

Update – Grazing and Water Quality

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UC Davis



UC RANGELANDS
Supporting Working Landscapes

rangelands.ucdavis.edu

Today

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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Next Steps.

Where do we go now?



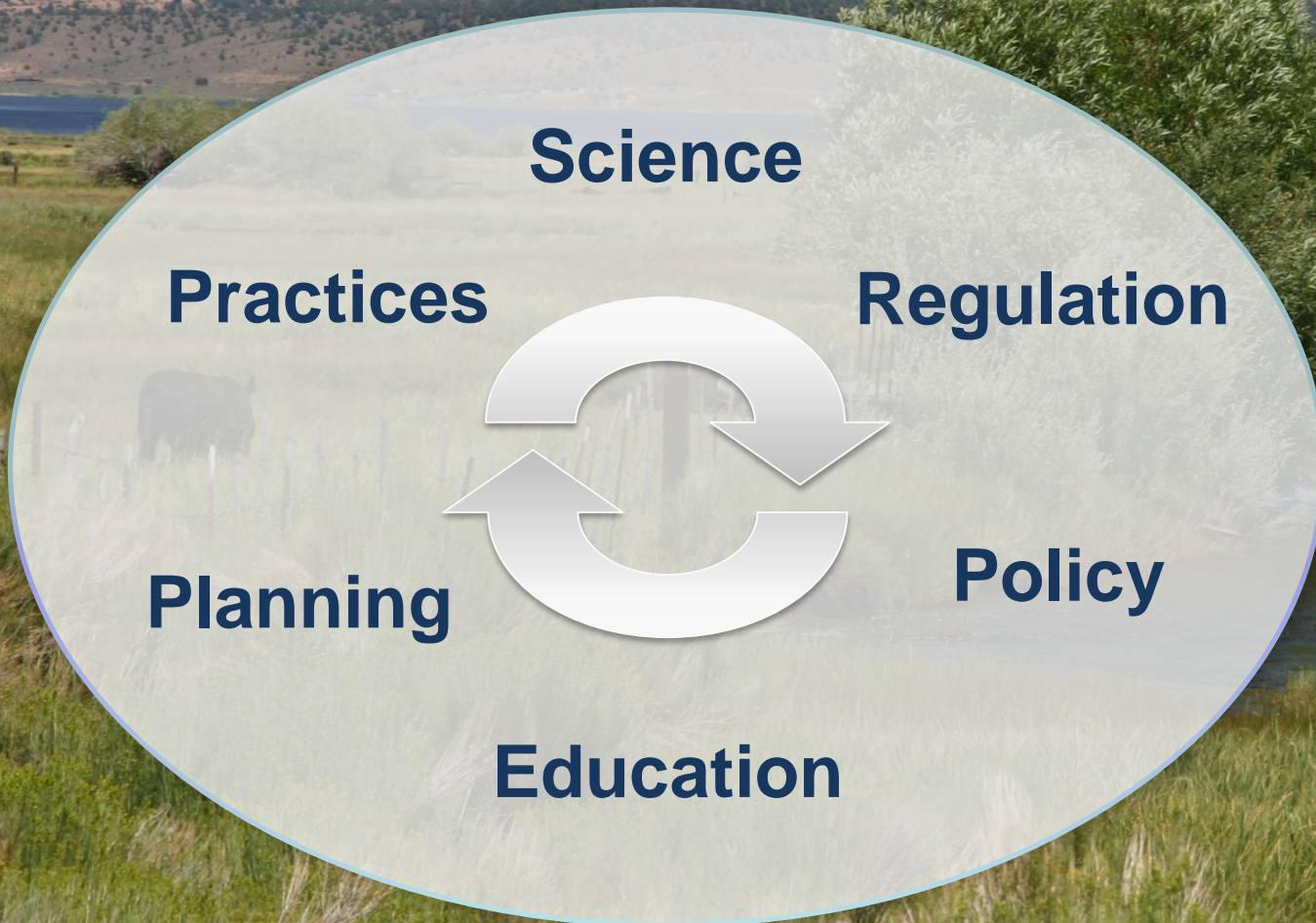
In the 1990's, concerns about...

