



Water In the West

An Overview of Water Issues

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Water Rights in the West...

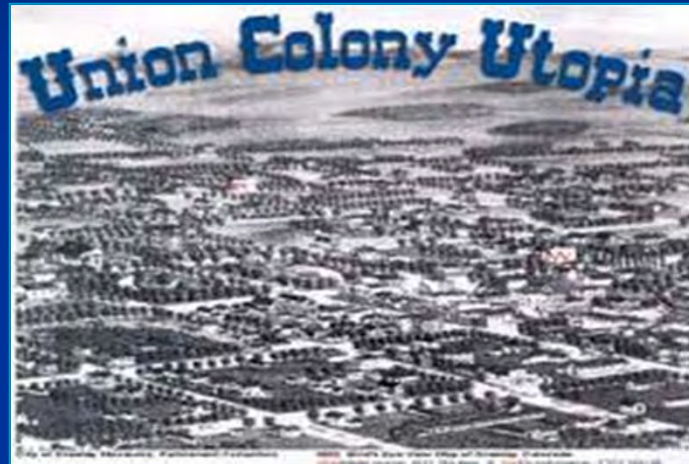


Discussing Water Rights, A Western Pastime

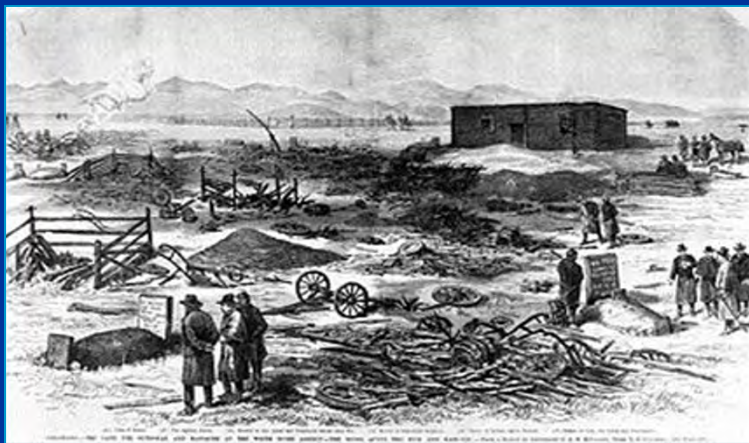
A Little History...



