

Overall Development Plan for Phase 7 WSM

Gary Shenk – CBPO

4/6/21

Modeling Workgroup

CBP Watershed Modeling Products

Existing

Long term

TMDL tracking
Eco-flows, etc.

CAST6-2017
CAST6-2019...
CAST6-2025

CAST7-2025

Calibration,
Estuarine loading
Water supply

P6
Dynamic
Model

P7
Dynamic
Model

2023
Prototype

Opportunity

...
Geomorphometry

Land Use

Computing
Power

New
Science

Fine-scale
tools
(field doc)

P7
CAST
DM

Partnership Need

PSC
directives

WQGIT
needs

STAC recs

Other GIT
needs

Water
supply
partners

Model
Data Set
Endpoint
Project/Decision

Complete
In Process
Not Started

Top ...
Up

P7 CAST
DM

Partnership Need

PSC
directives

1. Reassess 2035 climate in 2025
2. Don't change planning targets until 2025

Water
supply
partners

NHD100k hourly flow & temperature
Low flow extremes ; Reservoirs

Other GIT
needs

CAST inputs and outputs at NHD100k or NHD24k
Time-averaged N, P, S, flow, temp characteristics

STAC recs

Finer scale
Better characterize sources and sinks
Uncertainty Quantification (including BMPs)
Formalized optimization of CAST calibration

Revolutionize sediment
Match with monitoring data
More models in ensemble

WQGIT
needs

Science needs database – 1 science need: Finer Scale

- 1) refine urban phosphorus sensitivities
- 2) investigate the impact of urban BMPs using SWAT and/or SWMM models.

Model

Data Set

Endpoint

Project/Decision

Complete

In Process

Not Started

Top ...

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Partnership Need

Model

Data Set

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In Process

Not Started

Top ...

Up

PSC directives

- 1. Reassess **2035 climate** in 2025
- 2. Don't change planning targets until 2025

Water supply partners

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Other GIT needs

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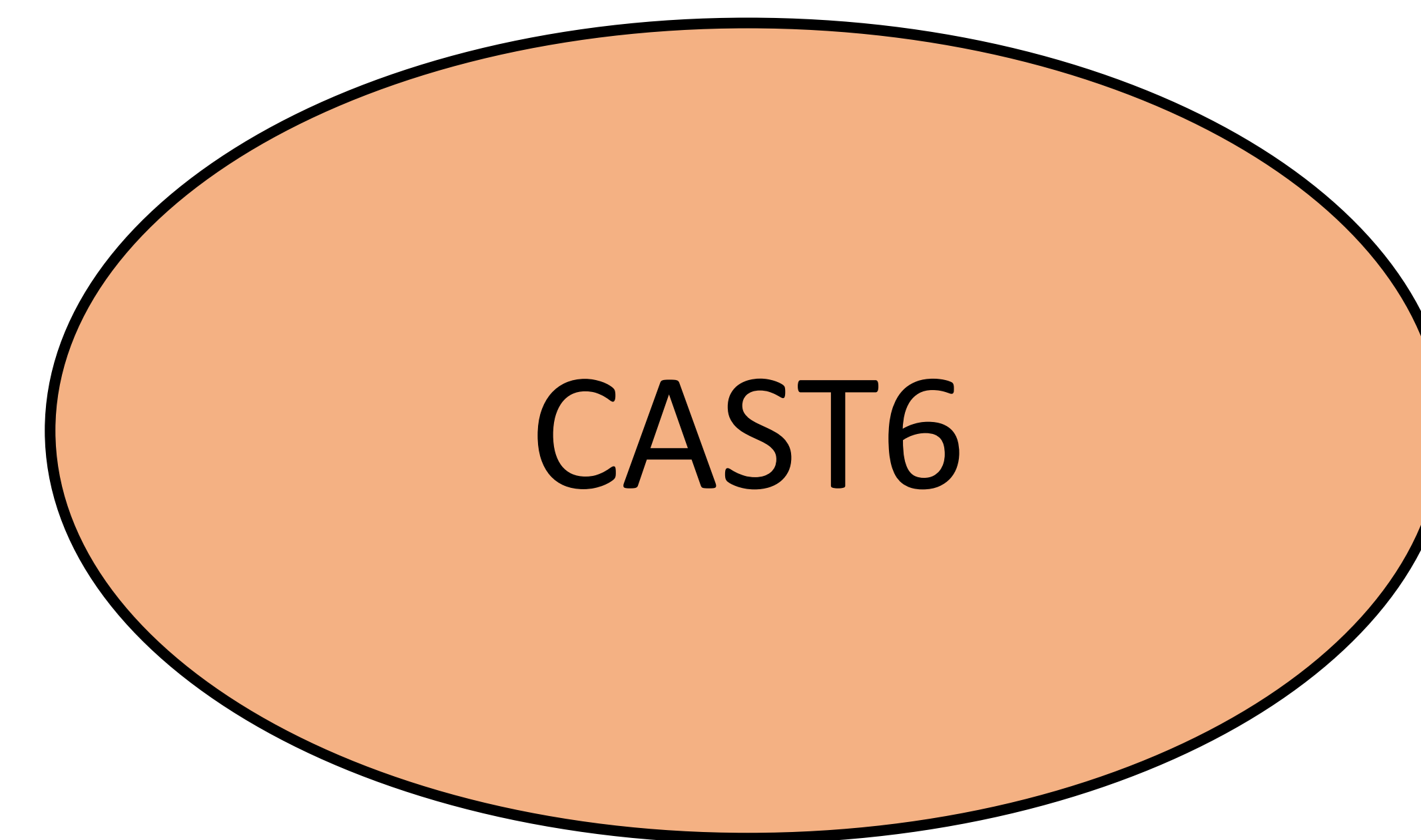
Revolutionize sediment
Match with monitoring data
More models in ensemble

WQGIT needs

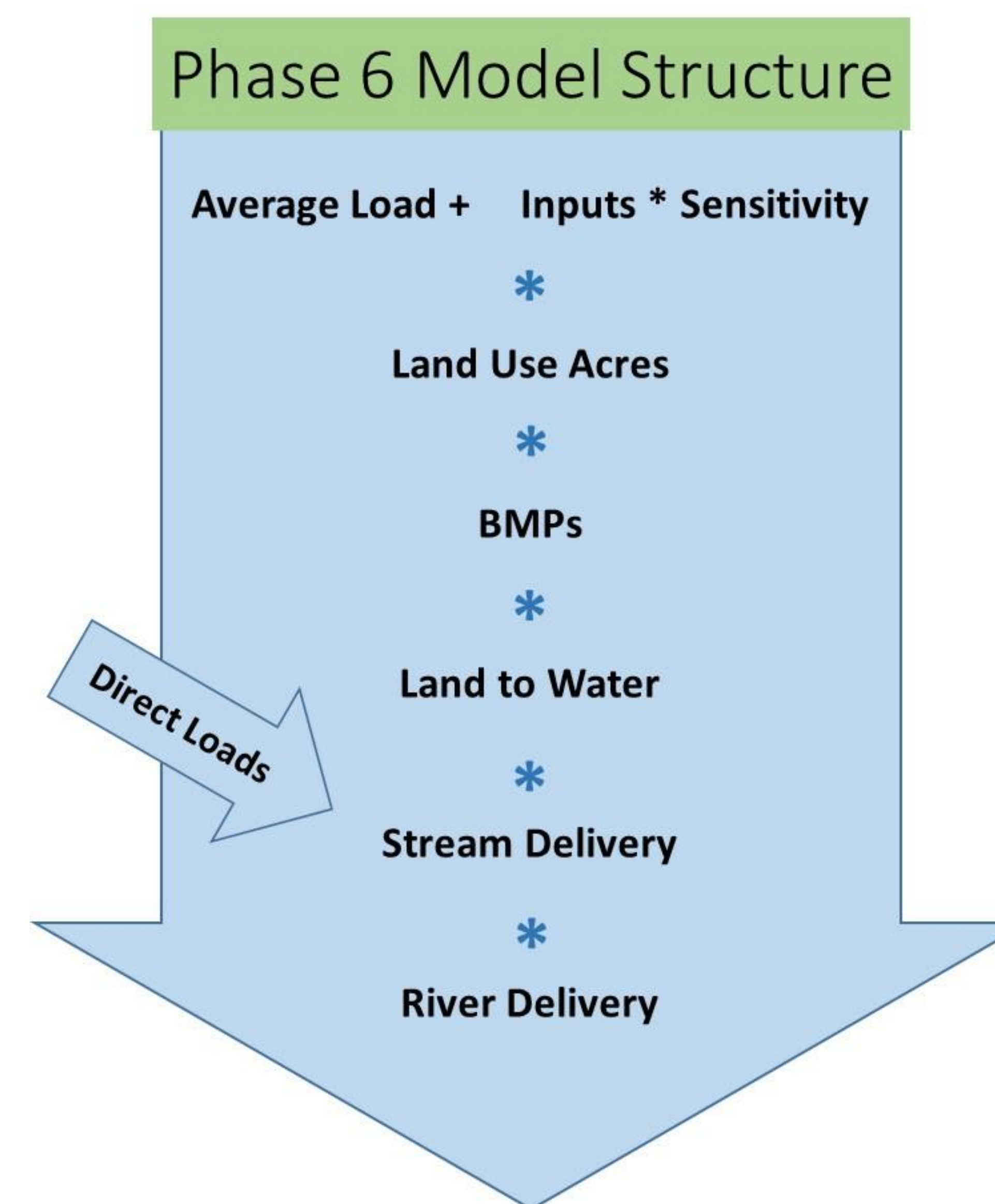
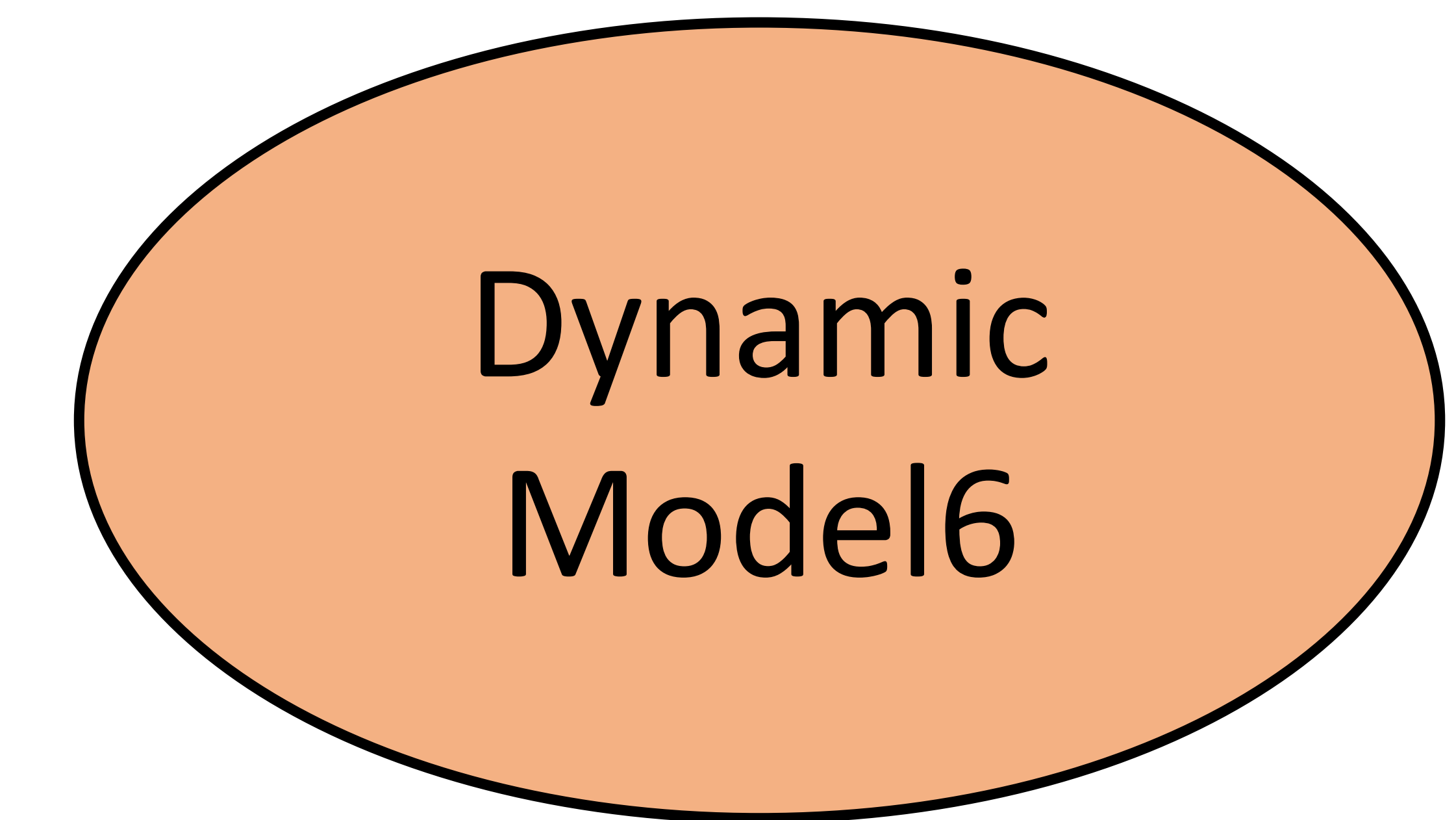
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CBP Phase 6 Model – Scenario Mode

