

# A Co-Benefit Approach to Prioritizing Lands for Coastal Resilience



# Increasing use of natural and nature-based features to build resilience to storm-driven flooding

## Natural and Nature Based Features (NNBF)

### Natural and Nature-Based Features (NNBFs)

- Beach
- Dune
- Forest
- Tree
- Scrub-Shrub
- Non-Tidal Forested Wetland
- Non-Tidal Scrub Shrub Wetland
- Non-Tidal Emergent Wetland
- Tidal Marsh
- Living Shoreline: Oyster Sill
- Living Shoreline: Marsh Sill
- Living Shoreline: Breakwater



Identify NNBFs that enhance flood resilience-

## Capacity of NNBFs to mitigate coastal flooding:

What are the characteristics of each NNBF that slow water movement, allow flood waters to infiltrate, and dampen wave energy?

Newsworks.org

**Coastal wetlands  
can act like 'shag  
carpet' during a  
hurricane —  
NewsWorks**



*Living shoreline project in Gloucester. Photo: Karen Duhring*

"...Because of their vegetation, the marshes act like shag carpeting, dampening the energy of a wave before it reaches land."

- Lenore Tedesco, PhD, executive director of The Wetlands Institute in Stone Harbor.

Diane Stopyra, April 30, 2016WHYY in Philadelphia

<https://whyy.org/articles/coastal-wetlands-can-act-like-shag-carpet-during-a-hurricane/>

# Approach to increase NNBF Use

Step 1. Model flood benefits:

NNBF Capacity  Flooding Resilience

Step 2. Add water quality and socio-economic benefits

NNBF + TMDL/ Stormwater & Community Rating System/  
FEMA Credits  Co-benefits

Step 3. NNBF Flood Protection + Co-Benefits = Priority land for protection

Step 4. Unprotected flood areas + Co-benefits = Priority areas for Restoration & Creation

# Step 1: NNBF for flood protection

## Use of Natural and Nature-Based Features (NNBFs) to Build Resilience to Coastal Flooding

Goals of the project:

- Map/Inventory of more than 350,000 NNBFs across the coastal region
- Identify those NNBFs that enhance flood resilience to about 190,000 buildings in coastal areas
- Identify the co-benefits generated by NNBFs
  - Ecologic – water quality
  - Socio-economic – CRS FEMA
- Identify those NNBFs that provide multiple benefits for communities



# How do we link NNBFs with the buildings they protect?

## Inundation Pathways (IPs)



**Inundation Pathways** represent lowest areas where flooding waters would begin to flood onto the land and approach buildings

- for more than 190,000 primary buildings in the coastal area @ less than 10 feet in elevation
- pathways based on land elevation derived from LIDAR data

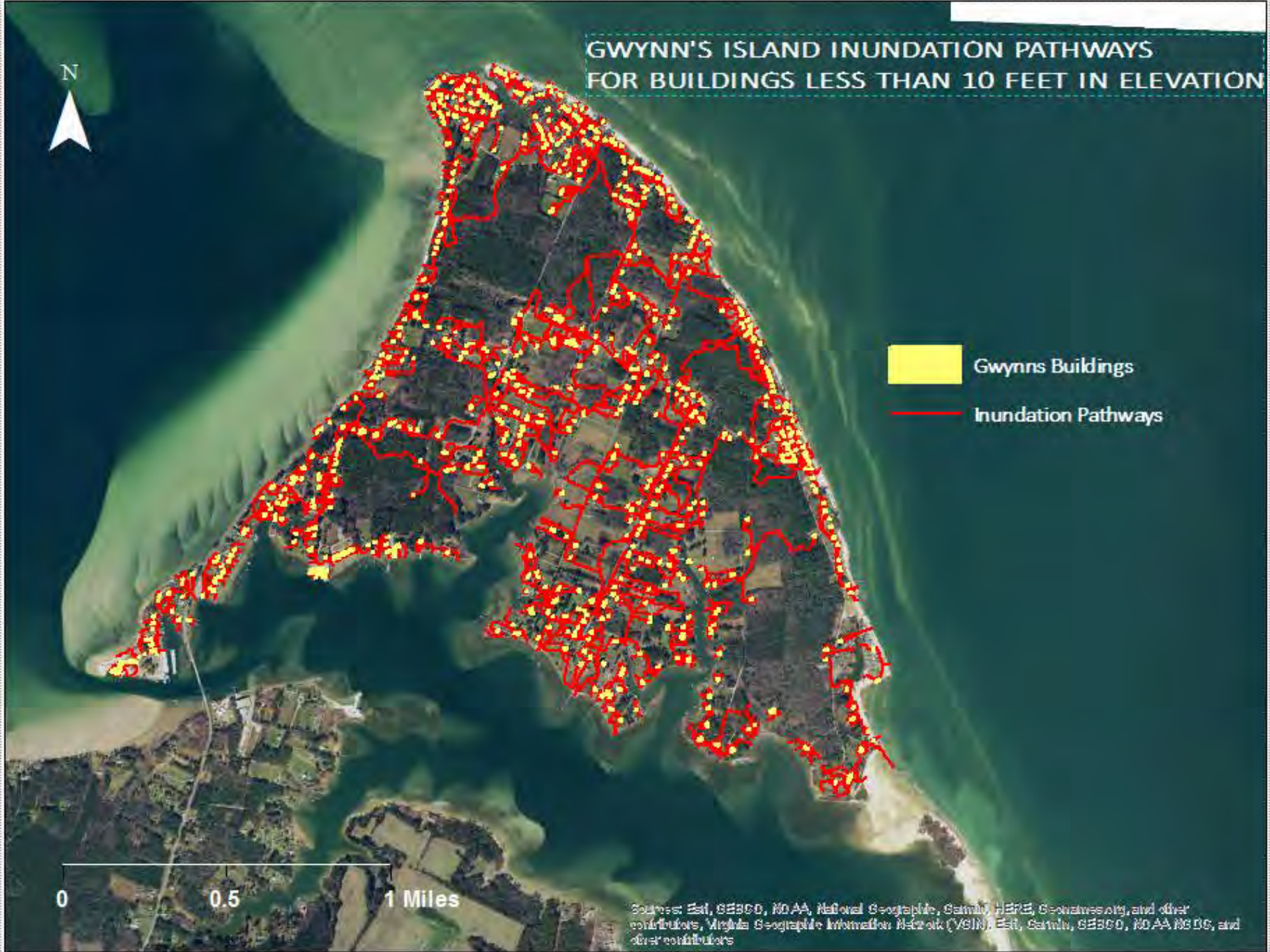
# GWYNN'S ISLAND INUNDATION PATHWAYS FOR BUILDINGS LESS THAN 10 FEET IN ELEVATION



