

Pasture Systems and Watershed Management Research Unit

University Park, Pennsylvania

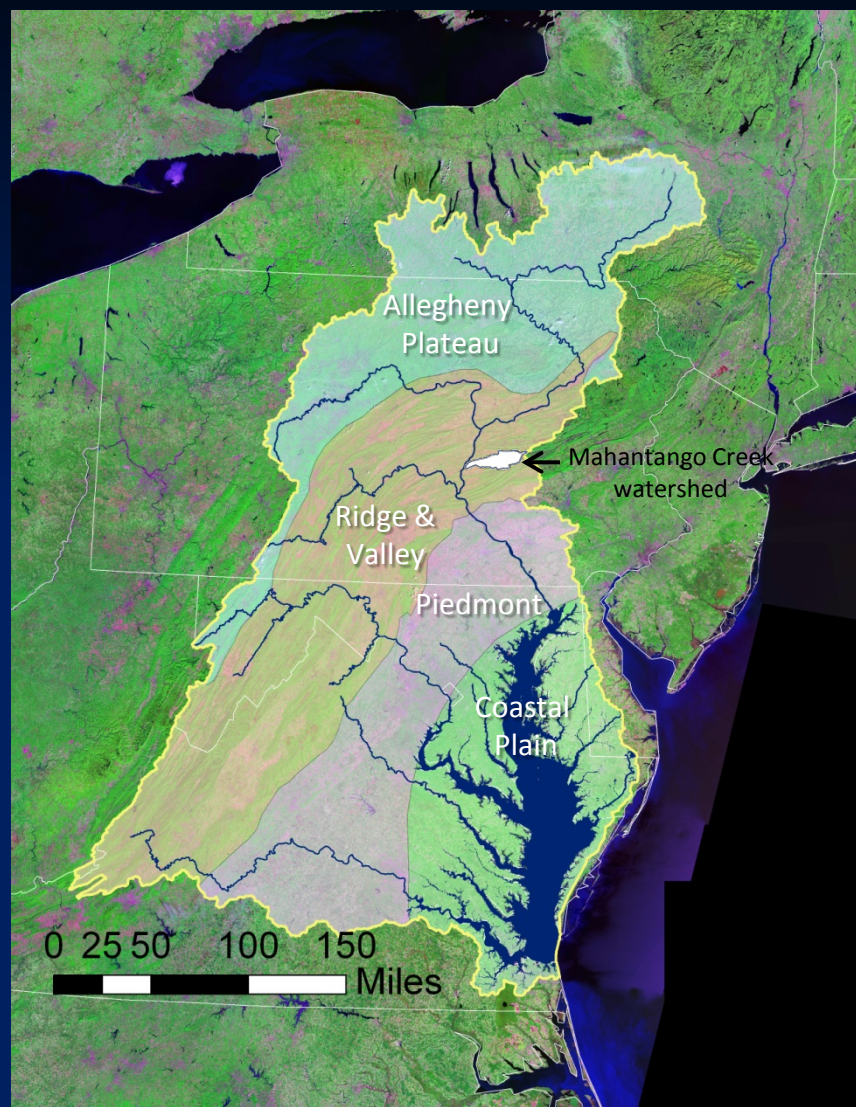


USDA-ARS multi-location project 464:

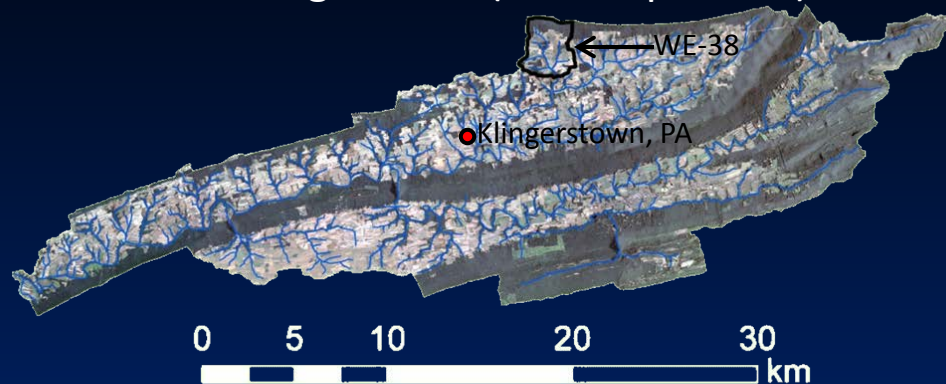
Impacts of climate change on US agro-ecosystems



