Major Issues for Water and Planning

- What are the **sustainable limits** to water supply?

- Is economic activity constrained by **lack of water supplies, inadequate capacity, or poor management of water infrastructure**?

- Could our urban centers improve by **reintegrating city form and function with water resources**?

- **PROBLEM**: Utilities don't plan communities, and community planners often assume utilities will meet needs regardless.

- **ASCE national scores for Infrastructure**
  - **Drinking water (D)**
 - **Wastewater (D+)**

Economic

Social

Environmental
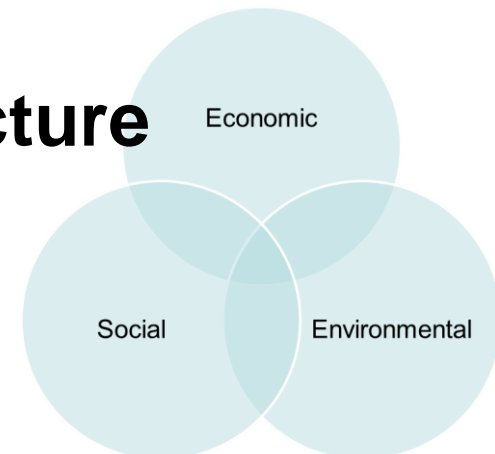
Key Background Information Needed*

- Existing water supplies and distribution systems
- Existing wastewater systems and receiving water capacity
- Existing stormwater systems
- Current system demands for water supply and wastewater
- Driving forces for water infrastructure needs
- Projected demands for water supply and wastewater
- Water stresses from existing and projected demands

*From Appendix A, Cesanek, Elmer and Graeff. Planners and Water. 2017. American Planning Association, PAS 588

NJDEP 2040 Demands Project

- 584 Public Community Water Supply (PCWS) systems
- Understand components of 2010 demands
  - Residential: indoor and outdoor, not including irrigation wells
  - Industrial
  - Commercial/Public Facilities/ Institutional
- Model 2010 demands and compare to actual demands
- Project PCWS demands to 2040 – multiple scenarios
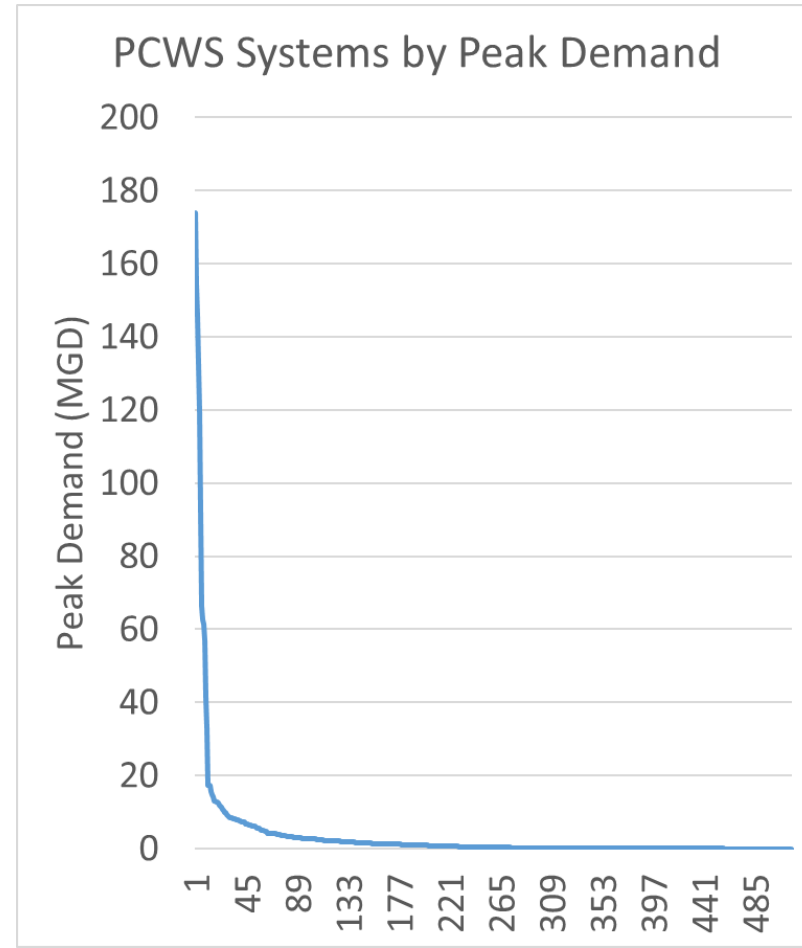
See www.danvanabs.com, Recent Projects

