



Konza Long Term Environmental Research Site: A Characterization of Land Change from 1990-2009

Nicholas Wilson¹, Amintas Brandão Jr.¹, and Robert Gilmore Pontius Jr.²
nwilson@clarku.edu, abrandaojr@gmail.com, and rpontius@clarku.edu

1 International Development, Community, and Environment, 2 Geography Department, Clark University



Introduction

The Konza LTER site is just outside of Manhattan, Kansas. The defining feature of the landscape is the tall grass prairie which is the most productive grasslands in North America. Intermixed with these grasslands is fertile farmland, forests, streams and rivers. The following land cover maps are from three points in time, 1990, 2005 and 2009. The analysis will show how changes in the landscape have occurred through this period.

Methods

Equation For Average Annual Landscape Change (Uniform Line)

$$= \frac{100 \times \text{area of change during all intervals} / \text{area of study region}}{\text{duration of all intervals}}$$

Equation for length of bar for Annual Landscape Change

$$= \frac{100 \times \text{area of change during interval } [Y_t, Y_{t+1}] / \text{area of study region}}{\text{duration of interval } [Y_t, Y_{t+1}]}$$

Equation For Average Annual Category Change (Uniform Line)

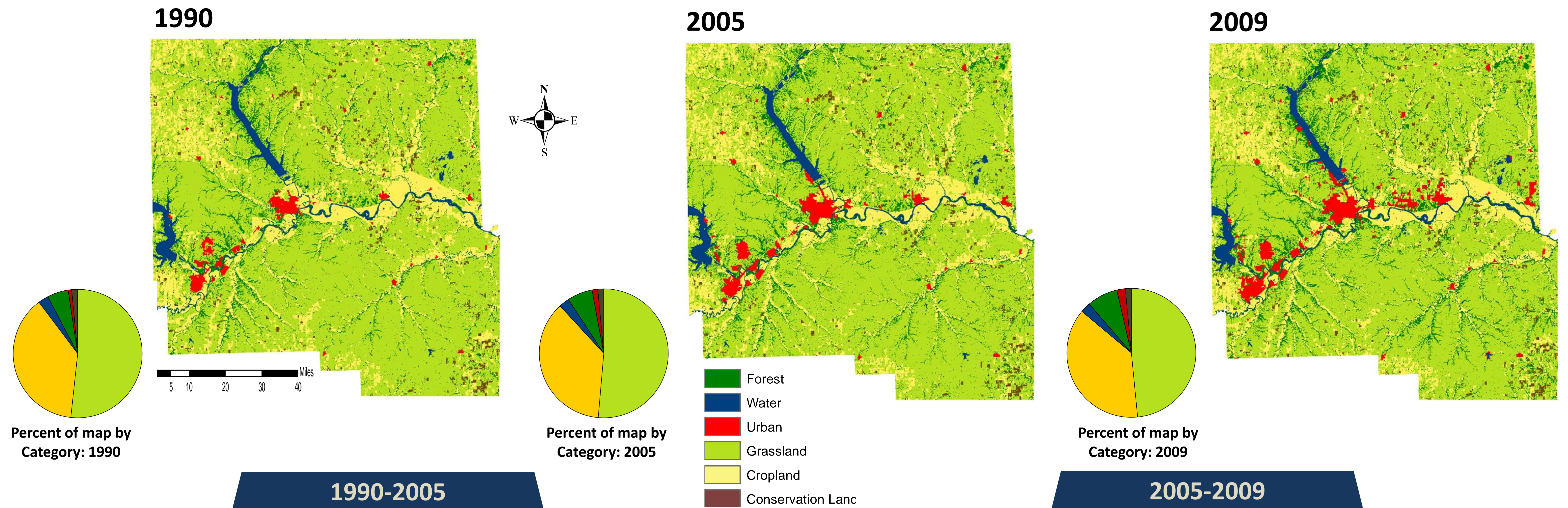
$$= 100 \times \frac{\text{area of change during } [Y_t, Y_{t+1}] / \text{duration of } [Y_t, Y_{t+1}]}{\text{area of study region}}$$

Equation for length of bar in gross category gain

$$= 100 \times \frac{\text{area of gross gain of category } j \text{ during } [Y_t, Y_{t+1}] / \text{duration of } [Y_t, Y_{t+1}]}{\text{area of category } j \text{ at time } Y_{t+1}}$$

Equation for length of bar in gross category loss

$$= 100 \times \frac{\text{area of gross loss of category } i \text{ during } [Y_t, Y_{t+1}] / \text{duration of } [Y_t, Y_{t+1}]}{\text{area of category } i \text{ at time } Y_t}$$

