

Interpreting Indicators of Rangeland Health

Process to collect and document professional knowledge and observations on selected indicators of rangeland health.



Rangeland Health

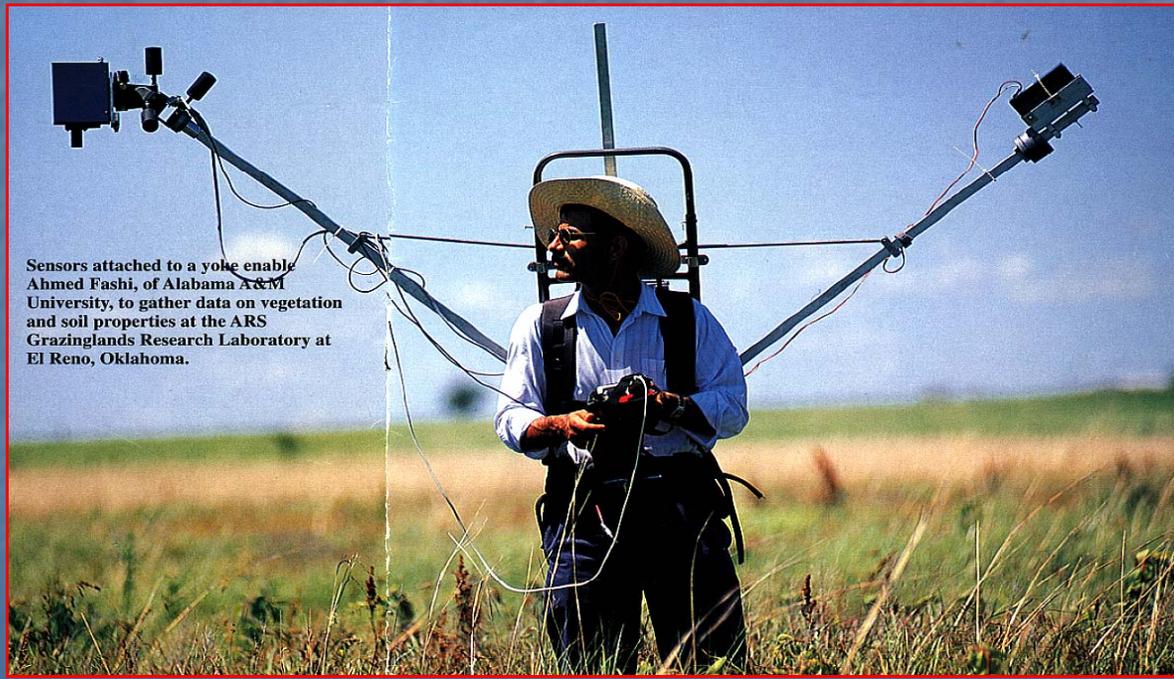
How Ecological Processes are Functioning?

- Soil/Site Stability
- Water Cycle and Hydrology
- Nutrient Cycle
- Energy Flow
- Plant Species Functional Diversity

Interpreting Indicators of Rangeland Health (IIRH) Attributes

- The degree of soil and site stability
- Hydrologic Function
- Integrity of the Biotic Community

How can we easily and economically determine if ecological processes are functioning?



Sensors attached to a yoke enable Ahmed Fashi, of Alabama A&M University, to gather data on vegetation and soil properties at the ARS Grazinglands Research Laboratory at El Reno, Oklahoma.

Indicators

Elements of an ecosystem used to assess processes that are too difficult or expensive to measure.

Due to the complexity of ecological processes a “suite” of indicators are recommended.



Indicators

1. Rills
2. Water Flow Patterns
3. Pedestals/Terracettes
4. Bare Ground
5. Gullies
6. Wind Scour Areas
7. Litter Movement
8. Resistance to Erosion
9. Loss of Soil Surface
10. Plant/Infiltration Effects
11. Compaction Layer
12. Functional/Structural Groups
13. Plant Mortality/Decadence
14. Litter Amount
15. Annual Production
16. Invasive Plants
17. Reproductive Capability

Optional Indicators

- Flexibility to add additional ecological indicators is provided.

- Biological crusts may be considered as an optional indicator:

- Colorado Plateau--important functional component
- Tall Grass Prairie--unimportant and rare component



RILLS

Small erosion rivulets that are generally linear and do not necessarily follow the microtopography (unlike water flow patterns). The indicator reflects the current depth, length and interval spacing of rills, relative to that described in the Reference Sheet.





WATER FLOW PATTERNS

The path that water takes (i.e. accumulates) as it moves across the soil surface during overland flow. These areas are not necessarily eroding, and may be well defined or almost invisible.





