

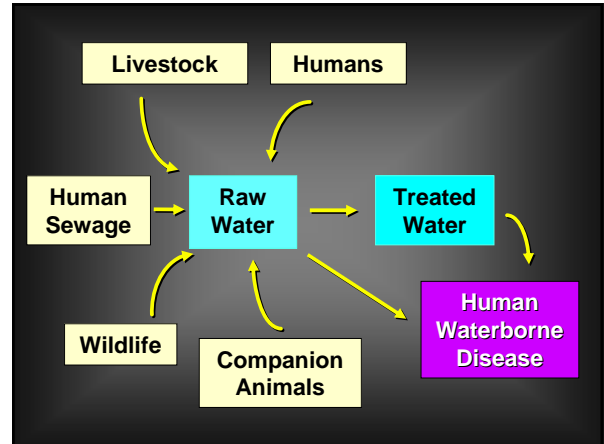
### Indicator bacteria and pathogen monitoring



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UCCE Livestock, Natural Resource, and Watershed Advisors

NRCS, local RCD, private land owners, watershed groups



### Livestock Pathogens of Waterborne & Public Health Concern:

**Protozoa:** hard to eliminate during water treatment,  
low infectious dose, mild to moderate illness

- ❖ *Cryptosporidium parvum*
- ❖ *Giardia duodenalis*

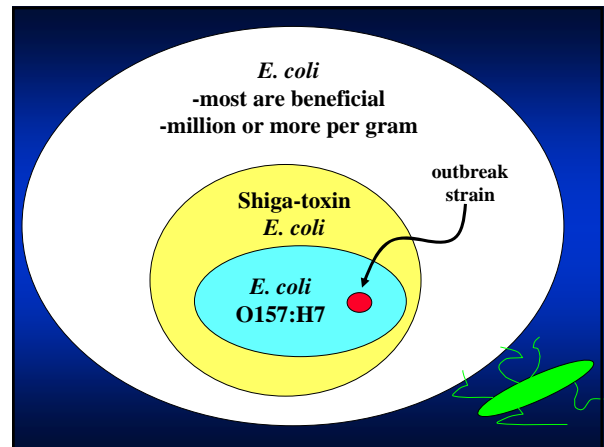
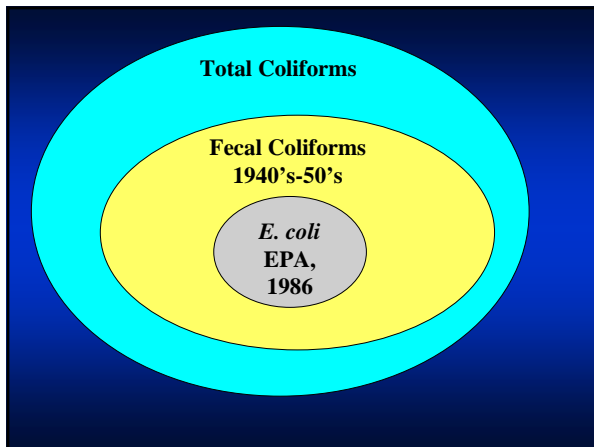
**Bacteria:** easier to eliminate during water treatment,  
higher infectious dose, mild to serious illness

