

Recent Trends/Challenges in Irrigated Agriculture –

Why is irrigation important in a
discussion of agricultural migration?

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Agricultural Research Service



American Agriculture's Accomplishments



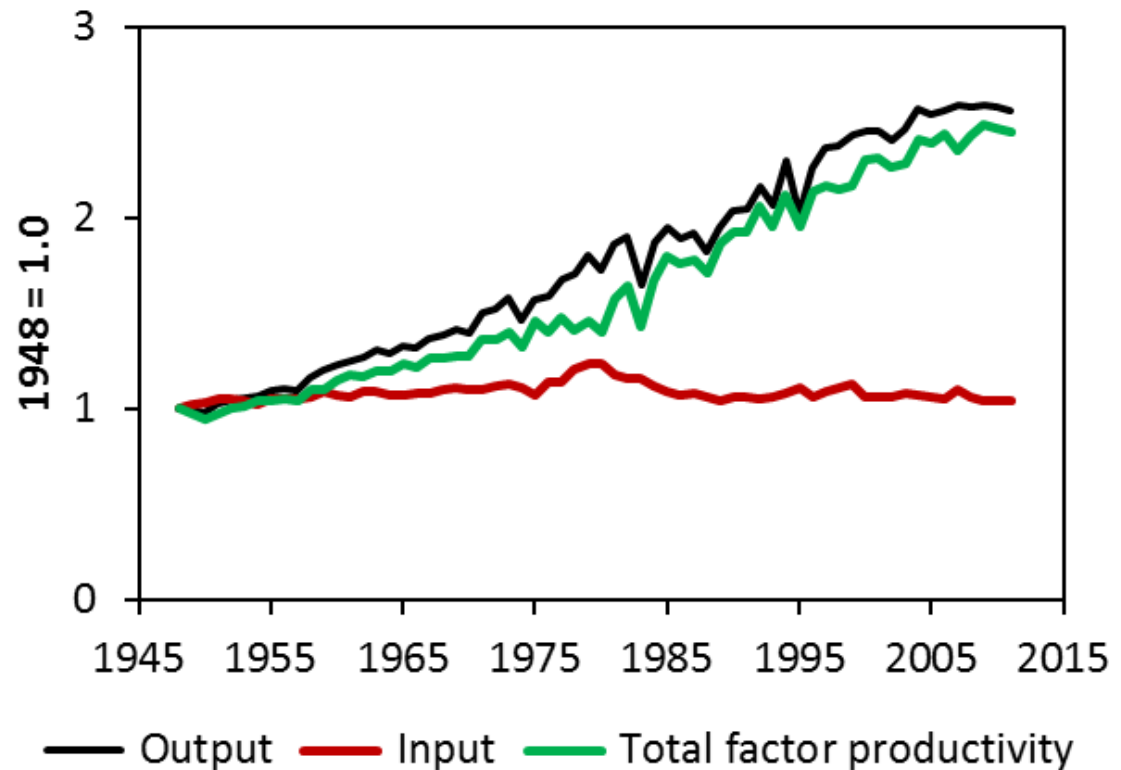
- 16% of the \$9 trillion gross domestic product
- 8% of U.S. exports
- 17% of employment
- <2% U.S. workforce on farms
- 100% of citizens are users

Trends in U.S. Agricultural Productivity

Since WWII in the USA:

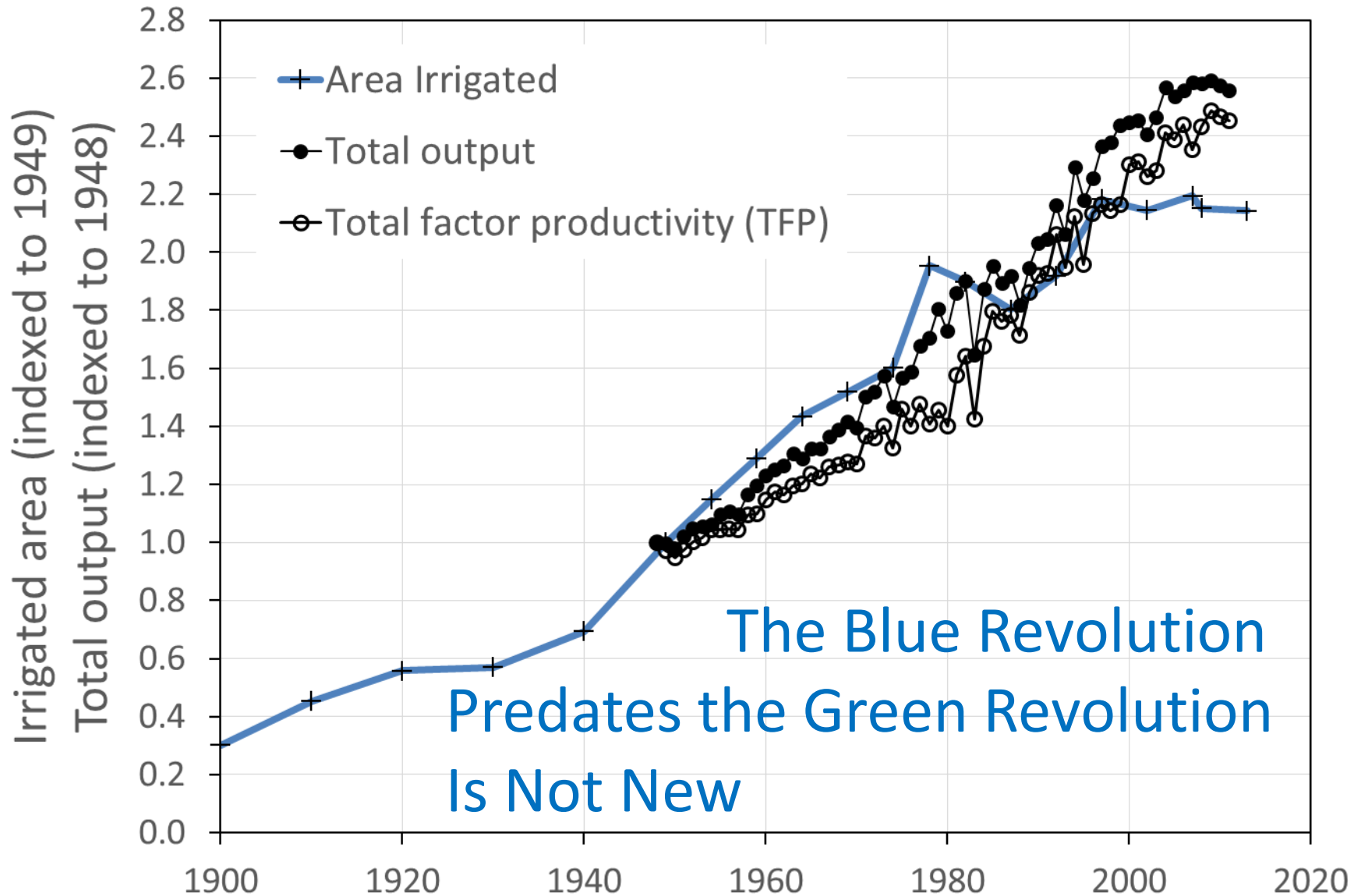
- Agricultural input growth was practically flat
- Growth in output driven by productivity gains
- Productivity growth $\sim 2\%$ per year

U.S. Agriculture Total Factor Productivity (TFP)



