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THE STATE UNIVERSITY OF NEW JERSEY

Preliminary Assessment of the Ramapo and Hackensack Watersheds in Rockland and Orange Counties

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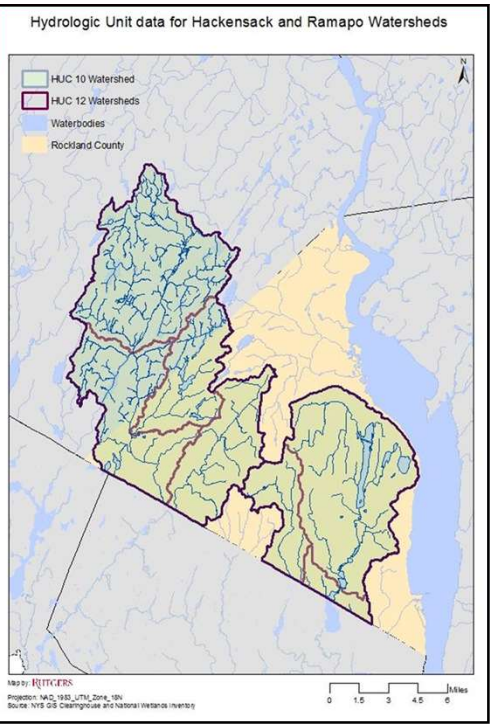
Project Focus

- Compile and assess "readily available information"
- Develop project plans
- Ramapo River watershed and tributaries
  - Mahwah River
- Hackensack River watershed and tributaries
  - Pascack Brook



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The Team

- **Daniel J. Van Abs**, Principal Investigator
- **Jennifer C. Ryan**, MLA 2017, Rutgers University, SEBS, Department of Landscape Architecture
- **Mukta Ramola**, MCRP Candidate 2018, Rutgers University, Edward J. Bloustein School of Planning and Public Policy

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Key Information Issues

What We Know

- Hydrology – a lot but not detailed enough
- Storm intensity increased
- Land use/land cover
- Zoning and land use ordinances are not sufficiently protective of water resources
- Water supply yields and projected demands
- Biological integrity of streams

What We Should Know

- More about Ramapo River in Orange County
- Impervious surfaces and development footprint by subwatershed, riparian areas and recharge areas
- Recharge losses and stream flow effects
- Flooding effects of stormwater v. floodplain development
- Suez-NY Ramapo model
- Infrastructure integrity

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Key Findings – Ramapo River

- Extensive preserved lands a critical buffer for water resources
- Experiencing ongoing water quality degradation. Treated sewage effluent, stormwater, nonpoint sources. Probable septic system stresses on ground water quality.
- Ramapo and Mahwah buried valley aquifers both stressed – water quality and yields. Fully allocated, induce from rivers, reduce stream flows in critical periods
- Minimum flow requirements at the border are a permanent constraint on water supply safe yield
- Lack of reservoir sites requires reliance on ground water, which in turn relies on stream flows
- Flat valleys enhance flooding potential

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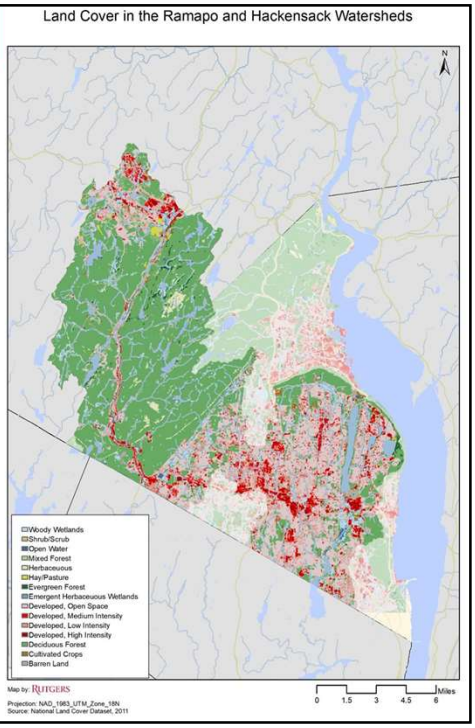
Ramapo 2012

