3.14 RISK ASSESSMENT: HAZARDOUS MATERIALS

DESCRIPTION

Substances that, because of their chemical or physical characteristics, are hazardous to humans and living organisms, property, and the environment, are regulated by the U.S. Environmental Protection Agency (EPA) and, when transported in commerce, by the U.S. Department of Transportation (DOT).

The EPA chooses to specifically list substances as hazardous and extremely hazardous, rather than providing objective definitions. Hazardous substances, as listed, are generally materials that, if released into the environment, tend to persist for long periods and pose long-term health hazards for living organisms. Extremely hazardous substances, while also generally toxic materials, represent acute health hazards that, when released, are immediately dangerous to the lives of humans and animals and cause serious damage to the environment. When facilities have these materials in quantities at or above the threshold planning quantity (TPQ), they must submit "Tier II" information to appropriate State and/or local agencies to facilitate emergency planning.

DOT regulations provide the following definition for the term "hazardous material":

> *Hazardous material* means a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 U.S.C. 5103). The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (see 49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions in part 173 of subchapter C of this chapter.

Preparation for Hazardous Materials Handling in Ada County/Source: www.accem.org/hazmatprep.html

When a substance meets the DOT definition of a hazardous material, it must be transported in accordance with safety regulations providing for appropriate packaging, communication of hazards, and proper shipping controls.

In addition to EPA and DOT regulations, the National Fire Protection Association (NFPA) develops codes and standards for the safe storage and use of hazardous materials. These codes and standards are

generally adopted locally and include the use of the NFPA 704 standard for communication of chemical hazards in terms of health, fire, instability (previously called "reactivity"), and other special hazards (such as water reactivity and oxidizer characteristics). Diamond-shaped NFPA 704 signs ranking the health, fire and instability hazards on a numerical scale from zero (least) to four (greatest) along with any special hazards, are usually required to be posted on chemical storage buildings, tanks, and other facilities. Similar NFPA 704 labels may also be required for individual containers stored and/or used inside facilities.

While it is defined somewhat differently by various organizations, the term "hazardous material" may be generally understood to encompass substances that have the capability to harm humans and other living organisms, property, and/or the environment. No universally accepted, objective definition of the term "hazardous material event" has been developed either. A useful working definition, however, might be framed as: any actual or threatened uncontrolled release of a hazardous material, its hazardous reaction products, or the energy released by its reactions that poses a significant risk to human life and health, property and/or the environment.

LOCATION, EXTENT, AND MAGNITUDE

Because hazardous materials are so widely used, stored and transported, a hazardous material event could take place almost anywhere. Moreover, many hazardous materials are used, stored and transported in very large quantities, so the impacts of an event may be widespread and powerful. Hazardous material incidents usually occur on major highways and railways. Map 3.14.B, located on page 4, shows the number of Tier II storage facilities per county. There is no magnitude rating for hazardous material incidents at present.

Source: ThinkStock.com

PAST OCCURRENCE

The Pipeline and Hazardous Materials Safety Administration tracks hazardous material releases through its nationwide database. Regulations in 49 CFR 171.15 and 171.16 govern situations where hazardous materials are released and the resulting required notifications and reporting. Unless they are properly reported, it is difficult to identify and track past hazardous materials releases. Between the years of 1998 through 2012, there have been no fatal release events in the State. Unfortunately, in May 2013 there was a release of suspected anhydrous ammonia in Pocatello that resulted in one death. Map 3.14.D (at the end of this section) summarizes all such events in Idaho from 1998 through 2012.

Listed below is a breakdown of the hazardous material incidents, by substance for Fiscal Year 2012 as provided by ID BHS. A map summarizing these incidents, by county, is found below in Map 3.14.A.

