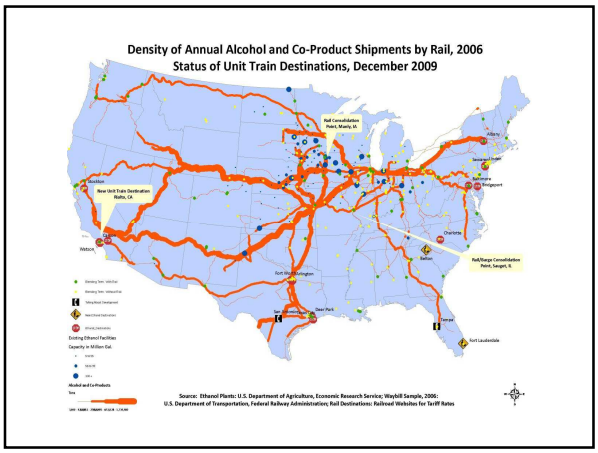
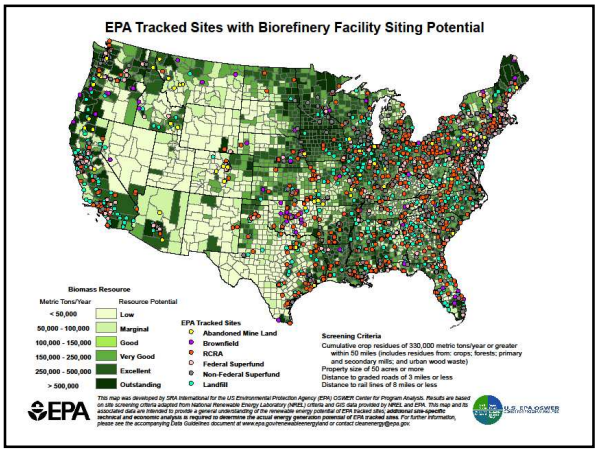


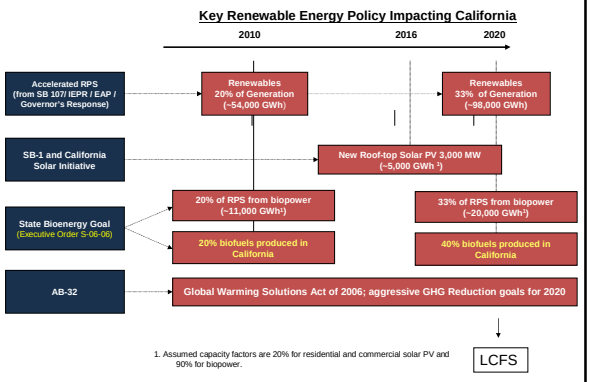
Advanced Biofuel Production by Region Mandated by RFS2 (USDA/2010)

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



Key Renewable Energy Policy Impacting California



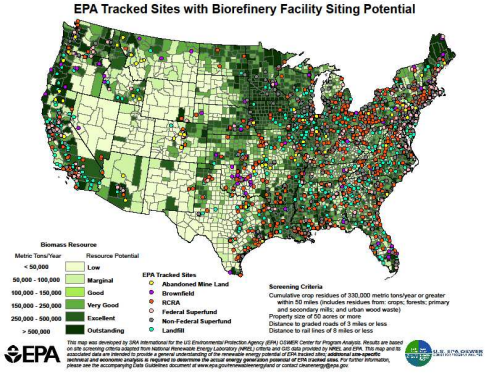
1. Assumed capacity factors are 20% for residential and commercial solar PV and 90% for biopower.

Koyama, CEC, 2009

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



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

Category	# cited
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

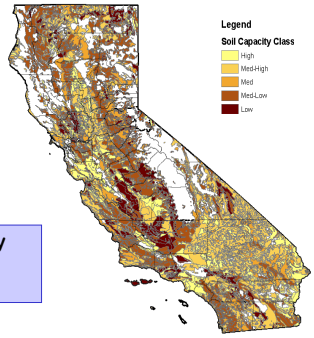
CARB/Soil Quality

What influences farming systems?

