ITS Heartland 2024

Session 3A: A Blooming Garden of TSMO and Rural Road Weather

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Presentation Outline:

1) Rural Roads + Weather
2) Data Gaps + Vision
3) Road Weather Industry Survey
4) Open Discussion

Presentation Outline:

1) **Rural Roads + Weather**
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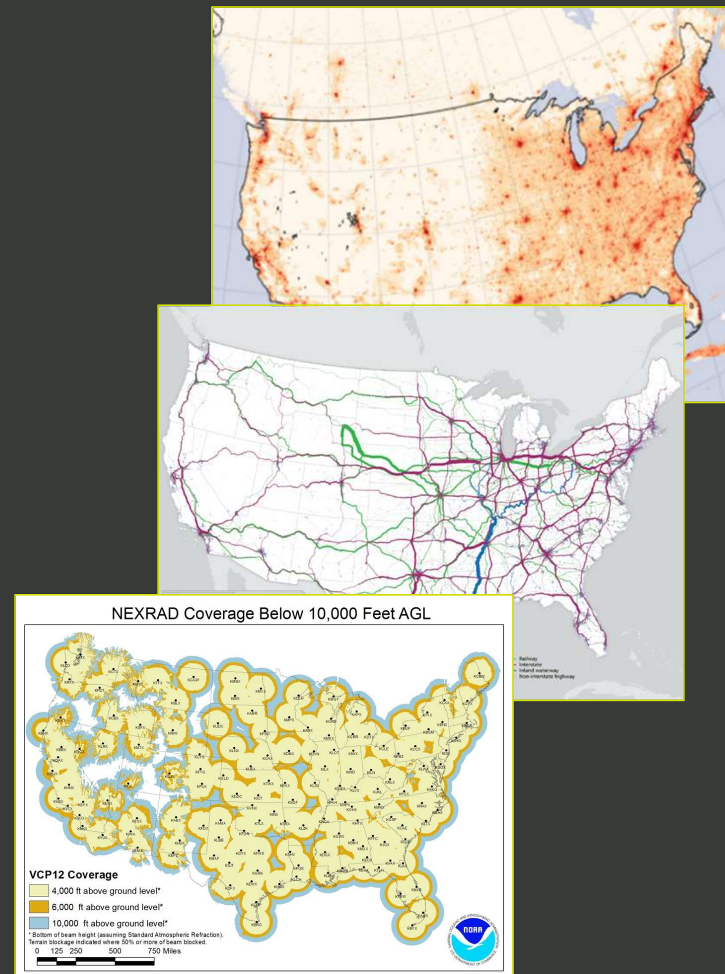
1) Rural Roads + Weather

- About **19% of the US population** in rural areas (GHSA)
- About **71% of public roads** (68% of lane miles) are rural – account for about **30% of national VMT** and about **46% of truck VMT** (USBTS).
- Rural road fatalities = **about 43% of all fatalities** – with **fatality rate almost twice as high** as urban roadways (NHTSA)
- Rural jurisdictions include **local**, **tribal**, and **state** roads – increasingly struggling to maintain roads with diminishing traffic while meeting the safety needs
- Dynamic **topography** compounds safety issues