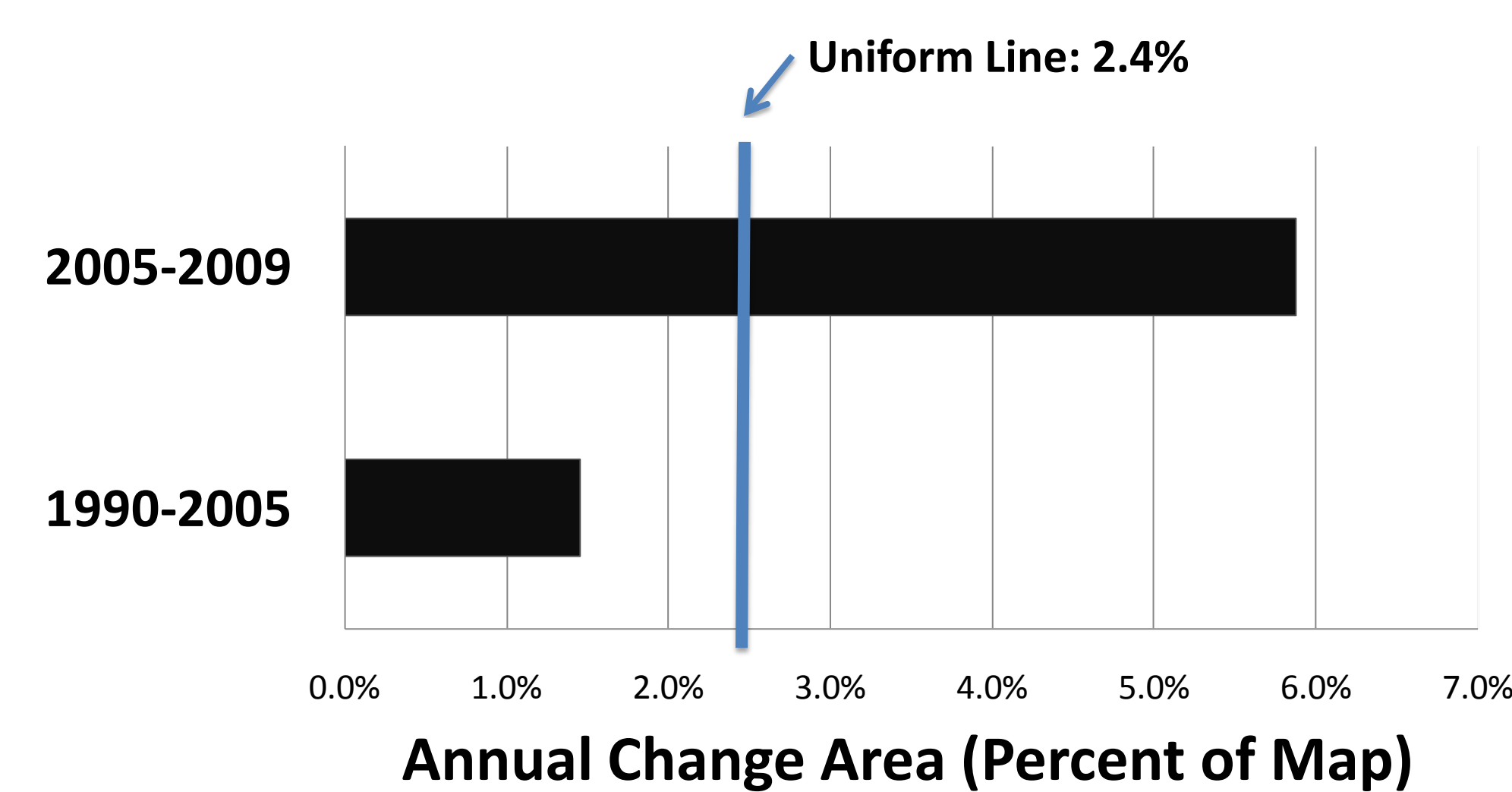


		2005							Total	Loss
		Grassland	Cropland	Forest	Urban	Conservation	Water			
1990	Grassland	46.5	2.2	2.6	0.3			51.7	5.2	
	Cropland	3.4	34.2	0.3	0.2			38.0	3.8	
	Forest	1.4		3.5	0.1			5.3	1.8	
	Urban				0.9			0.9	0.0	
	Conservation					1.5		1.5	0.0	
	Water						2.6	2.6	0.0	
Total		51.4	36.8	6.3	1.4	1.5	2.6	100.0	10.9	
Gain		4.8	2.6	2.9	0.6	0.0	0.0	10.9		

		2009							Total	Loss
		Grassland	Cropland	Forest	Urban	Conservation	Water			
2005	Grassland	44.6	3.3	2.9	0.6			51.4	6.8	
	Cropland	2.1	34.0	0.6				36.8	2.8	
	Forest	1.7	0.4	4.1				6.3	2.2	
	Urban				1.4			1.4	0.0	
	Conservation					1.5		1.5	0.0	
	Water						2.6	2.6	0.0	
Total		48.5	37.7	7.7	2.2	1.5	2.6	100.0	11.7	
Gain		3.8	3.7	3.5	0.8	0.0	0.0	11.8		

