Phase 7 Watershed Model Plans

CBPO Staff

Gopal Bhatt, Isabella Bertani, Lewis Linker and others

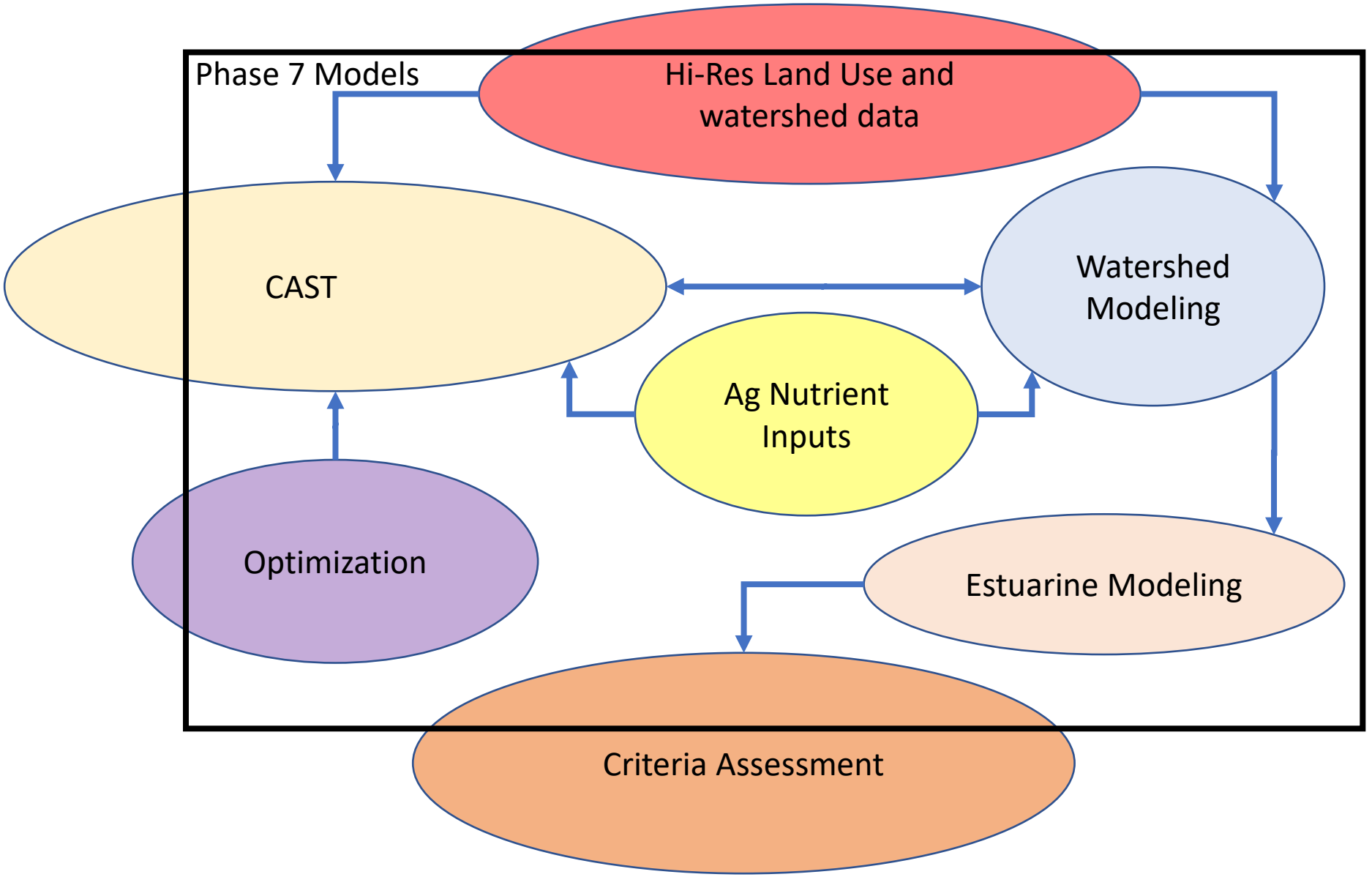
MWG

1/5/2024

Remember the Four I's
Core Values of the Modeling Workgroup

- **Integration -** Integration of the most recent science and knowledge in air, watershed, and coastal waters to support ecosystem modeling for restoration decision-making.
- **Innovation -** Embracing creativity and encouraging improvement in the development and support of transparent and robust modeling tools.
- **Independence** – Making modeling decisions on the basis of the best available evidence and using the most appropriate methods to produce, run, and interpret models, independent of policy considerations.
- **Inclusiveness -** Commitment to an open and transparent process and the engagement of relevant partners that results in strengthening the CBP partnership's decision-making tools.

