

Phase 7 Watershed Model Plans

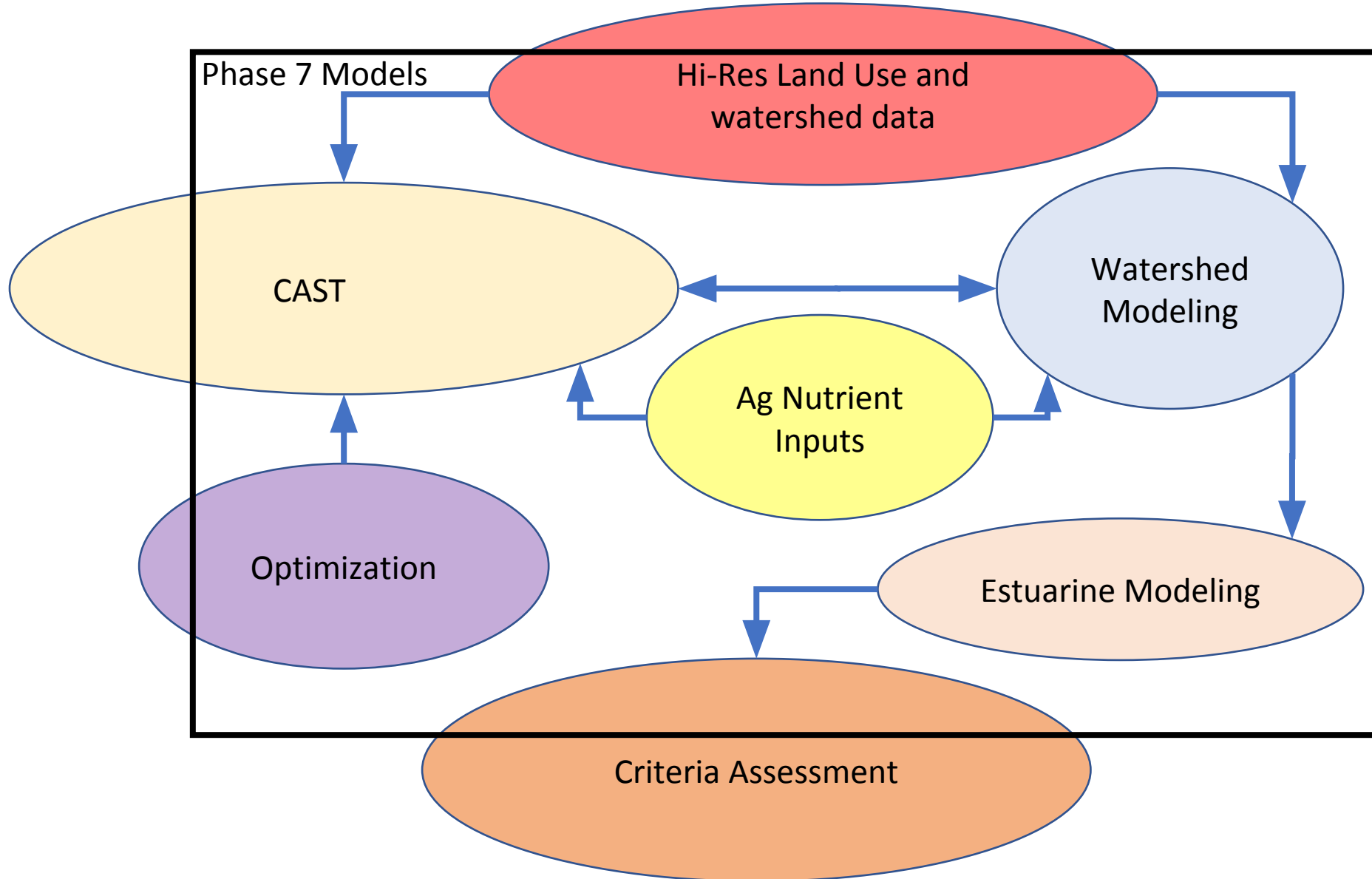
CBPO Staff

Gopal Bhatt, Isabella Bertani, Joseph Delesantro, Lewis Linker and others

MWG

7/9/2024

Phase 7 Development Tracks



Web page

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

Auston Smith



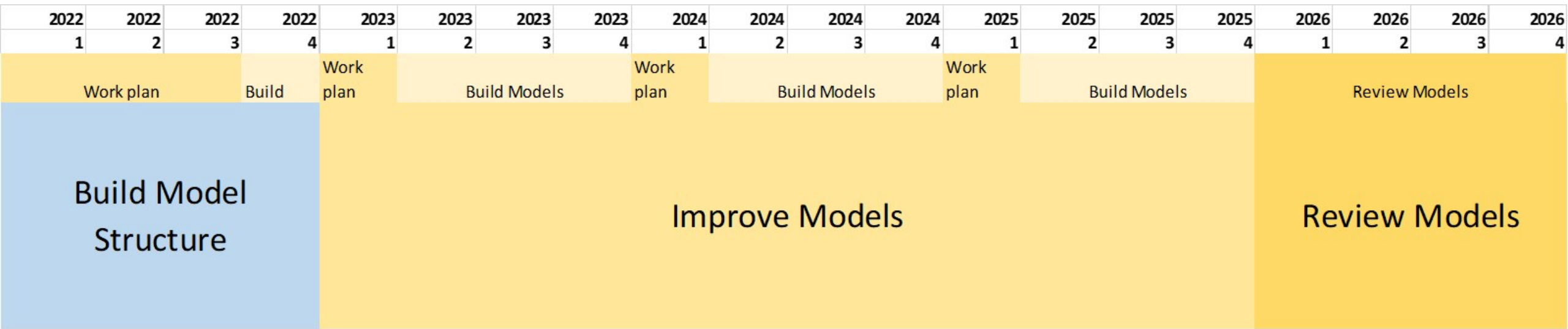
The screenshot shows a web browser window with the URL `chesapeakebay.net/what/programs/modeling/phase_7_model_development`. The page header features the Chesapeake Bay Program logo and a navigation menu with links: Discover the Chesapeake, Learn the Issues, State of the Chesapeake, Take Action, In the News, Who We Are, and What We Do. Below the header, the page title is "Phase 7 Model Development" with a sub-header stating: "The Chesapeake Bay Program is updating its modeling and analysis tools used in the Chesapeake Bay TMDL." A list of six interrelated projects is provided:

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

Below the list is a diagram titled "Phase 7 Models" showing the relationships between four main components: "Hi-Res Land Use" (red oval), "CAST" (yellow oval), "Ag Nutrient Inputs" (yellow circle), and "Watershed Modeling" (blue circle). Arrows indicate the flow of information: "Hi-Res Land Use" feeds into "CAST" and "Watershed Modeling"; "Ag Nutrient Inputs" feeds into "CAST" and "Watershed Modeling"; and "CAST" and "Watershed Modeling" are interconnected with bidirectional arrows.

