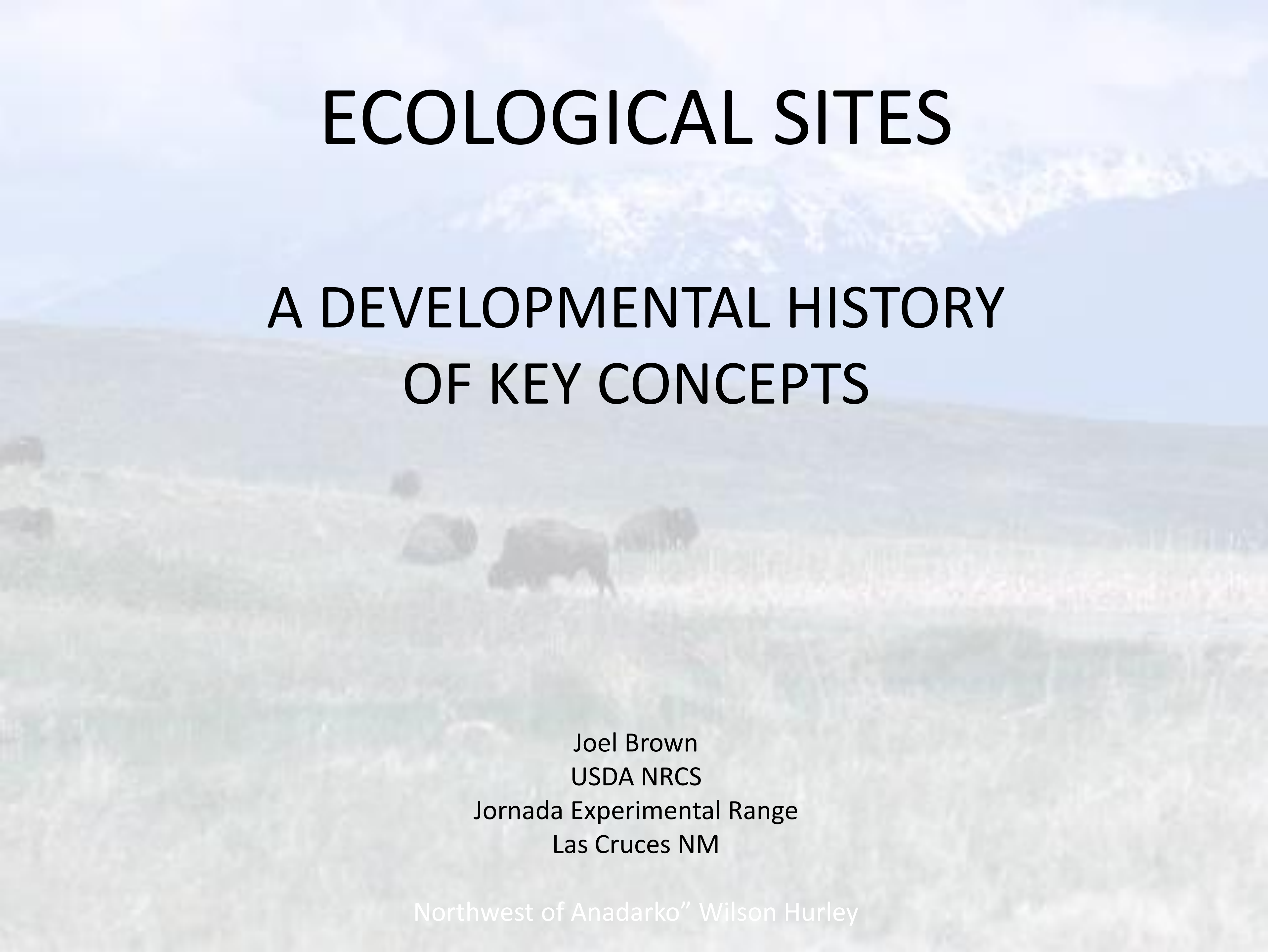
ECOLOGICAL SITES

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

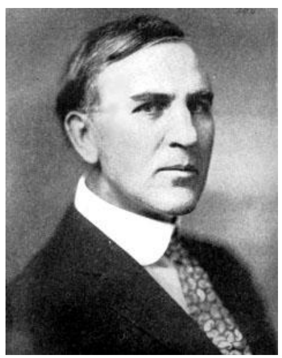
Uses

“Arcadia Round Up” Linda Tuma Robertson

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, A.W. 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

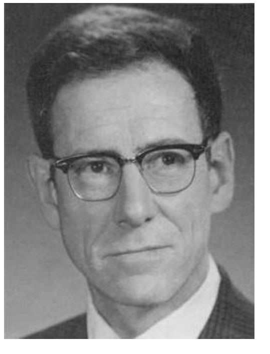
Tansley. A.G. 1935. The use and abuse of vegetational concepts and terms*.* *Ecology* 16: 284-307

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 Acadamy 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.

