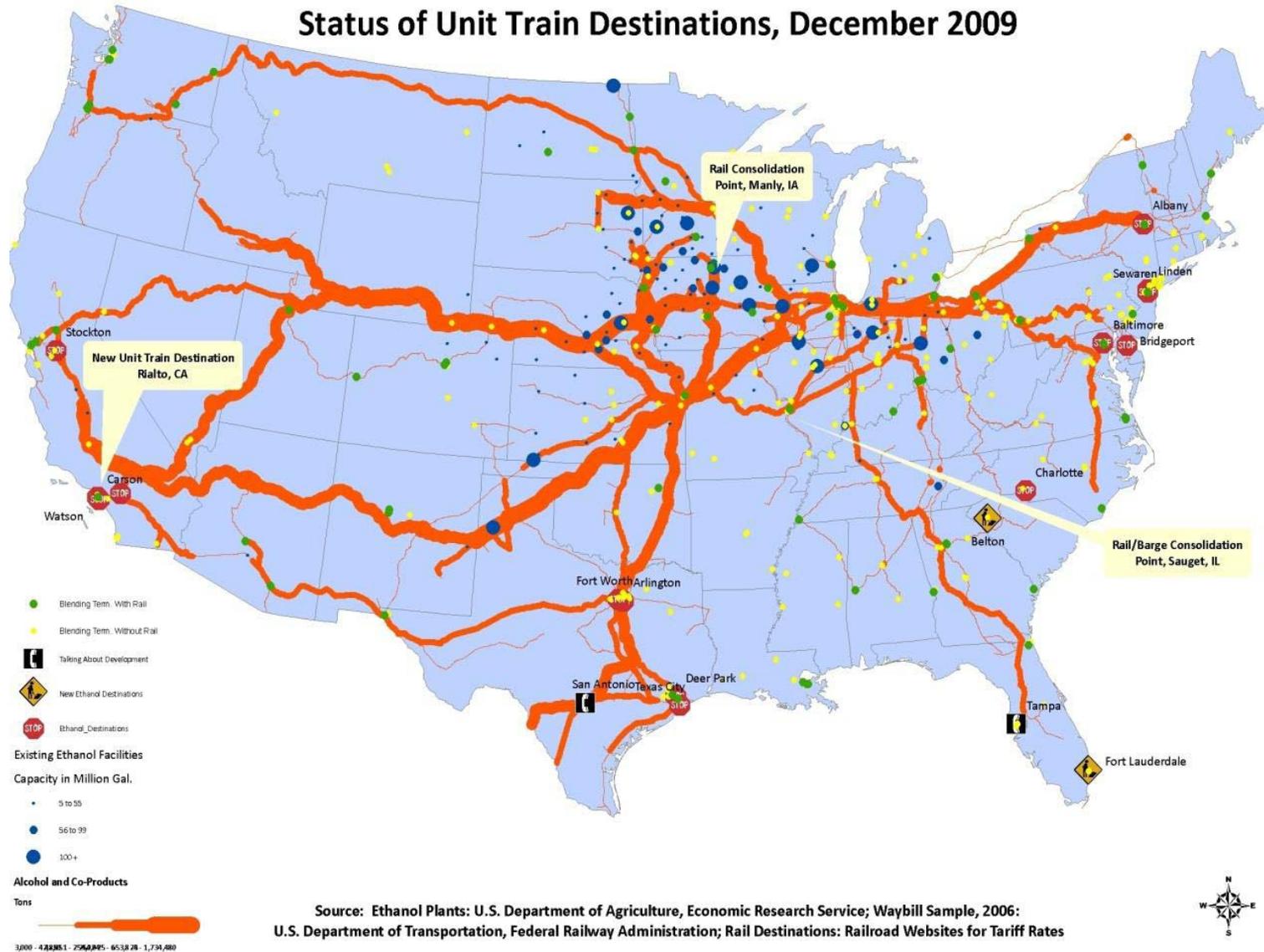


Density of Annual Alcohol and Co-Product Shipments by Rail, 2006

Status of Unit Train Destinations, December 2009

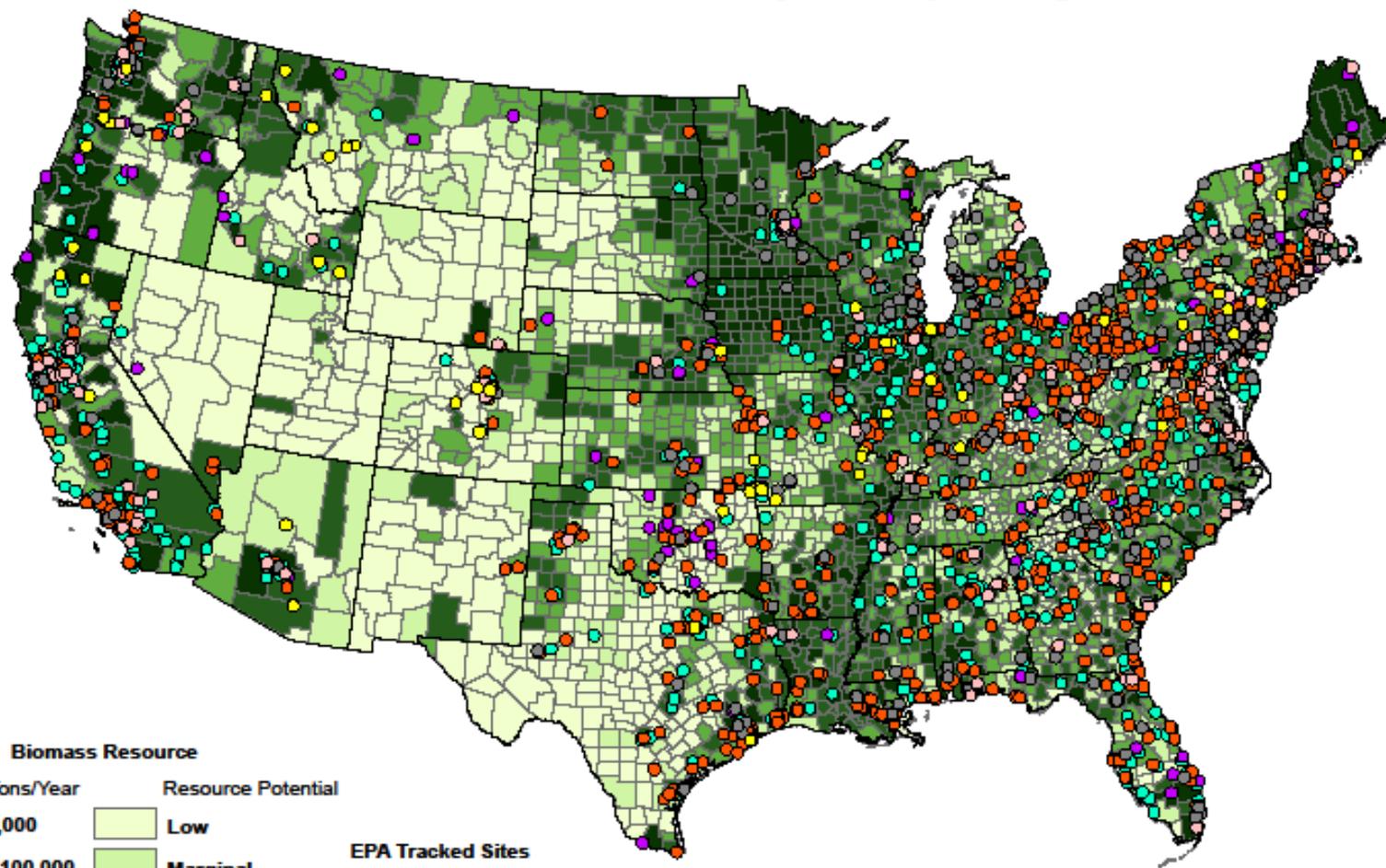


Advanced Biofuel Production by Region Mandated by RFS2 (USDA/2010)

Region		Advanced biofuels (bg/y)		Total	
	% of total	EtOH	biodiesel	Volume	RFS2
Southeast	49.8	10.45	0.01	10.46	10.47
Central east	43.3	8.83	0.26	9.09	9.22
Northeast	2.0	0.42	0.01	0.42	0.43
Northwest	4.6	0.79	0.18	0.96	1.05
West	<0.3	0.06	0.00	0.06	0.06
US		20.6	0.45	21.0	21.2

SE: per. grasses, soybean, logging residues, other biomass crops; CE: per. grasses, corn stover, soybean, logging residues; NE: per. grasses, corn stover, soybean, logging residues; NW: straw, canola, logging residues; W: logging residues, sweet sorghum

EPA Tracked Sites with Biorefinery Facility Siting Potential



Biomass Resource

Metric Tons/Year	Resource Potential
< 50,000	Low
50,000 - 100,000	Marginal
100,000 - 150,000	Good
150,000 - 250,000	Very Good
250,000 - 500,000	Excellent
> 500,000	Outstanding

EPA Tracked Sites

- Abandoned Mine Land
- Brownfield
- RCRA
- Federal Superfund
- Non-Federal Superfund
- Landfill

Screening Criteria

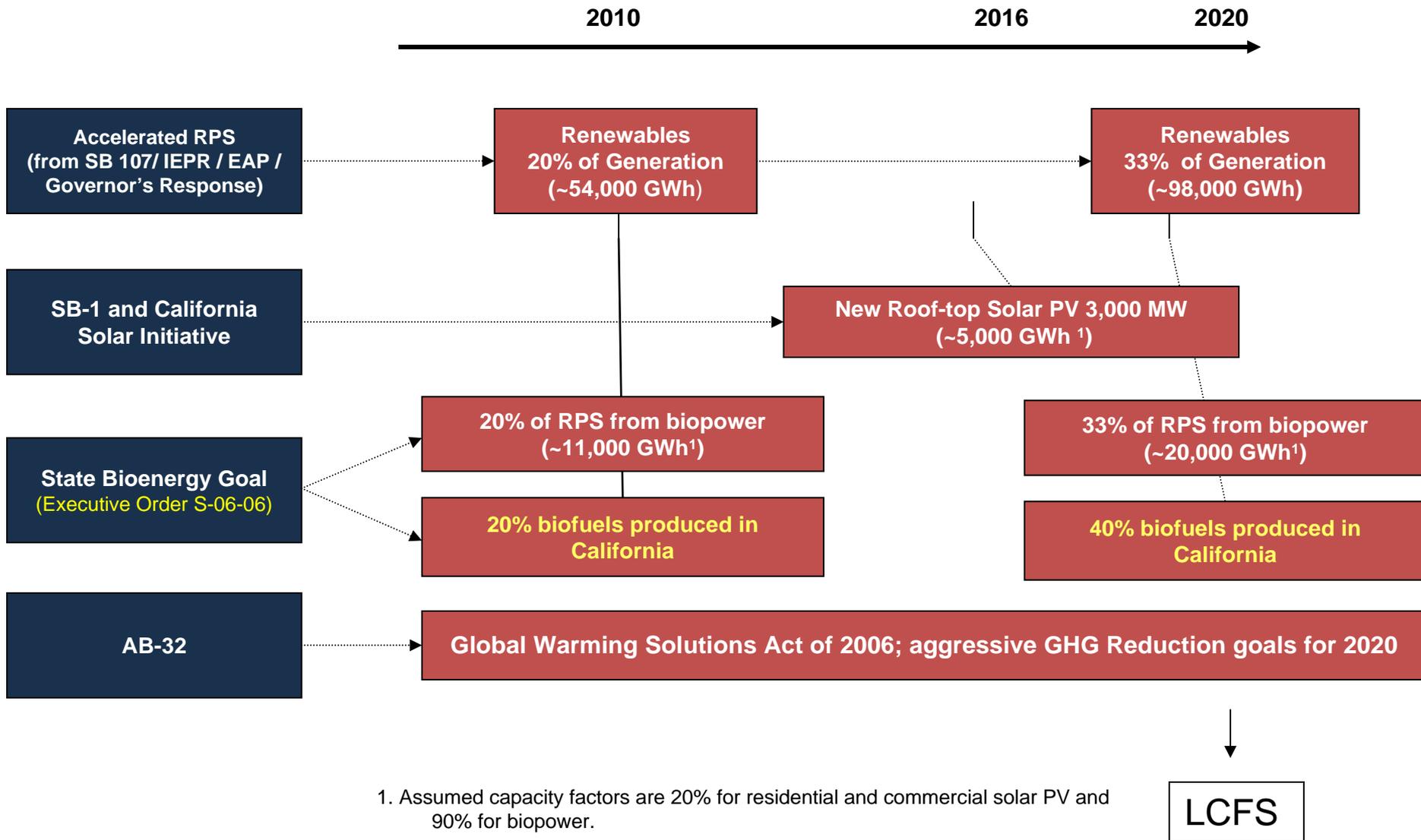
- Cumulative crop residues of 330,000 metric tons/year or greater within 50 miles (includes residues from: crops; forests; primary and secondary mills; and urban wood waste)
- Property size of 50 acres or more
- Distance to graded roads of 3 miles or less
- Distance to rail lines of 8 miles or less



