

Synergistic Observations and Hydrologic Modeling over a Snow-Dominated Mountain Basin

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Coupling Atmosphere, Surface & Subsurface processes

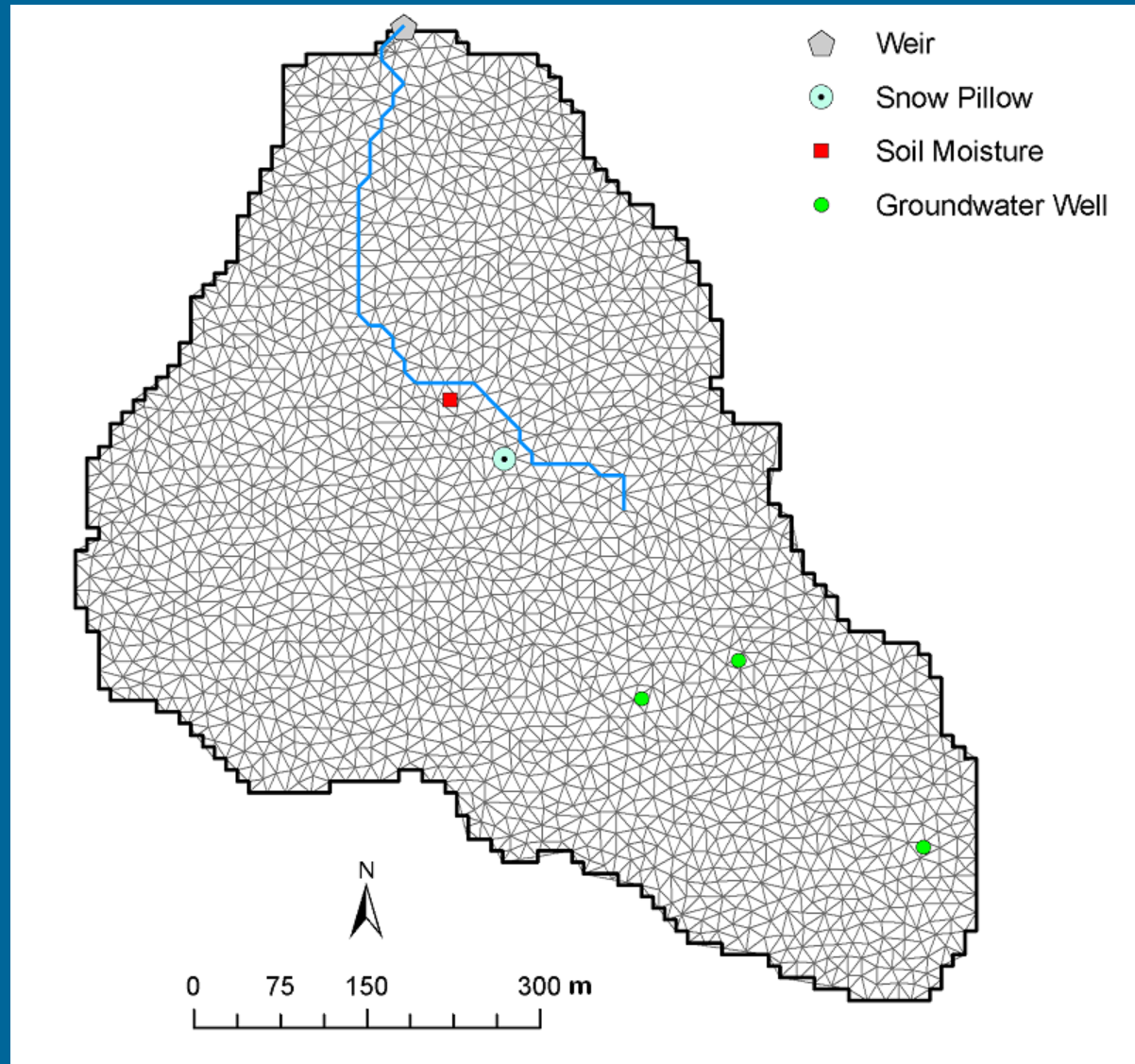
An integrated measurement & modeling strategy:

- Critical for scaling & SVAT modeling
- Critical for Remote Sensing Assessment & Validation
- Improved hydrologic simulations
- Improved water supply prediction
- Improved eco-hydrologic understanding

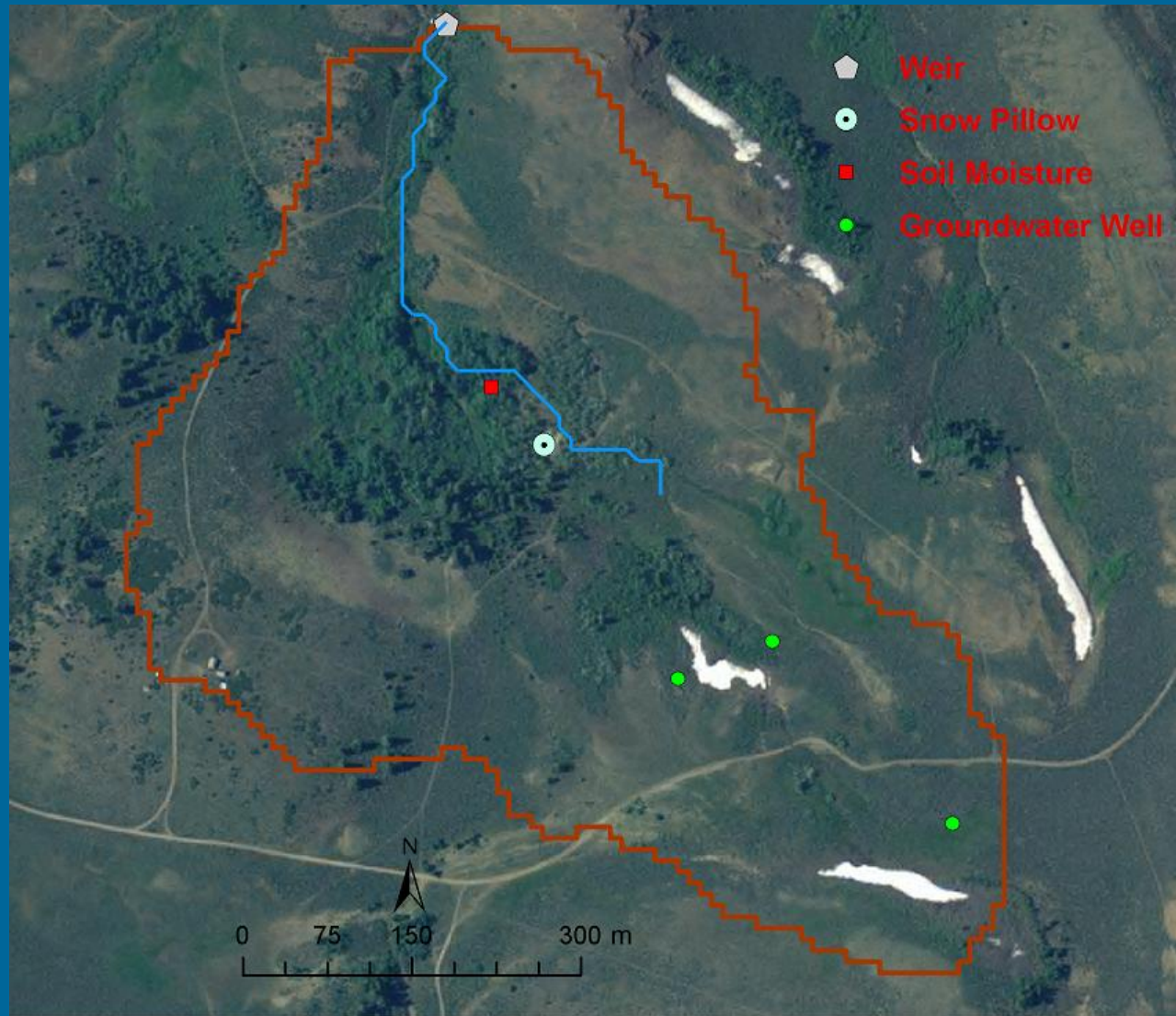
2006 Water Year - Soft-coupling between *Isnobal & PIHM*

- Conversion of raster to unstructured grids
- 1st detailed evaluation of ground-water data...
- Limited validation of soil moisture and groundwater
- Some validation on ET

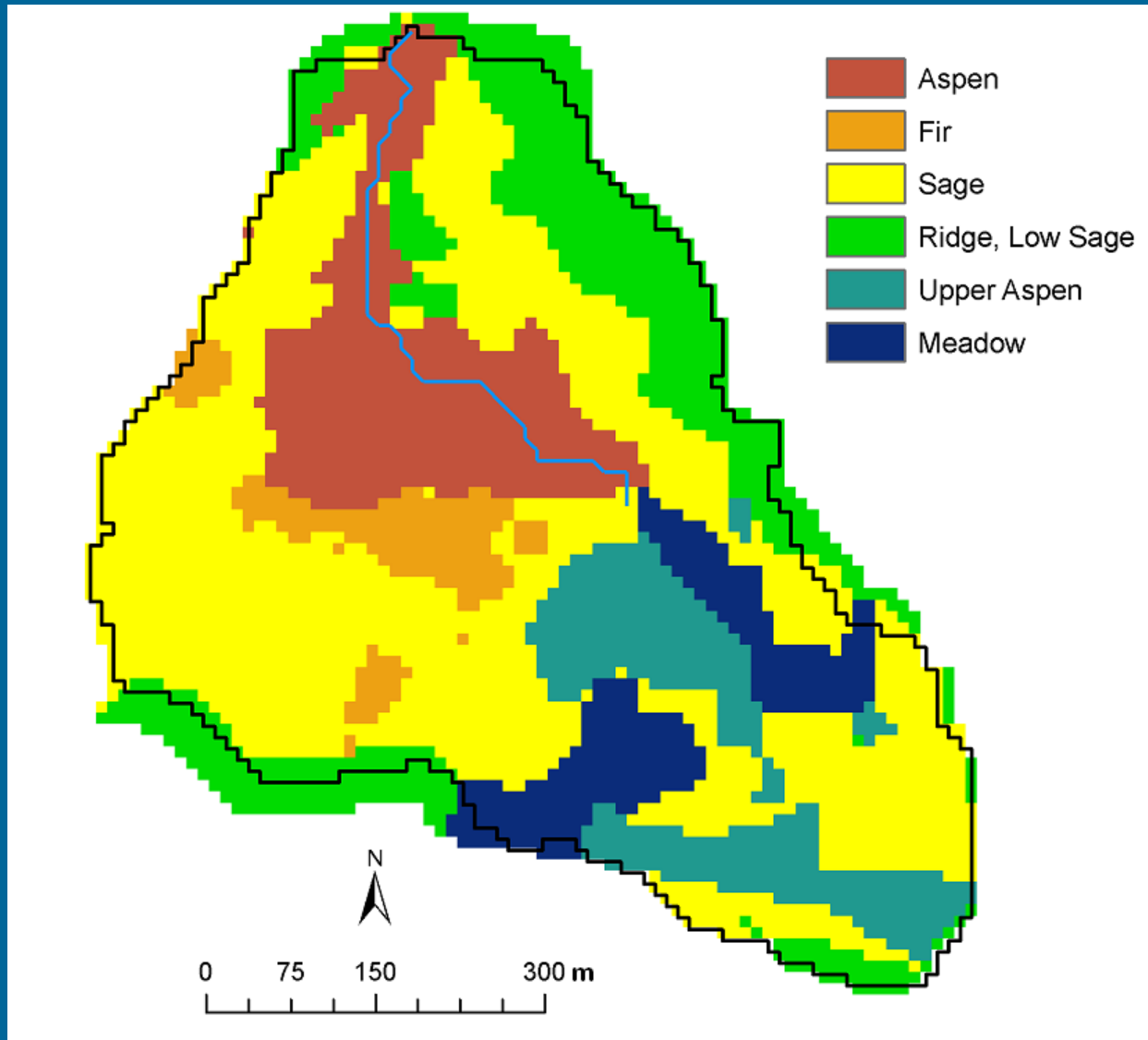
Constrained Unstructured Mesh Decomposition Provides Additional Accuracy and Flexibility



