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Hurricane and Flood Safety

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1. Introduction

Hurricanes are powerful weather phenomena. Their devastating effects are amplified by their irregular and repeat occurrence throughout the storm season, which typically runs from the summer into fall seasons. The 2016 Atlantic hurricane season was notable in its severity, being an “above-normal” year for the first time since 2012. Hurricane Matthew was compared to 2007’s Hurricane Felix for its severity, and 1999’s Hurricane Floyd for its significant inland flooding and loss of life (NOAA, 2017). Furthermore, there is an interest in the possible relationship between storm frequency, intensity and anthropogenic climate change.

Addressing hurricanes and flooding is a daunting task. The difficulty of such work is only complicated for zoological institutions. In addition to the health and safety of staff and guests, institutions are responsible for dependent animals with specific care and safety requirements. Zoological institutions must be vigilant and engage in regular efforts, both proactive and retroactive, to address the potential impacts of hurricanes and flooding.

Many ask what significant role zoo keepers play in institutional planning and response – a valid question. The answer lies in the extensive knowledge zoo keepers have regarding the operations of their given areas. It is zoo keepers who are best equipped to assess relevant

risks and their severity due to this detailed knowledge, subsequently determining what is of immediate concern and communicating their findings to upper management. Conversely, when zoo keepers understand what has to be considered in the planning process, they are able to provide more pointed and pertinent constructive criticism when institutions publish a “Continuity of Operations Plan,” or COOP, for review. A more knowledgeable staff, at all levels and within all departments, results in a more adaptable and responsive organization; ultimately enhancing the animal care.

2. Apples and Oranges: Storm forecasts and preparation resources

Navigating multiple storm resources with different terminology, and subsequently integrating that information, presents challenges when preparing for, and assessing, the threat of a potential natural disaster. Fortunately, the task is not impossible and there are community organizations that are invested in the safety and success of zoos to weather hurricanes and flooding successfully.

Getting the Information

The National Weather Service (NWS) as a part of the National Oceanic and Atmospheric Administration (NOAA) monitors weather conditions and potential storm activity across the United States. Its mission is

to provide weather information “...for the protection of life and property...” and does so through up-to-date forecasts and weather education resources (“About NOAA’s National Weather Service”). It is this organization that developed and implements a standardized weather notification system using the now familiar terminology including “advisory,” “warning,” and “watch,” to denote the threat level of potential storms (“National Weather Service Glossary,” 2009). Such information is subsequently disseminated through NOAA Weather Radio stations and devices, including its own website. The forecasts, advisories and safety tips they provide are up-to-date and used to inform crisis management decisions on the ground.

Basic Concerns and Preparation

The Federal Emergency Management Agency (FEMA) works to inform organizations across the United States on best practices and associated risks of weather emergencies including floods and hurricanes. It is FEMA that compiles flood hazard maps and further information to assess the risk potential within communities. While helpful, the information provided by FEMA is macroscopic in its approach, focusing on community-wide weather response and individual homeowner responsibilities.

Fortunately, there exists another resource specifically for animal care organizations. The

Zoo and Aquarium All Hazards Preparedness, Response, and Recovery (ZAHP) Fusion Center facilitated by the Association of Zoos and Aquariums (AZA) is an open resource meant to assist zoological facilities stay up to date on current safety topics and practices, including hurricanes and flooding. ZAHP monitors potential emergencies across the United States and compiles the zoo-pertinent information for easy access. It further offers assistance to organizations facing a severe weather emergency and can establish connections with community resources.

You're not in this alone

It is good practice for all zoological institutions to reach out to appropriate public safety organizations prior to any imminent weather threat to establish proactive, reciprocal relationships. It was a well-established relationship that facilitated better communication and information flow at Jacksonville Zoo and Gardens (JZG) when faced with a severe weather emergency. Rick Holzworth, Security and Safety Manager at JZG, had a staff member ride out Hurricane Matthew at the Duval County Emergency Office of Communications a part of their COOP. Holzworth and the institution benefited immensely from this placement, as they were able to receive firsthand information including weather updates, citywide contingency planning, and broader transportation infrastructure conditions in order to coordinate their own recovery. This placement was made possible by the institution's pre-established relationships with emergency services, which allows for well-rehearsed and knowledgeable assistance on behalf of the community. The benefits of such relationships extend far beyond the consequences of any one emergency situation.

