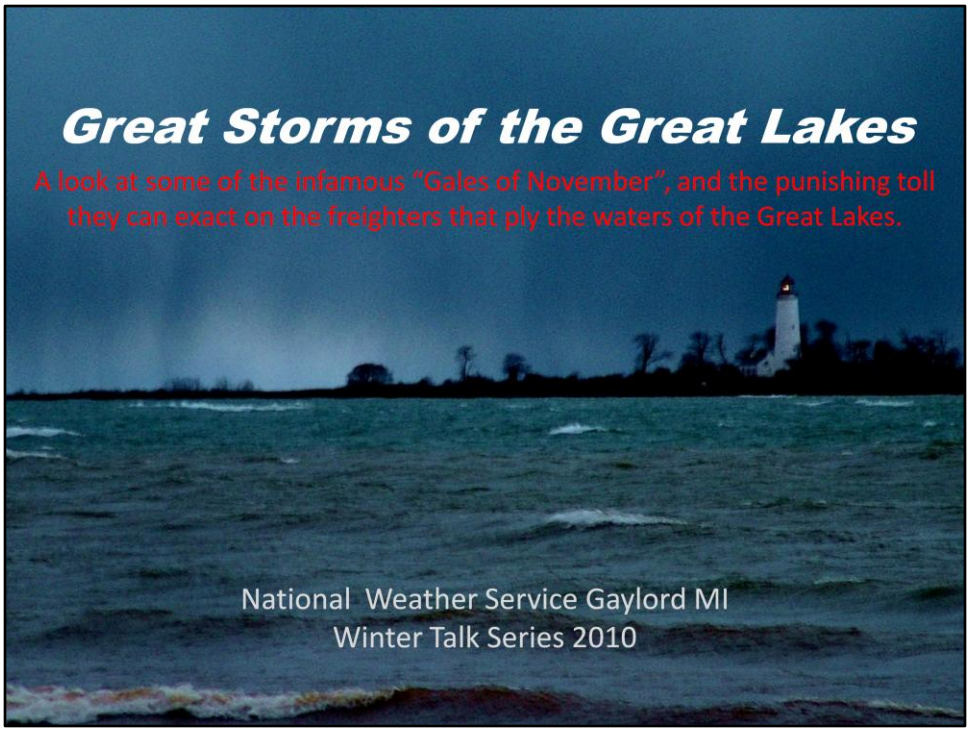
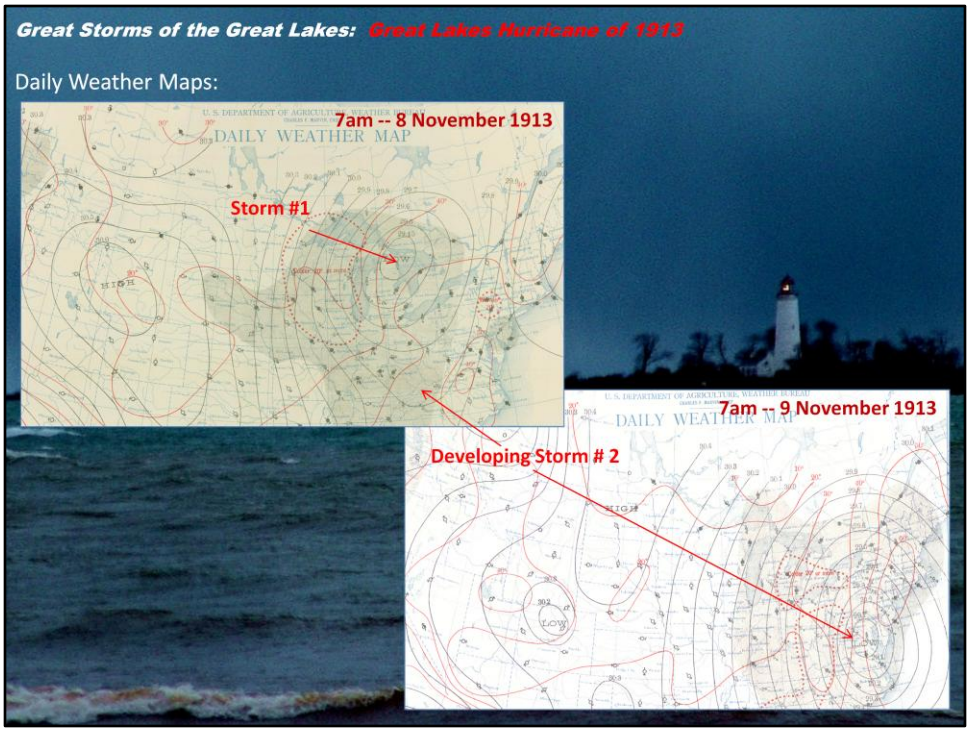


Each slide has notes in sort of an "outline" format in order to put each slide into context and get the story across. If there are animations on a slide...I will put that information up front so that you can anticipate them and not be surprised when you call up a slide and it is mostly blank.

Since the sinking of the French trading vessel *Griffon* in 1679 on Lake Michigan, one of the first shipwrecks on the Great Lakes, thousands of other ships have met a similar fate battling the wicked autumn storms spawned over the Great Lakes region. This presentation will focus on some of the more famous of these storms from the 20th century.

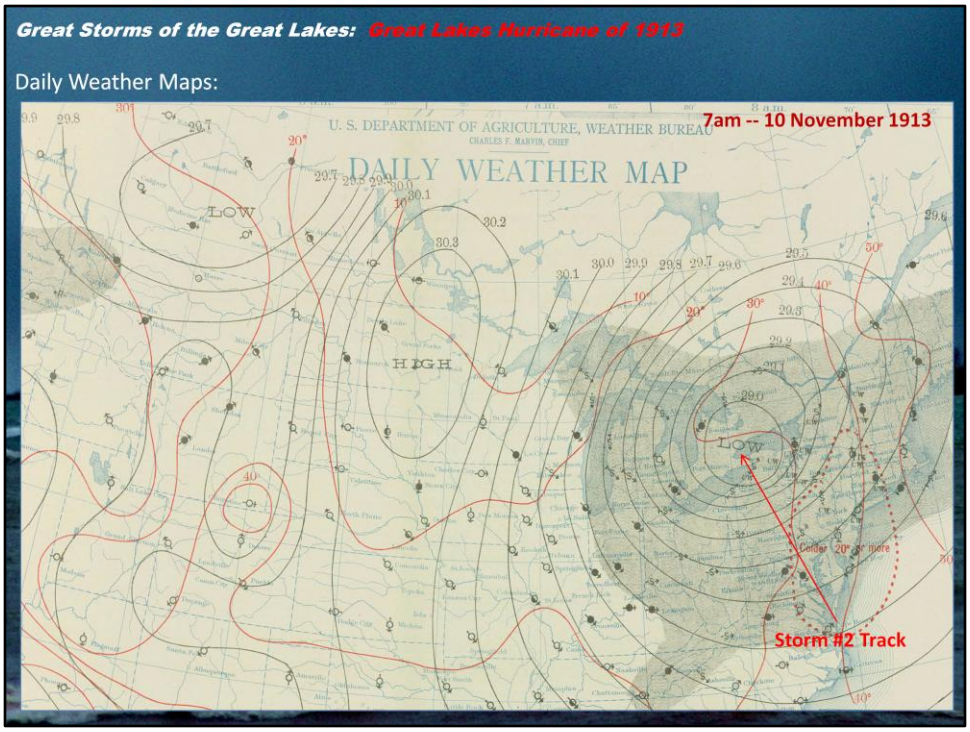
-- Widely considered to be one of the greatest storms to hit the Great Lakes. the "Big Blow of 1913" was responsible for taking at least 258 lives on the Great Lakes.
-- Twelve vessels sank in the storm and 30 others were crippled.
-- Of the eighteen ships that battled the storm on Lake Huron, eight of them sank.
-- The map shows the locations of ships that sank (black) or were stranded (gray) as a result of the storm. Note the majority of wrecks occurred on Lake Huron.



-- The 1913 storm actually consisted of a couple different areas of low pressure impacting the Great Lakes.

-- The top left map is from November 8th 1913, and shows low pressure over northern Lake Huron...with strong northerly winds on the backside of it impacting Lake Superior. Notice the trough extending south from the low into the southeastern U.S., likely associated with a cold front.

-- 24 hours later on November 9th (bottom right), another area of low pressure formed over the southeastern U.S. and deepened rapidly as it lifted up the east coast. Strong winds are now impacting Lakes Michigan and Huron, and temperatures are 15-20 degrees colder that they were 24 hours earlier.



-- The low has lifted north near Toronto by the morning of the 10th . At its deepest, the storm's central pressure bottomed out at 28.60 inches.

