

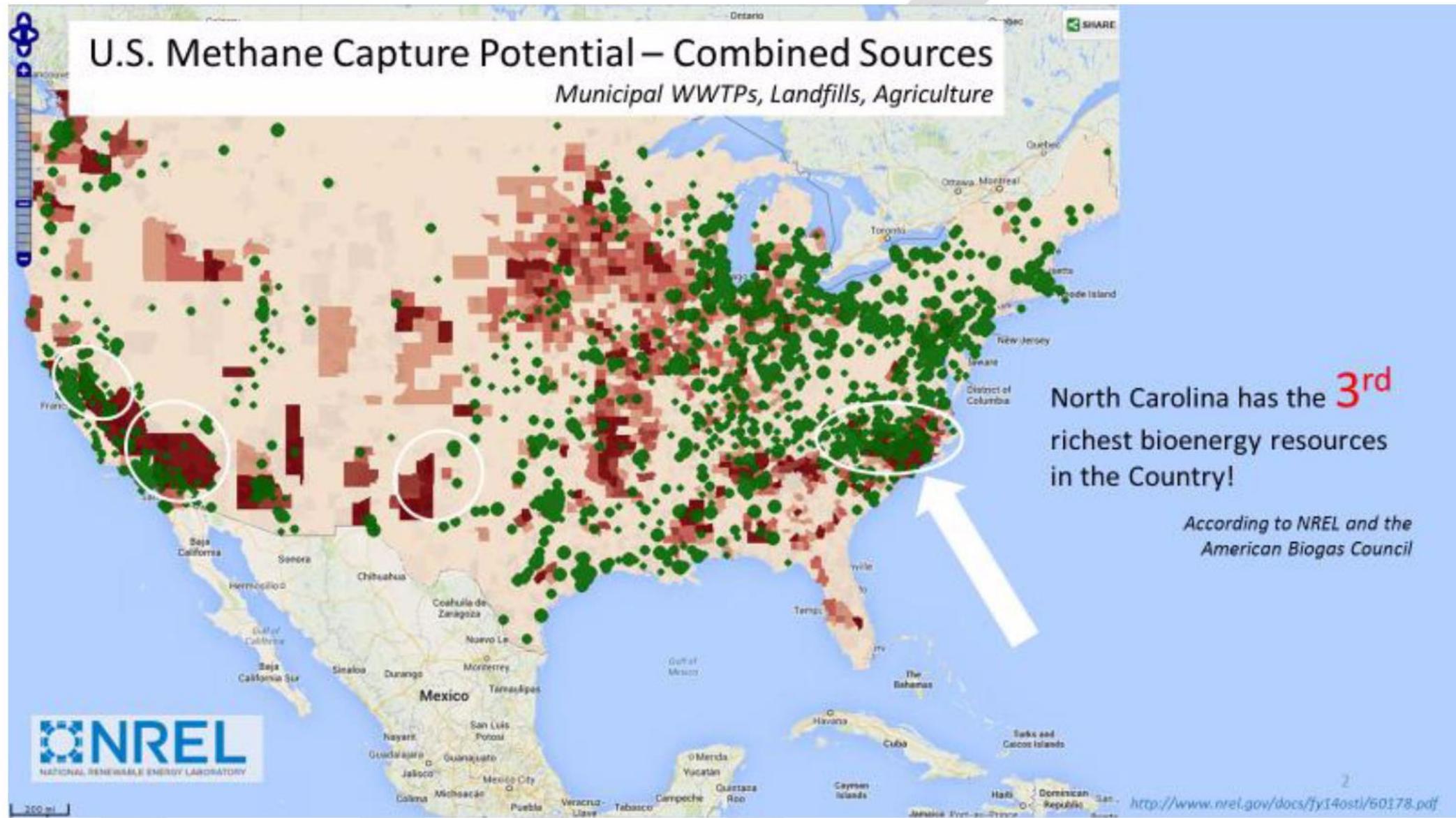
# GIS at the NSOE with John Fay

T Vujic Presentation

February 11, 2019

# Biogas

- Generated through anaerobic decomposition of organic material (landfill waste, wastewater treatment plants, livestock operations, crop residues; industrial foodwaste)
- Approximately 50–60% methane (CH<sub>4</sub>) and 40–50% carbon dioxide (CO<sub>2</sub>), with traces of other gases and impurities.
- Methane in biogas is the same methane that makes up natural gas; once biogas is scrubbed of impurities and pressurized, it can be used interchangeably with conventional natural gas

