

Groundwater and Agricultural Bioenergy Feedstock Production

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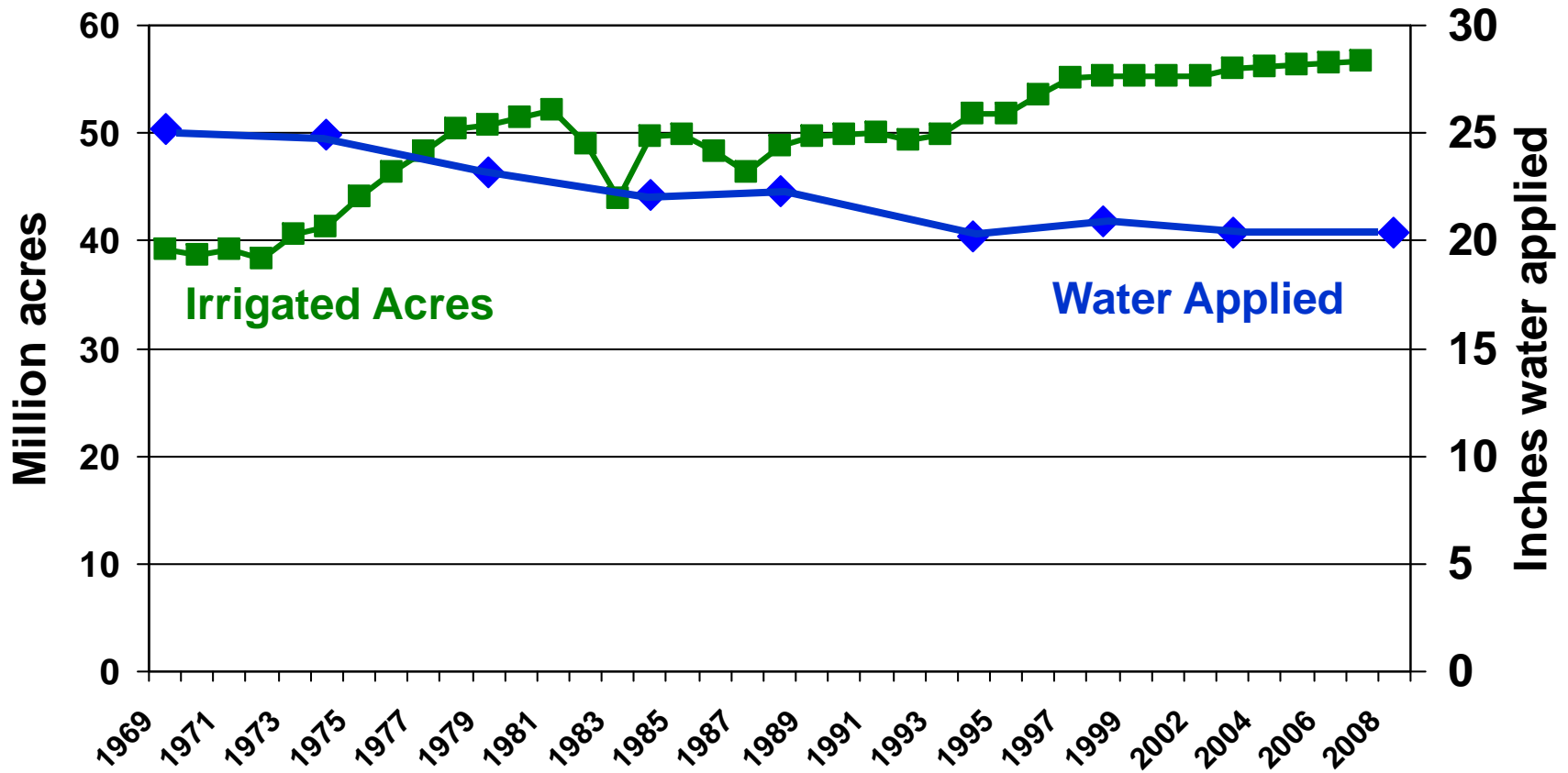


Goal of presentation

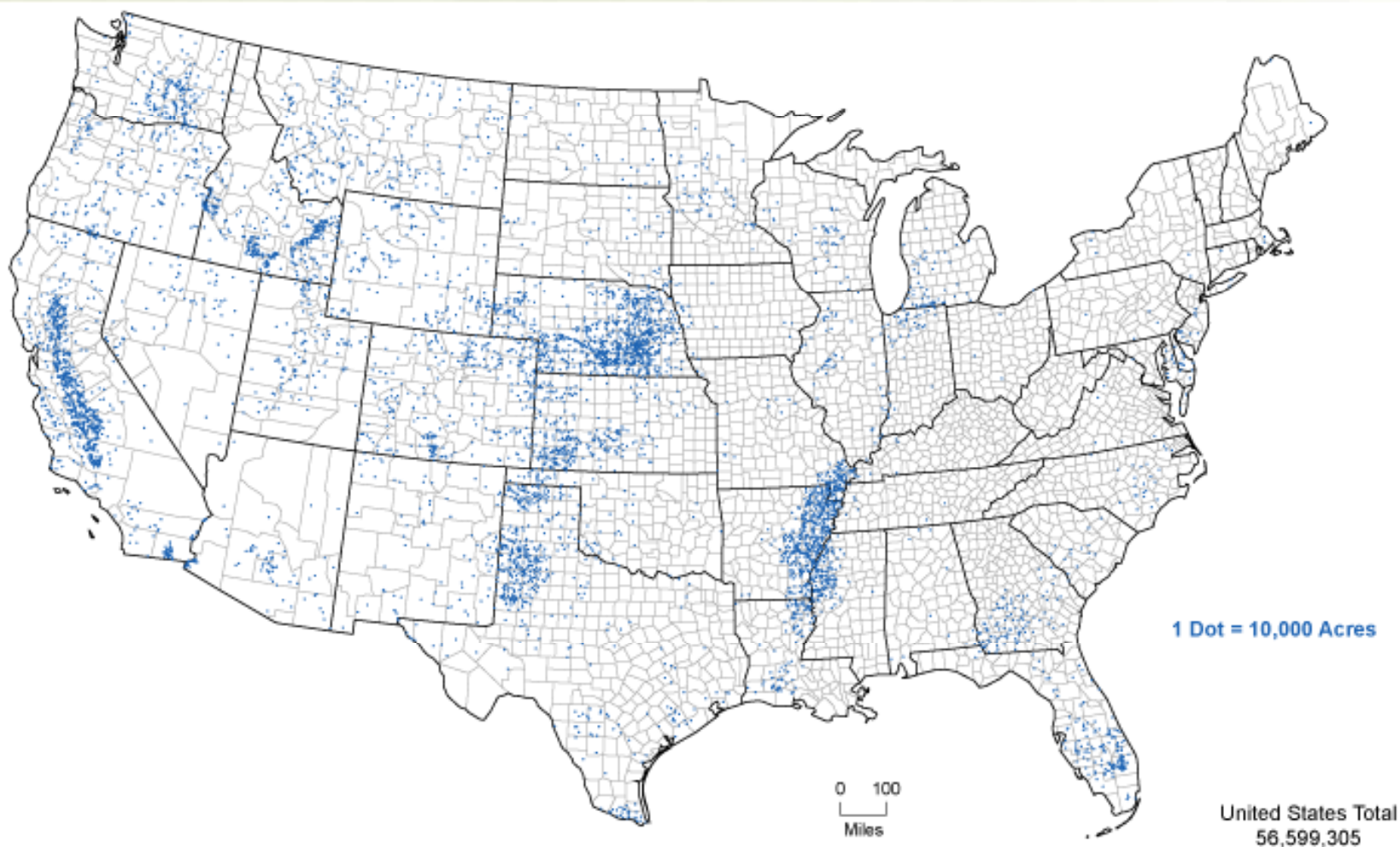
- Provide a National perspective on irrigated agriculture
 - Acres
 - Water use
 - Crops
- What do trends and current conditions tell us about the water and land potentially used for biofuel production?
- What are the groundwater implications?



