

US EPA ARCHIVE DOCUMENT

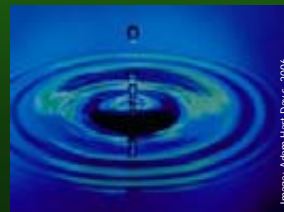
Source Water Protection: Dairies, Irrigated Agriculture, and Groundwater

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<http://groundwater.ucdavis.edu>



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UC
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MERCED COUNTY
CALFED BAY-DELTA PROGRAM
Water Boards

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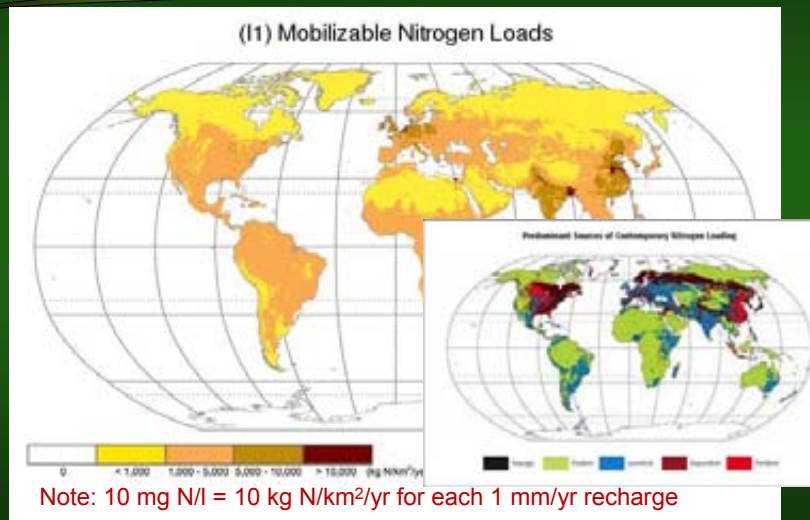
Motivation

- Worldwide dependence on groundwater
 - 2-3 billion people
 - > 60% of gw use towards farming in arid/semi arid regions
- Surge of groundwater use over past 50 years (turbine pump, cheap energy, food demands)
- Increasing intensity of landuse (crops, animals, industry, urban)



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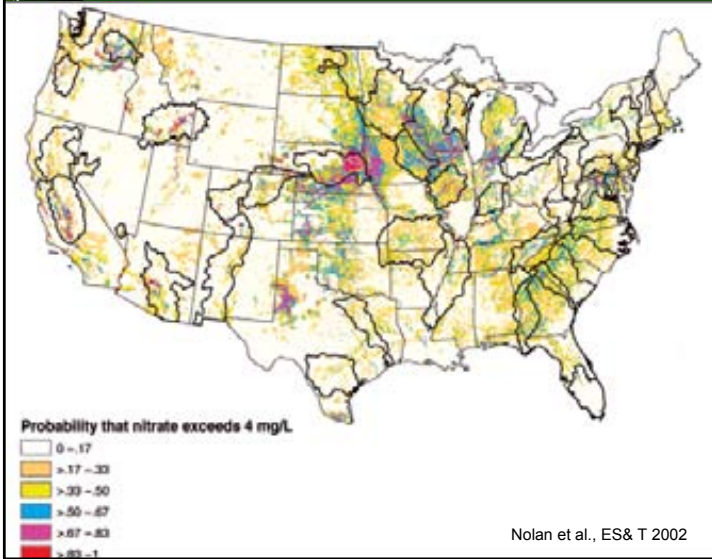
Pervasive GW Pollutant: NO₃



