Missouri Biogas
A Sustainable Energy Source

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Energy, Ecosystem, and Wildlife Currently at Odds

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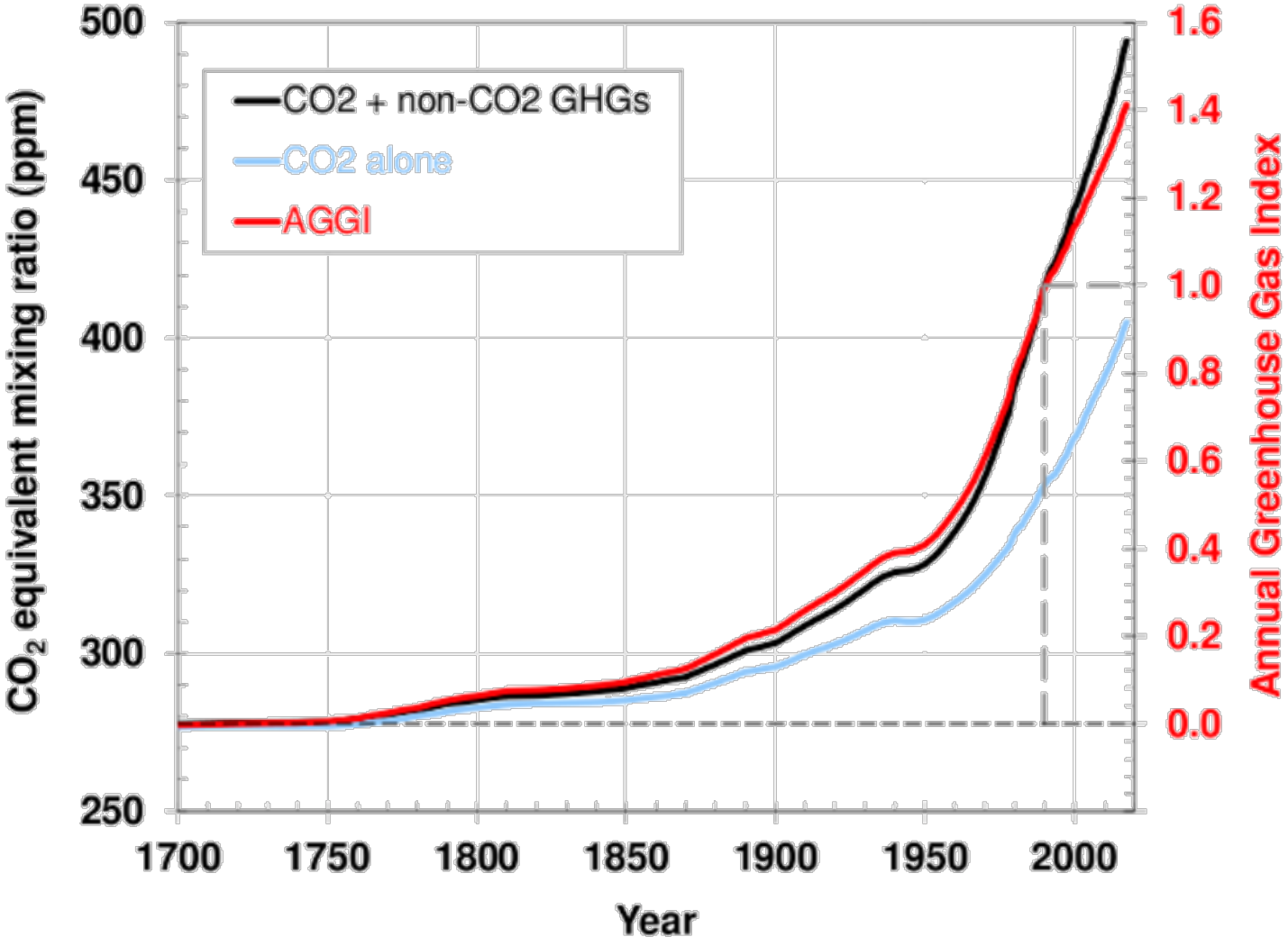
Annual Greenhouse Gas Index



Source: https://www.ersl.noaa.gov/gmd/aggi/aggi.html

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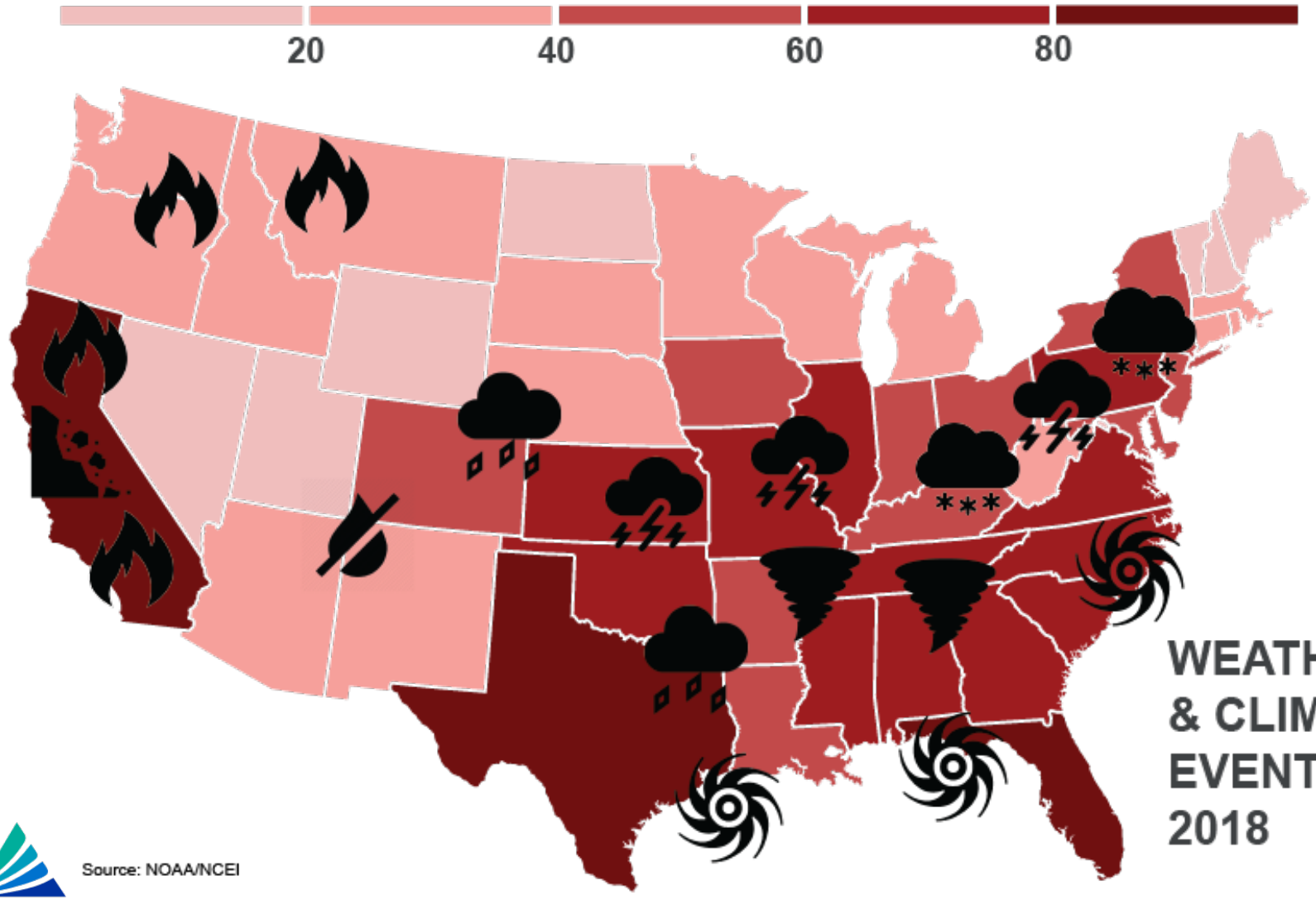
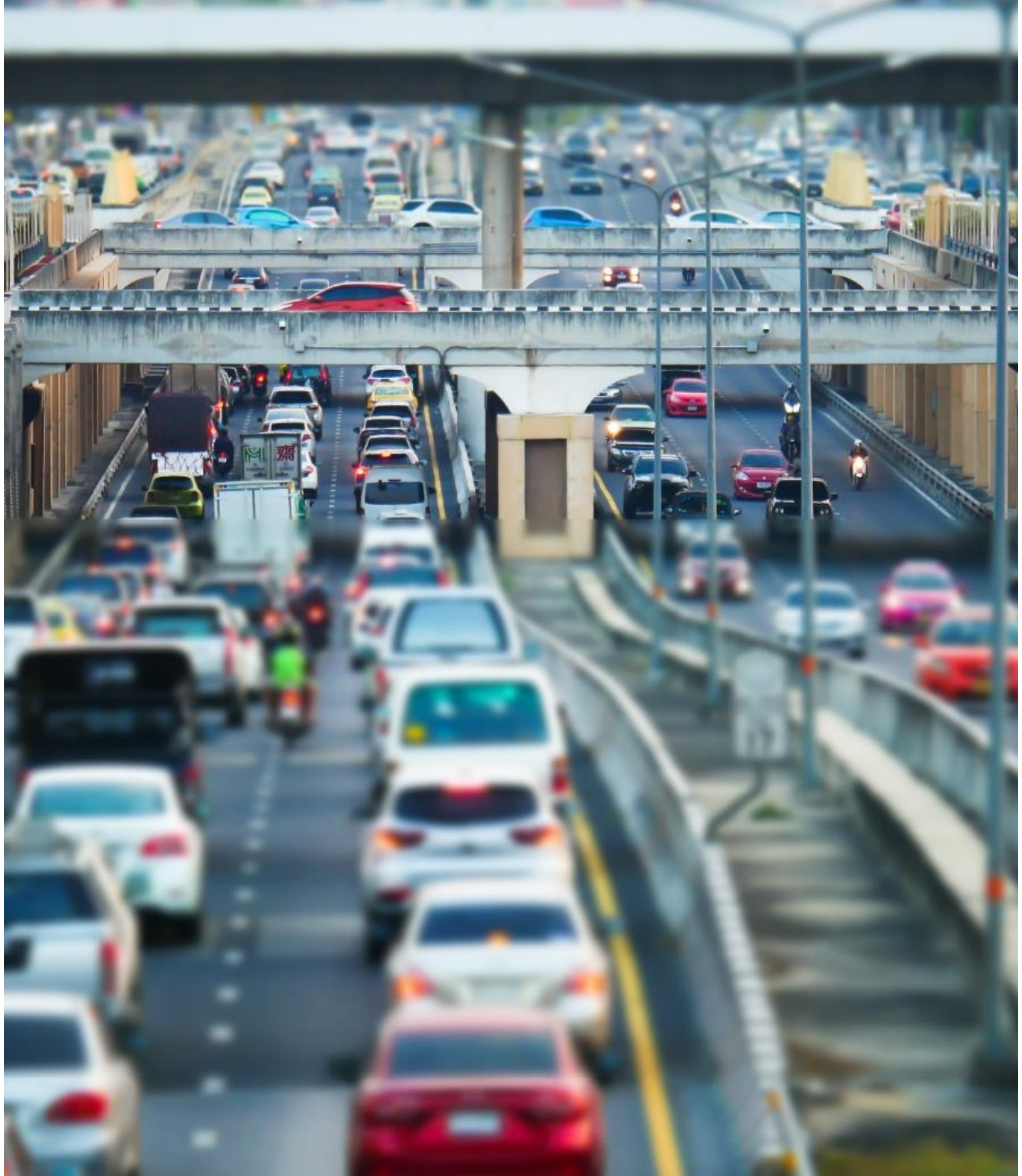
BILLION DOLLAR DISASTERS



