

QUANTIFYING WATER QUALITY BENEFITS OF WEATHER FORECASTING BASED MANURE APPLICATION TIMING STRATEGIES IN THE SUSQUEHANNA RIVER BASIN

Arghajeet Saha¹, Cibin Raj²

¹Graduate Student, ²Assistant Professor, The Pennsylvania State University, University Park, State College-16801

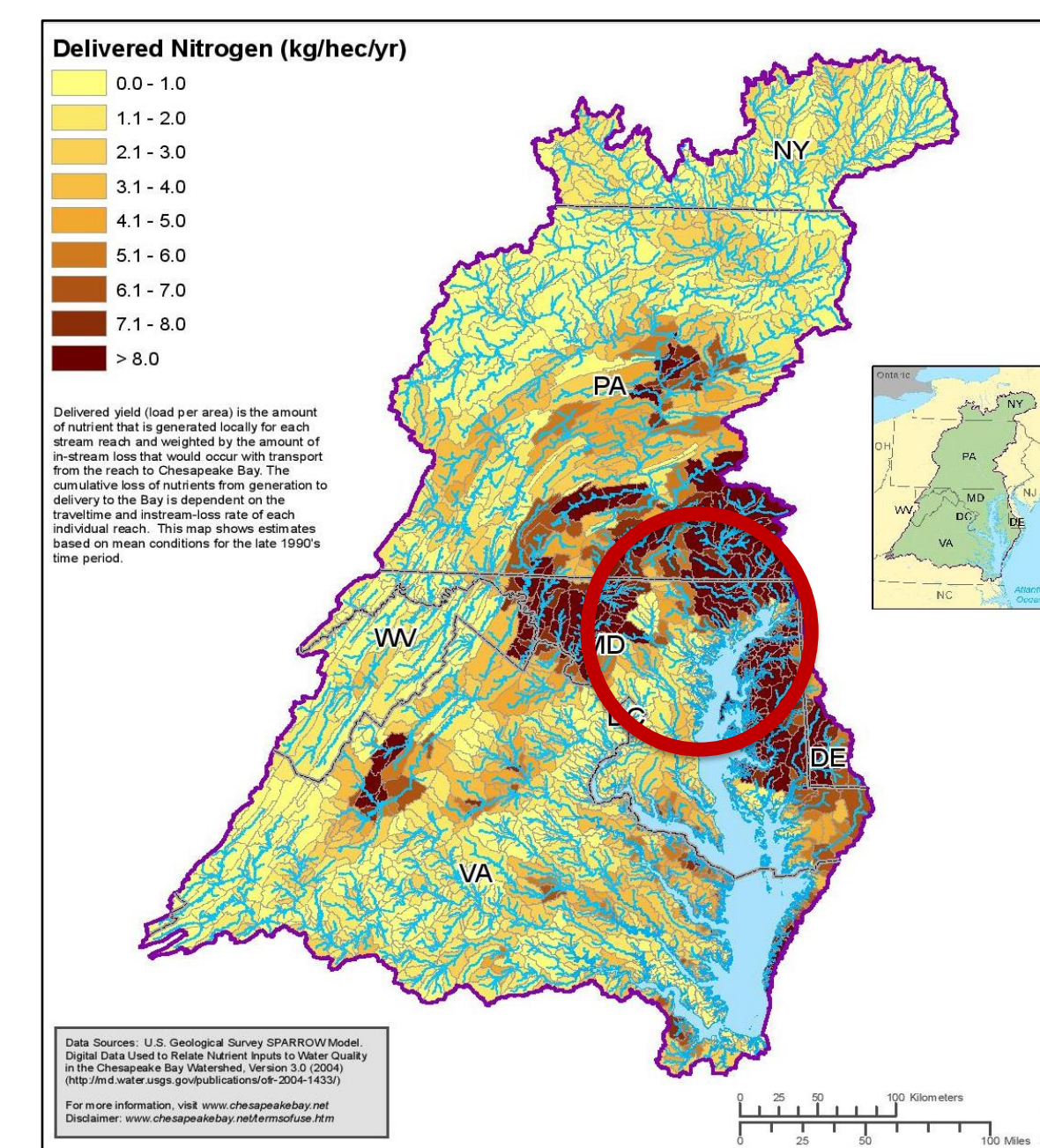


Research Goal

To develop sustainable nutrient management strategies focusing on minimizing nutrient loading from the SRB through strategic weather planning for manure application.

