Landscape Management: Conceptual Considerations and Practical Application

Presentation Objectives:

Describe the concept of landscape management

Address relevant resource management issues

Illustrate with examples

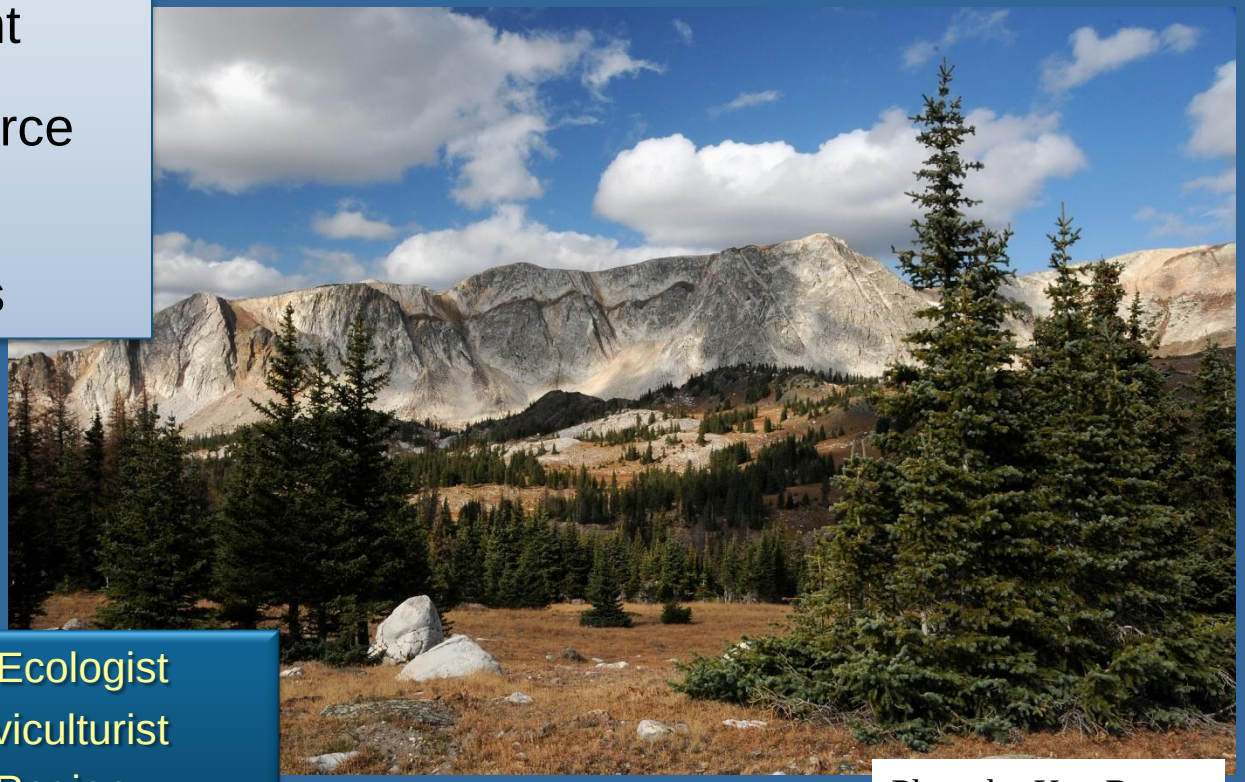


Photo by Ken Regan

Claudia Regan, Regional Ecologist
Jim Thinnes, Regional Silviculturist
USFS Rocky Mountain Region

What is landscape management?

- Scenery management?
- Management to achieve certain landscape scale patterns?
- Management that emerges from assessment at broad or multiple scales?
- Management that is applying principles of landscape ecology?
- Management that is addressing the intersection of resource objectives and social or economic concerns?
- Management that is addressing the intersection of multiple resource objectives or issues?

What is landscape management?

Management to achieve desired conditions, measured by ecosystem responses, at large spatial scales

Photo - Wally Covington

Presentation Outline

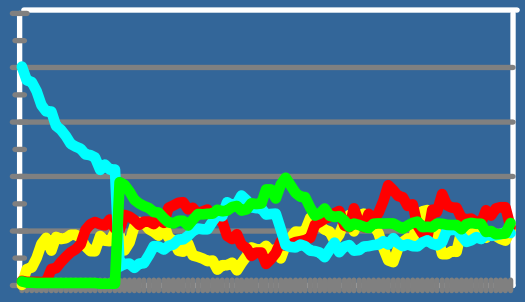
Photo by Ken Regan

- Review conceptual/theoretical underpinnings- landscape ecology principles - Claudia
- Discuss some practical implications and considerations in applying landscape management - Jim
- Provide examples of effective application of landscape management to 3 contrasting resource management issues

Principles from Landscape Ecology

Review conceptual underpinnings for developing landscape management approaches.

Landscape Structure Dynamics



Stand Initiation
Understory Reinitiation
Stem Exclusion
Shifting Mosaic

Defining a landscape

What is a landscape?
A landscape is a spatially heterogeneous area composed of a cluster of interacting ecosystems.

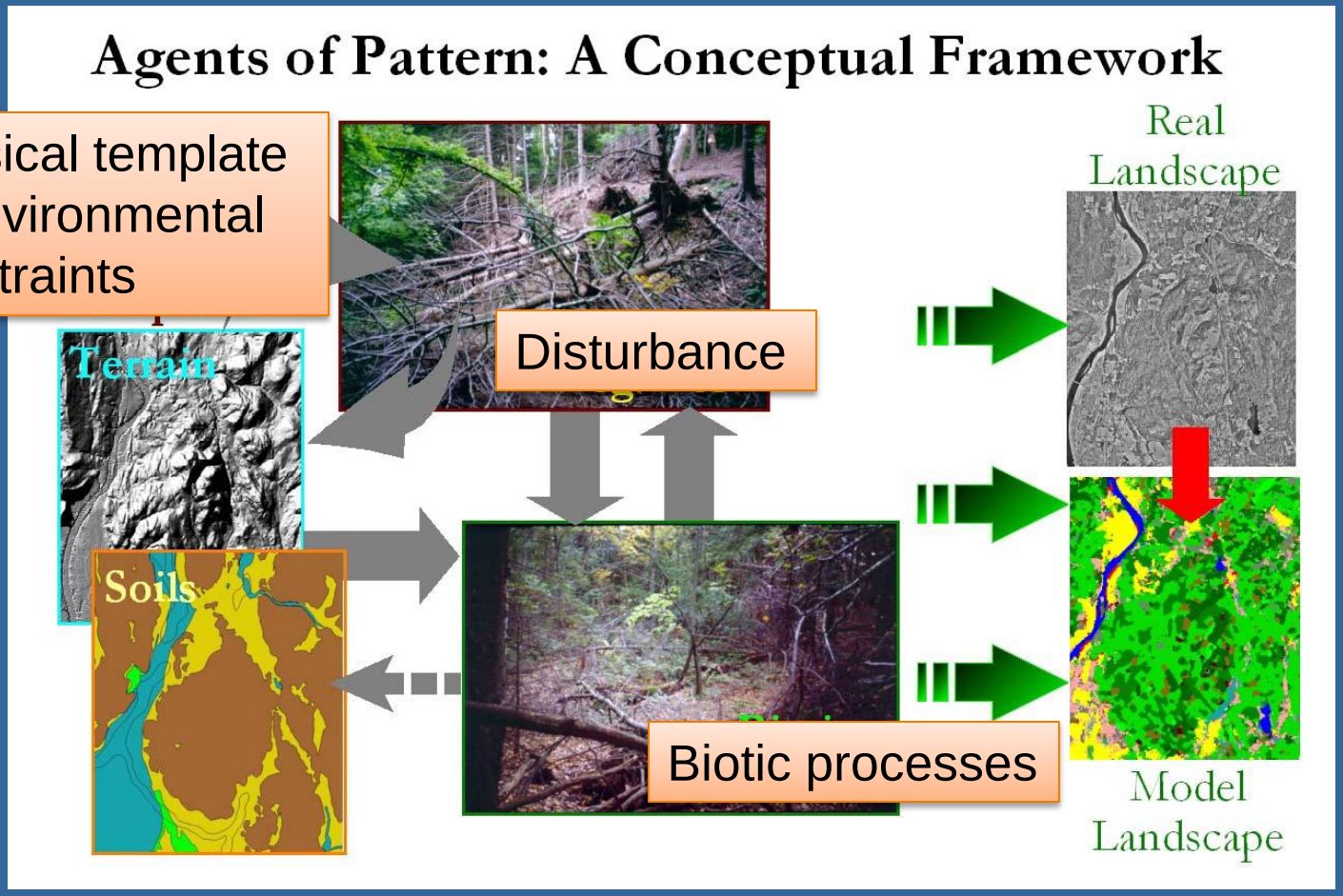
When delineating a landscape, remember:

A landscape can only be defined based on the resource question or management application of interest.

A landscape is not defined by its size. The spatial extent may be a few square meters or many square kilometers depending on the specific process or organism of interest. For addressing fire in forested ecosystems, landscapes are usually in the range of 1,000's to 10,000's acres.

A landscape can be either terrestrial or aquatic since spatial heterogeneity is a feature of both.

Landscape Pattern:
Three agents of pattern formation



From Kevin McGarigal, UMASS

Landscape Pattern:
Implications of landscape pattern

How does landscape pattern affect:

Populations and metapopulations?

Communities?

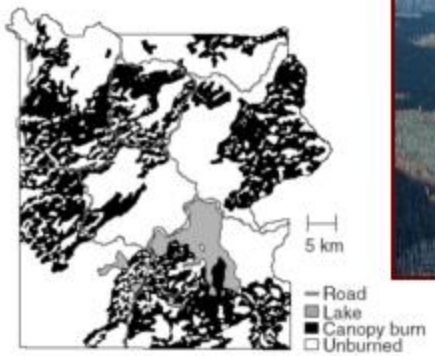
Ecosystem Processes?

Will forest management to create desired landscape patterns influence these at broad scales?