- Diesel Fuel (56)

- Explosive Material (26)
- Oil/Petroleum (24)
- Unknown (24)
- Hydraulic Fluid (22)
- Mineral Oil (18)
- Gasoline (13)
- Drug Lab (12)
- All Others (between 7 – 1)

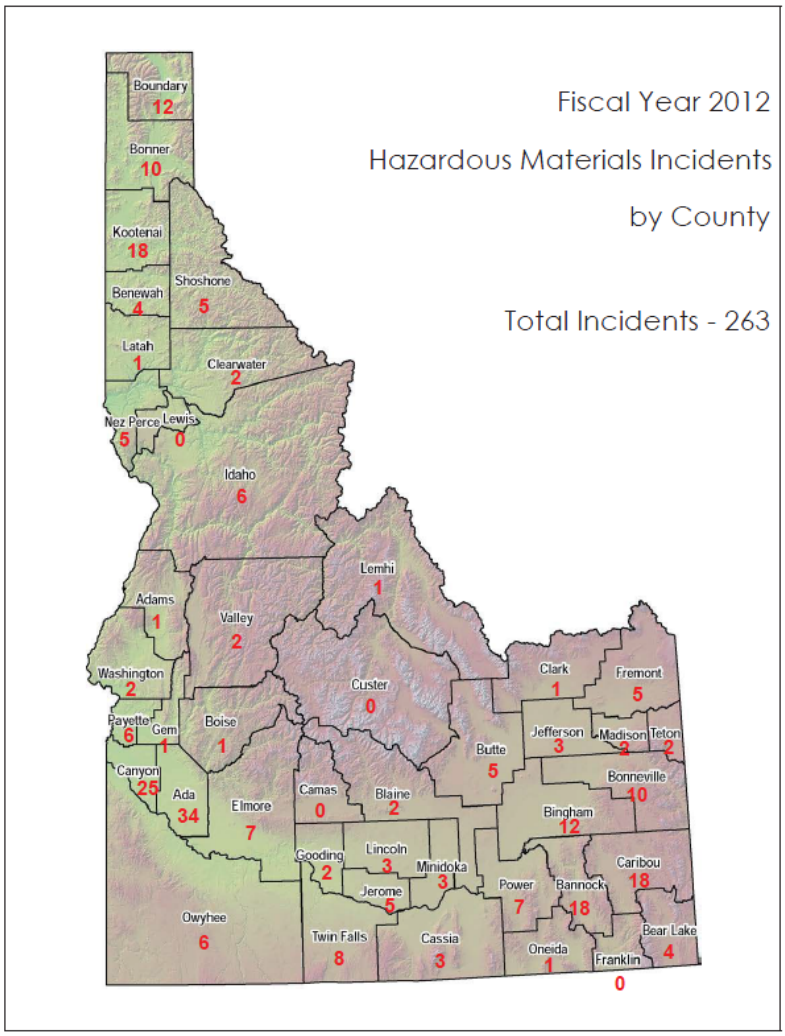
FUTURE OCCURRENCE

The events that can produce a hazardous materials release vary greatly; therefore, future releases are statistically independent of past events. The fact that all releases have a human component makes prediction difficult. Unfortunately, the short period of recorded and observed historical data that contribute to the risk make it difficult to develop return periods for hazardous material release areas in Idaho. However, like any other type of event, a return period and probability of future occurrence can be developed from the historical records that are available.

It can reasonably be assumed, based on observations recorded from 1998 through 2012 that a hazardous materials release has occurred once every 0.02 years.

[(Current Year) 2012] subtracted by [(Historical Year) 1998] = 14 Years on Record

[(Years on Record) 14] divided by [(Number of Historical Events) 654] = 0.02



Map 3.14.A: Hazardous Materials Incidents (2012) / Source: ID BHS

Based on historical probability, there is a 100-percent chance that a hazardous materials release will occur in any given year in Idaho.