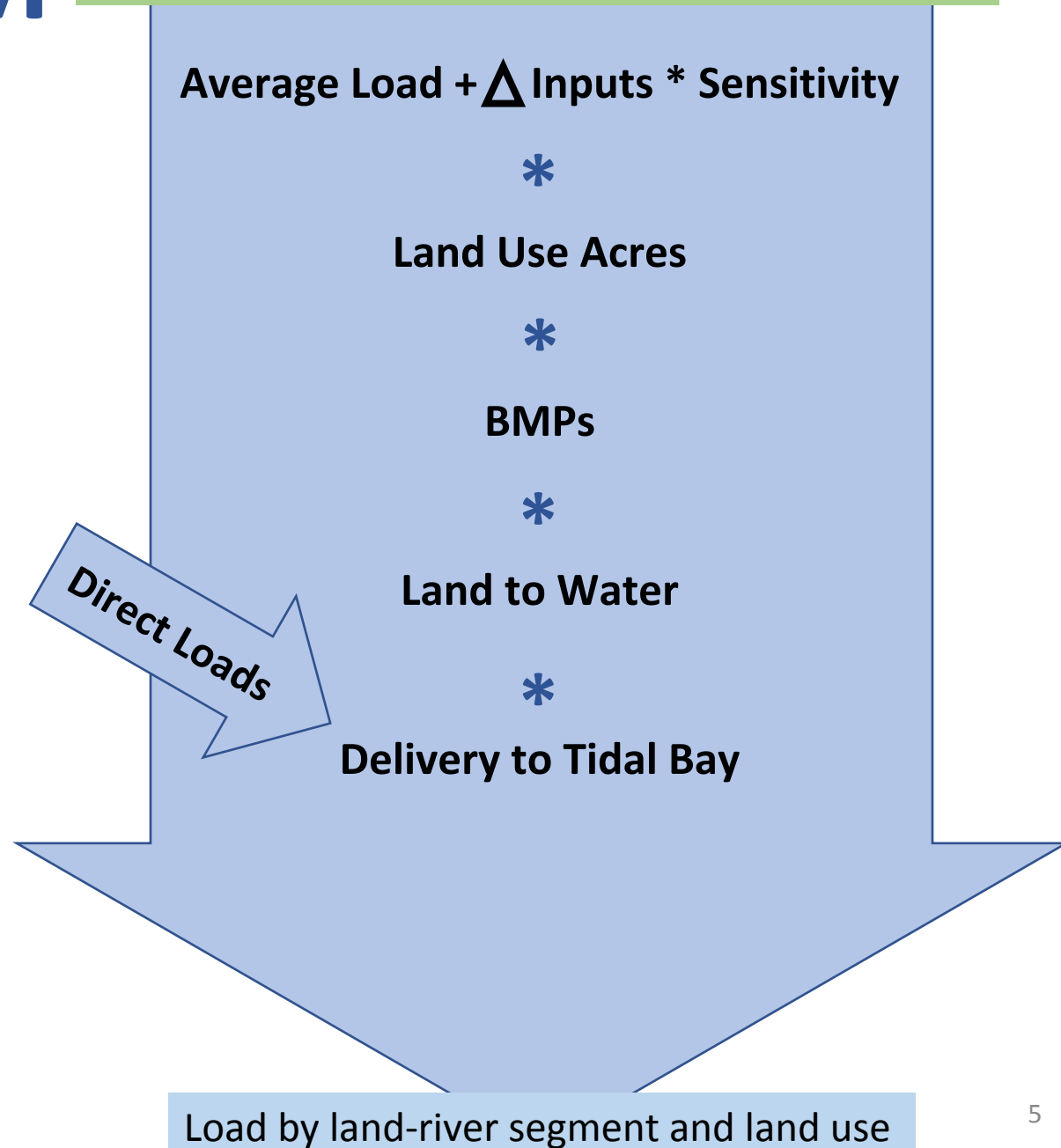
On the right side of the page, there is a sidebar with a "Modeling" section containing a link to "Phase 7 Model Development". Below this is a "Programs & Projects" section with a list of links: Modeling, Monitoring, Quality Assurance, Resource Lands Assessment, Chesapeake Bay TMDL, Watershed Implementation Plans, and BMP Verification.

Watershed Model Plan – Big Picture



Phase 7 CAST

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



Sensitivities – all else being equal...