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

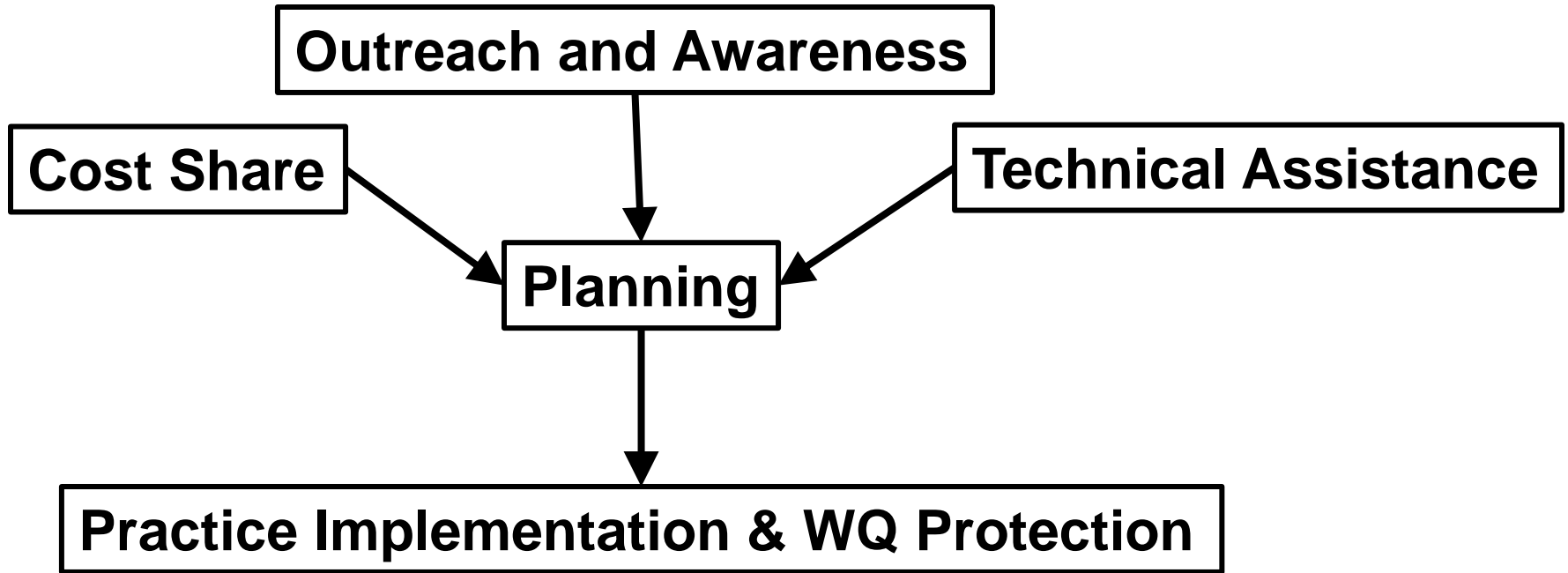


Rangeland Watershed Program

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



WQ protection over the past 25 year



Ranch Water Quality Planning Short Course

- SWRCB funded curriculum development.
- 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.



USDA – Practice Cost Share (2009-2014)

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

cross fencing

riparian planting

off-stream drinking water



Over 100 research papers

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





RANGELAND WATERSHED LABORATORY

Microbial Water Quality Information Center

Rangeland Watershed Laboratory Home [Plant](#)

Microbial Sources



Beneficial Uses



Rangeland Watersheds: Uses and Benefits to Society

Eighty-five percent of the State's surface drinking and irrigation water are generated and stored within California's 30 million acres of rangeland watersheds. These watersheds are often extensively grazed by livestock, predominantly beef cattle. Over the past 2 decades, microbial pollutants have been a primary water quality concern associated with livestock production on California's rangeland watersheds. Drinking water treatment procedures may not be completely effective against some microbial pathogens (especially *Cryptosporidium*), so managing livestock is a vital practice to reduce the prospect of extensive waterborne outbreaks as in Milwaukee in 1993.