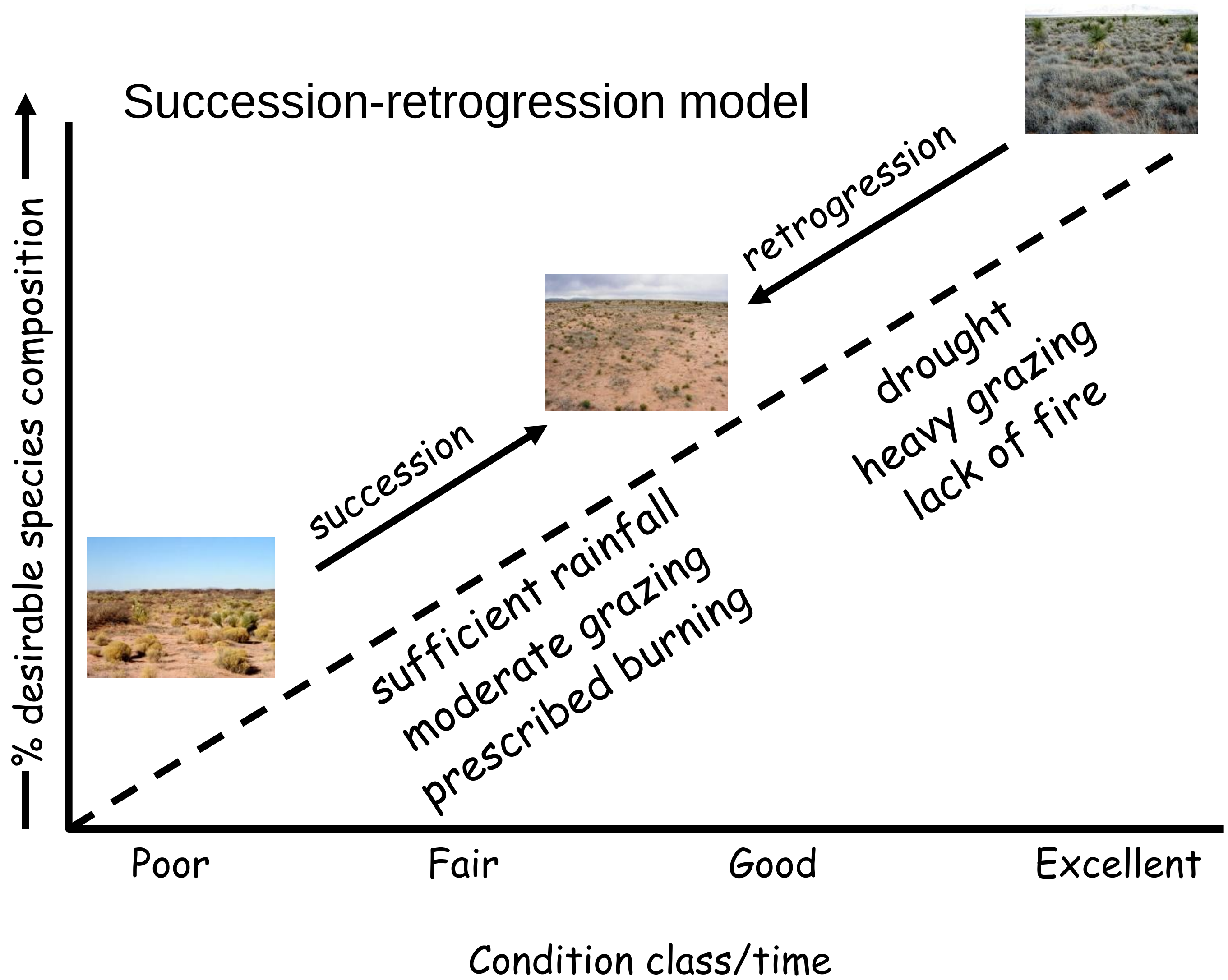
Defined subunits of rangeland ecosystems as 'range sites' and developed a quantitative method to compare existing vegetation to climax conditions as a basis for management.