Average Load

$\Delta \text{Inputs} * \text{Sensitivity}$

BMPs

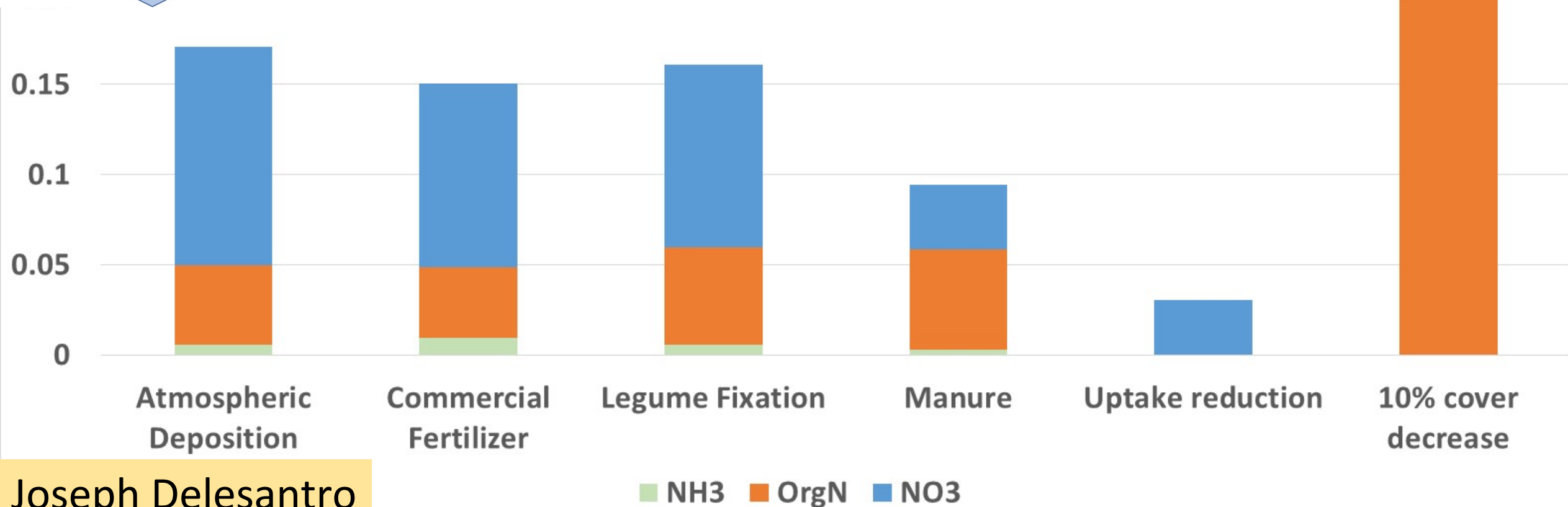
Acres

Land to Water

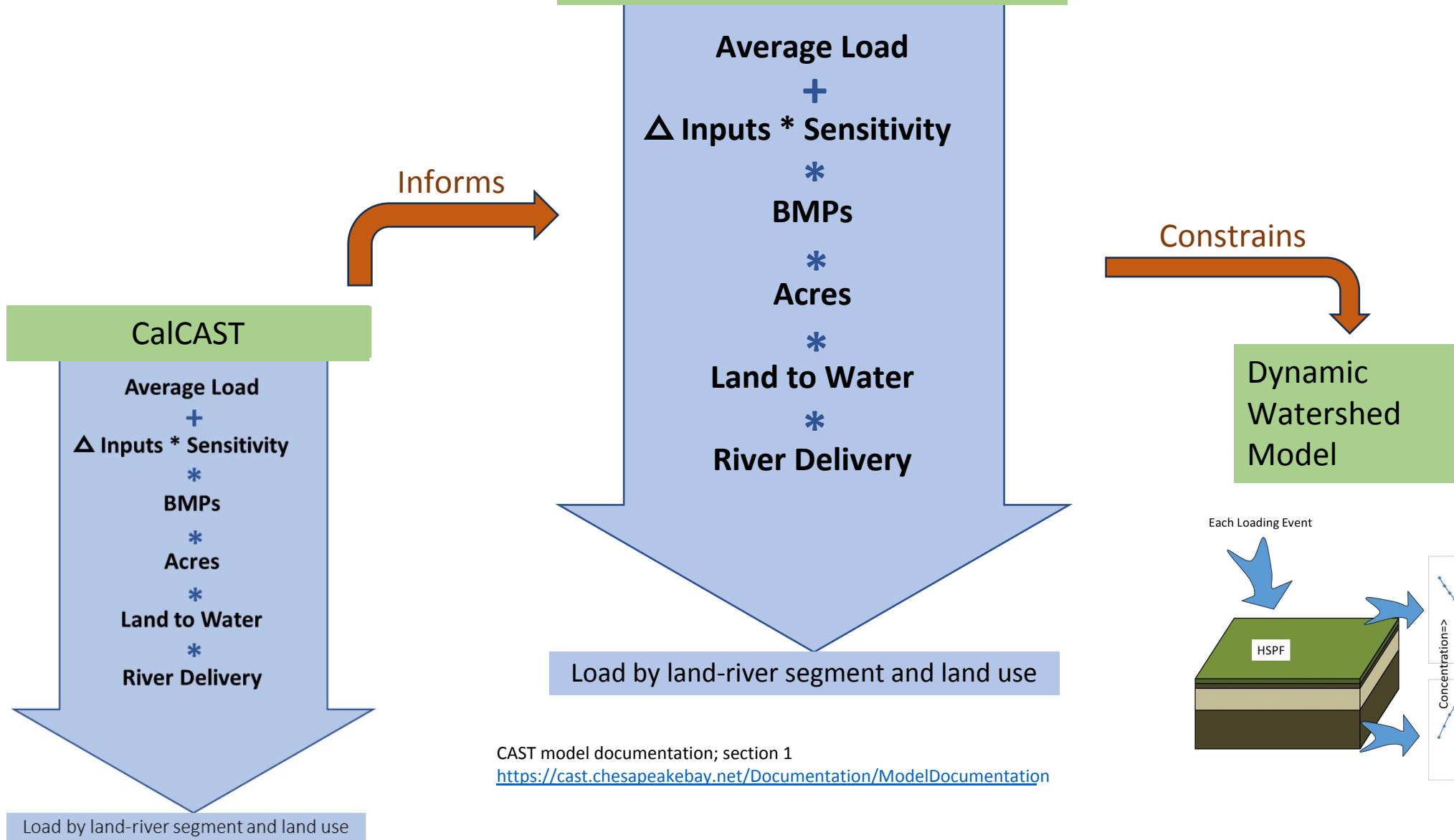