Overview

Indicators

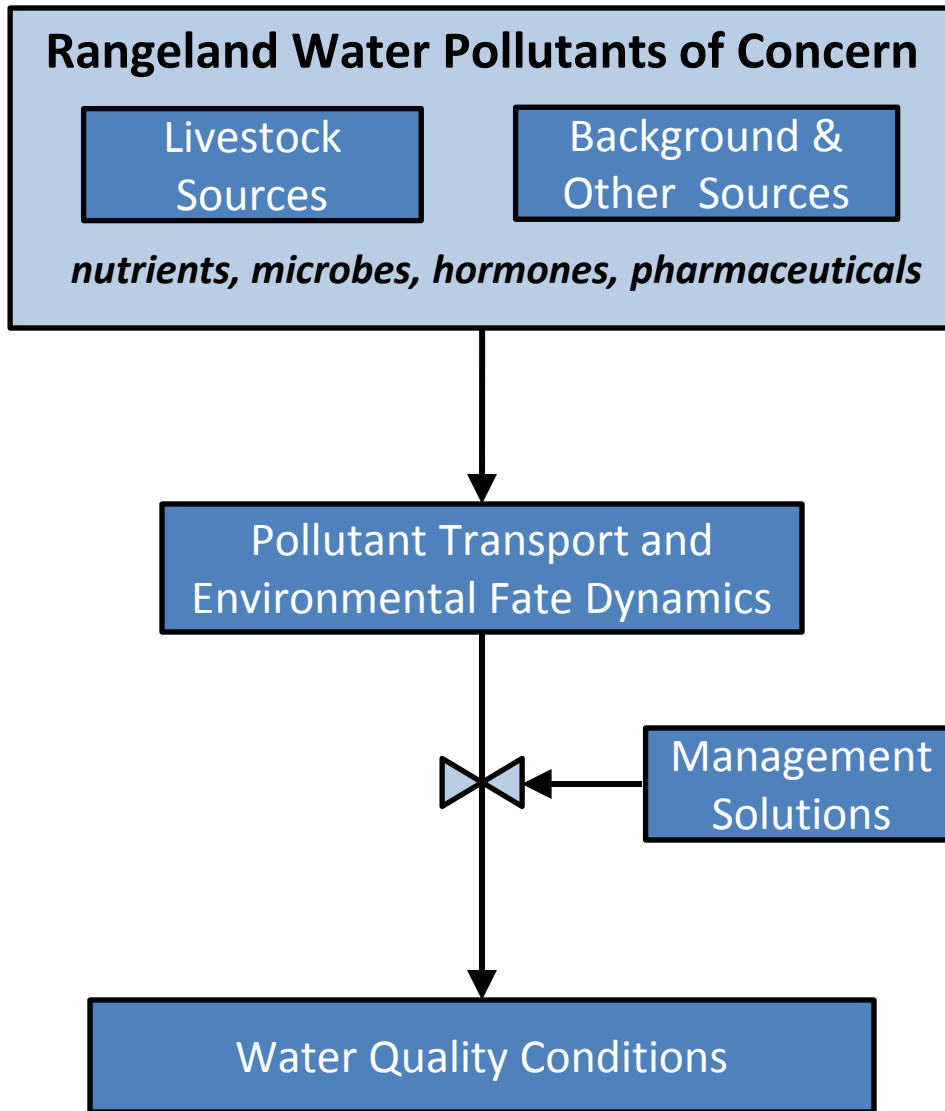
Risk Factors

Science

FAQ

**Use pointer to explore clickable features. Beta Version 1.0

The Line of Research



The Line of Research

Rangeland Water Pollutants of Concern

Livestock
Sources

Background &
Other Sources

nutrients, microbes, hormones, pharmaceuticals

Pollutant Transport and
Environmental Fate Dynamics

Management
Solutions

Water Quality Conditions

- Livestock can increase microbial concentrations
- *Cryptosporidium* in cattle not infectious to humans

Key New Finding

<i>Cryptosporidium</i>	No. Observations
<i>C. ryanae</i>	61/81 (75%)
<i>C. bovis</i>	19/81 (24%)
<i>C. andersoni</i>	1/81 (1%)
<i>C. parvum</i>	0/81 (0%)

E.R. Atwill et al. In Prep.

- Species and subtypes identified in cattle have low to no infectivity for humans.
- Protozoal contamination by cattle may not be the public health threat once thought.

Prevalence of *E. coli* O157:H7 Wildlife and Beef Cattle CA Central Coast, 2008-10



E. coli O157:H7

Feral pig	10/200	(5%)
Coyote	2/95	(2%)
Am. crow	5/93	(5%)
Cowbird	2/60	(3%)
Rabbit	0/108	(0%)
Skunk	0/63	(0%)
Tule elk	3/150	(2%)
Deer	0/447	(0%)
Rodents	2/1043	(0.2%)
Beef cattle	68/2715	(2.5%)

The Line of Research

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Pollutant Transport and
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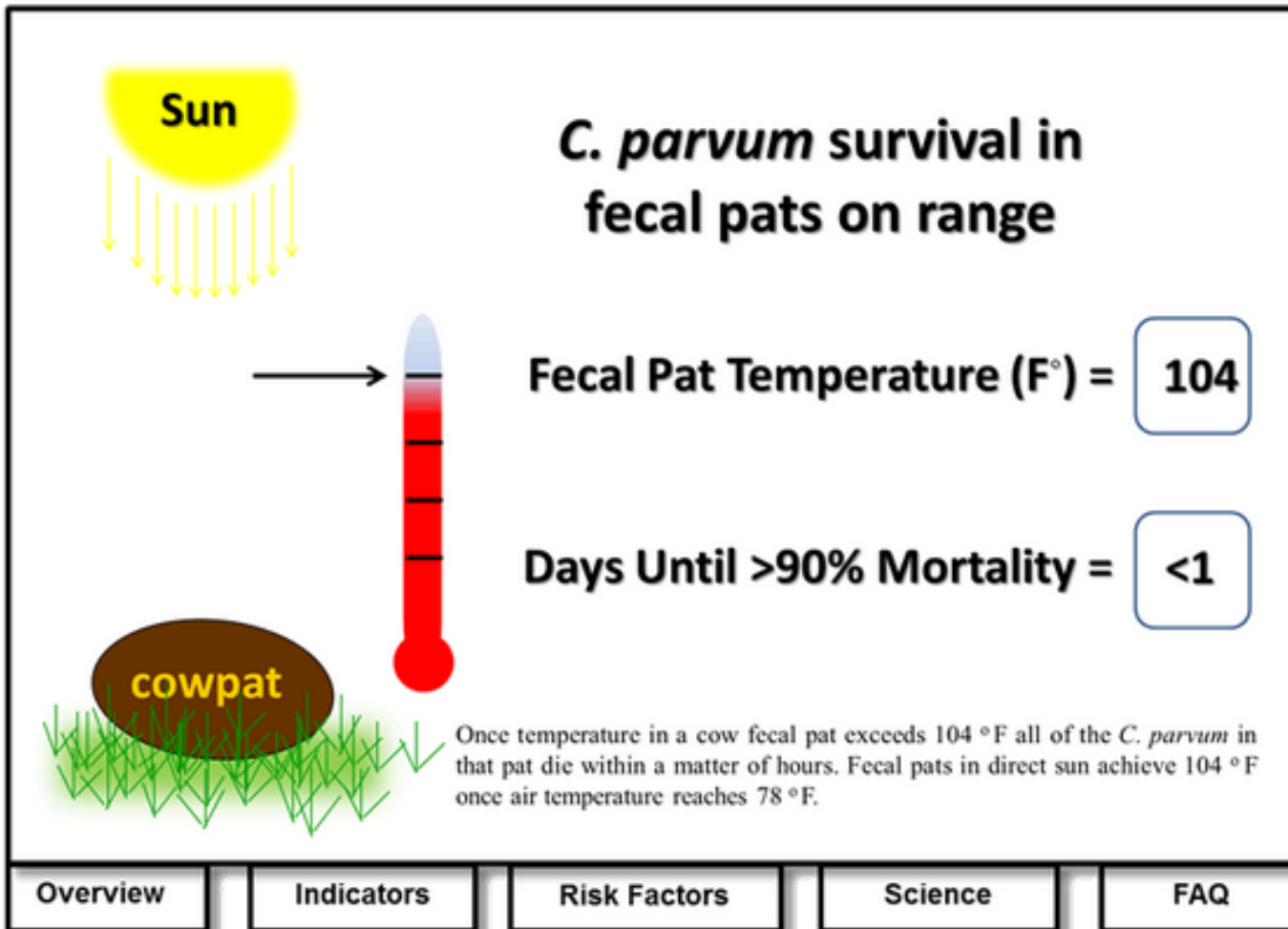
Management
Solutions