The Mahantango Creek Experimental watersheds



Mahantango Creek (1968 – present)

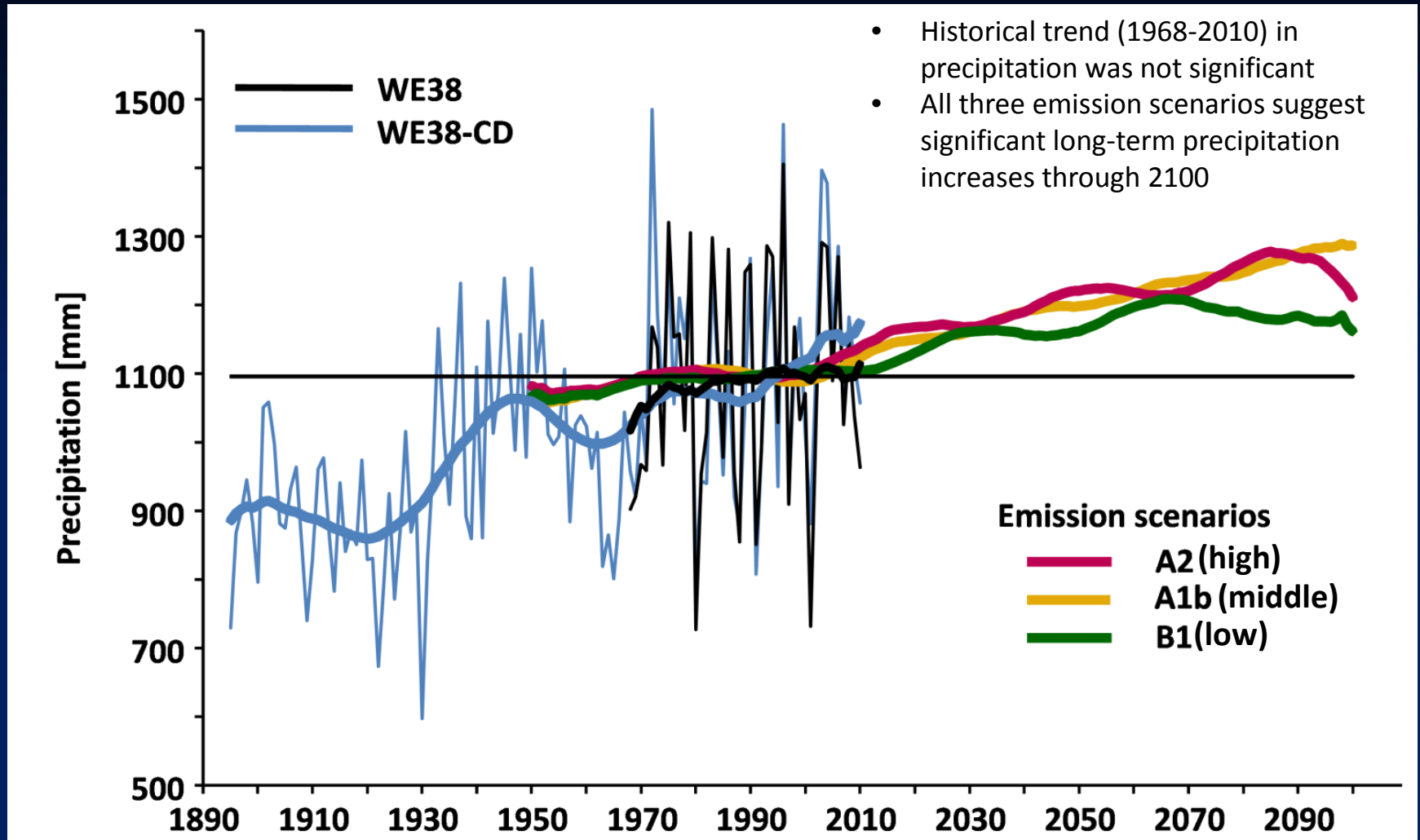


WE-38 watershed (3.5 mi²)



