

Markets for Water Pollution in North Carolina

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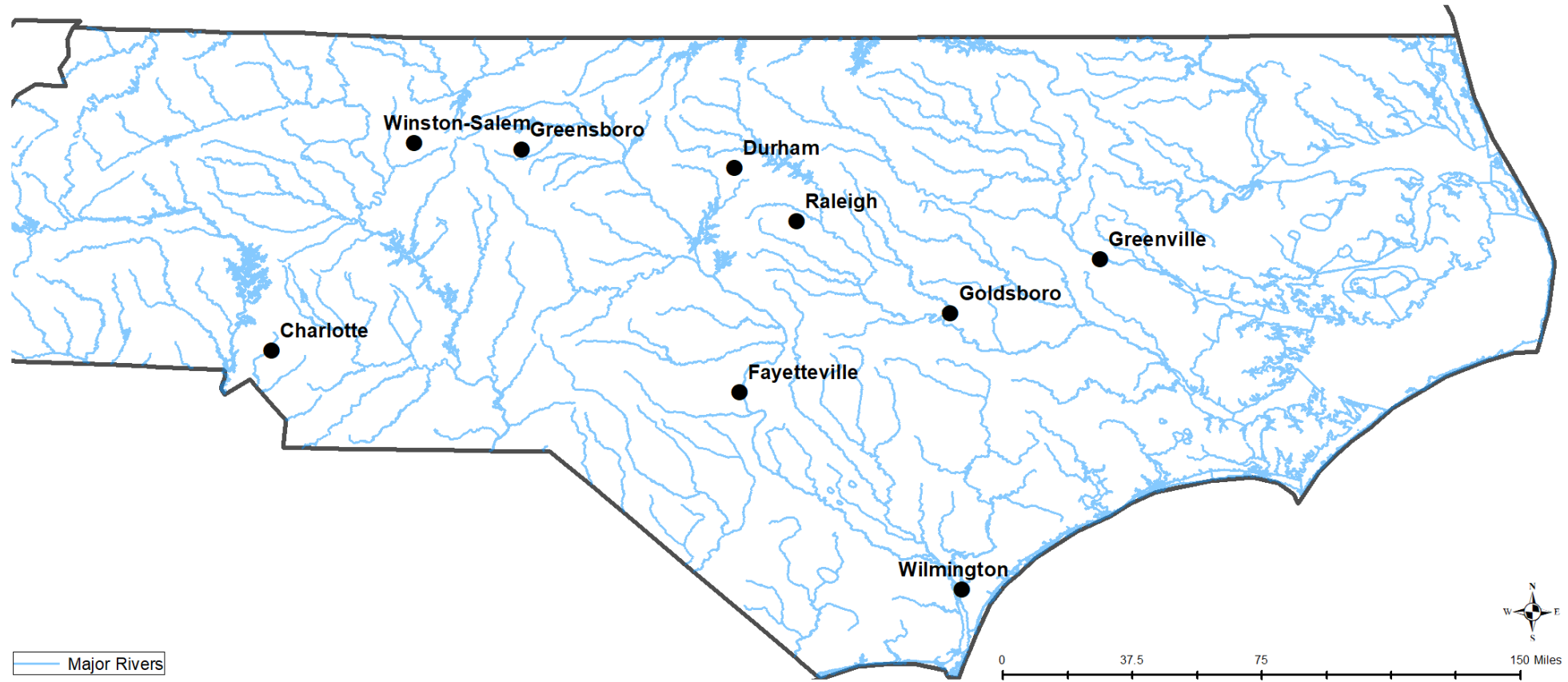
North Carolina State University

Introduce Problem in NC

- NC waters primary pollutants are Nitrogen and Phosphorous
 - Increase algae growth and oxygen levels damaging ecosystems
 - Result in eutrophication
- Fish Kill in Pamlico Sound



