Introduction to Livestock GRACEnet and how ARS Research can be Transferred to NRCS

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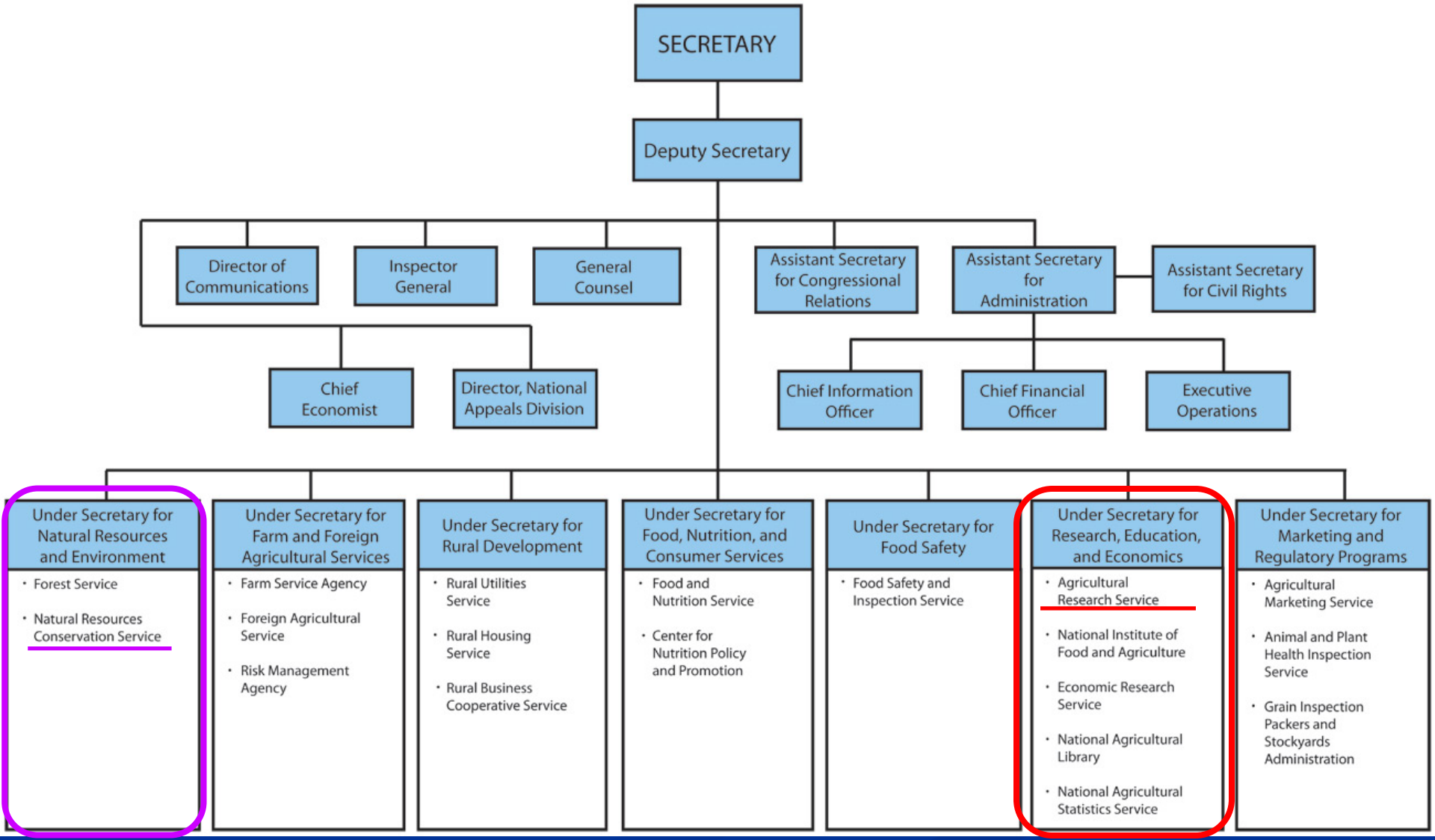
United States Department of Agricultural



USDA - Agricultural Research Service

In-house research agency for the USDA.

Our job is finding solutions to agricultural problems that affect Americans every day, from field to table such as:

- Protecting crops and livestock from pests and disease.
- Improving the quality and safety of agricultural products.
- Determining the best nutrition for people from infancy to old age.
- Sustaining our soil and other natural resources.
- Ensuring profitability for farmers and processors.
- Keeping costs down for consumers.

USDA ars Agricultural Research Service
www.ars.usda.gov

ARS National Programs

Animal Production & Protection	Crop Production & Protection	Nutrition, Food Safety & Quality	Natural Resources & Sustainable Agricultural Systems
• Food Animal Production • Animal Health • Veterinary, Medical and Urban Entomology • Aquaculture	• Plant Genetic Resources, Genomics and Genetic Improvement • Plant Biology & Molecular Processes • Plant Diseases • Crop Protection & Quarantine • Crop Production • Methyl Bromide Alternatives	• Human Nutrition • Food Safety (animal and plant products) • Quality & Utilization of Agricultural Products	• Water Availability and Watershed Management • Climate Change, Soils and Emissions • Agricultural and Industrial Byproducts • Pasture, Forage and Range Land Systems • Agricultural System Competitiveness and Sustainability • Bioenergy

USDA Agricultural Research Service

2000 Scientists, 90+ locations, $1.1 billion budget

USDA NRCS

Originally established as the Soil Conservation Service now expanded to wider conservation services

NRCS works with landowners through conservation planning and assistance designed to benefit the soil, water, air, plants, and animals that result in productive lands and healthy ecosystems

Linking ARS and NRCS

ARS Technology Transfer

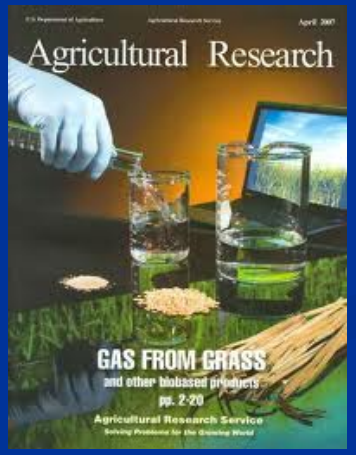
ARS's Office of Technology Transfer helps move ARS research discoveries to the marketplace.

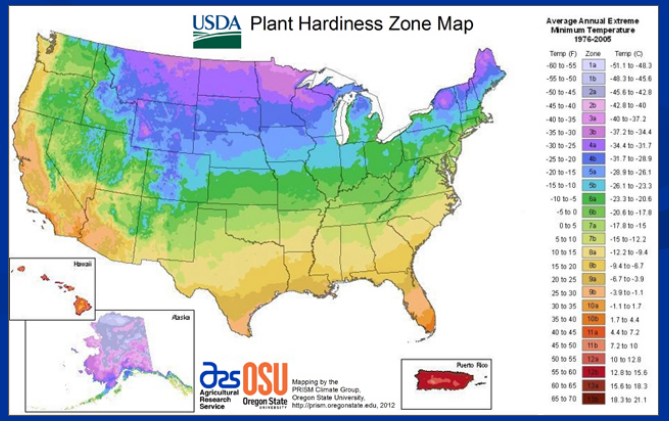
Technology Transfer is also transferring research to our stakeholders including:

- Producers
- Public
- Government Agencies (NRCS, EPA, etc.)

