TETRA TECH

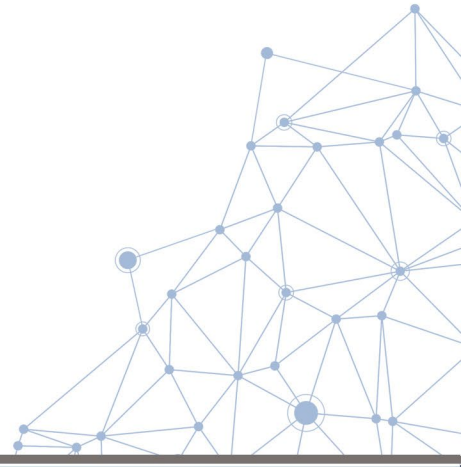
Planning Together for a Resilient Putnam County

2020 County Hazard Mitigation Plan

Steering Committee Meeting - Risk Assessment Review
July 27, 2020

Agenda

1. Opening Remarks
2. **Project Status** - where we are in the process, public outreach
3. Risk Assessment Overview
4. Risk Ranking
5. Strengths, Weaknesses, Obstacles and Opportunities Exercise
6. Next Steps
7. Adjournment



Progress Update

Municipality	LOIP Received	Status
Putnam County		Annex meeting held; in progress
Brewster (V)		Annex update underway- substantially completed
Carmel (T)	X	Annex update underway- substantially completed
Cold Spring (V)		Meeting pending
Kent (T)		Meeting pending
Nelsonville (V)		Annex update underway- substantially completed
Patterson (T)	X	Annex update underway- substantially completed
Philipstown (T)	X	Meeting pending
Putnam Valley (T)	X	Annex update underway- substantially completed
Southeast (T)	X	Annex update underway- substantially completed

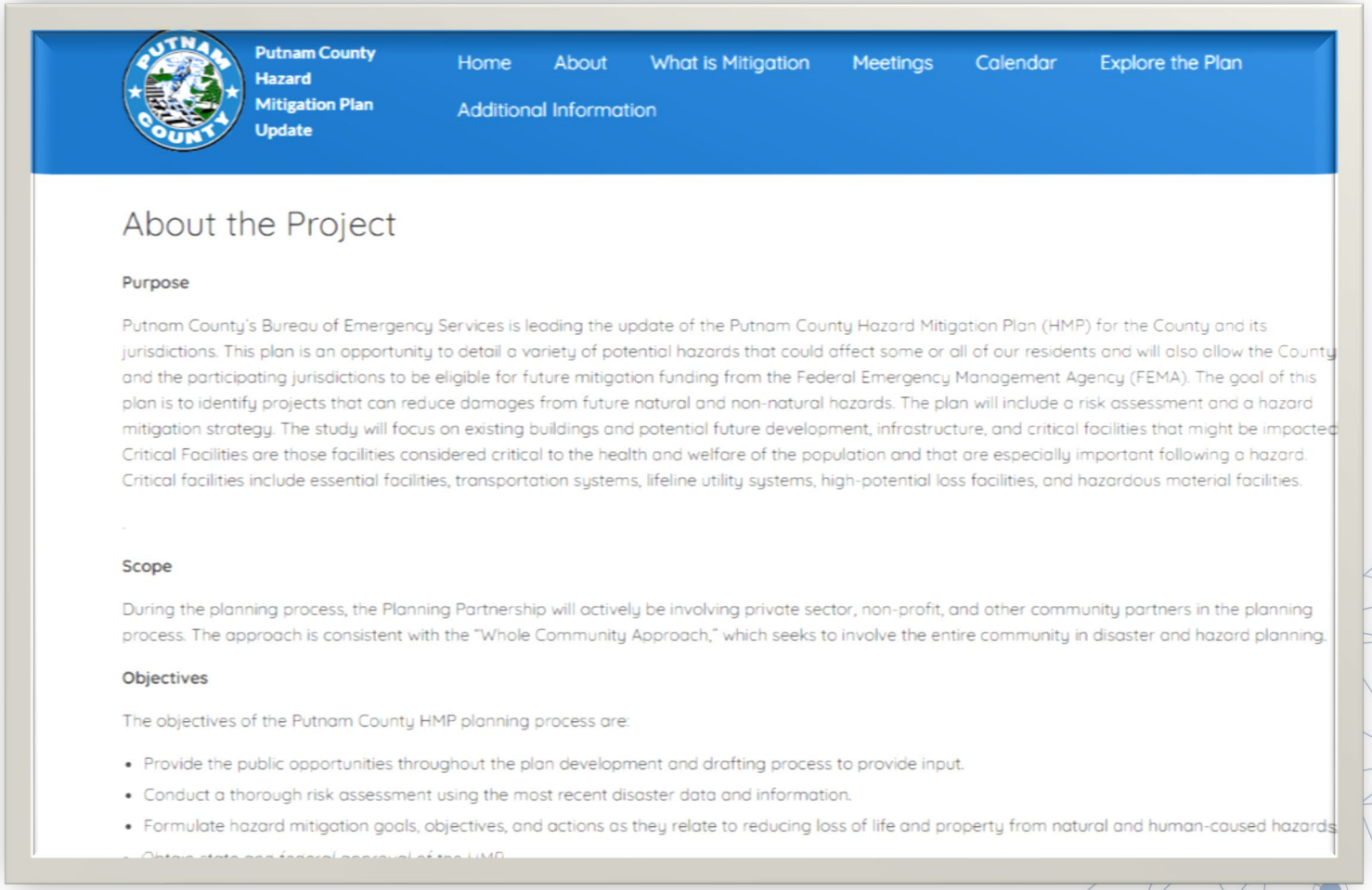
Schedule

Task	Date
Data Collection	Complete
Update Hazard Profiles	Complete
Risk Assessment	Complete
Risk Results Presentation	July 29, 2020
Mitigation Strategy Workshop	August 26, 2020
Review Draft Plan	October 21, 2020
Submit to NYSDHSES	November 18, 2020
Submit to FEMA	TBD

ACTION! Take and Distribute the Citizen Survey!

- Ready to go – here is the link – post on your municipal websites
- https://www.surveymonkey.com/r/PutnamHMP2020

- HMP Website available here: https://www.putnamcountynyhmp.com



Hazards of Concern

- Drought
- Earthquake
- Extreme Temperature
- Flood
- Harmful Algal Bloom
- Disease Outbreak
- Severe Storm
- Severe Winter Storm
- Wildfire

SEVERE STORMS

NYS HMP Reports $2.43M in wind damages

$106,000 annually

$74.2 Million

Potential Losses in Building Stock in 500-year MRP Windstorm

0.27% of total County GBS

Total Storms (1950-2019)	203
Thunderstorm	122
Hail	31
Heavy Rain	16

Recent Impacts

0 Disaster Declarations since Hurricane Sandy (2012)

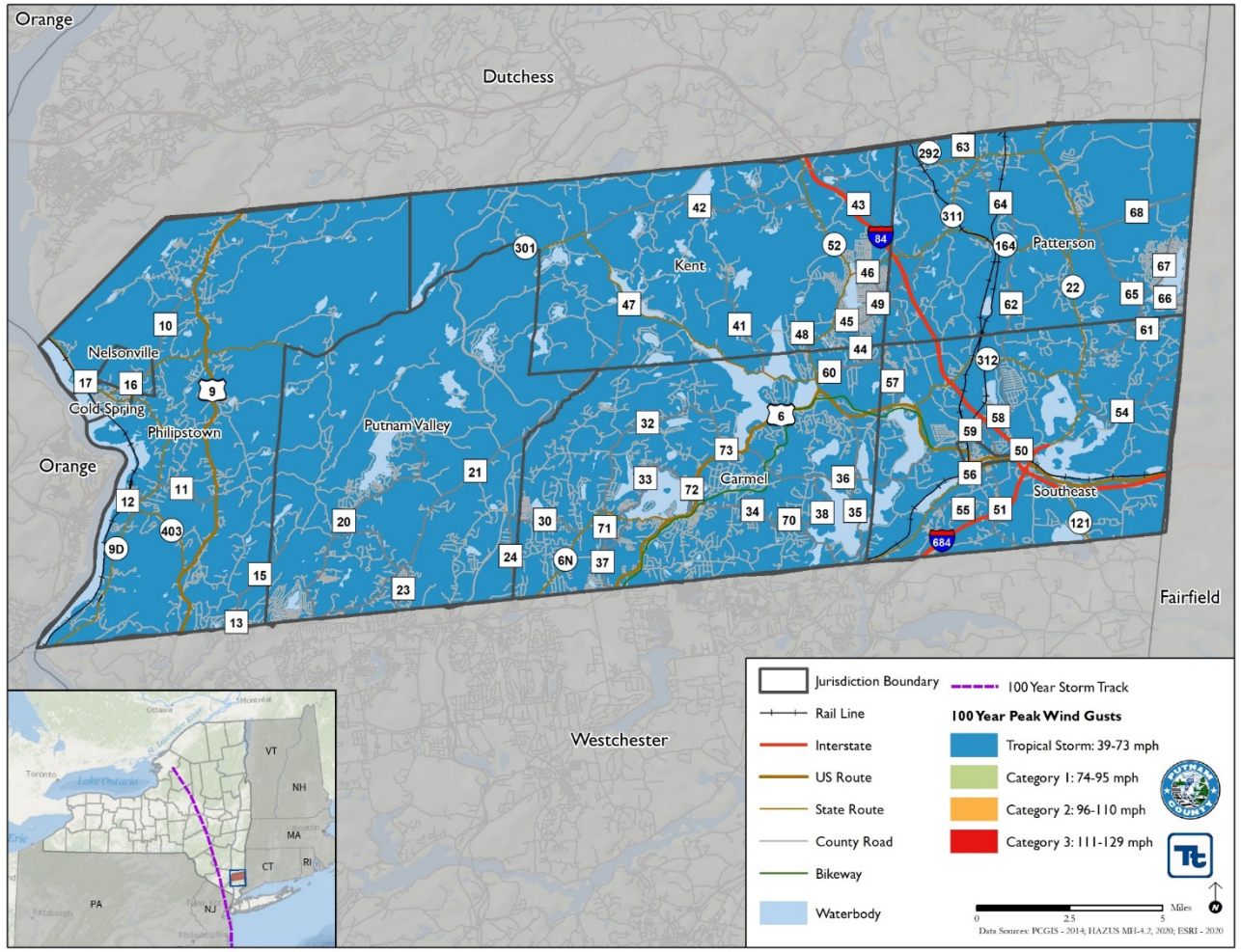
Severe Storms Includes...

