

OLIVIA REDMOND

Selected Science, Weather & Environmental Writing

Writing portfolio prepared for AccuWeather

Selected writing samples from academic work in science writing, environmental studies, and GIS. These pieces demonstrate my experience communicating weather, climate, environmental science, and geospatial analysis to different audiences. Original citations, references, and source materials are retained where applicable.

Selected samples

1. Science News Story - Climate change, archaeology, and human resilience
2. Virginia "Goldilocks" Climate - GIS climate communication and interpolation
3. The Arctic, Extreme Winter Weather Events, and Climate Change?
4. Scientist Profile - Dr. Cassie Gurbisz and submerged aquatic vegetation
5. Scientific Article Summary - Lake Heatwaves Under Climate Change
6. Literature Review Excerpt - Food deserts, food insecurity, and rural communities

SCIENCE NEWS STORY

When Archaeology and Environmental Science Collaborate: Does Climate Change Mean Societal Collapse?

ENG 201 | March 16, 2021

For as long as the Earth has been inhabitable, the climate that fostered life has varied. Before humans roamed the planet, climate variations, or climate changes, determined what species survived or went extinct. When the climate changes significantly, not all species can withstand it, so they may end up going extinct. When many species go extinct at the same time, these periods become known as extinction events, such as the Permian-Triassic extinction event or the Cretaceous-Paleogene extinction event that killed the dinosaurs.

Of course, climate change has yet to cause our species to go extinct. Humans have withstood many extreme changes in climate, and advancements in technology, written history, and archaeology have allowed us to discover and learn about ancient human cultures that may have disappeared in part because of climate changes.

Notably, the climate during the existence of the Mayan civilization shifted dramatically, and climate was one factor affecting Mayan society. The climate during Mayan times was normally warm and humid, which allowed people to farm food that supported the population. Over time, the climate became cooler and drier. It became harder to farm and produce enough food to support the population.

The shift from a warm, humid climate to a cooler, drier climate is termed aridification. Researchers from Washington University in St. Louis, Missouri, and the Chinese Academy of Sciences conducted a study on the central plains of ancient China and its population during the Bronze Age. They investigated why the population did not collapse during a climatic shift into aridification. The results were published in *Environmental Research Letters* on January 22, 2021. Researchers found that despite aridification during the Neolithic-Bronze Age transition, from 4,000 to 3,700 years ago, the population did not collapse; instead, it increased dramatically.

The researchers gathered pollen samples, sediment cores, and radiocarbon-dated artifacts from the Neolithic-Bronze Age transition. Using field data, they theorized that from 3,900 to 3,500 years ago, the population dramatically increased because of new agricultural methods and technology, including the introduction of crops such as millet, wheat, soybean, and rice. These new species allowed for diversification of crops and helped reduce food-production risks. The population also improved water-management systems by implementing technology such as irrigation.

"People in the past were able to overcome climate adversity because they were willing to change," says Tristram R. Kidder, the Edward S. and Tedi Macias Professor of Anthropology in Arts & Sciences at Washington University in St. Louis. "Our work shows that we need to have a nuanced appreciation of human resilience as we consider the effects of climate and its effects on human societies."

Returning to the present day, Earth's current human population is forced to examine the consequences and effects of anthropogenic, or human-caused, climate change that will affect us and future generations. Perhaps climate change was once a world-ending proposition for ancient civilizations, but as the study shows, humans are more complex, flexible, and resilient than that. Kidder explains, "We have remarkable capacity to adapt. But part of the lesson here is that our social, political and technological systems have to be flexible." We humans are resilient, but living in a stressed environment will also require us to adapt.

Original source link

<https://iopscience.iop.org/article/10.1088/1748-9326/abdf0a>

Welcome to Virginia: The “Goldilocks” State for Lovers

GEOXL 181B Advanced GIS | October 6, 2025 | Selected excerpt

Virginia’s climate is often described as “just right.” The climate is classified as humid subtropical. The Commonwealth experiences four distinct seasons with mild temperatures and manageable humidity. The state contains regional variation shaped by the Atlantic Ocean, Chesapeake Bay, and Blue Ridge Mountains. From climates with coastal warmth to mountain chill, homebuyers can find the ideal climate that fits their lifestyle.

