



U.S. Needs to Bring Agriculture Back to Water

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USDA-CSREES

National Water Conference

Research, Extension and Education for
Water Quality and Quantity

January 28-February 1, 2007

Marriott Savannah Riverfront

Savannah, Georgia



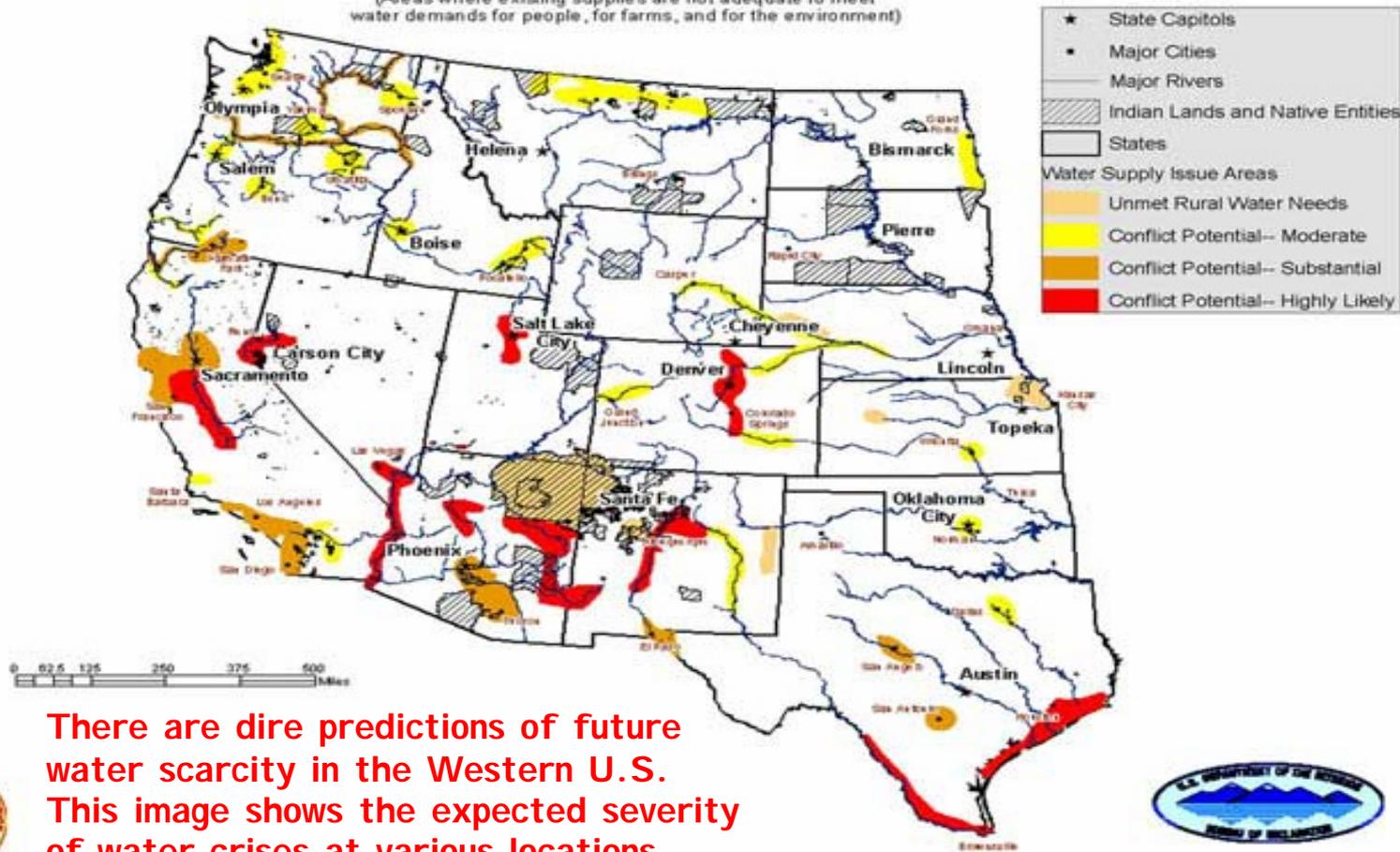
Developing Dilemma for American Agriculture

- Associated with a Growing Water Crisis in the Western U.S.
- Global Warming is Expected to Exacerbate this Water Crisis
- Water Conservation will help but not Solve Western Water Woes
- Current Level of Irrigated Acreage in the West is not Sustainable
- Western Irrigation Water Drying up and being Reallocated to Other Uses
- Agricultural Losses will Threaten U.S. Food and Energy Security
- What will be the Long-term Solution?
- More Prime Farmland Under Irrigation in the Humid Southeast



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)



There are dire predictions of future water scarcity in the Western U.S. This image shows the expected severity of water crises at various locations.

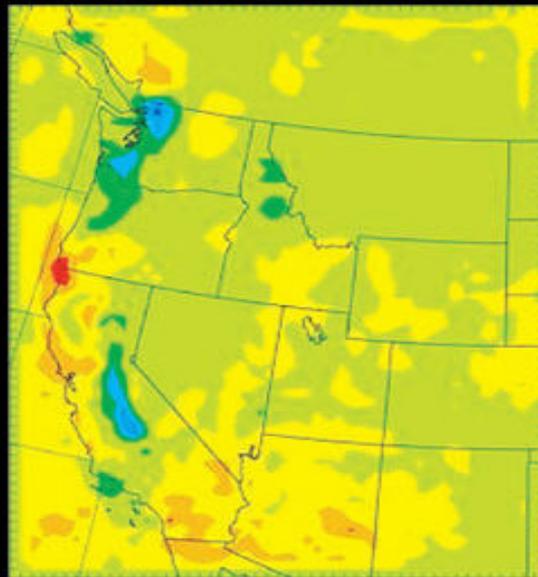


Future climatic changes are expected to further reduce water availability for summer irrigation in the West.

Extreme events may increase but total annual snow accumulation that feeds rivers used for irrigation is expected to decrease substantially.

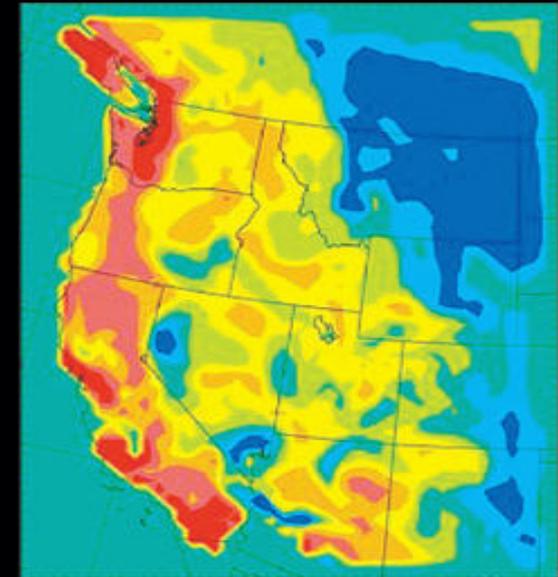
Mid-Century Climate Change Effects on Snow and Extreme Precipitation in the Western U.S.

Change in Extreme Precipitation (mm/day)

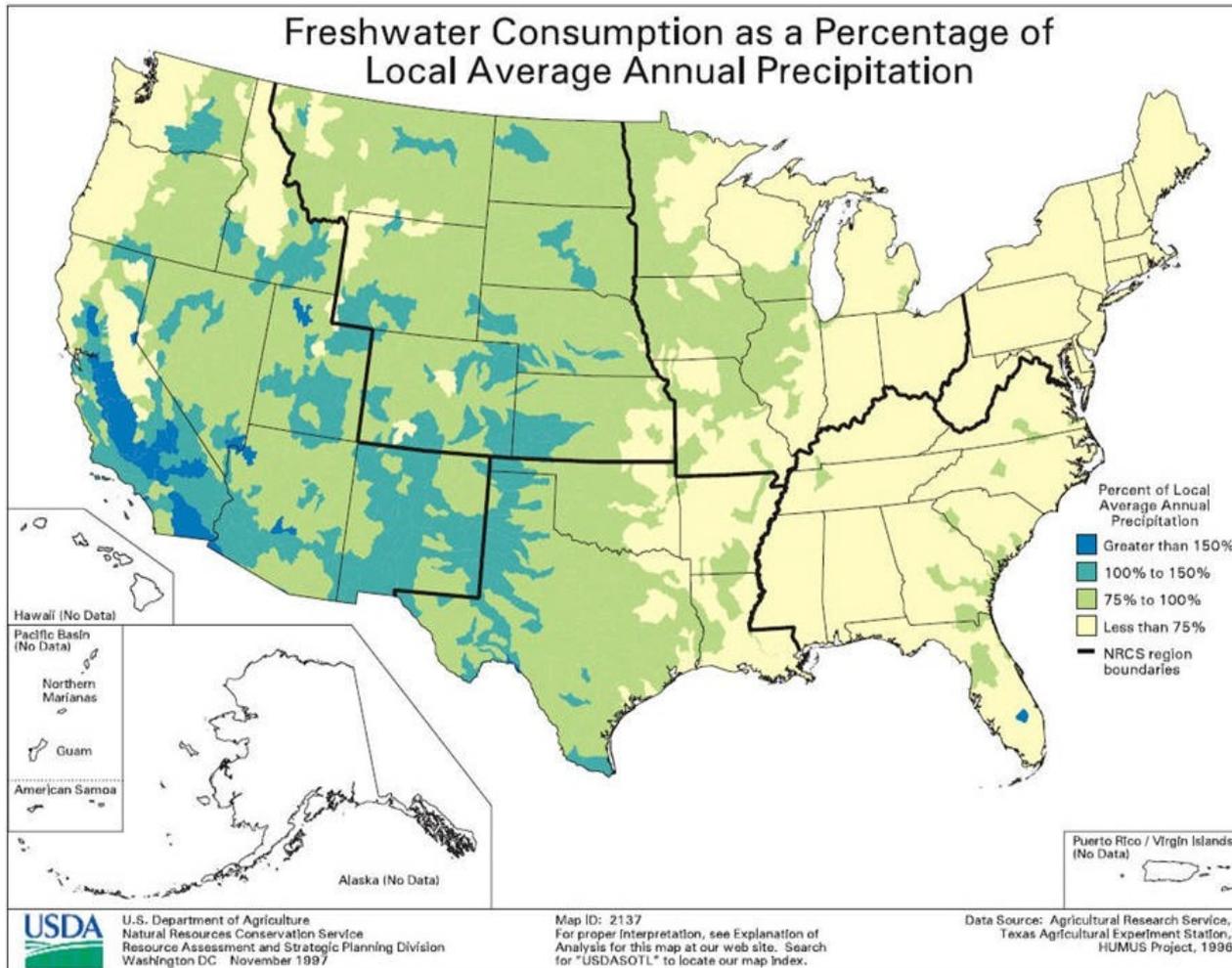


-6 -3 0 3 6 9 12

Change in Annual Mean Snowpack (%)



-75 -60 -45 -30 -15 0 15



If annual snow pack decreases, this will worsen the situation in some areas where water is already consumed at levels that exceed local rainfall. Major farming areas are most likely to suffer the consequences.

If snow melt did not feed the rivers that irrigate California's Central Valley, the most productive agricultural region in the world would not exist.



The distinctive Central Valley contains most of California's best farmland.
Map courtesy of U.S. Geological Survey





There are **federal**, **state** and **local** water projects that support irrigation in the Central Valley as well as the Imperial and Coachella Valleys further south. Irrigation is the largest water consumer but in the near future more of this water will likely be reallocated to urban and environmental use. Food products from the Central Valley total over \$13 billion annually. Over 75% of the U.S. supply for certain food crops are currently grown in the Central Valley.



Map courtesy of the California Department of Water Resources.

Map courtesy of California Department of
Water Resources.



