

Biofuels in North Carolina

A Presentation to the House Select Committee on
Energy Independence and Alternative Fuels

February 8, 2012

❑ Biofuels in the State

- ❑ Biofuels Center of North Carolina – mission, objectives
- ❑ Federal and State Policy
- ❑ Biofuels supply and demand
- ❑ Vehicles that can use biofuels – scale, issues...
- ❑ Biofuels demand by transportation sector

How compatible are biofuels with existing vehicles and infrastructure and what's the status of development in North Carolina?

Biofuels in North Carolina

- ❑ A variety of alternative fuels and vehicles will be a part of North Carolina's and the nations future
 - ❑ **Liquid transportation fuels will continue to dominate**
 - ❑ Compatible with existing vehicles and infrastructure
 - ❑ **Biofuels will represent ~20% of the nations transportation fuel demands – maybe more**

North Carolina's Legislated Strategic Plan for Biofuels Leadership

By Policy:

- ❑ **“By 2017, 10 percent of liquid fuels sold in North Carolina will come from biofuels grown and produced within the State.”**
 - ❑ **500 – 600 MGY** projected
- ❑ **NC will not pursue corn based or derived biofuels**

The Biofuels Center Oxford, NC

Mission:

- ❑ To facilitate and support the development of a sustainable biofuels industry across North Carolina.



Renewable Energy

BioEnergy

Renewable Power “Electricity”

BioPower

- ❑ Targets domestic fossil fuels that are combusted* to generate electricity
 - ❑ Coal*
 - ❑ Natural gas*
 - ❑ Nuclear fission

Renewable Fuels “Transportation”

BioFuels

- ❑ EISA targets imported crude oil and its refined products
 - ❑ Gasoline
 - ❑ Diesel Fuels
 - ❑ Aviation Fuels

