



**DEVELOPING AN APPROACH TO WATER  
QUALITY TRADING POTENTIAL IN  
WATERSHEDS OF SOUTHERN LOUISIANA**

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*Restore America's Estuaries 2016*

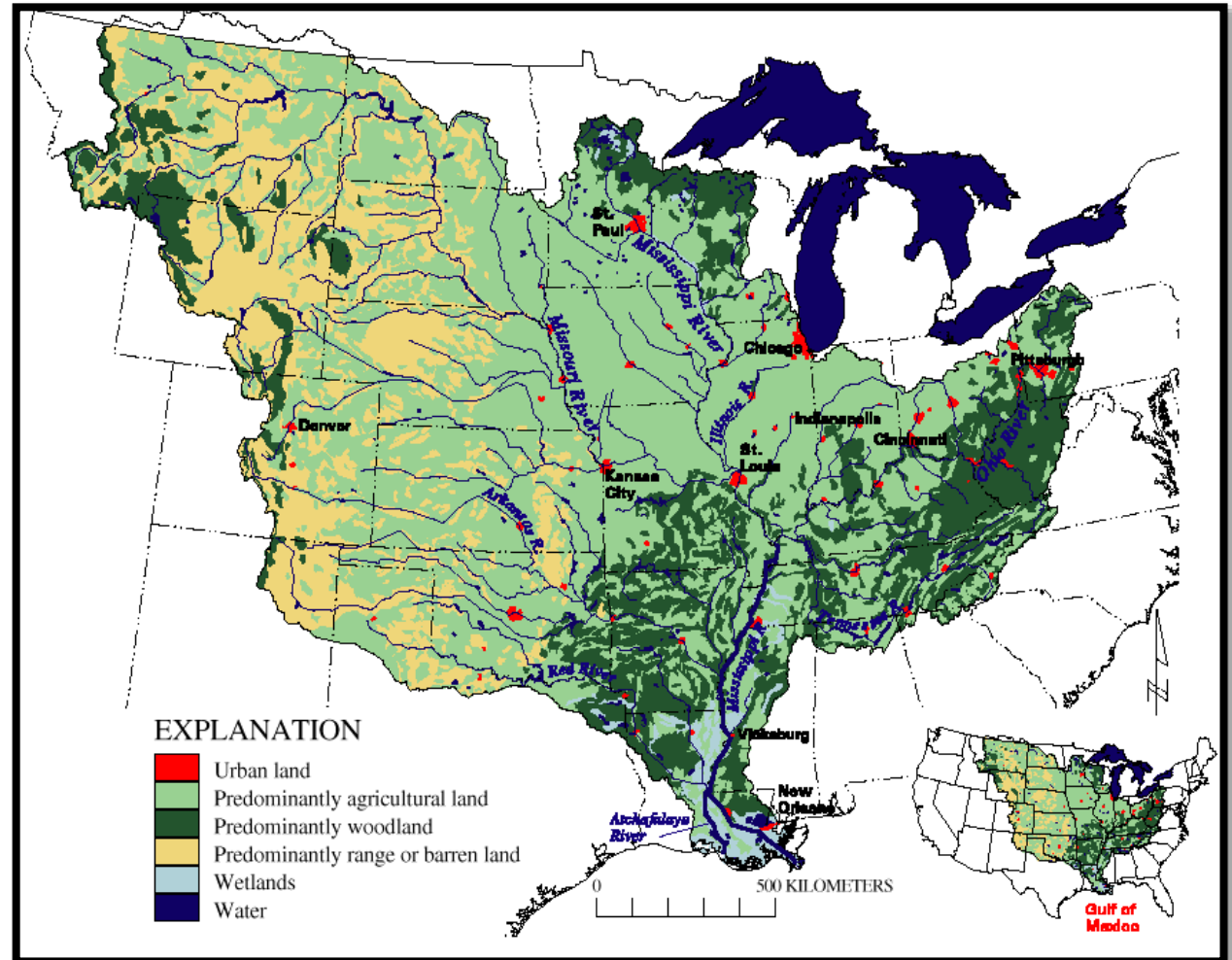


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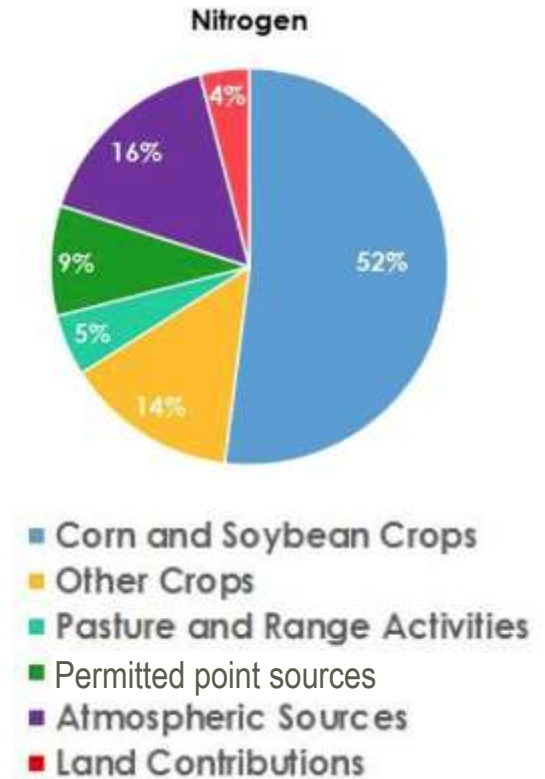
# MISSISSIPPI RIVER BASIN