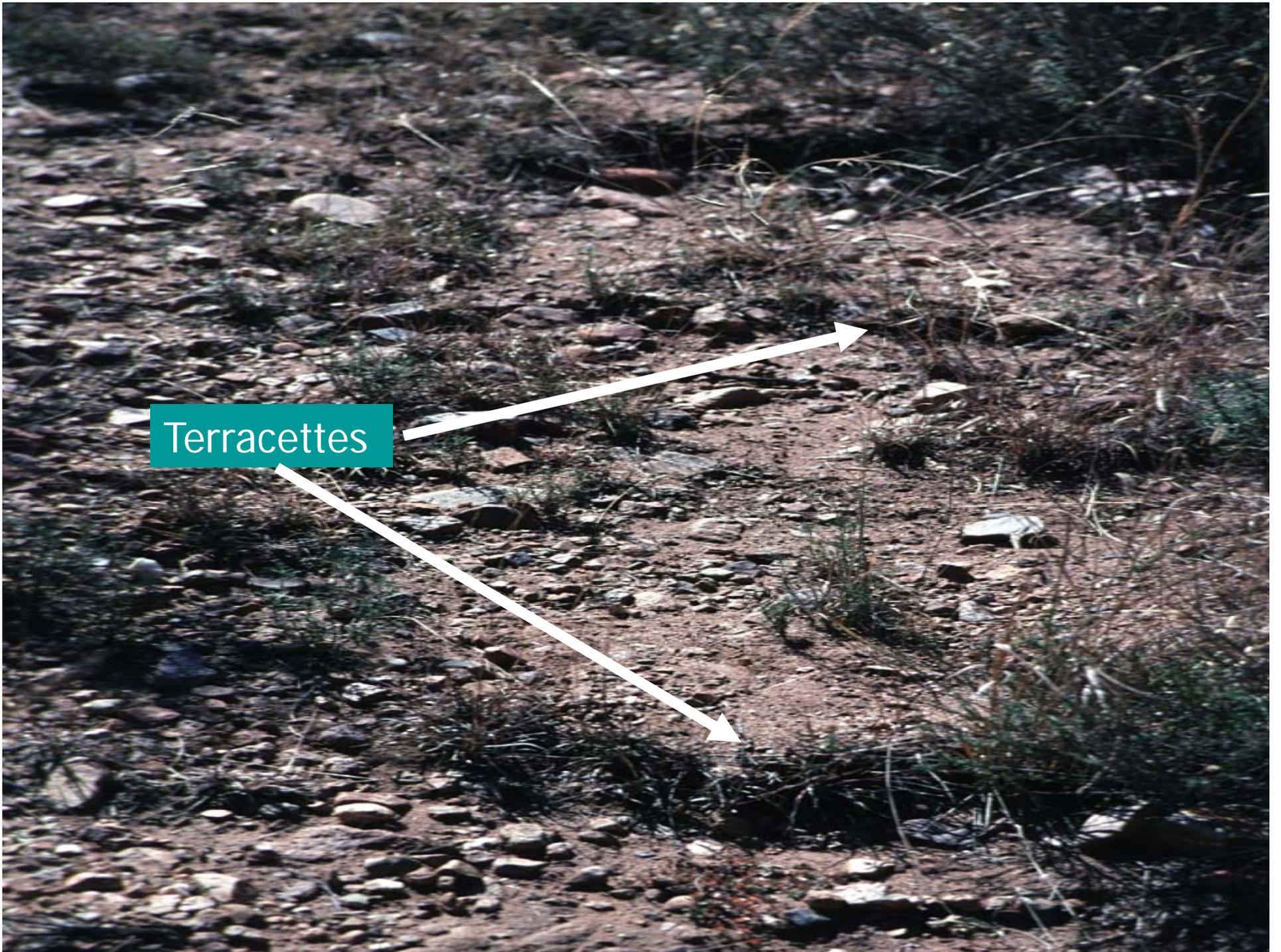
PEDESTALS or TERRACETTES

Pedestals are rocks or plants that appear elevated as a result of soil loss by wind or water erosion. This indicator does not include elevated surfaces caused by litter fall and/or frost-heave.

Terracettes are benches of soil deposition behind obstacles caused by water movement (not wind).



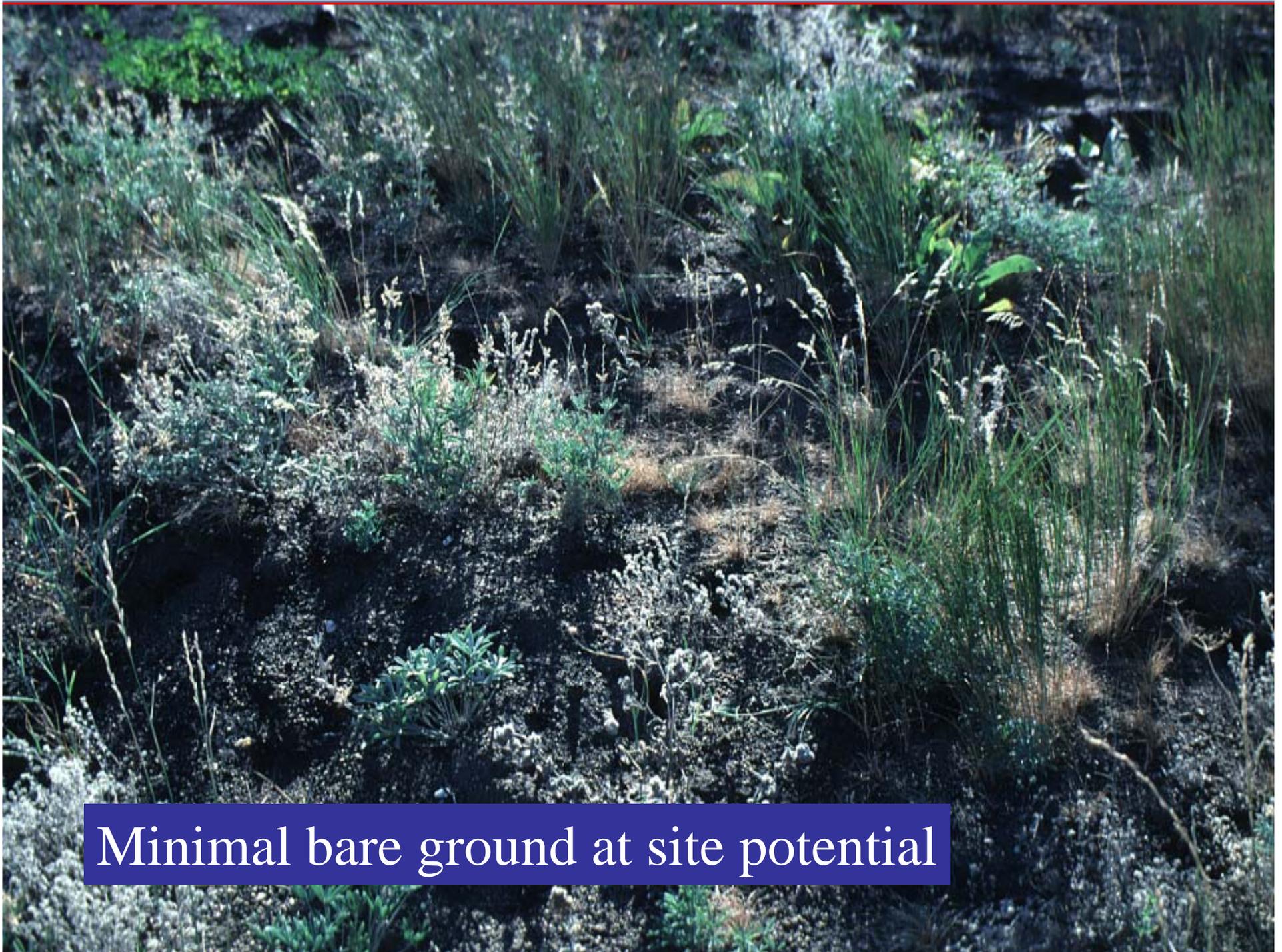
Terracettes



BARE GROUND

Exposed Soil

Soil covered by gravels, biological crust, litter, woody debris or live or standing dead vegetation is *not* bare ground.



