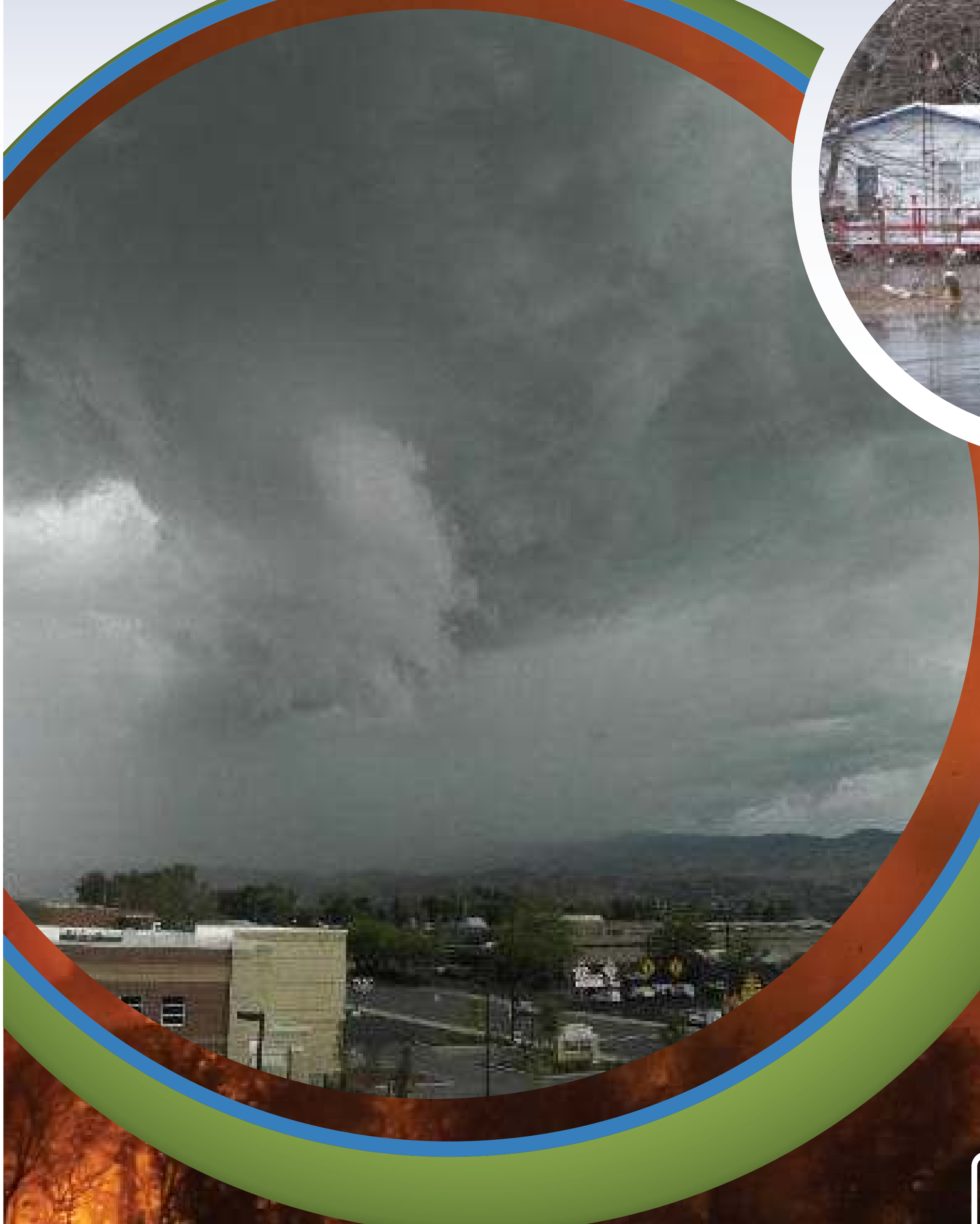
2022 Ada County
Multi-Hazard Mitigation Plan

Public Review Draft | July 2022



Volume 1
Countywide Elements

TETRA TECH

2022 Ada County Multi-Hazard Mitigation Plan

Volume 1—Countywide Elements

July 2022

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CONTENTS

Appendices

Tables

Figures

ACKNOWLEDGMENTS

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DEFINITIONS

1 Percent Annual Chance Flood—The level of flooding that has a 1 percent chance of being equaled or exceeded in any given year. Though often referred to as the "100-year flood," this event can occur more than once in a relatively short period of time.

Acre-Foot—An acre-foot is the amount of water it takes to cover 1 acre to a depth of 1 foot. This measure is used to describe the quantity of storage in a water reservoir. An acre-foot is a unit of volume. One acre foot equals 7,758 barrels; 325,829 gallons; or 43,560 cubic feet. An average household of four will use approximately 1 acre-foot of water per year.

Asset—An asset is any man-made or natural feature that has value, including, but not limited to, people; buildings; infrastructure, such as bridges, roads, sewers, and water systems; lifelines, such as electricity and communication resources; and environmental, cultural, or recreational features such as parks, wetlands, and landmarks.

Base Flood—The flood having a 1% chance of being equaled or exceeded in any given year, also known as the "100-year" or "1% chance" flood. The base flood is a statistical concept used to ensure that all properties subject to the National Flood Insurance Program (NFIP) are protected to the same degree against flooding.

Basin—A basin is the area within which all surface water—whether from rainfall, snowmelt, springs, or other sources—flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Basins are also referred to as "watersheds" and "drainage basins."

Benefit/Cost Analysis—A benefit/cost analysis is a systematic, quantitative method of comparing projected benefits to projected costs of a project or policy. It is used as a measure of cost effectiveness.

Benefit—A benefit is a net project outcome and is usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of benefit-cost analysis of proposed mitigation measures, benefits are limited to specific, measurable, risk reduction factors, including reduction in expected property losses (buildings, contents and functions) and protection of human life.

BLM—Bureau of Land Management

BRIC—Building Resilient Infrastructure and Communities

Building—A building is defined as a structure that is walled and roofed, principally aboveground, and permanently fixed to a site. The term includes manufactured homes on permanent foundations on which the wheels and axles carry no weight.

Capability Assessment—A capability assessment provides a description and analysis of a community's current capacity to address threats associated with hazards. The assessment includes two components—an inventory of an agency's mission, programs and policies, and an analysis of its capacity to carry them out. A capability assessment is an integral part of the planning process in which a community's actions to reduce losses are identified, reviewed, and analyzed, and the framework for implementation is identified.

CDBG-DR—Community Development Block Grant Disaster Recovery grants

CDC—U.S. Centers for Disease Control and Prevention

CFR—Code of Federal Regulations

cfs—cubic feet per second

Community Rating System (CRS)—The CRS is a voluntary program under the NFIP that rewards participating communities (provides incentives) for exceeding the minimum requirements of the NFIP and completing activities that reduce flood hazard risk by providing flood insurance premium discounts.

COMPASS—Community Planning Association of SW Idaho

Critical Facility—A critical facility is one that is deemed vital to the Ada County planning area's ability to provide essential services while protecting life and property. A critical facility may be a system or an asset, either physical or virtual, the loss of which would have a profound impact on the security, economy, public health or safety, environment, or any combination of thereof, across the planning area.

CRS—Community Rating System

Cubic Feet per Second (cfs)—Discharge or river flow is commonly measured in cfs. One cubic foot is about 7.5 gallons of liquid.

Dam Failure—Dam failure refers to a partial or complete breach in a dam (or levee) that impacts its integrity. Dam failures occur for a number of reasons, such as flash flooding, inadequate spillway size, mechanical failure of valves or other equipment, freezing and thawing cycles, earthquakes, and intentional destruction.

Dam—Any artificial barrier or controlling mechanism that can or does impound 10 acre-feet or more of water.

Debris Avalanche—A debris flow that travels faster than about 10 miles per hour (mph).

Debris Flow—Dense mixtures of water-saturated debris that move down-valley; looking and behaving much like flowing concrete. They form when loose masses of unconsolidated material are saturated, become unstable, and move down slope. The source of water varies but includes rainfall, melting snow or ice, and glacial outburst floods.

DFIRM—Digital Flood Insurance Rate Maps

Disaster Mitigation Act of 2000 (DMA); The DMA is Public Law 106-390 and is the latest federal legislation enacted to encourage and promote proactive, pre-disaster planning as a condition of receiving financial assistance under the Robert T. Stafford Act. The DMA emphasizes planning for disasters before they occur. The DMA established a pre-disaster hazard mitigation program and new requirements for the national post-disaster hazard mitigation grant program.

DMA—Disaster Mitigation Act

Drainage Basin—A basin is the area within which all surface water- whether from rainfall, snowmelt, springs or other sources- flows to a single water body or watercourse. The boundary of a river basin is defined by natural topography, such as hills, mountains and ridges. Drainage basins are also referred to as **watersheds** or **basins**.

Drought—Drought is a period of time without substantial rainfall or snowfall from one year to the next. Drought can also be defined as the cumulative impacts of several dry years or a deficiency of precipitation over an extended period of time, which in turn results in water shortages for some activity, group, or environmental function. A hydrological drought is caused by deficiencies in surface and subsurface water supplies. A socioeconomic drought impacts the health, well-being, and quality of life or starts to have an adverse impact on a region. Drought is a normal, recurrent feature of climate and occurs almost everywhere.

Earthquake—An earthquake is defined as a sudden slip on a fault, volcanic or magmatic activity, and sudden stress changes in the earth that result in ground shaking and radiated seismic energy. Earthquakes can last from a few seconds to over 5 minutes, and have been known to occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris as shocks shake, damage, or demolish buildings and other structures.

EMAP—Emergency Management Accreditation Program

EMCR—Ada County Emergency Management & Community Resilience

EPA—U.S. Environmental Protection Agency

ESA—Endangered Species Act

Exposure—Exposure is defined as the number and dollar value of assets considered to be at risk during the occurrence of a specific hazard.

Extent—The extent is the size of an area affected by a hazard.

FEMA—Federal Emergency Management Agency

FERC—Federal Energy Regulatory Commission

Fire Behavior—Fire behavior refers to the physical characteristics of a fire and is a function of the interaction between the fuel characteristics (such as type of vegetation and structures that could burn), topography, and weather. Variables that affect fire behavior include the rate of spread, intensity, fuel consumption, and fire type (such as underbrush versus crown fire).

Fire Frequency—Fire frequency is the broad measure of the rate of fire occurrence in a particular area. An estimate of the areas most likely to burn is based on past fire history or fire rotation in the area, fuel conditions, weather, ignition sources (such as human or lightning), fire suppression response, and other factors.

Firewise—National Fire Protection Association program encouraging local solutions for wildfire safety by involving homeowners, community leaders, planners, developers, firefighters and others in the effort to protect people and property from the risk of wildfire. The program is co-sponsored by the U.S. Forest Service, the U.S. Department of the Interior, and the National Association of State Foresters.

FIRM—Flood Insurance Rate Map

Flash Flood—A flash flood occurs with little or no warning when water levels rise at an extremely fast rate

Flood Insurance Rate Map (FIRM)—FIRMs are the official maps on which the Federal Emergency Management Agency (FEMA) has delineated the Special Flood Hazard Area (SFHA).

Flood Insurance Study—A report published by the Federal Insurance and Mitigation Administration for a community in conjunction with the community's Flood Insurance rate Map. The study contains such background data as the base flood discharges and water surface elevations that were used to prepare the FIRM. In most cases, a community FIRM with detailed mapping will have a corresponding flood insurance study.

Floodplain—Any land area susceptible to being inundated by flood waters from any source. A flood insurance rate map identifies most, but not necessarily all, of a community's floodplain as the Special Flood Hazard Area (SFHA).

Floodway—Floodways are areas within a floodplain that are reserved for the purpose of conveying flood discharge without increasing the base flood elevation more than 1 foot. Generally speaking, no development is allowed in floodways, as any structures located there would block the flow of floodwaters.

FMA—Flood Mitigation Assistance

FRCC—Fire Regime Condition Class

Freeboard—Freeboard is the margin of safety added to the base flood elevation.

Frequency—For the purposes of this plan, frequency refers to how often a hazard of specific magnitude, duration, and/or extent is expected to occur on average. Statistically, a hazard with a 100-year frequency is expected to occur about once every 100 years on average and has a 1 percent chance of occurring any given year. Frequency reliability varies depending on the type of hazard considered.

Geographic Information System (GIS)—GIS is a computer software application that relates data regarding physical and other features on the earth to a database for mapping and analysis.

GIS—Geographic Information System

Goal—A goal is a general guideline that explains what is to be achieved. Goals are usually broad-based, long-term, policy-type statements and represent global visions. Goals help define the benefits that a plan is trying to achieve. The success of a hazard mitigation plan is measured by the degree to which its goals have been met (that is, by the actual benefits in terms of actual hazard mitigation).

Hazard Mitigation Grant Program (HMGP)—Authorized under Section 202 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the HMGP is administered by FEMA and provides grants to states, tribes and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster

Hazard—A hazard is a source of potential danger or adverse condition that could harm people and/or cause property damage.

Hazus—Hazus is a GIS-based program used to support the development of risk assessments as required under the DMA. The Hazus software program assesses risk in a quantitative manner to estimate damages and losses associated with natural hazards. Hazus is FEMA's nationally applicable, standardized methodology and software program and contains modules for estimating potential losses from earthquakes, floods and wind hazards. Hazus has also been used to assess vulnerability (exposure) for other hazards.

HMGP—Hazard Mitigation Grant Program

Hydraulics—Hydraulics is the branch of science or engineering that addresses fluids (especially water) in motion in rivers or canals, works and machinery for conducting or raising water, the use of water as a prime mover, and other fluid-related areas.

Hydrology—Hydrology is the analysis of waters of the earth. For example, a flood discharge estimate is developed by conducting a hydrologic study.

IBC—International Building Code

IDWR—Idaho Department of Water Resources

Intensity—For the purposes of this plan, intensity refers to the measure of the effects of a hazard.

Inventory—The assets identified in a study region comprise an inventory. Inventories include assets that could be lost when a disaster occurs and community resources are at risk. Assets include people, buildings, transportation, and other valued community resources.

Landslide—Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting upon them.

Lightning—Lightning is an electrical discharge resulting from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a "bolt," usually within or between clouds and the ground. A bolt of lightning instantaneously reaches temperatures approaching 50,000ºF. The rapid heating and cooling of air near lightning causes thunder. Lightning is a major threat during thunderstorms. In the United States, 75 to 100 Americans are struck and killed by lightning each year (see http://www.fema.gov/hazard/thunderstorms/thunder.shtm).

Liquefaction—Liquefaction is the complete failure of soils, occurring when soils lose shear strength and flow horizontally. It is most likely to occur in fine grain sands and silts, which behave like viscous fluids when liquefaction occurs. This situation is extremely hazardous to development on the soils that liquefy, and generally results in extreme property damage and threats to life and safety.

