# US DEMOGRAPHIC OUTLOOK 2005-2050

## Infrastructure Implications of a Larger, More Concentrated, More Diverse Population
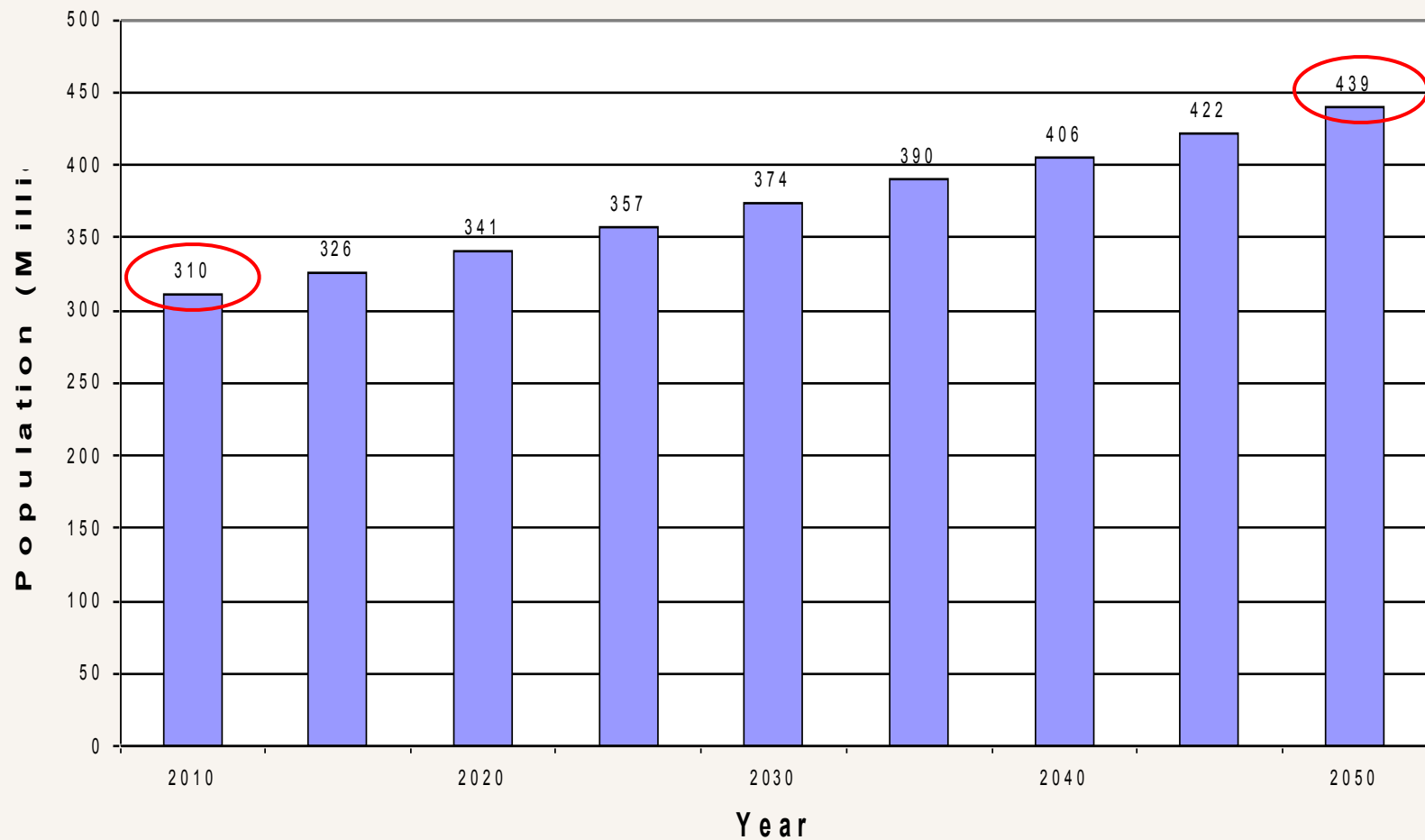
Messner Project Team Meeting
June 29, 2009

Elise Barrella & Sara Beck

# Outline

- US Population Projections
- Implications of New Demographics
- Spatial distribution of population
  - New settlement patterns
  - MegaRegions
- Infrastructure Projections
  - Transportation
  - Water Resources
  - Wastewater
- Planning Implications
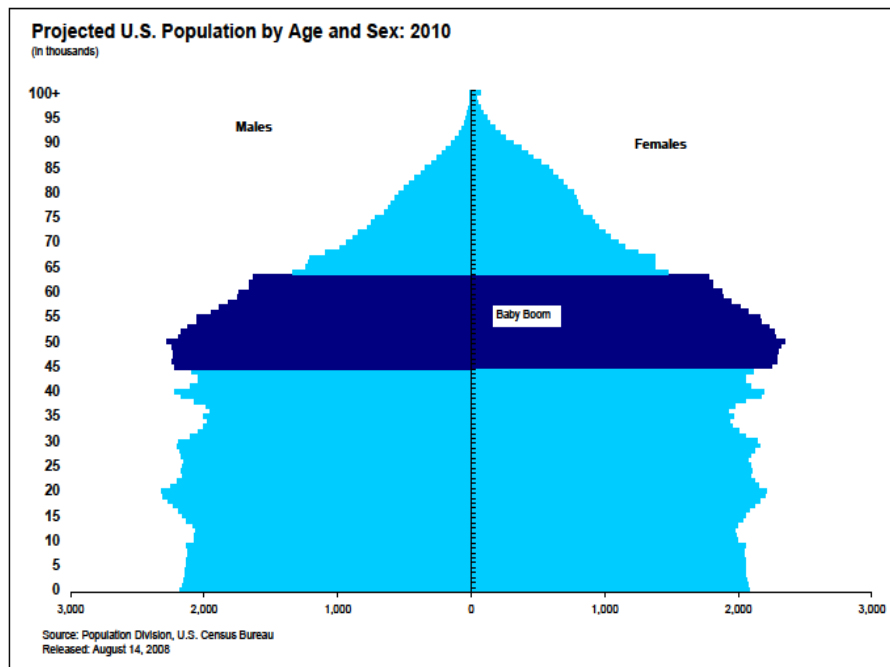
# US Population Projections

**Total United States Population**
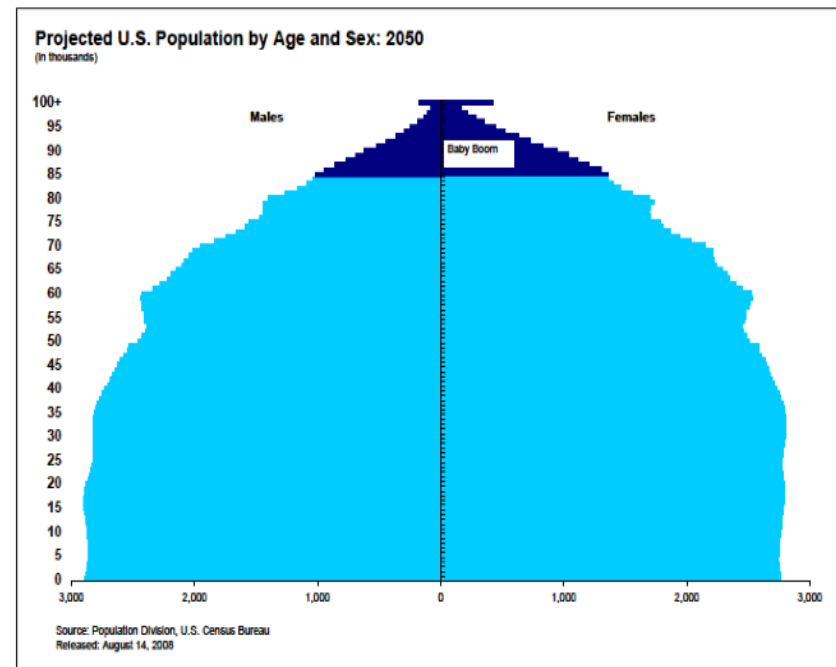
# Population Pyramid Projections

2010

2050



Projected U.S. Population by Age and Sex: 2010
(in thousands)

Males

Females

Baby Boom

Source: Population Division, U.S. Census Bureau
Released: August 14, 2008



Projected U.S. Population by Age and Sex: 2050
(in thousands)

Males

Females

Baby Boom

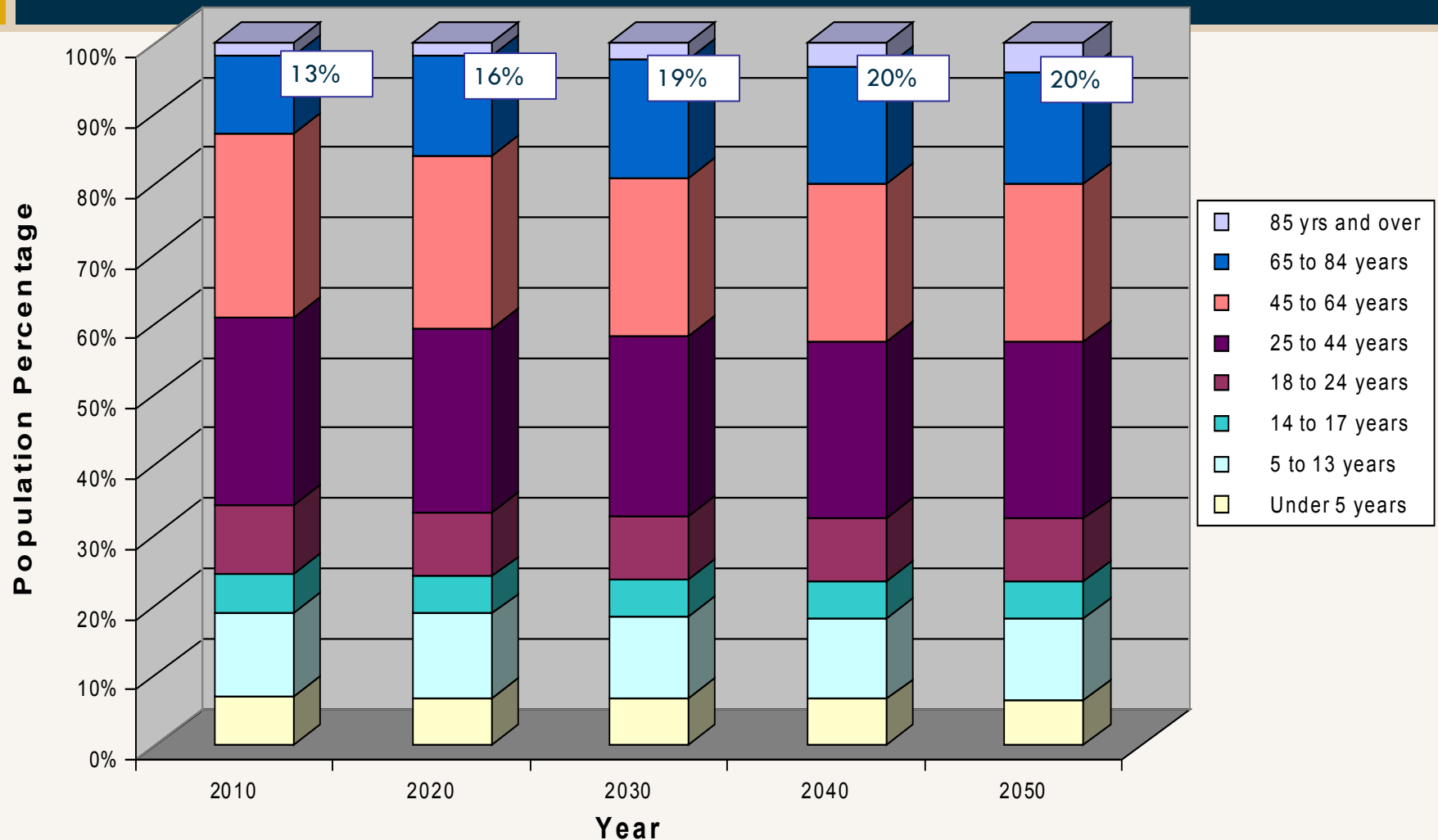Source: Population Division, U.S. Census Bureau
Released: August 14, 2008
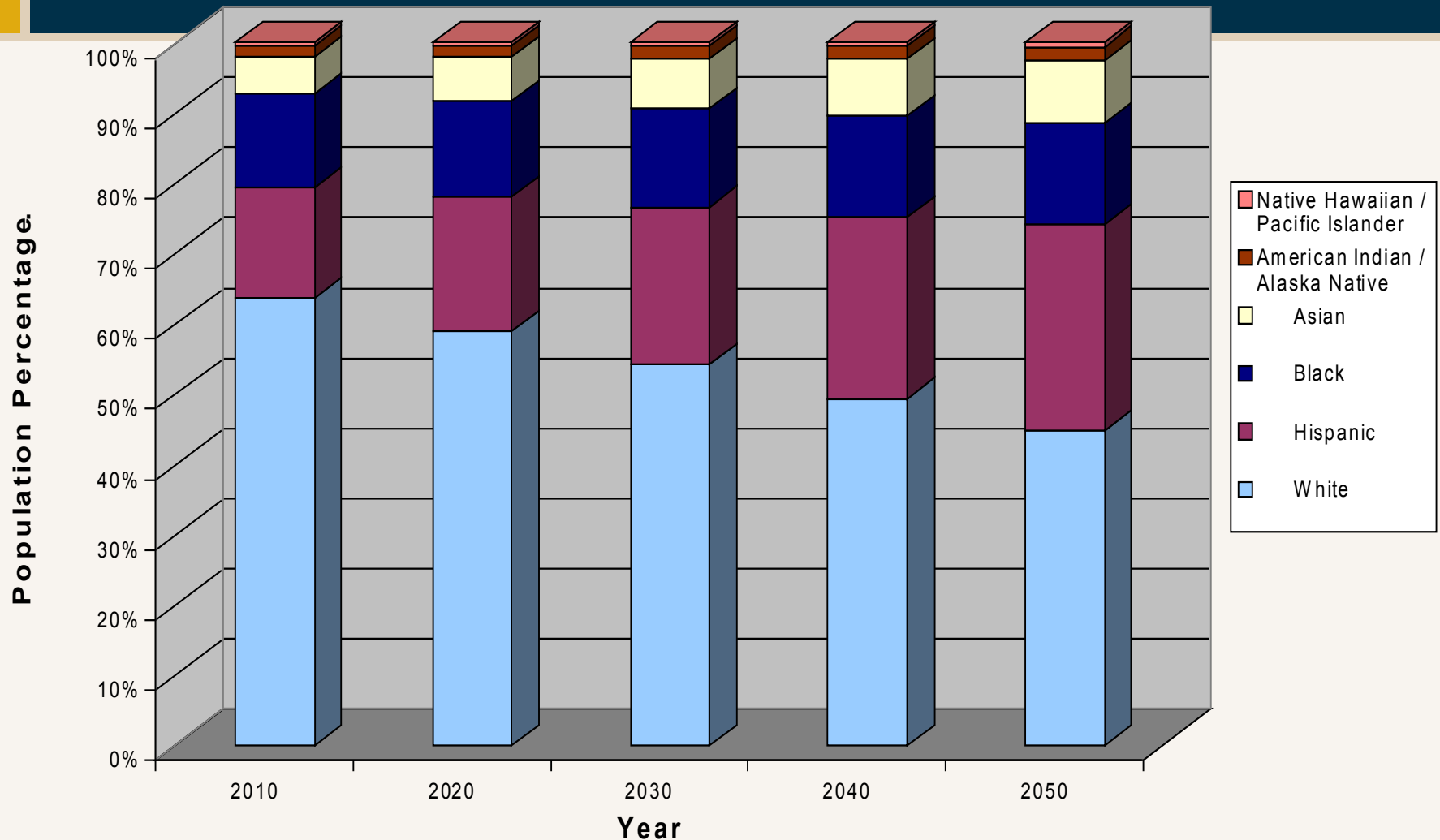
# By midcentury, the nation will be older…