RELATIONSHIPS TO OTHER HAZARDS

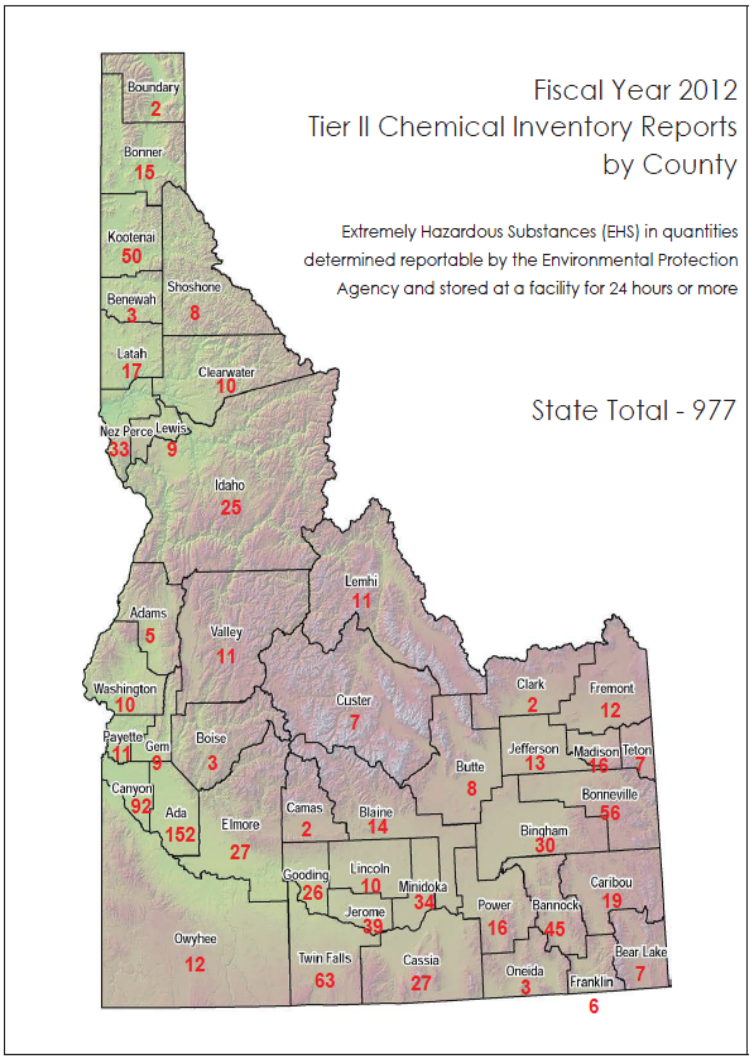
Hazardous material release events are generally a very small-scale event that would not influence or impact other hazards.

ENVIRONMENTAL IMPACTS

Hazardous materials incidents can have obvious, direct environmental impact as well as long-term, insidious environmental damage. Water pollution is an immediate concern for direct human consumption, recreation, crop irrigation, and fish and wildlife consumption. Depending on the material, pollutants can bioaccumulate to differing degrees, affecting animals high on the food chain long after a spill. Hazardous material incidents would not likely affect geology, but could significantly impact soils and farmlands, requiring expensive remediation. Unless a spill is directly adjacent, hazardous materials incidents are unlikely to affect or archeological sites.

DEVELOPMENT TREND IMPACTS

There are no land-use regulations that restrict building around industrial facilities or along transportation routes. As the population increases, development will also continue to increase in these areas, thereby exposing a greater number of individuals to the risk of a hazardous materials release. Increased development will lead to increased vulnerability and potential losses.