Minimal bare ground at site potential

High amount of bare ground



GULLIES

Channel cut into the soil by the action of running water. Natural flow patterns that have never eroded are not gullies.





Gullies

Active erosion on parts of this gully



Stable gully except for active headcut



WIND SCoured, BLOWOUT and DEPOSITIONAL AREAS

Evidence of wind erosion more than
expected for the site.





LITTER MOVEMENT

The degree and amount of litter (i.e., dead plant material that is in contact with the soil surface) movement (e.g., redistribution), and size of litter moved.





SOIL SURFACE RESISTANCE TO EROSION

Soil surfaces are stabilized by soil organic matter being incorporated into aggregates at the soil surface, adhesion of decomposing organic matter to the soil surface, and biological crusts.

Soil Surface Resistance to Erosion

Lack of organic matter increases physical crust



SOIL SURFACE LOSS or DEGRADATION

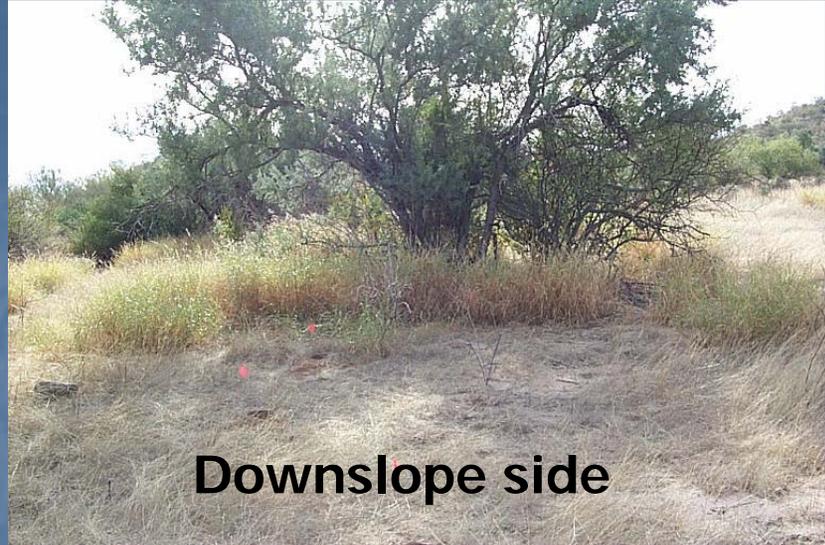
The surface of the soil where organic matter accumulation and decomposition begin.

It may or may not be the "A" or "O" horizon.

The two primary soil properties used to make this evaluation are the organic matter content and the structure of the surface layer or horizon



