

# Why We Do Our Work



## An Overview

### Institute of Bioenergy, Climate, and Environment

Ali Mohamed, Director  
Division of Environmental Systems

[amohamed@nifa.usda.gov](mailto:amohamed@nifa.usda.gov)

(202) 720-5229

September 17, 2014



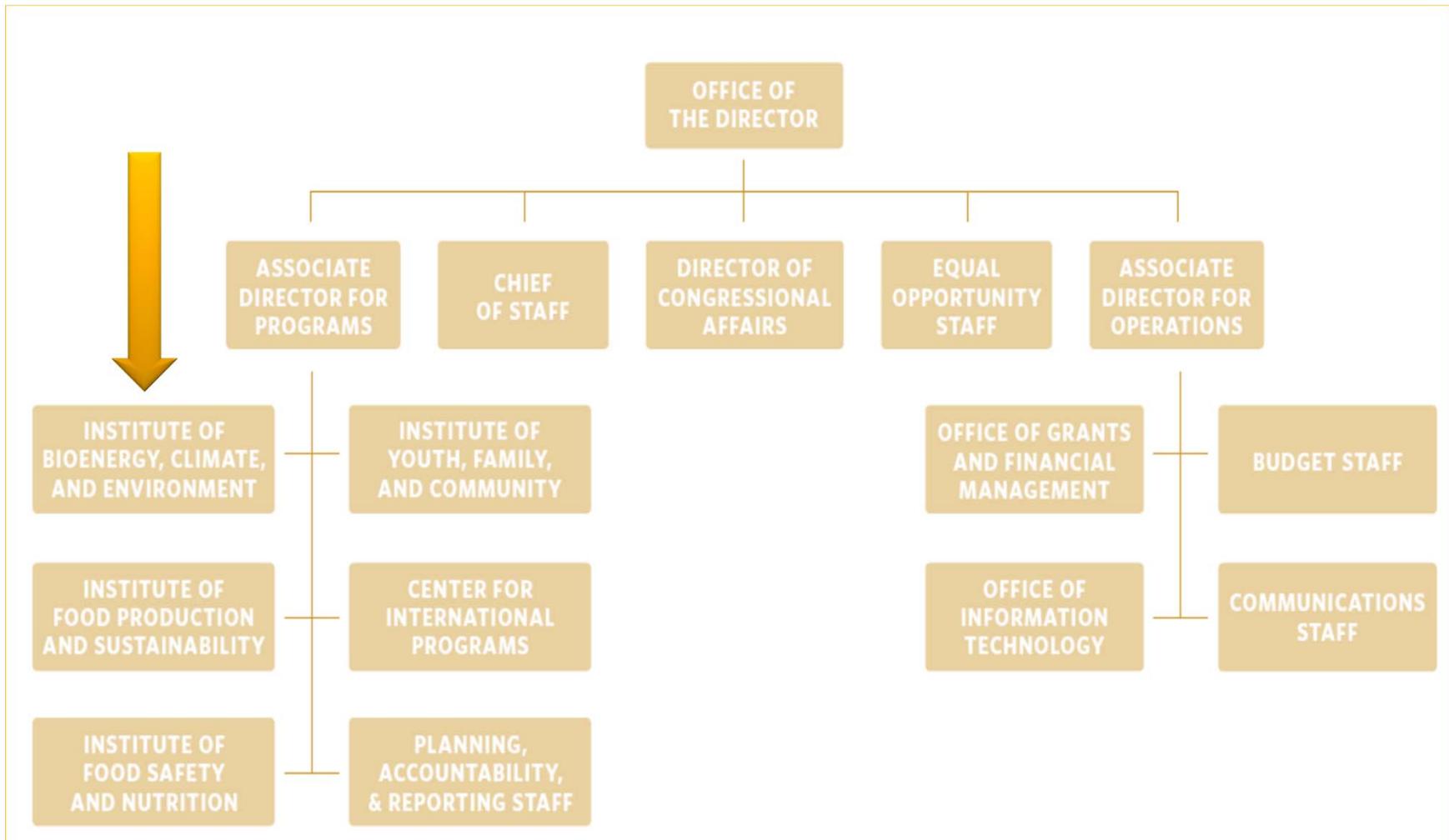




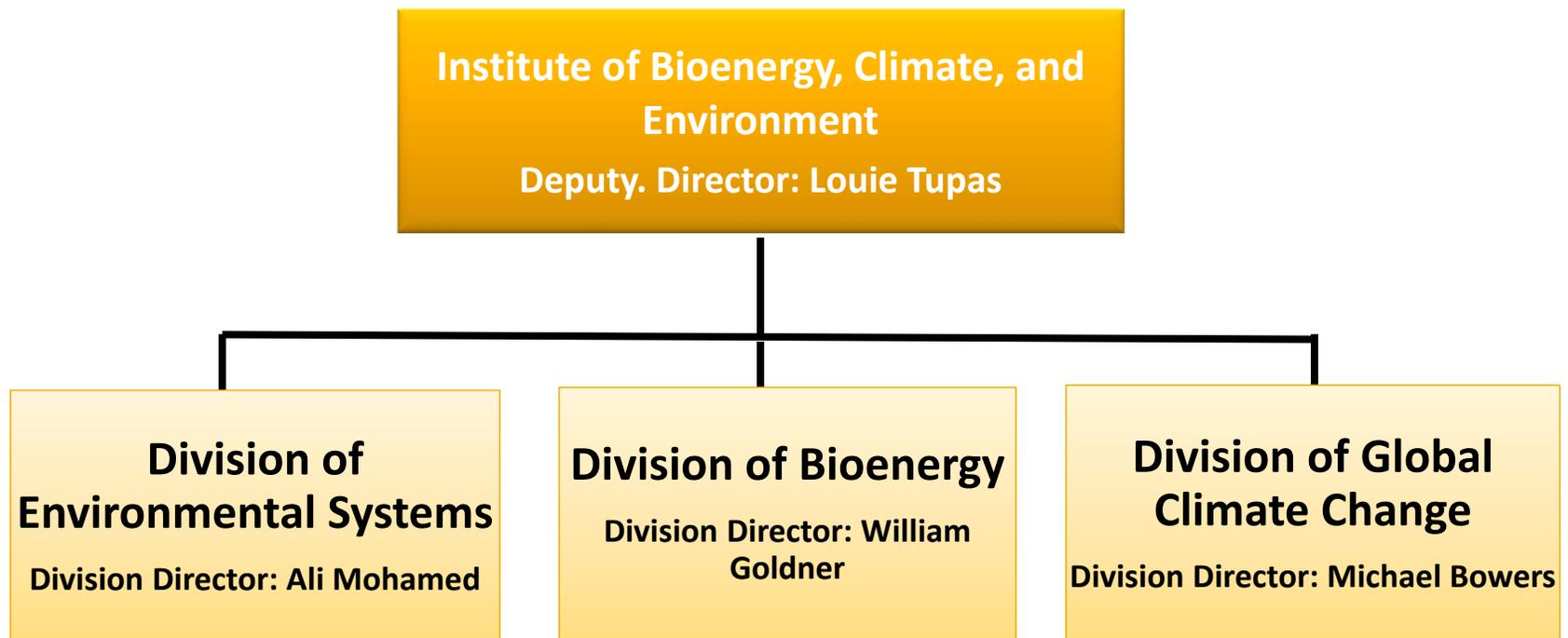
# **Institute of Bioenergy, Climate, and Environment**

- ✓ **The Institute of Bioenergy, Climate, and Environment (IBCE) is one of four NIFA institutes that fund transdisciplinary, outcome-driven programs to address national science priorities.**
- ✓ **IBCE comprises three divisions: the Division of Bioenergy, the Division of Climate Change, and the Division of Environmental Systems.**