Map 3.14.B: Tier II Facilities (2012) / Source: ID BHS

CRITICAL INFRASTRUCTURE AND STATE FACILITY IMPACTS

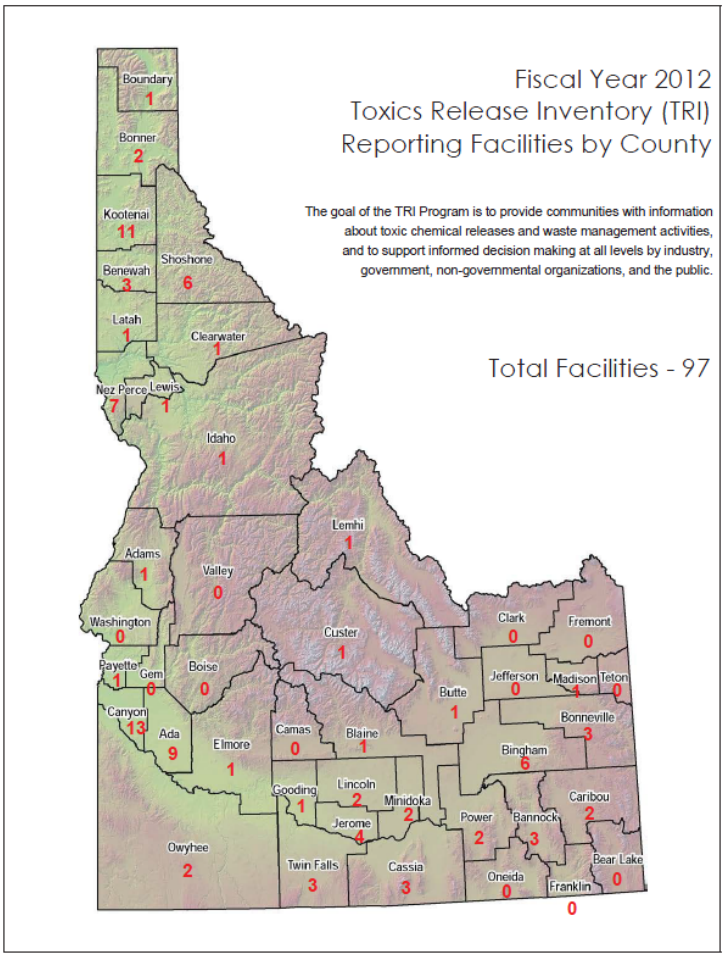
Major highways and railways are frequently used to transport hazardous materials. Hazardous materials could also affect water treatment facilities.

VULNERABILITY ASSESSMENT

The risk of hazardous materials incidents in Idaho can be expected to remain at historical levels with small, incremental increases in proportion to statewide increases in population and economic activity. Transportation incident risk might also be expected to be influenced to some extent by population and economic activity increases in surrounding States.

Serious hazardous materials incidents – those causing hospitalizations, deaths, and large-scale economic loss and environmental damage – are generally the result of a series of improbable events involving large quantities of material and are, thus, relatively rare and difficult to predict. Tier II reporting reveals the location and identity of large quantities of hazardous materials in storage and use. 977 Idaho facilities submitted Tier II reports in 2012. A map of this information broken down by county can be found in Map 3.14.B, located on page 4.

In addition, the Idaho National Laboratory (INL) site in southeastern Idaho routinely stores, uses, and ships high-activity radioactive materials. Hazard mitigation for the INL is addressed in separate INL and county plans. The presence of large shipments of hazardous materials is essentially a constant on rail lines and highways.



Map 3.14.C: TRI Reporting Facilities (2012) / Source: ID BHS

The Toxics Release Inventory (TRI) Program's goal is to provide communities with information about toxic chemical releases and waste management activities, and to support informed decisions making at all levels by industry, government, non-governmental organizations, and the public. Map 3.14.C shows the numbers of those types of facilities, per county, in 2012.

Local Hazard Mitigation Plan Vulnerability Assessments

Forty-seven local mitigation plans were analyzed to determine the major hazards in each jurisdiction. Map 3.14.E (at the end of this section) shows the 15 localities that ranked hazardous materials as such. This list of 15 counties has not

changed since the 2010 plan update.

When comparing Map 3.14.D to Map 3.14.E (at the end of this section), what stands out is that many of the localities that rank hazardous material events as a major hazard have not historically seen an abnormally high number of reported releases. But in reviewing some of the other maps, such as 3.14.A, 3.14.B, and 3.14.C; this does show that in many of these 15 localities, the risk for a hazardous material release is present.

LOSS ESTIMATION

No specific, statewide loss estimation exists for the hazard of hazardous materials. Historical losses tend to be related to property damages more than to loss of life and injury. The historical data sets, from 1998 through 2012, used to produce Map 3.14.D (at the end of this section) documents that damages per event average $14,393. This equates to an average yearly damage figure of $672,153. Comparing these results to those numbers analyzed during the 2010 plan update show a slight average increase of approximately $500 per event. In reviewing the data, it seems 2011 saw an unusually high amount of reported damages, which may have skewed these results. Future plan updates should review this same data to see if trends become apparent.

