Phase 7 Watershed Model Plans

CBPO Staff

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MWG

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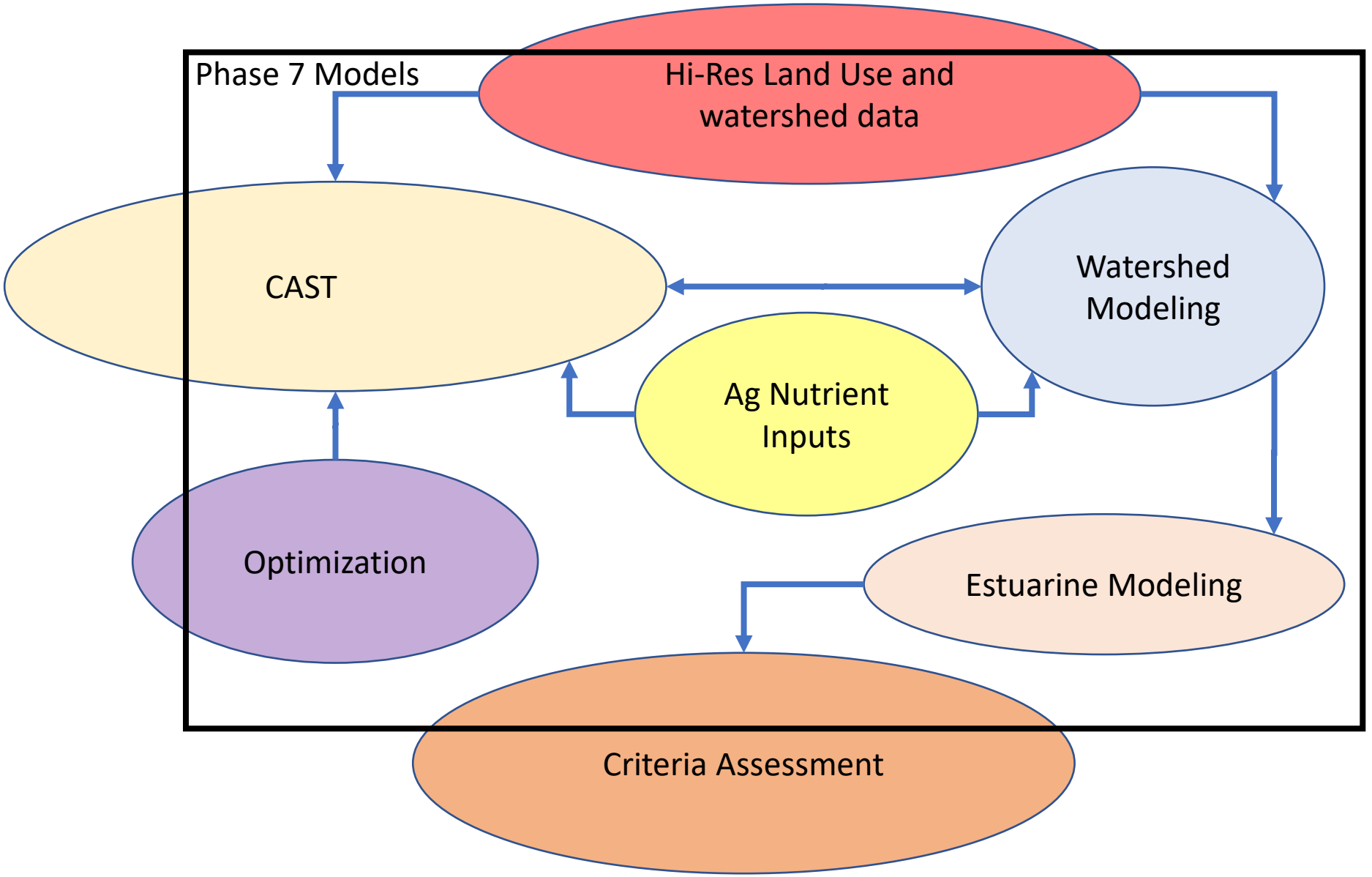
Remember the Four I's
Core Values of the Modeling Workgroup