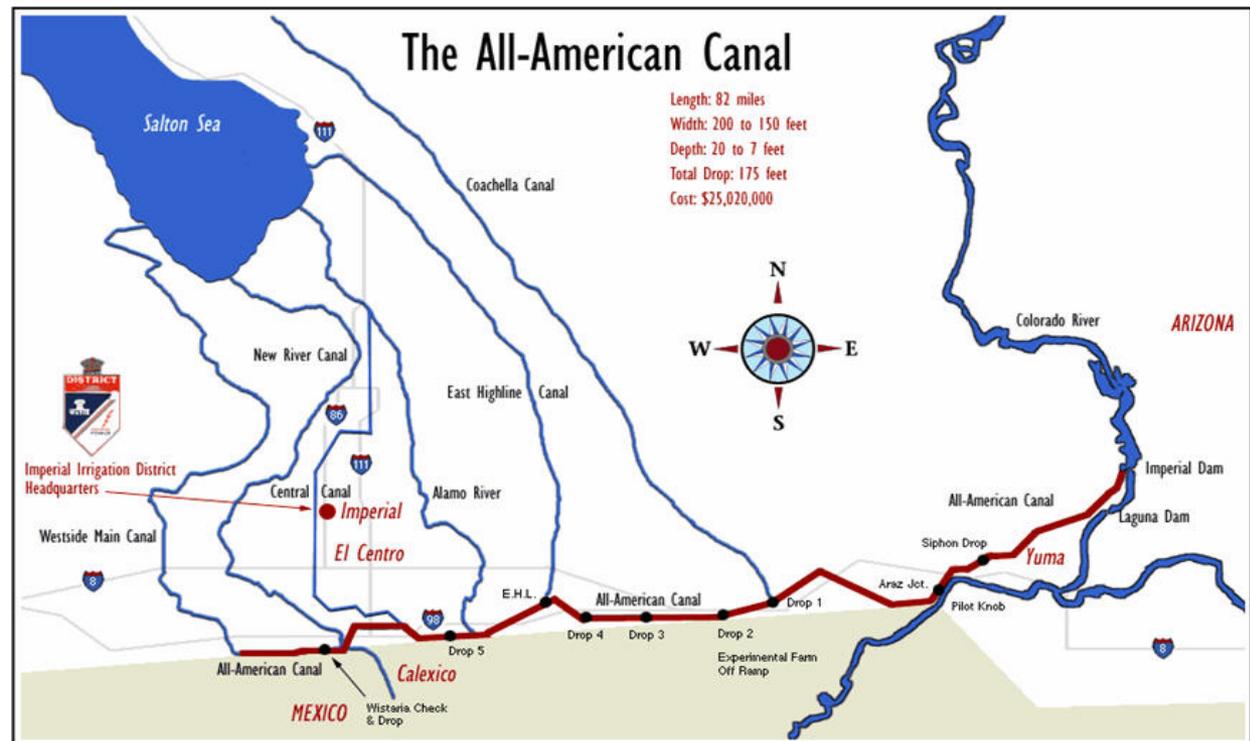
Federal water projects feed farms in the Imperial and Coachella Valleys which provide nearly 85% of the nation's winter vegetable crops. This was once a desert wasteland but it is supplied with enough Colorado River Water to satisfy the yearly needs of a city of 24 million. San Diego is negotiating to get some of this water in the future.

Massive dams are still being built in the Southwest to help supply the area's growing water demands especially during peak summer use. But sustaining current agriculture irrigation levels will be a problem because the area is developing so fast.



Very aggressive water conservation, recycling and re-use efforts are underway in the West. The scale of these efforts are difficult to fathom in the East. Consider the recent project where DOI agreed to concrete line the All American Canal at a cost of \$200 million to reduce seepage losses of 77,000 acre-ft of water per year. In Southern California's arid climate this will provide enough water to irrigate about 20,000 acres of cropland.

By comparison, \$200 million could build on-farm ponds in the Southeast capable of holding 300,000 acre-ft of water, enough water to irrigate 300,000 to 500,000 acres of cropland annually.



Agriculture grows where water flows and so do cities. But the days of building canals to take fresh water hundreds of miles from nearby rivers in the West is probably over. Water from the Colorado River system is over-allocated already and more water to this area must either be imported from a greater distance or from coastal desalted seawater.



Irrigation from snow melt



Canal to Phoenix

Citizen groups from California to Washington DC are pushing Congress to end federally subsidized water for irrigation in the West. For more than 50 years, an acre-ft of water for irrigation has cost only 5 to 15% of what others pay for the same water. Environmental groups are also calling for more water to feed the rivers that have been dried up because of irrigation. These groups are gaining in numbers and clout and the courts are beginning to rule in their favor.



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Western Water Campaign

Central Valley Project

In the interest of federal taxpayers, this program works to end the over 60 years of federal water subsidies that have been provided to users of [California's Central Valley Project \(CVP\)](#).

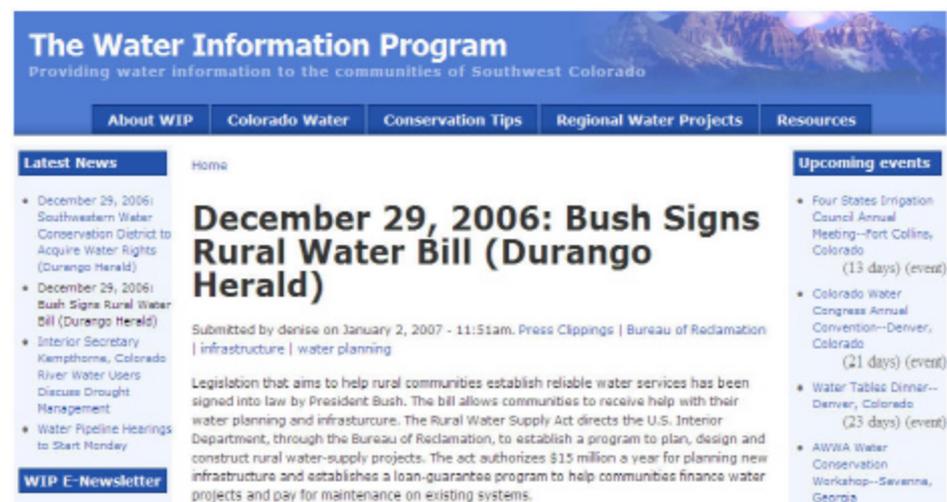
Of the approximate \$3.6 billion cost of the project, water users have repaid approximately 19% of their share. Taxpayers have already picked up \$1.2 billion of the construction costs and are paying the interest on the remaining \$1.9 billion left to be repaid by project beneficiaries before the year 2030.

Central Valley Water Project Repayment Graph, 1949-1998

Resources

- [TCS comment on Westlands Irrigation District Contract Renewal](#)
- [TCS comments on DEIS for San Luis Drain](#)
- [May 3, 2004 -- TCS and National Taxpayers Union urge fiscal responsibility in renegotiating of CVP contract](#)

» Take Action Now! «
Today's Actions



The Water Information Program
Providing water information to the communities of Southwest Colorado

About WIP Colorado Water Conservation Tips Regional Water Projects Resources

Latest News

December 29, 2006
Southwestern Water Conservation District to Acquire Water Rights (Durango Herald)

December 29, 2006
Bush Signs Rural Water Bill (Durango Herald)

Interior Secretary Kempthorne, Colorado River Water Users Discuss Drought Management

Water Pipeline Hearings to Start Monday

WIP E-Newsletter

December 29, 2006: Bush Signs Rural Water Bill (Durango Herald)

Submitted by dense on January 2, 2007 - 11:51am. Press Clippings | Bureau of Redamation | infrastructure | water planning

Legislation that aims to help rural communities establish reliable water services has been signed into law by President Bush. The bill allows communities to receive help with their water planning and infrastructure. The Rural Water Supply Act directs the U.S. Interior Department, through the Bureau of Reclamation, to establish a program to plan, design and construct rural water-supply projects. The act authorizes \$15 million a year for planning new infrastructure and establishes a loan-guarantee program to help communities finance water projects and pay for maintenance on existing systems.

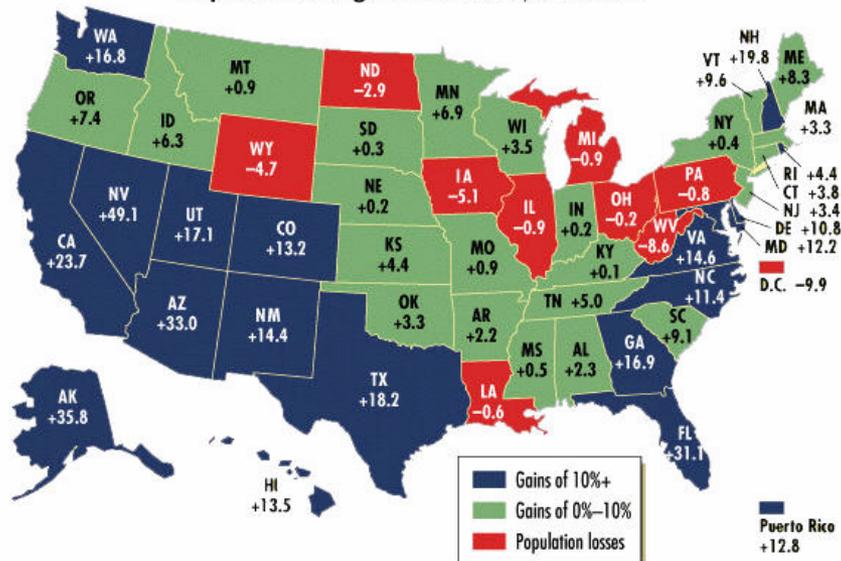
Upcoming events

- Four States Irrigation Council Annual Meeting--Fort Collins, Colorado (13 days) (event)
- Colorado Water Congress Annual Convention--Denver, Colorado (21 days) (event)
- Water Tables Dinner--Denver, Colorado (23 days) (event)
- AWWA Water Conservation Workshop--Savanna, Georgia

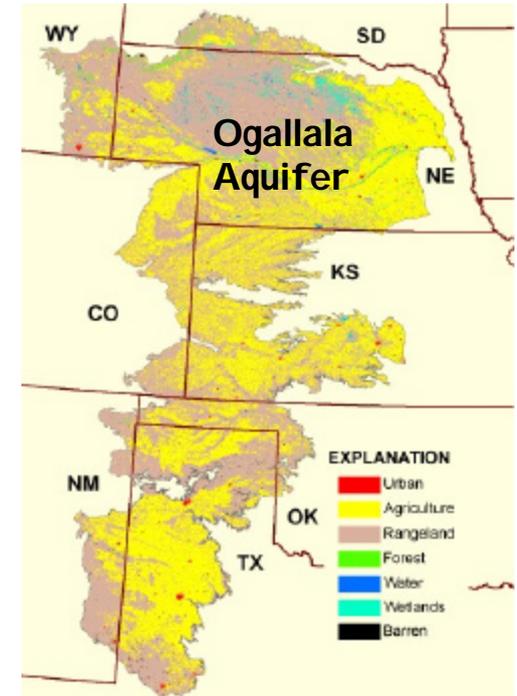
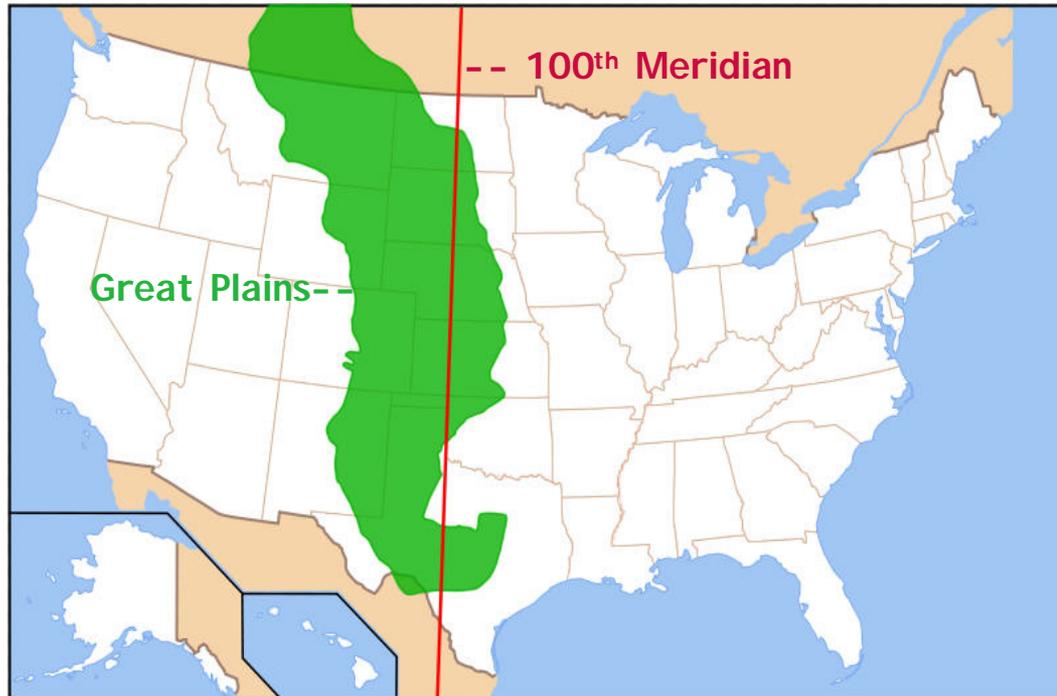
Not just the big cities but smaller developing rural areas also want a water guarantee. The president just signed such a bill this past December.

