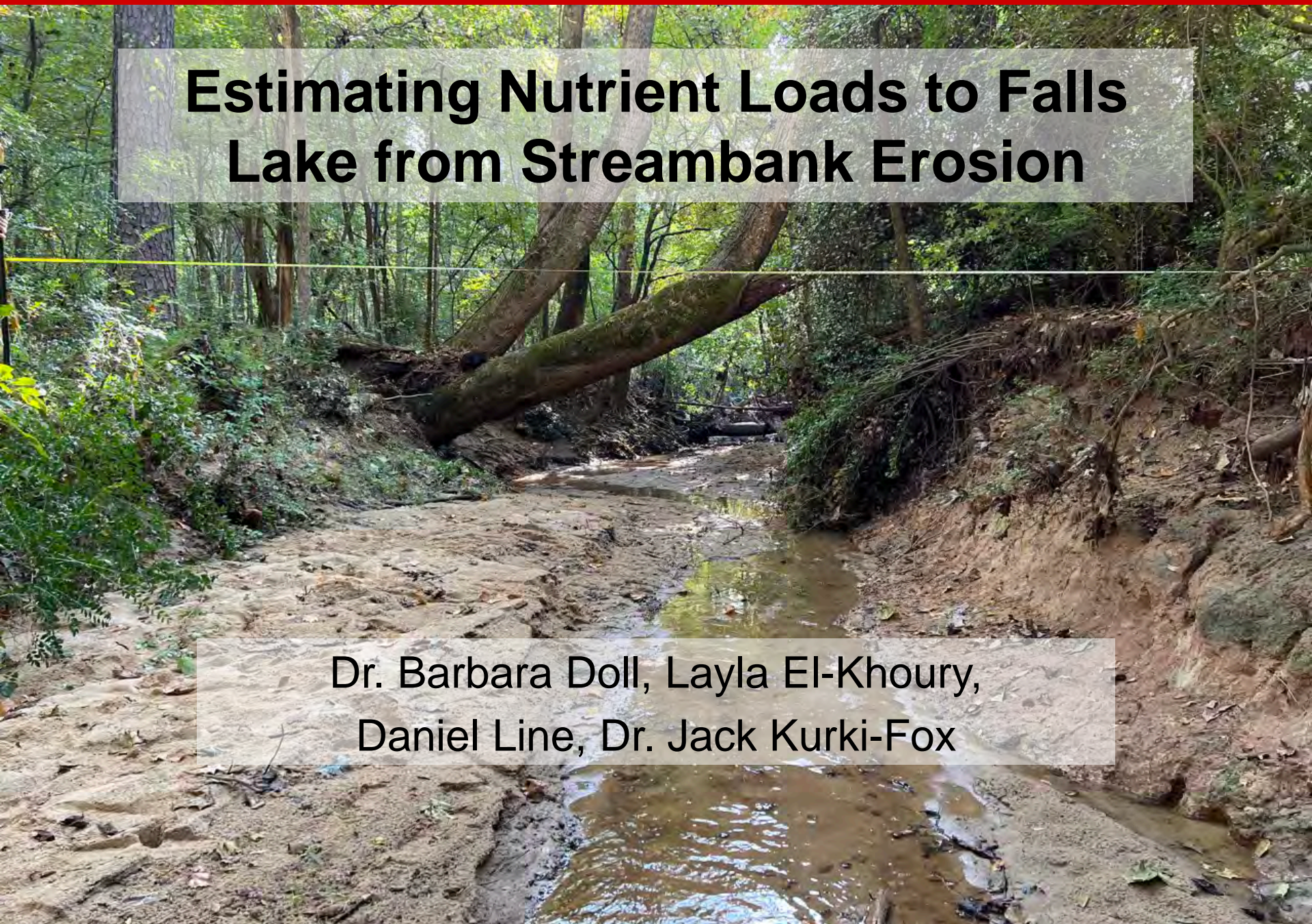


Estimating Nutrient Loads to Falls Lake from Streambank Erosion

Dr. Barbara Doll, Layla El-Khoury,
Daniel Line, Dr. Jack Kurki-Fox

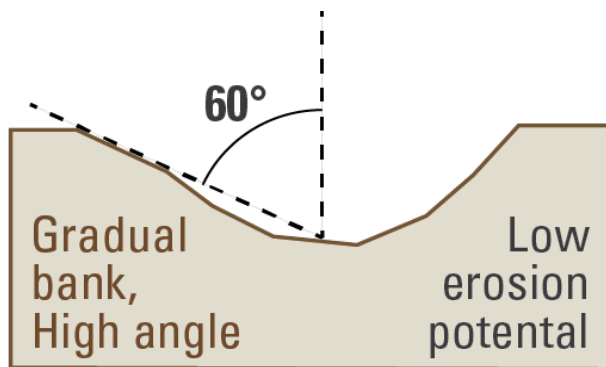
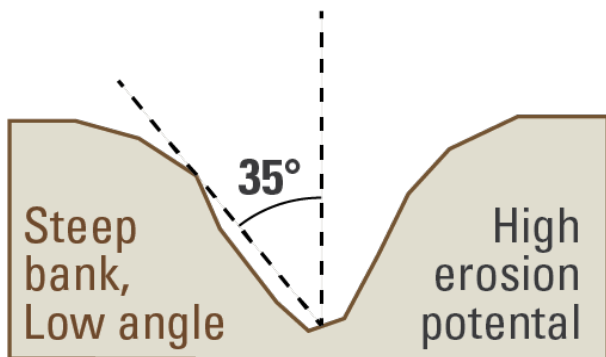


Objectives

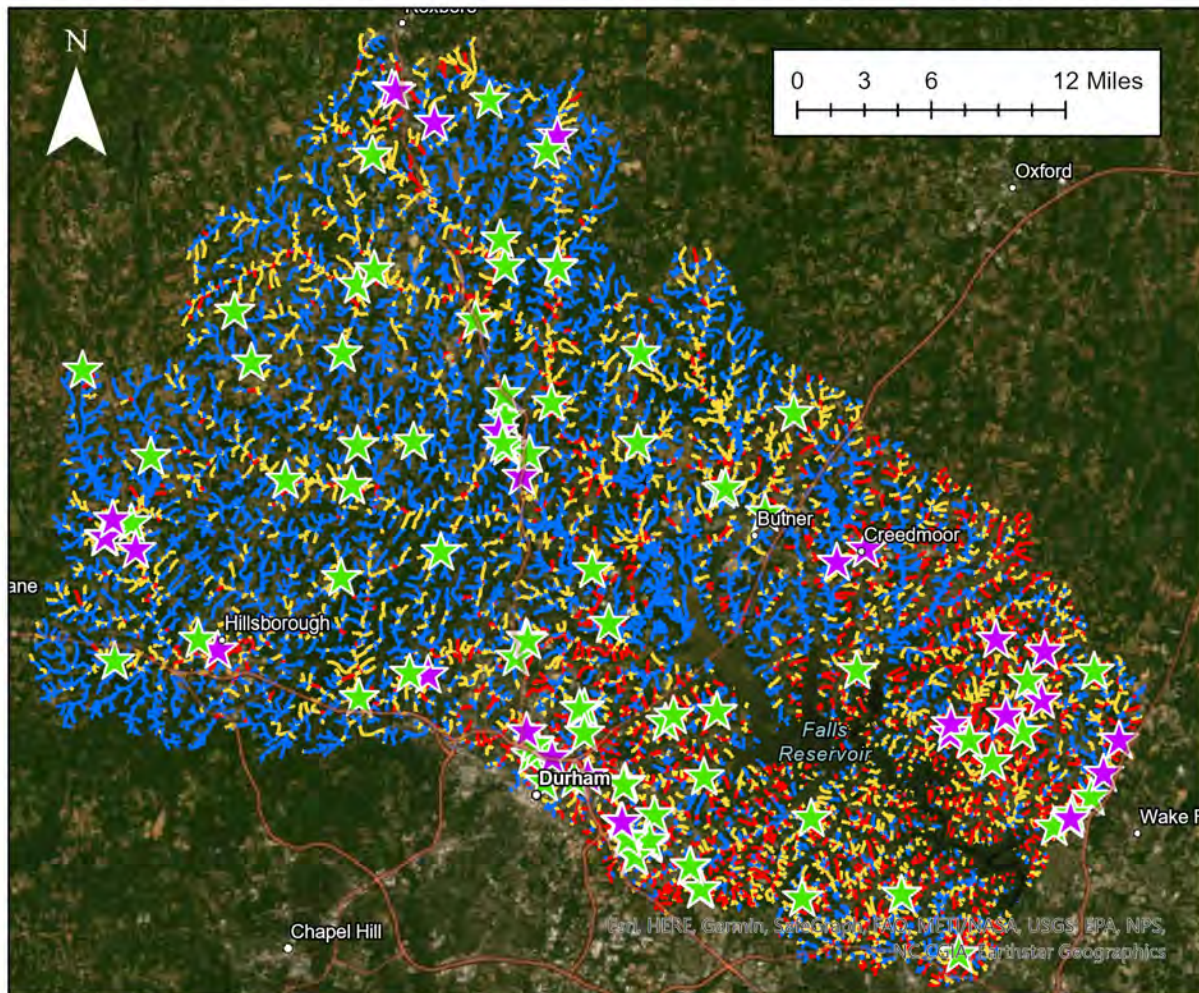
1. Identify streambank erosion hot spots
2. Quantify streambank erosion rates, and sediment and nutrient loads
3. Quantify watershed disturbance
4. Compare water quality, land disturbance and streambank erosion at 5 study watersheds