- Fourth largest watershed in the world
- Includes parts of 31 US states and 2 Canadian provinces
- 41% of the upper 48 states drain to the Gulf of Mexico



# CONTEXT FOR WATER QUALITY TRADING IN COASTAL LOUISIANA

- Water quality trading potentially a cost effective way to reduce nutrients and improve water quality
- Nutrient load from lower Mississippi River:  
 $\sim 960 \times 10^6 \text{ kg NO}_3\text{-N yr}^{-1}$  (Rabalais 2002, Lundberg et al. 2014, Caffrey and Day, 1986)
- 66% of nitrogen comes from crop lands
- 9% comes from permitted point sources
- Louisiana contributes 1.7% to the nitrogen to Mississippi and Atchafalaya Rivers (Alexander et al. 2008)
- Currently Louisiana statutes only include point to point water quality trades
- **Aim:** *assess if publicly available data can assist in comparing water quality trading potential at a watershed scale, considering point to point and point to non point trading*



From: 992-001-001NG-Nutrient Inventory Update; USGS 2007

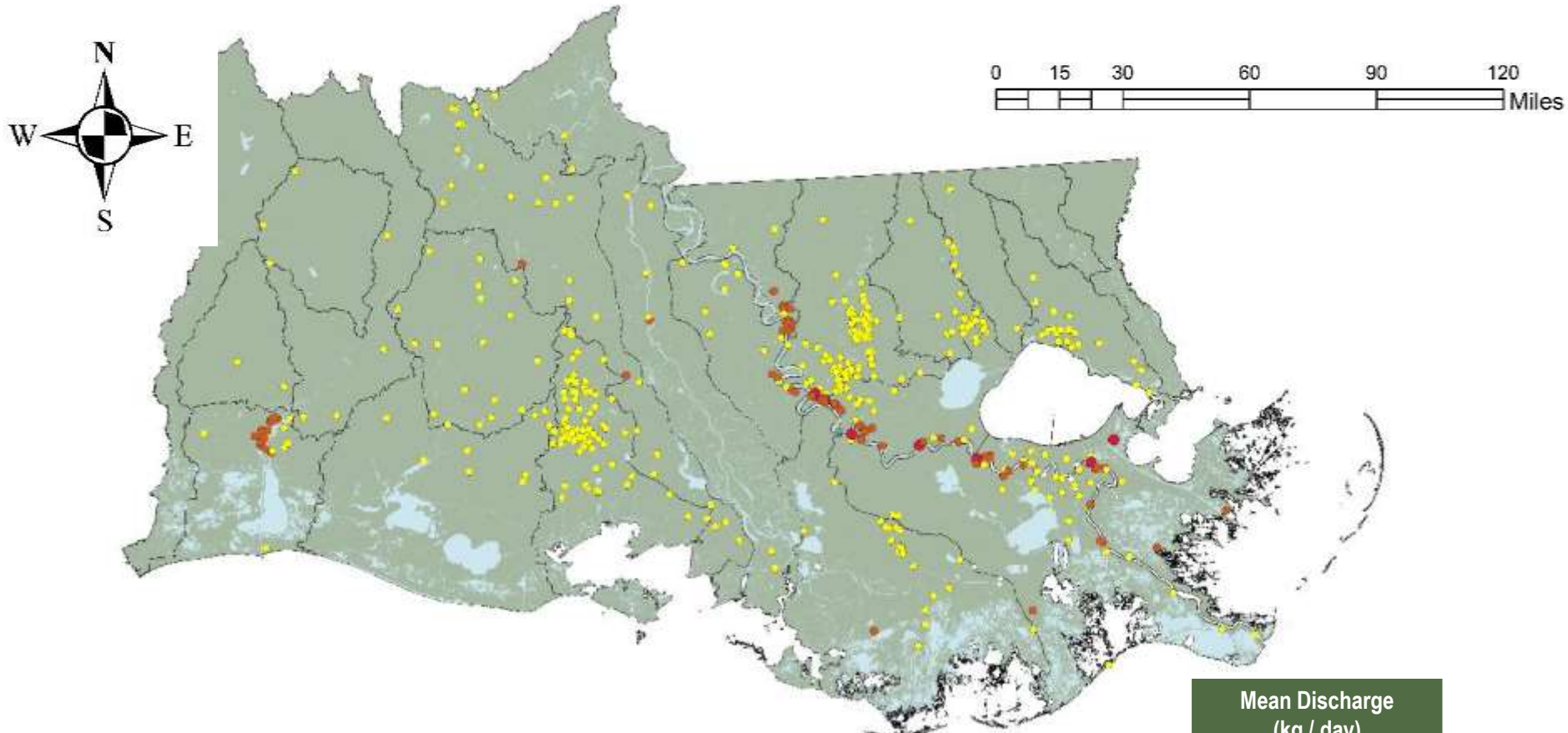


# SOURCES OF DATA

- ◆ EPA Facility Registry Service (FRS): permitted point sources of nutrients - Discharge Monitoring Report (DMR) data
- ◆ Assessed Standard Industrial Classification (SIC) codes, removing facilities with negligible discharge – focused on 384 remaining facilities
- ◆ Summarized for 27 HUC 8 coastal watersheds in Louisiana
- ◆ Land use data – USDA cropland data layer
- ◆ 303(D) listings and areas under Total Maximum Daily Loads – US EPA
- ◆ Watershed receiving nutrient inputs identified within FRS



