

Range & Ranch Water Quality

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UC Davis & UC Cooperative Extension



Rangeland Watershed Laboratory
rangelandwatersheds.ucdavis.edu



Overview

Background - CA Range Experience
Ranch Water Quality Short Course
Water Quality Research Highlights







CA Rangelands

~40 million acres
50% private
50% public


mountain meadows



annual grassland



oak woodland



Support a \$2.8B cattle industry

cattle & claves 2012




Safe Water to Drink and Irrigate



In the early 1990's, concerns about...


- Clean water
- Human health
- Riparian health
- Sensitive species

"How are you enforcing the Clean Water Act on rangeland watersheds in CA?"




Bay Area in 1995

Livestock




Pathogens



C. parvum

Drinking Water



ContraCostali

Fine parasite has water districts, cattle ranch


Parasite

Scientists seek water solution to halt mystery spread outbreak


Water district backs away from cattle grazing ban around lake

Parasite risks

San Francisco water district targets cattle



- 1997 the Coho salmon was ESA listed
- Sediment and stream temperature
- TMDL consent decree for 22 northern California waterbodies

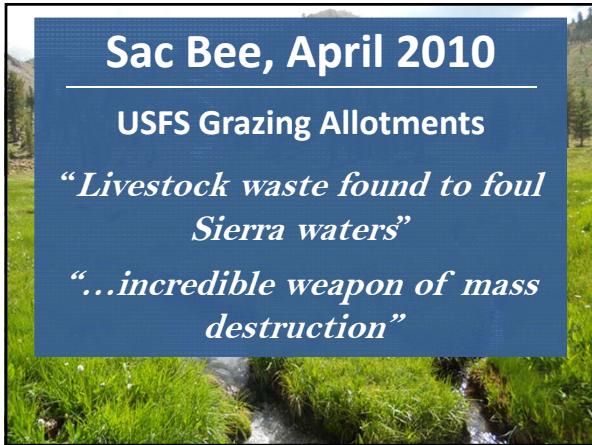


Sac Bee, April 2010

USFS Grazing Allotments

“Livestock waste found to foul Sierra waters”

“...incredible weapon of mass destruction”




Rangeland Watershed Program

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

Basic Research

How do these watersheds function?




Extension

Inform management, policy, regulation.

Applied Research

How does management effect function?



Ranch Water Quality Planning Short Course

- Our first educational program
- Industry requested
- 1994, course development, pilot courses
- 1995-2013, >80 courses taught, 1200+ ranches, 6+ million acres
- Ranch Water Quality Plan – tailored to ranch, watershed, regulatory vehicle

Ranch Water Quality Plan

1 Inventory existing improvements
Document past and current BMPs



off-stream drinking water developments



cross fencing

Ranch Water Quality Plan

2 Inventory water quality problems

erosion, degraded riparian areas, fecal sources



road culvert - erosion




streambank - erosion

Ranch Water Quality Plan

3 Prioritize problems to solve

cost, benefit, permits, technical assistance

RANGELAND MONITORING SERIES Publication 8014



Sediment Delivery Inventory and Monitoring

A Method for Water Quality Management in Rangeland Watersheds

UNIVERSITY OF CALIFORNIA
Division of Agriculture and Natural Resources
<http://rangeland.ucdavis.edu>

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Sediment Delivery Inventory and Monitoring Worksheet

Site # 1 Location Description Streambank cutting in Leaning Pasture

Site Selection Criteria ("y" or "n")
 Deliverable to surface watercourse? Reasonably responsive to mitigation?
 Management induced? Greater than volume threshold (V_T = 10)?

