New Jersey Water Supply Plan

New Jersey County Planners Association

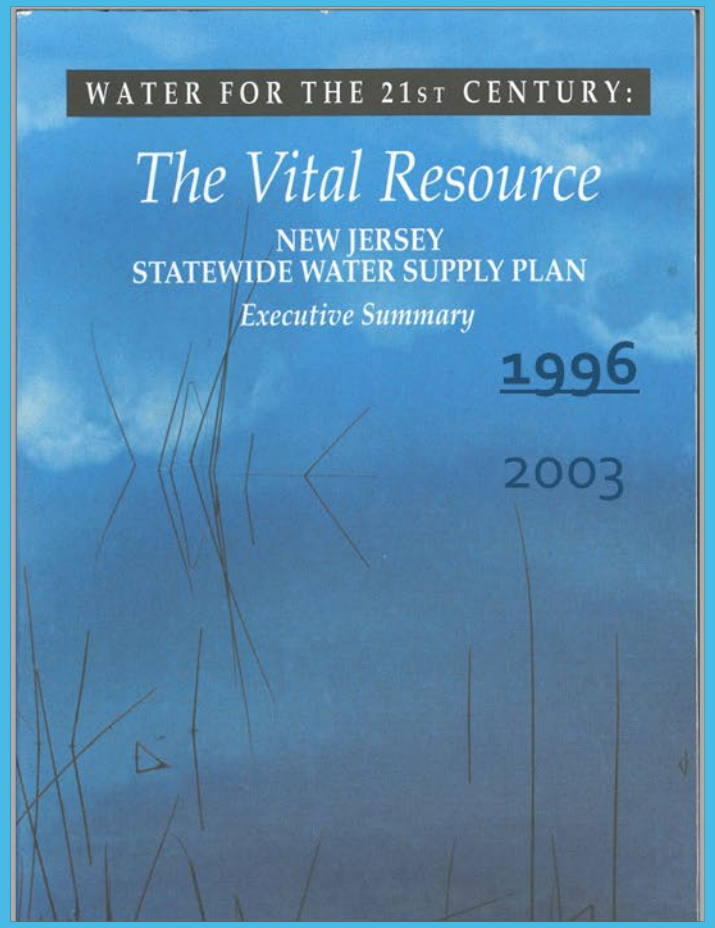
October 20, 2021

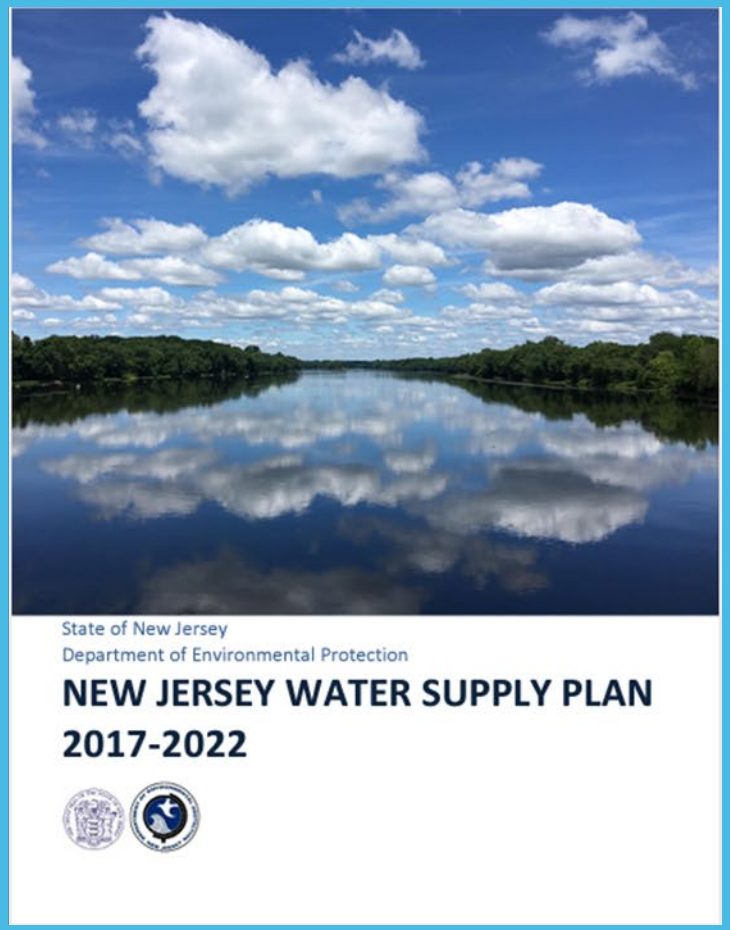
Planning Principles

- Water as a public trust resource
- DEP administers program to oversee withdrawal and use
- Equitable access
- Protection is more cost-effective than remedial treatment
- Policies and programs should be feasible and cost-effective, not cosmetic or "feel good" without impact
- Increased costs demand increased proof of effectiveness
- Implementation resources always a constraint – priorities

Ongoing Water Supply Planning

The 1981 New Jersey Water Supply Management Act (N.J.S.A. 58:1A-1 et. seq.) directs the NJDEP to develop and periodically revise the New Jersey Statewide Water Supply Plan (NJSWSP or Plan) in order to improve the management and protection of the State's water supplies.





What the 2023 plan does and does not do

- The plan **will**:
  - Evaluate available water supplies for current and future use
  - Evaluate the effect of climate change on water supplies
  - Define water withdrawal and use trends throughout the state
  - Project future water demands through 2050
  - Compare current and future use to available water
  - Identify areas where water may be limited and outline specific actions that the department should take or policies that the department should implement to address these shortfalls
  - Include an assessment of water supply issues for EJ communities
  - Be a living plan that evolves to address emerging issues and address policies
  - Direct research efforts over the five-year planning horizon

What the 2023 plan does and does not do

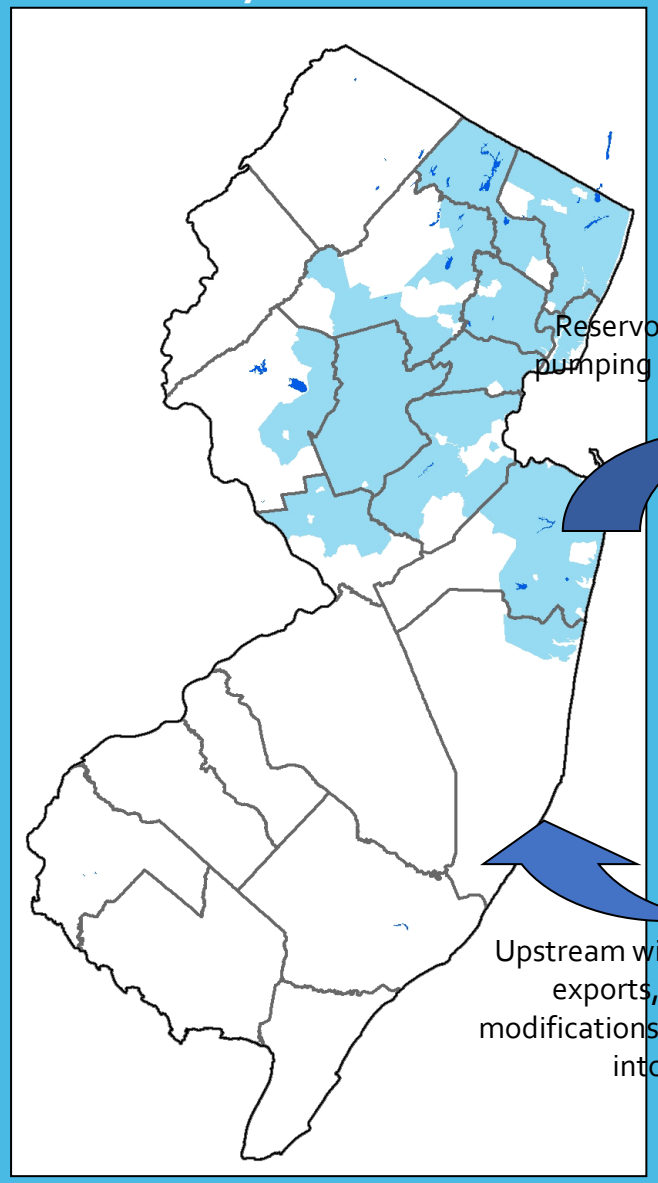
- The plan **will not**:
  - Solve every water supply problem
  - Be a regulatory tool- rather it is used to inform individual water allocation permit decision making and focus department efforts
  - Override other regulatory programs, e.g. safe drinking water, land use permitting or wastewater management, but it can make recommendations

BUT

- But the WSP is an ideal tool and primary avenue to address current water availability problems and prevent future ones from occurring!