**Agriculture sector
is science driven**

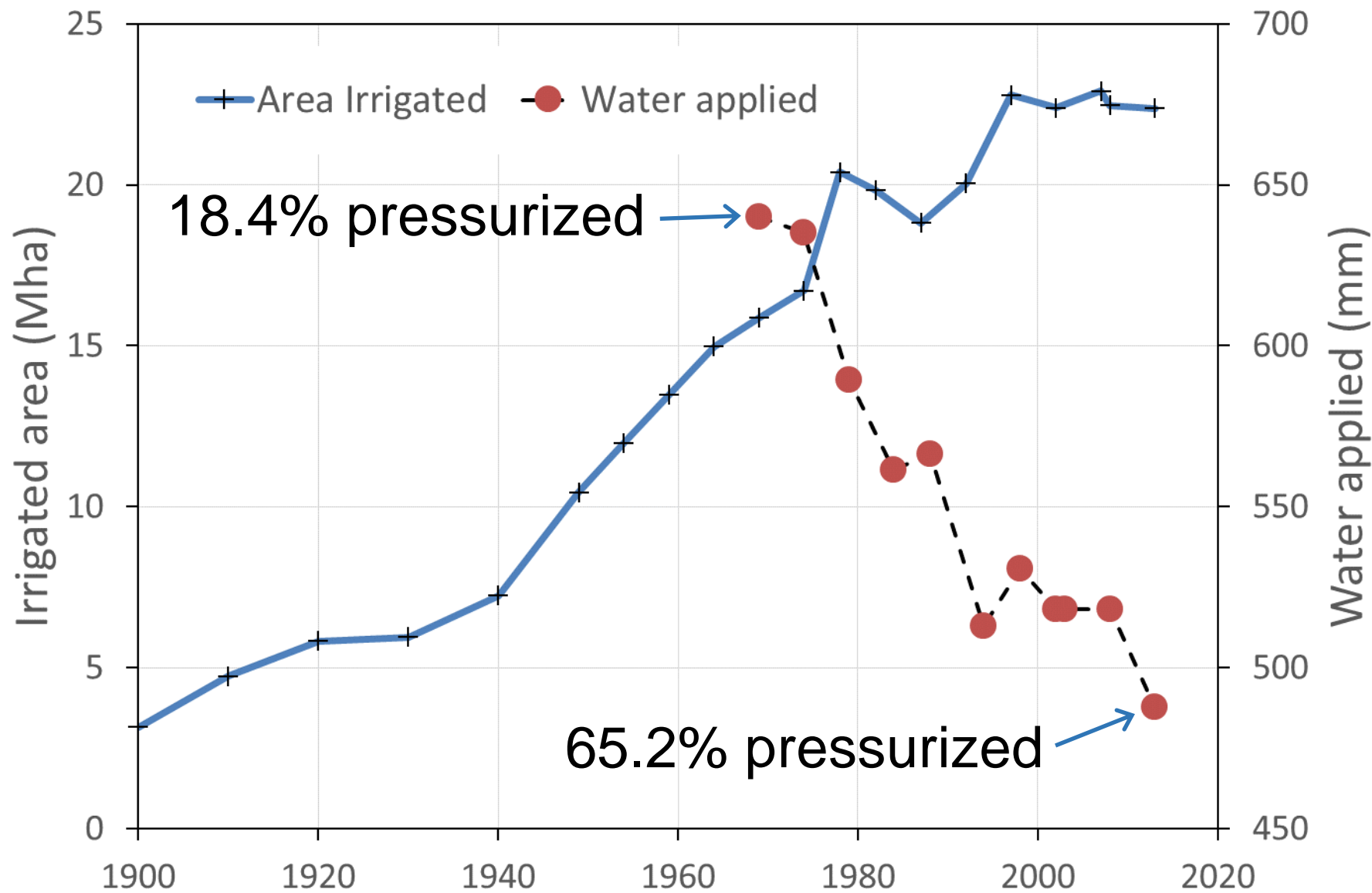
Science & Water Driven Productivity



Irrigated agriculture:

- 40% of U.S. crop market value
- 7.5% of cropped land
- In the 17 western states:
 - \$117 billion annual farm gate value of production
 - \$156 billion annual total economic impact
- In the Plains states – produces >3 times the net revenue as dryland farming
- Doubles water use efficiency – stabilizes yields
- 18% increase in Midwest since 1998
- >40% increases in Alabama, Georgia, Maryland, South Carolina and Tennessee since 1998