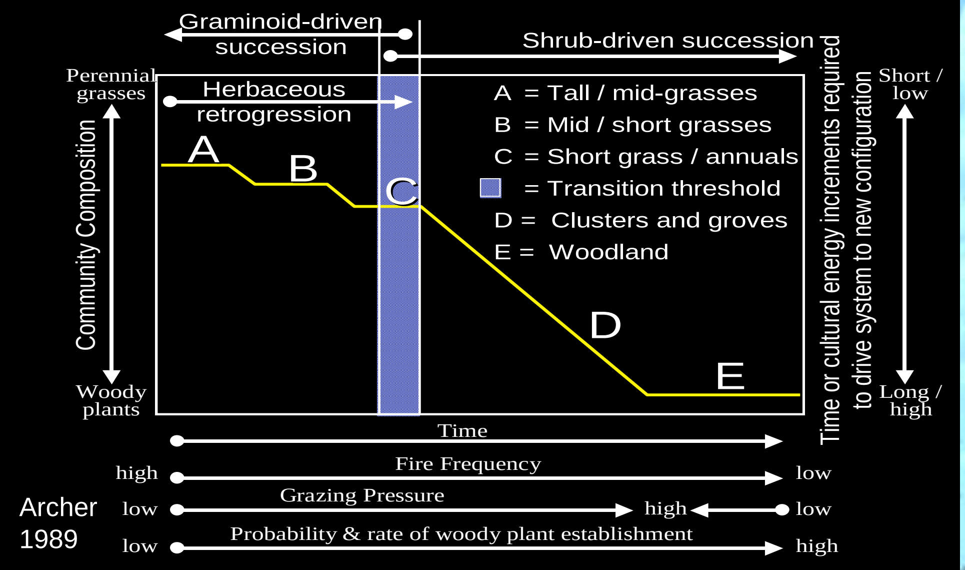
Range condition concept for planning, implementing and assessing conservation practices and systems, program and policy decisions

E.J. Dyksterhuis
Photo Texas A&M

1900 1925 1950 1975 2000

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

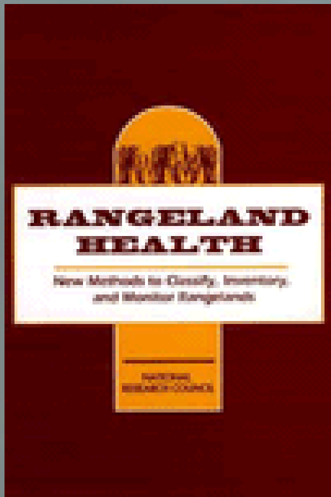




Holling 1973 'Stability and resilience of ecological systems'

May 1977 'Multiple stable states in ecological systems'

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



National Research Council (1994)

Range Manage.
271-282 May 1995

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, 1989-94, Chairman 1989-92
Patricia S. Johnson, South Dakota State Univ., Brookings, South Dakota, 1989-94, Chairman 1992-94
George Ruyle, University of Arizona, Tucson, Arizona, 1989-94
Fred Smeins, Texas A&M University, College Station, Texas, 1989-94
Dick Loper, Consultant, Lander, Wyoming, 1989-94
Dick Whetsell, Rancher, Pawhuska, Oklahoma, 1989-94
Dennis Child, USDA/ARS, Washington, D.C., 1989-92
Phillip Sims, USDA/ARS, Woodward, Oklahoma, 1989-94
Ray Smith, Bureau of Indian Affairs, Herndon, Virginia, 1989-94
Len Volland, U.S. Forest Service, Portland, Oregon, 1989-92
Miles Hemstrom, U.S. Forest Service, Lakewood, Colorado, 1992-94
Everet Bainter, Soil Conservation Service, Casper, Wyoming, 1989-92
Arnold Mendenhall, Soil Conservation Service, Lincoln, Nebraska, 1991-92
Keith Wadman, Soil Conservation Service, Washington, D.C., 1992-94
Dave Pranzen, U.S. Fish and Wildlife Service, Lakeview, Oregon, 1989-91
Milt Sathers, U.S. Fish and Wildlife Service, Evergreen, Colorado, 1991-94
John Willoughby, Bureau of Land Management, Sacramento, California, 1989-91
Ned Habich, Bureau of Land Management, Lakewood, Colorado, 1992-94
Tom Gavin, National Park Service, San Francisco, California, 1992-93
Jennifer Haley, National Park Service, Boulder City, Nevada, 1993-94

