

## Chapter 3

## AIR

## Key issues facing Utah's air

- 3.A Summertime Ozone On The Wasatch Front
- 3.B Managing Utah's Air: Progress on Particulate Matter
- 3.C The Impacts of Wildfire on Air Quality
- 3.D Successes Of The Utah Pollinator Habitat Program
- 3.E The Science of Contrails

WINDBLOWN DUST OVER CACHE VALLEY | STEVE SMITH

## Chapter Introduction

BRIAN STEED

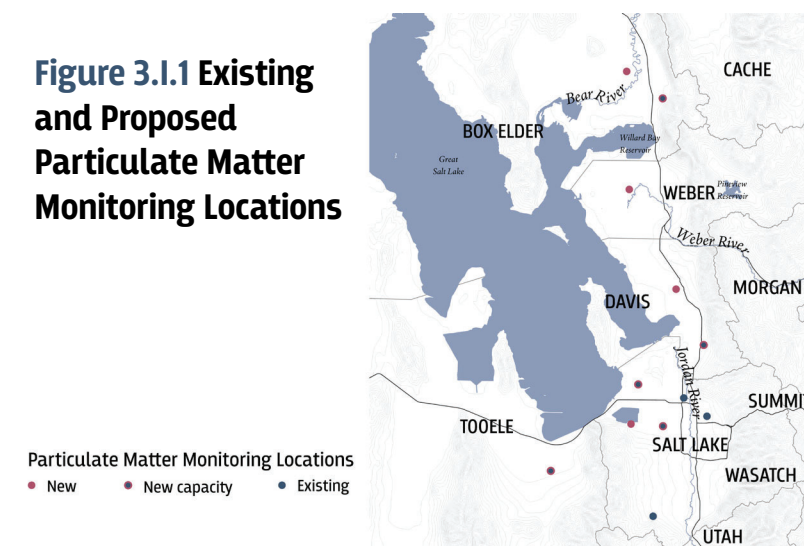
Utah's air challenges are statewide—stretching from the Wasatch Front and Cache Valley to the Uinta Basin and communities downwind of the Great Salt Lake. Strengthening air quality monitoring and implementing emission-reduction strategies gives policymakers and residents the tools to better protect public health, guide investments, and respond to the most pressing sources of pollution.

In 2025, the Utah Division of Air Quality advanced a major expansion of its dust particulate (PM<sub>10</sub>) monitoring network. A preliminary plan for 19 new dust monitors—a mix of continuous and filter-based instruments—was designed to monitor dust from the Great Salt Lake, West Desert, Sevier Dry Lake, and other playas. These new data sources will help scientists and regulators understand the timing, severity, and composition of dust events that affect nearby communities and accelerate snowmelt in mountain watersheds.

Along the Wasatch Front, summer ozone remains one of the most persistent air quality challenges. Hot, sunny days combine with vehicle emissions, industrial activity, wildfire smoke, and complex mountain-valley meteorology to create ozone concentrations that regularly exceed federal health standards. Recent multi-agency research efforts, such as the Utah Summer Ozone Study, are expanding monitoring and chemical analysis to better identify the sources and conditions driving these spikes. These findings are critical to help refine strategies that will reduce ozone precursors and protect public health during peak summer months.

Expanded monitoring for both dust and ozone supports health and deepens our scientific understanding of Utah's unique air quality dynamics. Just as importantly, it creates a foundation of trusted data that can guide state policy while giving local communities the information they need to adapt and respond.

**Figure 3.1.1 Existing and Proposed Particulate Matter Monitoring Locations**



Map Created by Kori Ann Kurtzeborn, Data from Utah Department of Environmental Quality



WINDBLOWN DUST OVER CACHE VALLEY | STEVE SMITH



# Summertime Ozone on the Wasatch Front

BECKY CLOSE & RYAN BARES



Substantial progress has been made to reduce ozone forming emissions, yet ozone levels remain stagnant. Research is required to identify effective reduction targets for locally caused ozone pollution.