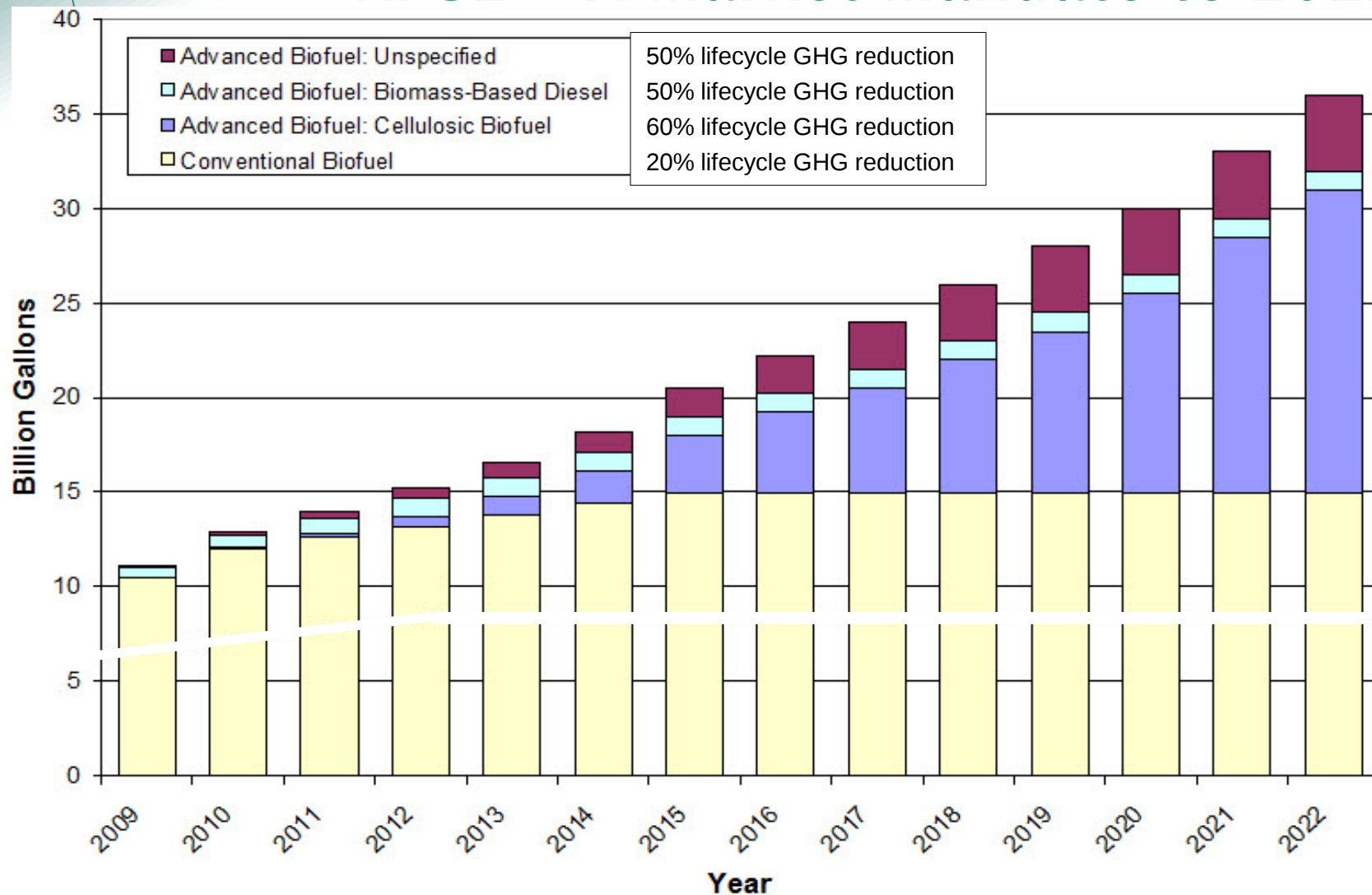
Biofuels in North Carolina

□ National Policy and Drivers

2007 U.S. Energy Bill

Energy Independence & Security Act

RFS2 – A Market Mandate to 2022



Renewable Fuels Standard 2

RFS 2

Source: Office of Transportation and Air Quality
US Environmental Protection Agency, Feb. 2010

- ❑ Four Separate Biofuel Categories
 - ❑ Biomass-Based Diesel: 1 Bgal by 2012 and beyond
 - ❑ E.g., Biodiesel, “renewable diesel” if fats and oils not co-processed with petroleum
 - ❑ Must meet a 50% lifecycle GHG threshold
 - ❑ Cellulosic Biofuel: 16 Bgal by 2022
 - ❑ Renewable fuel produced from cellulose, hemicellulose, or lignin
 - ❑ E.g., cellulosic ethanol, BTL diesel (aka FT diesel), green gasoline, etc.
 - ❑ Must meet a 60% lifecycle GHG threshold
 - ❑ Advanced Biofuel: Total of 21 Bgal by 2022 (Minimum of 4 billion additional)
 - ❑ Essentially anything but corn starch ethanol
 - ❑ Includes cellulosic biofuels and biomass-based diesel
 - ❑ Must meet a 50% lifecycle GHG threshold
 - ❑ Renewable Biofuel: Total of 36 Bgal by 2022 (Minimum of 15 Bgal additional)
 - ❑ Ethanol derived from corn starch –or any other qualifying renewable fuel
 - ❑ Must meet 20% lifecycle GHG threshold -Only applies to fuel produced in new facilities

NOTE: Existing biofuel facilities (domestic and foreign) are not required to meet GHG threshold for conventional biofuel category –facilities are “Grandfathered.”

Biofuels in North Carolina

□ Supply & Demand

North Carolina Total Gasoline & Diesel Fuel Sales

All Sales/Deliveries by Prime Supplier

North Carolina Prime Supplier Gasoline and Diesel Sales Volumes, BGY										
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Gasoline	4.15	4.25	4.28	4.30	4.21	4.24	4.22	4.03	4.10	4.14
Diesel ^{No. 2}	1.26	1.18	1.21	1.20	1.23	1.26	1.31	*1.32	*1.22	*1.21
Total	5.41	5.43	5.49	5.50	5.44	5.50	5.53	5.35	5.32	5.35

* High Sulfur Diesel Sales withheld by EIA Statistics to avoid disclosure of individual company data

Energy Information Administration
Official Energy Statistics from the U.S. Government

Source: http://www.eia.gov/dnav/pet/pet_cons_prim_dcu_SNC_a.htm

Biofuels in North Carolina

Existing Production Capacity

❑ Biodiesel

- ❑ 13 million gallons of capacity
- ❑ 2.2 million gallons of production (B100)

❑ Fuel Ethanol

- ❑ Clean Burn Fuels, Hoke County (Raeford)
 - ❑ 60 MGY plus operational capacity
 - ❑ 1st generation corn plant
 - ❑ Multiple millions gallons production in 2011
 - ❑ Status: Idled and Bankrupt, Controlled by the bank consortium holding the debt – Cape Fear Farm Credit

North Carolina's Biodiesel Industry

North Carolina Biodiesel Producers, 2011

Producer	Location	Production (Mil of Gal)	Capacity (MGY)	
Blue Ridge Biofuels	Buncombe County	Confidential	0.5	
Piedmont Biofuels	Chatham County		1.3	
Triangle Biofuels	Wilson County		3.0	
Foothills Bio-Energies	Caldwell County		3.0	
Patriot Biodiesel	Guilford County		5.2	
Total		2.2 MGY	13.0 MGY	

