

## 1. Health Canada study:

- The Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) collected data on fireworks-related injuries between April 1, 2011 and April 13, 2023.
- They reported 210 cases of injuries related to fireworks and similar products during this period.
- Burns were the most common injury, accounting for 61% of cases, followed by eye injuries at 19.1%.
- Young adults aged 20-29 had the highest injury rate, with 22 cases per 100,000 CHIRPP records.

## 2. Environmental impact research:

- Gwen O'Sullivan, an assistant professor of environmental science at Mount Royal University in Calgary, has studied the environmental impacts of fireworks.
- Her research highlights that fireworks release perchlorates and toxic metals into the environment, contaminating soil and water.
- The explosive charges in fireworks contain perchlorates that deposit back to the surface after detonation.

## 3. Wildlife impact studies:

- The Calgary Wildlife Rehabilitation Society (CWRS) has reported increased calls about wildlife sightings in unusual areas during periods of widespread fireworks use.
- They found that fireworks cause anxiety and disorientation in animals, leading to behaviors like deer fleeing into roadways and birds flying into windows.

## 4. Air quality concerns:

- Canadian researchers have noted that fireworks generate particulate matter, affecting air quality and potentially causing breathing difficulties for people with respiratory conditions.
- There's often an increased number of hospital visits after holidays featuring firework displays.

## 5. Noise pollution effects:

- Canadian studies have shown that the loud noises from fireworks can trigger panic in vulnerable populations, including refugees from war-torn countries.
- The Centre for Newcomers in Calgary reported that fireworks can reawaken traumatic memories for refugees.

These findings demonstrate that Canadian researchers have been actively studying various aspects of fireworks hazards, including health impacts, environmental pollution, and effects on wildlife and vulnerable populations.

## US Research:

Based on the information provided, fireworks pose several environmental hazards, particularly to water resources:

### 1. Water contamination:

- The Marion County Wellfield Education Corporation highlights that fireworks debris containing heavy metals and perchlorate compounds can contaminate drinking water supplies<sup>1</sup>.
- These contaminants can be washed out of the air by rainfall and accumulate in groundwater or surface water<sup>1</sup>.
- Debris left on the ground can deteriorate and enter watersheds<sup>1</sup>.

### 2. Research on water pollution:

- The U.S. Geological Survey (USGS) and National Park Service conducted a study at Mount Rushmore from 2011-2015<sup>1</sup>.
- They found elevated perchlorate concentrations in soil where fireworks were launched and where debris landed<sup>1</sup>.
- Higher concentrations of chemicals and metals were detected in water bodies inside the memorial<sup>1</sup>.

### 3. Perchlorate contamination:

- Perchlorate, used in fireworks to aid combustion, can persist in the environment for long periods<sup>3</sup>.
- It easily contaminates soil and water, affecting plant absorption and fish development<sup>3</sup>.
- Groundwater testing in Long Island, New York, showed perchlorate levels of tens of  $\mu\text{g/L}$  within 100m of fireworks sites<sup>2</sup>.

#### 4. Duration of contamination:

- Studies on perchlorate degradation in water showed it can take 20-80 days for levels to become undetectable, with some cases lasting up to 90 days<sup>2</sup>.

#### 5. Impacts on drinking water:

- At Mount Rushmore, perchlorate levels in the drainage basin feeding drinking water wells exceeded EPA Drinking Water Health Advisory levels of 15 µg/L<sup>2</sup>.
- Ranges found were 0.2-38 µg/L in groundwater, 2.2-54 µg/L in surface water, and 0.61-19 µg/L in drinking water wells<sup>2</sup>.

#### 6. Other pollutants:

- Fireworks release metal salts that can poison soil, air, and water<sup>4</sup>.
- These substances can cause various health issues when inhaled or ingested<sup>4</sup>.

The Marion County Wellfield Education Corporation emphasizes the need for awareness about fireworks' impact on drinking water and encourages alternative celebrations to protect water resources<sup>1</sup>.