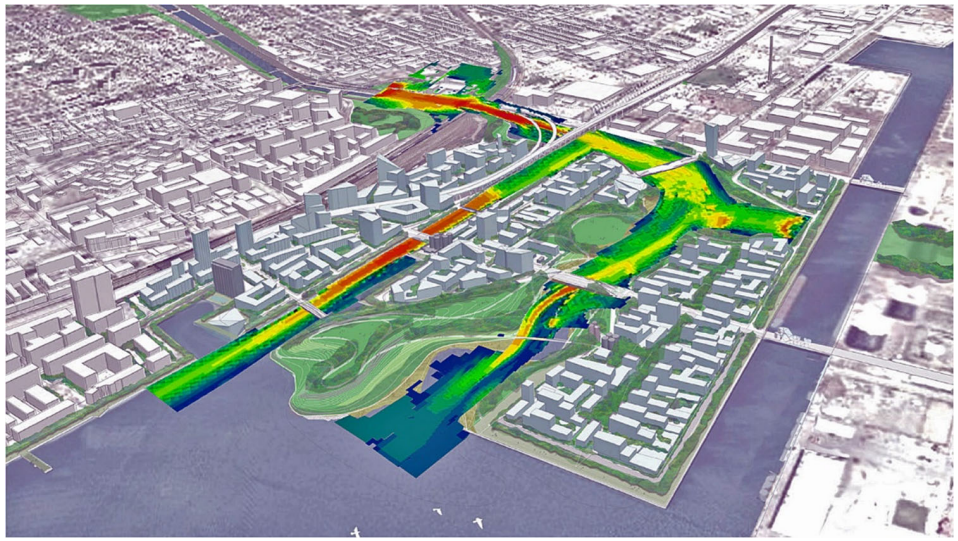
Engineering With Nature – Proposed Design Tool