This map was developed by SRA International for the US Environmental Protection Agency (EPA) OSWER Center for Program Analysis. Results are based on site screening criteria adapted from National Renewable Energy Laboratory (NREL) criteria and GIS data provided by NREL and EPA. This map and its associated data are intended to provide a general understanding of the renewable energy potential of EPA tracked sites; additional site-specific technical and economic analysis is required to determine the actual energy generation potential of EPA tracked sites. For further information, please see the accompanying Data Guidelines document at www.epa.gov/renewableenergyland or contact cleanenergy@epa.gov.



Key Renewable Energy Policy Impacting California

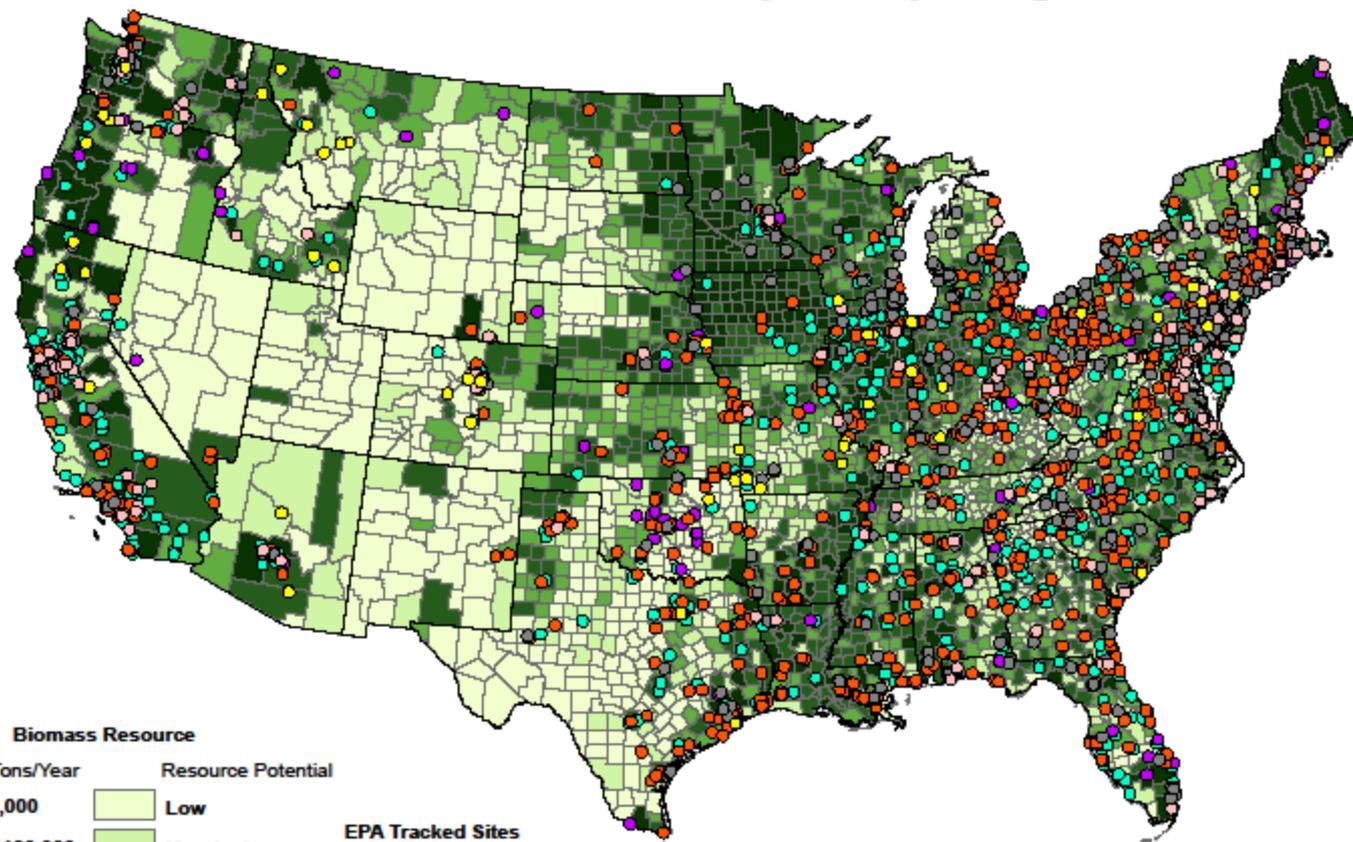


Opportunities for biofuel feedstock production in California's agricultural systems exist, but are overlooked from a national perspective.



Canola grown as bee pasture in young pistachio orchard, Kern County_2010

EPA Tracked Sites with Biorefinery Facility Siting Potential



Biomass Resource

Metric Tons/Year	Resource Potential
< 50,000	Low
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- EPA Tracked Sites**
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Biofuels and agricultural landscapes in California and the United States: What do soils and climate have to do with it?

Steve Kaffka

Air Resources Board

Sustainability Work Group

September 15, 2010



Sustainability standards and soil quality

<u>Category</u>	<u># cited</u>
Nutrients in rivers	4
Greenhouse gases	7
Soil quality	8
Water quality	4
Crop genetic diversity	7
Ecosystem diversity	7
Biodiversity	2
Nutrient use	6

Survey of 16 different sustainability standards. Source: Field to Market: Keystone Alliance

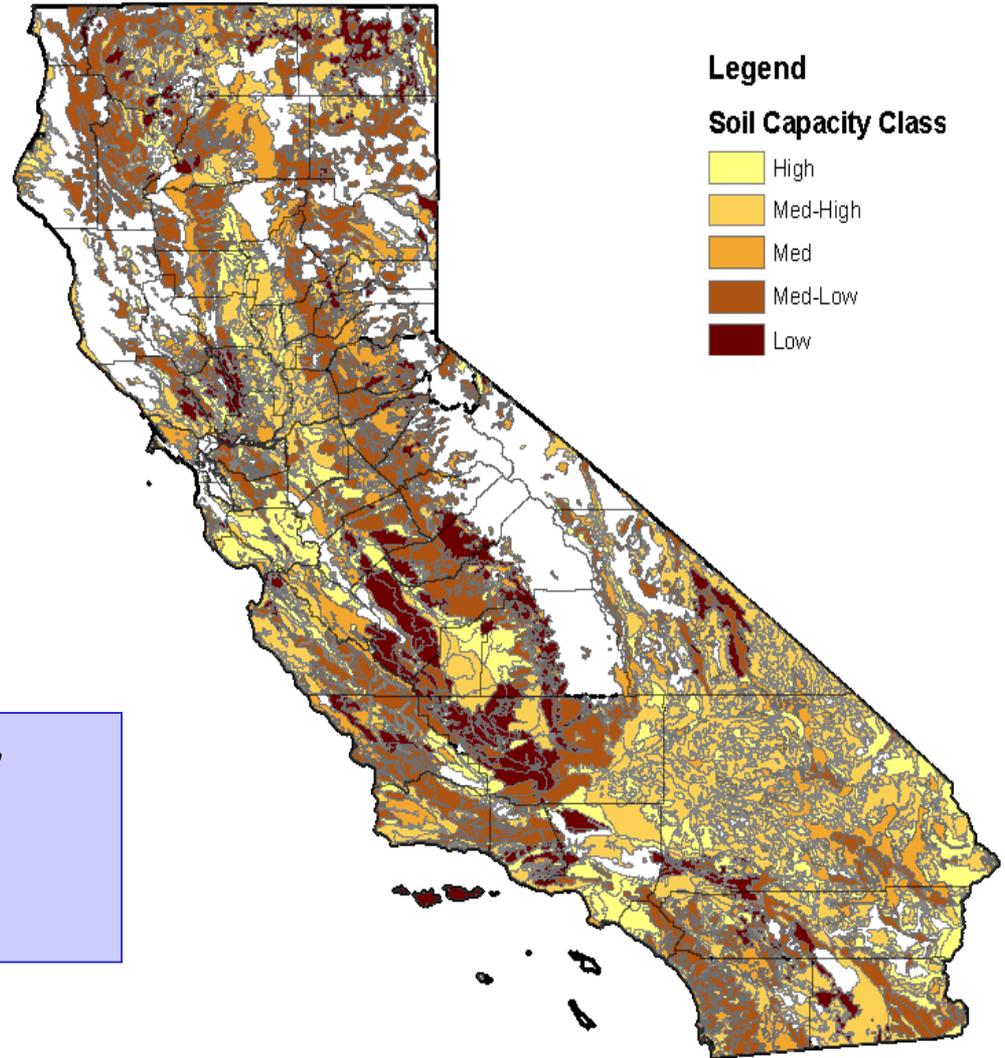
CARB/Soil Quality

What influences farming systems?