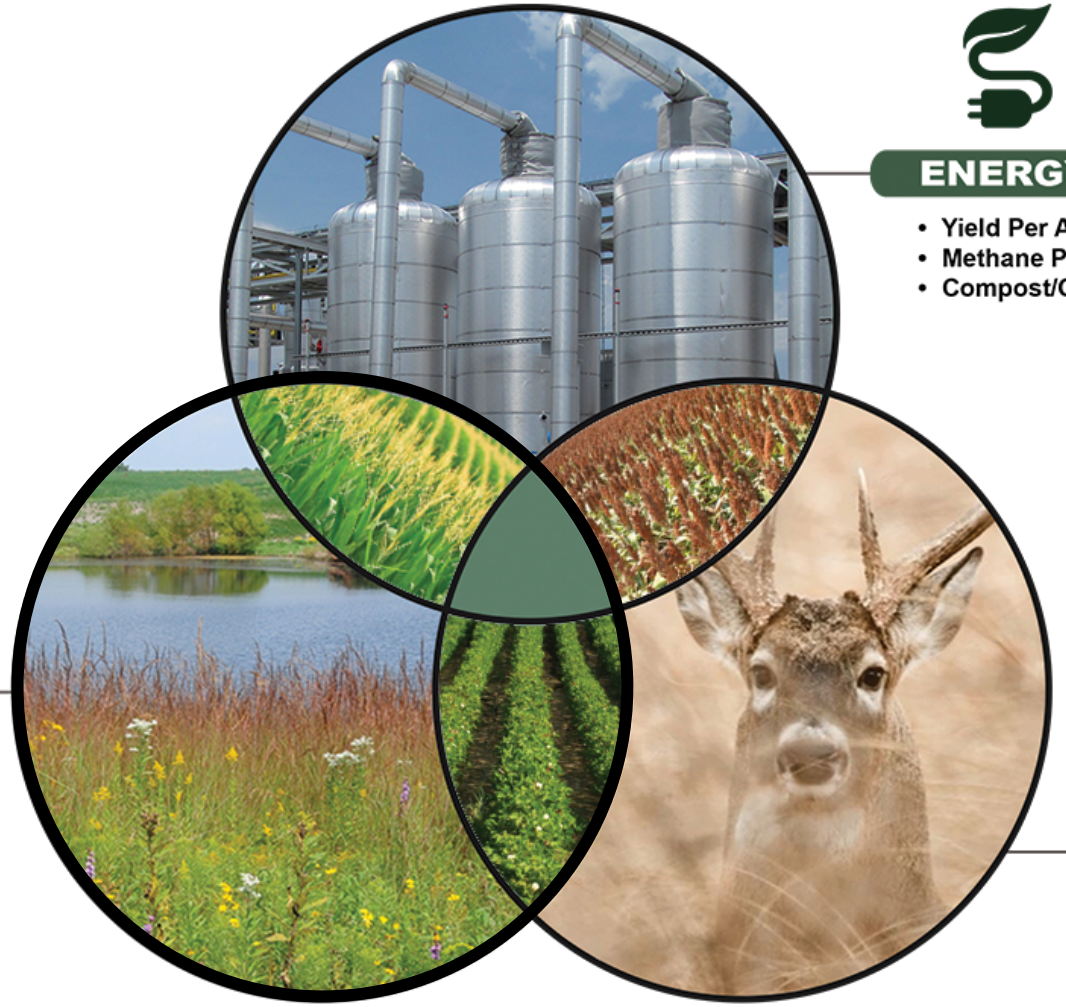
Source: NOAA/NCEI



Population Growth to 9.6B by 2050

- Increasing amount of stress on our landscape
- Planet is facing competing demands
- Erosion, soil degradation, and water problems arising
- Climate and weather patterns changing
- Our planet is in need of help, so what can we do?

A New Way with Roeslein Alternative Energy



ENERGY

- Yield Per Acre
- Methane Production
- Compost/Organic Fertilizer

ECOSYSTEM

- Clean Water
- Water Storage
- Soil Health
- CO2 Sequestration
- Carbon Rebuilding

WILDLIFE

- Pollinators
- Grassland Birds
- Food & Shelter

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Annual Cost of Soil Erosion

- U.S. Cropland Soil Erosion = 5.6 tons / acre
- U.S. Total Soil Erosion Cost = $44B / year

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Source: https://www.sciencedaily.com/releases/2014/06/140618163922.htm

