32nd Annual Mapping Contest Maps

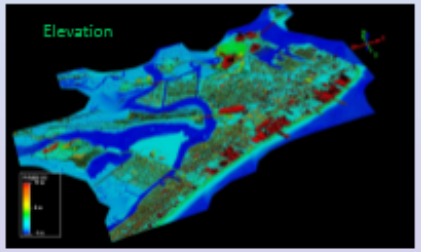
3D

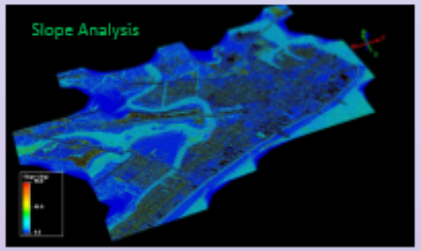
LiDAR & Solar PV Suitability: Atlantic City, New Jersey

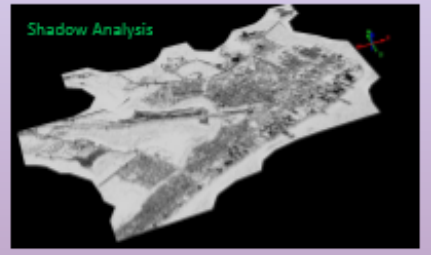
State of New Jersey
Department of Environmental Protection
Air Quality, Energy & Sustainability

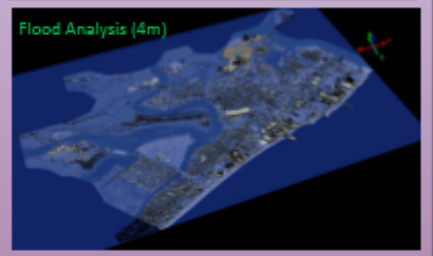
Anthony Bevacqua NJDEP Bureau of Energy & Sustainability

Municipality-Wide Insights from DSM

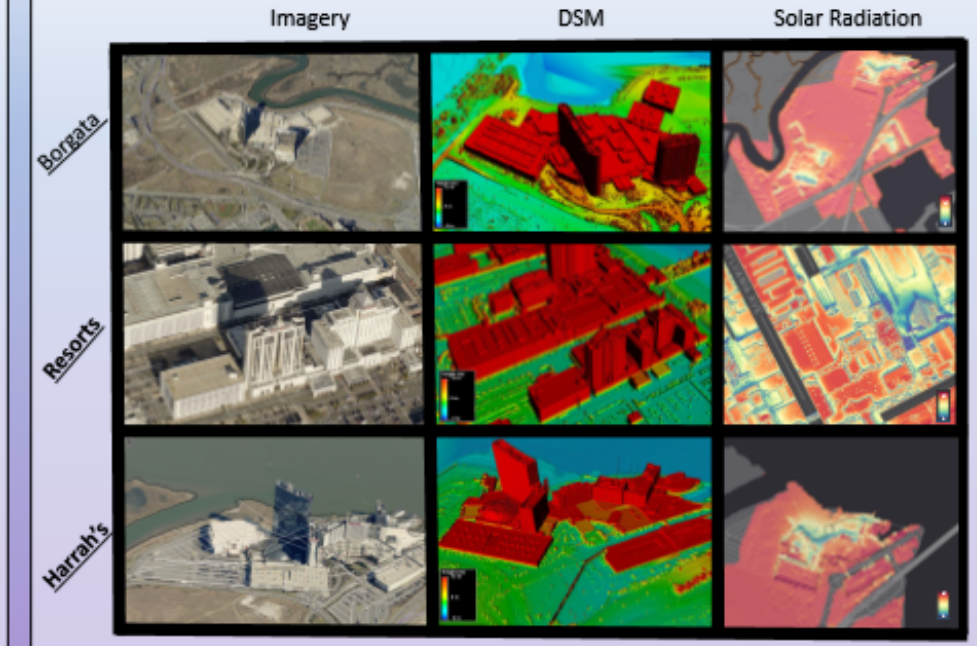








Local Solar Suitability Models



Optimal Array Location & System Size Estimate

	Usable Space	Approx. Square Meters	PVWATTS System DC Estimate
Borgata		10,000 m²	16,000 KW
Resorts		3,700 m²	592 KW
Harrah's		21,000 m²	3,360 KW

Abstract

The purpose of this work is to present alternative methods for siting solar photovoltaics. The current methods for most projects includes time consuming in situ measurements of available space, solar shading, and roof conditions. The research shown here highlights the potential for the use of remote sensing techniques that utilize Light Detection and Ranging (LiDAR), and Oblique Imagery to gain siting information remotely. When this data is available, assessment time and costs are drastically reduced. This information can be used in project planning and design, as well as policy development.

Methods

First, data was collected including the municipal boundary, the building footprints, the compressed LAZ files, and 2017 DEP imagery. The LiDAR collection tile index was used to select tiles that contained building footprints. From this, a study area wide Digital Surface Model (DSM) was created. From this model, slope analysis, shadow analysis, and flood analysis was performed across the municipality. The next step was to identify commercial buildings that could support PV systems large enough to participate in net metering, grid supply, or community solar programs. Once these three local sites were identified, solar radiation analysis was performed to identify optimal locations for PV technology. Finally, the PVWATTS estimate of system size and available space was used to estimate the potential size PV system that could be adopted.

Results

The results of this research include a municipality-wide analysis of Solar PV Suitability. The remote sensing data of imagery and LiDAR yielded fine resolution spatial data that can be used to identify suitable areas for PV adoption. Additionally, three locations were identified of varying potential.

Discussion

Remote sensing offers significant advantages to siting large scale PV projects. When used in conjunction with other tools such as the NJDEP Solar Siting Analysis, and in situ measurements, the siting and design process for solar PV can be made more efficient. Additionally, this type of high resolution analysis can be used in clean energy policy development.

Acknowledgements

Thank you to NOAA for making this LiDAR collection available, Bing & Microsoft for sharing their building footprint data, and to NJDEP Bureau of GIS for their data, technical support and for hosting the event.

For more information on how the NJDEP Bureau of Energy and Sustainability is using GIS go to our Spatial Analysis Research page at https://www.nj.gov/dep/aqes/gisresearch.html

USGS · NREL · Bing · Quick Terrain Modeler

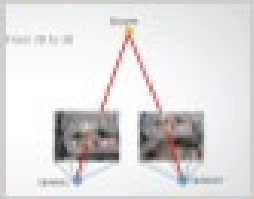
Exploring 3D Mapping Utilizing Drone Technology

An Unmanned Aircraft System (UAS) or Drone, is an aircraft without a human pilot onboard. The UAS is controlled from an operator on the ground. Drones capture high-resolution imagery of land areas. Drone pilots use field-approved pilot process programs such as DroneDeploy (1) and PIX4D Mapper (2) to process drone imagery into 3D GIS data. 3D GIS data is generated from a process called Structure From Motion. This is a photogrammetric range imaging technique for estimating three-dimensional structures from a combination of two-dimensional image sequences (3).

Drone 3D Applications include 3D Visualization, 3D Object Modeling, 3D Volumetric Measurements, 3D Terrain Measurements, Change Detection for Cultural and Natural Environments.

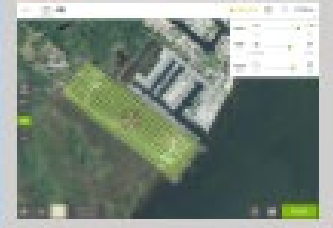
Structure From Motion Concept

Structure from Motion photogrammetry generates a 3D point cloud of terrain (3,4,5).



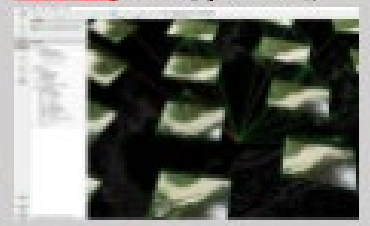
Generating 3D Mapping Utilizing Drones

PIX4D Capture – 3D Double Grid Mission Planning (1)



Drone Field Image Capture (1)

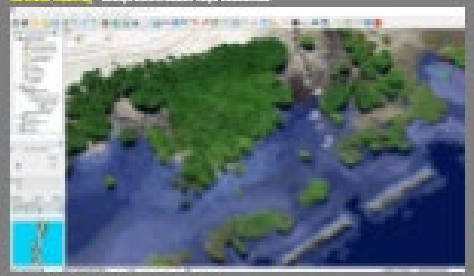
PIX4D Post Processing – 3D Point Cloud, Digital Elevation Model (1)



3D Point Cloud Analysis in Quick Terrain Modeler (3)

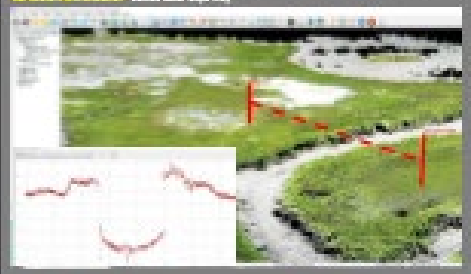
3D Terrain Surface – Shapes from Points

3D Water Modeling – Ready-Made Drone Image Overlayed

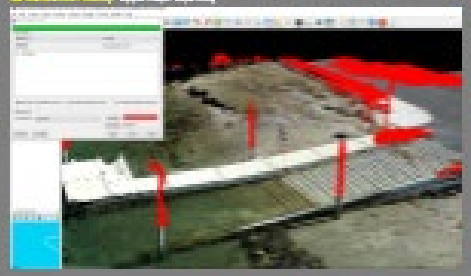


3D Volume Modeling – Stockpile Boundary Map

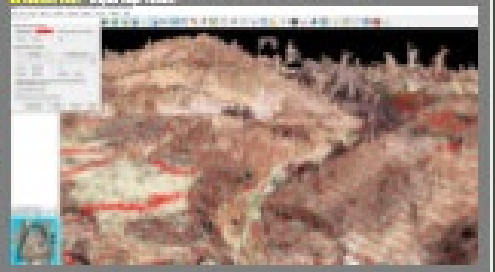
3D Terrain Measurements – Random Slope Shape Map



3D Profile Modeling – Shapes Shown Slope Map



3D Surface Cuts – Shapes Shape Terrain



3D Drone Specifications: DJI Phantom 3 Pro
Weight: 1280g | Max Speed: 16 mph | Flight Time: 23 mins | Camera with phone DJI GO app
Video: 2.7K | 30 fps | Remote Control Range: Return Home = Yes

Poster Development: Dave Dunlavey, NCSP-GCS

References
1. Drone Field Planner – Steve Jenkins, NCSP-
2. Drone Field Planner – Dave Dunlavey, NCSP-
3. DroneDeploy EDU
4. PIX4D
5. Wikipedia
6. Quick Terrain Modeler – Applied Imagery

Analytic Methods and Results

Harnessing Geospatial Intelligence to Quantify Community Solar Opportunities: Atlantic County, New Jersey

Anthony Bevacqua Montclair CESAC

Purpose

The purpose of this work is to harness geospatial intelligence to identify locations for future Community Solar installations. Second only to the transportation sector, electricity generation is a high emitter of greenhouse gasses, particularly carbon dioxide. Increasing renewable energy deployment, such as photovoltaics, is a way to curb these emissions and mitigate climate change. Traditional solar markets like residential net metering and large scale grid supply have limitations and barriers to entry. Community Solar is a new renewable energy market in New Jersey, and allows for increased participants and additional environmental benefits. As with all solar photovoltaic development and policy planning, siting information is critical. In our analysis, we use a series of spatial data to construct a Community Solar suitability surface for Atlantic County, New Jersey. We then dive deeper by estimating anticipated solar energy at optimal locations. By calling upon established methods in spatial analysis and energy modeling, we provide new insight that can support informed policy making.

Methods

The first stage is to identify and collect relevant input data for the model. Fortunately, the New Jersey Board of Public Utilities has recently published the evaluation criteria for the New Jersey Community Solar Pilot Program. These criteria are used to rank proposed community solar projects.

We identify geospatial data which describes the evaluation criteria. This includes land use land cover, county zoning data, agriculture development areas, electric distribution hosting capacity, landfills, parking areas, conservation areas, open space, and building footprints.

After the data was collected it was converted into raster format to be used in the suitability overlay. Allowable hosting capacity was made available through Atlantic City Electric. This polyline data was converted to points. These points were used to interpolate a raster surface using inverse distance weighting (IDW). Landfill boundaries were identified using imagery interpretation. Agriculture development areas were only available in PDF format. These were georeferenced and exported for the model.

Building Footprint data was used from the NJDEP Impervious Surface for Atlantic County. This data was developed by the NJDEP BGIS using a Geographic Object-Oriented Image Analysis framework which utilizes a combination of LiDAR point clouds and several vector data sets. Parking area boundaries were identified using open street map data.

After all data was converted to raster format, it was reclassified based on the evaluation criteria and combined using raster calculator. This produced a Community Solar suitability surface. Additionally, an estimated Solar PV capacity was calculated based on NREL PVWATTS for parking areas, landfills, and buildings.

Upon identifying suitable location, we used LiDAR to create a digital surface model (DSM) of the Borgata Hotel and Casino, a large commercial rooftop which could serve local environmental justice communities. This DSM was used to calculate the solar radiation potential in Watts per Square Meter for an entire year.

Results & Discussion

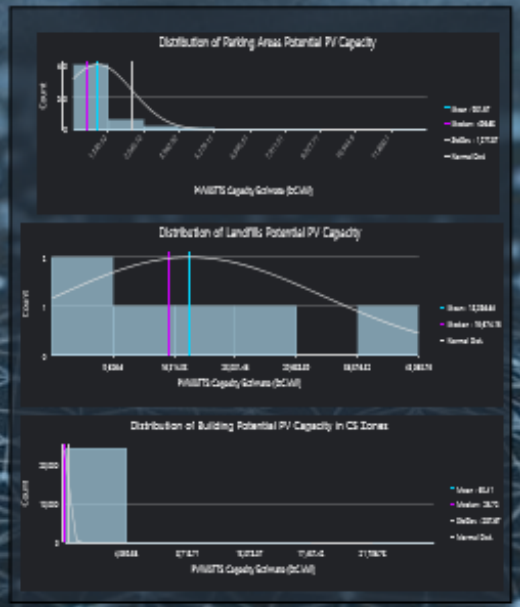
The results of this research include the identification of locations that would be suitable for community solar adoption. This information can be used during the New Jersey Pilot Community Solar Program as well as in future planning of solar photovoltaic deployment.

Acknowledgements

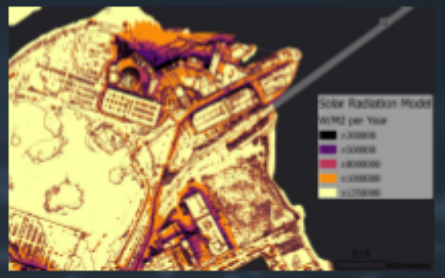
Thank you to our data sources Atlantic County, Open Street Map, and USGS. A special thank you to NJDEP Bureau of GIS for developing, collecting, and hosting data, particularly the classified impervious surface data.

Montclair State University
CESAC
Clean Energy and Sustainability Analytics Center

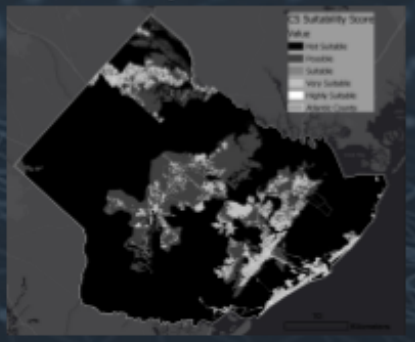
Model Tabular Results



Solar Radiation Model of Prime Locations Borgata Hotel & Casino



Suitability Model Results

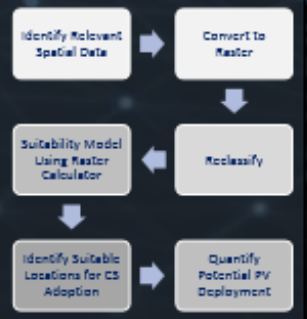


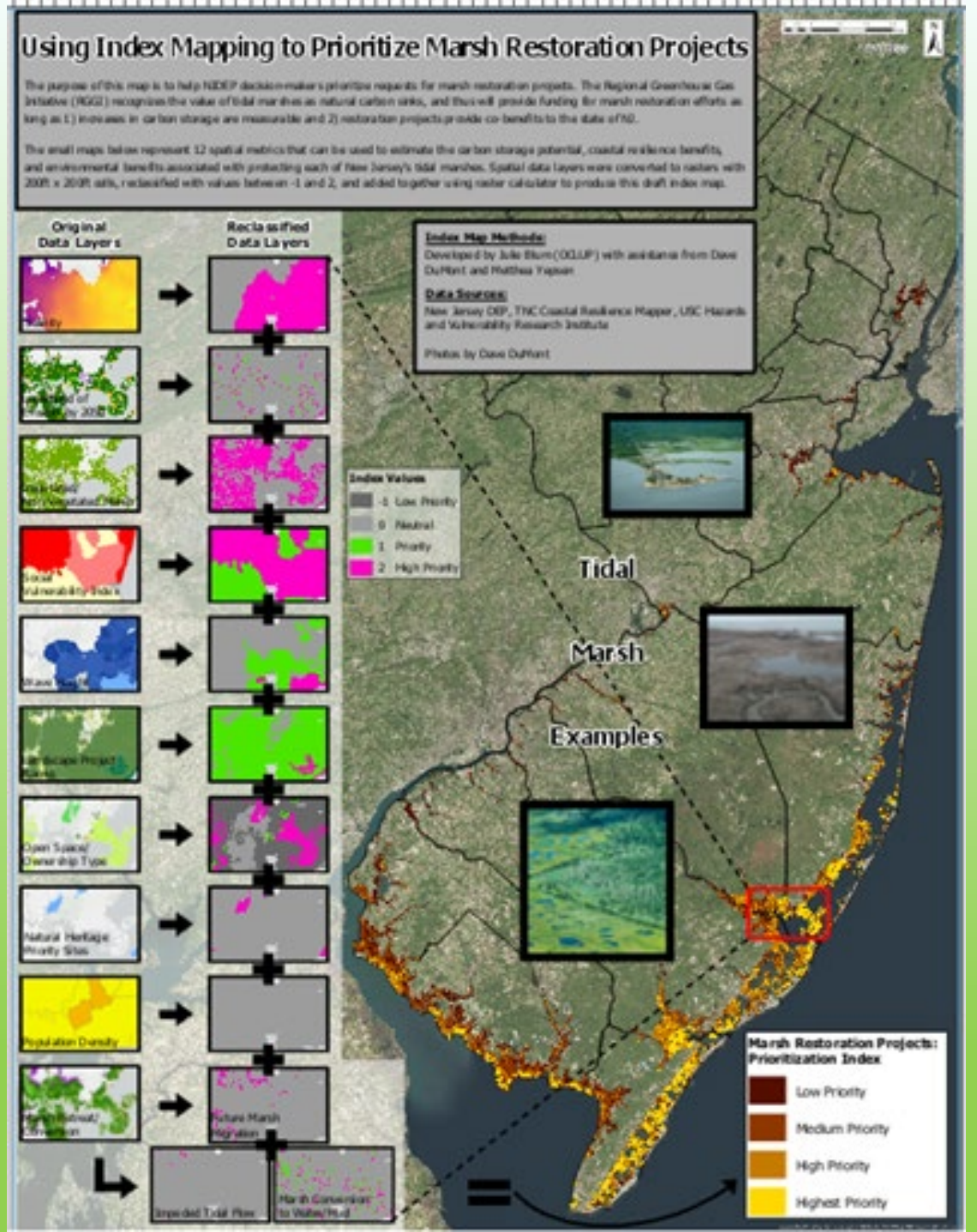
Study Area: Atlantic County, NJ

Model Framework

Suitability Model Inputs

Methodology Workflow

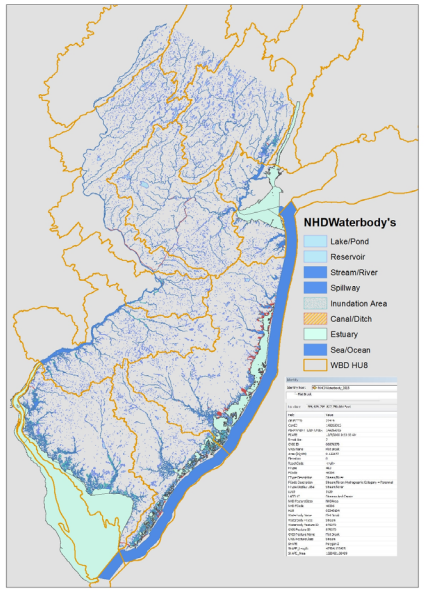



Using Index Mapping to Prioritize Marsh Restoration Projects
The purpose of this map is to help NJDEP decision-makers prioritize requests for marsh restoration projects. The Regional Greenhouse Gas Initiative (RGGI) recognizes the value of tidal marshes as natural carbon sinks, and thus will provide funding for marsh restoration efforts as long as 1) increases in carbon storage are measurable and 2) restoration projects provide co-benefits to the state of NJ.
The small maps below represent 12 spatial metrics that can be used to estimate the carbon storage potential, coastal resilience benefits, and environmental benefits associated with protecting each of New Jersey's tidal marshes. Spatial data layers were converted to rasters with 200ft x 200ft cells, reclassified with values between -1 and 2, and added together using raster calculator to produce this draft index map.
Original Data Layers
Reclassified Data Layers
Index Map Methods:
Developed by Julie Blum (OCLUP) with assistance from Dave DuMont and Matthew Yepsen
Data Sources:
New Jersey DEP, TNC Coastal Resilience Mapper, USC Hazards and Vulnerability Research Institute
Photos by Dave DuMont
Index Values
-1 Low Priority
0 Neutral
1 Priority
2 High Priority
Tidal
Marsh
Examples
Marsh Restoration Projects: Prioritization Index
Low Priority
Medium Priority
High Priority
Highest Priority

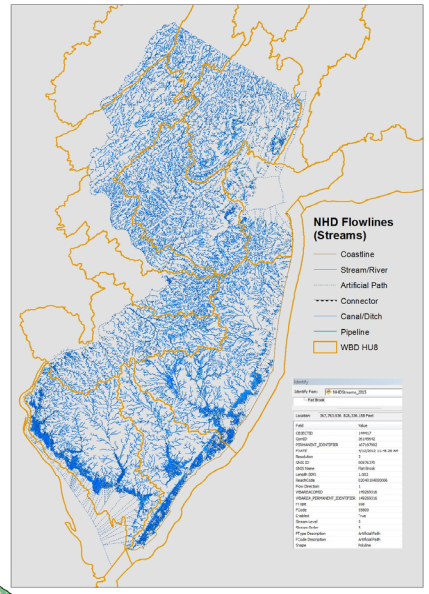
National Hydrography Dataset - Land Use / Land Cover 2015 Integration Project

Update the National Hydrography Data (NHD) layers for NJ to 2015 Imagery

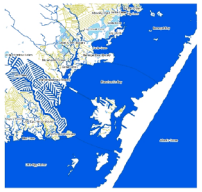
Update Waterbody's (polygons) to 2015 imagery
Transfer NHD attributes to new waterbody's
Integrate Geographic Names (GNIS) attributes
Integrate Marine Water attributes
Replace 2012 WATER in Land Use/Land Cover 2015 layer
Prepare for conflation with USGS NHD



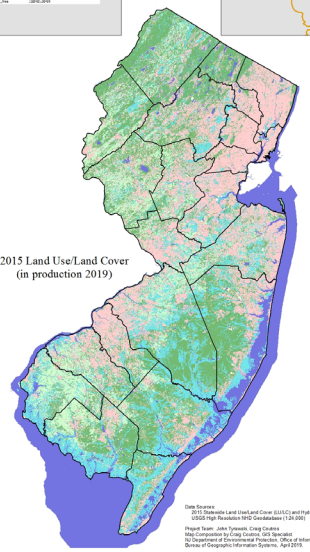
Update Streams (lines) to 2015 imagery
Utilize LiDAR generated DEM to create drainage lines to verify & add streams
Set and Store FlowDirection on all streams
Transfer attributes to new streams
Prepare for conflation with USGS NHD



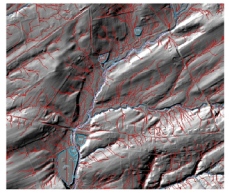
Integrate Geographic Names (GNIS) attributes
Integrate Marine Water attributes



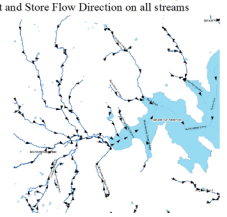
Integrate the data and NHD attributes into the Land Use/Land Cover "WATER"



Utilize LiDAR generated DEM to create drainage lines to verify & add streams



Create Geometric Network for tracing Up/Down stream
Set and Store Flow Direction on all streams



Data Sources:
2015 Statewide Land Use/Land Cover (LULC) and Hydrography data sets
USGS High Resolution NHD Geodatabases (1:24,000)

Project Team: John Tylecki, Craig Coburn
Map Composition by Craig Coburn, GIS Specialist
NJ Department of Environmental Protection, Office of Information Resources Management, Bureau of Geographic Information Systems, April 2019.