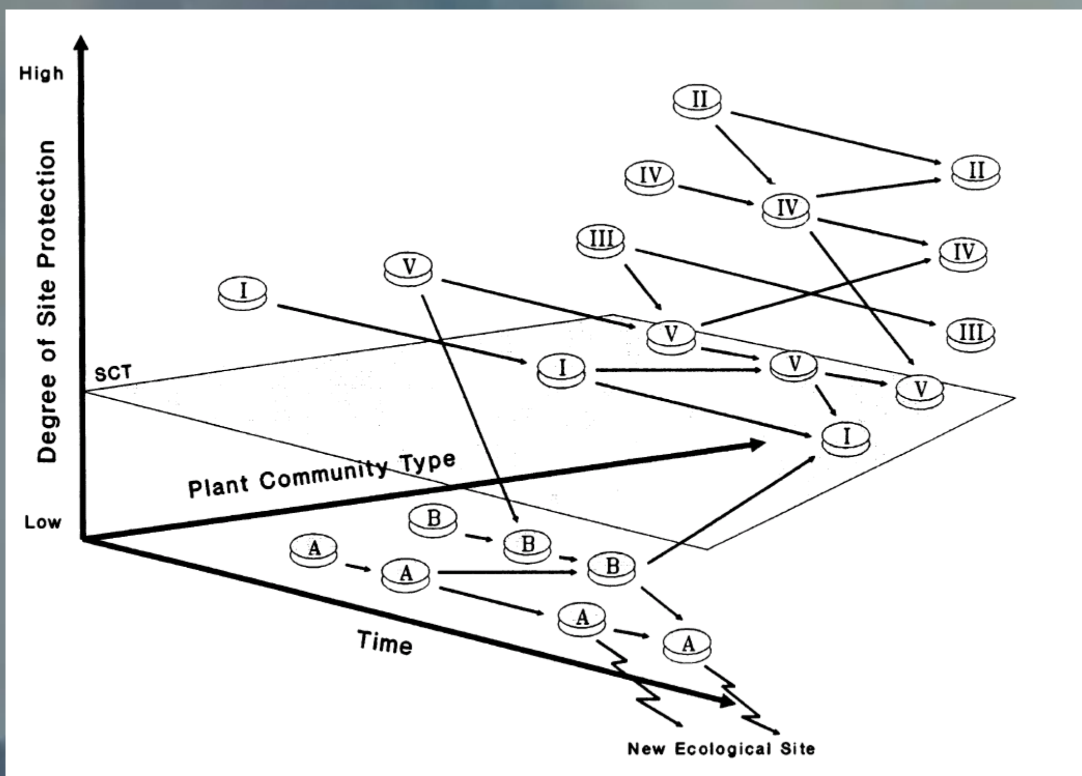
Abstract

Range condition score or classification does not tell us, in a general sense, much of what managers and the public want to know about rangelands. Range condition is not a reliable indicator, across all rangelands, of biodiversity, erosion potential, nutrient cycling, value for wildlife species, or productivity. Succession, the basis for the current concept of range condition is not an adequate yardstick for evaluation of rangelands. The Society for Range Management (SRM) established the Task Group on Unity in Concepts and Terminology which has developed new concepts for evaluation of the status of rangelands. These concepts are based on the premise that the most important and basic physical resource on each ecological site is the soil. If sufficient soil is lost from an ecological site, the potential of the site is changed. The Task Group made three recommendations, which were adopted by the SRM: 1) evaluations of rangelands should be made from the basis of the same land unit classification, ecological site; 2) plant communities likely to occur on a site should be evaluated for protection of that site against accelerated erosion (Site Conservation Rating, [SCR]); and 3) selection of a Desired Plant Community (DPC) for an ecological site should be made considering both SCR and management objectives for that site.

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

Visual examples of some of these concepts will appear in an article to be published in Rangelands Vol. 17(3):85-92, June 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)**

