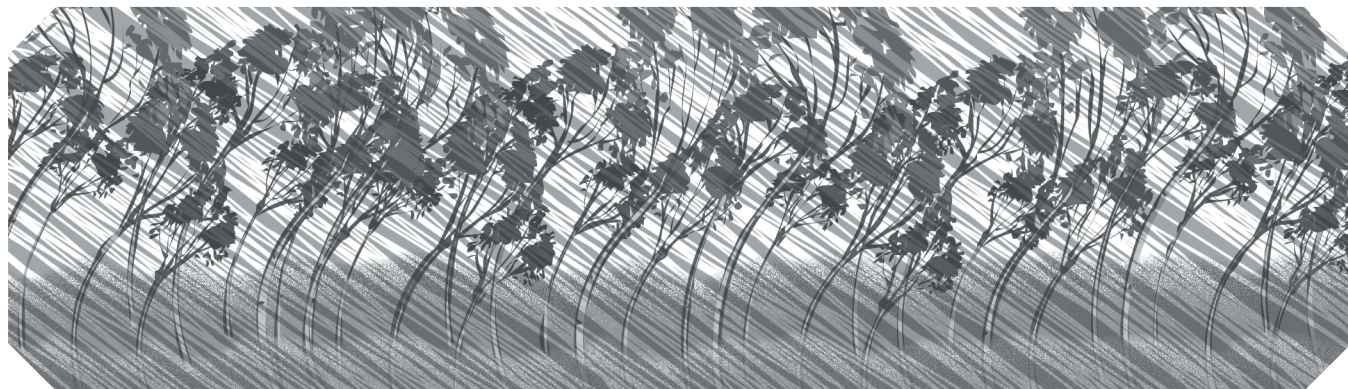


GURPS®

Fourth Edition

DISASTERS

HURRICANE



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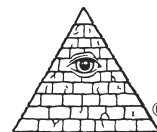
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*Blow wind, swell billow, and swim bark! The storm is up,
and all is on the hazard.*

– William Shakespeare, *Julius Caesar*

Additional Art Acknowledgments

P. 8: “Stormy Landscape,” by Hendrik Meijer. From the Ian Woodner Family Collection Fund, 2007, the Metropolitan Museum of Art, New York, metmuseum.org.

P. 16: Highsmith, C. M., photographer. *Waffle House Restaurant torn apart by Hurricane Katrina on the Biloxi, Mississippi coast*. Biloxi, Mississippi, 2006. [Photograph] Retrieved from the Library of Congress, loc.gov/item/2010630838.

P. 18: “Sudden Shower at Shōno, from the series Fifty-three Stations of the Tōkaidō,” by Utagawa Hiroshige. From the Rogers Fund, 1914, the Metropolitan Museum of Art, New York, metmuseum.org.

P. 20: *Carrying out bodies just removed from the wreckage, Galveston*. Galveston, Texas, ca. 1900. [Photograph] Retrieved from the Library of Congress, loc.gov/item/00651006.

P. 23: “Hurricane, Bahamas,” by Winslow Homer. From Amelia B. Lazarus Fund, 1910, the Metropolitan Museum of Art, New York, metmuseum.org.

INTRODUCTION

You've had a couple of days' warning, but it's never enough. You have half the plywood you need, and don't know how high the water will get this time. The evacuation order was just announced . . .

Water is the key to life, but it is also our greatest enemy. We can't go more than a few days without a drink, but it can kill millions at a time. When water combines with wind, devastating hurricanes form. They wreck ships, destroy cities, and flood areas from horizon to horizon. They are even given names.

Hurricanes can provide a complication in any game setting. Hurricanes are natural disasters, terrifying in both scope and intensity. In a futuristic scenario, weather control devices may cause them, creating unstoppable disaster weapons. In a historical or fantasy setting, the hurricane may arrive with little warning, and villagers must react in real time to impending destruction. In a space-opera setting, hurricanes can be just

as destructive on other planets as they are on Earth. In a military-focused campaign, storms and weather affect the battle and the war. Hurricanes can also strike ships at sea.

Hurricanes have two distinct phases that lend themselves storytelling. The first phase is the storm itself, with wind, rain, and immediate destruction. The second phase is post-storm flooding, which lingers and establishes a setting for rescues and recovery.

Hurricanes come with many side effects. In a modern world, the power can go out, media are affected, and law enforcement may collapse. Gas lines explode, and businesses are destroyed. Effects can be mixed and matched with other disasters, such as a post-hurricane nuclear catastrophe or a zombie uprising among the storm's dead.

Outcomes described in this supplement are those historically associated with severe hurricanes, though application to the game depends on the setting. Where possible, extended effects and long-term results are also described, allowing the ramifications of the disaster to continue beyond a single adventure.

ABOUT *GURPS*

Steve Jackson Games is committed to full support of *GURPS* players. We can be reached by email: info@sjgames.com. Our address is SJ Games, P.O. Box 18957, Austin, TX 78760. Resources include:

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Internet. To discuss *GURPS* with our staff and your fellow gamers, visit our forums at forums.sjgames.com. You can also join us at facebook.com/sjgames or twitter.com/sjgames. Share your brief campaign teasers with #GURPShook on Twitter. Or explore that hashtag for ideas to add to your own game! The web page for *GURPS Disasters: Hurricane* is gurps.sjgames.com/hurricane.

Store Finder (storefinder.sjgames.com): Discover nearby places to buy *GURPS* items and other Steve Jackson Games products. Local shops are great places to play our games and meet fellow gamers!

Bibliographies. Bibliographies are a great resource for finding more of what you love! We've added them to many *GURPS* book web pages with links to help you find the next perfect element for your game.

Errata. Everyone makes mistakes, including us – but we do our best to fix our errors. Errata pages for *GURPS* releases are available at sjgames.com/errata/gurps.

Rules and statistics in this book are specifically for the *GURPS Basic Set, Fourth Edition*. Page references that begin with B refer to that book, not this one.

GLOSSARY

Beaufort Wind Scale: A system for correlating wind speeds, ocean-wave height, and expected wind effects. See p. 14.

hurricane: A weather pattern with rotation, winds greater than 74 mph, and lower pressure than a tropical storm.

recovery: The long-term rebuilding of a community after a disaster.

response: The immediate acts to contain a disaster, save lives, and limit property damage.

Saffir-Simpson Hurricane Wind Scale: A system for classifying hurricanes into one of five categories by wind speed. See p. 5.

tropical depression: A weather pattern with low pressure forming in the tropics, with winds up to 38 mph.

tropical storm: A weather pattern with rotation, winds up to 74 mph, and lower pressure than a tropical depression.

ABOUT THE AUTHOR

James P. Howard, II is a scientist in Maryland. James holds a Ph.D. in public policy and a Master of Science in environmental engineering and science. He's written books on mathematics and public policy, and this is his first gaming module. James enjoys playing various roleplaying games with his children. Follow his latest interests, work, and thoughts at jameshoward.us.

CHAPTER ONE

STORM FRONT

Hurricanes are forces of nature. They occur when the temperature and pressure line up just right over tropical and subtropical waters. Of course, there are exceptions – a hurricane once formed over the Great Lakes between the United States and Canada. Once a hurricane has formed, it cannot be stopped.

“Hurricane” is the traditional name for storms in the Atlantic and eastern Pacific. Storms in the western Pacific are called typhoons. Collectively, hurricanes and typhoons are called tropical cyclones, reflecting their origins along the equator and their sustained spinning winds.

Some places are struck repeatedly by hurricanes. Areas like Florida, Caribbean islands, and the Gulf of Mexico shore

are frequently hit during the North Atlantic storm season, which lasts from June through November. In the Pacific, the Philippines, Okinawa in Japan, and areas around the South China Sea are often hit from May through November. In the Indian Ocean, India and Madagascar are commonly struck by hurricanes; their season runs from April through December of each year.

Hurricanes happen far more often in the Northern Hemisphere than the Southern Hemisphere. They usually move toward the west and northwest, except those in the eastern Pacific. Eastern Pacific hurricanes generally move toward the east.

HURRICANE SCIENCE

Hurricanes are created by thermodynamics. Wind and water mix to form an intense storm that destroys anything in the way. Storm preparation is difficult, but knowing how storms form helps.

Storms start rotating due to the Coriolis force exerted by a spinning Earth. Tropical cyclones north of the equator rotate counterclockwise. South of the equator, storms rotate clockwise. This force also keeps storms from crossing the equator, with rare exceptions. Certain types of storms (called anticyclonic storms) occur when high-pressure regions start

rotating. These spin in the opposite direction and generally occur at higher latitudes, from rotating Arctic air. Regardless of where the storms form and hit, they continue overland until they run out of energy.

FORMATION

Hurricanes in the Atlantic Ocean form when a mass of warm air moves off the western coast of the African continent over the ocean. This mass of air starts warming the surface water, causing it to evaporate into the warm air mass. Because warmer air is associated with a lower atmospheric pressure, these are called tropical depressions. The warmer the air is, the lower the pressure. Warmth and low pressure combine to evaporate more and more water, making the storm stronger. As long as the water stays warm, the cycle is self-sustaining.

As a tropical depression gets more intense, it organizes and starts rotating; an eye develops. Closer to the eye is more intense, with greater wind and more rain, but the eye itself is calmer. When the winds reach a certain speed, the storm goes from a tropical depression to a tropical storm, and it gets a name.

In the Atlantic, there are six lists of names maintained by the World Meteorological Organization, each with one name for almost every letter of the alphabet. On the first of May, the new hurricane season starts, and the first storm is named with the first name on the year's list. Each name is used in turn. At the end of the year, the next list of names is used.

