

Federal Motor Carrier Safety Administration

Weather and CMV Safety

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ART Forum





Report Overview

- ◆ Purpose: Analyze how existing weather condition affect CMV safety & operations, and investigate the potential impacts from climate change
- ◆ Data: Looked at all CMV crashes from 1975-2006 (FARS), focus on weather-related. Normalized data by VMT, plotted into GIS
- ◆ Analysis: Compared results with NCDC Climate Atlas, Storms Database, NTSB and other sources
- ◆ Investigation: Reviewed IPCC and CCSP scenarios for potential implications for CMVs from climate change



Examples of Weather Events on CMVs

- ◆ Rain
- ◆ Snow and Ice Thunderstorms, Tornadoes, Snow Squalls
- ◆ Fog / Impaired Visibility
- ◆ Temperature Extremes / Extreme Heat
- ◆ High Winds
- ◆ Wet Pavement
- ◆ Hurricanes
- ◆ Flooding
- ◆ Drought
- ◆ Slides (snow, mud, rock)



Examples of Weather Impacts on CMVs

- ◆ Loss of traction & control
- ◆ Stress/damage to vehicle components, infrastructure, cargo, tires
- ◆ Rapidly changing conditions with multiple risks of collisions and damage
- ◆ Reduced speed & visibility
- ◆ Vehicle instability, blow-overs
- ◆ Supply chain disruptions, road closures, rerouting, mode shifts



Mobility and Safety Impacts

◆ Mobility

- About 25% of non-recurrent delays on freeways are due to weather; Total system delay is about 1 billion hours per year
- Weather-related delay adds \$3.4 billion to freight costs annually

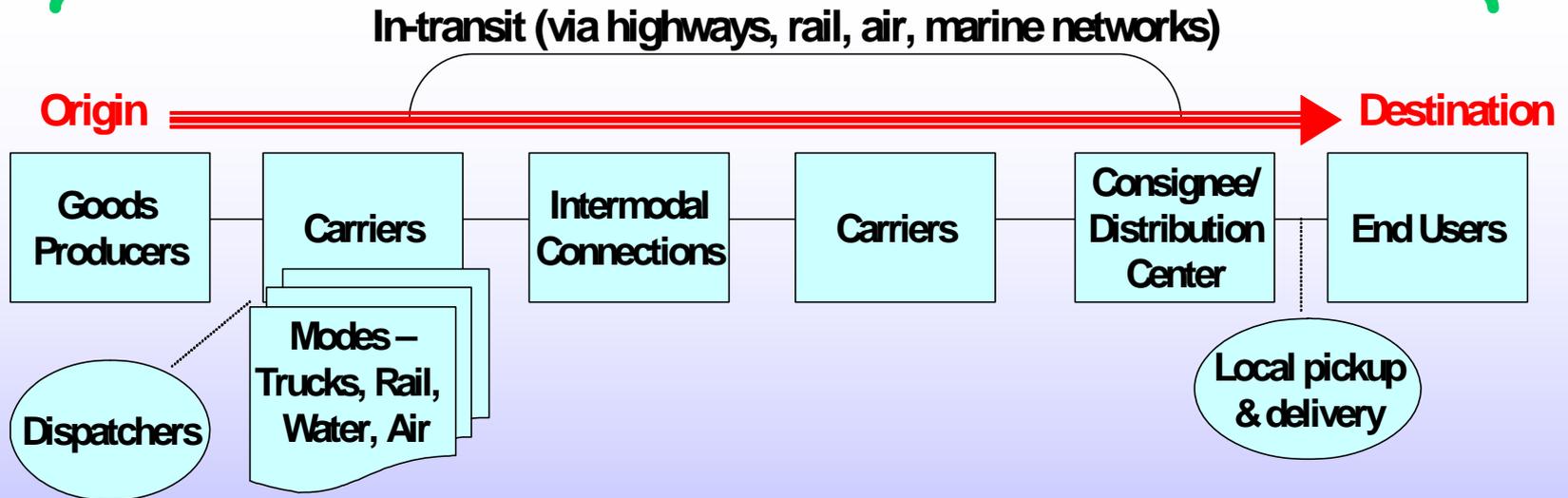
◆ Safety

- Approximately 16% of all fatal CMV crashes are associate with adverse weather
- Fatal crashes for rain, snow/sleet, and fog are higher for CMVs than for all vehicles

