

# Seeing Red:

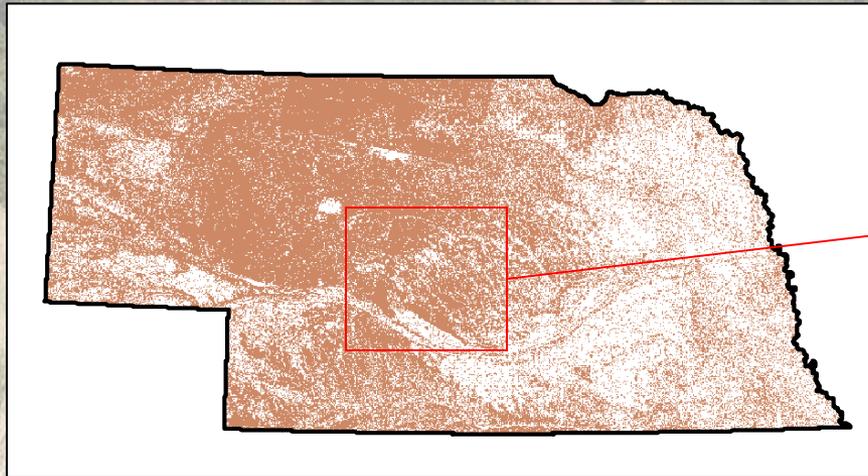
An object-oriented approach to identifying red cedar populations in central Nebraska

- I. Background/Introduction
- II. Problem Statement
- III. Solutions
  - I. Eyeball
  - II. Global Positioning
  - III. GIS/Remote Sensing
    - I. Landsat TM – regional
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    - III. Comparison of approaches
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  - II. Potential Problems
- V. Demonstration
- VI. Comments/Questions

# Background...

## Rangeland in NE

- ▲ **Over 50% of state in Pasture or Grass (NASS, 2003)**
- ▲ **Brush Management Practices**
  - ▲ Attempting to restore balance to the natural plant community.
  - ▲ Brush plants use 3-5 times more water than native grasses.
  - ▲ Reducing brush plants will provide more water for natural grasses, resulting in higher quality forage for livestock.
  - ▲ Thinning brush plants also reduces competition that desirable plants have for sunlight and nutrients (increases forage yield).
  - ▲ NRCS provides cost-share to landowners for brush management (\$50 and \$200 payment levels).



# Red Cedar...

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## **DESCRIPTION**

- Eastern red cedar is a translocated species that rarely exceeds 30 feet high.
- Coniferous tree with scale-like leaves and blue-black berries.

## **EFFECTS OF INVASION**

- After settlement, fires were greatly suppressed, thus removing the primary limiting factor for red cedar establishment. In the absence of fire, red cedar can dominate natural communities. This plant will often form closed stands, excluding most other plant species.
- Red cedar is pollinated by wind; male and female flowers are on different trees.
- Most seeds are dispersed by birds.
- Establishment of red cedar is slow because seeds are not produced in the first 10 years. However, habitat modification accelerates once seeds are produced and scattered, and culminates in a canopy of red cedar with bare ground underneath.

## **CONTROLLING RED CEDAR**

- Because the bark is very thin, red cedar is extremely sensitive to fire. Prescribed fires are the easiest and most cost-effective control method for red cedar.
- Lumber and wood-chipping industries cut and use larger trees for biofuel and landscaping.

# Dilemma...

## How can we accurately identify and inventory red cedar in the field?

### ◆ **Eyeball Estimates**

- ◆ Requires site visit – this requires time.
- ◆ Subjective – eyeballs are different (usually eyes see more cover than is actually there).
- ◆ Topography may play a role – may not be able to see all cedars due to elevation differences.



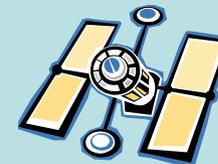
### ◆ **GPS every red cedar (or GPS around groups of trees)**

- ◆ Requires site visit – a lot of time involved.
- ◆ What to do in mixed forest areas?
- ◆ Largely unmanageable.



### ◆ **GIS/Remote Sensing approach**

- ◆ No site visit required.
- ◆ Requires photo interpretation skills.
- ◆ Requires appropriate image analysis software.
- ◆ Not as subjective – software determines cover type.
- ◆ Some interpretation error.