Phase 7 Development Tracks



Web page

- Overview
- Seven Projects
  - Descriptions
  - Documents
- Linked from
  - Modeling Workgroup
  - WQGIT
  - Many WQGIT WGs

Phase 7 Model Development | Ch

chesapeakebay.net/what/programs/modeling/phase_7_model_development

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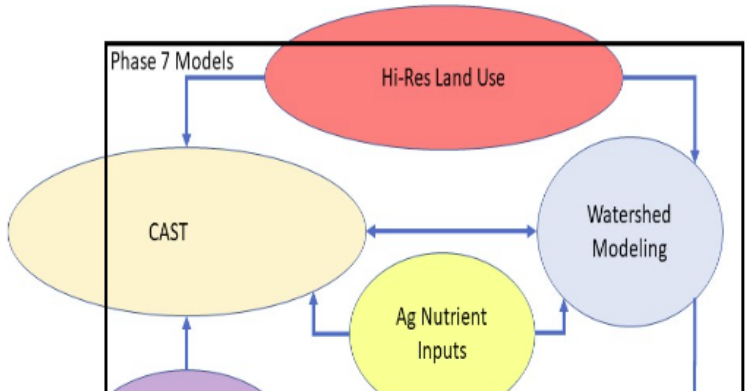
WHAT WE DO > PROGRAMS & PROJECTS > PHASE 7 MODEL DEVELOPMENT

Phase 7 Model Development

The Chesapeake Bay Program is updating its modeling and analysis tools used in the Chesapeake Bay TMDL.

Currently in development, the Phase 7 Modeling Tools will be used by the partnership to inform decisions related to nutrient and sediment reduction goals outlined in the Chesapeake Bay Watershed Agreement. Integral to this updated suite of tools is the ability to project climate change effect through 2035. The model, which will be ready for use by 2027, consists of six interrelated projects:

1. High Resolution Land Use
2. Chesapeake Assessment Scenario Tool (CAST)
3. Optimization
4. Agricultural Inputs
5. Watershed Modeling
6. Estuarine Modeling
7. Criteria Assessment