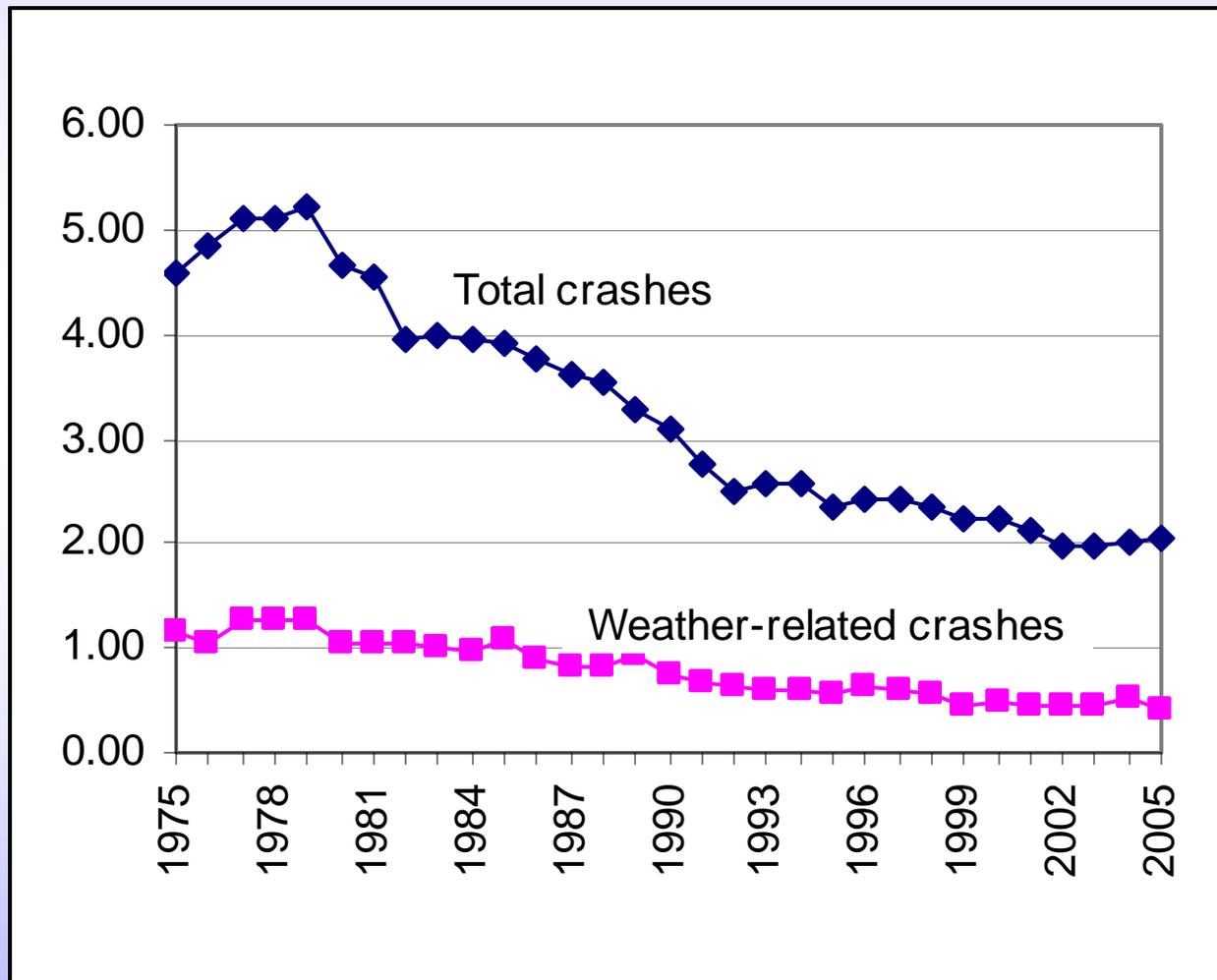


Typical Supply Chain

Exposure to adverse weather may occur at any point in the supply chain and cause safety problems, delays, and ripple effects throughout the chain