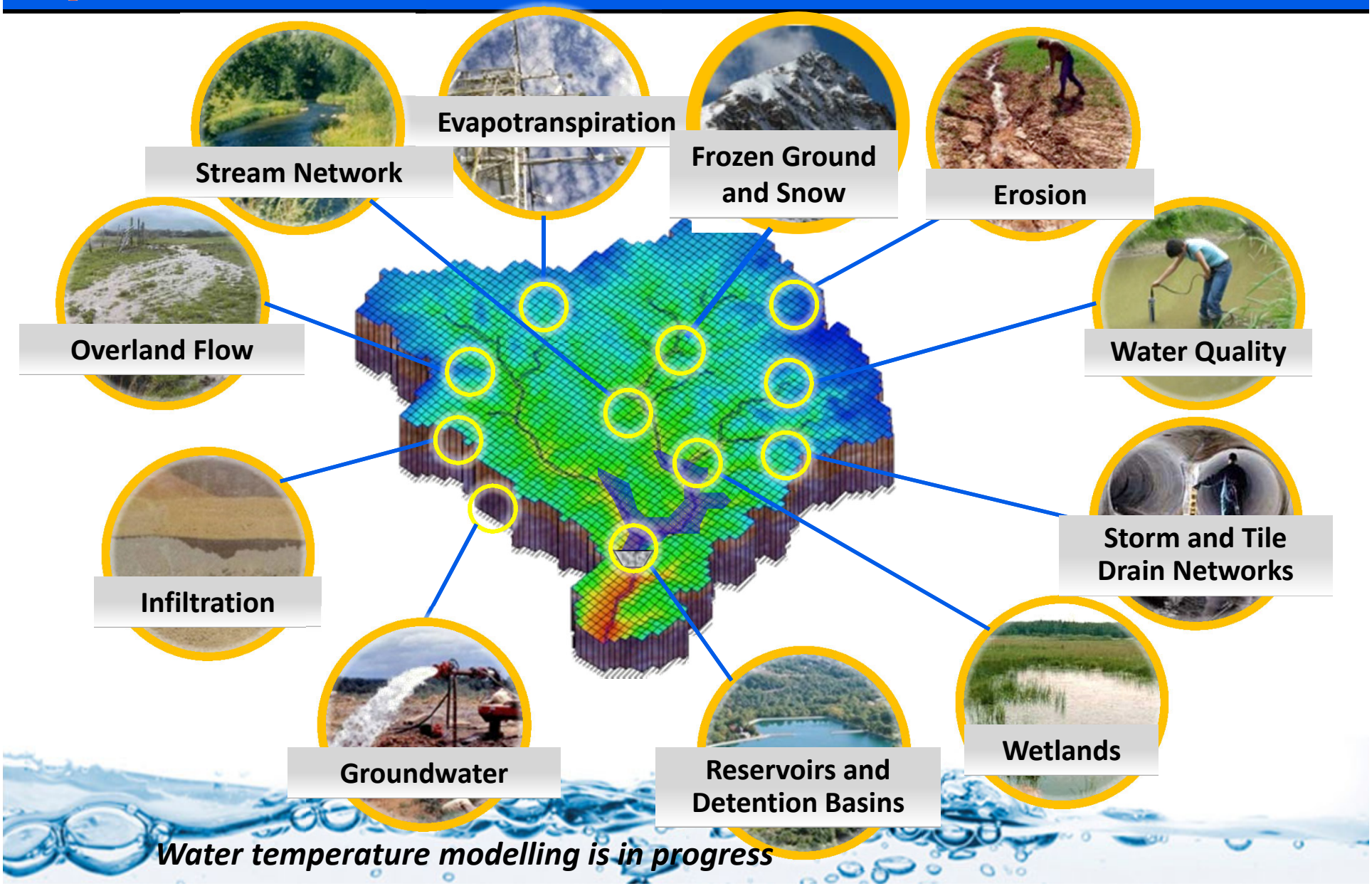


Existing ERDC Tools and Modules

1) Gridded Surface Subsurface Hydrologic Analysis (GSSHA)
2) Nutrient Simulation Module
3) Contaminant Simulation Module
4) Mercury (HG) Simulation Module
5) Riparian Vegetation Simulation Module

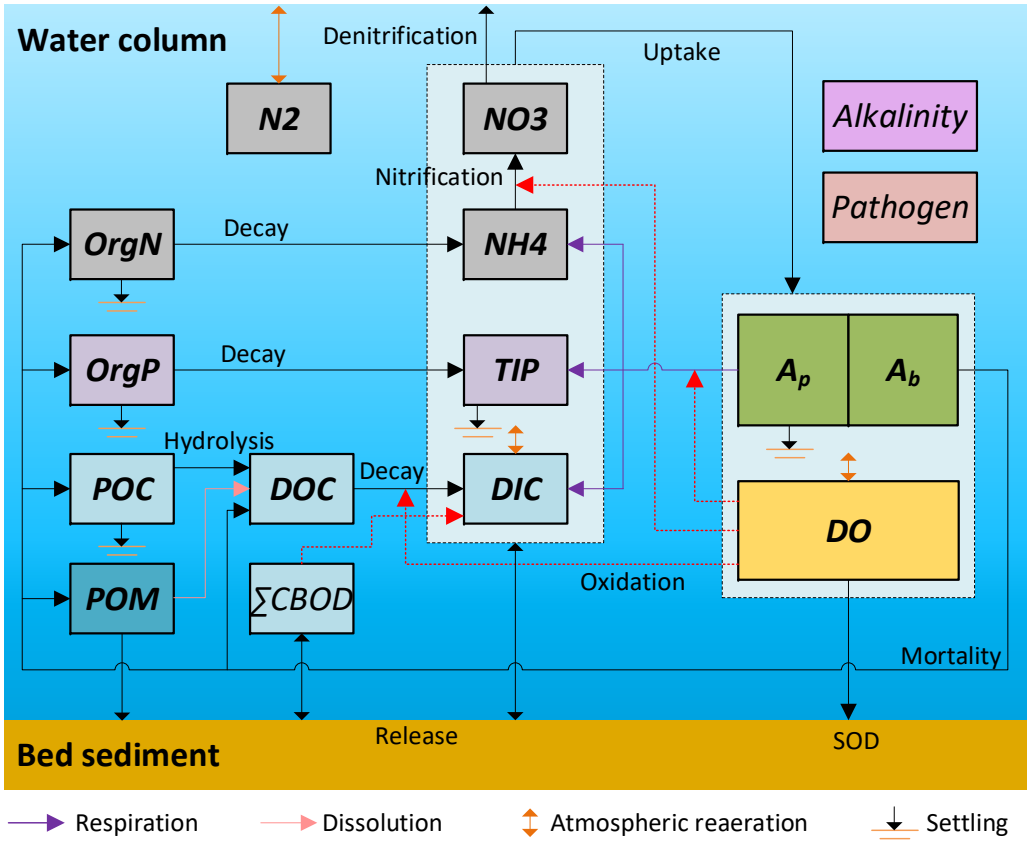
Models and Modules need to be integrated

