

# Major weather events: Flooding, hurricanes and nor'easters

## Overview

In 2019, the United States experienced nine natural disasters that each caused more than \$1 billion in damage. This week for our Special Topic, we look back at three major weather events and analyze their impact on freight markets.

We chose the flooding of the Missouri River valley in the spring of 2019; Hurricanes Florence and Michael in the fall of 2018; the period of severe winter weather that hit the Northeast in March 2018, a month that included four named nor'easters.

Floods are the most destructive and disruptive weather events, especially when they occur due to sudden rainfall, as opposed to gradual snowmelt. Wind damage alone — like that caused by fast-moving Hurricane Michael — does not significantly disrupt supply chain movements.

Snow events in regions prepared to handle them cause major disruptions only if they are protracted and generate cumulative snowfall well in excess of normal weather patterns. In our view, in the case of already-undesirable destinations like Philadelphia and Albany, New York, winter storms and the threat of further winter storms were enough to negatively influence carrier sentiment toward the markets, regardless of the actual levels of accumulated snow.

## Midwest flooding

Duration	180 days
Rain/snowfall	10.85"
Kansas City trough volumes	152.59
Kansas City peak rejections	20.18%

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## Hurricanes

Hurricane Florence rainfall	26.58"
Hurricane Michael wind speed	161 mph
Wilmington, NC, tender rejections	43.64%
Wilmington, NC, lead times	2.967 days

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## Nor'easters

Cumulative snowfall/peak ITRI	
Boston	9 in. / 22.47%
Philadelphia	13 in. / 35.86%
Elizabeth, NJ	11 in. / 29.77%
Albany, NY	8 in. / 35.30%

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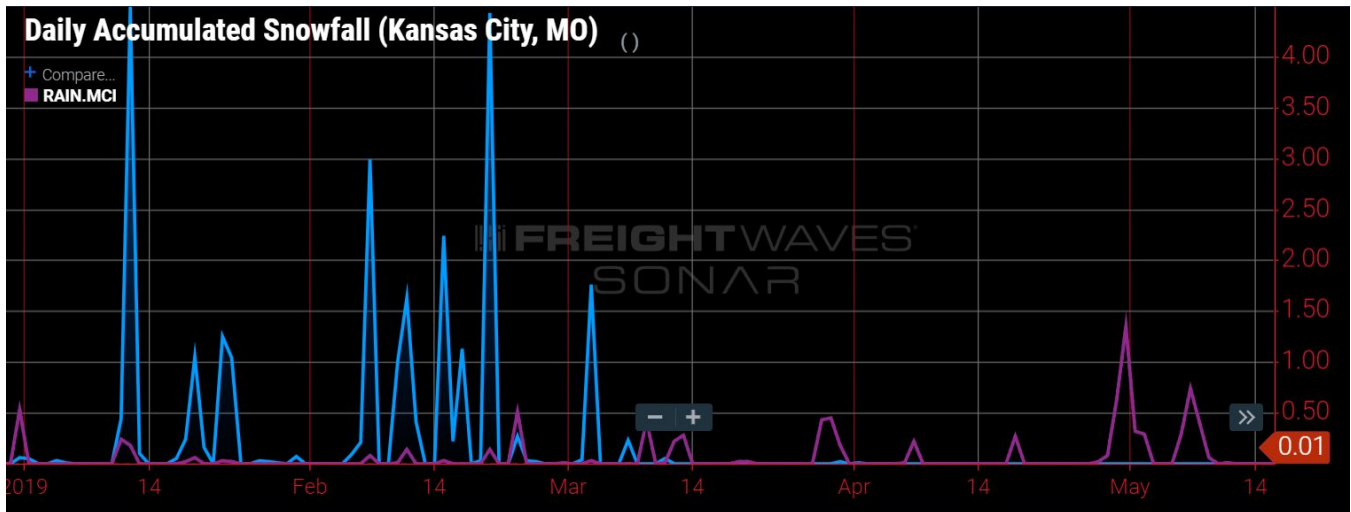
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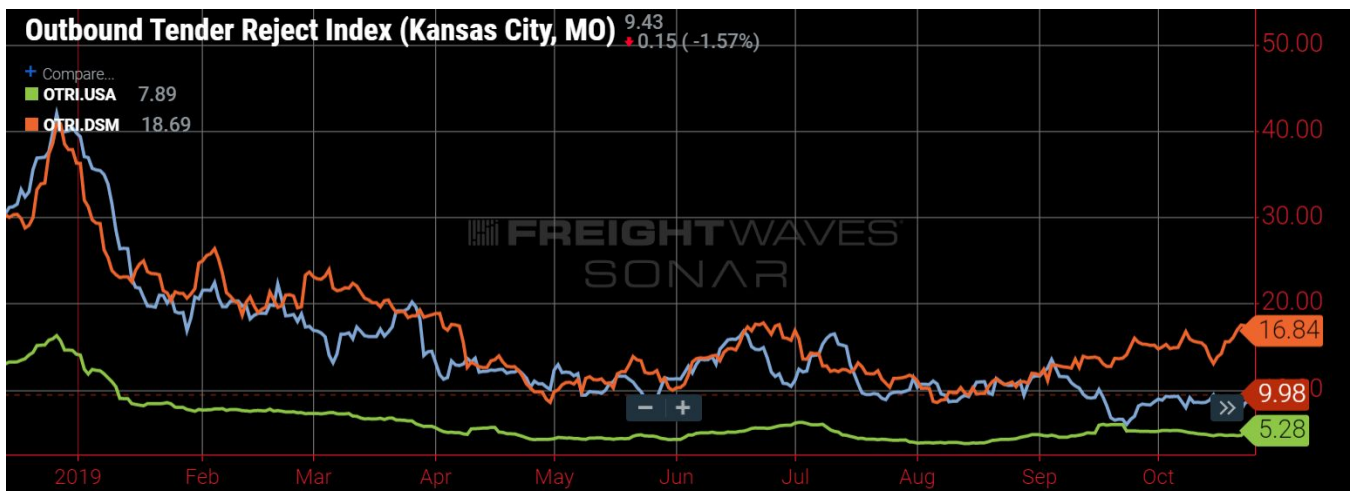
## Flooding