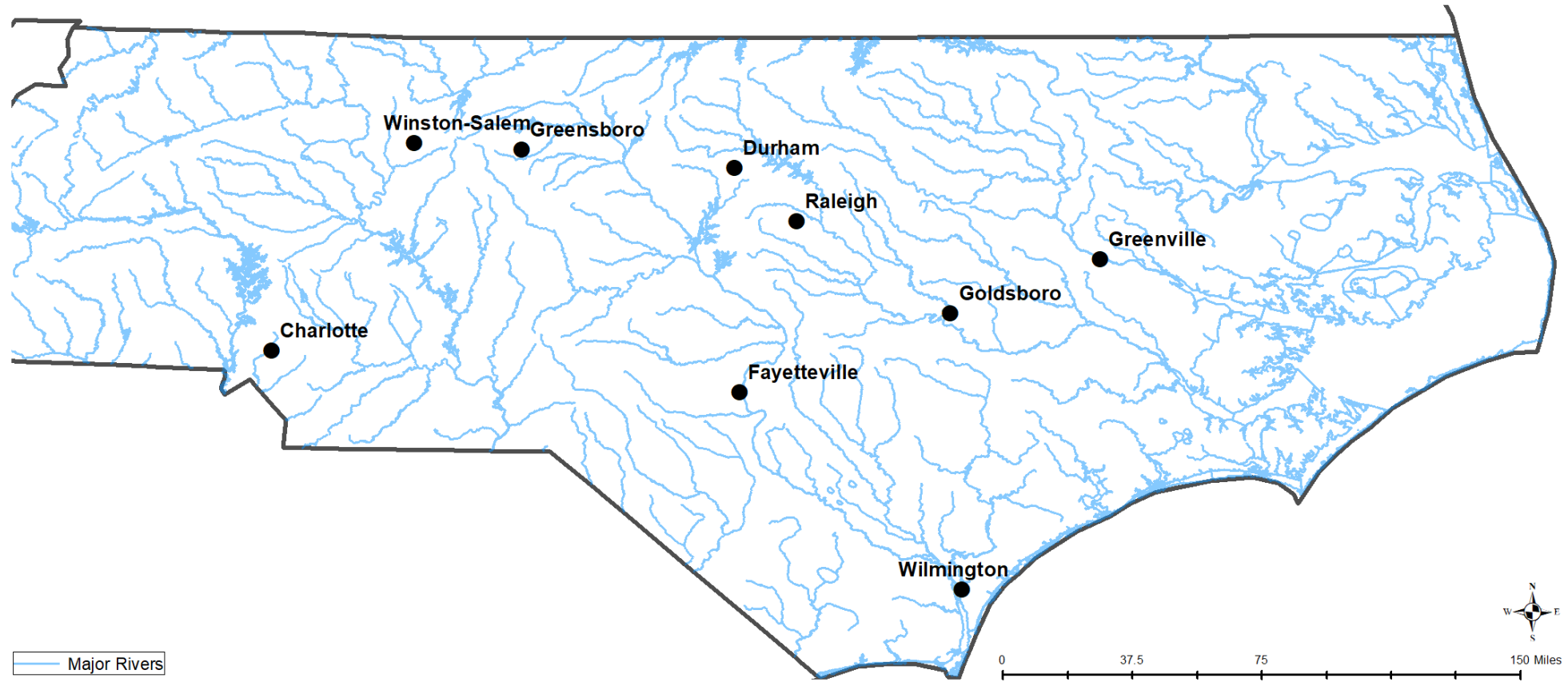
North Carolina's Major Rivers



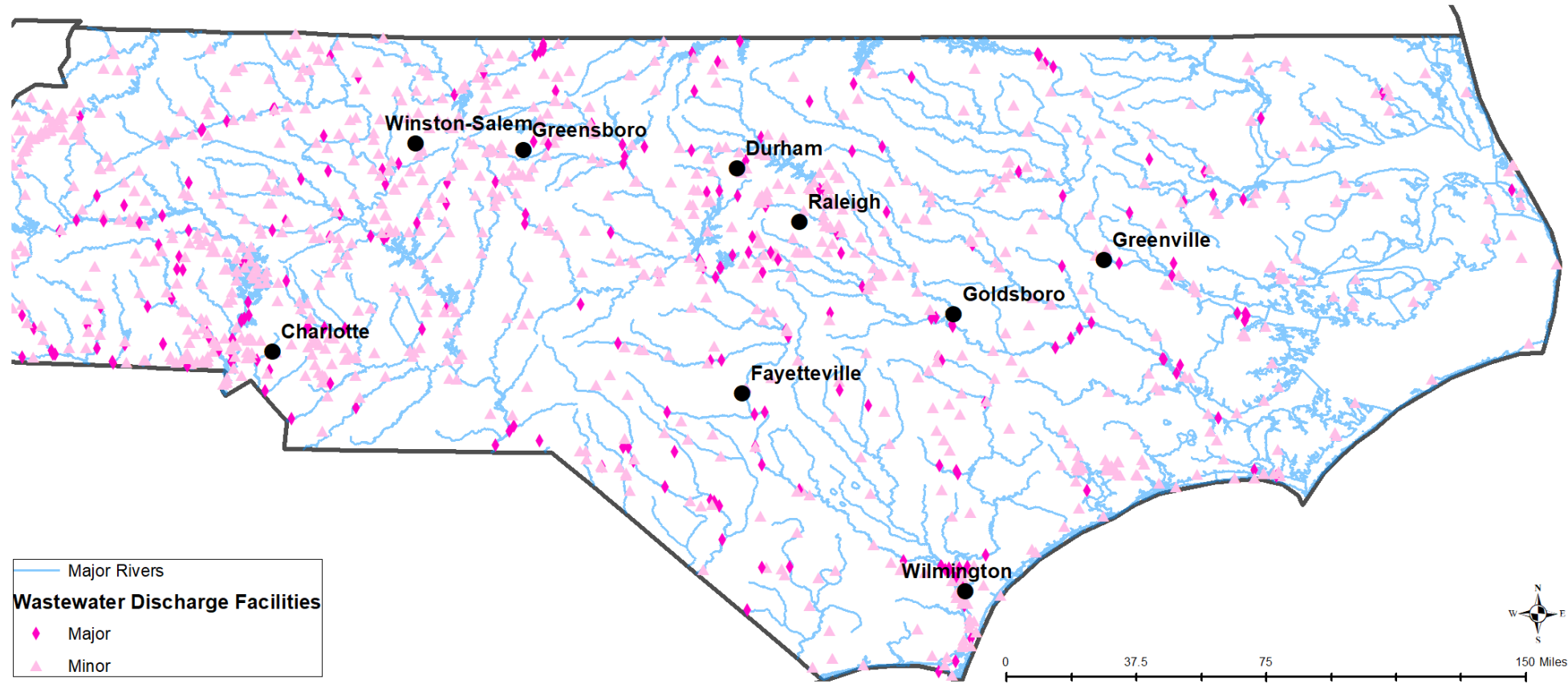
Regulatory setting

- Under The Clean Water Act, the EPA develops standards to ensure water is suitable for a variety of purposes- drinking, swimming fishing
- NCDEQ responsible for achieving standards mandated by Clean Water Act.
- Point Sources: Activities that discharge pollutants directly into water
 - Require a National Pollution Discharge Elimination System (NPDES) Permit
 - Limits volume of pollutant that can be discharged
- Non-point sources: Activities that indirectly degrade water quality through runoff
 - Generally not regulated under CWA