*Terms to Know:*  
Precursor: Chemical, like nitrogen oxides or VOCs, that reacts to create ozone

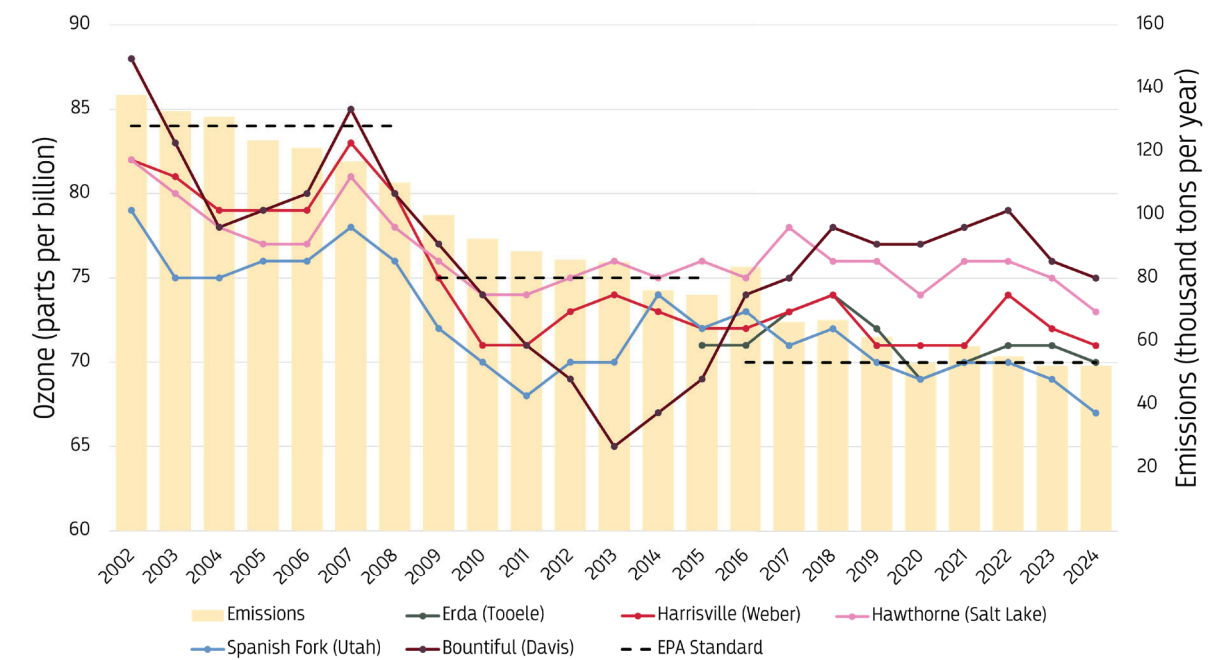
Ozone is a persistent and difficult pollution problem to solve in several metropolitan areas in the Intermountain West, including the Wasatch Front. Ozone is a highly reactive, invisible gas that when inhaled burns and irritates the lungs. Exposure to high concentrations of ozone has negative health impacts, especially for those with preexisting respiratory issues, and those exercising or working outside midday during the summer months.

Implementation Plan that includes reasonable strategies to reduce ozone forming emissions.

The state has made substantial progress over the past two decades to reduce ozone forming emissions; however, ozone levels have remained stagnant or increased over the last 10 years. Natural, background, and international emissions also contribute to the problem. To better understand what's happening in the local airshed and determine what policy options are available to reduce local contributions to ozone, the Division of Air Quality will focus on study data collected at Utah's Photochemical Assessment Monitors and during the recent Utah Summer Ozone Study. The results of this research will help the state identify and target specific policies to more effectively reduce the local human-caused pollutants responsible for ozone formation.

Ozone is a summertime pollutant of concern for the Wasatch Front, which continues to exceed the health-based standard of 70 parts per billion (ppb), despite significant progress reducing ozone forming emissions. The Wasatch Front is currently designated as moderate nonattainment status under the Clean Air Act, and the state has submitted to the Environmental Protection Agency a State

Figure 3.A.1 Ozone Levels and Precursor Emissions



# Northern Utah Ambient Particulate Matter in 2025

RANDAL MARTIN

Utah has achieved progress in cutting winter  $PM_{2.5}$ . New studies and monitoring capacity will provide additional insights on how to improve summer  $PM_{10}$ .

*Terms to Know:*  
Design Value: EPA's calculated pollution level used to determine air quality compliance.

Airborne particulate matter, especially along the Wasatch Front and in Cache Valley, is one of Utah's biggest air quality concerns. Regulators track two main types:  $PM_{10}$  (particles smaller than 10 microns) and  $PM_{2.5}$  (smaller than 2.5 microns).  $PM_{10}$  can be inhaled into the lungs, while  $PM_{2.5}$  is more dangerous because it reaches deep into the lungs and can harm long-term health.

