Irrigation Resources to Grow Biofuel: A National Overview

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Transition to a Bio-Economy: Environmental and Rural Development Impacts

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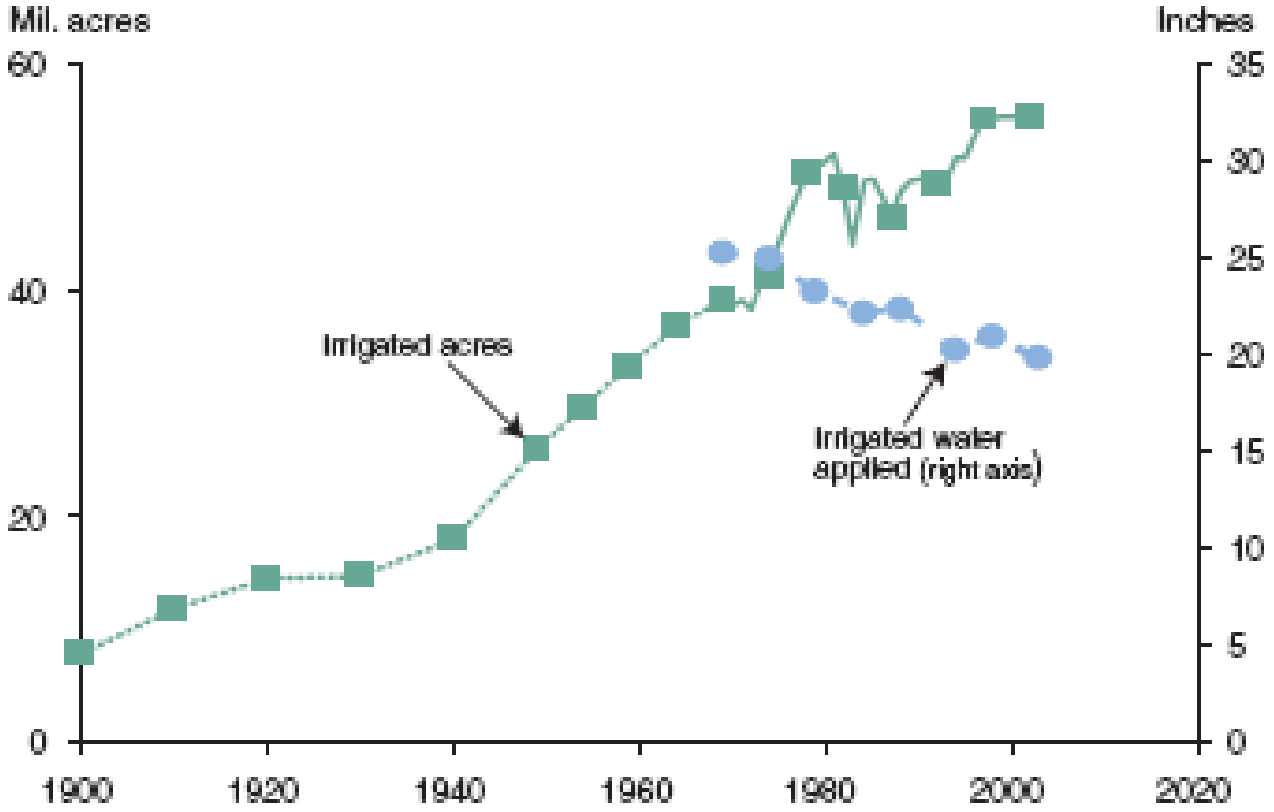
NRCS

Goal of presentation

- Provide a National perspective on irrigated agriculture
  - Acres
  - Water use
  - Crops
- What do trends and current conditions tell us about the water and land potentially used for biofuel production?