UN World Water Development Report II, 2006

University of California, Davis, 2009

Nitrogen Load: Risk Analysis

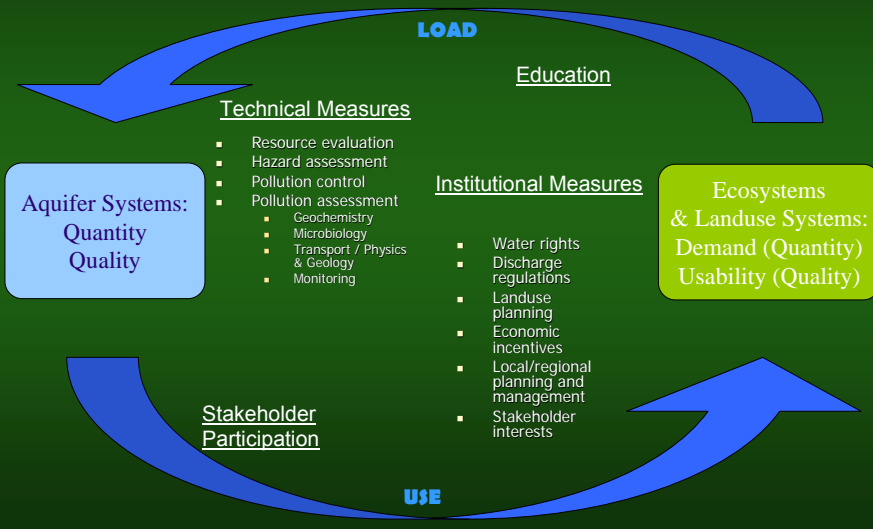


Based on logistic regression model:

- N loading
- % cropland or pasture
- Human population density
- Well drained soil
- Sand/gravel aquifer
- Depth to gw

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Integrated GW Resources Mgmt



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Perspectives on NPS Pollution for Successful Source Protection

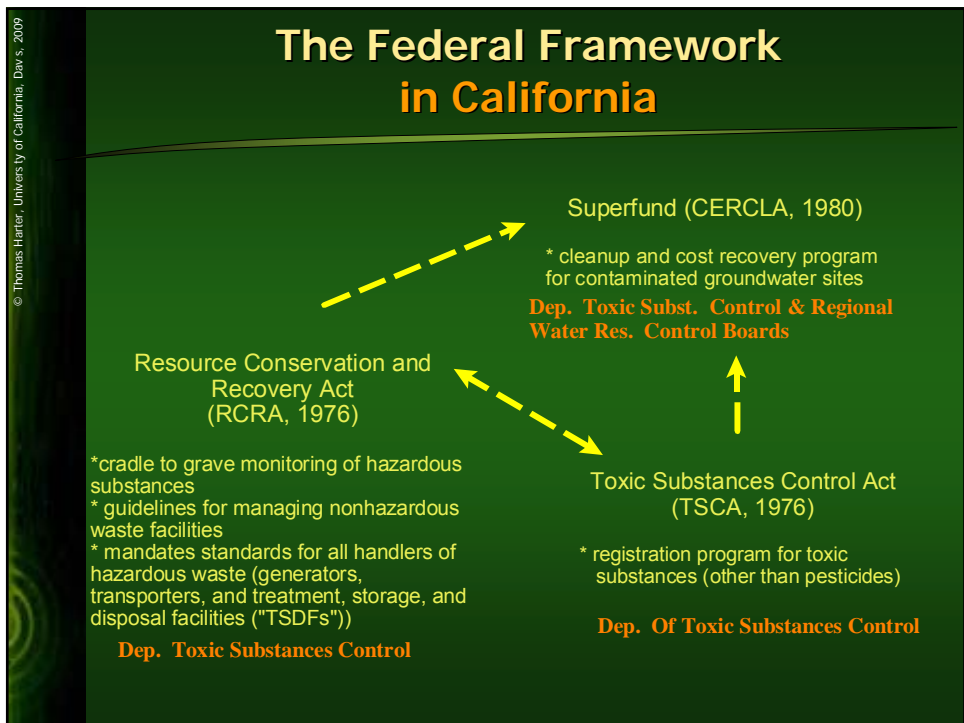
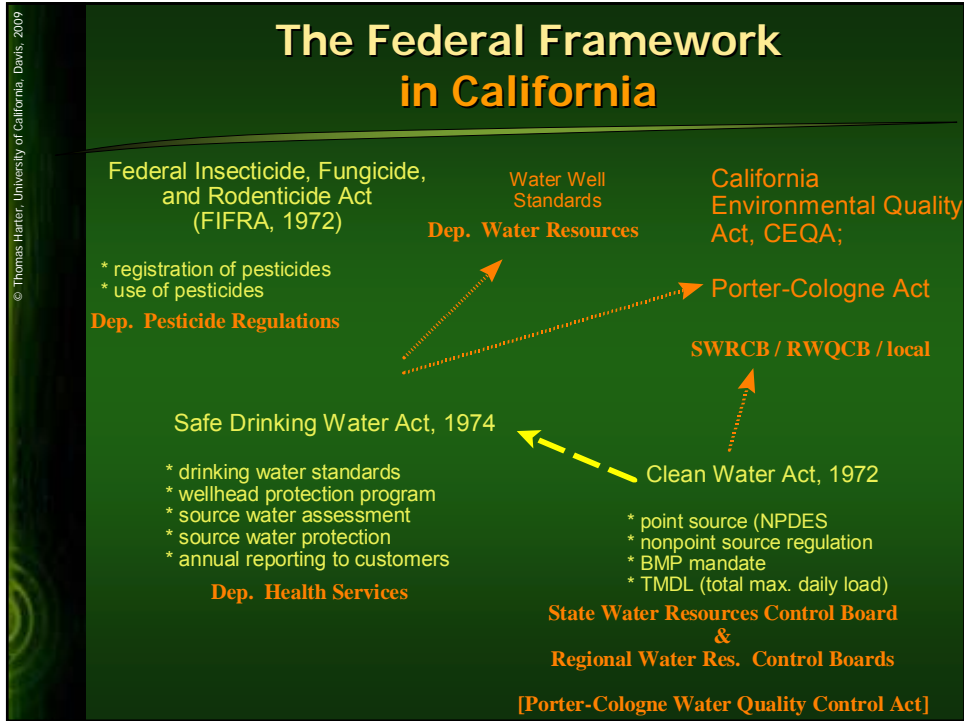
- Understanding NPS Sources
 - here: dairies/(C)AFOs]
 - source control
 - management practices
- Understanding pollutants
 - physics/chemistry of environmental fate
 - Transport
 - Sorption
 - Degradation
 - analytical methods
 - assessment models
- Policy
 - regulatory programs
 - management programs
 - role of monitoring / feedback