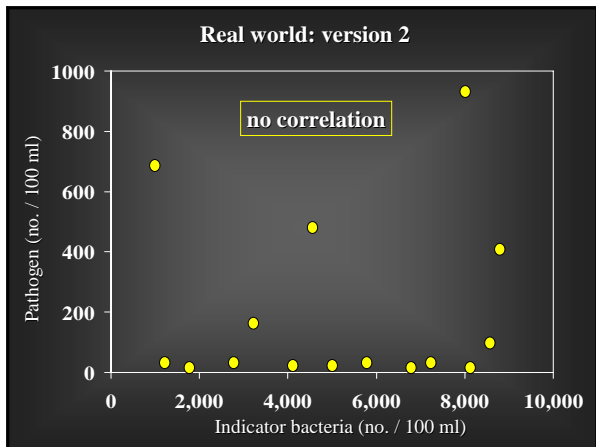
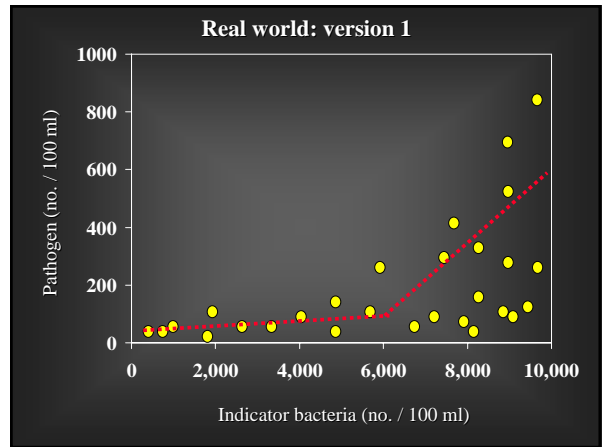
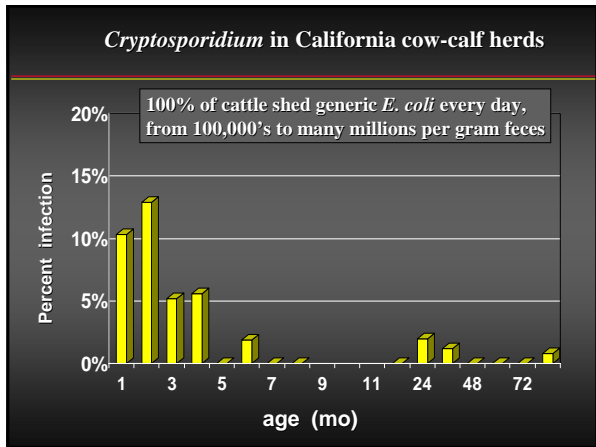
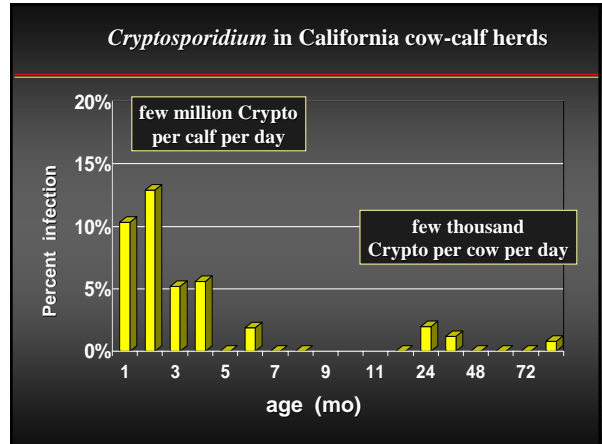
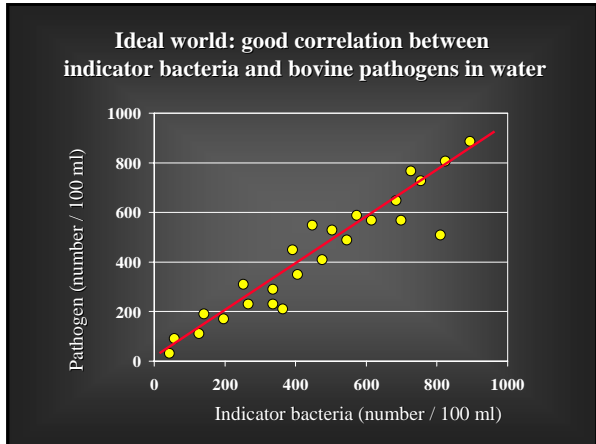
- ❖ Pathogenic *E. coli*
- ❖ *Salmonella*
- ❖ *Campylobacter*
- ❖ *Listeria*

### What are indicator bacteria?



Bacterial species that when present in **water, food, etc.** indicate the potential presence of fecal material and associated fecal pathogens.





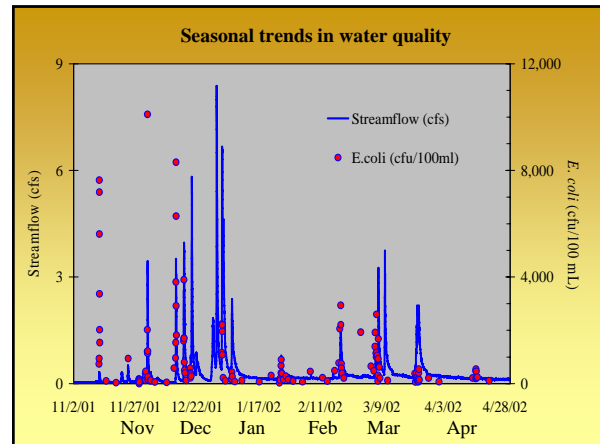
Correlations of indicators with pathogens mostly **unknown** for animal-to-human and animal-to-animal pathogens on agricultural watersheds