Falls Lake Site Selection

USGS 3m Positive Openness (PO)



- Sites: 111
- XS: 28



Legend

Possible Sites

Visited

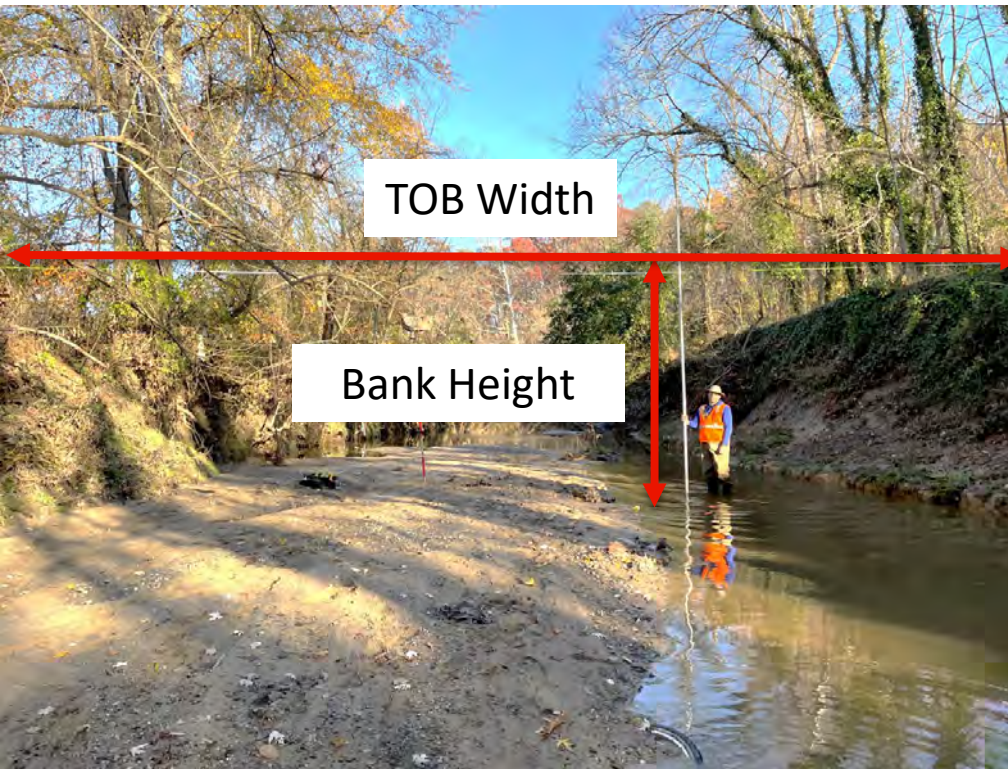
- ★ XS
- ★ Visited

DOT Atlas Streams

- None
- SC
- UC_MW
- Other

Assessment Protocol

1. Validation of sites along 100 ft reaches



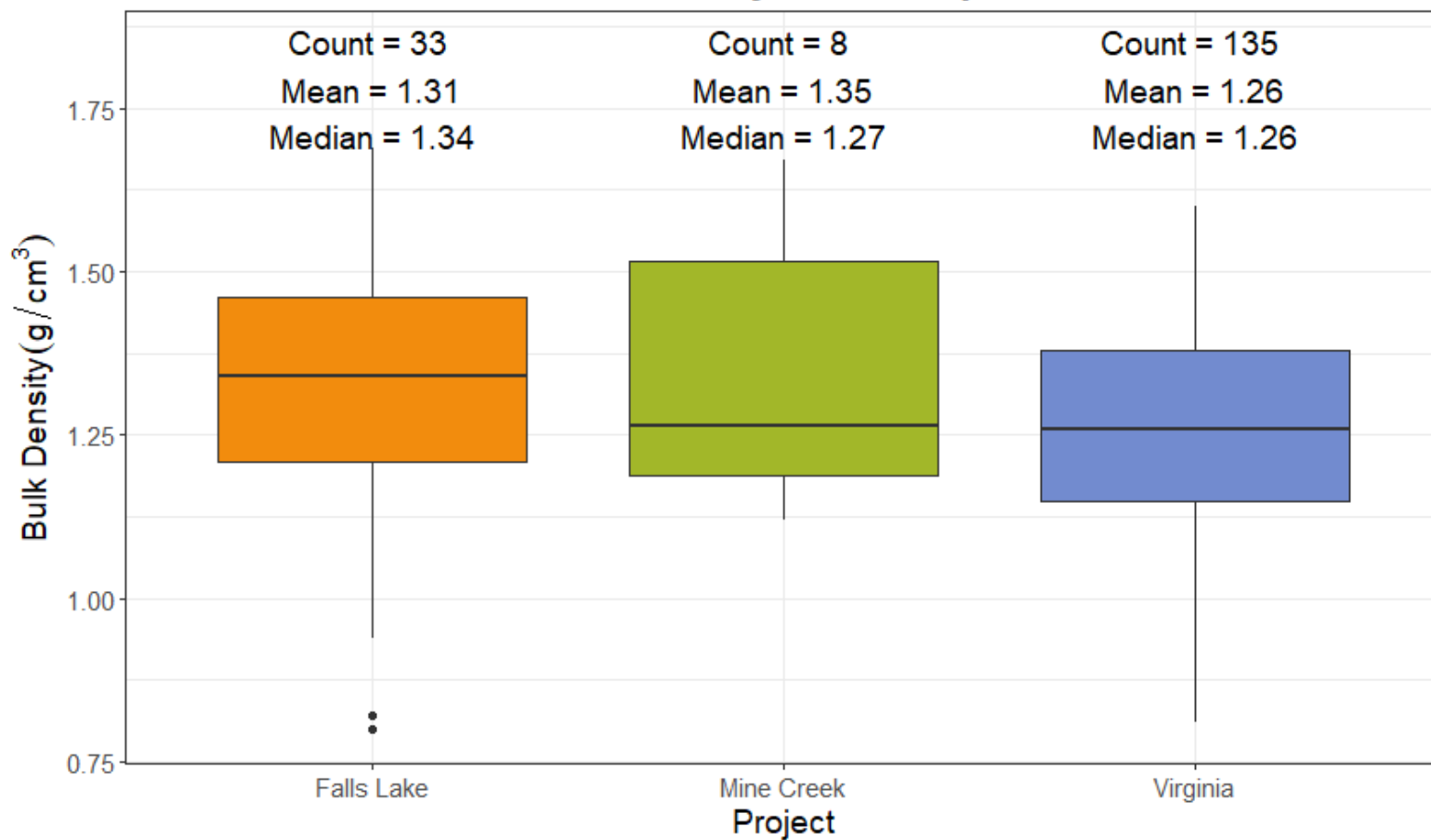
Assessment Protocol

2. XS/BEHI (28)
 - a. Along eroding bank:
 - TOB surveys on eroding bank
 - BEHI assessment
 - b. Resurvey sites 6-9 months later
3. Soil Samples
 - a. TN, TP, Bulk Density