(FreightWaves SONAR: Daily accumulation of snow and rain in the Kansas City, Missouri, market)

The movement of freight is dependent on the weather, and in early 2019, weather played a big part in how freight moved throughout the Midwest. Markets like Kansas City, Missouri, and Des Moines, Iowa, experienced record snowfall in the first quarter of 2019, with Kansas City averaging 0.5" of snow per day in February.

Once the snow began to melt, the water flooded the Missouri River and many freight markets in the Missouri River Valley. St. Joseph, Missouri, suffered some of the worst flooding in the region, with water rising over 15 feet on the interstate, causing I-29 to close in both March and May.



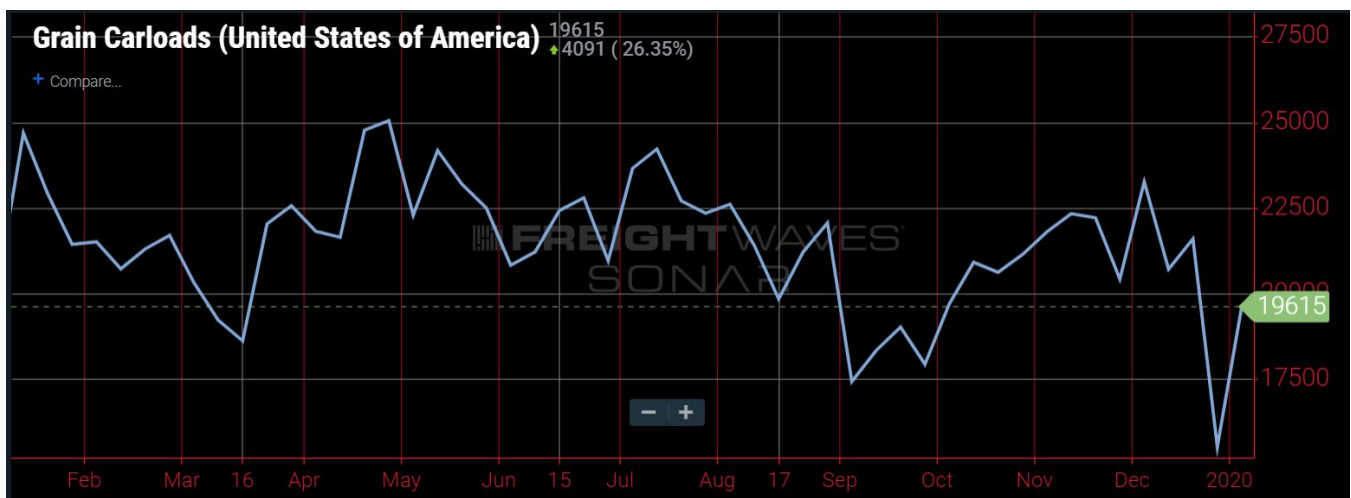
(FreightWaves SONAR: Outbound Tender Rejection Rates)

Carriers avoided the Kansas City and Des Moines markets all throughout March as Outbound Tender Rejections remained elevated in comparison to the national levels. Capacity in these regions is typically tighter than national average tender rejections, but in Q1 2019, the Midwest diverged upward as the national market relaxed from its 2018 highs.

