



Eleven Days after Hurricane Carol slammed the Island in August 1964, Hurricane Edna struck on September 11, flooding Edgartown (Vineyard Gazette Archive)

## Guidelines for Storm Preparedness

West Tisbury Climate Action Committee  
May 2020

May 3-9, 2020: Hurricane Preparedness Week  
National Weather Service

## Storm Preparedness

It should come as no surprise that Martha's Vineyard is vulnerable to Nor'easter storms formed over the cold Atlantic between September and April; and hurricanes formed over warm tropical waters from June to November. The absence of hurricanes in recent years have lulled some into thinking they are no longer a serious threat to the Vineyard. The truth is that storms and hurricanes will lash the Vineyard, flooding low-lying portions of our villages, uprooting trees, bringing down power lines, snatching boats from their moorings, and disruption ferry service to the mainland. It is not a question of *if*; it is a matter of *when* and with *what degree of severity*.

What is equally sure is that with a modicum of preparedness, your chances of riding out a storm and coping with the inevitable disruptions in the aftermath — the loss of power, telephone and internet connections, and delayed resupplying from the mainland — increase substantially.

This manual breaks down emergency preparedness into stages; What you can do immediately without a storm in sight. What you can do when you know a storm is on its way. And, what you can do to make your surroundings as safe as possible when the storm hits.

Storm risk varies by the size and path of the storm and by the population of the Vineyard. Coping with a storm off-season with a population of 16,000 is one kind of challenge. A storm during the season when there may be 60,000 residents is a different magnitude of problem. Some seasonal residents will be familiar with life on the Vineyard, including its storms and how to prepare for them. Short-term renters may not and will rely on their landlords for guidance. The information regarding the basic survival kit will enable landlords to do storm preparedness for their clients so that renters will have the basics for making it through a weather emergency.

The information comes from a variety of sources devoted to emergency preparedness. Including the work of Russ Hartenstine, West Tisbury's Emergency Manager, and other island emergency managers, members of the West Tisbury Climate Action Committee, NOAA, National Weather Service, FEMA, Center for Disease Control, the Red Cross, and the Massachusetts Emergency Management Agency.

### Why do I need to prepare?

If you remain a skeptic about the need for preparedness, read on. You live on or are visiting an island, and storms, as the article by Tom Dunlop attests, are no stranger to its shores. (with permission from the author and Martha's Vineyard Magazine)

## They Never Really Hit the Vineyard, Right?

**Once upon a time it was standard wisdom that the hurricane of 1938 was the first and worst to hit the Island. But hidden in the bottom of coastal marshes, and in old logbooks and newspapers, is the true story of New England hurricanes.**

Tom Dunlop

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Joseph Chase Allen, the waterfront columnist for the Vineyard Gazette, had never seen anything like it.

It was less the yowling of the wind than it was the way the sea rushed in. Some fishermen and shopkeepers struggling along the piers of Menemsha said it came at them like a tidal wave, but what witnesses on a hill looking down on the little seaport saw was Vineyard Sound rolling in through the jetties as a ferocious, rising river – gray, twenty feet high, heedless of boundaries and whitewater fast. It lifted and overran everything in a moment, shoving boats and shacks and piers and huge embankments of sand into the face of a hundred-mile-an-hour gale that cried at the onrushing wreckage from the opposite way.

Joe Allen had first gone fishing from Menemsha as a boy of fourteen in 1906 with Captain Everett Anderson Poole in his catboat Goldenrod. Now, on the night of September 21, 1938, he had to write a story for the Gazette about how Menemsha was gone, swept entirely away, leaving behind a plain of beaches, grounded fishing boats, floodwater, and timbers where only a few hours before a fishing village had stood. With the power out, he felt his way into his Vineyard Haven garage, turned on the headlights of his car, and began to type.

“The ruin at Menemsha Creek constitutes something unbelievable,” his story began, and trying to pull together all the things he had seen and heard, he wrote: “The circumstance which caught even the oldest and most experienced fisherman unaware was the direction of the wind, which was southeast becoming south. Wind from this direction has never been known to reach a high velocity on the Vineyard or to cause serious damage.”

