Federal Motor Carrier Safety Administration
Office of Analysis, Research and Technology

Weather and CMV Safety

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Report Overview

- Purpose: Analyze how existing weather condition affect Commercial Motor Vehicle (CMV) safety & operations, and investigate the potential impacts from climate change
- Data: Looked at all CMV crashes from 1975–2006 Fatality Analysis Reporting System (FARS), focus on weather-related. Normalized data by VMT, plotted into a Geographic Information System (GIS)

Report Overview

- Analysis: Compared results with National Climatic Data Center (NCDC) Climate Atlas, Storms Database, National Transportation Safety Board (NTSB) and other sources
- Investigation: Reviewed Intergovernmental Panel on Climate Change (IPCC) and United States Climate Change Science Program (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

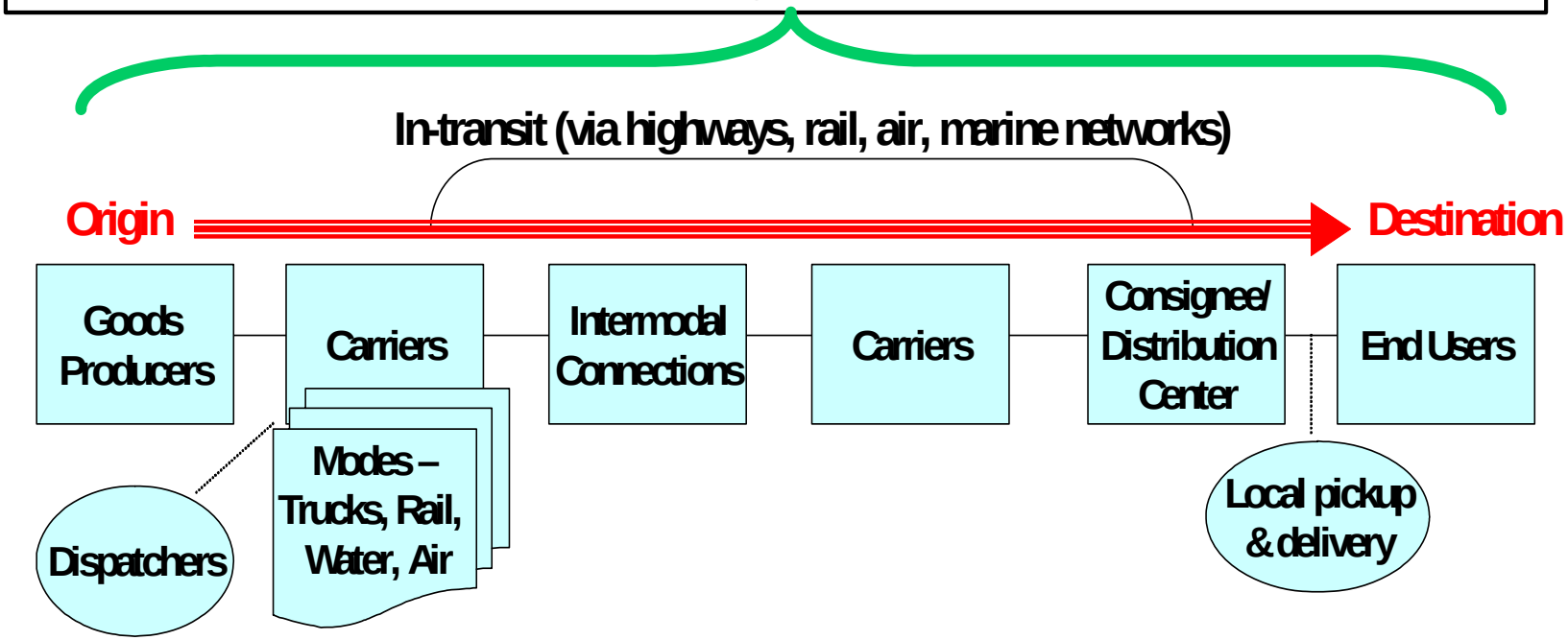
- Loss of traction and control
- Stress/damage to vehicle components, infrastructure, cargo, tires
- Rapidly changing conditions with multiple risks of collisions and damage
- Reduced speed and visibility
- Vehicle instability, blow-overs
- Supply chain disruptions, road closures, rerouting, mode shifts

