



MODIFIED LANDSCAPE FUNCTIONAL ANALYSIS

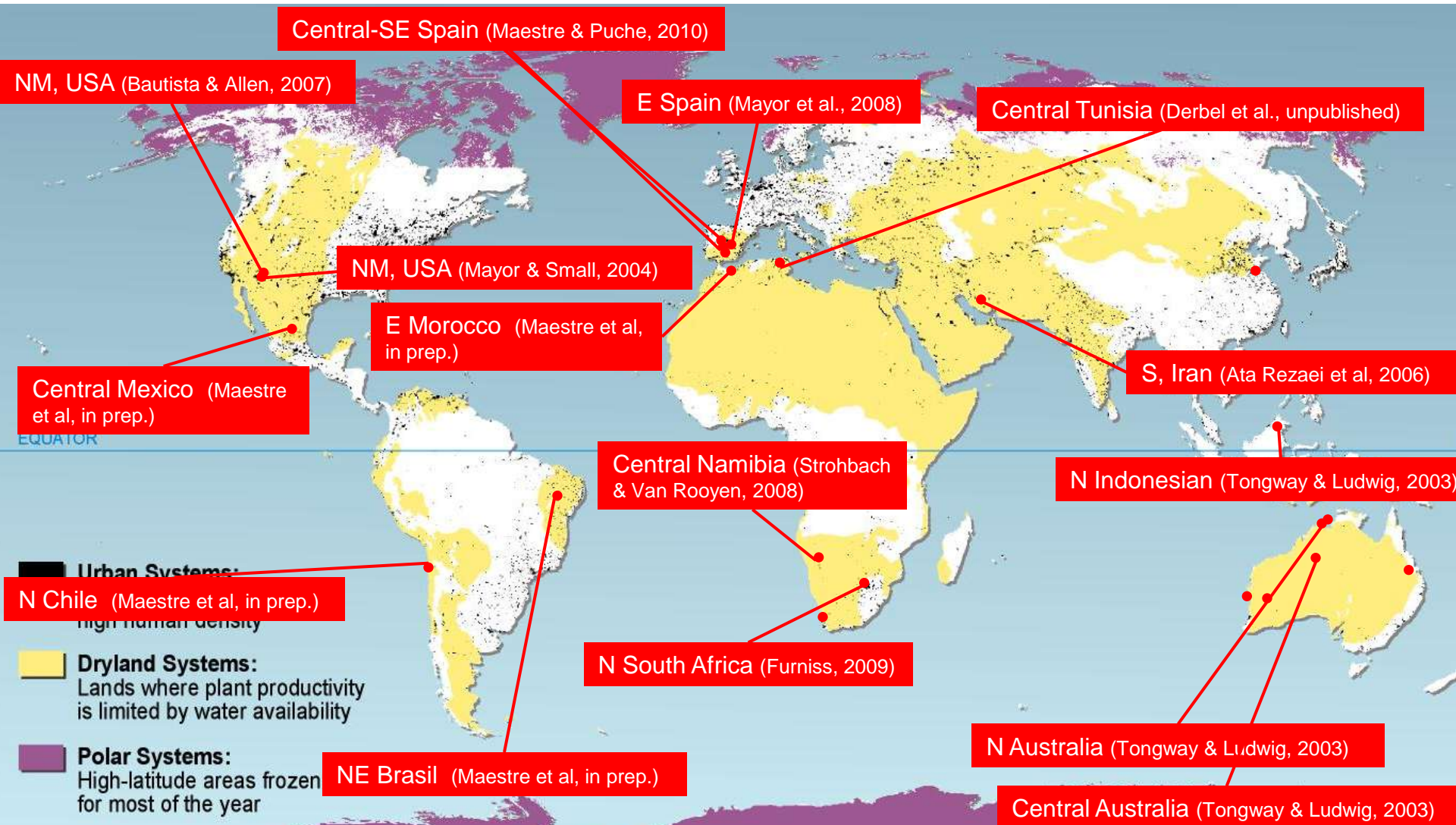
A method for Ground-based biophysical assessment

