The King Farm:
A Case Study in the Effect of Agricultural Legacies on Forest Change Dynamics

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Non-equilibrium Dynamics: What causes forests to change?

- Deer Overabundance
- Drought (Climate Change)
- Fire Suppression
- Timber Harvest
- Invasive pathogens
- Agricultural Land Use

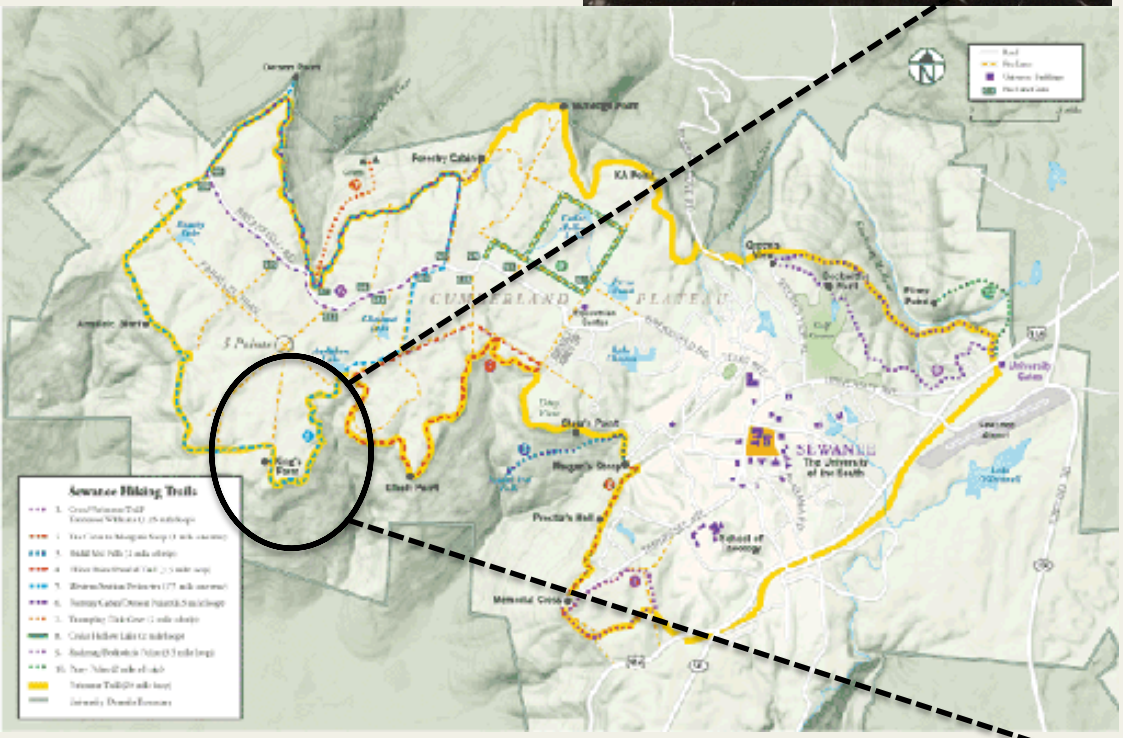
Agricultural Abandonment

- Forest lands regenerating from previous agricultural sites represent as much as 80% of a landscape in some areas such as New England (Flinn and Vellend 2005).

- Concept of a “natural” landscape is slowly disappearing due to omnipresent anthropogenic influence (Christensen 1989).

- **Agricultural Legacies**: Lasting effects on the ecological community and the regeneration capacity of a forest due to alterations made to a landscape during an agricultural regime.

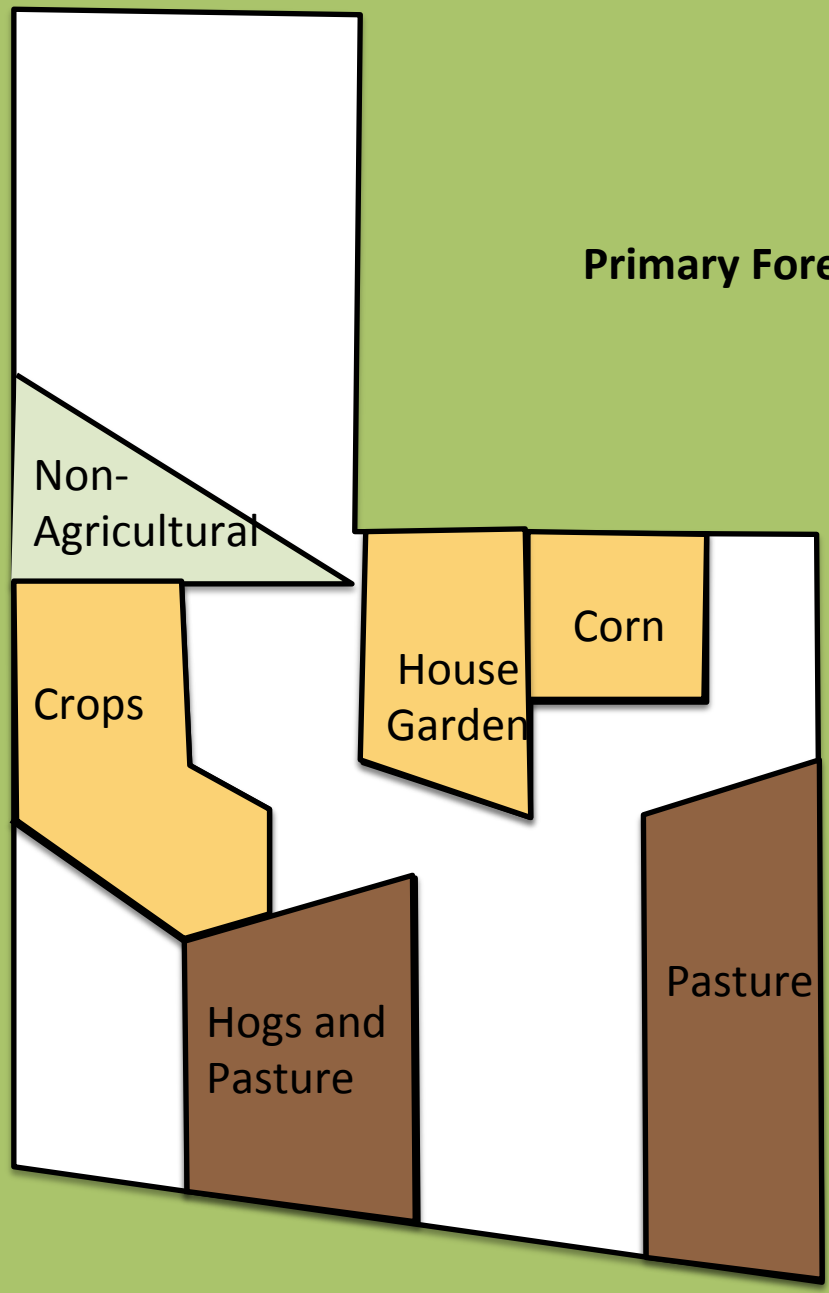
Study Site: The King Farm



Time Line:

