

ECOLOGICAL SITES

A DEVELOPMENTAL HISTORY OF KEY CONCEPTS

Joel Brown
USDA NRCS
Jornada Experimental Range
Las Cruces NM

Northwest of Anadarko" Wilson Hurley

A Short Interpretive History

Important Concepts

Uses

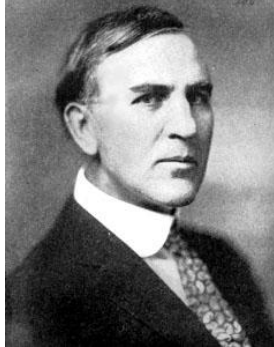


Frederic Clements-An elaborate theory of vegetation dynamics controlled by the regional climate with a temporal classification system to explain local variability. Viewed the plant formation as an organism.

Student of Charles Bessey (taxonomist)



Charles Bessey
Iowa State Univ.



Frederic
Clements
Ecology

1900

1925

1950

1975

2000

C.F. Korstian. 1919. Native vegetation as a criterion of site.
Plant World 22: 253-261.

The native vegetation could be used to subdivide the landscape and serve as a guide for selecting plant materials for revegetation following disturbance.



Clarence
Korstian
Unknown



Photo by C.F. Korstian (1922),
from the US Forest Service
Collection



Photo by C.F. Korstian (1930),
from the Forest History Society
Collection

1900

1925

1950

1975

2000

A.W. Sampson.1917. Succession as a factor in range management. *Journal of Forestry* 15: 593-596.

Indicator plants could be used to define subunits of the landscape for use in assessment and management, particularly after disturbance (erosion).



Arthur Sampson
*Journal of Range
Management*



Intermountain Forest and Range Experiment
Station 1921. US Forest Service Photo.



Intermountain Forest and Range
Experiment Station 1917. US
Forest Service Photo.

1900

1925

1950

1975

2000

Tansley, A.G. 1935. The use and abuse of vegetational concepts and terms. *Ecology* 16: 284-307

Whittaker, R.H. 1953. A Consideration of Climax Theory: the Climax as a population and pattern. *Ecological Monographs* 23: 41-78.

Plant communities responded to changes in soil variability within a given climatic region, but still resulted in a stable climax. The idea of a 'polyclimax' was first proposed and the term 'ecotope' proposed.



Sir Arthur
Tansley



Robert Whittaker
National Academy
of Sciences

1900

1925

1950

1975

2000

Dyksterhuis, E.J. 1949. Condition and management of rangelands based on quantitative ecology. *Journal of Range Management* 2: 104-115.