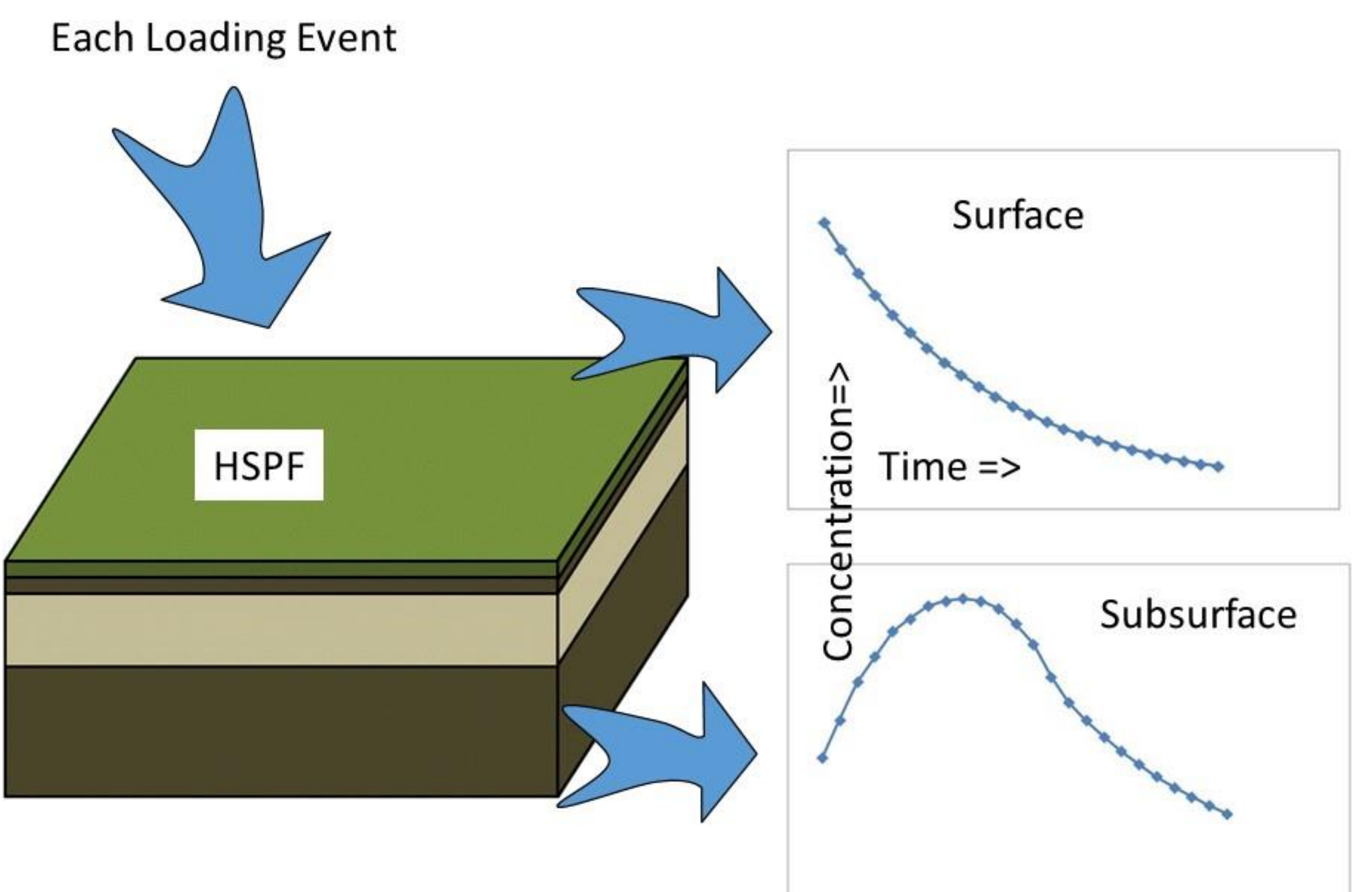
Land-river segment



Land-river segment



CAST determines CBP official scenario loads

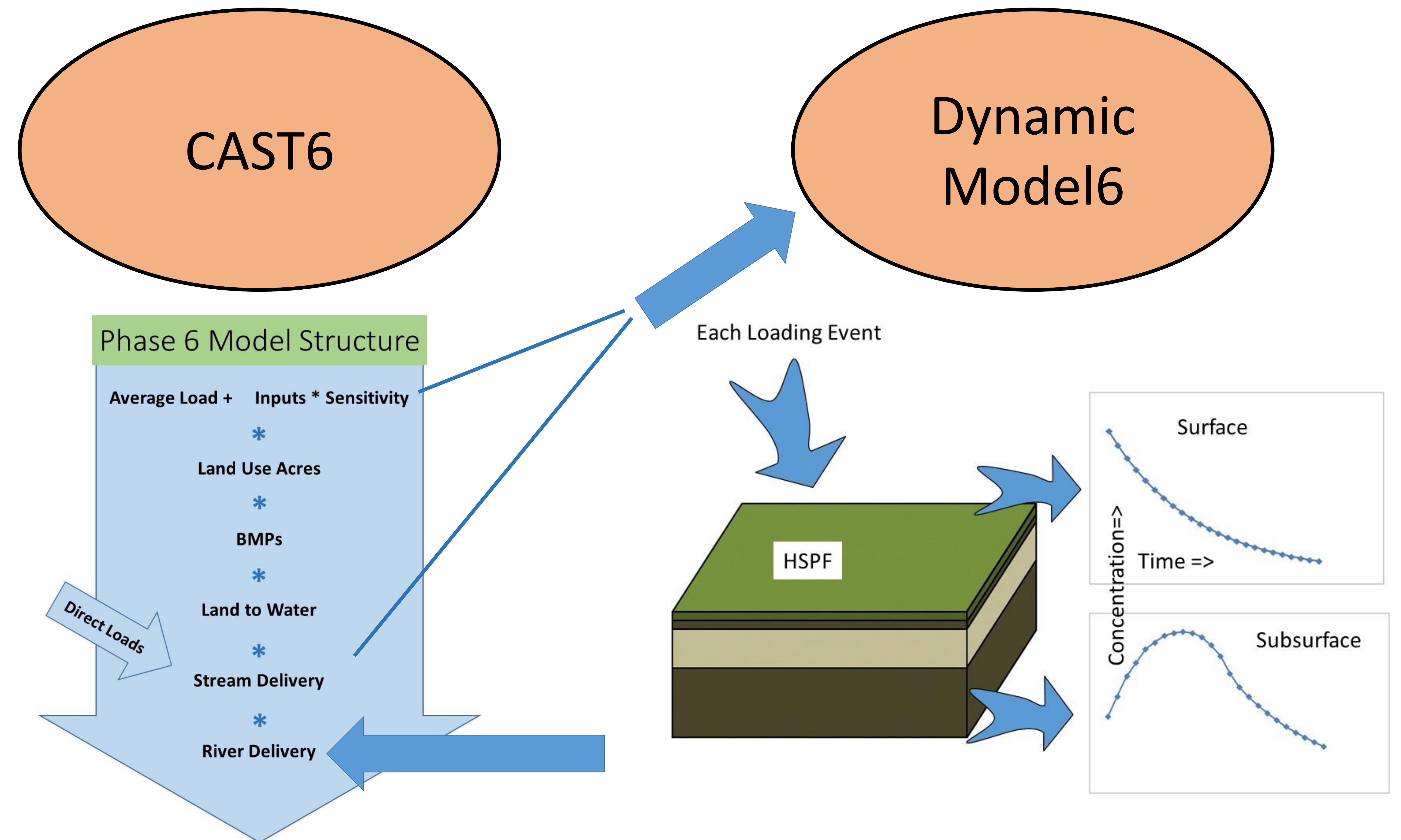


CAST loads are temporally disaggregated for estuarine model

CBP Phase 6 Model – Calibration Mode

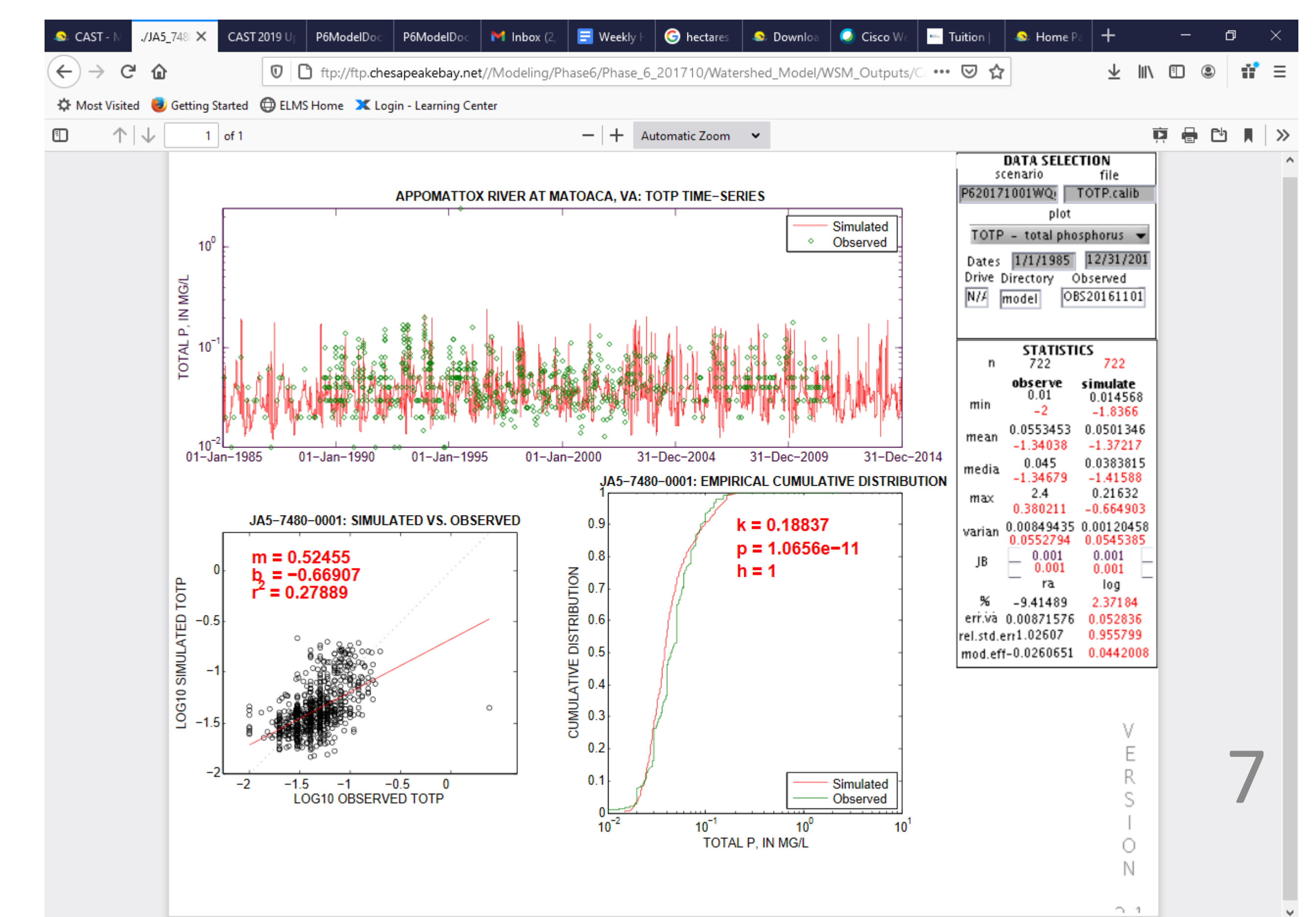
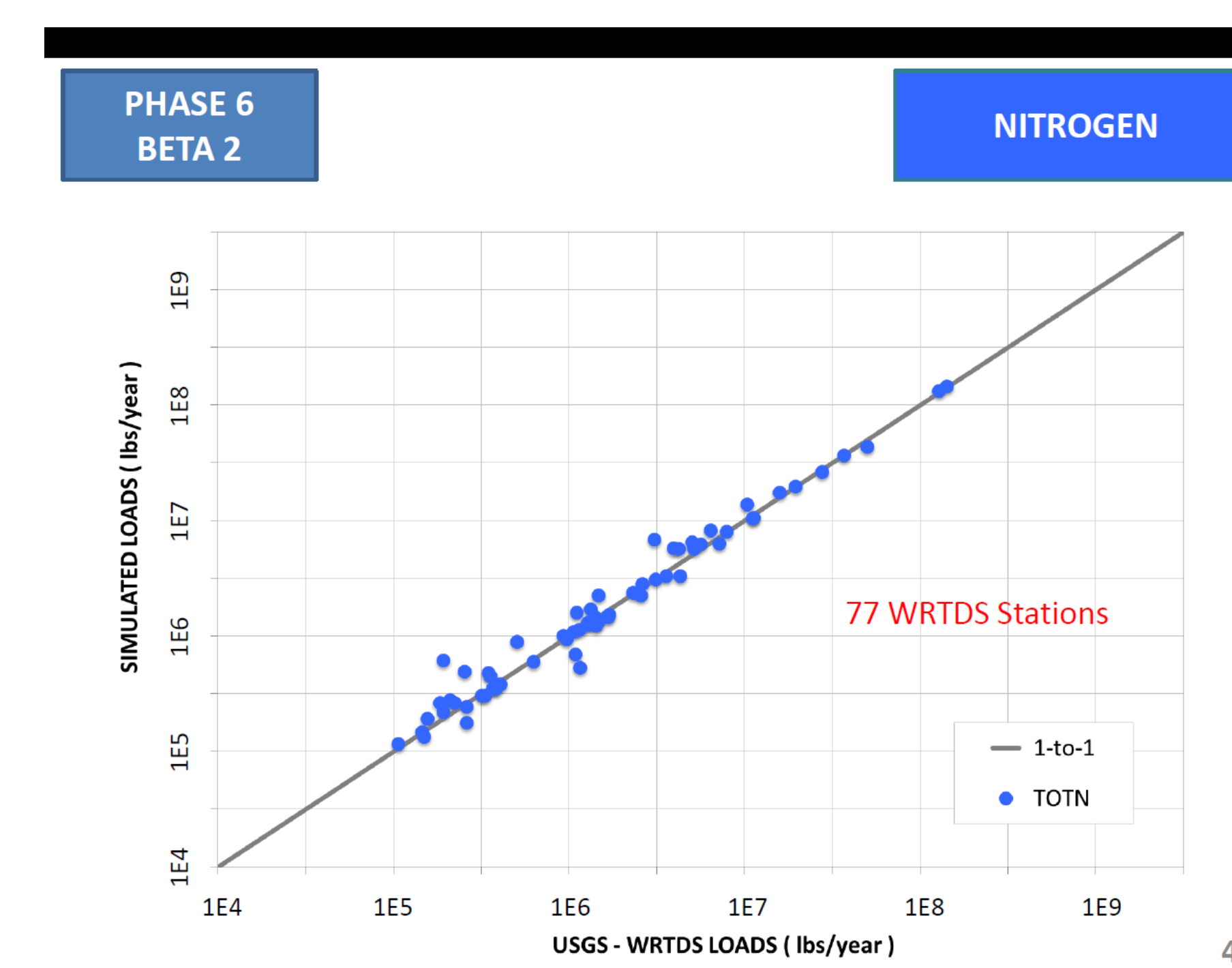
Land-river segment

