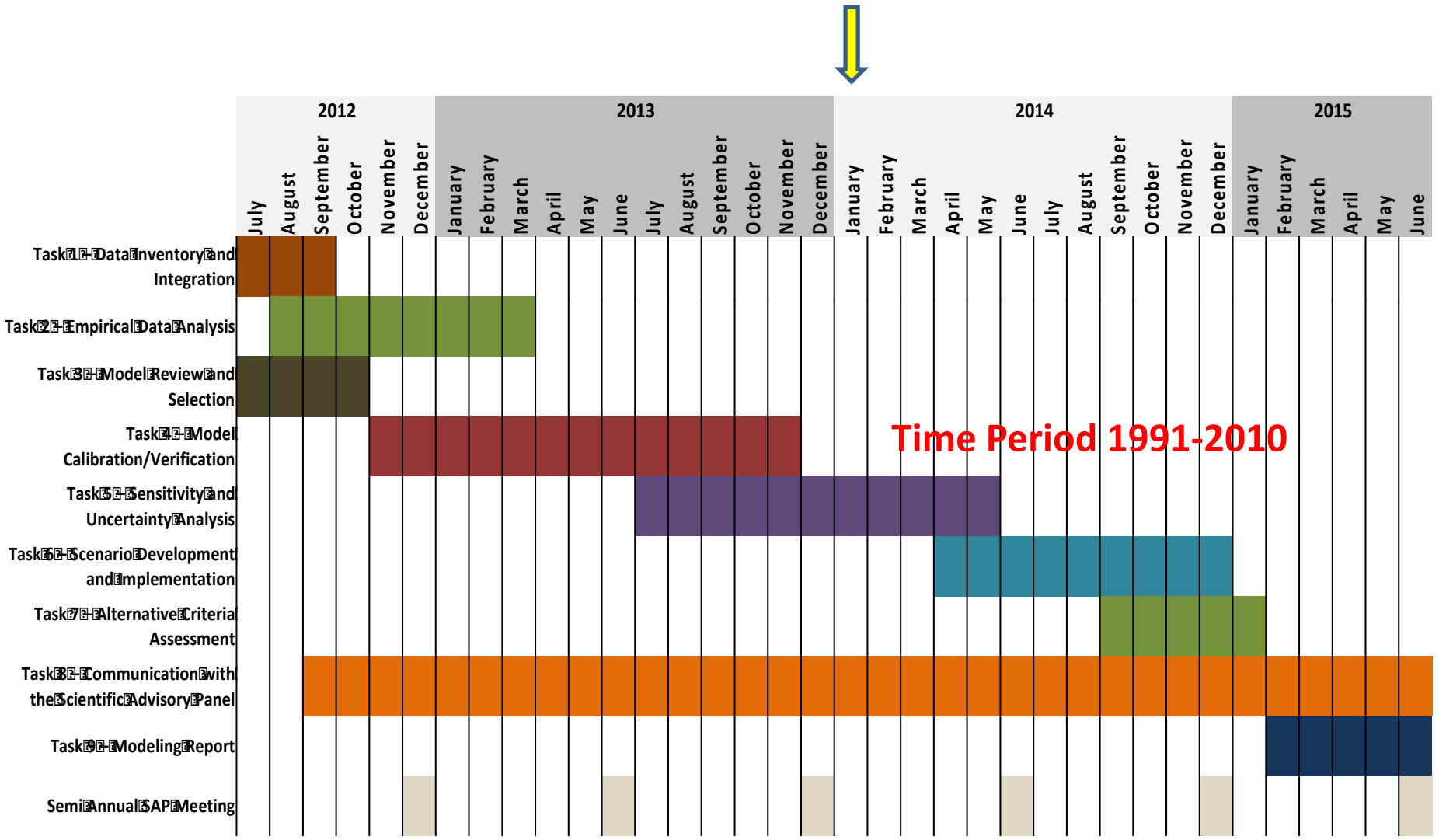




JR Chl-a Study Schedule

2011 - - - - - -	Workplan Developed Notice of Intended Regulatory Action (NOIRA)
2012 - - - - - -	Workplan Implementation
2012-14 - - - -	Monitoring and Modeling
2015 - - - - - -	Assessment Review and Science Advisory Panel Recommendations
2016 - - - - - -	Develop Regulatory Proposal (if appropriate)
2017 - - - - - -	Complete Regulatory Review & WIP III