Manure Contribution to Chesapeake Bay Pollution

- 30% area in agricultural production. Over 80 k farms.
- 42% N and 55% P from agriculture sources to Bay (CBP, 2010).
- 19% N and 26% P coming from manure sources (CBP, 2010).
- NM recommendations in various states - PA Act-38
- Generally, nutrient loss happen due to events after manure application.

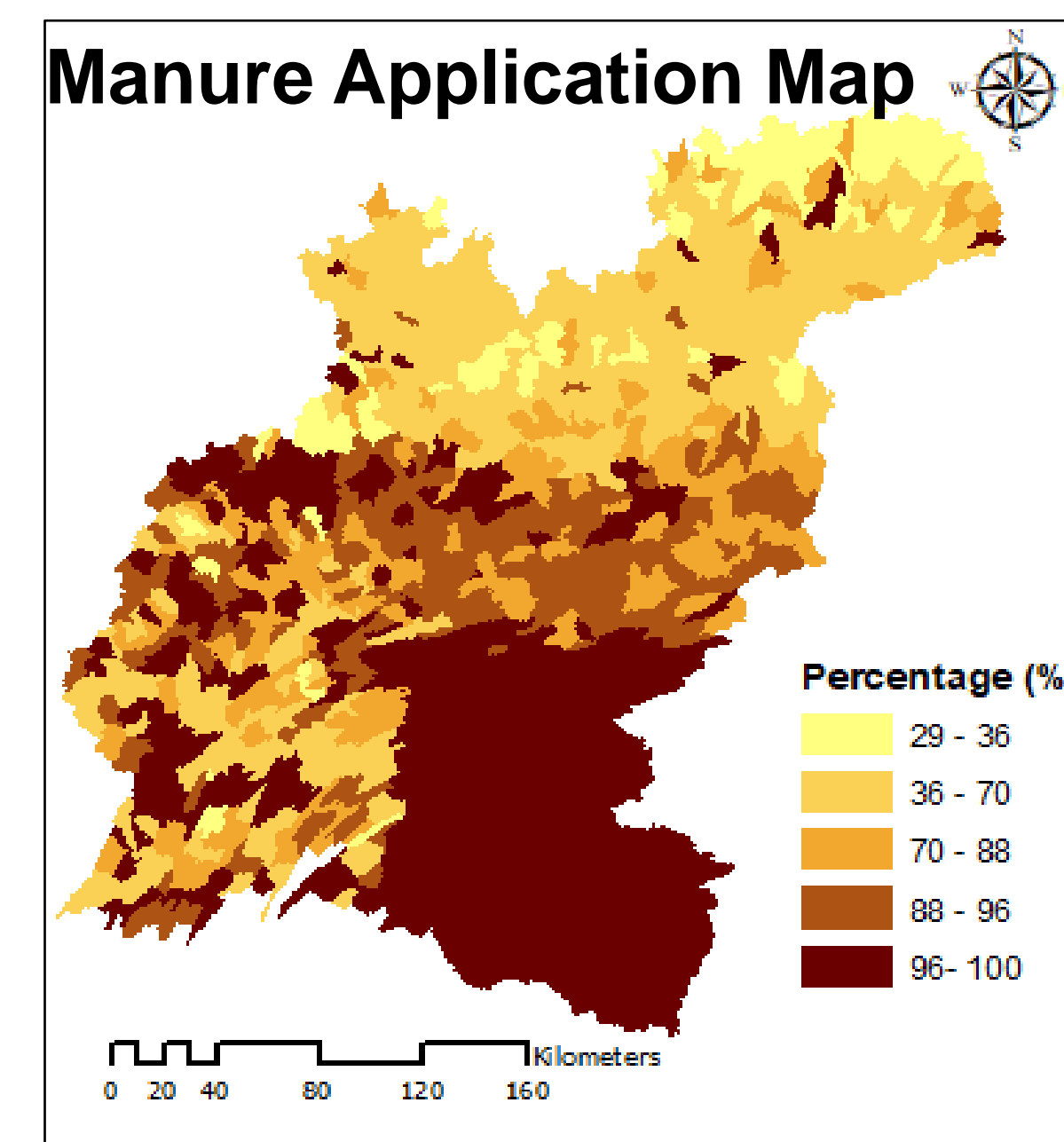
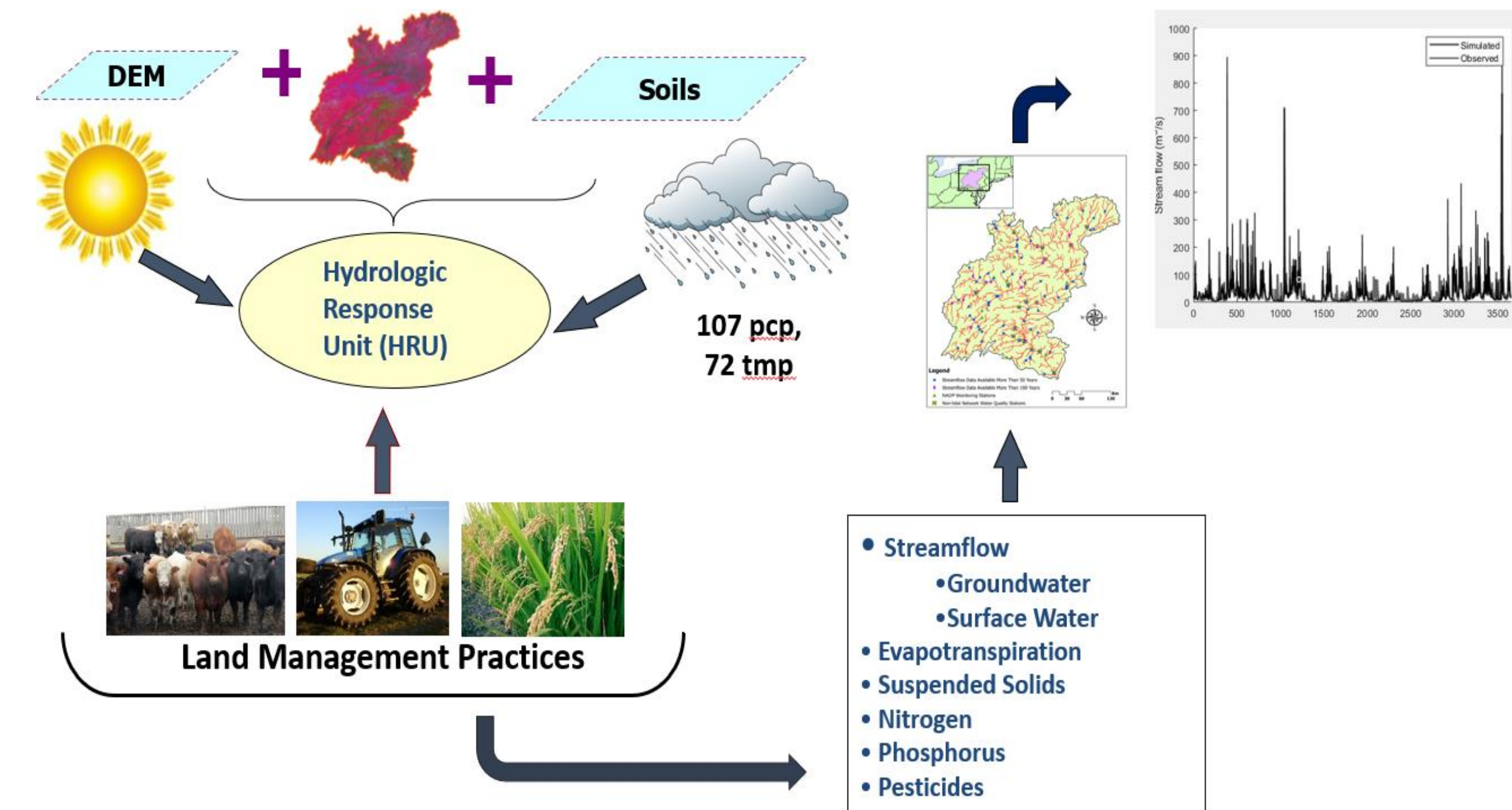