Proposed Bicycle Network

Brick Township, New Jersey

Bicycle and Pedestrian Master Plan

Existing Bicycle Infrastructure

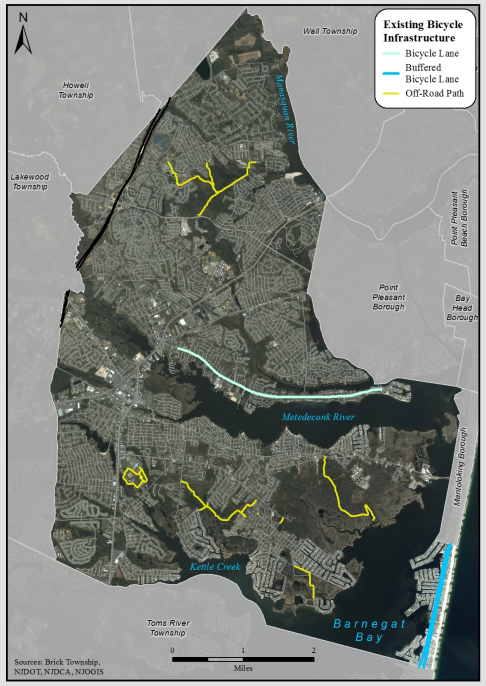
Brick Township currently lacks a comprehensive bicycle network. Bicycle infrastructure exists along a few roads and within protected nature areas, but it is generally difficult for a bicyclist to safely travel within the Township. Local Planning Services partnered with Brick Township to create a proposed bicycle network as part of a Bicycle and Pedestrian Master Plan. This plan is driven by the vision of making Brick a place where bicycling is safe, enjoyable and convenient for people of all ages and abilities.

Off-road path within the Saw Mill Tract.

Bicycle lane on Princeton Avenue.

Buffered bicycle lane on State Route 35.

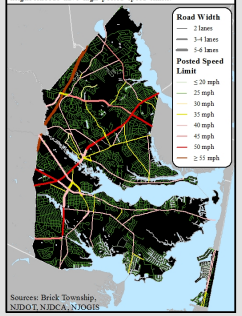
Bicyclist rides on "goat path" because of unsafe riding conditions within right of way.



Analysis

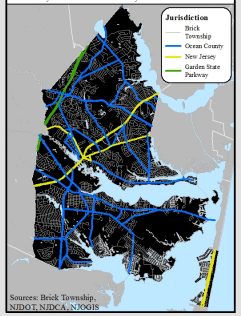
Road Conditions

The road layout follows the geographic contours of the Township, not a grid system. Most residential neighborhoods have low-speed, two-lane roads. However, almost all roads that connect the neighborhoods have high posted speed limits.



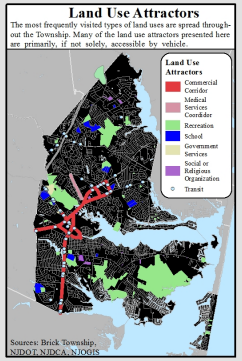
Road Jurisdiction

There are 368 miles of roads in Brick. The Township maintains nearly 300 miles. Most local roads are found within residential neighborhoods that do not connect to other areas of the Township. The County and State control the only arterial and collector roads.



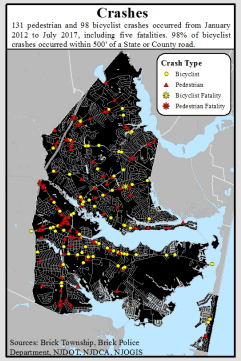
Land Use Attractors

The most frequently visited types of land uses are spread throughout the Township. Many of the land use attractors presented here are primarily, if not solely, accessible by vehicle.



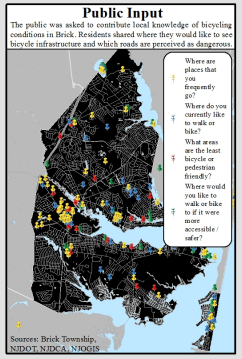
Crashes

131 pedestrian and 98 bicyclist crashes occurred from January 2012 to July 2017, including five fatalities. 98% of bicyclist crashes occurred within 500' of a State or County road.



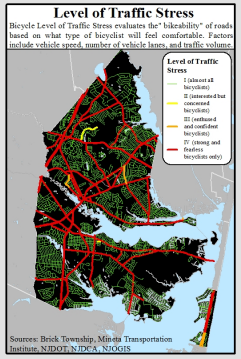
Public Input

The public was asked to contribute local knowledge of bicycling conditions in Brick. Residents shared where they would like to see bicycle infrastructure and which roads are perceived as dangerous.



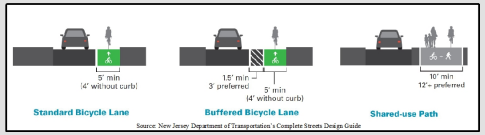
Level of Traffic Stress

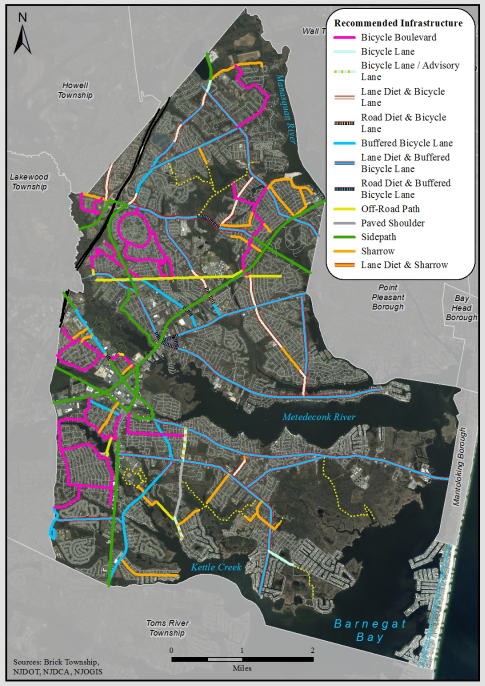
Bicycle Level of Traffic Stress evaluates the' bikeability" of roads based on what type of bicyclist will feel comfortable. Factors include vehicle speed, number of vehicle lanes, and traffic volume.



Proposed Bicycle Network

Local Planning Services created a proposed bicycle network that seeks to connect every neighborhood within the Township. The type of infrastructure recommended is adapted from the New Jersey Department of Transportation's Complete Streets Design Guide to realistically match local conditions. This establishes nearly 90 miles of bicycle facilities that include dedicated bicycle lanes, bicycle boulevards within residential neighborhoods, and off-road trails. Implementation is broken into three phases to prioritize roads with higher demand for bicycle facilities and recognize logistical constraints of infrastructure construction.

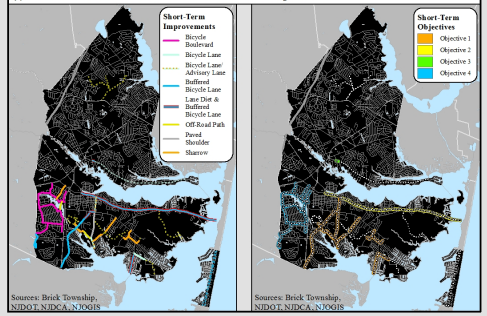




Implementation Plan

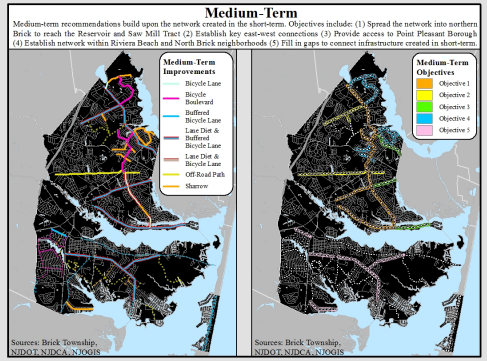
Short-Term

Short-term recommendations focus on implementing infrastructure improvements that are highest priority, lowest cost, and align with existing road improvement plans. Objectives of this phase are: (1) Expand the Airport Tract trail network. (2) Connect Downtown Brick and the Brick Barrier Island neighborhood via Mantoloking Road (3) Begin the transition to buffered bicycle lanes on Princeton Avenue (4) Create an alternative network to Brick Boulevard within the Lake Riviera neighborhood.



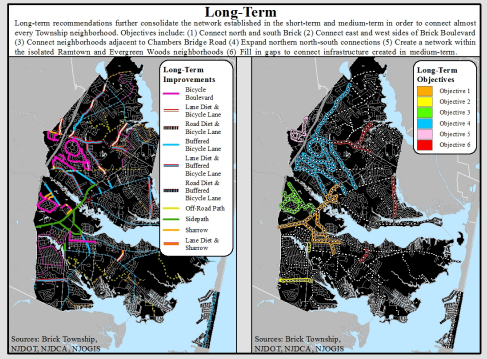
Medium-Term

Medium-term recommendations build upon the network created in the short-term. Objectives include: (1) Spread the network into northern Brick to reach the Reservoir and Saw Mill Tract (2) Establish key east-west connections (3) Provide access to Point Pleasant Borough (4) Establish network within Riviera Beach and North Brick neighborhoods (5) Fill in gaps to connect infrastructure created in short-term.



Long-Term

Long-term recommendations further consolidate the network established in the short-term and medium-term in order to connect almost every Township neighborhood. Objectives include: (1) Connect north and south Brick (2) Connect east and west sides of Brick Boulevard (3) Connect neighborhoods adjacent to Chambers Bridge Road (4) Expand northern north-south connections (5) Create a network within the isolated Ramtown and Evergreen Woods neighborhoods (6) Fill in gaps to connect infrastructure created in medium-term.



Land-Use/Land-Cover Changes in Riparian Buffer Zones from 1986 to 2015

Lori A. Lester & Nicholas A. Procopio
NJDEP Division of Science and Research

Objective

To quantify the Land-Use/Land-Cover (LULC) changes in riparian buffer zones from 1986 to 2015

Introduction

- Regulatory changes to riparian buffer widths could result in increased development near streams, thus impairing sensitive waterbodies
- Riparian buffers provide many benefits to the environment including:
  - Reducing the inputs of excessive nutrients, sediment, organic matter, and other pollutants to surface waters
  - Shading the streams to moderate temperature and retain more dissolved oxygen to support aquatic flora and fauna
  - Providing natural organic matter and large woody debris as food and habitat for aquatic organisms
  - Reducing stream bank erosion and sedimentation
- Changes in riparian areas through time were assessed on selected riparian buffer widths and LULC data

Geospatial Method

Created freshwater streams layer	Created buffer layers	Clipped LULC maps	Calculated LULC areas and percent change over time
- Removed all SE, SC, and duel classified streams from "Surface Water Quality Standards" layer - Clipped the resulting layer using the "Municipalities clipped to coast" layer	- Buffered the freshwater streams line layer to create two new layers: 1.) 150 ft buffer layer 2.) 300 ft buffer layer	- Clipped the 1986 and 2015 LULC maps using two buffer layers to create four new layers: 1.) 150 ft buffer, 1986 LULC 2.) 150 ft buffer, 2015 LULC 3.) 300 ft buffer, 1986 LULC 4.) 300 ft buffer, 2015 LULC	- Used the Summary Statistics tool to sum areas based on LULC type for each of the four buffered LULC layers - Calculated percent change in LULC over time

Results

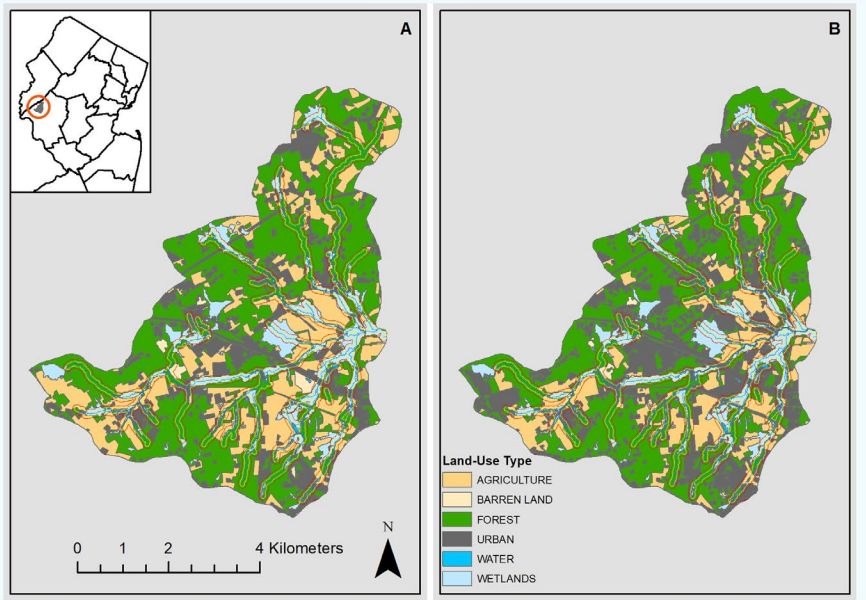


Fig. 1. Land-use/Land-cover changes in the Mulhockaway Creek between 1986 (A) and 2015 (B). Freshwater streams are depicted by blue lines, 150 ft buffer by yellow lines, and 300 ft buffer by red lines.

Table 1. Land-use/Land-cover changes in a 150 ft buffer of freshwater streams in NJ from 1986 to 2015.

Land-use/ Land-cover	1986 LULC (acres)	1986 % of 150ft Buffer	2015 LULC (acres)	2015 % of 150ft Buffer	Change (acres) 1986 to 2015	% Change 1986 to 2015
Agriculture	34,064.9	7.3	24,197.3	5.2	-9,867.6	-29.0
Barren Land	1,920.4	0.4	1,121.6	0.2	-798.8	-41.6
Forest	113,876.5	24.3	113,361.9	24.1	-514.6	-0.5
Urban	52,108.5	11.1	65,281.5	13.9	13,173.0	25.3
Water	34,510.9	7.4	38,969.0	8.3	4,458.1	12.9
Wetlands	233,031.7	49.6	226,581.6	48.3	-6,450.2	-2.8
Total Acres	469,513.0		469,513.0			

Table 2. Land-use/Land-cover changes in a 300 ft buffer of freshwater streams in NJ from 1986 to 2015.

Land-use/ Land-cover	1986 LULC (acres)	1986 % of 150ft Buffer	2015 LULC (acres)	2015 % of 150ft Buffer	Change (acres) 1986 to 2015	% Change 1986 to 2015
Agriculture	93,811.4	10.6	67,767.4	7.7	-26,044.0	-27.8
Barren Land	4,651.9	0.5	3,101.3	0.4	-1,550.6	-33.3
Forest	253,035.0	28.7	247,565.0	28.1	-5,470.0	-2.2
Urban	129,077.7	14.6	167,747.6	19.0	38,669.9	30.0
Water	46,939.7	5.3	52,426.7	5.9	5,486.9	11.7
Wetlands	354,073.1	40.2	342,985.4	38.9	-11,087.8	-3.1
Total Acres	881,589.0		881,593.4			

Results Continued

- LULC changes were summarized in Tables 1 & 2
  - Agricultural lands decreased over time
  - Urban/developed lands increased in both riparian zones
  - Barren areas decreased since 1986
  - Water increased over time
  - Wetland area decreased by 2.8% (150 ft) and 3.1% (300 ft)
  - Forest area decreased by 0.5% (150 ft) and 2.2% (300 ft)
- Wetland and forest combined made up 72.4% (150 ft) and 67.0% (300 ft) of area in 2015
- Combined wetland and forest area decreased 2.0% (150 ft) and 2.7% (300 ft) since 1986

Discussion

- LULC classification was more accurate in 2015
  - Minimum mapping unit decreased from 2.5 acres (1986) to 1 acre (2015)
  - Resolution of aerial photograph improved
- Loss of natural cover occurred in riparian zones
  - Caution must be taken when evaluating small changes in percent cover
  - Only changes greater than 5% should be considered significant[1]
  - Although natural cover loss was less than 5% statewide, further analysis on areas of concern would likely show greater changes in natural cover
- Future studies should:
  - Assess change in areas of concern based on water classification or antidegradation status
  - Quantify the transition of riparian areas between LULC categories over time

Works Cited

1.) Hasse, J. and R. Lathrop. 2010. Changing Landscapes in the Garden State: Urban Growth and Open Space Loss in NJ 1986 thru 2007. 26 pp.

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CESAC
Clean Energy and Sustainability Analytics Center

Using ArcGIS as a Data Preparation and Analysis Tool in Modeling: A Case of the Emerald Ash Borer (Agrilus plannipensis)

Erik Lyttek, Montclair State University CESAC

Introduction:
By exporting spatial elements from ArcGIS into Tractable Point Features, analysis methods not commonly available in ArcGIS can be performed.

Here we see:
•A reaction diffusion PDE equation making use of GIS data and knowledge of the spread and habits of EAB.

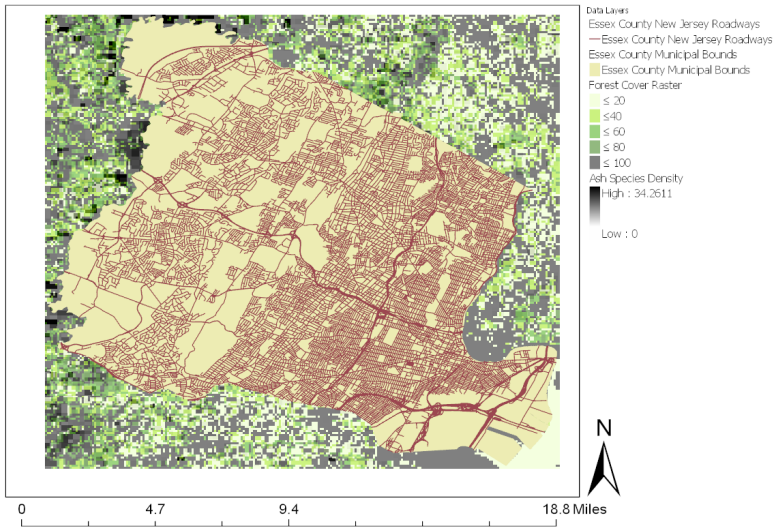
•This model is relatively simple currently.

•EAB at a predetermined origin grow and spread outwards at a rate dependent on experimental natural spread results.

• Current plans are to integrate roadways (in progress) as well as topography among other factors.

•This method is very easy to iterate on and additional columns for computed variables are simple to make and populate.

Step 1: Layered Original Data Set



Process Flow:

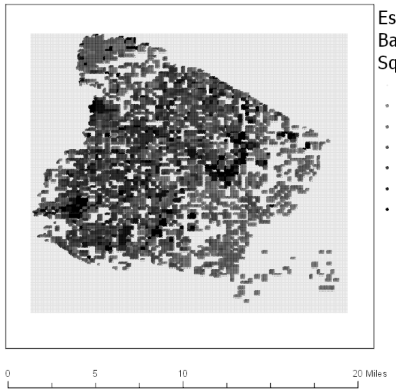
Shown here we have a progression from raw data (Step 1).

To a layered Point cloud containing all necessary information including boundary conditions (Step 2).

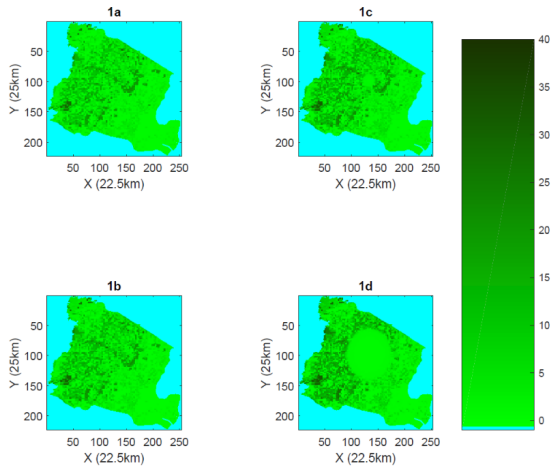
Compute using Raster to MultiPoint, Multipart to Singlepart and Intersection. Shown Used Raster to Point. Use Raster to ASCII to export. Followed by an external Model run, in this case a MATLAB script (Step 3).

External code not discussed here.
Finally, the output can be reimported to ArcMap and transformed into new data layers using Point to Raster (Step 4).

Step 2: Layered Point cloud

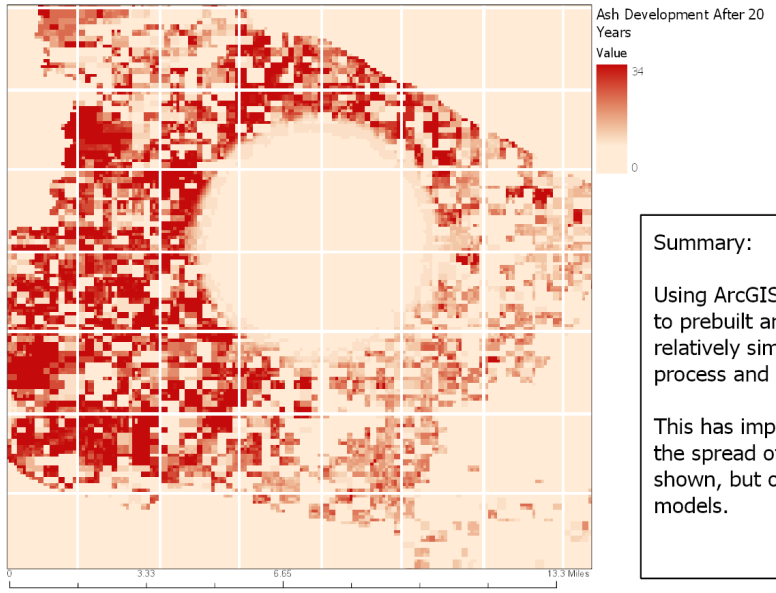


Step 3: Model Run and Testing



The Figure Above shows the development of an EAB infestation Across 20 years time from a single point source excluding the impacts of human mediated transport.
1a: Initial Condition
1b: 5 Years Progress
1c: 10 Years Progress
1d 20 Years Progress

Step 4: Import Back to Raster



Summary:

Using ArcGIS you are not limited to prebuilt and plug-in tools. It is a relatively simple process to export, process and reimport data.

This has implications for not only the spread of invasive pests, as shown, but other time dependent models.