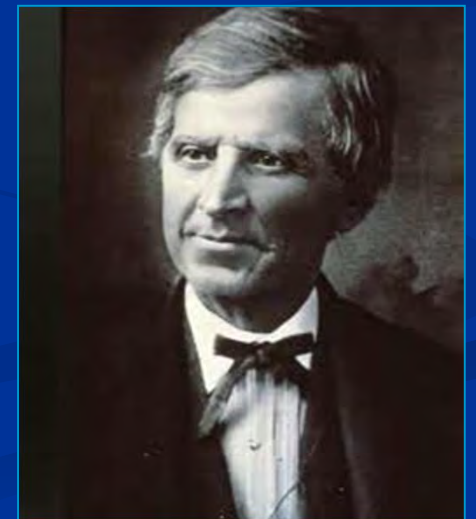
Horace Greeley



Union Ditch

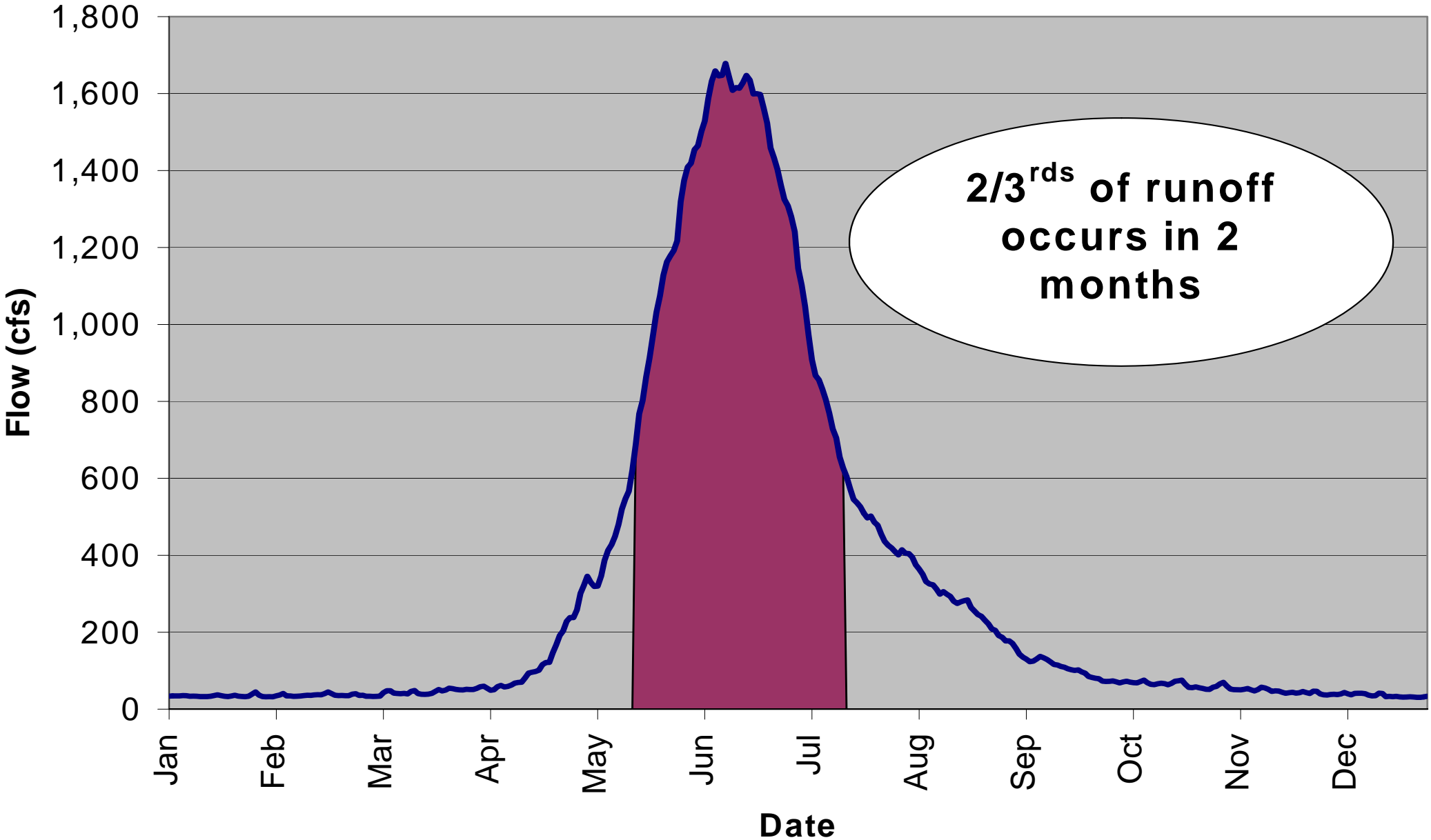


1870 Union Colony



Nathan Meeker

Average Poudre River Flows

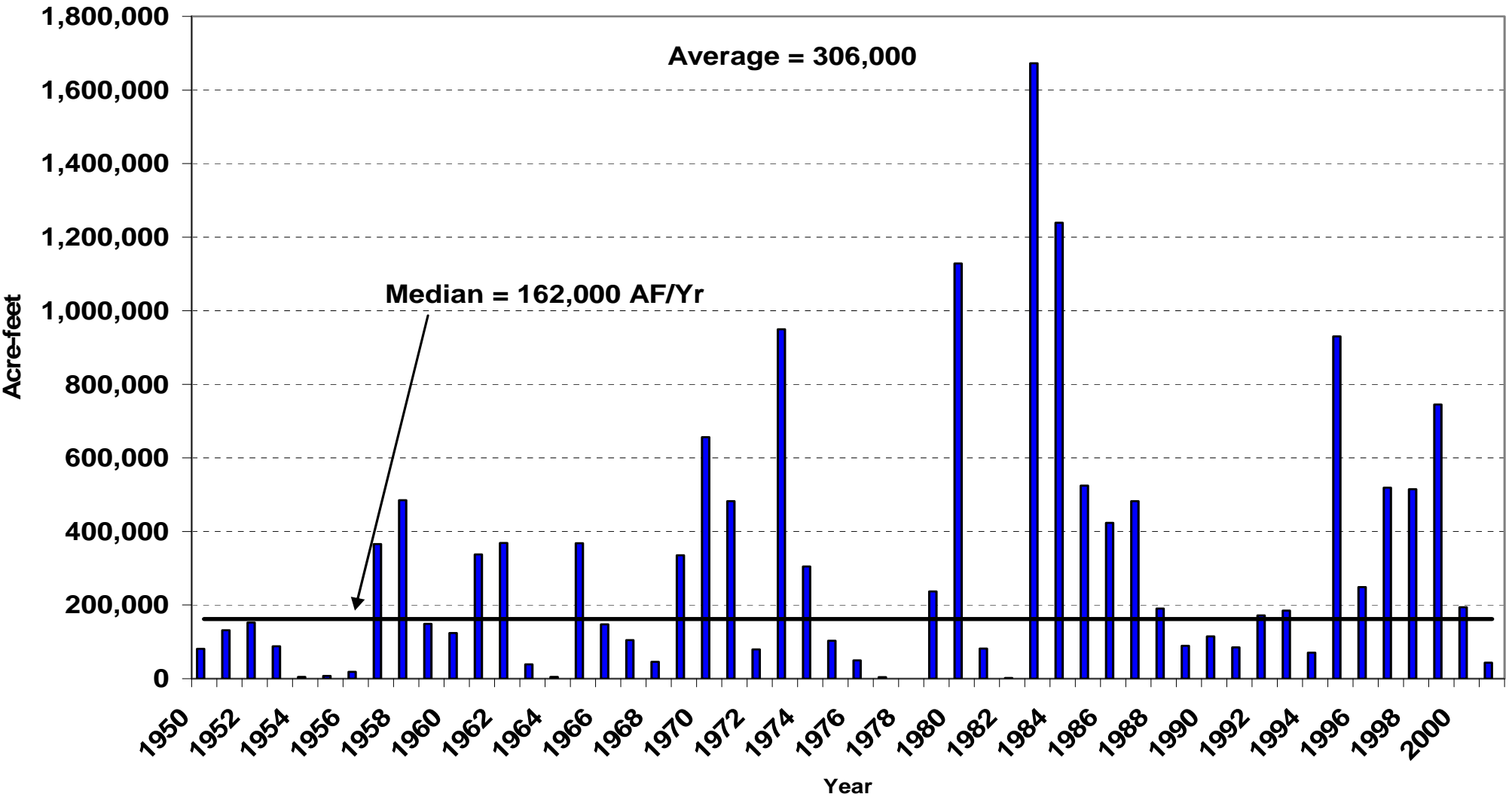


**2/3^{rds} of runoff
occurs in 2
months**

Source: Cache la Poudre River at the Mouth of the Canyon Gage (USGS 06752000)

Available Flow for the South Platte River at Kersey Gage 1950-2001

(Source NCWCD Northern Integrated Supply Study)



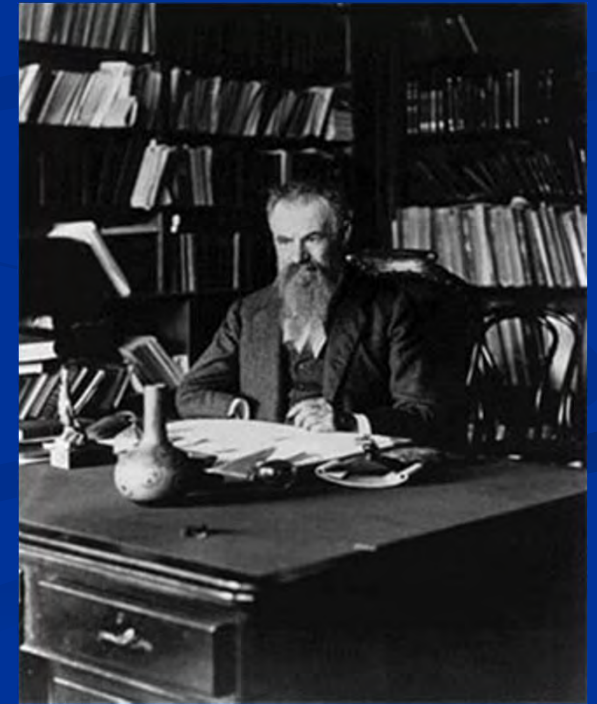
Prior Appropriation Doctrine

- **Earliest appropriators have the highest priority, “First in time, first in right.”**
- **Security of supply depends on priority**
- **Right of use can be forfeited by nonuse
“Use it or lose it**
- **Water must be diverted and put to beneficial use without waste**



**John Wesley Powell
at the 1893 International Irrigation Conference**

“I tell you gentlemen, you are piling up a heritage of conflict and litigation over water rights, for there is not sufficient water to supply the land.”



Significance of irrigated agriculture

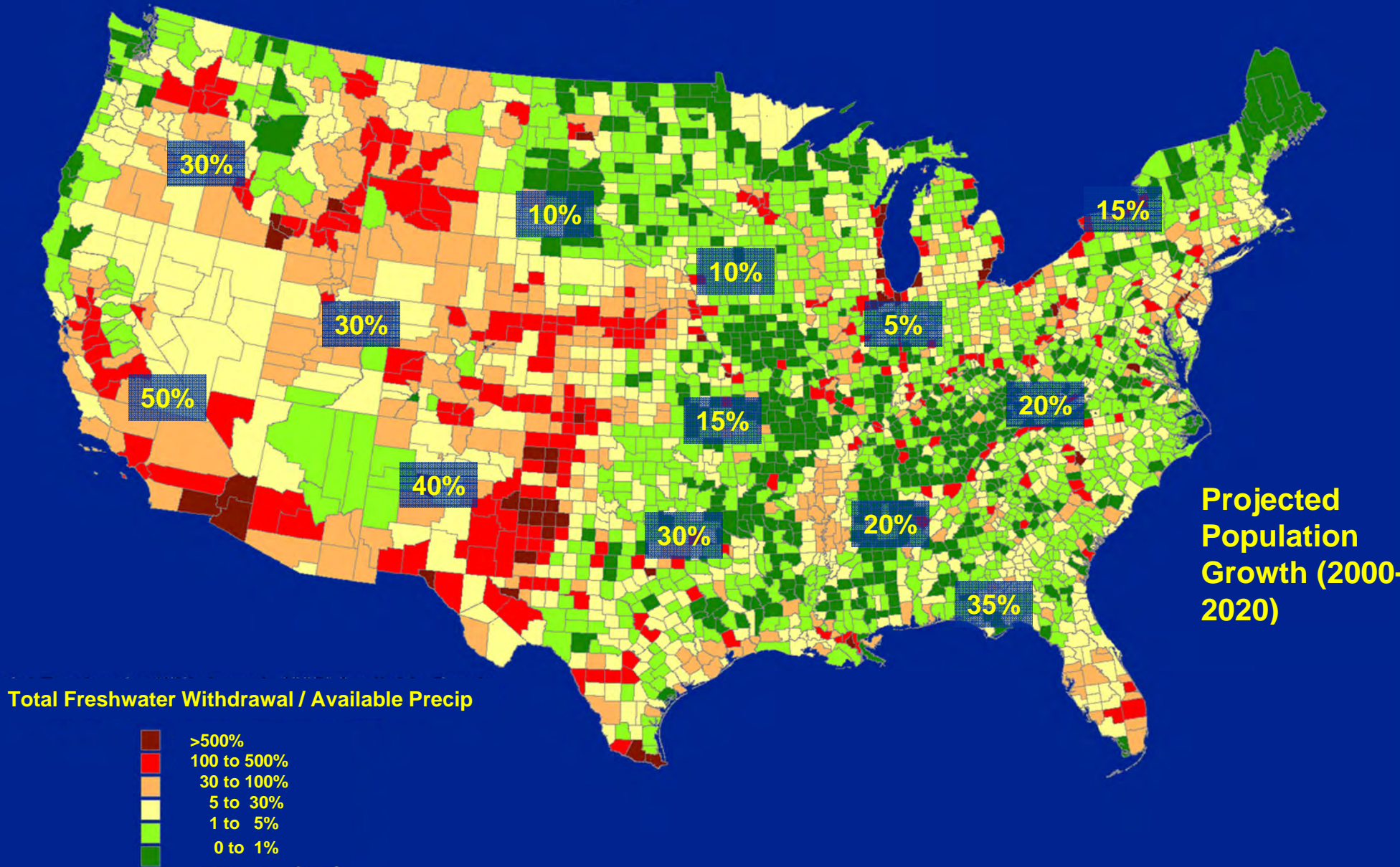
- 56 million irrigated acres (24 million in the 11 western states) out of 400 million acres of crops in USA
- 15% of total US crop acres are irrigated, producing almost half of total crop value



Ag water is being managed unsustainably across much of the US

- Fully appropriated river systems and over-drafted groundwater aquifers
- Poorly managed irrigation and drainage water results in off-site transport of sediments, nutrients, pathogens, emerging contaminants and leads to salinization in arid regions
- Fresh water ecosystems are threatened in many basins

Water challenges are nationwide



External Factors create Ag Water Vulnerability

- Urban growth & competition
- Interstate water disputes
- Energy needs and costs
- Endangered species
- Periodic drought
- Changing climate

Voice of the Rocky Mountain Empire

THE DENVER POST

WEDNESDAY, SEPTEMBER 17, 2008 CHANCE OF RAIN ▲ 84° ▼ 51° » 14B • DENVERPOST.COM • © THE DENVER POST • 50 CENTS PRICE MAY VARY



Years of record drought plus cattle-killing blizzards have left farmers in 22 counties

HIGH, DRY AND DEVASTATED



By Howard Pankratz *The Denver Post*

It's hard to imagine from the look of the lush lawns of metro Denver, but from the plains to the Front Range, much of eastern Colorado is a disaster area. On Monday, the U.S. Agriculture Department designated 22 Colorado counties as "primary natural disaster areas" because of what the agency described as drought conditions since Jan. 1.

