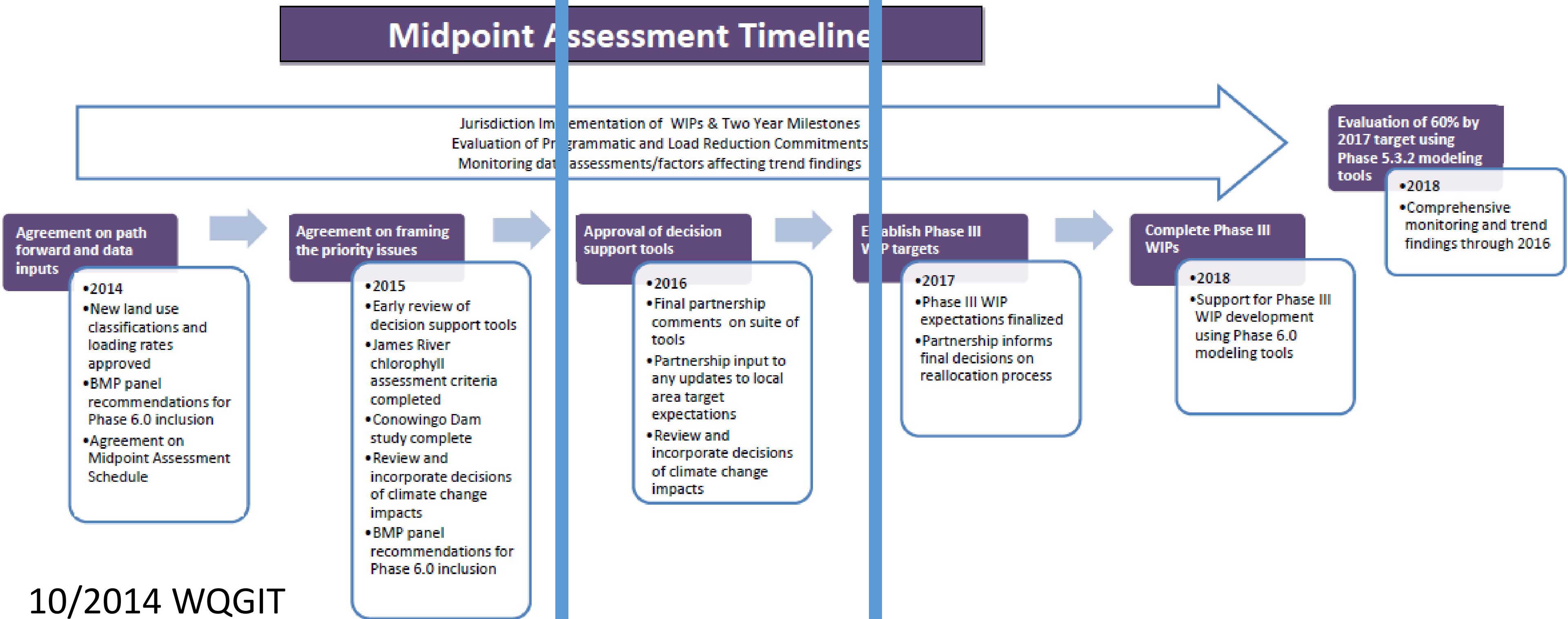
Scenario Builder and Watershed Model Progress toward the MPA