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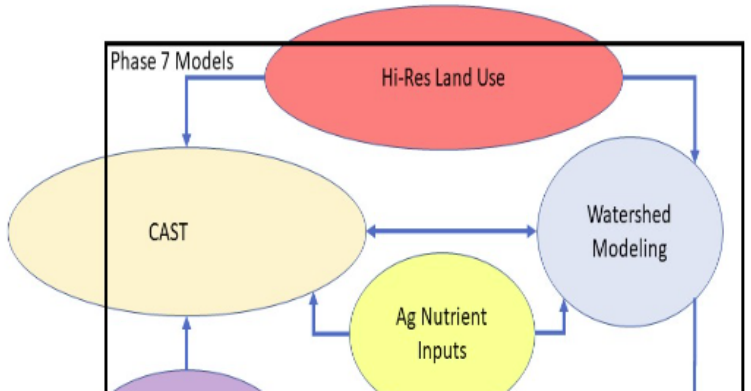
WHAT WE DO > PROGRAMS & PROJECTS > PHASE 7 MODEL DEVELOPMENT

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

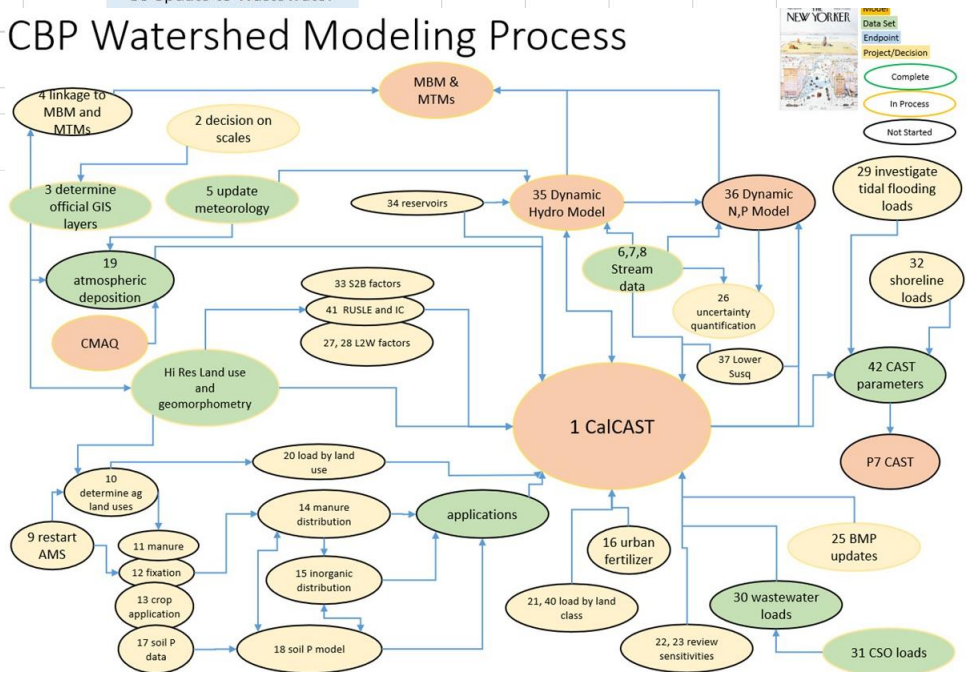
Modeling
Monitoring
Quality Assurance
Resource Lands Assessment
Chesapeake Bay TMDL
Watershed Implementation Plans
BMP Verification

Each Track Has Provided Schedule Documents

Format will vary by Track

	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
Phase 7 Activity	Work plan			Build	Work plan	Build Models			Work plan	Build Models			Work plan	Build Models		
General	1 Develop CalCAST using P6 data								1 Use CalCAST as primary calibration tool							
	3 Determine official CBPO GIS layers															
	5 system of annual meteorology updates															
	25 BMP updates															
			35 Dynamic model for hydrology, sediment, and temperature													
						29 Investigate tidal flooding loads										
									30 Update to Wastewater							
			31 Update to CSOs													
Variable Scale Modeling																