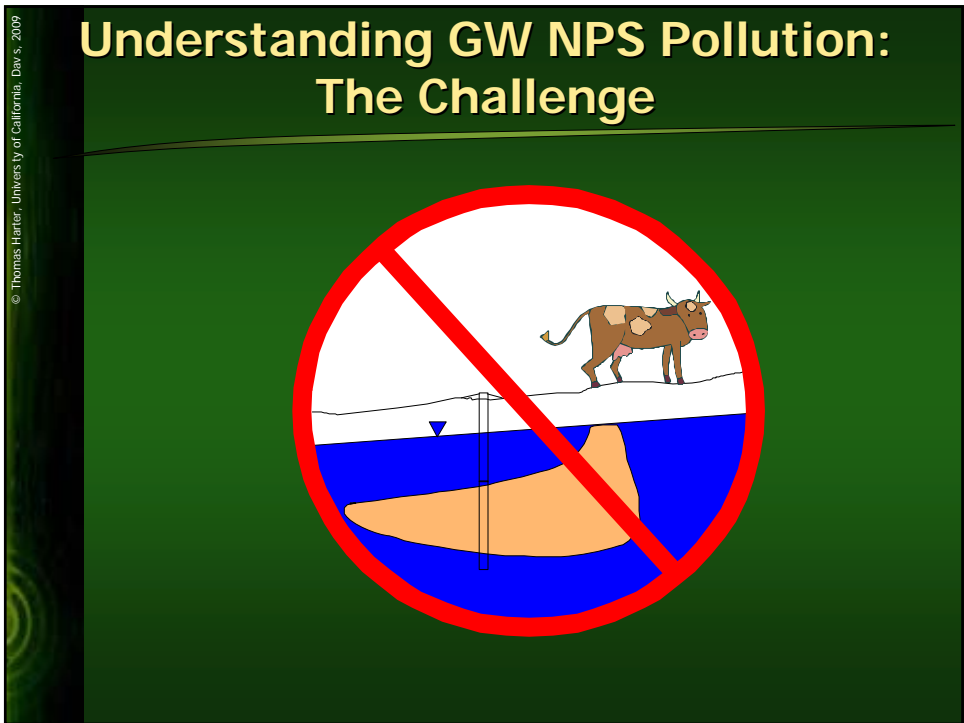
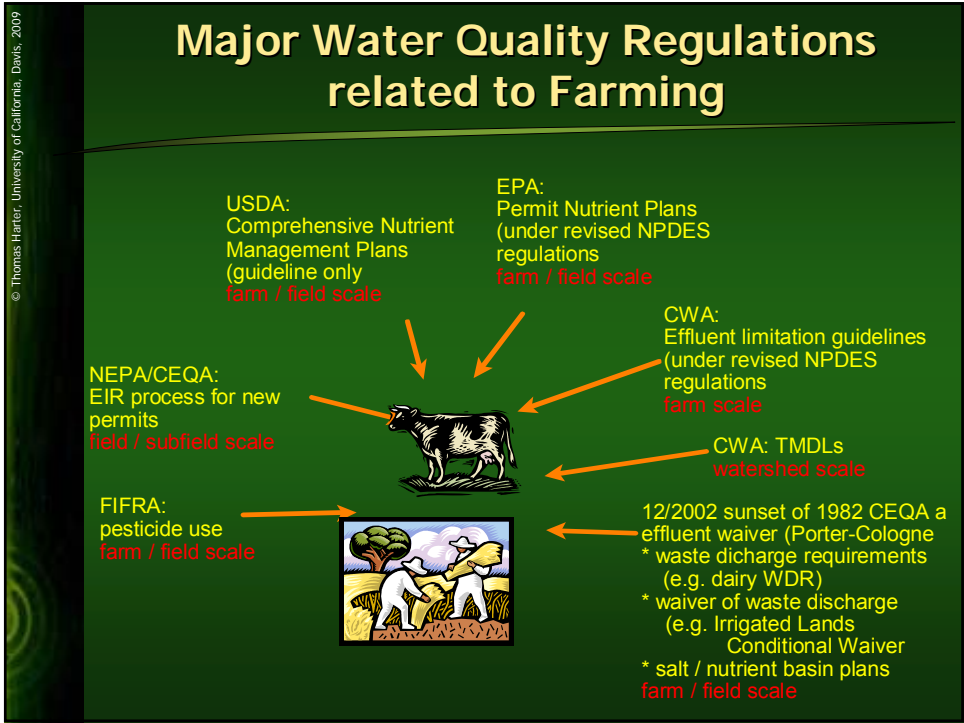
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