Modeling

Phase 7 Model Development

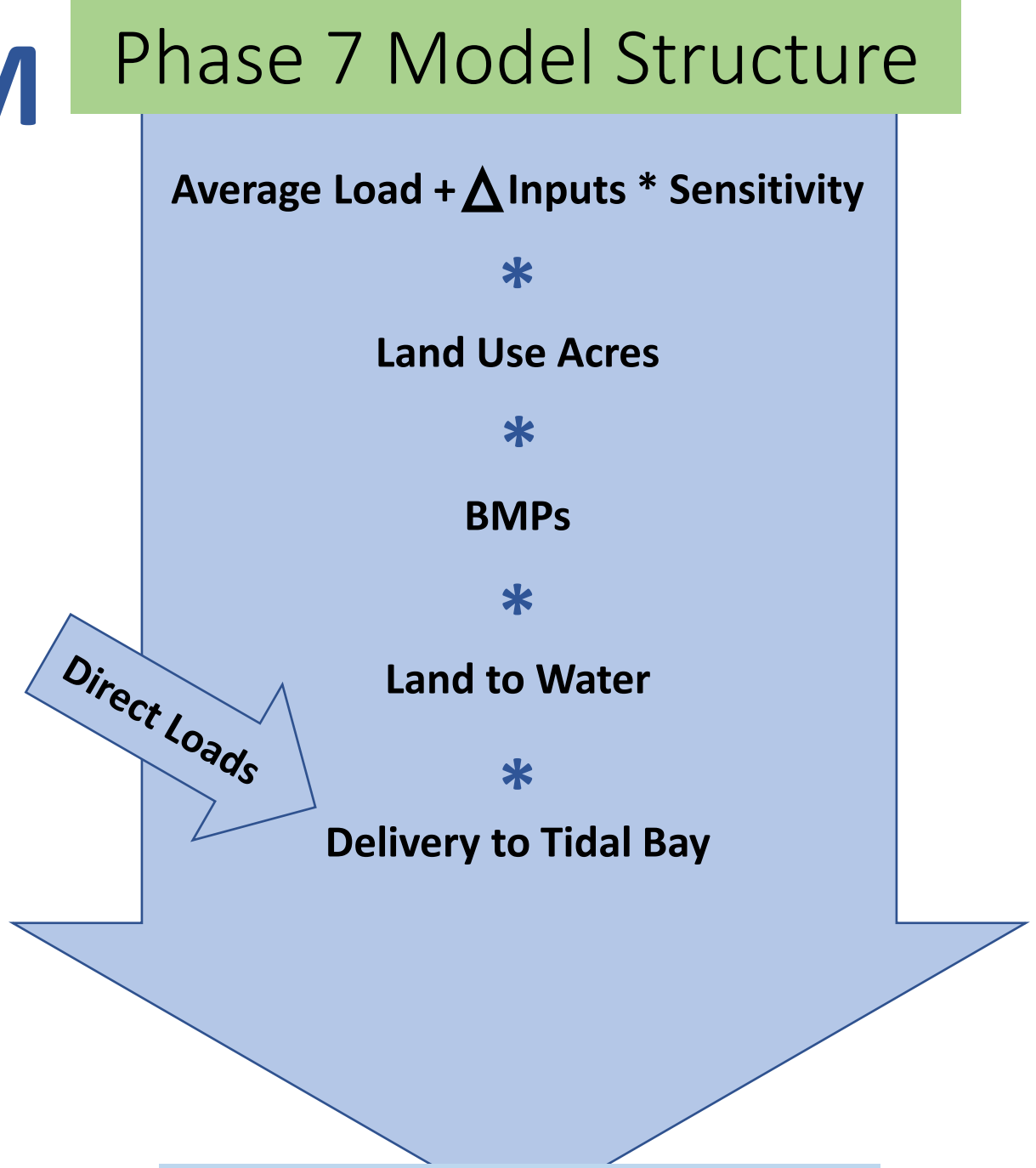
Programs & Projects

Modeling
Monitoring
Quality Assurance
Resource Lands Assessment
Chesapeake Bay TMDL
Watershed Implementation Plans
BMP Verification

