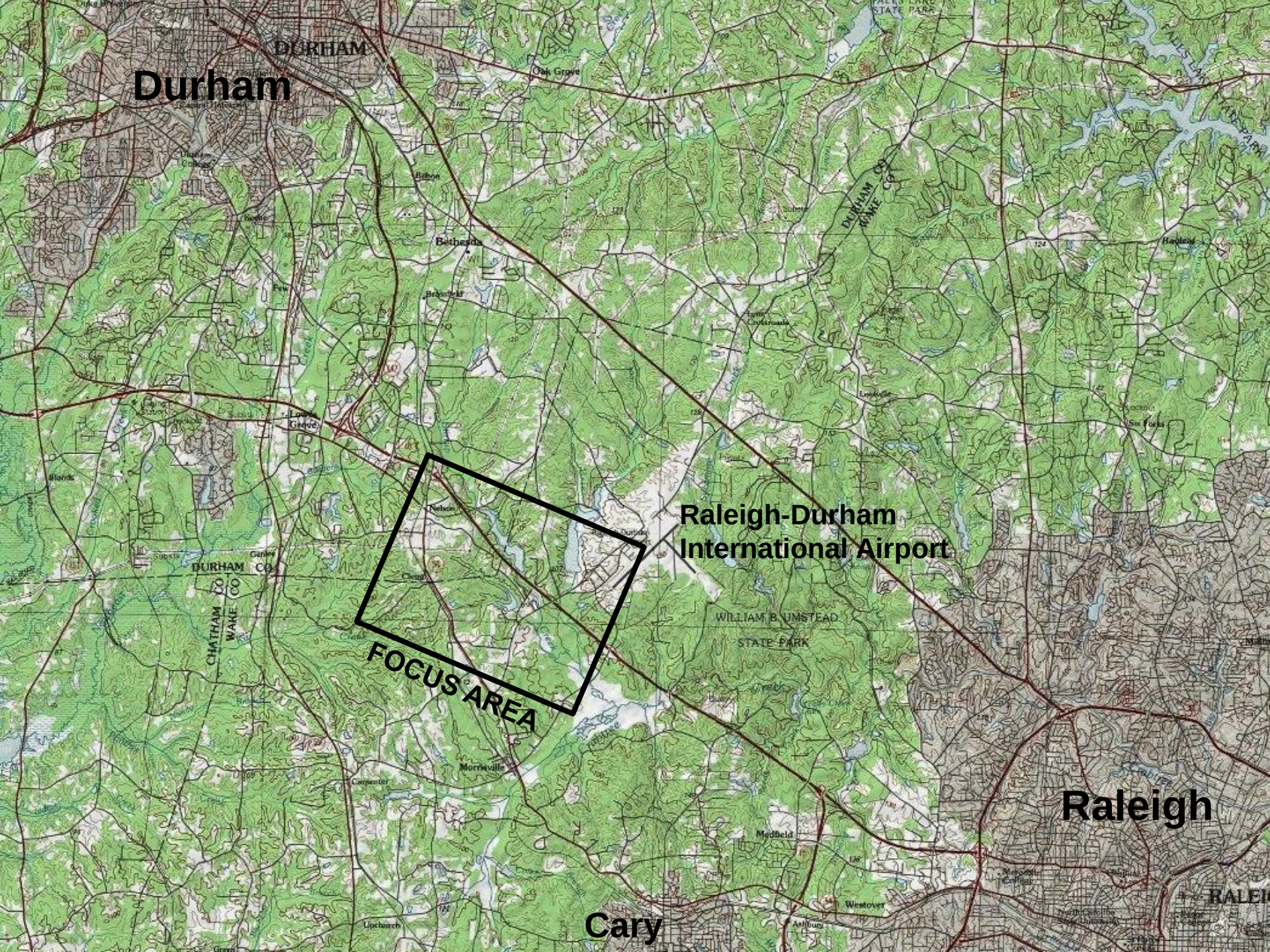
Monitoring deforestation from urban development near Raleigh, NC