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

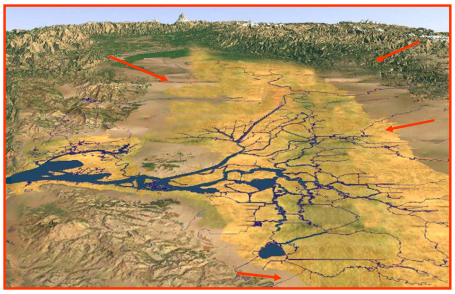
Could biofuel feedstocks be produced in California? Yes, but the optimal crops or crop residues will vary with location.

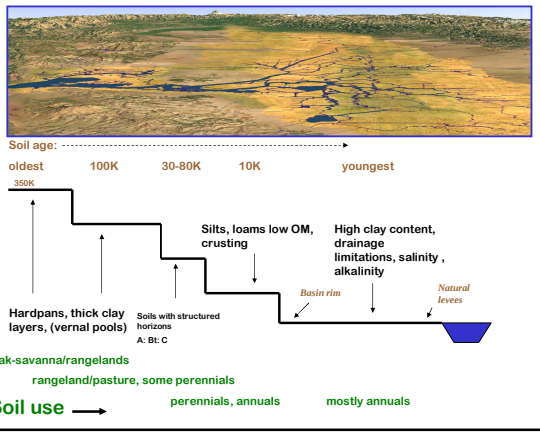
Soil capability classes across California



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.





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.

CA DWR

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.

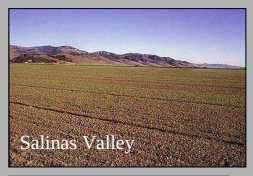
Some of the highest yields of spring wheat in the world are produced in the TID. Potatoes are the most important crop.

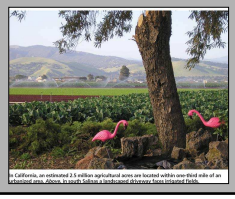
Coastal regions of California produce highly valuable horticultural crops year-round

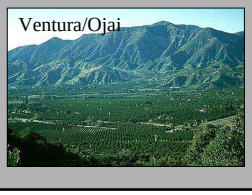
Grape prices and total production continue to rise in California. Since 2000, an average of 175 new wineries have opened each year. Above, V. Sattui Winery in the Napa Valley was established in 1885.

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

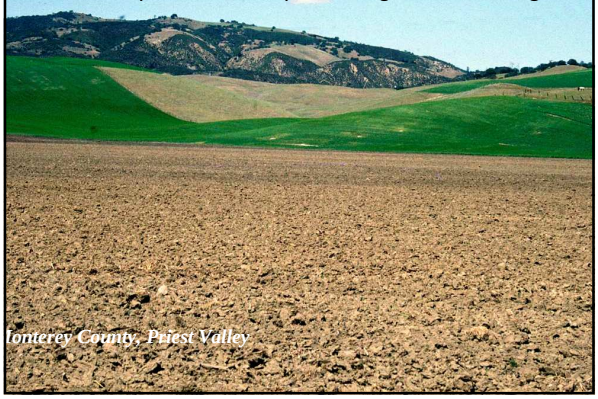
Coastal Valleys produce cool season vegetables, strawberries and citrus in the south. Soils are generally well-drained, allowing harvest year round.