U.S. Irrigation – 2nd Blue Revolution



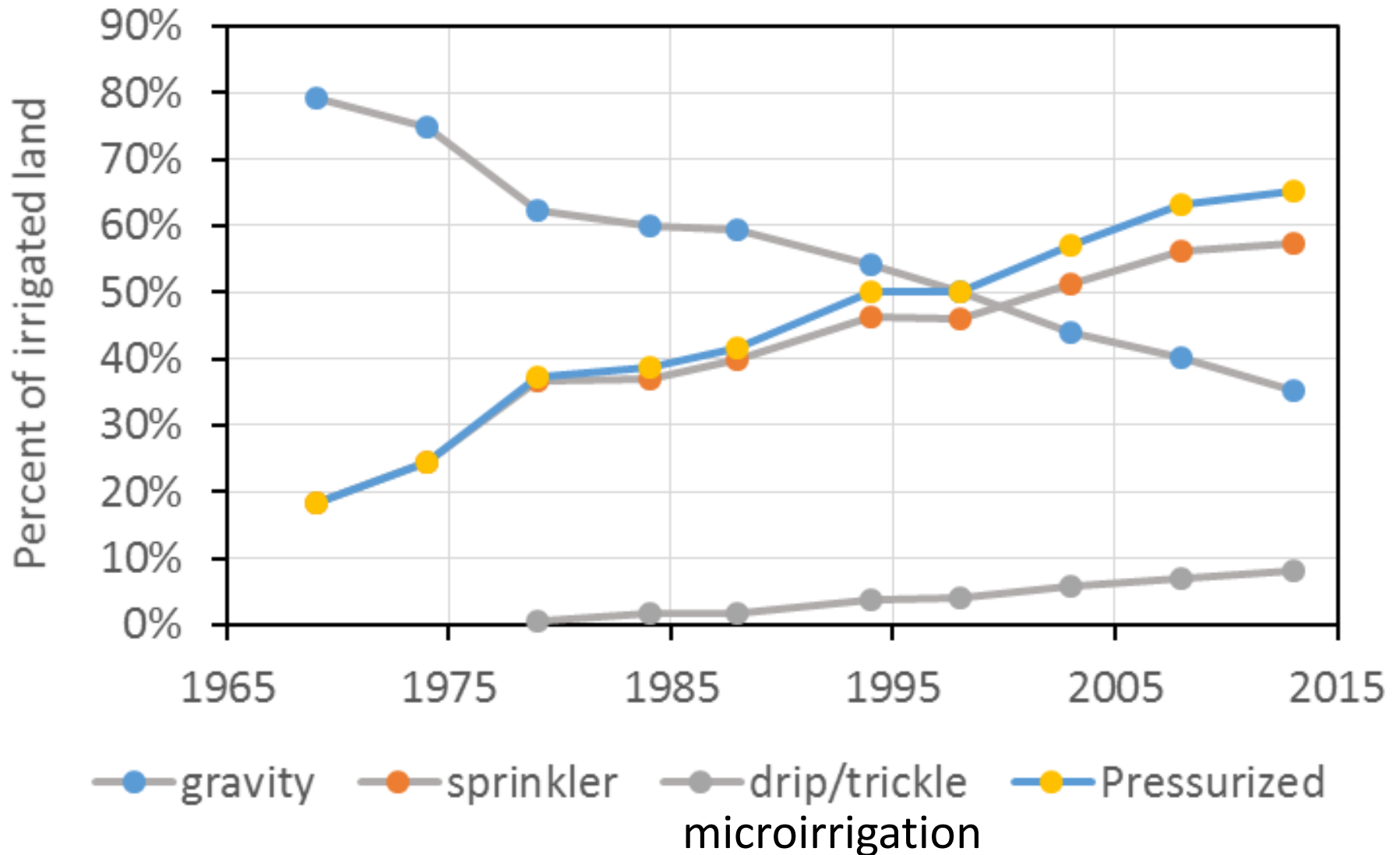
Source: ERS 2002, 2013

Year

Pressurized irrigation

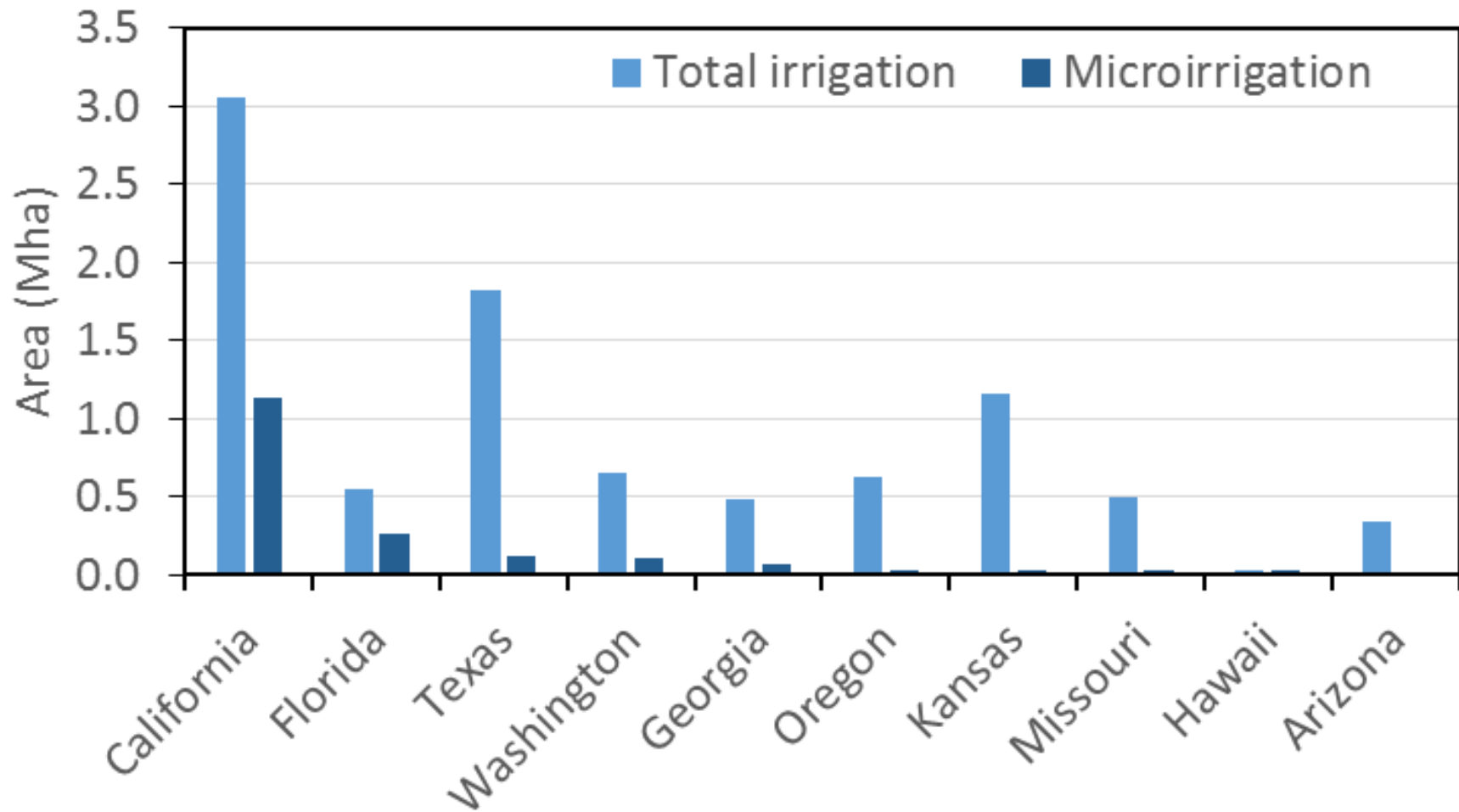
- Increased control and precision of application
 - Improved uniformity
 - Increased water and nutrient use efficiencies
 - Easier metering
 - >63% in USA, >85% in High Plains
 - 95% in Jordan Valley, Jordan
- Recent advances in site-specific, variable-rate irrigation (SSVRI) using pressurized irrigation systems have brought into play a greatly increased ability to manage water applications in time and space
 - Applicable to both microirrigation and center pivot systems.