Land-river segment

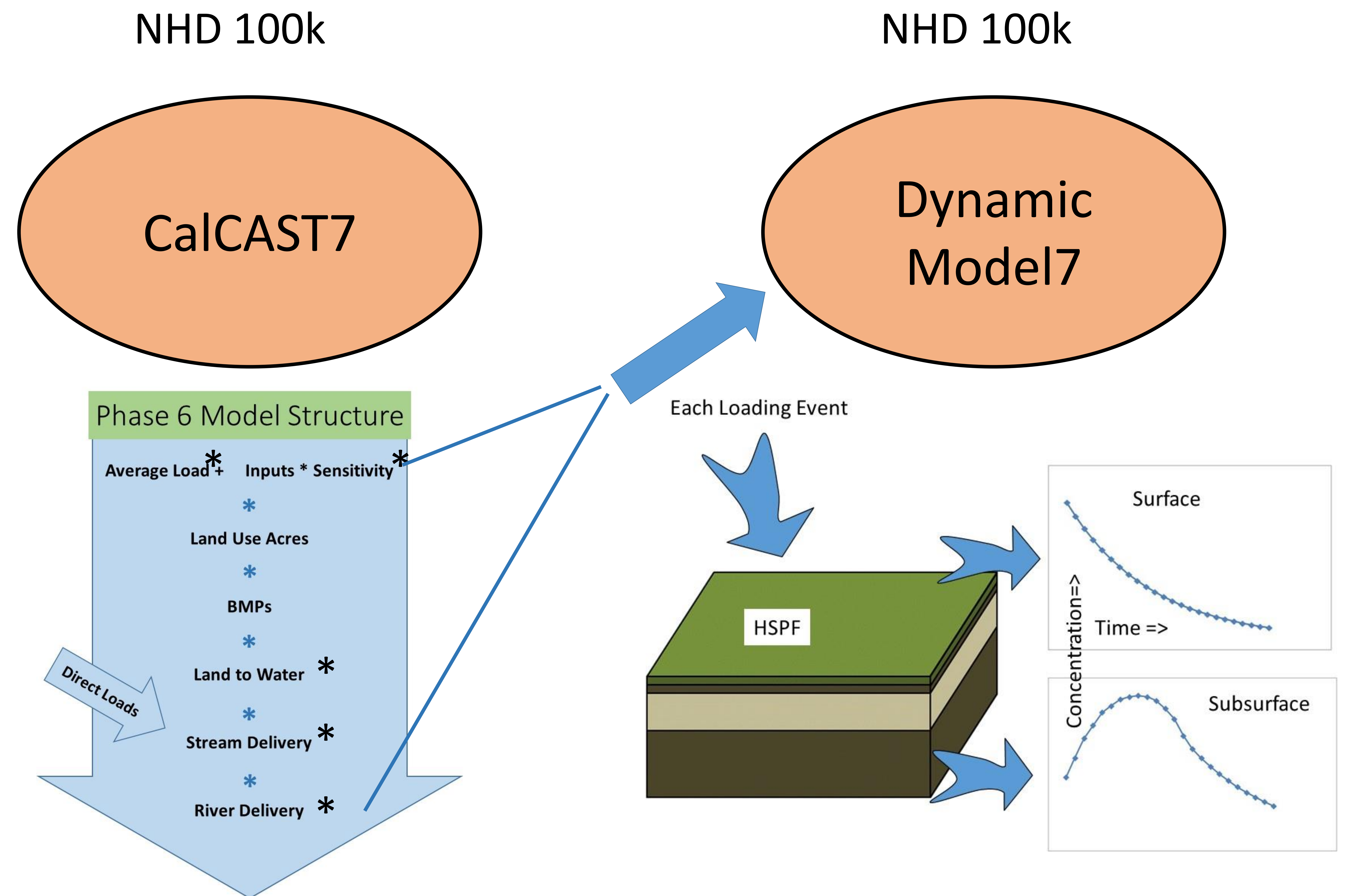


Competing data sets
(e.g. land to water)
are compared

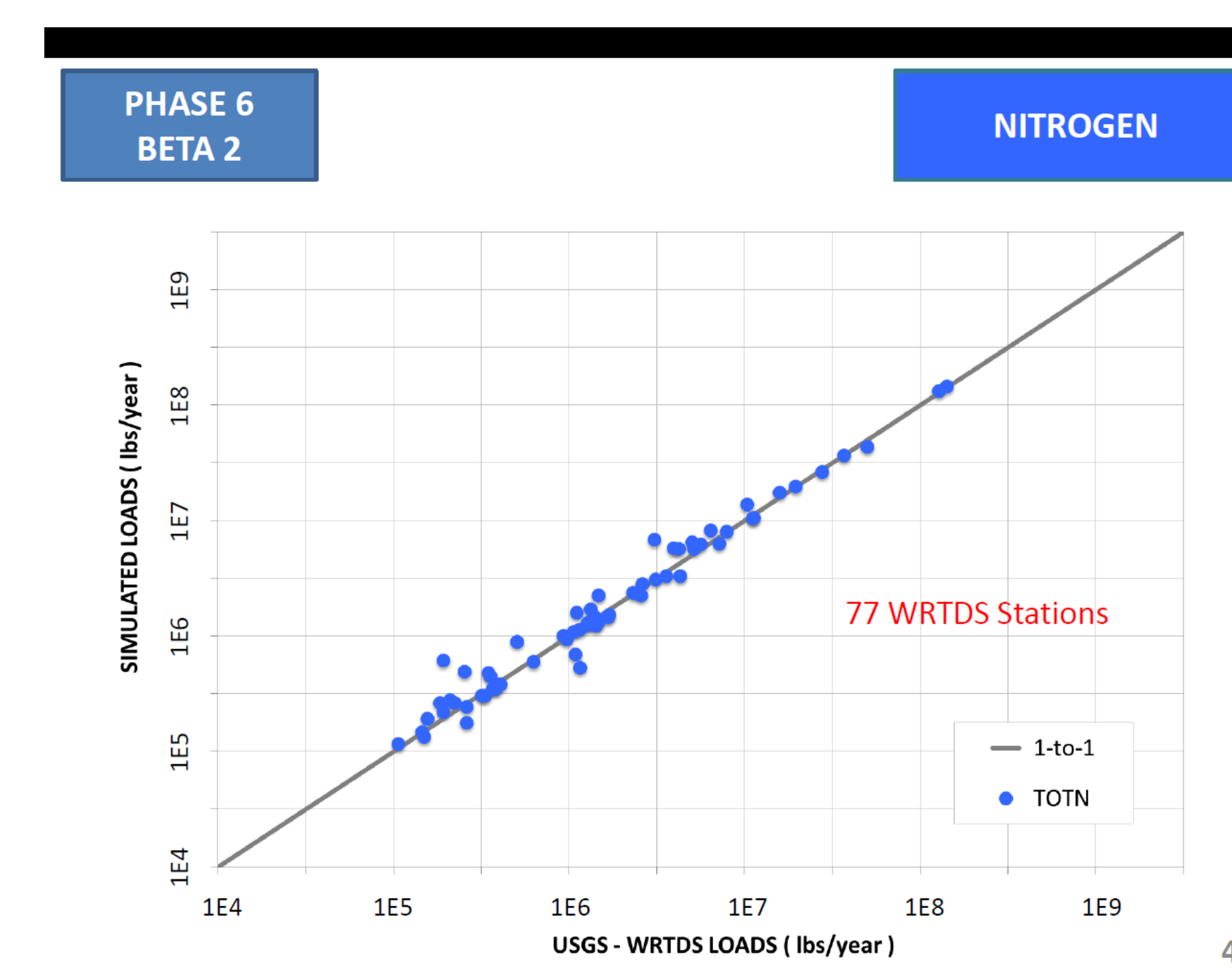
Temporal calibration



CBP Phase 7 Model – Calibration Mode

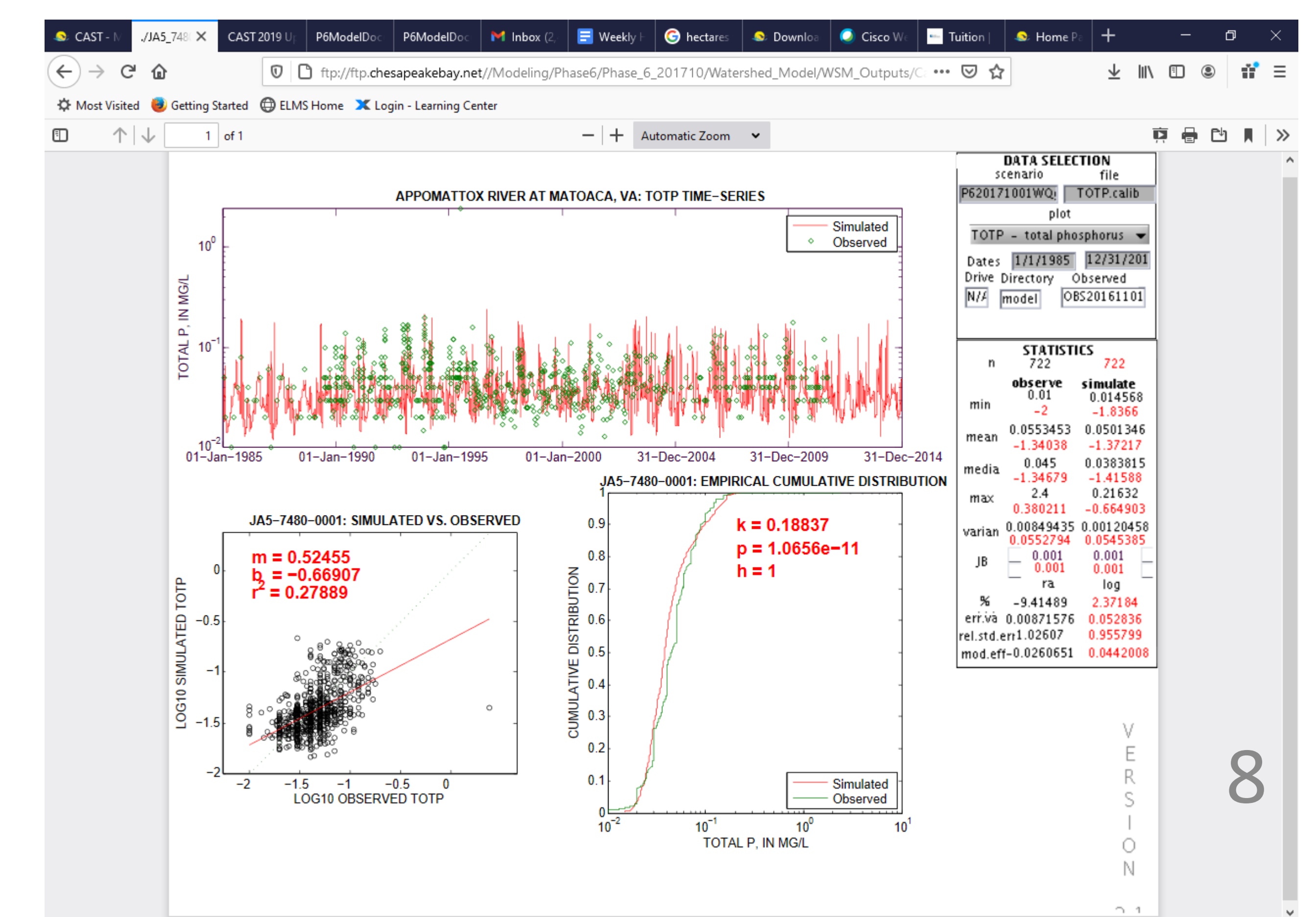


Calibration of meta-parameters to spatial loads



Potential feedback

Temporal calibration



CBP Phase 7 Model – Calibration Mode

10m pixel

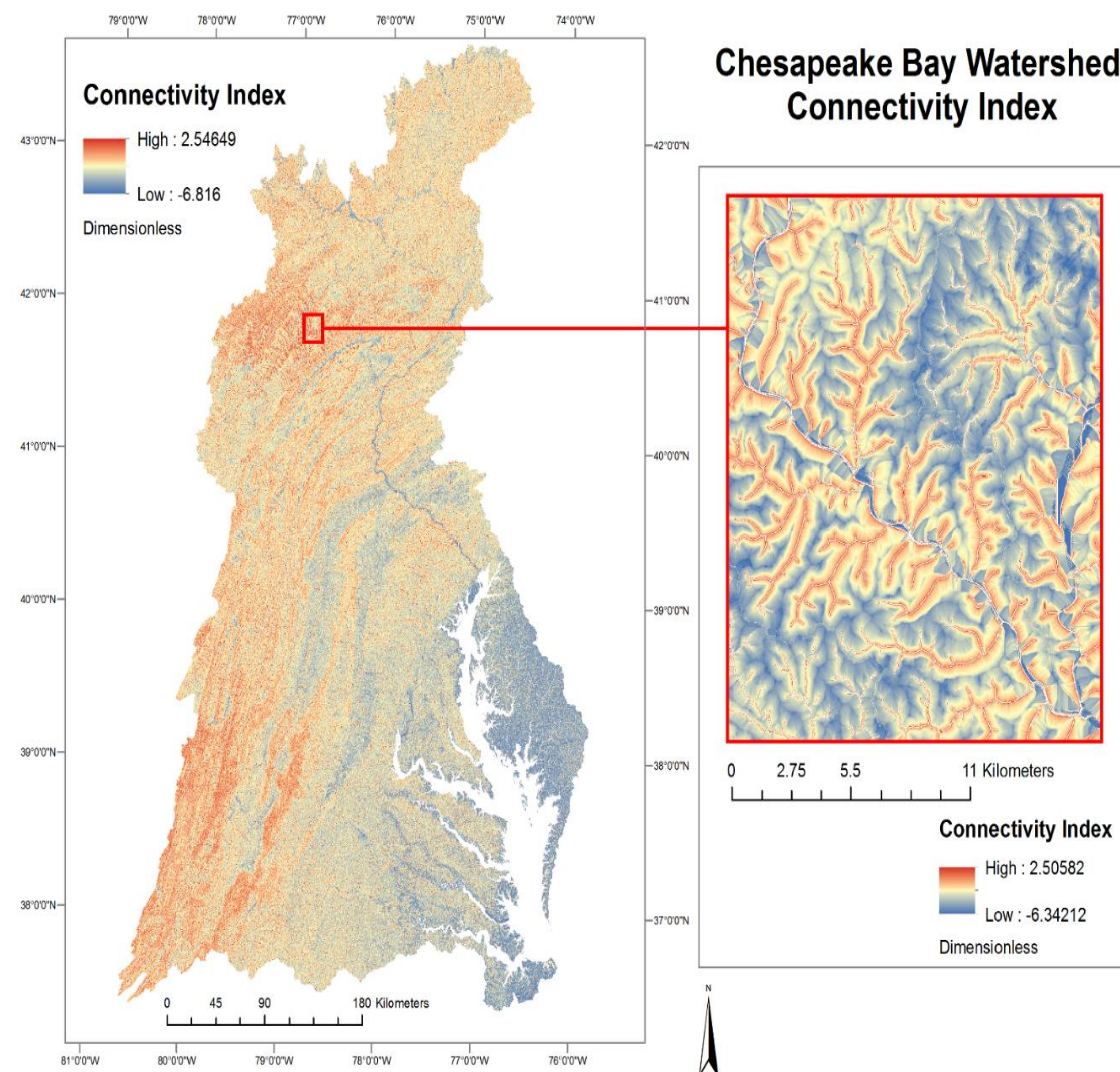
Distributed
Static
Model7

NHD 100k

CalCAST7

NHD 100k

Dynamic
Model7

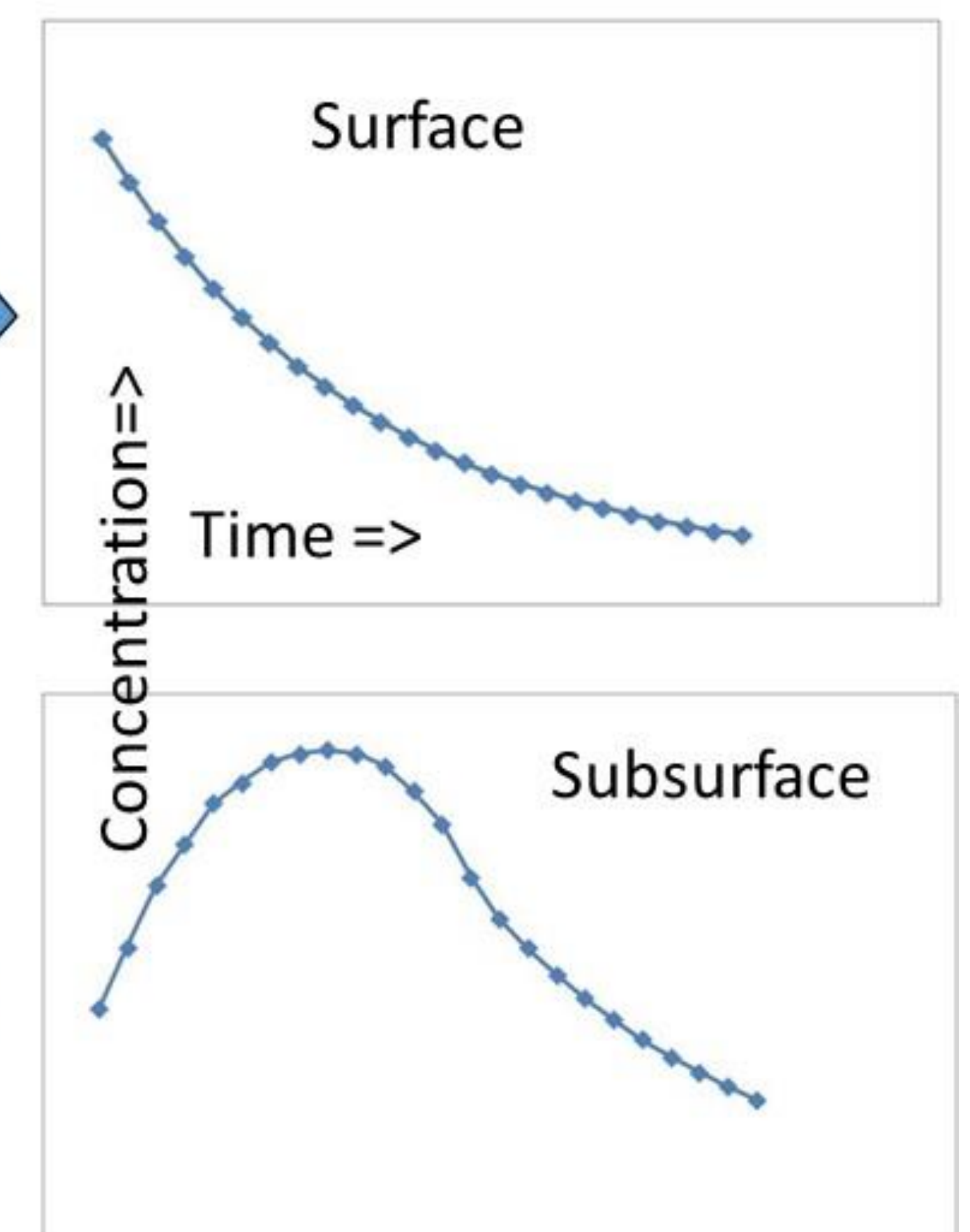
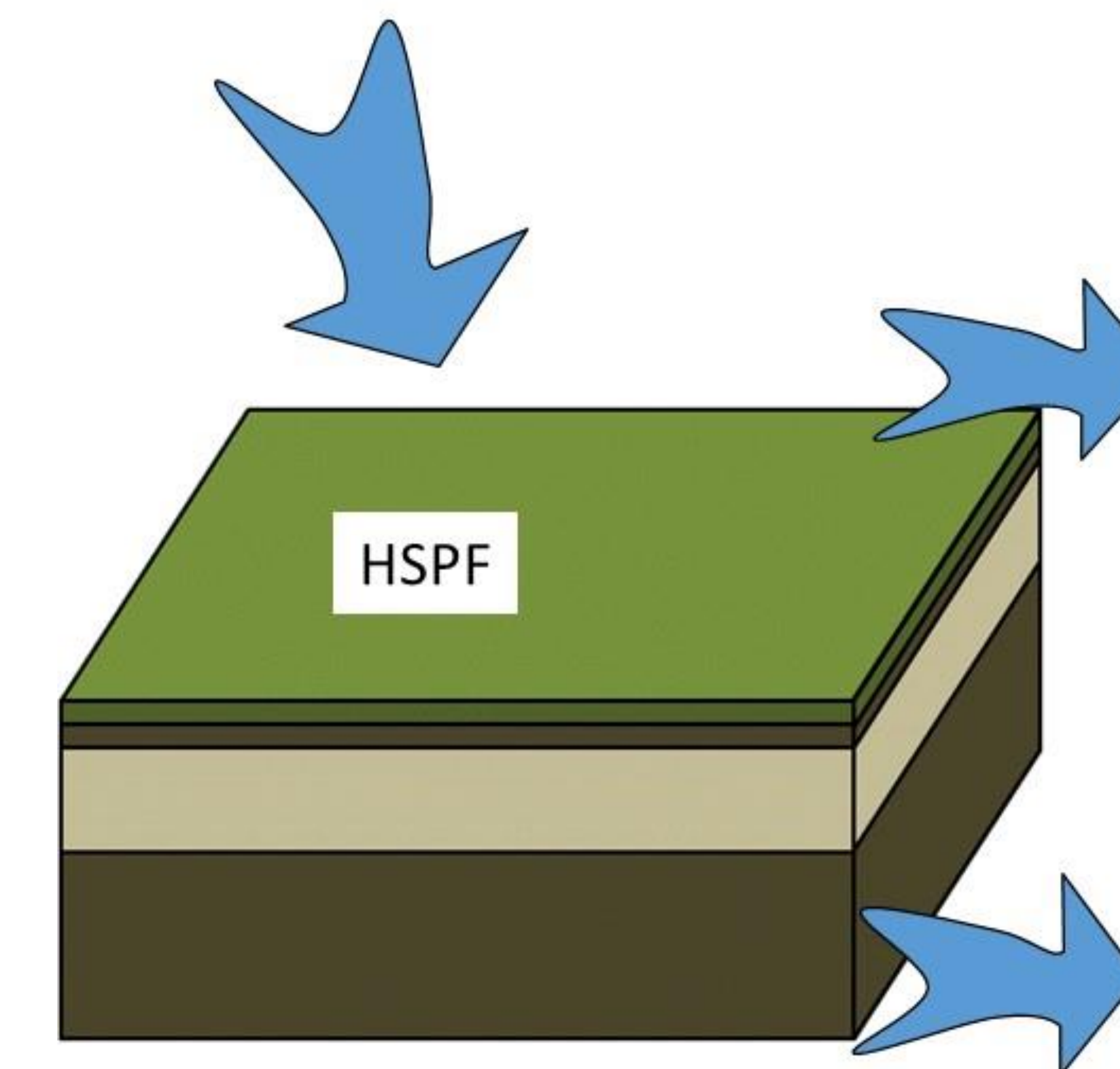


Phase 6 Model Structure

Average Load * Inputs * Sensitivity *
Land Use Acres
BMPs
Land to Water *
Stream Delivery *
River Delivery *

Direct Loads

Each Loading Event



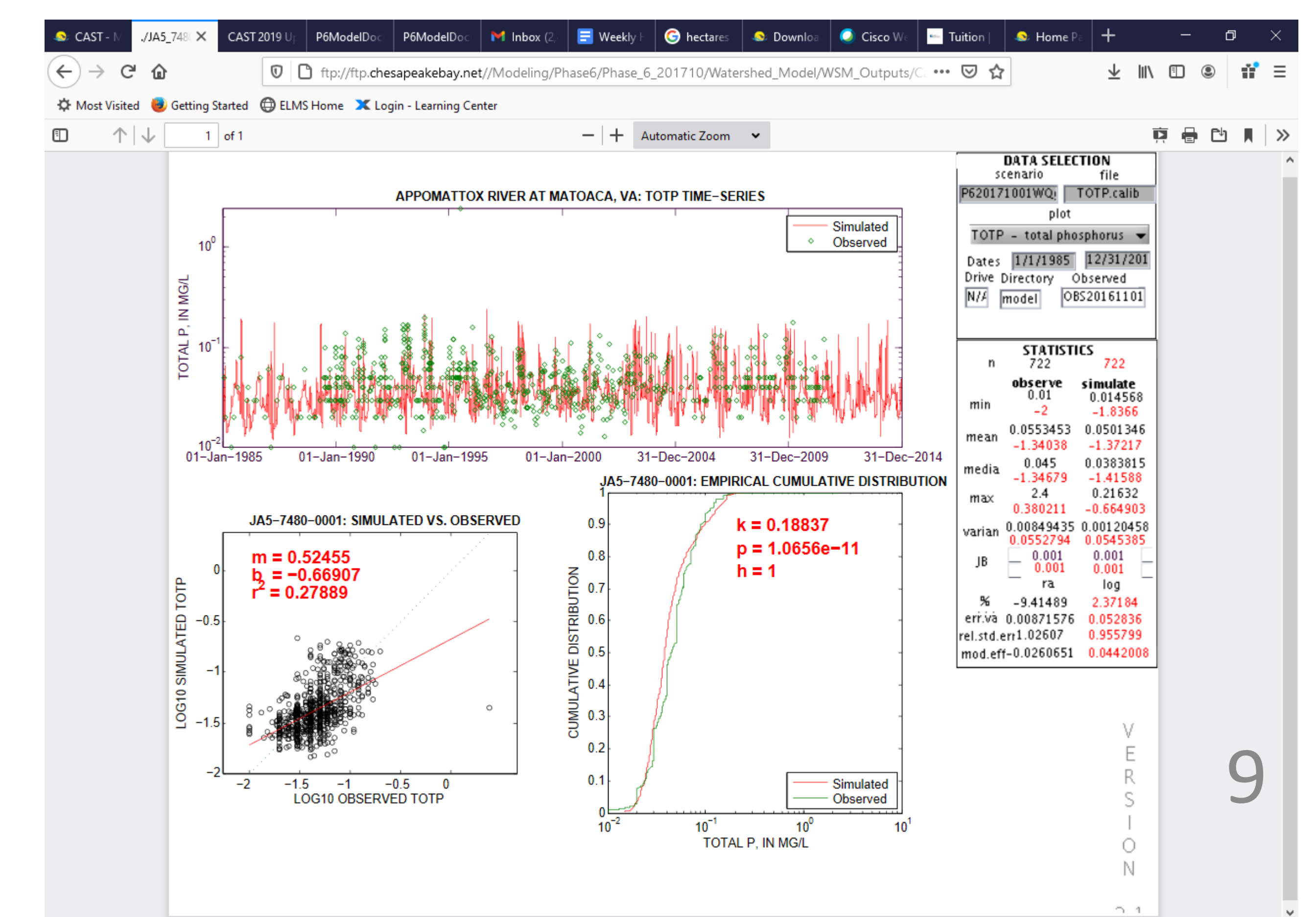
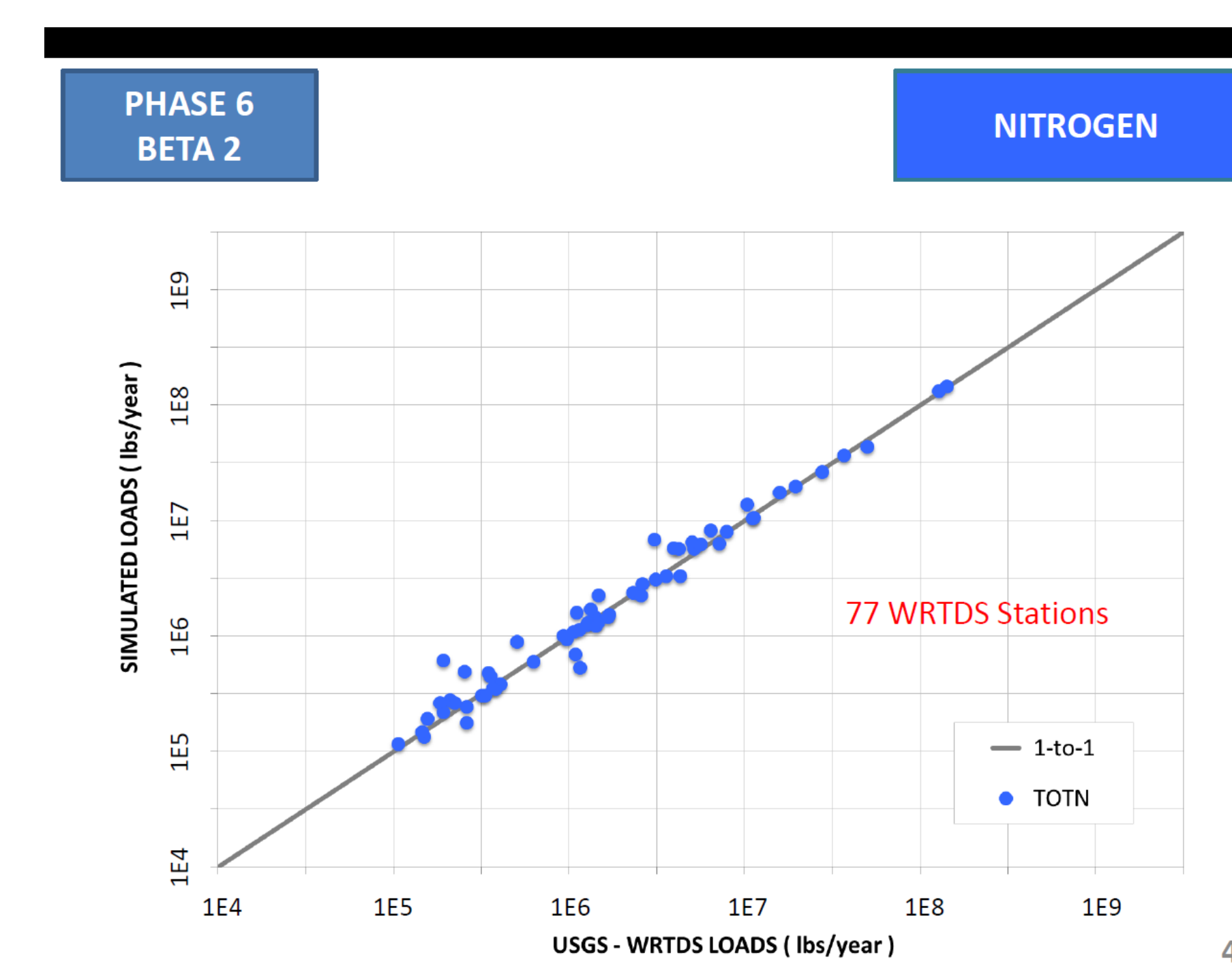
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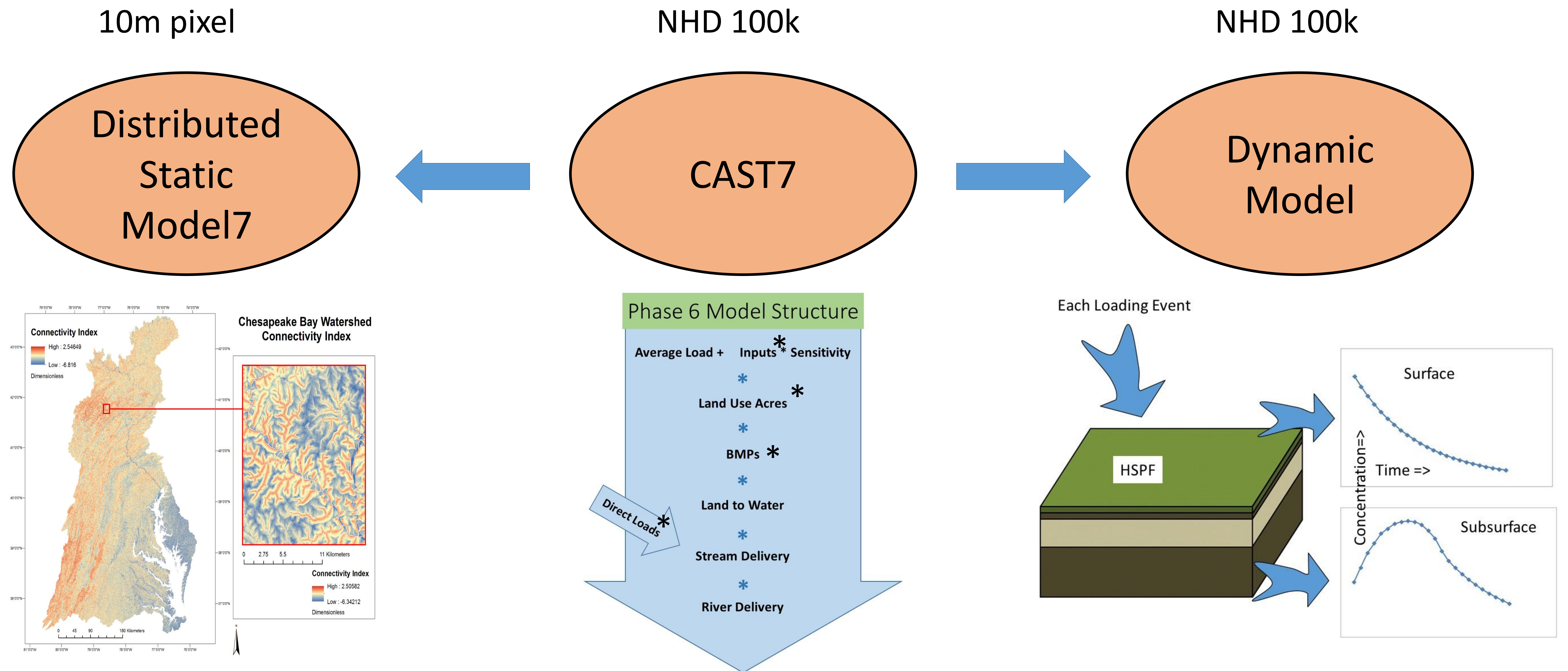
Generation of
summarized loading
parameters for flow,
N, P, and S

Potential
feedback

Potential
feedback



CBP Phase 7 Model – Scenario Mode



CAST loads can be
downscaled to finer
scale to apply
differential BMP
crediting

(if credible methods
are found)

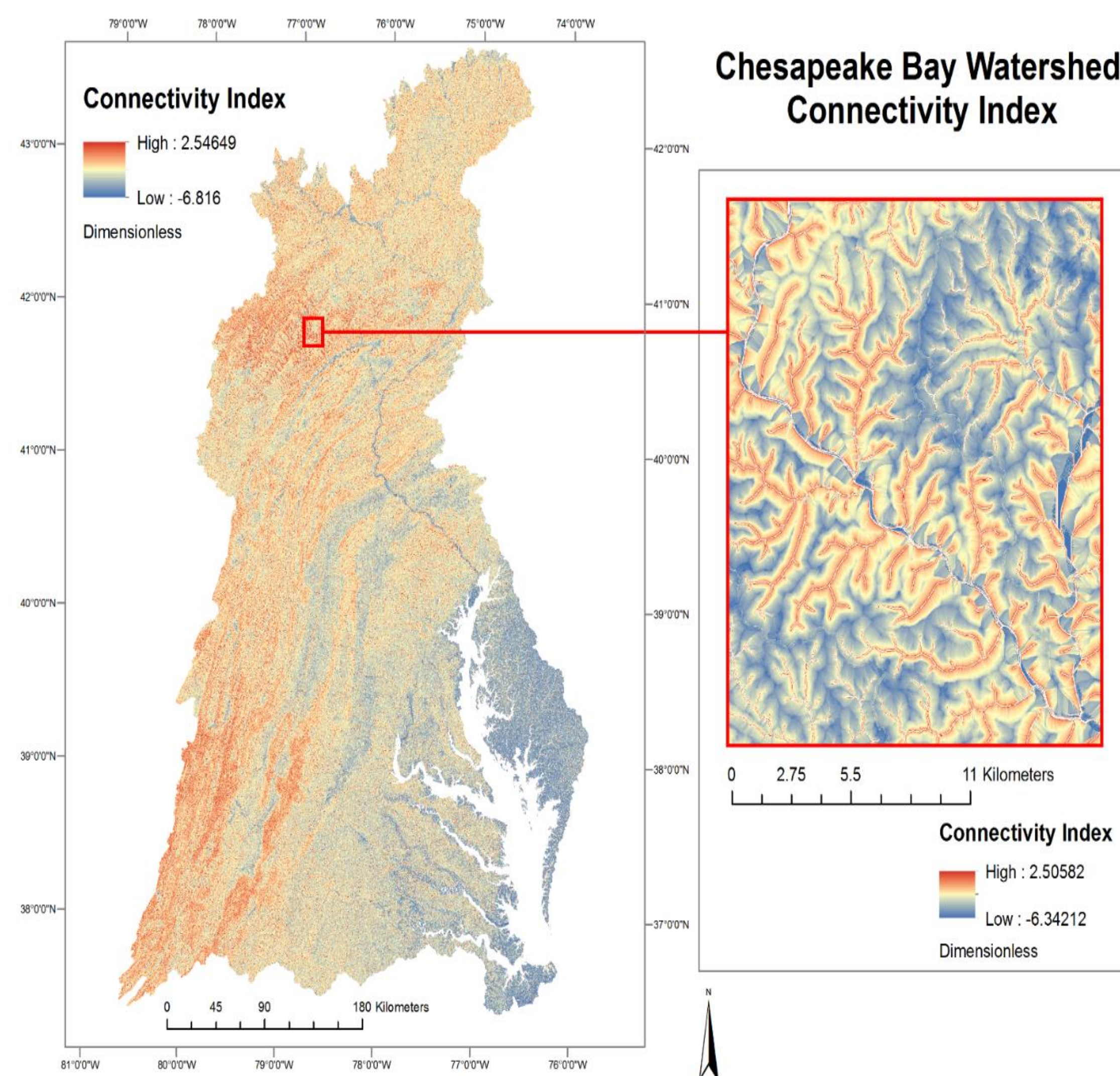
CAST determines CBP
official scenario loads

CAST loads are
temporally
disaggregated for
estuarine model

CBP Phase 7 Model – Who?