- 52% forested
- 16% residential
- 26% commercial, roads, transitional, industrial
- Recent development primarily in Orange County headwaters (Kiryas Joel and Harriman) and in Ramapo Township



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Key Findings – Hackensack River

- Highly developed watershed – very different from Ramapo
- Water quality and biological integrity of streams degraded
- Major concerns are existing development and redevelopment, not as much “greenfield” development
- Fully allocated water supply, but more reliant on reservoir
- Minimum flow requirements at the border are a major constraint on water supply safe yield

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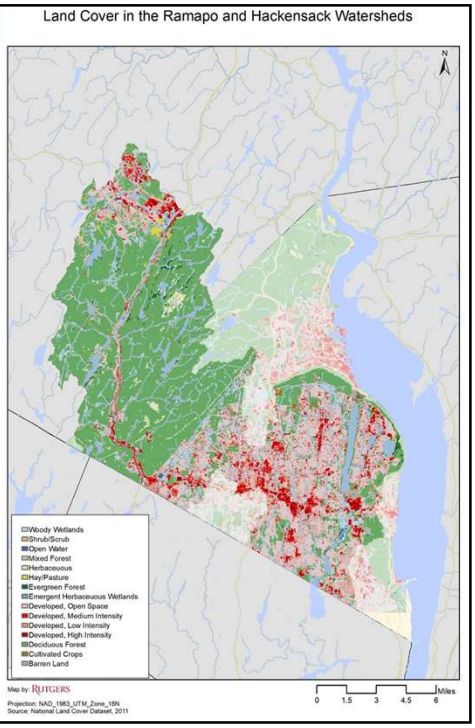
Hackensack 2012

- 12% forested
- 46% residential
- 33% commercial, roads, transitional, industrial
- Recent development scattered throughout the watershed



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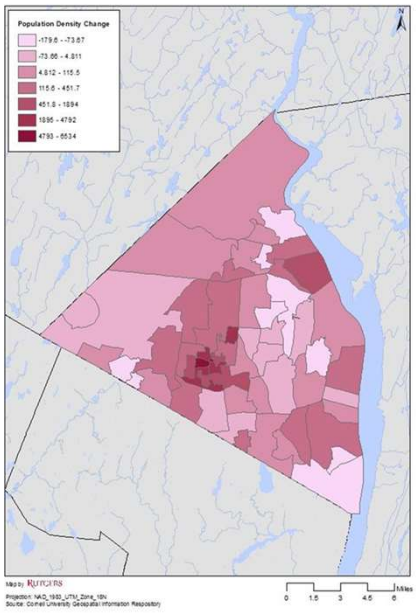
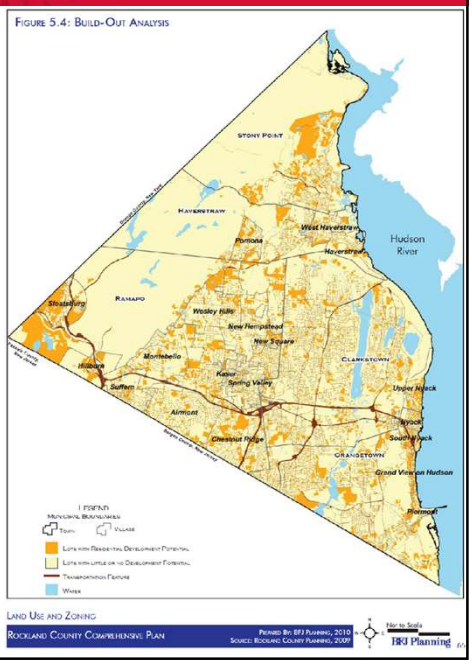
Population Density change between 2000 and 2010