Where Our Water Comes From

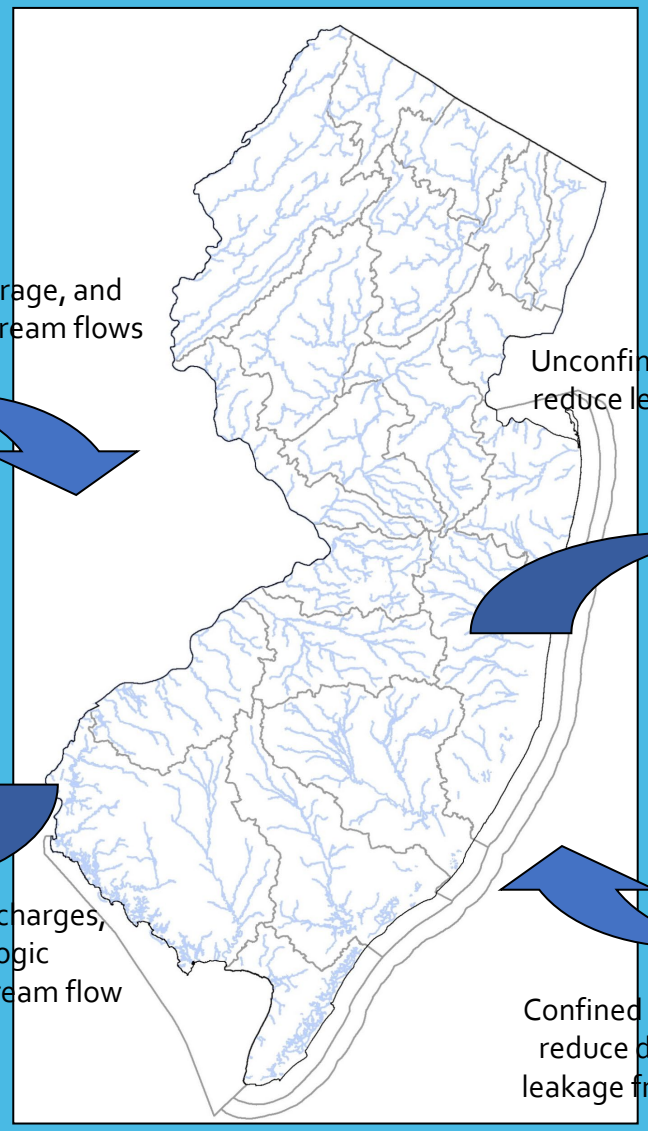
Reservoir Systems – Safe Yield



Reservoir releases, storage, and pumping affect down stream flows

Upstream withdrawals, discharges, exports, and/or hydrologic modifications can reduce stream flow into the reservoir

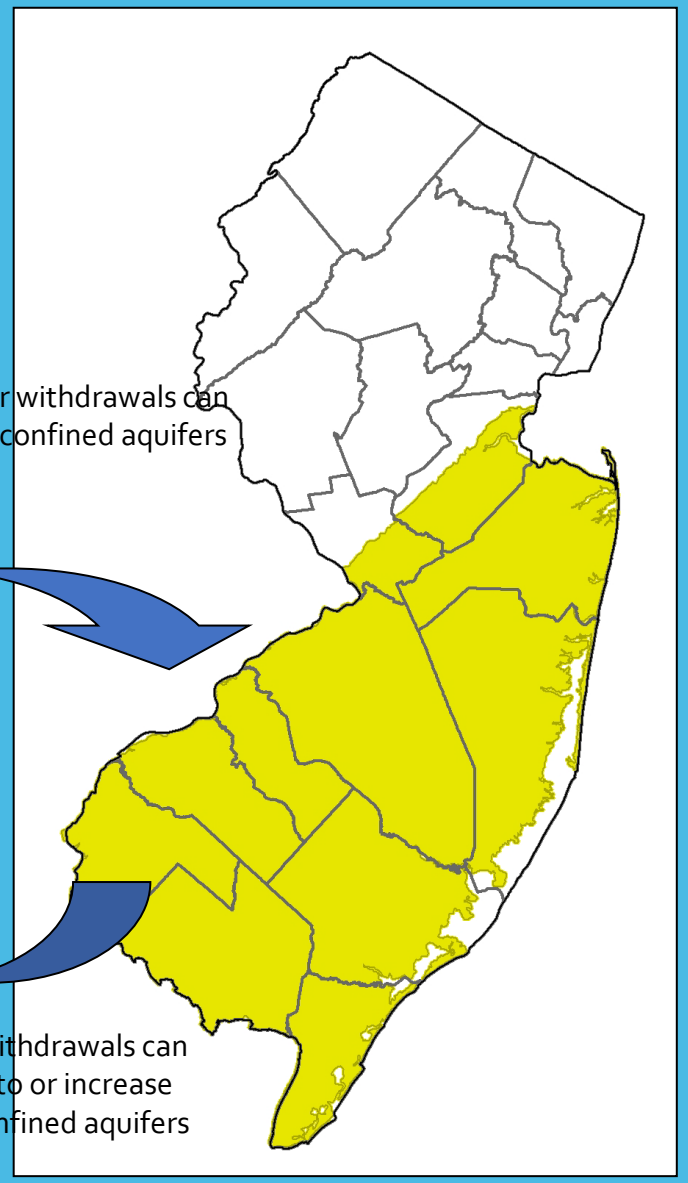
Unconfined Aquifers and Related Surface Water



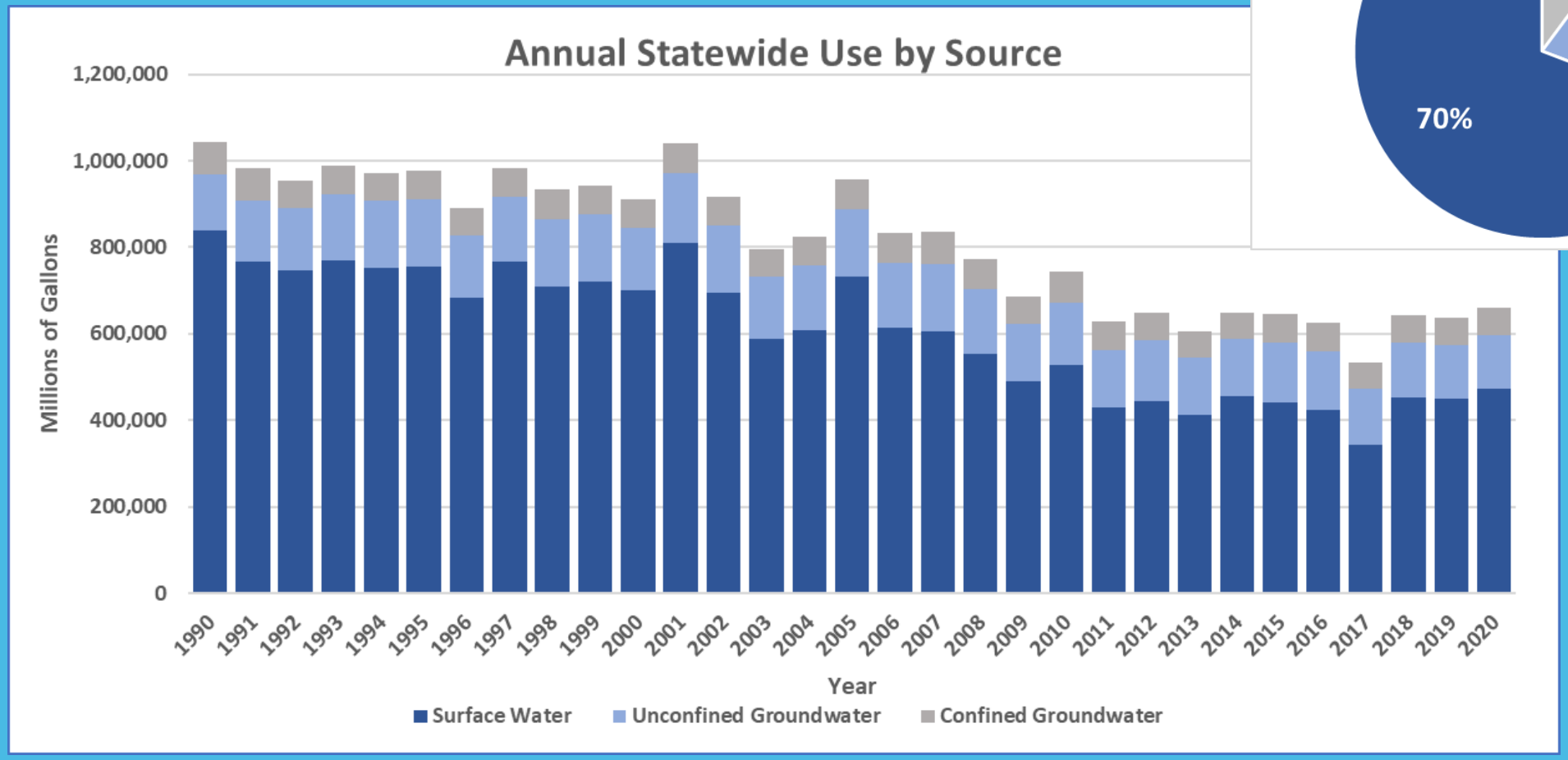
Unconfined aquifer withdrawals can reduce leakage to confined aquifers

