Short-term Urban Area Forecasts supporting 2015 Milestone Development

Peter Claggett, Fred Irani, Renee Thompson, and David Donato

June 17, 2013
Land Use Workgroup Meeting

U.S. Department of the Interior
U.S. Geological Survey

2015 Milestones Land Use

- Sept. 2013 version (pop. updates for VA, MD, DE, and Wash. Metro region, 2012 pop estimates, new ag extrapolation method).

- April 2014 version (pop updates for PA, NY, and WV, 2013 pop estimates, 2011 land cover, and 2012 Ag Census, new ag extrapolation method).

1. Forecast urban and agricultural land uses, septic systems and population on sewer to 2015 (Trend Scenario).

2. Use new agricultural extrapolation method and current version of Chesapeake Bay Land Change Model (v2)

USGS

CBLCM v2 method

Caroline County, Virginia

Historic Population (U.S. Census):
Year 1990 = 19,227
Year 2000 = 22,121

Historic Housing (U.S. Census):
Year 1990 = 7,290
Year 2000 = 8,889

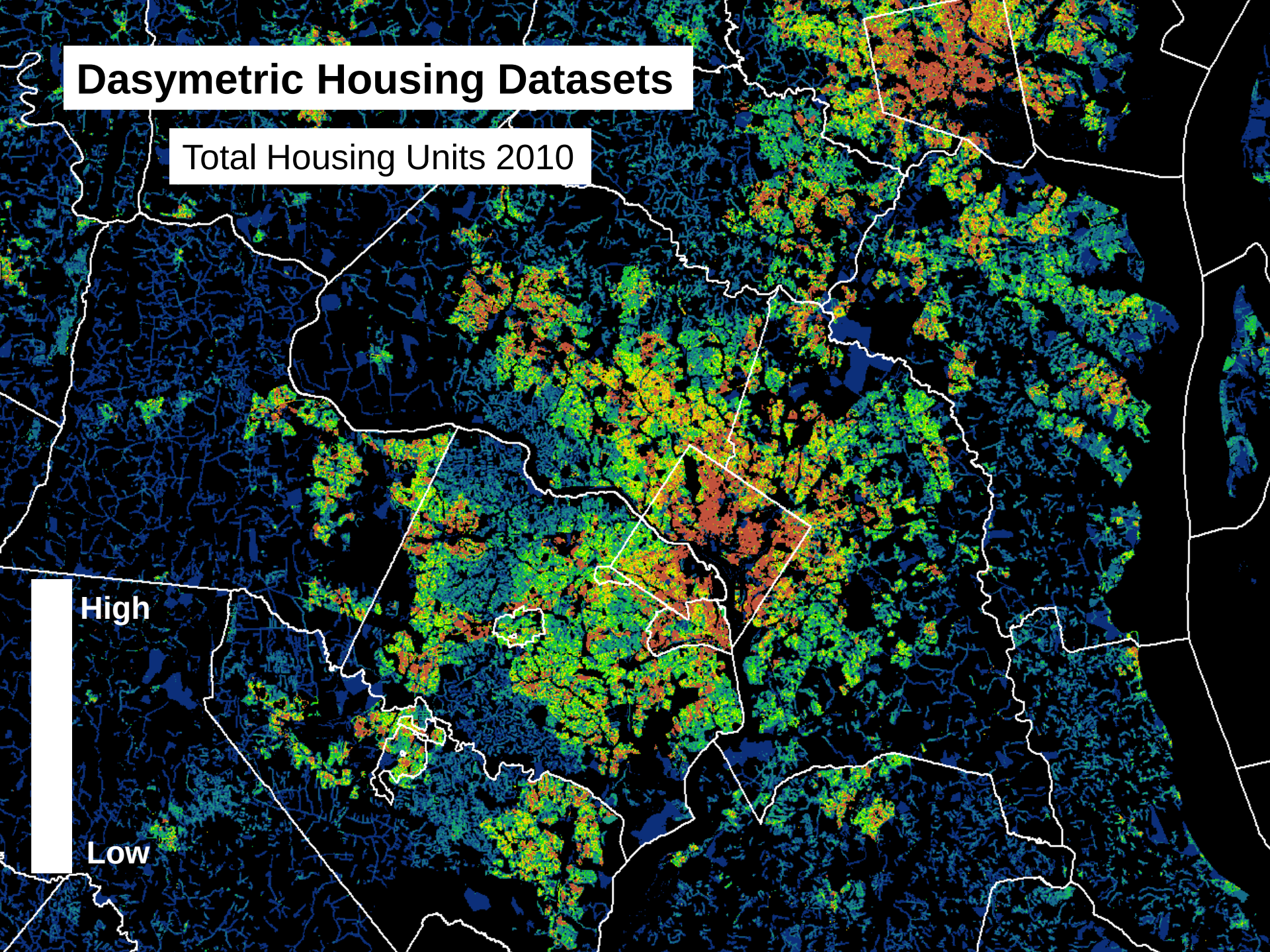
Projected Population (VEC):
Year 2010 = 29,201
Year 2020 = 36,058
Year 2030 = 43,662