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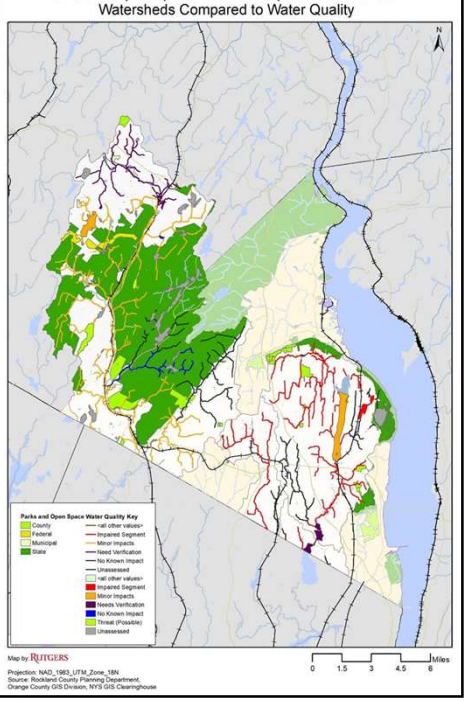
Water Quality

- Hackensack River has the greatest concentration of impaired waters and declining further
- Ramapo River mostly minor quality impacts or unassessed, but impaired sites in valley area near Suffern and biological monitoring shows moderate scores and declining further

Parks and Open Space in the Ramapo and Hackensack Watersheds Compared to Water Quality



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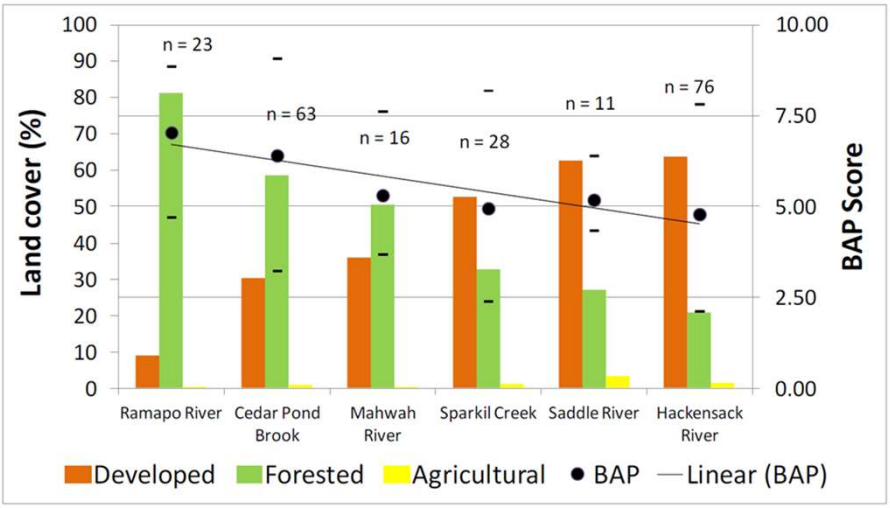
Development Damages Streams



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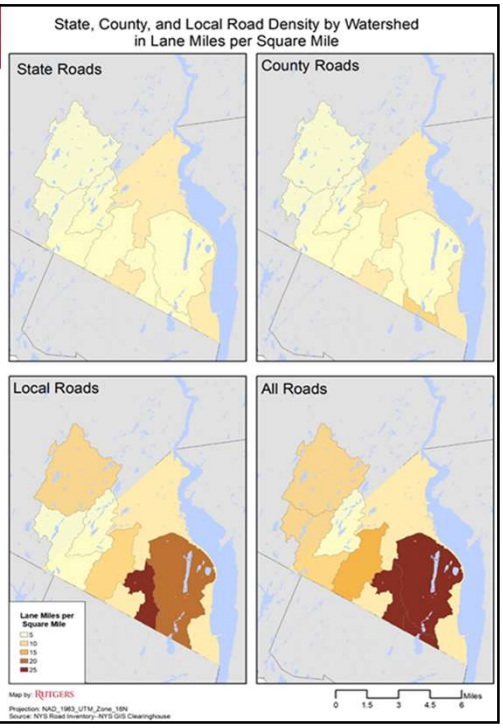
Water Under A-Salt

