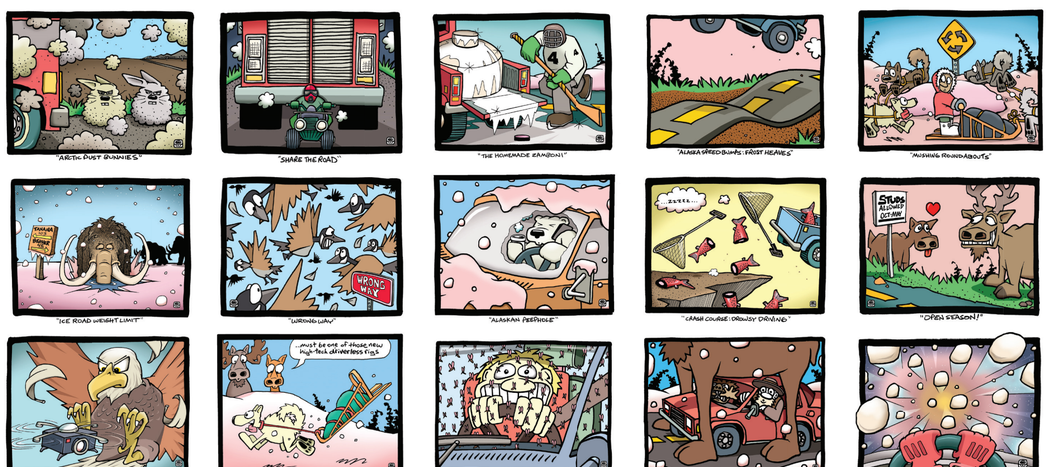
ROAD SAFETY NUGGETS



by Nathan Belz & Jamie Smith

ROAD SAFETY NUGGETS

by
Nathan Belz
and
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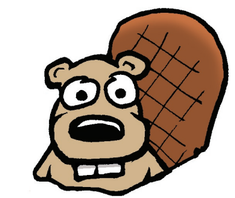
The current state of learning and engagement is much more audiovisual than it has ever been. Additionally, the use of cartoons can help break down certain social barriers and have the potential to promote thinking and discussion on critical and important societal issues such as climate change, conservation, and transportation safety culture. A growing amount of literature supports the use of art as an effective means of science communication because of the visceral and emotional responses that are elicited when engaging the imagination. To that end, cartoons (i.e., comic panels) are used here to present timely and relevant transportation safety issues addressed at the Center for Safety Equity in Transportation (CSET), a Tier 1 University Transportation Center led by the University of Alaska Fairbanks with partners at the University of Hawaii, University of Idaho, and University of Washington. By blending art and deep knowledge of transformative engineering research, the authors hope to help the public better understand and digest complex transportation safety issues.



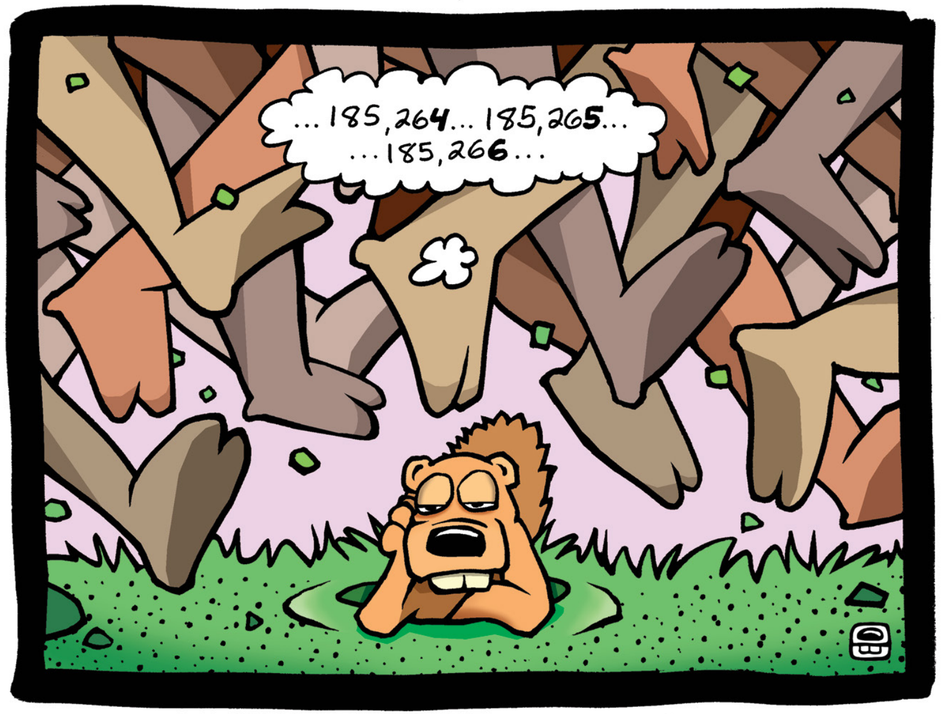
ENJOY!

DAM JAM

In 2019, before the height of the pandemic, Americans spent an average of 54 hours in delays, about **20 minutes per weekday**, in delays caused by congestion resulting in an estimated **190 BILLION dollars** in associated costs and **3.5 BILLION gallons** of wasted fuel. Congestion estimates originate from detailed traffic speed data collected as part of the annual Urban Mobility Report, for which more than a billion data points for speeds are collected across 1.5 million miles of U.S. streets and highways. While crashes tend to be less severe during periods of high congestion, **crash frequency tends to increase.**

LEARN MORE!

"DAMTRAFFIC JAM"



"PEAK HOUR TRAFFIC COUNT"

TRAFFIC COUNTS

CTRA, short for **C**ounting **T**raffic in **R**ural **A**reas, is a small 3D-printed traffic counter developed at UAF by Dr. Nathan Belz and Daniel Eagan that **addresses lack of data in rural and isolated Alaska communities**. The low-cost traffic counting solution is **built on open source coding** as to afford communities with limited resources the ability to generate the data necessary for transportation safety and planning purposes. These efforts are consistent with current trends to make technologies more accessible from a cost perspective as well as **reducing our infrastructure footprint** (i.e., miniaturization of technologies).

LEARN MORE!

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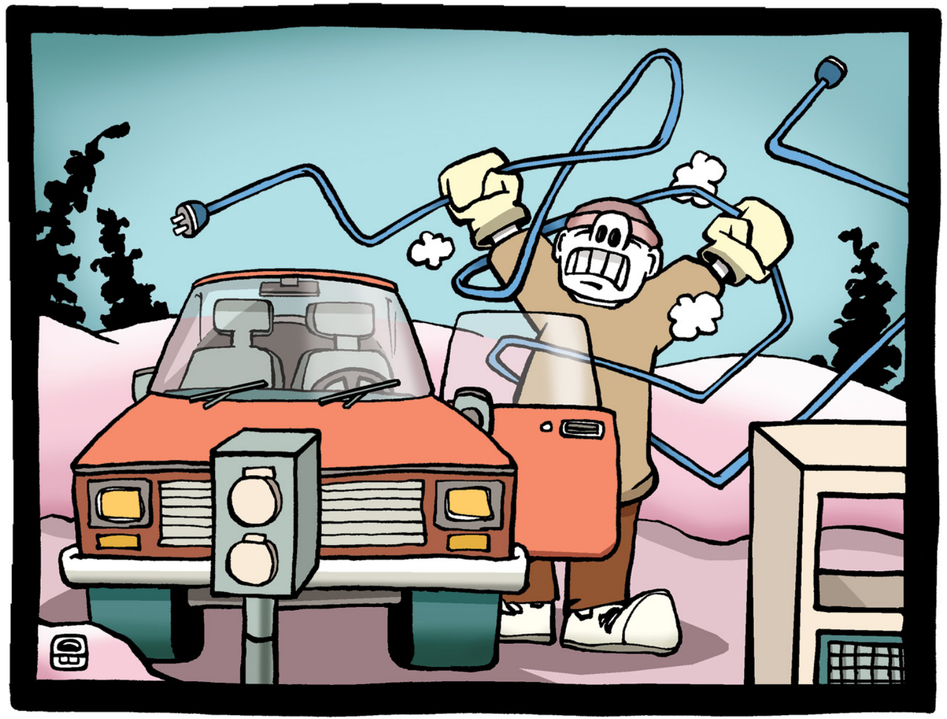
ARCTIC PLUG-INS