North Carolina's NPDES Permits



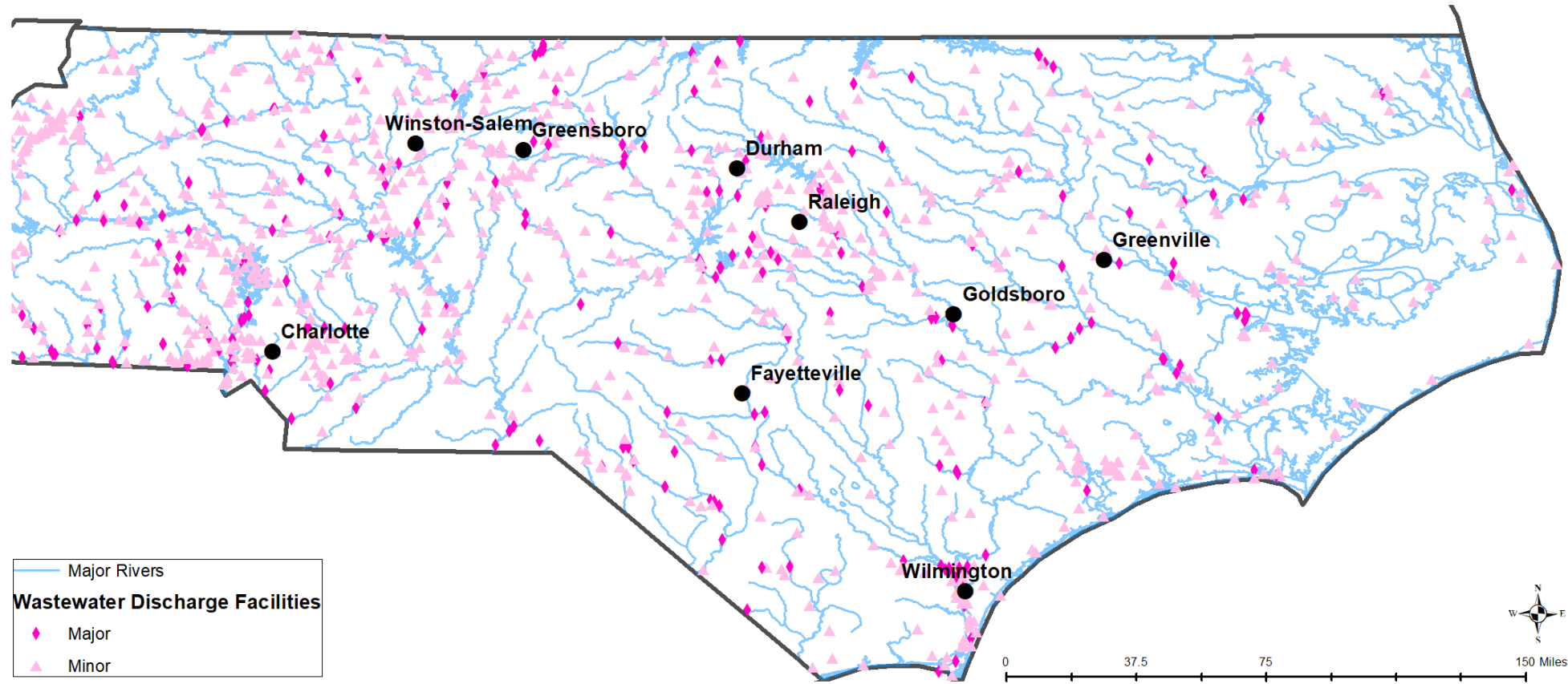
NPDES Permits



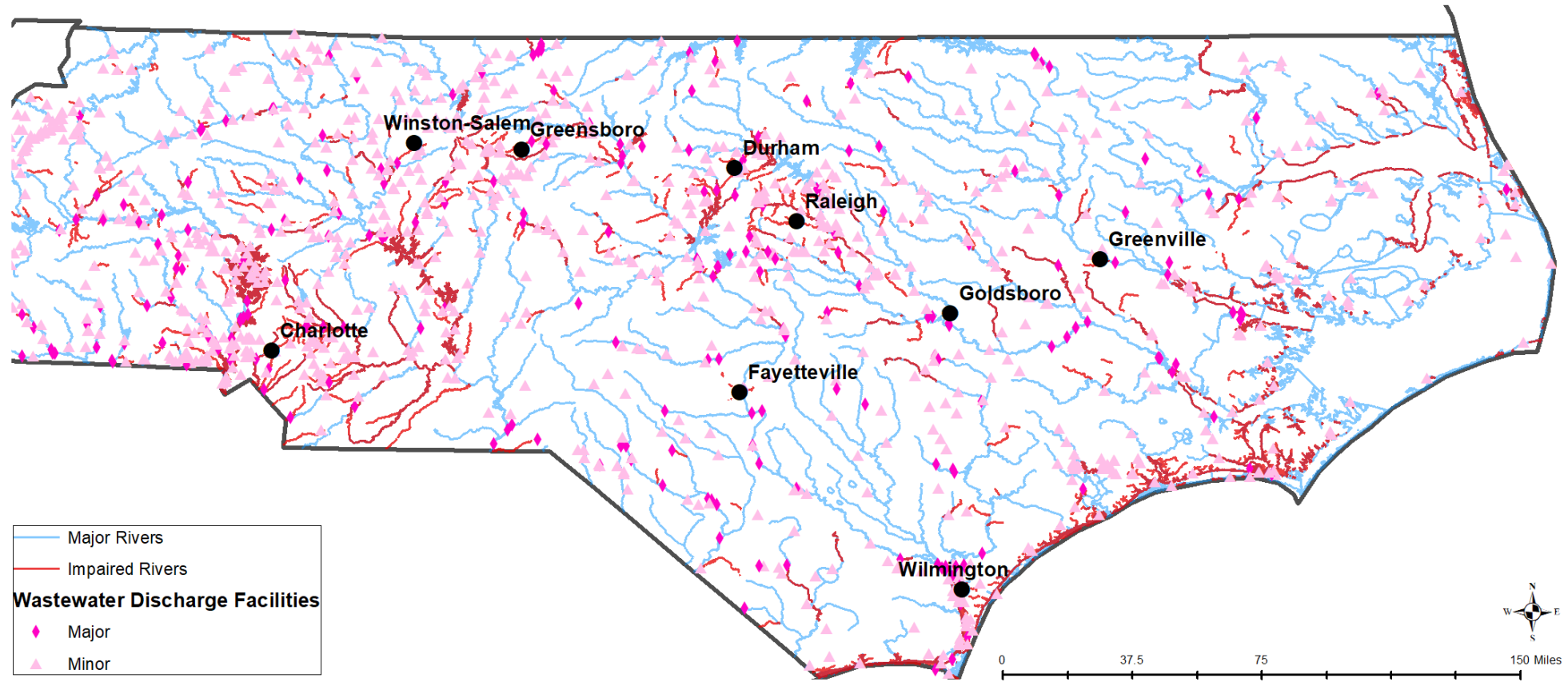
North Carolina Waters

- Has resulted in NCDEQ classifying waters as “impaired.”
- Impaired waters face:
 - more severe restrictions on various pollutions levels, known as total maximum daily load (TMDL)
 - Stricter nutrient discharge allowances in NPDES permits
 - Requirements of stormwater management