River Delivery

Change in output from 1 pound of input change - Nitrogen

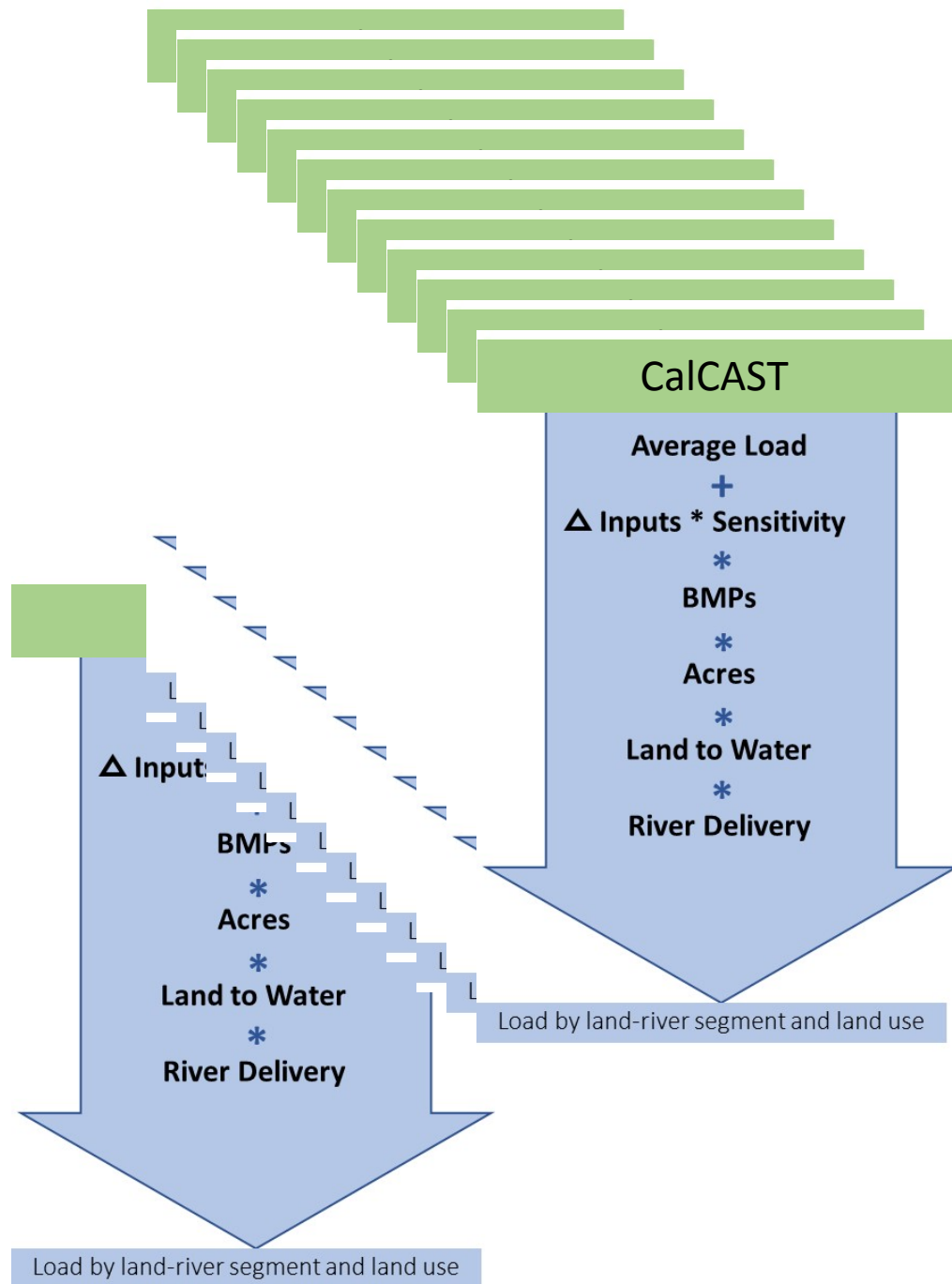
P7 workplan: will investigate new sensitivities

