


Nutrient Dynamics and Water Quality on Rangelands

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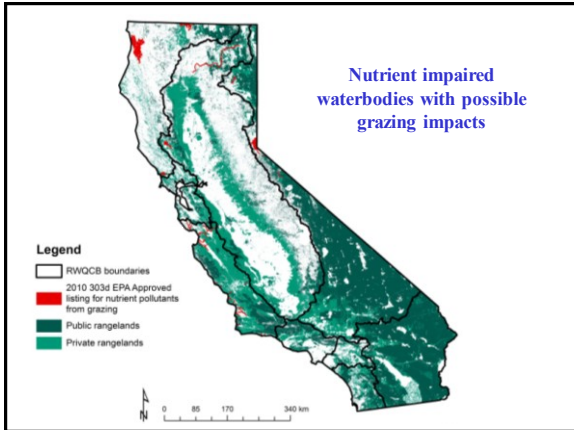
Core Research Team

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- David Lewis
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- Toby O'Geen
- Randy Dahlgren
- Mike Singer
- John Harper
- Ken Tate

Urban-Wildland-Agricultural Interface




80% of Reservoirs

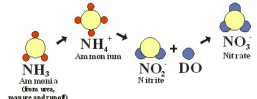



Nutrient Pollution

Nitrogen

- organic forms
- ammonium ($\text{NH}_3/\text{NH}_4^+$)
- nitrate (NO_3^-)






● = Nitrogen
 ● = Hydrogen
 ● = Oxygen

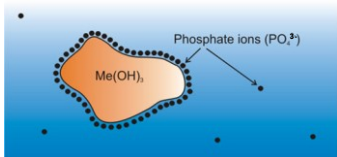
Organic N

Nutrient Pollution

Phosphorus

- organic forms
- adsorbed to particles
- dissolved phosphate (PO_4^{3-})





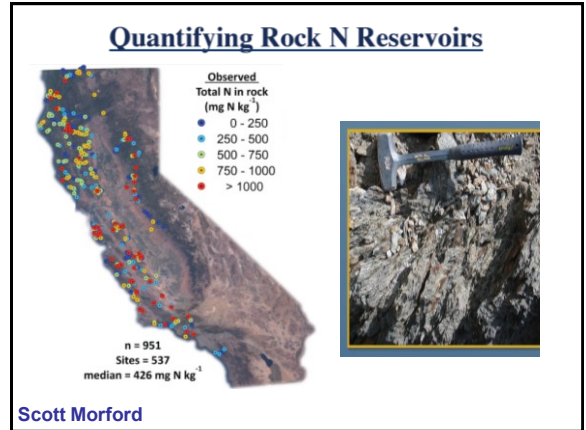
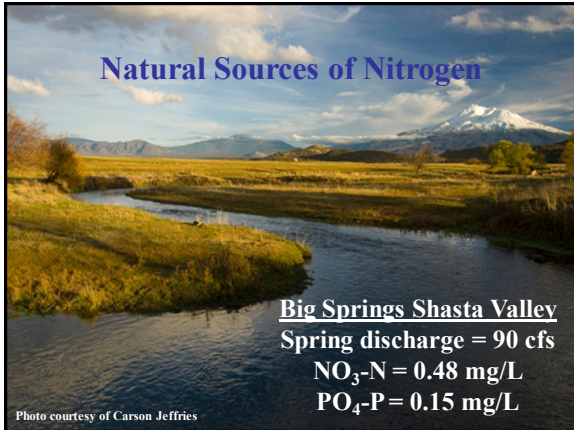
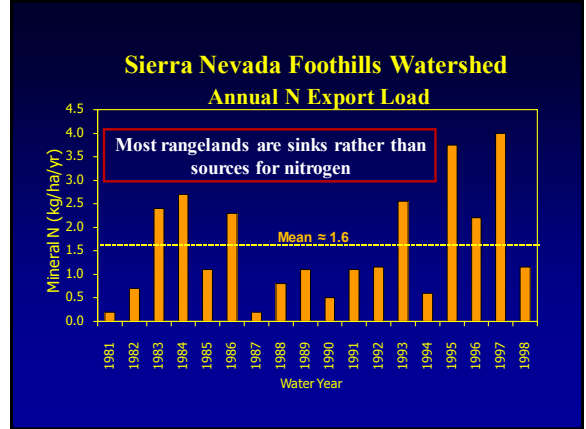
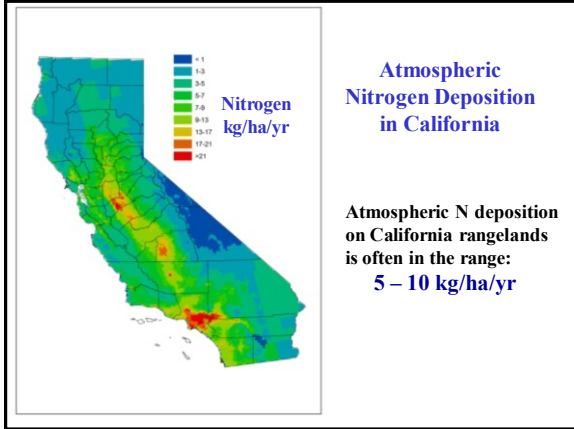
Phosphate ions (PO_4^{3-})