Agents of Pattern Formation: Disturbance

Role of "Natural" Disturbances

- The disturbance-generated mosaic

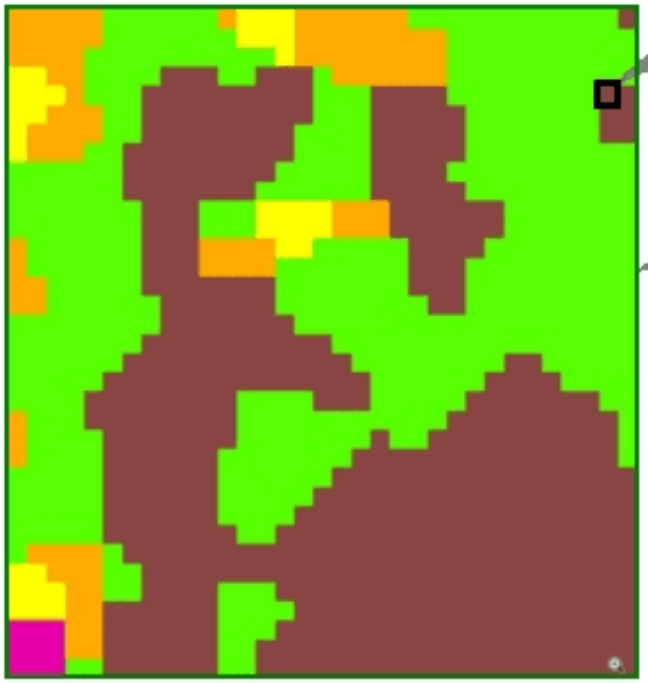


Fire (Yellowstone National Park)

From Kevin McGarigal, UMASS

Landscape Pattern:
Scale – grain and extent

Components of Scale



GRAIN: The minimum resolution of the data, defined by the cell or minimum polygon size.

EXTENT: The scope or domain of the data, defined as the size of the landscape or study area under consideration.

Minimum Patch Size?

From Kevin McGarigal, UMASS

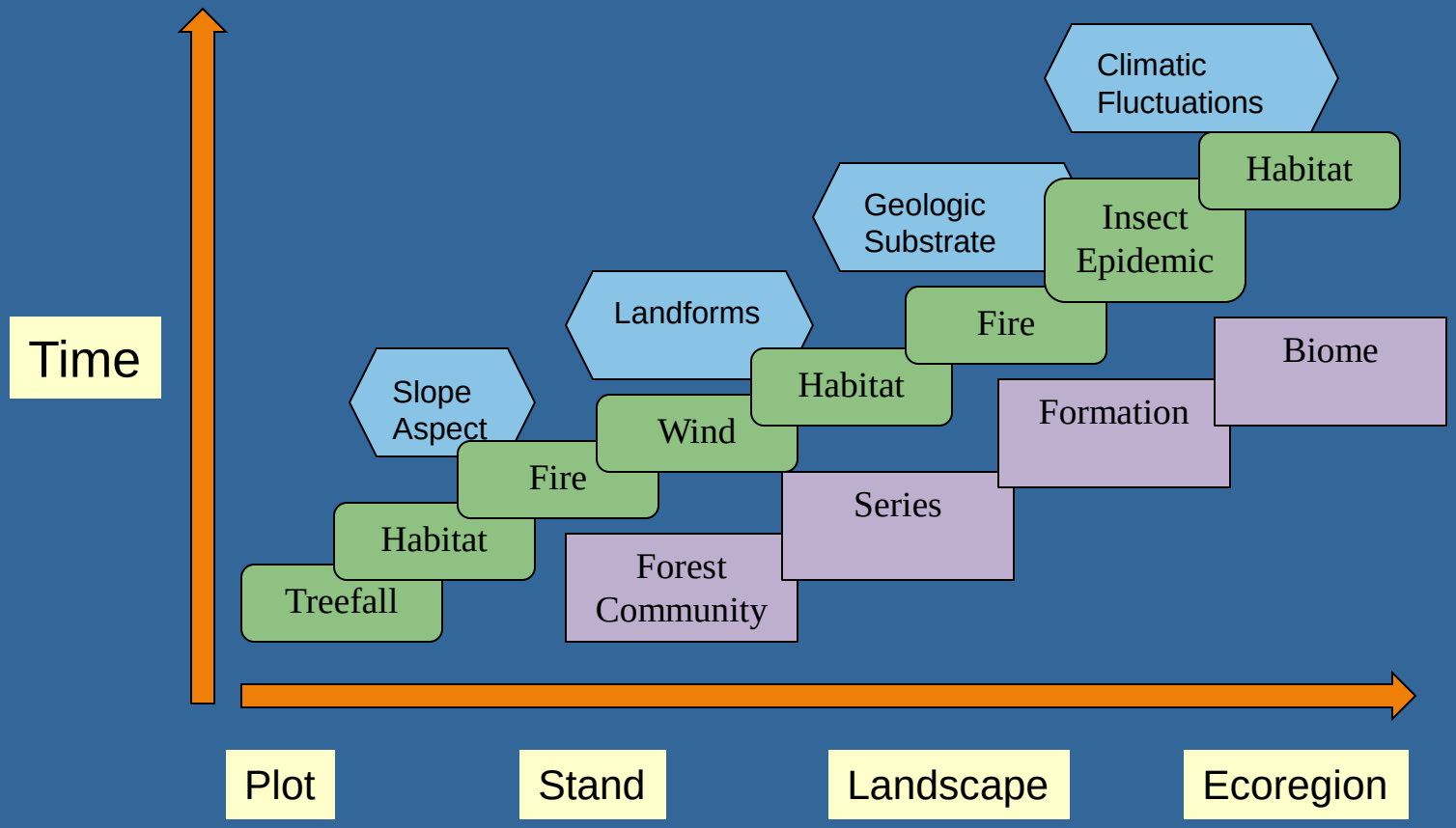
Landscape Pattern:
Scale – grain and extent

Components of Scale

- From an "anthropogenic perspective", grain and extent may be defined on the basis of management objectives.
  - Grain is the finest unit of management (e.g., stand).
  - Extent is the total area under management consideration (e.g., forest).

From Kevin McGarigal, UMASS

Landscape Pattern:
Characteristic ecological scales

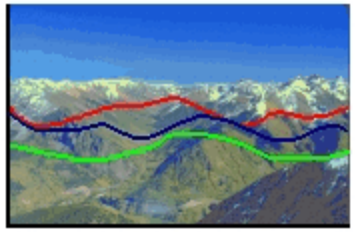


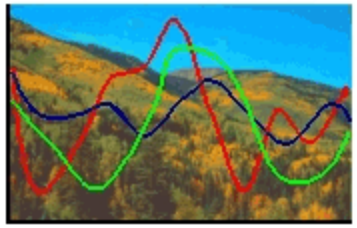
Scale matters ecologically

Landscape Pattern:
Scale influences data and interpretations

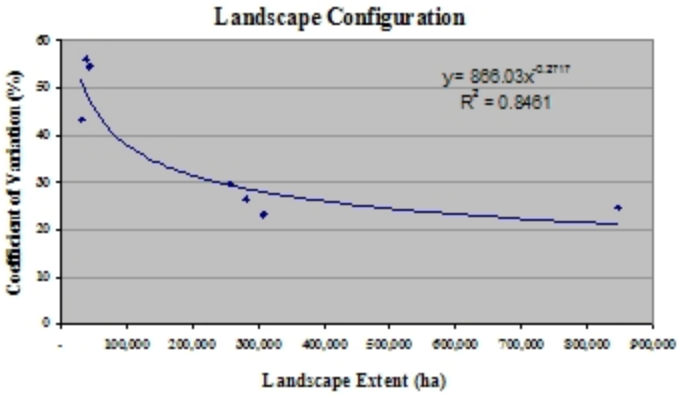
Why is Scale Important?

- As one changes scale, statistical relationship may change.



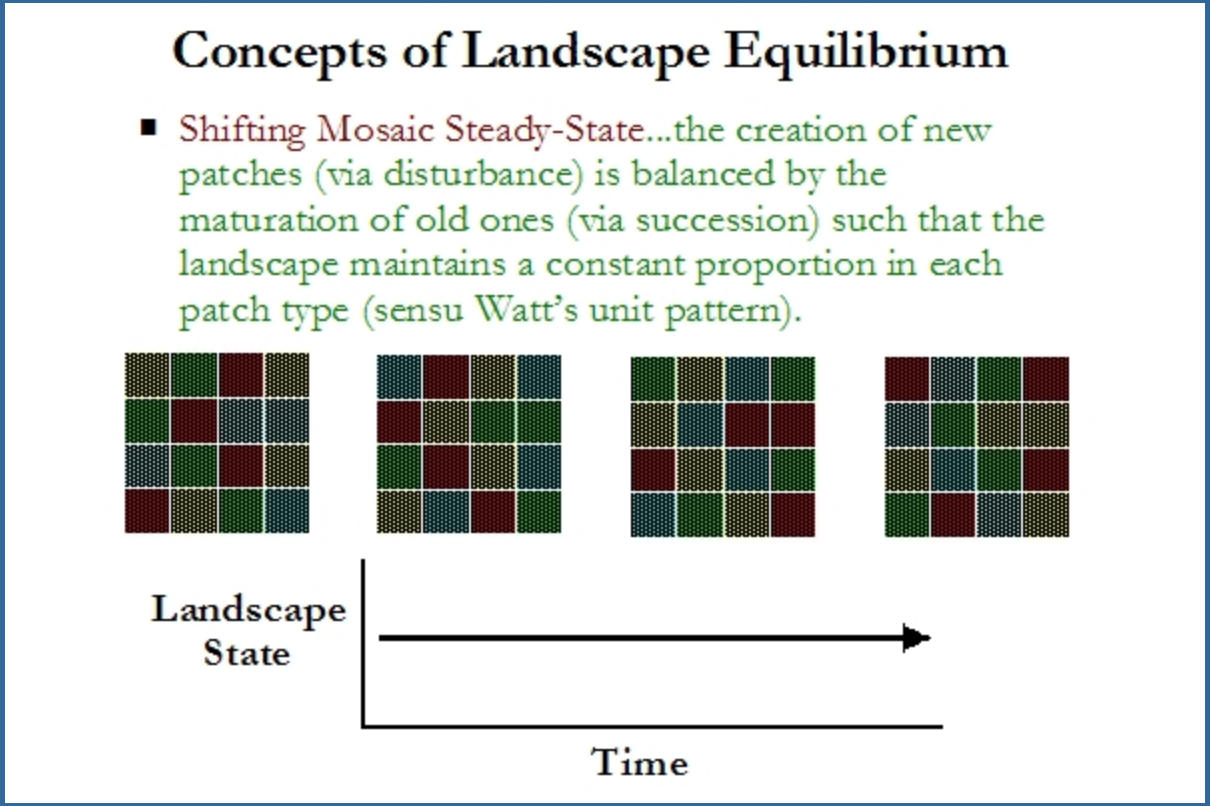


Range of variability decreases with increasing spatial extent.