# GIS/RS Approach #1:

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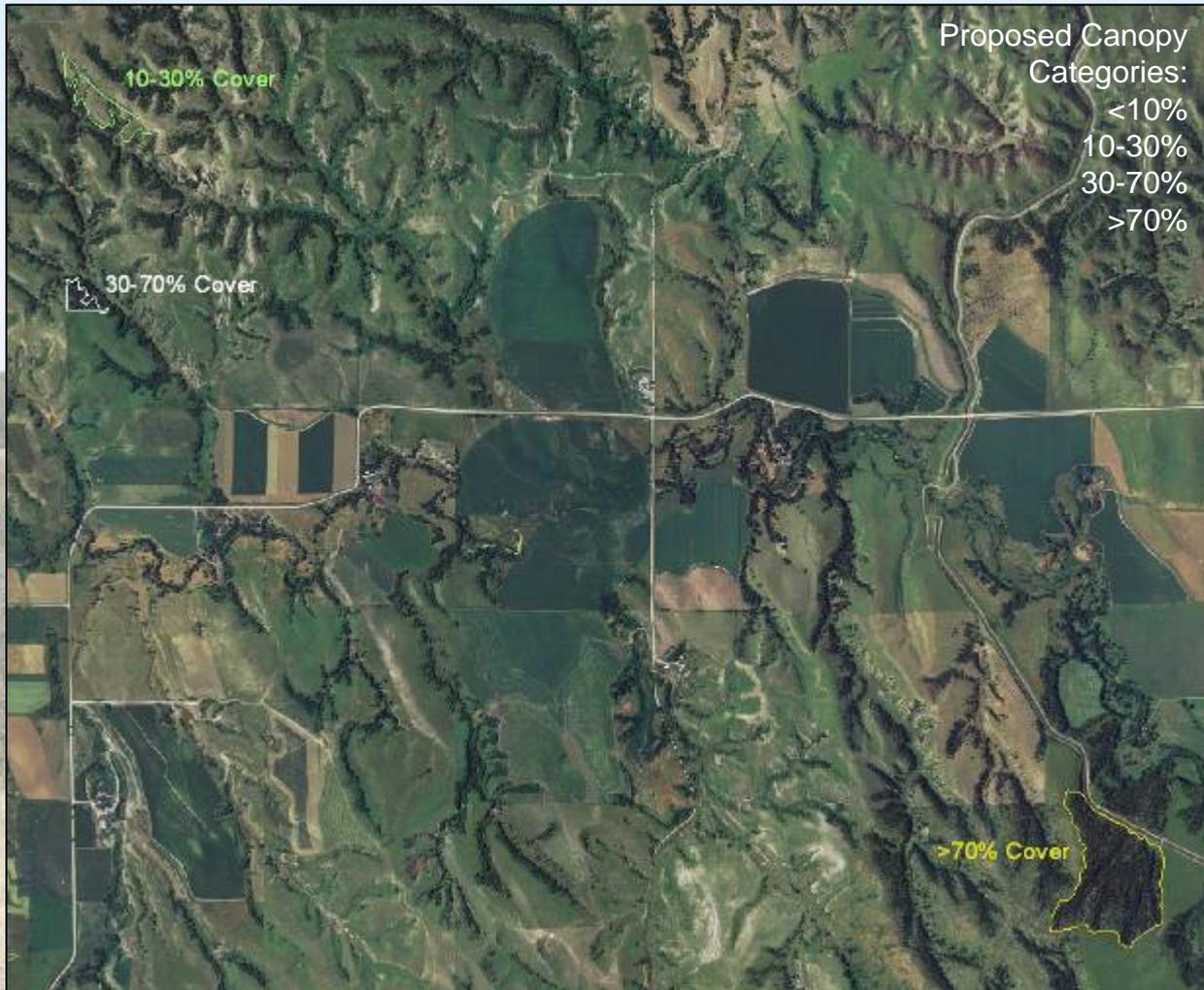
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Satellite Interpretation (regional approach)

## Thematic Mapper Imagery

- 30-meter resolution
- 2005 (July – September)
- 7 Spectral Bands

# Target Plots...



## Target Plots

- Use GPS with beacon receiver to collect target plots of red cedar (forest) cover.
- Collect additional information for each plot – estimated average tree diameter, estimated average tree height, forest type (cedar, cedar/hwd, etc.), aspect, & cover percentage.
- Percent Cover class will be used to assign categories to the classified satellite image.

# Preliminary Categories...

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- **10-30% Cover**

- Trees are scattered enough that you can easily drive through them.
- Can control with Fire.

- **30-70% Cover**

- Trees are scattered enough that you can still drive through them, but you will need to alter your course frequently.
- Can control with clippers/dozer.