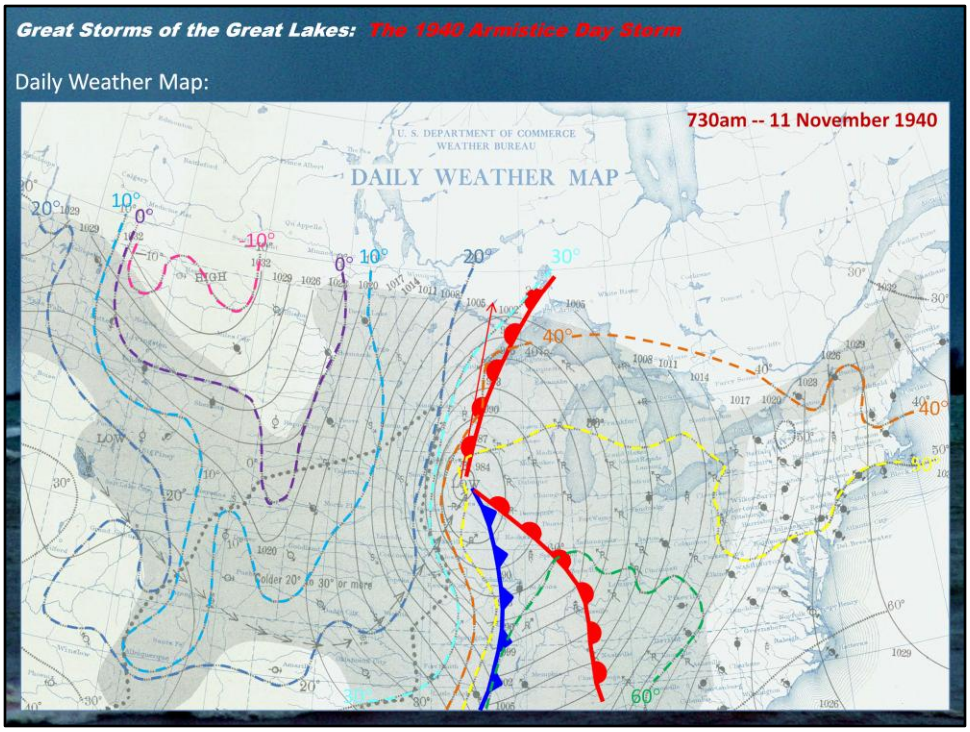
-- The strong pressure difference between the low and the arctic high pressure over the Dakotas/Minnesota continues to drive strong north to northwest winds across the Upper Lakes.

-- Hurricane force wind gusts were produced on Lake Huron, building waves up to 35 feet.

-- For a week following the storm, frozen bodies of the crews of the stricken Lake Huron vessels drifted onto the Canadian shoreline.

-- One of the bodies identified was that of the Chief Engineer of the *Charles M. Price*, though he was found wearing a life preserver from the *Regina* which foundered nearby...a mystery of the storm that was never solved.

-- The financial loss in ships and lost cargo totaled over $100 million in today's currency.



-- A notorious storm not only for the Great Lakes, but for the entire upper Midwest.

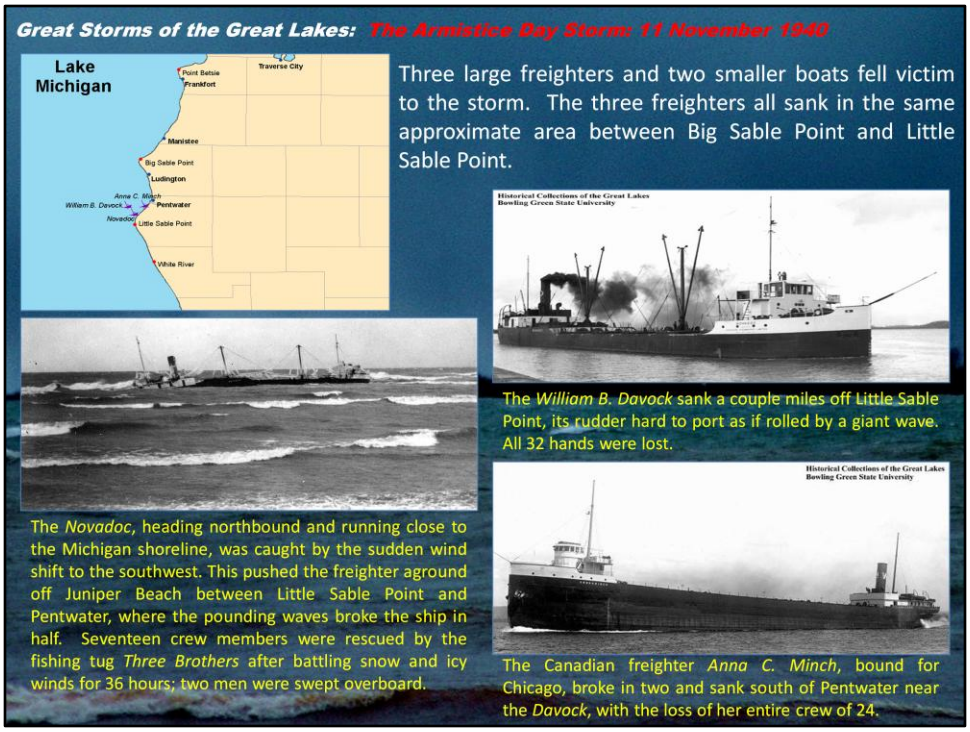
-- Unseasonably mild holiday weather ahead of the storm lured hundreds of unsuspecting duck hunters out to wetlands and marshes of the upper Midwest, who were then stranded when cold winds suddenly picked up, dropping temperatures and changing rain over to blizzard conditions. Fifty hunters froze to death, ill equipped to handle the sudden cold.

-- A total of 154 persons died as a result of the storm across the Midwest...66 of them were sailors on the Great Lakes.

-- The storm tracked across the Rocky Mountains and the southern Plains (arrows on the map show the storm's track), then turned northeast. By the morning of the 11th, the storm had tracked into central Iowa, with a strong temperature contrast behind the cold front that extends south across Missouri (isotherms are marked every 10 degrees).

-- Rain and mild temperatures had advanced north along the Mississippi River by the morning of the 11th (where the duck hunters were already out in force), but snow, blizzard conditions, and temperatures in the teens had already set in across the eastern Plains.

-- The storm tracked almost due north on the 11th...moving through Duluth during the afternoon (with a central pressure of 28.66 inches). The cold front swept quickly east...as the front passed Chicago, the temperature dropped from 63 degrees at 11am to 35 degrees by 2pm...and 26 degrees by 5pm.



Animations (2)

-- Ships out on Lake Michigan bore the brunt of the Armistice Day storm, where five ships sank during the storm.

-- Three large freighters sank between Little Sable Point and Big Sable Point (shown in the map).

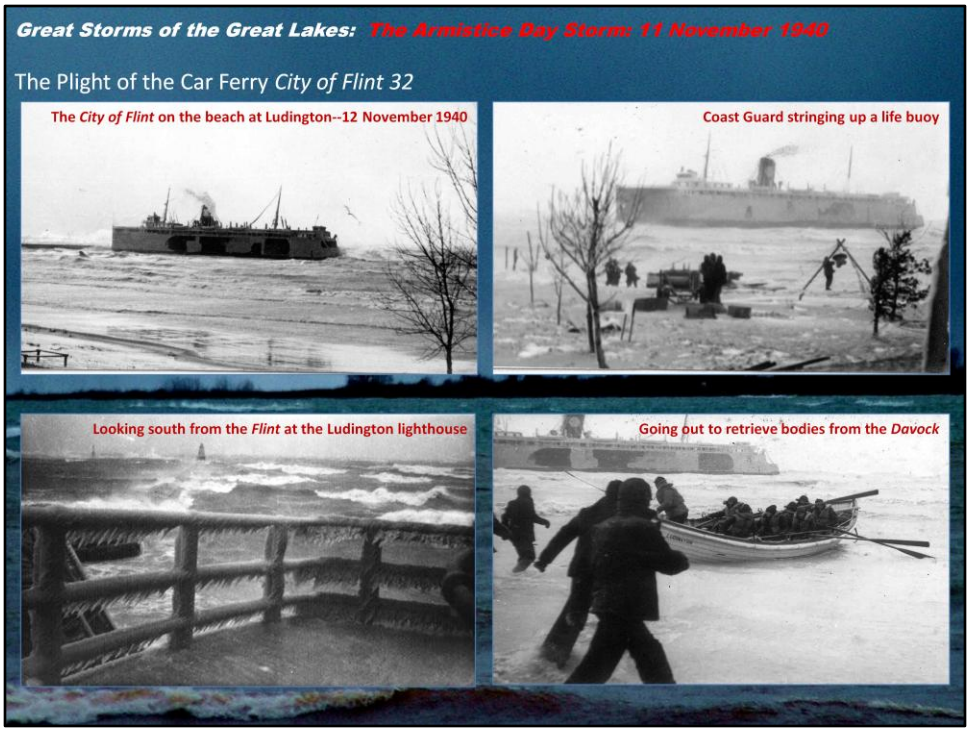
-- Winds were initially out of the southeast as the storm moved northeast across the Midwest...and many boats, based on a forecast of southeast gales backing to northeast gales, traveled close to the western shore of Lower Michigan for protection.

