




Managing Dairy Manure in the Central Valley, California



Georgia Dairy Producer Conference
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“As California goes, so goes the nation”



Dairy producers are

Creative

Ingenious

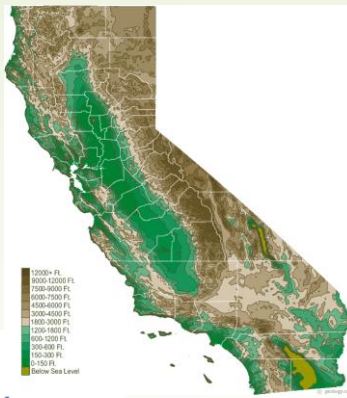
Gifted

Innovative

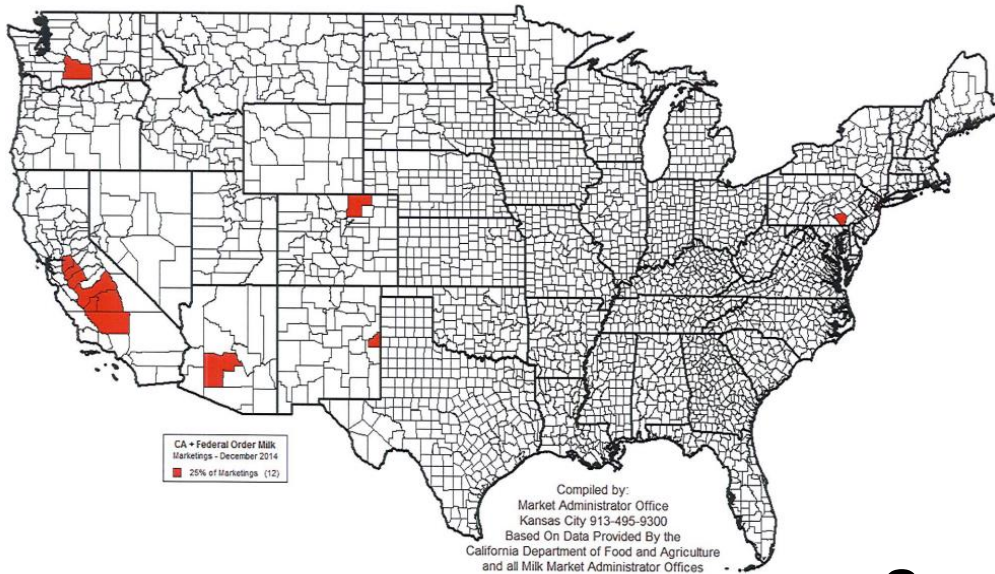
Resilient

Inventive

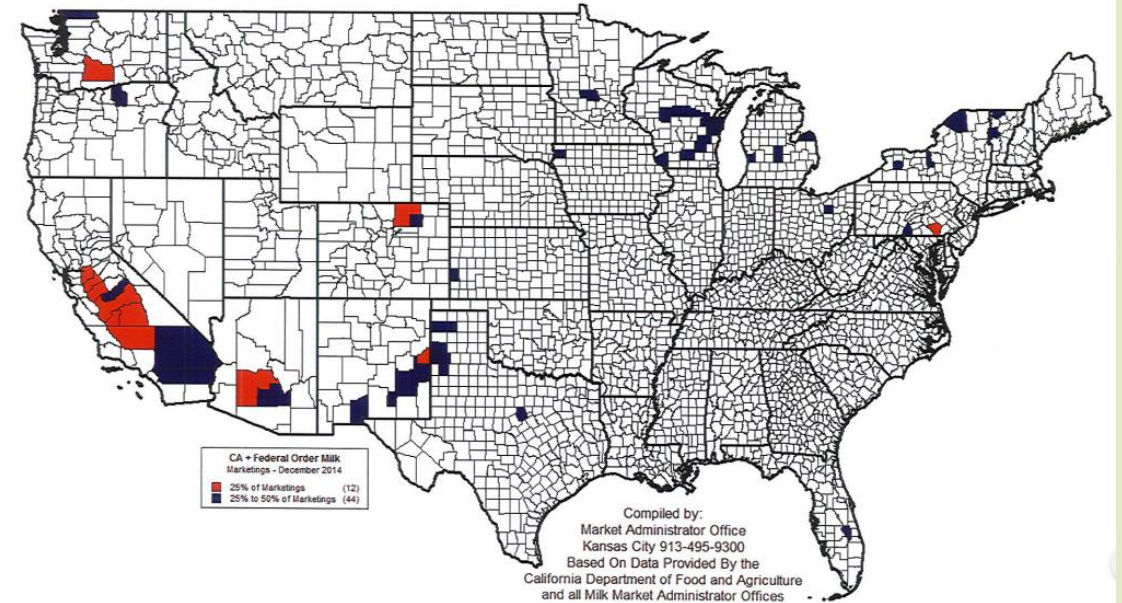
Imaginative



12 Counties Marketed 25% Of All CA + Federal Order Milk During December 2014

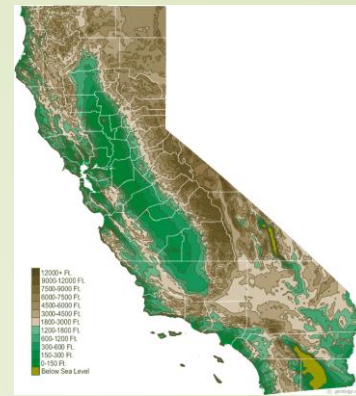


56 Counties Marketed 50% Of All CA + Federal Order Milk During December 2014