Technology Transfer can be accomplished via:

- Publications
- Presentations
- Webinars
- Factsheets
- Websites
- etc.



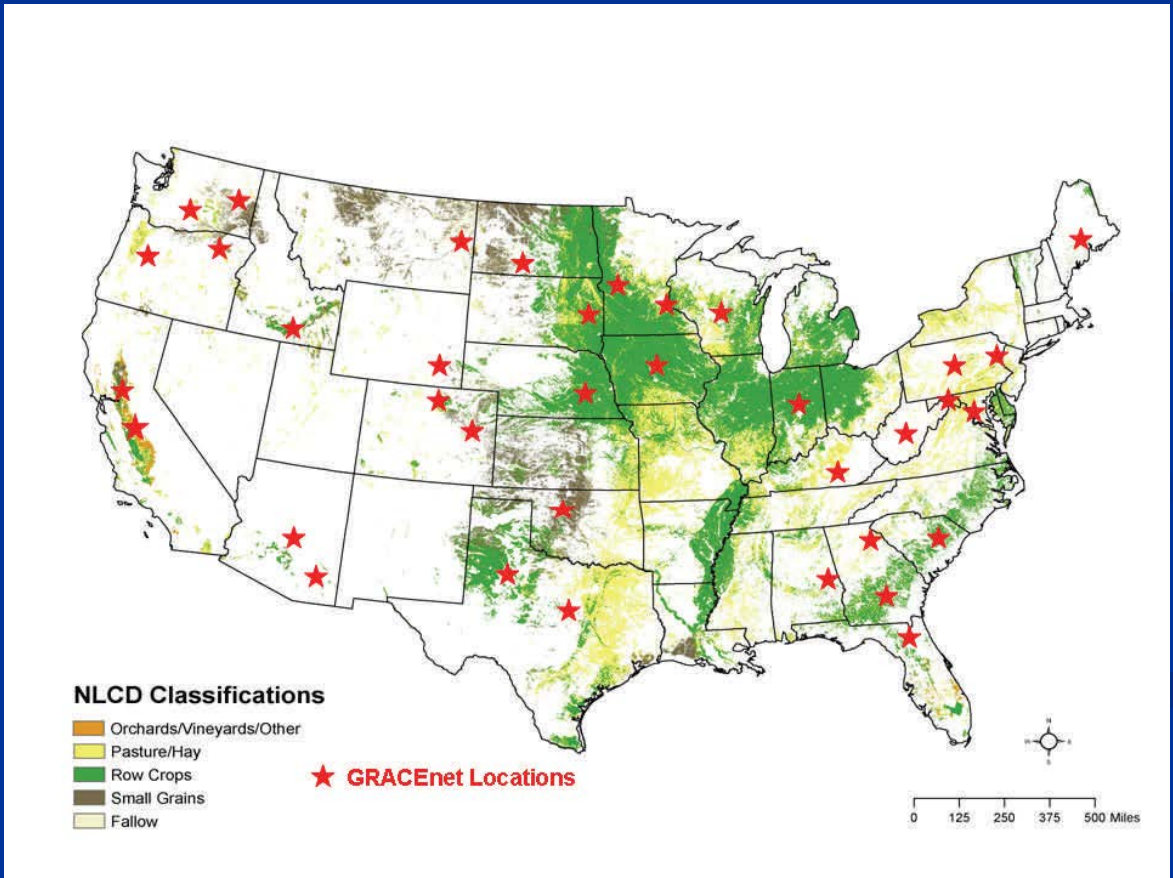


Livestock GRACEnet
Another vehicle for Technology Transfer?

GRACEnet Project

Greenhouse gas Reduction through Agricultural Carbon Enhancement network

A nationwide research program administered by USDA-ARS to assess soil carbon sequestration and greenhouse gas mitigation by agricultural management



GRACEnet Objectives

1. Evaluate status and direction of change in soil carbon for typical and alternative agricultural systems

2. Determine net greenhouse gas emissions (carbon dioxide, nitrous oxide, methane) of current agricultural systems for typical and alternative agricultural systems

3. Determine the environmental effects (water, air and soil quality) of agricultural systems developed to reduce greenhouse gas emission and increase soil carbon storage

GRACEnet Approach

1. Business as usual in production agriculture for various areas of the country.
   What is the carbon accumulation/loss rate under typical agricultural management?

2. Maximizing carbon sequestration rate.
   What can be done to reach the highest carbon sequestration rate?

3. Minimizing net greenhouse gas emission.
   Agriculture is the main source of nitrous oxide and methane to the atmosphere. Practices will be developed to decrease the emission of these gases.

4. Maximizing environmental benefits by improving water, air, and soil quality.
   This scenario investigates management systems to optimize both agricultural and environmental benefits by sequestering soil carbon and decreasing greenhouse gas emissions.

GRACEnet Products

1. Sampling protocols
   Available for download on the website

2. Publications
   Multiple peer reviewed publications, Special Collections papers (Soil & Tillage Research) "Greenhouse Gas Contributions and Mitigation Potential in Agricultural Regions of North America" and book "Managing Agricultural Greenhouse Gasses"

3. Database
   Data from GRACEnet projects which can be used for model validation, testing, etc.

Livestock GRACEnet

…a USDA ARS working group focused on atmospheric emissions from livestock production.

Livestock GRACEnet Mission

…to lead the development of livestock management practices to reduce greenhouse gas, ammonia, and other emissions and provide a sound scientific basis for accurate measurement and modeling of emissions from livestock agriculture.

We will accomplish this by:

- Collaborating in the identification and further development of appropriate management practices
- Supporting policy-makers' and regulators' need for consistent, reliable data and information
- Fostering scientific transparency and rigor
- Transferring new knowledge efficiently to stakeholders and the scientific community

Livestock GRACEnet Objectives

1. Develop emission factors for NH_3, CH_4, N_2O, and VOCs from animal production facilities based on animal type, production scenario and climatic conditions

2. Identify and develop livestock management and manure handling systems to reduce emissions.

Livestock GRACEnet Approach

1. Business as usual.
   What is the emission rate under typical management practices? Theses business as usual systems should be economically viable and used by the majority of producers in that region.

2. Optimize nutrient utilization (e.g. Dietary protein) and capture and reduce losses.
   What has been done to achieve the highest reduction in emissions from that production system?

