Bright Spots and Opportunities for the Transportation Network on Cape Cod
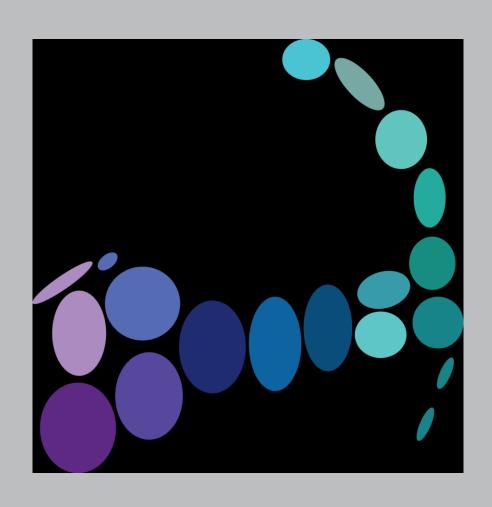Cally Harper, PhD

All 15 towns are vulnerable to water rise.

See UPWP 3.4 2014 Report available on CCC website

Where do we go from here?

Where do we go from here?

Strategy #1: "Stand on the Shoulders of Others"

Where do we go from here?

Strategy #2: Focus attention on our unique vulnerabilities

Where do we go from here?

Strategy #3:
Communicate with
Those on
The Front Lines

We used all 3 strategies:

Used data from federal + state partners
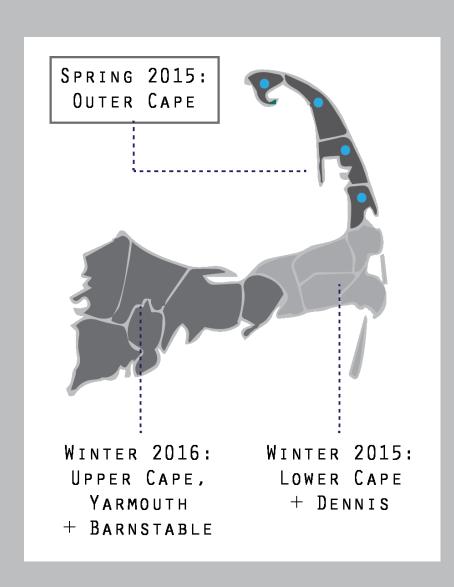
Developed region specific tools

Meetings with DPW Directors

A SUB-REGIONAL APPROACH:

Spring 2015: Outer Cape

Winter 2016: Upper Cape, Yarmouth + Barnstable
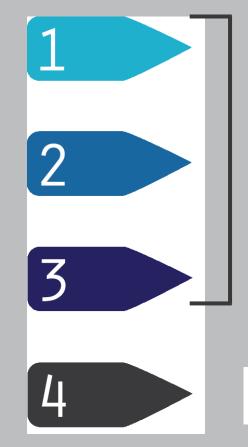
Winter 2015: Lower Cape + Dennis

Divided Cape Cod into 3 sub-regions

Kicked off with the Outer Cape

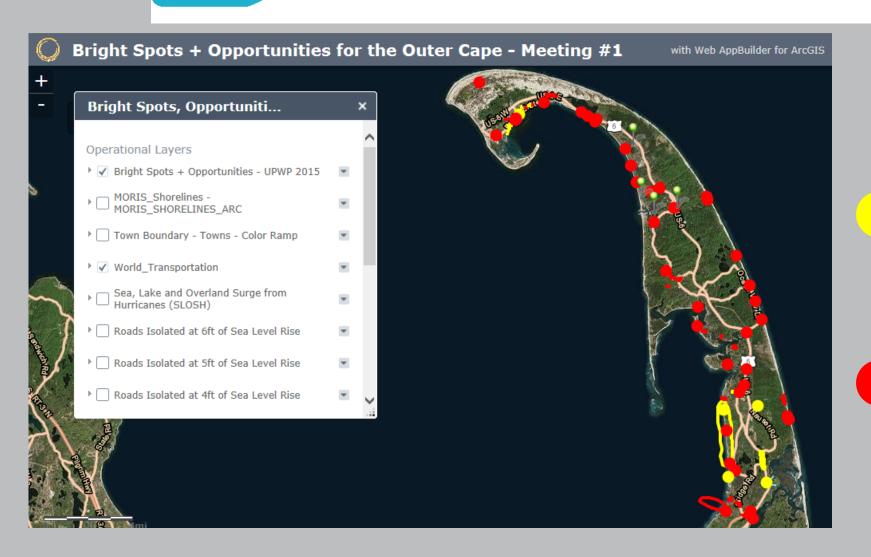Will repeat this project in remaining Sub-regions

meetings with outer cape DPW Directors

1

2

3

One-on-one meetings (12 total)

