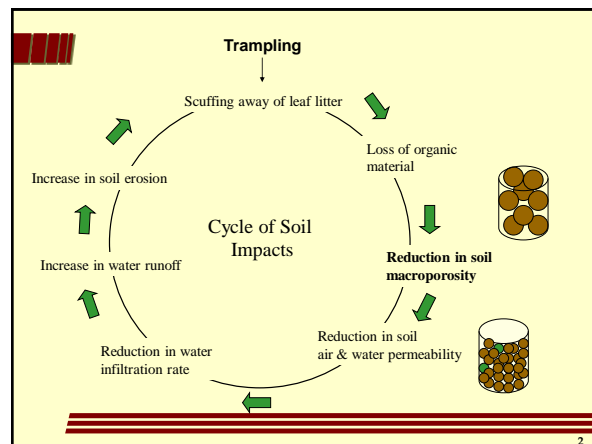


## Monitoring Impacts to Soils

CSS 496  
Professor Ed Krumpke

1



2

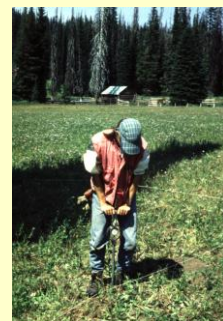
## Bulk Density

- Human Activity Monitored:  
*Soil Compaction caused by Trampling by people & livestock*
- Bulk density increases with use
- Must be compared with a control
- Difficult to measure in the field

3

## Penetration Resistance (Penetrometer)

- *Trampling by people & livestock*
- Penetration resistance increases with use
- Needs a control
- Varies with stony soils and soil moisture



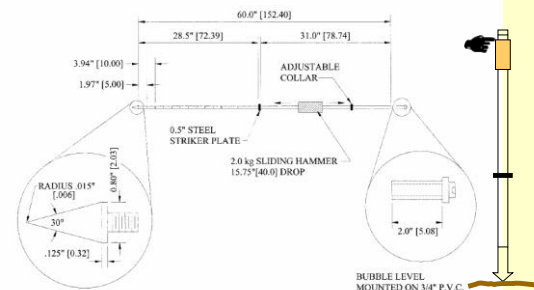
4

## Proving Ring Penetrometer



5

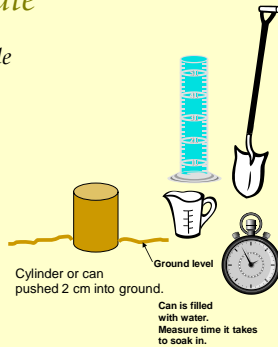
## JORNADA IMPACT PENETROMETER



6

## Infiltration Rate

- Trampling by people & livestock
- Water infiltration decreases with compaction
- Needs a control
- Varies with soil moisture
- Disturbs the site

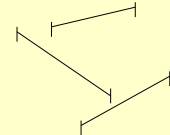


7

## Depth of Litter & Duff Layer

- Trampling & erosion
- Thickness of litter & duff layer decreases with use
- Needs a control
- Needs many measurements
- Responds well to amount of use

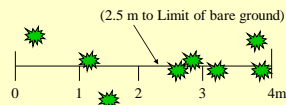
Multiple transects required



8

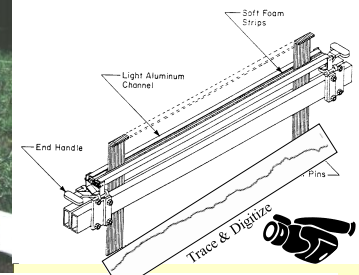
## Exposed Bare Mineral Soil

- Trampling & erosion
  - Bare mineral soil increases with use
  - Needs a control
  - Responds well to amount of use
  - "The damage is already done"
- Measure from center until tape crosses at least two plants within each meter over a span of two consecutive meters. When this occurs the measurement is ended at the first of these plants.



9

## Measuring Soil Surface Roughness

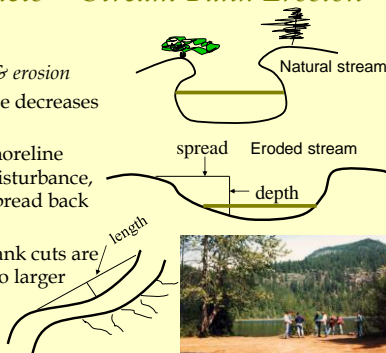


Fit a regression line

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## Soil Impacts -- Stream Bank Erosion

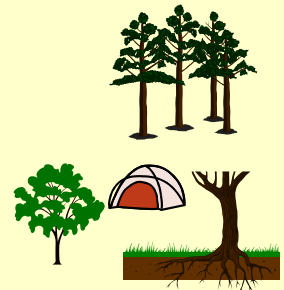
- Trampling & erosion
- Bank profile decreases with use.
- Measure shoreline length of disturbance, depth, & spread back from bank.
- Multiple bank cuts are precursor to larger erosion.



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## Soil Impacts -- Exposed tree roots

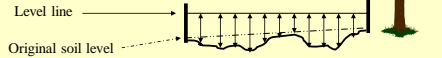
- Trampling & erosion
- Root exposure increases with use.
- Correlates with advanced soil loss.
- Count number of trees with exposed roots.
- % cover



12

## Soil Impacts -- Trail erosion

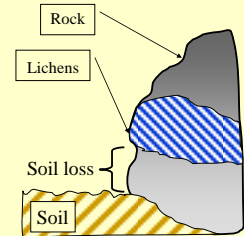
- Trampling & erosion
- Trail Depth -- may provide earlier indication of trail deterioration than trail width.
- Trail Width -- responds to amount of use better than trail depth.
- Cross-sectional Area -- considered best indicator of trail deterioration.



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## Soil Impacts -- Lichen Lines on Rocks

- Erosion & soil loss
- Lichens do not grow below the soil surface.
- The line on rocks below which there are no lichens indicates how much soil has been lost.
- Situational, works best with large rocks, eventually disappears.
- (Other causes are possible.)



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## Soil Impacts -- Smoke Scars on Cliffs & Overhangs

- Accretion & loss of lichens & moss
- Soot, tars & creosote
- Vegetative material killed
- Extremely slow to recover
- Photographic record



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## Cryptogamic Soil Crust or Biologic Soil Crust



16

## Cryptogamic Soil Crust in Deserts

Cryptogamic crust is a hard soil crust dominated by a plant community of algae, lichens, or mosses. Prevents erosion & fixes nitrogen.

- % ground cover
- % disturbed crust
- Needs a control
- "May be too late..."

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