The great influx of people that have moved to the western sun belt areas are not moving there because of its highly productive desert agriculture. Population growth rate in the West is not expected to decline within the foreseeable future.

Population Change in the States, 1980-1990

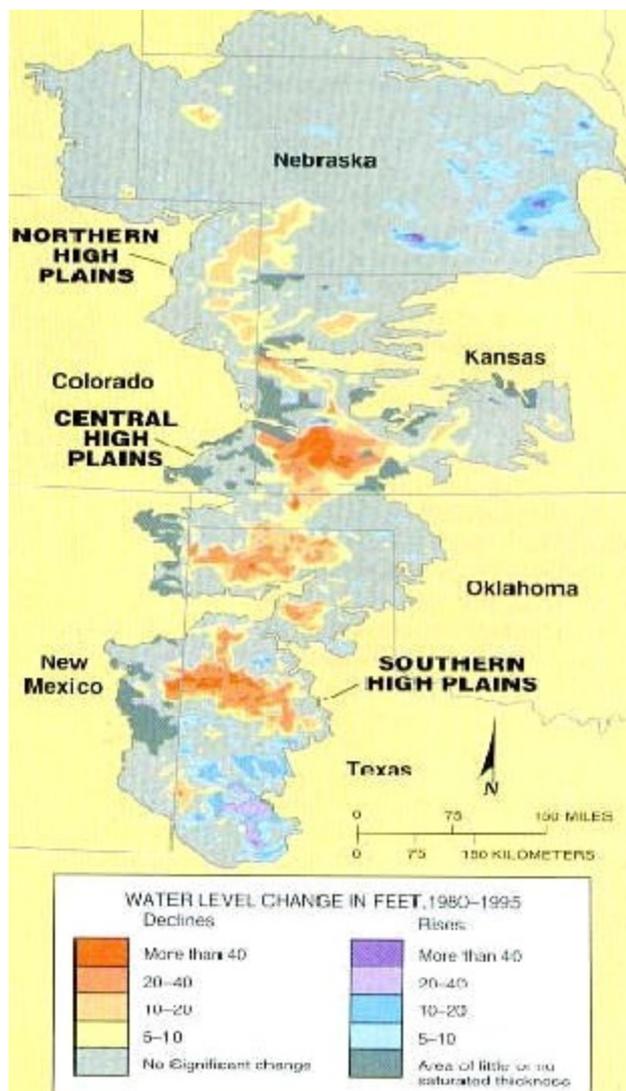


Another agriculture area that may be in trouble is the Great Plains. Agriculture came to this area as a result of the Homestead Act. Dust Bowl days of the 1930s brought much of the struggling agriculture in this area to an abrupt end. The area was revitalized by rural electrification after WWII. Cheap electricity made it possible to pump water from the greatest aquifer in the world, the Ogallala. Therefore, cheap water turned this area into one of the most productive agricultural areas in the United States.



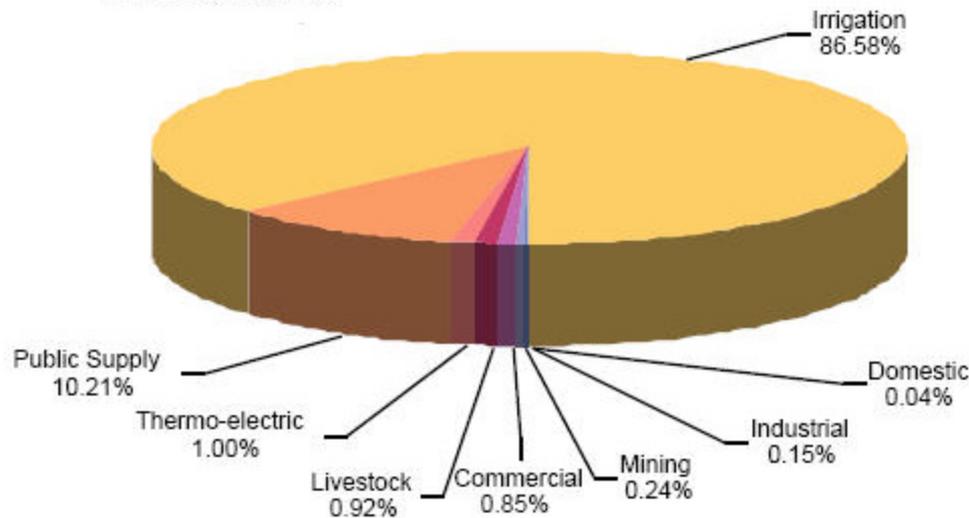
Status of the Ogallala

High groundwater pumping to support irrigated agriculture in this semi-arid climate of the Great Plains has resulted in significantly reduced water levels in the Ogallala, especially in those areas where the aquifer is not very thick and recharge is almost non-existent. Some land areas have subsided causing further problems. Current agricultural production levels cannot be sustained as portions of the Ogallala dry up.



Water for irrigation has been on a gradual decline in the West since 1980 and has declined at an even greater pace since the mid-1990s. Irrigation accounted for 87% of consumptive water use in the West in 1995.

Relative Consumptive Water Use in the West

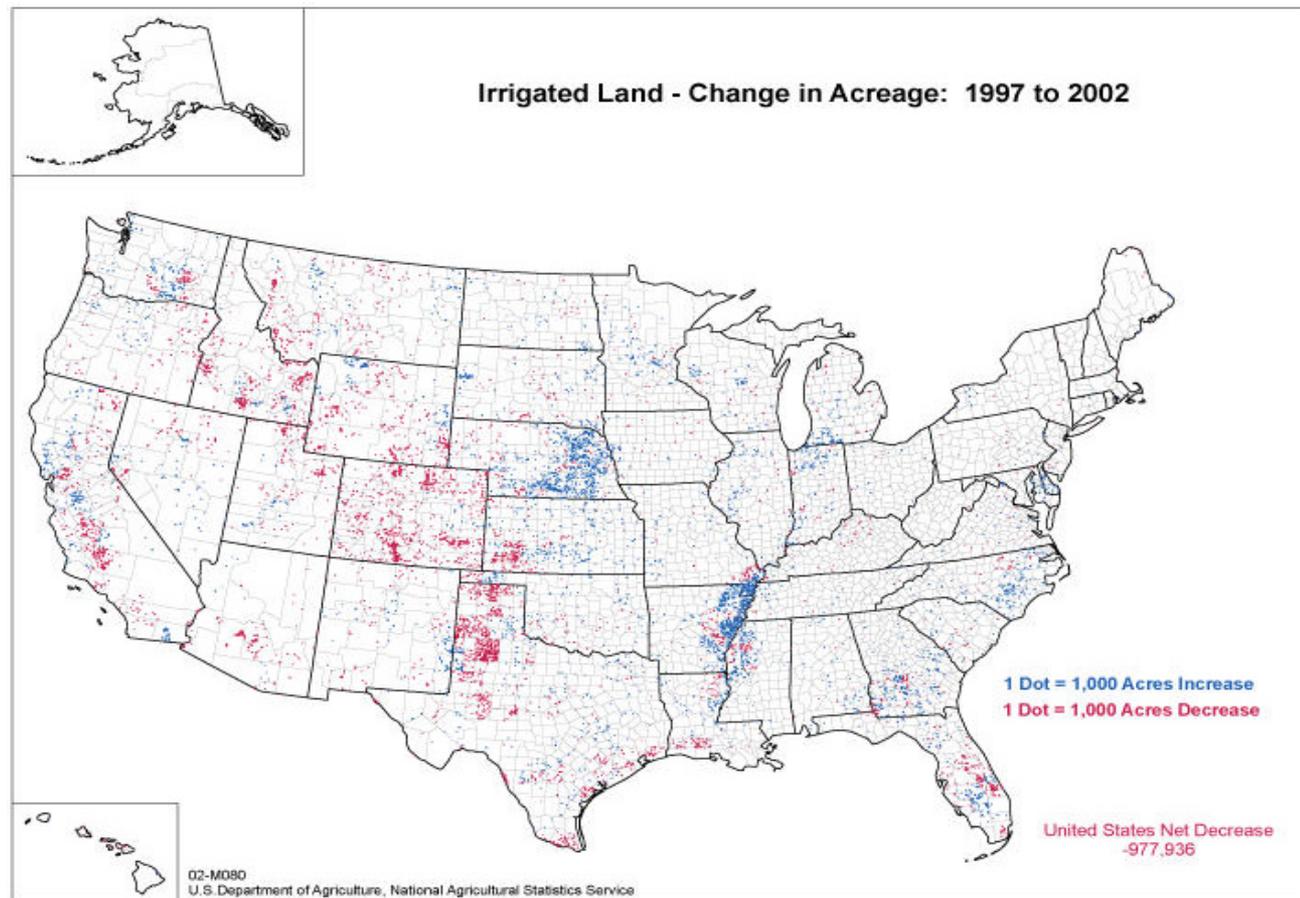


In 1995, 87% of the water used in the West was for irrigation. However, water use for irrigation has declined slightly since 1980, while municipal uses have grown.

It is quite obvious from the figure below that most of the net loss in irrigation (almost a million acres) between 1997 and 2002 occurred in the semi-arid and arid West. Most of this was for the least valuable crops.

Irrigation acreage increased in several areas east of the 100th meridian, primarily from greater groundwater use. But there was very little increase of surface water withdrawal from the vast surface water sources in the Southeast.

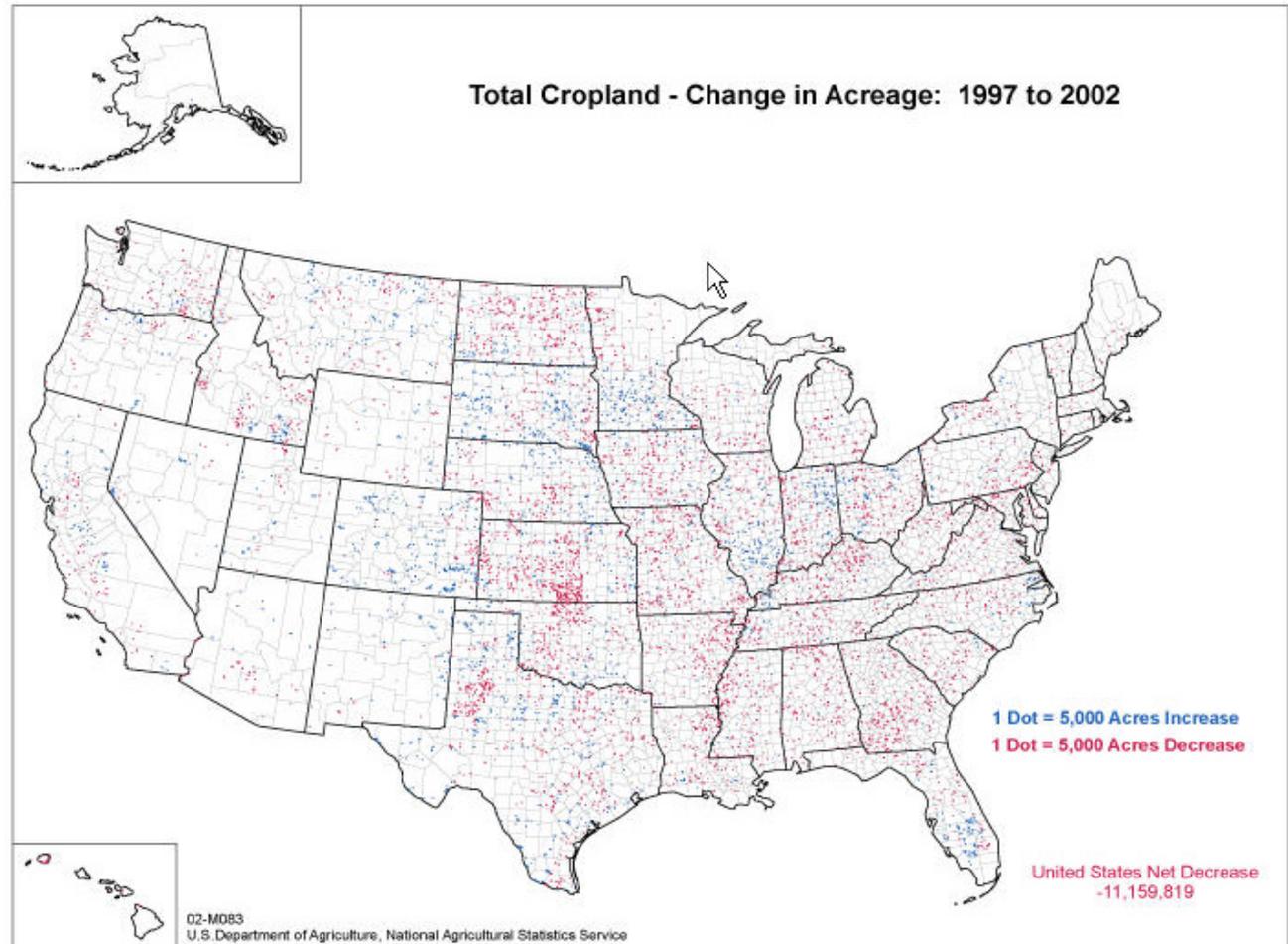
Why is that?