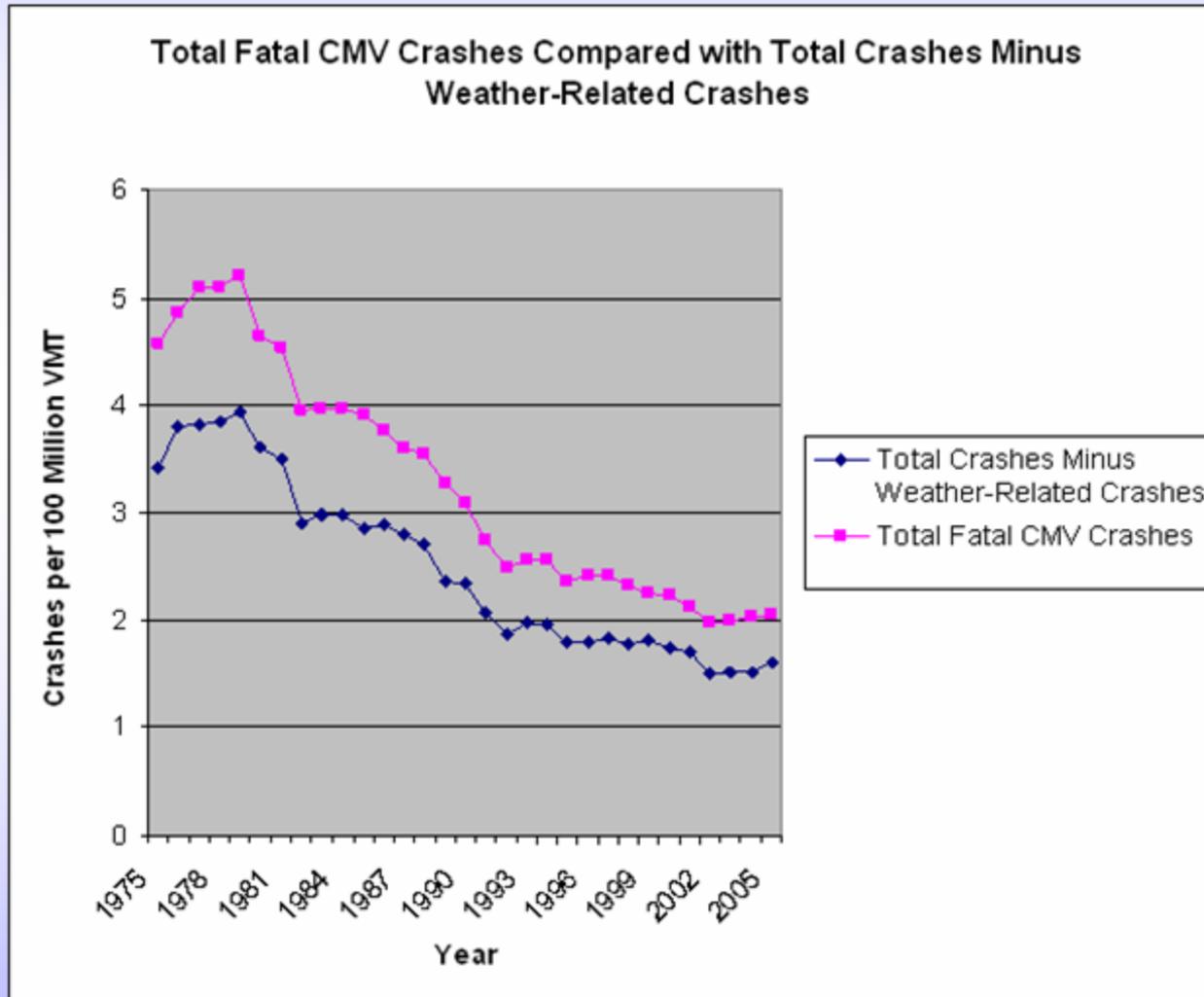


Fatal Large Truck Crashes vs. Fatal, Weather-related Large Truck Crashes



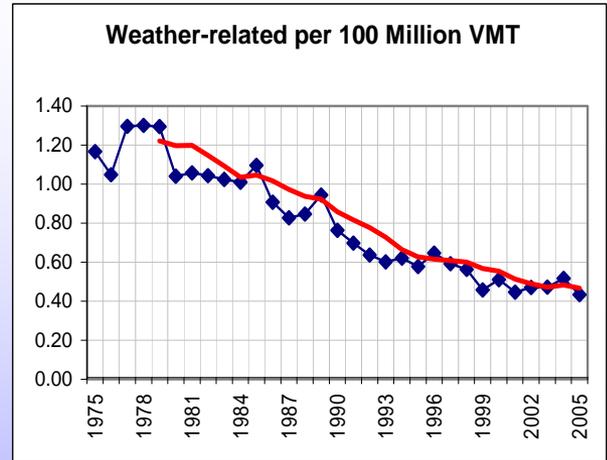
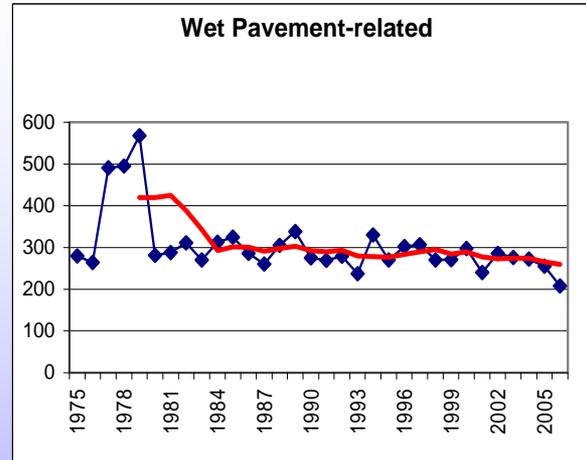
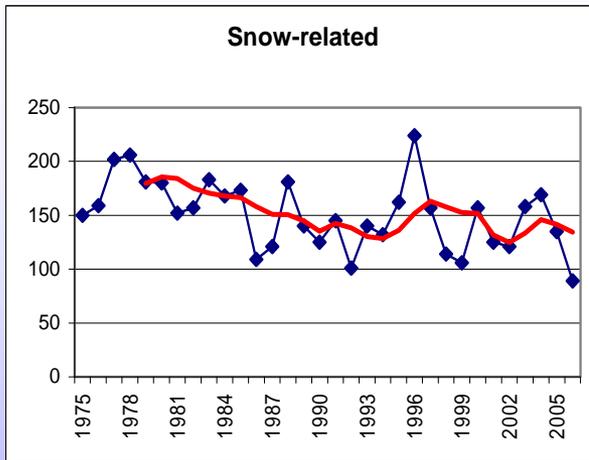
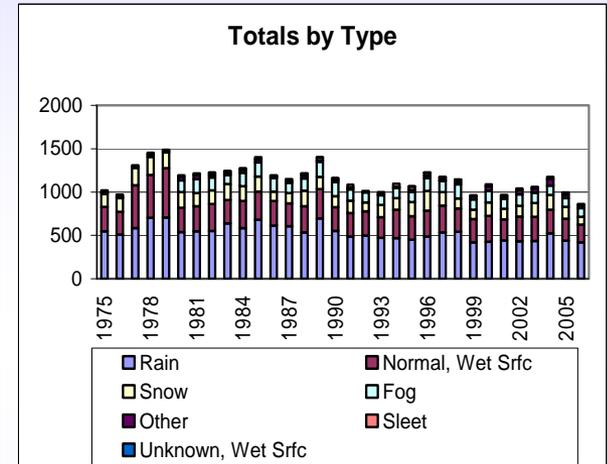
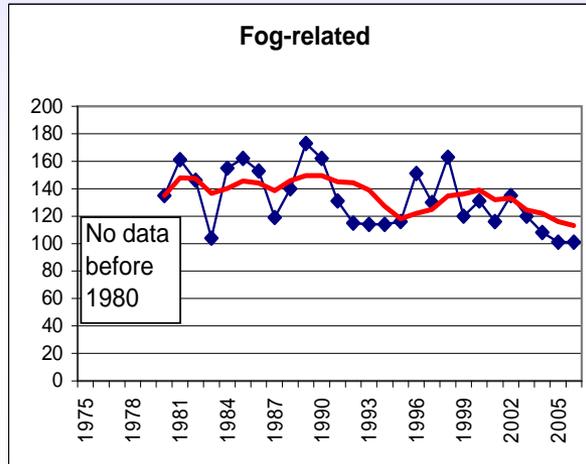
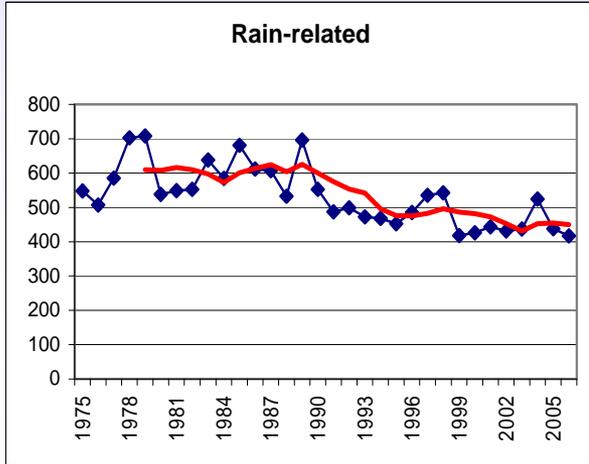
per 100 million VMT 1975–2005