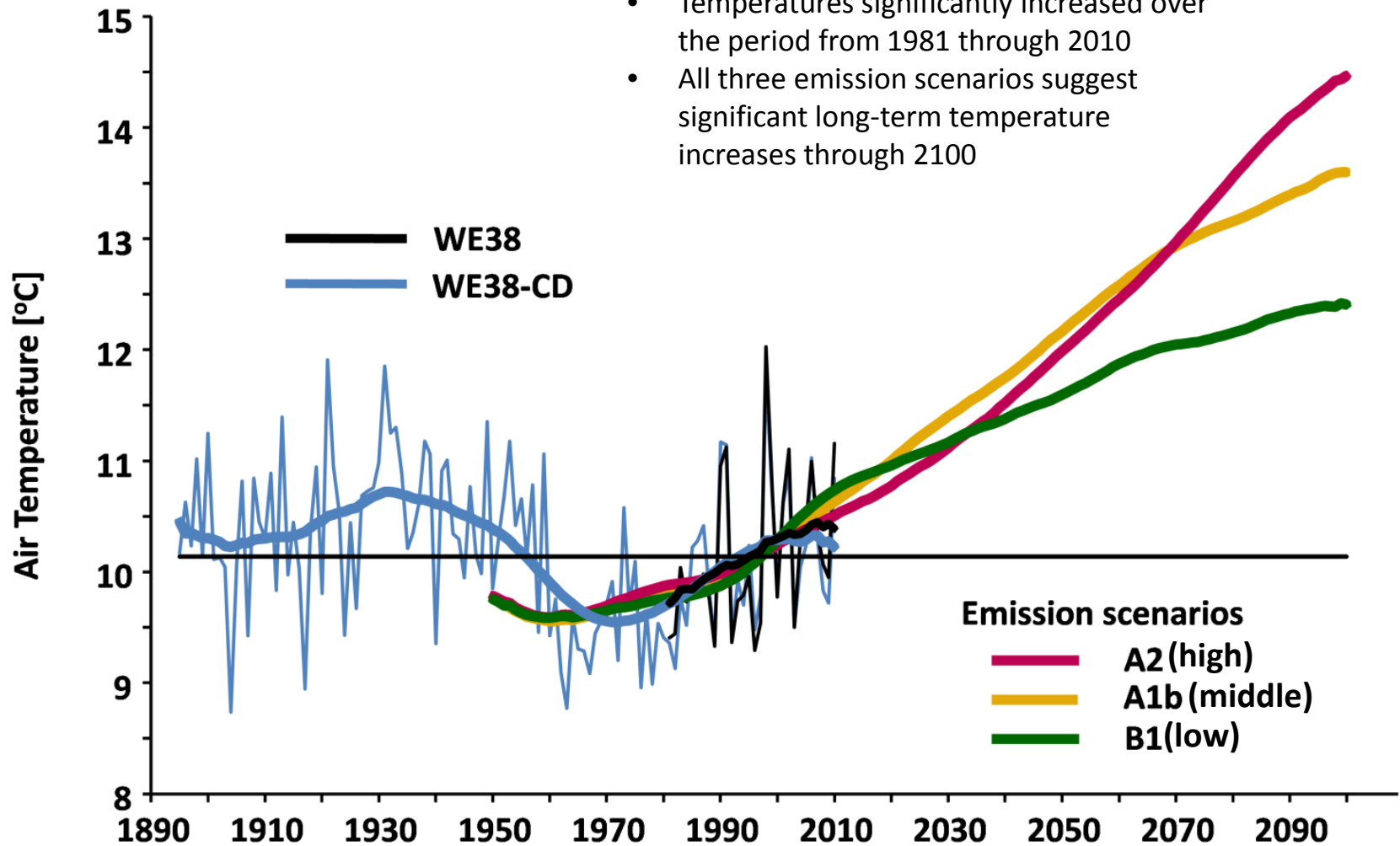
Three climate stations assessed for long-term trends in precipitation and temperature.