CLIMATE CHANGE

A major effect of climate change is the warming of the oceans and the atmosphere. While storms are not necessarily more frequent, they are growing stronger than storms have been in years past. Hurricane Katrina was the harbinger of this, and larger storms have struck Texas, Florida, New York, and Puerto Rico in the Atlantic region. The Pacific has also seen an increasing number of dangerous storms since 2000, with more damage and more lives lost.

As oceans and the atmosphere get hotter, they produce more intense storms. Those storms cause more damage and put more lives at risk. Campaigns set in a time or place affected by global climate change could reasonably have many adventures involve increasingly intense storms.

Climate change is also breeding a new type of overland storm, the derecho. A derecho is a fast-moving straight-line storm front that moves over land with winds up to 100 mph and rains of up to 1" every five minutes. However, the storms usually finish much faster than typical hurricanes.

If a storm is considered too deadly or costly, its name is permanently retired and replaced on the master lists. Pacific typhoons use lists that include names contributed by each East Asian nation. India, Australia, and the Philippines each have their own systems for tropical-cyclone naming.

HURRICANE WIND SCALE: SAFFIR-SIMPSON

Storms range from Category 1 to Category 5 on the Saffir-Simpson Hurricane Wind Scale (see below). The higher the number, the more intense the storm; the category indicates expected damage. A Category 4 is expected to do substantially more damage than a Category 2. A Category 5 hurricane can mean devastation on a biblical scale, but they tend to slow down and drop a category level before hitting land.

Two ratings are below Category 1. A tropical depression is anything with sustained winds less than 38 mph, and a

tropical storm is up to 73 mph. Until 74 mph, a storm is not yet a hurricane, but can be just as dangerous. Superstorm Sandy brought sustained winds of less than 40 mph to New Jersey, but more than two million households were affected, with 300,000 damaged or destroyed because of the length of time the storm stayed in place and the amount of rain.

Although higher is obviously more intense, lower-rated storms can be even more dangerous depending on where they strike and how long they last. Katrina was a Category 4 when it struck New Orleans, and 2011's Irene never exceeded Category 3 while causing almost as much damage as Katrina.

Saffir-Simpson Hurricane Wind Scale

<i>Category</i>	<i>Sustained Wind Speed</i>
1	74 to 95 mph
2	96 to 110 mph
3	111 to 129 mph
4	130 to 156 mph
5	over 156 mph

HURRICANE HAZARDS

Hurricane hazards are many and varied. The two most obvious are flooding and winds, both of which are substantial. Since the effects of flooding and high winds do not dissipate instantly, that complicates matters further. Secondary risks spring up in the wake of the water and wind. These are worse in societies with higher technology levels, especially when that technology is driven by electricity, always sensitive to water.

Hurricanes are multi-day affairs as they move onto land. A hurricane travels slowly as it moves ashore, causing an area to be directly affected by the storm for a day or more. This is the most dangerous time for anyone and anything in the way.

FLOODING

Flooding is often associated with hurricanes because this is the most common effect. The water comes from two sources: above and the sea. Rainfall is torrential and up to 6" of water per hour in the worst hurricanes. Since the ground can only absorb 1" of rain or so per hour, the rest of that water has to go somewhere. If it can't, flooding occurs. Fast flows can carry away a car with only 4" of water. This is the freshwater hell the hurricane brings.

Since the hurricane is coming over the ocean, the storm drags the ocean with it. As the winds whip the water, waves build up and come ashore. This is the storm surge, and it wrecks a coastline in minutes. The highest ever recorded came with Hurricane Katrina, and it was between 25' and 30'. (The storm surge is not the same as a tsunami, which stops after 10 to 15 minutes. The storm surge continues as long as the wind does.)

It takes time for the water to leave. The only mechanisms to direct excess water away are storm-drainage systems and existing rivers, neither of which handles more than a few inches of water effectively. Closer to the ocean, the water flows

down roads and back out to the sea. Further inland, floodwater can take longer to reach reservoirs and seas. In the most severe storms, it can take days for the water to drain.

The danger of flowing water, beyond the obvious hazard of its rapid movement, is worsened by its contents. Anything the water picks up is carried with it. Trash, downed trees, cars, bits of buildings broken off, and the like all speed along with the water. It might even contain chemicals it picked up from factories or storage facilities, or it could have overflow from a wastewater-treatment plant.

The water should not be drunk or even stepped in if it can be avoided. Disinfection is necessary if the water is contacted. Someone with an open wound is at significant risk for infection.

See pp. 15-16 for game mechanics relating to flooding.

SEVERE WINDS

The wind can cause just as much damage as water – sometimes more! As shown by the Saffir-Simpson Hurricane Wind Scale (above), hurricanes are rated based on wind speed, not water content or temperature. The scale tops out at Category 5 because at the time it was created, sustained winds of 157 mph or more would destroy any human-built structure.

The wind can rip the roofs off of buildings and can send trees through windows. Gusts can twist off signs and traffic signals, and tear down power lines. The wind can also complicate response efforts.

After the wind has torn holes in walls and opened homes like sardine cans, water can enter freely, causing additional damage. The combination of wind and rain are the reason for the phrase "the perfect storm." The two work together to destroy everything in the hurricane's path. The good news is that unlike floodwaters, the wind stops when the storm stops.

See pp. 14-15 for game mechanics relating to wind.

SECONDARY HAZARDS

After the water and wind hit, new hazards emerge.

Because hurricanes are warm-water storms, the aftermath is typically hot. This is accentuated by the occurrence of hurricanes in already warm, semi-tropical climates. The conditions can make it difficult to work on cleanup and recovery, imposing penalties to tasks (see *Heat*, p. B434). In addition, warmth and water lead to humidity, which can cause long-term damage to structures. High humidity will warp or rot wooden frames and building materials. Mold and mildew can damage a building from the inside out.

In the initial aftermath, electrical lines may be cut, and gas mains can be leaking due to snuffed pilot lights. Electricity and water are an unfortunate mixture, and can deliver incapacitating or deadly shocks to anyone near a downed power line. See *Electricity*, pp. B432-433, for more on its dangerous effects.

Destroyed buildings are a collection of hazards. Wind and flooding can weaken the structural integrity of buildings. If natural gas has built up inside a structure, the slightest spark (like dragging a piece of debris with a rusty nail) can cause an explosion capable of leveling a city block – or at least what’s left after the wind has ripped through.

If a building isn’t properly dried out, mold takes over. Mold grows well in a humid environment – and hurricanes leave one behind. So-called “black mold” can cause respiratory irritation to anyone breathing air tainted by it (see *Coughing or Sneezing*, p. B428), and can become *dangerous* with extended exposure.

There can be a terrible stench of rotten meat in the building. In the best of circumstances, the stink comes from spoiled food in a powerless refrigerator or freezer. Worse, the smell may come from a dead body (animal or human) hidden in the debris. The smell might induce nausea, making rescue or cleanup more challenging (see *Nauseated*, p. B428).

The debris itself can be a problem. Jagged edges can tear clothing and cut skin. Anything recently covered in water is also a breeding ground for bacteria; getting cut could mean being infected with tetanus (lockjaw) or another disease. See *Infection*, p. B444, for more information.

Stray animals are another danger after a storm. Many people leave their pets behind when evacuating. Other animals are displaced from their natural habitats, either by being carried away from their homes by the water, or by having their homes destroyed by the storm. By the time they get to land, many animals are hungry and may attack rescuers or cleanup crews.

Technology is affected by flooding. Salt water causes corrosion. Anything driven by electricity is shorted out. Power plants, even hydroelectric, could be wrecked. Manufacturing facilities may be destroyed, and chemical plants may leak harmful chemicals. In addition, storm surge carrying ocean water is saltier and corrodes metals relatively quickly, in just a few days in some cases. While the cause was a tsunami and not a storm, the floodwaters that struck the Fukushima Daiichi Nuclear Power Plant in Japan in 2011 caused the power plant to fail, leading to a multiday nuclear crisis and a full-scale nuclear disaster. For more information on gaming nuclear accidents, see ***GURPS Disasters: Meltdown and Fallout***.

See *Aftermath* (p. 9) for more details about secondary hazards.

The situation is untenable. It's just heartbreaking.

– Gov. Kathleen Blanco (about the effects of Hurricane Katrina)

THE HURRICANE CYCLE

To best incorporate a hurricane into a campaign, it helps to understand the disaster cycle with specific application to hurricanes. The hurricane cycle is best defined for the Southeastern United States. This is the model for a modern-day setting.

This cycle can be adapted for different tech levels. Less-advanced societies have less time for warning and preparation. They also have less ability to protect themselves from winds and flooding. More advanced societies have more warning, more preparation, and more ways to mitigate damage. At the highest TLs, hurricanes may be nonexistent as weather control satellites stop them or technological resilience makes them irrelevant. For an example, see the TL10 weather control satellites on p. 79 of ***GURPS Ultra-Tech***.

WARNING AND PREPARATION

In the United States, hurricanes are monitored by the National Hurricane Center (NHC; founded in 1965), which

is part of the National Weather Service (NWS; founded in 1870). The NHC is based in Miami, Florida, but also tracks tropical storms globally. As tropical storms start to form, the NHC’s surveillance includes tracking the storm, predicting where it will go, and predicting how much stronger it will get. From 1890 to 1965, hurricane warnings were produced by the United States Weather Bureau, and from 1870 to 1890, by the United States Army. Before 1870, there was no organized hurricane monitoring in the Atlantic Ocean.

Much of this is based on satellite imagery, though the NHC also flies crewed aircraft through even intense storms to collect information on their wind and pressure. The NHC issues notices and advisories as plain text. Until 2016, the plain text was written in all capital letters, like all other NWS notices. These reports from the NHC are the basis for weather forecasts on television, radio, and weather websites. The NHC also makes reports available as soon as practical over the Internet; these are available to anyone worldwide for free.

