

***Grazing and Water Quality***  
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 UC Davis – UC Cooperative Extension



 **Rangeland Watershed Laboratory**  
 rangelandwatersheds.ucdavis.edu

 **UC CE**  
 University of California  
 Agriculture and Natural Resources

**Today (In the context of GRAP)**

**California's rangeland WQ partnership.**  
*Where we've been and where we are now.*



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**WQ impairments, grazing, and California.**  
*Status check on grazing land WQ conditions.*



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WQ impairments, grazing, and California.  
*Status check on grazing land WQ conditions.*

**Future UC grazing and WQ activities.**  
*Where do we go now?*



**Stakeholder concerns about GRAP....**

- Transparency
- Preconceptions
- Reinventing wheel
- Evidence of need
- Dissolving trust
- One-size-does-not-fit-all
- Socio-economic-ecological consequences

*GRAP Listening Sessions*



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*GRAP Listening Sessions*





### Early 1990's, concerns about...

- Microbial pollutants – *Cryptosporidium*, *E. coli*
- Nutrients – nitrogen and phosphorus
- Sediment – erosion, fish habitat



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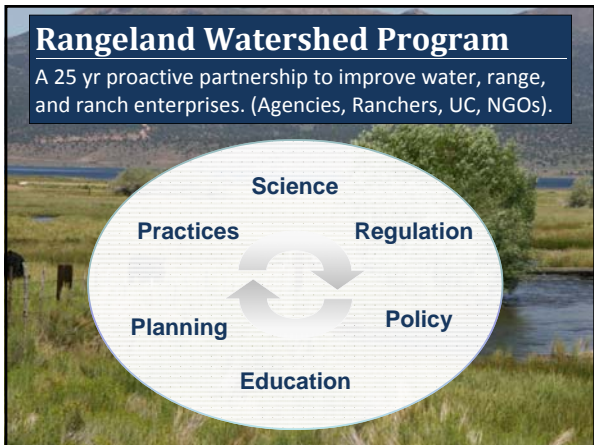
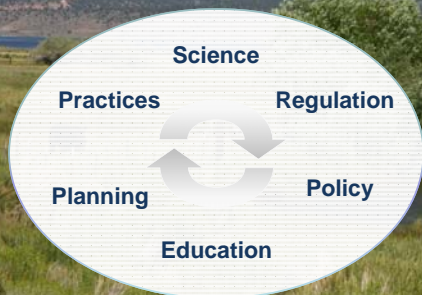
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**Rangeland Watershed Program  
was formed to address these  
concerns.**



### Rangeland Watershed Program

A 25 yr proactive partnership to improve water, range, and ranch enterprises. (Agencies, Ranchers, UC, NGOs).



### Rangeland Watershed Program

- Integrate science, policy, and management.



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- Effective policies and strategies to safeguard water quality.
- Education to identify and manage WQ risks.
- Ranch specific WQ management plans and actions.
- Supporting research base.



## 25 years of progress

**CA Rangeland WQ Management Plan – complete 1995**



1990

2015

## CA Rangeland WQ Management Plan



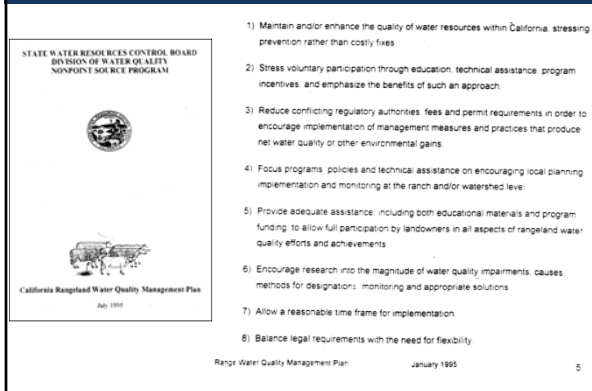
California Rangeland Water Quality Management Plan

July 1995

- 1. Outlines science-based management strategies to prevent water quality impairments.**
- 2. Provides for educational programs to develop on-ranch water quality protection strategies.**

[http://www.waterboards.ca.gov/publications\\_forms/publications/general/docs/ca\\_rangeland\\_wqmgmt\\_plan\\_july1995.pdf](http://www.waterboards.ca.gov/publications_forms/publications/general/docs/ca_rangeland_wqmgmt_plan_july1995.pdf)

## Goals and Approach



**Crafted in partnership**





## 25 years of progress

CA Rangeland WQ Management Plan – complete 1995

Ranch WQ Planning Short Courses – 1994 to present

1990

2015

## Ranch Water Quality Planning Short Course

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- 1994-2015, >80 courses taught, 35 counties, 1000+ ranches, 2+ million acres.
- Ranch Water Quality Plan – tailored to ranch, watershed, and regulatory vehicle.
- Curriculum updates to include newest research and local compliance requirements.