- **>70% Cover**

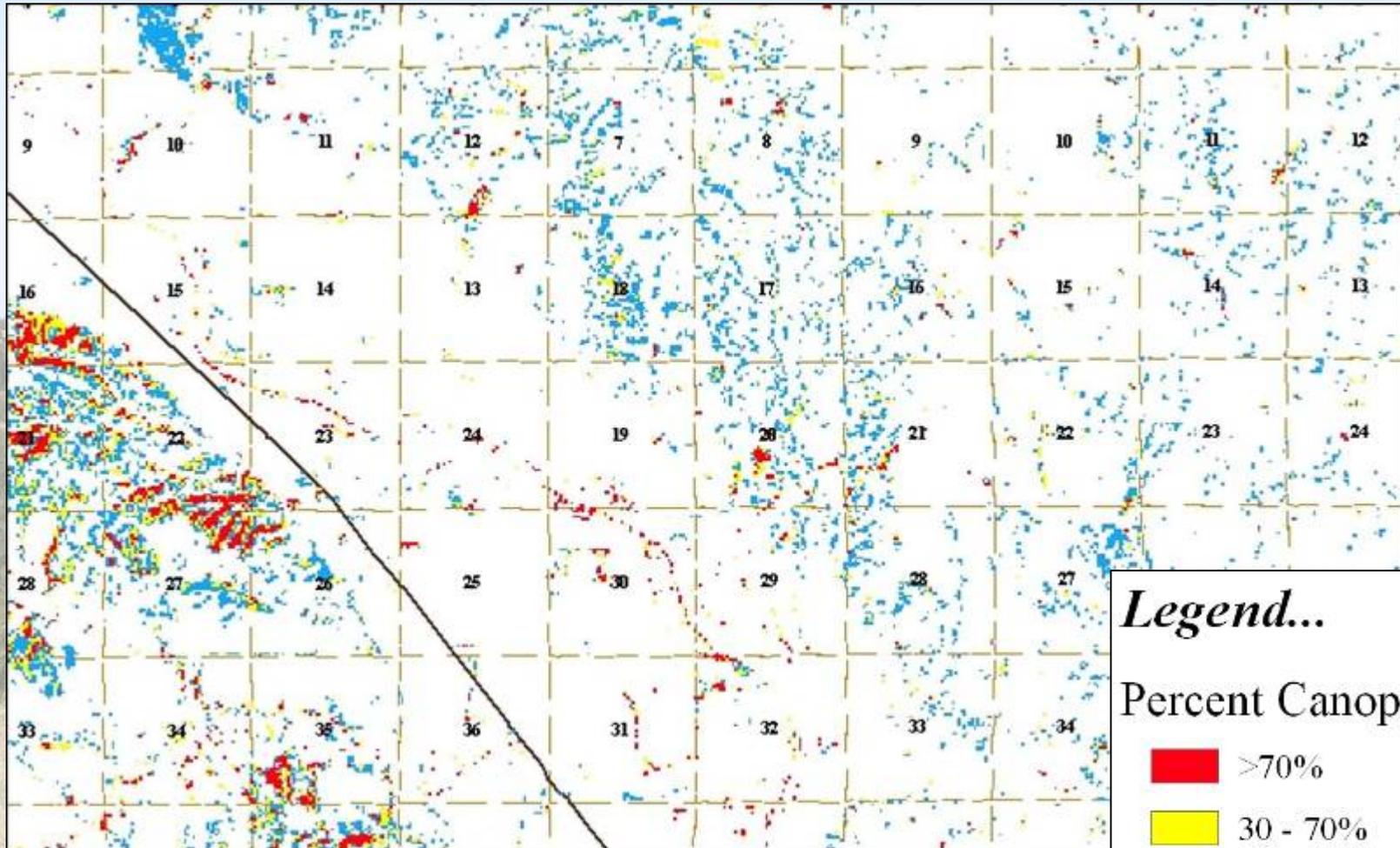
- Trees are so thick that you cannot drive through them.
- Can control with dozer.

# Satellite Imagery...

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# Canopy Cover Map...



## *Legend...*

### Percent Canopy Cover

	>70%	3,898 ac.
	30 - 70%	5,127 ac.
	10 - 30%	18,882 ac.

# GIS/RS Approach #2:

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Aerial Photo Interpretation (local/detailed approach)