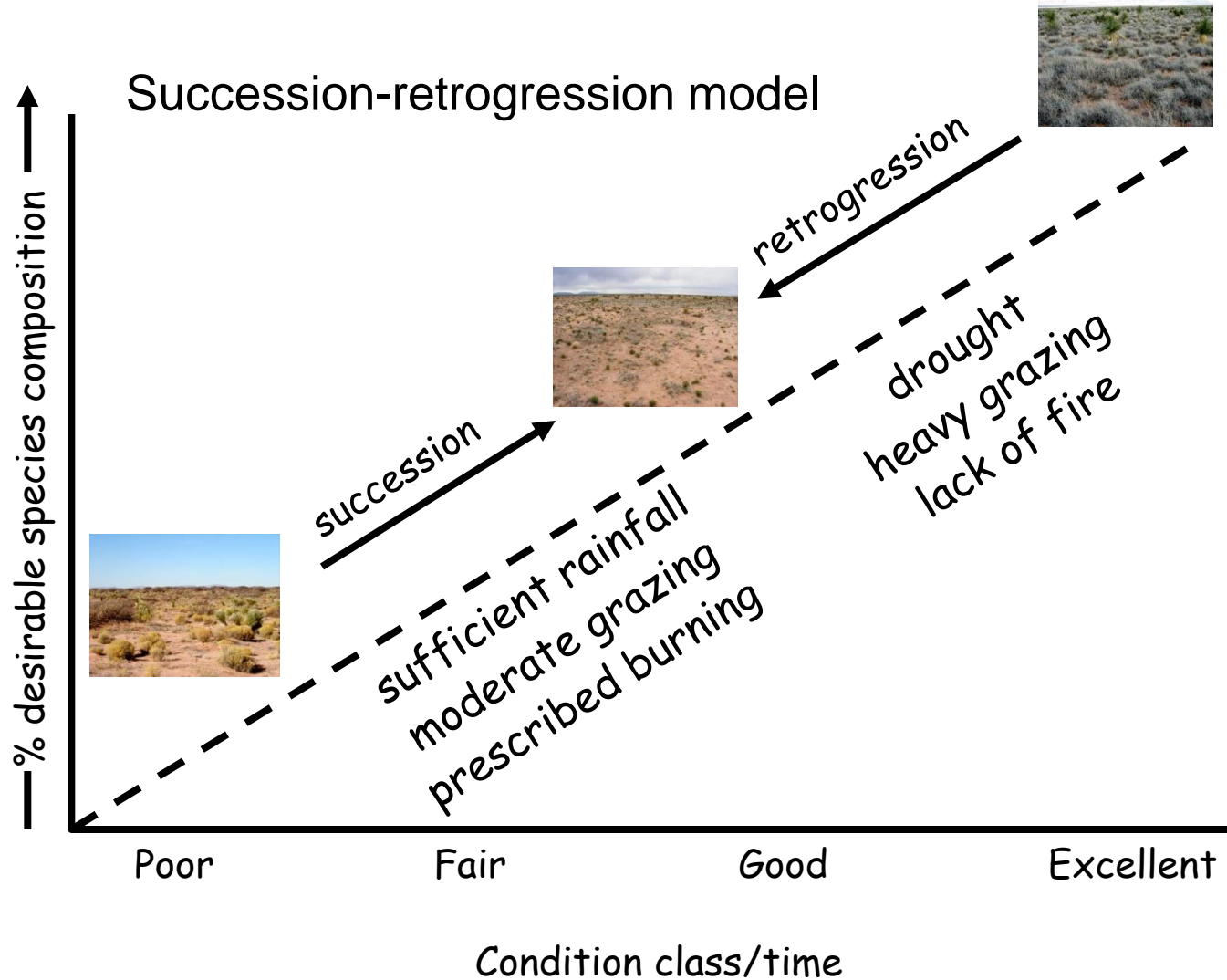
Defined subunits of rangeland ecosystems as 'range sites' and developed a quantitative method to compare existing vegetation to climax conditions as a basis for management.

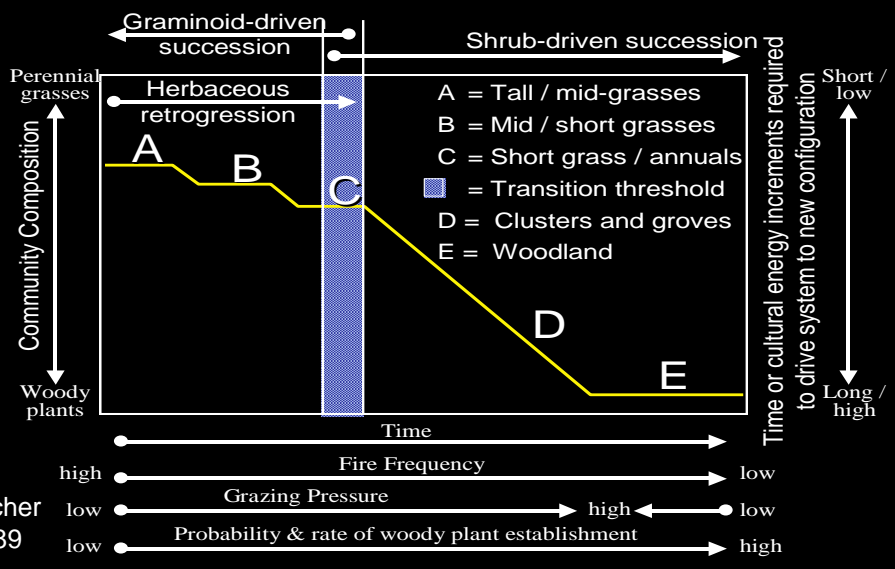
Range condition concept for planning, implementing and assessing conservation practices and systems, program and policy decisions