Capacity Utilization: 17%

Primary Challenge is Feedstock Cost
Market Demand is High

Biofuels in North Carolina - Consumption

❑ Fuel Ethanol

❑ Over 95 % of all gasoline sold in NC is E-10

- ❑ More than 4.14 BGY of gasoline sold in NC during 2010
- ❑ Nearly 4 billion gallons of E10 was sold in NC in 2010
- ❑ **400 million gallons of fuel ethanol consumed in NC during 2010 – imported from Midwestern states**

❑ Bio-Diesel

- ❑ **More than 1.12 BGY of diesel fuel sold in NC in 2010**
- ❑ NC DOT purchased 7.2 MGY of B20 in fiscal year 2010/11
 - ❑ **NC DOT purchased 1.44 million gallons of bio-diesel (B-100)**
 - ❑ NC manufacturers produced 2.2 million gallons of biodiesel in 2011

Biofuels in North Carolina - Consumption

❑ By transportation sector

❑ Public

- ❑ All standard gasoline vehicles at 10% ethanol
- ❑ 26% of the states fleets are flex fuel vehicles (E85)
 - ❑ E85 refueling stations are limited
 - ❑ NC DOT installed 4 new E85 fuel stations in 2011
- ❑ NC DOT biodiesel consumption – 7.2 MGY as B20
 - ❑ Most/all diesel powered vehicles can utilize biodiesel
- ❑ NC universities have many flex fuel and biodiesel vehicles

❑ Commercial, Residential

- ❑ All standard gasoline vehicles at 10% ethanol
- ❑ Flex fuel/E85 vehicles – **285,000** including the public sector
- ❑ RFS will drive greater flex fuel vehicle adoption
- ❑ **EPA approved E15 blends for late model gasoline vehicles**

Biofuels in North Carolina - Consumption

❑ By transportation sector

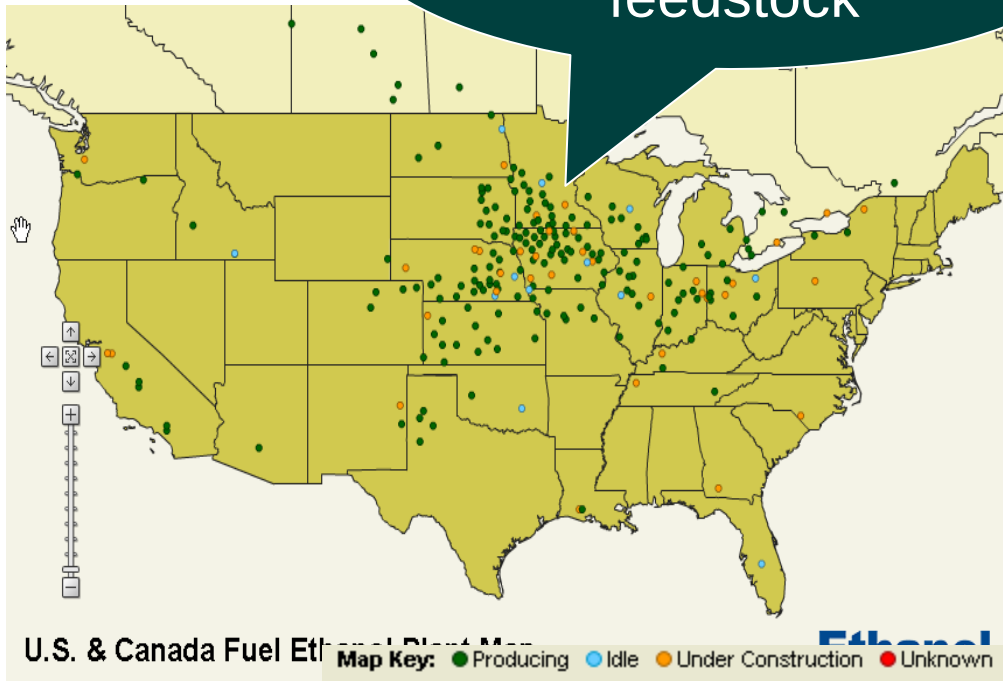
❑ Heavy Industry

- ❑ Dominated by diesel powered vehicles
- ❑ Delivered fuels costs, mileage and vehicle maintenance are key
- ❑ Can utilize biodiesel
- ❑ Adoption of biodiesel is understood to be small
- ❑ Not a target market segment for NC's biodiesel producers