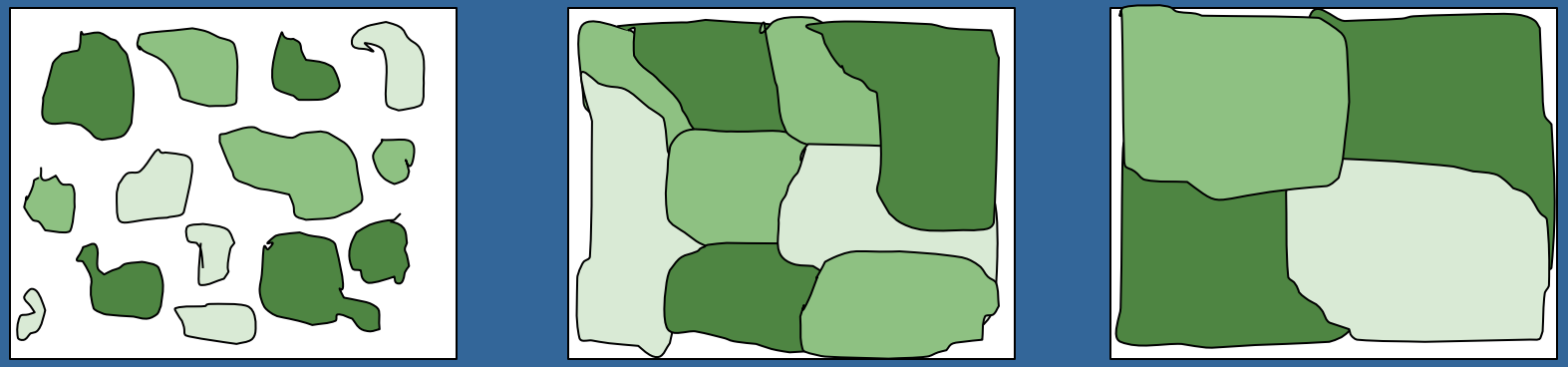
From Kevin McGarigal, UMASS

Landscape Pattern: *equilibrial landscapes?*



Scale dependent!

Landscape Pattern:
disturbance and incorporating area



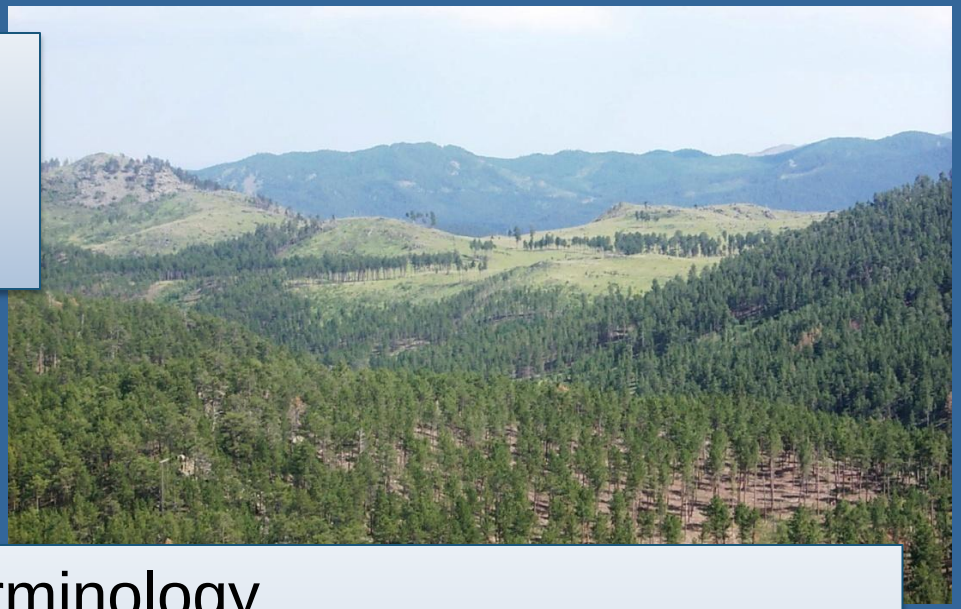
Disturbance frequency increases

Disturbance severity increases

Defining the unit pattern defines the minimum space to fully represent the vegetation "patches (minimum dynamic area)

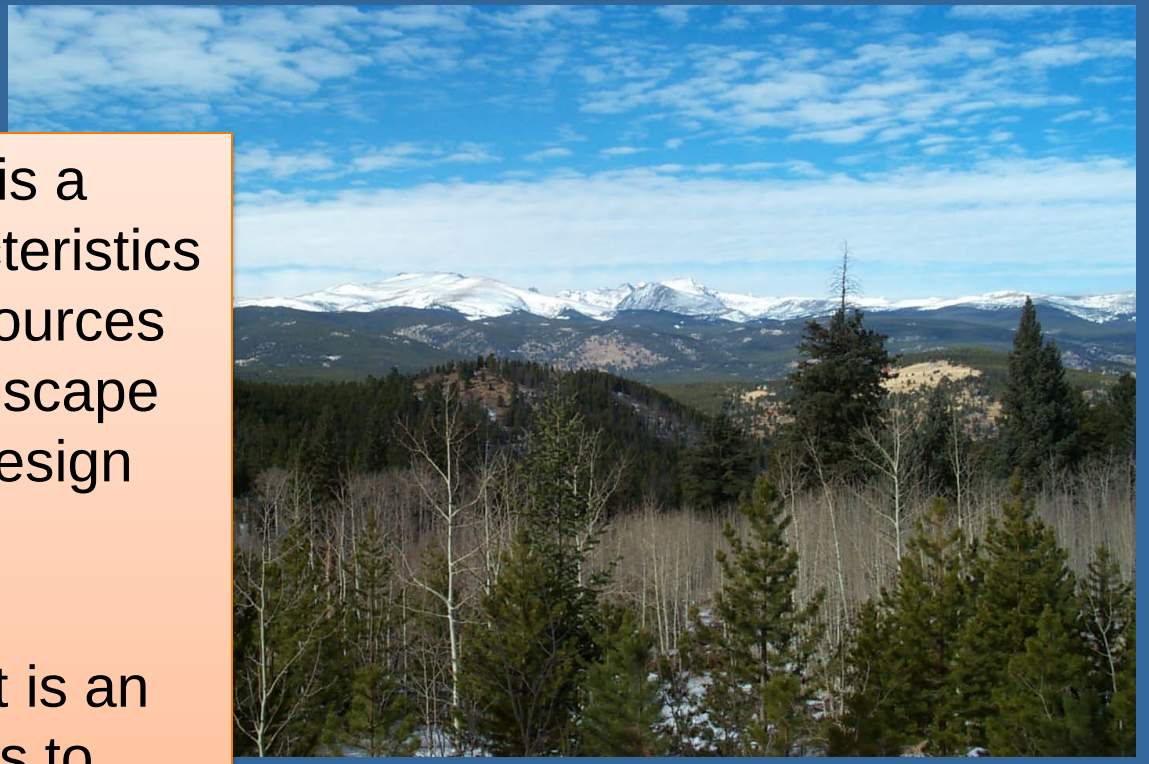
Practical Considerations in Applying Landscape Management

Provide a review of some practical considerations of landscape management



Terminology
Identifying the landscape
Determining landscape objectives
Recognizing constraints
Monitoring the results

Landscape Assessment and Landscape Management



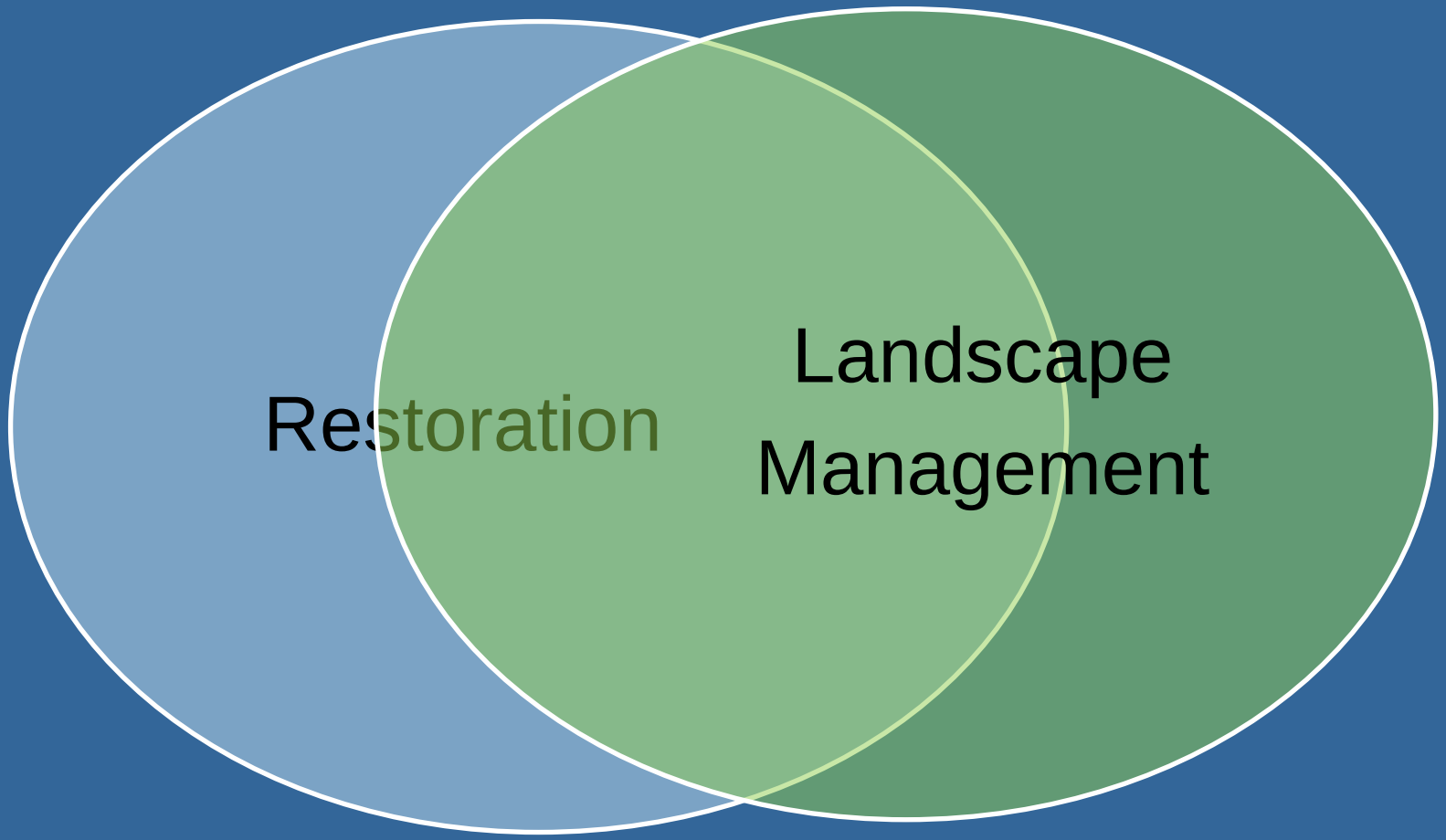
- Landscape assessment is a description of the characteristics and an evaluation of resources and conditions. The landscape assessment is used to design landscape management approaches.
- Landscape management is an action or series of actions to achieve a desired response at a large scale (1000s-10,000s acres)

Restoration, Landscape Management, and Treatment Scale

- Restoration is the process of returning ecosystems to their historic structure and composition.
  - *A stand or stream reach can be restored, but the scale would not be considered landscape management*.