The declaration is the latest in a string of hard times for ranchers and farmers in an area stretching roughly from Interstate 25 east to the Kansas border and from the New Mexico border north to Lincoln County.

"Southeast Colorado had unprecedented drought in 2002, 2003, 2004, 2005. We just had continual drought," said Chuck Hanagan, the executive director for the Otero-Crowley Farm Service Agency, a branch of the U.S. Department of Agriculture.

DROUGHT » 10A

CROPS



August rain has helped, but crop yields have been lower and some ranchers worry they will not be able to grow enough feed.

CATTLE

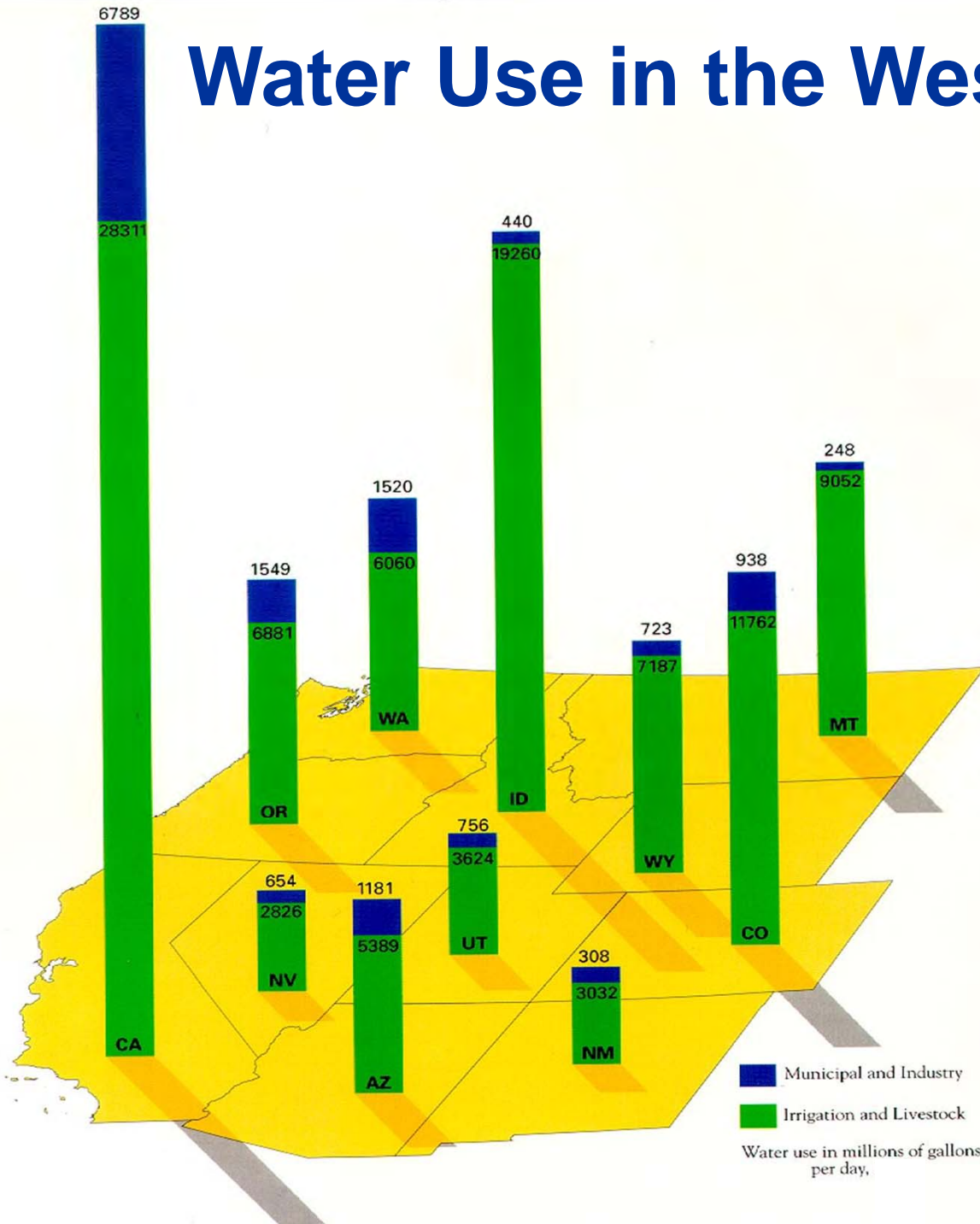


The blizzards of late 2006 killed more than 10,000 cattle. Ranchers have not been able to rebuild herds.

CLIMATE

Southeast Colorado experienced unprecedented drought in 2002, 2003, 2004 and 2005. Then the drought returned in 2007 and 2008. *The Denver Post* file photos

