Water Quality Contaminant Transport from Soils to Surface Water in Annual Rangelands

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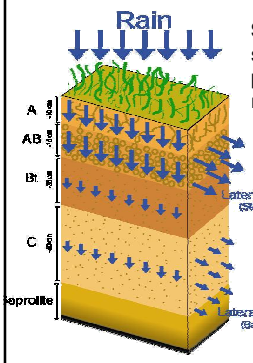
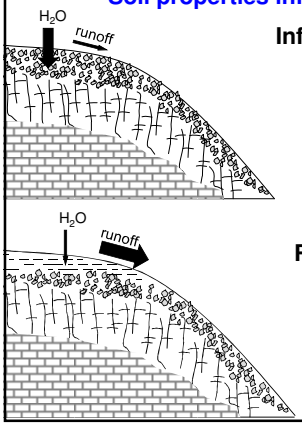
Hydrologic flowpaths in soil effect surface water quality



Surface runoff: suspended sediment, pathogens, particulate phosphorus, particulate organic matter

Sub-surface lateral flow: nitrate, dissolved organic carbon, dissolved forms of phosphorus

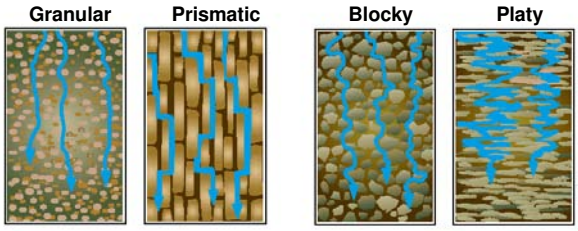
Soil properties influence surface runoff



Infiltration capacity exceeds rainfall intensity
Low runoff:
Good structure
Sandy or loamy textures
High porosity

Rainfall intensity exceeds infiltration capacity
High runoff:
Poor structure
Compaction
Clayey textures
Low porosity

Effects of soil structure (aggregation) on water infiltration



USDA-NRCS

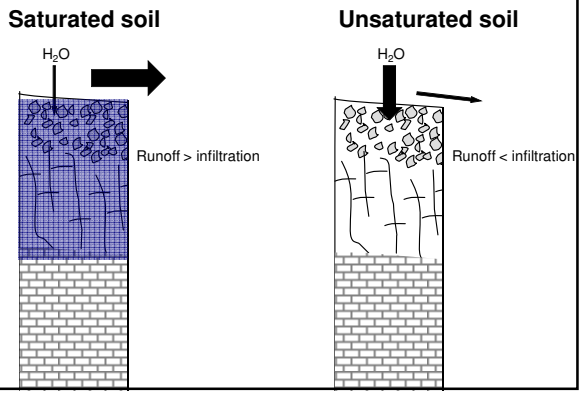
Rangeland soil with good soil structure

Compacted rangeland soil

Evidence of poor drainage in compacted soil horizon "cow pan"

Evidence of poor drainage in compacted soil horizon "cow pan" in Coast Range

Effects of soil moisture storage on runoff



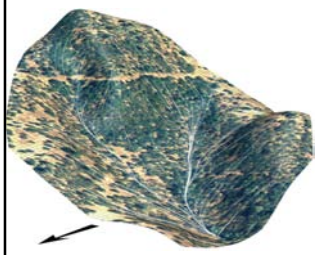
"Redoximorphic features" evidence of seasonal saturation

Soil moisture storage

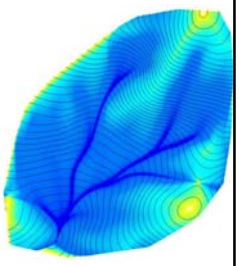
depth to bedrock or restrictive layer

Saturated soils can be unstable especially when combined with tree removal

Soil landscape properties that govern subsurface flow



Sierra Foothill Research and Extension Center's Experimental Watershed

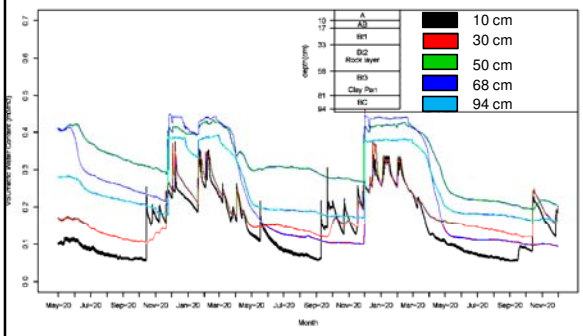


Hydrologic flowpath determined by surface topography

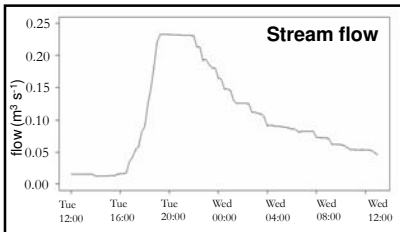
Monitoring infrastructure

Stream flow, perched water, soil water content, groundwater, bypass flow, and surface runoff