## Age Group Projections



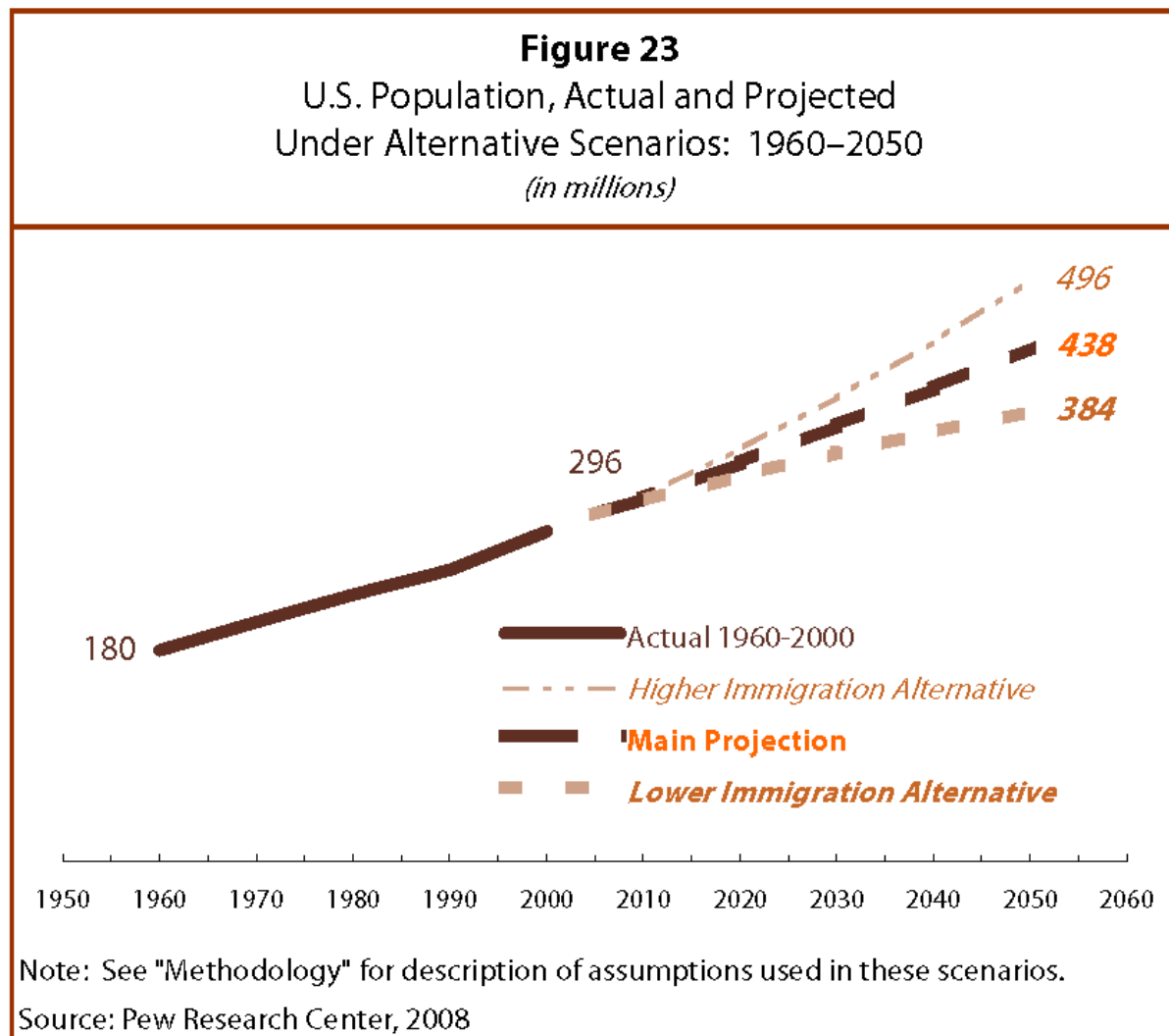Source: United States Census Bureau: 2008 National Population Projection Tables

# … and more racially and ethnically diverse…

## Race Projections



Source: United States Census Bureau: 2008 National Population Projection Tables

# Immigration policy could have a significant impact…



**Figure 23**
U.S. Population, Actual and Projected
Under Alternative Scenarios: 1960–2050
*(in millions)*

496

438

384

296

180

Actual 1960-2000
*Higher Immigration Alternative*
**Main Projection**
*Lower Immigration Alternative*

1950  1960  1970  1980  1990  2000  2010  2020  2030  2040  2050  2060

Note: See "Methodology" for description of assumptions used in these scenarios.
Source: Pew Research Center, 2008

| | New Immigrants* | National Average |
|---|---|---|
| Average HH Size | 3.6 | 2.6 |
| Avg. Workers pr Household | 2.0 | 1.4 |
| Avg. Vehicles per Household | 1.3 | 1.7 |
| Percent of 16+ who Drive | 60.6 | 91.5 |
| Percent of 16+ in Labor Force | 65.2 | 69.8 |
| Percent Part-time Workers | 22.7 | 18.7 |
| Usual Distance to Work (miles) | 9.5 | 13.2 |
| Usual Time to Work (minutes) | 24.6 | 25.5 |
| Percent Home Owned | 16.1 | 72.3 |
| Percent Rent | 82.8 | 27.2 |
| Average Daily Trips per Household | 10.2 | 9.6 |

New Immigrant is defined as foreign-born person living in the US for less than 3 years

# Figure 19
## Working-Age Population by Race and Ethnicity, Actual and Projected: 1960, 2005 and 2050
### (% share of population ages 18 to 64)

**White***
- 1960: 87%
- 2005: 68%
- 2050: 45%

**Hispanic**
- 1960: 2.9%
- 2005: 14%
- 2050: 31%

**Black***
- 1960: 10%
- 2005: 12%
- 2050: 14%

**Asian***
- 1960: 0.6%
- 2005: 5%
- 2050: 10%
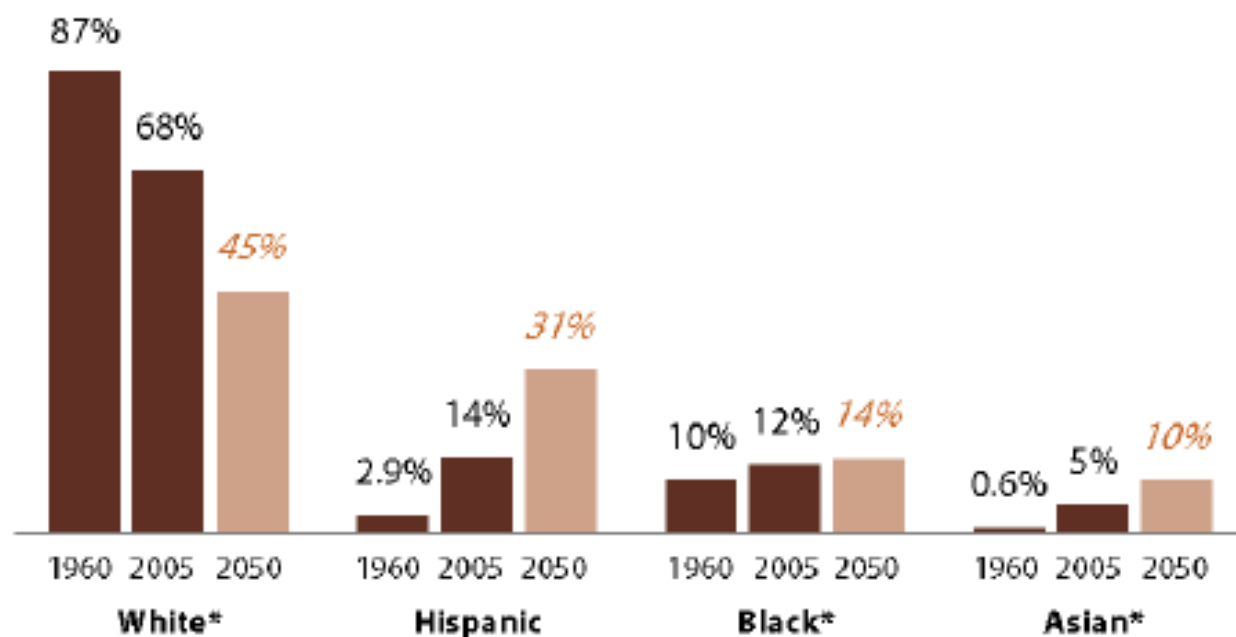
Note: All races modified and not Hispanic (*); American Indian/Alaska Native not shown. See "Methodology." Projections for 2050 indicated by light brown bars.

Source: Pew Research Center, 2008

# Summary of Population Changes

- Grow from 296M to 438M, an increase of 142M (48%)
- 82% of growth due to immigrants and their US-born offspring
- Nearly 1 in 5 Americans will be foreign-born vs. 1 in 8 in 2005
- Non-Hispanic Whites will become a minority
- Hispanics will triple in number, increasing share to 29% of population
- Blacks will remain 13% of the population; Asians will increase to 9% from 5%
- Elderly population will more than double
- Gap between the number of working-age people and dependents (children and seniors) will widen as boomers age

# Implications of Aging Population

- Percent of older Americans who continue to drive is growing, especially older women
  - Safety implications
  - Air quality concerns (older cars)
- Dependence on private car increasing, on transit decreasing
- Make 22% less trips than those <65, but mostly non-work trips
- Important subsets are less likely to have car access
- Special transit services often not available or inadequate

NHTS, March 2009, Older Americans: Safety Implications

Brookings Institution, 2003, The Mobility Needs of Older Americans: Implications for Transportation Reauthorization

- Affordable housing
  - provision and maintenance of housing and location efficiency
  - property values and tax rates
- Older adults, along with other low- or fixed-income persons, are most susceptible to rising energy, housing, and transportation costs

# Implications of More Diverse Population

- Elderly Hispanic or black persons are more likely to require assistance due to medical conditions
  - Also less likely to be licensed
  - Rely more on family members
- Greater demand for public transportation
- Need for bilingual or multilingual signage
- More housing options needed for larger size and composition of families

# Where will all the people go?

- From 2007-2008, only 12% of population changed residences

- Why move?  Economic opportunity

- Why stay?  Family and social network

- Differences between movers and stayers?  Geography and education

- Why fewer moves? Aging population and more two-career households

- Economic downturn may have also contributed

Pew Research Center, December 2008, Who Moves? Who Stays Put? Where's Home?