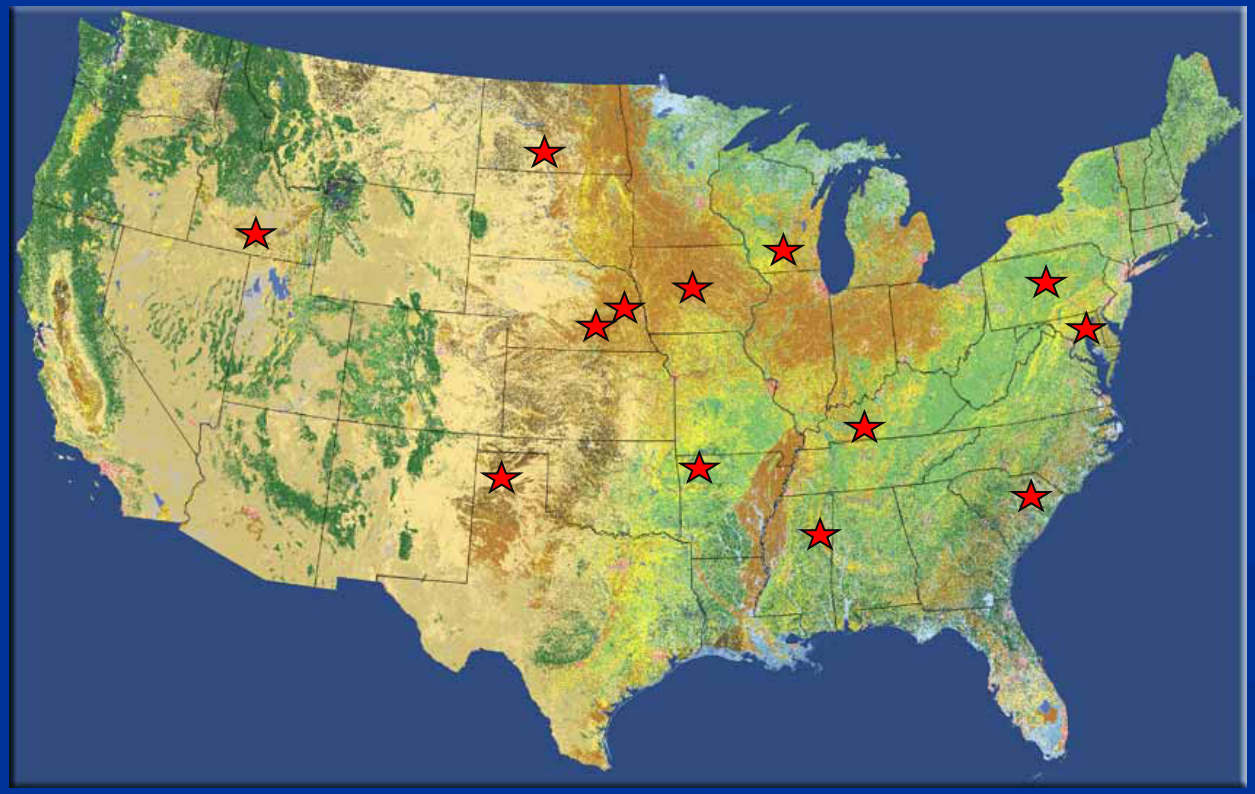
3. Maximizing environmental benefits.
   Reducing emissions may become part of a larger conservation benefit package. Producers and policy makers will be interested in tradeoffs among management options. With careful management how can emission be balanced with water quality, air quality and animal production/health goals?

Livestock GRACEnet Products

1. A national database of emissions from a range of species, production scenarios, and climatic conditions.
2. Regional and national guidelines related to estimating emission factors from animal production facilities.
3. Regional and national guidelines of management practices to reduce emissions from production facilities.
4. Development and evaluation of process based models to estimate emissions from production facilities and whole farm systems
5. Summary papers for action agencies and policy makers based on the current state of knowledge.

Livestock GRACEnet Members

ARS workgroup focusing on the effects of livestock production on emissions and air quality (beef, dairy, poultry, swine).