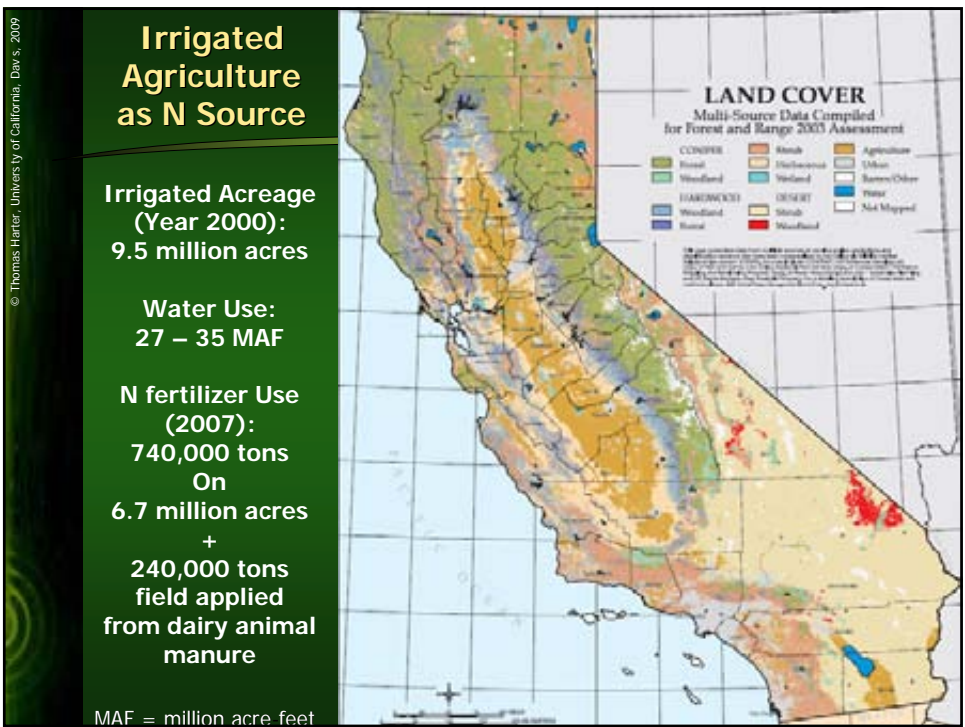
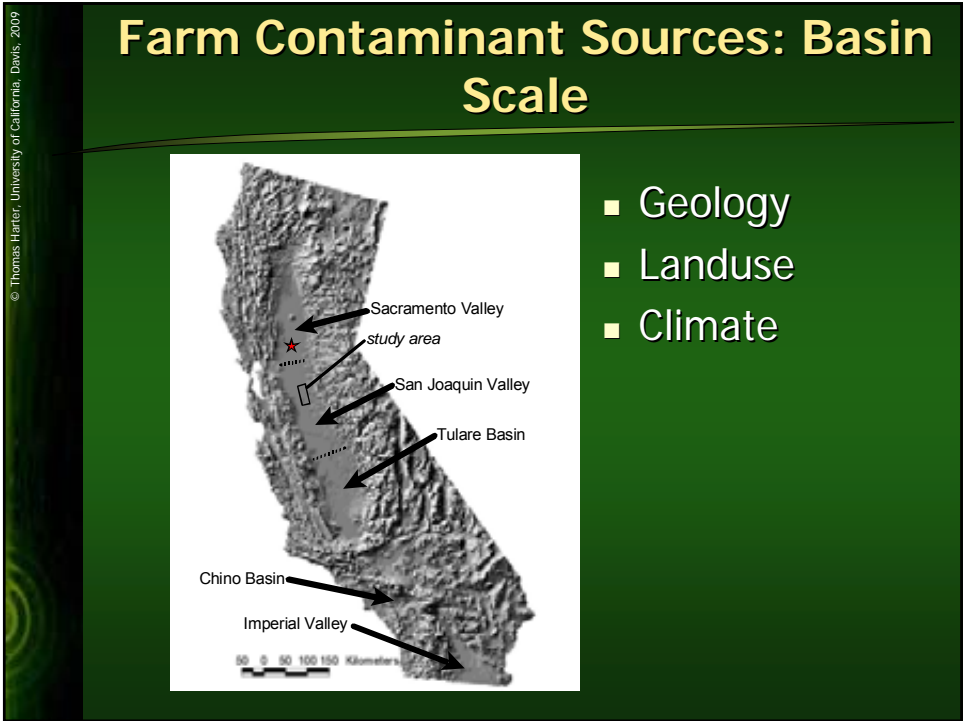
Agricultural NPS Pollutants