# NIFA Flow Chart



# IBCE



# **Institute of Bioenergy, Climate, and Environment**

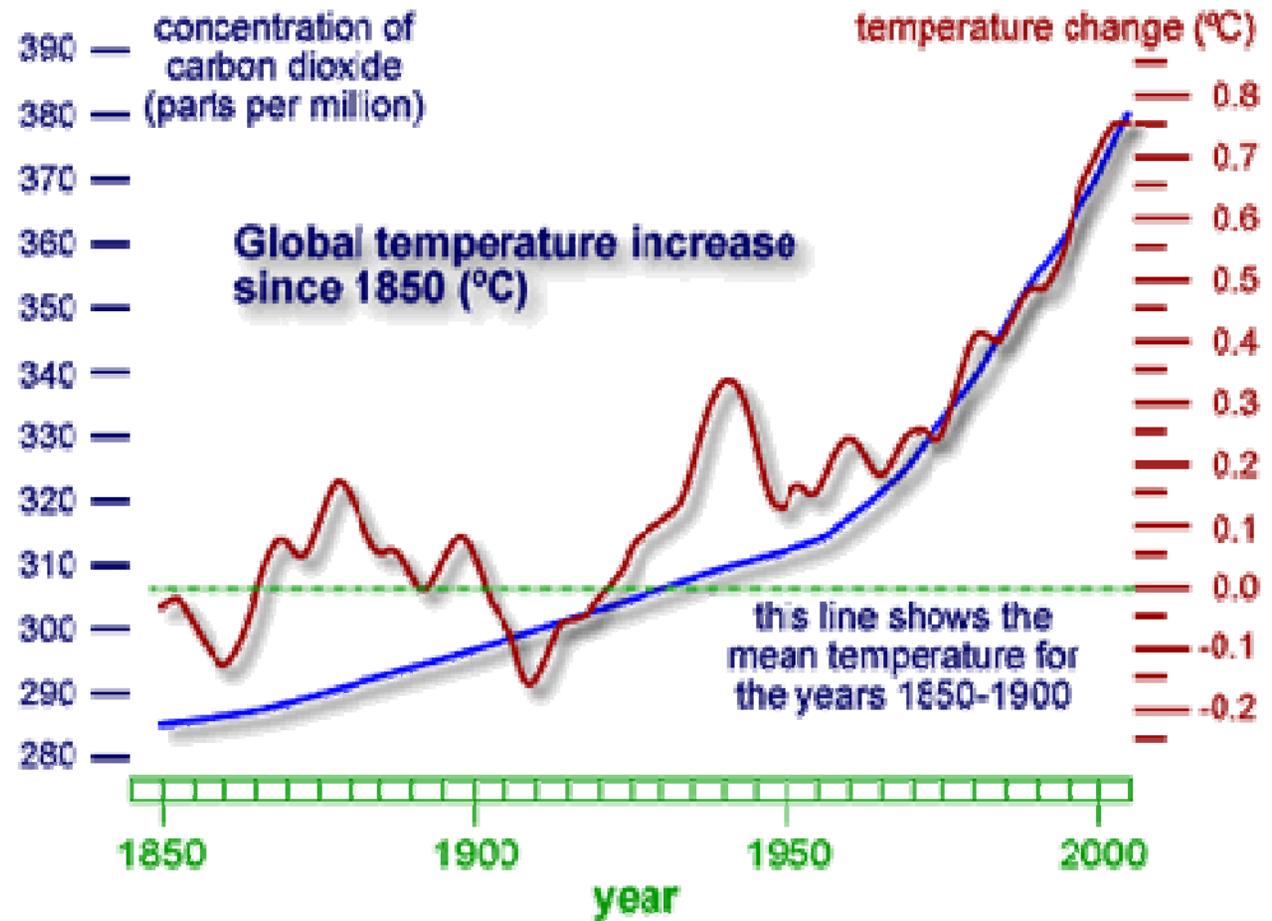
## **Why We Do Our Work**

- **Respond to a Changing Climate.**
- **Reduce Dependence on Foreign Petroleum.**
- **Achieve Sustainable Use of Natural Resources.**
- **Minimize the impact of Agriculture Practices on Environment.**

# Division of Global Climate Change

- The Division activities that help agricultural and natural resource systems adapt to climate variables such as droughts, floods, and temperature extremes.
- The division focuses on challenges that are fundamental to sustainable agricultural production and the management of healthy forests and rangelands.