Conversion to Pressurized Systems

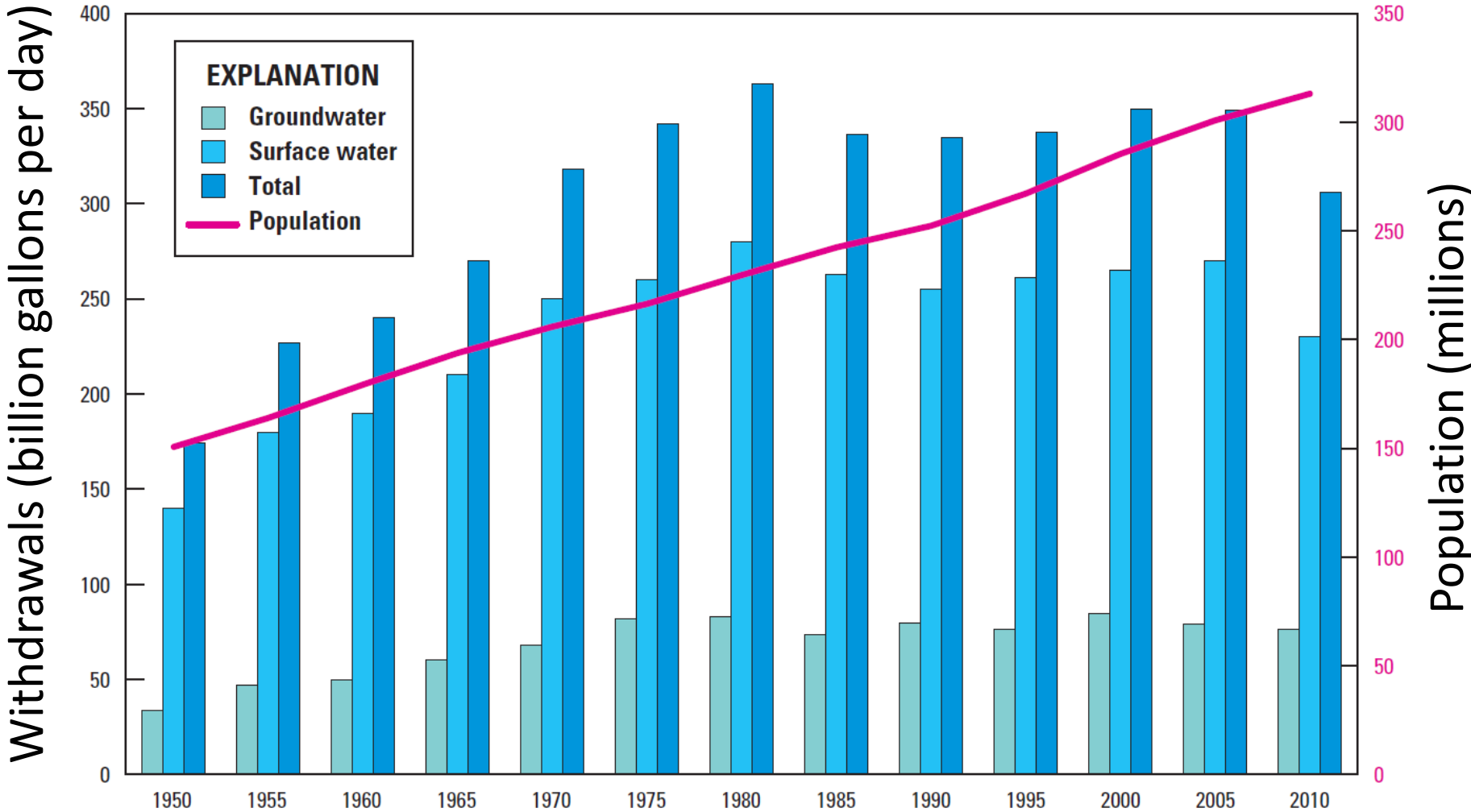


Microirrigation increasing

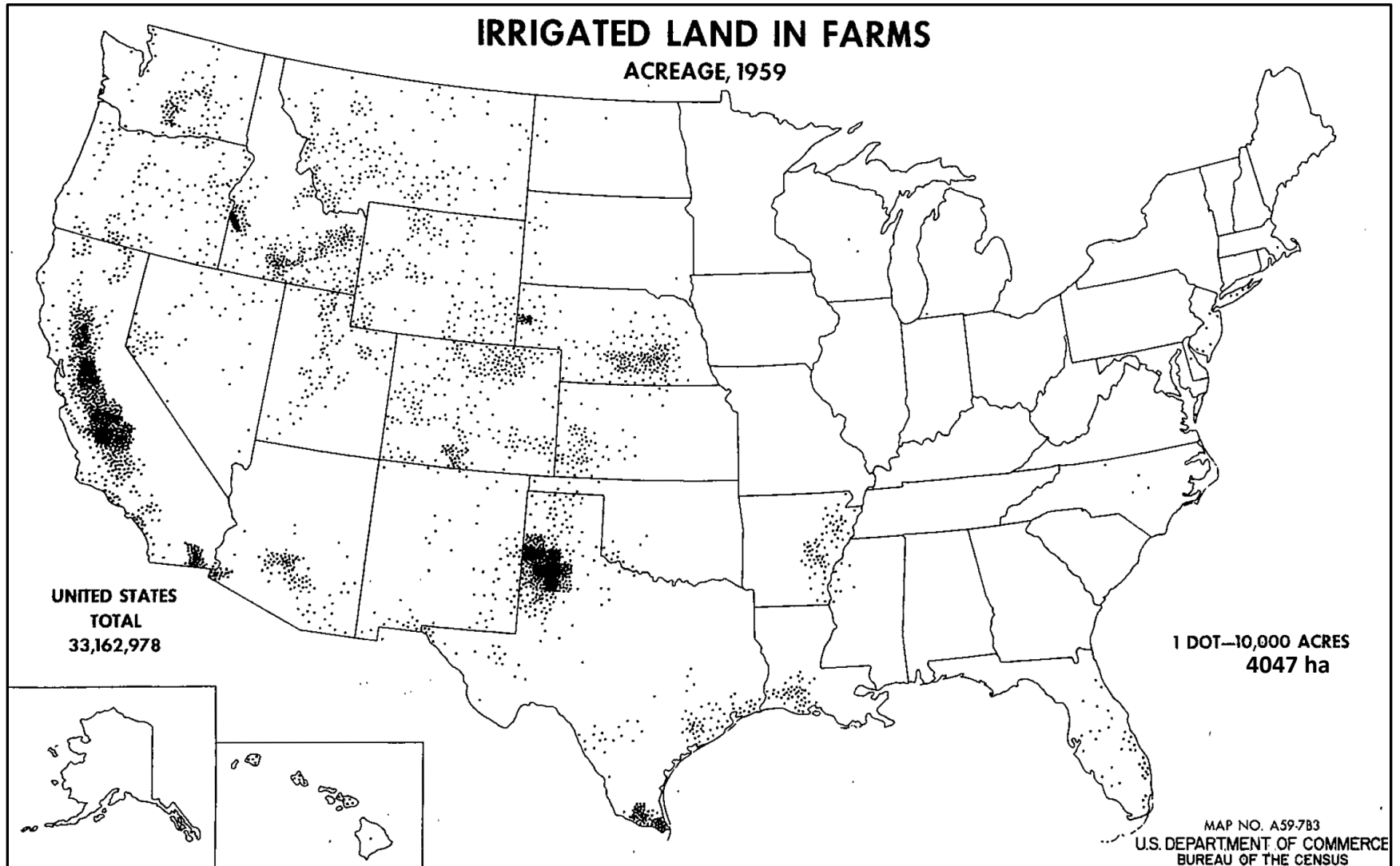
Top 10 Microirrigation States



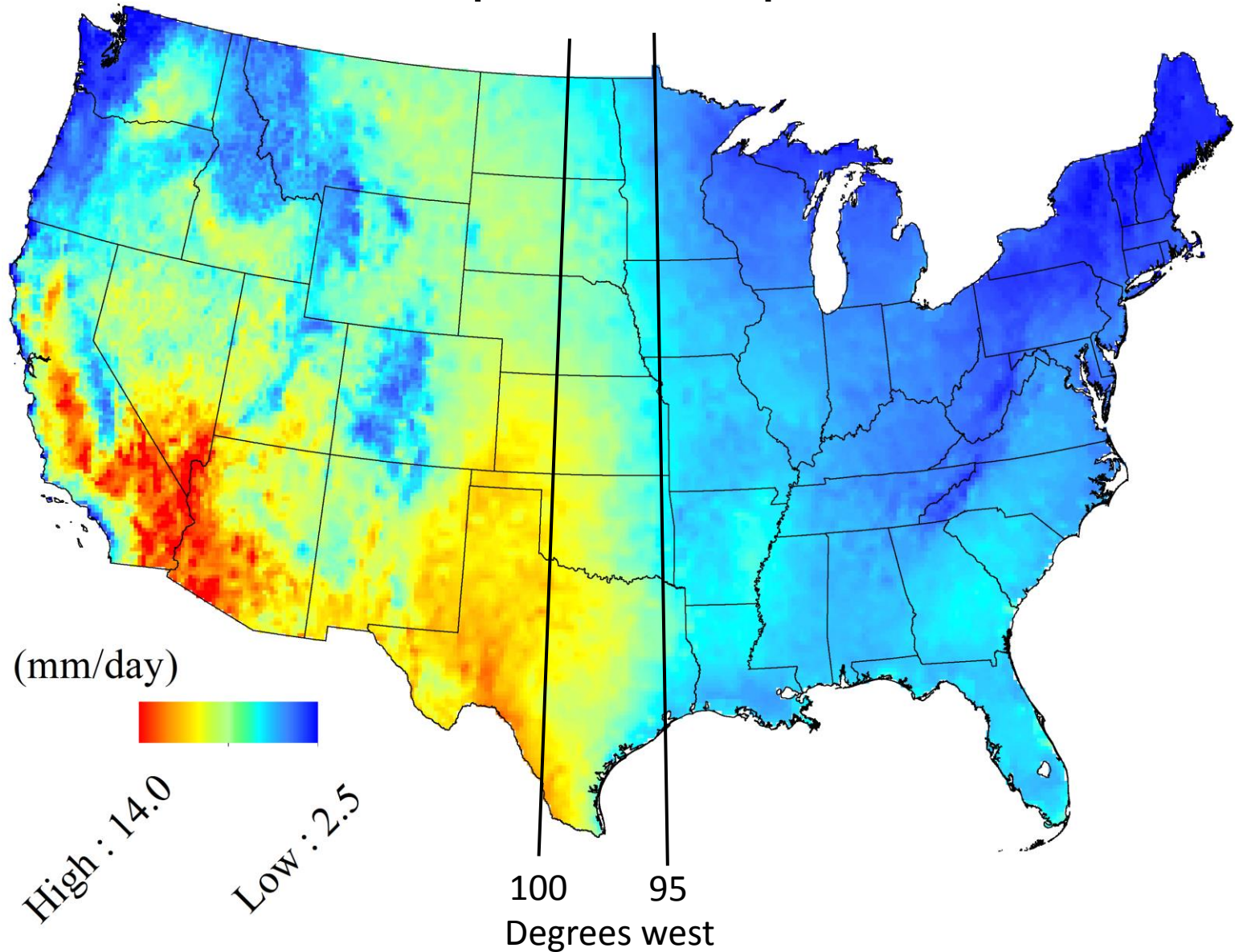
Trends in population and irrigation withdrawals, 1950-2010



