

# Case Studies

## Shaping Water Reuse Practices in the U.S.

Robert Bastian

Office of Wastewater Management  
U.S. Environmental Protection Agency  
Washington, D.C. 20460

May 25, 2011

**TABLE 1.1 Some Early Land Treatment Systems in the United States**

Location	Date started	Area, acres
Boulder, Colo.	1890	—
Calumet City, Mich.	1888*	12
Woodland, Calif.	1889	240
Fresno, Calif.	1891*	4000
San Antonio, Tex.	1895	4000
Vineland, N.J.	1901*	14
Lubbock, Tex.	1915*	—
Bakersfield, Calif.	1912*	2400

\*System still in operation.

LIST OF WESTERN CITIES USING IRRIGATION OF SEWAGE  
IN 1934 AND 1937 (Hutchins, 1939)

IRRIGATION WITH SEWAGE TAKEN DIRECTLY FROM OUTFALLS OR DISPOSAL PLANTS

Arizona: Casa Grande, Nogales, Phoenix,\* Tucson.  
California: Bakersfield, Banning, Chino, Cloverdale, Colfax, Colton, Corcoran,  
Dixon, Elsinore, Exeter, Fowler, Fresno, Hanford, Hemet, Indio, Kingsburg,  
Lemoore, Livermore, Lodi,\*\* Madera, Manteca, Marysville, Merced, Modesto,  
Ontario, Orland, Pasadena, Pomona, Ripon, Riverside, San Luis Obispo, Santa  
Maria, Santa Paula, Santa Rosa, Selma, Sonoma, St. Helena, Susanville, Tulare,  
Turlock, Ukiah, Vacaville, Visalia, Wasco,† Whittier, Woodland, Yreka.  
Colorado: Greeley.  
Idaho: Glenns Ferry, Meridian.  
Kansas: Liberal, Scott City.  
Montana: Anaconda, Helena, White Sulphur Springs.  
New Mexico: Clovis, Portales, Sante Fe.  
Oregon: Ashland, Burns.  
Texas: Abilene, Amarillo, Baird, Breckenridge, Brownfield, Canyon, Carlsbad  
(State Sanitarium), Childress, Coleman, Dublin, Falfurrias,†† Georgetown,  
Karnes City, Kerrville, Kingsville, Lubbock, Midland, Mission, Munday, Plain-  
view, Robstown, Roscoe, Rotan, San Angelo, San Antonio, San Marcos (irriga-  
tion with sludge), Snyder, Stamford, Stephenville, Sweetwater, Tahoka, Uvalde.  
Utah: Brigham, Richfield, Salt Lake City, St. George.  
Washington: Pomeroy, Walla Walla.  
Wyoming: Cheyenne.

\* *Direct Irrigation only on park surrounding plant; not considered in total figures.*

\*\* *Effluent taken directly into irrigation district canal.*

† *Creamery waste only.*

†† *Sewage irrigation previously practiced and abandoned, just now being resumed.*

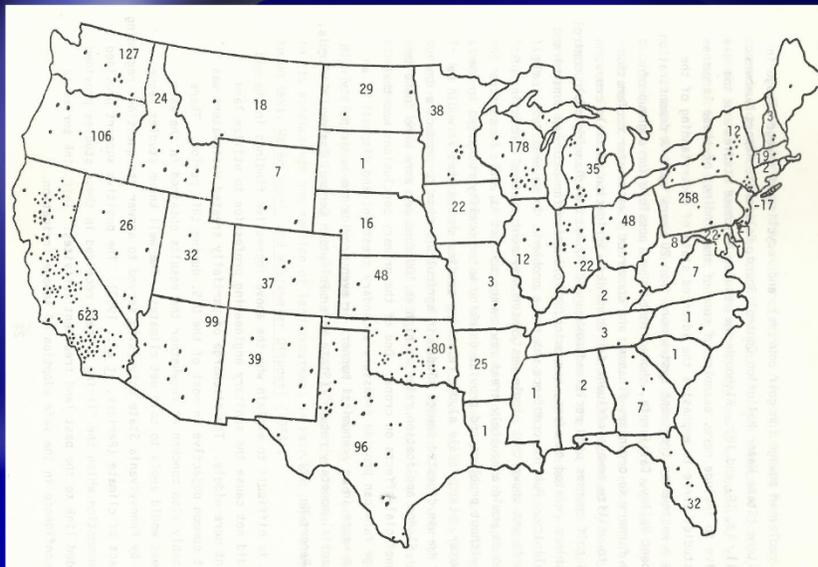
LIST OF WESTERN CITIES USING IRRIGATION OF SEWAGE  
IN 1934 AND 1937 (Hutchins, 1939)