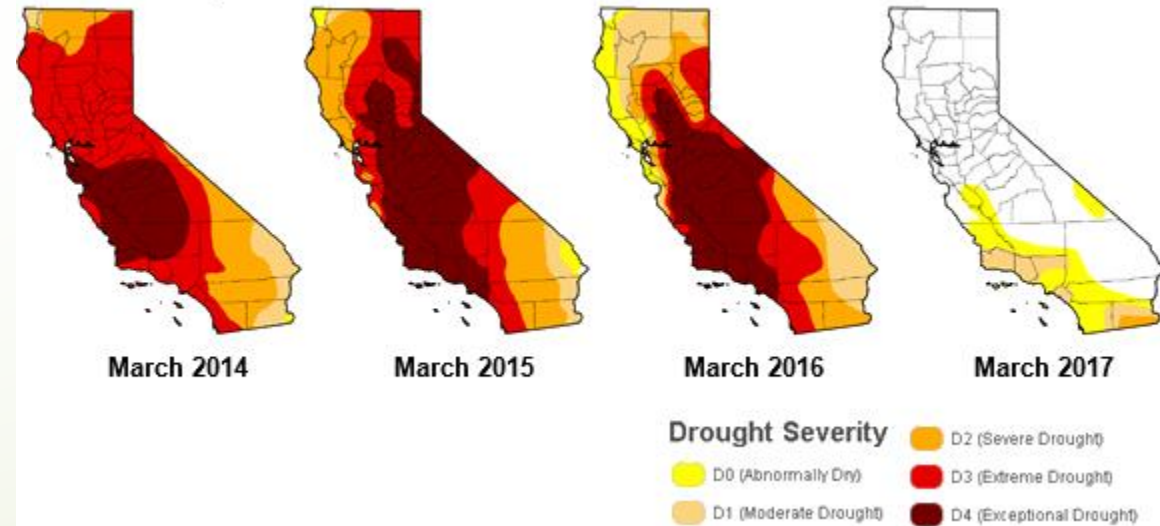


San Joaquin Valley
8 counties
c. 1050 dairies
c. 90% CA cows

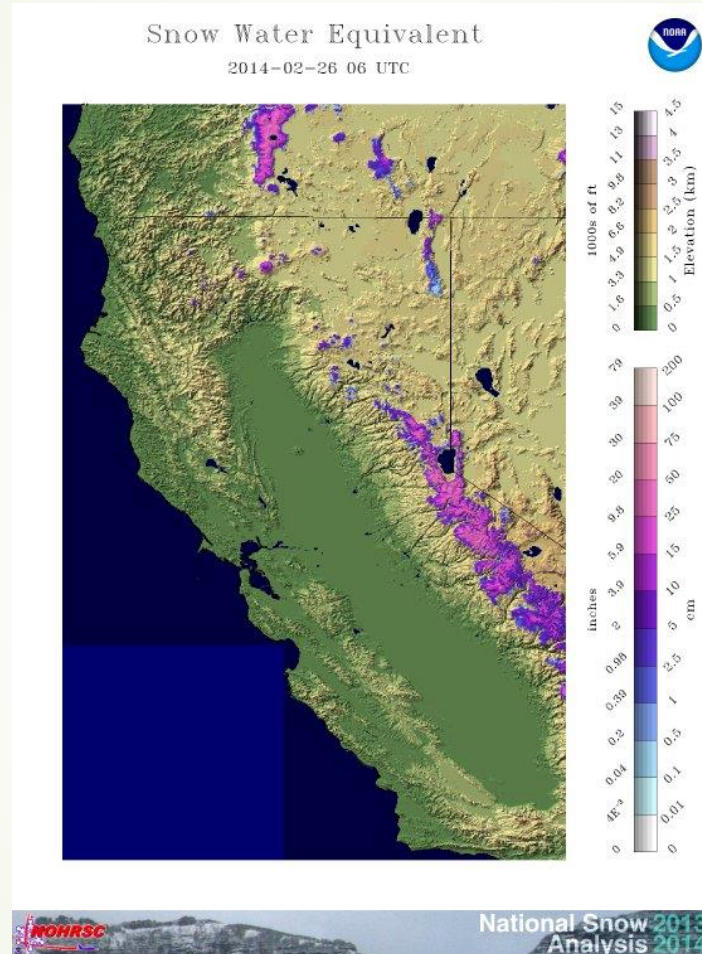
Uncertain water future



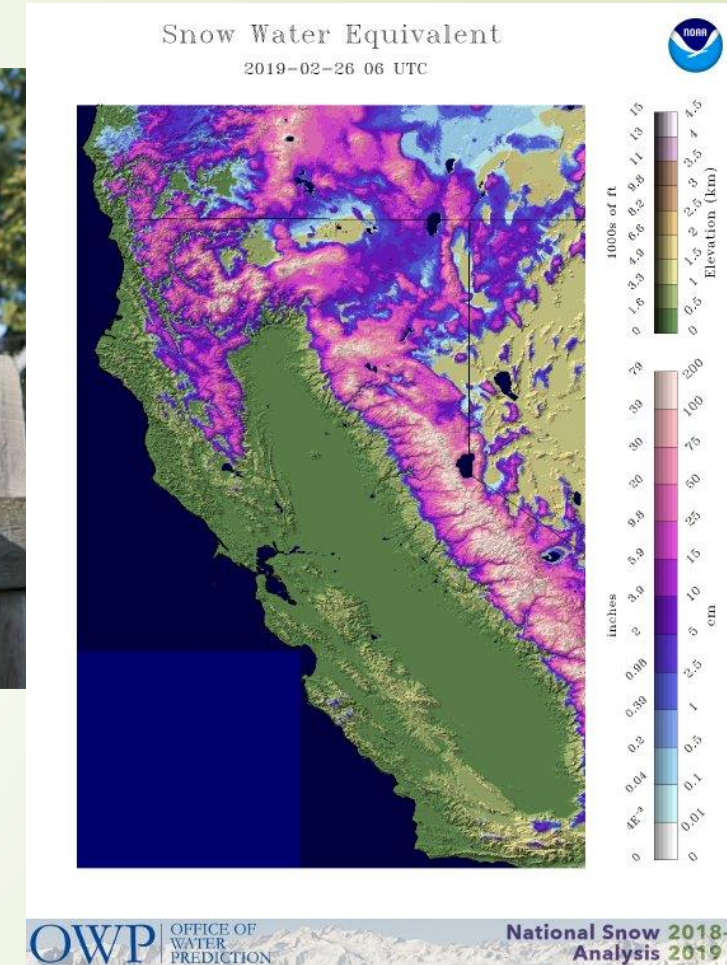
California drought status



Uncertain Rain/Snow fall

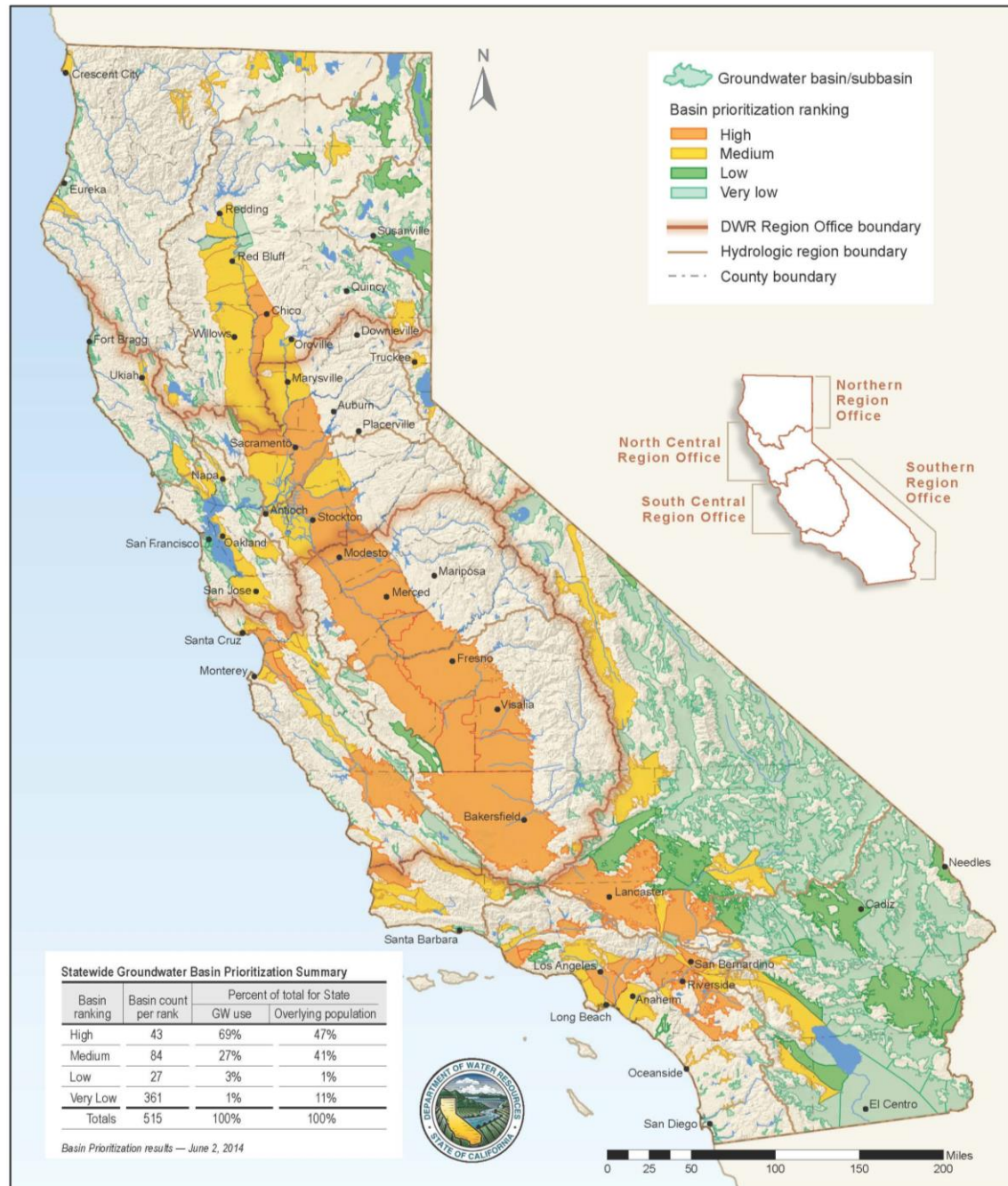


2014

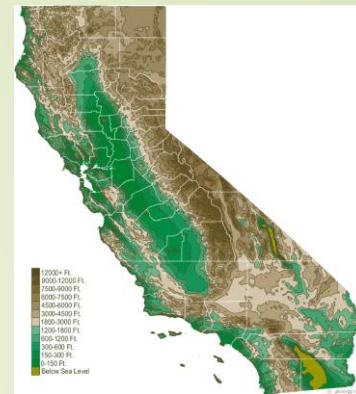


2019

<https://www.nohrsc.noaa.gov/nas>



Sustainable Groundwater Management Act SGMA



Groundwater-Level Declines



Land Subsidence

Extensive groundwater withdrawals from aquifer systems have caused land subsidence in many California basins. Land subsidence can damage structures such as wells,