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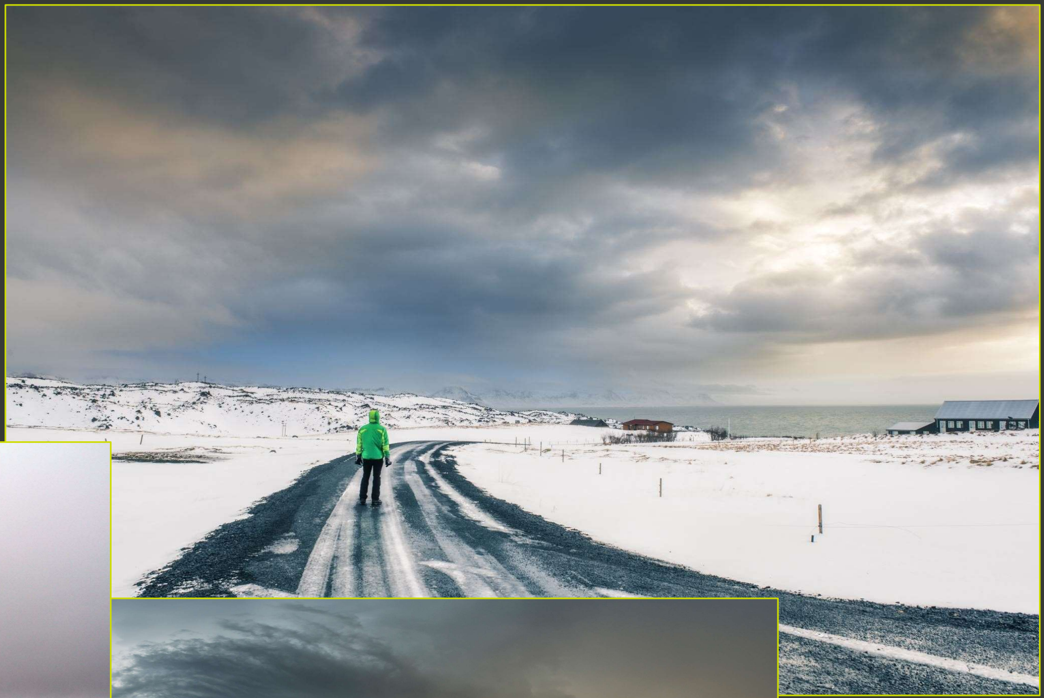
1) Rural Roads + Weather

- Weather impacts are extensive …
  - **Roadway**
  - **Vehicle**
  - **Driver**



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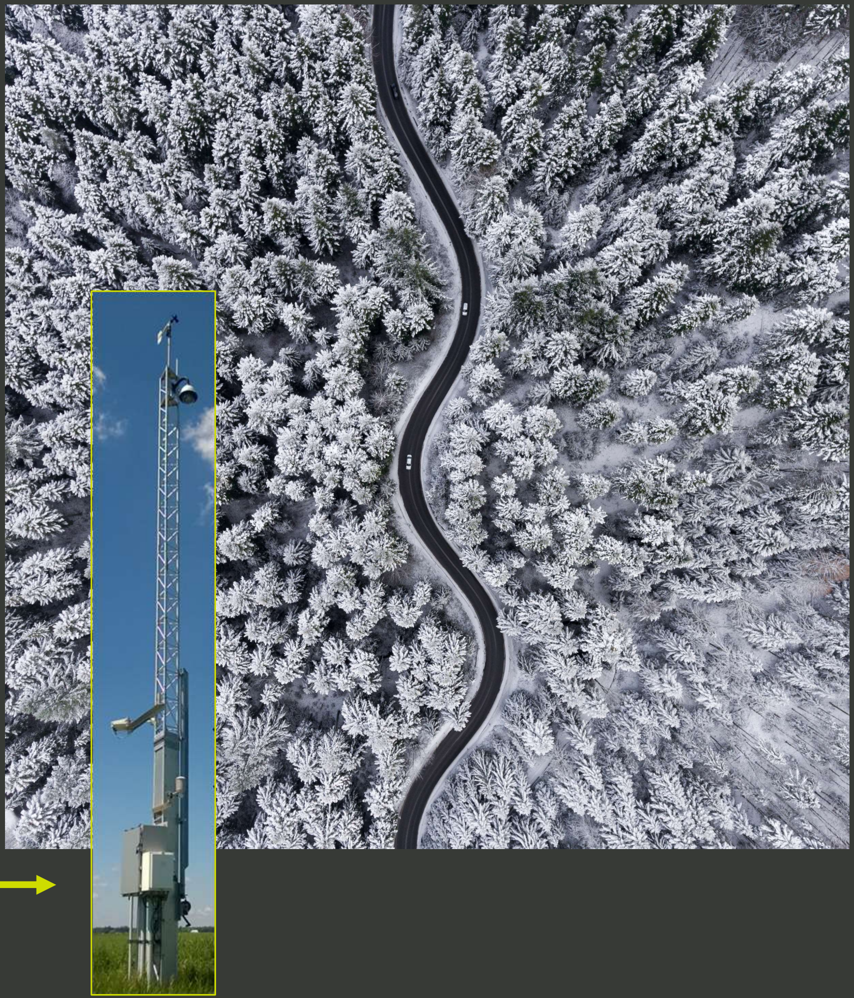
1) Rural Roads + Weather