Projected Housing (control totals):
Year 2010 = 12,777
Year 2020 = 17,026
Year 2030 = 22,441

$$\frac{\text{Population projection - Pop in group housing}}{\text{Estimated future average household size}} + \text{Estimated vacant housing}$$

Dasymetric Housing Datasets

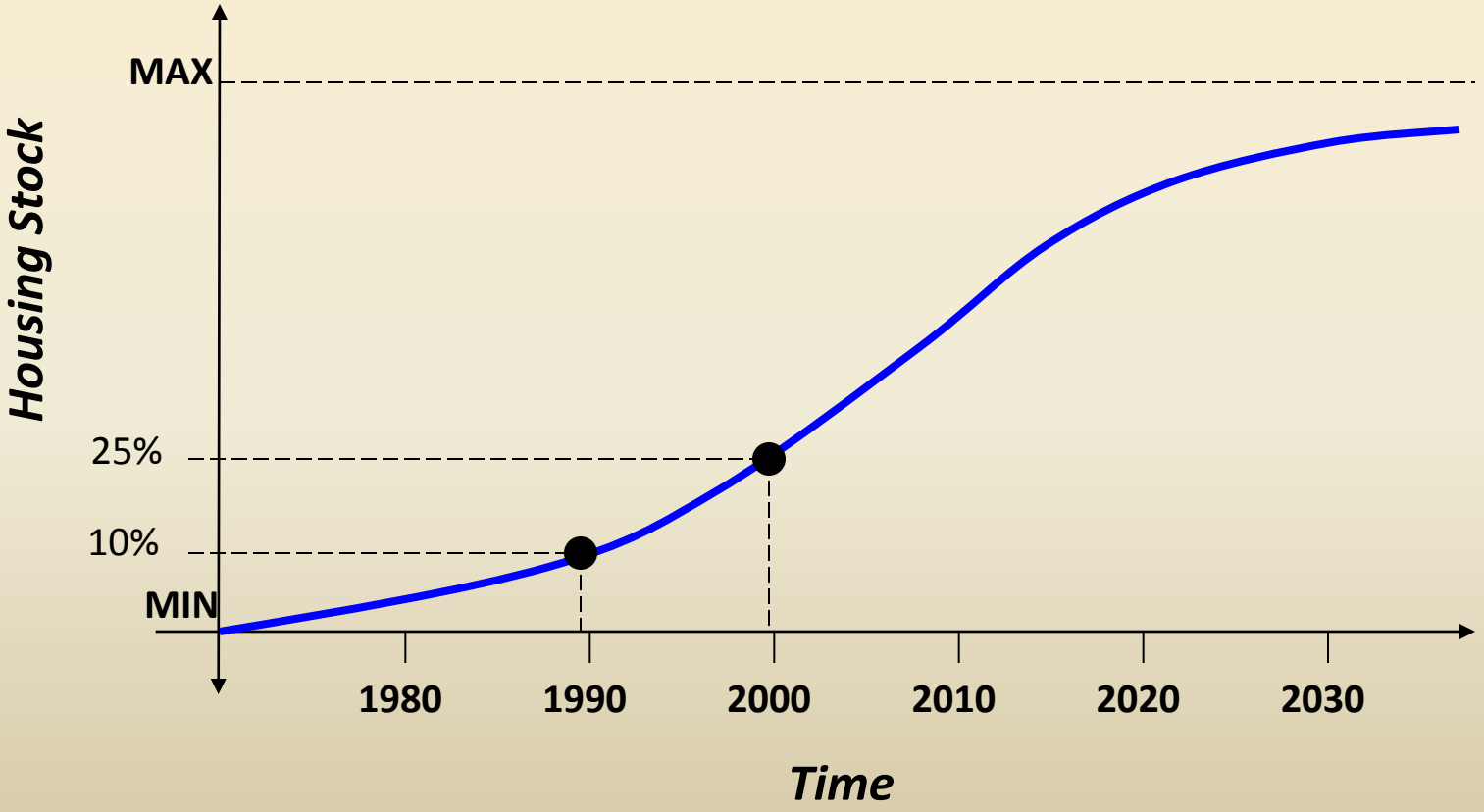
Total Housing Units 2010



Land-River Segment Extrapolation
(Gompertz Curve Fitting)