1st Generation Corn Ethanol

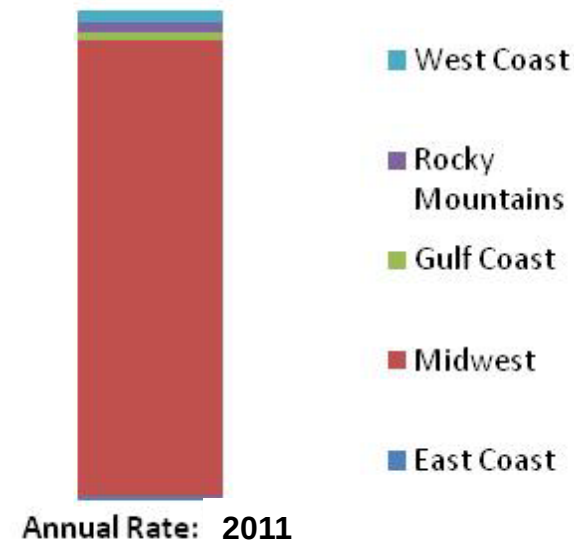
14 Billion Gallons Produced in 2011

Successful plants
locate close to the
feedstock



14 Billion Gallons

93%
Midwest



Source: <http://www.ethanolproducer.com/plantmap/>

http://tonto.eia.doe.gov/dnav/pet/pet_pnp_oxy_a_EPOOXE_YOP_mbbbl_m.htm

Energy Information Administration
Official Energy Statistics from the U.S. Government

Biofuels in North Carolina

- ❑ Compatibility with Existing Petroleum Infrastructure

Biofuels Defined

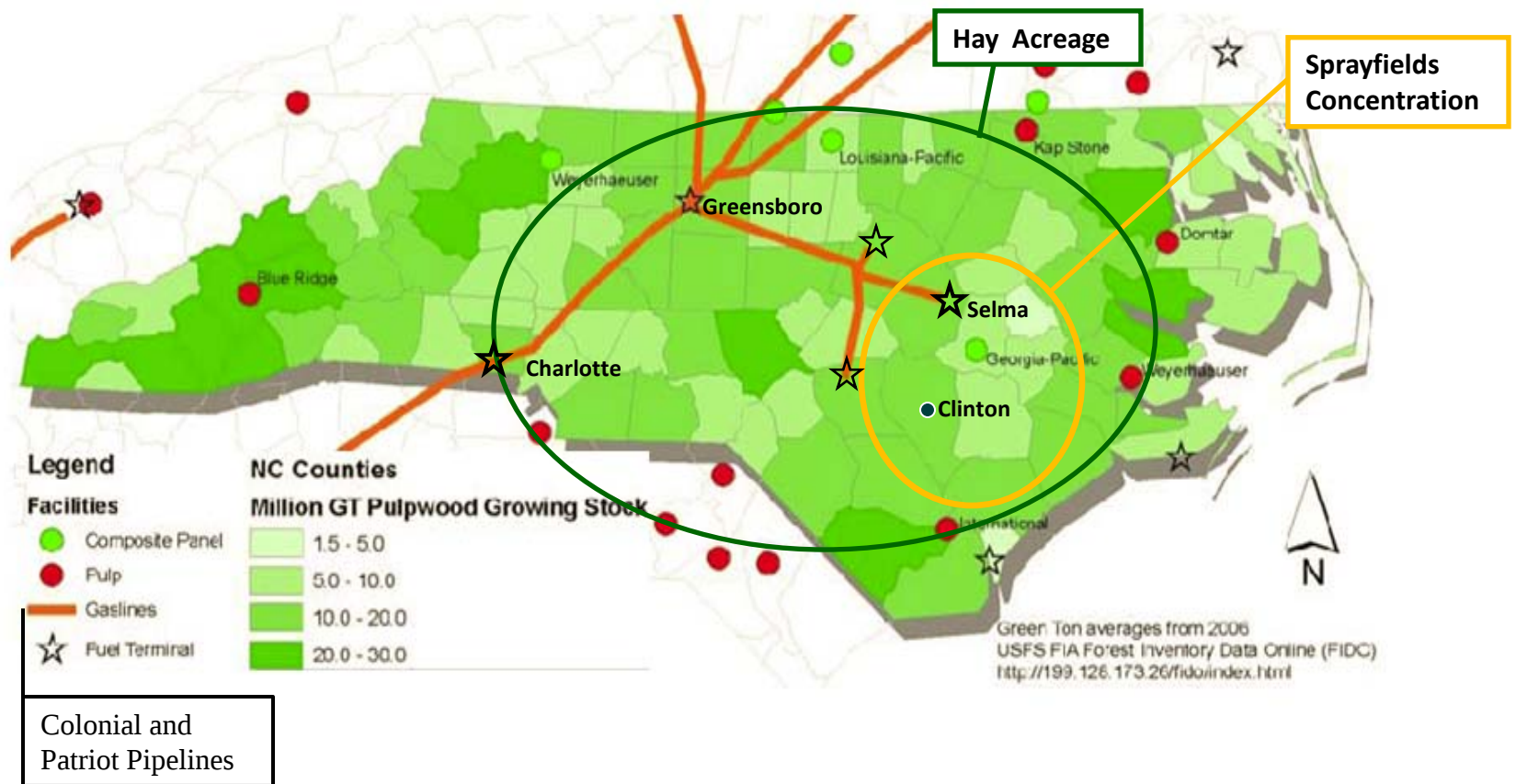
Compatibility with Petroleum Infrastructure