ACCESSING THE IMPACT OF SOCIOECONOMIC FACTORS TO PUBLIC ELECTRIC VEHICLE CHARGING STATION (EVS) IN NEW JERSEY

Gia Nguyen, Pankaj Lal Ph.D., Anthony Bevaccqua, CESAC -Montclair State University

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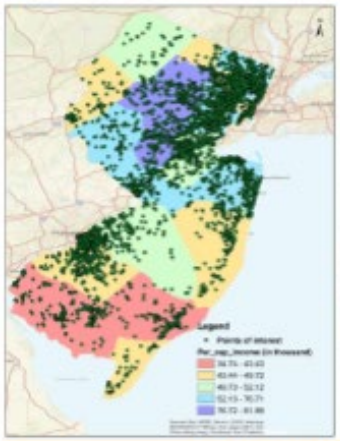
CESAC
Clean Energy and Sustainability Analytics Center

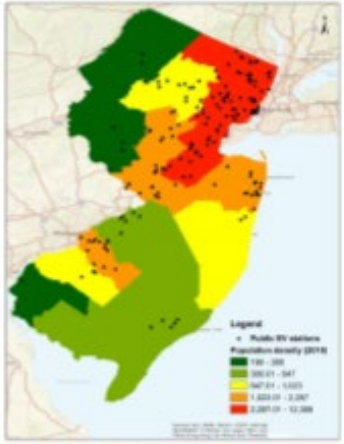
Background

New Jersey will spend $3.2 million to build 827 electric vehicle charging outlets across the state to moving forward on state's commitment to clean transportation (NJDEP, 2019). It is important to define where are suitable areas to place these charging stations. In this study, we would like to access the impact of socioeconomic factors including local population, traffic density, per capita income, and distances from the point of interest to locating EVs. To achieve the objective, spatial regression analysis is applied to identify correlations of independent parameters to EVS location. The independent parameters will be the values of the socioeconomic factors. The regression model would be in the format as :

$Y = \text{Intercep} + \alpha X_1 + \beta X_2 + \gamma X_3 + \delta X_4 + \varepsilon$, where Y is number of EVs within NJ counties, X_1 is the local population density, X_2 is the per capita income, X_3 is number of points of interest, X_4 is number of electric vehicles registered, and ε is a residue of the regression model. By using existing EVs locations in New Jersey counties and recent socioeconomic conditions at the county level as input, the analysis would identify coefficients including α, β, γ, and δ to evaluate potential impacts of factors. Population density (2010), per capita income (2010-2016), and number of registered electric vehicles are average values of New Jersey counties where the EVs located. Distances to the point of interest will be estimated by using Service-Area algorithm in Network Analyst to calculate service region of a charging station within 15-minute driving distance based on the real street network. In doing that we aim to identify optimal locations for sitting new charging stations.

Methods and Materials

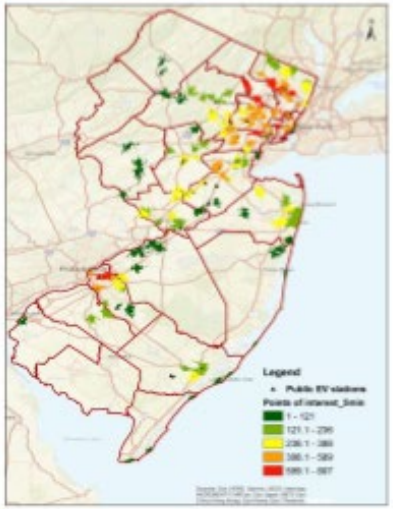


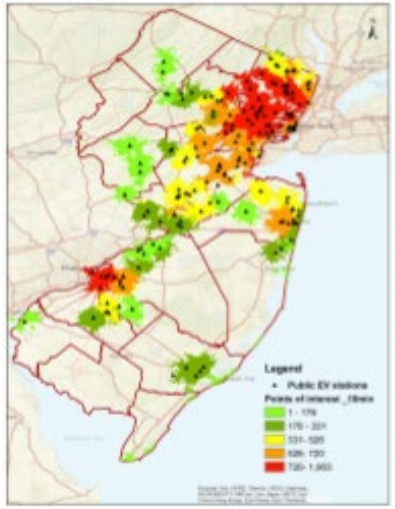


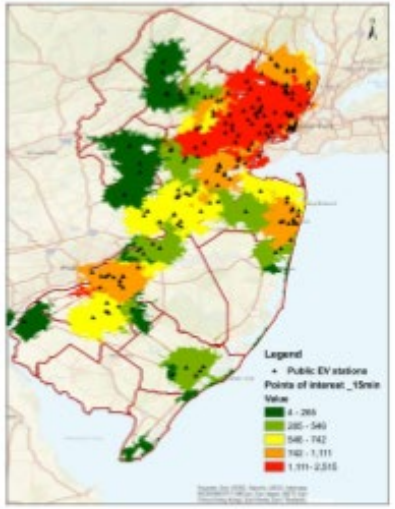
Acknowledgments

We gratefully acknowledge support for this work from CESAC.

Result

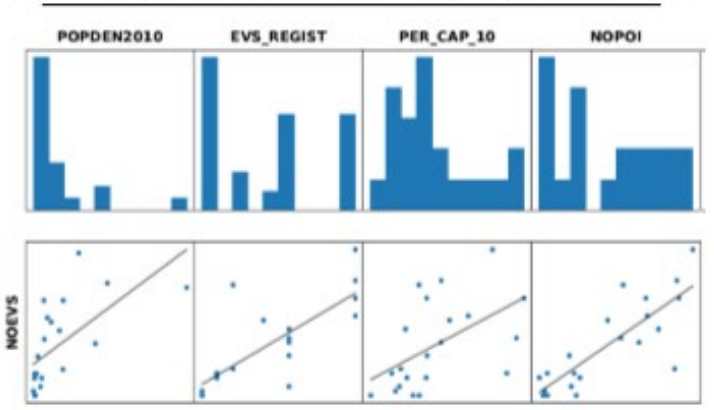


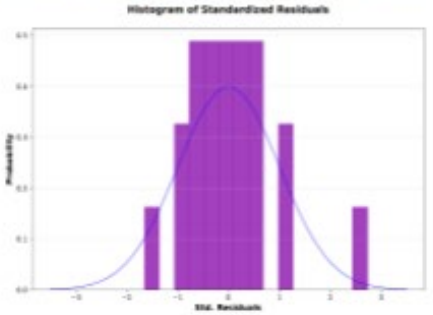




Summary of OLS Results - Model Variables

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	-0.985894	3.781166	-2.379080	0.030144*	3.113983	-2.888806	0.010685*	------
POPDEN2010	0.001497	0.000346	4.330733	0.000518*	0.000195	7.673195	0.000001*	1.403122
EVS_REGIST	0.018154	0.006136	2.958800	0.009239*	0.005824	3.117309	0.006634*	3.170578
PER_CAP_10	0.156121	0.074761	2.088277	0.053114	0.054667	2.855882	0.011439*	1.416681
NOPOI	0.005291	0.004174	1.267624	0.223072	0.004205	1.258380	0.226309	3.326427





Input Features:	NJ_counties_POIs131.shp
Number of Observations:	21
Multiple R-Squared [d]:	0.888311
Joint F-Statistic [e]:	31.813640
Joint Wald Statistic [e]:	222.244601
Koenker (BP) Statistic [f]:	2.028800
Jarque-Bera Statistic [g]:	0.031607


Cooper Plaza Neighborhood Inventory,2019
Cooper University Hospital
Cooper University Hospital
Cooper Institute for Medical Research
Legend
Housing Condition
Historic District
Housing Conditions
Building Type
Legend
Building Status
Legend
Physical Condition of the Houses

Fair Winds and Following Seas: Threats to New Jersey's Coastal Heritage

Christina Servetnick, T. Cregg Madrigal, and Elizabeth Davis
New Jersey Department of Environmental Protection
Municipal Finance and Construction Element

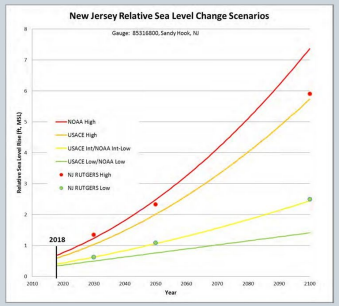
Introduction

New Jersey is home to 58 National Historic Landmarks and thousands of historic buildings and archaeological sites. Coastal areas were important to both prehistoric and historic people, so it is no surprise that many of these sites are located near our shores, bays, and rivers.

Historic preservation efforts have protected many of them from deterioration, destruction, and redevelopment, but sea level rise threatens all historic and archaeological sites in its path. It is not only inundation from sea level rise that is a concern. Superstorm Sandy 2012 showed that many more historic properties are at risk of destruction from stormwater surges, flooding, and erosion.

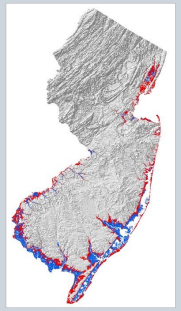
Thanks to many years of work by culture resource professionals, we can use inventories of significant historic properties to estimate the effect that sea level rise and storm surges will have on historic properties in New Jersey.

Sea Level Rise and Storm Surges



Sea Level Rise
On the East Coast, sea level has been rising by one inch every three years (sealevelrise.org). According to the Army Corps of Engineers' 2015 North Atlantic Coast Comprehensive Study, the sea level in New Jersey is projected to rise between 0.5 and 2.5 feet by 2050. For simplicity, we use a 1-foot sea level rise.

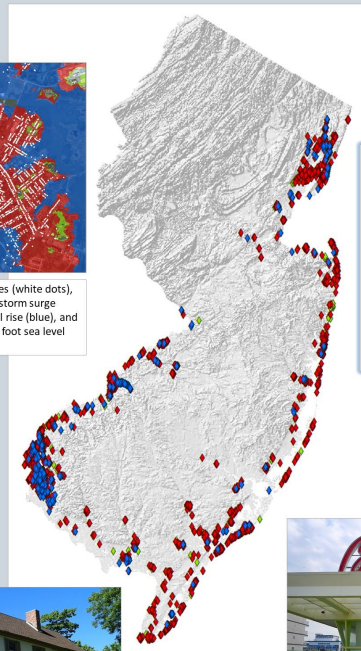
Current 30-year storm surge, according to *New Jersey's Coastal Community Vulnerability Assessment and Mapping Protocol*



Potential conditions in 2050: a 1 foot sea level rise (blue) with the 30-year storm tidal surge added (red)

Results: Historic Properties

Salem City historic properties (white dots), along with current 30-year storm surge region (red), 1 foot sea level rise (blue), and 30-year storm surge after 1 foot sea level rise (green).



- Historic properties currently at risk of flooding from storm surges
- Properties that will be affected by a 1-foot sea level rise
- Properties that will be threatened by storm surges by 2050

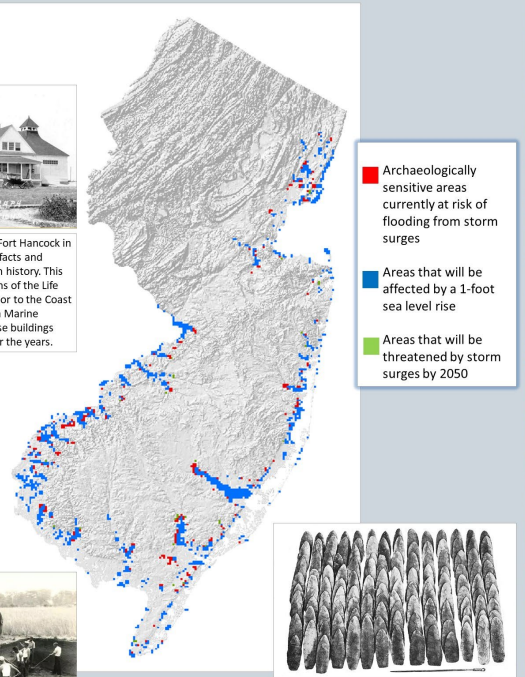
The 1704/1724 George Abbott House in Salem County. Based on forecasts, by 2050, its outbuildings will be inundated by sea level rise and the house itself will be surrounded by water.

Motels in the Wildwoods Shore Historic District are historically significant for their distinctive Doo Wop style of architecture. Many were demolished for redevelopment projects, and the surviving resorts remain vulnerable to flooding. By 2050, all of the properties within the historic district will be at risk from storm surges.

Results
National Register Listed and Eligible Properties at risk today: *16,548*
Properties at risk by 2050: *18,918*
Properties inundated by 1-foot sea level rise: *528*

Results: Archaeological Sites

Archaeological excavations at Fort Hancock in Sandy Hook have revealed artifacts and foundations from the site's rich history. This includes the former foundations of the Life Saving Service Station (precursor to the Coast Guard) and the Western Union Marine Observatory, shown here. These buildings were moved several times over the years.



- Archaeologically sensitive areas currently at risk of flooding from storm surges
- Areas that will be affected by a 1-foot sea level rise
- Areas that will be threatened by storm surges by 2050

Abbott Farm, a National Historic Landmark, is a 2,000 year old prehistoric site complex on the Delaware River. Low-lying portions of the complex are especially vulnerable to flooding.

Stone tool cache from Abbott Farm NHL. Thousands of archaeological sites have been identified throughout New Jersey. Most of these sites haven't been studied, and many of them face flooding and erosion due to climate change.

Results
Archaeologically sensitive areas at risk today: *229,120 acres*
Sensitive areas at risk by 2050: *233,760 acres*
Area inundated by 1-foot sea level rise: *190,240 acres*

Conclusions

Historic sites in New Jersey are already threatened by water damage. Ongoing sea level rise will increase the risk. Sites that now face intermittent or seasonal risk may, by 2050, be permanently under water. This is not the only danger, as coastal storms bring erosion and wind damage that destroy buildings and archaeological sites. If sea level rise is greater than the conservative estimate we use in this study, even more historic properties will be affected.

In the wake of Superstorm Sandy, NJ DEP and affected municipalities have been working to mitigate the impact that storms have on our communities. Planning for stormwater resiliency and resistance must take New Jersey's cultural resources into account. These initiatives can decrease damage from flooding and also help protect New Jersey's cultural resources.

Beach Erosion in New Jersey. (Dale Gerhard, The Press of Atlantic City)

References

- *National Oceanic and Atmospheric Administration Sea Level Rise and Coastal Flooding Impacts Viewer* https://www.coast.noaa.gov/slr
- US Army Corps of Engineers North Atlantic Coast Comprehensive Study Report https://www.nad.usace.army.mil/CompStudy/
- *New Jersey's Coastal Community Vulnerability Assessment and Mapping Protocol*, 2011, Office of Coastal Management, NJ DEP
- Historic Properties of New Jersey, NJDEP/NJHPO (NJ-Geoweb)
- Archaeological Site Grid of New Jersey, NJDEP/NJHPO (NJ-Geoweb)

This poster was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

Educational Map (Instructional Presentation)

LRS 101:

A Walkthrough of Creating a Feature Class from a Database Table and NJDOT's Roadway Network

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WHAT IS LRS?

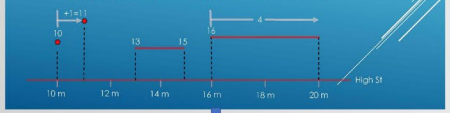
- **Linear Referencing System**
- A way to store geographic information about linear features (roads, streams, pipes, etc) by the **distance along the line** rather than **x,y coordinates**
- These are called **Events**
- Stored in **tables** separate from the linear feature
- Need to use special tools to view them geographically

Ex. **LRS** Point **events stored in table** as distance measurement of a linear feature

Ex Points stored by coordinates in separate feature class

MORE ABOUT LRS

- Can store information as
  - point events
    - along the line using a single measure
    - Number of units from a specific measure along the line
  - line events
    - with a start & end measurement
    - start measurement plus a number of units for which it continues



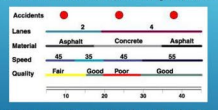
LRS TERMS

- **Route** – a line feature (street, river, pipe, etc) that
  - has a **unique identifier**
  - has a system of measurement
  - is stored with other routes in a special feature class called a **Route feature class.** In addition to x,y coordinates, route feature classes also store an **m-coordinate (x,y,m)** that holds the **m-values** (measurement). All routes in a route feature class must use a common measurement system
- **Measure** – the value stored in the route representing a location relative to the beginning of the feature or some point along the feature
  - Stored as an **m-value** on route vertices (x,y,m)
  - Can be any unit of **measure**: feet, miles, time,... cigarettes?

- **Event** – a row in a table representing a linear or point feature which occurs along a route
  - Contains a **unique identifier** that matches the corresponding **route's identifier**
  - Contains an **m-value** in same measurement units as corresponding route feature class
  - Stored with other events in an **event table** (.dbf, Excel, geodatabase)

WHY USE LRS?

- Avoid splitting or segmenting linear features due to change in attributes
- Mapping data that is recorded using a measure
  - Such as accidents which are recorded by referencing mileposts on highways



- Make use of existing data sources that are formatted for LRS

EXAMPLE OF EXISTING LRS DATA

- **Data from NJ Department of Transportation (NJDOT)**
- **Route feature class** = NJDOT's Roadway Network LRS (https://www.state.nj.us/transportation/gis/data.shtm)
  - Statewide - over 39,000 miles of roadway Includes Interstate, Toll routes, US routes, State routes, County routes, Local streets & ramps
  - Structured to conform to Esri's UNETRANS (Unified NEtwork TRANSportation) data model which is a generic model for transportation applications using Esri software
  - Updated every calendar year
  - Route Identifier = SRI#
- **Event tables** = NJDOT's Straight Line Diagram (SLD) MS Access Database
  - Large database (over 630 MB)
  - Can be requested through NJDOT (Don Perry)
  - Over 100 tables
  - Route Identifier = SRI#
    - Around 33 point event tables (camera, inlet, sign, signal, etc.)
    - Around 45 line event tables (curb, fiber optic, passing zone, speed, etc.)

Speed

BURLINGTON COUNTY'S NEED FOR SPEED LIMITS

- Preparing road centerlines for use by 911 call center
- Wanted Speed limits for calculating Travel Time
- NJDOT's LRS was recommended
- Obtained the Roadway Network LRS and Straight Line Diagram (SLD) MS Access Database

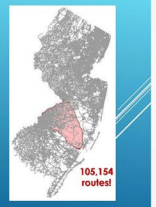
Needed to have the speed limits in a feature class

How do we do that

Dynamic segmentation – process of mapping the **events** onto **route features** for displaying on a map

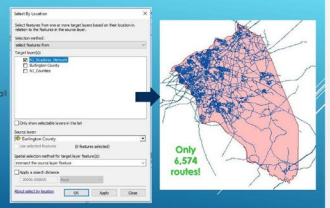
USING NJDOT'S LRS ROUTES AND SLD DATABASE

- **Preparing the Routes**
  - Data is statewide & a lot of data
  - **We only needed Burlington County**
  - Routes represent an entire road or highway with no segmentation
  - Measures start at beginning of Route (0) and continue to the end
  - **Can't clip to the County** – if beginning or end of measure for speed limit fell outside of County, it wouldn't map correctly



USING NJDOT'S LRS ROUTES AND SLD DATABASE

- **Preparing the Routes, cont.**
  - Used **Select by Location** to select all **Routes that Intersected** the County instead

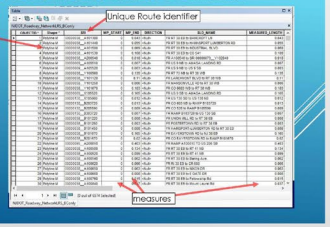


USING NJDOT'S LRS ROUTES AND SLD DATABASE

Route Feature Class
Polyline M: stores x,y,m values

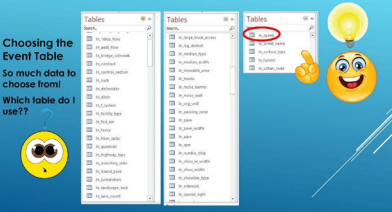
Unique Route Identifier

- **Preparing the Routes, cont.**
- **LRS Route table**



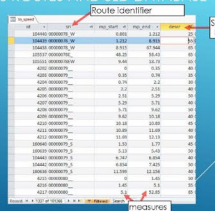
USING NJDOT'S LRS ROUTES AND SLD DATABASE

- **Choosing the Event Table**
- **So much data to choose from!**
- **Which table do I use??**

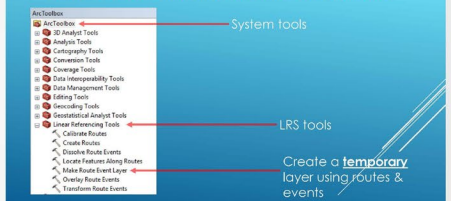


USING NJDOT'S LRS ROUTES AND SLD DATABASE

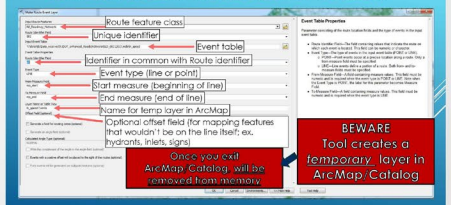
- **Choosing the Event Table:**
- **Speed Limit event table**



USING LRS TOOLS IN ARCGIS DESKTOP TOOLBOX



USING LRS TOOLS IN ARCGIS DESKTOP TOOLBOX

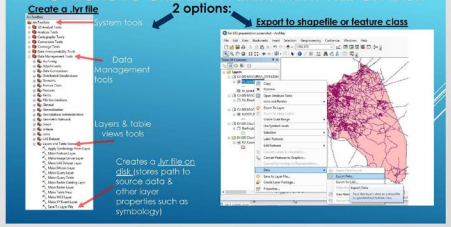


OPTIONS TO CREATE A PERMANENT FILE ON DISK

2 options:

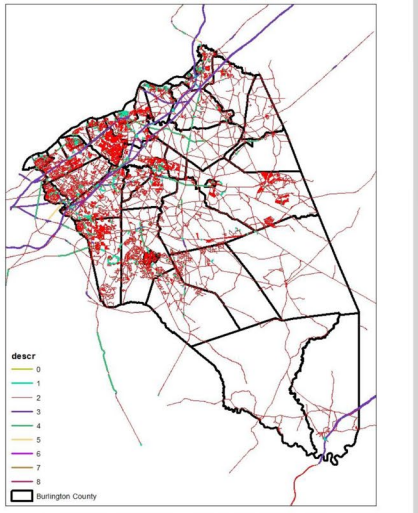
Create a .lyr file

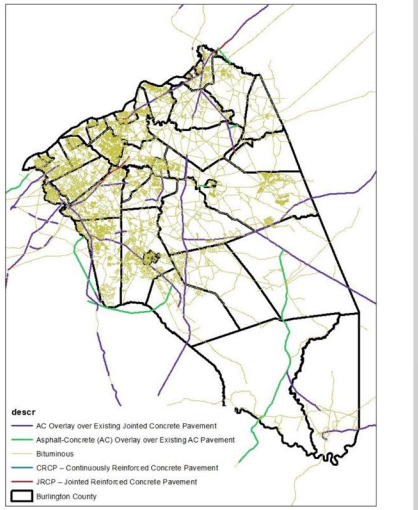
Export to shapefile or feature class



RESULTING SPEED LIMIT FEATURE CLASS

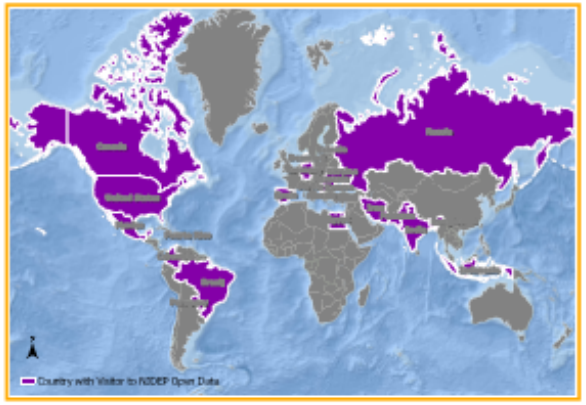
Other Examples





Discover NJDEP's Open Data

Visitors Around the World



The NJDEP is transitioning its GIS data downloads to Esri's ArcGIS Open Data platform.

Statistics about visitors and data downloads were collected using Google Analytics from February 25-April 5, 2019.