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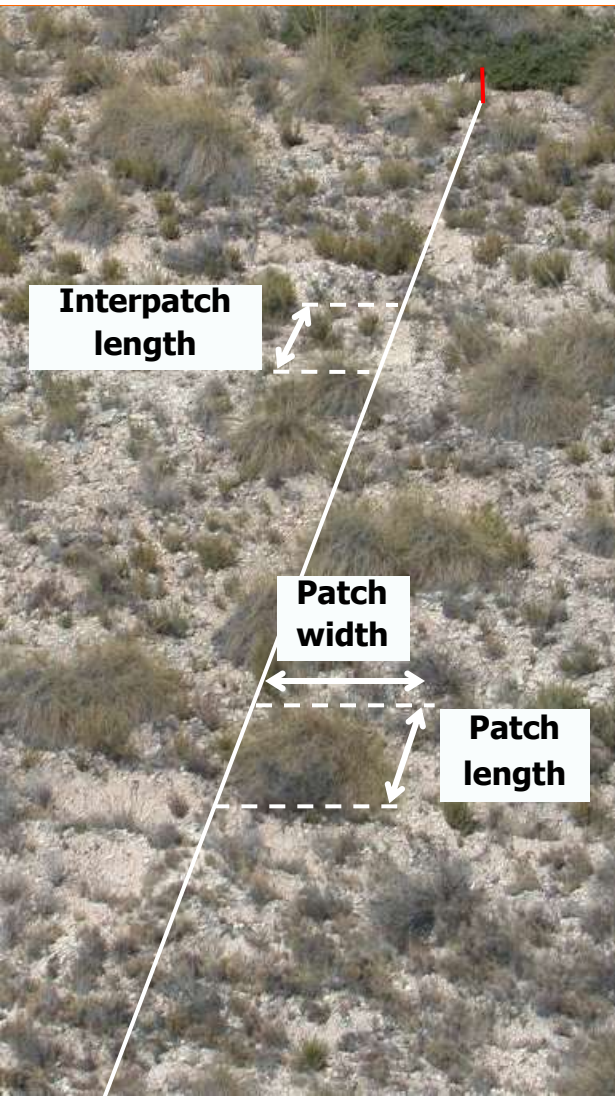


PRACTICE 2nd workshop, Sardinia October 2010

Worldwide application of *Landscape Functional Analysis*



I. Structural metrics: **Vegetation patch cover & pattern**



Sampling units

Linear transects

(parallel to direction of flow of resources)