Sediment Volume (yds³)
 Eroded volume: H_c 3 L_c 27 W_c 7 Volume (H x L x W) = 567
 Potential volume: H_p 4 L_p 31 W_p 5 Volume (H x L x W) = 620
 % Deliverable (check one) 0-30% 30-60% 60-90% 90-100%

Unstable Areas (sediment delivery sites not meeting source site criteria)
 Pointsource monitoring No monitoring

Category (check only one)
 Road Riparian Hillslope/lands

Process (check only one)
 Streambank cutting Sheet erosion RR Gully Mass wasting

Influence (check all that apply)
 Road drainage design Road fill failure Grazing Off-property road sediment Riparian sediment
 Culvert design Road cut failure Livestock trail Stream channelization Fertilizer
 Diversion potential Crop agriculture Concentration area Dams and spillways Other

Potential Control Measure (check all that apply)
 Road improvement Grade stabilization Grazing management Landslide treatment
 Surface treatment Streambank protection Monitoring only

Prioritization (points provided below, see Table 1 in user guide for further detail)	Description	Points
Assistance needed:	<u>check permit needs, bank armor design</u>	<u>1</u>
Estimated time:	<u>> 1 week</u>	<u>1</u>
Estimated cost (\$):	<u>> \$10,000</u>	<u>1</u>
Potential volume:	<u>copy from Sediment Volume section above</u> <u>620 yds³</u>	<u>6</u>
% Deliverable:	<u>copy from Sediment Volume section above</u> <u>90-100</u>	<u>8</u>
Total Priority Score =		<u>19</u>

Study – 10 north coast ranches


1. Test the inventory tool.
2. Document inventory tool in the research literature.
3. Sediment sources?

49 sites "regulated"

- 0.2M yd³ sediment reduced
- 77% roads
- 1% livestock

56 sites "background"

- 41.0M yd³ sediment reduced



Survey identifies sediment sources in North Coast rangelands
David J. Lewis, K. W. Tate, J. M. Harper, J. J. J. J.

This research provides the ability of...
 The authors provide a method...
 The authors provide a method...
 The authors provide a method...

Ranch Water Quality Plan


4 Identify and implement BMPs

There is a toolbox of tested options

cross fencing

riparian planting

off-stream drinking water



Ranch Water Quality Plan

5 Document BMP implementation

Record keeping, photo monitoring, annual accomplishment report, etc.

RANGELAND MONITORING SERIES Publication 8067




Photo-Monitoring for Better Land Use Planning and Assessment

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<http://rangeland.ucdavis.edu>

NEIL MCDUGGALD is UC Cooperative Extension Livestock, Range, and Natural Resources Advisor, Fresno and Madera Counties. BILL FROST is UCCE Range and Natural Resources Advisor, El Dorado and Amador Counties; and DENNIS DUDLEY is Range Conservationist, USDA Natural Resources Conservation Service, Madera, California.

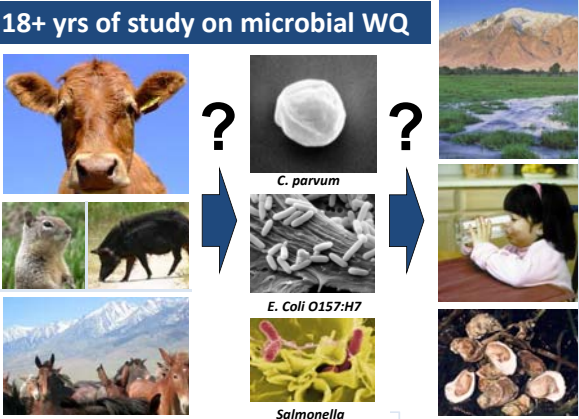
The verb to monitor means to watch or to check, often for the purpose of detecting change. There are many ways to monitor change on the landscape, but none is simpler than photo-monitoring and recording observations. This publication will help landowners develop a photo-monitoring program for their property. Other aspects of monitoring are covered in other publications (see Additional Reading). Photo monitoring is a valuable tool for documenting your management as well as conditions or events that affect your management. Photo points are easily established. You may

Supporting Research

Collaborative with industry, other partners
 What are the real WQ concerns?
 How can management create WQ risk?
 How can management reduce WQ risk?