Groundwater-Storage Reductions

Long-term declines in groundwater levels, if predominant within a basin and not offset by rising groundwater levels,

- Medium & High priority basins-**
- ✓ Form Groundwater sustainability agency (2017)
 - ✓ Develop ('22) -- implement plan ('40)



I'm thinking about
changing manure
management



Does waste
character, location,
volume or air
emissions change?

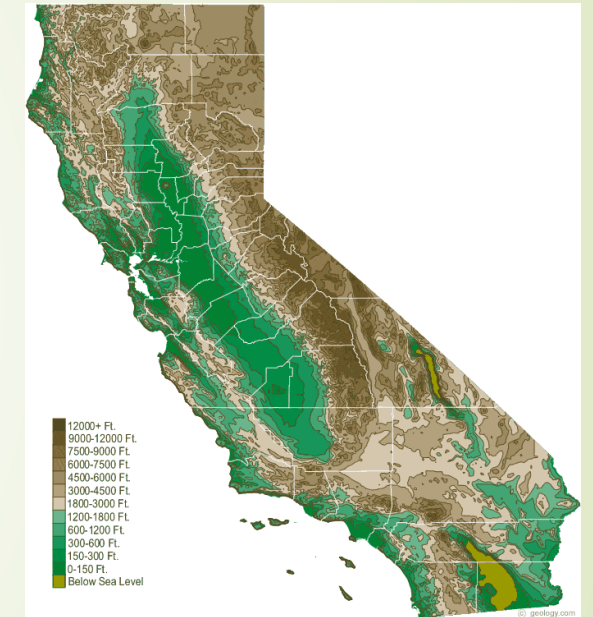
Yes, gather patience
and wallet: consult



**Ground
and
surface
waters**



**Ambient air quality
standards (particulate
