

Green Infrastructure Champions Program

This program is partially funded by the Rutgers New Jersey Agricultural Experiment Station, The Geraldine R. Dodge Foundation, NJ Sea Grant Consortium, The William Penn Foundation and is a collaboration of the Rutgers Cooperative Extension Water Resources Program and the Green Infrastructure Subcommittee of Jersey Water Works.



**Please enter your full name
and affiliation in the chat. This
is how will take attendance.**



IMAGINE A BETTER NEW JERSEY



Green Infrastructure Champion Training: Part 10

“Using Green Infrastructure to Promote
Climate Resiliency”

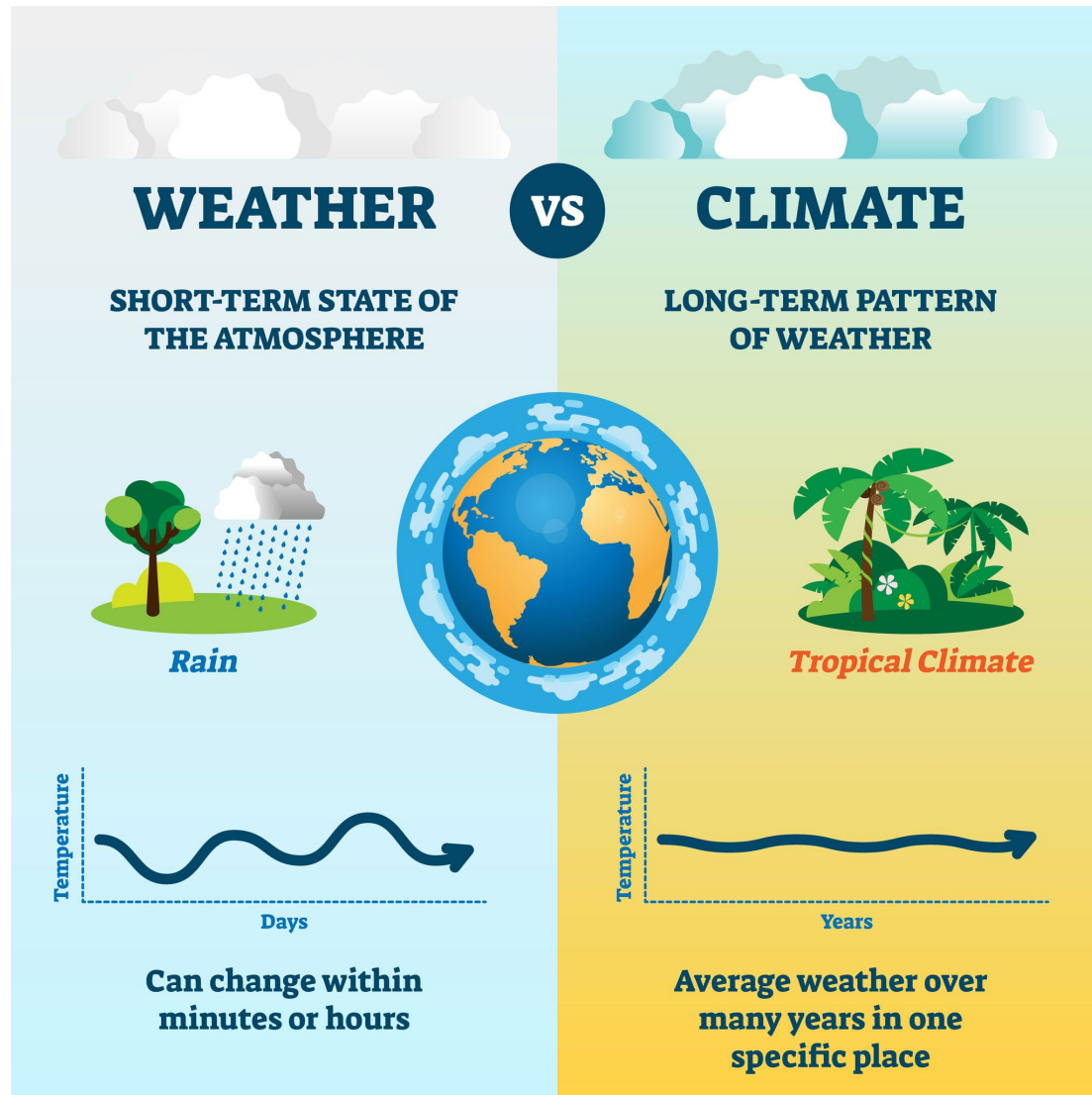
May 19, 2023
Virtual Webinar

Rutgers Cooperative Extension Water Resources Program
Cody Obropta, P.E.

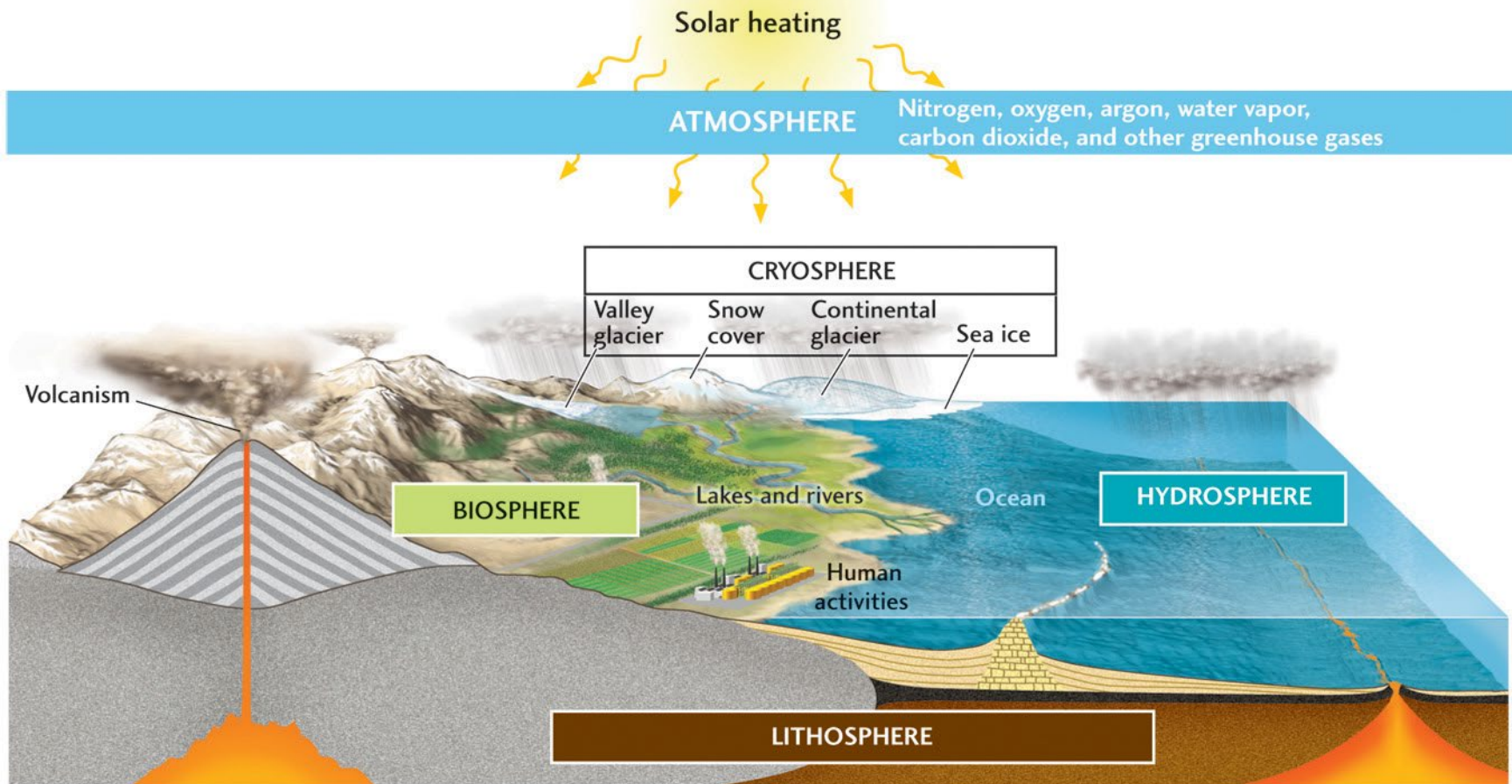


Part I: What is Climate?

The difference between weather and climate:



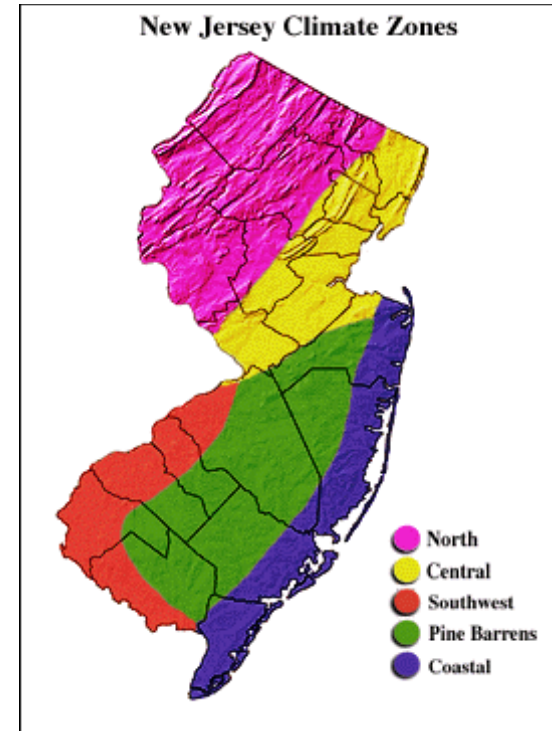
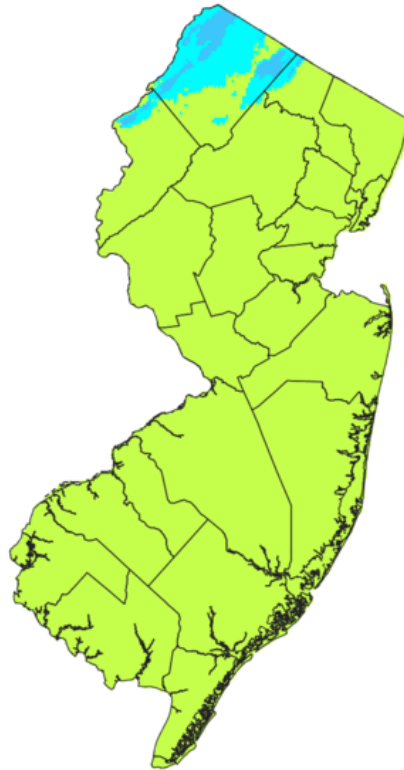
The Earth's Climate



- The climate includes many components of the Earth's system and interactions between them.

New Jersey's Climate

Köppen Climate Types of New Jersey

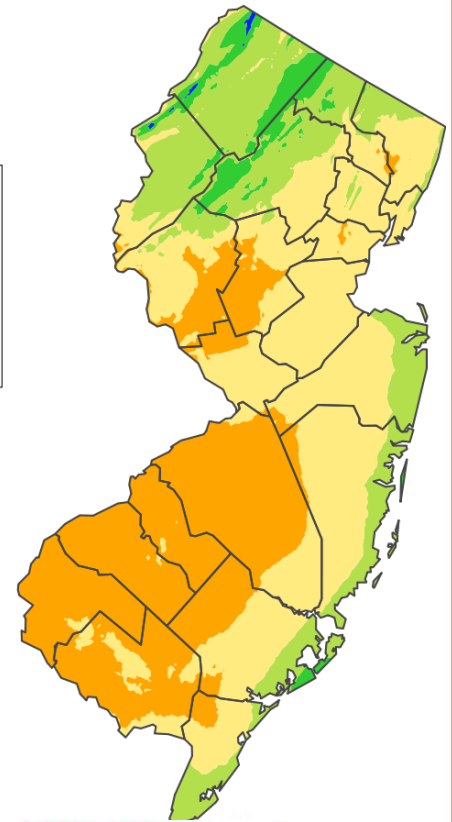
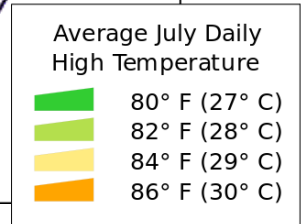
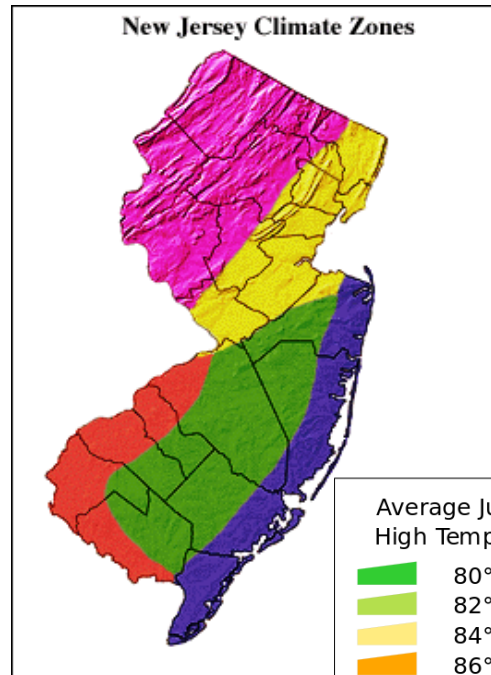
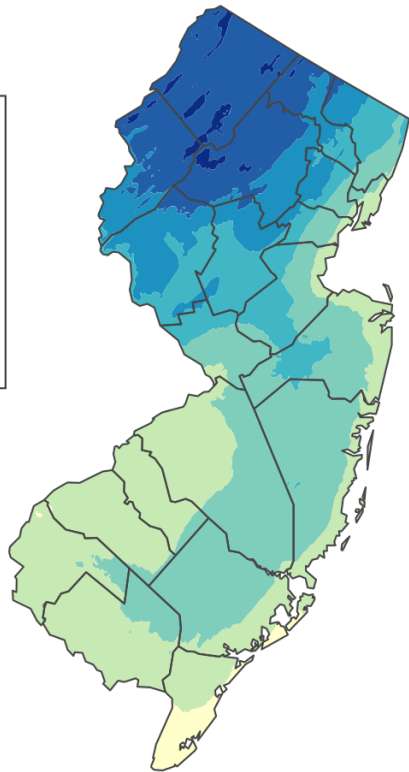
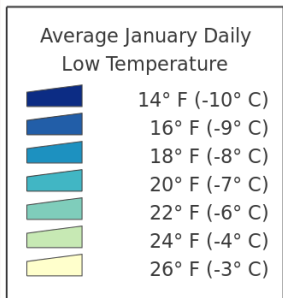


Köppen Climate Type

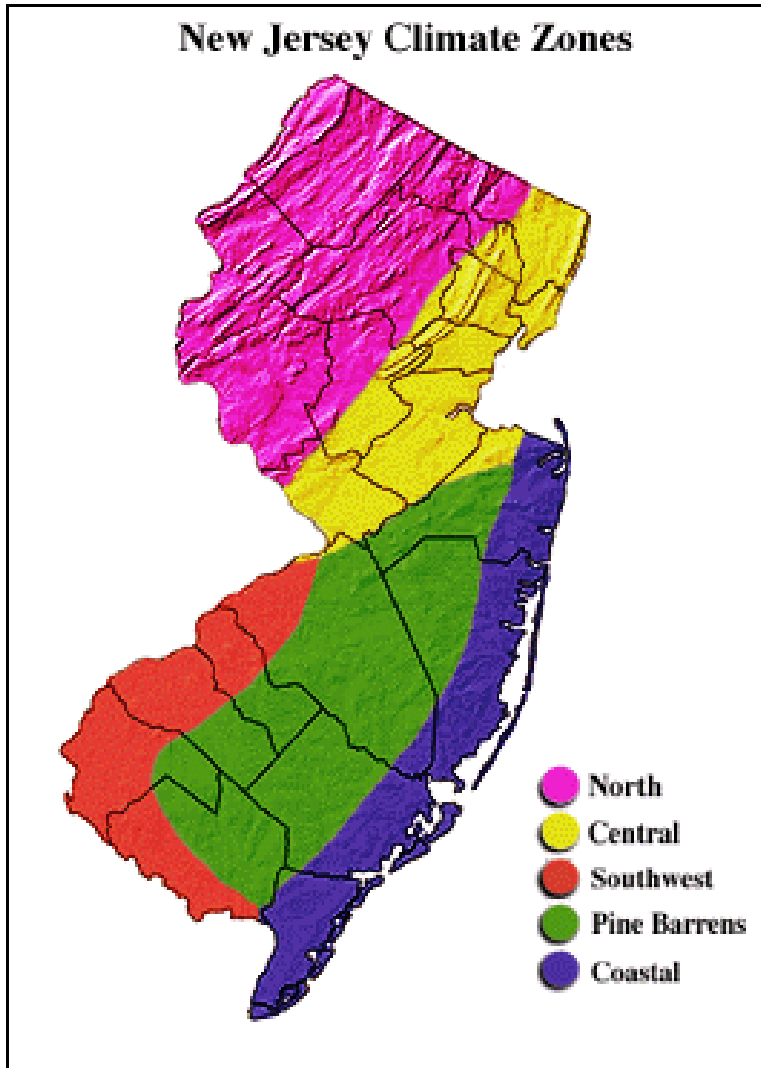
-  Cfa (Humid subtropical)
-  Dfa (Hot-summer humid continental)
-  Dfb (Warm-summer humid continental)

Data sources: 1991-2020 climate normals from PRISM Climate Group, Oregon State University, <https://prism.oregonstate.edu>; Outline map from US Census Bureau

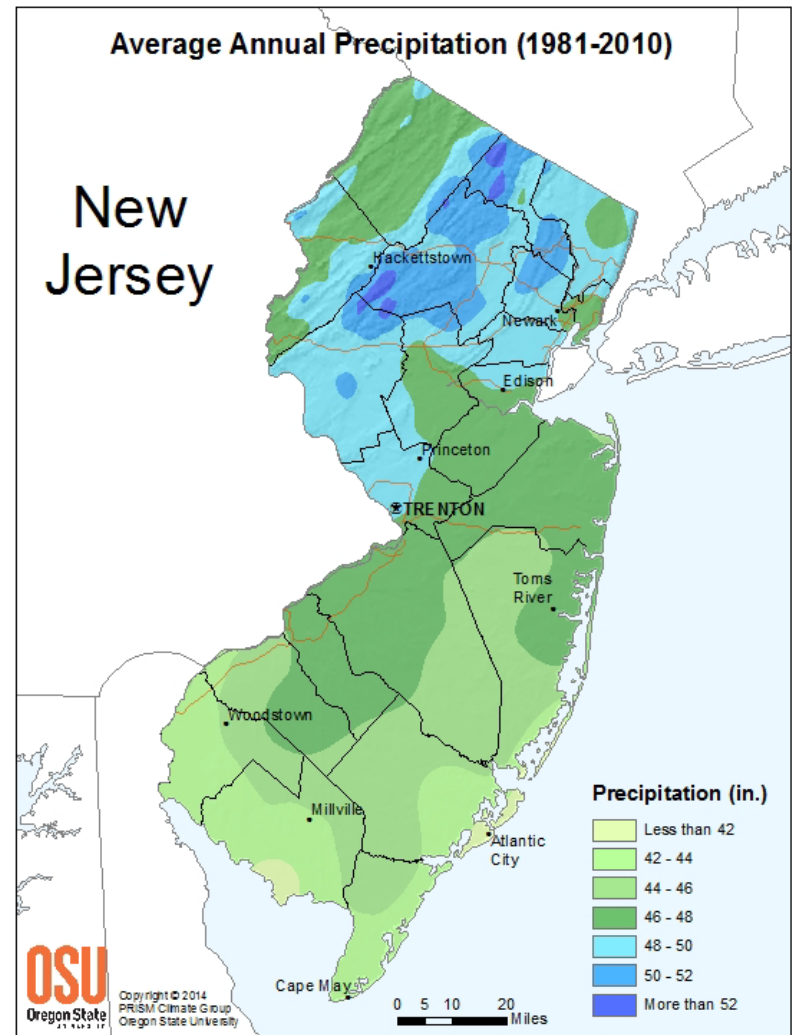
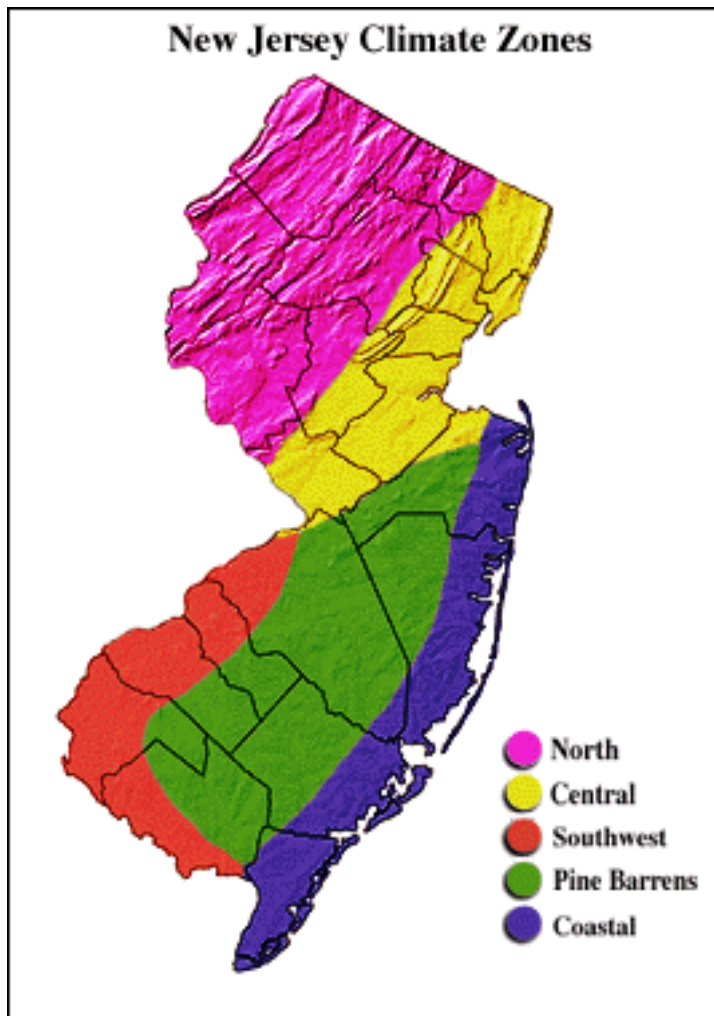
Average Daily Temperatures in NJ



Plant Hardiness Zone Map



NJ Average Precipitation



New Jersey

Land Use / Land Cover 1995 - 2002 Change Analysis



Agriculture

1995

More than 21,000 acres of Agricultural Land were converted to Residential Urban Land.



2002



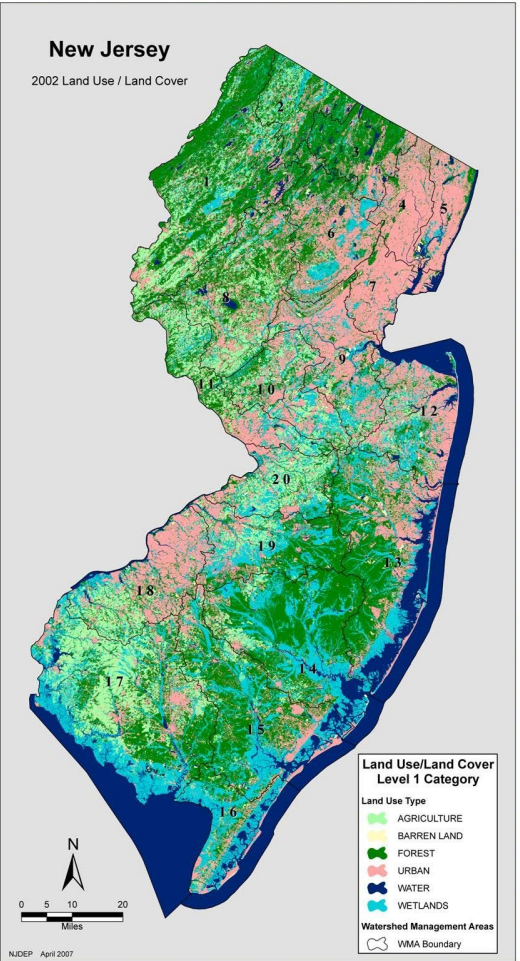
Forests

1995

More than 38,000 acres of Forest Land were converted to Residential Urban Land



2002



1995 - 2002 Change Analysis by Watershed Management Area
Land Use Type - Level 1 Category (acres)

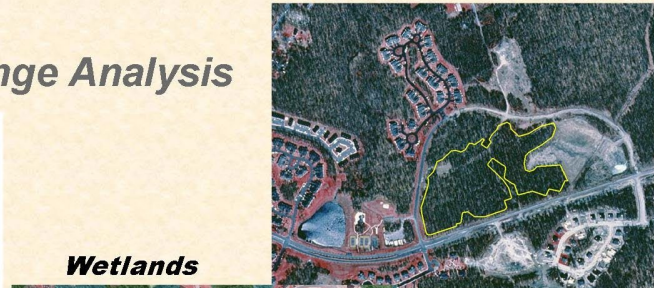
Land Use Type	WMA 1	WMA 2	WMA 3	WMA 4	WMA 5	WMA 6	WMA 7	WMA 8	WMA 9	WMA 10	WMA 11	WMA 12	WMA 13	WMA 14	WMA 15	WMA 16	WMA 17	WMA 18	WMA 19	WMA 20	WMA 21
Agriculture	2,851	2,572	37	-45	-28	488	-7	2,384	3,078	8,748	4,254	1,395	272	1,418	468	3,235	4,278	2,686	3,828		
Barren Land	728	5	268	81	339	71	378	-339	242	311	1,542	261	135	280	292	81	247	284	278		
Forest	1,487	170	1,238	5,122	425	3,657	1,519	2,228	2,681	284	139	3,252	8,422	1,263	4,951	589	5,188	1,228	1,921		
Urban Land	8,188	2,086	1,932	1,388	729	4,815	614	18,448	8,159	18,611	5,729	1,728	15,148	6,429	5,295	1,791	5,788	7,488	5,661	4,271	
Water	483	184	11	-11	218	44	-7	9	7	82	9	-48	28	281	148	138	41	148	41		
Wetlands	65	296	383	358	475	488	-278	-551	1,091	1,879	458	4,881	439	393	10	831	837	1,489	737	427	

Aerial Information Systems, Inc. (AIS), Redlands, California developed the 2002 Statewide Land Use/Land Cover (LULC) and Hydrography Update data sets for the New Jersey Department of Environmental Protection (NJDEP). AIS has provided NJDEP with the data for the development of the 1995 Integrated Terrain and Mapping (ITM) project and the 1995 LULC Update.