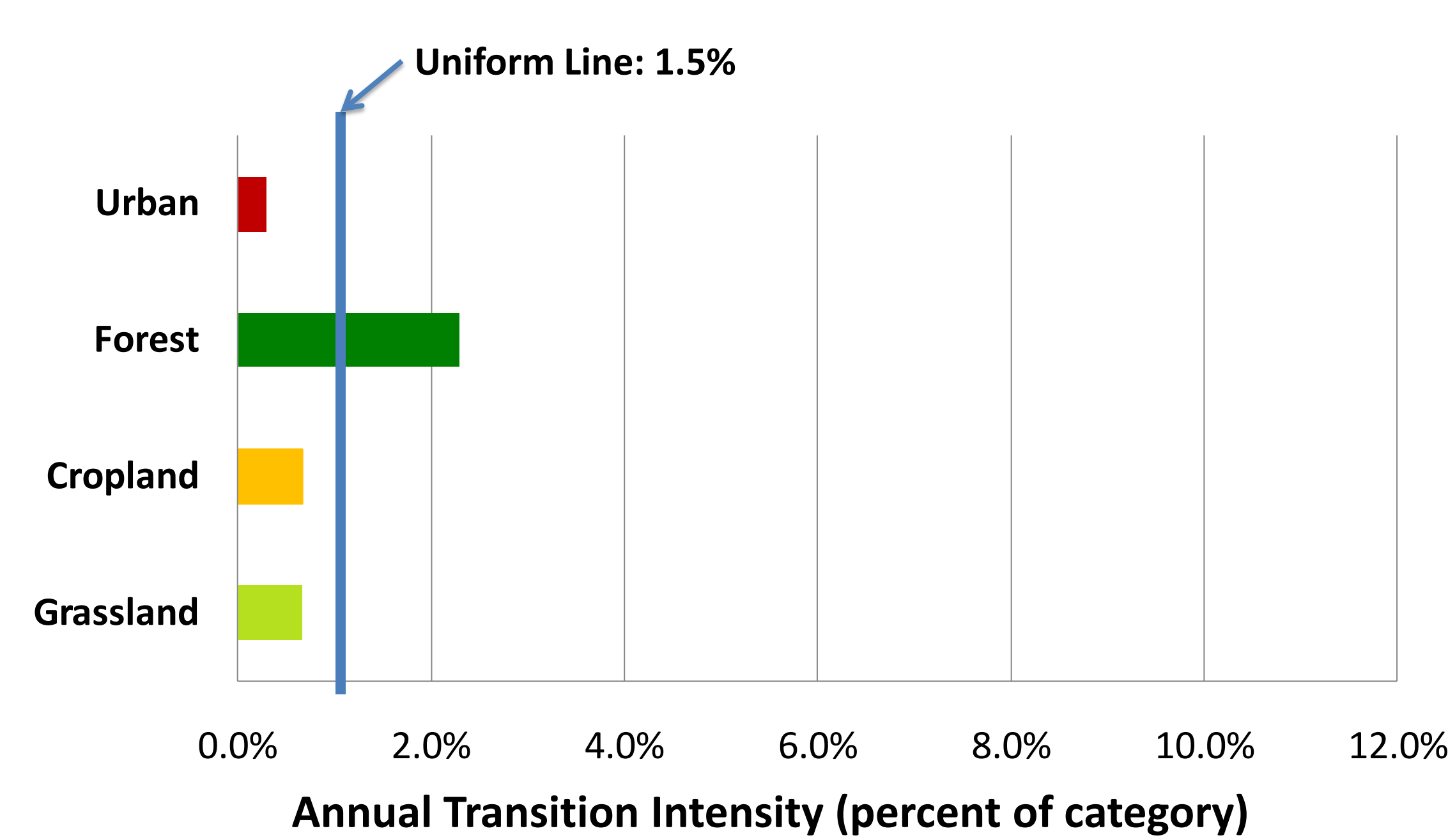
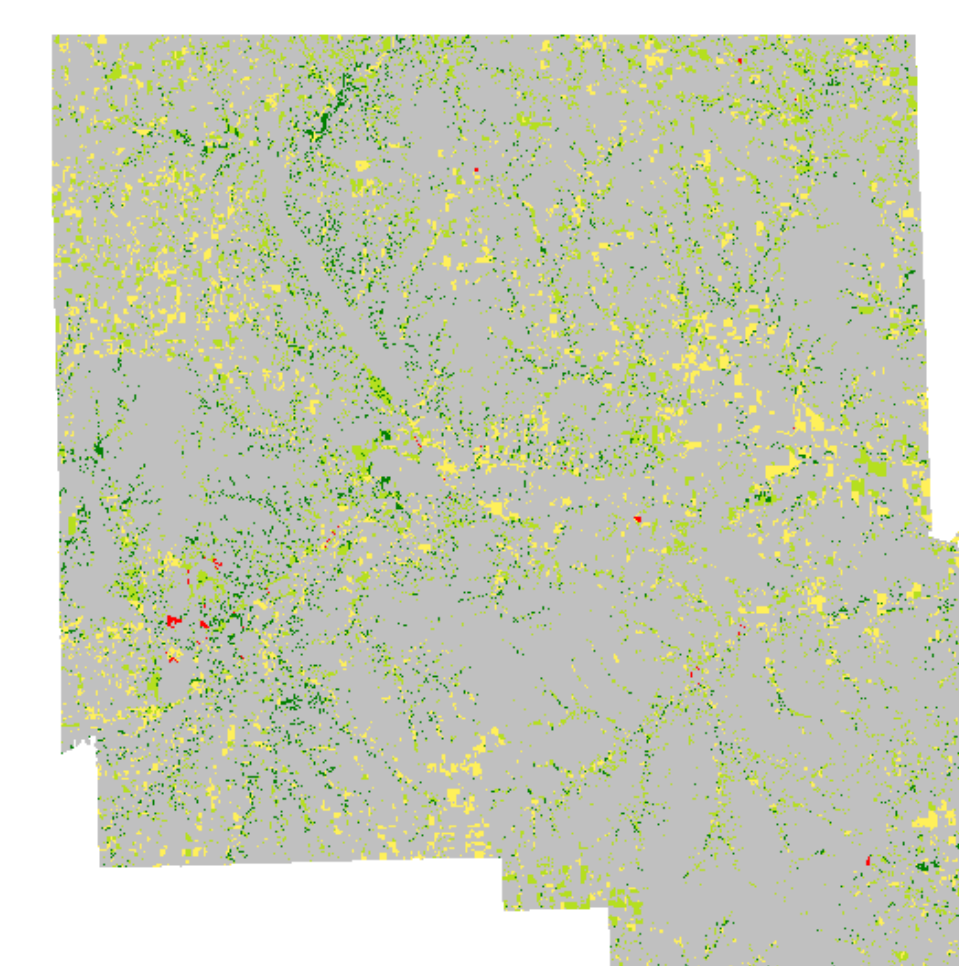
*The number highlighted in red is the largest transition; A blank cell indicates a value of zero