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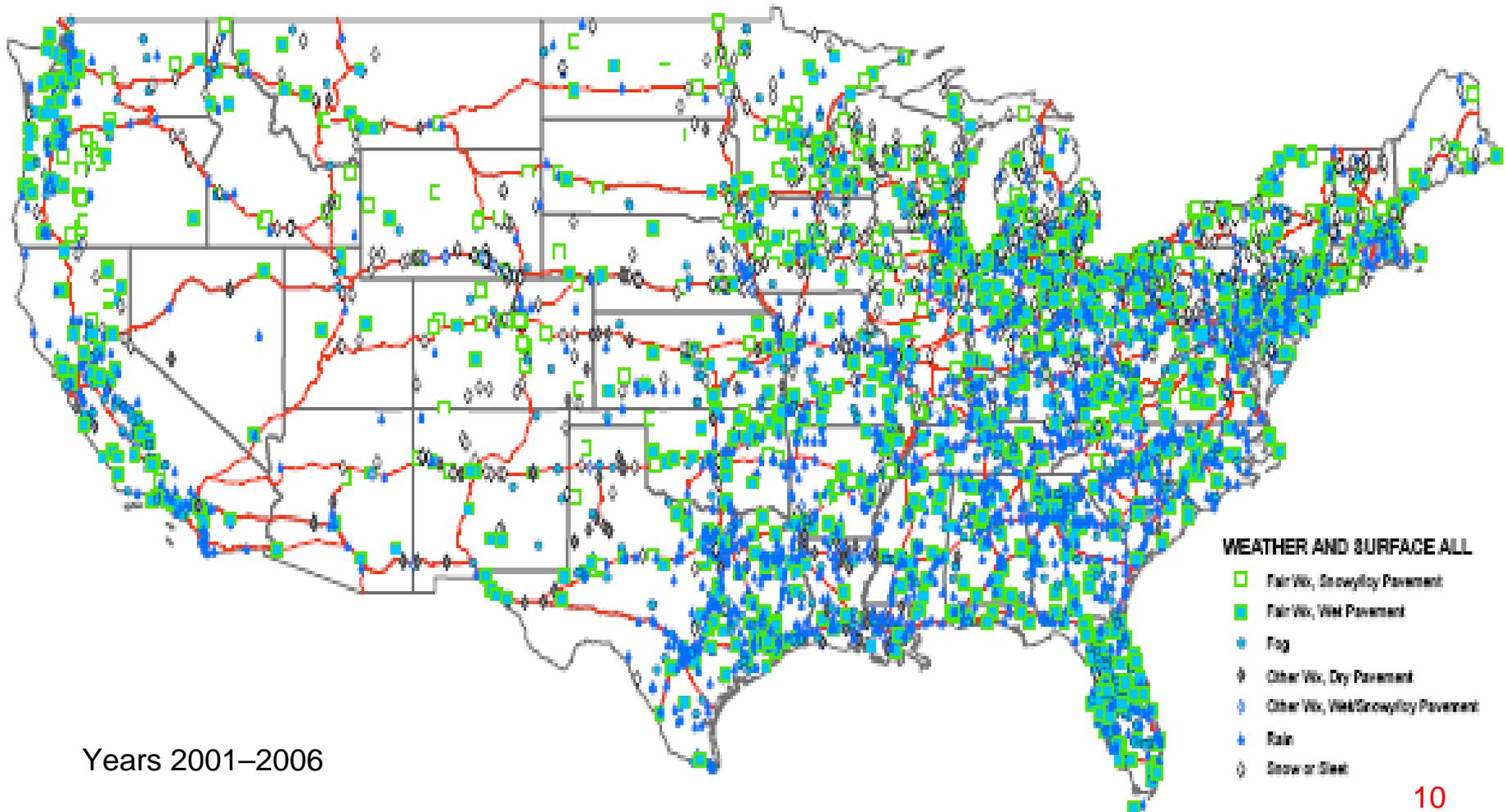