Funding for this project was provided by a Title NJ Department of Transportation, The NJ Department of Environmental Protection, and through a grant from the National Oceanic and Atmospheric Administration (NOAA).

Project Team: Craig Collins, John Trivelpy, Lawrence Thomson

Map Composition by Craig Collins, OIS Specialist
NJ Department of Environmental Protection, Office of Information Resources Management, Bureau of Geographic Information Systems, April 2007.



Wetlands

1995

Almost 6,000 acres of previously mapped Freshwater Wetlands are now in Residential Urban Land.



2002

Land Use/Land Cover Level 1 Change Analysis					
2002 Statewide Land Use/Land Cover Statistics (in acres)					
Land Use Type	Revised 1995	2002	Net Change 1995-02	Net % Change 1995/97-2002	Annual Rate of Change (7 years) 1995/97-2002 (ac/yr)
Agriculture	652,334	596,804	-55,530	-8.30%	-7.933
Barren Land	57,562	61,352	3,789	6.18%	541
Forest	1,616,683	1,575,220	-41,463	-2.53%	-5,923
Urban Land	1,334,476	1,440,464	105,988	7.96%	16,141
Water	800,610	800,572	-38	0.00%	-5
Wetlands	1,022,291	1,009,544	-12,747	-1.26%	-1,821
Total	5,483,955	5,483,955			

Source: NJDEP Land Use/Land Cover Level 1 Data Analysis, 1995/97 - 2002

1995 Statewide Land Use/Land Cover Statistics (in acres)					
Land Use Type	1995	1995	Net Change 1986-95	Net % Change 1986-1995/97	Annual Rate of Change (9 years) 1986-1995/97 (ac/yr)
Agriculture	744,382	659,017	-85,365	-12.95%	-9,485
Barren Land	57,223	57,971	748	1.29%	83
Forest	1,641,278	1,602,578	-38,701	-2.41%	-4,300
Urban Land	1,208,553	1,342,525	133,972	9.88%	14,886
Water	285,498	290,643	5,143	1.77%	571
Wetlands	1,045,259	1,023,471	-21,788	-1.53%	-1,755
Total	4,986,264	4,986,265			

Source: NJDEP Land Use/Land Cover Level 1 Data Analysis, 1986 - 1995/97

Note: The values for the 1995/97 interpretation were revised during the 2002 update. The values shown for "Water" now include lakes, ponds, reservoirs, major watercourses, enclosed tidal bays (eg, Barnegat Bay), and the tidal and non-tidal portions of the Delaware Bay. The "Water" values also now include any open water areas of Delaware Bay, Raritan Bay or the Atlantic Ocean out to the boundaries of the VMA. The 1986/95 "Water" values do not include any open water areas of the Delaware Bay, Raritan Bay or the Atlantic Ocean, even though the boundaries of some VMAs do extend into these water bodies.

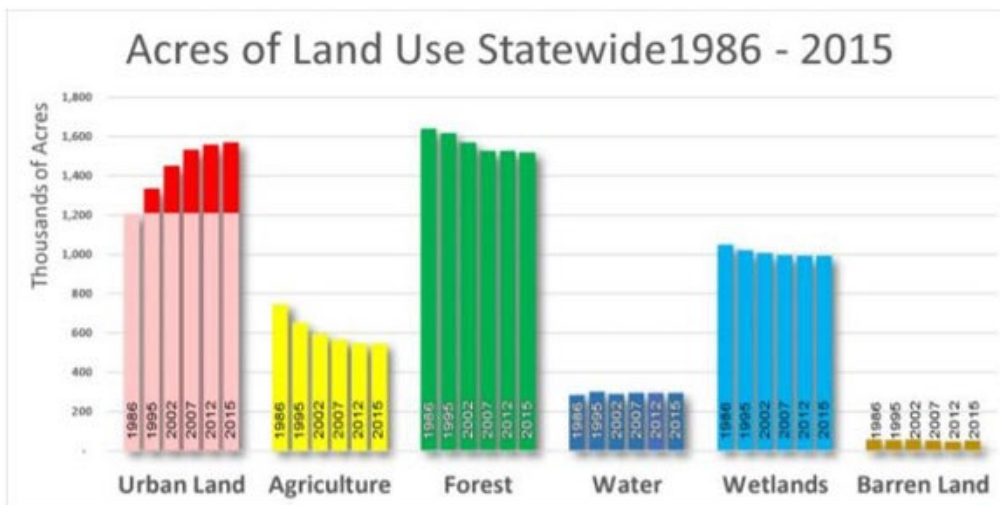
In January 2007, the New Jersey Department of Environmental Protection released the Land Use/Land Cover 2002 Update data sets. This is the third in a series of land use/land cover layers that the NJDEP first began producing in 1986 utilizing a modified Anderson Classification System.

The first land use layer NJDEP produced was based on aerial photography captured in the spring of 1986 with a minimum mapping unit of 2.5 acres. Freshwater wetlands were mapped under the New Jersey Freshwater Wetlands Mapping Program and were incorporated into the 1986 land use data sets. The second iteration of the land use data was based on photography captured in 1995/97 with a minimum mapping unit of 1 acre. These first two mapping efforts provided NJDEP with the data to begin Land Use Change Analysis.

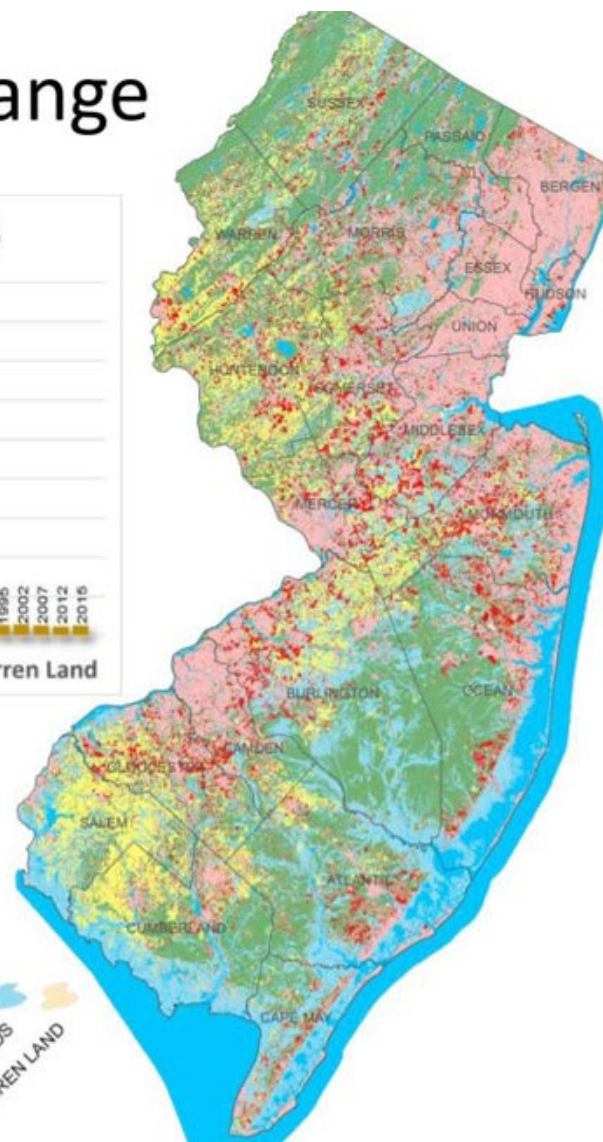
This latest series is based on photography captured in the spring of 2002. As with both previous layers, the 2002 data was produced by visually interpreting color infrared photography, however, the 1 foot pixel resolution of the 2002 imagery improved the ability of the interpreters to identify features. Through this process, photo-interpreters examine each image, and based on their knowledge of photo signatures, classify the image into well defined land use/land cover codes as well as determining the percent Impervious Surface. The 94 land use classification codes are grouped into 6 - Level 1 categories to produce this land use/land cover type map.

All three land use/land cover data sets contain important land use data used in a wide variety of environmental analyses. Every effort has been made to insure that all land use data sets are as accurate as possible. However, LULC data is not intended to substitute for or on the ground jurisdictional boundaries. Users of all data sets should understand the mapping process, appropriate uses and limitations of the data.

Dynamic Landscape Change

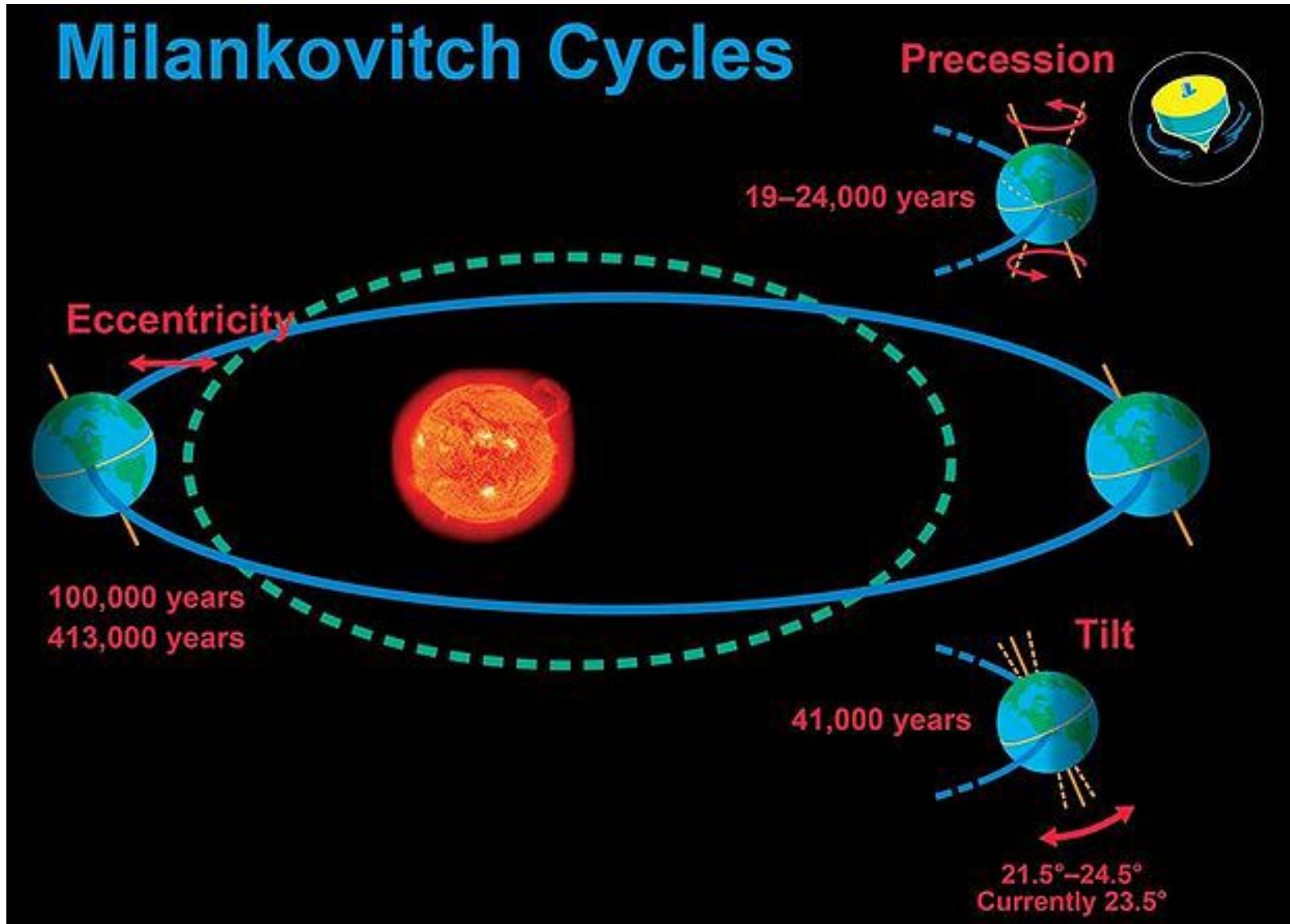


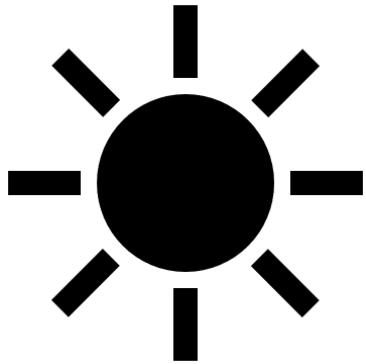
	2012-2015	1986-2015
Urban Growth	10,404 Acres	360,376 Acres
Farmland Loss	(2,087) Acres	(200,876) Acres
Forest Loss	(9,494) Acres	(122,569) Acres
Wetlands Loss	(2,295) Acres	(57,166) Acres



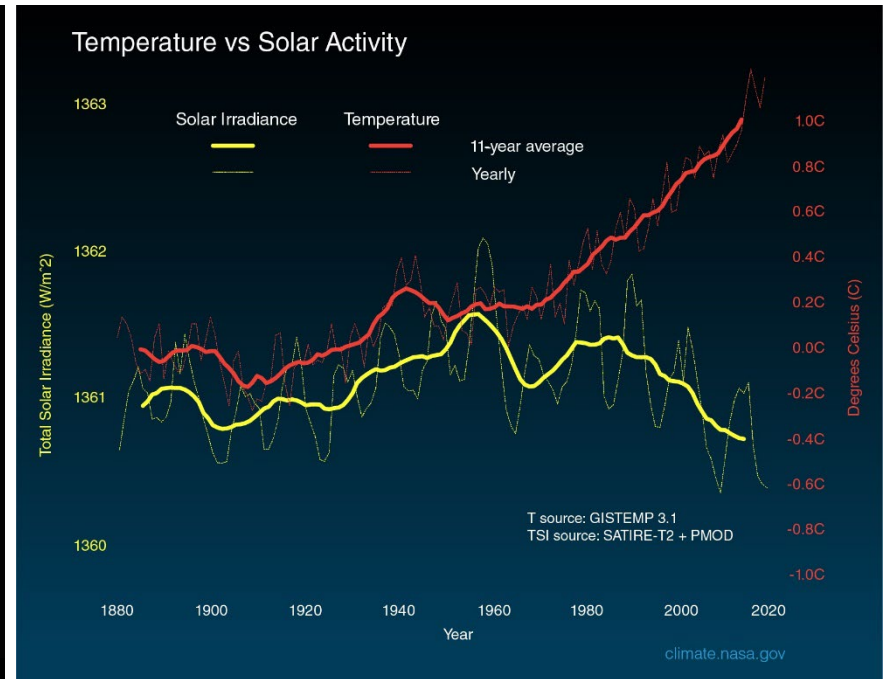
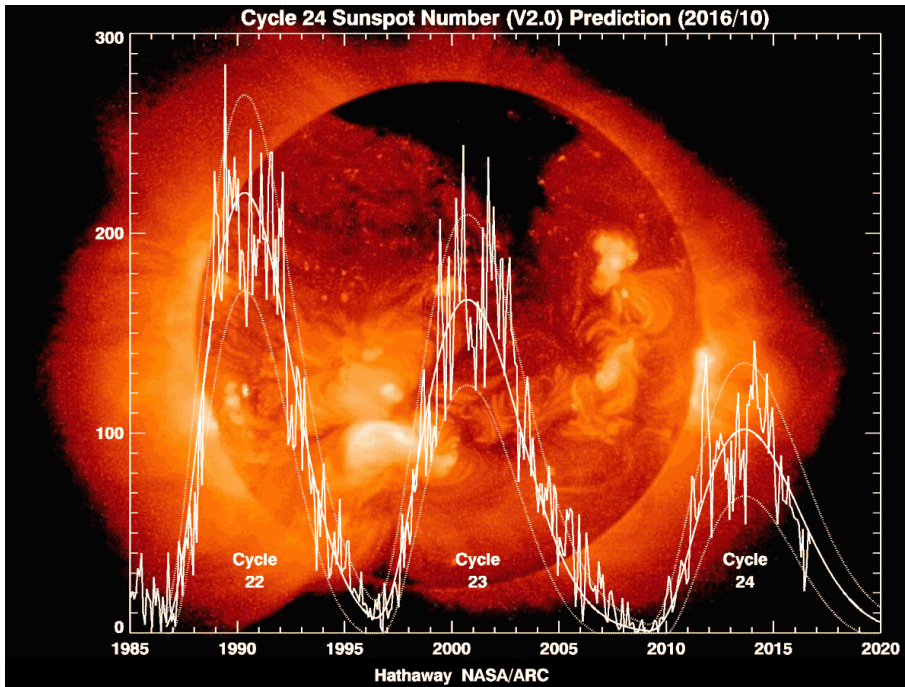
Part II: Causes of Climate Change

Natural Climate Change

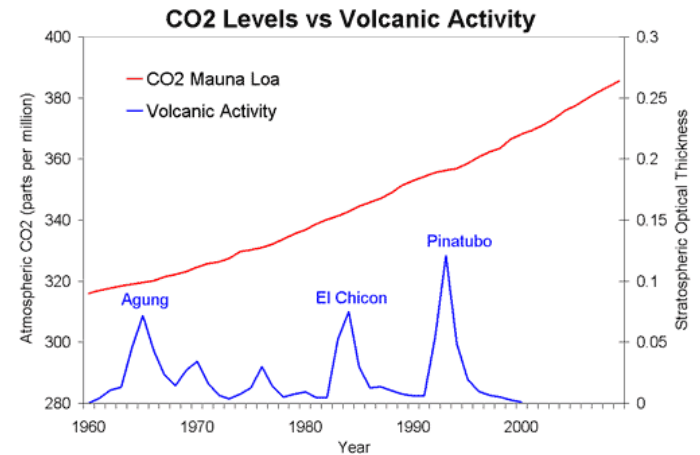
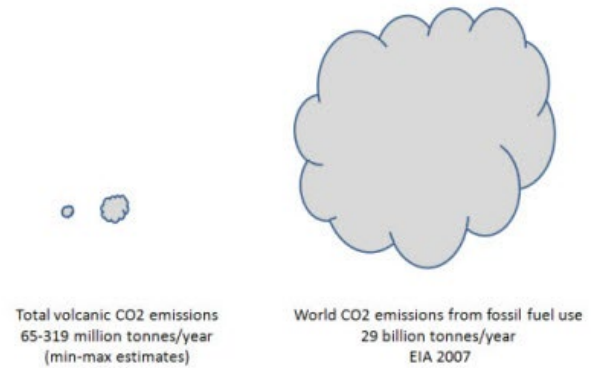
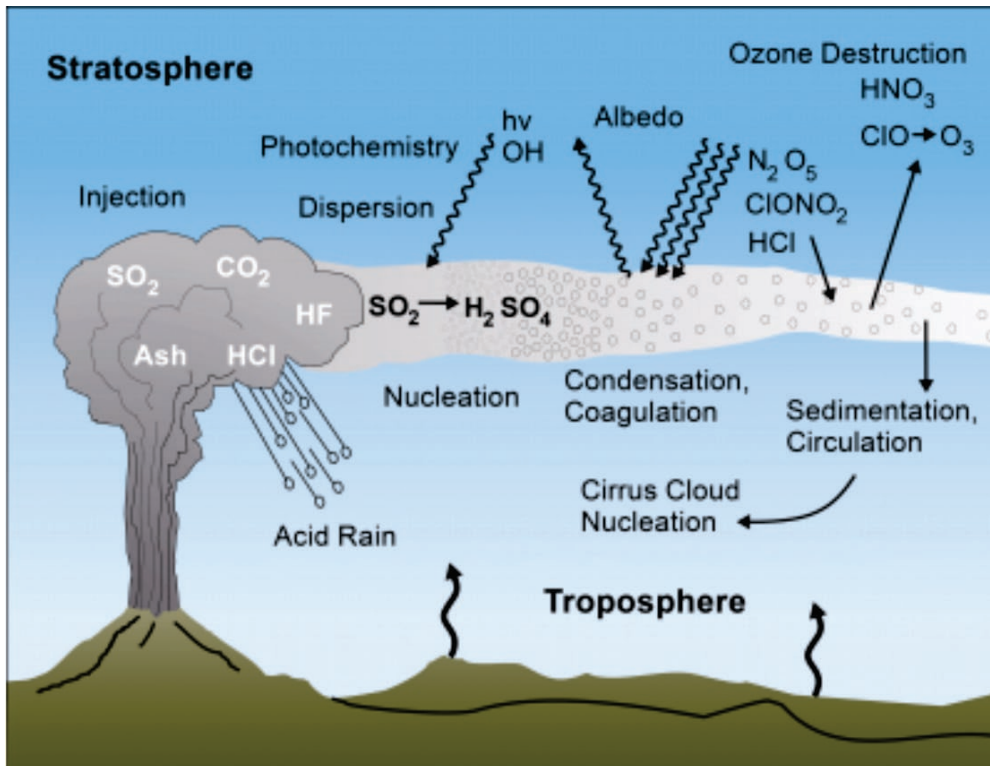




The Sun (obviously)



Volcanoes



This cartoon, from the USGS, illustrates the dispersal of aerosols and some of the photochemical interactions in the stratosphere. Circulation of an aerosol cloud in is eventually terminated when the particles succumb to gravity, gradually sinking to the lower atmosphere and earth's surface.