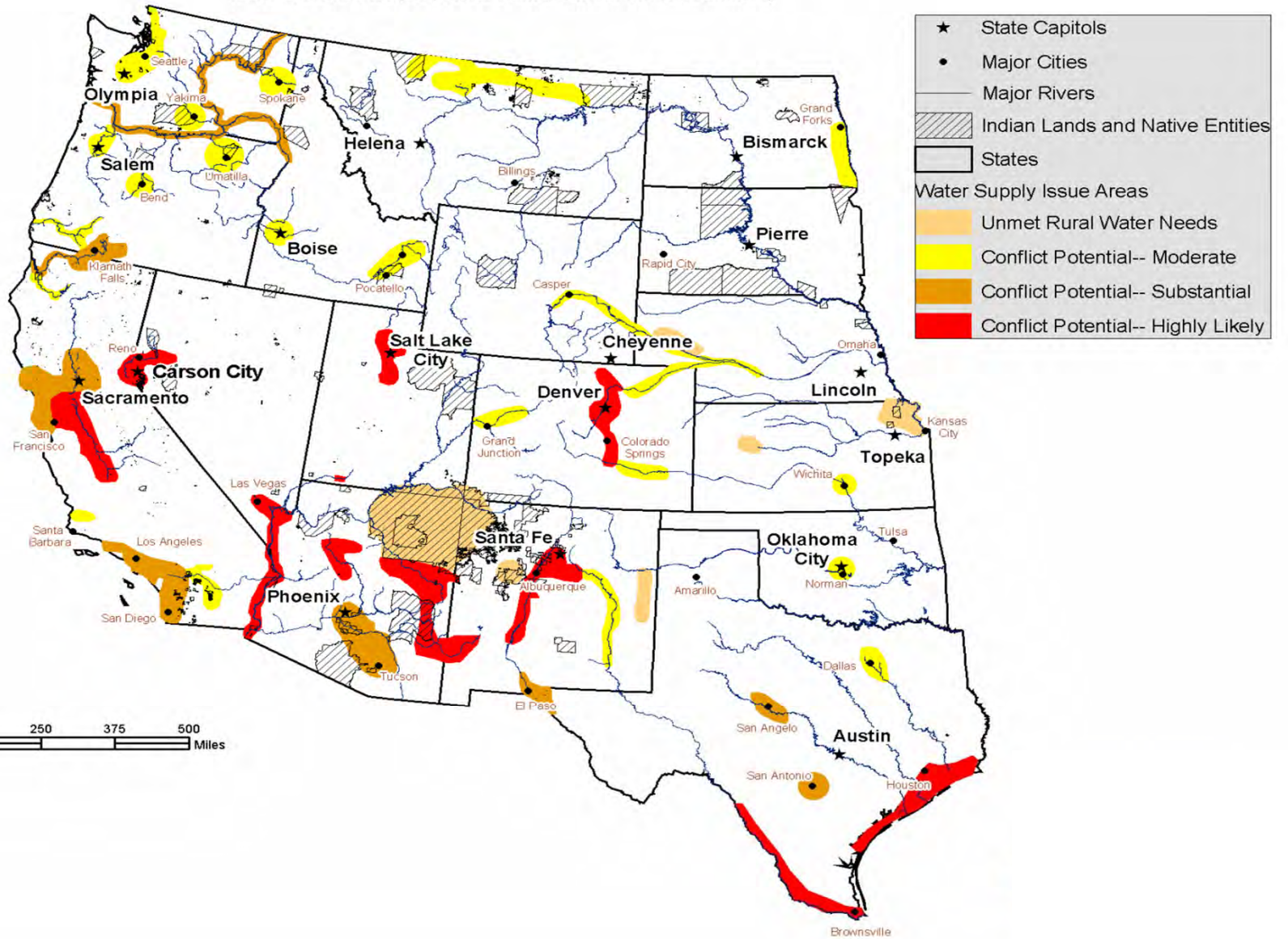
Water Use in the West



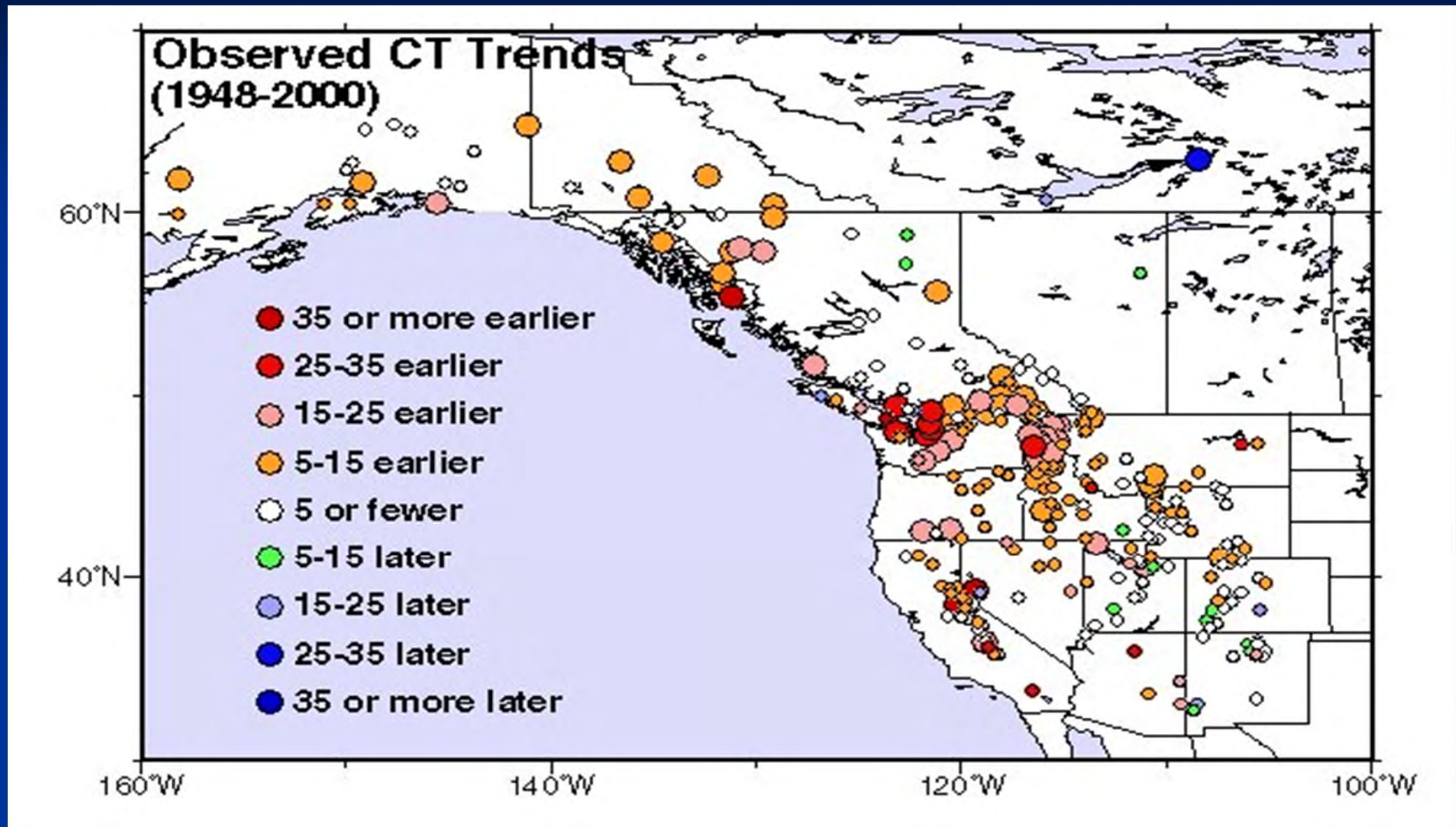
- Food production is water intensive
- 73% of water withdrawals for irrigation; food production consumes 80 - 90% of total
- Value of water in agriculture is ~ order of magnitude lower than value of water for M&I uses

Potential Water Supply Crises by 2025

(Areas where existing supplies are not adequate to meet water demands for people, for farms, and for the environment)



Western runoff is occurring earlier

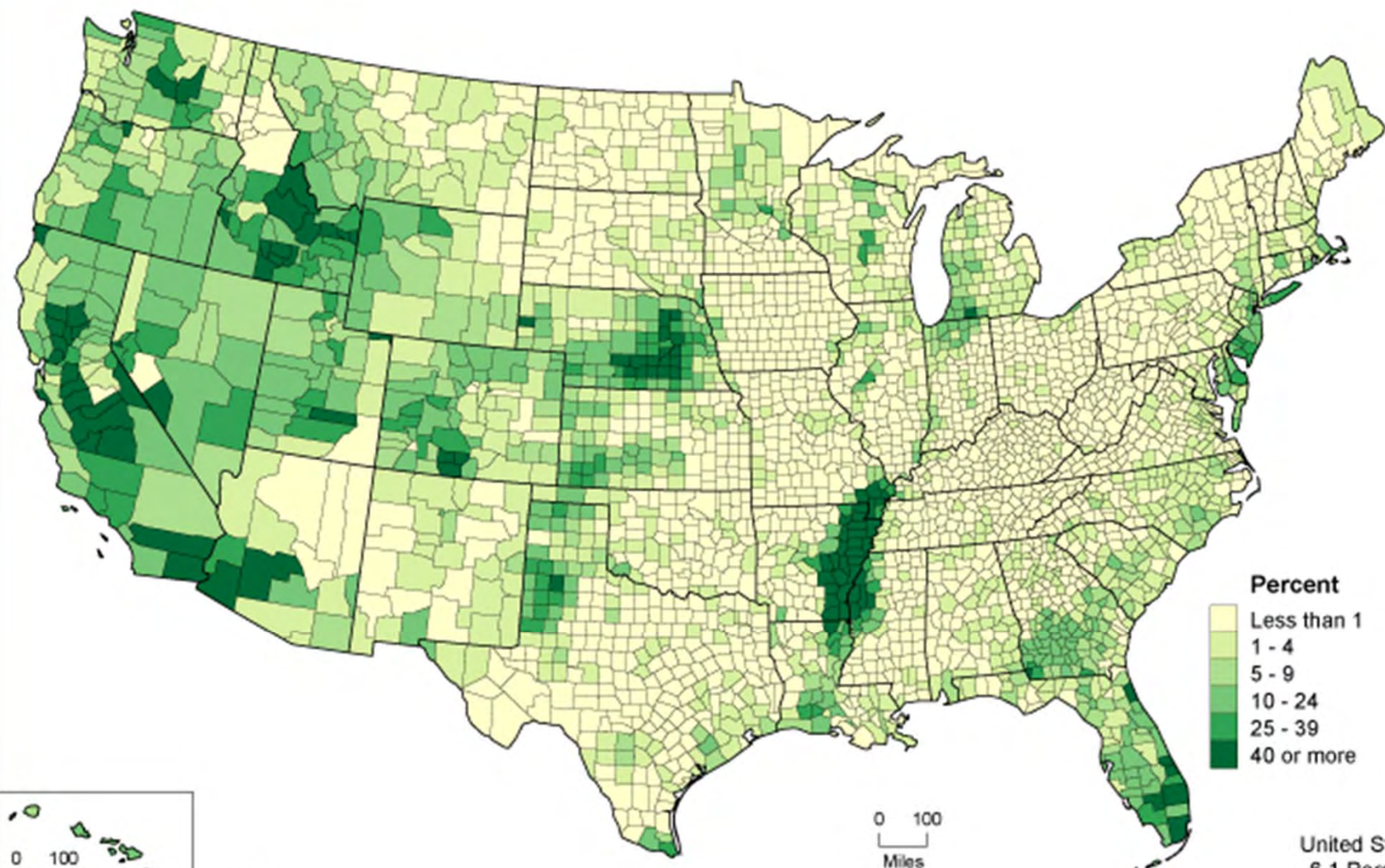


Trends in center of mass of runoff

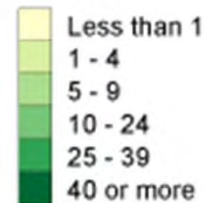
0 200
Miles



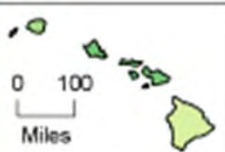
Acres of Irrigated Land as Percent of Land in Farms Acreage: 2007