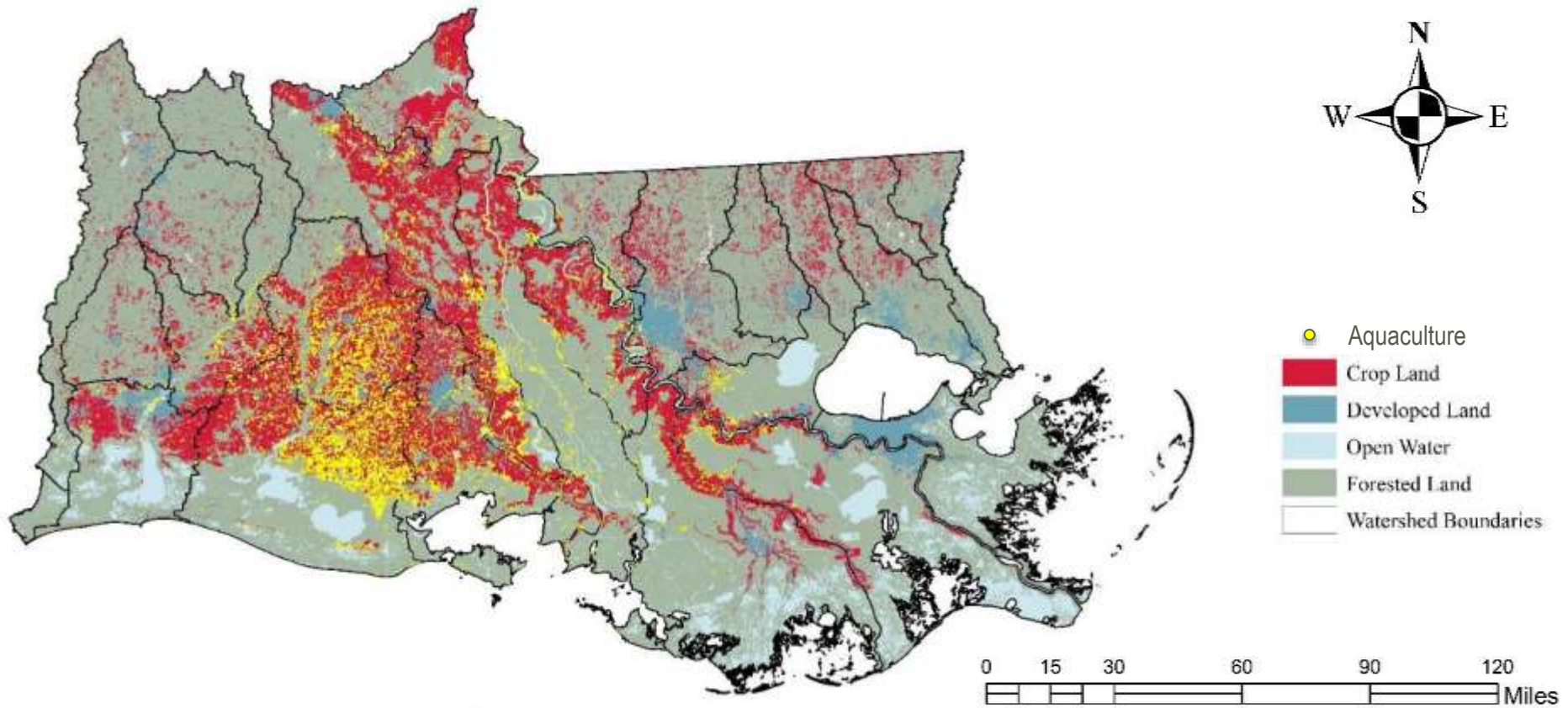
# PERMITTED POINT SOURCES IN COASTAL LOUISIANA (FRS-DMR)



- Total nitrogen discharge from permitted point sources for 27 coastal watersheds  $\sim 3 \times 10^6$  kg yr<sup>-1</sup> (of  $960 \times 10^6$  kg yr<sup>-1</sup> from Mississippi River)
- Wastewater treatment not captured in EPA Discharge Monitoring Reports
- Facilities >50kg per day clustered on Mississippi River and Lake Charles



# POTENTIAL NON POINT SOURCES OF NUTRIENTS IN COASTAL LOUISIANA



- Crop land largest area in western watersheds, following river channels in southeastern watersheds
- High number of aquaculture facilities, in particular crayfish ponds – often mixed with rice cropping
- NB: Data does not include fallow, pasture or forestry areas

