

# **WHEN SEVERE STORMS OCCUR MORE OFTEN, HOW DO WE ENSURE RESILIENCE OF THE ROAD NETWORK?**

# Outline

- Impactful storms – more frequent, or more noticed?
- Recovery after storms – resilience in the spotlight
- Pro-active road closures as a tool for resilience
- Some safety issues with road closures
- Going forward – the need for objective measures in resilience

# Storms of Note

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- Northern US, Dec. 21-26, 2022 – impacted more than 200 million, severe blizzard conditions, 30 – 130 cm of snow in impacted areas, extreme cold (-20 C air temperatures)
- Fairbanks AK, Dec. 21-24, 2021 – extreme cold prior to storm (-40 C), then wet heavy snow, then ice storm (5 cm), then more heavy snow (50 cm) and back to cold
- Fargo ND, Dec. 25-27, 2023 – 2.5 cm of ice in storm, resulting in closed roads and power outages for several days
- Sweden, Jan 4., 2024 – heavy snow, 1000+ vehicles trapped on E22, record low cold temperatures also recorded



# The Recovery Process

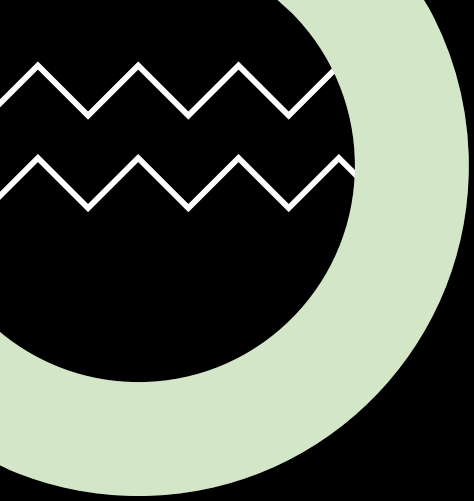
- In all cases, took several days (up to 8 for the first storm) with major road closures (e.g. I-80, I-90, I-94 in 1<sup>st</sup> storm, E22 in 4<sup>th</sup>)
- Even local events can have broad geographic impacts (e.g. Fargo event)
- Long term failures of the transportation network have both social and economic costs
- Increasing emphasis being placed on managing such events better, but little guidance as yet on how

# Road Closure as a Strategy or Tool



- Closure prior to crashes or vehicles being stuck allow for better management of severe storm situations - but they bring challenges
- Decision making process must be clear – who has final authority, and do all involved trust that authority (“chain of trust” issue)
- Communication to the public is critical, and also very difficult
- “vehicle storage” during the closure must be planned, and may result in closure over a much larger area than that directly impacted



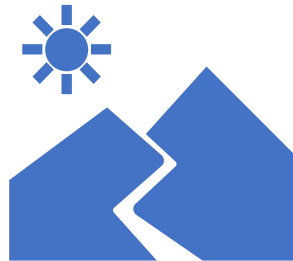


# Deciding to Close a Road

- Not considering those cases where crashes “close the road” for you
- Best practice seems to be where those “closest” to the closure make the decision – maintenance supervisor for that stretch of road and the State Patrol supervisor who works that stretch
- BUT there needs to be a “chain of trust” from those folk all the way up the administrative ladder to the Governor or Minister of Transportation to be sure that decisions will not be second-guessed
- Low visibility may close the road to maintenance vehicles too, which delays the clean-up of the road and its subsequent re-opening



# Safety Concerns with Road Closures



**Some road users will try to find a way around the closure**

Livestock truckers, holiday travelers

Almost always, any “unclosed roads” are in worse shape than those deliberately closed