24 Scientists

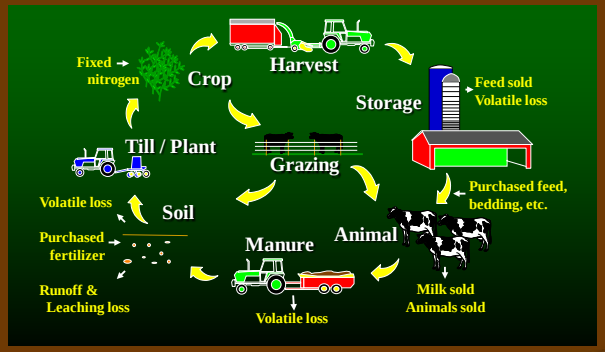
13 Locations

Livestock GRACEnet Research

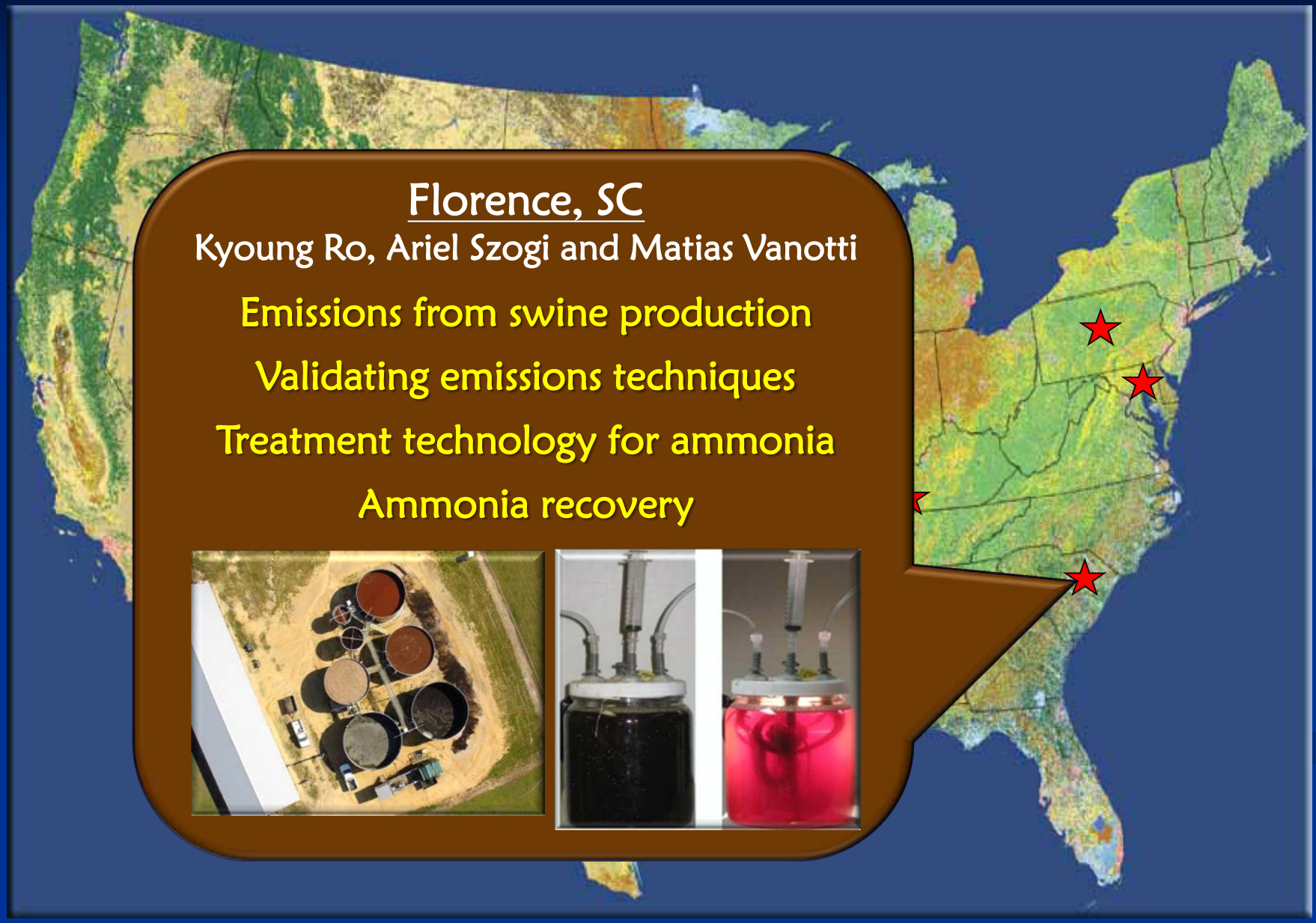
University Park, PA
Al Rotz

Whole farm systems modeling to estimate emissions and nutrient losses

Integrated Farm System Model
Dairy Gas Emissions Model
Dairy GHG



Livestock GRACEnet Research



Florence, SC

Kyoung Ro, Ariel Szogi and Matias Vanotti

Emissions from swine production