## 25 years of progress

CA Rangeland WQ Management Plan – complete 1995

Ranch WQ Planning Short Courses – 1994 to present

On-ranch WQ Management Practice Implementation

1990

2015



## Short course effectiveness evaluations



### Evaluation of California's Rangeland Water Quality Education Program

Author(s): Stephanie Larson, Kelly Smith, David Lewis, John Harper, and Melvin George

Source: Rangeland Ecology & Management, 58(5):514-522.

Published By: Society for Range Management

DOI: <http://dx.doi.org/10.2111/04-16.1>

URL: <http://www.bioone.org/doi/full/10.2111/04-16.1>

### California's Rangeland Water Quality Management Plan: An Update

Author(s): Melvin George, Stephanie Larson-Praplan, John Harper, David Lewis, and Michael Lennox

Source: Rangelands, 33(1):20-24, 2011.

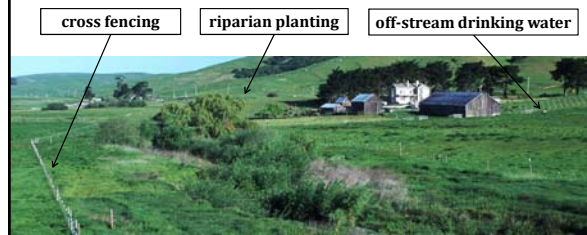
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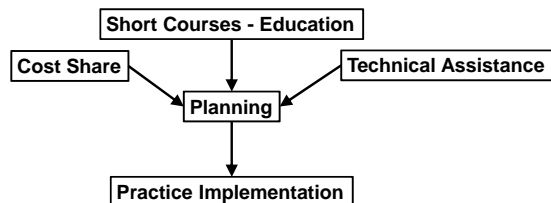
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## USDA – Practice Cost Share (2009-2014)

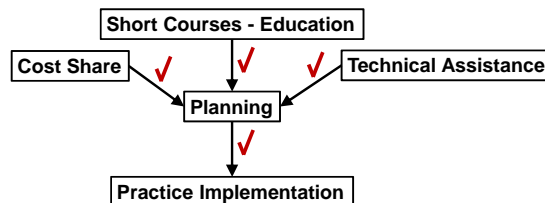
- \$302 M in rangeland WQ practice implementation
- 7,385 contracts with landowners
- 5.7 M acres contracted



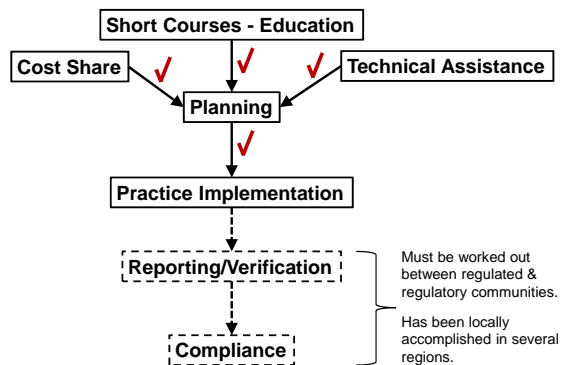
## What is Regulatory Compliance?



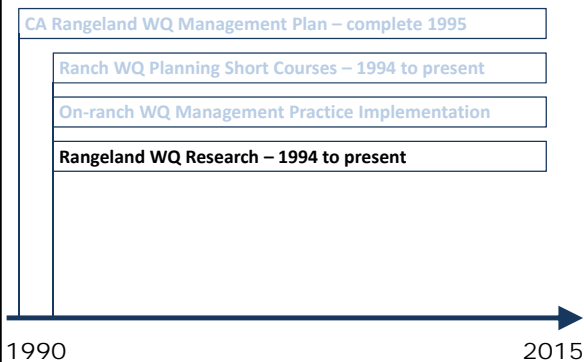
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## 25 years of progress



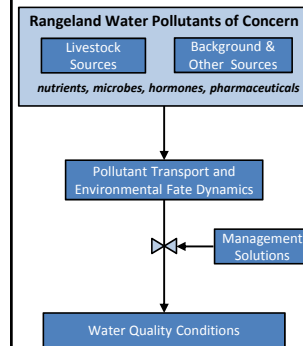


## Over 100 research papers

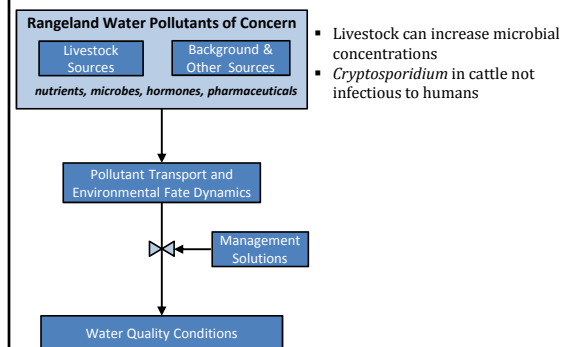
- Pollutant sources on grazing lands
- Transport, fate, mitigation of these pollutants
- WQ conditions on rangelands



