

Vegetation and Soil Sampling for STM and ESD Development

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Sampling for ESDs

Part 1:

How can sampling be structured and carried out?

There is no single best method

- There are many styles of sampling, varying resources available to ESD developers, and varying levels and types of expertise
- Common goal is a data-driven and repeatable approach to ESDs
- Methods used to develop ESDs within an LRU and MLRA should be consistent and documented as part of set of ESDs
- Training for the next generation of range cons

A general strategy for sampling

1. Rapid survey of map units across LRU (**Tier1**)



2. How do map units differ, how many community types?



3. Use ARC GIS to locate all representatives of key map units from digital soil survey



4. Rapid survey of map unit delineations (**Tier1**)



5. “Transect” a subset of map unit delineations with different communities
(at least 3 replicates/community/map unit), id map unit component (**Tier2**)



6. Evaluate data: important community differences and....

a) no soil differences=different states

b) associated with unique soil or climate properties=different LRU and/or sites



7. Select representatives of states within an Ecological Site for intensive measurement (**Tier3**)

Tier 1: Traverse (ESD Quick data form)

Date:	Observers:							
Area :								
Point	State/community	MU	Landform	Soil family/characteristics	Series	Easting	Northing	Elevation



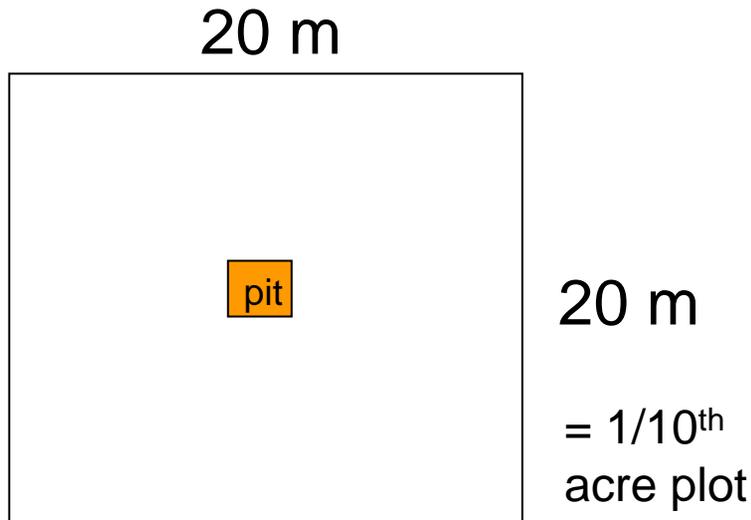
Tobosa-honey mesquite community

Very rapid identification of plant community from catalog of types generated at S&T workshops or in databases (geolocation also important!)

Tier 2: Transect (Plant Composition and Pattern form)

Modified Domin-Krajina cover estimate in 20x20 m plot

+-few	1--<0.1%	2--<1%	3--1-4%	4--5-10%	5--10-25%	6--25-33%	7--33-50%	8--50-75%	9--> 75%
+-<0.2m2	1--0.2-0.5m2	2--0.5-4m2	3--4-20m2	4--20-40m2	5--40-100 m2	6--100-132 m2	7--132-200	8-200-300	9--300-380
Woody	Class	Grass	Class	Forb	Class	Other	Class		
						Litter			Percent Scale
						Cryptogram			