Front continue to drop. Utah has now submitted documents to the EPA requesting that the Wasatch Front receive a "Clean Designation," a decision expected in 2025. These gains came even as Utah's economy and population grew.

Over the past two decades, Utah has made major progress in reducing  $PM_{2.5}$  during winter inversions. In the mid-2000s, parts of northern Utah were labeled "non-attainment" areas by the U.S. Environmental Protection Agency, meaning air quality did not meet federal standards. Since then, scientists, regulators, industries, and community members worked together to understand how weather, emissions, and chemistry combined to create Utah's unique ammonium nitrate-based winter pollution. That collaboration led to new State Implementation Plans and a series of strategies to reduce emissions.

Dust has become a newer concern. As the Great Salt Lake shrinks, exposed lakebed can release fine dust during strong wind events. Similar conditions also occur at Sevier Dry Lake and in the West Desert. Most of this dust is made of natural earth materials, but it can sometimes include small amounts of harmful metals such as arsenic or selenium. These episodes are usually short-lived, lasting a few hours, but they can create very high temporary  $PM_{10}$  levels. Even brief exposure to high dust concentrations can affect lung function. To better understand the risk, the Utah Division of Air Quality has plans to add monitors around the Great Salt Lake, and universities and state agencies have formed a working group to guide research and policy.

The results have been significant. Cache Valley reached compliance in 2021, and design values for the Wasatch



EXPOSED LAKEBED ON THE GREAT SALT LAKE | STEPHANIE FROHMAN

Figure 3.B.1  $PM_{2.5}$  Concentrations and Gross Domestic Product Change

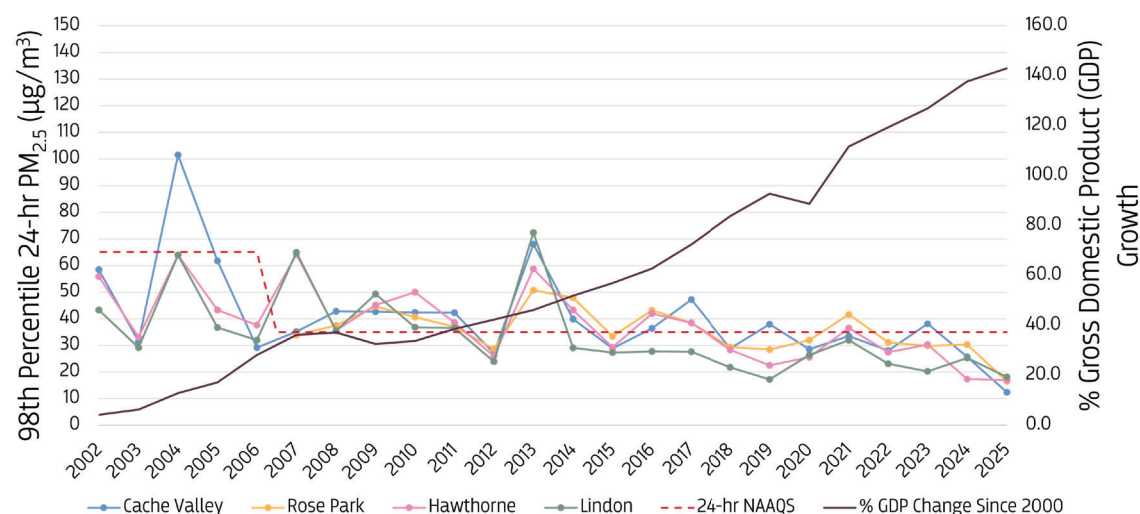
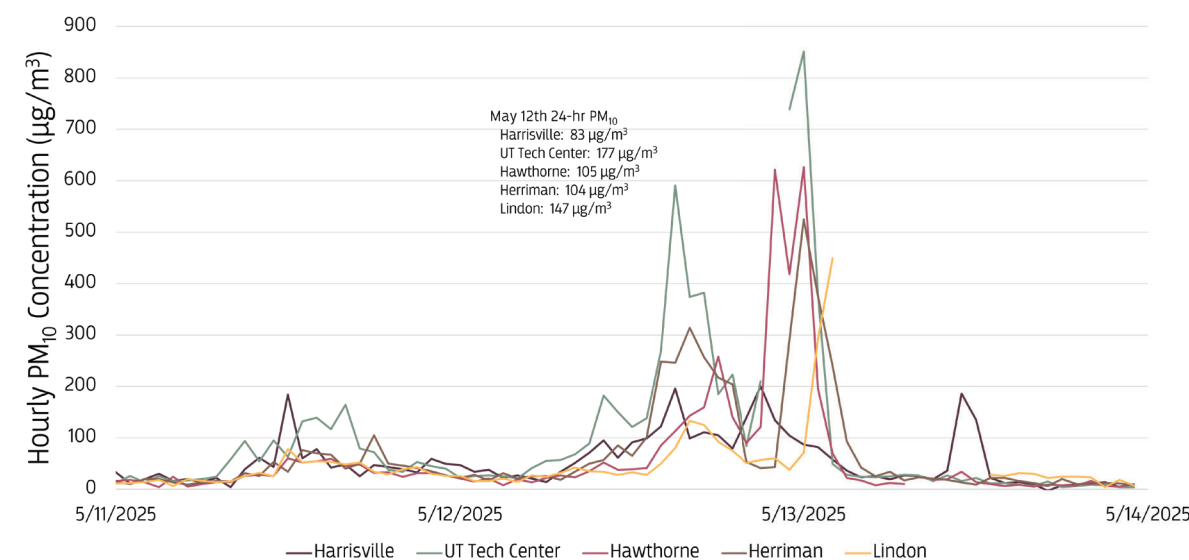