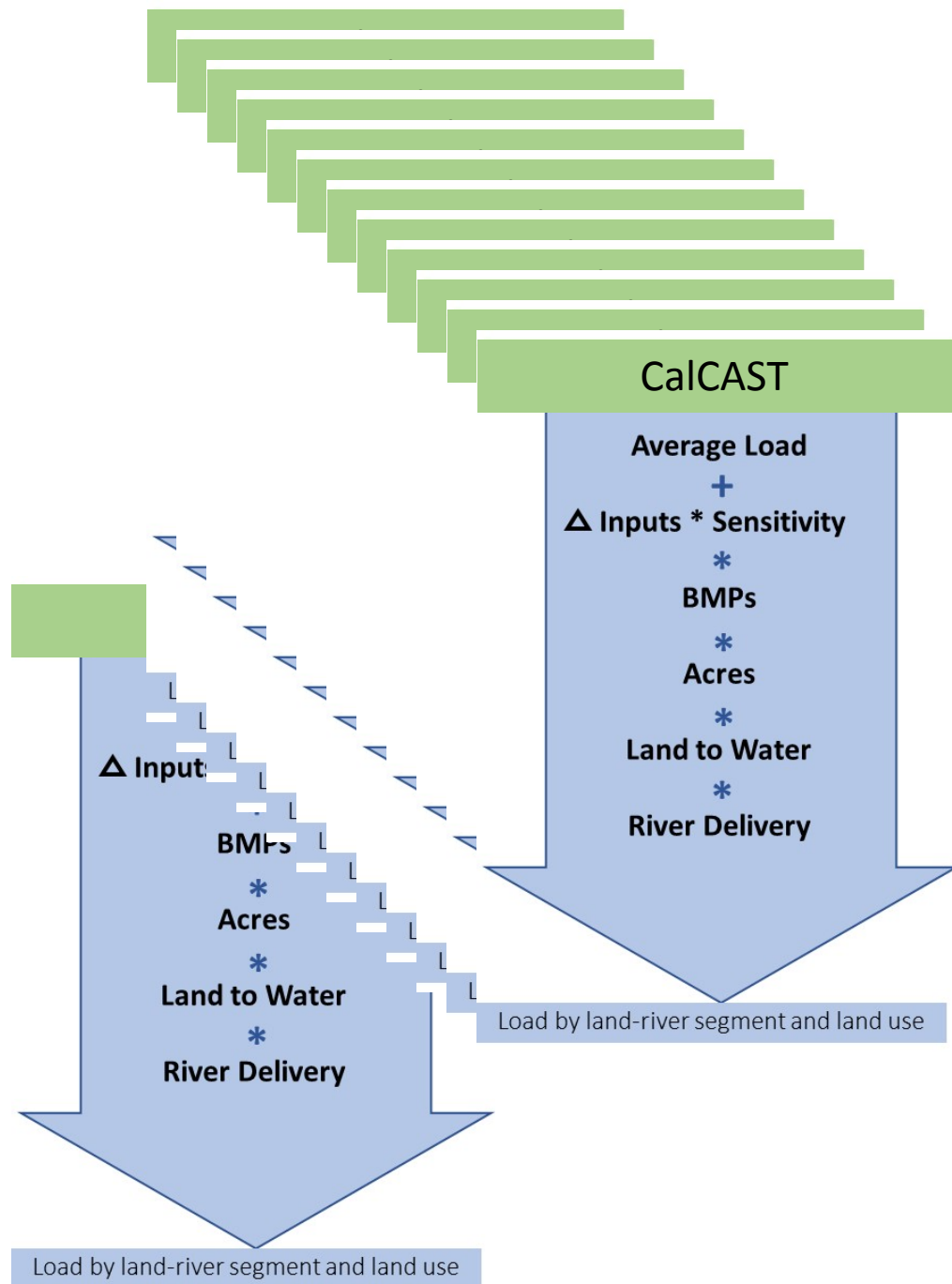


Phase 7 CAST Structure



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

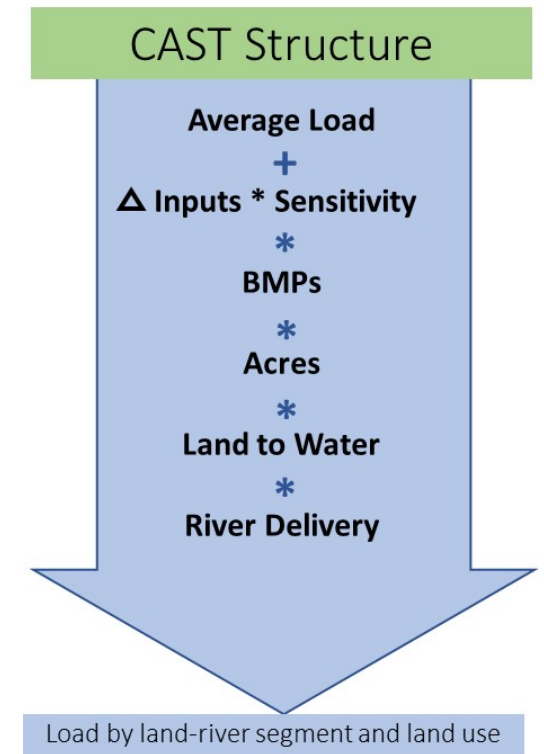




Constituent	Average Annual	Annual Flow-Normalized	Annual True Condition
Flow	X		X
Baseflow	X		X
Nitrogen	X	X	X
Phosphorus	X	X	X
Sediment	X	X	X

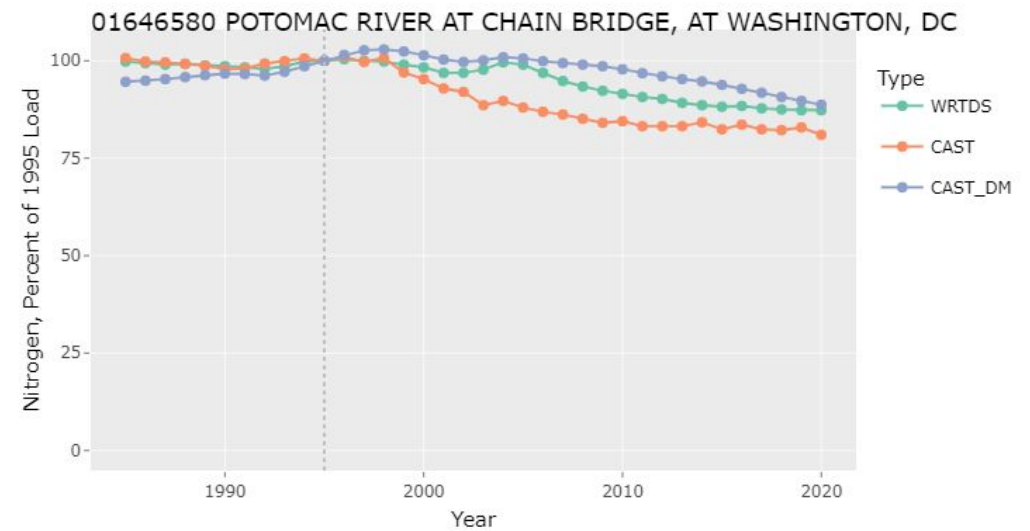
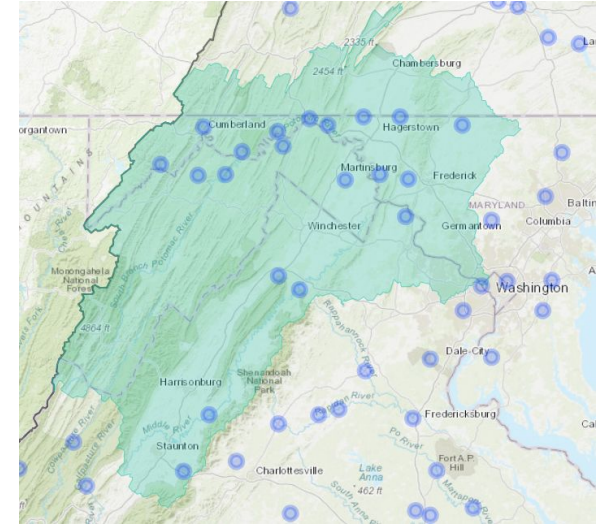
Model Types – Average Annual

- One calibration value per station
- Long history of use in Sparrow models
- Used in P6 (CB Sparrow version 4) to predict
 - Land to water
 - Stream to river
 - Inform sensitivities and average load
- Plan A for generating CAST parameters
- Currently used to constrain the Dynamic Watershed Model
 - Flow, baseflow, Nitrogen, Phosphorus, and Sediment



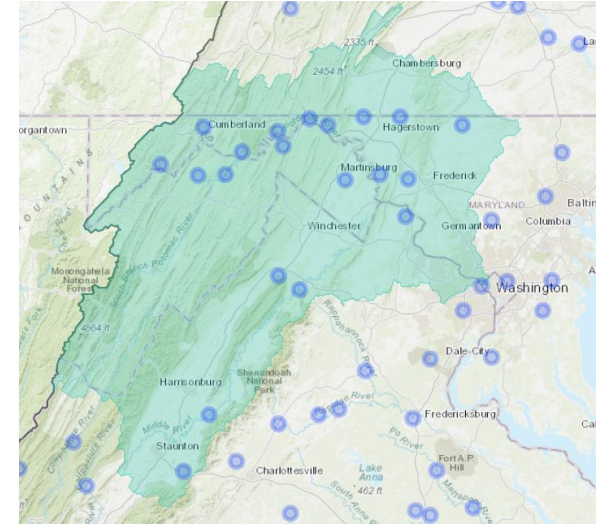
Model Types – Annual Flow Normalized

- One calibration value per year per station
- Fewer similar sparrow models
- Incorporates lag time
- Research Model
 - Potentially generating understanding of trend differences between CAST and USGS estimates of flow-normalized trend
- Plan B for parameterizing CAST and constraining the DWM