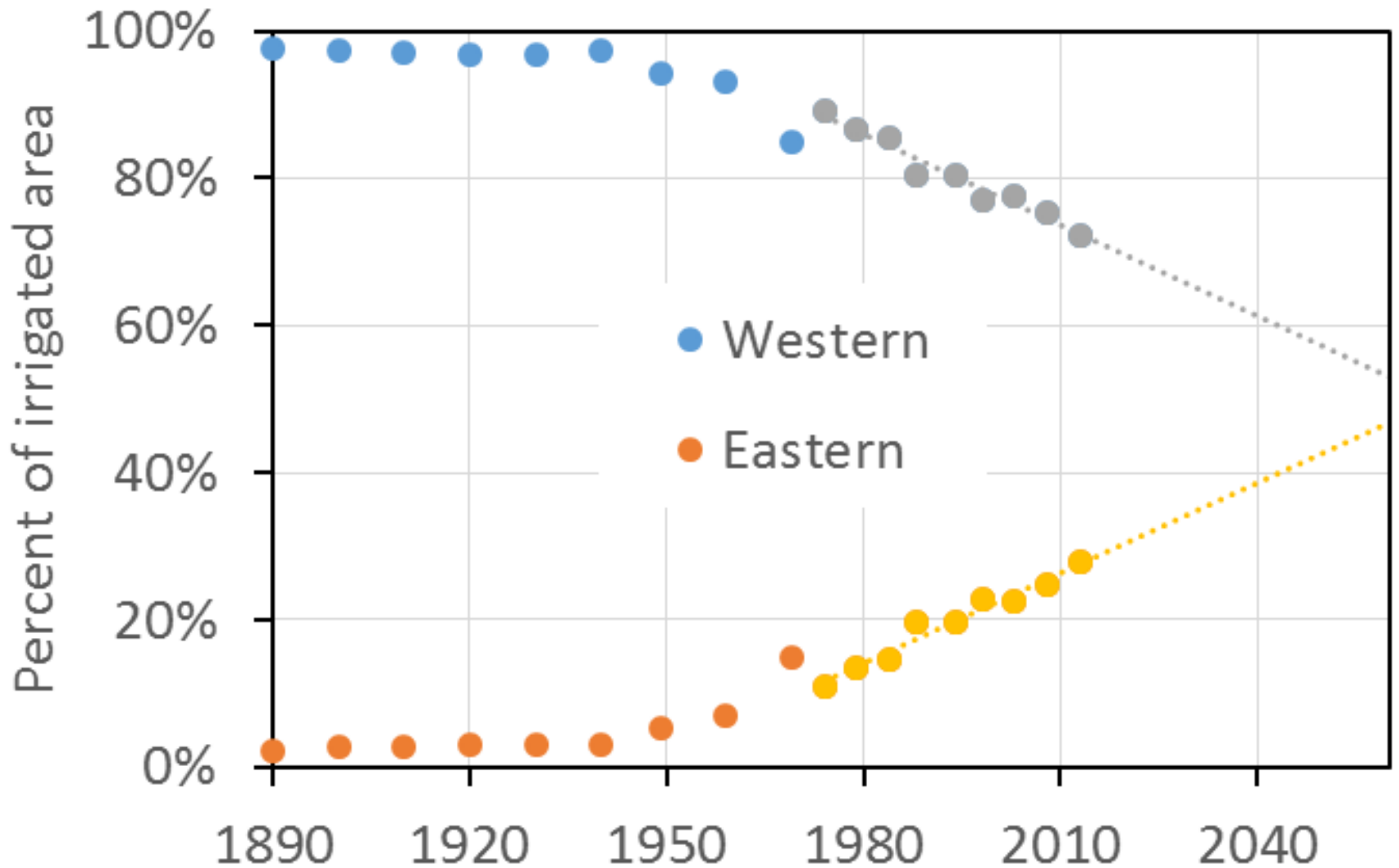
Status - 1959



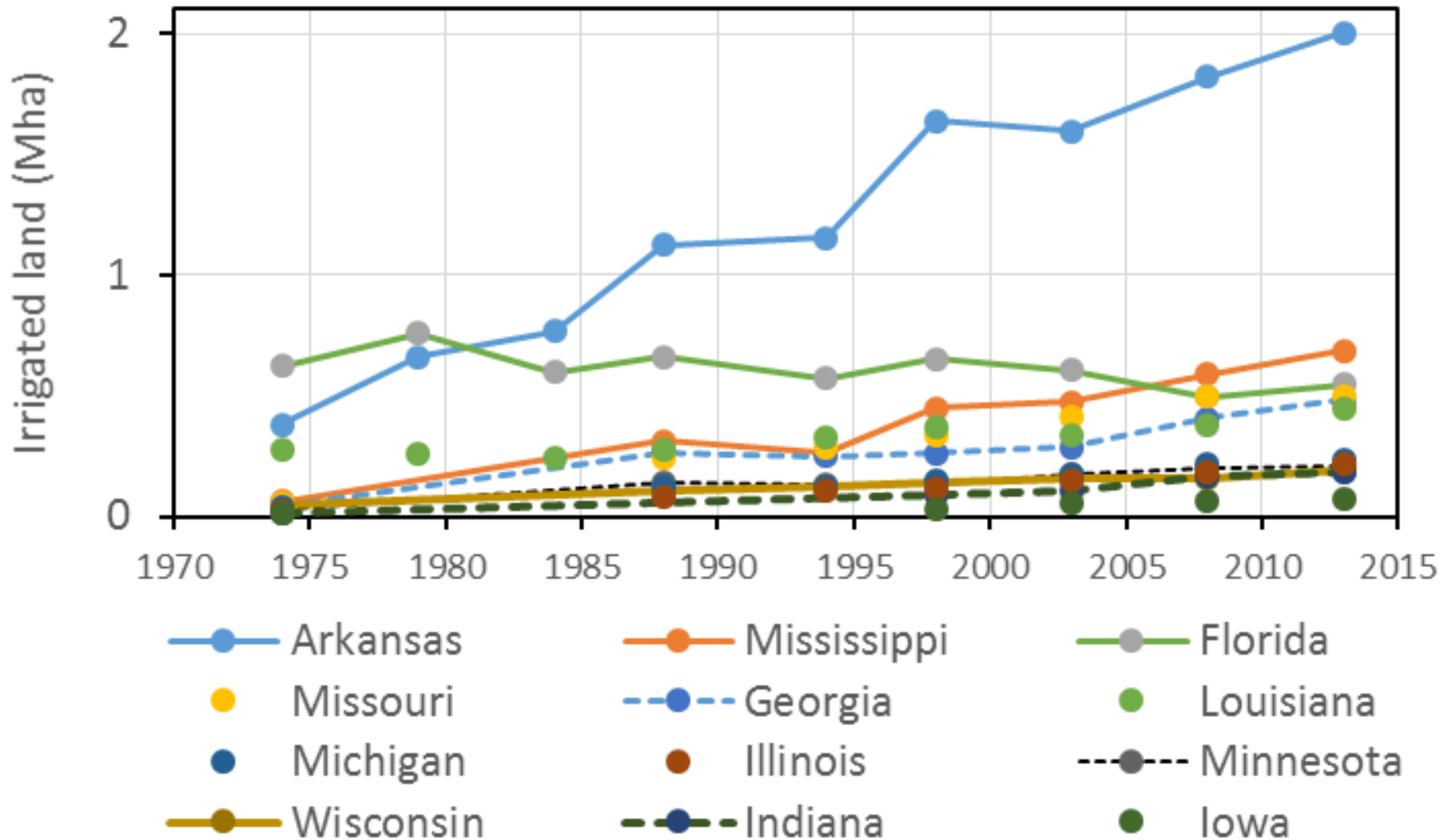
Reference evapotranspiration



Eastward migration of U.S. irrigation



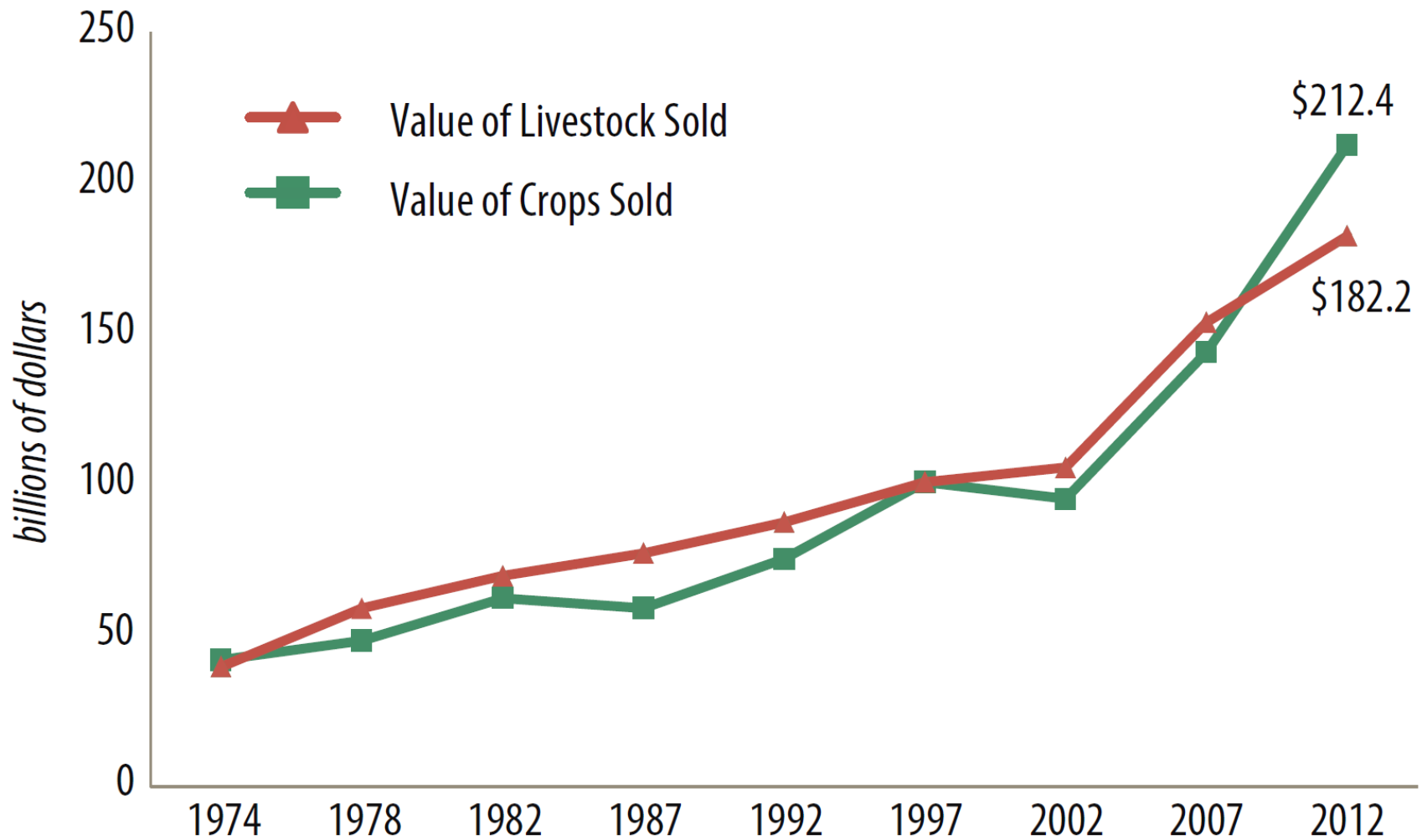
Eastern irrigation growth



Eastward migration of irrigation

- Multiple factors drive eastern irrigation expansion and adoption of pressurized irrigation:
 - Overall increased climate variability –