Windstorms, thunderstorms, hurricanes and tropical storms, Nor'easters, hail and tornadoes

Estimated Exposure for Severe Storms

Hazard Type	Number of Occurrences Between 1950 and 2019	Rate of Occurrence	Recurrence Interval (in years)	Probability of event Occurring in Any Given Year	% Chance of Occurring in Any Given Year
Funnel Cloud	2	0.0	35.0	0.0	2.9
Hail	31	0.4	2.3	0.4	44.3
Heavy Rain	16	0.2	4.4	0.2	22.9
High Wind*	14	0.2	5.0	0.2	20.0
Hurricane**	0	0.0	N/A	N/A	N/A
Lightning	6	0.1	11.7	0.1	8.6
Strong Wind	5	0.1	14.0	0.1	7.1
Thunderstorm Wind	122	1.8	0.6	1.7	100
Tornado	6	0.1	11.7	0.1	8.6
Tropical Depression**	0	0.0	N/A	N/A	N/A
Tropical Storm***	1	0.0	70.0	0.0	1.4
TOTAL	203	2.9	0.3	2.9	100.0

Estimated Exposure for 100-Year Peak Wind Gusts



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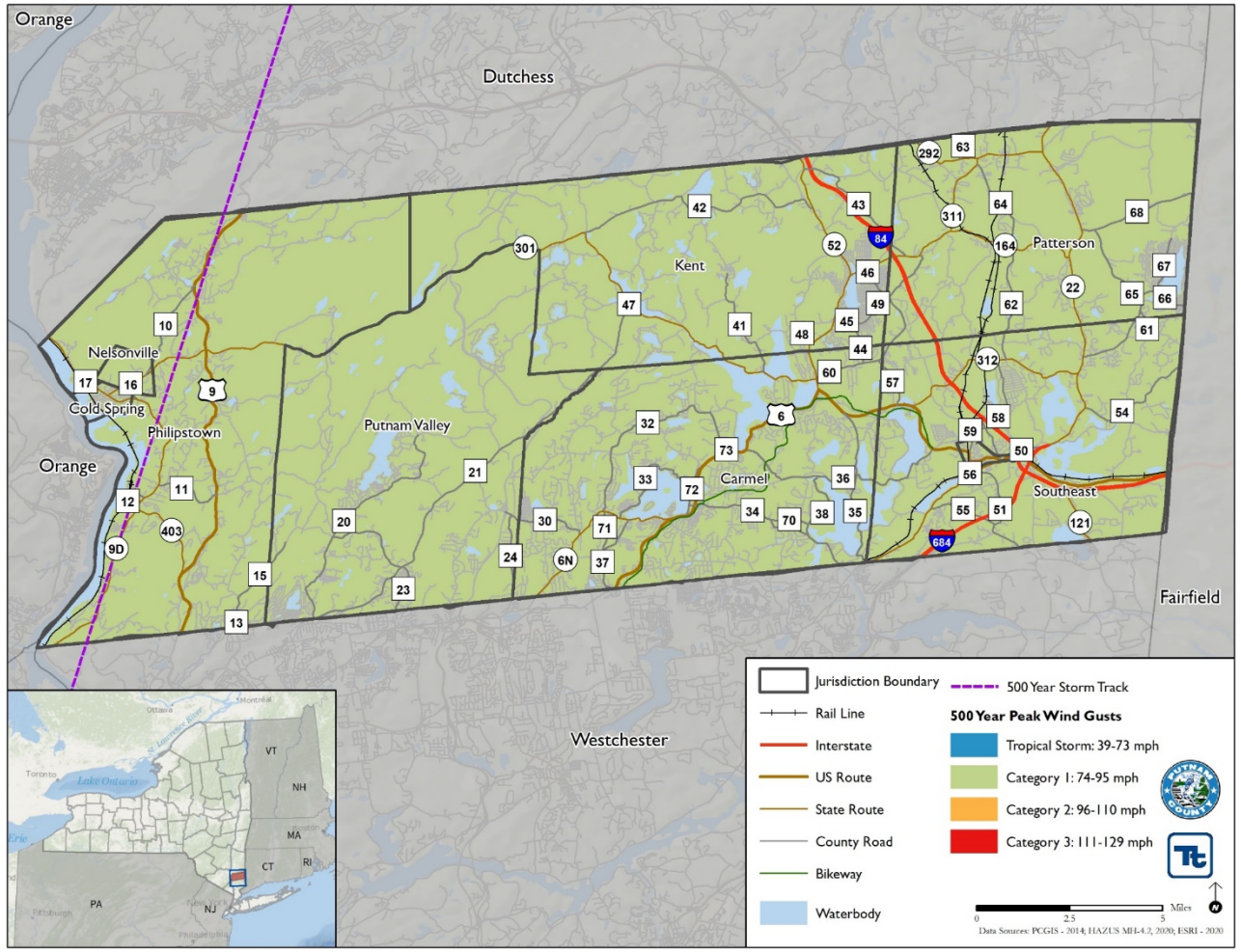
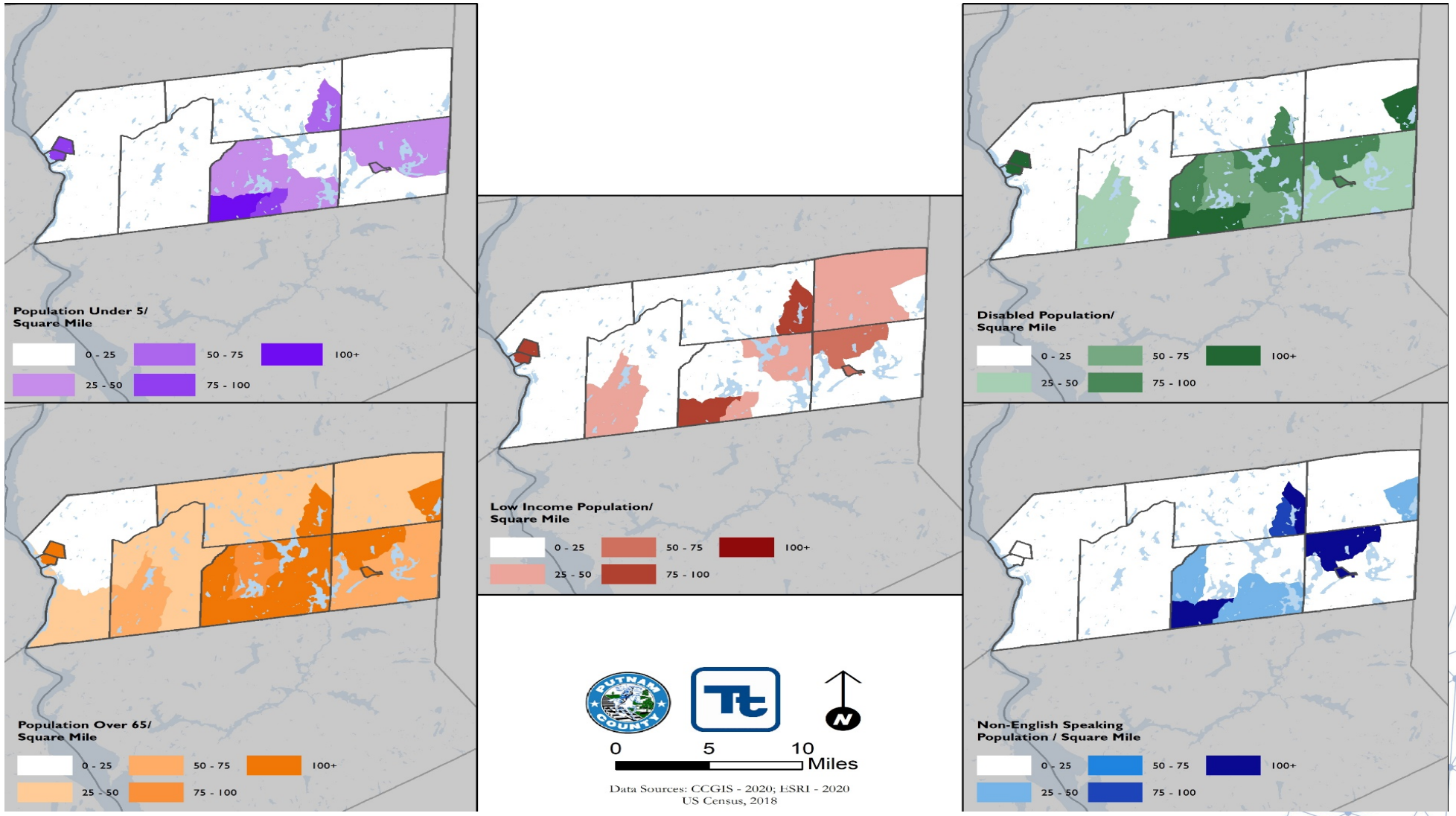