Figure 3.B.2 May 2025 Hourly  $PM_{10}$



# The Impacts of Wildfire on Air Quality

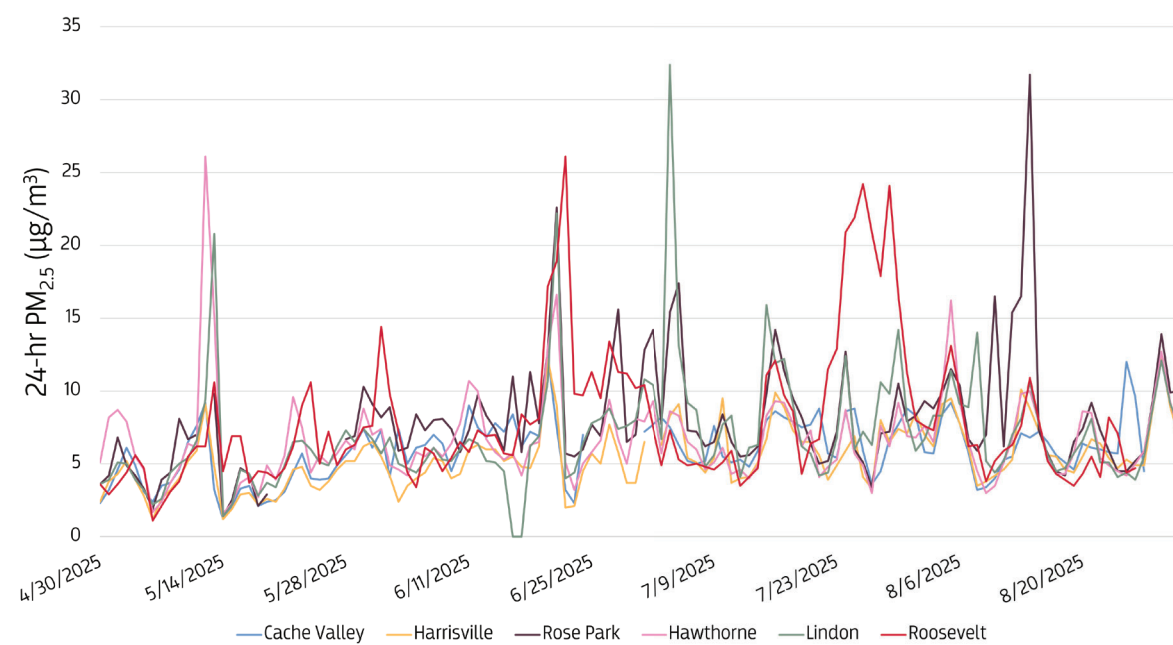
RANDAL MARTIN

Wildfires bring localized particulate matter pollution during summer months. Its chemical composition varies from typical particulate matter pollution, presenting new health challenges.