- 1. climate and soils**
- 2. economic incentives**
- 3. regulations**

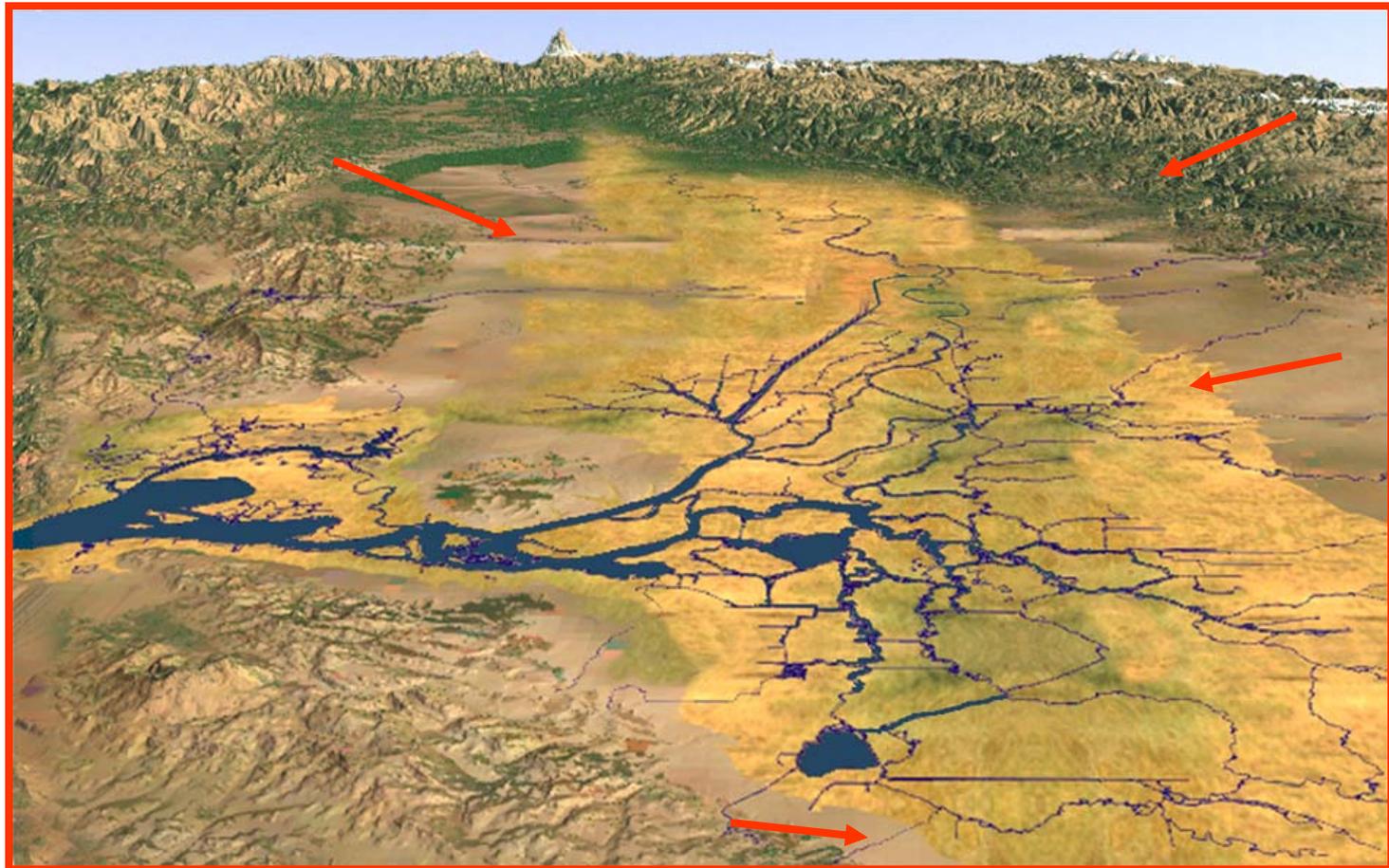
Could biofuel feedstocks be produced in California? Yes, but the optimal crops or crop residues will vary with location.

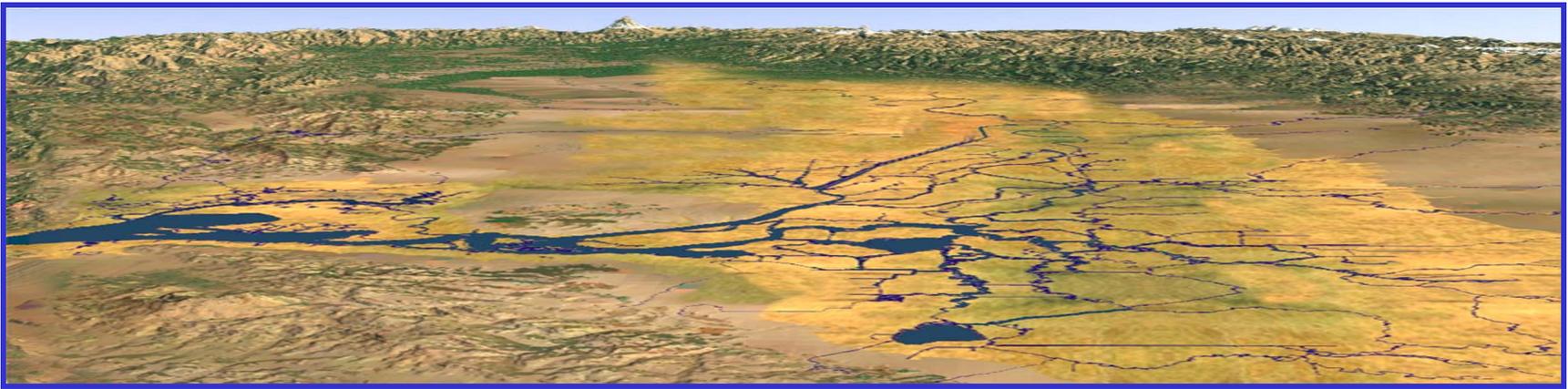
Soil capability classes across California



Soils vary significantly across the California landscape.

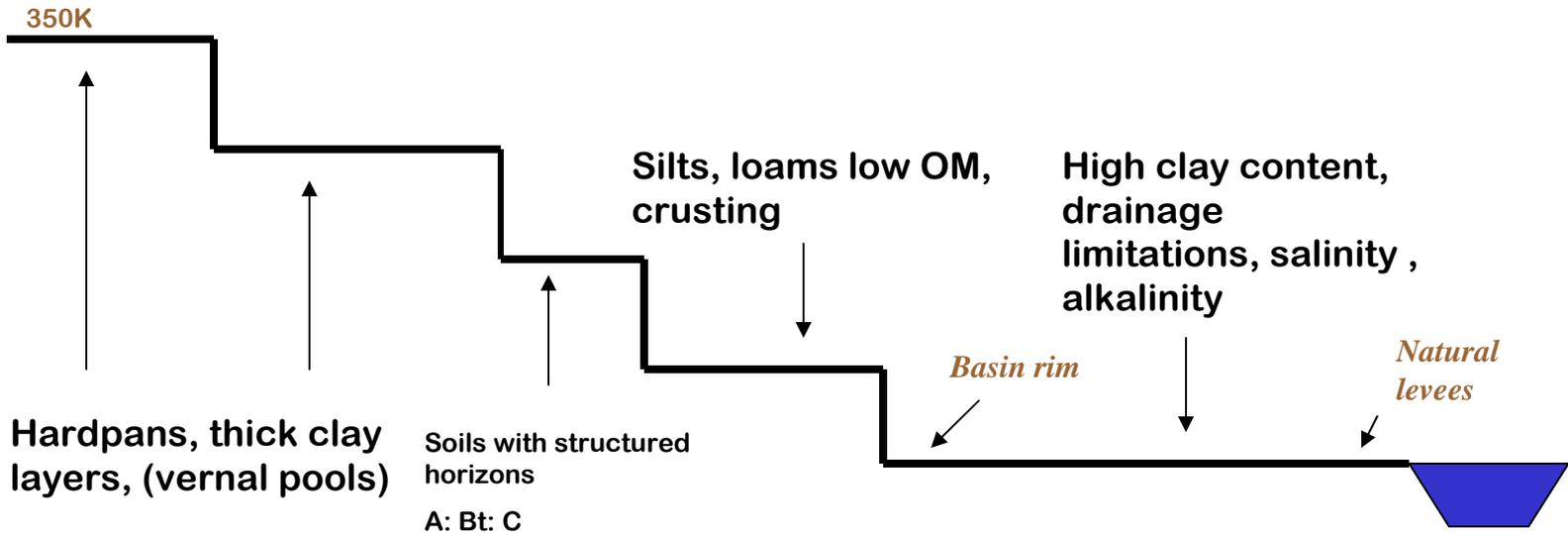
The soils of California's valleys were formed via erosion of parent materials eroded from the bordering hills and mountains and deposited over geologic time.





Soil age: ----->

oldest 100K 30-80K 10K youngest



Oak-savanna/rangelands

rangeland/pasture, some perennials

Soil use →

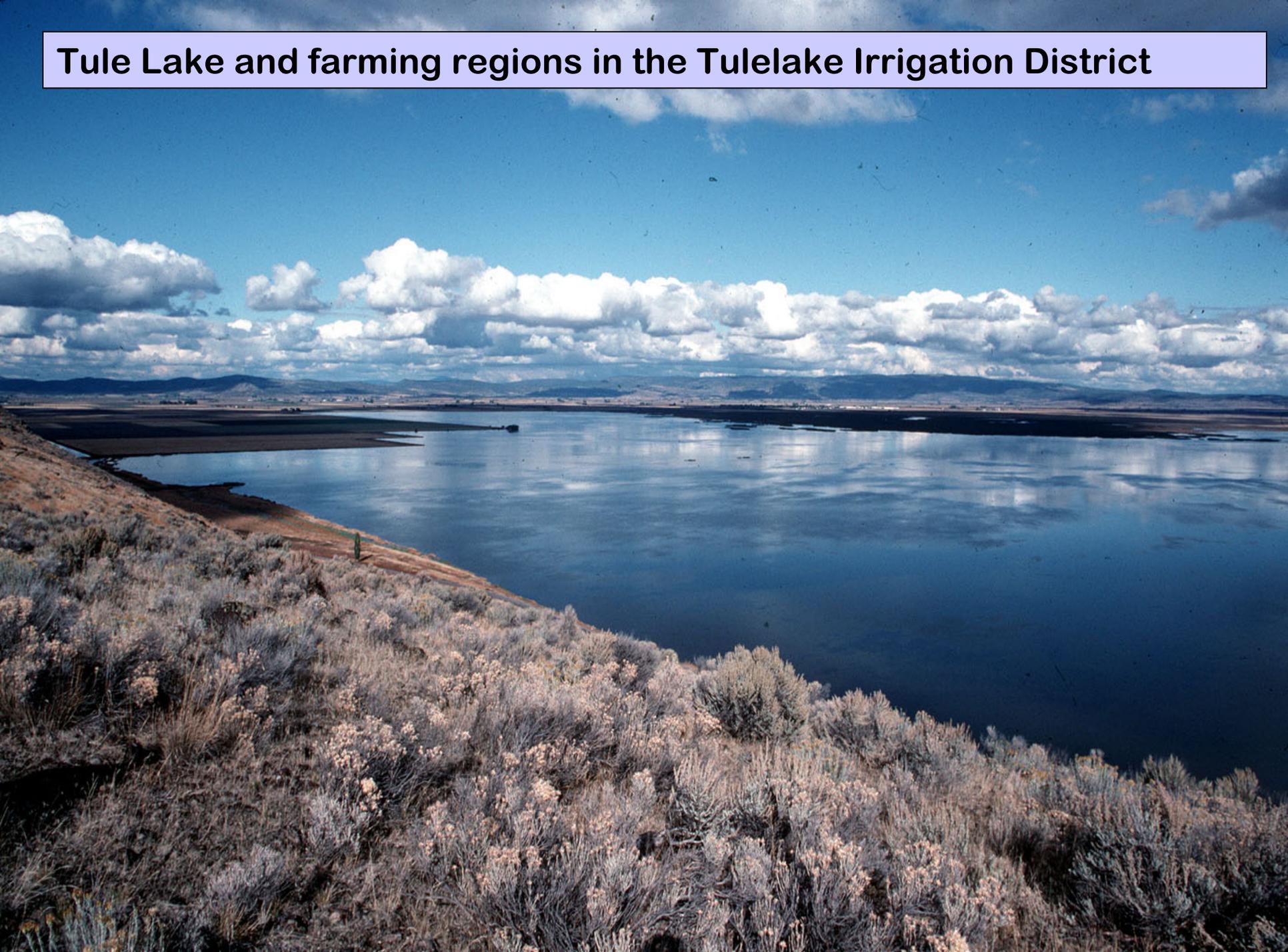
perennials, annuals

mostly annuals

There are a number of distinctive farming regions in California. In the northeast (the upper Klamath Basin and areas around the Pitt and Fall Rivers), small grains, potatoes, wild rice and forages are the primary crops.