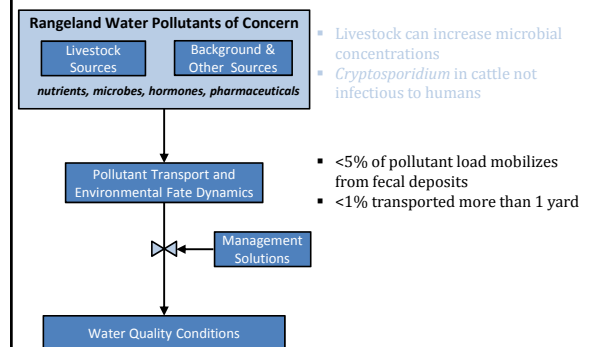
## The Line of Research



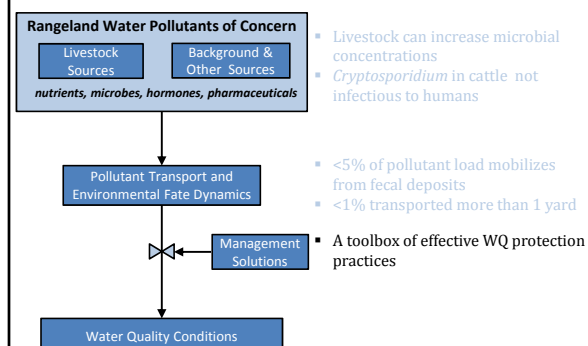
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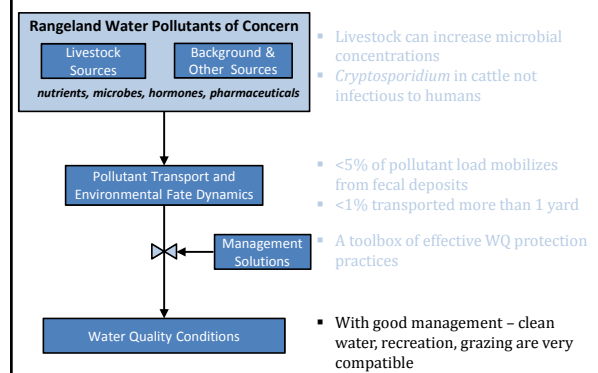
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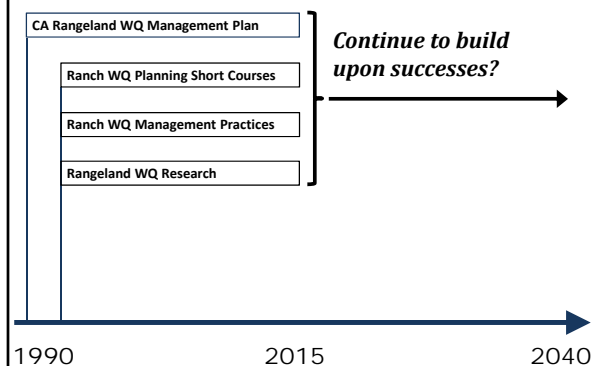


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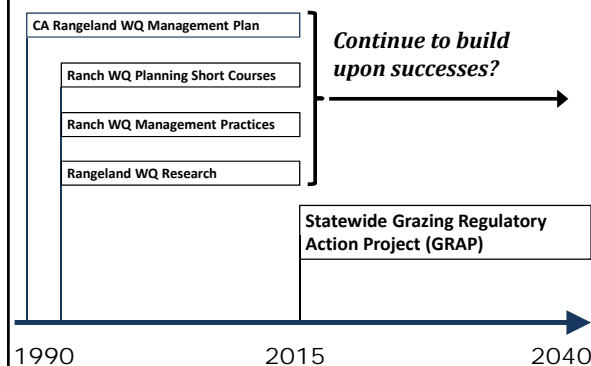




## The next 25 years ??



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## Water quality impairments in CA?

### GRAP Listening Sessions

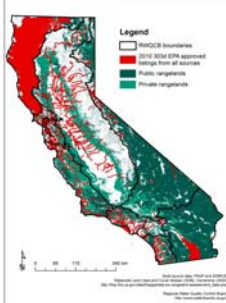
- Stakeholders were directed to 2010 303d impaired water body list for supporting information on the extent of grazing related WQ impairments.



