Developing County Level Time Series of Nutrient Inventories and Trend Maps

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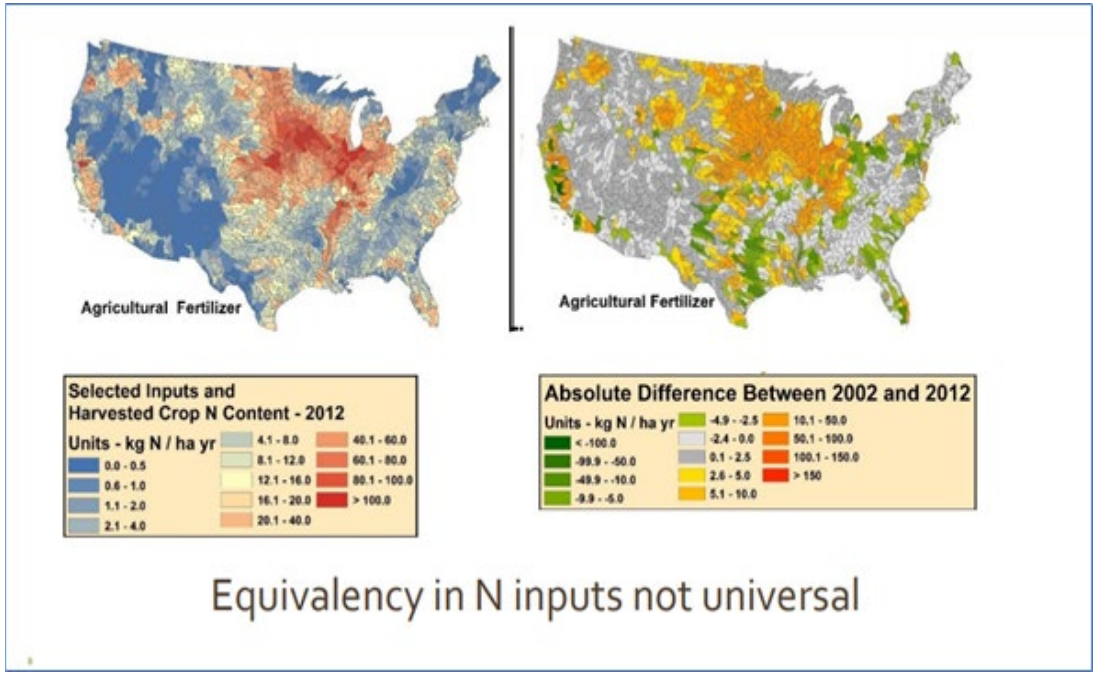
Modeling Workgroup Quarterly Review

April 7, 2020

A reminder…

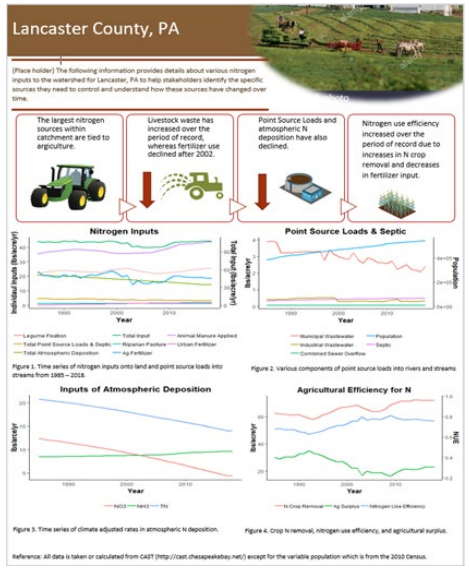
Previous Work: a national nutrient inventory.



Equivalency in N inputs not universal

Our Work: a Chesapeake Bay Watershed nutrient inventory:

- Factsheets to show N/P fluxes



Requests from Modeling Workgroup

- Gain feedback on the factsheets from local managers and planners ✔
- Draft an Introduction Chapter ✔
  - Acknowledge the uncertainty in the data ✔
  - Highlight trends across the watershed ✔
- Modeling Workgroup review draft

Feedback

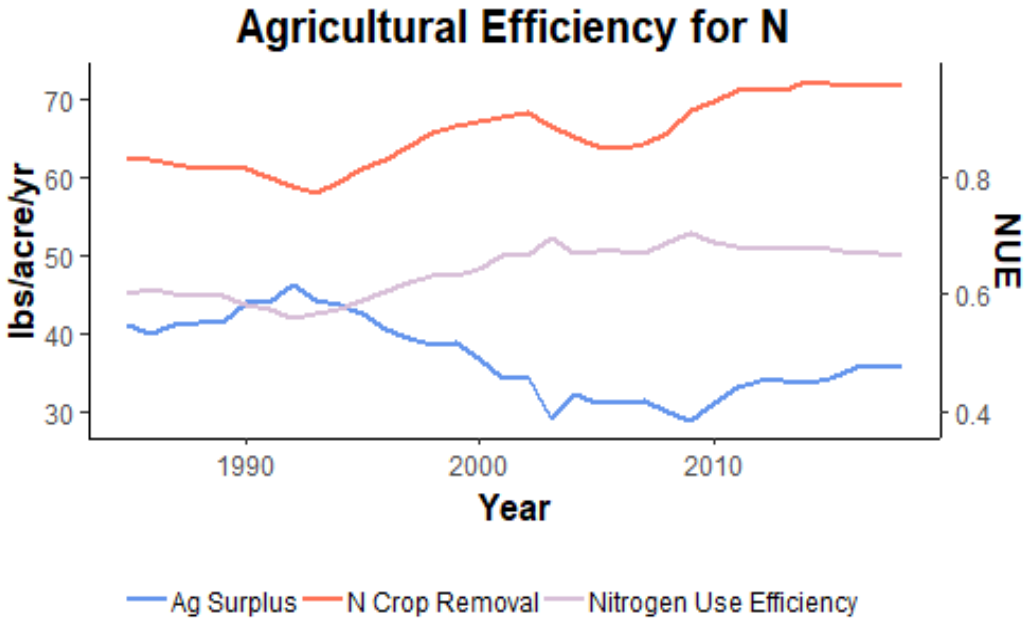
- Gathered specific feedback from folks that work with:
  - local government staff
  - local elected officials
  - communications
  - conservation districts
  - planning district commissions
  - non-profits

Feedback

- General feedback:
  - Positive feedback on content and idea of sharing this information
  - Potential interested users:
    - Non-technical - local elected officials, senior staff, general public
    - Somewhat technical - some appointed officials, senior staff, nonprofits
    - Technical - planners, environmental agency staff
  - **Addresses need to tailor delivery of information to audience and make more accessible to non-technical groups**

Feedback

- Need to provide more information on connection between data and potential courses of action
  - How to do this without going out of scope?



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locally tailored solutions

Highlights from Introduction

Highlights from Introduction
Good News

- "Clean water, abundant life, conserved lands and access to the water, a vibrant cultural heritage, and a diversity of engaged citizens and stakeholders"
  - Environmentally and economically sustainable
- Milieu of management actions taken to improve water quality are working
  - Wastewater treatment plant upgrades
  - Improving air quality and decreasing atmospheric nitrogen deposition
  - Improving fertilizer and manure nutrient use efficiency on farms
  - Implementing urban and agricultural best management practices designed to diminish the loss of excess nutrient from land to streams

Highlights from Introduction Challenges

- Progress in decreasing nutrient pollution and improving surface water quality is not guaranteed
  - Urbanization, growing population, and continued evolution of agricultural practices
  - Uncertain climate futures

Highlights from Introduction Tools and Solutions

- Local, state, and federal partners should be equipped with the best, up-to-date, local-level information available on:
  - Likely sources of pollution
  - How these sources have changed through time
- Tailor near- and long-term management strategies with **INVENTORIES**
  - CBP with its state partners have developed some of the most advanced, comprehensive estimates of nitrogen (N) and phosphorus (P) fluxes
  - Develop novel, targeted management strategies and regulatory structures required to meet multiple environmental and economic endpoints
  - Derive key metrics that identify inefficiencies in the use or handling of N and P

Highlights from Introduction Deliverables

- A downloadable database of all county-level nutrient fluxes and derived metrics for 1985-2018
- Bay-wide, county-level trend results and maps for all nutrient fluxes
- County-level “Fact Sheets” presenting simple time series and statement of trends for major sources of nutrient fluxes in the Chesapeake Bay counties.