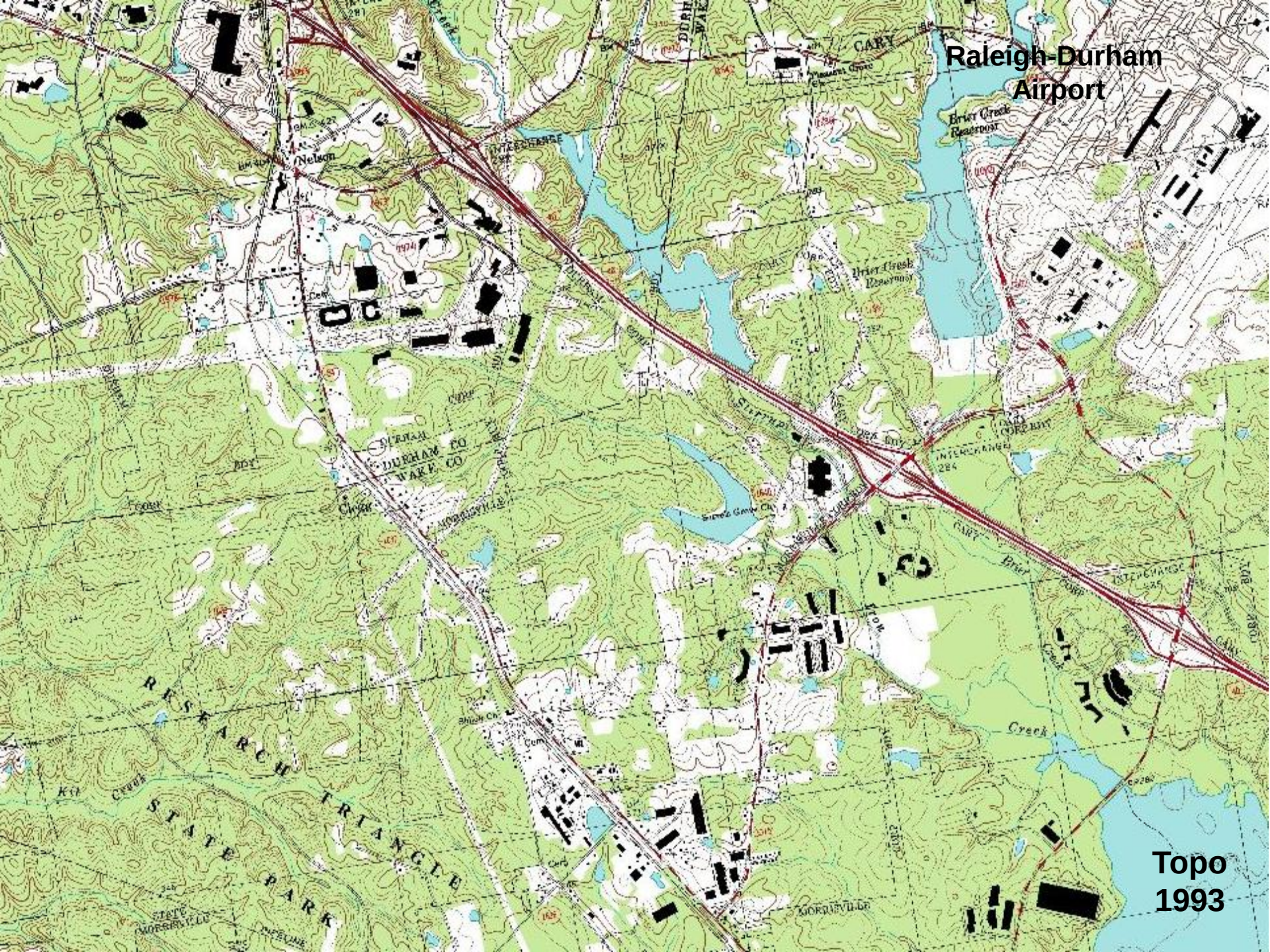
Assessment: July 13, 2011

http: ews.forestthreats.org

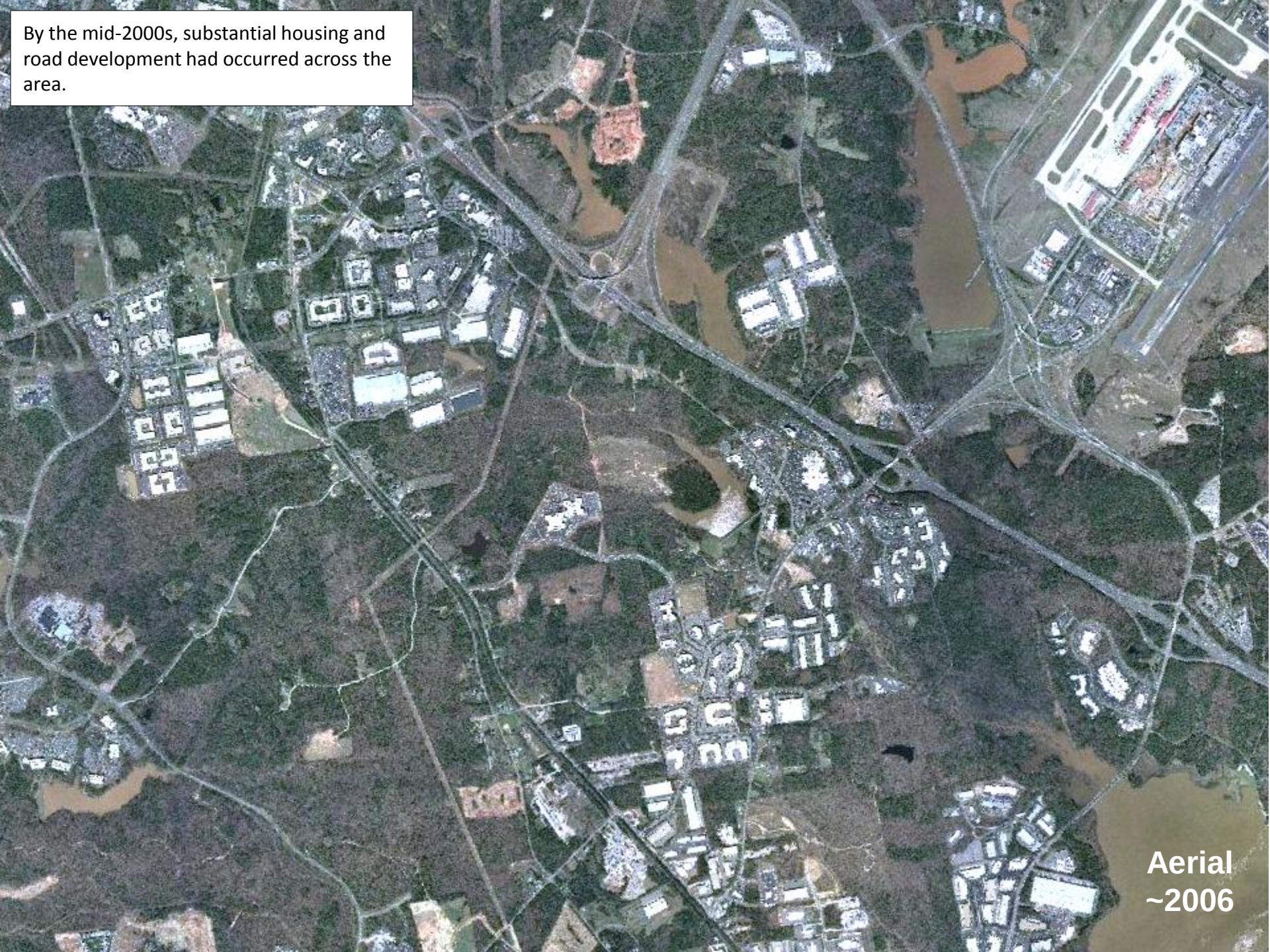
The Raleigh-Durham area has experienced phenomenal population growth during the last decade. According to the US Census, the six county area added 400,000 residents between 2000 and 2010, and it is now home to about 1.6 million people. Due to annexation and the great flux of new arrivals, Raleigh now ranks as the fastest growing city in the US. It's population increased 46% over the last decade.