- New immigrants will be concentrated in certain areas (West and Northeast)
  - Stress on existing aging infrastructure
  - Demands for new infrastructure (housing, transportation, etc.)
- Location of first entry has shifted to suburbs
- Elderly also more likely to be located in the suburbs
- Often fewer transportation options in suburban locations

# Aging suburbs due in part to "age-in-place" phenomenon



Figure 2. Percent of U.S. Elderly by Residential Location

RURAL **23%**

SUBURB **56%**

CENTER CITY **21%**
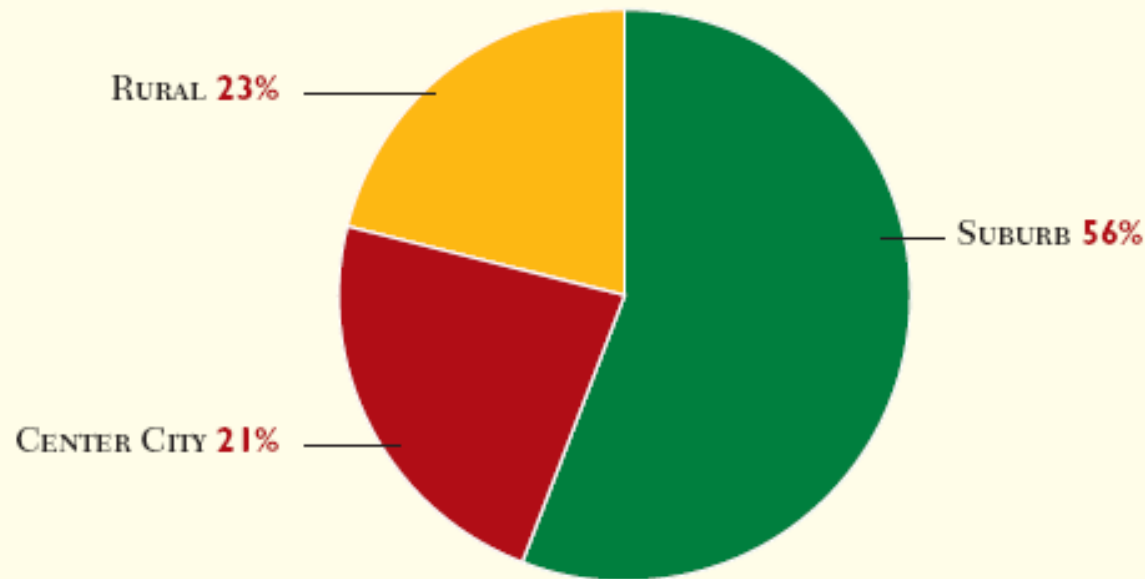
Source: Lavada E. DeSalles, "Testimony to U.S. Senate Committee on Banking, Housing and Urban Affairs," July 17, 2002

Brookings Institution, 2003, The Mobility Needs of Older Americans: Implications for Transportation Reauthorization

# Suburban havens (Northeast) and Suburban Growth Centers (Sunbelt)

**Table 1. Metropolitan Areas' Suburban Share of Elderly Over Age 65 and Change in Population Under 35, 1990–2000.**

| Metropolitan Rank in Percent of Suburban Population 65+ | Metropolitan Area | Percent of Suburban Population 65+ | Percent change in Suburban Population Under 35 |
|---|---|---|---|
| 1 | Sarasota, FL MSA | 29.5 | 13.0 |
| 2 | West Palm Beach, FL MSA | 24.0 | 22.3 |
| 3 | Tampa, FL MSA | 20.5 | 11.9 |
| 4 | Scranton, PA MSA | 18.8 | -11.0 |
| 5 | Pittsburgh, PA MSA | 17.9 | -11.2 |
| 6 | Tucson, AZ MSA | 17.3 | 20.7 |
| 7 | Monmouth, NJ PMSA | 16.9 | 3.4 |
| 8 | Buffalo, NY MSA | 16.6 | -9.6 |
| 9 | Youngstown, OH MSA | 16.3 | -8.7 |
| 10 | Fort Lauderdale, FL MSA | 16.2 | 32.0 |
| 11 | Allentown, PA MSA | 16.0 | -3.4 |
| 12 | Providence, RI-MA NECMA | 15.3 | -6.3 |
| 13 | Cleveland, OH MSA | 15.0 | -6.1 |
| 14 | Phoenix, AZ MSA | 14.9 | 47.5 |
| 15 | Harrisburg, PA MSA | 14.9 | -2.8 |
| 16 | Hartford, CT NECMA | 14.5 | -7.4 |
| 17 | Springfield, MA NECMA | 14.4 | -9.0 |
| 18 | Albany, NY MSA | 14.3 | -8.3 |
| 19 | Bergen, NJ MSA | 14.1 | 1.4 |
| 20 | Bridgeport, CT NECMA | 14.1 | -3.5 |

*Source. William Frey, "Boomers and Seniors in the Suburbs" (Washington, Brookings, 2003).*
*Note: MSA is metropolitan statistical area; PMSA is a primary metropolitan statistical area, and NECMA is New England County Metropolitan Area.*

**Table 2. Metropolitan Areas' Suburban Change in Elderly Over Age 65 and Change in Population Under 35, 1990–2000.**

| Metropolitan Rank in Growth in Percent of Suburban Population 65+ | Metropolitan Area | Percent Change in Suburban Population 65+ | Percent change in Suburban Population Under 35 |
|---|---|---|---|
| 1 | El Paso, TX MSA | 83.1 | 39.5 |
| 2 | Las Vegas, NV-AZ MSA | 78.1 | 75.4 |
| 3 | Colorado Springs, CO MSA | 69.8 | 17.7 |
| 4 | Honolulu, HI MSA | 53.4 | -7.1 |
| 5 | Tucson, AZ MSA | 53.1 | 20.7 |
| 6 | Phoenix-Mesa, AZ MSA | 52.1 | 47.5 |
| 7 | Austin, TX MSA | 48.6 | 42.4 |
| 8 | McAllen, TX MSA | 47.3 | 50.7 |
| 9 | Denver, CO PMSA | 47.2 | 23.5 |
| 10 | Jacksonville, FL MSA | 46.6 | 16.2 |
| 11 | Houston, TX PMSA | 46.2 | 19.6 |
| 12 | Albuquerque, NM MSA | 43.0 | 12.1 |
| 13 | Dallas, TX PMSA | 41.5 | 28.2 |
| 14 | Salt Lake City, UT MSA | 41.3 | 17.7 |
| 15 | Baton Rouge, LA MSA | 40.1 | 8.2 |
| 16 | Atlanta, GA MSA | 39.9 | 35.3 |
| 17 | Memphis, TN-AR-MS MSA | 39.8 | 6.8 |
| 18 | Sacramento, CA PMSA | 39.6 | 13.5 |
| 19 | Fort Worth, TX PMSA | 39.2 | 14.1 |
| 20 | Columbia, SC MSA | 36.3 | 5.0 |

*Source: William Frey, "Boomers and Seniors in the Suburbs" (Washington, Brookings, 2003).*
*Note: MSA is metropolitan statistical area; PMSA is a primary metropolitan statistical area, and NECMA is New England County Metropolitan Area.*

Brookings Institution, 2003, The Mobility Needs of Older Americans: Implications for Transportation Reauthorization

# Population Change Among States

**Where are people moving to?**

- Raleigh, NC
- Austin, TX*
- Charlotte, NC*
- Phoenix, AZ
- Dallas, TX*
- San Antonio, TX
- Houston, TX
- New Orleans, LA
- Atlanta, GA
- Denver, CO*

Data from 2008 Census released in March '09

*Corresponds with data from American Moving and Storage Association

## Where Does Your State Fit?

| High Magnet/Low Sticky | Low Magnet/High Sticky |
|---|---|
| Alaska | Alabama |
| Arkansas | California |
| Colorado | Illinois |
| Delaware | Indiana |
| District of Columbia | Kentucky |
| Idaho | Louisiana |
| Kansas | Massachusetts |
| Montana | Michigan |
| Nevada | Minnesota |
| New Hampshire | Missouri |
| New Mexico | Ohio |
| Vermont | Pennsylvania |
| Wyoming | Texas |
| | Utah |
| | Wisconsin |

| High Magnet/High Sticky | Low Magnet/Low Sticky |
|---|---|
| Arizona | Iowa |
| Florida | Maine |
| Georgia | Mississippi |
| Maryland | Nebraska |
| North Carolina | New York |
| Oregon | North Dakota |
| South Carolina | Rhode Island |
| Tennessee | South Dakota |
| Virginia | West Virginia |
| Washington | |

### Neither Here Nor There

Connecticut   Hawaii   New Jersey   Oklahoma

Note: Listings within each category are in alphabetical order.

Pew Research Center, March 2009, Magnet or Sticky?  A State-by-State Typology

**2008** Population Estimates for 2008
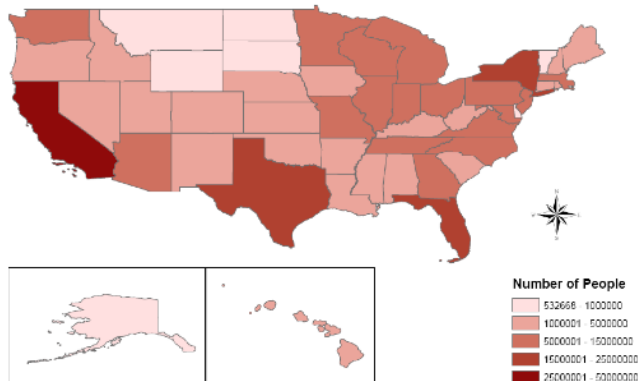
**2030** Population Projections in 2030

Number of People
- 532668 - 1000000
- 1000001 - 5000000
- 5000001 - 15000000
- 15000001 - 25000000
- 25000001 - 50000000

Number of People
- 522979 - 1500000
- 1500001 - 2500000
- 2500001 - 7500000
- 7500001 - 20000000
- 20000001 - 50000000
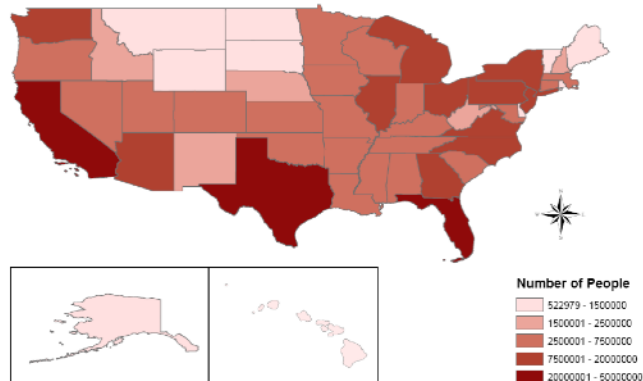
# Changes in Population from 2000 to 2030 (Percent)

**Percent Population Change**
- -5.5 - 0.0
- 0.1 - 25.0
- 25.1 - 50.0
- 50.1 - 75.0
- 75.1 - 100.0
- 100.1 - 115.0
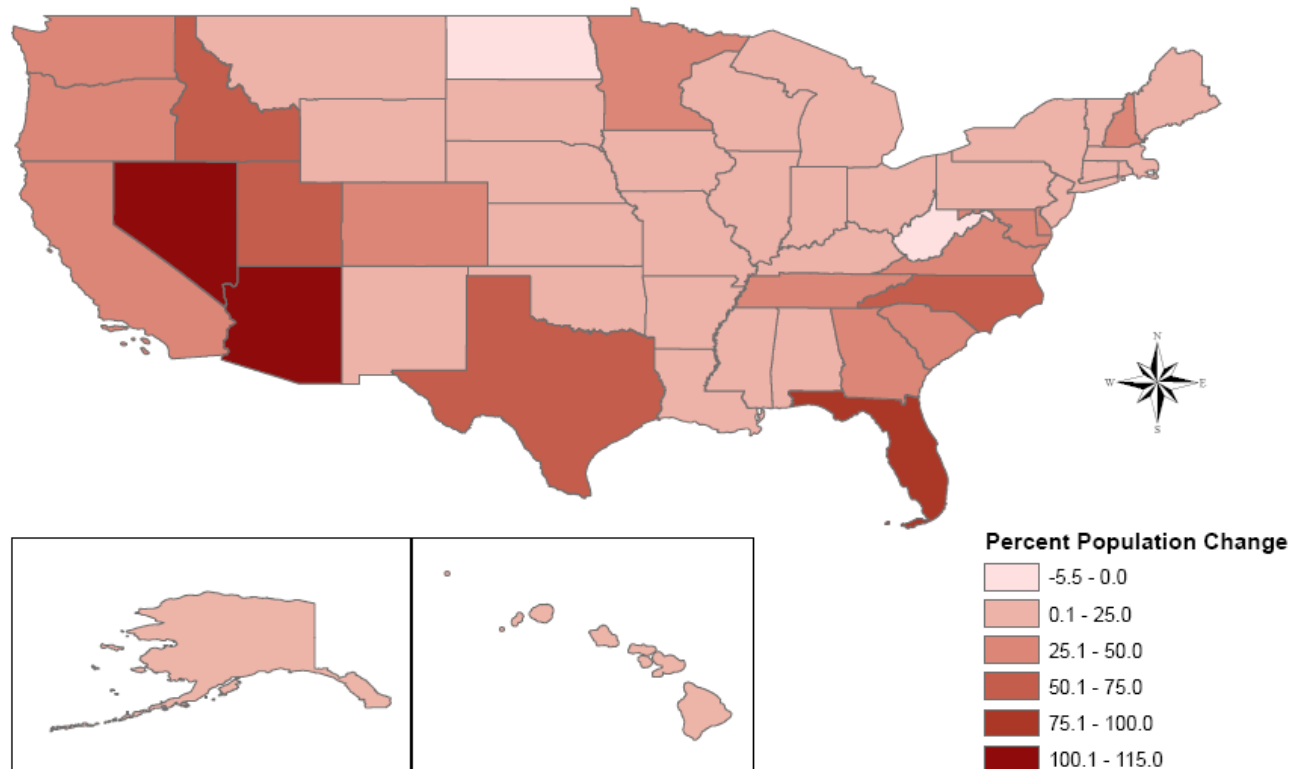
Data from US Census Bureau 2008 TIGERLine