- Salinity
- Nitrate
- Pesticides
- Emerging contaminants in animal farming:
 - Pathogens (*E. coli* H7 O157, *Campylobacter*, *Salmonella*, *Cryptosporidium*)
 - Antibiotics & other pharmaceuticals
 - Steroid hormones









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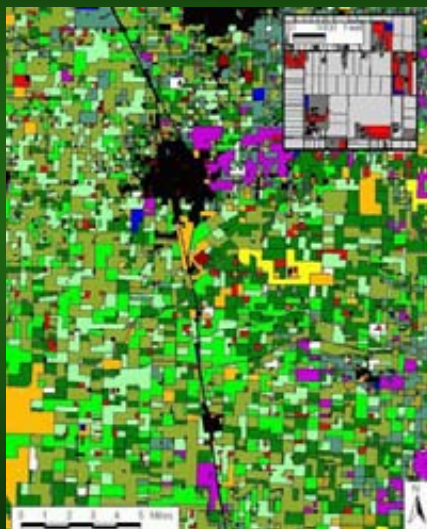
Dairies in the San Joaquin Valley

- ~1,500 dairies
- ~1.5 million milking cows
- trend to > 2 million milking cows
- additional support stock: 1.5 million
- 1 cow = 20 – 40 humans in waste production (solids, BOD, N)



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Farm Contaminant Sources: Regional Scale




- Source of N (2007):
 - Fertilizer use (varies with farm / farming practices) *740,000 tons*
 - Animal Manure *240,000 tons*
 - Septic leach fields *27,000 tons*
 - Irrigation water source & mgmt.
 - Treated municipal effluent *31,000 tons*