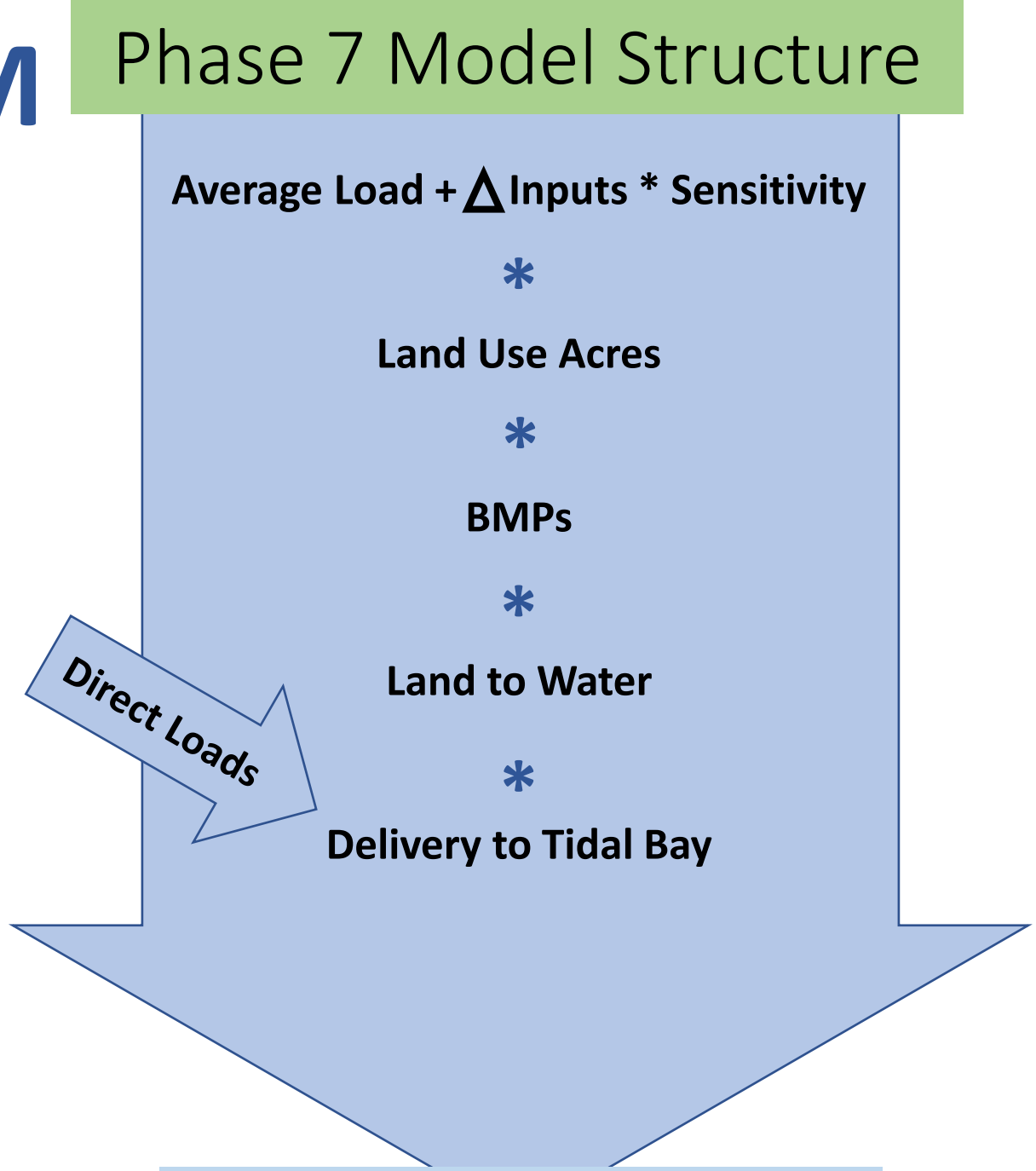
Item	Category	What: short description	Why: who asked for it or why is it necessary	Who in C elsewhen the work		development time	
1	General	Develop CalCAST. CalCAST will be a tool for comparing estimated load to monitored loads given a set of inputs and parameters. It will be used in the calibration	CalCAST allows the CBP to test various data sets and strategies to see which match monitoring data best. Primary suggestion of STAC Phase 6 STAC review and Future of Modeling workshop. Allows efficient incoporation of all other development priorities	Bertani; Bhatt; Shenk	MWG	First priority. The rest of development depends on CalCAST. Need decisions on scale. 2022	A model of loads at a point is developed in Section 12 of the documentation. It will be implemented for speed of calculation with the potential to wrap parameter estimation techiques around it
2	variable scale modeling	Discuss scale and reach decision	Development of various Phase 7 tasks will benefit from knowledge of the output scale	Shenk	WQGIT, MWG	2022-2025	Presentation to WQGIT and MWG on various aspects, discussed in section 2
3	General	determine official versions of GIS layers: NHD, county, shoreline, Lrseg	Counties have updated boundaries. NHD necessary to use many important data sets, shoreline determines watershed/estuarine parameters. Lrseg may change for NHD boundaries	McDonald, Fitch, Ahmed, Bhatt	MWG	early 2022	CBPO discussions, with results to be written into section 2
4	Main bay and tributary models	physical and chemical linkage with estuarine model	Needed to run estuarine models	Bhatt	MWG	late 2022. Need to determine form of dynamic model first for the variable description.	Indentify set of terminal segments. Identify estuarine cell for each terminal segment. Compare old ICM variables with new ICM variables. Do new WSM variables match up?