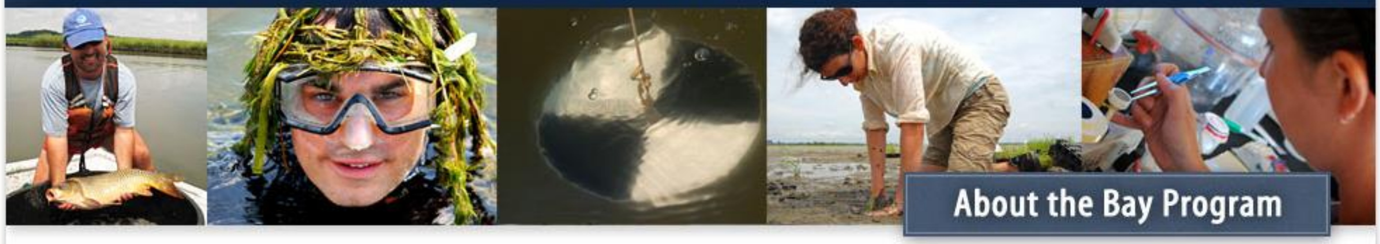
Gary Shenk Modeling Workgroup 1/28/2015



10/2014 WQGIT
12/2014 STAC

CREATE The Models | **REVIEW The Models** | **USE The Models**

Ongoing: AgWG, AMS, WTWG, LUWG, USWG, FWG
…



Home > About the Bay Program > How We're Organized > Water Quality Goal Implementation Team > Scenario Builder and Watershed Model Plan for the MPA
Text Size: A A A

Who We Are
How We Work
How We're Organized
Chesapeake Executive Council
Principals' Staff Committee
Management Board
Citizens Advisory Committee
Local Government Advisory Committee
Scientific and Technical Advisory Committee
Communications Workgroup
Scientific and Technical Analysis and Reporting

Scenario Builder and Watershed Model Plan for the MPA

In preparation for the 2017 Mid-Point Assessment, the CBP Partnership has expressed priorities for the Phase 6 watershed model development which are detailed in documents under the 'Projects and Resources' tab on the Water Quality GIT page. Initial priorities were set in the October 2012 water quality GIT meeting. These priorities have been updated and refined by recommendations from subsequent workshops and CBP meetings. The MPA master schedule lists these priorities in a table format. Additional documents on the web page are specific work plans to accomplish these tasks.

Out of necessity, phase 6 development is occurring along multiple parallel paths. These must eventually meet in a draft phase 6 watershed model and scenario builder that will be ready for full partnership review beginning January 1 2016. These parallel paths encompass all of the CBP priorities.

This document summarizes the priorities and identifies lead researchers for each effort. The descriptions here are brief with links to more detailed workplans.

Efforts

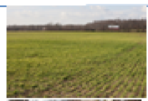
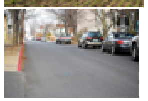
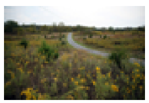
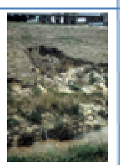
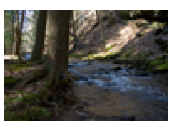
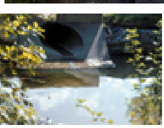
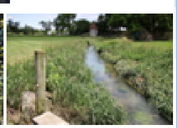
Below are the efforts related to the Scenario Builder and Watershed Model Plan for the Mid-Point Assessment

- **BMP effectiveness**
- **BMP Implementation Accounting**
- **Fertilizer and Manure Applications**
- **Land Use Types and Acreage**
- **Land Use Loading Rates**

1-Slide Status Report

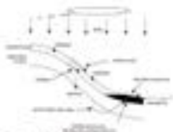
Groundwater Lag	Tues 11:15
Sensitivities to inputs	Tues 1:30
Watershed Model Development	Tues 2:30
Land Use Types and Acreage	Wed 10:20
Fine-scale Processes	Wed 11:10
Land Use Loading Rates	Wed 11:30
Calibration Methodology	Wed 1:00
Reservoirs	Wed 2:00
Climate Change	Early January
Scenario Builder Development	SEP
Atmospheric Data	