Water Quality Conditions

- Livestock can increase microbial concentrations
- *Cryptosporidium* in cattle not infectious to humans
- Can have rapid inactivation of microbes
- <10% of pollutant load mobilizes from fecal deposits

Key Findings

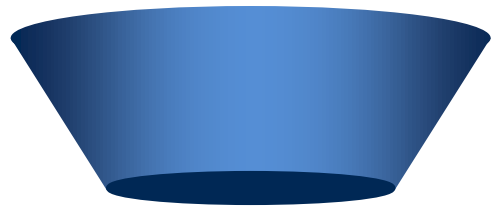
Cryptosporidium eggs die in one day of 78 F air temperature in direct sun.



Cryptosporidium parvum Survival in the Environment

The survival of pathogens in the environment is highly correlated to weather patterns. In hot weather, feces quickly dry out, killing most pathogens that were contained within them. In cooler weather, fecal pats are a more favorable environment for pathogens as the pats remain moist for a much longer period of time. To evaluate and confirm this phenomenon, we measured the ambient temperature and the temperature within fecal pats in two different environments- sun and shade, for a year. [More>>](#)

The whole range is a microbial filter...



>90% of pollutants trapped at fecal pat



70-99% trapped each additional 1 yard



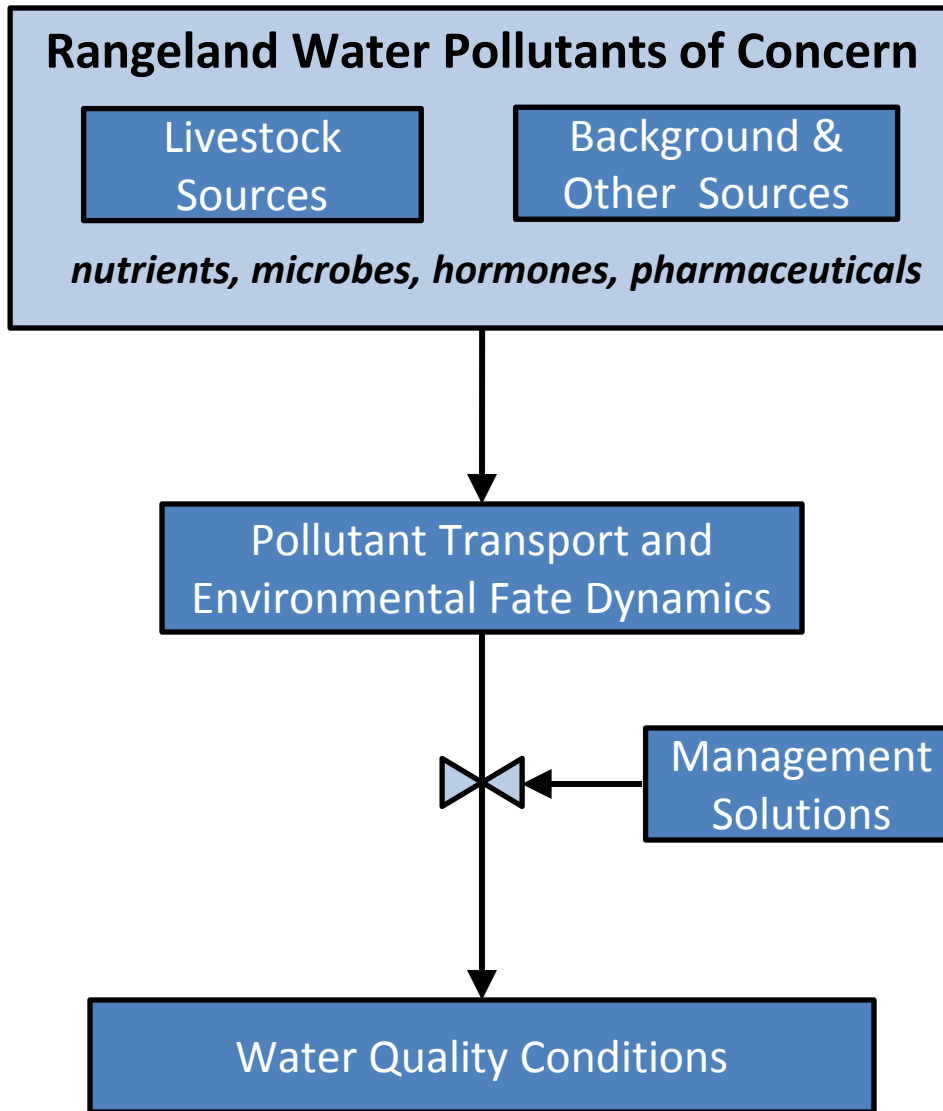
30-70% trapped in riparian areas



fecal pat

**Similar findings for:
Pharmaceuticals and
Hormones**

The Line of Research



- Livestock can increase microbial concentrations
- *Cryptosporidium* in cattle not infectious to humans
- Can have rapid inactivation of microbes
- <10% of pollutant load mobilizes from fecal deposits
- A toolbox of effective WQ protection practices

Range management that reduces water pollution risk

Moderate stocking

Set stocking rate in balance with forage production and site resiliency to reduce impacts to soil and vegetation.