Like the rest of the Northeast, the Vineyard was taken completely by surprise by the Great New England Hurricane of 1938. Never in living memory had a storm struck with such ferocity, and few thought such a storm was even possible here. New research, however, indicates that storms rivaling or even surpassing the strength of the 1938 hurricane have reached our corner of the world since record keeping began, and even long before. What's more, with our coastlines built up and teeming with people to a degree unimaginable when the colossal tempest struck three-quarters of a century ago, scientists warn that we may be as unprepared for the next catastrophic storm as was Menemsha in 1938. It's a matter of when, they say, not if.

“There are aspects to understanding the history that help you very much prepare for what could occur,” says Chris Landsea, the science and operations officer at the National Hurricane Center in Miami. “For example, in Massachusetts, the strongest hurricane that we believe occurred in the historical record was in 1635, the Great Colonial Hurricane.” He estimates that storm was a high-end Category 3 or a low-end Category 4; by contrast the 1938 hurricane was most likely a Category 2 storm when it demolished Menemsha.

“Up in New England, it’s something you probably haven’t experienced, or your parents, or even your grandparents – a direct hit by a major hurricane. So it makes it more difficult to take it seriously as a threat. But when you’re looking back on the past, you say, ‘Well, it’s happened before.’ And we know with weather patterns, if it’s happened before, it’s probably going to happen again.”

“A hurricane travels like a rotating cork in a turbulent stream,” says Kerry Emanuel when trying to explain why any particular hurricane might veer north toward New England rather than hitting a more familiar target in, say, Florida. A professor of atmospheric science at M.I.T. in Cambridge, Emanuel is a leader in the effort to model how hurricanes might change in number and strength over time, based on records from the past and how the climate may be evolving now. “A hurricane is simply moving with the large-scale air-flow in which it’s embedded. When you’re in the tropics, the trade winds are relatively steady; they’re blowing out of the east, and hurricanes almost always move toward the west.”

These equatorial and low-latitude hurricanes behave fairly predictably, buzz-sawing their way across the Caribbean or into the Gulf of Mexico, varying in strength but seldom changing much in structure. But if a tropical system catches a tributary current of air that pulls it toward the Eastern Seaboard, it can be bounced around by various high and low pressure systems and behave erratically for reasons scientists do not yet fully understand.

“It’s a chaotic system that’s always evolving,” says Emanuel. “And it’s chance: when and where the hurricane gets into the mid-latitudes, what’s going on? It’s almost like a pinball machine.” Most often, even a powerful hurricane weakens as it heads north along the coastline. Cooler sea surface temperatures in the middle latitudes deprive it of energy, while adverse winds buffet, shear, and tear it apart.

But once in a while, a hurricane coming up the East Coast will combine with a non-tropical weather system. “And if the phasing is right,” says Emanuel, “it will get swept up and accelerate northward so fast that it really doesn’t have time to spin down, and that sort of interaction can even temporarily intensify the winds. And it makes for a storm – and Sandy [in 2012] was kind of an example of this – that’s a hybrid between a hurricane and a winter-type storm.”

The hurricane of 1938 was also just such a wild New England mongrel. So, very likely, were the Great Coastal Hurricane of 1806 and the Great Colonial Hurricane of 1635, the other two hurricanes in the historic period thought to rival or even surpass the 1938 tempest in strength, speed, and wrecking force. Caught and transmogrified by weather systems along the coastline and the Atlantic beyond, both storms may have hurtled northward along the seaboard at fifty miles an hour, or more, even as they devolved from purely tropical systems into vicious North Atlantic hybrids. They annihilated towns and forests on the right sides of the hurricane centers,

where the forward motion adds to the speed of the winds around the core, and inundated them on the left sides, where the rain is often heaviest.

In the pages of journals, letters, logbooks, and newspapers run the stories of dozens of hurricanes that wheeled up the coast to lash, flood, and splinter the Vineyard and the rest of New England before the storm of 1938. Cleanup of tree devastation in the Camp Ground after Hurricane Gloria in 1985

The Gazette went to press on September 15, 1904, for instance, reporting on a storm that had whistled just below hurricane force in Edgartown early that morning, causing the tide to rush out of the harbor at a speed estimated at eight knots.