# DGCC

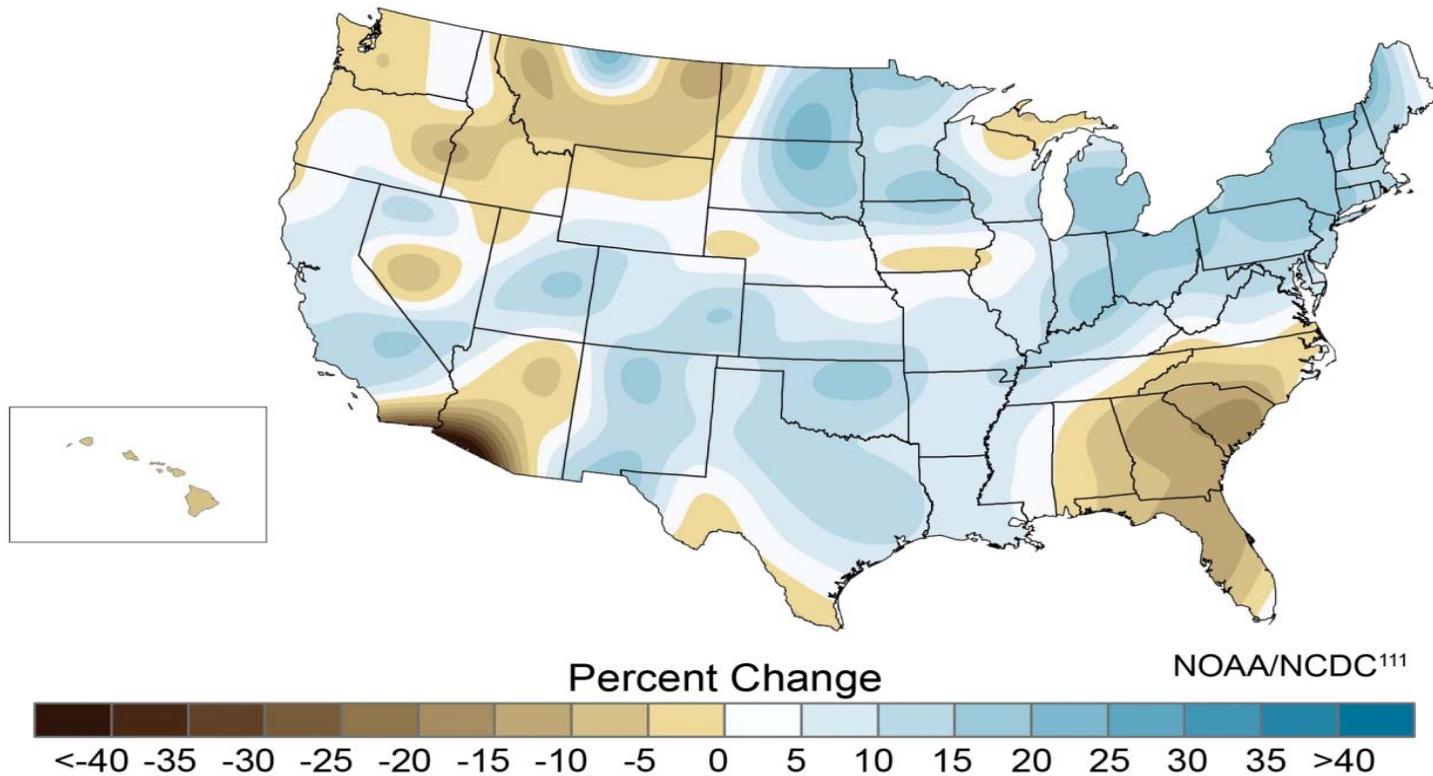




# Anticipated Outcomes

- Long-term outcomes include:
  - ✓ developing new varieties of plants and animals that can adapt to climate variability;
  - ✓ increasing carbon sequestration;
  - ✓ identifying new strategies for agriculture and forest production systems that are adapted to climate variability;
  - ✓ advancing the sustainable use of natural resources; and improving conservation activities in the use of energy, nitrogen fertilizer, and water.

# Observed Change in Annual Precipitation 1958-2008.



NOAA

# **Earth's Changing Climate Will Cause Farmers, Ranchers, and Forest Owners To:**

- **Change the types of crops planted, where certain crops are planted, evaluate if irrigation is cost effective, and change how the crops are managed.**
- **Adapt animal production systems.**
- **Work with rangelands that are not as productive per acre.**
- **Address growing forest health challenges.**