Animation 1: The *William B. Davock*, and the Canadian freighter *Anna C. Minch*, were among those boats traveling along the western Michigan shore, heading south toward Chicago. But when the cold front crossed the lake during the early afternoon, winds shifted to southwest and increased, leaving these boats exposed to the building winds and waves.

The *Davock* sank a couple miles off Little Sable Point, its rudder hard to port as if rolled by a giant wave.

The *Minch* sank nearby south of Pentwater, having been split in two by the giant waves. All hands were lost on both vessels.

Animation 2: The 253-foot *Novadoc*, heading north, was driven aground off Juniper



One of the interesting stories from the Armistice Day storm came from the experiences of two of the car ferries that docked at Ludington. Around 11pm on the night of the 11th, the car ferries *Pere Marquette No. 21* and the *City of Flint 32* were attempting to dock at Ludington.

-- The *No. 21* was driven hard against the pier, but made it into port.

-- The *Flint* then missed the entrance piers entirely, and was pushed broadside to the beach by the winds and waves. The captain ordered the ships holds flooded so that the vessel would settle to the lake bottom…allowing the Coast Guard to eventually rescue the 45 crew members and four passengers, although the rescue took two days.

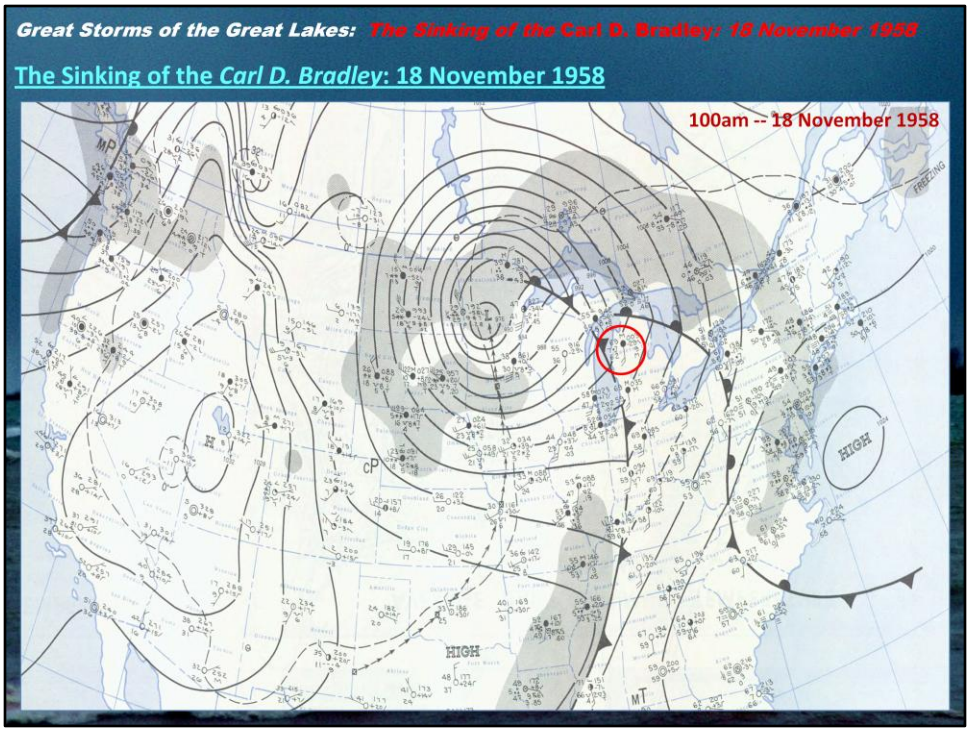
The pictures in this slide are as follows:

-- Top left: A view of the *Flint* from the beach at Ludington.

-- Top right: Coast Guard sets up a breeches buoy to attempt to ferry passengers off the boat (the tripod on the right side of the picture). This was tested using two crew members, who spent most of their trip to shore submerged in the cold waters of Lake Michigan…so they eventually abandoned the idea and used small boats to get the passengers off once the waves subsided.

-- Bottom left: Looking south at the waves from the stern of the *Flint* toward the Ludington North Breakwater light.

-- Bottom right: During the afternoon of the 12th, bodies from the crews of the sunken *William B. Davock* and *Anna C. Minch* began to wash ashore at Ludington. This last picture shows the Coast Guard launching their lifeboat to pick up one of the first bodies to arrive.

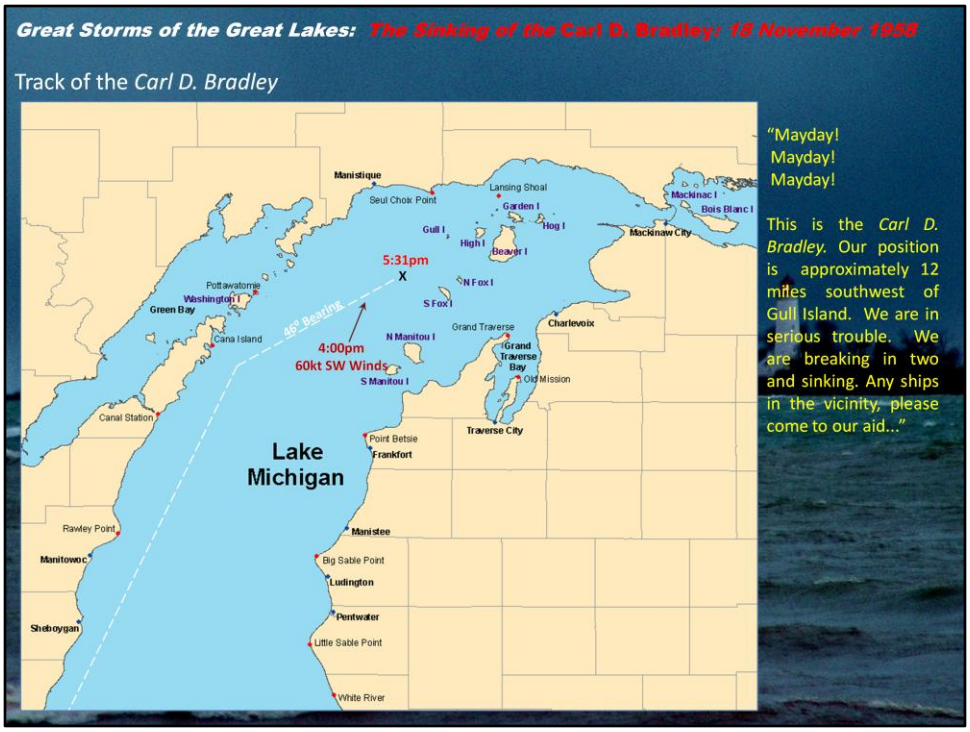


-- The 623 foot limestone hauler *Carl D. Bradley* was sailing northbound on Lake Michigan, returning to its home port of Rogers City on its second-to-last run of the season, when it was caught in a violent storm that lifted nearly due north from the Texas Panhandle and central Oklahoma through Minnesota…a somewhat similar track to the 1940 Armistice Day storm.

-- Like the Armistice Day Storm, passage of a cold front shifted winds to the southwest and up the long axis of the lake.

-- This map from 100 am on November 18th , about 16 and a half hours prior to the Bradley sinking, shows the cold front crossing Lake Michigan.

-- Notice the temperature of 69 degrees at Traverse City, an unusually warm temperature for mid November during the daytime…let alone at 100am. In fact, this 69 degree reading is still the record high temperature at Traverse City for November 18th…so there is still a legacy from this infamous storm on the record books.