Georgia Tech — School of Civil and Environmental Engineering

CEE 8900: Independent Research Project
Messner Project: Demographics Research

Map Prepared by: Sara Beck

Date: June 24, 2009

# Climate Change & Migration



Animation of sea level rise in Northeast: http://www.geo.arizona.edu/dgesl/research/other/climate_change_and_sea_level/sea_level_rise/northeast/slr_usane_a.htm

# U.S. Drought Monitor

**June 16, 2009**
Valid 8 a.m. EDT
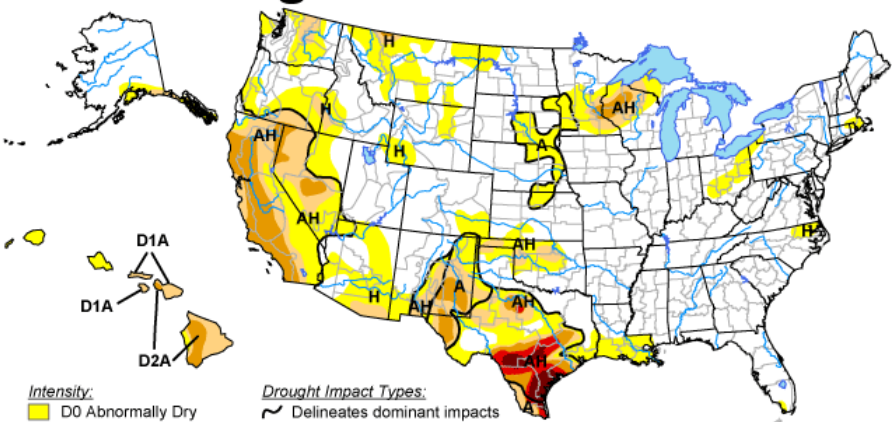
D1A
D1A
D2A

AH

**Intensity:**
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**
~ Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

http://drought.unl.edu/dm

*Released Thursday, June 18, 2009*
*Author: M. Brewer/L. Love-Brotak, NOAA/NESDIS/NCDC*

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# U.S. Drought Monitor

**June 17, 2008**
Valid 8 a.m. EDT
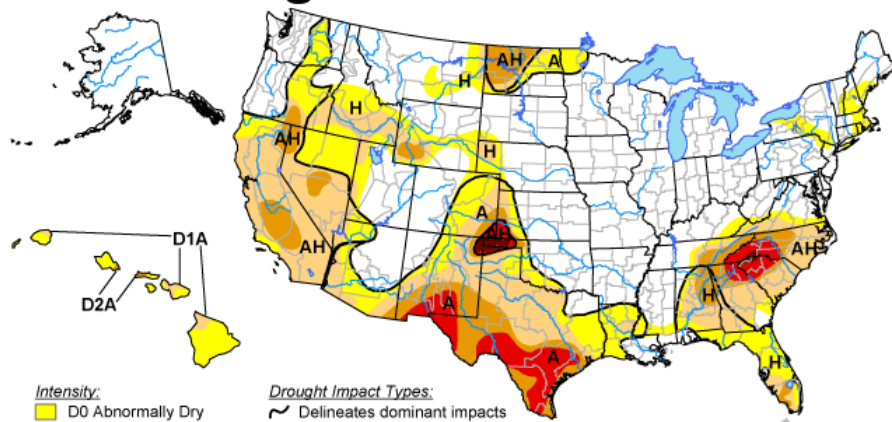
D1A
D2A

**Intensity:**
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**
~ Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

http://drought.unl.edu/dm

*Released Thursday, June 19, 2008*
*Author: Rich Tinker, CPC/NOAA*

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# U.S. Drought Monitor

**June 19, 2007**
Valid 8 a.m. EDT
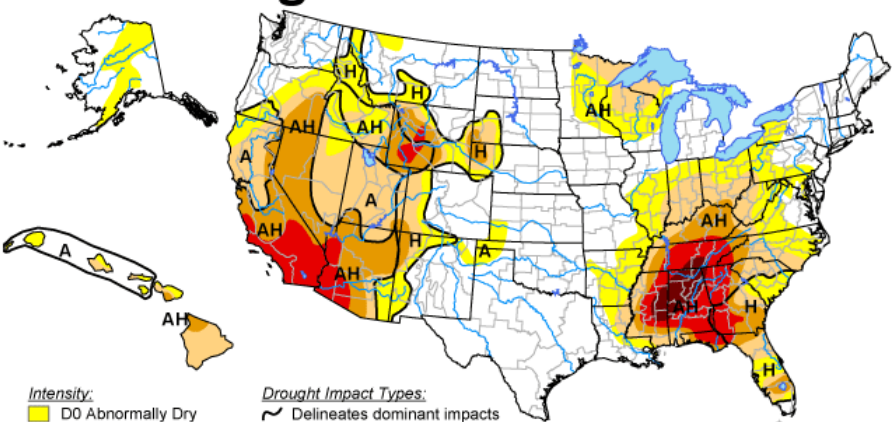
**Intensity:**
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**
~ Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

http://drought.unl.edu/dm

*Released Thursday, June 21, 2007*
*Author: Rich Tinker, Climate Prediction Center, NCEP/NWS//NOAA*

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# U.S. Drought Monitor

**June 13, 2006**
Valid 8 a.m. EDT
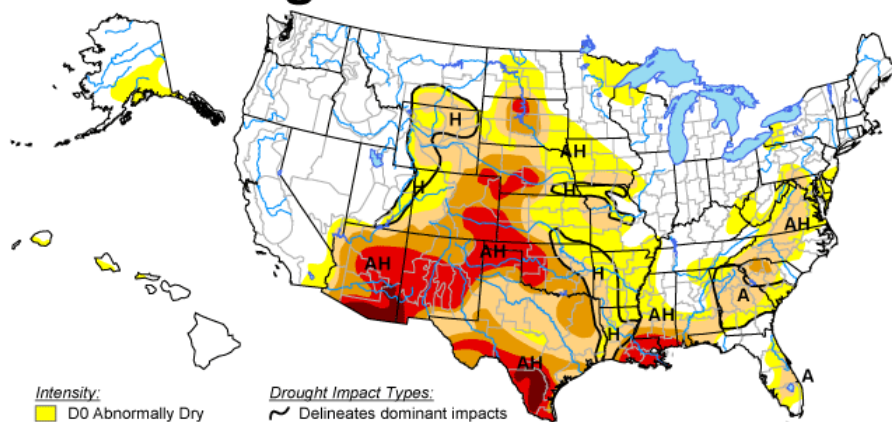
**Intensity:**
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**
~ Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

http://drought.unl.edu/dm

*Released Thursday, June 15, 2006*
*Author: Rich Tinker, Climate Prediction Center, NOAA*

# MegaRegions Framework

- Between 2005 and 2050, more than half of the nation's population growth, and perhaps as much as two-thirds of its economic growth, will occur in several "MegaRegions."
- These regions are characterized as networks of metropolitan centers and their surrounding areas that have existing environmental, economic and infrastructure relationships. The traits of a megaregion also include a shared sense of identity, particularly stemming from economic and social interactions.
- They often cross county and state lines and are linked by transportation and communication networks.

# RPA's MegaRegions (2006)
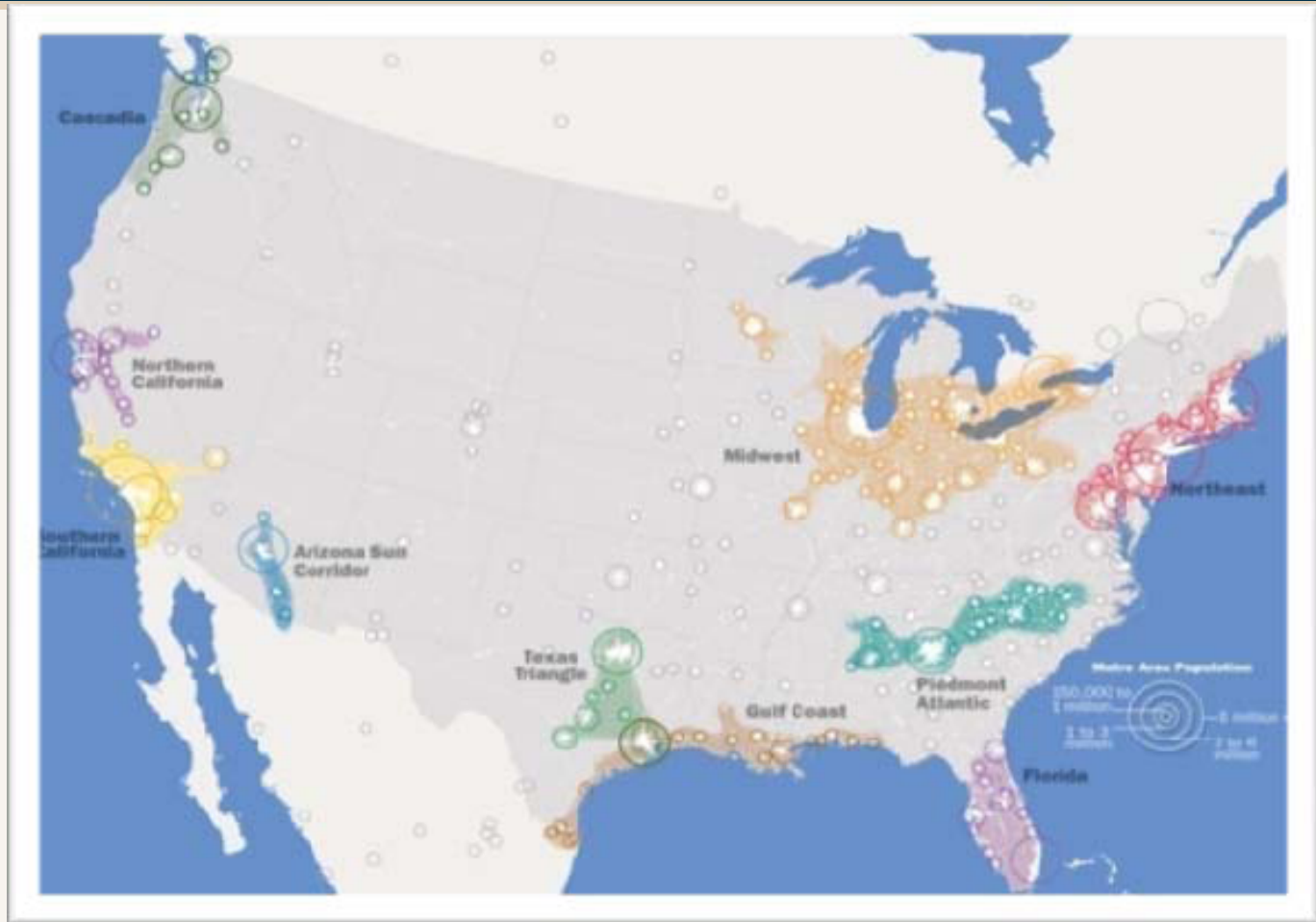
# MegaPolitans (2005)

# Criteria for MegaRegions

| | Metropolitan Institute | Regional Plan Association |
|---|---|---|
| **Analysis Unit** | County | County |
| **Requirements of megaregions** | More than 2 metropolitan areas & 10 million population by 2040 | N/A |
| **Analysis Criteria** | - Population size<br>- Contiguity<br>- Cultural and historical geography<br>- Physical environment<br>- Links of large centers<br>- Growth projections<br>- Goods and service flows | - Environmental systems and topography<br>- Infrastructure system<br>- Economic linkage<br>- Settlement patterns and land use<br>- Shared culture and history |