Highlights from Introduction Uncertainty

- Interpretable: The majority of flux and derived variable estimates are generated using empirical to semi-empirical models and can be tracked back to observed data.
  - **Highlight the observations that drive or constrain the models**

Highlights from Introduction Uncertainty

- Uncertainty: Assumptions about the deposition and/or allocation of N and P introduce sources of uncertainty to the estimates. Unless there is significant bias spatially or in a specific component of the inventory, the confidence in flux estimates increases with spatial scale.
  - **Walk the reader through how fertilizer is allocated across the Bay**
  - **Confidence increases with scale**

Highlights from Introduction Uncertainty

- Precision: Many of the major flux estimates like atmospheric deposition, fertilizer, and livestock manure application rates are consistent with other published methodologies used to estimate the magnitude and trend of nutrient inputs and removal.
  - **Highlight other approaches using the same root data get similar estimates**

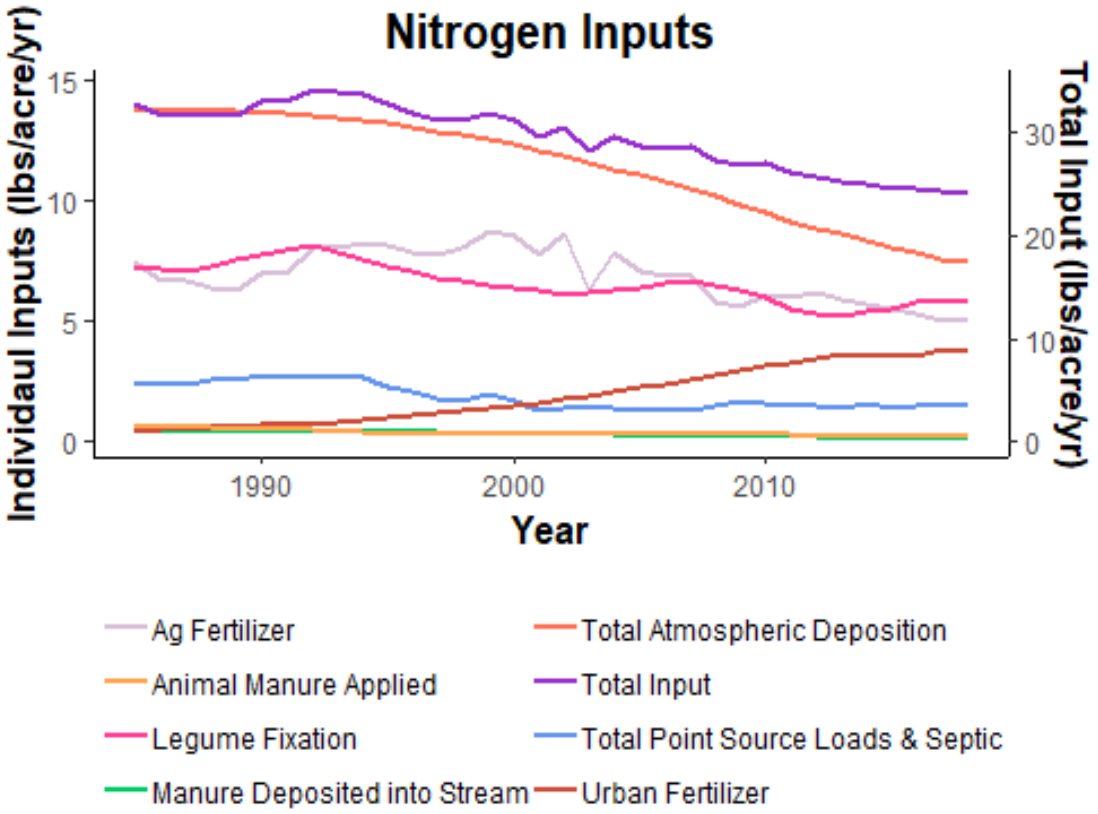
Highlights from Introduction Uncertainty

- Comprehensive: Through a deliberative process with local stakeholders and researchers, CBP has incorporated the impacts of management actions on the use and allocation of nutrients across the Chesapeake Bay watershed.
  - **Highlight how the Bay Program and its partners have developed tailored estimates**

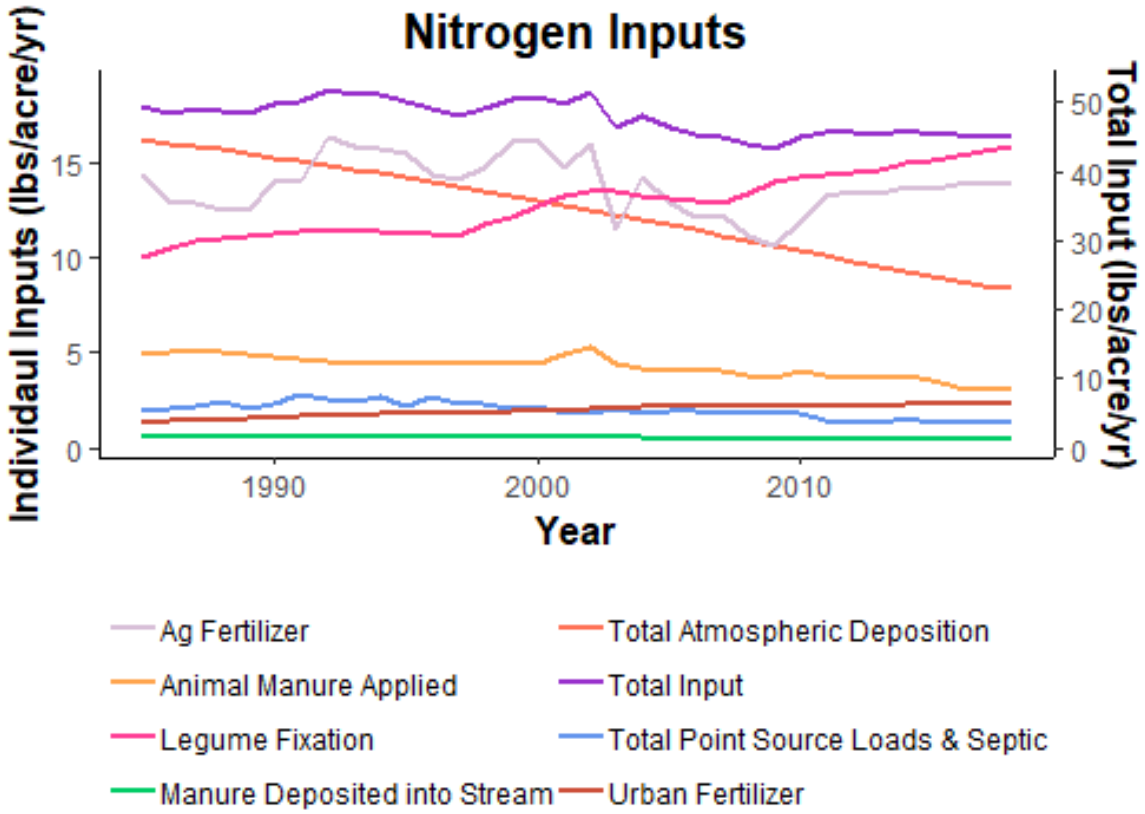
Trends Nutrient Inventories across the Watershed