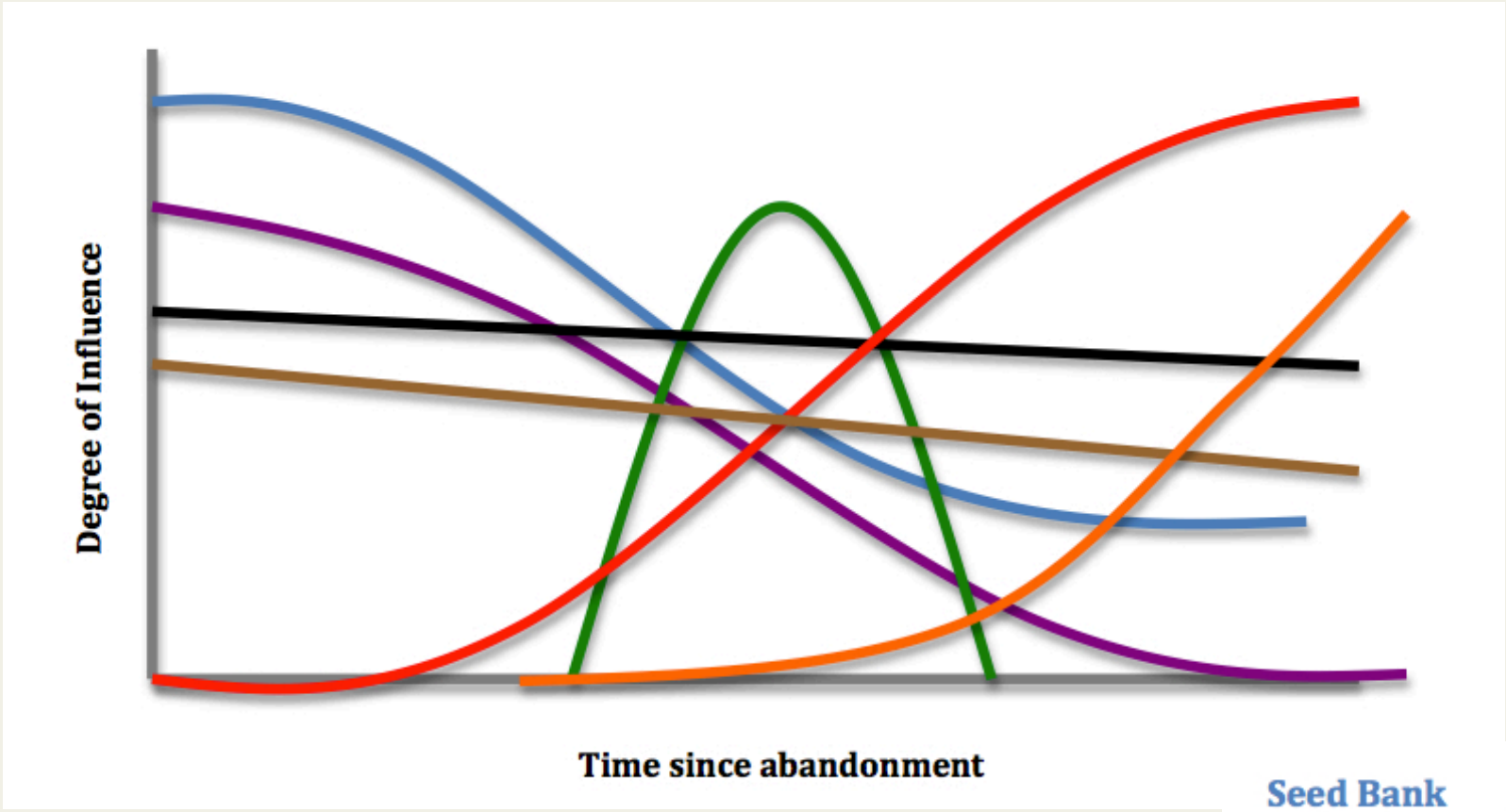
- 1825: Evidence of a “plantation” on the land
- 1901: Land is sold and part is dedicated to raising hogs
- 1915: Hog farming continues; land is cleared for other agriculture
- 1930s - 1946: Isaac King
  - continues farming and hogs
  - pasture, row crops, a house site, and family garden
- 1946: Family abandons farm
- 1960-62: Charles Cheston plants pine
- 1980s: Southern Pine Bark Beetle outbreak