- Chloride levels up, have closed wells
- Road salting, affected by increases in road lane miles
- Chlorides move quickly with water flow, into streams and aquifers
- Only remedy is time and reduction in use



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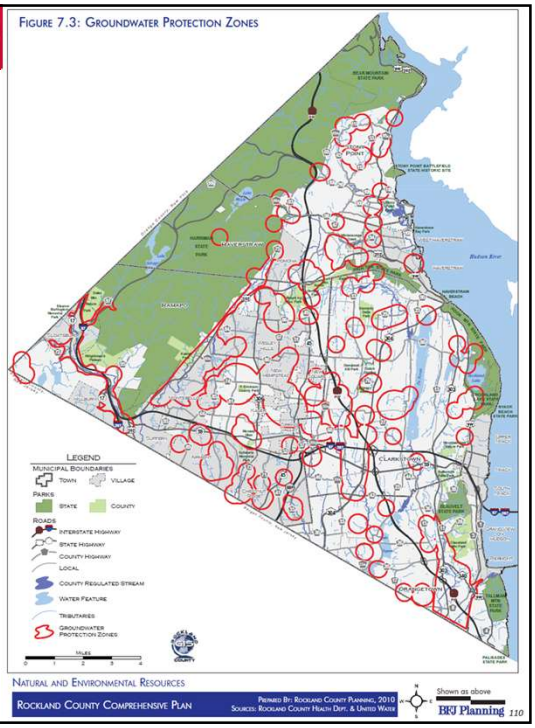
Aquifers Critical

- Majority (>70%) of Rockland supply
- Currently primary Orange County supply in Ramapo watershed
- Aquifers all at risk of or experiencing contamination
- Most wells are in developed areas; little potential for risk prevention, so risk mitigation is now key



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Key Findings – General

- Residential per capita water demands are declining
- Existing water infrastructure is aging – all types
- State agencies are responsible for water allocations, water quality standards, effluent discharge permits, water quality restoration requirements (e.g., TMDLs)
- Storm intensity is increasing, stressing stream channels and stormwater infrastructure
- Existing regulations, ordinances and plans do not ensure nondegradation, or for that matter restoration
- Enhanced regulatory responses require full technical justification, sufficient to pass judicial scrutiny
- Educational, contractual and incentive-based responses need sufficient technical evidence to justify program costs

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Declining per capita water consumption

Table 5-1 Per Capita Consumption (Gallons per Capita per Day)

TOWN	INDOOR USE (GPCD)		TOTAL USE (GPCD)	
	AVG.	MEDIAN	AVG.	MEDIAN
Clarkstown	57.8	51.6	70.7	58.9
Haverstraw	54.4	49.9	59.8	54.4
Orangetown	54.8	50.4	66.3	55.2
Ramapo	54.1	48.0	62.6	55.5
Stony Point	54.6	48.1	69.6	58.1
All Survey Data	**55.2**	**49.6**	**66.2**	**56.3**

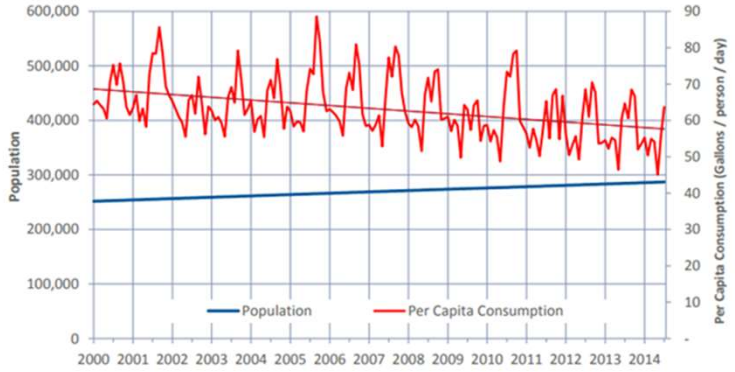

Figure 3-2 Historical Trends in Population Growth and Per Capita Consumption

CDM Smith

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Water Infrastructure Service Areas