- Approximately 22% of crashes are **weather-related** – about **6,000 fatalities** annually (FHWA)
- Rural crashes and fatalities during inclement weather – **not insignificant**.
- TRB + rural road advocates have identified this issue as an important area in **need of research and funding** (TRB)
- **Road weather** takes a broad view of weather and narrows its focus to the state of the pavement surface and the near-surface atmosphere.
- RWIS



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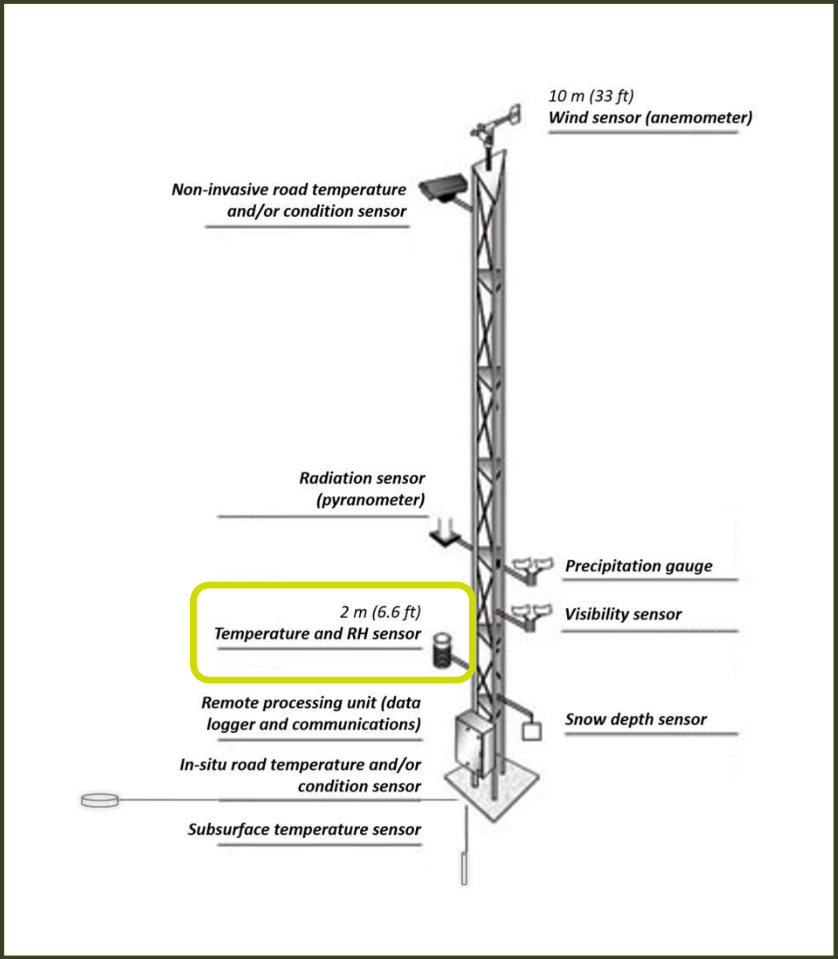
1) Rural Roads + Weather

- Road Weather Information Systems (**RWIS**) generally refers to networks of environmental sensing stations (ESS) that observe the near-surface atmosphere, pavement surface, and subsurface.
- **ESS** is another common name for weather station, and weather stations vary slightly based on the expressed purpose of the measurements taken there.
- Why? → $ (cost)
- What is the future of **road weather data**?