	Gasoline Markets	Diesel Fuel Markets
1 st Generation	Fuel ethanol from corn <u>starch</u>	Biodiesel from oil seed crops – soybean oil, canola oil...
1.5 Generation	Fuel ethanol from alternative starch and sugar crops – sugar beet, cane sugar, ISP, sorghum...	Biodiesel from lower cost alternative lipid sources: WVO – yellow grease Animal fats – chicken fat Brown grease
2 nd Generation Requires advanced technologies	Advanced biofuels from lignocellulosic biomass - ethanol - mixed alcohols - butanol - biogasoline - others	Advanced biofuels from lignocellulosic biomass - FT Diesel - Jet Fuels Algae oil to biodiesel

Biofuels in North Carolina – Future

- ❑ **Compatible with existing transportation fuel infrastructure**
 - ❑ Oxygen sensors on engines required for higher ethanol blends, flex fuel vehicles – RFS driven
 - ❑ Blender pumps at retail stations required for higher ethanol blends – RFS driven
 - ❑ Traditional biodiesel will remain relatively small
 - ❑ Cellulosic ethanol is close at hand – RFS driven
 - ❑ “Drop in” biofuels will follow – RFS driven
 - ❑ **BFT diesel fuels** (bio Fischer Tropsch), same as pet diesel
 - ❑ **Bio-Gasoline**
 - ❑ **Bio-Jet fuels**

Compatibility with Petroleum Infrastructure



Alternative Fuels in North Carolina – Future

- ❑ **Part of the future but constrained due to incompatible with existing transportation fuel infrastructure**
 - ❑ Vehicles adaptation / purchase
 - ❑ Distribution adaptation
 - ❑ Significant investment, consumer & public/private
 - ❑ BP Energy Outlook to 2030 – global transportation fuels
 - ❑ 87% Petroleum
 - ❑ 7% Biofuels
 - ❑ All others constrained by lack of infrastructure

Alternative Fuels in North Carolina – Future

- ❑ **Optional technology platform – Compatible with petroleum infrastructure**
 - ❑ **Natural Gas**, as feedstock to **gasoline**
 - ❑ Thermochemical process technologies (Existing)
 - ❑ Economic viability tied directly to cost of natural gas
 - ❑ Not renewable or biofuel