# DEVELOPING RELEVANT COMPARATIVE METRICS

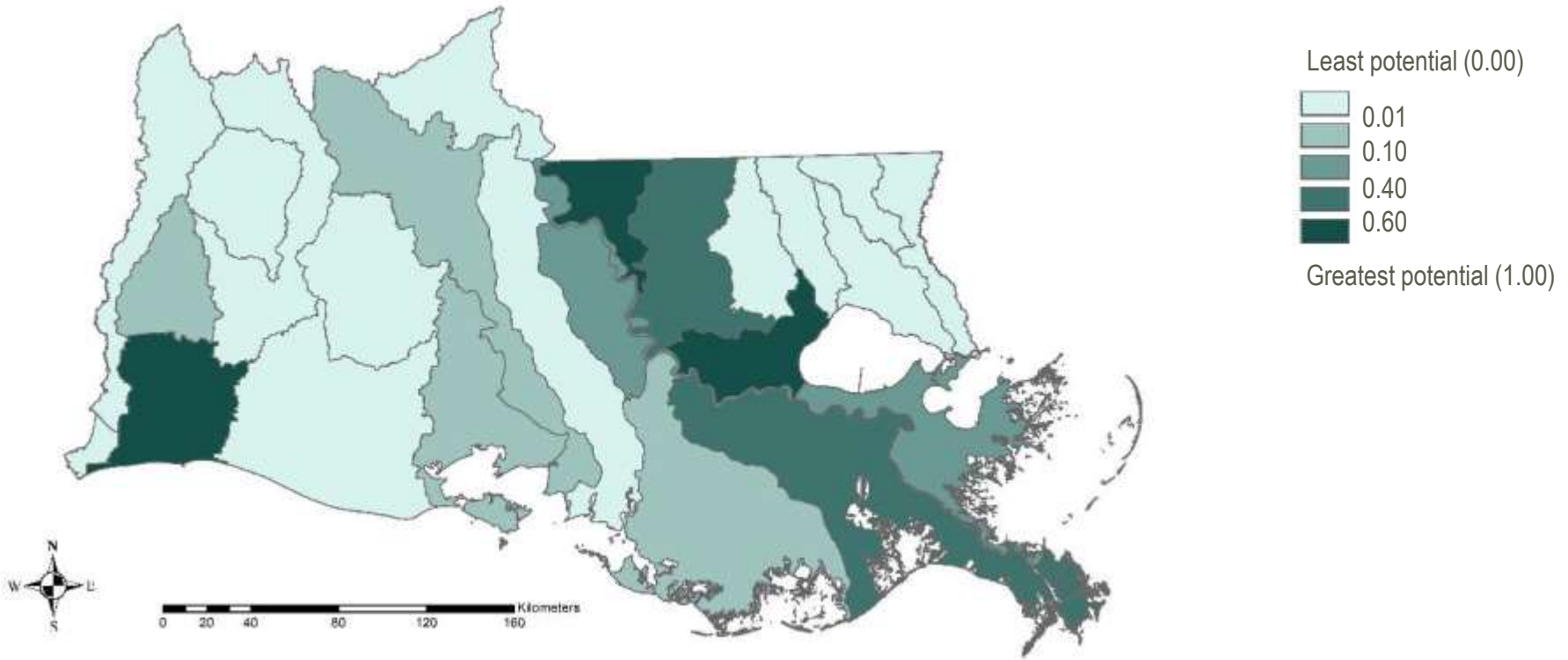
- Each metric was range standardized across all 27 watersheds (HUC 8)
- Allows for comparative assessment of watersheds
- All data is presented per watershed (not per unit area)

## Metrics calculated per watershed

1. Facilities with >50kg discharge per day
2. Percent watershed 303(d) impaired
3. Percent watershed under TMDL
4. Permitted nitrogen discharges
5. Percent watershed active cropland