Wildfire season across the western United States often leads to transport of particulate matter and other pollutants across long and local scales. Unlike winter inversions, which tend to be more localized, wildland fire plumes can either cover statewide areas or be more regionally limited depending on the location of the active burns. Wildland fire particulate matter is also compositionally different, being dominated by organic and inorganic carbon species, as opposed to the ammonium nitrate found in Utah's wintertime particulate. Wildland fires led to decreased air quality in Utah's urban centers approximately 18 days over the summer of 2024. As can be seen in Figure 3.C.1, Utah's broader airsheds were not comparatively impacted as frequently, with only two major episodes observed: one in June and a second in late July. NOAA's Hazard Mapping System Fire and Smoke Product and the U.S. Forest Service's databases show that the Forsyth fire and the France Canyon fire, both in southern Utah, produced

smoke plumes that strongly impacted most of Utah during mid-to-late June. These databases further support more significant impacts towards northeast Utah as measured at the Roosevelt site, but not the as much at the Wasatch Front locations in late July due the Monroe Canyon fire and the Arizona fires near the Grand Canyon National Park. The additional PM<sub>2.5</sub> peaks, observed at Hawthorne in May and Rose Park in August, are not known to be associated with wildland fire impacts. It is important to point out that even though these episodes can approach regulatory levels, they may be regulatorily "discounted" via exceptional event declarations. Regardless of a discount, the pollution still exists within the local atmosphere and can therefore still create a health burden for residents. Regulators and local governments would do well to watch for these events and recommend personal protective measures where appropriate.

Figure 3.C.1 Summer 2025 PM<sub>2.5</sub>



# Successes of the Utah Pollinator Habitat Program

MINDY WHEELER

The Utah Pollinator Program enables property owners to engage in conservation by providing pollinator habitat.

*Terms to Know:*

**Pollinator:** Animal, often bees or butterflies, that moves pollen to help plants reproduce.

The Utah Pollinator Habitat Pilot Program was founded in 2021 with the passage of H.B. 224 Pollinator Amendments. Given program success, the Legislature voted to provide ongoing funding to the Utah Pollinator Habitat Program, creating a permanent initiative under the Utah Department of Agriculture and Food's (UDAF) Conservation Division in 2025. With this development also came the capacity to oversee the continuation of existing services and the expansion of the program's reach and scope.

The Utah Pollinator Habitat program accepts applications from Utah residents for "pollinator

habitat kits" consisting of about 30 plant plugs, each composed of native upland or wetland species. The kits are designed to cover pollinator needs across seasons and regions of Utah. UDAF has partnered with the Utah State Correctional Facility horticulture program to grow the plants for the kits.

Applications for the kits are assessed based on regional needs and potential for project success. Applicants can apply for multiple kits based on the size of their property and suitable space and are required to submit an annual report of their project progress for a three-year period following award. The reports provide valuable information on the progress of the habitats and individual plant success.

The accomplishments of the program in 2024 and combined for the 2022-2024 program are shown in the figure.

LEFT: FLOWERS AND POLLINATORS | ROBB HANNAWACKER

BELOW: POLLINATOR HABITAT KITS | MINDY WHEELER



FLOWERS AND POLLINATORS | ROBB HANNAWACKER

Figure 3.D.1 Pollinator Program Accomplishments

| Number of:                                     | 2022      | 2023       | 2024       | Total      |
|--|-----------|------------|------------|------------|
| Applicants                                     | 327       | 341        | 486        | 1,154      |
| Awardees                                       | 103       | 210        | 366        | 679        |
| Plants Grown Out                               | 15,840    | 43,000     | 80,000     | 131,000    |
| New Areas Converted to Pollinator Habitat      | 9 Acres   | 17 Acres   | 17 Acres   | 41 Acres   |
| Gallons of Water Saved by New Program Awardees | 6,501,375 | 10,835,625 | 12,280,377 | 29,617,380 |



POLLINATOR HABITAT KITS | MINDY WHEELER

# The Science of Contrails

ROBERT GILLIES



Science from the age of steam helps explain contrail formations. Depending on atmospheric circumstances, sometimes they are visible and at other times invisible.