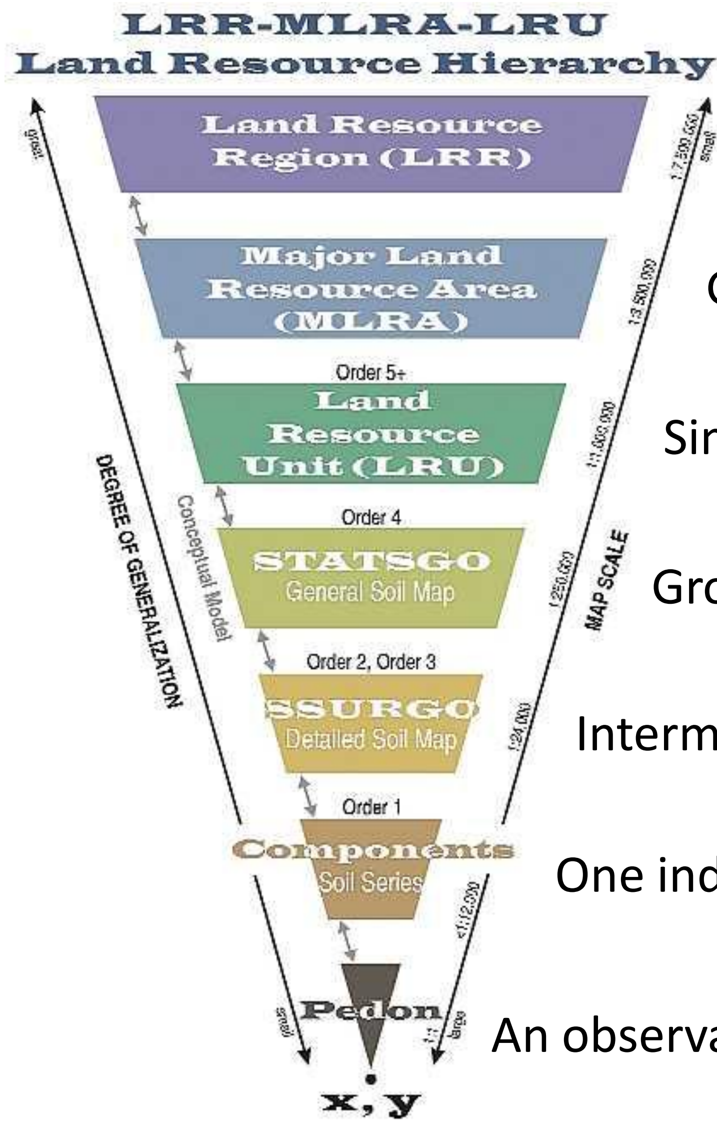
2. **Space: climate, geology, and edaphic properties are grouped together based on how they respond to change**

Important Concepts
In Dividing the Landscape

Spatial scale – what is a site?

Temporal scale- how does change occur?

Basics of ecological sites: spatial scales



Regions with similar climate, land use

Geographic areas with similar soils

Similar landscape patterns

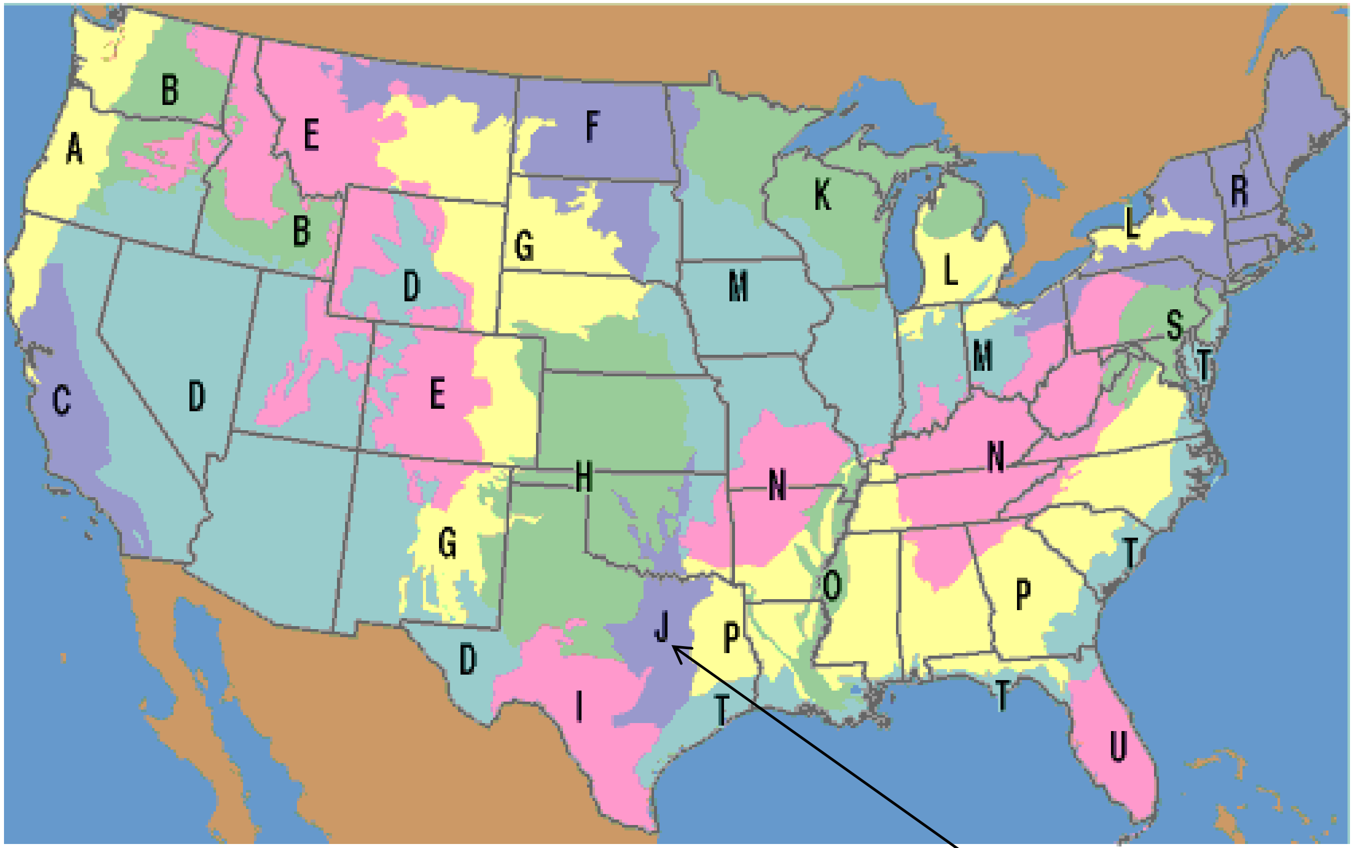
Groups of Ecological Stes that share landscapes