GSSHA Modeling Capabilities



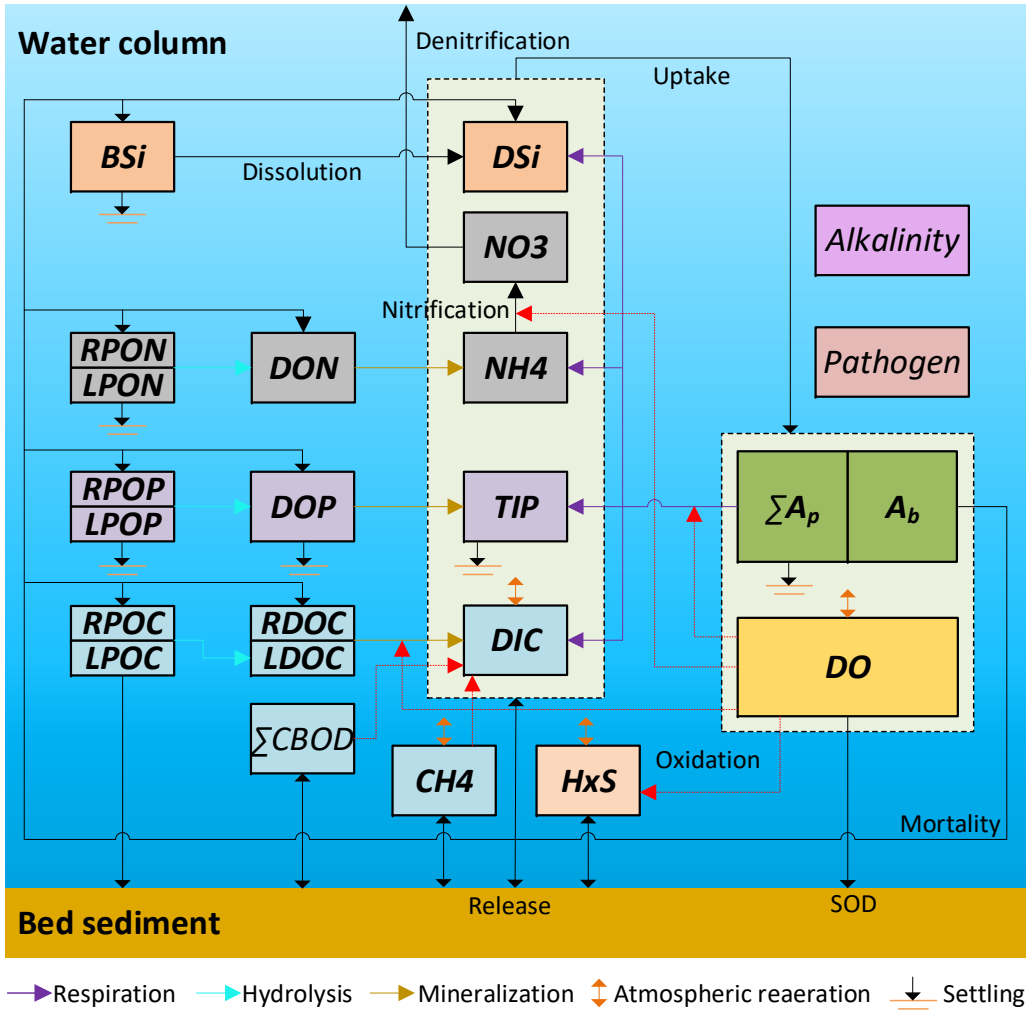
Water temperature modelling is in progress

Nutrient Simulation Module I (NSMI)



Reduced State Variable list for N, P, and C cycles

Nutrient Simulation Module II (NSMII)