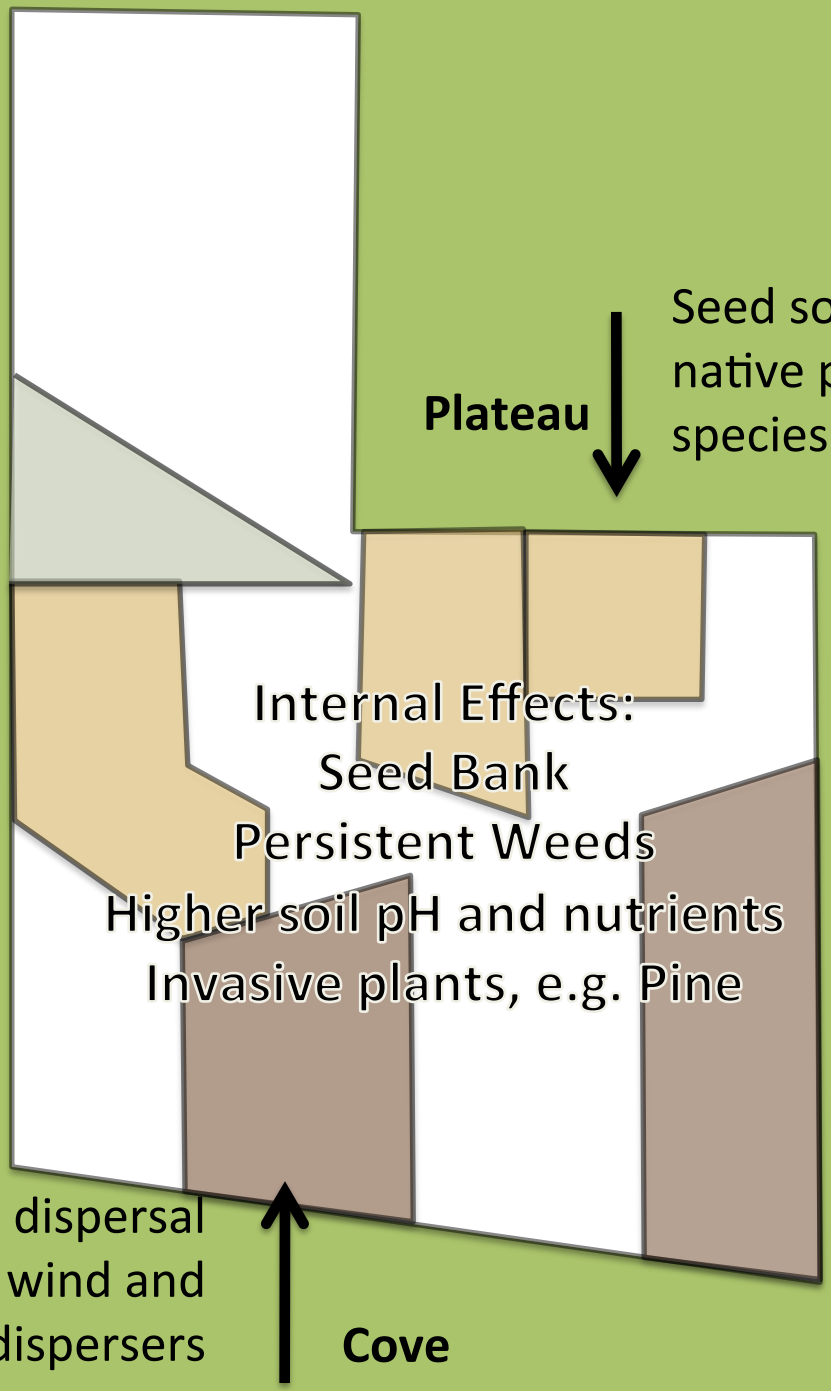
Primary Forest



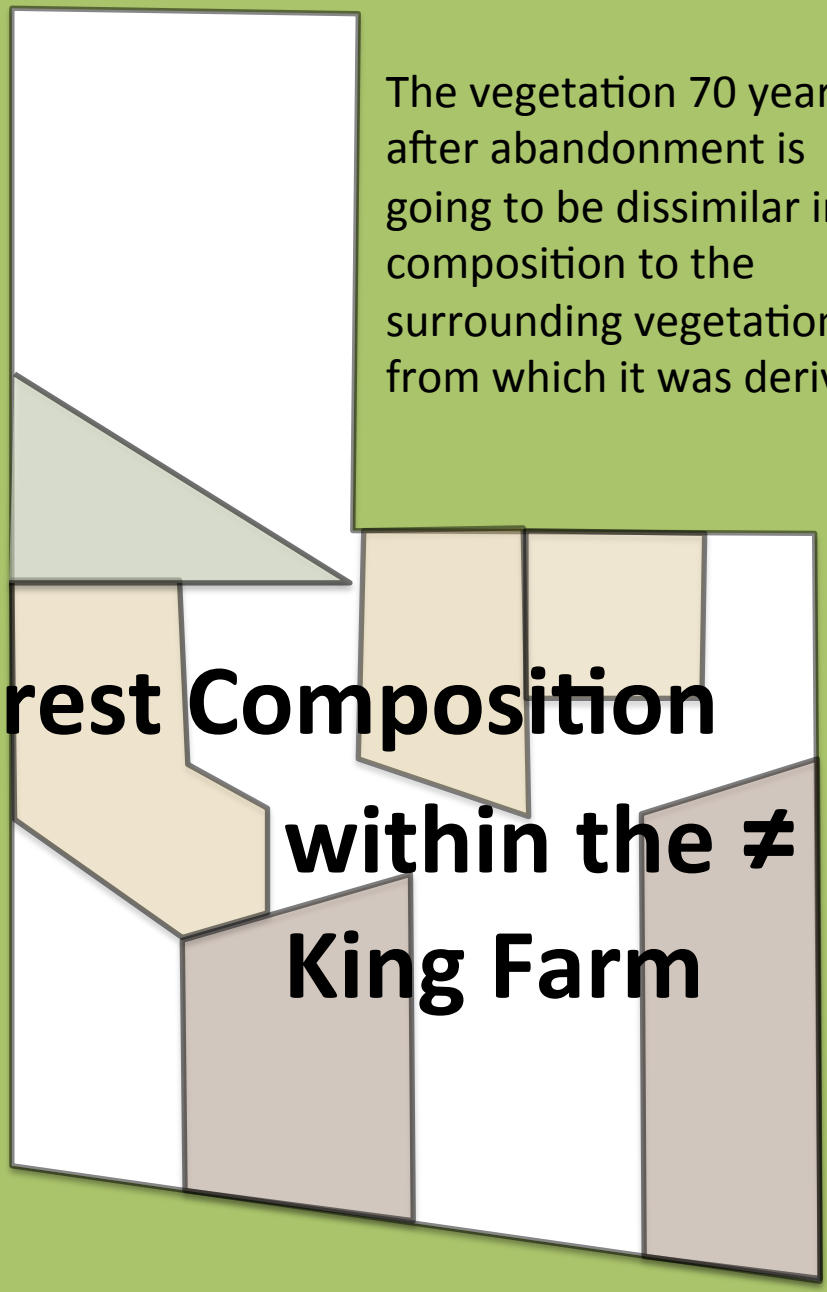
Primary Forest

Factors affecting regeneration




Plateau
Seed source from native plateau species
Forest-wide Effects:
White-tailed deer
Climate
Internal Effects:
Seed Bank
Persistent Weeds
Higher soil pH and nutrients
Invasive plants, e.g. Pine
Long distance dispersal from cove via wind and animal dispersers
Cove