## Color IR Aerial Photography

- 1-meter resolution
- 2006 (July – August)
- 3 Spectral Bands

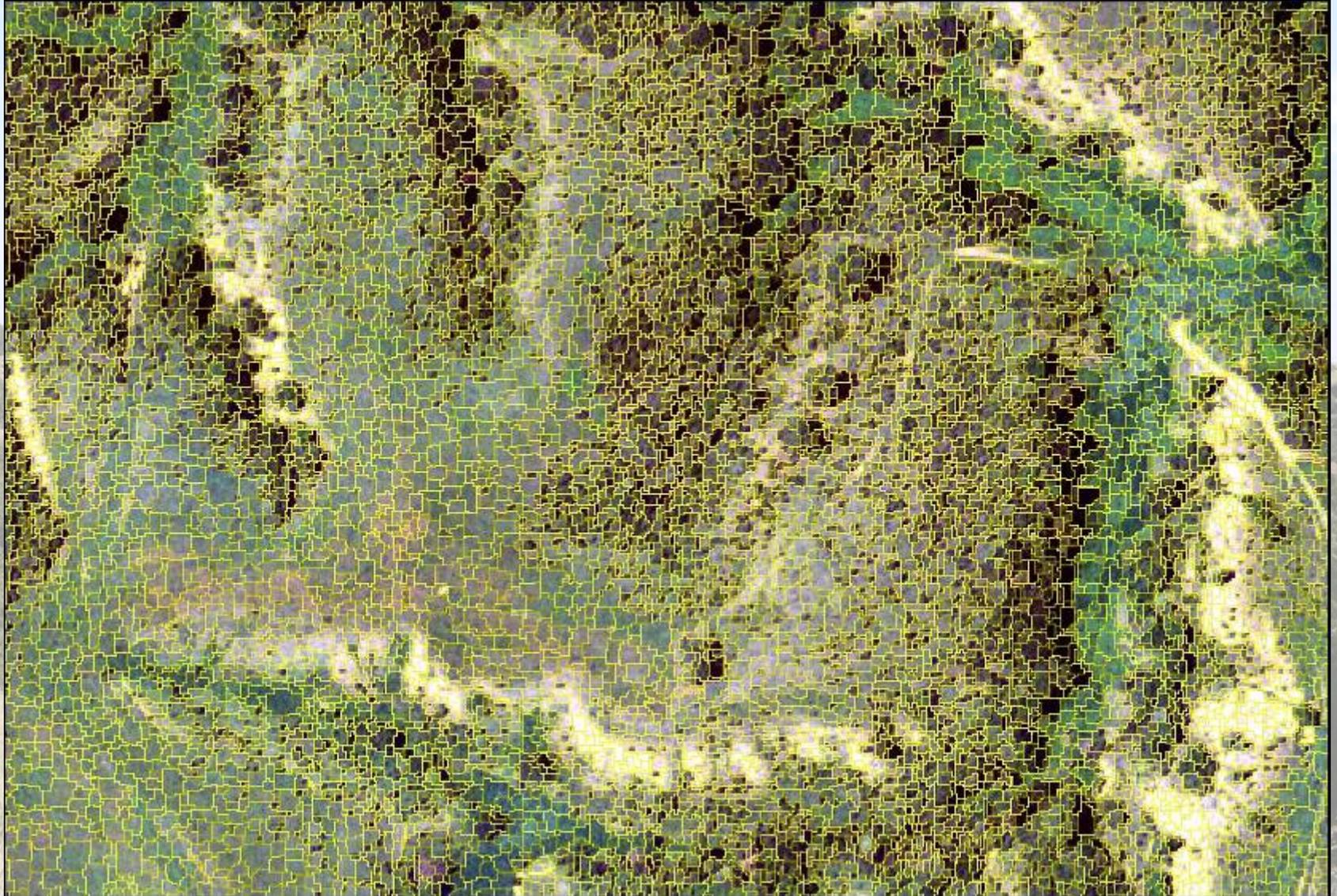
# Color IR Aerial Photo...

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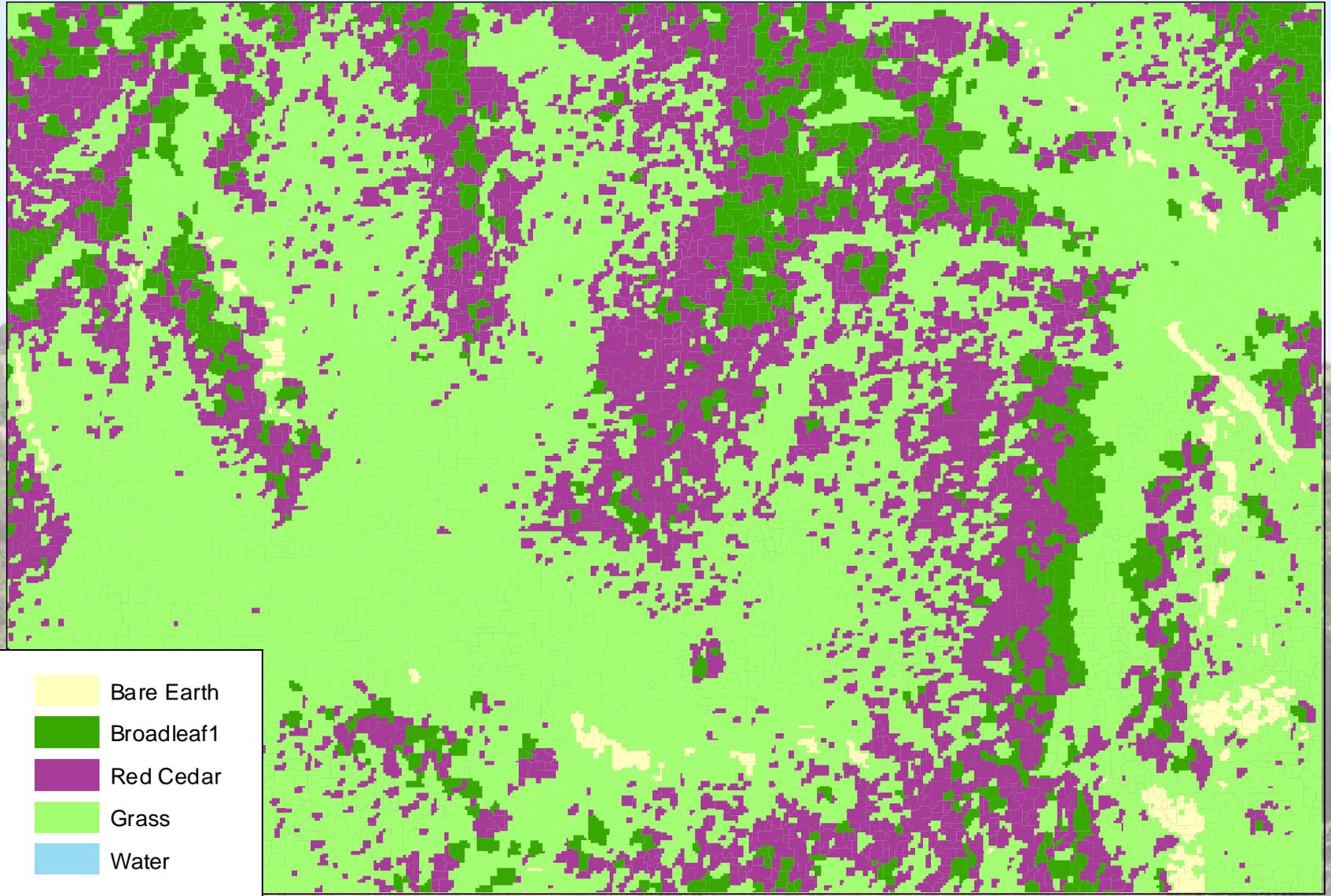
Run through shape/texture classifier...