Zoological institutions have a natural advantage when it comes to establishing relationships with community partners. It is difficult, but ultimately possible, to make the standard safety planning process more fun and exciting when it takes place at a zoo. Discussing site-specific information will include touring behind-the-scenes animal areas and further animal encounters that even the steeliest of emergency management professionals can't likely resist! Take advantage of this interest to better make known the institution's needs and cultivate strong relationships.

For all the benefits they can provide, internal and external partners often don't have the zoo-specific supplies necessary for animal care. At this point, zoos will need to extend their horizons and work with other animal care institutions to create "Partnership Agreements" (PA's) or "Memoranda of Agreement" (MOA's) to exchange or purchase necessary items in the event of an emergency.

The local pet shop may be able to cover the transportation needs for small mammals and reptiles, but when it comes to large mammals and primates, that dog crate will not suffice. Are there other institutions within reasonable distance that could provide a suitable transport crate? A large-scale weather event may interrupt national (or international) shipping schedules. Are their local animal feed stores or farmers that would be able to assist in supplying staple grains and feedstuffs for applicable animals? What about replacement fencing, appliances or generators? Establishing these PA's or MOA's with sufficient detail outlining necessary materials, supply transfer, and compensation, positions institutions for success and wastes little time when faced with a weather emergency.

3. At Your Local Facility...

Each zoo is different, and the role of the animal caregiver in the institution's COOP varies, but it is essential that zoo keepers are all aware of weather-associated risks and how they may impact the facility in order to be effective in times of emergency. The collective power of all staff is necessary to insure the safety of guests, employees and animals.

Above all else, the key to successfully surviving a hurricane and flooding event is preparation. When it comes to safety, the best defense is always a good offense. Paula Mills, Resource Specialist at Disney's Animals, Science and Environment, along with Holzworth, credits extensive pre-season preparations with successful hurricane and flood management by addressing potential hazards before they occur. Mills credits "organized and focused cleanup efforts, prior to hurricane/flooding season" as one key to the company's success when addressing hurricane and flood safety.

Follow the water

When the rain comes, where is the water going to go? Across the facility, mapping the topography and its elevation predicts where water will collect and what individual structures will most be at risk for flooding and water damage. Unfortunately, this aspect of the facility cannot be easily changed, but do not be fooled into thinking that there is nothing to be done.

Mills advises institutions to "have a walk-through to identify storm water paths and drains, including run-off flows and erosion potential." Water paths will only be effective if any surrounding mobile debris is removed and erosion prevention methods are enacted to prevent any blockages. Holzworth then suggests following those pathways in reverse, "storm runoff goes to a central runoff or retention pond, but when that is full the water will backflow out of the original storm drains. At that point what is now at risk?" It should not be a question of "if?" but "when?" will floodwaters collect and how is it going to be addressed? Even if run-off paths are clear and fully functional, the potential for flooding is still high.

Sandbags are often used to direct the flow of water, contain debris, filter sediment and better seal potential water entry-points of any given structure. Believe it or not, "there actually is a proper way to fill a sandbag," says Mills. Often, institutions will have a designated team to prepare sandbags to centralize and triage the response. These teams should be trained in filling, folding and stacking techniques to maximize efficiency and effectiveness. Furthermore, the team must be informed of safe lifting practices to prevent back injury.

Within animal areas, zoo keepers should be cognizant of building contents. Of utmost



Helpful Organizations & Links

Federal Emergency Management Agency (FEMA):
<https://www.fema.gov/>

Zoo & Aquarium Hazard Preparedness Program (ZAHP):
<http://zahp.aza.org/>

National Weather Service (NWS):
weather.gov

Occupational Health & Safety Administration (OSHA) - Flood Preparedness & Response:
<https://www.osha.gov/dts/weather/flood/>

Occupational Health & Safety Administration (OSHA) - Hurricane Preparedness and Response:
<https://www.osha.gov/dts/weather/hurricane/>

concern are the extensive and complex life support systems that are integral to the care of marine and invertebrate organisms. Outside of these systems, all animal care areas have contents that are at risk. What appliances are in the building and are they elevated off the ground? Are they permanent or can they easily be moved to a safer location to prevent water damage? What is contained in storage areas and office spaces? Are important paper records digitally stored as well? Should electronic equipment be moved or stored in another location? These are all questions that must be asked and subsequently addressed by keepers within animal areas. Dedicated facilities or IT personnel are most likely focused on major infrastructure protection when faced with a large-scale weather emergency.