In the Pacific, the Joint Typhoon Warning Center (JTWC) is a U.S. Department of Defense agency based out of Pearl Harbor, Hawaii. The JTWC provides typhoon tracking and warning for U.S. government agencies in the Pacific and Indian Oceans.

Once a hurricane watch is issued about where and when a hurricane may strike, local residents begin preparations. (Those with the means to purchase and stash supplies may even begin before the hurricane season hits, using emergency preparedness checklists available from various organizations.) Preparations start with acquiring supplies like food, gas, and stored fresh water. Purchasing food that depends on refrigeration is not wise, in case of power loss. At TL4 and below, fresh food is the only option in the short term, but residents may store what they can in waterproof containers, if they are available (see *Containers and Storage*, **GURPS Low-Tech**, pp. 34-35). If low-tech citizens know about regularly occurring storm seasons, they may preserve food ahead of time and keep it in suitable jugs and boxes; see *Food Preservation*, **GURPS Low-Tech Companion 3: Daily Life and Economics**, p. 13. At TL6 and above, shelf-stable food supplies like canned goods are preferred (see *Foodstuffs* in **GURPS High-Tech**, pp. 33-34, and in **GURPS Ultra-Tech**, pp. 73-74). At TL5, a limited selection of saved food items is available with elementary canning and preservation, but long-term supplies are uncommon.

Camping equipment at any TL can help keep residents alive. A portable power generator (**GURPS High-Tech**, p. 14) is useful for running small appliances. Survival gear such as shelters, cooking equipment, and water-processing systems (when available) are handy; see p. B288 for a general assortment of equipment; **GURPS Low-Tech**, pp. 31-32, 35-36, for TL4 and below; **GURPS High-Tech**, pp. 56-59, for TL5-8; and **GURPS Ultra-Tech**, pp. 75-77, at TL9 and above. At TL6 and above, residents should also have a standard battery-powered AM/FM radio (**GURPS High-Tech**, p. 44), since cellular and Internet service are unlikely to be available once the storm hits, and portable lighting (see *Lights* in **GURPS High-Tech**, pp. 51-52, and in **GURPS Ultra-Tech**, p. 74), since power will go out.

Some try to protect their homes, businesses, and properties from wind and water. At TL4 and below, **GURPS Low-Tech**, pp. 28-30, provides elementary hand tools for carpentry and construction. **GURPS High-Tech**, pp. 23-28, contains a number of options for basics at TL5-8 (like duct tape and power tools) that can help secure a structure. Similarly, **GURPS Ultra-Tech**, pp. 80-88, suggests futuristic tools for TL9 and above, plus a variety of labor-saving devices.

A first aid kit is necessary. Simple first aid kits (p. B289) with bandages are available at TL5. Better kits are available at TL6-8; see **GURPS High-Tech**, pp. 220-221. See **GURPS Ultra-Tech**, pp. 198, for a typical TL9 kit. Additionally, more advanced medical care (**Ultra-Tech**, pp. 196-206) might be procurable (depending on the setting) and can provide better field care, if it can run on batteries or a generator. Below TL5, only poultices and ointments of varying effectiveness can be acquired, plus bandages, tourniquets, and splints (see **GURPS Low-Tech** pp. 144-147). Before antibiotics, even a small cut can be a life-threatening injury.

More people needing the same basic supplies inevitably cause a run on the stores. Basic foodstuffs with a limited shelf life – as well as bottled water, medical supplies, sanitary items, batteries, and flashlights – dwindle in availability as the local stocks run out. Tempers flare when people seek items critical to protecting themselves, their families, and their property. To determine if a given good is in stock and available for purchase, use Merchant (p. B209), subject to difficulty modifiers: Life-saving equipment, food, fresh water, and durable goods are at -7. Gasoline and other fuels, transportation, and weapons are at -5. Acquiring anything else is at -1 (or worse, for things easily damaged by water). If circumstances merit, the GM may change the difficulty. For instance, finding new transportation may be at -7 if the nearest car lot was damaged.

Nuking a Hurricane

A popular myth says dangerous hurricanes can be disrupted with nuclear weapons. When a hurricane is approaching, commentators and Internet posts suggest nuking the storm before landfall to save everyone. As powerful as nuclear weapons are, they are minuscule compared to the energy of a hurricane. Anyone trying to nuke a hurricane will just end up creating a radio-active hurricane, which now spreads deadly radiation along with scouring winds, torrential rain, and racing floods.

EVACUATION

Evacuation standards were developed for the United States during the late 20th century and continue to be updated. Other countries have different approaches and capabilities, depending on the country's development and resources available. Much of what follows is specific to the modern United States, but it can be adapted for other nations, fictional countries, and futuristic settings.

For typical storms, those in the path may simply stay home. The local authorities may declare an emergency, and prohibit people from using the roads. However, those prohibitions have enough exceptions that they are basically meaningless; exceptions typically permit emergency travel, travel to and from work, and anything short of joyriding. As long as the power stays on, it is reasonably comfortable to ride out the storm with family and friends. Even with an emergency order in place, the local pizza place probably has drivers who can get there in 30 minutes or less.

For worse storms, the authorities order an evacuation. Anyone who heeds the warning may find themselves on highways jammed with others seeking safety. Authorities often try to ease the traffic by opening up shoulders, suspending tolls, and using contraflow (turning portions of roads into all-one-way routes).

Unfortunately, the evacuation order is ultimately voluntary since it's difficult to enforce. Some people stay put, saying they have survived every hurricane that has come along so far. Others may not be able to get out, either due to health issues that prevent them from traveling, or because they are unable to evacuate on their own and have no support. They might end up needing a rescue later.

Institutions have to make a different call. Hospitals stay open, at some level, providing emergency services no matter what. In an evacuation, some hospital patients are at greater risk from transportation than from the hurricane. When an evacuation is ordered, a hospital evaluates which patients should be taken to another location and leaves in place patients who cannot move.

Universities cancel classes and evacuate students staying on campus. The government is mostly closed, except for emergency operations. Businesses shut down major operations, and stores close. Some industrial facilities (such as industrial kilns) remain partially open, if a full-scale shutdown and restart is more difficult than continuous low-level operation. The local economy slowly stops.

Those who leave usually move toward higher ground inland. Evacuees might end up staying with family or friends. Someone with financial means might get a hotel room somewhere nice. If none of these are options, the evacuees end up in a shelter (set up in a location like a public school, community center, library, or sports arena).

Although the accommodations may be uncomfortable, it is only for a few days, and it beats taking a chance on dying. However, the destination is not necessarily immune to the storm, and may lose power because of hurricane damage.

Food choices are decided by location. In a nice hotel far from the storm, evacuees might dine out at a nearby restaurant. Those stuck in shelters have fewer options. Vending machines are quickly cleaned out, and people eat whatever they grabbed in preparation, typically without access to cooking appliances. After a day or two, the government

delivers supplies, and the provided food is retort-packaged foods (**GURPS High-Tech** p. 34), commonly called “meals, ready-to-eat” (MREs).

The evacuation center has communal restrooms. If the evacuation center is a high school, the gym has showers. Some people do not bother using the showers, and many do not even have a change of clothing. After a day or so, the smell of humans in close proximity can be overwhelming, and worse for lack of air conditioning. All social interactions are at -1 to relevant skills (in addition to any modifiers from advantages and disadvantages).

Sleeping in a shelter with (at most) a tumbling mat for a bed and hundreds of strangers drives already anxious people into a heightened state of anxiety. The closer evacuees are to other people, the greater potential there is for conflict. At an evacuation center, law and order are presumed to break down quickly. During Hurricane Katrina, nearly 10,000 people were evacuated to the Superdome. The media immediately started reporting on violent crimes, drug dealing, and an almost apocalyptic breakdown of society. Although three people died in the Superdome during the five days residents were stranded there, two were heart attacks and one was a suicide. Most of the violent crimes reported in the news were never verified, and the few that happened occurred after supplies ran low and infrastructure failed. People generally behave better than is portrayed in the media.

A societal breakdown is still possible in an evacuation center, depending on how long people are bunked together and how well authorities are managing the situation. Factors that increase hostility are a lack of food, lack of restrooms, poor sleeping conditions, hot temperatures, and an extended wait to return home. Social interactions may be at up to -5, on top of any other relevant modifiers.

THE EYE OF THE STORM

The actual storm is, in some ways, the most predictable part of the process. In the hurricane's path, the storm gradually intensifies, with growing amounts of rain and wind. The waters rise, and damage aggregates with each passing minute. The power can go out and fresh water can stop running.

At the outside edge of a hurricane strike, the storm's effects are weaker than near the eye. If the storm does not directly hit the area, it typically doesn't last long because less of the hurricane actually passes over the location. The effects are less intense overall.

Closer to the center, in contrast, hurricanes get stronger. The strongest winds and most rain are associated with the eye wall, surrounding the eye of the storm. If the eye of the storm is going to strike an area, then the storm is going to last longer, as more storm must pass over the location. During this time, the storm gradually increases in intensity until the center passes over.



The only break for an area in the path of the storm is when the eye of the hurricane passes over. The eye is the clear center of rotation, and is calm. There are little rain and little wind, making it easy to confuse this with a sudden end of the storm. The eye is several miles wide, and the best word to describe it is eerie. Depending on how fast the storm is moving, this period might last from a few minutes to an hour or more.

After the eye, the process happens all over again in reverse. The strongest part of the storm hits again, and then the winds slowly diminish in strength over many hours to a day or more.

AFTERMATH

When the storm subsides, people start to come back to a situation that might be more dangerous than the storm itself. The storm's effects add many new dangers to the area. Floodwaters are likely to stick around for some time. The water becomes dangerous for many reasons.