E.J. Dyksterhuis
Photo Texas
A&M



History of ecological sites: The equilibrium (linear change) model -1950s





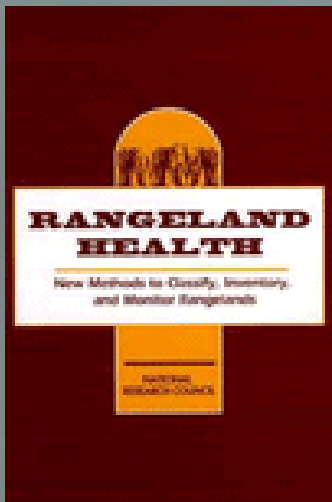
Holling 1973 'Stability and resilience of ecological systems'

May 1977 'Multiple stable states in ecological systems'

Westoby et al 1989 'Opportunistic management for rangelands not at equilibrium'

Archer 1989





National Research Council (1994)

NEW CONCEPTS FOR ASSESSMENT OF RANGELAND CONDITION

TASK GROUP ON UNITY IN CONCEPTS AND TERMINOLOGY

COMMITTEE MEMBERS

E. Lamar Smith University of Arizona Tucson, Arizona 1991-94 Chairman 1991-92	Phillip Sims USDA/ARS Woodland, Oklahoma 1991-94	Dave Franzen U.S. Fish and Wildlife Service LaBarge, Oregon 1991-94
Barbara S. Turner South Dakota State Univ. Brookings, South Dakota 1991-94	Ray Smith Bureau of Indian Affairs Herndon, Virginia 1991-94	Mike Roberts U.S. Fish and Wildlife Service Fortuna, California 1991-94
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Freddie Adams Texas A&M University College Station, Texas 1991-94	Ernest Baker Soil Conservation Service Casper, Wyoming 1991-92	Tom Gerwin National Park Service San Francisco, California 1991-94
Dick Layer Conservation Lakota, Wyoming 1991-94	Arnold Mendelsohn Soil Conservation Service Lincoln, Nebraska 1991-92	Jennifer Wiley National Park Service Boulder City, Nevada 1991-94
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David Child USDA/ARS Wapahoga, D.C. 1991-92		

