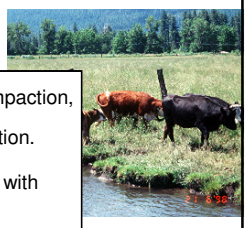
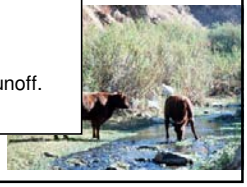
Integrating Water Quality Protection *into* Grazing Management Plans


Some Principles

- Maintain hydrologic function and filtering capacity of uplands and riparian areas.
- Manage grazing in or near riparian and runoff generation areas.
- Think tool box – not silver bullet.

Risk Factors

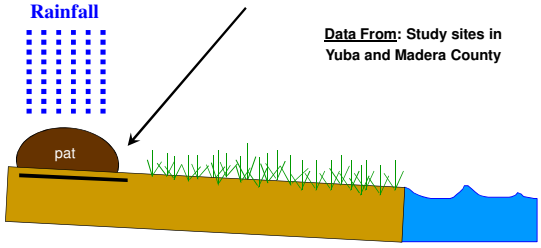
- Heavy grazing - excessive soil compaction, riparian degradation, reduced filtration.
- Livestock allowed frequent contact with surface water.
- Grazing during periods of runoff.
- Fecal deposition in areas of high runoff.

Opportunity

CA rangelands have great capacity to filter microbial and other pollutants transported in surface runoff

Filtration capacity of rangelands

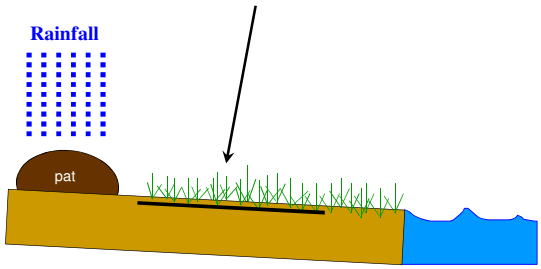
>90% of *E. coli*, *Enterococcus*, *C. parvum*, *Giardia*, *Salmonella* load retained in the fecal pat or trapped within 1 ft



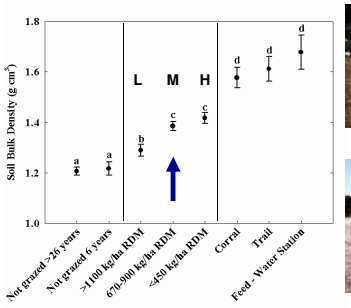
Data From: Study sites in Yuba and Madera County

Filtration capacity of rangelands

An additional 30% to 99.9% trapped within 1 yard of pat



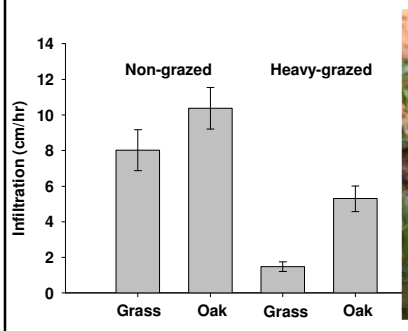
Appropriate grazing pressure to maintain soil surface infiltration rates and natural buffering capacity.



Stream Water Quality from Rangeland Watersheds at SFREC

Grazing Management	Sediment mg/L	Nitrate mg/L	*E. Coli* cfu/100ml
No Grazing	1.5	0.1	310
Moderate Grazing	6.5	0.4	425
Heavy Grazing	24.0	0.8	1250
WQ Standard	NA	10	126

Oaks, shrub species important to maintaining high infiltration rates in oak woodlands.