Validating emissions techniques

Treatment technology for ammonia

Ammonia recovery

Livestock GRACEnet Research

Bowling Green, KY

Karamat Sistani, Kim Cook, John Loughrin, Nanh Lovanh, Phil Silva

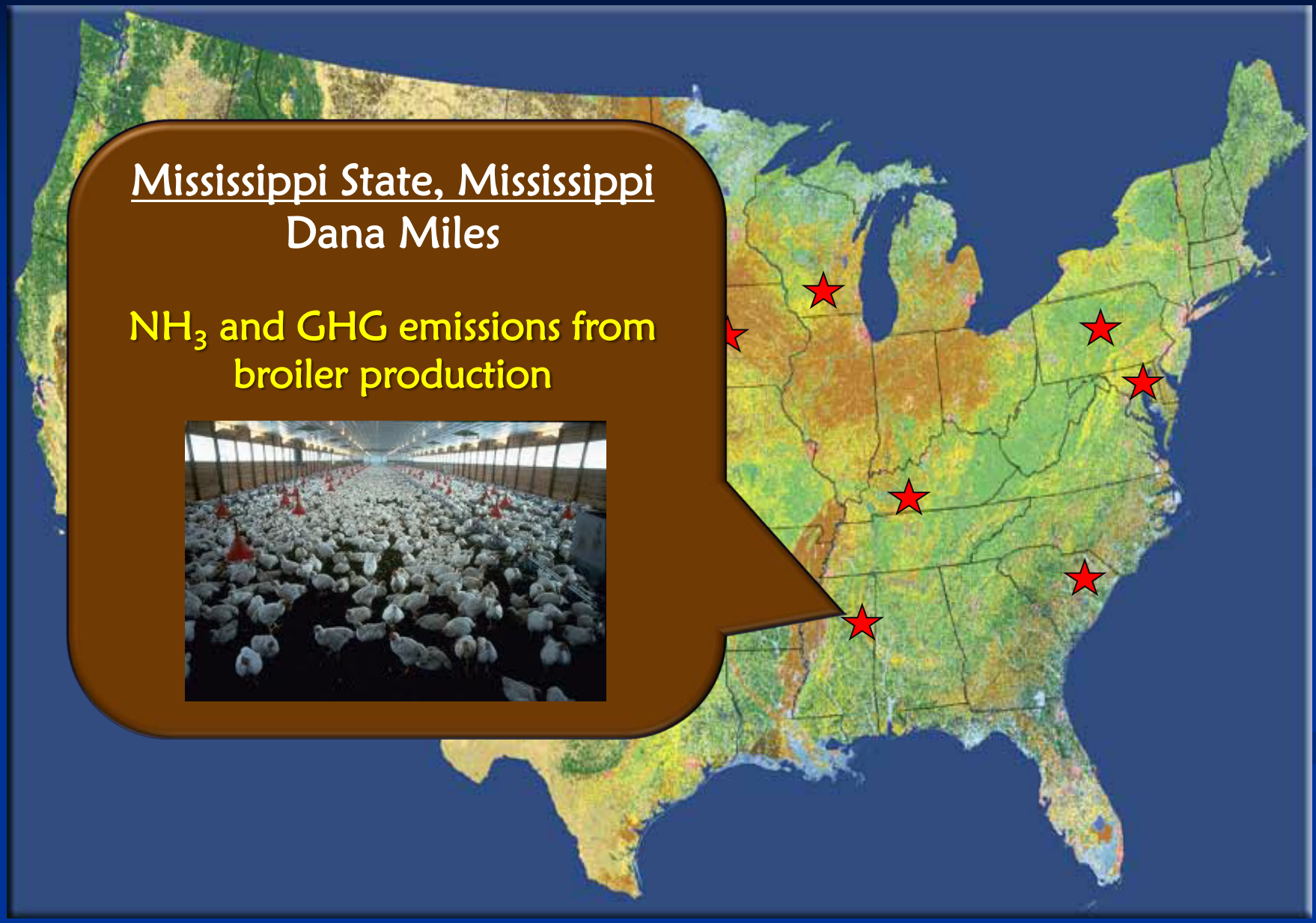
NH_3 and N_2O emissions from high rise swine housing

NH_3 from manure windrows

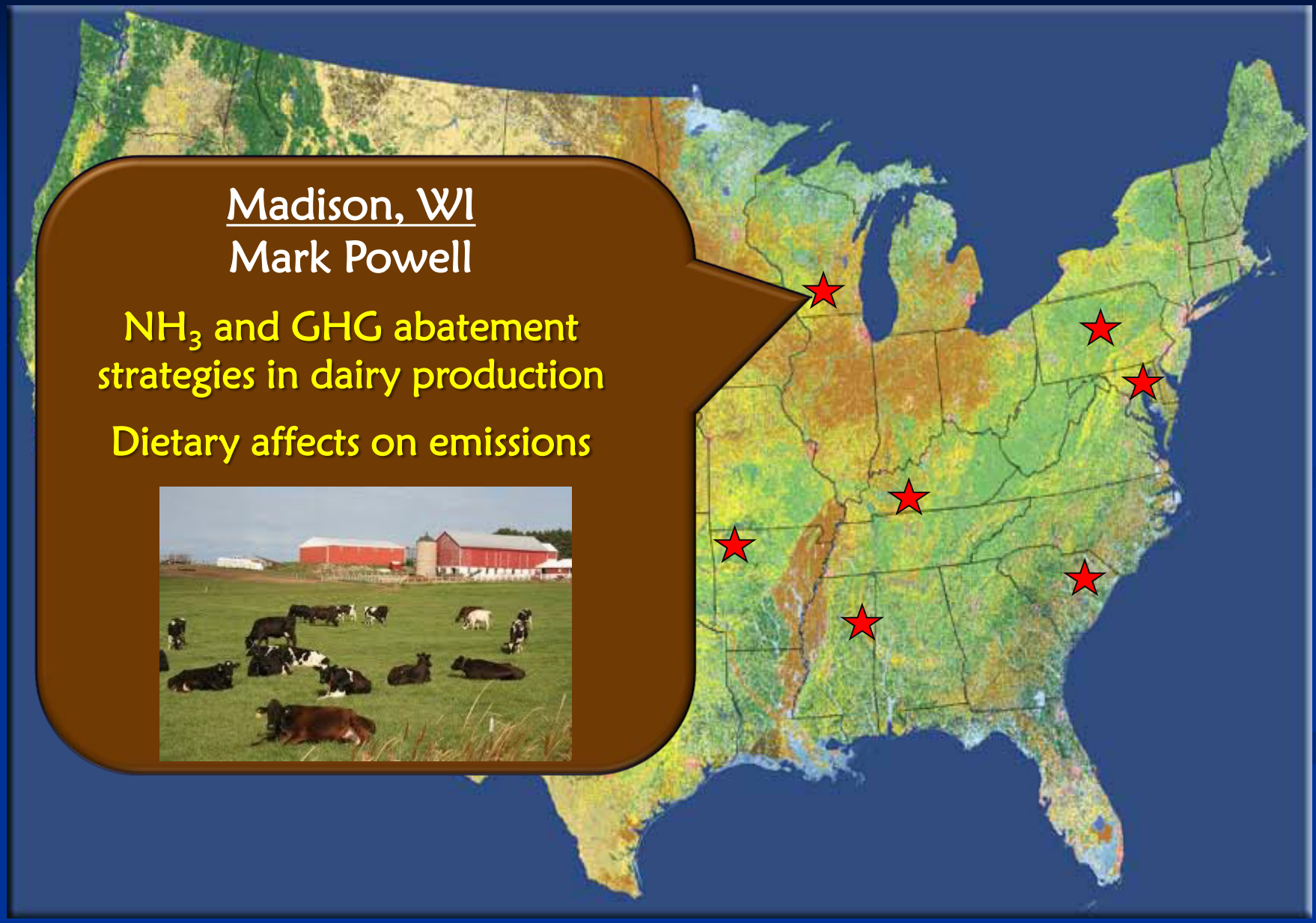
NH_3 and N_2O from manure land application