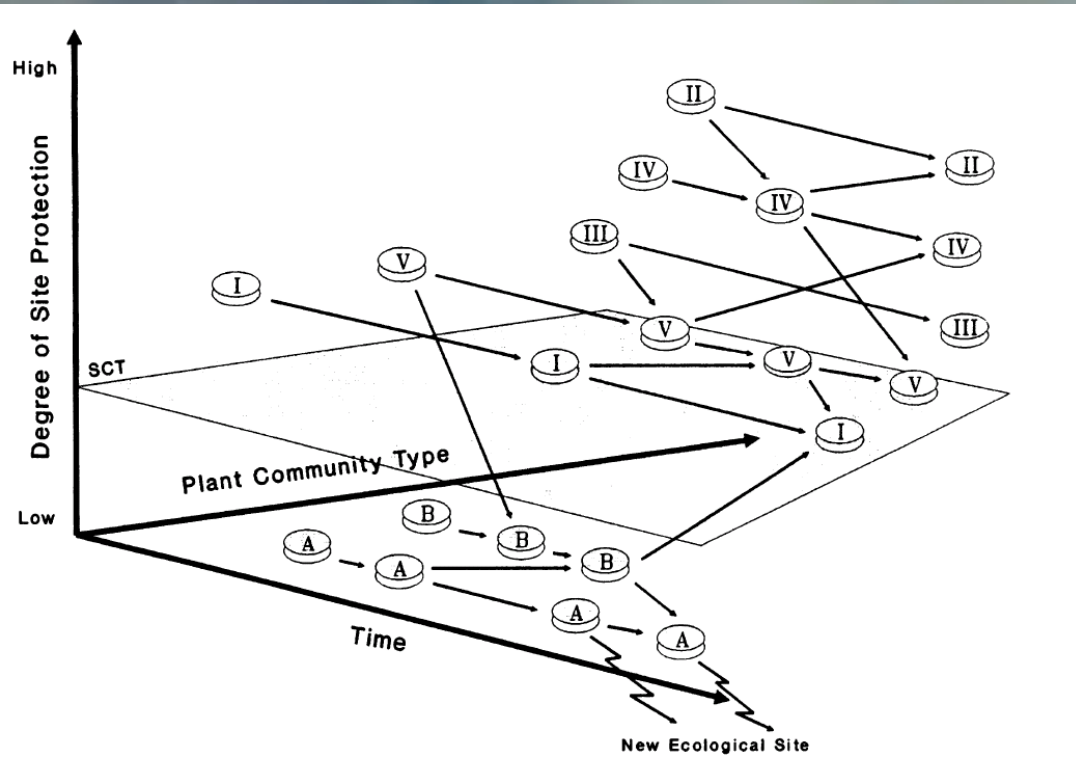
Abstract

Range condition score or classification does not tell us, in a meaningful way, about the status of the site. It is difficult to use a range condition score to make management decisions. The Task Group made three recommendations: new criteria for range condition, new criteria for site evaluation, and new criteria for site classification. The Task Group also made three recommendations: new criteria for range condition, new criteria for site evaluation, and new criteria for site classification. The Task Group also made three recommendations: new criteria for range condition, new criteria for site evaluation, and new criteria for site classification.

Key Words: Range Condition, Desired Plant Community, Site Conservation Threshold, Sustainability, Ecological Site, Soil Erosion

71 JOURNAL OF RANGE MANAGEMENT 48(3), May 1995

SRM Unity in Concepts and Terminology (1995)



TIME

- Multiple plant communities can occupy a site

- 'Threshold' of rangeland health, multiple stable states, at risk conditions, and early warning indicators as organizing principles