“All sorts of theories have been advanced as to the reason for the water receding with such velocity from the harbor,” said the Gazette, “possibly one of the most plausible being that this morning a storm of hurricane, and possibly of cyclonic, force somewhere within a radius of fifty miles must have caused very low tides in Vineyard Sound and on Nantucket Shoals which resulted in practically sucking the water from the harbor, helped of course by the northwest gale blowing between 8:30 and ten o’clock.”

“A TERRIFIC STORM,” wailed the Gazette on September 28, 1888: “Sweeps over the Vineyard Wednesday Morning – Wind and Rain Unlimited – Chimneys, Trees and Fences Laid Low – No Serious Damage to Shipping in This Vicinity – The Hardest Storm Known for 50 Years Up-Island. . . .”

Or: “3rd. Wind NE. Storm Gale, Rain and High Tide,” wrote the great Vineyard diarist Jeremiah Pease in October 1841: “The Breakwater leading to the Light House is injured by the Gale, about 200 feet breaks away at night. Gale continues during Monday. 7 schooners, 3 brigs & 1 sloop goes ashore at Holmes Hole driven from their anchors.”

And so on goes the reporting, occasionally speculative and almost always awed, backward through the history of Martha’s Vineyard. The written record goes back hundreds of years. Yet the story of Island hurricanes actually reaches back much further in time, into the realm of science known as “paleotempestology” – the study of storms before the written record began. In the muck of nearby coastal ponds, scientists are finding the geologic legacies of epic hurricanes going back thousands of years.

For the past twenty years, Jeff Donnelly, his colleagues, and students have been drilling into neighboring ponds and marshes and finding the signatures of recent and ancient hurricanes in the mud and sand below the bottom. Donnelly is a geologist and geophysicist with the Woods Hole Oceanographic Institution and among the pioneers in the field of paleotempestology.

Donnelly and his team pull up metal tubes packed with earth, stratified by layers of gravel and sand that were swept in over the wetlands by the vast river-like surges of long-ago hurricanes. Radiocarbon analysis of the organic earth above and below each layer of sediment gives the date of the storm that deposited it to within a few decades or even just a few years – depending on the site, where they drill within it, and how far down (and thus back in time) they go.

“One of the things that’s really rewarding – we spent the first ten years just trying to figure out how to make it work, what the best approaches are, the best sites for it. Now we’re at the stage where we’re generating these really reliable, detailed records,” says Donnelly.

Lying just fifteen miles to the northwest of the Vineyard, where Buzzards Bay begins to funnel toward the Cape Cod Canal, Mattapoisett Marsh in particular has proven exceptionally sensitive to the sedimentary overwash from hurricanes. There, Donnelly and his team have pulled up core samples laced with coarse layers of sand left behind by tremendous hurricanes from the historic period that must, to some degree, also have swept over the nearby Vineyard in 1815, 1727, 1635 and possibly 1638, among many others.

In concert with data from other wetlands, Mattapoisett Marsh shows that “the overall storminess in terms of numbers of events probably hasn’t changed that much [going back over two thousand years],” says Donnelly. But there are times when some of those hurricanes landed here with much greater force than others.

“Rather than getting one or three Category 1’s per century, you’re suddenly getting Cat 2’s and 3’s at that frequency,” he says. For example, at Mattapoisett Marsh and other sites, he has found “really large layers” of sediment from the period between two thousand years ago to nine hundred years ago. [From roughly 1 A.D. to 1100 A.D.]

“The layers of sand are always consistently bigger and coarser, swept in by really big waves,” Donnelly says. “Initially you think, ‘Well, maybe there’s some change in the geometry of the site that’s causing this.’ But now we’ve got a dozen sites and they all point to that same conclusion. So it’s possible that during this interval, the potential intensity of these storms was greater [and] that you got much bigger hurricanes.”

Donnelly points to warmer sea surface temperatures in the tropics and less vertical wind shear as probable factors that spurred the formation of more frequent, and more intense, storms. “In that interval, it seems as though there’s lots of activity being spawned in the deep tropics that are sort of spraying hurricanes all over the western North Atlantic.”