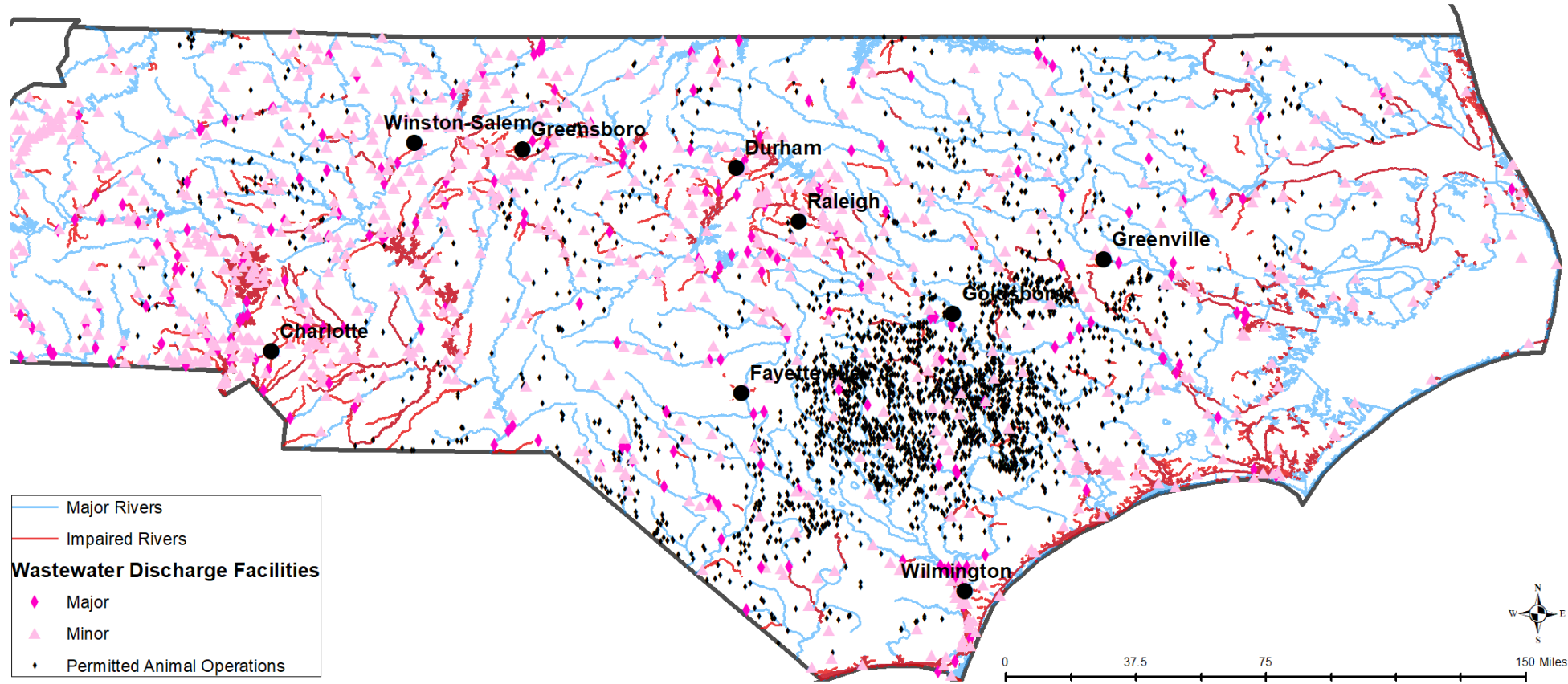
North Carolina's Impaired Waters



North Carolina's Impaired Waters



Permitted Animal Operations

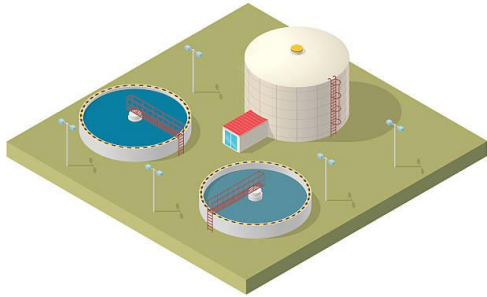


Cost-Effective Abatement

- Maintaining water quality is expensive
 - Cost of pollution control technology
 - Limitations placed on land use and input and output decisions
- Marginal Cost of abatement (MCA): cost of cutting back on pollution
 - Varies according to the actor → some high cost, some low cost

Cost of Abatement

- A wastewater treatment plant and a farm emit phosphate
- If total phosphate abatement needs to be 1,000kg and each actor abates the same amount...



$$\text{MCA} = \$150/\text{kg}$$

$$\begin{aligned} \text{Total Cost} &= 500\text{kg} \times \$150/\text{kg} \\ &= \$75,000 \end{aligned}$$



$$\text{MCA} = \$35/\text{kg}$$

$$\begin{aligned} \text{Total Cost} &= 500\text{kg} \times \$35/\text{kg} \\ &= \$17,500 \end{aligned}$$

$$\text{Total Cost} = \$92,500$$

Cost of Abatement

- If only the low cost farm abates:



$$\text{MCA} = \$35/\text{kg}$$

$$\begin{aligned}\text{Total Cost} &= 1,000\text{kg} \times \$35/\text{kg} \\ &= \mathbf{\$35,000}\end{aligned}$$

- Much lower cost, but allocating all abatement to the farm may not be fair. Look to market based solutions.

Cap-and-Trade

- Regulator sets pollution cap and allocates individual water pollution allowances to polluters in the target area
 - Allocation based on discharger's prior recorded use, type of use, classification of waters being discharged into
- Polluters trade excess nutrient discharge allowances
- Polluters with lower abatement costs benefit from selling allowances to high abatement cost polluters.
- Market for allowances:
 - quantifies a price for pollution
 - incentives search for cost-minimizing abatement procedures.