What is more alarming and even harder to understand is the fact that we had a huge decline (more than 11 million acres) in total cropland between 1997 and 2002. Most of this occurred in the East, not in the West.

The agriculture bio-energy initiative has great potential to increase both total cropland and irrigated cropland acreage in the East and Southeast in the near future.

It will take huge volumes of water to meet the predicted ethanol needs from corn.





Research, Extension & Education Water Quality Programs
through the Land Grant University System



Understanding Some Basic Facts



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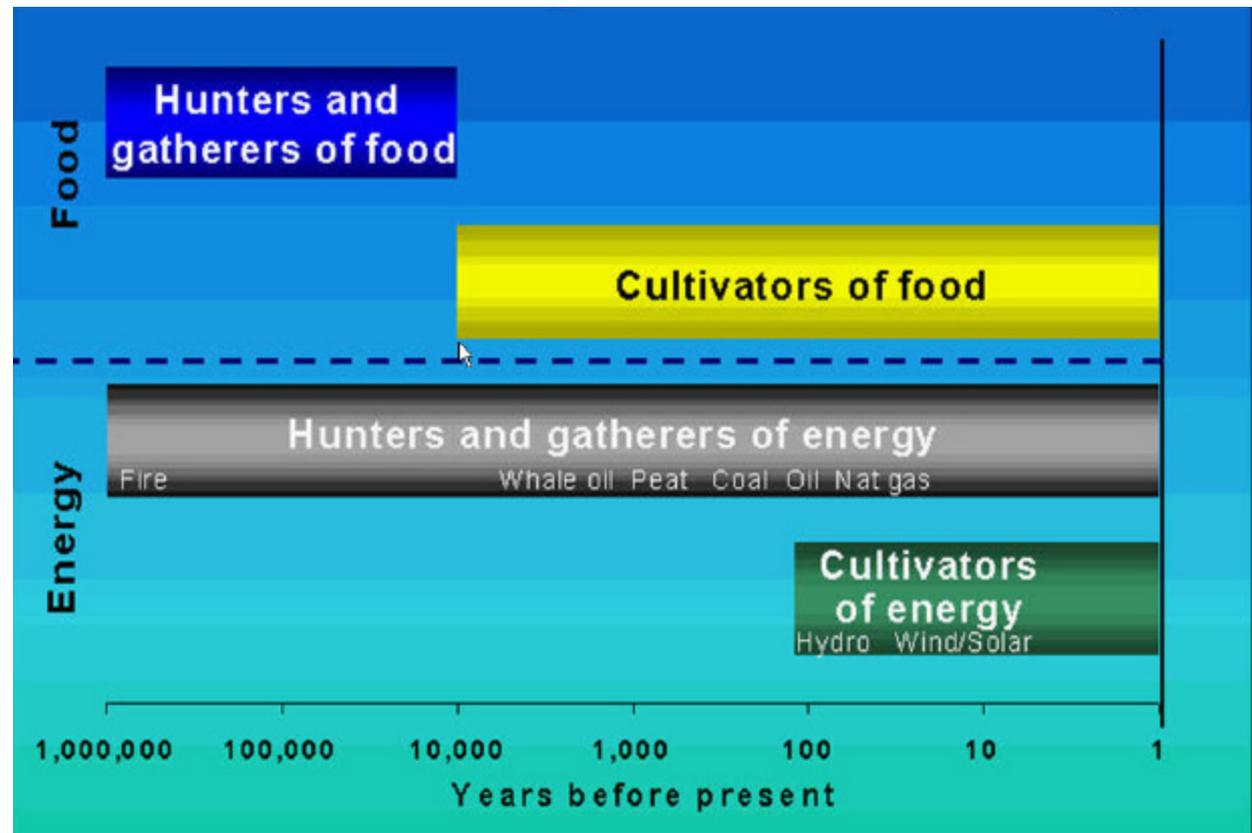


First, let us established the most important industry there is to any civilized society on earth. **What is it?**

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AGRICULTURE

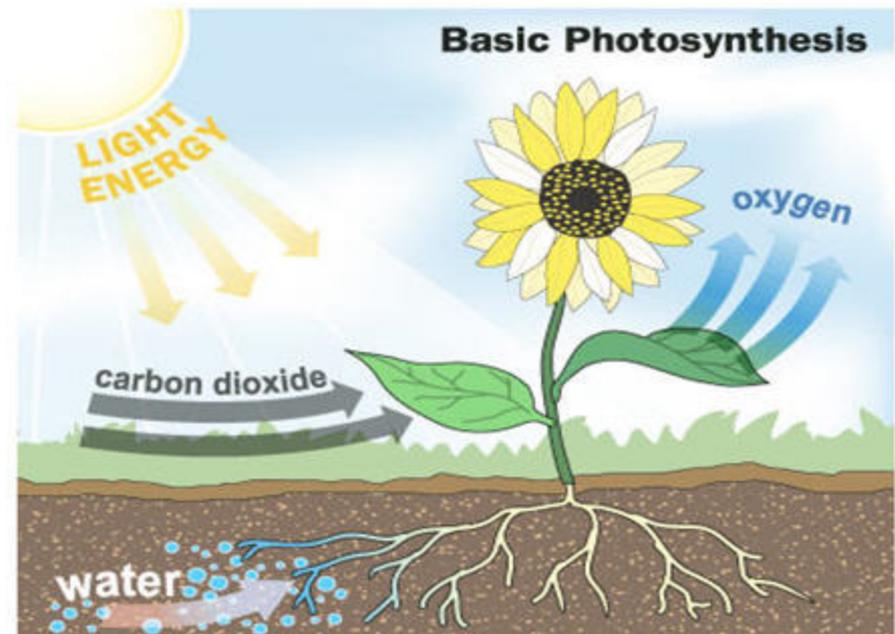
This figure shows the time line for food and energy development by humans. Agriculture and civilization began simultaneously as humans shifted from nomadic hunting and gathering of food to cultivated agriculture. Advances in agriculture then gave people more time for other activities that led to discovery of knowledge and further advances in the arts and sciences. We are still hunting and gathering much of our energy but that is changing and impacting agriculture.



What is the most critical element for long-term sustainable agriculture?

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WATER!



The plant absorbs carbon dioxide from the atmosphere, draws water up through its roots and uses light to *photosynthesize* sugars, which it uses as food. It excretes oxygen as a by-product of the process. Without water, photosynthesis cannot take place.

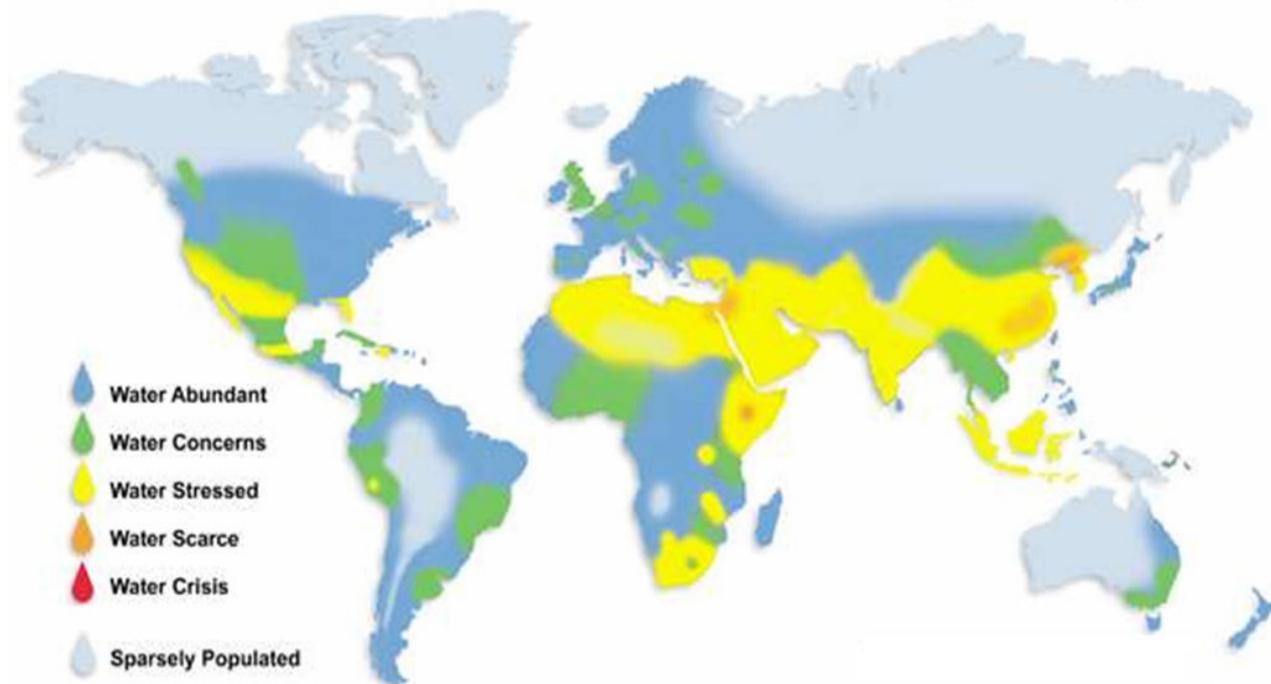
How does the U.S. compare with other countries of the world in reference to availability of fresh water?

How does the U.S. compare with other countries of the world in reference to availability of fresh water?

EXCELLENT!

The U.S. is relatively water rich with average annual precipitation of about 30 inches. However, there are arid areas that receive less than 5 inches and other areas that receive over 100 inches per year.

Worldwide Fresh Water Availability Today



What is the second most critical element for long-term sustainable agriculture?

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SOIL SUITABLE FOR AGRICULTURE--ARABLE LAND

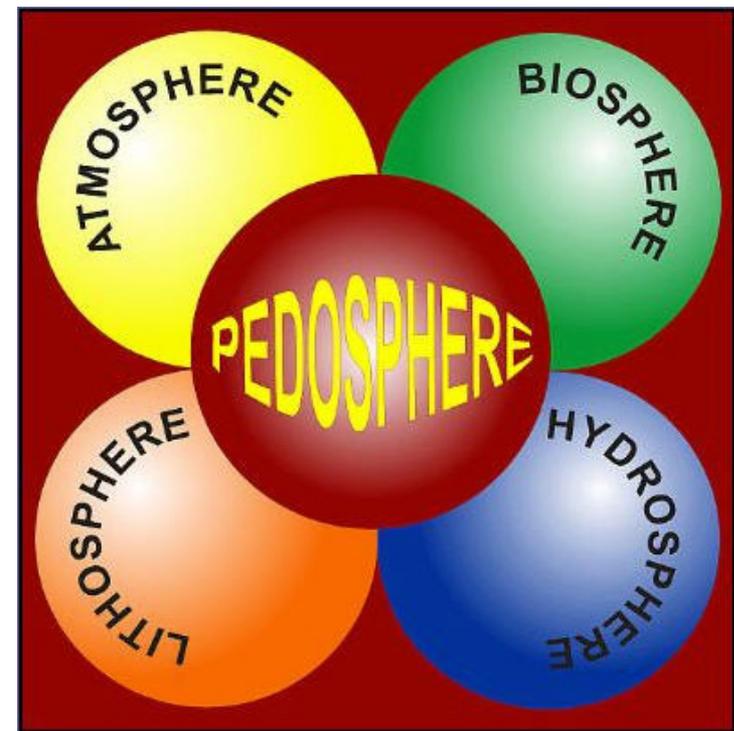
The Pedosphere As A Hub

A Soil by Any Other Name...

Would Work As Hard!

