

# Step 5

(Interpret indicators) and  
evaluate the 3 Rangeland  
Health Attributes

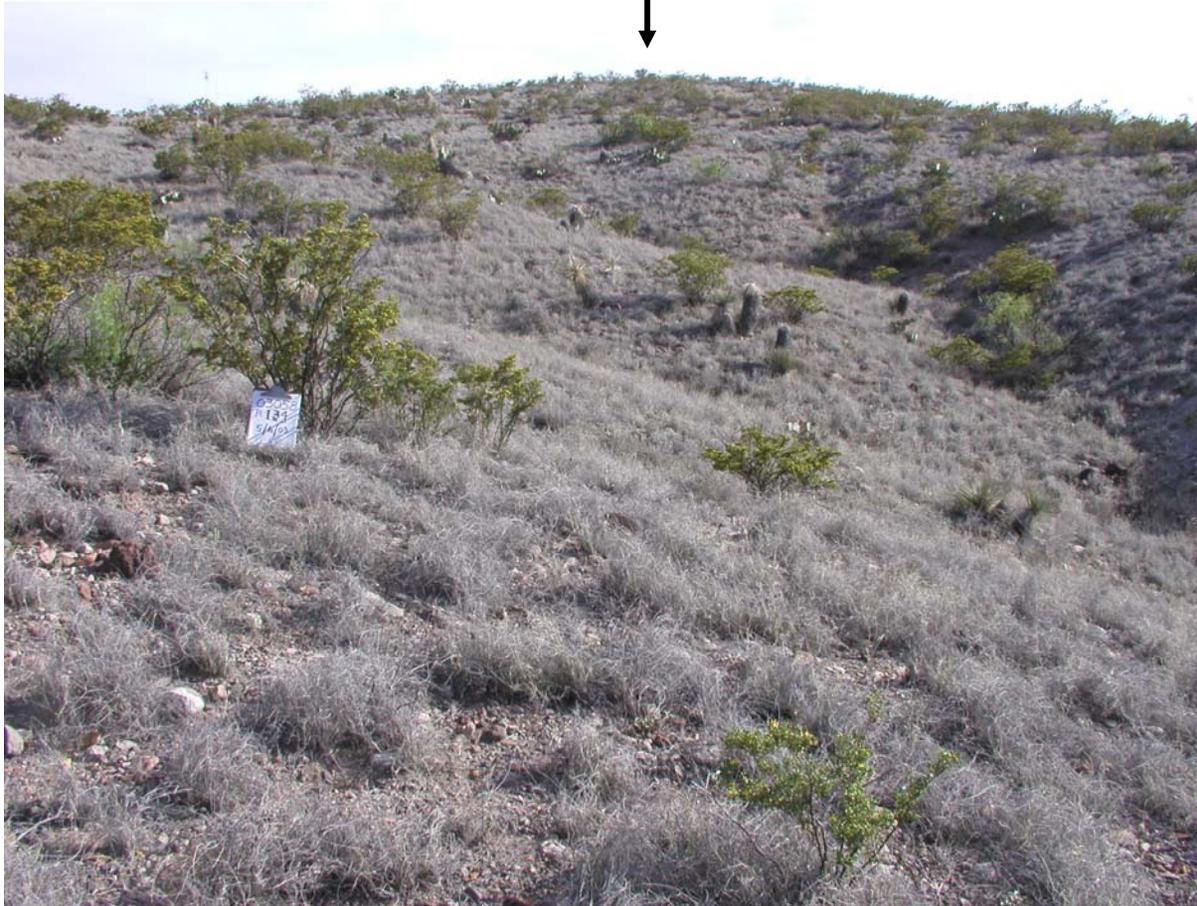


Interpret indicators: connecting indicators to changes in ecological processes



# A case study of process-indicator relationships

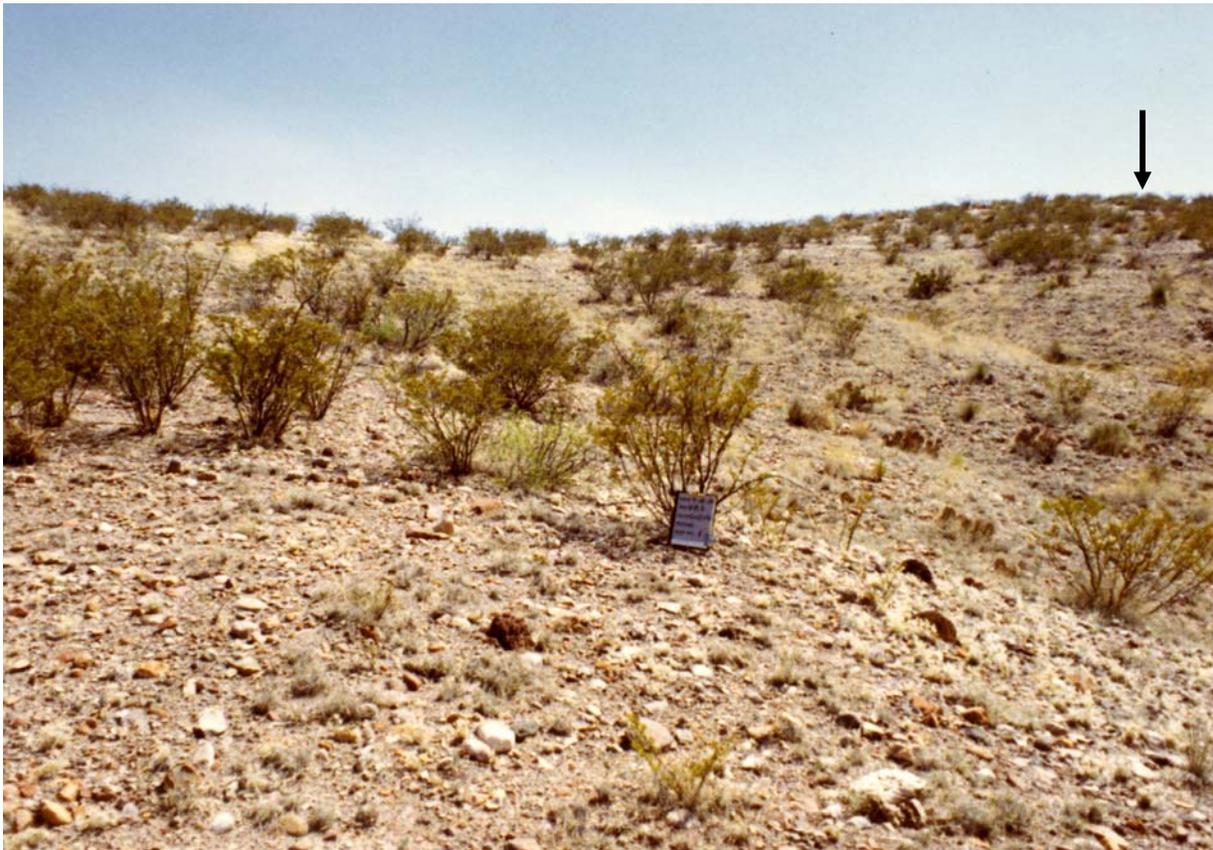
Reference community: *Bouteloua eriopoda*/*Larrea tridentata*; loamy-skeletal Calcisols



- Nearly continuous grass cover (4)
- Low shrub density (12)
- Small (>50 cm) bare gaps (4)
- No pedestals, rills, terracettes (3)
- High soil aggregate stability (8)
- Well developed, brown A horizon (9)

# A case study of process-indicator relationships

Degraded state: *Larrea tridentata*; loamy-skeletal Calcisols



- Few patches of grass (4)
- Shrubs dominant (12)
- Large (>2m) bare gaps (4)
- No pedestals, rills, terracettes (3)
- Low soil aggregate stability (8)
- Degrading A horizon (9)

# The sequence of indicators reflects the process of degradation



## *Biotic threshold*

- Functional/structural groups (12)
- Composition/structure relative to runoff (10)
- Water flow patterns (2)

**Soil degradation processes have been initiated but recovery possible**

## *Physical threshold*

- Soil aggregate stability (8)
- Loss of soil surface properties (A horizon) (9)

**Soil degradation processes has resulted in loss of A horizon, increased runoff, low water holding capacity, no grass establishment**

# The sequence of indicators reflects the process of degradation



## *Biotic threshold*

- Functional/structural groups (12)
- Composition/structure relative to runoff (10)
- Water flow patterns (2)

**Grazing management  
Is a solution**

## *Physical threshold*

- Soil aggregate stability (8)
- Loss of soil surface properties (A horizon) (9)