Displaced animals are likely in the water, especially dangerous reptiles. In the Southeastern United States, this means snakes and alligators. In Florida, crocodiles add to the mix. In Hawaii, the yellow-bellied sea snake is a venomous reptile related to the cobra that lives in the water. In the Philippines, true cobras are found in post-storm waters. In Japan, the habu snake lives in the south, and the mamushi snake lives in the north; both are venomous. Australia is known for many dangerous animals, especially reptiles and insects.

Other animals can also be dangerous, but less well adapted to the newly fluid environment. If the animal lived in a pond, lake, or marsh before the storm, the environment just got bigger. Bears, dogs, wild pigs, and some cats can swim moderately well. Insect resilience depends on their individual water-survival adaptations. Fire ants build impressive boats of their own bodies to save the colony, while bees fair less well in the rain. Aquatic insects are fine, provided the water is relatively clean.

Fish are sometimes affected. Saltwater fish typically cannot survive in fresh water, nor freshwater fish in salt water. Fish can also be carried over land by the storm and dropped with the rain. Some fish arrive at new locations with the floodwaters and become stranded in unusual places, such as basements and streets. After the water recedes, the fish can be trapped on land, quickly dying without water.

The floods can contain technogenic threats, because the water picks up anything it contacts. Floodwaters carry sewage from wastewater treatment plants or straight out of the sewer system. Chemicals from industrial or storage facilities can get swept into the water. A gas station or vehicles can leak fuel into floodwaters; the fuel floats, and burns if ignited. See *Floodwater* (pp. 15-16) for more information about effects.

The water can conceal other hazards. Fallen branches, downed power lines, broken glass, and smashed vehicles can all lurk in muddy waters. If it was on the street, it is now in the flood. See *Floating Debris* (p. 15) for details about how much injury this can cause.

Damaged buildings range in safety from minor or cosmetic damage to completely gone. It is the middle ground of

DISASTER-MANAGEMENT ASSISTANCE

In the United States, local civil authorities are supported by the Federal Emergency Management Agency (FEMA), which provides resources and backup for local operations. Local agencies are expected to address the first few days of a disaster, including rescue operations, and provide emergency assistance for displaced persons. FEMA's role is to support recovery and rebuilding through loans, flood insurance, and long-term assistance if necessary.

The Japanese Fire and Disaster Management Agency (FDMA), the Mexican National Civil Protection System, and the Indian National Disaster Management Authority (NDMA) fill a similar role to FEMA in supporting their local authorities. The Philippines use local authorities without central government assistance for disaster management.

partially destroyed buildings that presents the highest risk. Being inside is not safe because the structure may collapse at any point. However, it may be necessary to go in anyway. To understand the risk and determine what is happening with a building, see *Damage to Buildings and Structures*, p. B484. A GM who needs more detailed rules regarding building damage and collapse should refer to *This Old House (GURPS After the End 2: The New World*, pp. 34-35).

A dwelling not in immediate danger of collapse can still injure anyone entering. Any standing water should present the same concerns as water outdoors, with unknown animals, chemicals, sewage, broken glass, and other dangers below the surface.

The greatest hazard in the aftermath of any natural disaster, though, comes from everyone else who survived. In storms with evacuation orders, many do not leave because they had nowhere to go or no way to get out. These people need supplies to live. With civil authorities stretched to the limit, many people have no one to call for help. This leads to scavenging of washed-out stores. Anyone who has a store may decide to defend their property with force.

In the aftermath of the storm, police, fire, and emergency managers are exhausted from several days of preparation and disaster management. If insufficient personnel resources are available to give first responders adequate rest, these people become agitated and start making bad decisions, which can lead to accidents, further damage to property, and possibly loss of life.

Over time, the waters completely recede. Some people who return to their city find that their homes are completely destroyed. They may choose to rebuild or they may leave altogether, selling or abandoning their homes and letting someone else do the construction work. Businesses may rebuild, and commerce eventually goes back to regular levels of service. Schools and government might reopen and return to normal operations.

At lower TLs, medical care is less sophisticated, and injury victims are more likely to die. Buildings are also less resilient than those at higher TLs. Because of these complications, a community is less likely to recover and rebuild at lower TLs.

All but the hardest hit go back to their daily lives. People with resources, usually money, return to their routines in just a few days. Those with lesser resources do so when their jobs and schools have returned to normal, typically after a few weeks or a few months. For those who suffered the most, it

can take years before a semblance of normalcy returns. After Hurricane Katrina, for instance, people were living in temporary housing as much as 10 years after the storm struck.

See *Secondary Hazards* (p. 6) for additional indirect complications from storms.

*Gale-force winds blew for an entire day,
Blew hard as can be, and then down came the Deluge,
Sweeping like a battle over all the people.*

– Gilgamesh

MAJOR HISTORICAL STORMS

Many hurricanes have hit the United States and countries in the Pacific over the years, but a handful were so bad that horror is still associated with their names. Here are a few storms whose infamy has outlived the original damage done, to show the mark these disasters can leave on society.

HURRICANE AGNES

Hurricane Agnes was a 1972 hurricane that formed in the Gulf of Mexico, an origin point for many storms. Agnes slowly grew in strength as it headed north and struck western Cuba before hitting the United States. Agnes moved toward Alabama and Florida, and then continued right up the eastern coast of the United States. The storm went through Georgia, the Carolinas, Virginia, and Maryland before moving back out to sea. Once over the North Atlantic, the storm regained some intensity and moved back over the eastern seaboard, striking New Jersey and New York, and moving northward into Canada. The storm moved back out to sea, hitting Iceland, Ireland, and the United Kingdom before finally dissipating.

The damage associated with Agnes in the United States was the worst ever for a hurricane to that time. Among other effects from the storm were 4" to 8" of rain in the Southeastern United States. Flooding in New York and Pennsylvania ranged up to 8' deep. Maryland was likely hardest hit, with some areas seeing flooding of 40' after the storm. The effects were also felt inland, as the waves on Lake Erie in Ohio were as high as 4' above normal.

HURRICANE KATRINA

Hurricane Katrina is the benchmark against which modern storms are measured. Katrina formed in 2005 off the southeast coast of Florida and grew steadily as it moved toward Florida. It was a Category 1 storm when it hit Florida hours later.

Katrina would have been unremarkable in the history of hurricanes, but it crossed over the Florida peninsula into the

Gulf of Mexico. Over the warm waters of the Gulf, Katrina increased steadily in intensity before moving northward, almost striking New Orleans directly and causing damage across the Gulf Coast. The storm then traveled northward, tracking along the Mississippi River before dissipating over the Midwestern United States.

The most remarkable aspect of Katrina was the chaos that ensued in New Orleans. The main city sits in a large bowl bounded by levees that protect the city from typical flooding. During Katrina, many failures caused catastrophic flooding. First, several levees broke and were unable to handle the additional load of water in the Mississippi River. Nearly 150 drainage pumps normally keep the water from rising in the bowl, but many of those pumps failed due to lack of power or complete submersion under rapidly rising water.

Massive evacuations ensued, with many decamping to Houston, Texas. This complicated evacuation efforts two weeks later in Houston, when an even more intense storm, the Category 5 Hurricane Rita, struck Houston. These two storms in rapid succession stretched the capabilities of FEMA to its limits.

TYPHOON NANCY

In 1961, Typhoon Nancy formed in the open Pacific Ocean. After hitting Guam, it moved toward southern Japan. The storm then tracked northward, following the line of the Japanese islands. It then passed into the Sea of Okhotsk and struck the Soviet Union's Kamchatka Peninsula. After passing over the peninsula, the storm dissipated west of Alaska in the Bering Sea.

Nancy is considered the strongest tropical cyclone ever recorded. While the storm predated the Saffir-Simpson Hurricane Wind Scale, the winds at the time were recorded at 215 mph. Nancy destroyed more than 500 bridges in Japan and damaged or destroyed more than 325,000 homes. Despite the extensive damage, early warnings and preparations are credited with minimizing the death toll.

CHAPTER TWO

RIDING OUT THE STORM

As the hurricane builds and the aftermath unfolds, survival is paramount. Various traits can help those stuck in the hurricane's path survive. Some characters even have special

advantages and skills that give them an extra boost. As the storm rages and the effects mount, survivors need to interact with the world as it returns to normal.

CHARACTERS

The best way to survive a hurricane is to get out of the way. However, anyone stuck in the middle of one can rely on certain advantages and skills to help survive. These can be used by anyone – or put on any template – to reflect abilities one would learn on the job or by volunteering in the right fields.

*Certain traits can help
someone to survive a hurricane.*

ADVANTAGES

Humans are reasonably well adapted to deal with extreme weather. For cinematic campaigns, advantages like Breath-Holding (p. B41), Doesn't Breathe (p. B49), and Walk on Liquid (p. B97) are extremely helpful when the water is rising. Reduced Consumption (p. B80) is possible in any campaign, and is useful for surviving the aftermath of a hurricane, when food is scarce.

Some traits need special consideration when using them under hurricane conditions.

Amphibious

see p. B40

You may ignore all of the penalties associated with being in the water. Penalties associated with the wind and with vehicles still apply.

You may be adapted to water of a particular salinity level. If freshwater-adapted, you may be unable to tolerate being in salt water. If saltwater-adapted, you may be unable to tolerate being in fresh water. Hurricanes bring both freshwater and saltwater flooding, often resulting in a brackish mix.

An Amphibious character who is adapted to a specific salinity has a Weakness (p. B161) to the opposite salinity. A Weakness to a particular salinity is typically rare, though the GM may adjust that to reflect the setting. Being adapted to

both fresh and salt water is the default for aquatic characters and thus needs no Weakness to either.