Salinas Valley

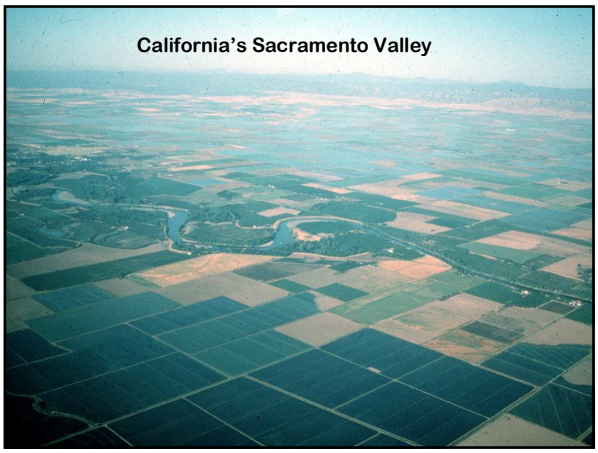



Ventura/Ojai

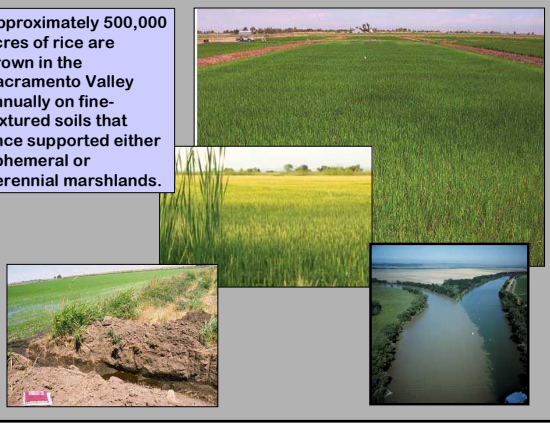
the coastal mountain valleys and hills, dry-farmed wheat and fflower is still produced, complementing cattle ranching.


lonterey County, Priest Valley

The most important agricultural region is the Central Valley

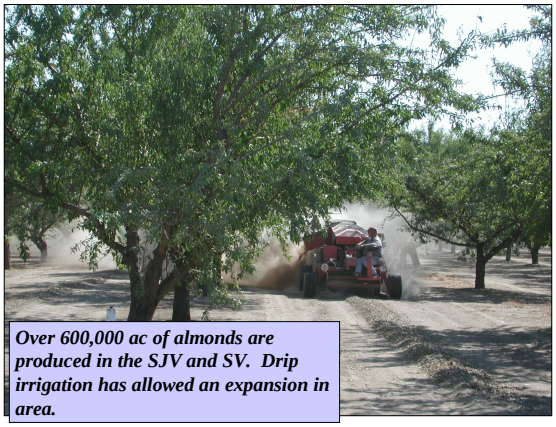


Approximately 500,000 acres of rice are grown in the Sacramento Valley annually on fine-textured soils that once supported either ephemeral or perennial marshlands.



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.



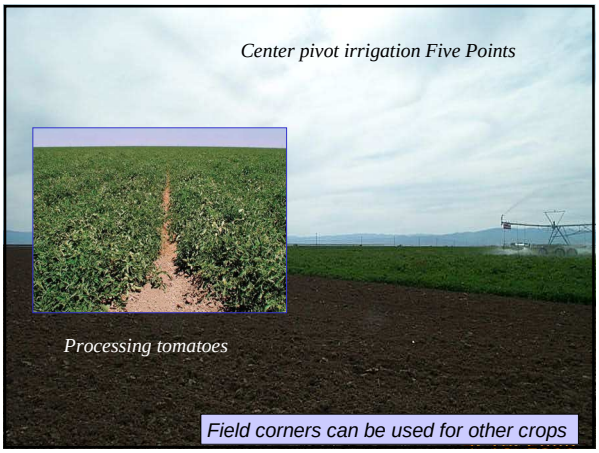
Over 600,000 ac of almonds are produced in the SJV and SV. Drip irrigation has allowed an expansion in area.

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

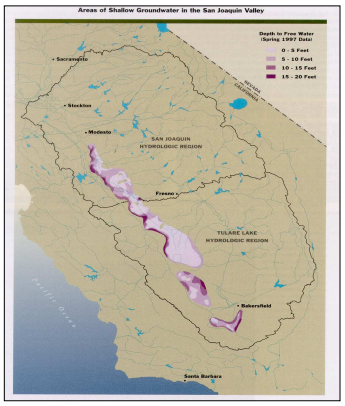
The western San Joaquin Valley generally has finer textured soils than the eastern side of the valley and areas with elevated levels of salinity and trace elements derived from marine shale parent material in the coastal mountains.

Looking north between Los Banos and Firebaugh


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.