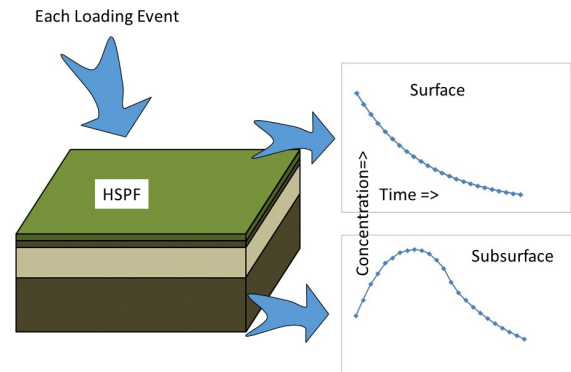
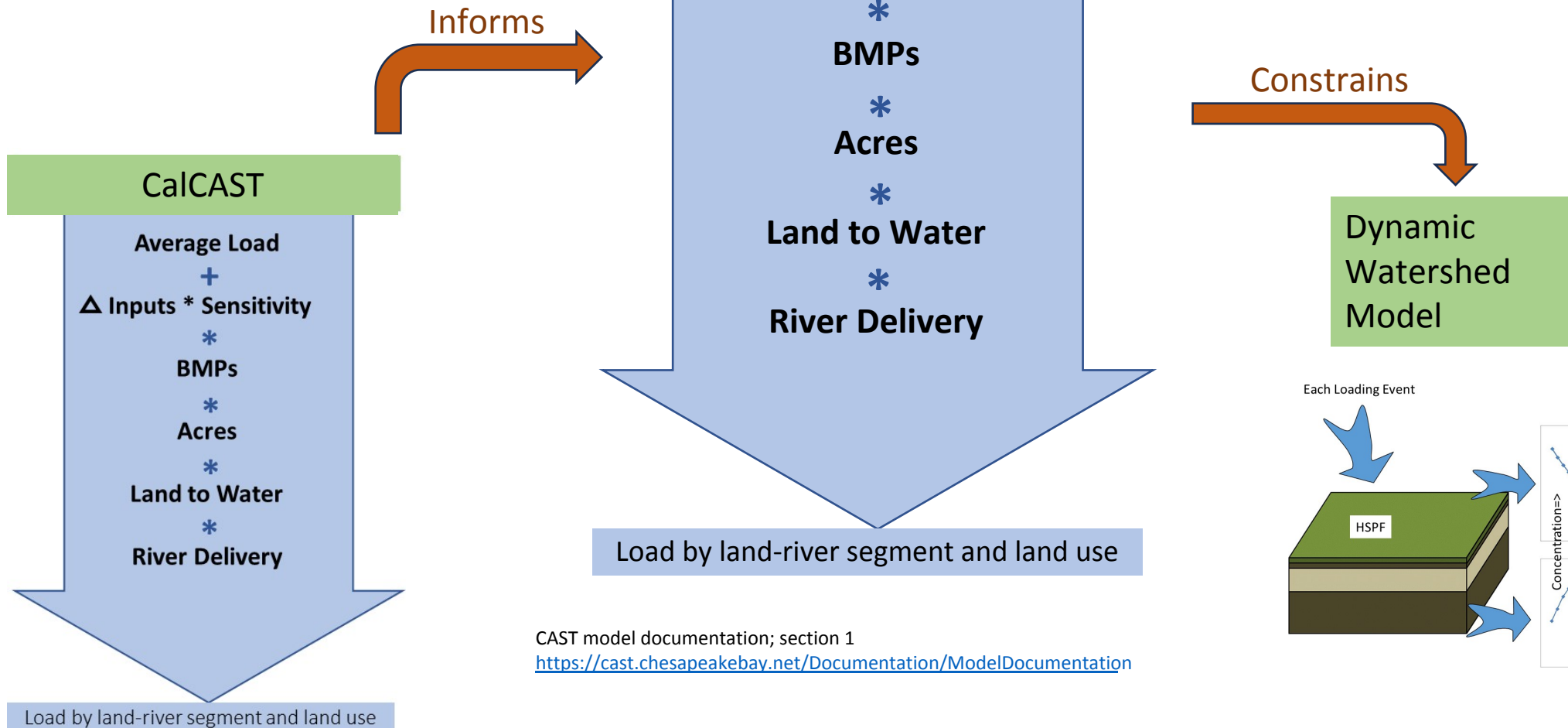


