



# Aquarium and Aquaculture Facility Emergency Preparedness and Recovery

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Prepare in advance





## Develop a Written Plan

- Chain of command, response team, and response procedures for all disasters
- Categories of concerns
- Specific events



# © Author/ISAAH Categories of Concern

- Loss of life
- Collection loss
- Utility failure
- Major facility damage
- Computer systems failure
- Loss of animal containment
- Crises communication & reporting structure



# © Author/ISAAH Specific Events

- Hurricane
- Tornado
- Earthquake
- Snow/ Ice
- Fire
- Terrorism
- Disease outbreak
- Animal Escape



## © Author/ISAAH Specific Events

- Define event
- Establish command center (primary and secondary)
- Reconfirm leadership
- Define specific actions to take



## © Author/ISAAH Prepare in advance

- Identify resources
  - Local, federal and other authorities
  - Plumber, electrician, animal care staff, researchers, disease experts
  - Emergency Contact Tree
  - Participate as a member on your local Emergency Management Action Team
  - Coordinate with local Emergency Management Services (EMS)



## Prepare in advance

- Obtain life support equipment and supplies
  - Propane heaters
  - Oxygen bottles for fish enclosures
  - Frozen water for chilled exhibits
  - Food on site suitable for 3-4 days
- Maintain equipment
  - Routine testing of generators/ heaters
  - Check flashlights and other battery powered equipment

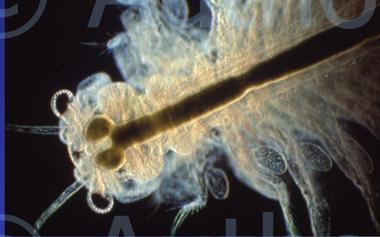


## Water Quality Management Plan

- Temperature
- pH
- Salinity
- Hardness
- Alkalinity
- Ammonia, nitrite, nitrate
- Dissolved oxygen



## Food Management Plan



## Prepare in advance

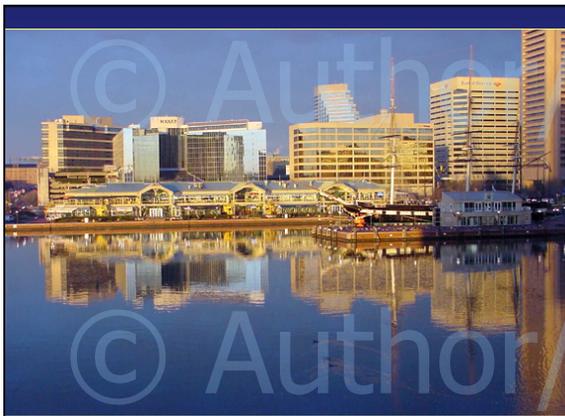
- Training and drills



# © Author/ISAHAH Implement Plan

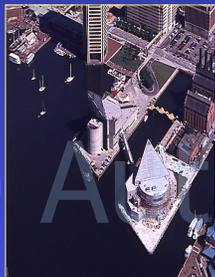


Hurricane Isabel  
September 14, 2002



## Risks Assessed:

- Power Loss
- Flooding
- Wind damage



## Preparations: Power Loss

- Ensure life support in the event of power loss
  - Extra O2 and regulators, air pumps
  - Dry ice to freezers, frozen salt water buckets
  - 500 W generator serviced – air and lights
  - Aquarium reserved 1500KW tractor-trailer generator



## Preparations: Flooding

- Flood gates installed
- Sandbags



1:00 am

- Water level crested over Pier 3, main aquarium building.
- Watertight gates appeared to be holding – some leakage held back with wet-vacs..