Manage livestock distribution

Distribute grazing and waste across the landscape, and actively manage grazing intensity in critical hydrologic zones.

Manage wet season

Distribute livestock to resilient soils and non-critical hydrologic zones during saturated conditions.

Prescribed grazing, cross fencing, off-stream drinking water, targeted supplemental feeding, riparian pastures, herding, vegetative buffer strips

**Research
Result**

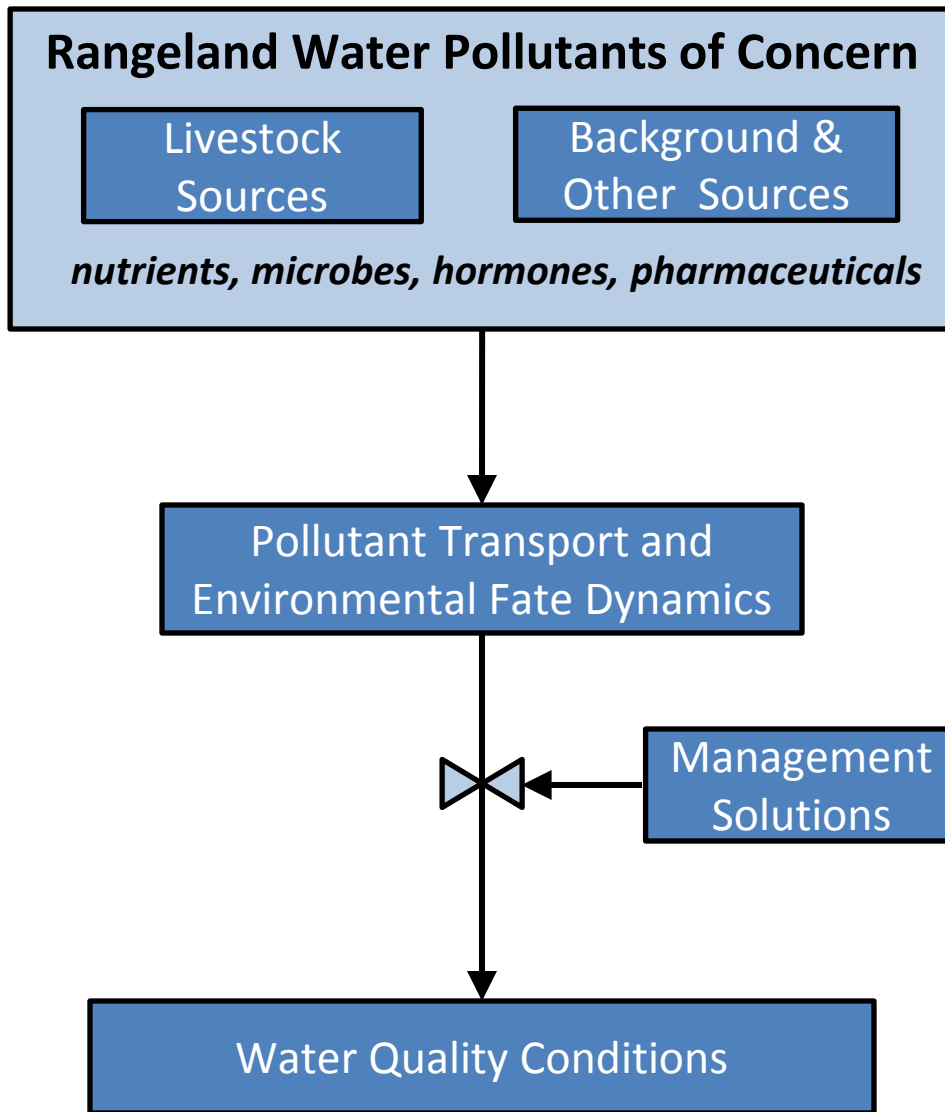
Over 60% of cattle fecal loading is near livestock attractants in summer

**Management
Implication**

We can position salt, feed, water to attract cattle and pathogens to “safe” areas – not near streams or runoff areas



The Line of Research



- Livestock can increase microbial concentrations
- *Cryptosporidium* in cattle not infectious to humans
- <10% of pollutant load mobilizes from fecal deposits
- <70% transported more than 1 yard
- A toolbox of effective WQ protection practices
- With good management – clean water, recreation, grazing are very compatible

Water quality impairments in CA?

2012 303d Impaired Water Bodies

CA.GOV CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
STATE WATER RESOURCES CONTROL BOARD

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Office of Governor Edmund G. Brown Jr. Visit his Website
Board Chair Felicia Marcus Visit the Water Board Members Page

Home → Water Issues → Programs → Tmdl

Impaired Water Bodies

Click on the "2012" bar to expand and retract the information.

- 2012 Integrated Report Approval Documents

Listing a water body as impaired in California is governed by the [Water Quality Control Policy for developing California's Clean Water Act Section 303\(d\) Listing Policy](#). The State and Regional Water Boards assess water quality data for California's waters every two years to determine if they contain pollutants at levels that exceed protective water quality criteria and standards. This biennial assessment is under Section 303(d) of the [Federal Clean Water Act](#).

Please allow time for the information below to appear. Tabs will be available to navigate to various topics.