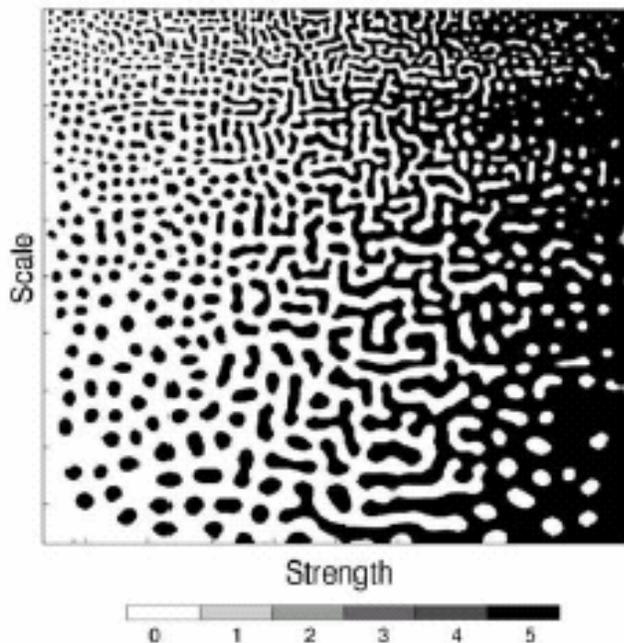


Cover estimated ocularly using cover scale within a 20x20 m area around pit, can be performed rapidly during soil survey transecting (15 minutes)

Tier 2: Transect (Plant Composition and Pattern form)

Resource retention class in 20 x 20 m

Interconnected grass cover or dense bunchgrasses; and surrounding ellipsoid bare patches < 30 cm	
Grass cover interconnected and surrounding ellipsoid bare ground patches from 30-__cm	cm
Grass cover fragmented by elongate bare ground areas to __ cm wide but bounded in plot	cm
Grass cover fragmented by elongate bare ground areas to __ cm wide that across entire width of plot	cm
Bare ground interconnected in several directions and isolated grass patches up to __ cm	cm
Bare ground interconnected with scattered or no grass plants	



A simple measure of patch structure that relates to the *potential for erosion*

Relates to Rangeland Health Indicators, but does not compare to a standard (because it is not defined yet)

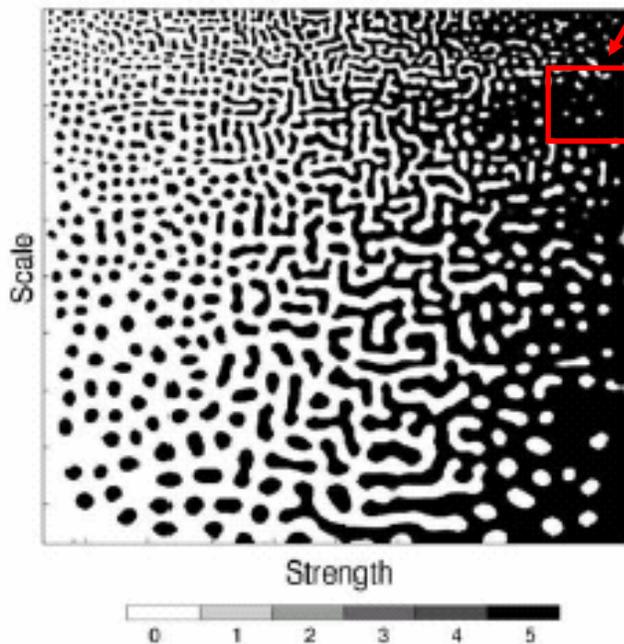
Used in S&T model text to describe states

Let's say black is grass

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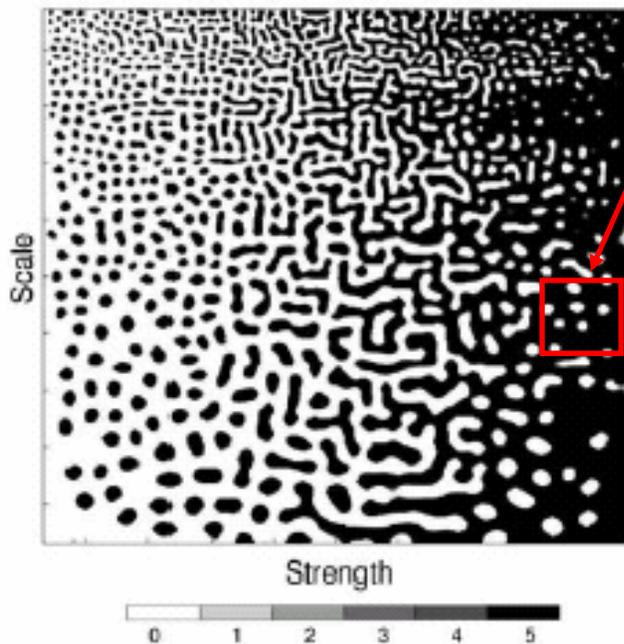