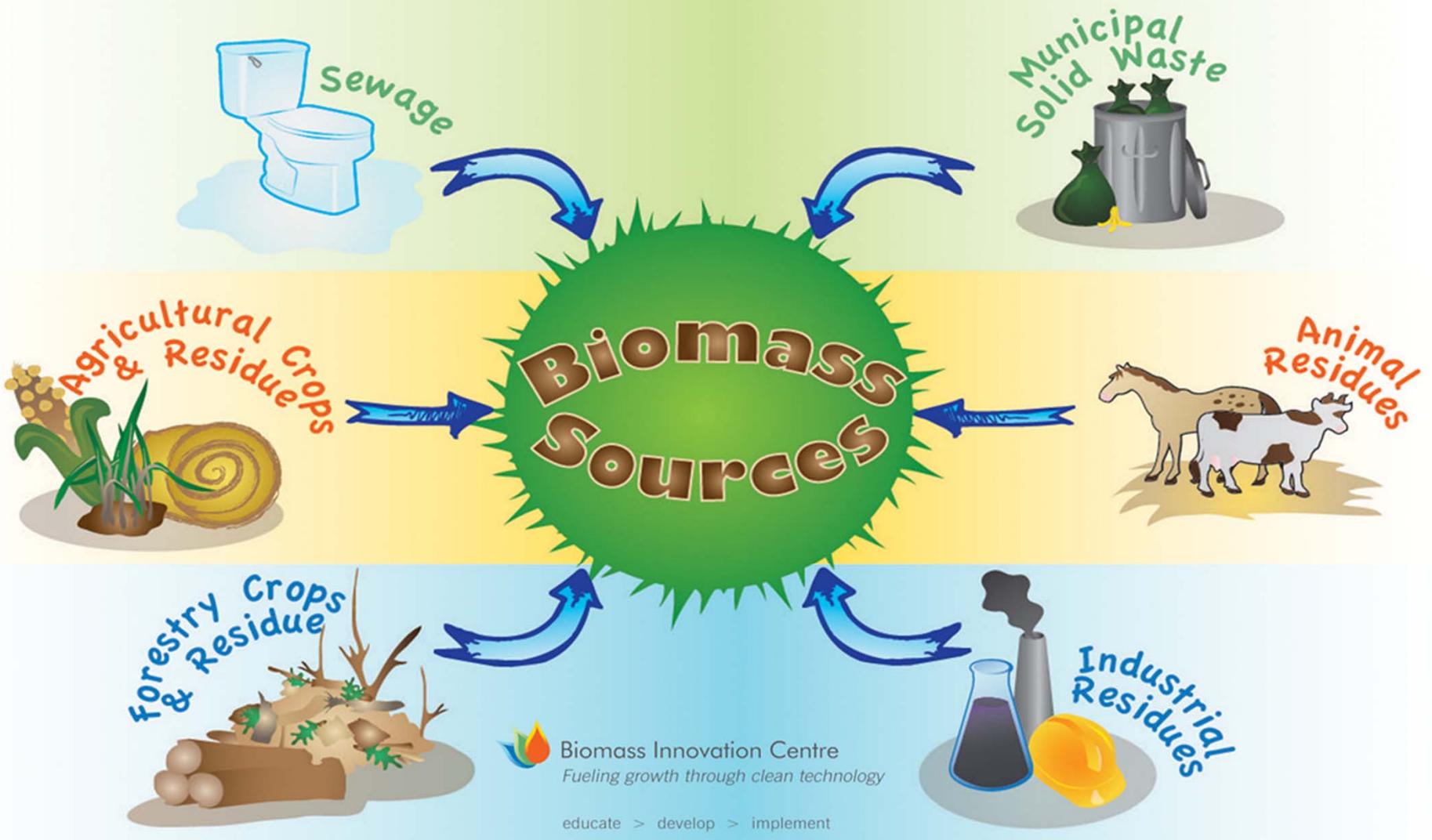
# **Division of Environmental Systems**

**The Division of Environmental Systems advances knowledge in the areas of natural resources, environment, and conservation.**



## **Division of Bioenergy**

- **The Division of Bioenergy supports the development of regional systems that produce sustainable bioenergy and biobased products.**
- **The goal of these systems is to deliver liquid transportation biofuels to help meet the nation's goal of 36 billion gallons per year of biofuels by 2022 and reduce our national dependence on foreign oil.**



# **Sustainable Bioenergy Science Challenges**

- **Development and deployment of superior genotypes of regionally-appropriate dedicated energy crops.**
- **Refinement and implementation of sustainable regional feedstock production practices which may include crop residues and wastes.**
- **Development of seamless and optimized feedstock logistics.**
- **Scalable, sustainable conversion technologies that can accept a diverse range of feedstocks.**
- **Bioeconomy and bioproducts**

# The Division Supports scientific work that

- involves air, water, soil, and wildlife resources in order to advance the sustainability of agricultural, forest, and range production systems.
- Mitigate:
  - Increasing water shortages,
  - loss of topsoil,
  - reduced biological diversity, and loss of habitat

# Division Priorities

- improving water quality, Water use, water security; and air quality
- developing sustainable ecosystem services;
- wildlife damage management;
- maintaining soil health and soil restoration; and
- improving the management and sustainable use of forests, and rangelands.

# Grant programs

- **develop innovative ways to achieve sustainable use of natural resources and**
- **develop educational and extension programs that implement best management practices to enhance environmental, social, and economic benefits.**