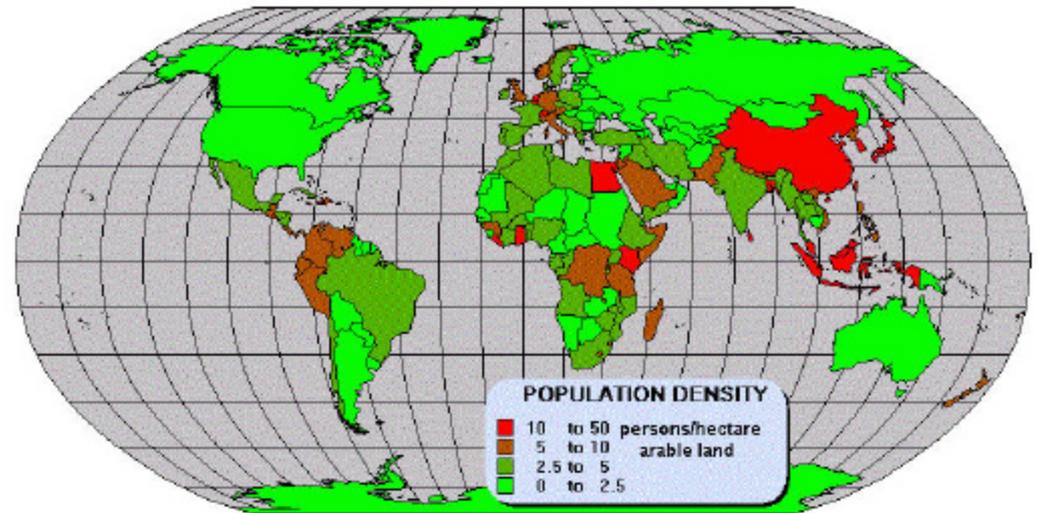
Did you know that the soil has another name? It is also called the **pedosphere**. The word **pedosphere** is like the word "**pedology**" which means the "study of soil." A soil scientist is also referred to as a "**Pedologist**." There are also other global regions or "**geospheres**" that we call the **hydrosphere** (water sphere), the **atmosphere** (air and climate sphere), the **lithosphere** (rock and other geologic material sphere), and the **biosphere** (the sphere where life exists).

In addition to growing food, filtering water and wastes, and building structures, the soil also has a lot of other uses. It is an integrator or hub, for example, for all of the other geospheres on earth.



How does the U.S. compare with the rest of the world in reference to availability of arable land?

How does the U.S. compare with the rest of the world in reference to availability of arable land?



EXCELLENT. The U.S. is fortunate to not only have a lot of very productive farmland but also has one of the lowest people to arable land ratios in the world.

Country/ Continent	Population	Square Miles	Arable Land (square miles)
China	1,306,313,812	3,705,407	594,427
Europe*	586,608,848	2,124,128	649,725
India	1,080,264,388	1,269,345	656,818
Japan	127,417,244	145,882	18,386
Mexico	106,202,903	761,606	105,406
United States (continental)	291,737,129	3,098,489	678,386
Total	3,498,544,324	11,104,857	2,703,148

Current Situation

The U.S. has become a net importer of food, energy and people. (We became a net importer of food in 2004.)

What does this mean for our country?

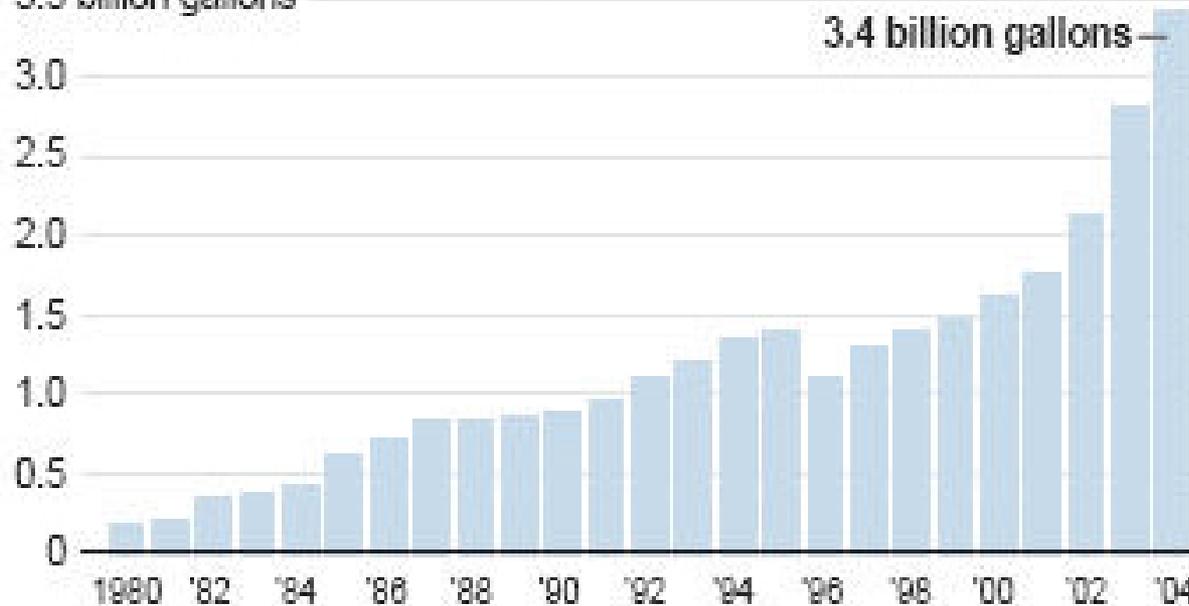
TROUBLE!!!!!! We need to re-think our agriculture, energy and water policies.

Based on resource availability, you would not expect food security to become an issue for the U.S. But it has just like energy security and the two are becoming more interlinked all the time.

Agriculture is rapidly becoming an integral part of the alternative carbon-based energy program for the U.S. primarily through ethanol production.

U.S. fuel ethanol production

3.5 billion gallons



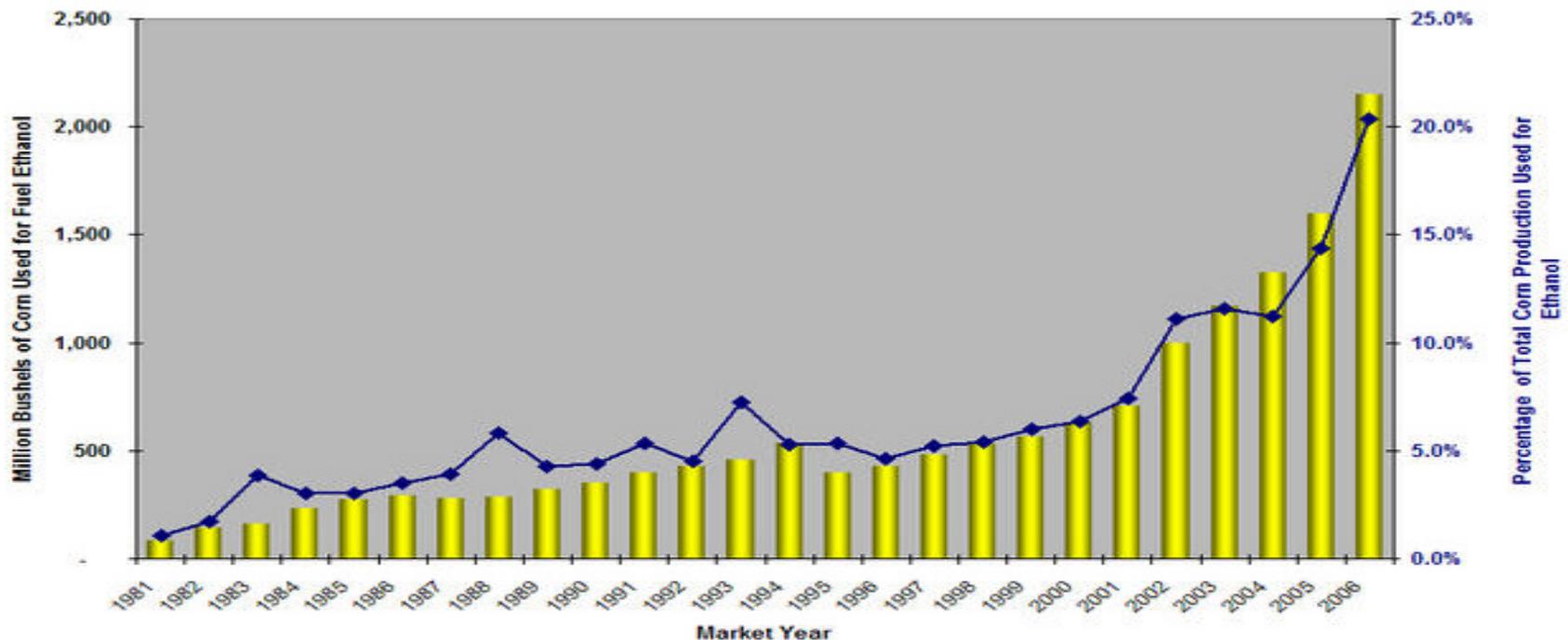
Ethanol production has grown rapidly, especially since 2002, and has become the MTBE replacement in gasoline.

SOURCE: Renewable Fuels Association

AP

Currently, fermentation of starch from corn grain is the primary method for ethanol production in the U.S. Over 20% of corn production in the U.S. went to ethanol production in 2006.

US Corn Production Used for Fuel Ethanol



Source: USDA

Ethanol production from corn is not without controversy.

Squeezing the world
grain supply



INDUSTRY IN CRISIS:

The greatest dilemma that the agricultural industry
has faced in the last 50 years is ethanol and corn prices

The future...is now!

As the grain-devouring ethanol industry threatens to cut short the world's supply of raw materials, corn prices are skyrocketing to an all-time high. New distilleries are opening every week. At 52 distilleries per year, and with each consuming one million tons of corn, North American crops are in short supply for feed and food production.

THE FACTS:

- The USA is the world's largest exporter of corn
- US Production, 300 Million tons of corn per year
- By 2010 Ethanol production will demand 140 Million tons of corn
- By 2008, the largest production state globally, Iowa will have to IMPORT corn to feed their animals and ethanol plants
- By 2010 we will have 50 Million tons of distillers dried grains (DDGs). How do we overcome its inconsistencies? Can this be used to feed our animals?

Can we Afford to Feed our Animals?

Can our industry survive?

Is there technology that can lower costs to keep us profitable?

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The grain devouring
Ethanol industry

Some feel that benefits of ethanol production from corn will be off-set by increasing animal feed and human food costs from products containing corn. The general feeling is that farmers will benefit.



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Where is the greatest supply of un-tapped fresh water in the U.S?

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Average Inches of Annual Precipitation
in the United States 1961-1990

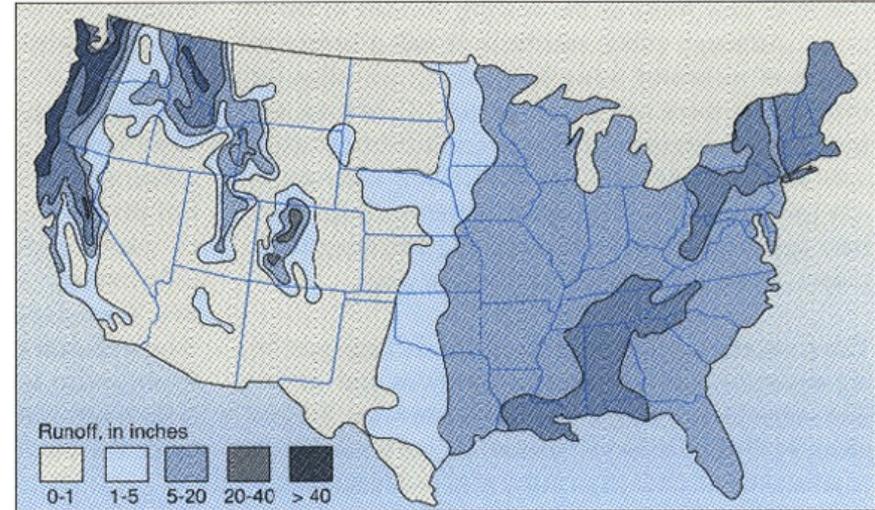
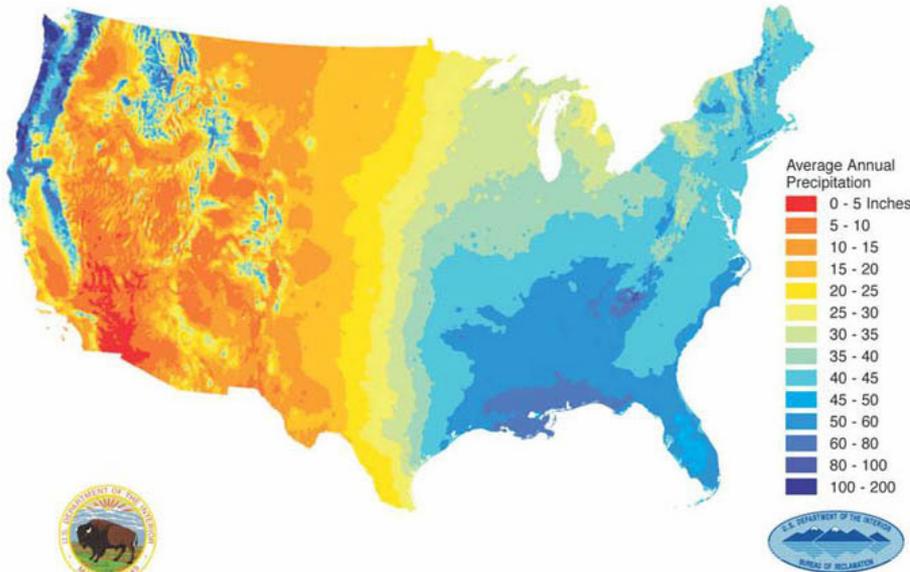


Figure 3 Average annual runoff in the conterminous U.S., from U.S. Geological Survey, National Water Summary 1983—Hydrologic Events and Issues: USGS Water-Supply Paper 2250 (1983).