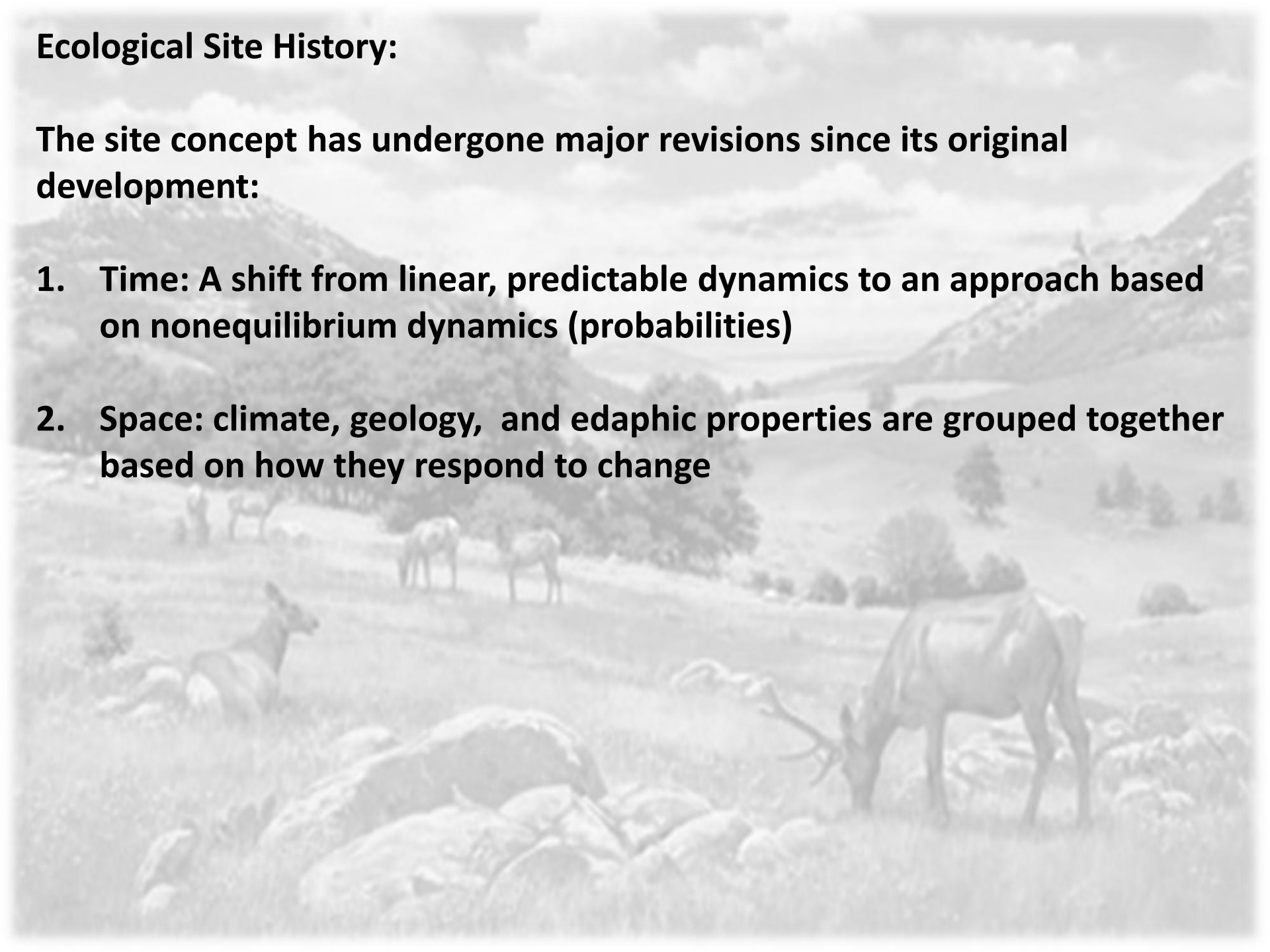
SPACE

- Subunits of the landscape remained the same

Ecological Site History:

The site concept has undergone major revisions since its original development:

- 1. Time: A shift from linear, predictable dynamics to an