A landscape is a heterogeneous land area with interacting ecosystems repeated in similar form throughout the defined area.

Fuel treatment blocks of unnatural structure and/or composition strategically placed across a large area would be landscape management, but it would not be restoration.



Restoration may or may not involve landscape management.
Landscape management may or may not result in restoration.

Landscape Management Considerations

1. Identify the spatial patterns*
2. Identify the ecological processes*
3. Determine the scale of disturbances or other drivers*
4. Delineate a contiguous area of interest
5. Determine the landscape objectives
6. Identify economic and social constraints
7. Not every acre needs to be actively managed
8. Scale treatment(s) to provide a desired landscape response

* Part of a landscape assessment

Landscape Objectives

- Potential Sources for Objectives:
  - Forest Plans
  - Community Wildfire Protection Plans
  - County Zoning
  - Collaborative Processes
- Potential Objectives:
  - Reduce Fire Hazard
  - Reduce Risk of Insect Epidemic
  - Watershed Management
  - Biodiversity Conservation
  - Resource Production (e.g. timber, big game, etc.)

Constraints on doing landscape management

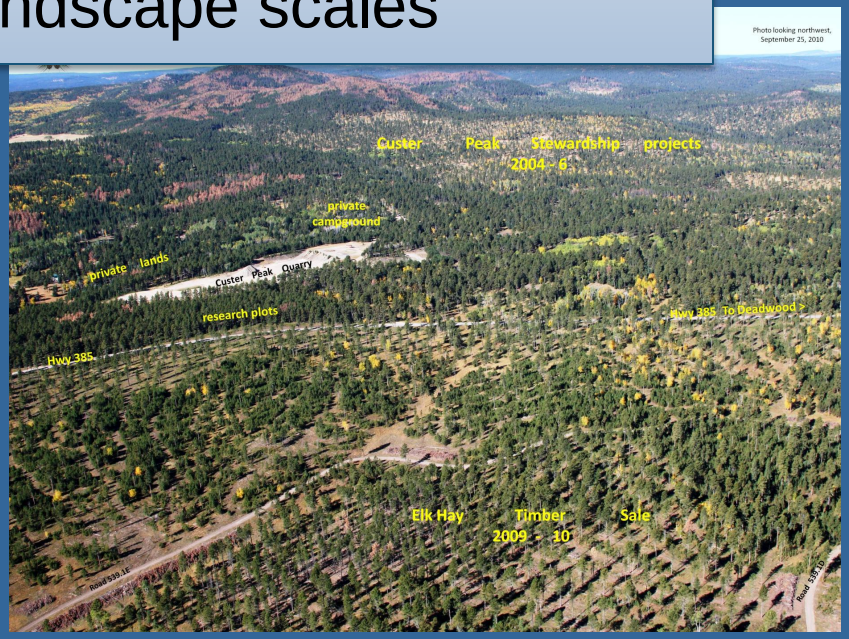
- Legal and regulatory requirements (e.g. wilderness, air quality, water quality, ESA, NHPA, etc.)
- Forest Plan management area restrictions
- Financial limitations
- Equipment capabilities
- Time sequence and/or duration

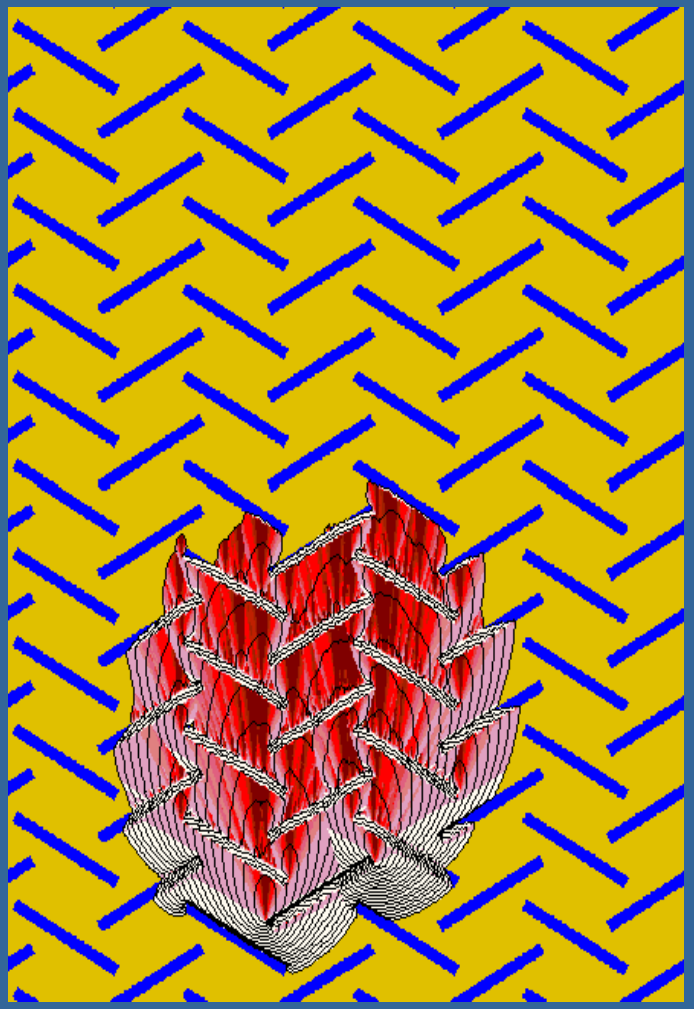
Landscape Monitoring

- Landscape and local metrics are different.
- Local monitoring typically evaluates attributes from points, lines, or stand-sized polygons. Examples are species composition, stand density, fuel model, etc.
- Landscape monitoring evaluates attributes at larger scales and typically requires remote sensing or sampling. Examples are patch size, structural stage distribution, condition class, etc.

From Concepts to Application of Landscape Management

Provide examples of conceptual and applied approaches to achieving desired responses at landscape scales