per 100 million VMT 1975–2005

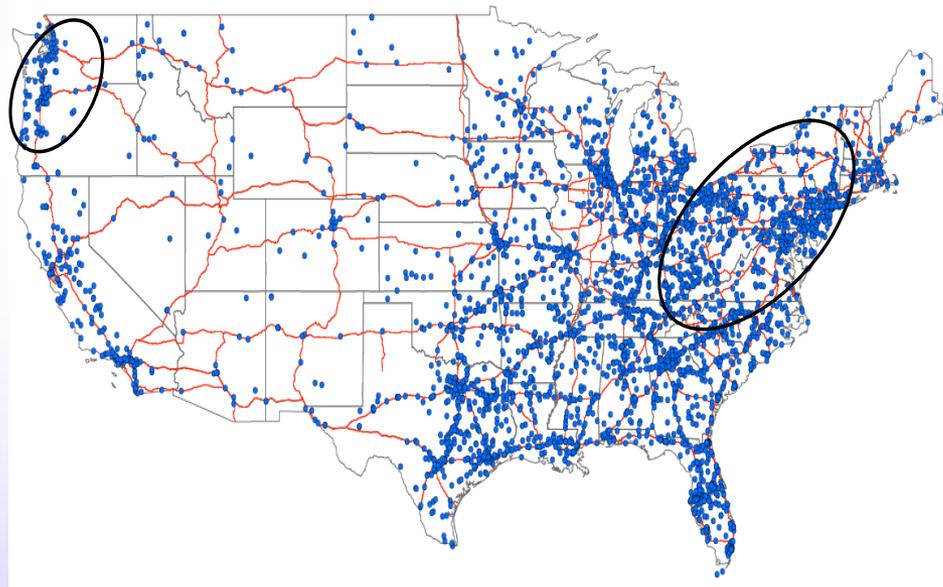
Fatal, Weather-related CMV Crashes by Type of Weather Event



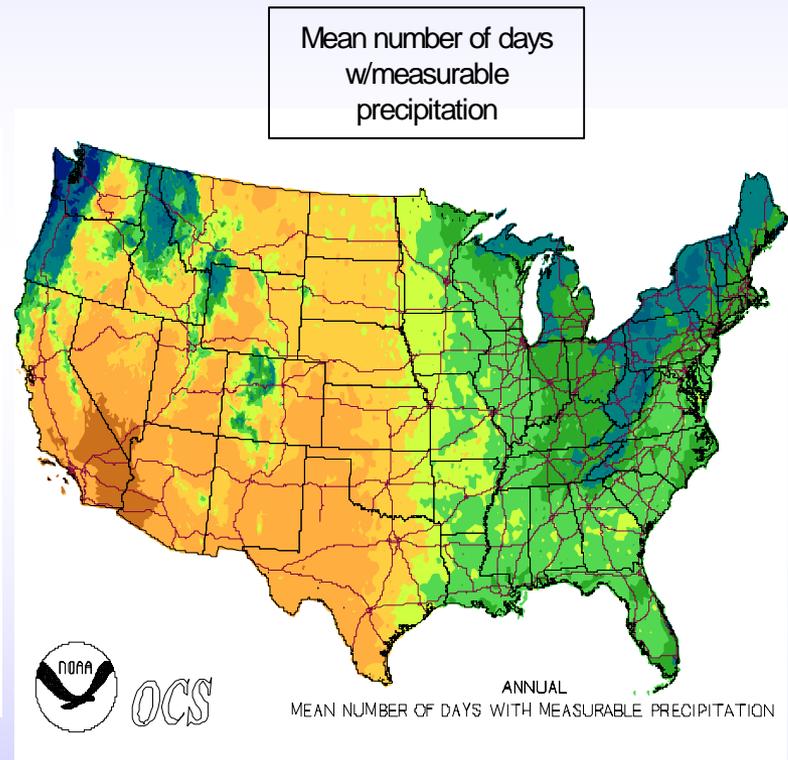
Fatal CMV Crashes in all Adverse Weather or Road Surface Conditions



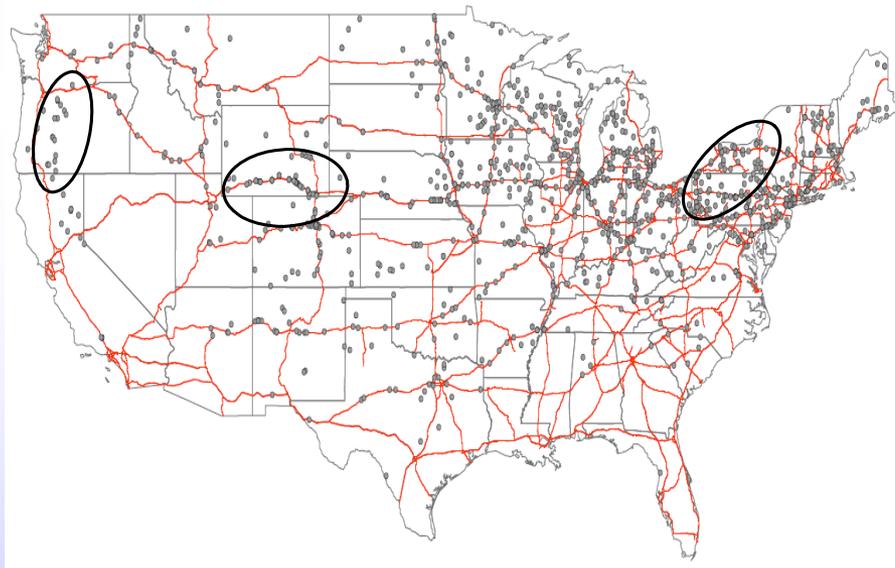
CMV Crashes in Rain and on Wet Pavement and U.S. Climate Atlas