Cast/CalCast/DM

Phase 7
CAST

Deterministic Scenario Tool:
1 set of loads for 1 set of inputs



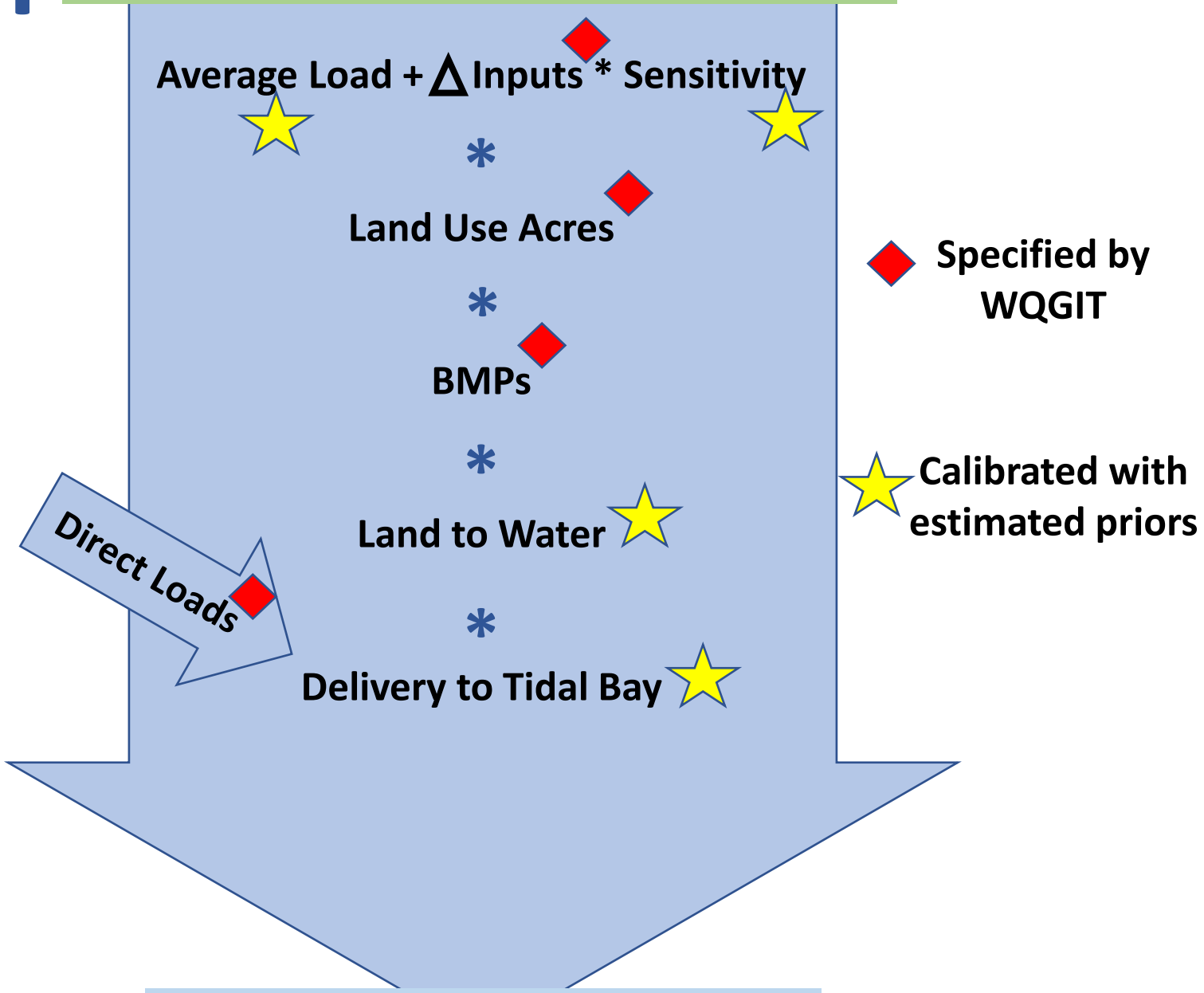
Cast/CalCast/DM

Phase 7
CalCAST

Tool for finding parameters that best match observations

Isabella Bertani

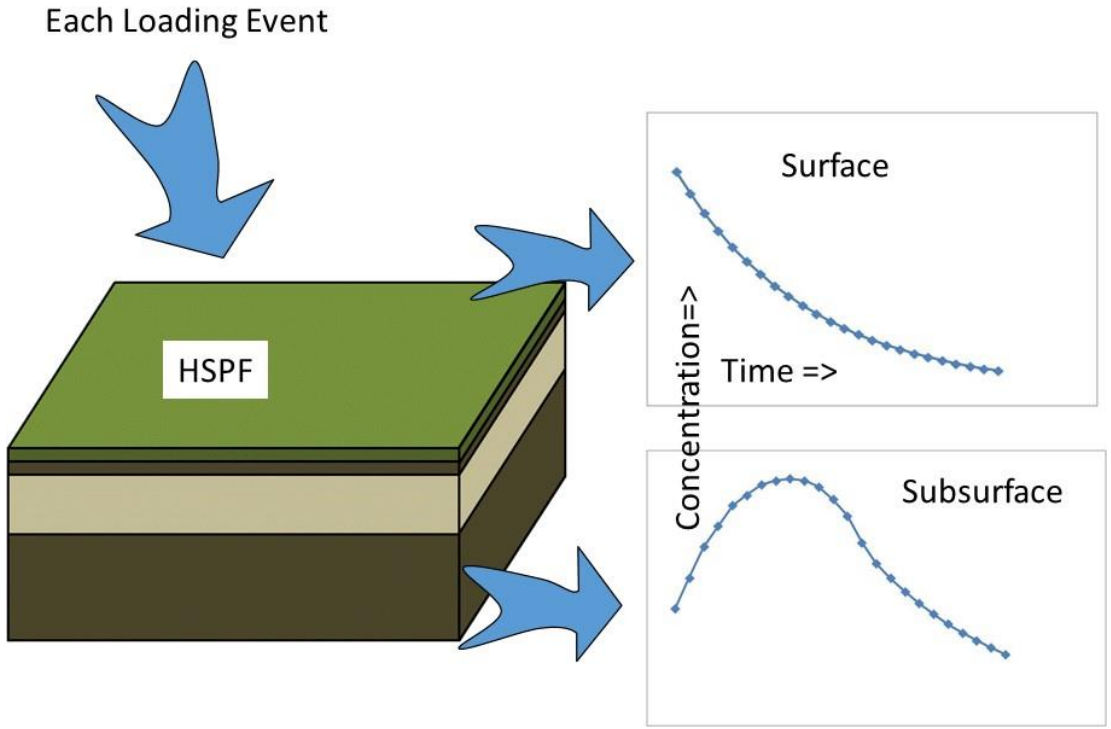
Phase 7 Model Structure



Cast/CalCast/DM

Phase 7
Dynamic Model

Tool for
- loading estuarine models
- Comparing against observations
- Other potential collaborative projects



Gopal Bhatt

Phase 7 CAST Structure

Average Load
+
Δ Inputs * Sensitivity
*
BMPs
*
Acres
*
Land to Water
*
River Delivery

Load by land-river segment and land use

Inform

Constrain

CalCAST

Average Load
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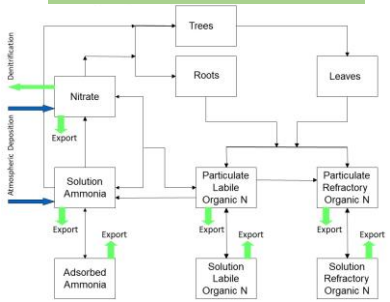