PCWS Systems by Peak Demand

Population Results by PCWS System
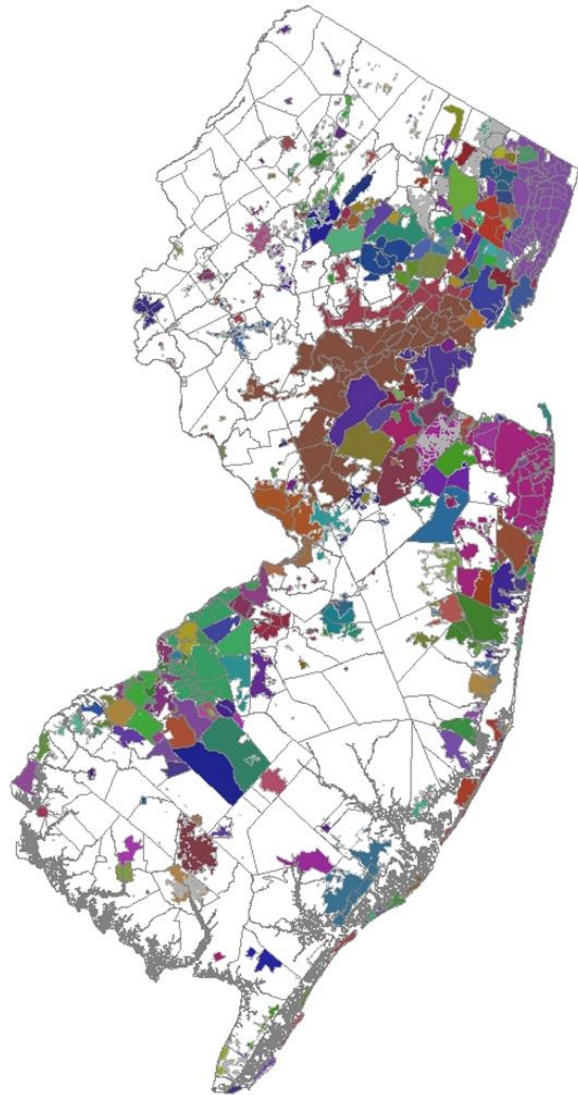
- ~90% of NJ residents served by PCWS systems
- 13 PCWS systems – 50% of all customers
- **37 PCWS systems – 80% of all customers**
- 547 systems – just 20% of all customers
- Most systems are <u>tiny!</u>

New Jersey Water System Populations
(Top ~50%) by Residential Development Density

System	High Density	Moderate Density	Low Density	Total	% of PCWS Population
Suez - Hackensack System	448,835	286,380	39,932	775,148	9.83%
NJ American - Raritan	263,497	294,324	148,708	706,529	8.96%
NJ American - Coastal North	103,861	191,690	71,594	367,145	4.66%
NJ American - Delaware Basin	257,948	37,473	979	296,400	3.76%
Passaic Valley Water Commission	82,799	189,811	18,424	291,034	3.69%
NJ American - Passaic	257,094	1,654	-	258,749	3.28%
Newark Water & Sewer Dept	104,820	108,349	41,754	254,923	3.23%
Jersey City MUA	238,444	-	-	238,444	3.02%
Middlesex Water Company	113,203	70,866	12,429	196,498	2.49%
Trenton City Water Dept	101,201	82,855	8,375	192,431	2.44%
Liberty Water Company (Elizabeth)	116,348	5,473	1	121,822	1.55%
NJ American - Atlantic	21,665	73,312	19,359	114,336	1.45%
Suez - Toms River System	32,661	66,153	12,142	110,955	1.41%

8 of the largest 13 systems are investor-owned. Jersey City and Liberty are managed under PPP contracts.