WE-38 trends in precipitation

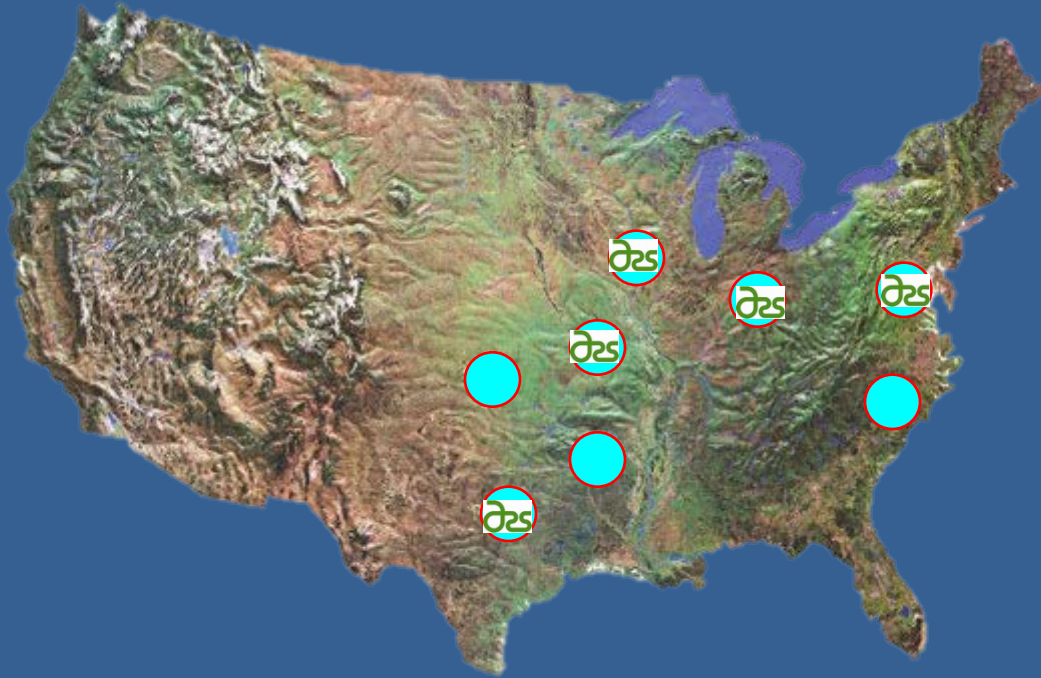


WE-38 trends in temperature

- Temperatures significantly increased over the period from 1981 through 2010
- All three emission scenarios suggest significant long-term temperature increases through 2100



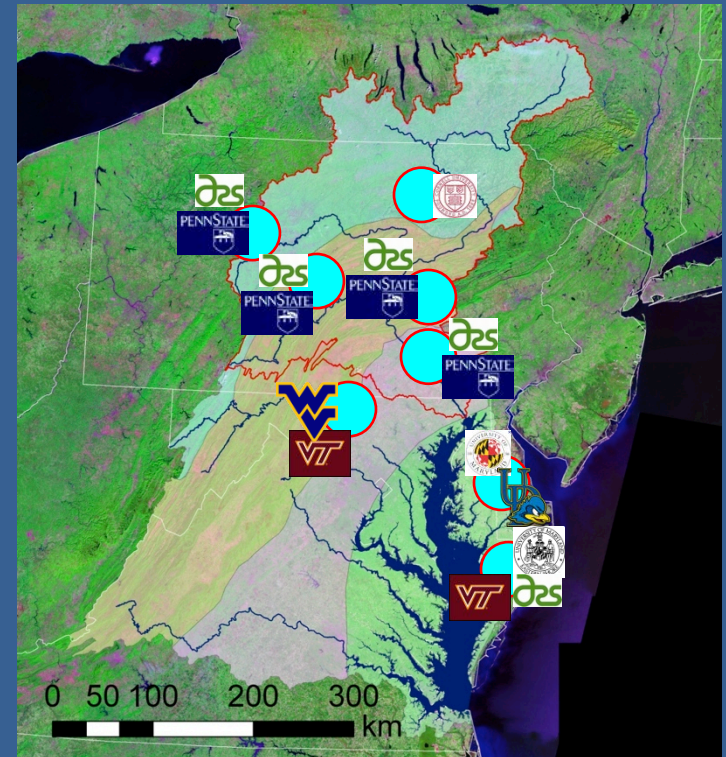
Multi-state comparison & upgrades of P Indices: *using field, watershed, and model data*