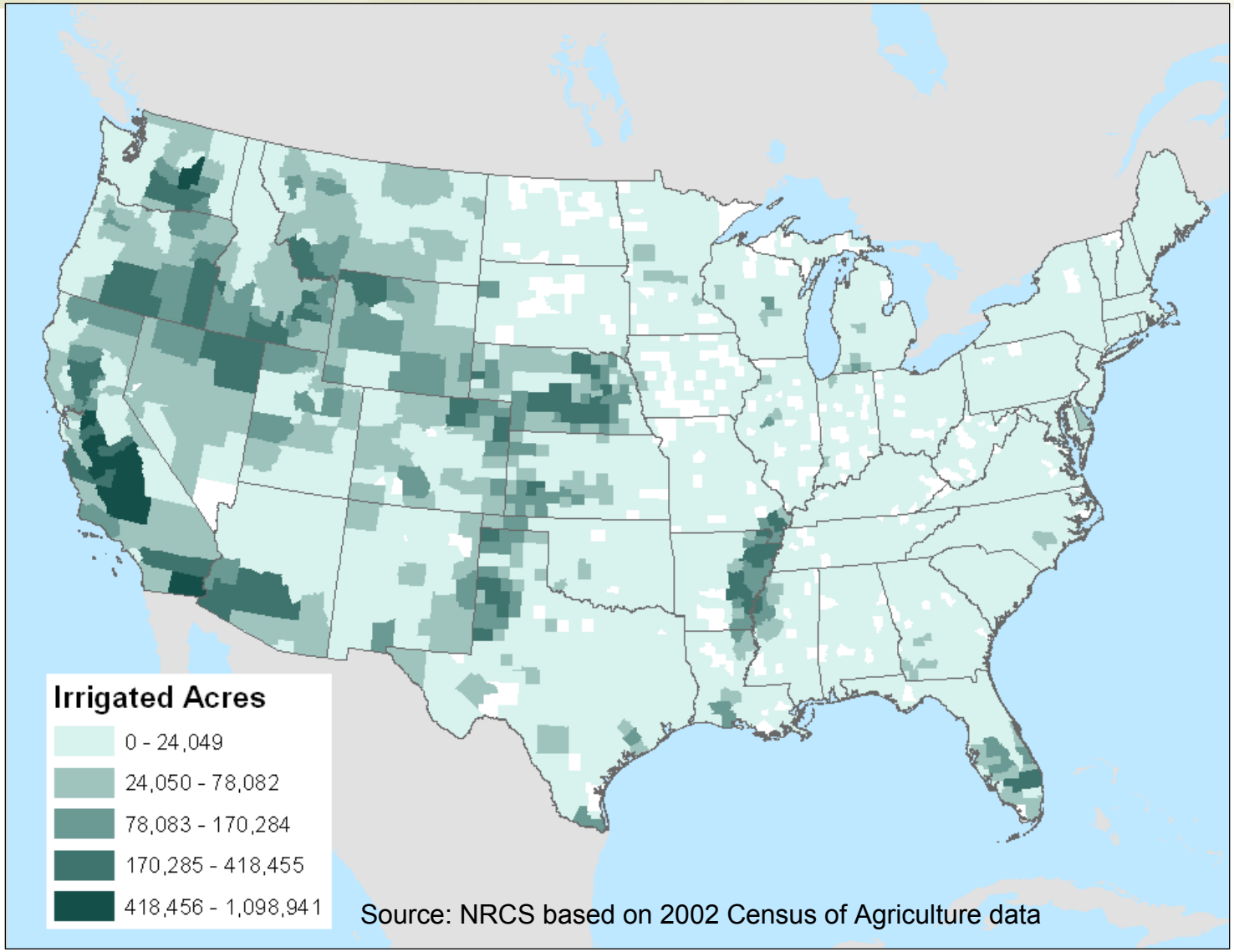
Irrigation overview

Trends in acres irrigated from 1900 to 2002 and water applied from 1969 to 2003

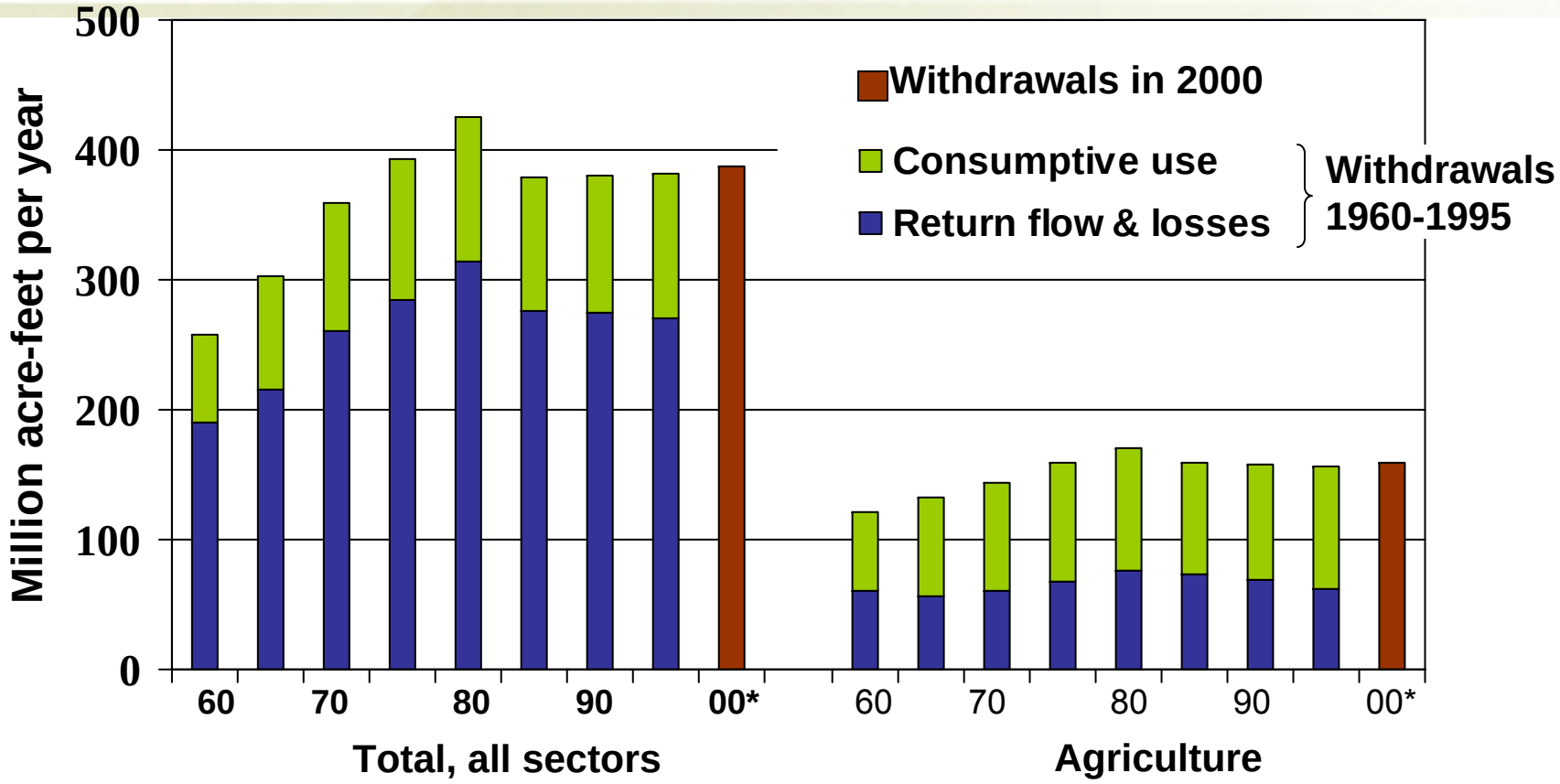


Source: USDA, Census of Agriculture and Farm and Ranch Irrigation Surveys, various years. Variation between Census of Agriculture years from 1969 to 2002 was based on ERS estimates.

Irrigation overview: Acres location



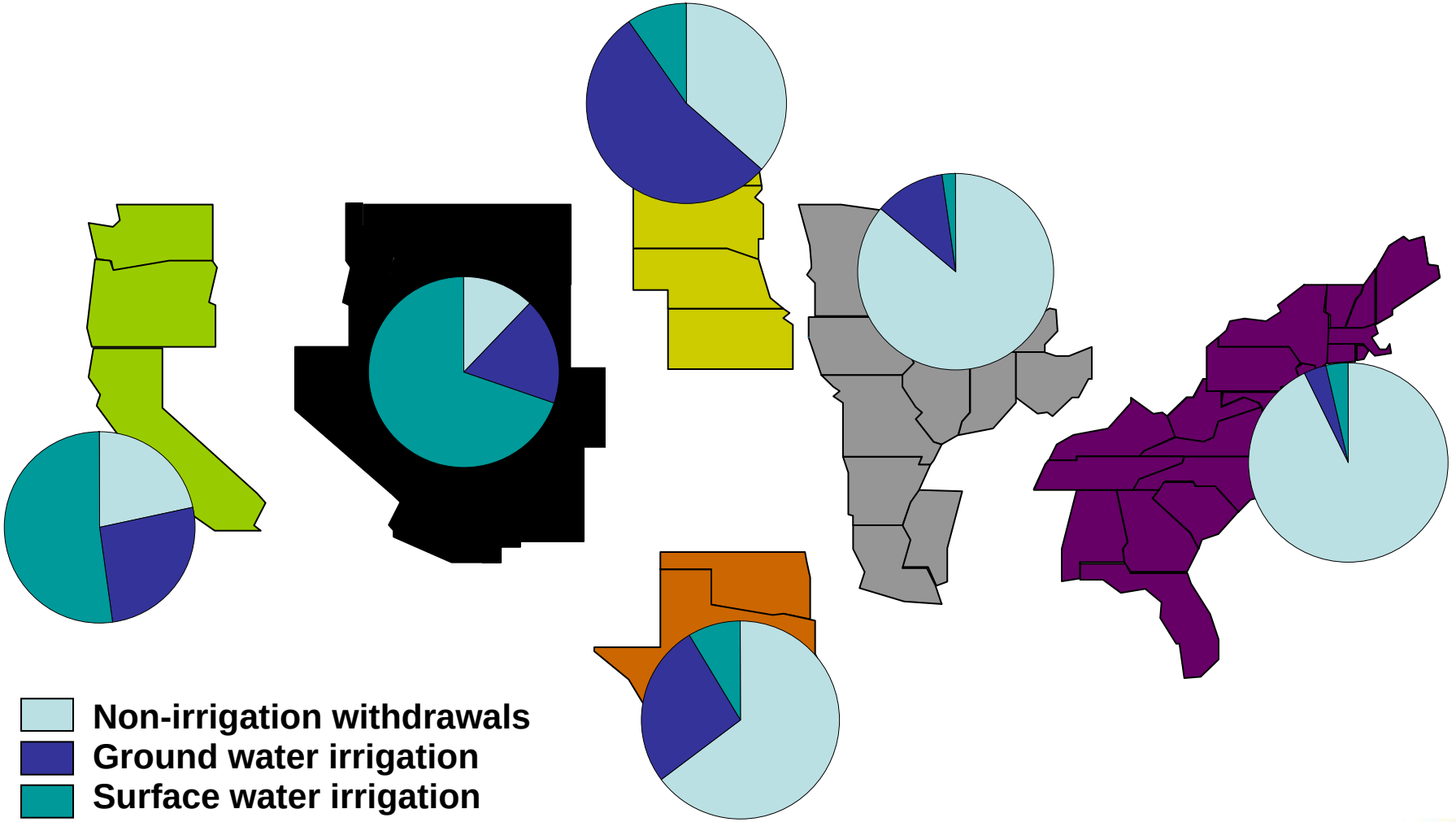
Total and agricultural water withdrawals in 2000 and withdrawals with consumptive use estimates, 1960-1995



Source: USDA, NRCS, based on Hutson et al, 2004

* Data limitations do not allow estimation of consumptive use in 2000.

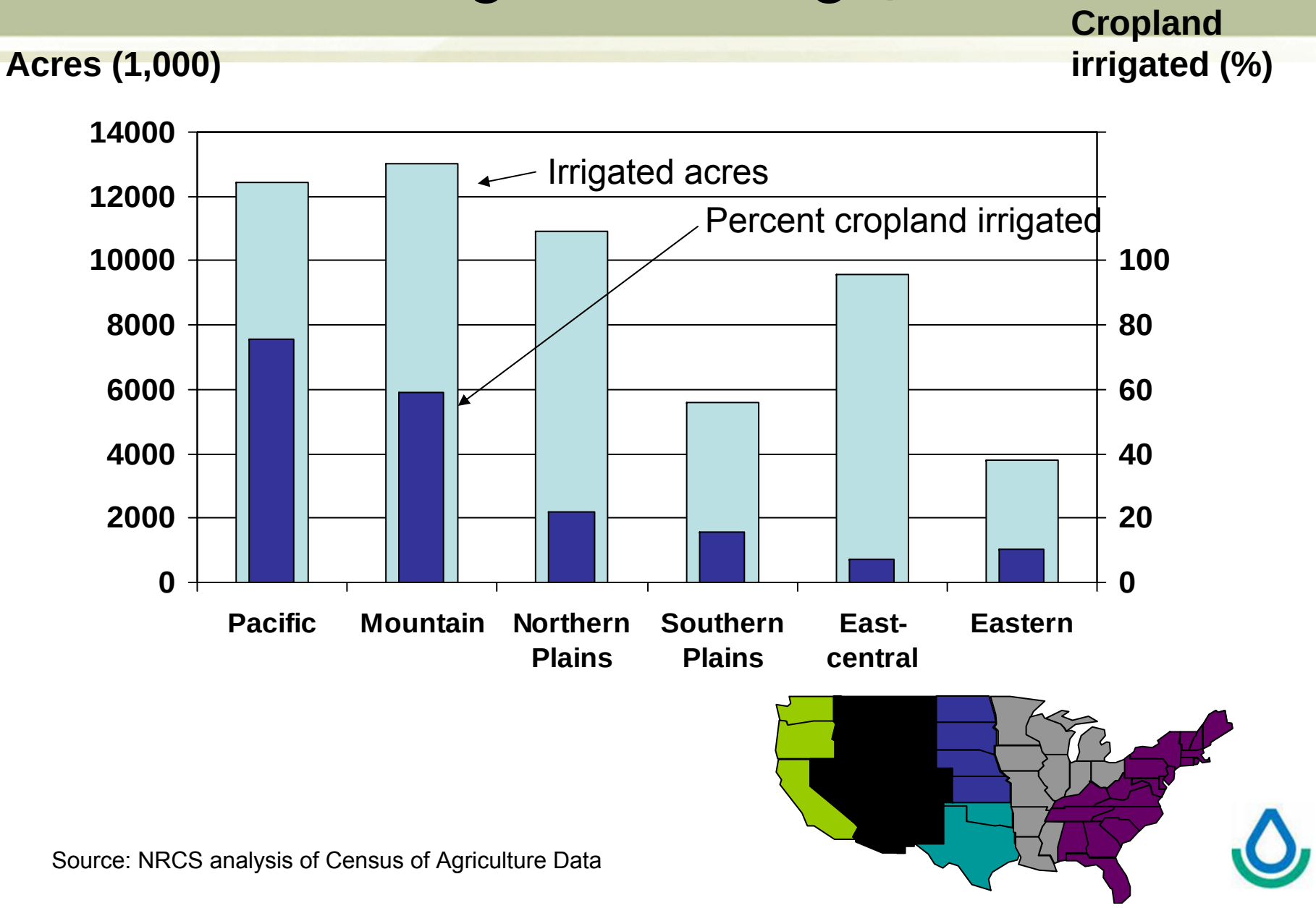
Sources of irrigation water and total water withdrawals, 2000