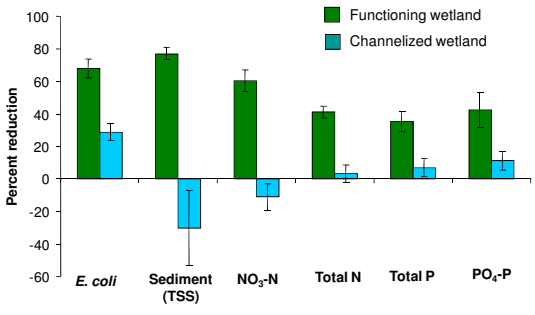
Riparian areas also filter pollutants from runoff

We examined filtration of pollutants in pasture runoff by two wetlands

Functioning Wetland

Channelized Wetland

Reduction of Pollutants due to Wetland

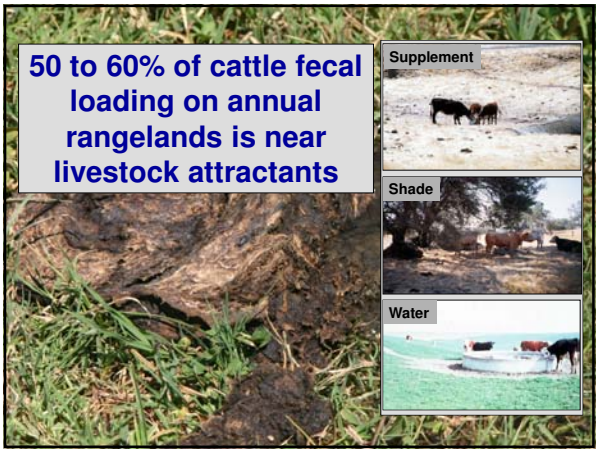


Distribute cow pats away from streams and the whole range is a buffer

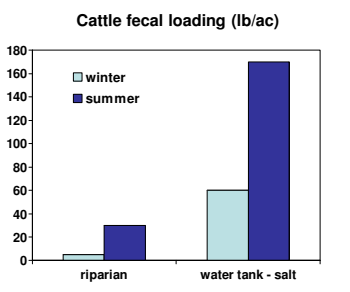
Opportunity

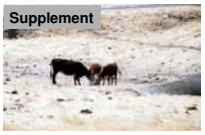
Livestock distribution tools such as stock water and supplemental feeding stations can be very effective.

50 to 60% of cattle fecal loading on annual rangelands is near livestock attractants



Fecal loading rates are dependent upon season, watershed position, & management.

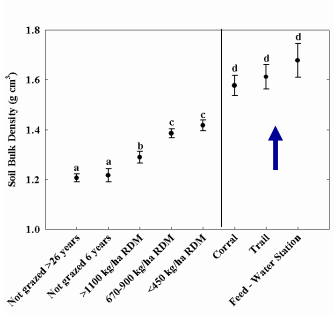


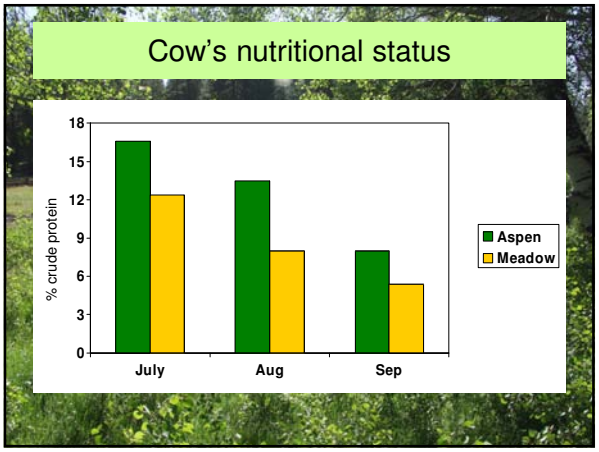


Do you know where your supplement is?

- Move existing supplement and water sites away from streams.
- Evaluate trails leading to and from existing and proposed sites – do they link site to stream during storms?

Increased runoff potential elevates the risk from livestock concentration areas





Grazing – Stream Health Score Correlations:
Meadow Streams

+ Time maintaining off-stream attractants (days/yr).
+ Herding to reduce time near stream (days/yr).
– Cattle density (AU/ac) .
– Frequency (times/yr).