Such development necessarily has implications for the environment. Most development was at the expense of the area's forests, and forests are important for ecological, water supply and recreational reasons. Continuous landscape monitoring can document where change is taking place and contextualize its long-term, broad-scale relevance.

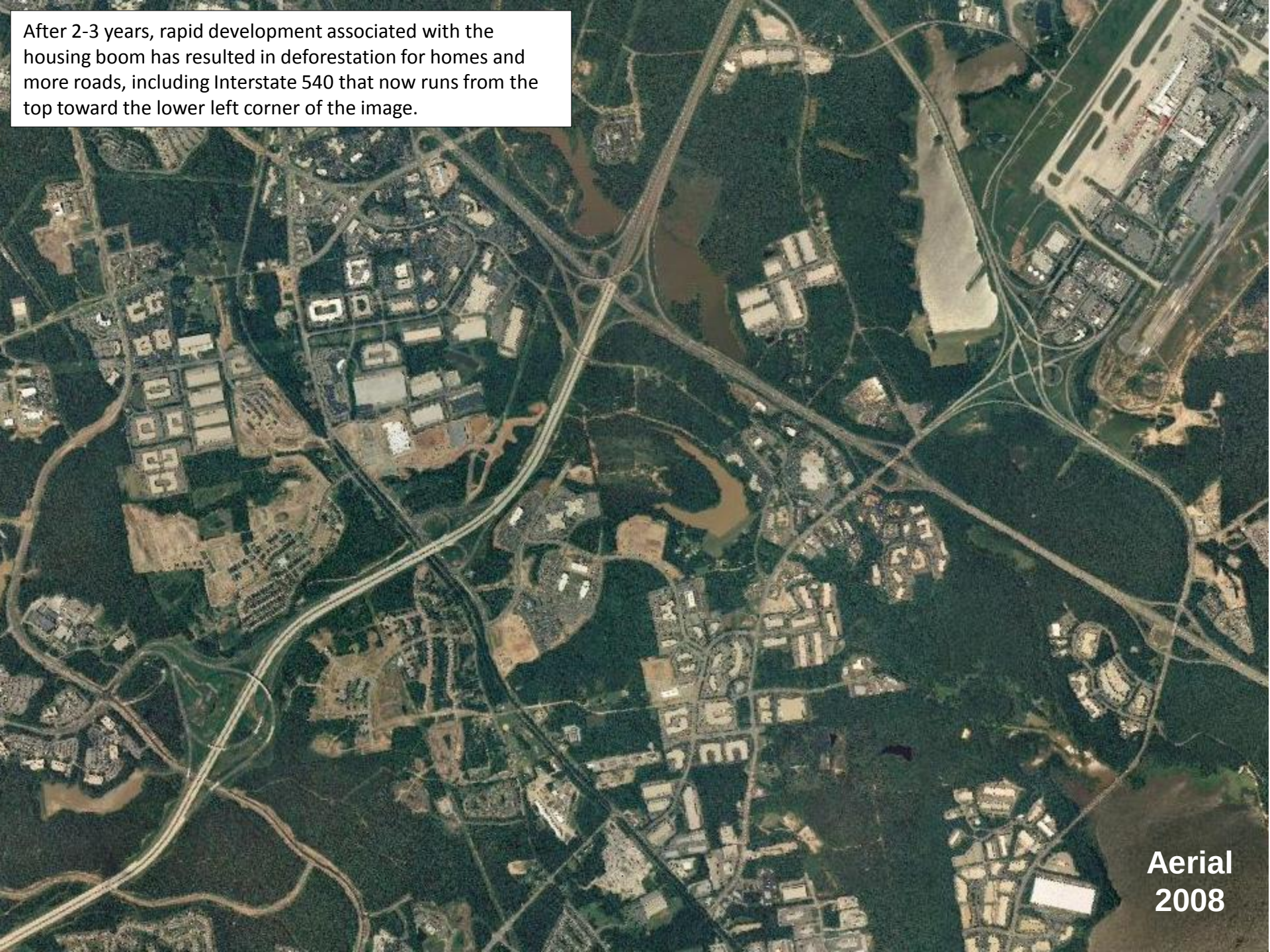

Durham
Raleigh-Durham
International Airport
FOCUS AREA
Raleigh
Cary

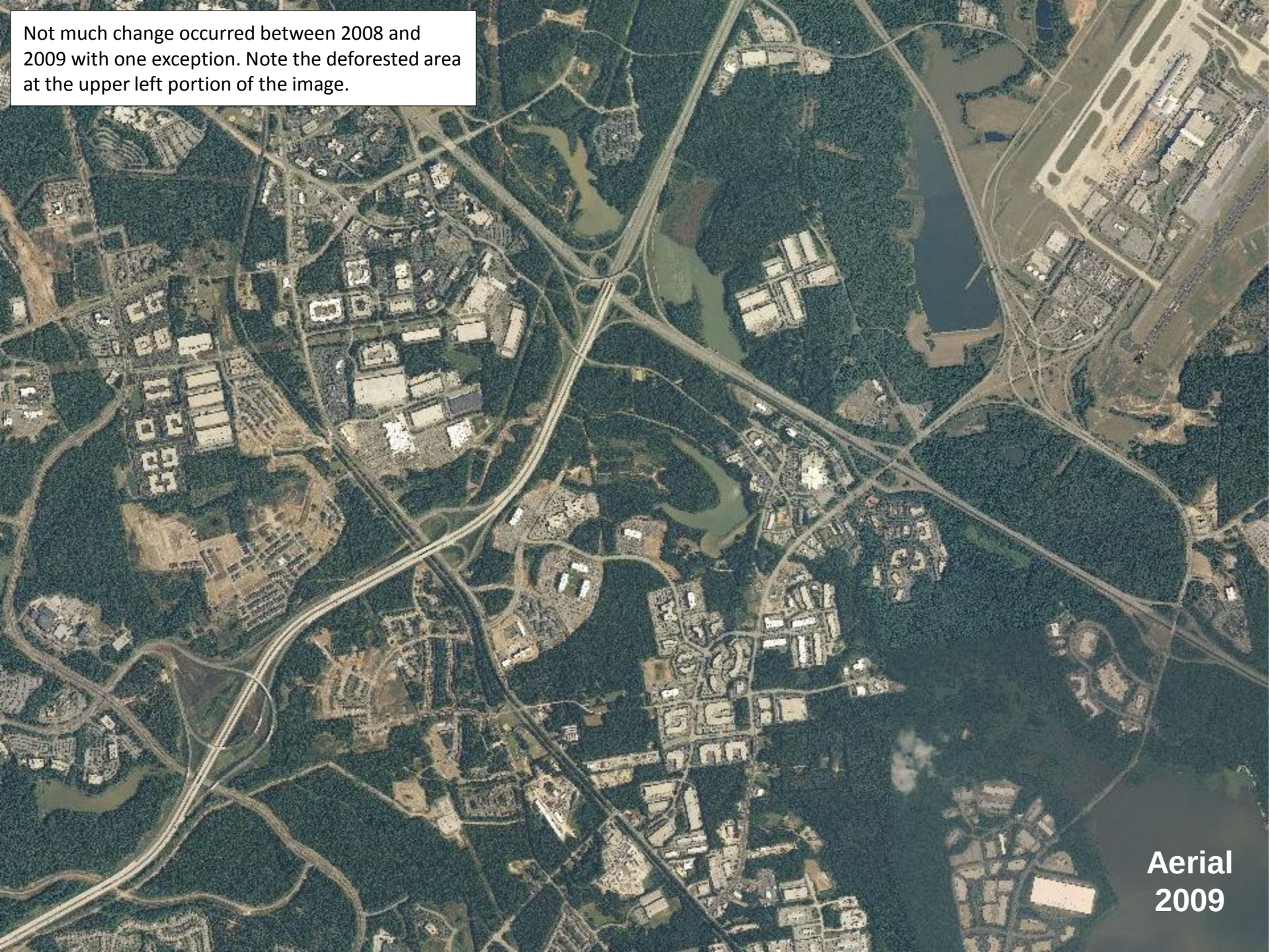

Raleigh-Durham
Airport
Topo
1993

By the mid-2000s, substantial housing and road development had occurred across the area.