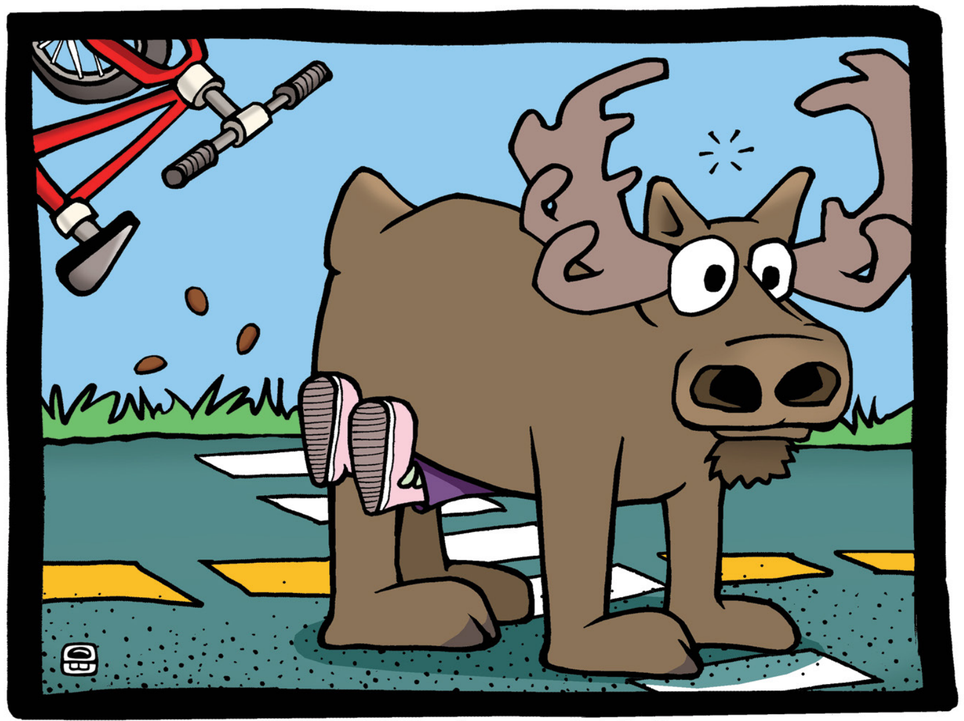
The Alaska Center for Energy and Power (ACEP) at UAF and the U.S. Arctic Research Commission (USARC) hosted a two-day virtual workshop in June 2020 with experts from varied backgrounds in academia, industry, and politics. The sessions addressed policy environment, charging behavior, operations and performance, and grid impacts - all focused on translating emerging research questions and best practices to EVs and their deployment in Alaska and the Arctic. A summary of the workshop can be found using the QR code below.

Haupert, C., Leach, T., Rosa, C., Whitney, E., Wilber, M. and Byrd, A., eds. 2021. Alaska Electric Vehicle Workshop: Report of the ACEP-USARC Virtual Workshop Held June 16–17, 2020. US Arctic Research Commission, 20 pp.

LEARN MORE!



"ARCTIC PLUG-INS"



"YIELD TO PEDESTRIANS"

YIELD TO PEDESTRIANS

In the United States more than **twenty thousand miles of defunct railroads have been converted to trails** for pedestrians and bicyclists. Many rail-trails are located near or cut through rural communities yet **often users are not local residents**, but rather affluent visitors from urban areas using the trails for recreation and tourism. With that in mind, **does a trail best serve the transportation needs of the local population**? Are there potential safety concerns at certain intersections or highway crossings that prevent wider use? Are there physical or policy barriers that restrict snowmobile and ATV travel?

LEARN MORE!

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ALASKA TAIL-GATING

Crash data for rural, isolated, and tribal (RITI) communities highlights three major areas of concern: **prevalence of exercise speeding, impaired and distracted driving, and underage driving**. While safety-focused educational programs awareness campaigns and stronger laws to address impaired driving have all contributed to reduction in crashes in urban areas, RITI communities experience **elevated rates of crashes resulting from these risk-tolerant behaviors** -on average, 30% of fatalities occurred due to speeding-related crashes and 45% of all fatalities were related to either impairment and/or distraction.

LEARN MORE!

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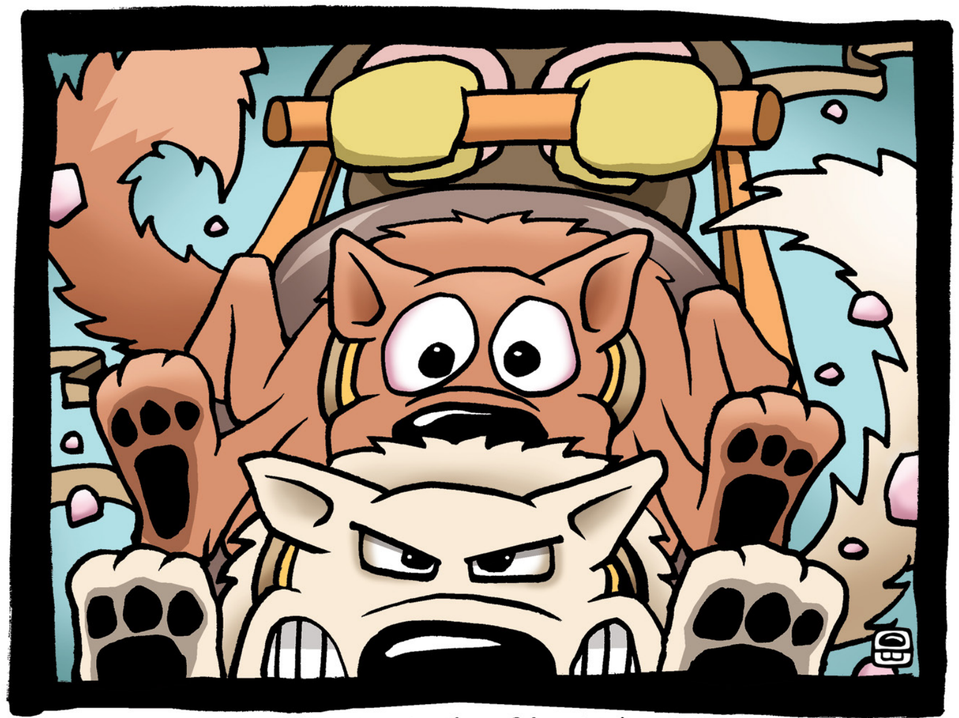