Upslope side



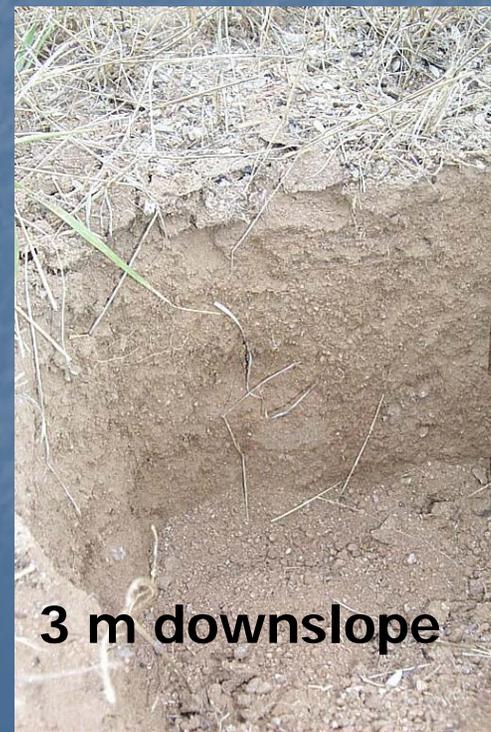
Downslope side



3 m upslope



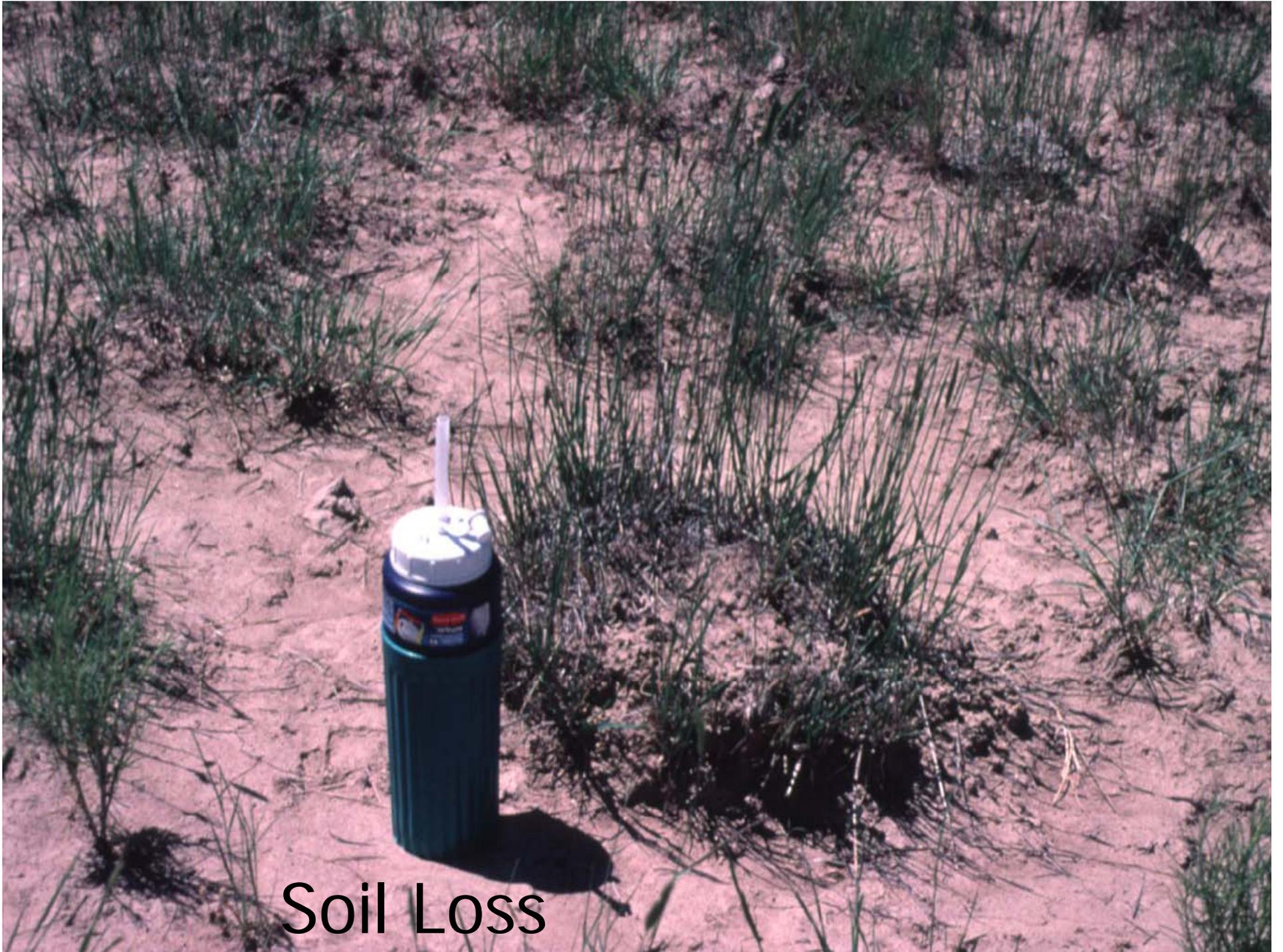
Under ironwood tree



3 m downslope



Soil
Degradation



Soil Loss

Soil Surface Loss or Degradation



Intact soil surface

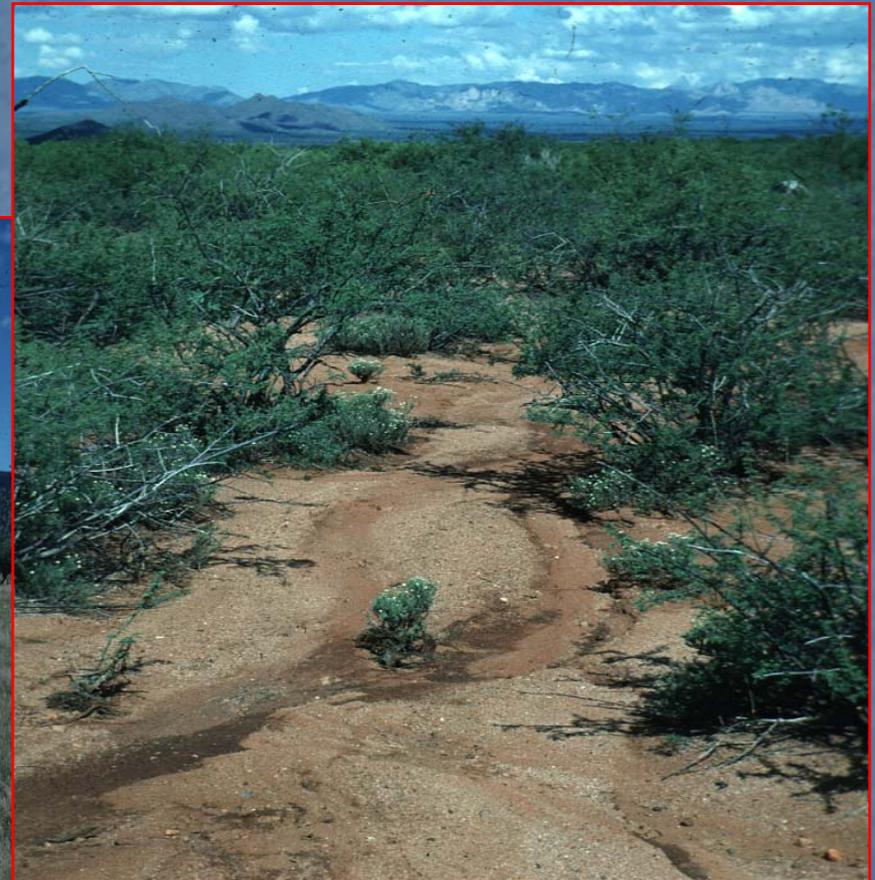
Loss of soil surface

PLANT COMMUNITY COMPOSITION & DISTRIBUTION RELATIVE TO INFILTRATION AND RUNOFF

The ability of the plant community to capture the precipitation. Composition changes can influence (positively or negatively) the ability of a site to capture and store precipitation.