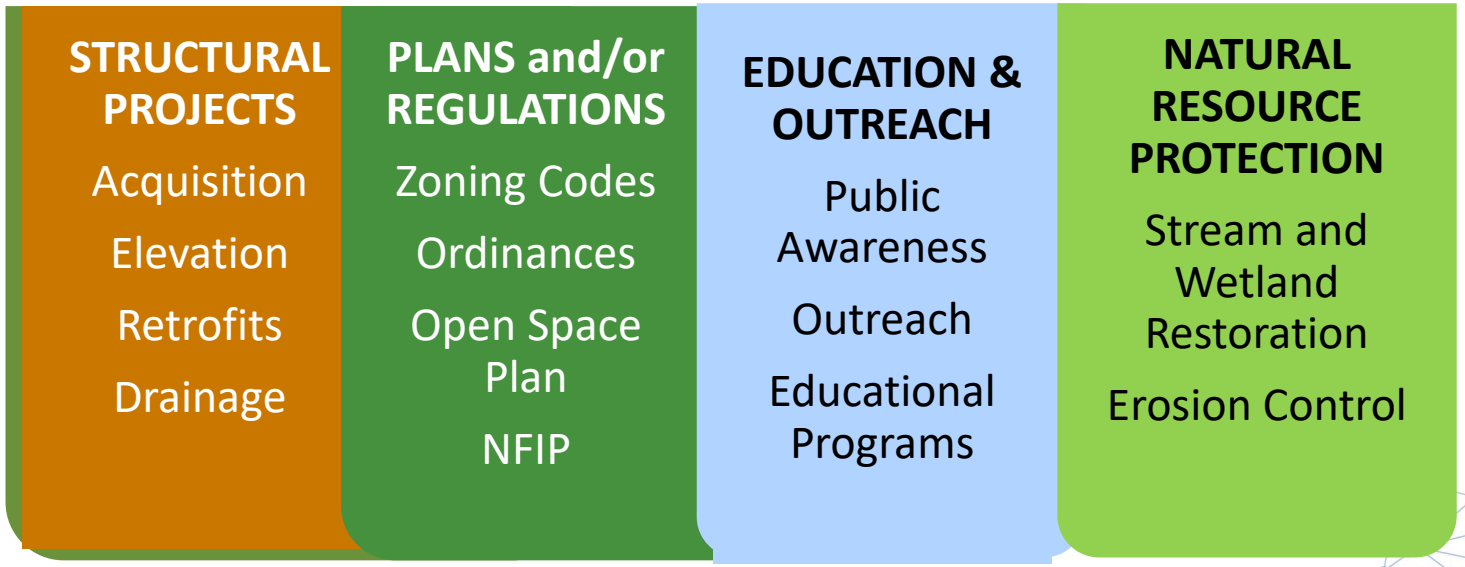
Vulnerable Populations



SWOO – Severe Storms

- Strengths
  - High response capability
- Weaknesses
  - Increasingly frequent occurrences
- Obstacles
  - Strained resources
- Opportunities
  - Infrastructure hardening

- Consider SWOO's in these areas:



SEVERE WINTER STORMS

79

Occurrences
(1996 – 2019)

$261,000

Annual Losses

$1.3 Billion

Potential Economic Damage

49

Heavy Snow Events
(1996 – 2019)

Risk for Putnam County

High

Estimated Exposure for Severe Winter Storms

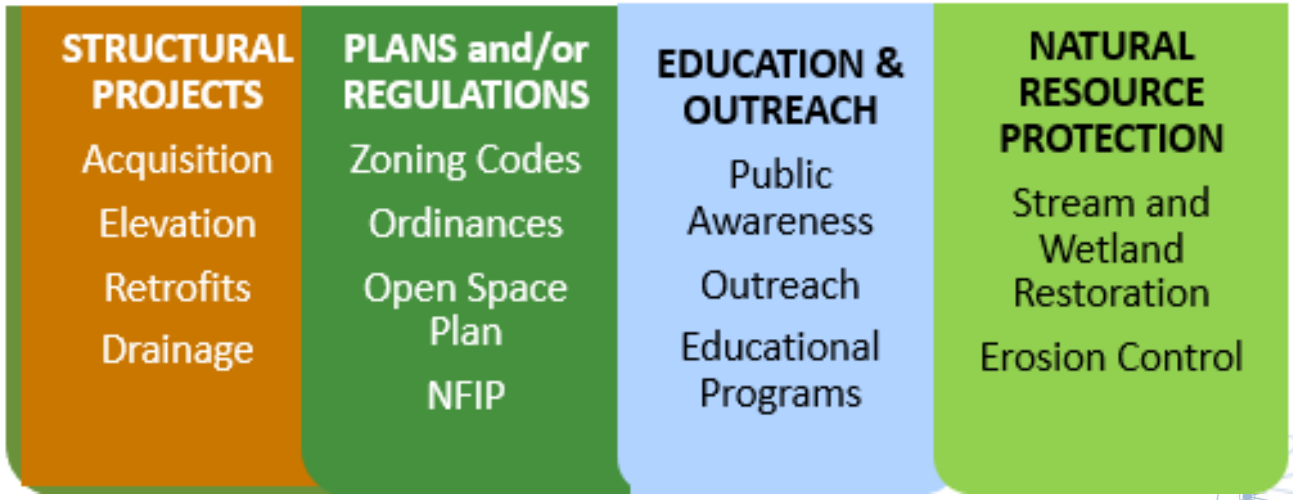
- The entirety of Putnam County is exposed to this hazard irrespective of geographic location.

Hazard Type*	Number of Occurrences Between 1996 and 2019	Rate of Occurrence	Recurrence Interval (in years)	Probability of event Occurring in Any Given Year	% Chance of Occurring in Any Given Year
Blizzard	0	0.0	N/A	N/A	N/A
Heavy Snow	49	2.1	0.5	2.0	100
Ice Storm	5	0.2	4.8	0.2	20.8
Lake Effect Snow	2	0.1	12.0	0.1	8.3
Sleet	0	0.0	N/A	N/A	N/A
Winter Storm	18	0.8	1.3	0.8	75.0
Winter Weather	5	0.2	4.8	0.2	20.8
TOTAL	79	3.4	0.3	3.3	100

SWOO – Severe Winter Storms

- Strengths
  - High response capability
- Weaknesses
  - Increasingly frequent occurren
- Obstacles
  - Strained resources
- Opportunities
  - Infrastructure hardening

- Consider SWOO's in these areas:



WILDFIRE

Population that lives in the Wildland-Urban Interface (WUI)

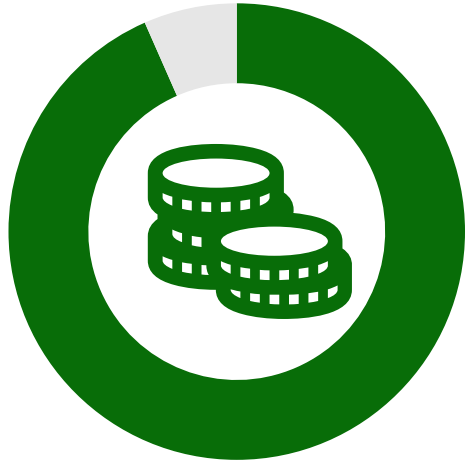
97%

96,096 people

Buildings within the Wildland-Urban Interface (WUI)