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The Mississippi River also experienced higher flood levels at the beginning of 2019. The floods in the Mississippi River Valley didn't have the same impacts on the freight markets as the floods just west along the Missouri River because the interstates didn't flood.

Ultimately, when segments of the interstate system close for an extended period of time, carriers have to find new ways to enter the market and find new routes around the flooding. Capacity in the markets most affected by flooding tighten as carriers search for better rates or loads that avoid those markets altogether. The less risk a carrier has to take for freight, the better because the risk of a potential insurance claim drops when compared to entering a market that has risk caused by nature.



(FreightWaves SONAR: Total grain carloads originating on U.S. rails)

Trucking companies weren't the only carriers affected by the flooding in the Midwest. Railroad grain volumes collapsed in both March and September due to flooding. Both fields and silos were heavily damaged by flooding all throughout the Midwest and beyond, from Illinois to Nebraska and from North Dakota all the way south to Louisiana.

**Hurricanes**

The 2018 hurricane season was the most recent hurricane season that affected the United States. Two large hurricanes, Florence and Michael, made landfall in the U.S. just a month apart from each other. Hurricane strength is determined by the sustained wind speed and categorized by the Saffir-Simpson scale. The Saffir-Simpson breaks down as follows:

- Category 1: 75-95 mph
- Category 2: 96-110 mph
- Category 3: 111-129 mph
- Category 4: 130-156 mph
- Category 5: 157+ mph

Category 3 or stronger hurricanes are considered major storms that have the ability to cause structural damage and loss of life. Hurricanes Florence and Michael were both very powerful storms throughout their path even though Florence lost steam prior to making landfall.

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Florence formed off the coast of East Africa at the end of August and quickly strengthened to a category 4 storm by Sept. 4. The storm moved across the Atlantic Ocean towards the East Coast of the U.S. On Sept. 14, 2018, Florence’s eyewall made landfall on the coast of North Carolina as a category 1 storm. It proved to be the wettest hurricane ever to hit North Carolina: Some areas received more than 25” of rainfall in a three-day span.

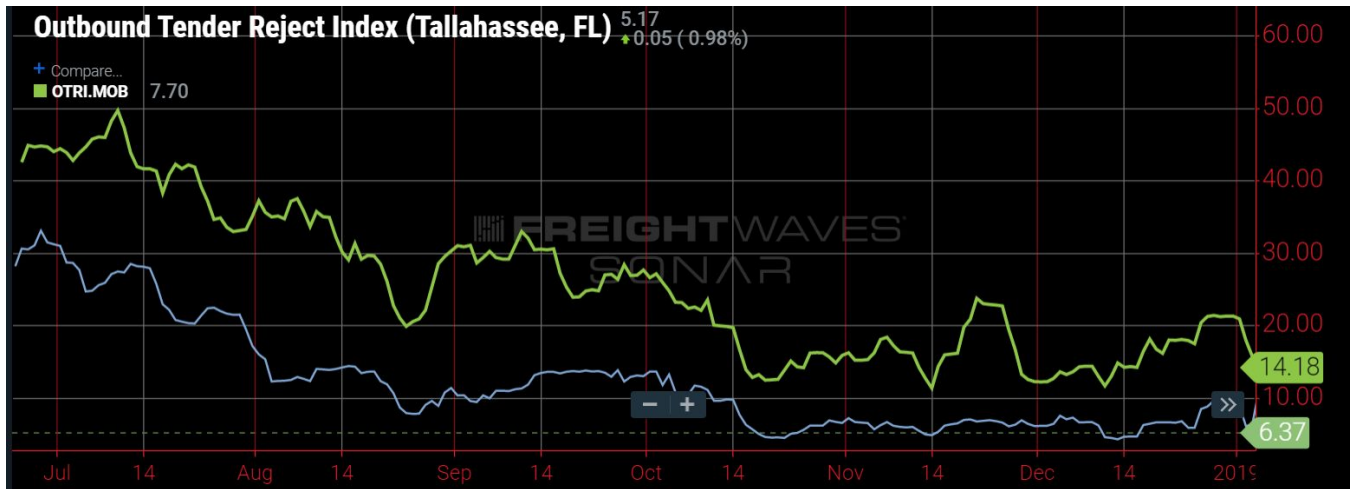


(FreightWaves SONAR: Blue line is Outbound Tender Rejections; the green line is Outbound Tender Lead Time.)