*Terms to Know:*

**Contrail:** Line-shaped clouds formed by aircraft exhaust mixing with moist cold air.

During the age of steam, in the late 19th century, it was critically important to understand how the liquid phases of water would change with temperature. Two scientists, a French engineer Émile Clapeyron and a German physicist Rudolf Clausius, derived the relationship in 1834—in recognition of their achievement, the relationship is called the Clausius-Clapeyron equation. In a nutshell, the Clausius-Clapeyron equation explains the amount of moisture in the atmosphere.

Commercial aircraft fly at high altitudes where the air is very cold. Per the Clausius-Clapeyron equation, it doesn't take much water vapor, produced by the plane's engines, to condense onto the engine's soot particles and form a cloud, which subsequently freezes to form ice crystals. This reaction results in a thin wispy appearance, also known

as a cirrus cloud. These clouds are referred to as aircraft contrails—a contraction of condensation trails.

So, why don't all commercial aircraft produce persistent contrails? The answer lies in the fact that the cold air at altitude is very dry, so much so that the ice crystals sublimate (pass directly from solid to vapor.) This process, along with the fact that the aircraft is moving very fast, explains the transitory nature of the contrails. There are atmospheric circumstances where the air at altitude becomes humid, like the approach of a storm front. In these cases, the ice particles cannot sublimate, and so contrails can hang on for longer, remaining visible in the sky. This explains why sometimes we see contrails but often we do not.

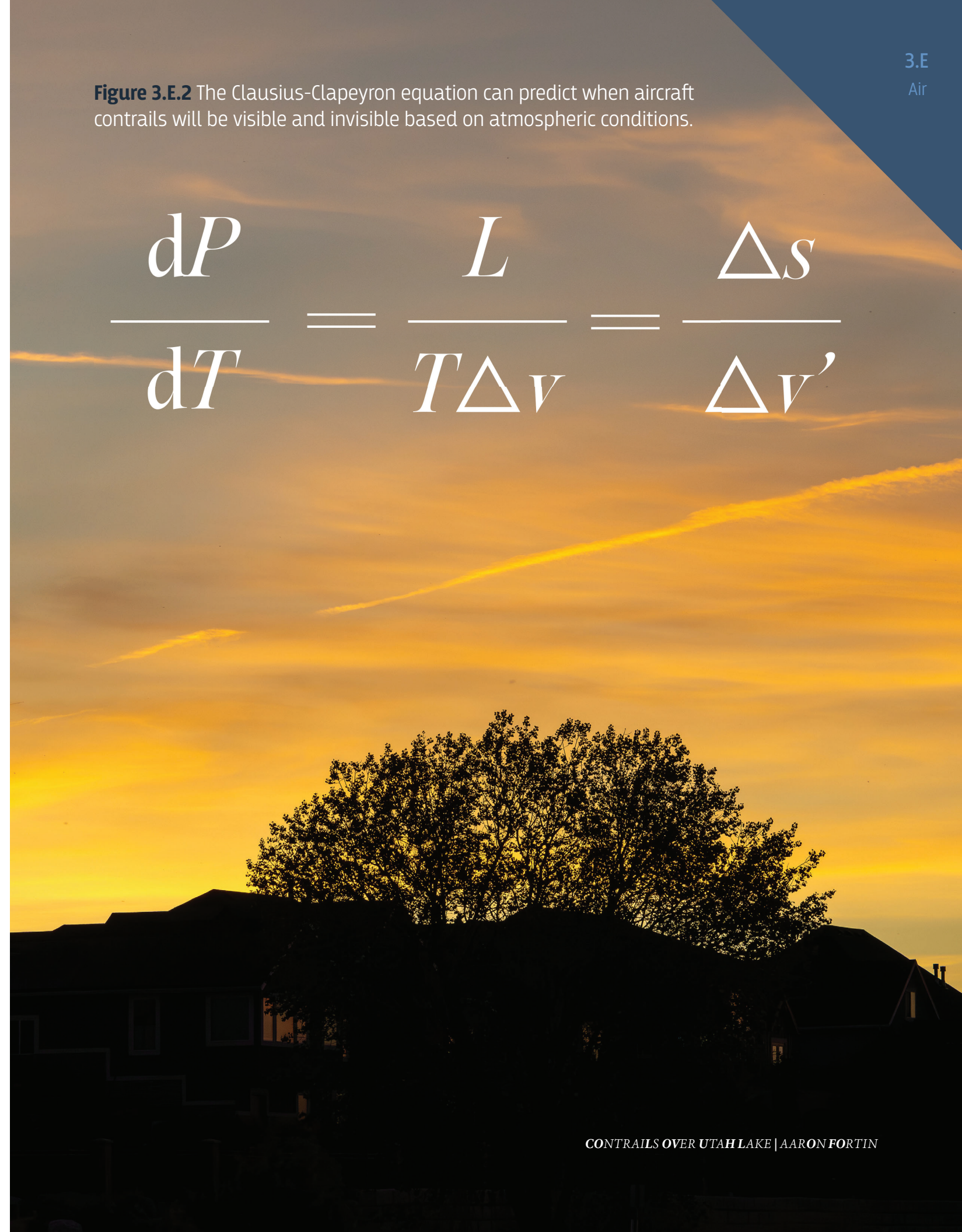
**Figure 3.E.1** Contrails Recorded In Logan, UT, Before Rainstorm.