U.S. irrigated acres & water applications



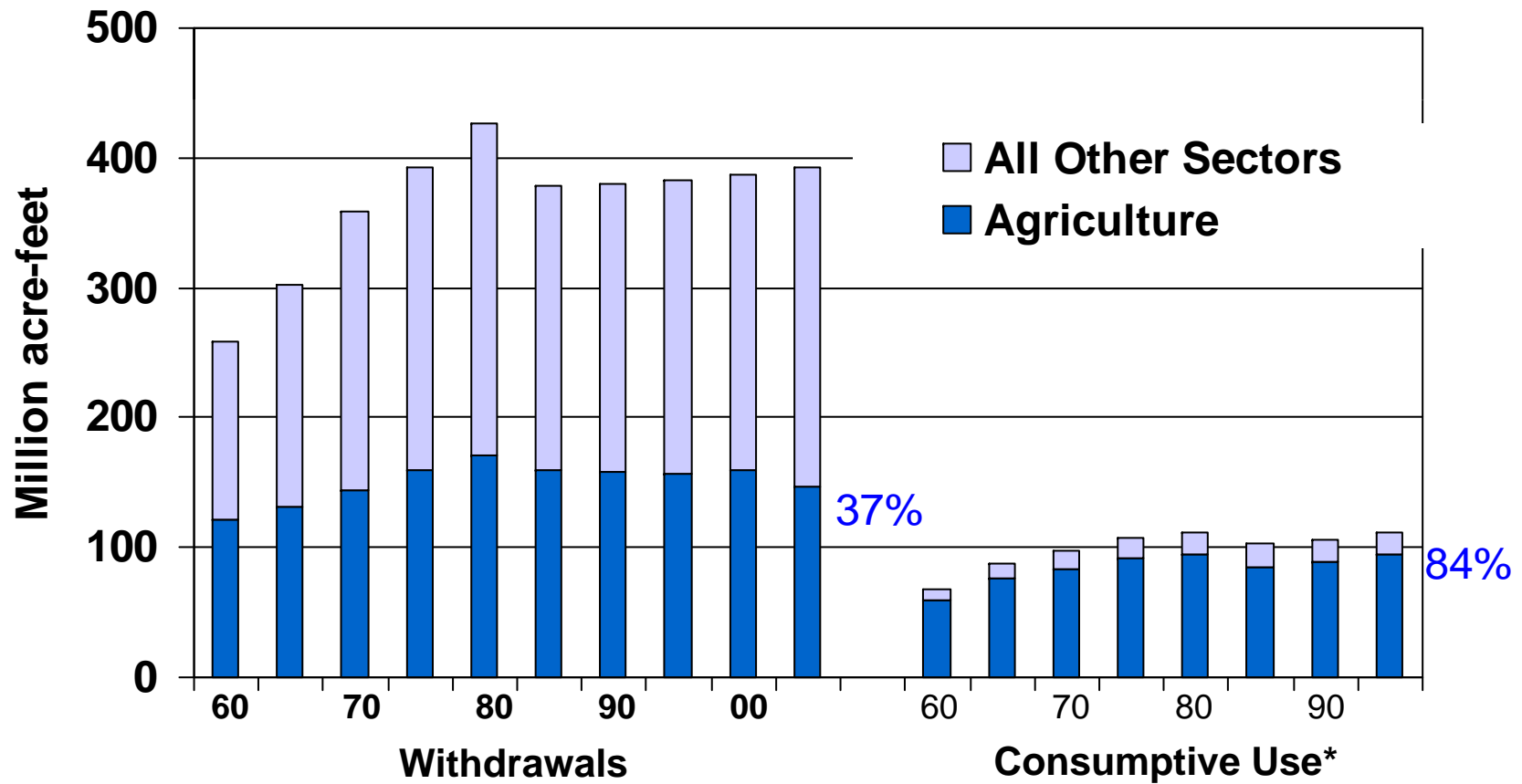
Irrigation overview: Acres location, 2007



Source: USDA, 2007 Census of Agriculture



Total and agricultural water withdrawals (1960-2005) and consumptive use estimates (1960-1995)



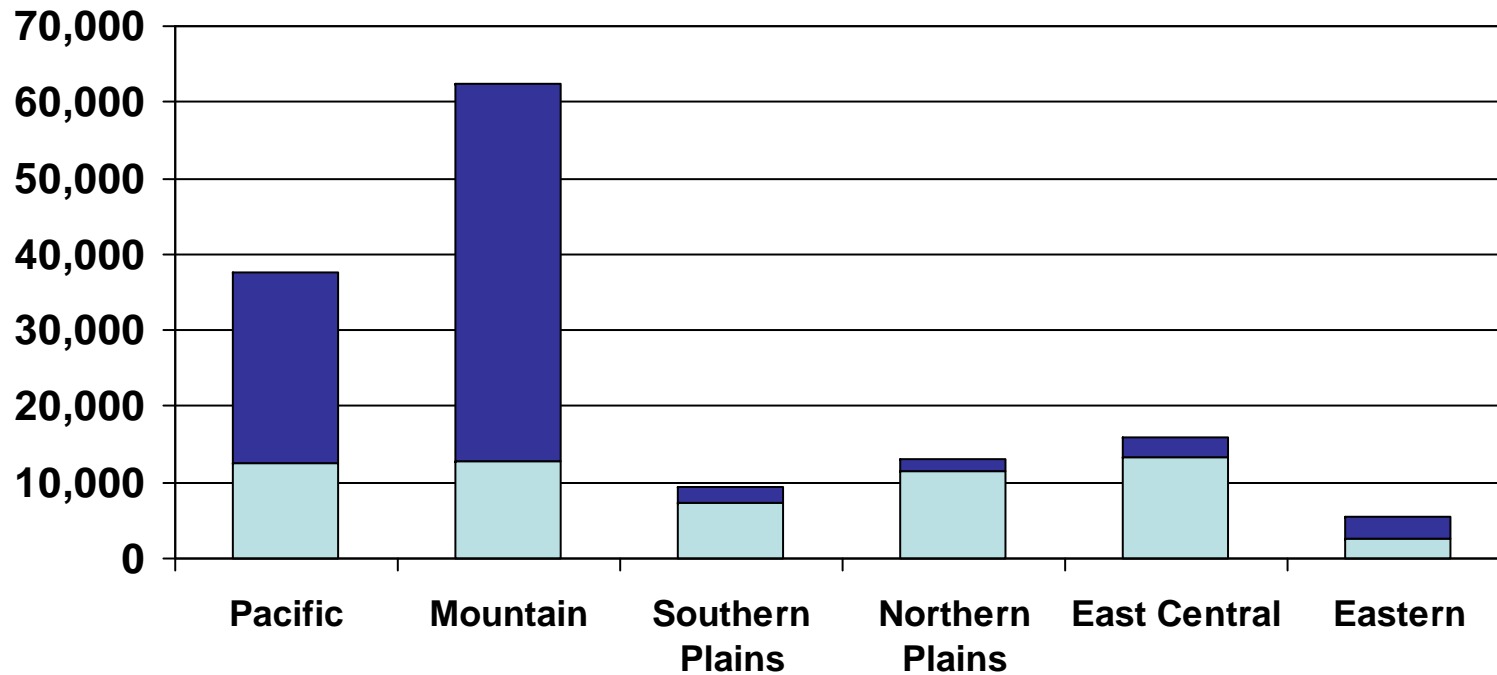
Source: USDA, NRCS, based on Kenny, et al, 2009

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

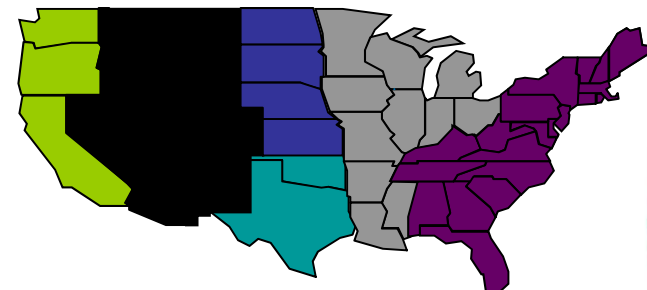


U.S. Irrigation water withdrawals, 2005

Acre-feet (1,000)