96.5%

30,241 buildings

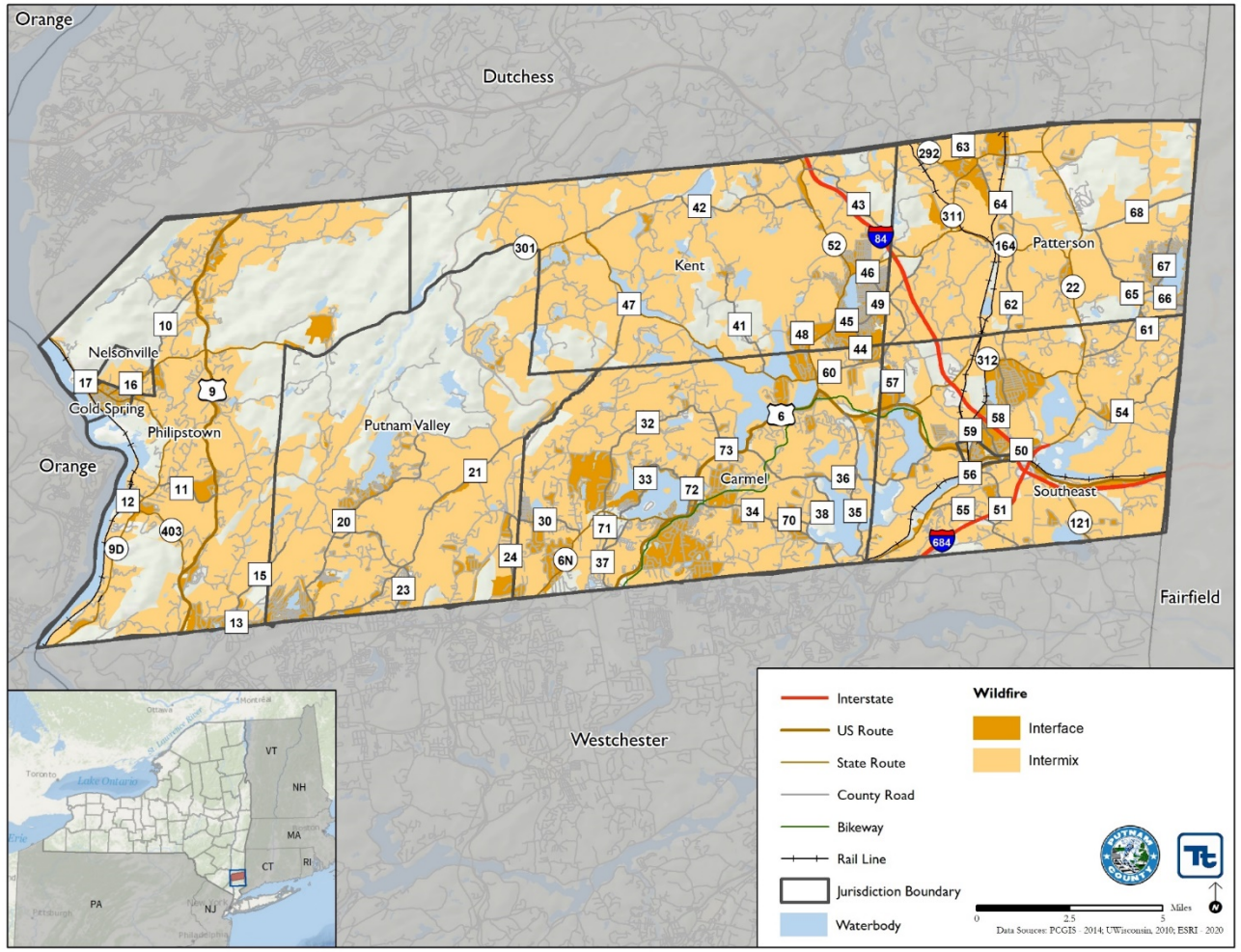


Percent of Replacement Cost Value (RCV) Exposed to wildfires

93.4%

$25.7 Billion

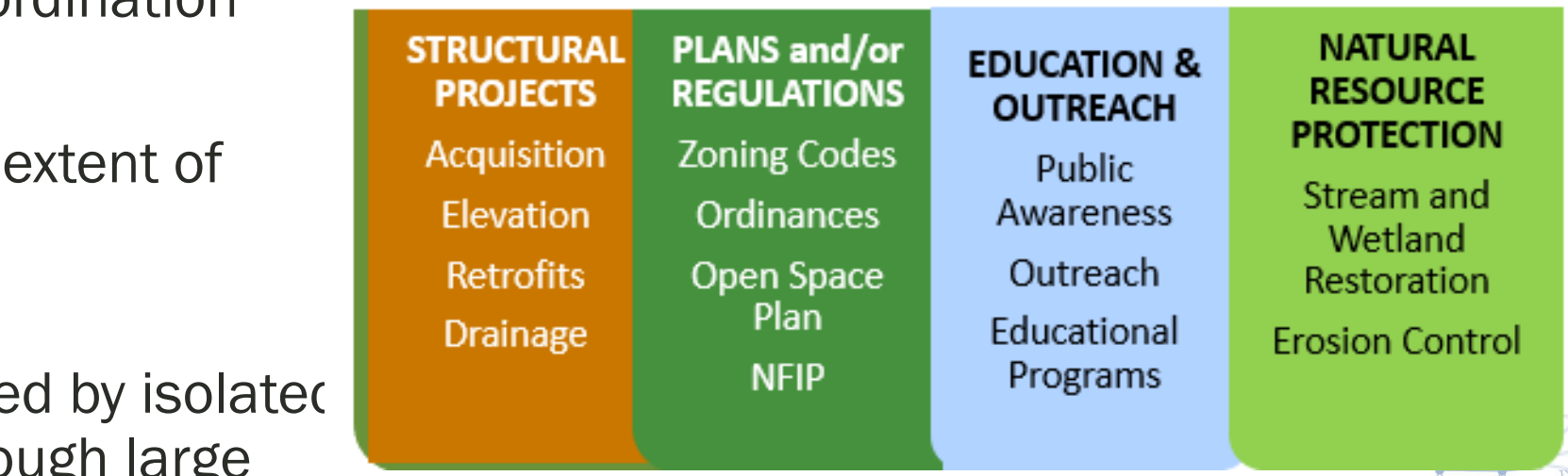
Wildfire Exposure



SWOO – Wildfire

- Strengths
  - Ability to fight smaller brushfires
  - Multi-jurisdictional coordination
- Weaknesses
  - High vulnerability and extent of forests
- Obstacles
  - Communities connected by isolated roadways that pass through large stands of forest
- Opportunities
  - Land use practices for WUI

- Consider SWOO's in these areas:



DROUGHT

96.5%

Percent of Building Stock Impacted

30,241

Buildings within the Wildland-Urban Interface (WUI)

High

Climate Change Impacts

7

Disaster Declarations (2014 – March 2020)

Putnam County has experienced abnormally dry periods at least annually since 2015.

A drought period beginning in May 2015 lasted 10 months, and one beginning in April 2016 lasted more than one year and included periods of extreme and severe drought conditions.

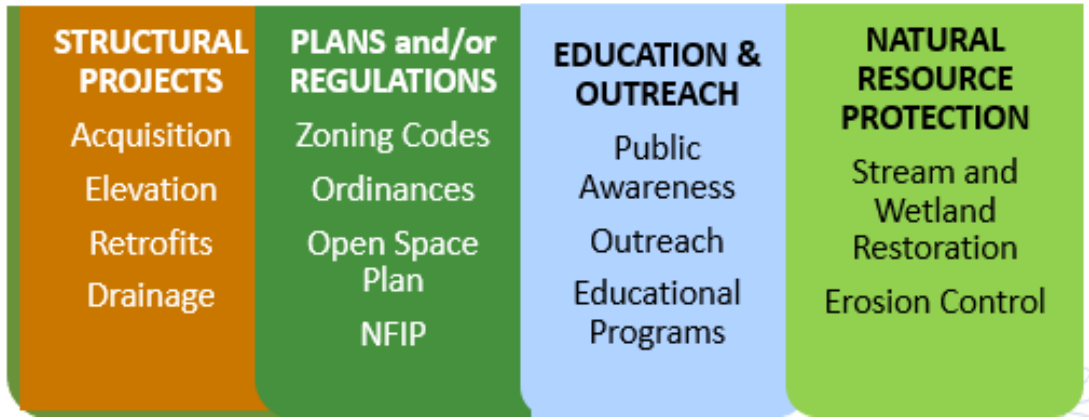
Drought

Dates of Event	Duration (Approx.)	Event Details*
March 17-March 30, 2020	2 weeks	Abnormally dry conditions were present in the County for a two-week period in mid-March.
September 17-November 5, 2019	1.5 months	Putnam County experienced abnormally dry conditions in the fall.
December 5, 2017-January 1, 2018	1 month	Abnormally dry conditions impacted the County in January 2018.
September 26-October 30, 2017	1 week	In October, abnormally dry conditions persisted in portions of the County and included all of the County for the week of October 24th.
April 19, 2016-May 8, 2017	1 year and 3 weeks	Drought and abnormally dry conditions persisted for more than a calendar year between spring 2016 and 2017. Between October 2016 and March 2017, severe drought conditions occurred and between mid-November and January extreme drought conditions occurred for portions of the County.
May 5, 2015-February 23, 2016	10 months	The latter half of 2015 saw abnormally dry conditions, with D1 ("Moderate drought") conditions observed May 19th to June 15th and in September through December.
August 26-December 15, 2014	3.5 months	According to the U.S. Drought Monitor, conditions were classified at D0, or abnormally dry status across Putnam County in the last quarter of 2014.

SWOO - Drought

- Strengths
  - Contingency plans for drought conditions
  - Reliance on Groundwater for much of County
- Weaknesses
  - Use of lake water as a water source for some communities
- Obstacles
  - NYCDEP water use
- Opportunities
  - Water conservation rules

- Consider SWOO's in these areas:



EARTHQUAKE

Population most susceptible to the impacts of earthquakes are those living in areas of National Earthquake Hazards Reduction Program (NEHRP) Class D and E soils. These types of soils can amplify ground shaking.