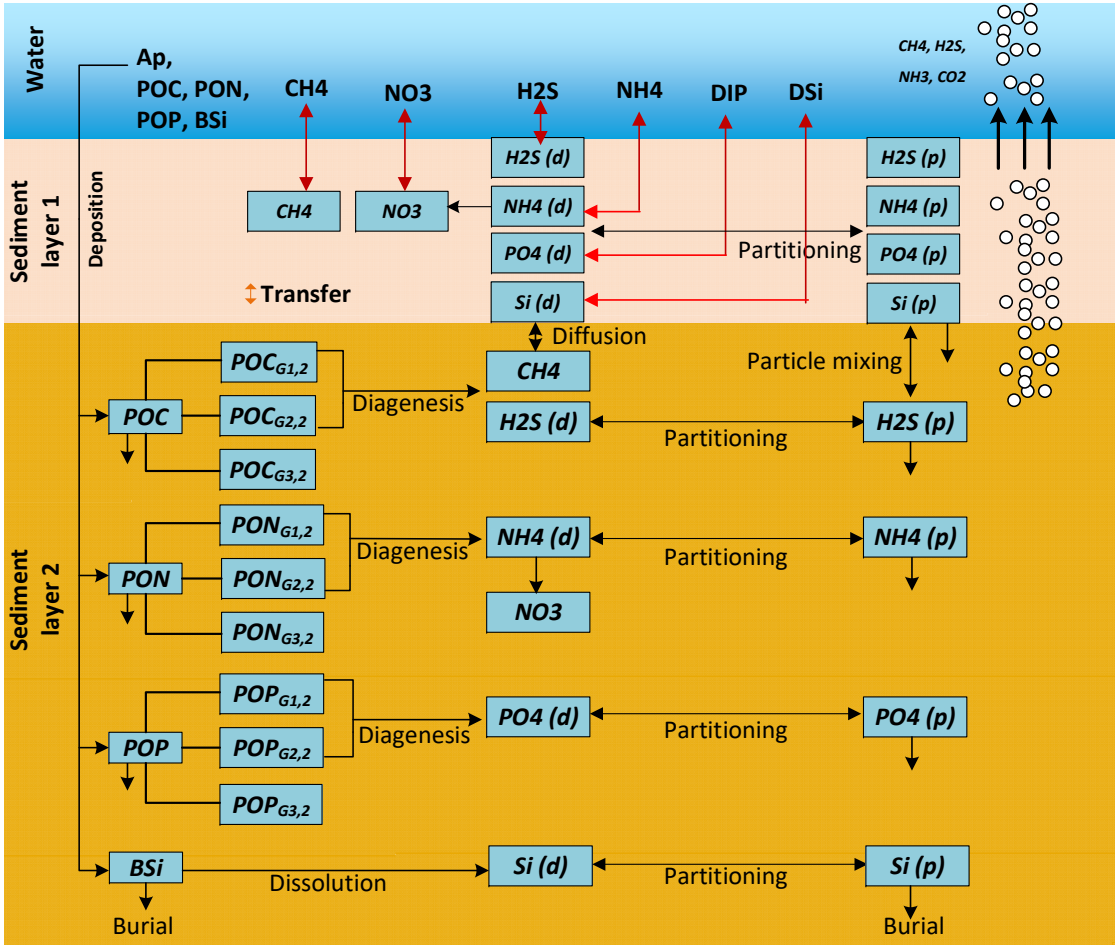


Expanded State Variable list for N, P, and C cycles

More Algal groups

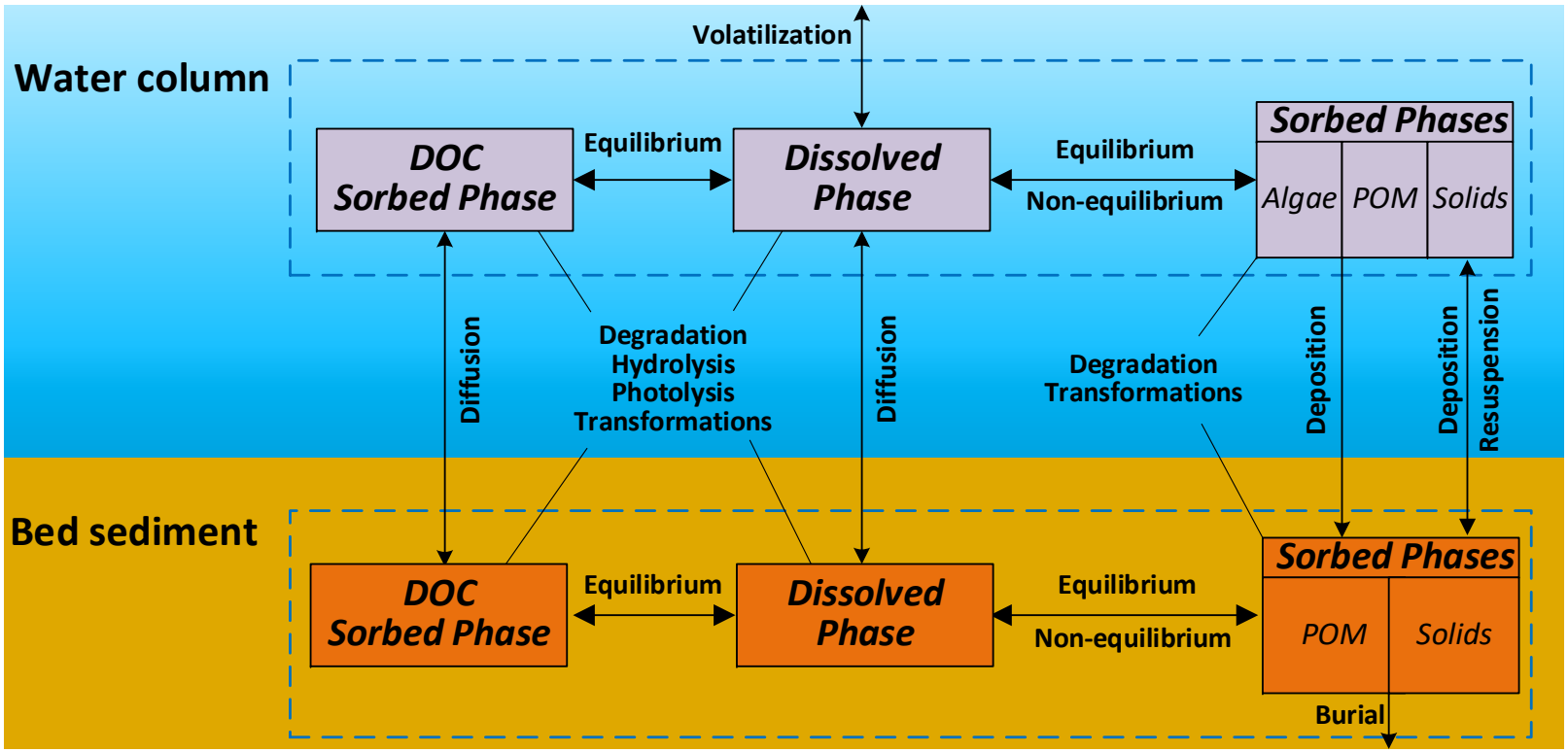