approach based on nonequilibrium dynamics (probabilities)**
- 2. Space: climate, geology, and edaphic properties are grouped together based on how they respond to change**



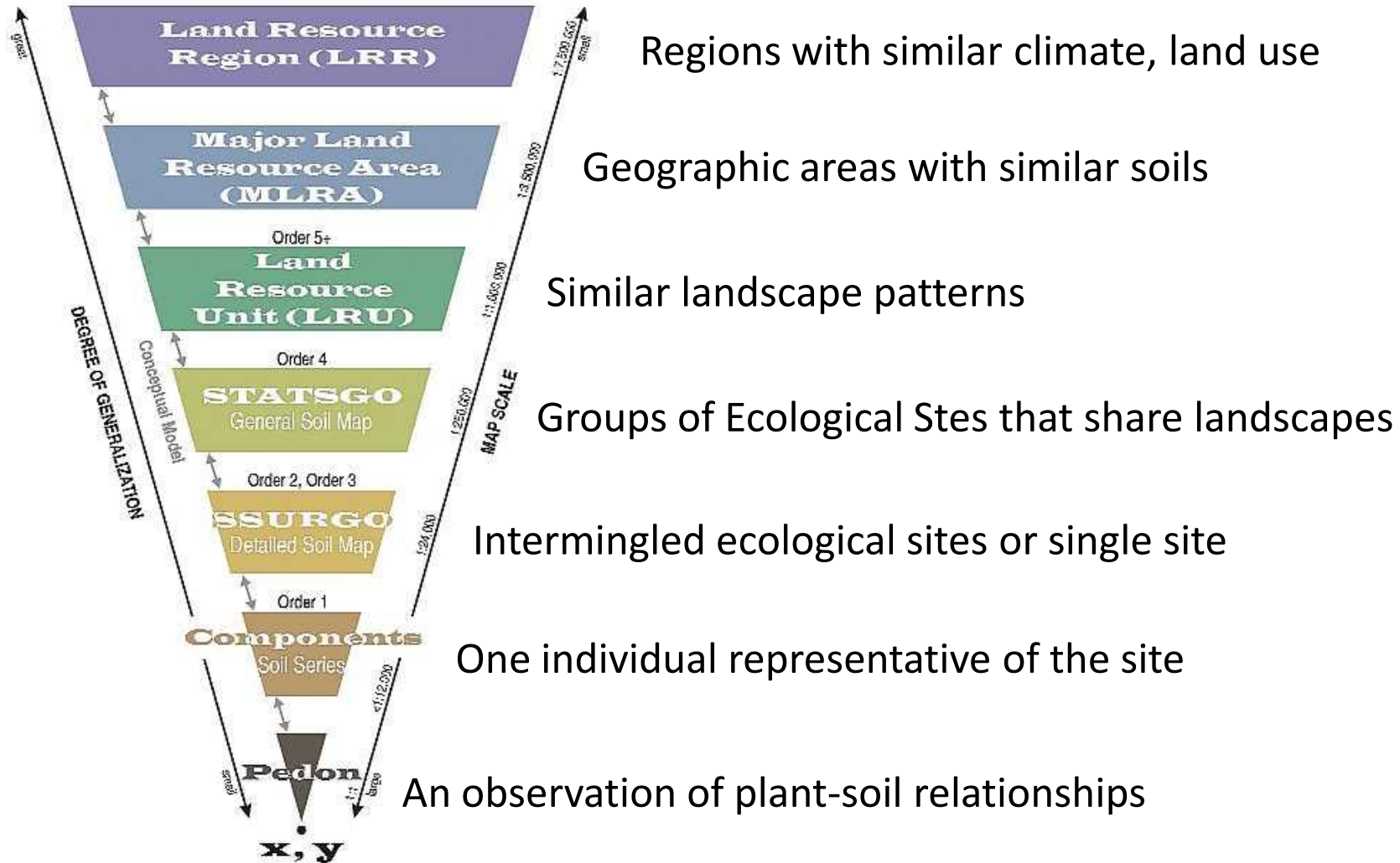
Important Concepts In Dividing the Landscape