The record of prehistoric hurricanes also reveals that not only are there extended periods when storms appear on average to be stronger. There are also times when big storms reach New England in clusters, with a frequency that stands out in the broader record.

“Records from Salt Pond, just down the road here, suggest there’s an interval between about 1440 and 1675 A.D. – and it’s more concentrated in the earlier part of that interval – that’s unprecedented in the last two thousand years,” says Donnelly. “I think there are five events that transport as much or more sediment as the 1635 hurricane, which is probably the biggest historical event. And they occur within about three decades. So you’re getting a 1635 hurricane event every six years, which is just way outside what you expect in the modern climate.”

The reasons are probably many and some are not yet entirely clear. The cluster of storms occurred during an interlude of warmth in the middle of the Little Ice Age, a period of prolonged chilliness that extended from around the early 1300s to the middle 1800s. It appears that sea

surface temperatures in the western North Atlantic had warmed significantly, while the deep tropics were cooler than today. Along with other factors, this may have stifled the generation of tropical systems in the Caribbean, while encouraging them to form off what is now the southeastern United States. Many coiled into hurricanes and, caught by air currents along the coastline, raced toward us in unusual numbers and with unrivaled destructive force.

Donnelly continues to research the phenomenon. Meantime, he worries about how human activity is warming the atmosphere and seas today, and what the possible consequences may be for a New England coastline now jammed with unsuspecting people, cities, and towns.

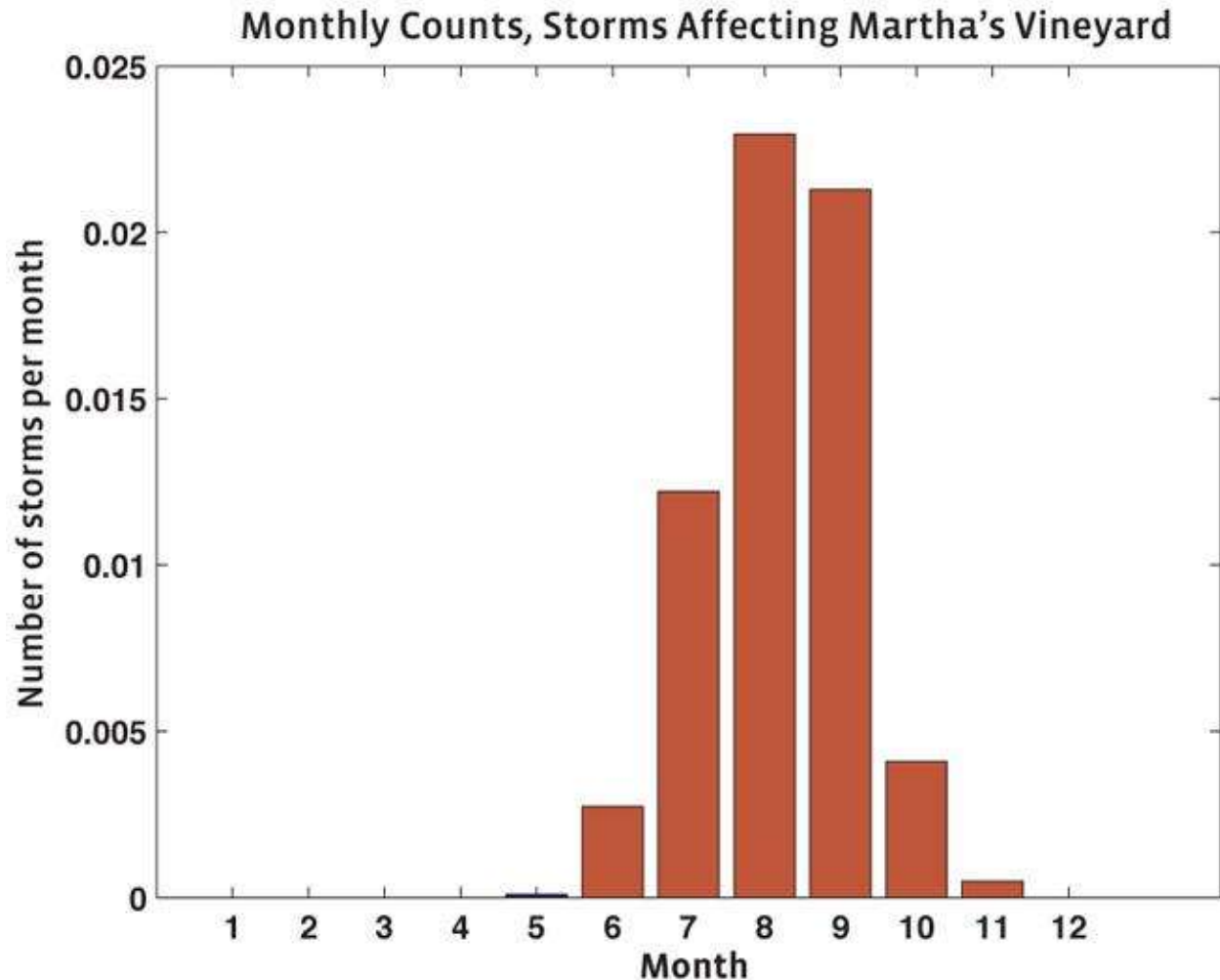
“The scary thing with this result we’ve pulled together – this hypothesis – is, what are we doing now? We’re cranking up the sea surface temperatures to levels that are similar to this earlier anomaly. We don’t quite know what El Niño is going to do, and that is a big player. We don’t know exactly what the Intertropical Convergence Zone is going to do, but we have some ideas. But the point is, we’re turning the knobs in the right direction to go into an interval that might be analogous to some of these earlier events. What does that mean?”