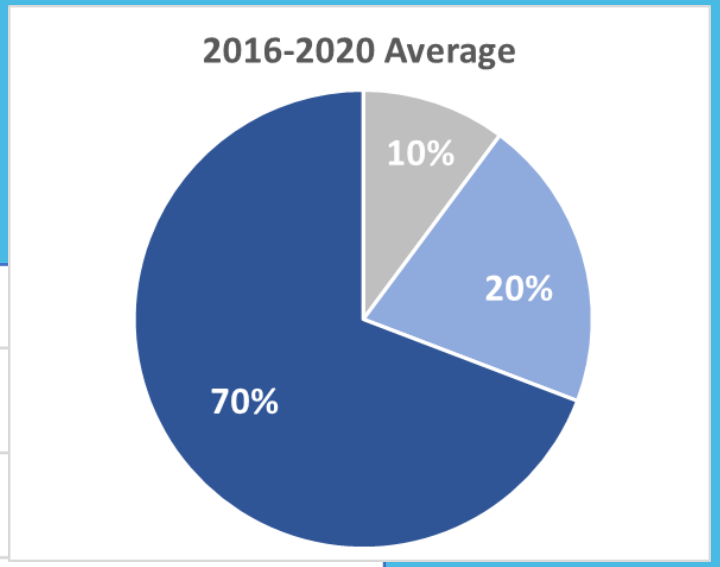
Confined aquifer withdrawals can reduce discharge to or increase leakage from unconfined aquifers

Confined Aquifers



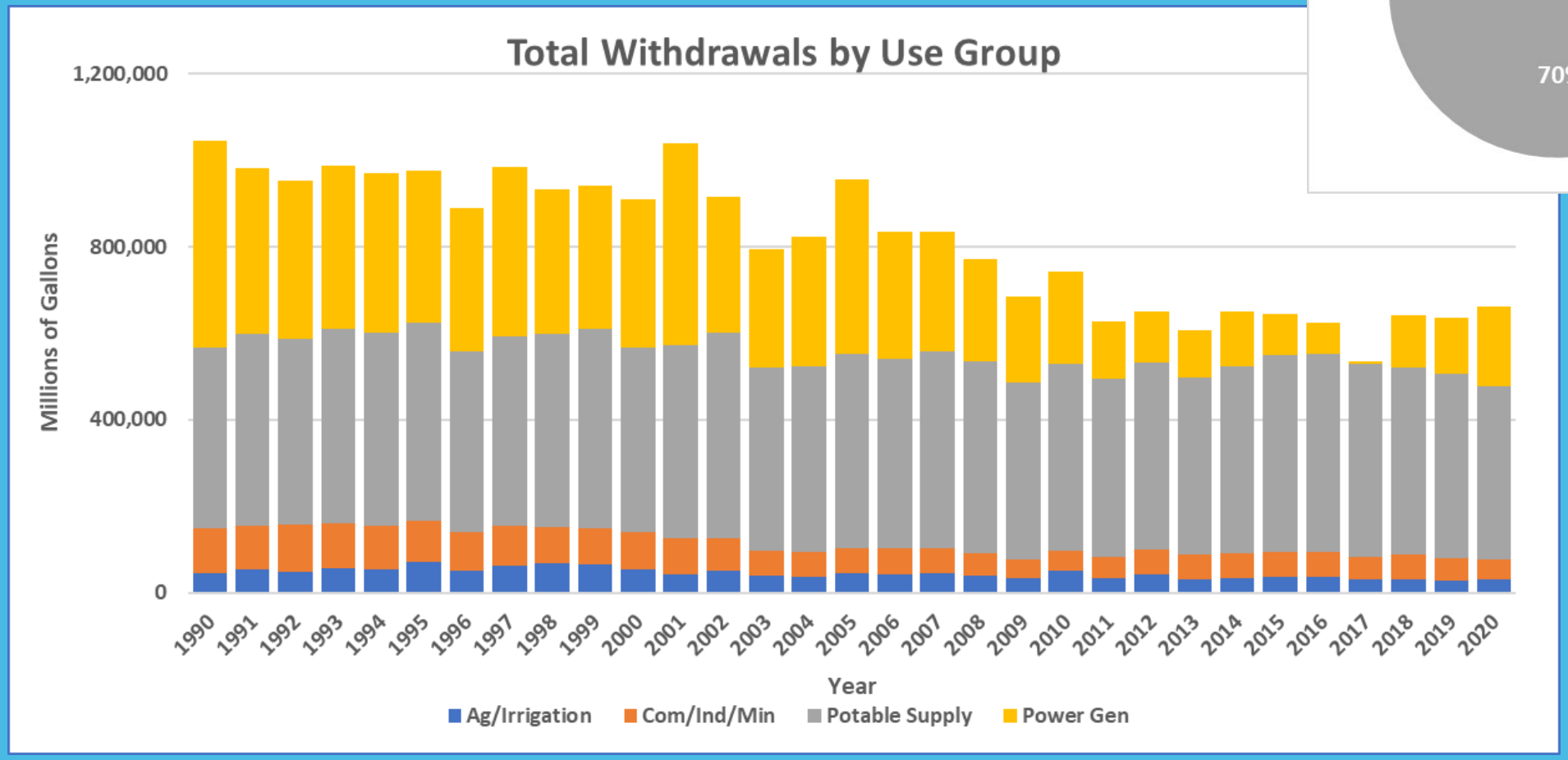
Source of Water





1,000,000 million gallons per year = 2.7 billion gallons per day
Newark uses roughly 80 million gallons per day

Use of Water


Total Withdrawals by Use Group
1,200,000
800,000
400,000
0
Millions of Gallons
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
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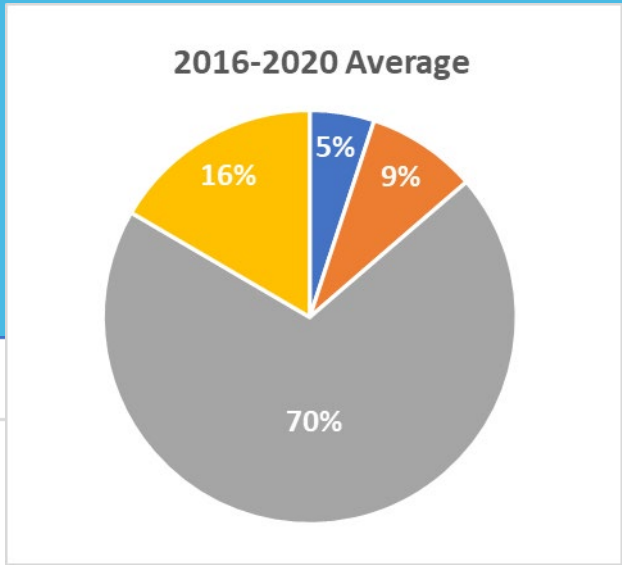
2019
2020
Year
Ag/Irrigation
Com/Ind/Min
Potable Supply
Power Gen


2016-2020 Average
5%
9%
16%
70%

Planning Around Uncertainty

- All water supply planning involves models
- Models are simplifications of reality
- No perfect knowledge of current and past conditions
- No perfect knowledge of the future
- Planning must acknowledge uncertainty (NOT “error”)