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Farm Contaminant Sources: Dairy Farm Scale



- Sources of N:
 - Feedlot
 - Lagoon
 - Storage areas
 - Manured fields
 - Fertilized fields
 - Various crops
 - Septic system



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Overview of dairy farms



Milking parlor

nutches

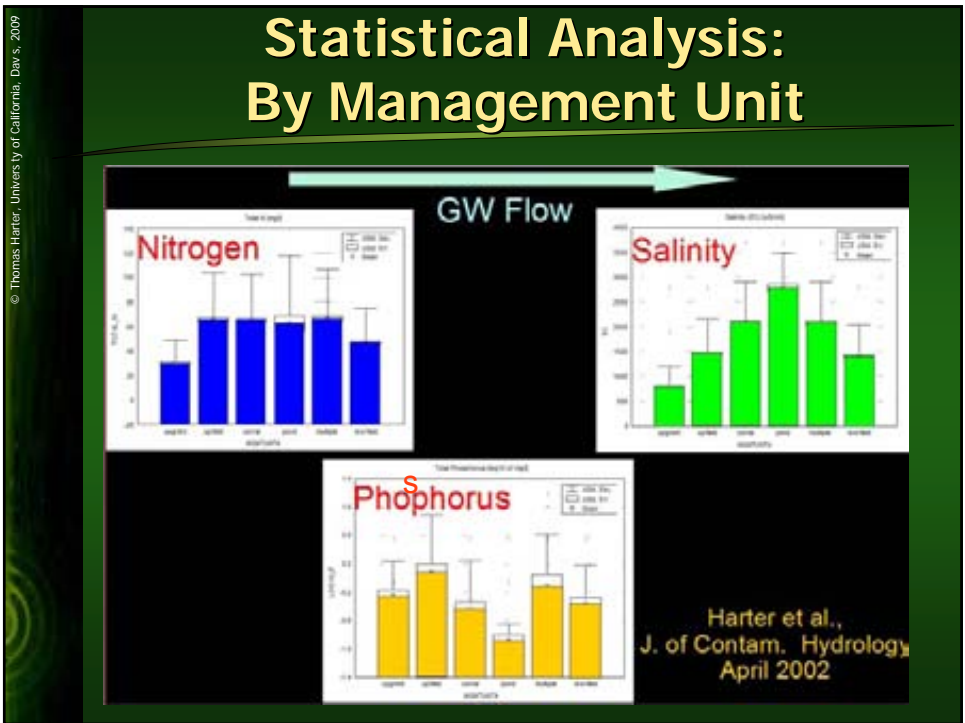
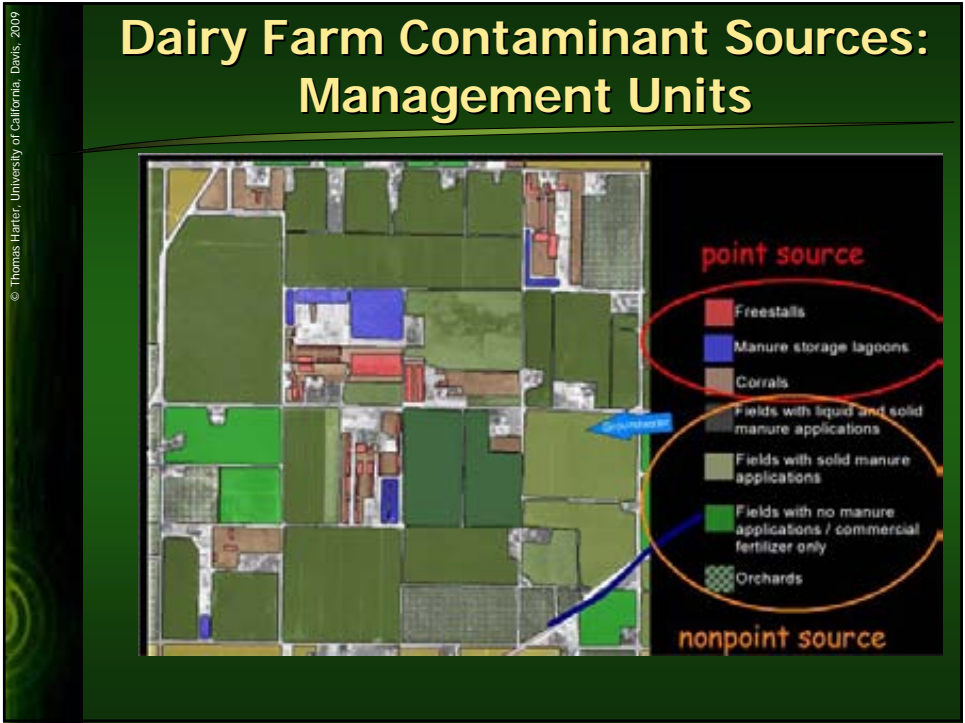
Fig