IRRIGATION WITH SEWAGE DIVERTED FROM PUBLIC STREAM CHANNELS

Arizona: Phoenix.  
California: Brea, Pasadena, San Bernadino, Santa Rosa, Tracy.  
Colorado: Denver, Greeley.  
Nebraska: Hastings.  
Nevada: Reno.  
New Mexico: Raton.  
Oregon: Ashland, Medford.  
South Dakota: Rapid City.  
Texas: San Angelo.  
Utah: Ogden.  
Washington: Walla Walla.  
Wyoming: Cheyenne.

APPENDIX C. (CONCLUDED) PLACES THAT HAVE (OR ARE STILL USING) LAND TREATMENT (Hartman, 1975; Rideal, 1906; Rafter and Baker, 1894; Hutchins, 1939).

Place	Year Started	Year Changed to Treatment and Discharge	Area Used (Ac)	Amount of Flow (MGD)/ Population
Burlington, NJ	1892	-	-	-
Cheyenne, WY	1883	-	-	-/11,690
Delano, CA	-	-	-	-
Deming, NM	1913	-	-	-
Fresno, CA	1890	-	2,000	14 (in 1974)/10,816 (1890)
Hanford, CA	-	-	160	1.5/-
Haworth, NJ	1907	-	-	-
Helena, MT	1889	-	-	-/13,834
Hightstown, NJ	1913	-	-	-
Kingsville, TX	-	1959	-	-
Las Vegas, NV	-	-	-	-
Los Angeles, CA	1883	1907	-	-/50,395
Lubbock, TX	1915	-	-	-
Midland, TX	-	-	500	4.5/-
Mt. Vernon, CA	-	-	-	-
Oildale, CA	1947	1973	400	2.4/-
Palm Springs, CA	-	-	100	1/-
Pasadena, CA	1893	-	300	-/4,882
Pleasantown, CA	1911	-	181	1.3/-
Pullman, IL	1881	-	140	-
Redding, CA	1888	-	-	-/1,821
Salt Lake City, UT	1890	-	-	-
Santa Rosa, CA	1889	-	-	-/5,220
Stockton, CA	1892	-	-	-/14,424
San Angelo, TX	-	-	700	5/-
Trinidad, CO	1892	-	-	-
San Antonio, TX	1900	-	1,500	-/5,523
San Bernadino, CA	-	-	-	-
Santa Rose, CA	-	-	-	-
Smithville, NJ	-	-	-	-
South Framingham, MA	1889	-	-	-
Torrance, CA	1913	-	-	-
Tucson, AR	1915	1965	-	-