Flight

see p. B56

Fliers with the Lighter Than Air limitation subtract 1 yard/second from air Move per 5 mph of wind speed if moving *against* the wind, or add 1 yard/second to air Move per 5 mph of wind speed if moving *with* it. Those without the limitation are still affected, just half as much: 1 yard/second per 10 mph of wind speed. Wind also affects your ability to steer; see *Wind* (pp. 14-15).

Night Vision

see p. B71

Under hurricane conditions, you may only ignore up to -2 in combat or Vision penalties due to darkness.

Perfect Balance

see p. B74

For personal actions and movement, you can ignore up to -4 in penalties to DX and DX-based skills due to strong wind. Penalties associated with water and with vehicles still apply.

Resistant

see pp. B80-81

Resistances to poisons, chemicals, environmental syndromes, and disease are exceptionally useful in post-hurricane situations, especially when in standing water.

Speak Underwater

see p. B87

In rushing water, your ability to communicate underwater is limited to no more than 10'.

Walk on Air

see p. B97

In hurricane-force winds, roll against DX once per minute of walking. Failure means a fall; the normal rules for falling while walking on air apply. Your Move is modified as it would be if walking on the ground; see *Wind* (pp. 14-15).

Walk on Liquid

see p. B97

Your Move is modified as it would be if walking on the ground; see *Wind* (pp. 14-15).

PERKS

Some people collapse in a crisis and do not know what to do, but other people were meant for this disaster.

Emergency Management

You know what to expect in a crisis. When rolling to find survivors, give medical aid, operate rescue equipment, or anything similar, you may ignore up to -2 in penalties from disaster victims (including ones you're helping) fidgeting, shouting, shoving, etc. This is training, not a lack of empathy.

This perk doesn't affect distractions in *combat* (e.g., Will rolls to maintain Aim) or Fright Checks – it's the specific ability to stay cool while rescuing people.

Strong Swimmer

You're an exceptionally powerful swimmer. You may ignore up to -2 to Swimming skill due to strong currents, waves, and winds.

DISADVANTAGES

Some disadvantages become more pronounced during hurricanes and similar natural disasters.

Duty

see pp. B133-134

Anyone in the danger zone due to employment – such as emergency-response teams, military personnel, and civilian officials – must respond to the disaster. Since they risk injury in the course of doing their jobs, their Duty is Extremely Hazardous.

Phobias

see pp. B148-150

Hurricanes offer many opportunities to confront Thalassophobia (p. B150). Anyone with a fear of oceans, water, swimming, or similar finds the rising waters an immediate threat. This complicates or prohibits activity in and around the water, even after the main storm has passed.

Wounded

see pp. B162

Apply -3 to all HT rolls to resist infection when in or exposed to floodwater.

QUIRKS

People who live around hurricane risks may be tolerant of and even used to the problem, although sometimes it's the opposite. Imaginative, for example, leads to questionable survival ideas, such as converting a car into an amphibious vehicle. In a few cases, people react to extreme events in an extreme way, making natural disasters an appropriate time to gain new quirks, such as Careful, Dislikes, Minor Addiction, and Minor Handicaps. For these and other quirks, see pp. B162-165.

God's Message

You know that apocalyptic flooding comes when God is angry with His people. You may even believe you know how to fix it. You are grounded, have a regular life, and are devout (you may even have Religious Ritual, p. B217, or Theology, p. B226). When you tell other people what to do to prevent the next disaster or recover more quickly from this one, most listeners react at -1.

Sign of the End-Times

You are *not* grounded. You may be a charismatic leader of a doomsday cult or just find yourself Blessed (p. B40), though others may disagree. You see the storm as more than God sending a message. These are the end-times and everyone shall perish, even if you have to help them on the way. Others react at -2 when they learn of your beliefs, except for any followers you may have and people with similar beliefs, who react at +1.

*Water its living strength first
shows,*

When obstacles its course oppose.

*– Johann Wolfgang von Goethe,
God, Soul, and World*

SKILLS

A number of existing skills can provide different kinds of information about what can happen during a hurricane, including Expert Skill (Hydrology) (p. B194), Geography (p. B198), Geology (p. B198), and Meteorology or Weather Sense (p. B209). Area Knowledge (pp. B176-177), Survival (pp. B223-224), and Urban Survival (p. B228) are essential skills for surviving a hurricane, depending on specialties selected, as is First Aid (p. B195). Other skills have special considerations when used during storms.

Climbing

see p. B183

The intensity of a storm may hinder climbing, at the GM's discretion. Under hurricane conditions, Climbing rolls are at -2.

Electronics Operation/TL (Communications)

see p. B189

In a hurricane, standard communications networks sink. Telephone poles are knocked over, and power is cut to cellular towers. At TL8 and above, without telephony, the Internet stops working.

Some specialized communications equipment keeps working in a disaster. Satellite phones continue functioning because the other end of the connection is in space, well above the storm. Amateur (ham) radio is often relied on in disasters as hams offer their services for long-distance communications. Ham radio's range is a function of both power and frequency used. Small handheld radios typically carry for 50 miles or more, even in poor weather conditions. A larger radio – for instance, attached to a car or truck – is capable of transnational broadcasting. Regardless of range, ham radio is best used for coordinating rescue activities, sending short messages, and passing along eyewitness reports.

Laser, microwave, and other specialized communications requiring line-of-sight or a wire fail almost immediately in hurricane, because of rain and flying debris.

Wireless communications are not foolproof, even without a storm. Electrical storms interfere with radio signals, and wind can knock out antennas. For digital communications, the interference causes lag or dropped connections. Analog communications break up with static.

When using specialized equipment during an intense storm, roll against Electronics Operation. Failure means communications are partially received, misunderstood, or directed to the wrong parties.

Search and Rescue/TL

Per/Hard

Default: Perception-5.

Search and Rescue covers the knowledge needed to find people who may be trapped or injured, and to get them to safety. Search-and-rescue efforts may be as simple as a coordinated walk through a building, using no special equipment. Knowledge of more advanced methods and equipment comes from professional training, though you may have learned procedures as a volunteer.

You must specialize, but check with the GM, who decides which options are available or most likely to be needed based on the setting. Search-and-rescue professionals generally focus on one or two areas. Possible specialties include:

Cave: Search and rescue in caves and mines. **GURPS Underground Adventures** offers adventure options, equipment, and templates designed for cave situations.

Combat: This specialty covers skills for rescuing service members in a war zone and recovering the bodies of those who did not make it back.

K9: Human-dog pairs make excellent search-and-rescue teams when both members have this skill. In these teams, a

SURVIVAL AND URBAN SURVIVAL

For more about these skills, see pp. B223-224 and 228. After a natural disaster, everything changes. The lay of the land is totally new, but oddly familiar. This is true for hurricanes, earthquakes, wildfires, and many other disasters. Even if you have basic survival skills, the natural disaster complicates the situation. Accordingly, after a natural disaster, all Survival and Urban Survival rolls are at -2. This penalty lasts until the area returns to some semblance of normalcy.

New Technique: Natural Disaster

Average

Default: prerequisite skill-2.

Prerequisite: Either any Survival skill or Urban Survival; cannot exceed prerequisite skill.

Some people have been through so many natural disasters that they've learned new coping skills. This technique covers that knowledge. It allows you to buy off the penalty to Survival or Urban Survival tasks in areas affected by natural disasters.

dog works with a handler by surveying large areas and signaling its handler when a suspected rescue victim is found. When conducting a search with a dog, this specialty represents the dog's ability to search; the handler (or GM) then makes Search and Rescue (K9) roll at +2 to interpret the dog's findings. See *Animal Handling* (p. B175) for related information about how to train a dog.

Maritime: This specialty deals with lifesaving services, searches for missing boats, and searches for those who have fallen overboard. **GURPS High-Tech**, pp. 59-60, suggests maritime equipment appropriate for TL5-8. At TL9 and above, advanced drysuits become available; see **GURPS Ultra-Tech**, p. 177. Below TL5, technology is not sufficient to aid maritime rescue.

Mountain: This specialty focuses on rescuing people trapped on mountains, requiring whatever climbing and survival gear the TL provides (**GURPS Low-Tech**, pp. 23-24, 98-100, 125; **GURPS High-Tech**, pp. 55-56, 63; and **GURPS Ultra-Tech**, pp. 75-77, 176-181).

Urban: This specialty covers training in saving people trapped in buildings, vehicles, and hazardous environments. This may involve using available protection or equipment, or improvising what's needed.

All search-and-rescue training includes learning how to improvise equipment for rescue and transport of victims. When improvising equipment, roll against an appropriate Engineer specialty (see pp. B190-191) at -2.

As the techniques used in one type of situation are partially applicable in other types, Search and Rescue specialties default to one another at -2. The *equipment* isn't universal, though. If essential gear isn't available or can't be improvised (as above), the rescue is impossible.

THE EFFECTS

Hurricanes are dangerous places. There are a lot of things that hurt or kill people in a storm. Trained experts avoid them. Except for news reporters standing in the rain for a shot, people should stay where it is safe. If someone cannot get out of the way of a storm, they will experience the fury of the hurricane. Any of the hurricane's effects can lead to a Fright Check (pp. B360-361), at the GM's discretion, when someone experiences unusual or fear-inducing conditions.

WIND

The following rules incorporate the Beaufort Wind Scale (below) into the existing **GURPS** rules, providing guidelines for the damage and effects of wind at subhurricane and hurricane speeds. Wind increases the difficulty of many physical acts and should be considered a hazard similar to an affliction for the duration of the storm. At high speeds, the wind may be disorienting and affect tasks that require clear thinking.

When people are indoors, the wind is unlikely to harm them directly, but it can damage the structure they are in.

The wind affects more than just people. Ocean waves can be driven by increased wind. Wave height at different wind speeds is included in *Beaufort Wind Scale* below.