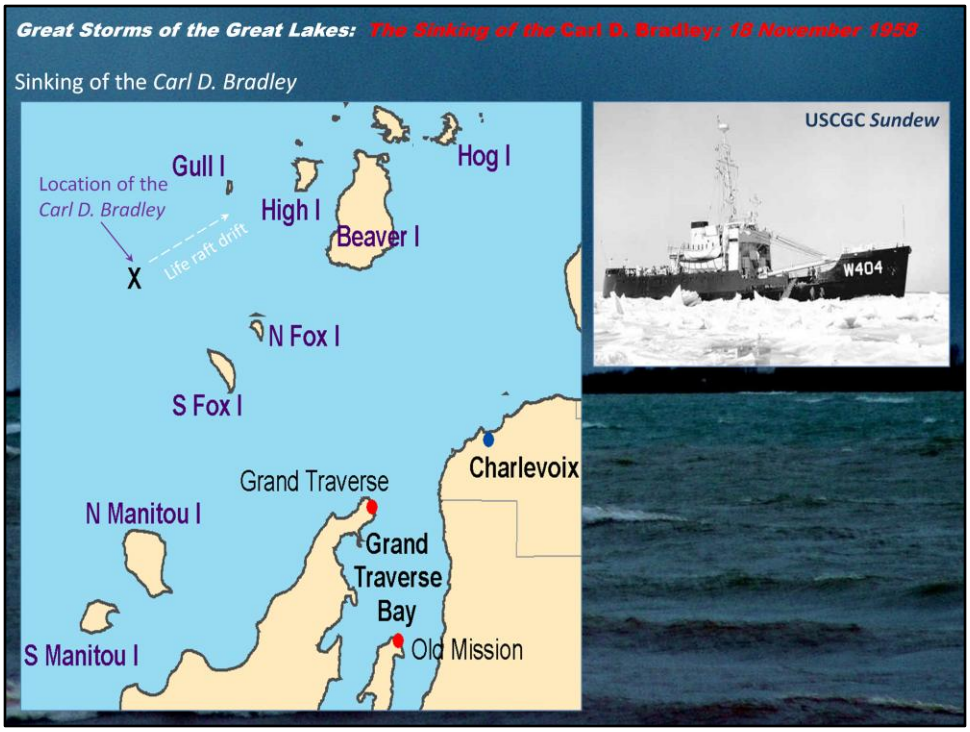
Animation

-- The *Bradley* left Gary, Indiana around 10:00 pm on the 17th, heading back home to Rogers City and sailing north along the Wisconsin shoreline through the afternoon of the 18th, taking advantage of the protection of the land mass from the winds and waves.

-- During the afternoon of the 18th, the *Bradley* turned northeast toward the Straits of Mackinac. As it tracked toward the middle part of the lake, the boat was buffeted by 60 knot storm force winds…building waves 20 to 30 feet high.

-- Around 5:30pm...the ship rode up on one of these waves, resulting in the boat "hogging", or bending upward in the middle. This caused the hull to crack, the opening growing wider with each wave that passed.

Animation: Upon seeing the ship begin to founder, First Mate Elmer Fleming grabbed the pilothouse radiophone and broadcast the Mayday message that is shown in the slide. He was able to broadcast his Mayday call twice before the electrical cables to the pilothouse snapped, cutting off communications.



Animation

-- It only took a matter of minutes for the *Bradley* to split apart completely and sink, throwing her crew of 35 into the cold and turbulent Lake Michigan waters.

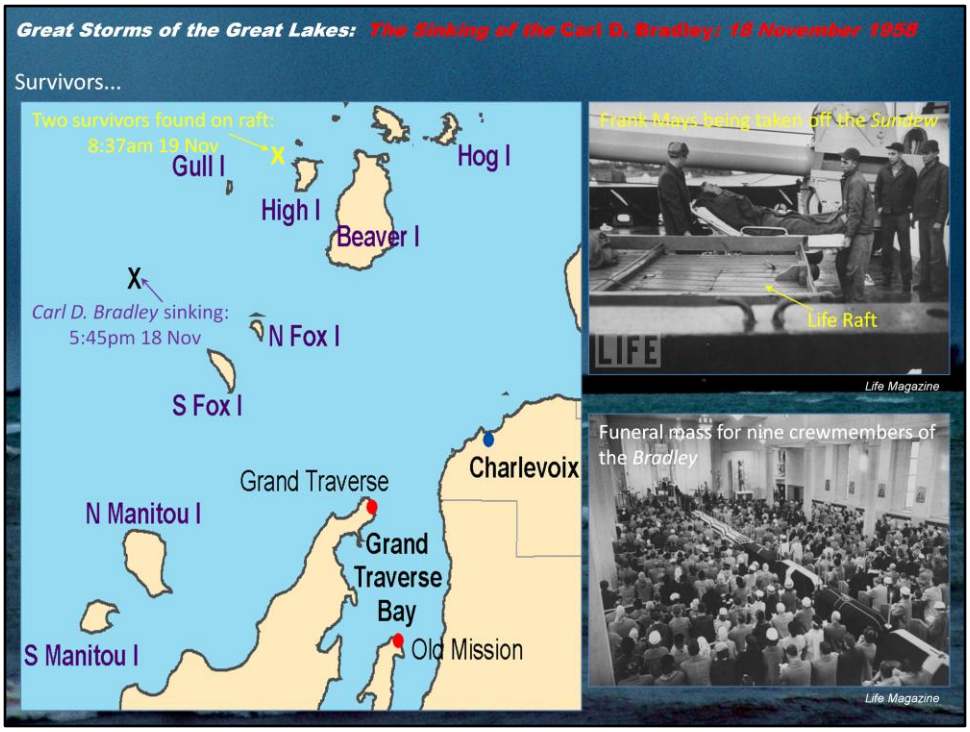
-- The boat sank too quickly for the lifeboats to be deployed, but a smaller pontoon-style life raft broke free, and four crew members managed to climb aboard.

-- The life raft was bounced around endlessly in the heavy seas, with the raft flipping over several times and tossing the four sailors into the 50 degree waters of Lake Michigan, forcing them to scramble back aboard their tiny craft. The winds and waves pushed the raft toward the Beaver Island archipelago.

Animation: The Coast Guard did pick up on Elmer Fleming's Mayday call, and attempted to dispatch several vessels and an aircraft toward the area of the sinking.

-- The USCG station in Charlevoix was one of the stations that responded, attempting to send out a 36 foot lifeboat, and the cutter *Sundew*.

-- The two boats had a difficult time getting out of the channel at Charlevoix. The small lifeboat could not make headway out of the channel and was forced to turn back, but the *Sundew* bravely plowed out into the lake, rolling as much as 50 degrees at times (and resulting in almost the entire crew getting seasick), but the cutter made it to the area where the Bradley sank in about four and a half hours.



Animations (2)

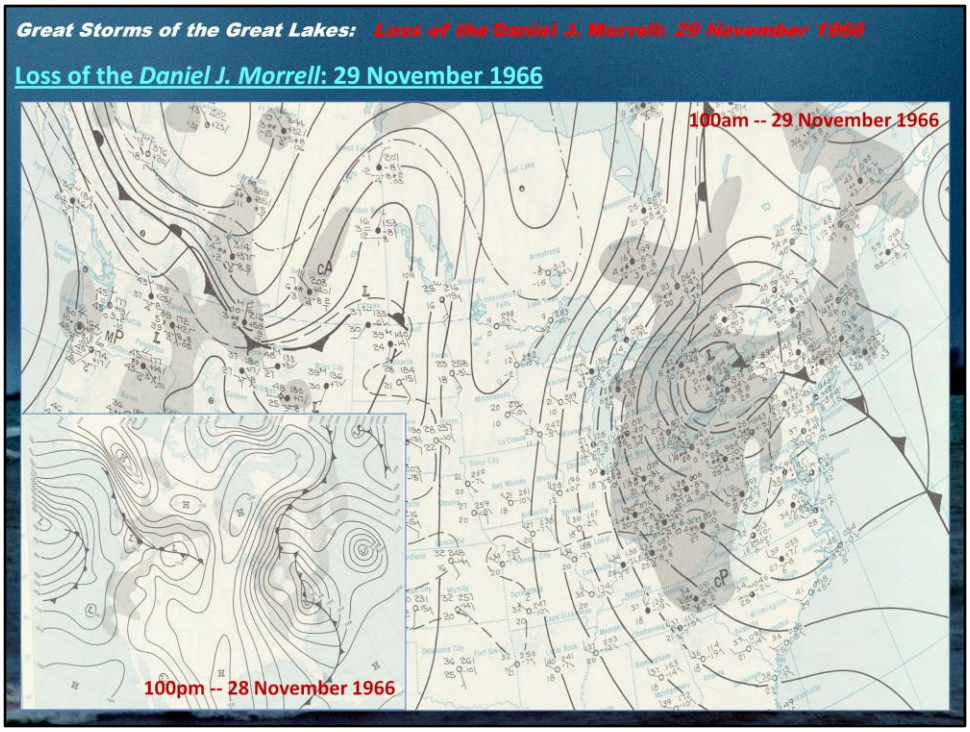
-- Capt. Harold Muth of the *Sundew* performed a grid search of the area, gradually tracking toward the northeast where he thought any pieces of the ship would float. Just after sunrise on the 19th, after nearly 10 hours of fruitless searching, the *Sundew* spotted a life raft off High Island.