Measurements

Patch length and width

Interpatch length

Derived metrics

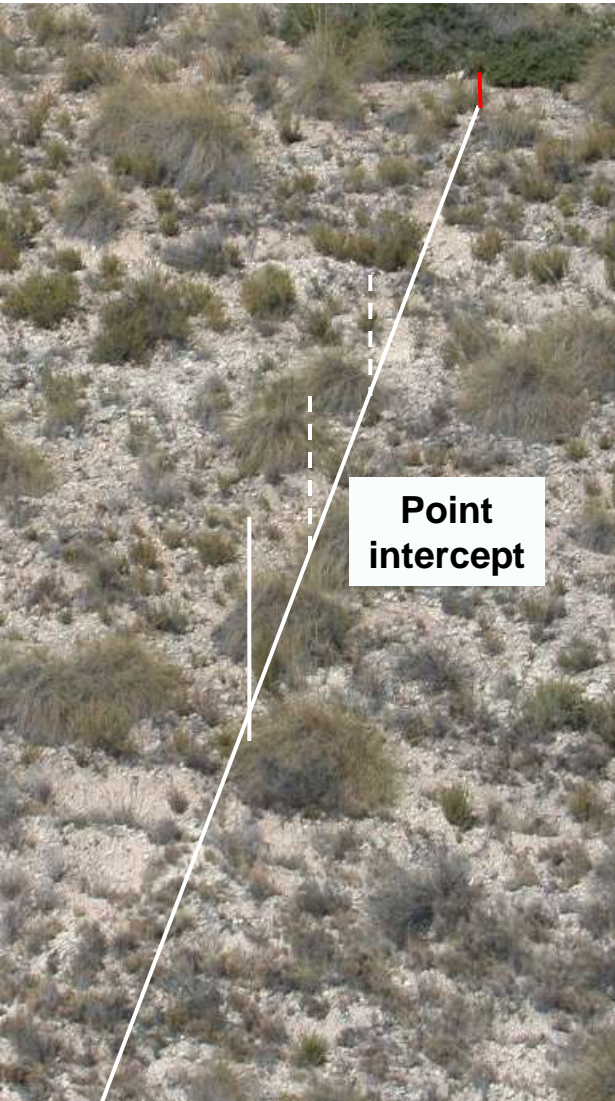
Patch length and width

Interpatch length

Patch (interpatch) cover

Patch density

I. Structural metrics: **Diversity of vascular plants**



Sampling units

Linear transects

(parallel to direction of flow of resources)

Measurements

Composition and abundance of vascular plants

Derived metrics

Richness

Diversity and evenness indices

Abundance of selected key species

Abundance of invasive alien species

II. Functional metrics: **Soil surface condition**

Soil surface features

Functional Indices

Per. veg. basal/canopy cover

Litter cover, origin & incorp.