Odor from anaerobic swine lagoons

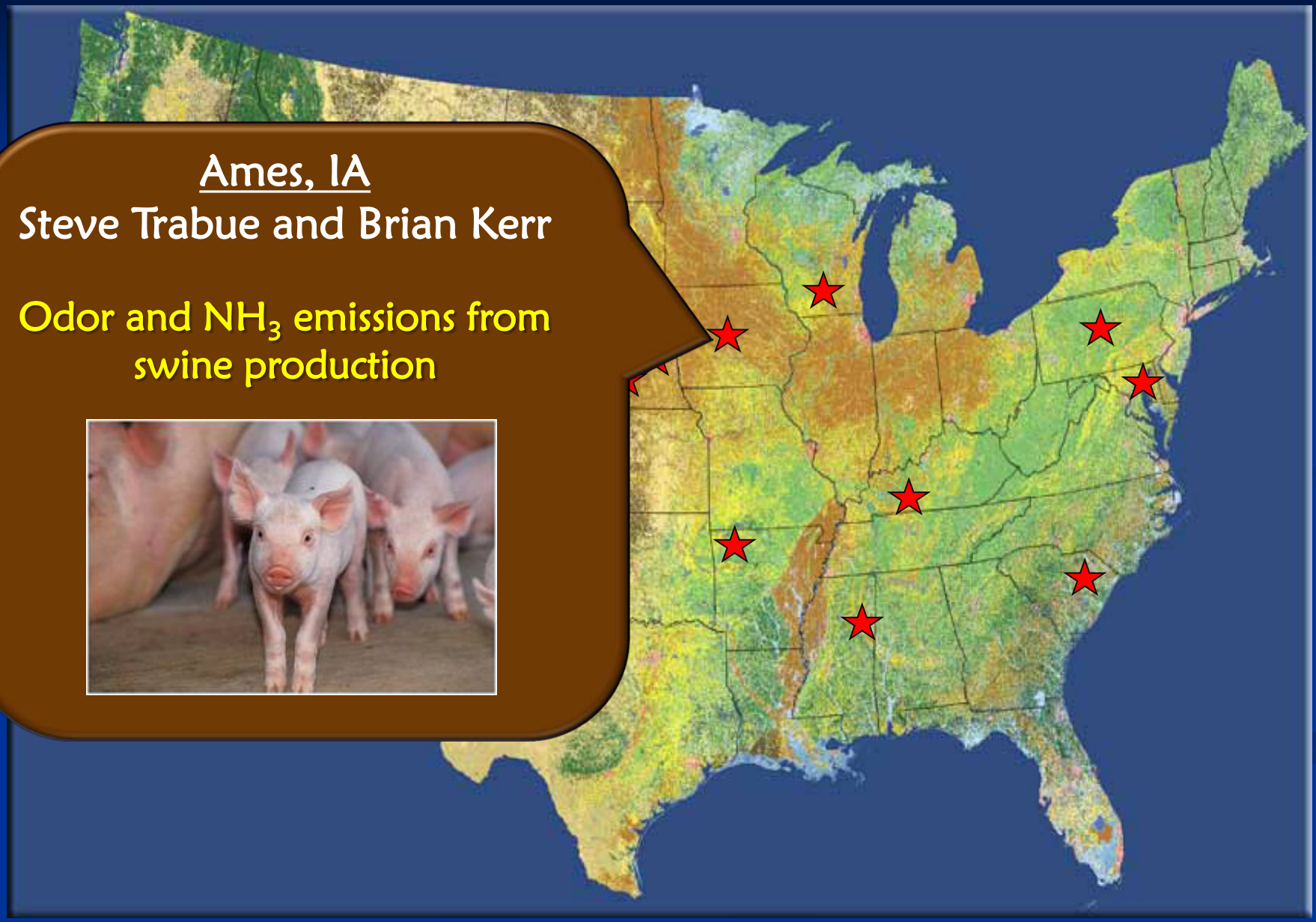
Livestock GRACEnet Research



Livestock GRACEnet Research



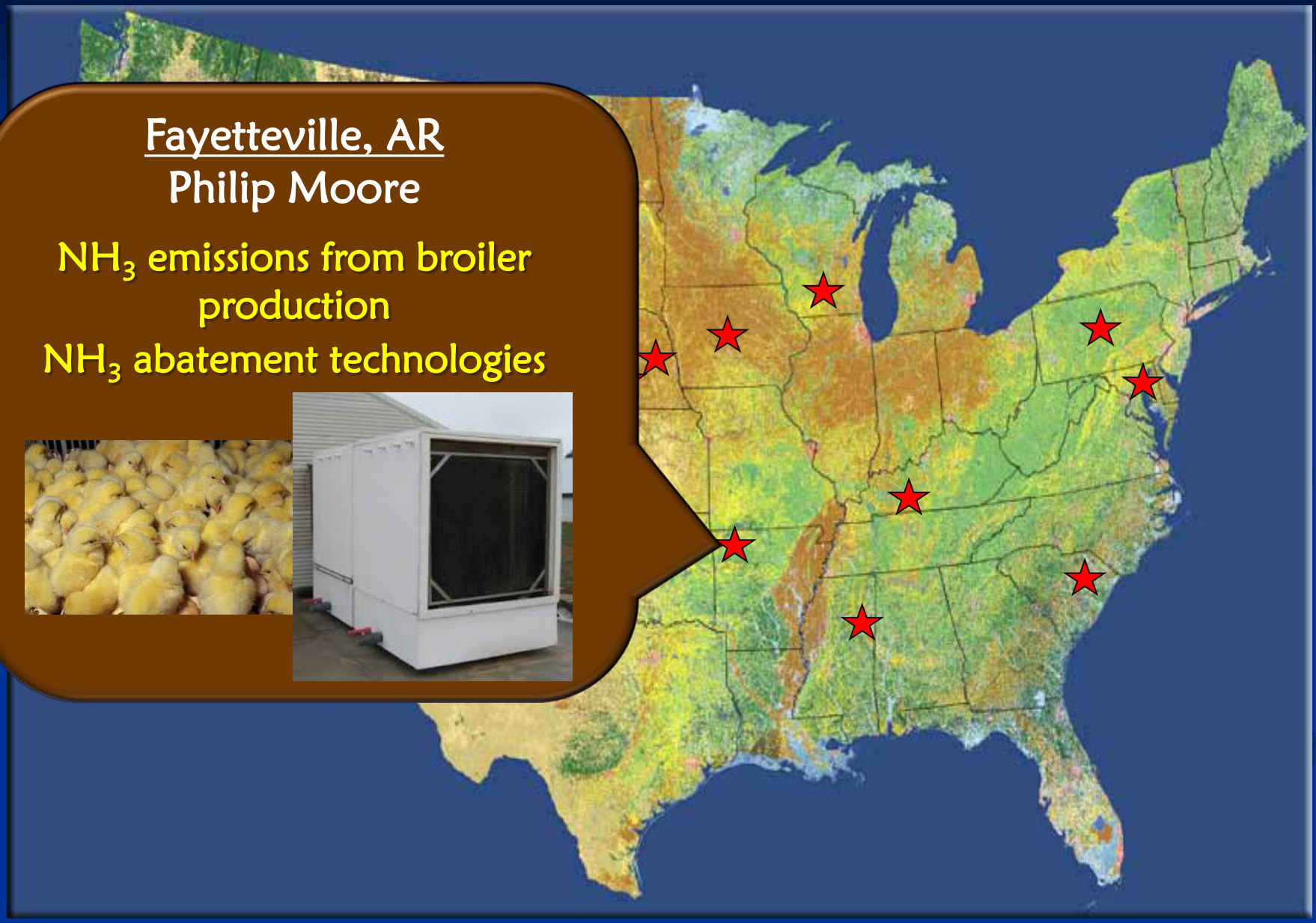
Livestock GRACEnet Research



Ames, IA
Steve Trabue and Brian Kerr

Odor and NH_3 emissions from swine production

Livestock GRACEnet Research



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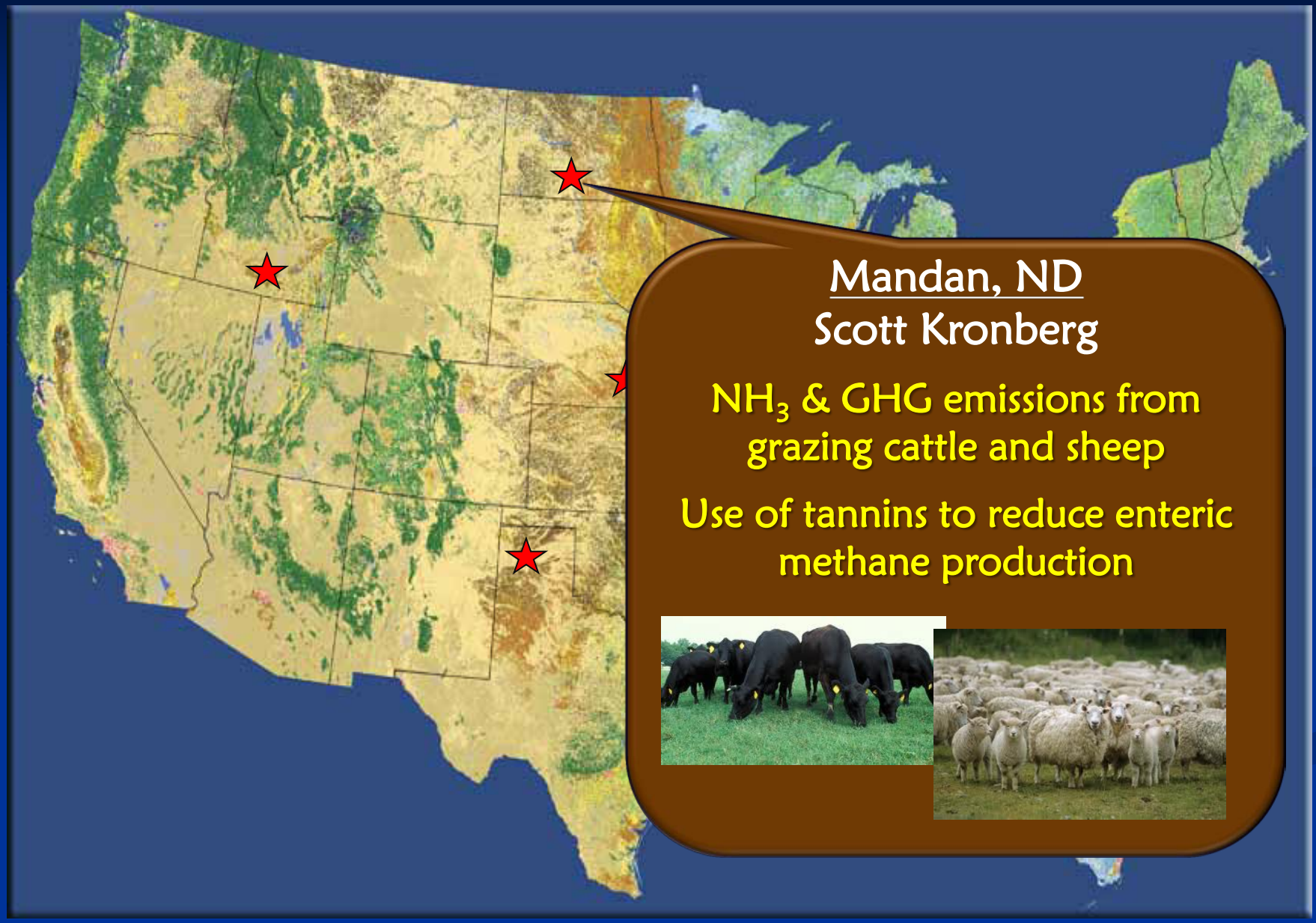