-- Of the four men who originally made it to the raft, only two remained by the time the *Sundew* reached it...First Mate Elmer Fleming, and Deck Watchmen Frank Mays.

Animation 1: At 8:37am...after drifting for nearly 15 hours and 17 miles from where the *Bradley* sank, the two men were plucked from the raft and taken back to Charlevoix. The top right picture shows Frank Mays being stretchered off the boat at Charlevoix, with the pontoon life raft shown in the foreground.

-- Mays and Fleming were the only two survivors found...33 crewmen died in the sinking. Fifteen bodies were never recovered.

Animation 2: The sinking was especially hard on the citizens of Rogers City, home to 23 members of the lost ship's crew. Six more were from other towns across northeast Lower Michigan. The picture on bottom right shows the funeral mass for nine members of the *Bradley* crew at St. Ignatius Church in Rogers City



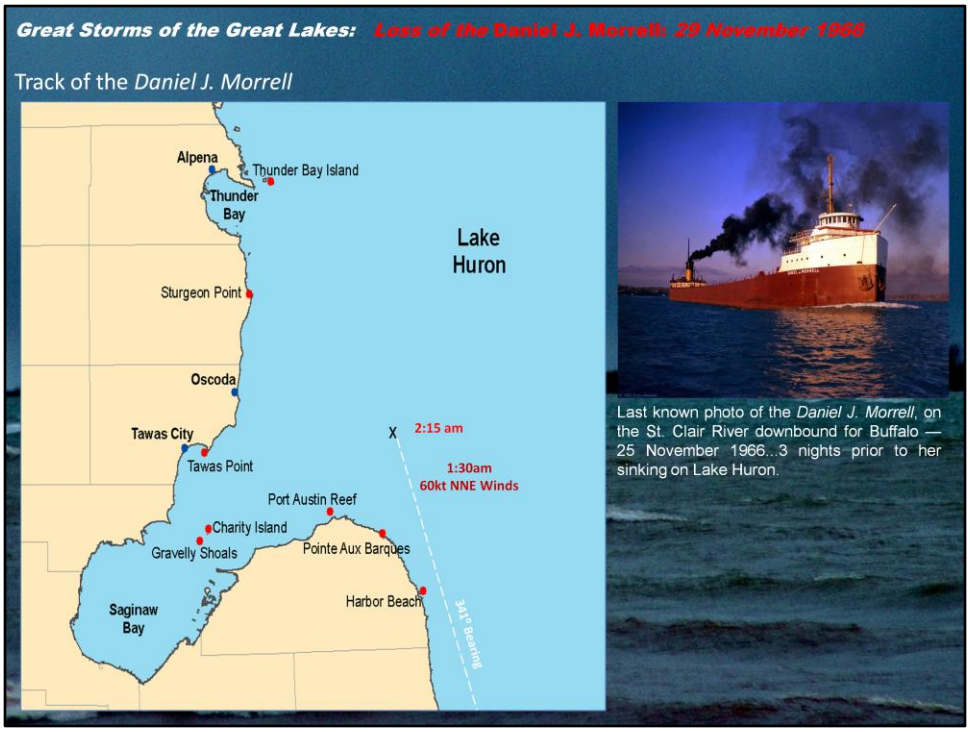
-- Making one last run of the season, departing Buffalo, New York for Taconite Harbor, Minnesota on 26 November, the *Daniel J. Morrell* ran into deteriorating weather on southern Lake Huron during the evening of 28 November.

-- The *Morrell* was traveling upbound on Lake Huron with its sister ship, the *Edward Y. Townsend.* Both ships were struggling with the increasing winds...which were coming out of the north around 60 knots, building waves to 25 feet on the southern end of Lake Huron.

The large map is valid at 100am on 29 November...roughly within an hour of the *Morrell* sinking. Low centered north of Lake Ontario...having tracked north-northwest during the afternoon and evening hours of the 28th (see inset map valid 12 hours earlier).

One thing you may want to mention is to compare some of the storm tracks we've already discussed. The Armistice Day Storm and the storm that sank the *Bradley* in 1958...storms that impacted Lake Michigan...tracked west of the Great Lakes, remaining over the midwest before moving northeast into Ontario. Strong southwest winds up the long axis of the lake built high waves which impacted ships in both storms on the northern/eastern sides of the lake.

By contrast, the 1913 storm and this storm in 1966 that impacted Lake Huron tracked from the Carolinas north-northwest across the lower Great Lakes. The resultant long north/northeast wind fetch built high waves which impacted ships on the western/southern sides of the lake.



-- With both ships running only with ballast (and thus higher in the water than if fully loaded), the captains of the *Morrell* and the *Townsend* were having trouble keeping their ships pointing into the winds and waves, and were at risk of getting pushed onto the beach.

-- Late on the evening of the 28th, the two captains discussed the possibility of turning and heading back to Port Huron. But it was decided that turning in such high seas with lighter than normal vessels would be too dangerous. They did leave open the possibility of taking shelter in Thunder Bay.

-- Around 200am on the 29th...deck watchman Dennis Hale was asleep in his bunk, when he was awoken by a couple of loud thuds. The lights were out in his cabin, and Hale rushed outside without getting dressed to see what was going on. He heard someone yell to put life jackets on. He went back into the dark cabin and grabbed his life jacket and his wool Navy peacoat, but was unable to find his pants or shoes in the dark. He went back out on deck.

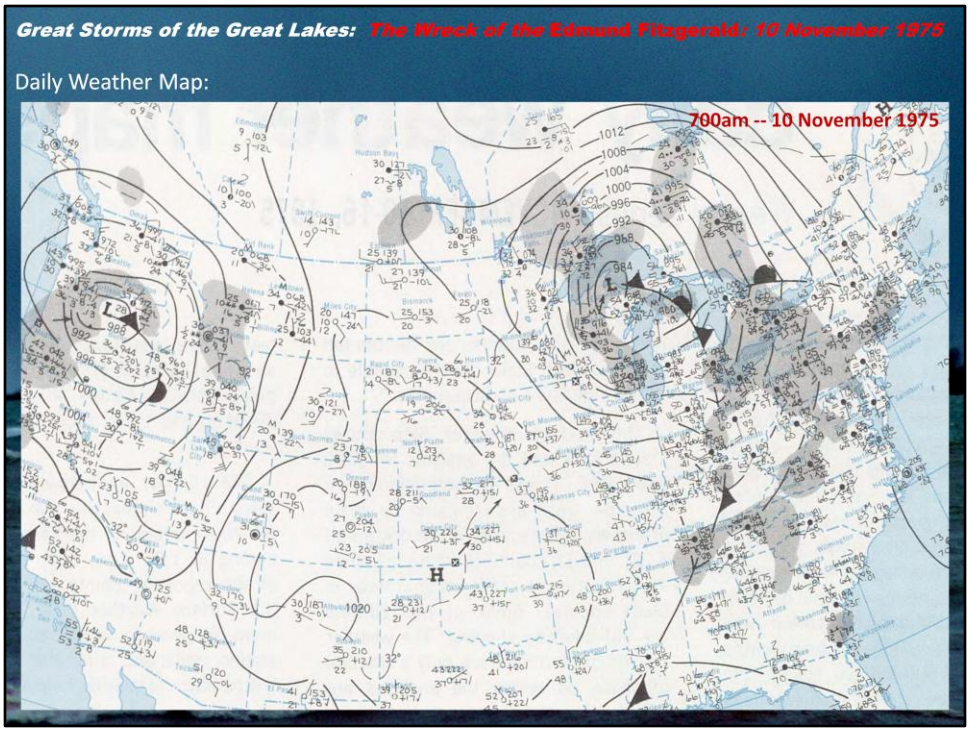
-- Then Hale and the other forward crew members saw an incredibly horrible sight. The center of the ship was higher than the stern, having been pushed up by a giant wave. Rivets popped out of steel plates, and metal cracked and broke near hatch 11. Then the stern slowly raised up. Realizing the ship was breaking up, the crew headed to the life raft.

-- About a dozen men boarded the pontoon style raft and waited for the ship to sink. The bow of the ship angled downward, and a wave smashed into the raft, sending all aboard into the cold lake. Only four men, including Dennis Hale, made it back to the

-- Despite other ships being unable to contact the *Morrell*, and the failure of the captain to check in with headquarters at 900am on the 29th , no concern was raised as to the fate of the ship until midday on the 30th, when the ship failed to arrive at Taconite Harbor.