Anthropogenic Factors

Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)

Search for a word



an·thro·po·gen·ic

/,anTHrəpō'jenik/

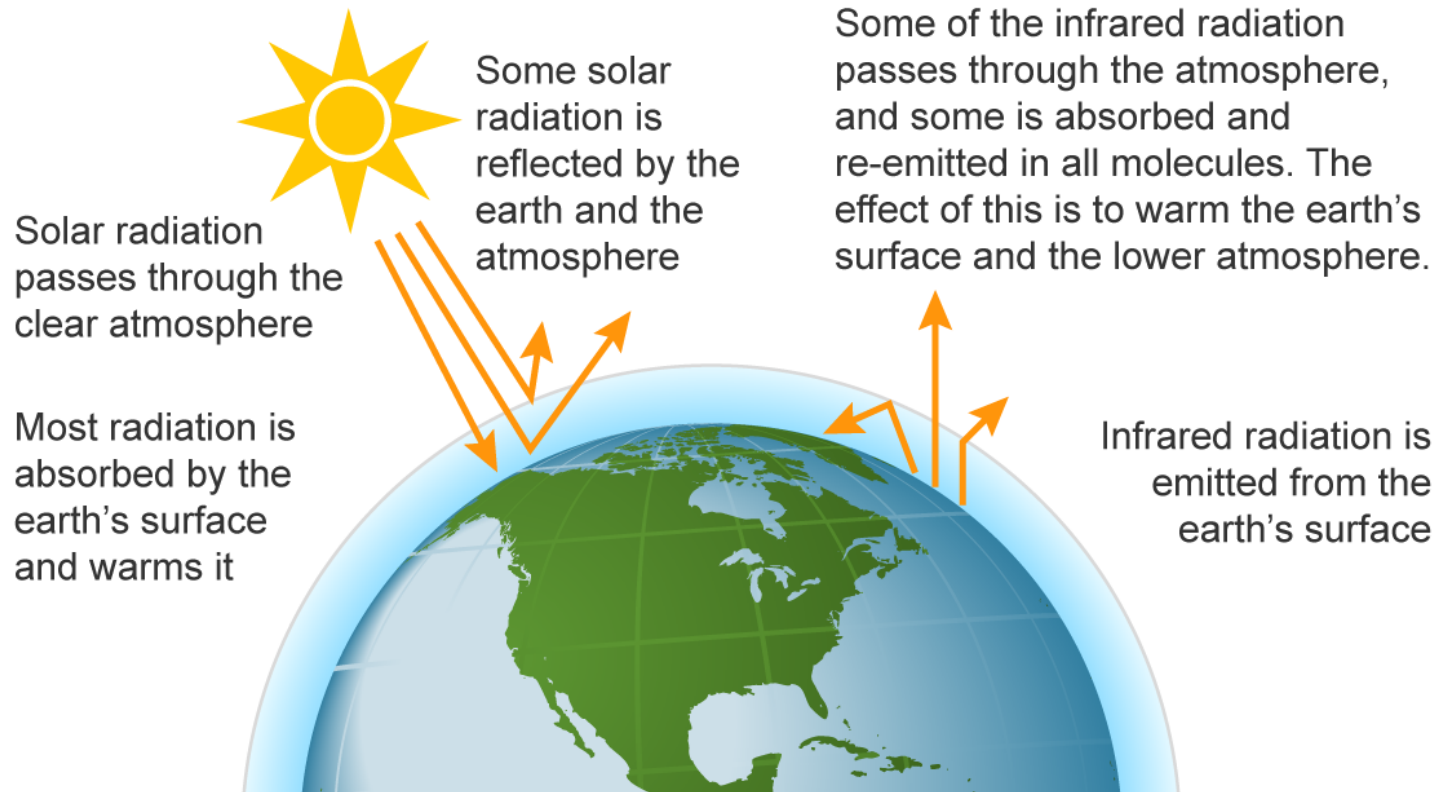
adjective

(chiefly of environmental pollution and pollutants) originating in human activity.
"anthropogenic emissions of sulfur dioxide"



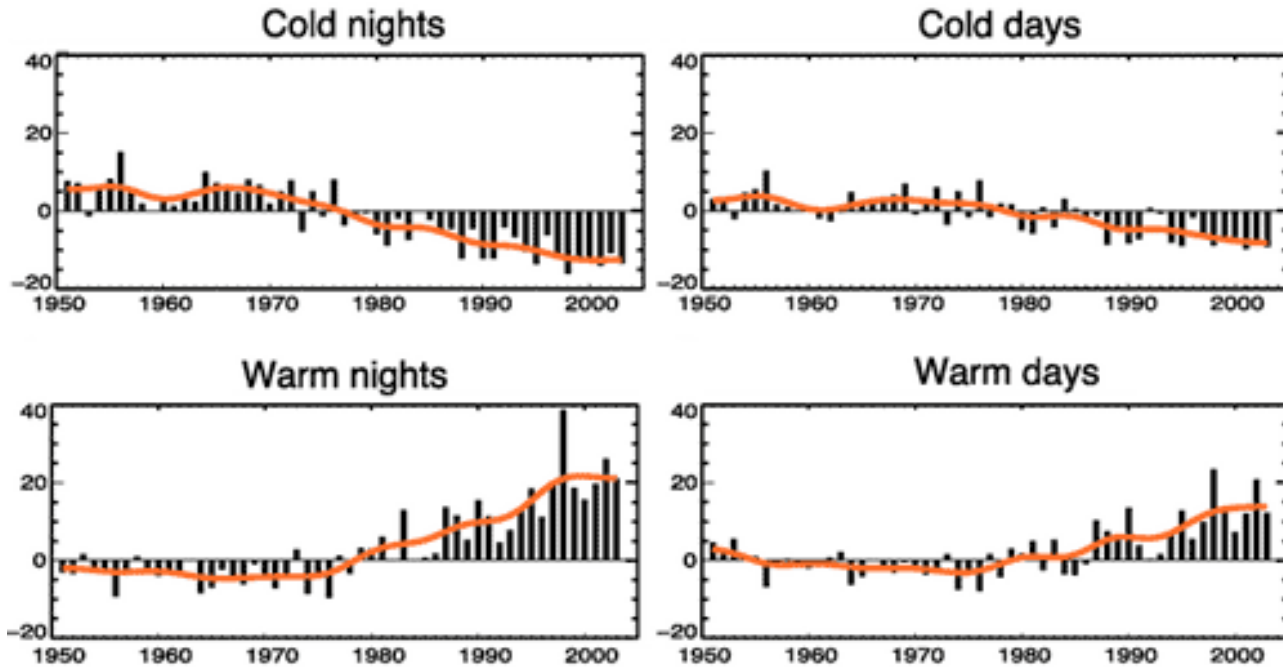
The Greenhouse Effect

The greenhouse effect



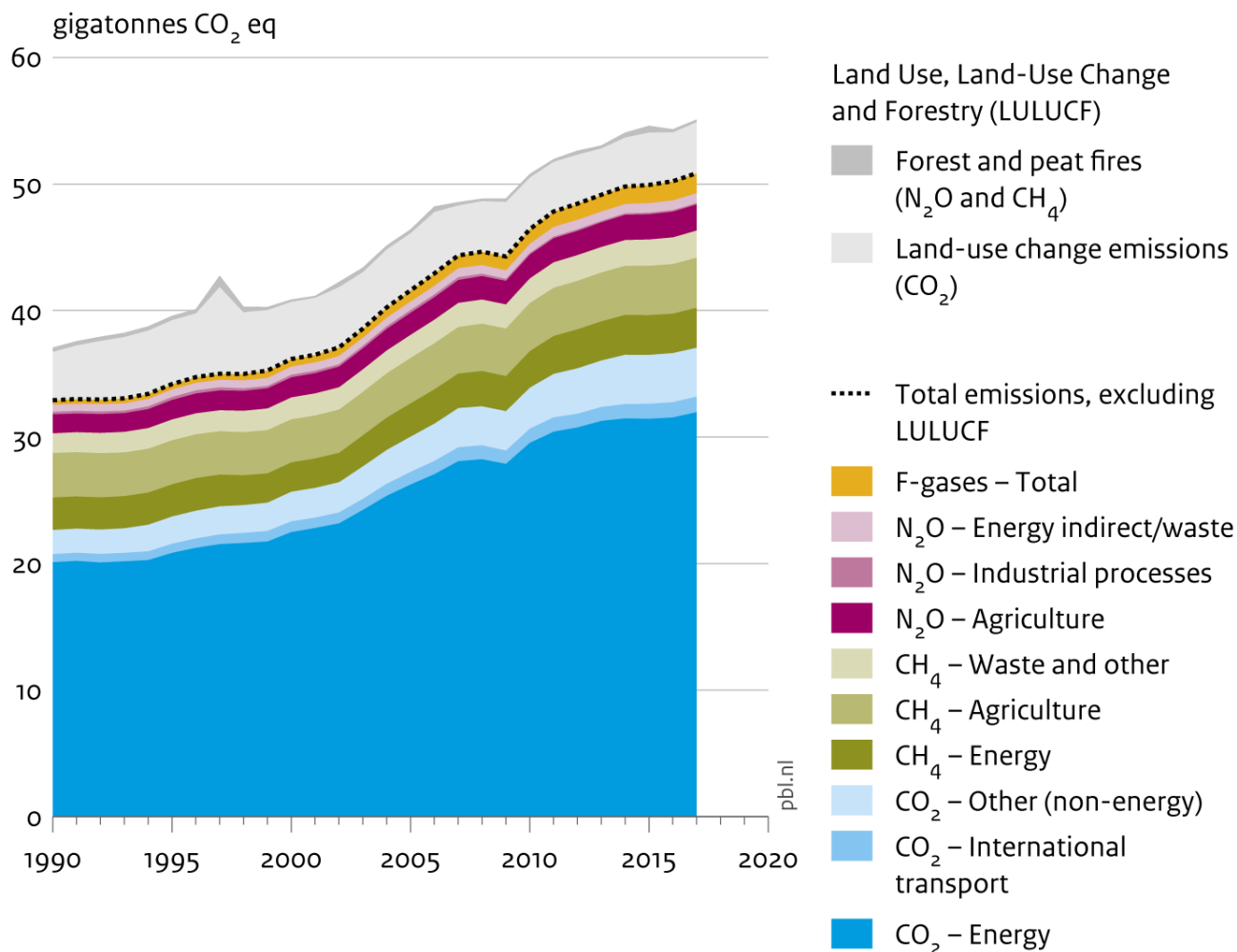
Greenhouse Effect

Frequency of cold and warm days and nights



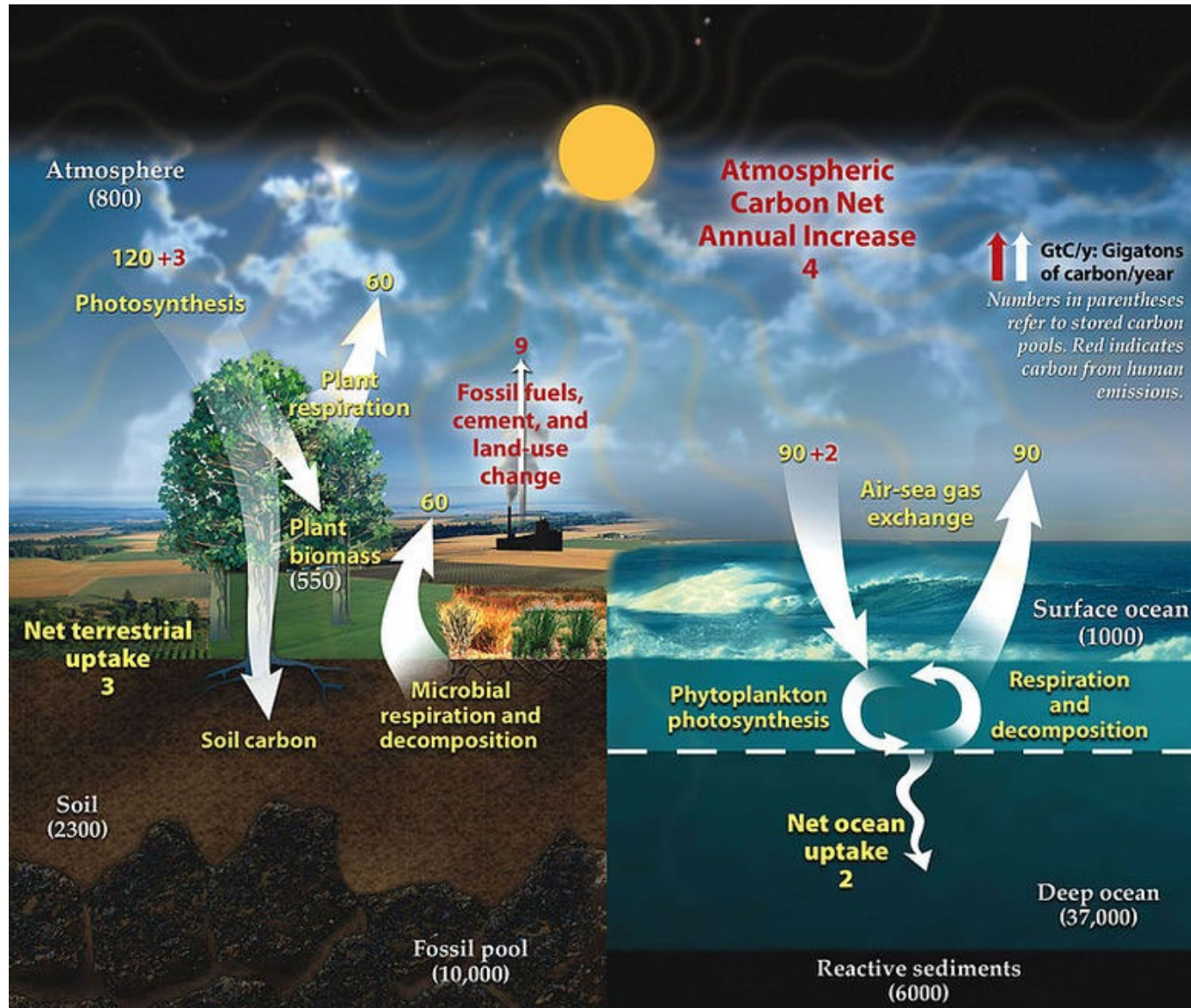
Greenhouse Gas Emissions

Global greenhouse gas emissions, per type of gas and source, including LULUCF

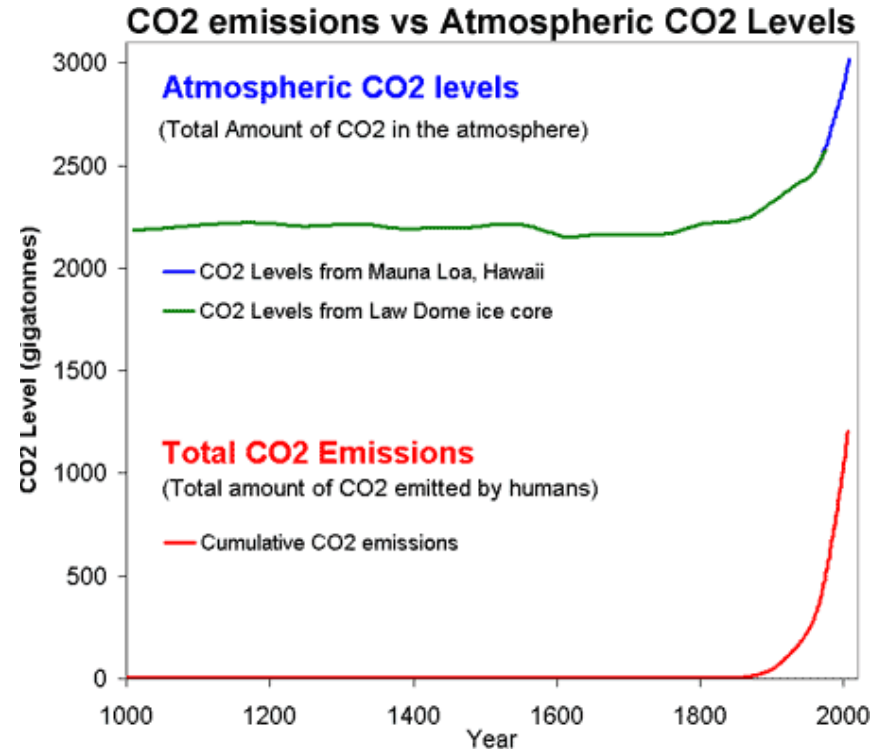
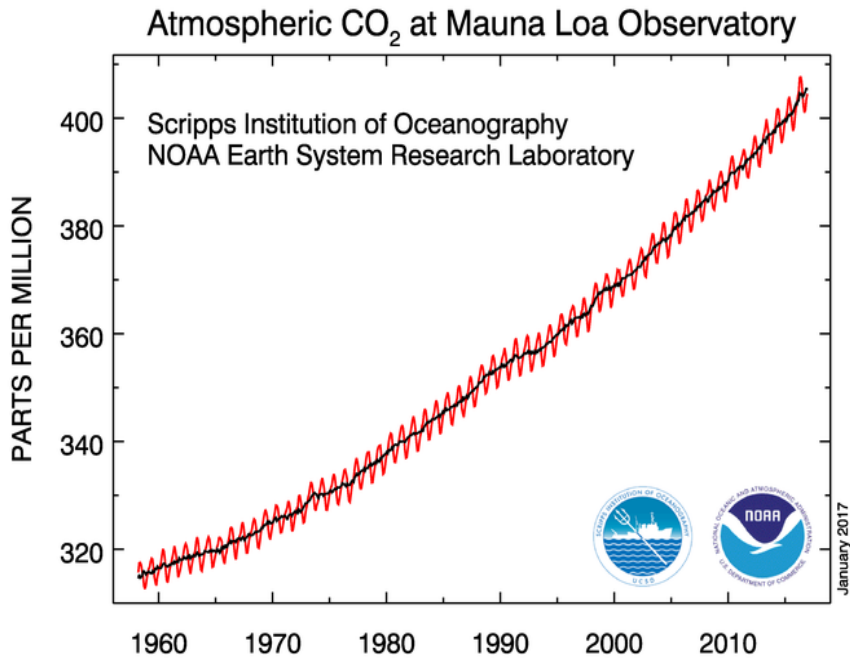


Source: EDGAR v5.0/v4.3.2 FT 2017 (EC-JRC/PBL, 2018); Houghton and Nassikas (2017)

The Carbon Cycle



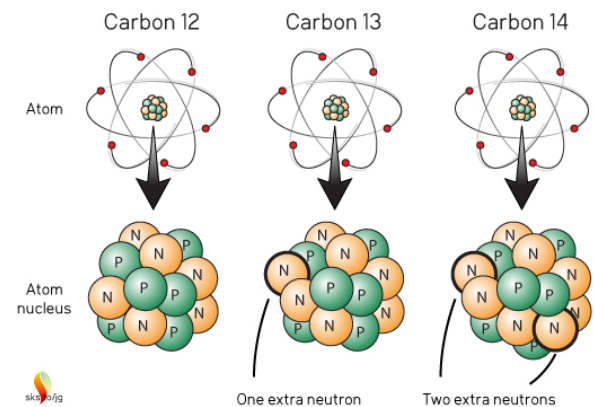
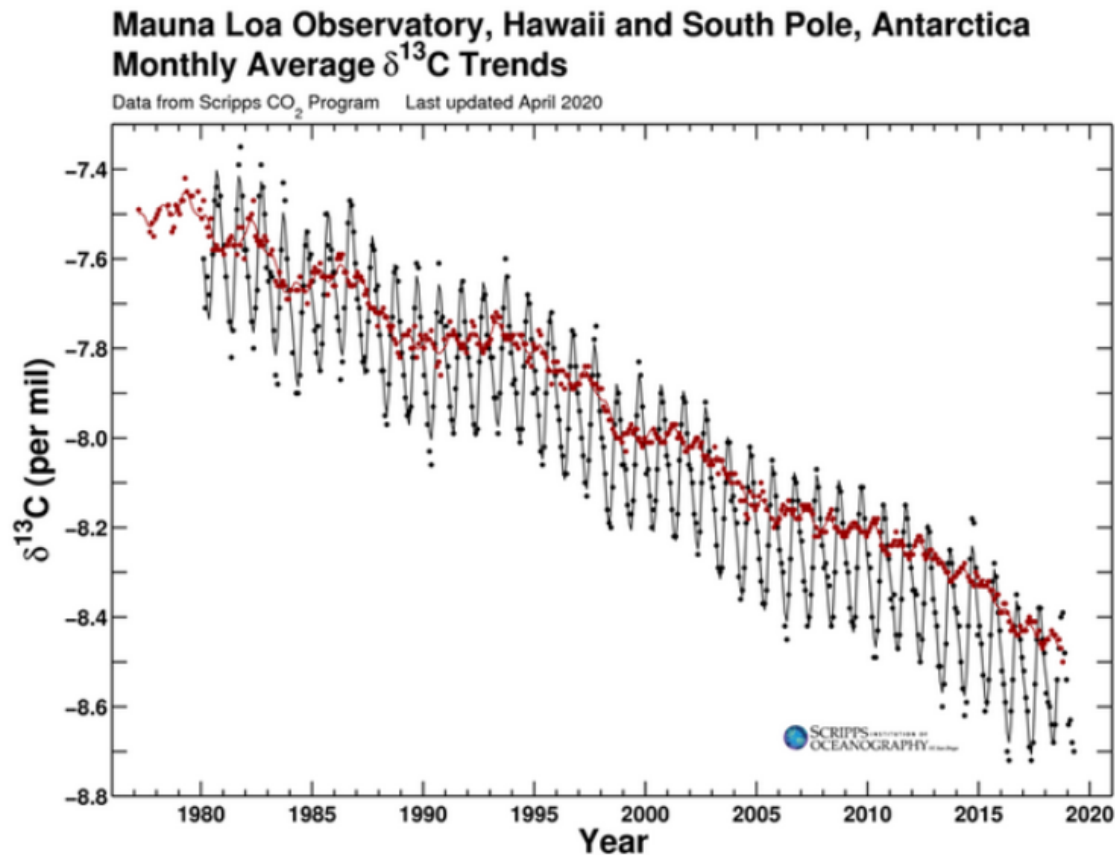
Greenhouse Gas Emissions



Human Footprints

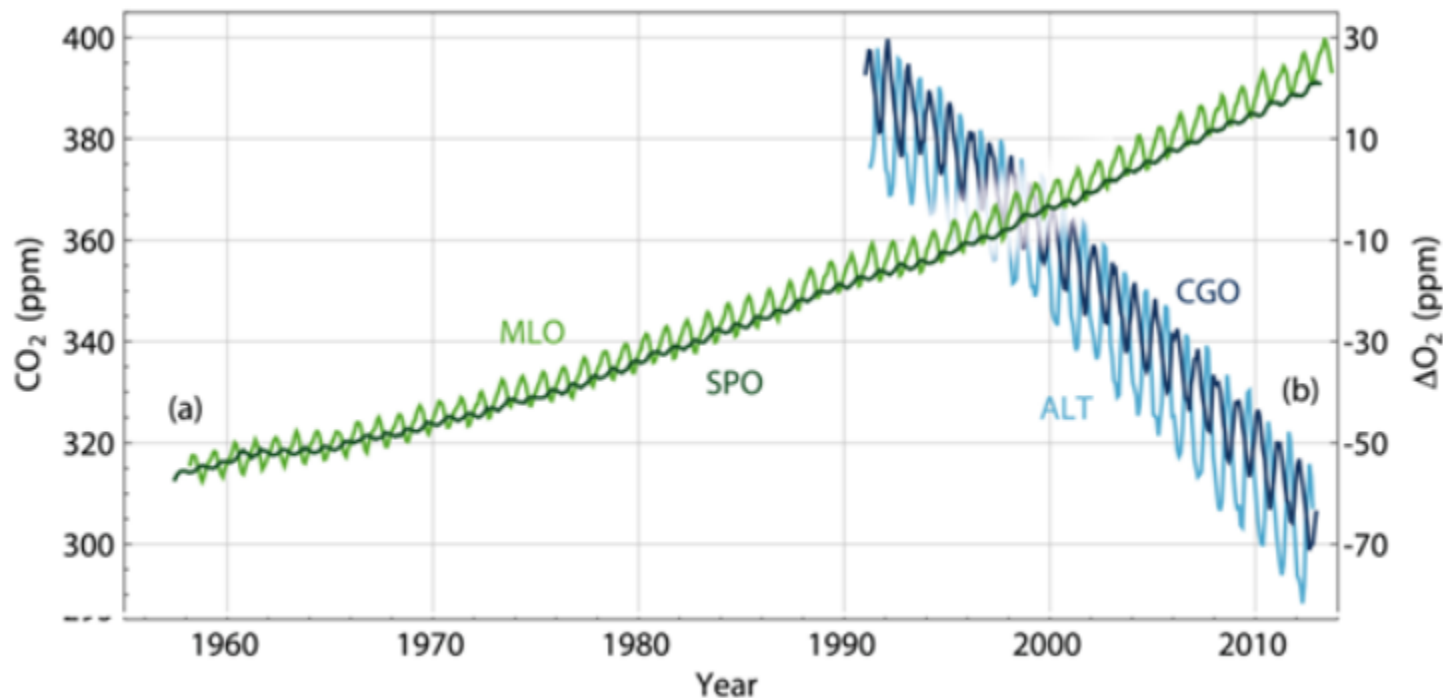
Isotope fingerprints point to human sources

Different sources of CO₂ have their own unique isotopic fingerprints. CO₂ from the fossil fuel burning doesn't have carbon 14 (¹⁴C), and CO₂ from terrestrial plants has less carbon 13 (¹³C) than from the ocean. Since fossil fuels are derived from ancient plants, they all have less ¹³C isotopes. Isotope data from ice cores show that since 1800, the carbon 13 in the atmosphere has decreased, which means the extra CO₂ in the atmosphere came from fossil fuel burning (Fig. 6).



Another human fingerprint: decreasing oxygen

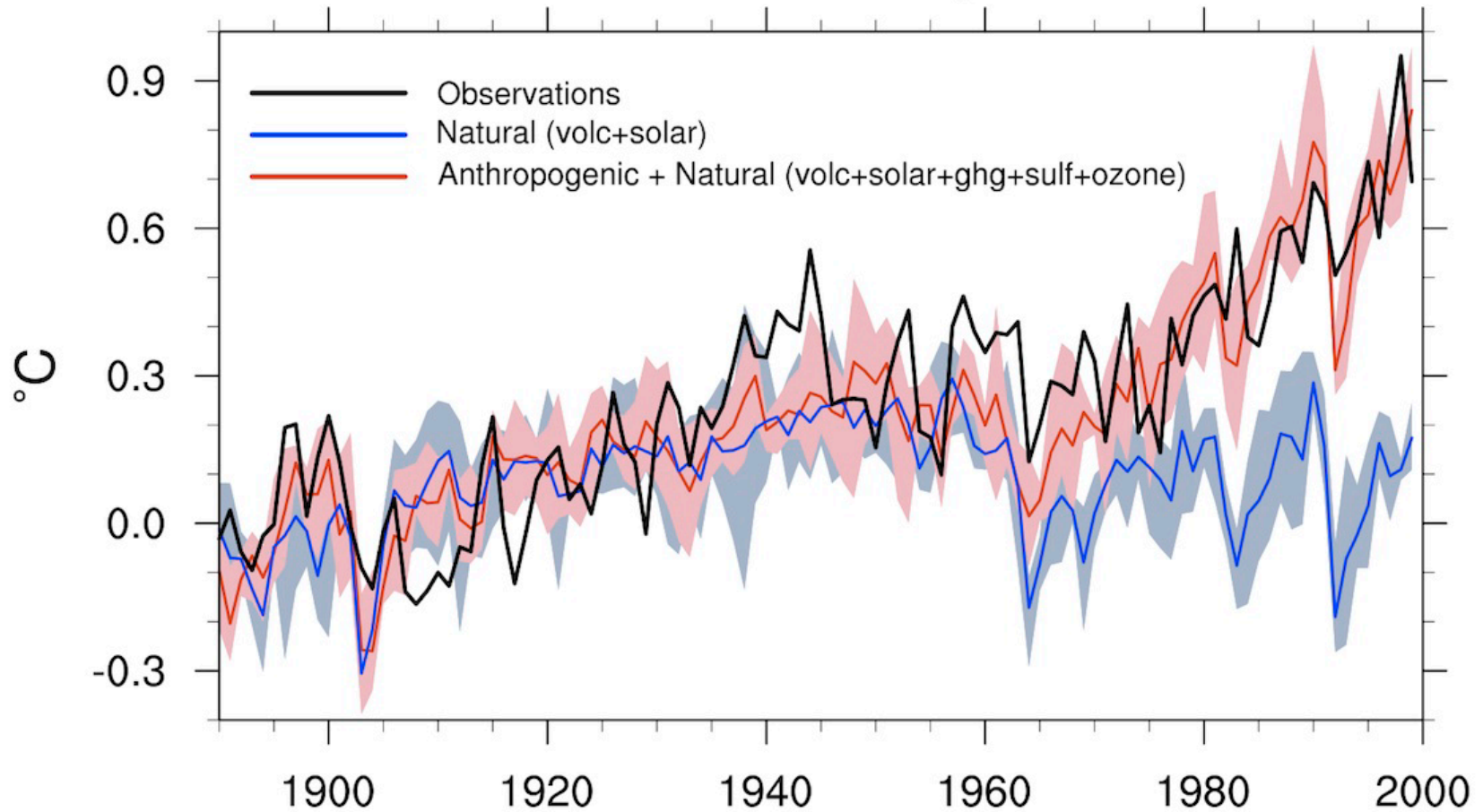
The decrease of atmospheric oxygen is an evidence indicating that the increase in atmospheric CO₂ is due to combustion of fossil fuels. Burning fossil fuels takes gas and oxygen and produces CO₂ and water. If human CO₂ emissions are the major reason, atmospheric oxygen (O₂) should decrease accordingly because of the consumption by chemical combustion. Just as we expected, O₂ has been decreasing since we've started measuring oxygen levels in the atmosphere (as shown in Fig. 5).