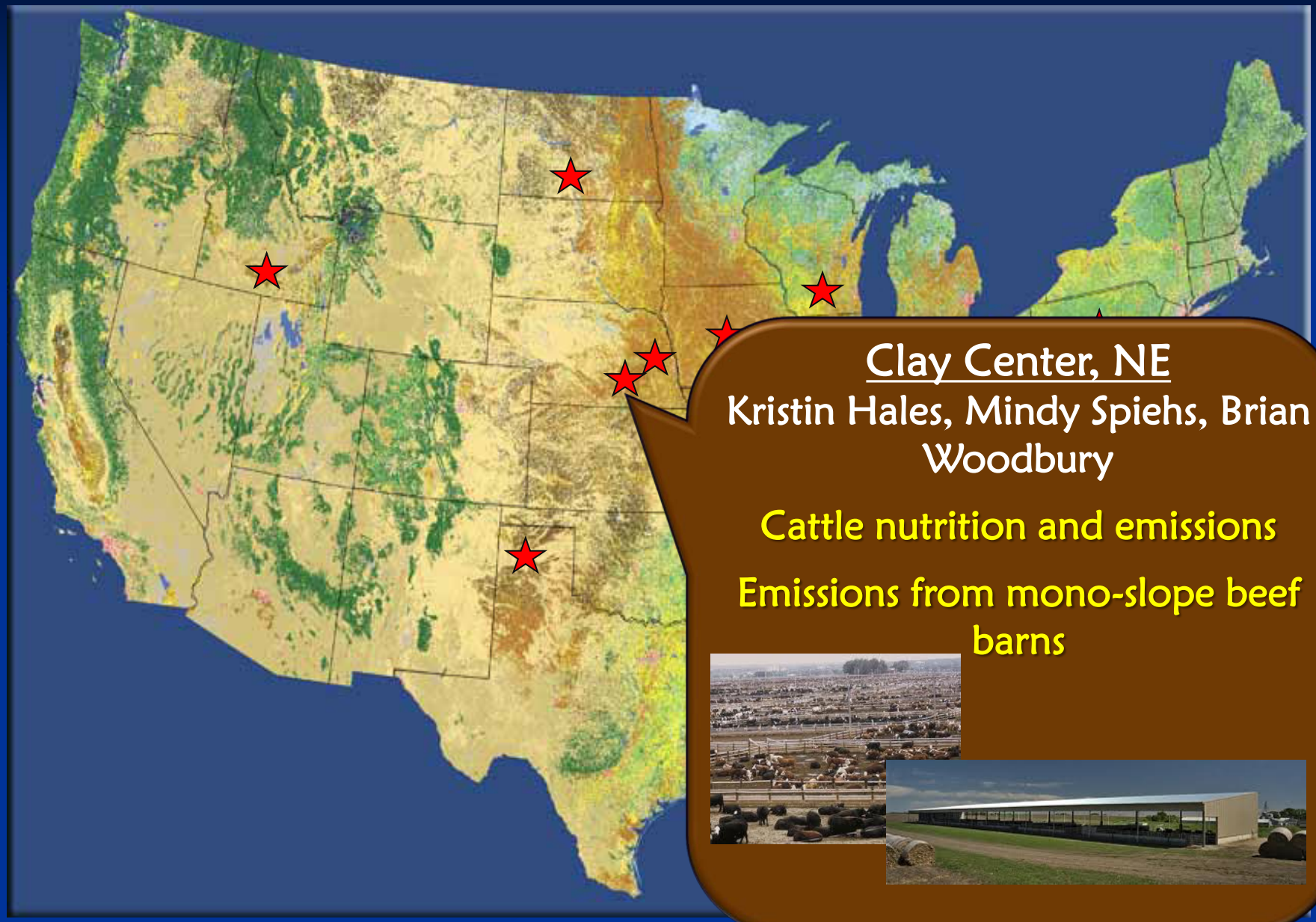
Mandan, ND

Scott Kronberg

NH_3 & GHG emissions from grazing cattle and sheep

Use of tannins to reduce enteric methane production

Livestock GRACEnet Research



Clay Center, NE

Kristin Hales, Mindy Spiehs, Brian Woodbury

Cattle nutrition and emissions

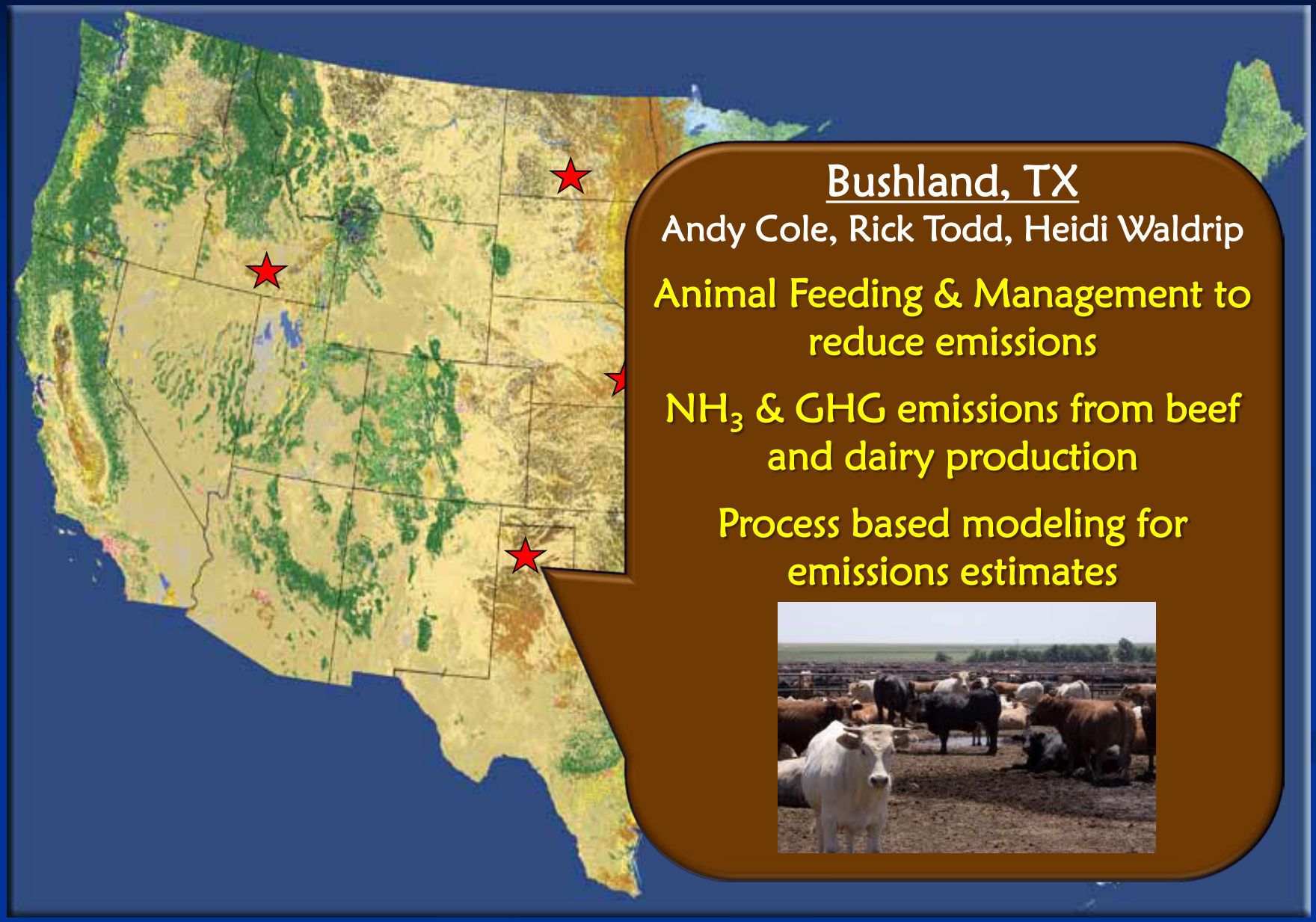
Emissions from mono-slope beef barns

Livestock GRACEnet Research

Lincoln, NE
Dan Miller

H_2S and odor emissions

Livestock GRACEnet Research



Bushland, TX

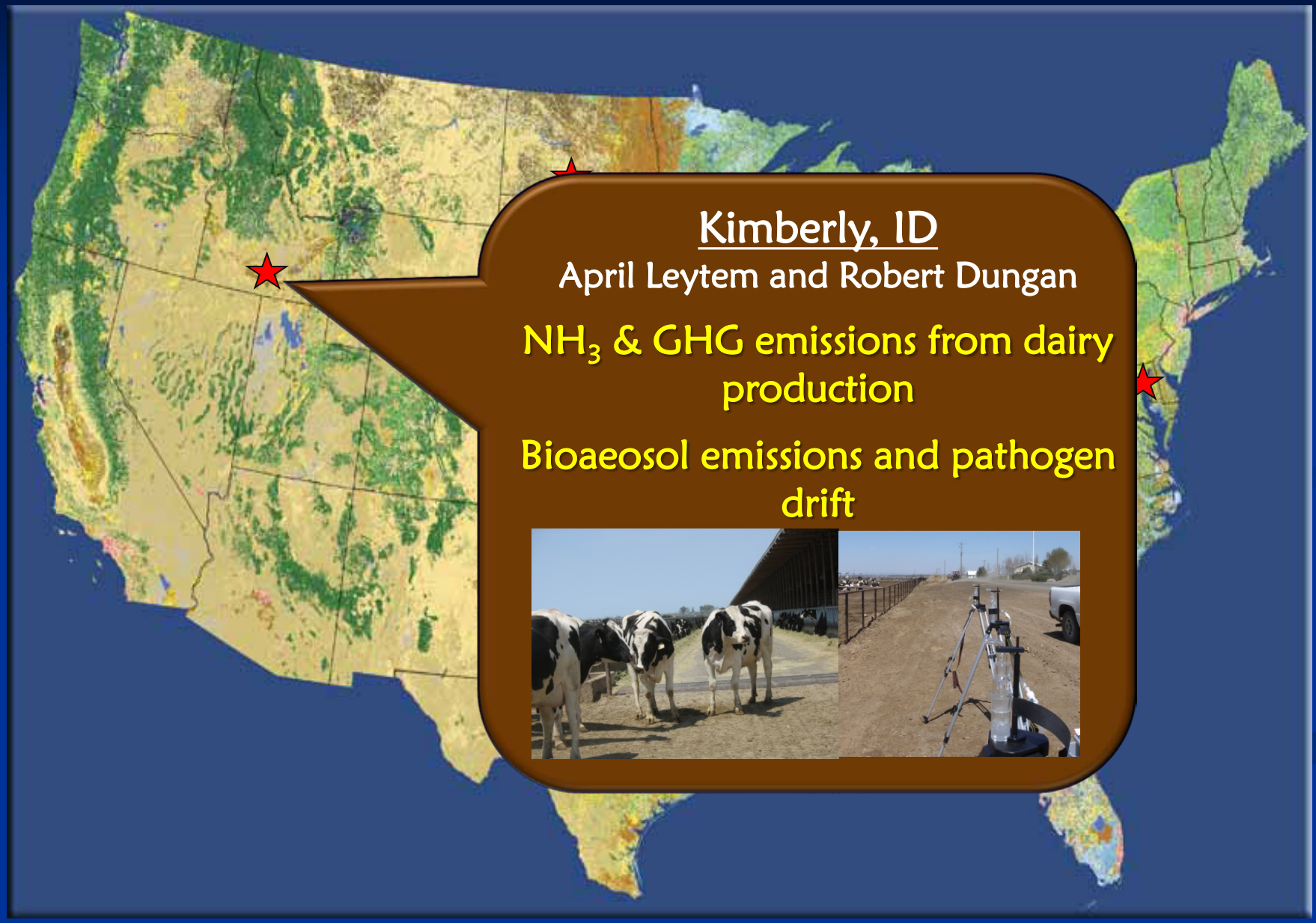
Andy Cole, Rick Todd, Heidi Waldrip

Animal Feeding & Management to reduce emissions

NH_3 & GHG emissions from beef and dairy production

Process based modeling for emissions estimates

Livestock GRACEnet Research



Kimberly, ID

April Leytem and Robert Dungan

NH_3 & GHG emissions from dairy production

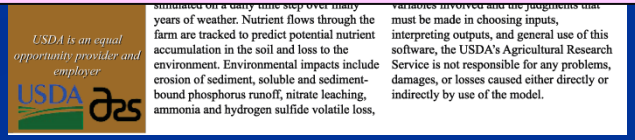
Bioaeosol emissions and pathogen drift

Livestock GRACEnet website

www.ars.usda.gov/LivestockGRACEnet

Series of factsheets that

- Treating Poultry Litter with Aluminum Sulfate
- Poultry Litter Moisture Management to Reduce Ammonia
- Subsurface Injection of Manure to Reduce Ammonia Losses and Odor
- Manure Scraper for Reducing Odor Emissions from Swine Barns
- Dietary Management to decrease Methane Emissions from Beef Feedlots
- Phase Feeding Crude Protein to Decrease Ammonia Emissions from Finishing Beef Cattle
- DairyGEM: Software for Evaluating Gaseous Emissions from Dairy Farms
- The Integrated Farm System Model: Software for Evaluating the Performance, Environmental Impact and Economics of Farming Systems



Livestock GRACEnet

2013 Waste to Worth Conference

Nine presentations that highlighted some of the work being done by our scientists

Presentations are available on-line at eXtension.org

Special JEQ Issue

There will be a special issue of JEQ that features work being done by the Livestock GRACEnet group which will be out late this year.

Methods Manual

We are developing a methods manual outlining the best methods for estimating emissions from livestock production facilities.

Future Livestock GRACEnet

There has been interest from the Global Research Alliance to open the group up to any interested parties….