Contribution of Manure from Susquehanna River Basin (SRB) to Bay Pollution

- SRB = 43% of the entire Chesapeake Bay drainage area.
- 46% TN and 26% TP load delivered to the Chesapeake Bay (EPA, 2010).
- PA contributes 16% N and 35% P from manure sources (USEPA, 2013).
- 13 million kilograms of N from five SRB (PA) counties.



SWAT Model Framework & Development for SRB



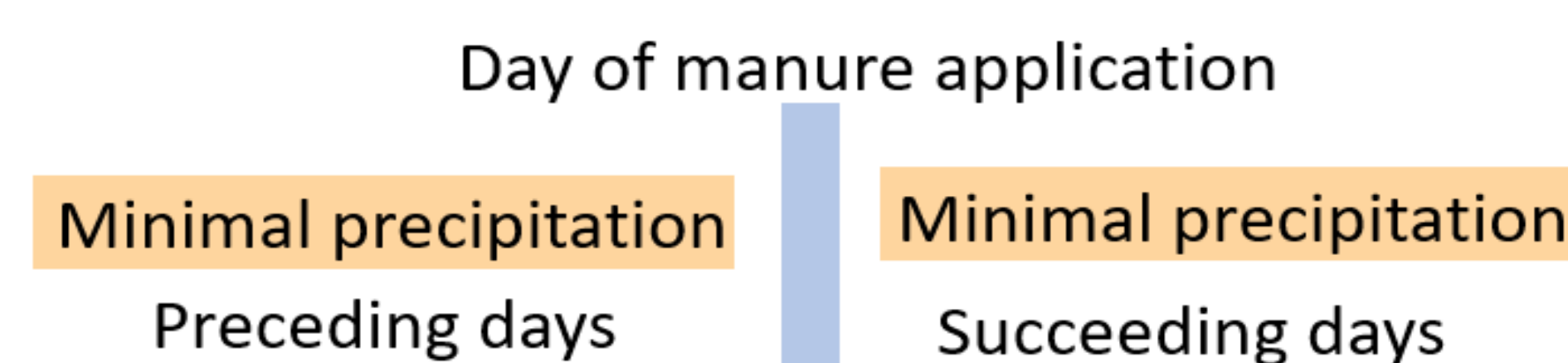
Data Sources = Federal sources (USDA-NRCS, NOAA, CASTNET, USDA NASS, PA Agronomy Guide, etc.)

- 65% land is forest, 14% crops
- Manure distribution = County level data by USDA-LTAR team from NASS.
- Downscaled to HUC 12 (subbasin)
- Manure applied by surface spread.