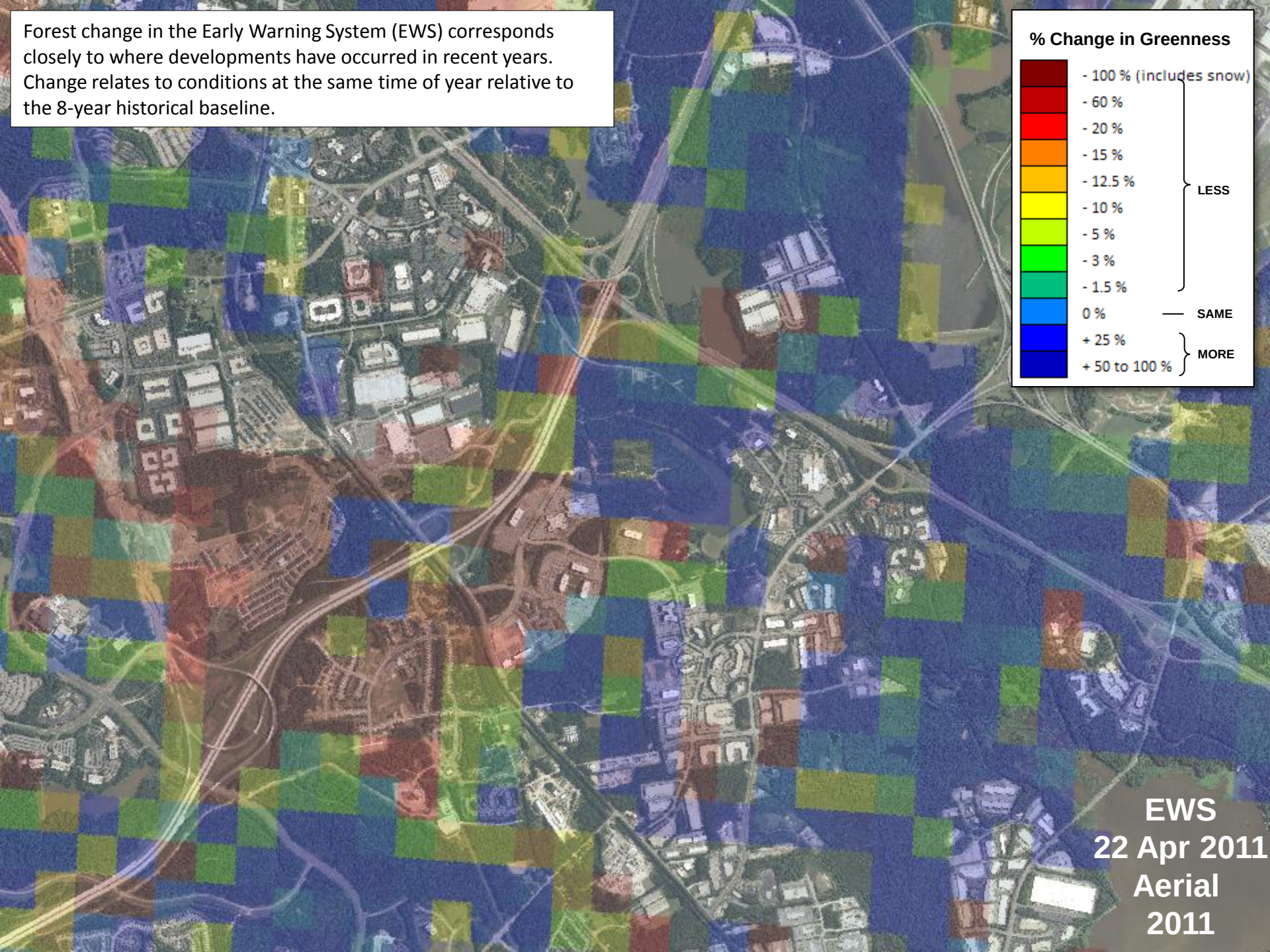


After 2-3 years, rapid development associated with the housing boom has resulted in deforestation for homes and more roads, including Interstate 540 that now runs from the top toward the lower left corner of the image.

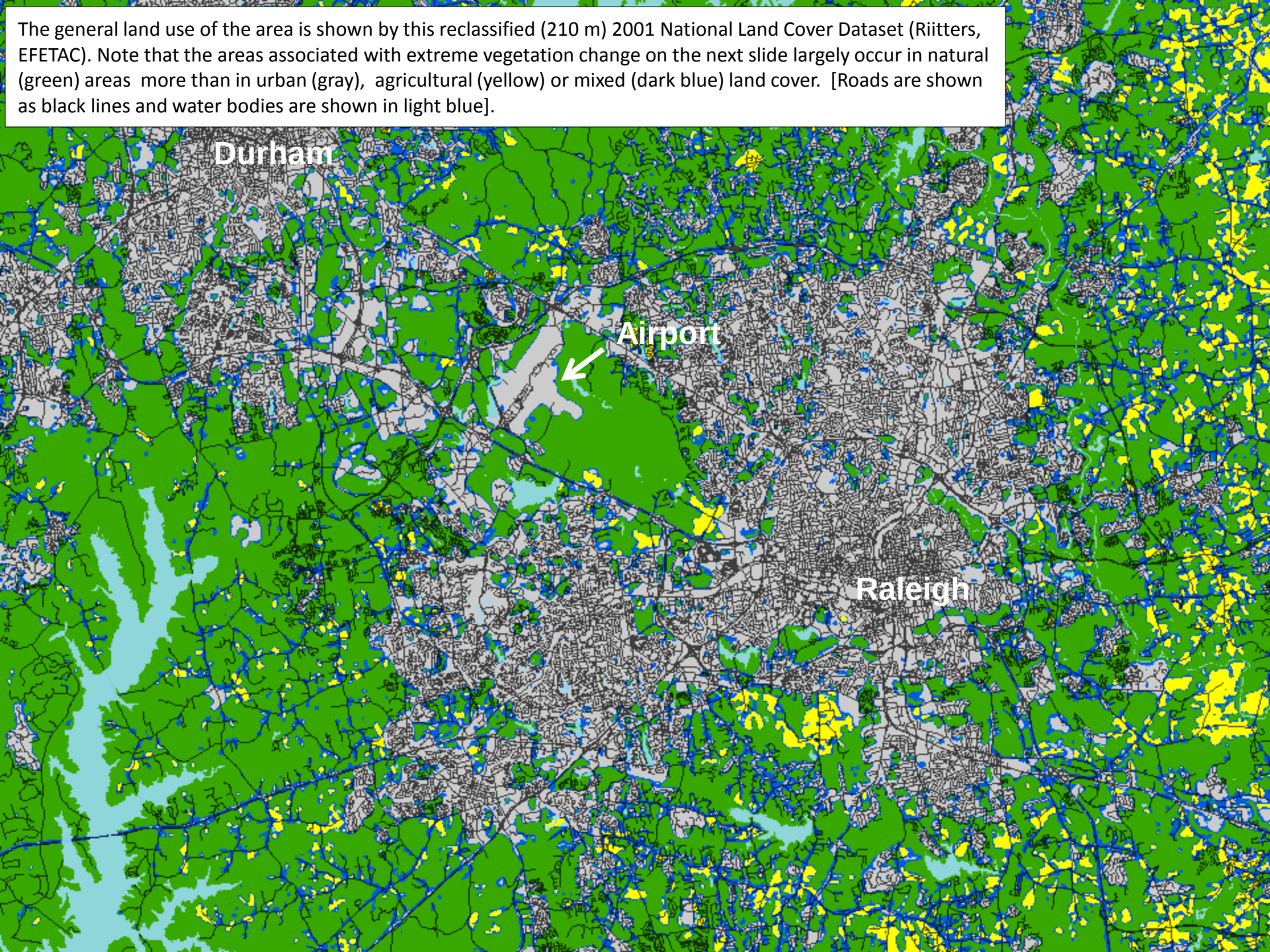



Not much change occurred between 2008 and 2009 with one exception. Note the deforested area at the upper left portion of the image.
Aerial
2009