Trends in nutrient inputs across a changing landscape

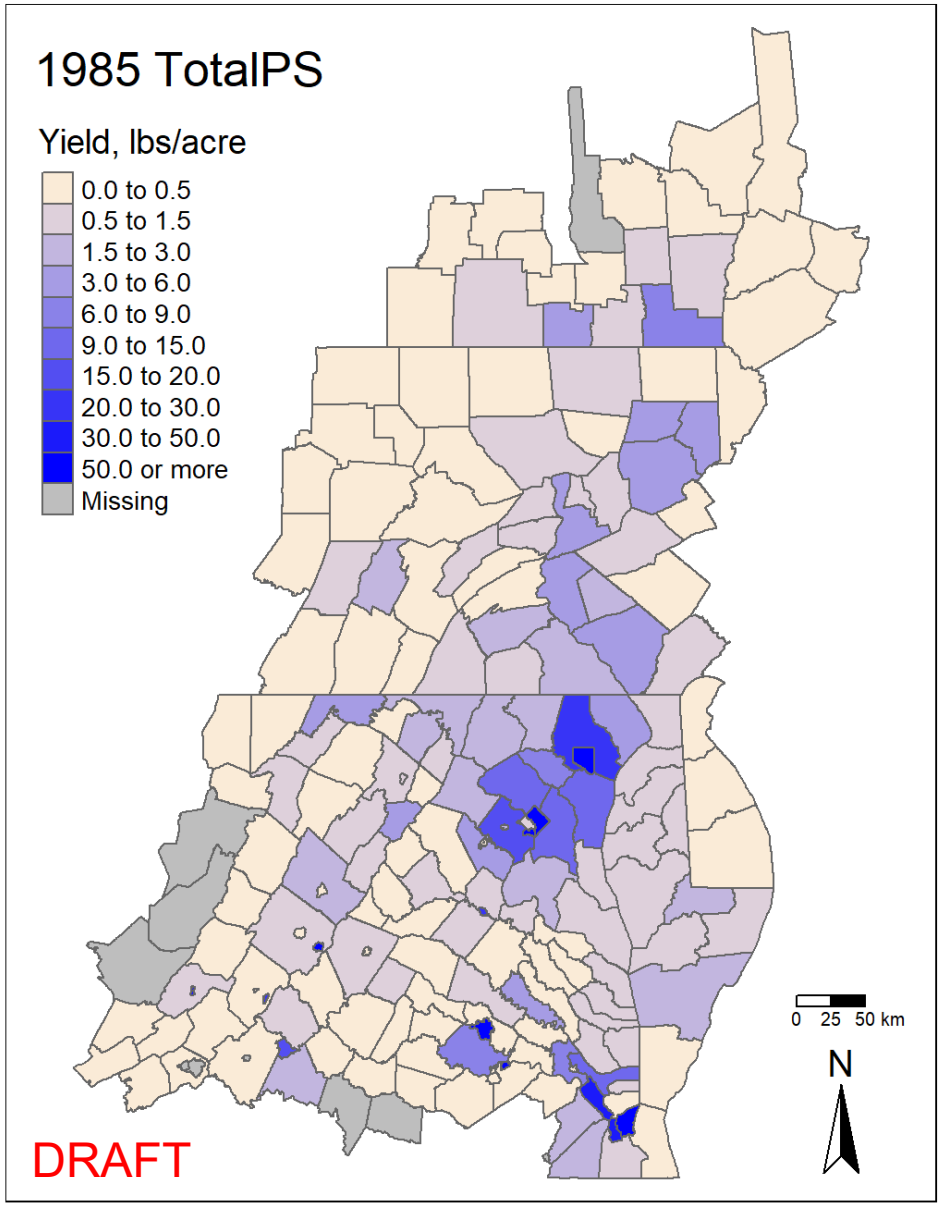
Loudoun County, VA

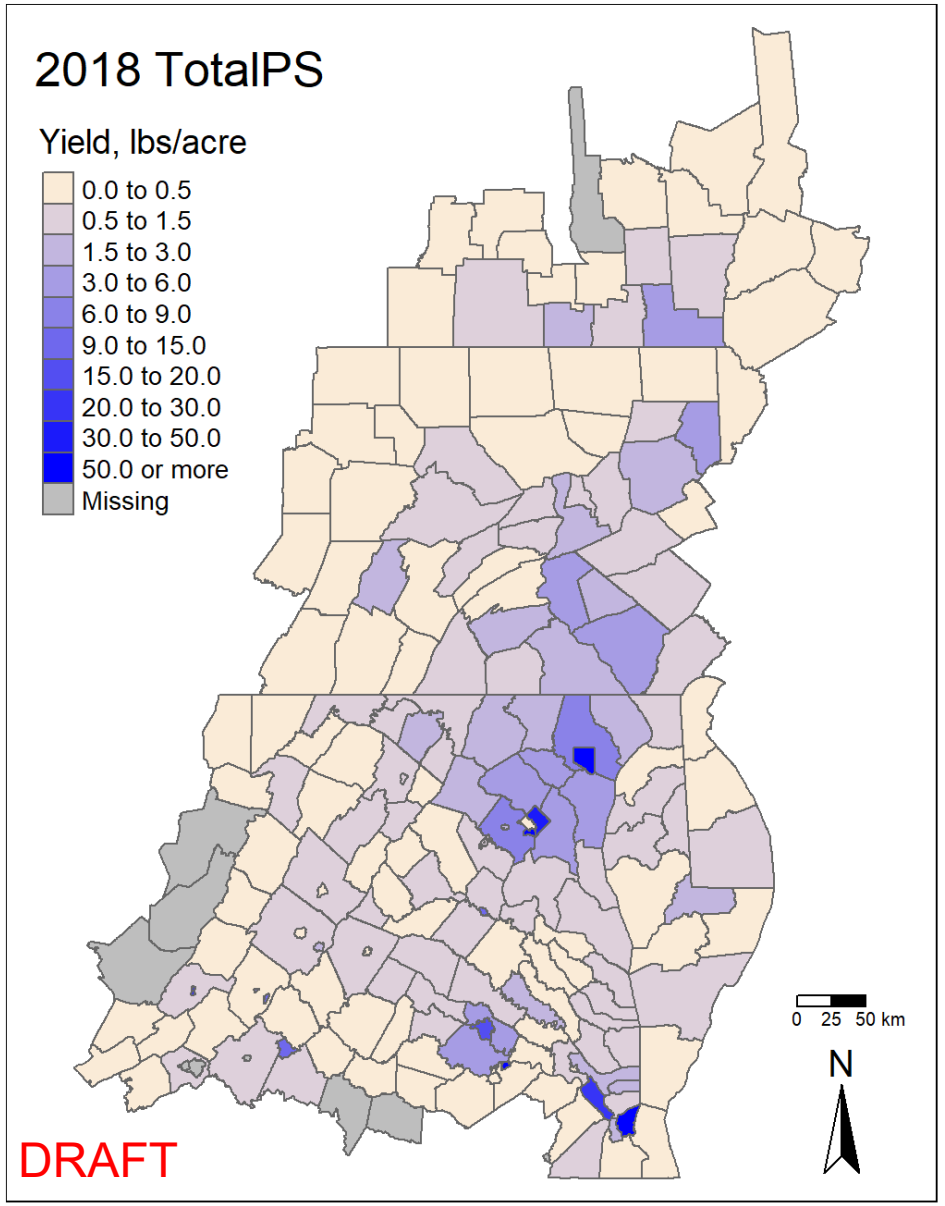


Washington County, MD