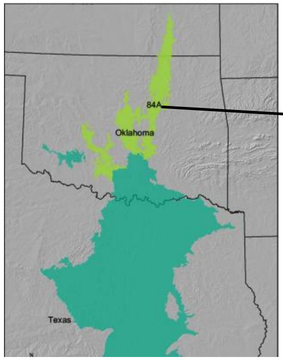
Intermingled ecological sites or single site

One individual representative of the site

An observation of plant-soil relationships

LAND RESOURCE REGIONS





LRR J-SOUTHWESTERN PRAIRIES

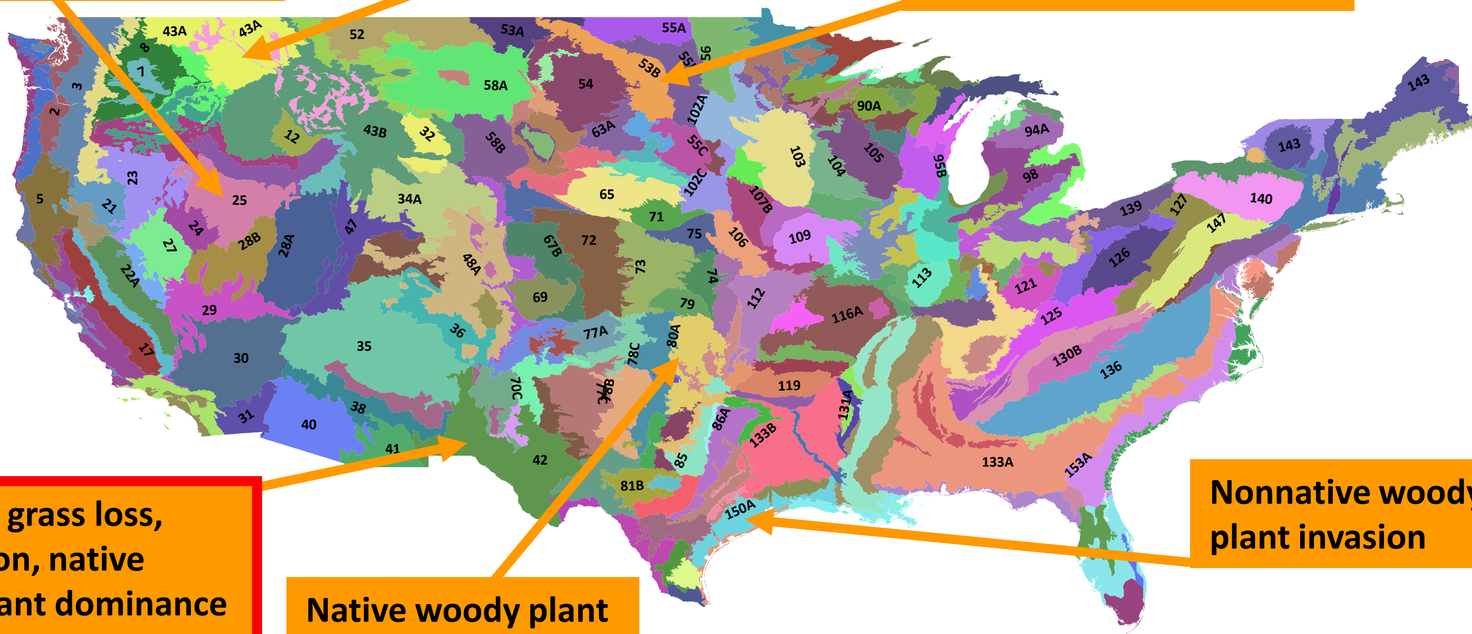
84A – Cross Timbers (Kansas, Oklahoma, and T exas)
84B – West Cross Timbers (Oklahoma and Texas)
84C – East Cross Timbers (Texas)
85 – Grand Prairie (Oklahoma and Texas)
86 – Texas Blackland Prairie (Texas)
87 – Texas Claypan Area (Texas)