Most objects can withstand some amount of wind without any damage. Trees can withstand some wind, but very high wind speeds shear off branches. Trees break with winds between 90 and 100 mph, regardless of size. Many trees uproot first in winds of approximately 60 mph. This is the wind speed where telephone poles and unreinforced wooden building materials break. A downed power line not only causes damage from the pole falling (*Damage from Falling Objects*, p. B431), but also from the live electrical wire (see *Lethal Electrical Damage*, pp. B432-433).

Buildings are reasonably resilient if constructed to local standards to withstand a hurricane. However, glass (DR 0-1, HP 1-3, and Brittle) is easily broken by flying material.

BEAUFORT WIND SCALE

These speeds and effects are valid for Earth near sea level. Effects at each level are not cumulative with previous levels. The wave height is the average wave height at sea. Note that the intensity of effects is also related to the atmospheric density; at extreme elevations, such as on top of a mountain, use the effects of one level lower for every 5,000' above sea level.

Beaufort Scale	Description	Wind Speed (mph)	Wave Height (ft)	Move Effect	Character Effects	Artifact Effects
0	Calm	< 1	0	—	—	—
1	Light Air	1-3	0-1	—	—	—
2	Light Breeze	4-7	1-2	—	—	—
3	Gentle Breeze	8-12	2-3.5	—	—	—
4	Moderate Breeze	13-18	3.5-6	—	-1 to all DX rolls	—
5	Fresh Breeze	19-24	6-9	—	-1 to all DX rolls	—
6	Strong Breeze	25-31	9-13	—	-1 to all DX rolls	—
7	High Wind	32-38	13-19	Move/2	-2 to all DX rolls; -1 to all IQ, ST, skill, and self-control rolls	—
8	Gale	39-46	18-25	Move/2	-2 to all DX rolls; -1 to all IQ, ST, skill, and self-control rolls	—
9	Strong Gale	47-54	23-32	Move/2	-2 to all DX rolls; -1 to all IQ, ST, skill, and self-control rolls	—
10	Storm	55-63	29-41	Move/4	-3 to all DX rolls; -2 to all IQ, ST, skill, and self-control rolls	2 points of damage per minute of continuous wind
11	Violent Storm	64-72	37-52	Move/4	-3 to all DX rolls; -2 to all IQ, ST, skill, and self-control rolls	10 points of damage per minute of continuous wind
12	Hurricane	>73	>46	Move/10	-4 to all DX rolls; -3 to all IQ, ST, skill, and self-control rolls	50 points of damage per minute of continuous wind

Shingles are torn from roofs in winds of 50 mph. Roofs are susceptible to collapse from the weight of water and debris. Use the “Artifact Effects” column in *Beaufort Wind Scale* (p. 14) to decide how storms affect buildings.

Light objects can be picked up by a storm. Lawn furniture, grills, and similar outdoor equipment are blown around in winds as low as 30 mph. Small cars can be lifted in 90 mph winds.

Flying Debris

Damage from flying debris is equivalent to the damage from a collision with an object of the debris’ size moving at a velocity equal to the prevailing wind speed. See *Structural Damage Table* (pp. B558-559) for some sample object HP, and see *Collisions and Falls* (pp. B430-432) to determine the amount of damage inflicted.

Aircraft

The situation is more complicated for air vehicles. A commercial airliner flies at speeds in excess of 400 mph. Military aircraft routinely fly at speeds greater than 1,000 mph. A headwind merely slows down an airplane, and a tailwind can speed it up. Crosswinds, however, affect airplanes much more. A commercial airliner cannot take off or land in crosswinds greater than about 35 mph. The heavier the plane, generally, the greater the crosswinds it can sustain. Flying in strong crosswinds is possible, but increases difficulty. For physical stress on aircraft, use the “Artifact Effects” column in *Beaufort Wind Scale* (p. 14). For piloting complications, the penalty to DX rolls under “Character Effects” also affects Piloting (p. B214).

Ride the air in whirlwind.

– John Milton,
Paradise Lost

Other Planets

Atmospheric density can change the wind effects of hurricanes on alien worlds. Pressure Support and pressure-mitigating equipment don’t alter this for characters or vehicles. On Mars, the surface air density is barely 1% of Earth’s, and wind effects are lower. On Venus, however, the surface air density is 50 times greater than Earth’s, giving even a light breeze of 5 mph the same force as a 300-mph wind on Earth.

The effects can be scaled to reflect the local environment. In any atmospheric density different from Earth’s, divide the local density by Earth’s air density at sea level (0.08 lbs./ft³) to get a density factor. Multiply the measured wind speed by the density factor, and look up the resultant value in the “Wind Speed” column in *Beaufort Wind Scale* (p. 14) to determine the wind’s effects at that density.

FLOODWATER

There is no standard scale for flood effects, but some general guidelines are helpful. First, in the United States, the

National Weather Service issues two types of advisories. One is a *flood watch*, which means the conditions are appropriate for a flood to occur and people should take protective action in the short term. The other is a *flood warning*, which means that a flood is imminent or has already been observed. In the event of a warning, everyone should take shelter in a high place immediately.

Any amount of standing water can be dangerous, and rushing water is more so. A wheeled vehicle can hydroplane on wet pavement, and get swept away in 6” of rushing water (see *Movement*, below). There are disease risks from even small puddles, which provide a breeding ground for mosquitoes and bacteria. Children can drown in as little as 2” of water.

Floodwaters pick up any chemicals, sewage, and other hazardous materials as they go (see p. 5). The longer floodwaters are around, the greater the risk. Everyone in direct contact with floodwaters should make a HT roll every 30 minutes they stay in the water to resist the effects of contaminants. Likewise, everyone in direct contact with floodwaters should make a HT roll at the end of the day to resist disease (see pp. B442-444). Instead of any other listed modifier, the penalty to this roll is equal to the number of days since the flood started, up to -4.

Floating Debris

Anything that has a lower density than the water itself floats – if it floats in a bathtub or pool, it floats in a flood. (While buoyancy is slightly greater in salt water, the difference is minimal.)

Determine damage from floating debris based on its size; use the prevailing water speed as the velocity. During a flash flood, water typically moves at about 10 mph, but the speed of the water is regulated by what it has to move around. If the area is reasonably open and flat, like a parking lot, double the water speed to 20 mph. If the area is crowded with buildings and structures, cut the speed in half, to 5 mph. See *Structural Damage Table* (pp. B558-559) for some sample object HP, and see *Collisions and Falls* (pp. B430-432) to determine the amount of damage inflicted.

Movement

Movement in water is slower for land-dwelling creatures (see p. B18) and land vehicles. The National Weather Service terms for water inundation – *minor*, *moderate*, *major*, and *record* – can help choose appropriate effects. In all cases, a land vehicle is probably drivable if the waterline is below its ground clearance, but the driver risks pulling water into the engine. Once filled with water, land vehicles sink.

A *minor flood* leaves no property damage and has minimal other effects. There may be standing water, but it is surmountable. For land-dwelling creatures, Move is halved. For land vehicles, Top Speed is halved. The water is too shallow for water vehicles.

Moderate flooding is more treacherous. There will be some inundation of buildings and roads, especially near water sources. For land-dwelling creatures, divide Move by four. If the water is rushing, people and objects may be swept away. For land vehicles, divide Top Speed by 10, though small cars have difficulty with traction, even at low speeds.

Major flooding is very dangerous. Floodwaters rush into buildings and cover roads, regardless of how close to the water source they are. This can be anything from a few inches to several feet of water. For land-dwelling creatures, divide Move by 10. Land vehicles are effectively immobilized, unless they are floating away. A car can float in as little as 6" of water. Two feet of water is sufficient to float large vehicles, like buses. Thus, during major flooding, assume all land vehicles are free-floating hazards. Water vehicles with shallow drafts are feasible at this level (see p. B466).

In *record flooding*, there is more water than has ever been recorded at the site. Walking is impossible, and swimming may be very effective. Using water vehicles is also feasible. Small recreational watercraft, for instance, are perfectly capable of operating in 3' of water. However, water vehicles need to take special care to avoid underwater obstacles in flooded streets and yards.

Other Planets

In floods composed of liquids other than water, objects behave differently. For example, in another word's liquid-methane hurricane, even water would sink, as water is denser than liquid methane. In fact, many objects sink in liquid methane that float away in just a few inches of water. It is also terribly cold, as methane is a liquid between -296°F and -258°F.

CHAOS

The chaos that can follow any natural disaster is broad and frightening. In the United States, the Federal Emergency Management Agency (FEMA) has been known to use an informal three-part assessment scale after disasters in the southern states, including hurricanes, called the Waffle House Index. The index, named after the casual breakfast chain that is ubiquitous in the Southeastern United States, relies on the fact that the restaurants are known for opening and operating under very bad conditions. After all, almost anyone can boil an egg even in the most adverse circumstances, and Waffle House (among other major companies) has a reputation for preparing well for hurricanes and other disasters.

The Waffle House Index is:

- *Red*: The restaurant is closed and cannot be opened.
- *Yellow*: The restaurant is open, but operating with a limited menu.
- *Green*: The restaurant is open and operating as normal.

At the green level, although the building or surrounding neighborhood may have sustained some damage, business can continue as normal for those who've made advanced preparations. Red means the physical infrastructure is destroyed or in severe disrepair, and the normal social order is in chaos. Yellow is somewhere in between. The index is

simple, but can be used to describe the chaos that ensues after a natural disaster.

Red Level

At the red level, everything with any social aspect becomes much more difficult. All stores, schools, government offices, and similar facilities are completely shut down or operating only in an emergency-services capacity. Wealth may be an advantage in purchasing anything: Those with money may convince individuals, or shop owners who are not formally open for business, to sell supplies.