Source: NRCS analysis of USGS water use data

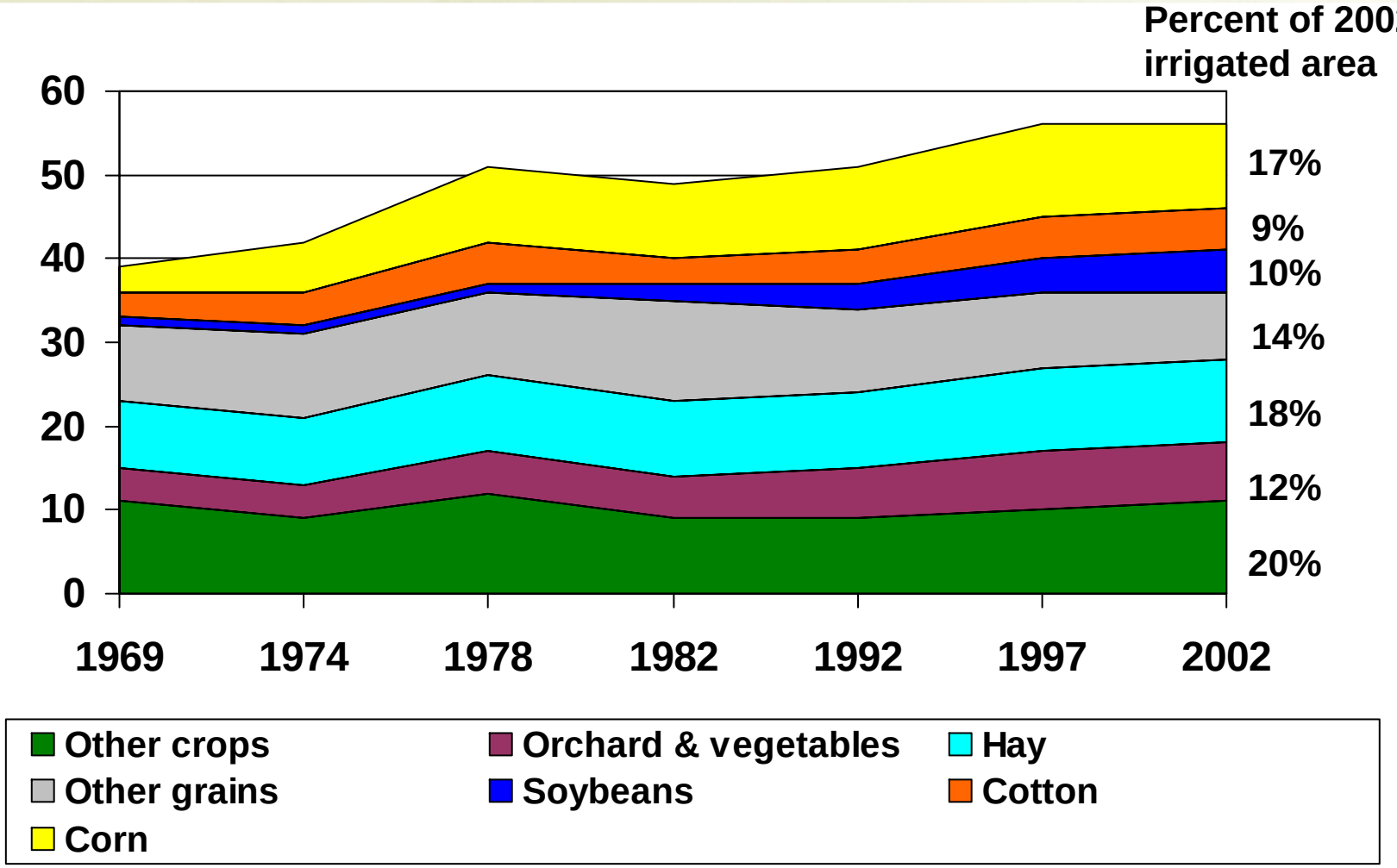
What is all that irrigation water used for?

U.S. Irrigated acreage, 2002



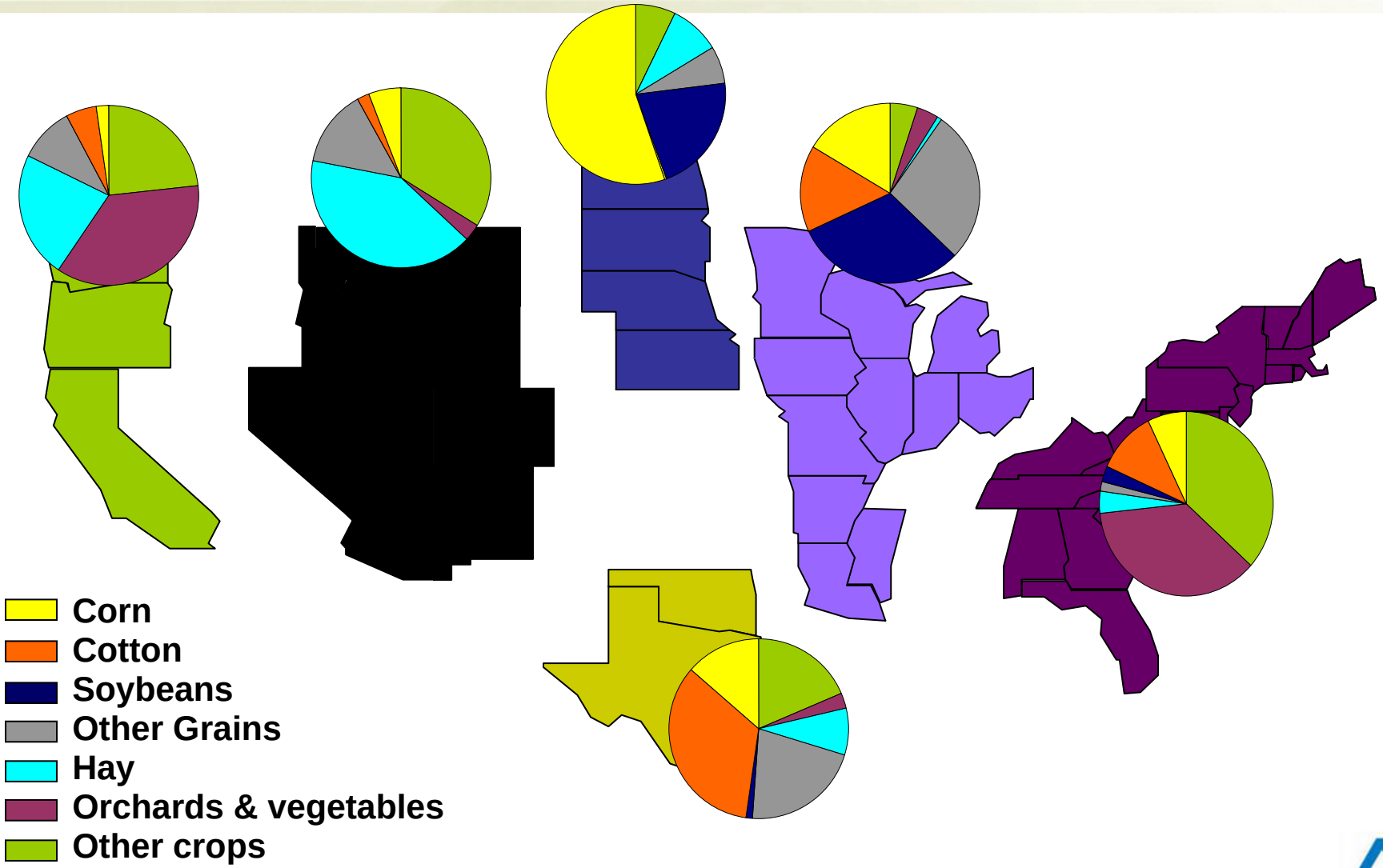
Source: NRCS analysis of Census of Agriculture Data