The amount of rain that fell on the Wilmington, North Carolina, market led to historic flooding in the area. The freight market saw spikes in Outbound Tender Rejections and Inbound Tender Rejections as carriers avoided the area prior to landfall. OTRI.ILM spiked to over 40% just three days prior to expected landfall, while at this time Outbound Tender Lead Time was also around three days. The loads that were being rejected were scheduled to be picked up on Sept. 13, just as the first rain bands hit the market. Rising insurance costs have forced carriers to become more risk-averse, so if they are able to avoid an area with an impending hurricane, they are going to stay away.

Hurricane Michael gained intensity more quickly and made landfall only three days after becoming a tropical depression. The storm formed in the Gulf of Mexico and eyed the Panhandle and coastal Alabama. Michael became a category 5 storm on Oct. 10, 2018, right before making landfall near Tyndall Air Force Base near Panama City Beach, Florida. The storm moved so quickly there was little time to prepare for its intensity.

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(FreightWaves SONAR: Outbound Tender Rejections for Tallahassee, Florida, and Mobile, Alabama)

Freight markets in the area didn't see the supply-side shocks that occurred in North Carolina during Hurricane Florence. Outbound Tender Rejections in Tallahassee saw just a small bump on the downward trend that occurred as the overall freight market began to soften in the back half of 2018.

Hurricane Michael did not produce as much rain as Hurricane Florence. The worst part of Michael was sustained winds over 160 mph when the storm made landfall. The Tallahassee market got just under 0.5" of rain for the day that Michael was in the area, whereas Wilmington saw sustained rain over 5" for multiple days.

Analyzing freight markets' reactions to the Florence and Michael storms, we deduce that flooding is more disruptive for freight markets than high wind. Flooding causes sustained impacts on transportation infrastructure and can damage more structures, roads and bridges over a wider area than typical high-wind events, where the worst damage is confined to the storm's eyewall.

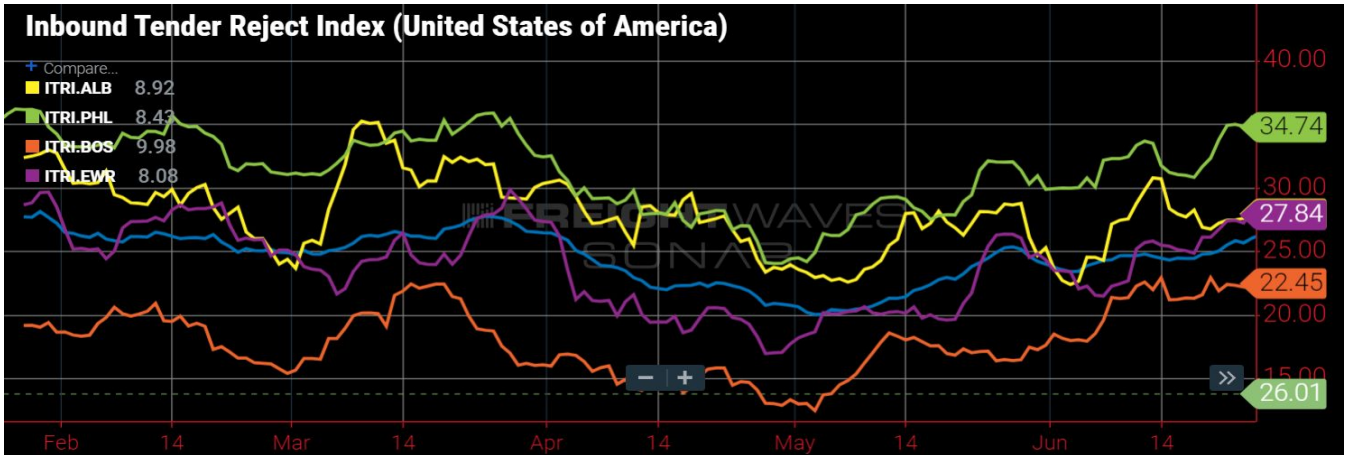
We note, too, that Hurricane Harvey, which flooded Houston in 2017, caused the greatest weather-related shock to freight markets in recent memory. In that storm, the catastrophic flooding of the U.S.'s fourth-largest city, major freight hub and center of the petrochemical industry created supply and demand shocks that rippled across the country for six months.