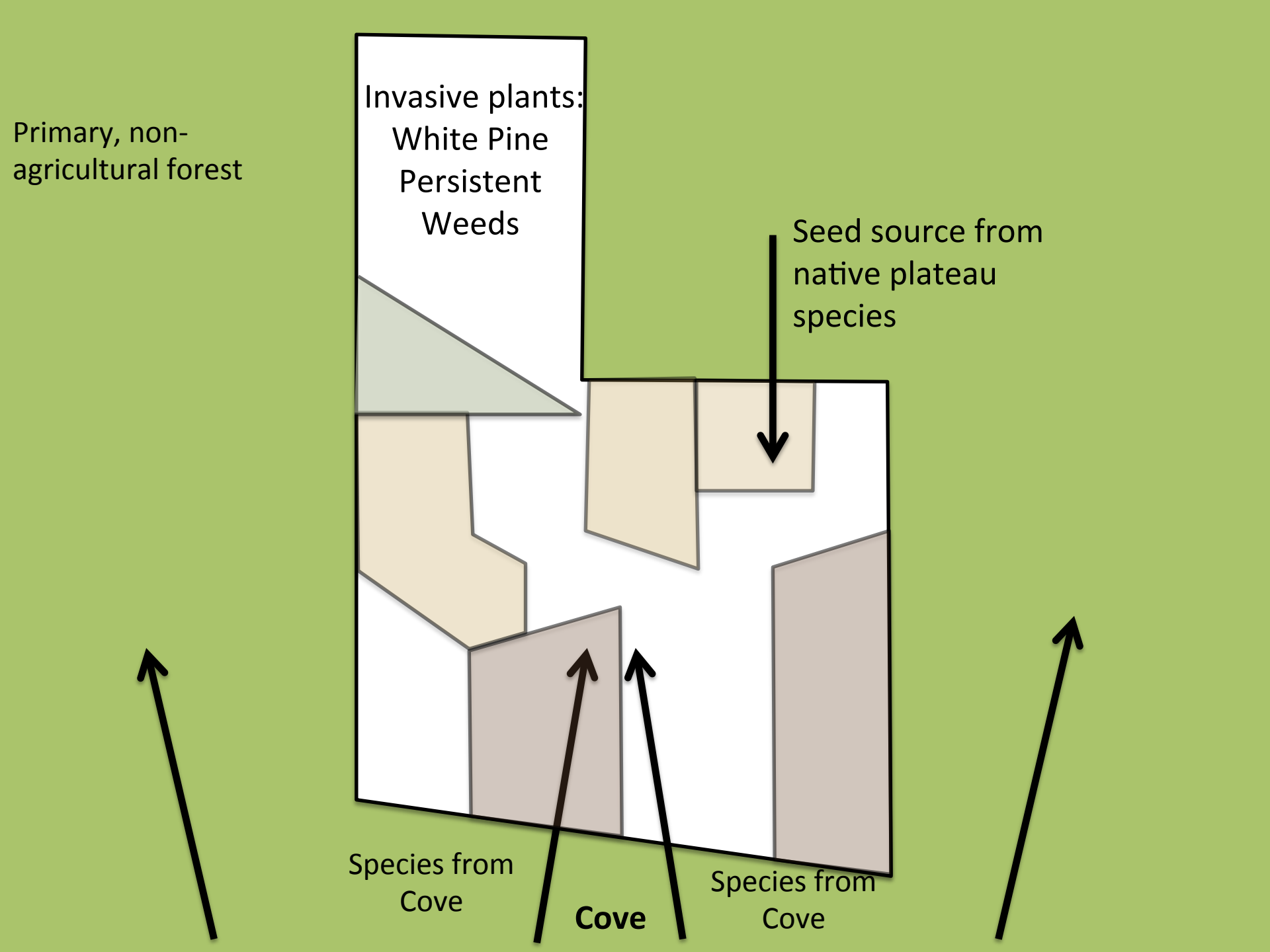
Hypothesis:

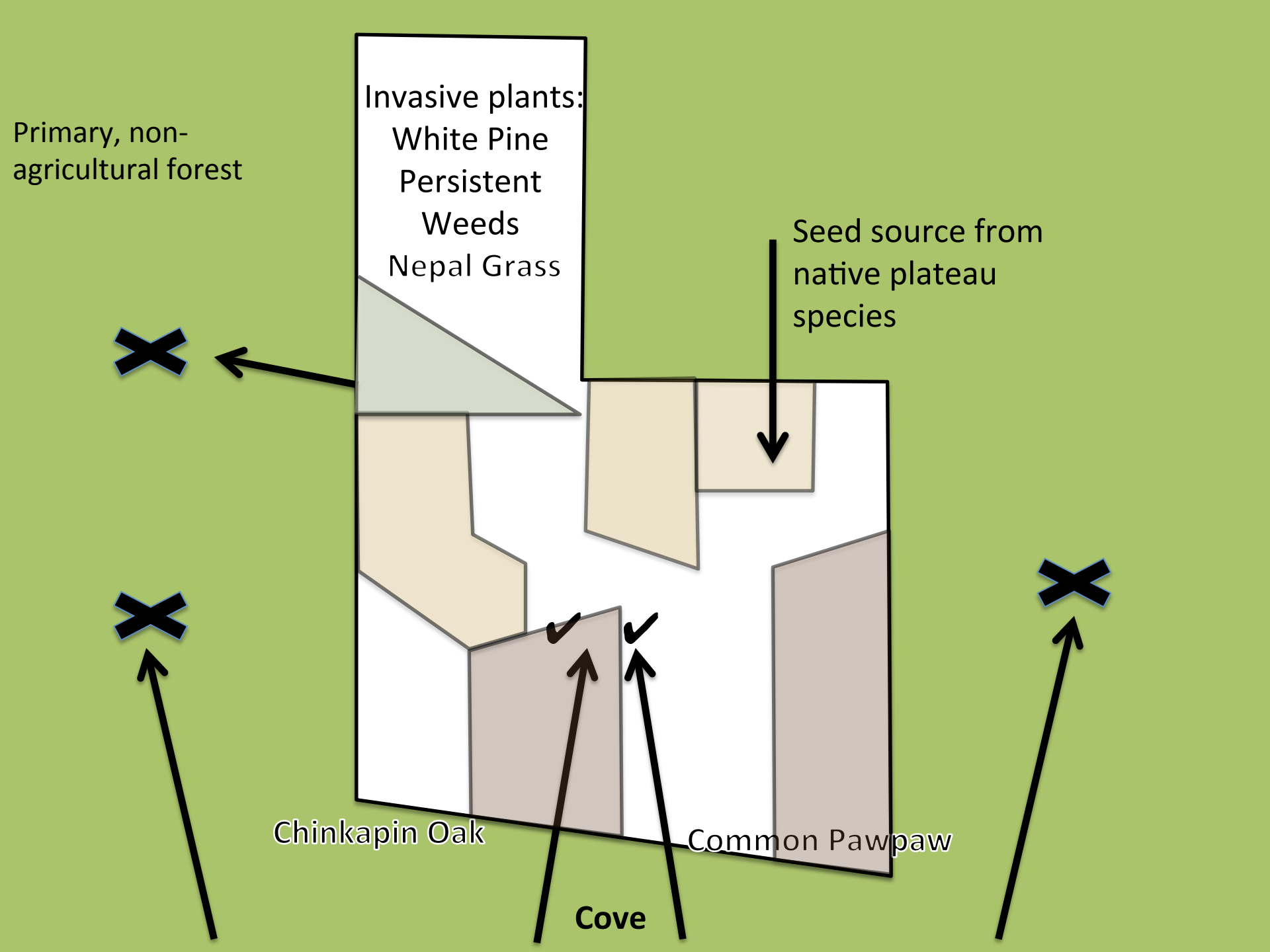


The vegetation 70 years after abandonment is going to be dissimilar in composition to the surrounding vegetation from which it was derived.