Groundwater Surface water



Source: NRCS analysis of USGS Water Use data



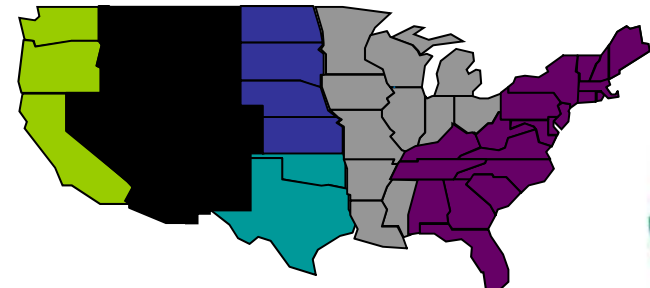
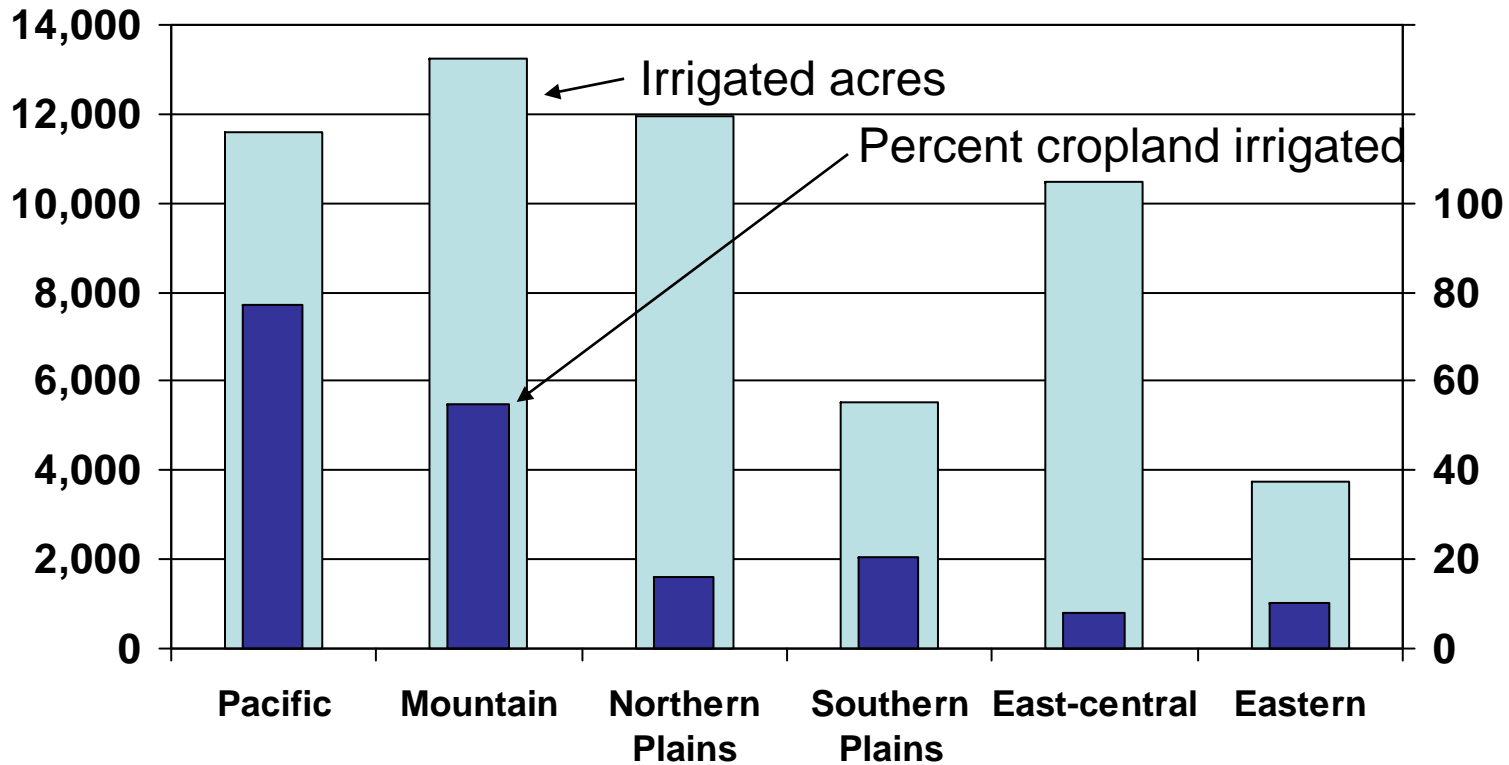
What is all that irrigation water used for?



U.S. irrigated acreage, 2007

Cropland irrigated (%)

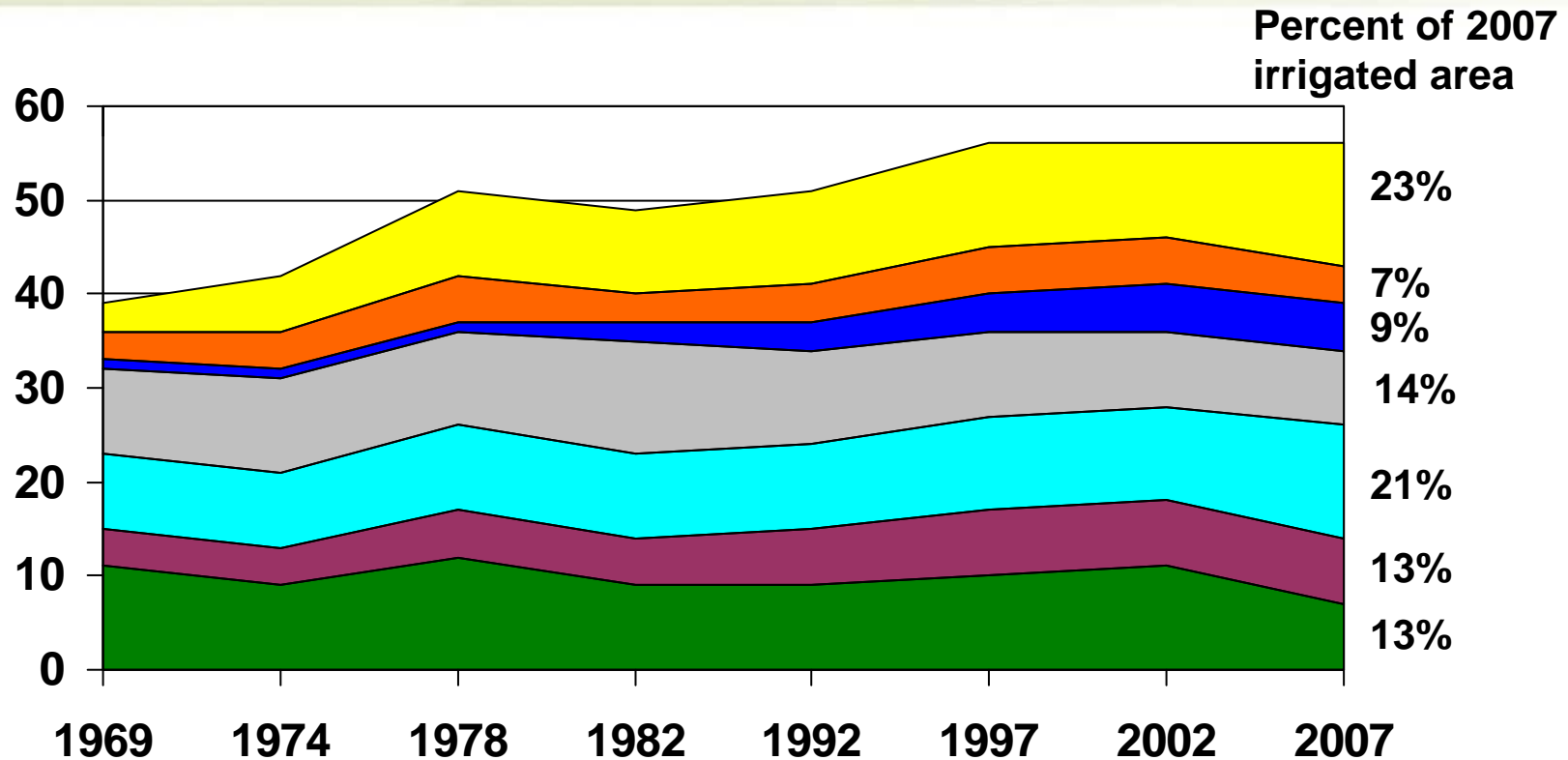
Acres (1,000)