U.S. Irrigated crops, 1969 - 2002



Source: NRCS analysis of Census of Agriculture Data

Regional Irrigated cropping patterns, 2002

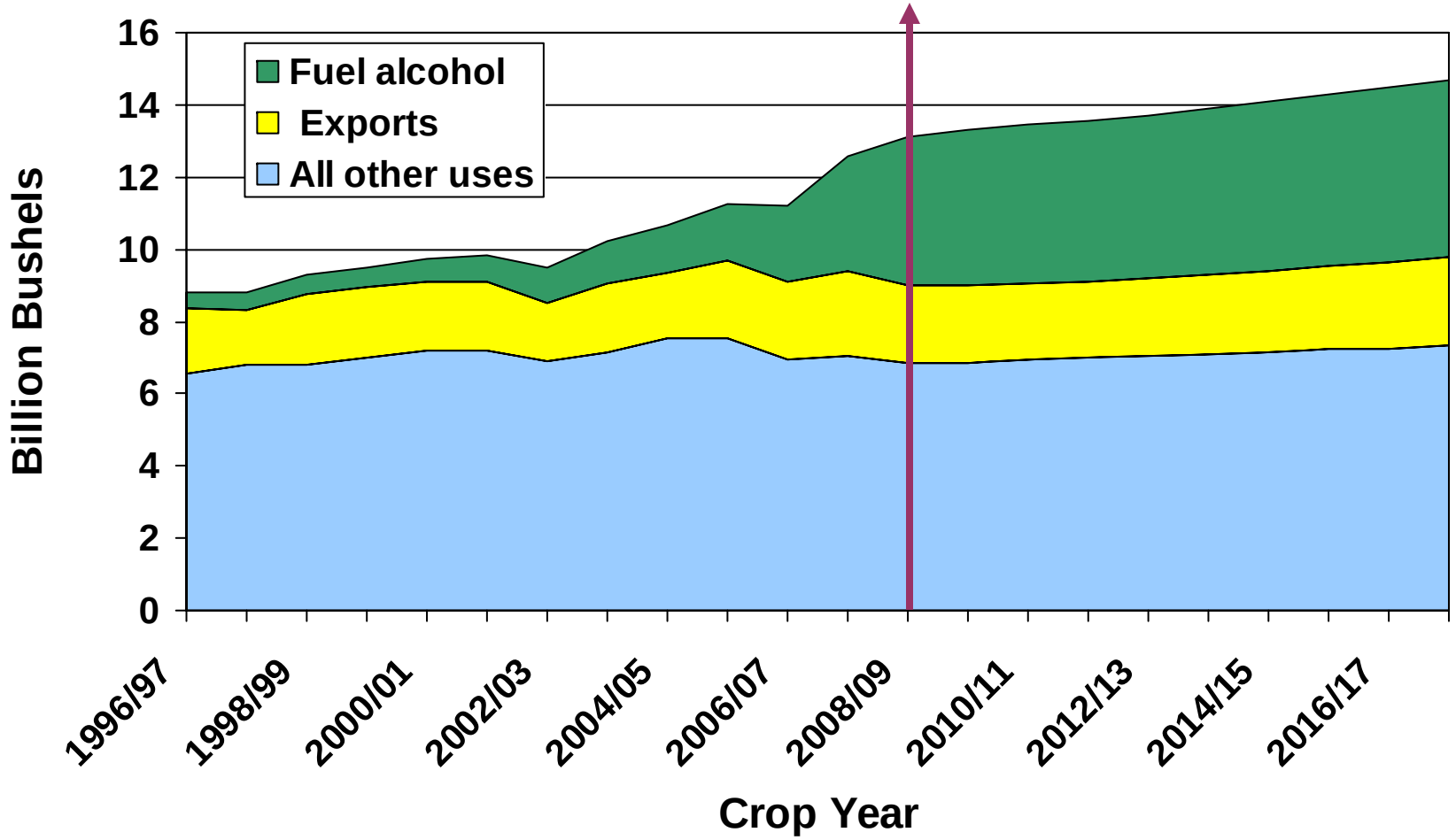


Source: NRCS analysis of Census of Agriculture Data

Land & Water – now add energy production …

Historic and projected uses for corn

Fuel alcohol: 4.1 Billion Bushels, 31% of crop



Source: USDA Baseline

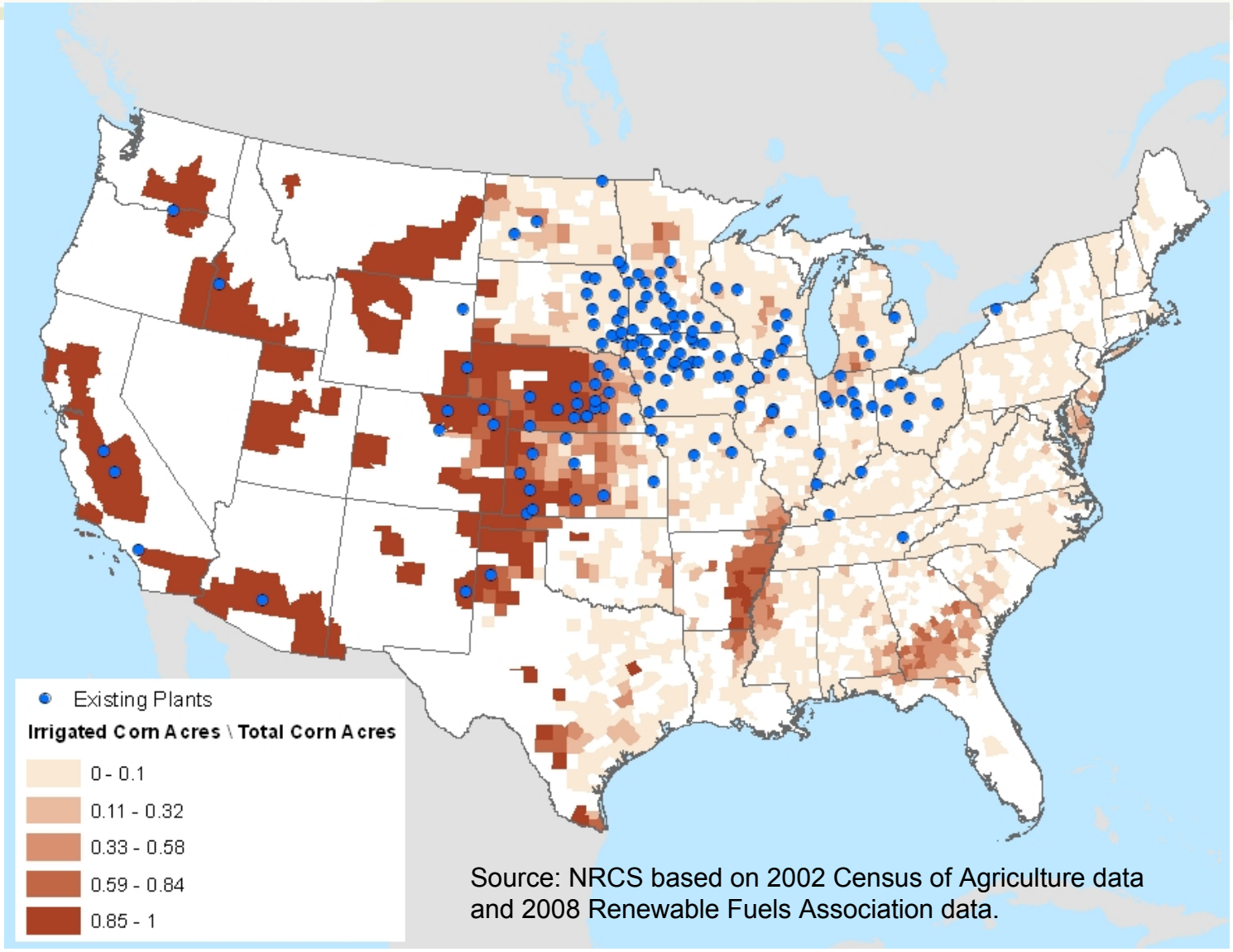
Cellulosic ethanol, the future of bioenergy?

"In 3 to 5 years, technology advances should occur that will allow the conversion of cellulosic materials, tree trimmings, old newspapers, crop residues, etc., to alcohol on an economic basis."

