# POTENTIAL IMPACTS OF CLIMATE CHANGE ON THE NEW JERSEY PINELANDS

## RUTGERS COASTAL CLIMATE RISK AND RESILIENCE GRADUATE PROGRAM

**New Jersey Pinelands Commission**
**May 23, 2019**

# The New Jersey Pinelands

## An Ecologically Sensitive Environment

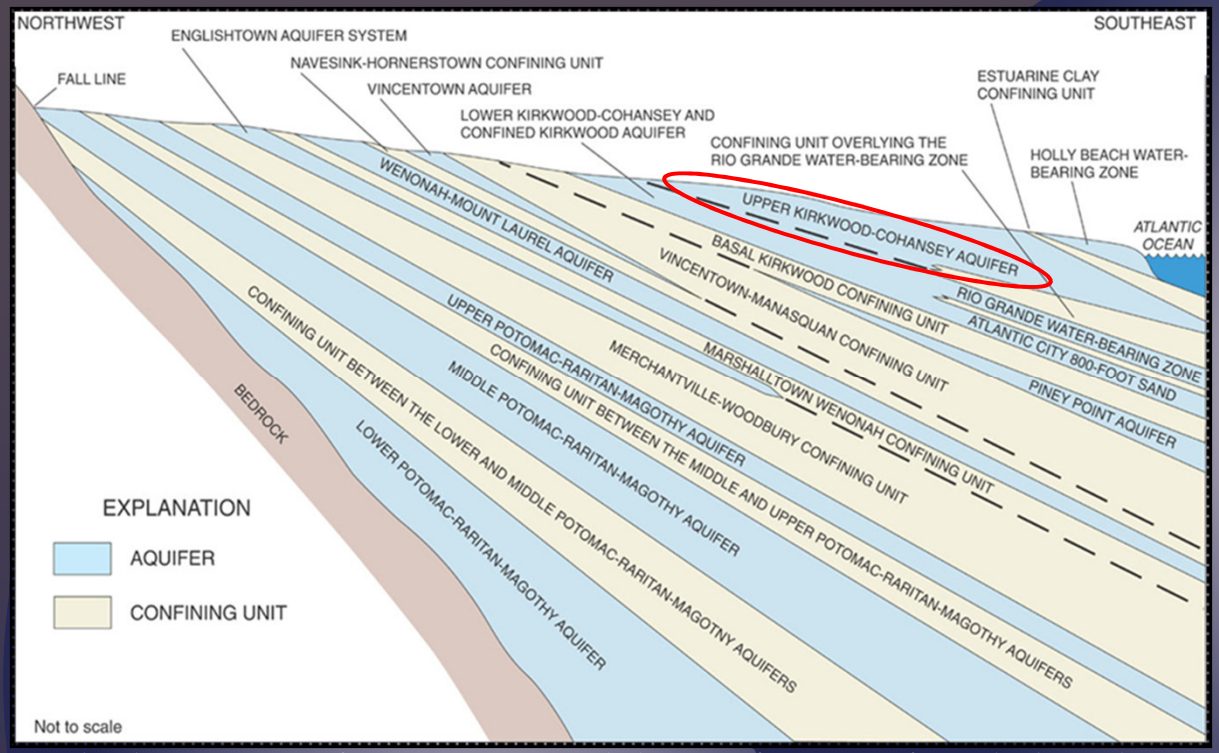
# Our Pinelands Area Climate Change Assumptions

Rising temperatures
Hotter and dryer, day to day
Warmer, especially in winter;  less cold extremes
Steady or increasing precipitation
Wet conditions occurring more intensely but not more frequently
Increasing variability and extreme storms, flood, drought, heat
Rising sea level

Dr. David A. Robinson
Professor, Department of Geography & New Jersey State Climatologist
Rutgers University

March 26, 2011 - Pinelands Short Course
November 18, 2015 - Presentation to the Pinelands Commission
March 12, 2016 - Pinelands Short Course
February 29, 2016 - Press of Atlantic City
March 10, 2018- Pinelands Short Course

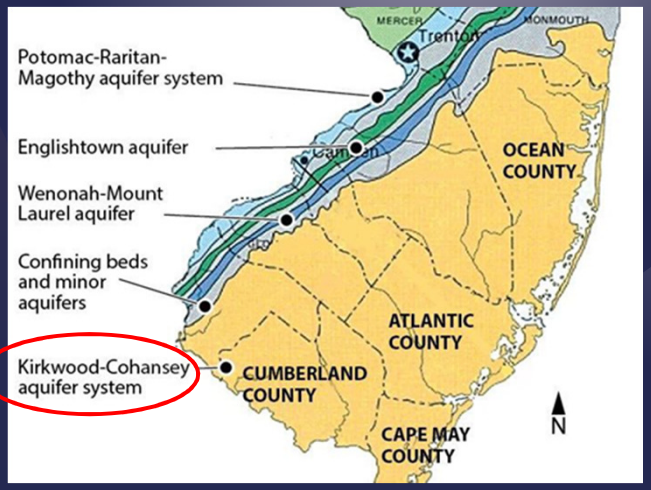
# Aquifers Underlying the New Jersey Coastal Plain



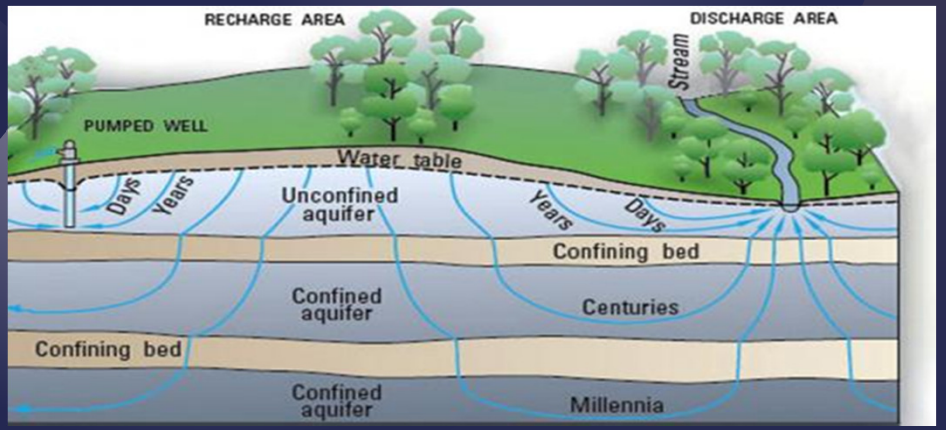

Generalized Cross Section of New Jersey's Coastal Plain Aquifer System. (from Charles et al., 2011)

## Aquifers

- Holly Beach
- Kirkwood – Cohansey
- Piney Point
- Wenonah-Mount Laurel
- Vincentown
- Englishtown
- Upper Potomac-Raritan-Magothy
- Middle Potomac-Raritan-Magothy
- Lower Potomac-Raritan-Magothy