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# Use Shape and Reflectance to Classify...

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# Comparison:

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Satellite vs. Aerial Images

# Apples and Oranges?...

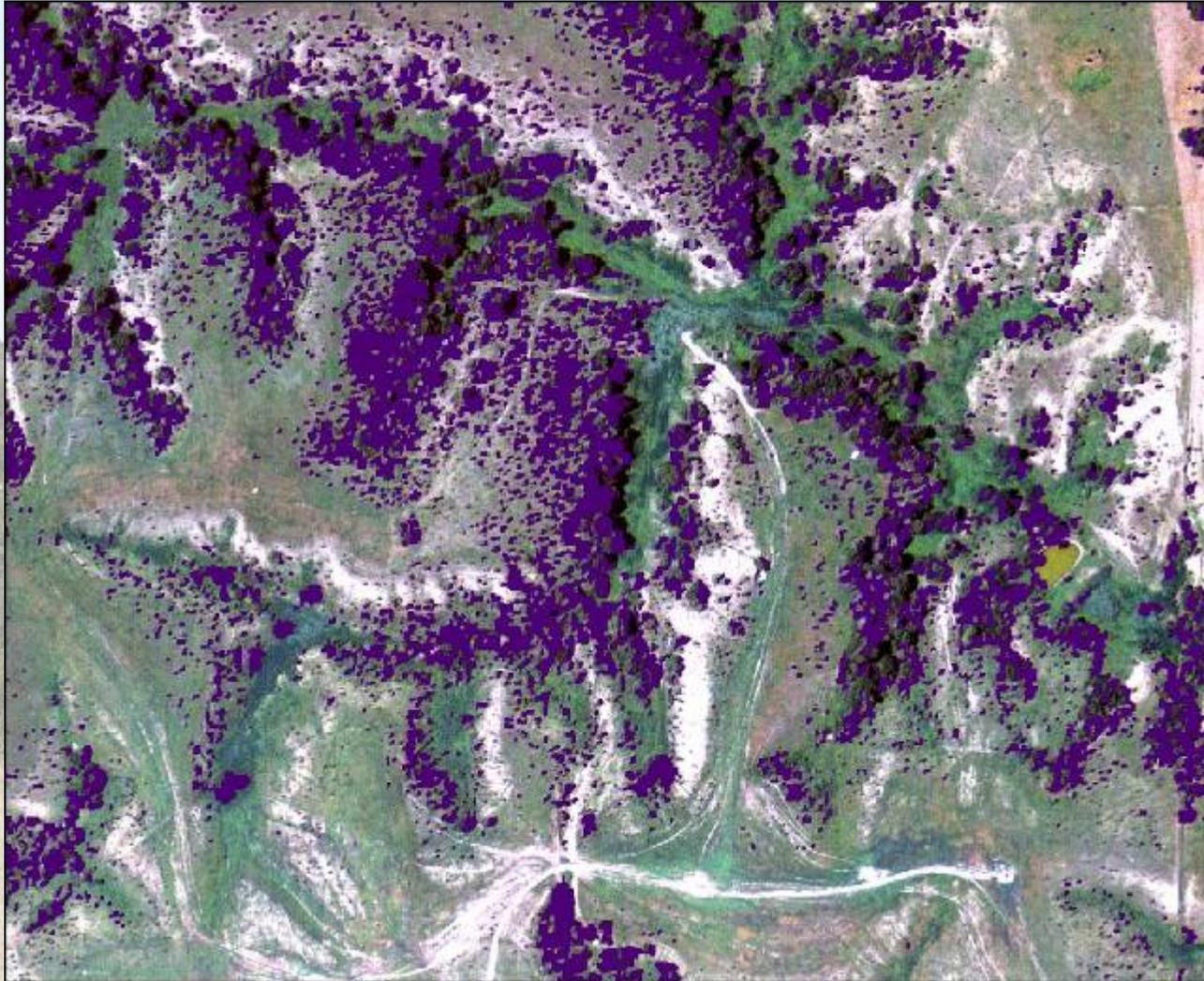


## Satellite

- Interpretation results represent percentages of canopy coverage.
  - 10.45 Ac (70-100%)
  - 23.57 Ac (30-70%)
  - 31.14 Ac (5-30%)
- Less detail.
- More error – More clean-up.
- From statewide perspective, this type of analysis may take less time (work in county-wide chunks).

