

Air Quality Literacy

A Guide for the University of Utah



Air Quality Literacy

WHAT IS AIR QUALITY LITERACY?

The Air Quality Literacy document aims to inform the University of Utah community about air quality issues along the Wasatch Front and provide the community with knowledge about how to make positive changes around this issue.

More specifically, this document highlights why air quality matters, the science behind why the Salt Lake Valley has inversions, and actions that individuals can take to improve air quality.

FRAMEWORK FOR UNDERSTANDING THIS DOCUMENT

Issues surrounding poor air quality are a global challenge, but we have unique circumstances, challenges, and opportunities for improvement in the Salt Lake Valley.

The Clean Air Act was created by the EPA to develop national programs, technical policies and regulations for controlling air pollution.

Regulating air pollution is a priority of the federal government because air pollution can cause adverse health effects in humans.¹

The Wasatch Front is plagued with poor air quality during the winter months between November and February.² This is in part due to pollution being trapped by the mountains that surround Salt Lake Valley and by human activities, particularly vehicle emissions, continually adding to trapped pollution.

Air pollution in the Salt Lake Valley is characterized by high levels of particulate matter smaller than 2.5 microns (PM_{2.5}) and is commonly referred to as an "inversion."²

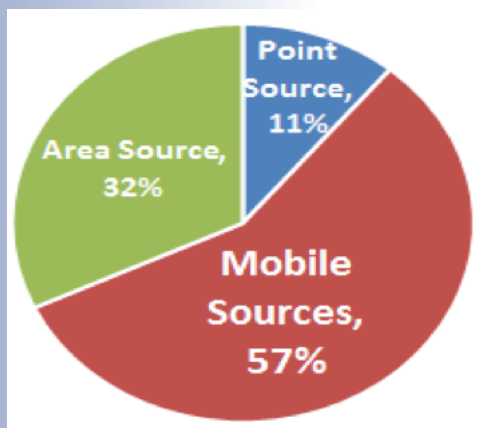
[1] U.S. Environmental Protection Agency, 2014. Air and Radiation. Retrieved from <http://www.epa.gov/air/> [2] Silcox et al., 2012, Wintertime PM_{2.5} concentrations during persistent, multi-day cold air pools in a mountain valley, *Atmospheric Environment*, 46: 17-24



Air Quality in Salt Lake City

The mountainous terrain that surrounds the Salt Lake Valley offers a beautiful scenery, but also leads to stable atmospheric conditions and temperature inversions (cold air in the valley capped by warm air above) during the wintertime. These wintertime “inversions,” or persistent cold air pools, cause daily emissions to accumulate in the valley, which leads to dangerous levels of particulate matter (PM_{2.5}) in the valley air.^{3,4}

PM_{2.5} are airborne particles that are smaller than 2.5 micrometers in diameter. One-third of PM_{2.5} particles are emitted directly into the air, while the other two-thirds of PM_{2.5} come from secondary chemical reactions in the air.³ According to the Utah Division of Air Quality, 57% of wintertime emissions (including primary & secondary PM_{2.5}) are contributed by “mobile sources,” the majority of which are personal and commercial vehicles.⁵



Wasatch front wintertime emission sources⁵



Air quality monitors measure PM_{2.5} and other pollutants at several locations in the Salt Lake Valley.

In addition to wintertime poor air-quality conditions, the Salt Lake Valley experiences elevated concentrations of ground-level ozone during the summertime.

Ozone is a clear, colorless gas composed of molecules of three oxygen atoms. Ozone is formed when volatile organic compounds (VOCs) react with nitrogen oxides (NO_x) in the presence of sunlight and heat.⁶ Not to be confused with stratospheric ozone, ground-level ozone can be inhaled and cause health problems. While ozone is created year-round, summer conditions often result in the highest ground-level ozone concentrations.⁷ According to the Utah Division of Air Quality, the largest source of both summertime VOCs and NO_x are on-road vehicle emissions.⁷

[3] Silcox et al., 2012, Wintertime PM_{2.5} concentrations during persistent, multi-day cold air pools in a mountain valley, Atmospheric Environment, 46: 17-24 [4] Kelly et al., 2013, Receptor model source attributions for Utah's Salt Lake City airshed and the impacts of wintertime secondary ammonium nitrate and ammonium, chloride aerosol, Journal of the Air & Waste Management Association, 63:5, 575-590 [5] Utah Division of Air Quality, March 26, 2014. Emission Sources of Winter PM 2.5. Retrieved from <http://www.deq.utah.gov/FactSheets/fspages/sources.htm> [6] Utah Division of Air Quality, Choose Clean Air. Retrieved from <http://www.cleanair.utah.gov/>. [7] Utah Division of Air Quality. Utah Division of Air Quality 2012 Annual Report. Retrieved from <http://www.airquality.utah.gov/Public-Interest/annual-report/pdf/2012Annual%20Report.pdf>.

Why does air quality matter?