**2000**
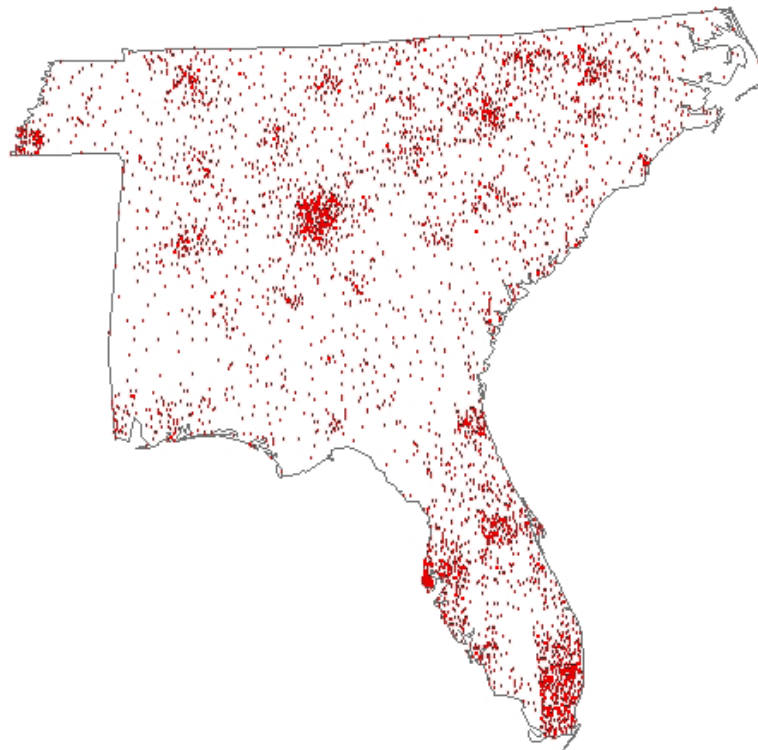
**2050**

Legend

· 1 Dot = 10,000 Population
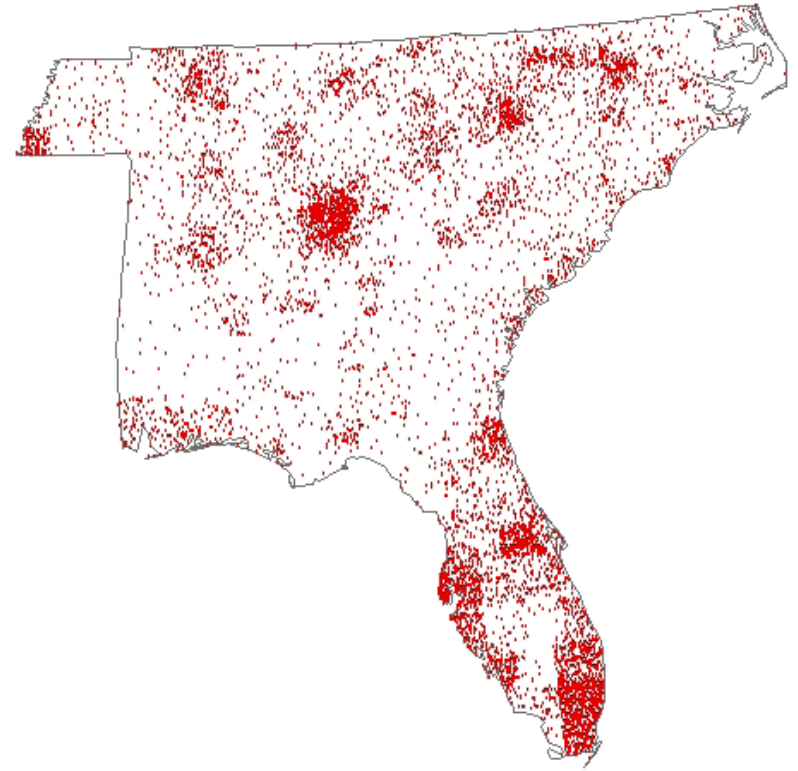
Miles
0   55   110   220   330   440

mountain range

cities

rivers

watersheds

protected lands

critical lands

Atlantic Ocean

Gulf of Mexico

| 0 | 45 | 90 | 180 | 270 | 360 |

Miles
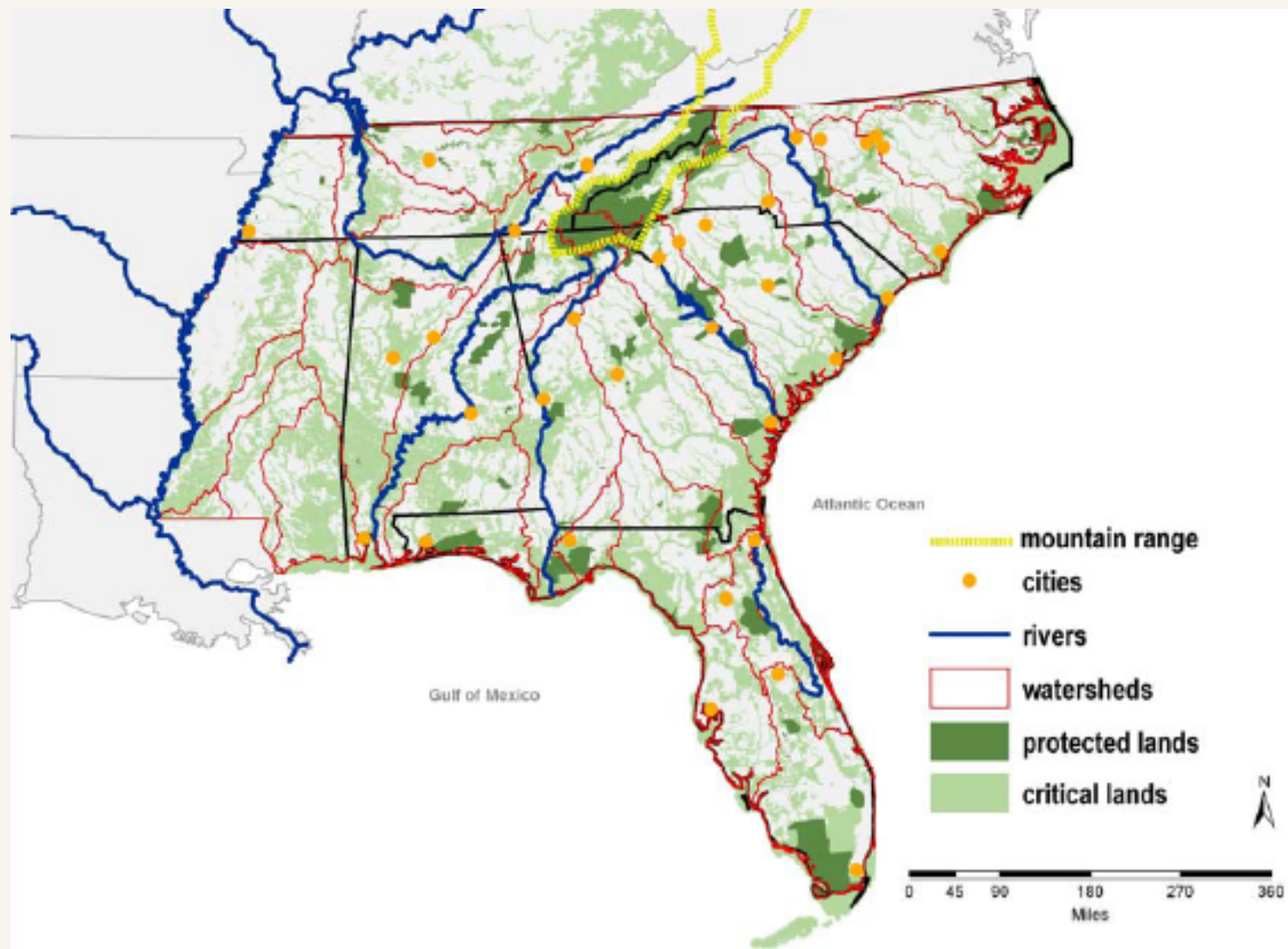
# Piedmont Atlantic MegaRegion
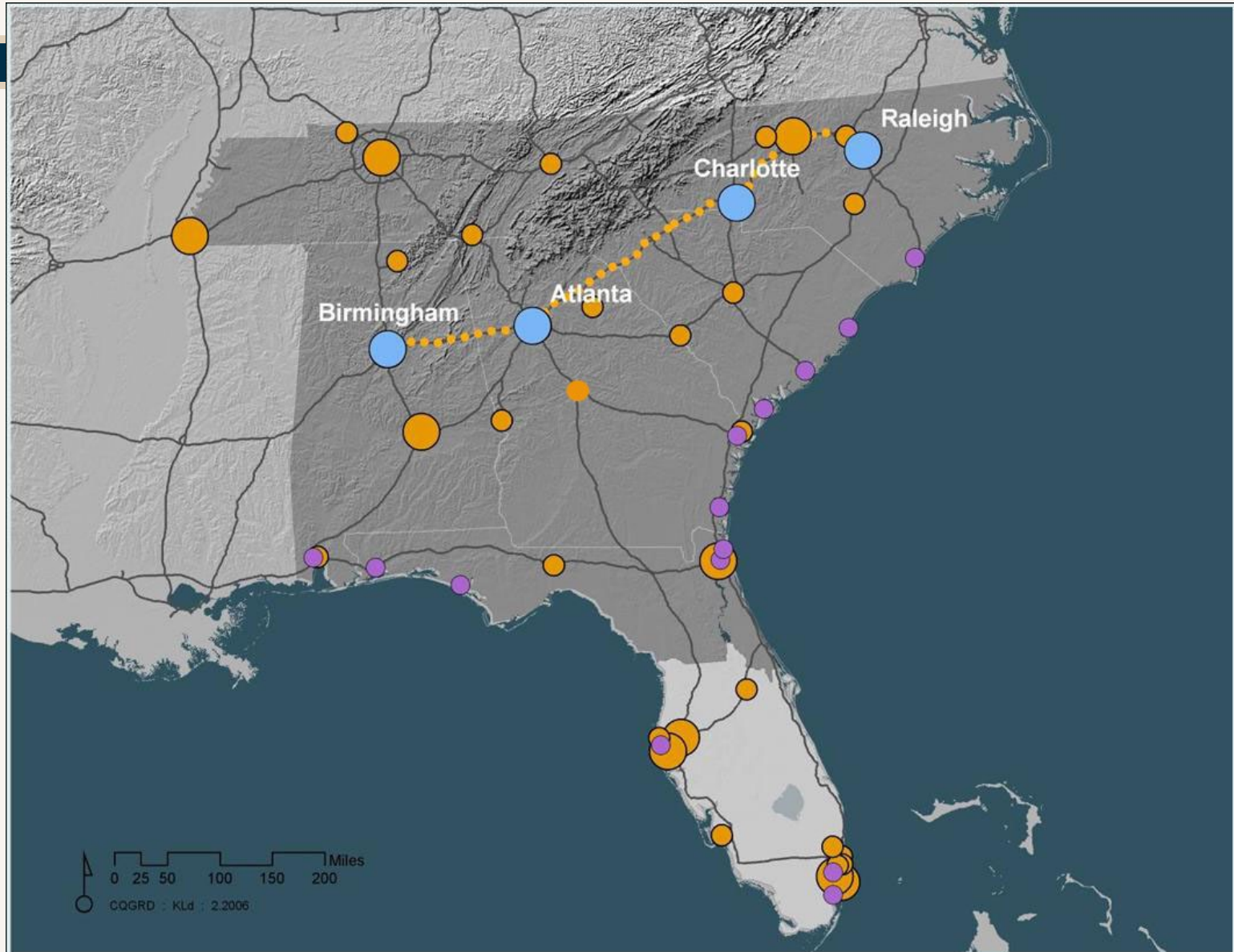
# Delineating MegaRegions (CQGRD)