Cryptogam cover

Surface roughness

Surface compaction

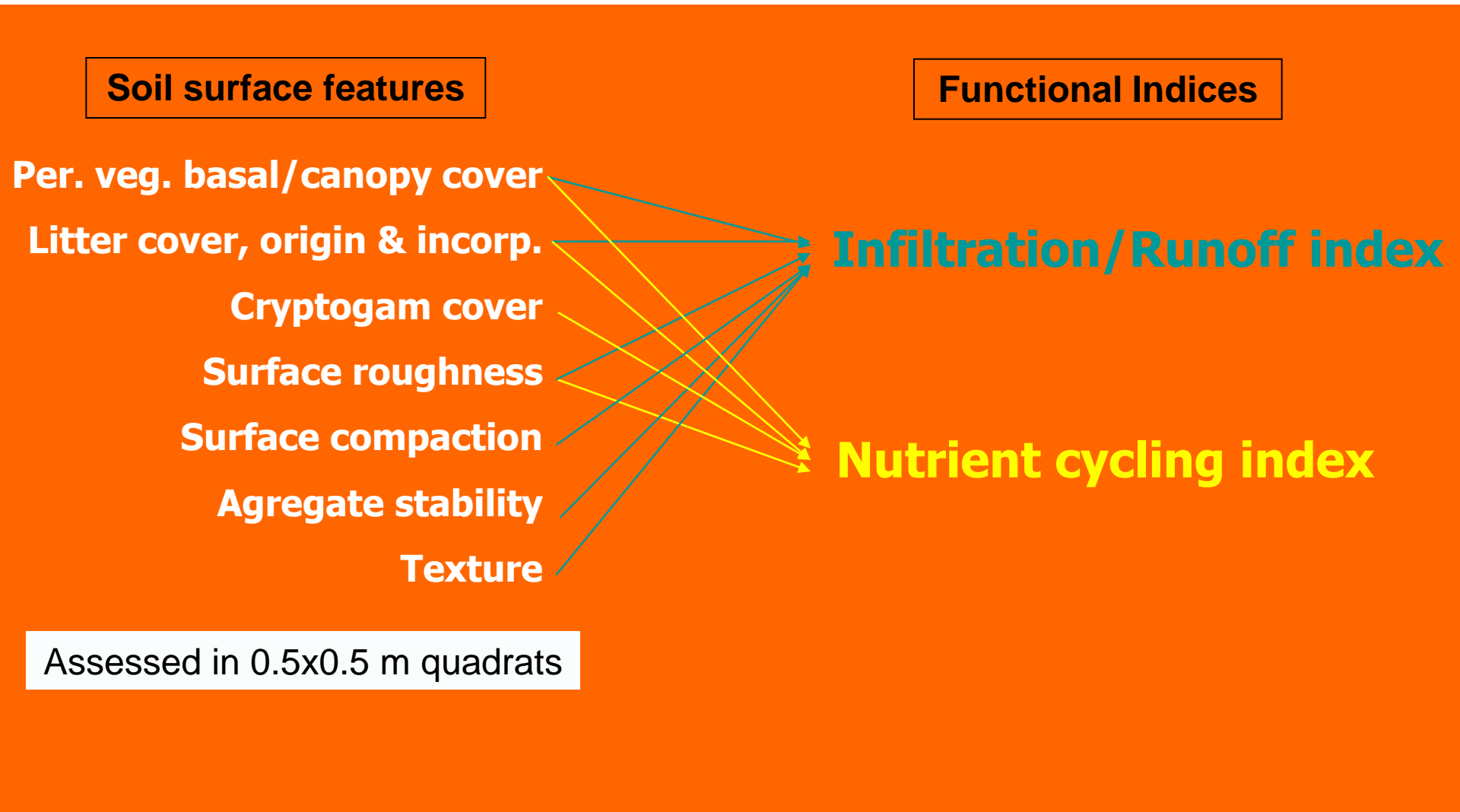
Agregate stability

Texture

Infiltration/Runoff index

Nutrient cycling index

Assessed in 0.5x0.5 m quadrats



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Soil surface feature:

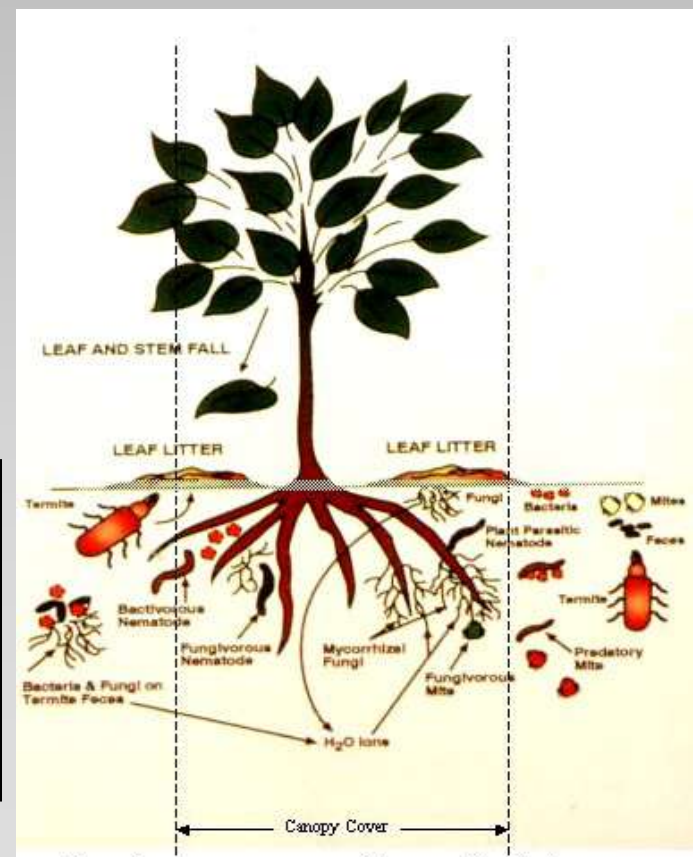
Perennial vegetation basal & canopy cover

Process addressed:

Below-ground biomass perennial vegetation contribution to infiltration and nutrient cycling processes

Measurement:

Basal cover of perennial grasses & canopy cover of trees and shrubs
 Not annuals (their contribution is included with litter)