Scale in the Chesapeake Bay Program Watershed Model

Landscape	*Phase 5* *Nutrients*	*Phase 5* *Sediment*	*Phase 6* *Nutrients*	*Phase 6* *Sediment*	*Sparrow*	*Other Data Sources*
Field   		**AG and Forest:** Used RUSLE2 to estimate EOF sediment targets **Urban:** Used Langland and Cronin To estimate pervious vs impervious loading	*Can we estimate EOF loads directly based on available information?*	*Should we update the sediment EOF estimates?*	Sources (fertilizer, manure, atdep, urban area) multiplied by global coefficients	Literature Reviews from TetraTech Sources in Phase 5 documentation Sensitivity documentation CEAP APLE
Land to stream   	Field-level, hillslope, and small stream processes are all combined in the Edge-of-Stream nutrient estimates No EOF is simulated EOS estimates are a combination of regional factors and field-scale process simulation calibrated to average export rates Informed by inputs and calibration	Hillslope and small stream processes are combined in a sediment delivery ratio that is based on the average distance between each major land use type and a major river, adjusted for the coastal plain.	*Can we estimate watershed delivery based on landscape parameters?*		Land to Water factors such as soil parameters and slopes	ICPRB/USGS Sparrow Land Data team Connected Impervious Land Data team Urban Tree Canopy
Stream to River    			*Can we estimate small stream effects?*		Explicitly simulated to NHD+ level	ICPRB/USGS Sparrow Land Data team Urban Stream Corridor Land Data team Riparian Forest Land Data team Riverine Wetlands Center for Watershed Protection CBP Grant
River to Estuary   	Directly Simulated in HSPF for river averaging at least 100 cfs Calibrated to WQ data		Directly Simulate in HSPF for river averaging at least 100 cfs Calibrate to WQ data		Explicitly simulated	Calibrate to sparrow DFS or loads?

Field

Land to stream



Stream to River

River to Estuary

Phase 5

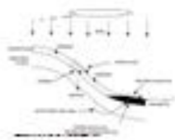
Nutrients	*Sediment*
Field-level, hillslope, and small stream processes are all combined in the Edge-of-Stream nutrient estimates	Edge of field is explicitly simulated
EOS estimates are a combination of regional factors and field-scale process simulation calibrated to average export rates	Sediment delivery ratio based on the average distance between each major land use type and a major river.