**Metro Regions:**
Combinations of core
counties and their areas
of influences

**Functional Regions:**
Clusters of Metro
Regions based on
functional relationships

**Megaregions:**
Geographically
contiguous and close
Functional Regions

# MegaRegions - 2050



Source: Center for Quality Growth and Regional Development (CQGRD), Georgia Institute of Technology, 2007
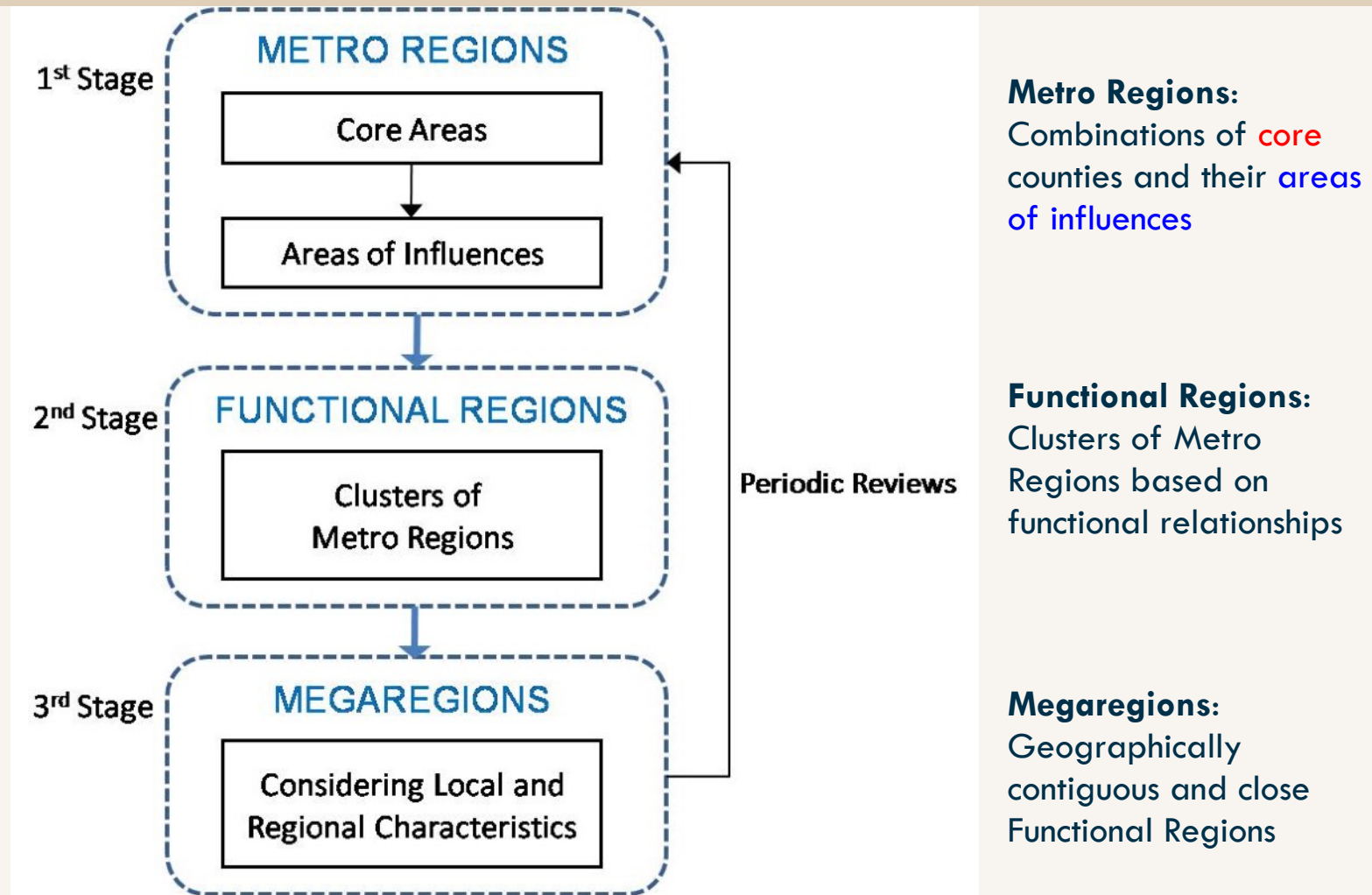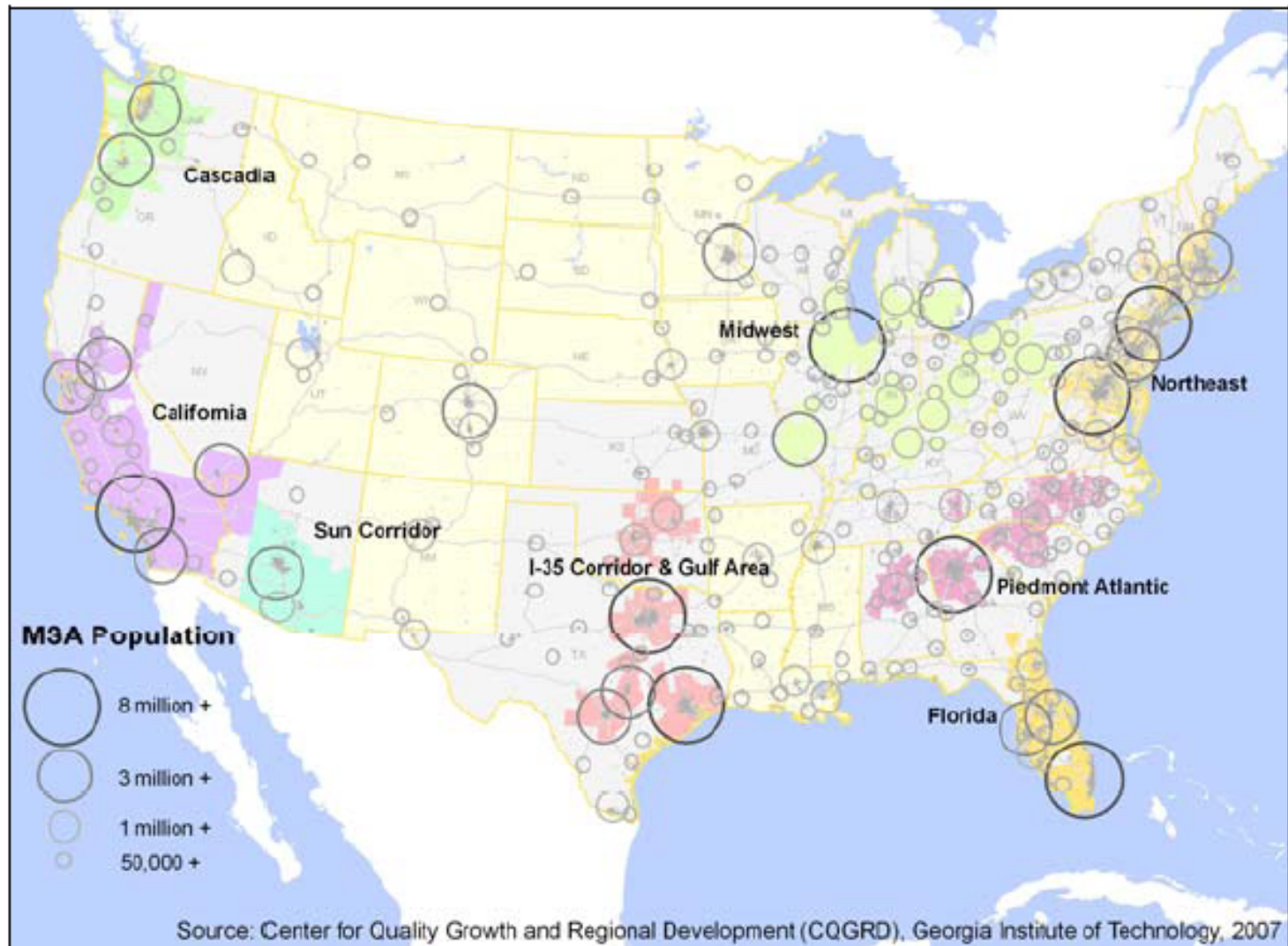
# Density of trade volumes with Canada and Mexico (2035)
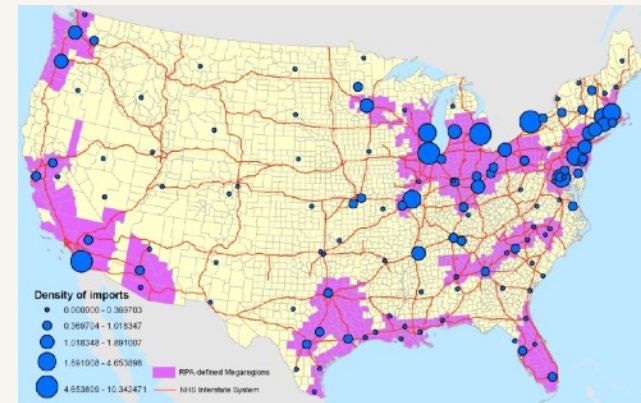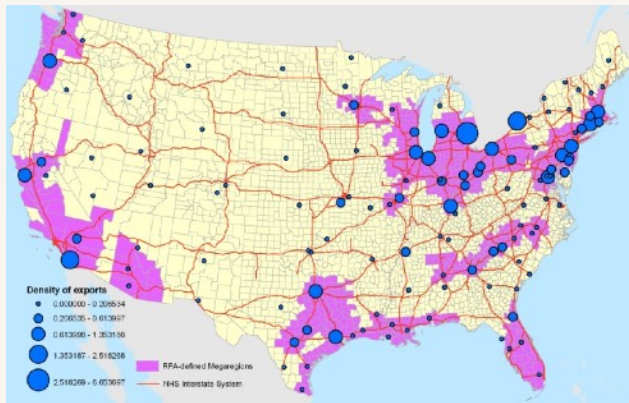


# Density of trade volumes with overseas countries (2035)
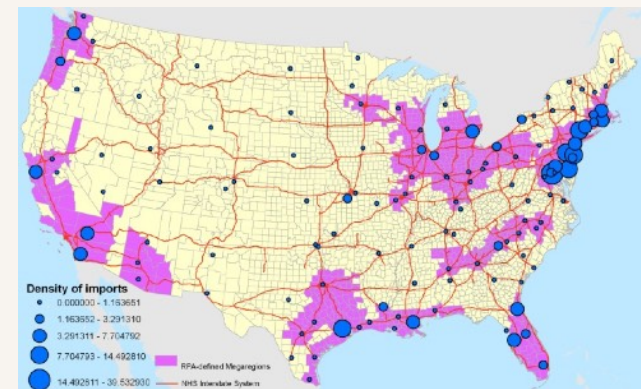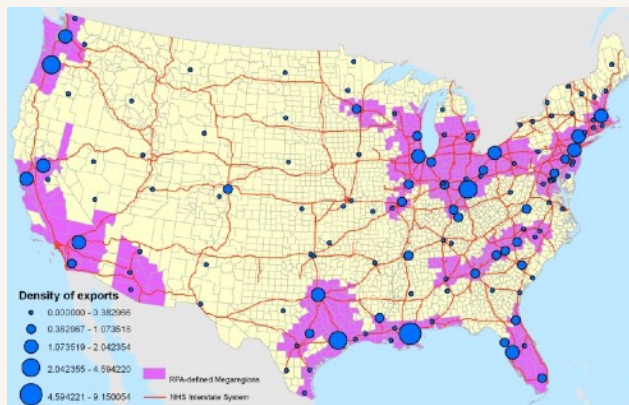