Local Government—Any county, municipality, city, town, township, public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate government entity, or agency or instrumentality of a local government; any Indian tribe or authorized tribal organization, or Alaska Native village or organization; and any rural community, unincorporated town or village, or other public entity.

Magnitude—Magnitude is the measure of the strength of an earthquake and is typically measured by the Richter scale. As an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Mitigation Actions—Mitigation actions are specific actions to achieve goals and objectives that minimize the effects from a disaster and reduce the loss of life and property.

Mitigation—A preventive action that can be taken in advance of an event that will reduce or eliminate the risk to life or property.

NASA—National Aeronautics and Space Administration

NEHRP—National Earthquake Hazards Reduction Program

NFIP—National Flood Insurance Program

NOAA—National Oceanic and Atmospheric Administration

NRC—Nuclear Regulatory Commission

NWS—National Weather Service

Objective—For the purposes of this plan, an objective is defined as a short-term aim that, when combined with other objectives, forms a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

PCB— Polychlorinated biphenyls

Peak Ground Acceleration—Peak ground acceleration (PGA) is a measure of the highest amplitude of ground shaking that accompanies an earthquake, based on a percentage of the force of gravity.

Performance Period—The five-year period after a local hazard mitigation plan is adopted before it expires and the adopting jurisdiction loses eligibility for some federal hazard mitigation funding

PGA—Peak ground acceleration

PIO—public information officer

Preparedness—Preparedness refers to actions that strengthen the capability of government, citizens and communities to respond to disasters.

Presidential Disaster Declaration—These declarations are typically made for events that cause more damage than state and local governments and resources can handle without federal government assistance. Generally, no specific dollar loss threshold has been established for such declarations. A Presidential Disaster Declaration puts into motion long-term federal recovery programs, some of which are matched by state programs, designed to help disaster victims, businesses and public entities.

Probability of Occurrence—The probability of occurrence is a statistical measure or estimate of the likelihood that a hazard will occur. This probability is generally based on past hazard events in the area and a forecast of events that could occur in the future. A probability factor based on yearly values of occurrence is used to estimate probability of occurrence.

Repetitive Loss Property—Any NFIP-insured property that, since 1978 and regardless of any changes of ownership during that period, has experienced four or more paid flood losses in excess of $1000, or two paid flood losses in excess of $1000 within any 10-year period since 1978, or three or more paid losses that equal or exceed the current value of the insured property.

Risk Assessment—Risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process assesses the vulnerability of people, buildings and infrastructure to hazards and focuses on (1) hazard identification; (2) impacts of hazards on physical, social and economic assets; (3) vulnerability identification; and (4) estimates of the cost of damage or costs that could be avoided through mitigation.

Risk Ranking—The relative rating of hazards based on their probability of occurrence and their expected impact on people, property and the economy.

Risk—Risk is the estimated impact that a hazard would have on people, services, facilities and structures in a community. Risk measures the likelihood of a hazard occurring and resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to occurrence of a specific type of hazard. Risk also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Riverine—Of or produced by a river. Riverine floodplains have readily identifiable channels. Floodway maps can only be prepared for riverine floodplains.

Robert T. Stafford Act—The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107, was signed into law on November 23, 1988. This law amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs.

SFHA—Special Flood Hazard Area

Special Flood Hazard Area—The base floodplain delineated on a Flood Insurance Rate Map. The SFHA is mapped as a Zone A in riverine situations and zone V in coastal situations. The SFHA may or may not encompass all of a community's flood problems

Stakeholder—Business leaders, civic groups, academia, non-profit organizations, major employers, managers of critical facilities, farmers, developers, special purpose districts, and others whose actions could impact hazard mitigation.

Steep Slope—Different communities and agencies define it differently, depending on what it is being applied to, but generally a steep slope is a slope in which the percent slope equals or exceeds 25%. For this study, steep slope is defined as slopes greater than 30%.

Stream Bank Erosion—Stream bank erosion is common along rivers, streams and drains where banks have been eroded, sloughed or undercut. However, it is important to remember that a stream is a dynamic and constantly changing system. It is natural for a stream to want to meander, so not all eroding banks are "bad" and in need of repair. Generally, stream bank erosion becomes a problem where development has limited the meandering nature of streams, where streams have been channelized, or where stream bank structures (like bridges, culverts, etc.) are located in places where they can actually cause damage to downstream areas. Stabilizing these areas can help protect watercourses from continued sedimentation, damage to adjacent land uses, control unwanted meander, and improvement of habitat for fish and wildlife.

TENORM—Technologically Enhanced Naturally Occurring Radioactive Material

Thunderstorm—A thunderstorm is a storm with lightning and thunder produced by cumulonimbus clouds. Thunderstorms usually produce gusty winds, heavy rains, and sometimes hail. Thunderstorms are usually short in duration (seldom more than 2 hours). Heavy rains associated with thunderstorms can lead to flash flooding during the wet or dry seasons.

Tornado—A tornado is a violently rotating column of air extending between and in contact with a cloud and the surface of the earth. Tornadoes are often (but not always) visible as funnel clouds. On a local scale, tornadoes are the most intense of all atmospheric circulations, and winds can reach destructive speeds of more than 300 mph. A tornado's vortex is typically a several hundred feet in diameter, and damage paths can be up to 1 mile wide and 50 miles long.

USDA—U.S. Department of Agriculture

USDM—U.S. Drought Monitor

USGS—U.S. Geological Survey

Vulnerability—Vulnerability describes how exposed or susceptible an asset is to damage. Vulnerability depends on an asset's construction and contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power. Flooding of an electric substation would affect not only the substation itself but businesses as well. Often, indirect effects can be much more widespread and damaging than direct effects.

Watershed—A watershed is an area that drains downgradient from areas of higher land to areas of lower land to the lowest point, a common drainage basin.

Wildfire—These terms refer to any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors—the presence of fuel, topography and air mass. Fuel can include living and dead vegetation on the ground, along the surface as brush and small trees, and in the air such as tree canopies. Topography includes both slope and elevation. Air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount, duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use and arson.

Wildland-Urban Interface Area—The geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Windstorm—Windstorms are generally short-duration events involving straight-line winds or gusts exceeding 50 mph. These gusts can produce winds of sufficient strength to cause property damage. Windstorms are especially dangerous in areas with significant tree stands, exposed property, poorly constructed buildings, mobile homes (manufactured housing units), major infrastructure, and aboveground utility lines. A windstorm can topple trees and power lines; cause damage to residential, commercial, critical facilities; and leave tons of debris in its wake.

WUI—Wildland Urban Interface

Zoning Ordinance—The zoning ordinance designates allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components—a zoning text and a zoning map.

EXECUTIVE SUMMARY

Hazard mitigation is the use of long-term and short-term policies, programs, projects, and other activities to alleviate the death, injury, and property damage that can result from a disaster. Ada County developed an updated hazard mitigation plan in partnership with the following local governments within the county:

- City of Boise
- City of Eagle
- City of Garden City
- City of Kuna
- City of Meridian
- City of Star
- Ada County Highway District
- Eagle Fire District
- Eagle Sewer District
- Eagle Urban Renewal Agency
- Flood Control District #10
- Greater Boise Auditorium District
- Independent School District of Boise
- Joint School District #2
- Kuna Rural Fire Protection District
- Meridian Development Corporation
- North Ada Co. Fire and Rescue
- Star Joint Fire Protection District
- Star Sewer District
- Whitney Fire Protection District

The hazard mitigation plan defines measures to reduce risks from natural disasters in the Ada County planning area, which consists of the entire county. The plan complies with federal and state hazard mitigation planning requirements to establish eligibility for funding under Federal Emergency Management Agency (FEMA) grant programs for all planning partners. It updates the County's previous hazard mitigation plan, from 2017.

PREVIOUS HAZARD MITIGATION PLANNING IN ADA COUNTY

Ada County and a group of planning partners prepared an initial hazard mitigation plan that was approved by FEMA in 2006. Federal regulations require updates of hazard mitigation plans on a 5-year cycle to reevaluate recommendations, monitor the impacts of actions that have been accomplished, and determine if there is a need to change the focus of mitigation strategies. A jurisdiction covered by a plan that has expired is no longer in compliance with the federal requirements for hazard mitigation planning.

To meet the federal requirements for updating plans, the 2006 plan was comprehensively updated in 2011. The 2011 update represented a significant enhancement of the 2006 plan in content, scope and coverage. The 2017 updated the 2011 plan. The *2022 Ada County Multi-Hazard Mitigation Plan* updates the 2017 plan.

PLAN UPDATE PROCESS

Updating the plan consisted of the following phases:

- **Organize Resources**—A planning team was assembled for the plan update, consisting of staff from Ada County Emergency Management & Community Resilience (EMCR) and a technical consultant. The team conducted outreach to establish the planning partnership. A 20-member steering committee was assembled to oversee the plan update, consisting of planning partner staff, residents, and other stakeholders in the planning area. Coordination with other local, state and federal agencies involved in hazard mitigation occurred throughout the plan update process. This phase included a review of the existing plan and existing programs that may support hazard mitigation actions.
- **Engage the Public**—The planning team implemented a public involvement strategy developed by the Steering Committee. The strategy included in-person and virtual public events to present the risk assessment and the draft plan, presentations at various events and to community groups, a hazard mitigation survey, an EMCR-sponsored website, and multiple media releases.
- **Update Goals, Objectives and Actions**—The Steering Committee updated the goals from the 2017 plan and confirmed a set of objectives. The planning partnership selected a range of mitigation actions to work toward achieving the goals set forth in this plan update. Additionally, the Steering Committee selected a set of countywide mitigation actions. The mitigation actions recommended in this plan include some that address limitations in the modeling caused by insufficient data, such as digitizing maps of urban flooding issues and collecting perishable data, such as high water marks, after hazard events.
- **Develop Plan Implementation and Maintenance Strategy**—The Steering Committee developed a plan implementation and maintenance strategy that includes the establishment of a hazard mitigation working group, annual progress reporting, a strategy for continued public involvement, a commitment to plan integration with other relevant plans and programs, and a recommitment from the planning partnership to actively maintain the plan over the five-year performance period.
- **Assemble the Updated Plan**—The planning team and Steering Committee assembled a document to meet hazard mitigation planning requirements for all partners. The updated plan contains two volumes. Volume 1 contains components that apply to all partners and the broader planning area. Volume 2 contains all components that are jurisdiction-specific. Each planning partner has an annex in Volume 2.
- **Plan Adoption**—Once pre-adoption approval has been granted by FEMA, the final adoption phase will begin. Each planning partner will individually adopt the updated plan.
- **Plan Implementation**—Plan implementation will occur over the next five years as the planning partnership begins to implement the county-wide and jurisdiction-specific actions identified in this plan.

RISK ASSESSMENT RESULTS

Risk assessment is the process of measuring the potential loss of life resulting from natural hazards, as well as personal injury and property damage, in order to determine the vulnerability of a community. The Steering Committee used the risk assessment to rate risk and to gauge the potential impacts of each hazard of concern in the planning area. The risk assessment included the following:

- Hazard identification and profiling
- Assessment of the impact of hazards on physical, social, and economic assets
- Identification of particular areas of vulnerability
- Estimates of the cost of potential damage.

Based on the risk assessment, hazards were rated for the risk they pose to the overall planning area. Figure ES-1 shows the resulting scores and ratings for the entire Ada County planning area.

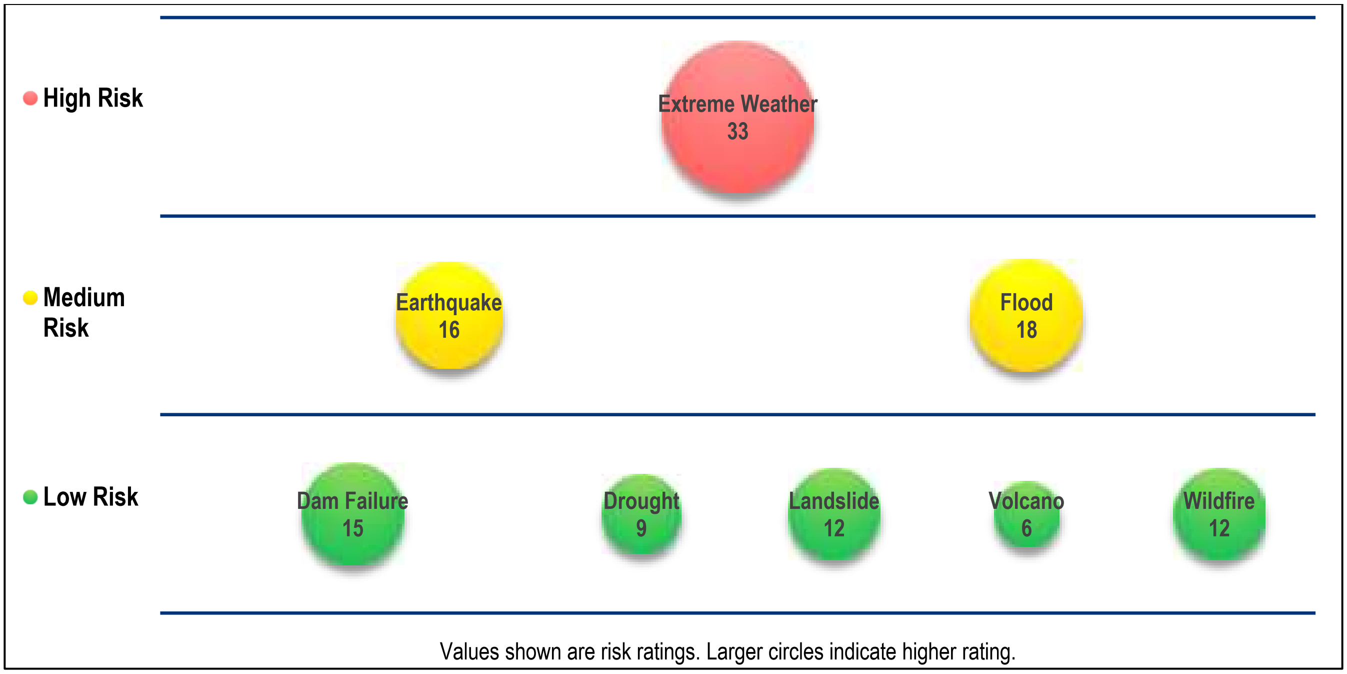


Figure ES-1. Countywide Hazard Risk Rating

Each planning partner also rated hazards for its own area. Figure ES-2 summarizes how the 20 participating planning partners rated each hazard. The results indicate the following general patterns:

- The extreme weather and flood hazards were most commonly ranked as high.
- The dam failure, earthquake, and flood hazards were most commonly ranked as medium.
- The landslide, drought, and volcano hazards were most commonly ranked as low.