Tule Lake and farming regions in the Tulelake Irrigation District



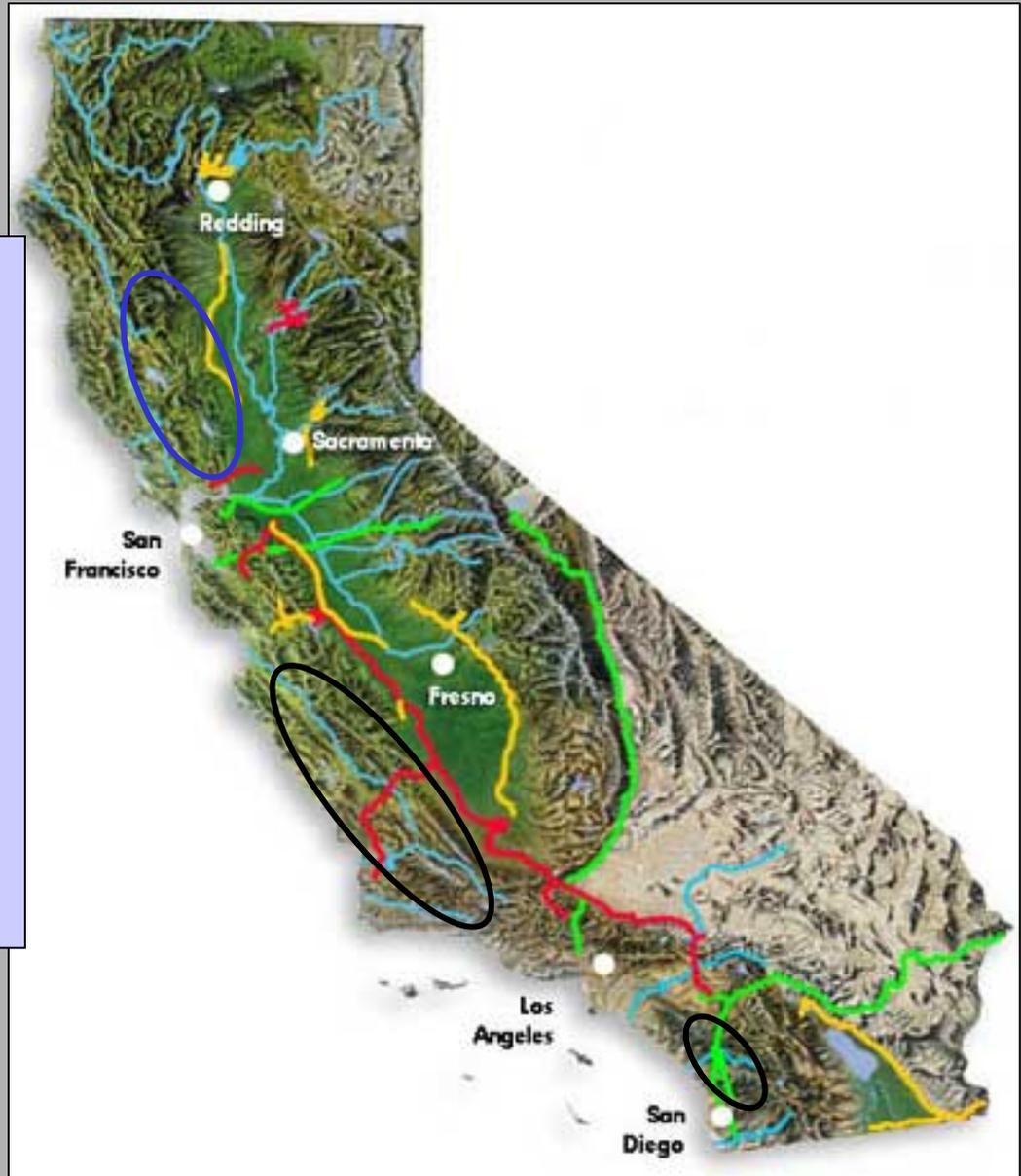
Soils in the TID and elsewhere in the UKB are unusual mixtures of volcanic minerals, diatomite and organic matter. These were formed under shallow lakes, are fertile and have excellent drainage properties.



Some of the highest yields of spring wheat in the world are produced in the TID. Potatoes are the most important crop.



**Coastal regions
of California
produce highly
valuable
horticultural
crops year-
round**

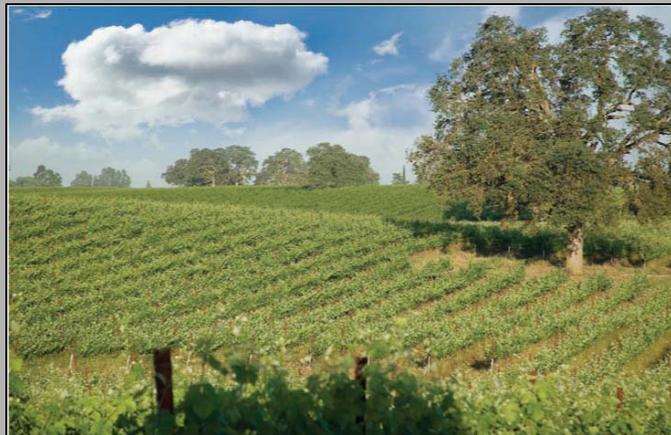




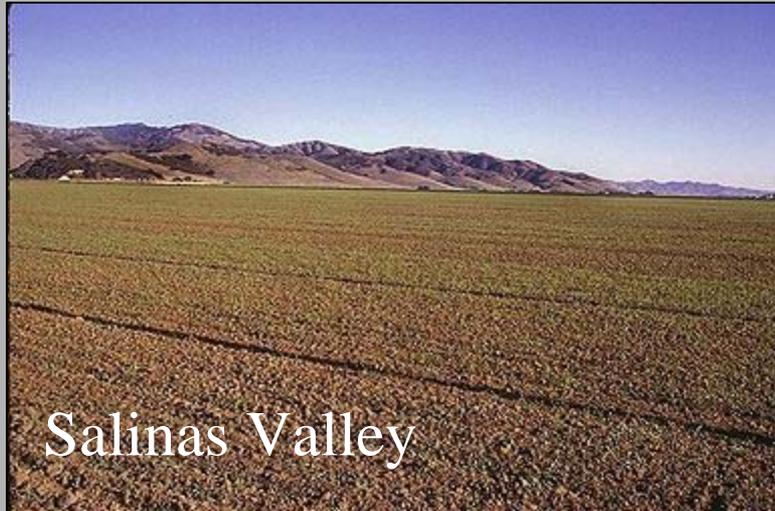
Grape prices and total production continue to rise in California. Since 2000, an average of 175 new wineries have opened each year. Above, V. Sattui Winery in the Napa Valley was established in 1885.



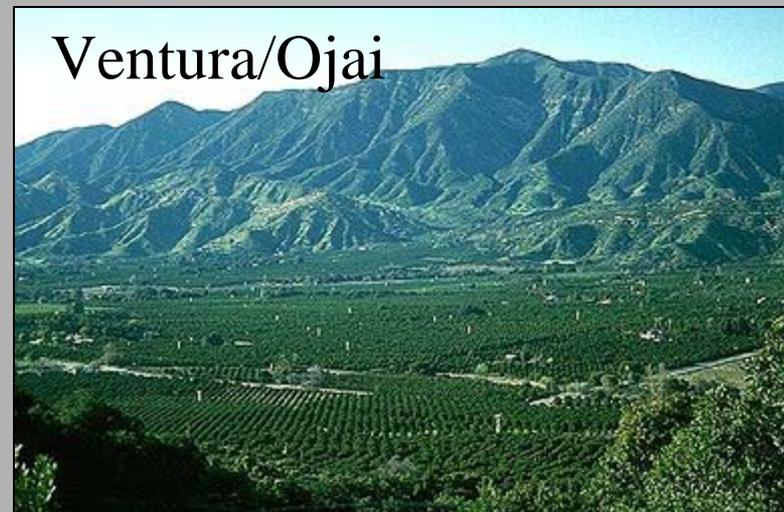
Fig. 1. Major wine-grape growing regions of California. Source: CDFA Annual Crush and Acreage Reports, 2006.



Coastal Valleys produce cool season vegetables, strawberries and citrus in the south. Soils are generally well-drained, allowing harvest year round.



In California, an estimated 2.5 million agricultural acres are located within one-third mile of an urbanized area. Above, in south Salinas a landscaped driveway faces irrigated fields.



the coastal mountain valleys and hills, dry-farmed wheat and alfalfa is still produced, complementing cattle ranching.



Monterey County, Priest Valley



Dry-farmed safflower





Cattle graze crop residues, and annual grasses on the hillsides.

The most important agricultural region is the Central Valley



California's Sacramento Valley



Approximately 500,000 acres of rice are grown in the Sacramento Valley annually on fine-textured soils that once supported either ephemeral or perennial marshlands.



The Delta is a unique region in California with high organic matter soils. Wheat and corn are the most common crops, but others increasingly are grown.