Plant Community Composition and Distribution Relative to Infiltration and Runoff

Desert grassland has good infiltration



Conversion to shrubs greatly increases runoff

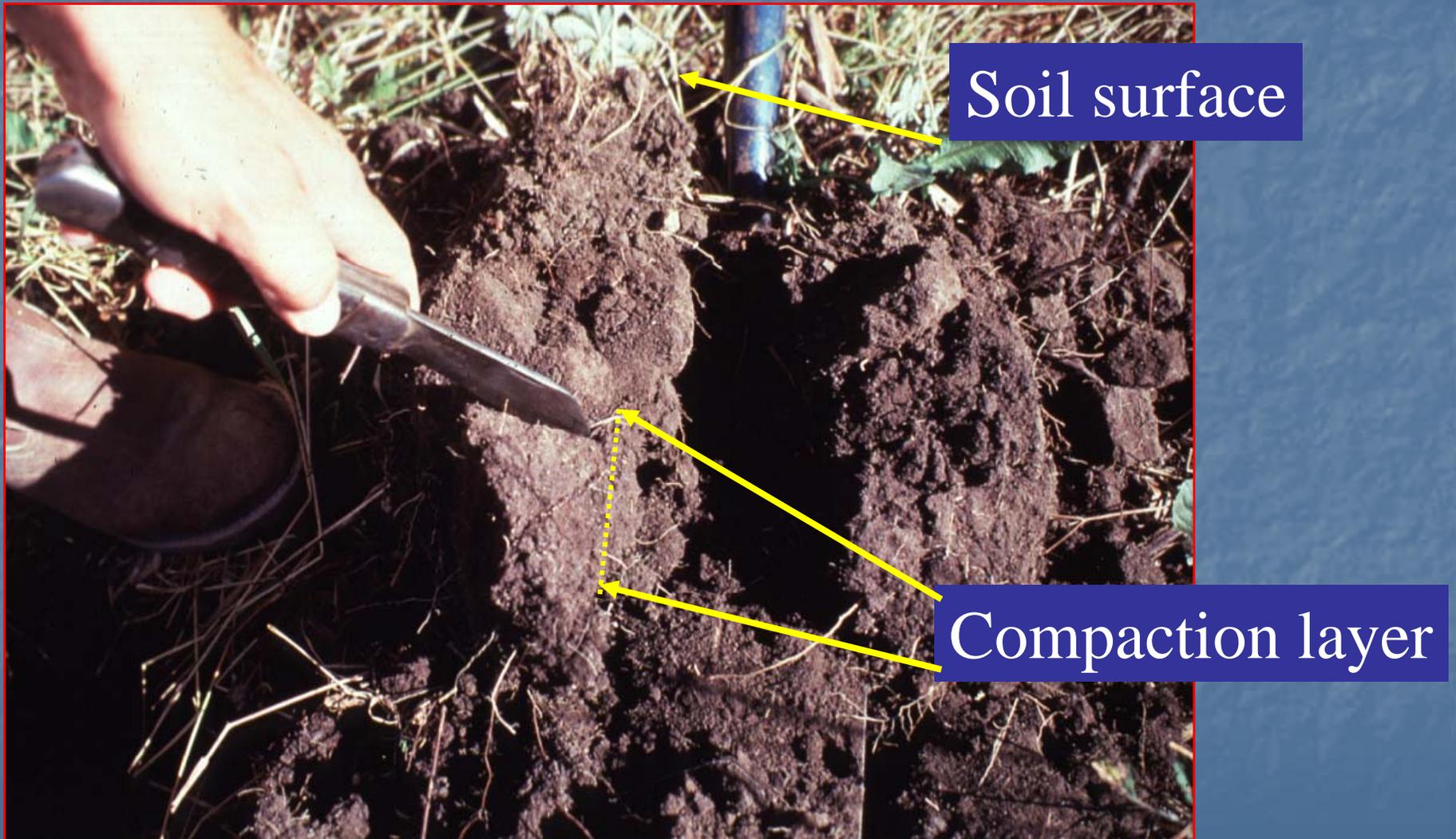
COMPACTION LAYER

A near surface layer of dense soil caused by repeated impacts on or disturbances of the soil surface. It can also occur below the surface at the bottom of a tillage layer.

Does not include soil textural changes.



Compaction Layer



FUNCTIONAL/STRUCTURAL GROUPS

Characterization of the plant community in terms of photosynthetic pathways, plant size and structure, rooting depth and structure, longevity, etc... Where relevant includes biological crusts.





FUNCTIONAL/STRUCTURAL GROUPS



Cool vs. warm season, tall vs. short grass, sprouting vs. nonsprouting Shrub, fibrous vs. tap root, annual vs. perennial.....

PLANT MORTALITY/DECADENCE

The proportion of dead or decadent (e.g., moribund, dying) to young or mature plants in the community, relative to that expected for the site under normal disturbance regimes

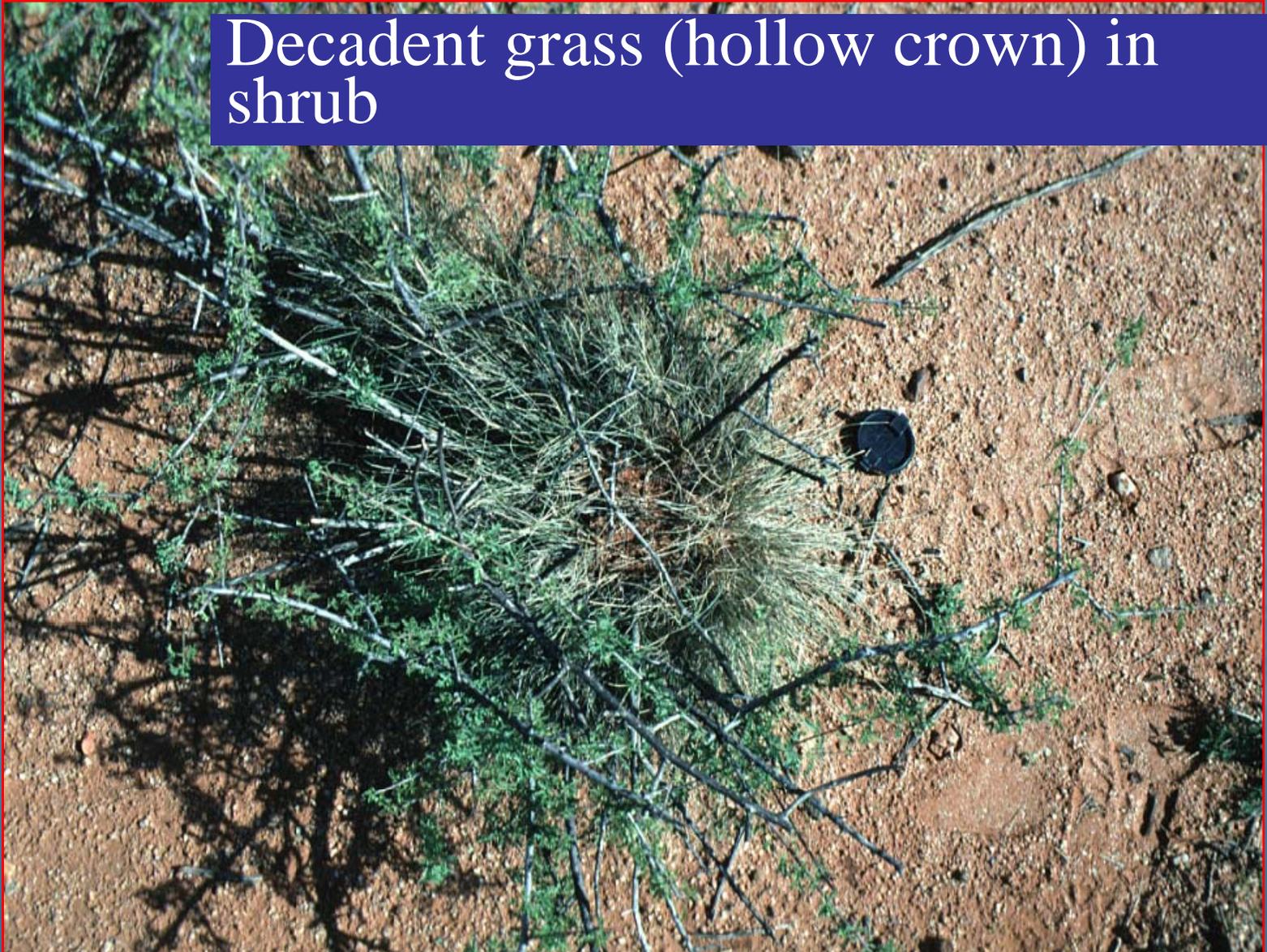
PLANT MORTALITY/DECADENCE

Dead sagebrush in larger stand



PLANT MORTALITY/DECADENCE

Decadent grass (hollow crown) in shrub



LITTER AMOUNT

Litter is any dead plant material (from both native and exotic plants) that is detached from the plant and in contact with the soil surface. Departure from expected associated with too much or too little litter.