10m pixel

Distributed
Static
Model7



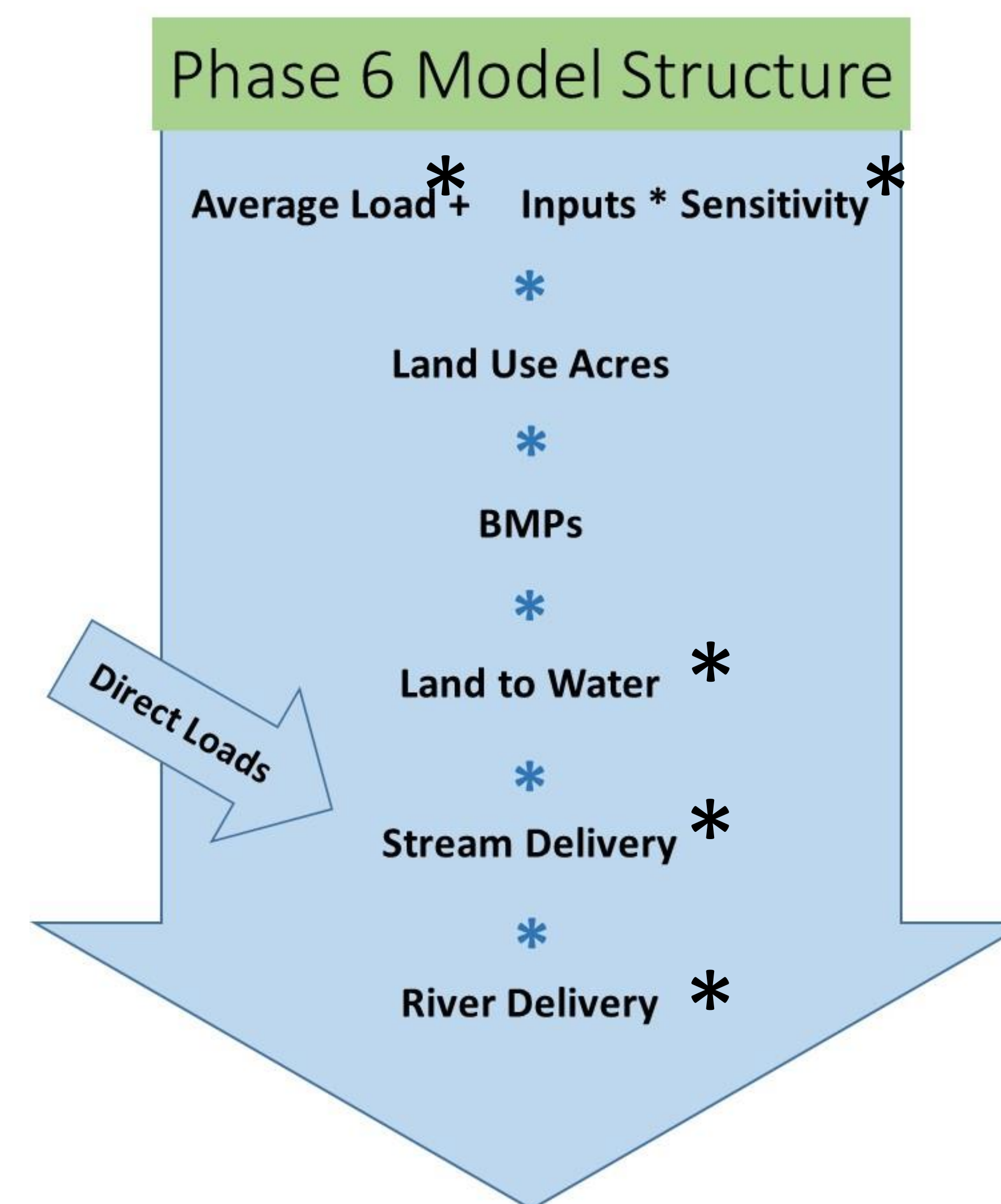
ORISE

Peter, Labeeb, Sarah

Isabella

NHD 100k

CalCAST7

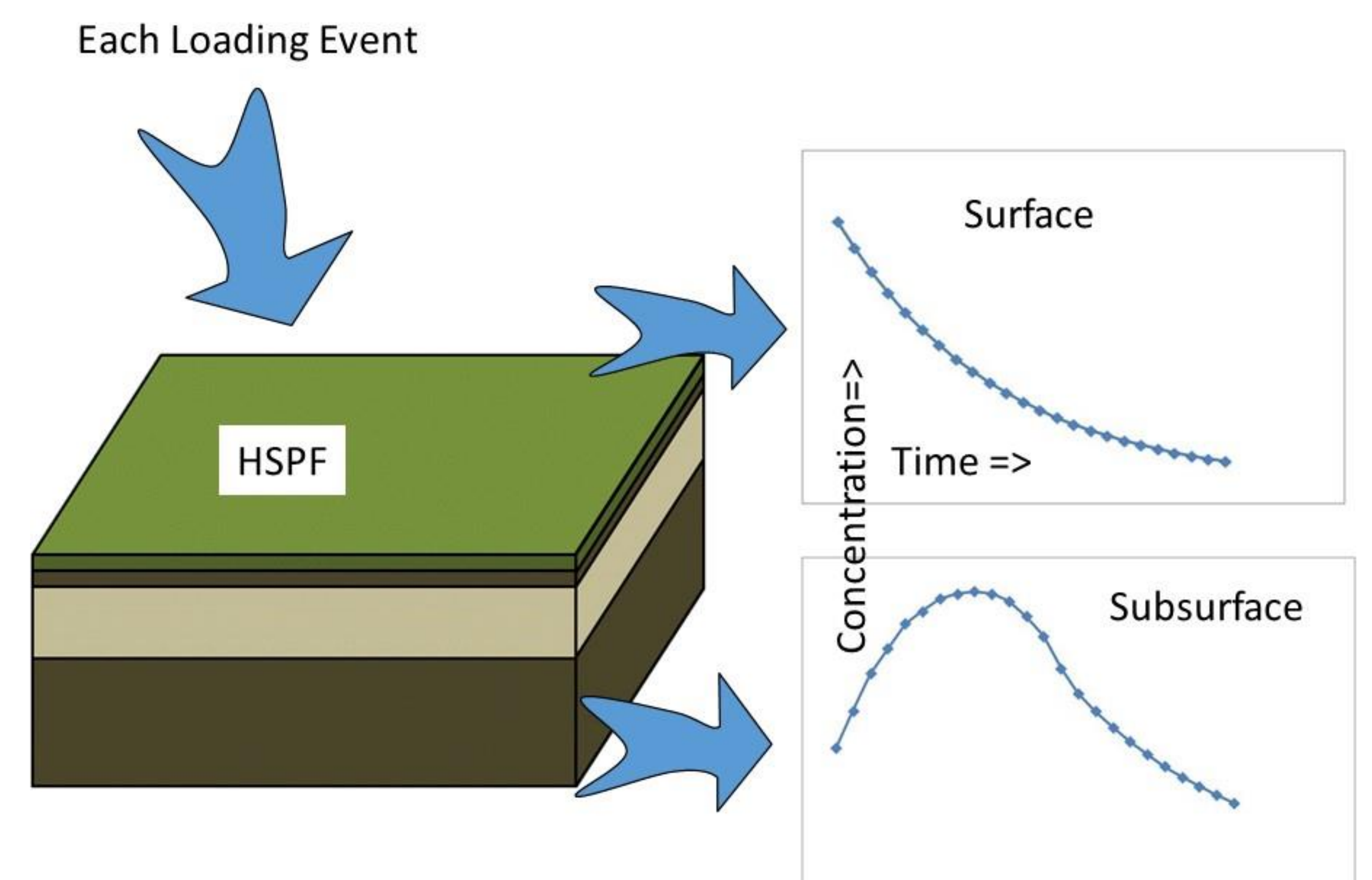


Gopal

Isabella

NHD 100k

Dynamic
Model7



Gopal

2021 2022
Hydrology
Sediment

- Inputs
- Structure

- Improvements

2022 2023
Nitrogen
Phosphorus

- Improvements
- Scale consistency

2024
Review
Refine

- STAC review
- Partnership review

- Refinements

2025
Apply

1. Reassess 2035 climate in 2025
2. Don't change planning targets until 2025

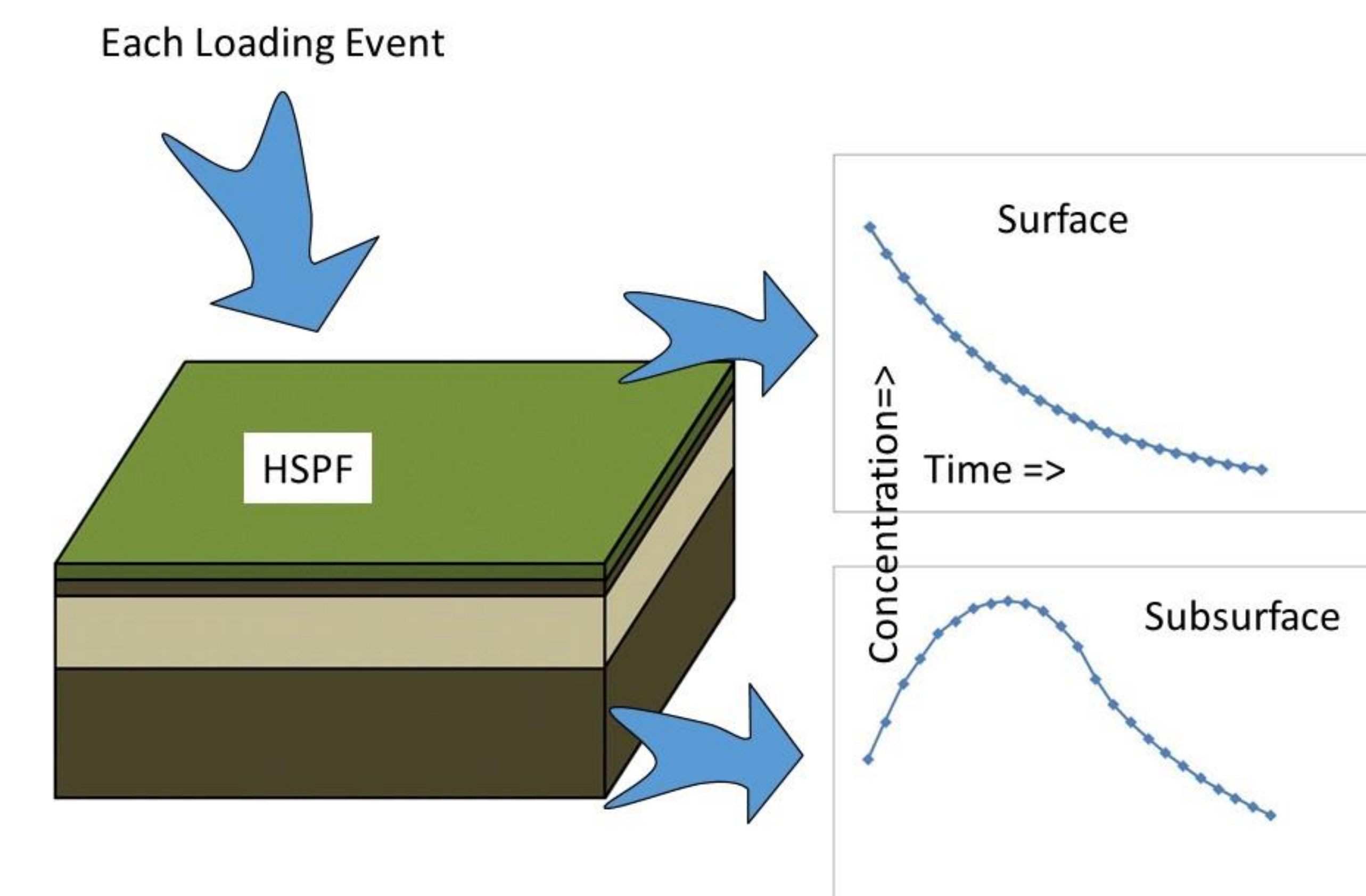
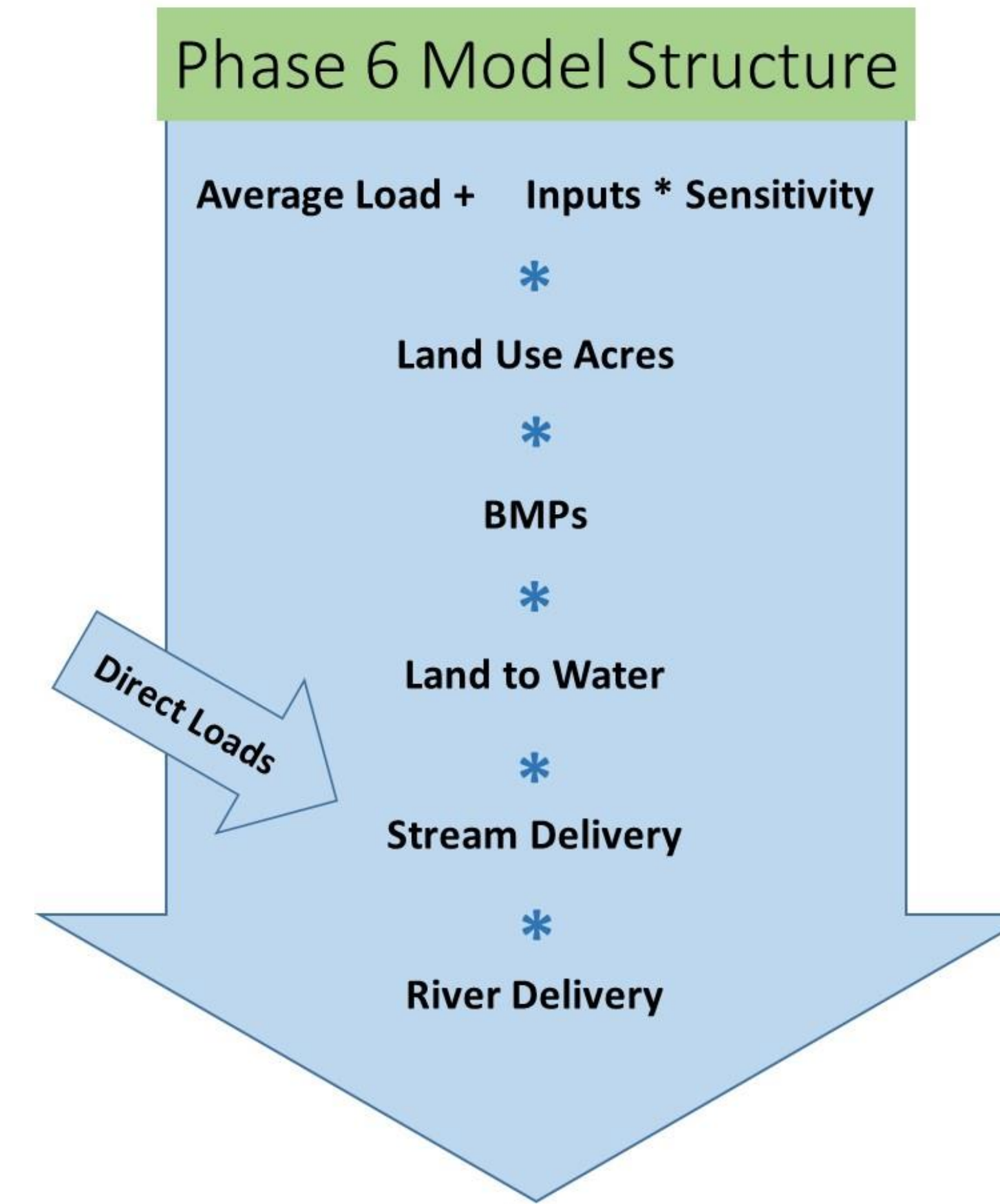
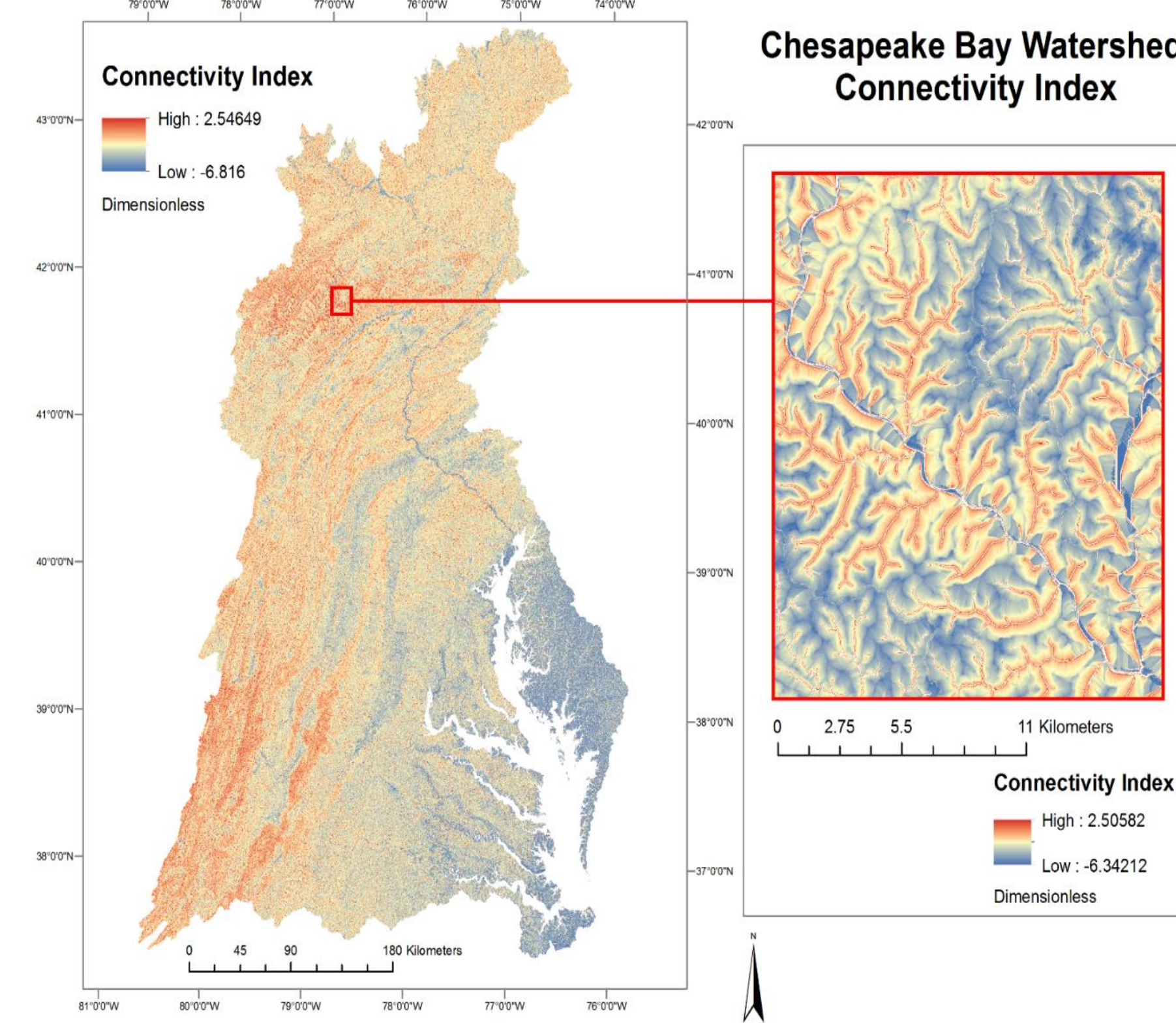
PSC
directives

2021
Hydrology

April

July

October



- NHD
- Data issues
- Database Structure
- “On the graph paper”

- Small-scale hydrologic feature effects on hydrograph

- Representation of flow at NHD scale
- Simulation of flow at river segment scale