Forest Composition within the ≠ King Farm

Native Plateau Forest


Primary, non-agricultural forest
Invasive plants: White Pine Persistent Weeds
Seed source from native plateau species
Species from Cove
Cove
Species from Cove


Primary, non-agricultural forest
Invasive plants:
White Pine
Persistent
Weeds
Nepal Grass
Seed source from native plateau species
Chinkapin Oak
Common Pawpaw
Cove

Primary, non-agricultural forest

Invasive plants:
White Pine
Persistent
Weeds:

Seed source from native plateau species

Cove

Primary, non-agricultural forest

Invasive plants:
White Pine
Persistent
Weeds:

Seed source from native plateau species

Cove

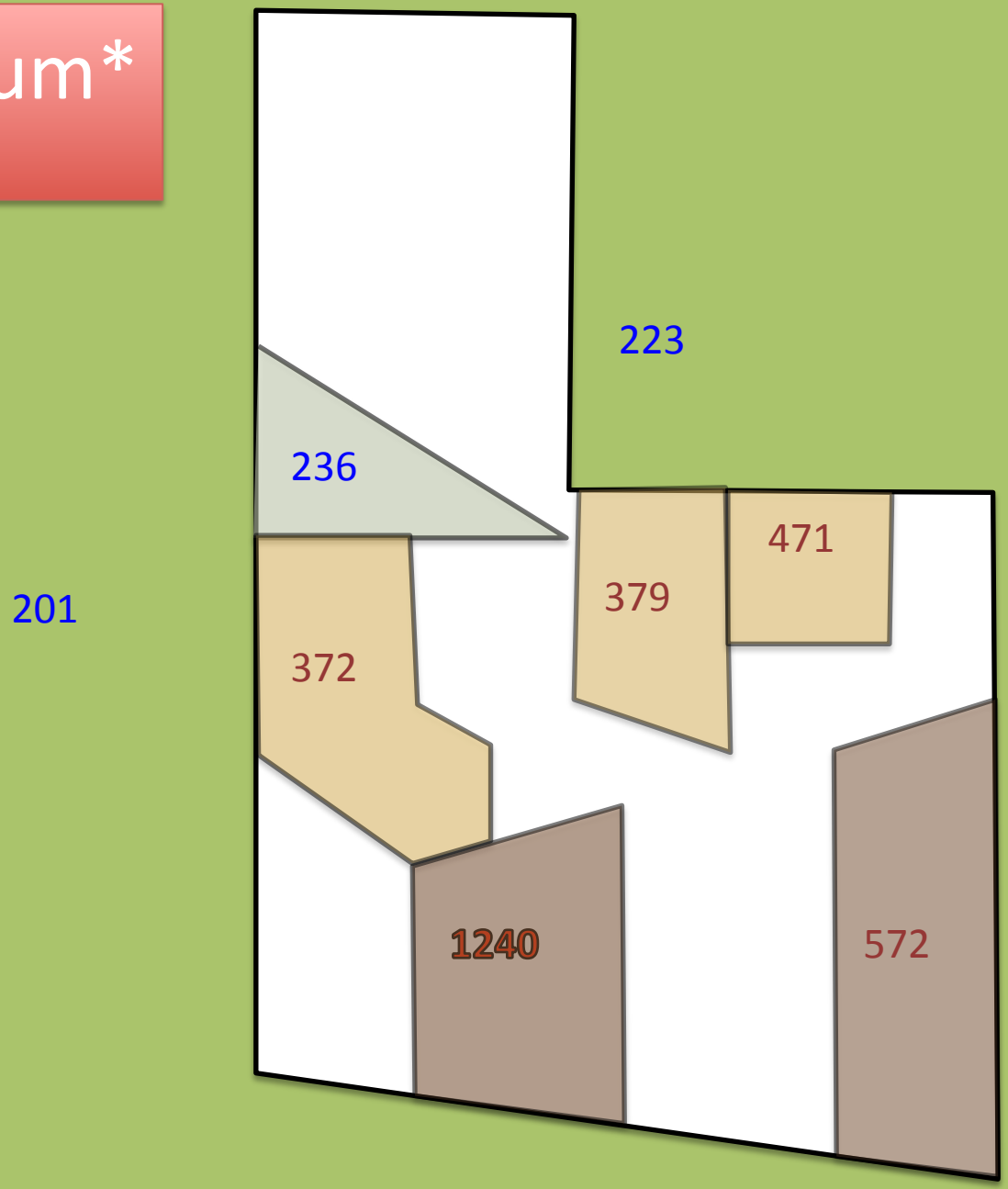
Overstory Similarity matrix

	Forest 1	Forest 2	NoAg 3a	Agr 13b	Agr 14a	Agr 4a	Agr 6a	Agr 11a
Forest 1	1							
Forest 2	**0.543**	1						
NoAg 3a	**0.569**	0.719	1					
Agr 13b	**0.118**	0.082	0.119	1				
Agr 14a	**0.103**	0.422	0.433	0.133	1			
Agr 4a	**0.147**	0.412	0.546	0.172	**0.855**	1		
Agr 6a	**0.137**	0.424	0.451	0.132	**0.774**	**0.784**	1	
Agr 11a	**0.111**	0.404	0.445	0.186	**0.892**	**0.872**	**0.779**	1
	Forest 1	Forest 2	NoAg 3a	Agr 13b	Agr 14a	Agr 4a	Agr 6a	Agr 11a