Percent



0 100
Miles

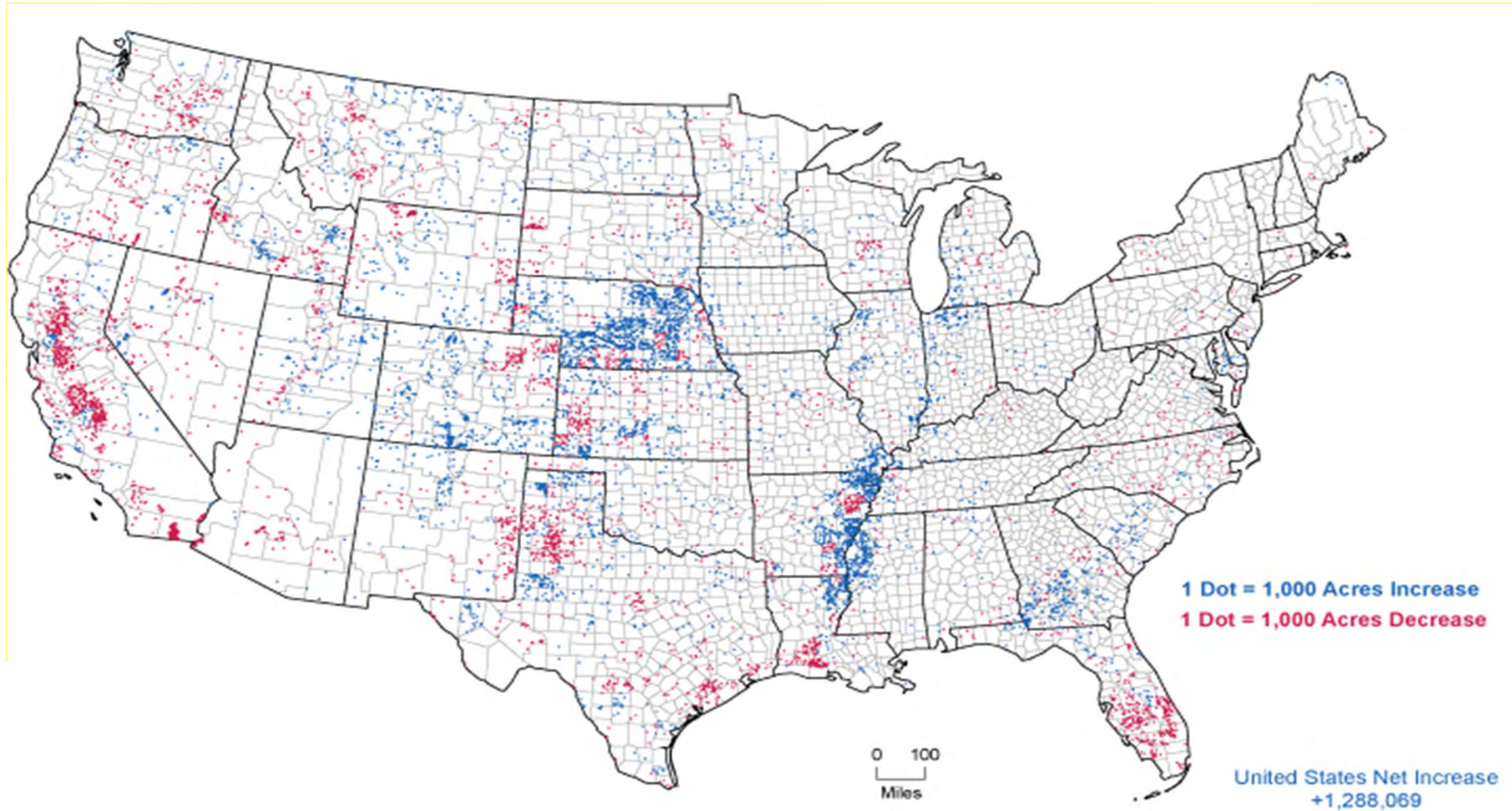


07-M082
U.S. Department of Agriculture, National Agricultural Statistics Service

0 100
Miles

United States
6.1 Percent

Irrigated Land – Change in Acreage: 2002 - 2007





Western Food Production and Water

***Four scenarios for us to
ponder...***

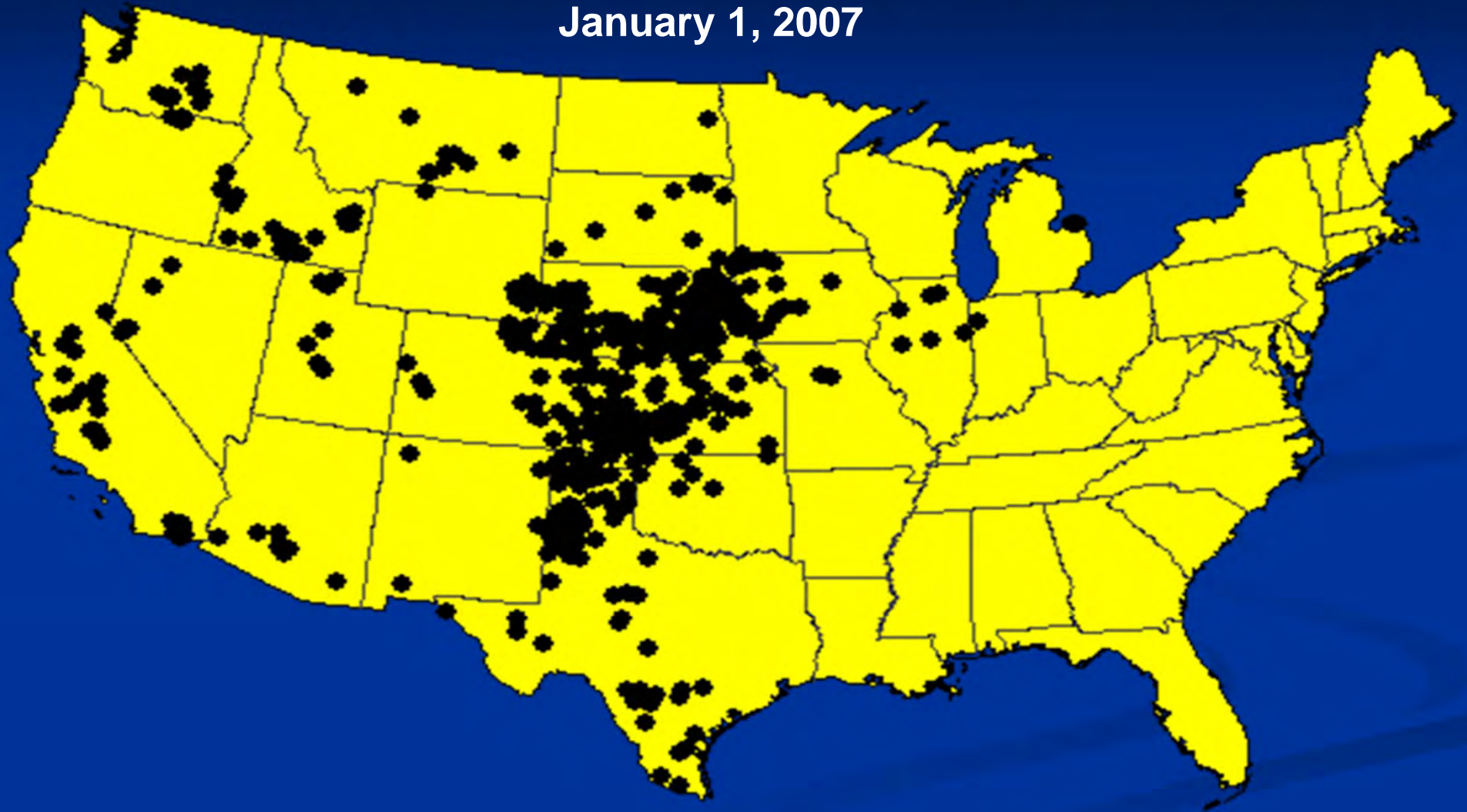
First Scenario: High Plains (Ogallala) Aquifer

- 174,000 sq. mi area of 8 states
- 14 million irrigated acres
- 165,000 irrigation wells
- ~25% of U.S. irrigated lands