matter, volatile
organic compounds,
ammonia)**



**Greenhouse gas
emissions (MANURE,
enteric)**



Safe Drinking Water Act



May 3, 2007

modified 2011, 2013, 2021??



Protect surface water

Protect **GROUNDWATER**

Nitrogen applied:Nitrogen removed ≤ 1.4
crop N use efficiency 71%

Monitor and report all applications to fields

Applies to all dairies in Valley

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

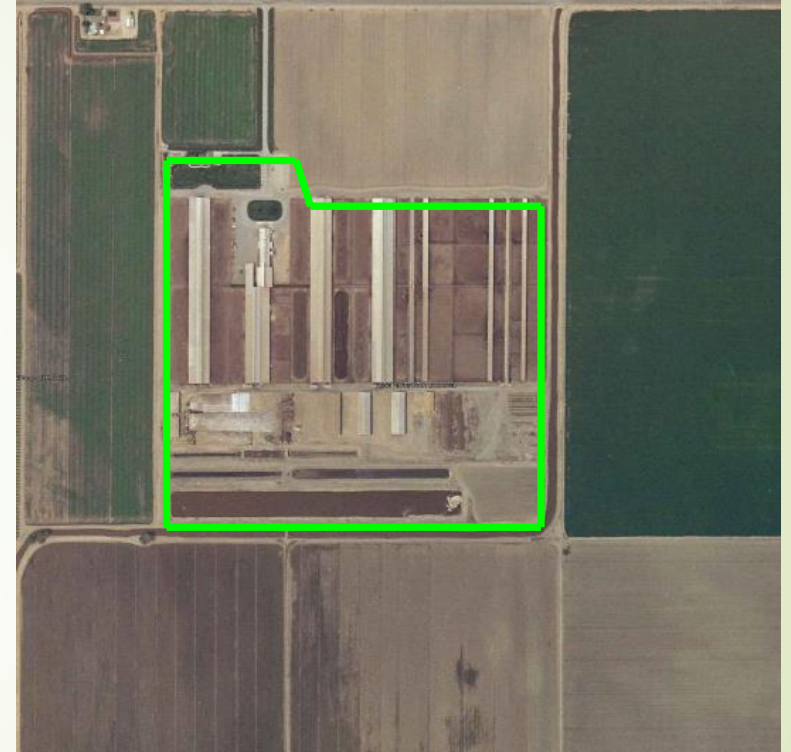
ORDER NO. R5-2007-0035

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER
FOR
EXISTING MILK COW DAIRIES



Each dairy:

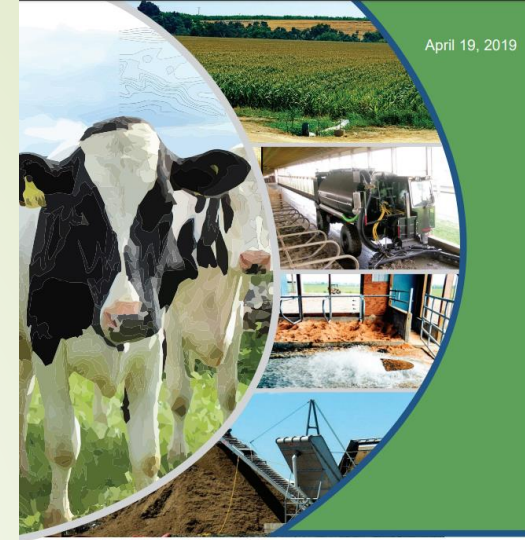
- **Waste Management Plan (WMP)**
- **Nutrient Management Plan (NMP)**
- **Do these work??**



ORDER NO. R5-2007-0035

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER
FOR
EXISTING MILK COW DAIRIES

Central Valley Dairy Representative Monitoring Program



April 19, 2019

Summary Representative Monitoring Report (Revised*)

Prepared and submitted to the Central Valley Regional Water Quality Control Board
by the Central Valley Dairy Representative Monitoring Program.

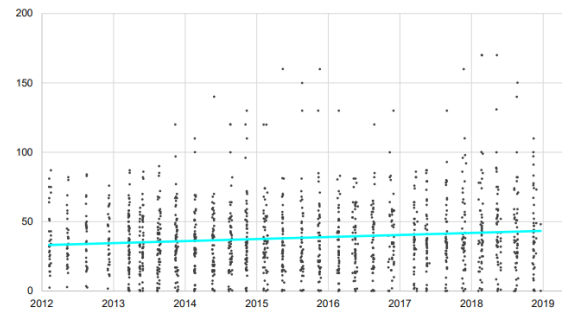


Figure 5.3.1.3k: Total nitrogen concentrations, fields (1 concentration >200 mg/L is not shown)

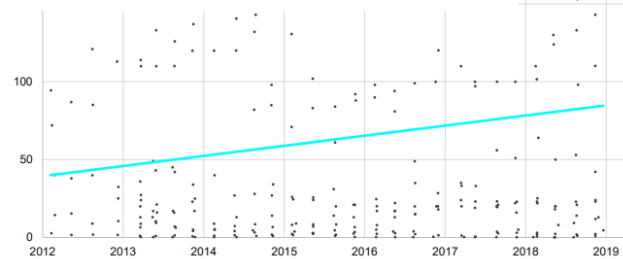


Figure 5.3.1.3n: Total nitrogen concentrations, lagoons (14 concentrations >200 mg/L are not shown)

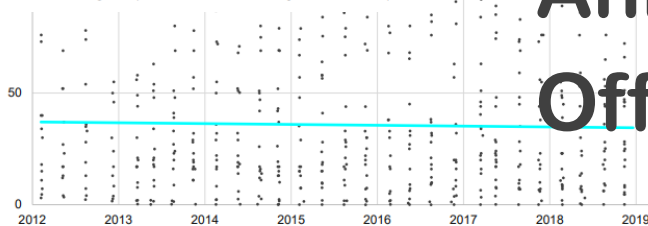


Figure 5.3.1.3m: Total nitrogen concentrations, animal housing (4 concentrations >150 mg/L are not shown)

