In the Face of the Flood: A County’s Efforts to Mitigate a Potential Massive Loss of Cultural Resources

Anne Arundel County, Maryland

Anastasia Poulos
Archaeological Sites Planner, Cultural Resources Division, Anne Arundel County
pzpoul44@aacounty.org, 410-222-7432
Sea Level Rise in Anne Arundel County, Maryland

534 Miles of Shoreline

Hundreds of Archaeology Sites & Historic Buildings Endangered
Storms

Hurricanes

Tornadoes

Erosion

Earthquakes
Volcanoes!

http://maxpixel.freegreatpicture.com/Lake-Glow-Water-Mountains-Lava-Volcano-Landscape-1728164
534 Miles of Shoreline

Hundreds of Archaeology Sites & Historic Buildings Endangered

Anne Arundel County has already experienced about 12” of SLR in the last 85 years

Local Sea Level Rise is predicted to be 2.1’ to 6.6’ by 2100

Coastal Floods are now more severe and more frequent
Recent Catastrophic Natural Events

- Hurricane Sandy (October 2012)
- The Derecho (June 2012) (*an intense traveling wind storm*)
- Hurricane Irene (August 2011)
- Hurricane Ernesto (September 2006)
- Tropical Storm Isabel (September 2003) (*highest observed area flood at 5.7’*)

Special Flood Hazard Area (SFHA) on Flood Insurance Rate Maps (FIRMs)

SFHAs are areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year.

The 1-percent annual chance flood is also referred to as the base flood or 100-year flood.

Aldridge Shell Midden Site – Eroded 200ft in 45 Years
Flooding, Sea Level Rise, Coastal Erosion, Tidal Groundwater: 
*The impact on archaeological Resources*
Fema 1% Flood Elevation with 6’ Sea Level Rise

Fema 1% Flood Elevation with 3’ Sea Level Rise

6.00’ – Sea Level Rise by 2100

5.76’ – Hurricane Isabel

3’ – Sea Level Rise by 2050

5.76’ – Hurricane Isabel
What are we doing about it?

Public- Private Partnerships

Non-Profit – Local – State - Federal

- **2010** – Vulnerability assessment (AACo/CCI)
- **2011** - Strategic plan (AACo/CCI)
- **2011/2012** – SWAT Team model (Preservation MD)
- **2012-2014** - Monitoring
- **2015-2017** – Hurricane Sandy grants
The 2012 Hazard Mitigation Plan of Anne Arundel County states the following as a goal:

“to reduce the potential impact of natural disasters in the County’s historic assets by identifying and protecting historic assets throughout the County that are at risk from natural hazards.”
State of Maryland’s Planning Tools

Anne Arundel County’s
All Hazard Mitigation Plan
& Long Term Recovery Plan

Time for an update ....

• Identify Resources
• Risk Assessment
• Develop a Mitigation Plan
• Implement the Plan

Local Government Planning
Part 1: Desk Audit
1. Build a geographic information system (GIS) database
2. Query the GIS database and develop suitability and vulnerability models
3. Assess results and classify sites by Priority (highest risk, a significant site, need for documentation, information potential)

Part 2: Field Survey
1. Visit high priority sites and high potential areas to evaluate for a management plan
2. Documentation
3. Triage excavation of endangered areas of one or two important archaeological sites in the survey area

Part 3: Planning Document
1. Develop Recommendations to include risk assessment and priority action plans for historic buildings and archaeological sites in FEMA’s 100-year flood zone
Predictive Modeling

Site Distribution Analysis

Regional Analysis

Site Protection

Computer Georeferenced:

- Historic Maps
- Historic Aerials
- Satellite Imagery and other
- Remote Sensing Imagery
- Relational Database
  - Artifact Data, Dates, Types, etc.
- Image Processing
- Modelling
  - Hydrological, landform classification,
  - Spatial Statistics
  - Automated Work Flows

Geographic Information Systems

Part 1: Desk Audit
Evaluating the Extent of the Problem

NUMBER of RESOURCES in the FEMA 100 year FLOOD ZONE

- **590**: Archaeology Sites (35% of all known archaeological sites!)
- **30**: Historic Properties on the National Register
- **210**: Historic Sites on County Inventory
- **91**: Known Cemeteries
- **3009**: # of parcels with standing structures given construction dates before 1950 on the SDAT (not documented)
Evaluating the Extent of the Problem

AREAS OF INTEREST for POTENTIAL SURVEY
Unsurveyed Areas within FEMA Flood Zones A, AE, VE
Anne Arundel County, MD

100 Foot Buffer of Recorded Archaeo Surveys in Flood Zones
Flood Zones with No Recorded Archaeological Survey History
Surveyed Floodplains_A_AE_VE_Clip
Grappling with HUGE Survey Areas

State Department of Assessments & Taxation (SDAT) – Real Property Database

<table>
<thead>
<tr>
<th>Premises Address:</th>
<th>1915 WHITEHALL RD ANNAPOLIS 21409-0000 Waterfront</th>
<th>Legal Description:</th>
<th>53.75 ACRES 1915 WHITEHALL RD ST MARGARETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map:</td>
<td>Grid: 0047</td>
<td>Parcel: 0007</td>
<td>Section: 0040</td>
</tr>
<tr>
<td></td>
<td>Sub District: 0040</td>
<td>Subdivision: 000</td>
<td>Block: 1915</td>
</tr>
<tr>
<td></td>
<td>Lot: 53.75</td>
<td>Assessment Year: 2016</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plat No:</td>
<td>Plat Ref:</td>
<td></td>
</tr>
</tbody>
</table>