It means no one yet knows what global climate change will do to the cycle of destructive hurricanes in southern New England. One line of scientific thought suggests that as the atmosphere and nearby sea surfaces warm, tropical systems may find more energy to tap into, theoretically making them stronger. But drying in the middle levels of the atmosphere and increased wind shear might also tear apart more storms aborning.

“So the global warming projections are pretty mixed,” says Landsea of the National Hurricane Center. “They suggest slightly stronger [storms] by a few percent about a hundred years from now. But they suggest substantially fewer tropical storms [transitioning] to hurricanes – on the order of 25 to 30 percent fewer tropical storms, fewer hurricanes.”

Kerry Emanuel of M.I.T. acknowledges this view, but points out that it’s really the more powerful storms that we should be worried about. “The damage is very much caused by the Category 3’s and up,” he says. “Unfortunately [the numbers of] those are due to go up.”

The prognosis for New England is made doubly hard to predict by the phenomenon of hybrid storms like Sandy and the 1938 storm. In other words, not only do researchers need to understand how climate change will affect hurricane formation, they need to understand what climate change will do to the winter-type storms that sometimes hybridize with hurricanes. “We haven’t done our homework on that,” says Emanuel, “so I wouldn’t want to say what would happen in New England.”



New England, of course, is what Donnelly of Woods Hole has zeroed in on – coastal New England in particular. “We don’t really know what the end game is,” he agrees. “It gets reported as a global mean, and they say, ‘Oh, well, slightly larger or slightly more storms, or slightly less.’ But if you look at regional differences, some regions are big winners and other regions are big losers.”

The losers could be us. Donnelly’s research shows that, among other influences, a prolonged and unusual warming of the surface of the sea off the southeastern coastline and a concurrent cooling in the tropics – caused by nature alone, with no assist from man – produced decades when the western North Atlantic and Northeast turned out to be the worst losers imaginable.

“From 1700 to today we’ve effectively been – at least in terms of the really big storms – in a relatively quiescent interval,” he says. “And now we may be transitioning into a much more active interval, perhaps analogous to some of these earlier ones, and we’ve put all this infrastructure and people in harm’s way.”



Forget Hurricane Sandy, a broad, fairly weak, lumbering hybrid storm whose surge still caused some \$70 billion in damages at the seaward corner of New York and New Jersey in 2012. The sort of thing Donnelly frets about comes at us with the speed and obliterating force of the hurricanes of 1635, 1815, or most recently 1938.