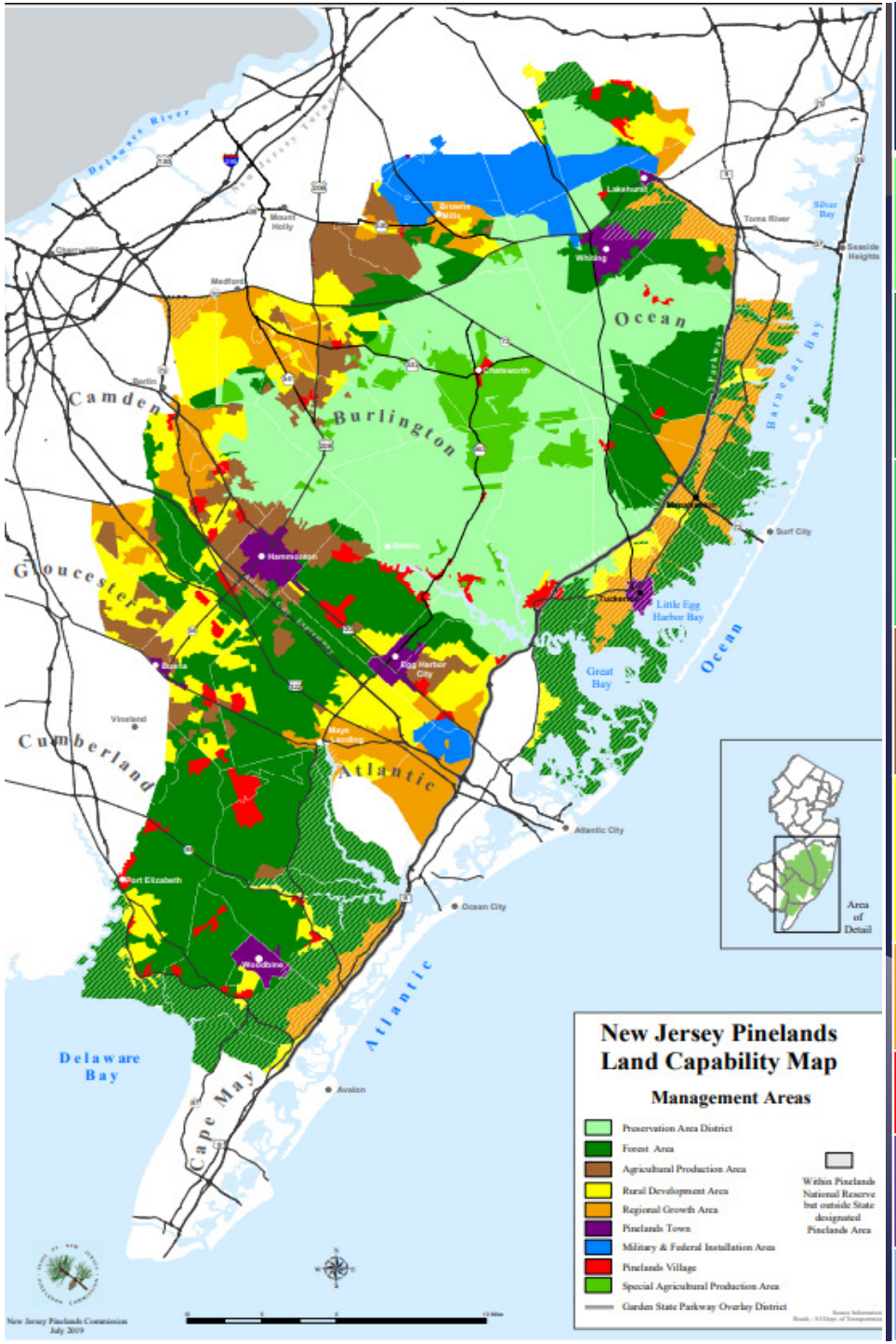

Source: Press of Atlantic City




Source: Pinelands Preservation Alliance

# NJ Pinelands Facts

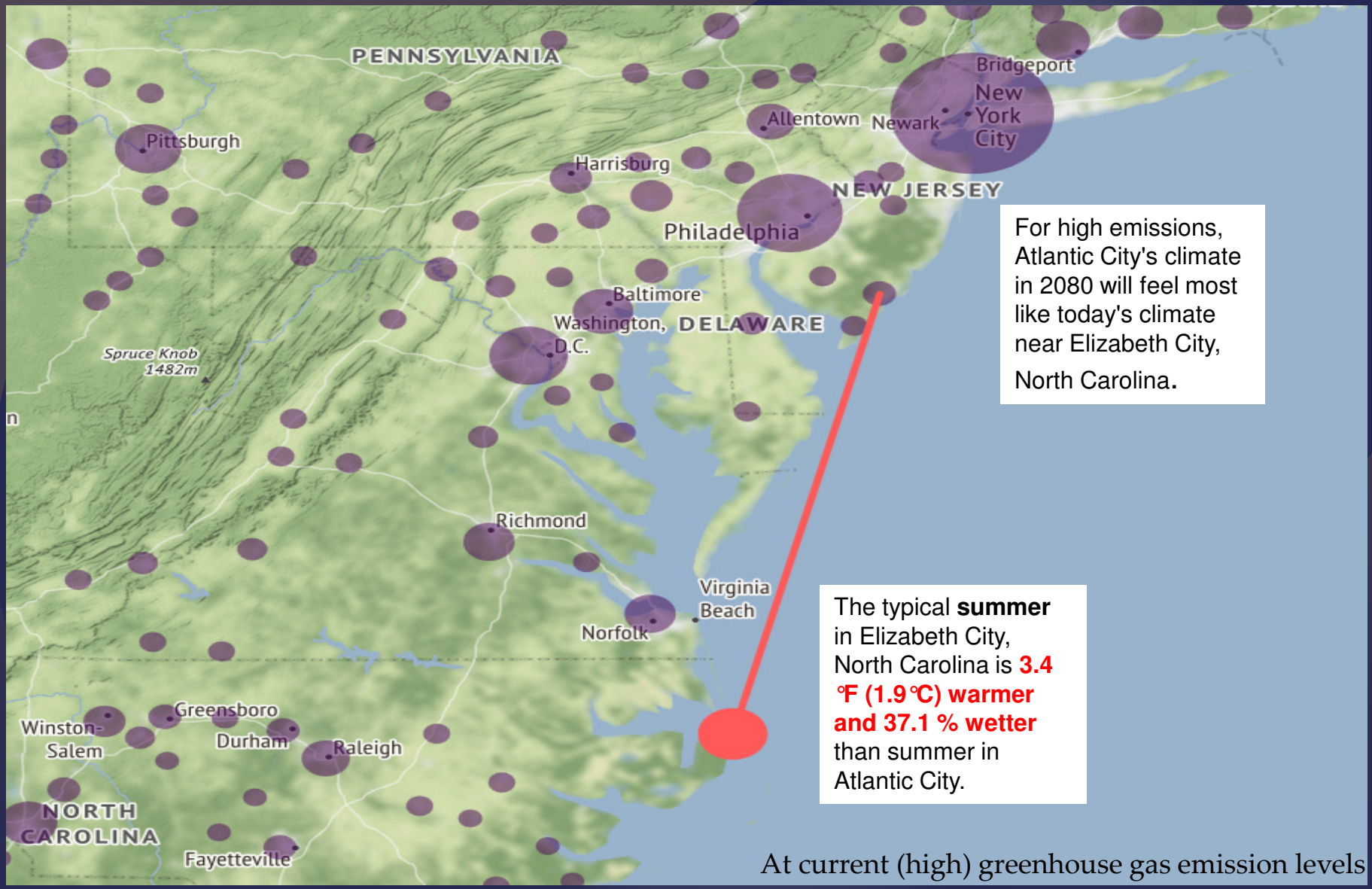
- Gained Federal & State designation and protection in 1978 & 1979
- Governed by the 15 member Pinelands Commission, an independent political subdivision of state government.
- Approximately one million acres – roughly 20% of NJ's land area
- Protected via land use controls & environmental programs.
- Rare ecosystem characterized by low pH, nutrient-poor streams fed by shallow groundwater
- 17.7 trillion gallon Kirkwood-Cohansey aquifer system – unconfined, often shallow- provides base-flow to wetlands, streams and rivers
- Habitat for 43 T&E animal species and 92 T&E plant species
- Headwaters to Atlantic and Delaware River Basin Watersheds




| Management Areas | Character | Permitted Uses | |
|---|---|---|---|
| | | Residential | Non-residential |
| Preservation Area District (PAD) | Wilderness Critical Ecosystem | Cultural housing on min 3.2 ac. | Expand existing uses only; low intensity recreation |
| Forest Area | Similar to PAD | Clustered housing on one ac. lots -1 home per 28 acres | Roadside retail of preexisting uses; low intensity rec. |
| Special Agriculture | Native plant agriculture – blueberry and cranberry, | Farm housing on min. 40 ac. | Expand existing uses only |
| Agricultural Production | Upland field and row crops | Farm housing min 10 acres; non-farm 1 home on 40 ac. | Agricultural commercial and industrial uses |
| Rural Development | Intermediate between Forest and Growth | Clustered housing on 1 ac. lots with 1 home per 5 ac. average | Commercial, industrial on septic and intensive recreation |
| Regional Growth | Capable of additional growth | 2 to 6 homes per ac with sewers | Sewered commercial and industrial uses |
| Village | Villages: small and isolated, Towns: larger and expansive | 1 to 5 ac. lots in village<br>2 to 4 homes per ac. with sewer | Sewered commercial and industrial |
| Town | | | |
| Military and Federal | Federal enclaves | Military housing | Military and similar |

| Pinelands Management Areas | Challenges resulting from climate change |
|---|---|
| **Preservation and Forest Area** | Wildfires<br>Invasive insect species<br>Instability in forest composition<br>Maintenance of ecological stream flows<br>Sea level rise pushing brackish waters inland<br>Water quality (Low DO with increased temps) |
| **Agricultural and Special Agricultural** | Length of growing season<br>Insect infestation and fungal disease<br>Drought / Deluge / Heat Stress<br>Crop yields<br>Irrigation demands |
| **Regional Growth Area, Towns and Villages** | Sustainable water supply<br>Public health and disease<br>Stormwater management – chronic / nuisance flooding<br>Displaced coastal population<br>Solid waste disposal from destructive coastal storms |
| **Rural Development Area** | Wildfire in RDA adjacent to forest management area-WUI<br>Displaced coastal population<br>Public health and disease<br>Water resources<br>Stormwater management |
| **Federal and Military Installation Areas** | Wildfire<br>Drought<br>Heat related illness<br>Worldwide humanitarian mission readiness<br>Climate related global conflict response readiness |

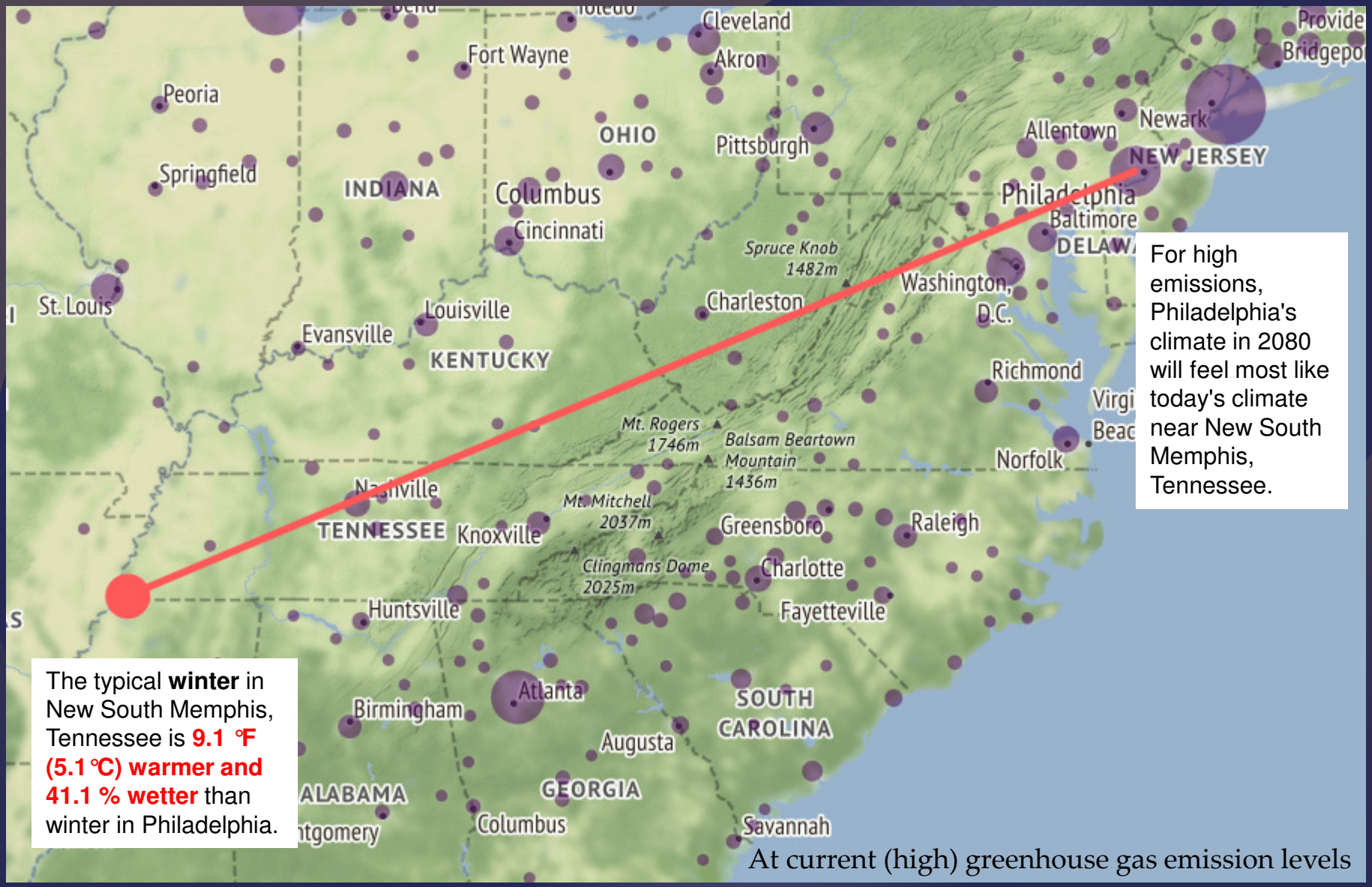
# What will climate feel like in 60 years?