CEC Model Timeline



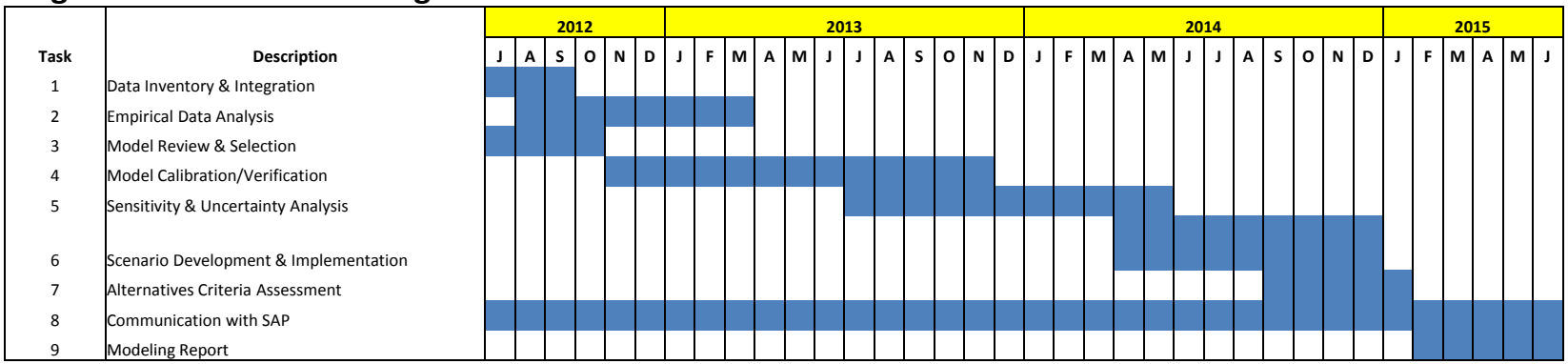
2011-2013 Data

Work:

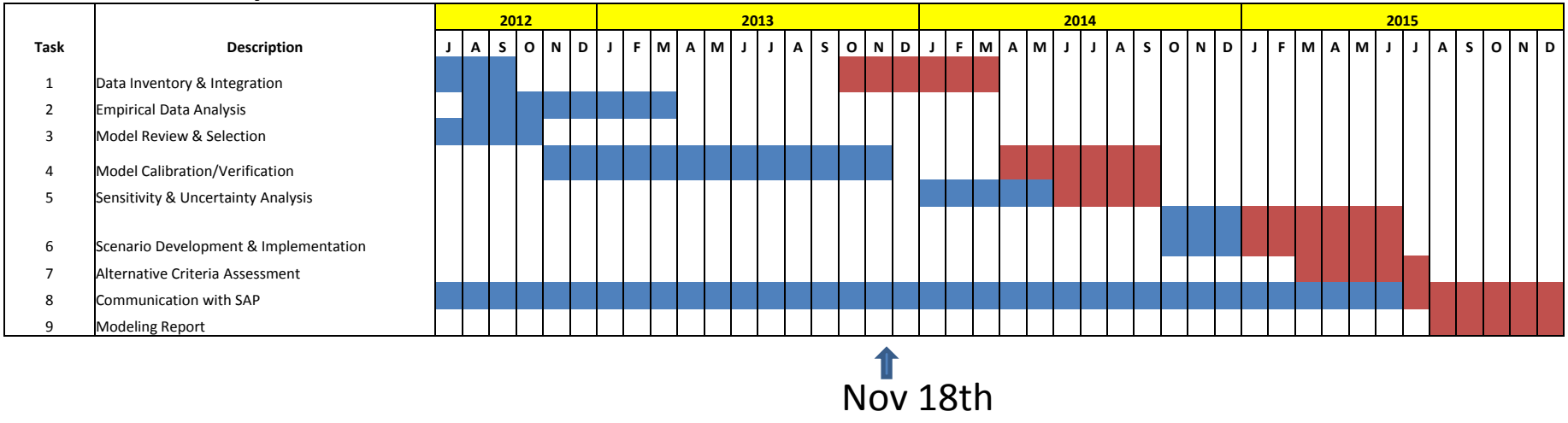
- Incorporate and reprocesses additional weather and climate data
- Incorporate additional Management, BMP, and farming info as needed
- Process additional point source, water quality and flow data
- Refine hydrologic and water quality calibration as needed
- Tidal/Non-tidal Water quality and plankton data analysis
- Updated boundary conditions (2011-13)
- Analysis of high frequency Data-flow will require identifying alternative statistical method for analysis
- Update Hydrodynamic model simulation and provide transport fields to water quality model
- Additional scenario runs
- Task 2 report addendum