Reynolds Mountain East Study Catchment Conversion to Unstructured Grid



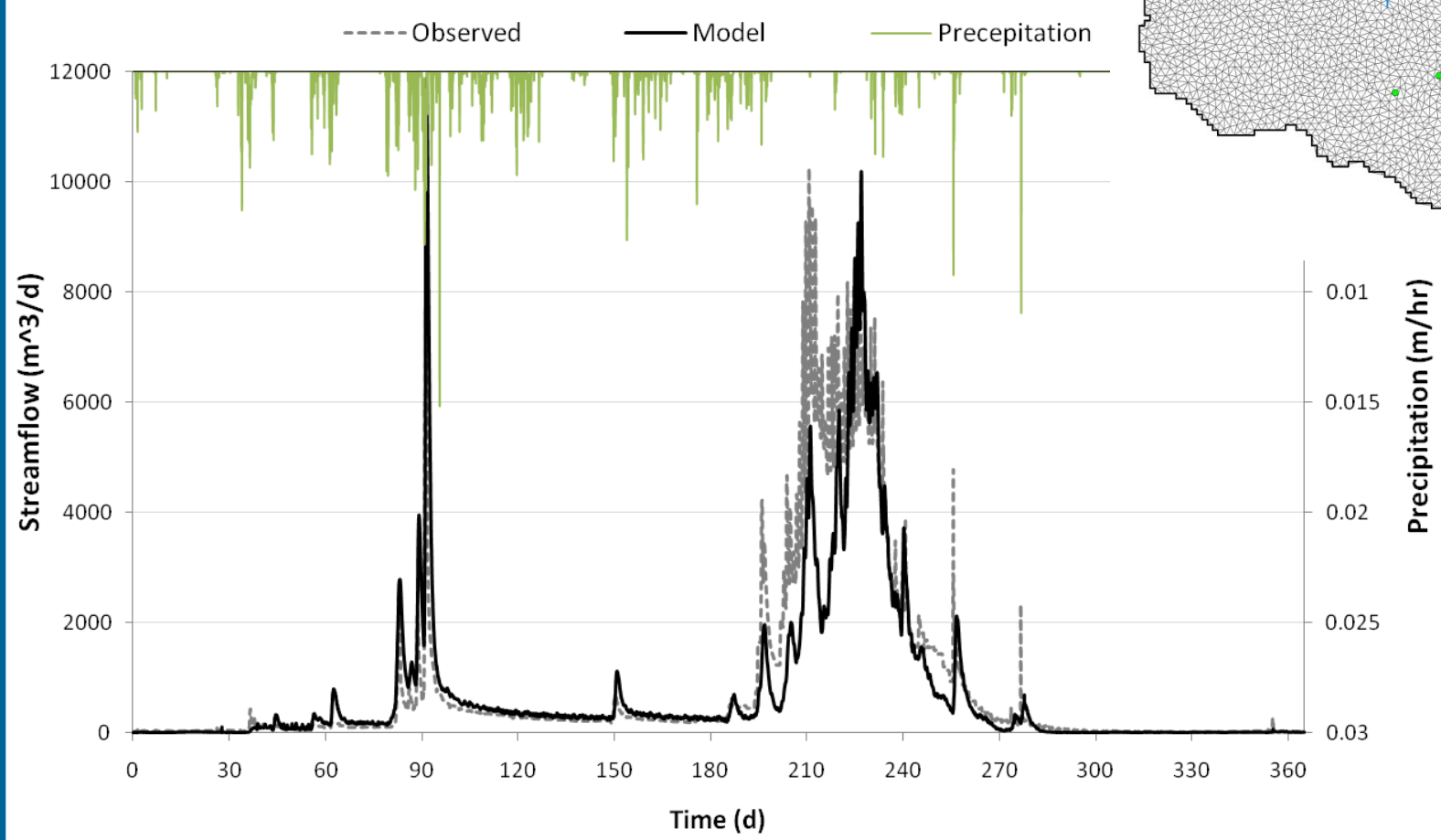
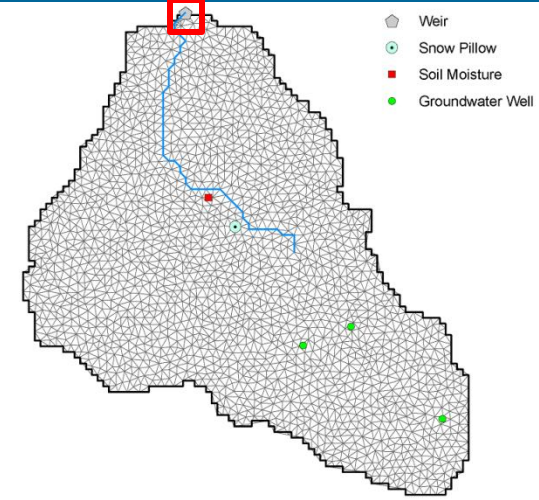
RME Vegetation Cover Regions



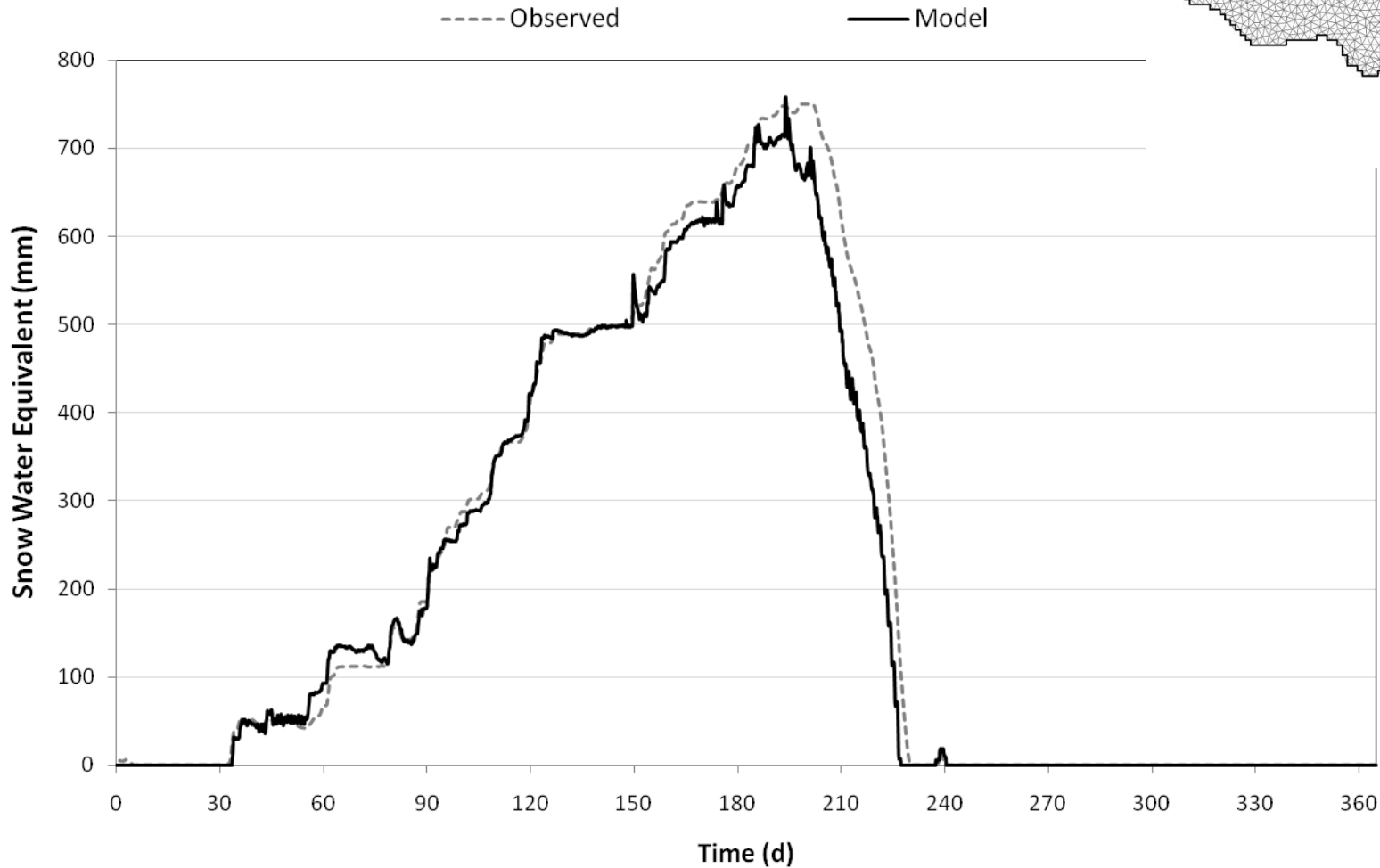
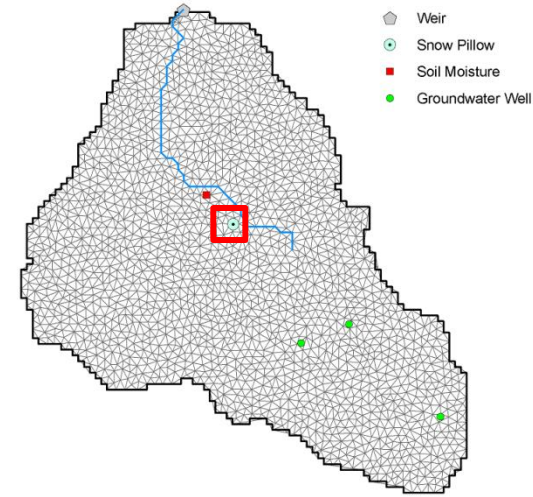
**We Are just beginning to learn how to use
this tool**

**Here are a Few Examples of
How we Can Use This Approach**

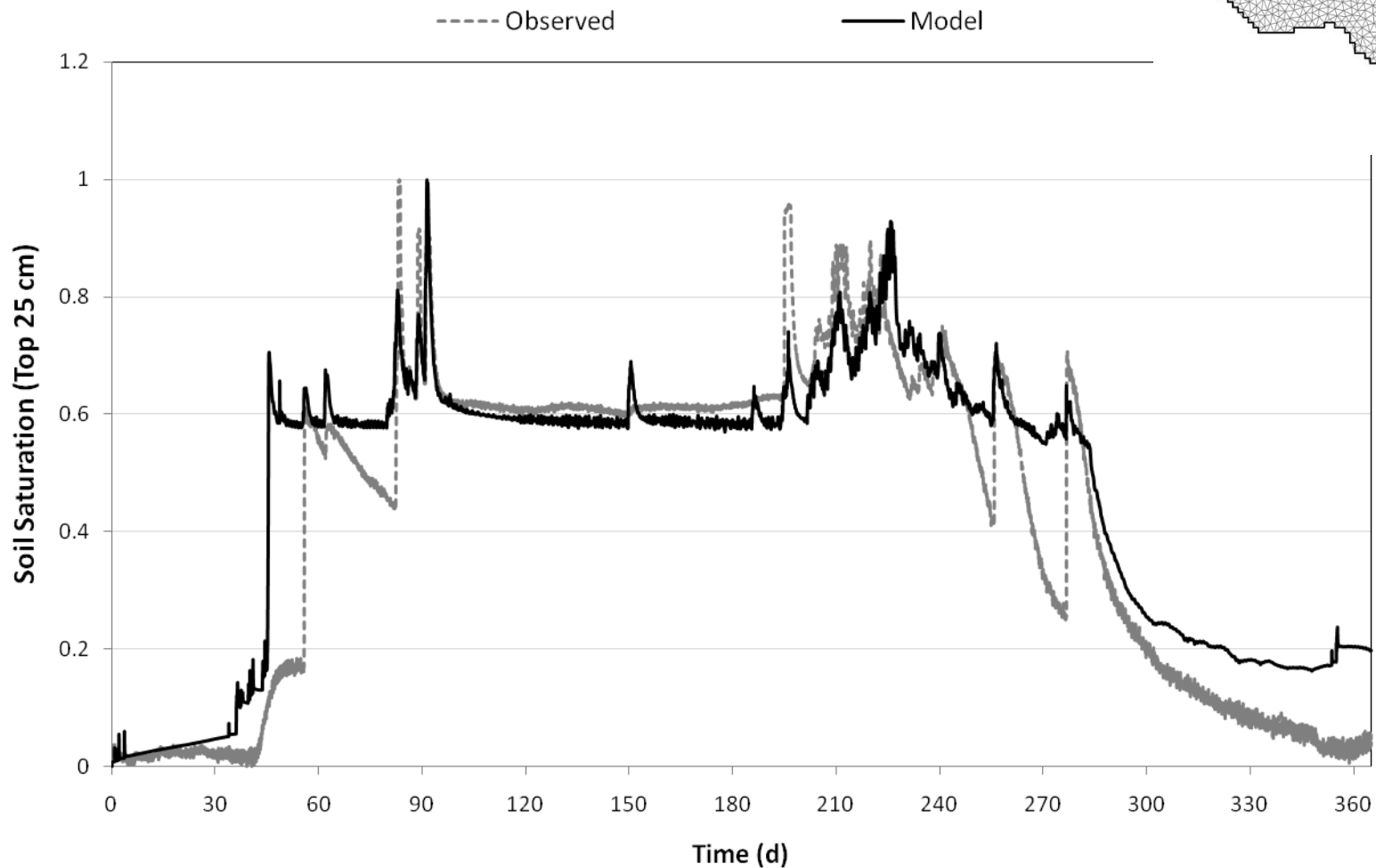
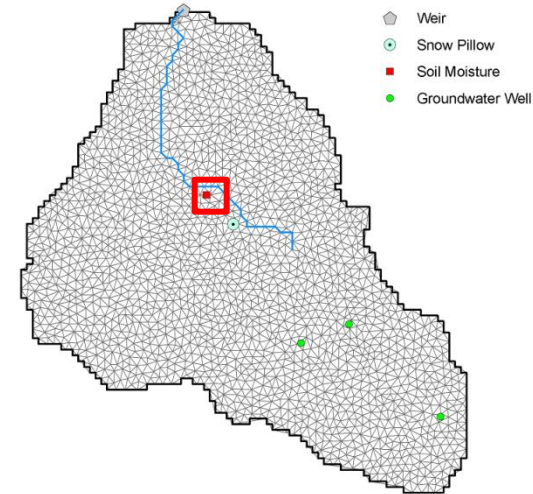
Simulated and Measured Streamflow