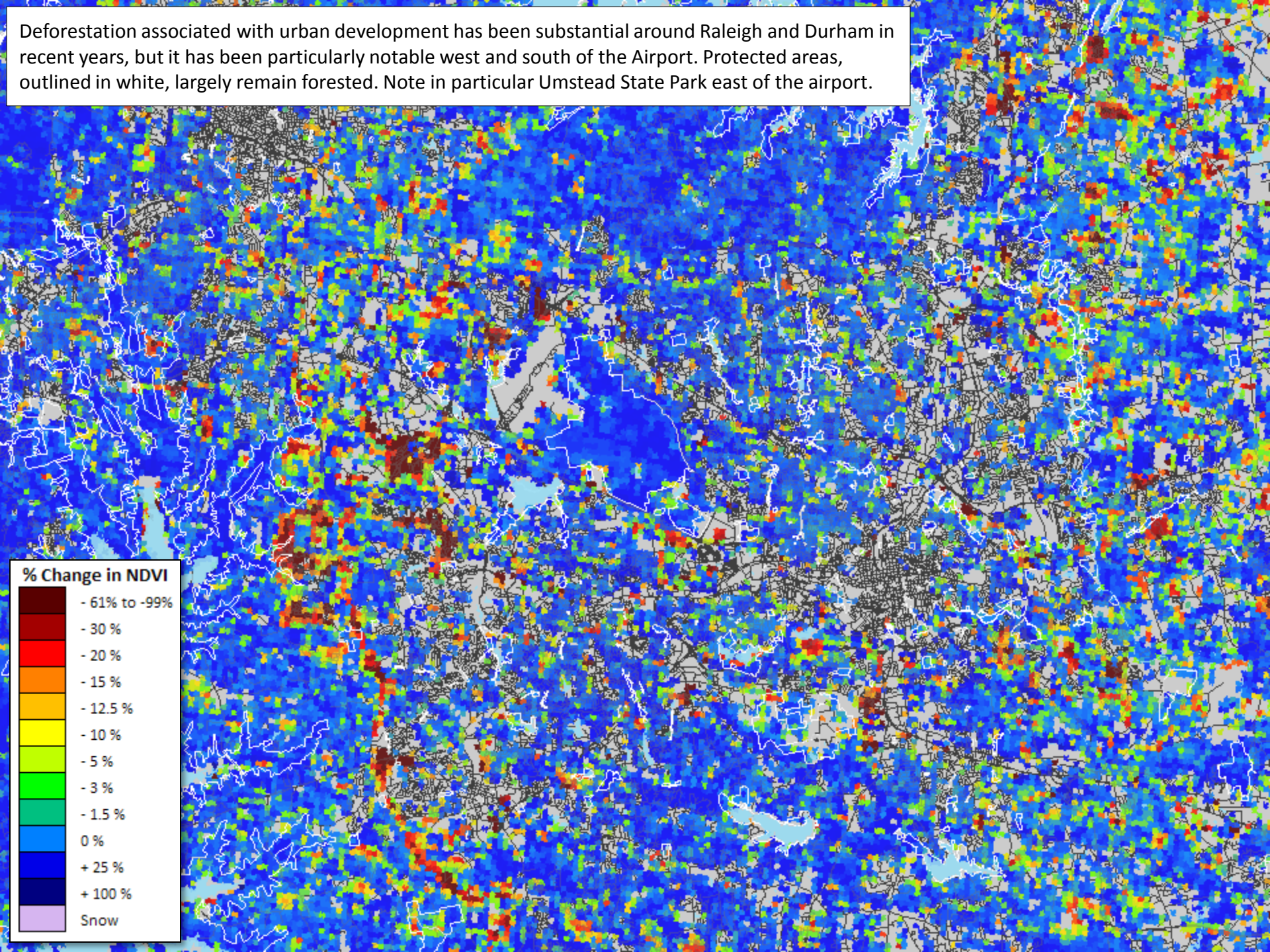

By the Summer of 2010, this major road associated deforestation extends toward the new Western Wake Parkway (Interstate 540), but there are few new homes being built, consistent with the recession economy.
Aerial
2010