Final 2012 California Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report)

2012 Integrated Report Map 303(d) List Admin. Record Data Download Contact Us

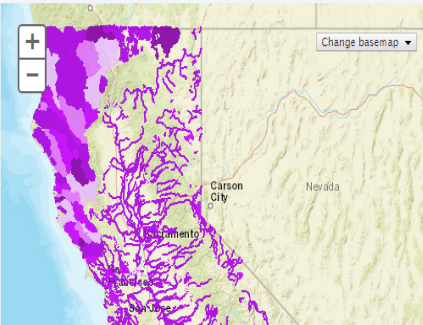
2012 INTEGRATED REPORT — ALL ASSESSED WATERS

Zoom to county: All Zoom to Regional Board: All Map Help
 Show county Show Regional Board

Zoom to water body: (Filter: All) Filter list by: Reset list

Show all assessed waters
 Show only impaired ("303(d)-listed") waters

Show water bodies by pollutant:
Pollutant category: All
Pollutant: All
Reset filters

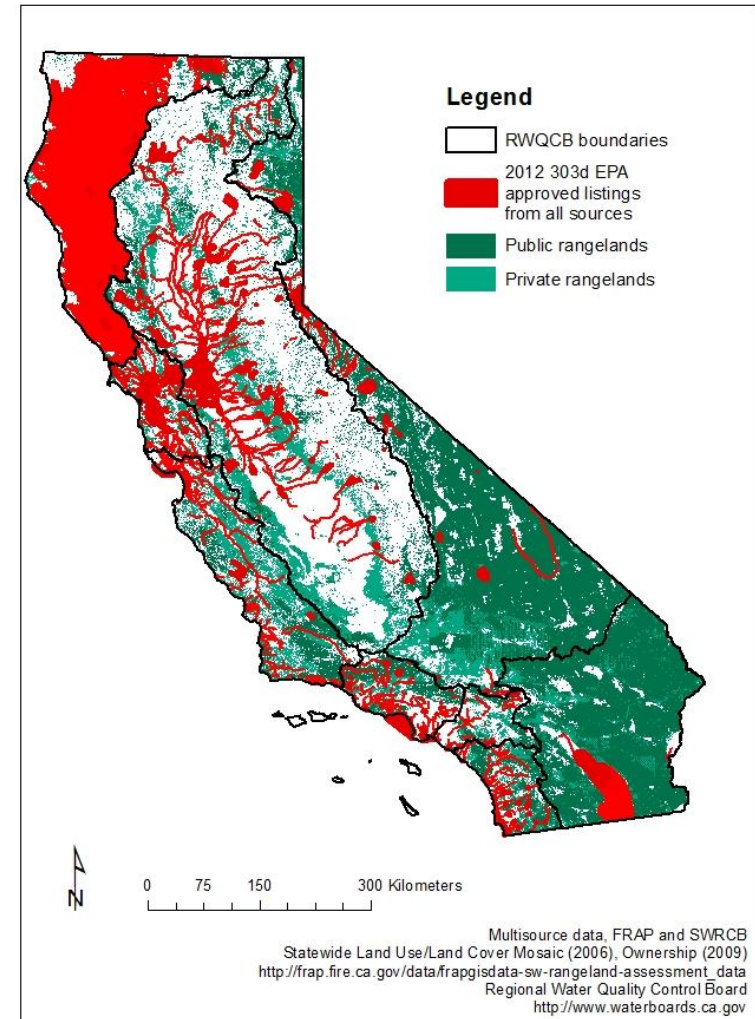


Water quality impairments in CA?

2012 303d Impaired Water Bodies

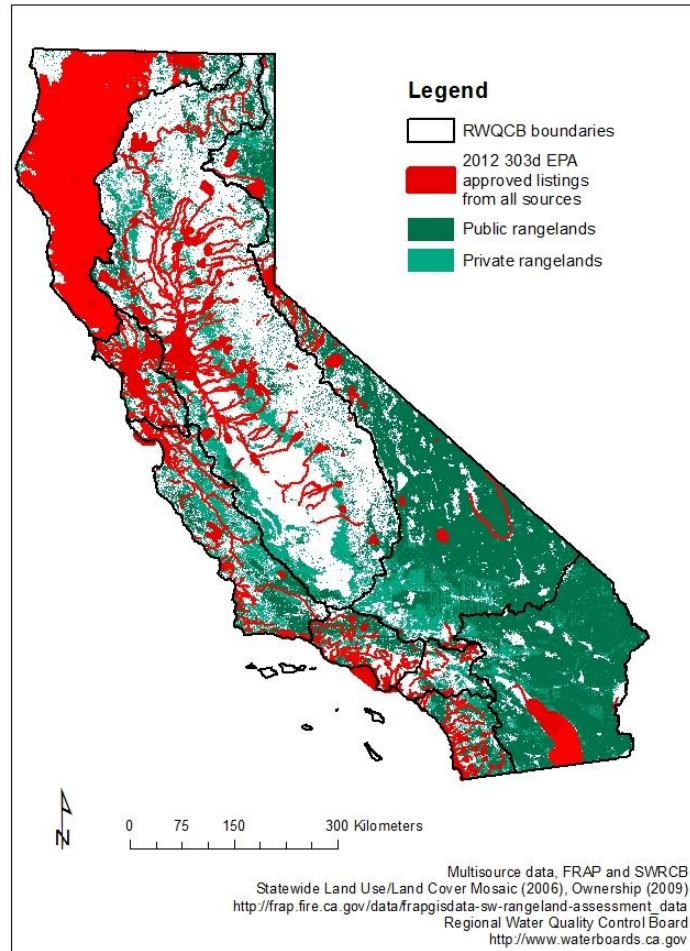
The screenshot shows the website for the California Environmental Protection Agency State Water Resources Control Board. The page is titled "Impaired Water Bodies" and includes a navigation menu with options like Home, About Us, Public Notices, Board Info, Board Decisions, Water Issues, Publications/Forms, and Press Room. A sidebar on the left lists various resources and programs. The main content area features a "Final 2012 California Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report)" section with a map interface. The map shows water bodies in purple, with a legend indicating that purple represents impaired water bodies. The map also includes a search bar, zoom controls, and a legend for the map's features.