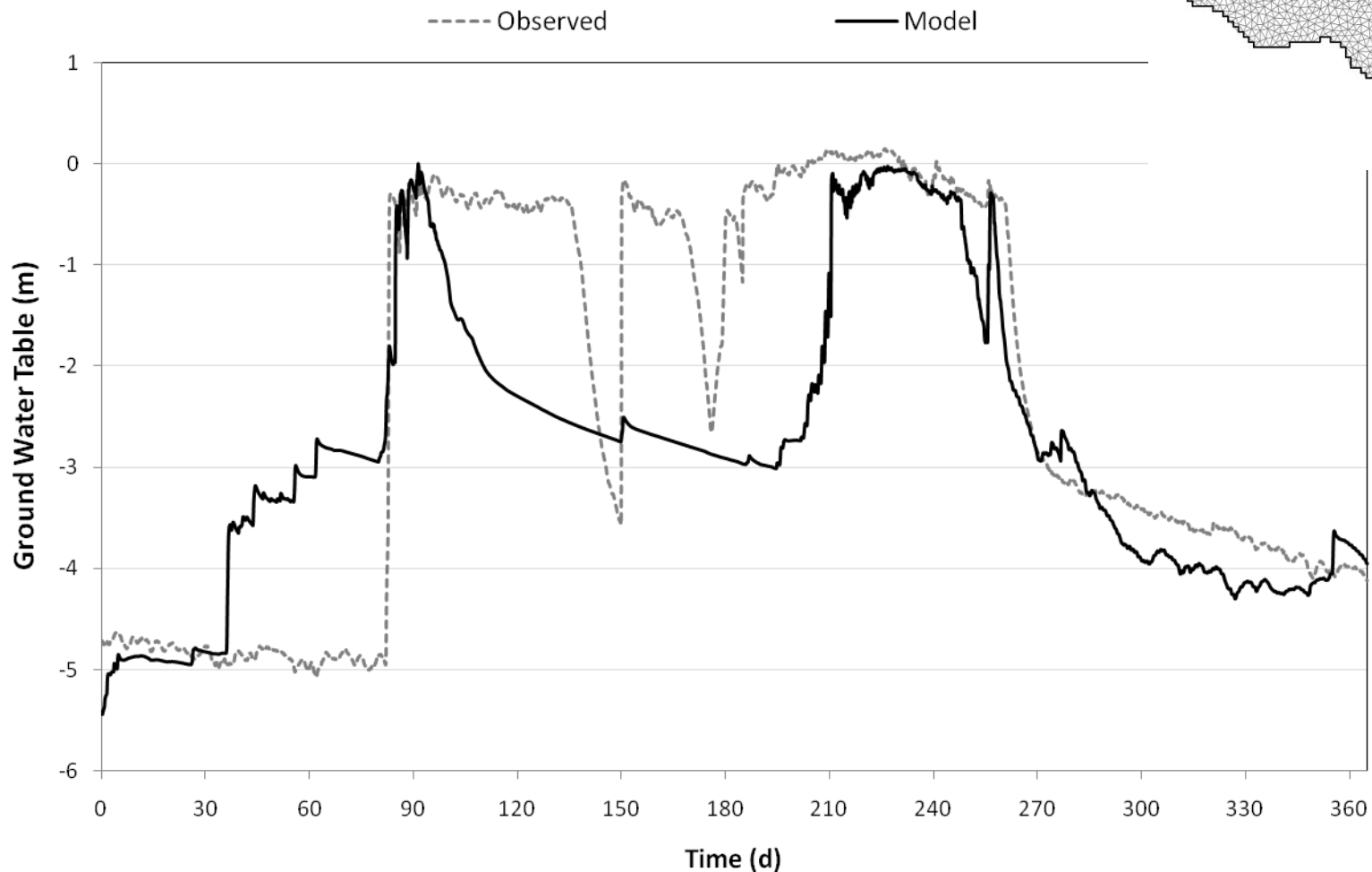
Simulated and Measured Snow Water Equivalent (SWE) (Snow Pillow)



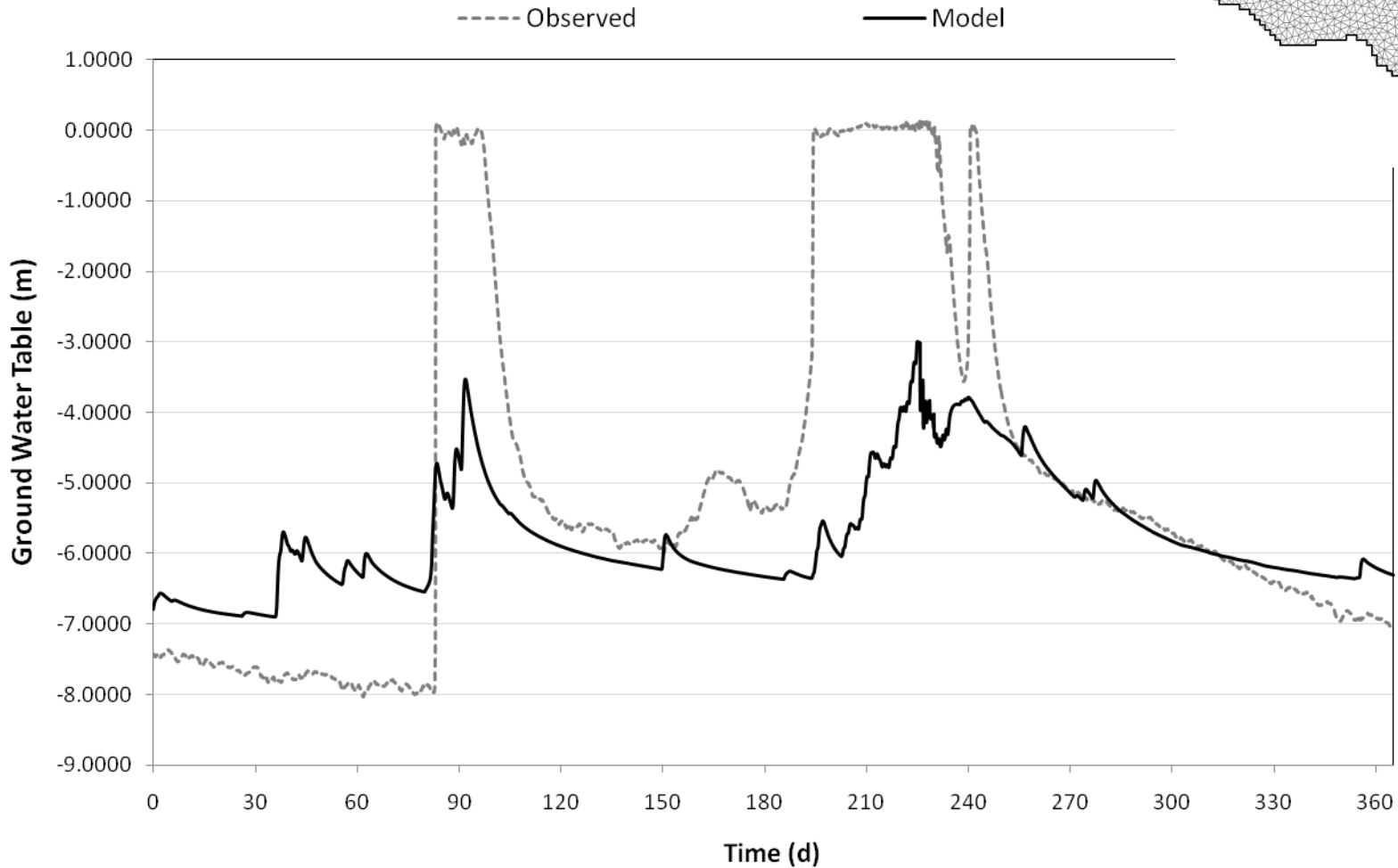
Simulated and Measured Soil Moisture (top 25 cm) (at Snow Pillow site)



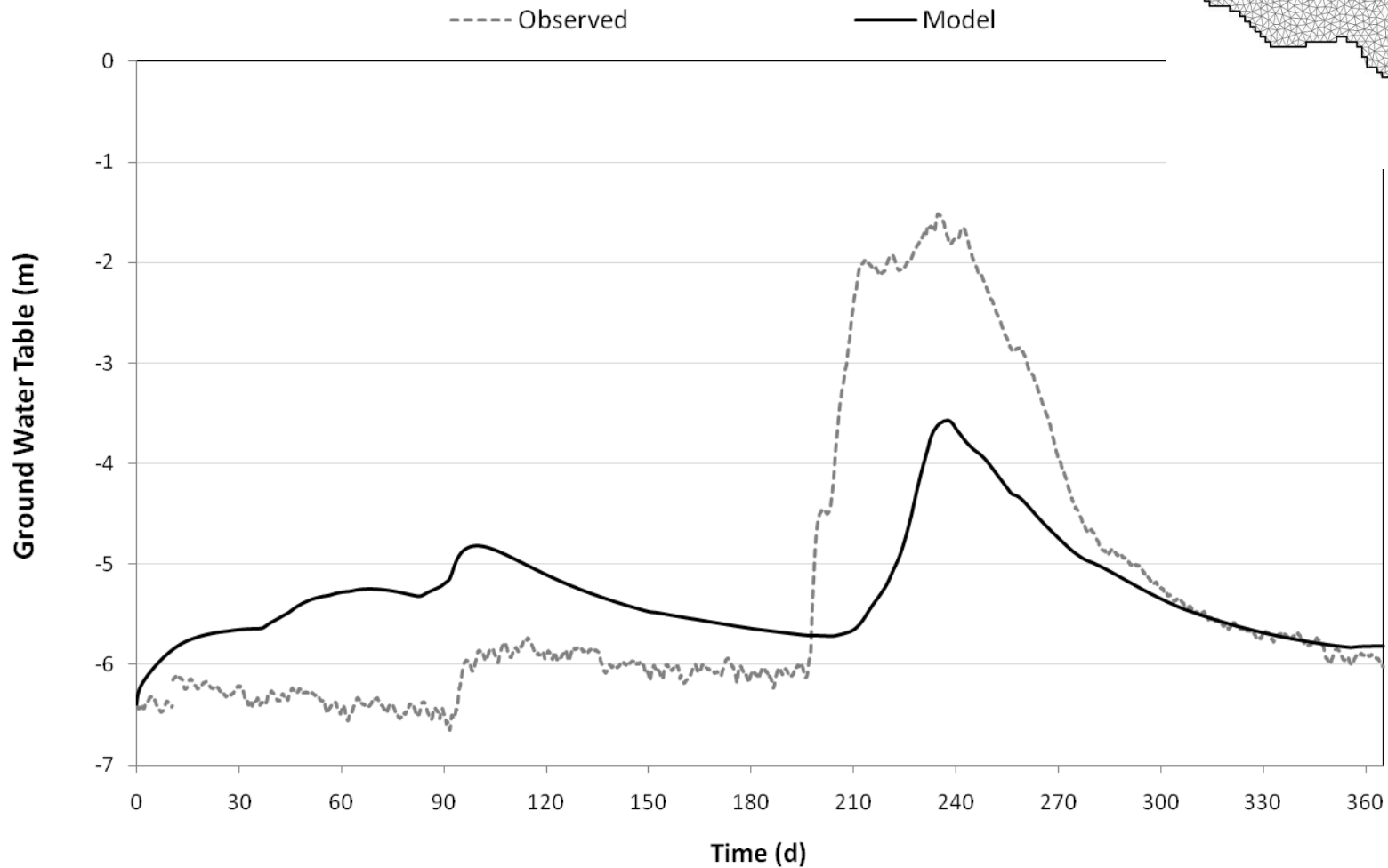
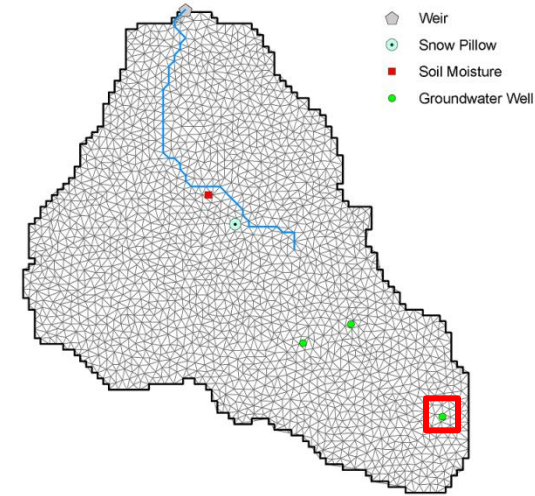
Simulated and Measured Groundwater Head Level (Site A – Aspen Drift)