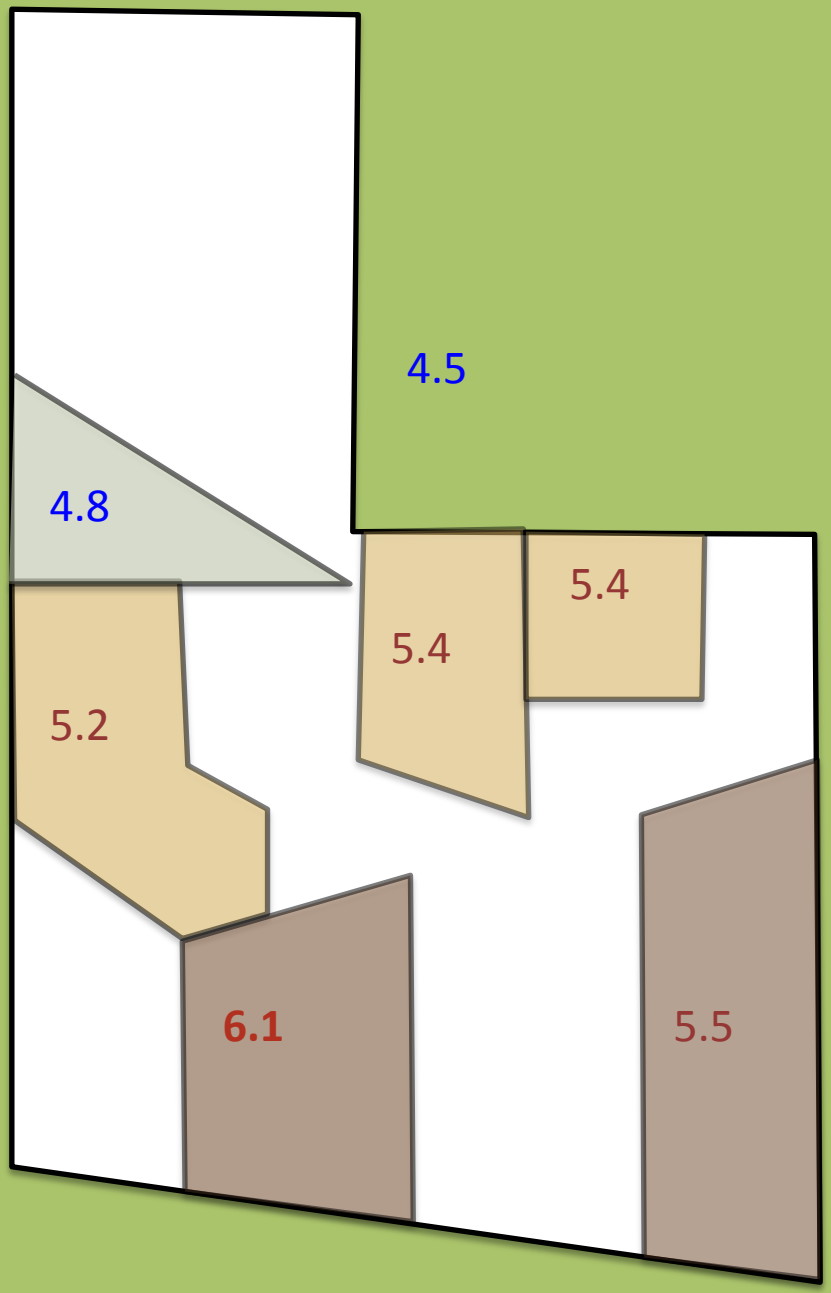
Understory Similarity matrix

	Forest 1	Forest 2	NoAg 3a	Agr 13b	Agr 14a	Agr 4a	Agr 6a	Agr 11a
Forest 1	1							
Forest 2	**0.261**	1						
NoAg 3a	**0.953**	0.213	1					
Agr 13b	**0.851**	0.416	0.867	1				
Agr 14a	0.09	**0.75**	0.086	0.448	1			
Agr 4a	0.093	0.547	0.083	0.299	**0.625**	1		
Agr 6a	0.055	0.345	0.052	0.227	**0.461**	**0.266**	1	
Agr 11a	0.055	0.284	0.044	0.312	**0.566**	**0.293**	0.569	1
	Forest 1	Forest 2	NoAg 3a	Agr 13b	Agr 14a	Agr 4a	Agr 6a	Agr 11a

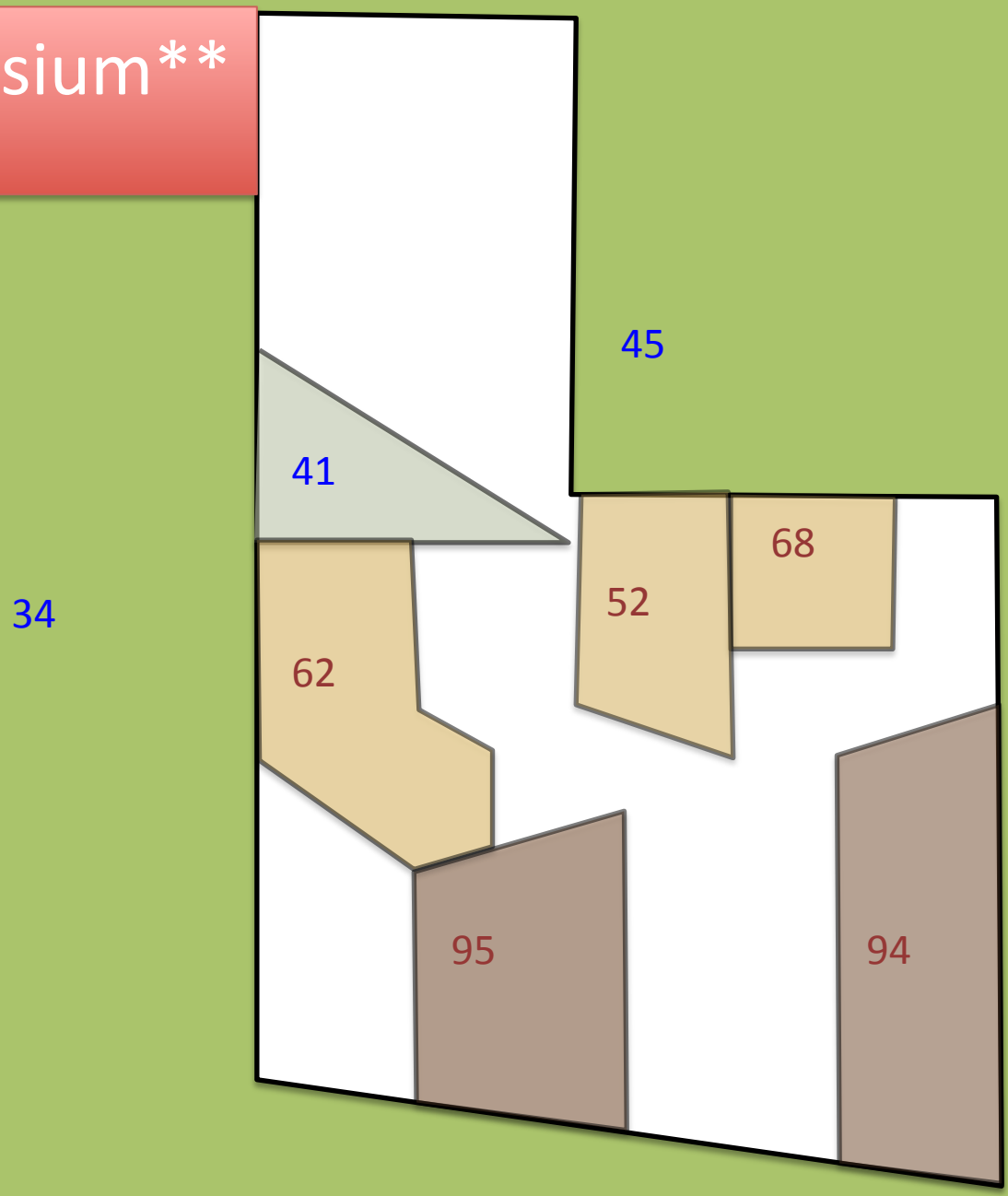
Calcium*
(ppm)