-- Throughout the morning and afternoon of the 29th, Dennis Hale and three other crewmates hung onto their life raft as it drifted southwest toward Michigan's Thumb. The other three men gradually froze to death, but Dennis Hale, dressed only in boxer shorts, his woolen pea coat, and a life preserver, managed to hang on long enough until his raft was finally discovered by the Coast Guard around 345pm on the 30th, 38 hours after the *Morrell* sank beneath him. Twenty eight sailors on the *Morrell* were lost.

Background info only: In a manner similar to the *Carl D. Bradley*, the *Morrell* cracked near hatch 11 (the *Bradley's* hull was cracked near hatch 10) while under ballast in high waves. It was later determined during the USCG investigation that ships built prior to 1948 (the *Morrell* was built in 1906...the *Bradley* in 1926) used a type of steel in their hulls that became brittle at temperatures below 33 degrees...conditions the *Morrell* encountered on Lake Huron the night she sank. This likely contributed to the ship's demise during the twisting and turning encountered on the choppy waves of Lake Huron. The *Townsend* also developed a crack in her hull during the storm, which resulted in the ship's seaworthiness certificate being revoked by the USCG upon the ship's arrival in the St. Mary's River. The *Townsend* never sailed again.

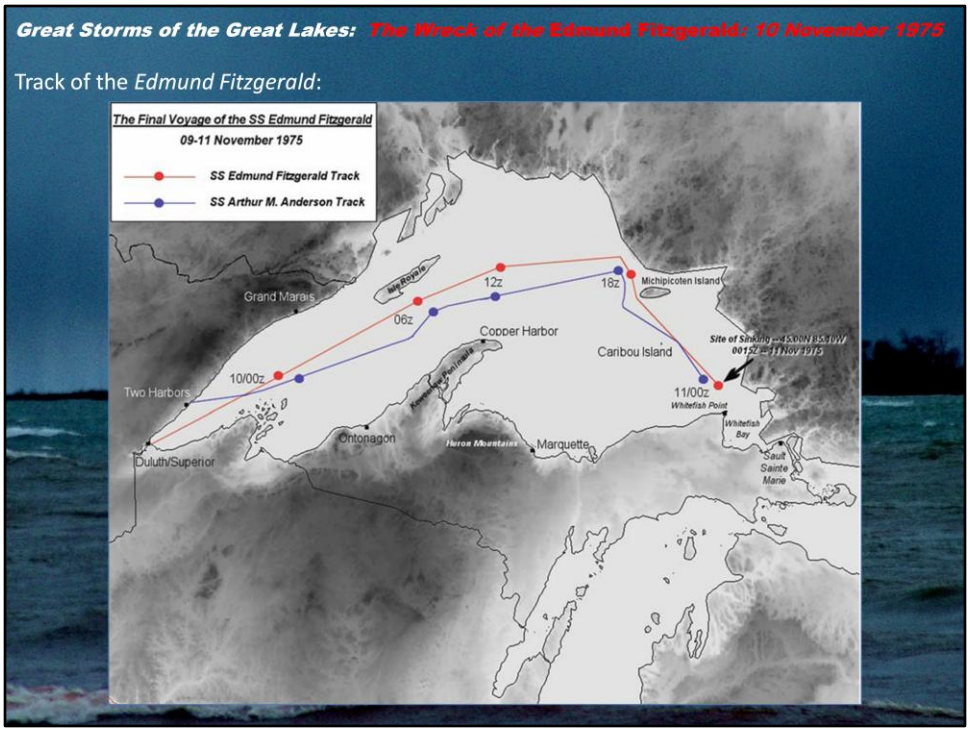


-- The most famous of Great Lakes shipwrecks...thanks in no small part to Canadian singer/songwriter Gordon Lightfoot, the *Edmund Fitzgerald* sank in a Lake Superior storm on 10 November 1975 with the loss of all 29 hands on board.

-- At 729 feet long, the *Fitzgerald* is the largest Great Lakes shipwreck.

-- This map, from 700am on 10 November, shows the storm near Marquette. The storm would lift quickly across Lake Superior and into northern Ontario by the afternoon.

-- The storm was initially forecast to pass south of Lake Superior…the farther west track had an impact on wind directions and likely had an adverse role in the sinking of the *Ftizgerald*.



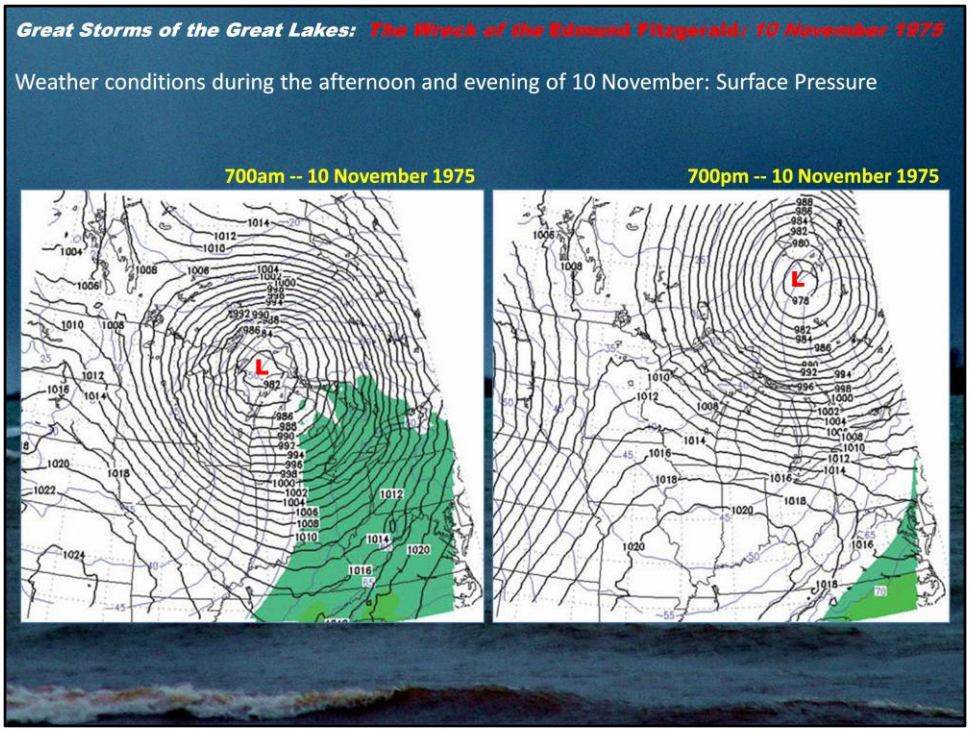
-- The *Fitzgerald* left Superior, Wisconsin on 9 November, with a load of iron ore bound for Detroit. Traveling along with the *Fitzgerald* was the ore carrier *Arthur M. Anderson*. Capt. Ernest McSorley of the *Fitzgerald*, and Capt. Bernie Cooper of the *Anderson* planned to take a longer northeasterly route across Lake Superior, tracking closer to the north shore of Lake Superior in anticipation of a northeasterly gale.

-- Instead, the tightly wound low pressure center crossed Lake Superior during the afternoon of the 10th. As the two ships turned southeast to head toward Whitefish Bay around midday on the 10th , winds shifted northwest in the wake of the storm now tracking north of the lake, its central pressure falling toward 28.70 inches. This wind shift allowed waves to build along the wide west-east expanse of Lake Superior.

-- As the afternoon wore on, the *Fitz* took a beating from the increasing winds and waves; around 315pm, McSorley radioed the *Anderson* that he had lost some vents and fence rail, and had taken on a list. By 400pm, winds over 60 knots tore the radar antenna from the pilothouse roof, forcing the *Fitz* to rely on radar fixes from the *Anderson* for navigation assistance.

-- The weather continued to worsen as daylight faded and the ship limped toward the safety of Whitefish Bay, with hurricane force wind gusts and waves in excess of 25 feet. At 710pm, when asked by the First Mate of the *Anderson* how they were making out with their problems, Capt. McSorley replied: "We are holding our own." That was the last transmission from the *Fitzgerald*.