From a general perspective, hazardous material releases damage and destroy public, commercial, and private property and natural resources. The resulting costs are for the restoration, maintenance, remediation, response, and post de facto litigation. Property damage routinely occurs on transportation facilities such as highways and railroads. Road closures are not uncommon. The economic costs of these disruptions can be significant, especially in areas with limited access options.

Source: ThinkStock.com

Direct costs can be defined as the cost of materials, carrier damage, property damage, response cost, and remediation/cleanup cost for a specific release. All other costs from hazardous material releases are indirect and include (1) loss of industrial productivity as a result of damage to land, facilities, or interruption of services, (2) loss of access to recreation lands and facilities, (3) cost of lost human productivity due to injury and death, (4) damages to ecosystems, and (5) the cost of litigation as a consequence of the release. Some of these indirect costs are difficult to measure and tend to be ignored. As a result, most estimates of loss are far too conservative.

Local Hazard Mitigation Plan Loss Estimations

The local mitigation plan roll-up estimates that losses for a hazardous materials event could vary from tens of thousands of dollars to the billions of dollars, depending on where and when it occurs. Out of

the 15 localities that ranked hazardous materials as a major hazard, a vast majority estimated those losses to be on the order of tens of thousands of dollars. Only two localities provided exact actual loss estimations. The Nez Perce Tribe estimated losses at $7.5M and Kootenai County's loss estimate was closer to $2.6B.

MITIGATION RATIONALE

Because hazardous materials are so widely used, stored and transported, a hazardous material event could take place almost anywhere. Further, many hazardous materials are used, stored and transported in very large quantities, so the impacts of an event may be widespread and powerful. For example, a 1947 Texas City, Texas, explosion of a ship carrying ammonium nitrate killed at least 581 people, injured or disabled more than 8,000, and caused property damage estimated in the hundreds of millions of dollars. Regulations and safety practices make such large-scale events unlikely, but smaller incidents may have severe impacts such as the following.

- Human deaths, injuries, and permanent disabilities
- Livestock/animal deaths
- Destruction of vegetation and crops
- Property damage and destruction
- Pollution of groundwater, drinking water supplies, and the environment
- Contamination of foodstuffs, property, land and structures
- Temporary or long-term closure of transportation routes and/or facilities
- Loss of business and industrial productivity
- Utility outages
- Clean-up and restoration costs
- Losses and inconvenience due to evacuation
- Loss of valuable chemical product