Source: NRCS analysis of Census of Agriculture Data



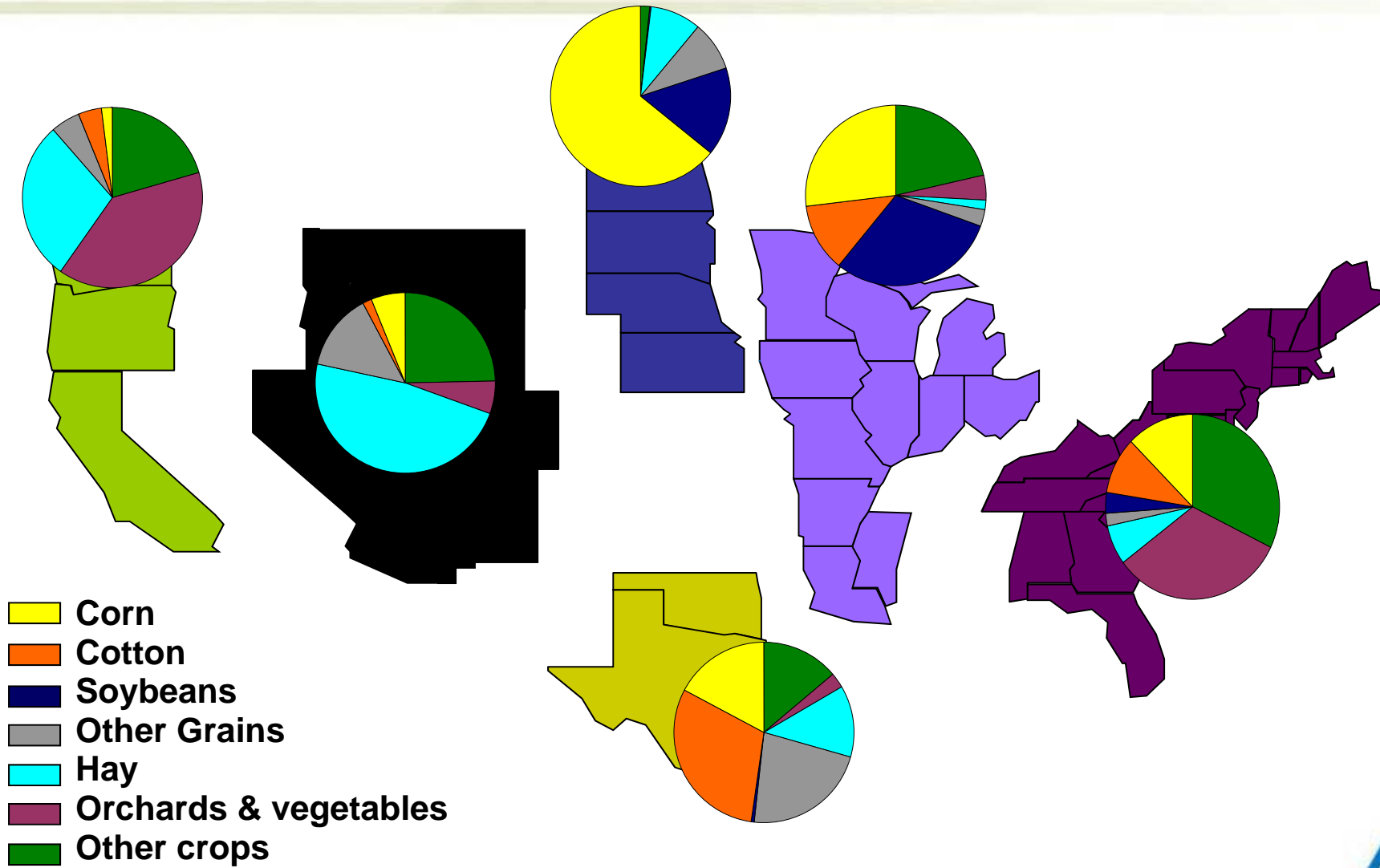
U.S. irrigated crops, 1969 - 2007



Source: NRCS analysis of Census of Agriculture Data



Regional Irrigated cropping patterns, 2007



Source: NRCS analysis of Census of Agriculture Data



How much water for an “average” corn field?

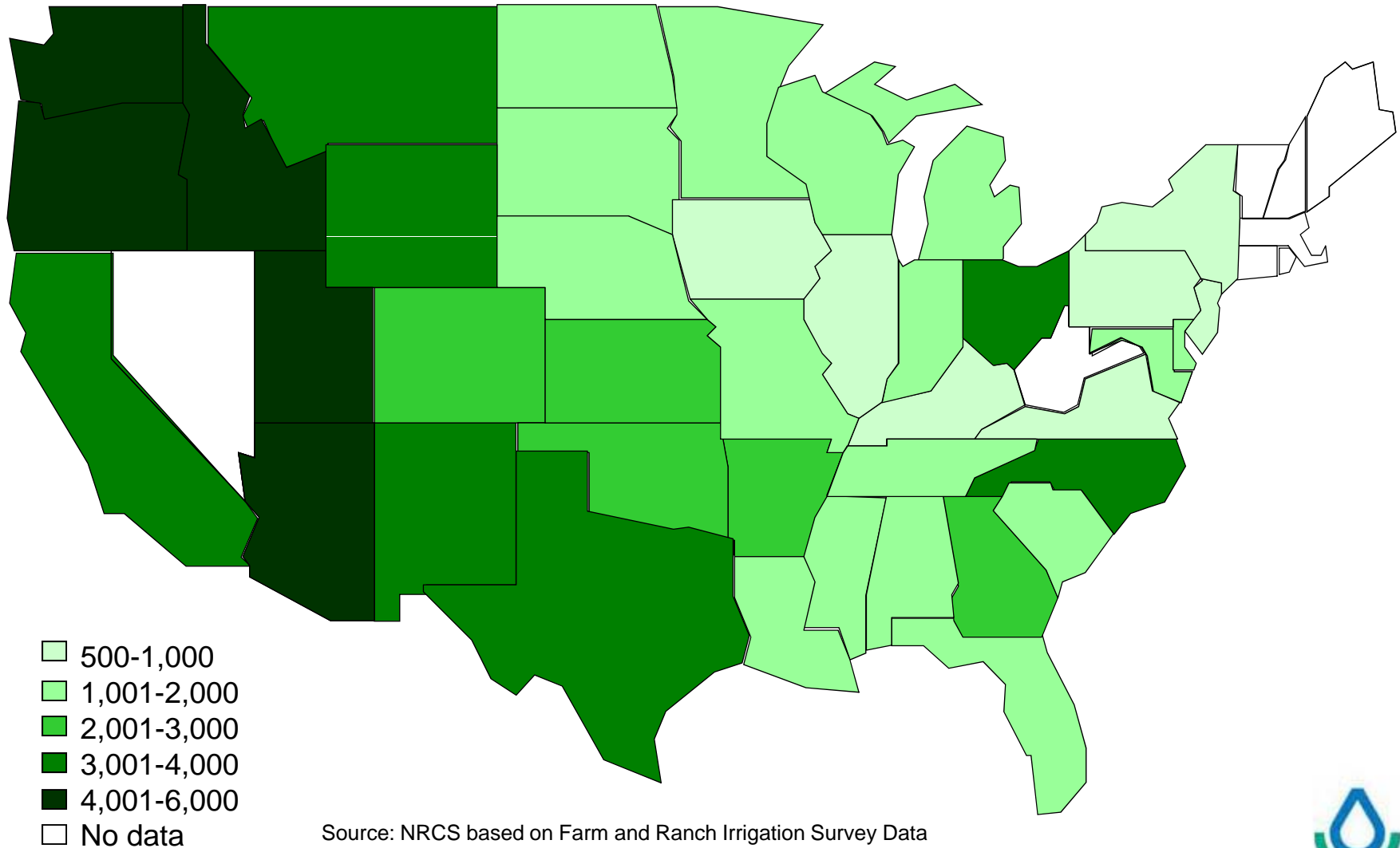


- 130 acre center-pivot field
- 12 inch application in 2008 (reduction from 14 in 2003)
- 42,357,120 gallons applied per year per field ($27,152 * 12 * 130$)
- States with >100,000 acres range from 21 to 85 million gallons per field
- 1,800 gallons /bu (based on average irrigated corn yield in 2008 of 181 bu/acre)