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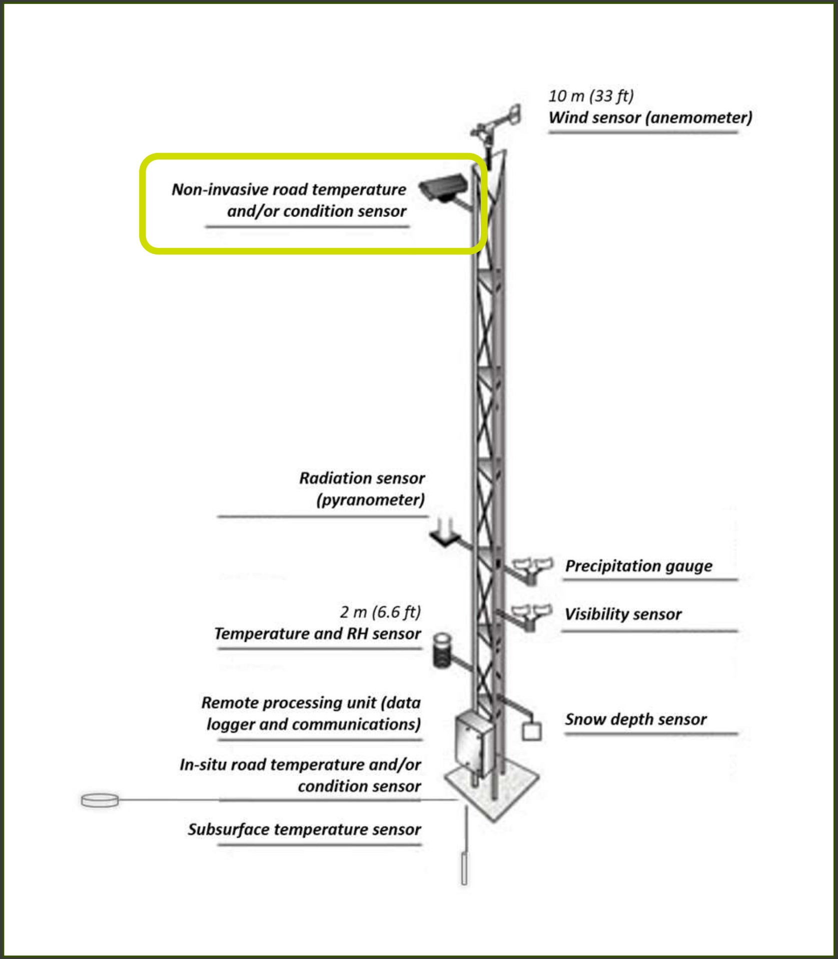
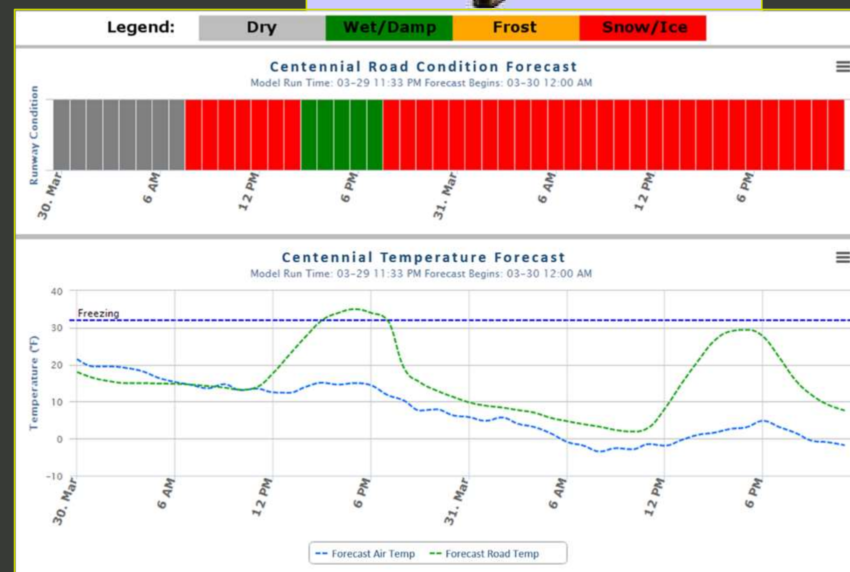
2) Data Gaps + Vision

- RWIS – historically used for road operations and winter maintenance activity by **larger roadway jurisdictions**.
- Location – “problem” areas vs. “representative” sites
- Routine **calibration and maintenance** of ESS
- Data **quality control** is critical
- Metadata provides **context**.
- Scientific-grade data with **significant cost**