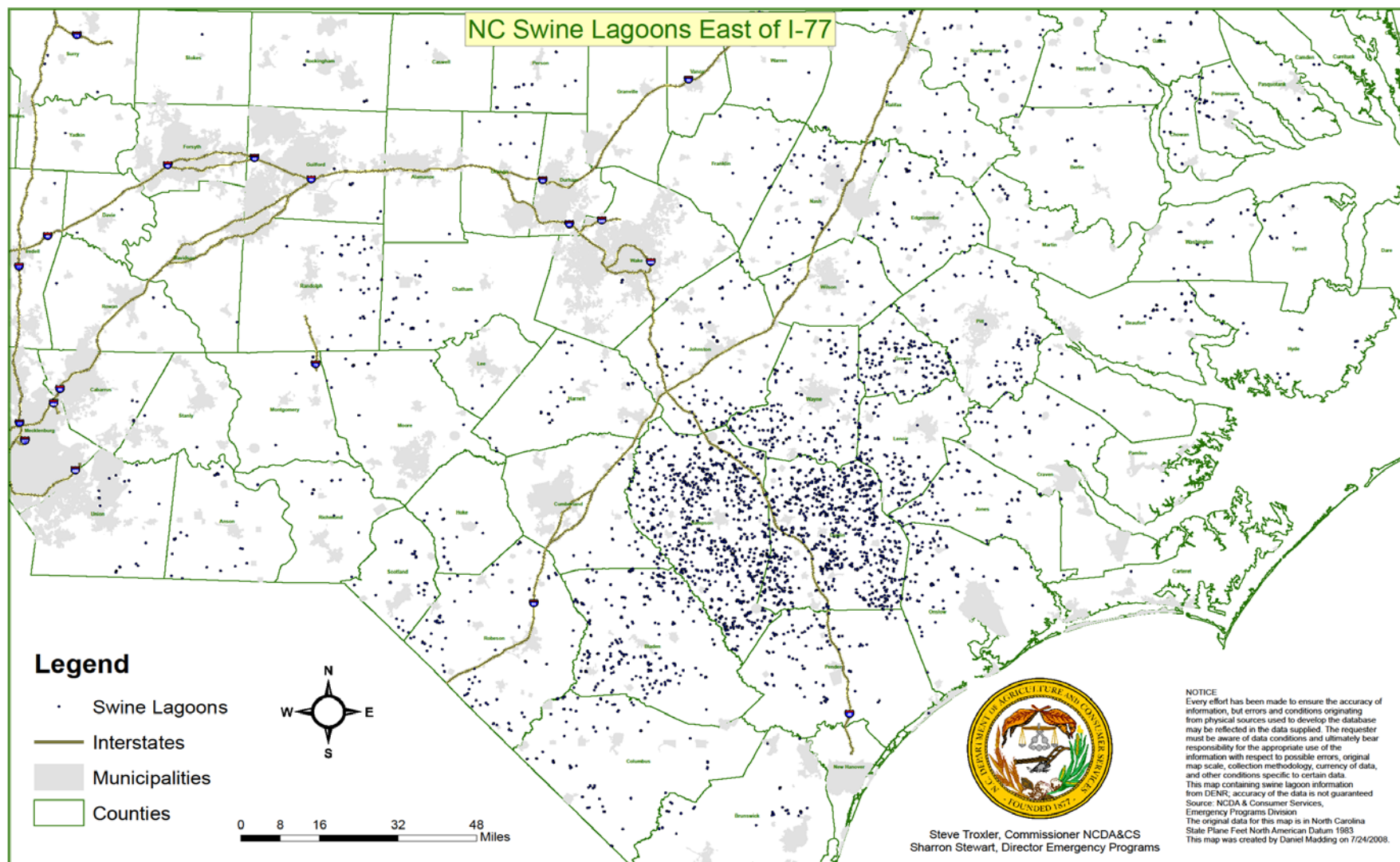
Biofuels in North Carolina - Future

Biofuels industry success requires economic sustainability across each link of the value chain