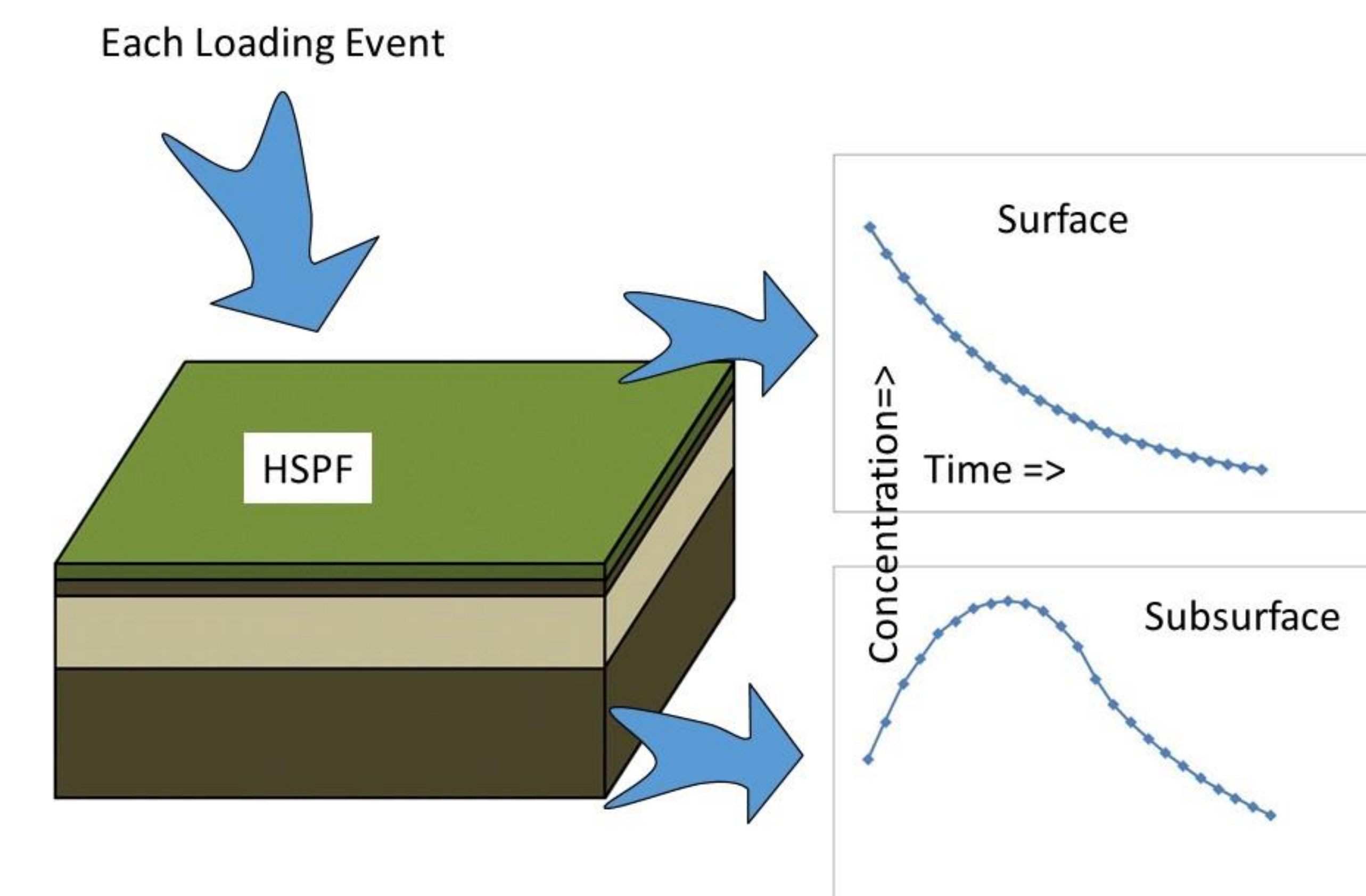
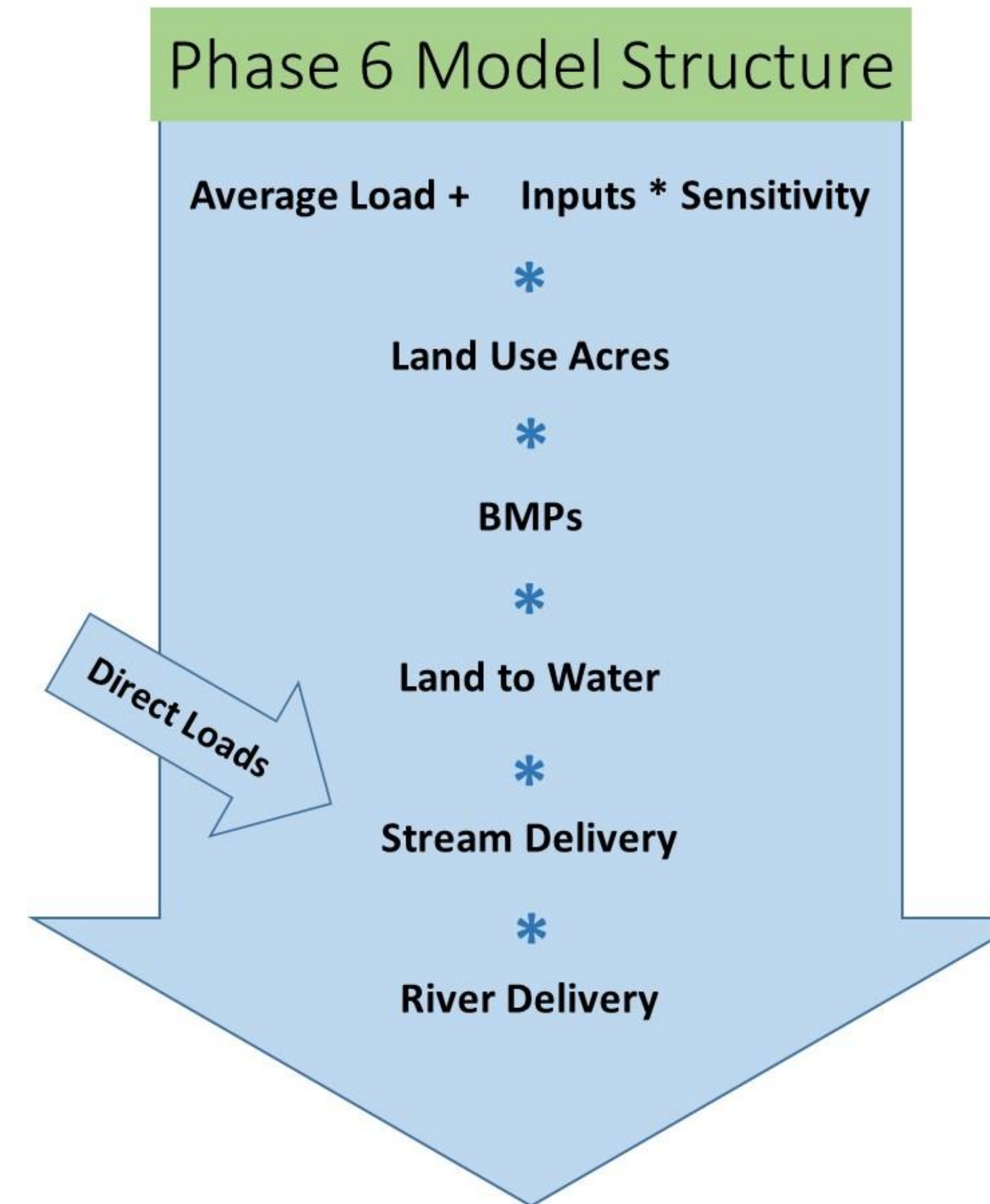
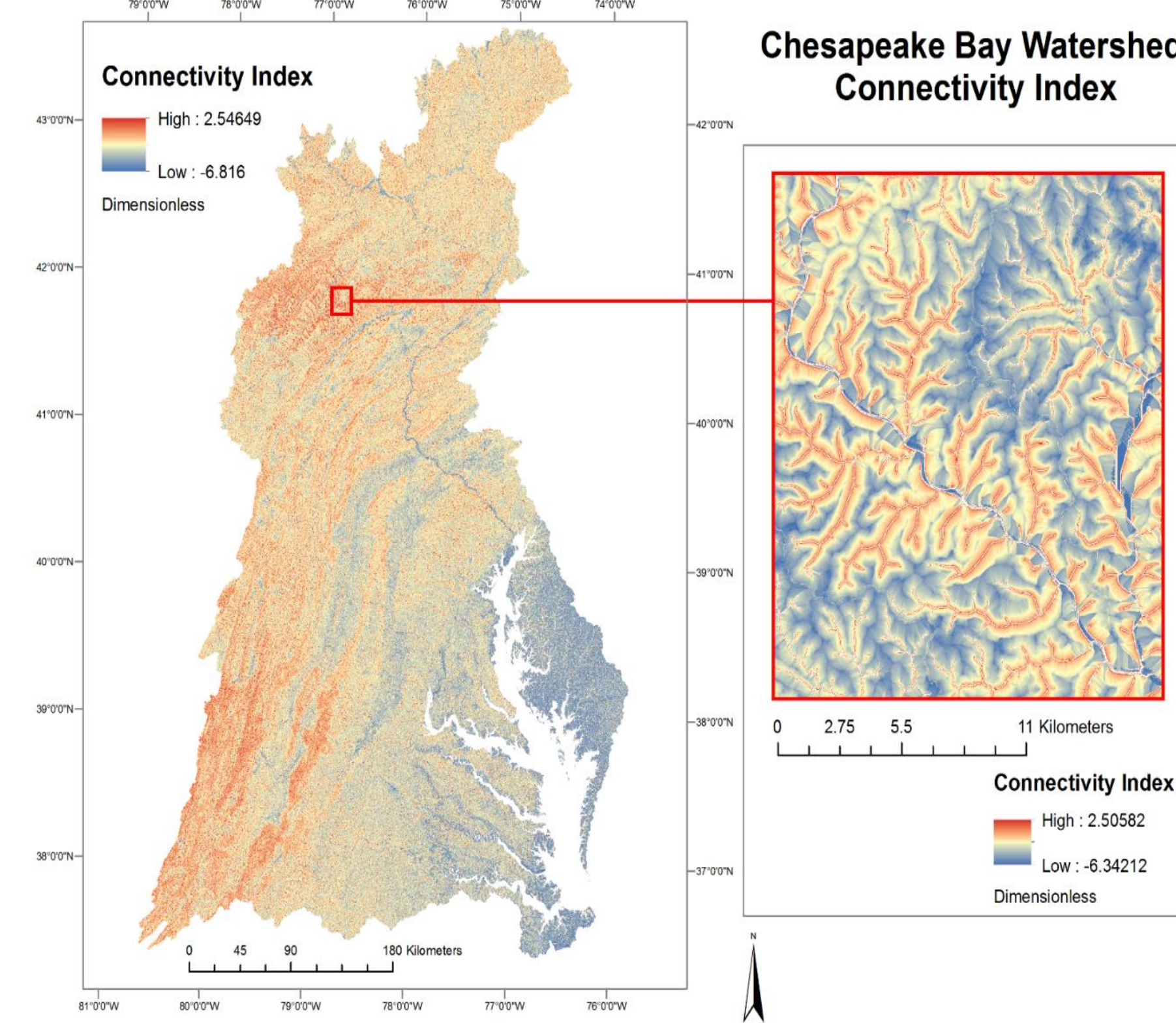
- Reasonable, consistent 3-phase hydrologic simulation

2021-2022
Sediment

October

January

April



- RUSLE recalculation
- Interconnectivity metric
- Pond influence

- Stream/Floodplain
- Calibration to long-term loads

- Dynamic simulation
- Calibration to grab samples

- Reasonable, consistent 3-phase sediment simulation

2021 2022
Hydrology
Sediment

2022 2023
Nitrogen
Phosphorus

2024
Review
Refine

2025
Apply

- WQGIT gives priorities

- Climate change
- Scale
- Uncertainty
- Something else?

1. Reassess 2035 climate in 2025
2. Don't change planning targets until 2025

PSC
directives

CBP Phase 7 Model – Calibration Mode

10m pixel

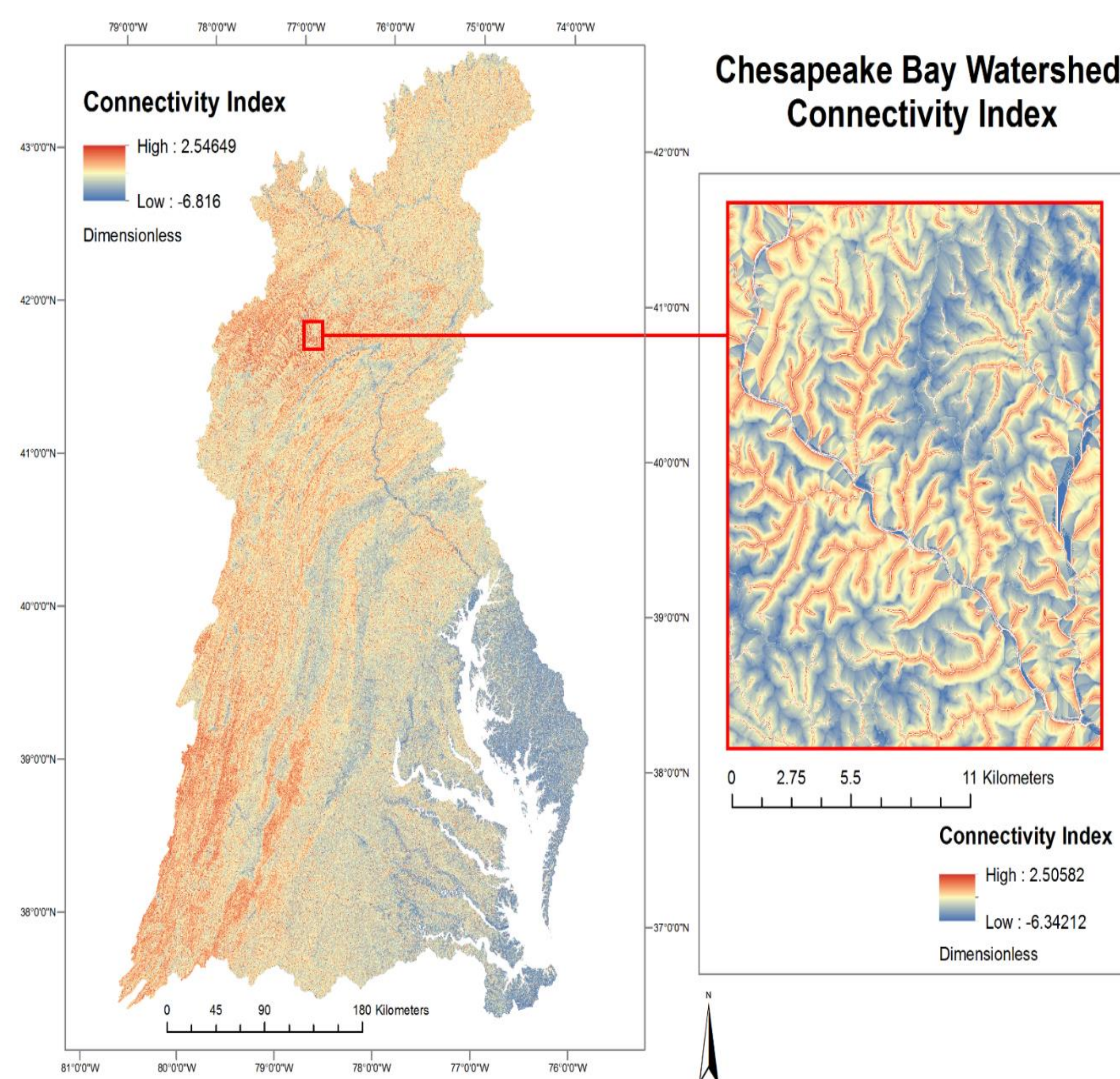
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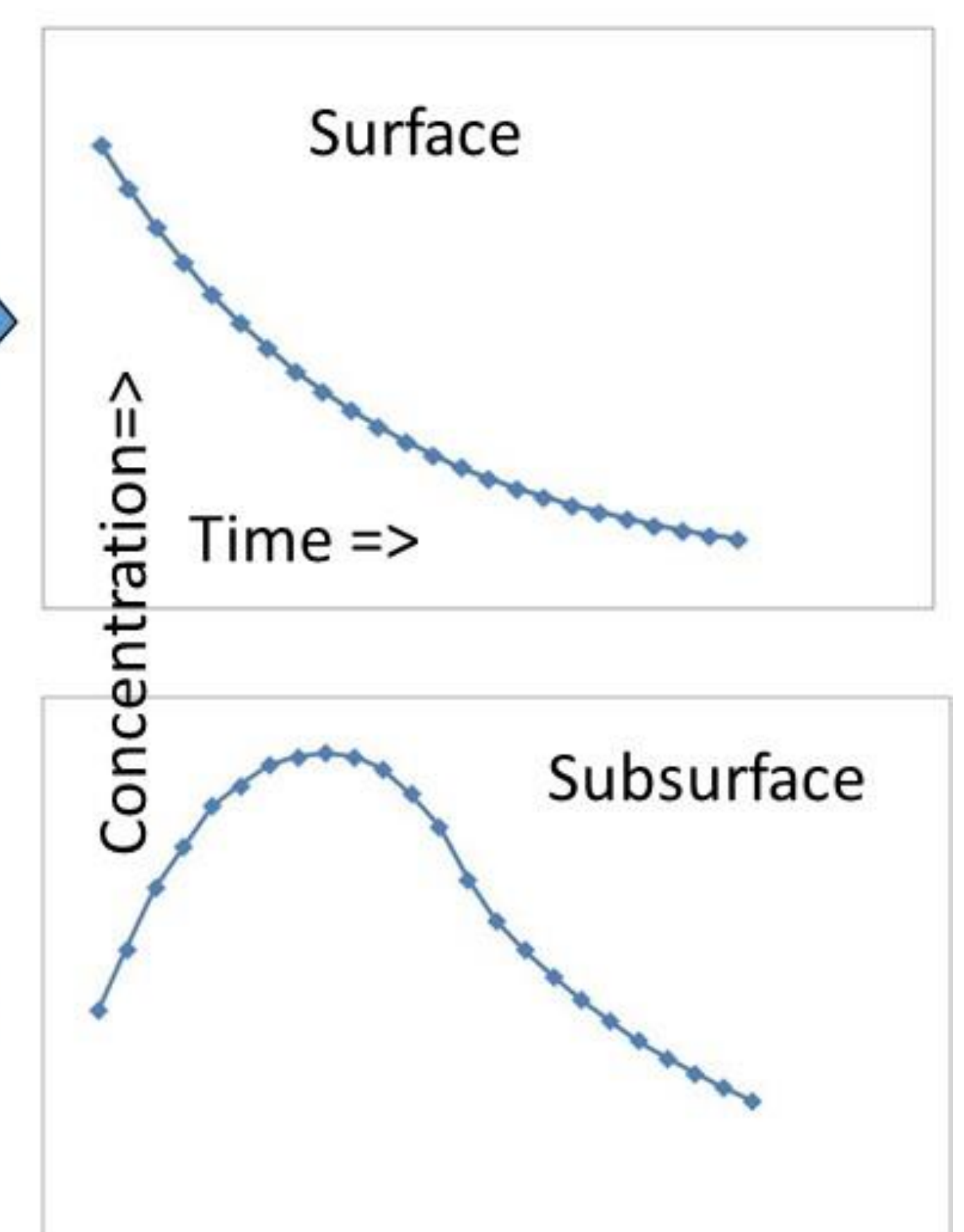
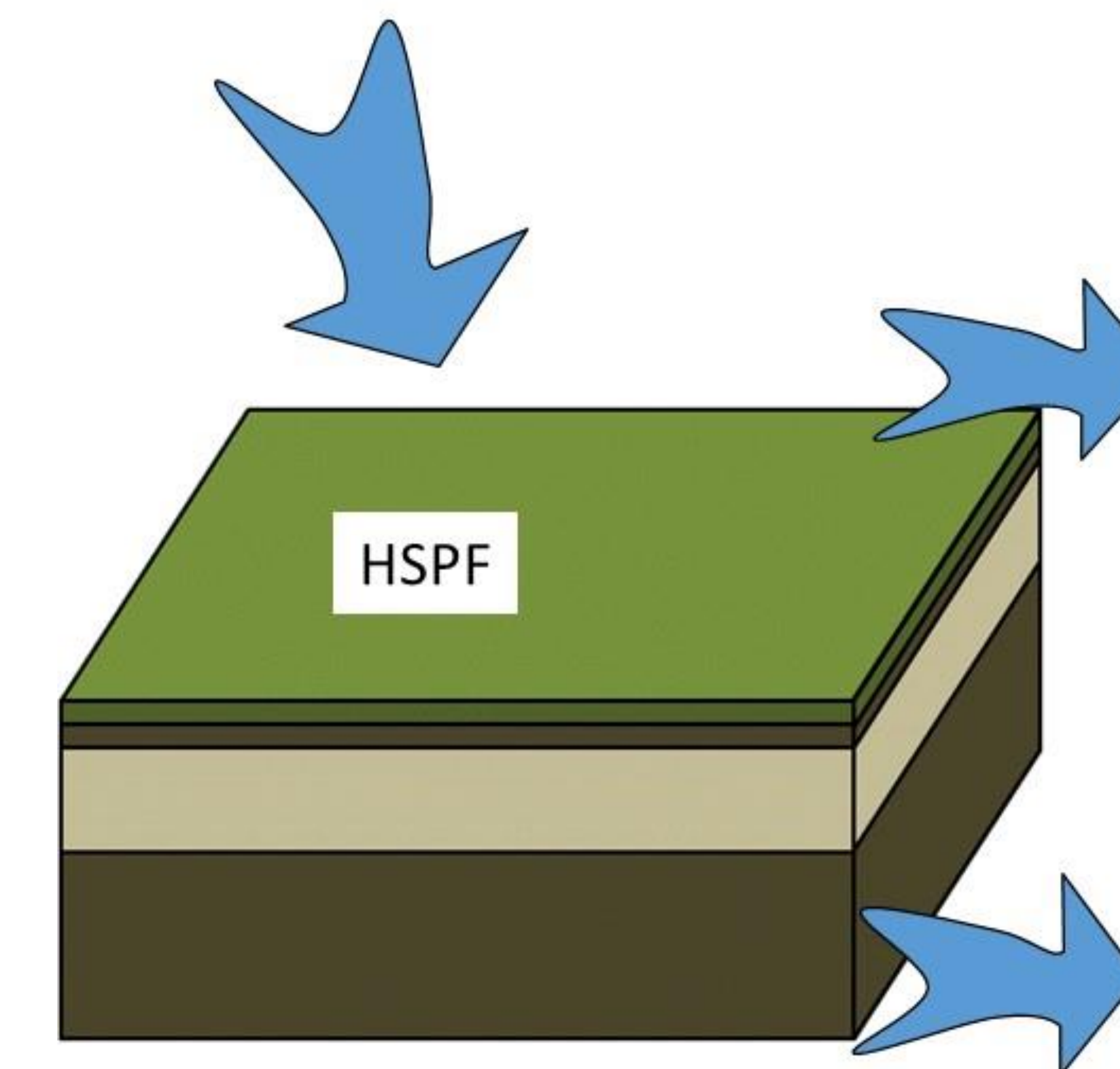


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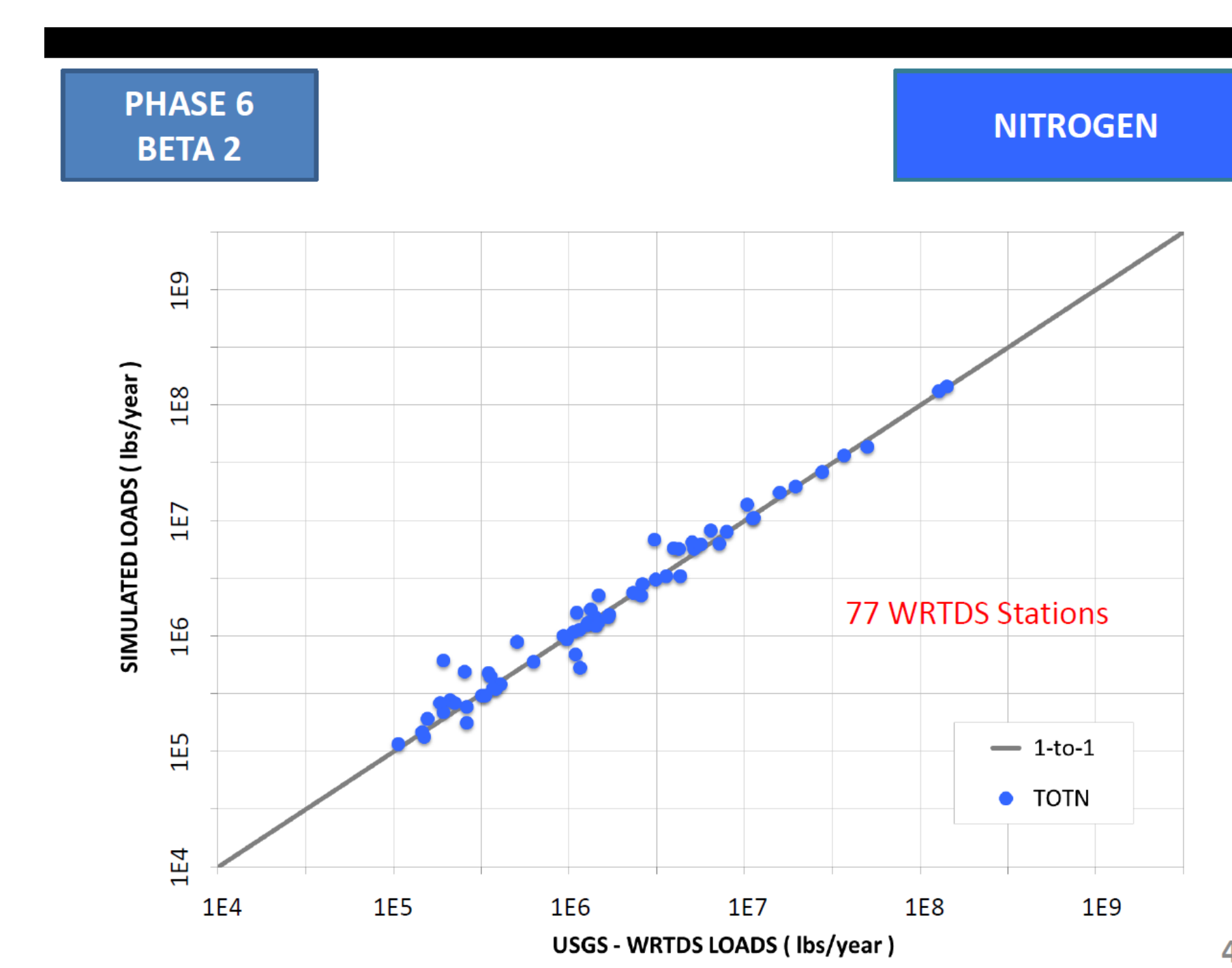


