The purpose of the risk assessment is to determine the potential impacts of natural hazards to the people, economy, and built and natural environments of the community. The outcomes of the risk assessment are a summary of key vulnerabilities that may be used to prioritize mitigation actions and emergency preparedness and response activities.

**Risk Assessment Framework**

**NATURAL HAZARDS**
- Location
- Extent (Magnitude/Strength)
- Previous Occurrences
- Future Probability

**COMMUNITY ASSETS**
- Population
- Built Environment
- Natural Environment
- Economy

**Steps to Develop the Risk Assessment**
1. Describe Hazards
2. Identify Community Assets
3. Evaluate Impacts & Potential Losses
4. Summarize Key Issues & Vulnerabilities

**NATURAL HAZARDS THAT AFFECT MANITOU SPRINGS**
- Wildfire
- Dam Failure
- Flooding
- Drought
- Hailstorm
- Lightning
- Severe Wind
- Tornado
- Winter Storm
- Earthquake
- Erosion and Deposition
- Landslide and Rockfall
- Mud and Debris Flow

**QUICK HIGHLIGHTS: PAST DAMAGE AND LOSS**
- 32 state or federal disaster declarations for El Paso County from 1965-2015: 11 flooding, 10 wildfire, 7 severe winter storm
- On average, there is a damaging wildfire event every 6 years.
- On average, there is a damaging flood event every 7 years.
- On average, severe drought periods occur every 3.1 years.
- 64 severe hail events >2 inches in diameter, 1955-2015
- In 1999, mud flows and landslides caused over $30 million in infrastructure and property damage in El Paso County.
- Since 1978, 98 flood insurance claims submitted; $2,812,584 total payments on losses
- In 1929, Ute Pass Fish Club dams broke flooding College Gulch with a 15-foot wall of water, destroying resort north of Manitou Springs on Highway 24, and causing 1 death.
- Mandatory evacuations occurred in City in 2012 due to Waldo Canyon fire, which burned 18,247 acres and 347 homes and killed two people in Colorado Springs.

**Past Damaging Flood Events**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>2 major events, multiple road closures</td>
</tr>
<tr>
<td>2013</td>
<td>1 death; major infrastructure damage; 30 downtown buildings damaged/destroyed</td>
</tr>
<tr>
<td>1999</td>
<td>$28 million damage</td>
</tr>
<tr>
<td>1964</td>
<td>Widespread damage</td>
</tr>
<tr>
<td>1947</td>
<td>1 death; small bridges destroyed</td>
</tr>
<tr>
<td>1940</td>
<td>Street flooding up to 3 feet</td>
</tr>
<tr>
<td>1902</td>
<td>100 structures off foundations; north side Canon Ave inundated</td>
</tr>
<tr>
<td>1882</td>
<td>1 death</td>
</tr>
</tbody>
</table>
WILDFIRE

CURRENT EXPOSURE TO WILDFIRE HAZARD AREAS

<table>
<thead>
<tr>
<th>Wildfire Hazard Areas</th>
<th>% Total Acres</th>
<th># of Parcels: % Total Parcels</th>
<th>Market Value of Parcels &amp; Improvements</th>
<th>% Total Market Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Risk</td>
<td>6%</td>
<td>237: 9%</td>
<td>$27,660,023</td>
<td>5%</td>
</tr>
<tr>
<td>Moderate Risk</td>
<td>69%</td>
<td>1,122: 41%</td>
<td>$236,415,489</td>
<td>46%</td>
</tr>
<tr>
<td>Moderate and High Risk</td>
<td>75%</td>
<td>1,359: 50%</td>
<td>$264,075,512</td>
<td>51%</td>
</tr>
</tbody>
</table>


Critical Facilities & Infrastructure

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Moderate Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Manitou Springs Middle School and High School</td>
<td>• Manitou Springs Elementary School</td>
</tr>
<tr>
<td>• Some structures in the High Road, Midland, and Peak View historic districts</td>
<td>• Public Services department building</td>
</tr>
<tr>
<td></td>
<td>• Crystal Hills water storage tank</td>
</tr>
<tr>
<td></td>
<td>• Manitou Springs Library</td>
</tr>
<tr>
<td></td>
<td>• Colorado Springs Utilities hydropower plant</td>
</tr>
<tr>
<td></td>
<td>• City raw water intake line and Manitou Reservoir</td>
</tr>
</tbody>
</table>

KEY VULNERABILITIES

• **No wildfire mitigation codes** – Risk will increase if new development, redevelopment, and infrastructure expansion occurs in high hazard areas without wildfire mitigation and safety standards in place.

• **High risk of building-to-building ignition** – High density, older housing construction exists in wildfire hazard areas and modifications have occurred over time without adequate regulation.