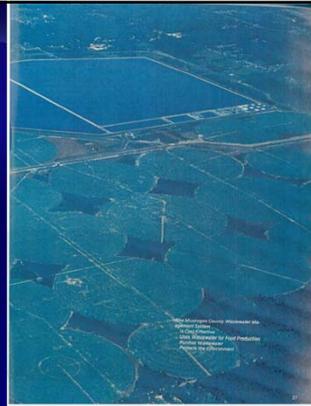


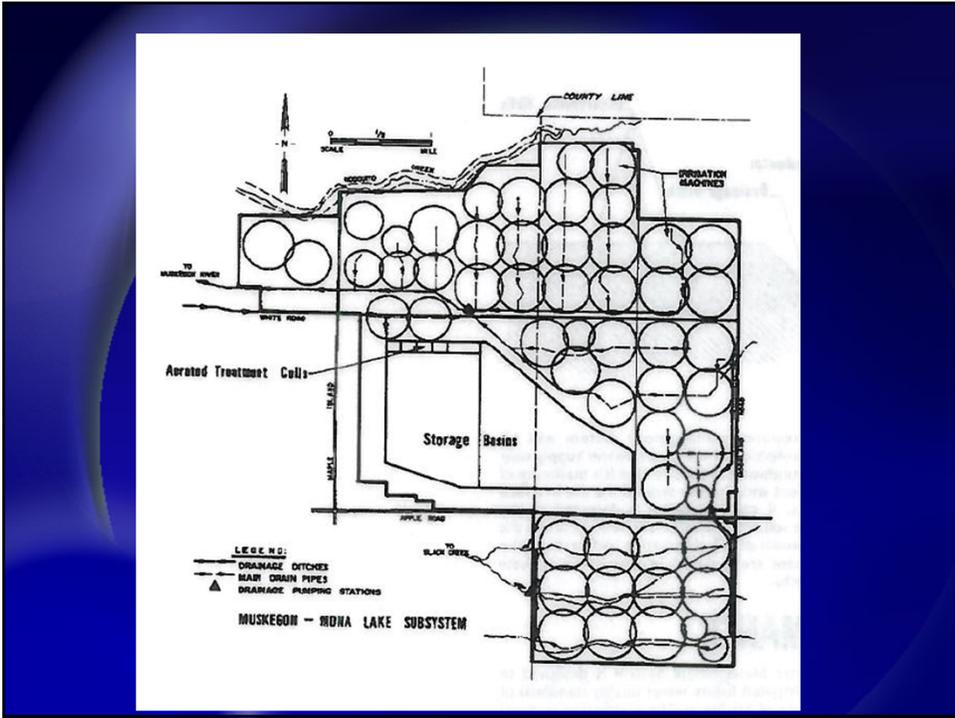
- ◆ Land treatment for “disposal” was used by many food processors for many years (e.g., Seabrook Farms, Campbell Soup, WA & ID potato processors)
  - ◆ Such projects were generally designed to maximize the amount of waste applied per acre rather than to use conventional irrigation procedures and historically accepted practices for recycling animal manure back to the land to optimize their use as a source of water for irrigation and/or nutrients
- ◆ Similar practices were attempted by some cities as a means of disposal of municipal effluents and sewage sludge