O.C. Doering III and R.M. Peart
"How Much Extra Energy Can Farms Produce?"
***Cutting Energy Costs,* 1980 USDA Yearbook of Agriculture**

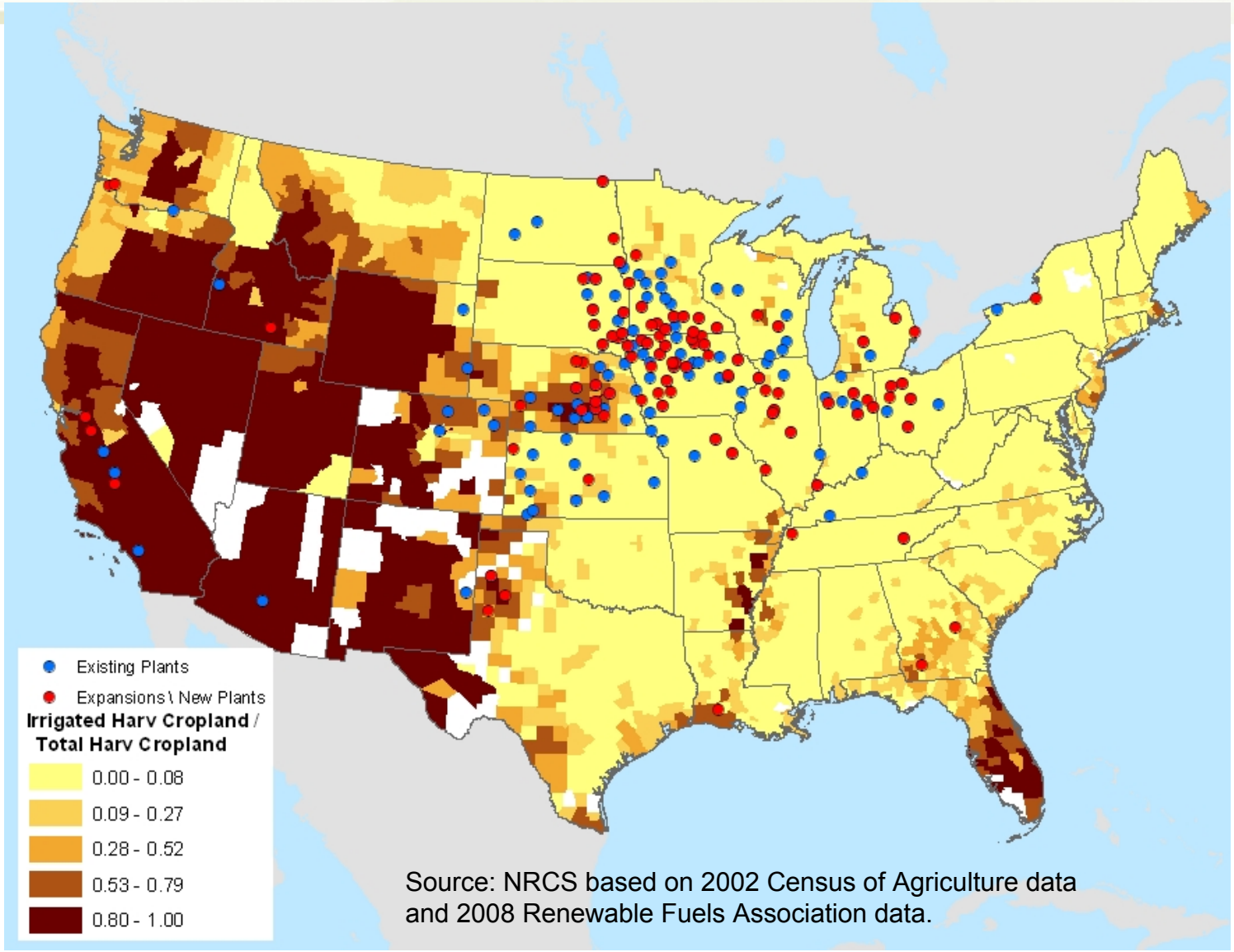
What does this mean for irrigation water demands?

Irrigated corn share and current ethanol plant locations



Source: NRCS based on 2002 Census of Agriculture data and 2008 Renewable Fuels Association data.

Irrigated acres share and current & planned ethanol plant locations



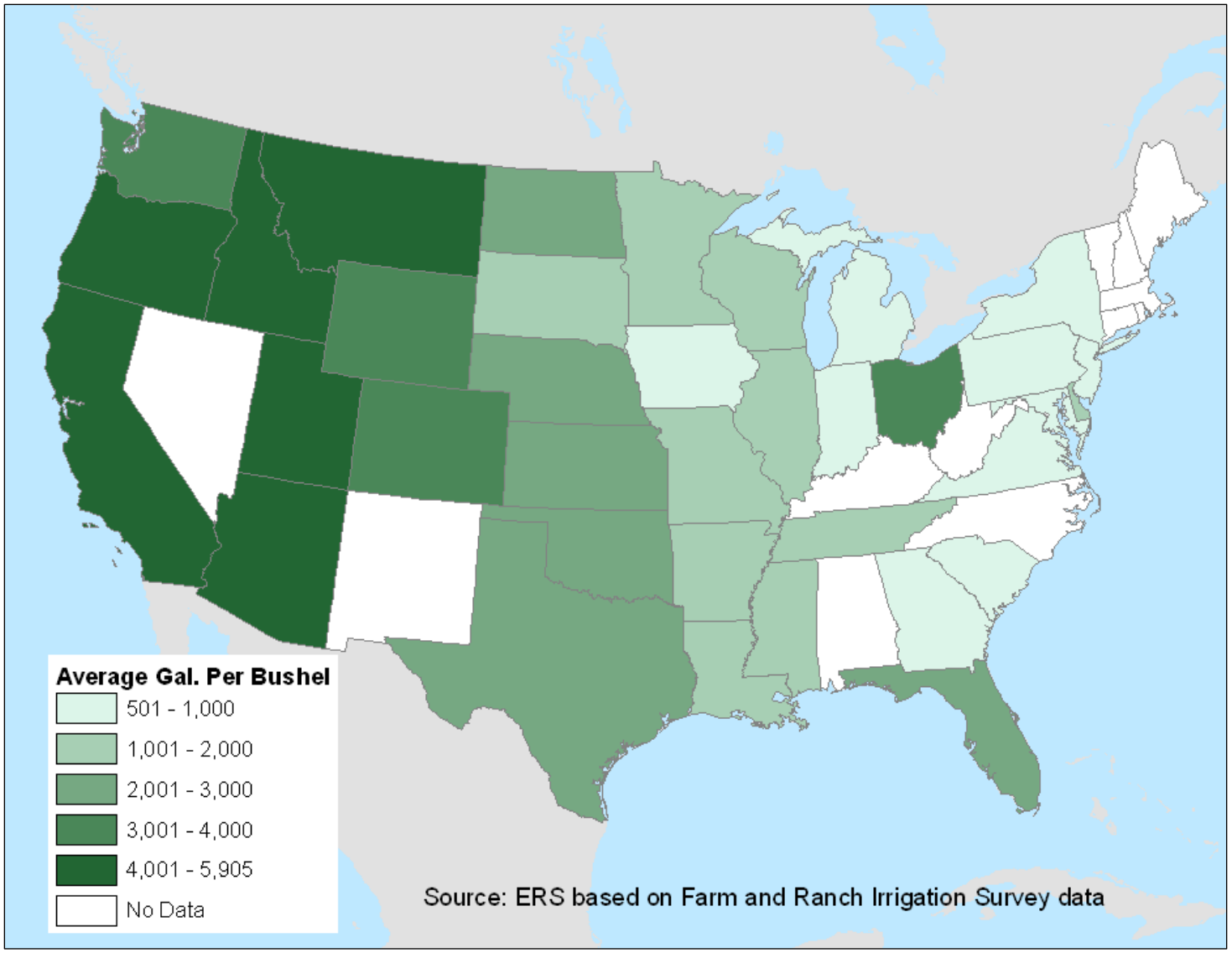
Source: NRCS based on 2002 Census of Agriculture data and 2008 Renewable Fuels Association data.

How much water for an “average” corn field?