LITTER AMOUNT



LITTER AMOUNT



ANNUAL PRODUCTION

Total annual production of above ground plant material. It is the net quantity of above-ground vascular plant material produced within a year



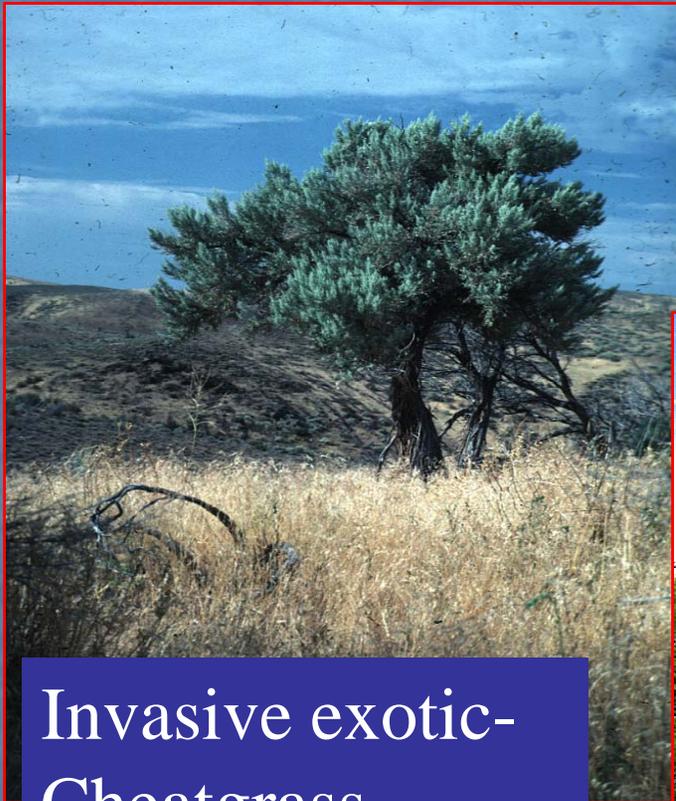
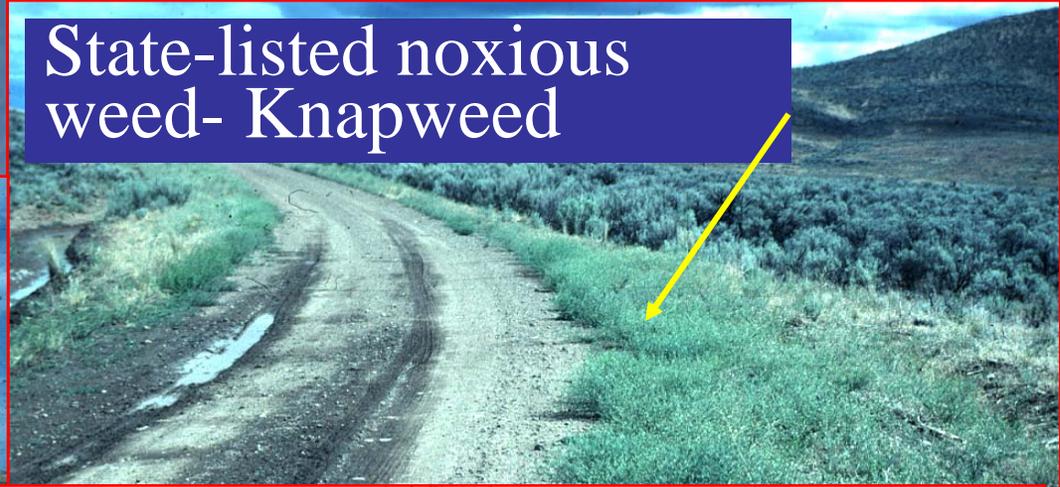


INVASIVE PLANTS

May or may not be noxious or exotic. Plants that will continue to increase on a site and become dominant on the site, regardless of management.

