Relating Land Uses to Loads

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Land Use Workgroup

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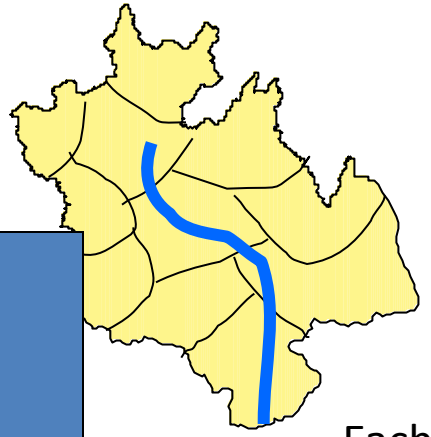
How the Watershed Model Works

Each segment consists of 30 separately-modeled land uses:

- Regulated Pervious Urban
- Regulated Impervious Urban
- Unregulated Pervious Urban
- Unregulated Impervious Urban
- Construction
- Extractive
- Combined Sewer System
- Wooded / Open
- Disturbed Forest

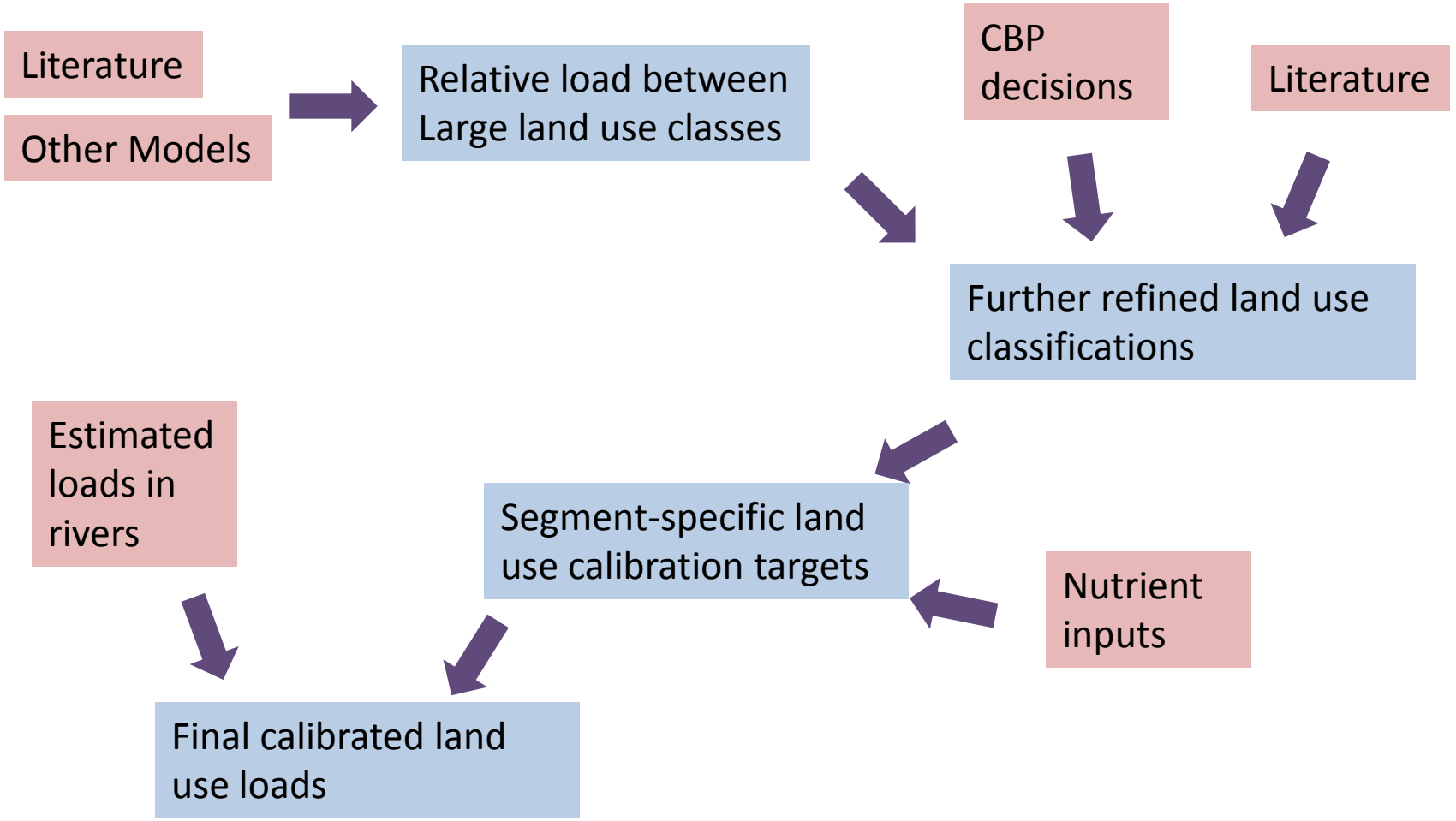
- Corn/Soy/Wheat rotation (high till)
- Corn/Soy/Wheat rotation (low till)
- Other Row Crops
- Alfalfa
- Nursery
- Pasture
- Degraded Riparian Pasture
- Afo / Cafo
- Fertilized Hay
- Unfertilized Hay
  - Nutrient management versions of the above