Simulated and Measured Groundwater Head Level (Site B – Sage site)

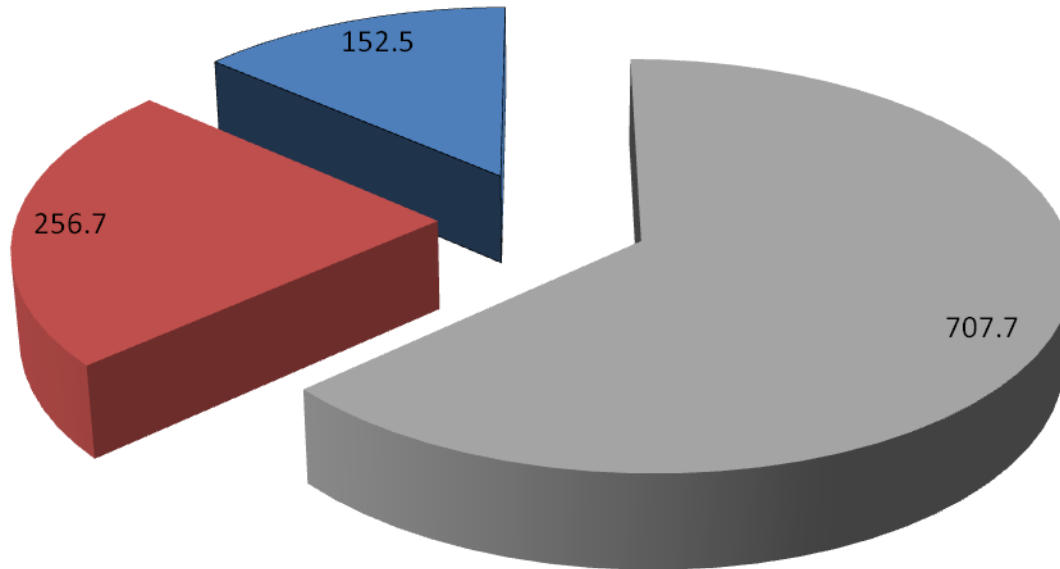


Simulated and Measured Groundwater Head Level (Site C – Meadow Site)



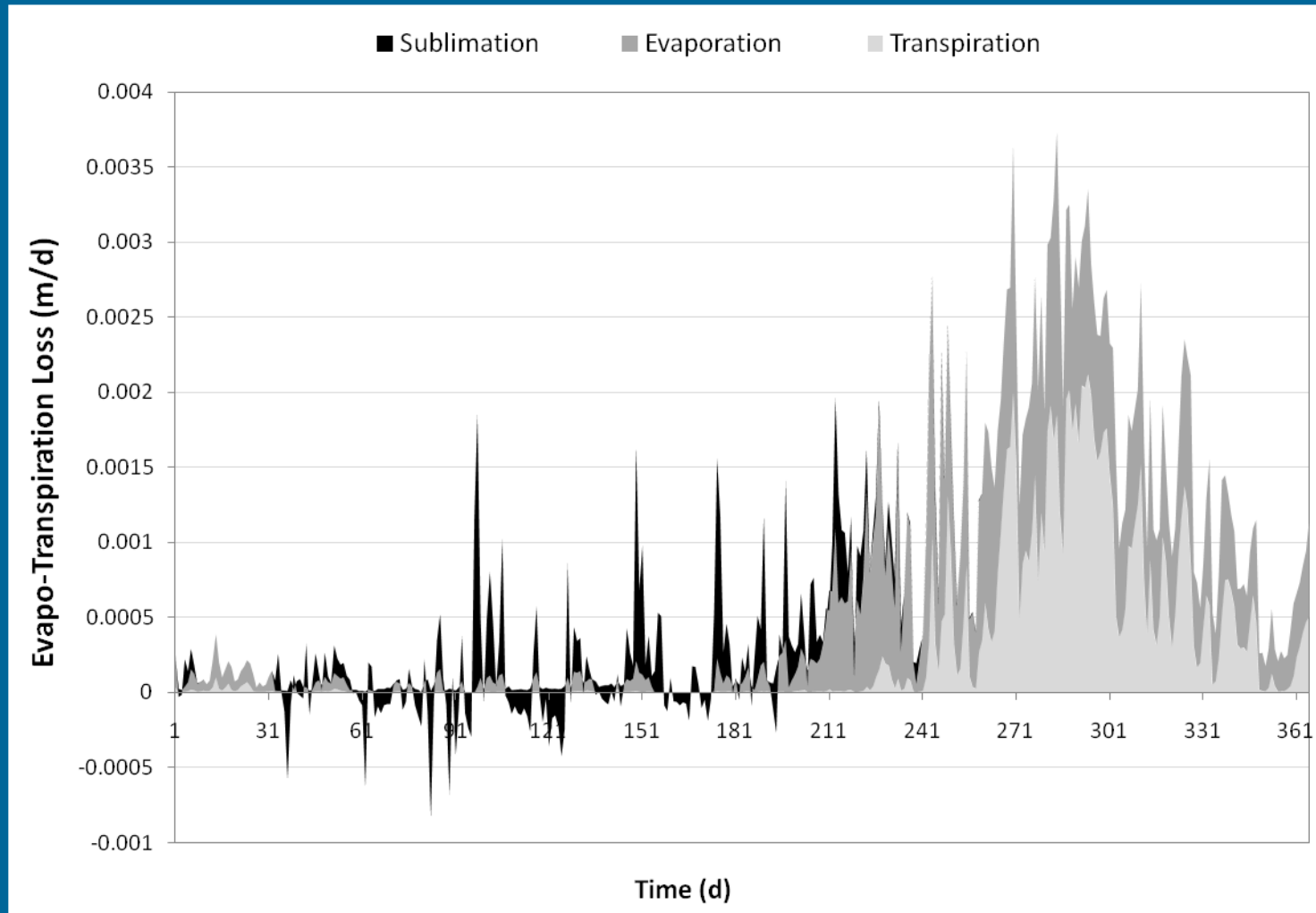
Mass Flux Partition Components

■ Streamflow ■ Evapo-Transpiration Loss ■ Storage

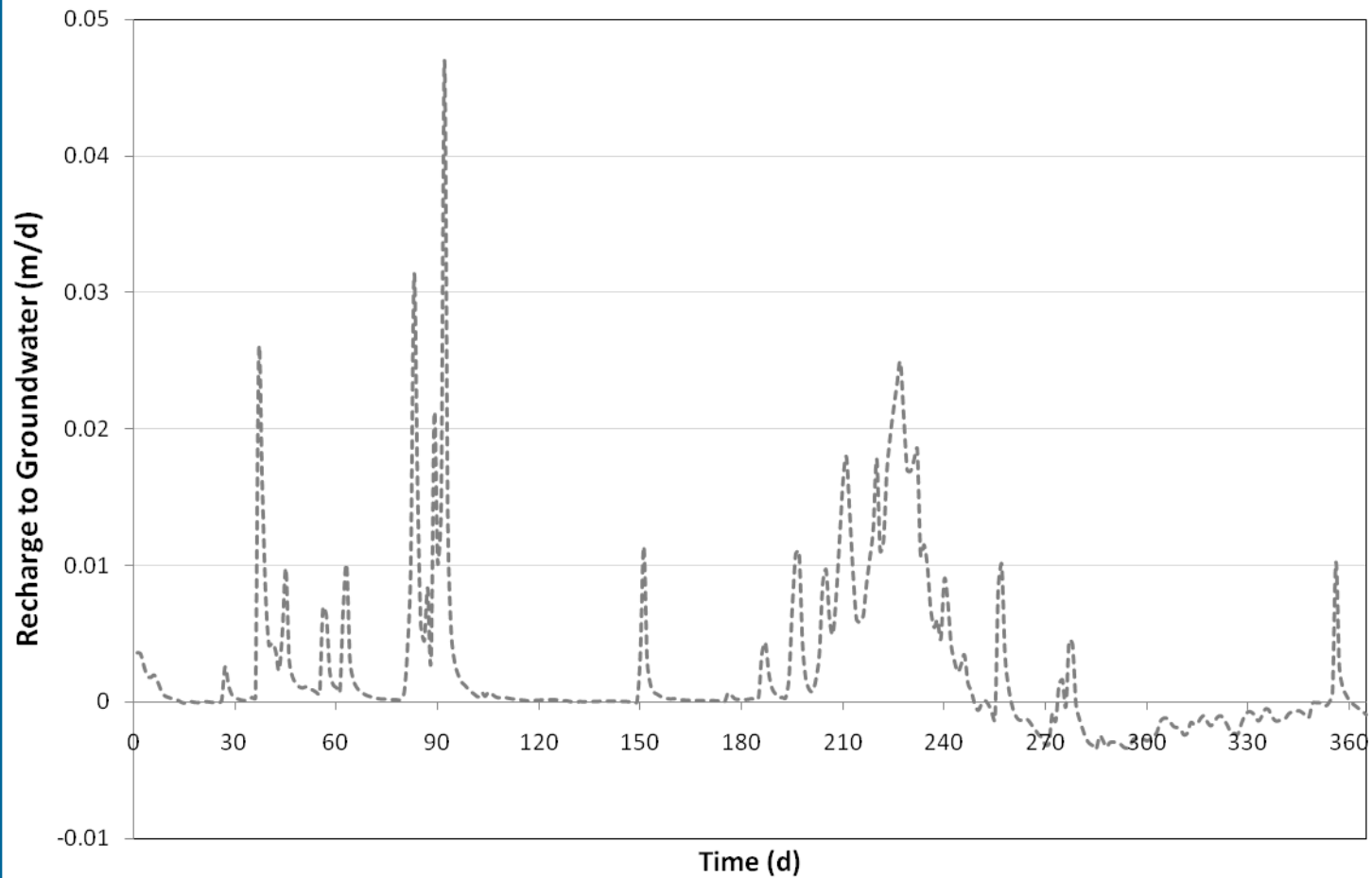


Annual Flux Partition (mm)

