Agriculture and Nitrogen Dynamics in the US

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Agricultural Research Service

USDA's chief scientific research agency:

- 1,200 research projects within 22 National Programs
- 2,100 scientists
- 6,000 other employees
- 100 research locations (including 5 outside the US)
- $1.2+ billion annual budget

ARS National Programs

ARS' 22 National Research Programs are organized around 4 themes:

- Nutrition, Food Safety/Quality
- Animal Production and Protection
- **Natural Resources and Sustainable Agricultural Systems (NRSAS)**
- Crop Production and Protection

NRSAS Mission

Develop scientific knowledge and technology to ensure safe and affordable food, feed, fiber, and renewable energy supplies . . .

While enhancing the environment and quality of life for producers, rural communities, the Nation, and the world.

Natural Resources & Sustainable Agricultural Systems Research Programs

ARS Nitrogen-Related Research

- Managing N Losses in Agricultural Drainage Waters
- GRACEnet
- NLEAP Model
- N Balance in Animal Production Systems

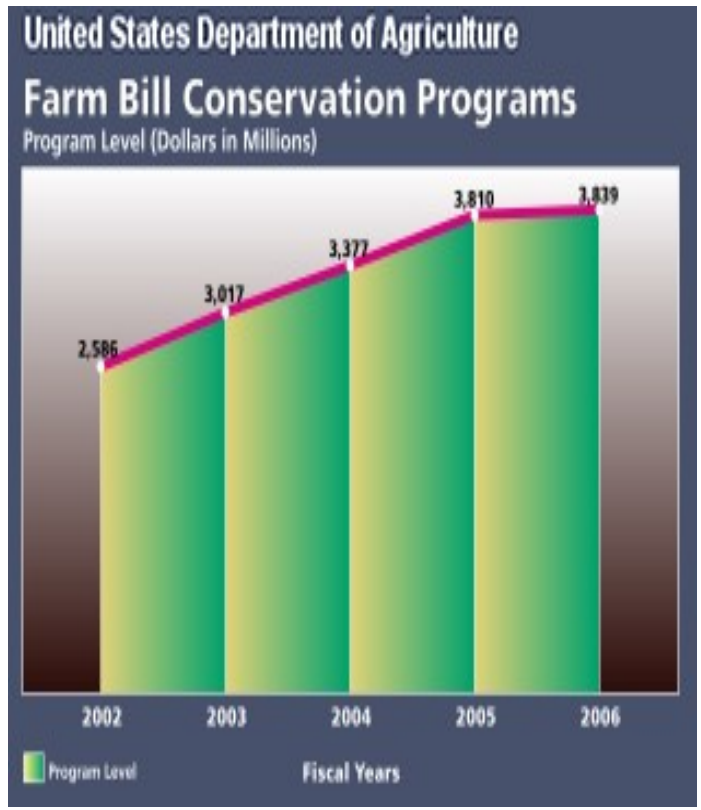
The Conservation Effects Assessment Project (CEAP)