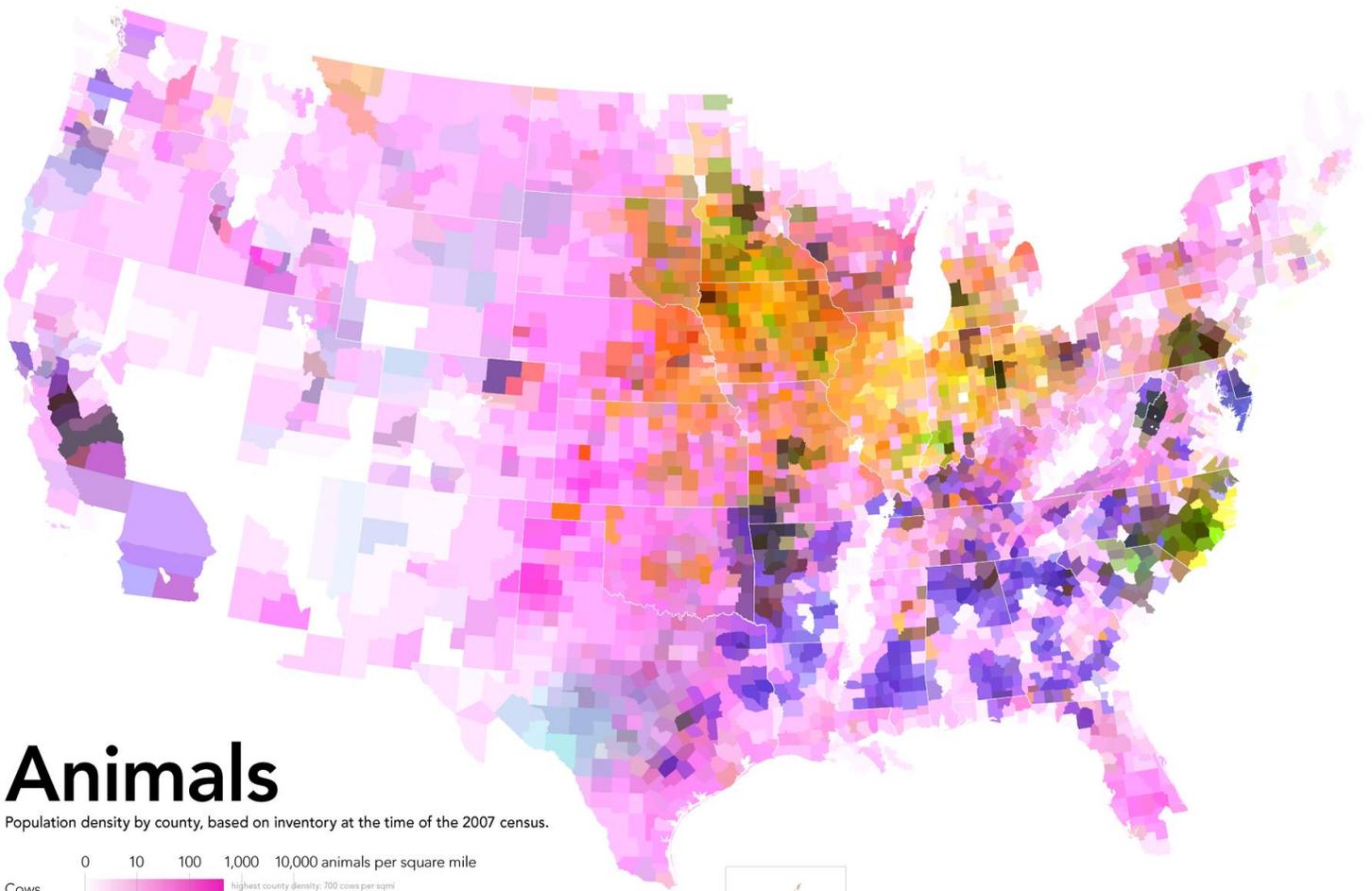


**Figure 3. Methane Capture Potential for the U.S. from wastewater treatment facilities, landfills, and agriculture**

# Yellow and Blue Make Green

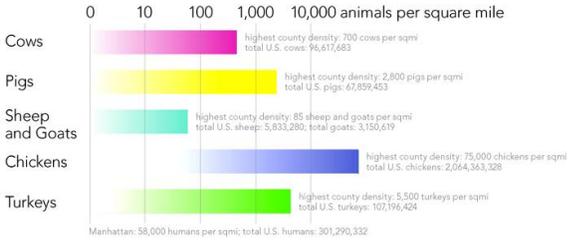
## 40 maps that explain food in America

[https://cdn1.vox-cdn.com/assets/4565291/animals2007\\_big.png](https://cdn1.vox-cdn.com/assets/4565291/animals2007_big.png)



# Animals

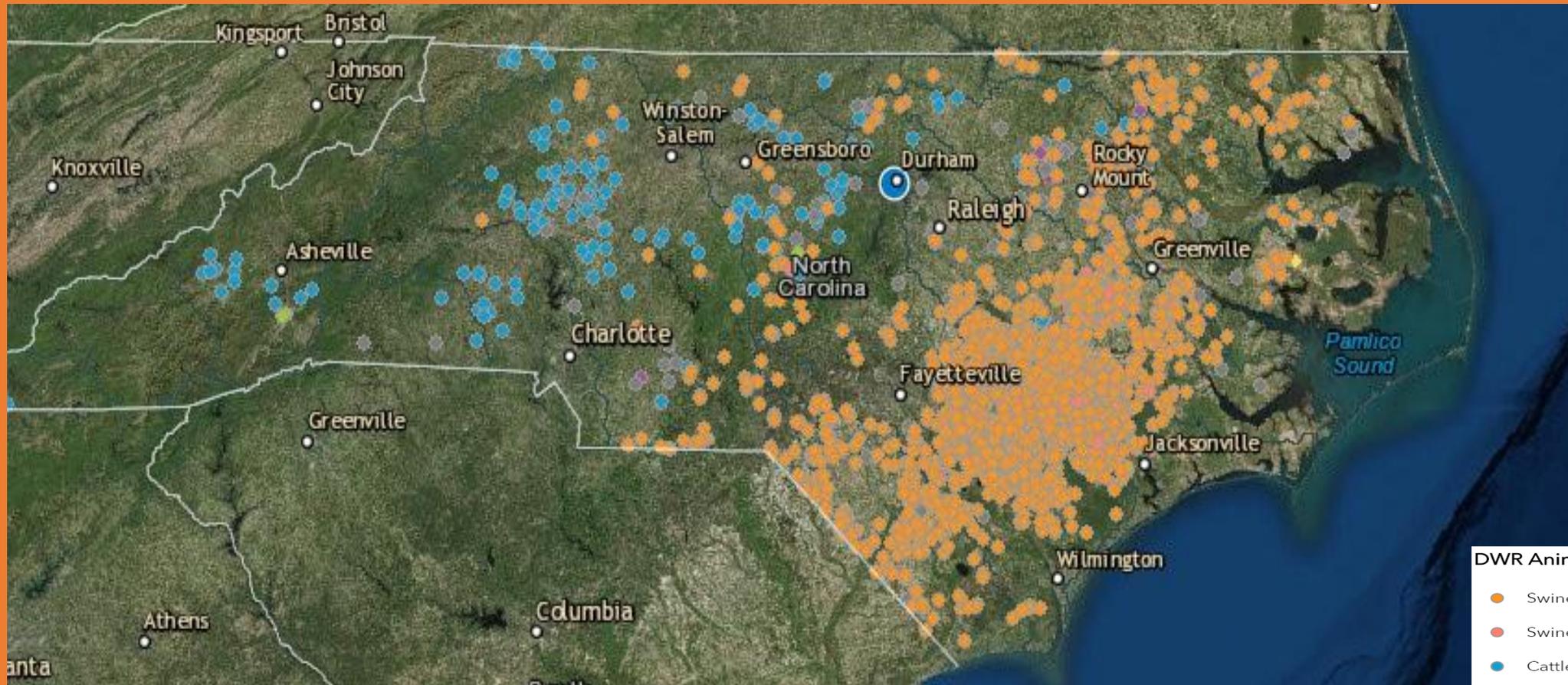
Population density by county, based on inventory at the time of the 2007 census.



All maps shown at the same scale using equal-area projections. Data from the 2007 U.S. Census of Agriculture. Map by Bill Rankin, 2009.