$1.67 billion

Replacement Cost Value (RCV) of exposed buildings to 1,000-year MRP

5,137

Population exposed to NEHRP D and E soil types

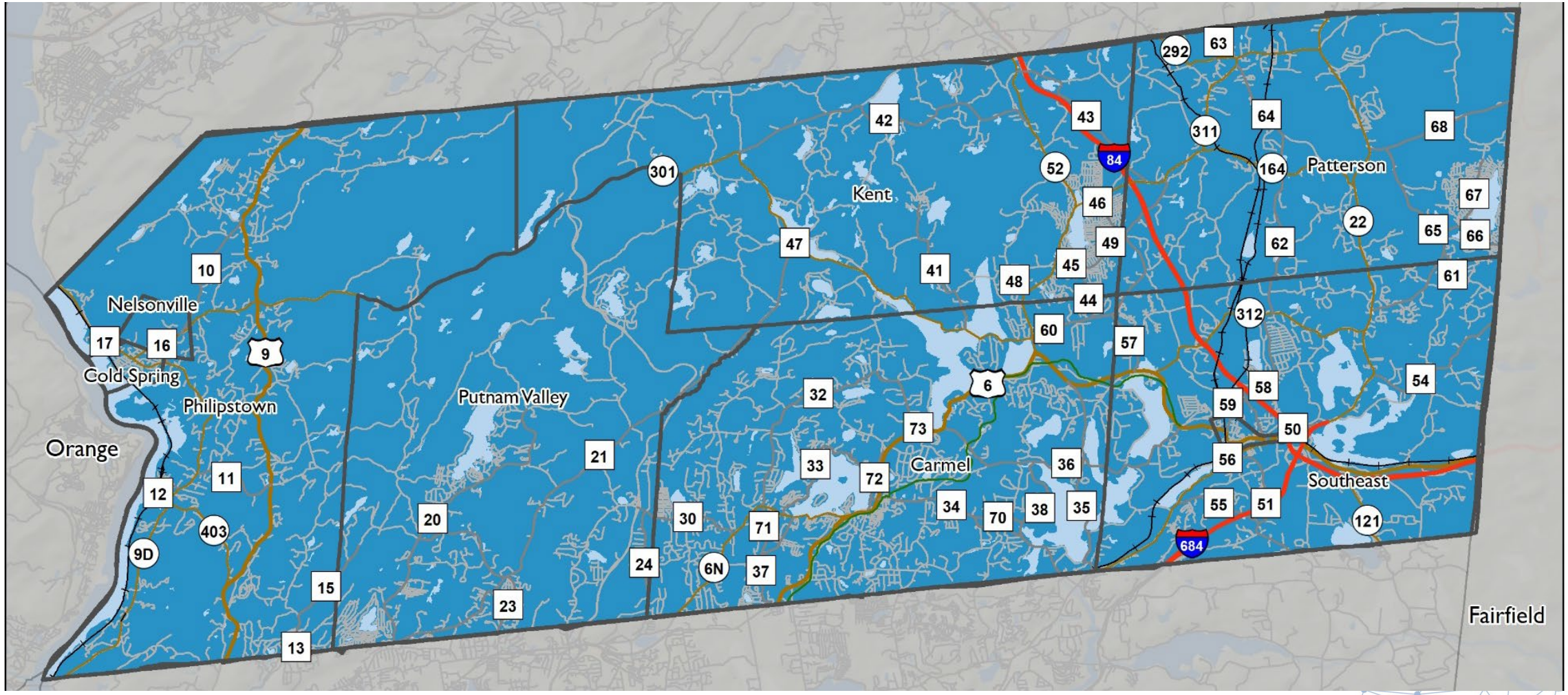
7

Estimated displaced households for a 2,500-year event

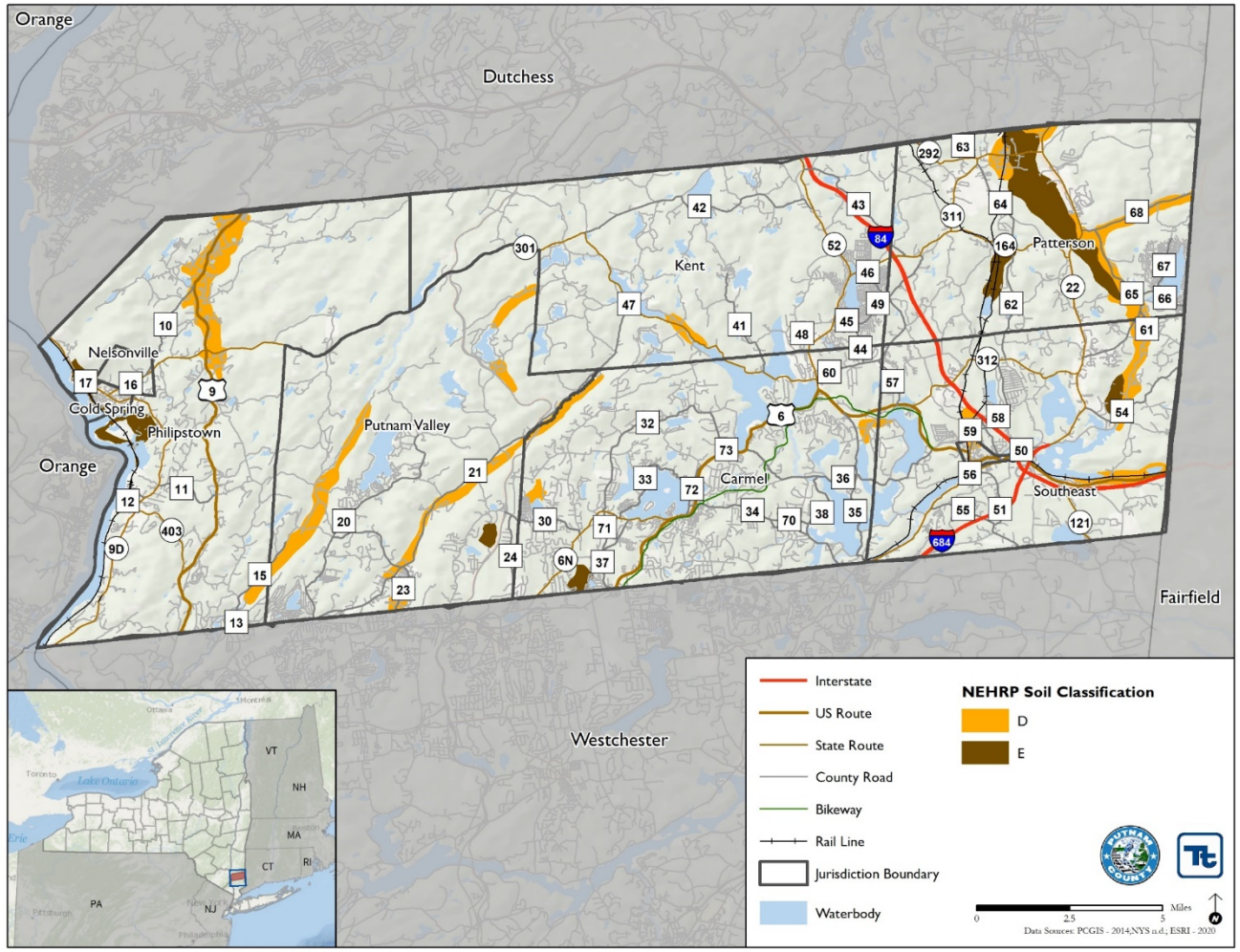
6

Earthquakes with epicenters in Putnam County (1950-2019)

2%/50-Year Earthquake Peak Ground Acceleration



NEHRP Soil Types



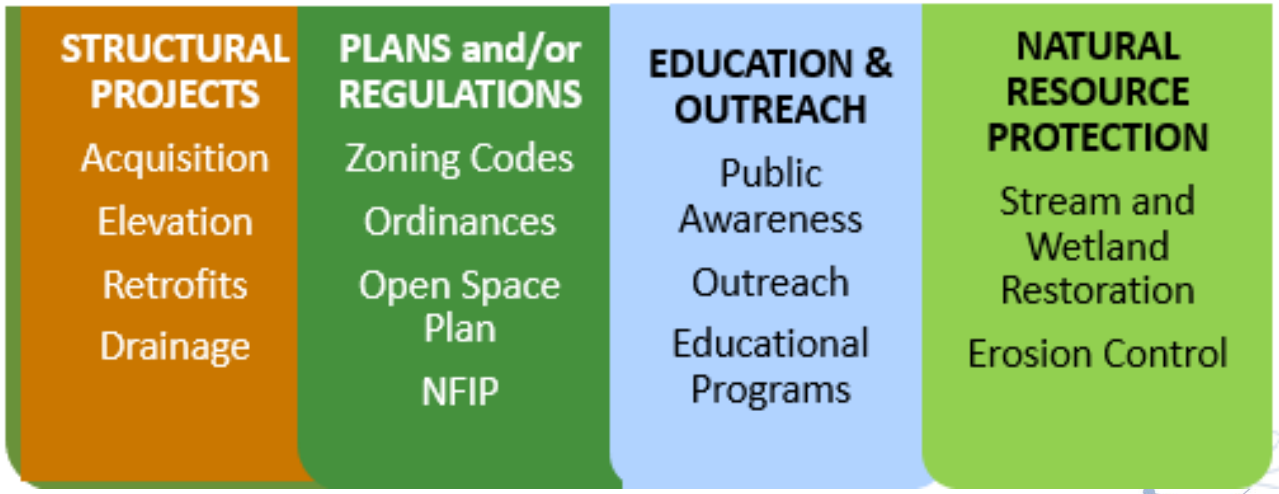
Earthquake

Dates of Event	Event Type	Location	FEMA Declaration Number (if applicable)	County Designated?	Event Details*
April 10, 2017	Earthquake	Pawling, NY	N/A	N/A	A magnitude 1.3 earthquake occurred in Pawling just outside of Putnam County.
February 7, 2018	Earthquake	Putnam Valley, NY	N/A	N/A	A magnitude 2.2 earthquake with an epicenter southwest of the intersection of Oscawana Lake Road and Cimmarron Road struck in the morning of February 7th. Two aftershocks each measuring 1.3 struck approximately two minutes and two hours later.