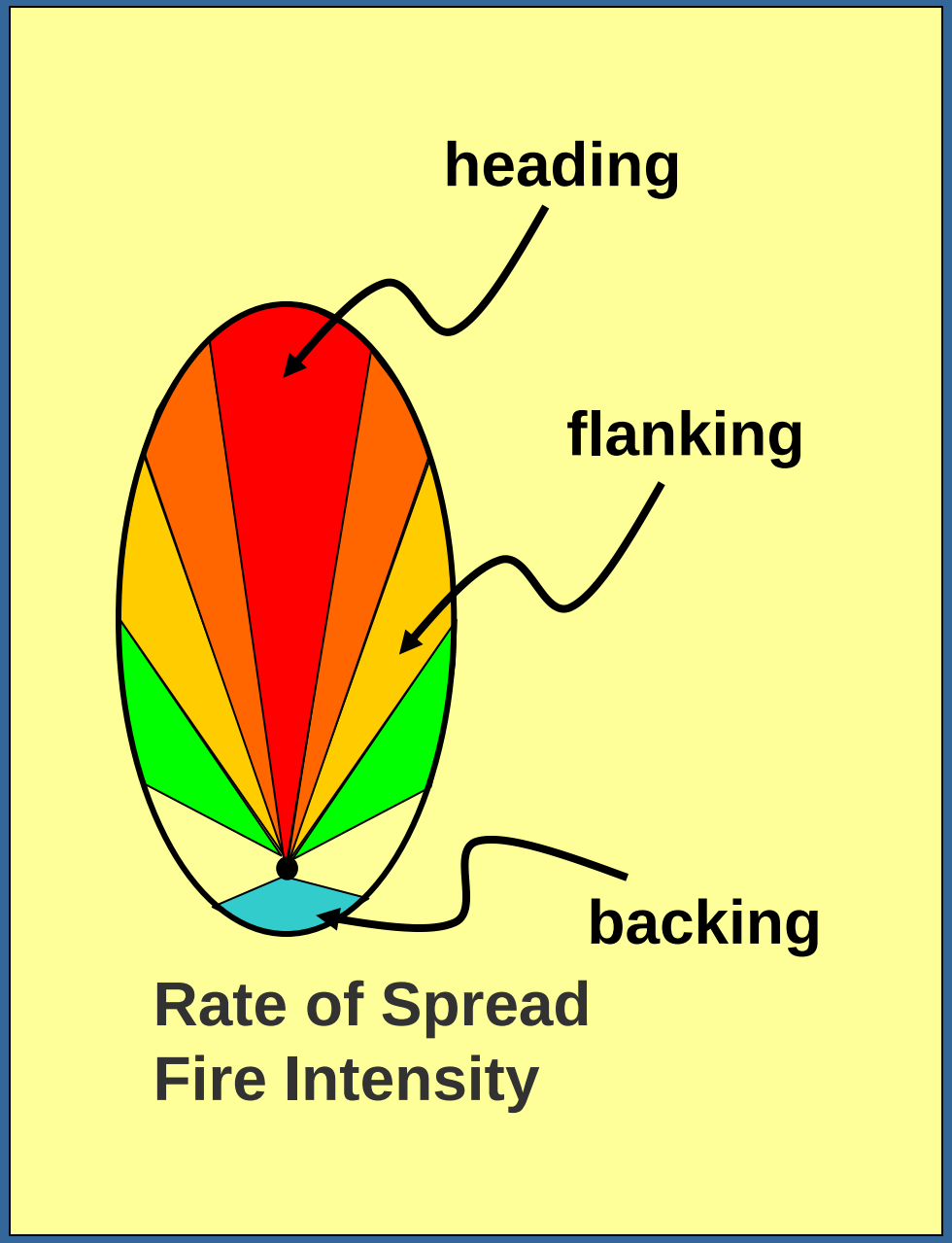


Example 1 - Fuel Treatment Concepts

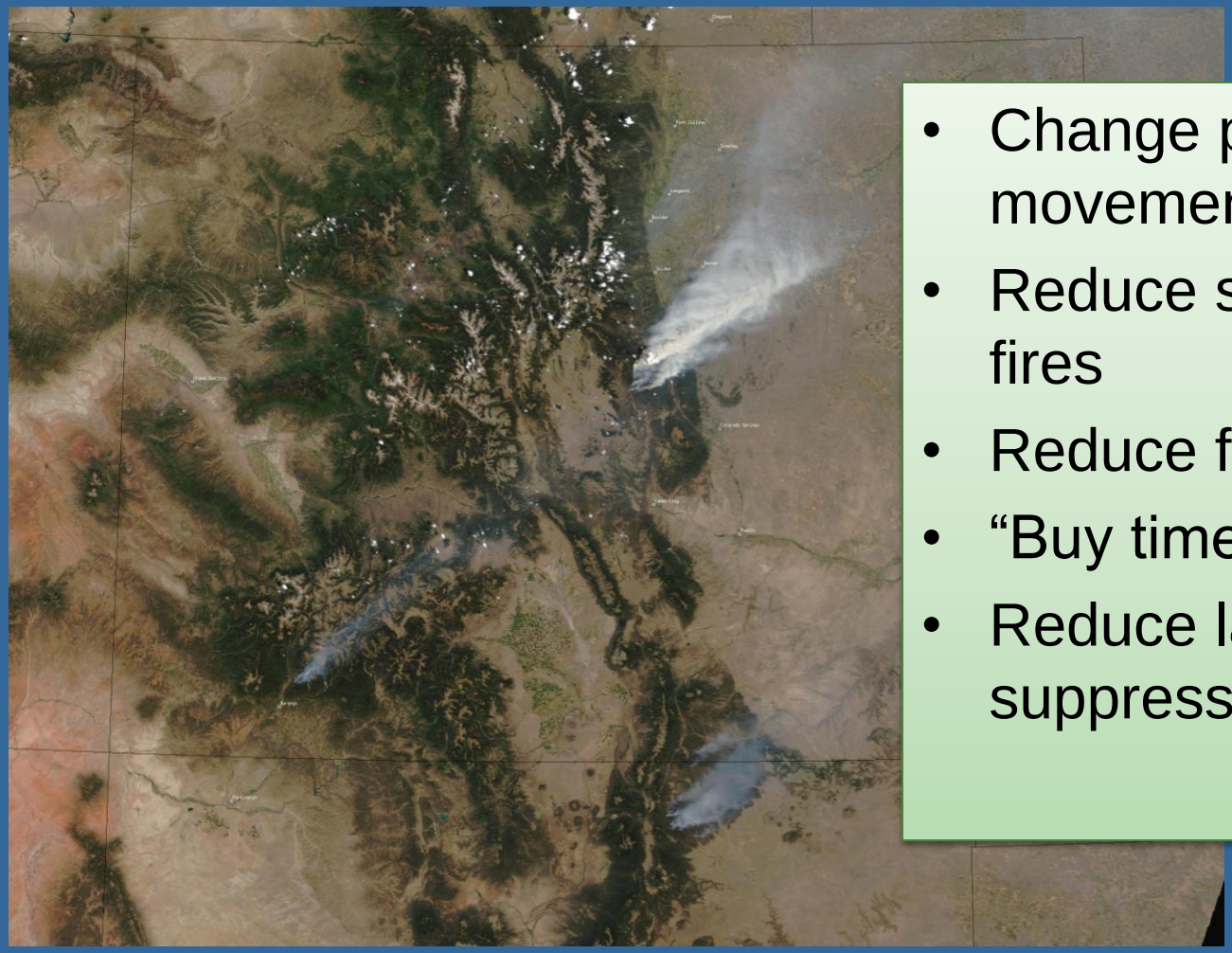
(information provided by Mark Finney)

- Fire behavior
- Landscape fuel management objectives
- Treatment strategies
- Strategically Placed Area Treatments (SPLATS)

Fire Behavior Varies by Spread Direction



Potential Landscape Fuel Management Objectives



- Change probability of fire movement
- Reduce size of large fires
- Reduce fire severity
- “Buy time” for restoration
- Reduce large-fire suppression costs