from Reitkerk et al., 2004, Science 305: 1926

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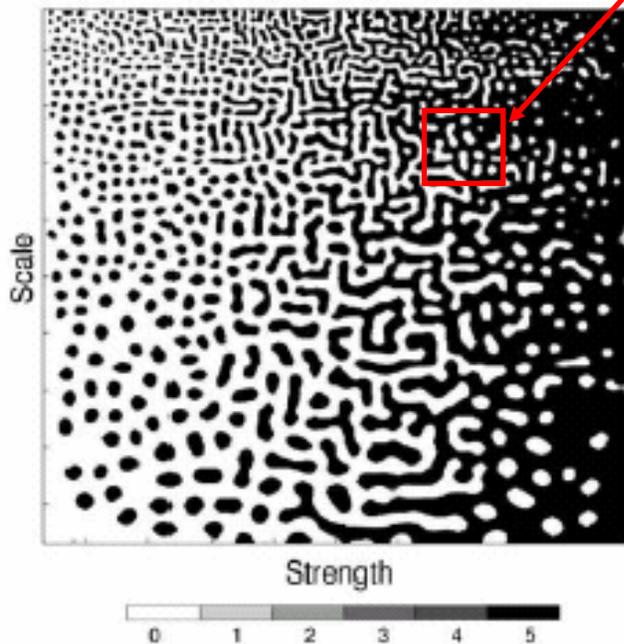


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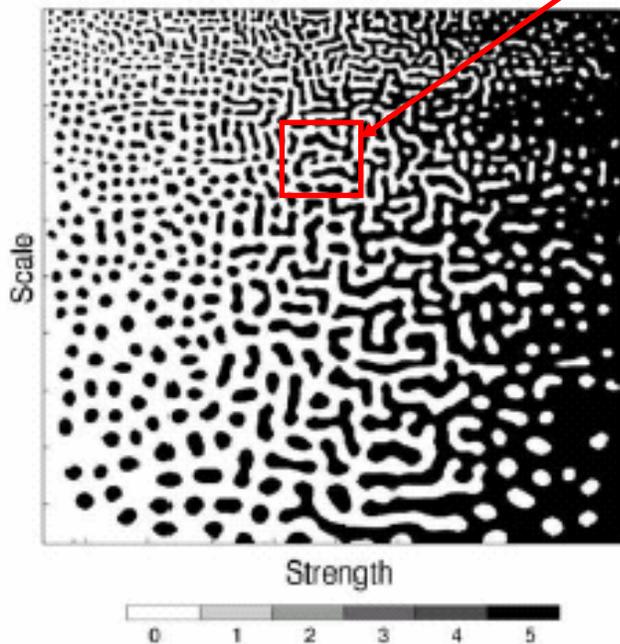


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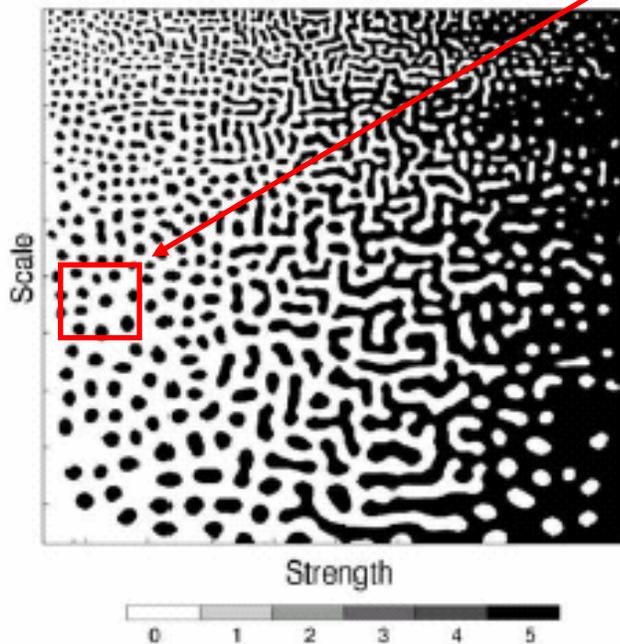


