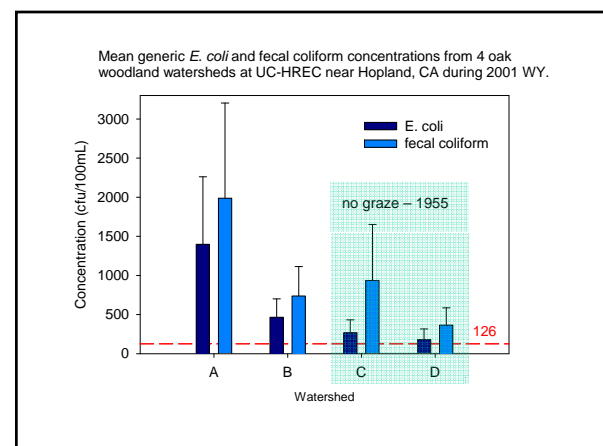
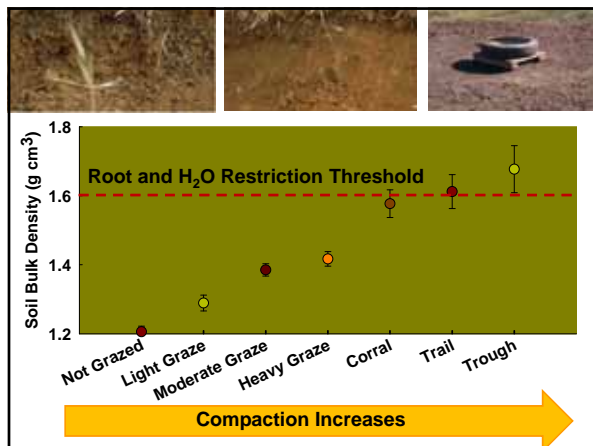


Stream Water Quality

Grazing Intensity	Sediment mg/L	Nitrate mg/L	<i>E. Coli</i> cfu/100ml
None 4000+ lb/ac RDM	2	0.1	310
Moderate 800 lb/ac RDM	7	0.4	425
Heavy 500 lb/ac RDM	24	0.8	1250



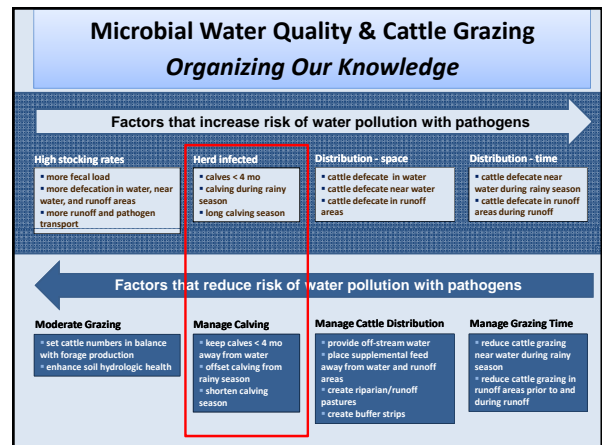


Soil Properties Dictate Resilience to Compaction

Soil Texture	Root and H ₂ O Restrictive Bulk Density (g/cm ³)
Sand	1.80
Loam	1.70
Sandy Clay	1.60
Silt Loam	1.55
Clay	1.40

Steps to Maintain Soil Health

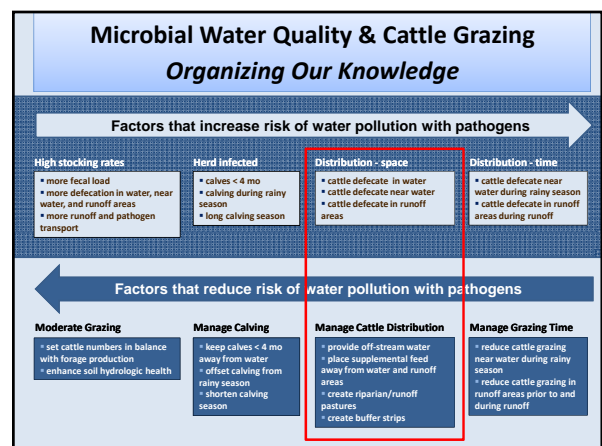
1. Get to know your soils
2. Careful with stock density sensitive soils when they are wet
3. Encourage landscape utilization with supplement and water
4. Avoid continuous heavy grazing

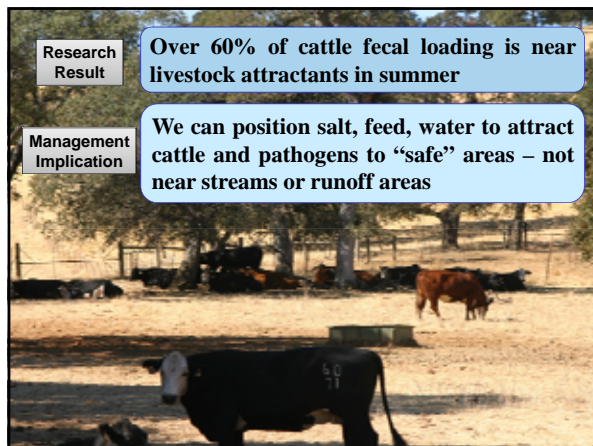


Cryptosporidium dynamics in wildlife and livestock

Animal	% infected
range beef cow	1-5*
range beef calve < 4 mo	10-20*
back country pack stock	0
feral pig	4-13
ground squirrel	7-15

***May not infect humans!**





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?