For animals within secured holding spaces, “finding higher ground” literally means climbing vertically within the secured space. Thus, zoo keepers must ensure there is secure perching in adequate numbers for all animals. Furthermore, food delivery chutes and water delivery devices, such as swine spigots or automatic watering bowls, may not be accessible should water or debris begin to accumulate at ground level where they are often placed. There should be alternate

locations within animal holding spaces, such as bowls or ledges along the perimeter, where diet items and fresh water can be safely distributed whilst avoiding contamination.

Don't blow over wind hazards

In addition to flooding and water damage, high winds are also significant safety hazards during hurricanes and tropical storms. These high winds have the potential to make those bulky and awkward zoo keeping tools into airborne missiles! Any free-floating objects stored in and around exhibit spaces should be collected and secured. If there is not room inside a secured structure to store these items (remember, the most delicate/water-sensitive items receive first priority for indoor storage) than they should be secured to the ground with bolts or securely cabled to a ground anchor.

Random pitchforks and wheelbarrows are not the only items susceptible to the gale force winds. Do any buildings lie within the fell-distance of large trees? Are those trees strong and healthy? Have they been trimmed appropriately? It is necessary to look laterally and vertically to assess potential wind hazards. Weak points of buildings, including windows and doors, should be reinforced with plywood covers and/or hurricane protection products in order to best prevent extensive damage from objects uprooted by high winds.

Storm players

The severity of storms and subsequent damage often inhibit staff from reaching the facility. This, in combination with the sensitive temporal aspect of animal care, often necessitates the use of a “storm” or “ride-out” team to ensure continuity of operations. These teams are a select group of employees who often remain on premises throughout the storm and/or are the first to report to the facility during or immediately after a storm. Depending on the size and makeup of the institution, these teams will also consist of animal care, veterinary care, and facilities personnel, specifically electricians and horticulturists/arborists. The key to a good response team is to have team members with extensive background knowledge of many operational areas, and the ability to triage threats and multi-task in response. When it comes to clean up and getting your zoo back up and running it will be everyone “digging in.”

Emergency response responsibilities must be outlined in the relevant formal job description (documents maintained by Human Resources outlining a position's specific duties and necessary qualifications/certifications); they do not fall under “Other Duties as Assigned” and staff cannot be solicited to volunteer for such duties. Human Resources and Risk Management/Safety should be consulted

when determining the staffing needs of an emergency response, keeping in mind the actions outlined in the institution's COOP. Staff in these designated positions should be further Hazardous Waste Operations and Emergency Response, or “HAZWOPER,” trained and certified (see OSHA “Hazardous Waste and Emergency Response,” 1910.120).

Taking care of these staff throughout the storm is of utmost importance; their needs and requirements must be added to the list of animal and facility concerns. Ironically, the most frequently forgotten “animals” that must be taken care of during the storm are staff! General first aid kits, specific prescription medications, individually packaged and preserved foods, fresh water sources, and portable generators or batteries to charge communication and medical devices for humans are often afterthoughts, but ultimately the most crucial to ensure continuity of operations. Especially important to remember are portable bathrooms. Flooding and sewer drain issues anywhere will likely impact plumbing everywhere. The toilets in the administration building may be at the highest point in the zoo, but they likely won't flush. Take note and prepare accordingly.

Conclusion

Preparing for storms is daunting; things will always go awry. But do not be fazed. Put a critical eye to every aspect of the COOP. Growth and improvement in emergency response will never come if institutions and their animal care staff accept the status quo. Emergencies and appropriate responses will evolve, institutions will never be able to predict perfectly any and everything that may happen, but they can be prepared - for the sake of the animals and the ethical responsibility it entails, they must.

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