• **Ruxton Canyon** – Many assets located in areas difficult to defend and evacuate. A wildfire in Ruxton could negatively impact the local economy and the watershed, increasing risk to flash flooding, erosion, and landslides.

• **Peak View Neighborhood** – High density, older building construction, low-income residents, inadequate regulation, steep topography, high fuel loads, difficult vehicle access, and insufficient water main line sizes to provide adequate fire protection all contribute to a highly vulnerable area.

• **Source water protection** – Wildfire along raw water line or within source water protection area could affect the City’s water supply and water quality.

• **Unlawful camping** – Encampments in the National Forest and open space areas are a growing problem and have been a source of past ignitions.
FLOOD

CURRENT EXPOSURE TO FLOOD HAZARD AREAS

<table>
<thead>
<tr>
<th>Flood Hazard Areas</th>
<th># of Parcels: % Total Parcels</th>
<th>Market Value of Parcels &amp; Improvements</th>
<th>% Total Market Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floodway</td>
<td>291: 11%</td>
<td>$56,127,977</td>
<td>11%</td>
</tr>
<tr>
<td>1% Annual Chance (100-year)</td>
<td>443: 16%</td>
<td>$85,553,978</td>
<td>16%</td>
</tr>
<tr>
<td>.2% Annual Chance (500-year)</td>
<td>496: 18%</td>
<td>$93,705,361</td>
<td>18%</td>
</tr>
</tbody>
</table>

Sources: El Paso County Assessor (data accessed 6/7/16). FEMA effective Flood Insurance Rate Map.

Critical Facilities & Infrastructure

<table>
<thead>
<tr>
<th>Floodway</th>
<th>1% Annual Flood (100-Year Flood)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Communication towers used by City and El Paso County Sheriff</td>
<td>• City Hall</td>
</tr>
<tr>
<td>• Number of bridges and street intersections</td>
<td>• Fire and Police Department</td>
</tr>
<tr>
<td></td>
<td>• Manitou Pool and Fitness Center</td>
</tr>
<tr>
<td></td>
<td>• Number of bridges and street intersections</td>
</tr>
<tr>
<td></td>
<td>• Cheyenne Village (serves adults with developmental disabilities)</td>
</tr>
</tbody>
</table>

KEY ISSUES AND VULNERABILITIES

• **Over 400 structures in 100-year floodplain**  – Many of these structures may have compromised structural integrity due to past damage. 30% of the City’s total assessed property value is located in the 100-year floodplain.

• **Loss of operation at critical facilities**  – Facilities critical to emergency response and recovery, as well as several community services buildings, are located in the 100-year floodplain.

• **Risk to life-safety**  – Flash flooding is a life safety concern due to the density of development in the floodplain; flash flood events have caused deaths in the past.

• **Damage to downtown and economy**  – Downtown businesses are at high risk to flood damage. Past events have closed businesses and caused some to relocate, leaving employees without work, and reducing visitors who are critical to the local economy.

• **Vulnerable bridges**  – Municipal and private bridges throughout City are at risk to damage from flooding.

• **Transportation and mobility**  – Roadways are inundated by water and debris during flood events, closing routes and blocking access. There are no dry ingress and egress access points through the City during a 100-year event.
LANDSLIDE/ROCKFALL/EROSION/MUD AND DEBRIS FLOW

CURRENT EXPOSURE TO LANDSLIDE HAZARDS

<table>
<thead>
<tr>
<th>Landslide Hazard Areas</th>
<th>% Acres Total</th>
<th># of Parcels: % Total Parcels</th>
<th>Market Value of Parcels &amp; Improvements</th>
<th>% Total Market Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable Soils</td>
<td>21%</td>
<td>246: 9%</td>
<td>$61,567,278</td>
<td>12%</td>
</tr>
<tr>
<td>Moderately Unstable Soils</td>
<td>28%</td>
<td>574: 21%</td>
<td>$70,999,720</td>
<td>14%</td>
</tr>
<tr>
<td>Subtotal for Unstable &amp; Moderately Unstable Soils</td>
<td>49%</td>
<td>820: 30%</td>
<td>$132,566,998</td>
<td>26%</td>
</tr>
</tbody>
</table>


Critical Facilities & Infrastructure

Unstable

- Communications tower used by City
- Water Treatment Plant
- Sections of the City’s raw water pipeline

Moderately Unstable

- Mesa water storage tank
- Colorado Springs Utilities hydropower plant
- City raw water intake
- Sections of the City’s raw water pipeline

KEY ISSUES AND VULNERABILITIES

- Highway 24 at Williams Canyon – Highway 24 is vulnerable to slope failures at Williams Canyon, from the north by Sunshine Trail, and from the south by Washington Avenue Bypass.
- Homes and infrastructure at risk – Areas where development is vulnerable to slope failure include Lovers Lane, South Ruxton, Washington Avenue Bypass, and the 800-900 block of Manitou Avenue.
- Retaining walls – Retaining walls (some historic) are vulnerable to failure along Fountain Creek, Ruxton Creek, Serpentine Avenue, Spencer Avenue, and Highway 24 at Crystal Hills Boulevard.
- Tourism at Ruxton Avenue and Cog Railway – Tourism could be affected by landslides along Ruxton Avenue and rockfall on the Cog Railway.