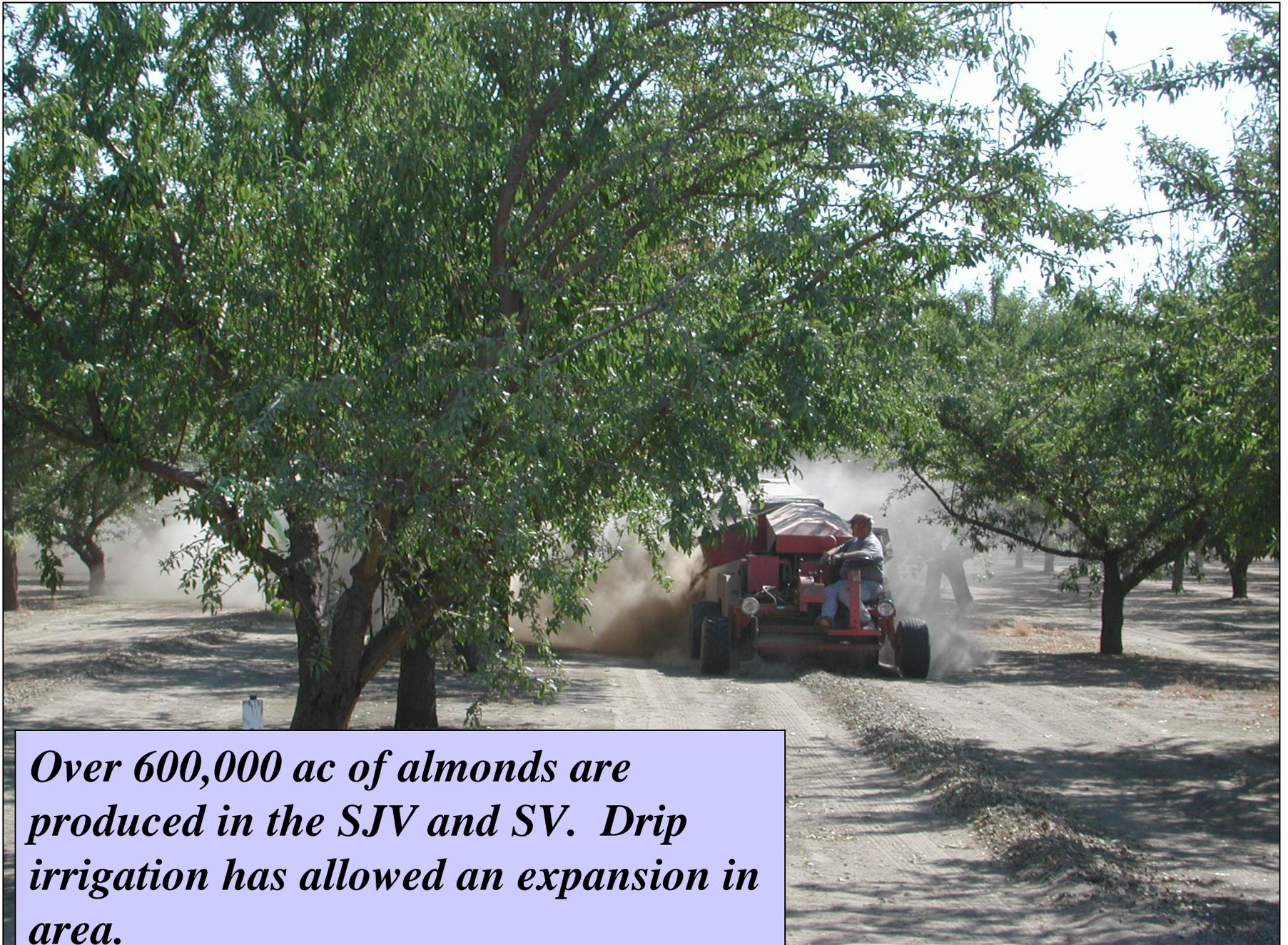


The San Joaquin Valley has had the largest economic value of any farming region in California, and is one of the most productive farming regions in the world. Soils vary significantly in quality.



Western San Joaquin Valley under full irrigation





Over 600,000 ac of almonds are produced in the SJV and SV. Drip irrigation has allowed an expansion in area.



Wine and table grapes and raisins are produced in the SJV, primarily in the eastern side of the valley where soils are sandy

The western San Joaquin Valley generally has finer textured soils than the eastern side of the valley and areas with elevated levels of salinity and trace elements derived from marine shale parent material in the coastal mountains.



Cantua Creek in the WSJV



CV-WRCB

4.19.2006

Center pivot irrigation Five Points



Processing tomatoes

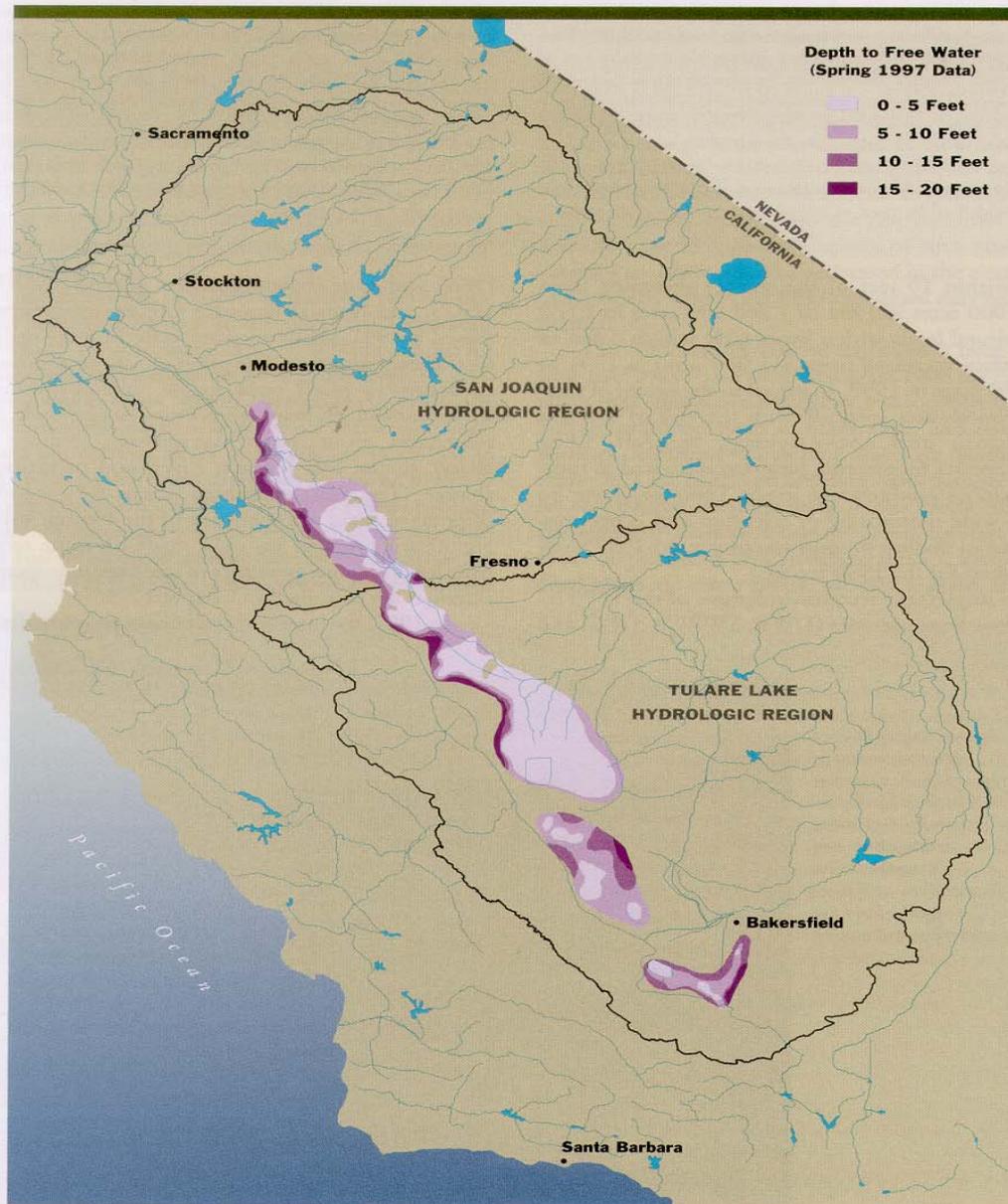


Field corners can be used for other crops



Safflower harvest in the Tulare Lake Bed near Corcoran. These soils are poorly drained and somewhat saline.