**Grazing management  
can no longer be used  
as a solution**

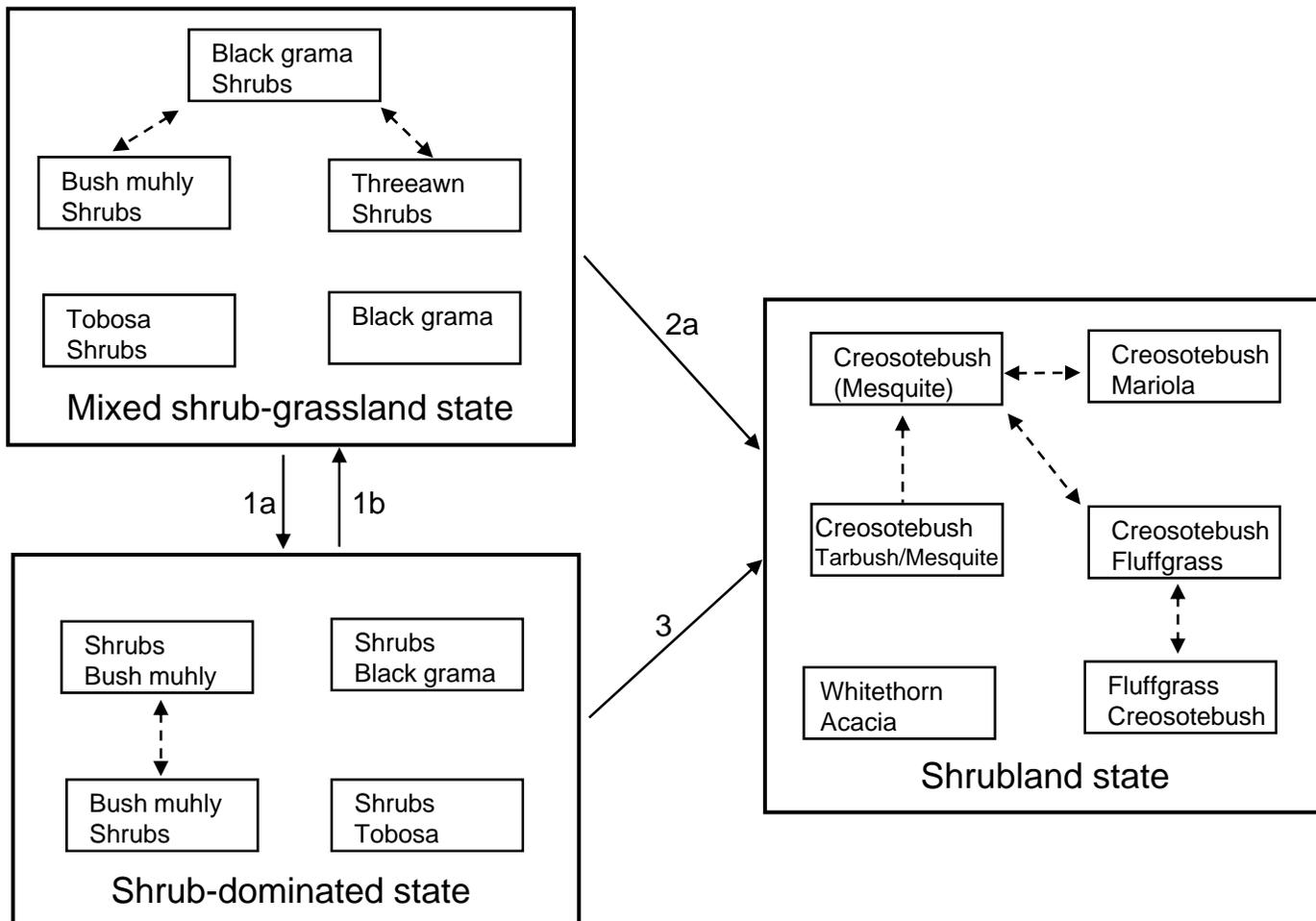
Bare gap size/erosion (10) is the critical process and *primary indicator* determining risk of irreversible degradation



A horizon degradation (9) is the critical process and *ultimate indicator* determining potential for recovery