Highlights from Introduction-Trends





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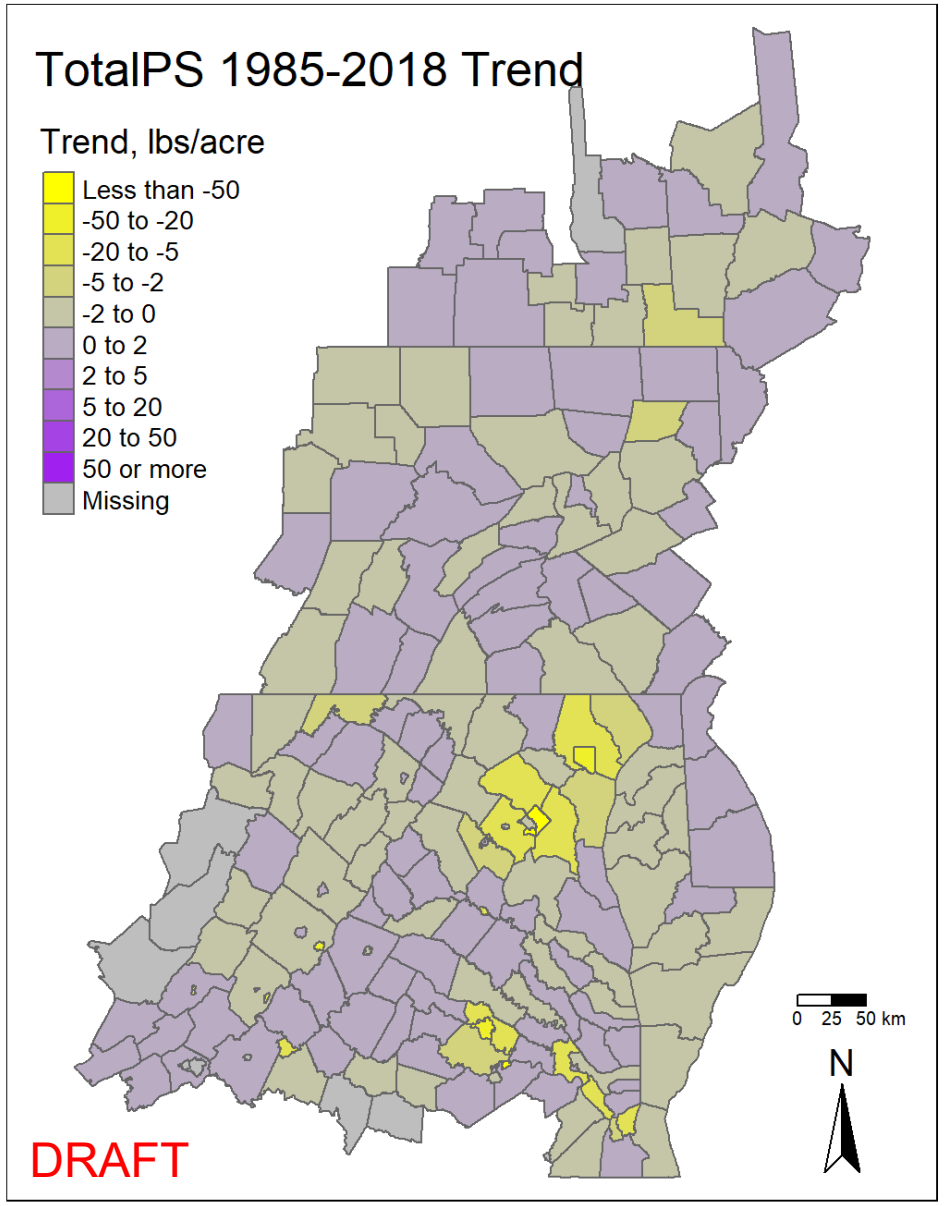
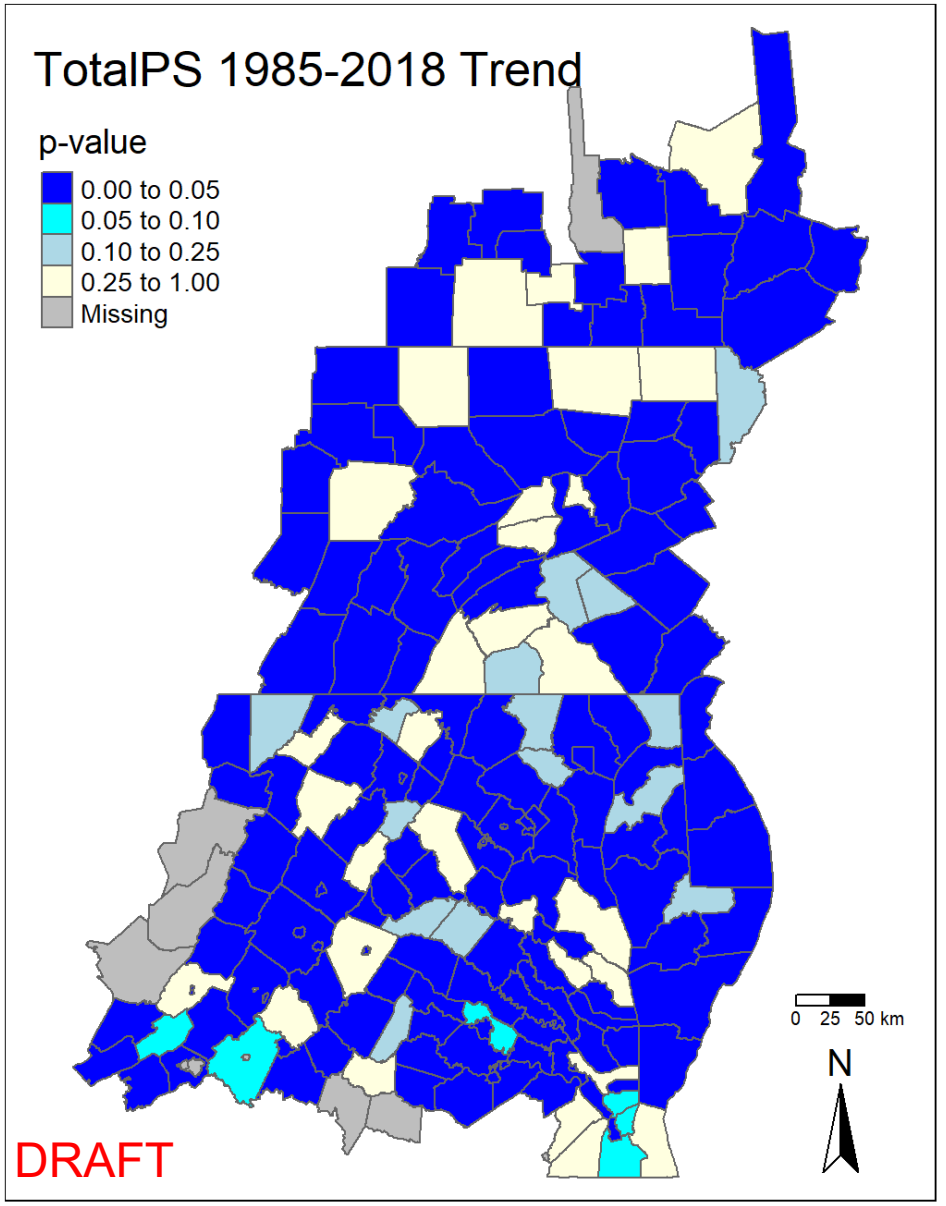