# **Environmental Systems Science Challenges**

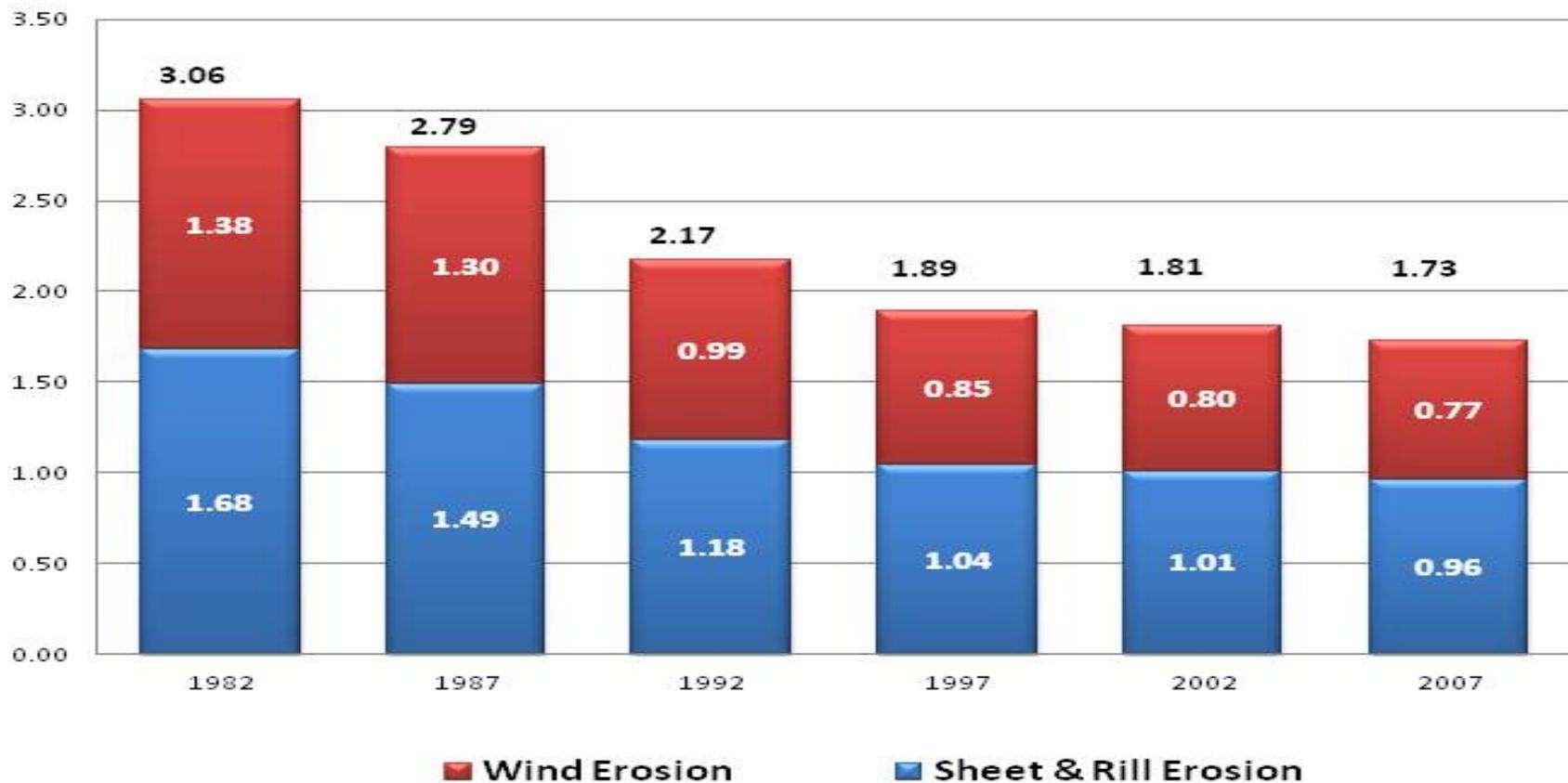
- **Increase efficiency in collecting, storing, conveying and using water.**
- **Improve soil and water management at whole watershed level.**
- **Prevent and mitigate pollution from agricultural and forestry practices and its effects on plants, animals, soil, air, water and humans.**
- **Improve knowledge, understanding and management of emissions, fate and transport, and practices to mitigate agricultural and forestry emissions.**
- **Improve the effectiveness of collecting, storing, transporting, treating and utilizing waste products from agriculture, forestry, and other origins.**

# **Environmental Systems Science Challenges**

- **Identify soil parameters for crop production, forest and rangeland management, housing, zoning, planning and other land uses. Understand chemical and physical relationships among soils, plants, water and nutrients to improve or restore soil production capability.**
- **Identify and understand biological processes and ecological relationships to improve rangeland management techniques and improve appraisals of range conditions for production of livestock forage, wildlife habitat and water yield.**
- **Improve management of forest plants and trees, forest ecosystem ecology, breeding, forest nursery practices and silvicultural techniques. Develop new wildfire prevention methods, technology for fuel hazard reduction.**