Source: FHWA Freight Analysis Framework (2006)
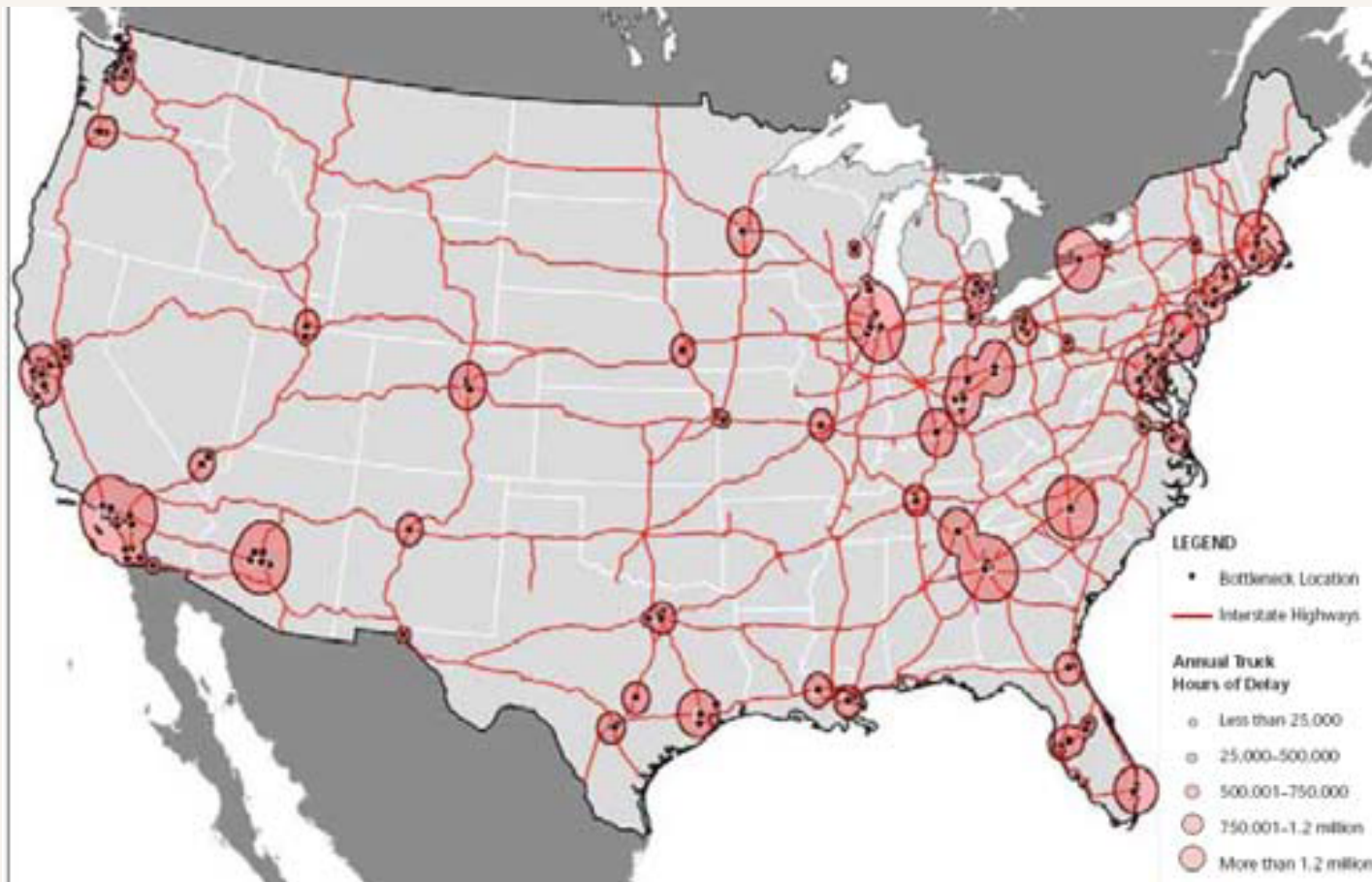
**Interstate Bottlenecks**
(National Surface Transportation Policy and Revenue Study Commission, 2007)
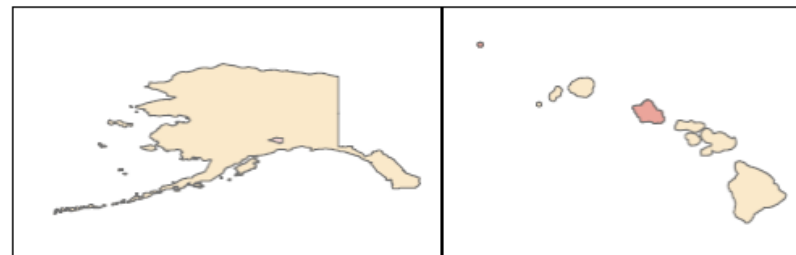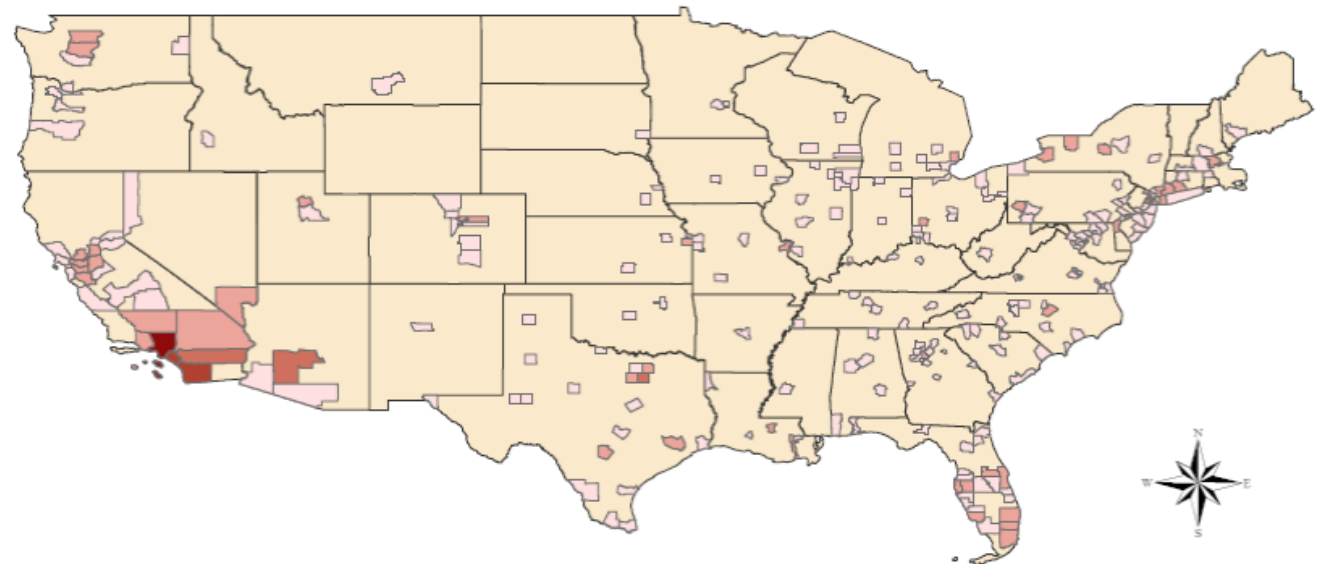
**Proposed High Speed Rail Corridors**
(FRA, 2005)

# Planning Challenges for MegaRegions

- Defining MegaRegions based on environmental, economic, cultural linkages

- Developing institutions for integrated planning across functions at megaregional scale

- Continually changing and growing rapidly, so planning requires flexibility

- Funding for projects that cross jurisdictional boundaries

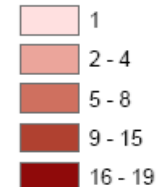- Different issues in different MegaRegions

# Infrastructure-Specific Projections – Water Systems

**In 10 years, 35 states will be facing water shortages. In 2009, 8% of water systems serve 81% of the population.**



Location of water systems serving over 100,000 people each

**Large Scale Water Systems**
- 1
- 2 - 4
- 5 - 8
- 9 - 15
- 16 - 19

Data from Environmental Protection Agency

Georgia Tech | College of Architecture

City Planning 6514 - Introduction to Geographic Information Systems
Major Assignment 1.3: National Base Map

Map Prepared by: Sara Beck

Date: June 23, 2009

# Infrastructure-Specific Projections – Water Pipes

**Many water and wastewater pipes are reaching the end of their design lives**
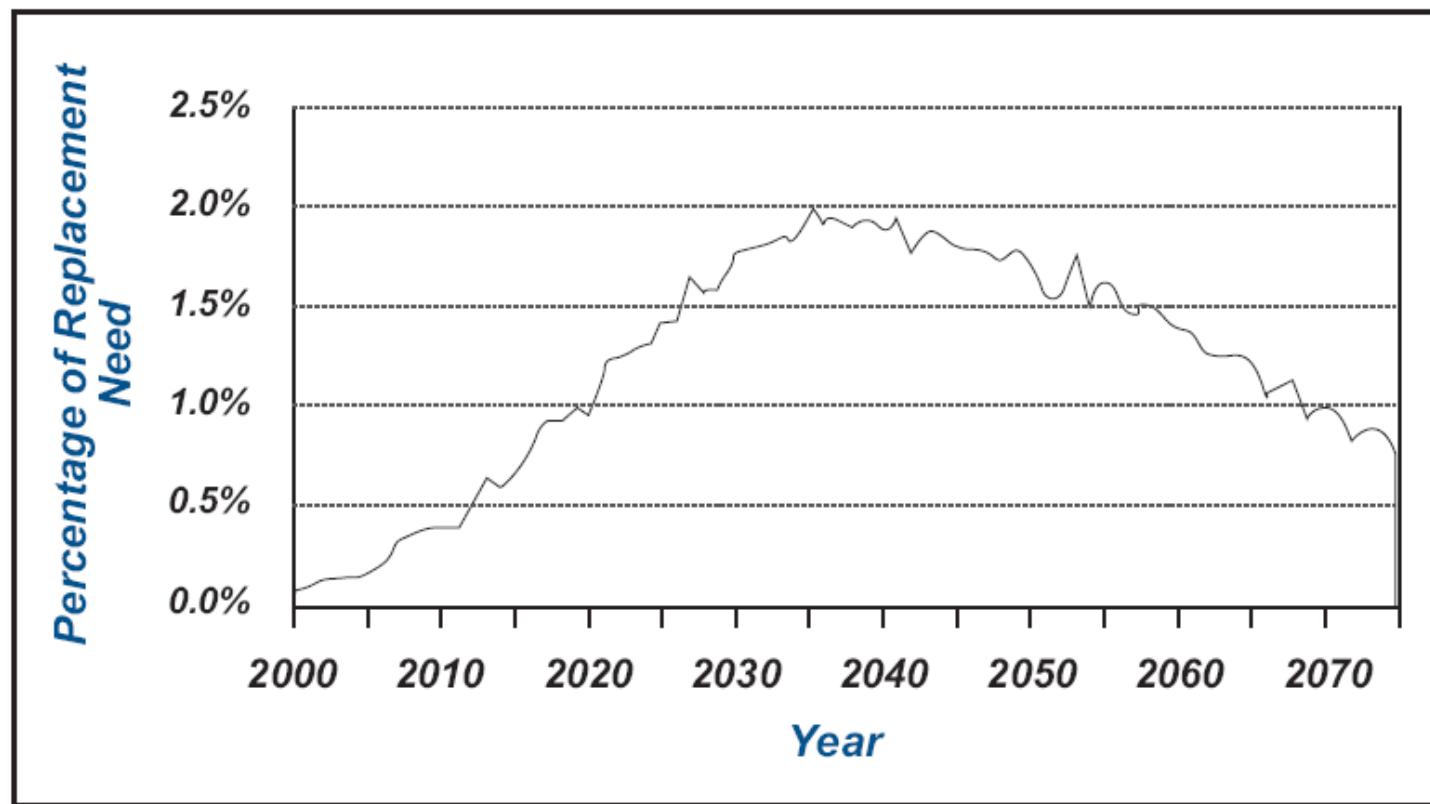


Figure 2–11: Projected Annual Replacement Needs for Transmission Lines and Distribution Mains, 2000–2075

# Infrastructure-Specific Projections - Bridges

- The average bridge is 43 years old

- 12% are structurally deficient

  - limited structural capacity

- 15% are functionally obsolete

  - can't accommodate current traffic volumes, vehicle sizes and weights

source: ASCE Infrastructure Report Card

**Miles of roads of federal-aid urbanized areas**

| | Total Miles/1,000 persons | |
| --- | --- | --- |
| | Interstate HWY | Local |
| Meagregions | 0.0586 | 2.6949 |
| Non-megaregions | 0.1075 | 3.8068 |

Source: CQGRD from Miles and daily vehicle-miles of travel, FHWA (2006)

**Share of the proposed mileage of SHR (%)**

|  | Megaregions | Non-megaregions | Total |
|---|---|---|---|
| Federally designated routes | 40.4 | 20.1 | 60.5 |
| Others | 25.3 | 14.2 | 39.5 |
| Total | 65.7 | 34.3 | 100.0 |

Source: Schwieterman & Scheidt (2007), Survey of Current High-Speed Rail Planning Efforts in the United States, Transportation Research Record, Journal of the Transportation Research Board, No. 1995. Railways 2007. 27-34.

# Planning Considerations

- Longer-term planning to begin preparing for demographic changes
- Travel forecasting based on mean indicators can mask needs of changing population
- Dealing with uncertainty
- Infrastructure planning and funding at multiple scales, including the MegaRegion
- Focus on jobs/housing/recreation balance in suburban locations OR making inner cities more attractive to families

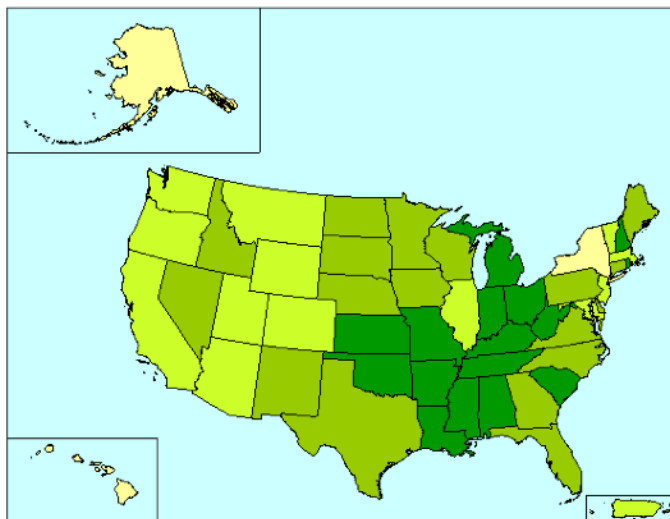# Additional Materials

# 2007 Transportation Data

## Driving Alone

**Data Classes**
Percent
- 36.3 – 36.3
- 54.3 – 67.4
- 72.1 – 75.6
- 76.6 – 80.1
- 80.6 – 83.6

**Features**
- Major Road
- Street
- Stream/Waterbody

Items in gray text
are not visible
at this zoom level

NOTE. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

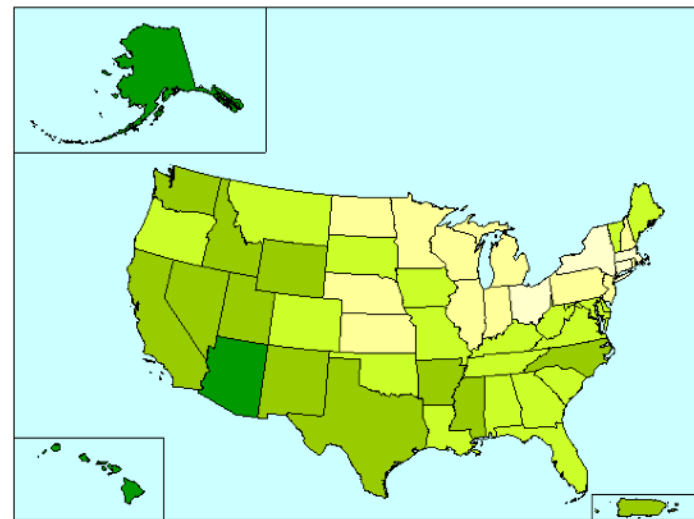Source: U.S. Census Bureau, 2006-2007 American Community Survey