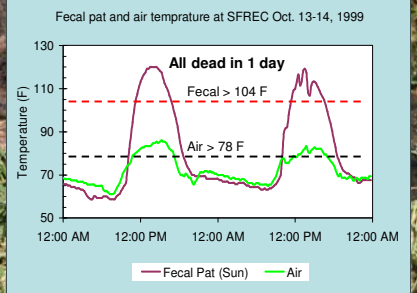
Fencing to manage grazing along streams.

- **Exclusionary buffers,** vegetation management for weeds, fuels, N uptake, etc.
- **Riparian pastures,** integrate into rotational grazing program based on timing, intensity, frequency of use.

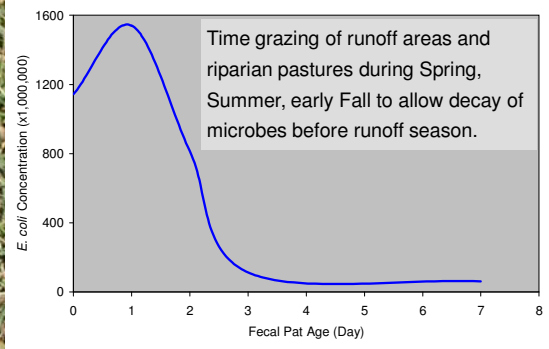
Fencing to manage grazing along streams.

- Reduce time spent in and near water - difficult during dry season without fencing.
- Control time of use near stream.
- Control intensity of use near stream.
- May not be needed.

Significant thermal inactivation of *C. parvum* during spring, summer, fall.



E. coli decay in fecal pat at SFREC Aug 2008

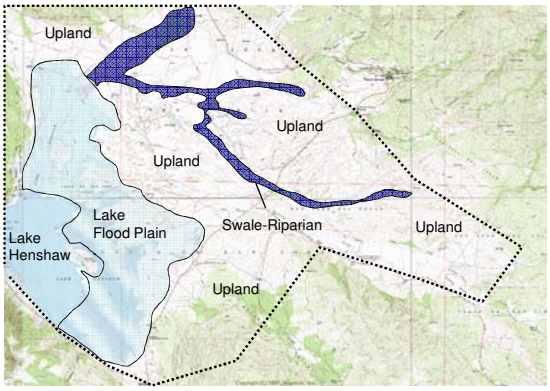


Time grazing of runoff areas and riparian pastures during Spring, Summer, early Fall to allow decay of microbes before runoff season.

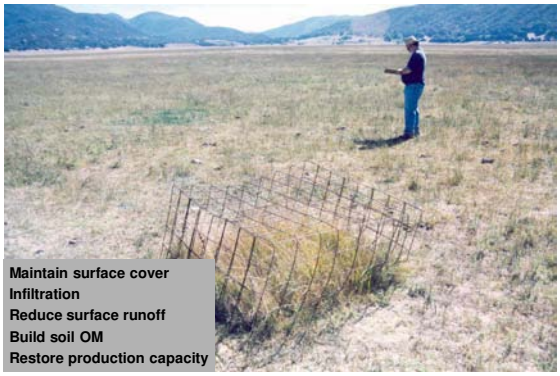
Example – putting the pieces together

- **Warner Ranch**
- **Drinking water for Vista, CA**
- **Owned by Vista Irrigation District**
- **Evaluated grazing plan – leased for dairy replacement heifers.**