Annual Landscape Change

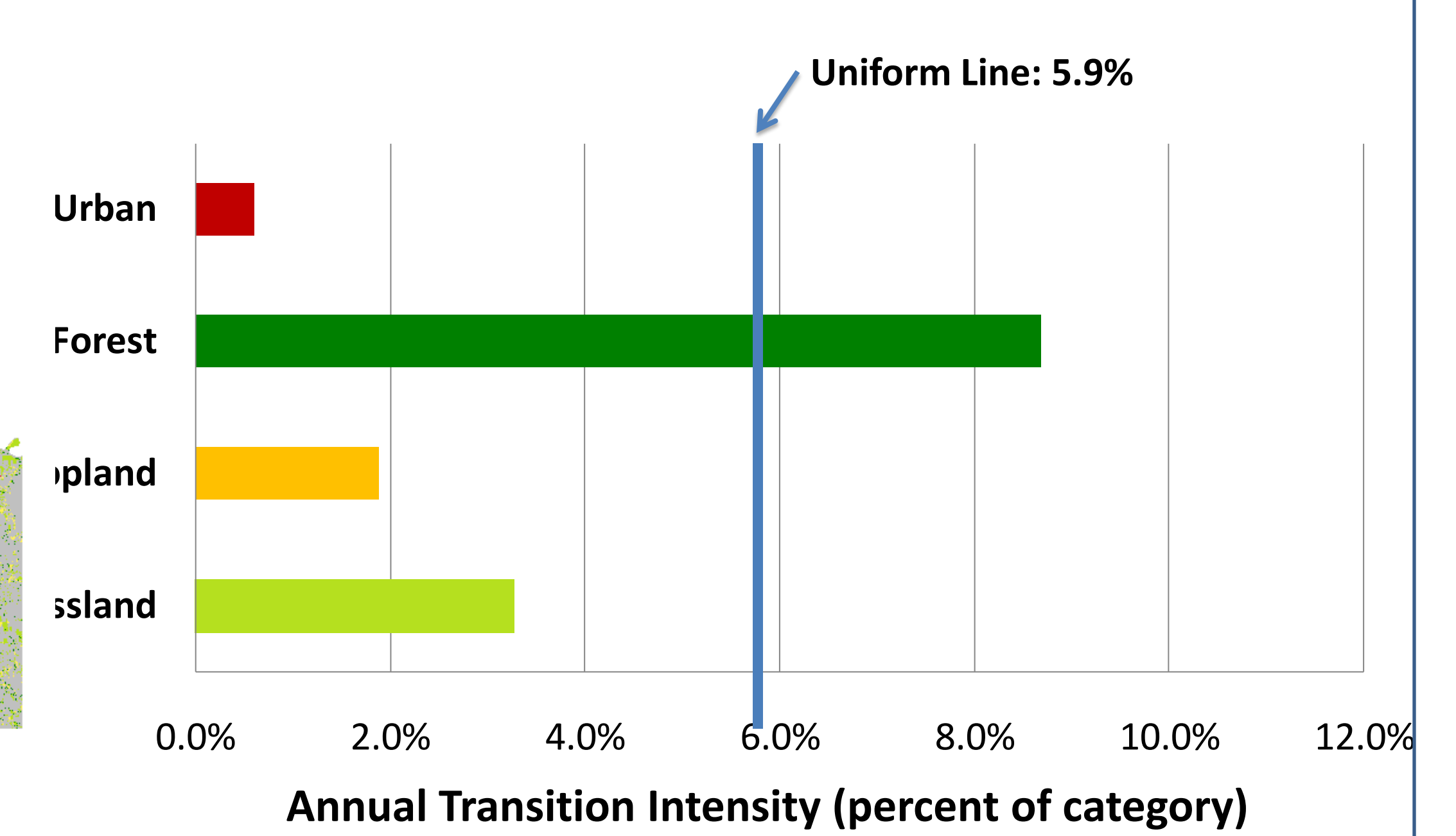
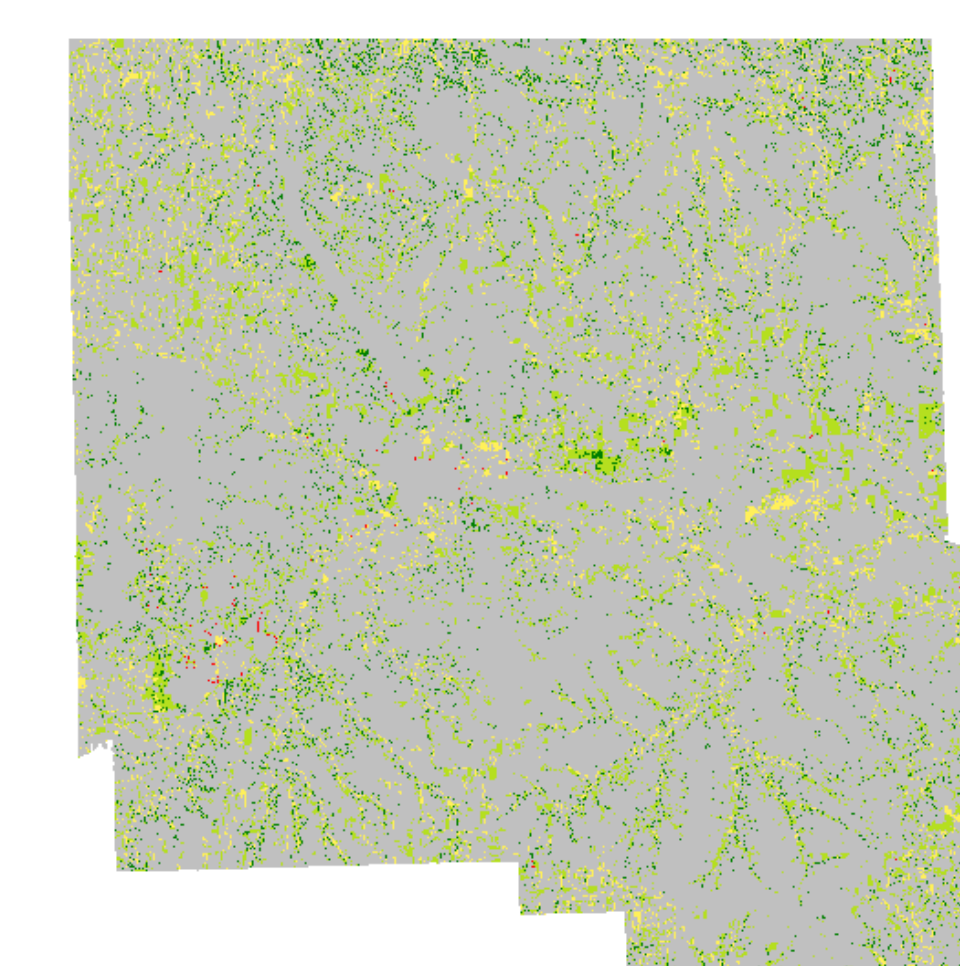