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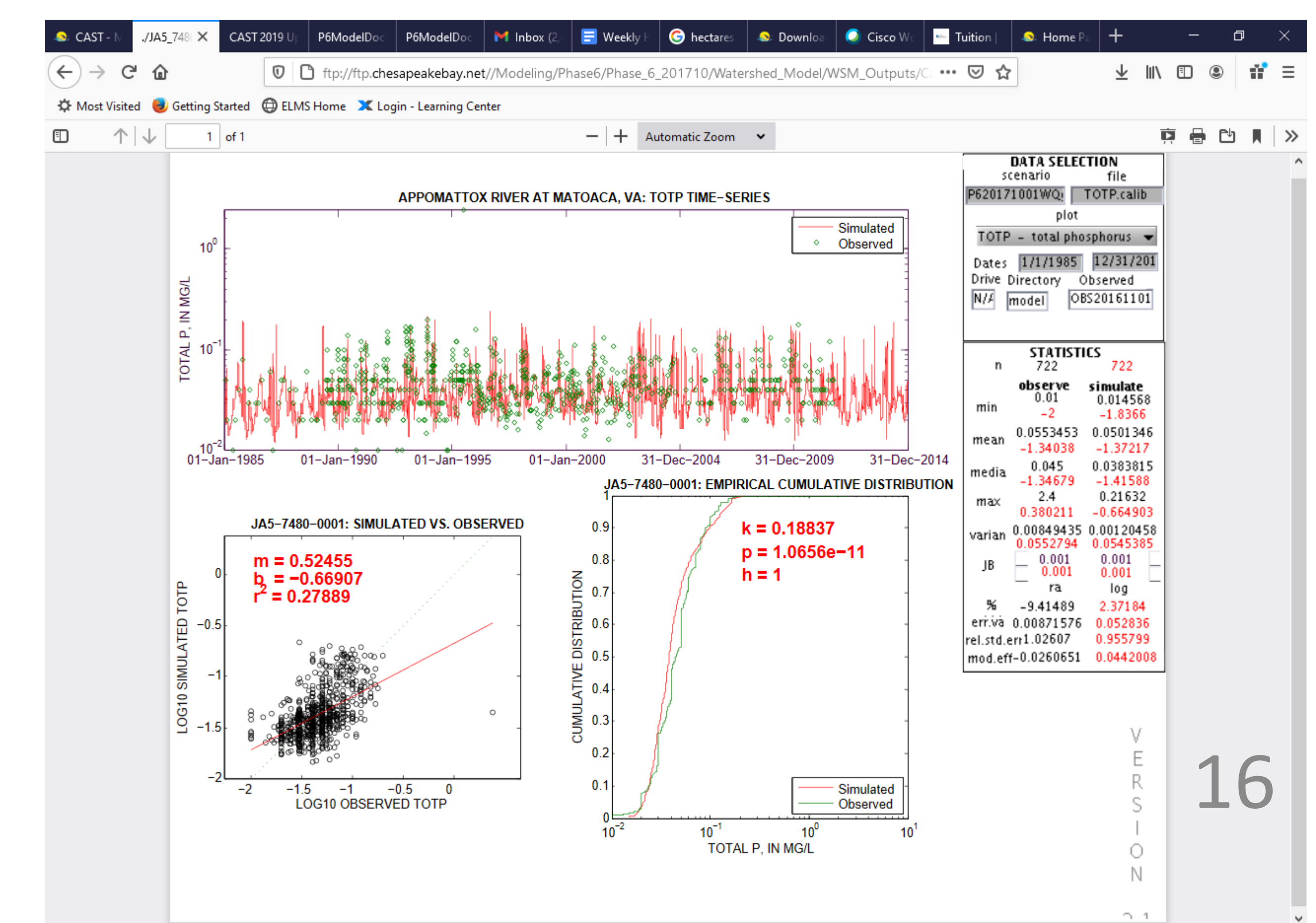
Temporal calibration

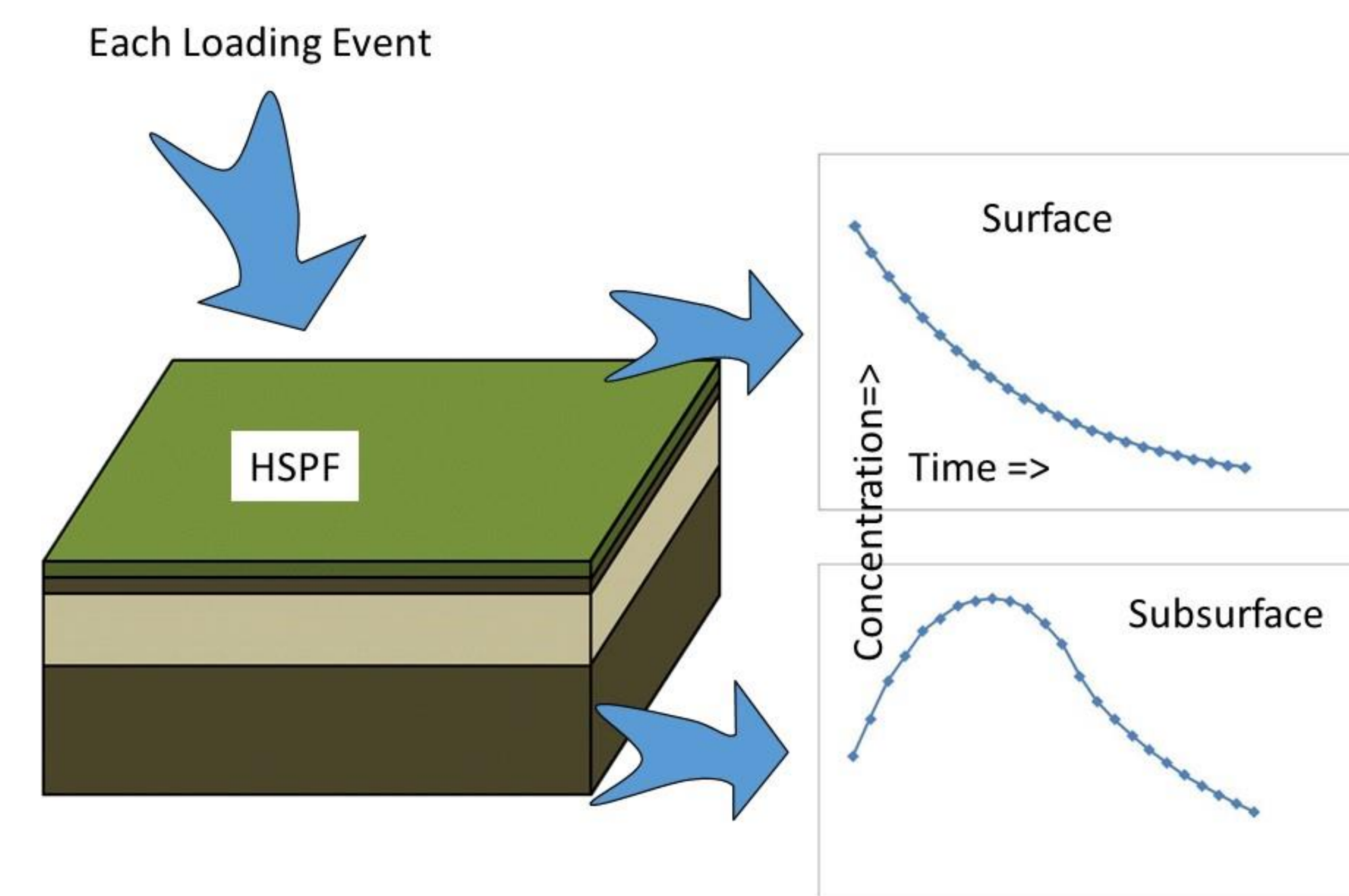
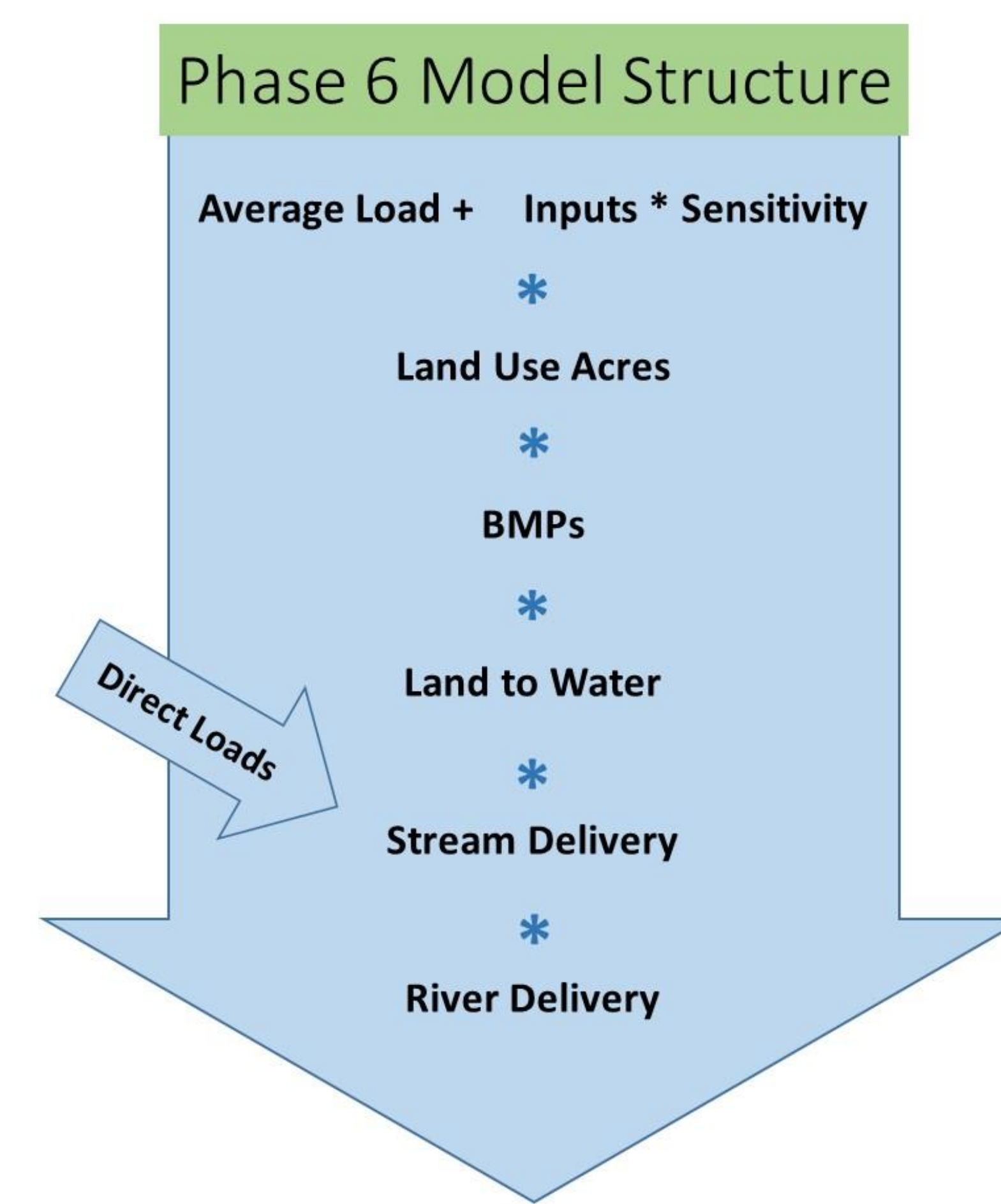
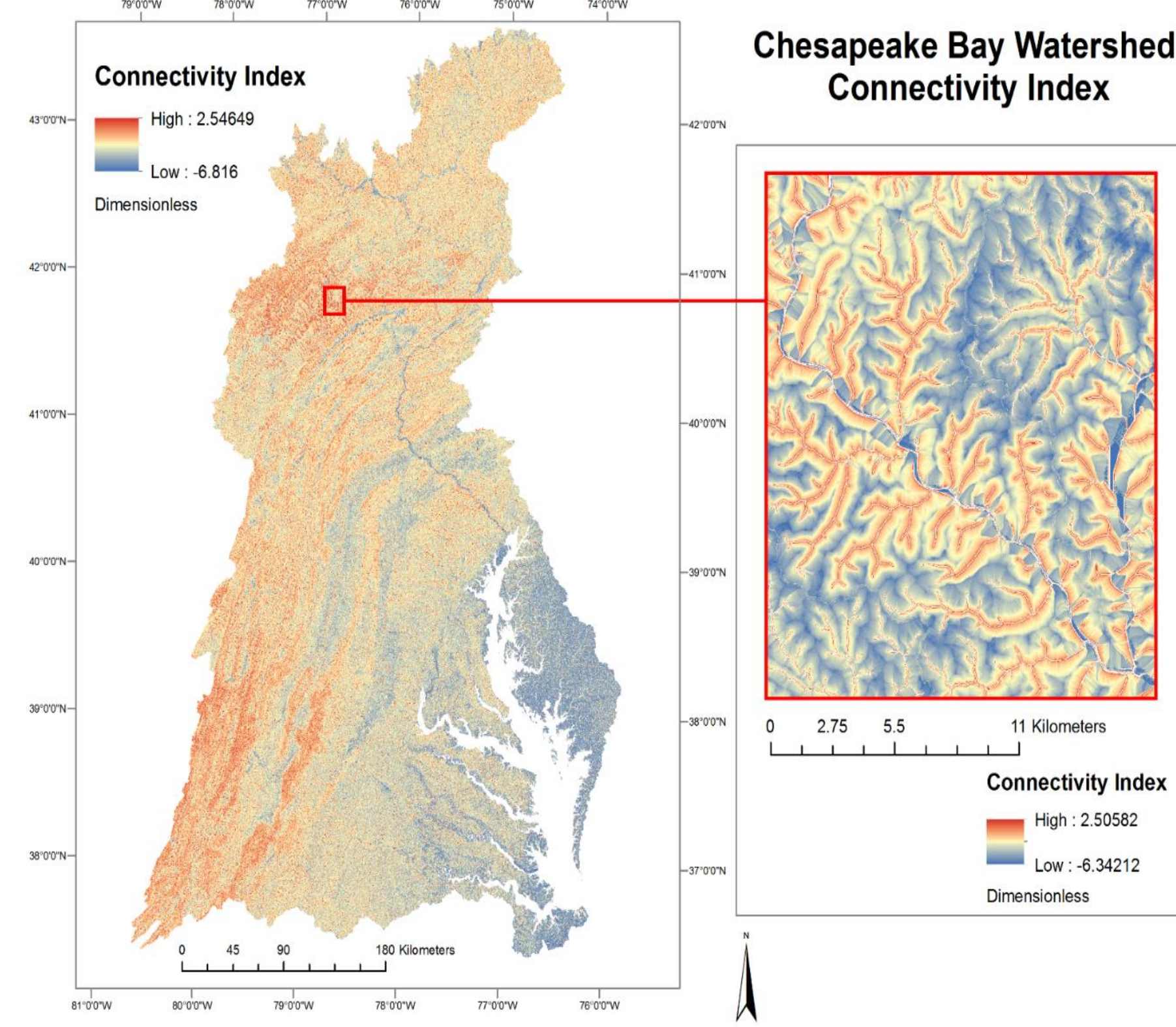
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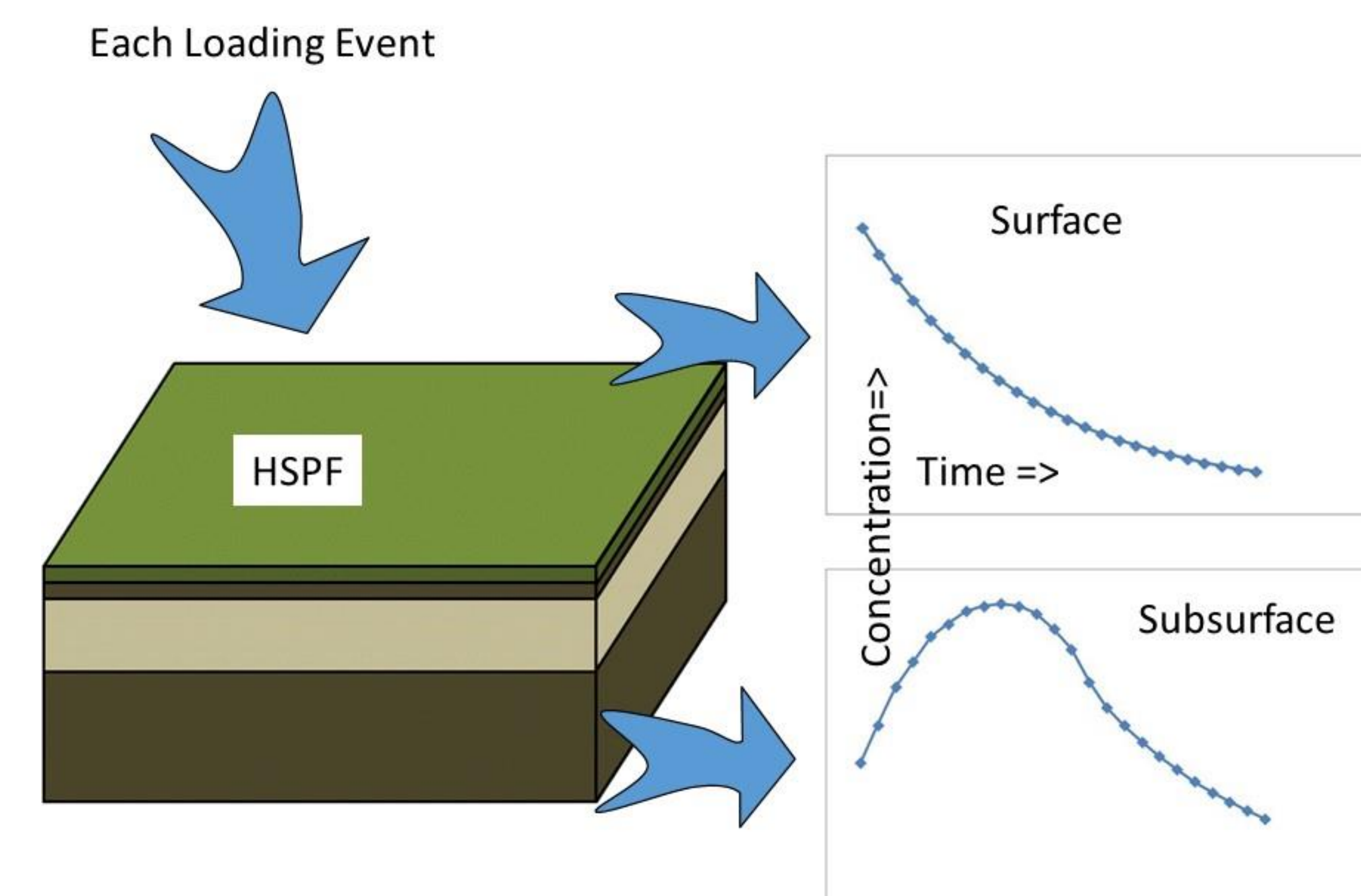
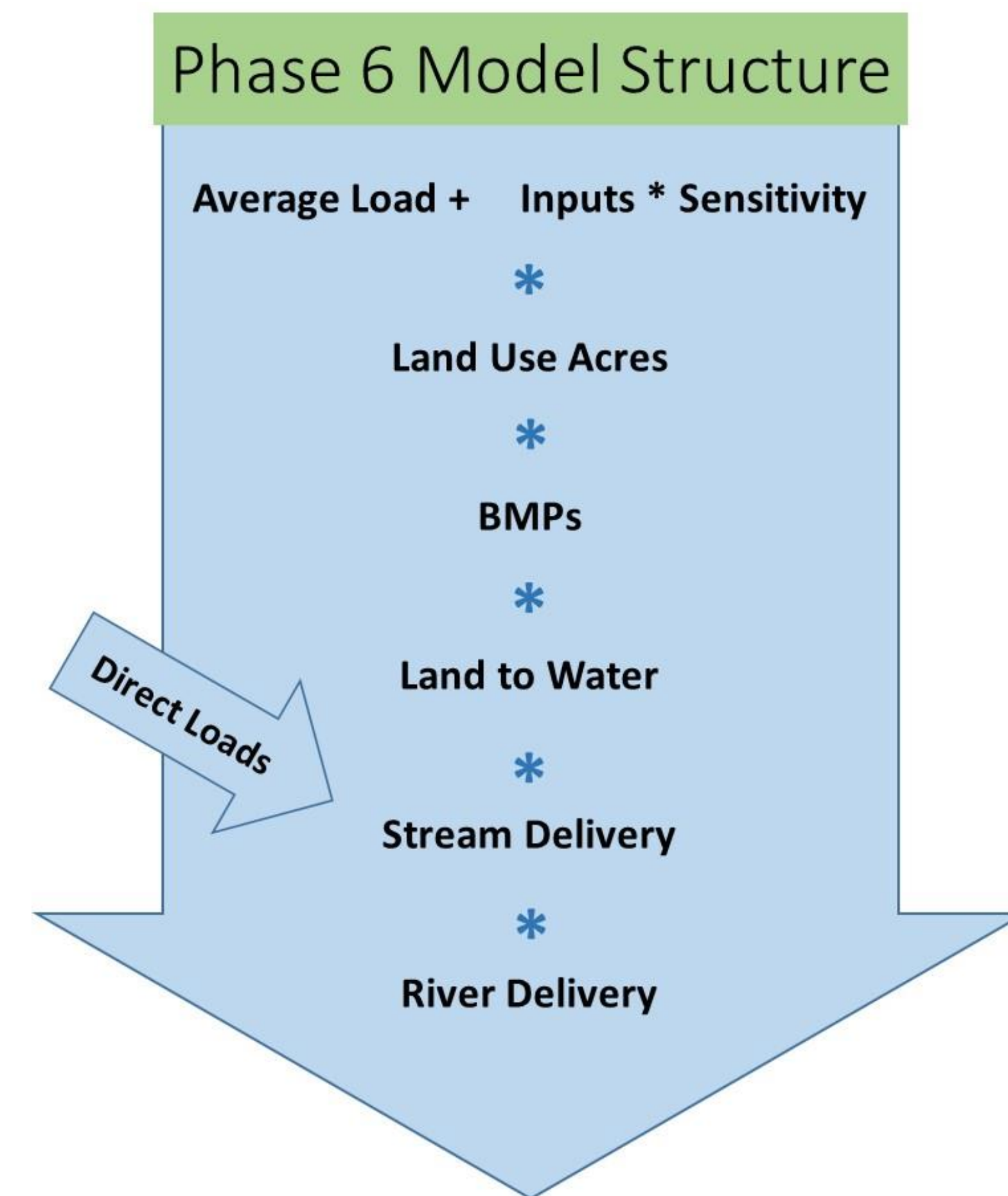
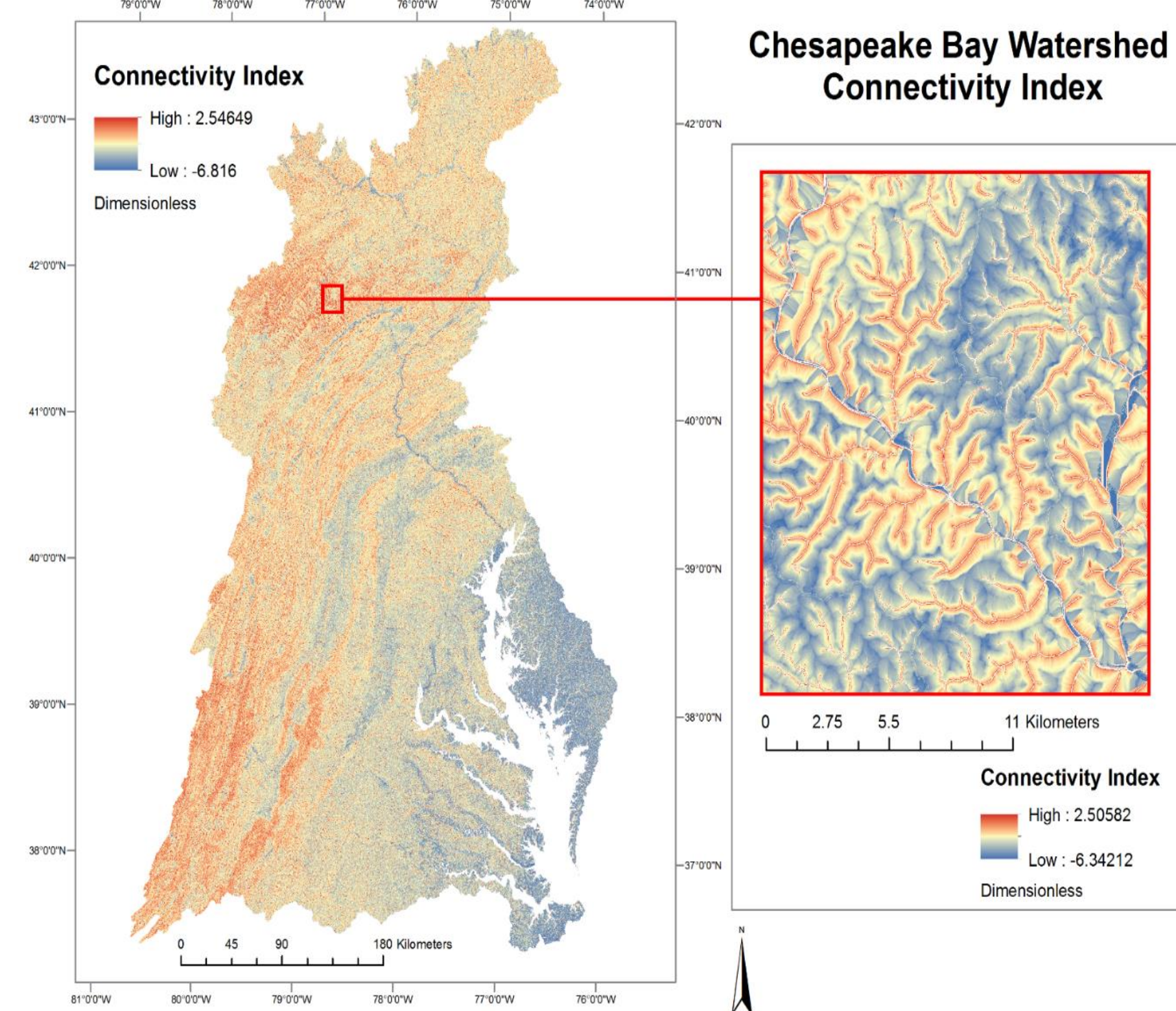