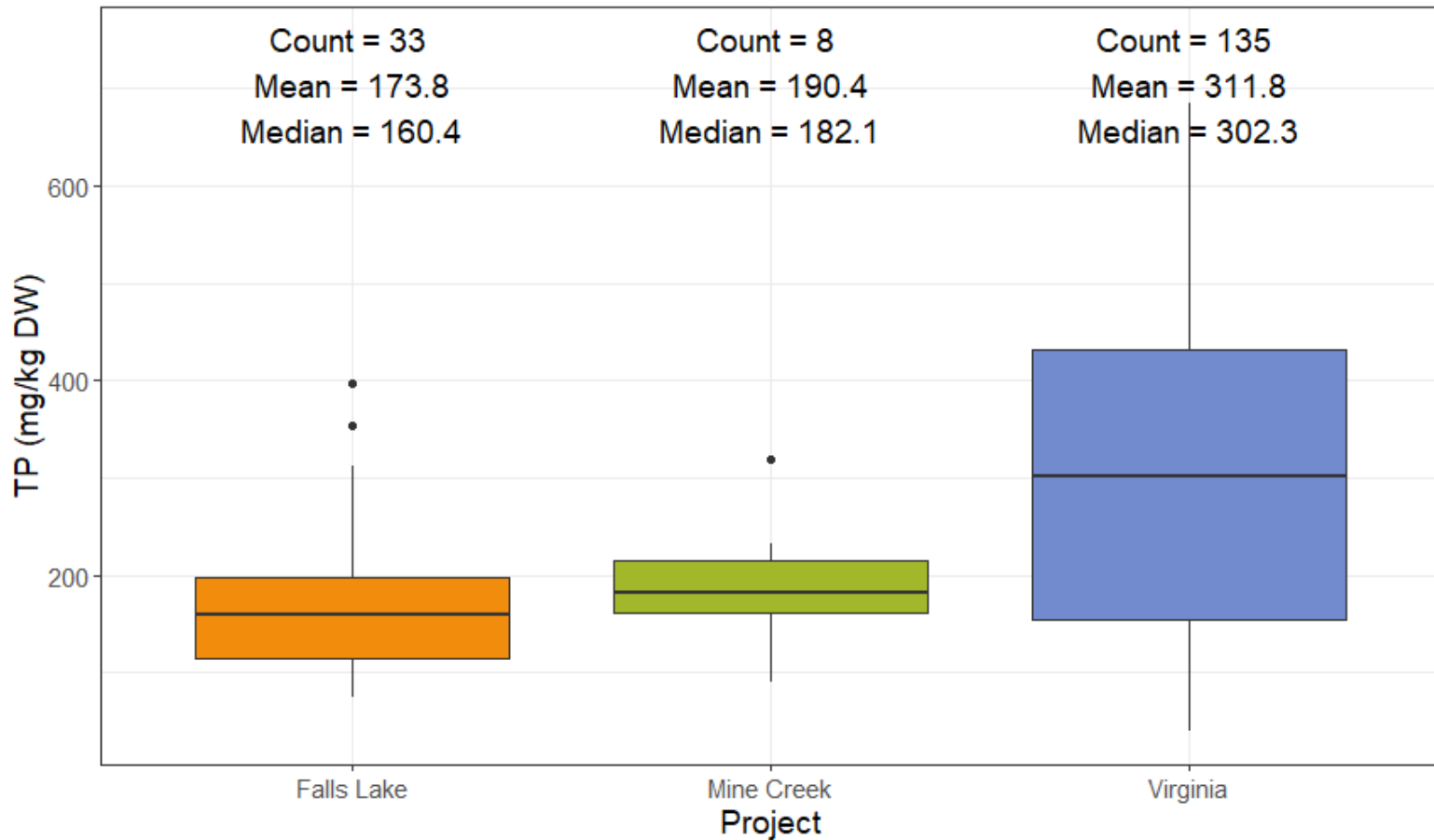
Soil Sample Results

Bulk Density Soil Samples



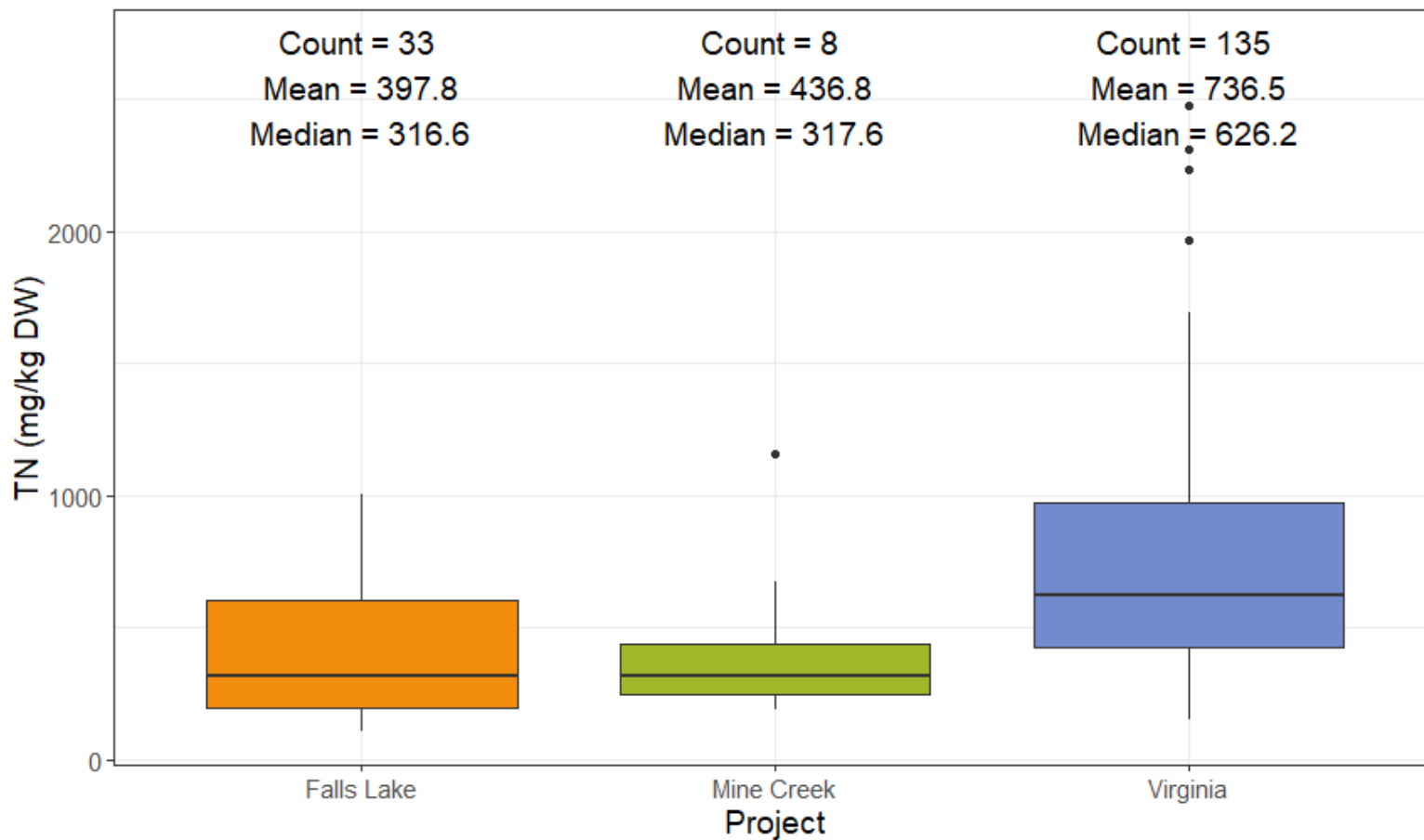
Soil Sample Results

Total Phosphorus Soil Samples



Soil Sample Results

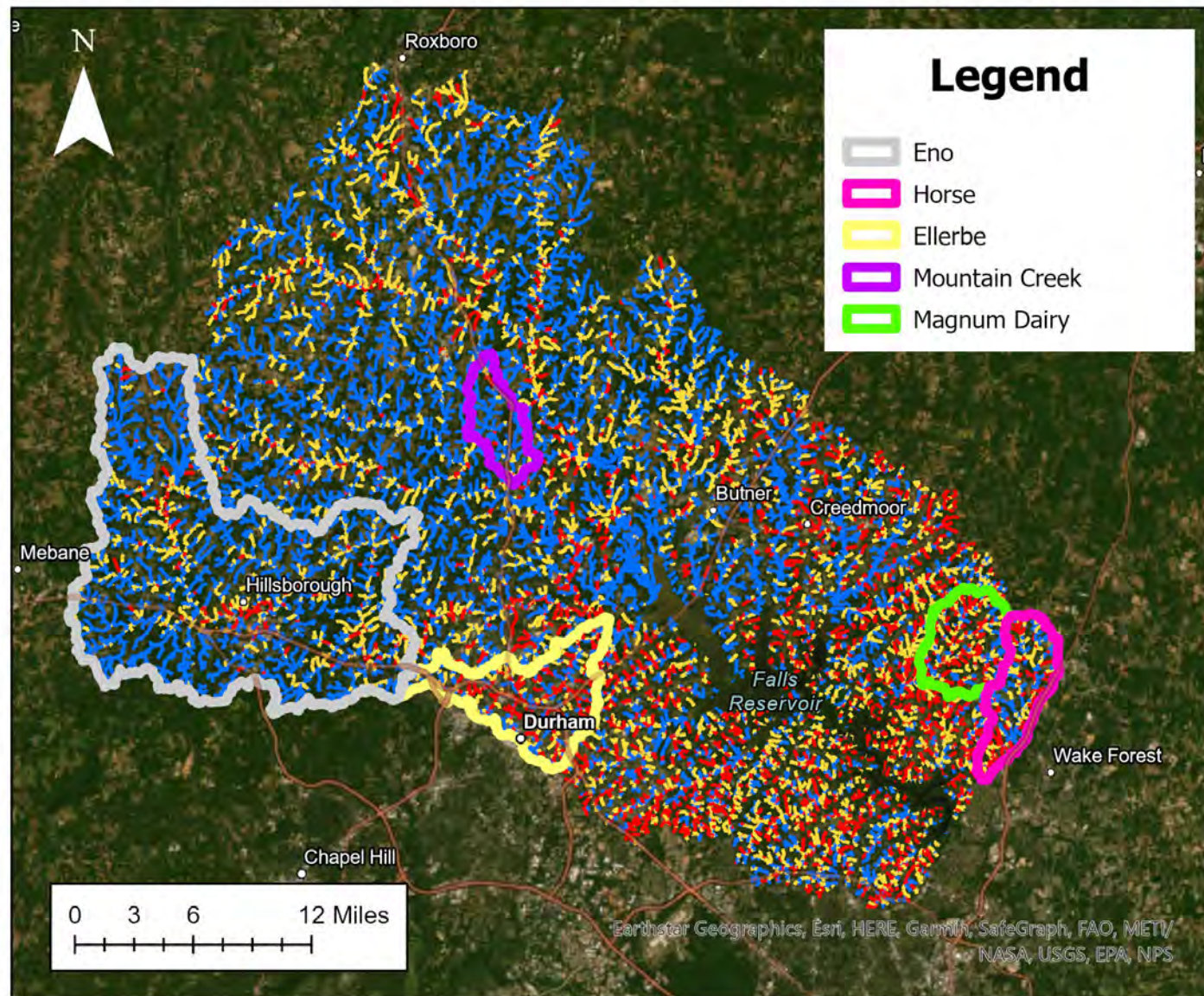
Total Nitrogen Soil Samples



Five Study Watersheds with USGS Gauges and ISCO Samplers

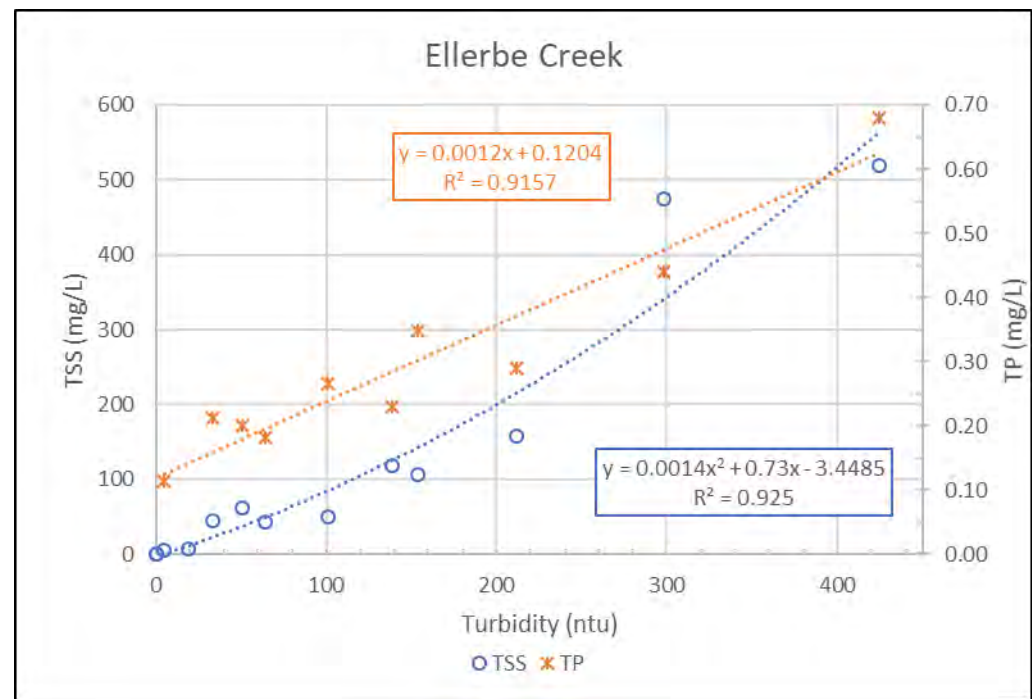