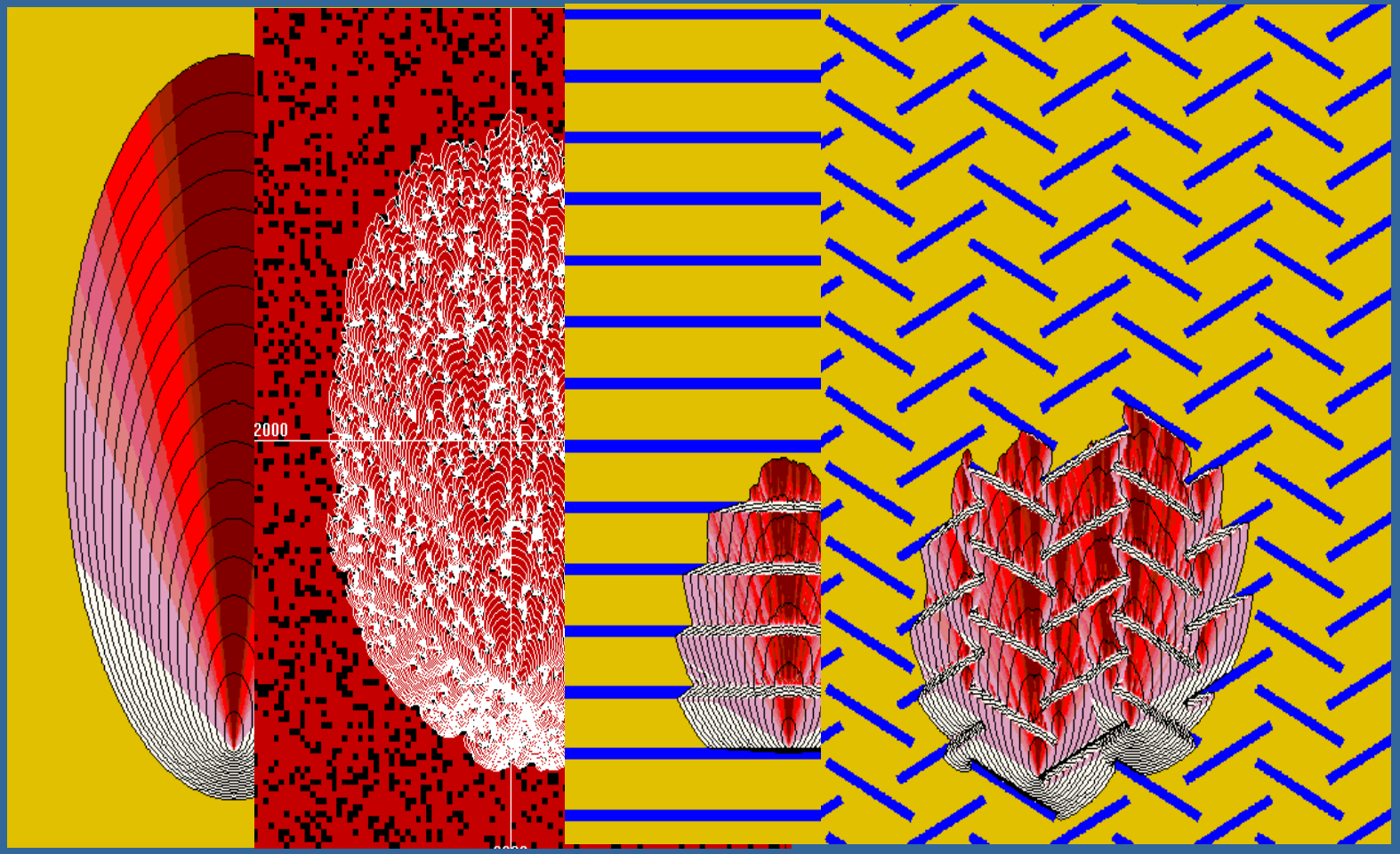
Landscape Fuel Treatments Strategies

- Fire Containment
  - Fuelbreaks

- Fire Modification
  - Area/dispersed treatments

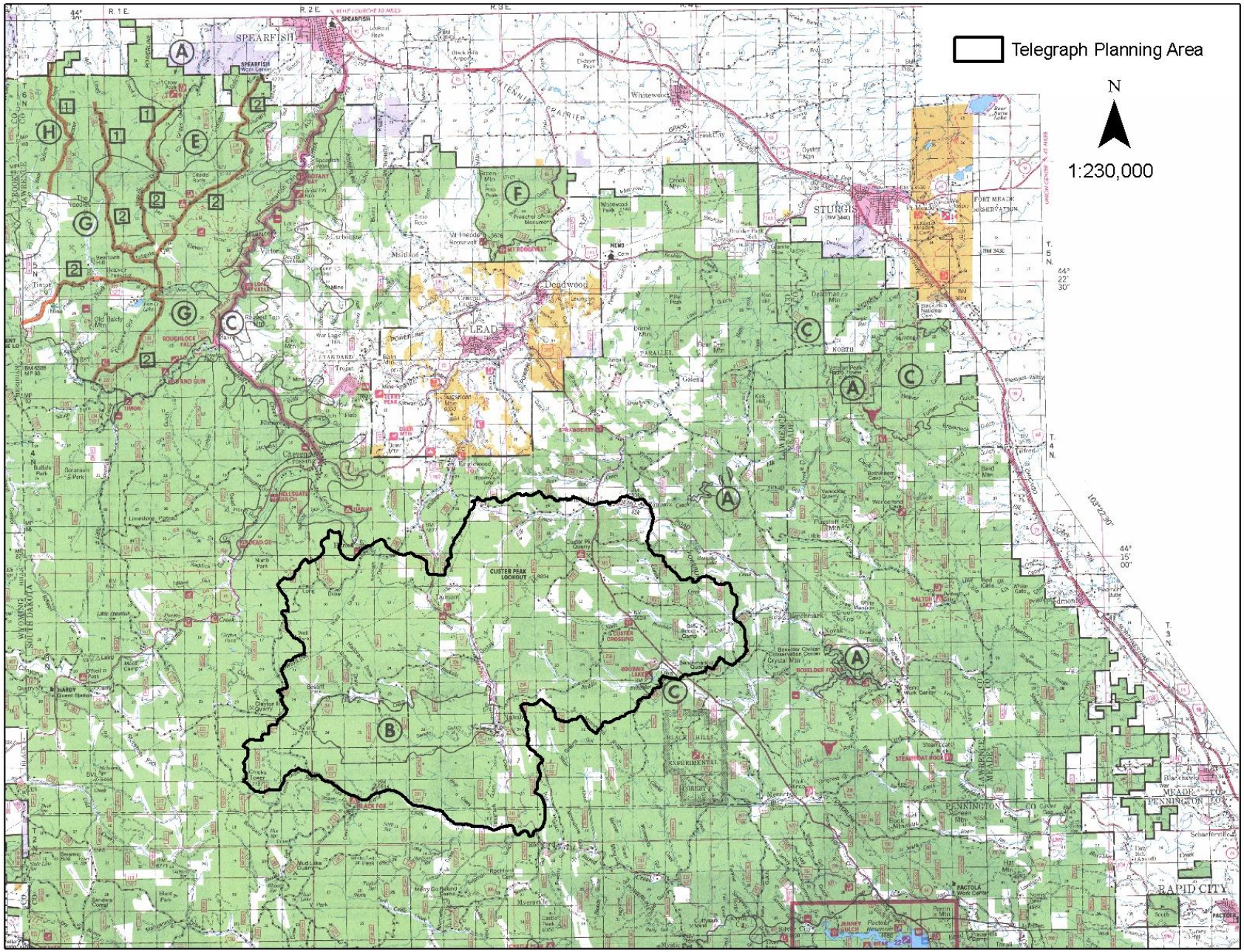
~20% treatment

Control | Random | Strips | Strategic

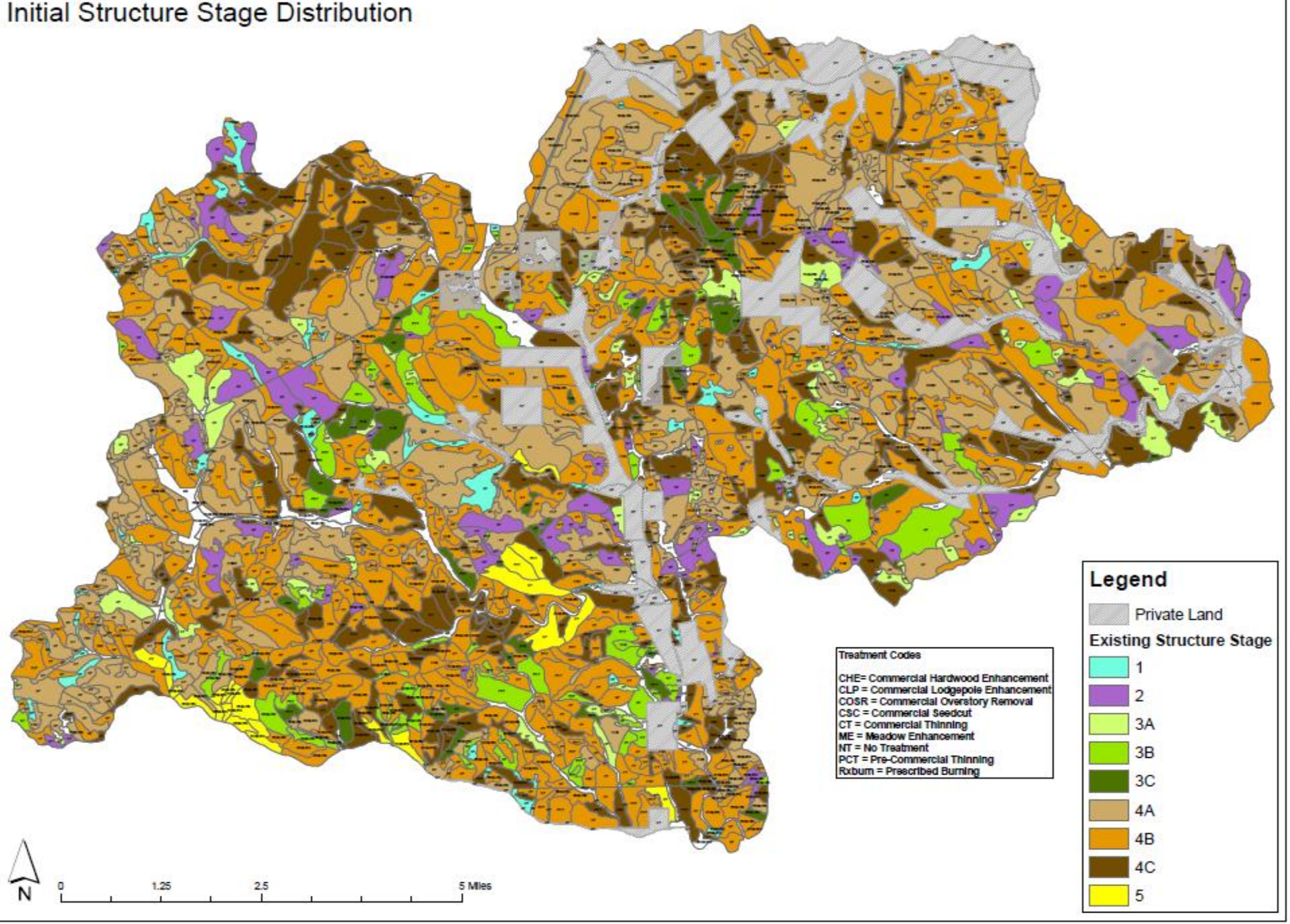


Example 2 - Black Hills Telegraph Project

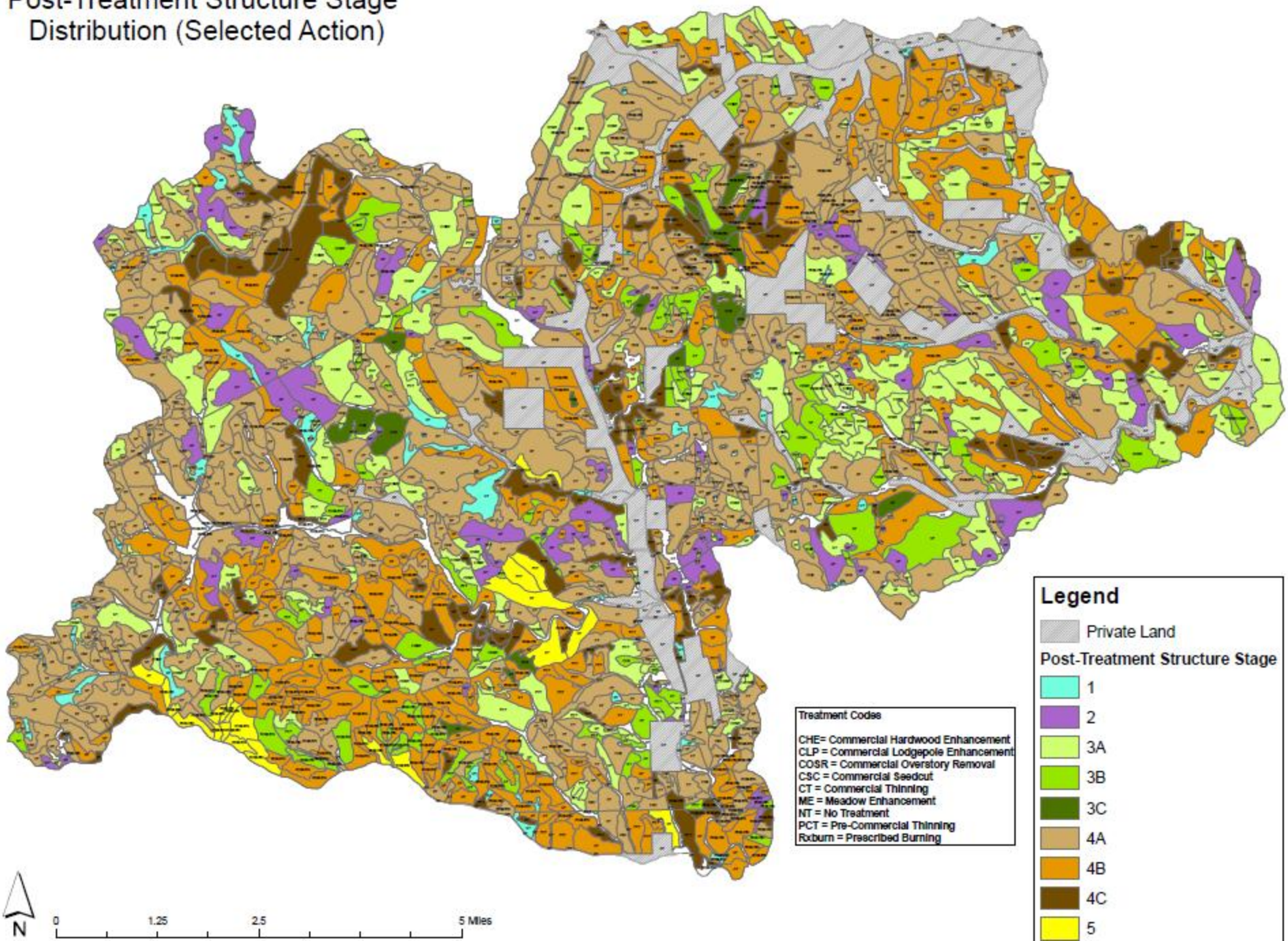
- 60,000-acre landscape
- Primarily ponderosa pine forest
- Surface and mixed fire regimes created heterogeneous, relatively open pine stands
- Fire exclusion resulted in denser forests
- Timber management reduced large tree component
- Timber management emphasis area
- Fire hazard concern
- Mountain pine beetle concern
- 33,700 acres treated (timber, noncommercial, & fire)


Telegraph Planning Area
N
1:230,000
SPEARFISH
STURGIS
Deadwood
LEAD
CUSTER PEAK LOOKOUT
PENNINGTON CO
RAPID CITY
A
B
C
E
F
G
H