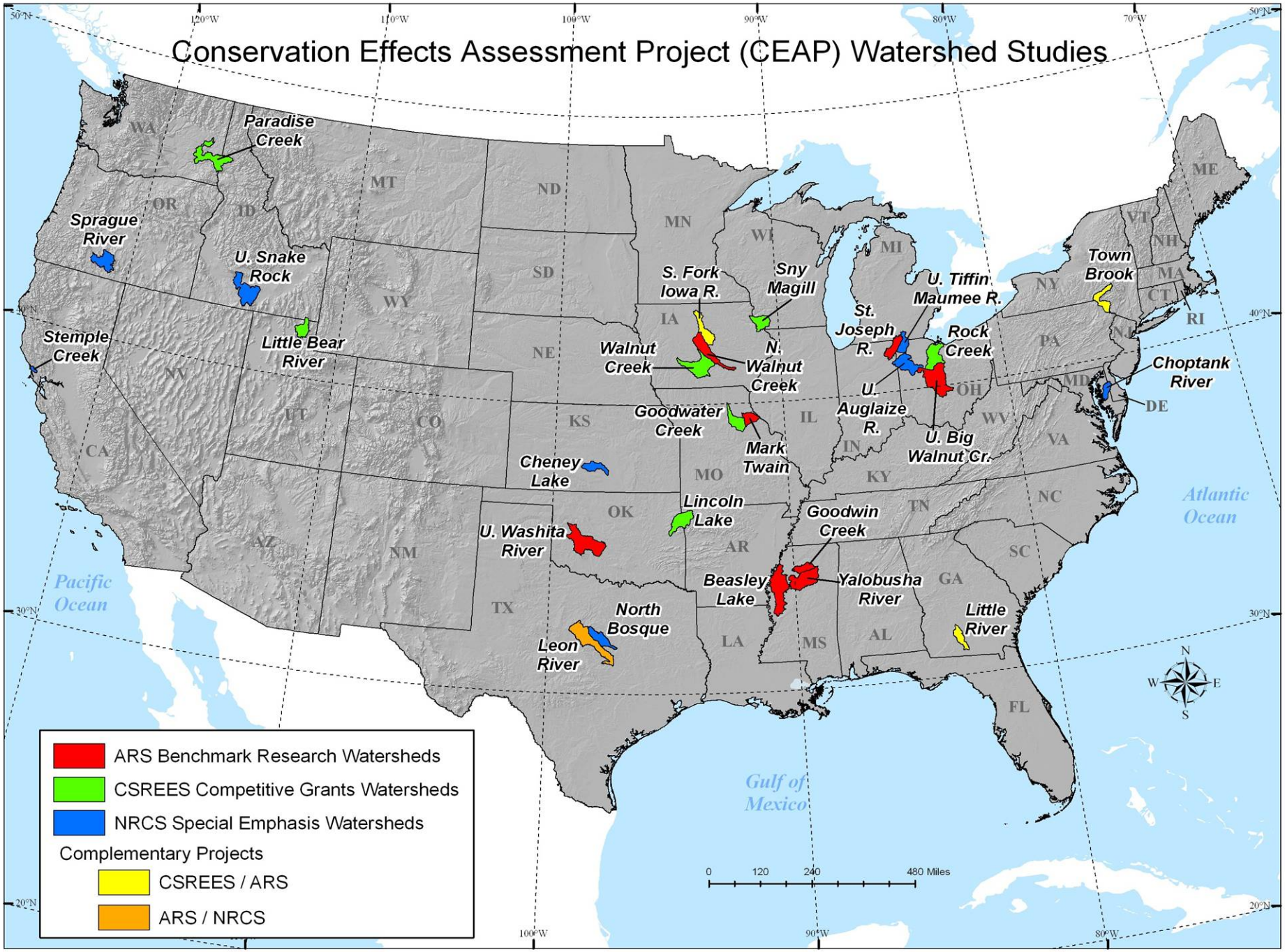
USDA spends $4B/yr on conservation practices to benefit the environment

CEAP was developed to document the effects of these practices on the landscape

Field-to-watershed scale projects use both monitoring data and model projections to estimate net cumulative impacts at the regional scale

The model used is the Soil Water Assessment Tool (SWAT)




Conservation Effects Assessment Project (CEAP) Watershed Studies
Paradise Creek
Sprague River
U. Snake Rock
Little Bear River
Stemple Creek
S. Fork Iowa R.
Sny Magill
Walnut Creek
N. Walnut Creek
Goodwater Creek
Mark Twain
Cheney Lake
Lincoln Lake
U. Washita River
North Bosque
Leon River
Beasley Lake
Goodwin Creek
Yalobusha River
Little River
St. Joseph R.
U. Tiffin
Maumee R.
Rock Creek
U. Auglaize R.
U. Big Walnut Cr.
Town Brook
Choptank River
Atlantic Ocean
Pacific Ocean
Gulf of Mexico
ARS Benchmark Research Watersheds
CSREES Competitive Grants Watersheds
NRCS Special Emphasis Watersheds
Complementary Projects
CSREES / ARS
ARS / NRCS
0 120 240 480 Miles

Choptank River Watershed Project

Overall Goal: Establish a watershed-scale assessment of NRCS/FSA conservation program effects.