Voluntary monitoring program

Lagoon

Fields

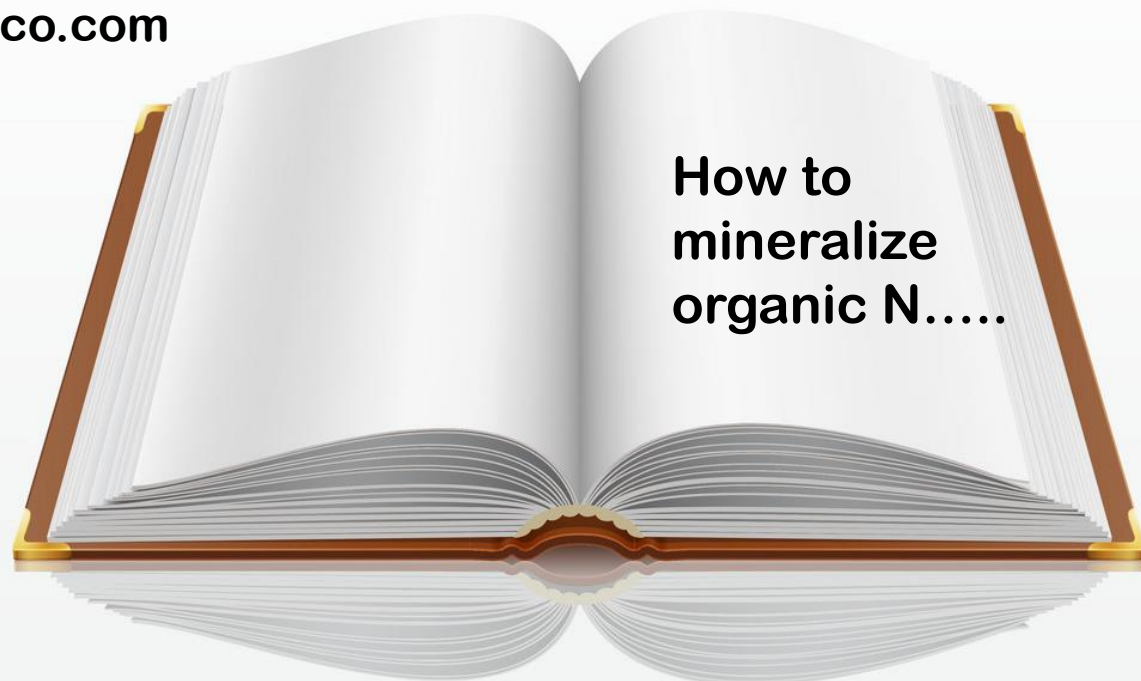
Animal housing

Off site

https://www.waterboards.ca.gov/centralvalley/water_issues/confined_animal_facilities/groundwater_monitoring/srmr_20190419.pdf



Source:Mosaicco.com



CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2007-0035

WASTE DISCHARGE REQUIREMENTS GENERAL ORDER
FOR
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Photo: Terry Dayhard's blog

Irrigation water management critical

NEW REGULATIONS COMING - 2020

What regulated entities and individuals need to know about changes in Nitrate and Salt compliance

What regulated entities and individuals need to know about changes in nitrate and salt compliance

NITRATE COMPLIANCE

Nitrate Control Program

Join a Management Zone for
Nitrate Compliance

SALT COMPLIANCE

Salt Control Program

Participate in P&O Study for Salt
Compliance

SAFE WATER

Safe Drinking Water



Improved management

Irrigation uniformity and efficiency

Nitrogen

Detailed recordkeeping

Increased research to identify new practices

Improved relationship with agency staff



Ag Exemption 2004

RIP

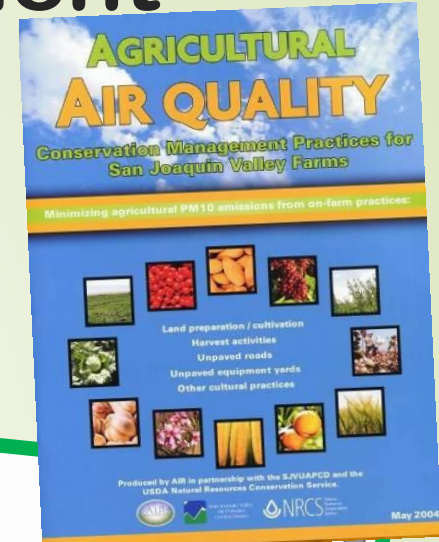
Air quality concern:

- ➡ Particulate matter: PM 10, PM fine
- ➡ Sulfate, dust, soot, ash, salts, and other pollutants
- ➡ Serious health risks



Rule 4550 - Conservation Management Practices (CMP; 12/31/2004)

- >100 acres of crops and/or >500 mature cows* (milk + dry cows)
- Feedlot & other CAFs >190* head
- Menu based approach, targeted areas around the operation
- Facilities inspected every 5 years



Conservation Management Practices: DAIRY

Farm Name: _____ CMP Plan Years: _____ to _____

Maximum Number of Milk Cows: _____ Maximum Number of Dry Cows: _____ Maximum Number of Support Stock: _____

Corral/Manure Handling

Select one of the following CMPs:

- ☐ Filtering Layer in Dairy Area
- ☐ Proper Fencing
- ☐ Proper Scraping and/or Manure Removal
- ☐ Multiple CMPs in Another Category
- ☐ Other (approved on a case-by-case basis)

Please describe the specifics of the practice(s) chosen above: _____

Overall Management/Feeding

Select one of the following CMPs:

- ☐ Proper Fertilizer Control
- ☐ Proper Fertilizer Application
- ☐ Proper Fertilizer Storage
- ☐ Proper Fertilizer Application
- ☐ Proper Fertilizer Storage
- ☐ Proper Fertilizer Application
- ☐ Other (approved on a case-by-case basis)

Please describe the specifics of the practice(s) chosen above: _____

the "Green Sheets"

*Based on actual numbers



San Joaquin Valley
Unified Air Pollution Control District

Air quality concern:

- ➡ Ozone: smog
- ➡ Nitrogen oxides (NO_x)
- ➡ Volatile organic compounds (VOCs)
- ➡ Sunlight and heat

San Joaquin Valley
Air Pollution Control District
Air Pollution Control Officer's
Determination of VOC Emission Factors
for Dairies



To reduce VOC emissions ...

Keep wet things wet



And dry things dry and under cover

Six Permitted Sources (2006, 2011)

- Select Mitigation Measures for each source:

- Feed

- General

- **Silage**

- Milk Parlor

- Cow Housing

- Freestalls

- Corrals

- Liquid manure

- Land application

- Solid manure





**Funds for irrigation pumps, feed mixers,
energy saving technologies**



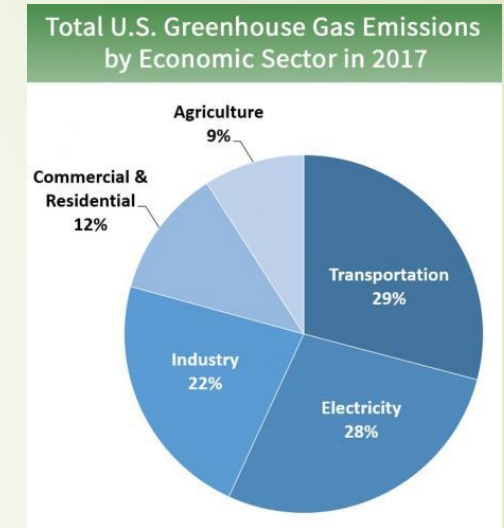
Improved silage management
Pack density
Cover management
Open face management
Reduced dust