Time Series for Nitrogen: Agricultural Efficiency

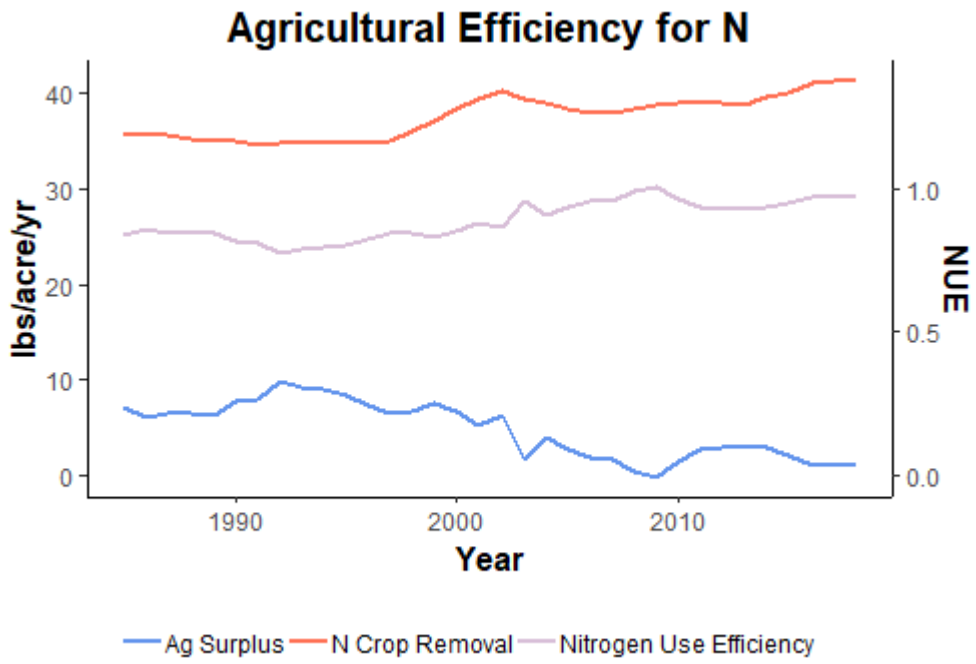
Ag Surplus is the extra N ag inputs not removed in crops

- **Ag Surplus** = Legume + Animal Manure Applied + Atm Dep On Ag Land + Ag Fertilizer + Direct Deposited Manure - N Crop Removal

Nitrogen Use Efficiency (NUE) is the proportion of N inputs removed from the field after harvest (crop out for N put in).

- **NUE** = N Crop Removal / (Legume + Animal Manure Applied+ Atm Dep On Ag Land+ Ag Fertilizer + Direct Deposited Manure)

Washington County, MD



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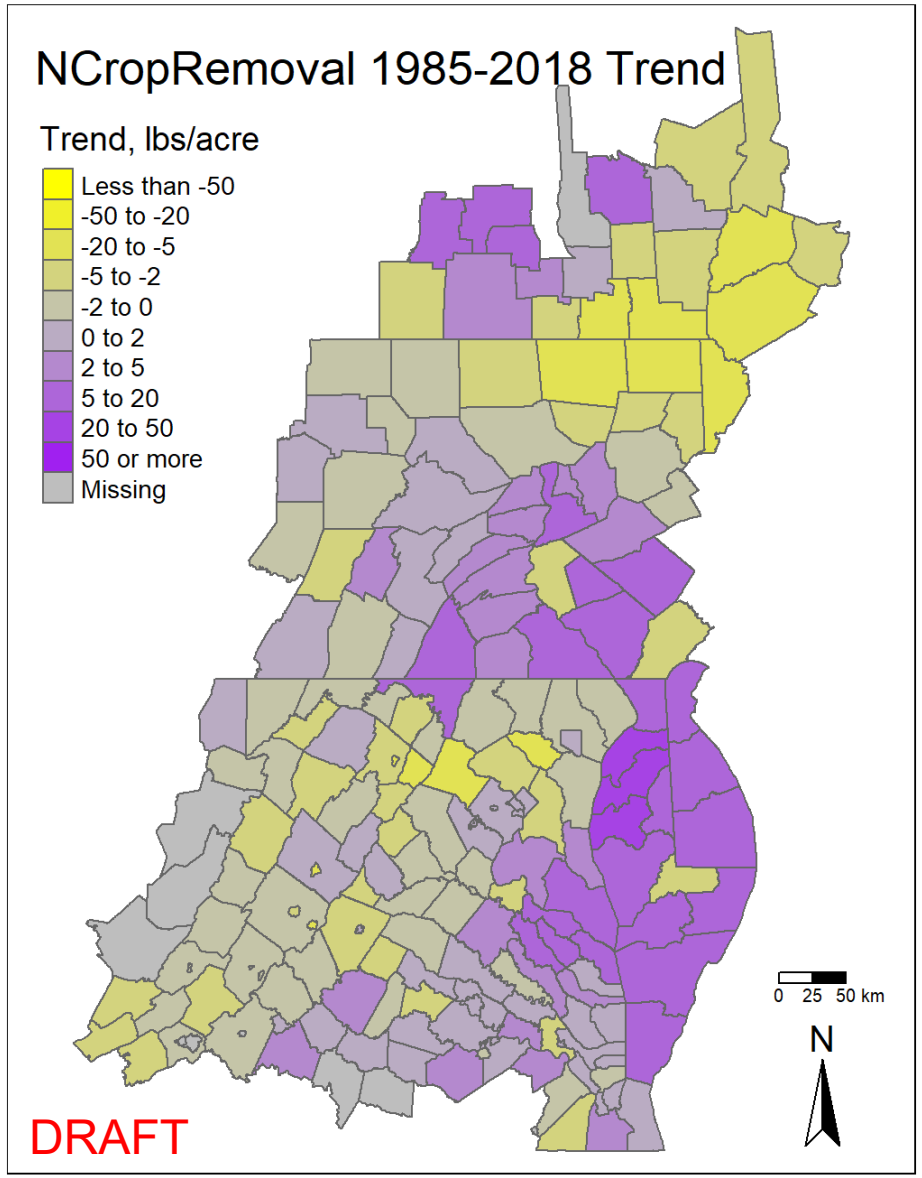

