

WIND HAZARDS



DESCRIPTION

Wind hazards in Colorado take three forms: high wind, tornadoes, and severe thunderstorms. It is not unusual to see tornadoes spin out of major thunderstorms or see severe wind accompany thunderstorms.

High winds are wind events with sustained wind speeds of 40 mph or greater and lasting for one hour or longer, or winds of 58 mph or greater for any duration (*National Weather Service, 2009*). Common in Colorado, Chinook winds are warm dry winds that descend from the eastern slopes of the Rocky Mountains, causing a rapid rise in temperature. Sometimes these winds move with considerable force. Cold, dry Bora winds are also experienced in Colorado. These winds are experienced after cold fronts pass through the state from the northwest. Bora winds can reach speeds of over 100 mph (*Colorado Natural Hazards Mitigation Plan, 2013, p. 3-88*).

A **tornado** is a localized, violently destructive windstorm occurring over land. Tornadoes are generated by severe thunderstorms. Tornadoes in Colorado are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the polar regions to generate severe thunderstorms. These thunderstorms often produce the violently rotating columns of wind known as funnel clouds (*National Weather Service, 2009*).

A **thunderstorm** is characterized by the presence of lightning and its resulting thunder. Thunderstorms are usually accompanied by strong winds, heavy rain, and hail, or sometimes no precipitation at all. Thunderstorms may line up in a series of rain bands known as a squall line. A **severe thunderstorm** is a storm that produces a tornado, winds of at least 58 mph (50 knots), and/or hail at least one inch in diameter. Structural wind damage may imply the occurrence of a severe thunderstorm. Strong or severe thunderstorms that rotate are known as super cells (*National Weather Service, 2009*).

WIND HAZARDS IN COLORADO

High wind events in Colorado are most common along the Front Range (due to Chinook and Bora winds coming down from the mountains) and in the northeastern counties. Additionally, the Grand Valley in the western part of the state has also experienced a high number of wind events.

In Colorado, the primary threat of tornado is east of the Continental Divide along the Front Range and foothills. Three counties (Adams, Weld, and Washington) each had over 100 reported tornadoes between 1950 and 2010. Most of these tornadoes are small and short lived. However, occasional strong tornadoes have been reported. The number of tornado fatalities remains very low for Colorado, but much of this is due to the low population density of some of the most tornado-prone areas of eastern Colorado (*Colorado Natural Hazards Mitigation Plan, 2013, p. 3-108*).

The average number of thunderstorms exceeding 50 knots from 2010 to 2015 was just over 100 storms per year (*Storm Events Database, n.d.*). Thunderstorms are quite prevalent in the Eastern Plains and along the eastern slopes of the mountains during the spring and summer.

RELATED HAZARDS

Severe thunderstorms can spawn super cells that can have tornadoes or hail embedded in them. The frequency of hail damage to crops in northeastern Colorado is quite high. With an average frequency of six or more hail days per year, some counties in eastern Colorado are among the most hail-prone areas in the country (*Storm Events Database, n.d.*). Another related hazard is flash flooding. The greatest threat of flooding in Colorado is not snowmelt; rather, it is flash flooding from localized intense thunderstorms.

ASSESSING THE RISK OF WIND HAZARDS

Unlike some of the other hazards that have loss estimation tools such as Hazus, there are no widely used tools available for predicting or assessing risks or potential losses to wind hazards. To assess wind hazards, communities may need to rely on historical wind hazards as documented in local or regional hazard mitigation plans, or as made available through data resources mentioned below in the available data sources section.

Some key questions for planners to consider in assessing their community's risk to wind hazards may include:

- Is there a history of damaging or destructive wind events in the community? If so, what has been done to minimize future damages to particular assets or sectors?
- Does the hazard event occur more frequently now than previously?
- Do local building codes or regulations adequately address wind hazards?
- Are current warning systems, shelter plans, and emergency procedures in place to protect people from tornadoes?
- Should there be any additional regulatory or incentive-based measures to increase the safety and protection of the community to wind hazards?

Whether to hire a consultant or conduct a community self-assessment is best determined by considering answers to these questions, in addition to consulting with the resources and other local experts as described below in the available data sources section. Planners should also collaborate with the local emergency manager, building inspector, and/or engineer for information regarding wind hazards and associated risks, as well as risk mitigation measures already in place or recommended for future consideration and implementation.

AVAILABLE DATA SOURCES

Colorado Natural Hazards Mitigation Plan

The *Colorado Natural Hazards Mitigation Plan* is the State's FEMA-approved plan that serves as a foundation for the State's program to reduce risks to people, property, and infrastructure from natural hazards. The Plan is administered and updated by the Colorado Division of Homeland Security and Emergency Management. dhsem.state.co.us/emergency-management/mitigation-recovery/mitigation/state-colorado-natural-hazards-mitigation-plan

Colorado Climate Center

The Colorado Climate Center is housed in the Department of Atmospheric Science at Colorado State University. It is a source of useful information on natural hazards in Colorado and provides an excellent resource to learn about climate in Colorado. ccc.atmos.colostate.edu

National Centers for Environmental Information

The National Centers for Environmental Information (NCEI) was formed in 2015 as a merger of NOAA's three existing National Data Centers. This site is a rich data source for climate and historical weather information and contains historical event data on a host of natural hazards.

ncdc.noaa.gov/stormevents

SHELDUS™

Developed by the Hazards & Vulnerability and Research Institute at the University of South Carolina, SHELDUS™ provides a county-level hazard loss data and map set for 18 different natural hazard events types, including wind hazards, and has been used by some Colorado communities in completing the risk assessments for their local or regional hazard mitigation plans.

hvri.geog.sc.edu/SHELDUS

American Society of Civil Engineers

A widely-recognized resource worth consulting for wind hazards is the American Society of Civil Engineers (ASCE), and particularly the data and information made available through *Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7-10)*. This technical publication represents a national standard for requirements on general structural design and it contains ultimate event wind maps for determining wind loads which are suitable for inclusion in building codes and other documents. In addition, this publication includes a detailed commentary with explanatory and supplementary information designed to assist building code staff and regulatory authorities. asce.org

Rocky Mountain Insurance Information Association

RMIIA is a non-profit insurance communications organization representing property and casualty insurers in Colorado, New Mexico, Utah, and Wyoming. RMIIA compiles overall estimates of insured losses and number of claims filed for catastrophes (insured natural disasters that cause more than \$25 million in damages).

- Hail: rmiia.org/catastrophes_and_statistics/hail.asp
- Tornadoes: rmiia.org/catastrophes_and_statistics/tornado.asp

National Weather Service (NWS)

The NWS is the official provider of U.S. weather, marine, fire, and aviation forecasts. The NWS issues warnings and provides data, products, forecasts, and information related to meteorology. The NWS is a component of the National Oceanic and Atmospheric Administration (NOAA). The NWS maintains a glossary of information on more than 2,000 terms, phrases, and abbreviations used by the NWS.

weather.gov/glossary

APPLICABLE PLANNING TOOLS AND STRATEGIES

The table below cites applicable planning tools and strategies that are profiled in this guide.

APPLICABLE PLANNING TOOLS AND STRATEGIES – WIND HAZARDS	
Addressing Hazards in Plans and Policies	<ul style="list-style-type: none"> • Comprehensive plan • Climate plan • Hazard mitigation plan • Pre-disaster planning
Strengthening Incentives	N/A
Protecting Sensitive Areas	N/A
Improving Site Development Standards	N/A
Improving Buildings and Infrastructure	<ul style="list-style-type: none"> • Building code • Critical infrastructure protection
Enhancing Administration and Enforcement	N/A