https://fitzlab.shinyapps.io/cityapp/

University of Maryland Center for Environmental Science

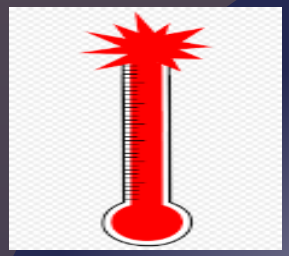
# What will climate feel like in 60 years?




https://fitzlab.shinyapps.io/cityapp/

University of Maryland Center for Environmental Science

# Potential Climate Change Manifestations and Impacts



**Rising Temperatures**

**Precipitation Extremes**

**Drought**

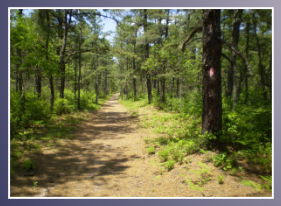
**Sea Level Rise**

## Health Impacts

- Heat-Related Mortality
- Infectious Diseases
- Air Quality-Respiratory Illness

## Agricultural Impacts

- Crop Yields
- Invasive insects
- Plant pathogens
- Irrigation demands



## Forest Impacts

- Forest composition
- Wildfire
- Invasive insects
- Geographic species range

## Water Resource Impacts

- Water supply
- Water quality
- Salt water intrusion

## Infrastructure

- Dams
- Roads and Bridges
- Occupied structures
- Landfills
- Wastewater treatment plants

## Species and Landscape

- Habitat transition
- Loss of native species
- Geographic species migration

Adapted from Dr. David A Robinson, March 12, 2016 Pinelands Short Course

# Wildfire

Pine Barrens: A fire adapted forest ecosystem that depends on wildfire for reproduction of the dominant upland species: *Pinus rigida* – the pitch pine.

Pitch pines:

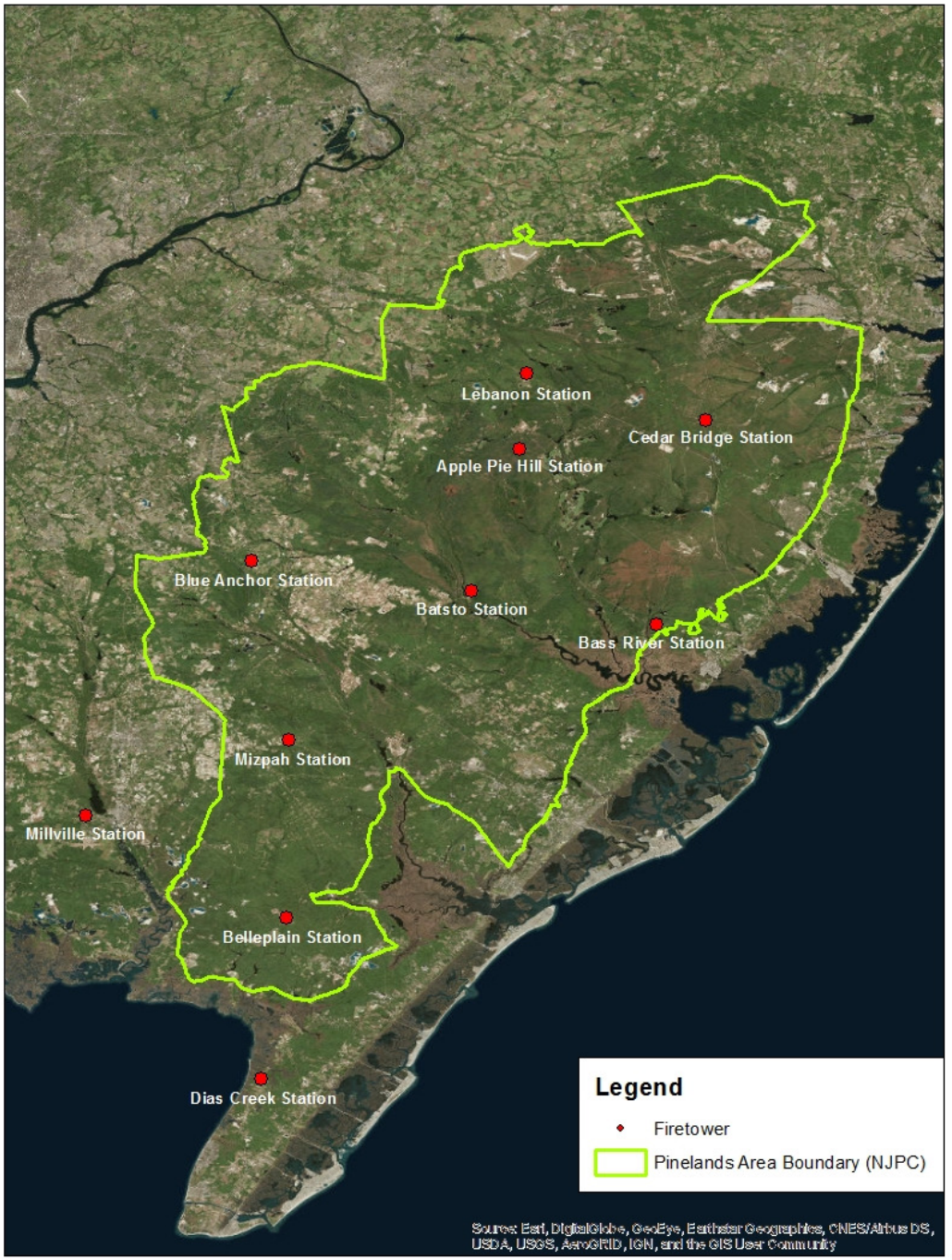
- Thrive is sandy, acidic and drought-prone soil
- Serotinous cones covered by resin release seeds only when
- exposed to fire
- Platy pine bark insulates cambium
- Generate new sprouts from stem and root buds after fire

# Protecting the built environment from a fire adapted ecosystem.

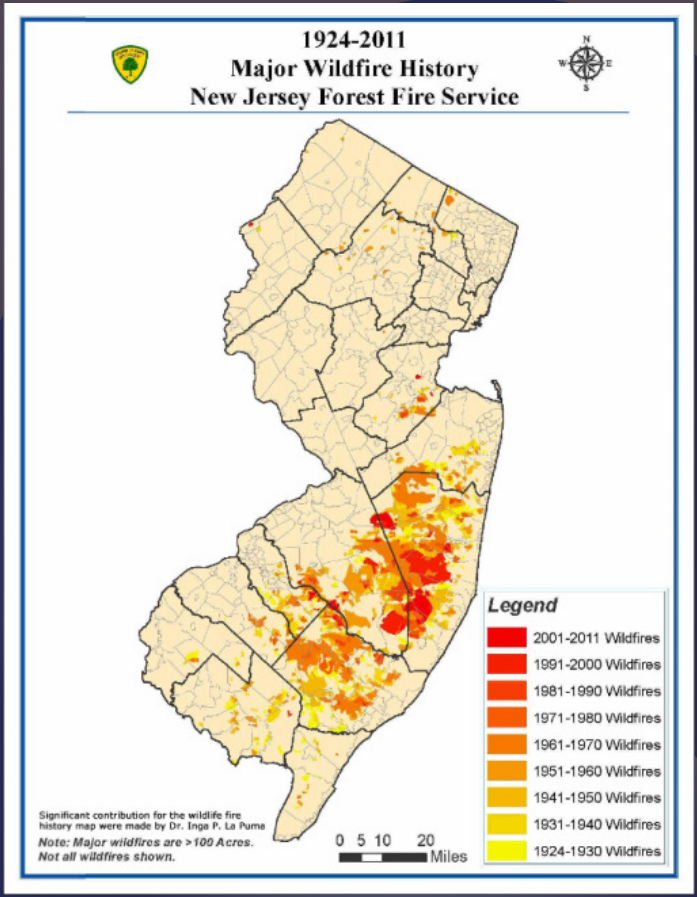

**NJ Forest Fire Service**

- Responds to > 1500 wildfires annually
- 1800 on-call wildfire fighters
- Fleet of ~ 275 vehicles
  - Brush trucks
  - Bulldozers
  - Airplanes
  - Helicopters