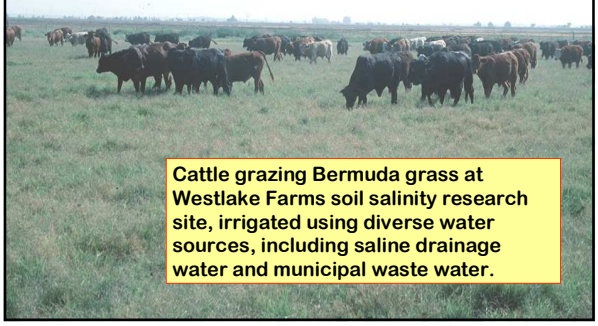


DWR, California Water Plan Update, Bulletin 160-98

Saline-sodic soil near Stratford

Shallow, saline water table

Drainage water reuse project at Westlake Farms near Stratford



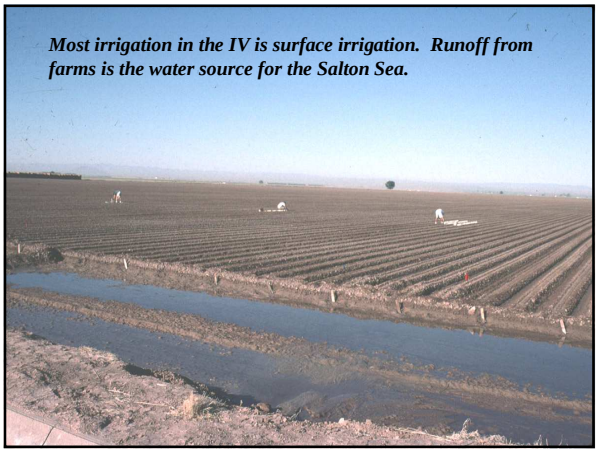
Cattle grazing Bermuda grass at Westlake Farms soil salinity research site, irrigated using diverse water sources, including saline drainage water and municipal waste water.

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

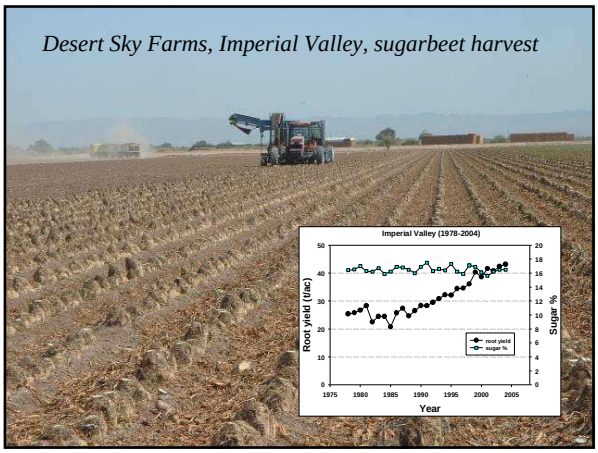
The Imperial Valley has mostly fine-textured soils derived from erosion of the Grand Canyon. Winter vegetables and fruits, alfalfa and other forages, and other arable crops like durum wheat and sugarbeets are produced.