146 datasets

Search Words

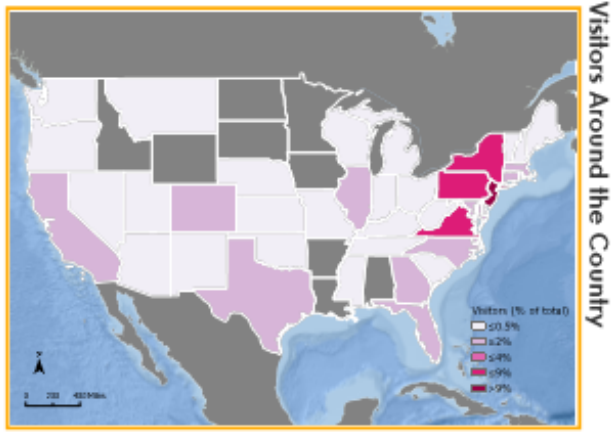
Local Visitors

Top 10 Data Downloads

1. Land Use/Land Cover
2. Wetlands
3. NHD Waterbody 2002
4. Known Contaminated Site List
5. NHD Streams 2002
6. Open Space
7. Sewer Service Area
8. Coastline (2012) of New Jersey
9. Tidelands Claim Line
10. Classification Exception Areas

Dataset Categories

Visitors Around the Country



https://gisdata-njdep.opendata.arcgis.com/

New Jersey Firearms and Public Health: Framework for a Life Cycle Assessment Approach

Introduction

This project explores the impact of firearms on New Jersey public health, by describing upstream and downstream characteristics of firearms production and use. A Life Cycle Assessment Framework is considered as a way to open up paths of policy, intervention and regulation from a variety of actors, with the goal of promoting public health.

Data

NJ SHAD, Vital Statistics, 2000-2017:

- Deaths from Firearm Injuries:
  - Firearm Homicides
  - Firearm Suicides
  - Accidental Injury and Undetermined Causes
- County death rates and total deaths
- Municipality death rates and total deaths, 2004-2017

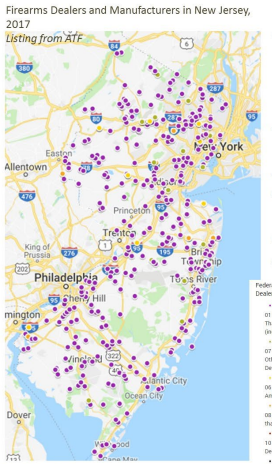
Conclusions

This exploratory study seeks to visualize a life cycle assessment approach to firearms. Through this process additional questions are raised:

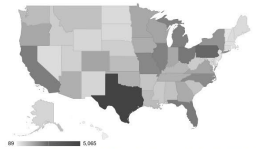
- Should guns be considered a form of pollution?
- How are the costs and benefits of firearms distributed spatially and demographically?
- Which governing and non-profit bodies are able to advocate for non-gun owners rights?

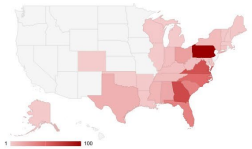
Design	***Material Extraction and Production***	***Manufacture and Construction***	***Distribution and Retail***	***Consumption: Use, Support and Maintenance***	***Disposal: Decommissioning and Material Recovery***
• Interventions exist to limit harmful designs (e.g. plastic guns, micro guns, 3D printed guns, ammo size) • New regulations could consider interventions to design flaws.	• Some materials are currently prohibited from use in firearms manufacture, and other materials could be considered. • Extraction and production costs could be quantified.	Quality control, occupational health, and proper handling of materials is important to any industry, but especially firearms.	• Licensing and regulation of firearms dealers • Waiting periods • Background checks • Limit to quantity of purchases • Limits to firearms advertising	• Licenses for owners • Safe storage: locks, unloaded • Physician intervention • Health interventions: before, during, after injury event	• Several police departments have expressed concern about sales of confiscated weapons; reuse is problematic, so is disposal

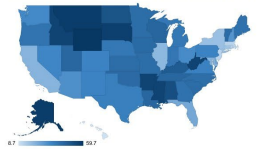
Firearms Dealers and Manufacturers, and Gun Ownership



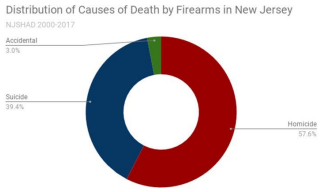
Firearms dealers out-number McDonald's in New Jersey 3:2. But, New Jersey ranks 46th in the number of dealers by state.

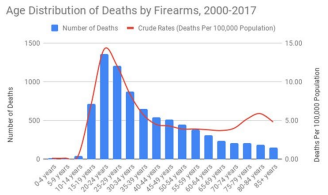

Firearms Dealers and Manufacturers by State, 2017


Traces for Crime Guns Recovered in New Jersey, 2018


Percent Gun Ownership, CDC BRFSS, 2001

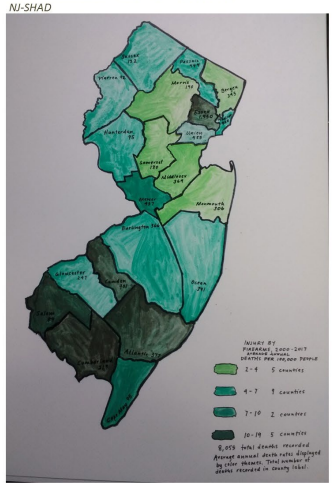
About the author:
Lisa Jordan is Director of the Spatial Data Center at Drew University. Her website is lisajordan.net.

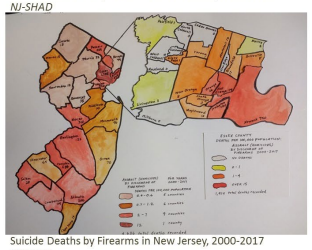


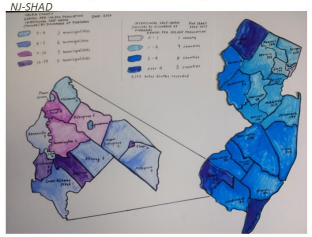


Interested in mapping NJ-SHAD health data? Visit bit.ly/NJSHAD-GIS for a how-to-guide.

Deaths by Firearm Injury: Homicides and Suicides







NJDEP Metadata Creation and Publication

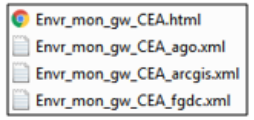
First Step: Metadata Creation

Every GIS layer published by NJDEP needs metadata that formally documents the "who, what, why, where, when, and how" of the data.

At BGIS we receive this information from the GIS layer's data steward and compile a rough draft of the metadata in Federal Geographic Data Committee Content Standard For Digital Geospatial Metadata (FGDC CSDGM) format.

Once the information is finalized the metadata is then upgraded to ArcGIS metadata for compatibility with the ArcCatalog metadata editor. An HTML copy of the metadata is created using the USGS Translator tool in ArcCatalog. If the GIS layer will be available on NJDEP's Open Data site, a special copy of the ArcGIS metadata is created with a hyperlink to the layer's zipped geodatabase download and an adjusted title.

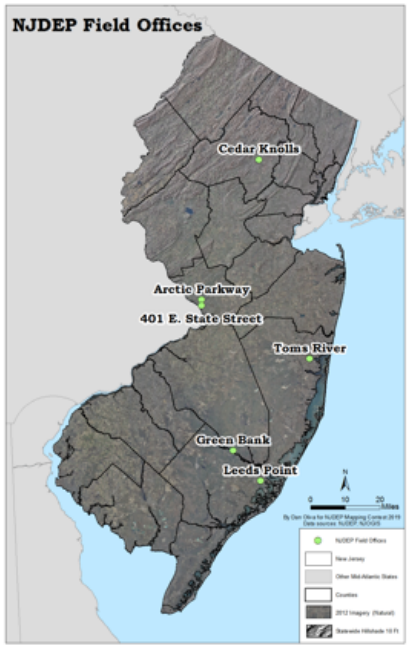
At this stage we have four files per GIS layer: the HTML document, the FGDC metadata (_fgdc), the ArcGIS metadata (_arcgis), and the ArcGIS Online metadata (_ago).



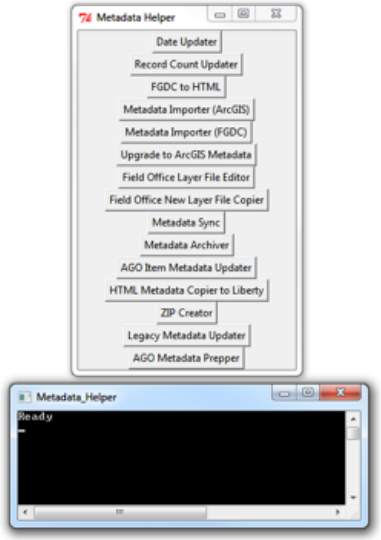
Second Step: Metadata Distribution

The metadata is now ready to be imported across NJDEP's GIS enterprise environment. This environment is comprised of two SDE databases, four file geodatabases located at 401 E. State Street, and five file geodatabases located at NJDEP field offices (see map).

This is done by first using the Metadata Importer (Conversion) tool to import the source _arcgis metadata file to its feature class in our development SDE database. After that initial import, our custom Metadata Sync script is run to import the metadata. The script uses the same Metadata Importer tool but iterates across our 11 internal destinations.



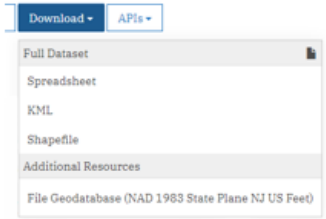
The field offices shown above utilize on-site NJDEP GIS Enterprise data and metadata. Every data layer and associated metadata file must be synchronized with their servers.



Third Step: Metadata Publication

We maintain a central directory and an archive of every metadata file for each of our enterprise feature classes. Once the publication metadata files for a new or updated feature class are created they must be sent to the central directory and their out of date counterparts archived.

At this point the GIS layer is served out on our external ArcGIS Server REST endpoints. That REST URL is then used in NJ-GeoWeb and ArcGIS Online. The ArcGIS Online Item that is created from the REST URL is then shared to an Open Data accessible group so it appears on our download page. The _ago metadata file is imported on to this ArcGIS Online Item. The unique zipped geodatabase download link is accessible in the Download drop down on Open Data as an Additional Resource (shown below). The publication process is now complete.



Metadata Python Scripts

We use a variety of custom Python scripts (shown to the left) to perform tasks for routine metadata updates and new metadata submittals. Most tasks are capable of batch processing. These scripts can:

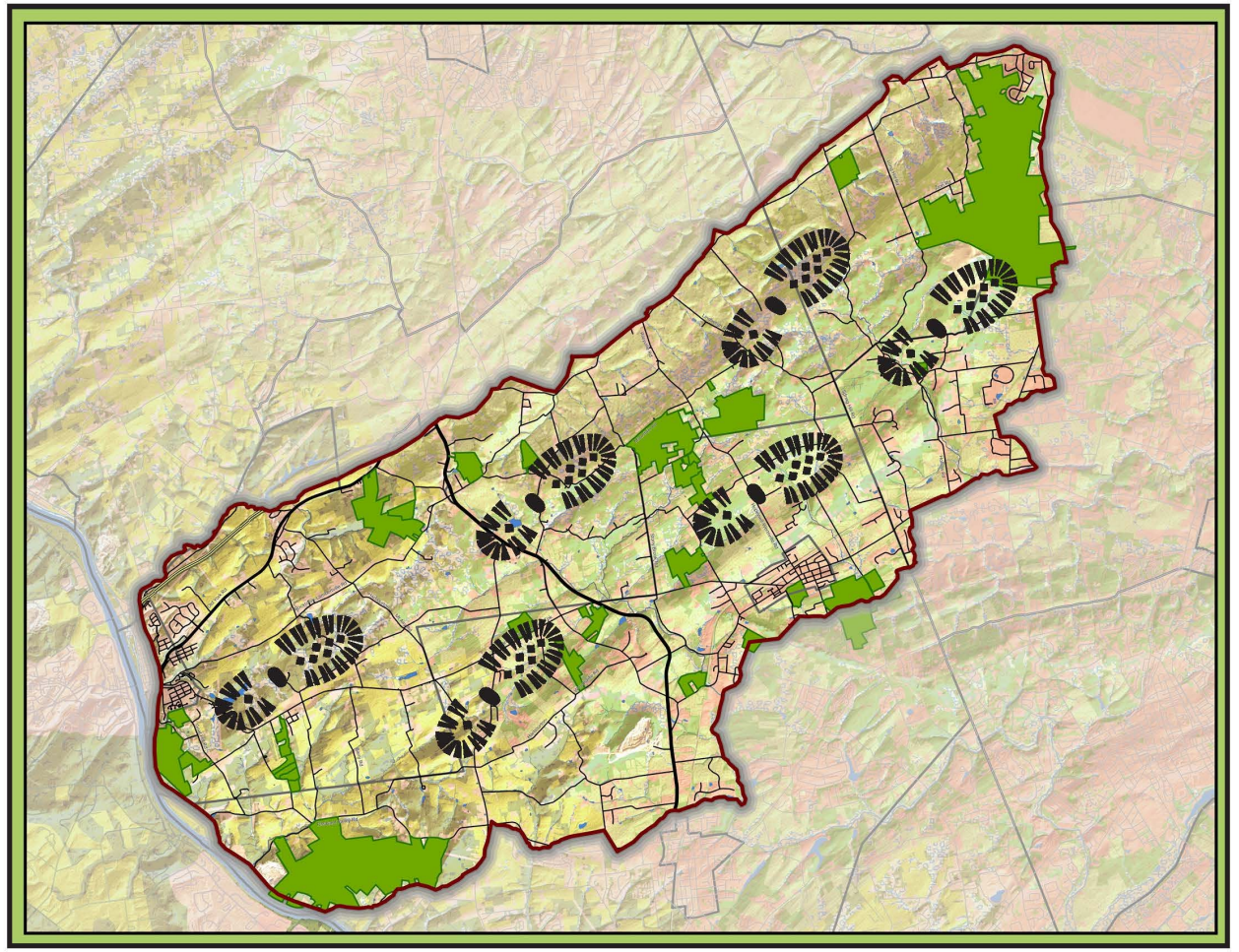
- Adjust dates and record counts
- Convert FGDC metadata to HTML
- Import Metadata from its development folder to our main SDE database
- Upgrade metadata from FGDC to ArcGIS format
- Synchronize metadata across our enterprise
- Archive metadata
- Update ArcGIS Online Item metadata
- Copy HTML metadata to our publicly accessible file server for use in NJ-GeoWeb
- Create zipped geodatabase feature classes with metadata for public download
- Update legacy metadata with current email and web domains as well as our new Use Constraint language
- Adjust newly created ArcGIS Online formatted metadata to remove unwanted tags and elements.

Created April 2019 by Dan Oliva (BGIS, NJDEP) for the 2019 NJDEP Mapping Contest.

Map Series or Atlas

Sourland Conservancy

Protecting New Jersey's Sourland Mountain Since 1986



Sourland Region Hiking Atlas

Middlesex County Rebranding Map Series Initiative

MIDDLESEX COUNTY • NJ

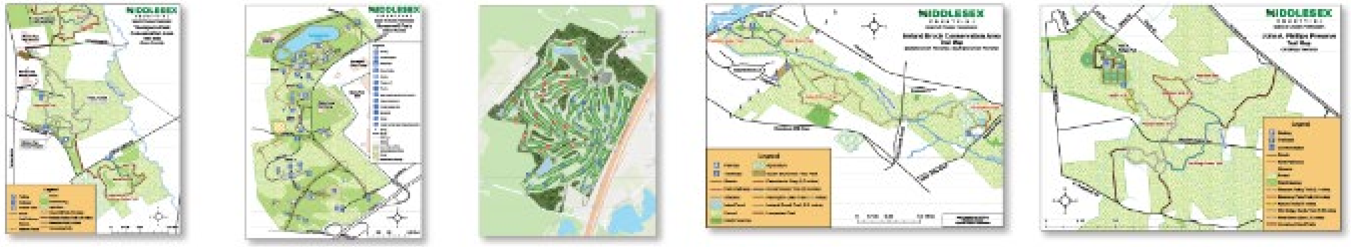
Erica Del Plato GIS Specialist
April 2019

Background

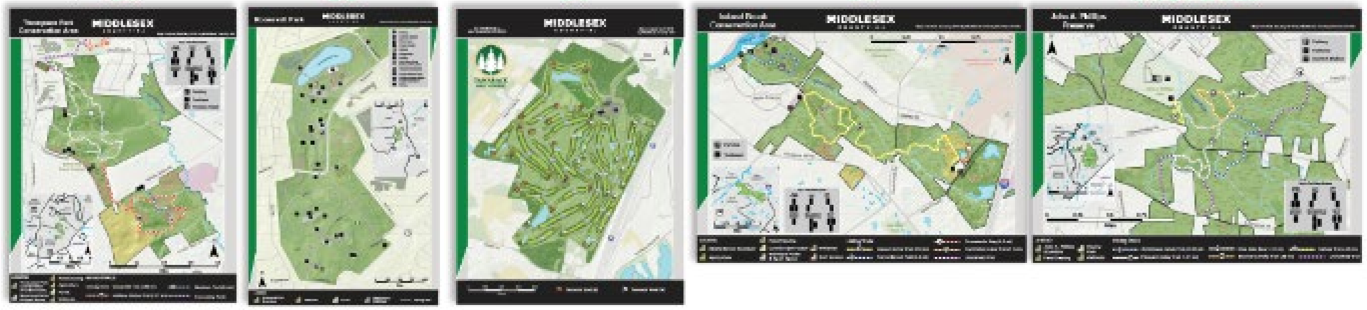
Methods/Data

County Park, Open Space and Golf Course Map Series

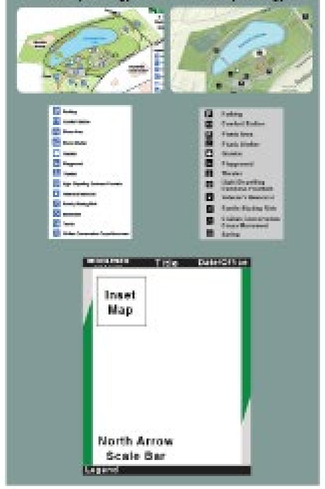
Old Maps



New Maps

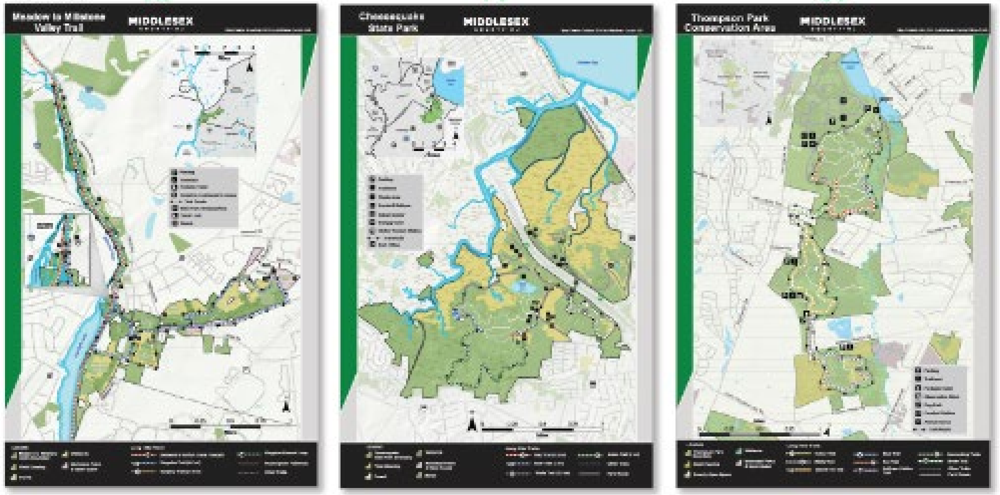


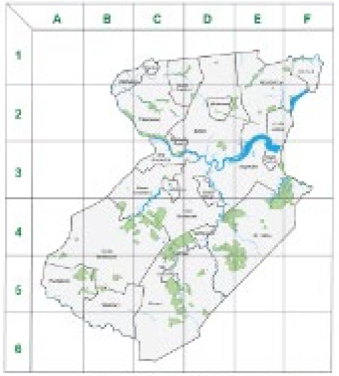
Symbology/Layout



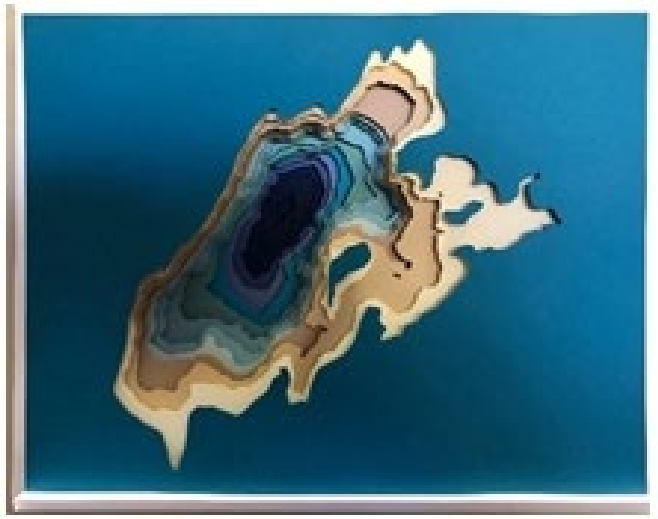
Long Hike Map Series

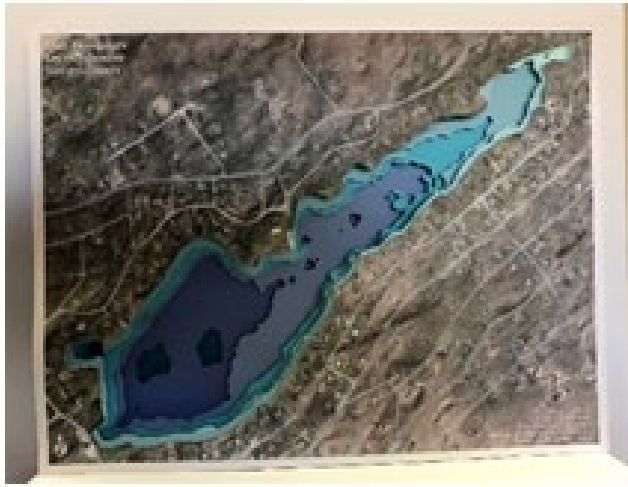
New Maps

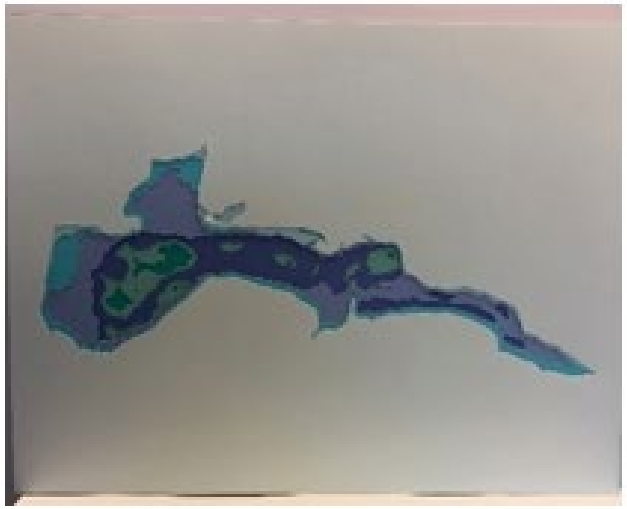


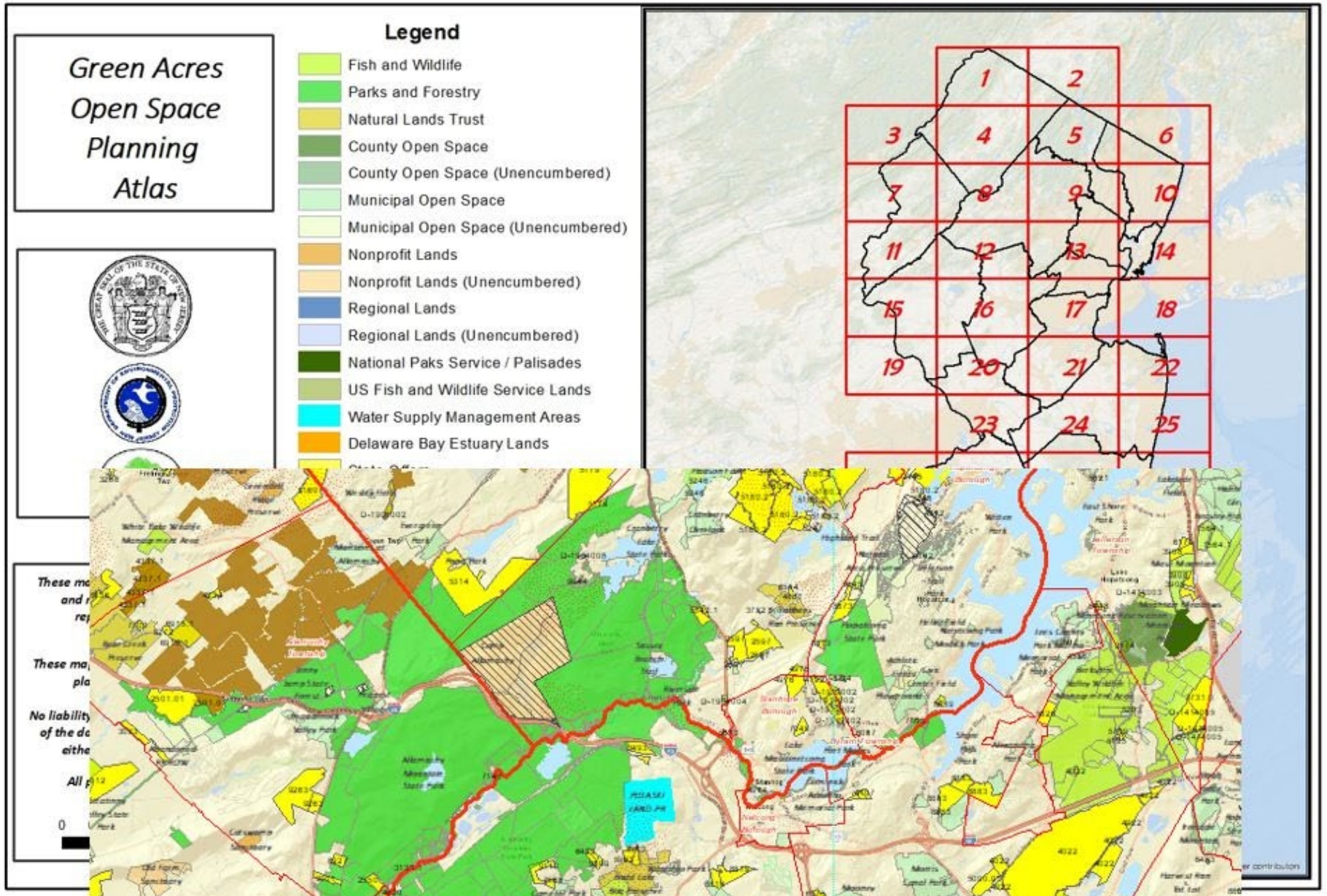


Middlesex County Grid Reference








Green Acres
Open Space
Planning
Atlas
Legend
Fish and Wildlife
Parks and Forestry
Natural Lands Trust
County Open Space
County Open Space (Unencumbered)
Municipal Open Space
Municipal Open Space (Unencumbered)
Nonprofit Lands
Nonprofit Lands (Unencumbered)
Regional Lands
Regional Lands (Unencumbered)
National Paks Service / Palisades
US Fish and Wildlife Service Lands
Water Supply Management Areas
Delaware Bay Estuary Lands
1
2
3
4
5
6
7
8
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Comparing Methods of Mapping Impervious Surface