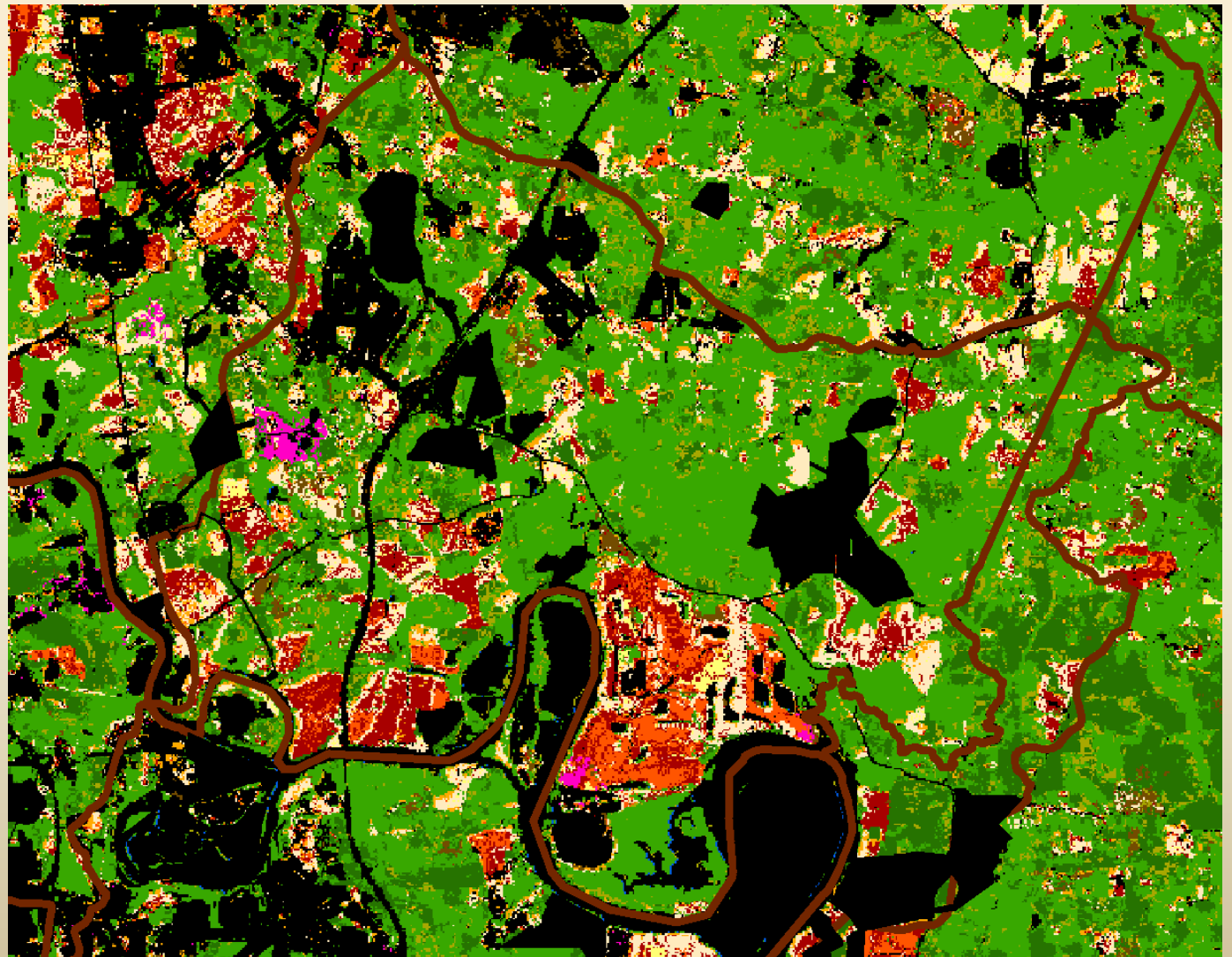
Future housing stock =

f (growth rate, maximum housing stock, and time)



Maximum Housing Stock =

$$\text{Total Housing in 2000} + \frac{\text{Available land for development}}{\text{Developed acres per house}}$$



Land-River Segment Scale: southern Caroline County

Residential Housing (GIS analysis):
Year 1990 = 3,996 units
Year 2000 = 5,087 units

→

Future Housing (Gompertz curve)
Year 2010 = 6,351 units
Year 2020 = 7,789 units
Year 2030 = 9,397 units

County: Gompertz Ratios:
Year 2010 = 1.19
Year 2020 = 1.33
Year 2030 = 1.48

→

Adjusted Future Housing:
Year 2010 = 7,559 units
Year 2020 = 10,341 units
Year 2030 = 13,910 units