SOUTHEAST

Average annual precipitation in the Southeast is over 50 inches per year. Annual runoff can exceed 20 inches per year. All the major rivers have very high winter flows and they are some of the least consumed surface water systems in the U.S.



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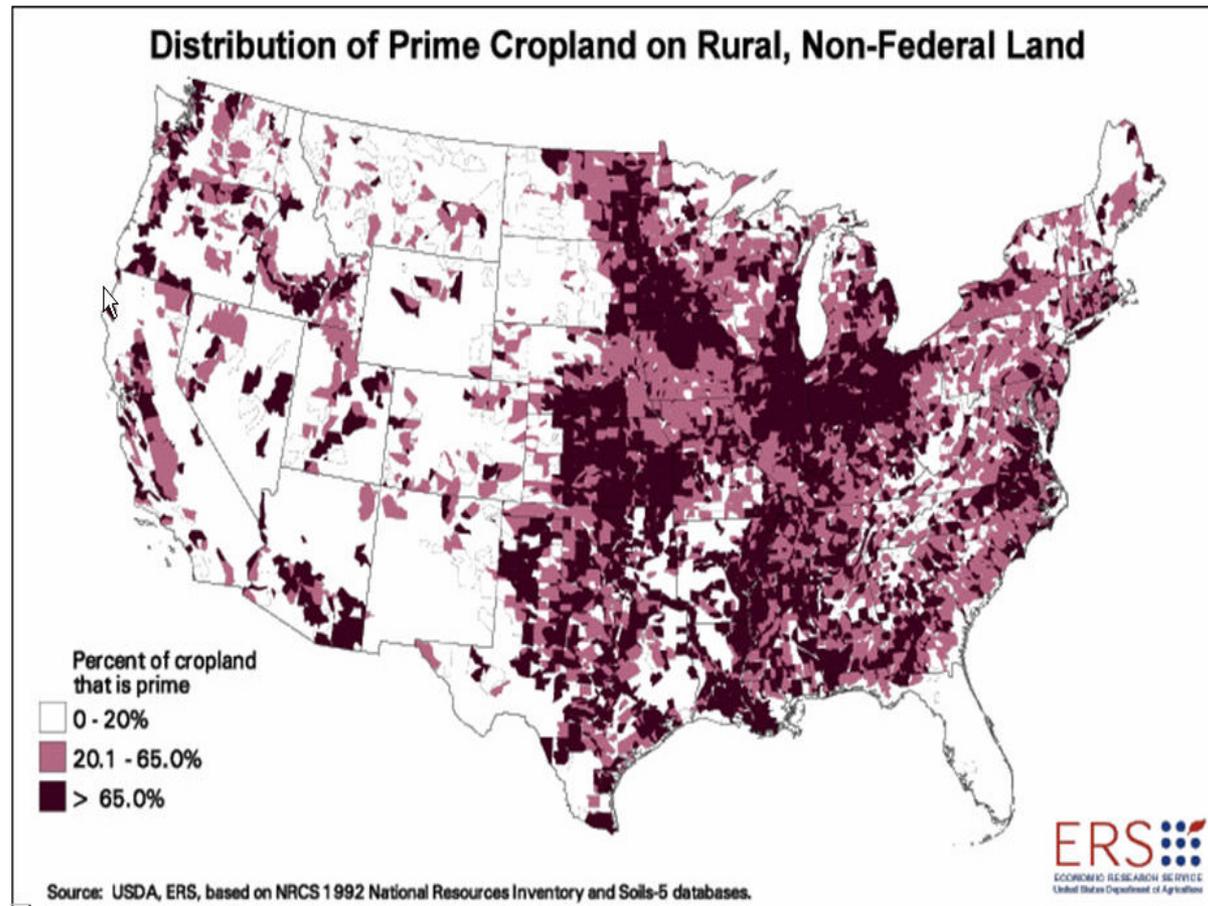


Where is the greatest supply of arable land in the U.S that is not currently in intensive agricultural production?

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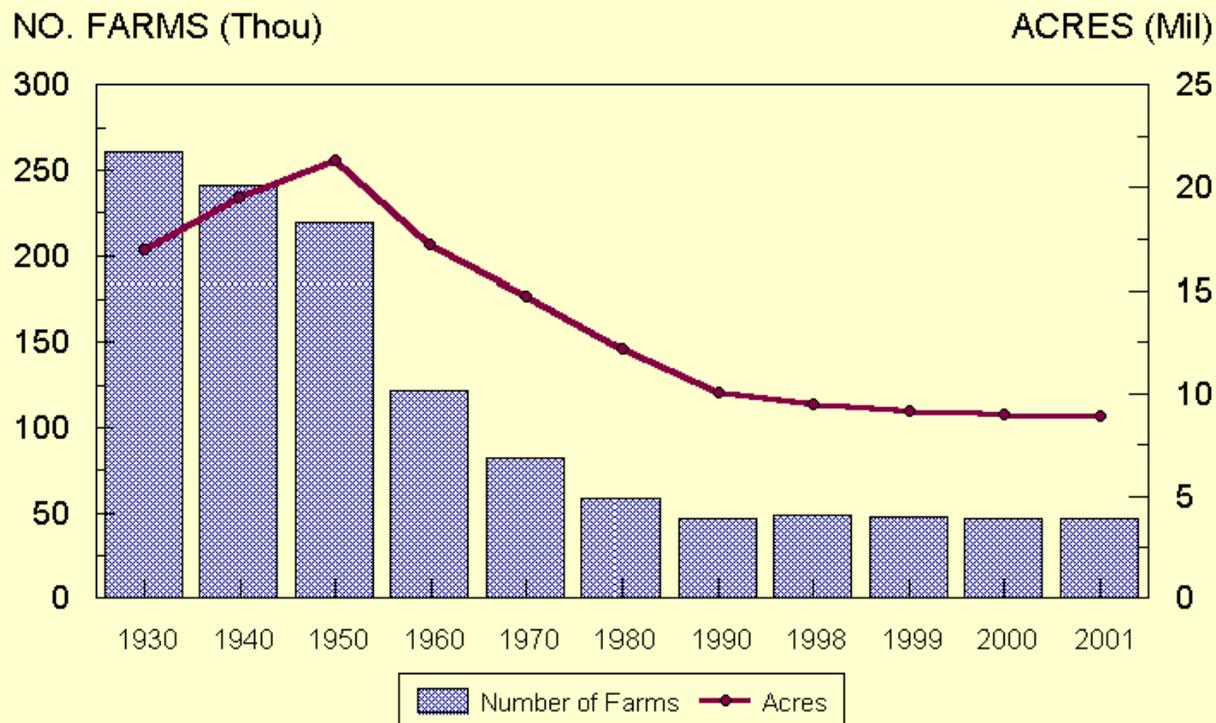
EAST and in the
Southeast in particular.

HOWEVER, this is where
many millions of acres went
out of farm production after
the 1950s. Improvements in
agriculture production from
new technology, higher yield
from deeper Mid-west soils
and cheap irrigation in both
the Great Plains and West,
combined with better
transportation systems, all
played a role in losses of
rain-fed southeastern
agriculture.

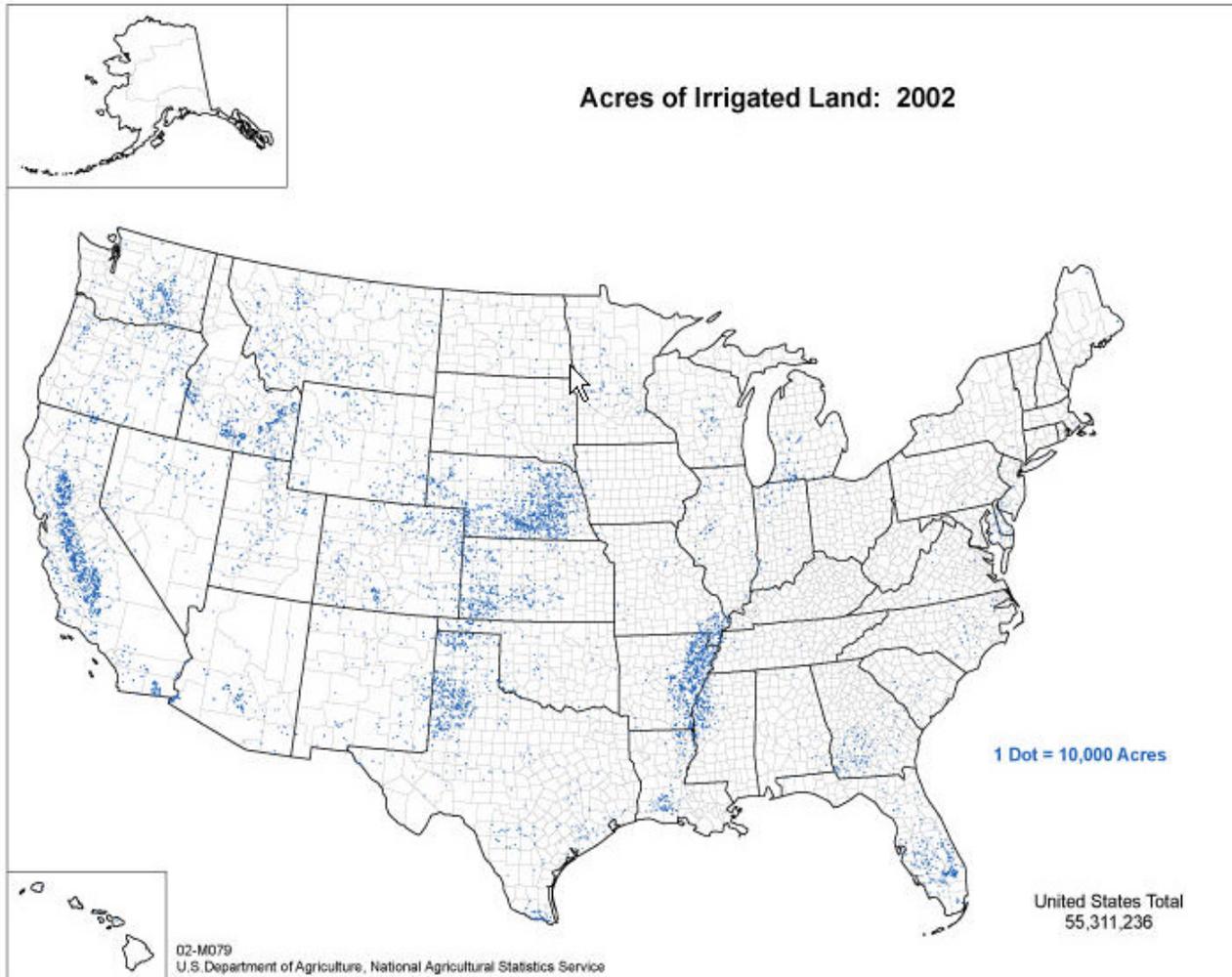


ALABAMA EXAMPLE , this figures shows that farm acres in Alabama decreased from 22 million in 1950 to around 8 million by 2001. A similar situation happened in other southern states and this devastated their rural economies.