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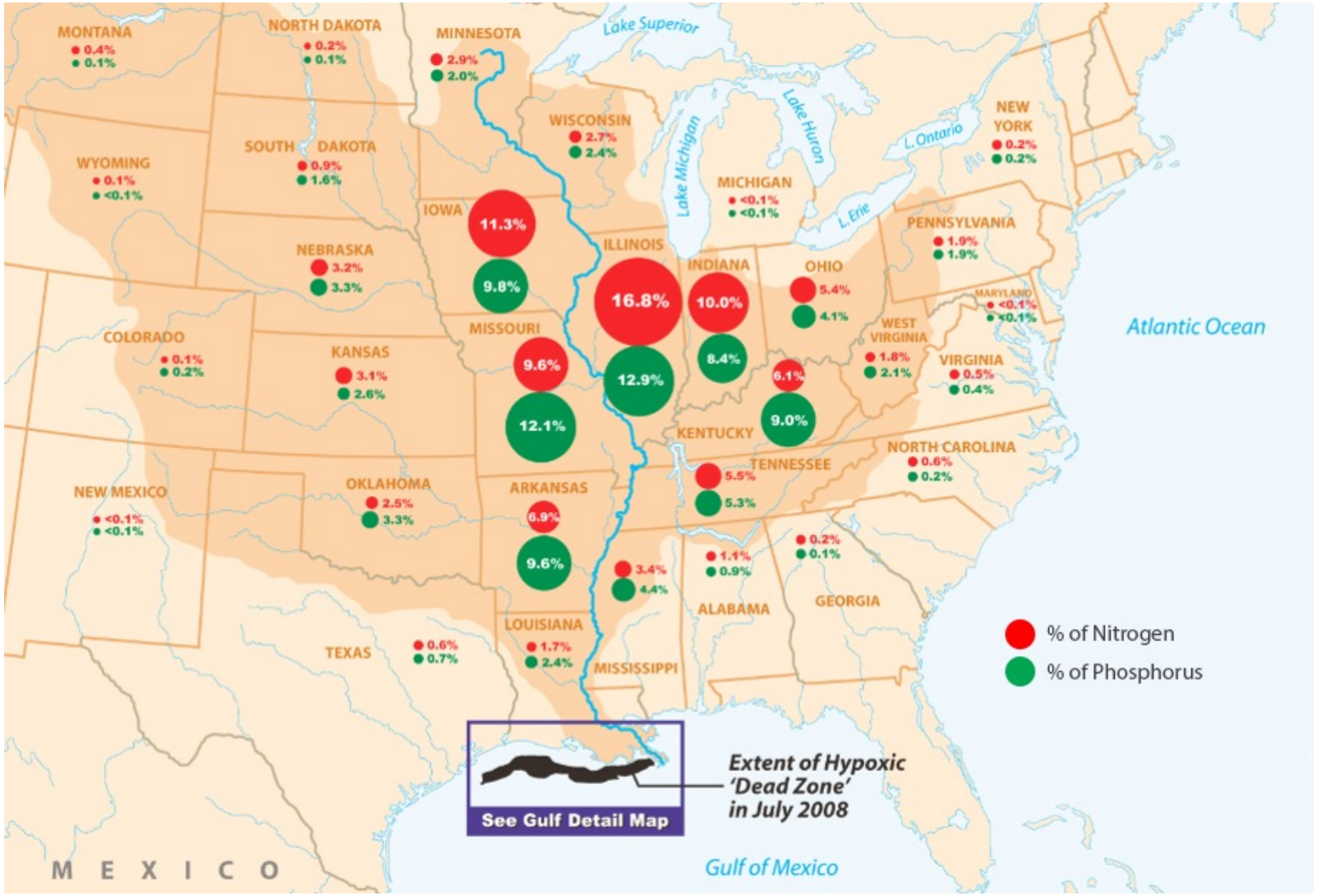
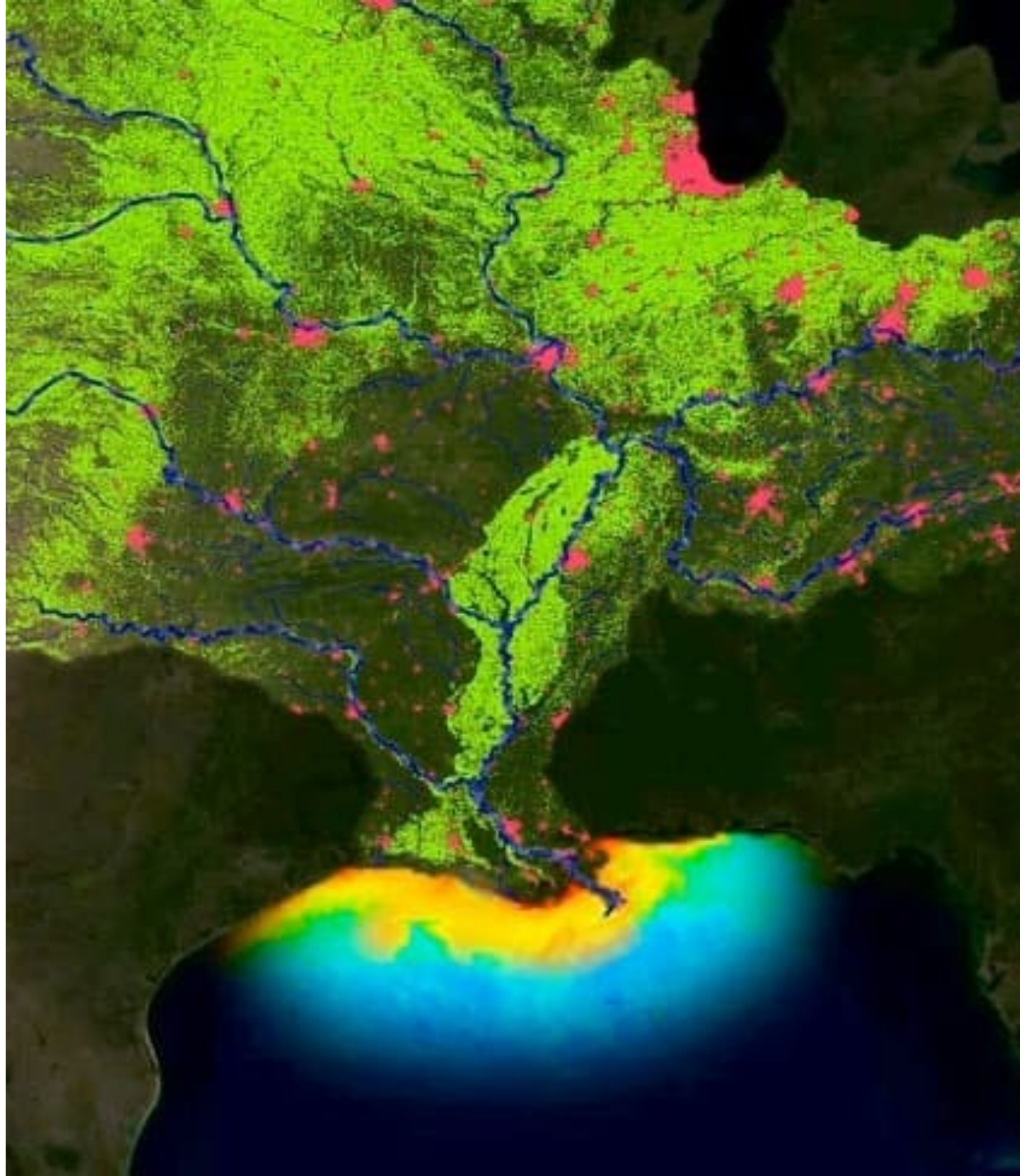
Mississippi River Basin Runoff



Source: https://infrascapedesign.files.wordpress.com/2010/07/hypoxiamap_entireusa.jpg



Negative Economic Impact with Hypoxia

- $350M fishing expenditures
- $350M boating expenditures
- $1.5B property value losses
- $44M for conservation plans
- $813M for bottled water due to taste/odor issues
- Significant impact on $1.6 Trillion Outdoor Industry