Cap-and-Trade

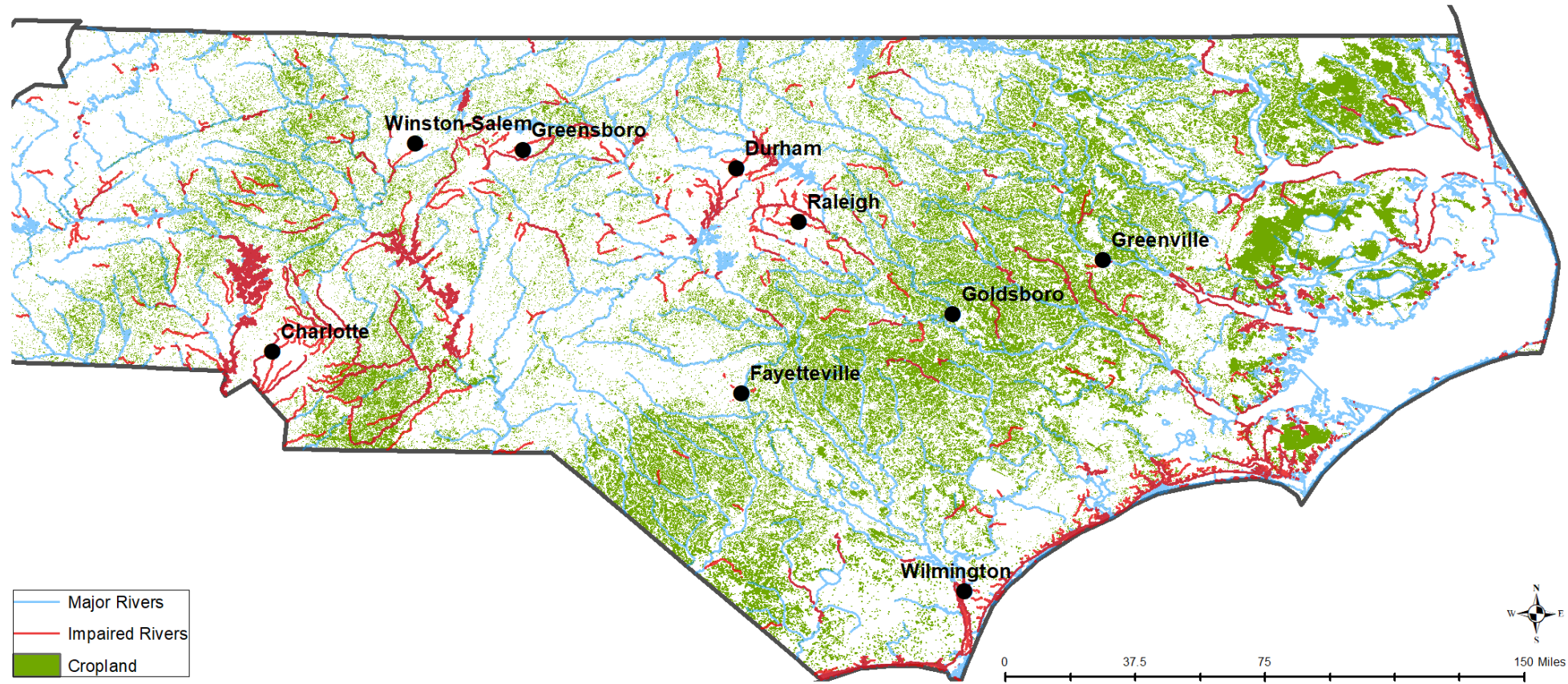
From the previous example:

- If the farmer and the wastewater plant are allocated same number of pollution permits
 - Wastewater plant would pay Farmer for 500 kg of abatement
 - Total cost to farmer to implement \$35,000:
 - Farmer's 500 kg of cut back \$17,500 plus additional 500 kg of abatement for the plant at \$17,500
 - Wastewater treatment plant willing to pay up to \$75,000 to farmer avoid abating 500 kg (cost of abatement of 500 kg)

Offsets

- Produced by construction or improvement of restoration projects.
- Price of offset based on documented water quality improvement
- Polluters can purchase offsets and credit their purchases towards pollution reduction requirements