2) Data Gaps + Vision

- How is **ESS data** used?
  - Road weather forecasting (nowcast, operational, extended, seasonal)
  - Pavement models
  - Traveler information
  - Winter maintenance decision support (MDSS)
- How else could it be used? – **accuracy vs trends**
- Technology used to observe (and forecast) is **rapidly developing and improving** – lower cost?
- Greater focus on real-time data ⟶ drivers

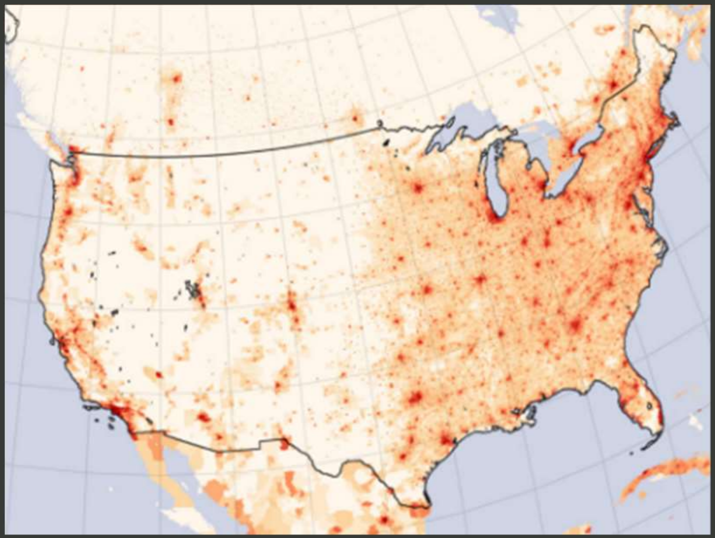


2) Data Gaps + Vision

Better Data

More Actionable Information

Better Driver Decisions



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3) Road Weather Industry Survey

IOWA DOT

IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY

National Center for Rural Road Safety
A Federal Highway Administration Center for Excellence

MONTANA STATE UNIVERSITY
Western Transportation Institute

IMS

WEATHERNET

LEAD CREEK TECHNOLOGIES LLC
Transportation Weather Solutions

VAISALA

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3) Road Weather Industry Survey

A) What are the promising **alternative RWIS technologies** on today's market?

- **Mini** "all-in-one" **RWIS** units with IR pavement sensors = inexpensive and good for **smaller agencies with readily available roadside infrastructure** like traffic signals.
- **RWIS Lite** captures just variables needed rather than a full array of atmospherics.
- **Portable Stations/Cameras** capture short-lived threats that don't to be monitored permanently (wildfires, burn scars, construction, floods) and allows flex where the current needs are in a very short period.
- Technology with functionality to **report friction and grip** of the roadway allows much greater level of precision – advance warning of potential hazards for traffic operations/management centers and key information for proactive winter maintenance operations.
- Limited use of **mobile data**, but it's getting a bit better.

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3) Road Weather Industry Survey

A) What are the promising **alternative RWIS technologies** on today's market?

- RWIS **friction measurement technology** offered in products/systems such as Mobile RWIS systems and miniaturized **IOT RWIS friction sensor deployments** allow large agencies a cost-effective way to manage key corridors and supplement existing reference networks while providing municipal agencies a less expensive way to start a road weather program.
- **Mobile units with expanded parameters** (condition, grip, layer thicknesses) data both as a stand-alone solution as well as couple with dynamic spreading.
- RWIS Lite, mini-RWIS, etc. has always been around. It's pared down RWIS that is **fit-for-purpose** for specific parameters but usually not a full sensor array deployed.
- Mini, mobile, modular and virtual all promising and may satisfy different needs . Additionally, somewhat like mini-RWIS, some agencies are beginning to **deploy singular sensors**.

3) Road Weather Industry Survey

B) Are there promising **alternative environmental and road condition data** sources?

- **In-vehicle** (CANbus) windshield wiper on/off data – Audi/Volkswagen in Utah.
- Enhancements to modeling with input and sharing from **more data points** = positive impacts to road weather and flooding solutions and applications.
- **Mobile data** that includes expanded parameters
- **CAV Data** – extracting, aggregating, and summarizing directly from vehicles – promising but challenges with applications limited to selected OEMs, differences among OEMs, and penetration.
- Application of **machine learning** (snowplow and fixed position) cameras is promising.
- Modeling, interpolation, and derivation of conditions given **combined/various datasets** is emerging.