SWOO - Earthquake

- Strengths
  - Robust emergency response apparatus
- Weaknesses
  - Acute vulnerability in some locations
- Obstacles
- Opportunities

- Consider SWOO's in these areas:



FLOOD

894 Residents Exposed to 1% Annual Flood Event

Buildings Exposed to 1% Annual Flood Event **359**

$439 Million Estimated Loss Potential from 1% Annual Event

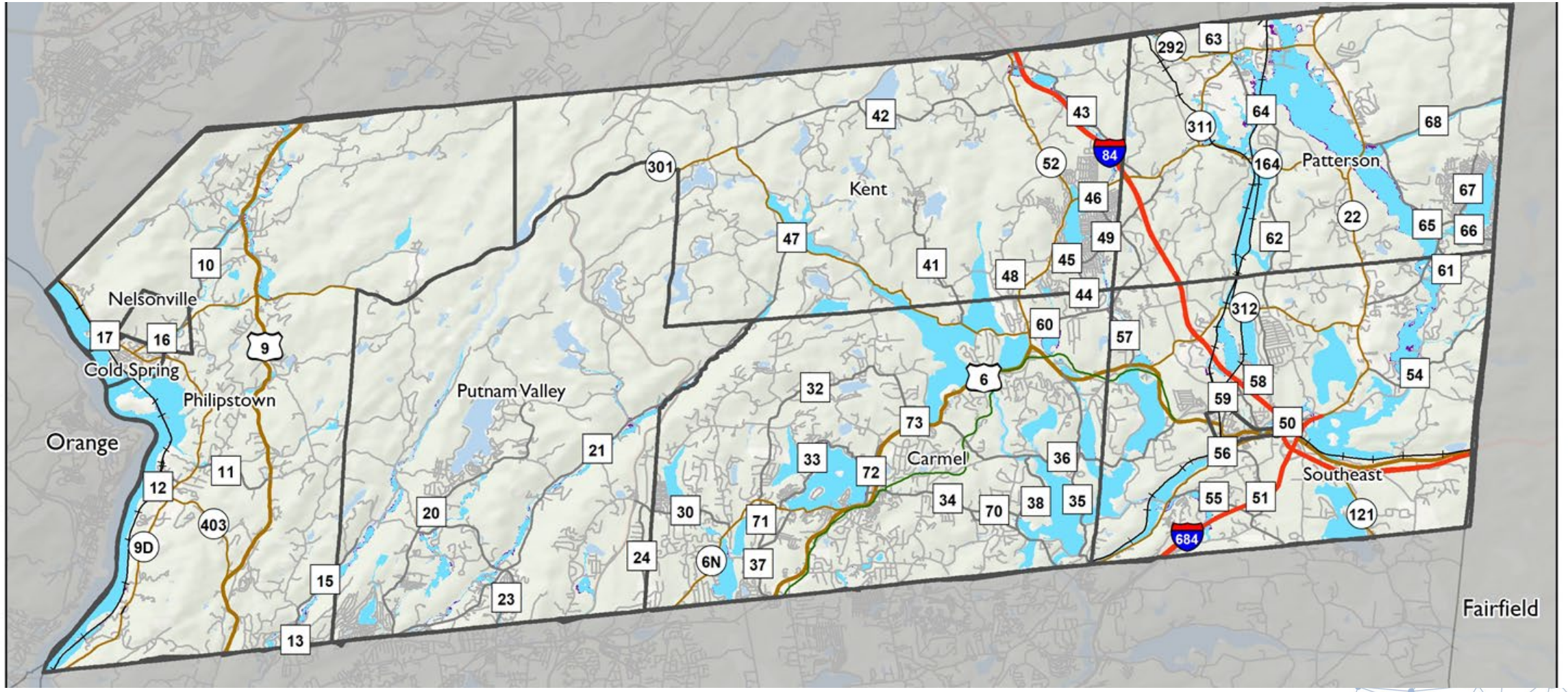
Highest Population Exposure (2.7%) **Philipstown**

Flood

- Putnam County has been impacted by flooding in the past. Its most recent disaster declaration was in 2012 for Hurricane Sandy.
- The Steering and Planning Committees identified floods as a hazard of concern for Putnam County.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
July 7, 2015	Flash Flood	N/A	N/A	Showers and thunderstorms struct the area, producing heavy rain and localized flash flooding. A vehicle at the intersection of Routes 6, 202, and 22 in Brewster became stranded in high water.
July 28, 2018	Flash Flood	N/A	N/A	Scattered showers and thunderstorms across the Lower Hudson Valley caused isolated flash flooding in northeastern Putnam County. Approximately 1.4 inches of rain fell. Route 311 in Patterson and Ludingtonville Road along I-84 in Lake Carmel were closed due to flooding.

Flood Exposure- Regulatory Floodplains



SWOO - Flood

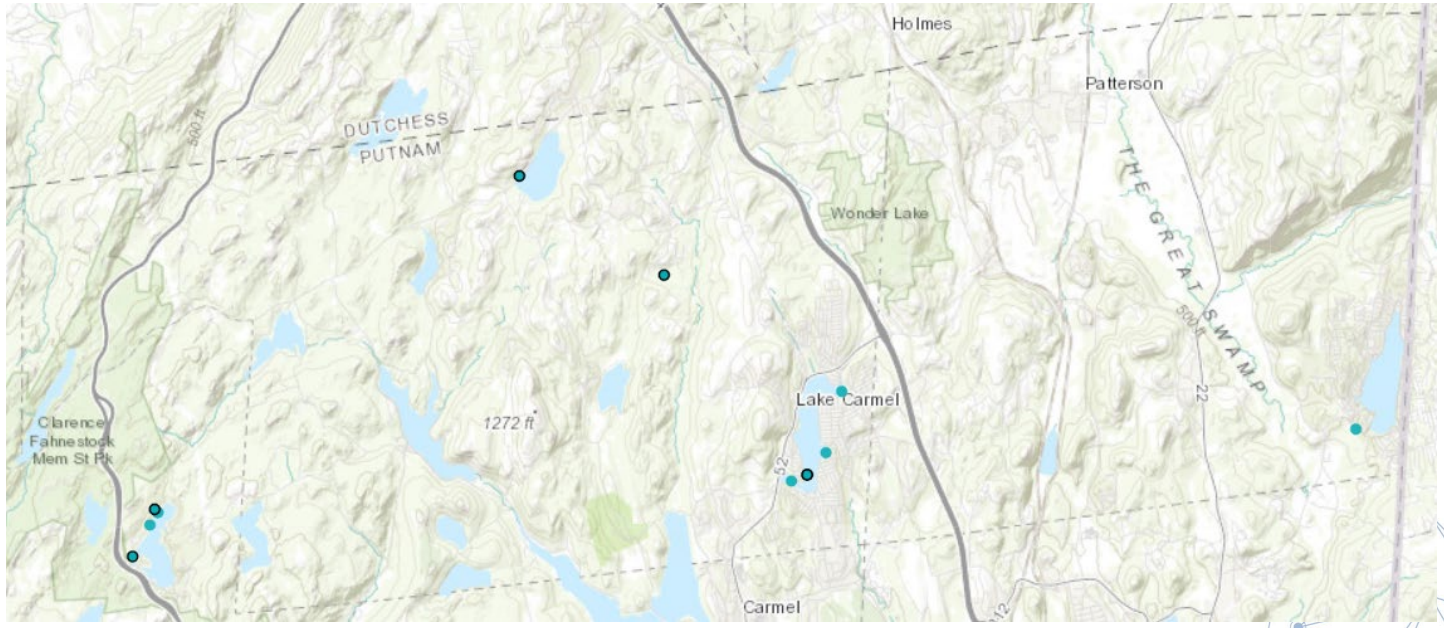
- Strengths
  - Low amount of vulnerability
- Weaknesses
  - Limited structural flood control
- Obstacles
- Opportunities

- Consider SWOO's in these areas:

STRUCTURAL PROJECTS	PLANS and/or REGULATIONS	EDUCATION & OUTREACH	NATURAL RESOURCE PROTECTION
Acquisition	Zoning Codes	Public Awareness	Stream and Wetland Restoration
Elevation	Ordinances	Outreach	Erosion Control
Retrofits	Open Space Plan	Educational Programs	
Drainage	NFIP		

Harmful Algal Blooms

- Putnam County is the subject of three action plans addressing harmful algal blooms by the State's Water Quality Rapid Response Team.
- Since the State started tracking blooms in 2012, the County has experienced 58 algal blooms across 23 lakes.
- The Steering and Planning Committees identified HABs as a hazard of concern for Putnam County.



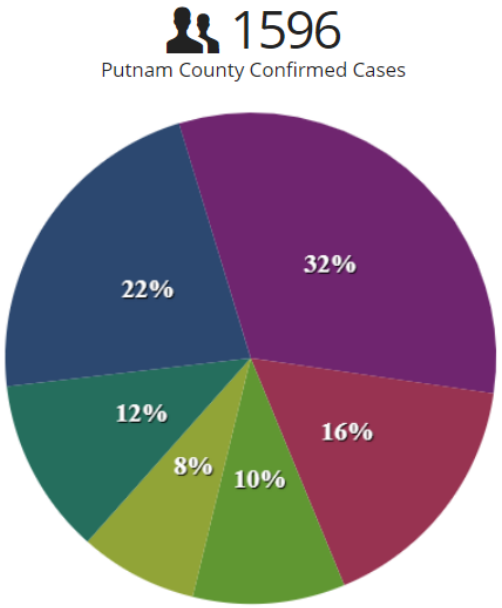
Estimated Exposure for Harmful Algal Blooms

- 10 confirmed High Toxins Blooms since 2012
- 26 Confirmed Blooms
- 21 Suspicious Blooms

2020 Current Beach Status

Town	Lake	Beach	Status	Reason
Kent	Lake Carmel	Beach 7	Closed	Blue-Green Algae
Philipstown	Cortlandt Lake	Continental Village Beach	Closed	Coliform
Putnam Valley	Lake Peekskill	Singers Beach	Closed	Blue-Green Algae

Disease Outbreak



Number of Confirmed Cases by Town

CARMEL	KENT	PATTERSON	PHILIPSTOWN	PUTNAM VALLEY	SOUTHEAST
511	263	160	124	185	353

- The county has been impacted by various diseases, including influenza, Lyme disease, food poisoning, measles, and COVID-19. As of June 30, 2020 Putnam County totaled 1,499 positive COVID-19 cases. The County has the ninth highest rate of cases in the State.
- The Steering and Planning Committees identified disease outbreak as a hazard of concern for Putnam County.