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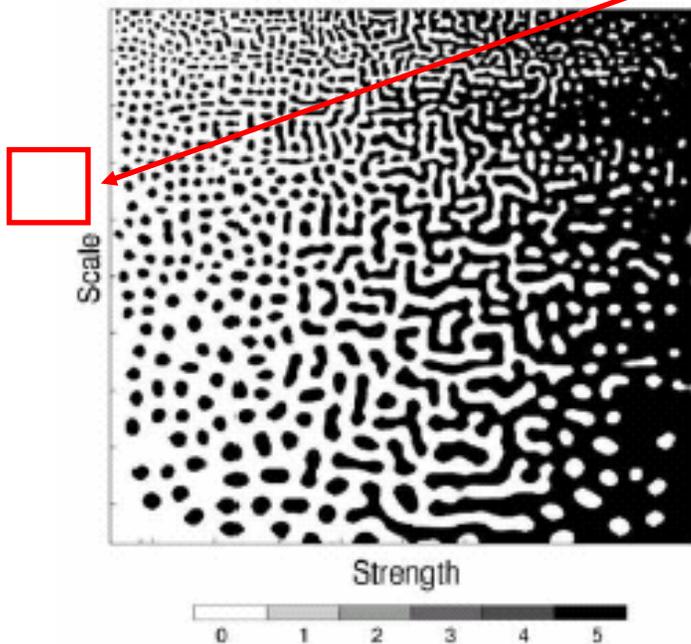


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Tier 2: Transect (Plant Composition and Pattern form)

Erosion pattern class in 20 x 20 m

Check one

No evidence of erosion or deposition	
Erosion limited to small (< 50 cm) blowouts or rills, few pedestals	
Erosion across large (> 50 cm) bare patches, gullies, flow patterns, but low soil loss	
Erosion across large areas with minor deflation, coppicing, flow patterns, pedestals	
Erosion across large areas with deflation, coppicing, and truncation of horizons	
Deposition across large areas, may have rills, flow patterns.	



A simple measure of erosion pattern that describes the *consequences of erosion processes for soils*

Relates to Rangeland Health Indicators, but does not compare to a standard (because it is not defined yet)

Used in S&T model text to describe states

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Another simple measure related to rangeland health indicators and used in text

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Tier 2: Transect (Soil form)