 - More frequent and severe mid-season droughts
 - Overall increased cost of agricultural production
 - Risk avoidance on the part of lenders
 - Increasing value of agricultural production
 - Reduced irrigated production in the West
 - Competition for water resources
 - Advanced irrigation technologies/application methods

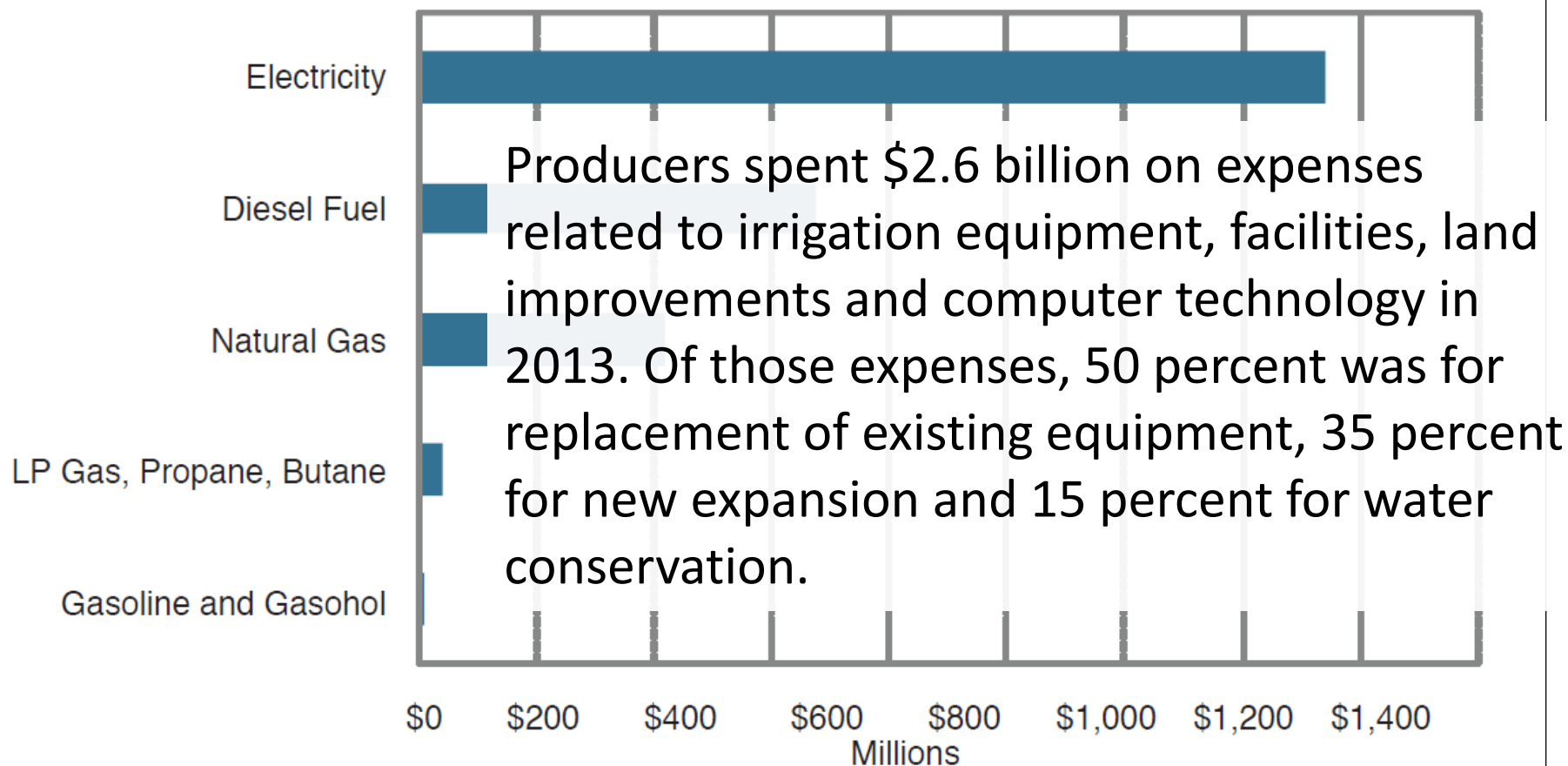
Value of U.S. Crop and Livestock Sales, 1974 - 2012