Special Tax Areas: NONE

<table>
<thead>
<tr>
<th>Primary Structure Built</th>
<th>1764</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Grade Enclosed Area</td>
<td>14,056 SF</td>
</tr>
<tr>
<td>Finished Basement Area</td>
<td></td>
</tr>
<tr>
<td>Property Land Area</td>
<td>53.7500 AC</td>
</tr>
<tr>
<td>County Use</td>
<td></td>
</tr>
<tr>
<td>Stories</td>
<td>Basement Type</td>
</tr>
<tr>
<td>2</td>
<td>NO</td>
</tr>
</tbody>
</table>
Choosing Three Project Areas

- Under-Surveyed
- Severe Repetitive Losses
- Significant Number of Potential Historic Properties
- Determined by the AACo’s Office of Emergency Management to be highly vulnerable flood risk areas
NUMBER of RESOURCES in the FEMA 100 year FLOOD ZONE in the Project Areas

- **67**: Archaeology Sites
- **7**: Historic Properties on the National Register
- **29**: Historic Sites on County Inventory
- **956**: # of parcels with standing structures given construction dates before 1950 on the SDAT (not documented)
Project Area 1:
“The Great Swamp,” Shady Side & Deale

Photo Courtesy of Stephanie Sperling
Franklin Point Farm Site: Eroded 400 Feet in 54 Years
Project Area 2: Pasadena, MD

Battery Hartshorne (1899-1900), Fort Smallwood, MD

Fort Smallwood:
- Endicott Period (1890-1910) Fortification
- One of four fortifications built on the Patapsco River
  - Ft. Howard, Ft. Armistead, Ft. Carroll
- Converted into a public park in the 1930s
Project Area 3:
Laurel, Jessup, and Maryland City

Riverine Flooding
Ellicott City, MD

Flooding
July 30, 2016.

Source: Wikimedia Commons

Photo by Scott Weaver
Source: http://www.preservationmaryland.org/help-ellicott-city-recover-destructive-flood/
Using GIS and Remote Sensing – Aerials and Historic Maps

1957 USGS Quad

Assessing Archaeological Potential
Assessing Archaeological Potential

Demolished: AA-1004 J. Parker Farm, mid-19th century
Creating Dynamic Maps – Spatial Analysis – New Data from Old

G. M. Hopkins Atlas of 1878

A Searchable Database.....
Polygon & Centroid

Feature to Point

INPUT

OUTPUT

POINT FEATURES LOCATED AT INPUT POLYGONS CENTROID
Part 2: Field Strategies

Data Recovery at Two Threatened Sites

MHT Survey form for Hazard Mitigation Planning
Salvage Excavation
A Beach Resort in Pasadena

Surface Collection:
A Quartz Projectile Point Tip, along with lithic Scatter including FCR, quartzite flakes, rhyolite.
A Forgotten Foundation in the Woods –
The Laurel Bottle Wall
A Forgotten Ironworks in the Jessup Floodplain

1878 Hopkins Atlas Overlay 2014 Orthoimagery

Legend:
- Blue: 100-Year Floodplain
- Yellow: Jessup-Archaeology_Sites_in_Floodplains
Part 3: Developing Recommendations
How to Respond?

Preserve and Protect in place?
Sacramento, California

Sited at the junction of the Sacramento and American Rivers, this city suffered repeated flooding in the 19th century. As a result, the entire city participated in elevating its buildings and streets in the 1860s and 1870s using screwjacks.
a Groin
Groins are structures that extend from the beach into the water. They help counter erosion by trapping sand from the current. Groins accumulate sand on their updrift side, but erosion is worse on the downdrift side, which is deprived of sand.

b Seawall
Seawalls protect property temporarily, but they also increase beach erosion by deflecting wave energy onto the sand in front of and beside them. High waves can wash over seawalls and destroy both the seawalls and the protected property.

c Importing sand
Importing sand to a beach is considered the best response to erosion. The new sand is often dredged from offshore and can cost tens of millions of dollars. Because it is often finer than beach sand, dredged sand erodes more quickly.
Hard-Shore Lining
Boat Wave Action
Some options for different living shorelines in coastal communities like Durham. Illustration by Liz Podowski King. Original content developed by Carolyn LaBarbiera and Liz Podowski King with support from the New York Department of State. Adapted for use by the NHDES Coastal Program.
Cape Hatteras, North Carolina

Constructed in 1870, this lighthouse was moved 2,900 feet in 1990 due to a receding shoreline.
Temple of Ramesses, Abu Simbel, Egypt (1264-1244 B.C.E.)

Due to the rising waters of Lake Nassar, UNESCO and the Egyptian government successfully moved the temple to the top of an artificial hill, about 200 feet above the original site from 1964 to 1968.

Accept the Losses

Which sites are we willing to lose?
Triage Archaeology

Monitoring and documentation is essential – how do we get the resources to do this?
Going beyond risk assessment

**Challenges**
- Interdepartmental Coordination
- Identifying and Designating Tasks
- Communication

**Solutions**
- Interdepartmental coordination
- Alert system; Social media
- On-site stewards (trained volunteers in monitoring, mitigation, response, and recovery efforts)
- Interactive Maps
- Educational Workshops for Public and Local Government Officials
Challenges
Challenges

Changing Floodplains - Daily, Tidal Flooding
Excavation Challenges

Tidal Groundwater
Archaeologists often face unforeseen challenges.... how about profiling in the face of rising tides?

Way to go, Stephanie Sperling!
Excavation Challenges

Covered with Two Feet of Sand
Getting Archaeology on the Table