Understanding Residential Demands

- Current average household and per capita demands
- How do rates vary:
  - Seasonally
  - By geographic area
  - By housing type
  - Other factors?
- How might residential per capita rates change?

Results: Per Capita Residential Demands (Case Study Weighted Averages)

Residential Density/Region	Coastal Plain	Piedmont	Highlands/ Ridge & Valley
High Density (HD) Annual	47.92	58.46	42.04
Medium Density (MD) Annual	59.04	61.20	53.52
Low Density (LD) Annual	93.27	73.95	61.09
High Density (HD) Summer	**53.49**	**62.61**	**42.47**
Medium Density (MD) Summer	75.88	76.62	59.42
Low Density (LD) Summer	**141.05**	**108.92**	**81.75**
High Density (HD) Non-Summer	45.13	**56.27**	41.82
Medium Density (MD) Non-Summer	50.59	**53.17**	50.62
Low Density (LD) Non-Summer	69.36	**56.61**	50.84

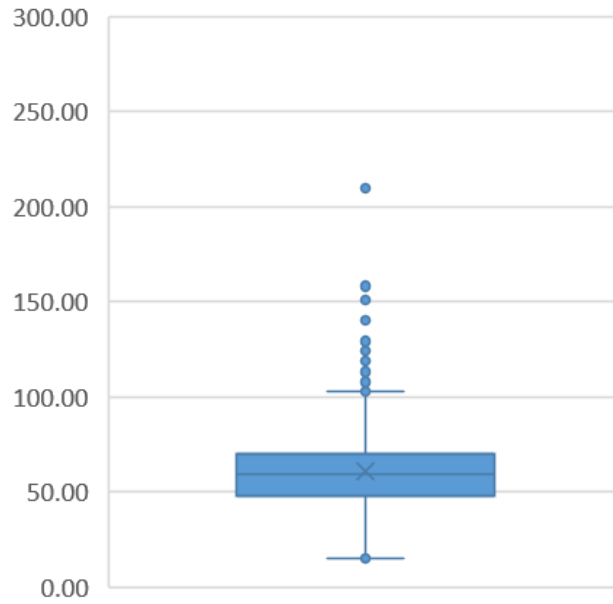|	Density	Ratio
Ratio of Summer Use to Non-Summer Use (Per Capita Per Day)	high	**1.15**
	medium	1.50
	low	**2.04**

Variations in Residential Water Demand
(Derived from data representing 3.6 million people in NJ)