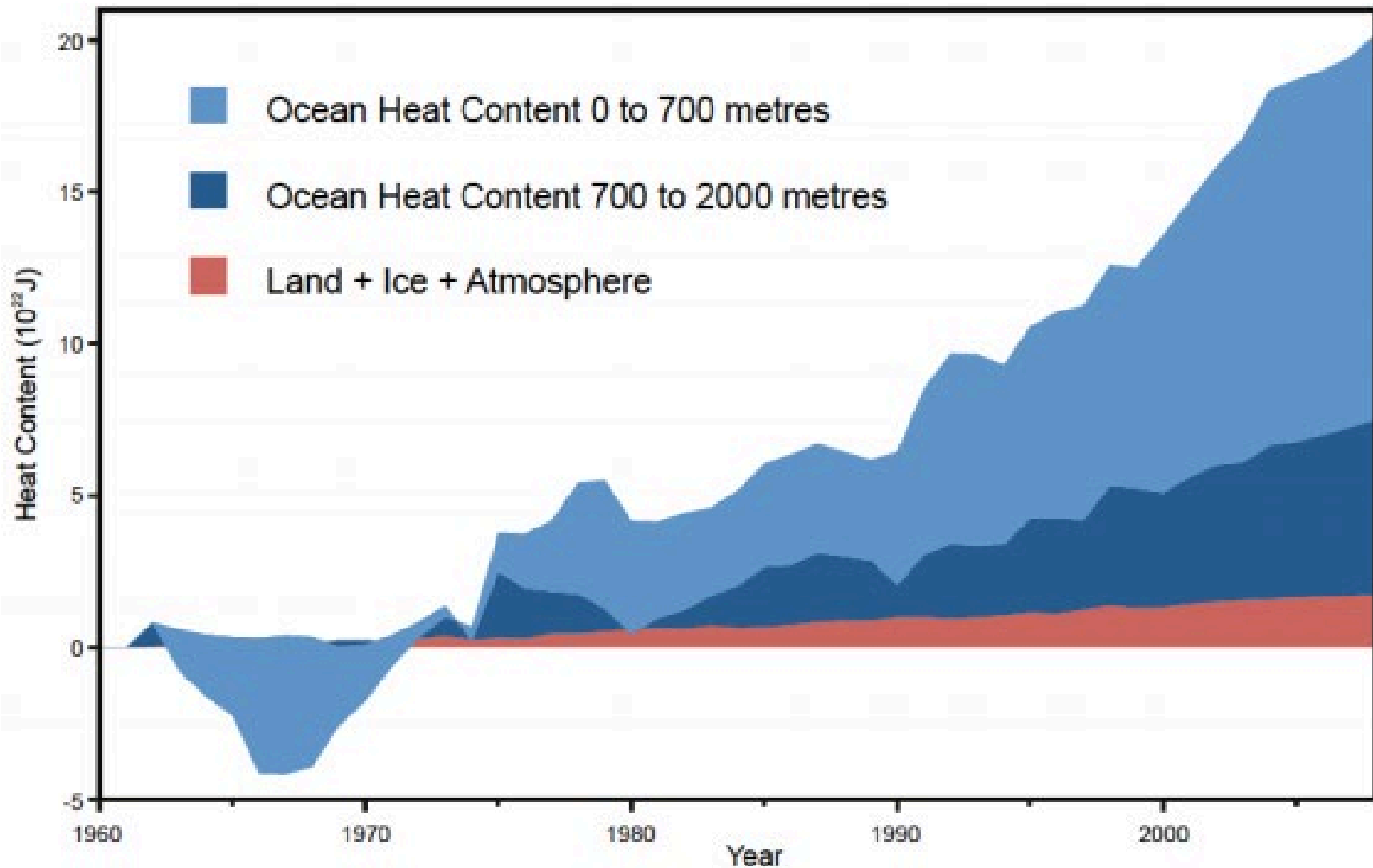
Parallel Climate Model Ensembles

Global Temperature Anomalies

from 1890-1919 average

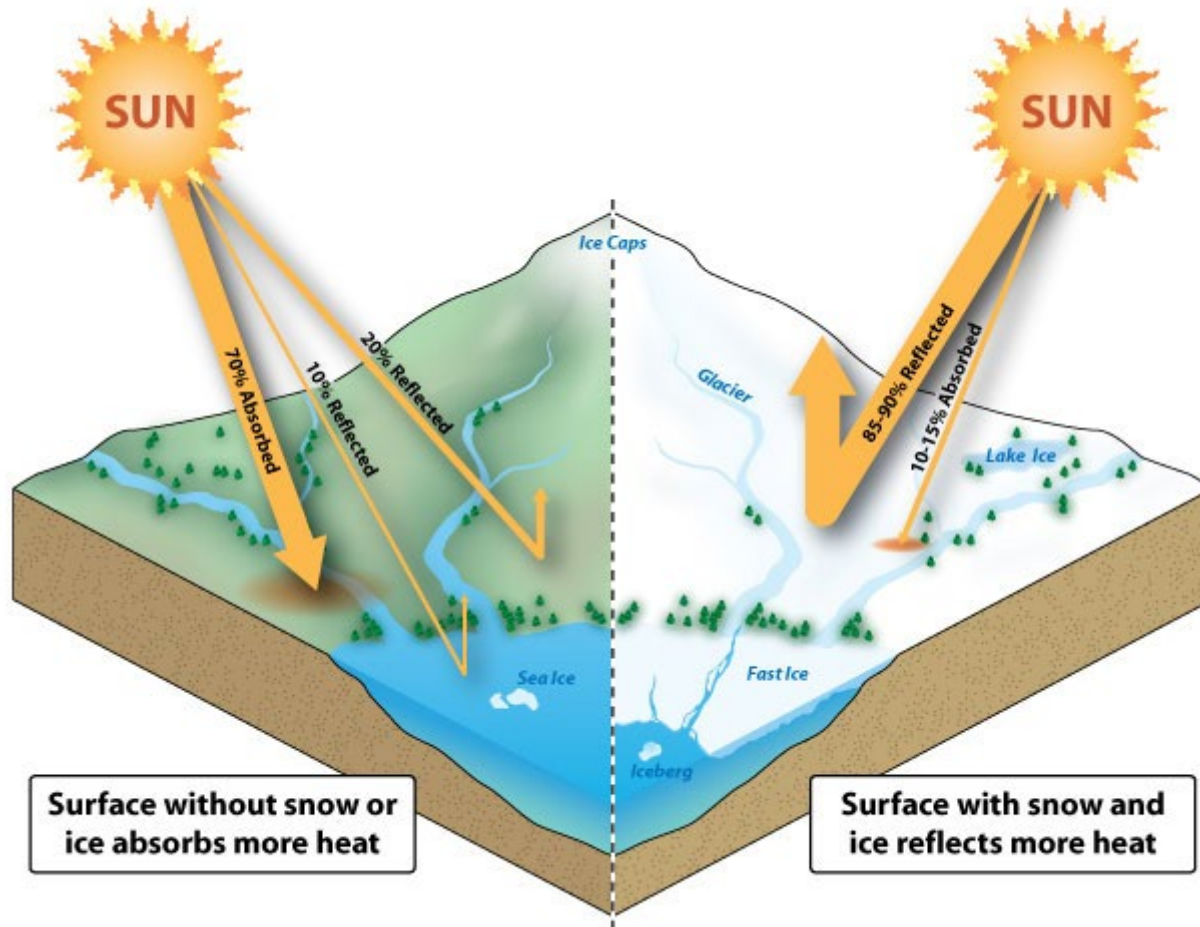


Heat Storage



Nuccitelli et al., 2012

Feedback Loops



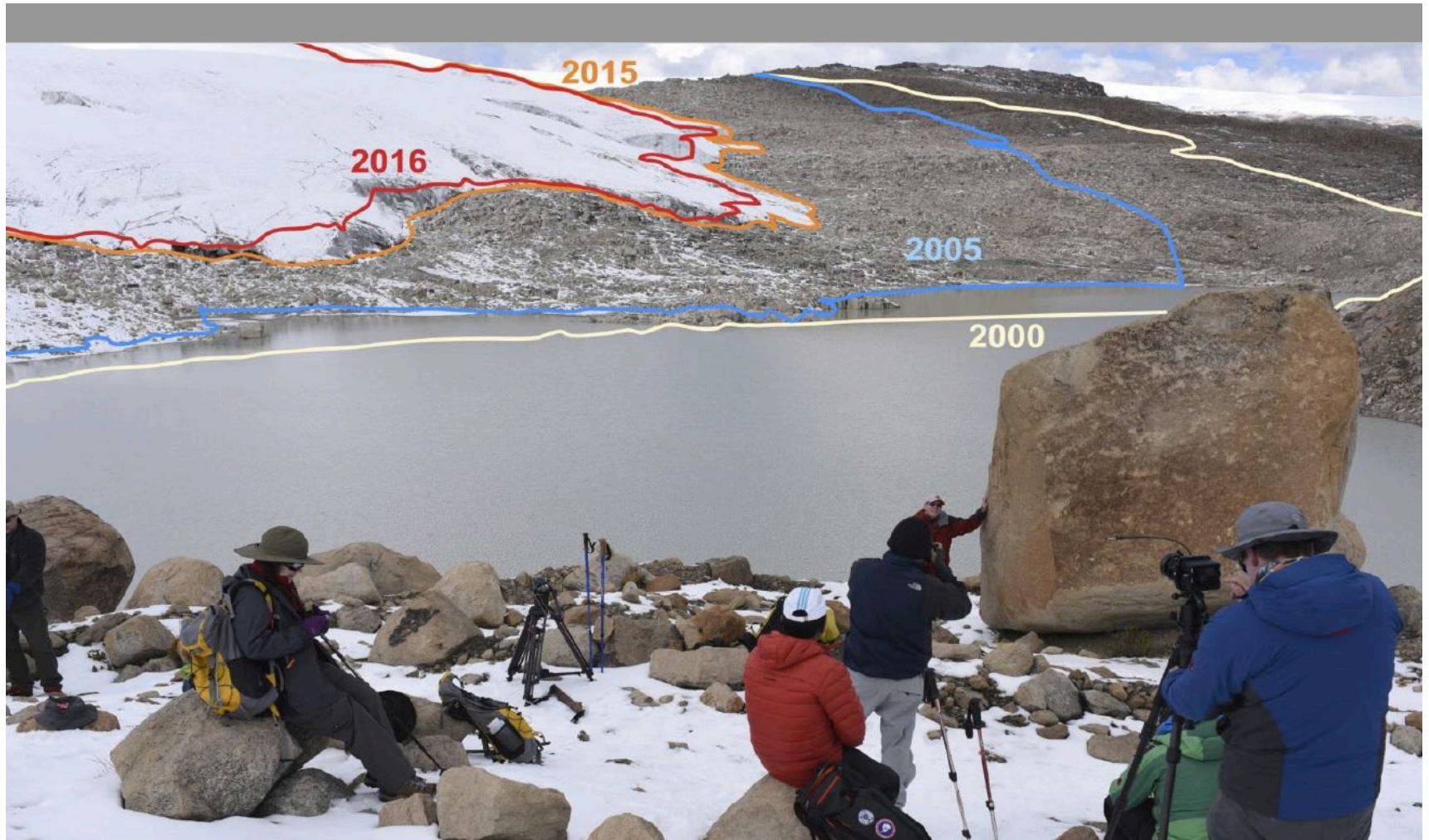
Surface without snow or ice absorbs more heat

Surface with snow and ice reflects more heat

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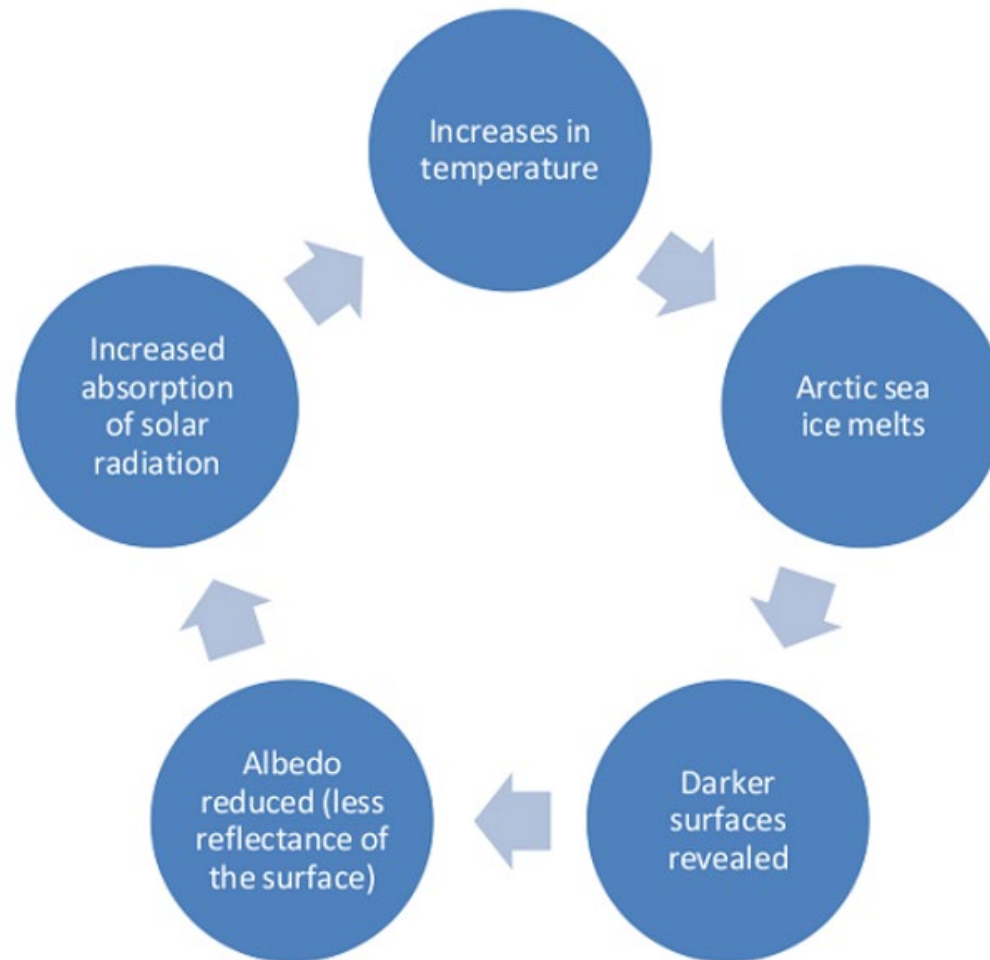
Peruvian Terminus Retreat

(Slide from a presentation created by the brilliant David Robinson)



Courtesy of L. Thompson

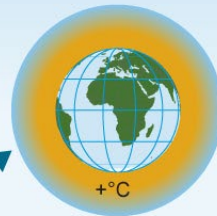
Feedback Loops



Feedback Loops

Permafrost thawing can intensify global warming

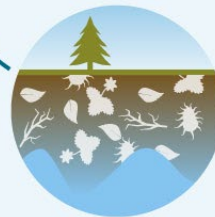
1. High levels of greenhouse gases, such as CO₂ and methane, in the atmosphere cause global temperatures to increase



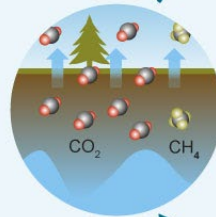
2. Increasing temperatures cause permafrost to thaw



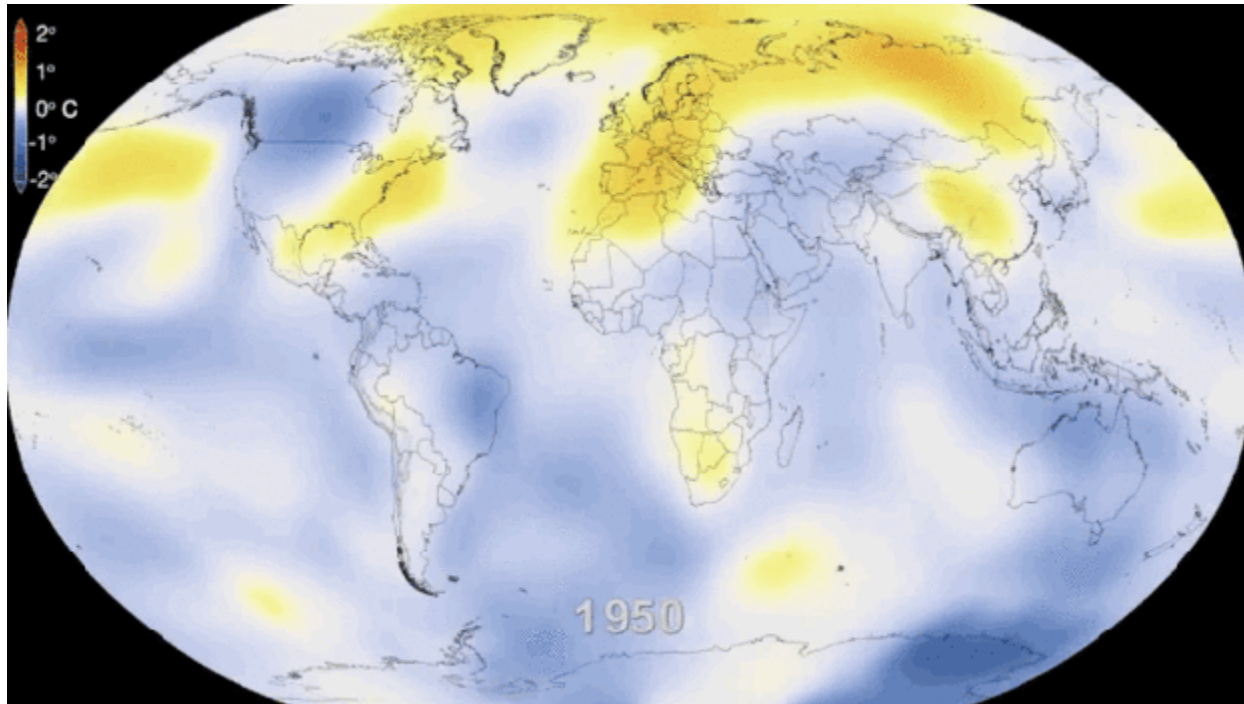
3. Thawing exposes previously frozen organic matter to decay



4. As organic matter decays, CO₂ and methane are released into the atmosphere



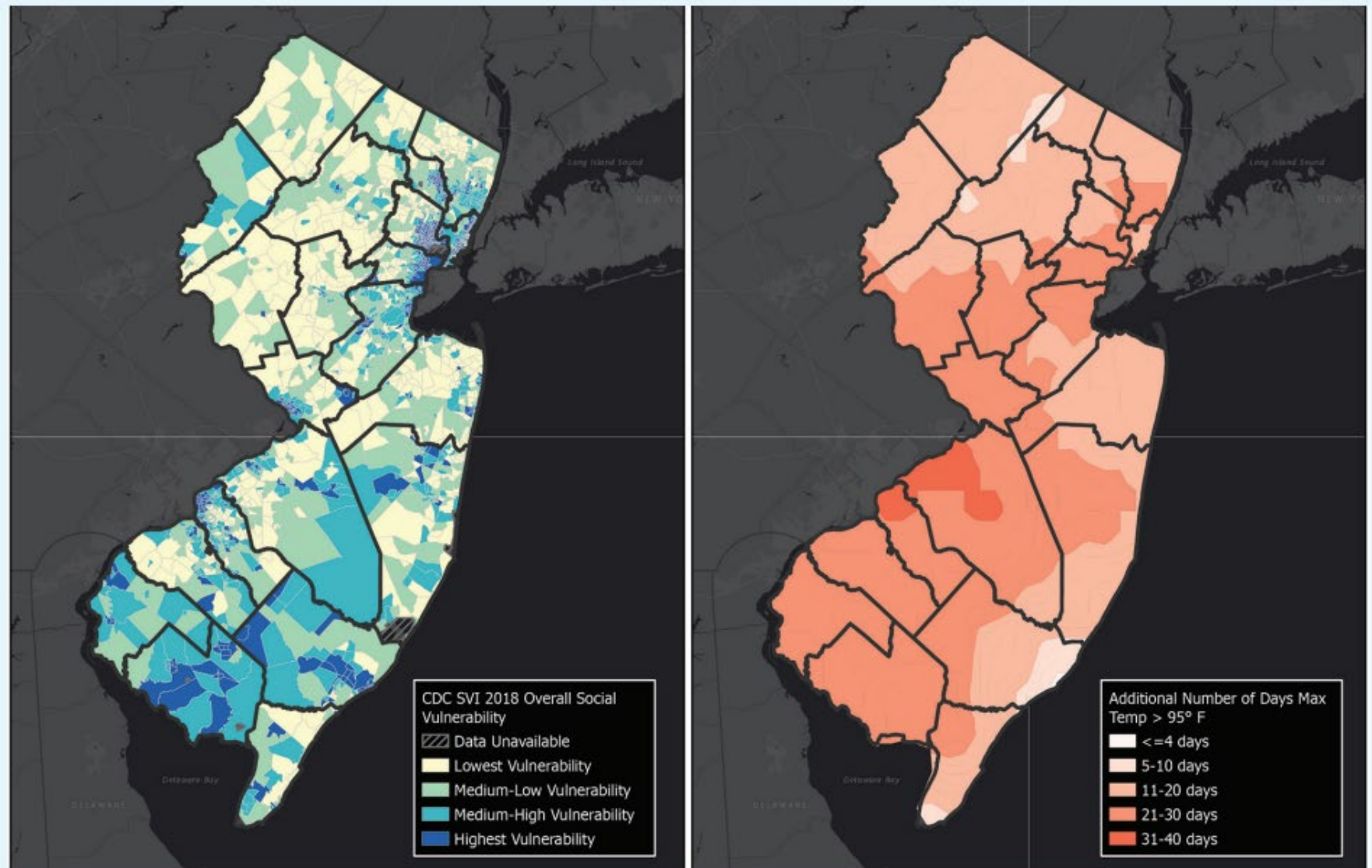
Warming Over Time



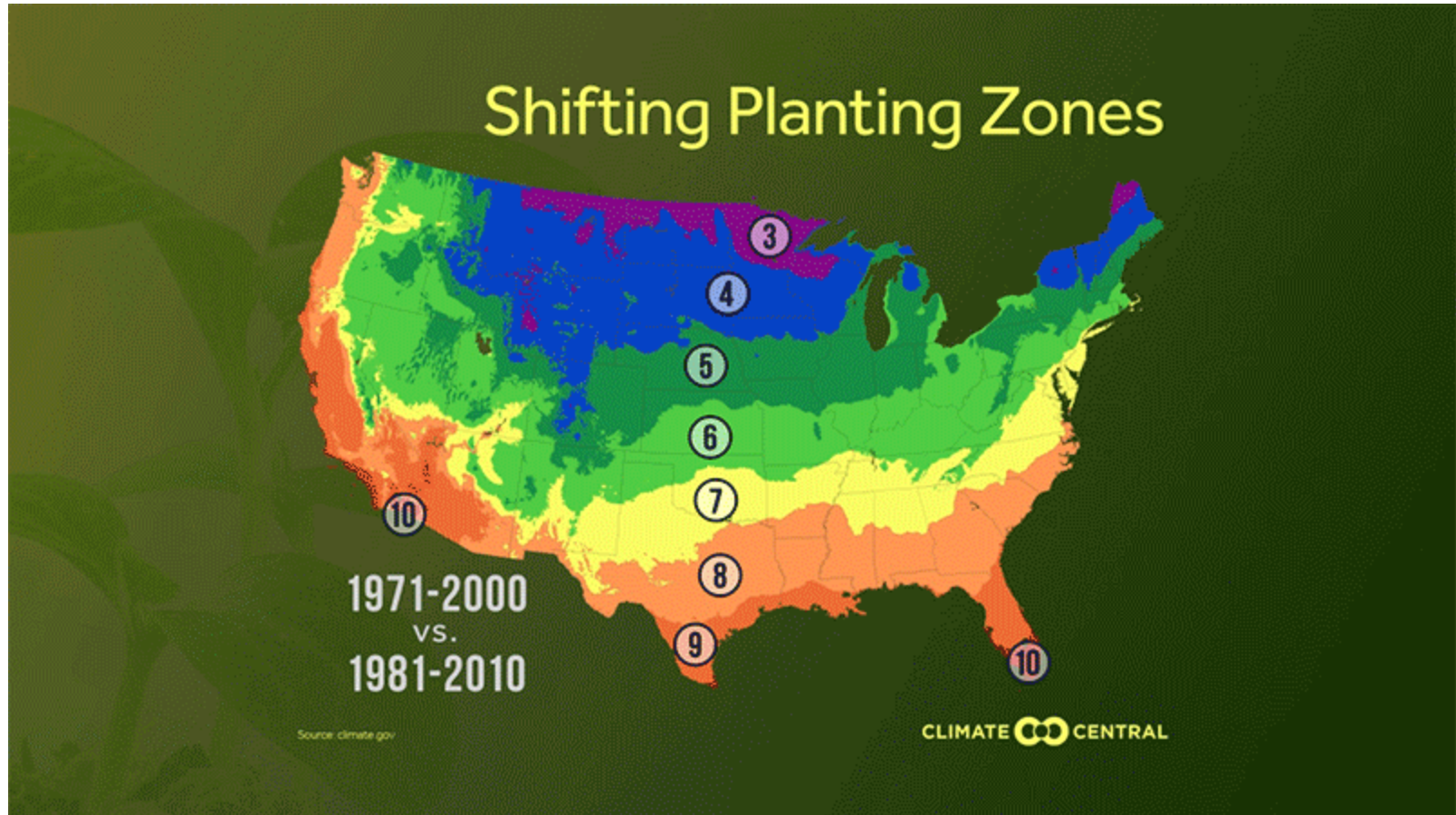
NASA Goddard Spaceflight Center

Part III: Climate Change in New Jersey

Increasing Excessive Temperature Days



Changing Hardiness Zones



From State of the Climate – New Jersey 2021

Temperatures are climbing

The mid-Atlantic region is one of the most rapidly warming locations in the

2021 was the
**3rd warmest
year**
on record in NJ

Average annual temperatures
in NJ increased nearly
4°F
since 1900, roughly
twice the global average

th

Drought



Droughts may occur more frequently due to the expected changes in precipitation patterns.