2011 Revised NRCS Nutrient Mgmt. Standard

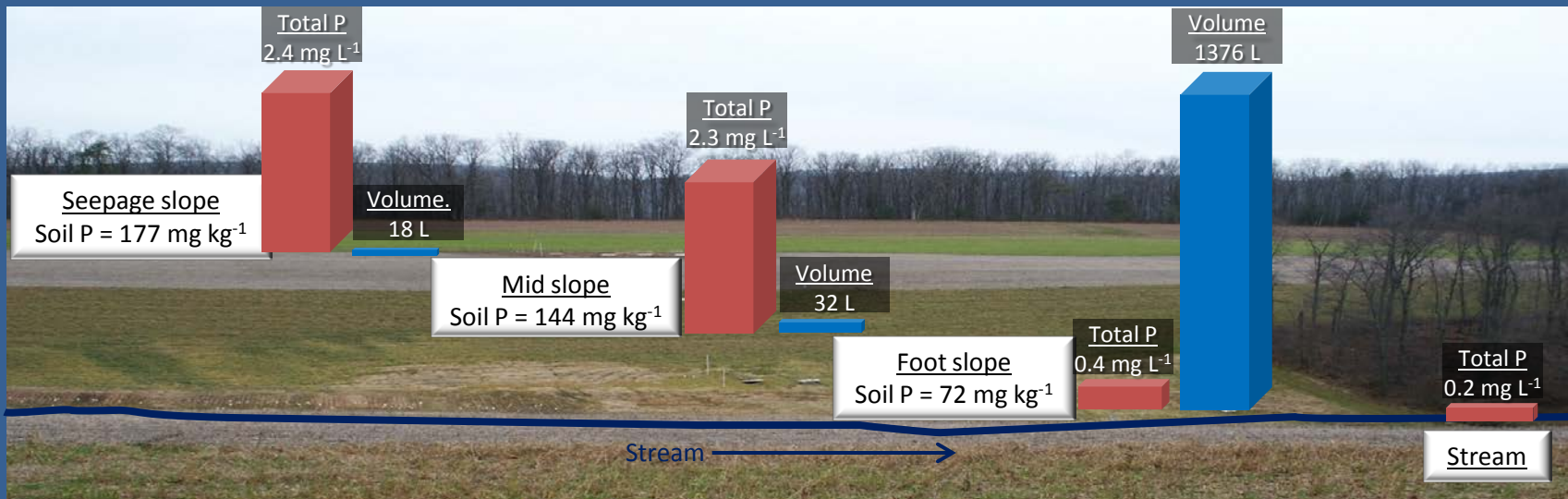
- USDA national initiative to inform local efforts
- Regional projects will result in changes in P Index and state nutrient management planning

Chesapeake Component



- 6 land grant universities
- 10 state agencies
- Conservation districts

Mean surface runoff: *P* conc. & flow



- *big P loads from small places*
- *runoff timing is not uniform*

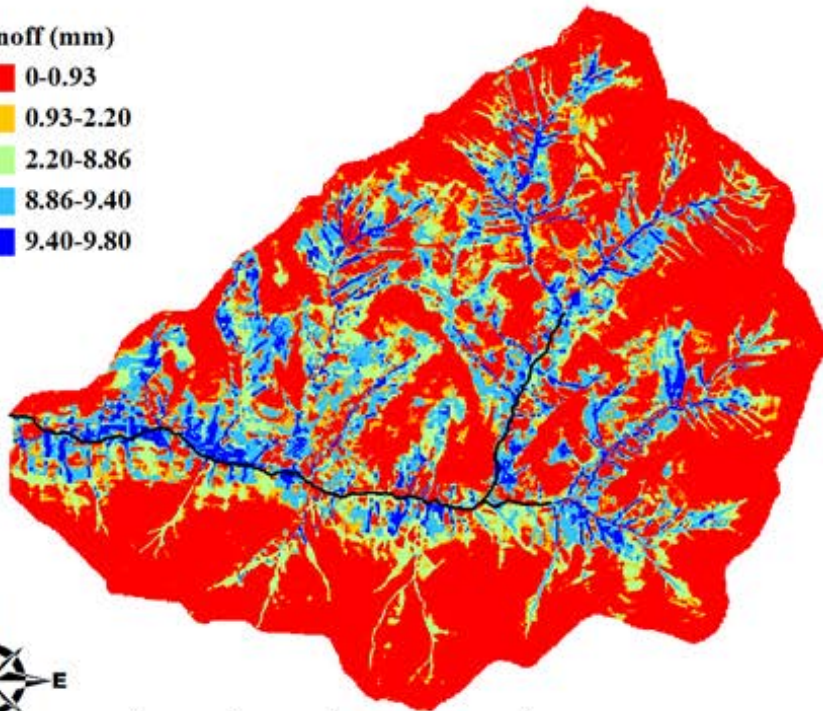
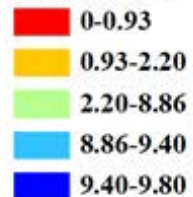
== > can we improve model simulations?
BOTH spatial & temporal