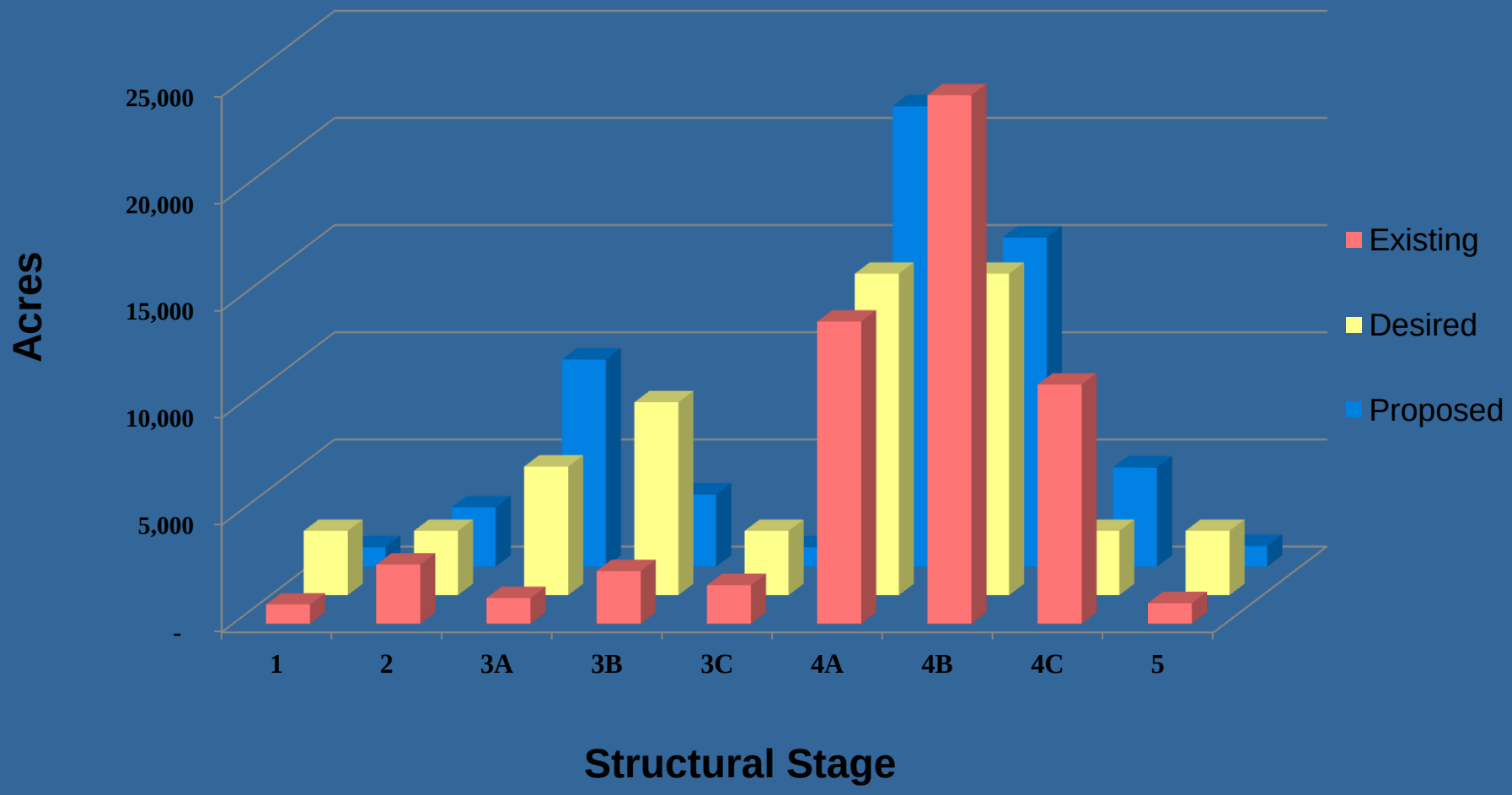
Telegraph Project Area
Initial Structure Stage Distribution

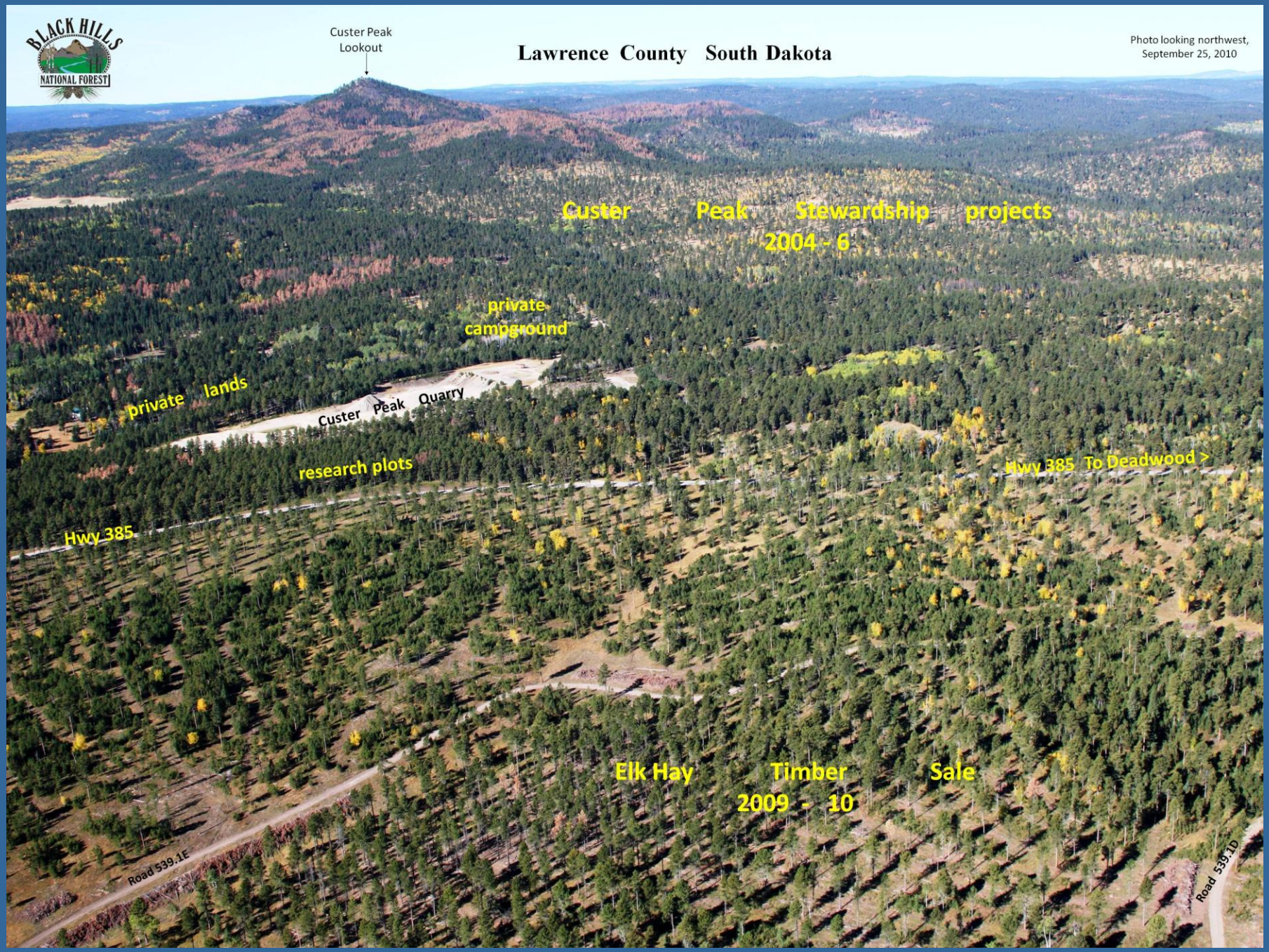


Telegraph Project Area
Post-Treatment Structure Stage Distribution (Selected Action)



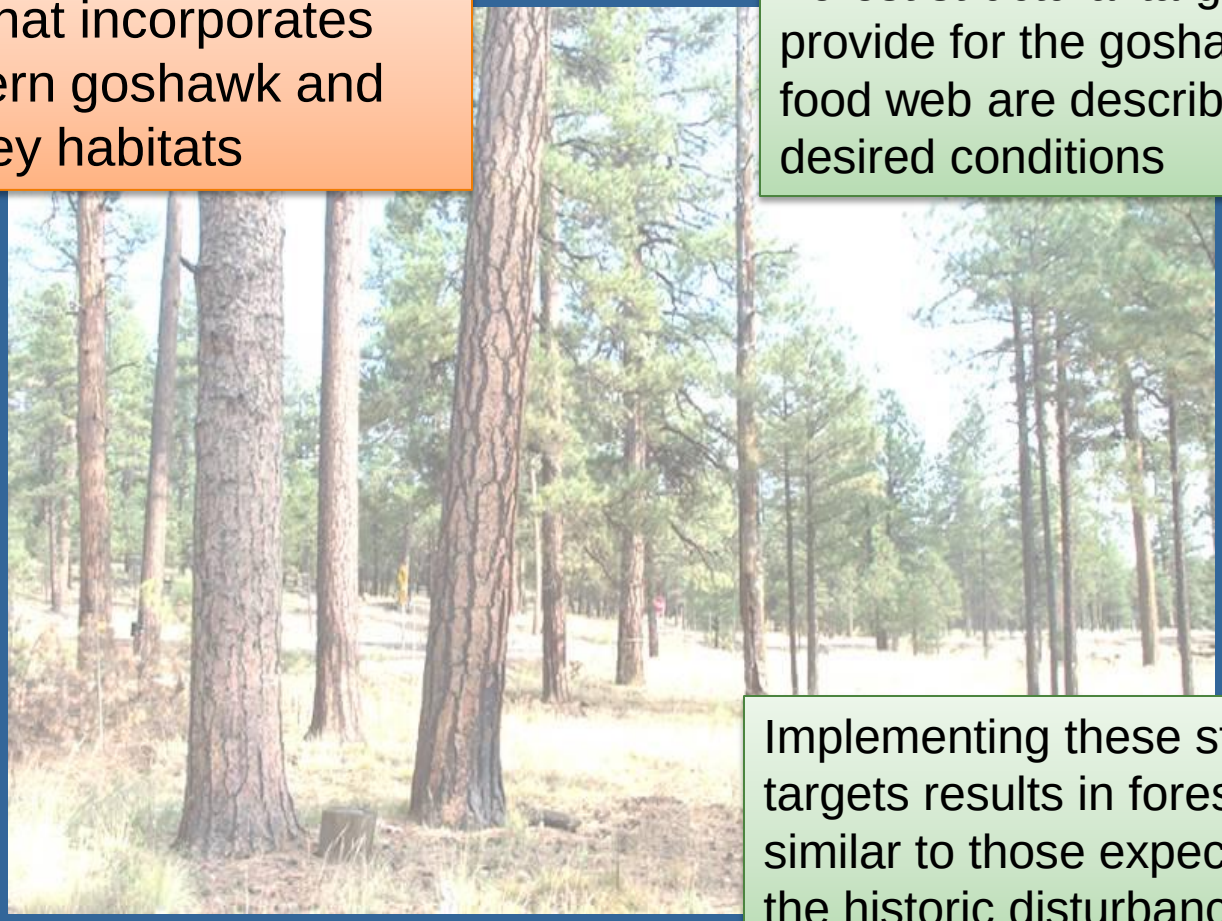
Telegraph Landscape Structural Stages




Custer Peak Lookout
Lawrence County South Dakota
Photo looking northwest, September 25, 2010
Custer Peak Stewardship projects
2004 - 6
private campground
private lands
Custer Peak Quarry
research plots
Hwy 385
Hwy 385 To Deadwood >
Elk Hay Timber Sale
2009 - 10
Road 539.1E
Road 539.1D