Manure Storage

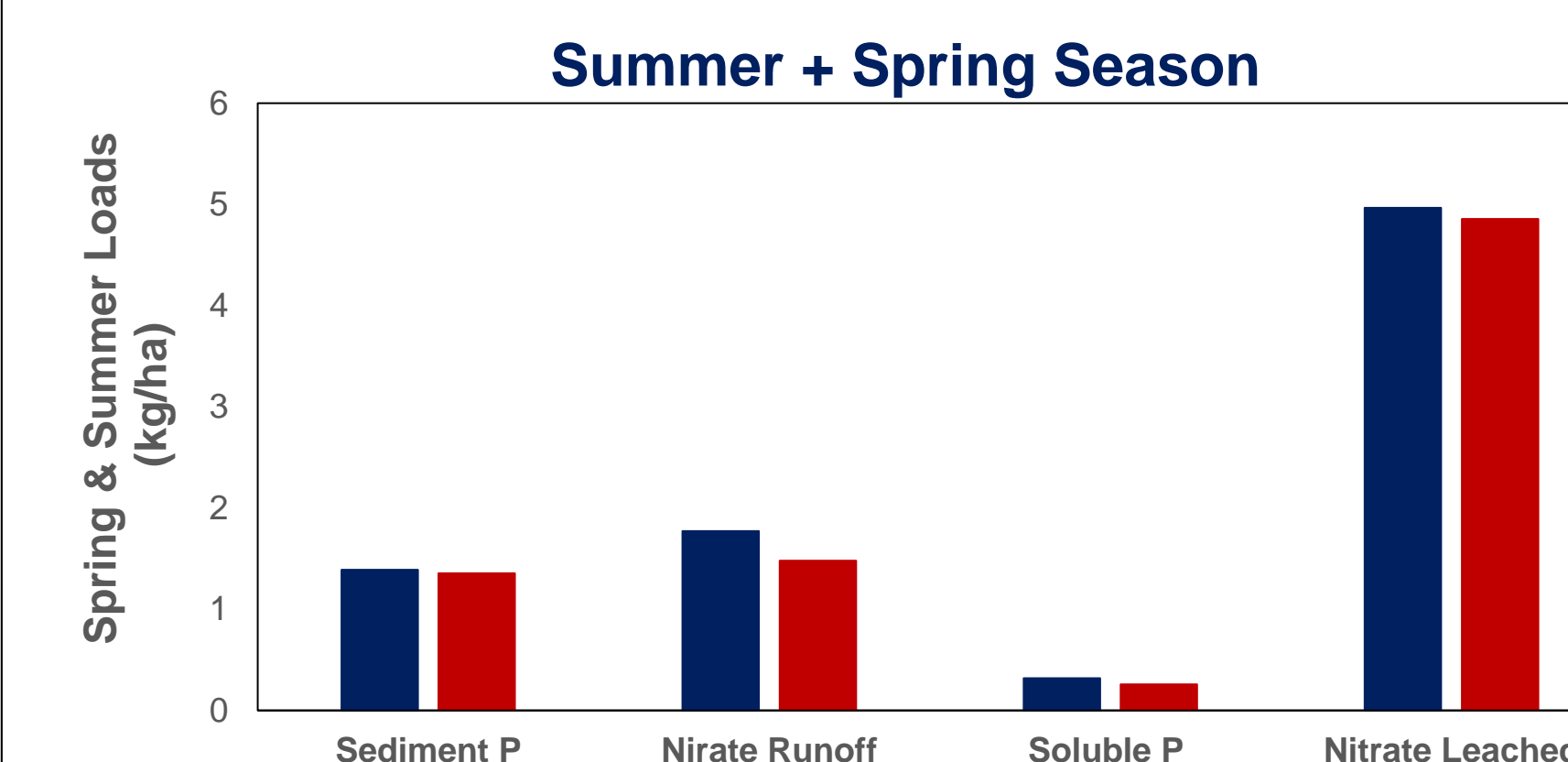
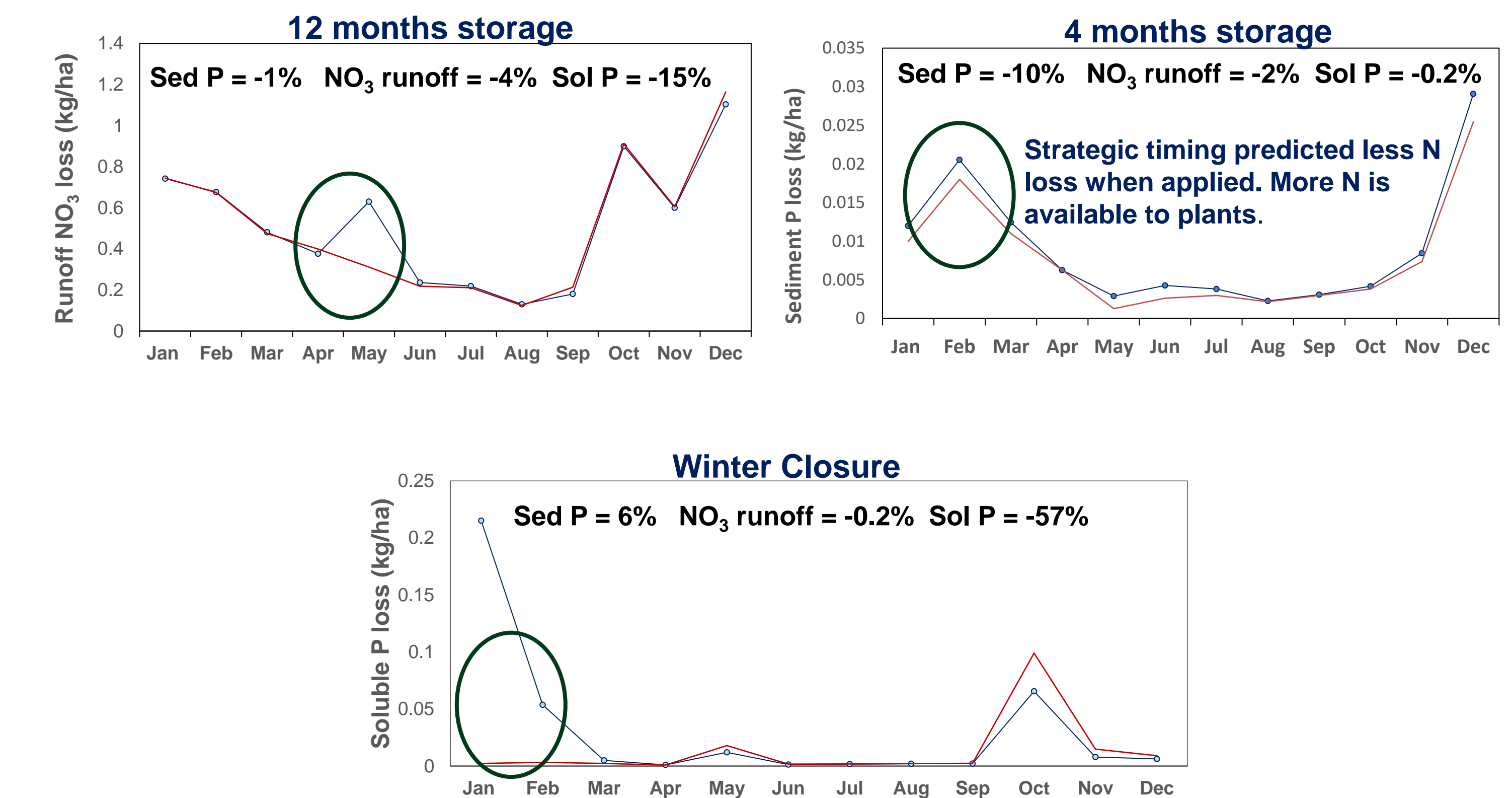
- 12 month manure storage: Spring application- row crops
- 6 month manure storage: Spring-Fall application- row crops
- 4 month manure storage: Spring-Fall-Winter application - hay areas