# Location of Swine Operations in NC

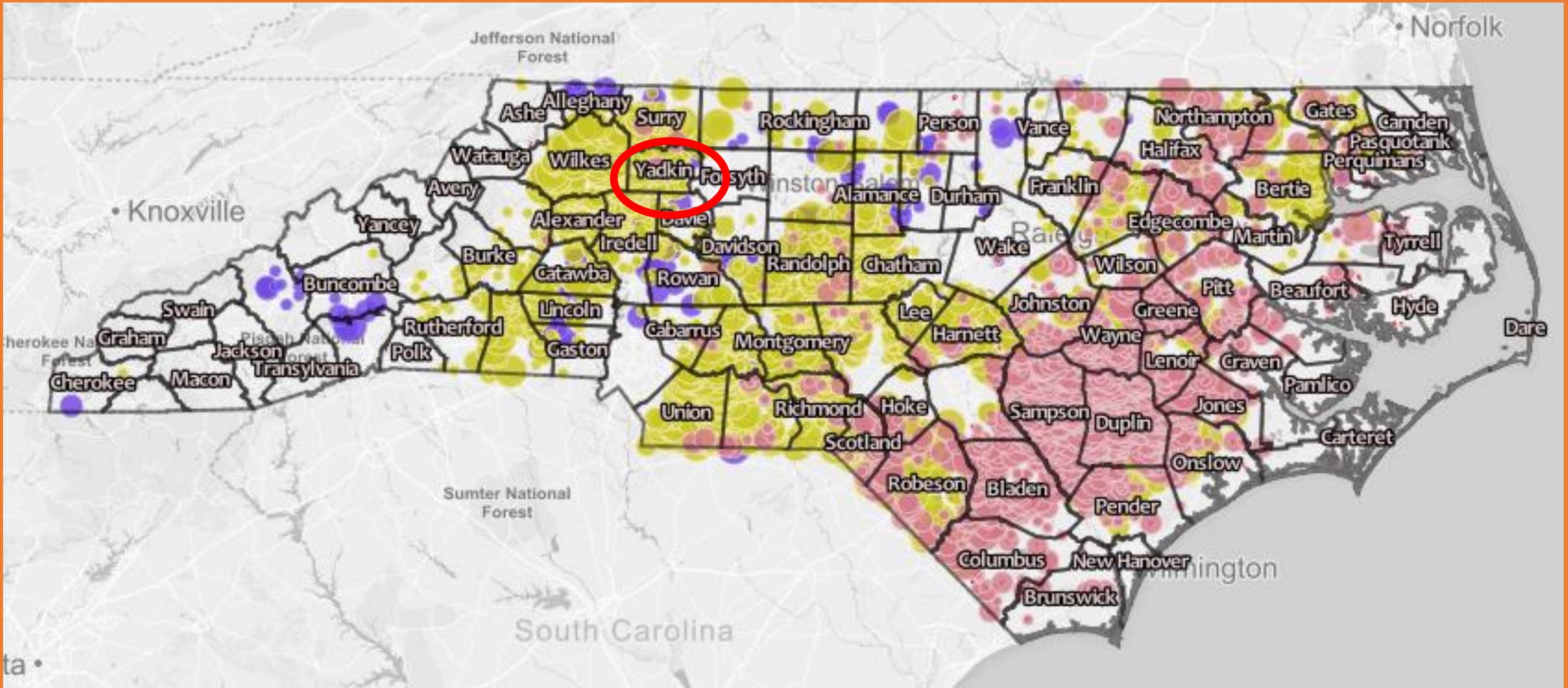


- DWR Animal Operation Permits
- Swine State COC
  - Swine NPDES COC
  - Cattle State COC
  - Cattle NPDES COC
  - Wet Poultry State COC
  - Wet Poultry NPDES COC
  - Animal Individual State
  - Animal Individual NPDES
  - Other

NC DEQ Division of Water Resources, Map of Animal Operation Permits

(current as of Feb. 2016); NCDEQ issues each general permit with a Certificate of Coverage (COC) corresponding to the number and type of animals permitted at the operation specific to the permittee.

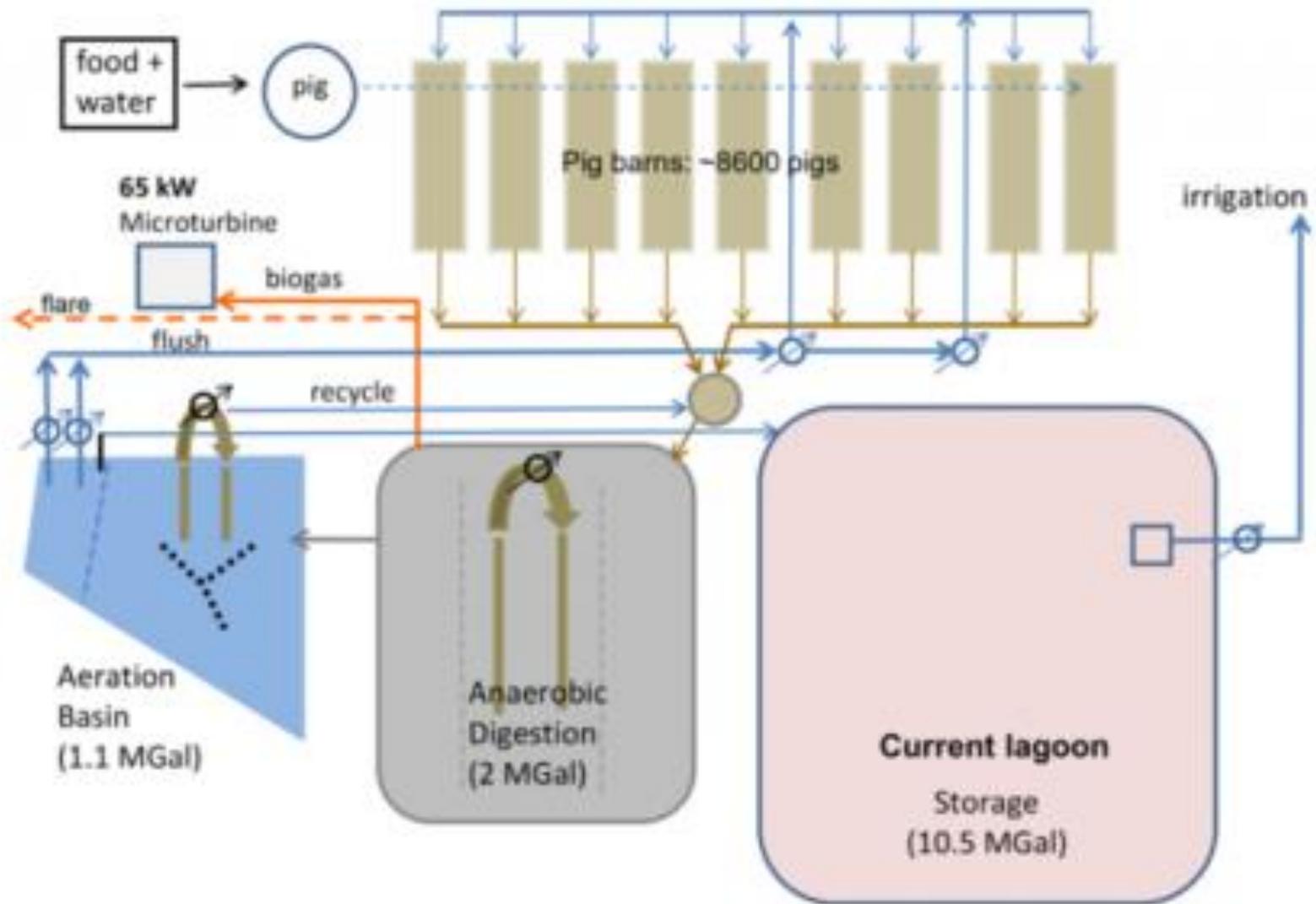
# Location and Density of Livestock and Poultry Operations: Swine, Poultry and Dairy