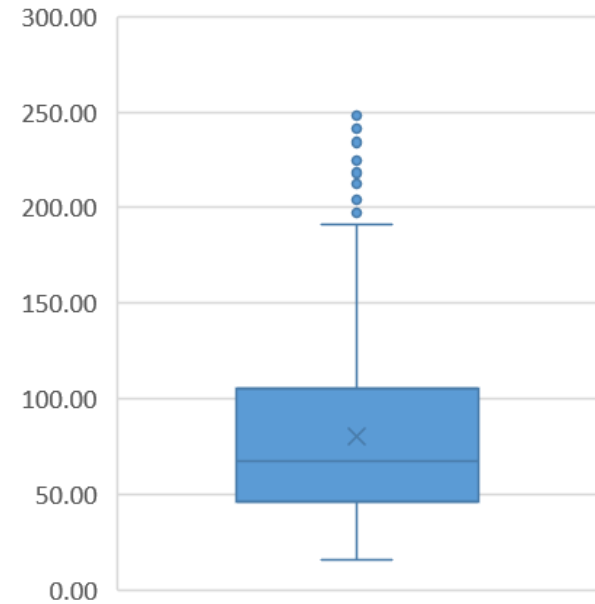High Density Residential Per Capita Demands: Case Study PCWS Systems — 1326 Results
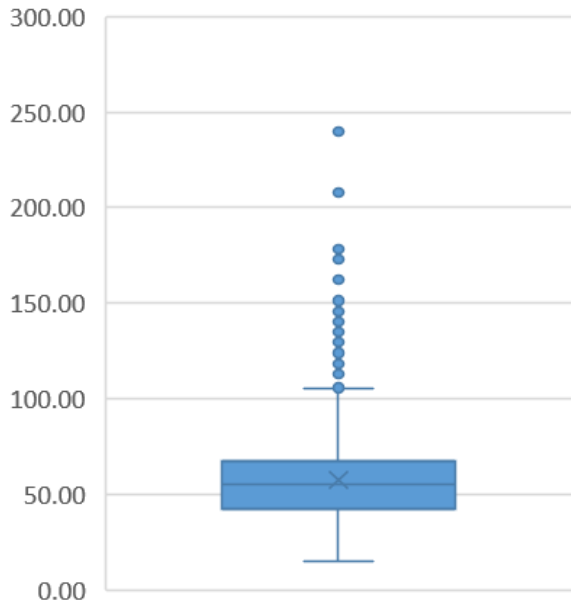
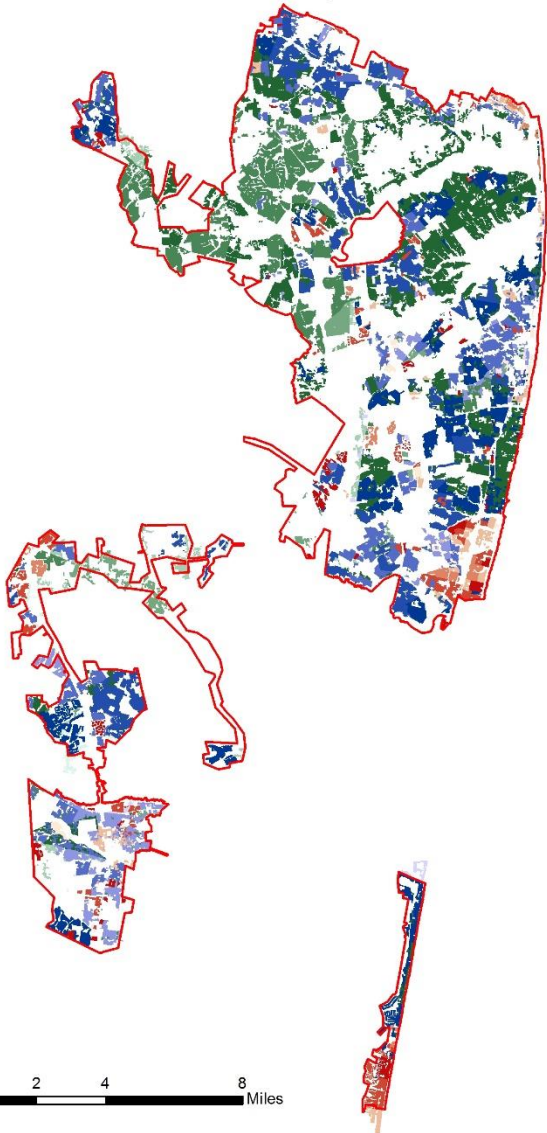Medium Density Residential Per Capita Demands: Case Study PCWS Systems — 1447 Results

Low Density Residential Per Capita Demands: Case Study PCWS Systems — 489 Results

RUTGERS

NJ American - Coastal North (PWID: NJ1345001)