Prices for everything, even things typically free, are marked up. Assume five times the normal price for most goods. If an item is in high demand, like fuel or medical supplies, assume 10 times the normal price. This sort of price gouging is illegal in many areas, but those laws are difficult

to enforce during a disaster. (However,

customers in areas where such premiums are illegal can file complaints with the government after disasters, and the state's department that handles these complaints looks into them and helps customers get reimbursed for the overpayment.)

Supplies also can be obtained through bartering, borrowing, theft, and other creative forms of acquisition. Anything someone buys from another person could have been stolen – and someone else may come looking for it and want it back.

Yellow Level

At the yellow level, basic services are available. Hotels, fast-food restaurants, grocery stores, hardware stores, and most government offices are open, but goods and services are limited. Only the most basic shelf-stable items and dry goods are available. Fresh and frozen food has likely

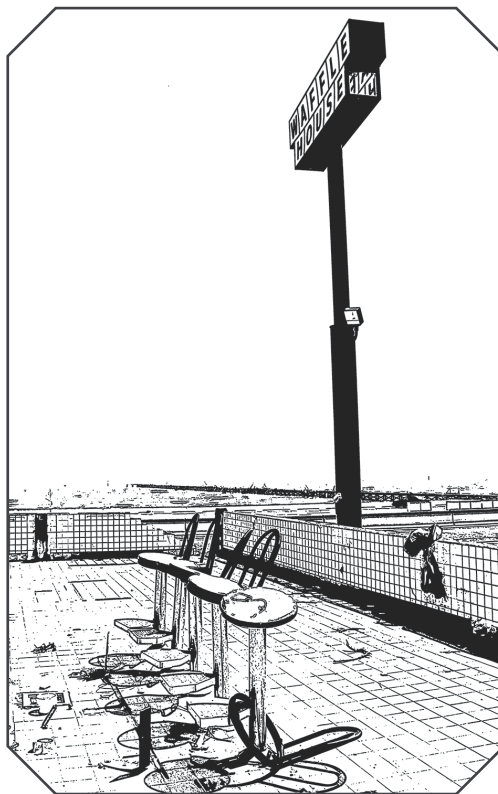
spoiled. Nicer restaurants, movie theaters, and non-essential public services (such as schools) are

not open.

The prices for most goods are elevated, but only to two times normal. High-demand goods are five times their normal prices. Barter is typically not viable, and police response to looting is slow but present.

Green Level

At the green level, almost everything normally available to the public is accessible. Specific facilities that suffered damage are closed, and small businesses may remain closed while the owners deal with other problems. Prices for most goods are unchanged. The exception to this is fuel, especially gasoline, where consumers are gouged at three times the normal price. Civil authorities stop looting almost immediately.



CHAPTER THREE

ADVENTURES AND CAMPAIGNS

As a natural disaster, a hurricane can take place in almost any setting, if the conditions are right. These intense storms can change up a world, be a background hazard in an adventure, or become the focus of a campaign. The core themes of

the storm are obviously wind and water. Connecting these storms to real-world locations increases the realism and intensity of the action.

SETTINGS

Hurricanes, like other basic weather patterns, have been a part of Earth's climate for millions of years, and they will continue to strike for the foreseeable future. Hurricanes can be a part of nearly any background, including other worlds.

HISTORICAL EARTH

Below TL7, hurricanes almost always come by surprise. Without satellite imagery and sophisticated weather models, nobody knows how much of a problem a storm will be until it hits. Even if someone figures it out, the lack of communications infrastructure means they can't tell very many people that a disaster is coming. This surprise factor makes survival especially difficult: No one has any notice, so there's no time to prepare or evacuate. The first inkling something is wrong is when the wind picks up and the rain starts.

If the heroes have seen a hurricane before, they might recognize key features, but they won't know how bad it will be. Could it be as mild as ones they have survived before? Will it be the worst to date? Only the survivors will know how bad the storm was – after it's over.

Even if the tech level does not permit preparation time, a society that has endured intense storms in the past is aware of the risks. The village may have adapted and found mechanisms for resilience. The residents might live further back from the ocean. They might construct homes designed to withstand the onslaught – stilts and thatch roofs go a long way to protect structures and inhabitants. The wealthy or important may live near land features that offer protection. That might be higher ground, behind a natural harbor, or simply further inland.

Communications are limited to those within unaided hearing distance. Aside from shouting, huge bells may ring to alert the surrounding community of danger. Lanterns displayed on towers or other tall structures might serve as signal devices; the village may even construct a lighthouse that

can withstand storms. Historically, signal flags have been used by ships at sea to communicate weather conditions – a red flag with a black square in the center is still associated with hurricanes. Other traditional communications tools like smoke signals and beacon fires are visible for significant distances; however, smoke is subject to wind disturbance, while beacon fires require dry wood or other fuels to burn. For these and other communications mechanisms at TL0-4, see *GURPS Low-Tech*, pp. 48-49.

Medical knowledge is limited. First aid technologies may include simple bandages and splints, and medicine may be based on traditional herbs or alchemy. See *Low-Tech*, pp. 144-154, for information on what's possible at TL0-4.

Anyone trying to flee the storm might ride horses or similar beasts, use animal-drawn wagons, or travel on foot.

MODERN EARTH

At TL7-8, the most important advantage to modern society is a space satellite infrastructure. Satellites provide two critical benefits. The first is global weather mapping; modern weather satellites can provide a picture of worldwide weather in seconds. The second is near-instantaneous communications across the entire planet.

Once a society has advanced weather prediction and communications that can reach the multitudes almost instantly, people can know the state of the world as it happens. The weather forecast is printed in the newspaper, announced on television and radio, or available on the Internet. Everyone becomes aware of impending disaster at least a few days before it hits. With this knowledge, those in the way of the storm can do the basics of preparation. They can stock up on food and other supplies, board up buildings, and move to safer areas before the winds even start. Overall, the preparation pattern resembles that outlined on pp. 6-7.

Modern Earth also offers some hindrances that make surviving the hurricane harder. Occasionally, weather predictions are wrong, and the storm moves toward an unprepared population, or becomes stronger than expected. Sometimes people think their preparations are enough that they don't need to evacuate. This causes problems during severe storms, when they find themselves stranded.

Additionally, the destruction of modern infrastructure causes hazards beyond the storm itself. Power lines can become dangerous in water. Wastewater-treatment systems can fail catastrophically. Chemicals from factories and storage facilities can leak, turning a flow of water into something toxic. Cars can be swept up floods, becoming kinetic torpedoes, ramming into whatever is downstream.

FUTURE EARTH

Weather control may be commonplace in the future. It might not be possible to stop the storm from forming, but weather control might redirect or dissipate it. (For example satellites, see *GURPS Ultra-Tech*, p. 79, and *Transhuman Space: Under Pressure*, pp. 26-27.) Weather control may be a weapon in the next war; striking an enemy force with a hurricane is clumsy, but more devastating than nuclear weapons. Adventures might be set in a redirected hurricane, or one the satellites failed to control.

If a society is more technologically reliant, more goes wrong when the technology is downed. A power outage that turns off the lights is one thing – a power outage that turns off society is another. Robots running the city can short out, oxygen generators in a smog-choked world can fail, and uploaded minds might have to take an unscheduled nap.

OTHER WORLDS

Like Earth, all worlds with an atmosphere have weather. Of the known planets, all of the gas giants regularly have cyclonic storms of various sizes. Jupiter's Great Red Spot is the most well known, but Neptune has Great Dark Spots that appear and disappear. These storms do not contain water, but are driven by the same thermodynamic and rotational forces that cause hurricanes on Earth. Mars also has cyclonic storms – though without water, hurricanes are not possible. On a future terraformed Mars with large bodies of water, the chance of hurricanes rises to slim. (See *GURPS Mars*, pp. 75-79, for weather on a terraformed Red Planet.)

Fully realized science-fiction and fantasy worlds can also produce destructive storms. Large bodies of liquid (warmer than the atmosphere above them) and sufficient planetary rotational speed are all that hurricanes need to form. Variants can make things more interesting. Cold worlds with liquid methane oceans, similar in concept to Saturn's moon Titan, could also see tropical cyclones given the right conditions. Although Titan itself rotates too slowly for cyclonic storms to form, methane and ethane rain are common sights on the dismal world.

The core concepts of a massive storm can even extend to a "space storm," where a turbulent nebula could rock ships. The GM will need to translate terrestrial storm hazards to space equivalents, but the *GURPS Spaceships* series can help: *GURPS Spaceships 4: Fighters, Carriers, and Mecha* has more information on environmental effects on space combat. *GURPS Spaceships 5: Exploration and Colony Spacecraft* offers details on assorted space hazards. *GURPS Spaceships 7: Divergent and Paranormal Tech* discusses features of an air-filled cosmos.

ADVENTURES

Hurricanes, like any other disaster, can spice up any existing campaign. Whether the heroes are teenagers living the adventures of high school, police or fire officials working the daily beat, or a group of thieves looking for the next big score, a hurricane does not discriminate in its victims. Anyone in the storm's path is affected.

How storms affect the PCs depends entirely on their team job or mission. Police, fire, and other public safety teams prepare for disasters and then deploy to a storm zone immediately after it hits. They have to do their jobs in the hurricane, including helping residents deal with the complications the storm presents. (See *GURPS Cops* for general details on police operations.) Other teams, such as astronauts at Cape Canaveral, may evacuate and only have to deal with the storm indirectly. Schoolteachers have to protect and support their students in an age-appropriate way, while lawyers may be limited to reviewing paperwork until the storm is over.

ESCAPE

Escape is on almost everyone's mind when a hurricane is inbound. At TL7-8, warnings come at least two to three

days ahead of landfall, so panic doesn't set in immediately for most people. People trying to escape via the highways may find themselves stuck in traffic and waiting for a long time.