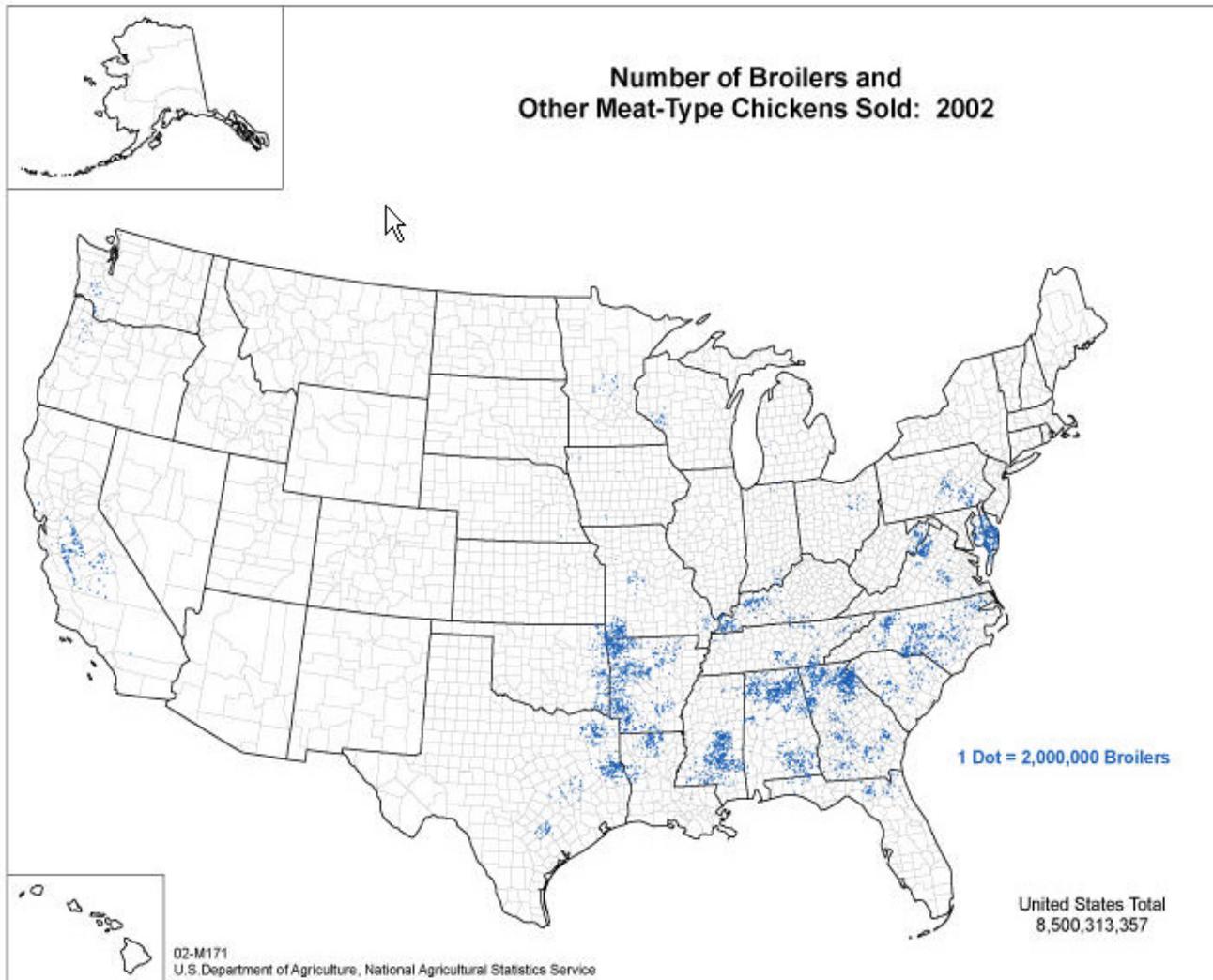
ALABAMA FARMS



Most southeastern soils are shallow, low in organic matter and have a relatively low water holding capacity. Under such conditions farmers are just a week away from a drought even with 50 plus inches of annual rainfall. Supplemental irrigation can solve this problem. Lack of water is not the reason why more irrigation is not being used in the Southeast.



Almost all of the irrigation growth in the Southeast in recent decades is coming from ground water. Look at the blue dots in the Southeast. These represent irrigation from the alluvial aquifer in Mississippi and Arkansas, and irrigation from the Floridan aquifer in Florida and Georgia.

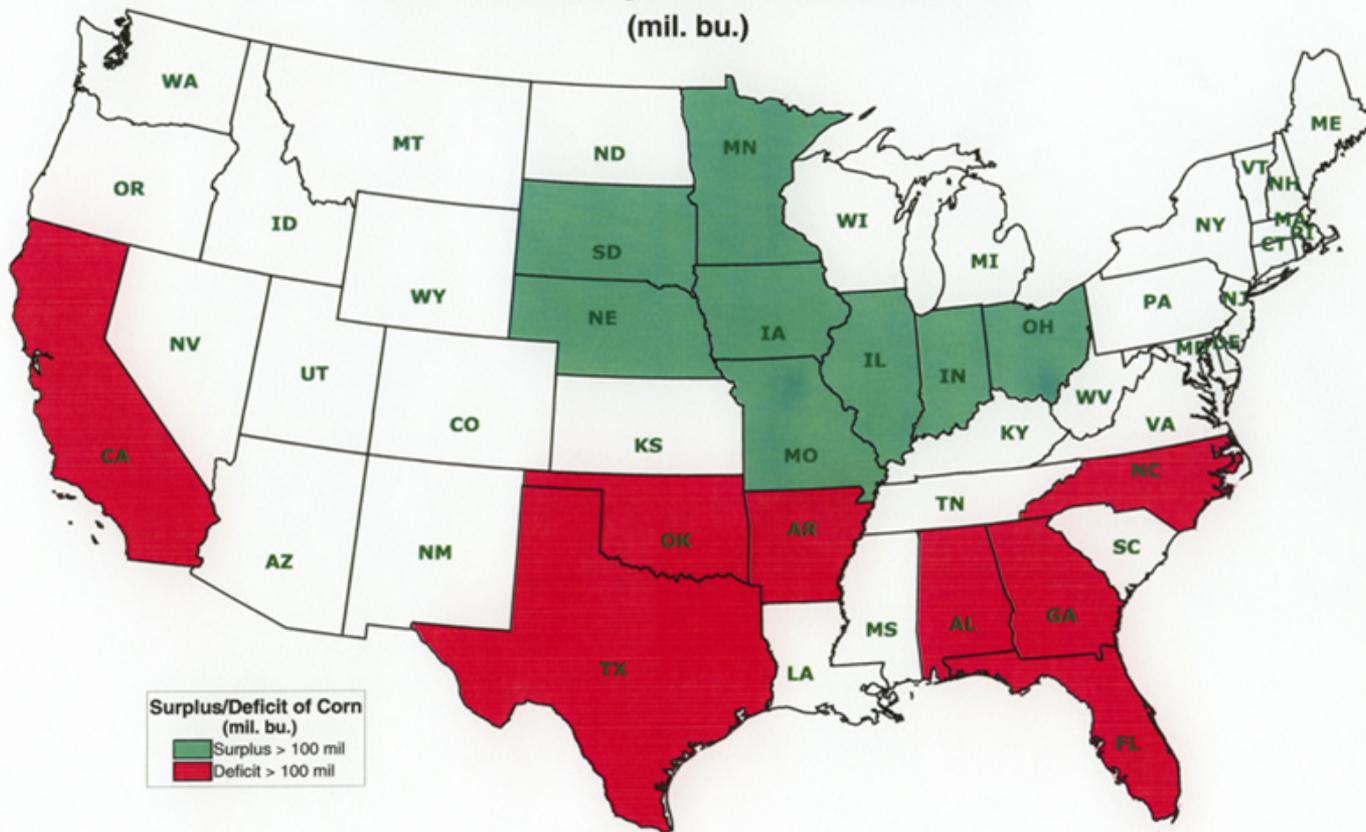


Some people's explanation for why we have not developed more irrigated grain production in the Southeast is because we grow chickens instead. We do, and we import most of the grain to feed them.



Corn Consumption Surplus/Deficit

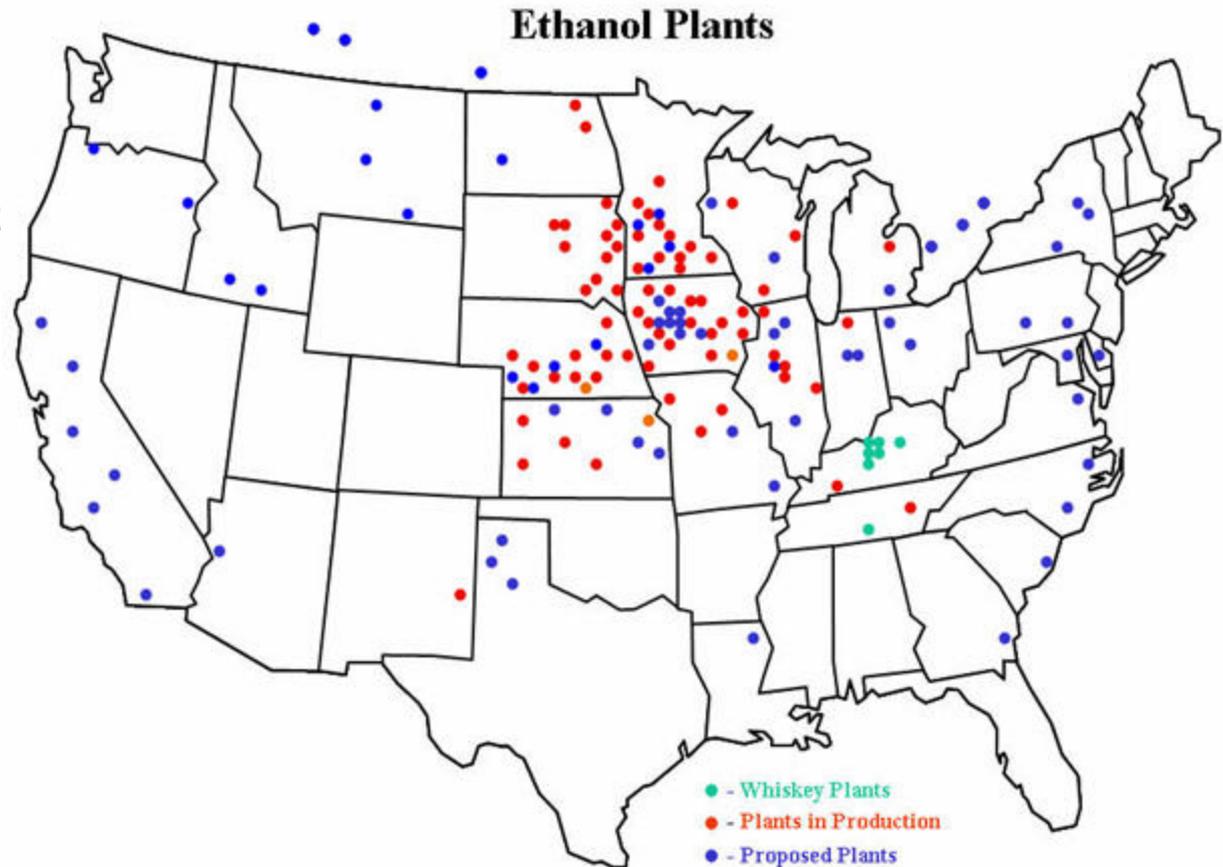
(mil. bu.)



Most states in the Southeast are grain deficit states.



More of the Mid-west
corn grain will be
needed to feed all
the ethanol plants
there and other
proposed sites
including several in
the Southeast.



The southeast must soon decide whether to continue barging in corn that is increasing in price to feed its animal industry as well as ethanol plants, or use more of its water to produce irrigated corn that is competitive with market prices elsewhere.





The Southeast not only has the land and water resources to play an important role in ethanol production but also has the climate to grow many of the high value horticultural fruit, vegetable, nut and nursery crops grown further west.

37th Parallel Approximates the 200-Day Growing Season





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Summary

What makes the most sense?