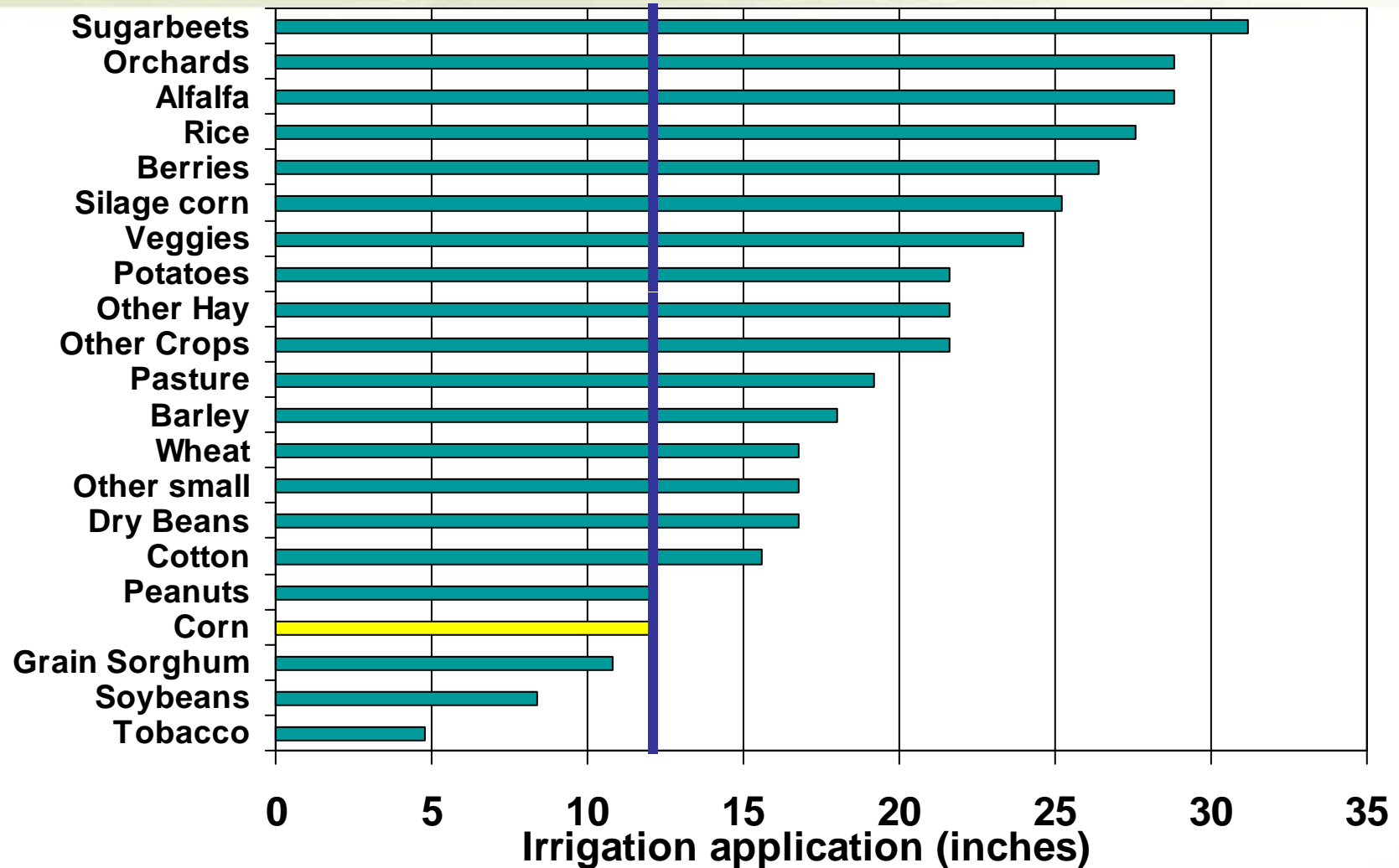
Source: USDA, NASS, Farm and Ranch Irrigation Survey



Gallons of irrigation water per bushel of irrigated corn, 2008



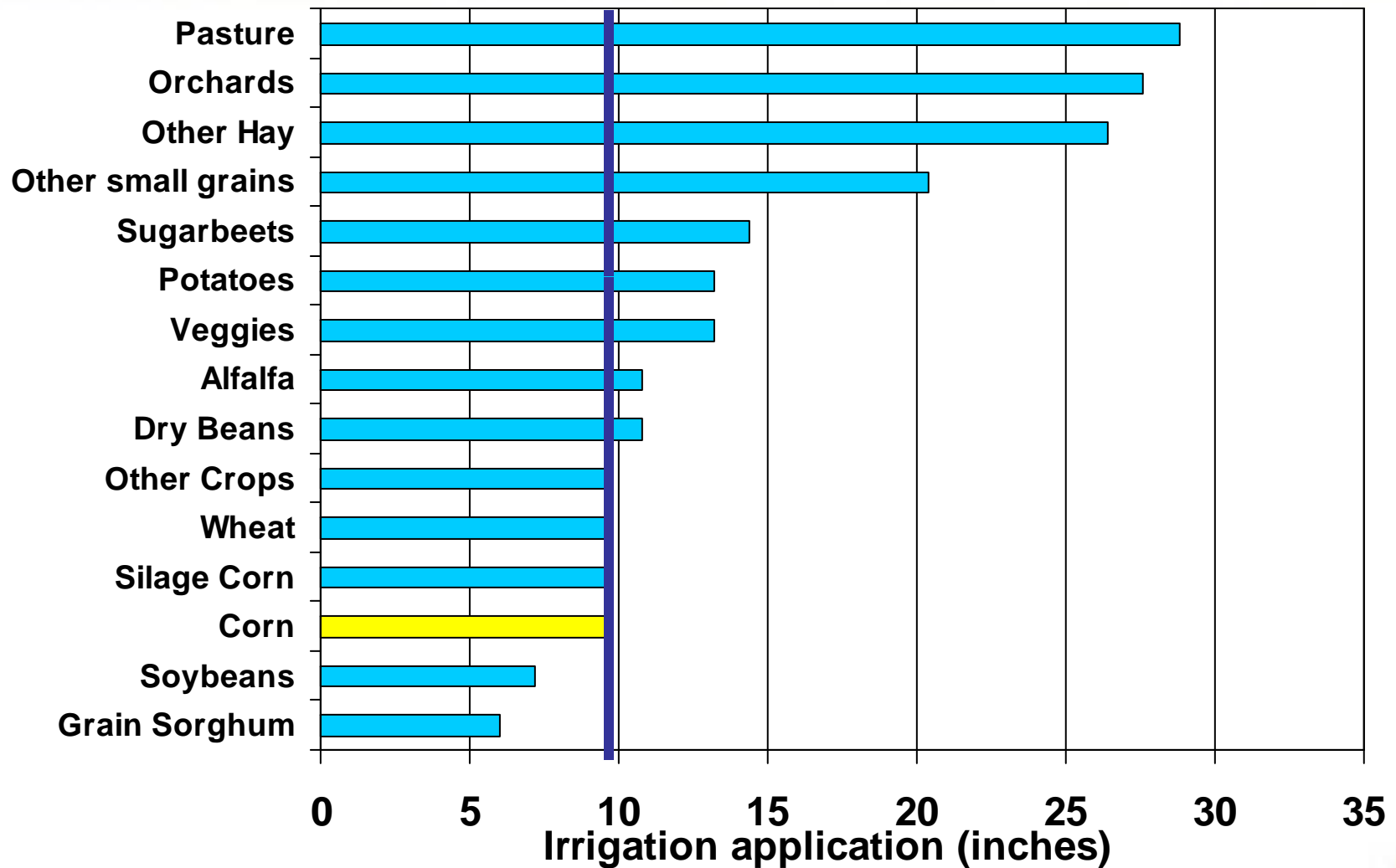
Average irrigation water applications levels for selected crops, U.S., 2008