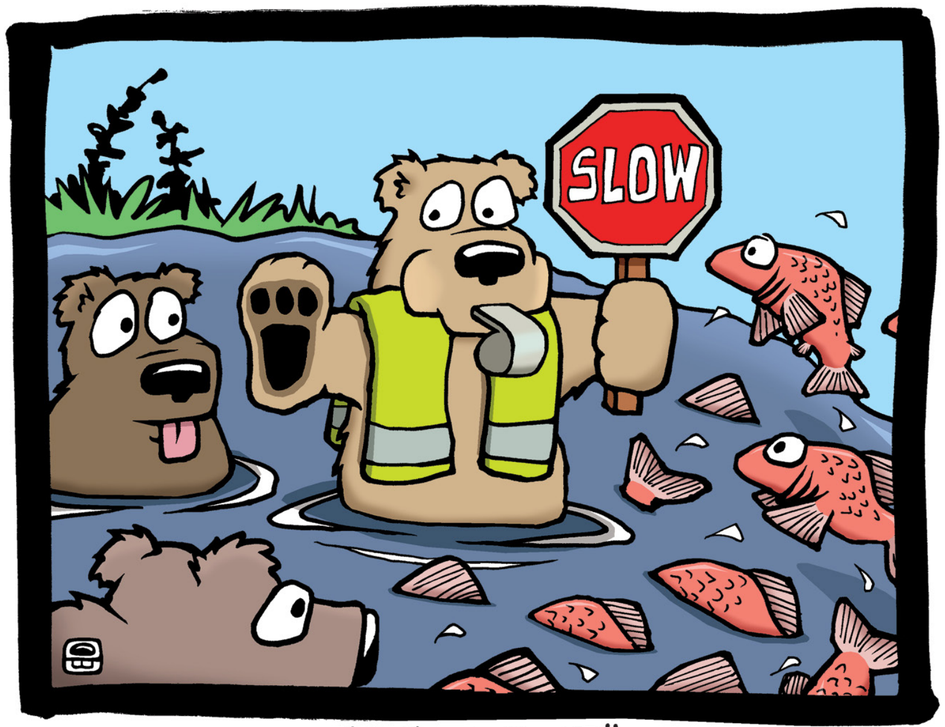

"SCHOOL ZONE"

SCHOOL ZONE

National research has shown that in the span of one generation, the percentage of children walking or bicycling to school has dropped precipitously, from approximately 50% in 1969 to just 13% in 2009. This decrease has resulted in **thirty billion miles** and **6.5 billion vehicle trips** to take children to and from schools, contributing to an increase of traffic congestion levels near schools - about 14% of traffic on the road during the morning commute. **Student safety is a concern, particularly in rural environments** where schools tend to be sited along or in the vicinity of high-volume, high-speed state highways.

LEARN MORE!

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TIPPING POINT

This CSET project seeks to better understand the **effects of tourism on rural roads**. The University of Hawaii conducted a case study on traffic congestion and parking problems on Oahu's rural North Shore, a popular tourist destination for surfing, turtle watching, along with other recreational activities. These issues are very similar to those experienced along the Seward Highway and the Parks Highway near Denali National Park. In addition, Hawaii DOT has declared that it will currently only consider mitigations that account for coastal erosion and threats to highways due to climate change/sea level rise.

LEARN MORE!

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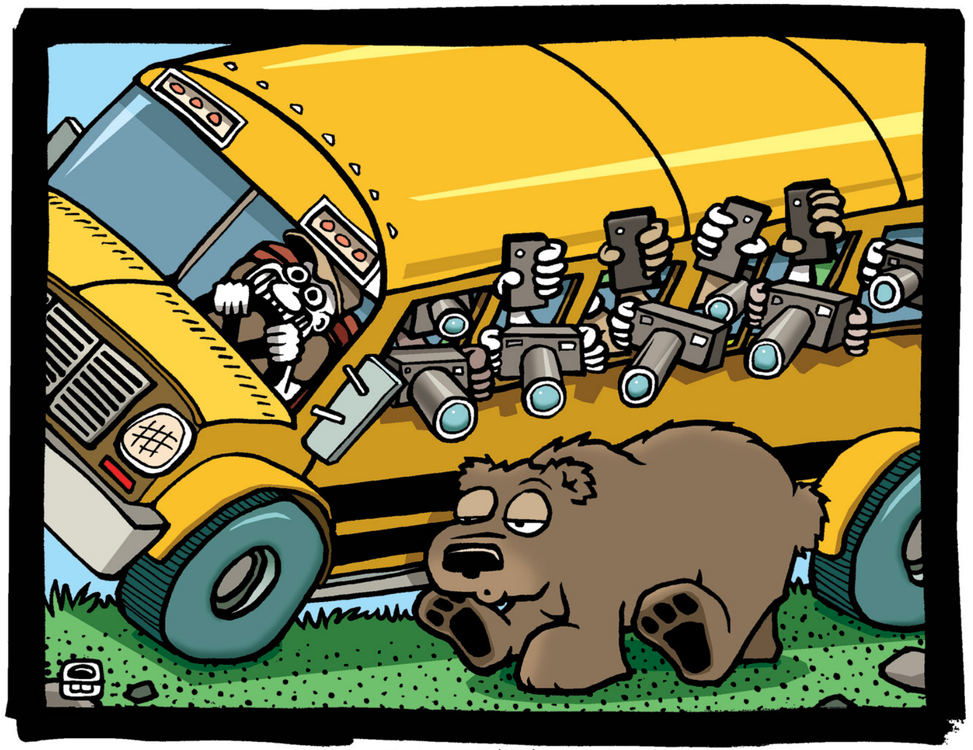

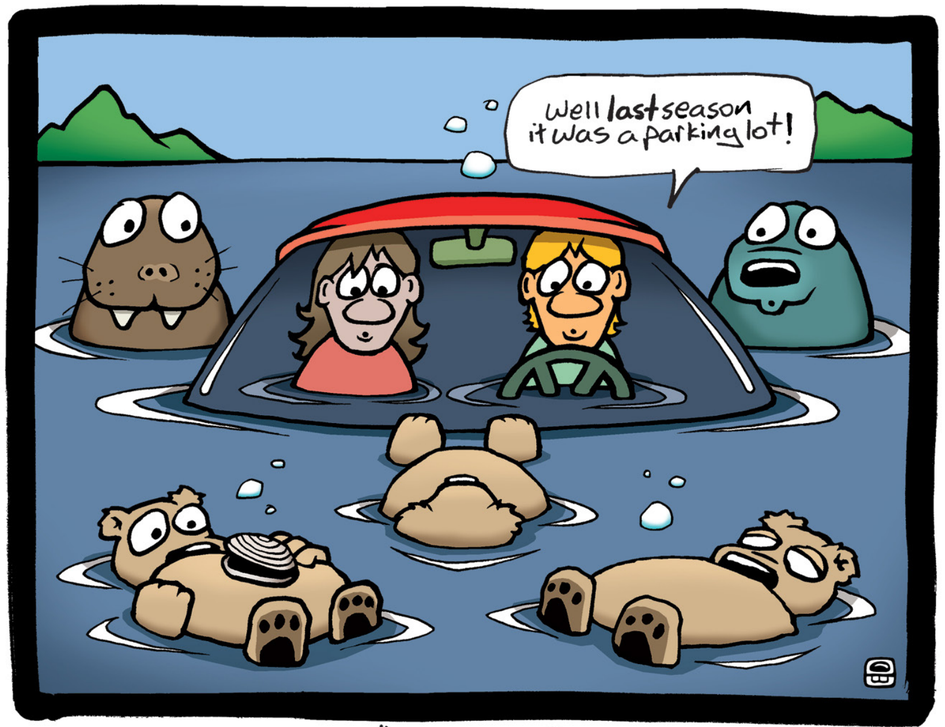

"DEAD END"

DEAD END

According to the National Research Council, **approximately 60,000 miles of coastal roads in the United States are already exposed to flooding** from coastal storms and high waves. The livelihoods and transportation safety of **indigenous rural communities are at more risk** to sea level rise and coastal flooding. This project aims to **understand perceived safety challenges with coastal flooding and the social sensitivity to such challenges**; understand value preference and priorities in adapting to sea level rise; and identify traditional knowledge in improving safe access to valued resources and activities.