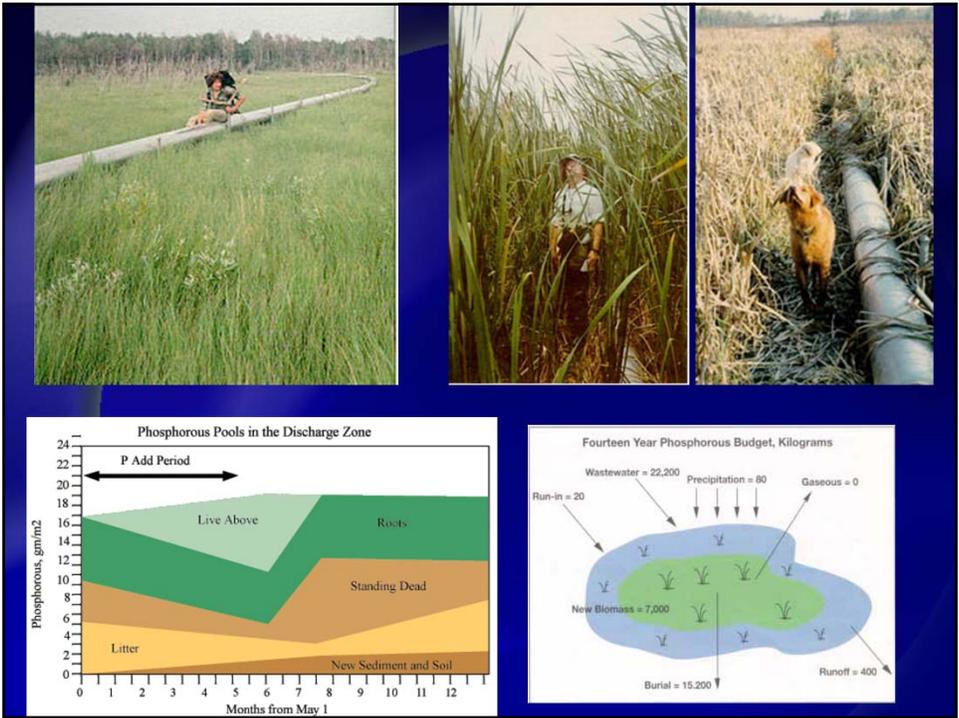
- ◆ Land treatment for “disposal” often resulted in problems such as:
  - ◆ elevated nitrates in the underlying groundwater
  - ◆ high nitrate forage
  - ◆ severe erosion and runoff from application sites into nearby water bodies
  - ◆ poor cover crop performance
  - ◆ odors and other undesirable site conditions developed due to excess moisture, organic matter, and nutrient loadings
- ◆ Similar problems have resulted from excessive manure application rates to farmland in some areas of the country

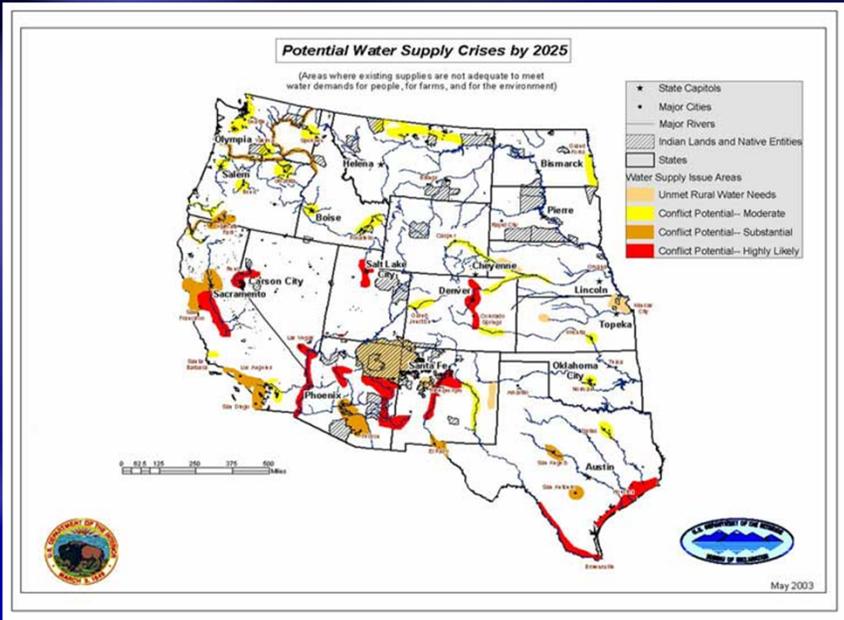
## The development of *Sustainable Land Application Practices*

- ◆ Modern “*Sustainable Land Application*” practices optimized for “treatment” and “reuse” while protecting the environment and/or use conventional irrigation procedures and historically accepted practices for recycling animal manure back to the land
  - ◆ Land treatment of municipal & industrial effluents
  - ◆ Reuse of treated effluents for irrigation









**USBR 2025 Report – Map of areas with conflict potential**