# New Jersey Forest Fire Service's Network of South Jersey Fire Lookout Towers



# Protecting the built environment from a fire adapted ecosystem.




**USFS**

**NJ Fire Danger Monitoring Console**

Most recent information collected as of April 25, 2019, 2:32 pm

| Site | Air Temp | RH | Wind Sp | Peak Gust | Wind Dir | 10hr Fuel Moisture | 10hr Fuel Temp | 24hr Precip |
|---|---|---|---|---|---|---|---|---|
| Ancora Hospital | 62 | 55 | 6 | | ESE | | | |
| Berkeley Twp. | 57 | 60 | 6 | 13 | ESE | 12 | 61 | 0.00 |
| Cedar Bridge | 56 | 58 | 3 | 11 | S | 9 | 62 | 0.00 |
| Coyle Field | 60 | 55 | 7 | | SE | | | |
| Cream Ridge | 62 | 52 | 6 | 11 | SSE | 8 | 64 | 0.00 |
| Forsythe | 55 | 70 | 7 | | ENE | | | |
| Fort Dix I | 64 | 48 | 5 | 11 | SSE | 6 | 66 | 0.00 |
| Hammonton | 62 | 57 | 5 | 11 | SE | | | 0.00 |
| Howell | 58 | 57 | 4 | 11 | SSE | | | 0.00 |
| Jackson | 61 | 53 | 6 | | SSE | | | |
| Oswego Lake | 59 | 57 | 5 | 10 | ESE | 12 | 64 | 0.00 |
| Piney Hollow | 64 | 52 | 4 | 8 | ESE | | | 0.00 |
| Silas Little | 63 | | 4 | 11 | S | 9 | 71 | 0.00 |
| South Brunswick | 69 | 40 | 3 | | SSW | | | |
| Upper Deerfield | 67 | 52 | 6 | 10 | SE | | | 0.00 |
| Woodbine | 58 | 61 | 0 | 18 | E | | | 0.00 |

| Legend: | | | |
|---|---|---|---|
| Relative Humidity | < 40% | < 30% | < 20% |
| Wind Speed/Gust | > 15 | > 20 | > 25 |
| Fuel Moisture | < 20 | < 15 | < 10 |

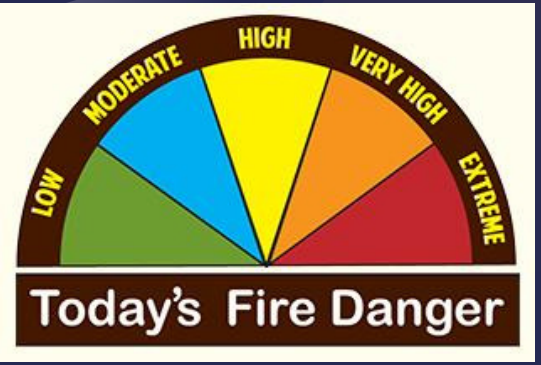
This page will automatically reload every 60 seconds.

**Fire Restriction Rating System**

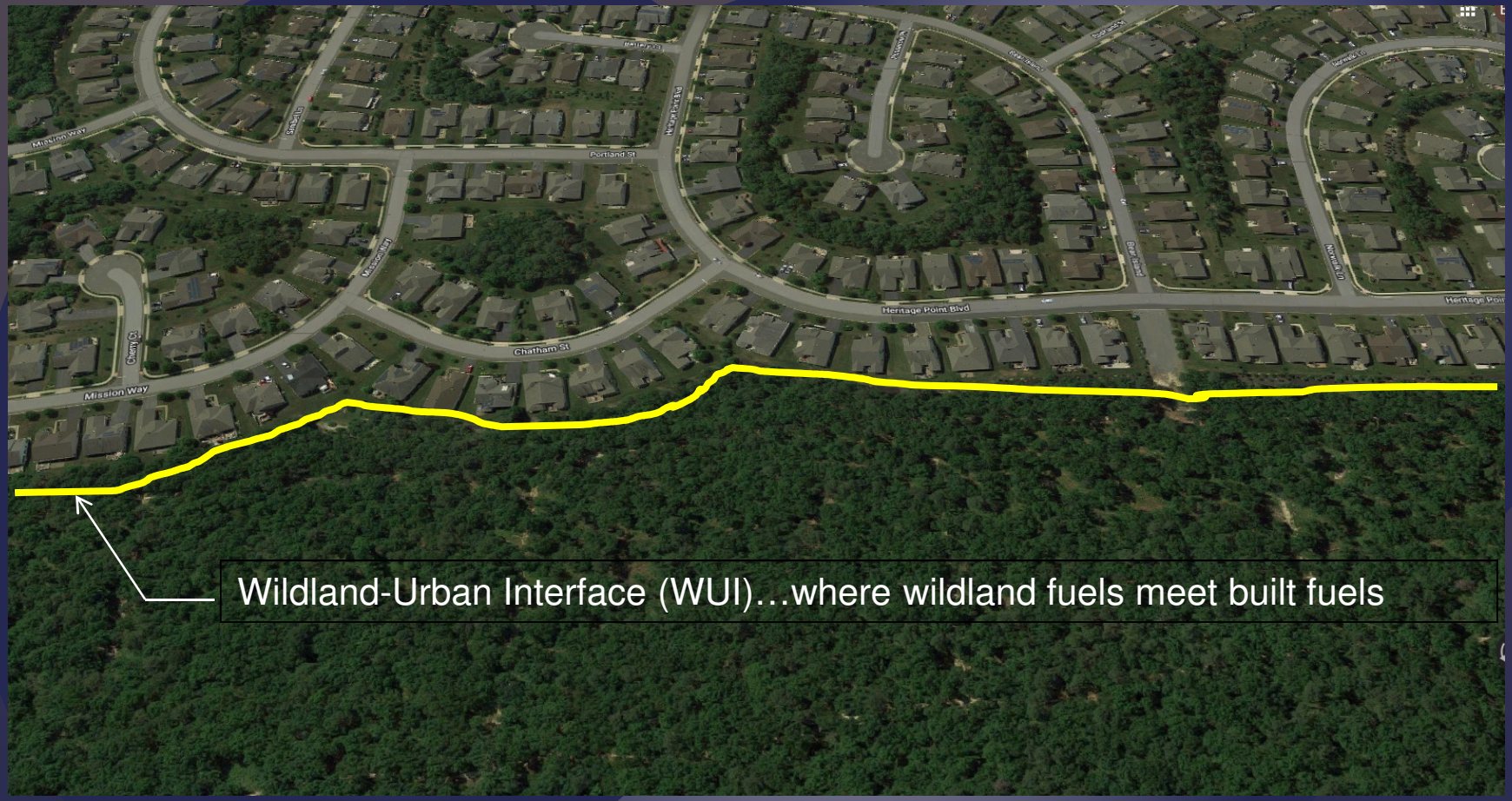
| |
|---|
| Stage #1 |
| Stage #2 |
| Stage #3 |

Increasing Temperatures + Drought + Human Habitation in Fire-Prone Areas = Danger to Public Safety and Infrastructure

**National Fire Danger Rating System**



# Protecting the built environment from a fire adapted ecosystem.




The Pinelands CMP requires:

- Defensive space (fire breaks) around structures at the WUI
- Fire resistant roof and exterior building materials
- Maintenance of (multiple) access roads and escape routes

# Identifying Optimal Regions within New Jersey's Pine Barren Forest for Urban Development Based on Wildfire Risk and the Wildland Urban-Interface Theory

## Abstract

As New Jersey's population increases, more of this population is relocating to the wildland-urban interface (WUI) of the south-central Pinelands region. Due to this increase in human activity coupled with local environmental conditions, local authorities are concerned about an increased possibility of wildfires that could damage both the area's infrastructure and ecosystem. To counteract this risk, it is necessary to develop methods for accurate wildfire assessment and mitigation efforts. This project partnered with the New Jersey Pinelands Commission (NJPC) to develop a Fire Risk Assessment Tool that identifies areas with high fire risk based on land cover characteristics. The team incorporated vegetation indices derived from Landsat 8 Operational Land Imager (OLI) and Sentinel-2 Multi-Spectral Instrument (MSI), land-use classification derived from LANDFIRE data and elevation into a fuzzy logic model to generate a 30 x 30 m Fire Risk Assessment Map. The map was used to analyze fire susceptibility in the Pinelands WUI and to identify optimal areas for urban expansion. Fifty-three percent of the total area within the Pinelands WUI was classified as having a moderate fire risk, while high and extremely-high fire risk accounted for 13%. An estimated 200,000 acres of land with a low to moderate risk of fire were identified as areas that would be suitable for development. The results and maps produced will be used by the New Jersey Pinelands Commission to guide urban development planning and decision making.

## Objectives

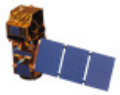
- Classify fire risk throughout the study area and ensure the usability of the Fire Risk Assessment Tool by our partners
- Analyze fire risk in the Pinelands WUI to aid our partners in identifying suitable areas for urban development
- Locate areas where our partners should apply fire mitigation efforts to minimize fire induced economic and infrastructure losses

## Project Partner

- New Jersey Pinelands Commission

## Study Area

## Earth Observations



Sentinel-2 Multi-Spectral Instrument (MSI)

Landsat 8 Operational Land Imager (OLI)

## Team Members

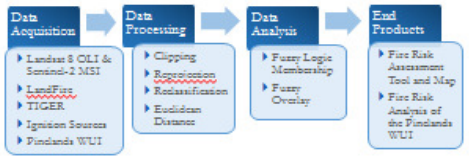
Man Kumari Giri
Project Lead

Mercedes Barkovich

Olivia Buchanan

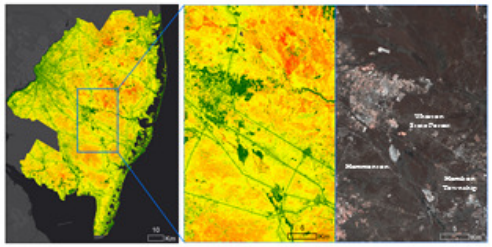
Nicholas McVey

## Methodology

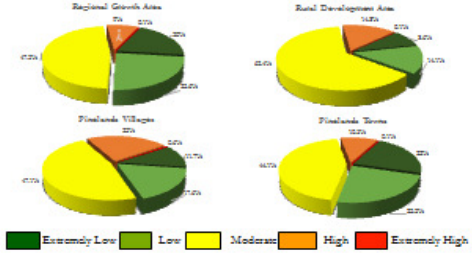



## Results

### Fire Risk Assessment Map



### Fire Risk Analysis of the Pinelands WUI




## Conclusions

- 53% of the Pinelands WUI were classified as moderate to low fire risk areas, while only 13% were considered high to extremely high fire risk areas.
- Approximately 200,000 acres of the WUI would be considered suitable for development based on their fire risk.
- The New Jersey Pinelands commission will use the Fire Risk Assessment Map for urban development decision making and planning
- The Fire Risk Assessment Tool will be used by our partner to generate up-to-date fire risk maps in the future.