MLRAs distinguish broad differences in potential and types of ecological dynamics

Non-native grass invasion, increased fire frequency, loss of native woody plants

Drought-triggered forest dieback

Non-native grass invasion, altered surface hydrology, reduced productivity



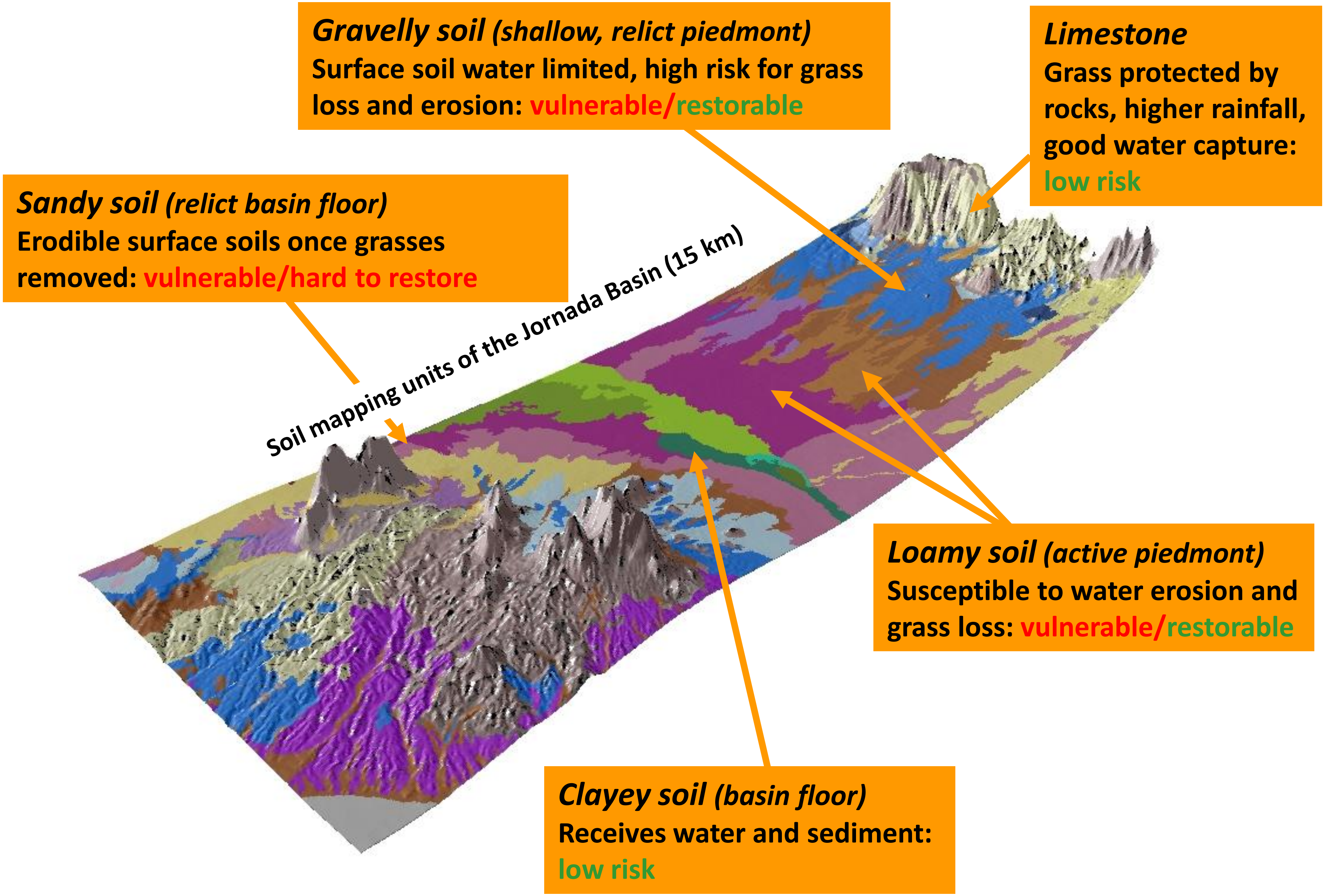
Perennial grass loss, soil erosion, native woody plant dominance