Organic P



$\text{NH}_3/\text{NH}_4/\text{PO}_4$ Runoff

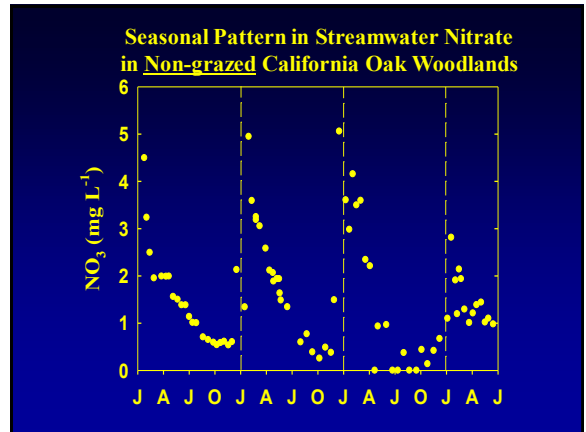
Nutrients (N/P)

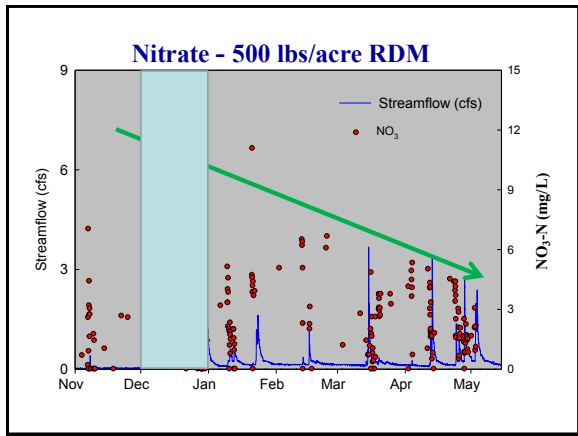
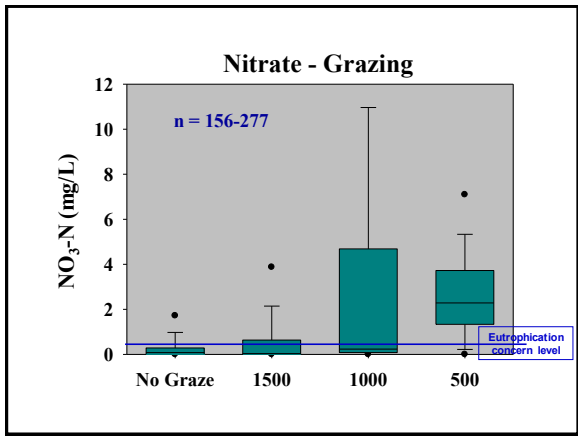
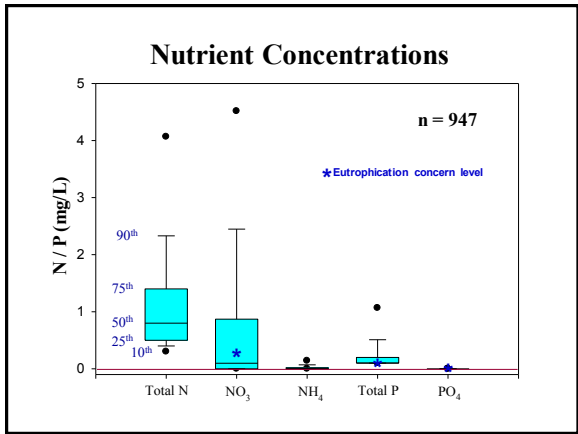
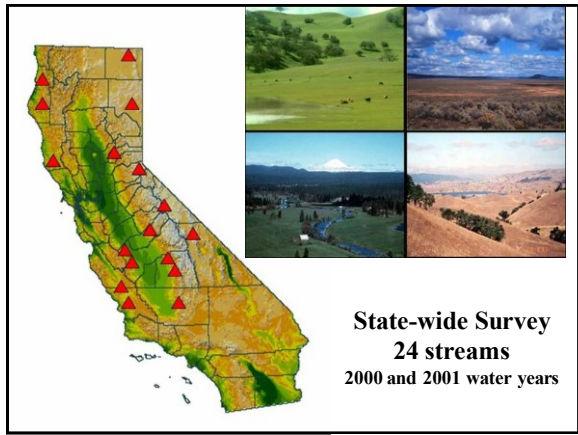