# 1. FACILITIES WITH >50 KG PERMITTED DISCHARGE PER DAY

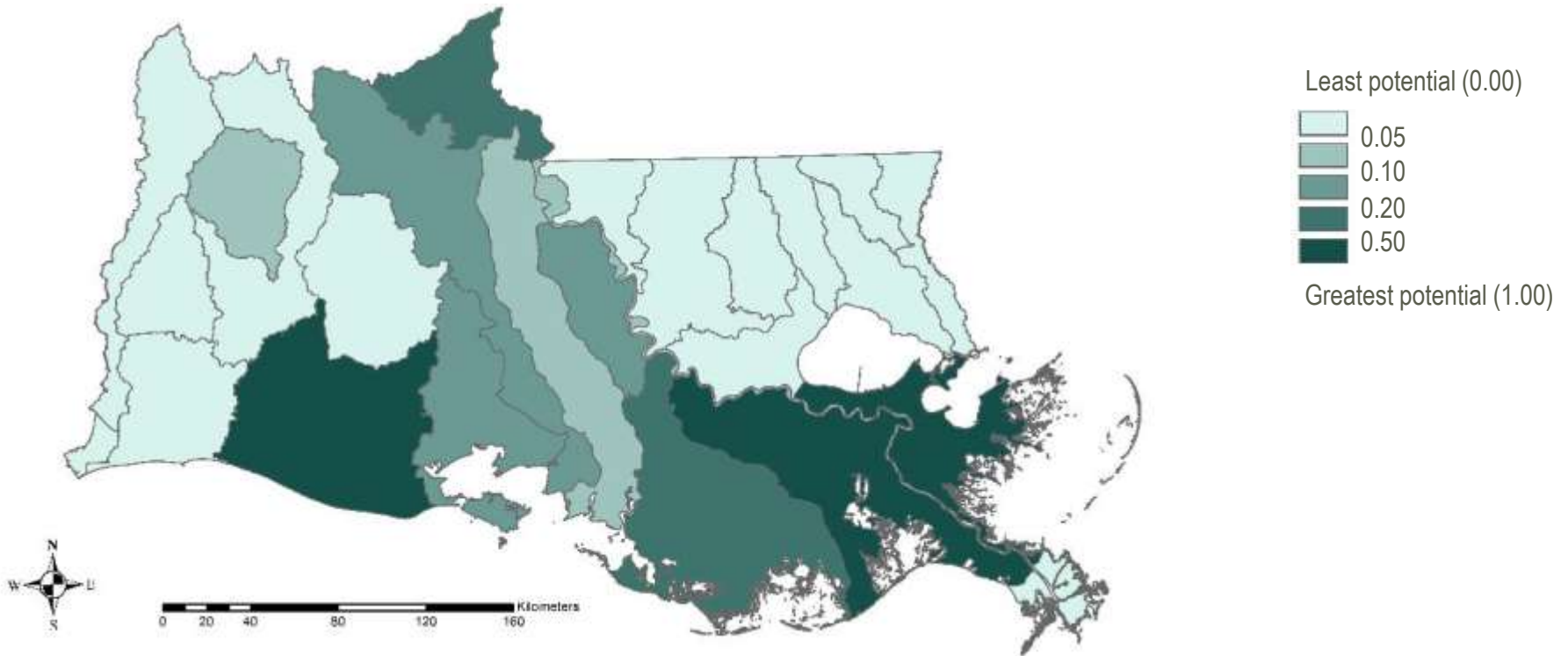


- **Approach:** Identified number of permitted facilities with > 50kg discharge nitrogen per day
- **Range:** 0 (13 watersheds) to 58 facilities
- **Observation:** 40% of these facilities in just 4 watersheds, 95% in 8 watersheds (or 27 total)
- **Mississippi River has greatest number of facilities with potential interest in trading**