Helminths    Protozoa    Viruses    Bacteria

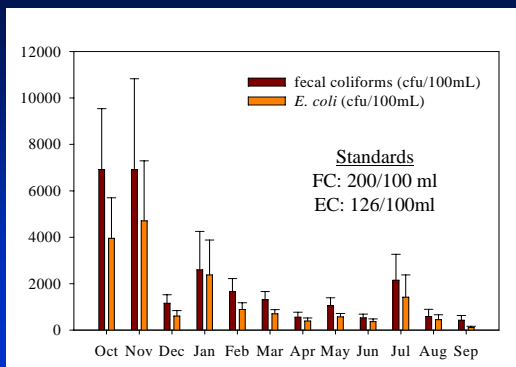
## STANDARDS FOR BACTERIA

### E. COLI

- geometric mean of **<126 bacteria per 100 ml** from 5+ samples in 30 days
- single grab samples should not exceed **235 bacteria per 100 ml**



Fourteen California rangeland streams, 10/2000-9/2002



### Pathogen monitoring Bridgeport Valley and Sierraville 102 water samples taken, 2007

	<i>E. coli</i> <u>&lt; 235 cfu/100 ml</u>	<i>E. coli</i> <u>≥ 235 cfu/100 ml</u>
Crypto	8%	11%
Salmonella	12%	11%
Campy	0%	0%

149 *E. coli* isolates, 2% *Stx1*, 0.7% *Stx2*

### Reducing waterborne microbial risk from animal agriculture

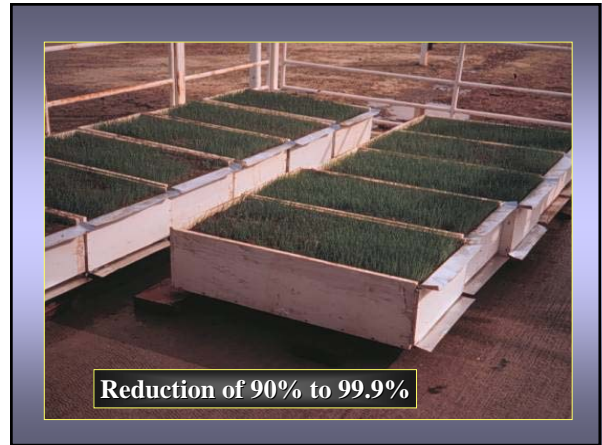
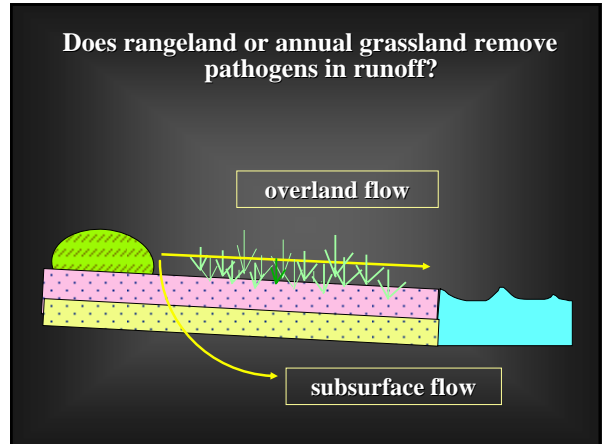
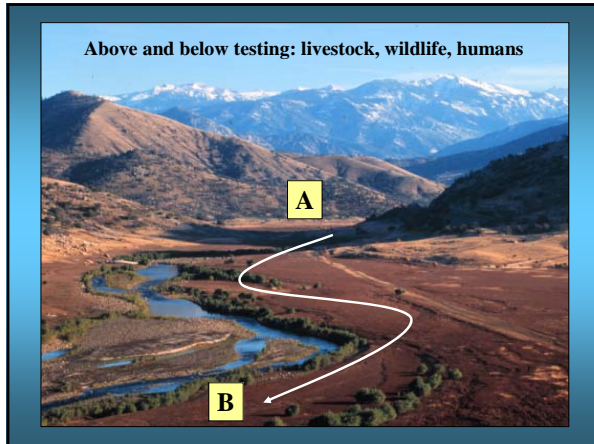
CORE PROCESS	GOAL FOR BMP
♦ pathogen loading	prevalence, intensity, and population density
♦ pathogen transport	reduce overland and subsurface transport
♦ pathogen survival & replication	enhance rate of inactivation

### Management Option:

minimize contact between water and fresh manure

Rest pasture prior to irrigation, reduce tailwater flows, push cows outside riparian areas, rotational grazing, off-site water, fencing, etc.





Sierra Foothill  
Research &  
Extension Center,  
University of California

**Buffer width (feet)**  
0.5, 3.5, 6.5

**Land slope (%)**  
5, 20, 35

**RDM (lbs/acre)**  
200, 600, 900, 4500



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



Assume 90% reduction / yd  
10 yards = 10 order reduction

**DNA fingerprinting**