Annual Gross Gain and Loss by Category

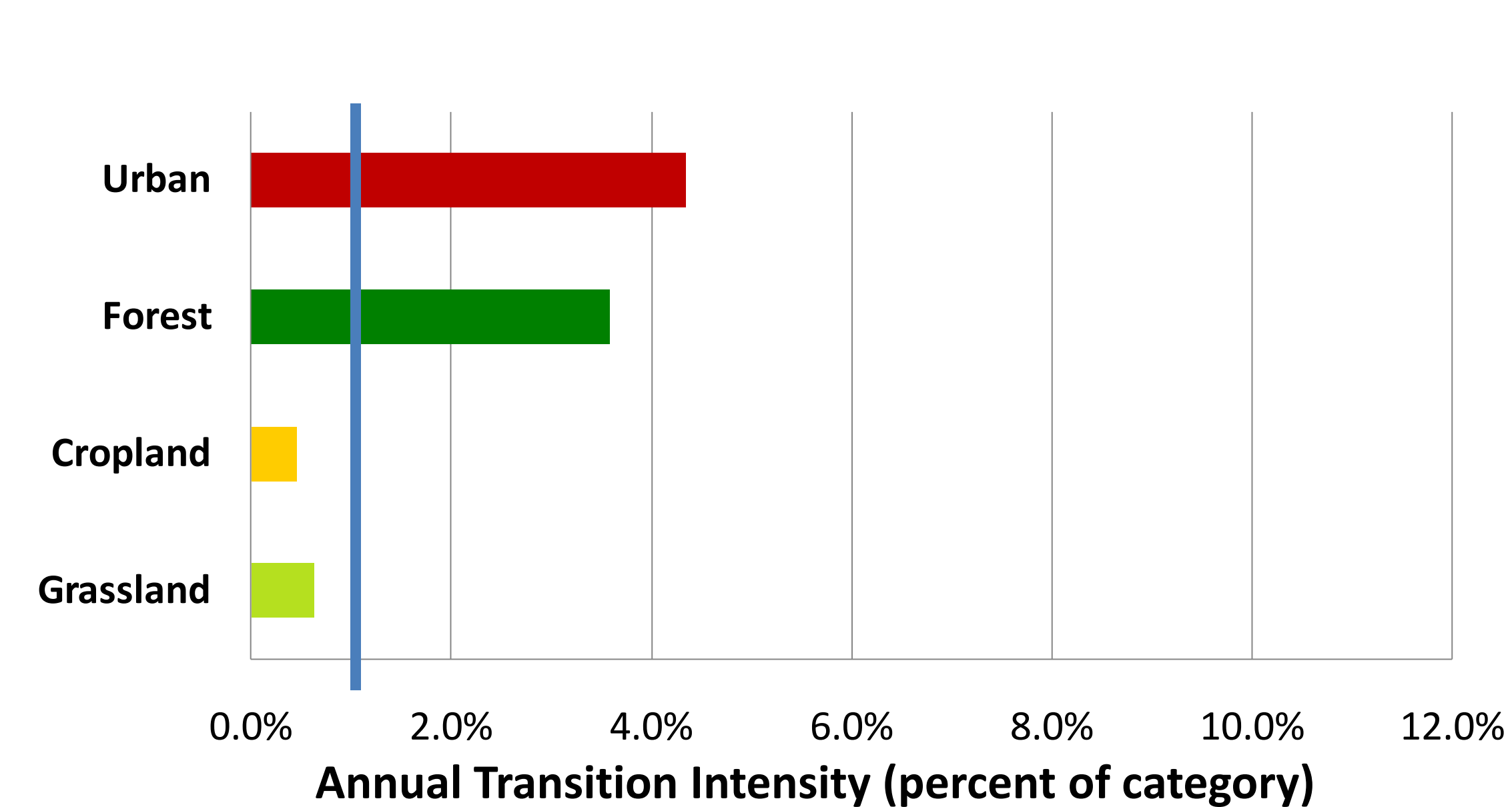