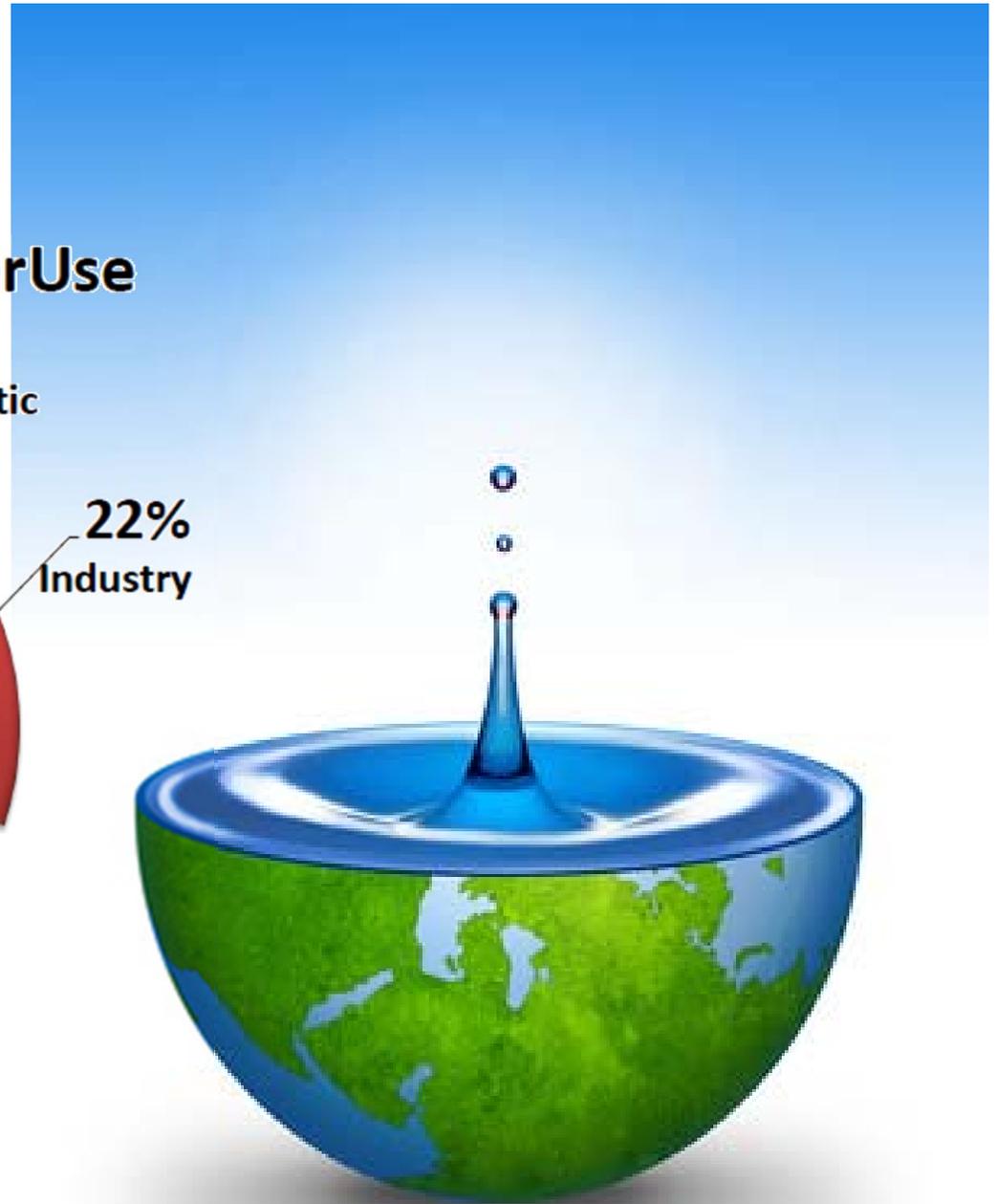
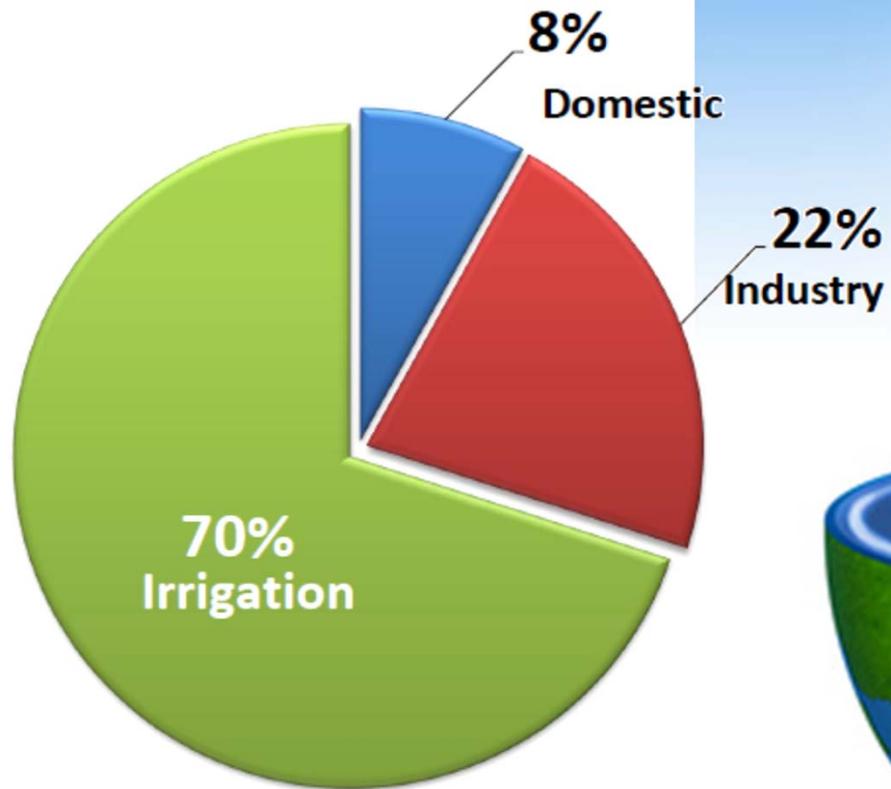
# ERODING CROPLAND SOILS CARRY NITROGEN RUNOFF WHICH COMPROMISES AQUATIC ECOSYSTEMS.