N

Legend

Water System

GPCD
Quantile Classification

HD
<=18
18 - 38
38 - 45
45 - 60
>60

MD
<=22
22 - 42
42 - 55
55 - 68
>68

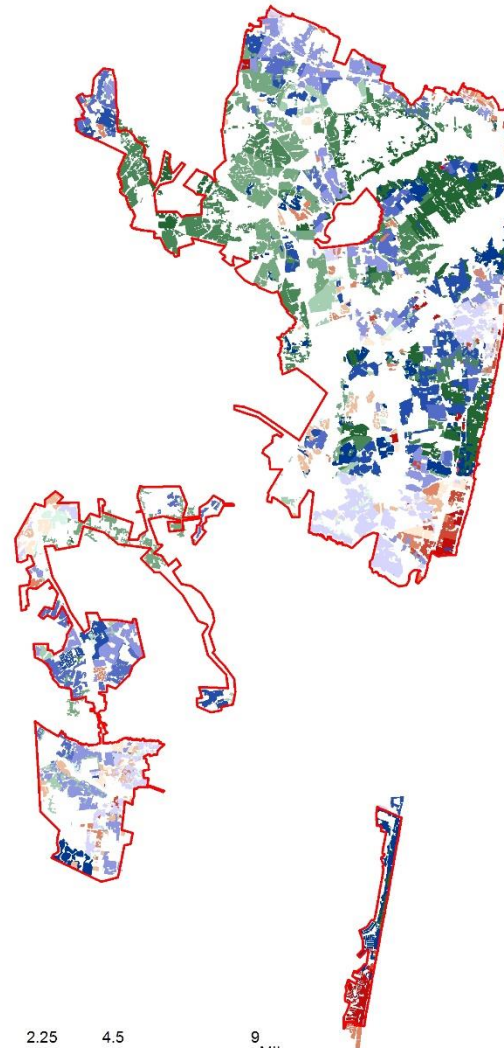**LD**
<=25
25 - 56
56 - 72
72 - 100
>100

0   2   4   8 Miles

NJ American - Coastal North (PWID: NJ1345001)

N

Legend

Water System

Summer/NonSummer
Quantile Classification

HD
<=100%
100% - 105%
105% - 120%
120% - 140%
>140%

MD
<=120%
120% - 145%
145% - 160%
160% - 185%
>185%

LD
<=125%
125% - 165%
165% - 200%
200% - 250%
>250%

0   2.25   4.5   9 Miles

Drivers for Change

- Population growth and demographic change
- Economic growth and business demands
- New regulatory requirements
- Changing public expectations
- Aging and failing infrastructure
- Increasing infrastructure costs
- Climate change – more frequent hot and dry periods, not always at the same time

What About 2040?