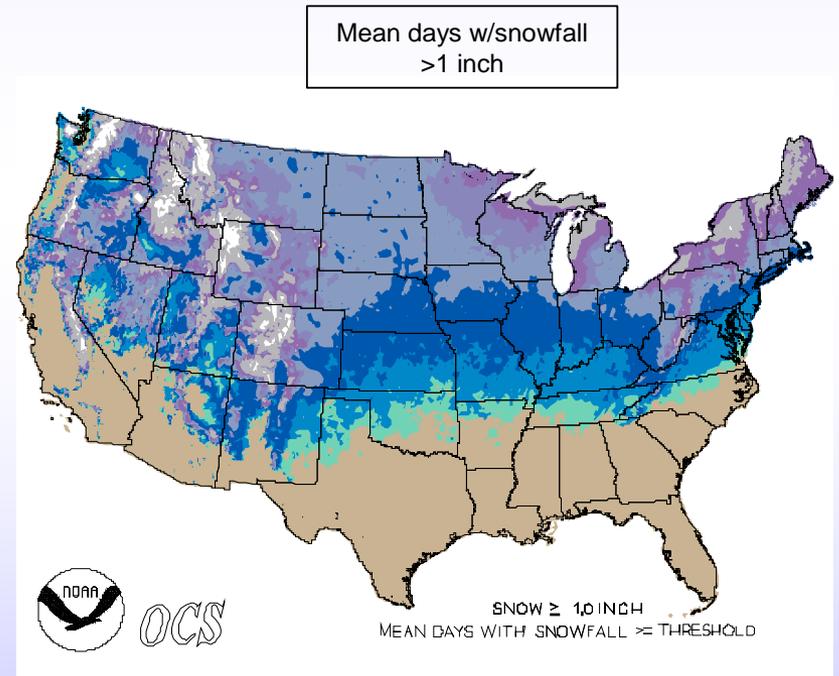
Years 2001–2006



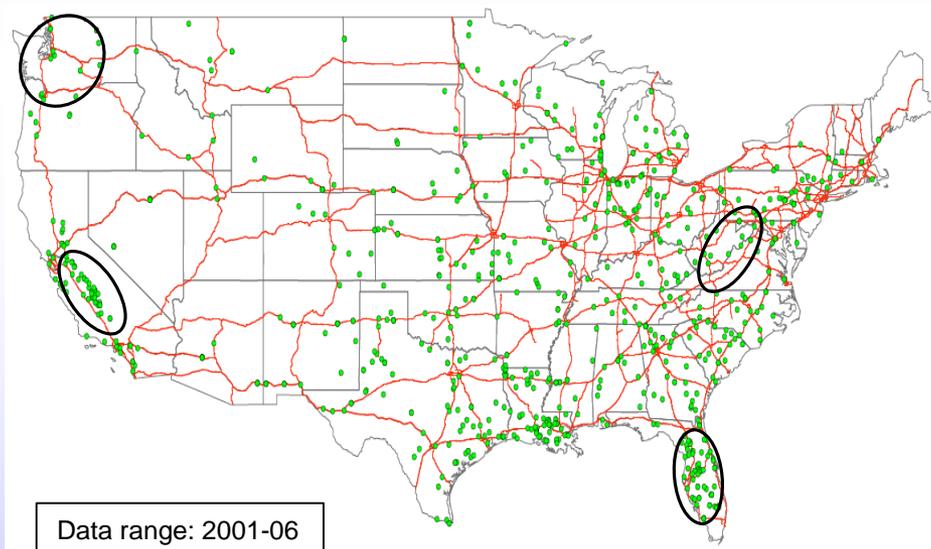
CMV Fatal Crashes in Snow, Sleet, or on Icy Pavement and U.S. Climate Atlas