Turbidity Monitoring

- 5% of samples go to lab for TP and TSS analysis

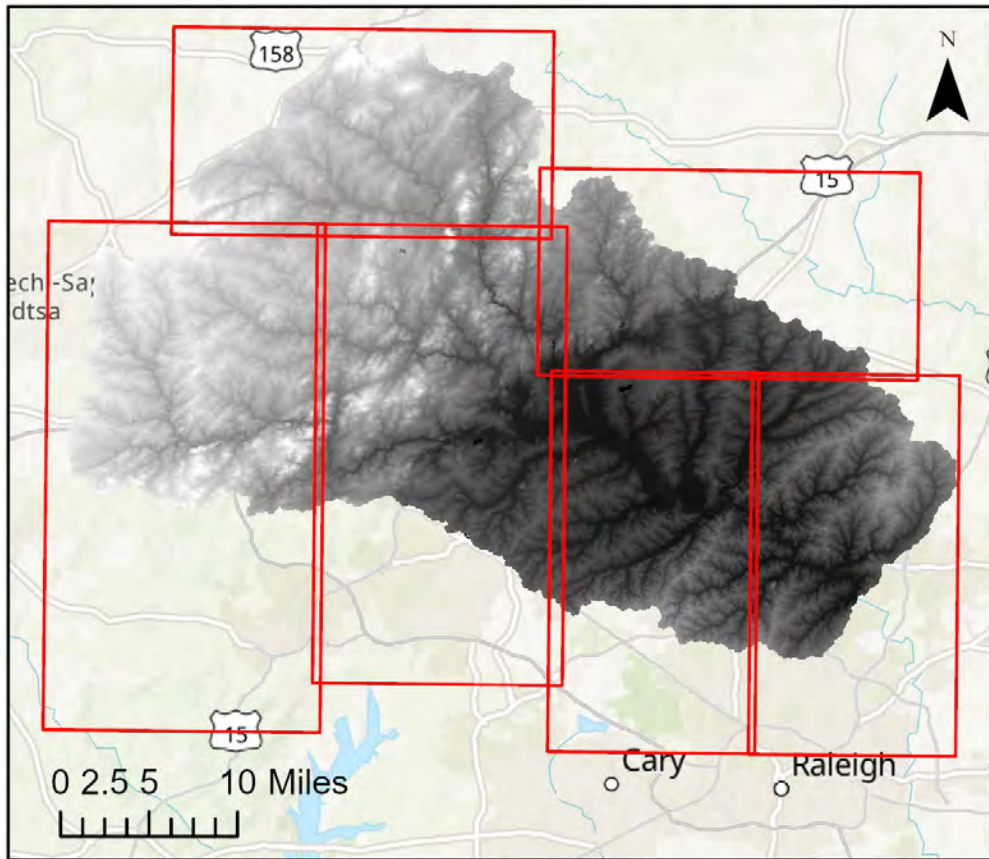


Water Quality Data

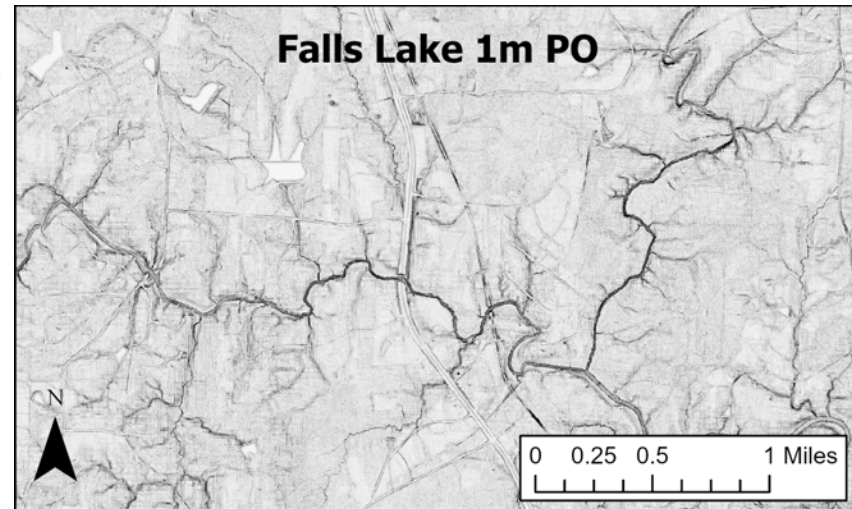
- Relate Turbidity to TSS & TP
- Develop sediment discharge relationships
- Estimate sediment loads
- Compare streambank erosion & land disturbance to sediment loads