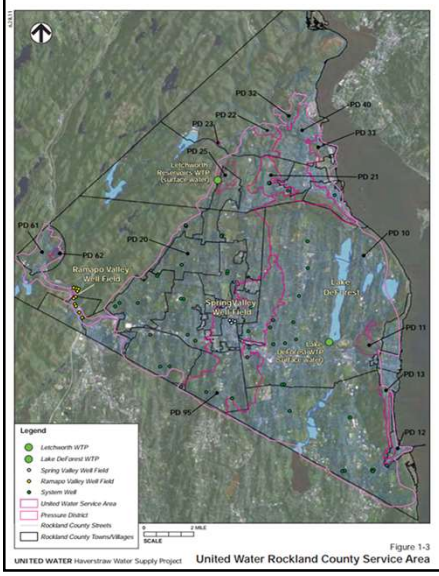
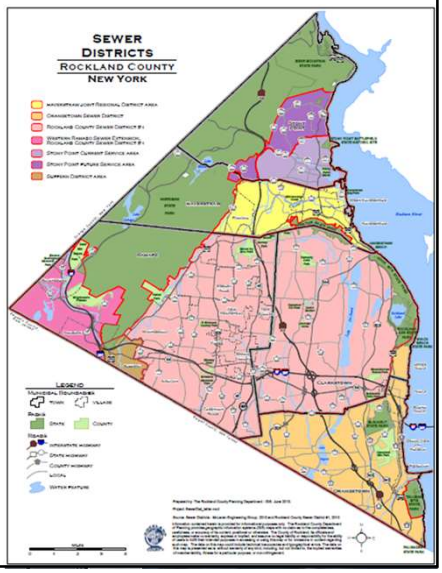


Figure 1-3
UNITED WATER Haverstraw Water Supply Project
United Water Rockland County Service Area



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Recommendations: Low Cost Actions

- Road Salt Management – Clear evidence of salinity increases due to road salt. Protect well fields as a priority.
- Stream and Riparian Area Integrity – Assessment first, then implementation of projects as funding available for priorities
- Recharge Loss Evaluation – Ground water supports all water supplies, plus stream flow. ID major losses, restoration options, implement as funding is available

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Recommendations: Higher Cost Actions

- Subwatershed Water Quality Plans – Nine Element "9E" plans per NYSDEC guidance to address areas dominated by nonpoint source pollution
- Stormwater Infrastructure Assets – ID major issues by subwatershed, engage system owners in upgrades/retrofits
- Sewer Infrastructure Assets – Utilities ID major issues of I&I, etc., and engage in asset management

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Recommendations: Highest Cost Actions

- TMDL models and water quality restoration plans – NYSDEC is responsible. Required to justify increased stringency of NPDES permits to address pollution problems.
- River flood models – Requires extensive field information and monitoring networks, calibration and verification. Beyond normal FEMA mapping process.
- Integrated watershed models – Combining stream hydrology and quality with ground water hydrology and quality. Practical and cost-effective only where a major driving force exists, such as yields and contamination for a major wellfield. Ramapo Valley?

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Modeling Stormwater and Nonpoint Sources

- Build on existing software platforms (e.g., USEPA BASINS, SWMM)
- **Option 1**: Use existing flow, quality and land use data. Not calibrated or verified. Simplified approach, providing a general sense of relative pollutant contributions. Modeling expertise required. Uses: non-regulatory programs, priority area identification, general site design ordinance provisions.
- **Option 2**: Add limited flow and quality monitoring. Still not calibrated or verified but better qualitative results. Modeling and monitoring expertise required. Uses: Rigorous site design ordinance provisions, more expensive programs.
- **Option 3**: Calibrated and verified models, with extensive data sets. Uses: High-end regulatory programs, targeted high-cost projects.

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Contact Information

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