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



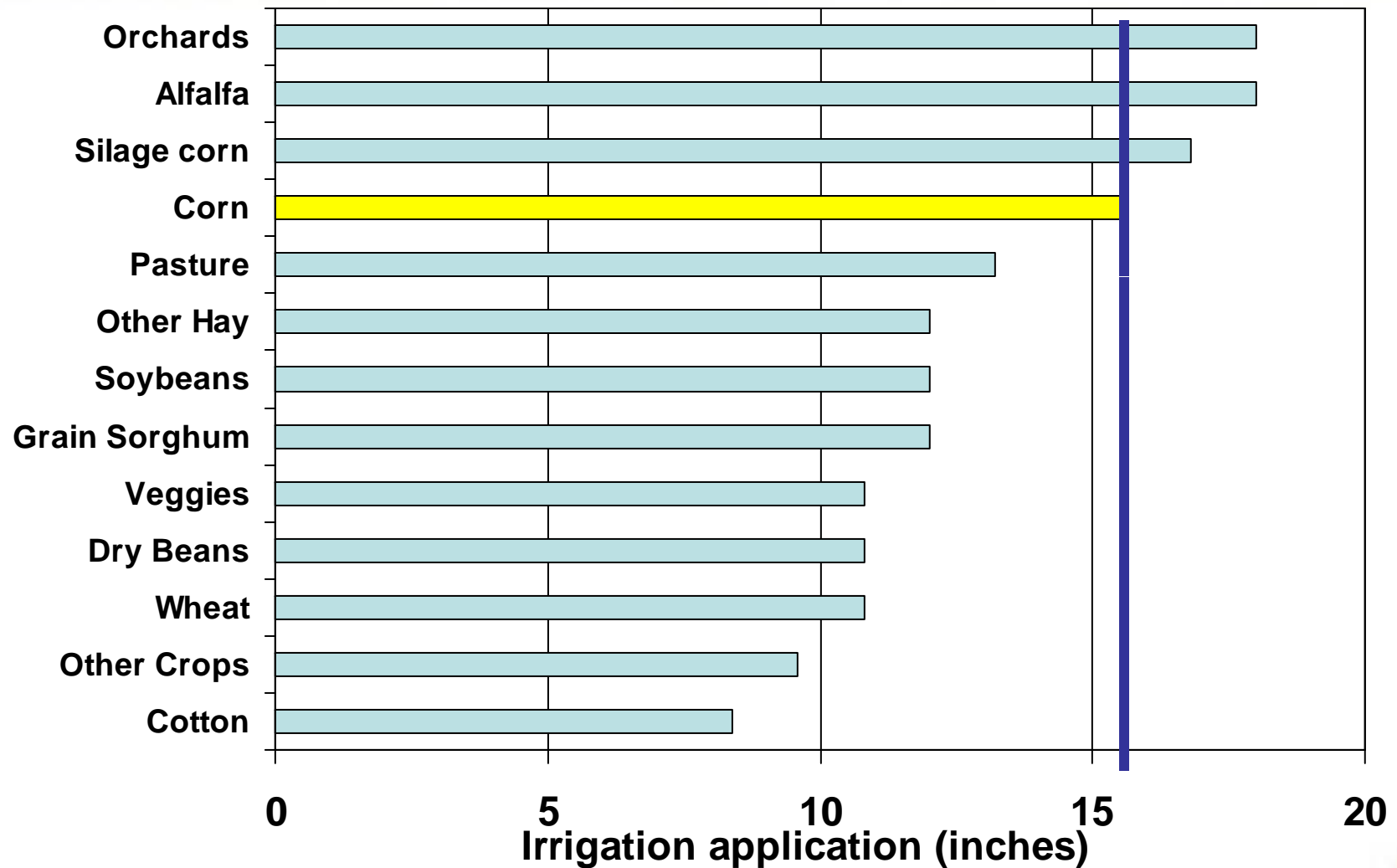
Average irrigation water applications levels for selected crops, Nebraska, 2008



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



Average irrigation water applications levels for selected crops, Kansas, 2008









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



Biofuel feedstock production and potential irrigation water demand



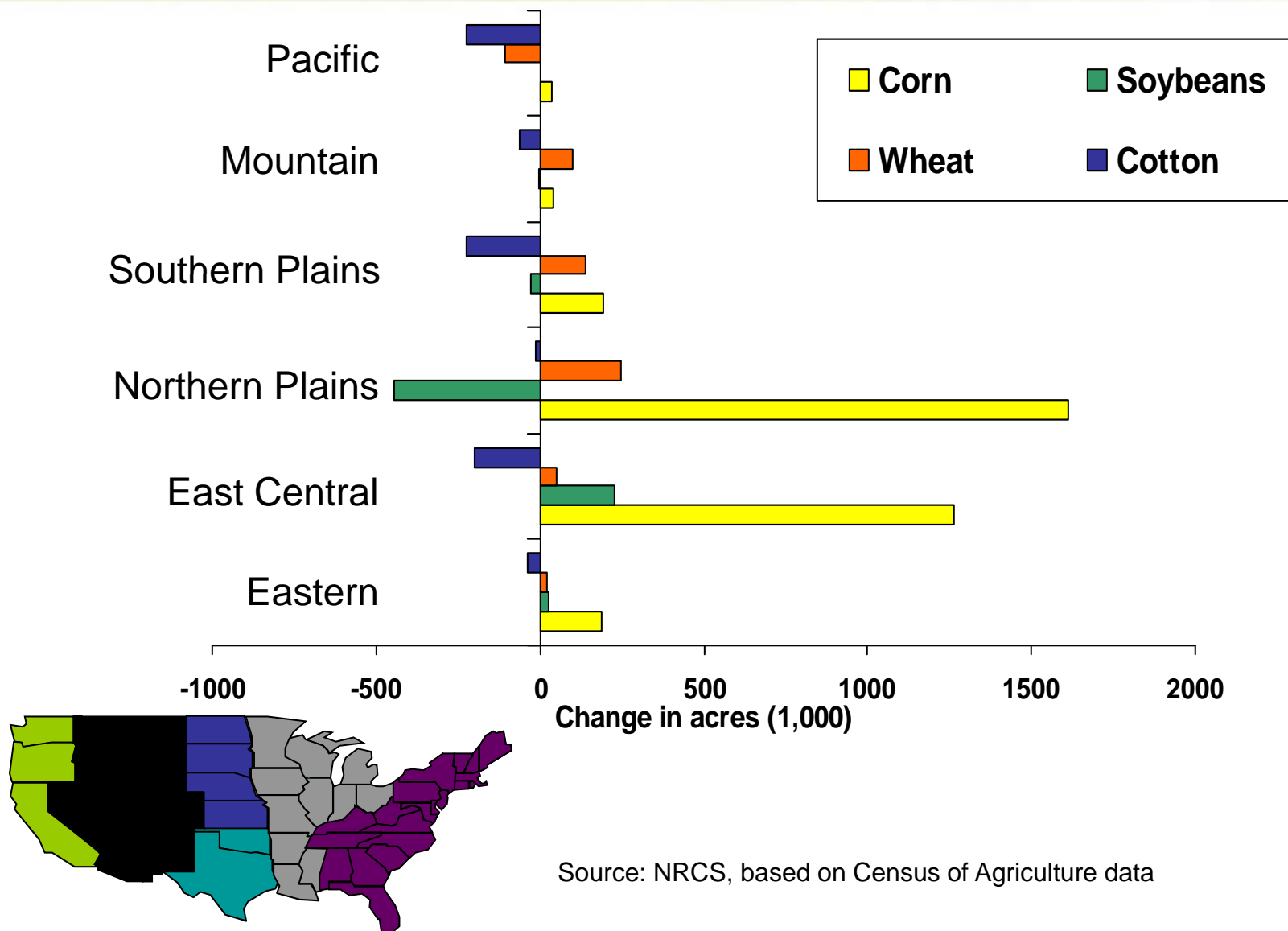
The Ethanol “Experiment” from 2002 to 2007

	2002-2007
• Corn acres	 26%
• Irrigated corn acres	 36%
• Corn production	 48%
• Corn exports	 53%
• Corn ethanol use	 275%
• Corn price	 81%