Future Urban Area in southern Caroline County segment, Virginia

Year 2000 = 5,087 units…….. 7,391 acres

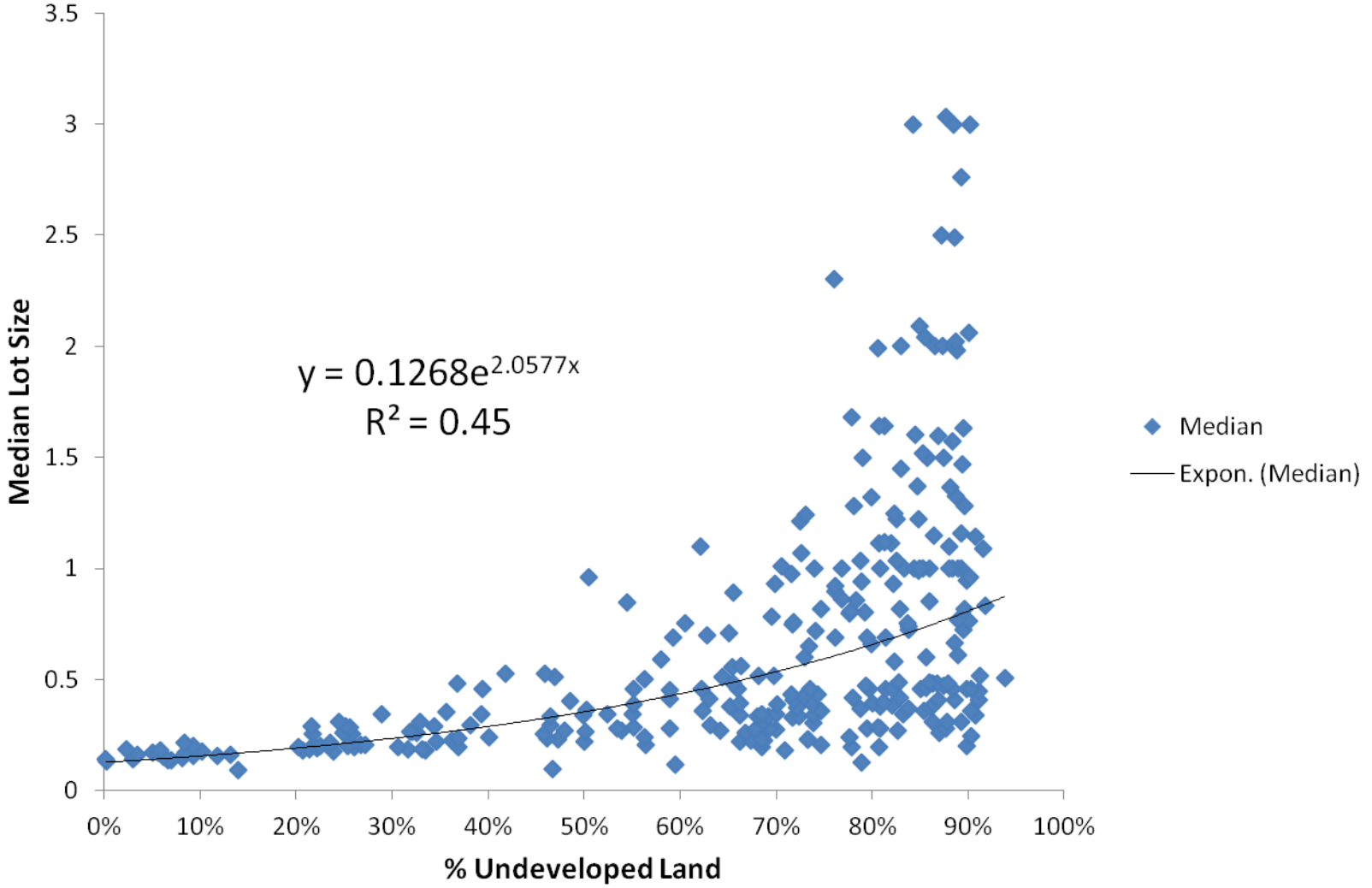
Year 2030 = 5,087 + 8,823 new units……????? acres

2030 Urban Area = 2000 Urban Area +
(additional units * 2006 urban land per house * density adjustment factor)

= 7,391 acres + (8,823 units * 1.45 * 0.91)

= 19,089 acres

As LRSEGs become more developed, housing densities increase.



Estimating Population on Sewer and On-site Septic Systems

# of Septic Systems in 2010 =

(Total Housing Units – Total Housing Units in Sewer Service Areas)
* (ratio of Total Households to Total Housing Units)
* (ratio of Single-detached to Total Housing Units)

# of Septic Systems in 2020 =

(# of Septic Systems in 2010)
\+ ((Change in Total Housing Units 2010 – 2020)
* (potential growth† on sewer))
* (ratio of Total Households to Total Housing Units)
* (ratio of Single-detached to Total Housing Units)

† **Potential growth on sewer considers:**

proportion of historical growth (1984 – 2006) on sewer
proportion of change in total housing units on sewer (2000 – 2010)
proportion of remaining land available for development within sewer service area

Estimating Population on Sewer

Population on Sewer in 2010 =

(Total Population 2010)

- (# of Septic Systems / Average Household Size 2010)

Population on Sewer in 2020 =

(Total Population 2020)

- (# of Septic Systems / Average Household Size est. 2020)

Some Important Assumptions

- Proportions of forest to farmland conversion are held constant based on historic proportions of conversion (1984 – 2006) at LRSEG or County scale.
    - Scale choice based on whether sufficient amount of change observed at LRSEG scale.

- Proportions of rural to suburban to urban development are held constant based on 2006 estimated proportions.

- Roads are held constant based on 2010 NAVTEQ Streets dataset