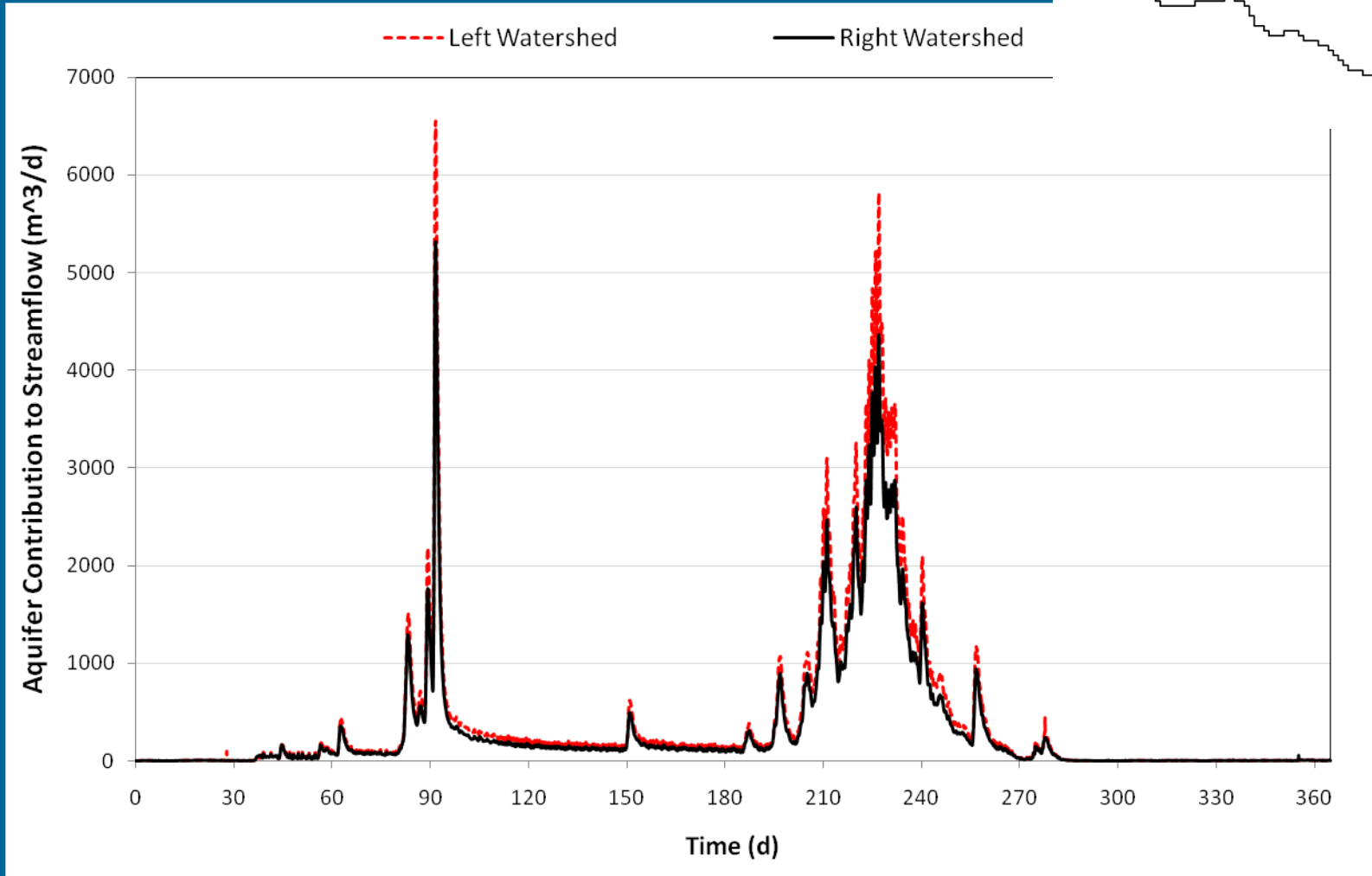
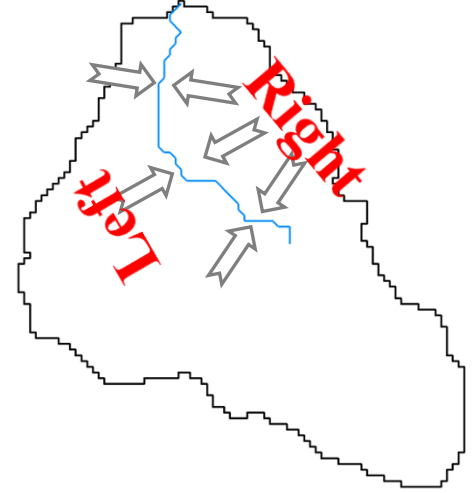
Mean Catchment Evaporative Flux Partitioning



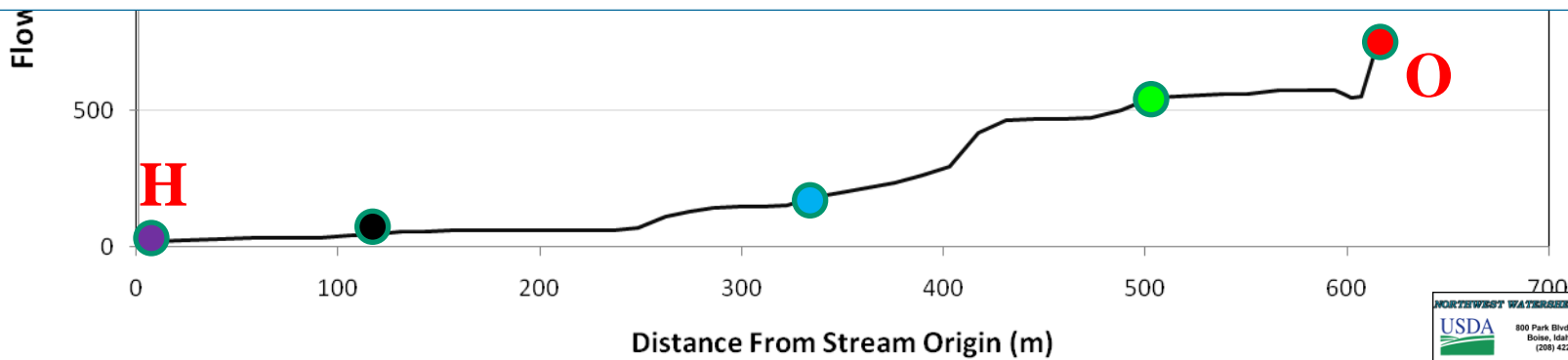
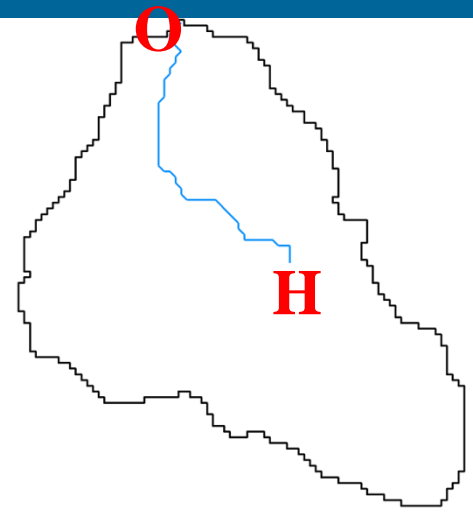
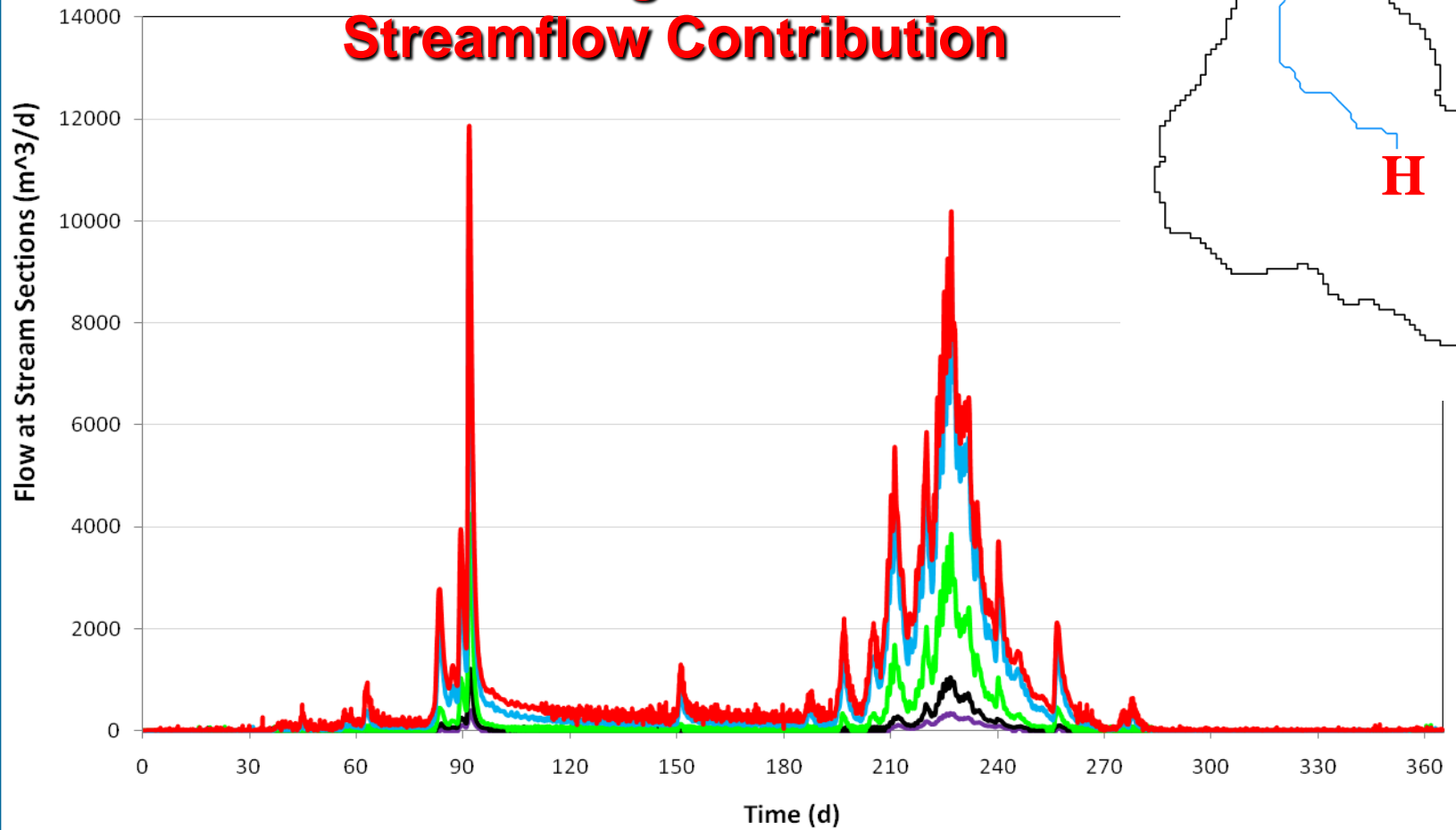
Mean Catchment Groundwater Recharge and Depletion