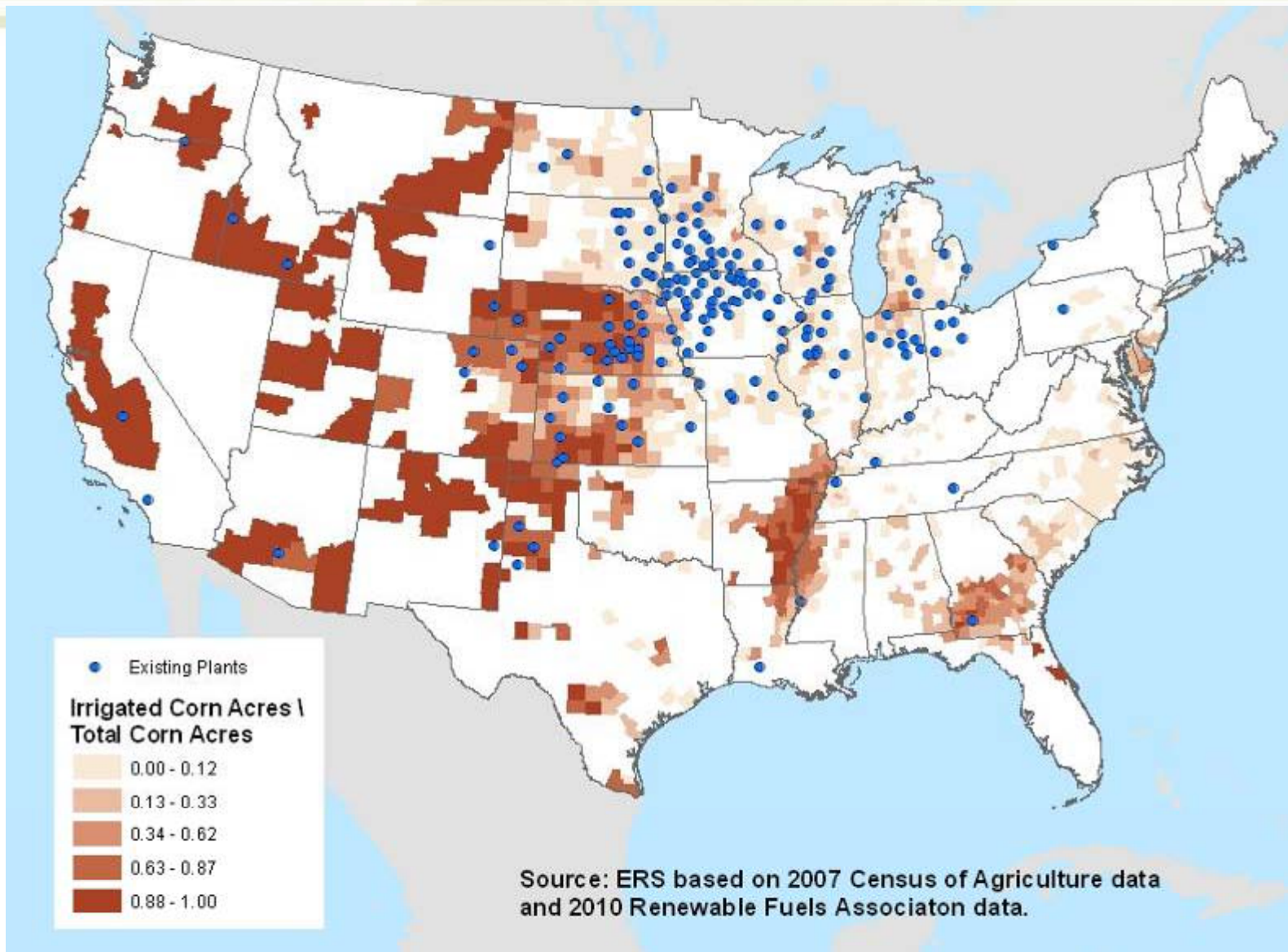
Source: NRCS, based on Census of Agriculture and ERS data



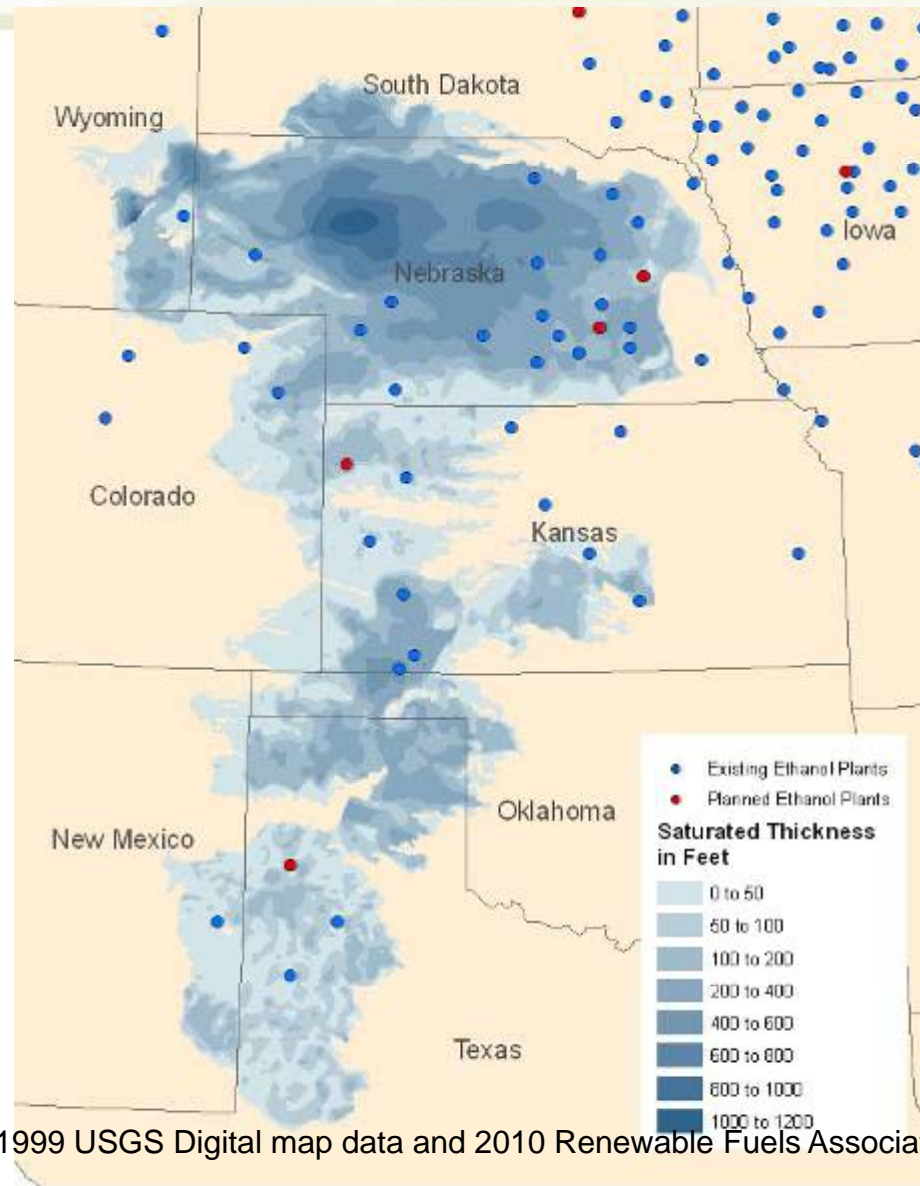
Regional crop shifts from 2002 to 2007, selected irrigated crops