Surface soil properties

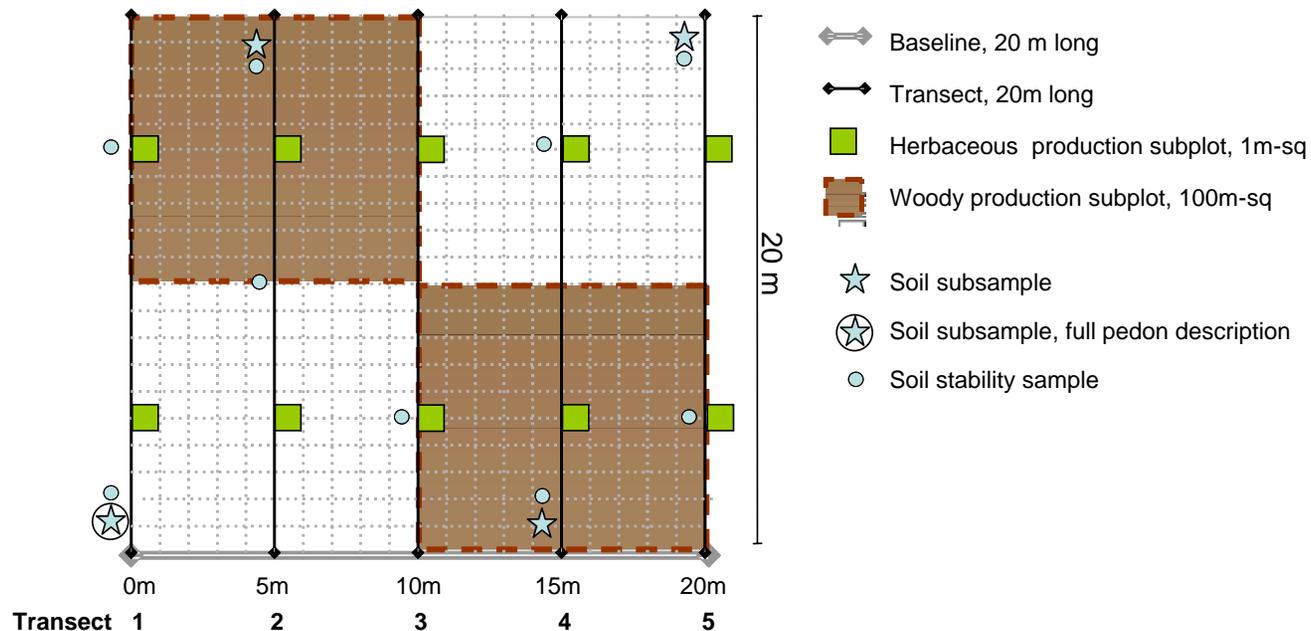
S = No crust; may be plant base or soil without any other surface feature	
WP = Weak physical or biological crust, may have few cyanobacterial sheaths dangling from ped, no darkening from cyanobacteria.	
SP = Strong physical crust	
PDB = Poorly developed biological crust assemblage, few to many cyanobacterial sheaths, may be slightly dark, can include some other morphological group (algal crust, lichen, moss)	
SDB = Strongly developed biological crust assemblage, obvious dark cyanobacteria, rubbery algal moss or lichen crust.	
CB = Cracking or curling, rubbery algal crusts, with or without lichen	
RA = Uniform rock armor	
CEM = Cemented	
D = Duff	
EL = Embedded litter	



These classes are estimated visually in Tier 2 plots or can be used with more intensive techniques

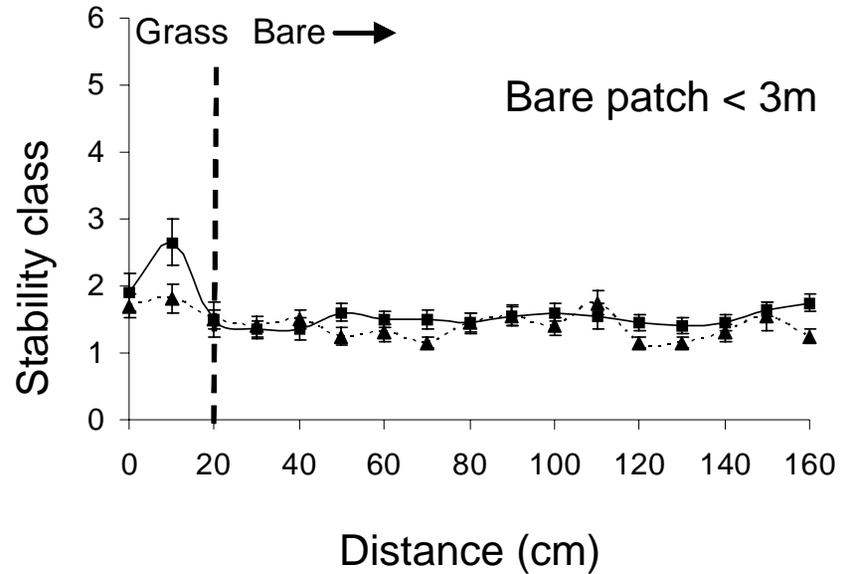
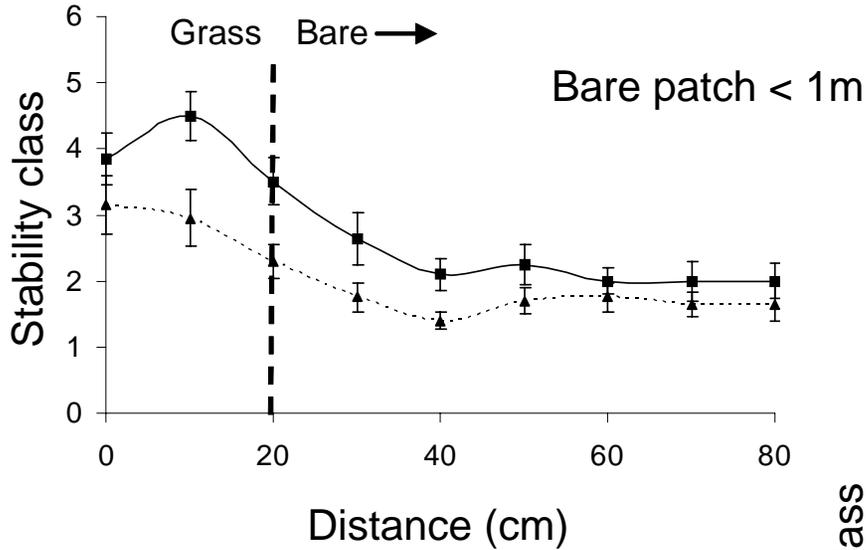
Tier 3: Intensive characterization: line point intercept vegetation, quantitative soil surface properties, production