Erosion on Cropland, by Year  
(Billions of Tons)

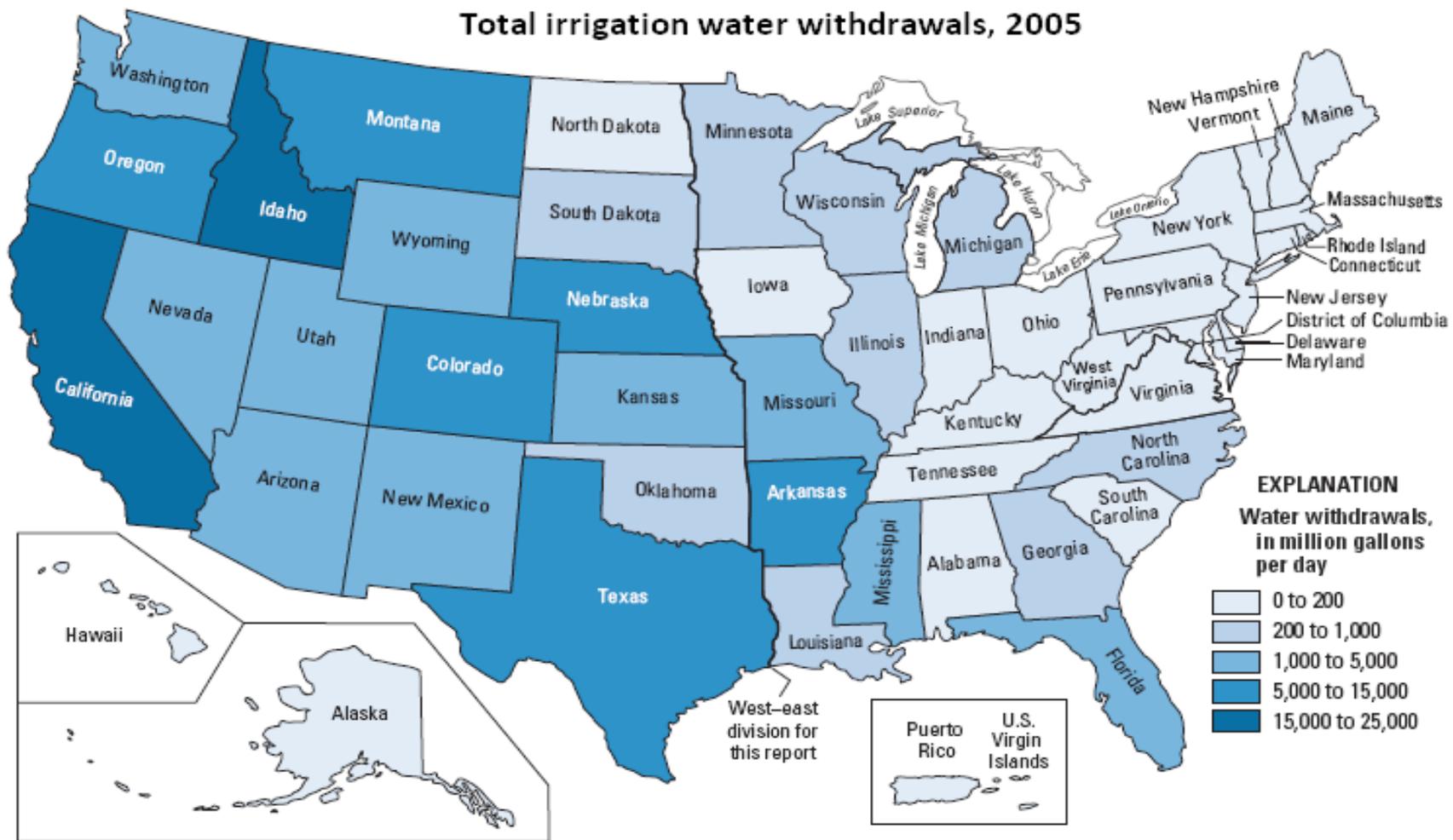


Cropland includes cultivated and non-cultivated cropland.