4

Group meeting to transfer info

1 IDENTIFY "BRIGHT SPOTS" AND OPPORTUNITIES

Bright Spots + Opportunities for the Outer Cape - Meeting #1

with Web AppBuilder for ArcGIS

Bright Spots, Opportuniti...

Operational Layers

▸ ☑ Bright Spots + Opportunities - UPWP 2015

▸ ☐ MORIS_Shorelines - MORIS_SHORELINES_ARC

▸ ☐ Town Boundary - Towns - Color Ramp

▸ ☑ World_Transportation

▸ ☐ Sea, Lake and Overland Surge from Hurricanes (SLOSH)

▸ ☐ Roads Isolated at 6ft of Sea Level Rise

▸ ☐ Roads Isolated at 5ft of Sea Level Rise

▸ ☐ Roads Isolated at 4ft of Sea Level Rise

CREATED AN ONLINE GIS TOOL TO GATHER DATA

"BRIGHT SPOT": ASSETS THAT ARE RESILIENT TO HAZARDS

"OPPORTUNITIES": ASSETS THAT ARE VULNERABLE TO HAZARDS

DEFINITIONS:

SENSITIVITY: THE DEGREE TO WHICH AN ASSET IS DIRECTLY AFFECTED BY CLIMATE CHANGE IMPACTS (SLR, SURGE, SHORELINE CHANGE)

ADAPTIVE CAPACITY: THE ASSET'S ABILITY TO ACCOMODATE CLIMATE CHANGE IMPACTS. IT CONSIDERS THE ASSET'S ABILITY TO RETURN TO NORMALCY AFTER A DISRUPTION.

CRITICALITY: AN ASSESSMENT WHICH INVOLVES IDENTIFYING THE MOST CRITICAL ELEMENT OF THE TRANSPORTATION SYSTEM USING SPECIFIC CRITERIA

NAME OF ASSET:

PROVINCETOWN MUNICIPAL AIRPORT

DESCRIPTION:

AIRPORT IS LOCATED IN AN AREA SUSCEPTIBLE TO FLOODING

RATIONALE
(REASON FOR THE RATING)

RATING
(HIGH, MEDIUM, LOW)