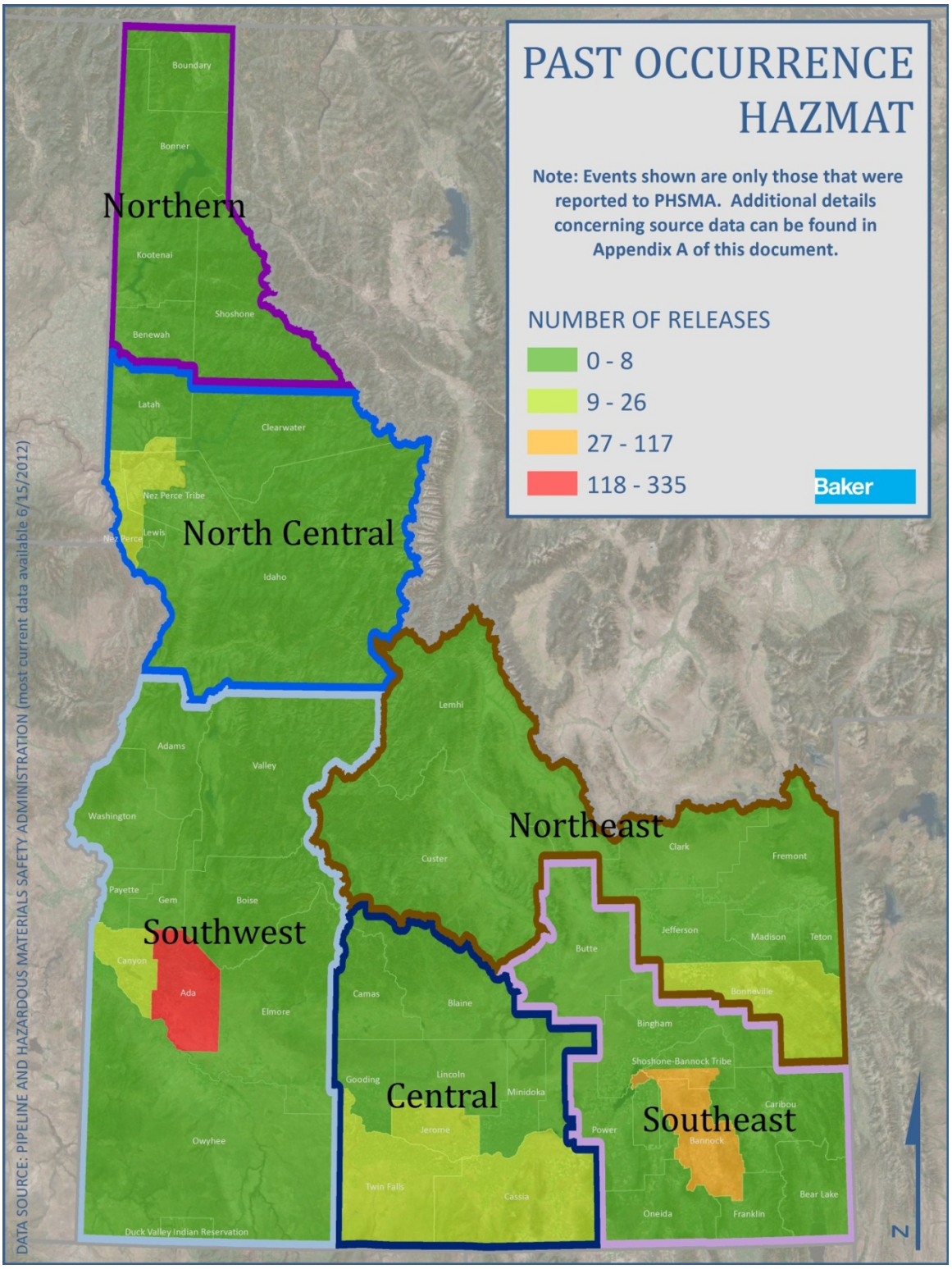
GENERAL MITIGATION APPROACHES

Education is very important when it comes to hazardous material mitigation. Workers must receive proper training in the use, safety, and regulations regarding hazardous materials. Workers and emergency response personnel must be trained in the appropriate techniques and safety measures for dealing with spills and incidents. The general public should be made aware of the hazards of household chemical products and methods for properly disposing of these products. In addition, numerous regulations and codes have been created to address containment, hazard communication, and controls.