Mobility and Safety Impacts

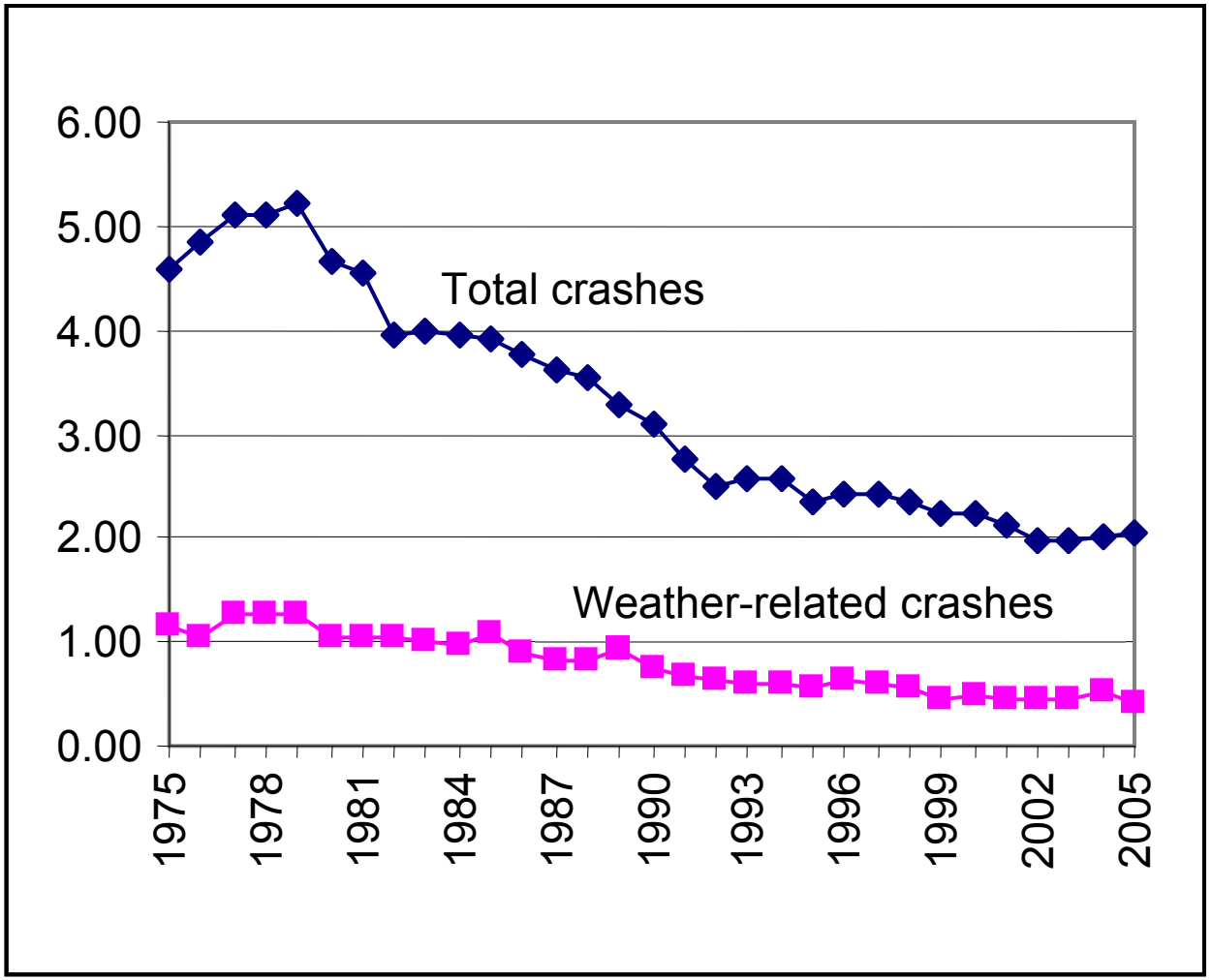
- Mobility
  - About 25% of non-recurrent delays on freeways are due to weather; Total system delay is about 1 billion hours per year
  - Weather-related delay adds $3.4 billion to freight costs annually
- Safety
  - Approximately 16% of all fatal CMV crashes are associated with adverse weather
  - Fatal 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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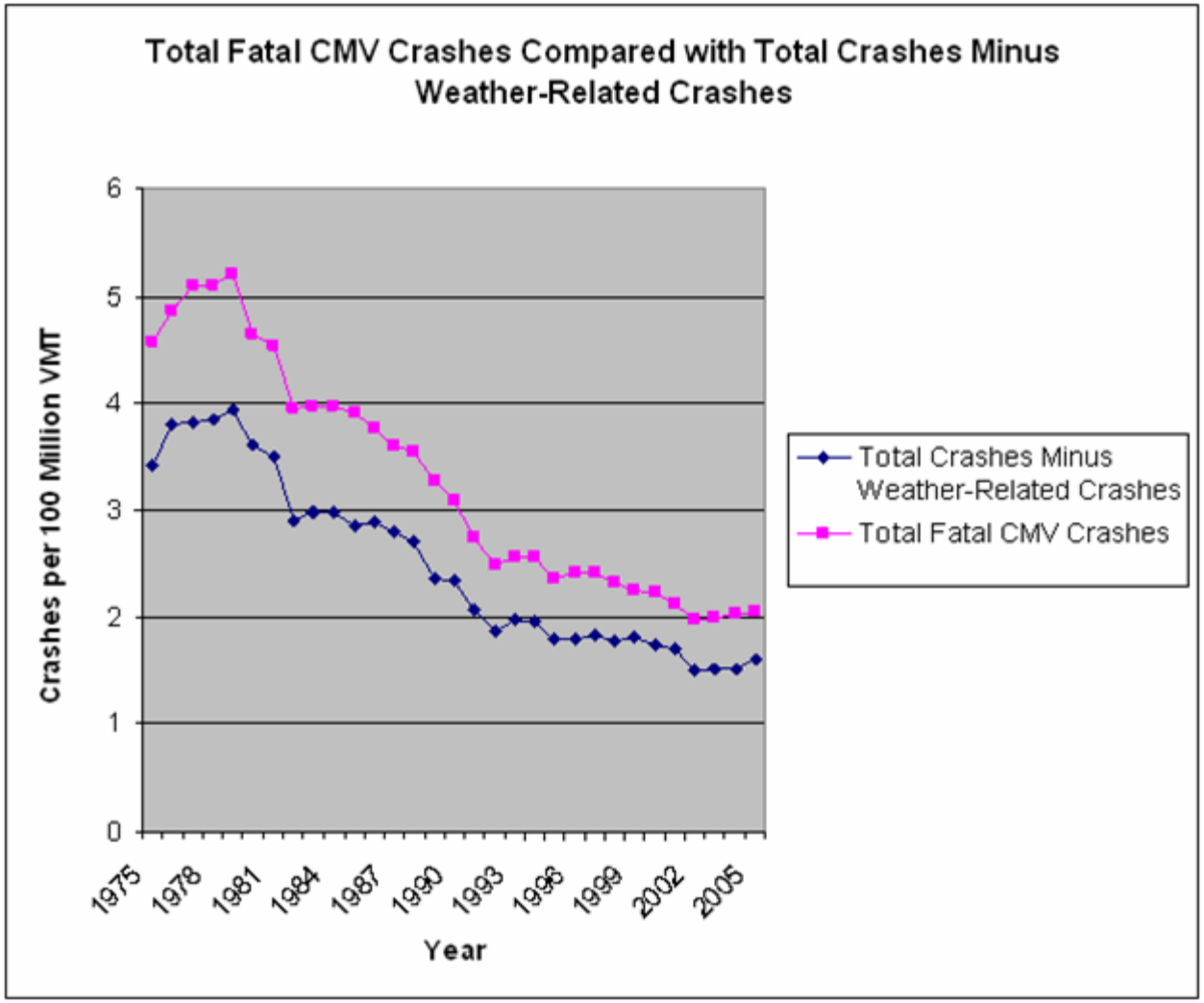