Generating 1m PO



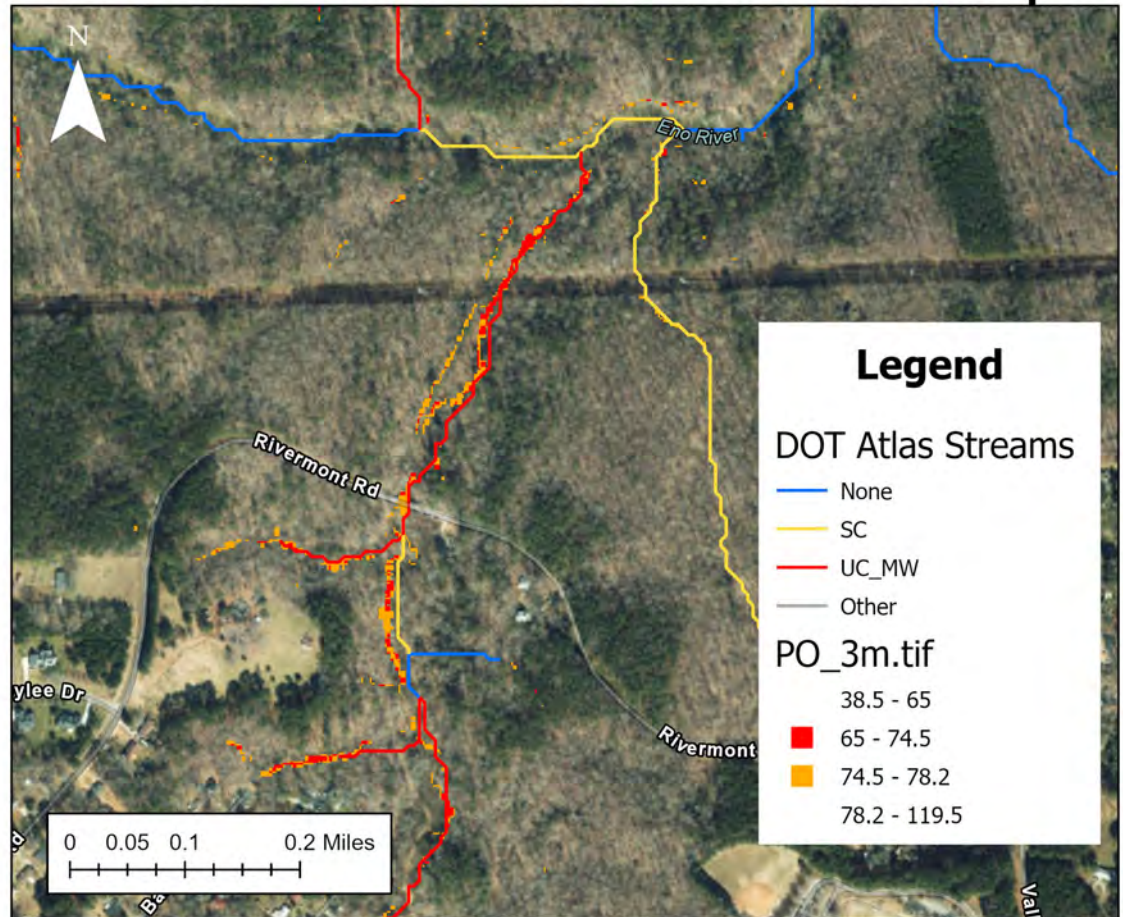
Relief Visualization Toolbox



Identifying Erosion Hotspots

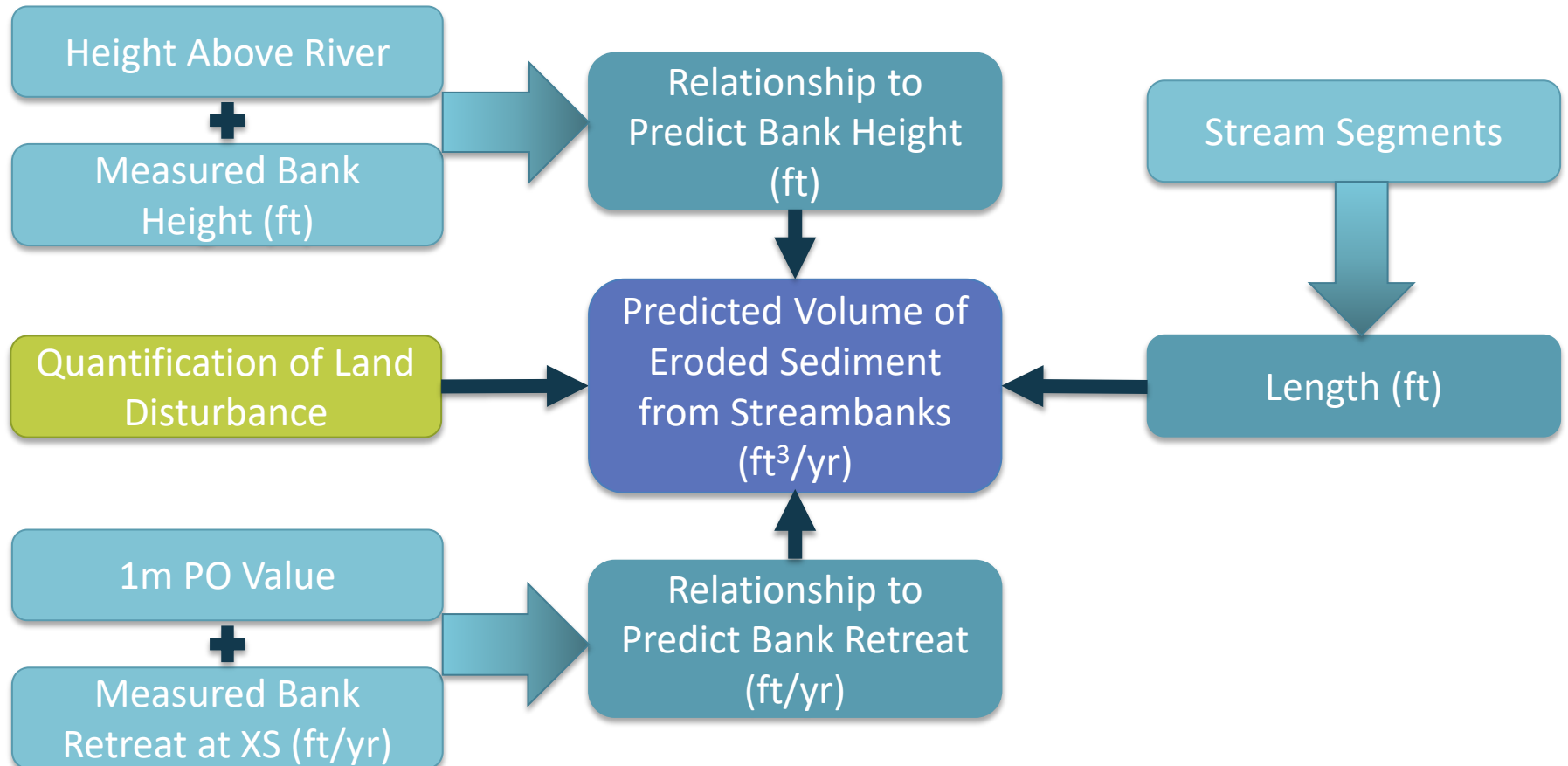
- 1m positive openness
- Erosion classification of reaches

Falls Lake Erosion Hotspots 3m PO Mine Creek Relationship



Predicting Streambank Sediment Loads

$$Volume = Bank Height \times Bank Length \times Bank Retreat$$

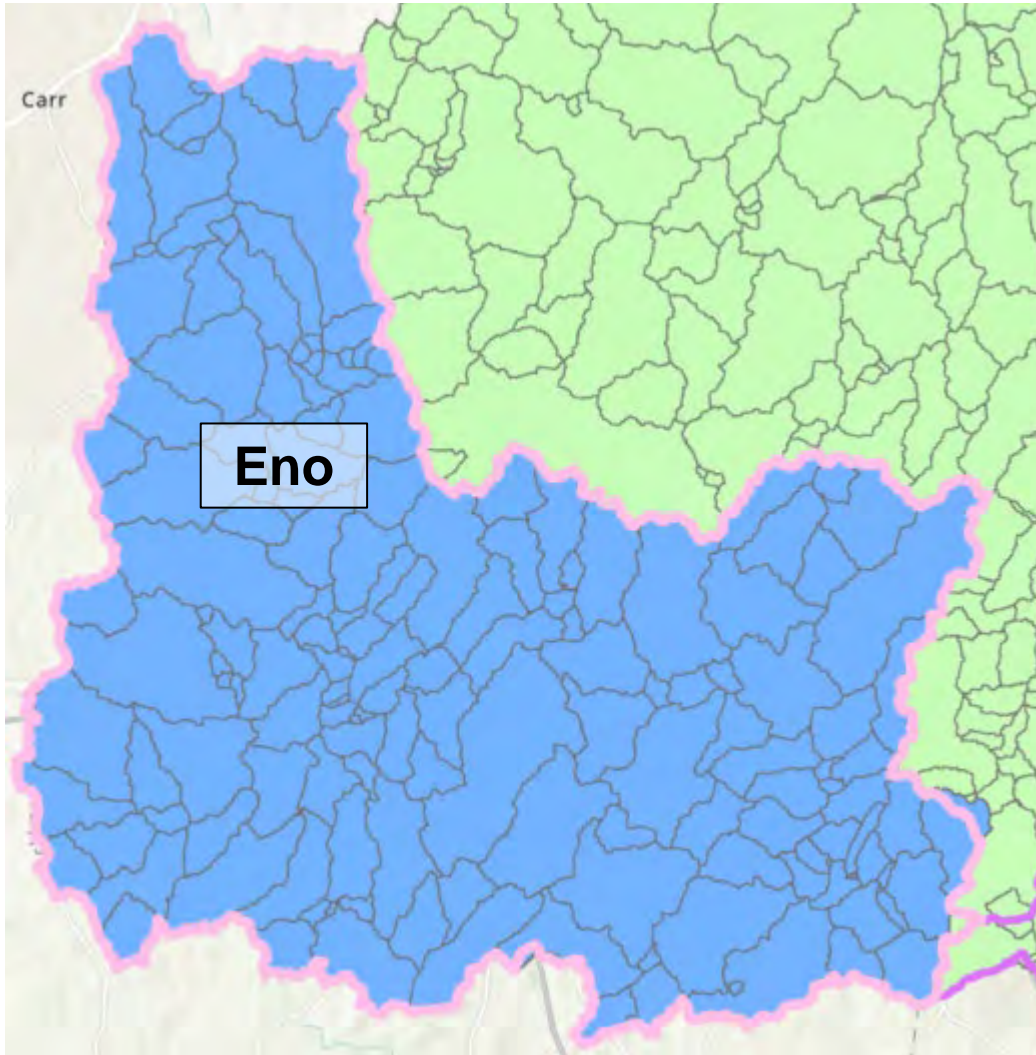


Comparing Predicted Loads from Streambank Erosion

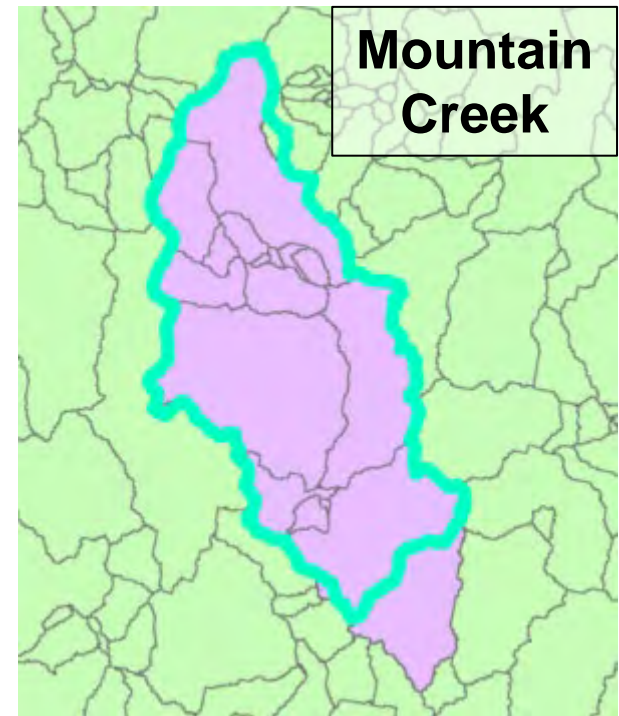
	TSS	TP	TN
Falls Lake Watershed			
USGS NC SPARROW	✓	✓*	✗
Upper Neuse River Basin Association	✗	✓	✓
5 Study Watersheds			
USGS NC SPARROW	✓	✓*	✗
Upper Neuse River Basin Association	✓	✓	✓