Invasive Plants

State-listed noxious weed- Knapweed



Invasive exotic-
Cheatgrass

Invasive native- Juniper

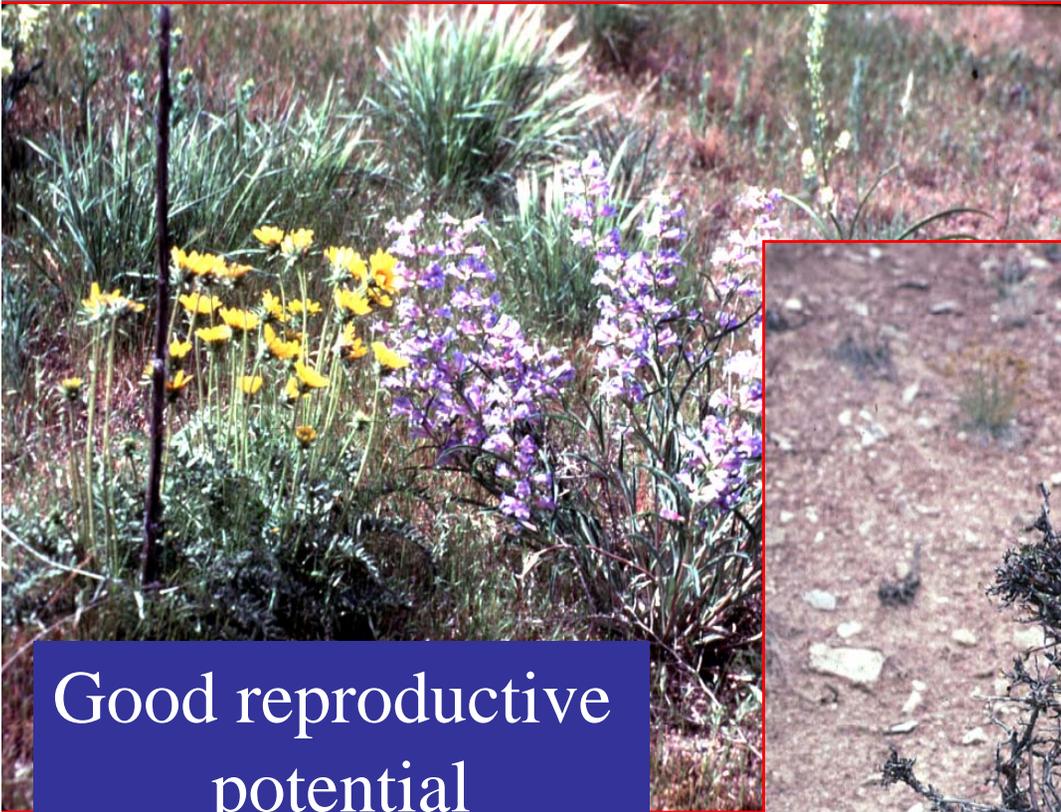


PERENNIAL PLANT REPRODUCTIVE CAPABILITY

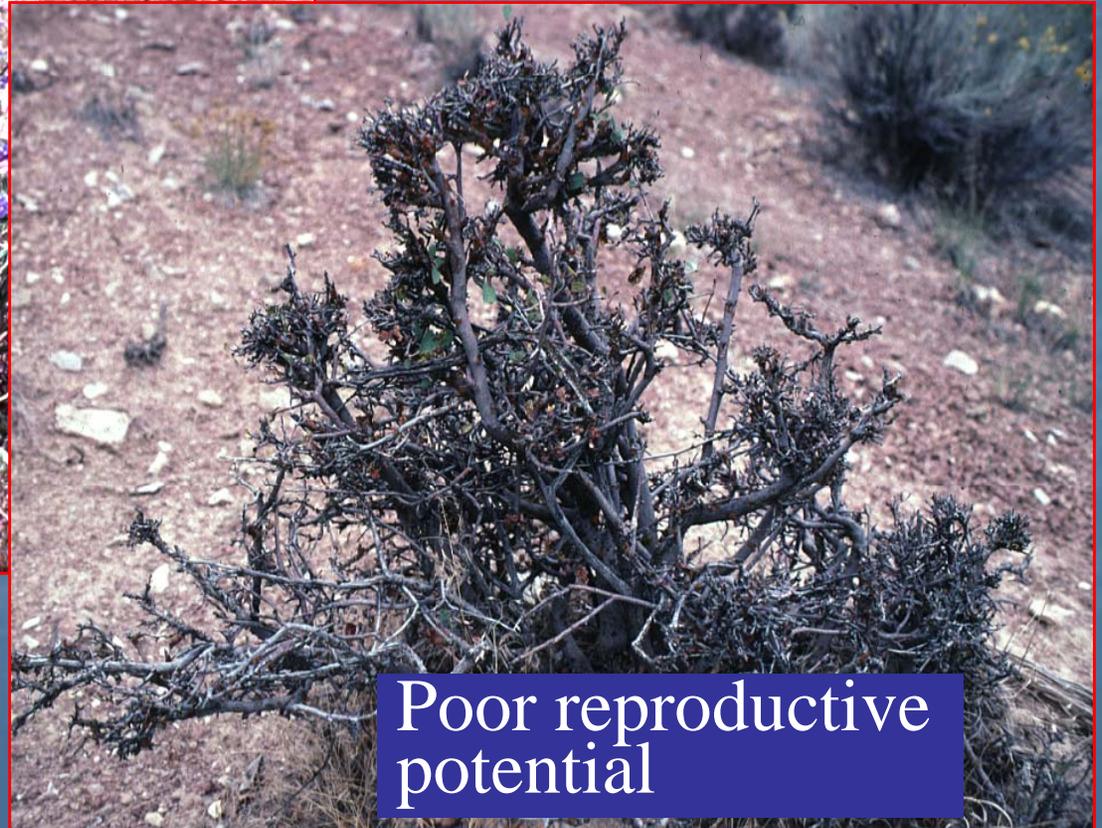
The ability of native or seeded plants (**not including invasives**) to produce seed, seedlings, or vegetative reproduction, if the weather conditions allow.

The presence or absence of young plants and seedlings is *not* used for this indicator.

Reproductive Capability of Perennial Plants



Good reproductive potential



Poor reproductive potential





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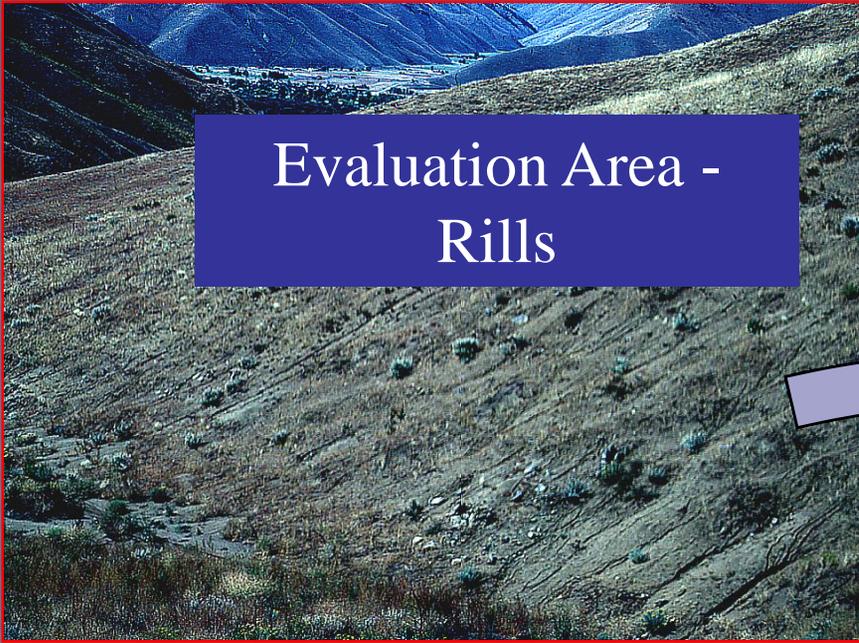
DIST Monticello
ALLOT Indian Creek

PASTURE

PLOT NO. 6

Indicators are Assessed

- Sliding Scale of Five Categories
- Agreement with the Reference Sheet
- Indicators are Grouped into Attributes of Rangeland Health (Stability, Hydrologic Function, Biotic Integrity)
- Preponderance of Evidence