CEC Model Timeline

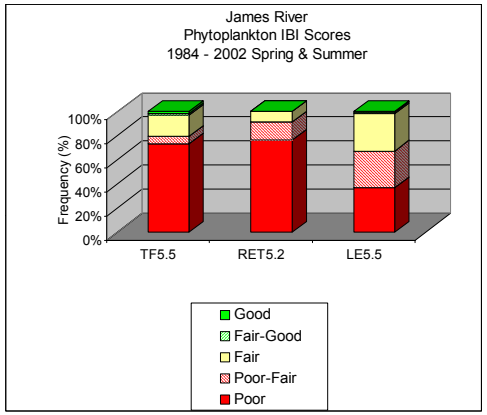
Original Schedule - Modeling



Modified Schedule – Modeling to include additional years 2011-2013



Basis for Chlorophyll *a* Numeric Criteria



- Balance = Phytoplankton Index of Biotic Integrity (IBI), Diversity Indices
- Undesirable or nuisance aquatic plant life... = HAB, food quality issues
- Natural characteristics
- Attainability

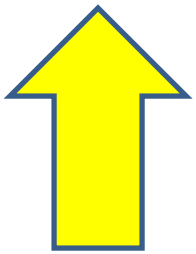
James River CHLa Study

Re-visit existing numeric CHLa criteria for the James

Re-visit the **JR TMDL loads** with a site-specific water quality – HAB model.

Designated Use	Chlorophyll a µ/l	James River 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	

TMDL Model Scenarios – assess chlorophyll-a attainment



28 Scenarios

Appendix J
Key Chesapeake Bay TMDL Reference and Management Modeling Scenarios: Definitions and Descriptions

1985 Scenario

The 1985 scenario uses the estimated 1985 land uses, NPS loadings, animal numbers, atmospheric deposition, and point source loads. This scenario estimates the highest loads of nitrogen, phosphorus, and sediment to the Bay in recent time (using a constant 1991-2000 hydrology). The Phase 5.3 Chesapeake Bay Watershed Model simulated nitrogen, phosphorus, and sediment loads for this scenario are listed in Tables J-2, J-4, and J-6, respectively.

2009 Scenario

The 2009 scenario uses the estimated 2009 land uses, NPS loadings, animal numbers, atmospheric deposition, and point source loads as well as the best management practices tracked and reported by the seven watershed jurisdictions through 2009. The 2009 year was chosen as the baseline for the TMDL, as it was the most recent year for which complete implementation data (BMPs, waster loads, etc.) was available during the Bay TMDL development process. Phase 5.3 Chesapeake Bay Watershed Model simulated nitrogen, phosphorus and sediment loads for this scenario are listed in Tables J-2, J-4, and J-6, respectively.