Research Result

>90% of *E. coli* retained in the fecal pat or trapped within 1 ft

An additional 70% to 99.9% trapped within 1 yard of pat

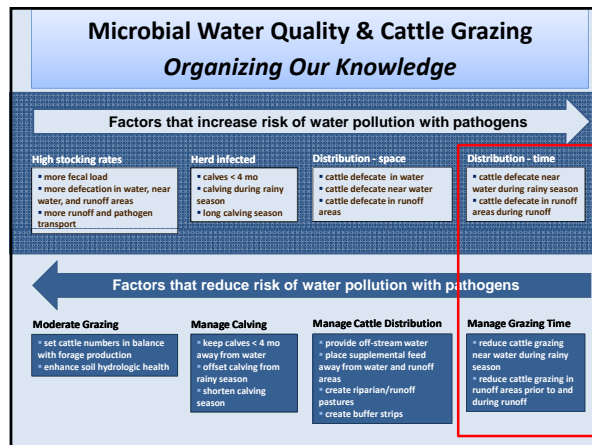
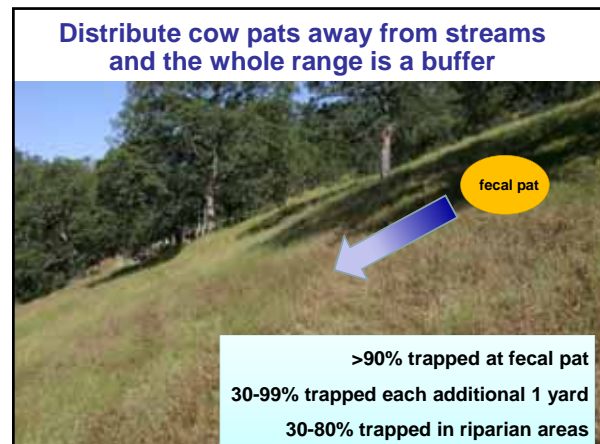
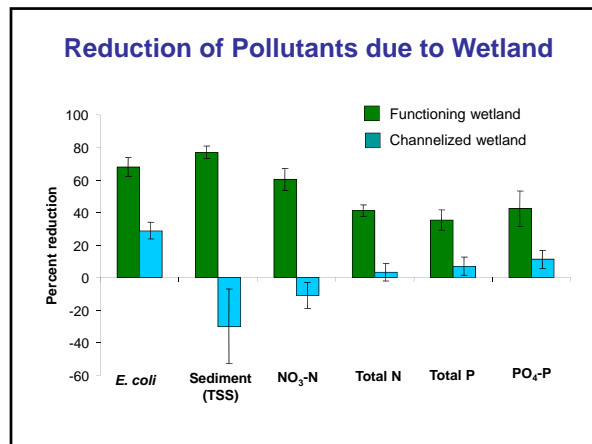
Management Implications

- Keep pats out of creeks.
- Move cattle, pats away from critical areas with distribution tools.
- Narrow buffer strips are effective.
- Maintain soil infiltration rates.
- Moderate stocking rates.

We examined filtration of pollutants in pasture runoff by two wetlands

Functioning Wetland

Channelized Wetland



C. parvum survival in cow pats on range

	Days until >90% dead	Fecal Pat Temperature (°F)
Research Result	72	50
	29	68
	5	86
	<1	104

Translation

Once temperature in a cow fecal pat exceeds 104 °F all of the *C. parvum* in that pat die within a matter of hours. Fecal pats in direct sun achieve 104 °F once air temperature reaches 78 °F.

Management Implication

We can use this fact to time grazing in critical runoff areas so that there are enough days above 78 °F to neutralize any *C. parvum* in cattle fecal pats prior to rainfall and runoff.

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.



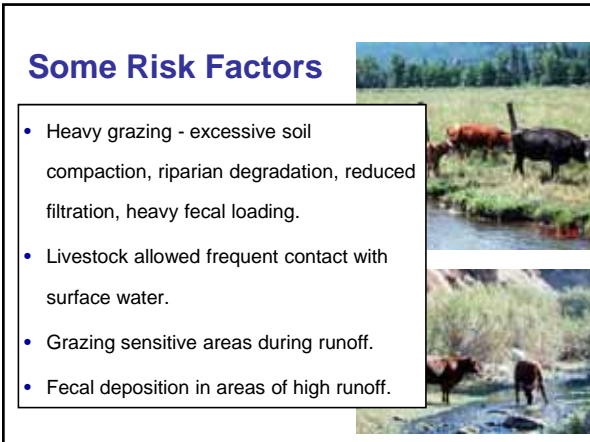
Fencing Along Streams?

- Manage 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.



Some Risk Factors

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



Some Opportunities

- Pathogen prevalence low in beef cattle, confined to certain classes.
- Rangelands have great capacity to filter pollutants in runoff.
- Pathogens can die quickly in fecal pats during spring-fall.
- Think tool box – not silver bullet.