Warner Ranch – Lower Lake Henshaw Watershed

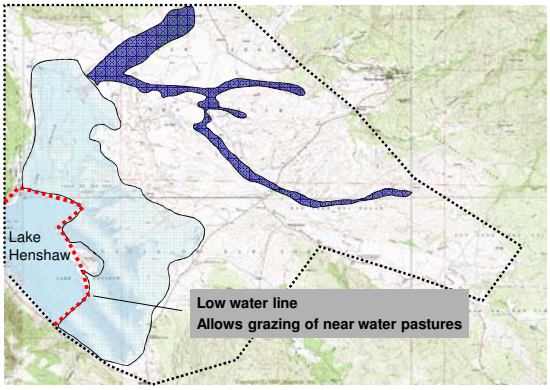


First Step – establish and achieve RDM standards

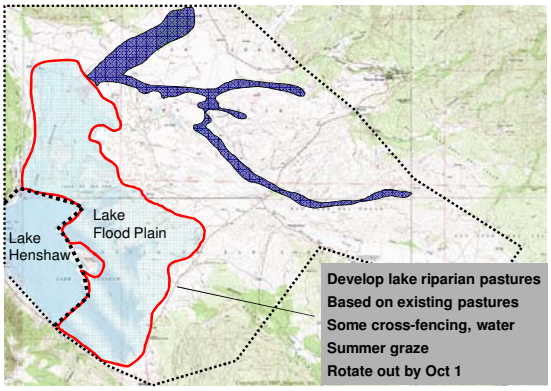


Maintain surface cover
Infiltration
Reduce surface runoff
Build soil OM
Restore production capacity

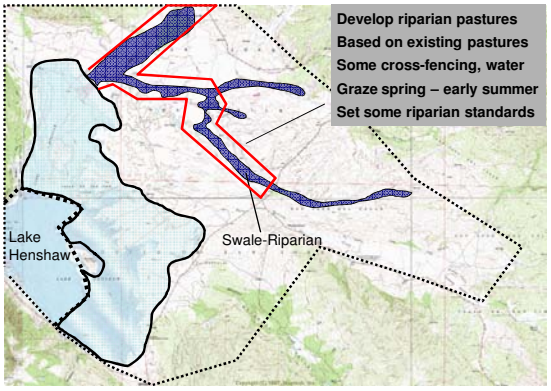
Second Step – Control access to Lake Henshaw