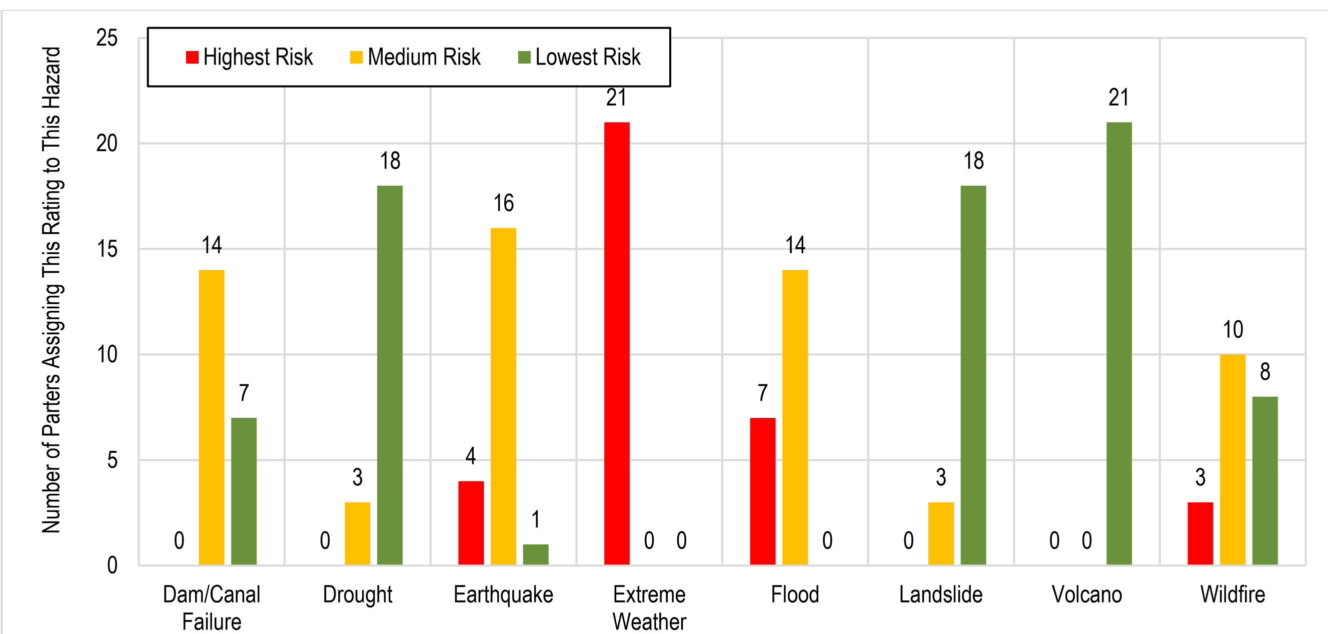


Figure ES-2. Summary of Risk Rating for Individual Planning Partners

MITIGATION MISSION STATEMENT, GOALS AND OBJECTIVES

The following mission statement guided the Steering Committee and the planning partnership in selecting the actions contained in this plan update:

> To reduce the vulnerability to natural hazards in order to protect the health, safety, welfare and economy of the Ada County community.

The Steering Committee and the planning partnership established the following goals for the plan update:

- Protect lives and reduce hazard related injuries
- Minimize or reduce current and future damage from natural hazards to property, including critical facilities and environment
- Encourage the development and implementation of long-term, cost-effective mitigation projects that foster resilience for the whole community
- Maintain, enhance, and restore the natural environment's capacity to deal with the impacts of natural hazard events.
- Improve emergency management preparedness, collaboration, and outreach within the planning area.

The following objectives were identified that meet multiple goals, helping to establish priorities for recommended mitigation actions:

1. Minimize disruption of local government and commerce operations caused by the identified hazards.
2. Using best available data, science, and knowledge, continually improve understanding of the location and potential impacts of the identified hazards.
3. Based on willing participation, encourage retrofit, purchase, or relocation of real property, based on one or more of the following criteria: level of exposure, repetitive loss history, and previous damage from natural hazards.
4. Based on understanding of risk, prevent or discourage new development in hazardous areas; if building occurs in high-risk areas, ensure that it is done in such a way as to minimize risk.
5. Strengthen codes and code enforcement to ensure that new construction and redevelopment of property and infrastructure can withstand the impacts of hazards.
6. Integrate hazard mitigation policies into local government land use plans that not only protect the built environment, but also maintain or enhance the natural environment's ability to withstand and recover from disasters, with an emphasis on the promotion of regional consistency in policy.
7. Develop new, and improve existing, early warning emergency notification protocols, systems, and evacuation procedures.
8. Perform whole community engagement to educate the public on the area's potential hazards and ways to personally prepare, respond, recover and mitigate the impacts of these events.
9. Establish partnerships among all levels of government, the business community, and other stakeholders to improve and implement methods to protect life, property and the natural environment.
10. Increase the resilience and continuity of operations of identified critical facilities and infrastructure within the planning area to maintain delivery of essential services to the whole community.

MITIGATION ACTIONS

Mitigation actions presented in this update are activities designed to reduce or eliminate losses resulting from natural hazards. The update process resulted in the identification of more than 250 mitigation actions for implementation by individual planning partners, as presented in Volume 2 of this plan. In addition, the steering committee and planning partnership identified 15 countywide actions benefiting the whole partnership, as listed in Table ES-1.

Table ES-1. Countywide Mitigation Actions

Hazards Addressed	Lead Agency	Possible Funding Sources or Resources	Timeline	Objectives
CW-1—Sponsor and maintain a natural-hazard informational website to include the following types of information: • Hazard-specific information such as warning, private property mitigation alternatives, important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • CRS creditable information • Links to planning partners' pages, FEMA and Idaho Office of Emergency Management Natural hazard mitigation plan information such as progress reports, mitigation success stories, update strategies, Steering Committee meetings.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	EMCR Operational Budget	Ongoing	2, 8, 9
CW-2—Maintain the Steering Committee as a functioning body, under the ground rules established at its inception, to monitor progress of the plan, provide technical assistance to planning partners, and oversee the update of the plan according to schedule.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs	Ongoing	6, 8, 9
CW-3—All planning partners that committed to the update effort will formally adopt this plan when pre-adoption approval has been granted by the Idaho Office of Emergency Management and FEMA Region 10. Each planning partner will adhere to the plan maintenance protocol identified in this plan. All actions under this action will be coordinated by EMCR.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs	Short-term	All
CW-4—Continue to implement ongoing public outreach programs administered by EMCR. Seek opportunities to promote the mitigation of natural hazards within the planning area, using information contained in this plan.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs	Ongoing	2, 8, 9
CW-5—Seek out and use the best available data, science and technology to update the risk assessment to this plan as that data, science, technology and funding resources become available.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	FEMA HMGP, RiskMAP, federal hazard analysis funding	Long-term	2, 9
CW-6—Continue to support and coordinate with the Idaho Silver Jackets program.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs	Ongoing	2, 6, 8, 9
CW-7—Provide technical support and coordination for available grant funding opportunities to the planning partnership.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs, FEMA HMGP	Short-term	2, 9
CW-8—Participate as a cooperating partner with FEMA and other stakeholders in FEMA's RiskMAP initiative.				
Flood	EMCR	Can be funded under existing programs, RiskMAP initiative	Short-term	2, 9
CW-9—Leverage public outreach partnering capabilities within the planning area to promote a uniform and consistent message on the importance of proactive hazard mitigation.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	EMCR Operational Budget	Ongoing	All

Hazards Addressed	Lead Agency	Possible Funding Sources or Resources	Timeline	Objectives
CW-10—Coordinate mitigation planning and project efforts within the planning area to leverage all resources available to the planning partnership.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	EMCR Operational Budget	Ongoing	1, 9, 10
CW-11—Where appropriate, support retrofitting, purchase, or relocation of structures located in hazard-prone areas to protect them from future damage, with repetitive and severe repetitive loss properties as a priority. Seek opportunities to leverage partnerships within the planning area in these pursuits.				
Dam/Canal Failure, Earthquake, Flood, Landslide, Extreme Weather, Wildfire	Planning Partners	FEMA HMGP, BRIC, FMA	Long-term	3, 9
CW-12—Use information contained in the Ada County Multi-Hazard Mitigation Plan to support updates to other emergency management plans in effect within the planning area.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs	Short-term	1, 2, 6, 10
CW-13—Using the most current Hazus model and other data available, examine exposure and level of risk to the known hazards of concern for first responder facilities and identified potential sheltering sites.				
Dam/Canal Failure, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs	Long-term	2, 9
CW-14—Based on identified risks, relocate or structurally harden first responder facilities as needed. Relocation may not be an option based on response requirements of the organization.				
Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	FEMA HMGP	Long-term	3, 9
CW-15—Using the most current Hazus model and other data available, categorize potential sheltering sites from lowest to highest exposure to the known hazards of concern. Identify partners that own the sheltering sites and encourage building enhancements at those sites that would allow for operations during a major disaster event.				
Dam/Canal Failure, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire	EMCR	Can be funded under existing programs, FEMA HMGP	Long-term	2, 9

IMPLEMENTATION

Full implementation of the recommendations of this plan will require time and resources. The measure of the plan’s success will be its ability to adapt to changing conditions. Ada County and its planning partners will assume responsibility for adopting the recommendations of this plan and committing resources toward implementation. The framework established by this plan commits all planning partners to pursue actions when the benefits of a project exceed its costs. The planning partnership developed this plan with extensive public input, and public support of the actions identified in this plan will help ensure the plan’s success.

Part 1. PLANNING PROCESS AND COMMUNITY PROFILE

1. INTRODUCTION

1.1 WHY PREPARE THIS PLAN?

The inevitability of natural hazards in Ada County creates an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future hazard events. Identifying risks posed by hazards and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses can work together with the County to create a plan that addresses the potential impacts of hazard events and ways to mitigate those impacts.

1.1.1 Federal Guidance

Hazard mitigation is defined as any action taken to reduce or alleviate the loss of life, personal injury, and property damage that can result from a disaster. It involves long- and short-term actions implemented before, during and after disasters. Hazard mitigation activities include planning efforts, policy changes, programs, studies, improvement projects, and other steps to reduce the impacts of hazards.

The federal Disaster Mitigation Act (DMA) emphasizes planning for disasters before they occur. The DMA requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. Regulations developed to fulfill the DMA's requirements are included in Title 44 of the Code of Federal Regulations (44 CFR).

The responsibility for hazard mitigation lies with not only with local, state, and federal governments, but also with private property owners and commercial and institutional interests. The DMA encourages cooperation among state and local authorities in pre-disaster planning. The enhanced planning network called for by the DMA helps local governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more cost-effective risk-reduction projects.

The DMA also promotes sustainability in hazard mitigation. To be sustainable, hazard mitigation needs to incorporate sound management of natural resources and address hazards and mitigation in the largest possible social and economic context.

1.1.2 Local Concerns

The *2022 Ada County Multi-Hazard Mitigation Plan* is the third comprehensive update to Ada County's hazard mitigation plan since its initial development in 2005; previous updates were completed in 2011 and 2017. Several factors initiated Ada County's ongoing efforts to plan for hazard mitigation:

- The Ada County area has significant exposure to numerous natural hazards that have caused millions of dollars in past damage.
- The County and its planning partners want to be proactive in preparing for the impacts of natural hazards.

- Local resources to undertake risk reduction initiatives are limited. Being able to leverage federal financial assistance is paramount to successful hazard mitigation.

Like all previous versions of this plan, the 2022 update was developed by Ada County in partnership with participating municipalities and special purpose districts within the county. One of the benefits of such multi-jurisdictional planning is the ability to pool resources and eliminate redundant activities within a planning area that has uniform risk exposure and vulnerabilities. The Federal Emergency Management Agency (FEMA) encourages multi-jurisdictional planning under its guidance for the DMA. The plan will help guide and coordinate mitigation activities throughout the planning area.

1.1.3 Plan Objectives

The main purpose of this planning effort was to identify risks posed by hazards and to develop strategies to reduce the impact of hazard events on people and property in Ada County; however, the plan was also developed to meet the following objectives:

- Meet or exceed requirements of the DMA.
- Enable all planning partners to continue using federal grant funding to reduce risk through mitigation.
- Meet the needs of each planning partner as well as state and federal requirements.
- Create a risk assessment that focuses on Ada County hazards of concern.
- Create a single planning document that integrates all planning partners into a framework that supports partnerships within the county, and puts all partners on the same planning cycle for future updates.
- Meet the planning requirements of FEMA's Community Rating System (CRS), allowing planning partners that participate in the CRS program to maintain or enhance their CRS classifications.
- Coordinate existing plans and programs so that high-priority actions to mitigate possible disaster impacts are funded and implemented.

1.2 WHO WILL BENEFIT FROM THIS PLAN?

This update identifies resources, information, and strategies for reducing risk from natural hazards. Elements and strategies in the plan were selected because they meet a program requirement and because they best meet the needs of the planning partners and their citizens.

All citizens and businesses of Ada County are the ultimate beneficiaries of this hazard mitigation plan. The plan reduces risk for those who live in, work in, and visit the county. It provides a viable planning framework for all foreseeable natural hazards that may impact the county. Participation in development of the plan by key stakeholders in the county helped ensure that outcomes will be mutually beneficial. The resources and background information in the plan are applicable countywide, and the plan's goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships.

1.3 HOW TO USE THIS PLAN

This plan has been set up in two volumes so that elements that are jurisdiction-specific can easily be distinguished from those that apply to the whole planning area:

- **Volume 1**—Volume 1 includes all federally required elements of a disaster mitigation plan that apply to the entire planning area. This includes the description of the planning process, public involvement strategy, goals and objectives, countywide hazard risk assessment, countywide mitigation actions, and a strategy for maintaining and implementing the plan. Appendices provided at the end of Volume 1 include information or explanations to support the main content of the plan.

- **Volume 2**—Volume 2 includes all federally required jurisdiction-specific elements, in annexes for each participating jurisdiction. It includes a description of the participation requirements established by the Steering Committee, as well as instructions and templates that the partners used to complete their annexes. Volume 2 also includes "linkage" procedures for eligible jurisdictions that did not participate in development of this plan but wish to adopt it in the future.

Each planning partner will adopt Volume 1 in its entirety, its own jurisdiction-specific annex in Volume 2, and at least the introduction and appendices to Volume 2. Partners may at their discretion adopt Volume 2 in its entirety.

2. PLAN UPDATE—WHAT HAS CHANGED?

2.1 PREVIOUS PLANS

2.1.1 The 2006 Plan

In 2005, Ada County led a planning effort to prepare the *Ada County All Hazards Mitigation Plan*. Ada County and 10 planning partners adopted that plan in October 2006. It received FEMA approval in November 2006, establishing compliance with the DMA for all participating planning partners. The plan addressed five identified hazards: flood, landslide, earthquake, extreme weather and wildfire.