SEA LEVEL RISE
- SENSITIVITY
- ADAPTIVE CAPACITY

STORM SURGE
- SENSITIVITY
- ADAPTIVE CAPACITY

SHORELINE CHANGE
- SENSITIVITY
- ADAPTIVE CAPACITY

CRITICALITY
- NETWORK
- COMMUNITY

CREATED "REPORT CARDS" FOR EACH ASSET

DPW PROVIDED ADAPTIVE CAPACITY + CRITICALITY SCORES BASED ON THEIR KNOWLEDGE

SENSITIVITY SCORES CAME FROM TOOLS DEVELOPED BY CCC AND STATE AGENCIES

3 USED A MODEL TO RANK ASSETS ACCORDING TO THEIR VULNERABILITY

Created another tool to rank vulnerable assets

Sea Level Rise					Storm Surge					Shoreline Change					Criticality					Total Score	Asset Rank
Sensitivity	S score	Adaptive Capacity	AC score	V score	Sensitivity	S score	Adaptive Capacity	AC Score	V Score	Sensitivity	S score	Adaptive Capacity	AC score	V Score	To the Transportation Network	Score	To the Community	Score	Crit Score		
5 ft - low	1	low	3	4	cat 3 - low	1	low	3	4	low	1	na	0	1	high	3	high	3	6	15	2
6 feet - low	1	high	1	2	over cat 4 - low	1	high	1	2	high	3	high	1	4	low	1	low	1	2	10	6
6 feet - low	1	high	1	2	over cat 4 - low	1	high	1	2	high	3	high	1	4	medium	2	medium	2	4	12	4
4 feet - medium	2	medium	2	4	cat 3 - low	1	medium	2	3	na	0	na	0	0	medium	2	medium	2	4	11	5
6 feet - low	1	high	1	2	over cat 4 - low	1	high	1	2	high	3	medium	2	5	low	1	high	3	4	13	3
6 feet - low	1	medium	2	3	cat 3 - low	1	medium	2	3	na	0	na	0	0	high	3	high	3	6	12	4
6 feet - low	1	low	3	4	over cat 4 - low	1	low	3	4	high	3	low	3	6	high	3	high	3	6	20	1

USED A MODEL TO RANK ASSETS ACCORDING TO THEIR VULNERABILITY

CREATED ANOTHER TOOL TO RANK VULNERABLE ASSETS

INPUTS: SENSITIVITY, ADAPTIVE CAPACITY + CRITICALITY SCORES

Sea Level Rise					Storm Surge					Shoreline Change					Criticality					Total Score	Asset Rank
Sensitivity	S score	Adaptive Capacity	AC score	V score	Sensitivity	S score	Adaptive Capacity	AC Score	V Score	Sensitivity	S score	Adaptive Capacity	AC score	V Score	To the Transportation Network	Score	To the Community	Score	Crit Scor		
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6 feet - low	1	high	1	2	over cat 4 - low	1	high	1	2	high	3	high	1	4	low	1	low	1	2	10	6	
6 feet - low	1	high	1	2	over cat 4 - low	1	high	1	2	high	3	high	1	4	medium	2	medium	2	4	12	4	
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6 feet - low	1	high	1	2	over cat 4 - low	1	high	1	2	high	3	medium	2	5	low	1	high	3	4	13	3	
6 feet - low	1	medium	2	3	cat 3 - low	1	medium	2	3	na	0	na	0	0	high	3	high	3	6	12	4	
6 feet - low	1	low	3	4	over cat 4 - low	1	low	3	4	high	3	low	3	6	high	3	high	3	6	20	1	

3 USED A MODEL TO RANK ASSETS ACCORDING TO THEIR VULNERABILITY

Created another tool to rank vulnerable assets

Inputs: sensitivity, adaptive capacity + criticality scores

Output: vulnerability ranking scheme

Sea Level Rise					Storm Surge					Shoreline Change					Criticality					Total Score	Asset Rank
Sensitivity	S score	Adaptive Capacity	AC score	V score	Sensitivity	S score	Adaptive Capacity	AC Score	V Score	Sensitivity	S score	Adaptive Capacity	AC score	V Score	To the Transportation Network	Score	To the Community	Score	Crit Score		
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6 feet - low	1	low	3	4	over cat 4 - low	1	low	3	4	high	3	low	3	6	high	3	high	3	6	20	1

Assets Vulnerable to SLR, Surge + Erosion:

6 roadways, 1 Airport

5 culverts, 3 roadways, 2 parking lots

4 culverts, 5 roadways, 4 parking Lots, 2 town landings, 1 bridge

7 roadways, 4 culverts, 1 rotary

PROVINCETOWN

- Ryder/Bradford Streets

During this UPWP project, CCC assisted Provincetown with a FEMA Grant application to Mitigate the flooding at Ryder + Bradford Streets

1. RELOCATE AND UPSIZE STORM WATER PIPE

36 INCHES   48 INCHES

2. INSTALL STORM WATER PUMP

3. INSTALL POROUS PAVEMENT NEAR TOWN HALL

RESERVOIR BED OF CRUSHED STONE

Lessons Learned:

- Climate models Alone do not accurately predict vulnerability; local knowledge must be included

   - Example: Ballston Beach in Truro

- Vulnerability assessments should not be stand alone activities; requires yearly monitoring and action plans

LOOKING AHEAD: TAKING THIS PROJECT ON THE ROAD

SPRING 2015:
OUTER CAPE

WINTER 2016:
UPPER CAPE,
YARMOUTH
+ BARNSTABLE

WINTER 2015:
LOWER CAPE
+ DENNIS