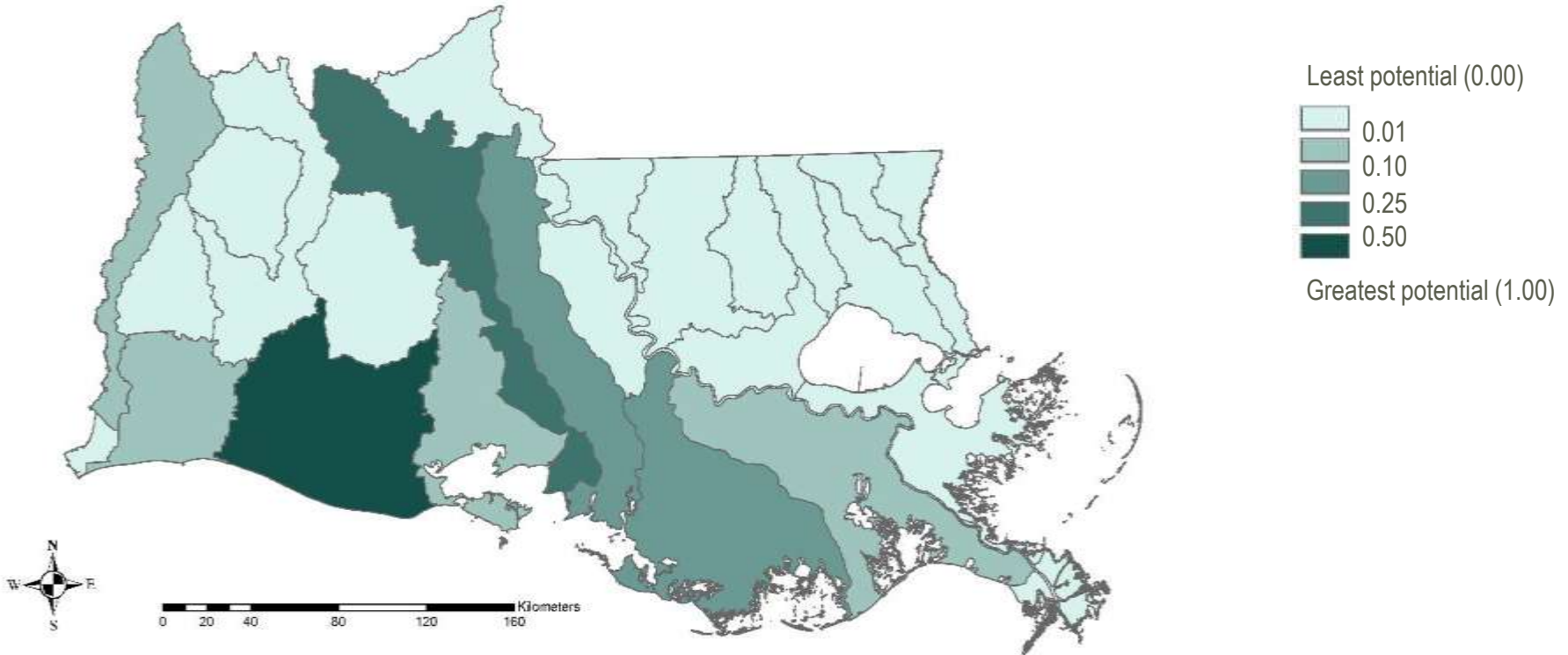
## 2. PERCENT WATERSHED 303(D) IMPAIRED



- **Approach:** area of Clean Water Act 303(d) impaired water as percentage of watershed area
- **Range:** 0 (11 watersheds) to 5.7% of watersheds classified as impaired
- **Observation:** 3 watersheds with >3%, 8 with > 0.5% area classified as impaired (of 27 total)
- **Identified 3 watersheds with greatest potential to improve water quality**



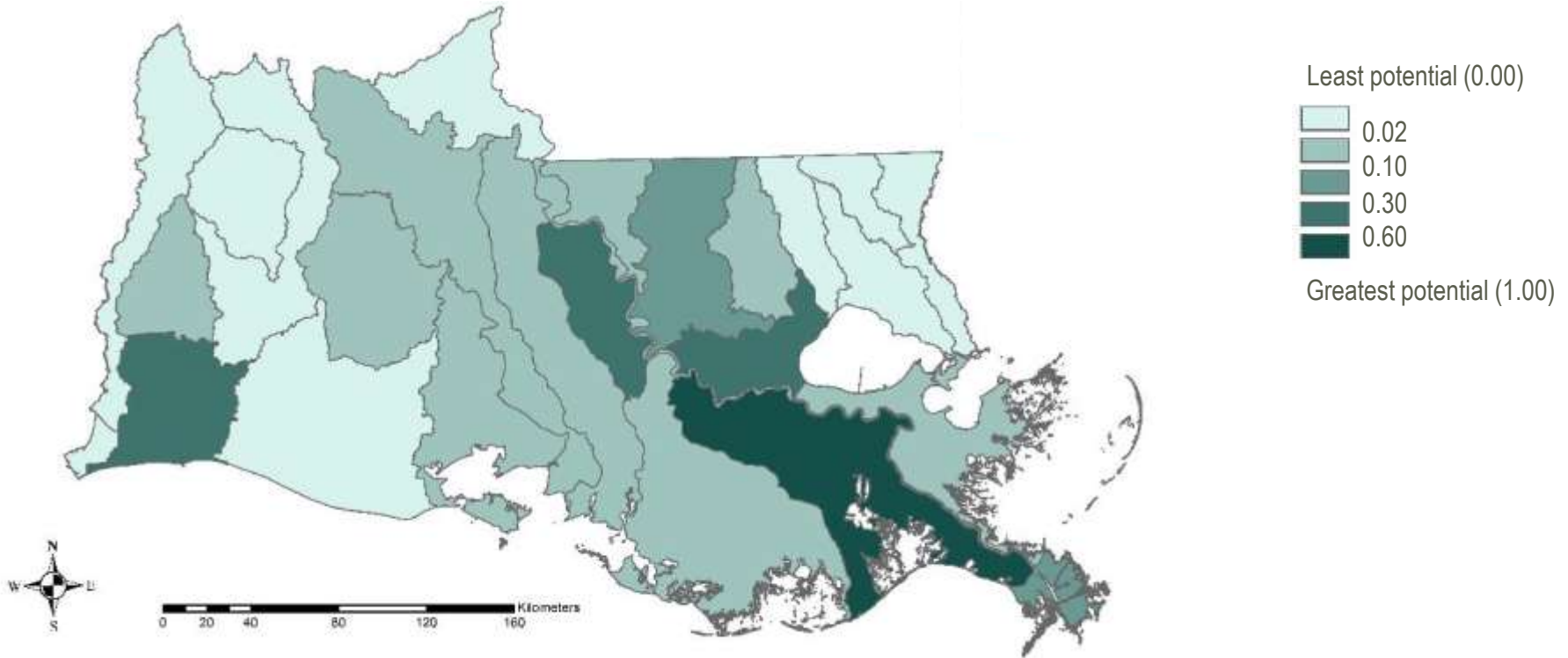
### 3. PERCENT WATERSHED UNDER TOTAL MAXIMUM DAILY LOAD



- **Approach:** percentage area of watershed with established Total Maximum Daily Load
- **Range:** 0 (11 watersheds) to 5.3% of watershed area under TMDL
- **Observation:** All except 4 watersheds have <math><0.5\%</math> of area under TMDL (of 27 total)
- **TMDLs apply to both point and non point sources, providing incentive for trading**