QUIZ

Globally livestock are responsible for the largest contribution to ghg (bigger than transportation) **TRUE**

In the United States livestock are responsible for the largest contribution to ghg (bigger than transportation)



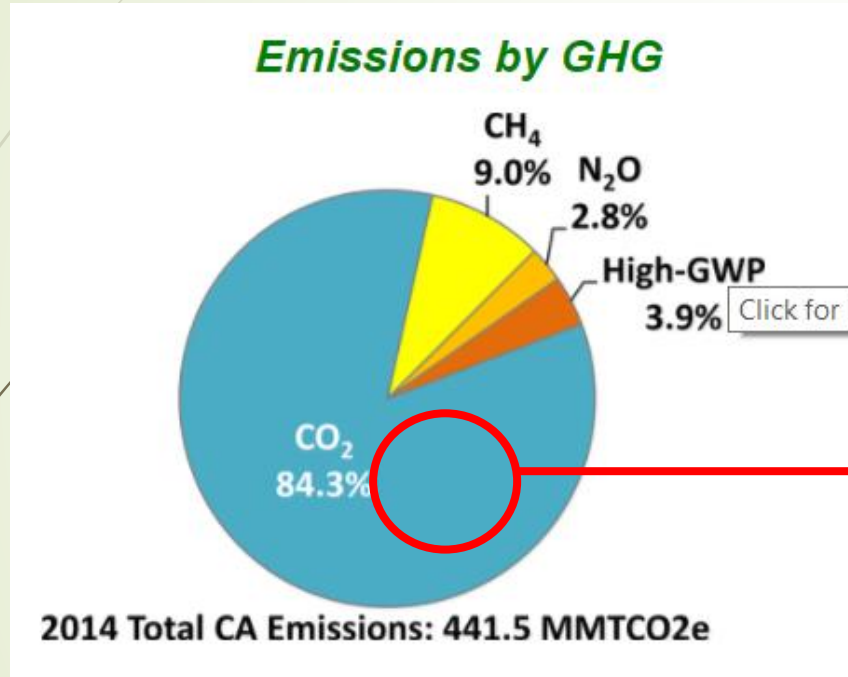
FALSE

United States dairy sector strives to be net zero carbon by 2050

TRUE

California's carbon story due 2030 . . .

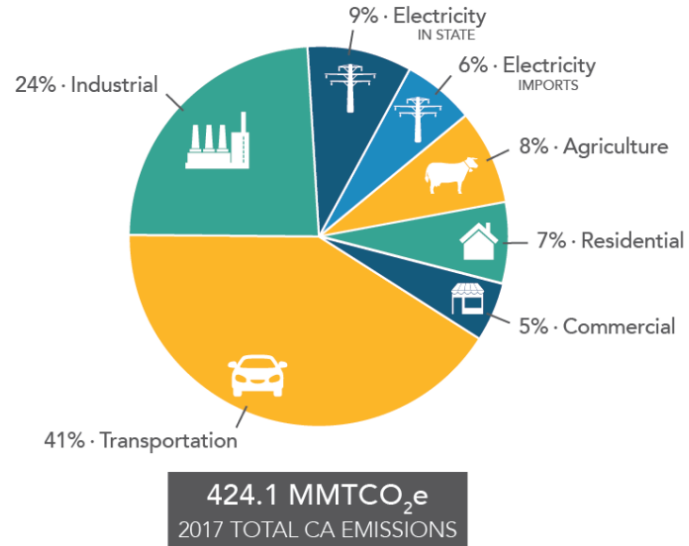
Greenhouse Gases



- Methane (CH₄) – 25X more global warming potential than CO₂
- 59% of CH₄ comes from Ag sources (primarily from manure + enteric fermentation)