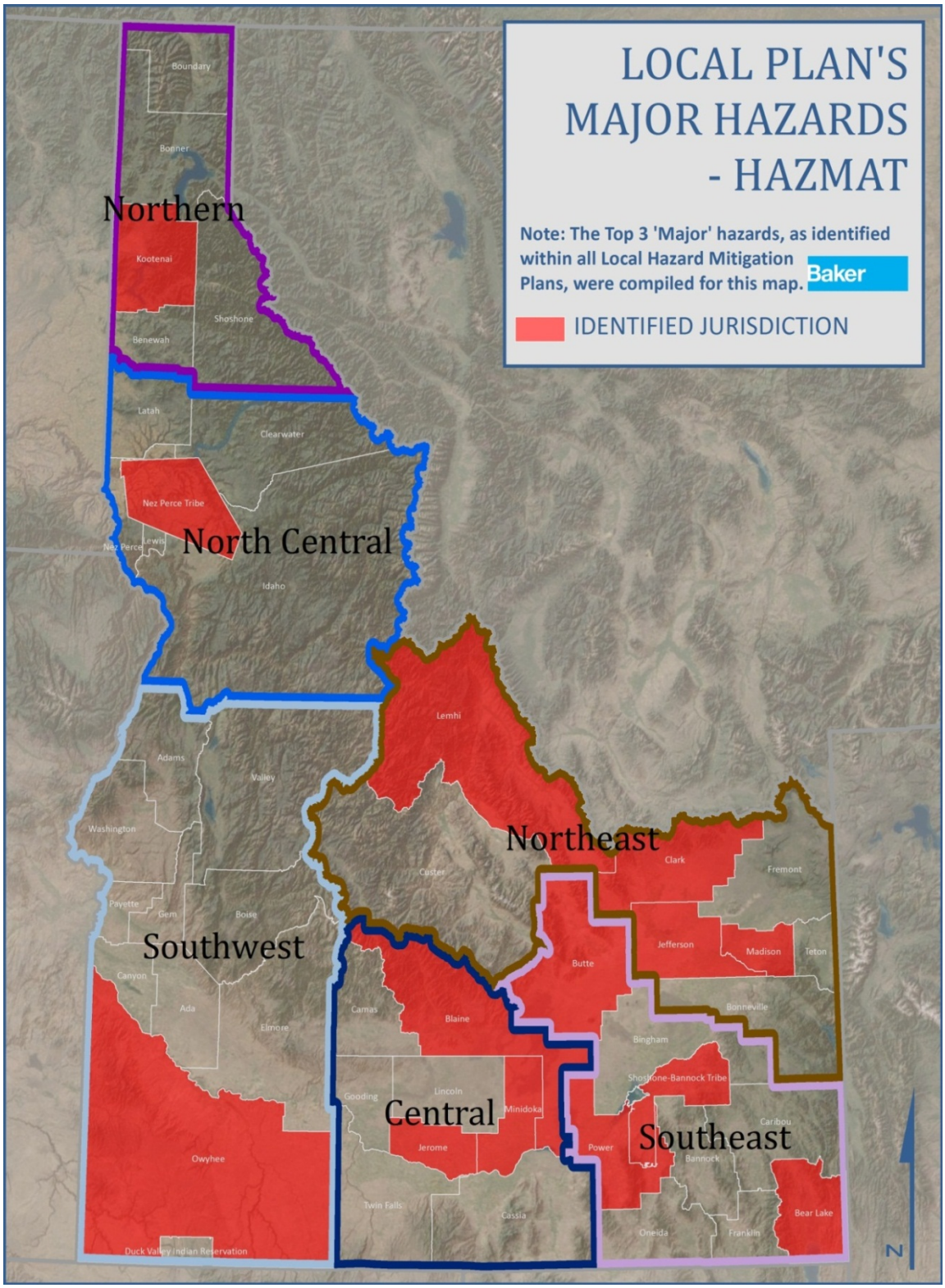
Hazardous materials are best managed through suitable containment. When hazardous materials are properly contained, they are unlikely to cause harm. The design of containers for transportation and storage should be based on chemical and physical characteristics, the degree of hazard offered by the product, and (to some extent) on economic considerations. Most regulations and codes require containers to resist the most severe stresses that may reasonably be expected during normal handling, storage, and use.

Hazard communication is also an important regulatory measure. Where required by USDOT regulations, hazard communication information is provided in the form of container markings and labels, vehicle placarding, and shipping paper entries. Facilities are required to identify chemical hazards in buildings, tanks, and other storage facilities using the NFPA 704 system.

USDOT regulations impose certain controls on the types of chemicals that may be shipped together, how they must be loaded and secured on vehicles, levels of allowable radiation exposure and radiological contamination and, for certain high-level radioactive shipments, highway routing. Codes and zoning requirements may also address allowable locations for chemical storage and use.



Map 3.14.D: Past Occurrences of Hazardous Materials Events



Map 3.14.E: Hazardous Material Events Identified as Local Plan Major Hazard