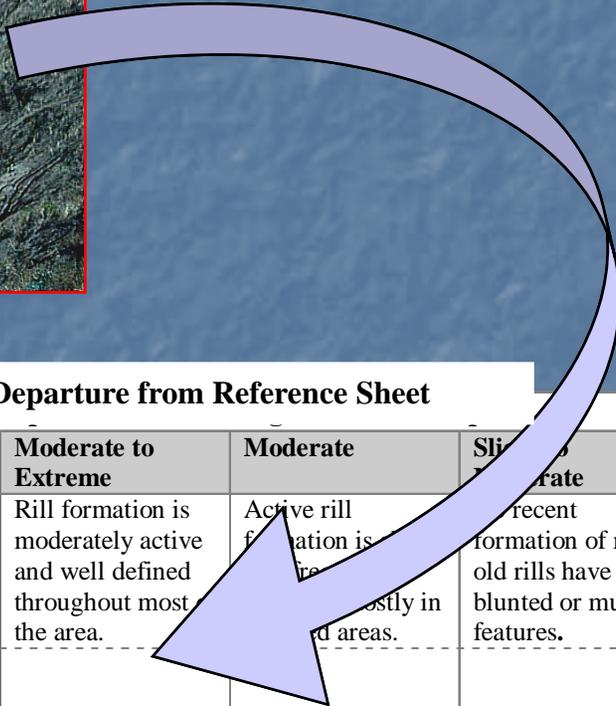


Evaluation Area -
Rills

Evaluate 17 Indicators

Departure from Reference Sheet

Indicator	Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to Slight
1. Rills (Default description)	Rill formation is severe and well defined throughout most of the area.	Rill formation is moderately active and well defined throughout most of the area.	Active rill formation is visible mostly in eroded areas.	Recent formation of rills; old rills have blunted or muted features.	Current or past formation of rills as expected for the site.
1. Rills (Revised description)					

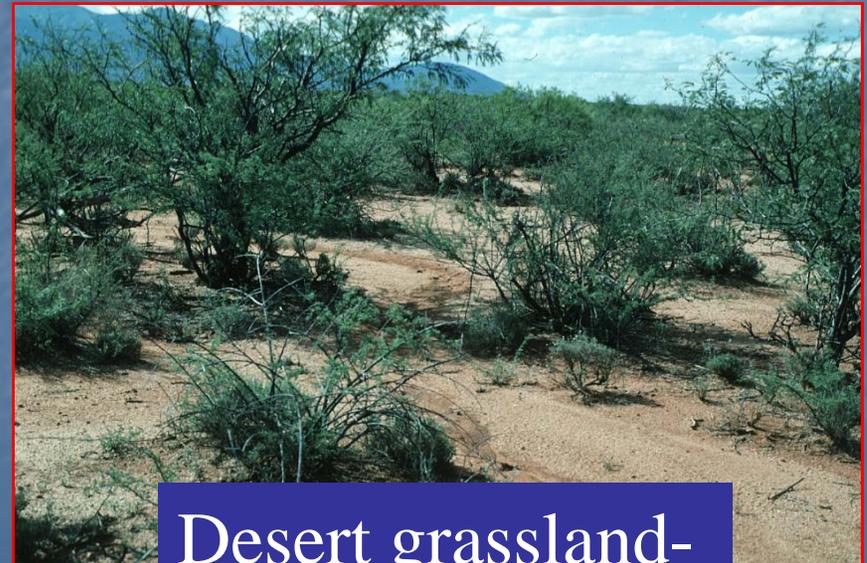


Soil/Site Stability

The capacity of an area to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.



Desert grassland-
good stability



Desert grassland-
loss of stability

Indicators of Soil/Site Stability

- Rills
- Water Flow Patterns
- Pedestals/Terracettes
- Bare Ground
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- Wind Scour Areas
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Hydrologic Function

The capacity of an area 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 when a reduction does occur.



Sagebrush “captures” snow



Grasses have reduced ability (structure) to “capture” snow

Indicators of Hydrologic Function

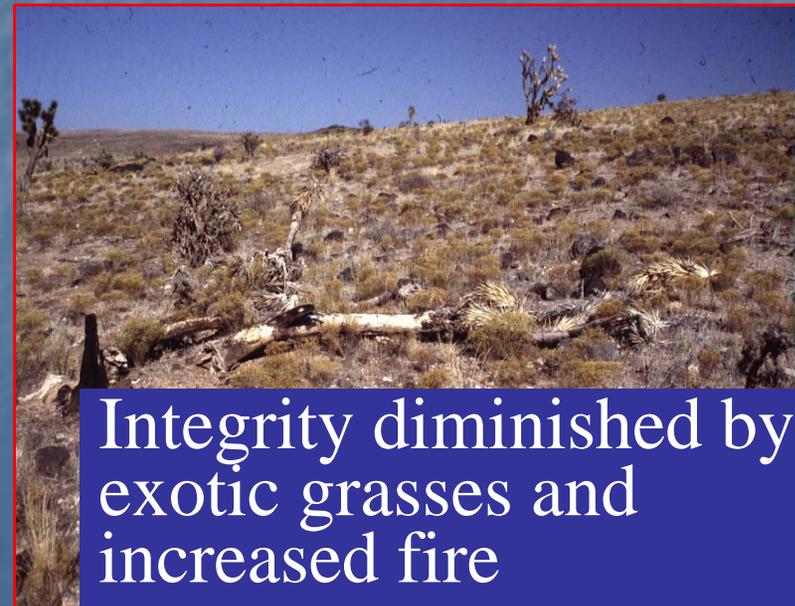
- **Rills**
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- Annual Production
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- Reproductive Capability

Integrity of the Biotic Community

The capacity of the biotic community to support ecological processes within the normal range of variability expected for the site, to resist a loss in the capacity to support these processes, and to recover this capacity when losses do occur. The biotic community includes plants, animals, and microorganisms occurring both above and below ground.



Joshua tree/blackbrush site



Integrity diminished by exotic grasses and increased fire

Indicators of Biotic Integrity

- Rills
- Water Flow Patterns
- Pedestals/Terracettes
- Bare Ground
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- Wind Scour Areas
- Litter Movement
- **Resistance to Erosion**
- **Plant/infiltration effects**
- Loss of soil surface
- **Compaction layer**
- **Functional/structural groups**
- **Plant mortality/decadence**
- **Litter Amount**
- **Annual Production**
- **Invasive Plants**
- **Reproductive Capability**