Bed Sediment Diagensis

Sediment Diagenesis Module



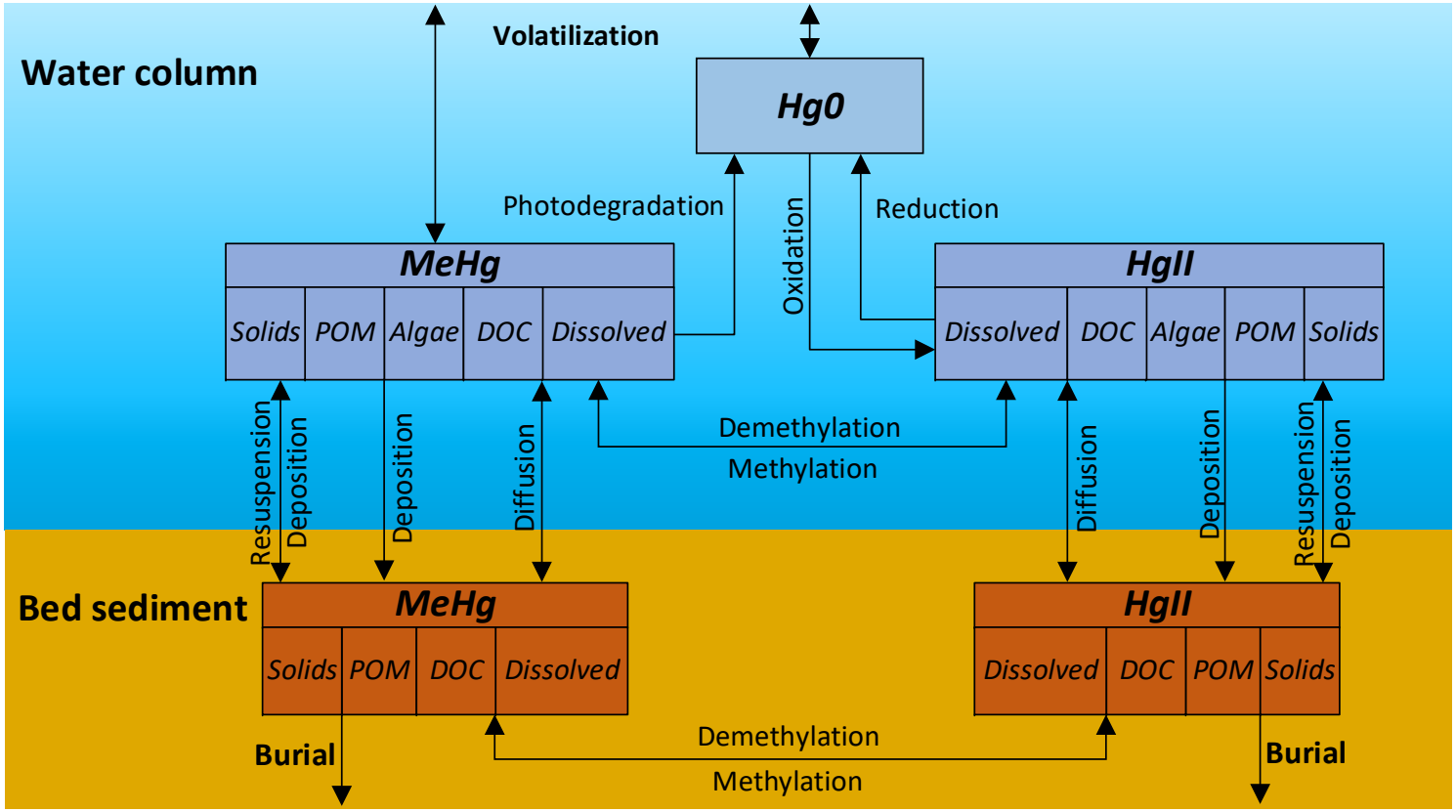
Detailed Water Quality Analysis of Bed Sediments