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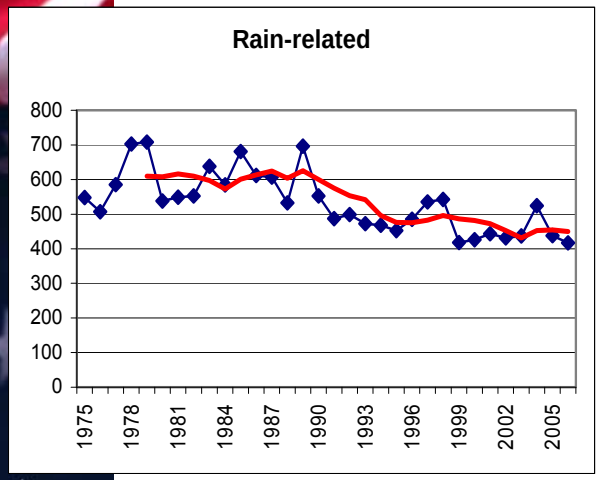
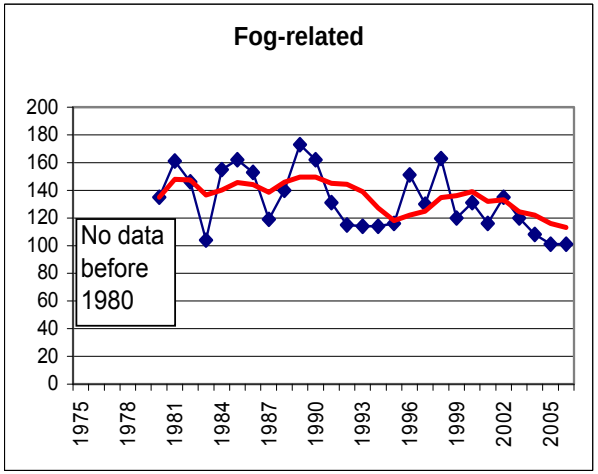
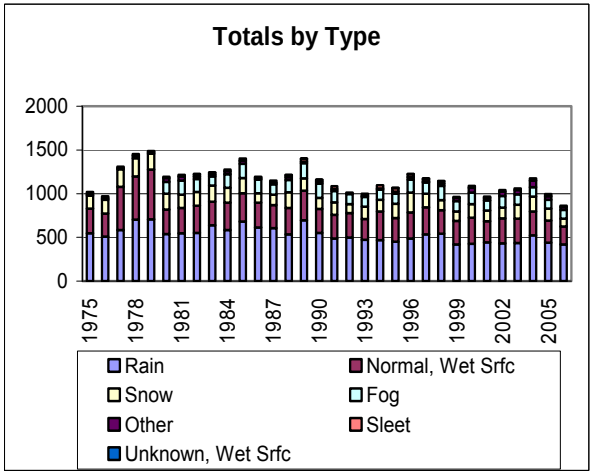
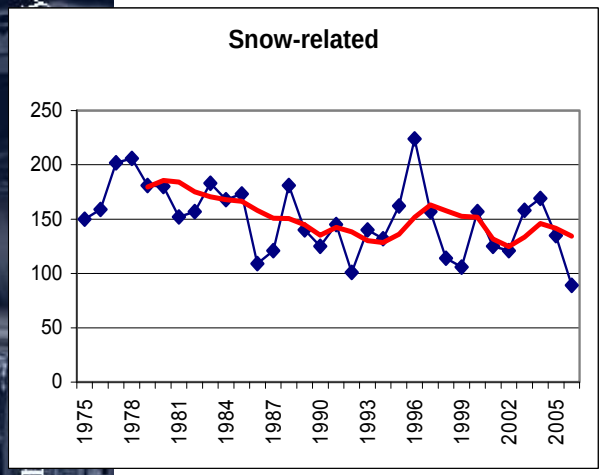
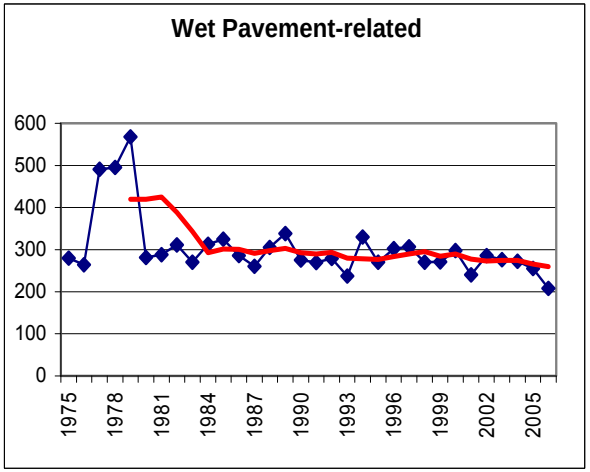
Fatal, Weather-related CMV Crashes by Type of Weather Event