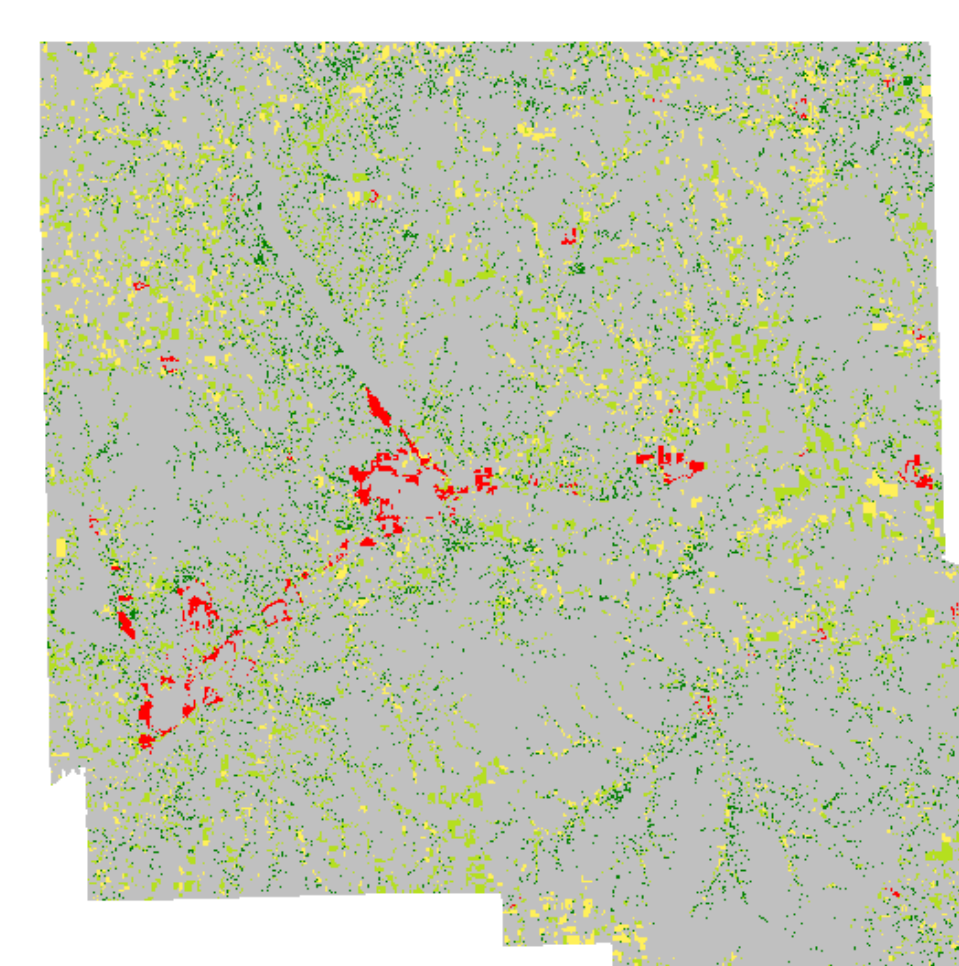
Losses: 1990-2005