* There is only a source from channel incision (not streambank erosion for TP)

Generating Loads from NC SPARROW

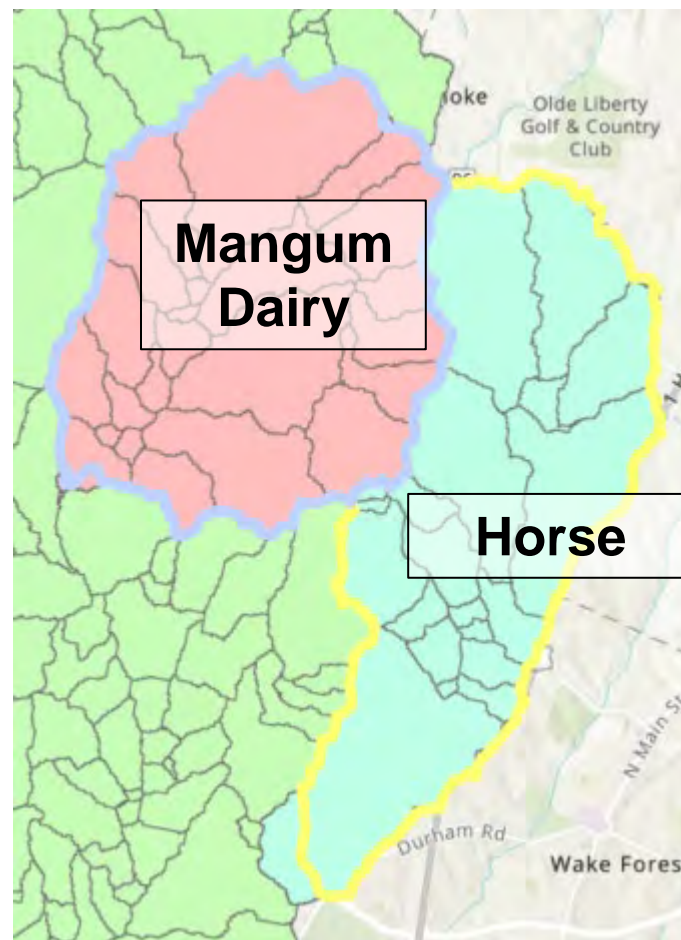
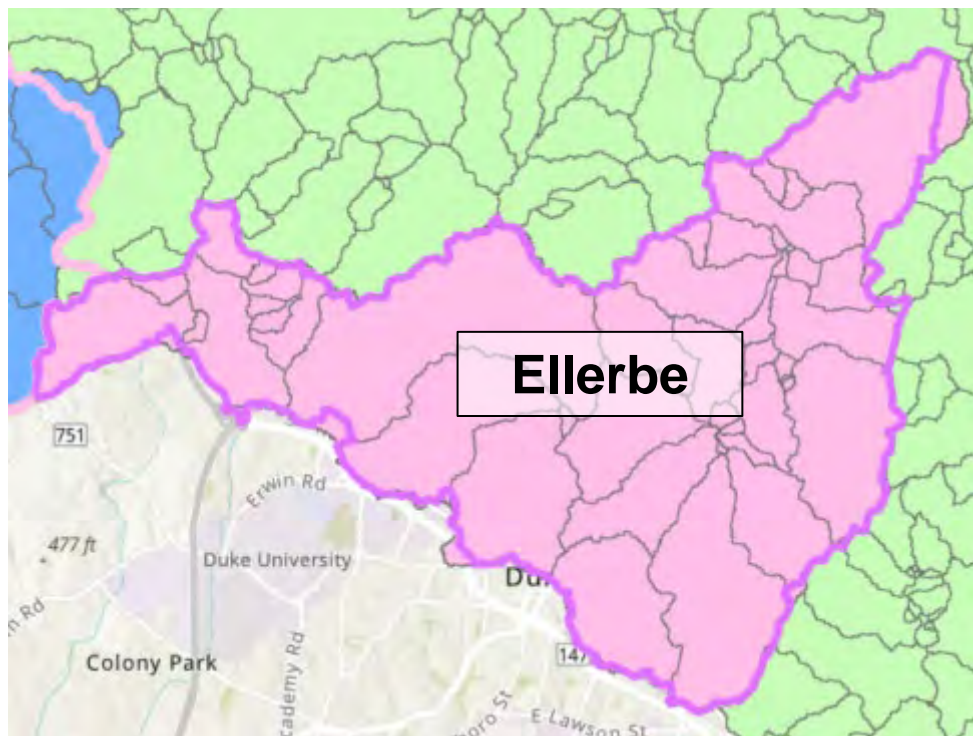


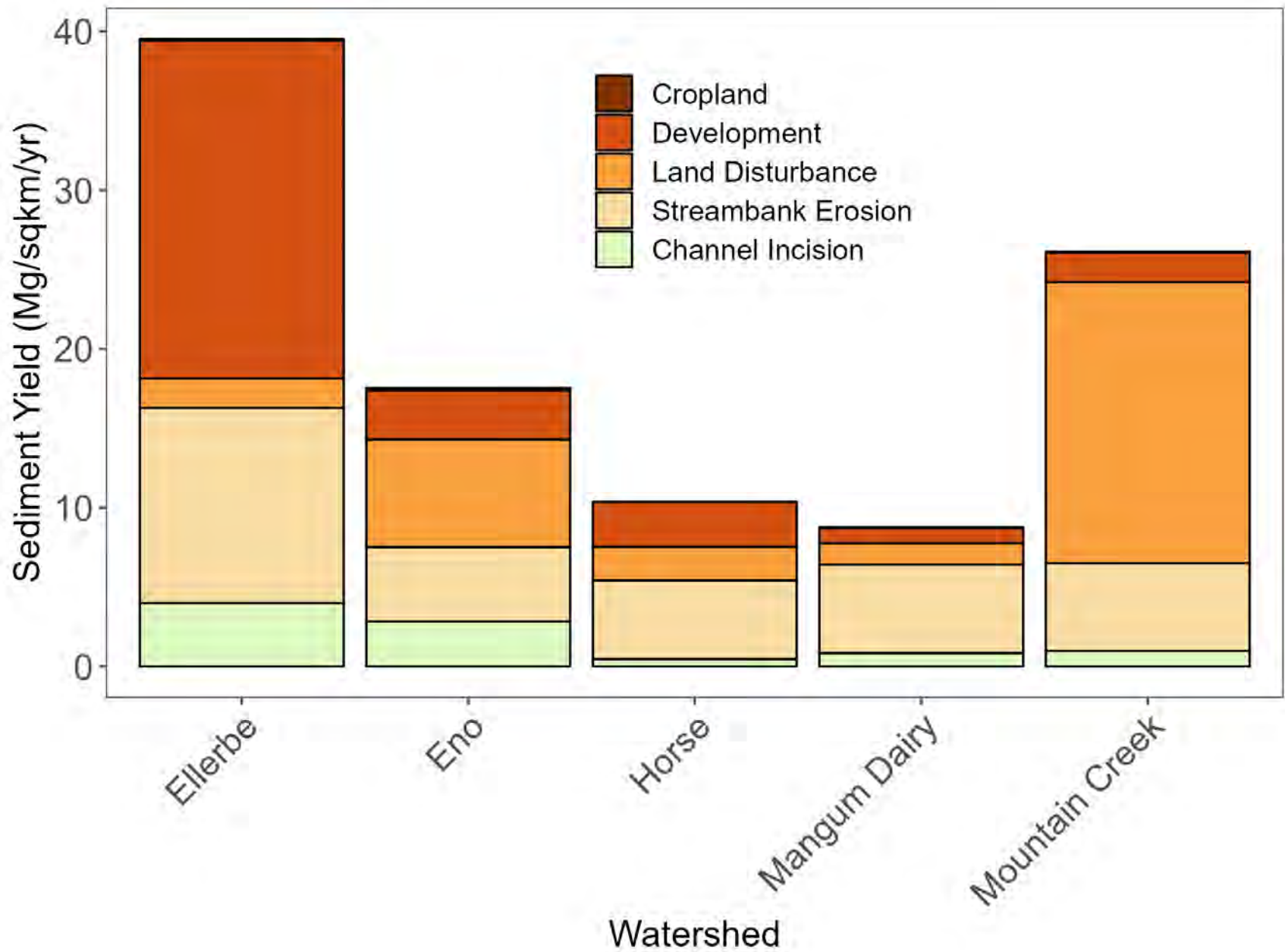
1. Isolated catchments within each watershed