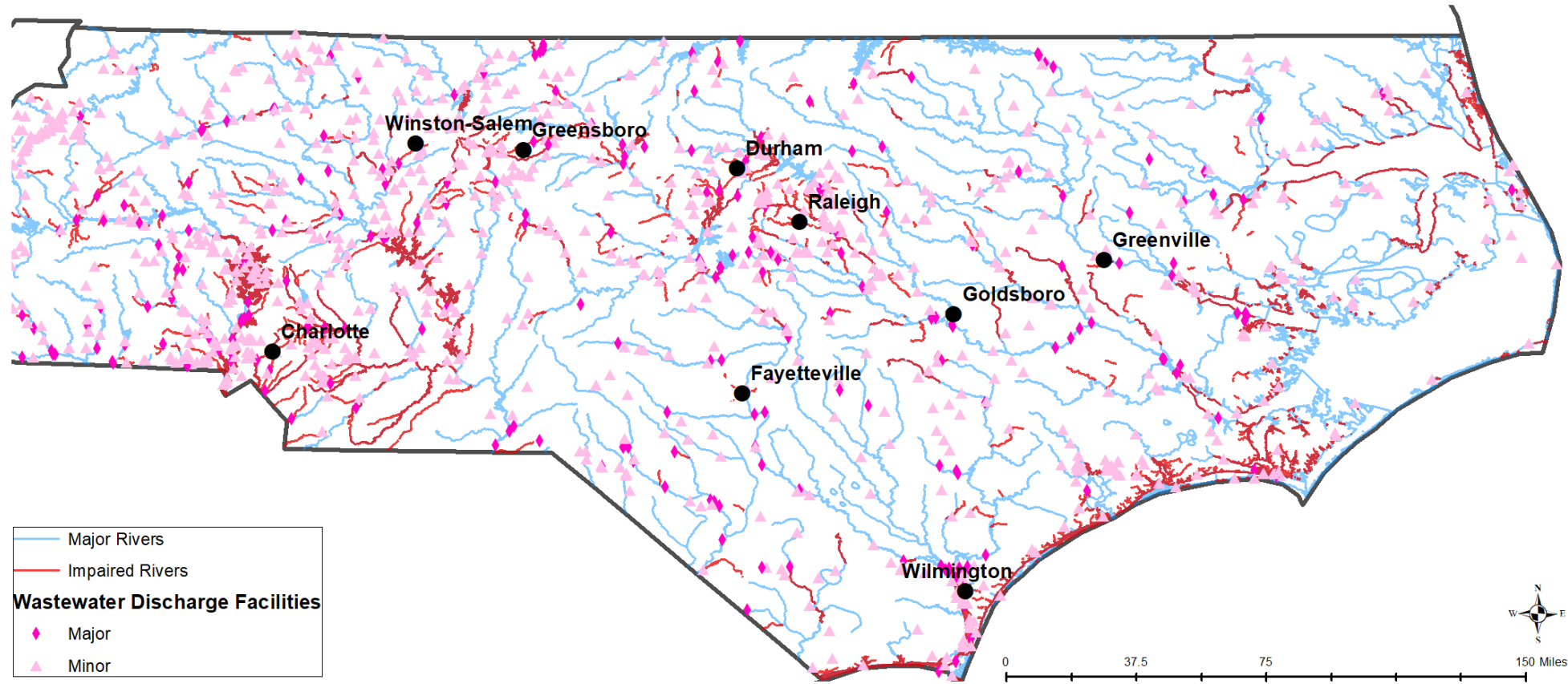
Cropland and Impaired Waters



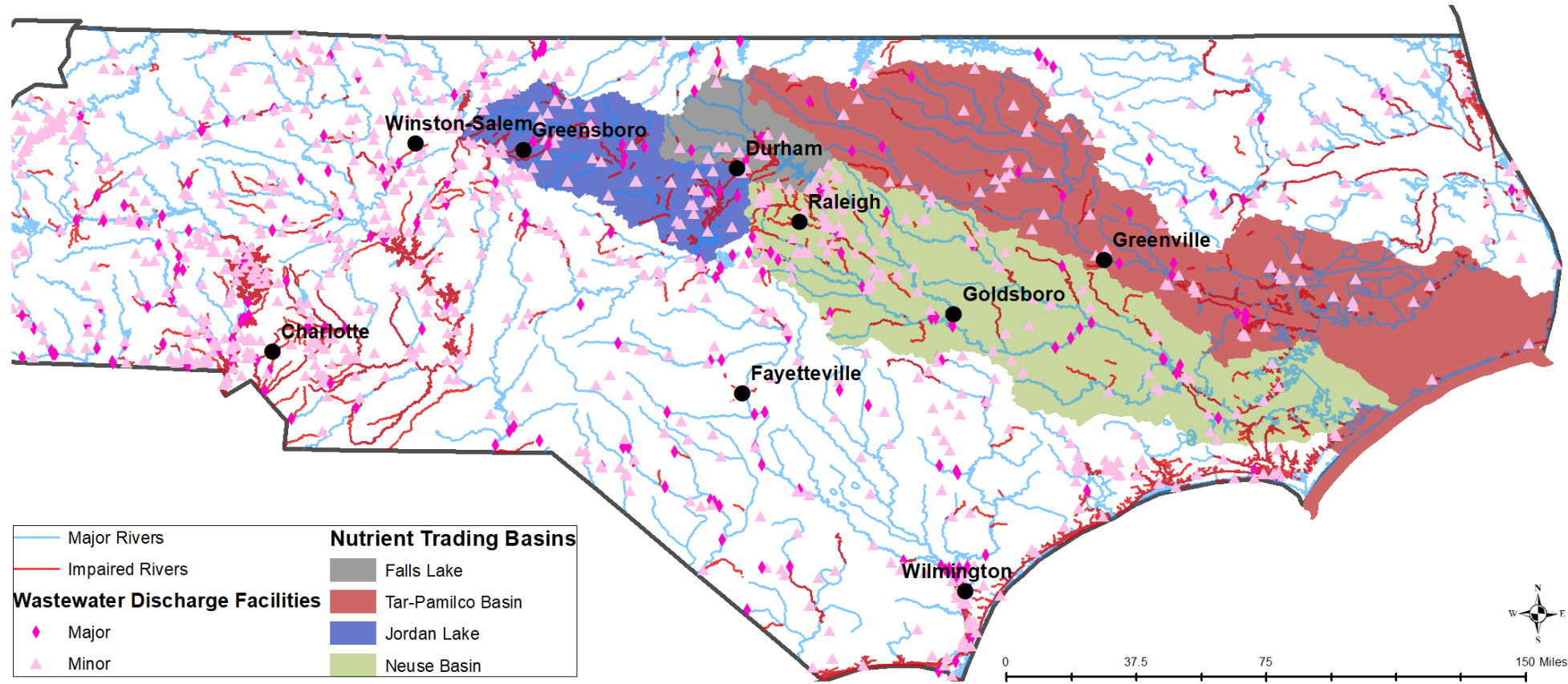
North Carolina Markets

- Markets in NC consist of Nitrogen and Phosphorous credit trading
- Two basins & two watersheds have nutrient credit markets
 - Neuse River Basin, Tar-Pamlico River Basins
 - Jordan Lake Watershed and Falls Lake Watershed
- Pollution allowances supplemented by nutrient offset credits.