## Acknowledgements

Dr. Jeffrey Luvall (NASA Marshall Space Flight Center)
Dr. Robert Griffin (University of Alabama in Huntsville)
Leigh Sinclair (University of Alabama in Huntsville/Information Technology and Systems Center)
Maggi Klug (University of Alabama in Huntsville)
Larry Liggon (New Jersey Pinelands Commission)
Gina Berg (New Jersey Pinelands Commission)
William Zipse (New Jersey Forest Fire Service)
Jeremy Webber (New Jersey Forest Fire Service)



# NASA's Satellite Eye in the Sky

University of Alabama & NASA Marshall Space Flight Center

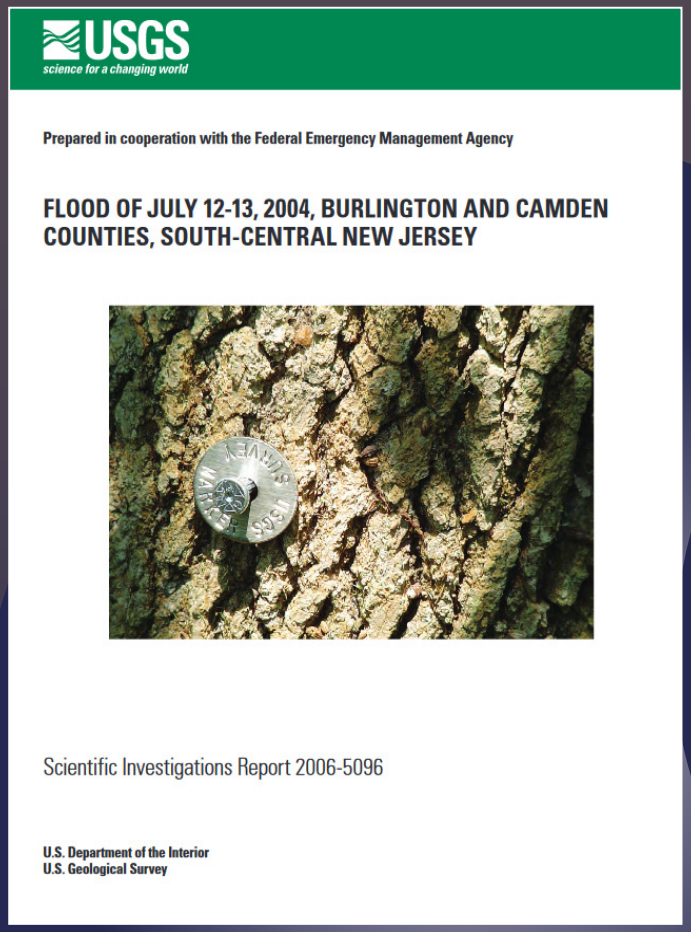
## Key findings:

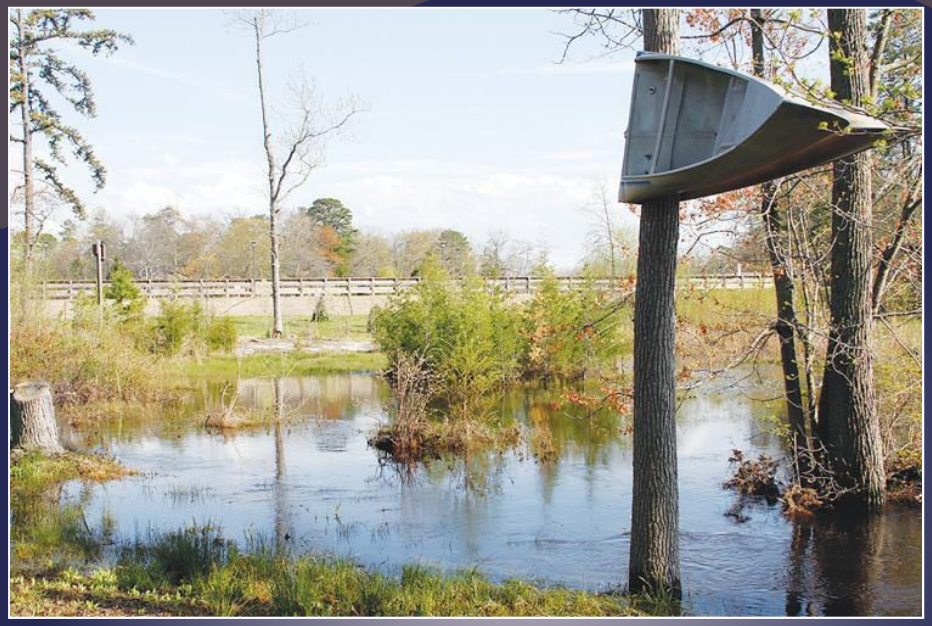
- The Extremely High Fire Risk areas are primarily within the Preservation Area where development is prohibited.
- The Regional Growth Area has the least total area under High Fire Risk.

---

The CMP can be credited with reducing risk to infrastructure and public safety by directing development toward the margins of the Pinelands and steering it away from the heavily forested Forest Area and Preservation Area District.

# Precipitation



- 13.2 " rain – up to 3 "/ hr.- not associated with a hurricane
- Rancocas & Pennsauken Creeks, Cooper River flooding
- Forty-five dams topped, twenty-eight dams damaged, and **seventeen dams failed completely**
- 500-year flood elevations exceeded at numerous sites
- More than 1200 homes flood damaged
- Contamination of drinking water supplies & sewage system failures
- 25 major road closure including NJTP & Routes 70 & 73 with serious damage or destruction of 14 bridges

Photos: Press of Atlantic City

# South Jersey Derecho June 2012

- Eighty seven mph straight line winds at AC Airport
- 206,000 homes without power many for > 1 week during 9 day stretch of 90-100 ° F heat and humidity.
- Thousands of trees uprooted or destroyed
- Derecho recurrence interval on the order of one per every 2 to 4 years
- Pinelands Executive Director executes Emergency Provision of the CMP authorizing the creation of temporary debris management facilities for processing of vegetative debris resulting from the storms

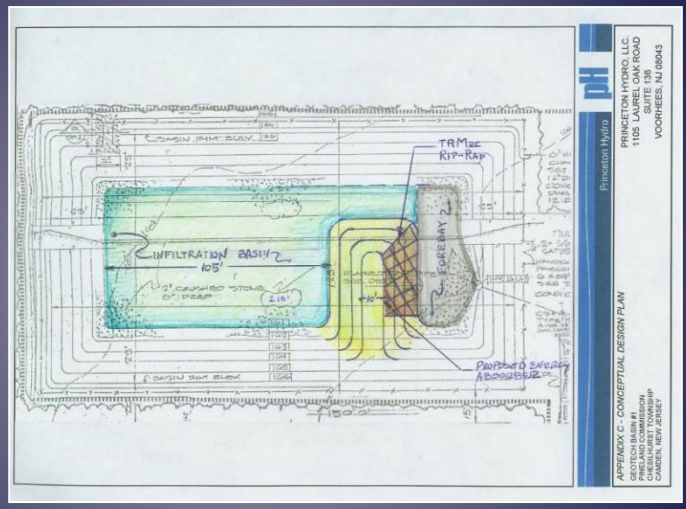
# Stormwater Management -

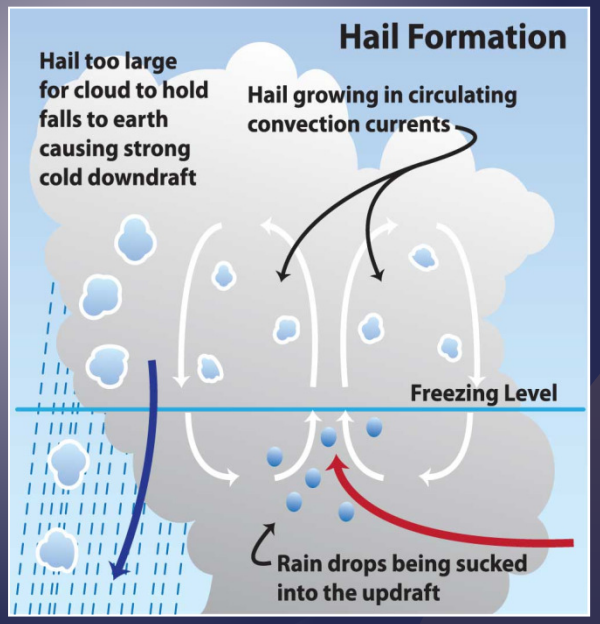
Groundwater recharge for aquifer replenishment required since 1981

Mandatory recharge of runoff from the 10-year storm - on the order of 5” rainfall volume

Significantly larger recharge required in the Pinelands

Storms of greater intensity and increased stormwater runoff will require reevaluation of stormwater management standards to minimize flood damage, protect water quality and provide groundwater recharge





Hail Formation
Hail too large for cloud to hold falls to earth causing strong cold downdraft
Hail growing in circulating convection currents
Freezing Level
Rain drops being sucked into the updraft

# Coastal Storms

Ryan Morrill

***ROAD TO NOWHERE:** A closed and abandoned sand mine pit off Route 72 and West Bay Avenue is the new home for totaled flood-damaged cars as they await transport to car auction sites.*

# *Pinelands Commission Tries to Close Flood Car Receiving Site in Barnegat*

Think your storm-totaled car is off the road? Think again. Though you may have been saved the costs of repairing a saltwater-damaged car, someone else may be purchasing that car very soon.

That's the business of IAA, a subsidiary of KAR Auction Services Inc., which purchases totaled cars from insurance companies, dealerships, rental car companies and fleet lease companies. Based in the Midwest, the IAA website states that 3.5 million vehicles are deemed total losses in the United States each year.