Incorporating latest model improvements

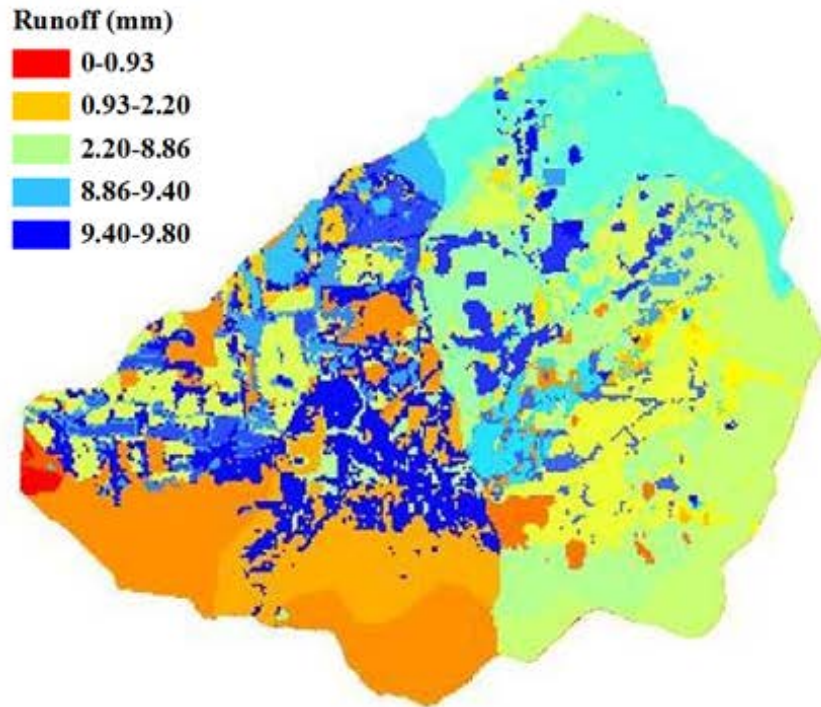
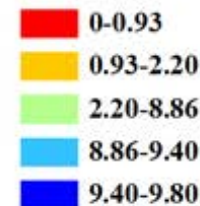
Modified

Standard

Runoff (mm)



Runoff (mm)



Database for long-term WE-38 watershed data:

STEWARDS, data papers, management surveys

Elevation

5 m and 30 m DEMs
from recent LiDAR

Soils

SSURGO, STATSGO or
any better soils data

Climate

Precipitation
Maximum temperature ($^{\circ}\text{C}$)
Minimum temperature ($^{\circ}\text{C}$)
Solar radiation (MJ/m^2)
Relative humidity (%)
Wind speed (m s^{-1})

Land Use

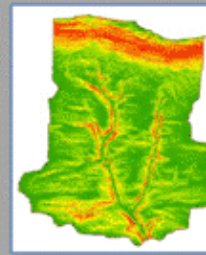
Crop management
Crop yield
Tillage
Fertilizer
Pesticide