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

DWR, California Water Plan Update, Bulletin 160-98



Desert Sky Farms, Imperial Valley, sugarbeet harvest

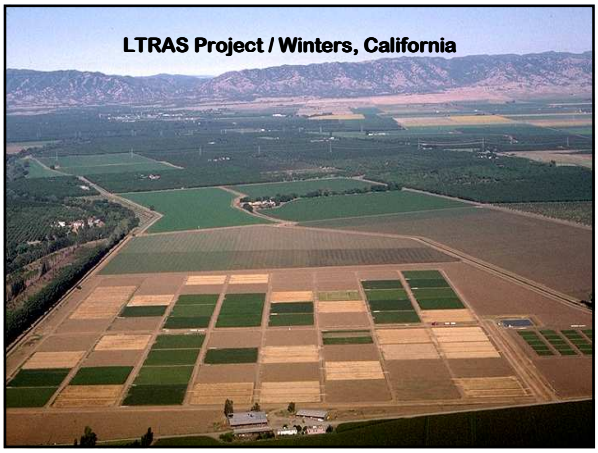


Bermuda grass for hay and seed

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

Sugarcane in the IV

LTRAS Project / Winters, California



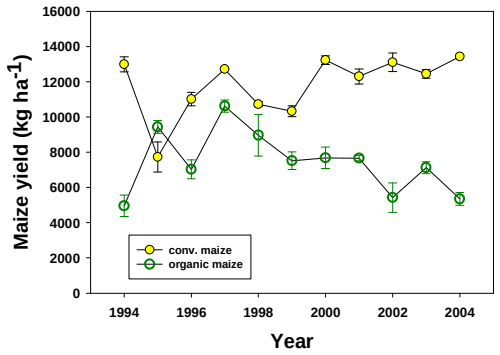
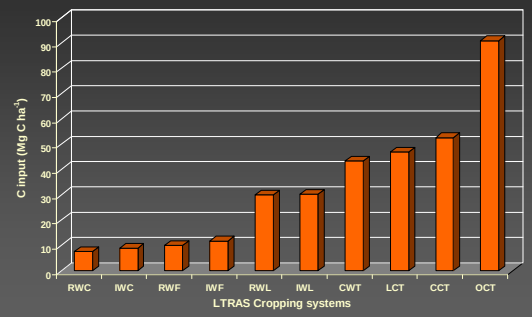


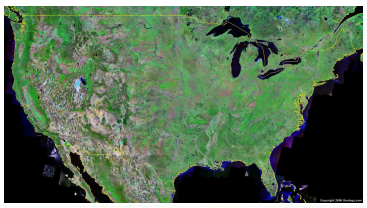
Fig. 1. Maize yields, 1994-2004, LTRAS

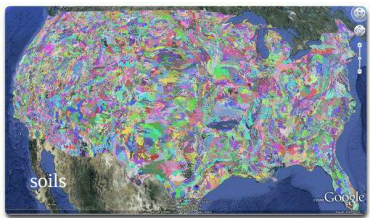
Total C input over 10 years of cropping



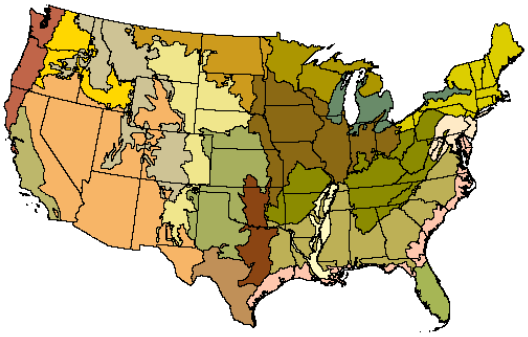
Kong et al. 2004

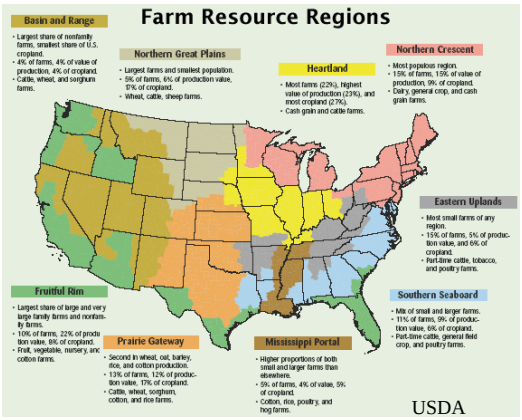
Vegetation patterns and farming systems across the United States are a function of precipitation and soils.



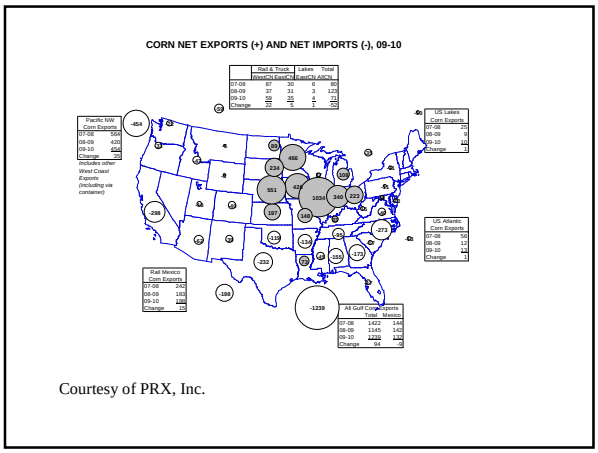


USDA's classification of agricultural regions





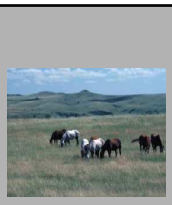
USDA



Courtesy of PRX, Inc.

Tama County, 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?