Avg annual temperatures are projected to increase

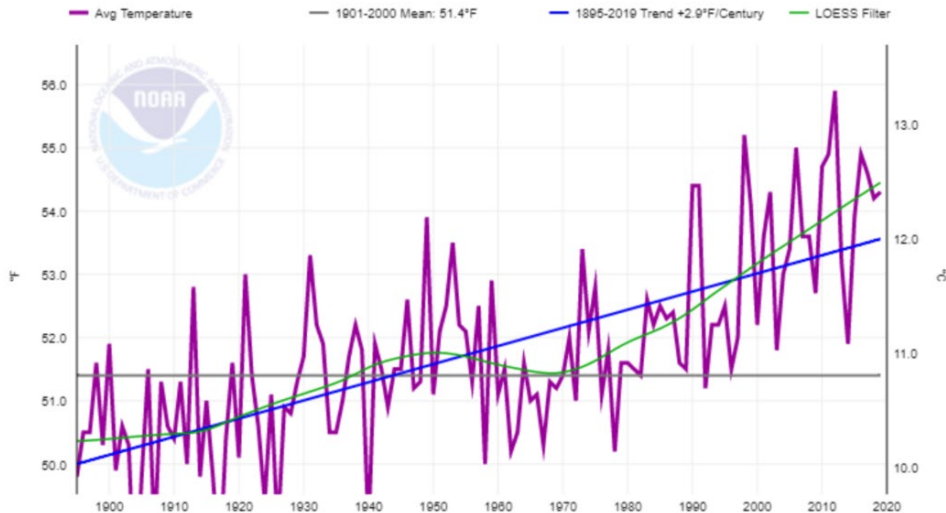
↑ **5–8 °F**

above preindustrial levels by 2100 in a low emissions scenario

↑ **8–14 °F**

by 2100 in a high emissions scenario

New Jersey, Average Temperature, January-December



National Centers for Environmental Information

It is anticipated that droughts lasting three to six months and longer may slightly increase in frequency in the Northeastern United States under a low emissions scenario and will significantly increase under a high emissions scenario.



From State of the Climate – New Jersey 2021

Sea-level rise is accelerating

And the trend is expected to continue well beyond the 21st century.

Sea level at Atlantic City
rose about

18 inches

since 1911, more than
double the global average

**Average annual tidal
flooding days in Atlantic City**

	1950s:	<1
	2007-16:	8
projected	2030:	17-75
	2060:	85-315

with moderate emissions

Tidal flooding

in Atlantic City is
expected to occur at least

240 days a year

with moderate emissions by 2100

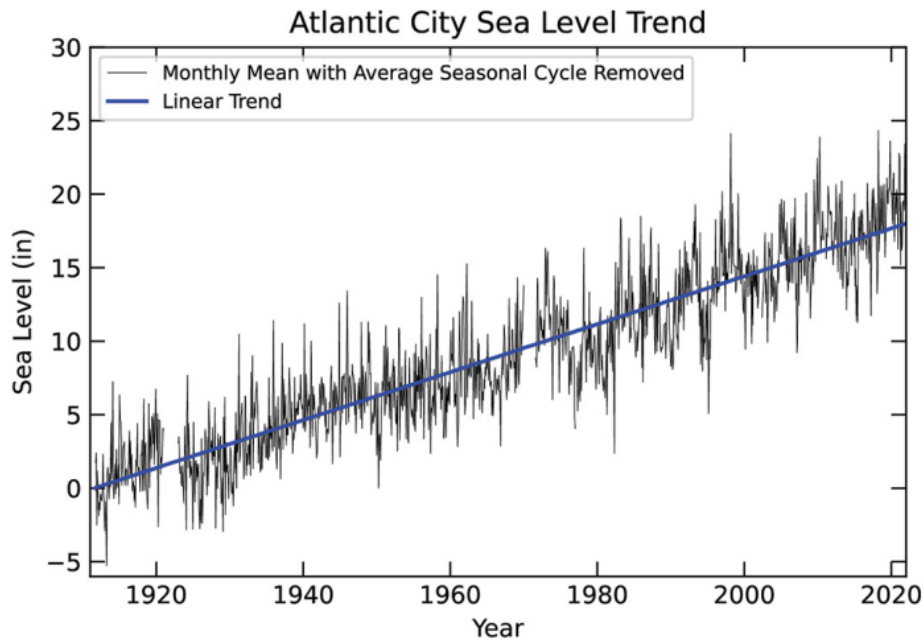
Sea level is projected
to increase

**0.5–1.1 ft
by 2030**

and

**0.9–2.1 ft
by 2050**

relative to the year 2000



From State of the Climate – New Jersey 2021

Ida delivered catastrophic flooding (and a glimpse of the future)

Warming temperatures are driving greater variability in precipitation. New Jersey is wetter overall, and heavy rainfall is occurring more often.

30 lives lost

2nd greatest loss of life in NJ due to a natural disaster since 1900

Estimated
\$16–24B in damages
in the Northeast U.S.

>9 inches of rain

in about 6 hrs in Somerset and Hunterdon counties, 2x normal rainfall for whole month of September

By 2100, annual rainfall is expected to increase about

5–8%

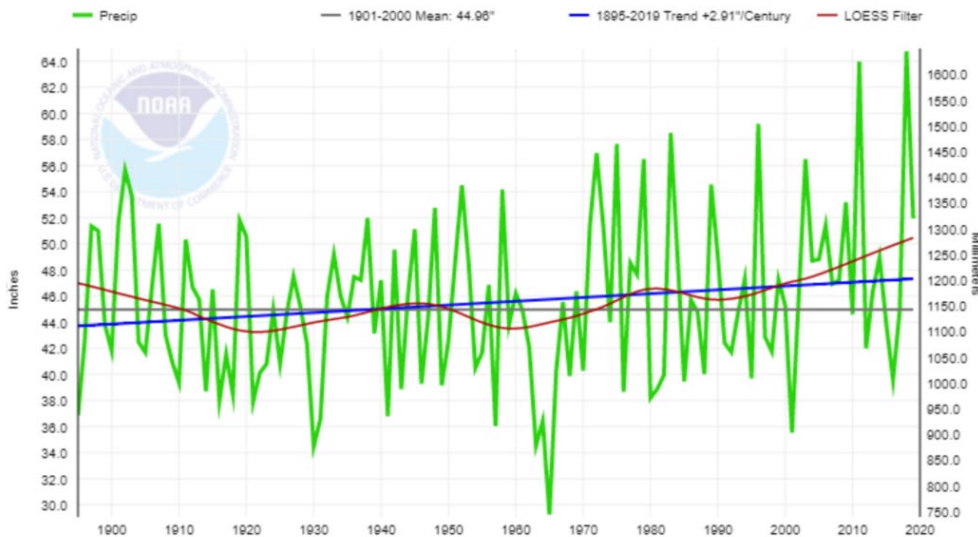
relative to 2010

Extreme 24-hour rainfall is expected to increase

5–15%

relative to 1950–1999

New Jersey, Precipitation, January–December



A change in extremes?



17 September 1999

2 crest 21.0' (nearby Blackwells Mills: 1921-present)

Manville



14 March 2010

6 crest 16.2' (1 May 2014 #7 crest 15.9')



16 April 2007

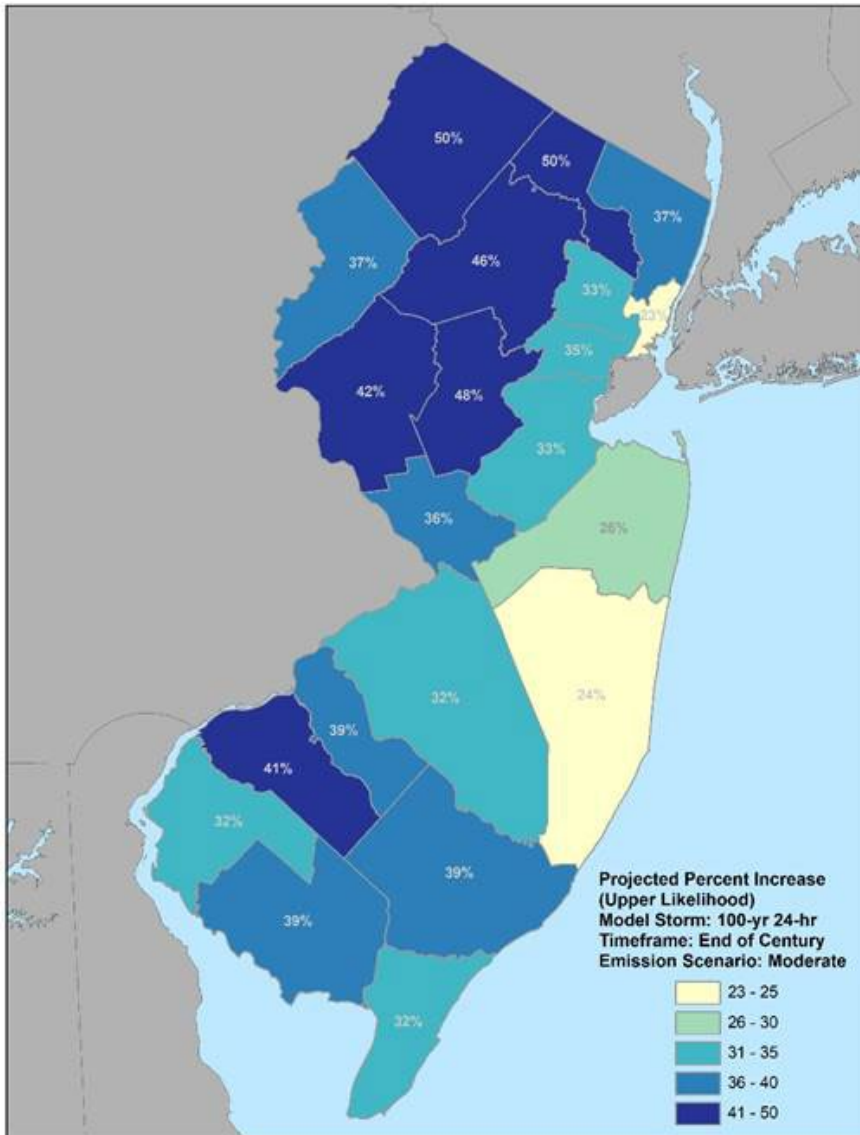
3 crest 19.2'



28 August 2011

1 crest 21.2'

Precipitation Increase



The studies show:

- **Precipitation is already 2.5% to 10% higher.** The precipitation expectations that presently guide state policy, planning and development criteria, and which rely upon data obtained through 1999, do not accurately reflect current precipitation intensity conditions. Extreme precipitation amounts are 2.5% higher now than the 1999 data suggests, and some parts of the state have seen a 10% increase above the outdated data.
- **Precipitation is likely to increase by more than 20% from the 1999 baseline by 2100,** and projected changes will be greater in the northern part of the state than in the southern and coastal areas, with projections for some northwestern counties seeing the greatest increase, some by as much as 50%.

New Jersey Extreme Precipitation Projection Tool

<https://njprojectedprecipitationchanges.com/>



New Jersey Extreme Precipitation Projection Tool



Northeast Regional Climate Center



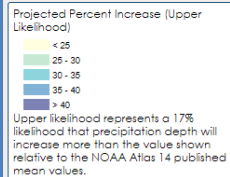
Cornell University

Select by

County
Municipal
Grid
Custom area

Click on a county on the map or select one from the dropdown list to view the precipitation data.

SOMERSET



Return Period

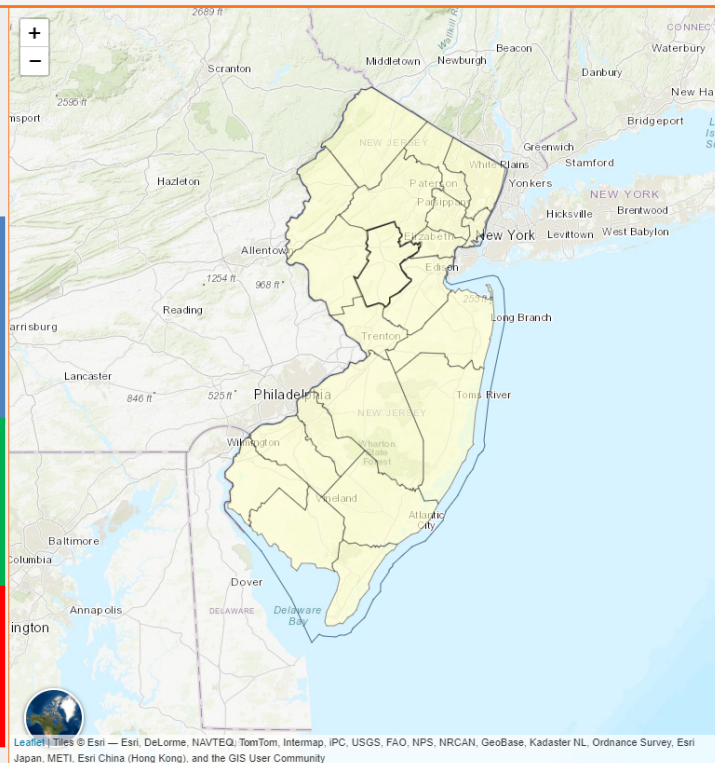
2-year
5-year
10-year
25-year
50-year
100-year

Emission Scenario

Moderate RCP 4.5
High RCP 8.5

Time Period

2020 - 2069
2050 - 2099



Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, IPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

User Guide Precipitation Projection About the Data

Background:

This site provides an interactive tool for users to identify regional and local estimates of projected changes in extreme rainfall amounts (measured in inches) within a 24-hour duration for various return periods between current estimates* and a future time period under either of two future emission scenarios.

Users can select their choice of rainfall return period, i.e., the 2-year, 10-year, 100-year storm, etc., the future greenhouse gas emission scenario determined by Representative Concentration Pathway (RCP) 4.5 or RCP 8.5, and future time period. Projections can be summarized by county, municipality, 0.1 degree grid cell, or for a custom area by drawing a polygon on the map area or uploading a GIS shapefile saved as a zip file. Projections for municipalities and custom areas are calculated based on the weighted average of projected change factors within the area that intersect 0.1 degree grid cells applied to the rainfall data from the current NOAA Atlas 14* dataset.

Return Period Options:

A storm return period is determined statistically, through a process called frequency analysis, and is used to estimate the probability that a given amount of rainfall from a precipitation event will occur. The return period is based on the probability that the given amount of rainfall will be equaled or exceeded in any given year. For example, based on historical data, it could be determined that there is a 1 in 100 (1%) chance that 8.5 inches of rain will fall in a certain area in a 24-hour period in any given year. Thus, a rainfall total of 8.5 inches in any 24-hour period is said to have a 100-year return period and may also be referred to as the 1% storm.

- 2-year Storm -- Precipitation depth (inches) associated with a 24-hour storm that has a 50% chance of occurring in any given year.
- 5-year Storm -- Precipitation depth (inches) associated with a 24-hour storm with a 20% chance of occurring in any given year.
- 10-year Storm -- Precipitation depth (inches) associated with a 24-hour storm with a 10% chance of occurring in any given year.
- 25-year Storm -- Precipitation depth (inches) associated with a 24-hour storm with a 4% chance of occurring in any given year.
- 50-year Storm -- Precipitation depth (inches) associated with a 24-hour storm with a 2% chance of occurring in any given year.
- 100-year Storm -- Precipitation depth (inches) associated with a 24-hour storm with a 1% chance of occurring in any given year.

Emission Scenario Options:

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For questions about the data, please contact NJDEP | For website related issues, please contact AECOM

RUTGERS
New Jersey Agricultural
Experiment Station



New Jersey Extreme Precipitation Projection Tool

<https://njprojectedprecipitationchanges.com/>



New Jersey Extreme Precipitation Projection Tool

Northeast Regional Climate Center

Cornell University

Select by

County

Municipal

Grid

Custom area

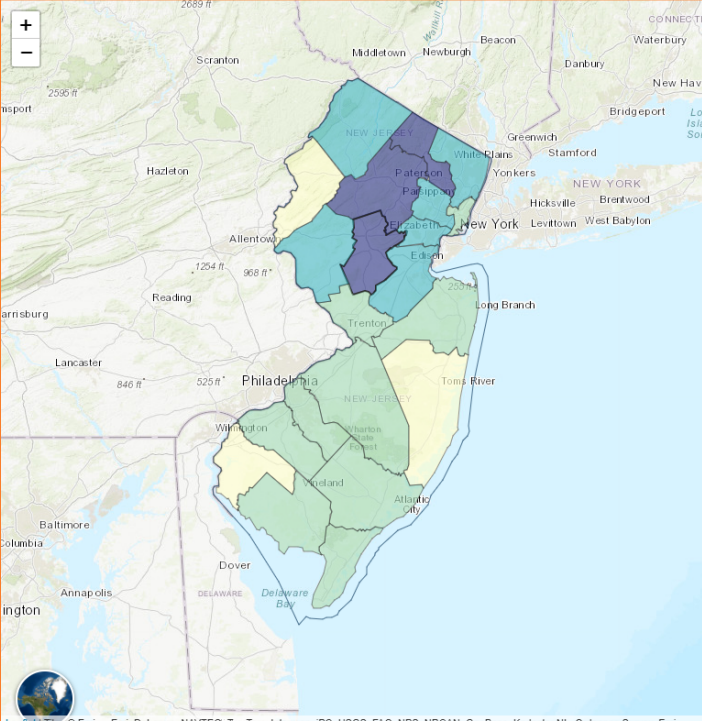
Click on a county on the map or select one from the dropdown list to view the precipitation data.

SOMERSET

Projected Percent Increase (Upper Likelihood)

- < 25
- 25 - 30
- 30 - 35
- 35 - 40
- > 40

Upper likelihood represents a 17% likelihood that precipitation depth will increase more than the value shown relative to the NOAA Atlas 14 published mean values.

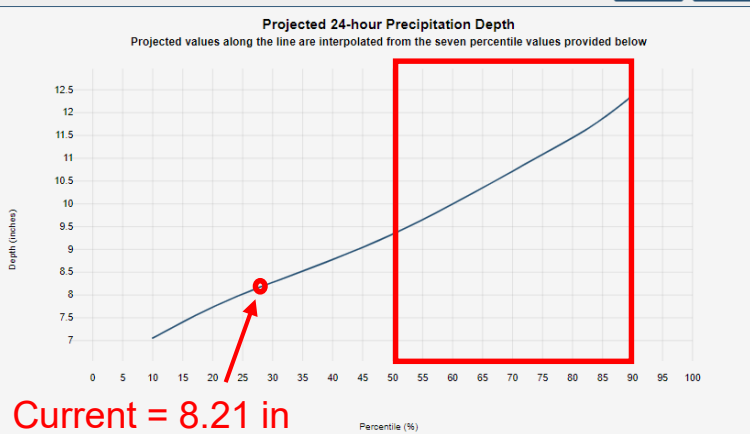


User Guide | **Precipitation Projection** | **About the Data**

100-yr Return Period RCP 4.5 Projection 2020-2069 - SOMERSET

Projected 24-hour Precipitation Depth

Projected values along the line are interpolated from the seven percentile values provided below



Current = 8.21 in

44% Higher

Duration (hrs)	Projected Depth (inches)						NOAA Atlas 14 Values (Inches, data through Dec. 2000)*			
	10th	17th	25th	Median	75th	83rd	90th	Low CI	Mean	High CI
24	7.06	7.55	8.06	9.21	11.10	11.64	12.37		8.11	

The projected precipitation data is referenced from the [Full Report](#) and [Supplemental Table](#) of the Future Precipitation Study.

*Bonnin, G.M., D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley, D., 2006. NOAA Atlas 14 Precipitation-Frequency Atlas of the United States Volume 2 Version 3.0: Delaware, District of Columbia, Illinois, Indiana, Kentucky, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, Silver Spring, Maryland: National Oceanic and Atmospheric Administration. Available online: <https://hdsc.nws.noaa.gov/hdsc/pfds/docs/NA14Vol2.pdf>

© 2022 New Jersey Department of Environmental Protection

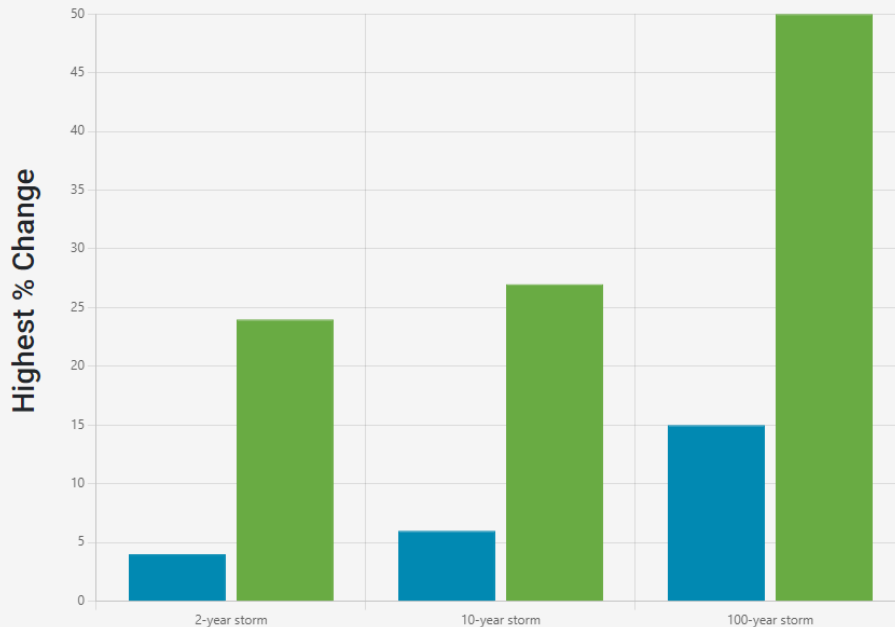
For questions about the data, please contact NJDEP | For website related issues, please contact AECOM

Underlying Science – Inland Flood Protection Rule

<https://dep.nj.gov/inland-flood-protection-rule/underlying-science/>

Highest Observed and Projected Precipitation Change

■ Observed Precipitation Change Since 1999
■ Projected Precipitation Change Under a Moderate Emissions Scenario for 2050-2099



Highest observed and projected extreme precipitation percent changes in New Jersey. For a 24-hour storm, the highest percent change of the analyzed NJ stations from 1950-1999 to 1950-2019 is displayed in blue bars for recurrence intervals (2-year, 10-year, 100-year). The green bars display the highest NJ county projected percent change at the upper likelihood for each recurrence interval under a moderate emissions scenario from 1950-1999 to 2050-2099.

More Intense Rain =
More Stormwater Runoff



More Runoff =
Increased Riverine Flow



More Flow =
Higher Flood Elevations



NJ Flood Mapper

<https://www.njfloodmapper.org/>

The screenshot displays the NJ Flood Mapper web application. The interface includes a top navigation bar with 'NJ Adapt' and 'NJFloodMapper' labels, a search icon, and buttons for 'Tour' and 'Report A Problem'. The main map area shows the New Jersey coastline and surrounding regions, with various cities and towns labeled. A blue box highlights the 'Map Layers' menu on the left side of the interface, which includes options like 'Total Water Levels Tool', 'Flood Hazards', 'Map Layers', 'New Jersey MyCoast', 'Municipal Snapshots', 'Basemaps', 'Save / Share / Print', 'Custom Layers', and 'Legend'. The 'Layer Control' panel on the right shows 'No Layers are selected'.