Disease Outbreak

Dates of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Event Details
May 2012	Biological	N/A	N/A	A food-borne illness manifested at a Mother's Day event at the Chuang Yen Monastery in Kent, sickening 100 people.
May 2018	Biological	N/A	N/A	A measles outbreak was reported in connection with international travelers to the Watchtower Education Center in Patterson.
March 2020-Present	Biological	DR-4480	es	Novel coronavirus COVID-19, a highly infectious respiratory disease, spreads throughout the United States. As of July 2020 it has infected 3.8 million people and has caused 140,630 deaths.

Extreme Temperature

- Putnam County was not included in any recent USDA disaster declarations related to extreme temperature events. However, the County remains at risk for relatively regularly-occurring extreme temperatures.
- The Steering and Planning Committees identified extreme temperature as a hazard of concern for Putnam County.

Dates of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Event Details
August 12-13, 2016	Excessive Heat	N/A	N/A	Excessive heat affected large sections of southern New York as a high pressure system stayed over the Atlantic Ocean and brought hotter and more humid air into the region. The heat index reached 110 degrees at Montgomery Airport and 107 degrees in Poughkeepsie.

Estimated Exposure

HABS, Extreme Temperature and Disease Outbreak

- GIS-based analyses were not used for calculating exposure to extreme disease, disease outbreak, or HABS hazards
- HABS hazards are more likely to occur with communities with large waterbodies
- Disease outbreak can have a significant impact on the economy, as demonstrated with COVID-19 outbreak
- Extreme temperatures to be exacerbated by climate change and significantly impact populations, but not property

What is Risk?

Risk is defined as a function of :

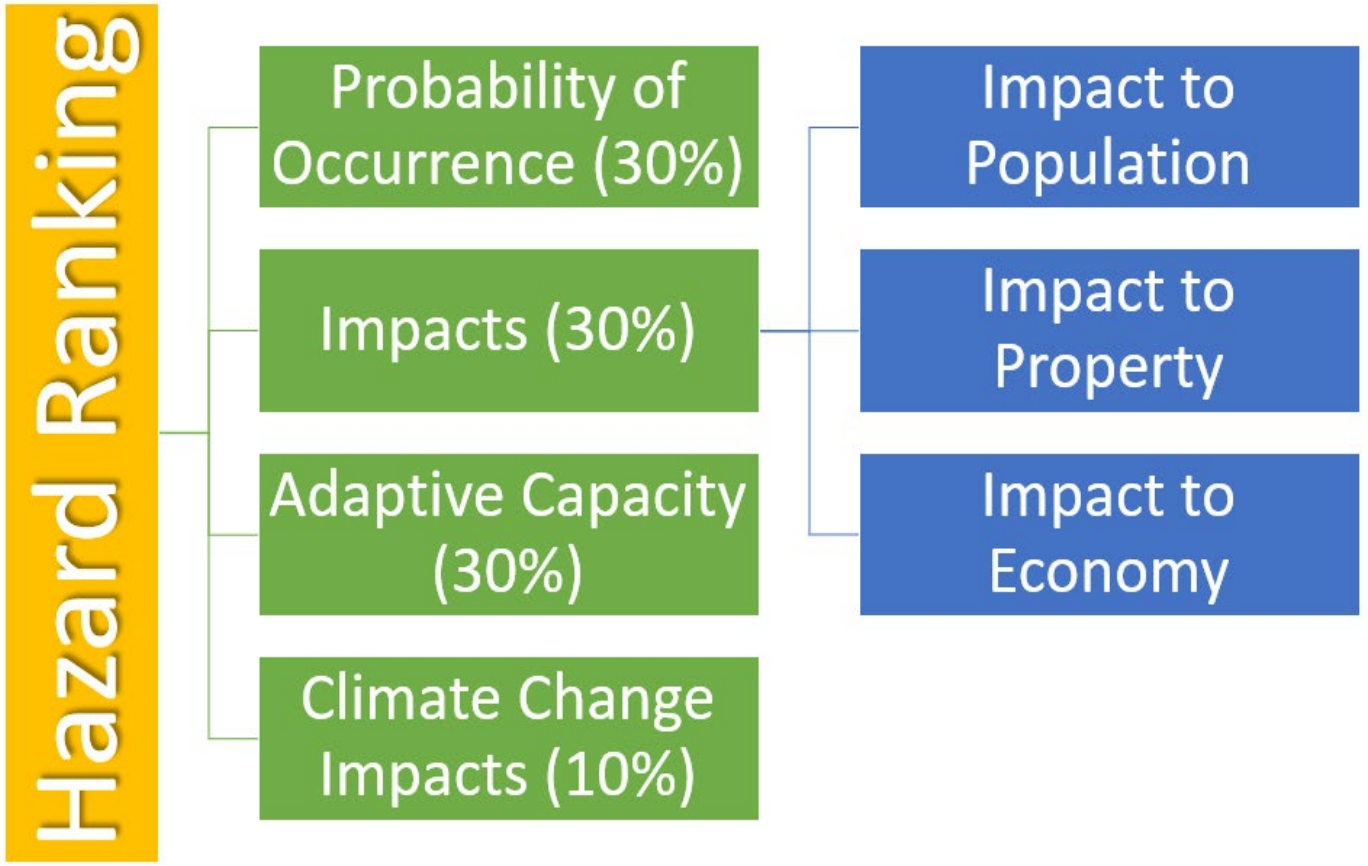
- ☑ Hazard
  - *Source of potential danger or adverse condition*
- ☑ Exposure
  - *Manmade or natural features that are exposed to the hazard*
- ☑ Vulnerability
  - *Damage susceptibility of the exposed features*
- ☑ Adaptive Capacity (or capability)
  - *Plans/policies*
  - *Response/recovery*
  - *Financial resources*

Hazard Ranking Approach

Hazard Ranking is determined by quantitative and qualitative factors including:

- The calculated *probability* of a hazard occurring based on historical data
- *Impacts to people, property, and the economy* based on GIS data and analysis of exposure.
- The degree to which *climate change* will affect future occurrences based on best available data.
- Capability- the ability of your community to respond to the hazard based on ordinances, mitigation strategies and procedures, and readiness.

Hazard Ranking Formula

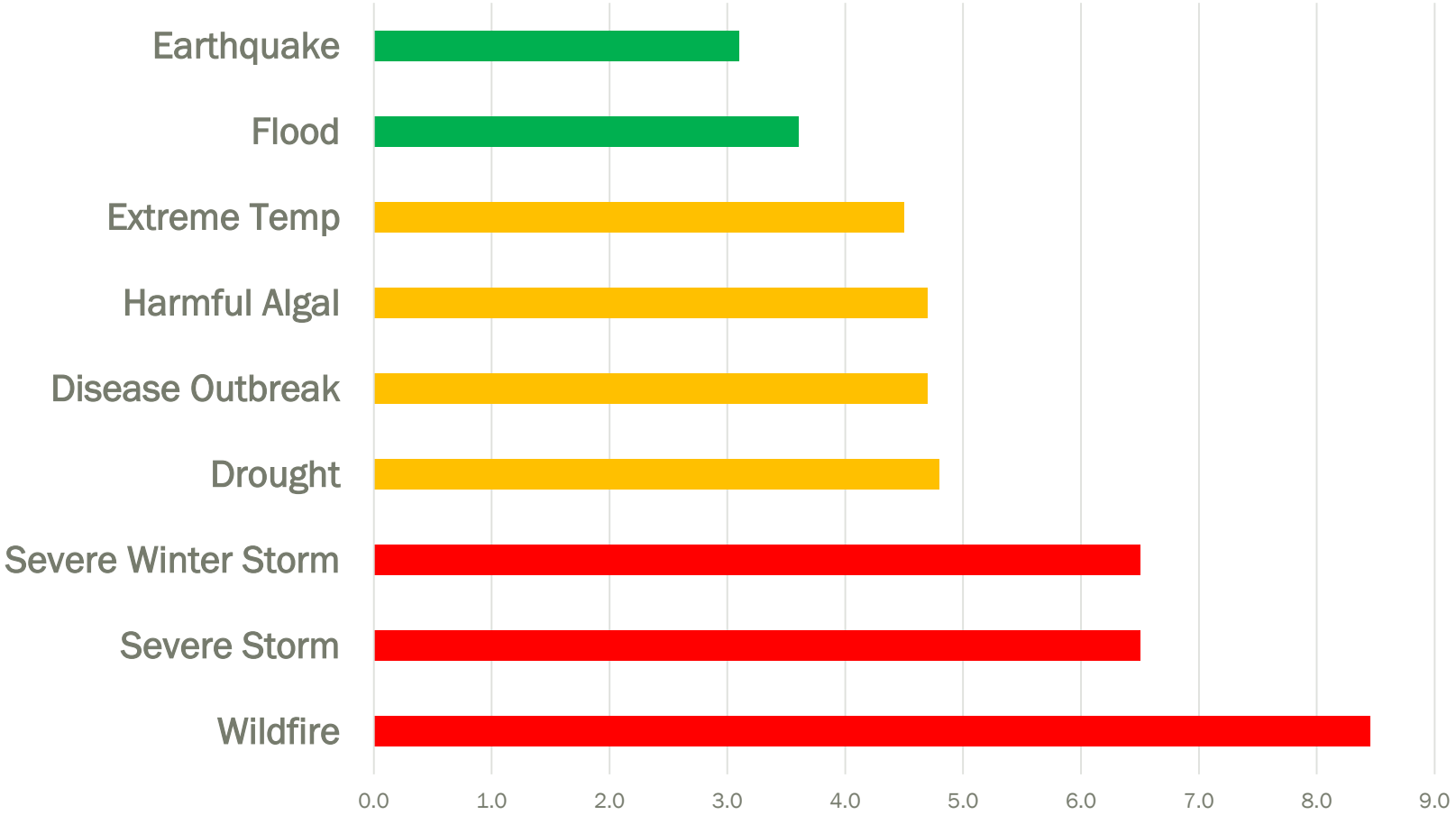


Adaptive Capacity

Describes a jurisdiction's current ability to protect from or withstand a hazard event