Source: Environmental Working Group

Loyd Ray Farms – Digester on left, existing lagoon on right





***Before:*** The second cover at LRF that exhibited issues.



***After:*** The new, better fitting cover at LRF.



***Before:*** The original smaller, unsuitable gas conditioning skid.



***After:*** The new, industrial-scale gas conditioning skid at LRF

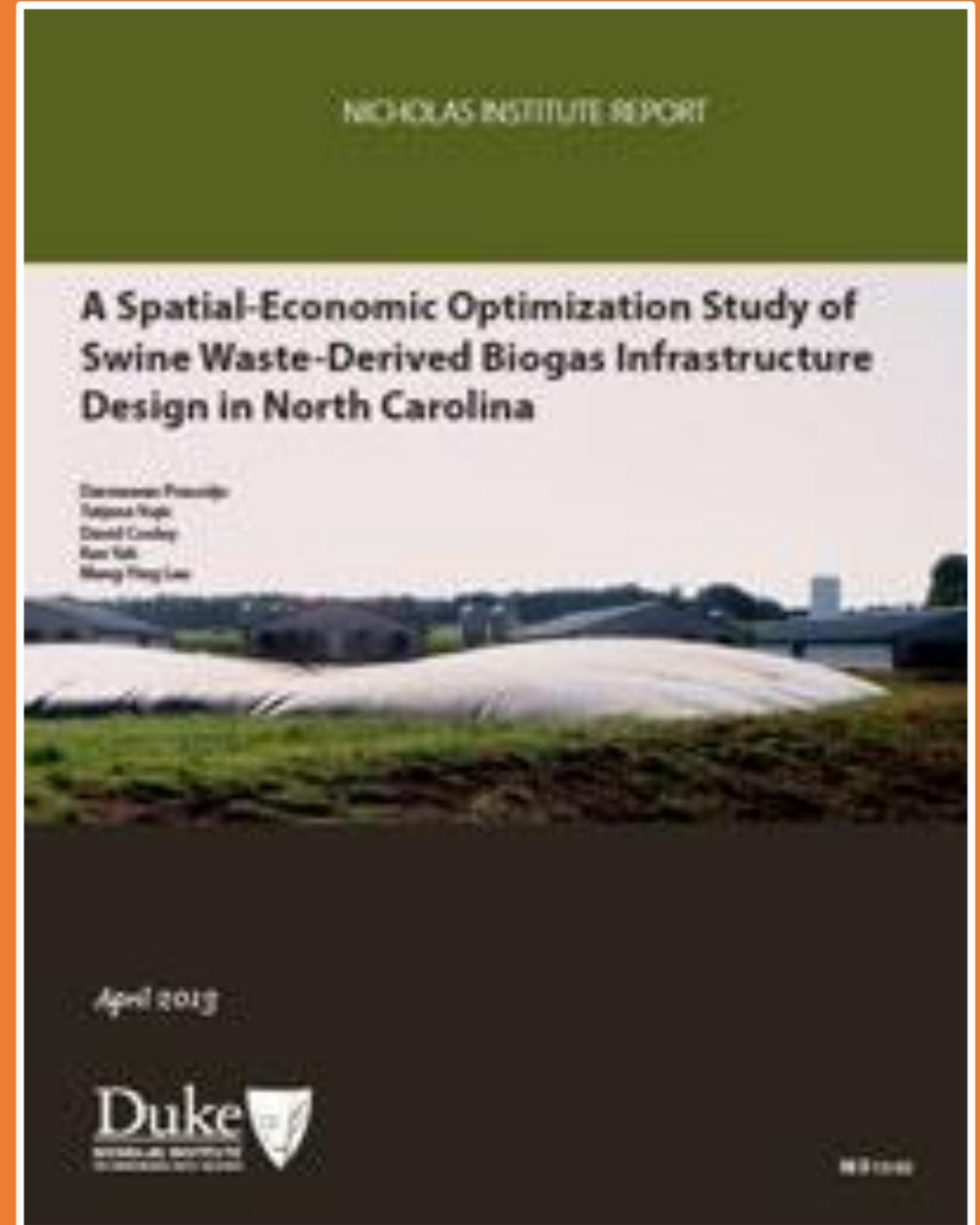


***Before:*** High foam levels in the aeration basin.

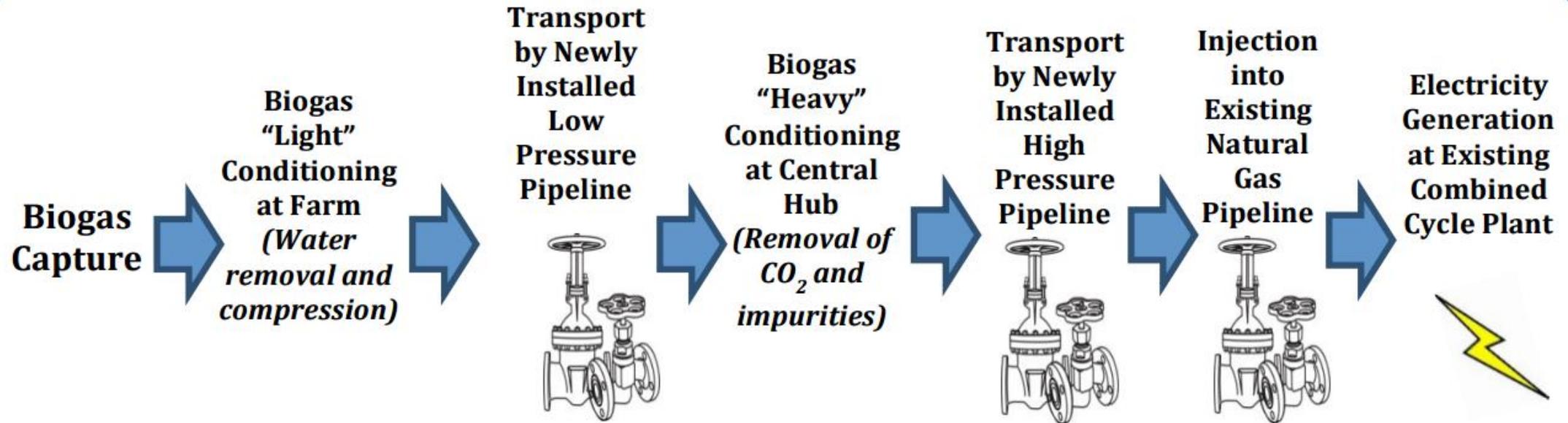


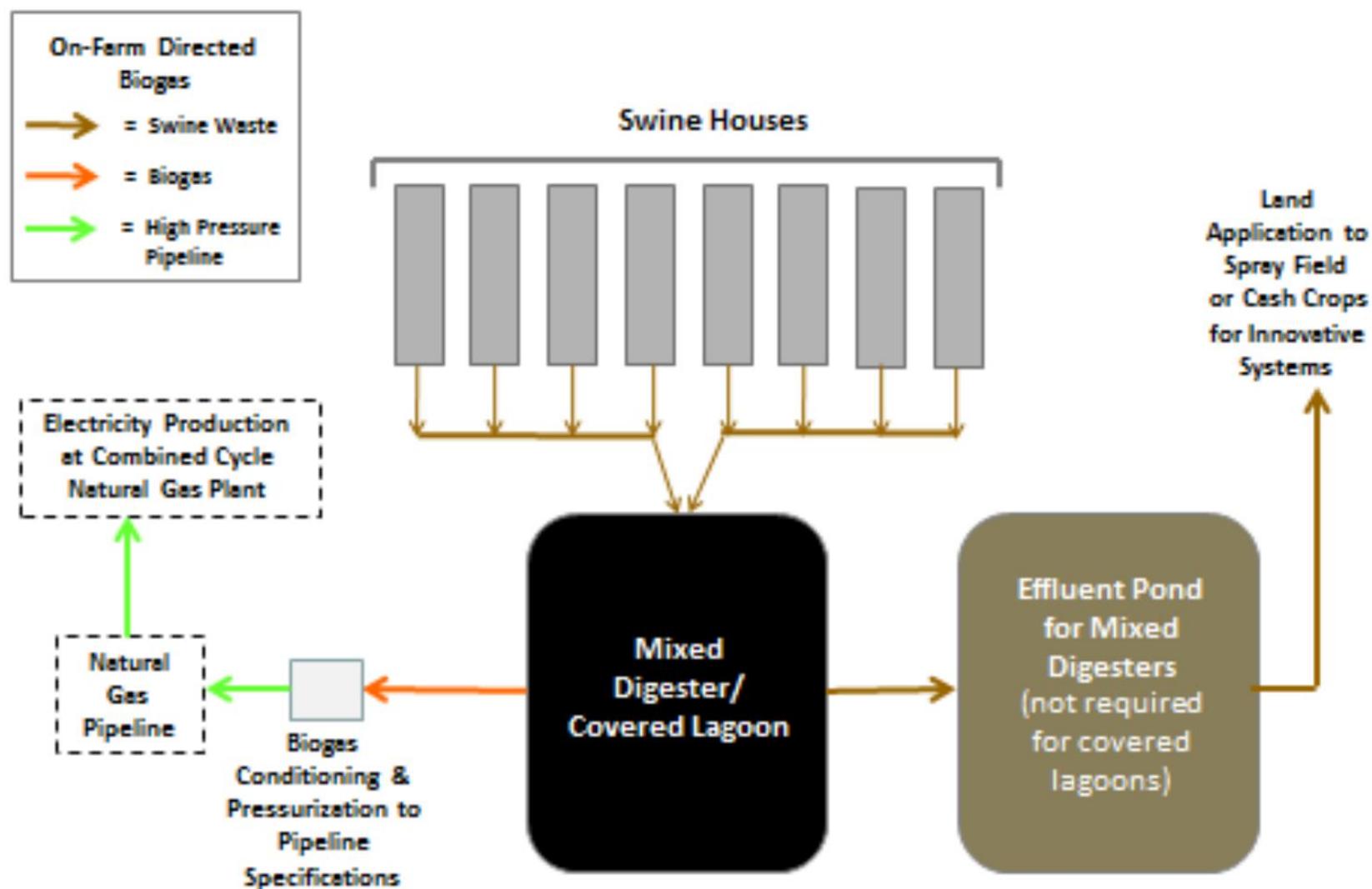
***After:*** Normal and controlled foam levels in the aeration basin.