- Monitor water quality in 15 sub-watersheds
- Evaluate the efficiency of conservation practices using water quality models and field measurements
  - Riparian buffers and CRP lands
  - Cover crops
  - Wetlands
  - Ditch management (controlled drainage)
- Develop innovative remote sensing tools to evaluate conservation practices within a complex agricultural landscape.

Remote Sensing of Cover Crop Nutrient Uptake on Maryland's Eastern Shore

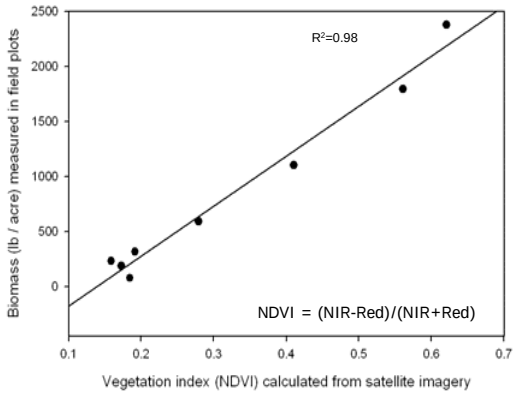
- Collaboration between USDA/ARS and MD Dept. of Agriculture (MDA)
- Objective: Evaluate the effects of cover crop implementation on N uptake in the Choptank watershed
- Method: Combines farm program information, remote sensing, and on-farm research
- Outcomes: Real-time measurements of cover crop effectiveness on all farms that enroll in the cost share programs