The Coastal and Tidewater Region includes Virginia Beach, Norfolk, Portsmouth, Hampton, Newport News, Poquoson, Smithfield, and Carrollton. This climate experiences mild winters and warm, humid summers moderated by the Chesapeake Bay and Atlantic Ocean. Temperatures range from 35-48°F in January and 70-87°F in August. The area generally experiences about 41 inches of annual rainfall. This climate is ideal for homebuyers who want to live a coastal lifestyle and participate in year-round outdoor recreation.

The Blue Ridge and Shenandoah Valley climate is cooler, less humid, and experiences crisp mountain air. This region is known for its scenic beauty. Temperatures range from 27-45°F in January and 65-86°F in August. The area experiences about 40 inches of rain annually. The lifestyle of this region is perfect for hikers, vineyard lovers, and people who want mountain views.

Interpolated Monthly Average Temperatures for the Month of January in Virginia Using the Kriging Method

Cartography By: Olivia Redmond
GEOXL181B

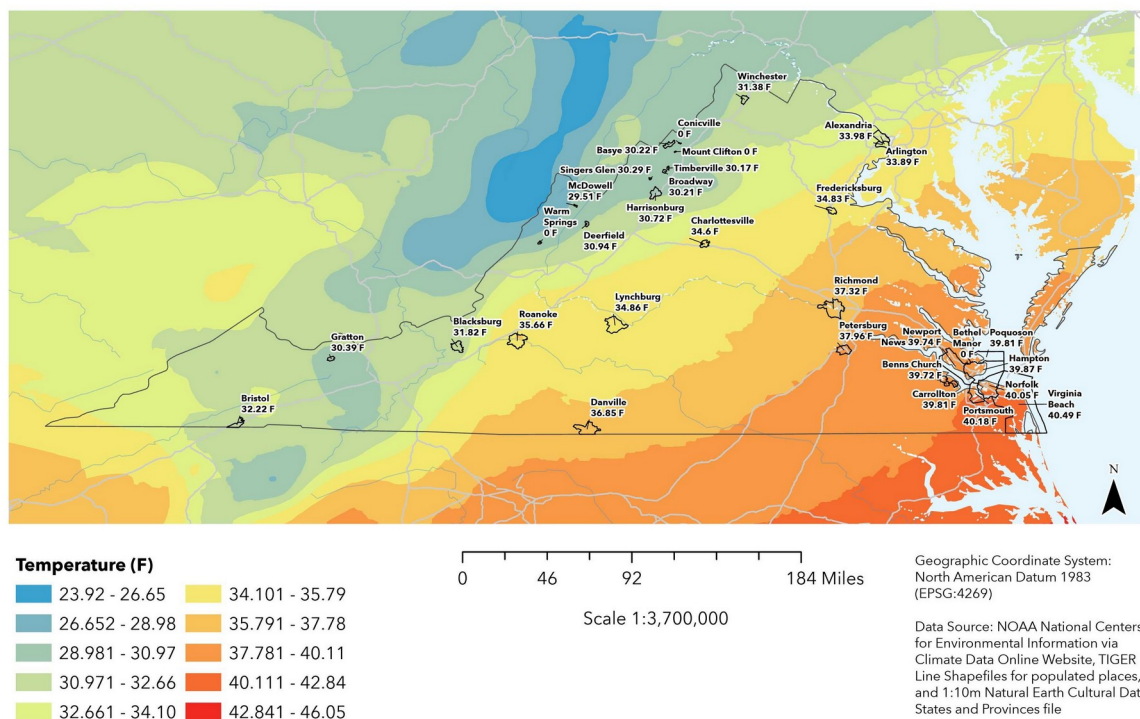


Figure 1. January average monthly temperatures interpolated across Virginia using Kriging.

Technical Addendum

The purpose of this technical addendum is to supplement the main brochure. I used an alternative interpolation method, Inverse Distance Weighted (IDW), to estimate average January temperatures across Virginia. The brochure features maps and tables using the Kriging method. This addendum compares the two methods and examines how interpolation techniques affect spatial temperature patterns, estimated values, and the rankings of the warmest and coolest locations.