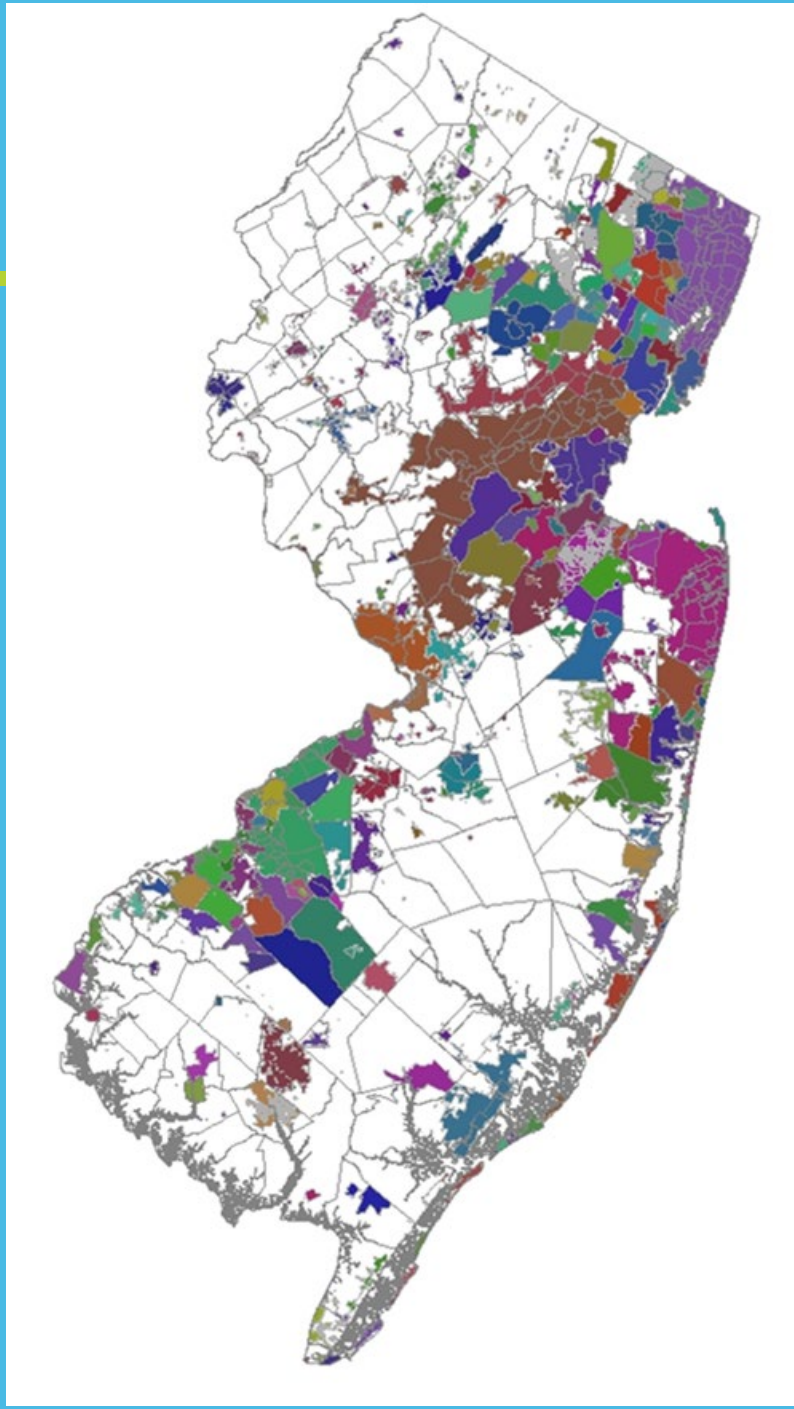
MPO Population Projections by County

- Projected population changes differ greatly among counties
- Four counties projected to increase >100,000. All are entirely or mostly in PCWS service areas
- The two least-populated (2020) counties projected to lose population through 2050

County	MPO Projected Growth 2020-2050
Atlantic	13,127
Bergen	**154,008**
Burlington	29,913
Camden	12,098
Cape May	(428)
Cumberland	12,873
Essex	**120,059**
Gloucester	35,898
Hudson	**181,887**
Hunterdon	5,936
Mercer	28,537
Middlesex	**102,327**
Monmouth	39,411
Morris	27,931
Ocean	**130,114**
Passaic	84,599
Salem	(6,724)
Somerset	26,965
Sussex	6,333
Union	98,369
Warren	5,603
New Jersey	**1,108,835**

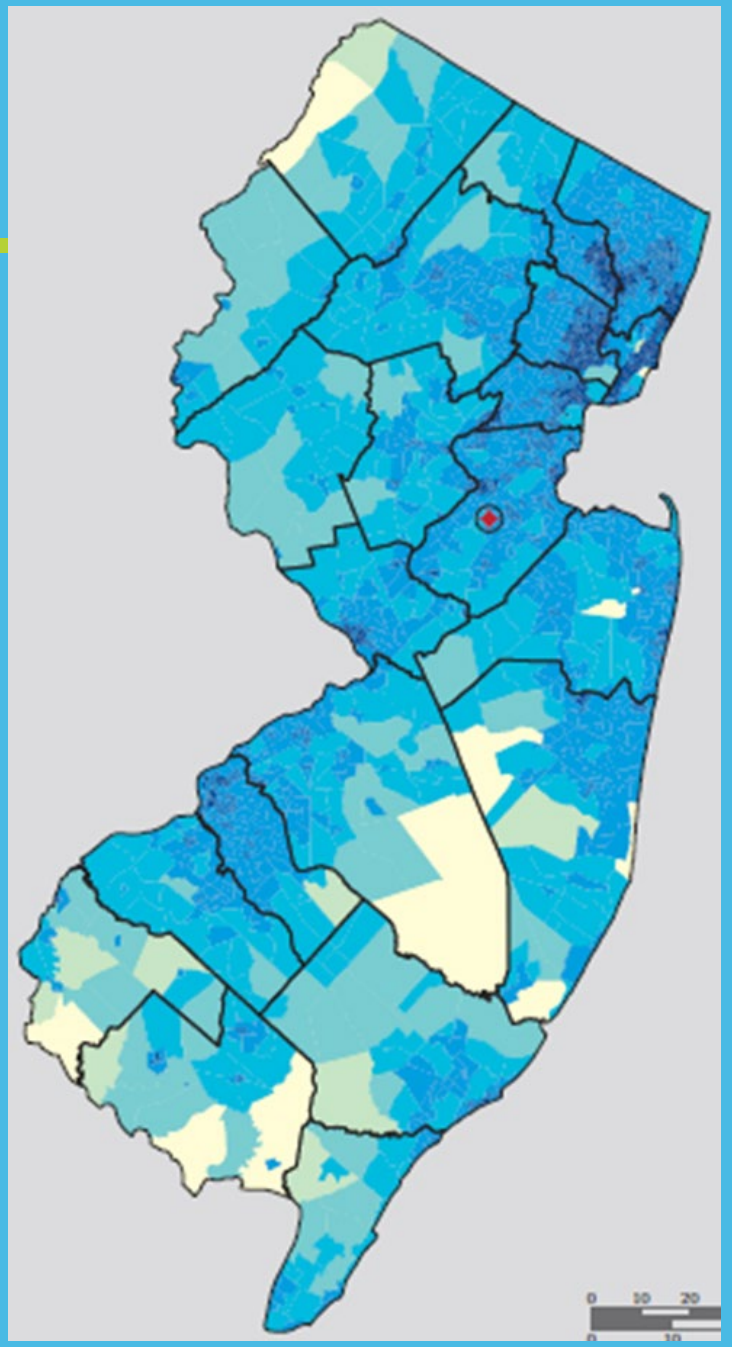
PCWS Population Projections

- Municipal & Census populations don't fit most PCWS service area boundaries
- Dasymetric Analysis: GIS tool to assign populations to PCWS service areas
- Factors in residential density (High, Medium and Low) from NJDEP 2017 Land Use/Land Cover mapping



PCWS Populations

Residential Density (2017 LULC)	Units/Acre	2020 (%)	2050 (%)
High	=>5	52.0	53.5
Medium	2-5	40.8	39.9
Low	<2	7.2	6.6