A principal objective of the planning process was the integration of the National Fire Plan, the Idaho Statewide Implementation Strategy, the Healthy Forests Restoration Act, the Idaho State Hazard Mitigation Plan 2004, the Ada County Comprehensive Plan, and FEMA requirements for a hazard mitigation plan. The effort used the best science from all partners, integrating local and regional knowledge about hazards while meeting the needs of local citizens, the regional economy and the significance of this region to the rest of Idaho and the Inland West.

The plan was published in three volumes: Volume I addressed flood, landslide, earthquake and extreme weather; Volume II addressed wildfire; and Volume III contained appendices. The plan presented 37 strategies to address flood, landslide, earthquake and extreme weather and 44 strategies addressing wildfire mitigation.

2.1.2 The 2011 Plan

Ada County comprehensively revised the original hazard mitigation plan in 2011. This plan differed from its predecessor for a variety of reasons:

- Better guidance existed at the time of its development.
- Science and technology had improved since the development of the initial plan.
- Newly available data and tools provided for a more detailed and accurate risk assessment.
- The risk assessment was prepared to better support future grant applications by providing information to support the measurement of "cost-effectiveness" required under FEMA mitigation grant programs.
- The plan was developed such that it met program requirements of the Community Rating System for participating jurisdictions.
- The participating partners included special purpose districts not involved in the initial planning effort.
- The plan was prepared as a more user-friendly document that is understandable to the general public.
- The plan identified actions rather than strategies. Strategies provide direction, but actions are fundable under grant programs.

The 2011 update, with 22 participating jurisdictions, addressed eight identified hazards: dam or canal failure, drought, volcano (ash fall), flood, landslide, earthquake, extreme weather and wildfire. The plan identified and prioritized 230 actions to be implanted by the planning partnership. The update received FEMA approval on December 22, 2011, maintaining the partners' DMA compliance. The status of recommended actions was monitored by a plan maintenance strategy identified in the plan that included annual progress reporting.

2.1.3 The 2017 Plan

Ada County updated the 2011 plan in 2017 with the following changes:

- Public outreach was enhanced by using social media and a web-based community survey.
- New, updated data provided a more detailed and accurate risk assessment.
- Climate conditions were addressed as a stand-alone chapter describing their impact on the hazards of concern.
- Changes in risk due to new development since the previous plan was adopted were addressed for each hazard of concern.
- The 2017 Plan had 20 planning partners. Boise State University also prepared an annex to the plan as a non-eligible planning partner and contributing stakeholder.

2.1.4 Progress Reporting

The planning partnership for the 2017 plan has completed several progress reports since that plan was completed. For the progress reports, each planning partner reviewed the actions identified for their community and the progress made on each action. Each planning partner also reviewed the priority of each action to determine if that priority needed to be changed due to economic, political, capacity, or disaster related changes within their jurisdiction. All of the completed progress reports for the 2017 plan can be viewed on the Ada County website at: https://adacounty.id.gov/ACEM/Mitigation.

2.2 WHY UPDATE?

2.2.1 Federal Eligibility

Under 44 CFR, hazard mitigation plans must present a schedule for monitoring, evaluating, and updating the plan. This provides an opportunity to reevaluate recommendations, monitor the impacts of completed actions, and determine any need to change the mitigation strategies. Local jurisdictions have a five-year "performance period" from the time they adopt a plan until its expiration. A jurisdiction covered by a plan that has expired is not able to pursue elements of federal funding for which a current hazard mitigation plan is a prerequisite. Hazard mitigation plans that are updated and approved prior to their expiration can maintain continuous funding eligibility.

2.2.2 Changes in Development

Local jurisdictions must revise their hazard mitigation plans to reflect changes in development in order to continue to be eligible for federal mitigation project grant funding (44 CFR Section 201.6(d)(3)). This ensures that the mitigation strategy continues to address the risk and vulnerability of existing and potential development and takes into consideration possible future conditions that could impact vulnerability. The following are significant development and demographic changes in Ada County since the 2017 hazard mitigation plan update:

- According to the 2020 U.S. Census, the reported population for Ada County was 494,399—a 13.8 percent increase from the population reported in the 2017 Plan.
- The valuation of the general building stock increased by 31.84 percent (Ada County Assessor, 2022)
- The total number of structures within the planning area increased by 16.2 percent, as detailed in Table 2-1.

Table 2-1. Percent Increase in General Building Stock

Municipality	Building County 2017 Plan	Building Count 2022 Plan	% Change
Boise	76,610	81,552	+6.1
Eagle	8,668	12,437	+30.3
Garden City	4,104	4,385	+6.4
Kuna	5,425	8,831	+38.6
Meridian	29,852	40,812	+26.9
Star	2,770	5,065	+45.3
Unincorporated County	19,019	21,720	+12.4
Total	**146,448**	**174,802**	**+16.2**

These number represent significant growth over five years. This plan update assumes that some of this new development occurred in hazard-prone areas. Because all such new development would have been regulated pursuant to local programs and codes, it is assumed that vulnerability did not increase even if exposure did. Ada County and its incorporated cities and towns have general/comprehensive plans that govern land-use decisions and policymaking, as well as building codes and flood-management regulations based on state and federal mandates. More detailed information on the types and location of new construction over the last five years is available in the city and county annexes in Volume 2 of this plan.

2.2.3 Emergency Management Accreditation Program

For the 2022 update, Ada County is pursuing accreditation under the Emergency Management Accreditation Program (EMAP). EMAP sets voluntary standards, assessments, and accreditation processes for disaster preparedness programs throughout the country.

2.3 THE UPDATED PLAN—WHAT IS DIFFERENT?

Due to the success of the prior plan update, no major changes were made to the format and function for this update. The plan has been enhanced using the best recently available data and technology, especially in the risk assessment portion. This plan update followed the same basic planning process as was used for the previous effort. A Steering Committee was once again the critical planning component in the process. Table 2-2 indicates the major changes between the two plans as they relate to 44 CFR planning requirements.

Table 2-2. Plan Changes Crosswalk

44 CFR Requirement	2017 Plan	Updated Plan
Requirement §201.6(b): In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: 1. An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; 2. An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and 3. Review and incorporation, if appropriate, of existing plans, studies, reports and technical information.	The 2017 plan followed an outreach strategy utilizing multiple media developed and approved by the Steering Committee. This strategy involved: • Public participation on an oversight Steering Committee. • Establishment of a plan informational website. • Press releases. • Utilization of social media • Web deployed survey Use of a public information survey Stakeholders were identified and coordinated with throughout the process. A comprehensive review of relevant plans and programs was performed by the planning team.	Public engagement enhancements for the 2022 plan included: • Utilization of social media • Web deployed survey • Enhanced press coverage As with the 2017 plan, the 2022 planning process identified key stakeholders and coordinated with them throughout the process. A comprehensive review of relevant plans and programs was performed by the core planning team.
§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.	The 2017 plan included a comprehensive risk assessment of eight hazards of concern. Risk was defined as (probability x impact), where impact is the impact on people, property and economy of the planning area. All planning partners ranked risk as it pertains to their jurisdiction. The potential impacts of climate conditions are discussed for each hazard.	The 2022 plan update assessed the same natural hazards of concern as the 2017 plan and applied the same risk ranking protocol. To meet EMAP criteria, expanded profiles were developed for the following non-natural hazards: • Civil disturbance and terrorism • Cyber disruption • Hazardous materials release • Public health emergency/pandemic • Radiological event • Utility failure
§201.6(c)(2)(i): [The risk assessment shall include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	The 2017 plan presented a risk assessment of each hazard of concern. Each chapter included the following components: • Hazard profile, including maps of extent and location, historical occurrences, frequency, severity and warning time. • Secondary hazards • Exposure of people, property, critical facilities and environment • Vulnerability of people, property, critical facilities and environment. • Future trends in development • Scenarios • issues	The 2022 plan update applied the same methodology to describe the extent and location of the natural hazards assessed by the plan.

44 CFR Requirement	2017 Plan	Updated Plan
§201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i). This description shall include an overall summary of each hazard and its impact on the community	Vulnerability was assessed for all hazards of concern. The Hazus computer model was used for the dam failure, earthquake and flood hazards. These were Level 2 analyses using city and county data. Site-specific data on County-identified critical facilities were entered into the Hazus model. Hazus outputs were generated for other hazards by applying an estimated damage function to an asset inventory extracted from Hazus.	The 2022 plan assessed vulnerability to all natural hazards using Hazus, updated with the best available data for the planning area. Hazus was used to model impacts from the dam failure, earthquake and flood hazards. Similar outputs were generated for the non-Hazus hazards using the same qualitative methodologies as used for the 2017 plan.
§201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program insured structures that have been repetitively damaged floods	During the 2017 plan update there were no repetitive loss properties identified in the Ada County planning area. However, a comprehensive flood insurance analysis that looks at policy coverage and claims history was performed as part of the flood hazard risk assessment.	There was an expansion in this plan to address repetitive loss properties that have now been identified by FEMA in the Ada County planning area.
Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure and critical facilities located in the identified hazard area.	A complete inventory of the numbers and types of buildings exposed was generated for each hazard of concern. The Steering Committee defined "critical facilities" for the planning area, and these were inventoried by exposure. Each hazard chapter provides a discussion on future development trends.	The 2022 plan includes a complete inventory of the numbers and types of buildings exposed for each hazard of concern. The Steering Committee defined "critical facilities" for the planning area, and these were inventoried by exposure. Each hazard chapter provides a discussion on future development trends.
Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) and a description of the methodology used to prepare the estimate.	Loss estimates were generated for all hazards of concern. These were generated by Hazus for the dam failure, earthquake and flood hazards. For the other hazards, loss estimates were generated by applying a regionally relevant damage function to the exposed inventory. In all cases, a damage function was applied to an asset inventory. The asset inventory was the same for all hazards and was generated in Hazus.	As was done with the 2017 plan, the 2022 plan includes loss estimates for all hazards of concern. These were generated by Hazus for the dam failure, earthquake and flood hazards. For the other hazards, loss estimates were generated by applying a regionally relevant damage function to the exposed inventory. The asset inventory was the same for all hazards and was generated in Hazus.
Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	There is a discussion of future development trends as they pertain to each hazard of concern. This discussion looks predominantly at the existing land use and the current regulatory environment that dictates this land use.	The 2022 plan describes future development trends as they pertain to each hazard of concern. This discussion looks predominantly at existing land use and the current regulatory environment that dictates this land use.

44 CFR Requirement	2017 Plan	Updated Plan
§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	The 2017 plan contained a mission statement, goals, objectives and actions. The mission statement, goals and objectives were regional and covered all planning partners. Each planning partner used the progress reporting from the plan maintenance and evaluated the status of actions identified in the 2011 plan. Actions that were completed or no longer considered to be feasible were removed. The balance of the actions were carried over to the 2017 plan and in some cases, new actions were added to the action plan. All objectives met multiple goals and stand alone as components of the plan. Each planning partner completed an assessment of its regulatory, technical and financial capabilities.	The 2022 plan includes a mission statement, goals, objectives, and actions. The mission statement, goals and objectives are regional and cover all planning partners. The Steering Committee made slight revisions to these components from the previous plan to better align with objectives for this update. Each planning partner used the progress reporting from the plan maintenance and evaluated the status of actions identified in the 2011 plan. Actions that were completed or no longer considered to be feasible were removed. The balance of the actions was carried over to the 2017 plan and in some cases, new actions were added to the action plan. Actions were prioritized using the same protocol that was applied for the 2017 plan.
Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	The Steering Committee identified a mission statement, five goals and ten objectives. These were completely new goals and objectives targeted specifically for this hazard mitigation plan. They were not carried over from any other planning document and were identified based upon the capabilities of the planning partnership. These planning components supported the actions identified in the plan.	The Steering Committee identified a mission statement, five goals and 10 objectives. These were slightly enhanced and targeted specifically for this hazard mitigation plan. These planning components support the actions identified in the plan.
Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	The 2017 plan includes a hazard mitigation catalog that was developed through a facilitated process. This catalog identifies actions that manipulate the hazard, reduce exposure to the hazard, reduce vulnerability, or increase mitigation capability. The catalog further segregates actions by scale of implementation. A table in the action plan section analyzes each action by mitigation type to illustrate the range of actions selected.	The same mitigation catalog approach that was utilized with the 2017 plan was applied to the 2022 plan update.
Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program, and continued compliance with the program's requirements, as appropriate.	All municipal planning partners that participate in the National Flood Insurance Program identified an action stating their commitment to maintain compliance and good standing under the program. Communities that participate in the Community Rating System have identified actions to maintain or enhance their standing under the CRS.	All municipal planning partners that participate in the National Flood Insurance Program identified an action stating their commitment to maintain compliance and good standing under the program. Communities that participate in the Community Rating System have identified actions to maintain or enhance their standing under the CRS.

44 CFR Requirement	2017 Plan	Updated Plan
Requirement: §201.6(c)(3)(iii): [The mitigation strategy shall describe] how the actions identified in section (c)(3)(ii) will be prioritized, implemented and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	Each recommended action was prioritized using a qualitative methodology based on the objectives the project will meet, the timeline for completion, how the project will be funded, the impact of the project, the benefits of the project and the costs of the project.	The same prioritization protocol that was utilized for the 2017 plan was applied to the 2022 plan update.
Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	The 2017 plan details a plan maintenance strategy similar to that of the initial plan. There is additional detail addressing deficiencies observed during the initial performance period of the plan. This includes a more defined role for the Steering Committee in annual plan review.	The 2017 plan maintenance strategy was carried over to the 2022 plan update.
Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	The 2017 plan details recommendations for incorporating the plan into other planning mechanisms such as: • Comprehensive Plan • Emergency response plan • Capital Improvement Programs • Municipal Code • Continuity of Operations Plan	The 2017 plan maintenance strategy was carried over to the 2022 plan update.
Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.	The 2017 plan details a strategy for continuing public involvement	The 2017 plan maintenance strategy was carried over to the 2022 plan update.
Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).	The 2017 plan achieved DMA compliance for 21 planning partners. Resolutions for each partner adopting the plan are included in an Appendix.	The 2022 plan achieved DMA compliance for 21 planning partners. Resolutions for each partner adopting the plan are included in an appendix.

3. PLAN DEVELOPMENT METHODOLOGY

3.1 FUNDING

This planning effort was funded by a grant from FEMA's Emergency Management Performance Grant program. Ada County Emergency Management & Community Resilience (EMCR) was the applicant agent for the grant. The grant was applied for in 2020, and funding was appropriated in 2021.