Calculating cover crop nutrient uptake

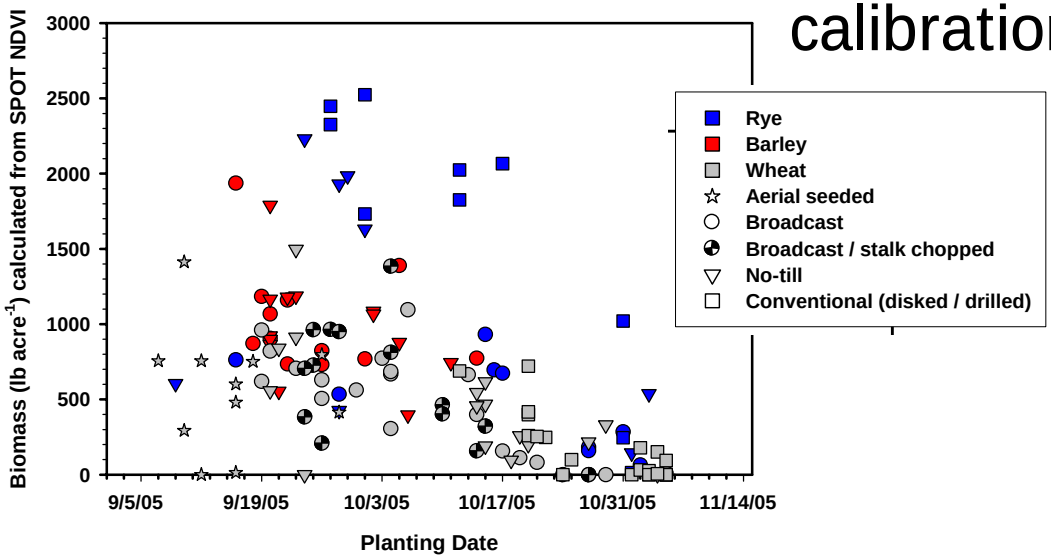
1. Identify fields and practices

2. Collect satellite imagery

3. Field-sample a few farms for calibration



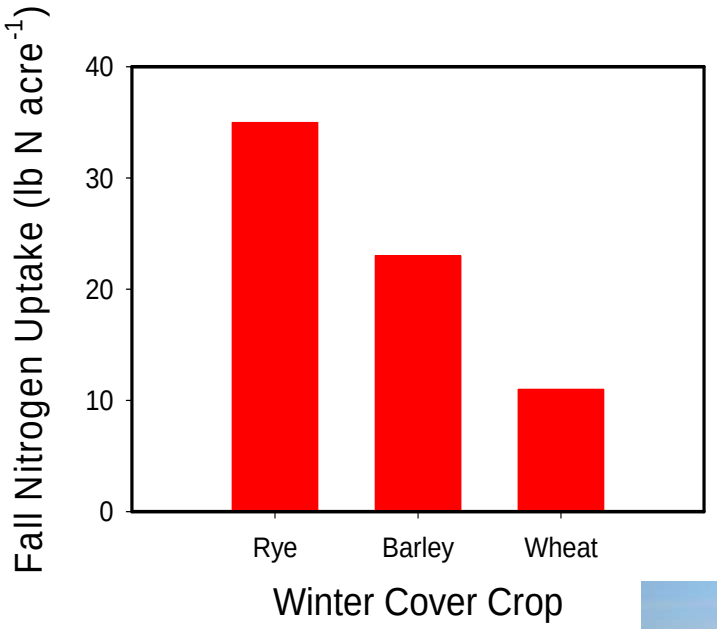
4. Calibrate vegetation index



5. Calculate biomass on all fields

Calculating cover crop nutrient uptake

Biomass (estimated from satellite imagery) x
Nutrient content (estimated from sampling) =
Nutrient uptake