LEARN MORE!

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DUST BUNNIES

The Alaska Department of Transportation and Public Facilities recently adopted a laboratory test method to **evaluate the performance of dust palliatives used on roadways**. The method uses a six foot by eight-inch column through which a sample of treated soil is dropped. The dust that remains in the column is measured and reported. In a follow-on effort UAF developed a portable, table-top dust fall column, which is **smaller and easier to use** in a field setting. The purpose of this study is to validate the new column and test method.

LEARN MORE!

PI: Billy Connor
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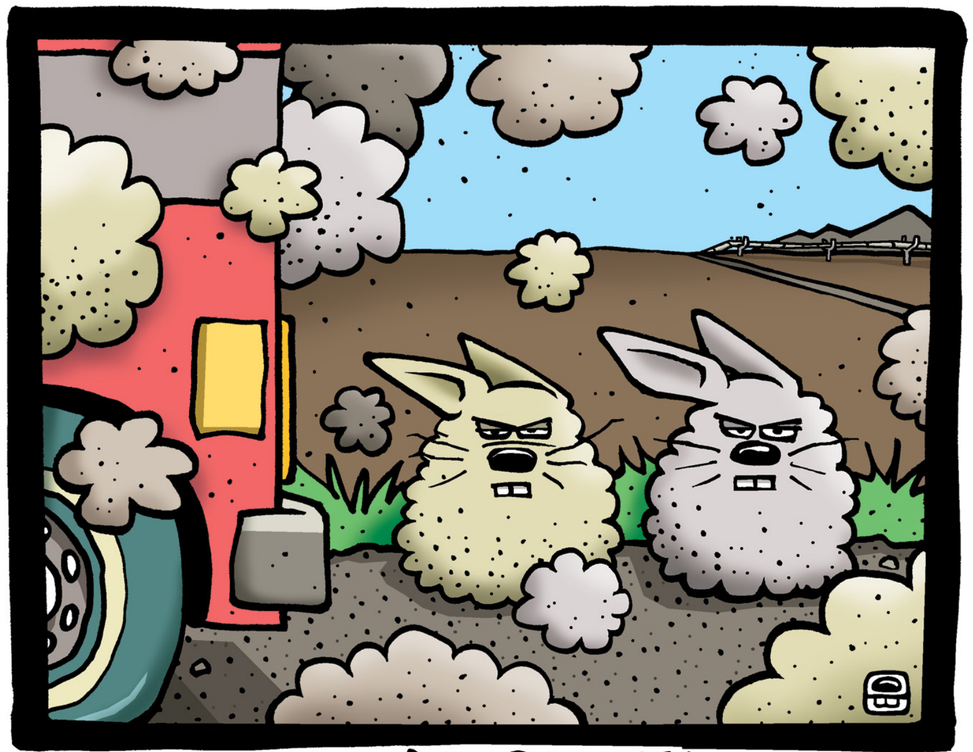
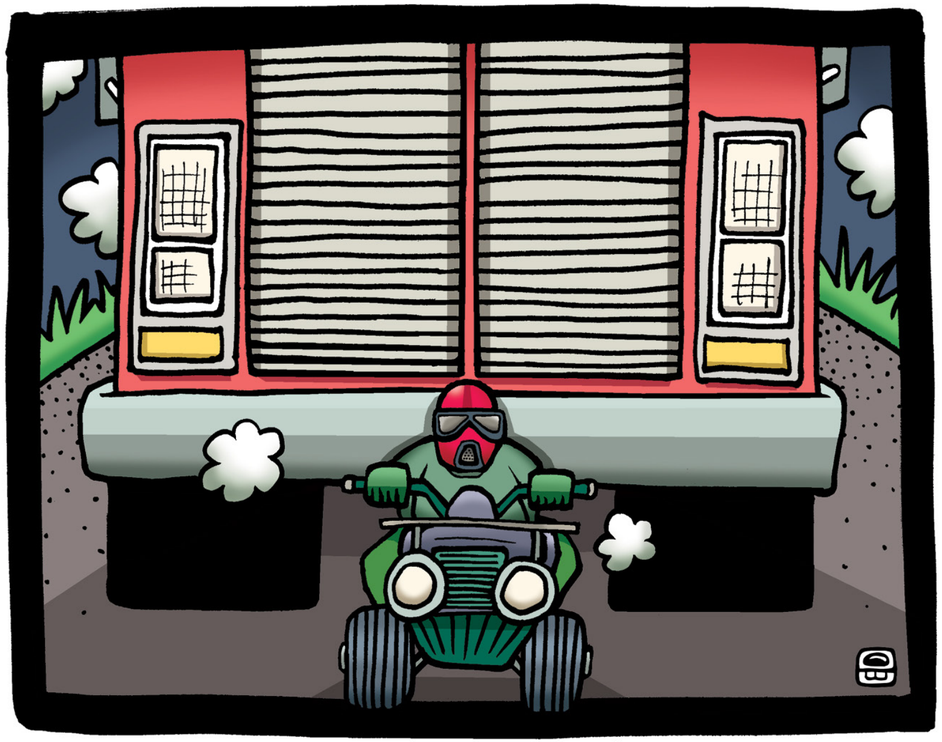


"ARCTIC DUST BUNNIES"



"SHARE THE ROAD"

SHARE THE ROAD

Travel environments in remote and isolated communities are quite unique. **Travel routes can vary greatly from season to season** and ATVs and snowmachines are used frequently. A single gravel road may serve as a travel corridor and the village playground simultaneously. **A lack of guidance exists** for communities that need road standards somewhere between a local and low-volume road and a trail system. This project will engage engineers and planners, conducting case studies in Alaska to develop a design philosophy, framework, and vehicle criteria to **meet the needs of remote and isolated communities.**

LEARN MORE!

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ALASKA SPEED BUMPS

The University of Washington Smart Transportation Applications & Research (STAR) Lab is developing, field testing, and establishing **standards for monitoring systems on rural roads.** These networks of sensors will monitor roads in rural areas with advanced sensing and communication technologies to **monitor traffic and roadway surface and environmental conditions**, analyze the collected data in real-time, **and broadcast useful information to road users.** The information will also help decision-makers and maintenance managers respond more rapidly to roadway issues.

LEARN MORE!