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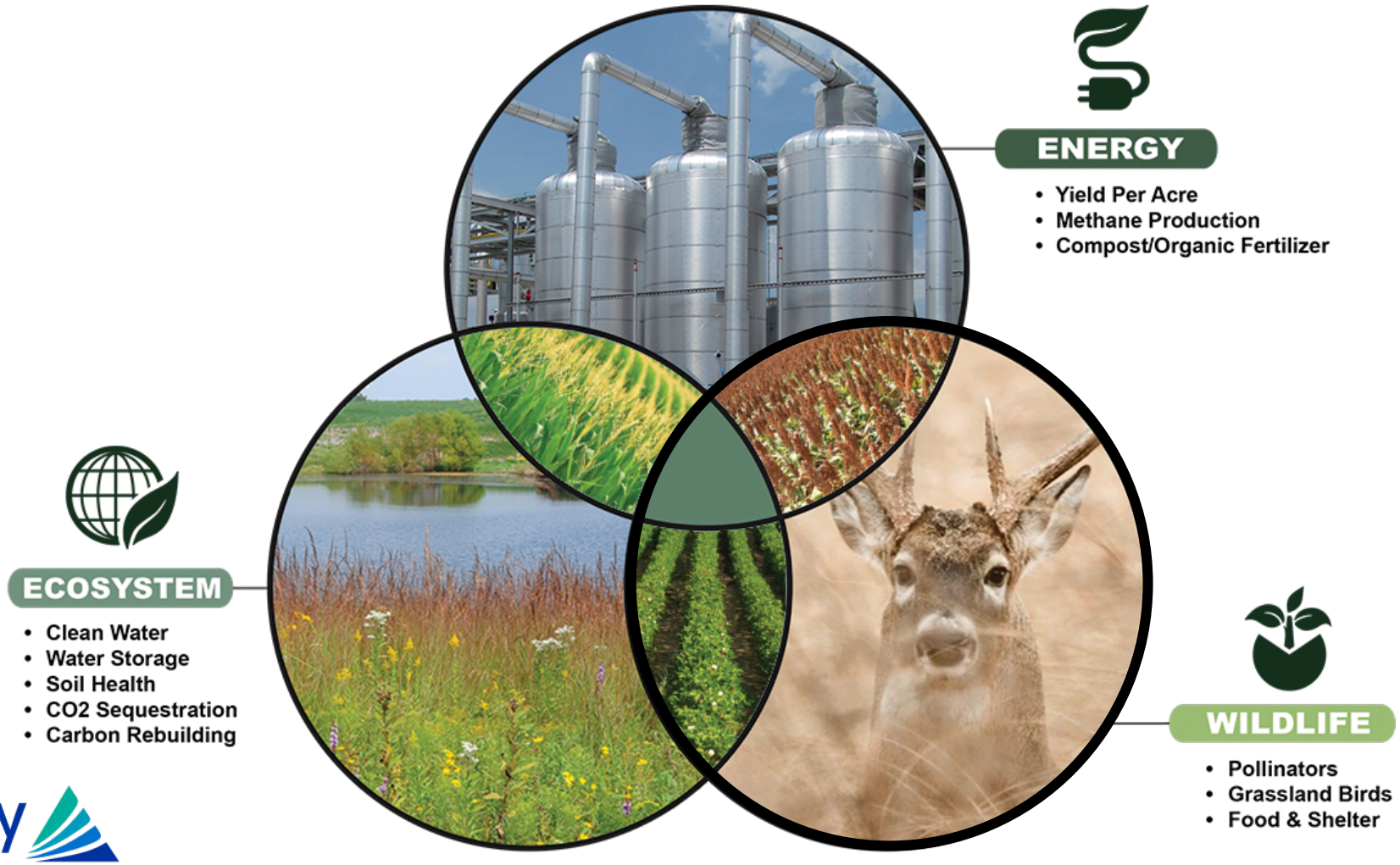
Energy, Ecosystem, and Wildlife Objectives in Balance



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Wildlife and Habitat Crisis

- Nature is declining globally at rates unprecedented in human history
- 1 million animal and plant species face extinction in the coming decades
- Nearly 40% of all species require urgent conservation action
- Native species in most major land-based habitats have fallen by at least 1/5 in 100 years

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Endangered Species Act (ESA)

- 1,600+ endangered and threatened animals and plants on the list
- 1.5 billion annual costs associated with administrating the ESA
- Burdensome and costly regulations for industry and landowners
- Broad economic impact of hundreds of billions annually
- Prairie Chicken listing estimated at 5.6 billion annual economic impact

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RAE Wildlife Benefits

- Restored native habitat for prairie and grassland species
- Improved water quality for aquatic species
- Increased nutrients in soil supporting life underground
- Supports $40 billion worth of pollinated products annually

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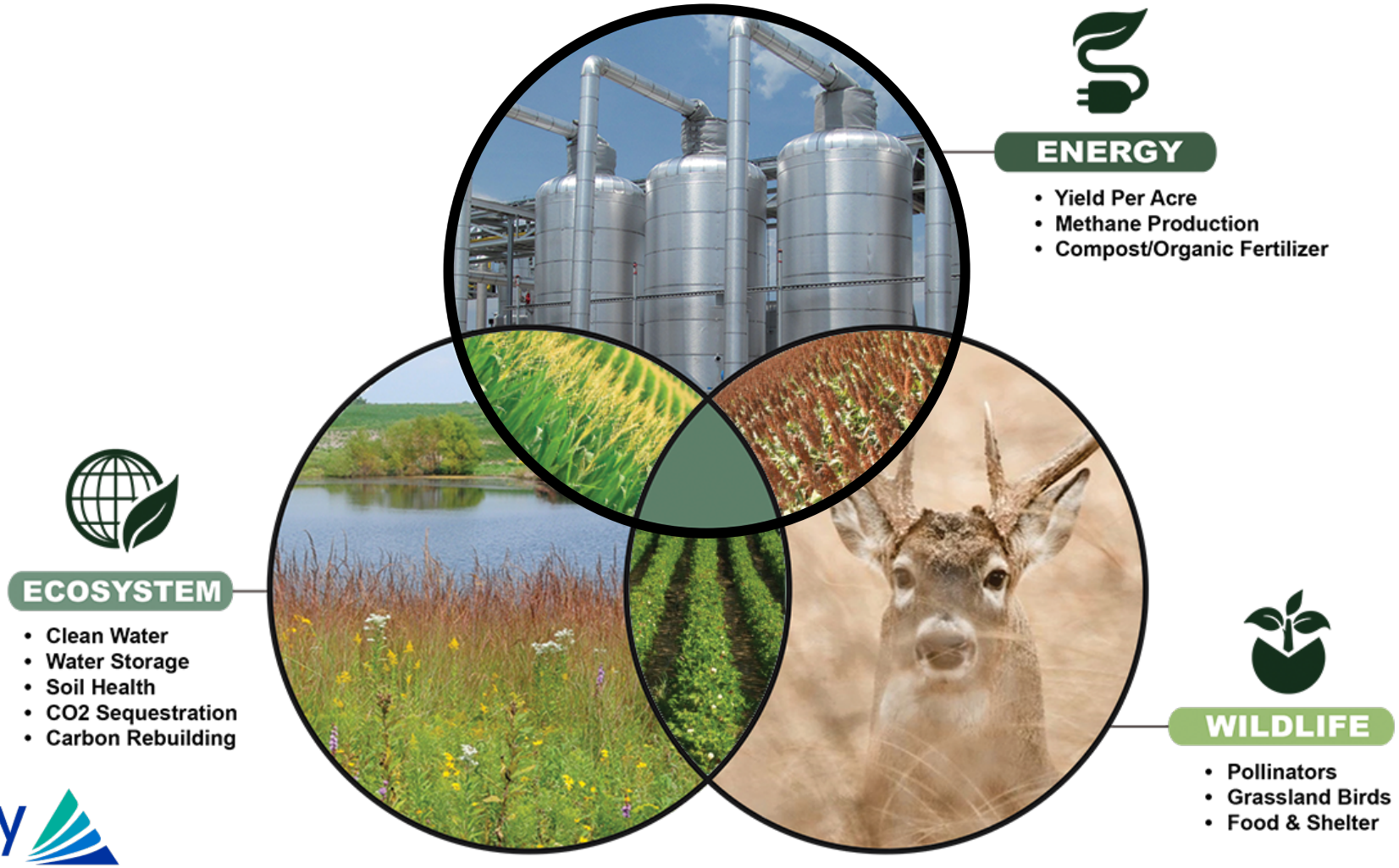