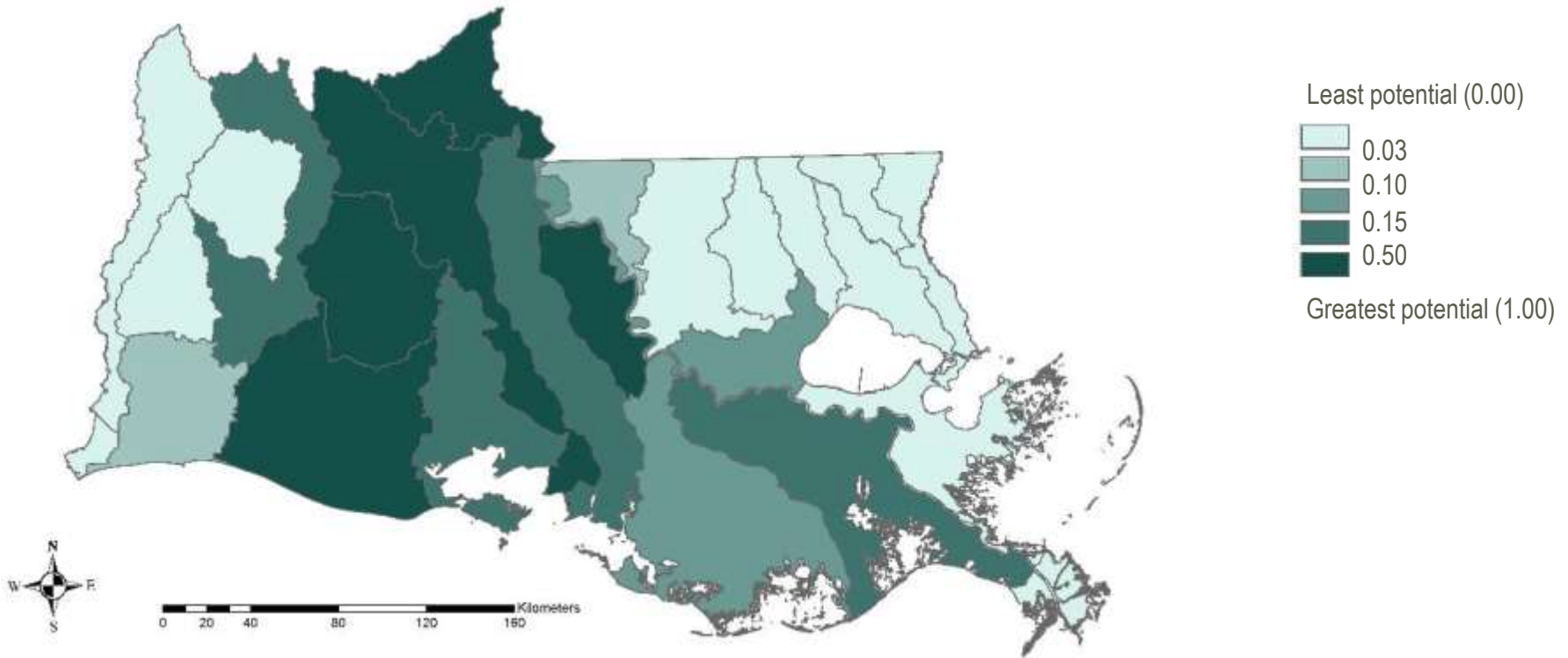
# 4. MAXIMUM PERMITTED NITROGEN DISCHARGES



- **Approach:** FRS-DMR total permitted nitrogen discharge by facility, summed to watershed
- **Range:** 0 (5 watersheds) to 16 metric tons per day
- **Observation:** 5 watersheds permitted for > 3 metric tons per day, 18 for < 1 metric ton per day
- **Trading needs to be within a water body, a broader geographic definition could maximize potential for trading currently permitted discharges**



# 5. PERCENTAGE WATERSHED ACTIVE CROPLAND

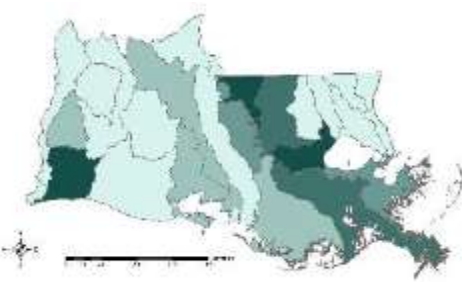


- **Approach:** area of cropland within each watershed, from USDA current land use layer
- **Range:** <1% (8 watersheds) to >50% ( 5 watersheds)
- **Observation:** Cropland clustered in watersheds in central and western areas of coastal Louisiana
- **Non point sources are focused in watersheds away from most permitted discharges**

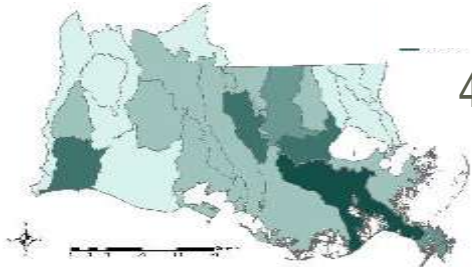


# APPROACH FOR COMBINED WATER QUALITY TRADING POTENTIAL

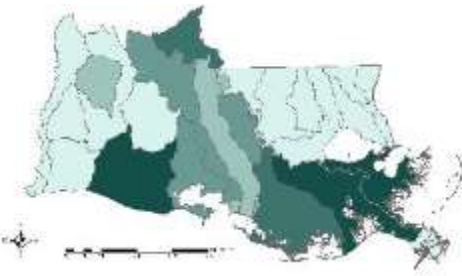
- Unweighted mean score across the five identified metrics was calculated for each watershed