PI: Yinhai Wang
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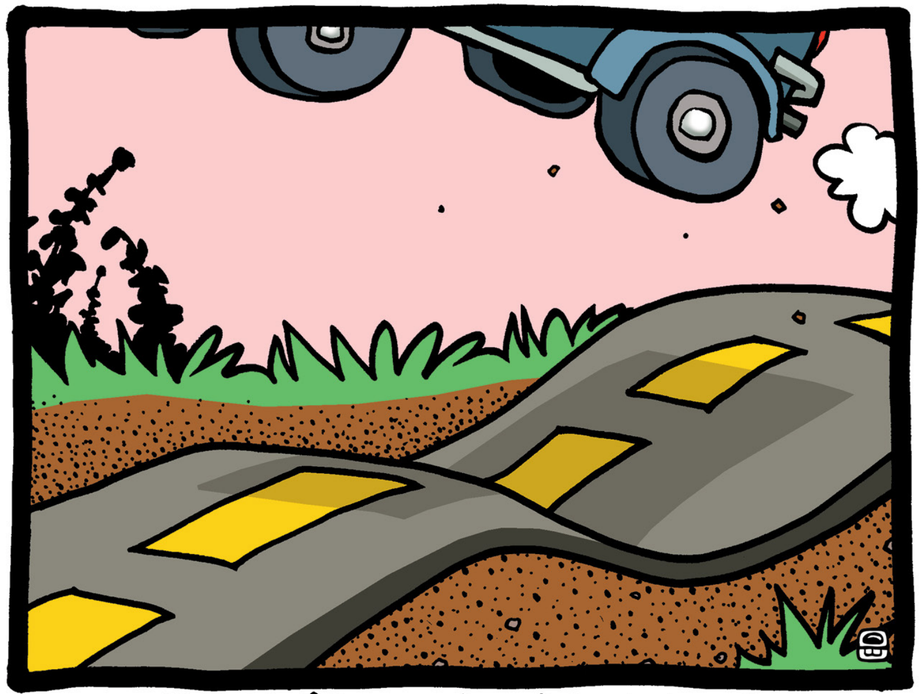

"ALASKA SPEED BUMPS: FROST HEAVES"

"MUSHING ROUNDABOUTS"

ROUNDABOUT

Roundabouts have advantages over other intersection control types due to **safety and capacity benefits** and lower fuel consumption and emissions when compared to other intersection types. However, these benefits can be **limited by poor driver behavior and judgment** when entering the roundabout. This research addresses the nature of gap distributions and turn indicator use by comparing vehicle headways measured at two different locations in each roundabout. Results indicate that **exiting drivers that do not use their turn indicator significantly influence the decision-making process of entering drivers**.

LEARN MORE!

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ICE ROAD

This project is part of a larger effort at UAF to improve the safety of ice roads, particularly as ice conditions are becoming increasingly variable and unreliable during winter months. The goal here is to **provide insight into the applicability of GPR surveys for minimizing environmental risks that affect communities relying on river ice transportation routes**. Specifically, measurements from different frequency GPR antennas are analyzed to distinguish layers of different ice types and to relate GPR measurements to the overall ice cover strength.

LEARN MORE!

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"ICE ROAD WEIGHT LIMIT"

"ALASKAN PEEPHOLE"

PEEPHOLE

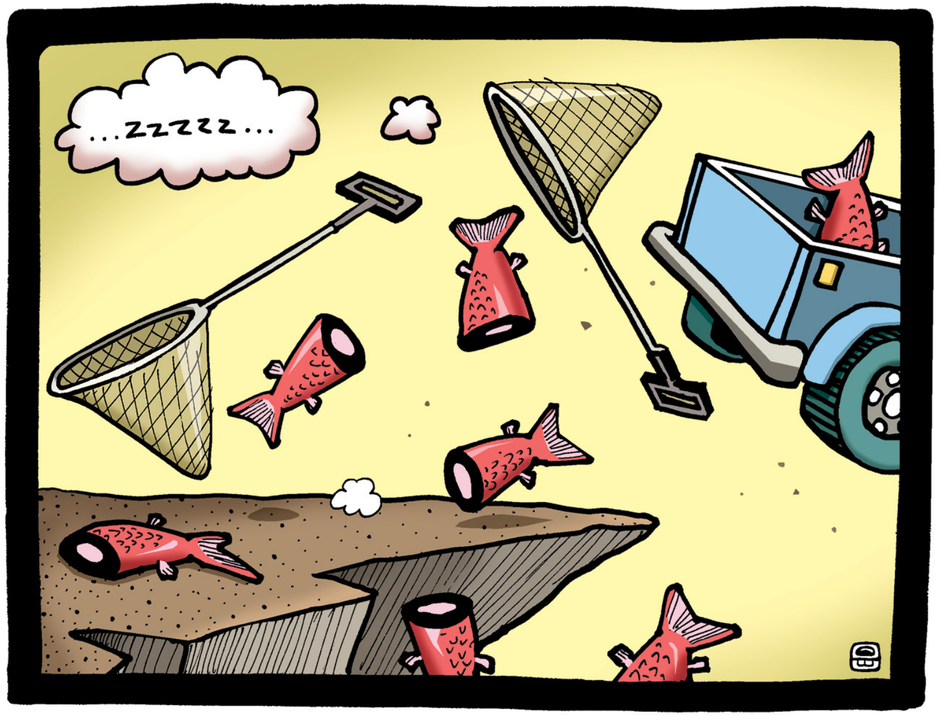
Traffic safety has become a top issue across the nation with severe injuries and fatalities on roadways on the rise. **Distracted driving is presumed to be a major contributor to these incidents**. At the University of Hawaii at Manoa, observations of 203 professional taxi drivers working at the same Honolulu taxi company were collected using a driving simulator. Observations revealed that the **drivers significantly increased their headway, lane deviations , total time of driving blind, driving blind incidents**, and significantly decreased lane change frequency. There was no significant effect on braking aggressiveness while reading text.

LEARN MORE!

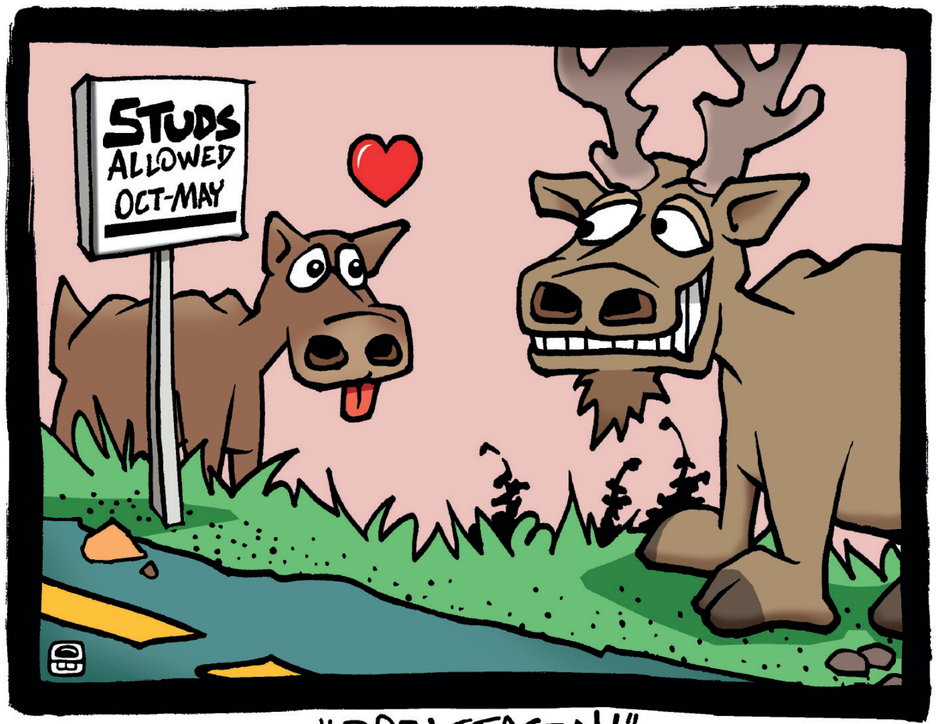
DROWSY DRIVING

In the state of Alaska, there are myriad opportunities for residents to participate in hunter-gatherer-type activities. The "boom and bust" nature of most of these activities **compresses the pressures on the physical infrastructure into small areas over short periods of time**; encouraging travelers to engage in risky behaviors such as driving while drowsy either on their way to or returning from said activities. The goal of this research is to **develop a data-driven approach using existing crash and injury data** to better understand characteristics of high-risk intersections and roadway features.