North Carolina's Nutrient Trading Basins



North Carolina's Nutrient Trading Basins

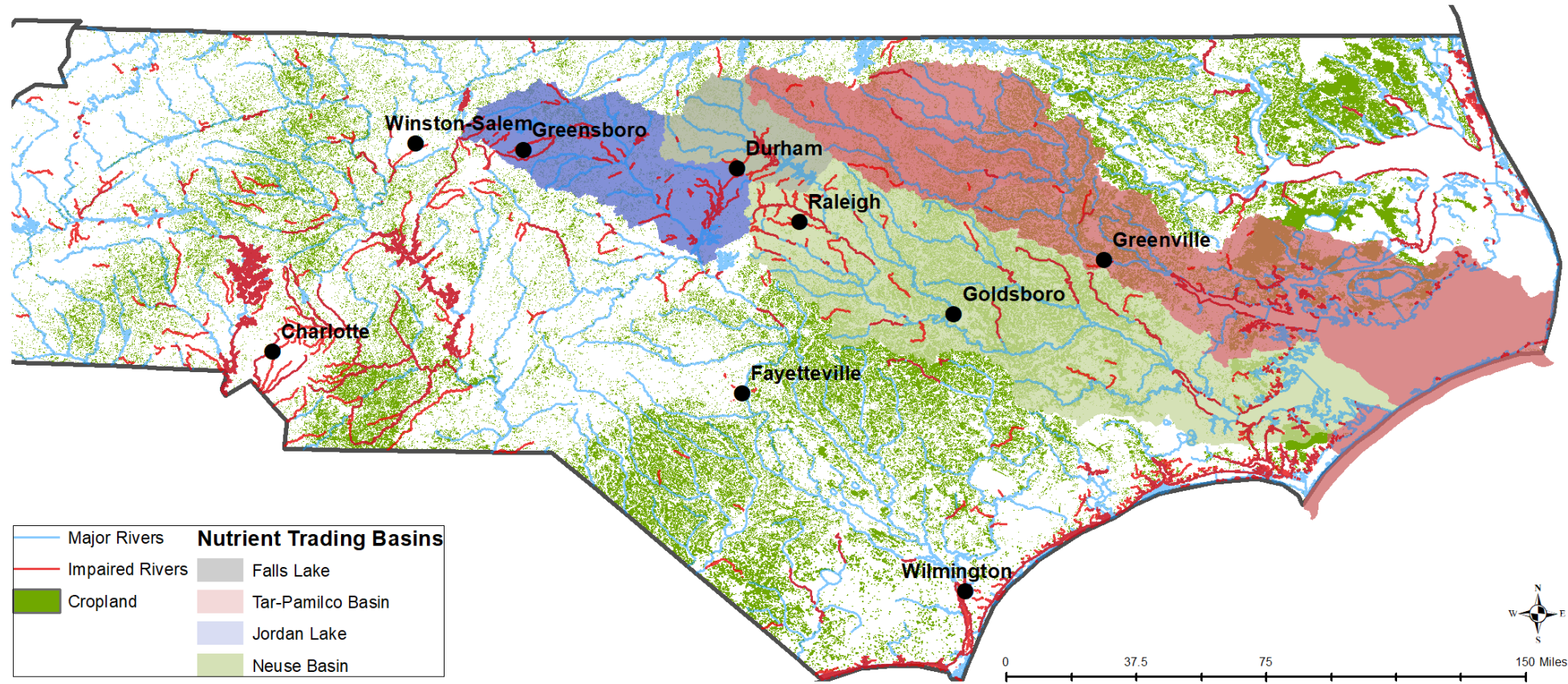


Buying Offsets in NC

- Private Mitigation Banks (PMBs)
- In-lieu fee mitigation
 - Only allowed when other options unavailable
- Most common and successful mitigation practice is creation/enhancement of riparian buffers



Current Potential for Cropland Offsets



Nutrient Allocation Trading in NC

- Available to point sources
- Requires mutually obtaining permit modifications
- Permitted if trades are within the same watershed and involve total Nitrogen, total Phosphorous, or sediment loads
- Only 7 allocation trades have occurred in NC since 2004
 - Prices ranging from \$291-\$495 lbs/N year
 - Last trade in 2012

Issues in Nutrient Trading

- Two major issues:

1. Uncertainty over future nutrient management needs

- Unwilling to trade credits that may be needed later
- Future Ratcheting

2. Credit valuation uncertainty

- Prevalent in offset credit production, especially agricultural riparian buffers

3. Permit modification process

Path Forward

- Joint Compliance
 - Multiple polluters can cooperate to satisfy a group cap.
 - Polluters form and govern cooperative groups to **jointly** meet regulatory requirements
 - Trading within association allows members to circumvent pollution permit modifications
 - Avoid cost of finding trading partner