All WQ Impairments (n=4,851)



Grazing as *potential* source of impairment?

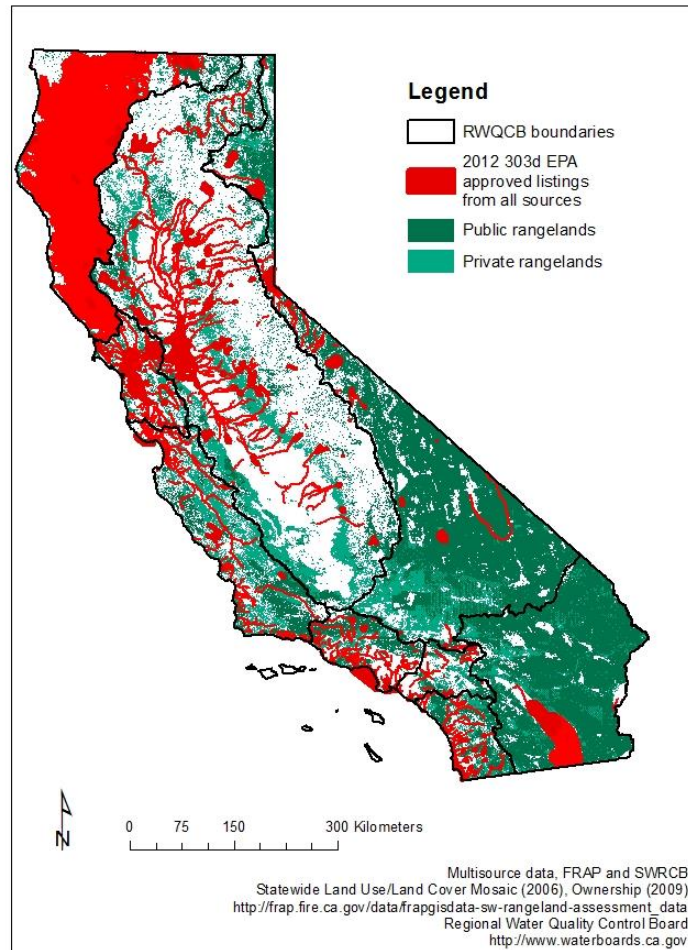
All WQ Impairments (n=4,851)



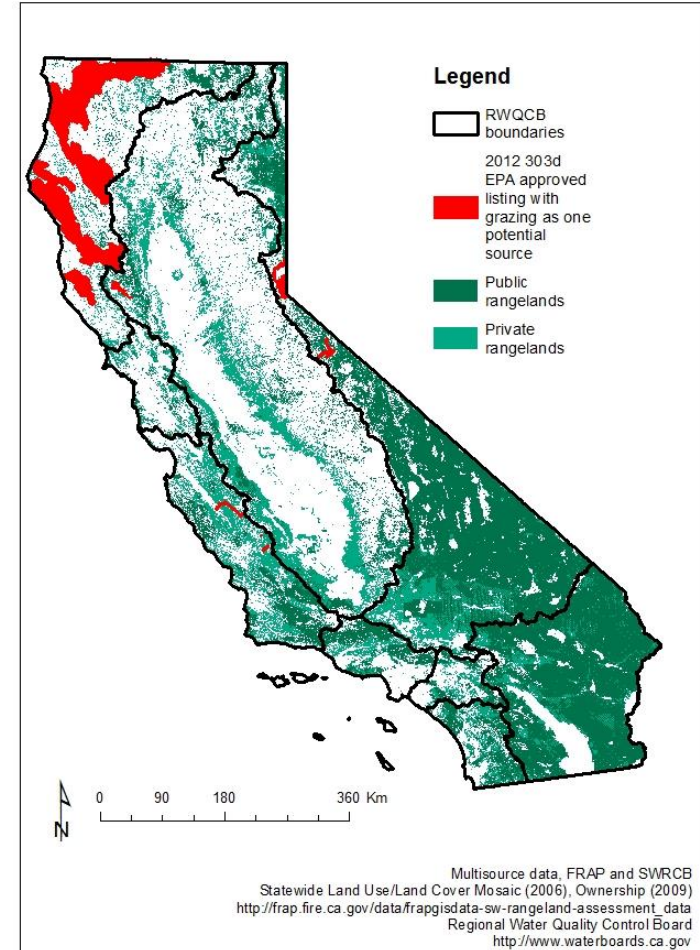
Grazing as *potential* source of impairment?

0.9% of all listings!

All WQ Impairments (n=4,851)



Grazing a *Potential* Source (n=42)



WQ Summary

- Water quality on extensively grazed rangelands and forests is often high.
- Management can certainly create risk to water quality, or it can protect water quality.
- Rangelands have great capacity to attenuate pollutants from livestock and other ranch activities – work with that potential.
- A large toolbox of tested, feasible practices exists.

Then along came GRAP!

Grazing Regulatory Action Project – A unilateral determination by CA Water Boards in 2014 that existing grazing land water quality programs are inadequate to address ubiquitous water quality impairments by grazing statewide.

GRAP Goal: “Develop strategies that Regional Water Boards can implement to enhance environmental benefits from grazing, protect beneficial uses of surface and groundwater, and address water quality impacts related to livestock grazing in California.”