Spatial scale – what is a site?

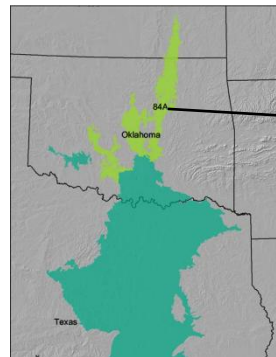
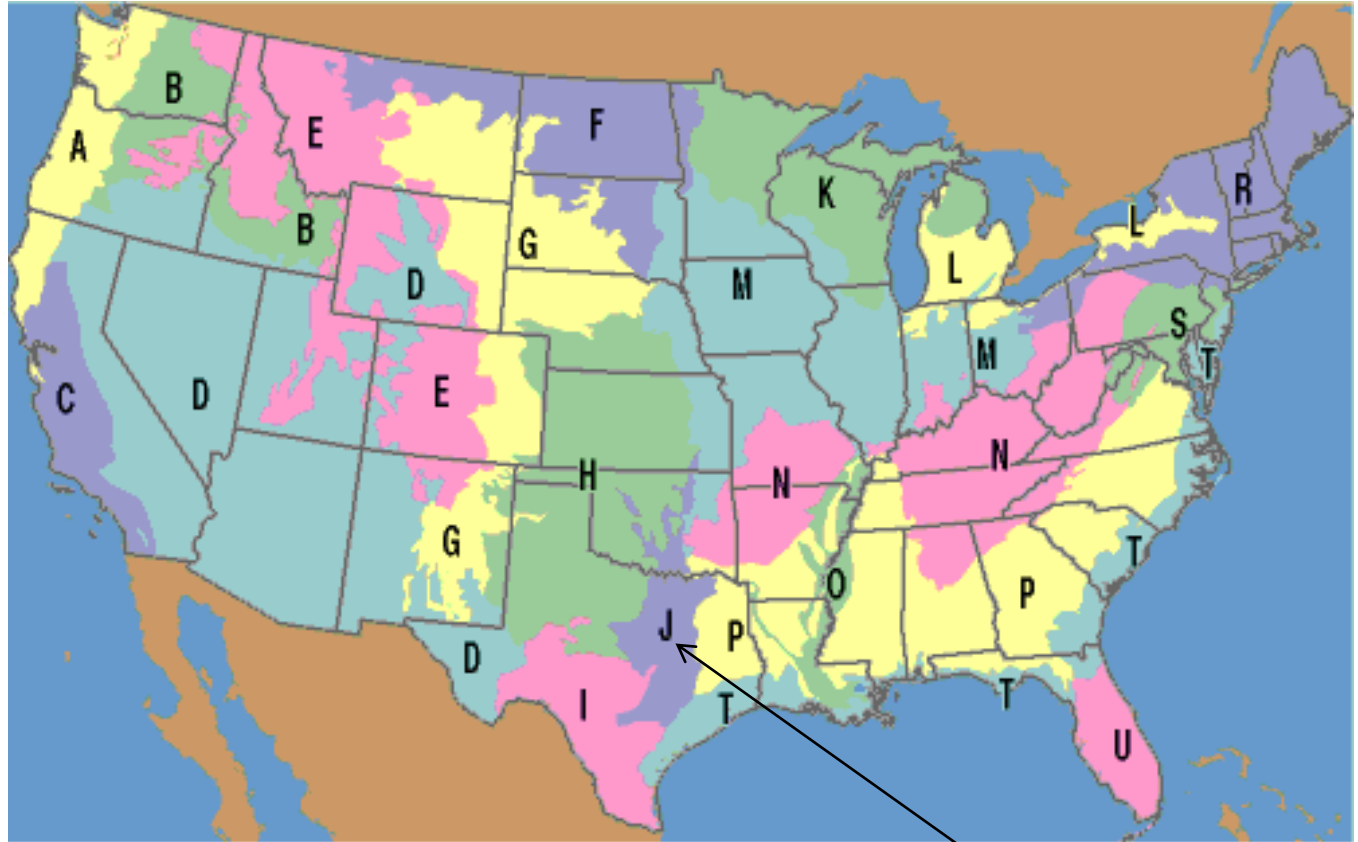
Temporal scale- how does change occur?