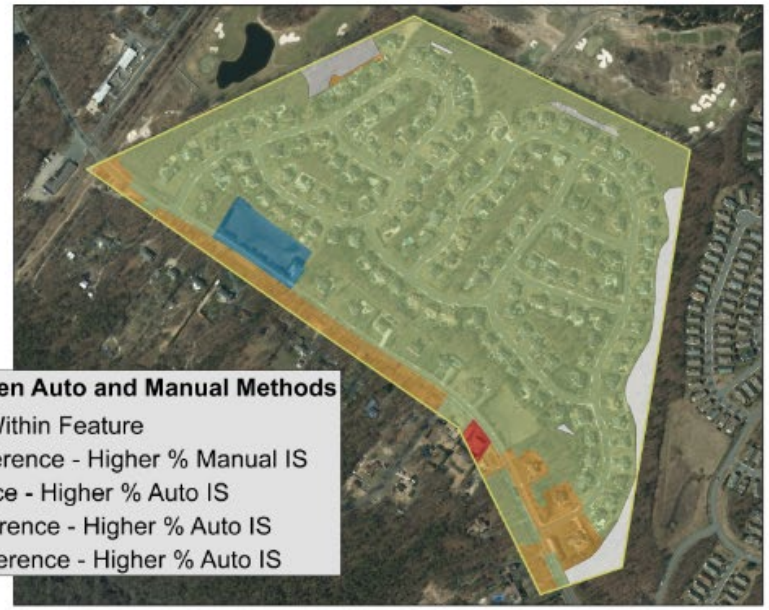
Impervious surface data has long been incorporated into the Land Use/Land Cover (LULC) dataset as an additional attribute based on each individual LU Code polygon. Normally, this would be done with approximate measurements across the state, and take many hours to complete. With the update of LULC 2015 coming, an automated method of mapping impervious surface (IS) data was developed to incorporate IS into the LULC, as well provide a standalone layer.

The Impervious Surface layer is divided into three categories: Buildings, Roads, and Other Impervious. "Other Impervious" features include any paved area (cement, brick, asphalt, etc.). Based on this criteria, I manually digitized the impervious surface features (Manual IS) of a neighborhood in Toms River, New Jersey.

Both Manual IS and Auto IS statistics were joined to the Land Use/Land Cover 2012 layer, respectively, to provide an update to the impervious surface information within each feature.

Location: Toms River, New Jersey
Study Area Size: Approximately 106 Acres
Data: Land Use/Land Cover 2012, Auto IS, Manual IS, 2015 Imagery

Data was provided by the NJDEP and OIT
Map Production By William Smith, NJDEP-BGIS
2019 Mapping Contest, Map Series



Difference Between the Auto IS and Manual IS Layers

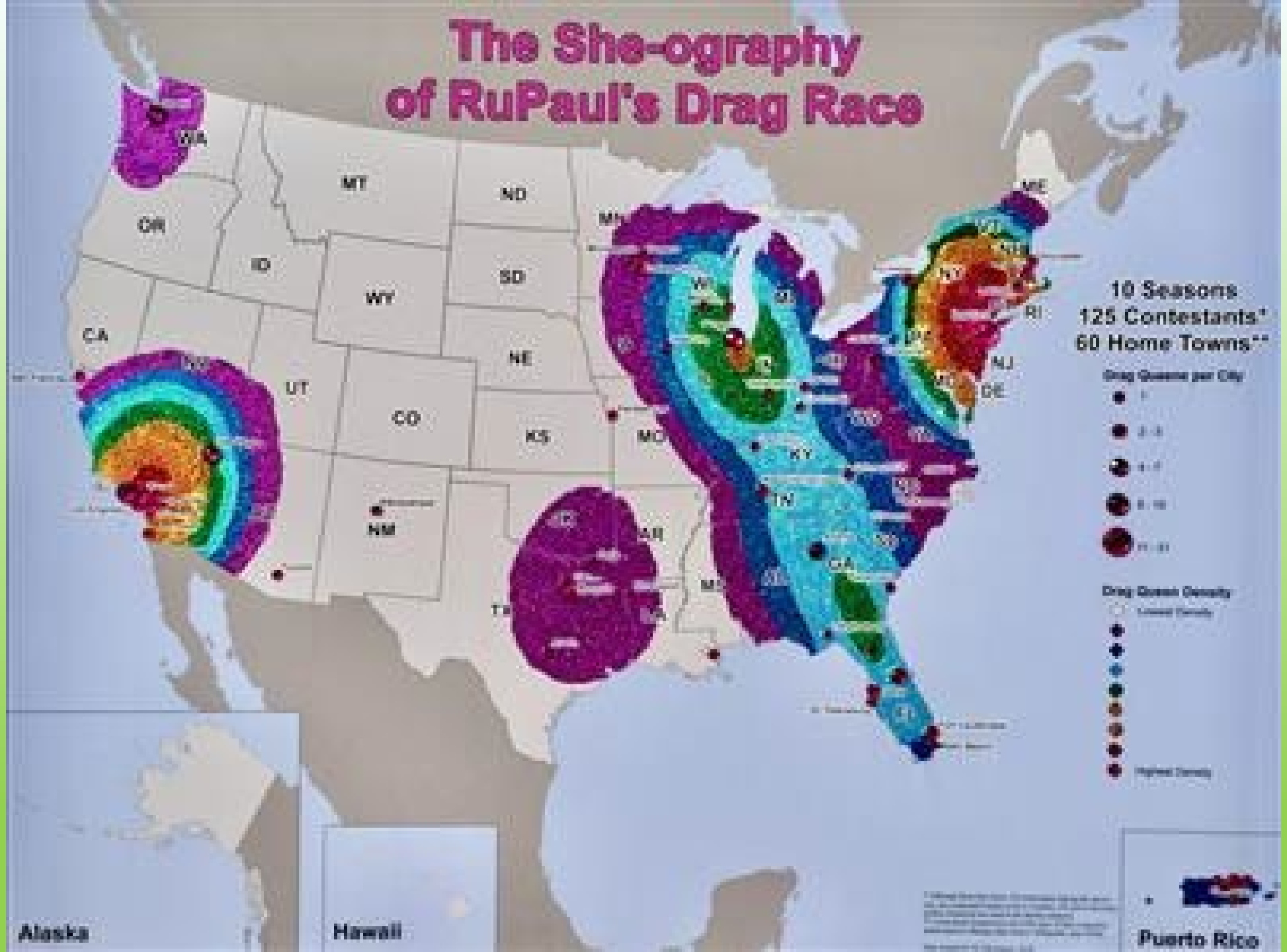
N
W E
S

1 in = 418 ft

Land Use/Land Cover 2012 with Auto IS integrated into LU12 Features

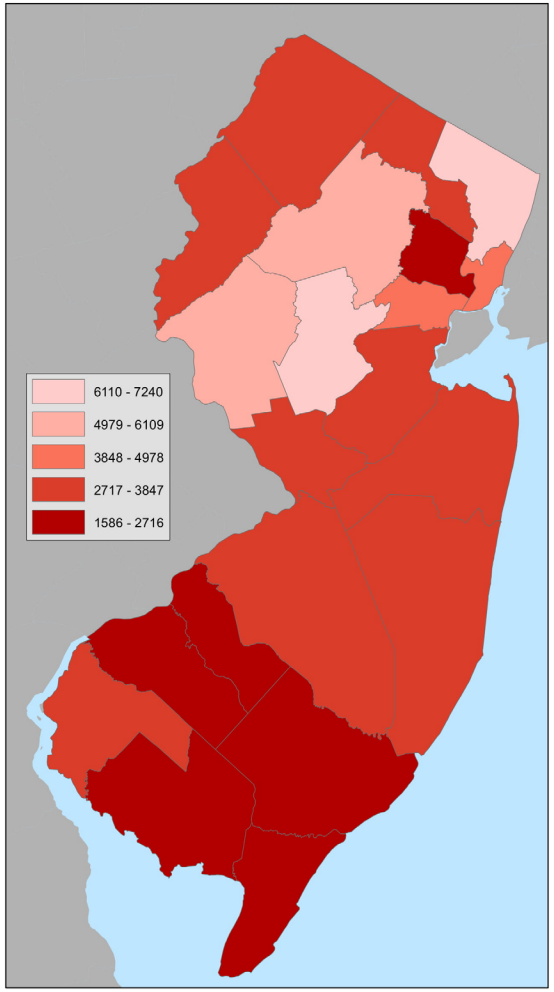
Land Use/Land Cover 2012 with Manual IS integrated into LU12 Features

Most Unique


The She-ography
of RuPaul's Drag Race
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
KY
TN
AL
GA
FL
SC
NC
VA
WV
PA
NY
ME
VT
NH
MA
RI
CT
NJ
DE
MD
10 Seasons
125 Contestants*
60 Home Towns**
Drag Queens per City
Drag Queen Density
Alaska
Hawaii
Puerto Rico


2019 MAP CONTEST
Dear map contest attendee.
Enjoy the map contest and remember to vote for your favorite most unique entry....wink wink.
Love.
Your favorite map contest card creator

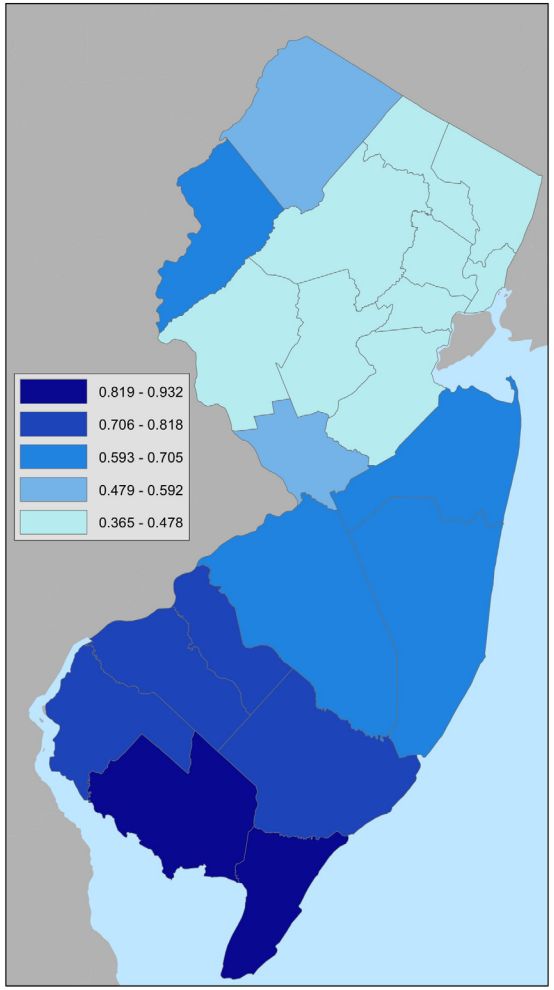
New Jersey's Opioid Crisis: Is There Hope?



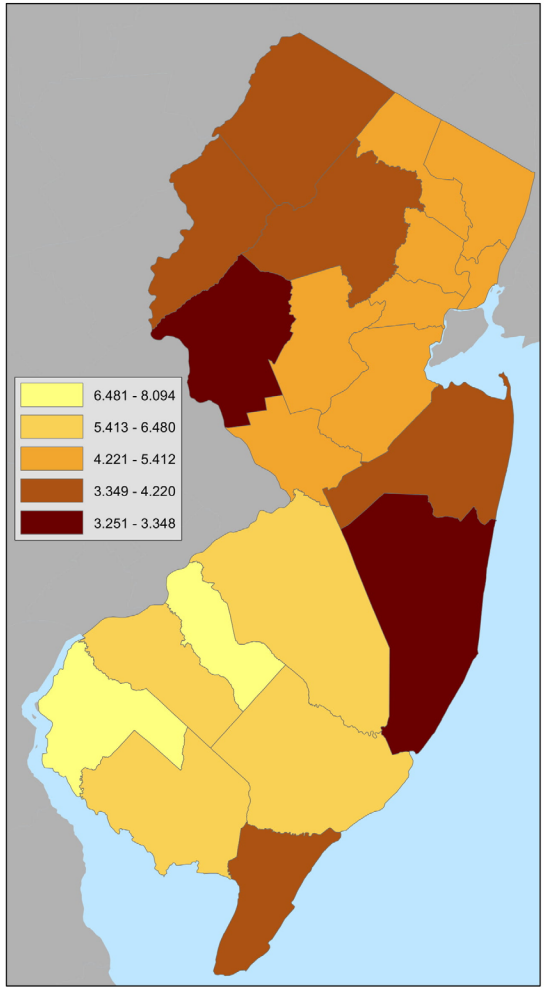
N

0 10 20 40 Miles

Residents per Death



Prescriptions per Resident



Naloxone (Narcan) Administrations per Death

Sources: Overdose Death, Naloxone, and Prescription information from njcares.gov
Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2017 from U.S. Census Bureau
State data from US Census Bureau and naturalearthdata.com

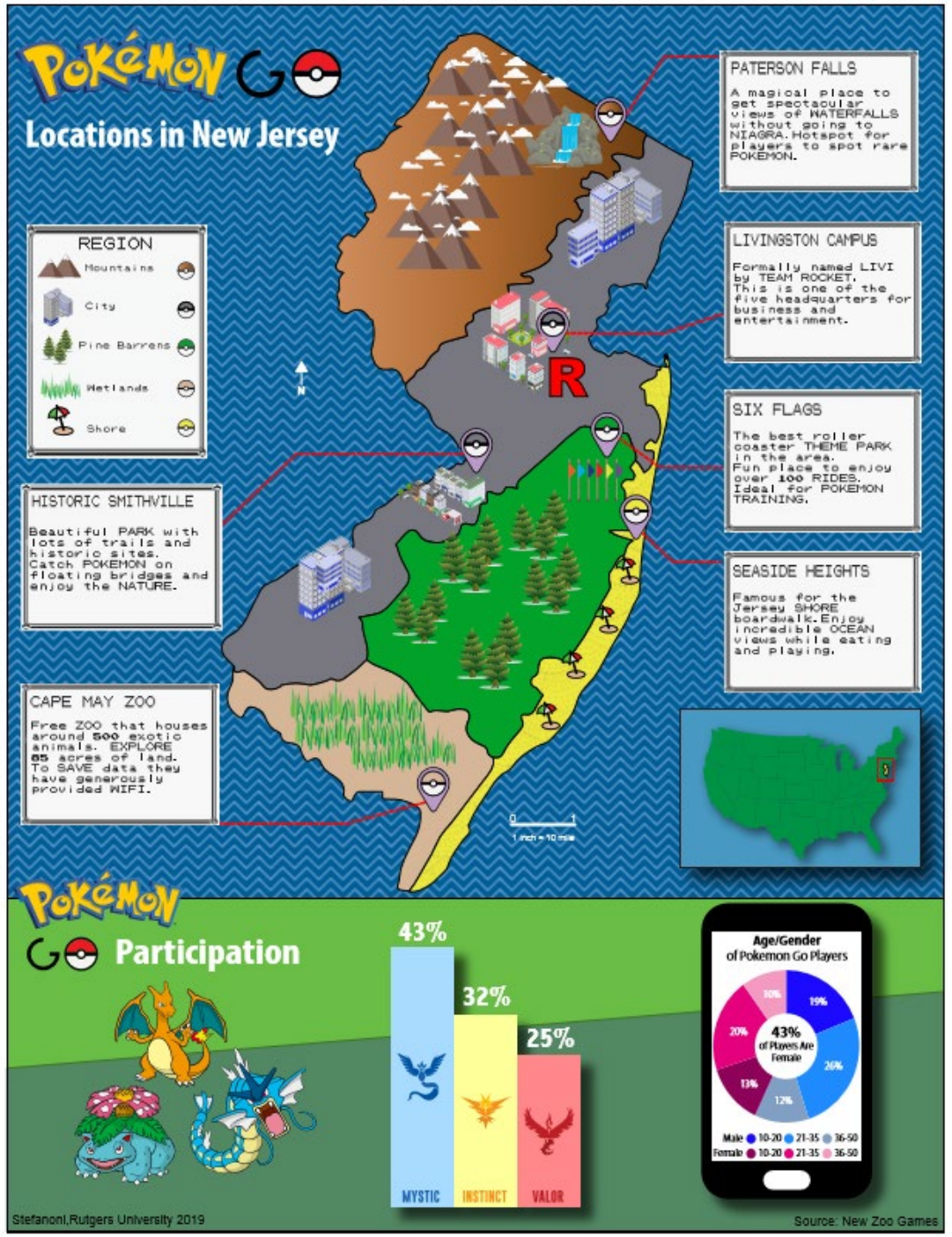
Purpose: The purpose of this map is to display opioid-related statistics for the state of New Jersey from 2017 ,including opioid related deaths, prescriptions per resident, naloxone administrations per death, and population of a county per death.