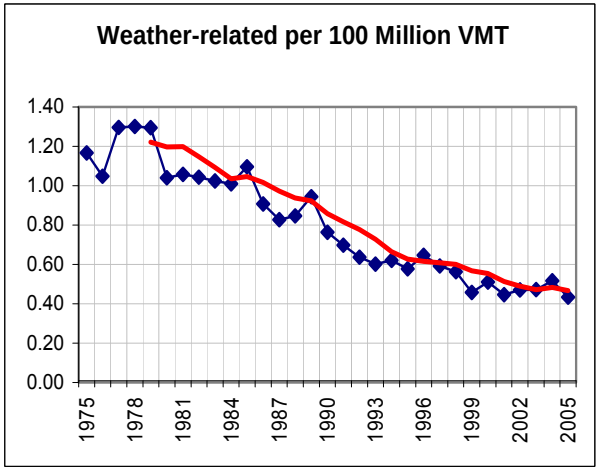






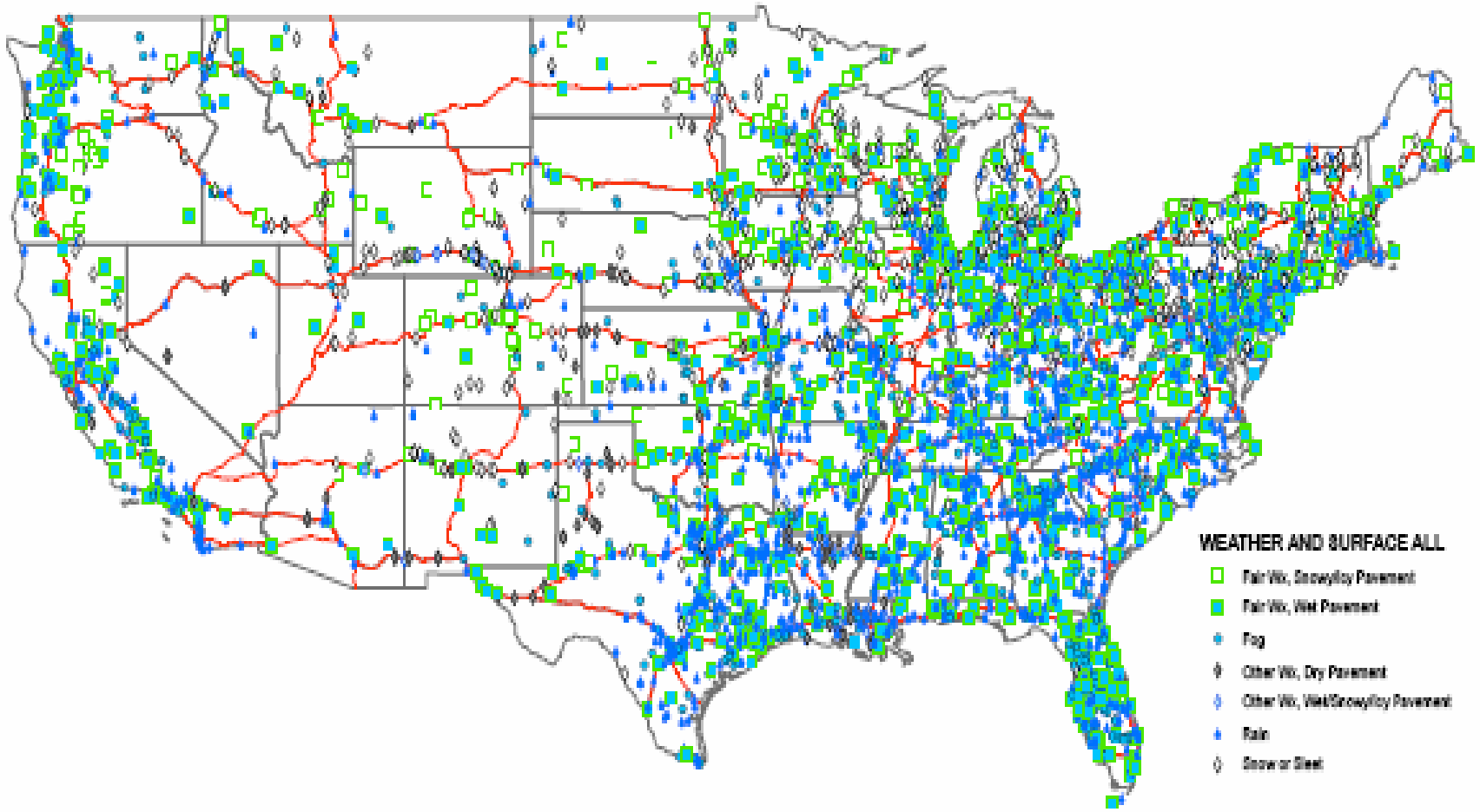






1975–2006 FARS data/NHTSA

Fatal CMV Crashes in all Adverse Weather or Road Surface Conditions



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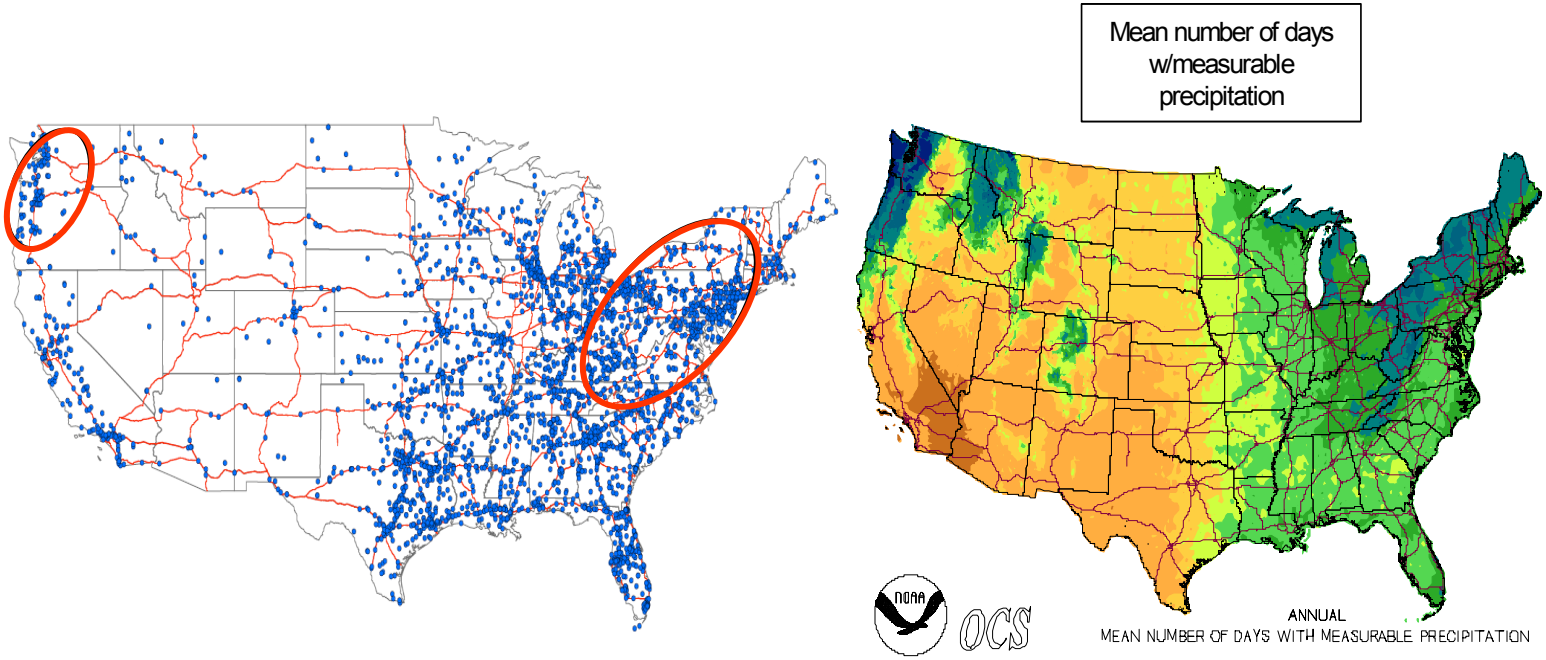
CMV Crashes in Rain and on Wet Pavement and U.S Climate Atlas