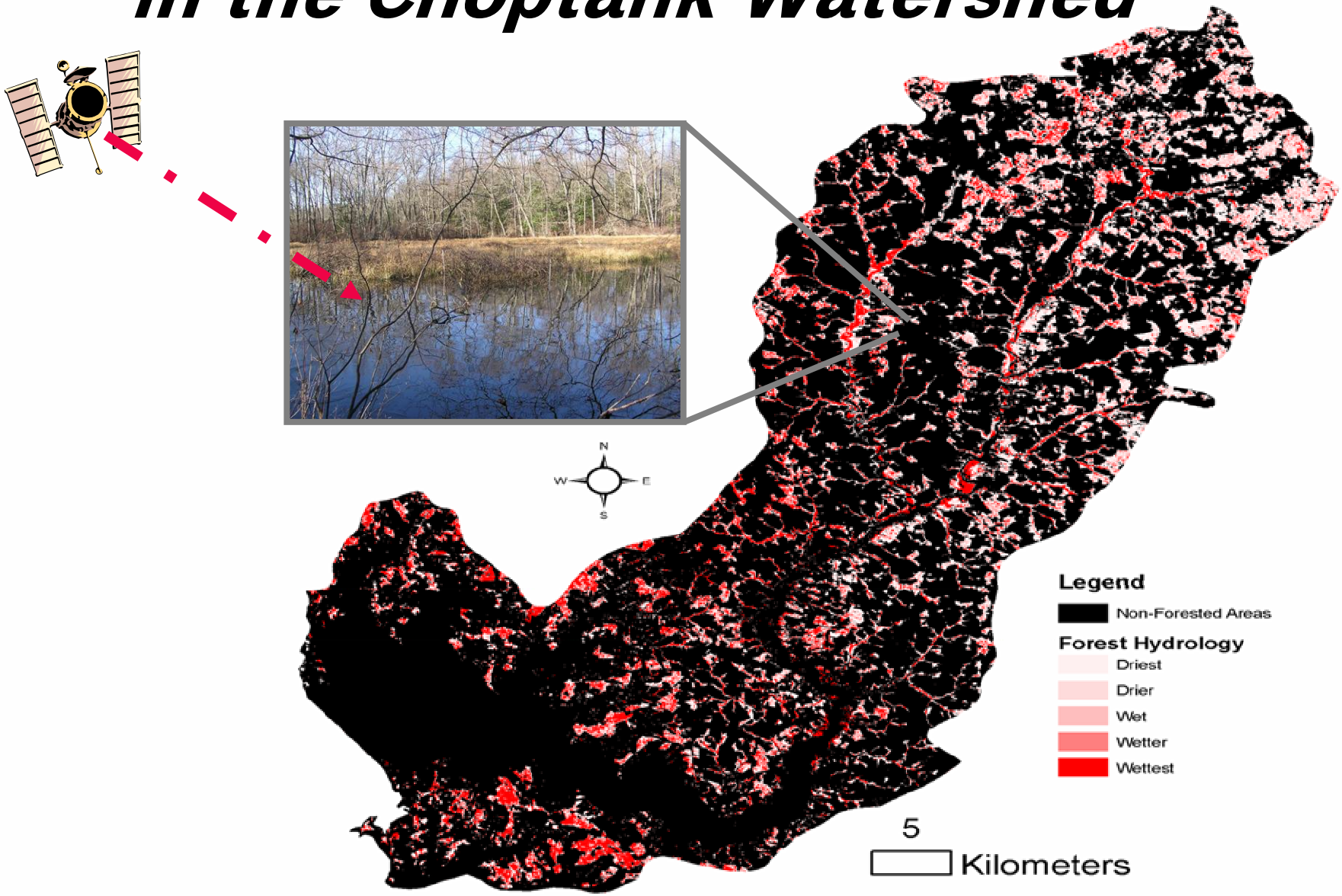


48,400 lb N uptake on 6300 acres of cover crops planted within the Choptank River study area (2005)