Interpolated Temperature Values in the State of Virginia Using the Inverse Distance Weighted Method

Cartography By: Olivia Redmond
GEOXL 181B

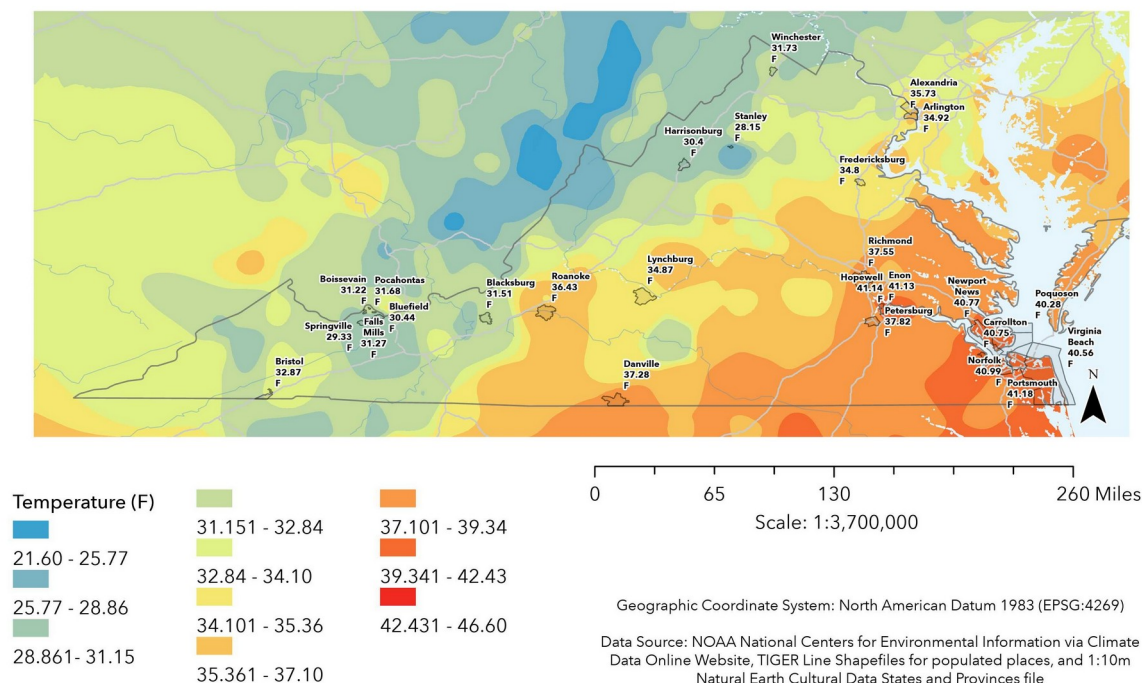


Figure 3. January temperature values interpolated across Virginia using the Inverse Distance Weighted method.

Both IDW and Kriging identify McDowell as the coldest area. Portsmouth emerged as the warmest under IDW, while Virginia Beach was warmest in Kriging. IDW produces slightly more extreme values due to its reliance on weighting values based on distance. Kriging smooths the surface using statistical modeling, reducing extremes but emphasizing spatial autocorrelation. The overall pattern of cooler temperatures in the west and warmer temperatures in the east remains the same, which supports a strong spatial trend across methods.

Sources retained from the original maps

- NOAA National Centers for Environmental Information via Climate Data Online Website
- TIGER/Line Shapefiles for populated places
- Natural Earth 1:10m Cultural Data - States and Provinces
- Geographic coordinate system: North American Datum 1983 (EPSG:4269)

The Arctic, Extreme Winter Weather Events, and Climate Change?

Original environmental research assignment

In an academic scientific journal article, “Warm Arctic episodes linked with increased frequency of extreme winter weather in the United States,” scientists Judah Cohen, Karl Pfeiffer, and Jennifer A. Francis observe potential relationships between Arctic warm periods and the frequency of severe winter weather events. The study finds that warmer Arctic periods are associated with more extreme winter weather, such as cold and snowstorms, in the eastern United States. The western United States experiences a different pattern, with mixed or milder winter weather during some warm Arctic periods.

Figure 8 from the paper shows the trend and association observed from PCH/PCT and AWSSI, a measurement index for winter severity in relation to the time in winter: early winter, mid-winter, and late winter. The figure allows the researchers to compare Arctic conditions with winter severity across several U.S. locations.

Figure 9 shows the frequency of heavy snowfall events during warm and cold periods in the Arctic. A colder Arctic period from 1950 to 1989 is shown in blue, and a warmer Arctic period from 1990 to 2016 is shown in green. In several eastern cities, the warmer period is associated with more frequent major snowfall events, while western cities show a different or weaker pattern.

The journal article leads scientists to continue observing Arctic temperature variations and severe winter weather frequency in North America. It expands our knowledge of severe weather affected by climate change from spring and summer events, such as hurricanes and tornadoes, to winter events such as Nor'easters. The study also shows why global warming does not simply mean that cold or snowy weather disappears.