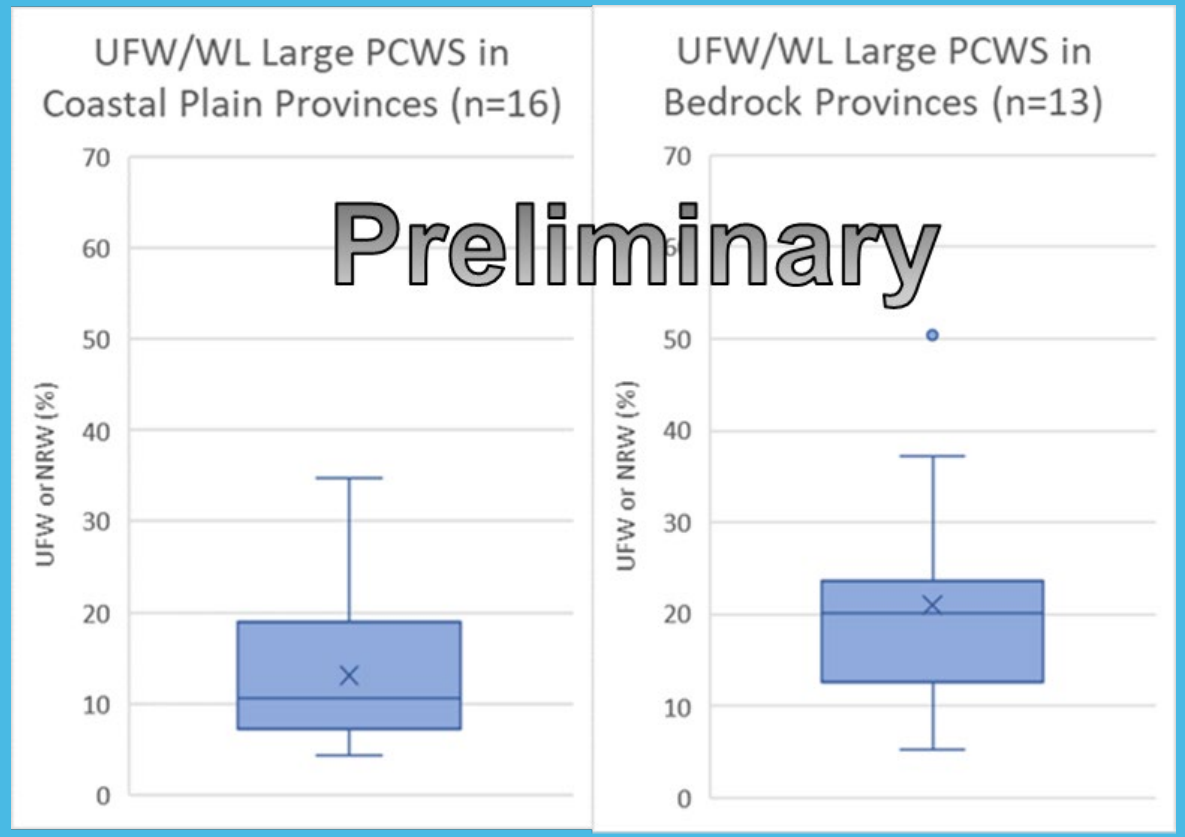
Residential Per Capita Demands (2018 Report)

Residential Density/Region	2010 CP	2010 PM	2010 HL	2050 CP	2050 PM	2050 HL
High Density (HD) Annual	47.92	58.46	42.04	43.13	49.89	37.84
Medium Density (MD) Annual	59.04	61.2	53.52	53.14	60.79	48.17
Low Density (LD) Annual	93.27	73.95	61.09	87.10	66.56	54.98
High Density (HD) Summer	53.49	62.61	42.47	52.96	52.96	38.22
Medium Density (MD) Summer	75.88	76.62	59.42	68.29	68.96	53.48
Low Density (LD) Summer	141.05	108.92	81.75	128.51	98.03	73.58
High Density (HD) Non-Summer	45.13	56.27	41.82	40.62	46.23	37.64
Medium Density (MD) Non-Summer	50.59	53.17	50.62	45.53	52.09	45.56
Low Density (LD) Non-Summer	69.36	56.61	50.84	62.93	50.95	45.76

Derived from monthly customer demand data representing nearly 3.6 million residents, 45% of the total PCWS service population. Mount Laurel MUA, Newark Water & Sewer, New Jersey American Water (28 systems), Passaic Valley Water Commission (PVWC), Ridgewood Water Department, Roxbury Township Water, and Suez-New Jersey (Hackensack and Franklin Lakes systems). All data provided under confidentiality agreements.

Water Losses

- Updated data sets from NJDEP and DRBC
- Analysis drafted and statistical analysis in progress
- DRBC data: Real water losses ~90% of total water losses
- Continuing finding of major differences between coastal and bedrock PCWS overall



Model Results – Very Preliminary

Metric/Scenario	Aggregate Volumes (MGD)		% Of Recent
Peak Annual Demands 2017-2021 (MGD)	1203.034		
2016-2020 Average Annual Demands (MGD)	945.561		
2050 Population Extrapolation from D/S Demands	1293.522		107.52
2050 Population Extrapolations from NJWaTr Demands	1016.868		107.54
	Nominal Water Losses	**Optimal Water Losses**	**Optimal % Of Recent**
2050 No Conservation Scenario Extrapolations from D/S Demands	1088.528	1083.955	90.10
2050 No Conservation Scenario Extrapolations from NJWaTr Demands	870.553	866.911	91.68
2050 Conservation Extrapolations from D/S Demands	999.459	995.266	82.73
2050 Conservation Extrapolations from NJWaTr Demands	798.483	795.150	84.09

Key Statewide Findings: Water losses and residential conservation are major factors in future PCWS demands

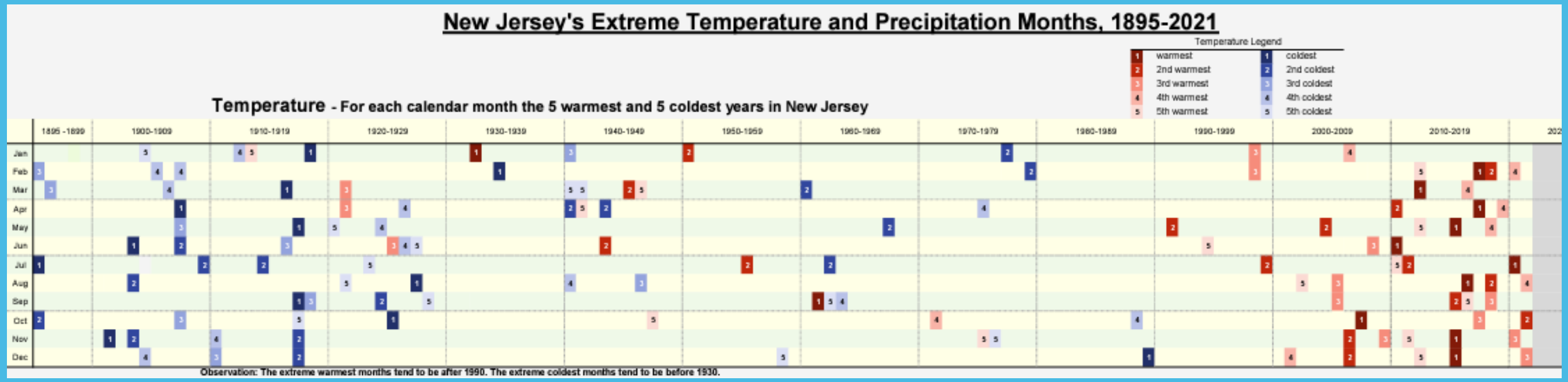
NJ Water Supply Plan and Climate Change

- 2017 WSP provided limited consideration…
- 2023 WSP initial assessments:
  - Limited in scope to DWSG conducted research
  - 2050 focus to synch with WSP demand forecasts
  - General direction and magnitude type-of findings
  - Identify limitations, data gaps, next steps and recommendations (where warranted)
  - Develop climate change water supply action plan for implementation during 2023-2028

https://dep.nj.gov/climatechange/

NJ Climate Science: Temperature

- New Jersey is warming faster than the rest of the Northeast region and the world
- Since 1895, New Jersey's annual temperature has increased by 3.5°F
- Annual temperatures increasing by 4.1°F to 5.7°F by 2050
- Winters warming faster coupled with hotter summers



Climate Change-Water Supply Nexus

Climate Change Drivers

- Temperature increases
- Precipitation increases and variability
- Sea-Level Rise

Water Resource Impacts

- Annual Streamflow
- Peak Streamflow
- Baseflow in streams
- Groundwater recharge
- Saltwater intrusion aquifers/estuaries
- Saltwater inundation storms/ sun-day flooding
- Drought