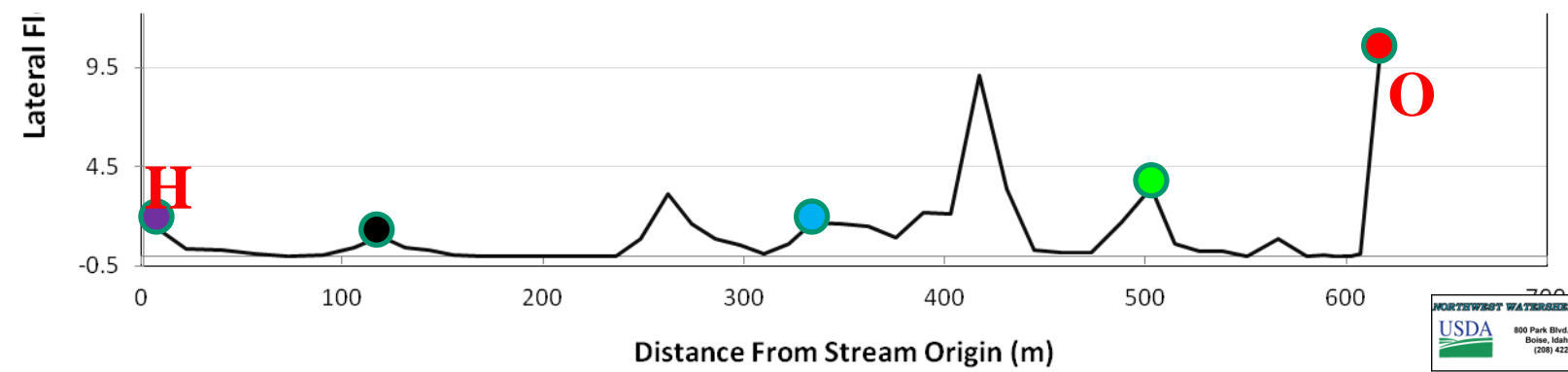
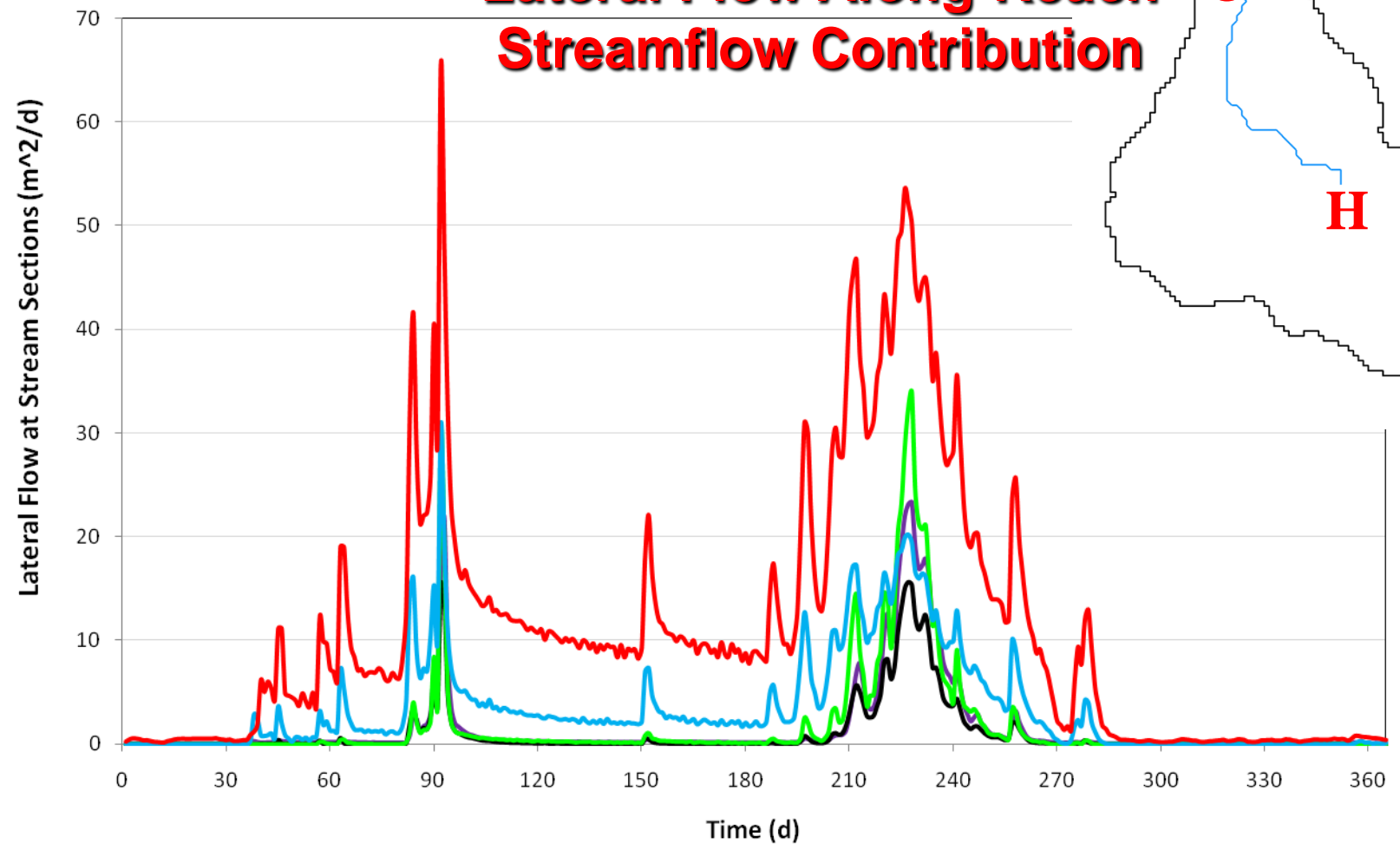
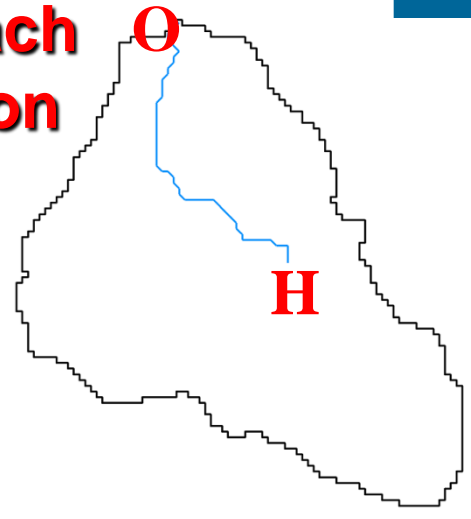
Right (44%) and Left (56%) Bank Streamflow Contribution



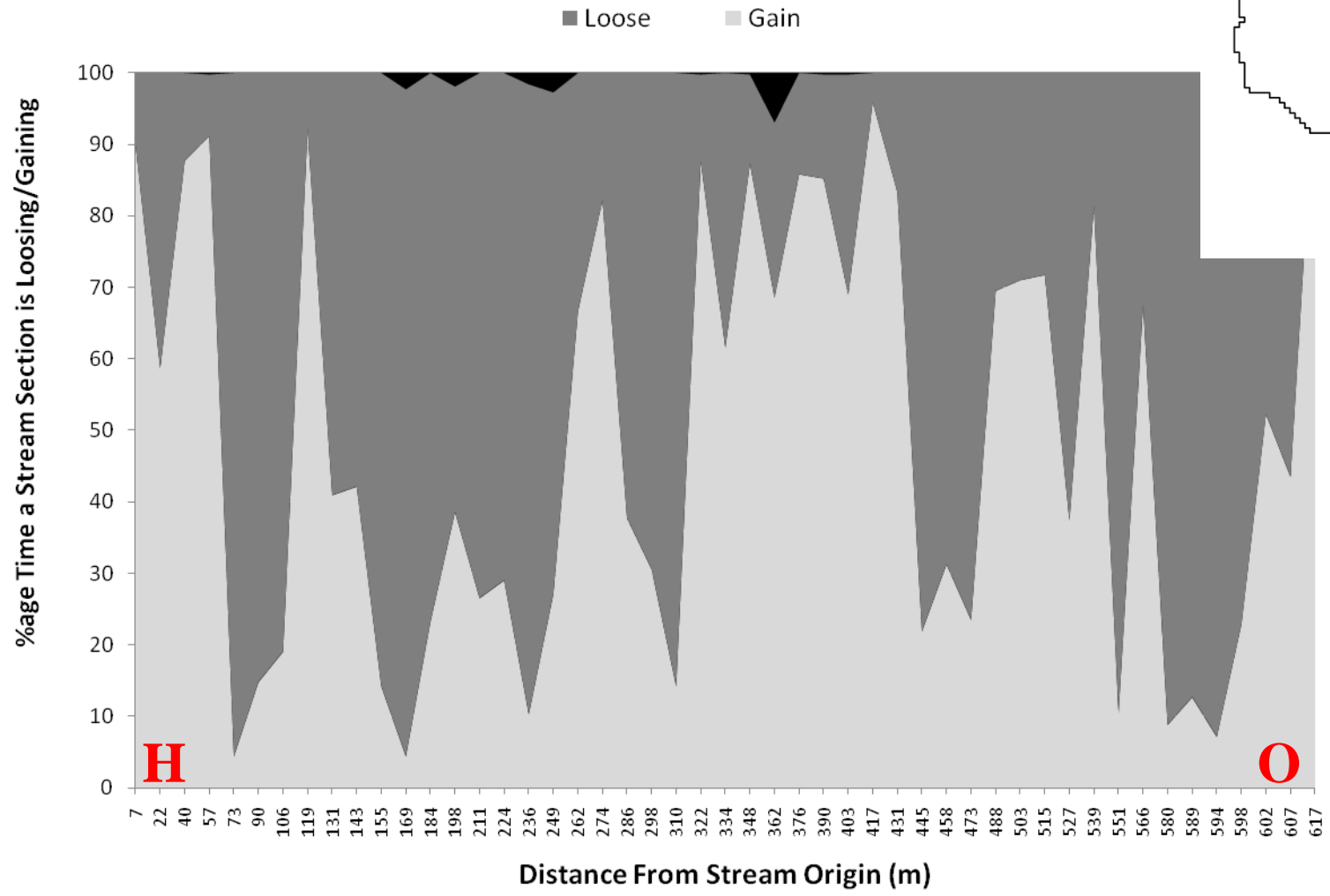
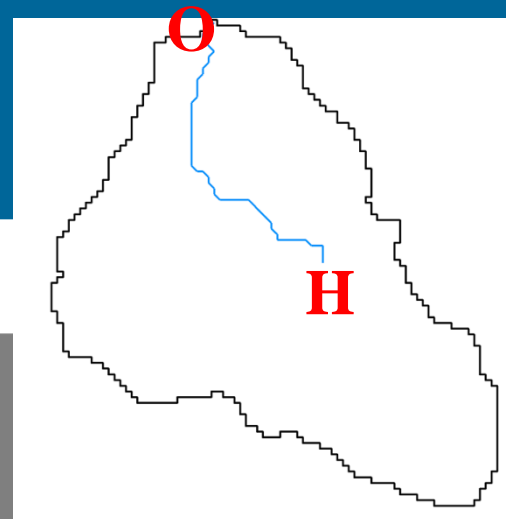
Along-Reach Streamflow Contribution



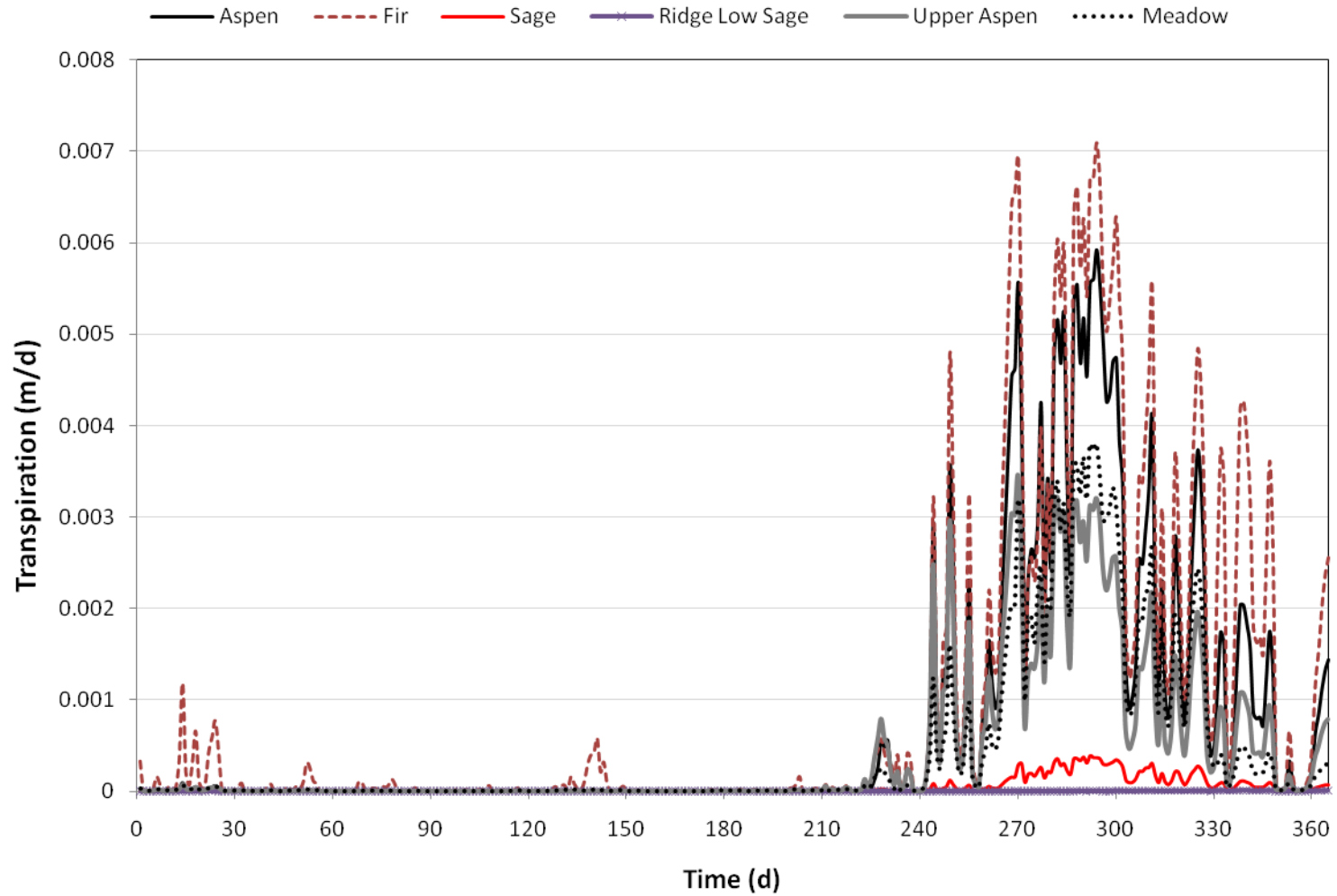
Lateral Flow Along-Reach Streamflow Contribution