LEARN MORE!



"CRASH COURSE: DROWSY DRIVING"



"OPEN SEASON!"

OPEN SEASON

Travel during winter months can be problematic in the Pacific Northwest due to the regular occurrence of snow and ice events. Traction afforded by specialty tires in the form of "studs" serves to **provide an added level of driving confidence** when weather conditions deteriorate. However, when roadway conditions improve, **recurring studded tire usage causes damage to the roadway infrastructure** in the form of surface wear and rutting over time. Left unattended, this damage **contributes to challenging and potentially dangerous driving conditions** by creating the opportunity for standing water to develop which may refreeze or increase potential to hydroplane.

LEARN MORE!

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NO FLY ZONE

This research explores and synthesizes the opportunities, challenges, and scenarios that drone technologies may help **develop context-sensitive solutions to resolve traffic safety related challenges in rural communities**. Although drones have been extensively tested in both urban and rural areas for other purposes, their use in a transportation context has not been fully explored. As a promising emerging technology, **drones may help address safety challenges**, and are especially appropriate for low-density communities where activities are dispersed in space and difficult to monitor large areas with limited personnel and access.

LEARN MORE!

PI: Jeff Ban
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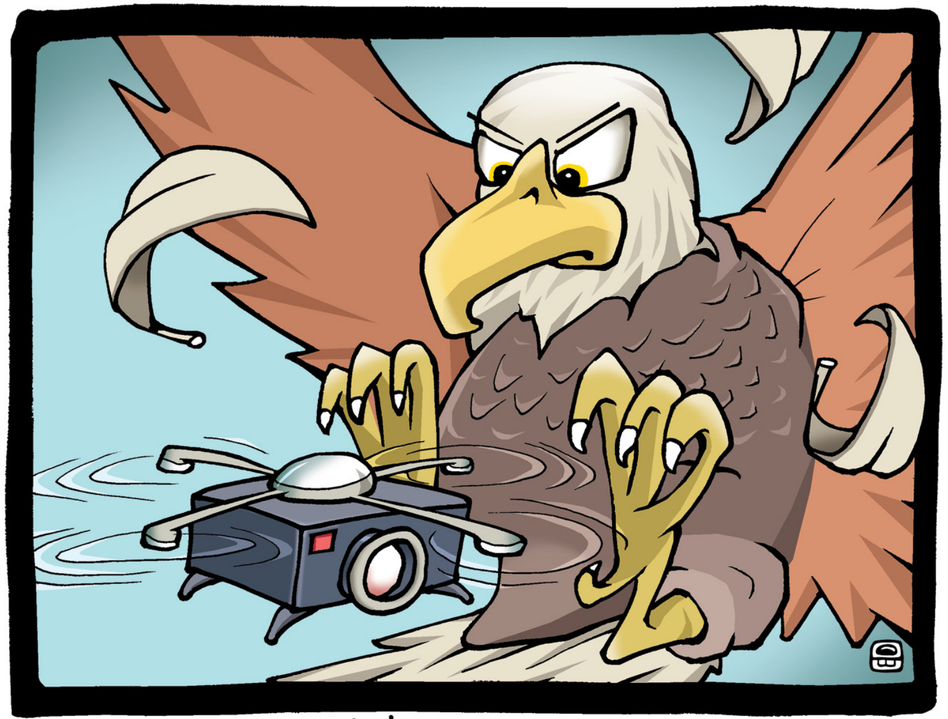
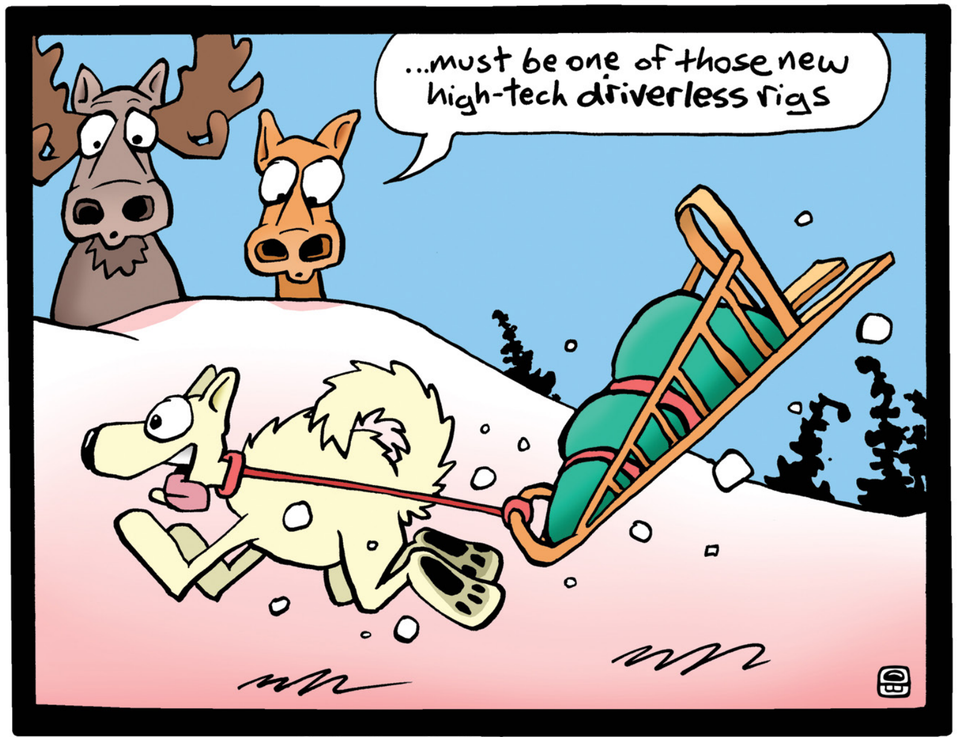


"NO FLY ZONE"



"THE ORIGINAL AUTONOMOUS VEHICLE"

AUTONOMOUS VEHICLE

Researchers at the University of Idaho are examining: **1) the extent to which rural community members might adopt self-driving capabilities for personal travel, 2) their confidence in such technology, and 3) how this technology might influence their current lifestyle.** The research findings should help transportation officials, planners, and engineers responsible for managing regional highways and roadways in rural communities by **expanding the collective understanding of current and future transportation and technology demands in rural communities.** The feedback will also help to shape policy and guide future education and outreach efforts.

LEARN MORE!

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WARPSPEED

Road Weather Information Systems (RWIS) help many transportation authorities, like Alaska DOT&PF, make informed decisions about winter road maintenance. The **use of RWIS provides a variety of advantages for improving road safety**, e.g., detecting conditions when ice is likely to be present on the road surface and providing real time video at select locations on a highway. This study presents **a novel approach for considering RWIS as a direct road safety countermeasure** and developing a crash modification factor for the use of RWIS in reducing crash rates during the winter season in the state of Alaska.