After several dry months, the North American Monsoon transported upper-level moisture Northward to Cache Valley, resulting in visible contrails and high cirrus seen here on the USU campus on September 8th, 2025. The following day 200th of-an-inch of rain was measured at USU's weather observatory.



**Figure 3.E.2** The Clausius-Clapeyron equation can predict when aircraft contrails will be visible and invisible based on atmospheric conditions.

$$\frac{dP}{dT} = \frac{L}{T\Delta v} = \frac{\Delta s}{\Delta v'}$$



CONTRAILS OVER UTAH LAKE | AARON FORTIN

# Utah's AIR in the news

Within the past year, state and national outlets reported widely on air quality challenges in Utah. These are some of the key topics that stayed in the news cycle.

## 1. RADIATION EXPOSURE COMPENSATION ACT RENEWED

Congress extended the Radiation Exposure Compensation Act (RECA) through 2028. Eligibility was broadened to include more cancers and more affected communities across the Intermountain West. Uranium workers remain eligible for compensation. The program provides financial assistance to those exposed during nuclear testing or uranium industry work, though policymakers continue to discuss whether further expansion is warranted.

## 2. OZONE LEVELS AND AIR QUALITY STANDARDS

Utah leaders and residents remain concerned about ozone pollution. Both the Wasatch Front and the Uinta Basin experience elevated ozone—along the Wasatch Front during summer heat and winter inversions, and in the Uinta Basin due to oil and gas production. The state has asked the EPA to reconsider how standards account for meteorological conditions that Utah cannot control, while federal discussions continue over how regulations will be applied.

## 3. WILDFIRE SMOKE WORSENS SUMMER AIR

The 2025 wildfire season was one of Utah's most active for human-caused fires, many occurring near populated wildland-urban interface areas. As a result, more Utahns were exposed to smoke. Air quality deteriorated for multiple days in central and southern Utah, with PM<sub>2.5</sub> levels spiking in Washington and Grand Counties during July.

## 4. EXPANDING DUST MONITORING AROUND GREAT SALT LAKE

The Utah Department of Environmental Quality (DEQ) installed or planned 19 new monitors in 2025 to measure dust impacts from exposed Great Salt Lake lakebed and other sources. Dust is difficult to track, but these monitors will give state scientists better data about how windblown dust affects nearby communities. Officials say additional monitors may be added in the future.

## 5. HALOGEN EMISSIONS REGULATION (H.B.240)

In 2025, the Utah Legislature passed H.B.240, giving the Division of Air Quality authority to regulate halogen emissions. These pollutants—released primarily from industrial sources—are known to amplify winter inversion pollution episodes by as much as 25%. State leaders and air quality experts agree that successful implementation will depend on building robust data collection systems and clear regulatory standards.

### What's going on in Utah's land, water and air?

We publish a weekly email newsletter containing a roundup of stories in the media related to Utah's land, water, and air. This year, we shared nearly 2,000 stories, primarily from local media, with additional coverage from national outlets. Subscribe to our weekly email news roundup at: [usu.edu/ilwa/newsletter](https://usu.edu/ilwa/newsletter).



### CHAPTER 3 REFERENCES

3.C.1. Martin, R. (2024). 3F: The Wasatch Front is Making Progress on PM<sub>2.5</sub> Levels. In, 2024 Report to the Governor and Legislature on Utah's Land, Water, and Air. Utah State University. <https://www.usu.edu/ilwa/reports/2024/air/3f-the-wasatch-front-is-making-progress-on-pm25-levels/PDF/?uri=CELEX:32023R0915Us>.