3.2 FORMATION OF THE PLANNING TEAM

Ada County hired Tetra Tech, Inc. to assist with development and implementation of the plan update. The Tetra Tech project manager assumed the role of the lead planner, reporting directly to a County-designated project manager. A planning team was formed to lead the planning effort, made up of the following members:

- Joe Lombardo (EMCR)—Director
- Paul Marusich (EMCR)—Deputy Director, County Project Manager
- Rob Flaner (Tetra Tech)—Project Manager, Lead Project Planner
- Carol Baumann (Tetra Tech)—Lead Risk Assessor
- Megan Brotherton (Tetra Tech)—Planner
- Desmian Alexander (Tetra Tech)—Planner

3.3 ESTABLISHMENT OF THE PLANNING PARTNERSHIP

Ada County opened this planning effort to all eligible local governments in the county. At a kickoff meeting on June 24, 2021, a presentation was made to introduce the plan update and solicit planning partner commitment. Each jurisdiction wishing to participate was asked to provide a "letter of intent" that designated a point of contact for the jurisdiction and confirmed the jurisdiction's commitment to the process and understanding of expectations. Table 3-1 lists planning partners that provided a letter of intent to participate in the plan update process.

3.4 DEFINING THE PLANNING AREA

The planning area consists of all of Ada County plus the portion of Flood Control District #10 that extends into Canyon County, as shown in Figure 3-1. The portion of Flood Control District #10 outside of Ada County is included in the planning area so that this plan fully covers the district. However, risk assessments in this plan apply only to the area within the Ada County boundaries because the flood control district has no critical facilities and no jurisdiction over development within its boundaries.

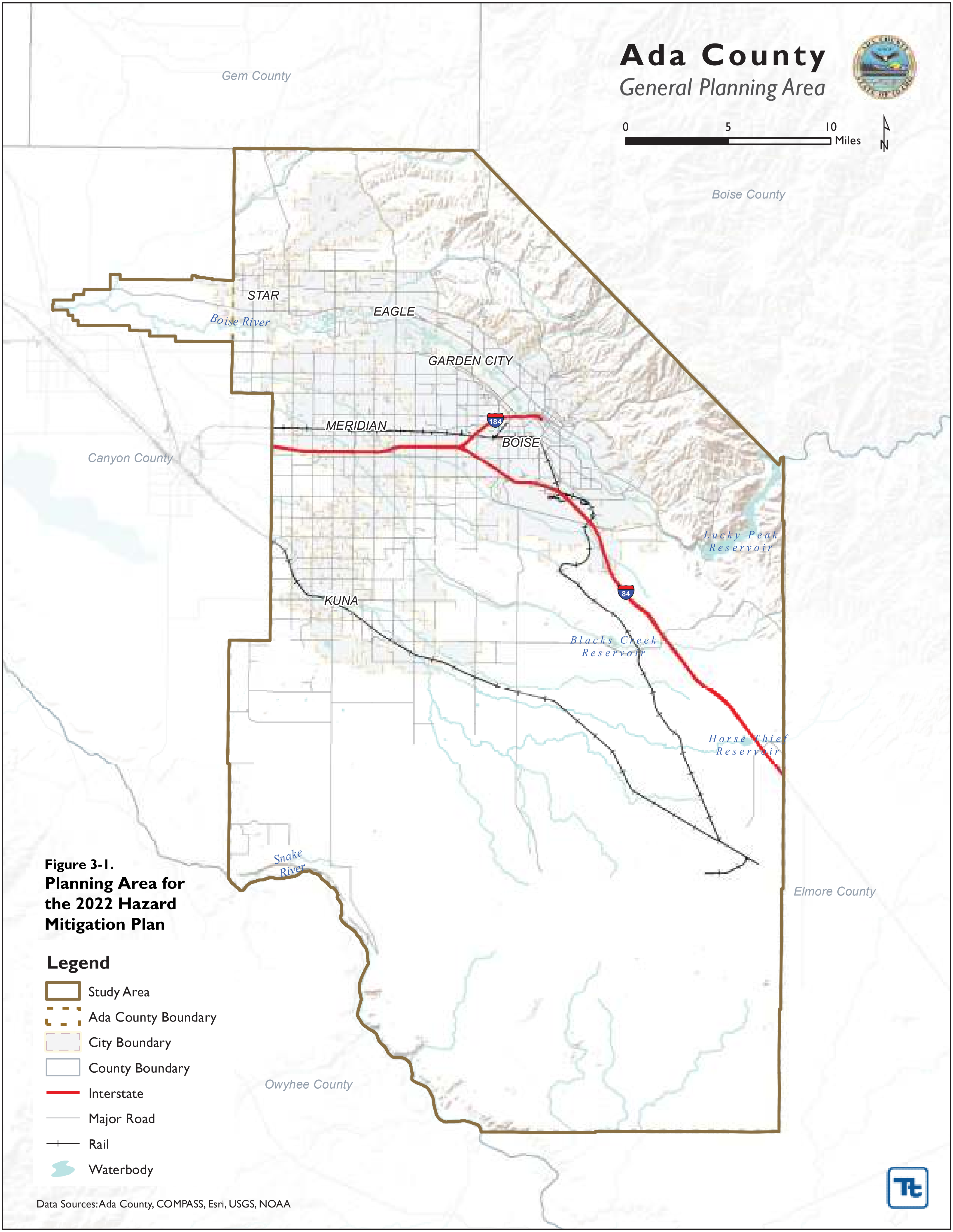


Figure 3-1.
Planning Area for the 2022 Hazard Mitigation Plan

Table 3-1. Planning Partners

Jurisdiction	Point of Contact	
	Name	Title
Cities/County		
Ada County	Paul Marusich	Deputy Director Ada County EMCR
City of Boise	Mallory Wilson	Emergency Manager
City of Eagle	Michael Williams	Floodplain Administrator/Planner III
City of Garden City	John Evans	Mayor
City of Kuna	Mike Borzick	GIS Manager
City of Meridian	Jason Korn	Environmental Programs Coordinator
City of Star	Jacob Qualls	City Clerk/Treasurer
Special Purpose Districts		
Ada County Highway District	Lloyd Carnegie	Maintenance Manager
Eagle Fire District	Tyler Lewis	Fire Chief
Eagle Sewer District	Neil Jenkins	General Manager
Eagle Urban Renewal Agency	Ashley Squyres	Administrator
Flood Control District #10	Mike Dimmick	District Manager
Greater Boise Auditorium District	Pat Rice	Executive Director
Independent School District of Boise	Bill McKitrick	Safety and Security Supervisor
Joint School District #2	Spencer McLean	Administrator Buildings and Grounds
Kuna Rural Fire Protection District	T.J. Lawrence	Fire Chief
Meridian Development Corporation	Ashley Squyres	Administrator
North Ada Co. Fire and Rescue	Shelley Young	Fire District Administrator
Star Joint Fire Protection District	Greg Timinsky	Fire Chief
Star Sewer District	Ryan V. Morgan	District Engineer
Whitney Fire Protection District	Renn Ross	Fire Chief

3.5 THE STEERING COMMITTEE

Hazard mitigation planning enhances collaboration and support among diverse parties whose interests can be affected by hazard losses. A steering committee was formed to oversee all phases of the plan update. The members of this committee included key planning partner staff, citizens and other stakeholders from within the planning area. The planning team assembled a list of candidates representing interests within the planning area that could have recommendations for the plan or be impacted by its recommendations. Table 3-2 lists the committee members.

Leadership roles and ground rules were established during the Steering Committee's initial meeting on July 6, 2021. The Steering Committee agreed to meet monthly as needed throughout the course of the plan's development. The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on the work plan established for the update. The Steering Committee met five times from July 2021 through March 2022. All Steering Committee meetings were open to the public, and agendas and meeting notes were posted to the hazard mitigation plan website, https://adacounty.id.gov/emergencymanagement/mitigation/. All open public meeting laws and policies were adhered to during the facilitation of these steering committee meetings.

Table 3-2. Steering Committee Members

Representing Jurisdiction/Agency	Primary Contact	Title	Alternate
Ada Co. Community Development	Zach Kirk	County Engineer	
Ada County Committee PIO	Elizabeth Duncan	Communications Manager	
Ada County EMCR	Paul "Crash" Marusich	Deputy Director	Joe Lombardo
Ada County Highway District	Lloyd Carnegie	Maintenance Manager	Dale Kuperus
Ada Fire-Adapted Communities	Jerry McAdams	Wildfire Mitigation Coordinator, Boise Fire Department	
Boise State University	Ben Wells	Assistant Director, Emergency Management	Barbara Beagles
City of Boise (Boise Fire/Emergency Management)	Mallory Wilson	Emergency Manager	Romeo Gervais, Jim Pardy
City of Eagle	Mike Williams	Floodplain Administrator/Planner III	Steve Noyes
City of Garden City	Jenah Thornborrow	Development Services Director	Colin Schmidt
City of Meridian	Jason Korn	Environmental Programs Coordinator	Joanna Hopson
Community Planning Association of Southwest Idaho (COMPASS)	Lila Klopfenstein	Assistant Planner	Hunter Mulhall
Fire Districts	Scott Buck	Deputy Chief/Fire Marshal, Eagle Fire Protection District	
Flood Control District #10	Mike Dimmick	District Manager	
General Public	Phil Bandy	Public Citizen	
Idaho Office of Emergency Management	Lorrie Pahl	Mitigation Planner	Susan Cleverley
Idaho Power	Marci Anderson	VP, Corporate Services and Communications	Chris Davidson
Land Trust of the Treasure Valley	Eric Grace	Executive Director	
Micron	Kelly Armstrong	Emergency Services Program Coordinator/EMT	Kelly Terashima
U.S. Army Corps of Engineers	Brandon Hobbs	Project Manager/Idaho Outreach Coordinator	
Water District 63	Mike Meyers	Watermaster	Rex Barrie

Due to the ongoing COVID-19 pandemic, the Steering Committee met virtually throughout the course of the plan's development, and all meetings were open to the public on line. Protocols for handling public comments were established in the ground rules developed by the Steering Committee.

3.6 COORDINATION WITH OTHER AGENCIES

44 CFR requires that opportunities for involvement in the planning be provided to neighboring communities, agencies involved in hazard mitigation, agencies that regulate development, businesses, academia and other private interests (Section 201.6.b.2). The initial coordination activity was an invitation to agencies to provide representatives to participate on the Steering Committee. As the plan update process proceeded, the following agencies were invited to participate and were kept apprised of plan development milestones:

- Idaho Office of Emergency Management
- Idaho Department of Water Resources (IDWR)
- Idaho Department of Lands
- Idaho Rivers United
- Boise River Enhancement Network
- Ada County Irrigation Districts
- Community Planning Association of Southwest Idaho (COMPASS)

- Idaho Silver Jackets
- National Weather Service
- U.S. Army Corps of Engineers
- U.S. Bureau of Land Management.

These agencies received meeting announcements, meeting agendas, and meeting minutes by e-mail throughout the plan update process. They supported the effort by attending meetings or providing feedback on issues. All were provided an opportunity to comment on this plan update, primarily through the hazard mitigation plan website. Each was sent an e-mail message informing them that draft portions of the plan were available for review.

The complete draft plan was sent to FEMA Region X, the Idaho Office of Emergency Management, Idaho Department of Lands and the Insurance Service Office for a pre-adoption review to ensure program compliance.

3.7 REVIEW OF EXISTING PROGRAMS

44 CFR states that hazard mitigation planning must include review and incorporation, if appropriate, of existing plans, studies, reports and technical information (Section 201.6.b(3)). Chapter 5 of this plan provides a review of laws and ordinances in effect within the planning area that can affect hazard mitigation actions. In addition, the following programs can affect mitigation within the planning area:

- Ada County Comprehensive Plan (2019 update)
- The comprehensive plans for each of the incorporated city planning partners
- Idaho State Hazard Mitigation Plan (2018)
- The Ada County Hazard Inventory and Vulnerability Analysis (2010)
- Ada County Threat/Hazard Identification and Risk Assessment (2018)
- The Ada County Emergency Operations Plan (2018)
- Ada County Flood Response Plan (2018)
- Ada County Wildfire Response Plan (May 2018)
- Ada County Failure Dam Response Plan (2018)
- Boise River Enhancement Plan (2015)

An assessment of all planning partners’ regulatory, technical and financial capabilities to implement hazard mitigation actions is presented in the individual jurisdiction-specific annexes in Volume 2. Many of these relevant plans, studies and regulations are cited in the capability assessments.

3.8 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about the planning area’s needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). The Community Rating

System expands on these requirements by making CRS credits available for optional public involvement activities. The strategy for involving the public in this plan update emphasized the following elements:

- Include members of the public on the Steering Committee.
- Use a questionnaire to determine if the public's perception of risk and support of hazard mitigation has changed since the initial planning process.
- Utilize social media tools to expand messaging
- Utilize/leverage existing public outreach efforts implemented by EMCR
- Attempt to reach as many planning area citizens as possible using multiple media.
- Identify and involve planning area stakeholders.

3.8.1 Stakeholders and the Steering Committee

Stakeholders are the individuals, agencies and jurisdictions that have a vested interest in the recommendations of the hazard mitigation plan, including planning partners. All planning partners are stakeholders in the process. The diversity brought to the table by special purpose districts and private non-profit entities creates an opportunity to leverage partnerships between entities that typically do not work together in the field of hazard mitigation.

The effort to include stakeholders in this plan update included stakeholder participation on the Steering Committee. All members of the Steering Committee live or work within the planning area. Two members of the committee represented Ada County citizens and property owner interests or represented public special interest groups (Land Trust of the Treasure Valley and Phil Bandy). Two members represented private sector interests. Boise State University provided a representative to the committee to represent the academic interests of this planning effort, and Water District # 63 represented irrigation district interest.

3.8.2 Hazard Mitigation Survey

Building upon the successful survey effort of the 2017 plan, the Steering Committee decided to deploy a survey again for the 2022 planning effort. The decision to survey was driven by the principal objective of gaining more responses from all portions of the County. A hazard mitigation survey (see Figure 3-2) developed by the planning team, with guidance from the Steering Committee, was used to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards.

This questionnaire was designed to help identify areas vulnerable to one or more natural hazards. Responses helped guide the Steering Committee in selecting goals, objectives and mitigation strategies. A web-based survey tool was used to develop and track the results of the survey. The survey was disseminated by electronic means, principally via the hazard mitigation plan website as well as social media (Facebook, Twitter, Next-Door). The survey and the website were advertised via multiple means during the survey period.

The survey was conducted from October 28, 2021, through April 30, 2022. More than 3,500 surveys were completed, covering all geographic locations in the County. This response was much greater than the 2,300 surveys received for the 2017 planning effort. This success is attributed to the power of social media tools such as Facebook, Twitter and Nextdoor. The survey questionnaire and a summary of results are in Appendix A.

2021 - 2022 Ada County Survey: Hazard Mitigation Planning

Page 1 of 13

1. Survey Introduction

A coalition of local governments and other stakeholders in Ada County is working together to update the Ada County Hazard Mitigation Plan. This plan was last updated in 2016 in response to Federal programs that enable the partnership to use pre- and post-disaster financial assistance to reduce the exposure of County residents to risks associated with natural hazards. In order to identify and plan for future natural disasters, we need your assistance. This questionnaire will provide valuable insight to the planning partnership that will be utilized in this plan update.