- Let Other Nations Grow More of the Agricultural Products we Need or
- Put More of our Prime Farmlands in the Humid East and Southeast under Irrigation



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Colleges and Universities

Alabama State Water Program

A Partnership of ASFA CSREES
& the Land Grant System

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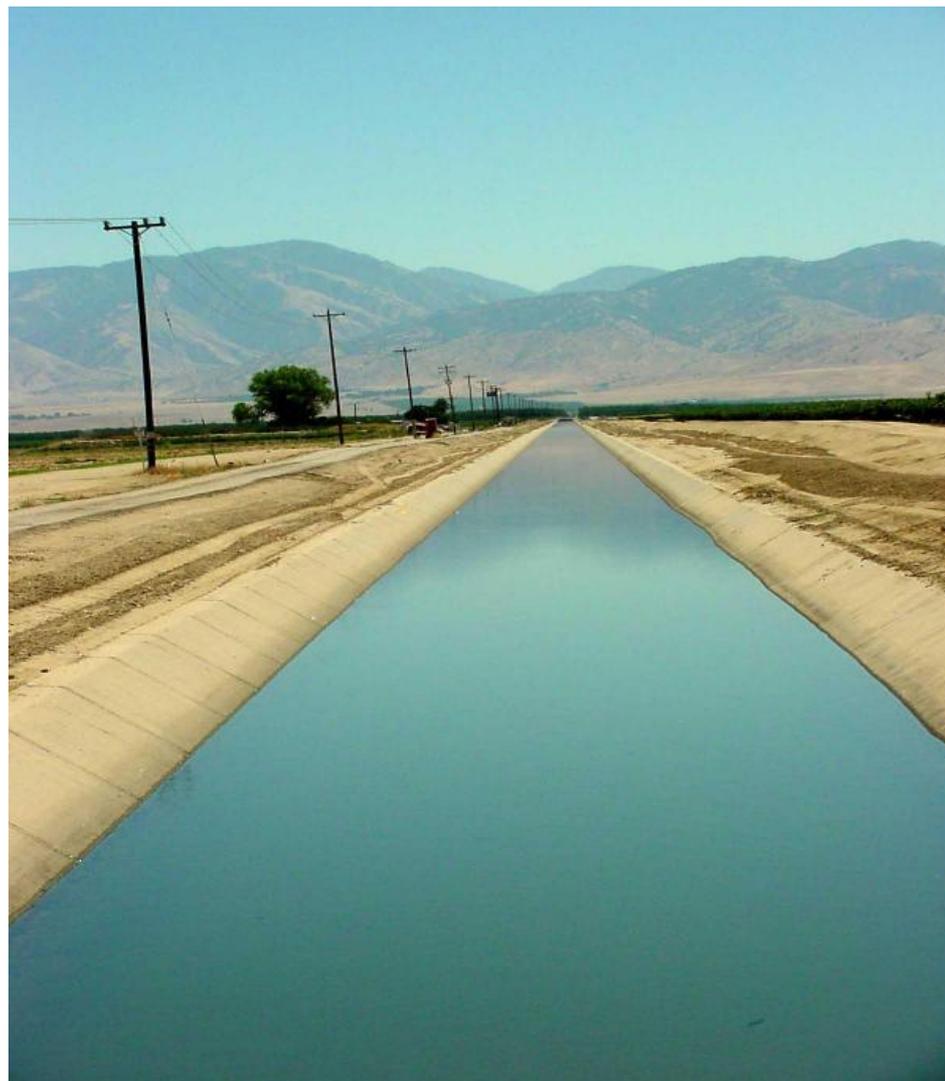
ALABAMA
COOPERATIVE
Extension
SYSTEM

Your Experts for Life

The threat to U.S. food and energy security can be reduced by better management and use of the Southeast's vast surface water resources to support and balance water needs for:

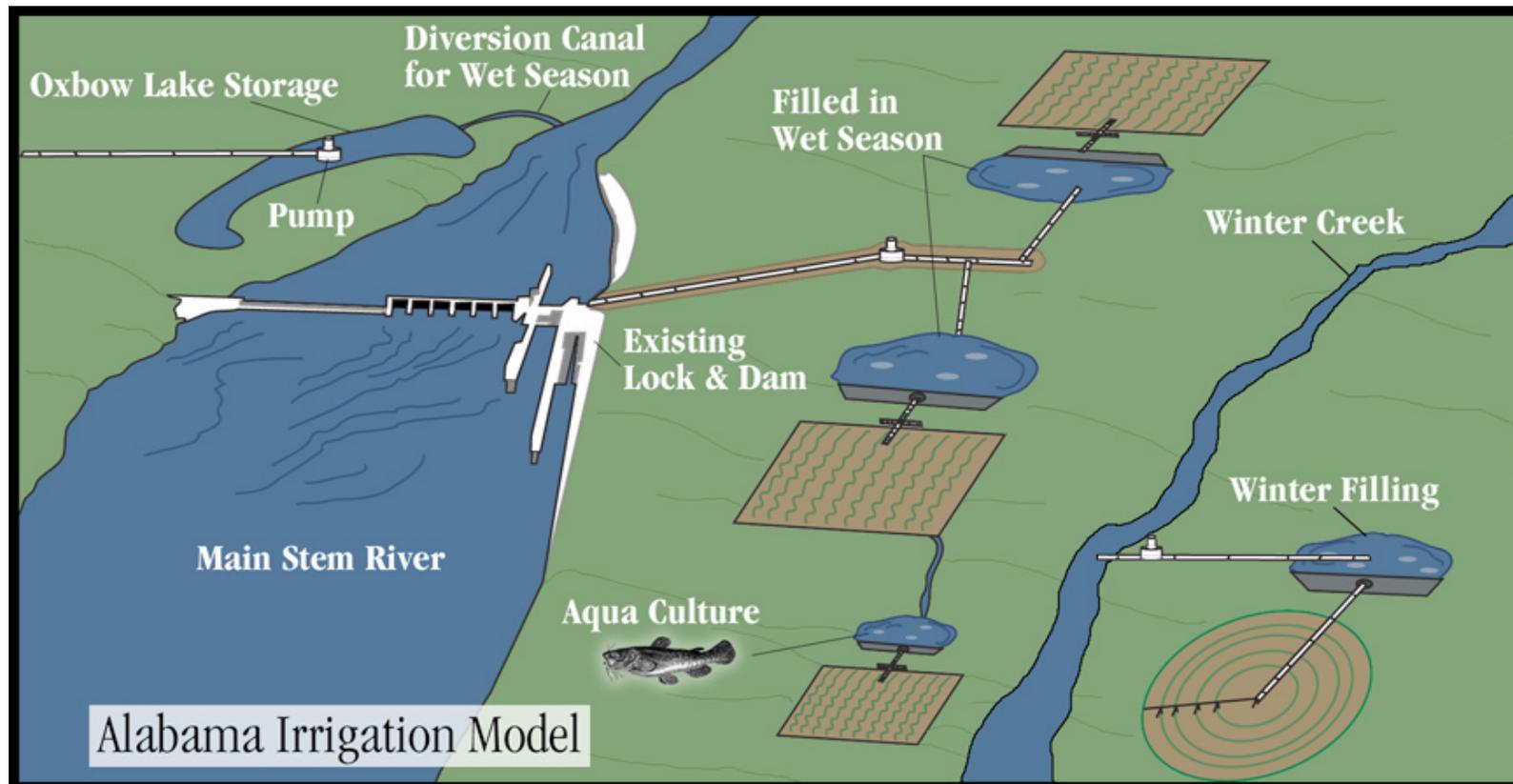
- 1) People,
- 2) Agriculture,
- 3) Bio-energy Production, and
- 4) The Environment.

Concrete-lined canals will probably not be needed. Changes in water policies and improved understanding or hydrology will be needed.



Sustainable Southeastern Model - Storage of Winter Surface Water for Supplemental Summer Irrigation

Even in dry years crops need less than a foot of water. Irrigation can be supported with a fraction of the winter river flow removed.





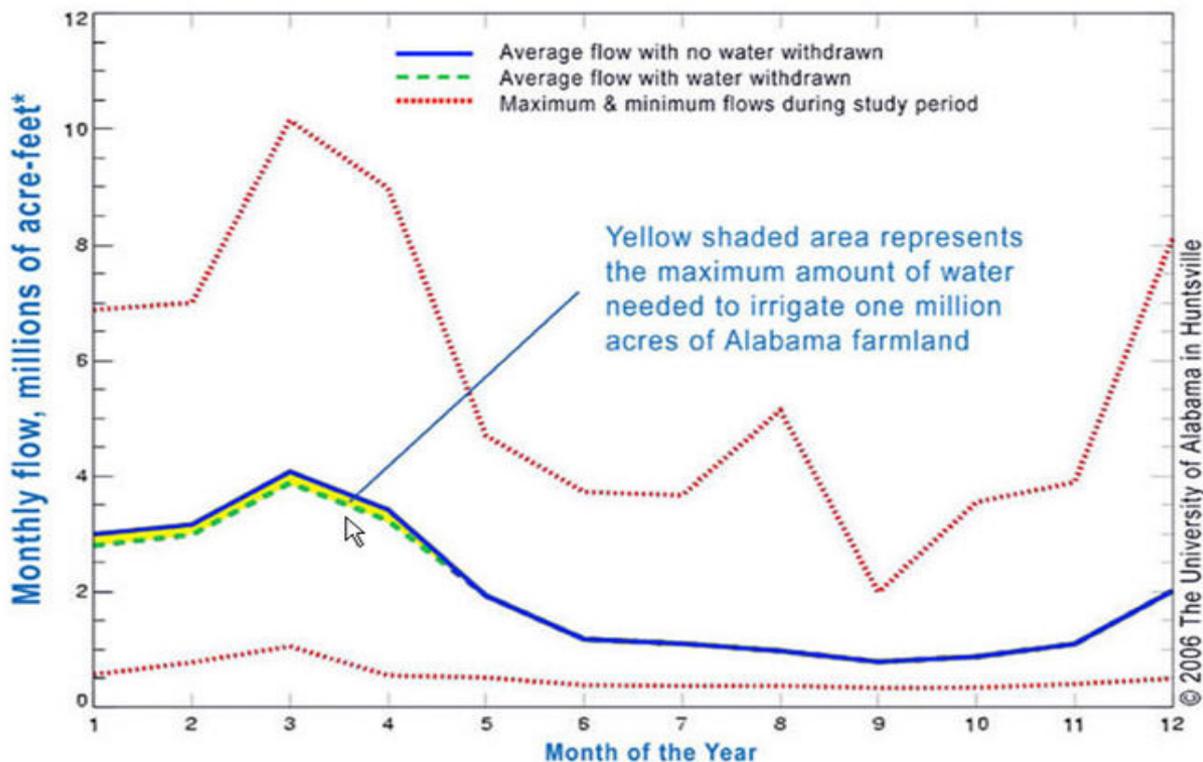
Off-stream storage reservoirs could be developed across the Southeast at reasonable cost and filled during high rainfall winter months to provide supplemental irrigation for millions of acres of cropland.





Using this approach, millions of acres could be irrigated across the Southeast with minimum impact to river systems.

Streamflow in the Alabama River at Claiborne Lock & Dam,
from January 1931 through December 2002





United States Land Grant
Colleges and Universities

Alabama State Water Program

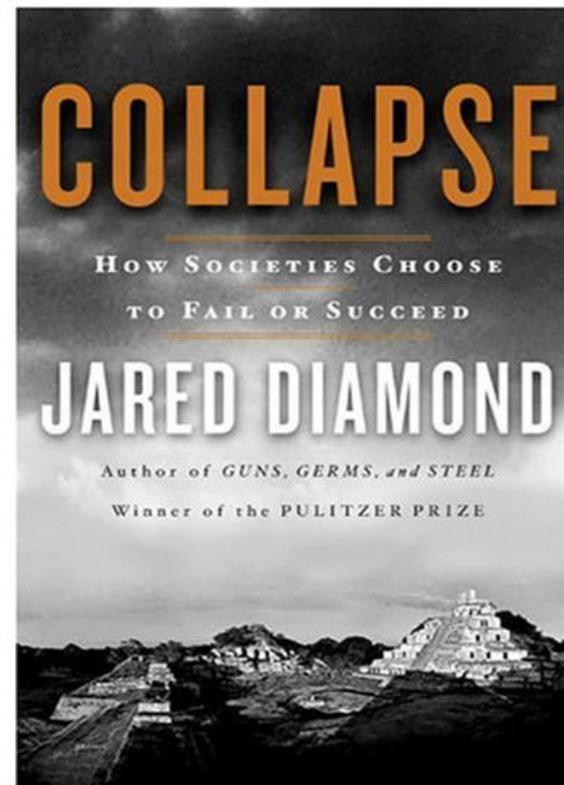
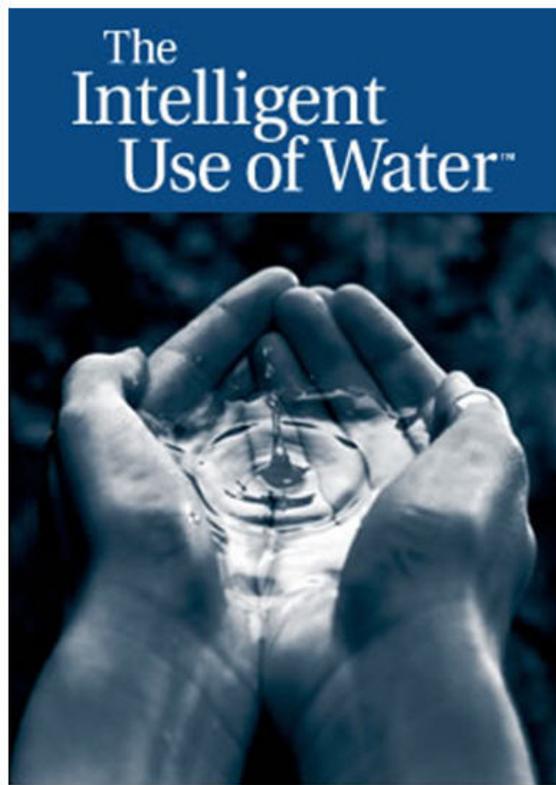
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Your Experts for Life

**SUSTAINING OUR
WAY OF LIFE--**Are we
going to make
intelligent use of our
most valuable
resources, water and
land, to support our
most important
industry, agriculture,
or are we going the
way of many other
civilizations?





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COOPERATIVE
Extension
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Questions