Major need for public education (and education of various apps) on this

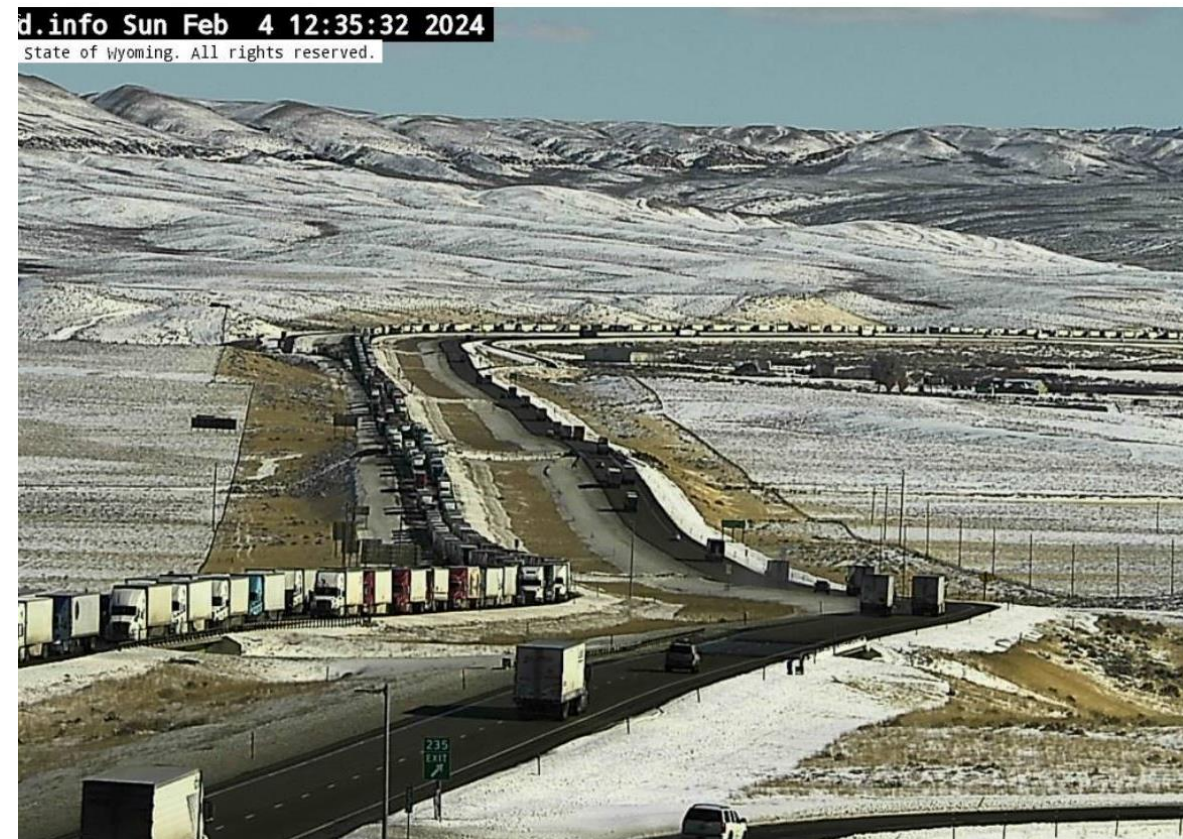
Also highlights the need for excellent communication



**Re-opening roads is not a trivial exercise, and should be planned as carefully as the road closure process**

## Re-Opening a Road...

- Not something we had thought of, but major concern to avoid the NASCAR rolling start phenomenon
- Use State Patrol as “pace cars”
- Announce an opening time, but allow some vehicles to access road prior to that start time to manage opening volume
- Be aware that it does need to be “managed”





## How Did Agencies Do?

- Not thrilled about having to close roads, but done when needed, and re-opened as soon as possible, given resources
- The long delay in road re-opening may lead to examination of why the road closures were so lengthy
- The emphasis on communication and information worked, but in certain specific categories, more is needed
- For the hardest hit agencies (the Dakotas, Wyoming) this was a “once in a lifetime” storm, and given that severity, things went well



# Lessons Learned



Communication is at least as important as everybody thought!



“Chains of trust” are extremely valuable, but need to be put in place long before the severe event happens



Road closures pose issues that go beyond the stretch of road being closed and include concerns about the re-opening process



Objective measures of resilience are needed to manage the impact of very severe winter storms



# Questions?

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