Nicholas Leusner

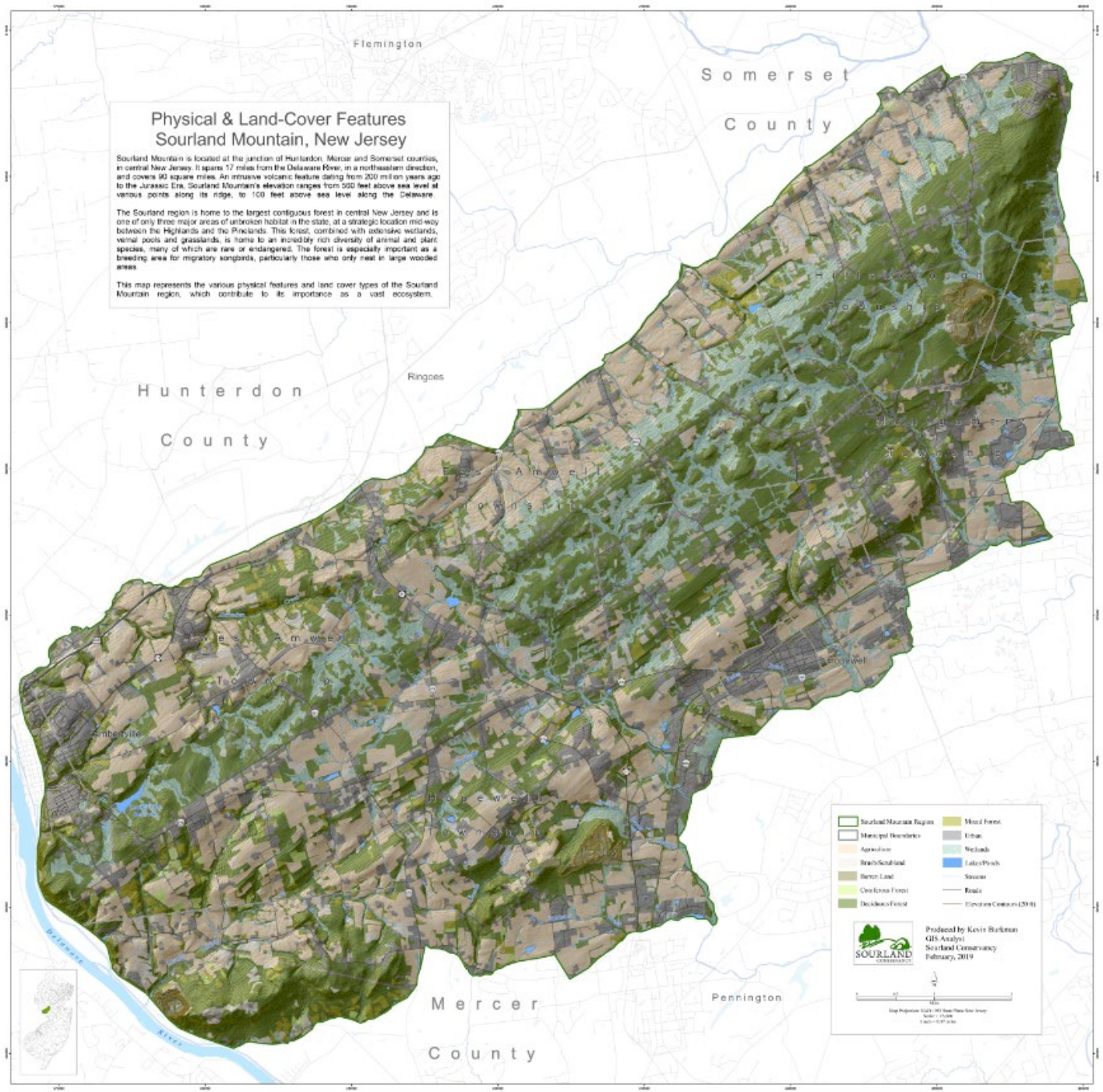
UNHEALTHY AIR QUALITY DAYS BY COUNTY

YOUR AIR YOUR DEP

REDUCING UNHEALTHY AIR QUALITY DAYS

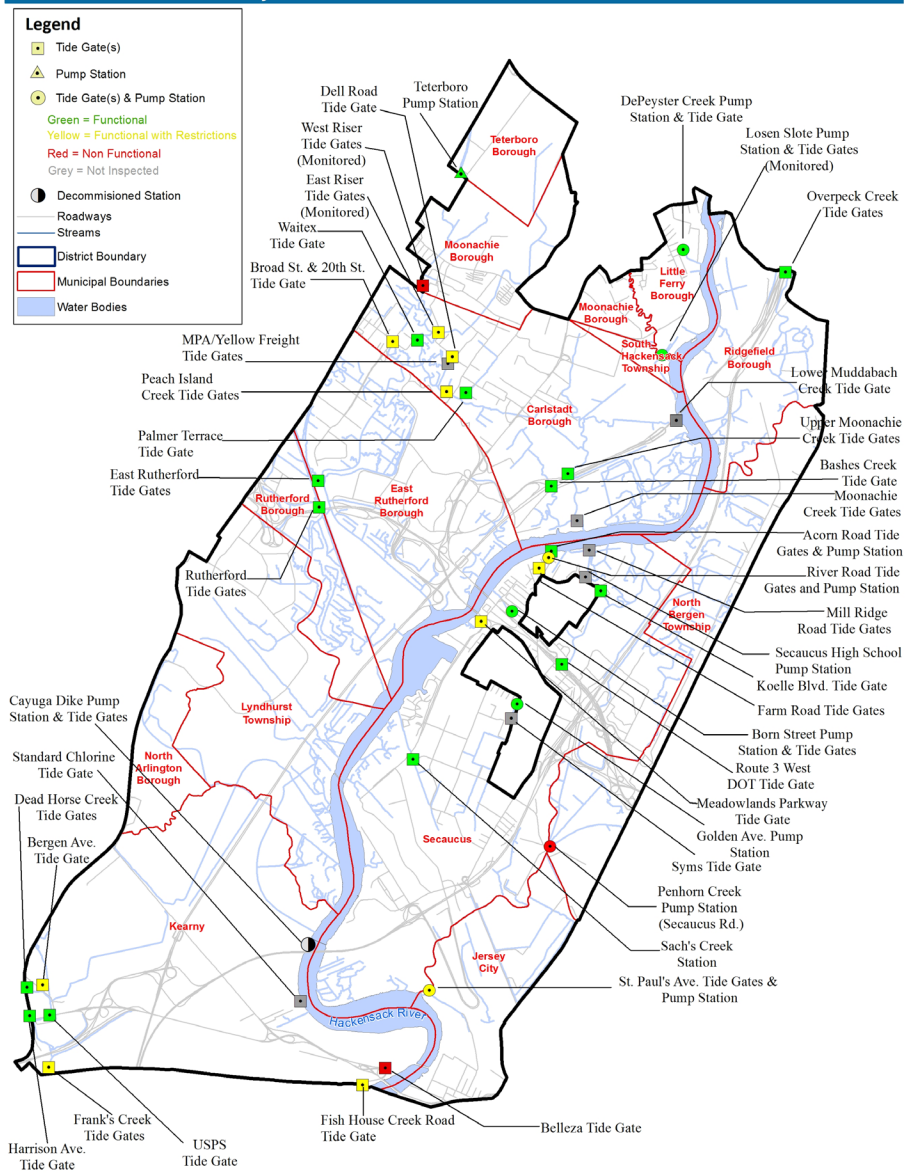

Pokémon GO
Locations in New Jersey
REGION
Mountains
City
Pine Barrens
Wetlands
Shore
N
R
PATERSON FALLS
A magical place to get spectacular views of WATERFALLS without going to NIAGRA. Hotspot for players to spot rare POKEMON.
LIVINGSTON CAMPUS
Formally named LIVI by TEAM ROCKET. This is one of the five headquarters for business and entertainment.
SIX FLAGS
The best roller coaster THEME PARK in the area. Fun place to enjoy over 100 RIDES. Ideal for POKEMON TRAINING.
SEASIDE HEIGHTS
Famous for the Jersey SHORE boardwalk. Enjoy incredible OCEAN views while eating and playing.
HISTORIC SMITHVILLE
Beautiful PARK with lots of trails and historic sites. Catch POKEMON on floating bridges and enjoy the NATURE.
CAPE MAY ZOO
Free ZOO that houses around 500 exotic animals. EXPLORE 85 acres of land. To SAVE data they have generously provided WIFI.
0
1
1 inch = 10 mile
Pokémon GO Participation
43%
32%
25%
MYSTIC
INSTINCT
VALOR
Age/Gender of Pokemon Go Players
43% of Players Are Female
19%
26%
12%
13%
20%
10%
Male 10-20 21-35 36-50
Female 10-20 21-35 36-50
Stefanoni,Rutgers University 2019
Source: New Zoo Games

Reference Map


Physical & Land-Cover Features
Sourland Mountain, New Jersey
Sourland Mountain is located at the junction of Hunterdon, Mercer and Somerset counties, in central New Jersey. It spans 17 miles from the Delaware River, in a northeastern direction, and covers 90 square miles. An intrusive volcanic feature dating from 200 million years ago to the Jurassic Era, Sourland Mountain's elevation ranges from 500 feet above sea level at various points along its ridge, to 100 feet above sea level along the Delaware.
The Sourland region is home to the largest contiguous forest in central New Jersey and is one of only three major areas of unbroken habitat in the state, at a strategic location mid-way between the Highlands and the Pinelands. This forest, combined with extensive wetlands, vernal pools and grasslands, is home to an incredibly rich diversity of animal and plant species, many of which are rare or endangered. The forest is especially important as a breeding area for migratory songbirds, particularly those who only nest in large wooded areas.
This map represents the various physical features and land cover types of the Sourland Mountain region, which contribute to its importance as a vast ecosystem.
Flemington
Somerset
County
Hunterdon
County
Ringoes
Hillsborough
Township
East Amwell
Township
Amwell
Township
Ewing
Township
Hopewell
Township
Hopewell
Emlenville
Mercer
County
Pennington
Delaware
River
Sourland Mountain Region
Municipal Boundaries
Agriculture
Beach/Scrubland
Barren Land
Coniferous Forest
Deciduous Forest
Mixed Forest
Urban
Wetlands
Lakes/Ponds
Streams
Roads
Elevation Contours (20 ft)
SOURLAND CONSERVANCY
Produced by Kevin Burkman
GIS Analyst
Sourland Conservancy
February, 2019

Water Control Structures

within the New Jersey Meadowlands District



Feet
0 2,500 5,000
Miles
0 0.5 1
N W E S

Units: US Survey Feet
Datum: North American Datum 1983
Coordinate System: NJ State Plane
Data Source(s): MERI, USGS, NJDOT

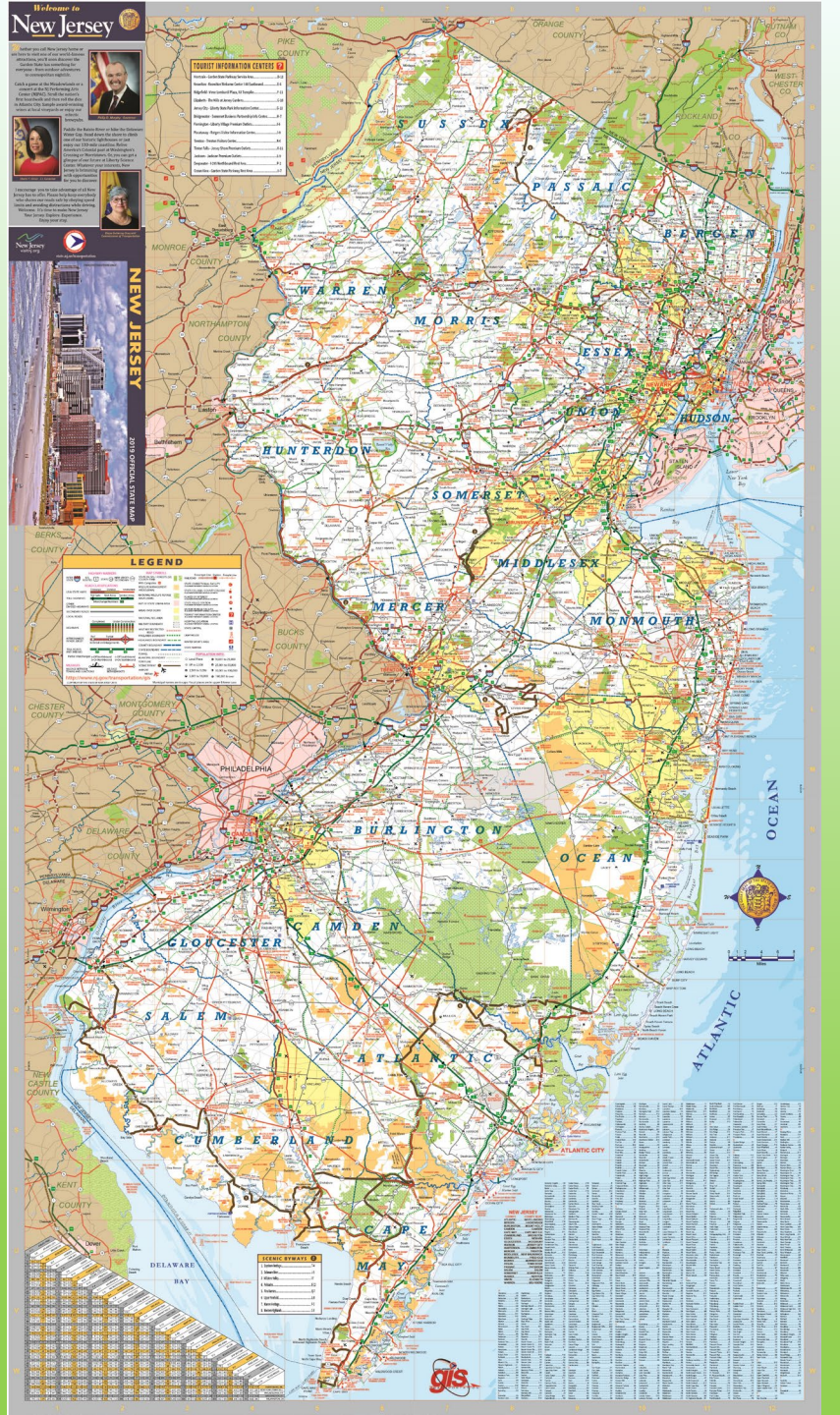
Disclaimer:
This map was created using MERI Geographic Information System digital data. The information provided on this map is provided "as is" with no warranty of any kind. This is neither an official state map nor state authorized; it is for information and presentation purposes only.

Tide Gate Monitoring Data can be viewed by visiting the MERI Website under the "Scientific Data" tab

RUTGERS UNIVERSITY | NEWARK
MERI | Meadowlands Environmental Research Institute

New Jersey Sports and Exposition Authority (NJSEA) - 1 DeKorte Park Plaza, Lyndhurst, NJ 07071 - (201) 460-1700 - Meadowlands Environmental Research Institute (MERI) - Geographic Information Systems (GIS)

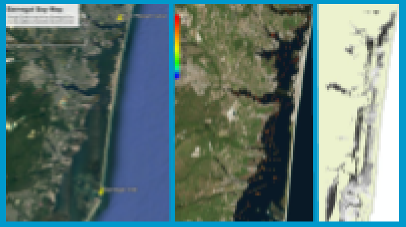

Welcome to New Jersey
NORTHERN METRO AREA
DOWNTOWN TRENTON
DOWNTOWN NEWARK
Skylands Region
Delaware River Region
Southern Shore Region
Greater Atlantic City Region
Shore Region
Gateway Region
New Jersey visitnj.org
TRANSPORTATION INFO
NJDOT's Safety Service Patrol
NEW YORK HARBOR COMMUTER FERRY ROUTES
NJTRANSIT
RAIL


Welcome to New Jersey
NEW JERSEY
2019 OFFICIAL STATE MAP
LEGEND
TOURIST INFORMATION CENTERS
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
UNION
HUDSON
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
BURLINGTON
OCEAN
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
PHILADELPHIA
ATLANTIC CITY
DELAWARE BAY
ATLANTIC OCEAN

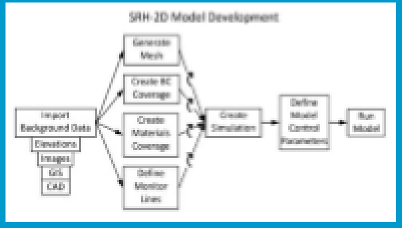
Student Map

Formulating a Model of Barnegat Bay to Observe Circulation Patterns and Simulate Sea Level Rise

Abstract



Introduction



Objective

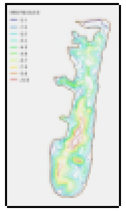
The purpose of this study is to design and implement a mathematical model of the Barnegat Bay to produce vector field visualizations that aid in further analyzing and understanding its circulation patterns.

Methodology

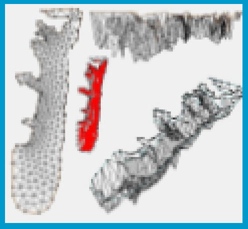
Mesh Computation

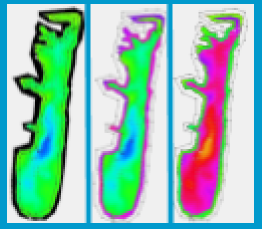
Creating Coverages

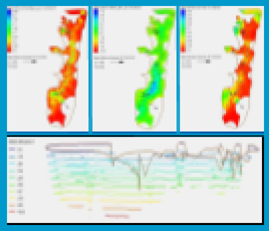
Contour Plot



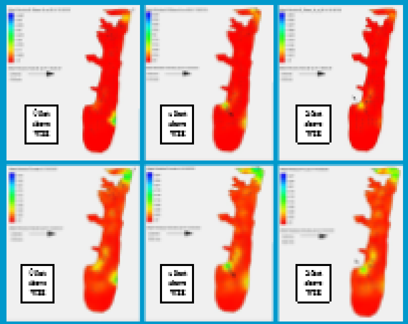
Generating Simulation







Case Study: Sea Level Rise



Discussion

Conclusion

Acknowledgements

Selected References

Toms River, New Jersey

DUI Arrests and Predictive Zones

Maria Dreher

Abstract

DUI arrest locations from the first six months of 2017 and 2018 were used to generate Thiessen polygons. The arrest coordinates were converted from addresses provided by the Toms River Police Department to gps points. These Thiessen polygons are areas where any spot inside it is closer to the included DUI arrest than any other DUI arrest location. Areas where the polygons are smaller indicate an area with high DUI activity. These maps show which areas are hotspots for DUI arrests and which are outliers so that local law enforcement can identify problem areas and better allocate resources to combat the issue.

Introduction

Toms River, the county seat of Ocean County, is a New Jersey township with a population of approximately 95,000 and a police department of about 160. About a quarter of all fatal crashes in New Jersey were caused by a drunk driver, yet many still continue to risk the lives of themselves and others by driving under the influence.

Methodology

Esri's ArcMap 10.7 software was used for this project. The Thiessen polygon tool and clip tool were the main tools used in this analysis. Toms River is shown as a salmon colored polygon. Roads are grey lines and major roads are indicated as black lines. 2017 DUI arrests (Figure 1) and their polygons are red. 2018 DUI arrests (Figure 2) and their polygons are shown in blue. The half mile perimeter around a location wih a liquor license is shown in green (Figure 3), The same six months were used from both years to account for any seasonal fluctuations. These maps are set to the same scale.

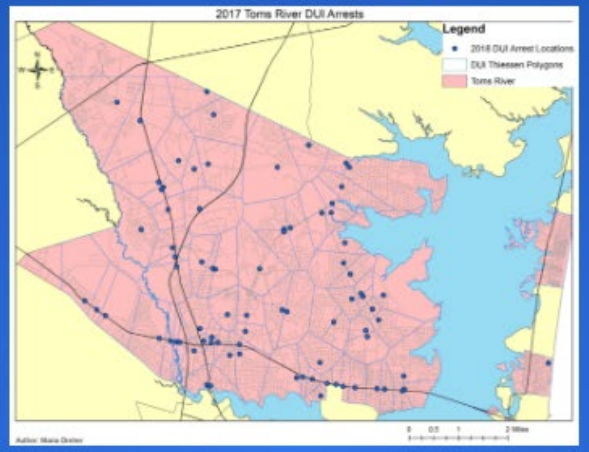


Figure 1: All DUI arrests made in Toms River, New Jersey during the first six months of 2017.

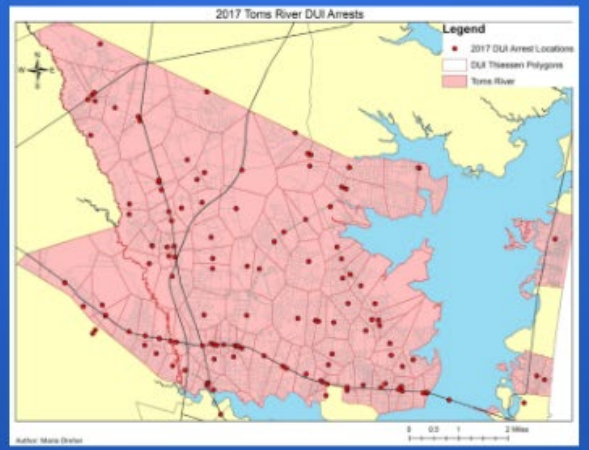


Figure 2: All DUI arrests made in Toms River, New Jersey during the first six months of 2018.

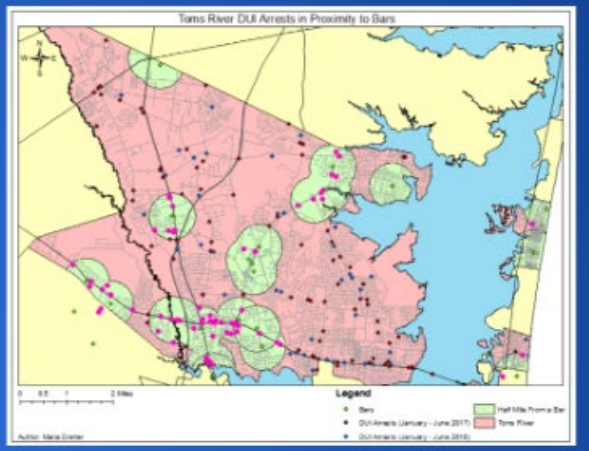


Figure 3: DUI arrests made in Toms River, New Jersey during the first six months of 2017 and 2018 with all of the locations with liquor licenses surrounded by a green half mile perimeter.

Conclusion

The hotspots of DUI activity are commonly centered around State Route 37 and Fischer boulevard. Although there were less DUI arrests made in 2018, the locations of common DUI arrest areas remained similar on the east side of town while there was an increase in DUI activity in the southwestern corner of town. Almost 25% of all DUI arrests are made within half a mile of a location with a liquor license. These maps show that certain roads and sections of town have more DUI activity

Acknowledgments

Thanks to the Toms River River Police Department and their employees: Officer Adam Koeppen and Chris Raia.

MATSGIS

Pinelands and Fire Fuel Hazard with Potential Human Impact in New Jersey

Erin Foreman
Marine Academy of Technology and Environmental Science

Abstract

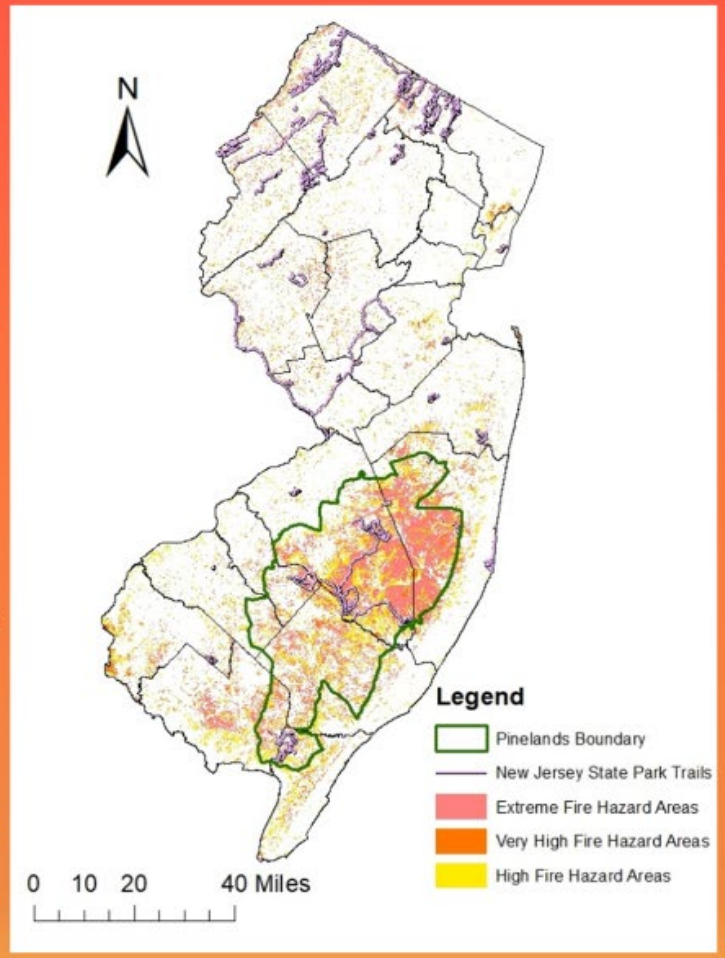
Fire hazards impact those who own or live on property in effected areas. As populations increase, urban and suburban areas will become more developed into extreme fire fuel hazard areas, such as those in Western Ocean County and Eastern Burlington County. Furthermore, State Park Trails that intersect these extreme fire fuel hazard areas should be closely monitored and watched for risks of human-caused wildfires. These wildfires, which serving some benefit to native Pine Species, could easily spread out of control and impact human residencies and wildlife habitat.

Introduction

Pitch Pine, (*Pinus Rigida*), is the predominant pine tree species within the pinelands. This species is adapted to survive and thrive with fire, producing serotinous cones that open and disperse seeds when exposed to heat. Layered bark protects the cambium of the tree from fire damage.

State Park Trails that go through areas of increased fire fuel hazard, such as those within the boundaries of the Pinelands, are areas where safety should be monitored closely.

Human causes of fire include smoking, unattended campfires, fireworks, burning debris, and machinery accidents. Human-caused wildfires account for an average of 61,952 fires and the burning of over 2.7 million acres in America annually.



MATSGIS

Methodology

Data was sourced from the New Jersey Geographical Information Network. Shape files for Pinelands Boundary, State Park Trails, and Fire Fuel Hazards for each county were included over the State County Layer. To only show indices for high, very high, and extreme fire fuel hazard, each county layers symbology was edited. Extreme fire fuel hazard areas are represented by the salmon color, very high is shown as orange, and high as yellow. The remaining indices are shown as hollow with no border.

Conclusion

Overall, extreme fire fuel hazard areas are condensed within the boundaries of the Pinelands, with multiple State Park trails intersecting these areas. Trails in Central and Eastern Burlington County should be closely monitored to minimize the probability of a human-caused wildfire from occurring. This map may be used in fields from forestry and state park officials to the general public so that they may become more educated on the risk of fires and the potential of their actions in these extreme hazard areas.

Sources

Windisch, Andrew. (4 Febraury 2009). *Management Approaches for Rare Ecological Communities of the Pinelands: Preserving the "Open-Canopy" Vegetation Types.*

Gucker, Corey L. (2007). *Pinus Rigida*. In: *Fire Effects Information System*.

Habitat Patches In and Around the Sedge Island Marine Conservation Zone

Kate LaVallee

Abstract

The Sedge Island Marine Conservation Zone (SIMCZ) located in Barnegat Bay in Ocean County, NJ, was the first marine conservation zone established in the state, intended to protect natural habitat and promote species growth. Due to the protection provided by the SIMCZ, species within the zone are allowed to flourish, migrating and breeding without hindrance by anthropogenic or naturally arising threats. The three habitats found within the SIMCZ exist in ecological patches and include submerged aquatic vegetation (SAV) beds, mixed macroalgae, and bare bottom substrates.