# Apples and Oranges?...

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## Aerial Photo

- Interpretation results represent actual canopy cover (25.32 Acres of Red Cedar cover in this image).
- More detail – Less clean-up.
- Error significantly lower.
- From statewide perspective, this type of analysis may take more time (need to work in smaller chunks).

# Discussion Points:

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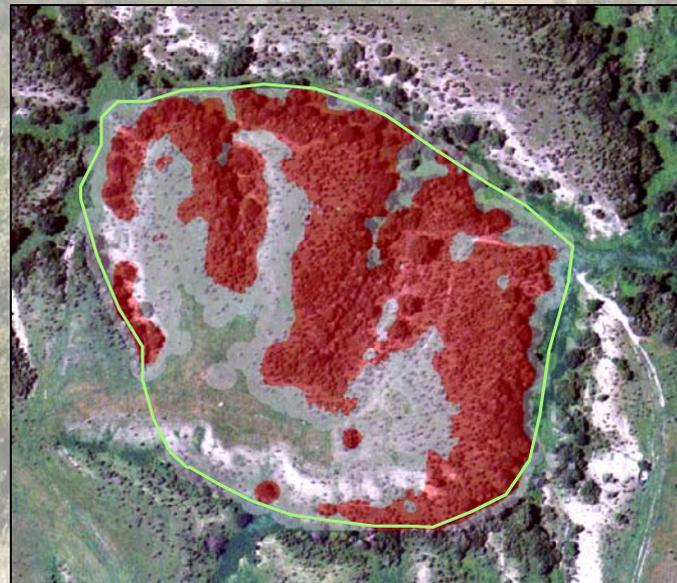


# Choosing between payment levels...



## Options:

- *Slope* – use slope to determine difference in payment options. Figure uses a 60% slope line to determine payment.
- *Payment* –  
2.62 ac. at \$50/ac. – \$131  
5.50 ac. at \$200/ac. – \$1100



## Other Options:

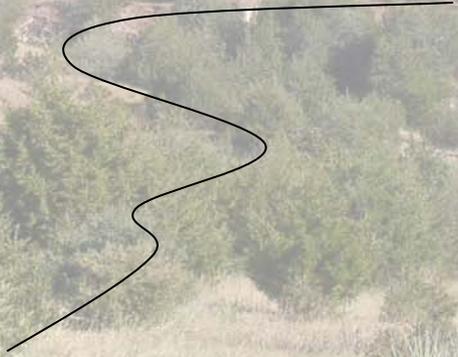
- *Density* – use canopy density statistics to determine difference in payment levels.
- *Combination* – put a model together that attempts to use both slope and density.
- *More?*