### Nor'easters

March of 2018 was especially brutal to the Northeast. It was a historic month for snowstorms, especially when you consider the timing, which was the end of winter. Four nor'easters hit in one month: Riley (March 2), Quinn (March 7), Skylar (March 13) and Toby (March 21).

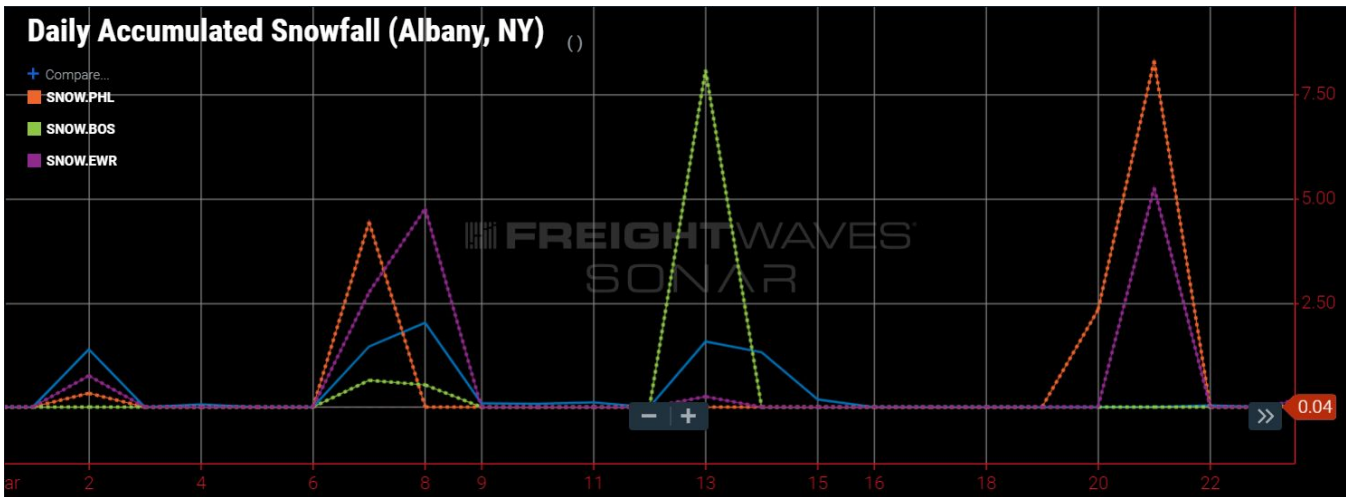
These winter storms are not only heavy snow-makers but also produce very high winds and icy conditions, leading to zero-visibility whiteout conditions at times. Coastal flooding is another concern. These storms can produce storm surges that damage beaches and flood coastal areas. Winter storm Riley produced the third-highest high tide in recorded history in Boston Harbor on March 2.

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(FreightWaves SONAR: Inbound Tender Rejections for Albany, Philadelphia, Boston and Elizabeth)

But how did these storms impact freight markets? Albany saw a significant spike in inbound tender rejections, which rose from ~24% on March 1 to ~35% on March 9. Elizabeth and Philadelphia saw their Inbound Tender Rejections rise throughout March, while Boston and Albany saw their Inbound Tender Rejection levels fall after mid-March. The major markets impacted by these four nor'easters did not receive large amounts of snow, which most likely contributed to the more muted response in Inbound Tender Rejection rates. Winter storms impact freight when either the snow is falling so fast that roads can't be cleared effectively or there are many strong storms in a row.



(FreightWaves SONAR: Snowfall for Philadelphia, Boston and Elizabeth)

Boston and Philadelphia received the most snowfall of the major markets we examined. The majority of the heavy snow was located inland and away from the coastal cities. The path of nor'easters is crucial in understanding which areas are going to be affected. The closer the center of the storm is to the coast, the more likely it is that snow will stay inland and not disrupt the coastal cities and ports. The converse is also true: If the center of the storm stays more out at sea, then it is more likely the heaviest snowfalls will occur in coastal cities.



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This is not to say that if the center of the storm stays close to the coast then the large coastal cities and ports are in the clear. It is likely that they will still experience high winds along with rain and storm surge. Storm surge can be incredibly costly and more damaging than the snowfall, and when the snow melts it produces runoff that can exacerbate flooding.

From our review of the severe winter weather events in the Northeast during March 2018, it appears that only protracted sequences of weather events with large cumulative effects can produce significant supply chain disruptions. The vast majority of snowfalls in regions where local authorities are prepared to clear roads are non-events. Personal safety and cargo risks to individual drivers, not disruptions of business operations, are likely the biggest dangers in snow events.