LEARN MORE!

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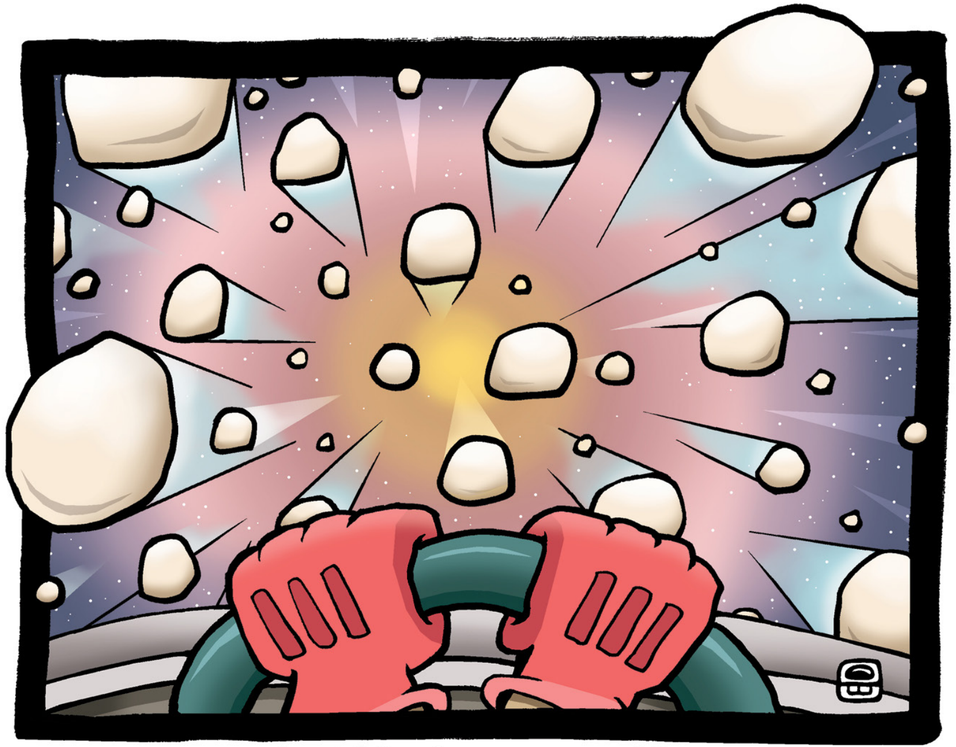

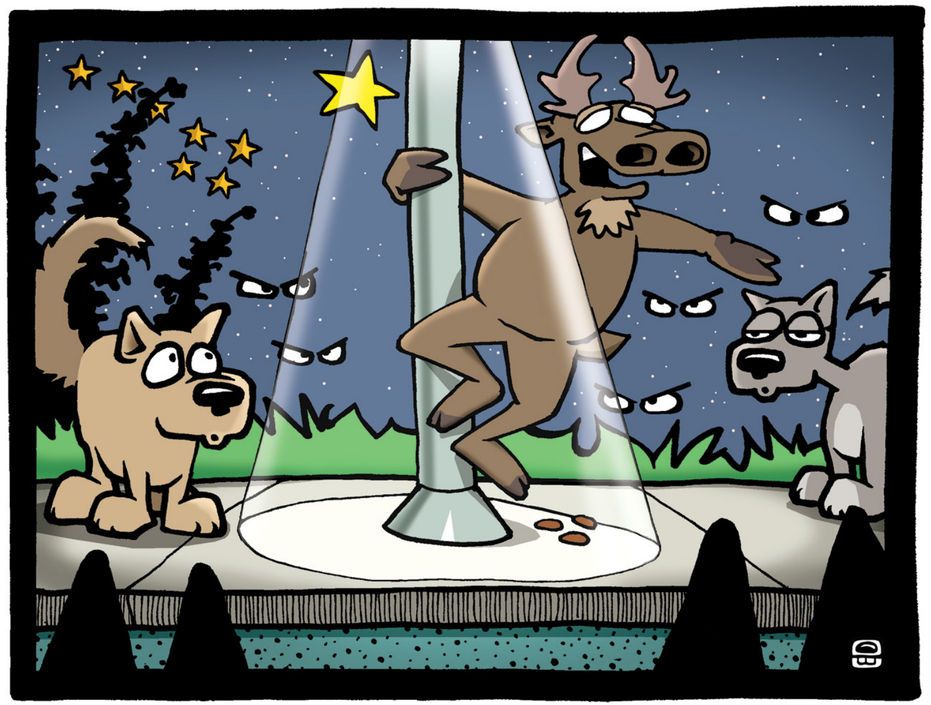

"STREETLIGHT SINATRA"

STREETLIGHT SINATRA

Crashes at isolated rural intersections are dangerous and often result in severe injury or fatality. Studies have found that poor lighting plays a significant role in many of these crashes. Since rural roads have low traffic volumes, especially at night, drivers are not expecting other vehicles. Other studies have found that **providing lit intersections reduces the number of crashes by as much as 33%.** The goal of this project is to develop a demand responsive lighting system for rural intersections, as found in much of rural Alaska, that can be deployed and managed by transportation agencies at a large scale.

LEARN MORE!