Years 2001–2006

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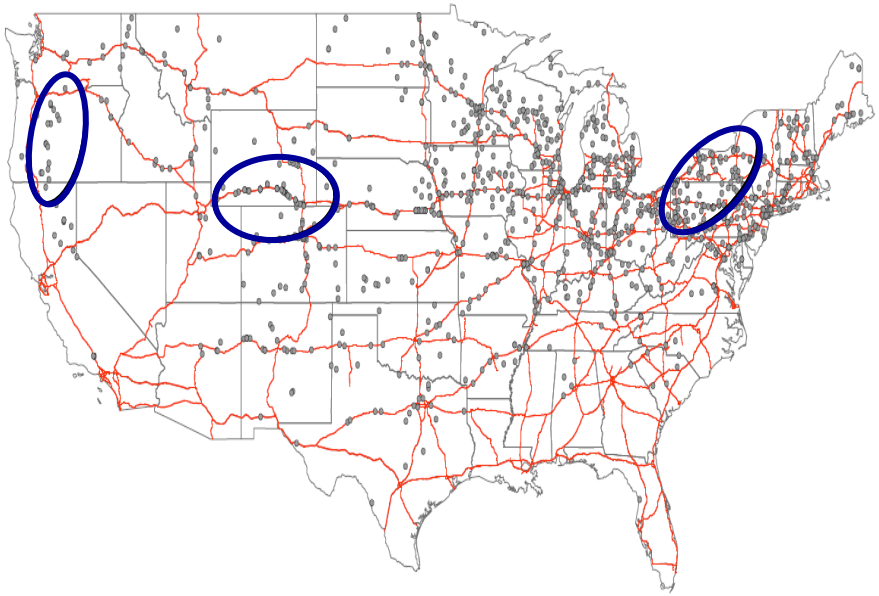
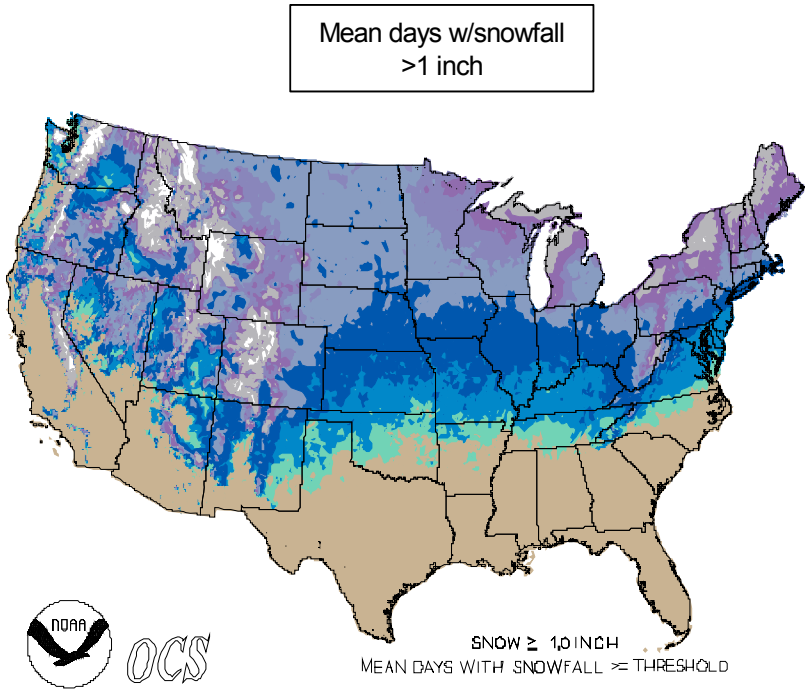
CMV Fatal Crashes in Snow, Sleet, or on Icy Pavement and U.S Climate Atlas