Irrigated corn share and current ethanol plant locations



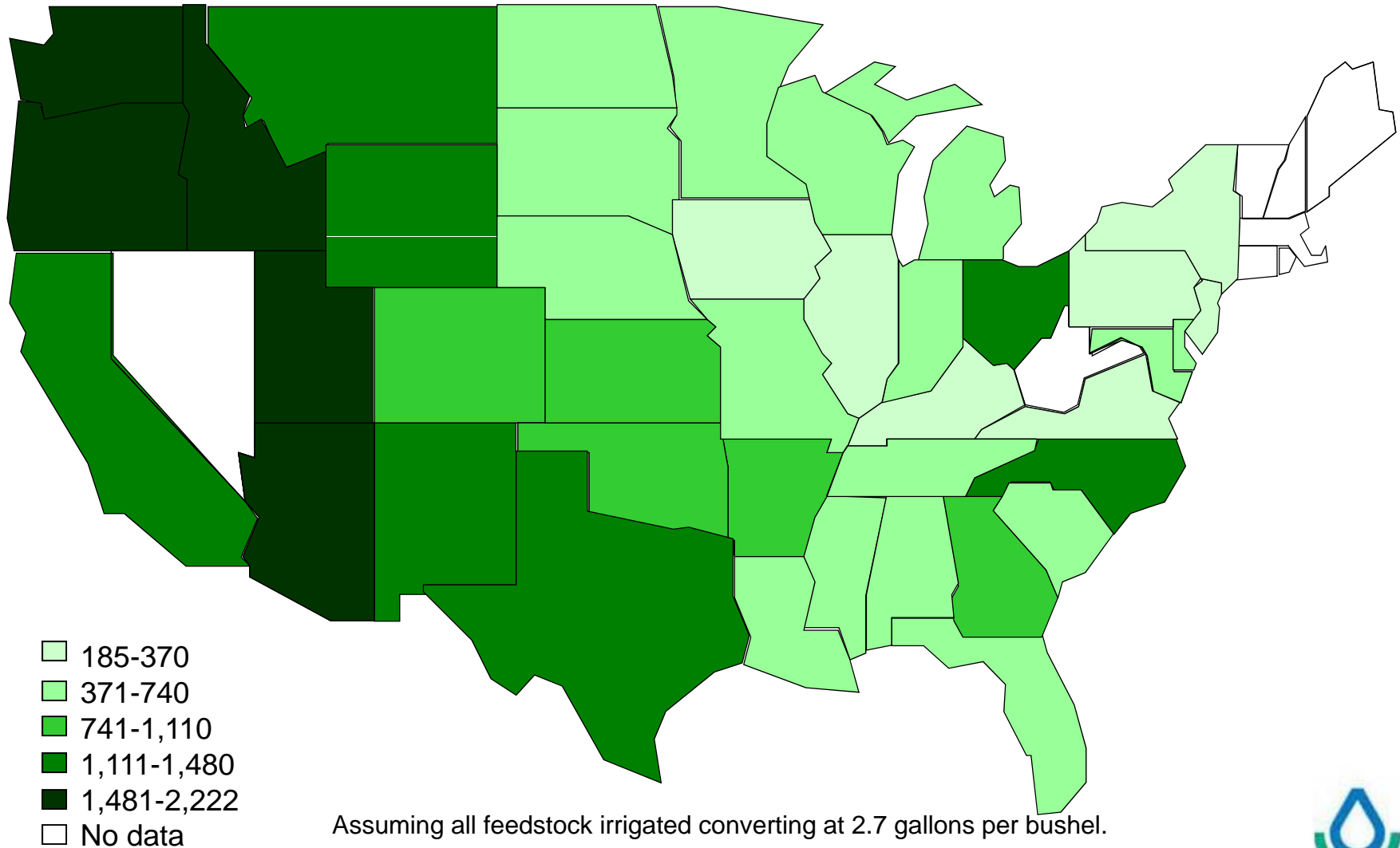
High Plains Aquifer remaining and current & planned ethanol plant locations



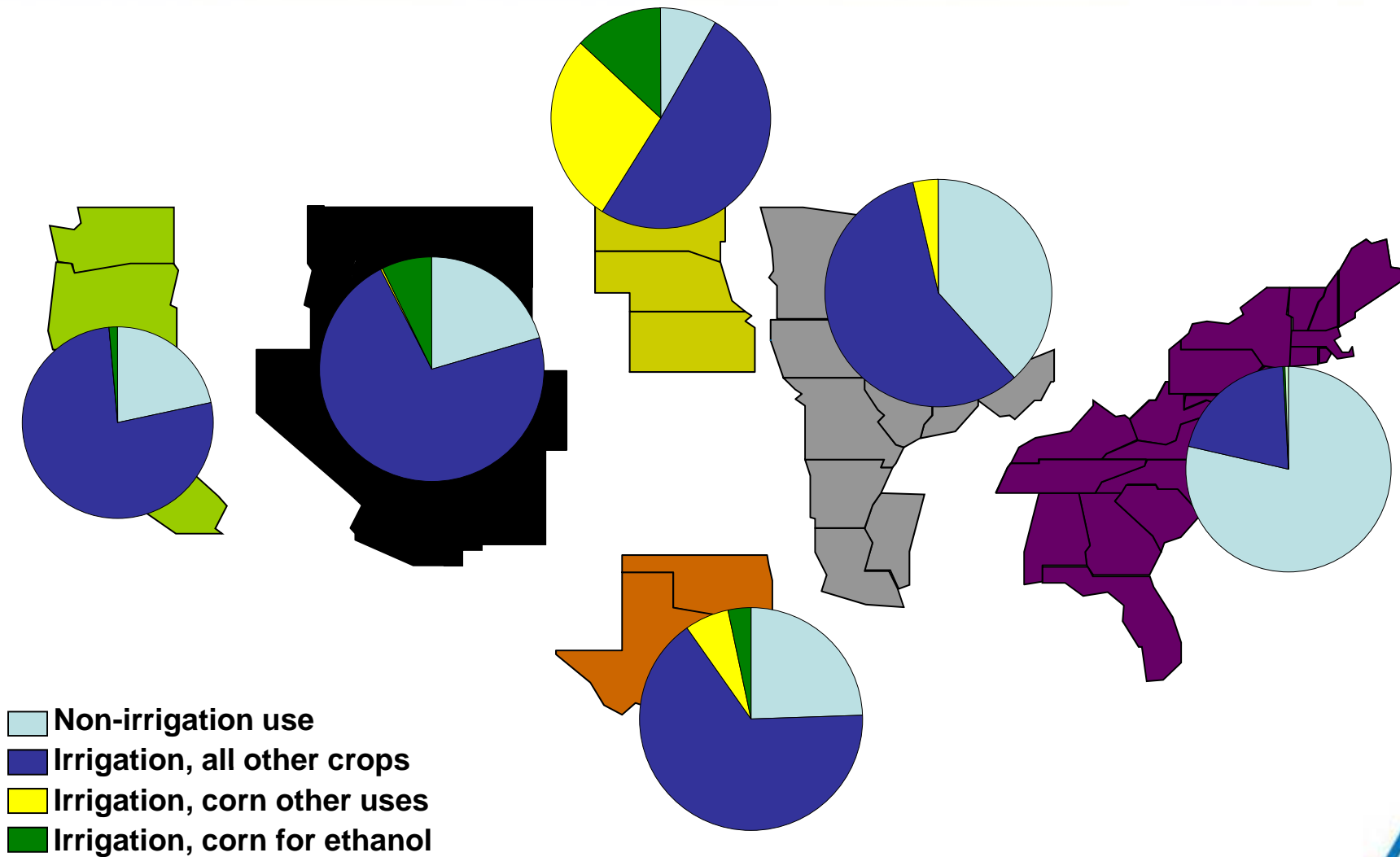
Source: NRCS based on 1999 USGS Digital map data and 2010 Renewable Fuels Association data.



Gallons of irrigation water per gallon of corn-based ethanol, 2008















Groundwater used for irrigation and the estimated ethanol share



Source: NRCS analysis of RFS, FRIS, and USGS water use data



The Ethanol “Experiment” Continues

	2002-2007	2002-2010
• Corn acres	 26%	 20%
• Irrigated corn acres	 36%	 ??
• Corn production	 48%	 45%
• Corn exports	 53%	 25%*
• Corn ethanol use	 275%	 400%**
• Corn price	 81%	 130%#

* 2009 data

** Projected

Percentage based on corn at \$5.40 per bushel, current price is \$7.54 per bushel

Source: NRCS, based on Census of Agriculture and ERS data



Biofuel Feedstock Summary

- In the short run, increased agricultural production for biofuels has not dramatically altered the national view of water use.
- Growing crops for next generation of 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
 - In some cases an impact on groundwater by driving demand for irrigation water



National Irrigation Overview Summary

- Irrigation is:
 - A leading sector for water withdrawals;
 - The dominant sector for consumptive water use;
 - Characterized by large volumes of applied water that can vary greatly by crop and region; and
 - An important, widespread agricultural practice.
- Irrigation with Groundwater is:
 - Located in all regions; and
 - The major water source for agricultural production in eastern 2/3 of the Nation.



Thank you!

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