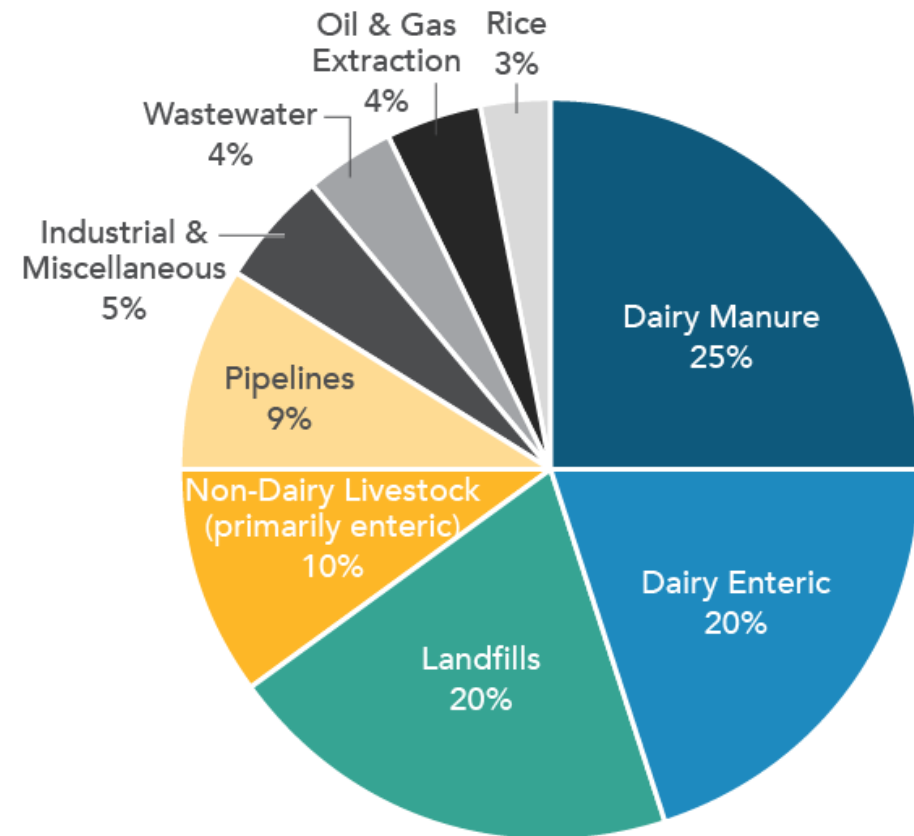
SB32 – Reduction of Green house gases (GHG 2006)
SB1383 – Short Lived Climate Pollutants (SLCP 2016)

2017 GHG Emissions by Main Economic Sector



Why focus on manure methane?

2013 Methane: 118 MMTCO₂e (20-yr GWP)





SB1383 / SLCP Reduction Strategy

Roadmap/timeline identified in legislation

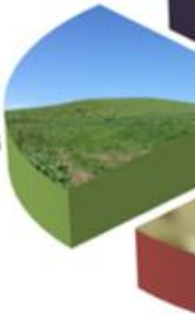
- Dairy industry, CDFA and other agencies and organizations
- Develop incentive-based development and research programs to fill-in data gaps.
- Identify and address technical, market, regulatory, and other challenges and barriers
- Develop/adopt regulations to reduce methane emissions by up to 40 percent below 2013 levels by 2030

SB1383 / SLCP Reduction Strategy



DAIRY AND LIVESTOCK GRE

Subgroup #1:
Non-Digesters



Implement regulations on or after January 1, 2024, if :

- (A) technologically feasible,
- (B) economically feasible considering milk and live cattle prices and the commitment of state, federal, and private funding, among other things, and that markets exist for the products generated ... methane emissions reduction projects, including composting, biomethane, and other products.

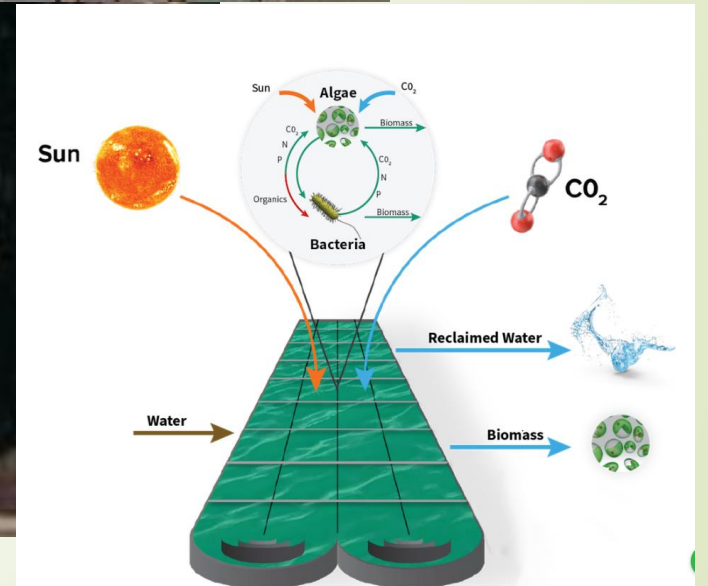


- **Treat manure anaerobically**
- **Make and use biogas**
- **Replace natural gas or as vehicle fuel**
- **Predominantly NOT electricity production**

<https://www.cdfa.ca.gov/oefi/ddrdp/>

Dairy Digesters


Year	No.
2015	6
2017	16
2018	42
2019	43
	107





- Prevent manure solids from being in anaerobic conditions
- Need to document (verify) methane reductions achieved

<https://www.cdfa.ca.gov/oefi/AMMP/>



AMMP funded projects in CA

Year	No.
2017	18
2018	39
2019	50
	107

AMMP

- conversion from flush to scrape
- solid separation then
 - dry,
 - spread,
 - solid storage or
 - composting



AMMP

- **pasture-based management practices**
 - ☐ **convert to pasture-based,**
 - ☐ **increase time livestock spend at pasture, and/or**
 - ☐ **construct compost bedded pack barn.**





\$250,000,000 State Cap and Trade funds
Work closely with agencies to guide research





Work with -----
Producers
Regulatory agency staff
Nutrient management consultants
Engineers
Citizen groups

University of California

Agriculture and Natural Resources



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Department of Animal Science, UC Davis
UC Agriculture and Natural Resources

Card by [Amy Krouse Rosenthal](#) (Author), [Tom Lichtenheld](#) (Illustrator)

Dairy producers are

Creative

Ingenious

Gifted

Innovative

Resilient

Inventive

Imaginative