Plus: Point Source and Septic Loads, and Atmospheric Deposition Loads

Each calibrated to nutrient and Sediment targets

Land Use Loads



Nutrient EOF Targets

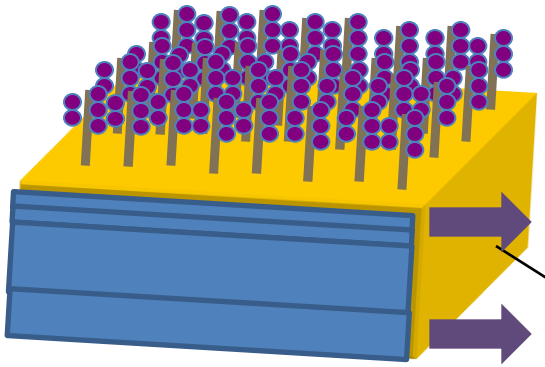
- Purpose: Develop targets that:
  - Appropriately order the influence of different land uses in the same area
  - Appropriately account for differences in loading between the same land uses in different areas.

- Regional differences due to physiographic effects will be resolved through load balancing in the river calibration.

Sources of Data

- Literature Reviews
  - Beaulac & Reckhow (1982)
  - Sweeney (2001)
  - Lin (2004)
  - Primary Sources (about 30)
- Previous Modeling Studies
  - Phase 4.3
  - Sparrow

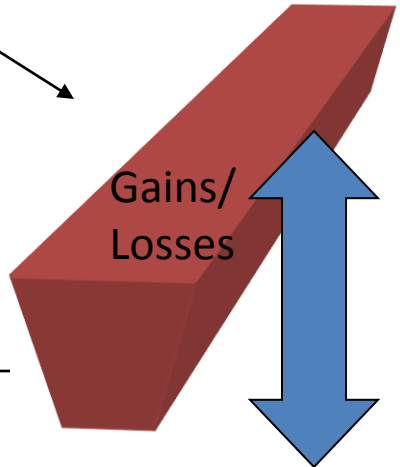
Scale issue



Edge of **Field**
Expected loads Leaving a representative acre

Measured Surface or total load?