20m x 20m plot, one stratum, four soil subsamples



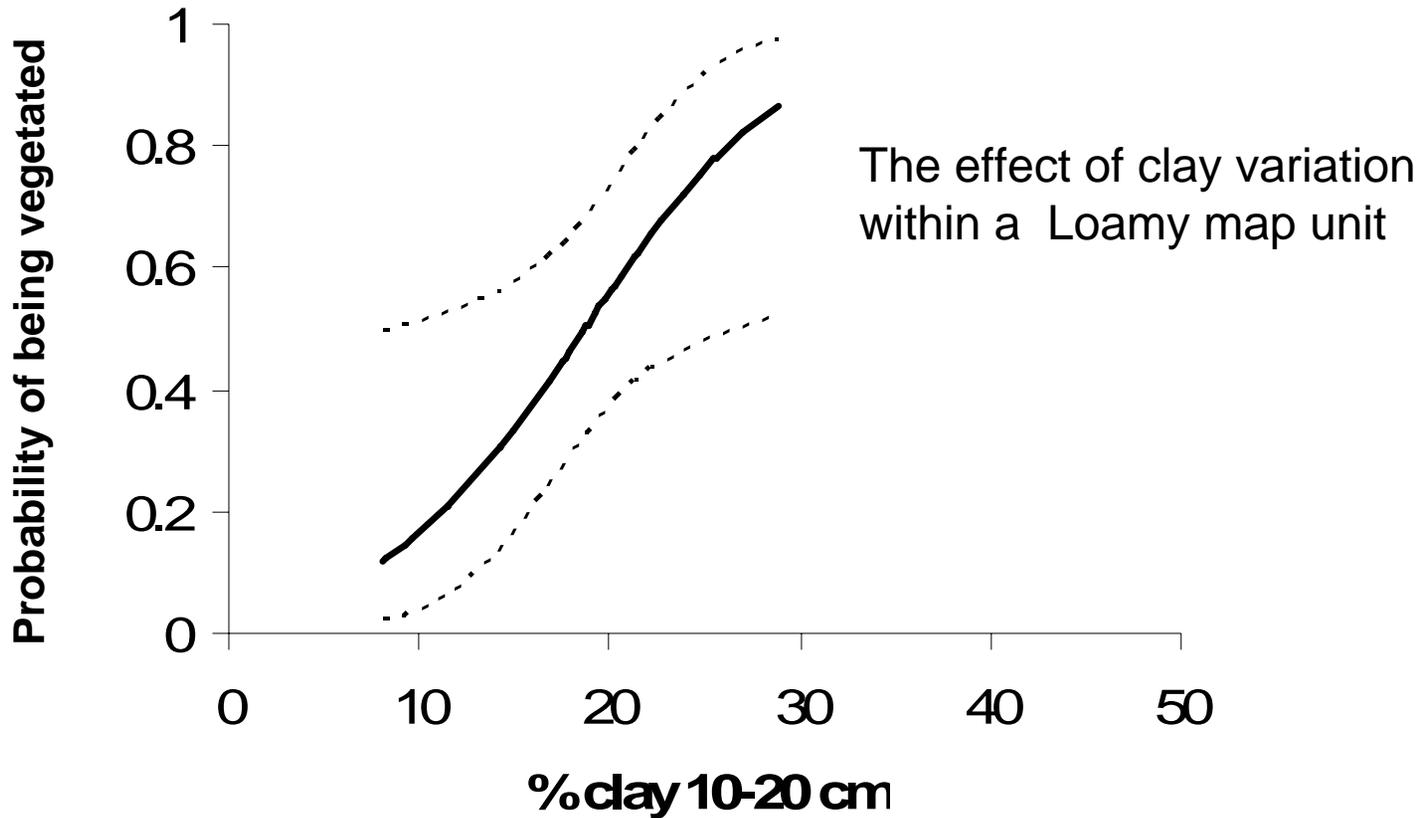
LPI design yields 200 points for basal and canopy cover but maintains observations within 10-20 m of the soil pit