Energy crops must provide greater value to the farm than existing crop practices

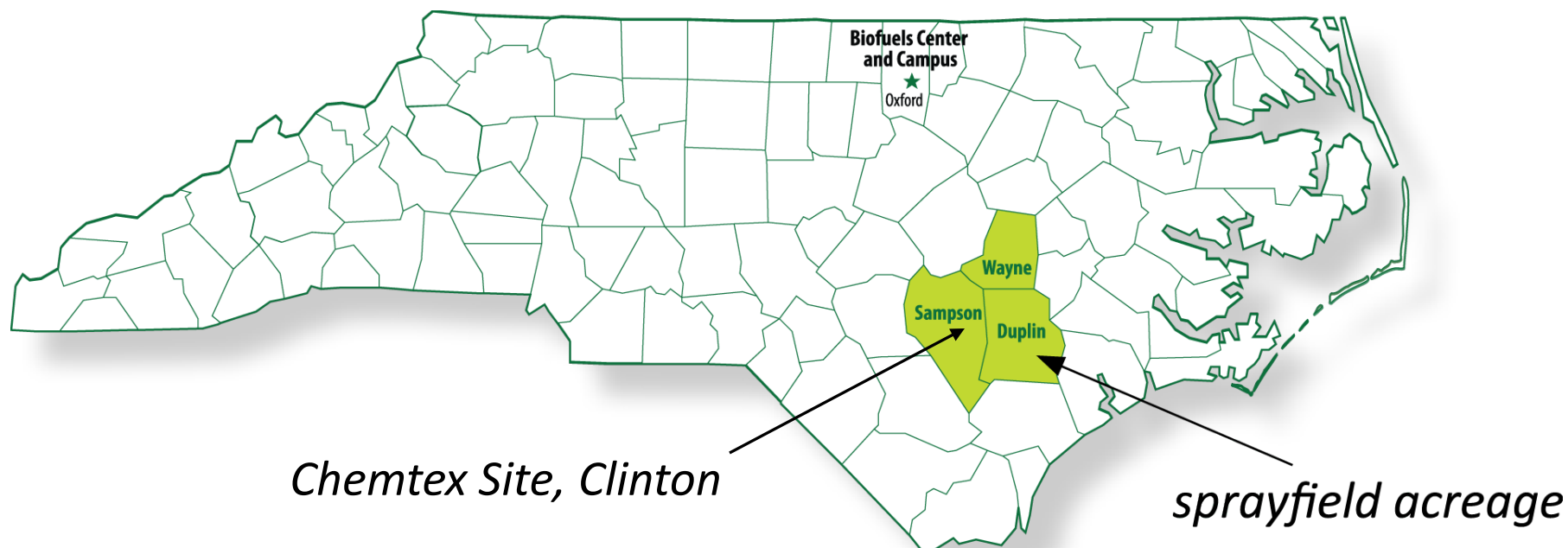


North Carolina Swine Lagoon Map

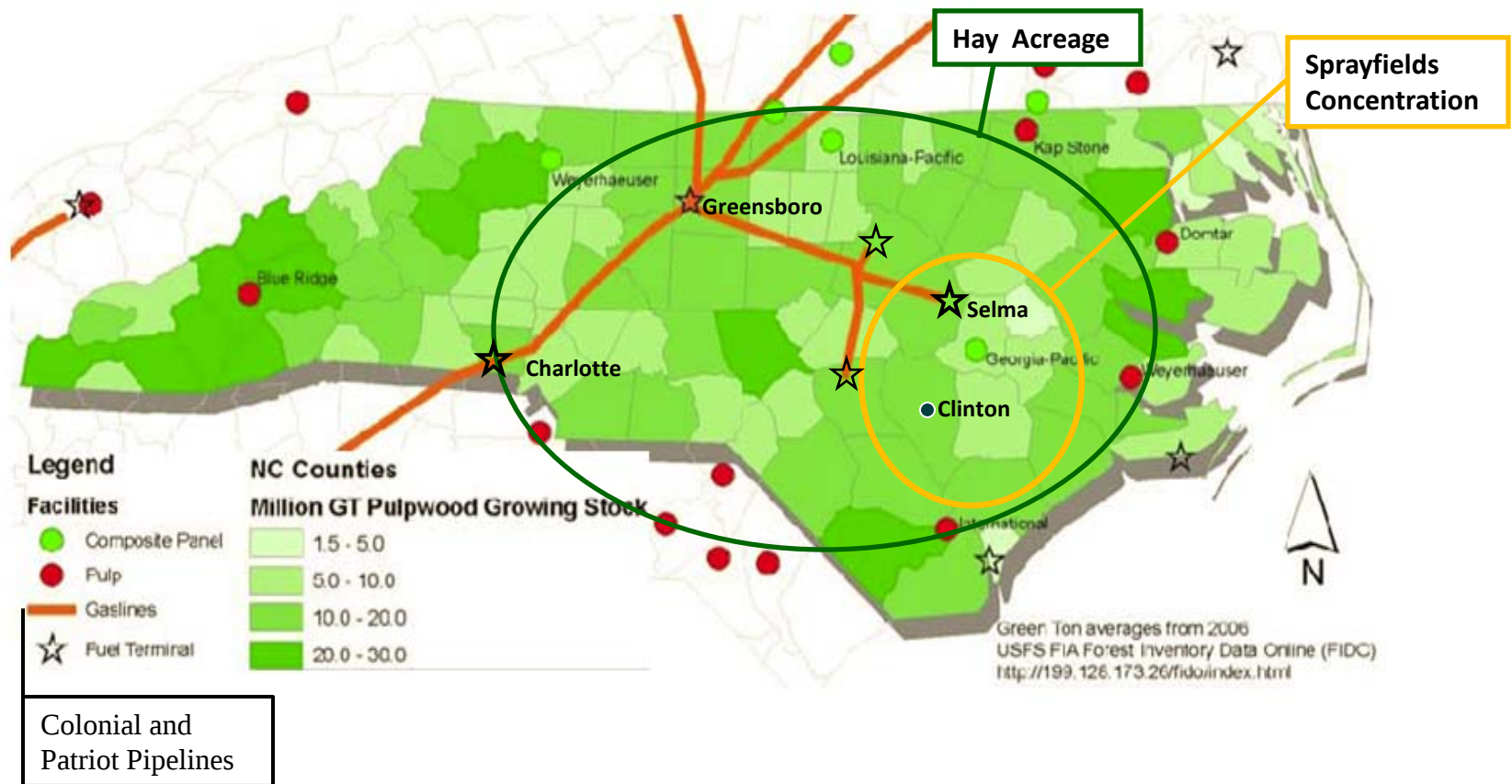


Swine Industry Concentration

Higher Value from Sprayfields with Energy Grasses

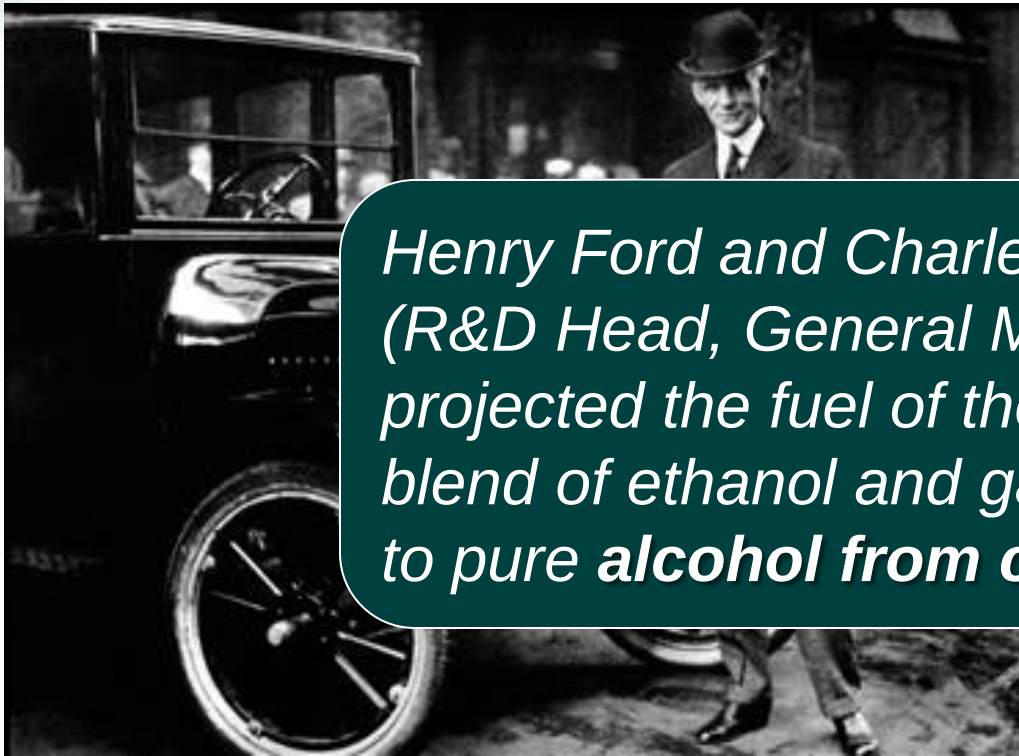


Biofuels in North Carolina Agriculture and Forest Resources



- ❑ PROESA™ **Renewable** Platform – Biofuels and Bioproducts
 - ❑ breakthrough technology – displaces petroleum with energy grasses
 - ❑ commercial ready
- ❑ **First plant under construction** – 14 MGY cellulosic ethanol
 - ❑ Crescentino Italy - 100% equity, zero debt
- ❑ **Second plant under development** - 20 MGY cellulosic ethanol
 - ❑ Near Clinton in Sampson County NC