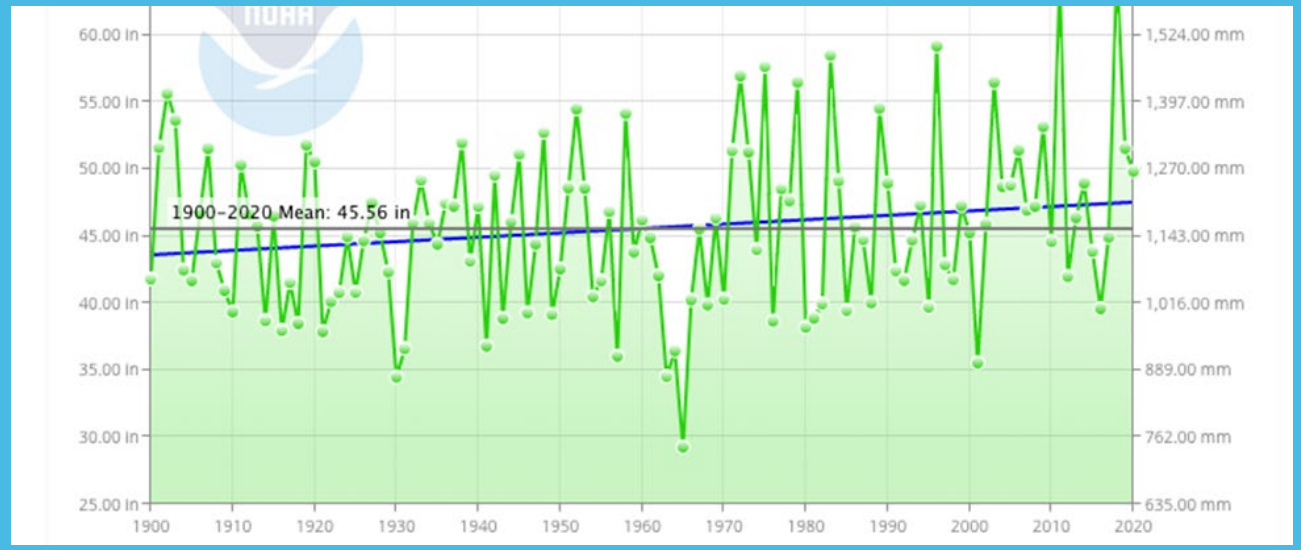
Water Supply Impacts

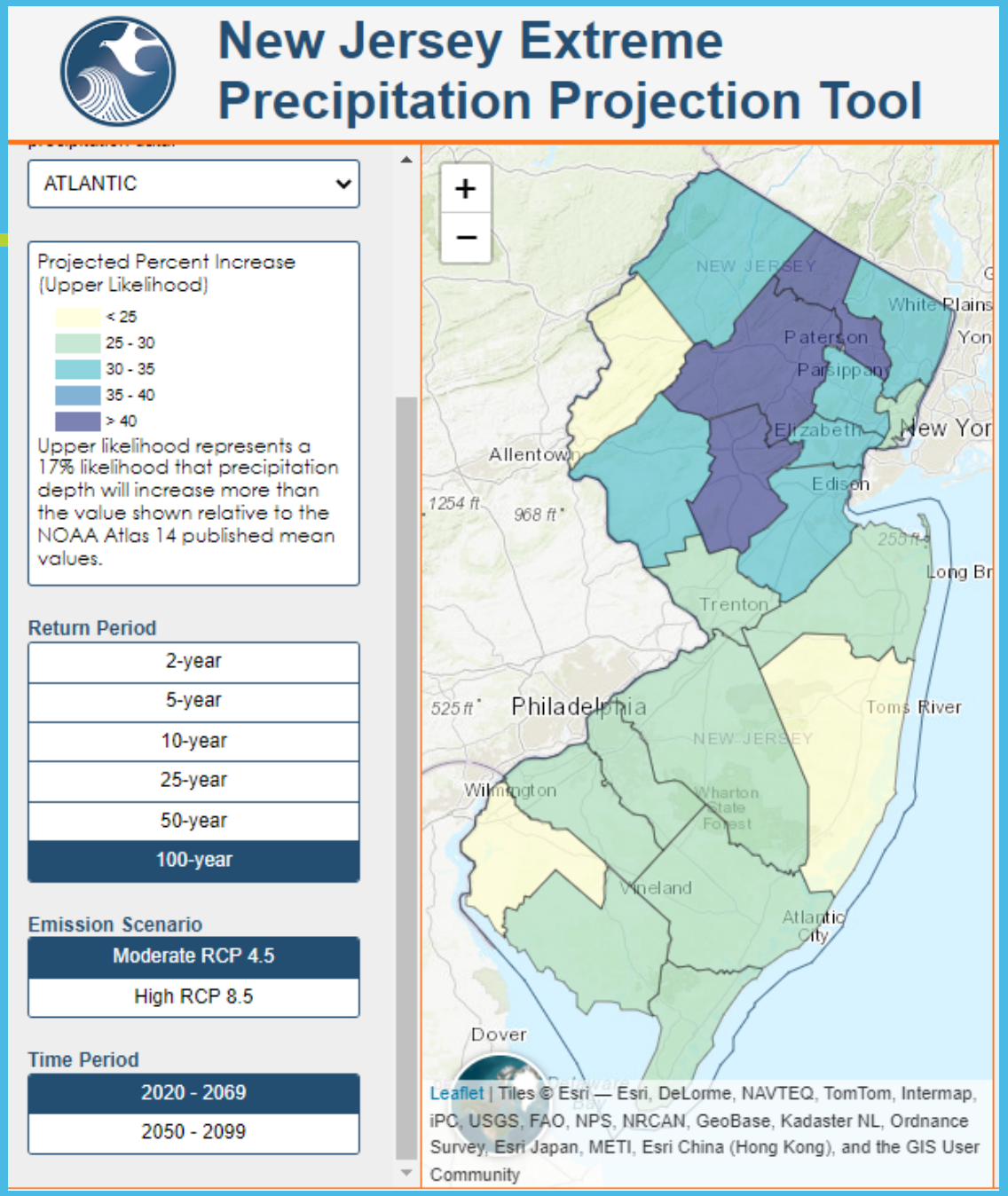
- Reservoir availability/ operations
- Water demand
- Water quality/treatment
- Saltwater intrusion wells/intakes
- Changes to aquifer availability
- Inundation of infrastructure
- Others…

Primary WSP evals

NJ Climate Science: Precip

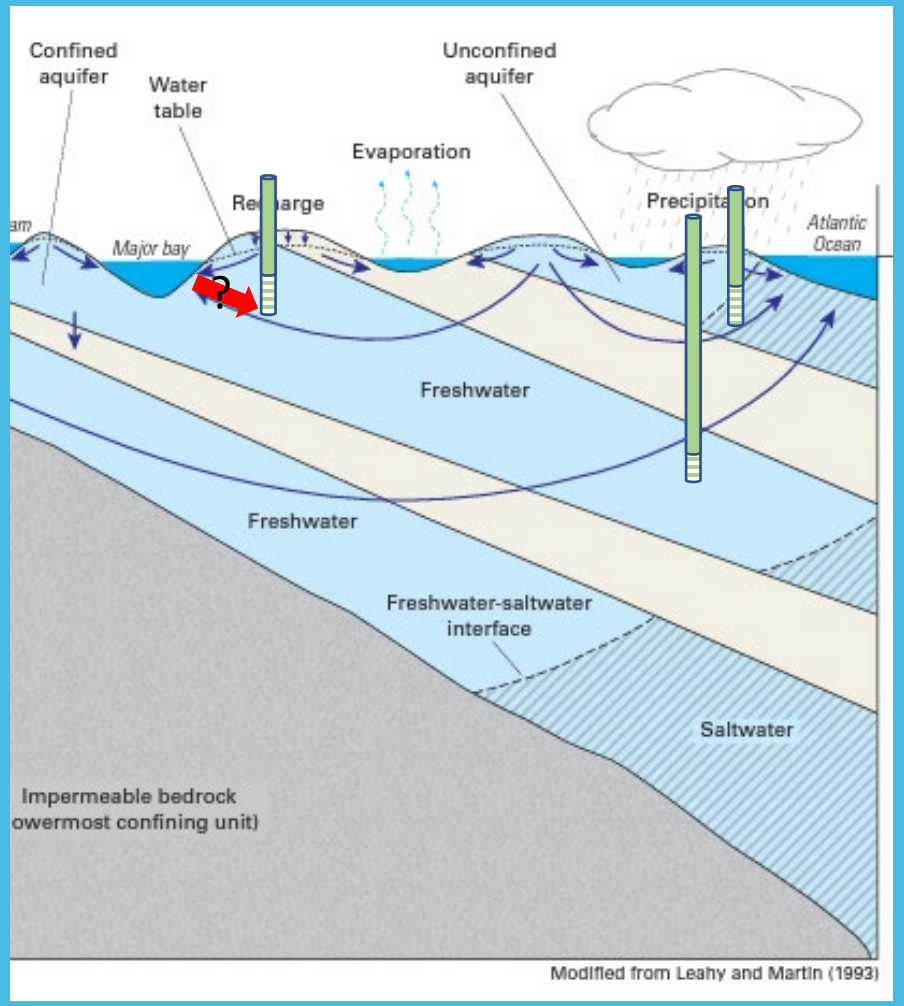
- Already receiving more annual precipitation
  - Receiving 3+ inches more than last century
  - 4% to 11% more by 2050
- South and coast and fall and spring wetter
- Larger events more frequent
- Subregions show more variability +-