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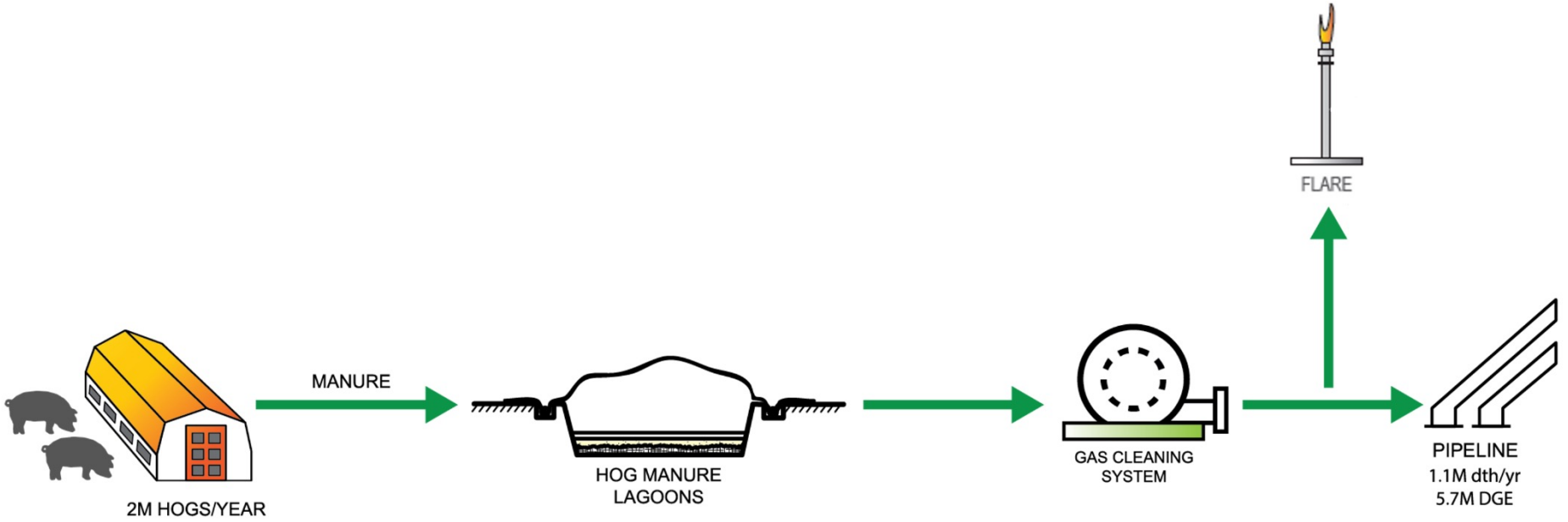
Northern Missouri Anaerobic Digestion of Manure

HOG:



BENEFITS:

- Separation of rain water from manure
- Reduced odor and pollutant emissions
- Production of renewable biofuel
- The solid fraction of the digestate is used as soil amendment.

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Environmental Considerations

- Air Permitting
- Air Dispersion Modeling
- Stormwater/Wastewater Discharge
  - CAFO
  - Construction Activities
- Land Application
- 401 Certification/404 Permitting
- Phase 1 Environmental Site Assessment
  - Historic Environmental Impacts
  - Archeological/Historic Sites
  - Endangered Species
  - Wetlands

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Air Permitting

- Single Source Determination
  - Belong to the same SIC Code?
  - Located on contiguous or adjacent properties?
  - Under the control of the same owner?
- AFO and CAFO exempted per 10 CSR 10-6.061(3)(A)2.D
- Determine potential emissions of lagoons as biogas is the raw material
  - Testing
  - Process knowledge
- Determine potential emissions from combustion emissions
  - AP-42 emission factors
  - Historical sampling
  - Mass balance

Air Permitting

- Lagoon Emissions
  - Methane
  - Carbon Dioxide
  - Volatile Organic Compounds
  - Ammonia
  - Hydrogen Sulfide
- Tail Gas Combustion Emissions
  - Particulate Matter
  - Volatile Organic Compounds
  - Sulfur Oxides
  - Nitrous Oxides
  - Carbon Dioxide

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Air Permitting

- Compare Uncontrolled Emissions to Missouri's De Minimis Thresholds
  - Hydrogen Sulfide: 10 tpy
  - Particulate Matter: 25/15/10 tpy
  - Volatile Organic Compounds: 40 tpy
  - Sulfur Oxides:40 tpy
  - Nitrous Oxides: 40 tpy
  - Carbon Dioxide: 40 tpy
- Compare Controlled Emissions to De Minimis to Determine Modeling Requirement

Air Permit Requirements

- Control Device Requirements
  - Operate all times
  - Minimum operating temperature
  - Operating and maintenance log
- Hydrogen Sulfide Sampling
- Emission Logs
  - Hydrogen Sulfide
  - Sulfur Oxides

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Stormwater/Wastewater Permitting

- CAFO General Permits
  - State Permit (No Discharge): MOGS10000
  - NPDES Permit: MOG010000
- Partnered farms are responsible for complying with the permit
- Both permits cover land application of biosolids
- Roeslein's equipment does not discharge wastewater

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Stormwater Permitting

- Land Disturbance Permit
  - Stormwater discharges associated with construction activities
  - Applicable if the land disturbed is one (1) or more acres
  - If construction of pipeline will disturb an acre or more of land this permit is required
- Requirements include:
  - Implementation of sediment control equipment
  - Development of a SWPPP
  - Weekly inspections
  - Inspections after large storm events

401 Certification/ 404 Permitting

- Required if the project involves placing material into jurisdictional waters
- Roeslein applies for these permits when the pipeline will cross wetlands, steams, lakes, or culverts under road crossings
- Requirements include:
  - Minimize stream profile changes
  - Use of clean fill only
  - Minimize vegetation clearing
  - No discharge of waste concrete

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Phase 1 Environmental Site Assessment

- Optional assessment done to ensure land was not historically impacted
- Ensures that Roeslein identifies potential archeological/historic sites, endangered species, and wetlands
- Will be used to change project if any vulnerable sites are identified

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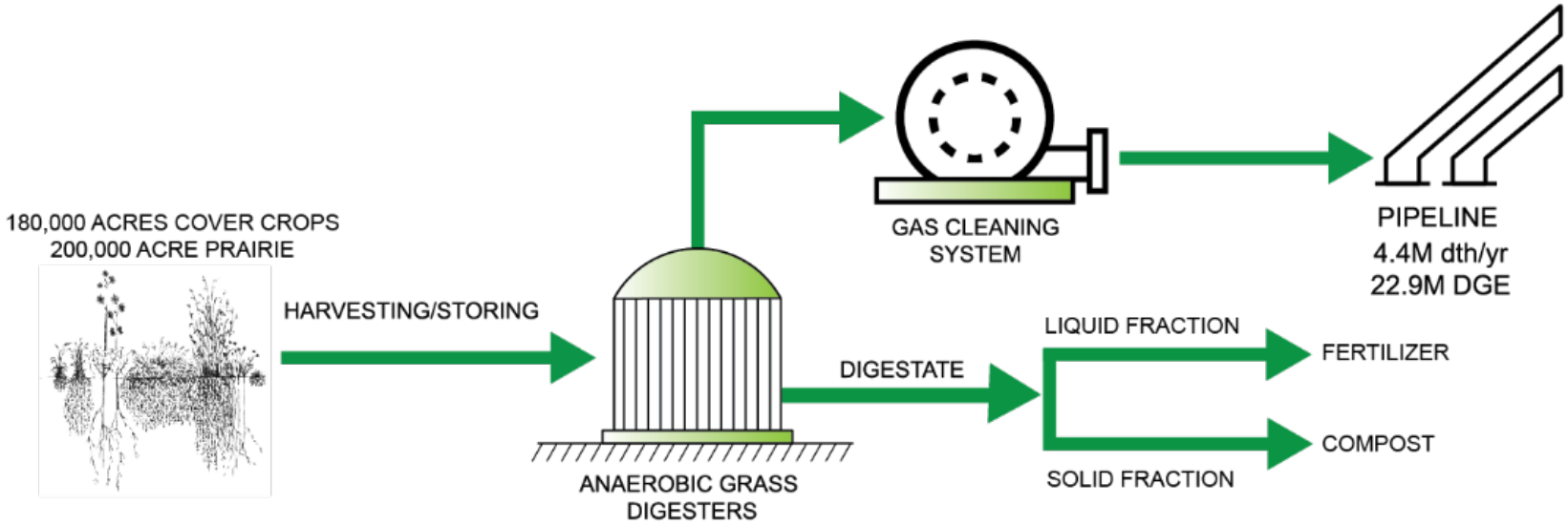
Northern Missouri Anaerobic Digestion of Cover Crops & Prairie

COVER CROPS & PRAIRIE:



BENEFITS: Ecological Services

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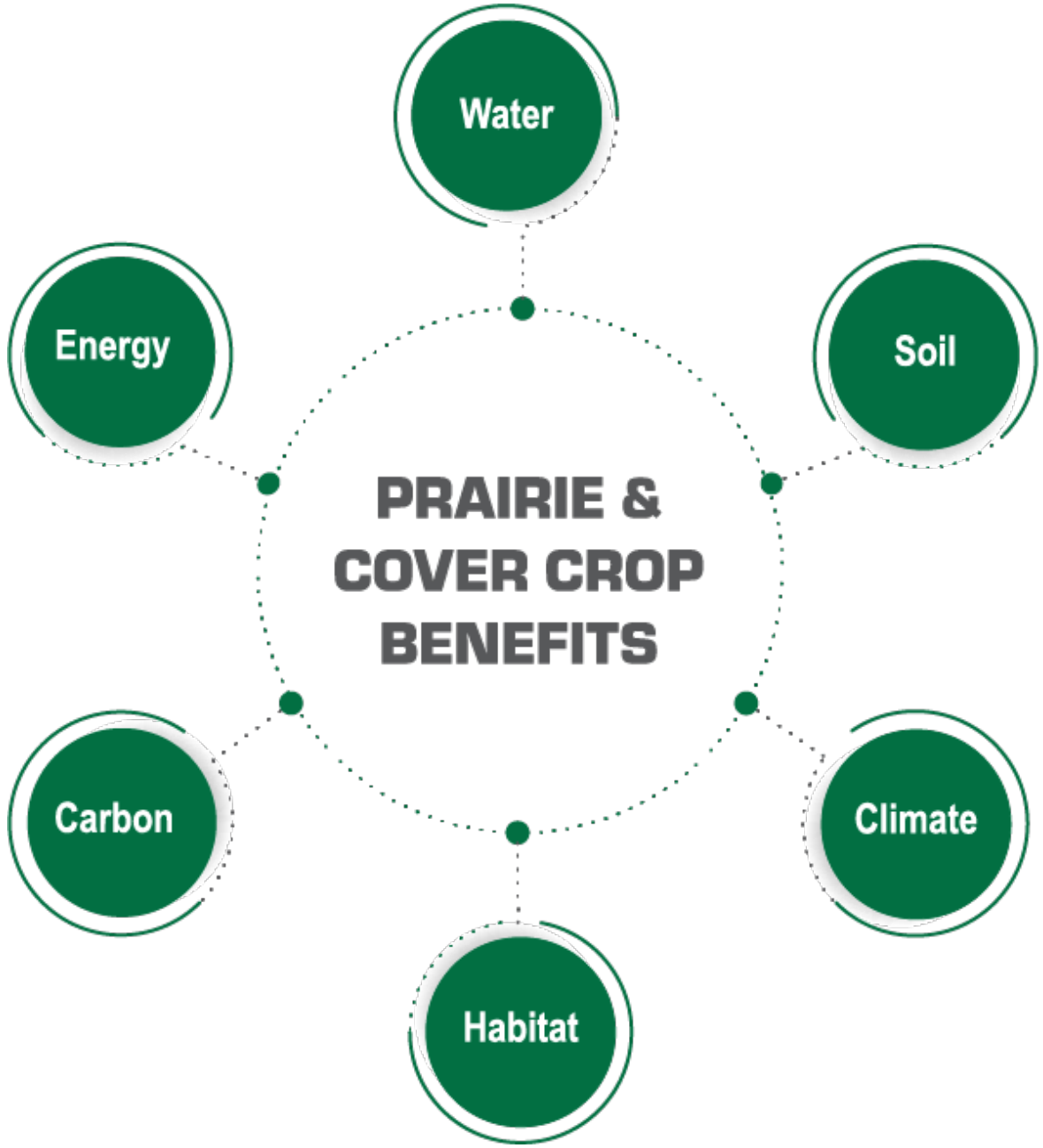
Eco Services



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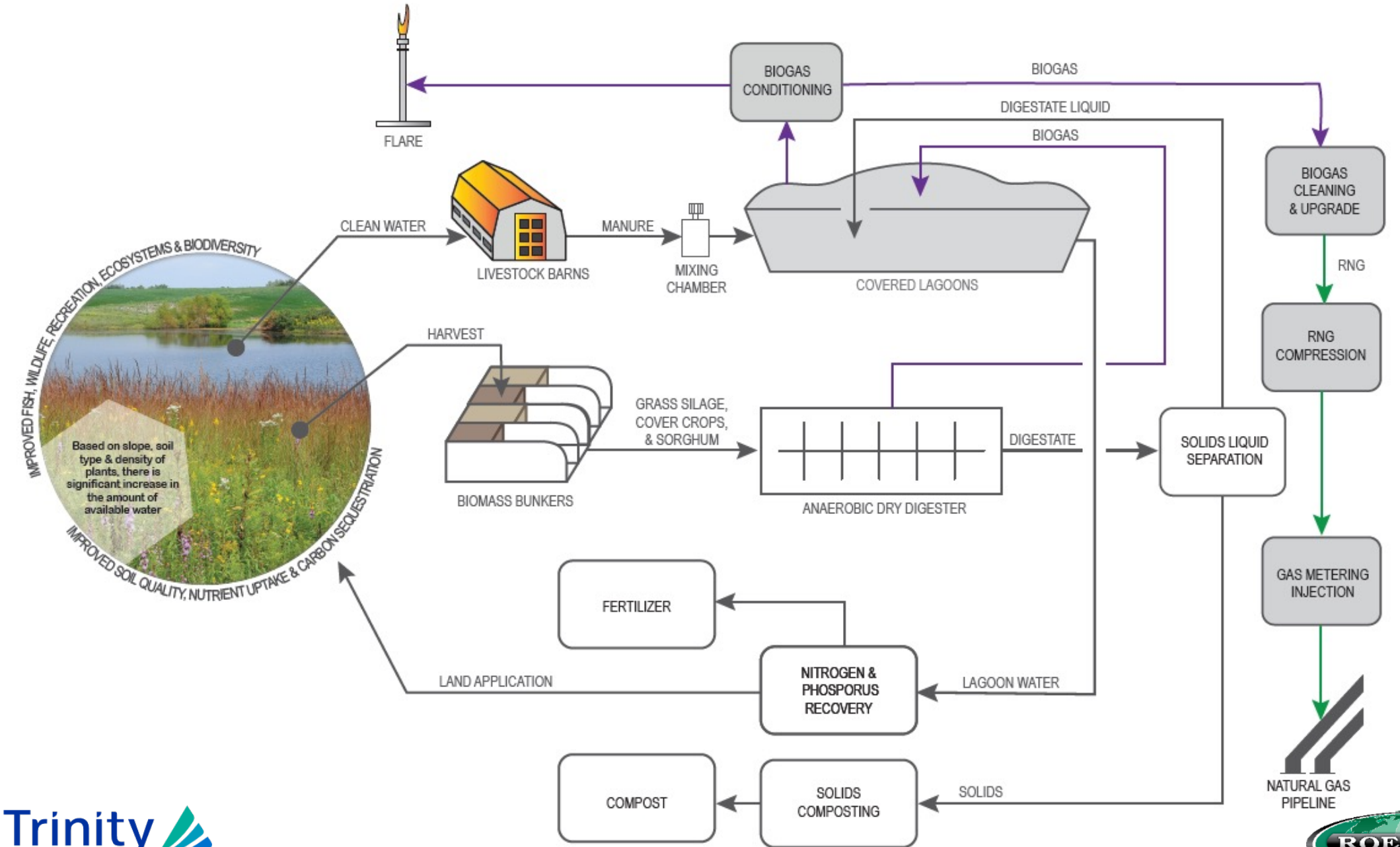

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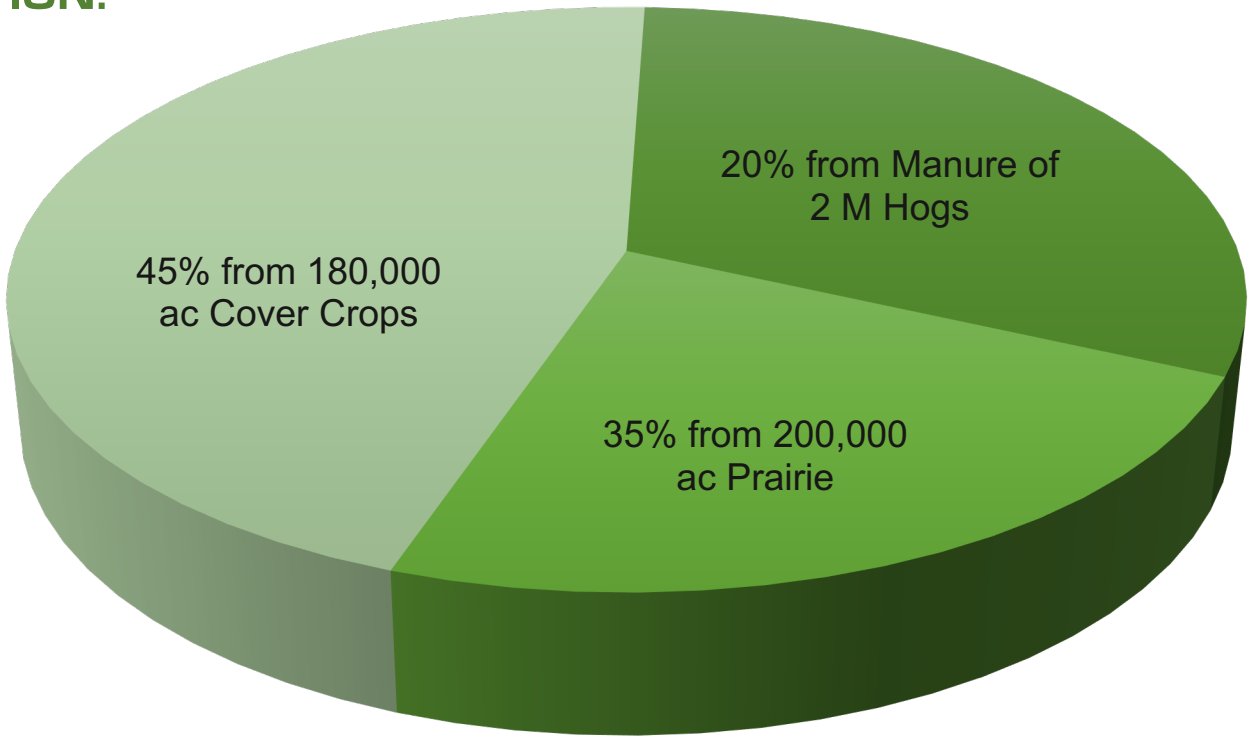
Northern Missouri Ag Potential of 5.5M dth/year