Years 2001–2006

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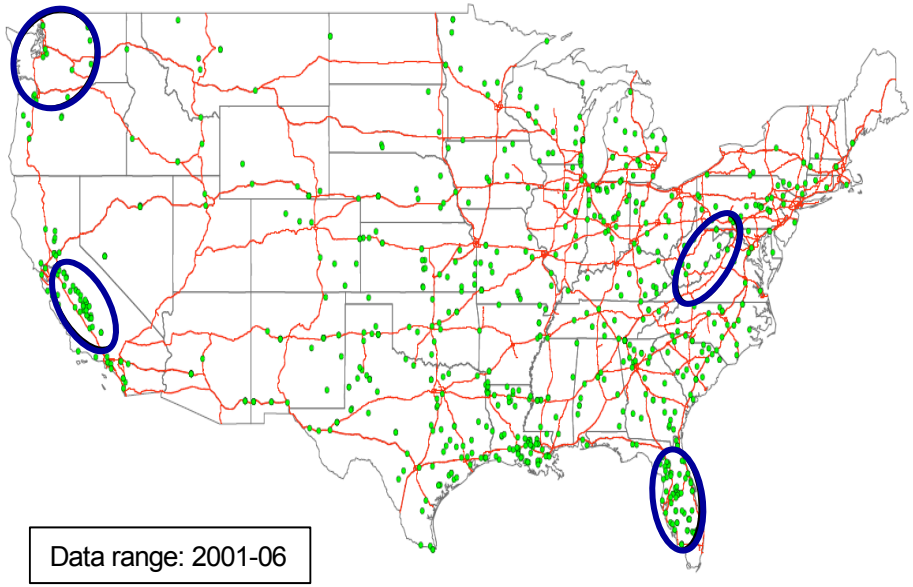
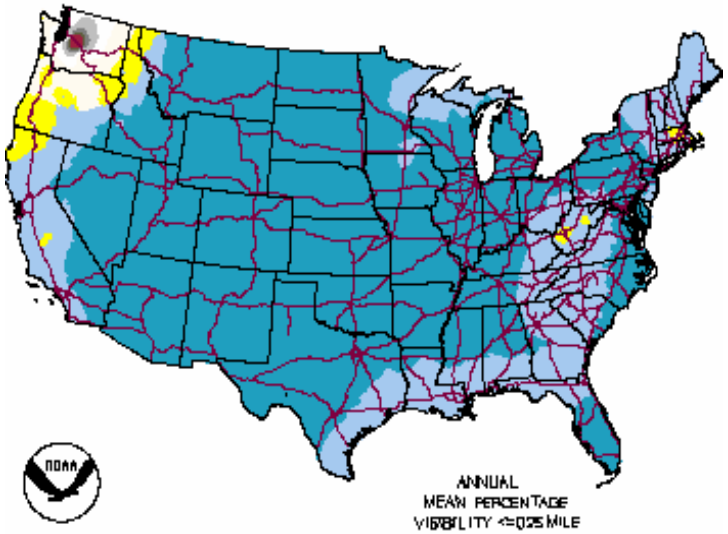
CMV Fatal Crashes in Fog and other Visibility Hazards and U.S Climate Atlas



Data range: 2001-06

Mean annual percentage w/visibility < ¼ mile



Years 2001–2006

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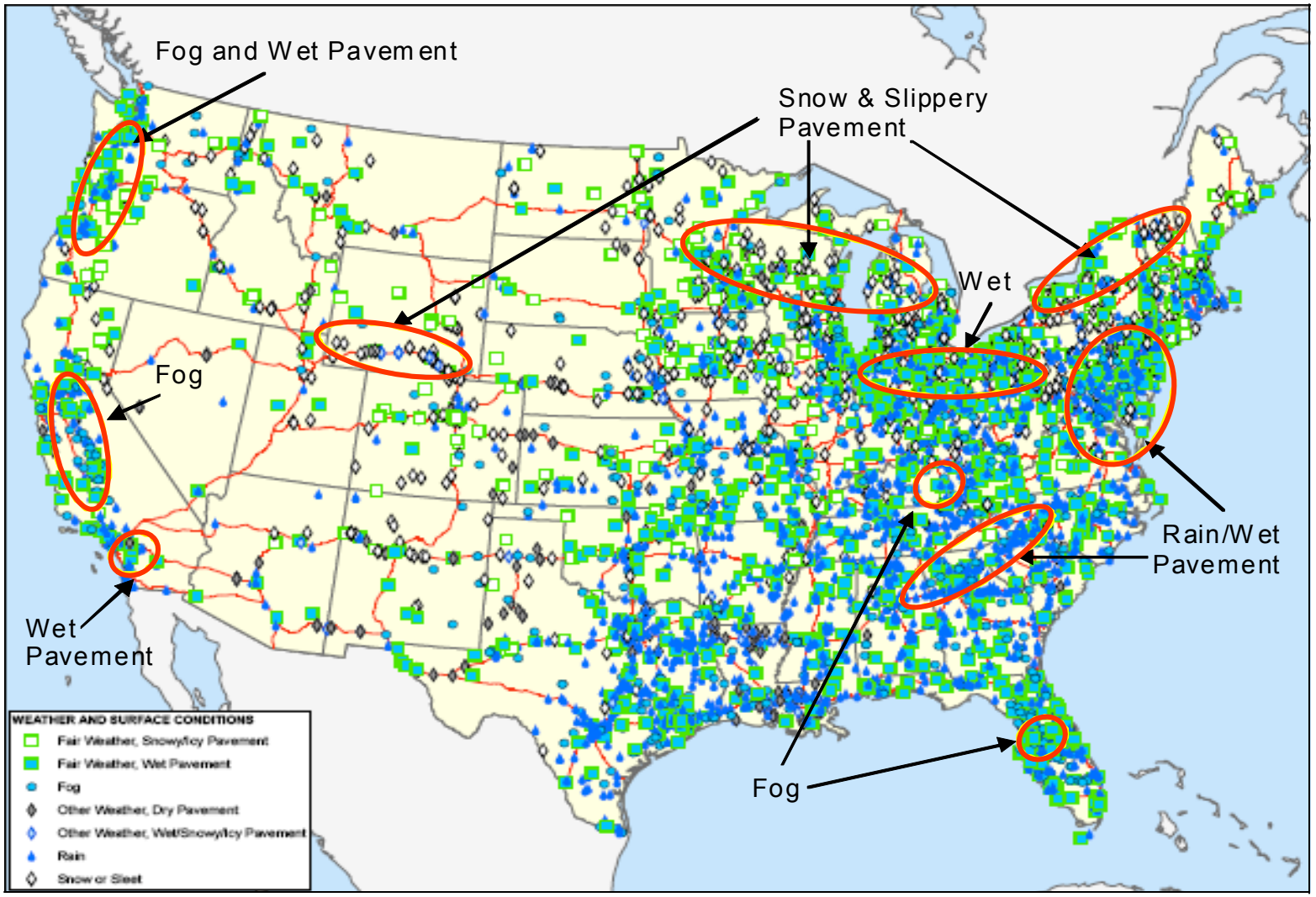
Locations of Fatal Crashes Involving Commercial Motor Vehicles by Weather Event