Load by land-river segment and land use

Temporal downscaling model

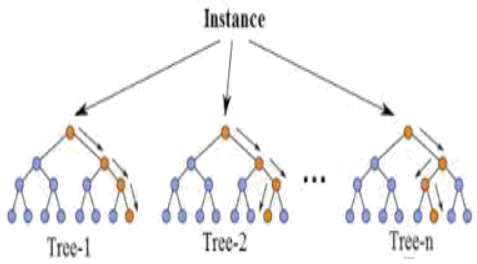


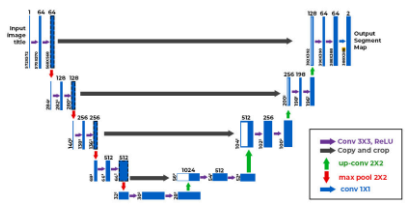
CAST model documentation; section 1
https://cast.chesapeakebay.net/Documentation/ModelDocumentation

New team members

Kim Van Meter

Chaopeng Shen





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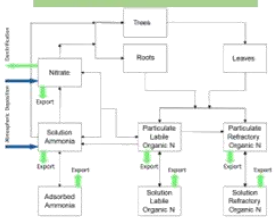

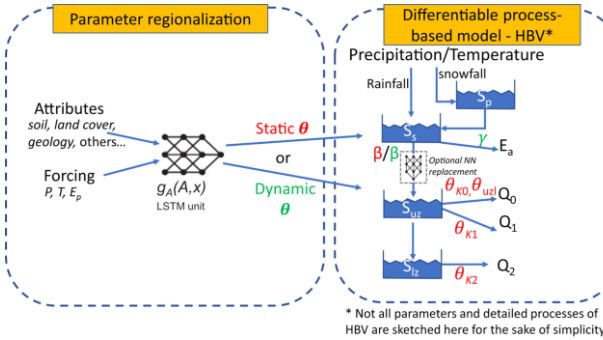

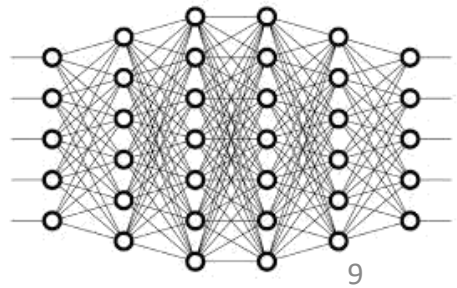

Watershed Model Plan – Big Picture

2022	2022	2022	2022	2023	2023	2023	2023	2024	2024	2024	2024	2025	2025	2025	2025	2026	2026	2026	2026
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Work plan			Build	Work plan	Build Models			Work plan	Build Models			Work plan	Build Models			Review Models			

