Flood Risk Management

Smithsonian Institution
Smithsonian on the Mall

- National Museum of African American History and Culture
- National Museum of American History
- National Museum of Natural History
- National Museum of the American Indian
- National Air and Space Museum
- Hirshhorn Museum & Sculpture Garden
## Vulnerability Summary

### National Mall Summary

<table>
<thead>
<tr>
<th>Climate Change Variable</th>
<th>Consequence</th>
<th>Time Frame</th>
<th>AIB</th>
<th>Freer</th>
<th>Hirshorn</th>
<th>NASM</th>
<th>NMAAHC</th>
<th>NMAI</th>
<th>NMAH</th>
<th>NMNH</th>
<th>Quad</th>
<th>SIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased frequency &amp; intensity of localized precipitation events</td>
<td>Interior Drainage Flooding (Pluvial)</td>
<td>Current</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2020s</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2080s</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Coast Storms &amp; Sea Level Rise</td>
<td>Storm Surge Flooding</td>
<td>Current</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2020s</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2050s</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100s</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

### Vulnerability Level

- **Very High**
- **High**
- **Moderate**
- **Low**
- **Minimal**
Vulnerability – NASM

Critical Elevation - First Floor: Elevation 18.9’

Flood Scenario 6: Elevation 16.3’
Flood Scenario 5: Elevation 15.3’
Flood Scenario 4: Elevation 12.3’
Flood Scenario 3: Elevation 11’
Flood Scenario 2: Elevation 9’

Critical Elevation - Delivery Ramp Entrance: Elevation 8.6’

Flood Scenario 1: Elevation 8.2’
Solution – NMAAHC

- Stormwater retention on site
- Cistern for rainwater re-use in building
- Building elevated above 100 yr. floodplain
- Structure below grade designed to withstand hydrostatic pressure of 500 yr. storm
- Automatic flood gate
Solution – NASM

- Floodgates at east protecting to 100 yr. + 3’
- Cisterns for stormwater retention, re-use of water for irrigation and toilets
- Tree preservation and tree planting
- Library, including rare books, moved to Hazy/Dulles
Solution – NMNH

- Stormwater retention tank
- Sump pumps at building interstitial space and ramps & increased size of storm drain
- Waterproofing
- Bioretention planters with new accessible entrance
Solution – NMAH Master Plan

- Hydraulically activated automatic flood barriers
- Rain gardens, bioswales, re-grading & increased tree canopy
- Cisterns
- Storm drain check valves
- Sump pumps independent of building’s plumbing
- Flood wall integrated with perimeter security and light well
- Relocate collections including libraries from lower floors to upper floors
- Elevate mechanical equipment
- Raise intakes
Continued Vulnerabilities

• Temporary flood barriers need storage and assembly
• Loss of utility service (power, steam)
• Loss of public transportation and communications
• Capacity of storm water systems
• Stress results in deterioration & increases maintenance
• Groundwater levels and quality