The survey consists of 30 questions plus an opportunity for any additional comments at the end. The survey should take less than 10 minutes to complete and is anonymous. When you have finished the survey, please click "Done" on the final page.

The Ada County Hazard Mitigation Planning Partnership thanks you for taking the time to participate in this information-gathering process.

Next

Figure 3-2. Sample Page from the Public Survey

The planning team reviewed the findings from the surveys received and provided the following feedback to the Steering Committee:

- Surveys were received from all six incorporated cities as well as unincorporated areas of the County.
- 46 percent of respondents noted that they are very concerned or extremely concerned about drought, followed by air quality (43 percent), climate change (39 percent), disease/epidemic (31 percent), and wildfire (30 percent).
- 73 percent of respondents have experienced a pandemic, followed by severe weather (60 percent), earthquake (52 percent), and drought (40 percent).
- 76 percent of respondents indicated that hazard information is effectively provided through the internet, followed by social media and TV news (both 61 percent), smart phone (58 percent), and radio (56 percent).
- More than half of the respondents support restrictions on land use in known high hazard areas.
- The concept of incentives to promote hazard mitigation actions on a personal scale was strongly supported, with 57 percent supporting an insurance premium discount and 53 percent supporting a rebate program to encourage them to spend money to retrofit their homes.

- 84 percent of respondents do not have flood insurance coverage; 82 percent do not have earthquake insurance.

3.8.3 Public Meetings and Events

With support of the Steering Committee, EMCR coordinated virtual and in-person public outreach events to educate the public on the hazards of concern and mitigation activities taking place around the community. These events provided the public unprecedented access to the plan update process. The sections below summarize the public meetings.

EMCR sponsored an outreach event at Micron on May 16 and 20. Micron is one of the largest private employers in Ada County and is also represented on the Steering Committee. The event promoted emergency preparedness and the hazard mitigation plan update. The booth, staffed by Greg Stone, Lori Beck, and Crash Marusich (EMCR) and Lindsey Samotis (Tetra Tech), reached 161 members of the public over the two-day event. Available handouts included *Emergency Preparedness Pointer* (Figure 3-3), *Family Emergency Preparedness* (72-hour kits, household communication/evacuation planning, pet preparedness etc.) and the *Hazards Affecting Ada County*.

3.8.4 Press and Social Media Coverage

Press releases distributed over the course of the plan's development and social media posts about the planning process triggered multiple levels of press coverage. Press releases and social media posts included the following:

- August 13, 2021—Initial press release on Facebook, Twitter, Nextdoor, and the EMCR and Ada County websites promoting the plan update and the public Steering Committee Meeting
- December 1, 2021—Ada County EMCR Tweet public survey promotion
- December 8, 2021—Ada County EMCR Tweet public survey promotion
- January 12, 2022—Ada County EMCR Tweet public survey promotion (see Figure 3-4)
- January 14, 2022—Ada County EMCR Tweet public survey promotion
- February 1, 2022—Ada County EMCR Tweet public survey promotion
- February 1, 2022—Emergency Preparedness Pointer distribution on Facebook, Twitter, Nextdoor, and the EMCR website
- April 20, 2022—City of Boise Nextdoor public survey promotion

3.8.5 Internet

The EMCR hazard mitigation webpage was utilized as the primary means for public access to all phases of this plan update process. This website has been maintained by EMCR during each plan update and is a robust data source for all aspects of emergency management in the Ada County planning area (see Figure 3-5):

https://adacounty.id.gov/emergencymanagement/mitigation/

The site's address was publicized in all press releases, mailings, questionnaires and public meetings. Information on the plan update process, the Steering Committee, the questionnaire and phased drafts of the plan was made available to the public on the site throughout the process. EMCR will continue to maintain this website as part of its overall public outreach program during the performance period for this plan update.

ADA COUNTY EMERGENCY MANAGEMENT & COMMUNITY RESILIENCE

EMERGENCY PREPAREDNESS POINTER

HAZARD MITIGATION

What is Hazard Mitigation?

Hazard Mitigation is the cornerstone of emergency management. It is defined as "sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects."

Often, actions to enhance mitigation require an initial investment. Studies have indicated that these investments produce a solid return following a disaster. Estimates show that for every 1 dollar spent on mitigation, 6 dollars are saved from future losses.

The Mitigation Process

People today don't think much about putting on a seatbelt when they get in a vehicle; it is just what they do. But it was not always that way. It took well documented research and public outreach to convince people that wearing a seatbelt would greatly reduce the risk of injury or death in an accident. Eventually the practice became law in all fifty states. The process of identifying a hazard, developing measures to reduce the effects or eliminate a hazard, and then implementing those measures is called mitigation. Seatbelts are an example of how a physical aspect (the seatbelt), a policy aspect (seatbelt law) and an educational element (public outreach) were implemented to achieve the goal of risk reduction. Currently, local jurisdictions and taxing districts are updating the Ada County Multi-Hazard Mitigation Plan (MHMP), which uses a similar type of process to address the natural hazards of our area.

Multi-Hazard Mitigation Plan

The Ada County Multi-Hazard Mitigation Plan discusses mitigation efforts for the entire county. This plan goes through an updating process every 5 years to ensure that the latest information and analysis relevant to hazard mitigation in Ada County is captured in the plan. The next update is set to finish in 2022.

We Need Your Help

The process of updating the Multi-Hazard Mitigation Plan is a group effort involving various stakeholders from around the county. One of the most important stakeholders in this process is you, the public. We need your help to better understand the public's view of our most prevalent hazards, risk exposure, and community preparedness.

We are all in this together to mitigate the impact hazards may have in our neighborhoods, communities, and the entire county. Recently, there was a survey available to help gather public input. Taking this survey allowed the public to get involved in this important project.

Public Outreach

The recent Hazard Mitigation Survey ran through April 30, 2022. This survey was completely anonymous and allowed the public to share their thoughts on how Ada County could become a safer, more resilient place to live, work, and play. In addition to the survey, public outreach events were held to allow the public to receive emergency preparedness information and discuss the Multi-Hazard Mitigation Plan with local experts.

Hazard Mitigation Resources

Interested in learning more about Multi-Hazard Mitigation? Check out the following resources:

- FEMA Mitigation for Homeowners Fact Sheet
- www.adacounty.id.gov/emergencymanagement/mitigation/
- www.ready.gov/risk-mitigation

EMERGENCY MANAGEMENT ADA COUNTY EMCR COMMUNITY RESILIENCE

Ada County Emergency Management & Community Resilience
Address: 7200 Barrister Drive. Boise, ID. 83704
Phone: (208) 577-4750 E-mail: gstone@adacounty.id.gov
FAX: (208) 577-4759 Website: www.adaprepare.id.gov

CodeRED

Figure 3-3. Public Outreach Handout

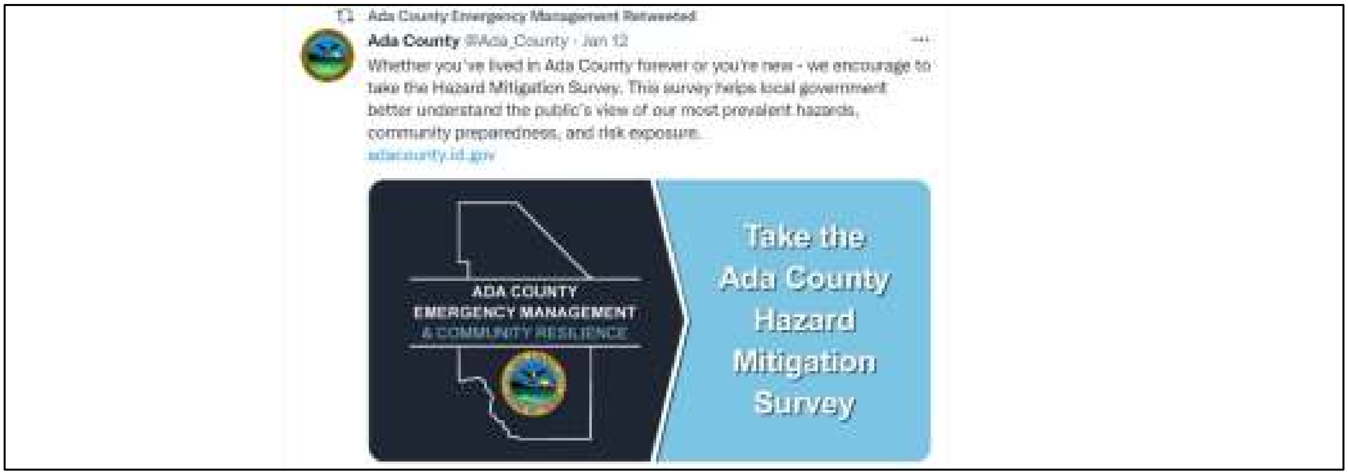


Figure 3-4. January 12, 2022, EMCR Tweet

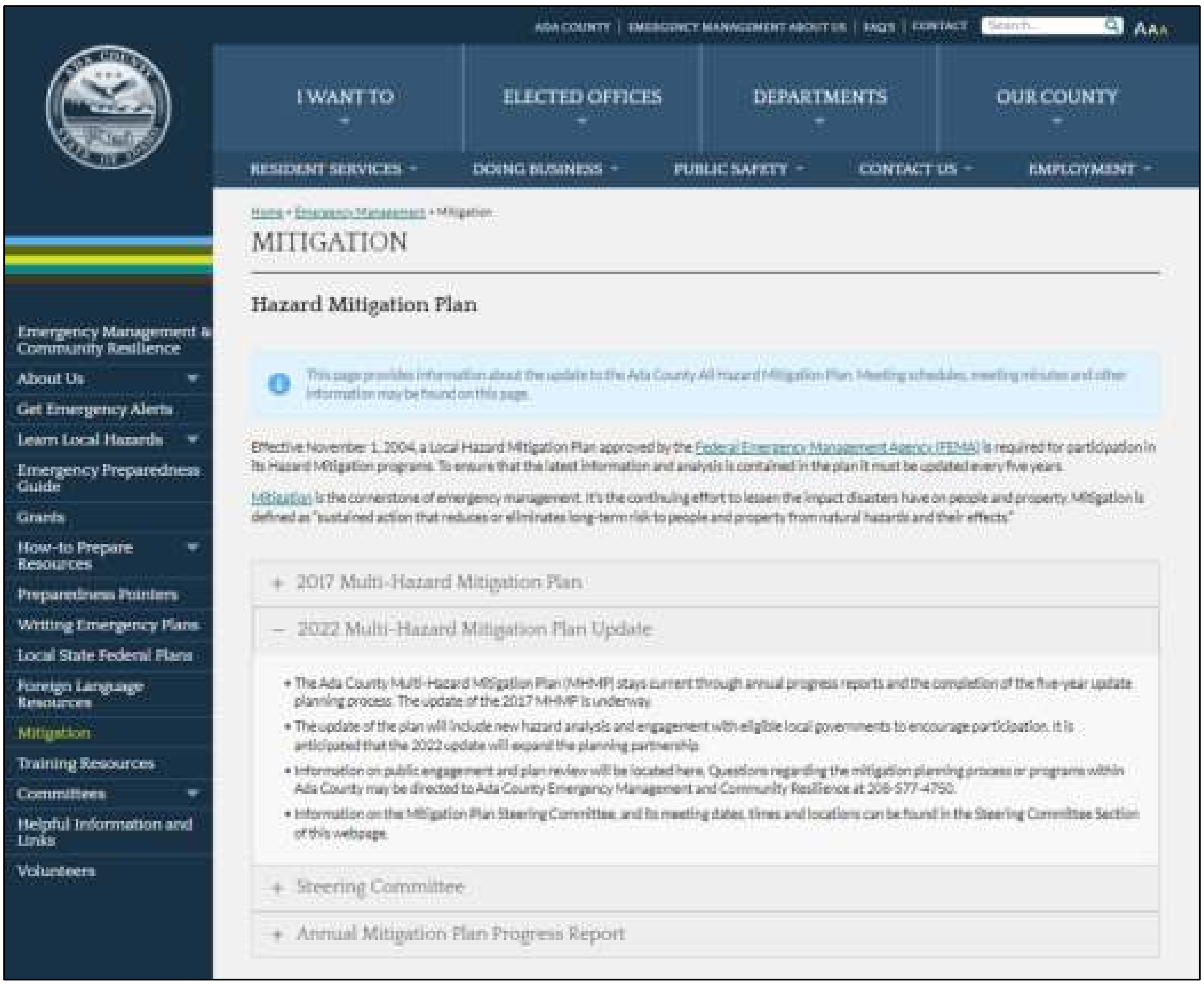


Figure 3-5. Sample Page from Multi-Hazard Mitigation Plan Web Site

3.9 PLAN DEVELOPMENT CHRONOLOGY/MILESTONES

Table 3-3 summarizes important milestones in the development of the plan update.

Table 3-3. Plan Development Milestones

Date	Event	Description	Attendance
2021			
5/5	County procures Tetra Tech to facilitate plan update	• Facilitation contractor secured	N/A
5/14	Core Planning team identified	• Formation of the planning team	N/A
6/16	Steering Committee	• Steering Committee membership confirmed	N/A
6/24	Planning Partner Kickoff meeting (Virtual)	• The Planning Team • The Disaster Mitigation Act • FEMA requirements for Natural Hazard Mitigation Plan update • Our work plan to complete the update • Steering Committee • Planning Partner expectations	22
7/6	Steering Committee Meeting #1	• Review purposes for update • Organize Steering Committee • Plan review • EMAP overview • Hazards of concern review • Public outreach strategy • Jurisdictional Annex overview	12
8/13	Public Outreach	• Press release to all media outlets announcing the plan update process	N/A
8/17	Steering Committee Meeting #2	• Assess data needs • Goal setting • Public involvement strategy	34
9/21	Steering Committee Meeting #3	• Phase 1 jurisdictional annex update, Phase 2 deployment date • Review/approve mission, goals and objectives • Finalize critical facilities definition • Public involvement strategy	22
10/19	Steering Committee Meeting #4	• Phase 2 jurisdictional annex update • Risk assessment update • Public involvement strategy • Core capability exercise • Upcoming grant opportunity	21
10/28	Public Outreach	• Hazard mitigation survey deployed	3,537
2022			
3/15	Steering Committee Meeting #5	• Risk assessment and repetitive loss properties update • Plan review observations • Plan maintenance strategy • Confirm countywide initiatives	18
4/1	Public Outreach	• Hazard mitigation survey closed	3,537
5/16	Public Outreach	• Hazard mitigation outreach event at Micron	60
5/20	Public Outreach	• Hazard mitigation outreach event at Micron	101
7/19	Steering Committee Meeting #6	•	__
TBD	Public Outreach	•	N/A

Date	Event	Description	Attendance
TBD	Public Outreach	• Initiation of final public comment period	N/A
TBD	Public Outreach	• Closure of the final public comment period	N/A
TBD	Plan Submittal	• Submittal of Draft Plan to Idaho Office of Emergency Management	
TBD	Plan Approval	• Approval pending adoption (APA) provided by FEMA	N/A
TBD	Adoption	• Adoption window of final plan opens	N/A

4. ADA COUNTY PROFILE

4.1 GEOGRAPHIC OVERVIEW

Ada County covers 1,060 square miles in southwestern Idaho's Treasure Valley. It is bounded on the north by Gem and Boise Counties, on the east by Elmore County, on the south by Owyhee County and on the west by Canyon County. Ada County is the most populous county Idaho. It has six incorporated cities:

- Boise, the county seat and state capital, is the most populous city in Ada County and the region. Boise serves as a retail and business center as well as the cultural and entertainment hub of the region.
- Meridian, the County's second largest city and the fastest growing city in the state, was established in 1891 and incorporated in 1903. Most of its residential neighborhoods are new, due to fast population growth in the last 20 years.
- Eagle, a bedroom community of Boise, is situated between the Boise Foothills and the Boise River. Eagle maintains its rural charm with open space, parks and access to the Boise River Greenbelt System.
- Garden City owes much of its early existence to gambling. Today, the small village adjacent to Boise has since capitalized on the rediscovery of the river and the natural environment.
- Kuna is a community rooted in agriculture in the southwestern portion of Ada County.
- Star is Ada County's smallest and newest incorporated city, though it was one of the earliest communities developed in the Boise River Valley. Varied growth and development rates over time have resulted in the un-incorporation and re-incorporation of this rural community.