Recently IAA set up shop in an abandoned mining pit in Barnegat Township off West Bay Avenue and Route 72. Reports by local residents about hundreds of cars arriving by tow trucks to the site alerted the N.J. Pinelands Commission to an illegal use of the area, which is in the Pinelands National Reserve forest management area – the most sensitive and most regulated part of the 1-million-acre Pinelands.

The site is being used as a holding facility for the hundreds of cars damaged by Hurricane Sandy, a use that officials contend violates the Pinelands Management Act.

The Pinelands Commission has sent two letters informing the landowners – Barnegat Holdings LLC and KJ&J Associates, 1468 and 1467 West Bay Ave. in Barnegat – that they must immediately desist and remove the cars.

Charles Horner, director of regulatory programs for the Pinelands Commission, wrote that the storage of motor vehicles is not a permitted use and also violates Barnegat Township zoning laws.

"IAA is working with city, state and other appropriate local officials to ensure we are meeting the necessary standards required for the temporary storage of storm-damaged vehicles," said IAA spokesman Lou Colasuonno.

The Pinelands Commission offered the landowners an option to apply for a commercial use from the commission, but also stated it is unlikely it would be approved by the N.J. Department of Environmental Protection.

"If Barnegat Township wishes to propose the use of the parcel as a debris management area for the storage of vehicles, the township should immediately contact the NJDEP Solid and Hazardous Waste Management Program," wrote Horner. "NJDEP would not allow a private entity to independently establish debris management areas."

— **Pat Johnson**

**Source: Sandpaper Dec. 5, 2012**

# Superstorm Sandy October 2012

- 5000 flood damaged cars transported to the Pinelands Forest Management Area
- Fifty acres of Pinelands converted to a junk yard virtually overnight.
- Concern over potential groundwater contamination from leaking gasoline, motor oil and other automotive fluids.
- Court action required to address the violation
- Phase I Environmental Site Assessment required to ensure no environmental degradation.
- Site restoration and soil stabilization measure required after the removal of vehicles.

# Ash Wednesday Storm March 1962

- AKA "Great March Storm of 1962" Extreme Nor'easter lingered during five high tide cycles over three days.
- Pummeled Long Beach Island with ocean waters overtopping the island in 5 locations.
- Seven deaths and six hundred homes on the island destroyed.
- Wrecked homes and their contents dumped in the Pine Barrens – at the site of the Stafford Township landfill
- Future coastal storms likely to lead to large quantities of solid waste being landfilled at the Cape May County MUA Landfill, the only landfill operating in the Pinelands and reducing it's useful life.

# Sea Level Rise

# Salt Water Intrusion - Impacts to Surface Water Ecosystems

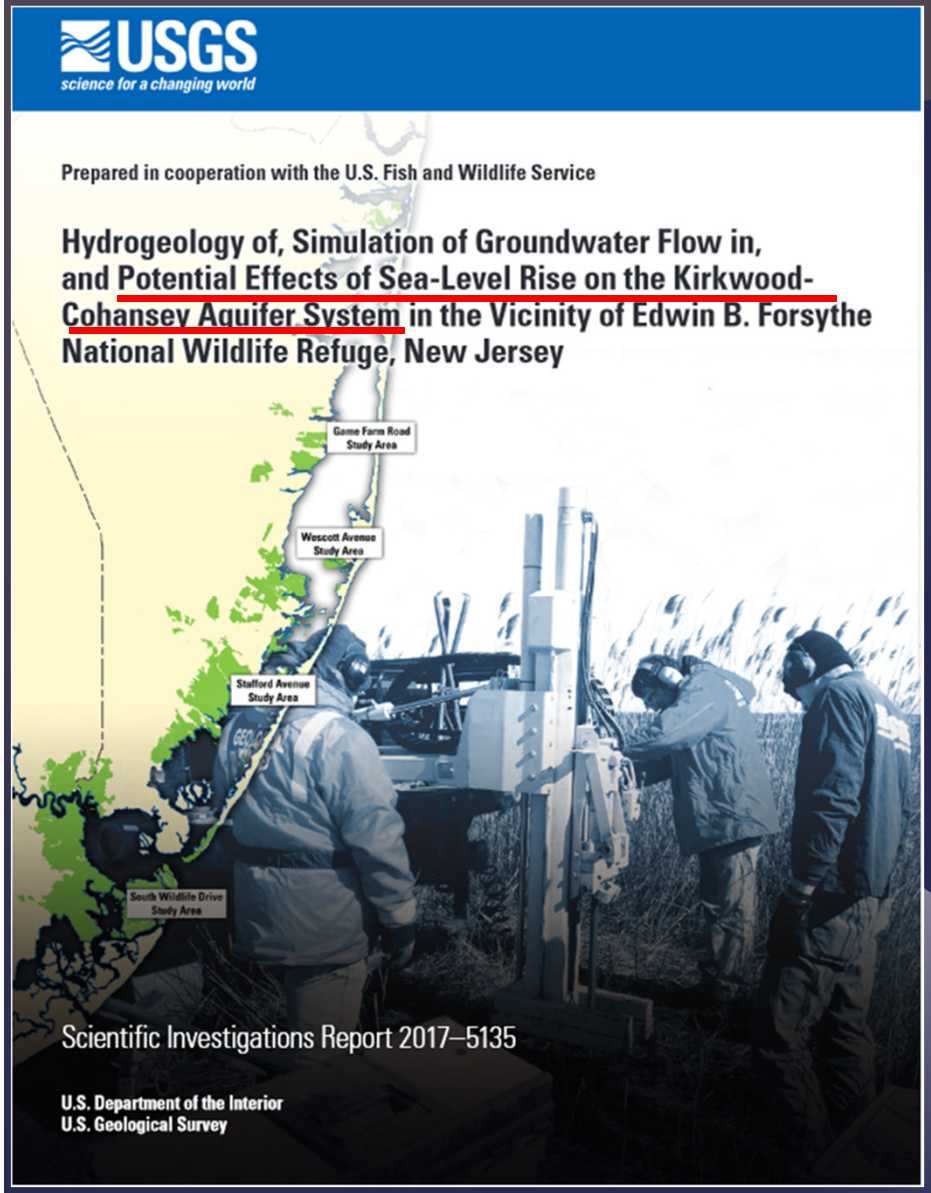
Episodic – Elevated sea levels amplify storm surge from coastal storms pushing salt water farther inland

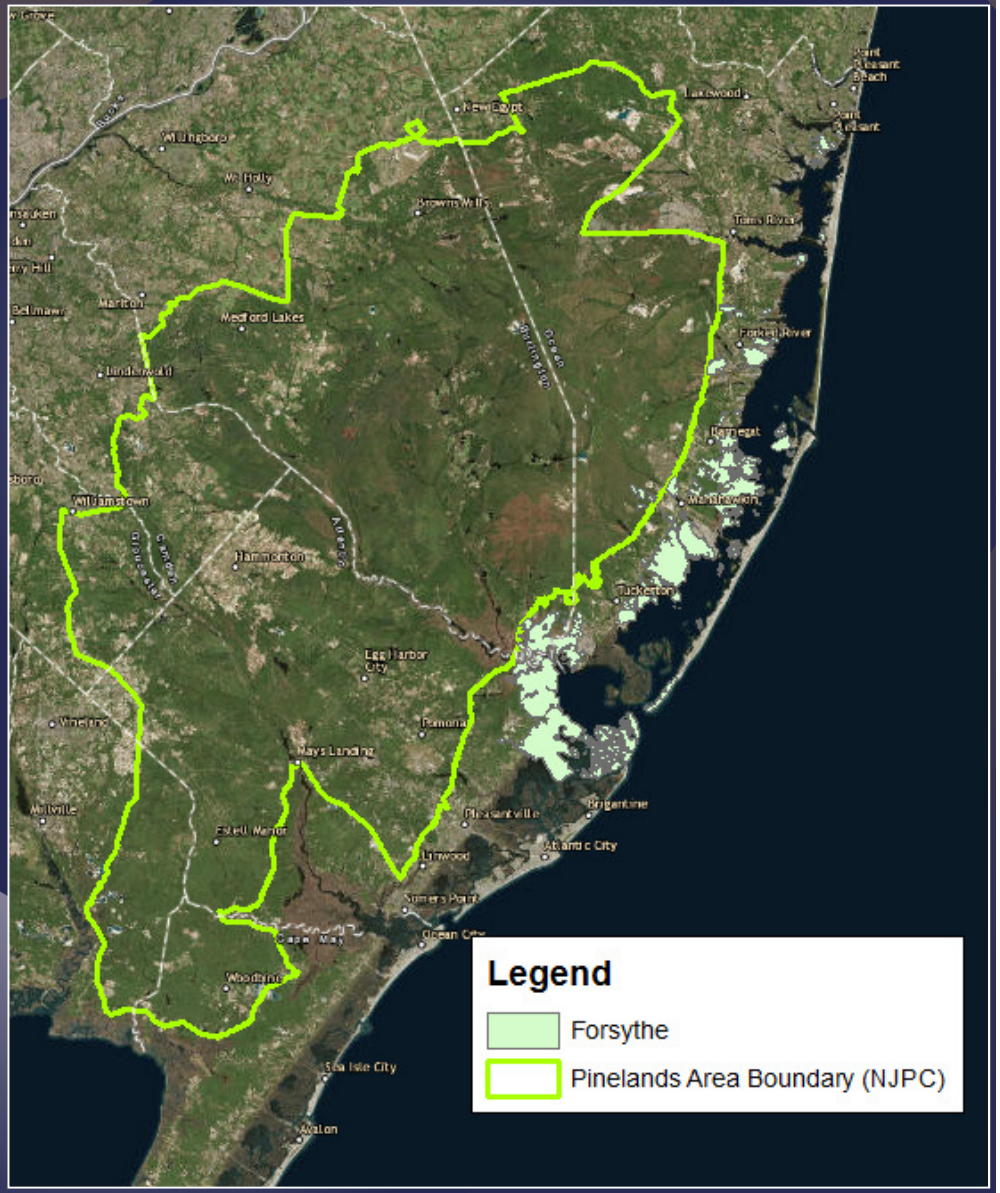
Chronic –Freshwater-seawater interface migrating inland with sea level rise