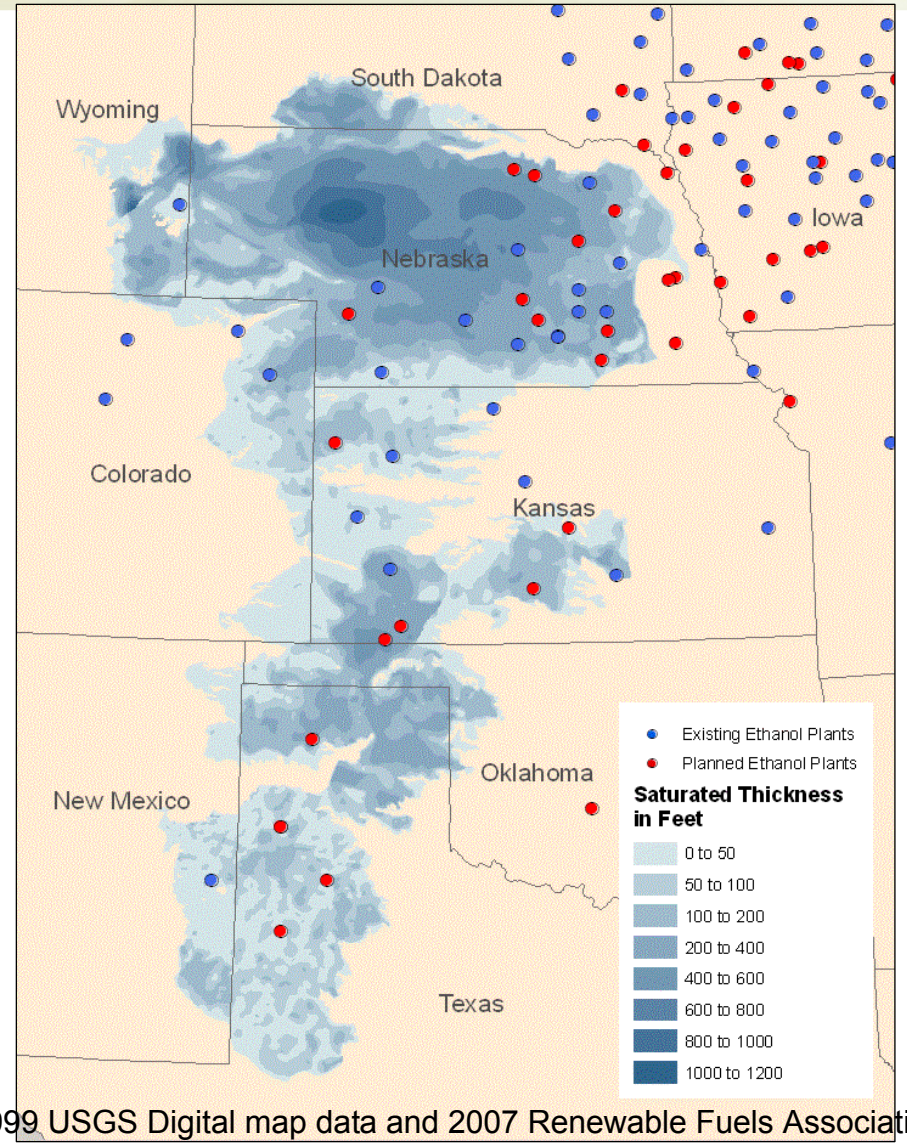
- 130 acre center-pivot field in Kansas
- 17 inch application in 2003
- 27,152 * 17 * 130 = 59,299,970 gallons per year per field applied (60 million gallons)
- Average irrigated Kansas corn yield in 2003 of 178 bu/acre
- This case 2,560 gal/bu

Source: USDA, NASS, Farm and Ranch Irrigation Survey

Gallons of irrigation water per bushel of irrigated corn, 2003

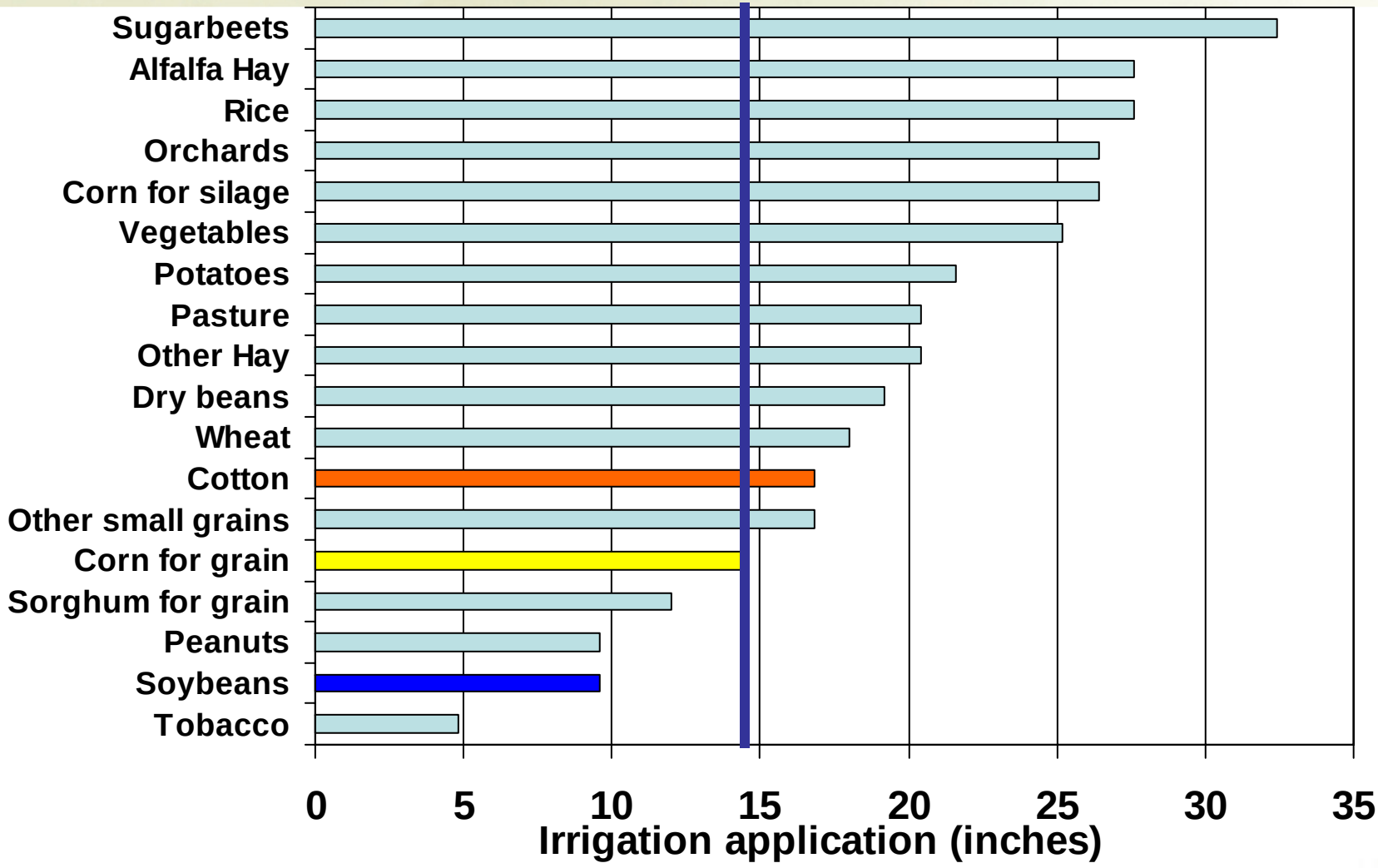


High Plains Aquifer remaining and current & planned ethanol plant locations



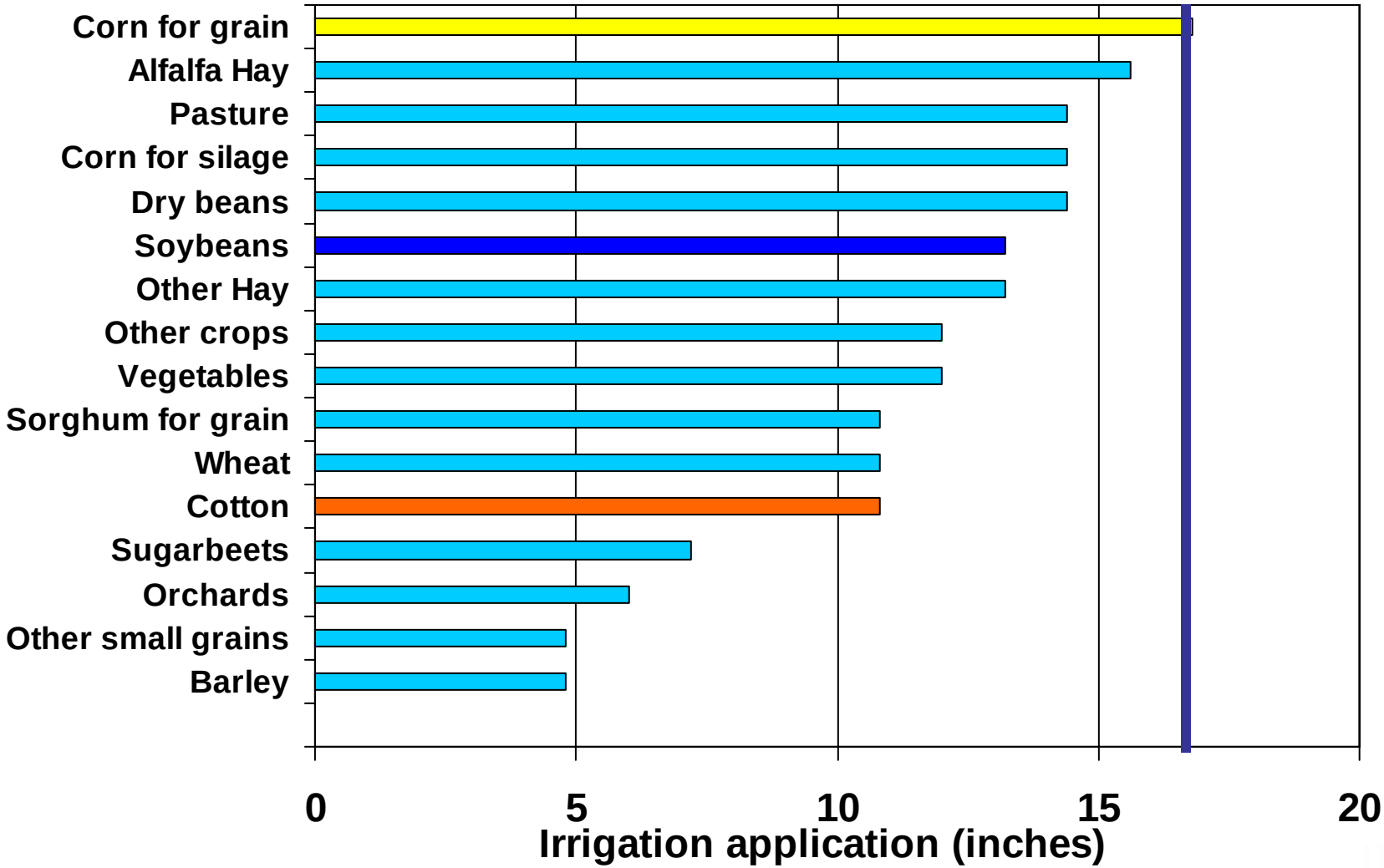
Source: NRCS based on 1999 USGS Digital map data and 2007 Renewable Fuels Association data.