 - ❑ **Feedstock advantaged - energy grasses on swine sprayfields**
 - ❑ Equity secured, including 25% equity stake from Toyota
 - ❑ **Closing project finance requires USDA 9003 loan guarantee**

The Automobile was Developed and Designed to Operate on Ethanol

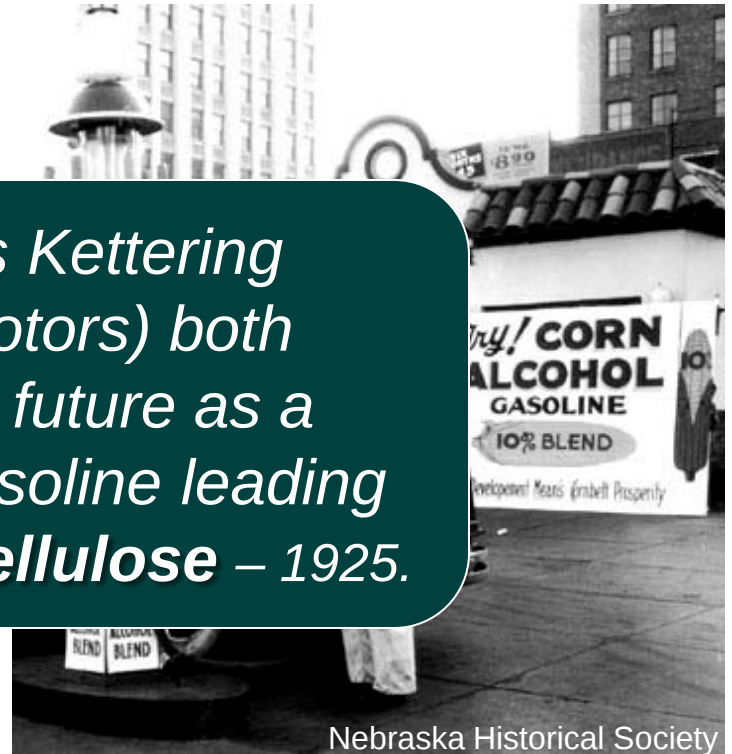


*Henry Ford and Charles Kettering (R&D Head, General Motors) both projected the fuel of the future as a blend of ethanol and gasoline leading to pure **alcohol from cellulose** – 1925.*

Henry Ford, 1925 – Ethanol is “the fuel of the future.” Bill Kovarik

<http://www.radford.edu/~wkovarik/papers/fuel.html>

BIOFUELSCENTER.ORG



Nebraska Historical Society

April 1933 - Lincoln Nebraska gas station selling "Corn Alcohol Gasoline."