- **Low** adaptive capacity means the jurisdiction does not have the capability to effectively respond, which leads to an increase in vulnerability. Examples include weak/outdated/inconsistent plans, policies, codes/ordinances in place; no redundancies; limited to no deployable resources; limited capabilities to respond; long recovery.
- **Medium** adaptive capacity indicates minimum requirements are in place; moderate capabilities; mitigation measures are identified but not implemented widespread; jurisdiction can recover but needs outside resources.
- **High** adaptive capacity shows that the jurisdiction does have the capability to effectively respond, plans/policies exceed minimum requirements; deployable resources all of which decreases vulnerability.

Overall Risk Ranking



Low	<3.8
Medium	3.9-4.9
High	>=5

Overall Risk Ranking – County-wide

HAZARD	RISK ASSESSMENT CATEGORY PROBABILITY		IMPACT				ADAPTIVE CAPACITY		CHANGING FUTURE CONDITIONS		RELATIVE RISK FACTOR
	Numeric Value	Score	Population Score	Built Environment Score	Economy Score	Total	Numeric Value	Score	Numeric Value	Score	
Drought	2	0.6	3	6	2	3.3	2	0.6	3	0.3	**4.8**
Disease Outbreak	2	0.6	6	2	3	3.3	2	0.6	2	0.2	**4.7**
Earthquake	2	0.6	3	1	1	1.5	2	0.6	1	0.1	**2.8**
Extreme Temp	2	0.6	6	2	2	3	2	0.6	3	0.3	**4.5**
Flood	3	0.9	3	2	1	1.8	2	0.6	3	0.3	**3.6**
Harmful Algal Bloom	3	0.9	6	2	3	3.3	1	0.3	2	0.2	**4.7**
Severe Storm	3	0.9	9	6	1	4.8	2	0.6	2	0.2	**6.5**
Severe Winter Storm	3	0.9	9	6	1	4.8	2	0.6	2	0.2	**6.5**
Wildfire	2	0.6	9	6	3	5.4	2	0.6	3	0.3	**6.9**

Low	<3.8
Medium	3.9-4.9
High	>=5

Overall Risk Ranking – Municipal Level

Putnam County Municipality	Hazard Ranking								
	Drought	Earthquake	Flood	Disease Outbreak	Harmful Algal	Extreme Temp	Severe Storm	Wildfire	Severe Winter Storm
Brewster (V)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Carmel (T)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Cold Spring (V)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Kent (T)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Nelsonville (V)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Patterson (T)	Medium	Low	Medium	Medium	Low	Medium	High	High	High
Philipstown (T)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Putnam Valley (T)	Medium	Low	Low	Medium	Low	Medium	High	High	High
Southeast (T)	Medium	Low	Low	Medium	Low	Medium	High	High	High
PutnamCounty	Medium	Low	Low	Medium	Medium	Medium	High	High	High

Low	<3.8
Medium	3.9-4.9
High	>=5

Village of Brewster
Draft Hazard Ranking and Draft Risk Assessment Results

Name: _____

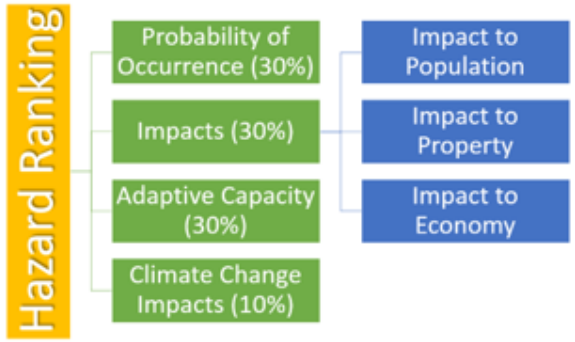
Title and Agency: _____

What is a Hazard Ranking?

A Hazard Ranking is used to understand your community's vulnerabilities to hazards and to prioritize projects and activities for mitigation.

Hazard Ranking is determined by quantitative and qualitative factors including:

1. The calculated probability of a hazard occurring based on historical data
2. Impacts to people, property, and the economy based on GIS data and analysis of exposure.
3. The degree to which climate change will affect future occurrences based on best available data.
4. Adaptive Capacity is the ability your community has to respond to the hazard based on ordinances, mitigation strategies and procedures, and readiness.



What is my Hazard Ranking?

The following tables represent the calculated rankings for the hazards of concern for the County and your community. Please review the calculated rankings and indicate whether or not you want to adjust the ranking. If you are changing the ranking, please provide detail as to why you are changing the ranking.

Table 1: 2015 and Draft 2020 County Hazard Rankings

Hazard	Countywide	
	2015	2020 Draft Update
Disease Outbreak *(new)*	-	Medium
Drought *(new)*	-	Low
Earthquake	Low	Low
Extreme Temperature	Medium	Medium
Flood	Medium	Medium
Harmful Algal Bloom *(new)*	-	Medium
Land Failure	High	-
Severe Weather	High	High
Severe Winter Weather	High	High
Wildfire	High	High

Table 2: 2015 and Draft 2020 Municipal Hazard Rankings

Hazard	Municipality					
		2020				
	2015	Draft 2020 Based on RA Results	Adaptive Capacity (Capabilities)	Municipal Hazard Ranking	Municipal Adaptative Capacity	If adjusting the ranking, please explain why.
Disease Outbreak *(new)*	N/A					
Drought *(new)*	N/A					
Earthquake						
Extreme Temperature						
Flood						
Harmful Algal Bloom *(new)*	N/A					
Severe Weather						
Severe Winter Weather						
Wildfire						

N/A = Not applicable; Disease Outbreak, Drought and Harmful Algal Bloom are new hazards of concern and were not evaluated in the 2015 plan.
RA = Risk Assessment

The Plan's Direction

Mitigation Toolbox → Mitigation Brainstorming → Updated Mitigation Strategy → Implementation

2020 Goals

2015 Mitigation Strategy

Risk Assessment Results

Capability Assessment Results

Subject Matter Expertise

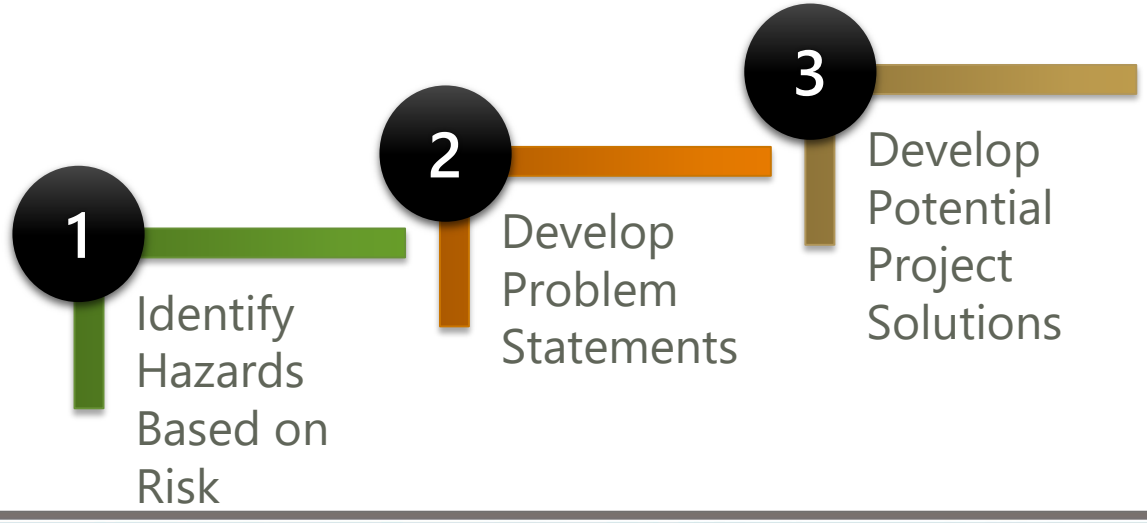
Stakeholder Public Input

Existing Plans/Integration

FEMA Resources

Next Step: Problem Statements

- One worksheet needs to be completed per mitigation action
- **Focus on your problems**
- Quality, not quantity
- Provide details to support the issues and to help define solutions
- We will provide this information to NYSDHSES to prepare for our next meeting on August 26th



Questions?

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Thank You!