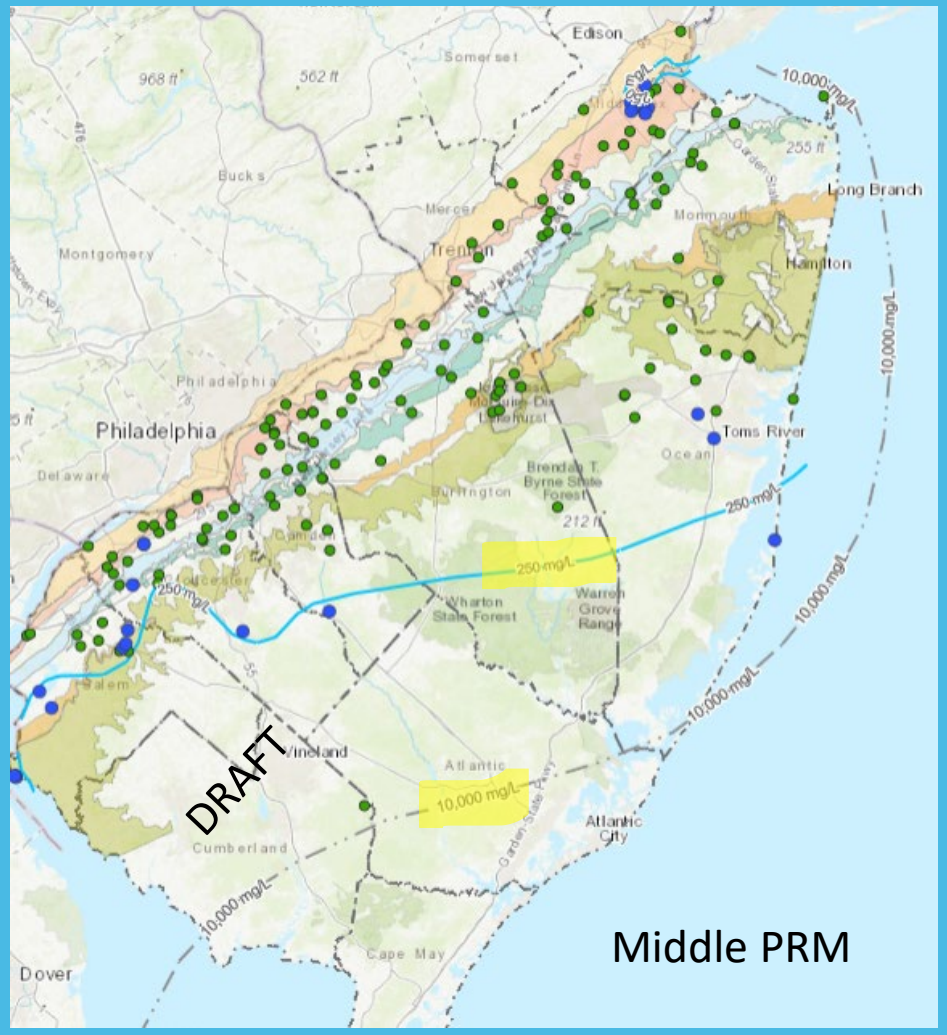




https://njprojectedprecipitationchanges.com/

Sea-level Rise and Saltwater Intrusion: Coastal Plain Schematics and Data



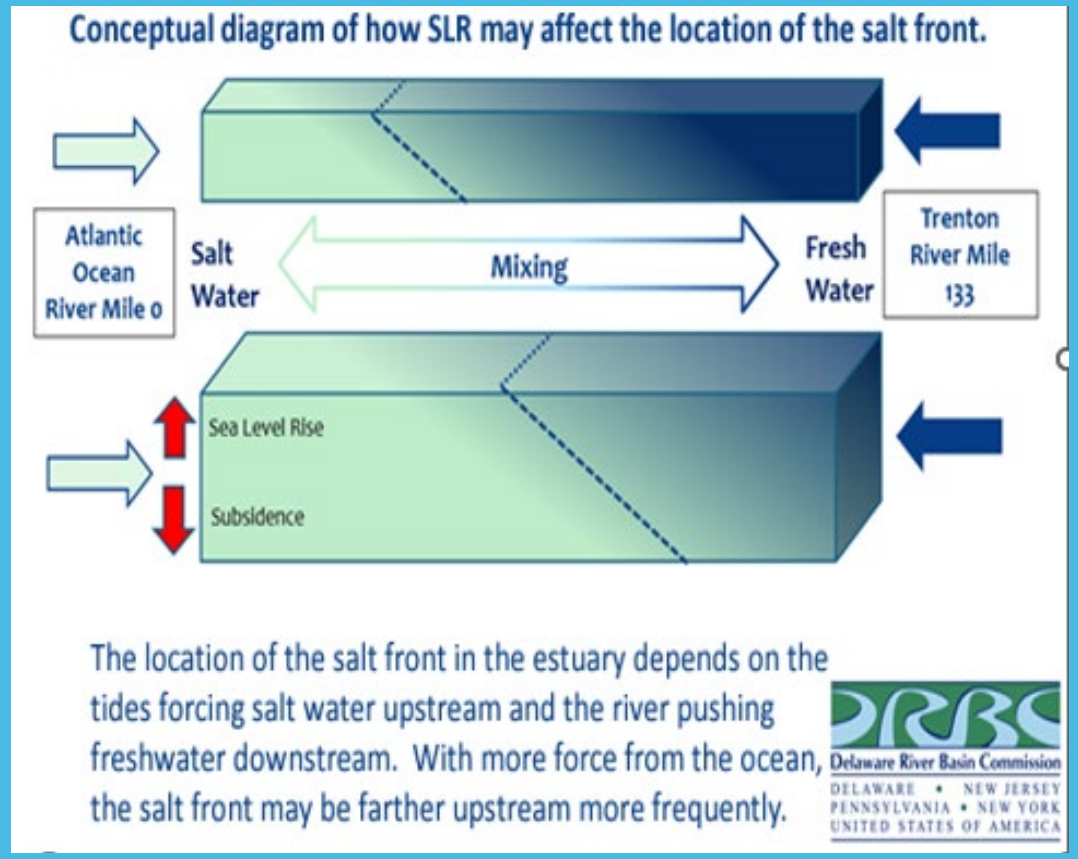


Sources:
Left- USGS Circular 1262
Right- 2018 USGS Synoptic (draft)

Sea-level Rise and Saltwater Intrusion: Estuaries and Other Sources

- Non-coastal plain aquifers, e.g. Newark basin aquifers
  - Very few wells near ocean/estuary in these aquifers
- Delaware Estuary
  - DRBC currently assessing degree of saltwater movement upriver under a variety of SLR and freshwater inflow scenarios
  - Initial assessment suggests some increased risk of 250 mg/L impact potable intake with 1 meter of SLR and drought of record flow conditions
  - Increased frequency of salty water near the PRM aquifer recharge area
- Reservoirs
  - Multiple water supply reservoirs near ocean/bay and/or at low elevations

Sea-level Rise and Estuaries

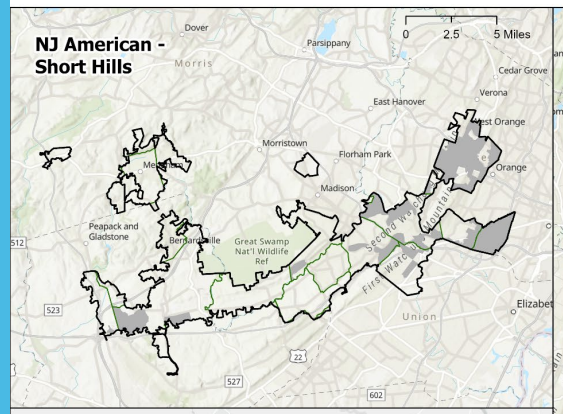


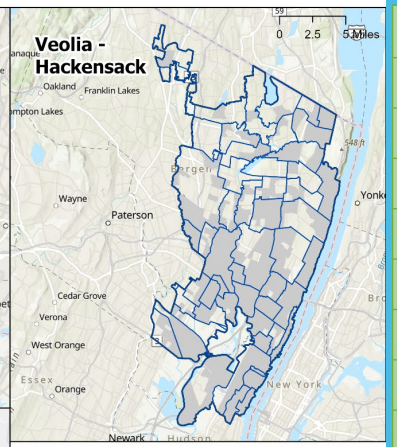
Environmental Justice Issues

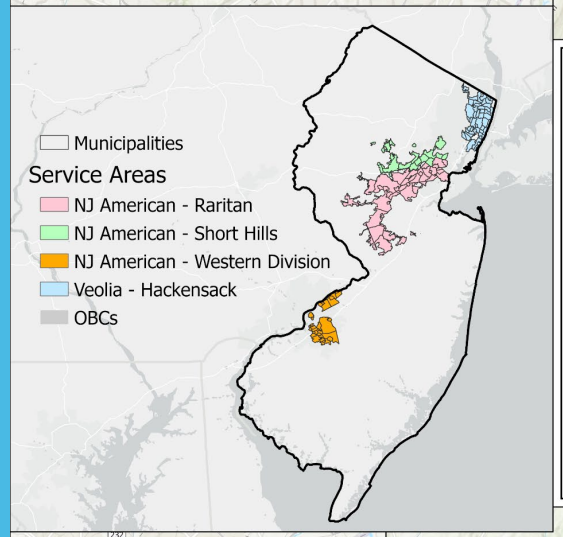
- What we know:
  - Everyone needs water; urban systems use less per person
  - Urban systems tend to be much older – they were built earliest
  - Rural towns/cities also tend to be older
  - Older systems break more frequently
  - Many disadvantaged communities already face affordability issues
  - Costs of rehabilitating systems will be high
  - Water quality issues exist and will also increase costs
- What we want to know:
  - What other critical water supply-related issues?
  - What priority among the identified issues?