Areas of Shallow Groundwater in the San Joaquin Valley



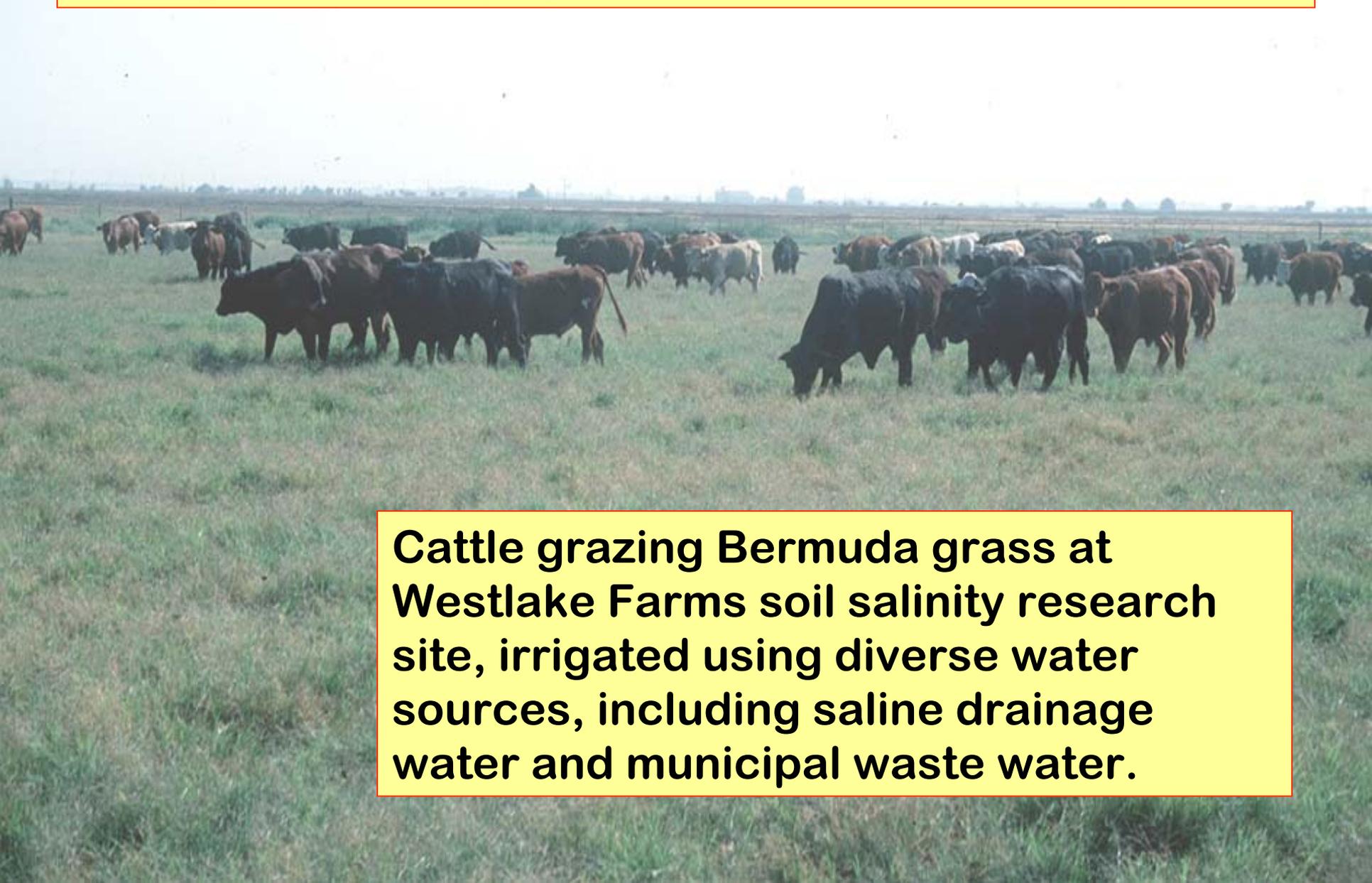


Saline-sodic soil
near Stratford

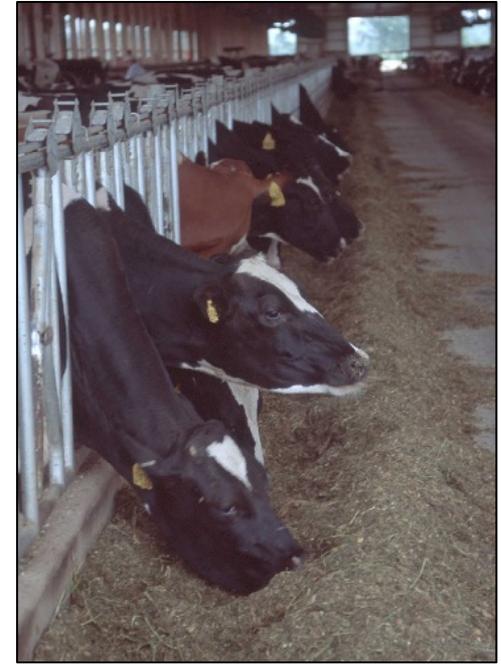
Shallow, saline
water table



Drainage water reuse project at Westlake Farms near Stratford



Cattle grazing Bermuda grass at Westlake Farms soil salinity research site, irrigated using diverse water sources, including saline drainage water and municipal waste water.



The San Joaquin Valley is home to more than 1,000,000 dairy cows, primarily in Tulare, Kern and Merced Counties

The Imperial Valley has mostly fine-textured soils derived from erosion of the Grand Canyon. Winter vegetables and fruits, alfalfa and other forages, and other arable crops like durum wheat and sugarbeets are produced.



Imperial Valley

Mexico



All American Canal transports water from the Colorado River to the Imperial Irrigation District



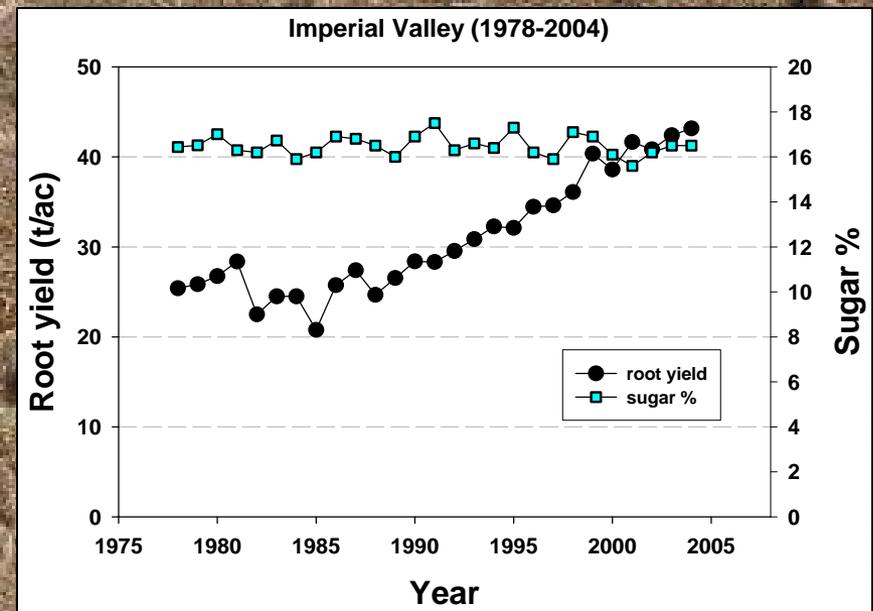
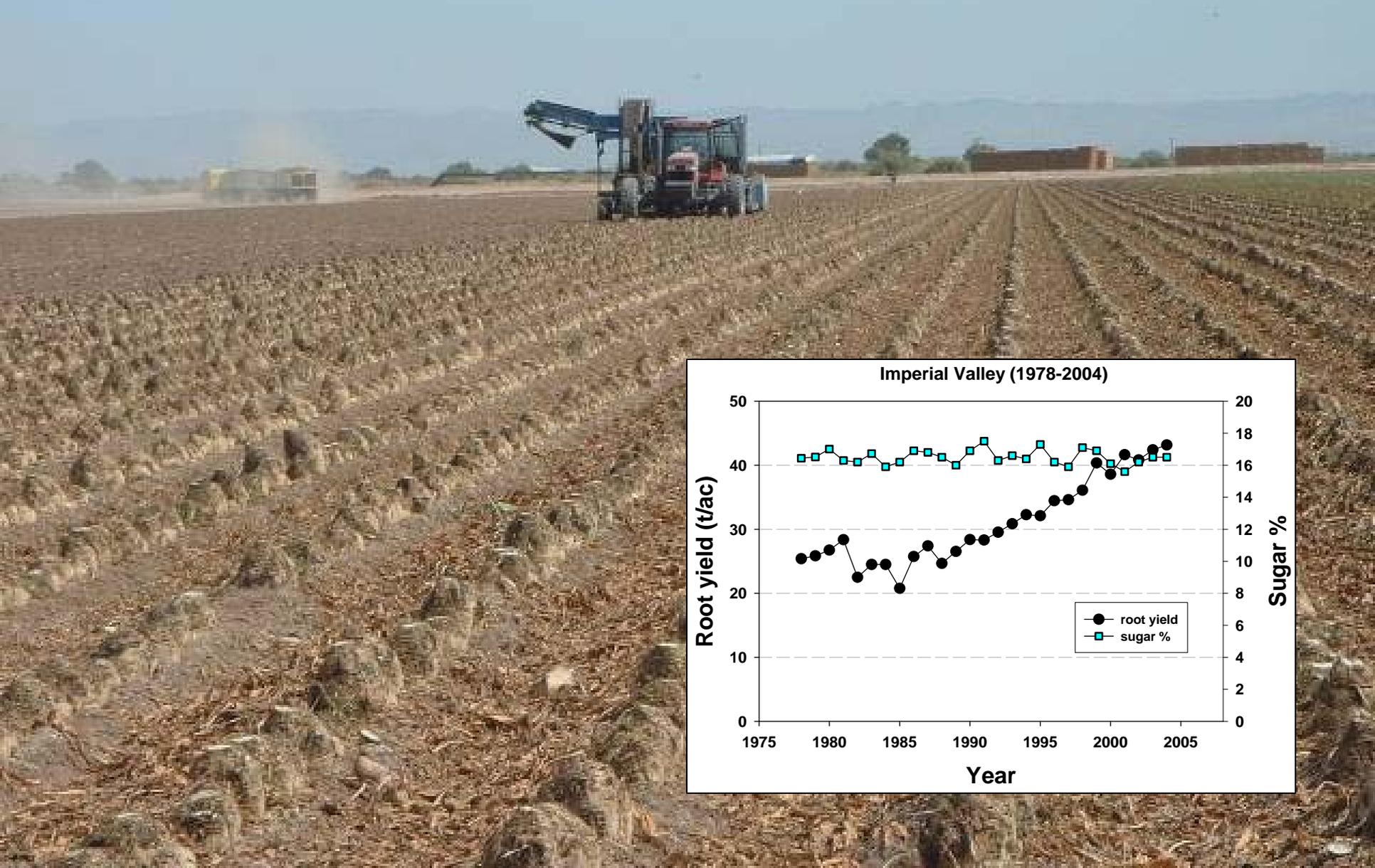
Sugarbeets in Imperial Valley



Most irrigation in the IV is surface irrigation. Runoff from farms is the water source for the Salton Sea.



Desert Sky Farms, Imperial Valley, sugarbeet harvest



Bermuda grass for hay and seed



*High yields of both
sugarbeets and
sugarcane are possible
in the Imperial Valley.*