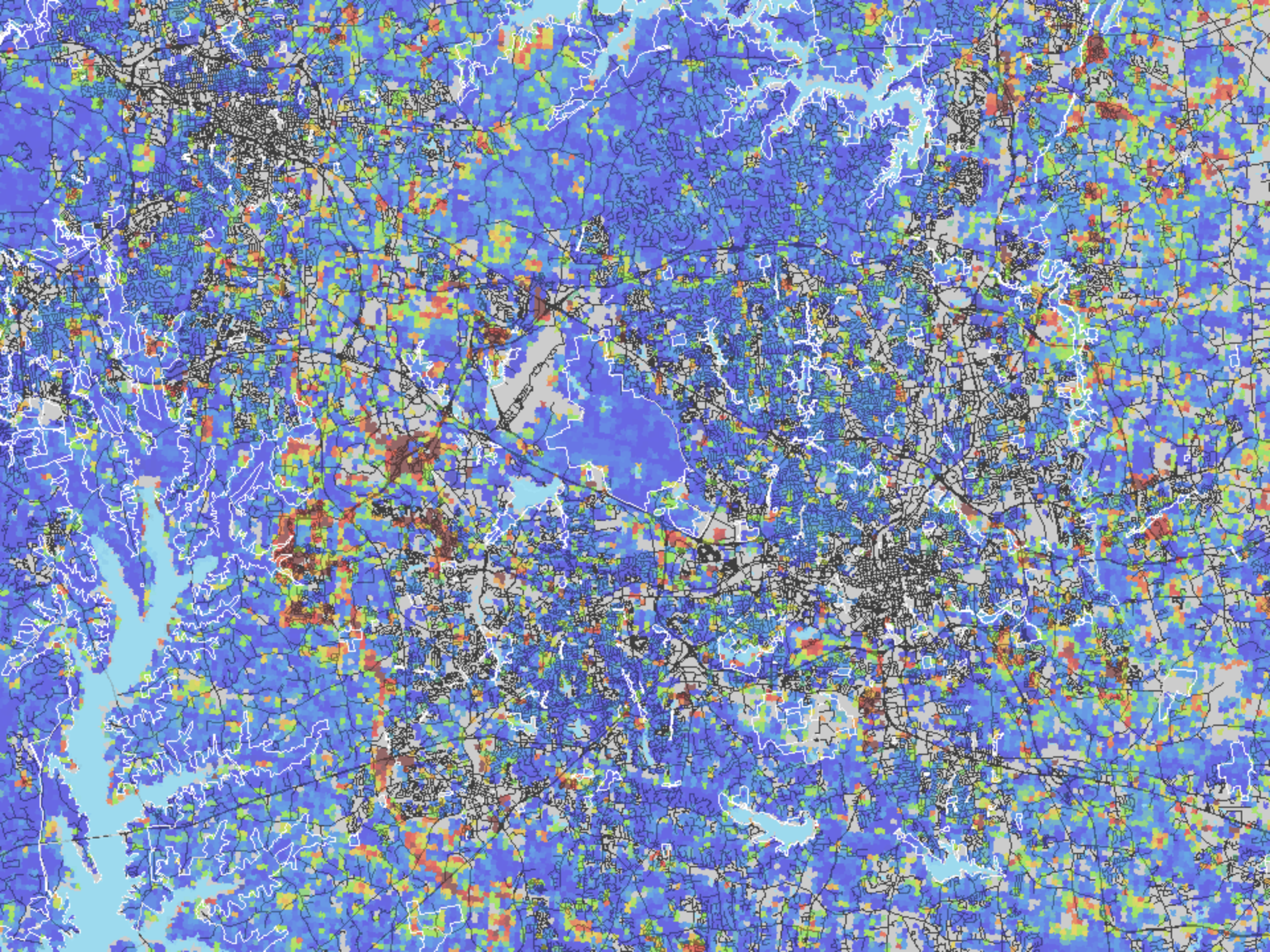

Forest change in the Early Warning System (EWS) corresponds closely to where developments have occurred in recent years. Change relates to conditions at the same time of year relative to the 8-year historical baseline.
% Change in Greenness
- 100 % (includes snow)
- 60 %
- 20 %
- 15 %
- 12.5 %
- 10 %
- 5 %
- 3 %
- 1.5 %
0 %
+ 25 %
+ 50 to 100 %
LESS
SAME
MORE
EWS
22 Apr 2011
Aerial
2011

The general land use of the area is shown by this reclassified (210 m) 2001 National Land Cover Dataset (Riitters, EFETAC). Note that the areas associated with extreme vegetation change on the next slide largely occur in natural (green) areas more than in urban (gray), agricultural (yellow) or mixed (dark blue) land cover. [Roads are shown as black lines and water bodies are shown in light blue].