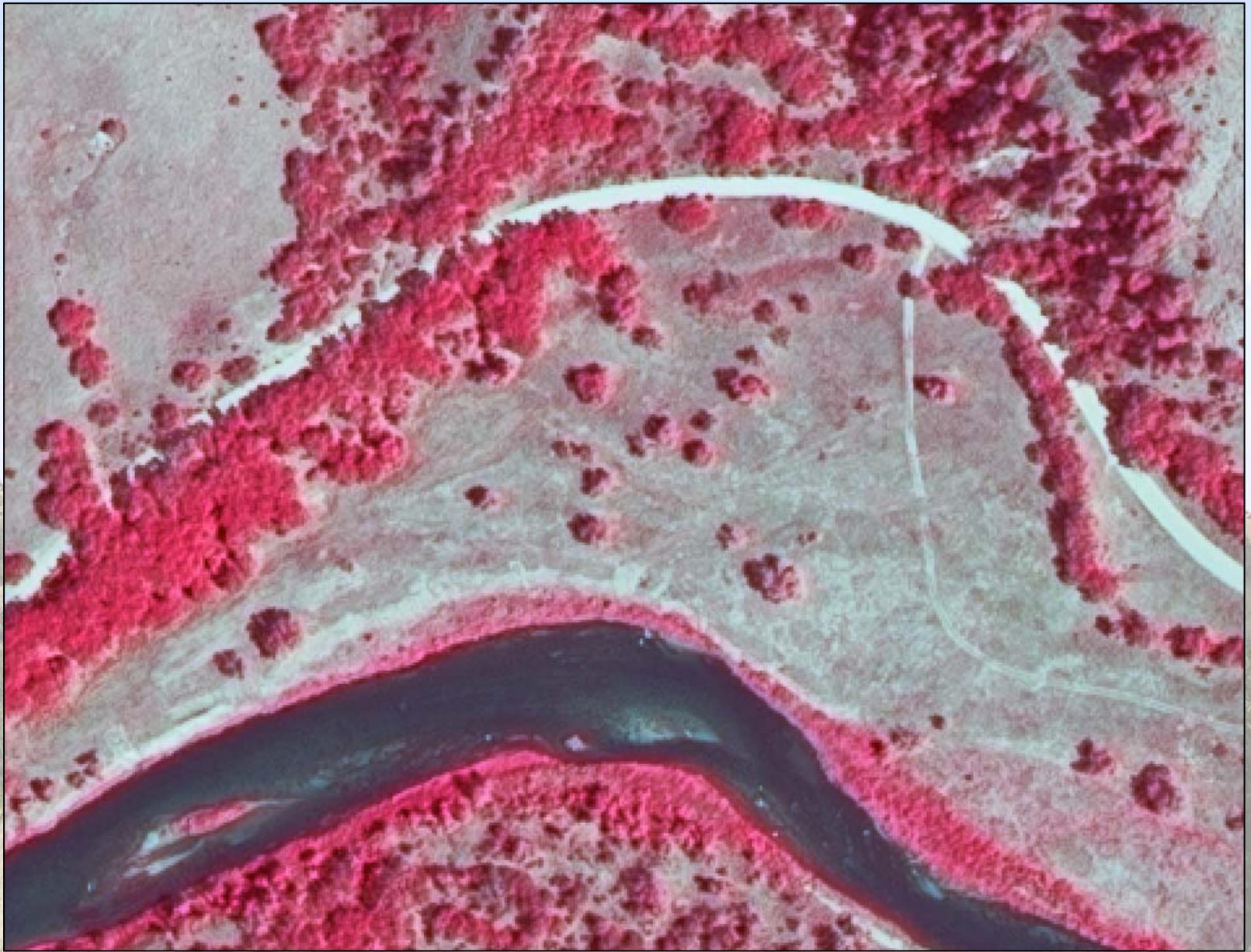
# The End...