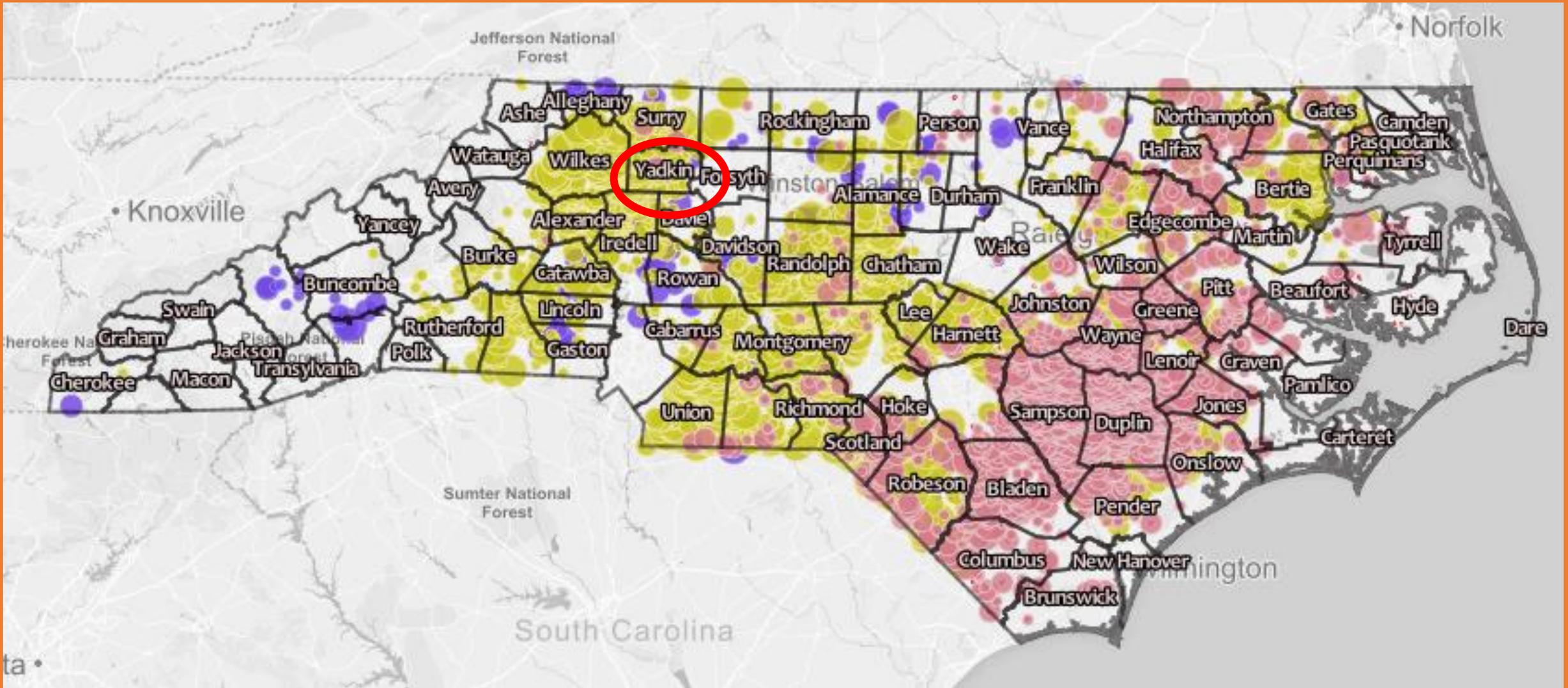


# Conceptualization of Directed Biogas Process



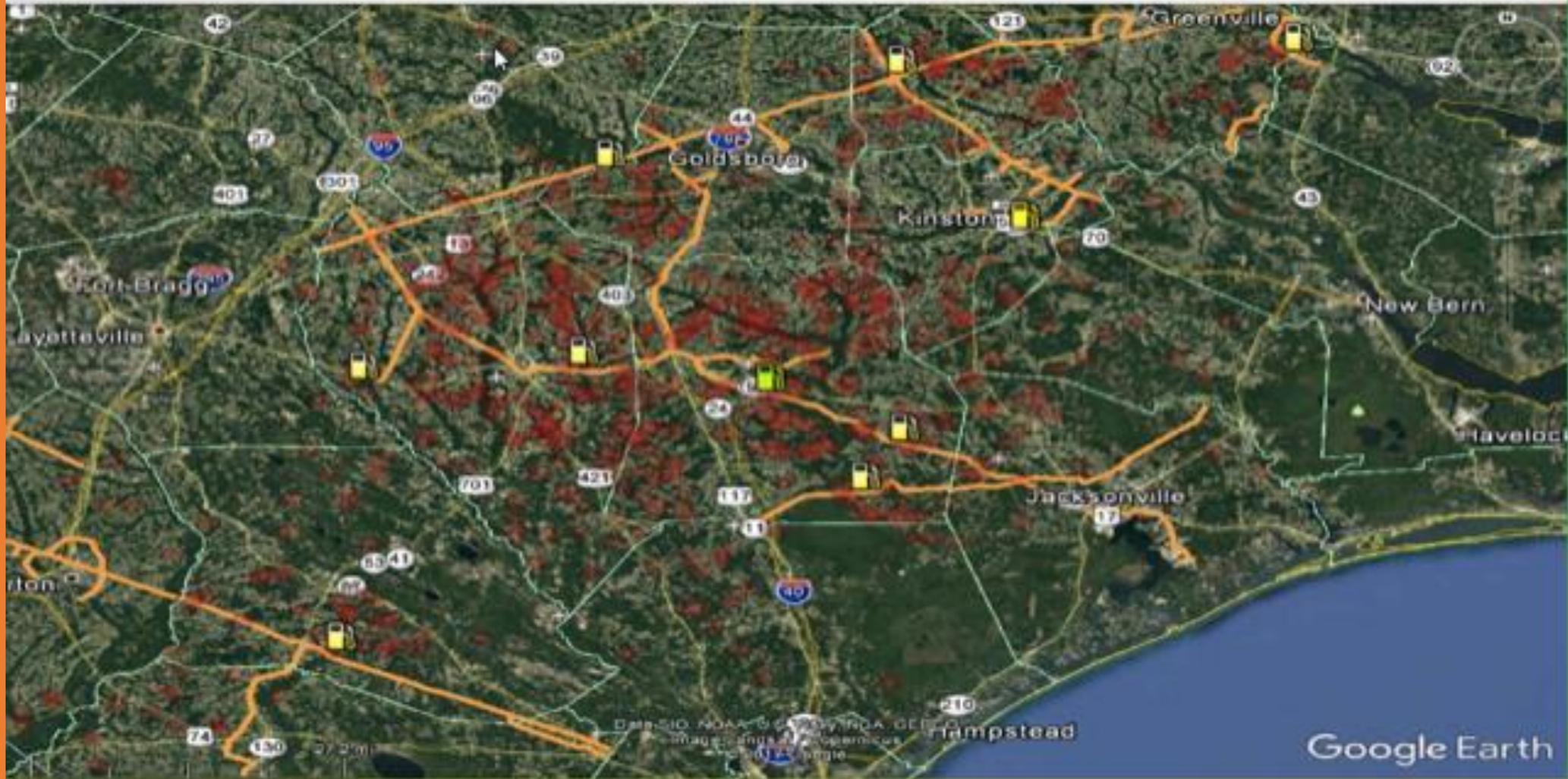


# Location and Density of Livestock and Poultry Operations: Swine, Poultry and Dairy



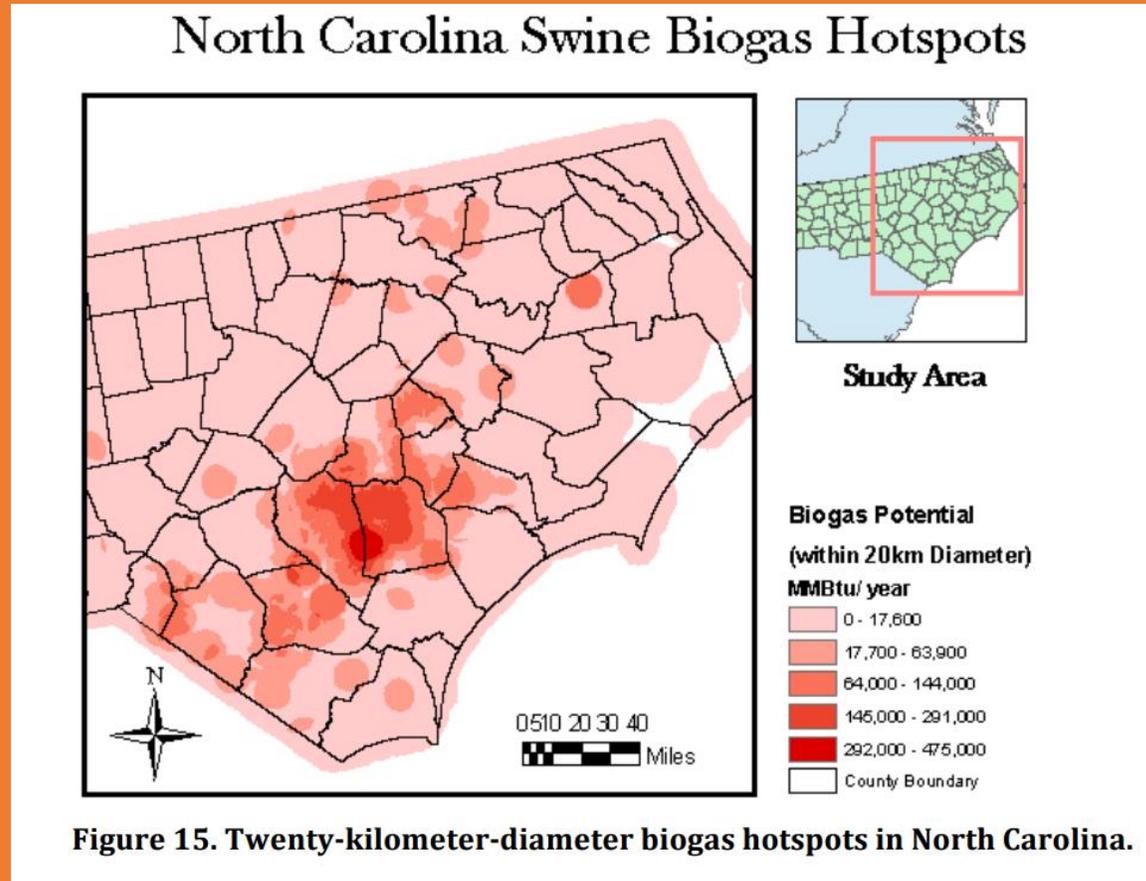
Source: Environmental Working Group

# N.C. BIOGAS OPPORTUNITY



This map shows the location of both hog farms and natural gas pipelines in Eastern North Carolina. Source: Smithfield Foods via NC Energy Policy Council