Directly Simulated in HSPF for river averaging at least 100 cfs

Calibrated to WQ data

Field

Land to stream



Stream to River

River to Estuary

Phase 6

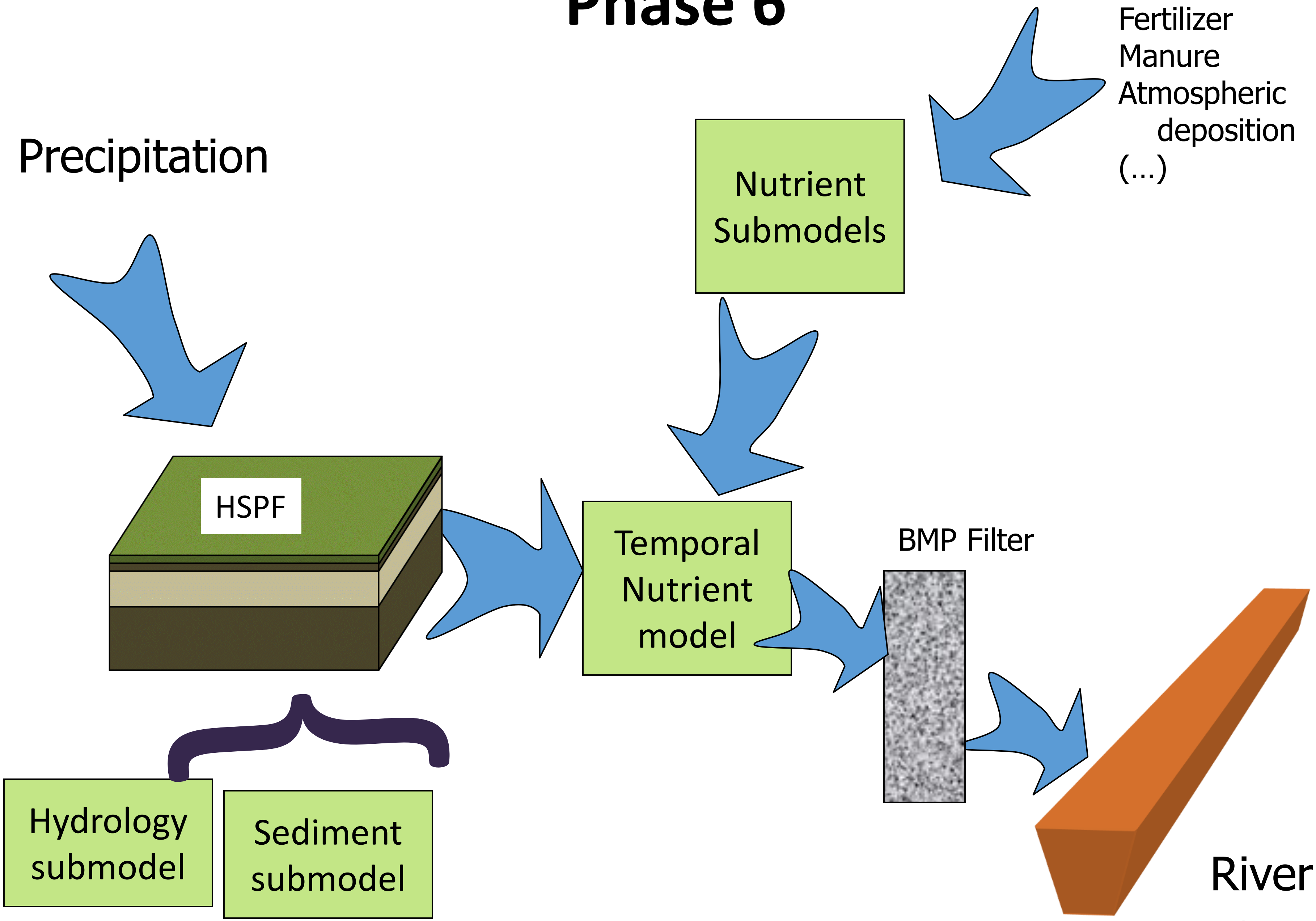
Nutrients	***Sediment***
Estimate Spatial Average EOS Based on land use and inputs	Update the sediment EOF estimates
Estimate watershed delivery variance based on landscape parameters	Estimate watershed delivery variance based on landscape parameters