Basal and Canopy cover	Class	Interpretation
1% or less	1	No below-ground contribution
1 to 10%	2	Low below-ground contribution
10 to 20%	3	Moderate below-ground contribution
More than 20%	4	High below-ground contribution

Soil surface feature:

Litter cover, origin & incorporation

Process addressed:

Decomposition of surface organic matter

Measurement:

Cover of litter layer **(and annual plants)**, and thickness (if cover > 100%)

Litter origin: local (l) or transported (t)

Degree of decomposition: nil (n), slight (s), moderate (m) or extensive (e)



Cover of plant litter	Class
<10%	1
10 to 25%	2
75 to 100%	5
100%, 21-70 mm thick	7

Soil surface feature:

Cryptogam cover

Process adressed:

Contribution of biocrusts to fertility of surface soil

Measurement:

Cover of cryptogam crust (algae, fungi, lichens and mosses)



Cryptogam cover	Class
0%	0
<1%%	1
1 to 10%	2
>50%	4

Soil surface feature:

Soil surface roughness

Process adressed:

Water infiltration, flow disruption and seed lodgement

Measurement:

Average depth of surface depressions



Surface roughness	Class
<3 mm	1
3-8 mm	2
8-25 mm	3
>25 mm	4

Soil surface feature:

Soil surface compaction

Process adressed:

Effect of mechanical disturbance

Measurement:

Surface resistance to penetration



Cover of plant litter	Class
Need metal tool	4
Need plastic tool	3
Easily penetrated with finger	2
Loose surface, no crust	1

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Soil surface feature:

Soil aggregate stability

Process addressed:

Soil stability/dispersiveness when wet

Measurement:

Observation of response of dry soil fragments ≈ 1 -cm cube size immersed in rainwater (over a period of \approx one minute)



Cover of plant litter	Class
Fragment collapses in 5 sec	1
Part surface remains	2
Surface remains	3
Whole fragment remains	4

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Soil surface feature:

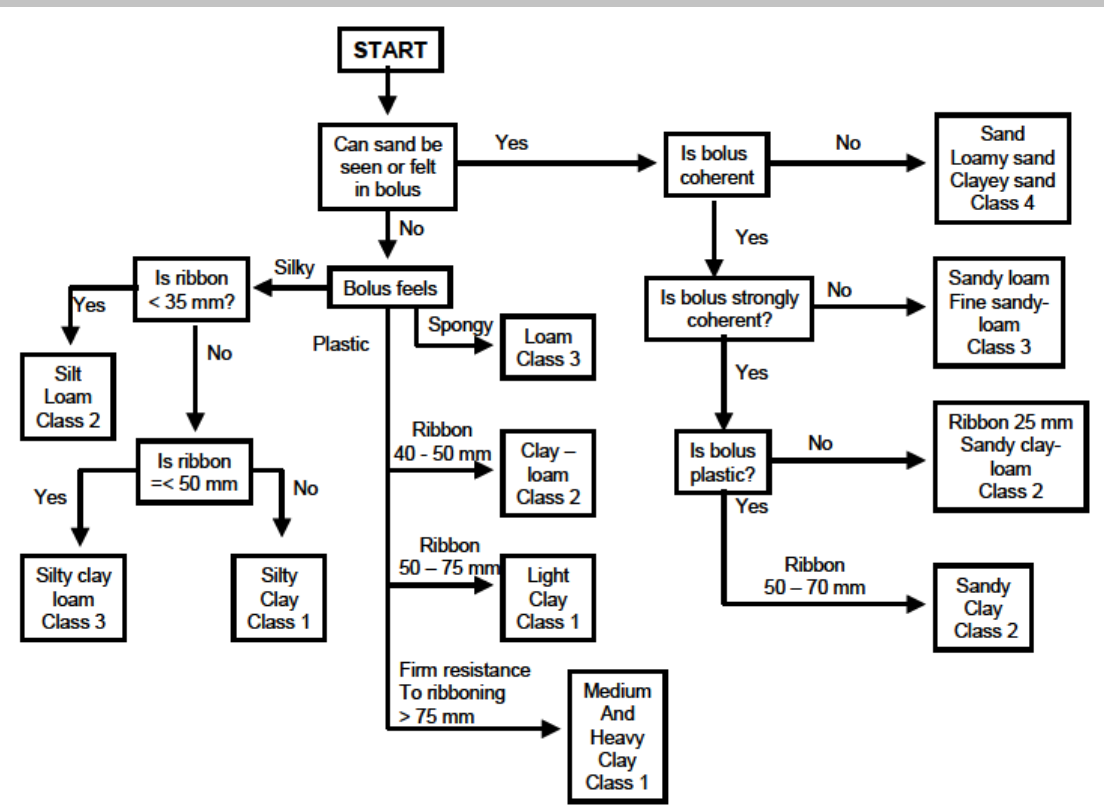
Soil surface texture

Process addressed:

Infiltration rate and water storage

Measurement:

Assessment of soil texture (0-5 cm surface depth) with a pedologists' moist bolus test and a simplified 4 point scale



Texture	Class
Silty clay to heavy clay	1
Sandy clay loam to sandy clay	2
Sandy loam to silt loam	3
Sandy to clayey sand	4

Excel spreadsheet example

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Soil Surface Assessment														
2	Action:-														
3	Date:-														
4	<i>Soil surface feature</i>	<i>Max score</i>	<i>Demo 1</i>	<i>Demo 2</i>	<i>Rep 3</i>	<i>Rep 4</i>	<i>Rep 5</i>								
5	Per. basal / canopy cover	4	2	1	0	0	0								
6	Litter cover, orig & incorp.	10	1ls	1tn	0	0	0								
7	Cryptogam cover	4	4	1	0	0	0								
8	Soil surface roughness	5	1	2	0	0	0								
9	Surface resist. to disturb.	5	4	4	0	0	0								
10	Slake test	4	3	3	0	0	0								
11	Texture	4	1	2	0	0	0								
20															
21	Infiltration/runoff index														
22	<i>Soil surface feature</i>	<i>Max score</i>	<i>Demo 1</i>	<i>Demo 2</i>	<i>Rep 3</i>	<i>Rep 4</i>	<i>Rep 5</i>								
23	Per. basal / canopy cover	4	2	1	0	0	0								
24	Litter cover, orig & incorp.	30	1.995	1	0	0	0								
25	Soil surface roughness	5	1	2	0	0	0								
26	Slake test	4	3	3	0	0	0								
27	Texture	4	1	2	0	0	0								
28	Surface resist. to disturb.	10	1	1	0	0	0								
29	Total		9.995	10	0	0	0								
30	Divide by		57	57	0	0	0								
31	%		17.54	17.54											
32															
33															
34	Nutrient cycling index														
35	<i>Soil surface feature</i>	<i>Max score</i>	<i>Demo 1</i>	<i>Demo 2</i>	<i>Rep 3</i>	<i>Rep 4</i>	<i>Rep 5</i>								
36	Per. basal / canopy cover	4	2	1	0	0	0								
37	Litter cover, orig & incorp.	30	1.995	1	0	0	0								
38	Cryptogam cover	4	4	1	0	0	0								
39	Soil surface roughness	5	1	2	0	0	0								
40	Total		8.995	5	0	0	0								
41	Divide by		43	43	0	0	0								
42	%		20.9	11.6											

Demo 1



Demo 2



Similar infiltration, different nutrient cycling

Sample size?

3 50-m transects X action (up to aprox. 10 ha)

5 quadrats on bare soil (interpatch) X action

Evaluation time per action?

60 min X 3 transects = 180 min

20 min X 5 quadrats = 100 min

≈ 5 hours x action (<10 ha)