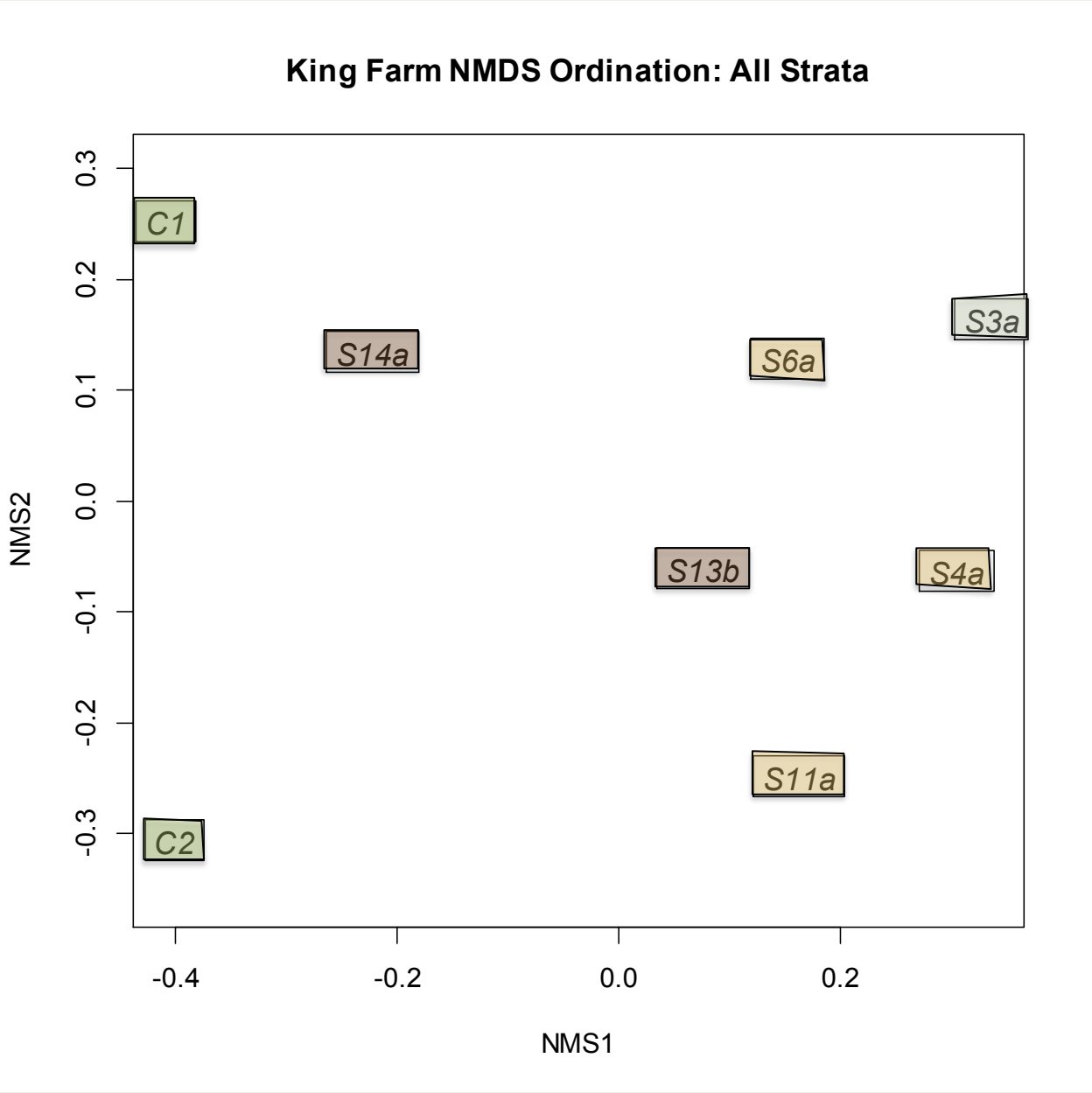


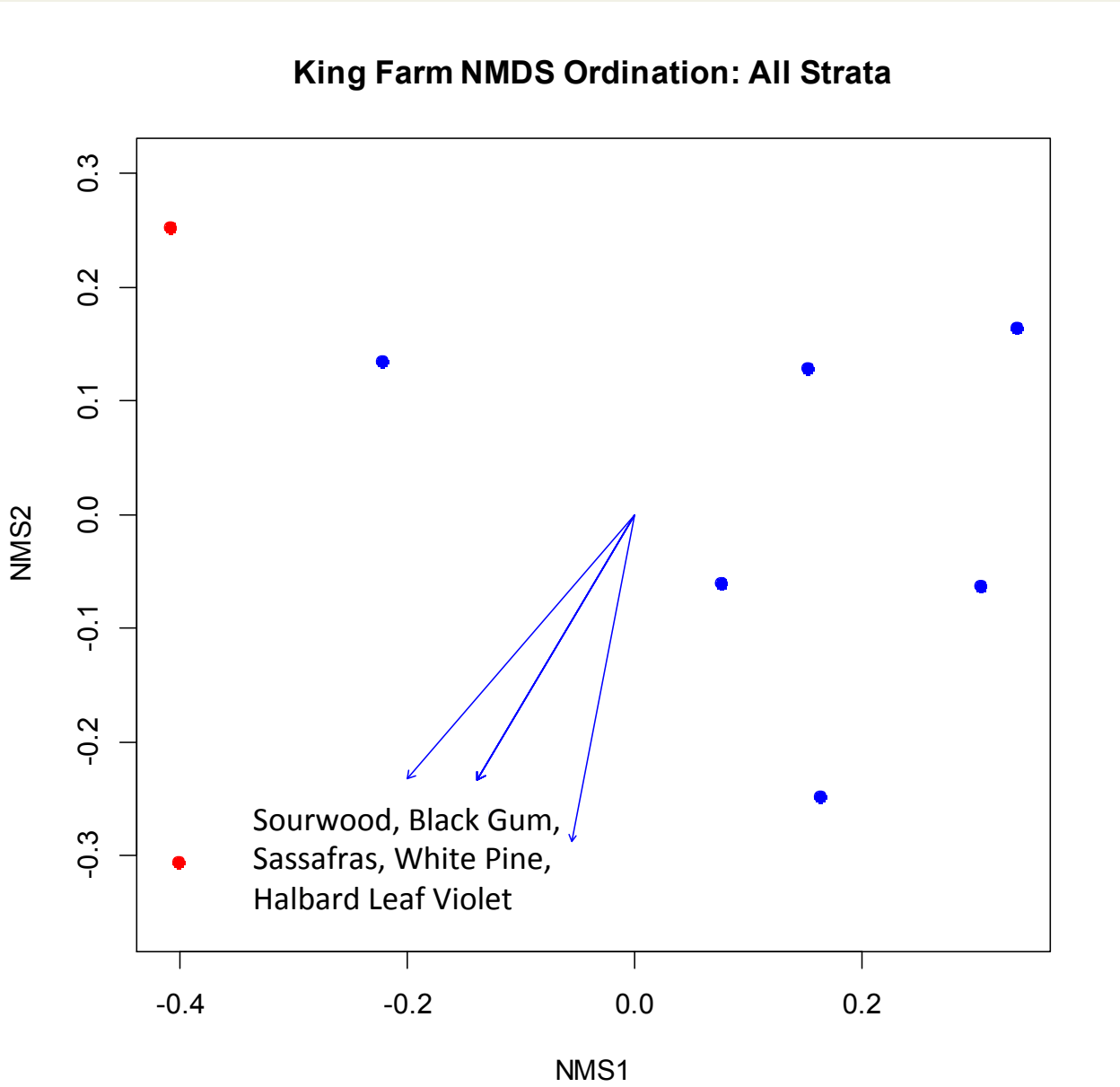
pH**

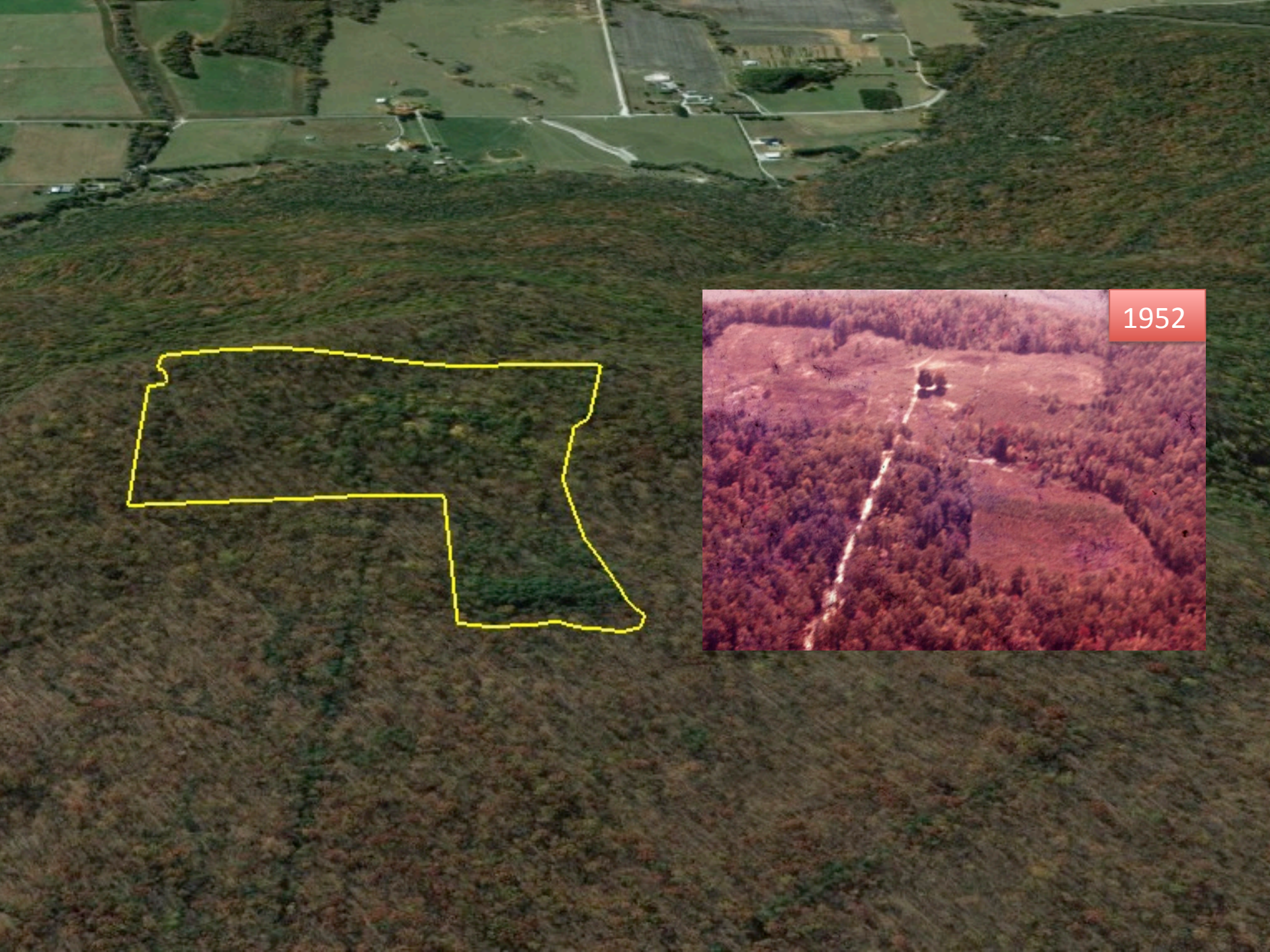


Magnesium**
(ppm)




King Farm NMDS Ordination: All Strata
C1
S14a
S3a
S6a
S13b
S4a
S11a
C2
NMS2
NMS1
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.2
0.0
0.2


King Farm NMDS Ordination: All Strata
NMS2
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.2
0.0
0.2
NMS1
Sourwood, Black Gum,
Sassafras, White Pine,
Halbard Leaf Violet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Therefore:

- Hypothesis is confirmed:
  - Legacies associated with agricultural disturbance are an important determinant of compositional change
  - Play an interacting role with other disturbances

- Future research

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