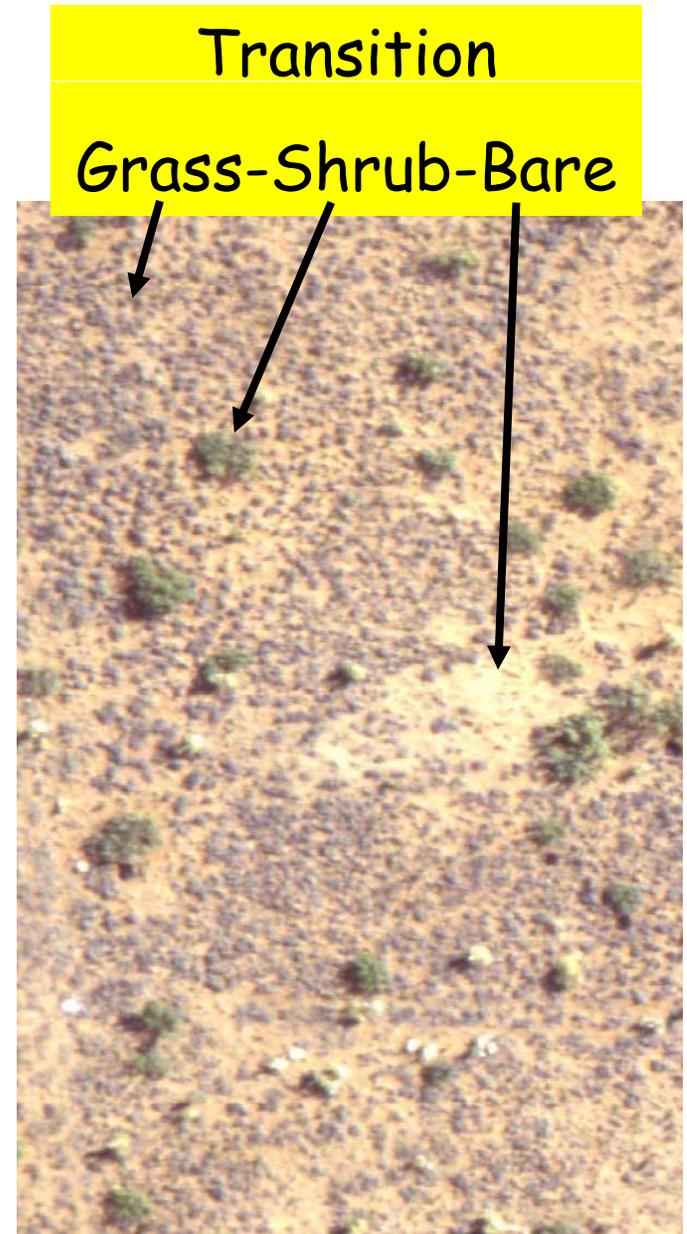


State-Transition model: MLRA 42, SD-2, Gravelly subgroup: Gravelly



- 1a. Overgrazing, summer drought, lack of fire; 1b. Shrub control, prescribed grazing  
 2. Severe overgrazing, widespread grass mortality, erosion and soil truncation  
 3. Long-term absence of grasses, competition by shrubs, erosion and soil truncation

# Process-indicator relationships: case #2 (sandy site)



# Scenario: grass loss before shrub invasion

Indicators (in approximate order)

4) Bare ground

increases wind erosion, reducing

8) Soil surface resistance to erosion  
which together increase

6) Wind scour areas

which further reduces infiltration,  
increasing

2) Water flow patterns

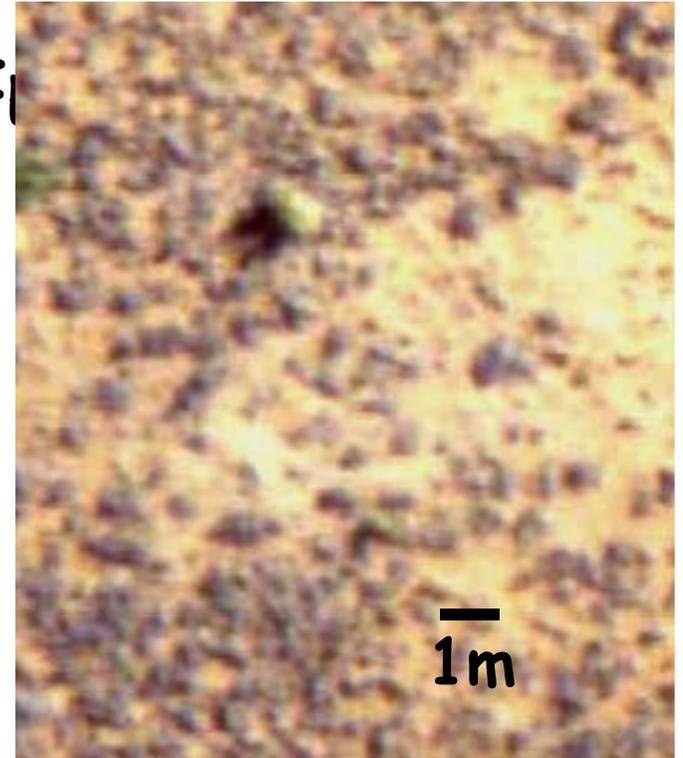
which cause additional erosion, creating