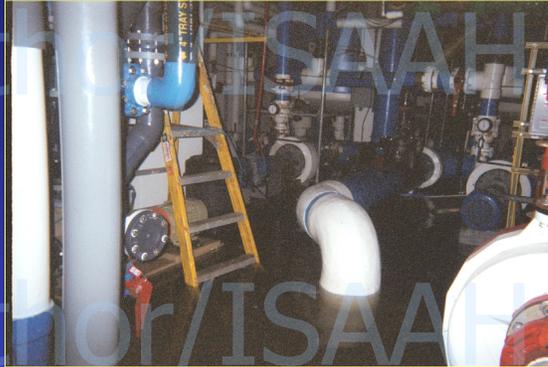
2:00 am  
(high-tide at 2:30 am)

- Battle to save Pier 3 ground level starts as floodwaters continue to rise.
- All available wet-vacs, sump pumps put in service.
- Harbor water bubbling up through cracks in floor.
- Bags of aquarium gravel and filter sand used to increase height of sandbagged areas.
- Start prep to shut down Pier 3 fish systems if needed.



3:00 am

- Floodgates and sandbags breached.
- Temporary construction wall blows out.
- Electrical room floods. Telecom room floods.
- Shut-down all power to Pier 3.
- Back-up generator providing air blower and emergency lights.



6:30 am

- Pier 3 generator dies – no air, no lights
- Secure air sources to critical Pier 3 exhibits – sequential prioritization
  - 1) expensive, rare, “signature”, sensitive
  - 2) tropical exhibits
  - 3) local exhibits
  - 4) back-up tanks abandoned



8:30 am

- Aquarium CEO arrives in canoe.
- Cell phones are dead, aquarium phones are flooded, pay phone in lobby works.
- No ETA on power. 1500KW generator can't be moved in.



10:30 am

(water levels falling)

- All air supplies brought in to Pier 4 by police boat
- All available O2 bottles ordered from local supplier.



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12:30 pm

- Small generator restarted – air blowers and emergency lights operational.
- Still no LSS, chillers, HVAC, phones, etc.



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1:00 pm

- Relief husbandry staff arrive.
- Transfer of status, plans, responsibilities.



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8:30 – 10:30 pm



- Electricity OK to turn back on
- Restart all fish systems individually
- All sand filters backwashed

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No

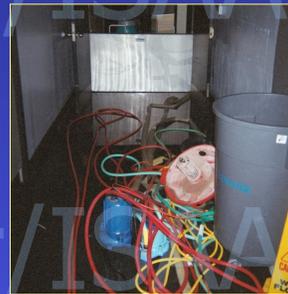
Animal  
Mortalities



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## Recovery

- \$1,000,000 damage and losses.
- Marathon effort to reopen building to public in 2 days.



## Lessons Learned - Staffing:



- Choose response personnel carefully for safety and physical exertion factors.
- Plan relief staff.
- Keep an up-to-date contact list.
- Make arrangements with police for staff to be granted entrance to “disaster” area.

## Lessons Learned - Equipment



- Have small portable generators and extra fuel available.
- Have extra oxygen bottles and regulators available at all times.
- Have multiple means of communication

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## In Conclusion



*A solid plan will likely not contain solutions to all emergencies, but it will provide the framework necessary to respond appropriately and minimize the severity of the disaster*

## Midnight

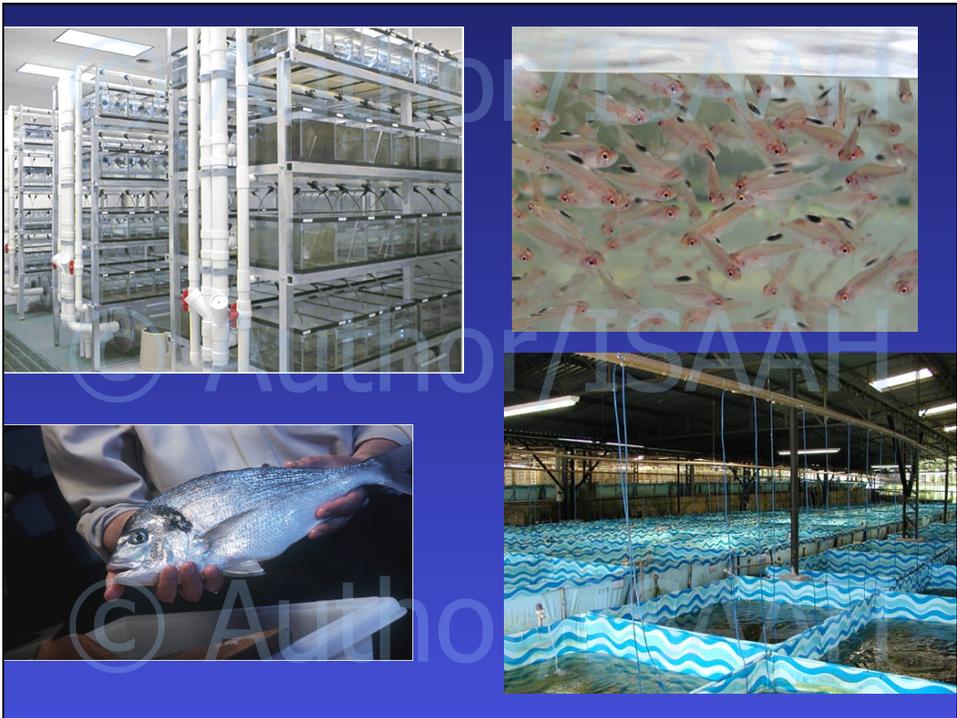
- Pier 4 power shut down.
- Dolphins without LSS.
- Rigged O2 bottles on 4 fish exhibits.
- Started watching harbor water level rising on Pier 3.