Years 2001–2006, Compared to NCDC Climatology Statistics

CMV Weather-related Crashes by Selected Interstate Highways

Years 2001–2006

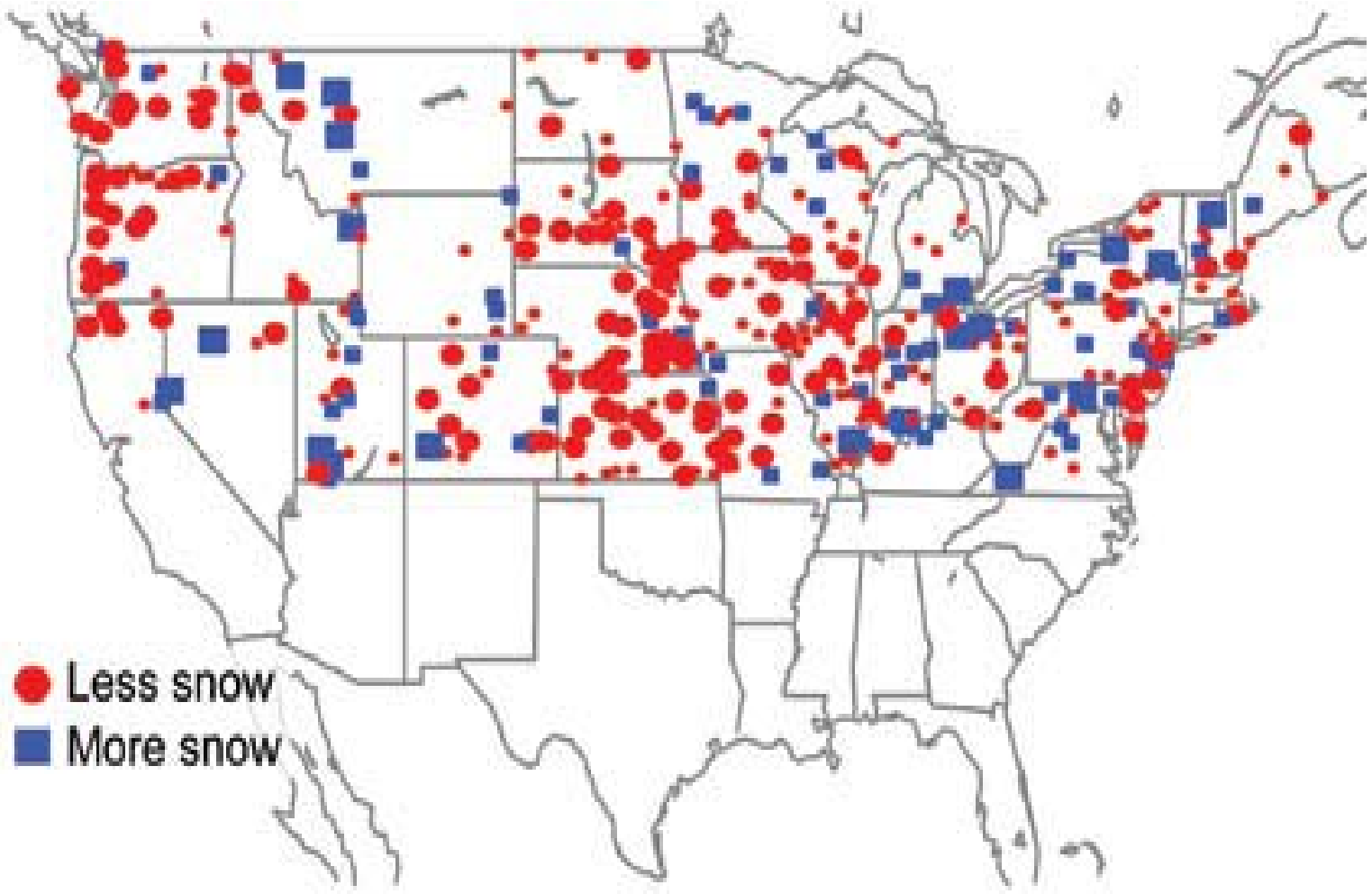
Climate Change and Variability

- Science based on IPCC and U.S. CCSP
- Most scientists agree climate change is largely a result of greenhouse gas emissions from human activities
- Global CO_2 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

Impacts to North America

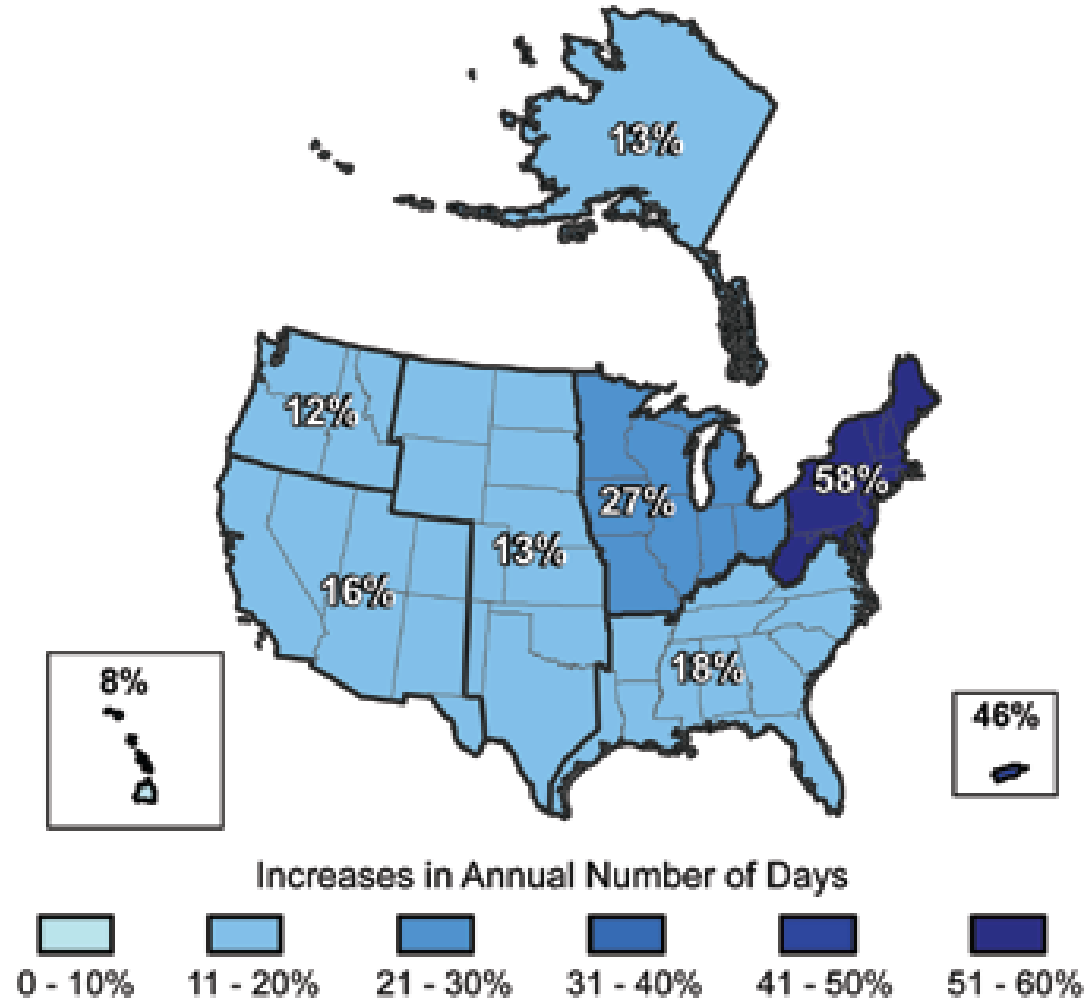
- Warming in western mountains projected to decrease snowpack, more winter flooding, reduced summer flow
- Increase in heat waves, duration and intensity
- Gulf Coast Study: Area at risk from subsidence and sea-level rise, hurricane intensity
- Cold-season storm tracks are shifting northward and the strongest storms are likely to become stronger and more frequent.