Weather Forecasting Strategy



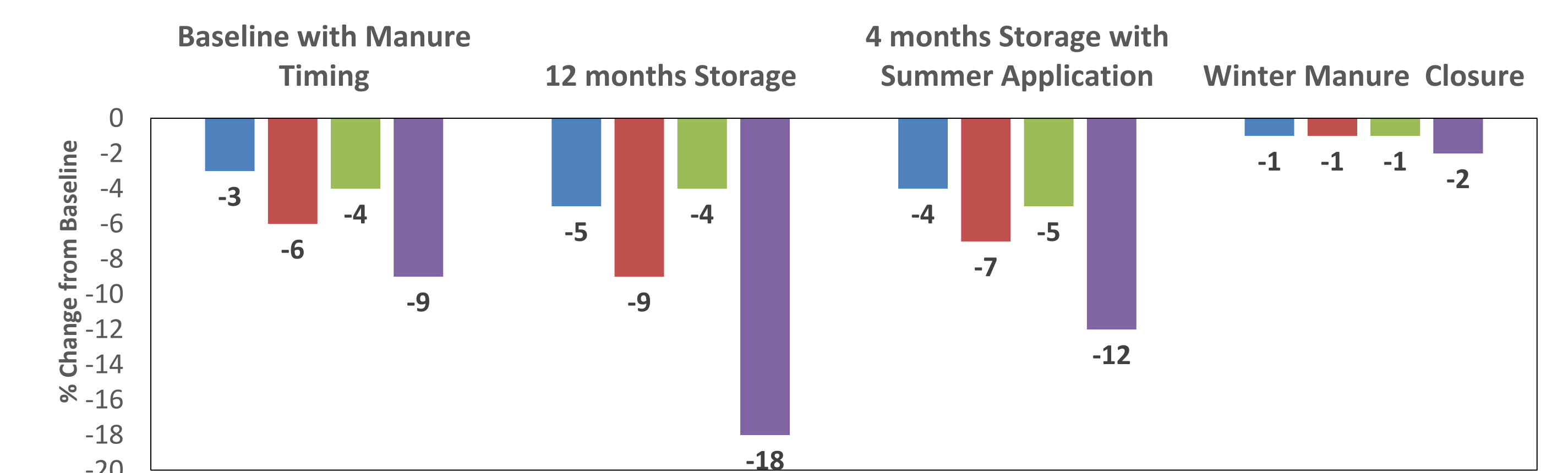
Timing strategy scenarios with weather data from last 10 years

Field Scale Results



	% Change from Spring + Summer Baseline	
	12 months	6 months
Sediment P	-2	-3
Nitrate Runoff	-17	-15
Soluble P	-19	-20

Watershed Scale Results



Research Findings

- In general manure timing strategy reduced N and P loads at both field and watershed scale.
- Timing strategy coupled with 12 months storage scenario is more effective in reduction of surface NO₃ and is more flexible in manure application timing.
- Manure winter closure period (no manure in winter) is very effective in managing nutrients (especially dissolved P loss).

Model Used

