

## Maine Beaches Conference

### Plenary 1 Impacts of Hurricane Sandy: Lessons for Maine

#### Jay Tanski

Long Island gets a hurricane every 17 years. But Sandy had a few important different characteristics that made it historical for the New York-New Jersey area.

Sandy was a huge hurricane. It had tropical force winds of a 1,000 mile diameter (hurricane strength winds usually 50-100 miles), making it more like a nor'easter. Second, was the track that it took – it didn't just go north and east, it took a hard left turn. The winds piled up water. Storm surge (extra height not including tide) from FL to ME. NY at the end of a funnel, so received highest storm surge. Gradient in storm tides (surge + tide) from 5.5 feet in Hamptons to 12 feet in NYC.

95,000 structures affected in Long Island alone – 10% of housing stock in area – created four million cubic yards of structural debris that had to be trucked and barged to landfills. Towns had to pay for it.

Houses built to flood insurance standards in 1970s did better than ones built earlier. Now, people are elevating, jacking up houses. The Army Corps of Engineering is looking at raising 5,000 structures at a cost of \$400 million. Before, local restrictions on height prevented people from elevating. After Sandy, communities removed those restrictions. Costs to raise structures, add stairs, etc. can run anywhere from \$70,000 to \$120,000 to raise structures, which can cause problems with accessibility.

Waves carried sand from beach to streets, etc., piles that had to be removed before recovery could begin. Sand had to be tested for toxics and sifted to remove debris before they could put it back on the beach.

Cars were flooded. 250,000 total, 160,000 in NY. Tree debris had to be chipped. Environmental problems included 68 million gallons of untreated sewage and 2.2 billion gallons of partially treated wastewater. Sea Grant is funding research on nitrogen released and impact. Also hundreds of oil spills (e.g., from home heating oil tanks). One surprise was the fires – don't usually see this with hurricanes or post tropical storms. FEMA thought maybe because in older, densely packed neighborhoods, fires were able to spread. Also, Long Island did not get rain with the storm – all to the west.

FEMA was re-doing flood maps when Sandy hit, so can't rebuild until new maps come out, and some properties are so small the height required might render the lots unbuildable (too high/inaccessible).

Areas with dunes did better. But even areas that had nourishment, if they did not maintain it, they had just as much damage as without any nourishing. Now people understand the magnitude of impact of dunes and are developing new nourishment and dune projects.

The storm has changed the complexion of the area. Three breaches of barrier island. Two were filled almost immediately. One question now facing communities is to close or not to close? The flow improves water quality, closing a breach can be costly (\$20 million), sensitive political issues.

72 dead in US total; 48 people died in NY. We had good warnings, but people did not heed them. We have to do a better job of making people hear the warnings and take action. NY-NJ Sea Grant embarking on major study of how people receive warnings, etc.

### John Cannon

Weather forecasts aren't going to really get any better. Instead, the National Weather Service is working on improving communication and decision support tools. Confidence levels 3-5 days before Sandy were "pretty shaky." Sandy brought a couple feet of snow. We did have some wave issues along coast of Maine, and flooding in Hampton, NH, where winter plows called in to move seaweed and rocks from roads. Only one hurricane in last 100 years (Carol 1954) caused flooding in Maine. Hurricanes are so fast and compact, don't have time to build up waves in the Gulf of Maine.

A high pressure system northeast of Maine drove Sandy west. This, plus an abnormally strong storm and abnormally warm water over the gulf stream so long, meant that Sandy remained a "tropical" storm throughout. The Gulf of Maine hit 83 degrees in August last summer.

Sandy went from tropical storm to a noreaster very quickly, shifting rainfall left of the track (related to jet stream), which happens about 50% of time with hurricanes. When you go from tropical storm to noreaster, the wind field expands north and east and wind speeds increase, rainfall shifts left, leading to widespread storm surge and flooding. Sandy switched very quickly, was powerful. However, nor'easters more predictable than tropical storms. Hybrid storms – like blizzards, which can look like hurricanes – are hard to identify.

NWS briefs emergency management agencies several times a day. Storm warnings, etc. use standard NWS language. How does this compare to the personal plea of one NJ meteorologist? Which is more effective?

Sandy's track was questionable, meteorologists had a hard time figuring out how strong the storm was. NWS looks at different model scenarios, to try to show areas that have more impact than others. Certainty increases as storm gets closer. Normally, National Hurricane Center would stop issuing products (surge forecasts, warnings etc) when storm stops being a hurricane, letting local NWS offices take over, but NHC is not going to do that anymore.

### Steve Dickson & Pete Slovinsky

There's no way Maine Geological Survey on their own could collect the amount of data collected by beach profile monitoring volunteers. 2012 was the anniversary of the Portland tide gauge, and an opportunity to analyze 100 years of data. What are the ingredients for a "superstorm" in Maine?

The storm most of us remember or read about was the blizzard of '78, it's the record holder for coastal flooding, caused \$47 million in damage, came at high tide. Three-foot surge on top of high tide = 14 foot storm tide. A January 1921 storm had a higher surge of 6.5 feet, but came when tide was out. The surge cycled up and down (seiche) with the tide for several days. If surge arrived 5 hours earlier, storm tide would have been 17.7 feet. Tidal range would have been 22.8 feet. All of a sudden oceanfront property in Portland would see tides like Eastport – water draining from the harbors, charging up rivers and estuaries and marshes, and flooding coastal property. But things would need to line up perfectly for these scenarios to occur.

How would this translate on the ground? Simulated highest tide of the year plus six feet for communities in southern Maine (see slides). MGS staff have been working with municipalities on sea level rise scenarios, emergency planning, infrastructure vulnerability (with DOT), and risk communication (with NWS).