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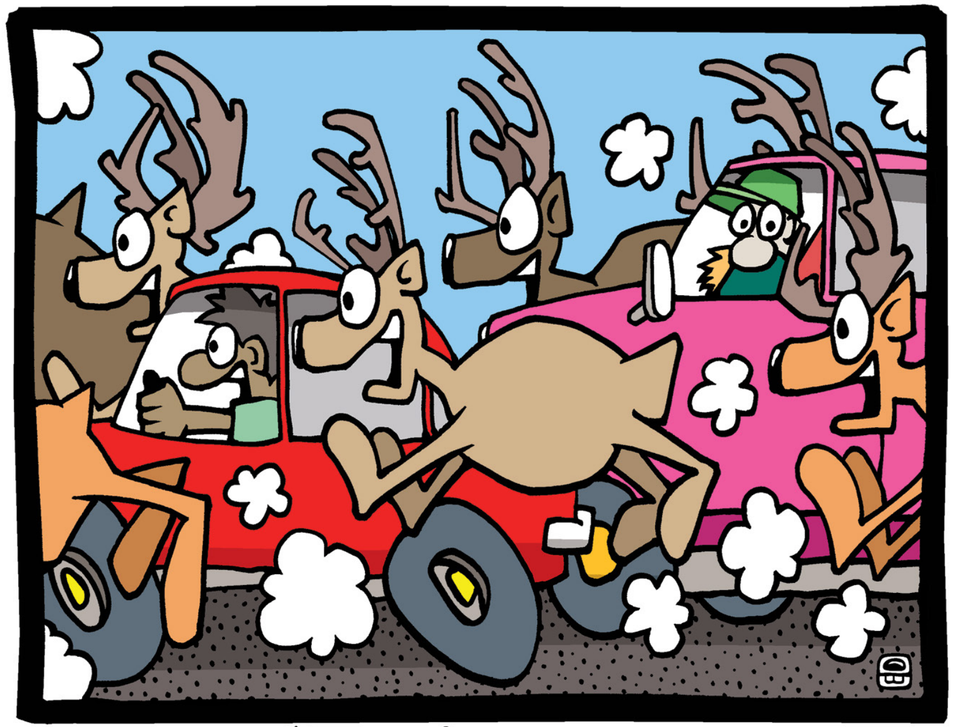
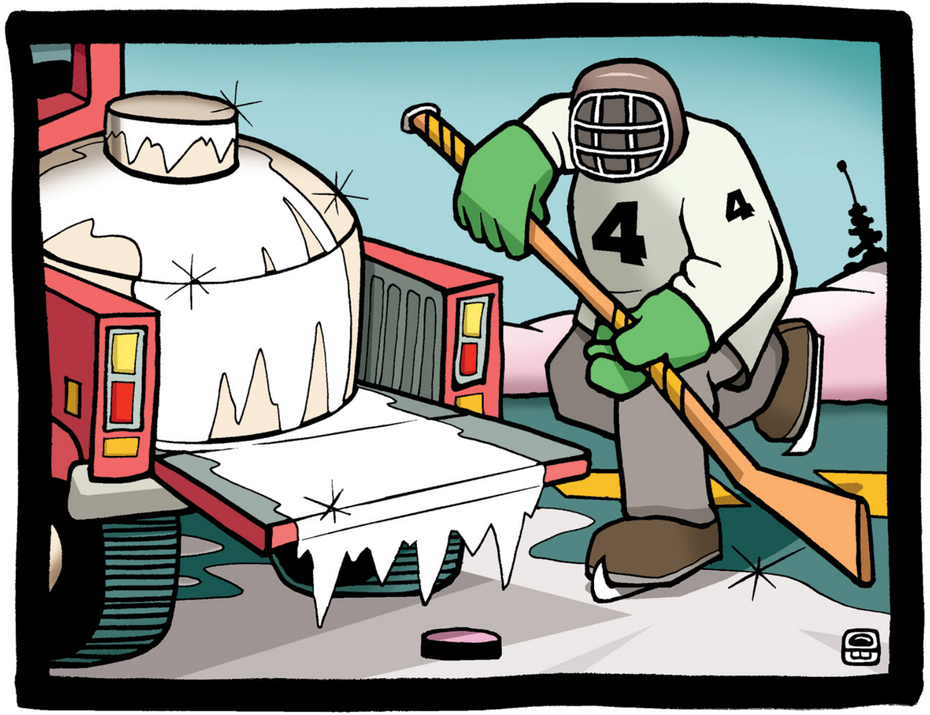
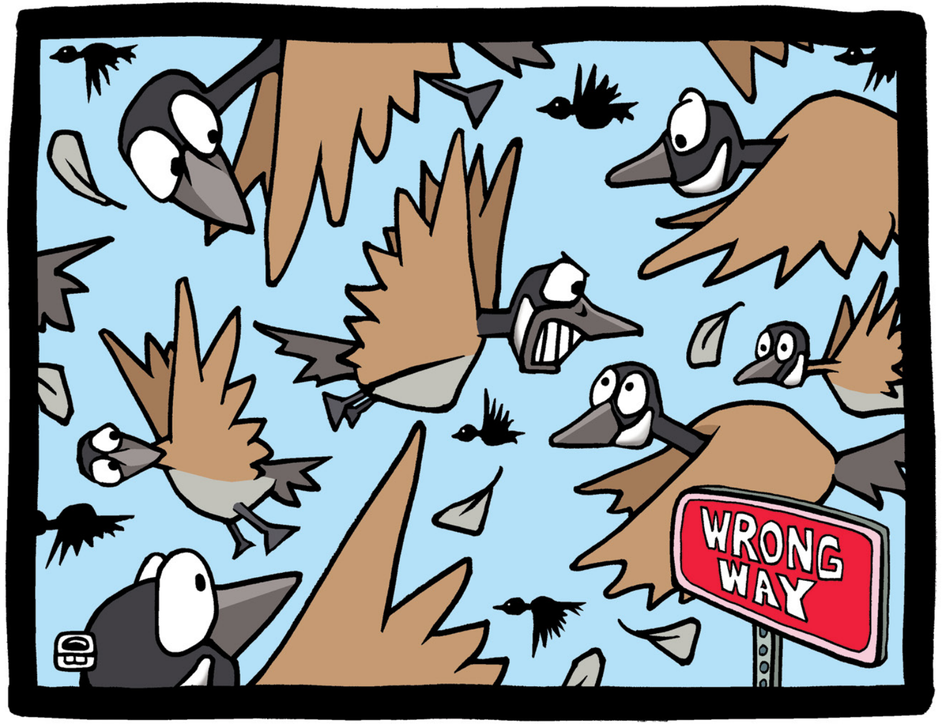
EXTRAS!



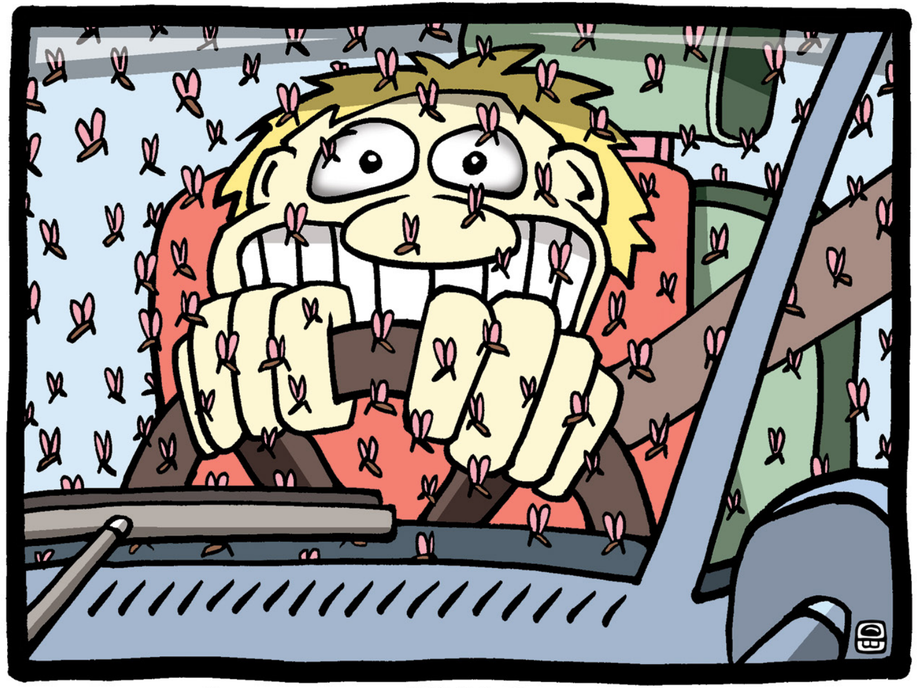
"ALASKA RUSH HOUR"



"THE HOMEMADE ZAMBONI"



"WRONG WAY"



"ALASKA DISTRACTED DRIVING"

"CLEARANCE"

THANKS FOR READING!

Dr. Nathan Belz is an associate professor in the Civil, Geological, and Environmental Engineering Department at UAF and serves as the assistant director for CSET. Nathan's primary research interest is how and why people make the transportation choices that they do and the implications for safety and efficiency of our roadways. He is an avid cyclist, fly fisherman, forager, wood carver, and hobby farmer and spends much of his free time enjoying the wilderness and wonderful trails that Alaska has to offer.

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Jamie Smith is a faculty member in the Art Department at UAF. He is an Alaskan artist and creator of the comic strips "Freeze-Frame" and "Nuggets". Jamie has illustrated several books, and his cartoons appear in newspapers and magazines across the state of Alaska. Jamie has also produced copious amounts of editorial cartoons for the Fairbanks Daily News-Miner since 1988, the content of which often deals with transportation and automobiles.

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