Estimate small stream effects

Directly Simulated in HSPF for river averaging at least 100 cfs

Calibrated to WQ data

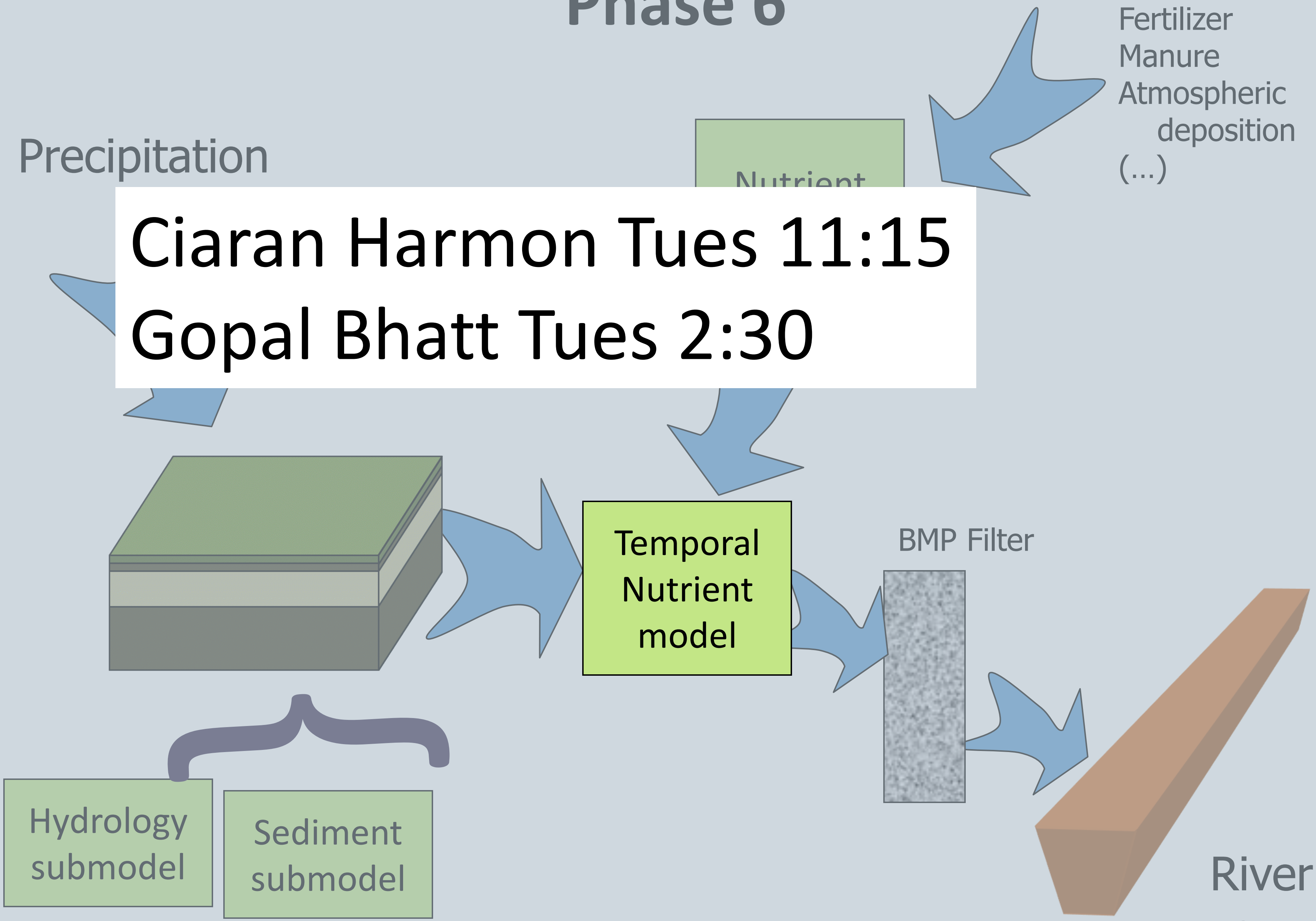
Phase 6


Fertilizer
Manure
Atmospheric
deposition
(…)
Precipitation
Nutrient Submodels
HSPF
Temporal Nutrient model
BMP Filter
Hydrology submodel
Sediment submodel
River