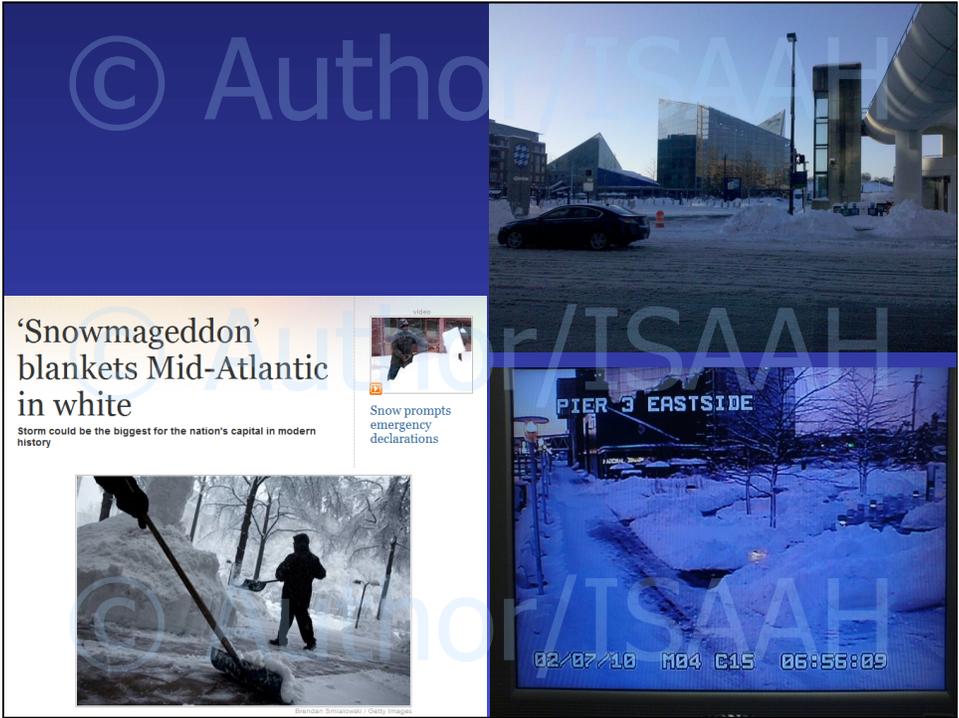


## 11:30 pm

- Harbor had risen to within 3" of our Marine Mammal Pavilion.
- High tide not expected until 2:30 am.
- Made decision to shut-down power to Pier 4 (Marine Mammal Pavilion).





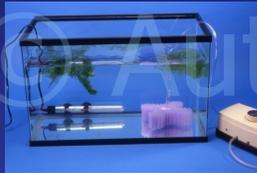




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# Filtration

- Mechanical
- Biological
- Chemical



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## Develop a Plan

- Leadership-
  - Chain of command
  - Disaster Response Team
- Roles and responsibilities (Duties)
- Determine primary and secondary sites for Command Center



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## Prepare, Implement, and Recover