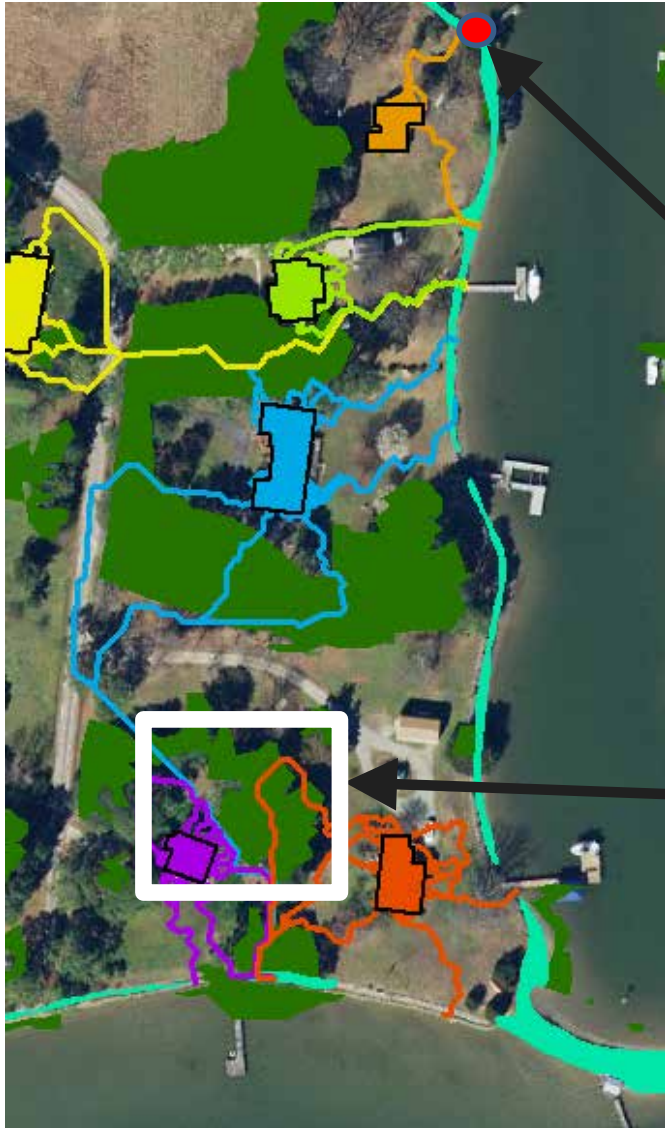
-  Gwynns Buildings
-  Inundation Pathways

0 0.5 1 Miles

Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Virginia Geographic Information Network (VGIN), Esri, Garmin, GEBCO, NOAA, and other contributors



# How to we link NNBFs with the buildings they protect? Inundation Pathways (IPs)



## Inundation Pathways

For each building, we can count the number and types NNBFs that protect it

- *This building is protected by 1 NNBF (a tidal marsh)*

For each NNBF, we can count the number of buildings it protects

- *This tree area protects 3 buildings*

NNBF Feature Types (in this map):

- Tidal Marsh
- Tree



# Relative importance of NNBF based on **how many buildings it protects**: NNBF Flooding Protection Value

## Flooding Protection Value

White = Zero score    Green = low score    Red = high score



Each NNBF is scored based on:

- Protection Potential
- # buildings the NNBF protects

Tidal Marsh:  
Protects 32 buildings

Tree area:  
Protects 0 buildings

# Areas for NNBF Creation/ Restoration



## Town of Cape Charles

500+ buildings.

Many shared Inundation Pathways

Lowest elevation could be priority for new NNBFs

Additional NNBFs priorities can be along IPs that protect:

- Important infrastructure: Schools, Hospitals, Shelters, etc
- Clusters of buildings

# Areas for NNBF Creation/ Restoration



## Town of Cape Charles

Lowest elevation could be priority for new NNBFs

Areas along the shore and within the FEMA floodplain may also qualify for:

- Flood Insurance Premium reductions via the Community Rating System

AND/ OR

- TMDL/ Stormwater credits

# Take Home Points

- Identifies Natural and Nature Based Features that provide flood protection benefits
- Identifies areas lacking NNBF flood protection benefits
- Incorporate water quality and flood insurance services into the assessment for existing features
- Can target locations for NNBF creation/ restoration to maximize multiple benefits
- Supports the preservation and implementation of NNBF features as a component of coastal community resilience