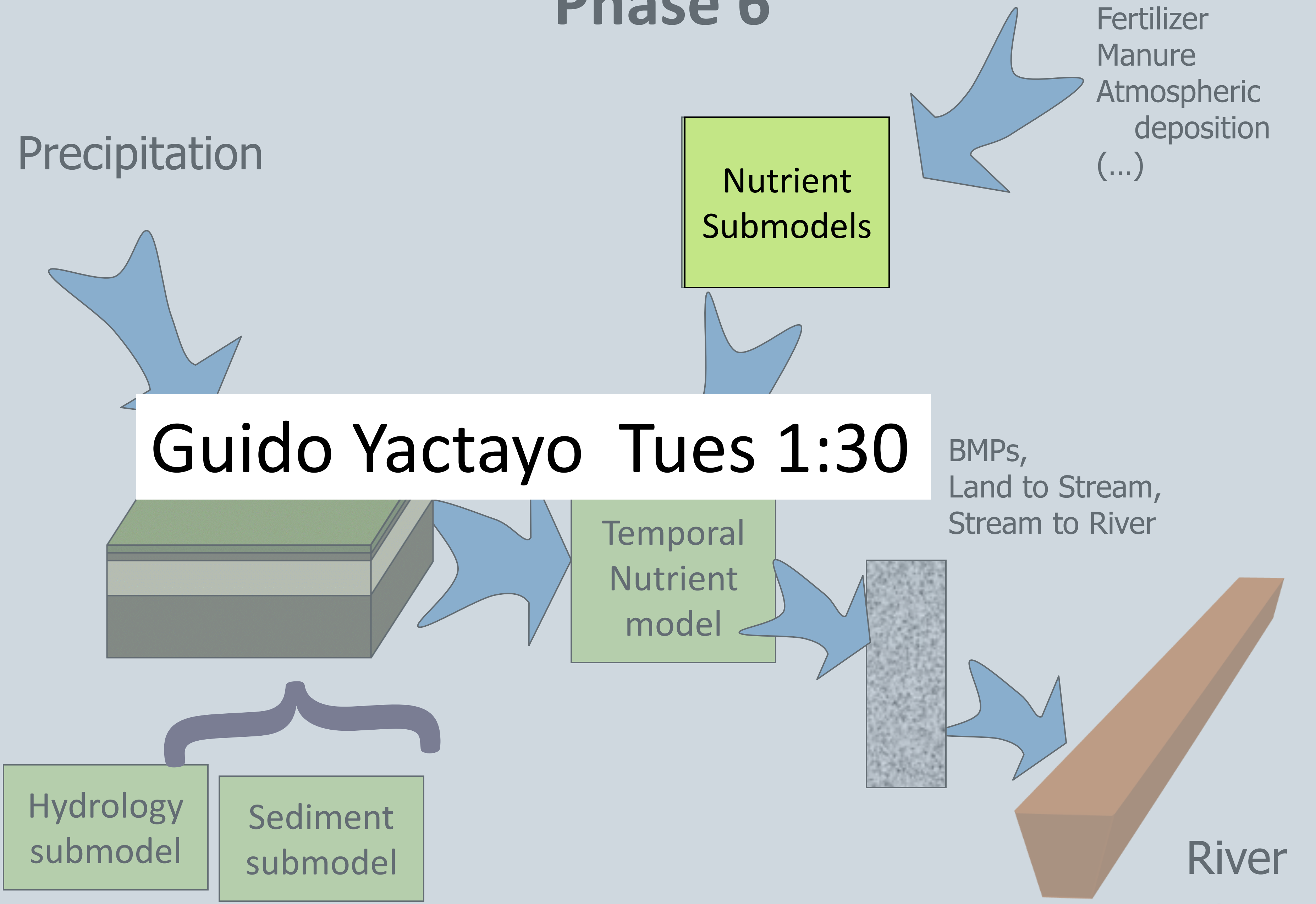
Phase 6

Ciaran Harmon Tues 11:15

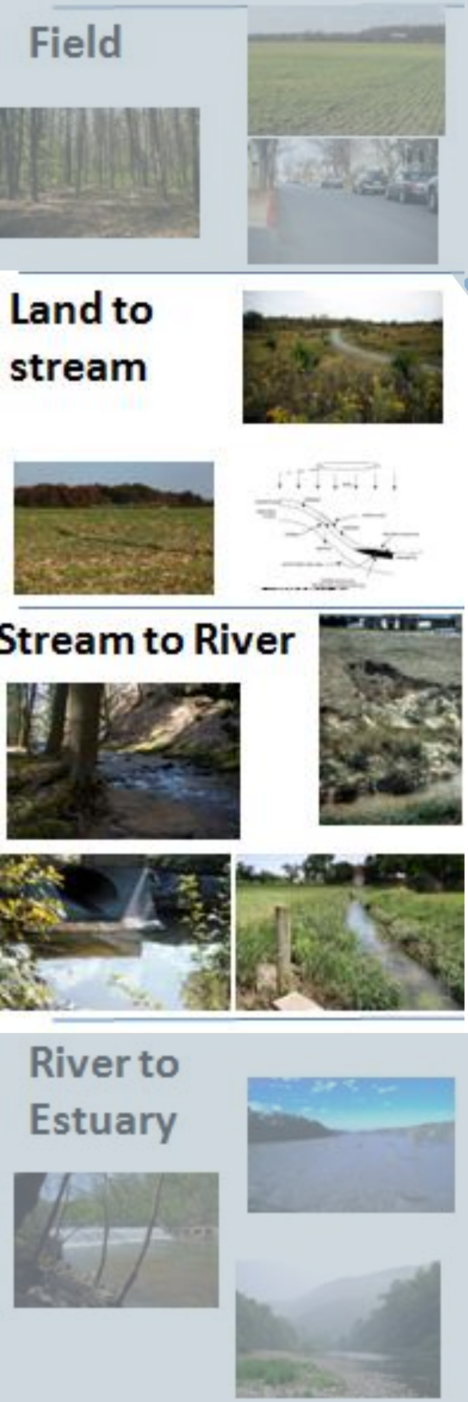
Gopal Bhatt Tues 2:30



Phase 6



Guido Yactayo Tues 1:30



Ph

Peter Claggett Wed 10:20

Nutrients | *Sediment*

John Jones Wed 11:10

Est… estimates
Based on land use and inputs

Estimate watershed delivery variance based on landscape parameters	Estimate watershed delivery variance based on landscape parameters

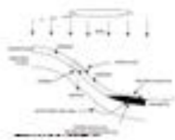
Estimate small stream effects

Directly Simulated in HSPF for river averaging at least 100 cfs

Calibrated to WQ data

Field

Land to stream



Stream to River

River to Estuary

Phase 6

Nutrients	*Sediment*
Estimate Spatial Average EOS Based on land use and inputs	Update the sediment EOF estimates
Estimate watershed delivery variance based on landscape parameters	Estimate watershed delivery variance based on landscape parameters
Estimate small stream effects	

Ross Mandel Wed 1:00

Calibrated to WQ data

Field



Phase 6

Nutrients	*Sediment*
Estimate Spatial Average EOS Based on land use and inputs	Update the sediment EOF estimates
Estimate watershed delivery variance based on landscape parameters	Estimate watershed delivery variance based on landscape parameters

Land to stream



Stream to River




Olivia Devereux Wed 11:30

Estimate small stream effects

River to Estuary



Directly Simulated in HSPF for river averaging at least 100 cfs

Calibrated to WQ data

Phase 6

Nutrients	*Sediment*
Estimate Spatial Average EOS Based on land use and inputs	Update the sediment EOF estimates
Estimate watershed delivery variance based on landscape parameters	Estimate watershed delivery variance based on landscape parameters