Those who know their way around the area could find an alternate route through back roads, with lower speed limits but potentially less traffic.

The heroes may encounter injuries, people who need rescuing, and any of the other chaos described here. Public officials do their best to stop panic, and are fairly successful. In areas frequently struck by hurricanes, residents are familiar with safety procedures because of drills and past storm experience. Public order is more likely to break down when the hurricane is striking somewhere new.

SURVIVE

If the protagonists have remained behind for any reason, then staying alive is the highest priority. Having the right skills (see pp. 12-13) is especially important to anyone in this situation. Wind and rain start off slowly and build up as the storm grows more intense. The group must seek shelter and find the necessary resources to ensure survival. The wind is dangerous and complicates any actions. Rising waters slow the adventurers down if they need to move to a new location. The more prepared the PCs, the better off they are.

As the storm winds down, the team must deal with the destruction of the town, which complicates survival as the group discovers basic goods inaccessible, electricity and water supplies unreliable, and medical help limited. If the heroes stayed behind because their jobs required it, then they continue working. Having to focus on two objectives makes basic survival even more challenging.

RESCUE

Rescue operations are an opportunity for the heroes to do the great work of protecting people and saving lives. In the most challenging of these adventures, the protagonists are ordinary people just trying to do the best they can. They may find neighbors around town who need rescuing. If the group has acquired a small boat, they can rescue people from flooding buildings and bring them to higher ground. They can also help anyone trapped in cars caught in the flood.

Professional rescuers may be fire, police, military, or specialized emergency management teams. They may have support that non-specialists do not. The team may have access to a helicopter that they can use to lift people off of the roofs of flooded buildings. Fire engines are massive vehicles that do not wash away as easily as a sedan, so these can get to places other ground vehicles cannot. Likewise, a fire truck with a ladder can reach people in the upper floors of homes.

Medical problems that rescue teams face in the aftermath of a hurricane are the same sorts of problems they see in other disasters, including heart attacks and strokes caused by increased stress. Disasters also exacerbate chronic conditions like high blood pressure and diabetes, because people forget to take medication or they lose it; stress compounds the effects of the missing medication. Common injuries in a hurricane come from falls and accidents leading to broken bones, sprains, and bruising.

Mental health is also impaired by stress. People with anxiety or depression are worse off in and after a storm. Alcohol and drug use increase. Rescuers encountering people who are under the influence or suffering from mental distress find the victims less rational and more difficult to work with.

IN THE MILITARY

In a game focused on soldiers in a war, a storm can hit, changing everything. While the fighting naturally tapers off during the worst of the wind and rain, the battle resumes as soon as practical. Soldiers can find themselves making difficult choices during a storm, such as rescuing enemy soldiers, knowing they will return to fighting when the disaster has cleared.

Heroes on naval vessels can be affected by the strong winds, rain, and waves of a hurricane. Sailors can "batten down the hatches," but the storm still rocks the ship. A group of sailors might find they are the only survivors of a ship-borne disaster, but they must still complete the mission to save their country. Alternatively, the naval crew may be trying to stop drug cartels from transporting goods under the cover of a storm.

ADVENTURE INSPIRATION

Many emergency management agencies use tabletop exercises to train their staff in planning and response. FEMA has produced a hurricane exercise that is freely available at fema.gov/media-library/assets/documents/27307. This includes supporting videos that might be useful to a GM.

Another FEMA resource is a collection of community exercises for different disasters, including a hurricane. These are available at fema.gov/media-library/assets/documents/100098.

Finally, readers wishing to learn more about disaster response in general can study more than 350 courses at FEMA's Emergency Management Institute, for free, at firstrespondertraining.gov. EMI's courses introduce students to basics of preparedness, community emergency response, and disaster-specific training, along with tabletop exercise design and emergency response standards.

ADVENTURE SEED: STEALING THE RELIC

A wealthy individual (who has a reputation for antisocial activities) has recently contacted the adventurers. The collector wants to acquire a relic believed to have powerful magical properties, quite likely for personal exploitation. The protagonists might not believe any of the magical nonsense, but the team of elite thieves know they are up to the task, and their shady sponsor is willing to pay a large amount of cash. The relic is on display in a famous museum, and the weather reports show an intense storm is coming in. Can the heroes steal the relic under the cover of wind and rain? Can they survive the disaster when it hits? Will they be caught, even though they think everyone else is focused on the storm? What if the relic really *is* magical?

Do you know why hurricanes have names instead of numbers? To keep the killing personal.

*– George Carlin, **Brain Droppings***

ADVENTURE SEED: EVACUATING THE JAIL

The storm is bearing down and everyone is evacuating. Local officials have debated whether to evacuate the jail. Leaving the prisoners in place is easier, but if something happens, someone might escape (and then there's the bad publicity . . .). So, the heroes are tasked with evacuating the jail. The team has to keep the inmates safe and fed. Certain prisoners might see this as an opportunity to escape. Can the team transport the detainees to the evacuation site without losing any? Can the group keep the convicts from harming each other? Can the inmates and security work together to survive? Alternatively, the PCs themselves are the prisoners – what are their odds of escaping?

ADVENTURE SEED: RAISING THE DEAD

A hurricane has hit a small town that is not often struck by tropical cyclones. The flooding washed the loose dirt from freshly dug graves, revealing a number of coffins. Before long, undead are climbing out of the cemetery. With each living human bitten by one of these creatures, the zombies convert another to their army of the living dead. If the PCs cannot stop the zombie invasion, it will spread. The storm destroyed the town, severely limiting resources (including fresh water, food, ammunition, and other supplies) and giving the zombies an edge. (See *GURPS Zombies* for more details on running games featuring zombies.)

ADVENTURE SEED: SUDDEN STORM OF FANTASY

The protagonists are ordinary fantasy adventurers looking for gold, fame, and maybe a dragon to slay. In their travels, the group comes upon an empty village. They go from building to building, checking out

the contents. Everything is wet, and some of the buildings are gone. The occasional body turns up. Without the context of a storm, nobody can tell what has happened. And then . . . the villagers who survived start to return home.

The conflicts start when the villagers find the adventurers and blame them for the storm. The band may defend themselves, but the villagers are convinced that the heroes caused the tragedy. The adventurers must figure out how to show that their arrival was coincidental, which may be difficult if they have picked up some trinkets from their search of the buildings and the bodies.



CAMPAIGNS

A natural disaster may be a life-changing – or even society-changing – event. When someone's home or town is destroyed, they might rebuild or they might chose to leave. In either situation, the months or years before life settles into a “new normal” can be a platform for a series of adventures, which can center on action, political intrigue, or anything in between.

A hurricane makes an excellent kickoff to a new campaign, because it fundamentally alters the setting in which the PCs started. In a sense, the adventurers are dropped into a world where many things are starting over, perhaps even at the societal level.

Focusing on emergency task forces is another path hurricane-focused campaigns can take. Such a team can travel to areas affected by intense storms or other natural disasters (like earthquakes), providing emergency management, search and rescue, and other operations that are needed during and after a disaster. The lull between major events is a natural break that allows rescuers to recover and improve their skills and equipment, and it gives the GM an opportunity to spread out adventures.

Setting an entire campaign in a *single* disaster is more challenging. As a mini-campaign set within a larger campaign, the storm provides opportunities to create outside stress that simply cannot be reasoned with – the storm is coming and stops for no one.

CAMPAIGN IDEA: REBUILDING THE VILLAGE

A pre-industrial village was struck by a typhoon, killing everyone but the PCs. Most of the village was destroyed and washed out to sea. The heroes have no choice but to build new lives.

What happens when the survivors are short on food? If the heroes move to an existing village, what conflicts does that cause? How will the struggling village react when the king sends a representative to collect the yearly taxes? What happens when the villagers discover precious metal deposits uncovered by the typhoon, which they can trade for food and shelter?

CAMPAIGN IDEA: EMERGENCY RESPONSE TEAM

The heroes are an elite search-and-rescue (SAR) team that is assembled for the coming hurricane season. In most parts of the world, this means May to November (in the United States, from Memorial Day through Thanksgiving). There may be long lulls in the action, depending on how many hurricanes the year brings. Recent years have produced as many as 28 named storms in the North Atlantic alone.

The SAR team includes different specialists who are ready to move around the world on little notice to rescue the trapped and save lives. They risk everything to protect strangers.

A rescue operation may be straightforward, but what will the PCs do when someone does not want to leave? When two rescue calls come in simultaneously, will the team make it to both, or will they have to make a decision about who lives and who dies? What happens when the team runs into corrupt local officials, using this disaster to make some cash on the side? Maybe a gang of thieves or black marketeers is preying on storm victims. The campaign can address all of these issues and more before the team disbands for the year.

*... I'll set a blackening
storm-cloud on them, rain
mingled with hailstones
Pouring to earth from
above, and I'll rumble
the whole sky with
thunder.*

– Virgil, Aeneid

CAMPAIGN IDEA: MAINTAINING ORDER

A team of rescuers is forced to deal with the long-running effects of a hurricane, before, during, and after. This could be a special-operations team from the National Guard or local equivalent who is tasked with running support services during a storm. Such a team typically includes an emergency manager, a communications officer, a supplies officer, and an operations officer. Each has a role in managing aspects of the storm: safe evacuation, emergency rescue, and supporting local law enforcement after the storm (by helping to stop looting and to ensure the area is safe for civilian return). Actual training scenarios used by real-world emergency managers can serve as inspiration for adventures.

As a different option, a precinct of local police officers may be called in to maintain order, rescuing people and stopping crime. The actions of law enforcement will have ramifications on the community beyond how they deal with the disaster. Police officers and firefighters will still be dealing with the effects of a hurricane long after the emergency-response team leaves. *GURPS Cops* has more information on running games with police officers.

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