3) Pedestals and terracettes  
and resulting

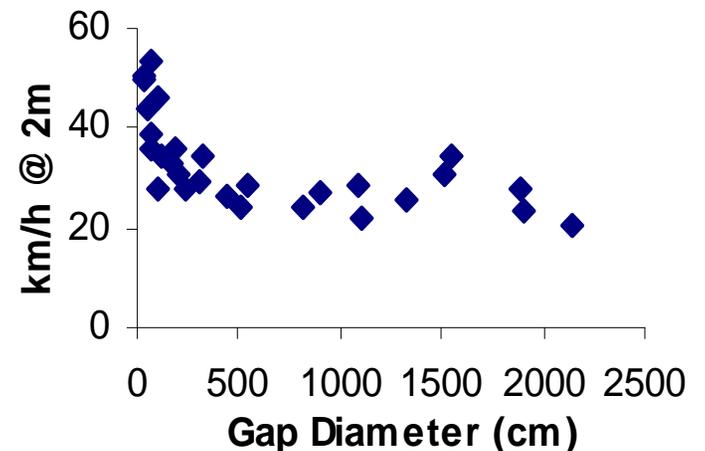
9) Soil surface loss and degradation

which further increases probability of  
shrub invasion, resulting in a change in

12) Functional/structural groups



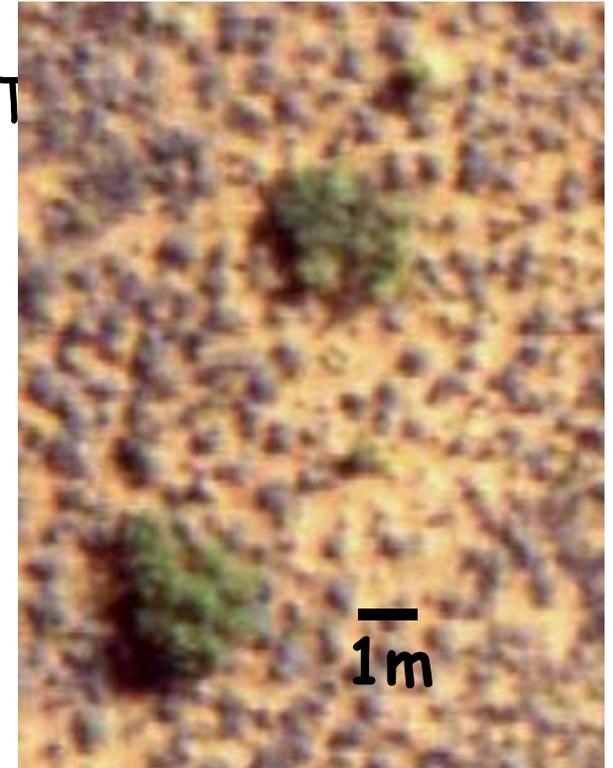
Threshold Velocity for Saltation



# Scenario: shrub invasion <sup>FT</sup> before grass loss

## Indicators (in approximate order)

- 12) Functional/structural groups  
change due to shrub invasion, leading to  
grass loss, which increases
- 4) Bare ground  
increases wind erosion, reducing
- 8) Soil surface resistance to erosion  
which together increase
- 6) Wind scour areas  
which further reduces infiltration,  
increasing
- 2) Water flow patterns  
which cause additional erosion, creating
- 3) Pedestals and terracettes  
and resulting in
- 9) Soil surface loss and degradation



Threshold Velocity for Saltation