-- Minutes later, the 729 foot ore boat disappeared from the *Anderson's* radar, without ever transmitting a distress call. The *Anderson* and several other boats



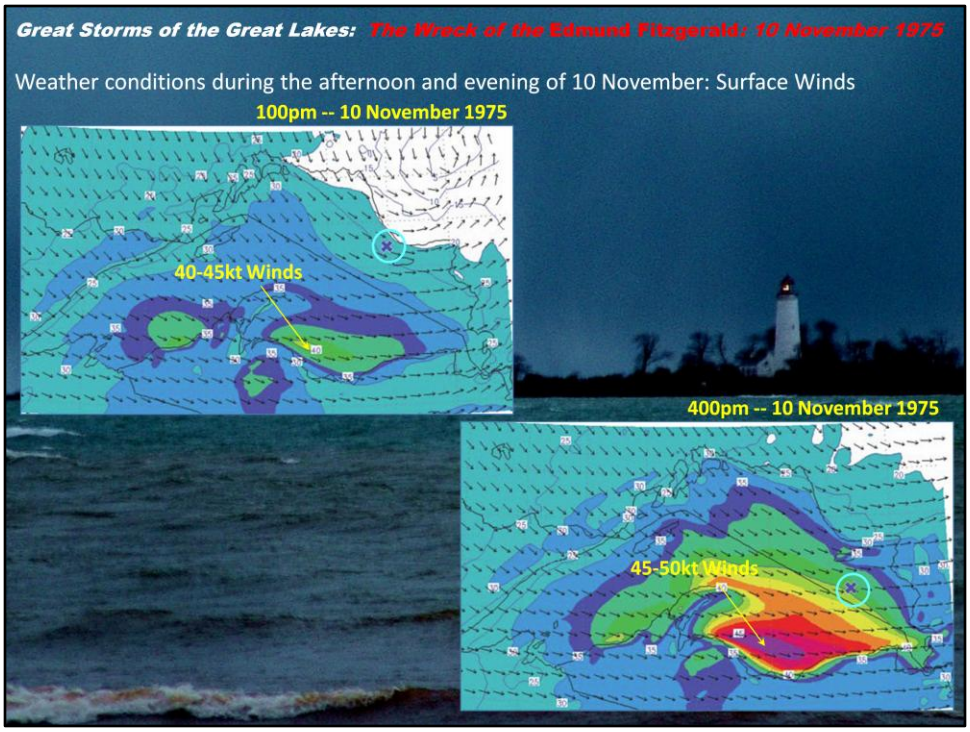
-- There are various theories as to why the *Fitzgerald* sank…and we won't focus on them here. One point that is agreed on is that the ship was likely hit by one or more large waves which caused the boat to capsize quickly without time to broadcast a distress call.

-- NOAA researchers Tom Hultquist and Mike Dutter of the NWS, and Dave Schwab of the Great Lakes Environmental Research Lab in Ann Arbor, did an interesting study of the storm that sunk the *Fitzgerald*, publishing their results in the *Bulletin of the American Meteorological Society* in 2006.

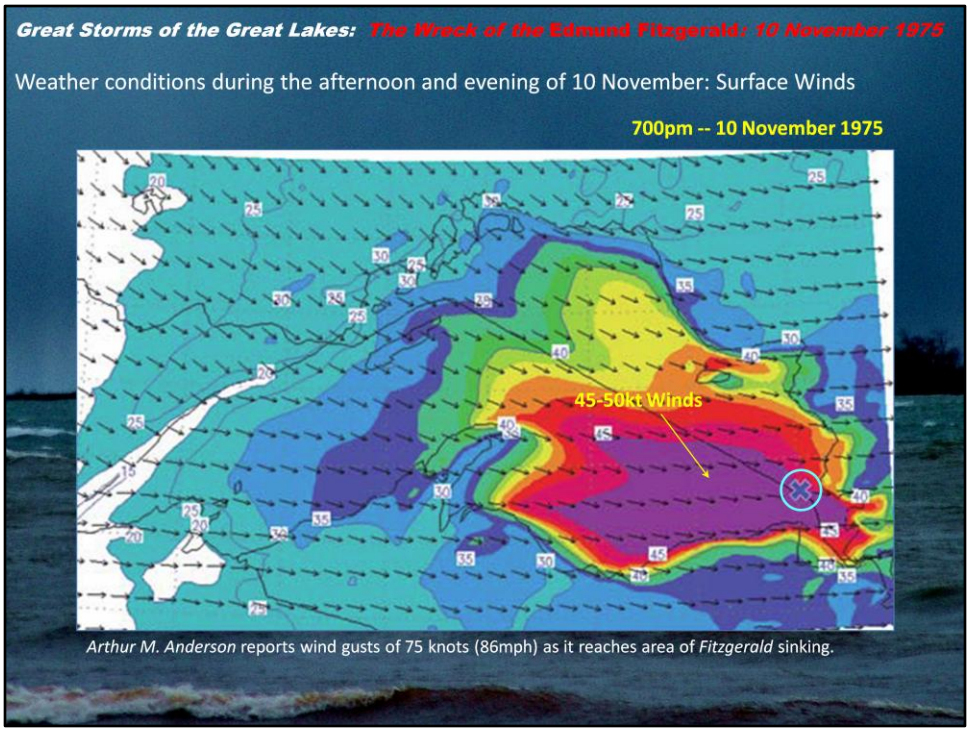
-- One of their findings was that, although weather conditions were severe throughout the storm, there was about a six hour period where the weather was particularly intense, which happened to coincide with the time of the *Fitzgerald's* sinking.

-- The idea behind the study was to use numerical models to simulate the conditions experienced on Lake Superior during the storm. They first used an atmospheric model in order to simulate the storm and, more importantly, the winds associated with the storm. They then took these simulated winds and used it to drive another model that simulates wave development. In this way, the authors of the study were able to create a representation of what wind and wave conditions were at the time of the *Ftizgerald's* demise.

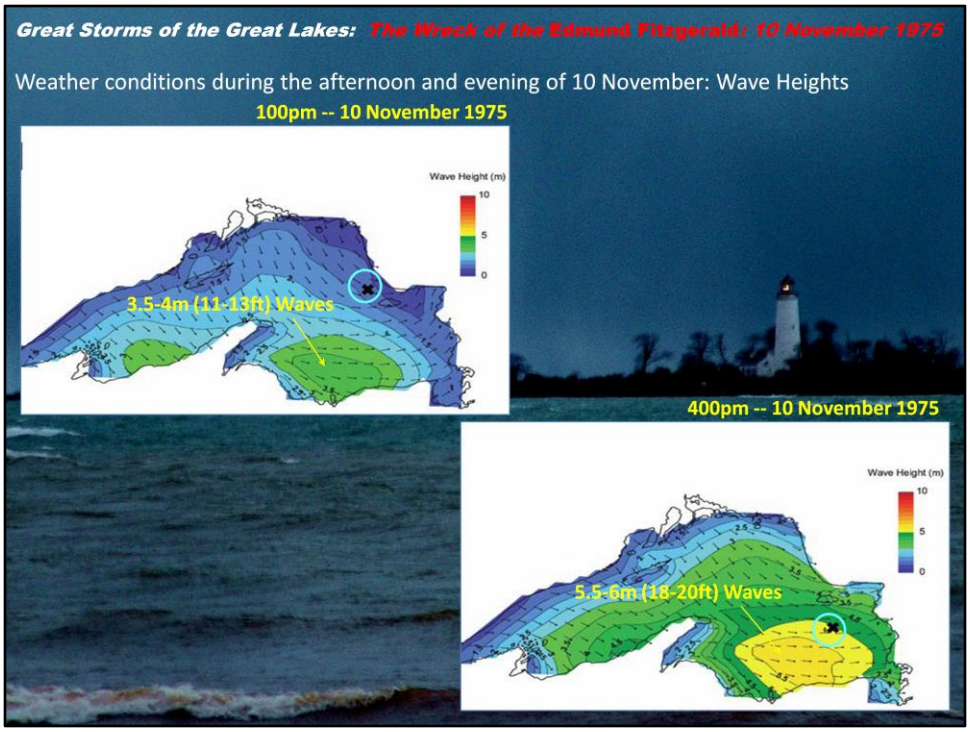
This first slide shows the MSLP pattern from the model…valid at 7am (left) and 7pm (right) on 10 November, showing the storm's track across Lake Superior and the tight pressure gradient associated with the backside of the storm impacting Lake Superior