Changes in Snowfall Contributions to Wintertime Precipitation 1949 to 2005



Source: U.S. Global Change Research Program **Global Climate Change Impacts in the United States**

Increases in the Number of Days with Very Heavy Precipitation (1958 to 2007)



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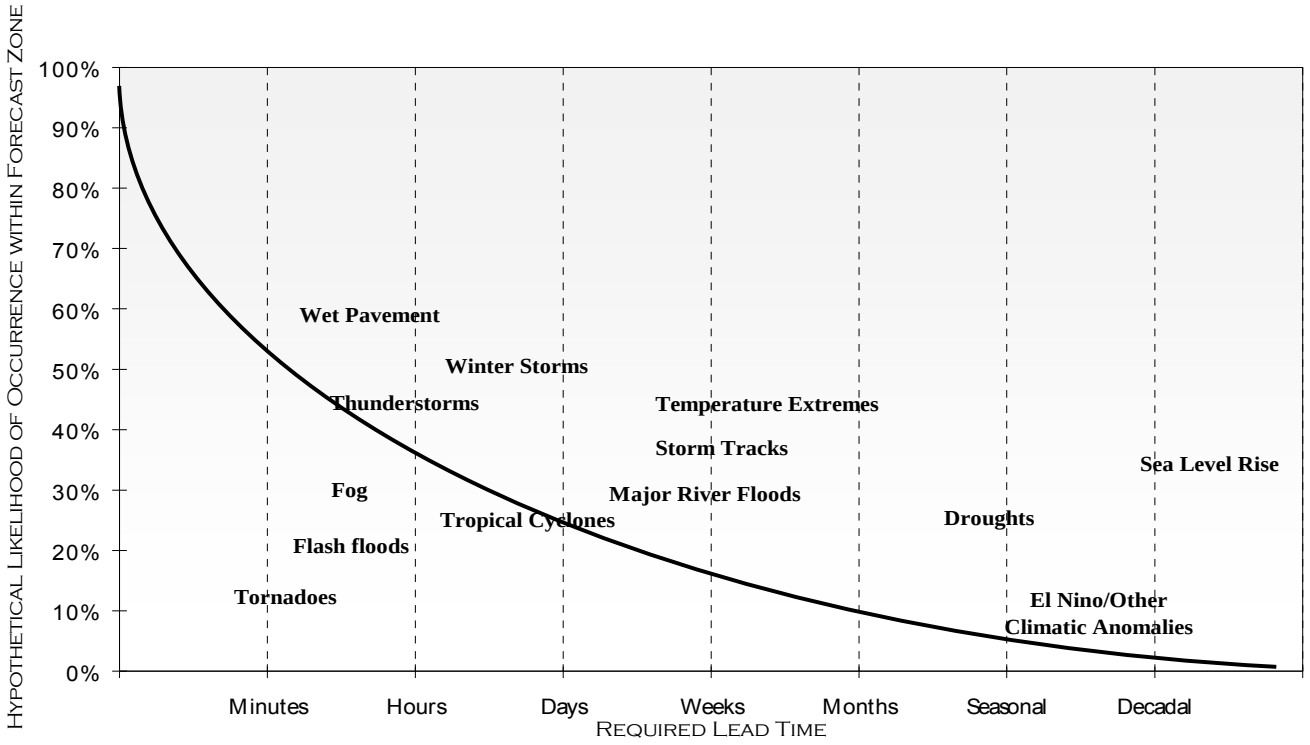
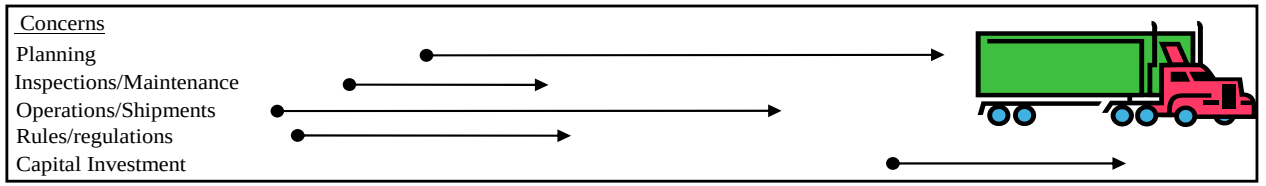
Implications for CMVs

- 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 CO_2 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





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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

Contact Information

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