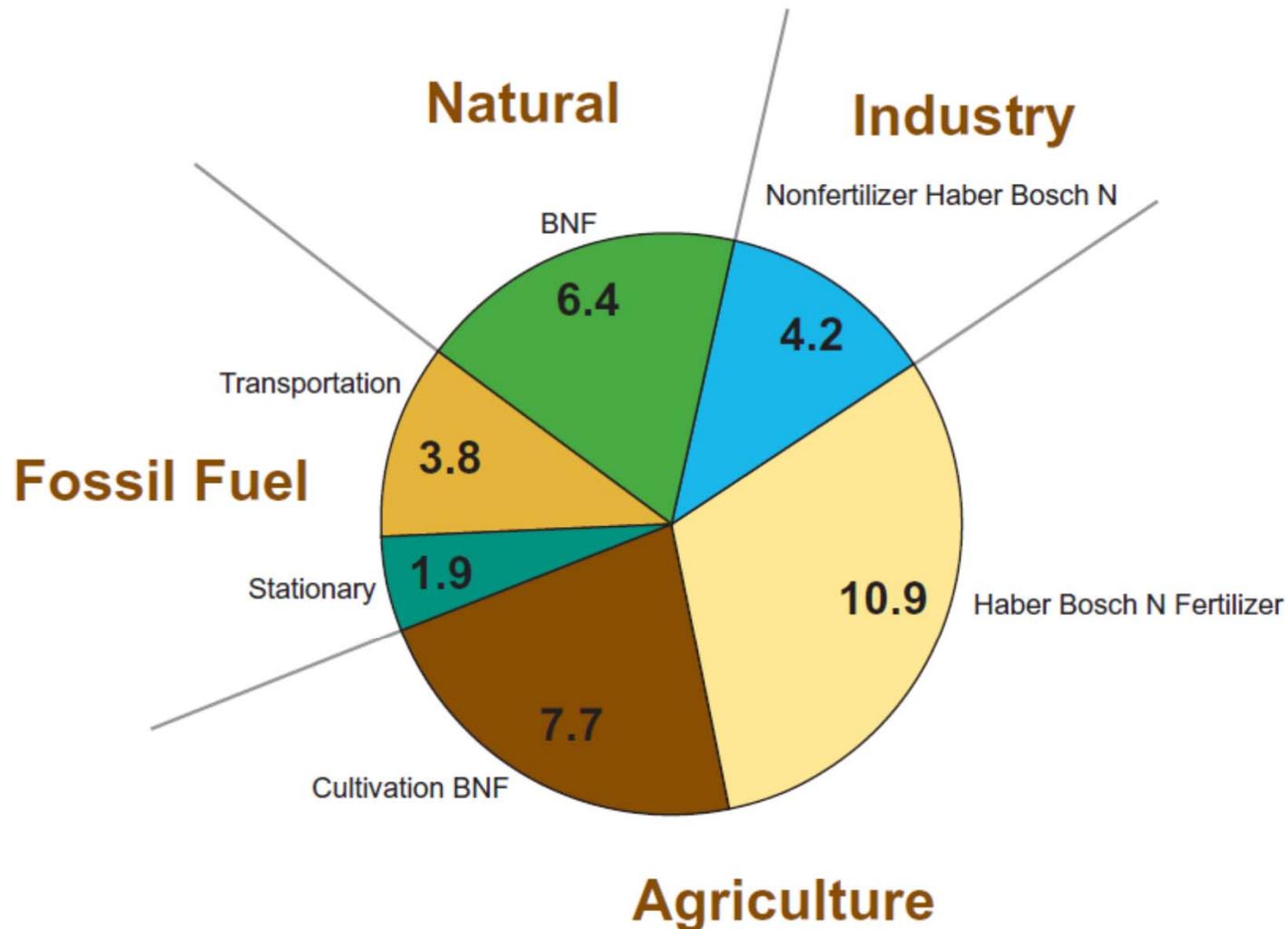
# Breakdown of Fresh Water Use



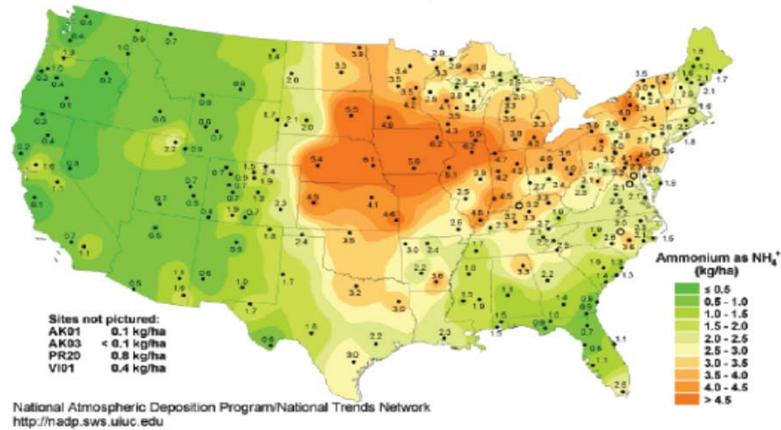
# Increasing Demands for Water Are Drawing Down Aquifers On An Unsustainable Basis



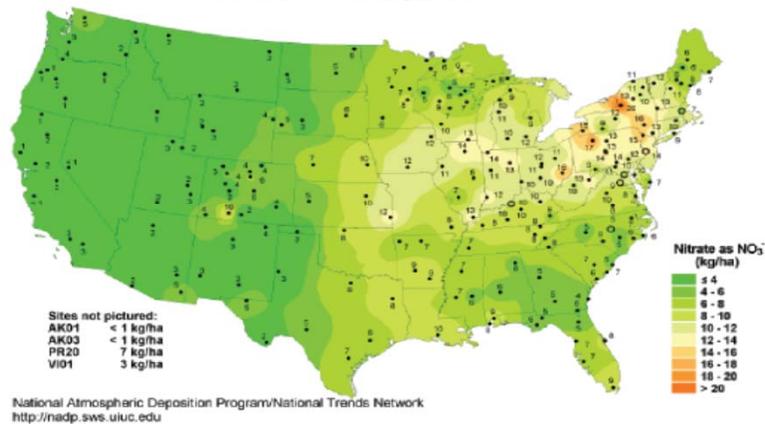
# Reactive Nitrogen



Ammonium ion wet deposition, 2007



Nitrate ion wet deposition, 2007



Inorganic nitrogen wet deposition from nitrate and ammonium, 2007

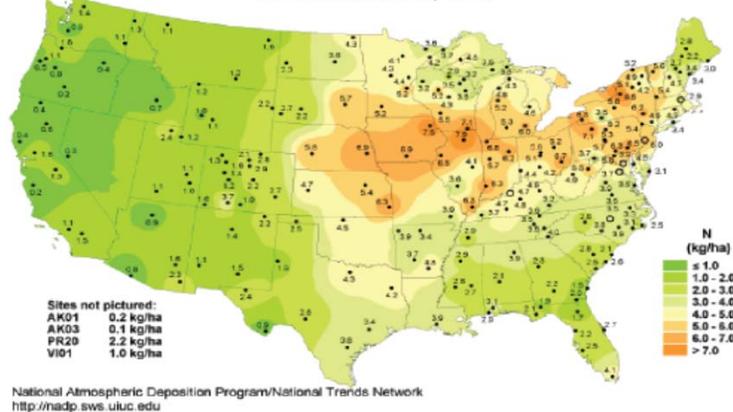


Figure A-3: Annual  $NH_4^+$ ,  $NO_3^-$ , and total inorganic N deposition for the year 2007 showing spatial patterns of deposition

Source: National Atmospheric Deposition Program, 2010.

# USDA's Small Business Innovation Research (SBIR)

- Program is housed within the Division of Environmental Systems. SBIR grants:
  - stimulate technological innovations in the private sector;
  - strengthen the role of small businesses in meeting federal research and development needs;
  - increase private sector commercialization of innovations derived from USDA-supported research and development efforts; and
  - foster participation by women-owned and socially and economically disadvantaged small business firms in technological innovations.

# Overview of NIFA's Institute of Bioenergy, Climate and Environment



**Questions?**