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3) Road Weather Industry Survey

C) Where are agencies/companies utilizing **road weather analysis and forecasting best practices**?

- **Utah DOT** road weather operations are the gold standard.
- Anti-Icing and responsible **salt/chemical management practices** have dramatically increased and improved over the last 10 years due to the outreach and routine education provided by industry leaders, public agencies, stakeholders, and peers.
- Winter operations and early traffic management solutions – industry acknowledges that weather has impact on traffic models but doesn't differentiate between **high and low accuracy data**. Winter maintenance operates on the premise that the difference in just a couple of degrees (higher accuracy) drives whether a treatment is applied, when it is applied, and/or what type of material is applied.
- **Variable speed limits**, pre-treatment strategies, and advanced messaging.

3) Road Weather Industry Survey

D) Are there **traveler information and high-risk warning/messaging best practices**?

- **Iowa DOT** was able to help counties in the hard-hit blizzard areas make road condition/closure information **more accessible** to travelers to find ways around the Interstate closures.
- **Utah DOT** begins messaging (social media, our VMS signs, webpage, etc.) early for long duration or well forecasted events – gives people a chance to change their plans ahead of time and avoid the period of highest concern.
- Utilize more-accurate, **real data** on our signs so people get a sense of how bad something is. For example, rather than saying "strong winds ahead" say "strong wind gusts to 65 mph observed next 100 miles" the real information makes folks much more likely to take action.
- **Not consistently** done the same way throughout the country.

3) Road Weather Industry Survey

D) Are there **traveler information and high-risk warning/messaging best practices**?

- Best practices are best managed on a **regional basis** based upon average ADT and specific traffic management policies. "Over messaging" the traveling public can be a real issue causing a percentage of the traveling public to ignore messaging regardless of the potential hazard or information – and can sometimes create a traffic hazard.

- This area is still evolving – NWS and highway agencies are beginning to use supporting data to assess the actual impacts of their messages, move away from traditional messaging in format and content and try to better **adapt to user needs and expectations**.

3) Road Weather Industry Survey

E) Are there promising **in-vehicle technologies** for both data reporting and information dissemination?

- Regarding in-vehicle dissemination we, have not done anything with that here yet, but we did see some very basic reporting information from at least one vendor this winter and the data was interesting. As you would imagine, it is **sparse in rural areas** and continues to be a coverage challenge there to get anything reliable and usable.
- Yes, In the simplest form, I believe that the ability to collect and share even basic **surface level air temperature and/or dew point from the driver's perspective** is good data for value added solutions.
- **Data quality** is a challenge with vehicles and must be managed or vehicle data will lose worth. Real-time data dissemination to the driver is the real challenge as driver distraction due to electronic devices is currently a large concern and problem.
- Opportunities exist with **CAV** (V2V or V2I) as well as **crowdsourced data**.

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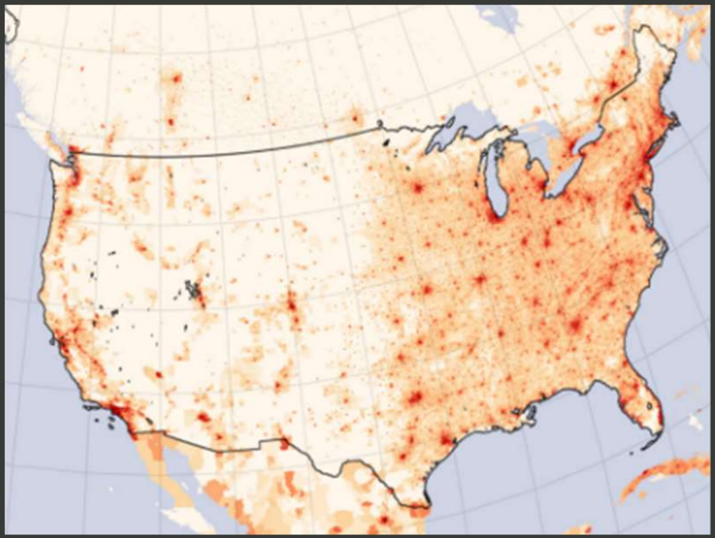

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