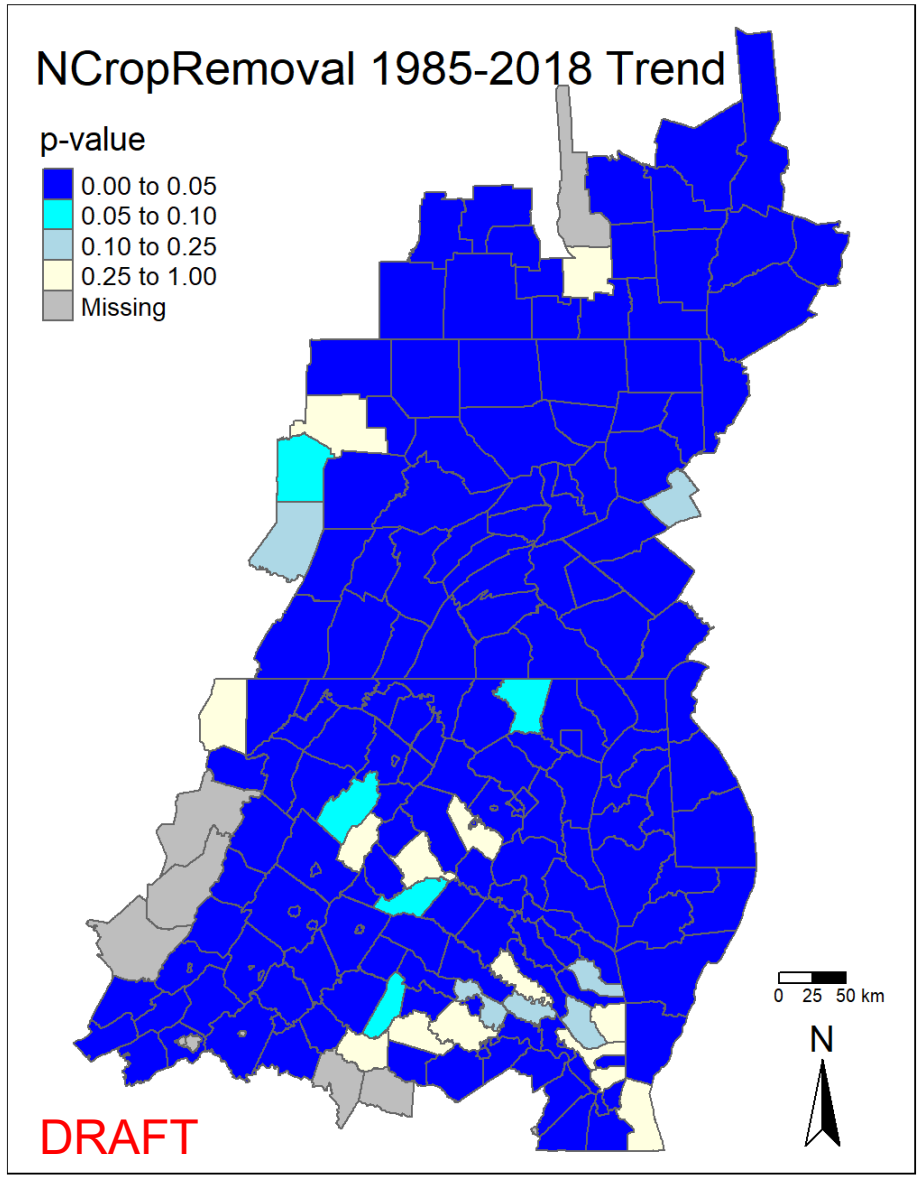

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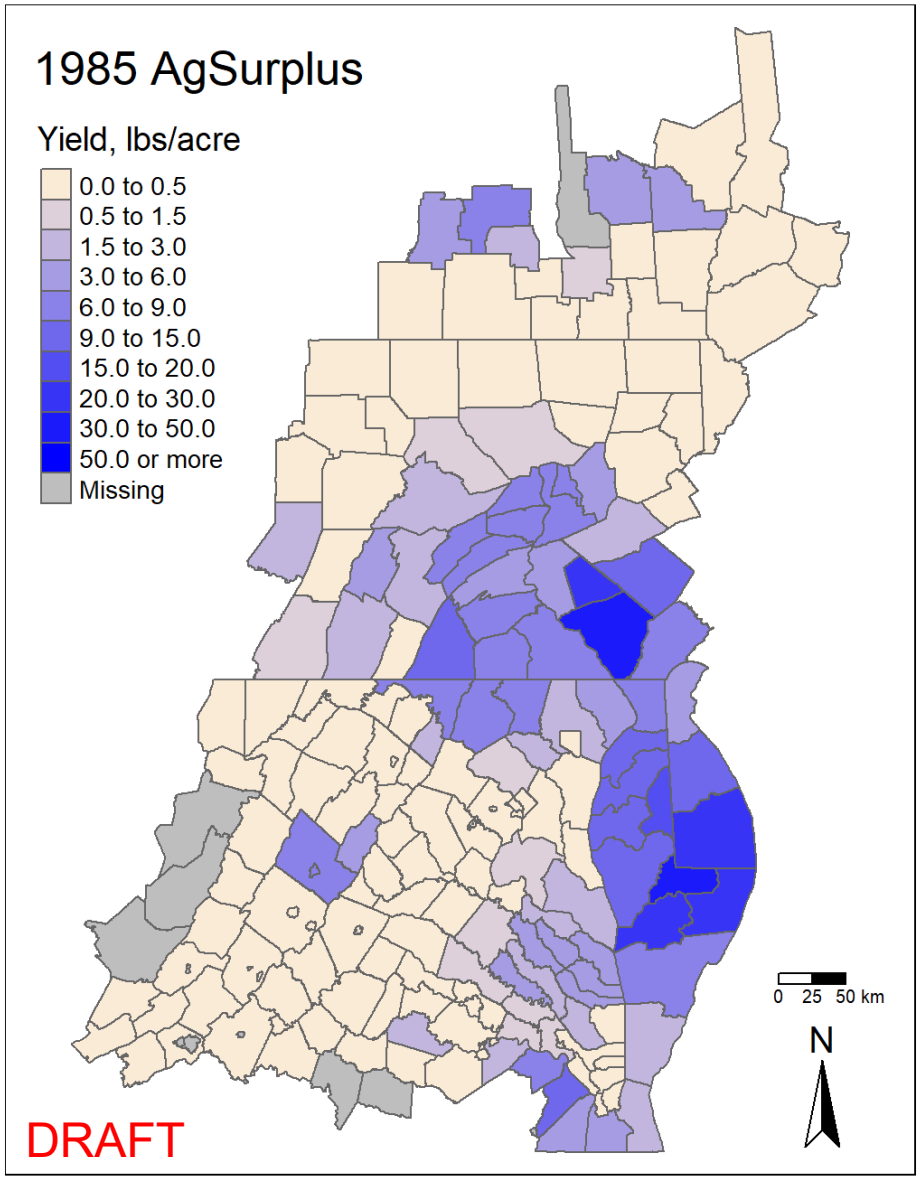