Generating Loads from NC SPARROW

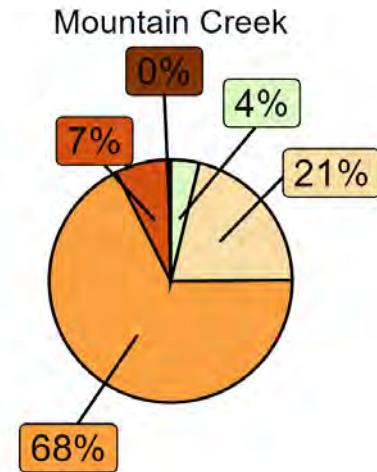
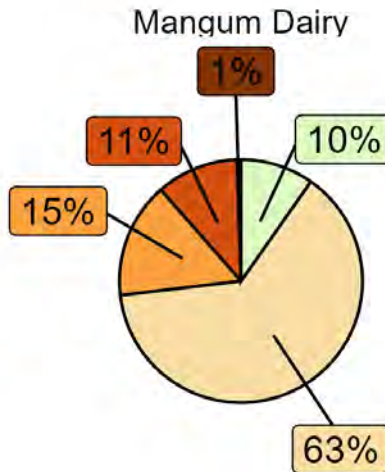
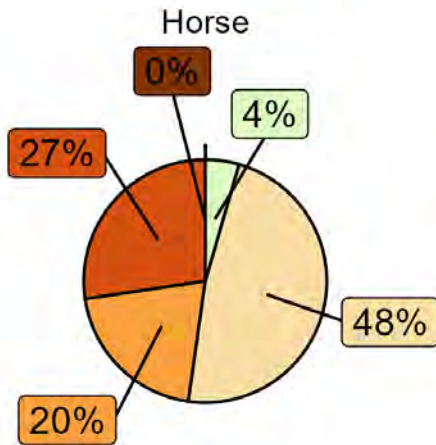
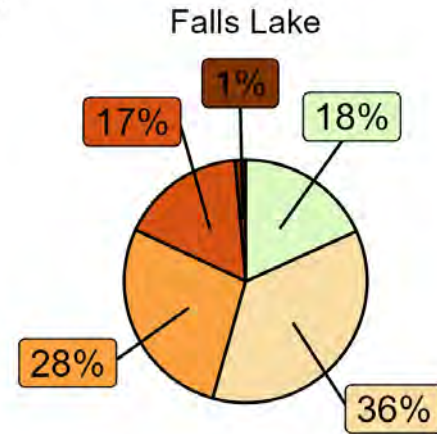
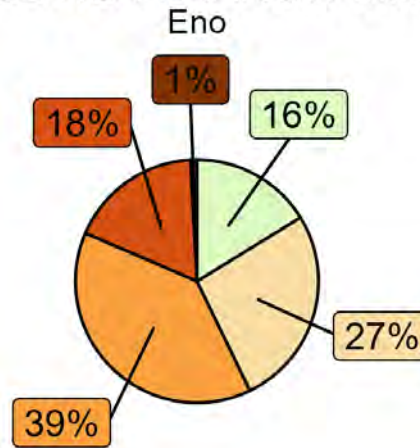
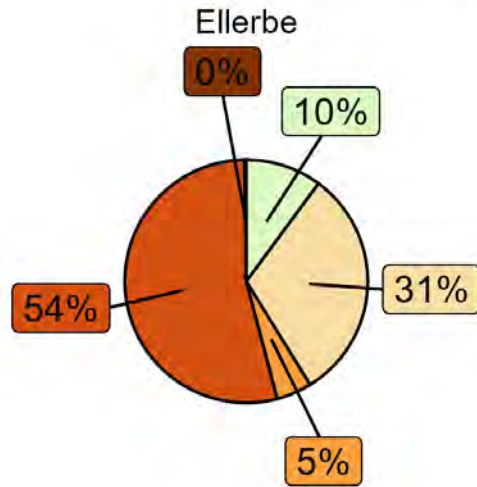
2. Use model inputs and outputs to determine incremental loads of TSS, TP and TN



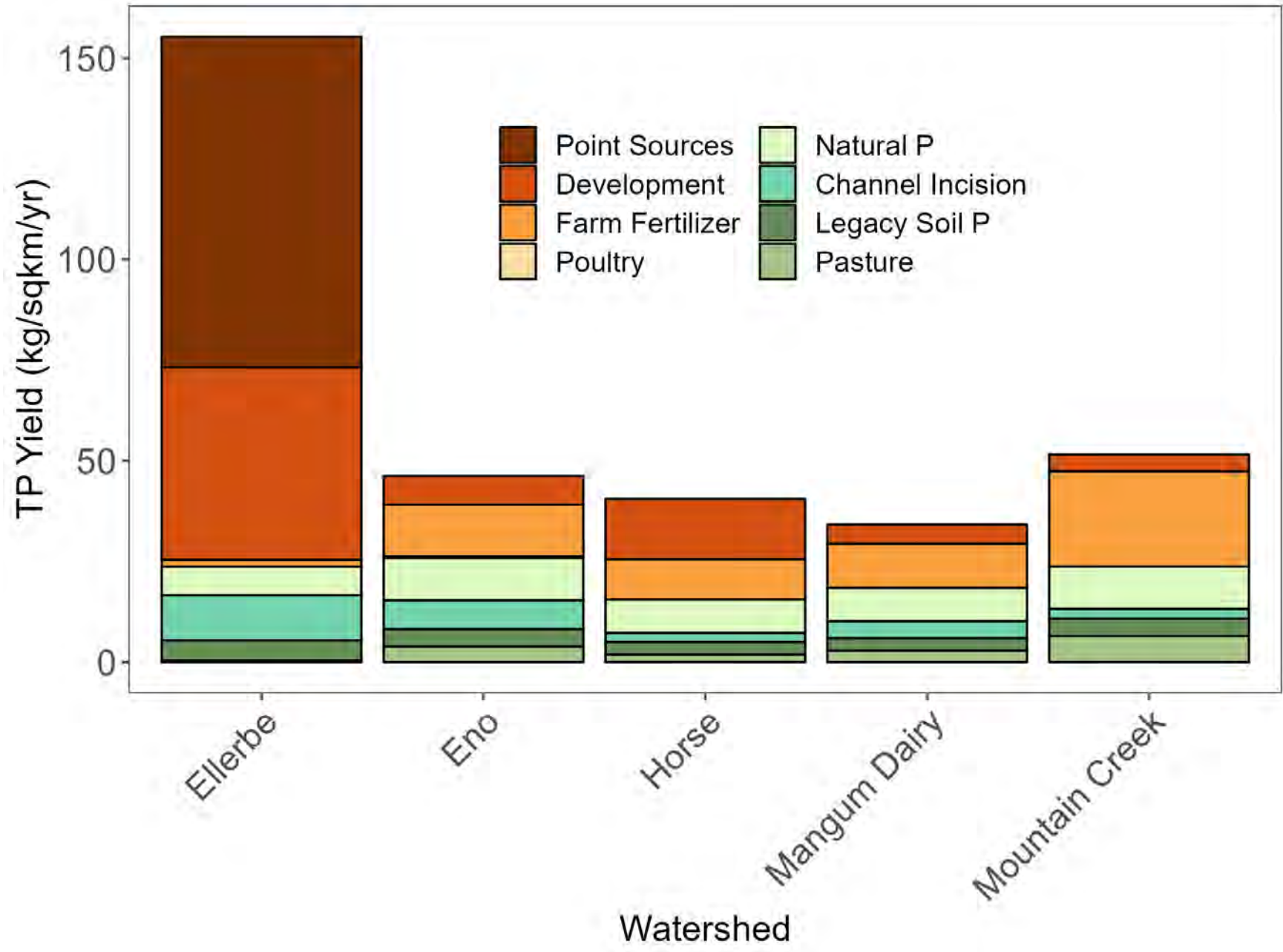


Percentage of Total Suspended Solids Yield by Source

USGS NC SPARROW Model

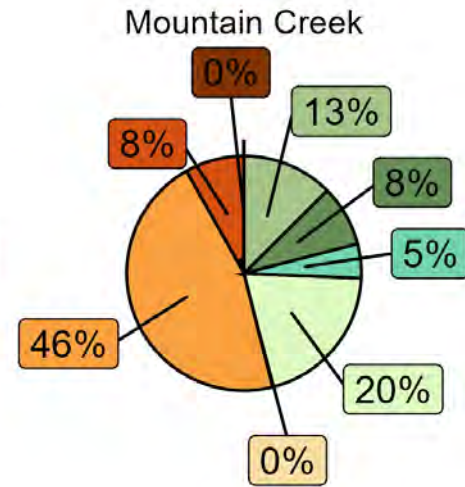
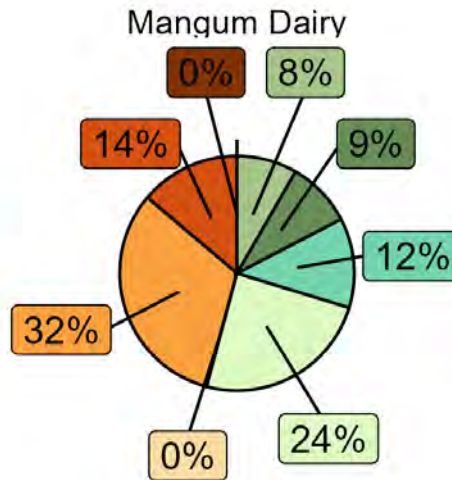
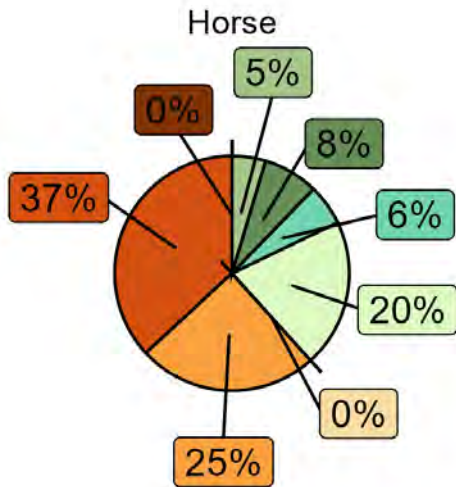
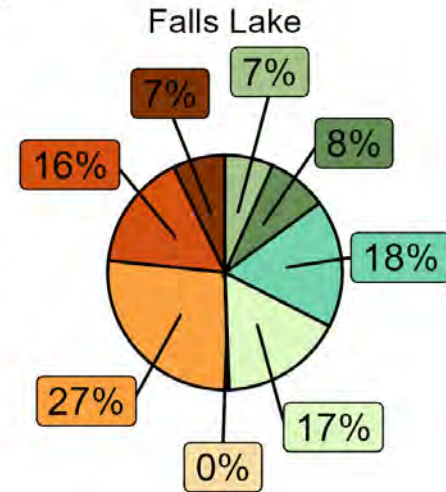
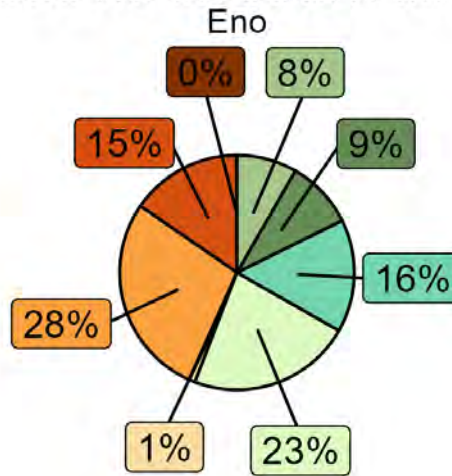
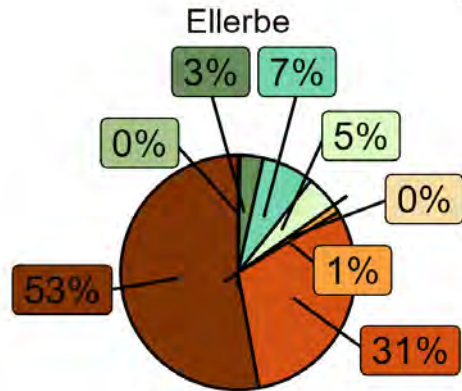