Tier 3: Soil stability sampling considerations



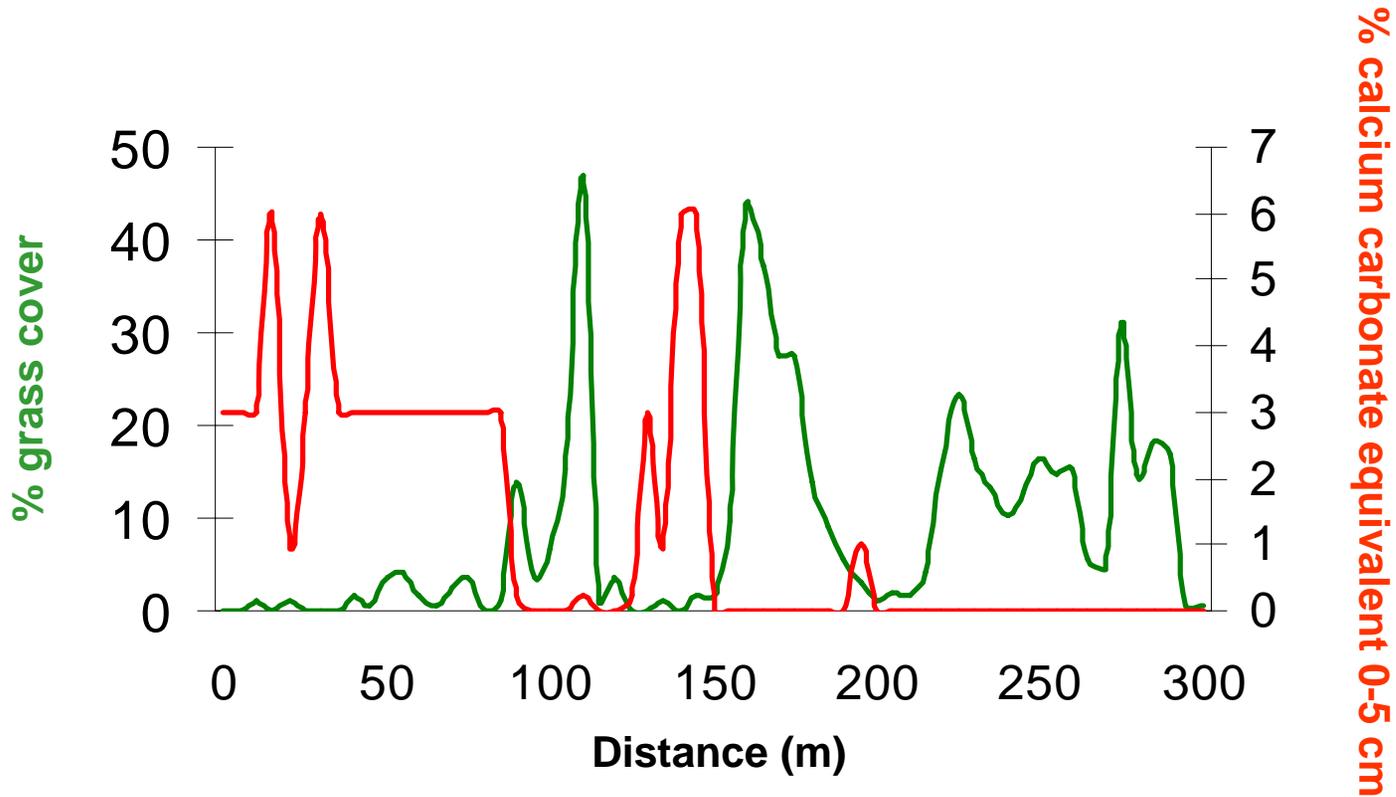
Values depend on condition, stratum (vegetated or bare), and spatial position