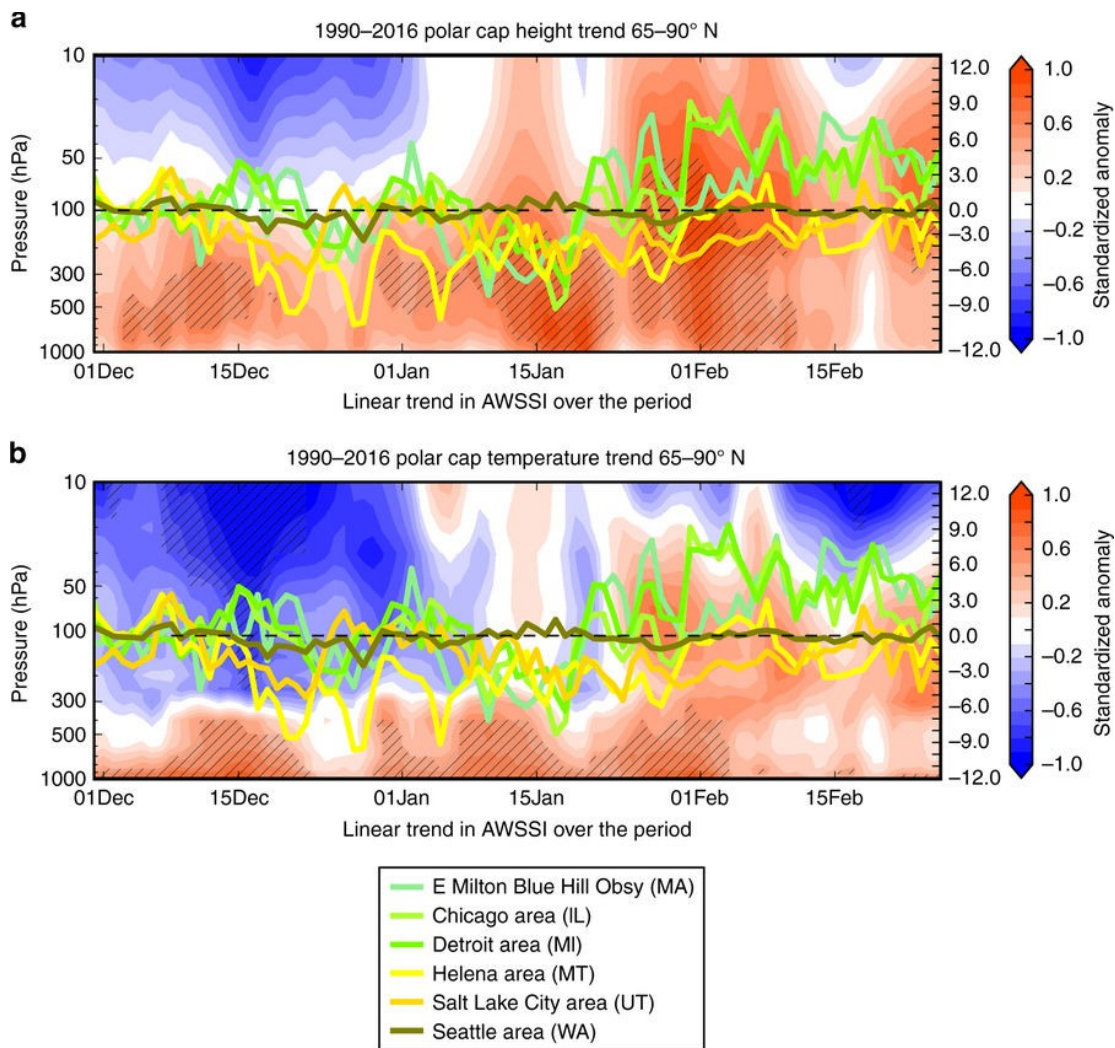


Figure 8 from the scientific article, retained from the original assignment.