The cities lie within the broad mountain valley and are close to Interstate 84, the primary transportation route through southern Idaho. Each is expected to grow with the regional development of the Treasure Valley.

4.2 HISTORICAL OVERVIEW

The Shoshone-Bannock tribe moved into the region between 4,000 and 5,000 years ago as hunters following large game migrating to the north. The Shoshone tribes were organized as a collection of extended families referred to as a band. Having occupied the Great Basin for centuries, the Shoshone were skilled at living in inhospitable arid deserts. Southern Idaho offered food resources across a vast region and at varying elevations. In the 1700s, Shoshone bands acquired horses, which expanded their trading opportunities with other tribes. Shoshone trade routes became trail routes used by migrants during the American westward movement of the mid-19th century.

The fur trade brought white settlers into Southern Idaho in the early 1800s. British fur traders were the first European explorers in the Boise Valley. In 1834, the British established Old Fort Boise at the mouth of the Boise River, but they abandoned it after two decades. Gold was discovered in 1862 in the Boise Basin, resulting in the establishment of small gold rush settlements and boom towns.

Though early encounters between natives and explorers were amiable, encroachment, settlement and cultural conflict irrevocably changed the native way of life. By the end of the 19th century, much of the Shoshone population had been forced onto reservations or had succumbed to diseases introduced by explorers and settlers.

Over the years, Boise became an important crossroads and trading center. Miners traveled through town on their way to mining settlements and many others traveling the Old Oregon Trail found the crossing at Boise River to be easier than other river crossings. The arrival of stagecoach and freight lines made the Boise area a regional transportation hub. With growing population and political influence, Boise incorporated in 1864. The territorial capital was relocated from Lewiston to Boise in the mid-1860s. The U.S. Army built Fort Boise in 1863, on what is now the northeastern part of Boise.

Ada County was formed December 22, 1864, with Boise as the county seat. The County was named after Ada Riggs, the first child born to Pioneer H.C. Riggs, a co-founder of the city of Boise. Soon after the formation of the County, population and industry began to grow, particularly around Boise. Boise developed as a key government center and the federal, state and local offices located there enhanced the County's ability to grow and prosper.

Timber was an important industry in Ada County at the turn of the 20th century. The first sawmill was established on the Boise River just east of Boise in 1905 by the Barber Lumber Company. A wooden dam was constructed across the river to provide a holding pond for logs and an electrical plant. A few other mills followed on the river and other tributaries in the County.

Ada County's economic base shifted to agriculture in the 1900s. The Boise Project resulted in the irrigation and cultivation of the formerly arid, sagebrush plains of central Ada County. Some of the first farms in the County were established along the low-lying floodplains of the Boise River and early irrigation systems were constructed around Garden City, Eagle Island, Dry Creek and Star. Post-war development included the construction of Anderson Ranch Dam to increase irrigation capabilities, produce power and reduce flooding in the valley.

As communities were platted and developed, streetcars and light rail trolley systems connected the towns of Star, Middleton, Kuna, Nampa, Boise, Eagle and Caldwell. The rail lines provided a means for local transportation and to ship freight and produce beyond the region. Invention of the car and construction of state and federal highways marked the end of the trolley system in Ada County by the 1920s.

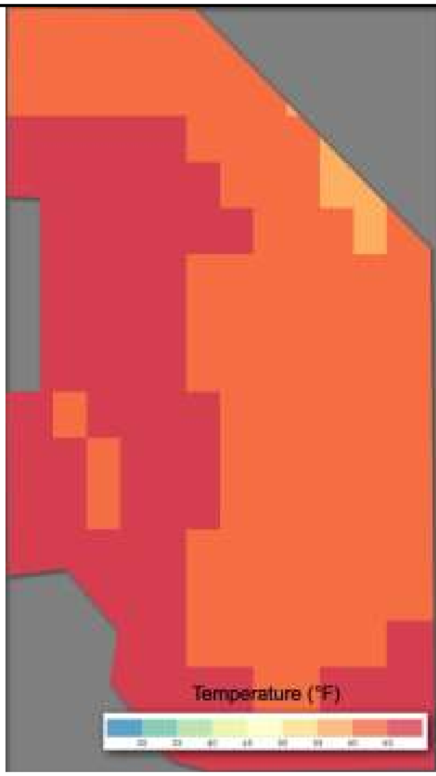
The J. R. Simplot Company agricultural processing business was founded in 1929 near the small agricultural community of Declo. The first Albertson's grocery store opened in Boise in 1939. Today, Albertson's and Simplot remain among the county's largest employers.

4.3 PHYSICAL SETTING

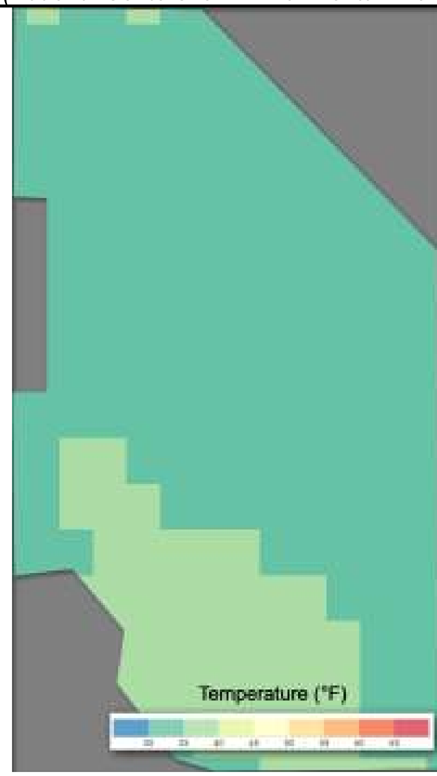
4.3.1 Climate

Ada County has a four-season climate with generally mild temperatures. Average daily temperatures reach the 70s in July and August and fall to about freezing in December and January. Precipitation is heaviest during winter and spring and drops off in summer. On average, Boise receives about 12 inches of precipitation annually, including about 18 inches of snowfall a year. Figure 4-1 shows the countywide distribution of average temperatures and precipitation for 1991 through 2020. Figure 4-2 shows the monthly average temperatures and precipitation at the Boise Air Terminal for 1991 through 2020.

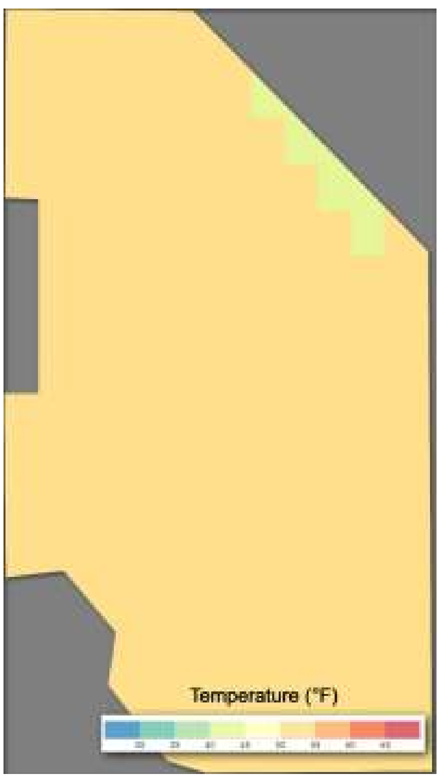
Source: (National Centers for Environmental Information n.d.)



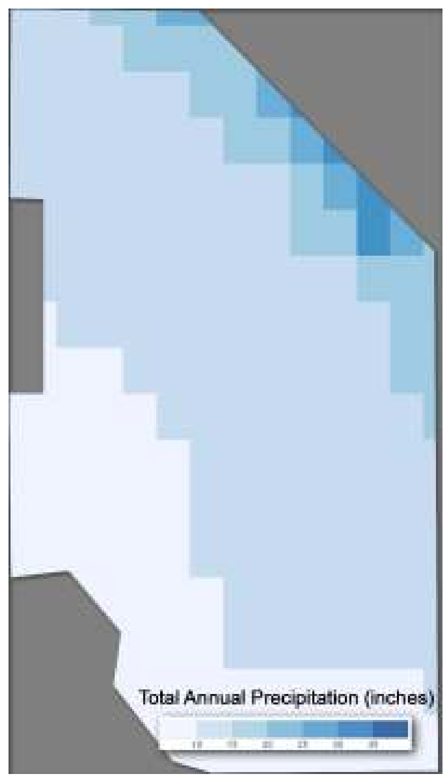
Normal Maximum Temperature (Annual Average)



Normal Minimum Temperature (Annual Average)



Normal Average Temperature (Annual Average)



Normal Precipitation (Annual Total)

Figure 4-1. 1991 – 2020 Normal Annual Temperatures and Precipitation Countywide

Source: (National Centers for Environmental Information n.d.)

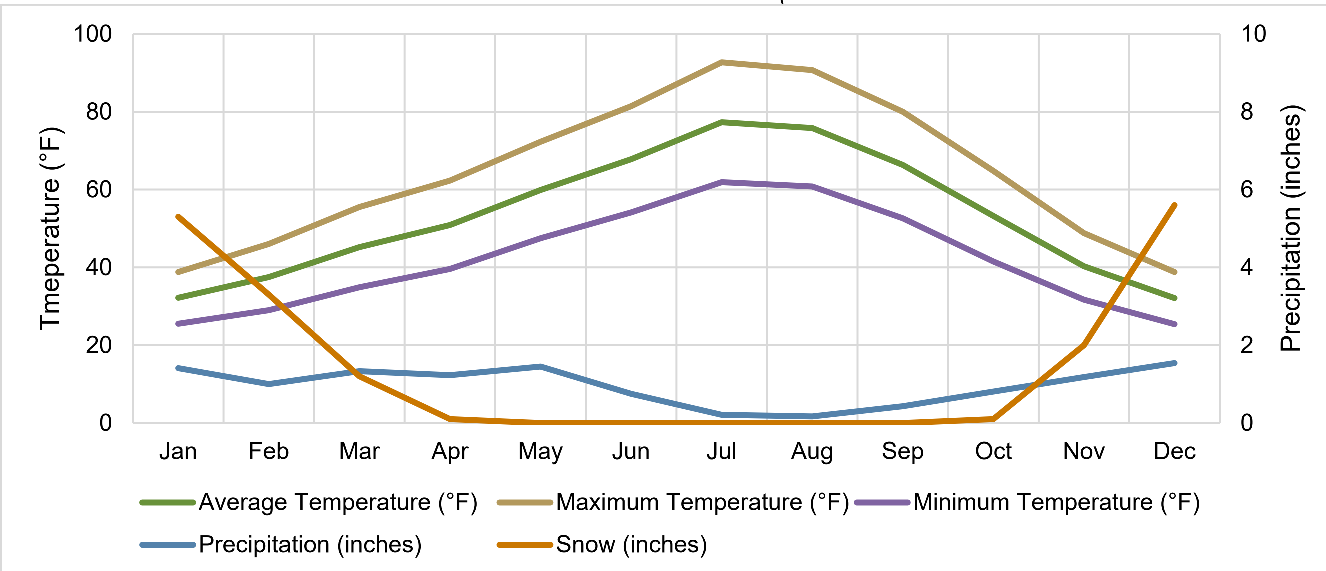


Figure 4-2. 1991 – 2020 Normal Monthly Temperatures and Precipitation for Boise Air Terminal

4.3.2 Hydrology

Treasure Valley, formerly known as the Lower Snake River Valley or the Boise River Valley, is a broad basin where the Payette, Boise, Weiser, Malheur and Owyhee Rivers drain into the Snake River. The Boise River is an important contributor to Ada County's quality of life, identity and economy. The Snake River, Ada County's largest river, meanders through the southern portion of the county, forming part of the county's boundary. These rivers, their impoundments, and their tributaries provide boating, fishing, bird watching and other water recreation activities. The major rivers and creeks, along with their tributary streams, gulches, canals and drainages, have contributed to local development but have also been the source of many flood events in Ada County.

The largest river in Ada County is the Snake River, which passes through the southern portion of the County. The Boise River, a tributary of the Snake River with headwaters in the mountains east and northeast of the County, is important to the County's quality of life, identity and economy. It is the county's primary source of irrigation water and a major source of drinking water. It also offers numerous recreational opportunities as well as important wildlife habitat. A system of dams and canals connected to the Boise River provides flood control for the majority of the Treasure Valley and irrigates 354,000 acres of lands in Ada County and other parts of the Treasure Valley.

Ada County's water supply comes from surface water, deep aquifers and shallow groundwater. The Treasure Valley Hydrologic Project indicates that the deep aquifers and shallow groundwater are separated from each other by clay zones that prevent the shallow water from recharging the deep aquifer in many, but not all, areas. Irrigation and canals are a major source of shallow groundwater recharge. The Treasure Valley Hydrologic Project estimates that 1 million acre-feet of water flows out of the Treasure Valley basin every year.

The depth to groundwater varies from 2 feet below surface level in western Ada County to 300 feet or more in the southern and eastern parts of the county. This, plus the area's relatively permeable soils, raises concerns about contamination of the Boise aquifer. The aquifer can be protected through the use of central sewage facilities, rather than individual septic systems, and best management practices for stormwater management.

4.3.3 Terrain

Ada County features streams, mountain ranges, extensive foothills and open space. Much of the county's landscape is dry grassland or sagebrush, with a few pockets of timbered land. Terrain ranges from 5,750 feet above sea level at the northern mountains to about 2,200 feet along the southern floodplains. This southern portion of the County is largely undeveloped as much of the land belongs to the federal government. The long time agricultural valley is bounded to the northwest by the foothills of the Boise Front.