United States Feedyards > 4,000 Head

January 1, 2007

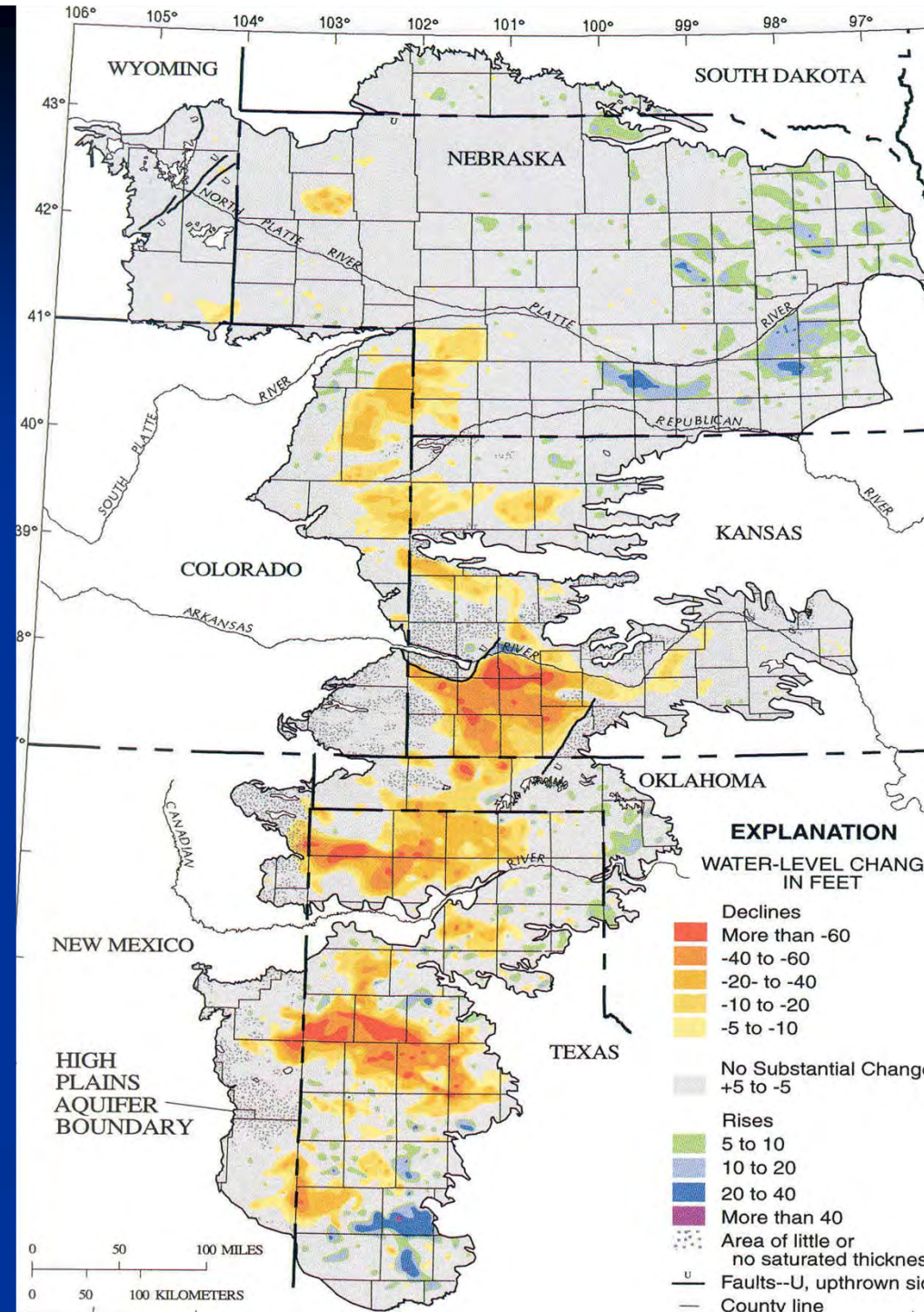


Water level changes in the HP Aquifer, 1980 – 2002

Aquifer contained ~3.27 Billion acre feet of water in 1990

Estimated depletion of 235 million acre feet

8% of total aquifer volume depleted



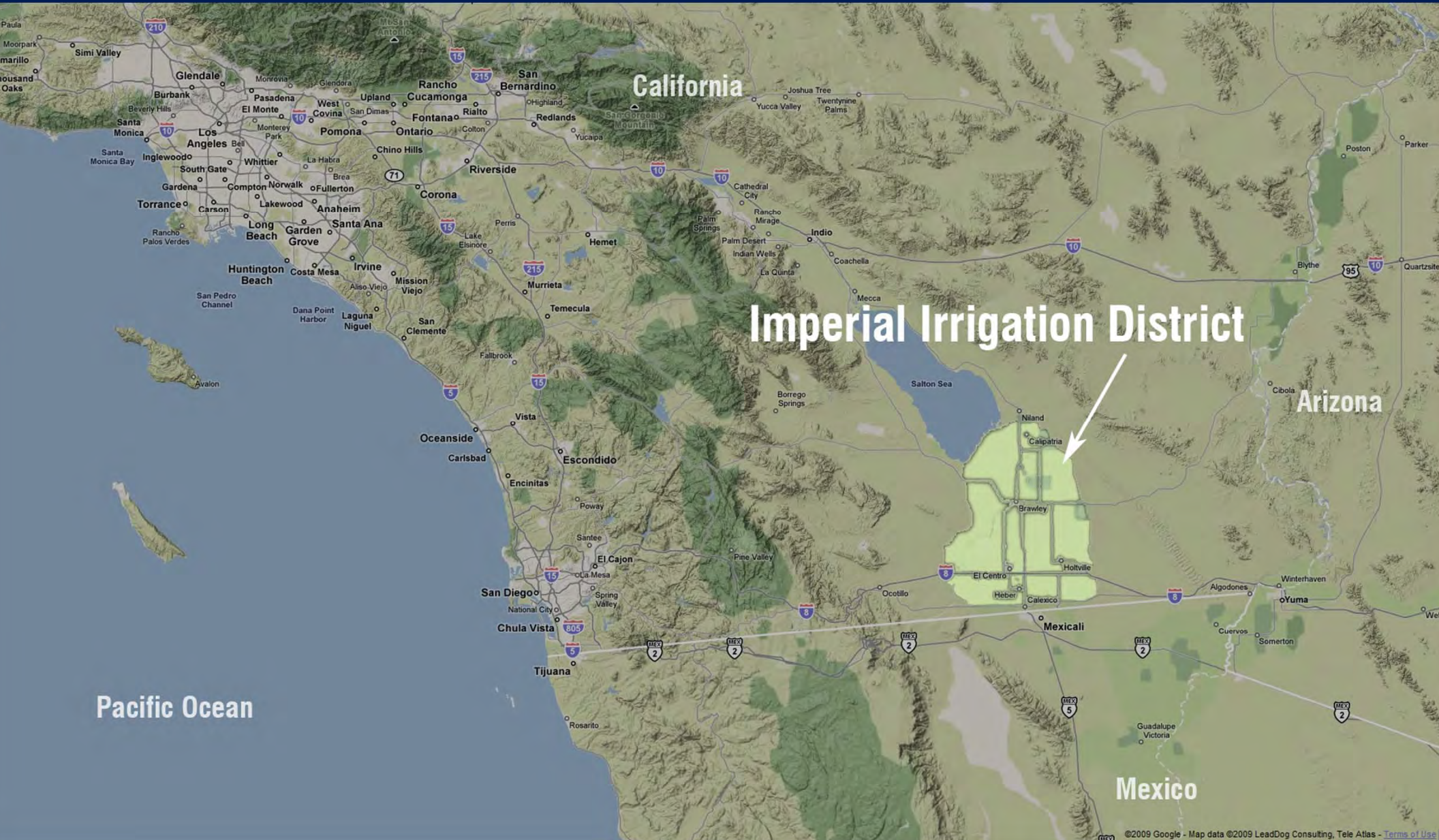


Conflicts over use of groundwater are increasing

- Groundwater use is affected by both legal and physical constraints
- Reliance on nonrenewable groundwater raises serious reliability and sustainability concerns



Second Scenario: Imperial Valley, CA



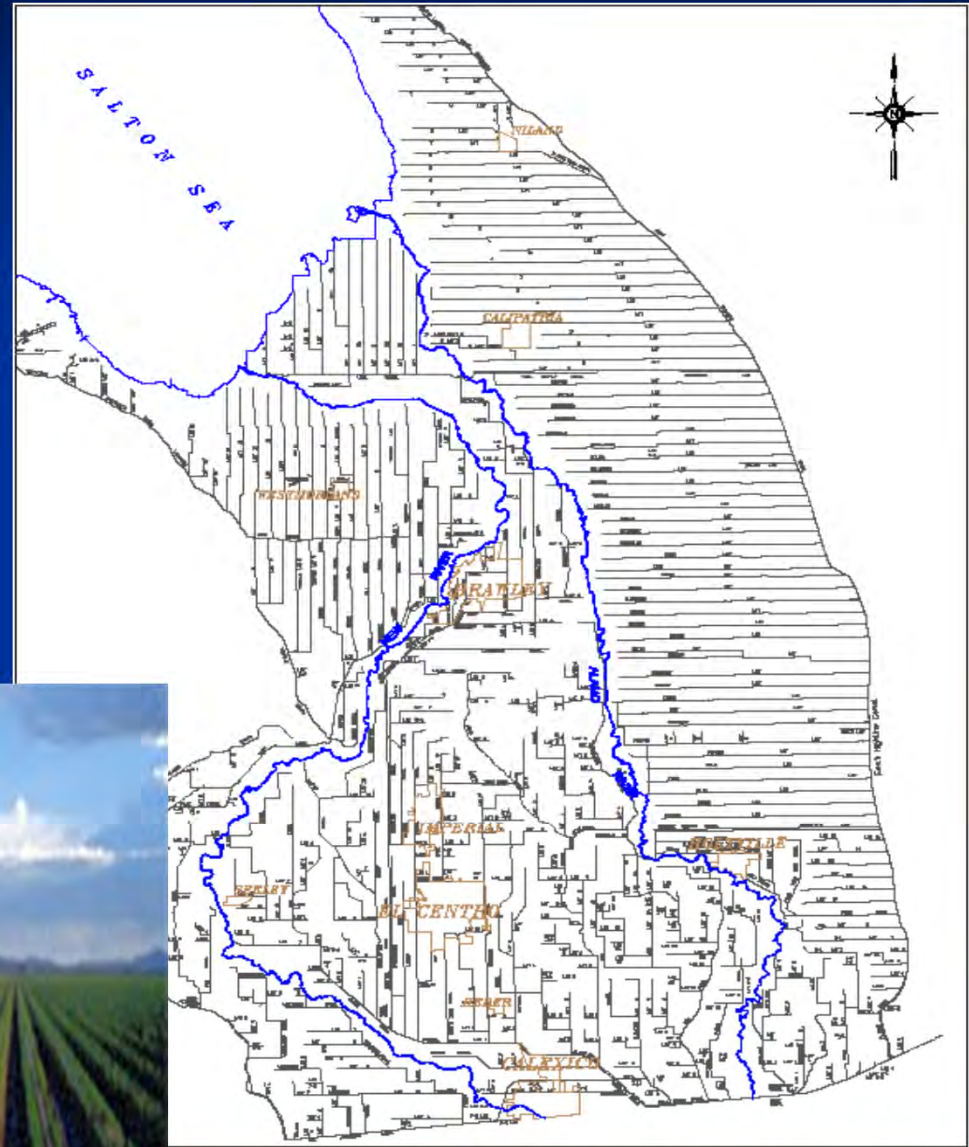
Imperial Irrigation District

Pacific Ocean

Mexico

Imperial Irrigation District

- 1,442 miles of lateral irrigation canals
- 148 miles of main delivery canals
- **Imperial Valley Commodity Total \$1,684,522,000**