Average irrigation water applications levels for selected crops, U.S., 2003



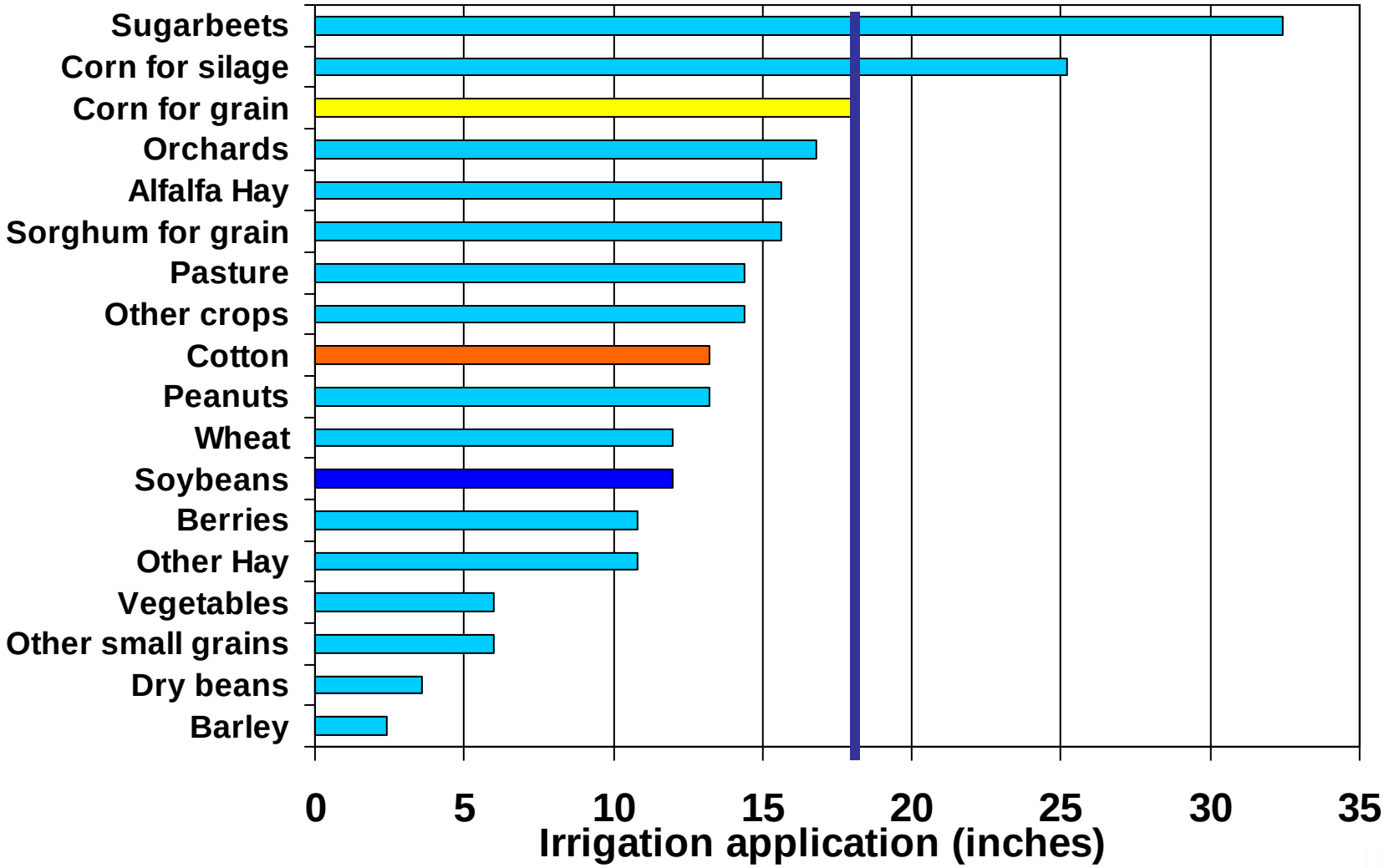
Source: ERS based on 2003 Farm and Ranch Irrigation Survey data.

Average irrigation water applications levels for selected crops, Kansas, 2003



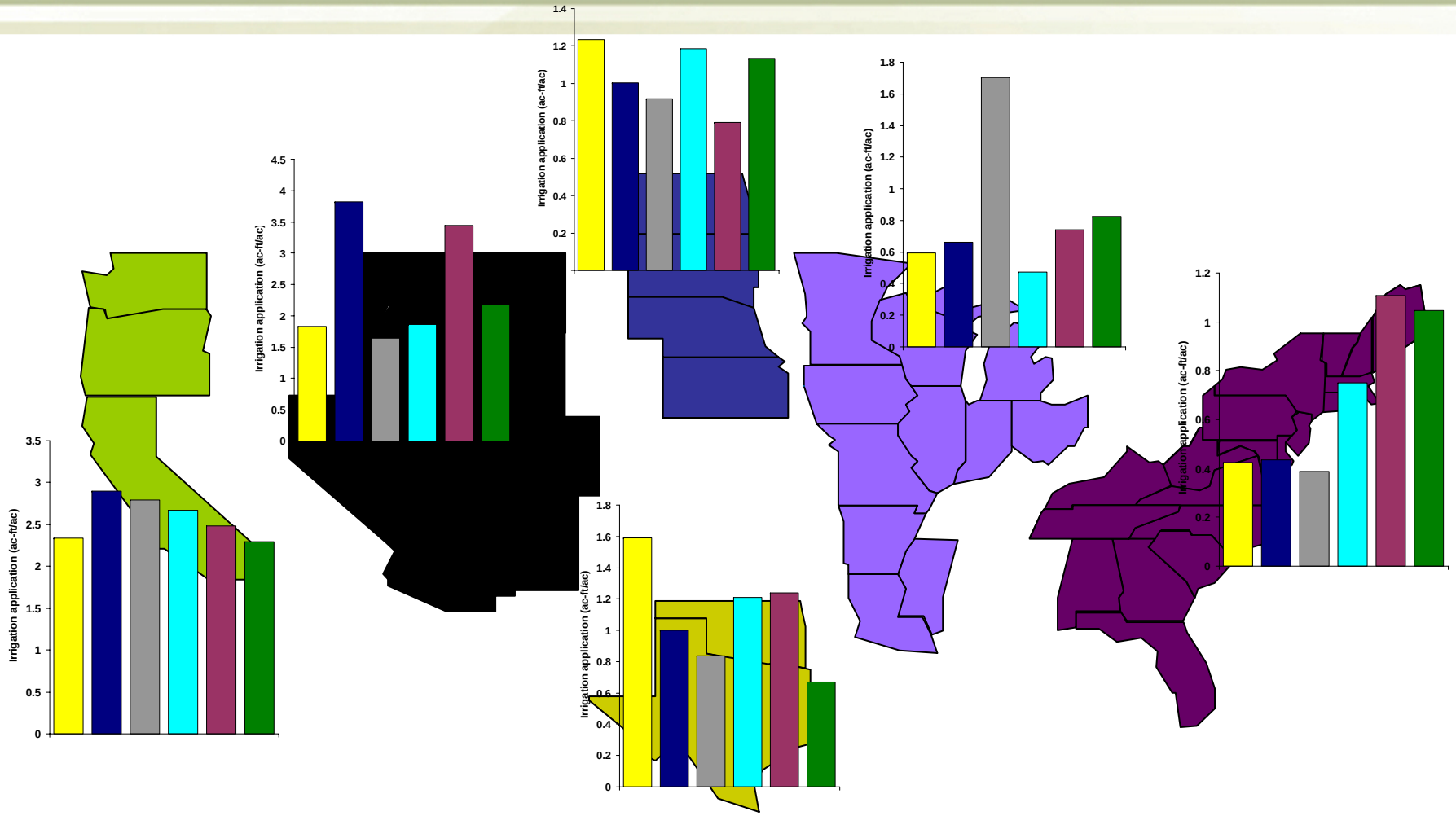
Source: ERS based on 2003 Farm and Ranch Irrigation Survey data