Proposed Schedule for GRAP Development	Estimated Date
•Focused Listening Sessions & Other Stakeholder Outreach	2014
•Development of Initial Proposal •CEQA Scoping and Broader Stakeholder Outreach •Public Comment on Proposal	2015
•Final Drafts of Proposal and Environmental Document •Consideration of Adoption by the State Water Board •Begin Implementation	2016

Scrap the GRAP!

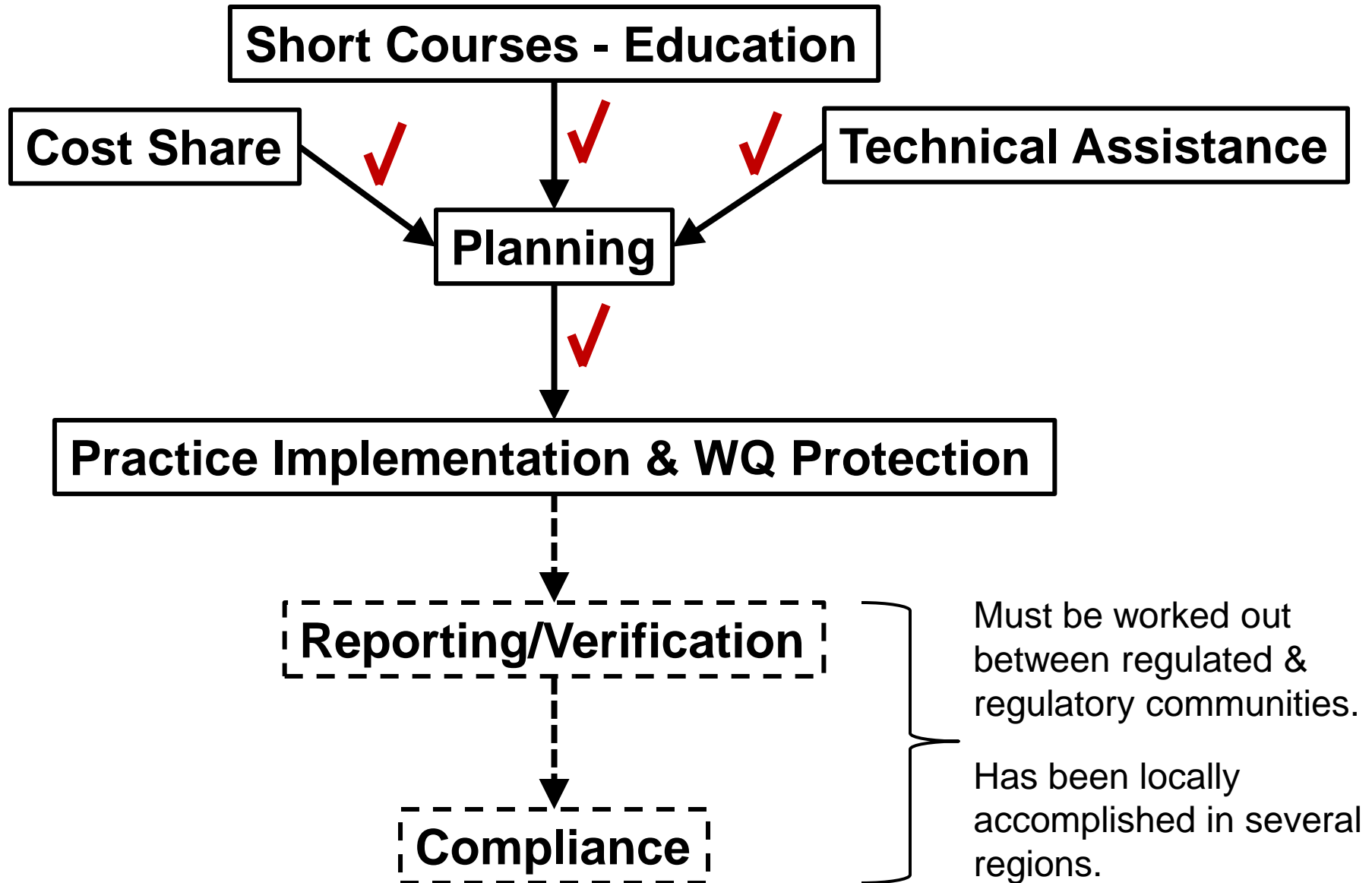
Concerns shared by rangeland stakeholders

- Transparency – not.
- Based on preconceived opinions not supporting data.
- Science to demonstrate need?
- Reinventing the wheel.
- Dissolving trust.
- One-size-does-not-fit-all.
- Unintended economic, social, and ecological consequences of singular focus on WQ?



200+ ranchers crowded into a GRAP listening session on January 9, 2015

What is Regulatory Compliance?



California Grazing Water Quality Partnership

Partnership Goal

Develop a contemporary, collaborative strategy for proactive grazing land water quality protection and regulatory compliance across the state for the next 25 years.

1. Policy

Collaborate to develop policies to address Elements 4 & 5 of the 2004 NPS-PIEP.



2. Plan Update

Update the 1995 Plan with contemporary water quality science, planning, education, management implementation, and policies.



3. Research

Address outstanding questions related to grazing lands water quality, policy, planning, and protection



CA Rangeland WQ Management Plan (2016)

Contemporary, collaborative strategy for proactive grazing land water quality protection and regulatory compliance across the state for the next 25 years.



Implementation

Conduct integrated outreach, education, planning, practice implementation, monitoring, and research to improve and protect water quality.