Contaminant Simulation Module



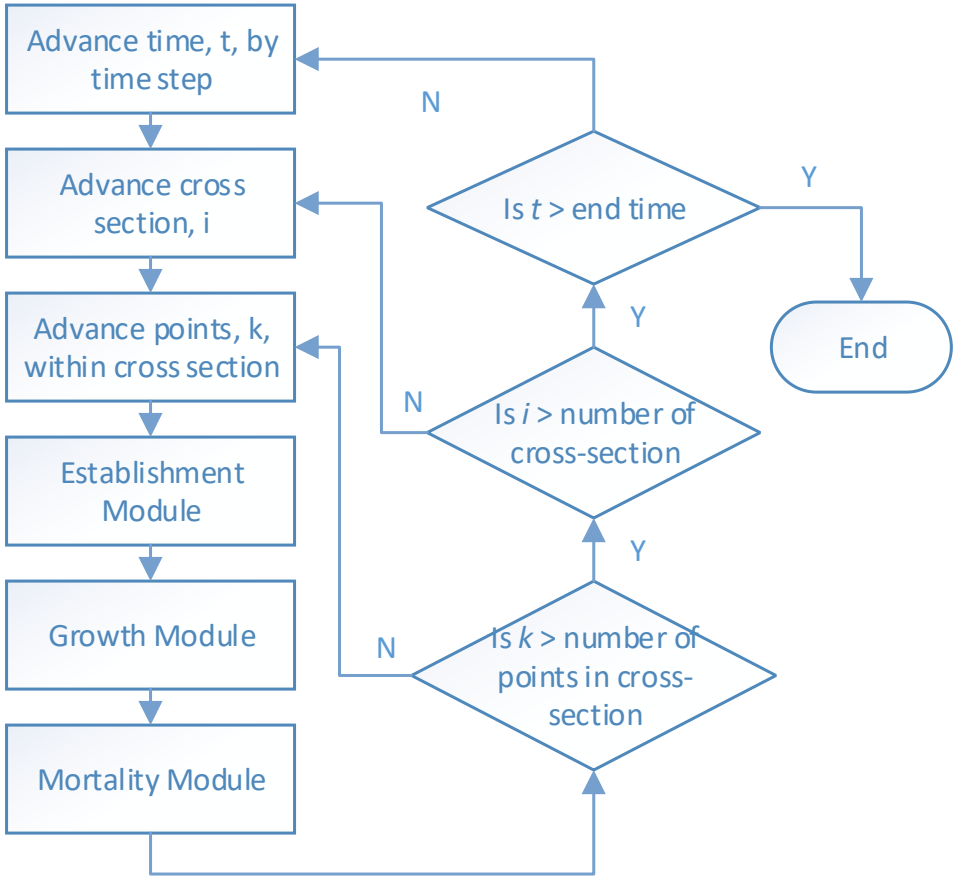
Detailed Analysis of Chemicals and Metals. Water Column and Bed Sediment Interactions.

Hg Simulation Module

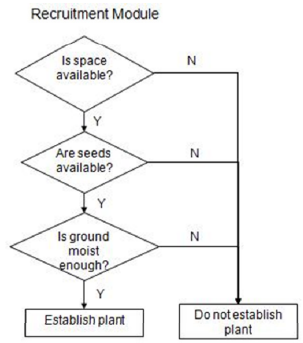


Detailed Analysis of Mercury Dynamics. Water Column and Bed Sediment Interactions.