Cast/CalCast/DM

Phase 7
CAST

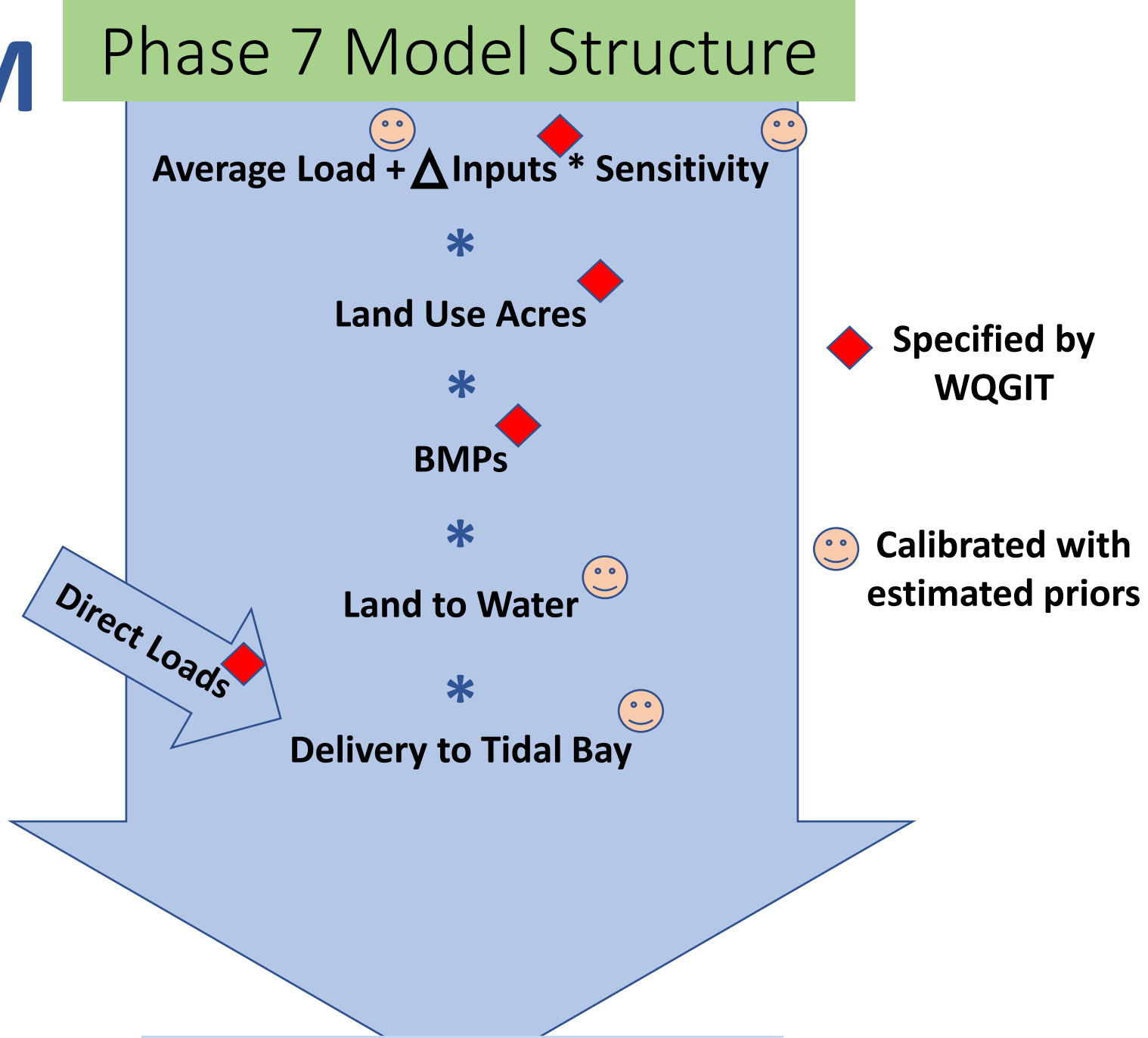
Deterministic
Scenario Tool:
1 set of loads for 1 set of inputs