SOURCES OF ENERGY GENERATION:



REVENUE POTENTIAL OF $243M

EQUIVILANT TO REMOVING 29M DIESEL GALLONS

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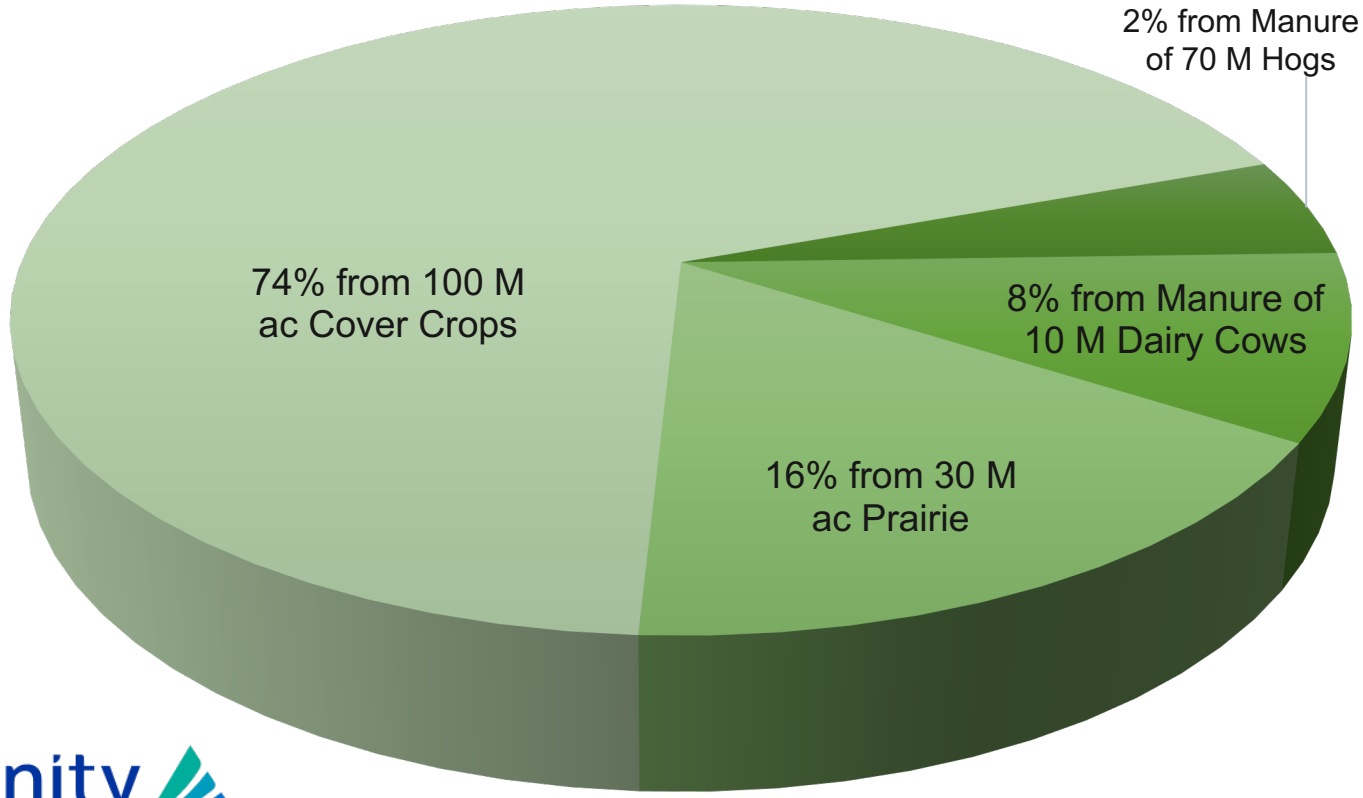
US Ag Production Potential of 1.8B dth/year

SOURCES OF ENERGY GENERATION:



REVENUE POTENTIAL OF $63.6 B

EQUIVILANT TO REMOVING 9.5B DIESEL GALLONS

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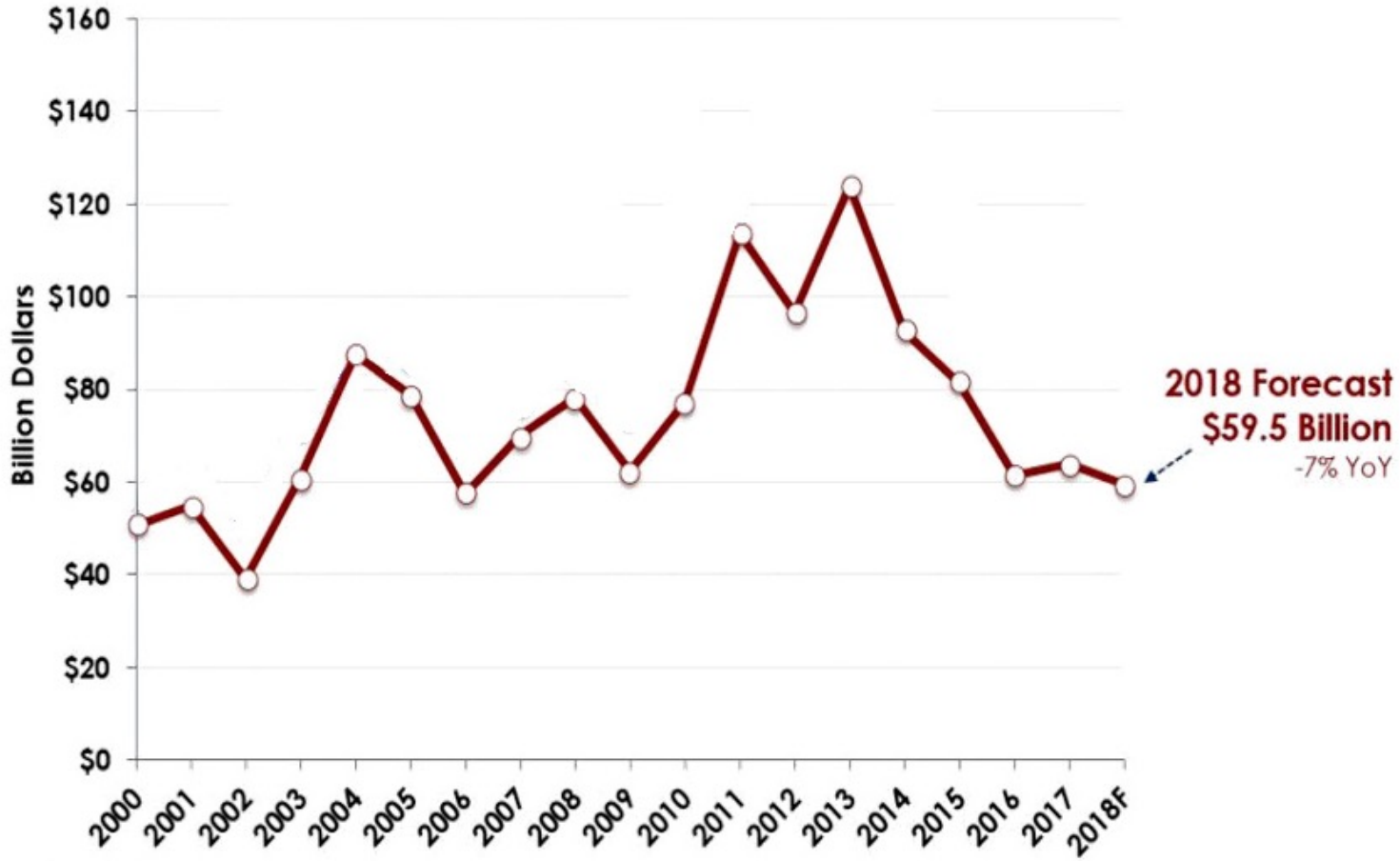
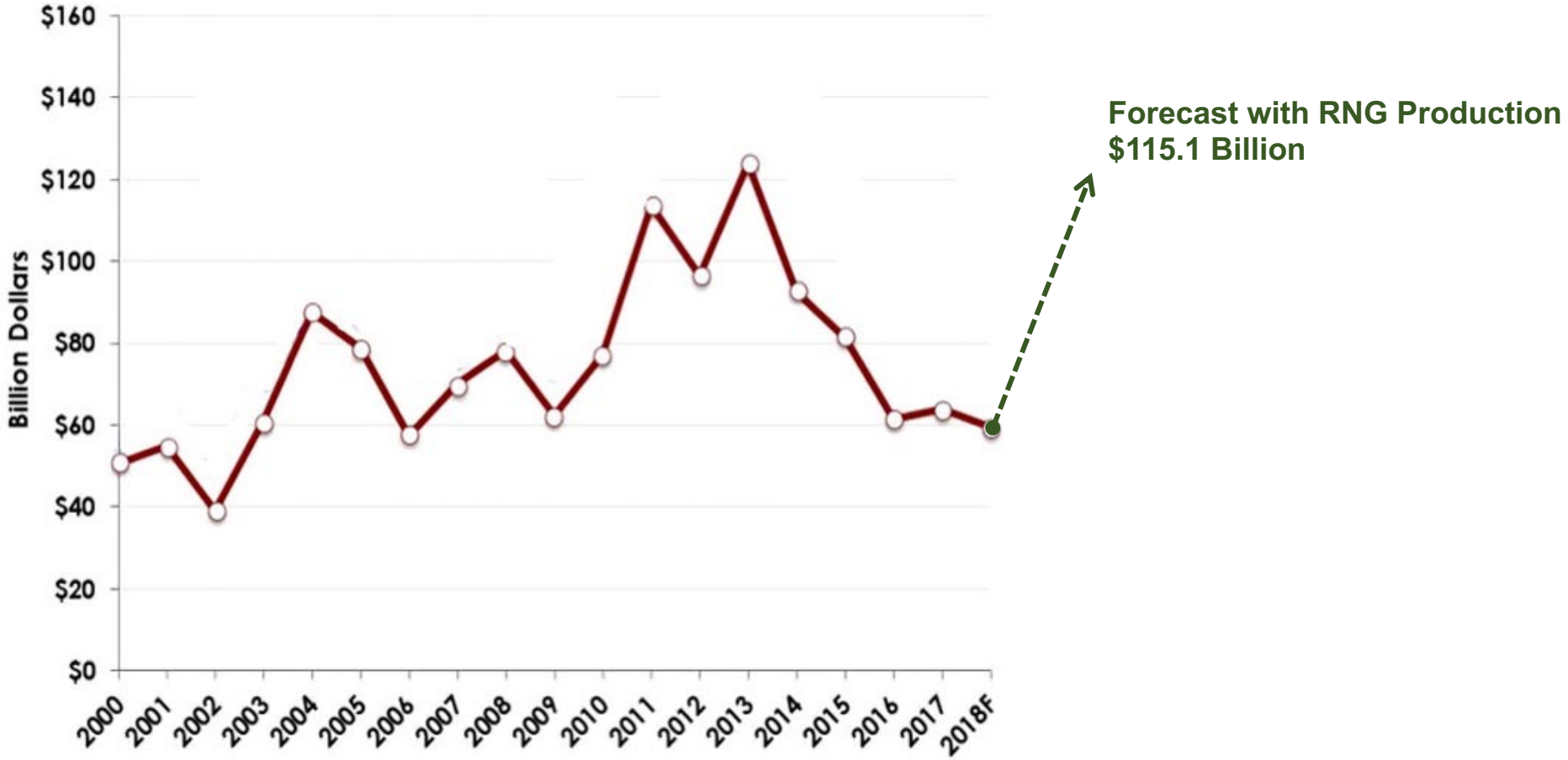
Net Farm Income



Source: USDA ERS

Net Farm Income with RNG Production



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FARM BUREAU

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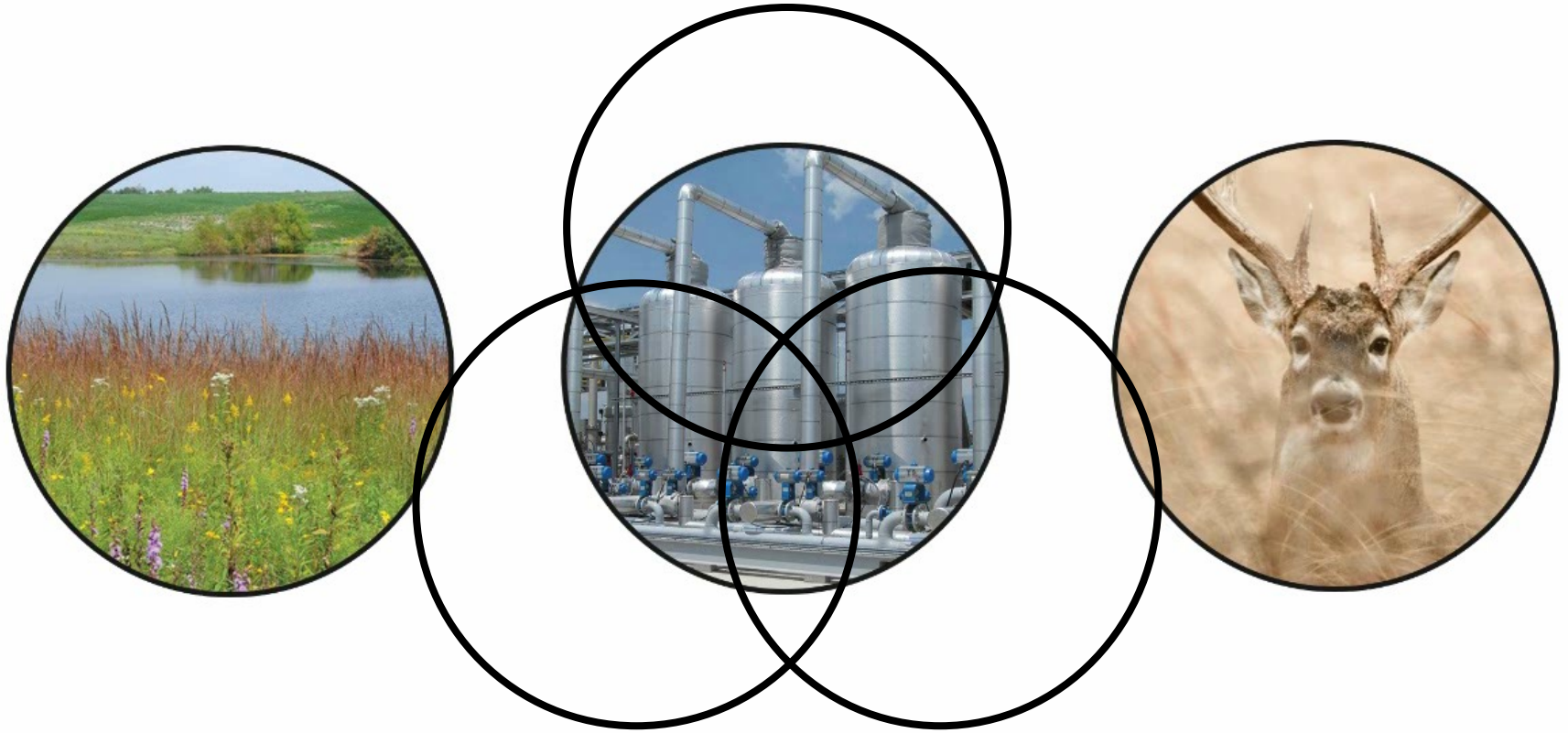

Combining Energy, Ecosystem, and Wildlife for a Sustainable Solution

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Thank You

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