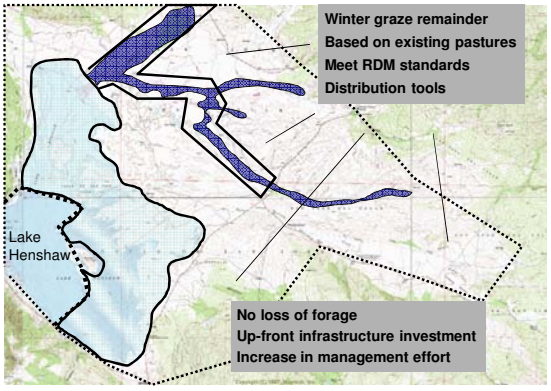
Second Step – Lake riparian pastures

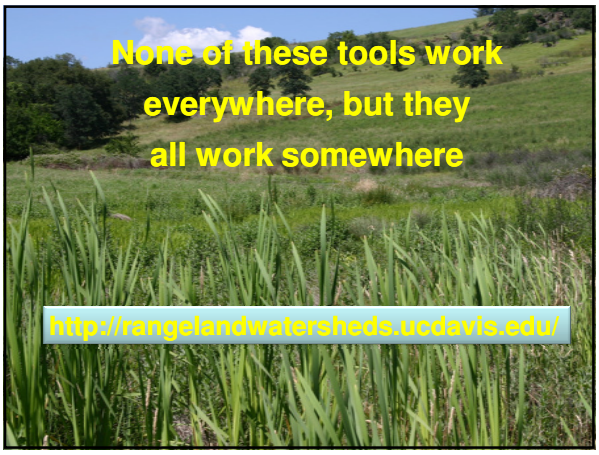


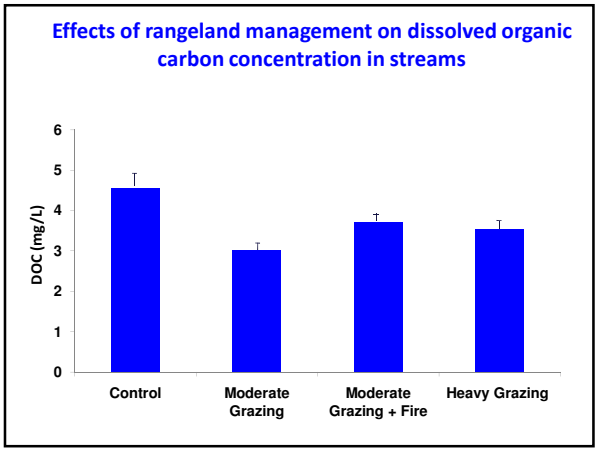
Third Step – swale riparian pastures

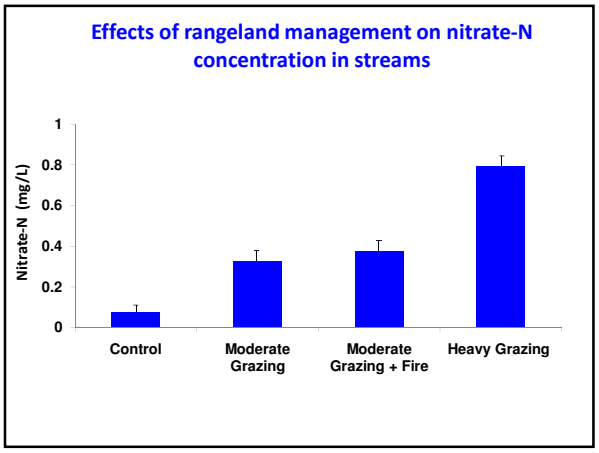


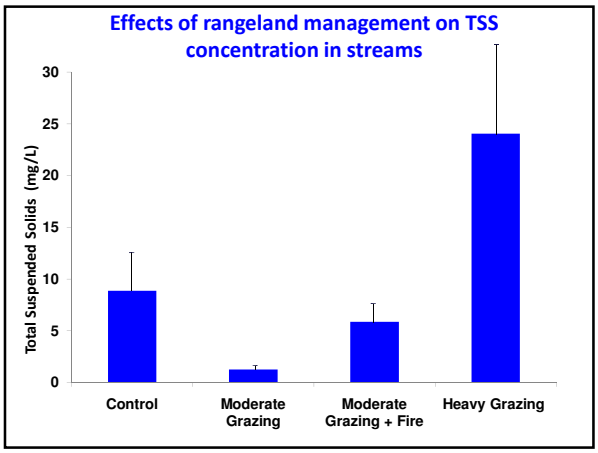
Fourth Step – Winter graze uplands



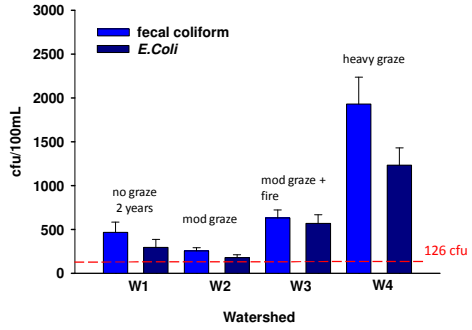

None of these tools work everywhere, but they all work somewhere
http://rangelandwatersheds.ucdavis.edu/


Effects of rangeland management on dissolved organic carbon concentration in streams
DOC (mg/L)
0
1
2
3
4
5
6
Control
Moderate Grazing
Moderate Grazing + Fire
Heavy Grazing


Effects of rangeland management on nitrate-N concentration in streams
Nitrate-N (mg/L)
0
0.2
0.4
0.6
0.8
1
Control
Moderate Grazing
Moderate Grazing + Fire
Heavy Grazing



SFREC – observe variable difference among non-grazed and moderately grazed watersheds, background not = 0.



Mean generic *E. coli* and fecal coliform concentrations from 4 oak woodland watersheds at UC-HREC near Hopland, CA during 2001 WY.