Native woody plant thickening, reduced fire frequency

Nonnative woody plant invasion

Major Land Resource Areas of the continental USA

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



Ecological Site Concept

- Similar to 'species' – a core concept with a defined amount of variability (in the climatic, geologic and edaphic properties)

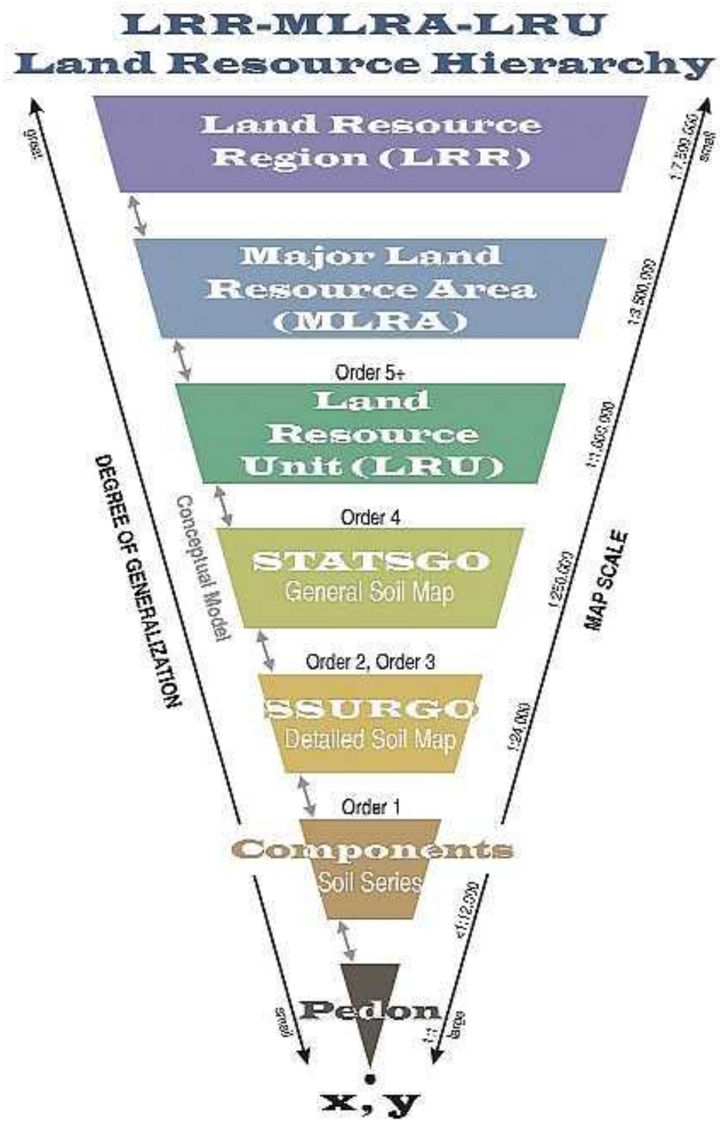
- Defines the distinguishing geophysical properties of a site and its temporal dynamics

"Sunset at Roman Nose State Park" Wilson Hurley

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.

Ecological Site Uses at LRU, MLRA and LRR Scales



Information can be aggregated at larger scales (Inventory)

SpatioTemporal Pattern detection (Intervention)

Predicted responses to climatic, socioeconomic factors (Modeling)

Impacts of policy and program decisions (Assessment)

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, 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.

“Showers of Sunshine” Linda Hurley Thompson