Gary Shenk Wed 2:00

Directly Simulated in HSPF for river averaging at least 100 cfs

Calibrated to WQ data

Progress Summary

- Working on extending to 2013. 2011 model complete
- Hydrology calibration complete and improved
- Land and river sediment improved calibration methods
- Provisional water quality running with
  - Sensitivities
  - Lag
  - Land to stream factors
  - Stream to river factors
  - P5 land use types and acreages

Calibration Timeline

- **October 2014** – Rough Draft of major changes to nutrient processing in Scenario Builder will need to be complete. Continued sensitivity refinement
- **February 2015** - draft targets for draft land Uses
- **March 2015** – All major partnership decisions are made on changes to scenario builder processing and data. Scenario builder final modifications begin.
- **April 2015** - final targets approved by Modeling Workgroup for draft land uses
- **Early October 2015** – All inputs are final and delivered to the WSM by the scenario builder team for the final calibration run. Final targets are based on this information.
- **December 2015** - Phase 6 draft model is complete.
- **December 2015 – December 2016** - Evaluation followed by fine tuning during the next year. Key scenarios available
- **September 2016** – Final comments on the draft Phase 6 model
- **December 2016** - All models are final. The partnership decision-making process begins to discuss how these new models will be used in the WIP3 process

STAC Guidance

2005

Review of the Chesapeake Bay Watershed Modeling Effort

By

Lawrence Band[1], Kenneth Campbell[2], Russell Kinerson[3], Kenneth Reckhow[4], and Claire Welty[5]