This is where you'll find the options to add data.

NJ Flood Mapper

<https://www.njfloodmapper.org/>

The screenshot displays the NJ Flood Mapper web application. The interface includes a navigation menu on the left with options like 'Home', 'Map Layers', and 'Legend'. The main content area features the 'Total Water Levels Tool' dialog box, which is currently open. This dialog box has a title bar with a back arrow and 'Total Water Levels Tool', and a close button. Below the title bar, there are tabs for 'Summary View', 'Tide Gauge', 'Emissions', 'Timeframe', 'SLR Estimate', and 'Flood Event'. The 'SLR Estimate' tab is selected and highlighted with a red box. The 'Total Water Level' is set to '4 Ft.' with a '+ Add' button next to it. Under 'Sea Level Estimate Selection', there are five radio button options: 8.8 ft. (Less than a 5% Chance of Exceeding), 6.3 ft. (Less than a 17% Chance of Exceeding), 3.9 ft. (Approximately a 50% Chance of Exceeding), 2.3 ft. (At least an 83% Chance of Exceeding), and 1.5 ft. (At least a 95% Chance of Exceeding). The 3.9 ft. option is selected and highlighted with a red box. To the right of these options is a 'High emissions' section with a note: 'Select a sea level rise estimate based on the level of risk tolerance for your planning project.' and a button for 'NJ Sea Level Rise Estimates Example'. The background shows a map of New Jersey with various cities labeled, including Trenton, Philadelphia, and Atlantic City. A 'Layer Control' panel is visible in the top right corner, showing 'Total Water Level (4 ft)' with an opacity slider set to 100%. The bottom of the page includes a scale bar (0 to 20 miles) and a footer with 'Powered by Esri'.

NJ Flood Mapper

<https://www.njfloodmapper.org/>

The screenshot displays the NJ Flood Mapper web application. The main map shows the state of New Jersey with a flood hazard overlay in green and blue. A 'Total Water Levels Tool' panel is open, showing 'Emissions' selected under 'Emission Scenario Selection'. A 'Layer Control' panel is also visible, showing 'Total Water Level (2 ft)' with an opacity slider at 100%.

Total Water Levels Tool

First time users, please use the interactive tool to determine your Total Water Level

Total Water Levels Tool

Customize the variables to produce a Total Water Level

Summary View | Tide Gauge | **Emissions** | Timeframe | SLR Estimate | Flood Event

Total Water Level: 2 Ft.

Emission Scenario Selection

Choose an emissions scenario based on future fossil fuel use and policy decisions.

High emissions | Moderate Emissions | Low Emissions

- **High GHG emissions** - Corresponds to a future consistent with the strong, continued growth of fossil fuel consumption.
- **Moderate GHG emissions** - Corresponds to a future consistent with current global policies.
- **Low GHG emissions** - Corresponds to a future consistent with the global goal of limiting warming to 2°C above early industrial (1850-1900) levels.

Layer Control

Show Legend | Remove All Layers

Total Water Level (2 ft) Opacity: 100%

ON OFF

0% 100%

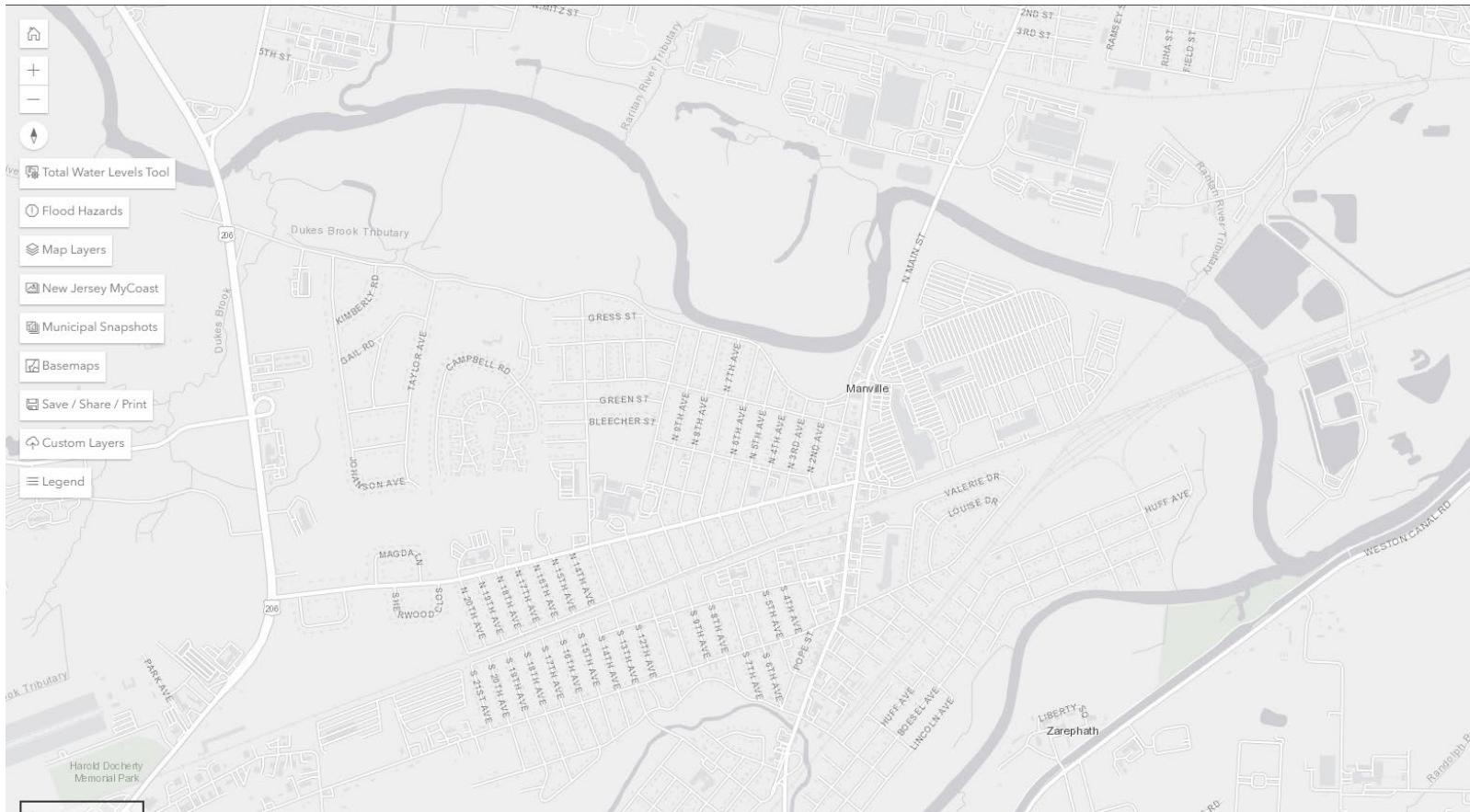
NJ Flood Mapper

<https://www.njfloodmapper.org/>

The screenshot displays the NJ Flood Mapper web application. The main map shows New Jersey with flood zones overlaid in green and blue. The interface includes a top navigation bar with 'NJ Adapt' and 'NJFloodMapper' logos, a search bar, and buttons for 'Tour' and 'Report A Problem'. On the left, there is a sidebar with navigation options like 'Home', 'Map Layers', and 'Custom Layers'. A central 'Total Water Levels Tool' panel is open, showing a 'Flood Event' tab. This panel includes a 'Total Water Level' of 8 Ft. and a 'Flood Event Height Selection' list with options: 4.8 ft above MHHW (100-year-flood), 3.3 ft above MHHW (10-year-flood), 2.4 ft above MHHW (2-year-flood), 1.6 ft above MHHW (Annual Flood), and 0.0 ft above MHHW (Permanent Inundation). A 'Historical Events' dropdown menu is set to '[10/29/2012] Hurricane Sandy'. A 'Layer Control' panel on the right shows the 'Total Water Level (8 ft)' layer is turned ON. The bottom of the page features a scale bar, map data sources (Esri, HERE, Garmin, etc.), and a 'Powered by Esri' logo.

Manville Example

<https://www.njfloormapper.org/>



Step one: Select an area of study.

You can zoom in and out using the mouse wheel.

Click and hold the left mouse button to drag the map view.

Manville Example

<https://www.njfloodmapper.org/>

The screenshot displays the NJ Flood Mapper interface. On the left, the 'Flood Hazards' panel lists several layers: Total Water Level, Sea Level Rise, SLR Mapping Confidence, HAND Inundation Levels, HAND Climate Change Flood Maps, Sandy Surge Extent, SLOSH Cat 1-4, and FEMA Flood Zones. The 'NJ Climate Adjusted Flood Elevations (CAFE)' layer is highlighted with a red box. A 'Details' button next to it is also highlighted. On the right, the 'Layer Control' panel shows the CAFE layer with an 'ON' status, a 'Remove' button, and an opacity slider set to 100%. A text box overlaid on the map states: 'You can adjust the transparency of the data, turn off the data, or remove the added data here.'

Step two: select data from the boxes on the left panel.

Note: hitting the + Details box gives additional information about the data.

Manville Example

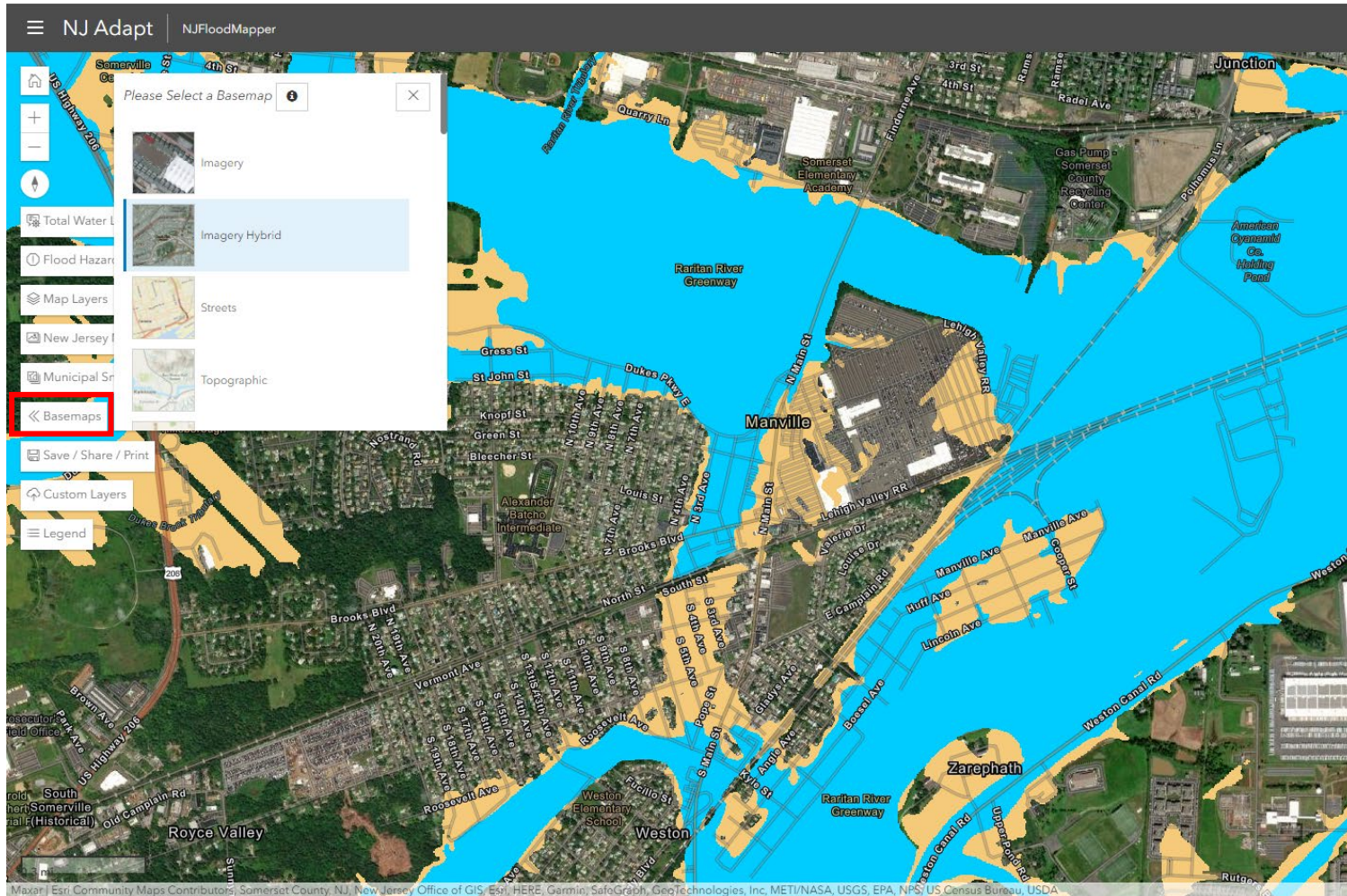
<https://www.njfloodmapper.org/>



Step three: Click the Legend on the side panel to reveal the meaning of the data.

Manville Example

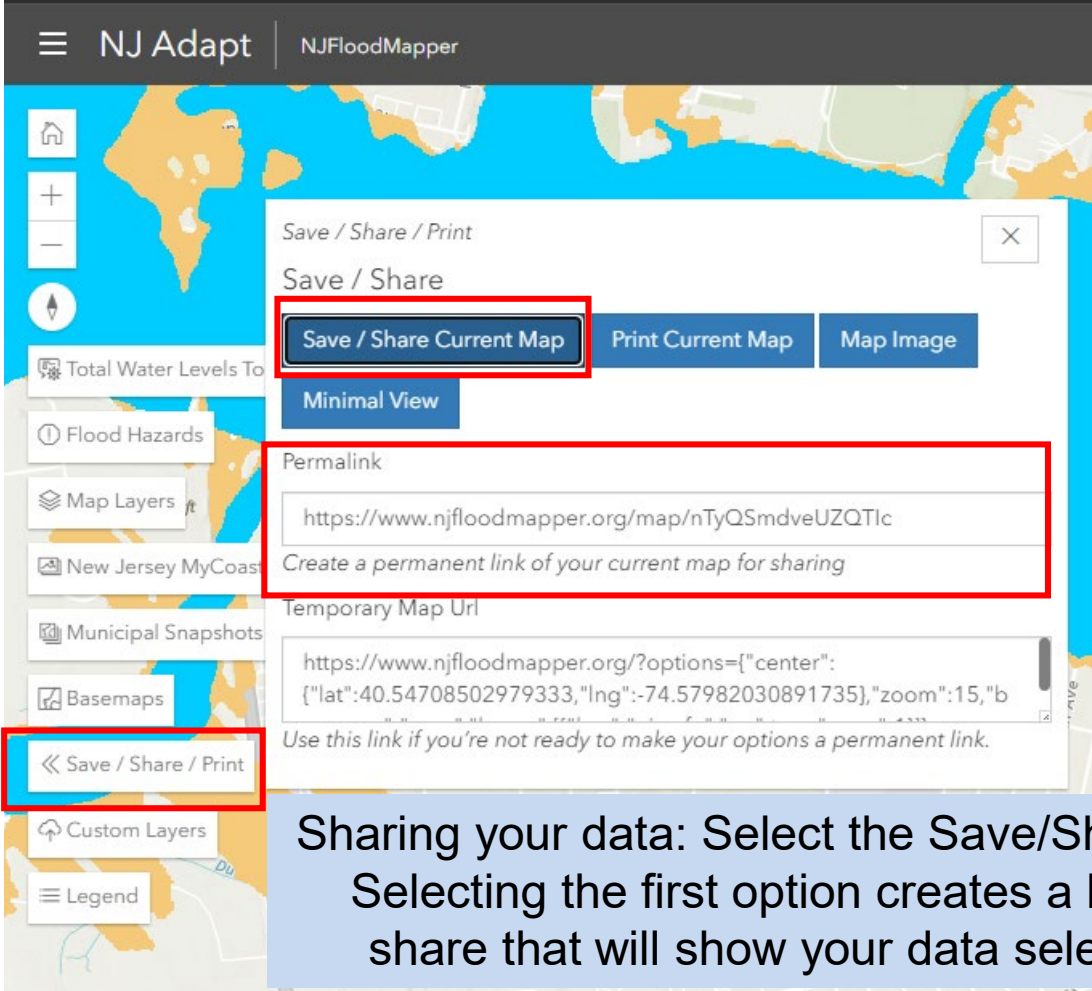
<https://www.njfloodmapper.org/>



Additional feature: Adding a Basemap.

Manville Example

<https://www.njfloodmapper.org/>



The screenshot shows the NJ Flood Mapper web application interface. The top navigation bar includes 'NJ Adapt' and 'NJFloodMapper'. A 'Save / Share / Print' menu is open, with the 'Save / Share Current Map' button highlighted by a red box. Below this menu, a 'Permalink' section is also highlighted with a red box, showing the URL: <https://www.njfloodmapper.org/map/nTyQSmdveUZQTlc>. The text below the permalink reads: 'Create a permanent link of your current map for sharing'. A 'Temporary Map Url' section is also visible, showing a longer URL: [https://www.njfloodmapper.org/?options={"center":{"lat":40.54708502979333,"lng":-74.57982030891735},"zoom":15,"b](https://www.njfloodmapper.org/?options={). The text below this URL reads: 'Use this link if you're not ready to make your options a permanent link.' The 'Save / Share / Print' button in the bottom left of the map area is also highlighted with a red box.

Sharing your data: Select the Save/Share/Print box. Selecting the first option creates a link you can share that will show your data selection/view.

Manville Example

<https://www.njfloodmapper.org/>

The screenshot displays the NJ Floodmapper web application. At the top, there is a navigation bar with a 'printMap.php' link on the left and a toolbar on the right containing a download icon, a printer icon (highlighted with a red box), and a menu icon. The main content area is divided into three sections: a sidebar on the left with a map thumbnail (labeled '1') and a legend (labeled '2'), a central map area showing a map of Manville, NJ, with flood hazard data overlaid, and a legend box at the bottom. The map shows a large body of water in blue, with flood hazard areas in orange and yellow. The legend box is titled 'Legends' and contains the following information:

Legends

CAFE 100yr

- NJ Climate Adjusted Flood Elevations (CAFE)
- FEMA 1% Annual Chance Flood Hazard + 3' ft
- FEMA 1% Annual Chance Flood Hazard
- Ocean/Bay/Major River Waters

If you select the “Print” option, it will download a view of the map with the data. It will also print the legend on a separate page. From there you can download as a PDF or send it to a printer.

Part IV: Establishing Green Infrastructure as a Method to Promote Climate Resiliency

IPCC Annual Report 6 Working Group II

- **“Green Infrastructure” is mentioned 155 times in the report.**
- “As green infrastructure is increasingly being used for stormwater absorption in cities (McPhillips et al., 2020), rain gardens, wetlands, or engineered infiltration ponds and bioswales are the nature-based solutions most likely to promote recharge, reduce evapotranspiration, and contribute to water provisioning.” — 6.3.4.5 Riverine Flood Impact Reduction (Pg. 1137)
- “Urban green infrastructure including urban gardens, can bring benefits to social cohesion, mental health and wellbeing and reduce the health impacts of heatwaves by decreasing temperatures, thus reducing inequities in exposure to heat stress for low income, marginalized groups (Hoffman et al., 2020) — 7.4.6.6 Adopting Mitigation Policies and Technologies that have Significant Health Co-benefits (Pg. 1408)

IPCC Annual Report 6 Working Group II

Diverse feasible climate responses and adaptation options exist to respond to Representative Key Risks of climate change, with varying synergies with mitigation

Multidimensional feasibility and synergies with mitigation of climate responses and adaptation options relevant in the near-term, at global scale and up to 1.5°C of global warming



IPCC Annual Report 6 Working Group II

Climate responses and adaptation options have benefits for ecosystems, ethnic groups, gender equity, low-income groups and the Sustainable Development Goals
 Relations of sectors and groups at risk (as observed) and the SDGs (relevant in the near-term, at global scale and up to 1.5°C of global warming) with climate responses and adaptation options



Footnotes: ¹ The term response is used here instead of adaptation because some responses, such as retreat, may or may not be considered to be adaptation. ² Including sustainable forest management, forest conservation and restoration, reforestation and afforestation. ³ Migration, when voluntary, safe and orderly, allows reduction of risks to climatic and non-climatic stressors. ⁴ The Sustainable Development Goals (SDGs) are integrated and indivisible, and efforts to achieve any goal in isolation may trigger synergies or trade-offs with other SDGs. ⁵ Relevant in the near-term, at global scale and up to 1.5°C of global warming.

IPCC Annual Report 6 Working Group III

Mitigation options have synergies with many Sustainable Development Goals, but some options can also have trade-offs. The synergies and trade-offs vary dependent on context and scale.



- Type of relations:
- Synergies
 - Trade-offs
 - Both synergies and trade-offs⁴
 - Blanks represent no assessment⁵
- Confidence level:
- High confidence
 - Medium confidence
 - Low confidence
- Related Sustainable Development Goals:
- 1 No poverty
 - 2 Zero hunger
 - 3 Good health and wellbeing
 - 4 Quality education
 - 5 Gender equality
 - 6 Clean water and sanitation
 - 7 Affordable and clean energy
 - 8 Decent work and economic growth
 - 9 Industry, innovation and infrastructure
 - 10 Reduced inequalities
 - 11 Sustainable cities and communities
 - 12 Responsible consumption and production
 - 13 Climate action
 - 14 Life below water
 - 15 Life on land
 - 16 Peace, justice and strong institutions
 - 17 Partnership for the goals

¹ Soil carbon management in cropland and grasslands, agroforestry, biochar

² Deforestation, loss and degradation of peatlands and coastal wetlands

³ Timber, biomass, agri feedstock

⁴ Lower of the two confidence levels has been reported

⁵ Not assessed due to limited literature

2020 CLIMATE RESILIENCE SURVEY RESULTS

Top Six Concerns regarding climate change effects as selected by participants:



1 Increasing precipitation/storms



3 Decreased water quality



5 Ocean acidification



2 Sea-level rise



4 Extreme temperatures



6 Decreased air quality

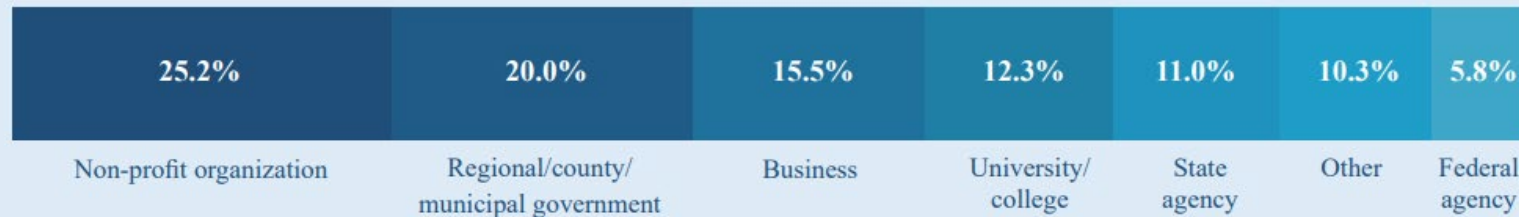
Climate Resilience Actions favored by participants to be implemented by the state:

1. Incentivize green infrastructure/nature-based solutions
2. Preserve natural lands
3. Regulate at risk buildings/development
4. Support vulnerable populations
5. Pilot innovative solutions

Coastal Resilience Strategies favored by participants to be implemented by the state:

1. Marsh restoration and migration
2. Living shorelines
3. Buyouts or managed retreat
4. Infrastructure projects
5. Beach and dune nourishment

Types of Organizations that participated:



STRATEGY 2.3: **Deploy Natural and Nature-based Solutions** **for Resilience**

ACTIONS

- 2.3.1** Create a homeowner assistance program to encourage use of nature-based shoreline stabilization statewide
- 2.3.2** Prioritize investment in green infrastructure to augment water quality protection and stormwater management, particularly in underserved communities
- 2.3.3** Deploy urban and community forestry solutions for heat mitigation, stormwater retention, beautification, and air quality benefits



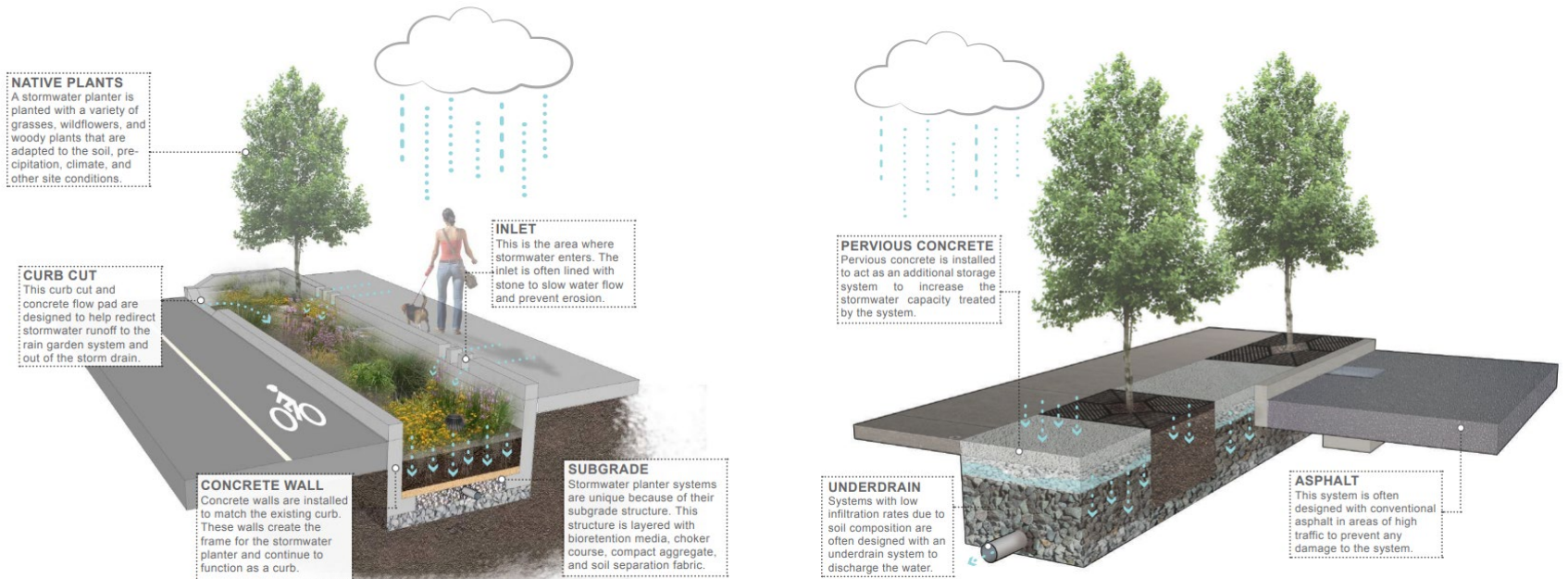
Rain Garden

Harnessing the power of nature through natural and nature-based solutions supports multiple resilience goals. Natural and nature-based solutions are resilience interventions that utilize natural ecological processes to reduce negative environmental impacts. Some common examples include trees

New Jersey Global Warming Response Act 80x50 Report

Table 7.5 Carbon Sequestration Programmatic Recommendations

Actions	Entity	Timeframe	Reference
Update the Municipal Land Use Law to encourage and facilitate green infrastructure including green streets. Prioritization should be given to infrastructure that accommodates trees.	DCA	Near-term	



New Jersey PACT

Protecting Against Climate Threats



Resilient Environments and Landscapes (REAL)

Modernizing environmental land use rules to respond to climate change by considering risks such as sea level rise and chronic flooding, and to facilitate climate resilience by supporting green infrastructure and renewable energy. To learn more about the Department's rulemaking efforts pursuant to the REAL initiative.