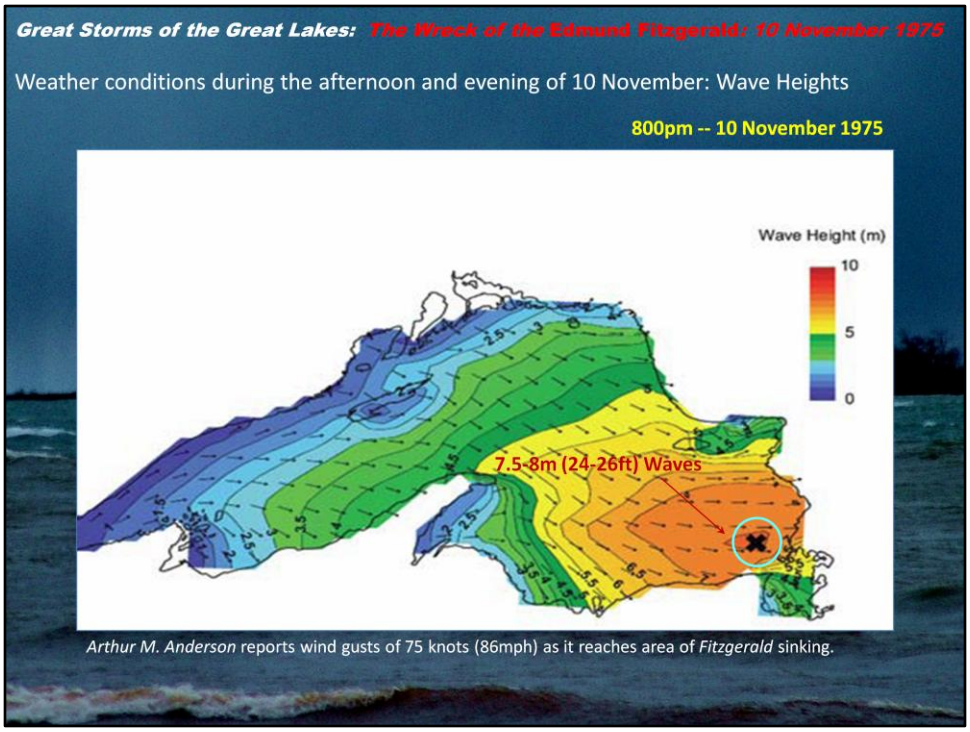
-- These maps show wind speed and direction at 100pm and 400pm on 10 November. Winds have shifted to the northwest by this time and are increasing…45-50kt (52-58mph) sustained winds are shown across southern Lake Superior by 400pm. The position of the Fitzgerald at the map valid time is indicated by the circled X.



This wind map is valid at 700pm…just a few minutes prior to the *Fitzgerald* sinking around 715pm. Widespread area of 45-50kt sustained winds are indicated over southeast Lake Superior. Wind gusts reported by the *Arthur M. Anderson* as it reached the point where the *Fitzgerald* went down were 75kts.



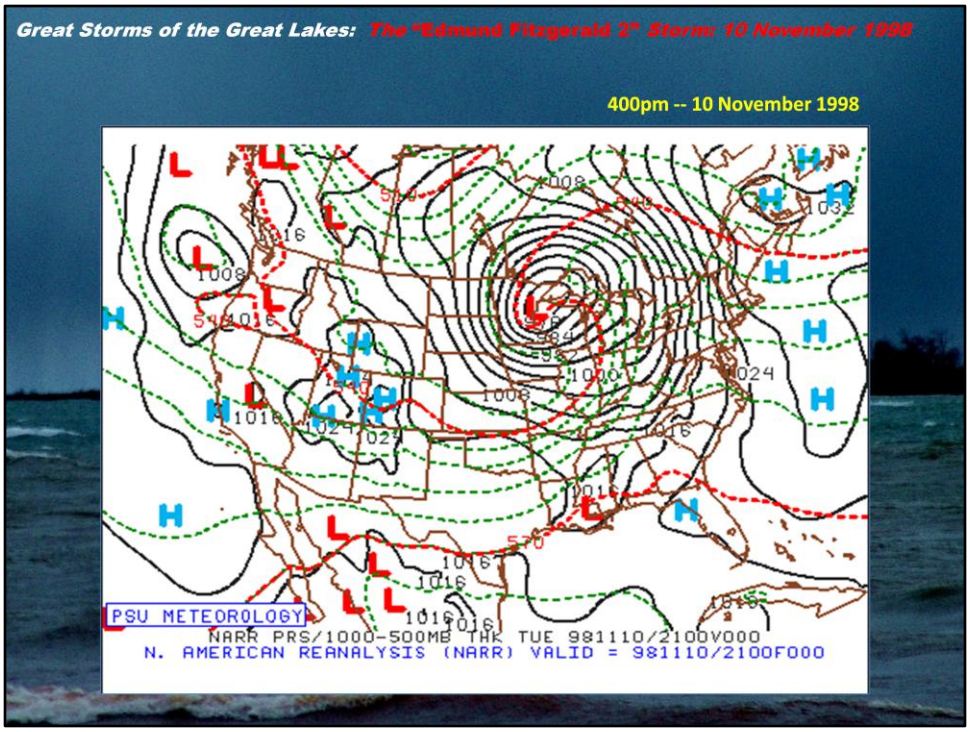
-- The next series of maps shows the corresponding wave height analysis for the wind analyses show before. We see significant wave heights building from around 12 feet at 100pm over southern Lake Superior…to nearly 20 feet by 400 pm. Again, the position of the *Fitzgerald* is denoted by the circled X.



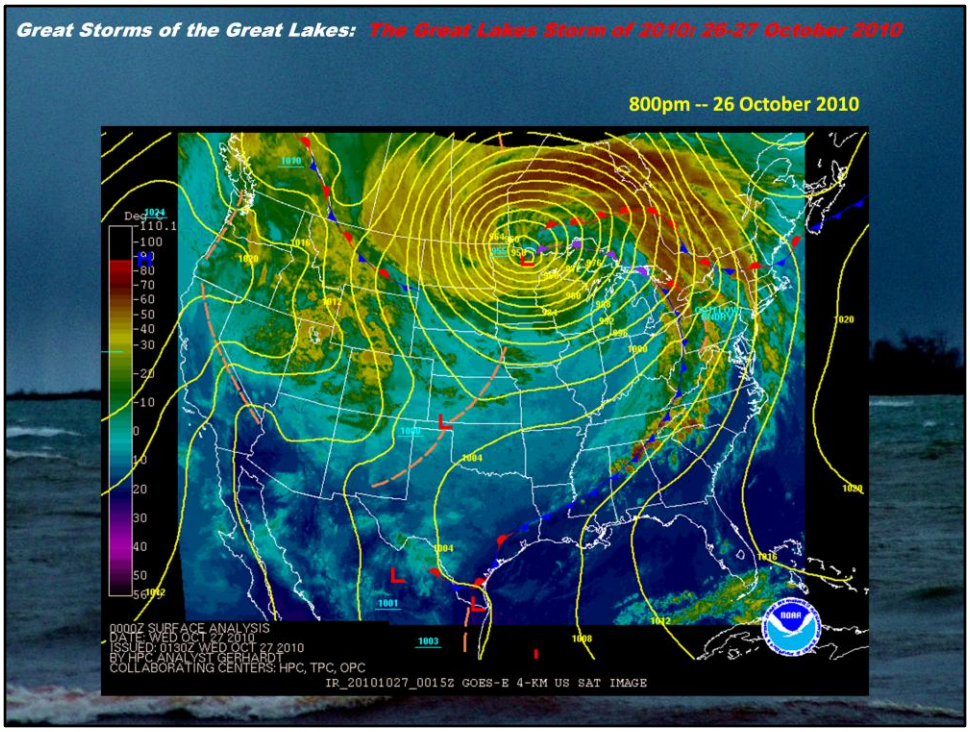
Around the time of the *Fitzgerald's* sinking, and at the same point…wave heights may have been at their highest than at any point during the storm. Significant wave heights of around 25 feet were likely occurring at the time of the ship's sinking…and based on this significant wave height it is theoretically possible that the maximum wave height may have approached 40 feet.

-- Also note the wave direction on the map…waves were coming almost directly at the starboard side of the southbound *Fitzgerald*…so it is quite possible that the ship may have been rolled by one or more large waves hitting it broadside…or swamped by large waves sweeping over its deck.

So despite the problems the *Fitzgerald* was already experiencing with regard to topside damage and a list/loss of buoyancy, it is quite possible that the loss of the boat may have just come down to being at the exact wrong place at the wrong time…being at a point on Lake Superior during this storm where the winds were strongest and waves at their highest…and moving directly broadside into the ship.



Remarkably enough, on the 23rd anniversary of the *Edmund Fitzgerald* sinking, a very similar storm system in strength and track impacted the Great Lakes region. This storm tracked a little farther west than the 1975 storm, but with the storm being well forecast ships sought safe harbor to ride out the storm, rather than being the next big boat to venture out into the lakes and not come back.



This map is from the most recent Great Lakes storm from the last week of October 2010 (8pm 26 October 2010)...showing the storm over northern Minnesota at its deepest point. This storm recorded the second lowest pressure for the lower 48 states for a non-tropical system (28.21 inches at Big Fork, Minnesota), and produced wind gusts of 50 to 75 mph inland (78 mph on the Mackinac Bridge and out on Whitefish Bay...72 mph at Naubinway...59 mph at Sault Ste. Marie) with wave heights on northern Lake Michigan approaching 25 feet.


Thank You