Introduction

- The Sedge Island Marine Conservation Zone (SIMCZ) is located in the Barnegat Bay on the western side of Island Beach State park, New Jersey.
- As a result of it being a conservation zone, it receives very low commercial boating traffic and prohibits PWC traffic.
- Many of these species are important for fisheries and have experienced decline in total populations in recent years
- The SIMCZ has many different habitats that facilitate species diversity including SAV, macro-algae substrates, and bare-bottom substrates. (**figure 1**)
- Submerged aquatic vegetation (SAV) habitats provide shelter for species, foster populations, and provide refuge from predators.
  - Commonly composed of eelgrass (*Zostera marina*).
- Mixed macroalgae habitats provide necessary resources for species and non disrupted bare bottom habitats provide safe migration routes.
  - Mainly consists of sea lettuce (*Ulva lactuca*), tangleweed (*Sphaerotrichia divaricata*), and false agardhiella (*Gracilaria verrucosa*).
- Bare bottom substrates have no algae and are usually areas of high flow rates.
- In order to ensure the success of the conservation zones, biological surveys have been conducted comparing the biodiversity of the conservation zones to the surrounding areas outside the zone

Figure 1: Images of the three habitat types taken during the 2018 SIMCZ sampling period in and around the SIMCZ, Island Beach State Park, NJ. Habitats are pictured from left to right: mixed-algae substrate, submerged aquatic vegetation, and bare-bottom substrate. (Images taken by Rory Hogan and Mr. Kelsey)

Methodology

- GPS coordinates collected from the SIMCZ biodiversity studies conducted in the summers of 2017 and 2018 were converted from Decimal Degrees Minutes to Decimal Degrees
- The world imagery base map was generated in ArcMap 10.2.2 and the coordinates were inputted
- Polygons surrounding clustered habitat sites and outlining the SIMCZ were created using the editor tool
- A compass rose and scale (in nautical miles) were inserted to provide spatial orientation
- Average length and area and total length and area were calculated using the summary statistic tool

Objective

Map the SIMCZ team sample sites from 2017 and 2018 and estimate patches of habitat types

Figure 2: Map of the 2017 and 2018 SIMCZ biodiversity study sites inside and around the SIMCZ in Island Beach State Park, NJ, organized by year and then habitat type.

Figure 3: Map of the 2017 and 2018 SIMCZ biodiversity study sites estimated habitat patches in and around the SIMCZ in Island Beach State Park, NJ. Patches were created by drawing polygons around clusters of similar habitat sites

Discussion

- 120 Sites were sampled from over the 2017-2018 SIMCZ sampling periods, 40 were SAV, 40 were Mixed-Algae, and 40 were Bare bottom (**figure 2**)
- The average area of a Bare-bottom patch was approximately 54,000 ft² with an average perimeter of around 3,000 ft. (**table 1**)
- The average area of a mixed-algae patch was around 87,000 ft² with an average perimeter of around 1,000 ft. (**table 1**)
- The average area of a SAV patch was 192,000 ft², with an average perimeter of 1,600 ft. (**table 1**)
- The SIMCZ and the areas around it were not dominantly one type of habitat but the SIMCZ contained smaller, more concentrated patches (**figure 3**)
- Of the surveyed area and estimated patches, 3% of the was mixed algae, 25% was bare and 72% was SAV

Table 1: Estimated average and total area of bare-bottom substrate, mixed-algae substrate, and submerged aquatic vegetation habitat patches. Patches were created by surrounding study sites of the same habitat with a polygon, which were then measured for area (ft²). Sample sites vary from June of 2017 to August of 2018 and were recorded during the Save Barnegat Bay Student Grant Program SIMCZ biodiversity collection periods.

Habitat	*Total Area (ft²)*	*Avg. Area (ft²)*	*Total Length (ft)*	*Avg. Length (ft)*
Bare	4,907,876	54,319	26,822	2,980
Mixed Algae	608,655	86,950	7,420	1,060
SAV	13,844,833	192,119	11,102	1,586

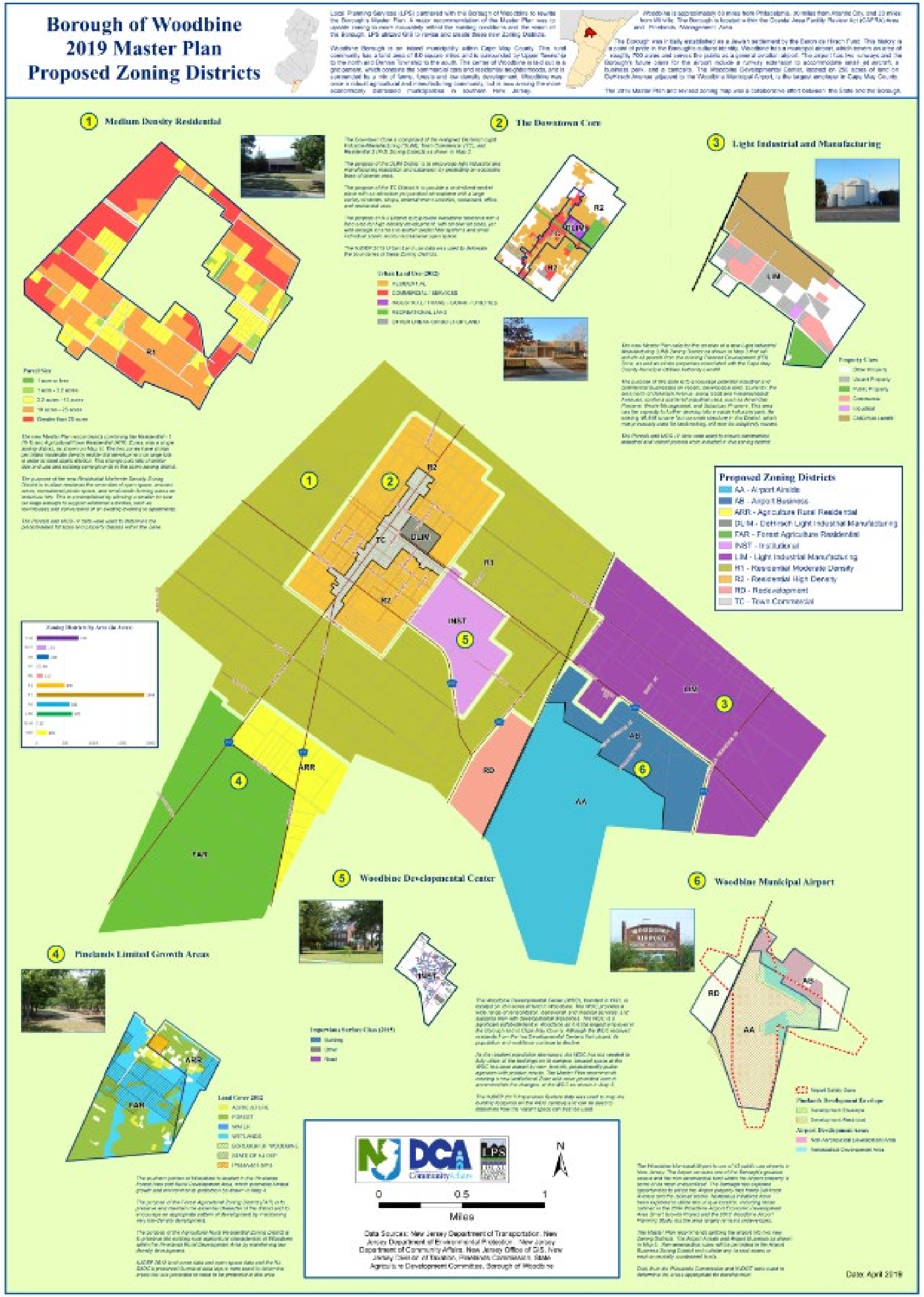
Conclusion

- Most of the survey area in and around the SIMCZ are SAV beds and bare-bottom substrates
- Smaller ecological patches are found within the SIMCZ while larger patches were observed outside of the zone
- This map can be used for future SIMCZ sampling for aid in locating certain habitat areas
- Sedge/Island Beach State Park attendants can use this map when kayaking to avoid going through difficult areas such as eelgrass

Acknowledgements

I would like to thank Mr. Kelsey for providing me the GIS knowledge, assistance, and equipment necessary for making these maps. I would also like to thank the SIMCZ team members from both 2017 and 2018, Alaina Perdon, Rory Hogan, Nick DeGennaro, Samantha Orndorff, Victoria Pobok for going out and collecting data on the SIMCZ habitat sites. I would also like to thank Mr.Kelsey, Karen Byrne, Sadie Wolfarth, Darren Dorris, and members of the 2018 Sedge Research Camp for assisting in the sampling and recording of said sites.

Thematic Map



Borough of Woodbine
2019 Master Plan
Proposed Zoning Districts
1 Medium Density Residential
2 The Downtown Core
3 Light Industrial and Manufacturing
4 Pinelands Limited Growth Areas
5 Woodbine Developmental Center
6 Woodbine Municipal Airport
Proposed Zoning Districts
AA - Airport Airside
AB - Airport Business
ARR - Agriculture Rural Residential
DLIM - DeHirsch Light Industrial Manufacturing
FAR - Forest Agriculture Residential
INST - Institutional
LIM - Light Industrial Manufacturing
R1 - Residential Moderate Density
R2 - Residential High Density
RD - Redevelopment
TC - Town Commercial
0 0.5 1
Miles
Data Sources: New Jersey Department of Transportation, New Jersey Department of Environmental Protection, New Jersey Department of Community Affairs, New Jersey Office of GIS, New Jersey Division of Taxation, Pinelands Commission, State Agriculture Development Committee, Borough of Woodbine
Date: April 2019

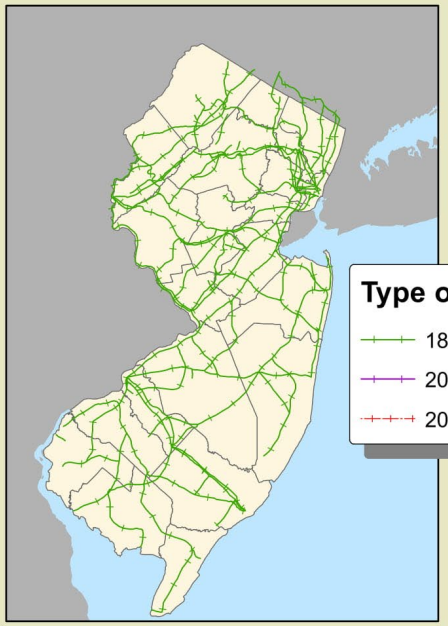
New Jersey's Railroads
Then and Now

Purpose: The purpose of this map is to evaluate the change in railroads between 1882 and 2017 and calculate the population per mile to determine if there has been proportional increase.

Conclusion: Based on population data from the map as well as the Census Bureau and NJDOT, there were 621 residents per mile of rail in 1882 and 3,099 residents per mile of rail in 2017, however, when the abandoned rail is removed from the 2017 figure, there were 4,357 residents per mile of rail, a 40.59% increase.

The total precentage of change of rail from 1882 to 2017 is an increase of 57.29% with the abandoned rail.

Without rail abandoned in 2017, the precentage of change of active rail from 1882 to 2017 is an increase of 11.87%, a signifigantly smaller precentage.



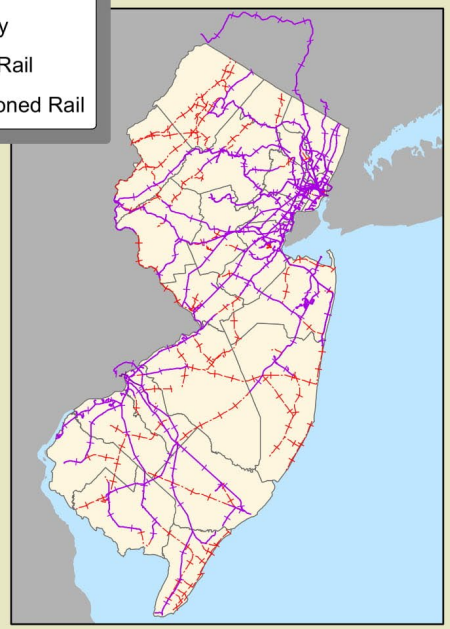
Type of Railway
- 1882 Railway
- 2017 Active Rail
- 2017 Abandoned Rail

1882 Rail Lines (Digitzied)

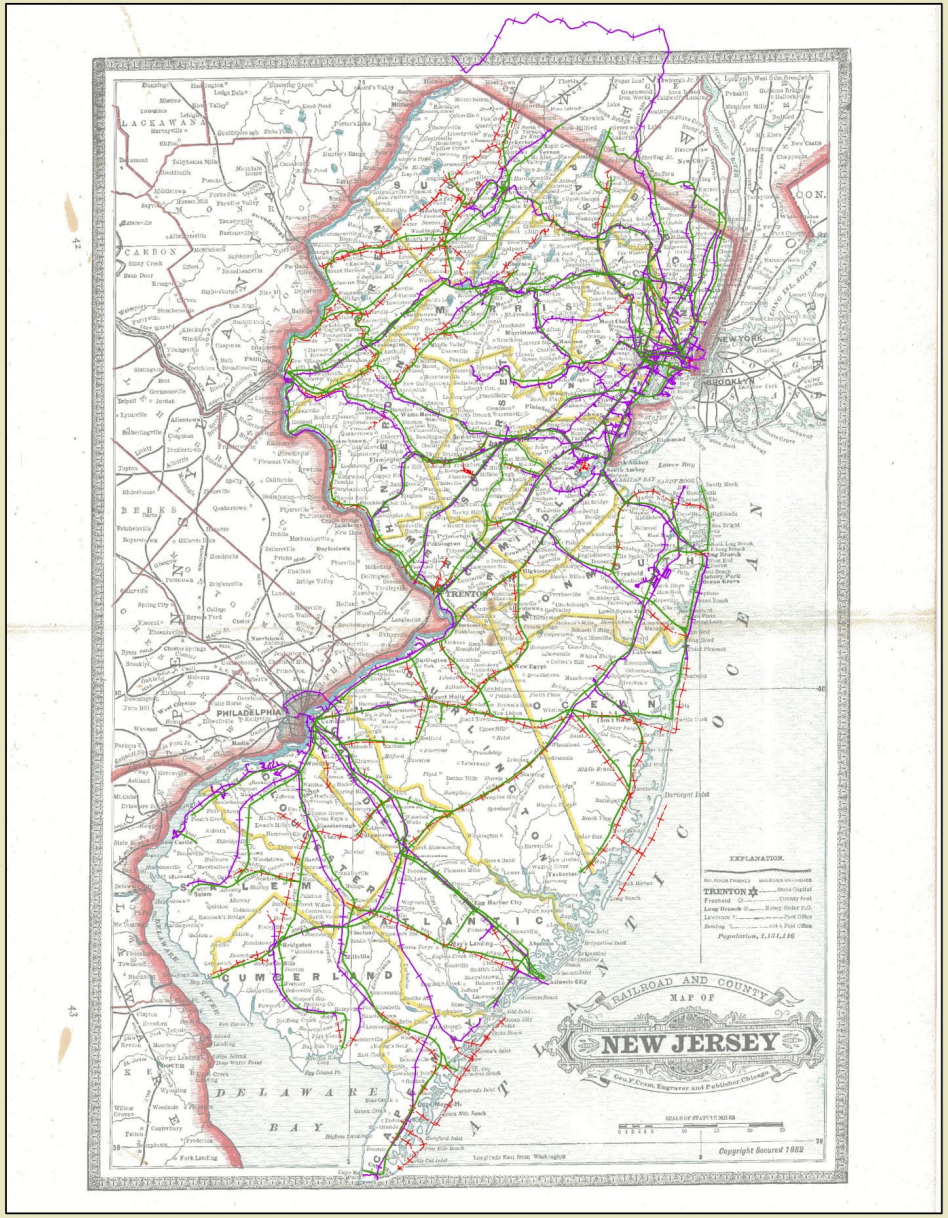
Milage of Railway in 1882:
1823.709 Miles

Milage of Active Rail in 2017
2040.272 Miles

Milage of Abandoned Rail in 2017
828.210 Miles



2017 Rail Lines

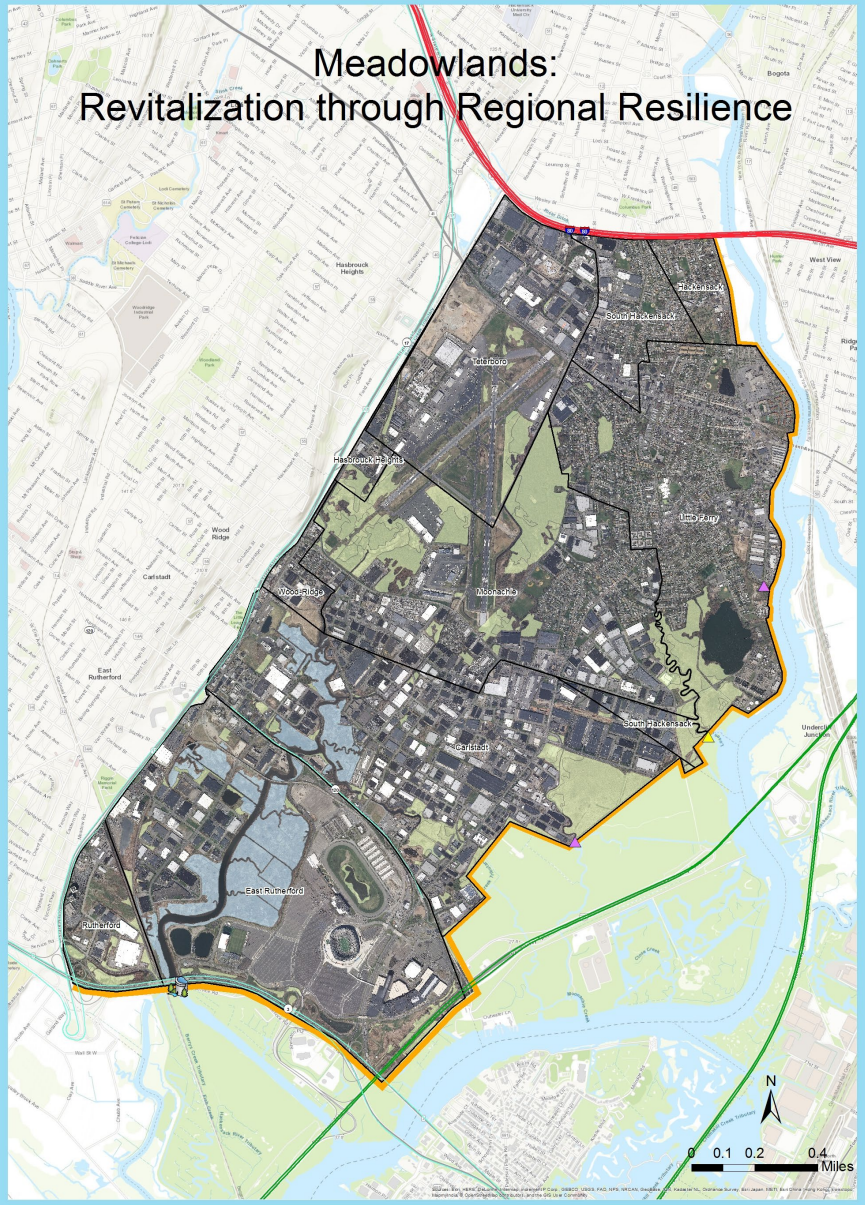


Miles
0 10 20 40

Data Sources: United States Census Bureau
New Jersey Department of Transportation GIS
Railroad and County Map of New Jersey by George F Cram 1882

Nicholas Leusner
Projection: Transverse Mercator
Coordinate System: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

Meadowlands:
Revitalization through Regional Resilience



Legend

- Municipalities
- Proposed Berm
- Water Control Structure
- **Pump Tidegates**
  - Active
  - Proposed
- Tidal Wetlands
- Other Wetlands

Purpose of Map: In response to Hurricane Sandy's devastation, the Meadowlands area was selected as a winner of HUD's Rebuild by Design competition in June of 2014. HUD had awarded $150 million towards the Rebuild by Design Meadowlands Phase 1 Pilot Area, a solution to decrease risks in flooding and increase resiliency in the area.

During the early phases of feasibility, DEP considered many variations of a storm surge barrier that would protect the project area. Design concepts were projected on maps to support the project decision making and to assist in DEP's effort to compete for additional funding to protect more area through the National Disaster Resiliency Competition (NDRC).

The goal of these maps was simplicity and clarity. In this design, a proposed water control structure would be built south of East Rutherford's tidal wetlands and Berrys Creek Canal; two proposed pump tidegates would be located in proximity of the Hackensack River and a berm wall would be built along the eastern and southern borders of this Meadowlands area.

Ultimately, the additional NDRC funding was not received to expand the Rebuild by Design Meadowlands project area beyond the Phase 1 Pilot Area and these proposed structures were not included. To learn more about the RBDM project, please visit the webpage at https://www.nj.gov/dep/floodresilience/rbd-meadowlands.htm

Project Locator

REFERENCES
Basemap: Esri, DeLorme, GEBCO, USGS and other contributors
NJDEP: 2012 Imagery, Wetlands/LULC, Major Roads
Proposed Structures: Bureau of Flood Resilience

Brian York, NJDEP Bureau of Flood Control

Story Map

A Story Map

Edit ×

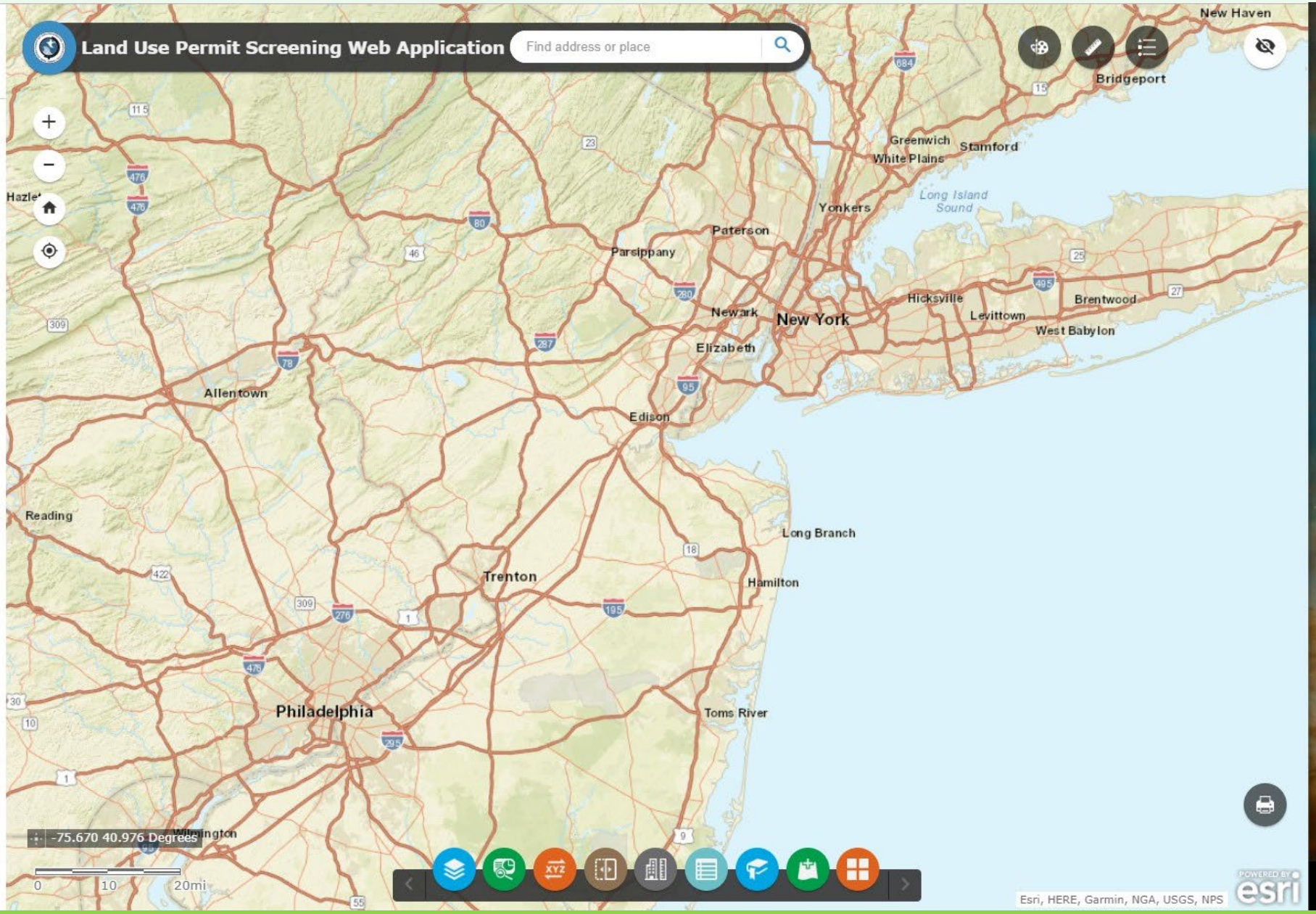
No issues detected ×

Story not shared ×

LAND USE SCREENING REPORT

This application will create a report to help you determine if your site may be located within any areas regulated by the Division of Land Use Regulation, such as freshwater wetlands, flood hazard areas, riparian zones, the CAFRA area, etc. The report can also help you determine if certain applicable features or resources, such as streams or threatened or endangered species habitat, are nearby. The information contained in the report will be useful in determining which permit(s) you need for your project and which regulations and standards you need to consider when designing your project. This report will also provide information necessary to complete a permit application, so you can print and save the report to include with your application.