Cast/CalCast/DM

Phase 7
CalCAST

Tool for finding parameters that best match observations

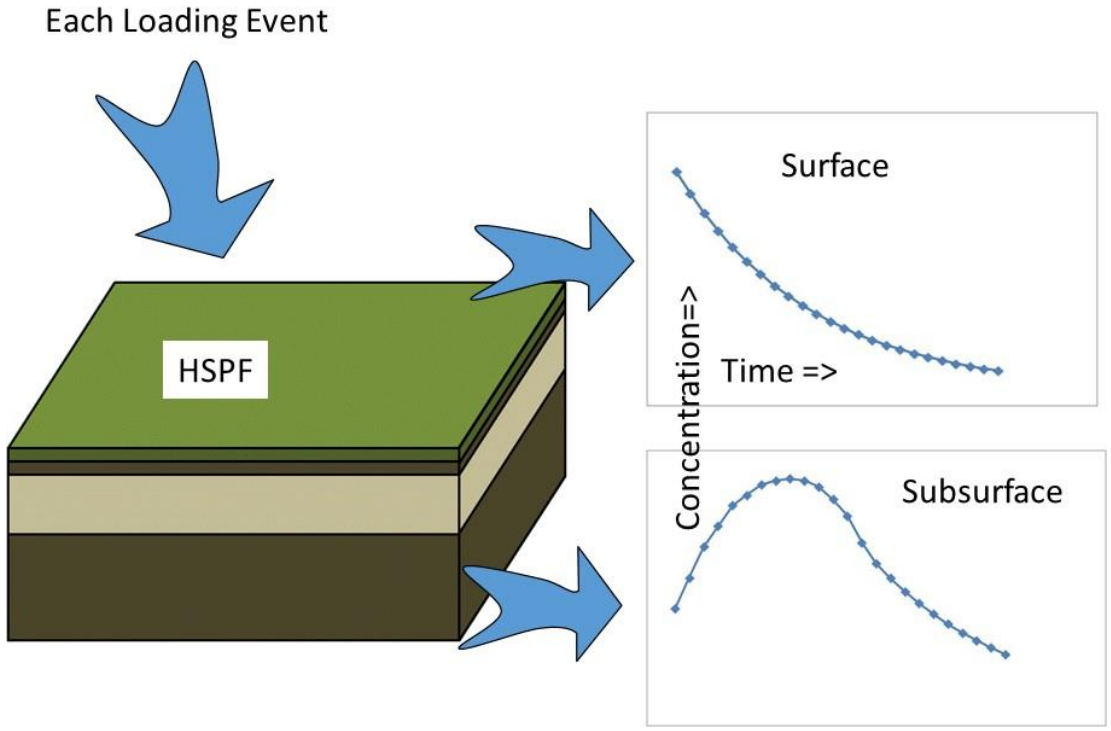


Cast/CalCast/DM

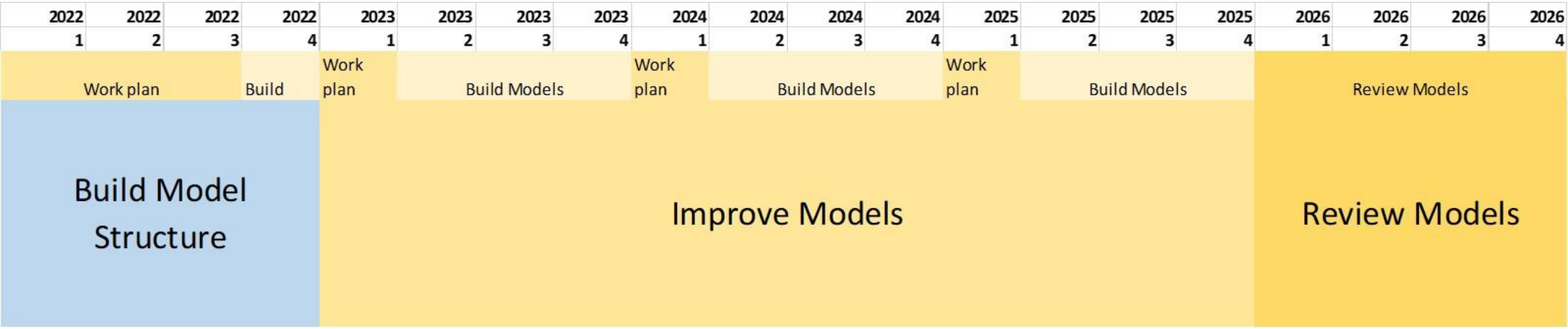
Phase 7
Dynamic Model

Tool for

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



Watershed Model Plan – Big Picture



Watershed Model Plan – Year 1 - 2022

Year	2022	2022	2022	2022
Quarter	1	2	3	4
CalCAST - Isabella	Develop CalCAST			
	Develop initial equations	refine equations		
	Gather Watershed Data			
	Develop statistical models to investigate potential important predictors			
	Investigate software types	Optimize for cloud		
	Initial Hydrology Model			
		Initial Sediment Model		
			Initial Nutrient Models	
Dynamic Model - Gopal	Create Data systems		Dynamic model Development	
	system of annual meteorology updates			
	Determine official CBPO GIS layers			
	Stream Flow, concentration, and load data			
		Initial hydrology model		
			Initial Sediment Model	
				Initial Nutrient Models

Watershed Model Plan – Year 2 - 2023

- Continue development of CalCAST and the Dynamic Watershed Model
- Investigate and incorporate new load sources
  - Tidal shoreline erosion
  - Tidal flooding
  - Boat Discharges
- Update CSO model
- Literature review of loading rates by land use
- Improve land to water factors
- Improve reservoir simulation

Help on the way
ORISE watershed modeler
to join team this year

Documentation

- Record of approved model
- MWG approves some sections; WQGIT approves others
- Will discuss sections as they come available

- Section 1: Overview
  - Draft available on Phase 7 website in .docx form
  - Accepting suggestions
  - Won’t be final until end of Phase 7 development