Tributary Strategy Scenario

The Tributary Strategy scenario estimates the nitrogen, phosphorus, and sediment loads through model simulations of full implementation of the seven jurisdictions' 2004-2005 tributary strategies throughout the Chesapeake Bay watershed. This scenario included an accounting for all the tributary strategy BMPs on a 2010 land use, and the 2010 estimated permitted loads for all the significant and non-significant wastewater dischargers, as described in Table J-1. Adjustments to the jurisdictions' tributary strategies developed in 2004 and 2005 to reflect changes in State laws or policies (e.g., permitting of significant wastewater discharge facilities) since development of the initial set of jurisdictional tributary strategies were also included in this scenario's input decks. Atmospheric deposition inputs were from the Community Multi-scale Air Quality Model's 12 km grid with an estimated 2010 deposition and included simulations of the State Implementation Plans to reach the 2010 Air Quality Standards. Phase 5.3 Chesapeake Bay Watershed Model simulated nitrogen, phosphorus, and sediment loads for this scenario are listed in Tables J-2, J-4, and J-6, respectively.

EPA Bay Program
2010 TMDL Model Scenarios

1985

2009

Tributary Strategy Scenario

1985 No Action – +7 scenarios

- •WWTP
- • CSO
- •On-Site Waste Treatment
- •Atmospheric Deposition
- •Urban Practices
- •Agricultural Practices
- •Forestry Practices

2010 No Action

E3 – Everyone, Everything, Everywhere

- • + 7 scenarios – see 1985 No action

•All Forest

•Base Calibration

•Allocations

•Loading Scenarios (N/P)

- •190/12.7
- •179/12
- •170/11.3

•James River

- •Level of Effort Potomac
- •½ Level of Effort Potomac

James River Scenarios
CEC Modeling Conference Call
Sept 9, 2013

- 1985 Baseline (start of the Bay Modeling Calibration)
- Tributary Strategy
- 2017 Midpoint Target
- 2025 TMDL
- Climate Change? (Critical Condition?)

JR Scenario Loads

(delivered)

WSM V-5.3.2

Scenario	Nitrogen (M lbs/yr)	Phosphorus (M lbs/yr)	TSS (M lbs/yrs)
1985 Baseline	41.5	6.62	1,548.6
Tributary Strategy	27.5	3.28	1,004.7
2017 PII WIP Target	26.9	3.35	1,055.4
2025 TMDL	23.0	2.78	862.9
Other			

James River Basin Delivered TN Loads
WSM V 5.3.2 Output for 1985 Baseline

MajorSource	Source	1985 Progress del_TOTN (lbs/year)
Agriculture	Agriculture	6,666,471
Agriculture	Agriculture_Regulated	0
Urban Runoff	Construction	212,244
Urban Runoff	Extractive	131,203
Urban Runoff	Impervious	1,203,062
Urban Runoff	Pervious	2,017,842
Non-Tidal Water Deposition	Non-Tidal Water Deposition	300,206
Septic	Septic	627,054
Forest	forest	6,045,903
Wastewater+CSO	wwtp	17,288,332
Wastewater+CSO	cso	261,652
Wastewater+CSO	indus	6,801,531
AllSources	AllSources	41,555,500

MajorSource	CBSegment	1985 Progress del_TOTN (lbs/year)
AllSources	APPTF	2,563,586
AllSources	CB8PH	162,496
AllSources	CHKOH	432,478
AllSources	EBEMH	240,962
AllSources	ELIPH	1,514,180
AllSources	JMSMH	2,384,991
AllSources	JMSOH	1,004,391
AllSources	JMSPH	3,298,586
AllSources	JMSTF1	11,438,566
AllSources	JMSTF2	16,558,822
AllSources	LAFMH	87,006
AllSources	LYNPH	1,256,209
AllSources	SBEMH	439,851
AllSources	WBEMH	173,375
AllSources	All CB Segments	41,555,500