- New Jersey total water demands have been flat despite adding 1.06 million people (15%), 1990-2010
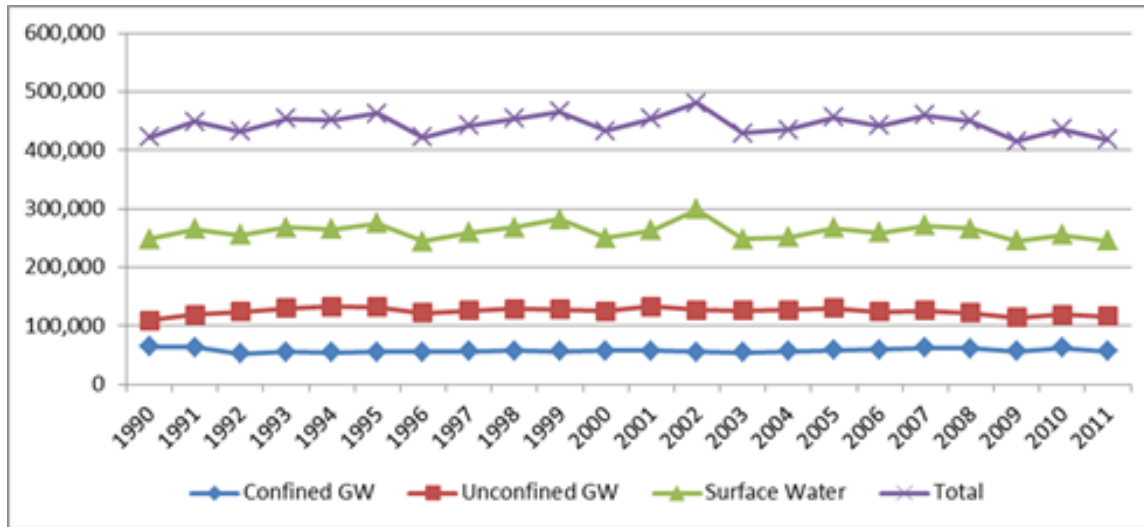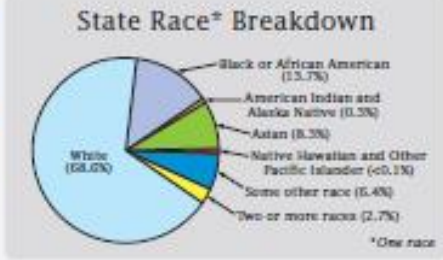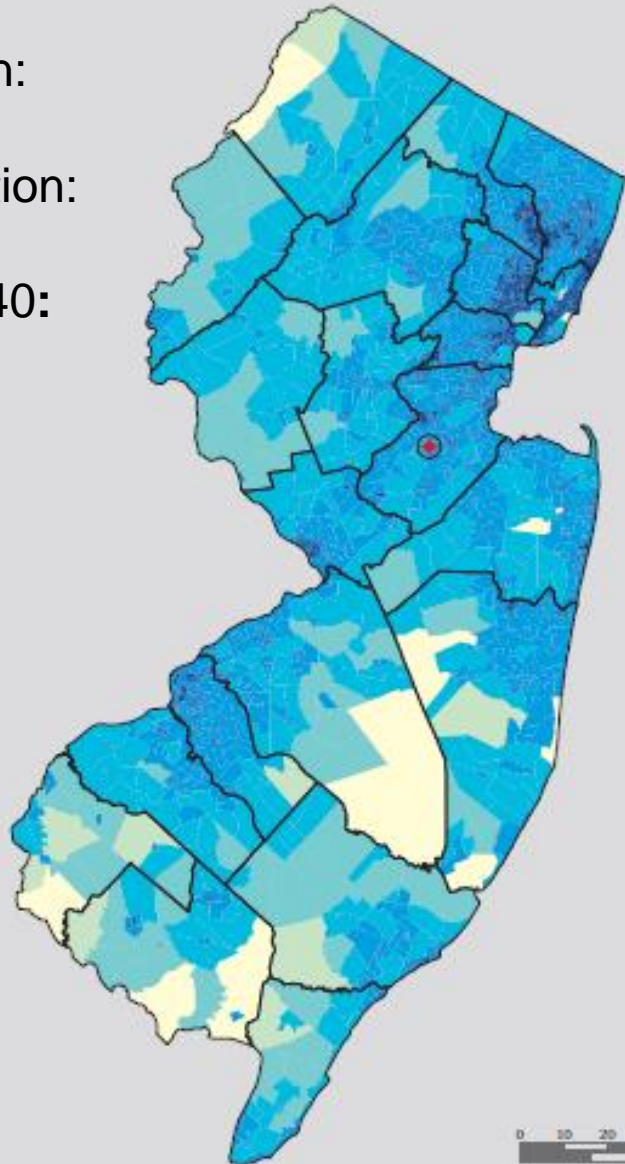

- Complicating factors during this period:
  industrial demand reductions, changes in non-revenue water
- Population trends uncertain, <u>highly</u> dependent on net migration
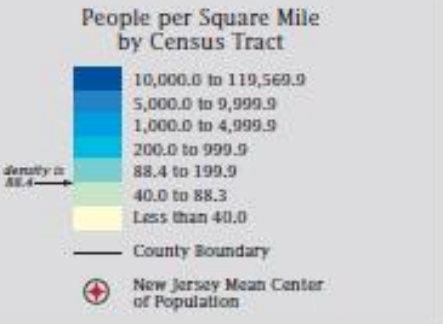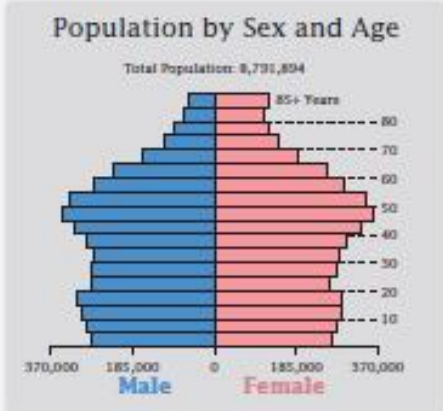- Per capita residential demands expected to decline