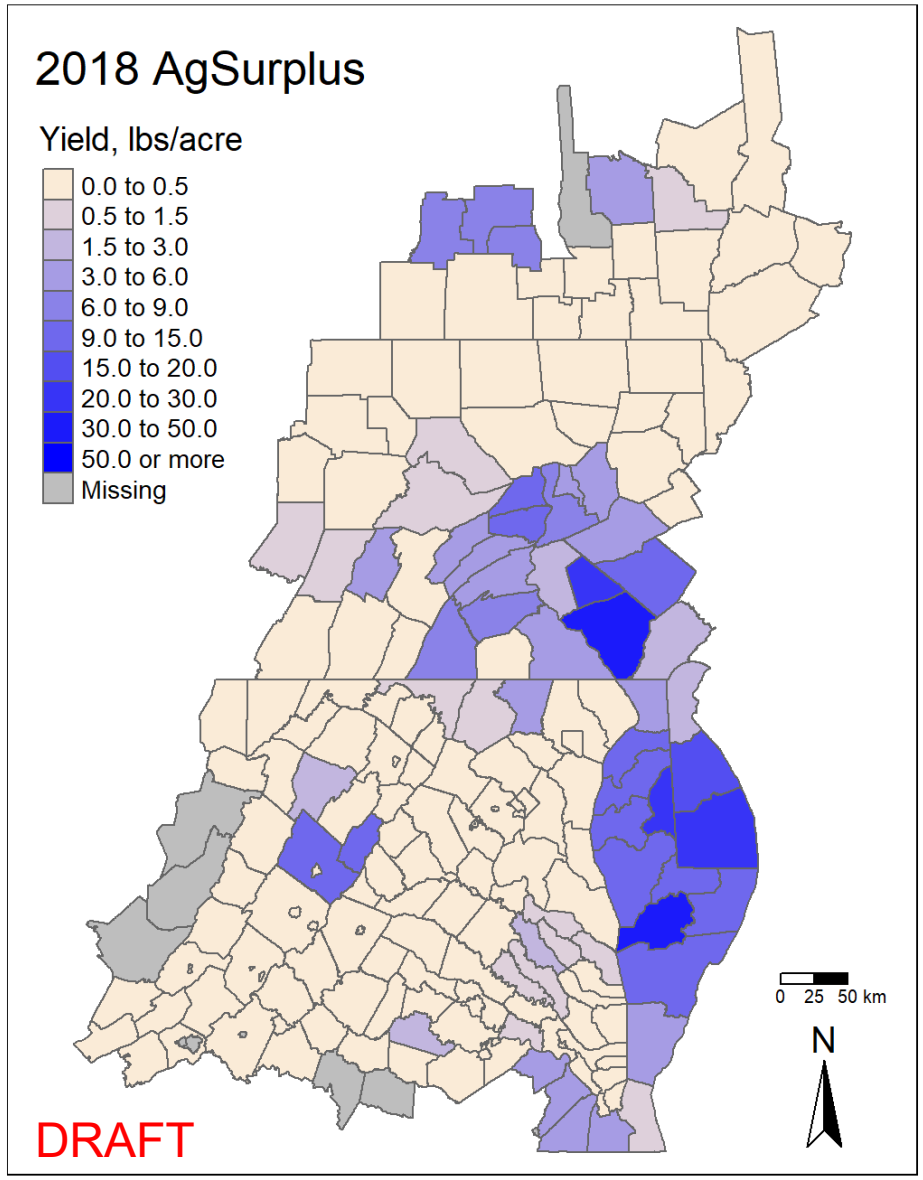

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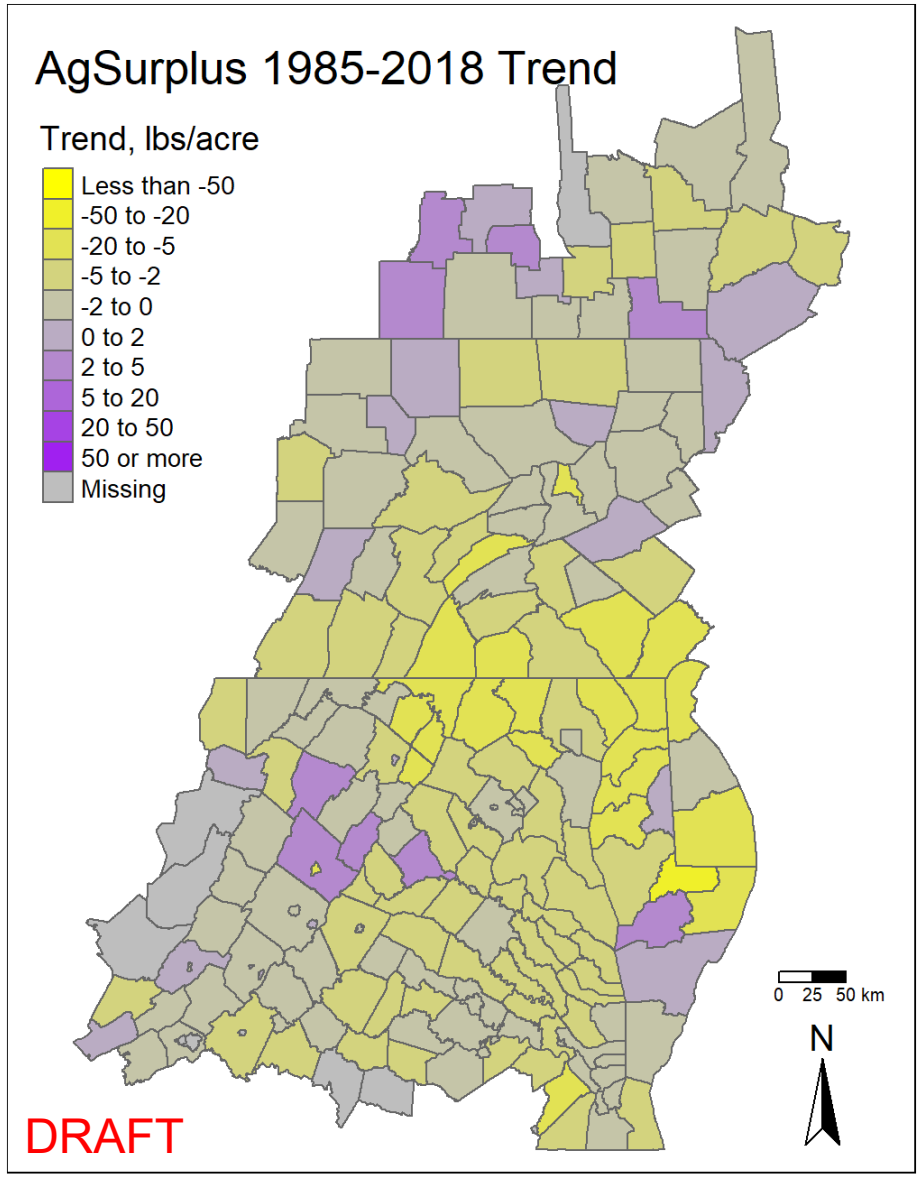