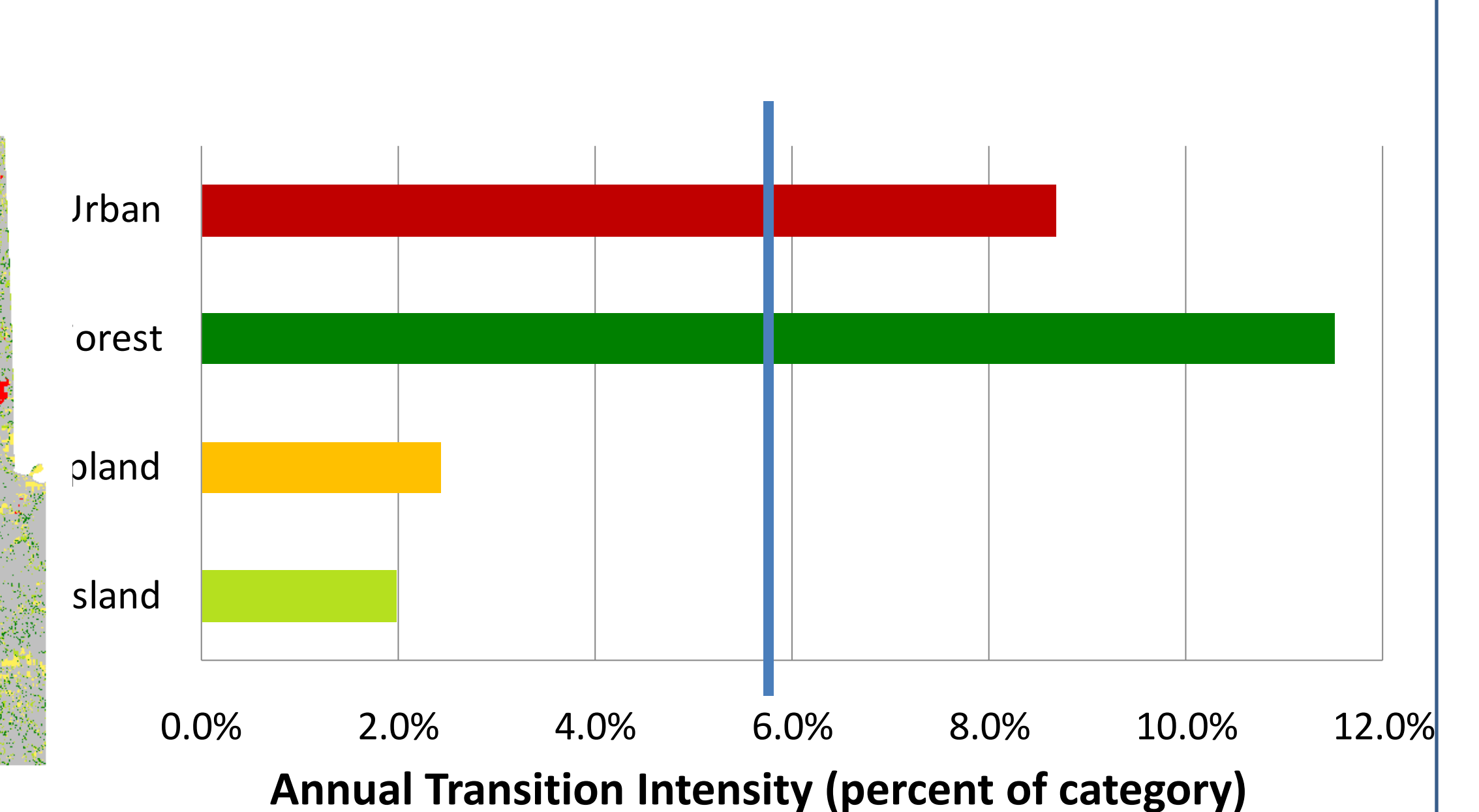
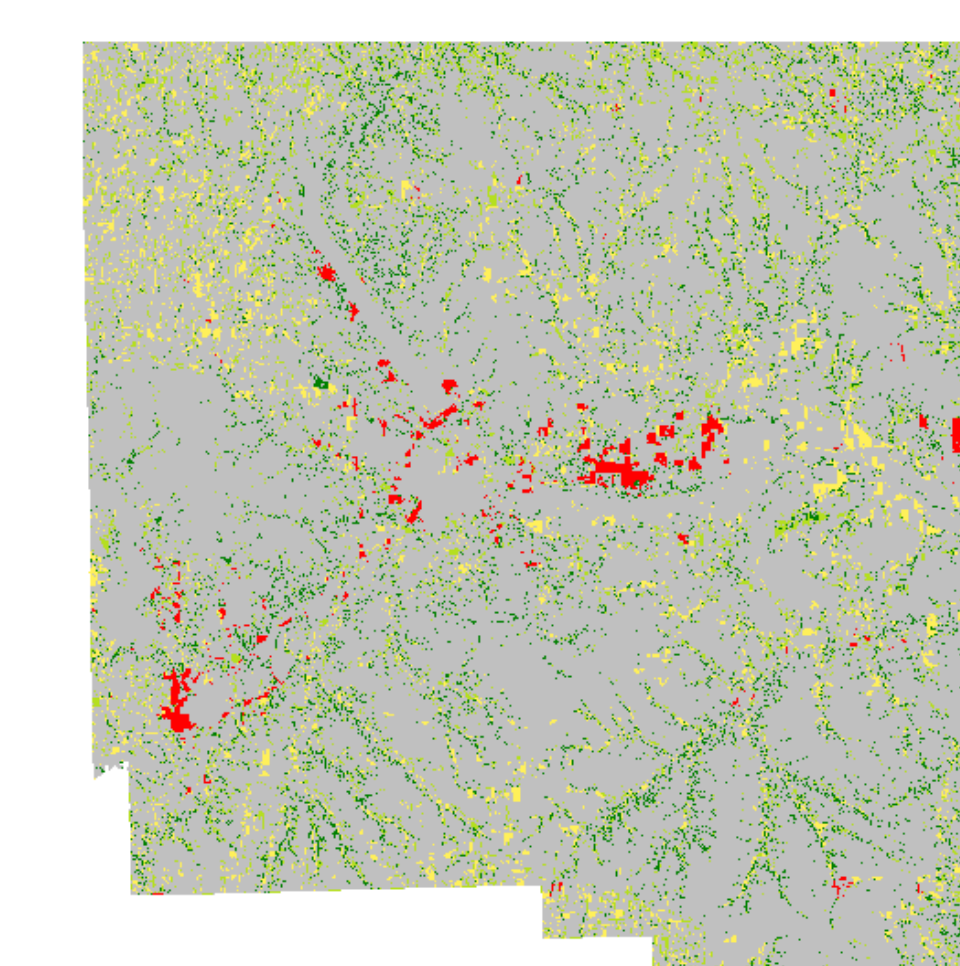
Losses: 2005-2009



Gains: 1990-2005



Gains: 2005-2009



Conclusions

1. The largest transitions are exchanges between cropland and grassland.
2. The rate of change was faster between 2005-2009 as compared to the rate of change between 1990-2005.
3. Forest shows both intensive gross gains and intensive gross losses relative to its size.
4. Urban shows intensive gross gains relative to its size.

Acknowledgements

The United States' National Science Foundation (NSF) supports this work via a supplement grant through the NSF's Long Term Ecological Research (LTER) network, Award #DEB-0620579. Several LTER sites are participating in this grant titled "Maps and Locals (MALS)" with principal investigators Gary Kofinas, Nathan Sayre, and Robert Gilmore Pontius Jr. Professor John Harrington from Kansas State University supplied the data for this analysis.