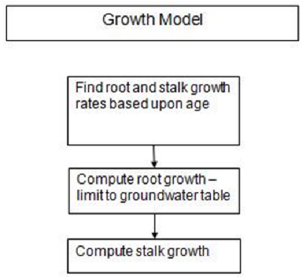
Vegetation Dynamics

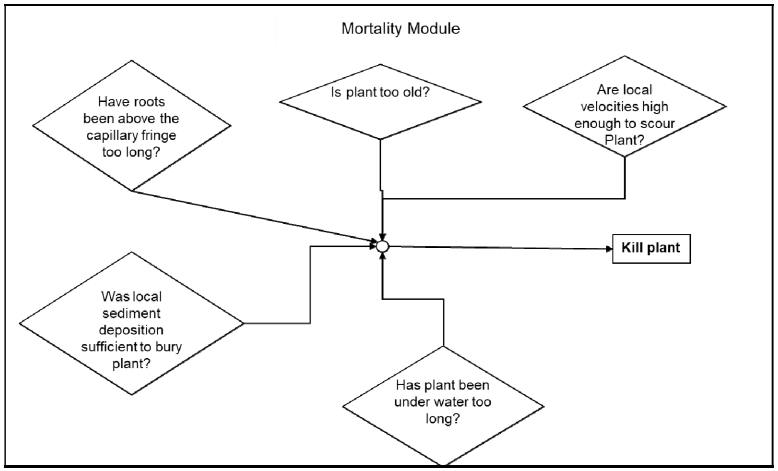


Vegetation Recruitment

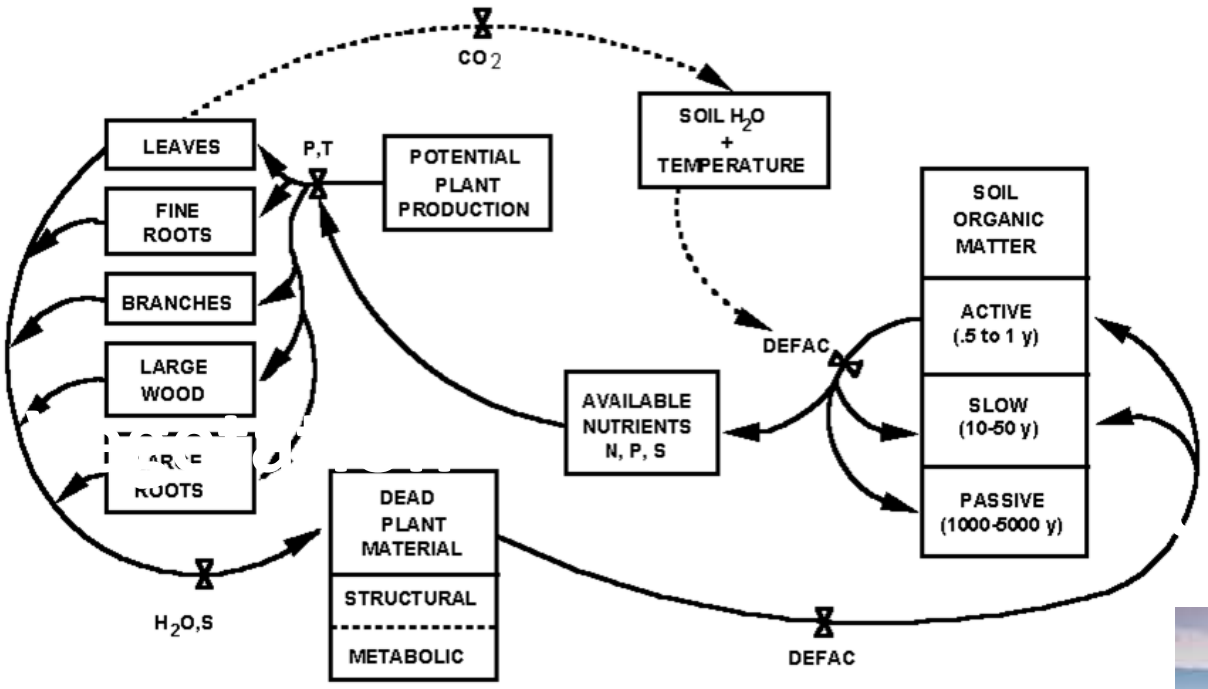


Vegetation Growth





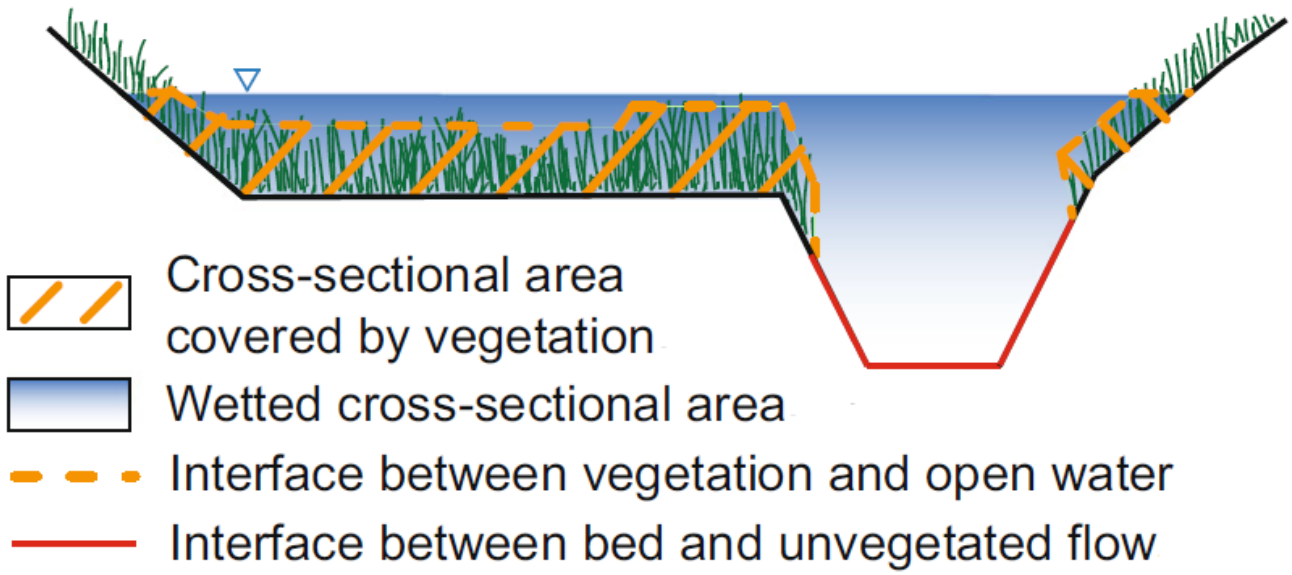
Vegetation and Nutrient Interactions



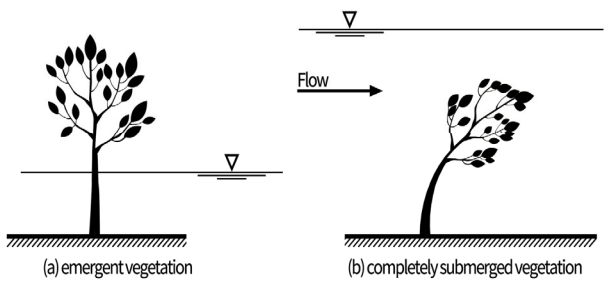
Literature Review done but not implemented within RVSM yet.

Will support BMP for load reductions. Need to expand to include Chemicals and Metals.

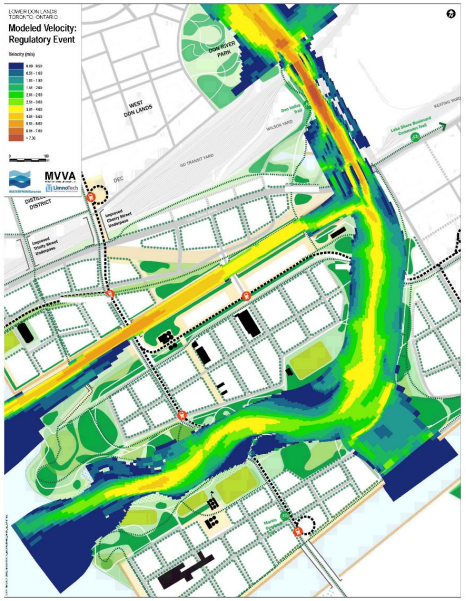
Dynamic Vegetation Roughness

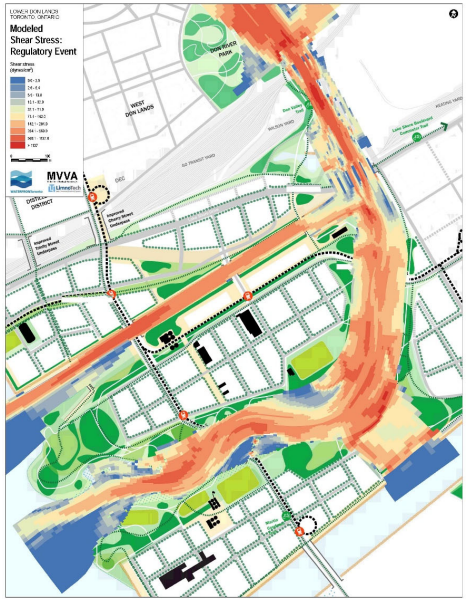


As Vegetation grows and dies, Hydraulic Roughness is allowed to change.



Example EWN Projects to be Supported





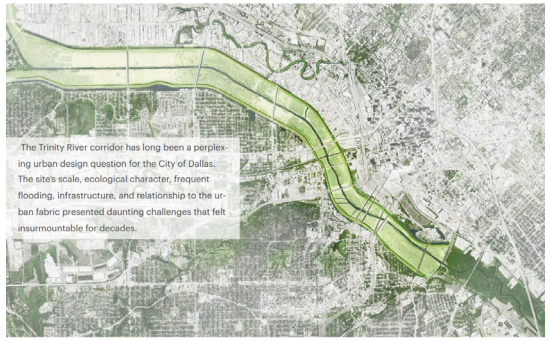
The Toronto Lower Don Lands project combined:

- **Design of a new mouth for the Don River,**
- **Design of engineered control structures,**
- **Detailed hydraulic and hydrodynamic flood modeling,**
- **Permitting, and**
- **Urban design/ landscape architecture for a new district of the City of Toronto.**

Example EWN Projects to be Supported

Dallas, TX – Trinity River Project Includes:

- River Channel modification / stream geomorphology
- Wetlands creation
- Park and trail planning
- Flood management
- Sediment management
- Corps permitting and levee management



Summary

- Provides a physically based modeling system that computes flows, sedimentation, water quality, and vegetation growth and mortality
- Supports man-made and nature based features in urban settings
- Allows for fine scale project features
- Supports USACE mission in flood control while incorporating nature based features in support of planning and engineering design projects