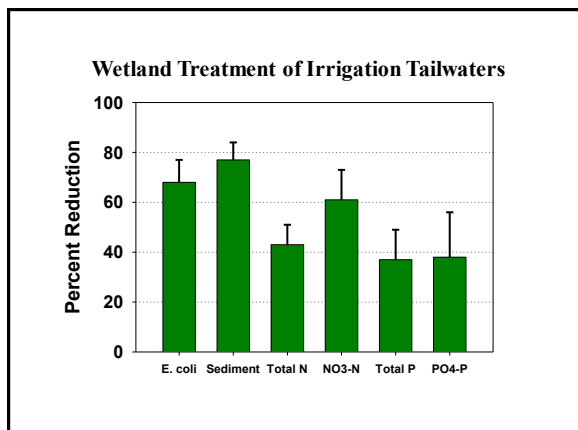
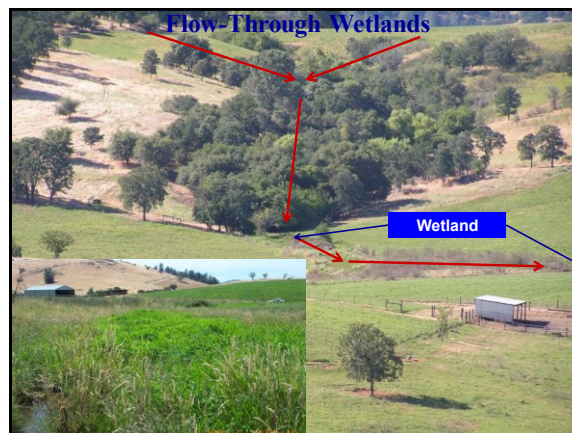
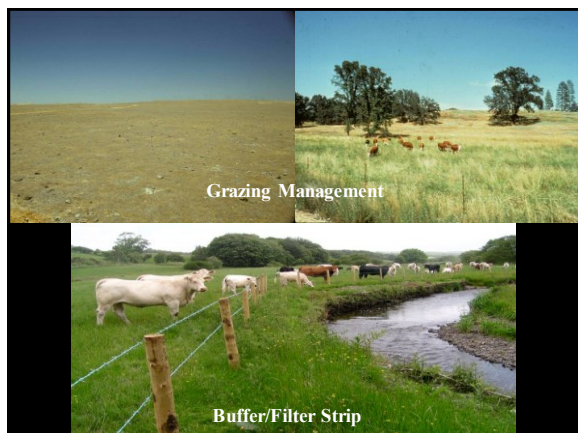
EPA Ambient Water Quality Criteria Recommendations
 Information Supporting the Development of State and Tribal Nutrient Criteria
 Rivers and Streams in Nutrient Ecoregion II

Background nutrient levels are not zero

| Nutrient | Background Level (mg/L) | Eutrophication Concern (mg/L) |
|--------------------|-------------------------|-------------------------------|
| TN | 0.15 – 0.53 | - |
| NO ₃ -N | 0.005 – 0.040 (0.50) | 0.30 |
| TP | 0.009 – 0.032 (0.15) | 0.10 |
| PO ₄ -P | (0.15) | 0.05 |







- ### Conclusions
- Most California rangelands are sinks rather than sources for nutrients
 - Background nutrient levels are not zero – there are many natural nutrient sources
 - California oak woodlands – annual grasslands are naturally susceptible to seasonal nitrate leaching
 - Rangeland streams rarely exceed nutrient thresholds for eutrophication, except during large storm events
 - Accurate nutrient monitoring of rangelands is extremely challenging given temporal variability