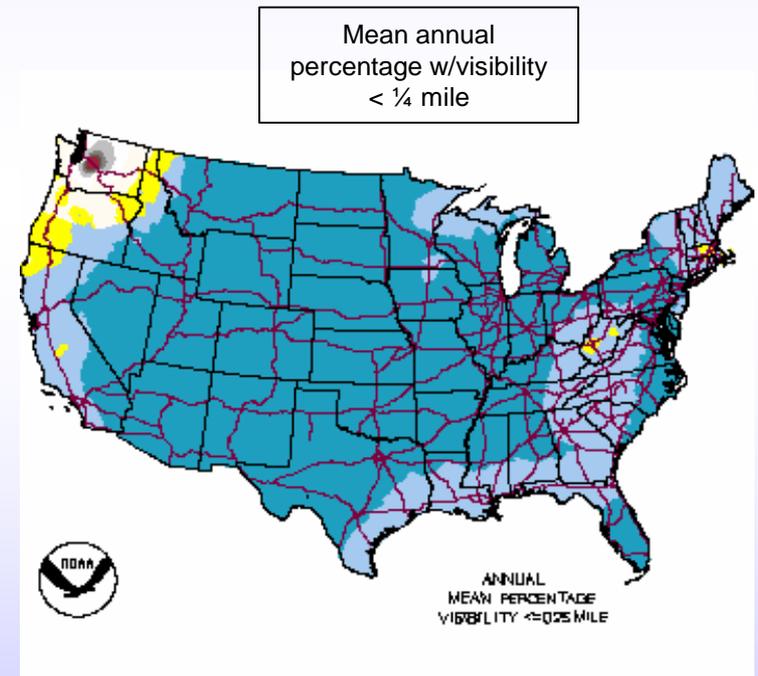
Years 2001–2006



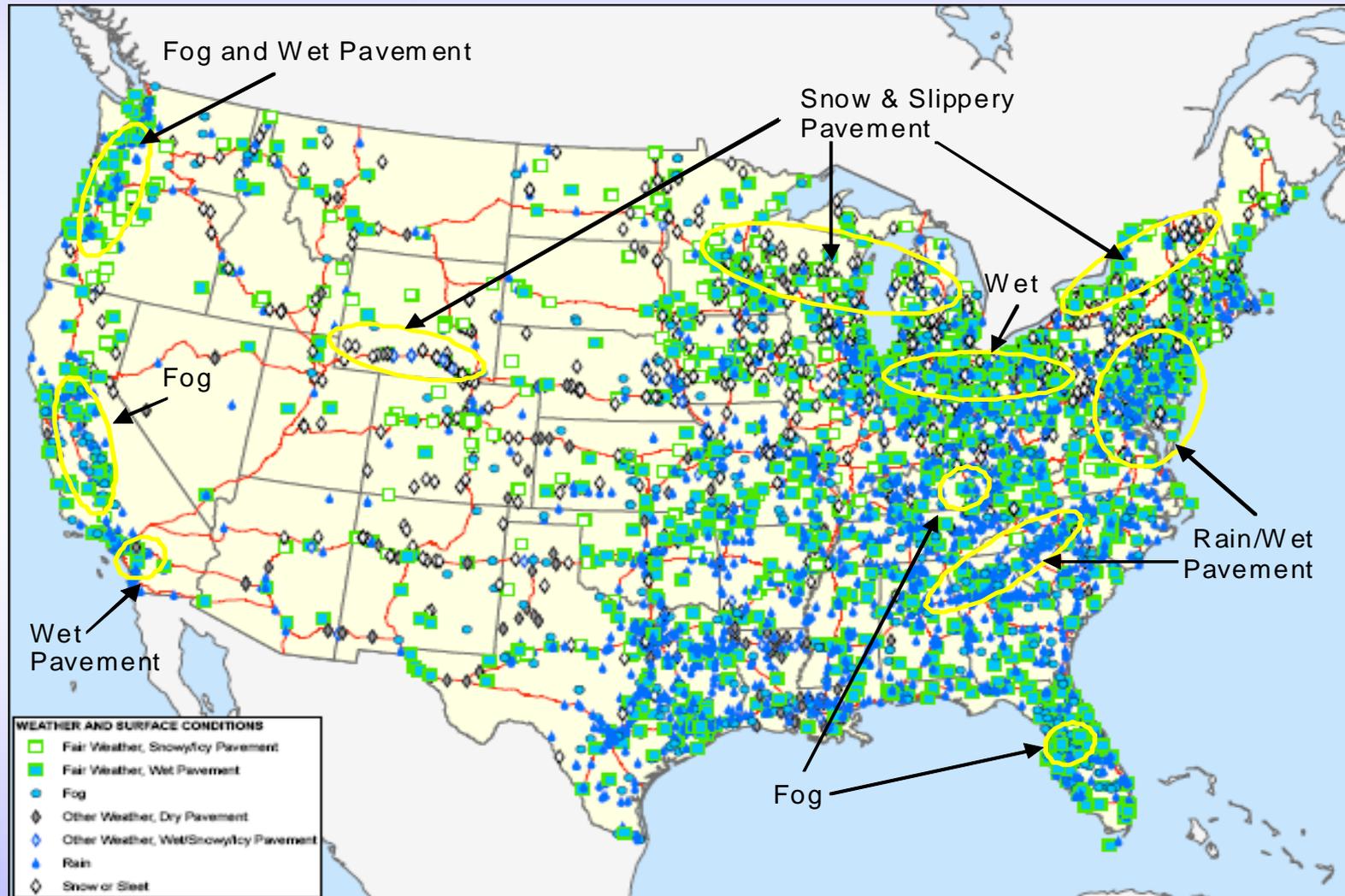
CMV Fatal Crashes in Fog and other Visibility Hazards and U.S Climate Atlas



Years 2001–2006



Locations of Fatal Crashes Involving Commercial Motor Vehicles by Weather Event



Years 2001–2006, Compared to NCDC Climatology Statistics

CMV Weather-related Crashes by Selected Interstate Highways



Years 2001–2006



Climate Change and Variability

- ◆ Science based on IPCC and USCCSP
- ◆ Most scientists agree climate change is largely a result of greenhouse gas emissions from human activities
- ◆ Global CO₂ emissions increasing
- ◆ Global temperature increasing, with extreme temperature events (heat) occurring more frequently
- ◆ Heavy precipitation events increasing in frequency over most land areas
- ◆ Sea-level rise increasing