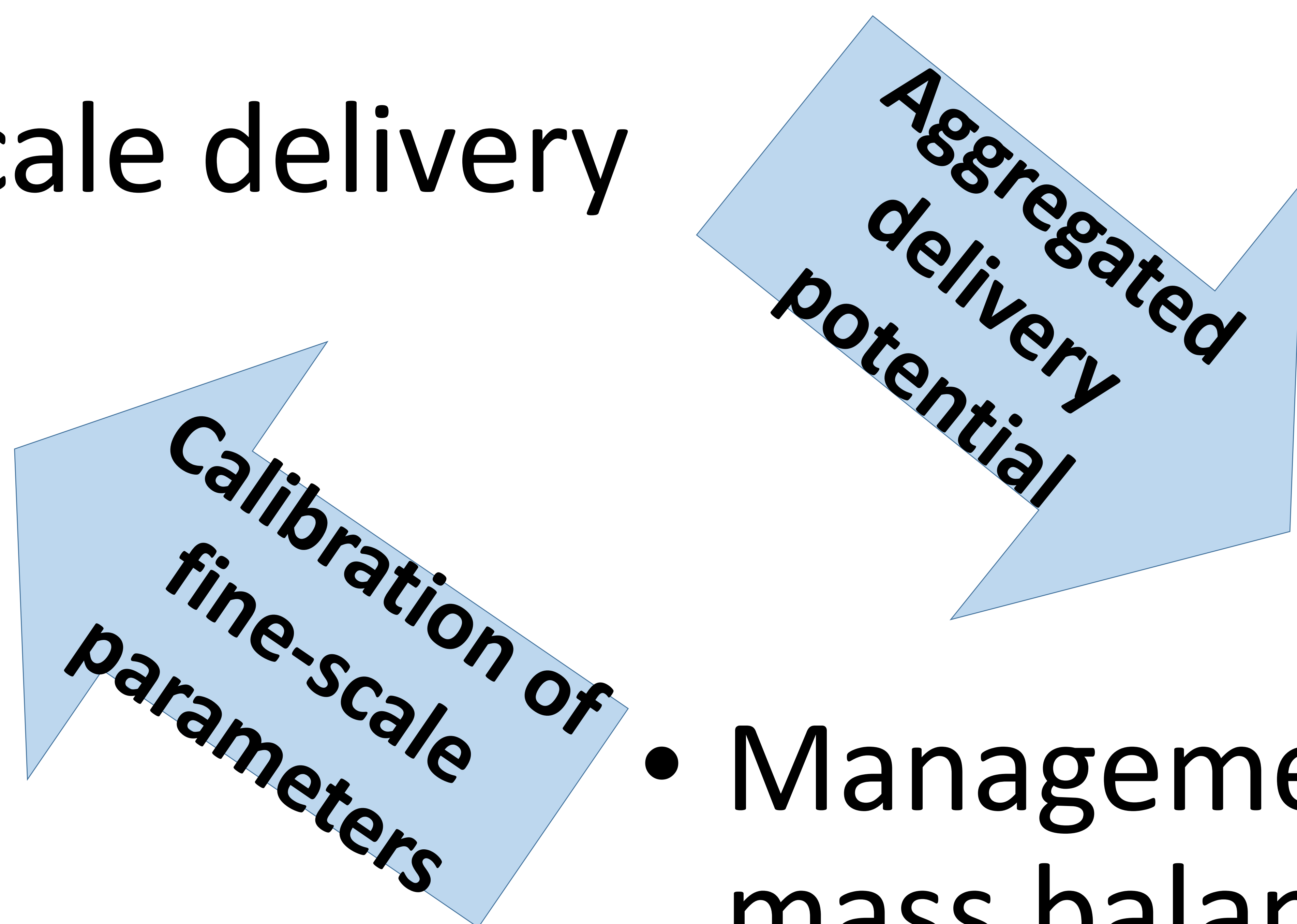
- Fine-scale delivery

- Management-scale mass balance

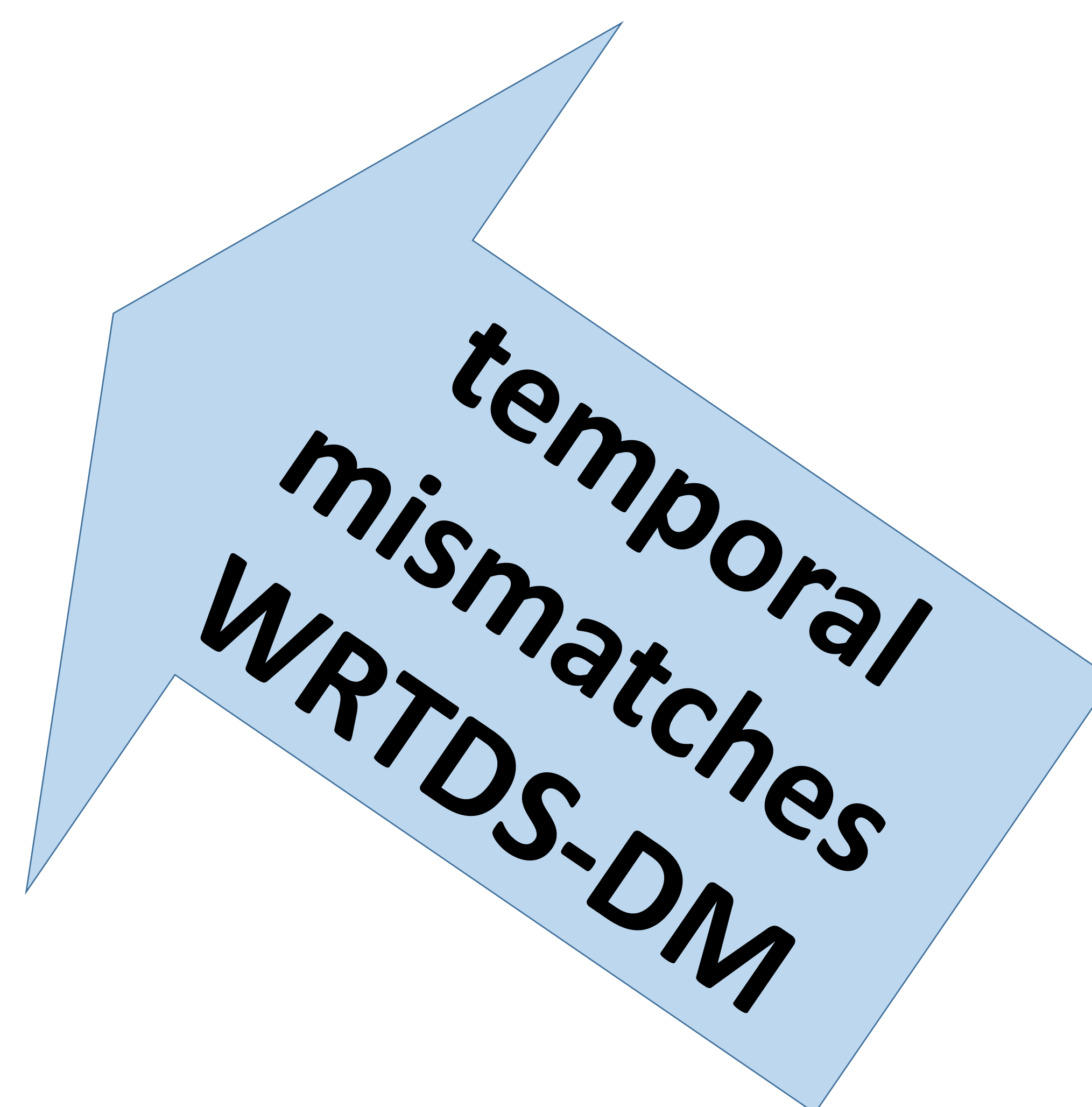
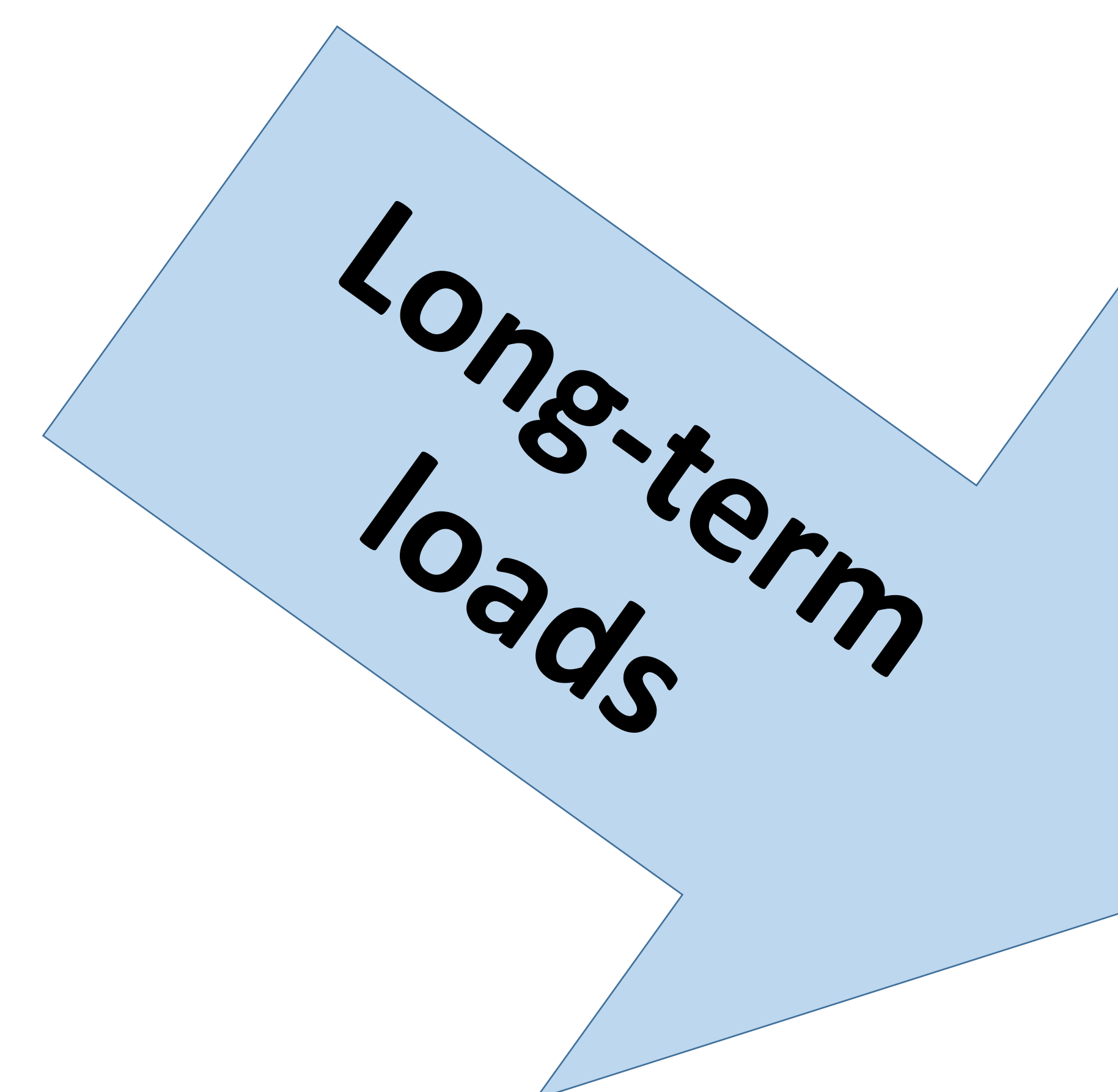
- Seasonal and flow dependencies