Source: USDA NASS, 2012 Census of Agriculture, *Preliminary Report* and prior Census of Agriculture data.

2003-2008: 12% increase in pumps, 74% increase in Energy Expense

Energy Expenses for Irrigation Pumping, 2013
Total: \$2.7 billion

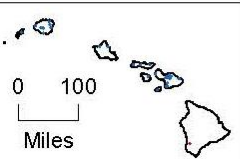
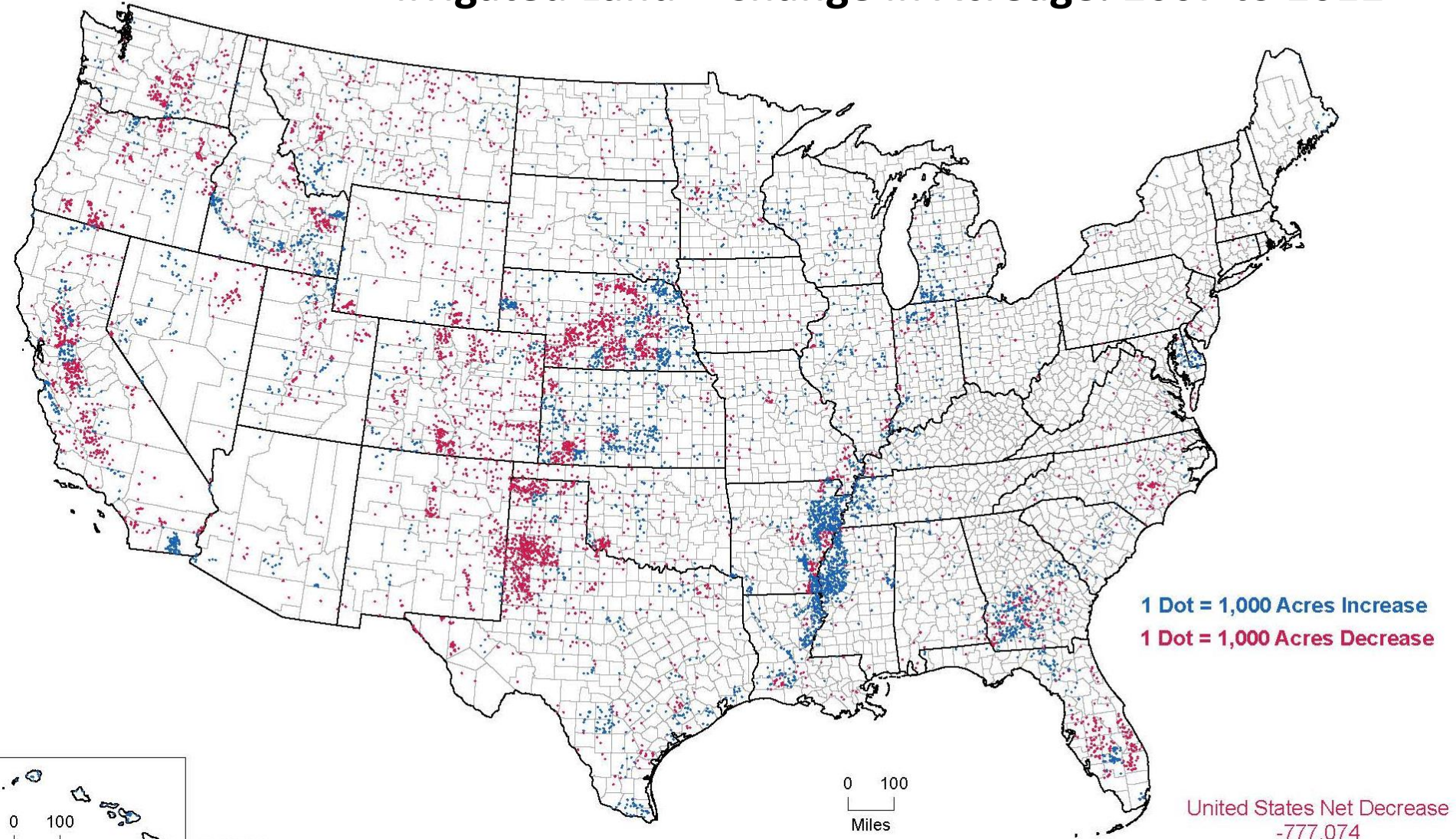


75,000 farms changed irrigation management or equipment to save energy/water



Irrigation continues to move eastward

Irrigated Land – Change in Acreage: 2007 to 2012



What Are We Missing?

- Yield increase not commensurate with added water
- Disease and pest pressures greater
- Resulting lack of competitiveness
- Lack of irrigation research specific to humid region
- Uncertain applicability of management and technology advances to humid/subhumid regions
- Economies of scale in irrigation infrastructure support
- ...

Thank you
Questions?



Thanks

Contact:

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U.S. Water Use by Sectors

Livestock



Less than 1 percent

Domestic



Less than 1 percent

Public Supply

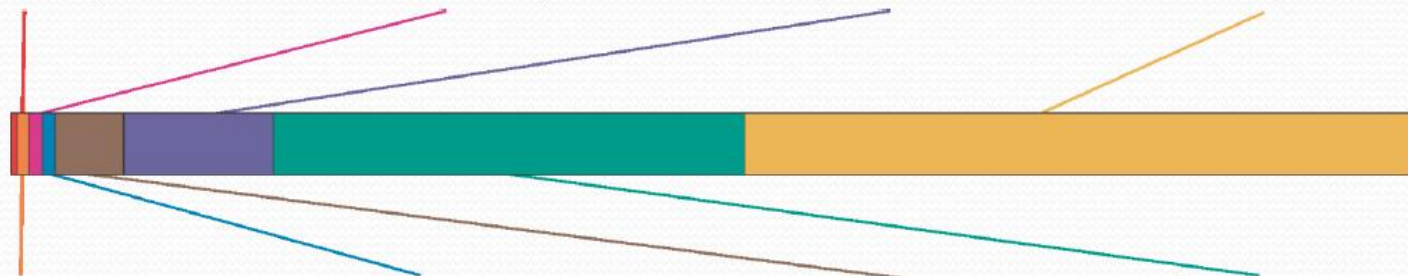


11 percent

Thermoelectric power



48 percent



Less than 1 percent



Mining

Less than 1 percent



Aquaculture

5 percent



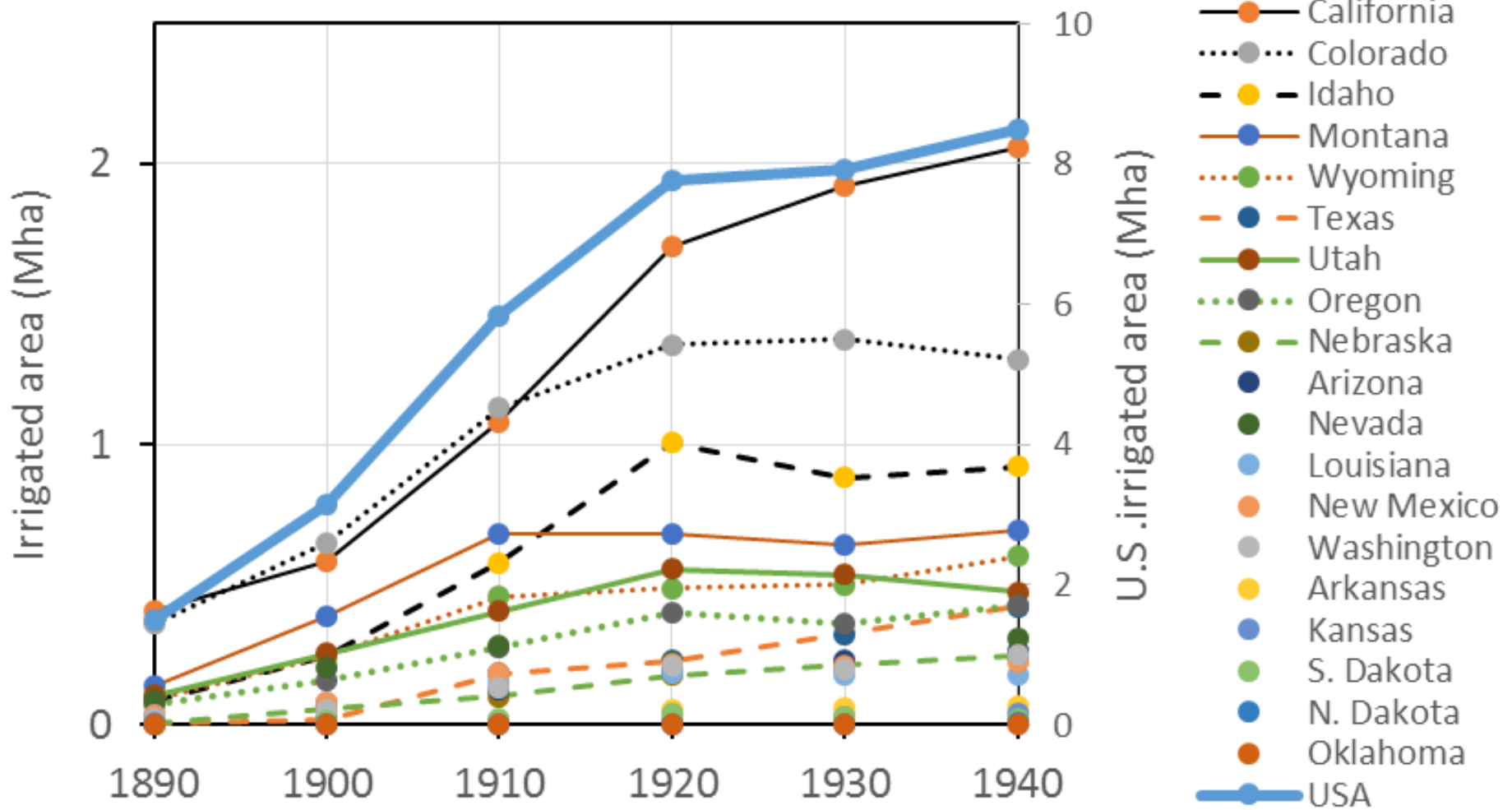
Industrial

34 percent



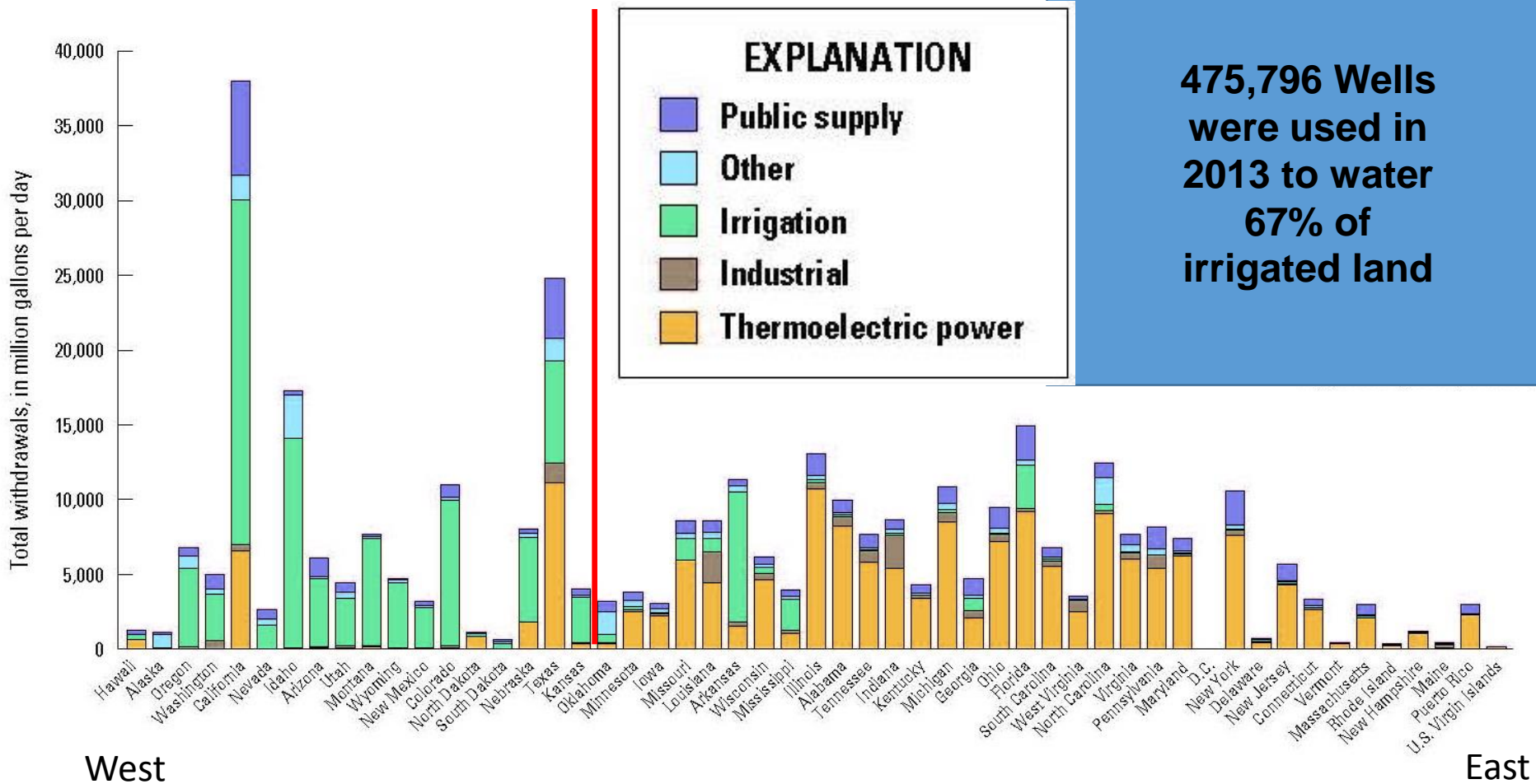
Irrigation

U.S. Irrigation Trends – by State



Irrigation withdrawals moving eastward

95 degrees West



2010 withdrawals by category, in million gallons per day. States are arranged geographically from west to east.