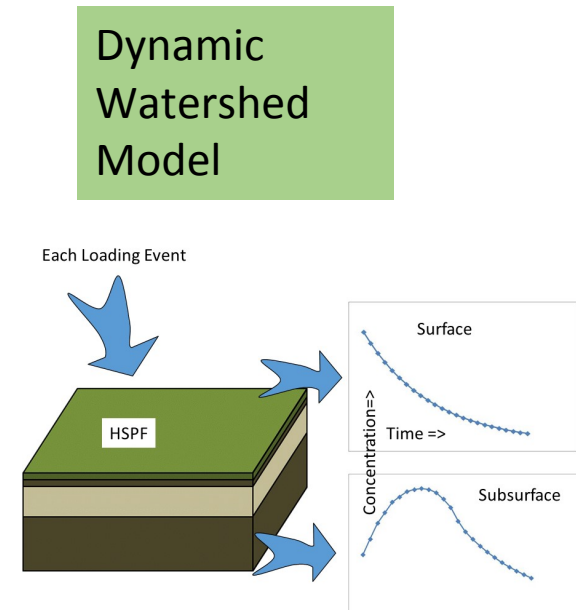
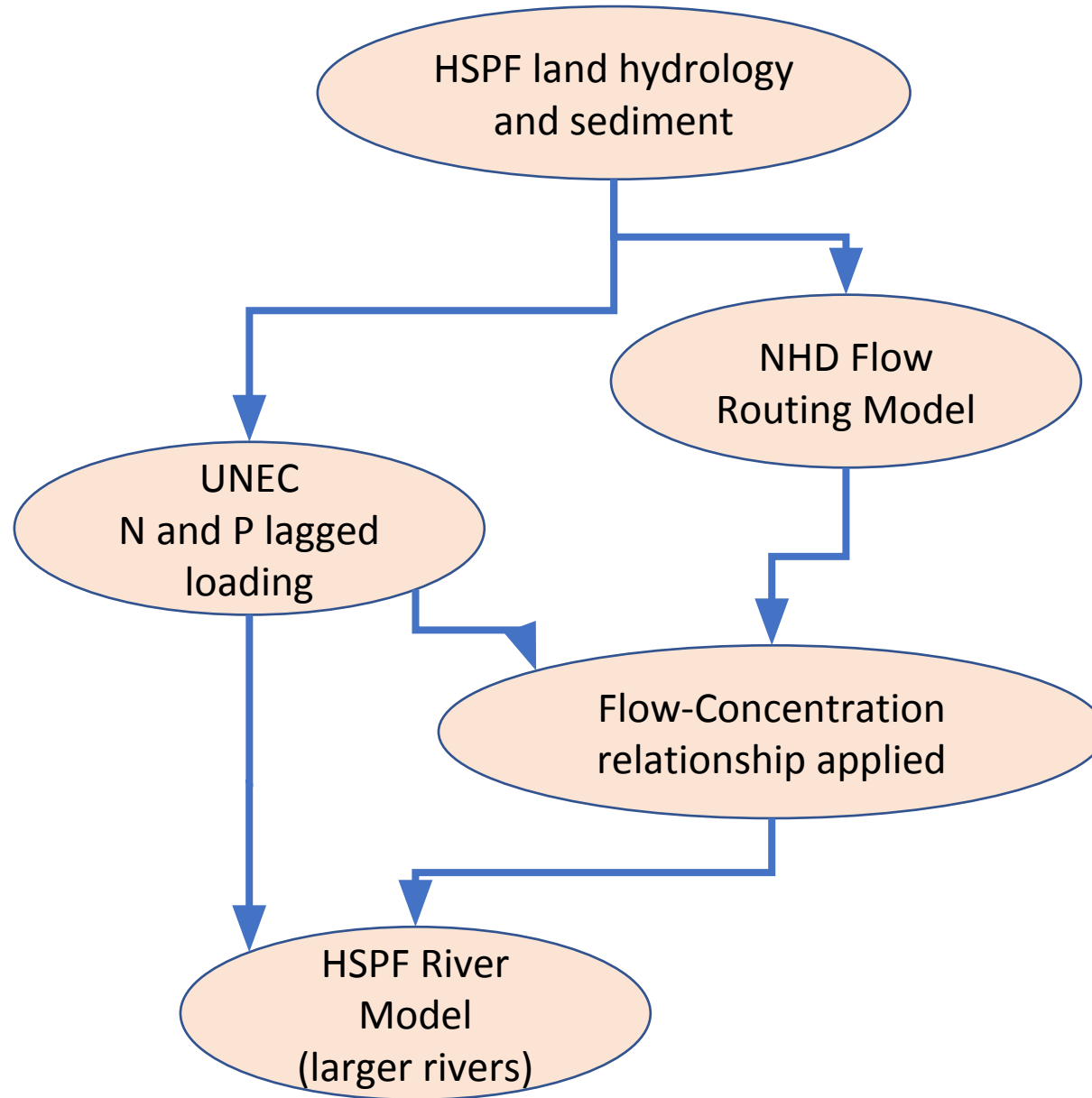
Model Types – Annual

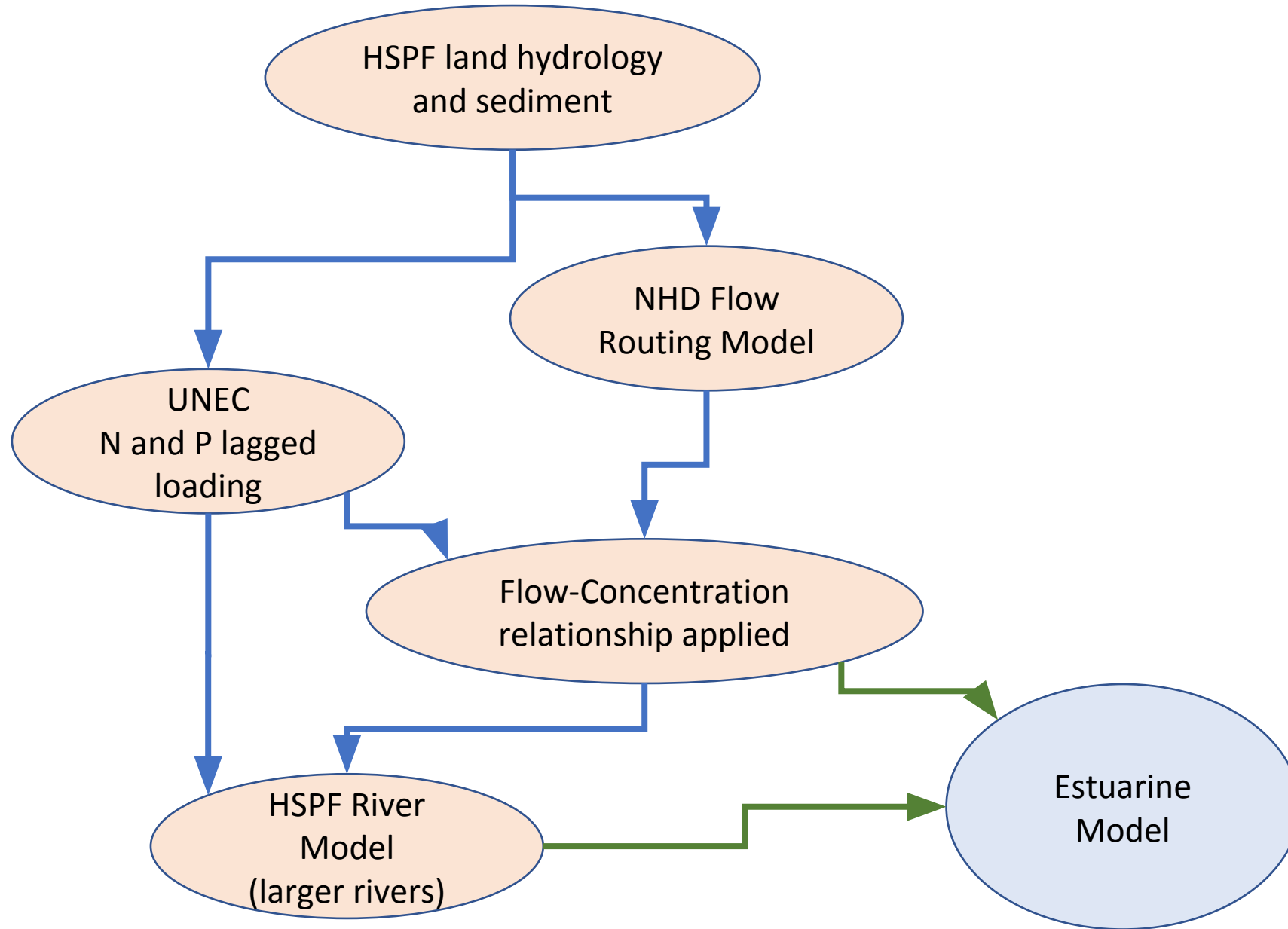
- One calibration value per year per station
- Incorporates lag time
- Research Model
 - Are different factors important in high flow vs low flow years
- Plan C for constraining the DWM
 - May inform annual predictions at NHD catchments directly loading shallow water