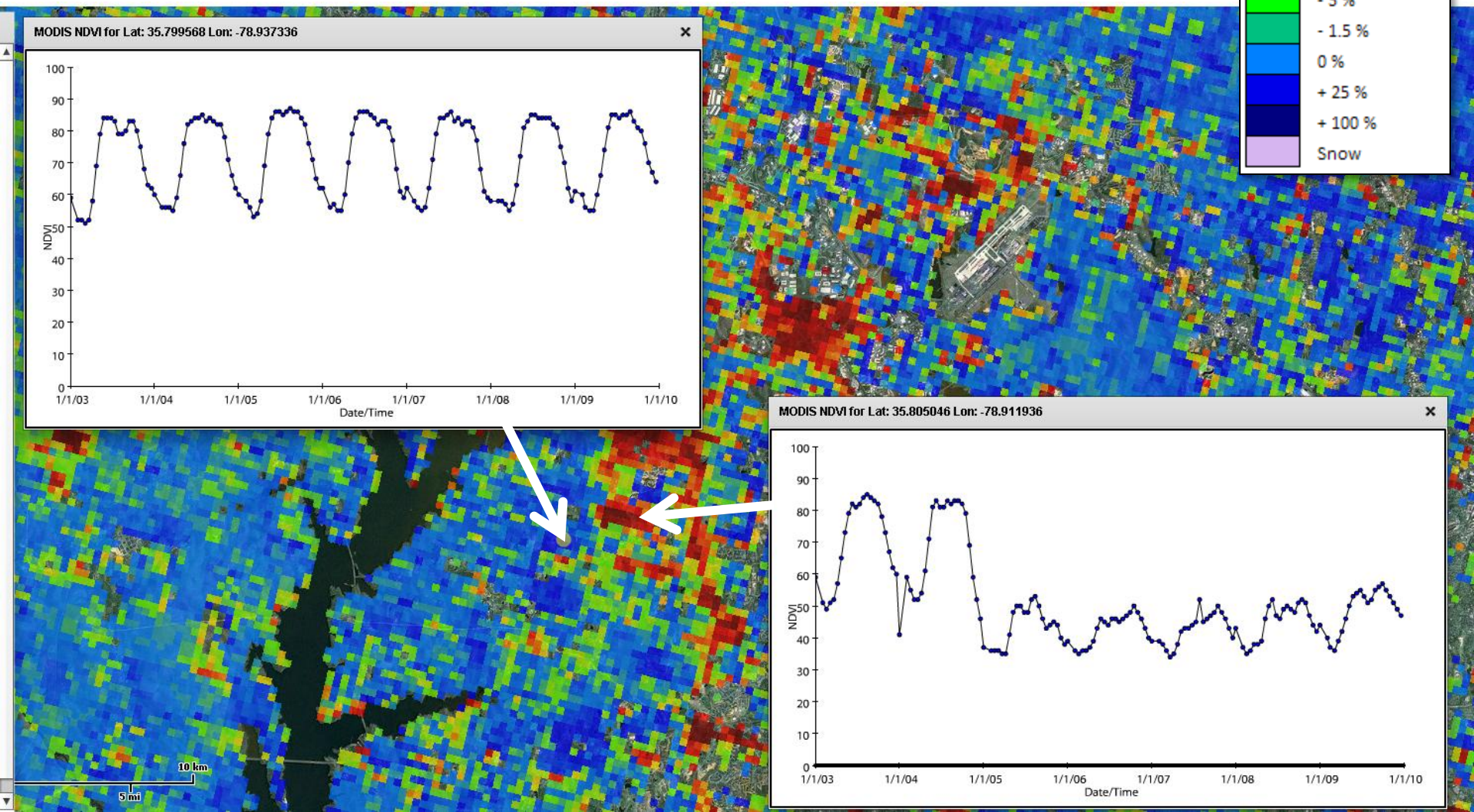


Deforestation associated with urban development has been substantial around Raleigh and Durham in recent years, but it has been particularly notable west and south of the Airport. Protected areas, outlined in white, largely remain forested. Note in particular Umstead State Park east of the airport.





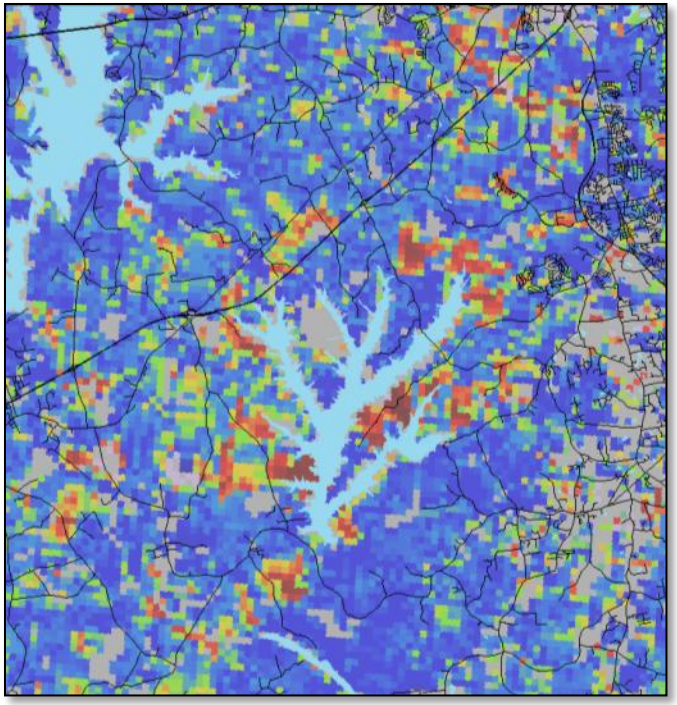
The EWS picks up changes in forest greenness over the years that normally vary seasonally with leaf emergence and fall (see the time series graph of greenness in the upper left selected from a blue pixel). Both short- and long-term disturbances are also apparent in these time traces. The system is sophisticated enough to tell us that the red pixel (graphed at the lower right) was deforested during the last few weeks of 2004.



Vegetation change patterns detected by the Early Warning System (EWS) within the Raleigh-Durham area consist of numerous sharp patches of reduced vegetation vigor. Comparison with historical aerial photos shows that most of this pattern was caused by deforestation for urban development. The preexisting forests were lost to roads, homes and commercial-industrial development throughout much the area, but the most intense development was at the leading edge of Raleigh's outward growth and in the interface between Raleigh and Durham near the Airport.

There is a clear "arc of deforestation" southwest of Raleigh and diffuse development within a broader mixed wildland-suburban belt. High amenity outlier sites, such as the area near Harris Lake shown at right, also experienced significant forest change.

High profile forest disturbances like fire, tornados, hurricanes or severe defoliations typically allow forest recovery, but urban development leads to ecosystem change that is more permanent. The gradual erosion of native forests by urbanization makes this threat easy to overlook. Long-term continuous monitoring, such as that provided by the EWS, can provide this context and perspective.



Development around Harris Lake, southwest of Raleigh, NC (EWS, April 22, 2011)

For an animated view of this development by Taija Tevia-Clark follow this link:

http://www.youtube.com/watch?v=h-MRThFfEvA