North America Impacts

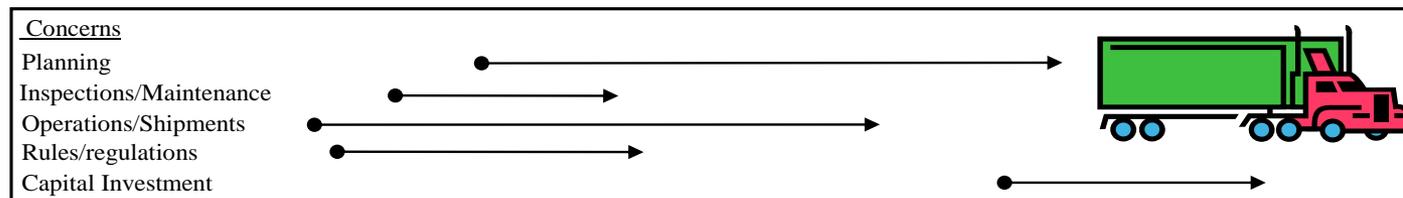
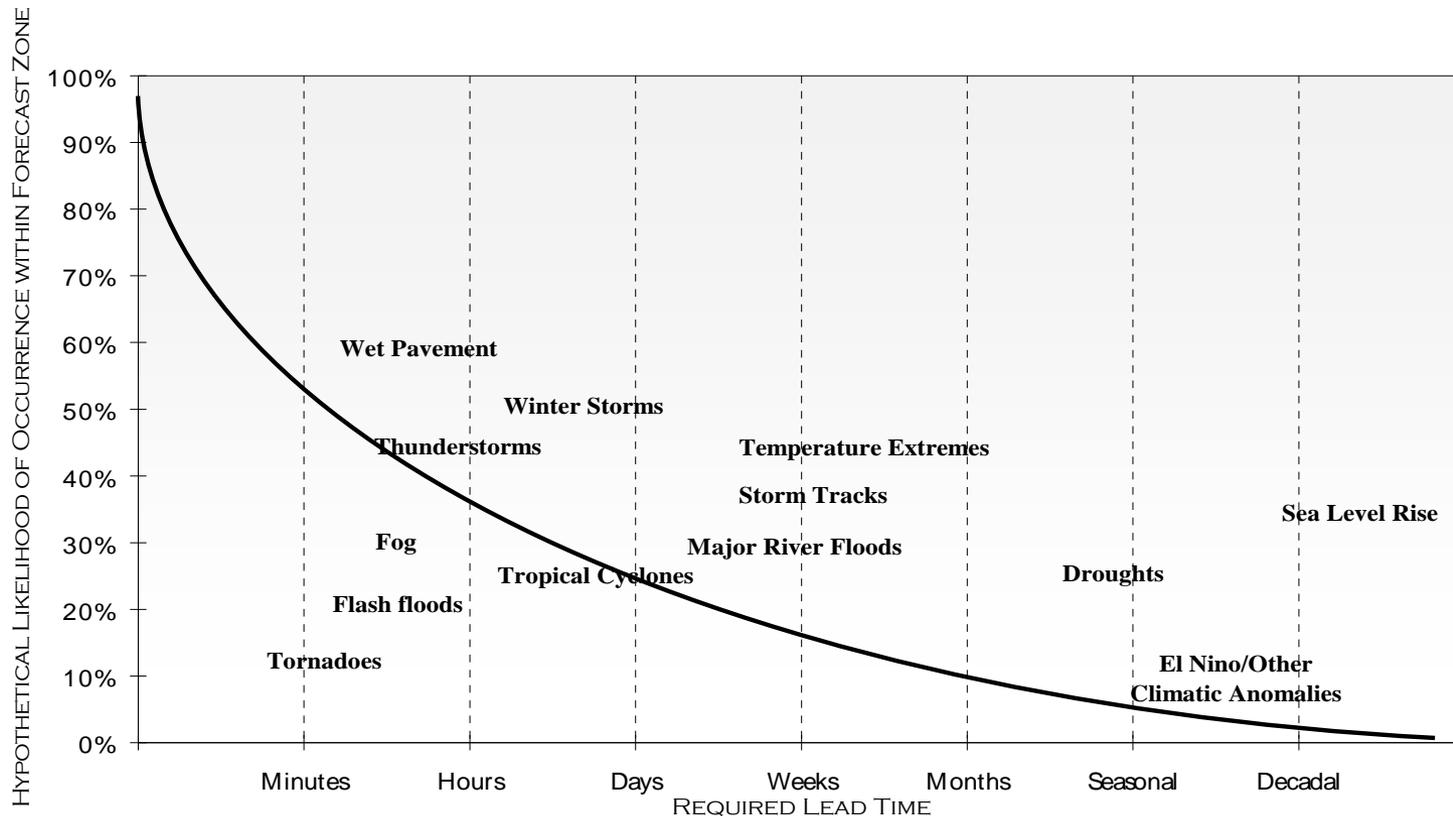
- ◆ Warming in western mountains projected to decrease snowpack, more winter flooding, reduced summer flow
- ◆ Initially, (next couple of decades) increase in rain-fed agriculture (though variable by location) then a drop off of productivity
- ◆ Increase in heat waves, duration and intensity
- ◆ Gulf Coast Study: Area at risk from subsidence and sea-level rise, hurricane intensity
- ◆ Storm types and typical locations could change:
 - Less snow, more ice
 - More severe events, heavier precipitation in short periods
 - More tornados, droughts, heavy winds



Implications for CMVs

- ◆ Safety affected by severe and abrupt weather events that could increase crash risk
- ◆ Shipping patterns and methods from flooding and drought, changes in agriculture
- ◆ Policies and programs in response to adaptation and CO₂ mitigation
- ◆ Decrease in snow could prevent crashes, but increases in ice could offset those
- ◆ Could produce economic gains and losses
- ◆ Damage/changes to transportation infrastructure

Planning for Climate Change Impacts and CMV Safety





Conclusions

- ◆ Weather influences safety and mobility in CMV operations
- ◆ Fatal weather-related crash data shows a declining trend from 1975 to present with a recent leveling off
- ◆ Potential for climate change to impact CMV safety and operations exists
- ◆ Further research areas include:
 - More robust GIS mapping of crashes and weather events
 - Mapping corridor analysis
 - Developing appropriate responses to address weather related crashes
- ◆ Investigate further climate change impacts on CMV safety and operations



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