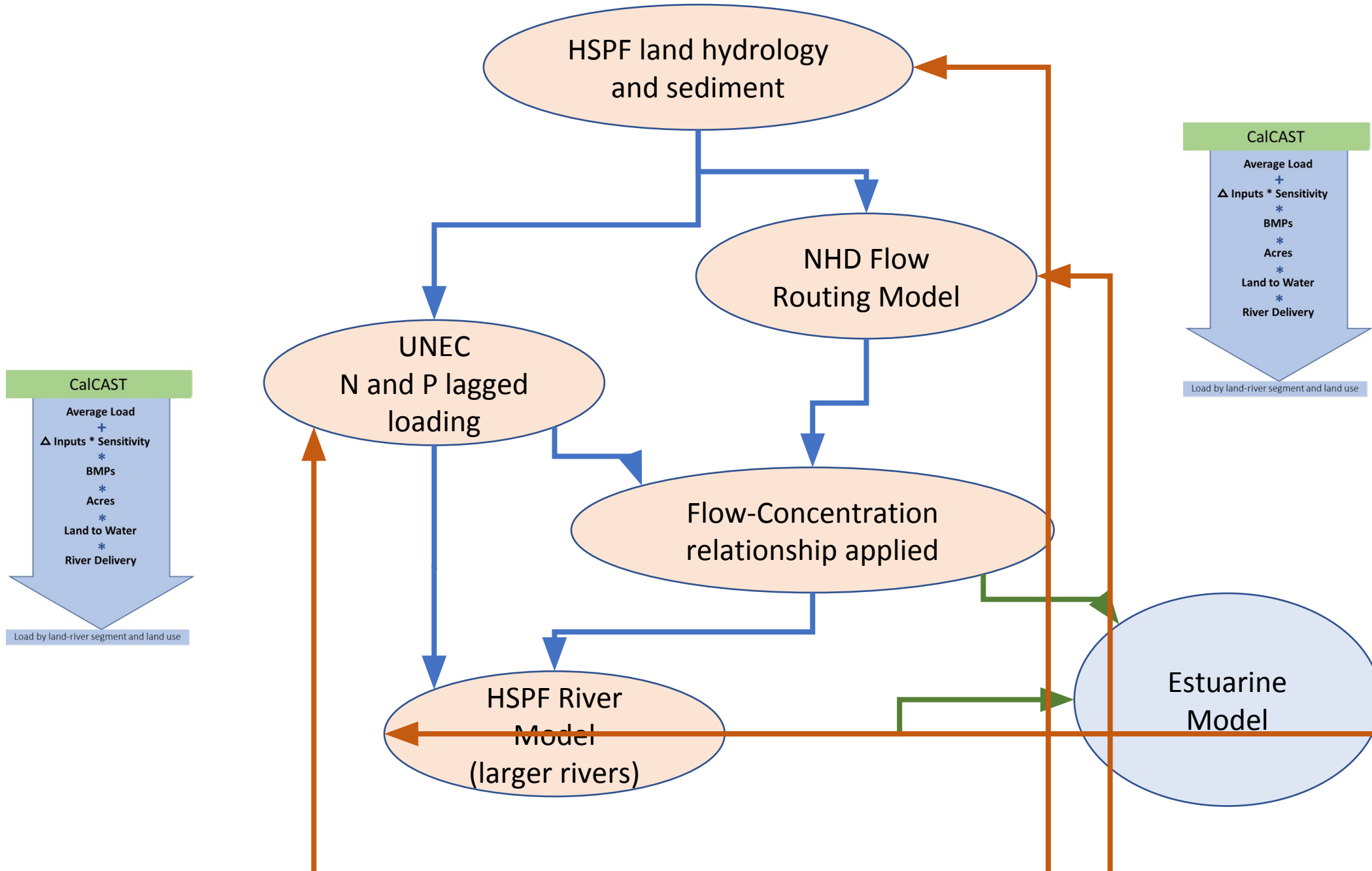


Phase 7 CAST Structure

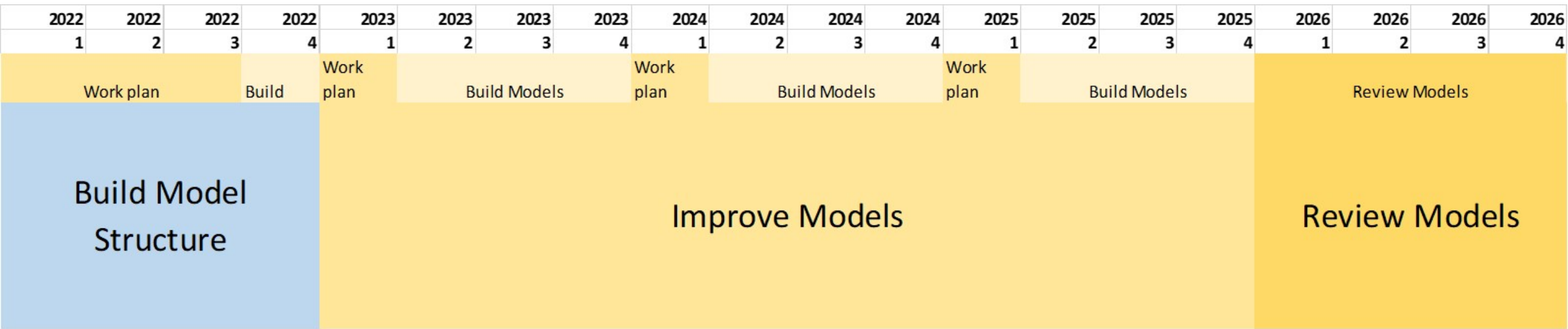








Watershed Model Plan – Big Picture



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