# BIOGAS HOTSPOTS



## OptimaBIOGAS Farms Selected for Stages 1, 2, and 3

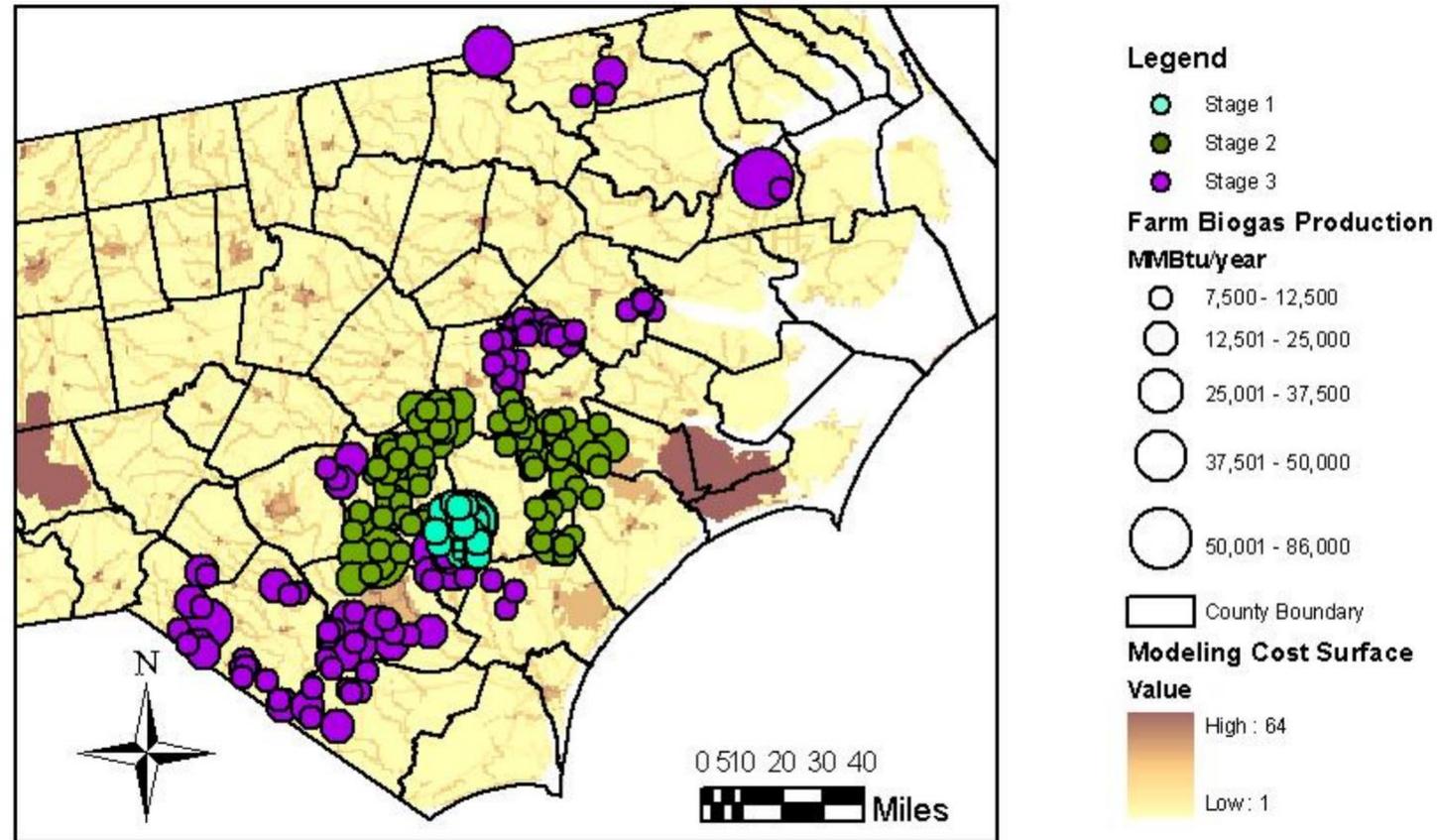


Figure 16. Farm groupings, by REPS stage.

# Example of Biogas Collection and Transport System Sufficient to Meet REPS Phase 1 Swine Set-Aside

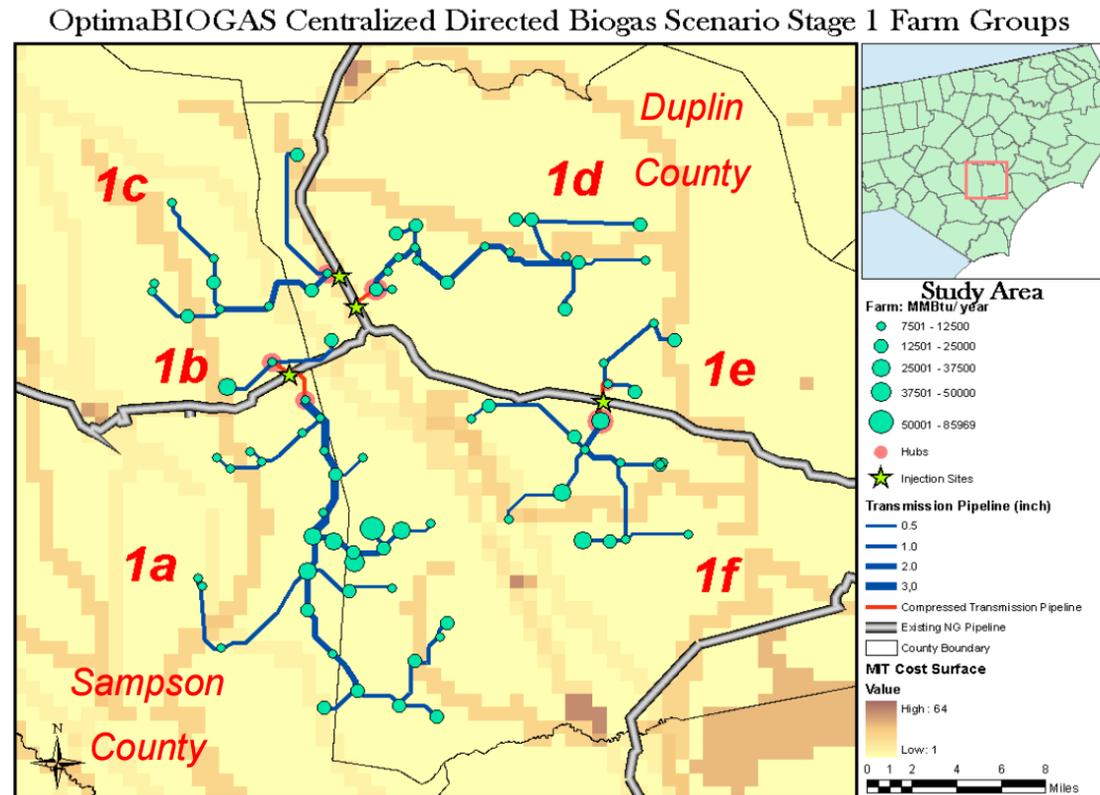


Figure 12. Individual farms, farm clusters, pipeline configurations, and hubs necessary to fulfill the centralized directed biogas scenario for stage 1 of the REPS, assuming use of covered lagoons for biogas capture. The subgroups (i.e., 1a, 1b, and so on) are groupings of farms, and each subgroup would have a single point of injection to the existing natural gas pipeline, as shown by the stars in the figure.