Average irrigation water applications levels for selected crops, Oklahoma, 2003



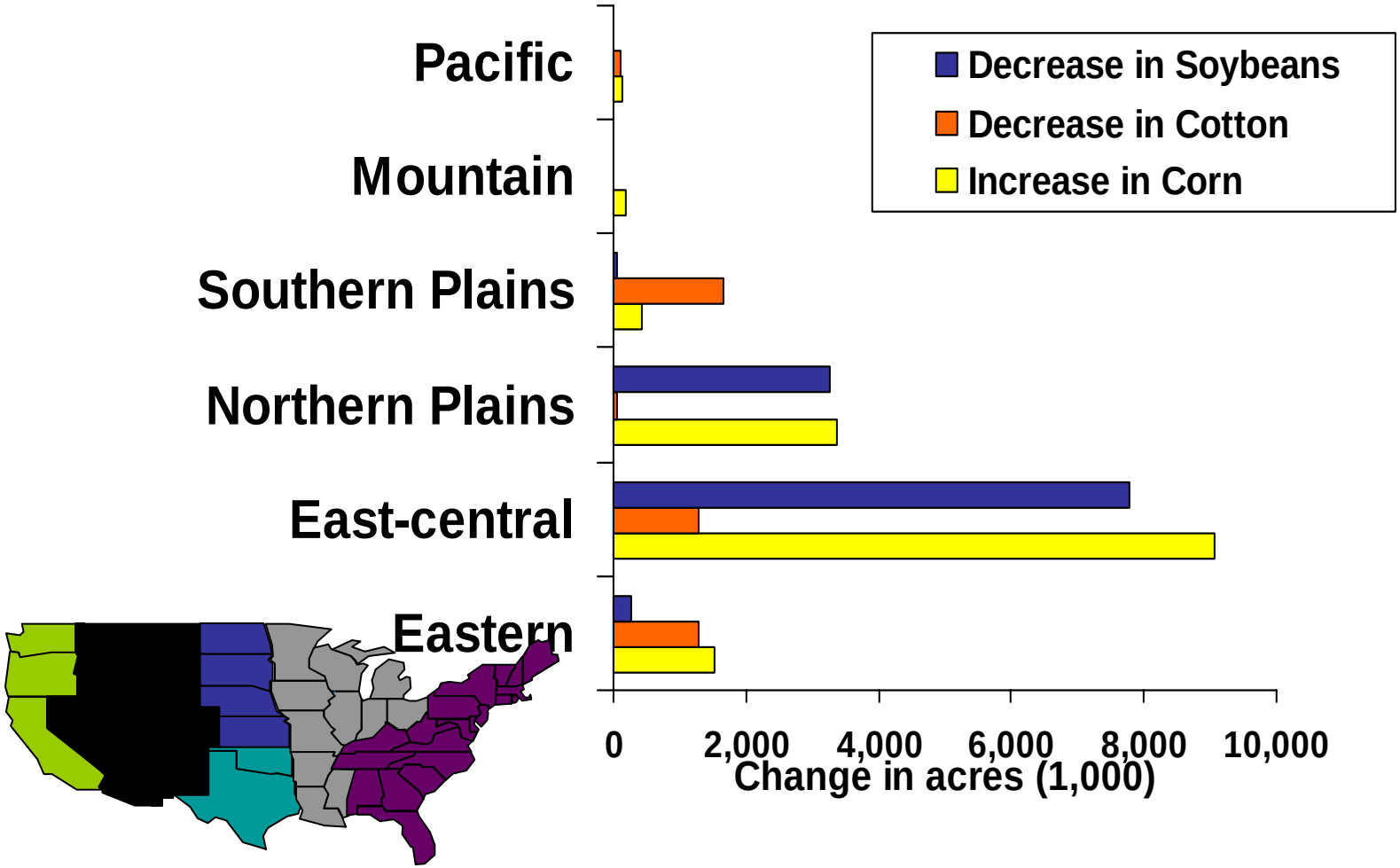
Source: ERS based on 2003 Farm and Ranch Irrigation Survey data

Regional Irrigation Water Applications, 2003



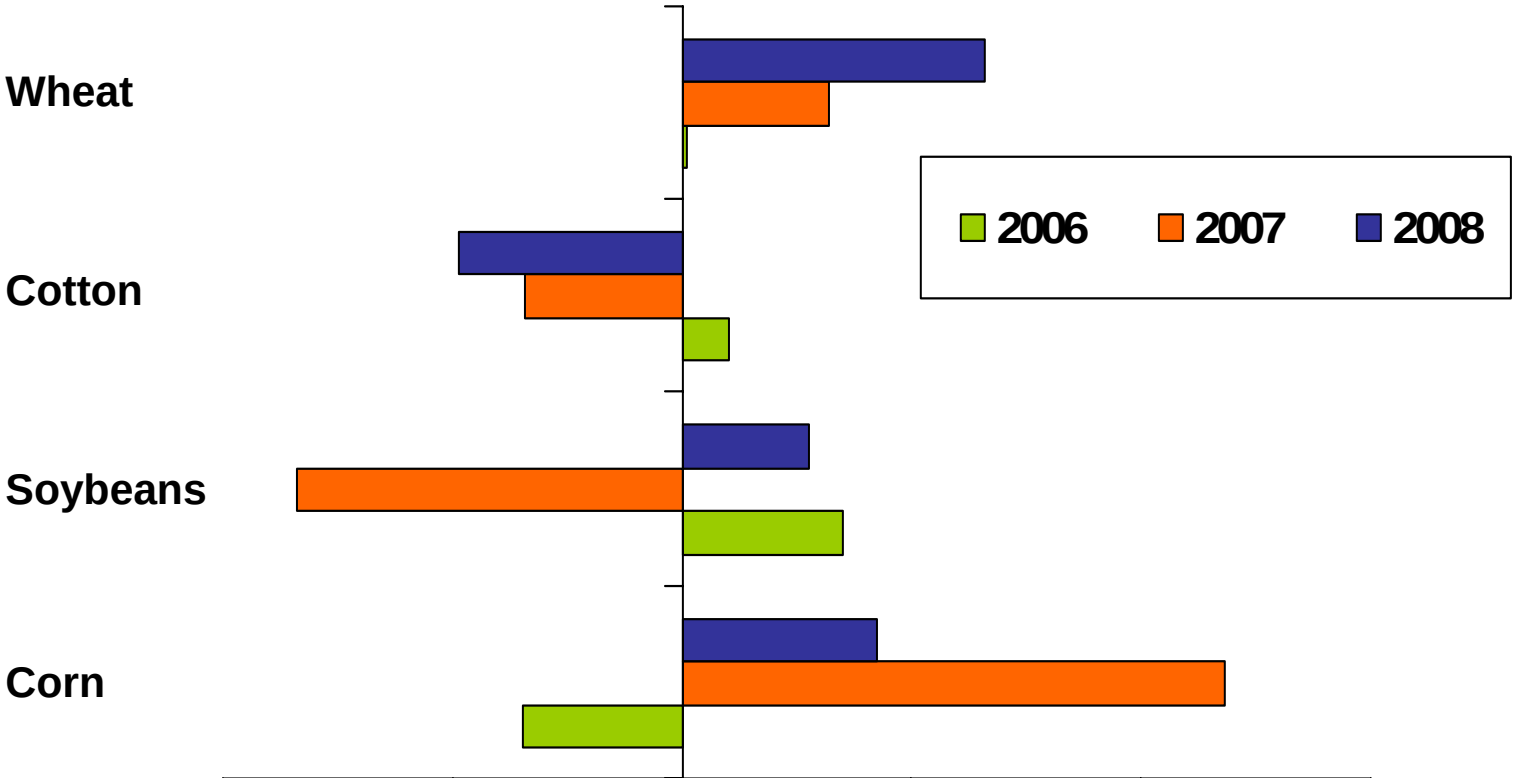
Source:NRCS analysis of Census of Agriculture Data

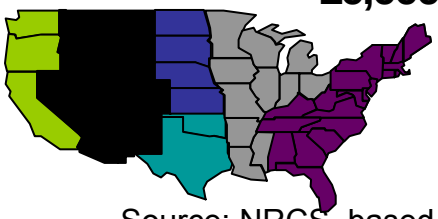
Projected Regional crop change, 2006 to 2007



Source: NRCS, based on NASS September Crop Production report

National crop acreage change from 2005





Source: NRCS, based on NASS March 2008 Projected Plantings reportt

Resource requirements for Biofuel production

- **Shifting** irrigated acres to biofuel production
  - Land - one for one primary shift (secondary impacts are likely as crop prices rise)
    - Nitrogen fertilizer needs.
    - Pesticide needs.
    - Erosion levels.
  - Irrigation water – depends on the specific crop shift and where it occurs
    - Soybeans to corn Northern Plains: ▲irrigation water application
    - Potatoes to corn in Pacific: ▼ irrigation water application

Resource requirements for Biofuel production

- **Develop** new irrigated acres for biofuel production?
  - Land – irrigable acres available, but …
  - Irrigation Water – location specific availability
    - Water use is controlled by State laws.
    - Many States are now using a local planning process to establish management goals.
    - Declines in water availability in some locations to meet environmental and water quality concerns.
    - Irrigated field-crop returns relative to non-irrigated

Summary

- In the short run, increased agricultural production for biofuels will not alter the national view of water use.
- Growing crops for biofuel production will have a more significant regional and local impact.
  - In some cases an increase in water use.
  - In other cases a decrease, depending on the crops being grown now and the biofuel crops produced.

Thank you!

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