2010 Census: New Jersey Profile

Population Density by Census Tract

2010 Census Population:
8.79 million
2040 Population Projection:
10.2-10.4 million
Projected Growth to 2040:
1.4-1.6 million

New Jersey Population 1970 to 2010

Year	Population
2010	8,791,894
2000	8,414,350
1990	7,730,188
1980	7,364,823
1970	7,168,164

State Race* Breakdown

- Black or African American (13.7%)
- American Indian and Alaska Native (0.3%)
- Asian (8.3%)
- Native Hawaiian and Other Pacific Islander (<0.1%)
- Some other race (6.4%)
- Two or more races (2.7%)
- White (68.6%)

*One race

Hispanic or Latino (of any race) makes up **17.7%** of the state population.

Population by Sex and Age

Total Population: 8,791,894

85+ Years

Male | Female

370,000   185,000   0   185,000   370,000

Housing Tenure

Total Occupied Housing Units:
3,214,360

65.4% Owner Occupied | 34.6% Renter Occupied

Average Household Size of Owner-Occupied Units: 2.79 people

Average Household Size of Renter-Occupied Units: 2.47 people

People per Square Mile by Census Tract

- 10,000.0 to 119,569.9
- 5,000.0 to 9,999.9
- 1,000.0 to 4,999.9
- 200.0 to 999.9
- 88.4 to 199.9
- 40.0 to 88.3
- Less than 40.0

U.S. density is 88.4

— County Boundary

⊕ New Jersey Mean Center of Population

0   10   20   30   40 Kilometers
0   10   20   30   40 Miles

Scenarios for Projecting 2040 Demands

- **Static:** Residential per capita demand not changed

- **Conservation Scenario**: Reduction of Residential per capital demand toward but not below 35 gpcd

- **Commercial**: Varies with population change

- **Industrial**: No change

- **Non-Revenue Water**: Two options applicable to each scenario
  - NRW status quo – existing or current averages
  - NRW aggressively controlled

Implications for 2040 Water Demands
(37 Largest Systems, 80% of Current Demands)

Total MGD	Scenario	Change
702.879	2008-2015 average demands	Baseline Condition
726.174	No Conservation with Nominal Water Losses	3.31% <u>higher</u> than Baseline
684.463	No Conservation with Optimum Water Losses	2.62% <u>less</u> than Baseline
680.541	Conservation with Nominal Water Losses	6.28% <u>less</u> than No Conservation scenario
641.464	**Conservation with Optimum Water Losses**	6.28% <u>less</u> than No Conservation scenario

Conservation/Optimum Water Loss scenario is 11.67% <u>less</u> than No Conservation/Nominal Water Loss scenario, despite 1.4 million new residents. 11 increase, 26 decrease

Uses of the Results

- **Verify demands** – statewide results aren't necessarily correct for any one system but the approach is replicable

- **System and subsystem demand projections** – evaluate existing or potential stresses to system

- **AMI/AMD targeting** – priorities using demand patterns

- **Drought conservation** – target areas with high annual demands and high summer:non-summer ratios.

- **Consumptive water uses** – controlling lawn irrigation will be important to future water supply sufficiency.

- **Development patterns** have a major influence on demands – strengthens the case for cluster development, redevelopment

Contact Information

Daniel J. Van Abs, PhD, PP/AICP

Associate Professor of Practice for Water, Society & Environment

Department of Human Ecology

School of Environmental & Biological Sciences

Rutgers-The State University of New Jersey

55 Dudley Road, New Brunswick, NJ 08903

vanabs@sebs.rutgers.edu

www.danvanabs.com

http://humanecology.rutgers.edu/
faculty.asp?fid=101

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