IID's Water Conservation and Transfer Programs

- Metropolitan Water District
 - 105,000 acre feet per year
 - 35 years
 - Cost Based – Facilities construction, operation and maintenance
- San Diego County Water Authority
 - 303,000 acre feet per year
 - Up to 75 years
 - Market Based – Value of water



Third Scenario:

Bay Delta and the Central Valley



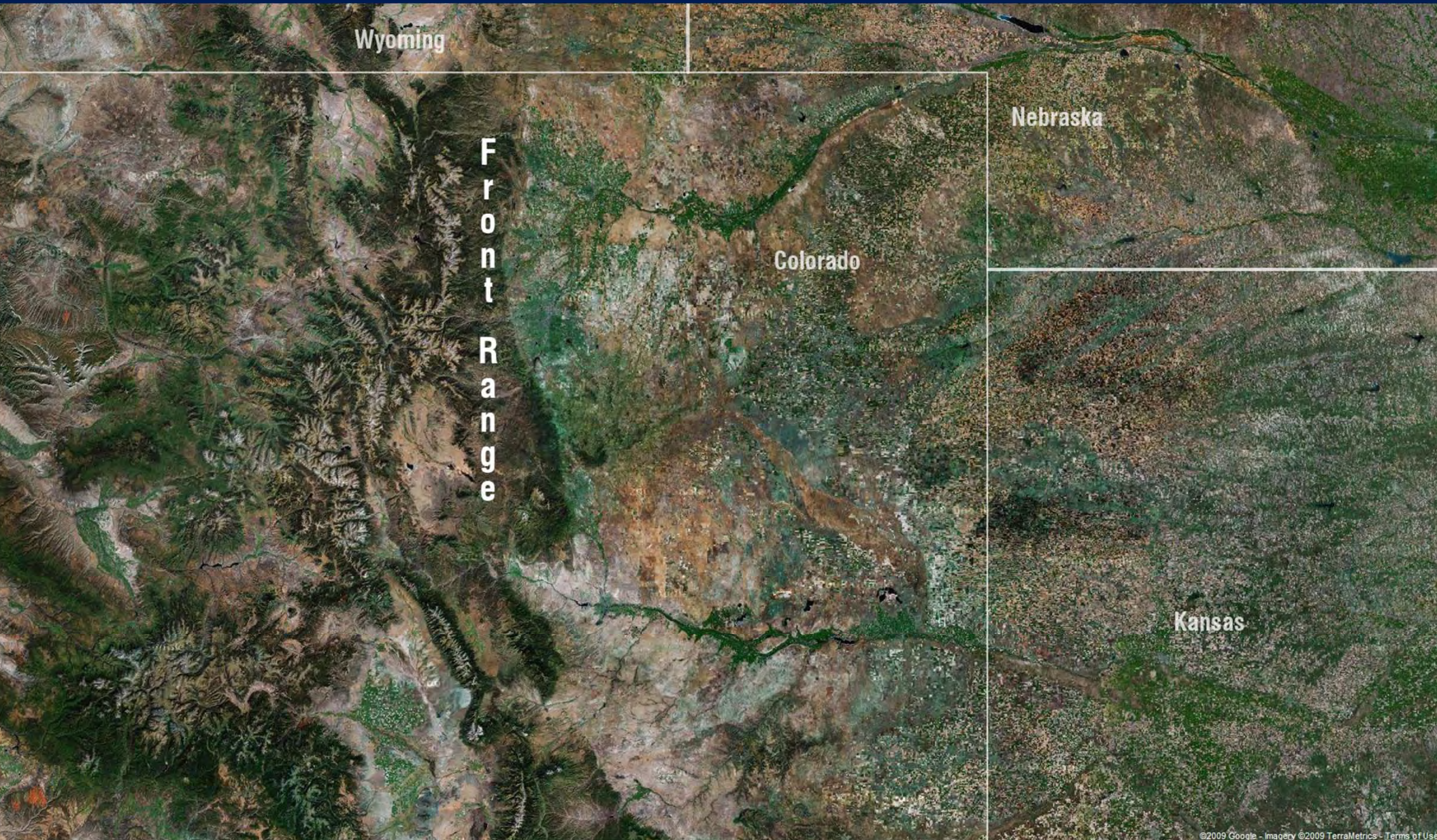
California's Central Valley Project

Provides about 5 MAF for farms -- enough to irrigate about 3 million acres. Large fraction of domestic vegetables are grown here.

In 2009, the US Fish and Wildlife Service imposed restrictions on the US Bureau of Reclamation operations of the project pumps to protect the Delta Smelt, resulting in a 10% allocation to agriculture south of the Delta.

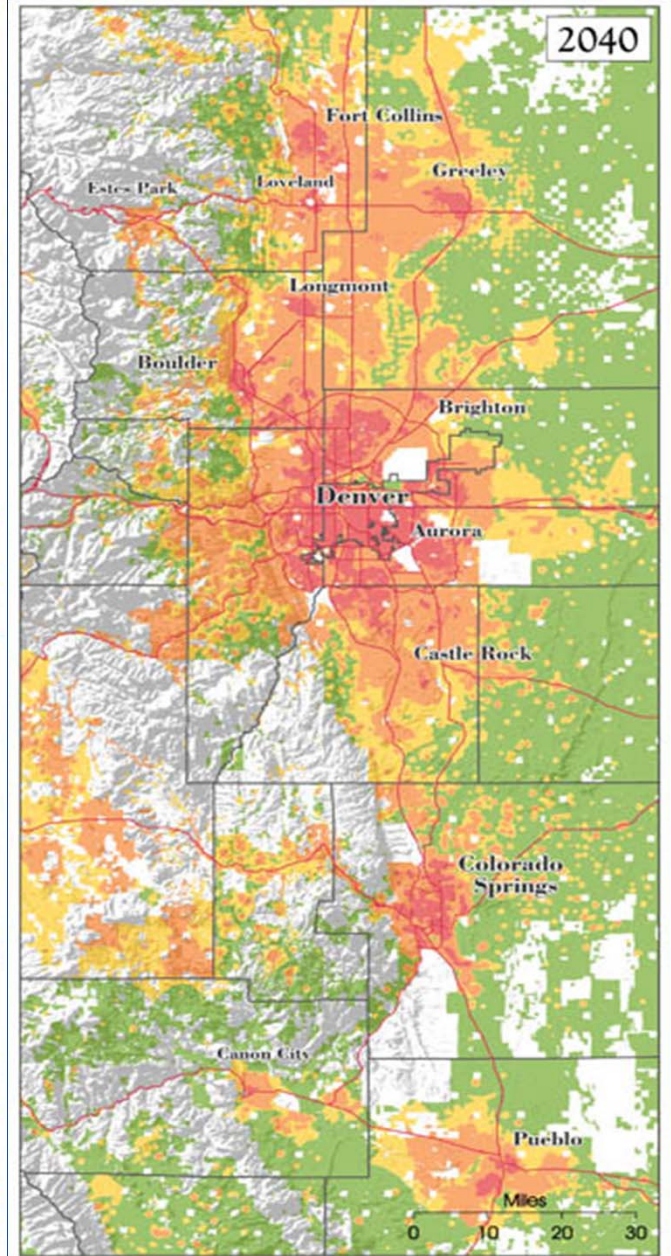
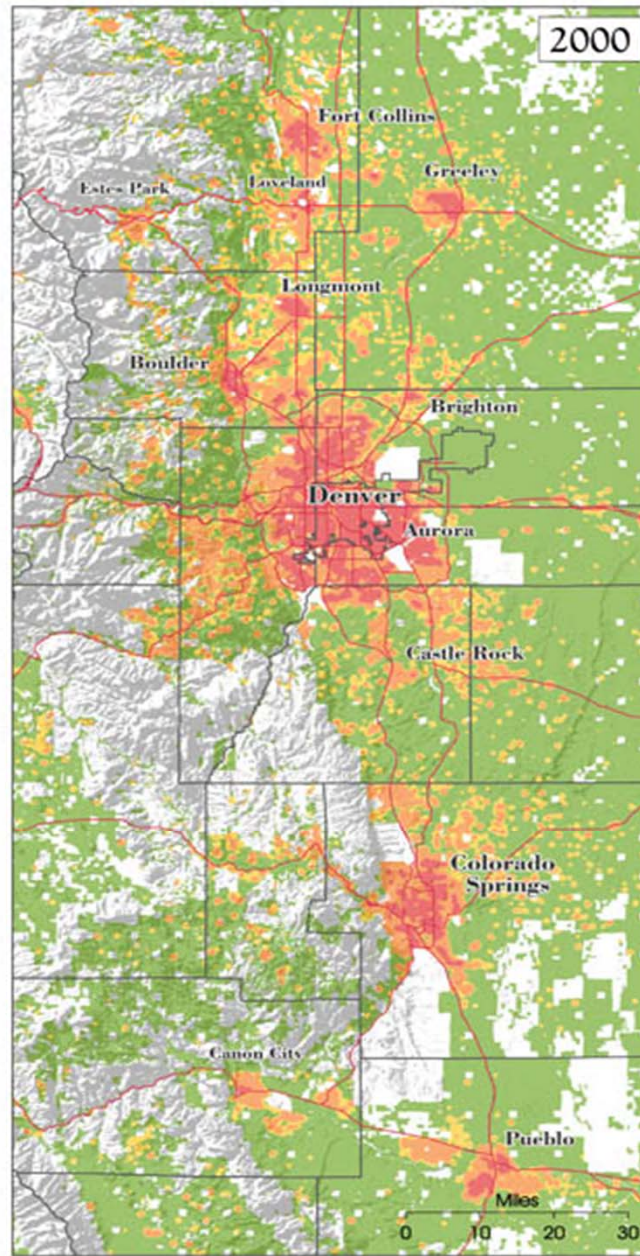
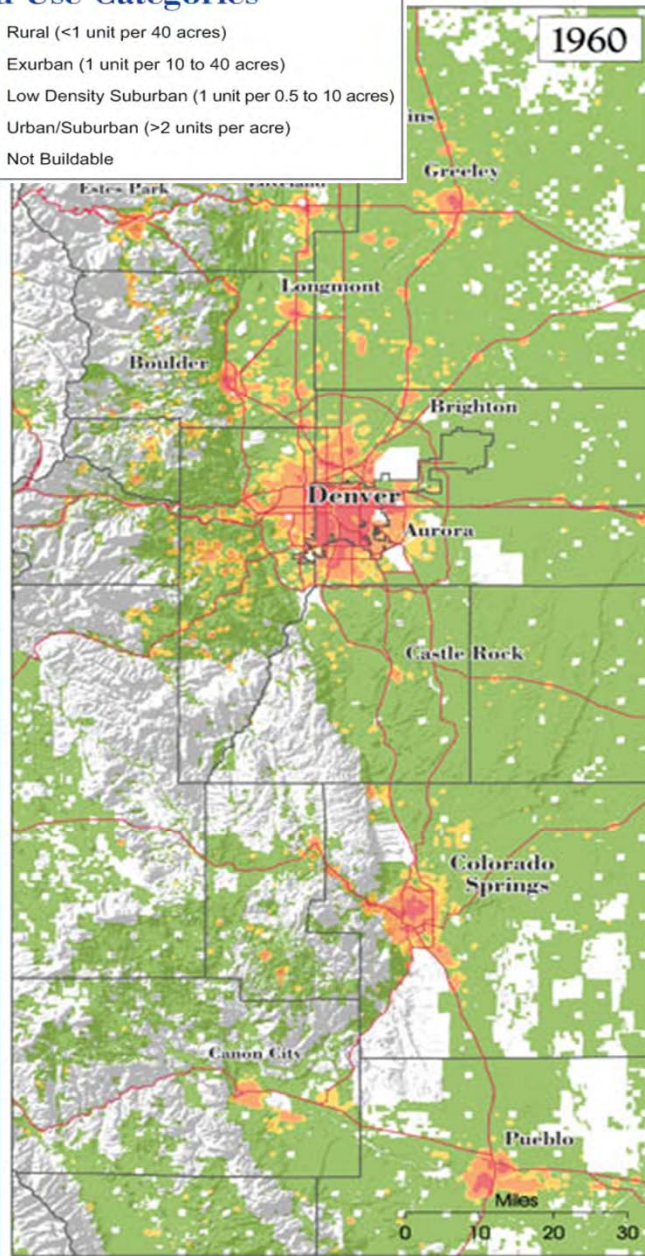