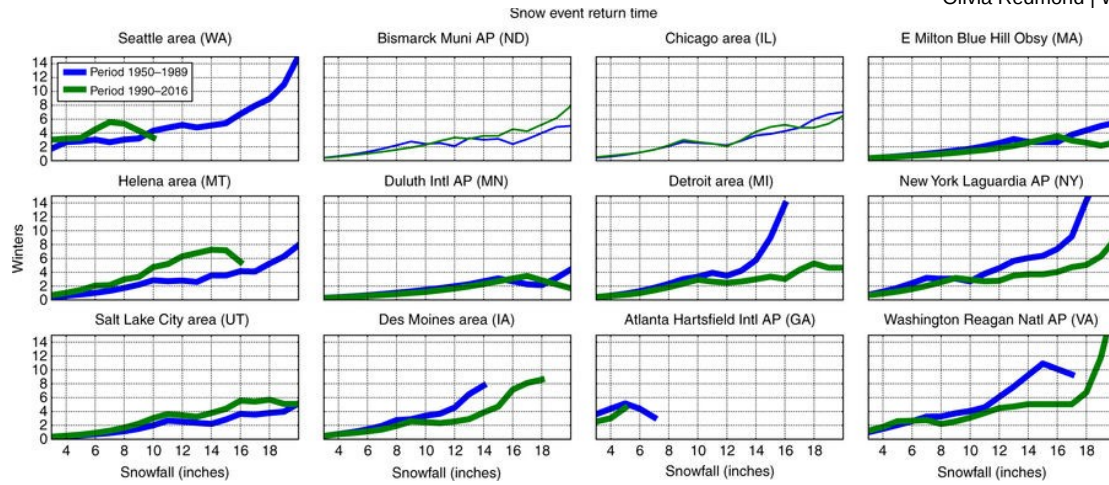


Figure 9 from the scientific article, retained from the original assignment.

Source retained from the original piece

- Cohen, Judah, Karl Pfeiffer, and Jennifer A. Francis. "Warm Arctic episodes linked with increased frequency of extreme winter weather in the United States."

SCIENTIST PROFILE

Dr. Cassie Gurbisz: An Ecosystem Ecologist Focusing on SAV*ENG 201 | February 16, 2021*

Submerged knee-deep in marsh mud stands a woman teaching environmental education to students, passionately teaching about the ecology of the marsh and the Chesapeake Bay surrounding it. Feet away from the marshes are underwater grasses that would become the subject of her doctorate research. These grasses are called submerged aquatic vegetation (SAV), and the woman teaching the students is Dr. Cassie Gurbisz.

Under greenish-blue brackish water are grasses called submerged aquatic vegetation. SAV provides essential ecosystem services such as creating habitat for fish and shellfish, protecting the shoreline from wave energy, and oxygenating the water. SAV are considered foundational species because they provide habitat for animals living in the Bay and food for consumer species in the food chain. SAV within the Chesapeake Bay are also considered indicator species because their presence is an indicator of the overall health of the Bay.

Dr. Gurbisz became interested in SAV when she decided to earn a doctorate at the University of Maryland Center for Environmental Science. She was drawn toward the water and SAV. Her Ph.D. dissertation focused on the environmental dynamics of a large bed of SAV in the upper Chesapeake Bay that had almost been wiped out by pollution and storms but recovered over the span of ten years.

The goal of her dissertation was to identify the environmental factors that led to the SAV bed's recovery. She found that significant nutrient-load reductions and increased water clarity during dry years helped the SAV bed recover.

Nutrient loads refer to the amount of suspended nutrients such as phosphorus or nitrogen that are present in the water, whether they are natural or human-caused. When the SAV bed started to recover, a feedback loop was established. The feedback loop consisted of growing seagrasses, water movement, and nutrient suspension in the water. This feedback loop contributed to the resilience of the SAV bed in the upper Chesapeake Bay.

The results of her dissertation and parts of her other research regarding the Susquehanna Flats were released to the public. The media and the public became very interested. Dr. Gurbisz's research showed evidence that nutrient-load reductions were beginning to affect the Chesapeake Bay environment.

Currently, Dr. Cassie Gurbisz's research focuses on an ecosystem-ecology approach to SAV. Ecosystem ecologists look at ecology from an ecosystem perspective. For example, many ecosystem ecologists focus on how carbon and nutrients cycle through an ecosystem and affect it. This kind of research can be seen in some of her past work, most notably the article "Long-term nutrient reductions lead to the unprecedented recovery of a temperate coastal region" in the Proceedings of the National Academy of Sciences.

Source named in the original piece

- "Long-term nutrient reductions lead to the unprecedented recovery of a temperate coastal region." Proceedings of the National Academy of Sciences.