NJPACT REAL Webinar 12/15/2022

<https://dep.nj.gov/wp-content/uploads/njpact/docs/real-webinar-12.15.22.pdf>

RESILIENT ENVIRONMENT AND LANDSCAPES (REAL)

Primary Elements

1. **Adjust Coastal Flood Hazard Areas** to account for rising sea levels and attendant storm surge, extending jurisdictional area further inland, requiring higher first-floor elevations or floodproofing.
2. **Remedy FEMA concerns** about State's consistency with National Flood Insurance Program (NFIP) through clarifying amendments to the FHA rules.
3. **Support renewable energy** through amendments that balance habitat conservation with novel infrastructure demands (e.g., location of offshore wind support infrastructure).
4. **Encourage nature-based solutions**; sound stormwater management practices; improved water quality in degraded (urban) and source (headwaters) areas.
5. **Improve DEP permitting processes**, including pathways for expediting projects.

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NJPACT REAL Webinar 12/15/2022

<https://dep.nj.gov/wp-content/uploads/njpact/docs/real-webinar-12.15.22.pdf>

Improve Protection of Land & Water Resources

Improve stormwater management :

- Require redevelopment projects to meet same water quality standards as new development
- Promote retention of SW runoff on site
- Require all Major Developments that require a FWW approval to meet SWM rules

Improve riparian zone protections:

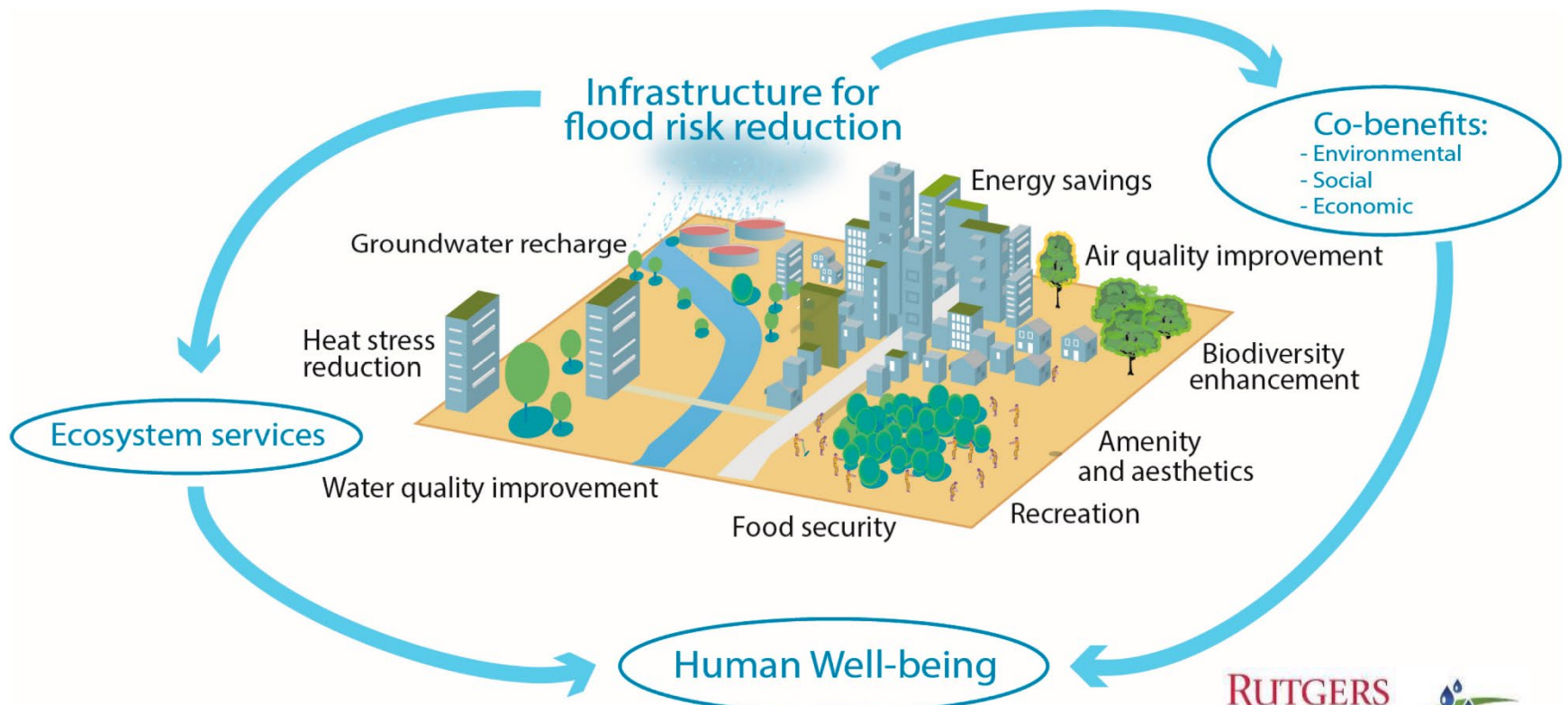
- Improve protection of headwater streams in the upper reaches of watersheds
- Place riparian zones on bay side of barrier island complexes



In Conclusion:

Green Infrastructure is frequently cited as a mitigation and adaptation strategy for addressing climate change

Well-Established Co-Benefits of Green Infrastructure:



RUTGERS

New Jersey Agricultural
Experiment Station



**So what did
we learn?**

Climate change ...
it's real, it's
happening now,
and it's affecting
New Jersey.



Climate Change in New Jersey

- More warm extremes and fewer cold extremes
- Heavy rains become more intense
- More intense dry spells
- Rising sea level with increased frequency and intensity of coastal flooding





What do we do now?

- Reduce carbon emissions
- Convert to alternative sustainable fuels (solar and wind)
- Pray
- Manage stormwater runoff more effectively using sustainable practices
- Work together – only through cooperative and collaborative partnership will be successful

Climate Change in New Jersey

- More warm extremes and fewer cold extremes
- Heavy rains become more intense
- More intense dry spells
- Rising sea level with increased frequency and intensity of coastal flooding



ENVIRONMENT

Murphy asks NJ to NJ reservoir levels little rain.











Scott Fallon
NorthJersey.com

Published 2:40 p.m. ET July 26, 2022 | Updated 7:54 a.



10 SIMPLE STEPS TO SAVE WATER THIS SUMMER

-  Water flowers and landscaping with water harvested in a rain barrel connected to a downspout. **1**
-  Use 30-50% less water with drip irrigation and micro-sprays compared to sprinklers. **2**
-  Only water when needed; in NJ most landscapes need only 1 inch of water per week. This often comes from dew and rainfall. **3**
-  If you have a pool purchase a water saving filter. **4**
-  Cover your pool when not in use to reduce evaporation rates. **5**
-  Avoid recreational toys that require a constant stream of water. **6**
-  Raise your lawnmower blade to at least 3 inches to promote deeper grass roots which hold water better. **7**
-  Use water from dehumidifiers and air conditioners to water your plants. **8**
-  Use native plants that need less water. **9**
-  Group plants together based on water needs. **10**

FOR IMMEDIATE RELEASE

August 9, 2022

NEW JERSEY ENVIRONMENTAL Murphy Administration Urges to Conserve Water to

New Jersey Commissioner of Environmental Protection **watch** as of August 9, 2022, and the Murphy Administration has urged water conservation as persistent dry and hot conditions continue.



The Commission has issued a three-stage drought watch to raise awareness and encourage voluntary conservation measures. The Commission will improve, declare a mandatory water conservation stage if conditions worsen.

conservation measures at the watch stage can be implemented during these conditions.

Summertime, means swimming pools, sprinkler jumping, and barbecues surrounding by manicured landscape. During the summer months, while water supplies are typically declining, water usage is increasing. In fact, water usage from winter to summer increases by approximately 30%. However, we can all do our part to reduce water usage by following these 10 simple tips.



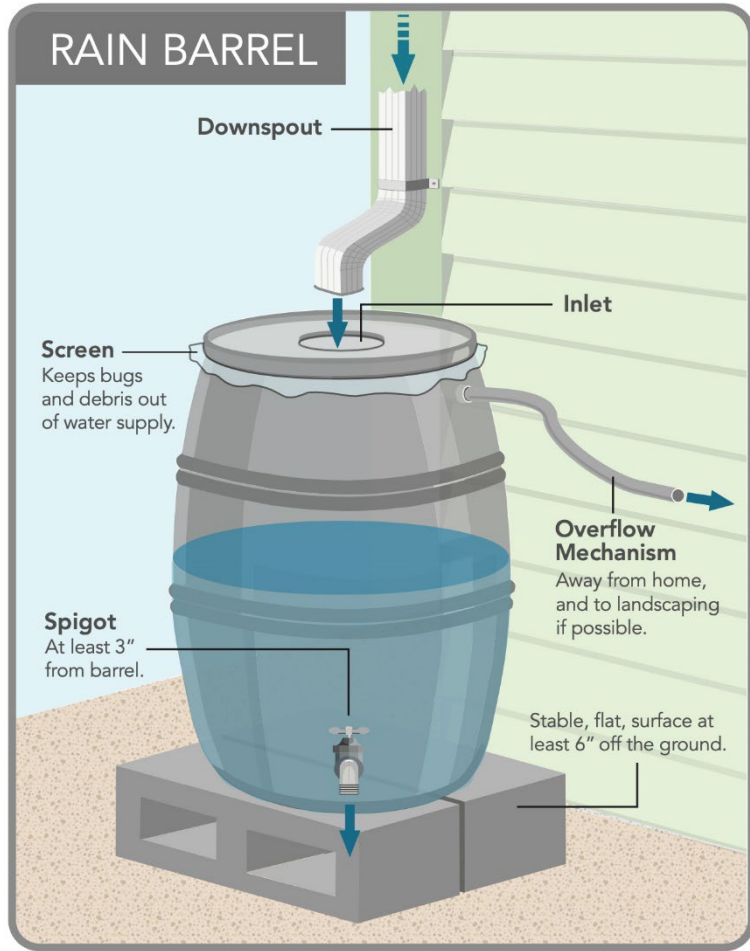
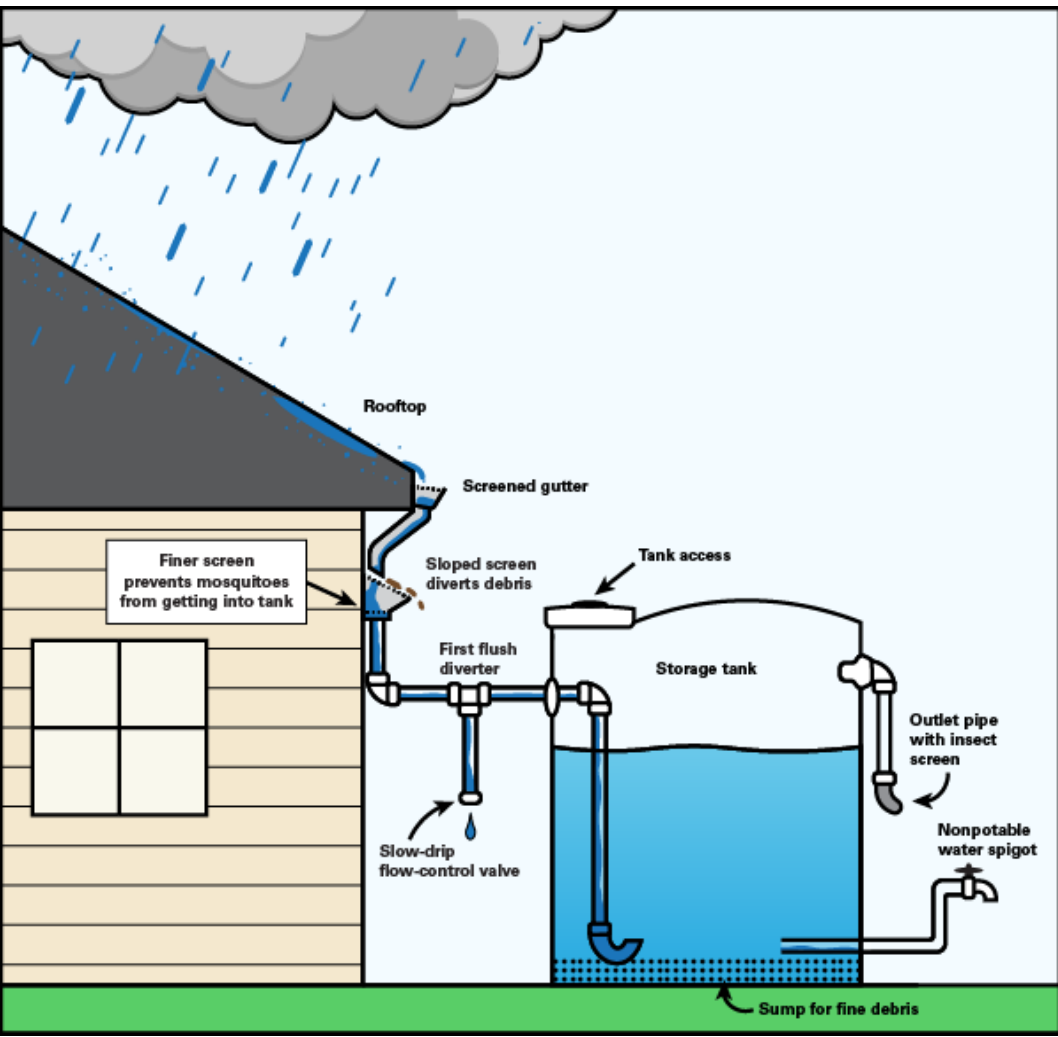


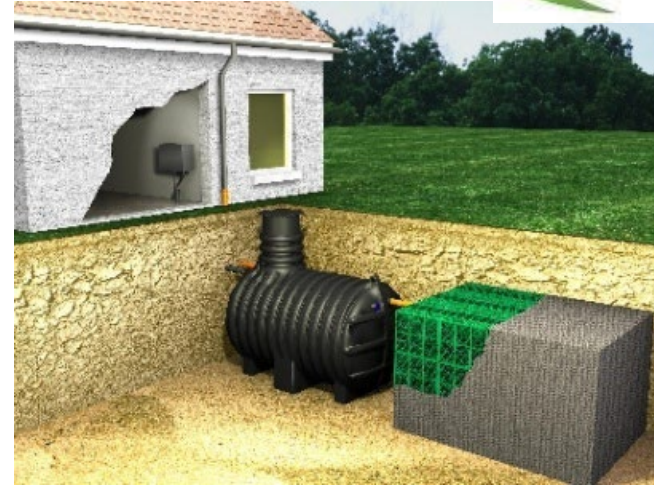
Rainwater Harvesting - Functions

- Collecting, filtering and storing water from roof tops, paved and unpaved areas for multiple uses.
- Harvested water can be used for nonpotable or potable purposes after testing and treatment.
- Surplus water after usage can be used for recharging groundwater.
- Systems can range in size from a simple PVC tank or cistern to a contractor designed and built tank/sump with water treatment facilities.



Rainwater Harvesting – Components







Sizing

- The rule of thumb is 600 gallons of water per inch of rain per thousand square feet of catchment area.
- Not all the rain that falls can actually be collected. Efficiency is usually presumed to be 75% depending on system design and capacity.





Sizing Formula

Here is the basic formula for calculating the potential amount that can be collected:

$$\text{(Catchment area)} \times \text{(inches of rain)} \times \text{(600 gallons)} \times \text{(.75)}$$

1,000 square feet



Design Example

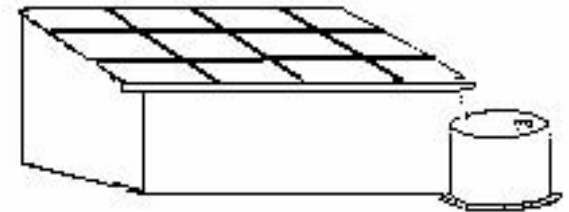
The sample roof shown below has a catchment area that is 40 feet wide and 30 feet long. Hence, it has a 1,200 square feet roof (40 feet wide x 30 feet long). Assume that it rains 2 inches. We can now plug this information into our general formula (see equation above).

Catchment Area = 1,200 square feet

Amount of Rain = 2 inches

Gallons of water collected per inch of rain per 1,000 square feet = 600 gallons

Percent Efficiency = 75% or 0.75



(1,200 square feet) x (2 inches of rain) x (600 gallons) x (.75)

----- = 1,080 gallons

1,000 square feet

First Flush Diverter or Roof Washer



The rule of thumb is one to two gallons of roof washer capacity for every 100 square feet of catchment area.



- **A one foot length of 6 inch diameter PVC pipe holds 1.5 gallons.**
- **A one foot length of 4 inch diameter PVC pipe holds 0.66 gallons.**



Construction

- The most stable place to position the cistern is against a stable wall on level ground as close to the downspout as possible.
- Gravity moves water downhill. Be sure there is available space for a downward pitch in all pipes.
- The cistern on its platform is the highest point of the garden but the lowest point of the system.
- The overflow pipe should be directed toward a rain garden not toward pathways or structures.
- The overflow pipe should flow from the cistern's highest point.
- The spigot should be at the cistern's lowest point.

Climate Change in New Jersey

- More warm extremes and fewer cold extremes
- Heavy rains become more intense
- More frequent dry spells
- Rising sea level with increased frequency and intensity of coastal flooding





Current Water Quality Design Storm:

1.25 inches of rain over two-hours

90% of New Jersey rainfall events come in storms of less than 1.25 inches of rain

Future Water Quality Design Storm: Unknown

Let's apply the "Future Precipitation Change Factors" for the 2-year storm from the proposed inland flood rule.



KNOWN: The New Jersey Water Quality Design Storm is 1.25 inches of rain over two-hours and 90% of New Jersey rainfall events come in storms of less than 1.25 inches of rain

UNKNOWN: If “heavy rains become more intense” due to climate change in New Jersey, how much will the New Jersey Water Quality Design Storm increase?

Future Precipitation Change Factors:

Current Water Quality Design Storm: 1.25 inches

Change factor for Somerset County 2-Year
Design Storm: 1.19

1.25 inches x 1.19 = 1.49 inches

Fun Fact: Rutgers WRP already designs many
of their rain gardens for a 1.5 inch storm event

And frequently, they target the current 2-year
storm event.

County	2-Year Design	10-Year Design	100-Year Design
	Storm	Storm	Storm
Atlantic	1.22	1.24	1.39
Bergen	1.20	1.23	1.37
Burlington	1.17	1.18	1.32
Camden	1.18	1.22	1.39
Cape May	1.21	1.24	1.32
Cumberland	1.20	1.21	1.39
Essex	1.19	1.22	1.33
Gloucester	1.19	1.23	1.41
Hudson	1.19	1.19	1.23
Hunterdon	1.19	1.23	1.42
Mercer	1.16	1.17	1.36
Middlesex	1.19	1.21	1.33
Monmouth	1.19	1.19	1.26
Morris	1.23	1.28	1.46
Ocean	1.18	1.19	1.24
Passaic	1.21	1.27	1.50
Salem	1.20	1.23	1.32
Somerset	1.19	1.24	1.48
Sussex	1.24	1.29	1.50
Union	1.20	1.23	1.35
Warren	1.20	1.25	1.37

Source: <https://www.nj.gov/dep/rules/proposals/proposal-20221205b.pdf>



Conservative Planning:

Rather than design for the anticipated future Water Quality Storm, we can design a garden to the current 2-year storm event.

Current Somerset County 2-year storm event:
3.3 inches over 24 hours

(this is more than double the anticipated future water quality design storm)





Parameters	Two-hour design storm	24-hour design storm
Rainfall total	1.25 inches	3.3 inches
Drainage area	1,000 sq.ft.	1,000 sq.ft.
Infiltration during the storm	None	0.5 to 1.0 in/hr
Cost basis	Surface area	Surface area

Climate Resilient Rain Garden

Drainage area = 1,000 sq.ft.

200 sq.ft.
0.0 in/hr

WATER QUALITY STORM
1.25" over 2-hr

\$2,000

260 sq.ft.
1.0 in/hr

2-YR STORM
3.3" over 24-hr

\$2,600

350 sq.ft.
0.5 in/hr

2-YR STORM
3.3" over 24-hr

Depth =
6.0 INCHES

\$3,500

NJclimate.org

Climate Resilient Rain Garden

260 sq.ft.
1.0 in/hr

2-YR STORM
3.3" over 24-hr

Depth =
6.0 INCHES



260 sq.ft.
0.5 in/hr

2-YR STORM
3.3" over 24-hr

Depth =
9.0 INCHES

\$2,600

Results

Rain Garden Surface Area (sq. ft.)	Rain Garden Depth (in.)	Rain Garden Storage Volume (cu. ft.)	Rain Garden Capacity for 2-hr Rainfall (in.)	Cost (\$)
200	6	100	1.25	2,000
260	6	130	1.56	2,600
350	6	175	2.10	3,500
260	9	195	2.34	2,600



What if we combined roadside rain gardens with street trees?