Edge of Stream
60-100 sq miles



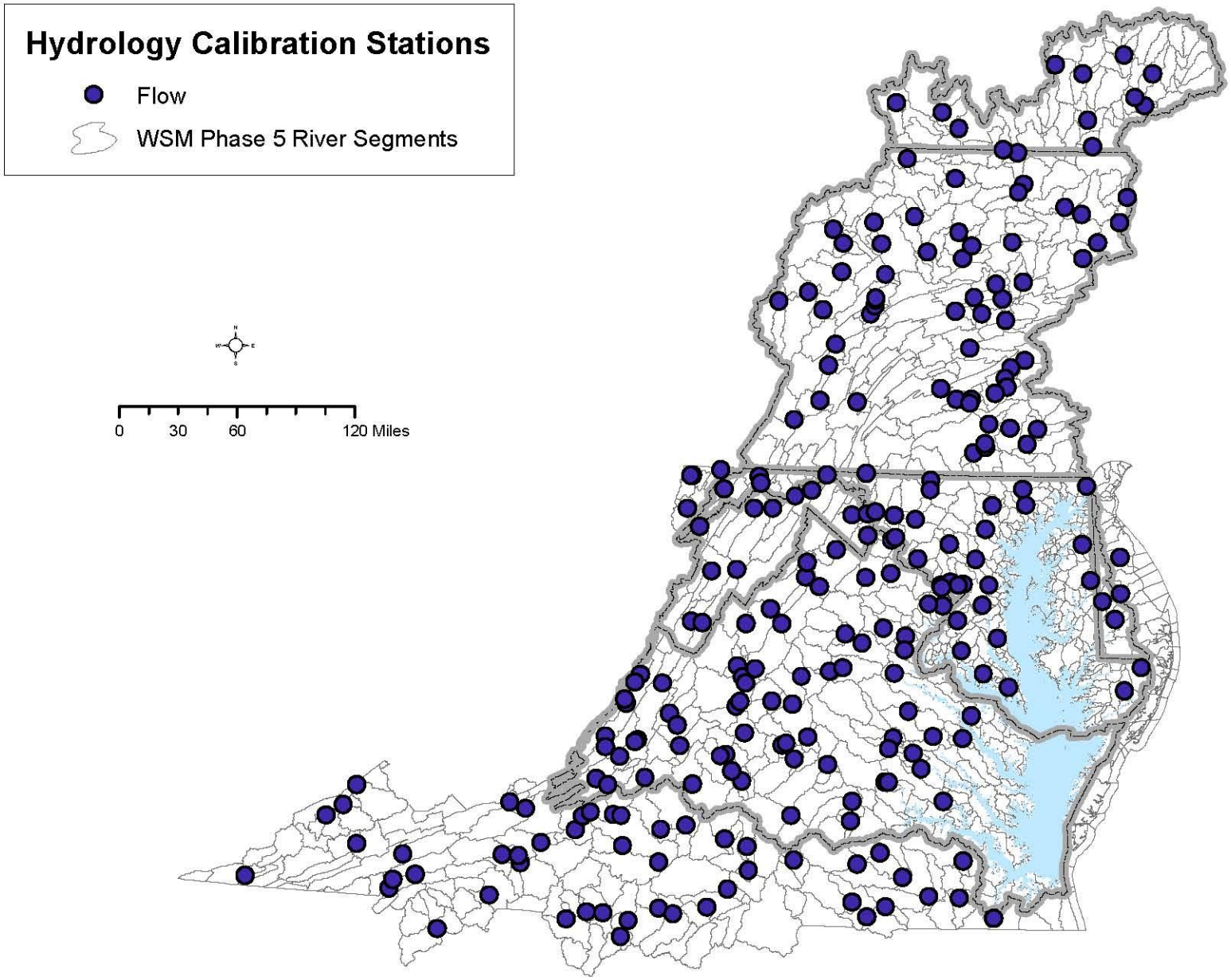
In Stream Concentrations

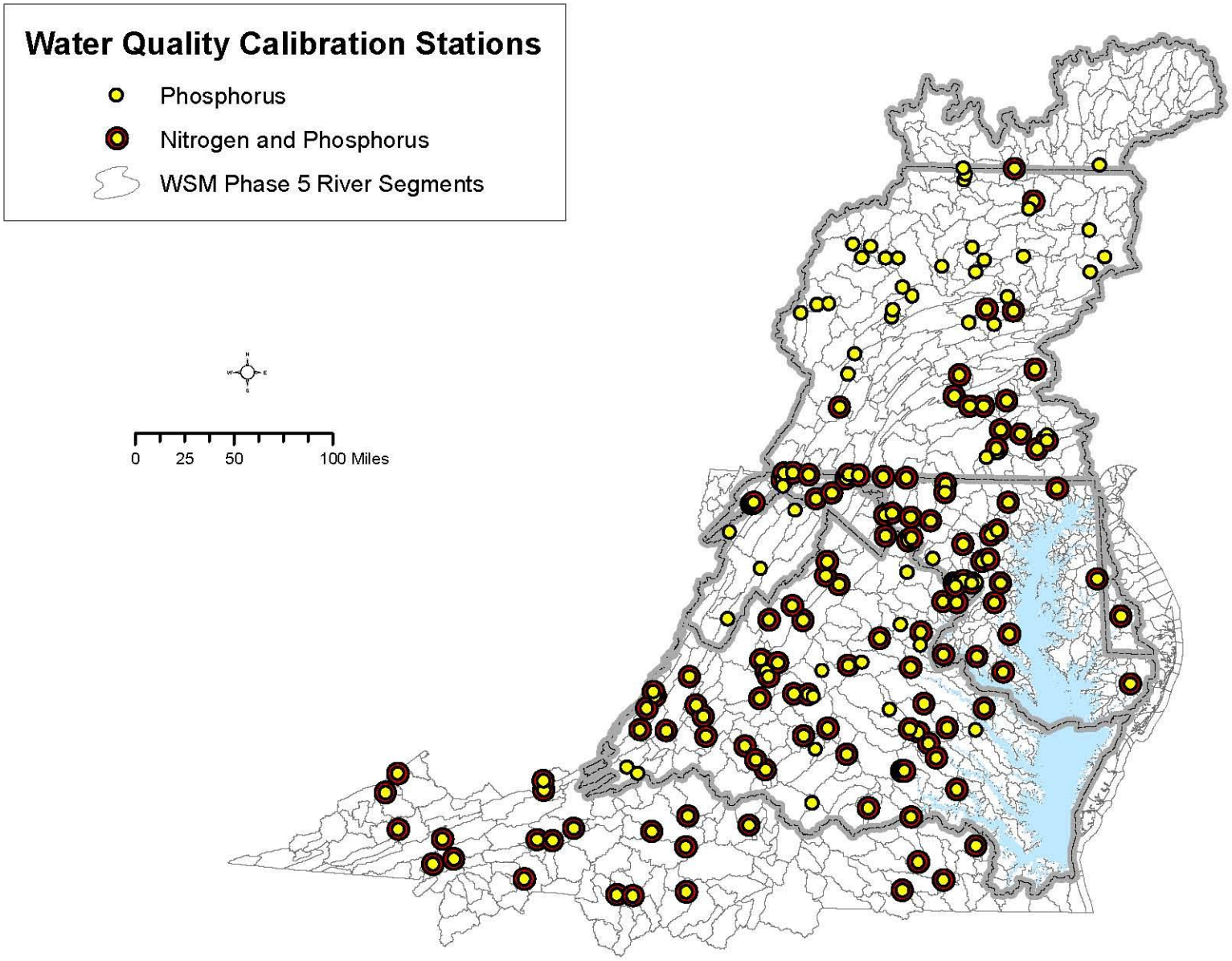
Average Targets

Land Use	**TN**	**TP**
Forest	2.0	0.15
Harvested Forest	20.0	0.80
Crop	23.0	2-2.5
Hay	6.0	0.4-0.8
Pasture	4.5	0.7
Urban	9.3	1.5
Extractive	12.5	3.5
Nursery	240	85

Differentiating between regions

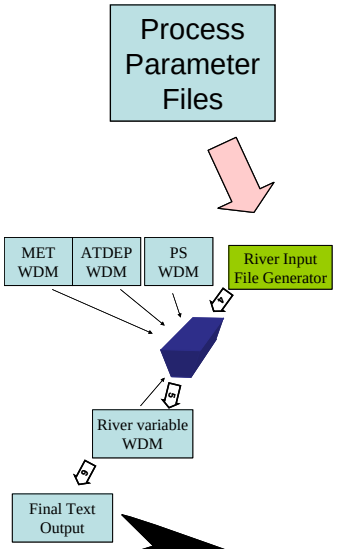
- Forest – Assume constant loss efficiency
- Crop –
  - median balance = median export
  - Zero balance = ½ median export
- Urban – Assume constant concentration
- No method of differentiation for
  - Alfalfa, construction, extractive, harvested forest, hay without nutrients, nurseries


Hydrology Calibration Stations
Flow
WSM Phase 5 River Segments
0
30
60
120 Miles


Water Quality Calibration Stations
Phosphorus
Nitrogen and Phosphorus
WSM Phase 5 River Segments
0
25
50
100 Miles