Please follow the instructions below to run the report for your project area.



Story Maps: Green Book Establishments in Atlantic City, NJ

Introduction

From 1936 to 1966, Victor Hugo Green published *The Negro Motorist Green Book*, a travel guide for African Americans listing the locations of establishments that wouldn't discriminate against black customers. The first edition was limited to New York City, but later editions would cover most of North America.

My initial project was to create a series of maps of New Jersey establishments listed in the Green Book series, and see what patterns/trends emerged as the years went by. However, I narrowed the scope to due a more thorough examination of Atlantic City after noticing that it had a high amount of listed businesses throughout the various editions and after further research showed it was a notable part of African American history in New Jersey in general.

My aim with this project is to map out locations in Atlantic City listed in the Green Book and observe any patterns appear over the years, as well as explore how it fits in with the history of African Americans and New Jersey.

Methods

The first step in this project was finding the Atlantic City locations in each of the Green Book editions, and then entering that data into separate Google Sheet documents (through a combination of copy/paste and typing out text). I then took the sheets and uploaded them to ArcGIS, made necessary edits (legend, colors, etc), and added them to a story map.

For the Northside boundary, I used the "map notes" function in ArcGIS to trace the boundary, save it as a layer, and later combined it with previously made maps

Data

My geographic area of focus is on Atlantic City, New Jersey. I used locations from the 1931, 1948, and 1956 editions of the Green Book. These (and other) editions of the Green Book were made available online through the New York Public Library.

Figure 1: Map showing Atlantic City businesses listed in the 1948 edition of the Green Book. The green border represents the "Northside" boundary.

Results

As I was mapping out the businesses, I began to notice that they were clustered in the same general area, to the point of almost forming a sort of border. It wasn't until I learned about the redlining of the Northside district and actually mapped it out with the listed businesses did I begin to fully grasp the significance. Even Atlantic City, which has such a key role in the history of black NJ history, existed (and still exists) in the shadow of Segregation.

Bibliography

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The Green Book, 1936-1966. The New York Public Library. Digital Collections. New York City, NY. https://digitalcollections.nypl.org/collections/the-green-book#/?tab=about

Newburger, Harriet, Anita Sands, and John Wackes. Atlantic City: Past as Prologue. Federal Reserve Bank of Philadelphia, Community Affairs Department Special Report (2009).

Hughes, S. (2017). How a single map helped determine the fate of Atlantic City's Northside. [online] Press of Atlantic City.

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Conclusions

While the very existence of the Green Book helps illustrate one of the more less visible aspects of Jim Crow, that something like a traveling wasn't always easy for African Americans and how limited their options were, there is more that can be done to illustrate this. A juxtaposition of hotels listed in the Green Book compared to all hotels would likely highlight this.

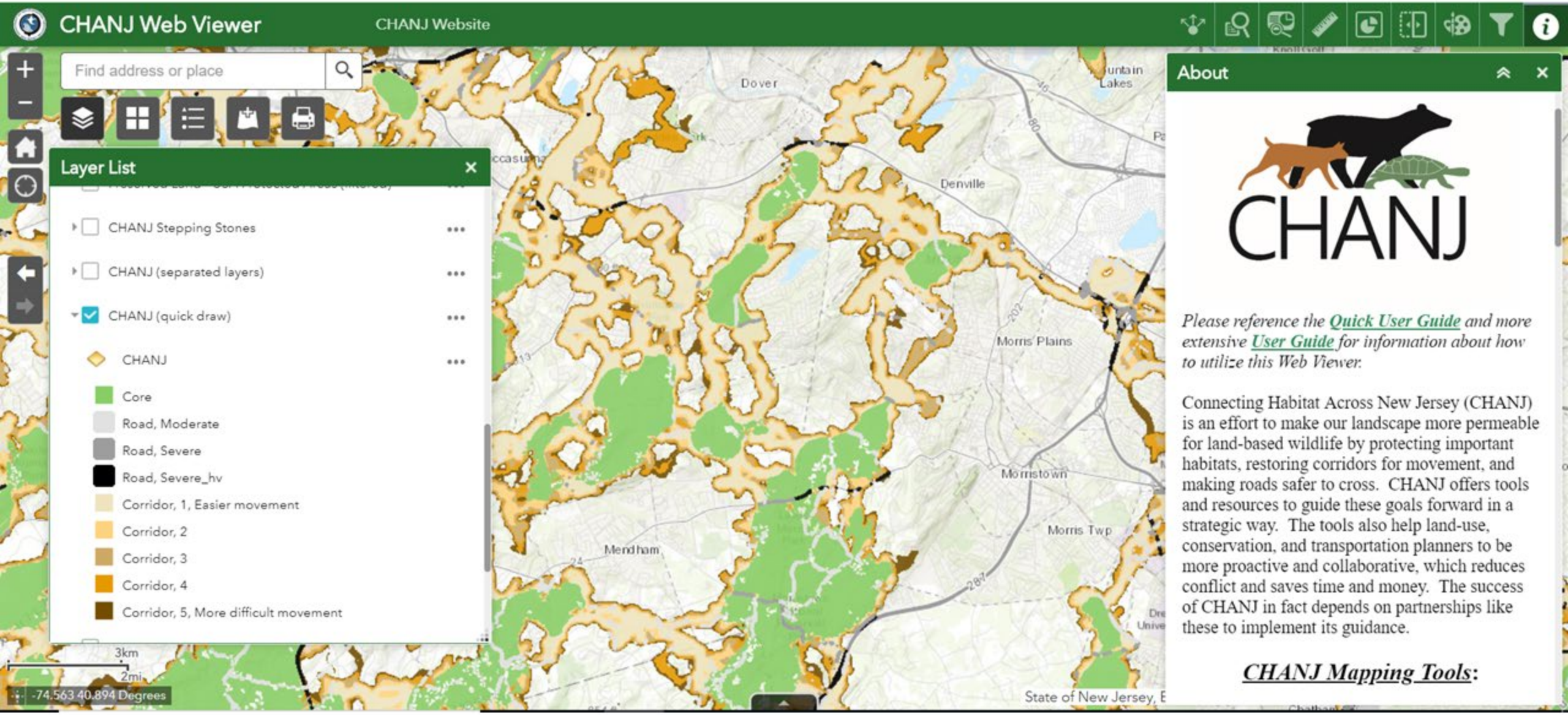
It's the aspect of redlining that may interest me the most. Victor Hugo wrote in the first edition of his book that he hoped there would be a time when this book was no longer needed. Sure enough, the Green Book ceased publication shortly after the Civil Rights Act passed. However, the impact of redlining persisted and still continues to this day. Perhaps most unsettling is that Atlantic City isn't an isolated case, but one of many cities that continues to feel the impact of this near invisible form of racism.

Nick Coffin - GIS 05/04/18


Whale Pond Brook Watershed
Greenway Plan
Take Action to Protect the
Watershed

A Tribute to My Father

Web Map Application



https://www.njfishandwildlife.com/ensp/chanj_map.htm

New Jersey Community Solar PV Siting Tool

Higher Siting Preference:

- Low to Moderate Income Population by Census Block Group
- NJDEP Solar Siting Analysis
- Landfill Sites over 35 Acres
- Brownfield Development Areas in New Jersey
- Areas of Historic Fill
- Known Contaminated Site List for New Jersey
- Deed Notice Areas in New Jersey

Medium Siting Preference:

- Areas in Need of Redevelopment
- Designated Centers of the NJ State Development and Redevelopment Plan
- Impervious Surface of New Jersey (via 2012 LULC)

Not Preferred / "No Points":

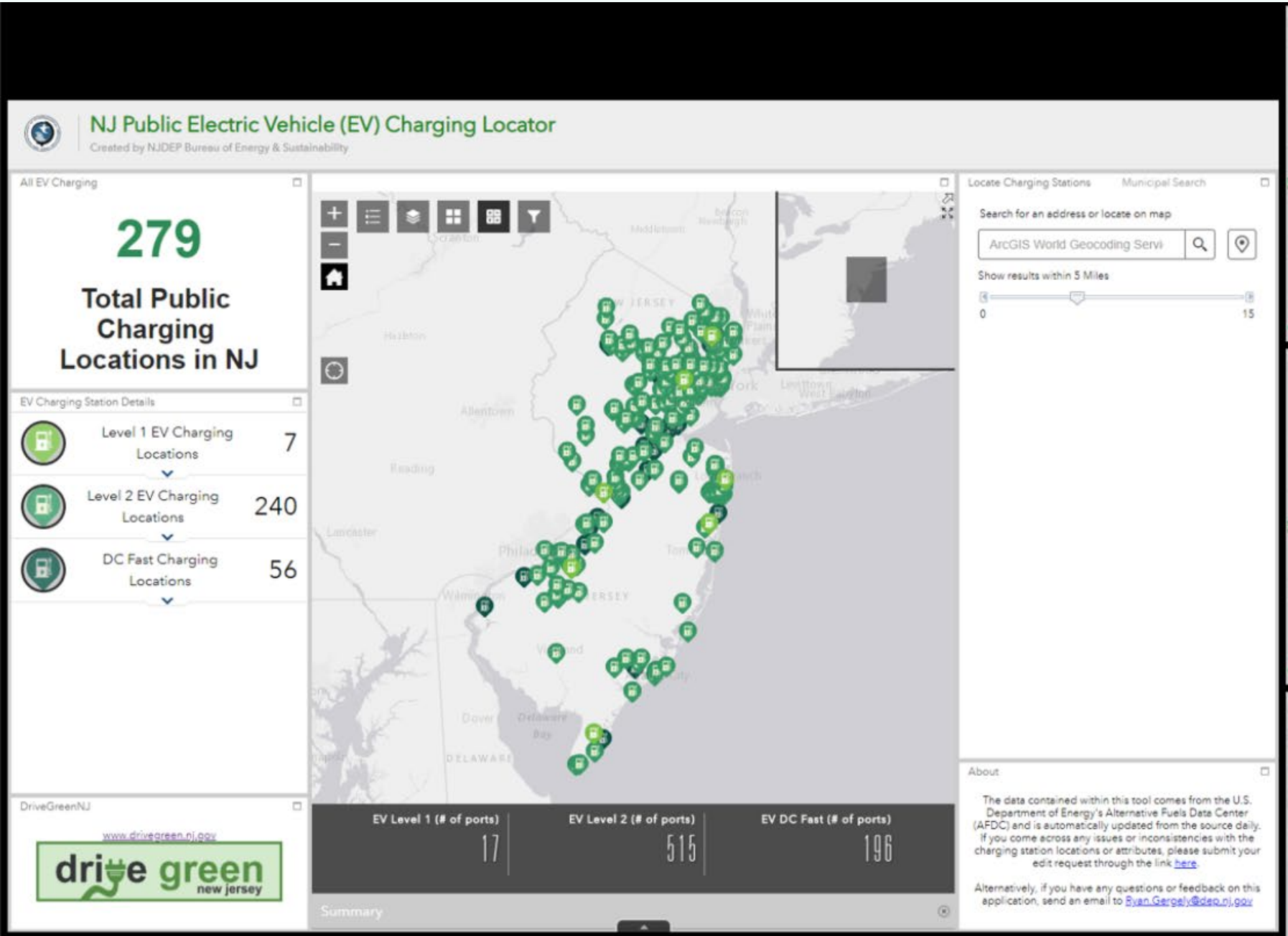
- Forests & Wetlands (via 2012 LULC)
- Agricultural Lands (via Parcels MOD-IV)
- State, Local and Nonprofit Open Space in New Jersey
- Preserved Farmland *Not Eligible*

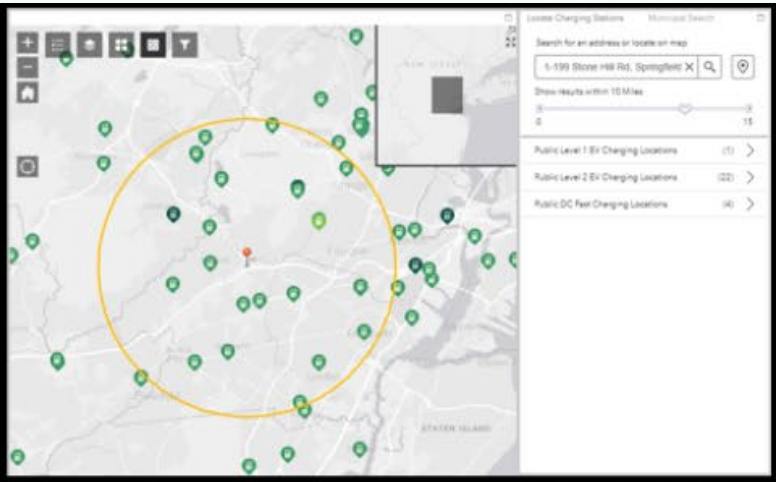
Other Helpful Data Layers:

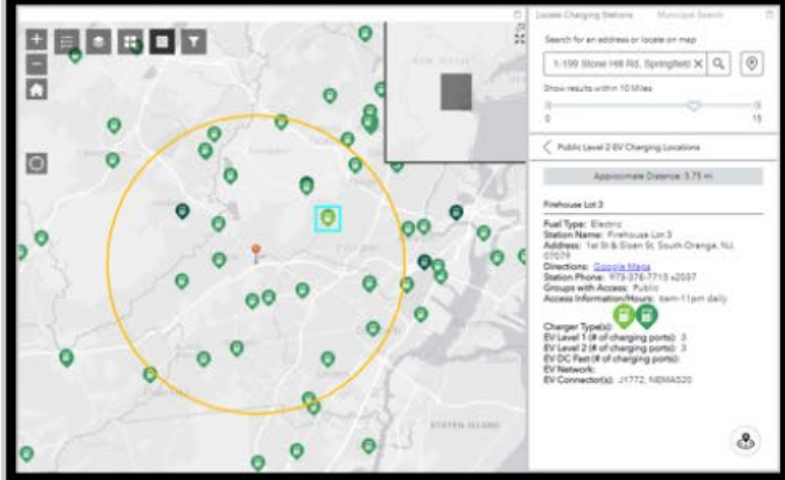
- Low to Moderate Income Population by Census Block Group
- New Jersey Counties
- New Jersey Municipalities
- Parcels and MOD-IV Composite of New Jersey
- Preserved farmland *Not Eligible*
- New Jersey Electric Utility Territories
- New Jersey Highlands Preservation and Planning Areas
- New Jersey Pinelands Management Areas
- Solar PV Grid Supply Installations
- Solar PV at Public Facilities
- New Jersey Smart Growth Areas

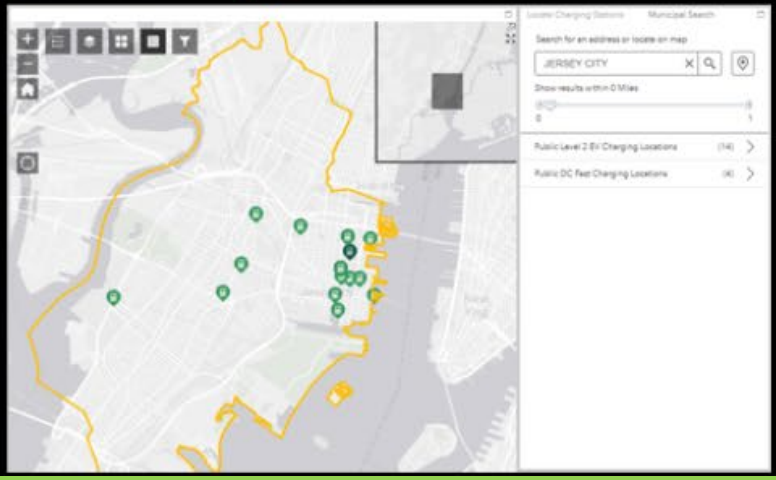
EDC Solar Hosting Capacity (In Development):

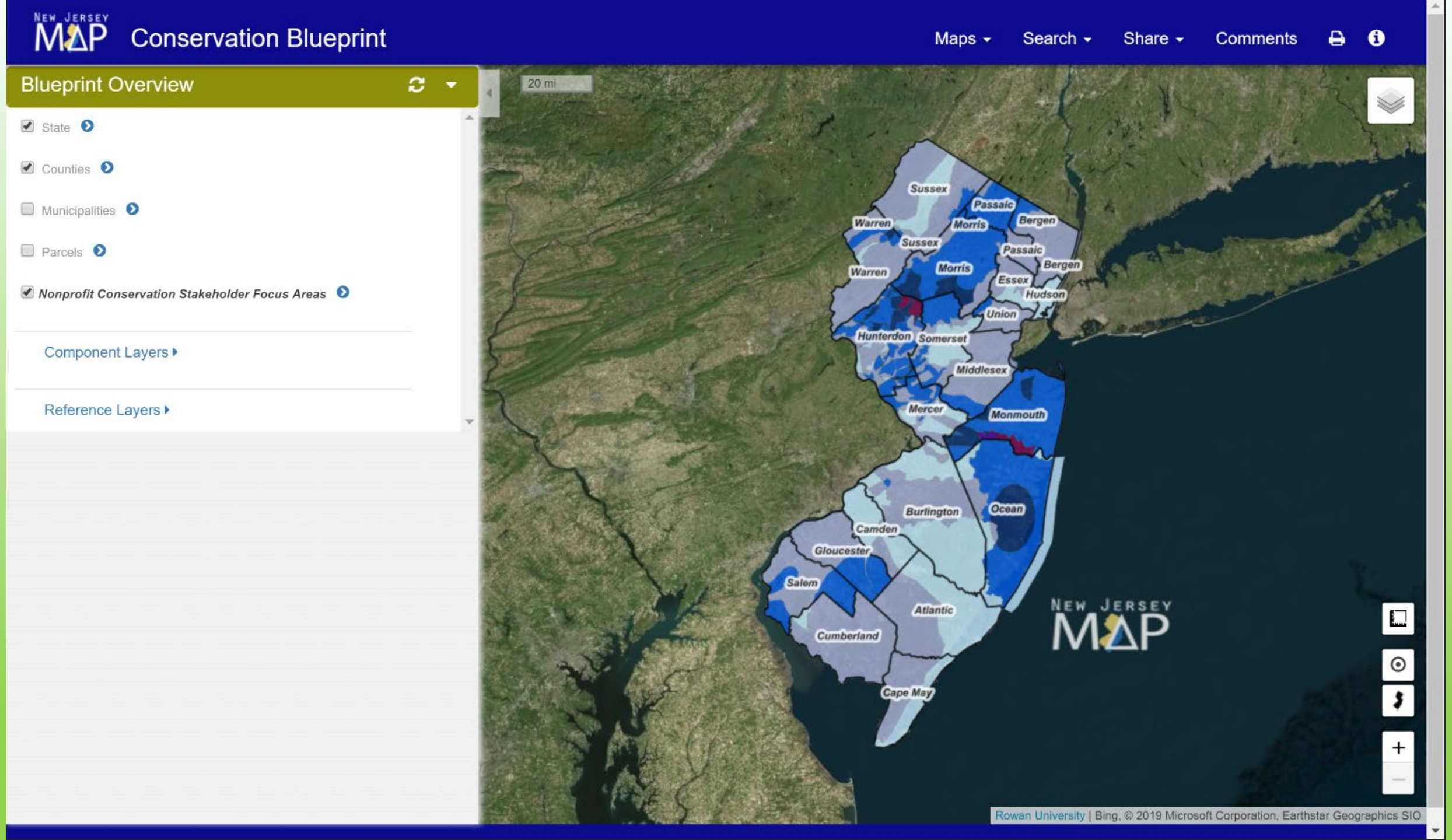
- Atlantic City Electric Hosting Capacity
- Jersey Central Power & Light Hosting Capacity (Pending)
- Public Service Electric & Gas Hosting Capacity (Pending)
- Orange & Rockland Hosting Capacity (Pending)


NJ Public Electric Vehicle (EV) Charging Locator
Created by NJDEP Bureau of Energy & Sustainability
All EV Charging
279
Total Public Charging Locations in NJ
EV Charging Station Details
Level 1 EV Charging Locations 7
Level 2 EV Charging Locations 240
DC Fast Charging Locations 56
DriveGreenNJ
www.drivegreen.nj.gov
drive green new jersey
EV Level 1 (# of ports) 17
EV Level 2 (# of ports) 515
EV DC Fast (# of ports) 196
Summary
Locate Charging Stations
Municipal Search
Search for an address or locate on map
ArcGIS World Geocoding Servi
Show results within 5 Miles
0
15
About
The data contained within this tool comes from the U.S. Department of Energy's Alternative Fuels Data Center (AFDC) and is automatically updated from the source daily. If you come across any issues or inconsistencies with the charging station locations or attributes, please submit your edit request through the link here.
Alternatively, if you have any questions or feedback on this application, send an email to Ryan.Gergely@dep.nj.gov








NEW JERSEY MAP
Conservation Blueprint
Maps
Search
Share
Comments
Blueprint Overview
State
Counties
Municipalities
Parcels
Nonprofit Conservation Stakeholder Focus Areas
Component Layers
Reference Layers
20 mi
Sussex
Passaic
Bergen
Warren
Morris
Sussex
Passaic
Bergen
Warren
Morris
Essex
Hudson
Union
Hunterdon
Somerset
Middlesex
Mercer
Monmouth
Burlington
Ocean
Camden
Gloucester
Salem
Atlantic
Cumberland
Cape May
NEW JERSEY MAP
Rowan University | Bing, © 2019 Microsoft Corporation, Earthstar Geographics SIO

Sediment Survey of Lower Raritan River (Metals)

Meadowlands Environmental Research Institute (MERI)

Sediment Sampling Points | Arsenic (As) Interpolation | Mercury (Hg) Interpolation | Selenium (Se) Interpolation | Cadmium (Cd) Interpolation | Lead (Pb) Interpolation | Chromium (Cr) Interpolation | Zinc (Zn) Interpolation | Silver (Ag) Interpolation

Mercury (Hg) Interpolation:

This map uses an inverse distance weighted (IDW) interpolation to show the predicted values of the concentration, in milligrams per kilogram (mg/kg), of mercury (Hg) in the study area where sediment samples were taken.

The location of the highest concentrations of mercury are shown in red and the lowest are shown in green. The corresponding values for the highest and lowest concentrations of mercury are shown in the legend.