Credit: Montgomery County, MD



Climate Change in New Jersey

- More warm extremes and fewer cold extremes
- Heavy rains become more intense
- More frequent dry spells
- Rising sea level with increased frequency and intensity of coastal flooding



NEW JERSEY BACK BAYS COASTAL STORM RISK MANAGEMENT INTERIM FEASIBILITY STUDY AND ENVIRONMENTAL SCOPING DOCUMENT

1 March 2019



U.S. Army Corps
of Engineers
Philadelphia District



NJDEP

Examples of Measures Under Consideration

Structural Measures

- Inlet Storm Surge Barriers
- Interior Bay Closures
- Raised Roads and Rails
- Levees
- Floodwalls (Permanent)
- Deployable Floodwalls
- Crown Walls
- Beach Restoration/Groins/Breakwaters
- Bulkheads
- Seawalls
- Revetments
- Stormwater System Drainage Improvements

Natural and Nature-Based Features

- Living Shorelines
- Reefs
- Wetland Restoration
- Submerged Aquatic Vegetation (SAV) Restoration
- **Green Stormwater Management**



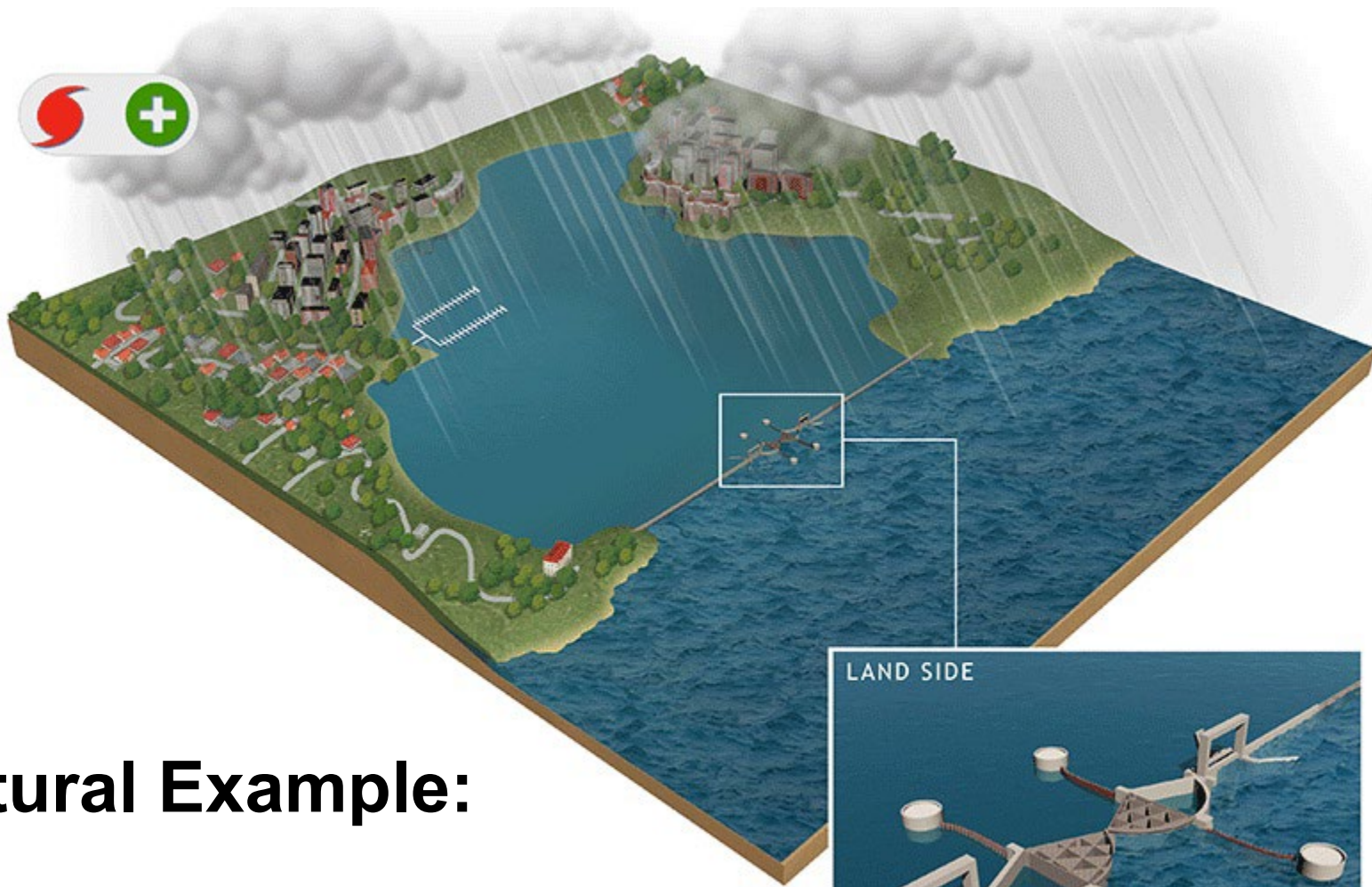
STRATEGY 6.4:
Manage Shoreline Stabilization with Nature-based Features



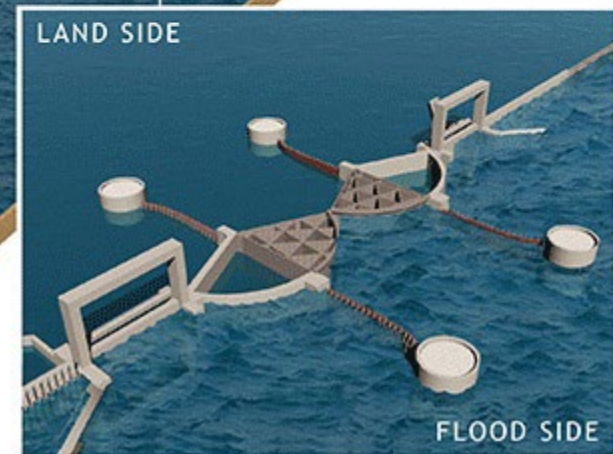
“Recognizing the adverse impacts of hard structures, in recent years New Jersey has promoted natural and nature-based solutions for shoreline stabilization that both protect upland structures and provide ecological benefits”

Living Shoreline, Brigantine, NJ

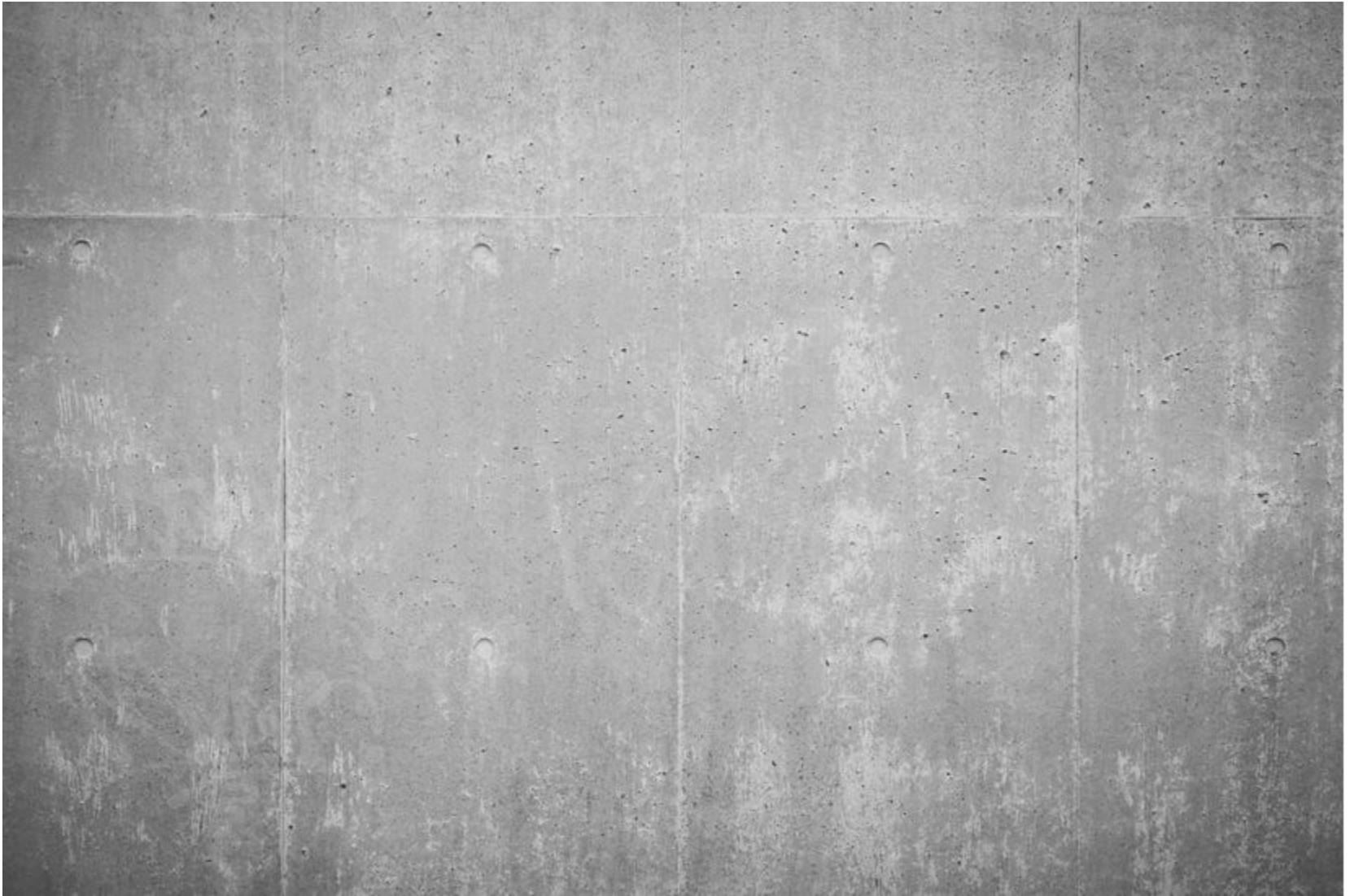
<https://www.nj.gov/dep/climatechange/docs/nj-climate-resilience-strategy-2021.pdf#page=78>

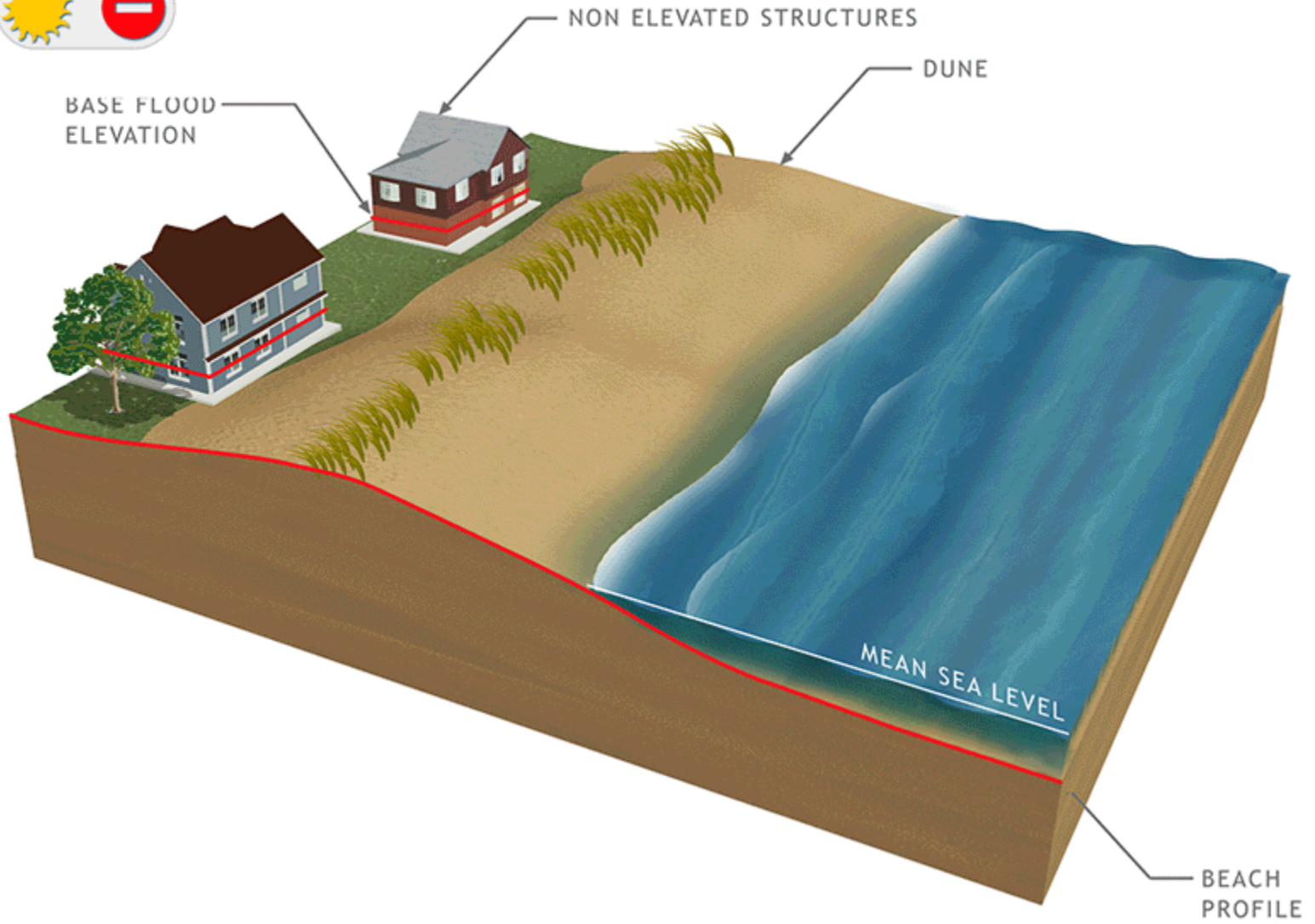


Structural Example:

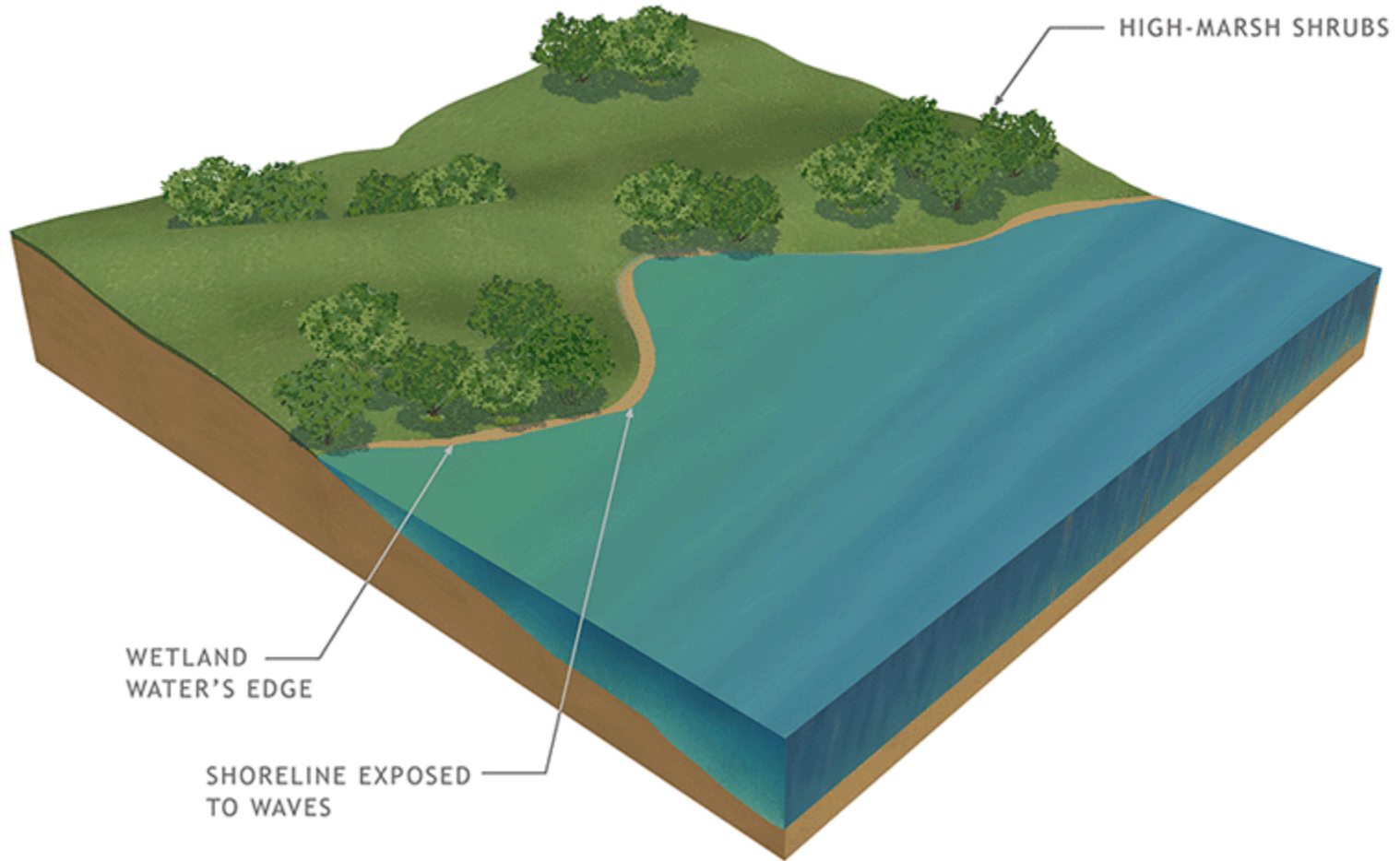


Structural Example:





Nature-Based Example:









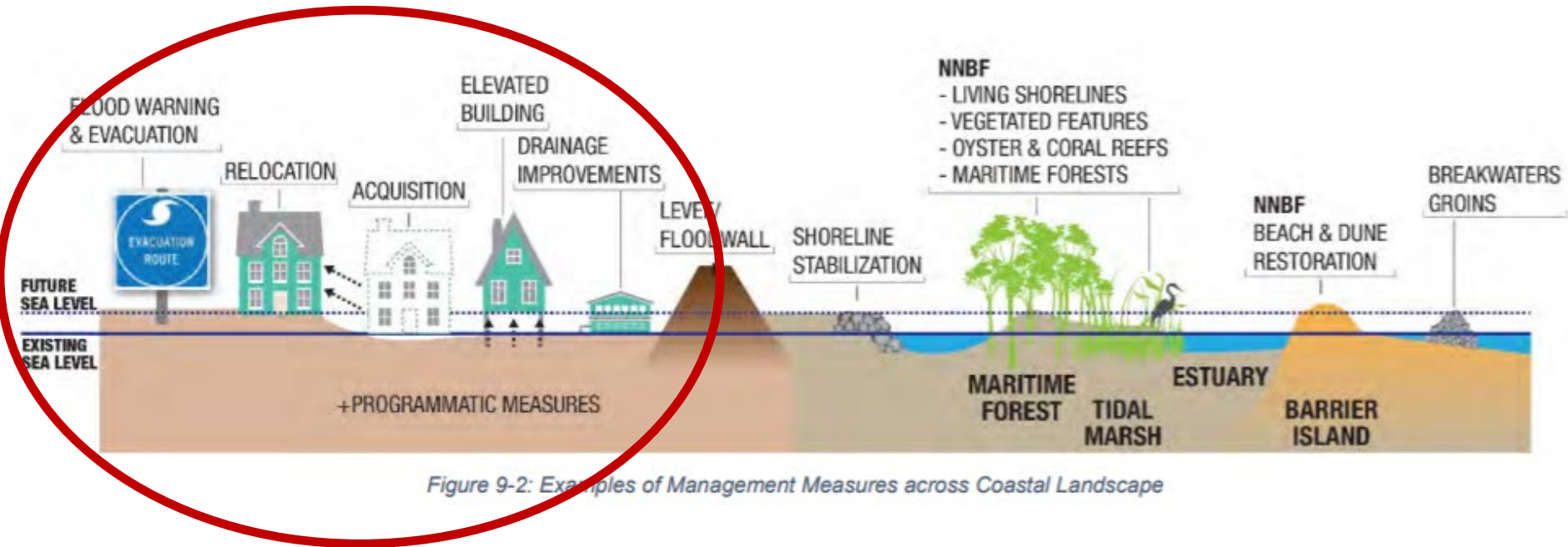
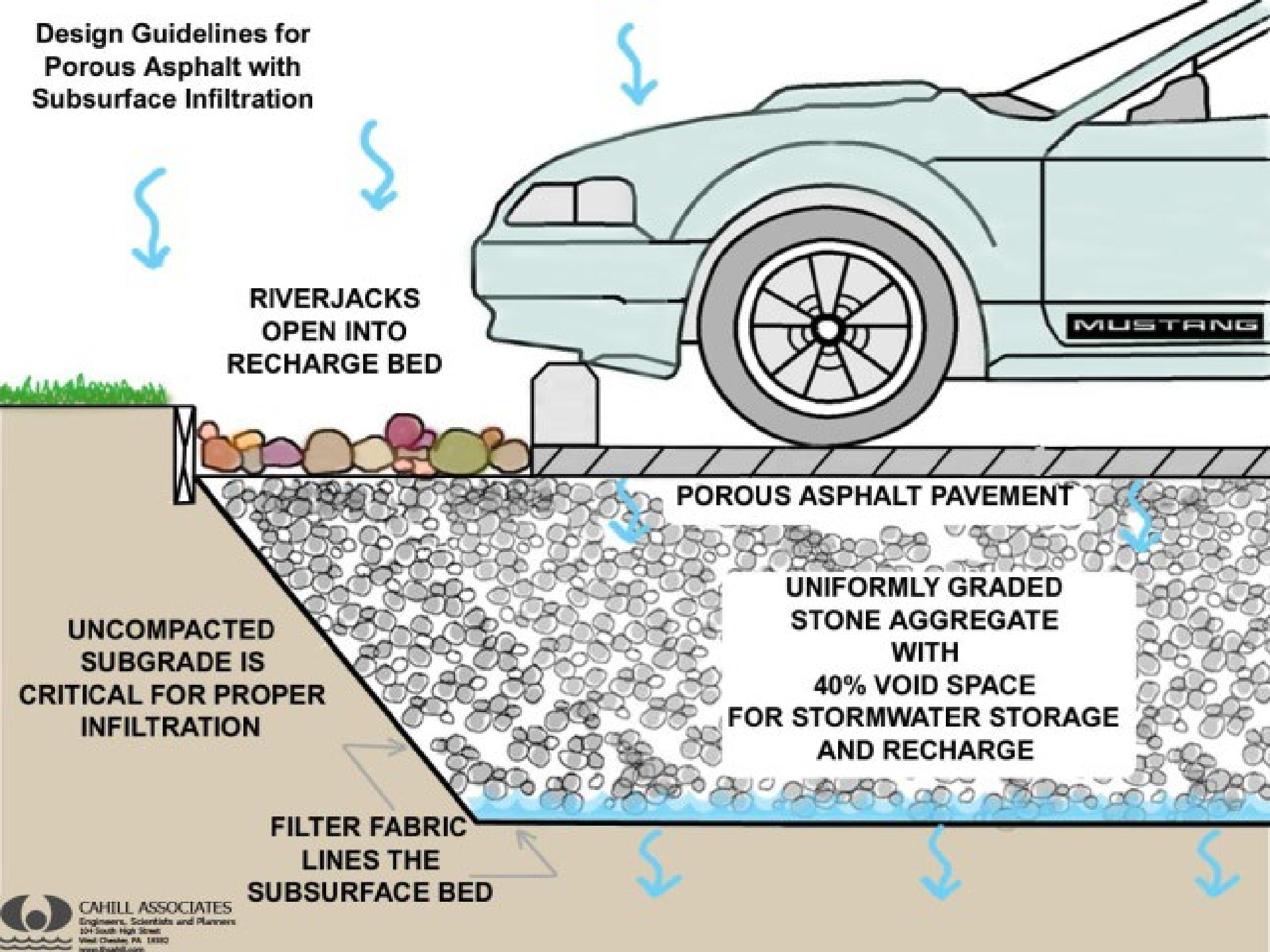


Figure 9-2: Examples of Management Measures across Coastal Landscape

Design Guidelines for Porous Asphalt with Subsurface Infiltration



**RIVERJACKS
OPEN INTO
RECHARGE BED**

POROUS ASPHALT PAVEMENT

**UNIFORMLY GRADED
STONE AGGREGATE
WITH
40% VOID SPACE
FOR STORMWATER STORAGE
AND RECHARGE**

**UNCOMPACTED
SUBGRADE IS
CRITICAL FOR PROPER
INFILTRATION**

**FILTER FABRIC
LINES THE
SUBSURFACE BED**

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OF NEW JERSEY



WE ARE DONE!

Congratulations!

Christopher C. Obropta, Ph.D., P.E.
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Rutgers Cooperative Extension

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www.water.rutgers.edu

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Save the Date!

**SATURDAY
MAY 20**

SEASIDE PARK

*Island Beach
State Park*

**SUNDAY
MAY 21**

SANDY HOOK

*NJSQC
Headquarters*

**11AM - 3PM, BOTH DAYS RAIN OR SHINE
FREE ADMISSION**

**LEARN ABOUT MARINE LIFE, ENERGY CONSERVATION AND WHAT
YOU CAN DO TO CARE FOR OUR COASTLINE**

Presented by New Jersey Natural Gas,
New Jersey Sea Grant Consortium,
Gateway National Park Service,
Asbury Park Press, NOAA and
NJDEP Division of Parks and Forestry

<https://oceanfundays.org>

Green Infrastructure Champion Continuing Education Opportunities

- September 14, 2023 from noon to 1 pm: Pocket Wetlands for Homeowners (Dr. Roy Messaros)
- September 28, 2023 from noon to 1 pm: Native Plants for Green Infrastructure Projects (Susan Tarr)
- October 12, 2023 from noon to 1 pm: Floating Wetlands Island: Community-Based Crandon Lake Restoration Project (Nathaniel Sajdak)
- October 19, 2023 from noon to 1 pm: Living Shorelines for New Jersey (Dr. Thomas Herrington)

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THE STATE UNIVERSITY
OF NEW JERSEY

NJ CLIMATE CHANGE RESOURCE CENTER

New Jersey Climate Change Research Symposium 2023



Event date: June 2, 2023

Cook Student Center, Rutgers University, New Brunswick, N.J.

[Register Now](#)

Join the NJ Climate Change Resource Center for a symposium presenting the latest natural and social science, economics, engineering, legal, and policy research related to understanding, assessing, evaluating, and responding to climate change in New Jersey.

The symposium will feature posters, panel sessions, and presentations by faculty, students, and staff of research institutions, public agencies, NGOs, and others engaged in climate change research in New Jersey.

Learn more and register at: njclimateresourcecenter.rutgers.edu/symposium-2023-welcome or scan the QR code below.



AGENDA AT A GLANCE

8:30AM Check-in / Light breakfast / Welcome

9:30AM Concurrent Sessions A

- A1 Panel: Climate Impacts on Agriculture and Renewable Energy in NJ
- A2 Oral Presentations: Coastal Climate Change Resource and Infrastructure Impacts and Local Response
- A3 Panel: Scholarship, Climate Action, and the Role of Universities

11:00AM Concurrent Sessions B

- B1 Panel: Usable Climate Science for NJ Communities
- B2 Oral Presentations: Citizen and Community Assessment, Policy, and Responses to Climate Change
- B3 Oral Presentations: Changes to Tropical Storms and Wave Climatologies along the NJ Coast

12:15PM Lunch

1:15PM Concurrent Sessions C

- C1 Panel: NJDEP's Approach to Climate Change Science and Policy
- C2 Panel: MACH-Integrating Real-World Climate Adaptation Decision Needs with Cutting Edge Climate Science
- C3 Oral Presentations: Emerging Approaches for Assessing Climate Change and Climate-Mediated Impacts

2:45-4PM Poster Session and Reception



<https://njclimateresourcecenter.rutgers.edu/symposium-2023-welcome/>