Basics of ecological sites: spatial scales

LRR-MLRA-LRU Land Resource Hierarchy



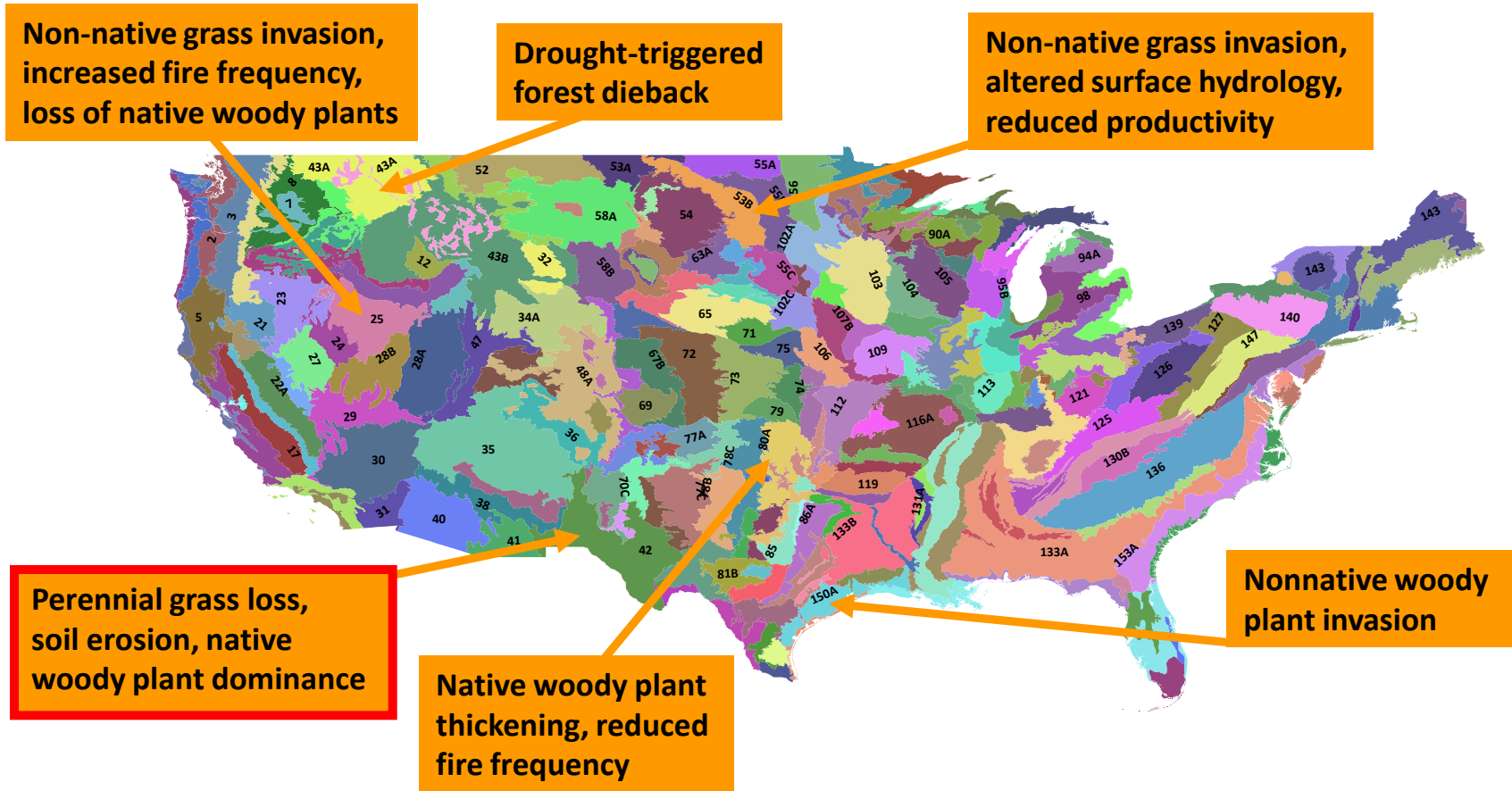
LAND RESOURCE REGIONS



LRR J-SOUTHWESTERN PRAIRIES

- 84A – Cross Timbers (Kansas, Oklahoma, and Texas)
- 84B – West Cross Timbers (Oklahoma and Texas)
- 84C – East Cross Timbers (Texas)
- 85 – Grand Prairie (Oklahoma and Texas)
- 86 – Texas Blackland Prairie (Texas)
- 87 – Texas Claypan Area (Texas)

MLRAs distinguish broad differences in potential and types of ecological dynamics



Major Land Resource Areas of the continental USA

The MLRA-level “model” is filtered by soils/topography and local climate (LRU)

Gravelly soil (shallow, relict piedmont)
Surface soil water limited, high risk for grass loss and erosion: **vulnerable/restorable**

Limestone
Grass protected by rocks, higher rainfall, good water capture: **low risk**

Sandy soil (relict basin floor)
Erodible surface soils once grasses removed: **vulnerable/hard to restore**

Loamy soil (active piedmont)
Susceptible to water erosion and grass loss: **vulnerable/restorable**

Clayey soil (basin floor)
Receives water and sediment: **low risk**

Soil mapping units of the Jornada Basin (15 km)



Ecological Site Concept

- Similar to ‘species’ – a core concept with a defined amount of variability (in the climatic, geologic and edaphic properties)
- Defines the distinguishing geophysical properties of a site and its temporal dynamics

Describing Temporal Change

Soil/Vegetation Concepts

- Existing vegetation can not be a primary ecological site criterion because it is easily manipulated therefore highly variable.
- However, certain species can be used to assist in ecological site definition and identification because they provide clues to soil and climatic conditions.
- The ecological site concept should be developed, using geophysical attributes that enable identification of the ecological site without vegetation on the site.

SUMMARY

The science and technology supporting ecological sites is developing and changing rapidly, but their history can offer valuable insights and help avoid stupid, but logical, mistakes

An Ecological Site, like a soil series or map unit component, makes little sense outside the spatial hierarchical land classification system

The development of Ecological Sites is systematic and evidence-based (question-hypothesis-test-refine), but the methodologies and techniques are highly diverse and require close attention and management.