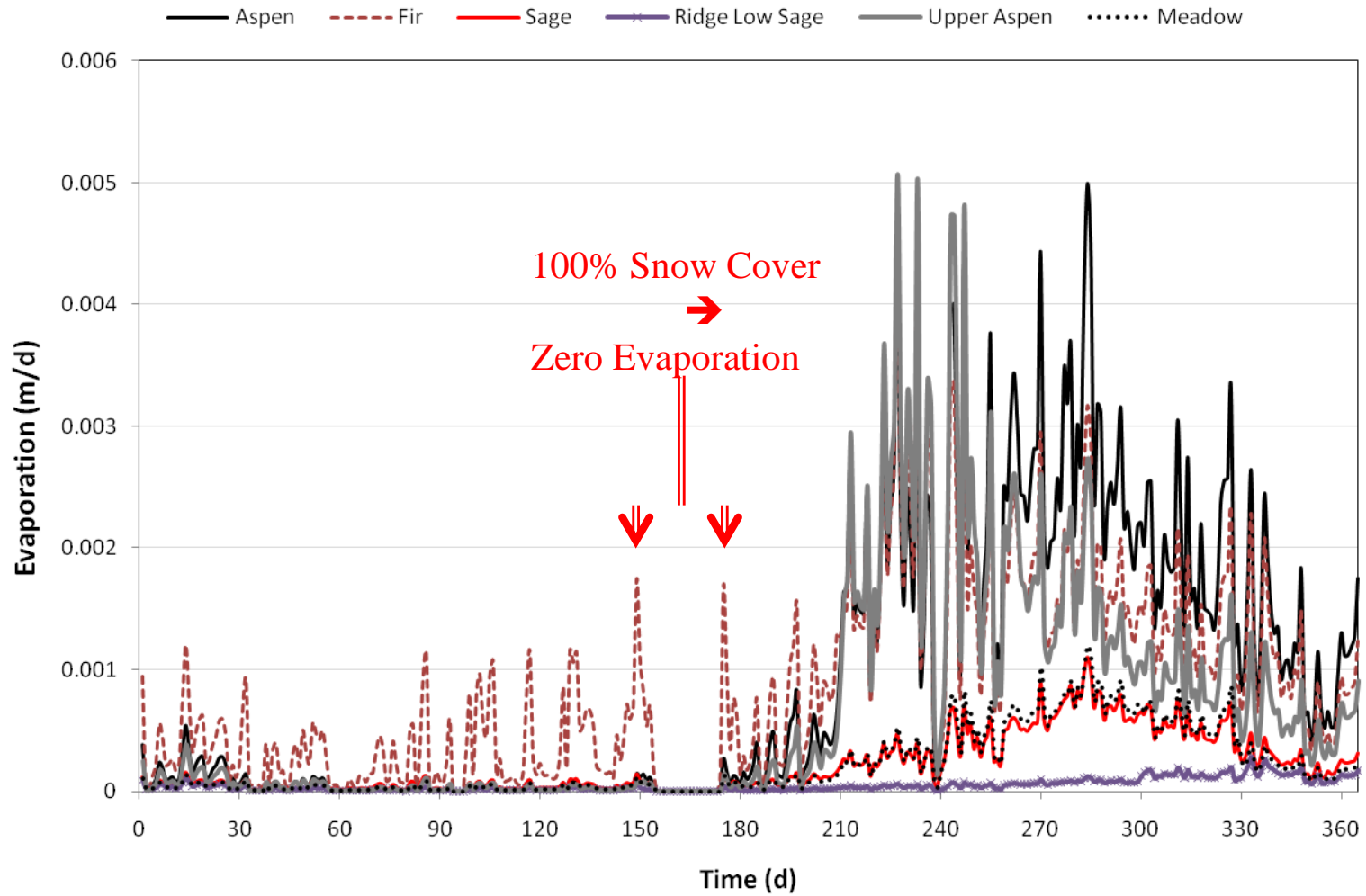
Losing or Gaining Percentage Along-Reach



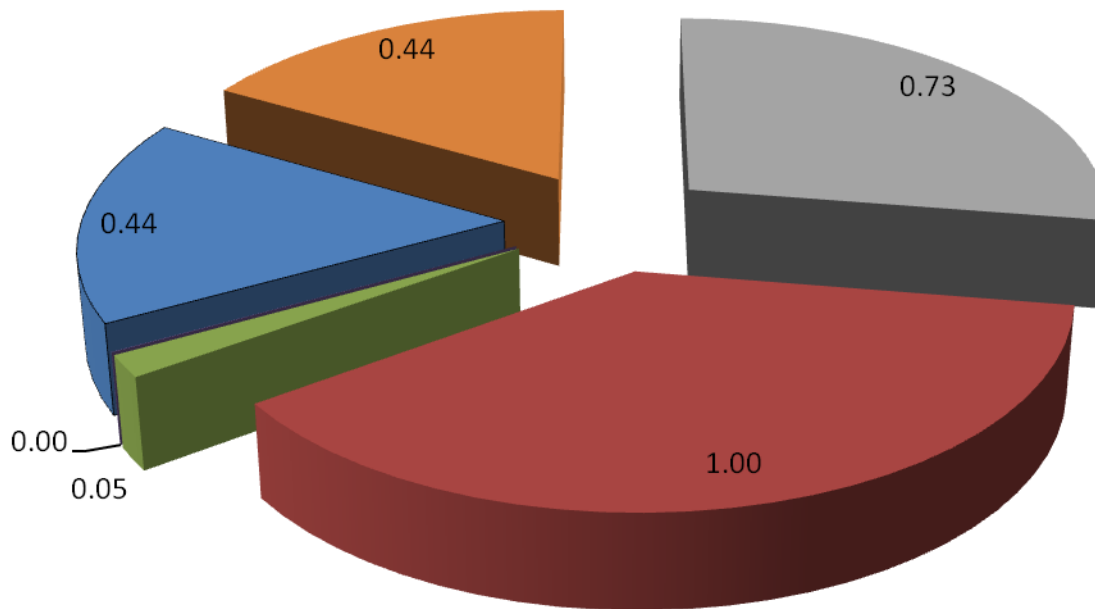
Transpiration by Vegetation Type



Evaporation by Vegetation Type

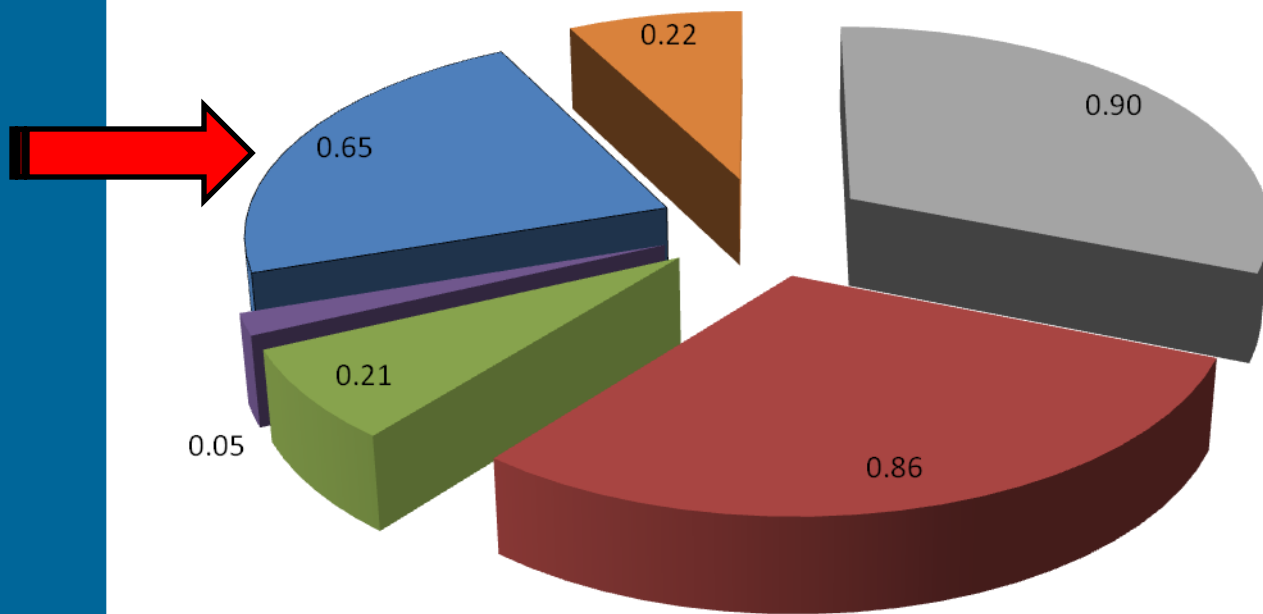


■ aspen ■ fir ■ sage ■ ridge/low sage ■ upper aspen ■ meadow



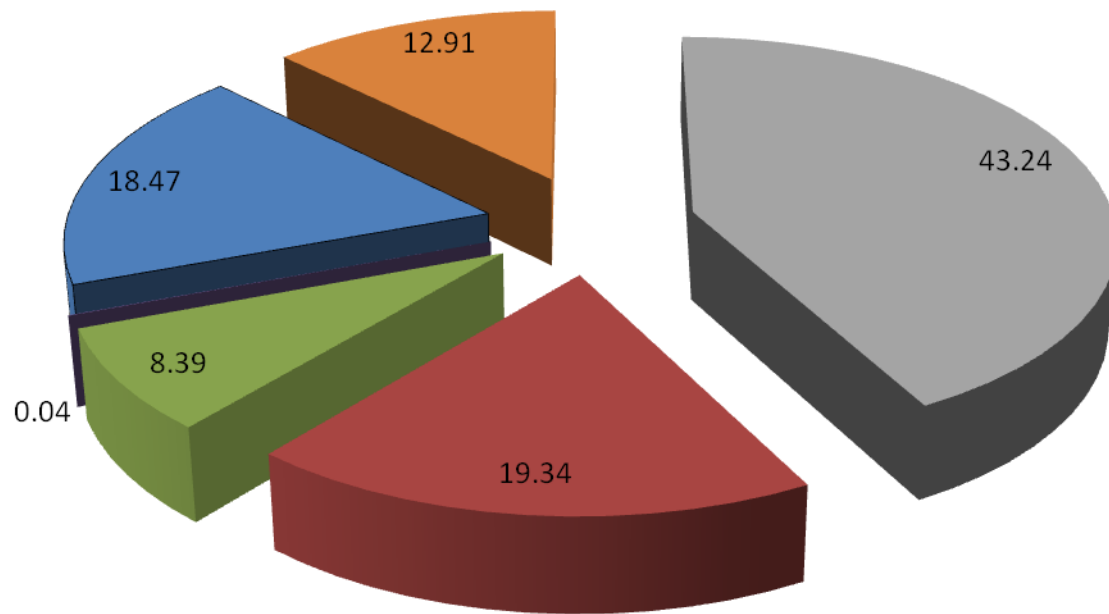
Transpiration Rate (mm/d)