  - 18-page summary

Documentation Section 1: Overview

- Introduction
- Management Context
- Total Maximum Daily Load (TMDL)
- Partnership's Plan for the post-2025 TMDL
- Governance (MWG vs WQGIT purviews)
- Overall CBP Model Framework

Accepting comments today on structure

Documentation Section 1: Overview

- Purposes
- Estimate Change in Load from Management Actions
- Deliver Loads to Estuarine Models
- Calibration and Validation
- Scientific Study
- Partnership Direction
- STAC
- WQGIT
- Other GITs
- Regional hydrologic modeling meeting

Documentation Section 1: Overview

- Model Structure
- CAST
- CalCAST
- DM-CAST
- Comparison of Model Structure to Previous CBWM Phases
- Documentation
- Development and Release Schedule

Goals for the end of 2022

- Model Structure
  - CalCAST and the Dynamic Model run at the NHD scale for flow, sediment, and nutrients
- Output quality
  - Reasonable outputs for 1985-2020
- Documentation
  - Section 1 overview: draft
  - Section 2 physical setting and segmentation: nearly finished
  - Section 3 meteorological and stream data: nearly finished
  - Section 12 CalCAST: early draft
  - Section 13 Dynamic Model: early draft

Goals for the end of 2025

- Model Structure
  - CalCAST and the Dynamic Model run at the NHD scale for flow, sediment, and nutrients
  - CAST running on scale of WQGIT's choosing
- Output quality - Improvement on phase 6
  - Spatial apportionment of loads by land use and region
  - Change in loads over time due to
    - Management actions
    - Climate change
  - Accuracy of spatial and temporal loads to the estuary in calibration period
- Documentation – all 20 sections complete