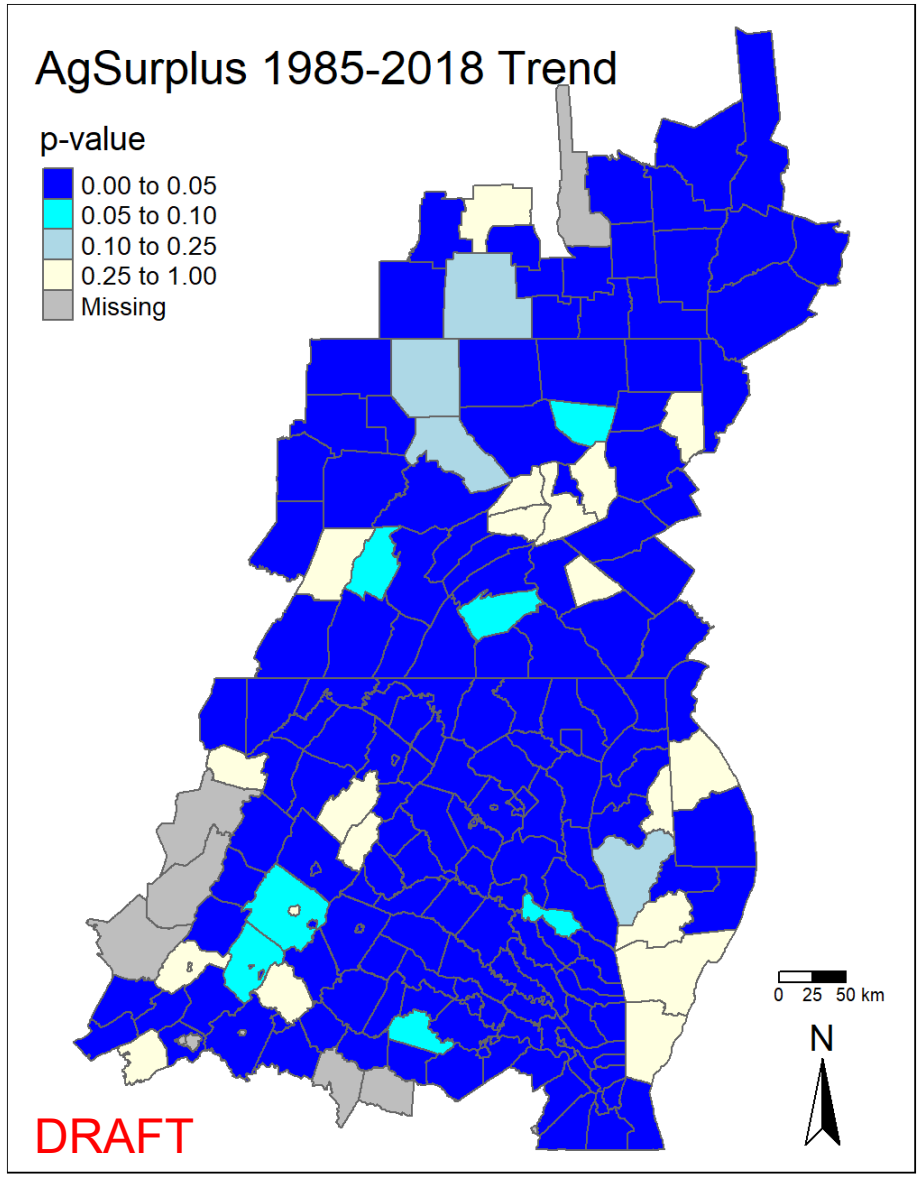

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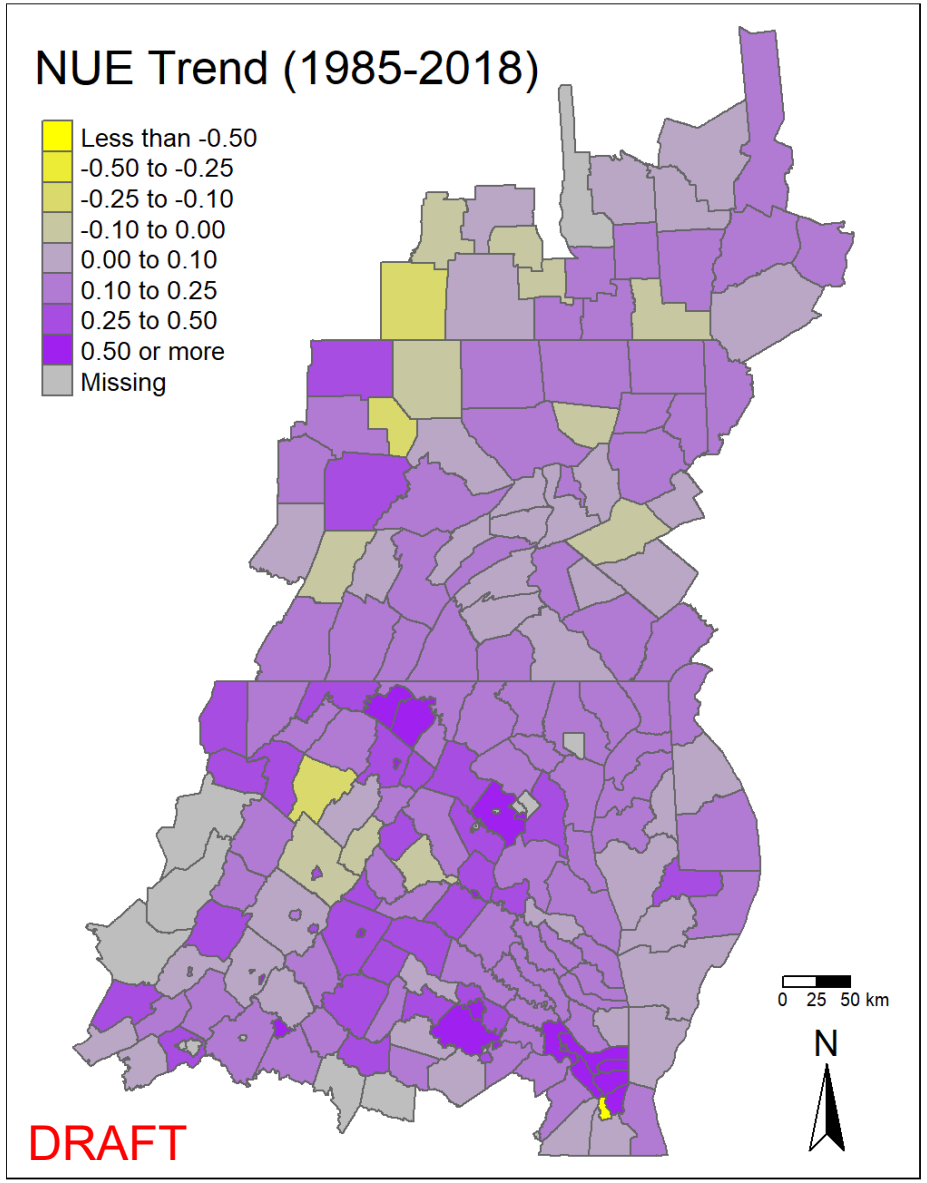

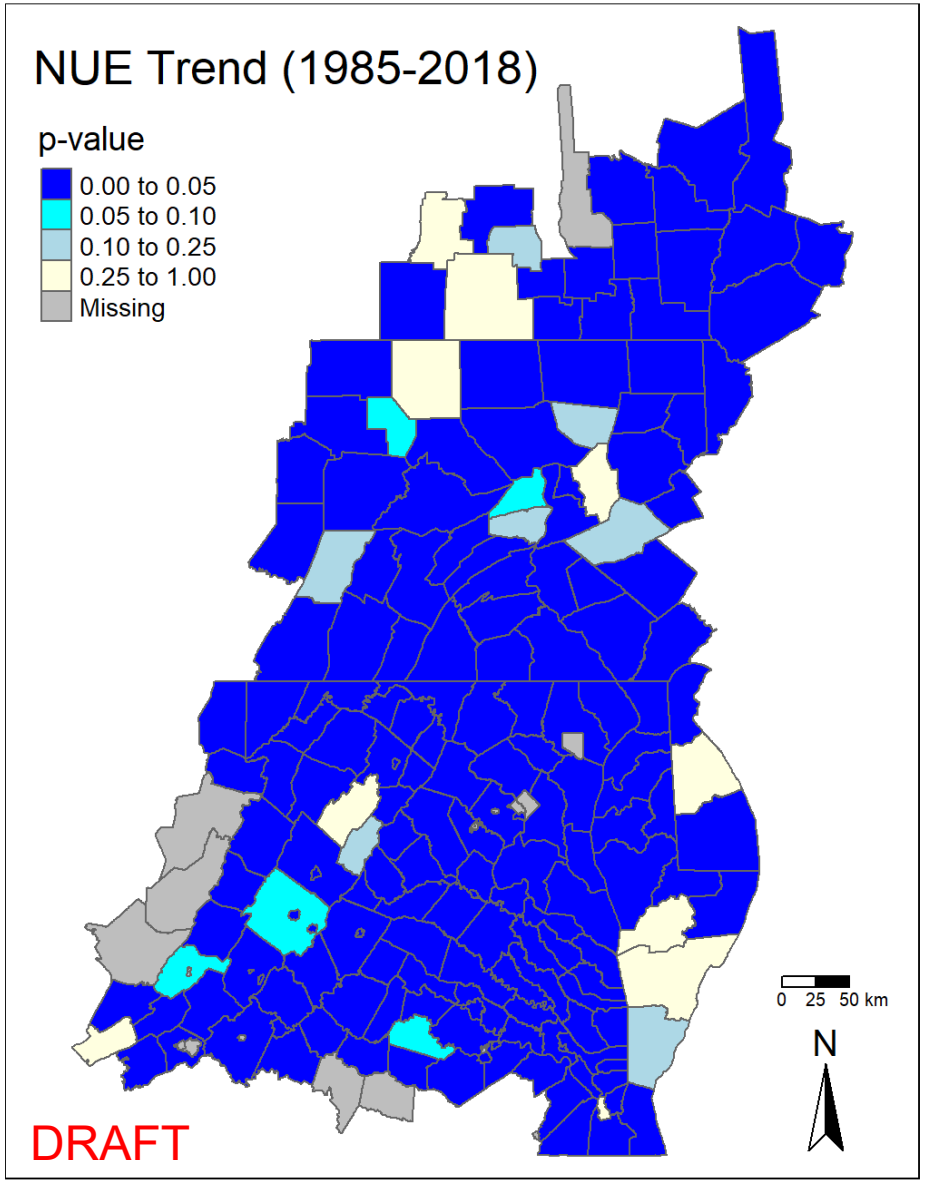

Next Steps

Introduction Chapter

- Modeling Workgroup and Water Quality GIT review intro chapter

Factsheet

- Present intro chapter and factsheet to WQGIT
- Present draft factsheet to Local Leadership Workgroup
- Incorporate feedback from interested local managers and planners and CBP workgroups
- Mass produce all county fact sheets after review

Maps

- Analyze graphs to understand spatial patterns
- Draft manuscript on N and P inventories and associated trends in the Chesapeake Bay