Build Model Structure

Improve Models

Review Models

CBP Watershed Modeling Process

Model
Data Set
Endpoint
Project/Decision

Complete
In Process
Not Started

4 linkage to MBM and MTMs
MBM & MTMs
2 decision on scales
38 produce climate data
46 WRTDS Baseflow
3 determine official GIS layers
5 update meteorology
35 Dynamic Hydro Model
36 Dynamic N,P Model
34 reservoirs
19 atmospheric deposition
6,7,8 Stream data
29 investigate tidal flooding loads
33 S2B factors
41 RUSLE and IC
26 uncertainty quantification
CMAQ
27, 28 L2W factors
37 Lower Susq
32 shoreline loads
Hi Res Land use and geomorphometry
1 CalCAST
42 CAST parameters
45 marine discharge
20 load by land use
10 determine ag land uses
P7 CAST
14 manure distribution
applications
9 restart AMS
11 manure
16 urban fertilizer
25 BMP updates
12 fixation
15 inorganic distribution
13 crop application
21, 40 load by land class
30, 43 wastewater loads
44 data to 1950
17 soil P data
18 soil P model
22, 23, 40 review sensitivities
31 CSO loads

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WQGIT and workgroups
Relative Loading Rates, BMPs, Land uses, New sources

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Land Data Team Sediment Washoff Land use

1 CalCAST

Output

AMS applications

WQGIT and workgroups Relative Loading Rates, BMPs, Land uses, New sources

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Gopal Bhatt

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1 CalCAST

Output

Isabella Bertani

CBP Watershed Modeling Process

Model
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Endpoint
Project/Decision

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Not Started

Joseph Delesantro

AMS applications

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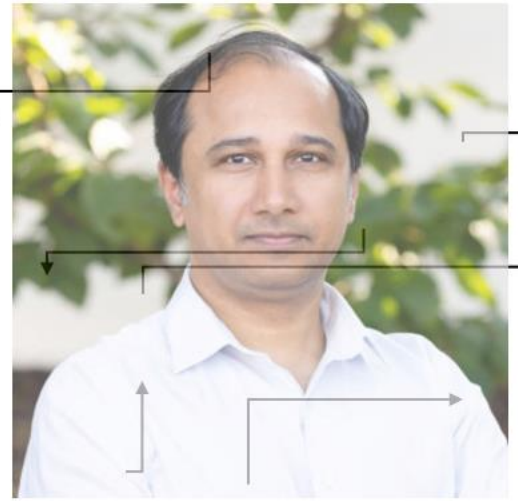