2010 303d Impaired Water Bodies

## Grazing as a potential source of impairment?

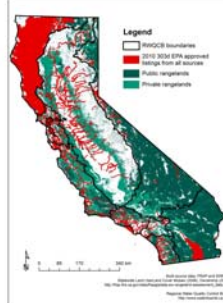
### All WQ Impairments (n=7,294)



2010 303d Impaired Water Bodies

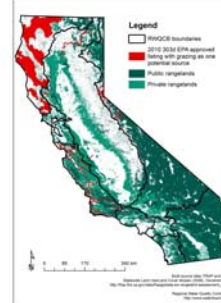
## Grazing as a potential source of impairment? 4% of all listings

### All WQ Impairments (n=7,294)



2010 303d Impaired Water Bodies

### Grazing a Potential Source (n=324)



Leslie Roche and D.J. Eastburn. 2015



### Grazing as a *potential* source of impairment?

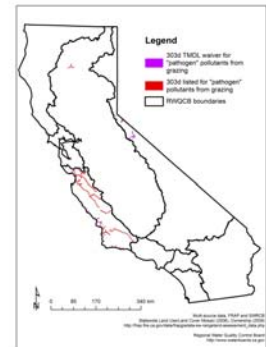
- 26% (85 of 324) of *potential* grazing impairments are pollutants not likely associated with grazing.
- All of these are in Central Coast RWQCB.

Pollutant	% Listings (No. Listings)
Salinity	12% (39)
pH	4% (14)
Unknown toxicity	4% (13)
Sediment toxicity	2% (6)
Chlorpyrifos	3% (8)
Diazinon	2% (5)

### Pathogens – *potential* grazing impairment

29% (93) of 324 listings

Indicator	% Pathogen Listings
Fecal Coliforms	41
<i>E. coli</i>	29
"pathogens"	23
Enterococcus	5
Total Coliforms	2



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#### USEPA Guidance

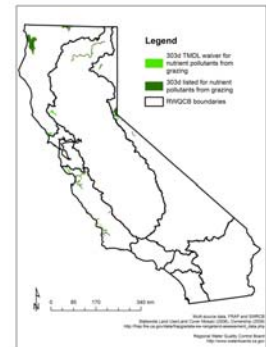
- E. coli* as indicator
- 100 or 126 cfu/100 mL



### Nutrients – *potential* grazing impairment

23% (76) of 324 listings

- Nitrogen
- Phosphorus



2010 303d Impaired Water Bodies

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- Nitrogen
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#### Areas with high background geologic N

Morford. Ph.D. Dissertation UCD. 2015.

Morford et al. *Nature*. 2011.

Holloway and Dahlgren. *Global Biogeochemical Cycles*. 2002.

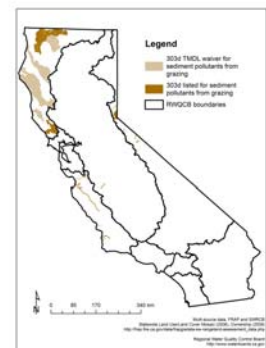
Holloway et al. *Nature*. 1998.



### Sediments – *potential* grazing impairment

16% (52) of 324 listings

- turbidity
- suspended solids
- fines



2010 303d Impaired Water Bodies



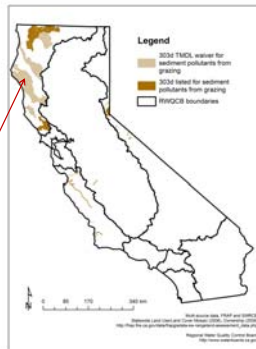
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- **turbidity**
- **suspended solids**
- **fines**

TMDLs completed.  
Grazing not found to be a source.  
Roads and historic management.

USEPA. Van Duzen River and Yager Creek Total  
Maximum Daily Load for Sediment. 1999.  
Lewis et al. *California Agriculture*. 2001.



## Preliminary Findings

Grazing as a *potential* source of impairment

- Represents **only** 4% of WQ impairments in CA.

2010 303d Impaired Water Bodies

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- **70% of microbial pollution listings are based on antiquated standards.**

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Grazing as a *potential* source of impairment

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- 35% of these listings are *already* addressed w/ a TMDL, or some other compliance vehicle.
- 26% are for pollutants *not associated* with grazing.
- 70% of microbial pollution listings are based on antiquated standards.
- **GRAP claims 146 fewer potential grazing impairments than contained in 2010 303d list.**

2010 303d Impaired Water Bodies



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  - *Peer-reviewed synthesis paper*
  - *Series of 1-2 page policy/informational briefs*
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  - *Peer reviewed policy papers*
- **Participate in grass-roots “grazing water quality workgroup”**
  - *Renewal of the WQ partnership*
  - *Build on existing successes and partnership*
  - *A positive alternative*

## Rangeland Watershed Laboratory

<http://rangelandwatersheds.ucdavis.edu>