6. Summarize results

Hulless barley also provides ethanol bioenergy

Monitoring Wetland Hydrology in the Choptank Watershed



Source Areas of N to the Gulf of Mexico

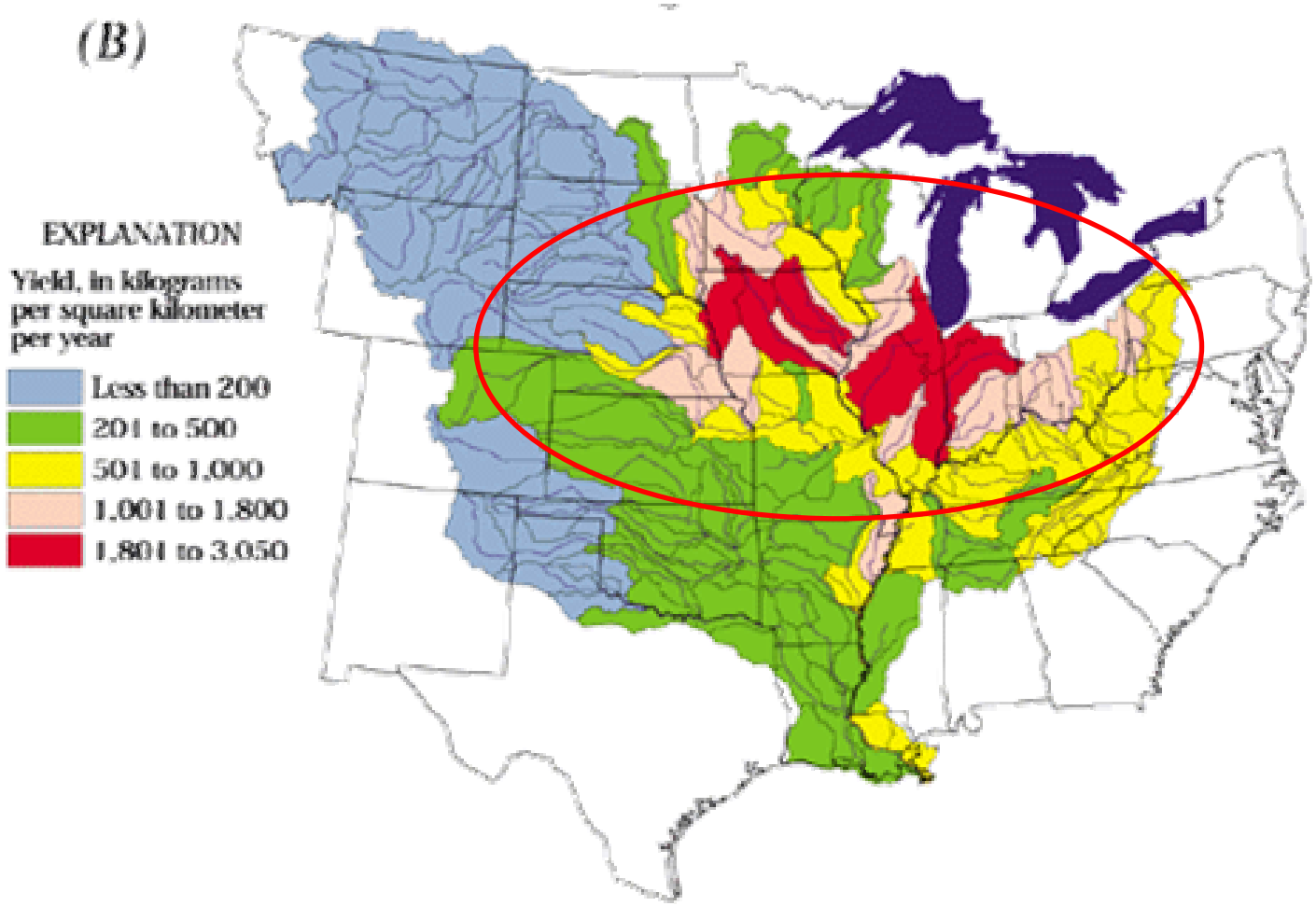
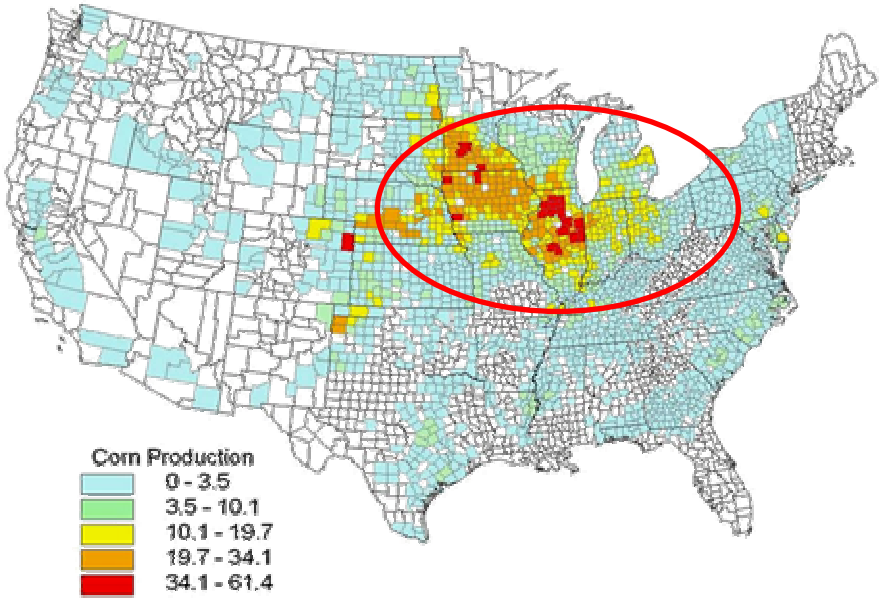


Figure 6. *(A)* Nitrogen inputs during 1992 and *(B)* average annual nitrogen yields of streams for 1980–96 (modified from Goolsby and others, 1999).

Corn Production



Subsurface Drainage