## Carpooling

**Data Classes**
Percent
- 6.8 – 8.4
- 8.7 – 9.9
- 10.1 – 11.5
- 11.6 – 12.9
- 13.6 – 15.6

**Features**
- Major Road
- Street
- Stream/Waterbody

Items in gray text
are not visible
at this zoom level

NOTE. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

Source: U.S. Census Bureau, 2006-2007 American Community Survey

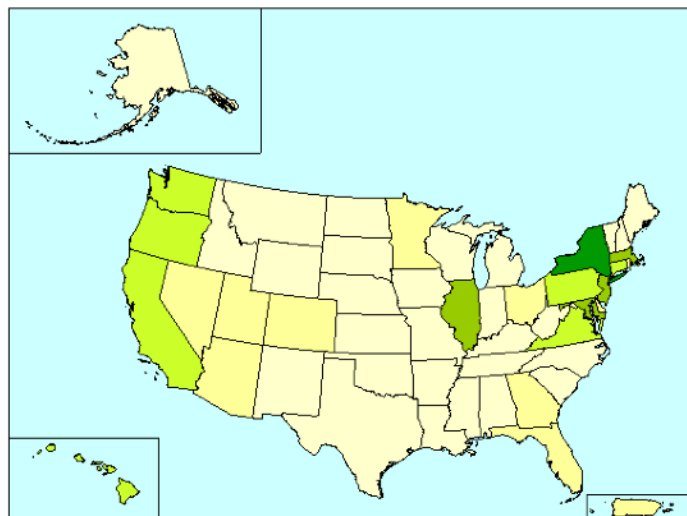## Public Transportation

**Data Classes**
Percent
- 0.4 – 1.7
- 1.9 – 3.5
- 3.9 – 5.5
- 8.6 – 10.3
- 26.3 – 37.8

**Features**
- Major Road
- Street
- Stream/Waterbody

Items in gray text
are not visible
at this zoom level

NOTE. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.
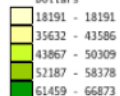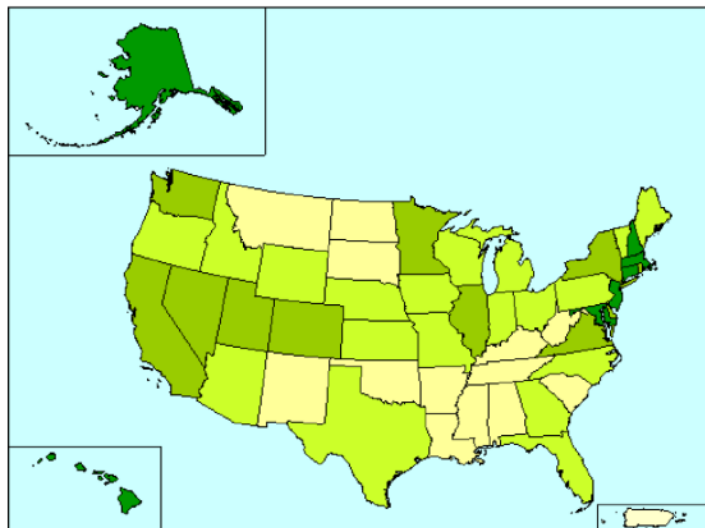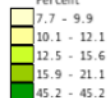
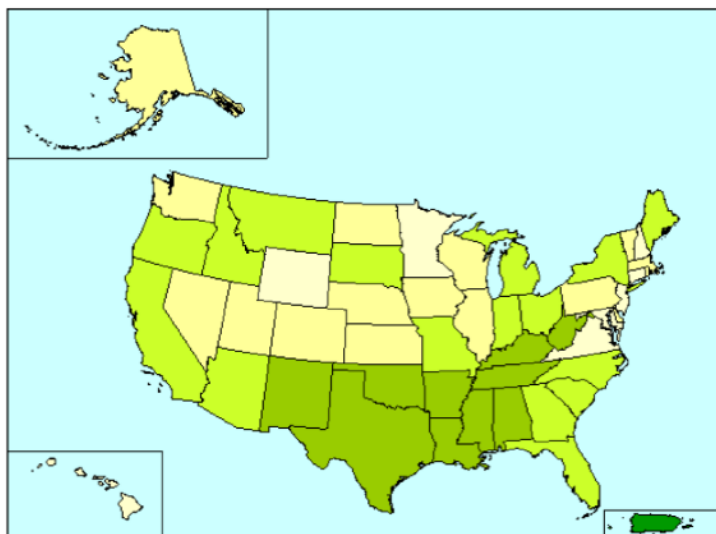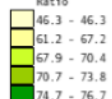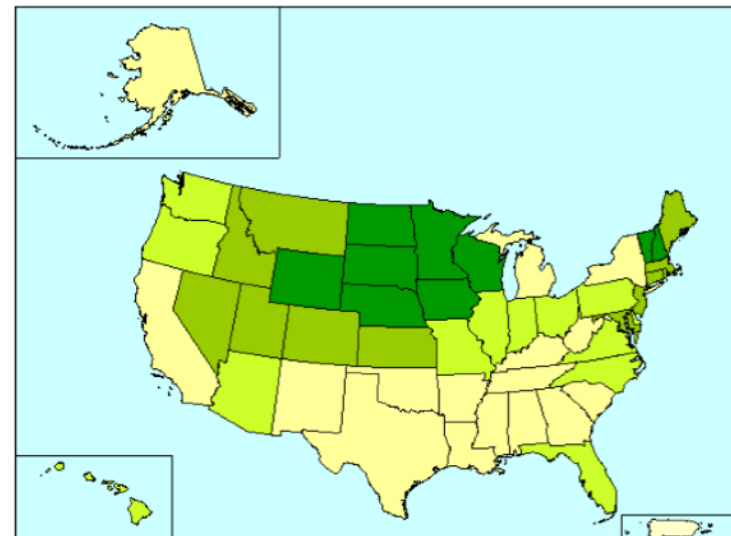Source: U.S. Census Bureau, 2006-2007 American Community Survey

# 2007 Income Data

## Median Household Income



## % Below Poverty Line



## Employment/Population Ratio

# Population Projections

| | 2000 Census Population | | | 2030 Projections Population | | | Change: 2000 to 2030 (Percent) | |
|---|---|---|---|---|---|---|---|---|
| | **United States** | **281,421,906** | | **United States** | **363,584,435** | | **United States** | **29.2** |
| 1 | California | 33,871,648 | 1 | California | 46,444,861 | 1 | Nevada | 114.3 |
| 2 | Texas | 20,851,820 | 2 | Texas | 33,317,744 | 2 | Arizona | 108.8 |
| 3 | New York | 18,976,457 | 3 | Florida | 28,685,769 | 3 | Florida | 79.5 |
| 4 | Florida | 15,982,378 | 4 | New York | 19,477,429 | 4 | Texas | 59.8 |
| 5 | Illinois | 12,419,293 | 5 | Illinois | 13,432,892 | 5 | Utah | 56.1 |
| 6 | Pennsylvania | 12,281,054 | 6 | Pennsylvania | 12,768,184 | 6 | Idaho | 52.2 |
| 7 | Ohio | 11,353,140 | 7 | North Carolina | 12,227,739 | 7 | North Carolina | 51.9 |
| 8 | Michigan | 9,938,444 | 8 | Georgia | 12,017,838 | 8 | Georgia | 46.8 |
| 9 | New Jersey | 8,414,350 | 9 | Ohio | 11,550,528 | 9 | Washington | 46.3 |
| 10 | Georgia | 8,186,453 | 10 | Arizona | 10,712,397 | 10 | Oregon | 41.3 |
| 11 | North Carolina | 8,049,313 | 11 | Michigan | 10,694,172 | 11 | Virginia | 38.8 |
| 12 | Virginia | 7,078,515 | 12 | Virginia | 9,825,019 | 12 | Alaska | 38.4 |
| 13 | Massachusetts | 6,349,097 | 13 | New Jersey | 9,802,440 | 13 | California | 37.1 |
| 14 | Indiana | 6,080,485 | 14 | Washington | 8,624,801 | 14 | Colorado | 34.7 |
| 15 | Washington | 5,894,121 | 15 | Tennessee | 7,380,634 | 15 | New Hampshire | 33.2 |
| 16 | Tennessee | 5,689,283 | 16 | Maryland | 7,022,251 | 16 | Maryland | 32.6 |
| 17 | Missouri | 5,595,211 | 17 | Massachusetts | 7,012,009 | 17 | Tennessee | 29.7 |
| 18 | Wisconsin | 5,363,675 | 18 | Indiana | 6,810,108 | 18 | Delaware | 29.2 |
| 19 | Maryland | 5,296,486 | 19 | Missouri | 6,430,173 | 19 | South Carolina | 28.3 |
| 20 | Arizona | 5,130,632 | 20 | Minnesota | 6,306,130 | 20 | Minnesota | 28.2 |

# 10 MegaRegions

| Metropolitan Institute (10 Megapolitan Areas) | Regional Plan Association (10 Megaregions) |
|---|---|
| 1.Northeast (Including Richmond (VA)) | 1.Northeast (Excluding Richmond and Virginia Beach (VA) of Chesapeake) |
| 2.Midwest (Including Chicago (IL), Detroit (MI), Indianapolis (IN), Cincinnati (OH), Columbus (OH), Pittsburgh (PA), Cleveland (OH)) | 2.Great Lakes (Including Minneapolis (MN), Chicago (IL), St. Louis (MO), Indianapolis (IN), Louisville (KY), Cincinnati (OH), Columbus (OH), Cleveland (OH), Detroit (MI), Pittsburgh (PA), Buffalo (NY)) |
| 3.Piedmont (Including Knoxville (TN)) | 3.Piedmont Atlantic (Excluding Knoxville (TN)) |
| 4.Peninsula (Excluding Jacksonville, FL) | 4.Florida (Including Jacksonville, FL) |
| 5.Gulf Coast (Including coast areas of LA, MS, AL, TX, and FL) | 5.Gulf Coast (Including coast areas of LA, MS, AL, TX, and FL) |
| 6. I-35 Corridor (Including Tulsa (OK), Oklahoma City (OK), Dallas-Fort Worth (TX),  San Antonio (TX), Austin (TX)) | 6.Texas Triangle (Including Dallas-Fort Worth, Houston, San Antonio, Austin) |
| 7. Valley of the Sun | 7.Arizona Sun Corridor |
| 8.Cascadia | 8.Cascadia |
| 9.NorCal | 9.Northern California |
| 10.Southland | 10.Southern California |

## 1. Data (1): Metro Regions

|  | Variables | Unit | Sources |
|---|---|---|---|
| **Core Areas** | Population | County | Woods & Poole |
|  | Employment (Industrial structure) | County | Woods & Poole |
|  | Gross Regional Product | County | Woods & Poole |
|  | Greenhouse Gas Emission | County | The Vulcan Project (Funded by the North American Carbon Program - NACP) |
|  | Global companies' revenue | City | CNN Fortune 500 Companies |
|  | Patent | County | U.S. Patent and Trademark Office |
|  | Interstate highway | County | ESRI |
|  | Railroad | County | ESRI |
|  | Airport enplanement | City | Bureau of Transportation Statistics |
| **Areas of Influences** | Commuting | County | U.S. Census Bureau |
|  | Future growth | County | Woods & Poole |
|  | Median housing value | County | U.S. Census Bureau |

# 1. Data (2): Functional Regions & Megaregions

**DATA & METHODOLOGIES**

|  | Variables | Unit | Sources |
|---|---|---|---|
| **Cluster of Metro Regions** | Movement of commodities | Region | FHWA |
|  | Air Travel frequencies | City | Bureau of Transportation Statistics |
| **Local and Regional Characteristics** | Environmentally sensitive areas | Nation | U.S. Fish & Wildlife Services, Greenpeace, EPA, etc. |
|  | Geographical obstacles | Nation | World Atlas, |
|  | Natural environments | County | McGrahanan (1999) |
|  | Contiguity and proximity | CBSA | GIS calculation |
|  | Voting patterns | County | USA Today |
|  | Local opinions | - | - |