Fourth Scenario: Colorado's Growing Front Range



Land Use Categories

- Rural (<1 unit per 40 acres)
- Exurban (1 unit per 10 to 40 acres)
- Low Density Suburban (1 unit per 0.5 to 10 acres)
- Urban/Suburban (>2 units per acre)
- Not Buildable

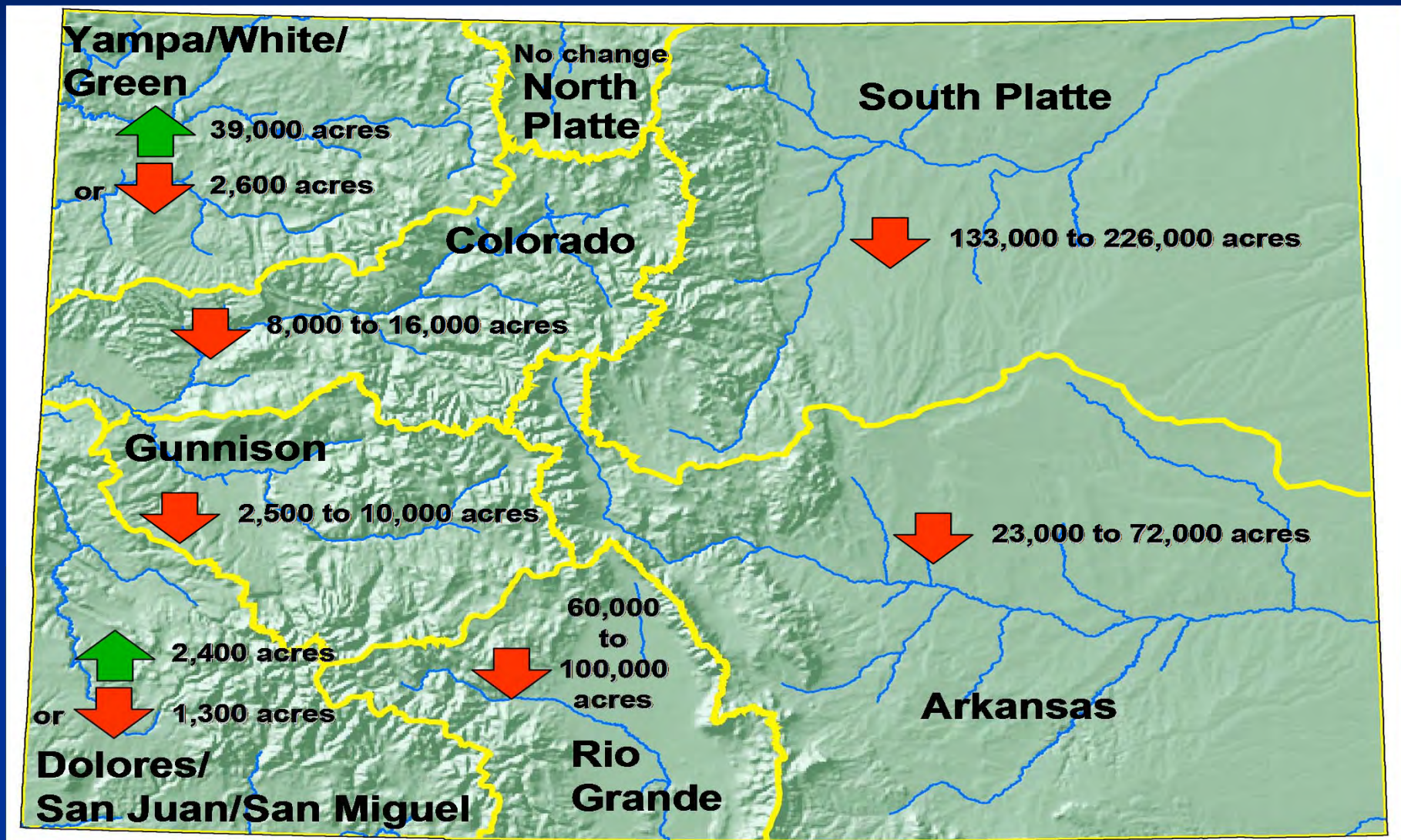


Colorado Front Range – Population expected to double by 2050

Market Driven Transfers of Agricultural Water to Municipal Use Are Rapidly Occurring



Potential Changes in Irrigated Acres in Colorado, 2005 to 2030



Meeting Colorado's Future Water Supply Needs

Are there viable alternatives to
traditional agricultural water
transfers?





Can Ag Water Conservation Provide Additional Water?

- Legal Impediments
- Physical Constraints
- Basin Scale Impacts
- Economic Considerations



Producer Responses to Reduced Water Availability

- ✓ Rotational and split cropping with dryland crops or fallow;
- ✓ Limited irrigation; Partial season irrigation
- ✓ Shift to sunflowers, sorghum, wheat, forage crops
- ✓ Higher level of scheduling and water management
- ✓ Reduced tillage; Re-nozzle and remove pivot end guns
- ✓ Use of EQIP and other federal farm programs

We must increase food productivity using less water and reduce Ag's footprint on water by:

- developing new crop varieties and cropping systems**
- developing ag enterprises that are resilient to uncertain water supplies and drought**
- transitioning to dryland and limited irrigation strategies**
- minimizing transport and maximizing assimilation of wastes**
- developing decision tools to increase flexibility, reduce risk, increase profitability (climate/water/energy)**
- improving agricultural water management institutions, policies and organizations**