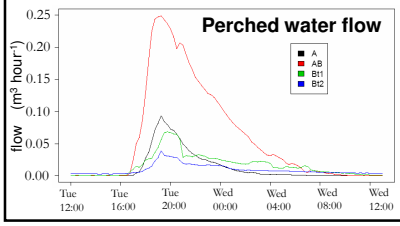
Temporal changes in soil water content 2006-2008



Flowpaths in soil

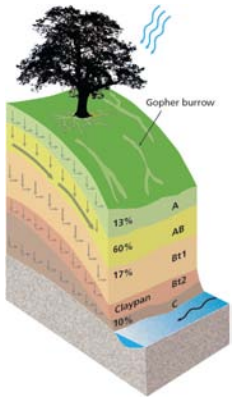


Stream flow corresponds with perched water flow above Bt1.

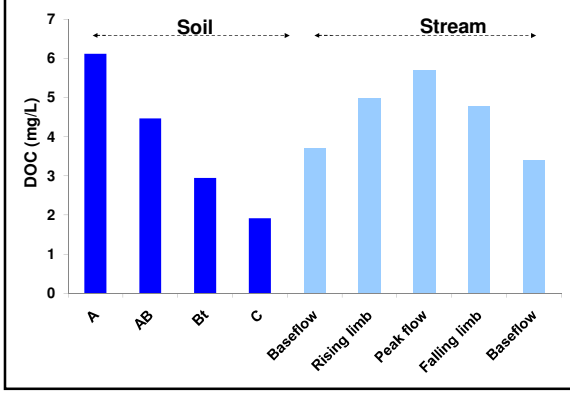


AB horizon supplies largest water volume

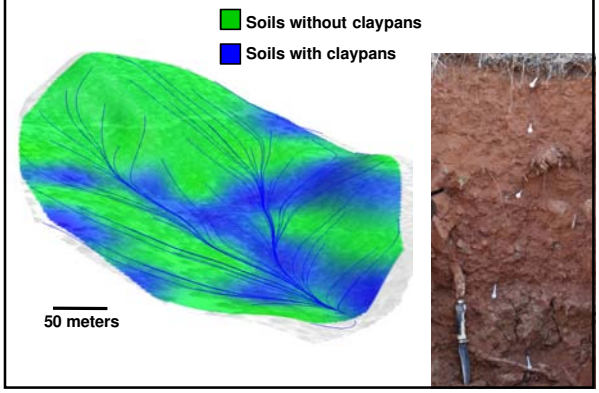
Conceptual model of water flow in soils



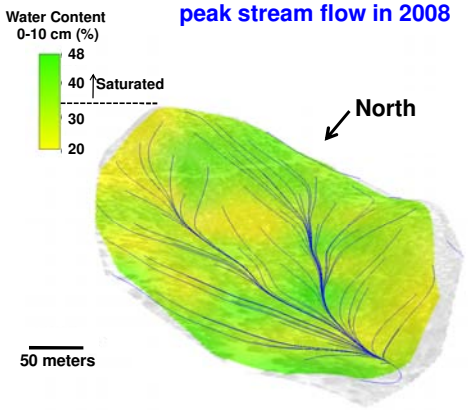
Dissolved organic carbon in soils vs. stream



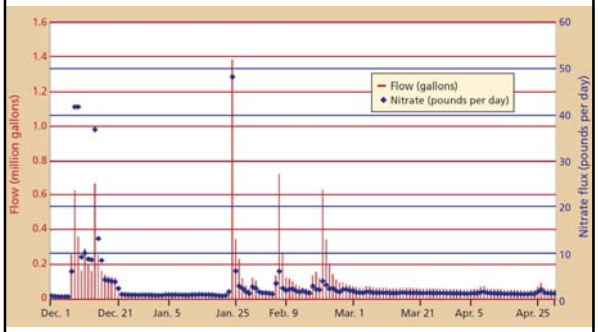
Spatial extent of soils with claypans



Distribution of soil moisture during peak stream flow in 2008



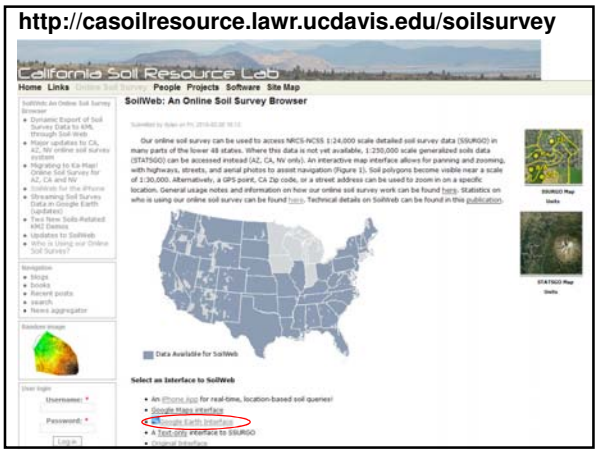
Nitrate-nitrogen dynamics in stream flow