Sugarcane in the IV

LTRAS Project / Winters, California



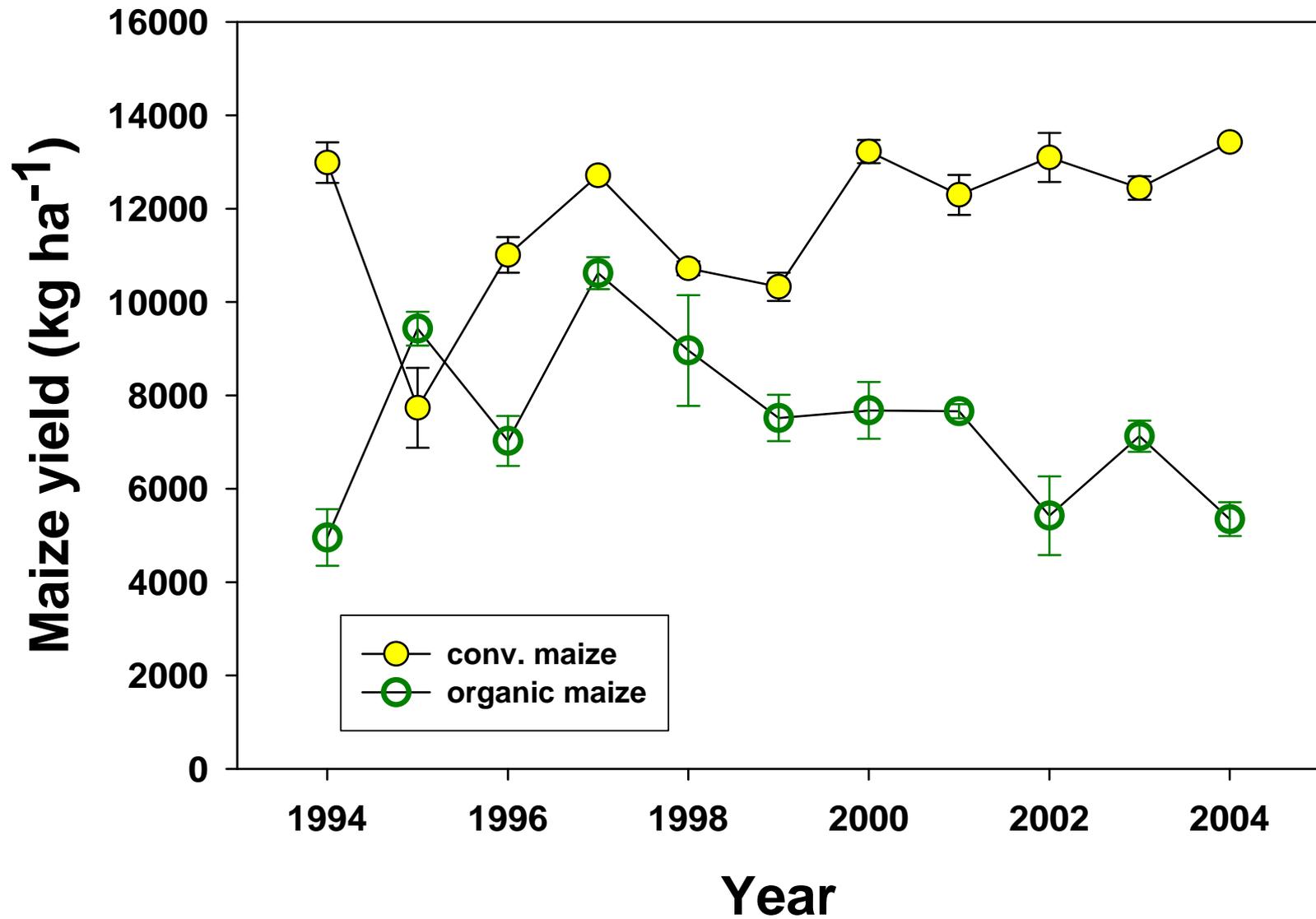
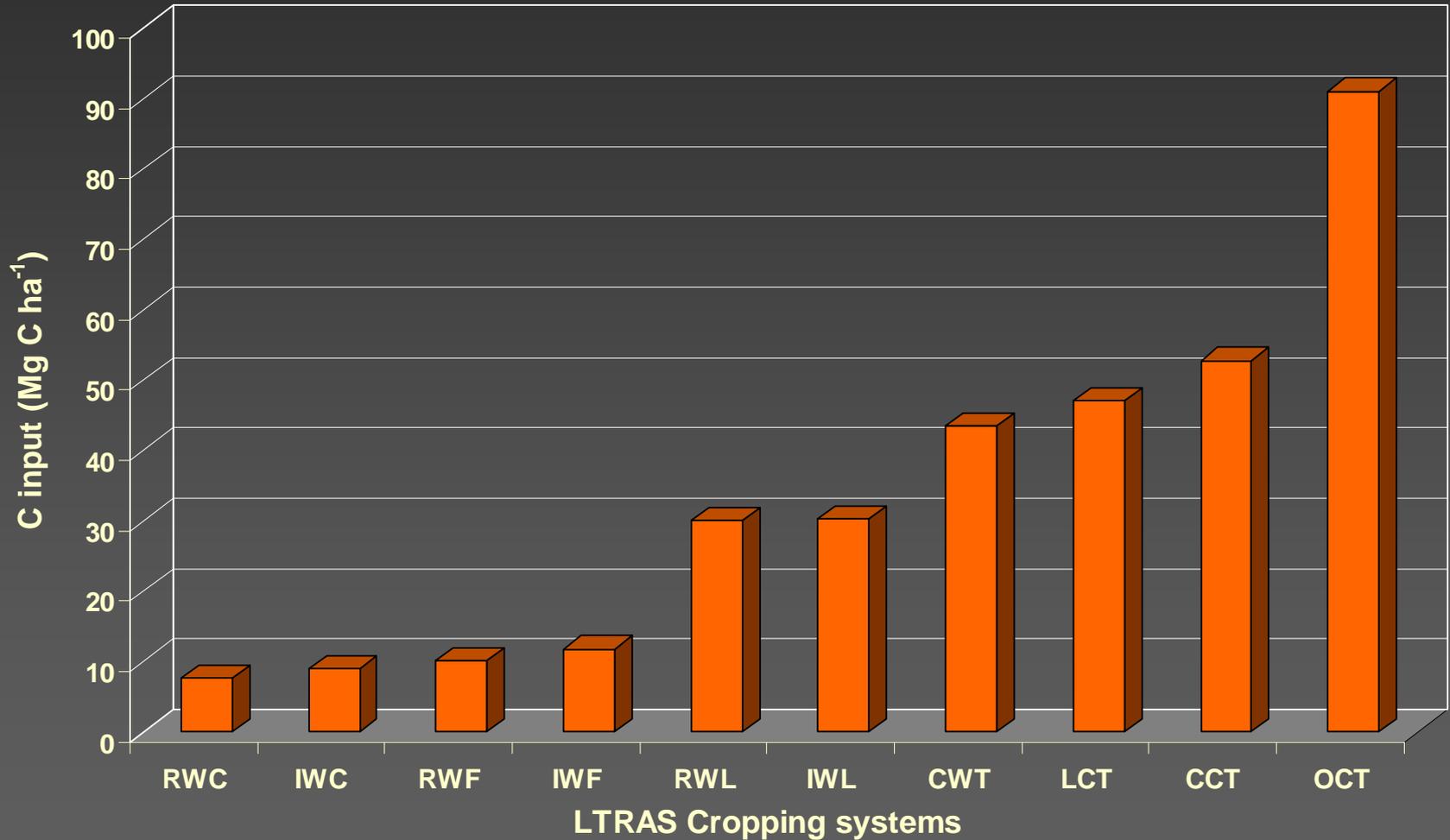


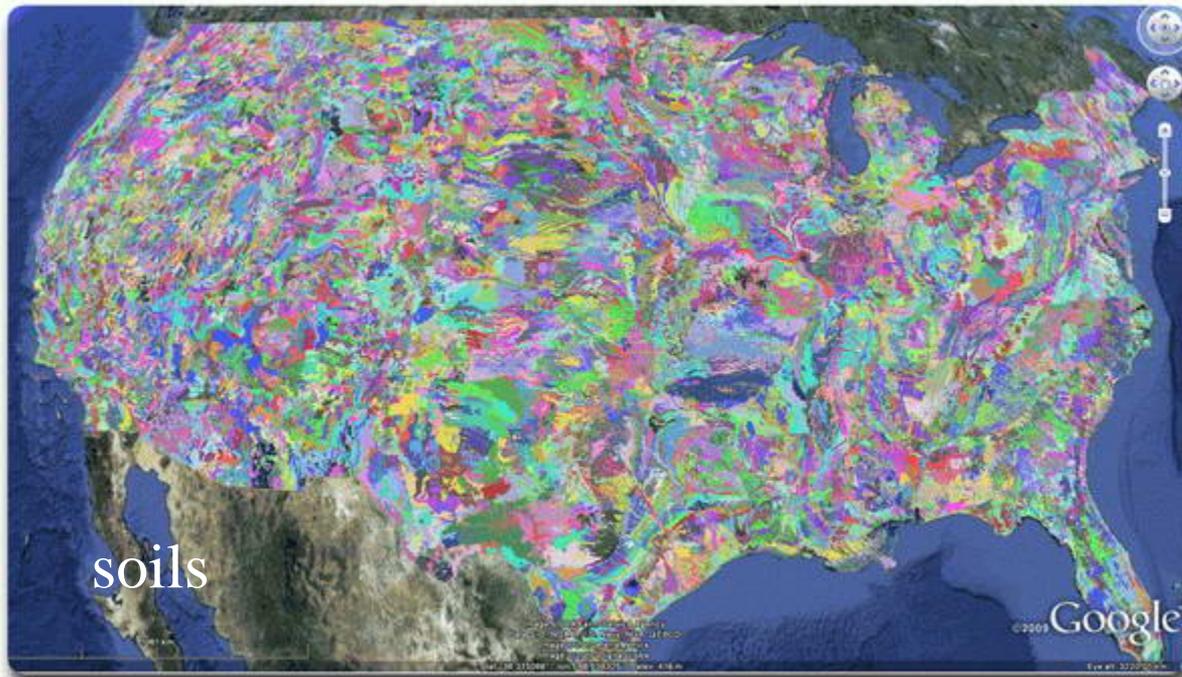
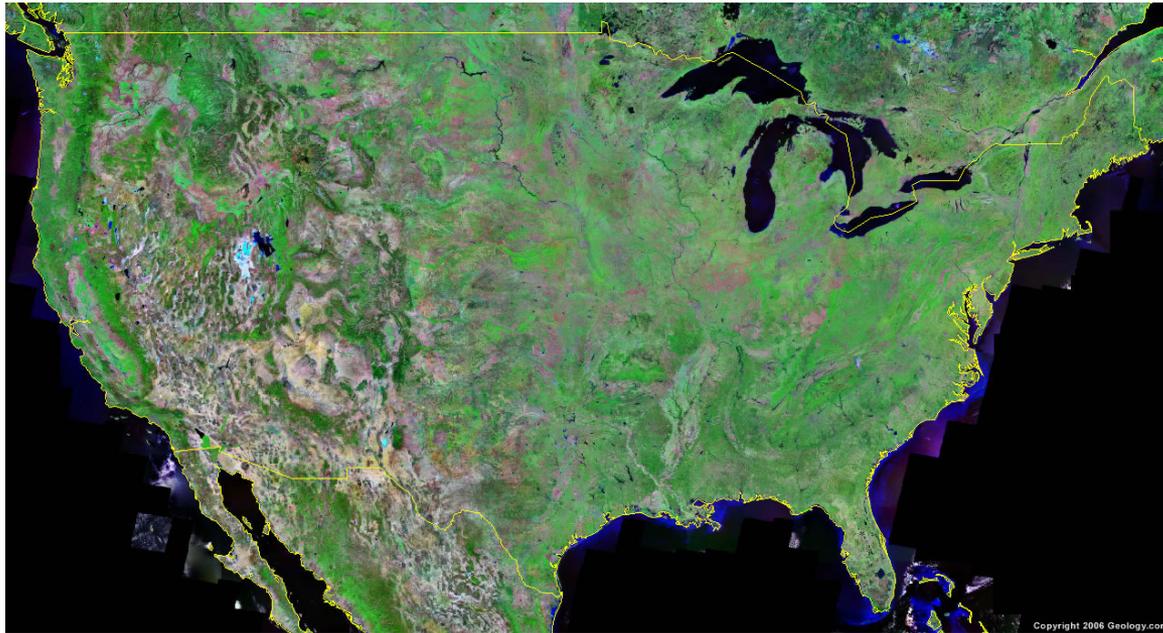
Fig. 1. Maize yields, 1994-2004, LTRAS