Livestock Research Group

- Improve the greenhouse gas intensity of livestock production systems
- Increase the quantity of carbon stored in those soils
- Key emissions covered:
  - methane from enteric fermentation and waste management
  - nitrous oxide from animal wastes and fertilizers

Paddy rice

Livestock

Crops

http://www.globalresearchalliance.org/

Livestock GRACEnet - NRCS Technology Transfer Webinar Series

This webinar series was developed to provide more information to NRCS regarding technologies that can be utilized to mitigate air quality concerns from livestock production systems. Each of the webinars will focus on the following:

- What is the technology? Provide some background on what it is, how it was developed, where it is applicable, what impact it can have, economics, etc.
- What NRCS practice standard does/can the technology fit under?
- What are the specific design, installation, ad operation/management criteria that need to be followed to ensure a successful application of the technology?

Livestock GRACEnet - NRCS Technology Transfer Webinar Series

"Feed Management for Beef Feedlots to Reduce Air Emissions"

Andy Cole, ARS Bushland TX

January, 2014

What effects do feedlots have on air quality?
What can we do (and not do) to decrease their effects?

Livestock GRACEnet - NRCS Technology Transfer Webinar Series

"Feed Management for Dairy Operations to Reduce Air Emissions"

Mark Powell, ARS Madison WI

February, 2014

Evaluating the effects of forages, concentrates and protein supplements on ammonia and methane emissions from dairy barns

Livestock GRACEnet - NRCS Technology Transfer Webinar Series

"Ammonia Recovery in Manure Management Systems"

Ariel Szogi and Matias Vanotti, ARS Florence, SC

March, 2014

Using anammox based de-ammonification

Ammonia Recovery from livestock waste with gas permeable membranes

Livestock GRACEnet - NRCS Technology Transfer Webinar Series

"Acid Scrubbers for Removal of Ammonia from Mechanically Ventilated Broiler Houses"

Philip Moore, ARS Fayetteville, AR

April, 2014

Ammonia Emissions from Broiler Production
Reduction in Ammonia Emissions with Ammonia Scrubbers

Questions?