Bare (soil) Facts

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General Questions for Workshop

1. **What are the best indicators of soil health?**
2. **How do we set acceptable thresholds of soil health?**
3. **What do we do when thresholds are exceeded?**

An indicator is a …

- component of a system whose characteristics are used as an index of an attribute that is too difficult, inconvenient or expensive to measure" (Pellant et al. 2005)
- 17 indicators are used to index soil and site stability, hydrologic function and biological integrity.

1. What are the best indicators of soil health? bare soil is one

Key literature:

Pellant, M. P. Shaver, D.A. Pyke, and J.E. Herrick. 2005. Interpreting indicators of rangeland health. Version 4. Technical Reference 1734-6. USDI, BLM, NSTC, Denver CO.

(available online)

- Included bare ground as a standard indicator in the rangeland health protocol
- Bare ground - "size and connectivity among areas of soil not protected by vegetation, biological soil crusts, litter, standing dead vegetation, gravel or rocks."
- Bare soil figures into 2 attributes: soil and site stability and hydrologic function (not so much for biological integrity)

Soil and Site Stability?

- The capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind or water.

Soil and Site Stability?

- Bare ground is more susceptible to erosion which can lead to..
- loss of relatively fertile A horizons (darkened by organic matter), and
- off site effects (sedimentation).

Hydrologic function?

- The capacity of the site to capture, store and safely release water from rainfall, run-on and snowmelt (where relevant), to resist a reduction in this capacity and to recover this capacity following degradation.

Hydrologic function?

- I like Jack Varian's approach (V6 Ranch) "Slow down water and preserve Nature's beauty"
- Bare soil, depending on the size and connectivity of patches, is more susceptible to accelerated runoff and erosion.
- Where there is no interception or other barriers to detachment of soil particles (i.e. gravel, litter) erosion is more likely to occur.

2. How do we set acceptable thresholds of soil health?

How much bare ground is too much?

It depends on the 'site.'

What is realistic?

- NBH Southern California Coast Ranges, Table Mountain locality Parkfield Grade, annual grassland on melange of Franciscan complex containing serpentine

Bare ground varies with…

- Soil type (parent material, texture, age)
- Plant communities
- Precipitation
- Grazing intensity

Bare ground varies in time and space…

- Numerical values (% bare ground)
- Size and connectivity of patches
- Temporal variation (adverse and beneficial weather cycles, legacy of prior uses, etc.)

To establish a threshold …is to decide on a measurement scheme

- See pp. 124-26 "Soil and water indicators of the Sustainable Rangelands Roundtable"
- Ground methods – point, line, area
- Remotely sensed data
- Issues of regional and national aggregation of data, reliability and consistency of data collection. What is the appropriate scale?

Measurement ideas

- Photoplots (see Elzinga et al. 1730-1)
- RDM methods (see DANR Rangeland Monitoring Series 8092 –California guidelines for residual dry matter management on coastal and foothill annual grasslands)
- Point frames
- Line intercept
- Golf balls?

Reality check

- Bare ground is important as an indicator.
- Is the method consistent between individuals?
- Is the method adequate and for the purpose and the scale of observation?
- How much are we to allow site specific variables to influence sampling/monitoring methods?
- How can bare ground monitoring be done in concert with measurement of other indicators?

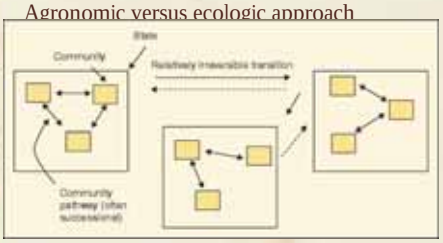
What happens when thresholds are exceeded?

- What is the root cause?
- Natural disaster?
- Management mismatched to abiotic or biotic factors?

What happens when thresholds are exceeded?

- Site conservation threshold concepts
- **Repairing Damaged Wildlands** by S. Whisenant

Agronomic versus ecologic approach



Closing thoughts about bare ground

- Understand the fluctuations in the system first.
- Estimate where the conservation threshold might be, beyond which repair becomes agronomic.
- Integrate monitoring as efficiently as possible, consider indirect measures of bare ground (RDM/Comparative yield?)
- Consider photoplots – permanent obejctive measured that lend themselves to image analysis.

Phenological Studies
Time Sequence of YST Growth

- Pictures at nine photoplots were taken every week or so from a constant height.
- March through July 2002 (and beyond)

Purpose:

- Inventory existing species,
- Observe YST phenology,
- Plan for mowing treatment,
- And understand soil moisture conditions

March 8 – Day 57

March 25 – Day 68

March 31 – Day 85

April 7 – Day 98

April 20 – Day 111

April 28 – Day 119

May 5 – Day 126

May 13 – Day 134

May 22 – Day 143

June 12 – Day 164

June 25 – Day 177

July 2 – Day 184

July 10 – Day 192