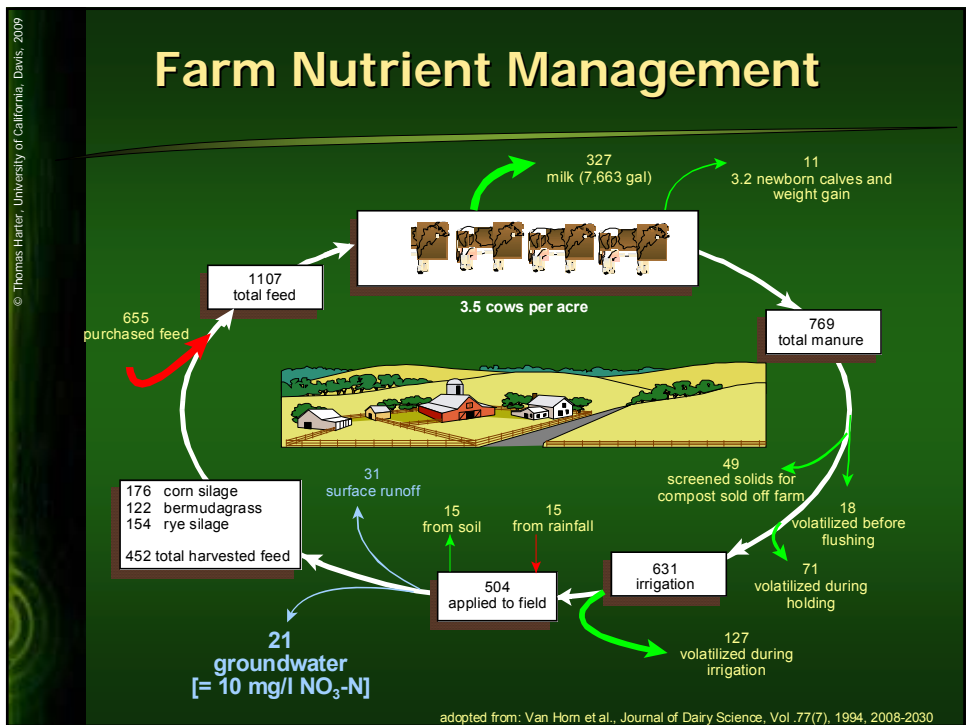
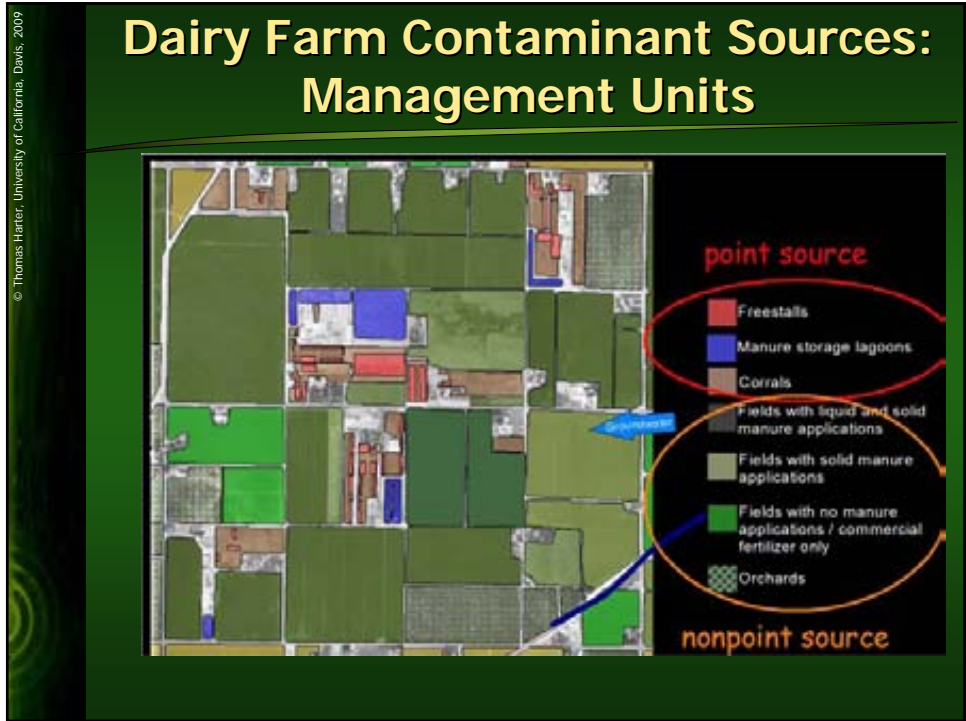
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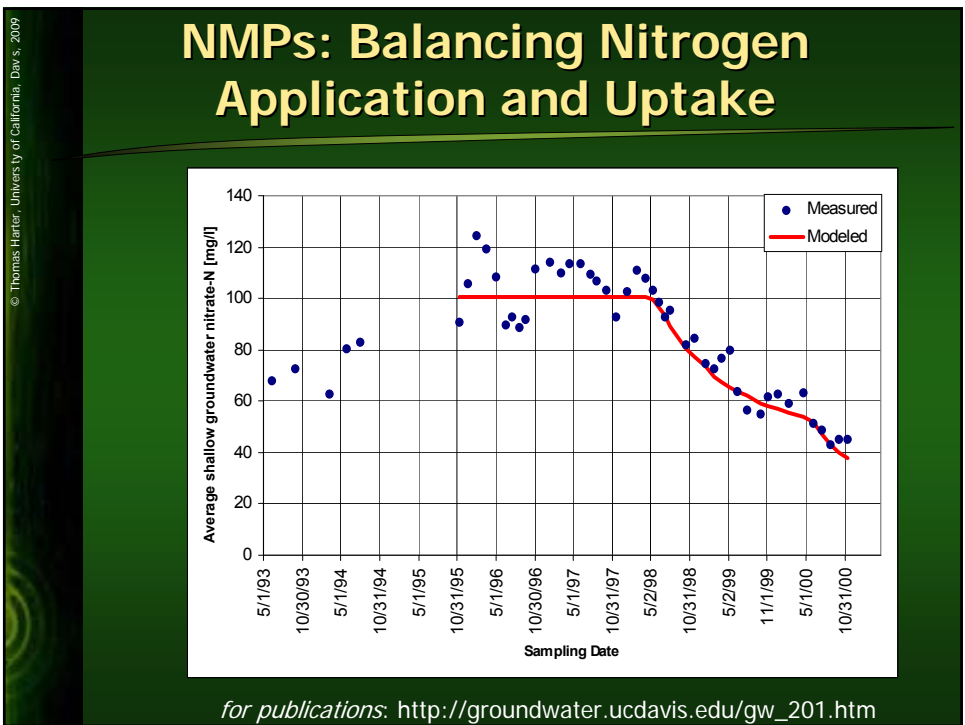
Dairy Nutrient Cycling

- <http://www.youtube.com/watch?v=G6QliWbvBwI>
- <http://ucanr.org/spotlight/groundwater.shtml>









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Central Valley Regional Water Quality Control Board Dairy Waste Discharge Requirements

- Preliminary Dairy Facility Assessment
 - Existing nutrient management
 - Existing waste management conditions
 - Existing water quality conditions
- Nutrient management plan (crop land)
- Waste management plan (animal facilities, waste storage facilities)
- Groundwater monitoring

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Toward Sustainable Groundwater in Agriculture

An International Conference
Linking Science and Policy

San Francisco, 15-17 June 2010
(tentative date)

For information and updates, check:
<http://groundwater.ucdavis.edu/calendar.htm>
<http://www.ag-groundwater.org>