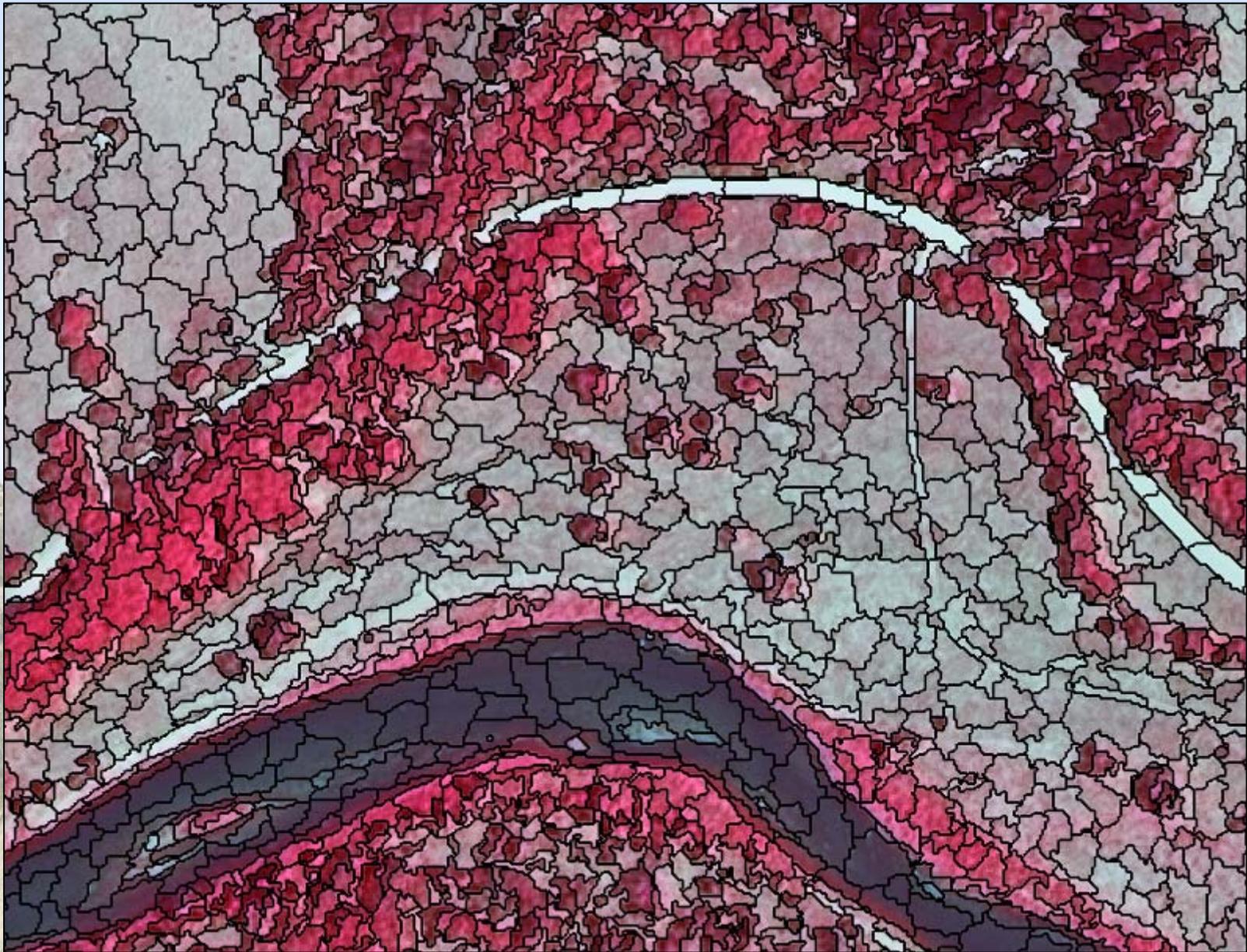
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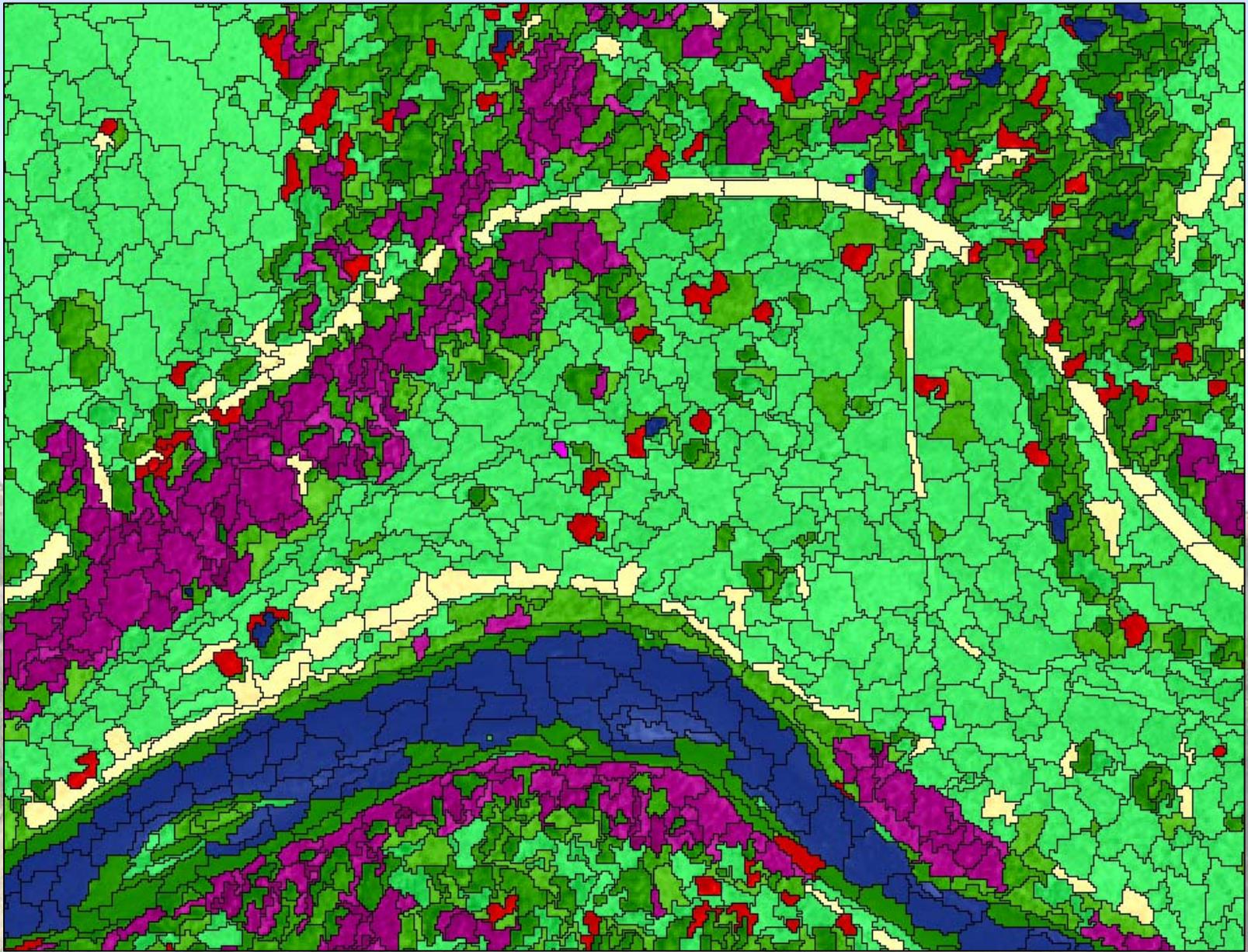
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Questions? – Comments









*Land Cover...*

 Agricultural Land  Deciduous Forest  Pine Forest  Cedar Forest  Built-up (urban)  Grass  Barren (no cover)  Water