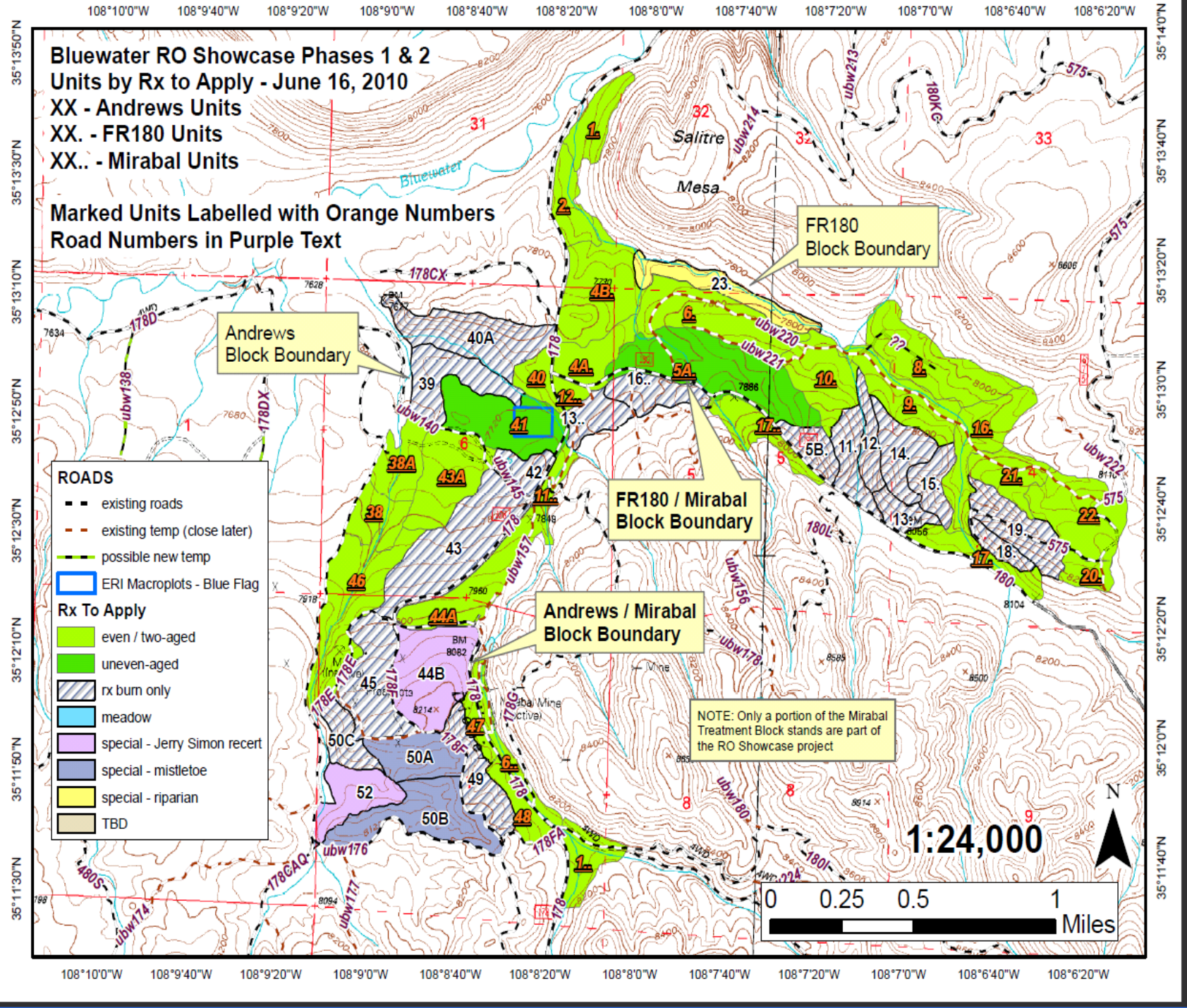
Example 3 – Wildlife Habitat Using Goshawk Guidelines

Food web based conservation approach that incorporates both northern goshawk and multiple prey habitats



Forest structural targets that will provide for the goshawk and the food web are described as desired conditions

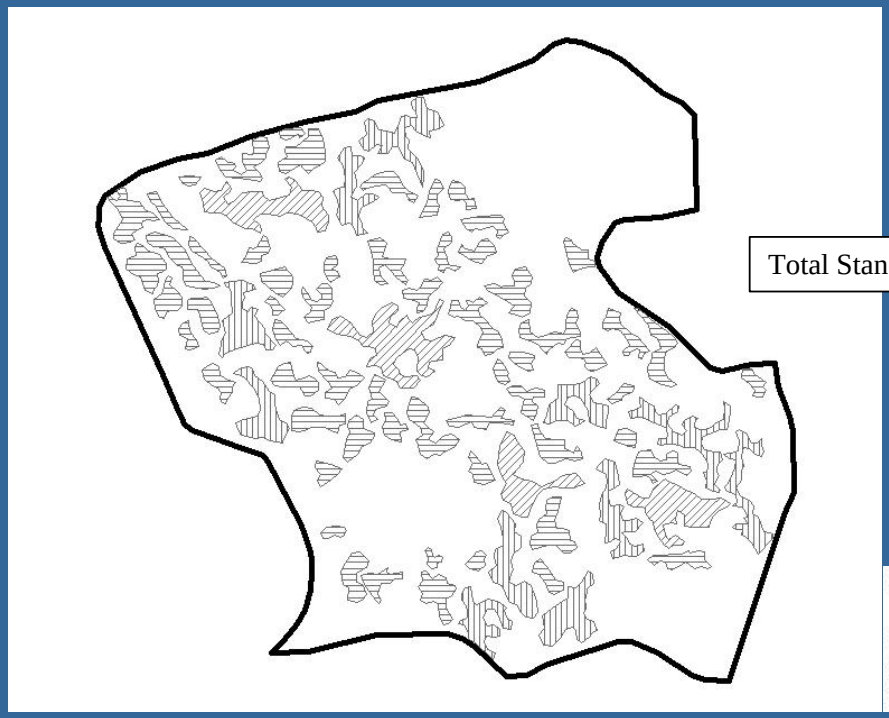
Implementing these structural targets results in forest conditions similar to those expected under the historic disturbance regime


Bluewater RO Showcase Phases 1 & 2
Units by Rx to Apply - June 16, 2010
XX - Andrews Units
XX. - FR180 Units
XX.. - Mirabal Units
Marked Units Labelled with Orange Numbers
Road Numbers in Purple Text
Andrews Block Boundary
FR180 Block Boundary
FR180 / Mirabal Block Boundary
Andrews / Mirabal Block Boundary
NOTE: Only a portion of the Mirabal Treatment Block stands are part of the RO Showcase project
ROADS
existing roads
existing temp (close later)
possible new temp
ERI Macroplots - Blue Flag
Rx To Apply
even / two-aged
uneven-aged
rx burn only
meadow
special - Jerry Simon recert
special - mistletoe
special - riparian
TBD
Salitre Mesa
Bluewater
1:24,000
0 0.25 0.5 1 Miles
N

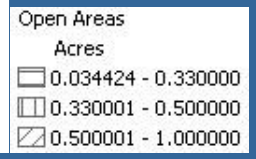
Post-Treatment, 2008 -Uneven-aged stand, 70 ft² BA

Pre-Treatment, 2007 -High-density uneven-aged stand

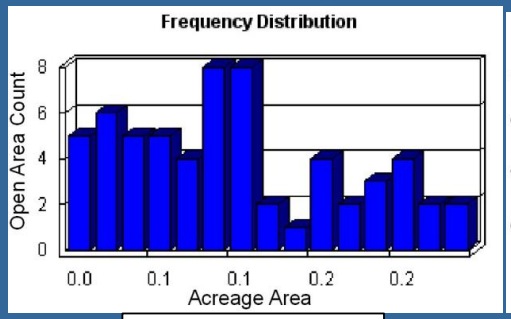
Created Canopy Gaps & Regeneration Group Openings



Total Stand Acres = 64.8

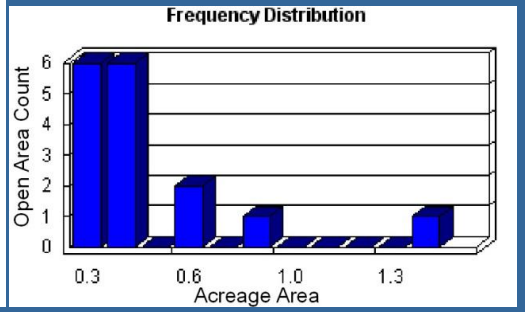


AREAS LESS 0.33 ACRE



Count: 61
Minimum: 0.034 acre
Maximum: 0.282

AREAS GREATER 0.33 ACRE



Count: 16
Minimum: 0.331 acre
Maximum: 1.392

Canopy gaps & regeneration openings were created on approximately 26% of the area (14% of the created openings ranged from 0.33 to 1.4 acres in size)

Post-Treatment, 2008

2005 Pre Treatment

2008 Post Treatment

Target structures are at the stand scale.

For these forest types, can recreate the finely grained, clumpy pattern repeatedly over large areas to scale from stands to landscapes.

For effective landscape management in the long term, it is important to consider maintenance of the desired conditions after initial treatments.

Questions?

Photo by Ken Regan