- Atlantic White Cedars adjacent to many Pinelands streams are not salt water tolerant, leaving "ghost forests" ("cedar cemeteries") on the landscape.
- Potential threat to numerous other freshwater-dependent plant and animal species

https://www.climatecentral.org/news/ghost-forests-appear-as-rising-tides-kill-trees-20701

https://www.nj.com/entertainment/2017/06/new_jersey_ghost_forest_pine_barrens_climate_chang.html




1986 Edwin B. Forsyth National Wildlife Refuge designated as a "Wetland of International Significance", one of only 17 such wetlands in the US

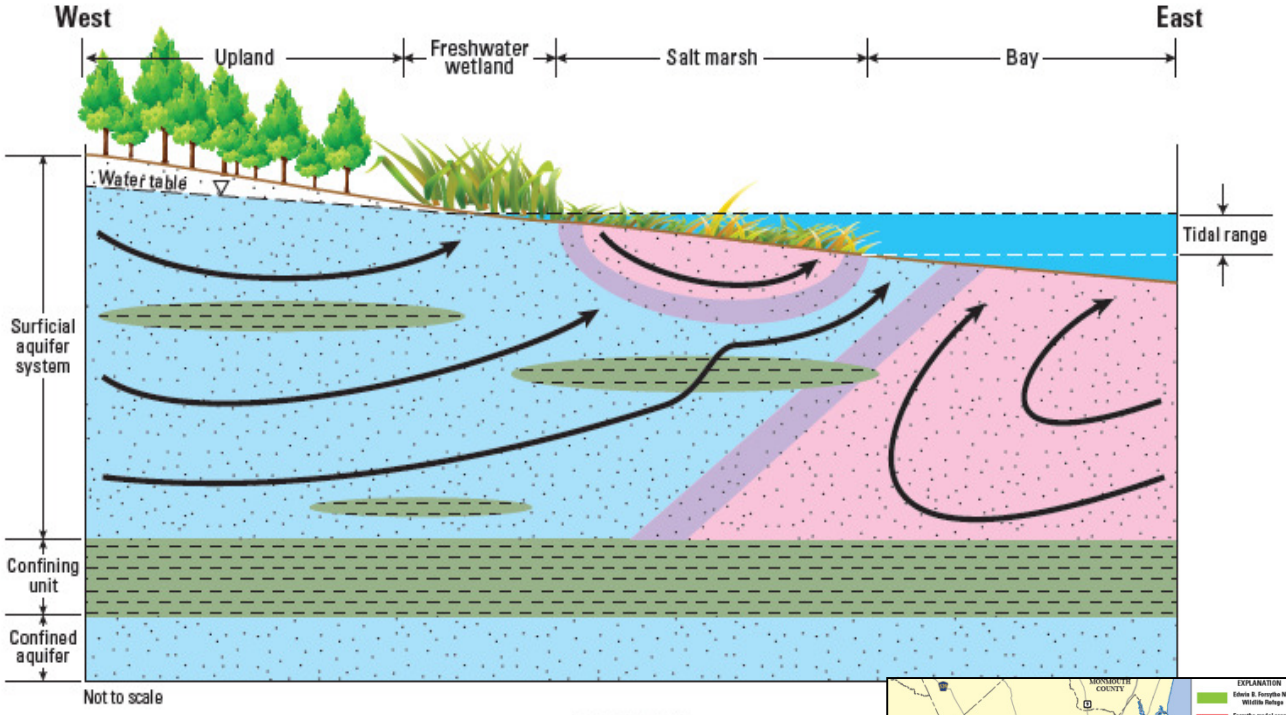
# Salt Water Intrusion -
## Potential Impacts to the Unconfined Kirkwood Cohansy Aquifer

In onshore areas:

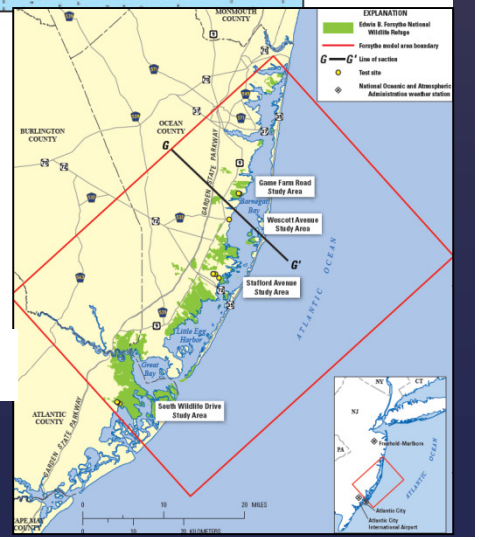
As SLR increases- Groundwater discharge to freshwater wetlands and streams is likely to increase

As SLR increases- Water tables are likely to rise

As SLR increases- the interface between fresh groundwater and saline groundwater is likely to move inland.




**Sea water is 2.5% denser than freshwater**




Source: USGS Scientific Investigations Report 2017-5135

# Managed Retreat

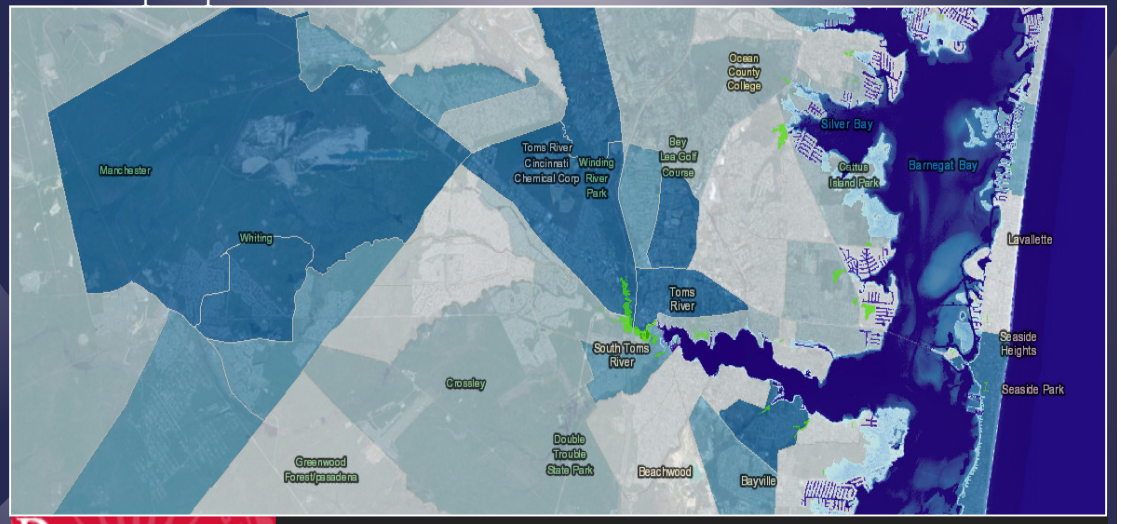
Population retreating from coastal communities may exert pressure on the Pinelands to accommodate displaced residents and businesses.

Population of >33,000 residents in at-risk homes in Ocean County alone - threatened by a 1.5ft. rise in sea level.

>65% of this population (20,805) resides in municipalities with at least some land in the Pinelands Area.

Significant loss of tax base will be realized with this retreat-shifting tax burden to inland businesses and residents


https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf




RUTGERS
School of Environmental and Biological Sciences

**Center for Remote Sensing and Spatial Analysis**

**2 ft. SLR depicted**

**Social Vulnerability**
Housing/Transportation
High Low N/A

http://njfloodmapper.org/slr/

# Agriculture

Longer growing seasons

Short term increased yields

Risk of heat stress

Increased pest populations

Increased chance of (flash) drought

Increased evaporation of water from farmland soil

Torrential rains – crop damage

Harsh weather extremes

Sprinklers can be used to cool crops – but increases risk of fungal disease

Increased stress on water supplies

2005- NJ declared a federal disaster area - crop damage from drought, excessive precipitation, excessive heat and humidity

2006 – Another federal declaration - excessive precipitation, high wind, hail and humidity.

Shifts in plant growing range

Both cranberries and blueberries require long winter-chill periods

# Forests

# The Pinelands Forest

Some of the largest unbroken forest in the eastern US.

Approximately 509, 071 acres of forested land in the PNR.

15,000- acre Pine Plains – most extensive pygmy forest in the entire US

Many rare plants and animals – some at their northern or southern geographic limits

Some species of plants [(1)] found nowhere else in the world.

Pine-Oak dominated

(1) Knieskern's Beaked Rush, Pickering's Morning Glory, Bog Asphodel

# Threats to the Pinelands Forest from Climate Change

## Southern Pine Beetle

Extremely destructive. After attacking a tree, the beetles burrow inside and lay eggs, often killing the tree within 3 to 4 months.

Re-entered NJ in 2001 after an absence of more than 60 years.

Infested more than 2,000 acres , including areas in the Pinelands.

Warmer temperatures will help the beetle spread further north, likely contributing to a shift away from Pitch Pine toward Loblolly Pine.

Source: Carissa F. Aoki https://www.state.nj.us/pinelands/science/pinesseries/Carissa%20Aoki%20-%20Forest%20Susceptibility%20to%20Southern%20Pine%20Beetle%20in%20the%20New%20Jersey%20Pinelands.pdf

# Wildfire: April 2019 11,0000 Acre Spring Hill Fire in Woodland & Washington Townships

https://matzav.com/massive-n-j-pinelands-forest-fire-declared-fully-contained-with-11000-acres-scorched/

# Ecosystem Services of Pinelands Forests – Services at Risk


https://www.njhiking.com/apple-pie-hill-wharton-state-forest/

Aquifer recharge and water purification

Heat island mitigation

Carbon capture

Roughly 2.5 million metric tons of carbon emissions stored in New Jersey's forests

Carbon dioxide, taken up through photosynthesis is stored in the vegetation and soils.

One mature tree absorbs carbon dioxide at a rate of 48 pounds per year.