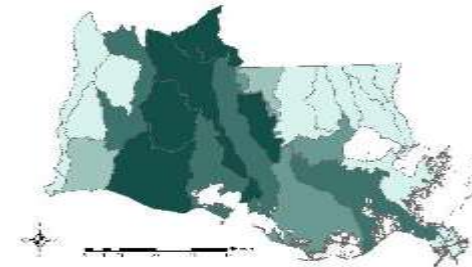
1. Facilities >50kg permitted discharge nitrogen per day



4. Maximum permitted nitrogen discharge



2. Percent watershed 303 (d) impaired



5. Percent watershed active cropland

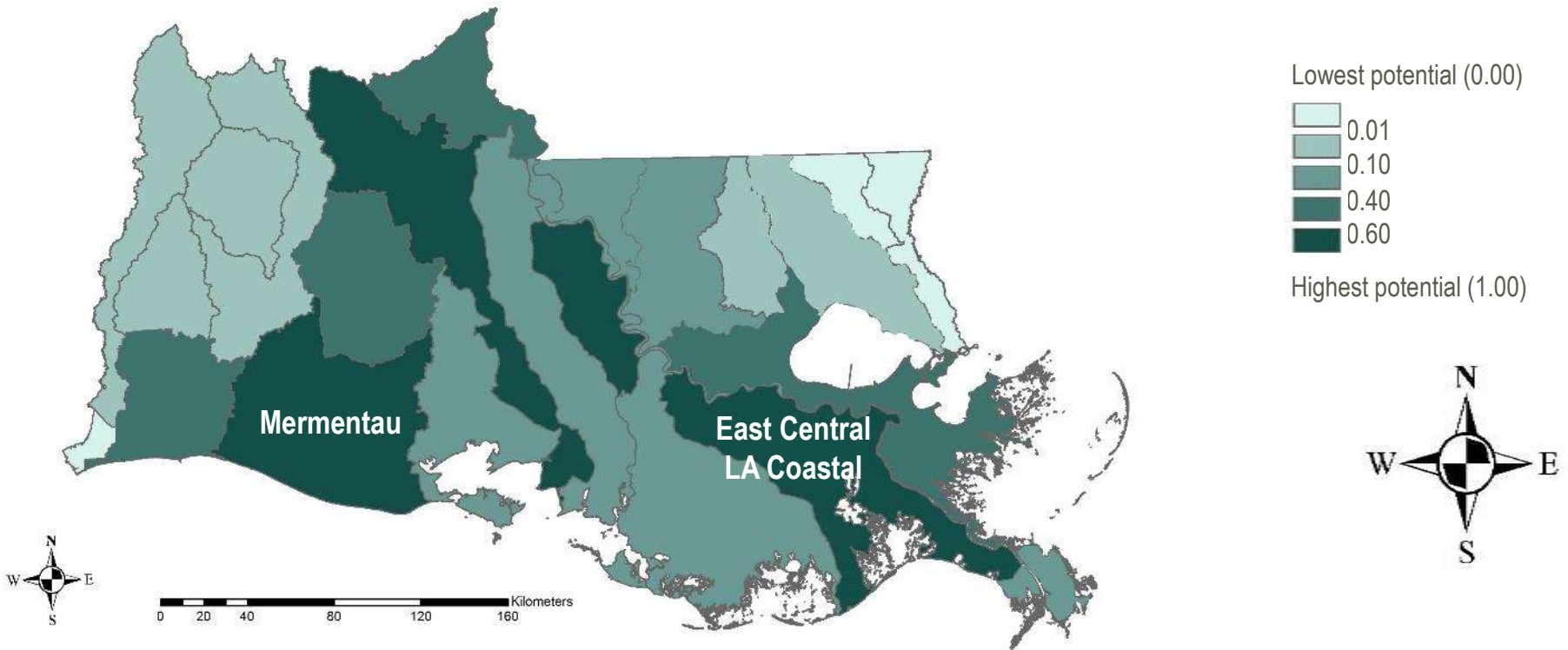


3. Percent watershed under TMDL





# COMBINED WATER QUALITY TRADING POTENTIAL



- **Potential for point to non point trading** : eg **Mermentau watershed** - low permitted facility discharge, highly agricultural, 303(d) listings, TMDL areas: ***high incentive and potential mechanisms***
- **Potential for point to point and point to non point trading**: eg **East Central Louisiana Coastal watershed** – high maximum permitted discharge from facilities with permitted discharge >50kg per day, 303(d) listings, moderate agricultural activity: ***high potential mechanisms***



# CONCLUSIONS

- Permitted facility nutrient discharges from Louisiana comprise a small percentage of nitrogen load from the Mississippi and Atchafalaya Rivers
- Defining the Gulf of Mexico as receiving waters rather than a formal watershed definition, could increase potential for water quality trading
- Summarizing publicly available data has potential utility to inform discussion on comparative watershed potential for point to point and point to non point water quality trading



# ACKNOWLEDGMENTS

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# THANK YOU

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