18+ yrs of study on microbial WQ



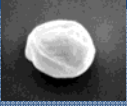
C. parvum
E. Coli O157:H7
Salmonella

Bay Area in 1995

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ContraCosta

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Cryptosporidium in wildlife and livestock

Animal	% infected
range beef cow	1-5*
range beef calve < 4 mo	10-15*
back country pack stock	0
feral pig	4-13
ground squirrel	7-15

*May not infect humans!

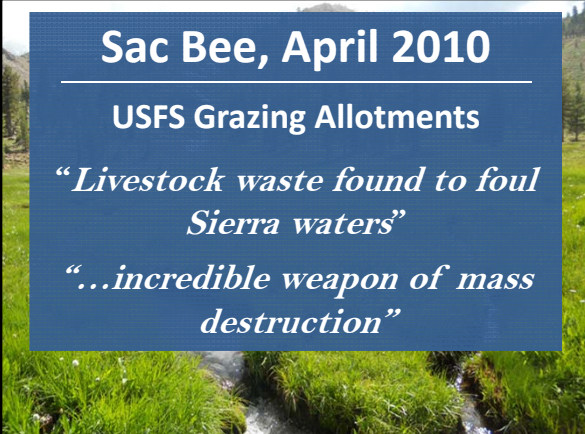
Atwill et al.

Sac Bee, April 2010

USFS Grazing Allotments

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“...incredible weapon of mass destruction”




Public Lands Grazing and WQ Study

“Our results do not support previous concerns of widespread microbial water quality pollution across these grazed landscapes, as concluded in other surveys”

Dr. Leslie Roche

Property Rights & Environmental Management/Federal Policy Committees Meeting

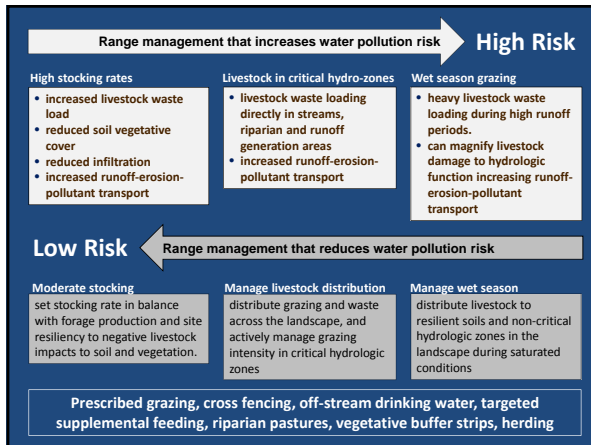
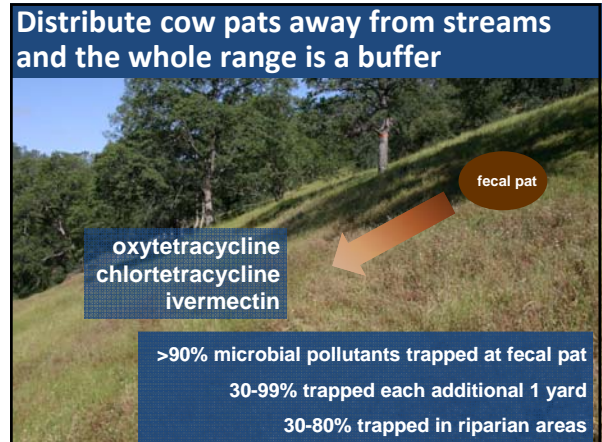
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Stocking Rate and WQ

Stocking Rate	Sediment ppm	Nitrate ppm	<i>E. coli</i> cfu/100ml
None	2	0.1	310
Moderate 800 lb/ac RDM	7	0.4	425
Heavy 400 lb/ac RDM	24	0.8	1250

WQ from 3 oak woodland watersheds receiving no cattle grazing, moderate, and heavy cattle grazing in Yuba County, CA (n=125 samples per watershed).



- ### Summary
- Water quality on extensively grazed rangelands is pretty high.
 - Management can create risk to 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.
 - Education programs can be very effective.