Pinelands are very efficient (in storing carbon dioxide); just a bit less productive than rich forests in Pennsylvania or upstate New York.

Dr. Kenneth Clark, USDA Research Forester Silas Little Experimental Forest

# Energy

## Atlantic County Utilities Authority – Jersey Atlantic Wind Farm

Not in the Pinelands- but close

Eastern, urban, coastal, industrial, onshore, multi-turbine wind farm

Five 1.5 MW (7.5 MW) turbines generate enough electricity to power 2,500 homes

## Stafford Township Impermeably-Capped Landfill – Brownfields Solar & Future Wind Turbines

In the Pinelands RGA

Up to 7 MW solar photo voltaics -24,624 panels at build out

3 or 4 wind turbines  proposed

# B.L. England (Beesley's Point) Generating Station

## Upper Township, Cape May County NJ

Controversial proposal for a methane gas transmission line to convert the coal/oil fired peaking plant to full time operation.

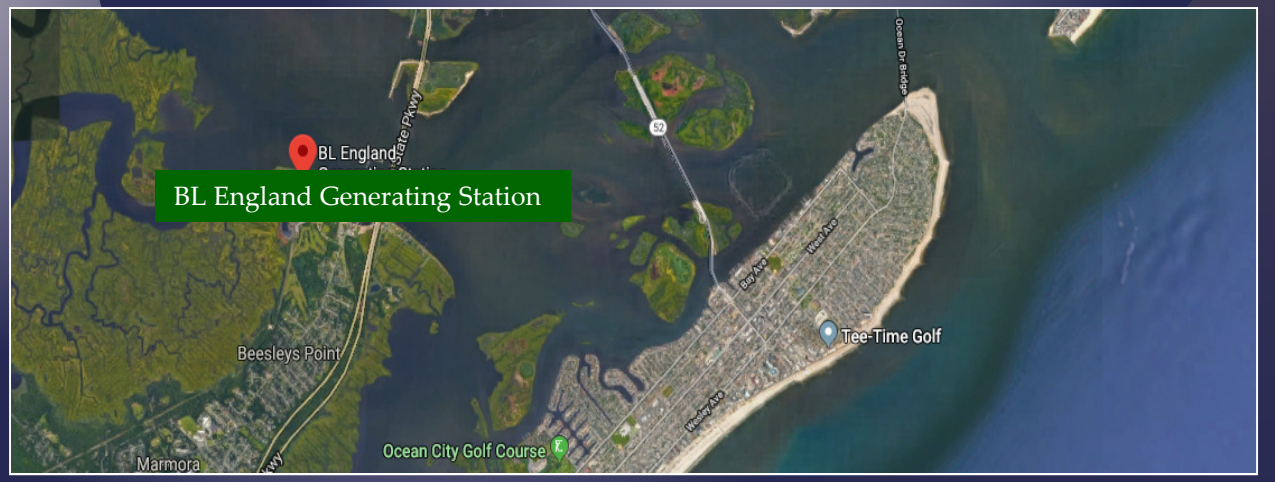

https://www.app.com/story/news/local/land-environment/2019/05/06/activists-still-battling-pinelands-pipeline-even-work-begins/1094200001/

https://en.wikipedia.org/wiki/B.L._England_Generating_Station#/media/File:Beesley_Point_Plant.jpg


https://www.njpen.com/pinelands-commission-approves-bl-england-pipeline-project-over-vocal-public-objection/#prettyPhoto/4/

# Feasibility studies for offshore wind turbines are underway

- Proposed wind farms ~10 miles off the coast of Atlantic City
- Both Oyster Creek and BL England generating stations provide a potential connection point to the existing electric transmission grid

# Solar Energy Facilities


https://www.solar-estimate.org/news/2018-04-27-what-is-community-solar

2012 CMP amendments to facilitate solar energy system installations:

No application needed for solar as an accessory use on any existing structure or impervious surface

Community solar in residential cluster development is permitted

Facility is not visible from wild and scenic rivers, special scenic corridors, Pine Plains, Forked River Mountains, roads and highways, low intensity recreation areas, campgrounds, residences on contiguous parcels.

# Solar Energy Facilities

Can't clear forest for solar in PAD and FA

Permitted on remediated brownfield sites

Permitted on landfills provided the landfill is closed per the CMP

Permitted on previously mined resource extraction sites not obligated to restore / reforest.

Permitted in the Agricultural Production Area, up to 20% of the parcel with a maximum of 10 acres - solar array on farms must avoid prime agricultural soils

Permitted in the Rural Development Area – maximum 30% of a parcel

Must avoid land with the highest ecological value

Limits on clearing for transmission line ROW

# Energy Conservation Requirements

## Incorporated into the Stafford Township Business Park MOA

All residential and commercial development to incorporate "Green Building Design" features of the Leadership in Energy and Environmental Design (LEED) program.

Bicycle friendly site planning
Fuel efficient vehicle privileges
Green power – solar photovoltaic systems
High efficiency mechanical systems
Minimum recycled content in building materials
Zero use of CFC-based refrigerants
Water conservation landscaping

# Public Health

# Air quality & Heat stresses

The US Centers for Disease Control and Prevention (CDC) Reports higher temperatures lead to:

Increased allergens (longer pollen seasons)

Increased [ ] of ground-level ozone (smog) – a severe lung irritant leading to diminished lung function, asthma and premature deaths.

Wildfires / smoke exposure leads to increased acute respiratory illness, and cardiovascular hospitalizations

The US Environmental Protection Agency monitors:

Heat-Related Deaths
Heat-Related Illnesses
Lyme Disease
West Nile Virus
Ragweed Pollen Season

as Climate Change Indicators

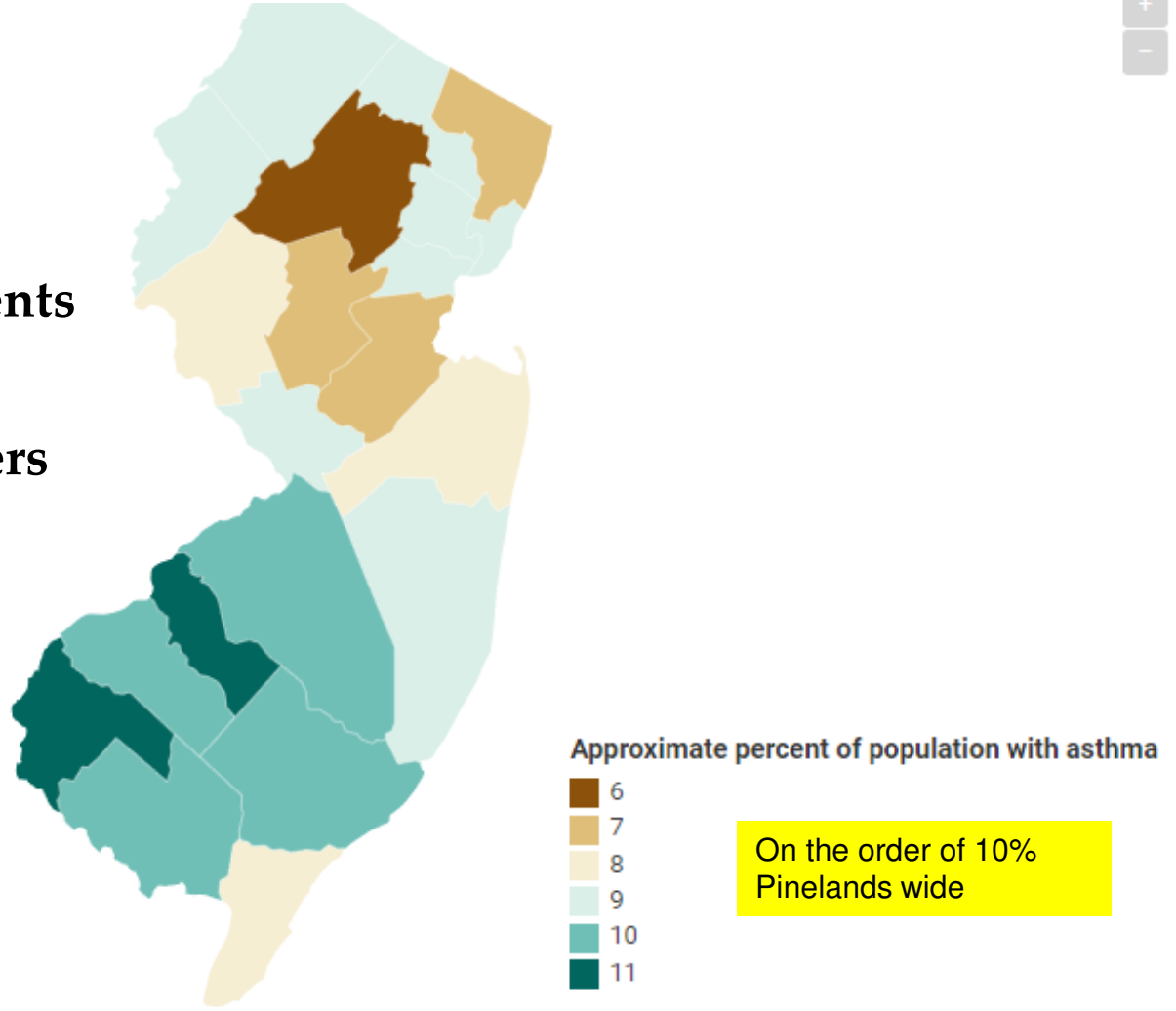
# New Jersey population with asthma

New Jersey State Health Assessment Data Survey Period 2011-2016

**702,492 Pinelands residents**
(2010 census data)

- **70,000 Asthma sufferers in the Pinelands Area**

The New Jersey Department of Health reports an average of about 100 deaths state-wide from asthma each year



## Looking Ahead:

The Pinelands Commission has recently announced the formation of a new Committee to study and address  Energy/Resiliency/Natural Resources/Climate Change.

**Ed Wengrowski, REHS**
**Environmental Technologies Coordinator**
**ed.wengrowski@pinelands.nj.gov**
**www.nj.gov/pinelands**