Chesapeake Bay Watershed Model Phase V Review

February 20, 2008

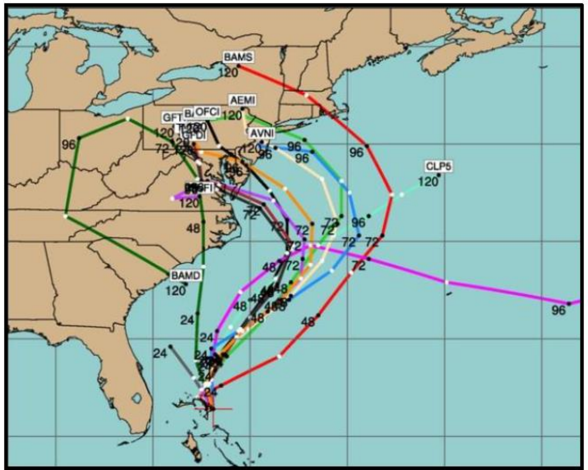
Lawrence Band[1], Theo Dillaha[2], Christopher Duffy[3], Kenneth Reckhow[4], Claire Welty[5]

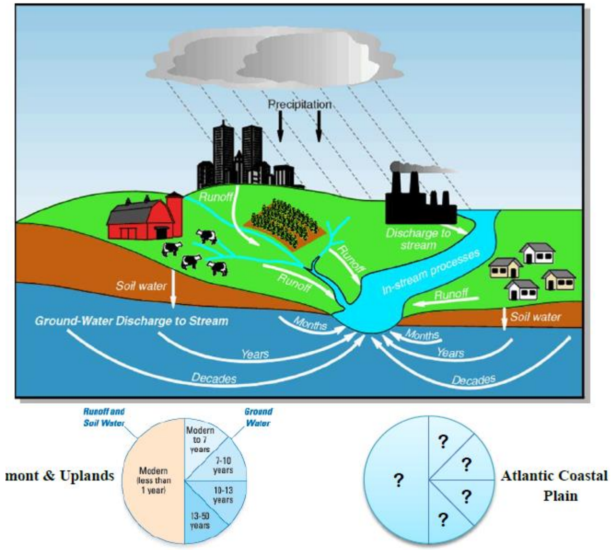
STAC Guidance

The Role of Natural Landscape Features in the Fate and Transport of Nutrients and Sediment

A Review of Agricultural P-dynamics in the Chesapeake Bay Watershed Model

Multiple Models for Management in the Chesapeake Bay





Incorporating Lag-Times Into The Chesapeake Bay Program

STAC Interactions

- Welcome Bill Ball
- Well received presentation on P6 in December
- Workshop Responses
  - Lag Time Response
  - Multiple Models Response
  - Phosphorus Dynamics
- Reviews in 2016
- Future Workshop Requests
  - Climate Change
  - Uncertainty
  - Conowingo

STAC Workshop: Climate Change

- Joint Modeling Workgroup and Climate workgroup proposals.
- Broad overview of CC effects on 31 Chesapeake Bay Agreement outcomes
  - Slight focus on Mid Point Assessment outcomes
- Outcome: Standardize climate inputs
  - Downscaled Precip, Temp, PET, etc
  - CO_2 concentrations
  - Terrestrial Effects?

STAC Workshop: Uncertainty Analysis

- Joint Modeling Workgroup and WQGIT
- Frequent request of STAC
- Priority of the WQGIT at the 10/2015 meeting

- Outcomes
  - Define question in the management context
  - Explore technical methods

STAC Workshop: Conowingo Infill

- Describe the behavior of the reservoir through time and over the range of flows.
  - How can this be represented in the CBWM?
- How will the nutrient speciation of particulate nutrients change under extreme to moderate high flows?
  - How does this affect Bay water quality?
- Is this happening in other reservoirs?

- Outcomes
  - Better integration of the research, monitoring, and modeling tools used to support the MPA