Nested Optimization

River Calibration

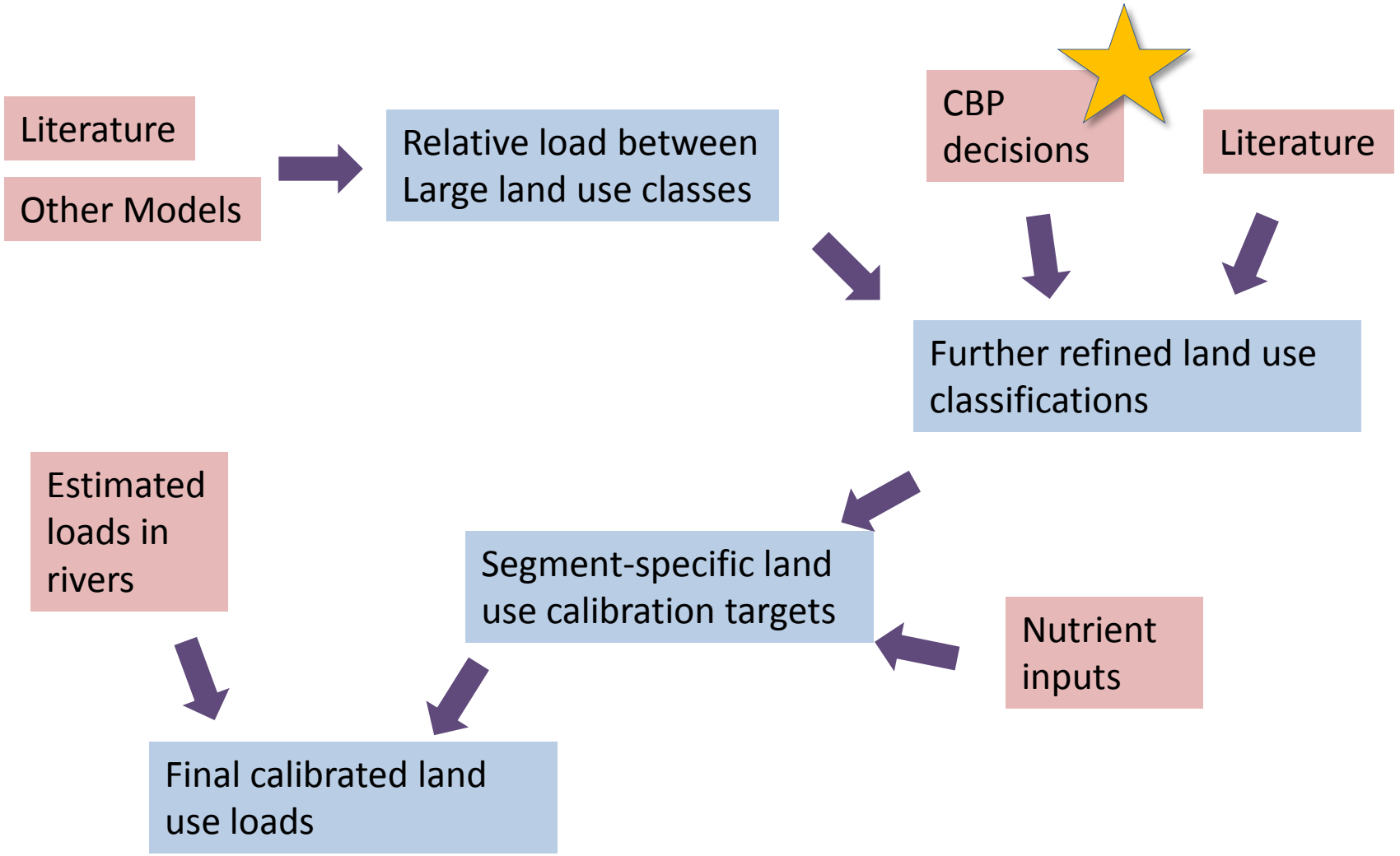


- Assume the sensitivity of the simulation to each parameter
- Determine an appropriate adjustment direction for each parameter
- Take a small step in that direction

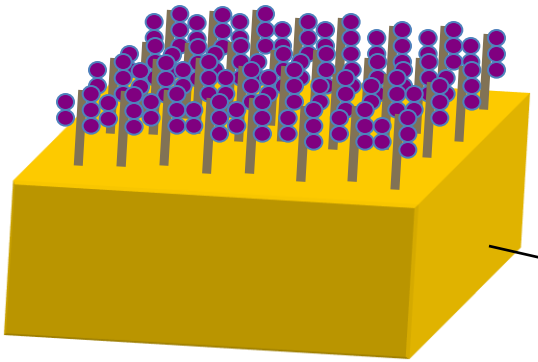
- Calculate necessary EOS to unbias the calibration
- Adjust EOS by that amount

Land Use Loads

LUWG can comment on any part of this process.



Scale in Phase 5 - Nutrients



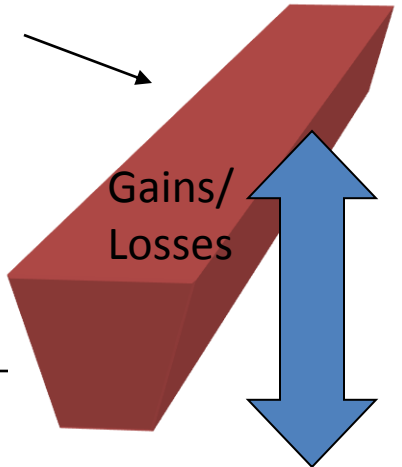
Edge of **Stream**
Expected loads from one acre that reach 100 cfs stream

BMP Factor

Land Acre Factor

Regional Factor

Edge of Stream
60-100 sq miles



In Stream Concentrations

Adding a new land use

- Where it is
  - Need to have consistent estimate through time
- What it does
  - Loads it receives
    - fertilizer, manure, etc
  - Loads it exports
    - Relative to inputs
    - Relative to other land uses
    - Relative to other measurable factors