OTHER HAZARDS

Severe Winter Storm – Major impacts include power outages and emergency access to neighborhoods in steep canyon areas.

Drought – Drought may impact water supply and quality. The City has limited capacity to store water and a junior right of storage. There are four levels of water restrictions in place.

Dam Failure – All Class 1 dams have emergency action plans in place and were inspected by the State in 2015.

Severe Weather – El Paso County has among the highest occurrence of lightning, hail, and severe wind hazards in Colorado. Past damages include downed trees, power outages, and damaged roofs.
VULNERABILITY SUMMARY

Building Stock – Many structures are vulnerable to hazards due to age, condition, and nonconformance with codes.

High Density on Steep Slopes – Developments in areas of steep topography have poor access for emergency and firefighting equipment and for evacuation purposes, putting the safety of residents, visitors, and first responders at risk.

Code Enforcement – A gap exists in the City’s tracking of building inspection activity, particularly for building remodels.

Infrastructure and Services – The City’s aging road, water, and sewer systems west of City Hall are in poor condition and vulnerable to natural hazards, including landslides, erosion, flooding, and winter and summer storm events.

Transportation and Mobility – The closure of Highway 24 and Manitou Avenue due to natural hazard events affects ingress and egress to the City.

Economic Risk – Downtown businesses are located in high hazard areas and vulnerable to damages from future flood and landslide/mud and debris flow events.

Risk Communication – Risk communication activities must target citizens and business owners but also visitors/tourists, seasonal residents, and vulnerable populations such as elderly and non-English speakers.

Future Growth and Development

New development and redevelopment in hazard areas without policies to mitigate losses will increase the community’s risk. Gaps in existing policies and regulations include:

• No hazard specific ordinance outside of the floodplain ordinance.
• No wildfire mitigation policies in place in wildland-urban interface areas.
• No formal review process, requirements, or criteria when site plans are submitted prevents hazards from being addressed.

Climate Change Considerations

Hazard information presented here is mostly based on past events. Scientists predict that climate change will result in future conditions that are different and less predictable. Extreme weather may increase in frequency and severity.

LEARN MORE

The complete draft Risk Assessment, maps, and background resources can be found in a Google Drive here: https://drive.google.com/drive/folders/0B_ji1_xkOujXSE5vWWFhRFJuQlU.
Plan Manitou | Natural Hazards Risk Summary

- Wildfire along raw water line could put water supply at risk.
- Wildfire, landslides, or rockfall closing the Manitou Incline or Cog Railway could impact tourism and the economy.
- Wildfire risk high south of Intermann Trail from west to east ends of City.
- Unlawful camping common in open space areas increases risk of ignitions.
- Peakview neighborhood: Vulnerable to wildfire due to fuels, topography, construction types, and insufficient water infrastructure for firefighting.
- Crystal Park Subdivision (~250 homes): One point ingress/egress makes evacuation and firefighting difficult.
- Ruxton Canyon: Impacts of 100-year flood likely severe due to constricted channel and high density.
- 480 structures, many historic, located in 100- and 500-year mapped floodplains.
- Historic, mixed use structures along Fountain Creek vulnerable due to age, location, construction type, and past flood damage. Flooding has caused downtown business closures and some relocation.
- Williams Canyon: Project to mitigate flooding through the Narrows. Canon Ave. infrastructure undersized to convey 100-year event.
- Historic city hall, fire and police departments located in floodplain and sometimes evacuated.
- Retaining walls (some historic) throughout City vulnerable due to slope failure.

**AREAS OF HAZARD RISK & VULNERABILITY**

- Municipal Boundaries
- City Open Space
- Federal Lands
- State & Local Lands
- Floodway
  - 1% Annual Chance Flood Hazard Area (100-year floodplain)
  - 0.2% Annual Chance Flood Hazard Area (500-year floodplain)
- Buildings in 1% Annual Chance Flood Hazard Area
- Buildings in 0.2% Annual Chance Flood Hazard Area
- Areas with Unstable Slopes
- Areas of High Wildfire Risk

**Critical Facilities**

- Congregate Housing/Group Homes
- Assisted Living Facilities
- Government Operations
- Fire Department
- Police Department
- Schools

**Critical Infrastructure**

- Bridges
- Communication Towers & Transmitters
- Utilities
- Raw Water Pipe

**Key Issues**

- Wildfire
- Flooding
- Landslide and Slope Failure