A tour group at Loyd Ray Farms. (Credit: Elizabeth Ouzts)

Nov 16, 2017

## Using biogas to clear the air near hog farms

North Carolina tries to mine its swine and deal with a poop problem that keeps piling up

[Elizabeth Ouzts](#)

# Community & Environmental Concerns

---

## Issues

10M animals on ~2,200 farms, 3,300 lagoons concentrated in eastern coastal plain (In early 1990's, number of hog farms in NC consolidated from ~15K to ~2200); lagoon and sprayfield system revolutionized industry, allowing for rise of large or concentrated animal feeding operations (CAFOs)

---

Methane emissions are usually the least of the communities' concerns; pressing issues are odors, ammonia, increased nutrient runoff, bacteria, fear of groundwater and surface water contamination; nuisance issues (flies, traffic, deadboxes); lowered property values; poor health outcomes (although industry debates scientific findings)

---

Most rural communities near swine farms consist of people of color; NC DEQ reached settlement with US EPA over Title VI (Discrimination Complaint) for not taking into account populations near swine farms in its permitting practices; 4 nuisance lawsuits pending against Smithfield Foods

---

# Smithfield rolls out biogas plan, says it will cover most lagoons

Tags: hog farm, environment, water quality, Smithfield Foods

Posted 8:14 p.m. yesterday

Updated 12:27 p.m. today



Climate change impacts worse than expected, global report warns  
The **Intergovernmental Panel on Climate Change** says the world is headed for painful problems sooner than expected, as emissions keep rising.



As Hurricane Florence floods dozens of hog waste pits, many in the state are wondering when the broken factory farm system will be fixed



Credit: Elizabeth Ouzts



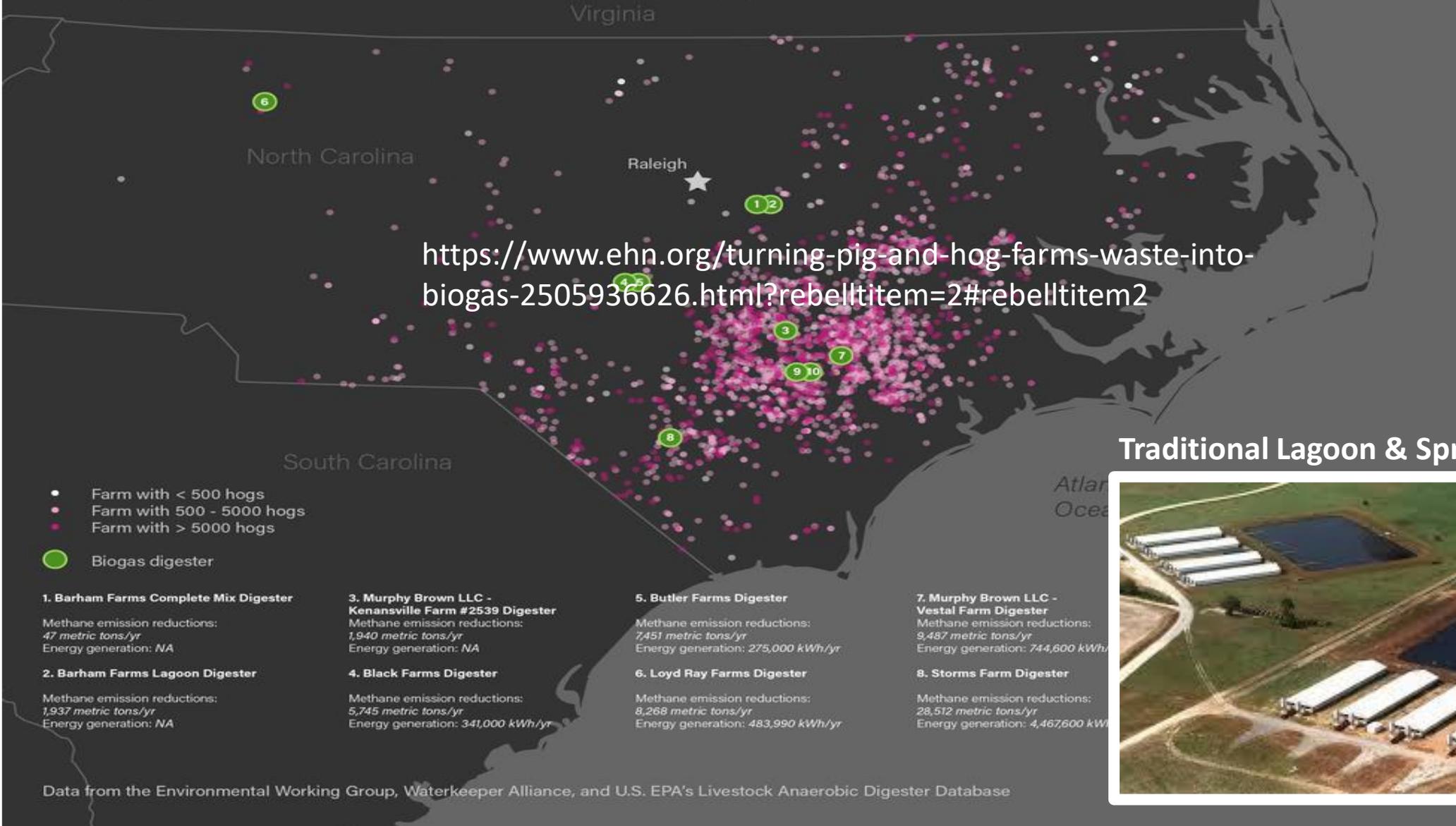
## A Third Smithfield Lawsuit Verdict Creates Alarm Among Producers

JoAnn Alumbaugh, Editor, PORK Network

August 4, 2018 12:01 AM



# Hog farms and biogas digesters in North Carolina



<https://www.ehn.org/turning-pig-and-hog-farms-waste-into-biogas-2505936626.html?rebellitem=2#rebellitem2>

## Traditional Lagoon & Sprayfield System