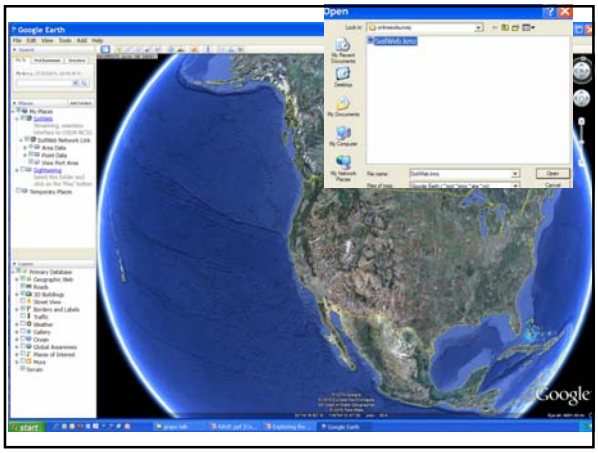


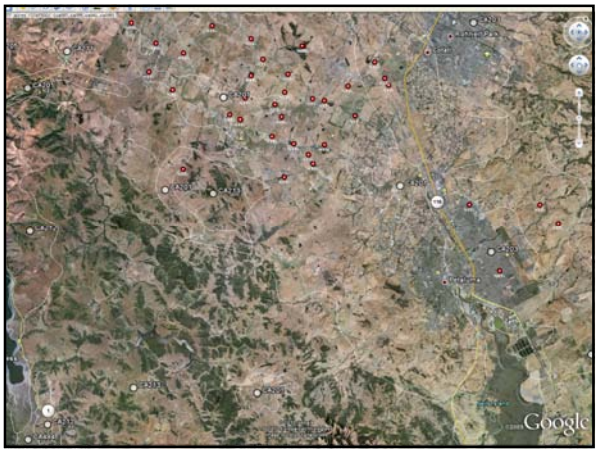
1992-1993 water year

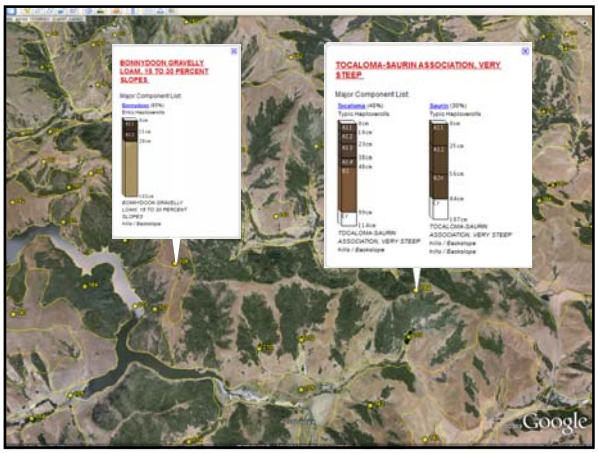
(O'Geen et al., 2010, *In:* California Agriculture)

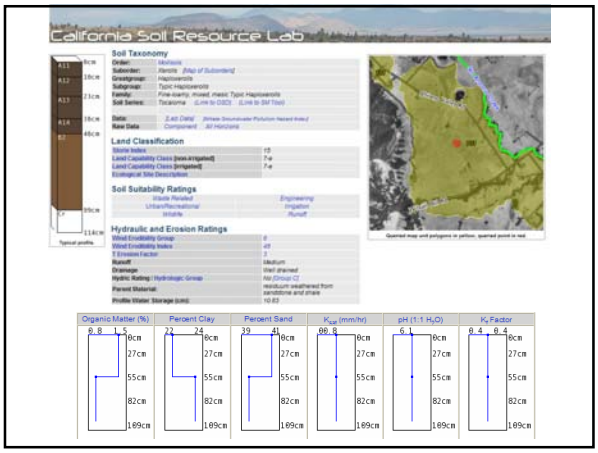
http://casoilresource.lawr.ucdavis.edu/soilsurvey



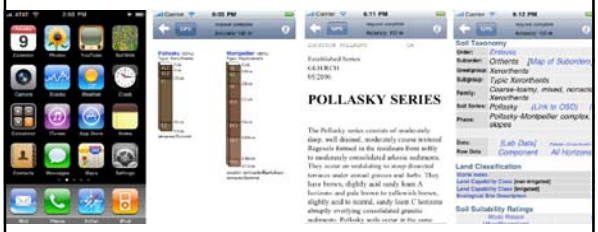








Iphone Soil App



Water quality policy and best management practices for annual rangelands should consider the systematic variation of soil properties

Thank You

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Thank you: Dylan Beaudette, Alex Swarowsky, Jiayou Deng, Donna Dutra, Tony Orozco, Dustin Flavell, Martin Beaton, Jeannie Evatt and SFREC Crew.