What to do with the data?



Good news: strong relationship between vegetation persistence and a soil property
Bad news: clay may vary from 10-30% over ca. 20 m

Scale of plant and soil variation is very important



When known, can report causes of variation within map units in S&T model text

Vegetation data associated to map units, but not necessarily soils at points

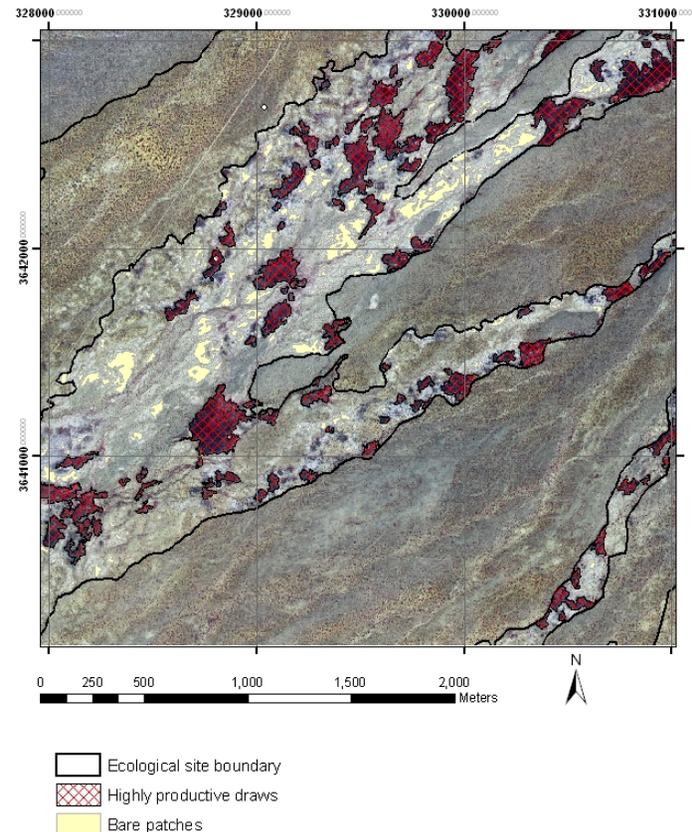
NRCS AZ example

- Soil scientist identifies representative map unit delineations for sampling
- Effects of soil variation within map unit averaged out with high intensity sampling
- Choose areas that are close to HCPC and areas recently burned
- Delineation is transected using 2-4 lines of 50 points each

- Canopy cover estimates for shrubs/count by size class (7x7m plots)
- Dry weight rank/comparative yield for production (40 x 40 cm plots)
- Herbaceous frequency using corners of clipping frame

- Supplement data on alternative states using NRI plots, ranch monitoring, etc.

The future (Tier 4): incorporating high resolution remote sensed patterns within ESDs and recommended monitoring structures



Steele et al., in prep.

Within an SD-2 Draw site, we can describe the pattern of highly vegetated and bare areas to help define states expressed at larger scales than a 400m² plot

Conclusions

- Basic protocol has successfully matched the pace of soil survey in the White Sands Missile Range survey
- Without additional range cons to participate in soil survey teams, valuable data are not being gathered
- Numerous samples of coupled plant, soil surface, and subsoil data at regional scales are essential to develop and improve ESDs and S&T models