“You’re destroying forests and ripping the tops of houses off into northern New England,” he says. “You’re still a catastrophic event into Vermont. It’s not just this coastal flooding and, ‘Oh, no, we’ve got some water in the subways.’ It’s a region-wide catastrophe on a scale which we’ve never seen.”

And for decades at a time – looking at the sandy layers lacing the mud that Donnelly has pulled up from the bottom of coastal ponds and marshes lying just a few miles away – it happens again and again and again.

*Additional sources include Early American Hurricanes: 1492-1870, by David M. Ludlum (American Meteorological Society, 1963); Landscape and Regional Impacts of Hurricanes in New England, by Emery R. Boose, Kristen E. Chamberlin, and David Foster (Harvard Forest, 2001); The Atlantic Hurricane Database Re-analysis Project, sponsored by the National Hurricane Center; and the libraries of the Martha’s Vineyard Museum and the Vineyard Gazette.*

## Household Survival Kit for All Emergencies

Regardless of the nature of the storm, a basic survival kit is something that homeowners and rental properties can and should PREPARE IN ADVANCE.

### Basic Kit:

- Water, two 2.5 gallon plastic jugs or other containers per household
- Food; at least a three-day supply of non-perishable foods that don’t require cooking; INCLUDE can opener and eating utensils
- Flashlight or lantern, with extra batteries
- Long-burning candles with holders; an adequate supply of matches in a waterproof container inside a plastic box
- A list of names and contact information of immediate neighbors
- Fire extinguisher
- Local area map

- First-aid kit and manual
- Whistle

### Kit Additions Done with Advanced Planning or Warning:

- Duplicate scripts for all medications and an updated list. A week's supply of your medications. Make arrangements IN ADVANCE for special needs (oxygen, insulin, etc.)
- Emergency radio
- A case with a second set of eyeglasses; spare batteries for hearing aids and other devices; disinfecting wipes; and extra rolls of toilet paper.
- Consider purchasing solar charging devices for phones and batteries and have piezo electric lighters and other lighters available.
- Compose a list of credit card and bank account numbers and keep in a secure place.
- Keep vital documents such as deeds, bills of sale, registrations passports, etc. in a dry, secure location or bank lockbox; make digital backups of such records.
- Extra set of household and vehicle keys
- Sewing kit
- Cash and coins
- Pets' food, bowls, leashes, medications, and carriers

### Mitigating Actions to Take as the Storm Approaches

- Consider collecting rain in barrels
- Fill bathtubs with water for flushing; fill big pots with water on your stove
- If you have a gas stove, make sure you know how to light it when power is out
- Prepare a tool kit containing an assortment of tools commonly used for repairs and storm debris removal
- Make sure all doors and windows are securely locked
- Have duct tape, plastic sheeting, or tarp on hand
- Stow lawn furniture or other items that might be carried by the wind
- Fill vehicle tanks in case of fuel supply interruptions; some question the need since you will have nowhere to go
- In most cases, residents of the Vineyard will be sheltering in place. But it may be necessary to go to a public shelter during or after the storm. You may have to leave in a hurry, set aside toiletries for all family members, a blanket or sleeping bag, washcloth and towel for each family member, clothes for three days. Also, have something to keep children occupied and pets contained.
- Be mindful of your neighbors, particularly any who, because of age or some other constraint, could use additional help in preparing for the oncoming storm. Check in with

them before, during (if safe), and after the storm. Ask for their family contact and leave your number for their family member in case they can't reach your neighbor

## Finding Shelter if You Need It:

Information regarding the accessibility of the West Tisbury and regional shelters is available on the West Tisbury Town Website, which presents a problem if Internet connections are down. If you are in need, contact the police department at 911.

The West Tisbury shelter is the West Tisbury Elementary School on Old County Road. The Regional shelter is at the Oak Bluffs School, 50 Trade Winds Road, Oak Bluffs.

How are people to know whether the shelter is open and how are they expected to get there? Are the elderly expected to drive themselves there? Referring people to the town website assume internet connections and passable roads.

## Alternate Route to the MV Hospital

[ INSERT MAP ]

The assumption here is that Beach Road alone floods. Is there anything that would cut the hospital off completely?