■ aspen ■ fir ■ sage ■ ridge/low sage ■ upper aspen ■ meadow



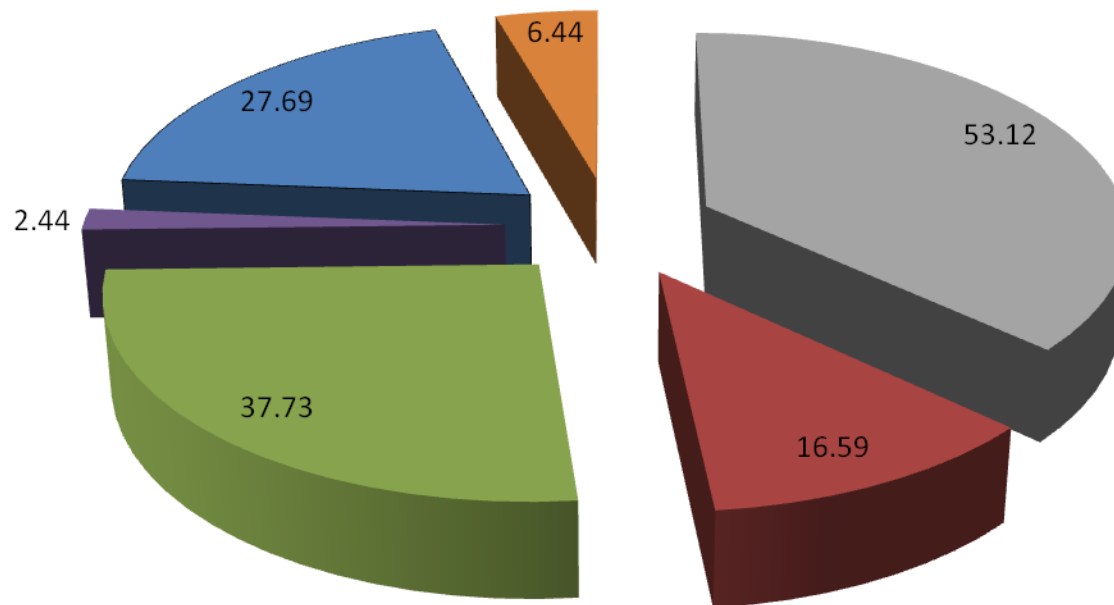
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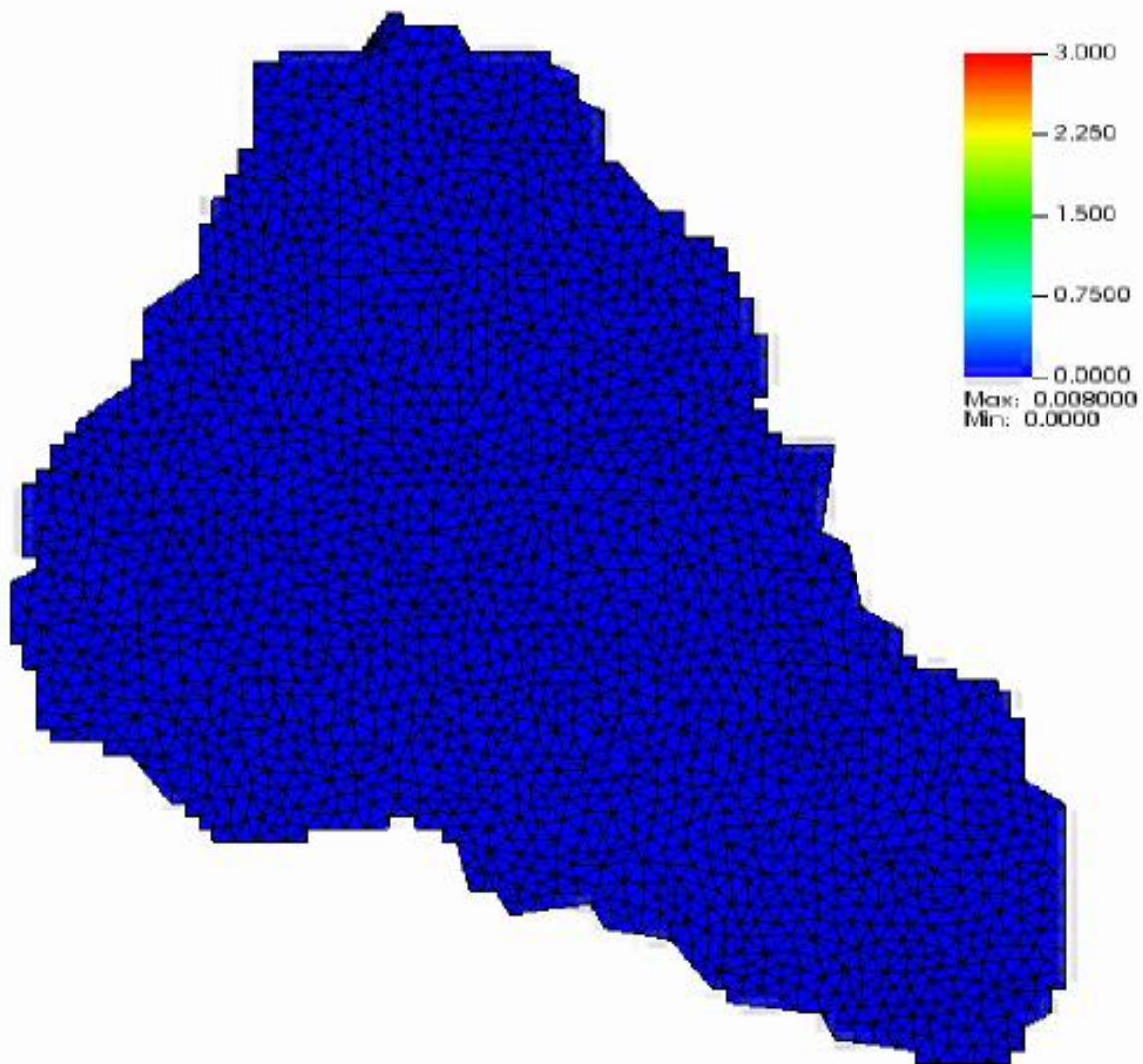
Transpiration (mm)

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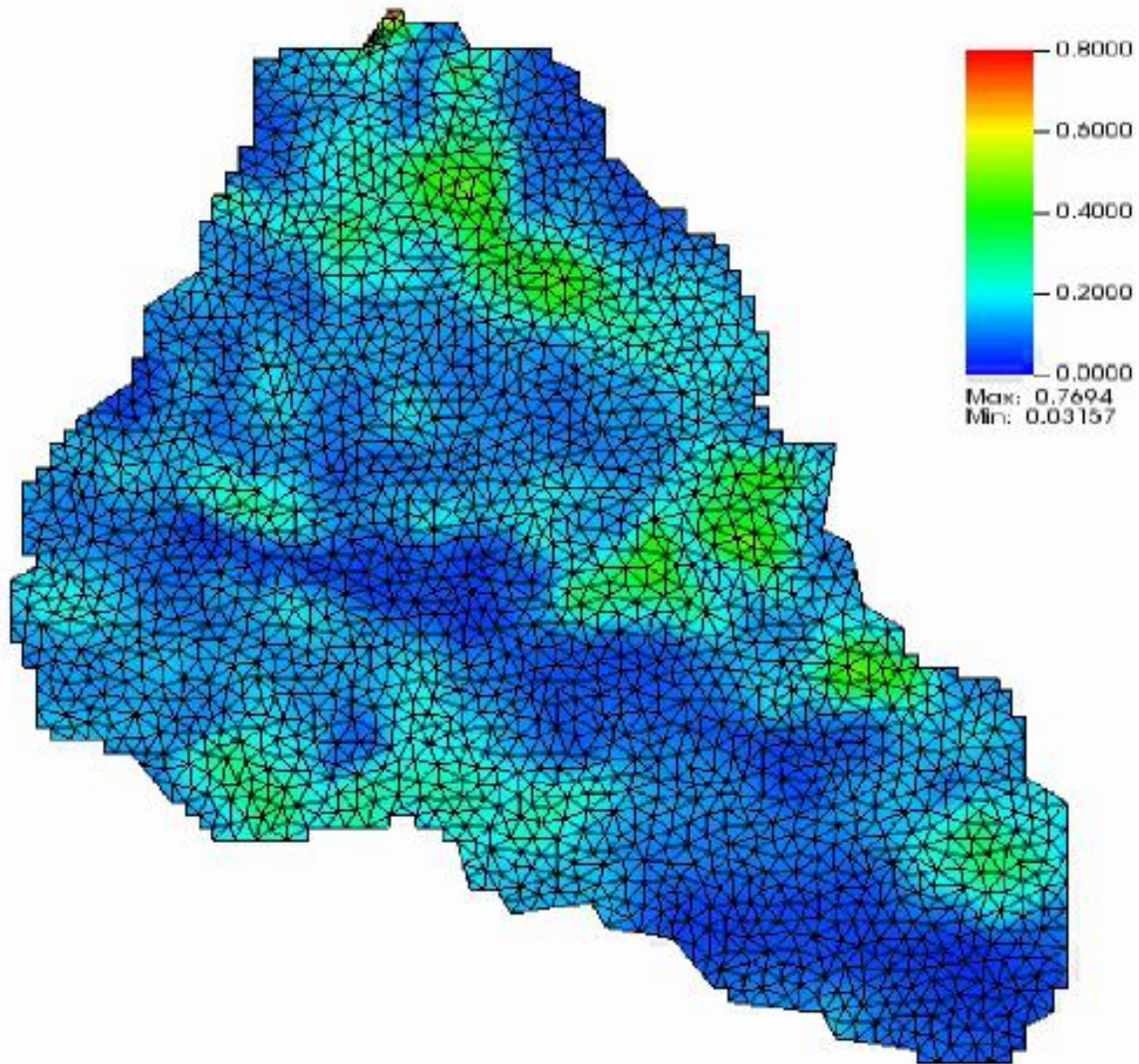
Evaporation (mm)

Snow Depth, 2006 Water Year



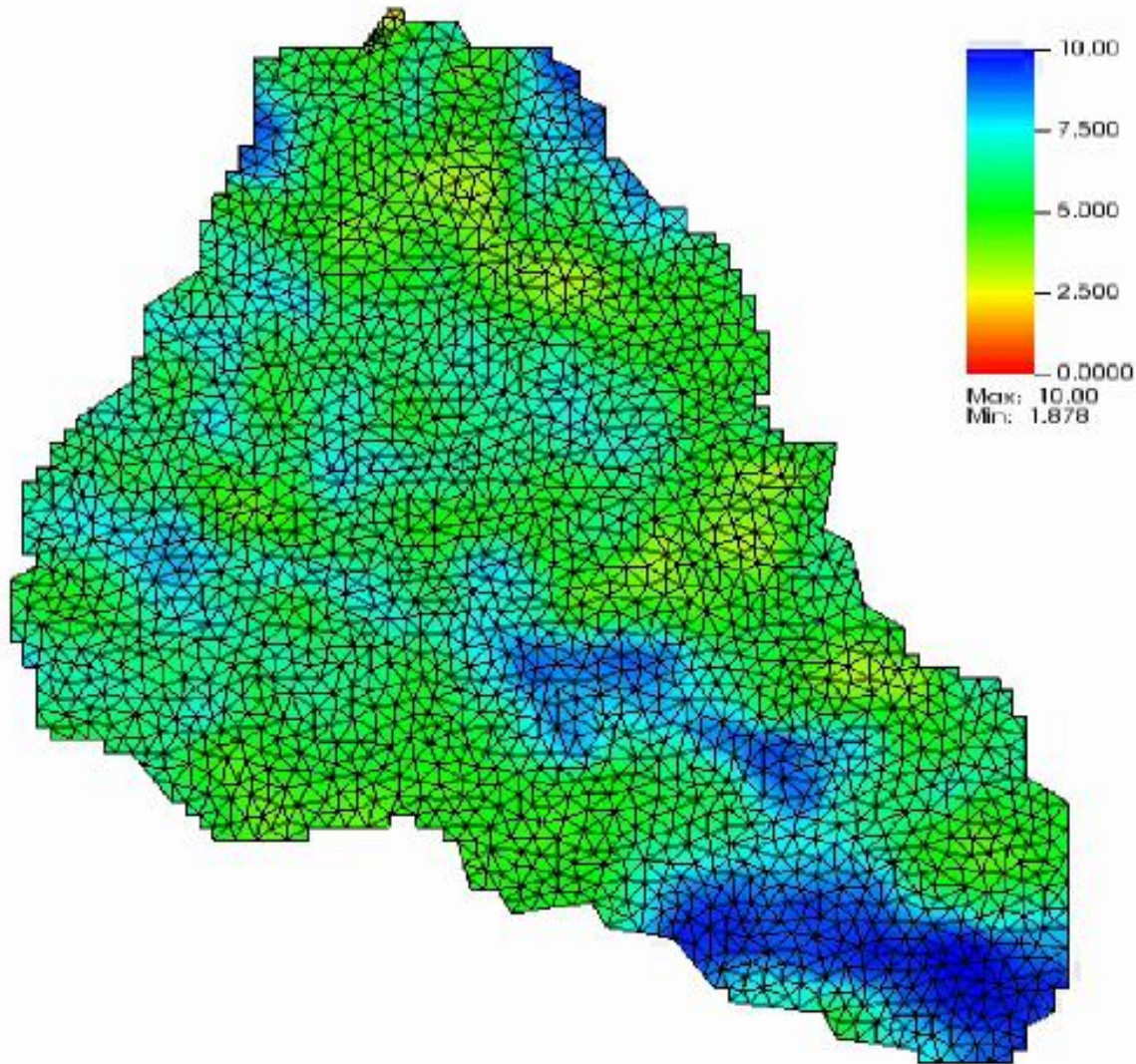
Time=1 day

Soil Moisture, 2006 Water Year



Time=1 day

Groundwater Head, 2006 Water Year



Time=1 day

- **Not perfect, but a good start**
- **Just beginning to learn about below ground processes**
- **Need to sort out groundwater data & need multi-year simulations for storage**
- **Use the model to locate optimum measurement sites**
- **Need to work on multi-processor numerical issues for larger-scale simulations**