Environmental Justice Communities and Water Purveyors

NJ service areas with a large number of overburdened communities







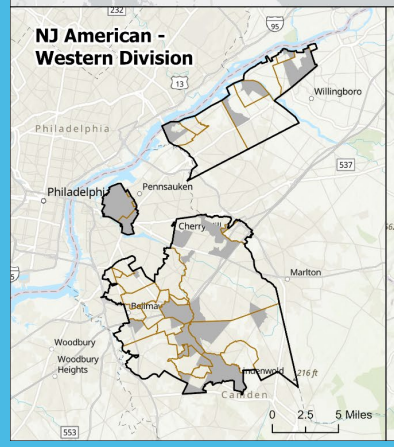
Percent Comprised of overburdened communities:

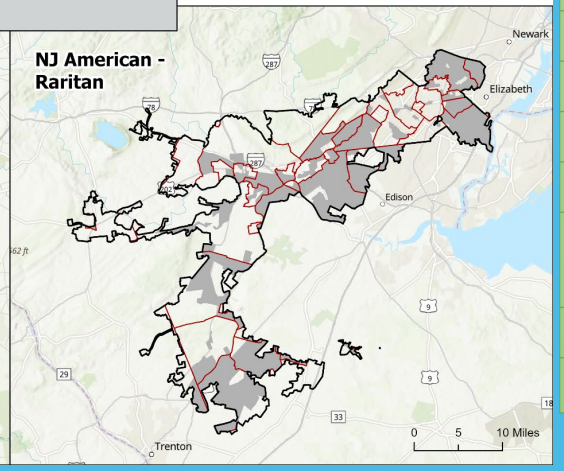
NJ American - Short Hills = 21%

Veolia - Hackensack = 57%

NJ American - Western Div. = 23%

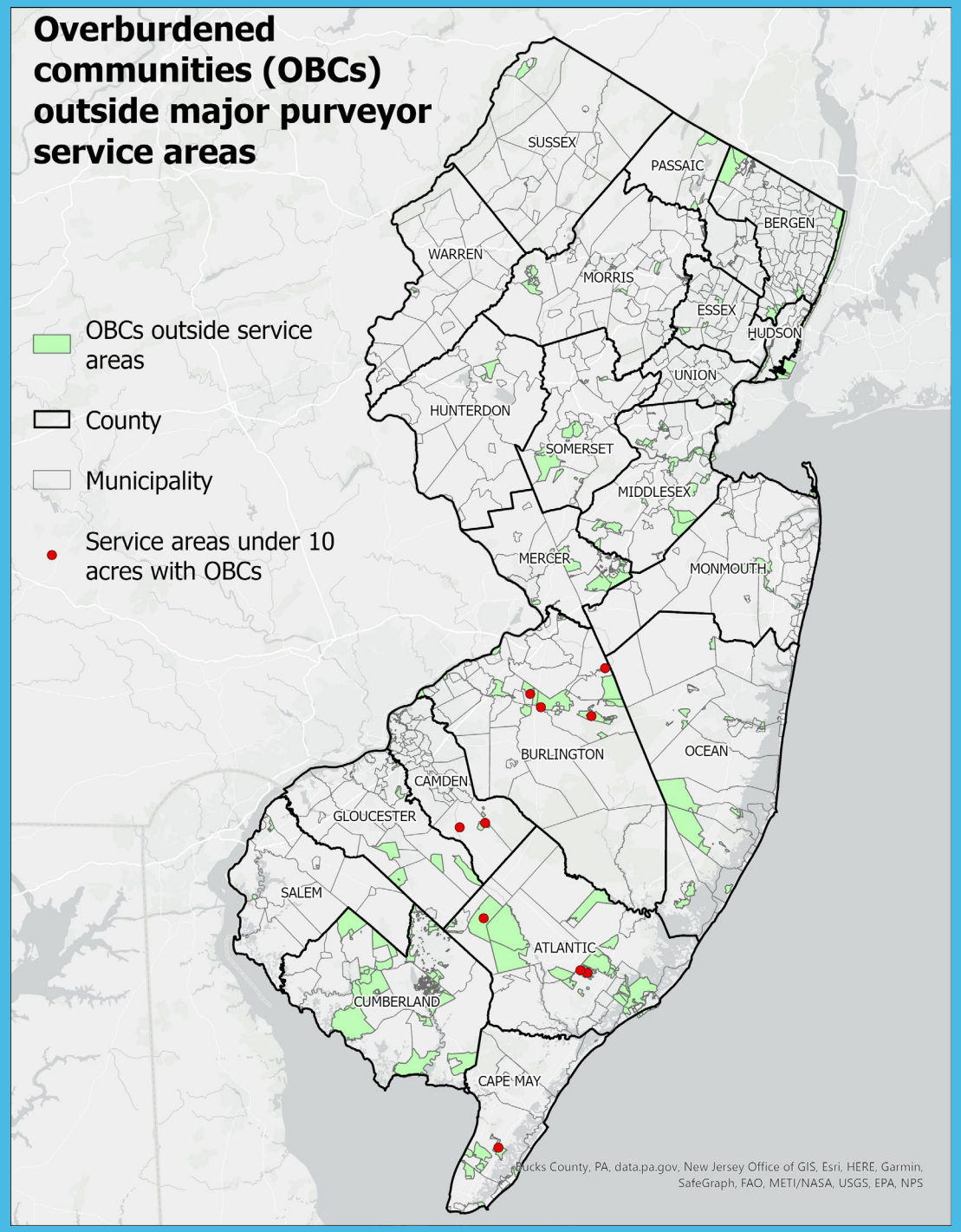
NJ American - Raritan = 43%





PWSID	County	Name	% EJ Com
NJ0102001	Atlantic	Atlantic City MUA	100%
NJ0408001	Camden	Camden City Water Department	100%
NJ0705001	Essex	East Orange Water Commission	100%
NJ0717001	Essex	Orange Water Department	100%
NJ1216001	Middlesex	Perth Amboy Dept of Municipal Utilities	100%
NJ0338001	Burlington	Willingboro MUA	100%
NJ0714001	Essex	Newark Water Department	99%
NJ0701001	Essex	Belleville Township Water Department	98%
NJ2004001	Union	Liberty Water Company c/o NJ American	98%
NJ1215001	Middlesex	North Brunswick Water Department	97%
NJ1221004	Middlesex	South Brunswick Twp Sewer & Water Dept	96%
NJ1214001	Middlesex	New Brunswick Water Department	94%
NJ1808001	Somerset	Franklin Township Department Public Works	93%
NJ0906001	Hudson	Jersey City MUA	92%
NJ0901001	Hudson	Bayonne City Water Department	89%
NJ0614003	Cumberland	Vineland City Water and Sewer Utility	88%
NJ1409001	Morris	Dover Water Commission	86%
NJ2013001	Union	Suez Rahway	82%
NJ1205001	Middlesex	Edison Water Company	82%
NJ1225001	Middlesex	Middlesex Water Company	80%
NJ1605002	Passaic	Passaic Valley Water Commission	79%
NJ0424001	Camden	Merchantville Pennsauken Water Commission	76%
NJ0702001	Essex	Bloomfield Water Department	74%
NJ1219001	Middlesex	Sayreville Borough Water Department	70%

Overburdened Communities Outside Water Purveyors



County	Municipality
Mercer	Lawrence Township
Ocean	Barnegat Township
Ocean	Stafford Township
Burlington	Pemberton Township
Atlantic	Buena Vista Township
Cumberland	Commercial Township
Somerset	Hillsborough Township
Middlesex	Old Bridge Township
Atlantic	Egg Harbor City
Middlesex	Monroe Township
Cumberland	Deerfield Township
Cape May	Middle Township
Cumberland	Maurice River Township
Cumberland	Millville
Mercer	East Windsor Township
Burlington	New Hanover Township

Thank You

Water Supply Plan Team

- Department Leads:
  - NJGWS Water Supply Modeling and Planning
  - DWSG Director's Office
  - AC WRM's Office

- Rutgers University Team:
  - Dr. Dan Van Abs, Professor of Professional Practice for Water, Society & Environment
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