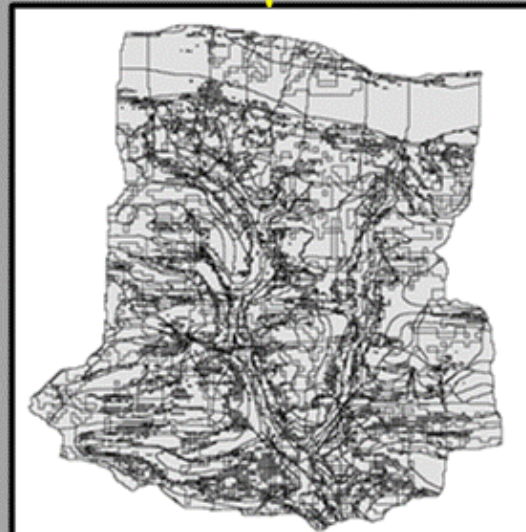
Land Use



Soil classification



Slope classes



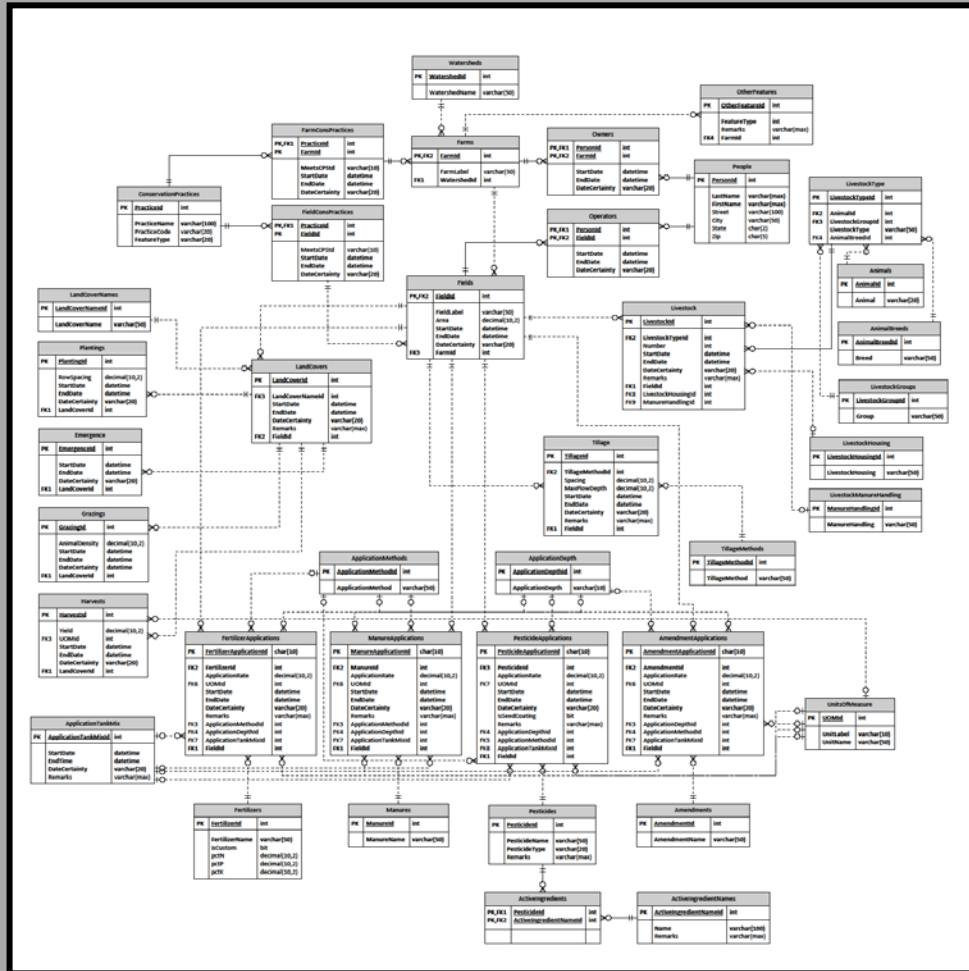
Hydrology

Runoff at outlet
Upstream runoff

Water Quality

Sediment
Dissolved reactive phosphorus
Orthophosphate
Total phosphorus
Total nitrogen
Organic nitrogen

Organizing management surveys into a searchable database



Smallest Field Unit

1. Spatial information (.shp file)
2. Unique Field Unit Identification*
3. Farm ID
4. Operator ID

*Each spatial unit is a single row

Crop Data

1. Unique field unit ID
2. Farm ID
3. Crop type
4. Planting date (Start/end date)

Multiple crop planting possible: the same field with different plantings will be contained in different rows, the date differentiates the rows

Harvest Options Data

A. Harvest only, B. Harvest/kill or C. Kill only*

1. Unique field unit ID
2. Farm ID
3. Harvest date
4. Yield information

*Three tables will be necessary to store the different harvest options. Each table would include similar information

Fertilizer Application Data

1. Unique field unit ID
2. Farm ID
3. Fertilizer Name
4. Fertilizer application method
5. Fertilizer application rate
6. Start/End
7. Remarks

Multiple fertilizer applications in a single field recorded in different rows. Date differentiates rows for single field.

Tillage Data

1. Unique field unit ID
2. Farm ID
3. Tillage Method
4. Spacing
5. Max Plow Depth
6. Start/End
7. Remarks

Multiple tillage operations in a single field recorded in different rows. Date differentiates rows for single field.

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