Poor air quality has direct health effects. Air pollution is considered the world's largest environmental health risk with 1 in 8 deaths worldwide caused by breathing contaminated air.^{8,9}

- **Common Symptoms:** Burning or watery eyes, coughing, sneezing, fatigue, dizziness, headaches, upper respiratory congestion, breathing difficulties and asthmatic episodes.¹⁰

- **More Severe Health Effects:** Damage to immune, neurological, and reproductive systems, muscle pain, irregular heart rhythms, nausea, vomiting, fever, hearing loss, cancer, and even death.^{10,11}

Particulate matter concentrations in the Salt Lake Valley often exceed health standards. Three regions along the Wasatch Front are considered in "non-attainment" and exceed current federal regulations during wintertime "inversions."¹² During "inversions", Emergency Room visits for asthma related symptoms rise almost 42%. A recent study from Harvard University has also positively correlated particulate matter pollution with autism, of which Utah has the highest rate per capita.⁴



Poor air quality has adverse health effects.

There are economic consequences of poor air quality:

- Increased health care costs as well as time away from work for individuals affected by poor air quality related illness.⁹

- The Salt Lake Valley acts as a hub for tourism and outdoor recreation, a multi-billion dollar industry, throughout the State of Utah. The yellow haze of the "inversion" effects visibility, detracts from the aesthetic qualities of the Wasatch Front, and decreases the appeal to tourism and recreational businesses.¹³

- Poor air quality deters new businesses and industries from moving to or developing in Utah due to the health risk associated with living in the Salt Lake Valley.¹⁴

- Air pollution can also stunt the growth and yield of nearby agricultural crops causing billions of dollars of losses annually.¹⁵

[8] World Health Organization, March 2014. Indoor Air Pollution and Health: Fact sheet N°292, Retrieved from who.int/mediacentre/factsheets/fs292/en/. [9] World Health Organization, March 2014. Ambient (outdoor) air quality and health: Fact sheet N°313, Retrieved from who.int/mediacentre/factsheets/fs313/en/. [10] U.S. Environmental Protection Agency, Feb. 2011, Health and Welfare Benefits Analyses to Support the Second Section 812 Benefit-Cost Analysis of the Clean Air Act. Chapter 2 Estimation of Human Health Effects and Economic Benefits. Retrieved from epa.gov/air/sect812/feb11/benefitsfullreport.pdf. [11] Andrea L. Roberts, et al., "Perinatal air pollutant exposures and autism spectrum disorder in the children of Nurses' Health Study II participants," Environmental Health Perspectives, 2013 [12] Utah Division of Air Quality, Division of Air Quality 2013 Annual Report. Retrieved from airquality.utah.gov/docs/2013AnnualReport_FINAL.pdf [13] Utah Economic Council. 2014. Utah Economic Outlook. pg. 32. Retrieved from business.utah.edu/sites/default/files/media/outlook.pdf [14] Division of Air Quality, 2012, October 11. It's Up To all of Us [Video file]. Retrieved from youtube.com/watch?v=V19WF1FptG4. [15] National Oceanic and Atmospheric Administration, 2009. State of the Science FACT SHEET: Air Quality. Retrieved from esrl.noaa.gov/csd/factsheets/airqualitysys.pdf

What can I do?



Live near the U

- Choosing housing near the University, near work, near a grocery store, and along bus and train routes will greatly reduce your need to drive. In addition, getting out of your car can make life more fun!

Carpool

- **Enterprise Car Share** offers hourly rentals of a variety of vehicles at several locations throughout downtown Salt Lake City and also the University of Utah campus. The rental includes fuel, insurance, and roadside assistance: enterprisecarshare.com/car-sharing/program/SLC
- **UTA's free ridematch system** makes it easy to find other commuters in the Salt Lake Valley you can carpool with: utaride-share.com
- **Zimride** is another excellent carpooling service: zimride.com. With a Zimride profile you can find a ride in your area, or post a ride of your own. Zimride uses social networking so you can check out the interests of other drivers and riders before you share a ride.



Bike

- **BikeSLC** website has a wealth of information to aid you in biking to campus, including a detailed map of Salt Lake City's bike routes: bikeslc.com
- Downtown Salt Lake City features a bicycle sharing system named **GREENbikeSLC**, which offers daily, weekly, and annual memberships: greenbikeslc.org
- **The Salt Lake Bicycle Collective** offers classes on bicycle maintenance and also used bicycles for sale: bicyclecollective.org
- **The Salt Lake County Bicycle Ambassador Program** offers county-wide bicycle mentorship: activetransportation.slco.org
- **The University of Utah** also has bicycle repair stations at several locations on campus.

What can I do?

Bus

- The University of Utah offers **free shuttles** that connect campus. Service is also provided for those with special needs: commuterservices.utah.edu/mass-transit/shuttles.

- The University of Utah has partnered with the Utah Transit Authority (UTA) to provide **unlimited free bus and rail travel** to students, faculty, and staff throughout UTA's system: www.rideuta.com.

Train

- **FrontRunner** commuter rail connects Ogden in the north and Provo in the south to Salt Lake City along with intermediate stops.

- Three **TRAX** light rail lines connect communities throughout the Salt Lake Valley with downtown and the University.

- A **streetcar** line connects the Sugar House neighborhood with the TRAX light rail.

- You can also take your **bicycle** with you when riding on UTA vehicles.

How to?

- There are many smartphone **apps** available to help you know how to get from point A to point B using public transit.

- Visit **UTA's App Center** page to see what apps are available for your phone: www.rideuta.com search "App Center."

- UTA also offers **Ride Time**, an SMS text message service that gives riders real-time bus departure information: rideuta.com search "Ride Time."

- **Google maps** transit directions is another great option for knowing bus routes, cycling routes, or walking routes.