Total C input over 10 years of cropping

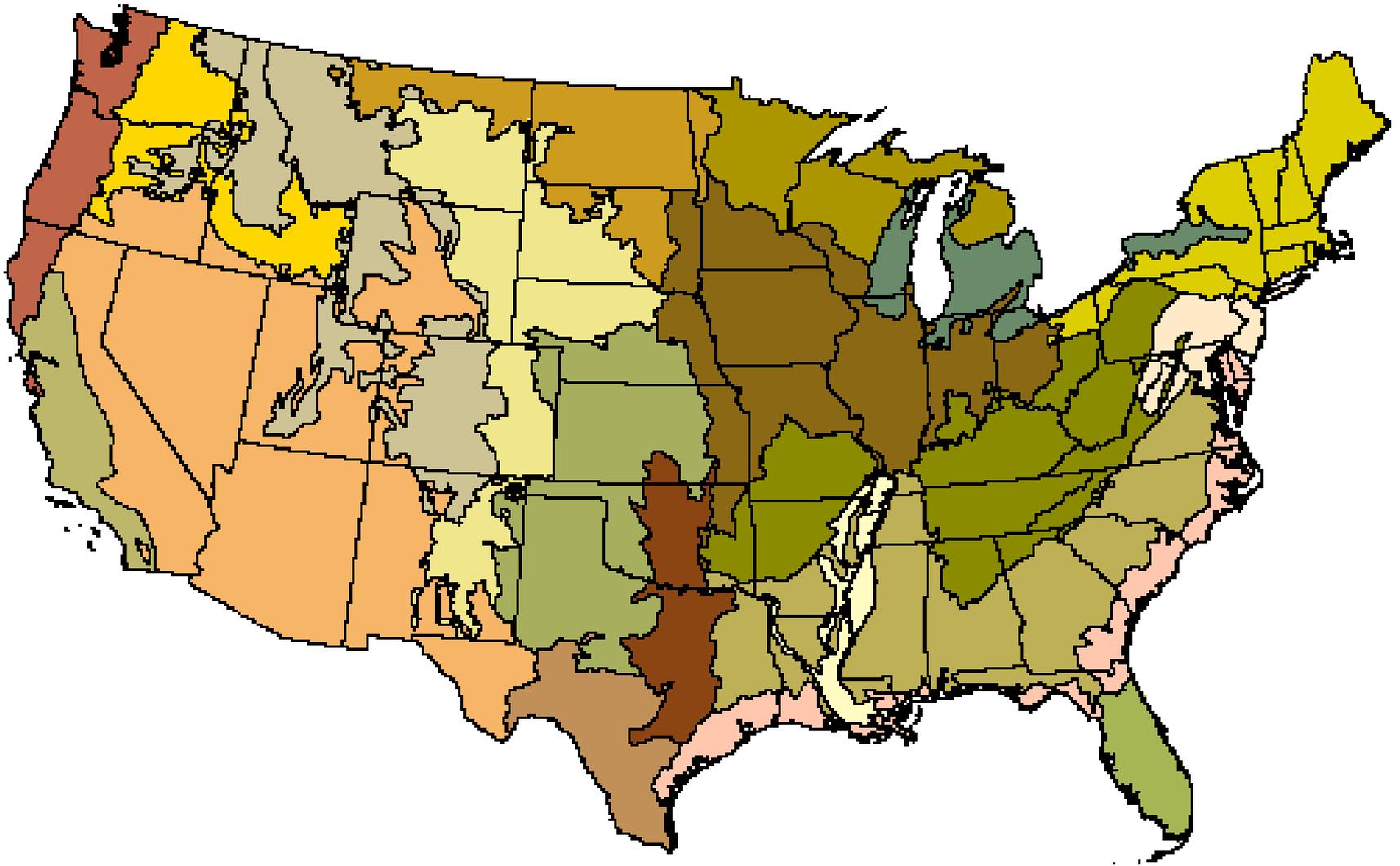


Vegetation patterns and farming systems across the United States are a function of precipitation and soils.





USDA's classification of agricultural regions



Farm Resource Regions

Basin and Range

- Largest share of nonfamily farms, smallest share of U.S. cropland.
- 4% of farms, 4% of value of production, 4% of cropland.
- Cattle, wheat, and sorghum farms.

Northern Great Plains

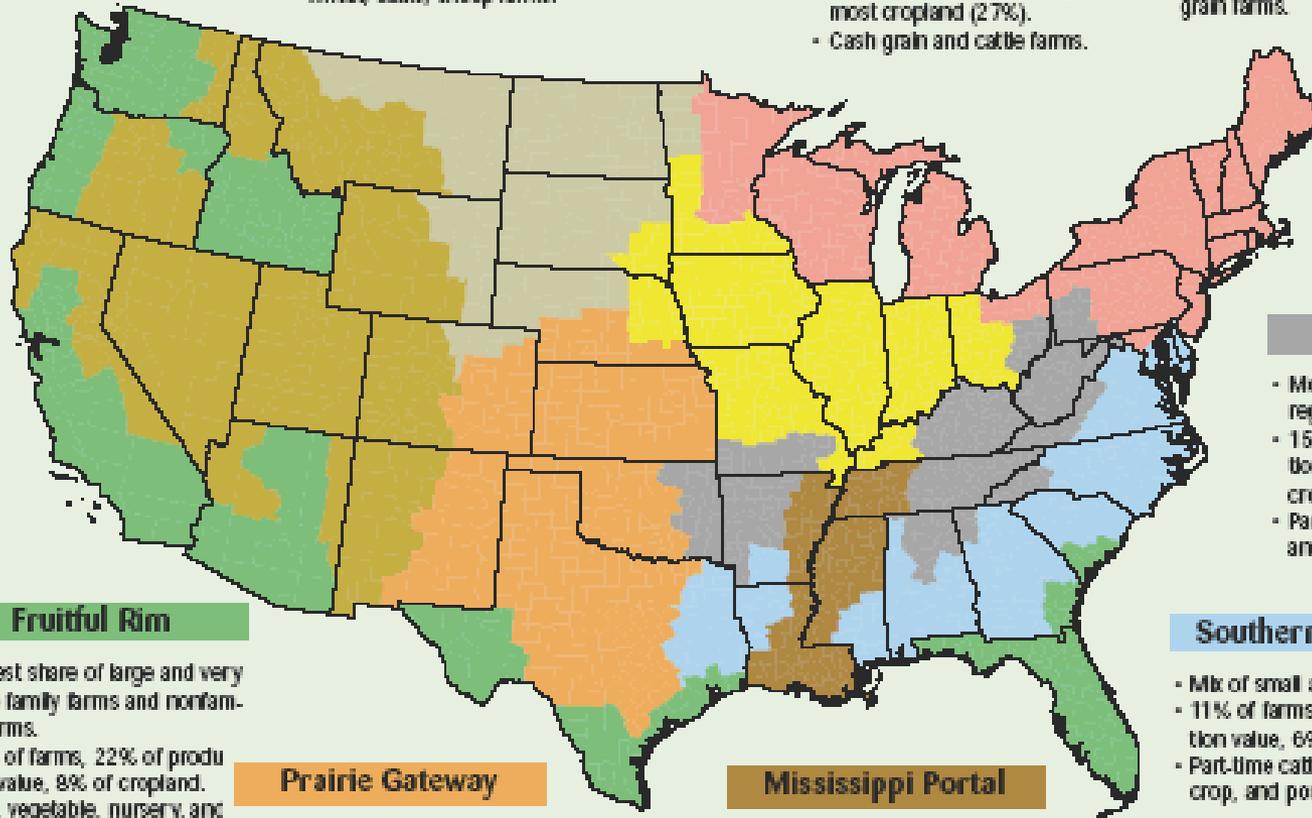
- Largest farms and smallest population.
- 5% of farms, 6% of production value, 17% of cropland.
- Wheat, cattle, sheep farms.

Heartland

- Most farms (22%), highest value of production (23%), and most cropland (27%).
- Cash grain and cattle farms.

Northern Crescent

- Most populous region.
- 15% of farms, 15% of value of production, 9% of cropland.
- Dairy, general crop, and cash grain farms.



Eastern Uplands

- Most small farms of any region.
- 15% of farms, 5% of production value, and 6% of cropland.
- Part-time cattle, tobacco, and poultry farms.

Fruitful Rim

- Largest share of large and very large family farms and nonfamily farms.
- 10% of farms, 22% of production value, 8% of cropland.
- Fruit, vegetable, nursery, and cotton farms.

Prairie Gateway

- Second in wheat, oat, barley, rice, and cotton production.
- 13% of farms, 12% of production value, 17% of cropland.
- Cattle, wheat, sorghum, cotton, and rice farms.

Mississippi Portal

- Higher proportions of both small and larger farms than elsewhere.
- 5% of farms, 4% of value, 5% of cropland.
- Cotton, rice, poultry, and hog farms.

Southern Seaboard

- Mix of small and larger farms.
- 11% of farms, 9% of production value, 6% of cropland.
- Part-time cattle, general field crop, and poultry farms.

CORN NET EXPORTS (+) AND NET IMPORTS (-), 09-10

	Rail & Truck		Lakes		Total
	WestCN	EastCN	EastCN	AllCN	
07-08	87	30	6	80	
08-09	37	31	3	123	
09-10	<u>59</u>	<u>35</u>	<u>4</u>	<u>71</u>	
Change	22	5	1	-52	

Pacific NW Corn Exports	
07-08	564
08-09	420
09-10	<u>454</u>
Change	35

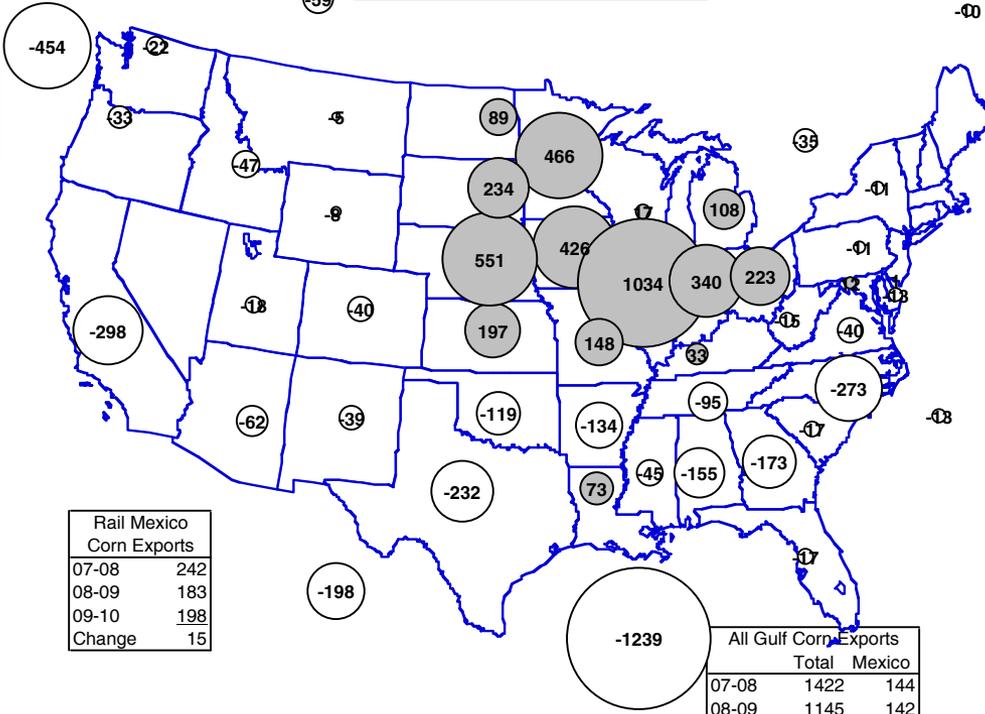
Includes other West Coast Exports (including via container)

Rail Mexico Corn Exports	
07-08	242
08-09	183
09-10	<u>198</u>
Change	15

US Lakes Corn Exports	
07-08	25
08-09	9
09-10	<u>10</u>
Change	1

US Atlantic Corn Exports	
07-08	56
08-09	12
09-10	<u>13</u>
Change	1

All Gulf Corn Exports		
	Total	Mexico
07-08	1422	144
08-09	1145	142
09-10	<u>1239</u>	<u>132</u>
Change	94	-9



Courtesy of PRX, Inc.



Tama County, Iowa



No-till or reduced-till corn production in Iowa



Iowa, native grasses



**Kansas, wheat and
native grass
pasture**



How does soil quality affect farming? Can it be maintained or improved while farming commercially? How will biofuel crops affect soil quality? What should sustainability standards say, if anything, about soil quality?