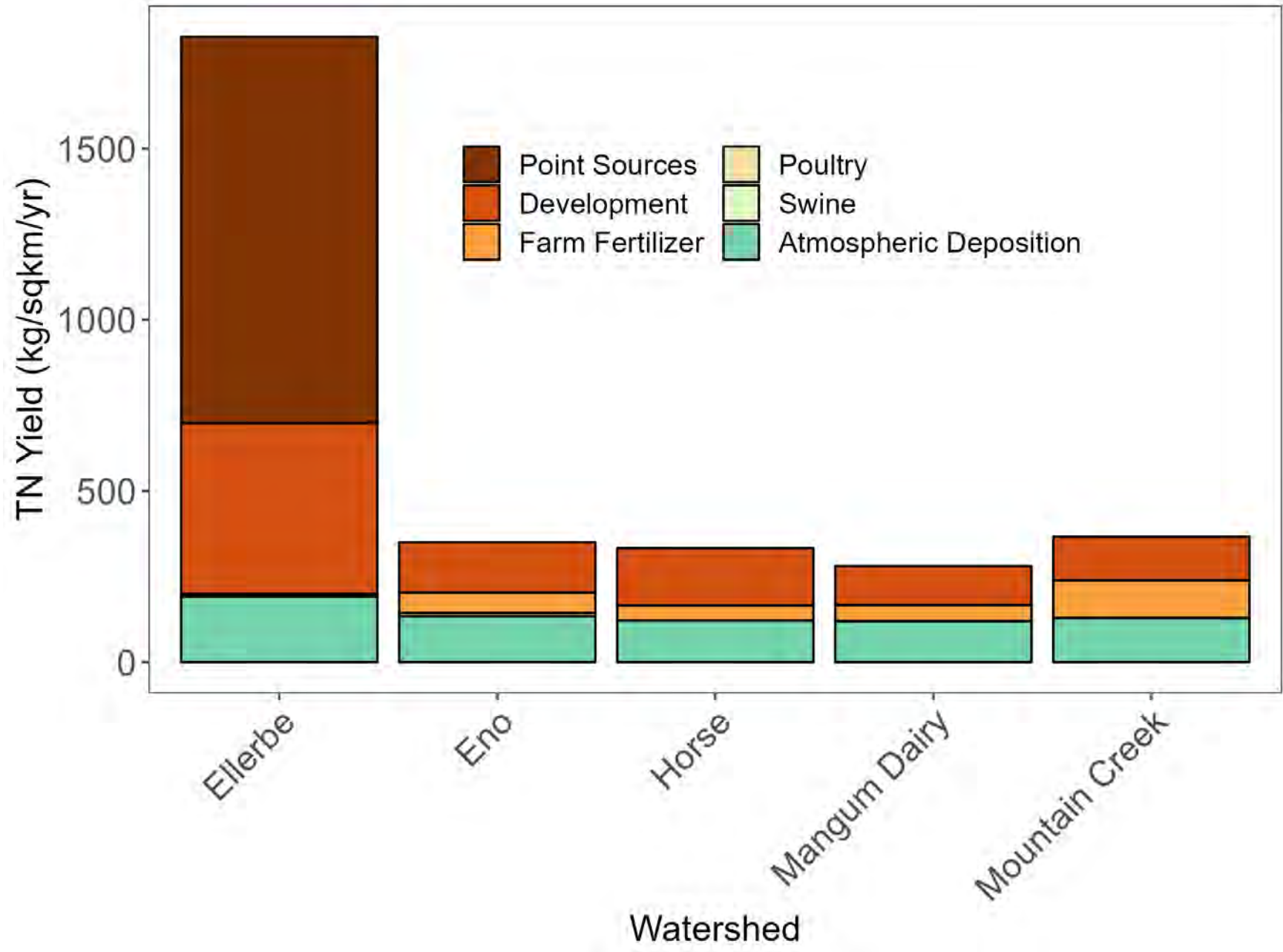
Cropland
 Development
 Land Disturbance
 Streambank Erosion
 Channel Incision



Percentage of Total Phosphorus Yield by Source

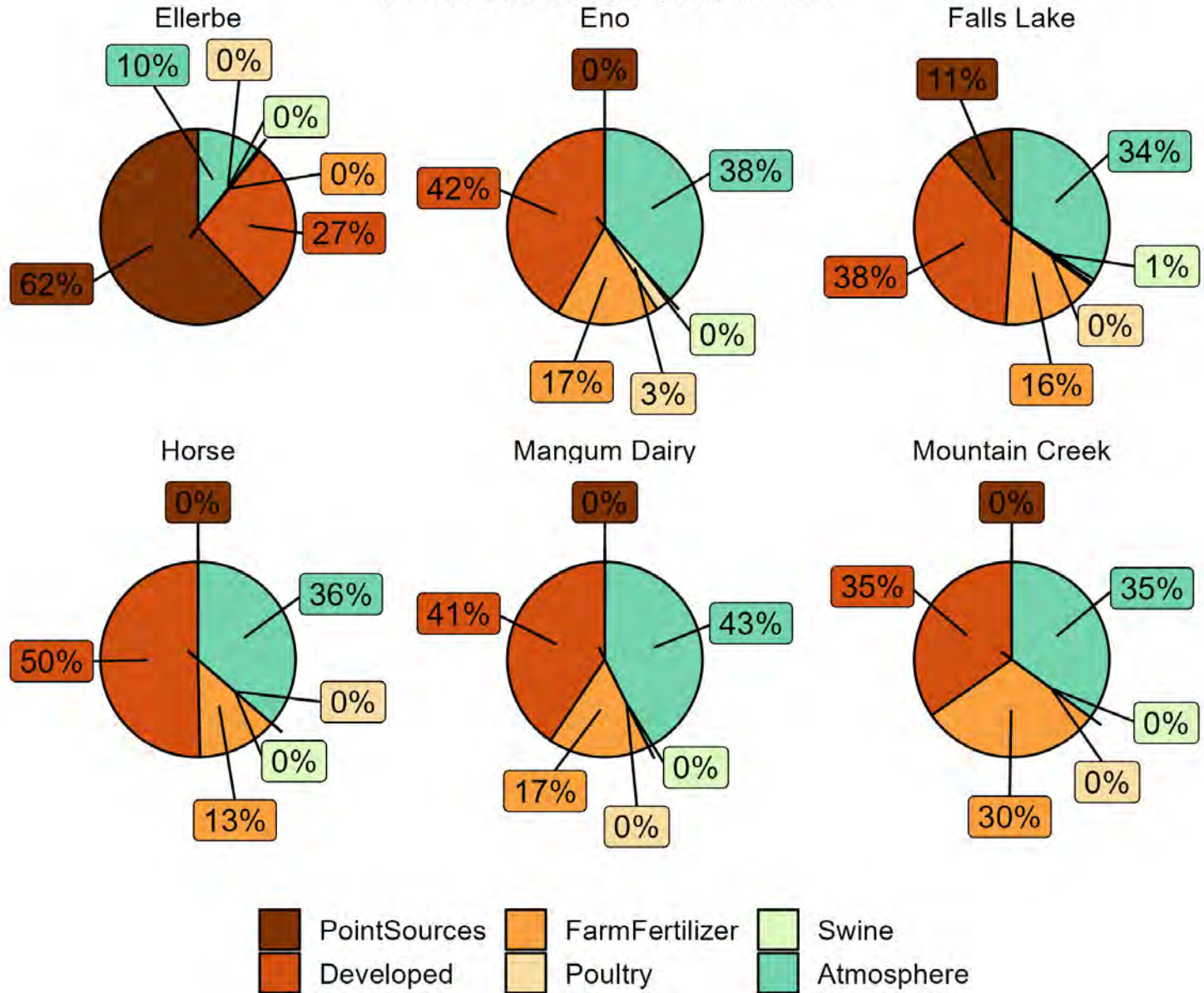
USGS NC SPARROW Model





Percentage of Total Nitrogen Yield by Source

USGS NC SPARROW Model



Questions?

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Layla El-Khoury: lcelkhou@ncsu.edu