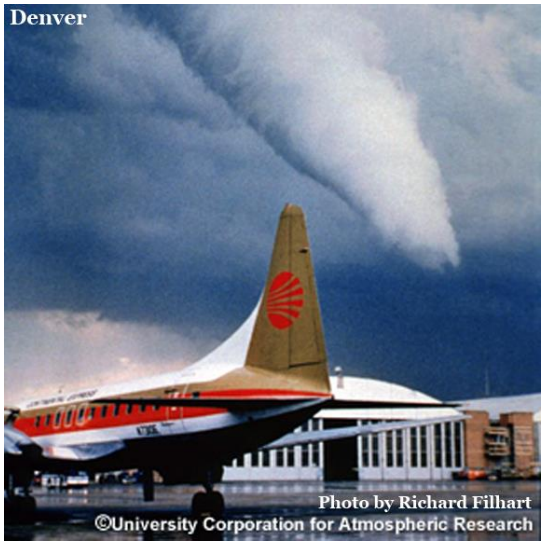
Wind

in the Intermountain Southwest

July 5, 2011, Phoenix
Credit: NOAA

Western Adaptation Alliance (WAA) cities are affected by many different kinds of wind events that can trigger an array of costly and sometimes deadly impacts, which range from damage to homes, buildings and utility infrastructure, to public health and recreation. The region experiences:

- tornadoes
- microbursts, which often accompany thunderstorms
- high wind episodes in almost any time of the year
- the deadly combination of wind and dust
- winds that feed wildfires
- powerful winds in the lee of high mountain ranges
- high winds accompanying tropical storms that occasionally make landfall in our arid region


Denver
Photo by Richard Filhart
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Climate models indicate a more northern winter and spring storm track, although they do not yet provide a robust prognosis with regard to future extreme wind episodes at daily time scales. Warmer temperatures allow the atmosphere to hold more moisture, which could mean more powerful summer thunderstorms, but there is a lack strong scientific evidence for a historic trend in summer thunderstorm power. However, the population in the region is growing faster than anywhere else in the country, which exposes many more people to the impact of these extreme wind events. Given just the high number of highway fatalities during dust storms, and the hundreds of millions of dollars in damages from tornadoes and storms, extreme wind events demand the utmost preparedness and vigilant attention.

KEY MESSAGES:

- Many types of wind events regularly affect the Intermountain Southwest.
- Extreme wind events and dust storms have killed people, damaged homes, buildings and airports, and caused power outages.
- Continued outreach and proactive planning by Western Adaptation Alliance (WAA) cities is essential for reducing impacts.

July, 2013, Las Vegas
Credit: City of Las Vegas Office of Emergency Management

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DUST ON SNOW

During the winter and spring, wind-blown dust can settle on mountain snowpack. Since the dust is far darker than snow, it absorbs more heat from sunlight and can hasten snowmelt and runoff. Studies show that these dust-on-snow events reduce the volume of runoff, and move the peak of spring runoff at least three weeks earlier, in the upper Colorado River Basin[a]. In years with extreme dust loading, peak runoff can be as much as six weeks earlier than pre-1800 levels. "The fact that three of the last five years through 2013 have seen 'extreme' dust loading may indicate a trend towards increasing alteration of hydrology."[b] This could be detrimental for cities that rely solely on the water stored in snowpack for their water supply, like **Aspen**. Perhaps equally important for some WAA cities is that early snowmelt strongly affects the length of the ski season and, hence, the local economy.

Disturbance of soil in lowland areas is an important factor in setting up substantial dust-on-snow events, making it possible to reduce the amount of dust settling on snow through improving land-use practices—a topic of active research[b].

Photo courtesy of Chris Landry, Center for Snow and Avalanche Studies, and the National Snow and Ice Data Center, University of Colorado, Boulder.

[a] Painter, T. H., J. S. Deems, J. Belnap, A. F. Hamlet, C. C. Landry, and B. Udall. 2010. Response of Colorado River runoff to dust radiative forcing in snow. *Proceedings of the National Academy of Sciences* 107:17125–17130.
[b] Lukas, J., N. Doesken, I. Rangwala, K. Wolter. 2014. Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation. A report for the Colorado Water Conservation Board. University of Colorado Boulder.

PREPARING FOR WIND: PAST, PRESENT, AND FUTURE

Tornadoes. Denver, located at the western edge of the Great Plains, has developed a tornado warning and alert system. Denver's outdoor warning siren system, updated between 2012 and 2014, includes 86 sirens and extensive online public information regarding public safety practices and shelter.

Dust. Many cities and counties in the southern part of the Southwest are prone to dust storms. County air quality departments and state environment departments, like those in New Mexico and Arizona, have materials on dust control for air quality concerns, and specific materials and warnings for dust storms. The New Mexico Environment Department's windblown dust page contains information on sources of dust, dust control regulations, and the health effects of dust pollution and dust storms. Doña Ana County—where the City of Las Cruces is located—has a Natural Events Action Plan, which includes the best available control measures for reducing windblown dust from manmade sources. Pima County, home to Tucson, provides similar materials, including extensive dust control regulations, acknowledgement of the fact that human disturbance of native soils and high wind events combine to generate severe dust storms. The Nevada Department of Transportation has also developed guidance for driving in high wind.

In recognition of the many deaths each year from dust storm traffic accidents, a consortium of Arizona state agencies and the National Weather Service have developed the Pull Aside-Stay Alive campaign and website, which contains guidance for drivers. A mobile phone "app", developed by the University of Arizona, provides dust storm alerts and safety tips; the app is available for free through multiple phone operating systems (e.g., via iTunes).

In October 2014, Clark County, home to Las Vegas, achieved special EPA status ("attainment status") for meeting health-based dust pollution standards. Key components of the Clark County dust control program include permit and industry education classes, an extensive program of controlling dust on vacant land parcels, and a dust complaint hotline.

Strong winds, microbursts, and public health. In recognition of the multiplier effect, when strong winds and microbursts damage one utility pole, which then takes out other poles connected to it, Tucson Electric Power (TEP) has implemented a process of "looping" in their power lines, to recirculate power from a downed pole to others. This keeps one utility pole from being a single point of failure and bringing down the entire system. Such measures are critical, because power outages can also trigger public health impacts, if vulnerable residents lose the ability to cool their homes during the hot summer season. In response to power outages as a result of a severe thunderstorm on July 13, 2014, the City of Tucson and Pima County opened Emergency Operations Centers and launched cooling stations; fortunately TEP's looping procedure allowed them to minimize the length of the outage, quickly restoring electric power.

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