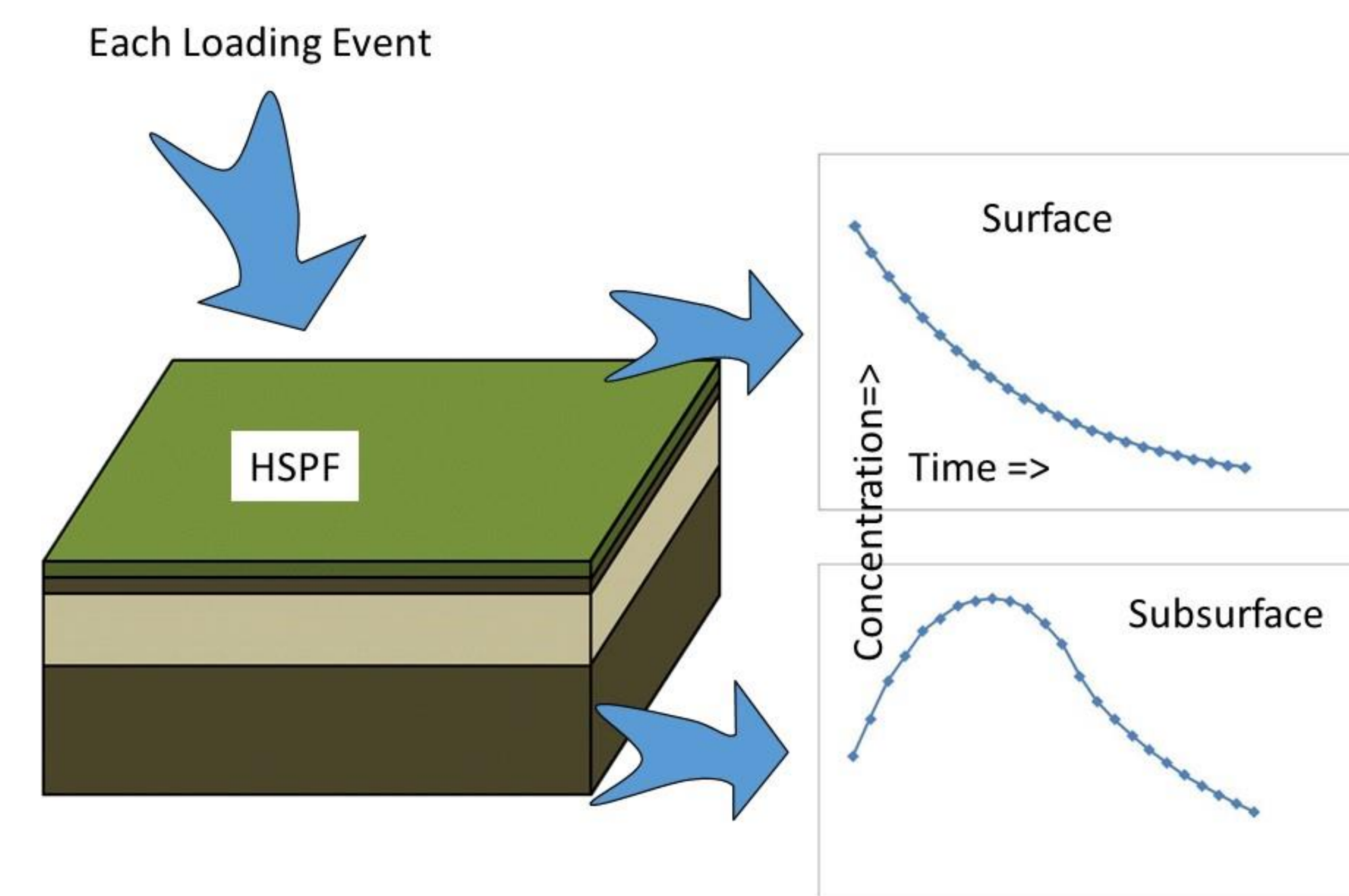
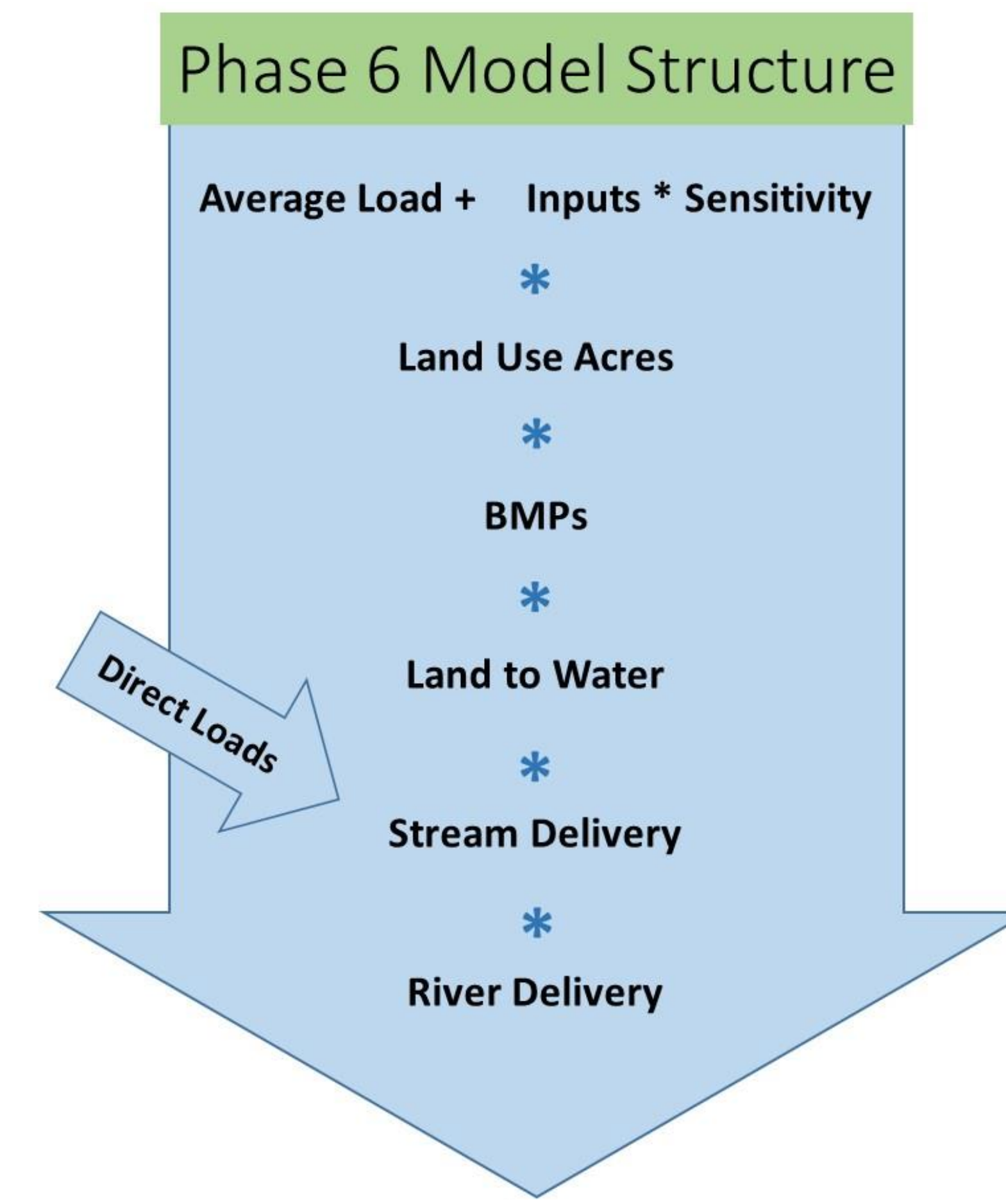
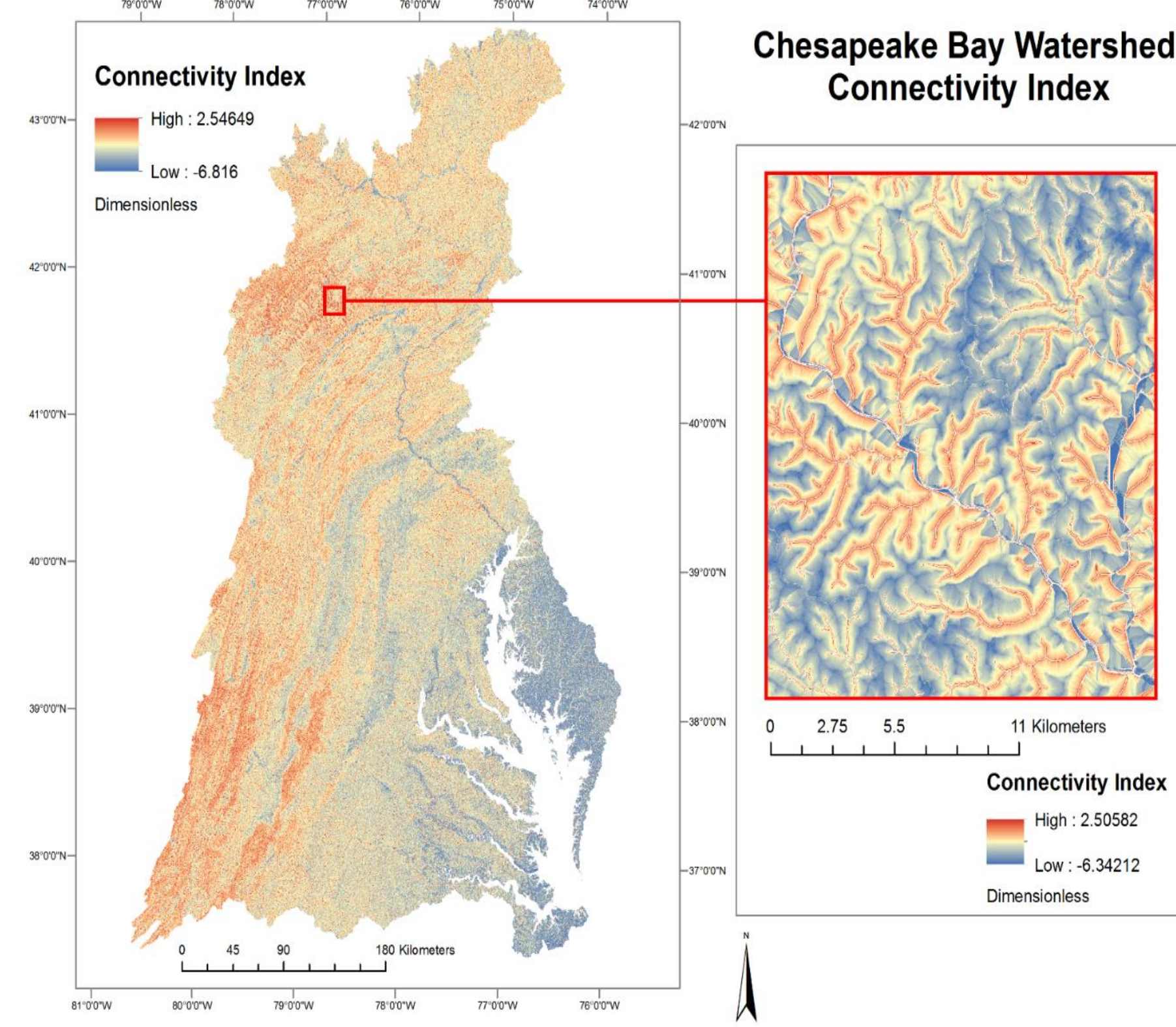
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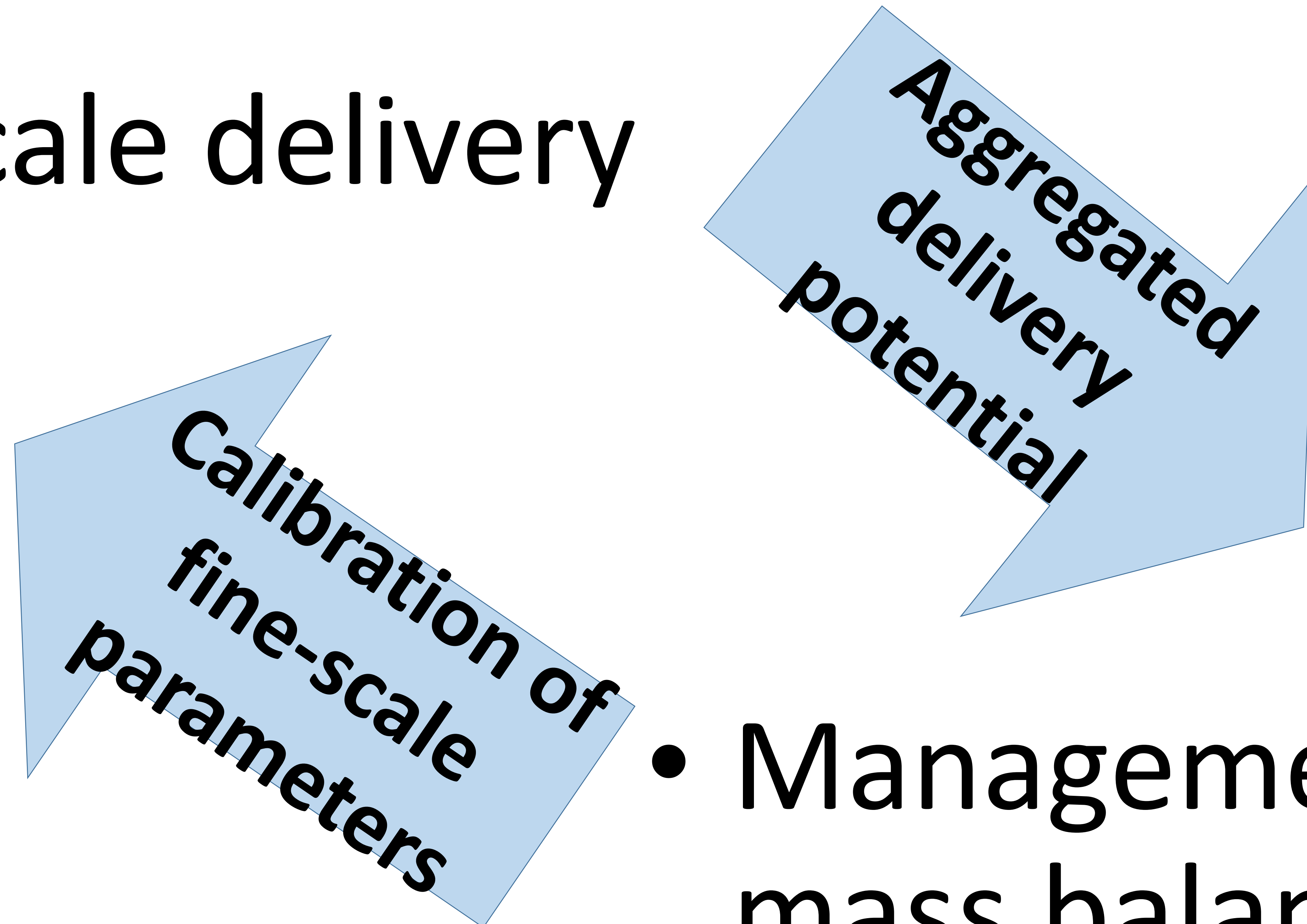
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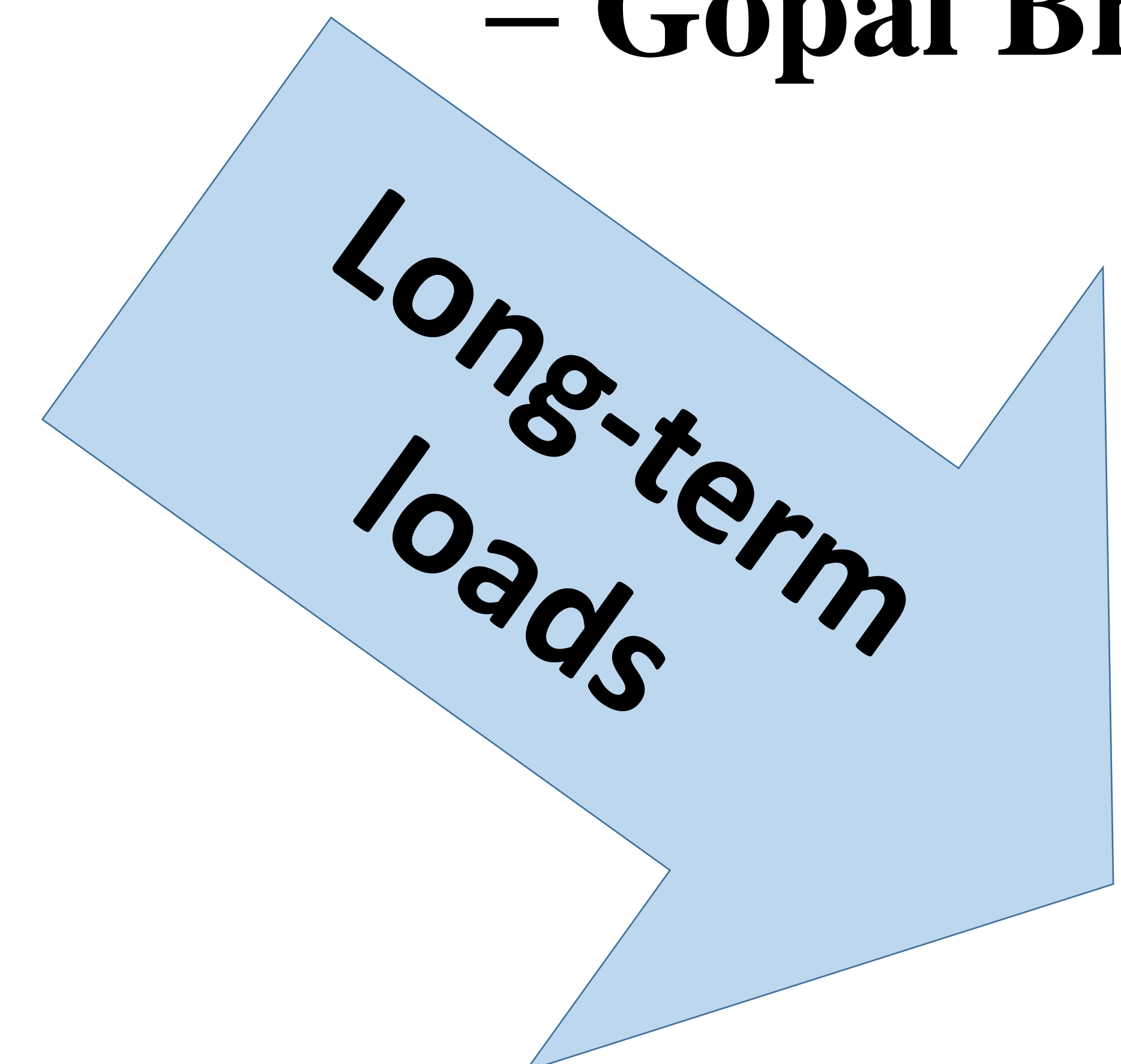


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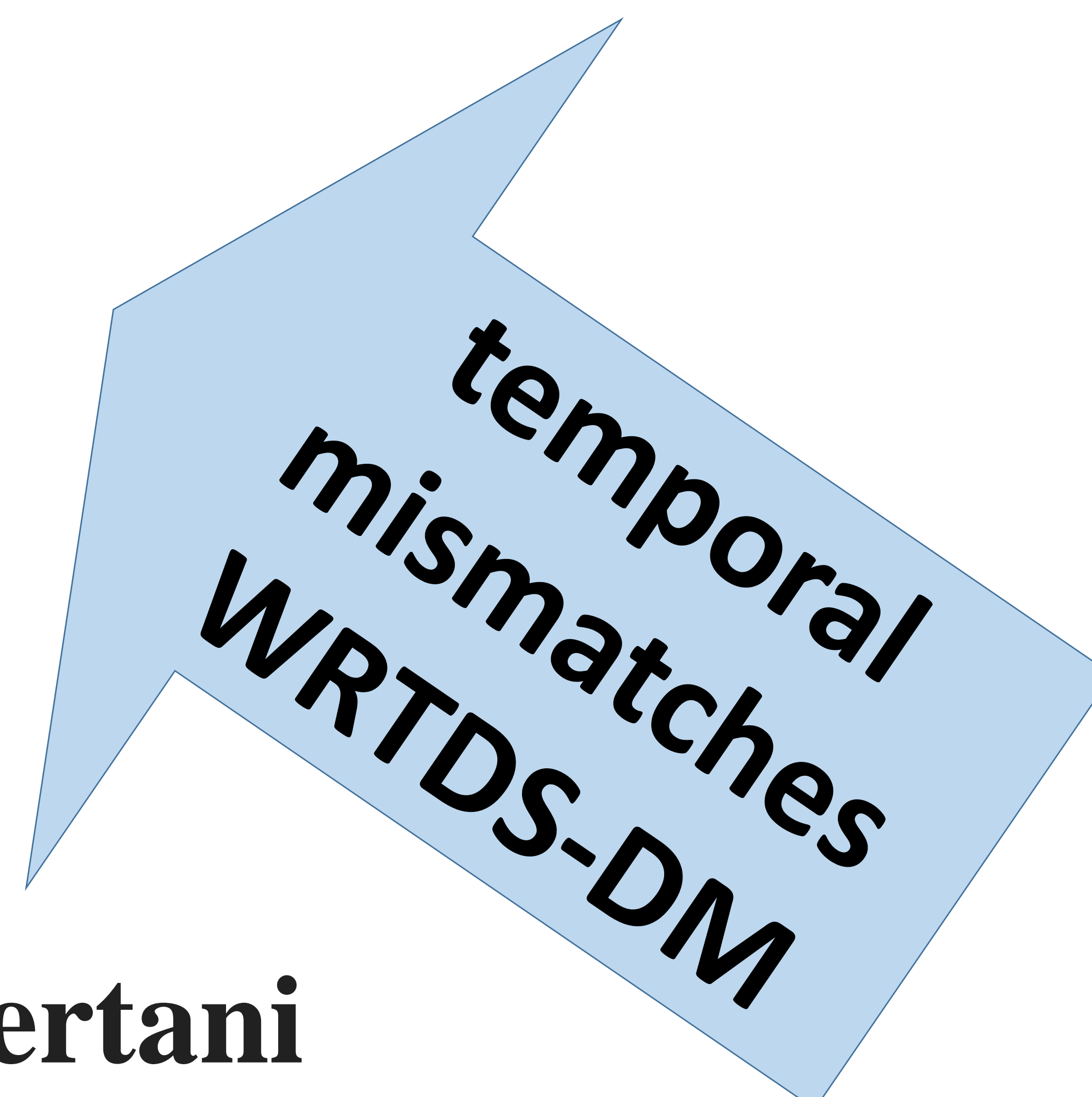
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9:45 Phase 7 WSM Development
– Gopal Bhatt



- Seasonal and flow dependencies

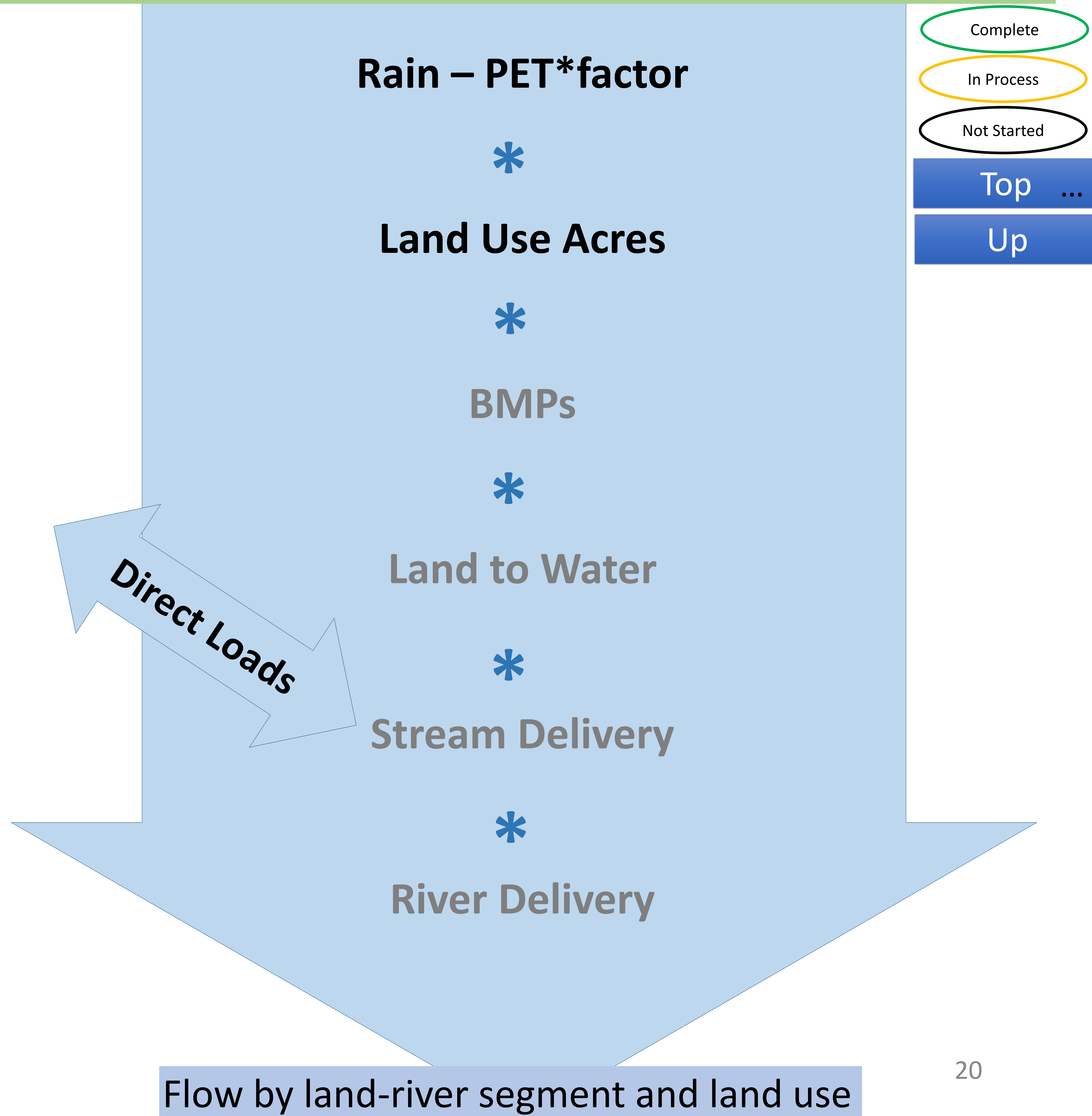
11:00 Comparison of Modeled and Monitored Nutrient Trends – Isabella Bertani



Phase 7 Model Structure

Initial model

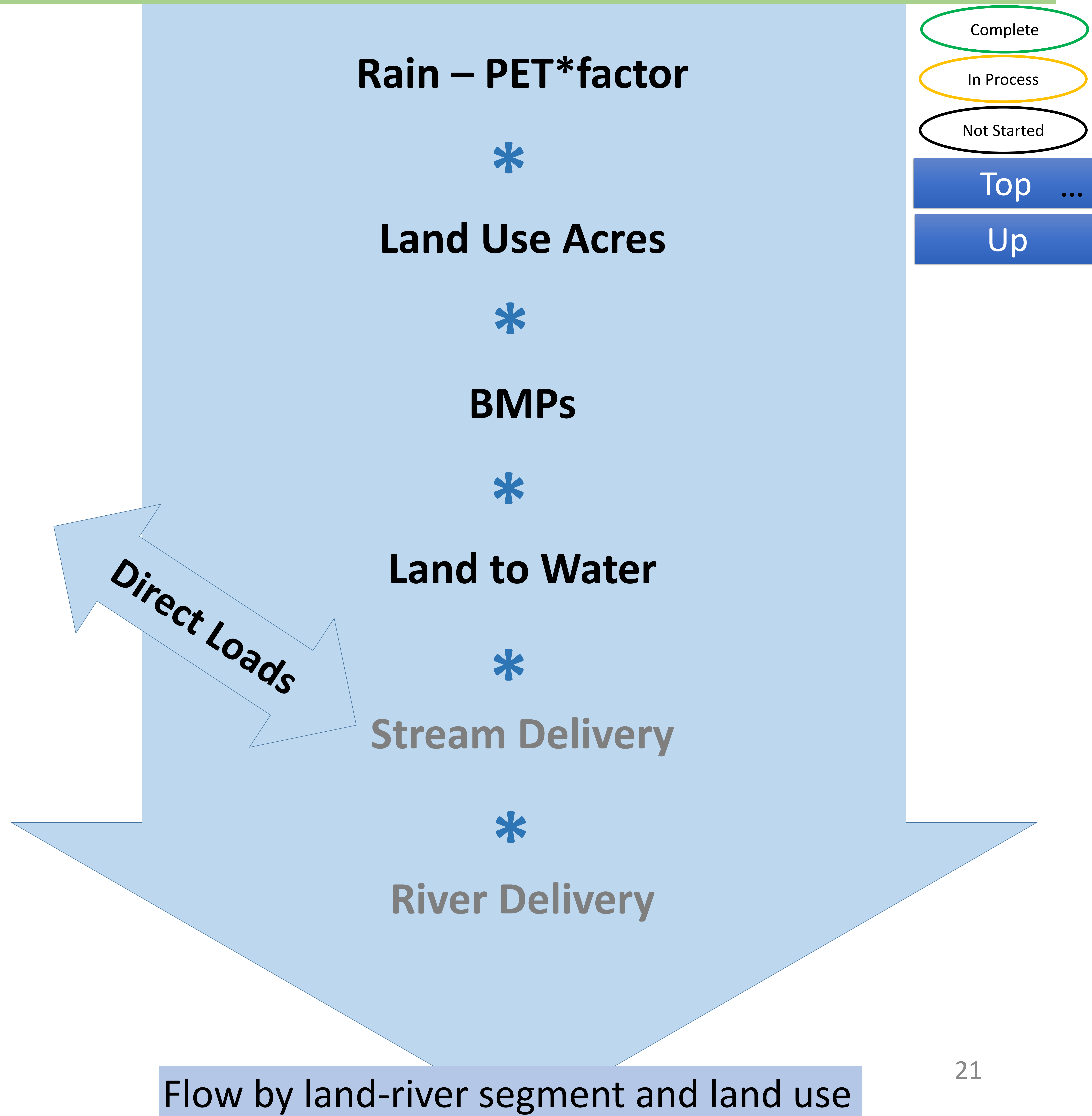
- Land use specific factor
- Total long-term flow



Phase 7 Model Structure

Future versions

- PET modified by
 - Geomorph factors
 - BMPs?
- Different endpoints
 - Storm/base
 - Hydrograph shape parameters?



2021 2022
Hydrology
Sediment

2022 2023
Nitrogen
Phosphorus

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PSC
directives

QUESTIONS AND COMMENTS