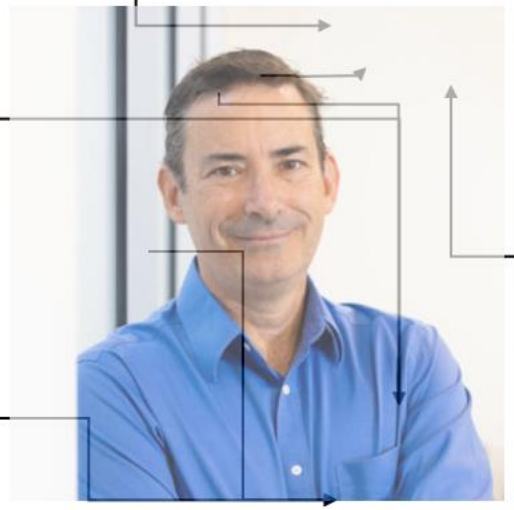

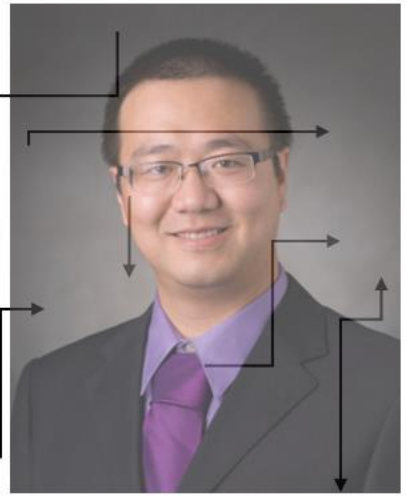

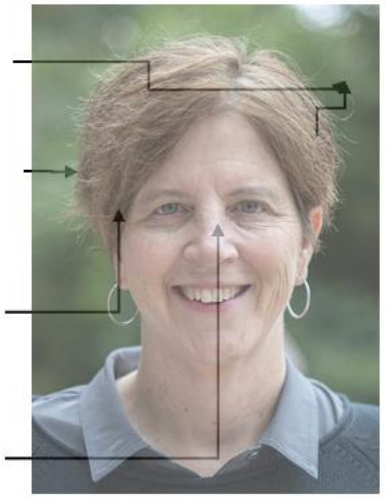

	2022 1	2022 2	2022 3	2022 4	2023 1	2023 2	2023 3	2023 4	2024 1	2024 2	2024 3	2024 4	2025 1	2025 2	2025 3	2025 4	2026 1	2026 2	2026 3	2026 4	2027 1
Phase 7 Activity	Work plan			Build	Work plan	Build Model r			Work plan	Build Model r			Work plan	Build Model r			Review Model r				
General	1 Develop CalCAST wring P6 data								1 Use CalCAST as primary calibration tool												
	official CBPO GIS layers																				
	System of annual meteorology updates																				
	25 BMP updates																				
			35 Dynamic model for hydrology, sediment, and temperature																		
									45 Investigate marine discharge loads												
									29 Investigate tidal flooding loads												
									30 Update to Watershed Loads												
									43 point source locations												
															42 CalCAST transfer to CAST						
									31 Update to CSOs												
Variable Scale Modeling													2 Partnership decision on Scales								
Nutrient application Calculation	9 Restart AMT				Update nutrient inputs																
					10 Determine Ag Land Uses																
							11 manure														
									12 fixation 13 crop												
											14 Manure distribution 15 inorganic distribution										
							17 Soil P data														
											18 Soil P Model										
			16 Urban fertilizer																		
							19 Atmospheric deposition														
Physical Process Simulation					6 Streamflow data																
					7 stream conc data																
							8 Stream load data														
									20 Review relative loading rates by land use												
									21 Review relative loading rates by land class												
									40 Add solar fields as land use in developed land class												
									22 Review of sensitivities												
									27 Investigate land to water												
									28 Incorporate local data in land to												
									32 Tidal Shoreline loads												
									34 Reservoir consideration												
													37 Lower Susquehanna Simulation								
									41 Recalculate RUSLE and IC												
									33 Stream to Bay factors												
Uncertainty Quantification	26 Methods				26 Parameters										26 Ures in review						
Improve climate change modeling									23 Review of sensitivities to climate variables												
																		38 Produce 2035 meteorology data sets			
																		39 Investigate CAST sensitivities to climate			
Main Bay and Tributary Models							4 physical and chemical linkage with estuarine model														
		36 Dynamic model for nutrients																			
High-Res Land Use									24 Convert fine-scale land use to CAST land use												

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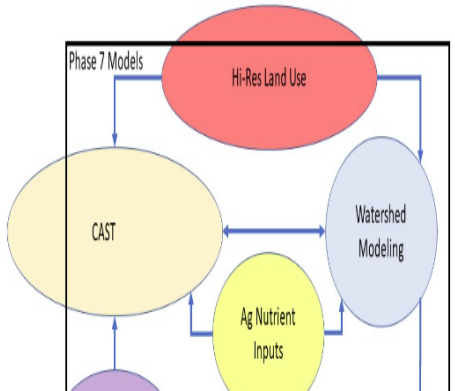

Modeling

Phase 7 Model Development

Programs & Projects

- Modeling
- Monitoring
- Quality Assurance
- Resource Lands Assessment
- Chesapeake Bay TMDL
- Watershed Implementation Plans
- BMP Verification

Reviews – start to plan

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Work plan			Build	Work plan	Build Models			Work plan	Build Models			Work plan	Build Models			Review Models			
Build Model Structure				Improve Models												Review Models			

- Partner comments
  - Comment, response, discussion
- STAC reviews
  - Watershed Model?
  - Inputs?
  - Land Use?

Phase 7 Watershed Model Plans

CBPO Staff

Gopal Bhatt, Isabella Bertani, Lewis Linker and others

MWG

1/5/2024