SCIENTIFIC ARTICLE SUMMARY

Scientific Article Summary: Lake Heatwaves Under Climate Change

Science Writing | February 1, 2021

The scientific research article “Lake heatwaves under climate change” by Woolway et al. in the journal *Nature* models average surface temperatures in lakes and analyzes heatwave events from 1901-2099 and how they will change due to global warming. Lake heatwave events are defined as periods when surface-water temperatures are warmer than average for a duration of time. Researchers use three different climate models, RCP 2.6, 6.0, and 8.5, each representing a different greenhouse-gas emission scenario: minor, moderate, and heavy. The results showed that lake heatwave events occurred more frequently from 1901-1999. All models predict that lake heatwave events of any intensity will increase in frequency and become more intense. For deeper lakes, heatwave events will be less intense but have a longer duration.

Source retained from the original piece

- Woolway et al. “Lake heatwaves under climate change.” *Nature*.

LITERATURE REVIEW EXCERPT

Food Deserts, Food Insecurity, and Nutritional Assistance Programs: Effects on Rural Communities

ENST 490 | November 15, 2020

This literature review focuses on the effects of food-desert conditions on rural communities in the United States of America. I identify specific groups, if any exist, that are disproportionately affected by food insecurity in rural areas. I examine the health effects of food deserts on rural communities in the U.S. and largely affected populations within those communities. I also explore current and future solutions to food insecurity in rural areas, such as community-based programs and nutritional-assistance programs.

The U.S. Department of Agriculture defines a food-desert census tract by two indicators: the tract must be low income, and a third of the population must have low access to large grocery stores or supermarkets greater than one mile away in metropolitan areas or greater than ten miles away in rural areas (Block et al. 2015; Miller et al. 2016; Ploeg 2011).

Food deserts are often places where it becomes difficult for the population to maintain food security. Food security is defined as a measurement of how readily available nutritional and adequate food sources are to households within a specific population (Anderson 1990; Coleman-Jensen 2012; USDA ERS Measurement). A food-insecure household is characterized by the limitation or uncertainty of nutritional, adequate, and safe foods being available in socially acceptable ways (Anderson 1990; USDA ERS Measurement).

Case Studies and Reports

All of the case studies recommend that a community-based and flexible approach be used to start alleviating food insecurity by aiming to change the structure and social life of a community (Ahmed et al. 2019; Miller et al. 2016; Pollard et al. 2019; Sundberg et al. 2020).

Both case studies of Native American reservations are in remote areas where community-based approaches are used to address food insecurity and related health issues (Ahmed et al. 2019; Sundberg et al. 2020). Both case studies involve fruits and vegetables: one studies the effects on the Flathead Reservation in the Rocky Mountain region, and the other designs a "Navajo Fruit and Vegetable Prescription (FVRx)" in the Navajo Nation (Ahmed et al. 2019; Sundberg et al. 2020).

Selected references from the original literature review

- Ahmed, Selena, Byker, Shanks Carmen, Dupuis, Virgil, and Pierre, Mike. "Advancing Healthy and Sustainable Food Environments: The Flathead Reservation Case Study," August 15, 2019.
- Block, Jason P., and S. V. Subramanian. "Moving Beyond 'Food Deserts': Reorienting United States Policies to Reduce Disparities in Diet Quality." PLOS Medicine 12, no. 12 (2015): e1001914. <https://doi.org/10.1371/journal.pmed.1001914>
- Coleman-Jensen, Alisha, and Mark Nord. U.S. Household Food Security Survey Module. Sept. 2012, p. 12.
- Miller, Wayne, et al. "Community Adaptations to an Impending Food Desert in Rural Appalachia, USA," 2016. <https://www.rrh.org.au/journal/article/3901>
- Ploeg, Michele Ver, David Nulph, and Ryan Williams. "USDA ERS - Data Feature: Mapping Food Deserts in the U.S.," 2011. <https://www.ers.usda.gov/amber-waves/2011/december/data-feature-mapping-food-deserts-in-the-us/>
- Pollard, Christina M., and Sue Booth. "Food Insecurity and Hunger in Rich Countries—It Is Time for Action against Inequality." International Journal of Environmental Research and Public Health 16, no. 10 (2019): 1804. <https://doi.org/10.3390/ijerph16101804>
- Sundberg, Michael A., et al. "Implementation of the Navajo Fruit and Vegetable Prescription Programme to Improve Access to Healthy Foods in a Rural Food Desert." Public Health Nutrition 23, no. 12 (2020): 2199-2210. <https://doi.org/10.1017/S1368980019005068>
- USDA ERS - Definitions of Food Security. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security/>
- USDA ERS - Measurement. <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement.aspx>