4.3.4 Geology

Ada County's terrain consists of a series of northwest trending mountains and valleys formed by thousands of years of tectonic plate movement, all part of the western Snake River Plain. On the south are extensive Quaternary gravel deposits that overlie Quaternary basalt. Recent cinder cones line the Snake River near Swan Falls. On the northeast is the Cretaceous Idaho batholith, home to Bogus Basin ski area. The batholith is a mountainous area that forms the northeast margin of the western Snake River Plain.

In the Boise foothills is a complex assemblage of sandstones and lake beds formed within or on the edges of Lake Idaho in the last 10 million years. Table rock sandstone, quarried since the mid-1800s, belongs to these strata. The City of Boise lies in the alluvial valley of the Boise River. The broad, flat valley floor sharply contrasts with the bold mountains and dissected foothills that are typical of most of southwest Idaho's terrain.

4.3.5 Soils

Soils at higher elevations in the northeastern part of the county are sloping to very steep, moderately deep and very deep, and well-drained. They are used mainly as rangeland and wildlife habitat and for recreation. Slope, inaccessibility and depth to rock are the main limitations to engineering uses.

Soils on lacustrine foothills above the Boise River are nearly level to very steep and well-drained to excessively drained. Erosion and sedimentation hazards are limitations to the use of these soils because of the fragile vegetative cover and the highly erosive nature of the soils. Flash flooding in major drainage ways during summer cloudbursts increases the potential for debris flows.

The soils in the central and southern parts of Ada County are on alluvial terraces, basalt plains and alluvial fans. The natural vegetation is predominantly sagebrush and bunchgrass. These soils are shallow to very deep; and they are somewhat poorly drained, well-drained, and somewhat excessively drained. They are used mainly for farming and as rangeland and wildlife habitat. A significant acreage is used for urban development. The gentle slopes in these areas generally have significant erosion potential, even when vegetation is removed by wildfire. Where excessively drained soils exist on sloped areas, erosion potential is somewhat higher. However, this combination is only found occasionally in the southern portion of the county.

4.4 DEVELOPMENT

4.4.1 Land Ownership and Use

According to Ada County's Comprehensive Plan, 48 percent of the land in the County is privately owned, 2 percent is held by local government, 7 percent belongs to state government, and 43 percent is owned by the federal government, primarily the Bureau of Land Management (BLM).

A key element in risk assessment is to look at land use in hazard areas that have a delineated extent (dam failure, flood, landslide and wildfire). For example, an agricultural, low-density use of the floodplain is a lower risk use than a high density, residential use. Figure 4-3 shows Ada County land use taken from the County's most recent comprehensive plan (Ada County 2019).

4.4.2 Building Count, Occupancy Class and Estimated Replacement Value

Table 4-1 presents planning area building counts by building occupancy class. Table 4-2 summarizes estimated replacement value for building structures and contents combined.

Table 4-1. Planning Area Building Counts by Occupancy Class

	Number of Buildings							
	Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Total
City of Boise	76,386	4,824	27	35	165	71	44	81,552
City of Eagle	11,810	601	1	2	8	11	4	12,437
City of Garden City	3,664	705	0	4	6	4	2	4,385
City of Kuna	8,663	145	0	1	13	5	4	8,831
City of Meridian	39,226	1,463	8	15	62	14	24	40,812
City of Star	4,957	97	0	1	8	2	0	5,065
Unincorporated	21,506	162	7	10	28	5	2	21,720
Total	**166,212**	**7,997**	**43**	**68**	**290**	**112**	**80**	**174,802**

Table 4-2. Estimated Replacement Value of Planning Area Buildings

Jurisdiction	Estimated Total Replacement Value (Structure and Contents)
City of Boise	$61,280,836,767
City of Eagle	$9,838,649,929
City of Garden City	$3,705,101,875
City of Kuna	$3,886,826,099
City of Meridian	$28,959,315,273
City of Star	$2,845,160,473
Unincorporated	$12,472,792,807
Total	**$122,988,683,223**

4.4.3 Critical Facilities

Critical facilities are those that are essential to the health and welfare of the population. These become especially important after any hazard event. Also included are facilities that hold or carry significant amounts of hazardous materials with a potential to impact public health and welfare during a hazard event. The risk assessment for each hazard in this plan discusses that hazard's potential impact on critical facilities. Through a facilitated exercise, the Steering Committee crafted the following definition of "critical facilities" for this plan:

> *A critical facility is one that is deemed vital to the Ada County planning area's ability to provide essential services while protecting life and property. A critical facility may be a system or an asset, either physical or virtual, the loss of which would have a profound impact on the security, economy, public health or safety, environment, or any combination of thereof, across the planning area.*

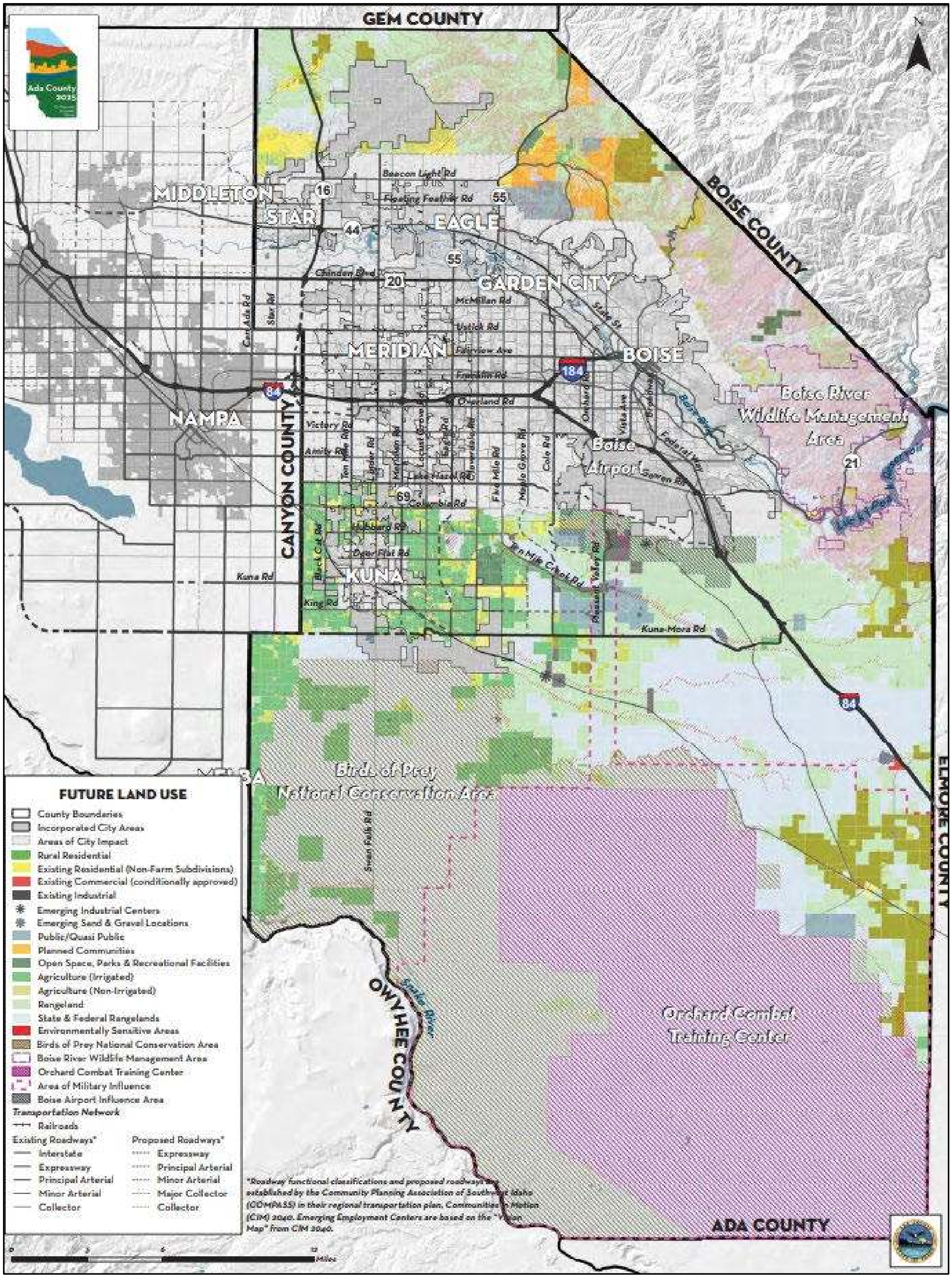


Figure 4-3. Future Ada County Land Use

For some hazards, potential damage to critical facilities was estimated using FEMA's Hazus computer model. For this reason, the list of critical facilities was categorized using categories that are defined in the Hazus model:

- **Safety and Security**—Law Enforcement/Security, Search and Rescue, Fire Services, Government Service, Responder Safety, and Imminent Hazard Mitigation
- **Food, Water and Sheltering**—Evacuations, Schools, Food/Potable Water, Shelter, Durable Goods, Water Infrastructure, and Agriculture
- **Health and Medical**—Medical Care/Hospitals: Patient Movement, Public Health, Fatality Management, Health Care, and Supply Chain
- **Energy**—Power (Grid), Temporary Power and Fuel
- **Communications**—Infrastructure, Alerts, Warnings, Messages, 911 and Dispatch, Responder Communications and Financial Services
- **Transportation**—Highway/Roadway, Mass Transit, Railway, Aviation, Maritime and Pipeline
- **Hazardous Materials**—Facilities, Hazardous Debris, Pollutants and Contaminants

Table 4-3 summarizes the number of critical facilities by Hazus-defined category, based on the best data available on critical facilities at the time of this plan update. The County and its planning partners consider this information to be subject to change as new information about critical facilities becomes available during the performance period for this plan. Due to the sensitivity of this information, a detailed list of facilities is not provided. The location of critical facilities in unincorporated areas of the county is shown on Figure 4-4 and Figure 4-5.

Table 4-3. Planning Area Critical Facilities

	Number of Facilities							
	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
City of Boise	194	37	187	30	66	263	239	1,016
City of Eagle	14	2	34	1	5	17	39	112
City of Garden City	71	0	19	4	4	6	10	114
City of Kuna	9	4	14	0	4	17	22	70
City of Meridian	45	7	38	6	29	53	100	278
City of Star	2	0	8	0	1	8	25	44
Unincorporated	103	31	118	4	6	25	201	488
Total	438	81	418	45	115	389	636	2,122

4.4.4 Development Trends

Ada County continues to experience rapid growth. Land use in the planning area will continue to be directed by comprehensive plans adopted under Idaho's land use regulation law. The County and each city have adopted comprehensive plans that govern land use and policy making for their jurisdictions. This hazard mitigation plan will work together with these programs to support wise land use in the future by providing vital information on the risk associated with natural hazards in Ada County. All municipal planning partners have included actions in their action plans to consider incorporating the Ada County Multi-Hazard Mitigation Plan into their comprehensive plans by reference. This would ensure that all future trends in development could include the benefits of the information on risk and vulnerability to natural hazards identified in this plan.

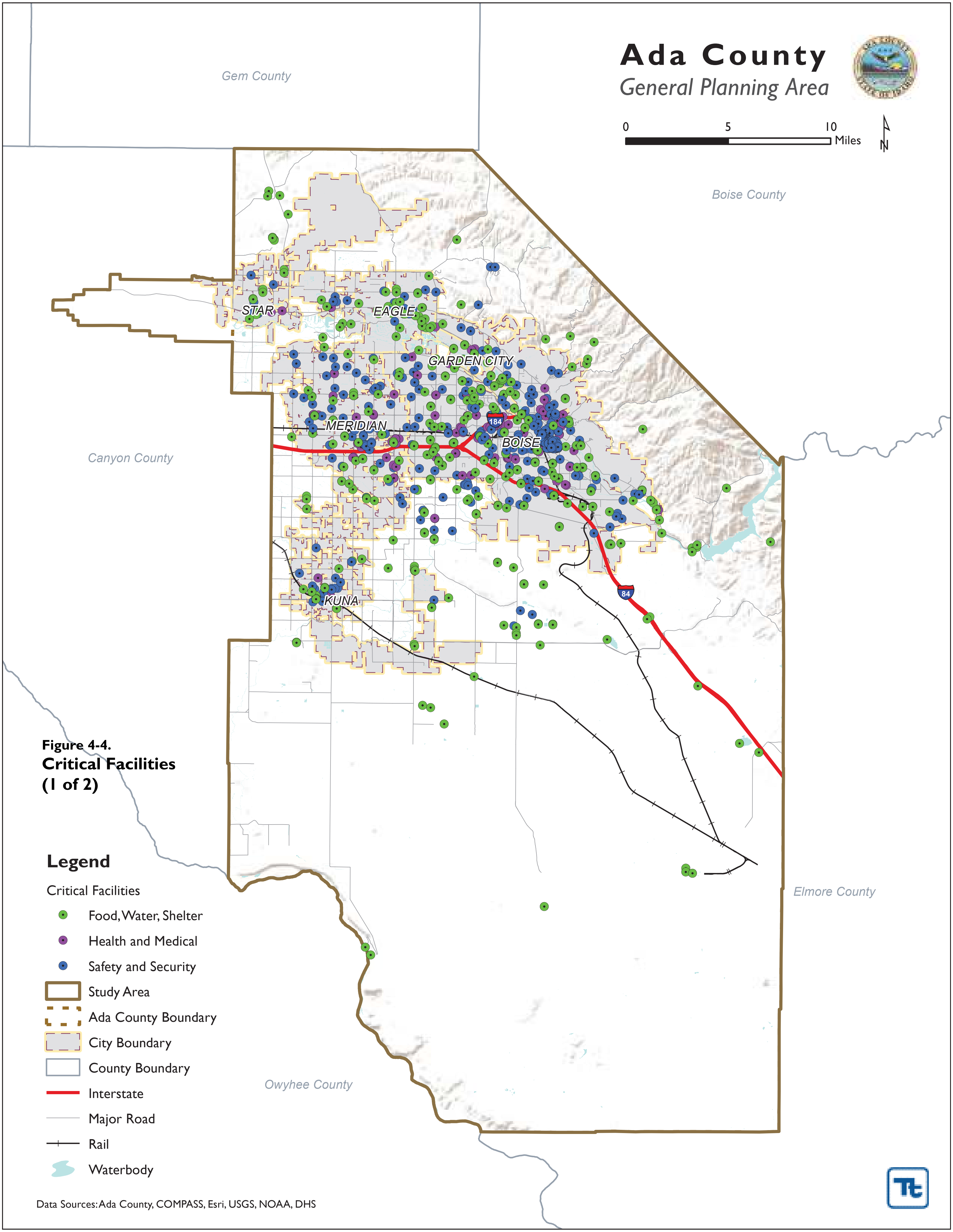
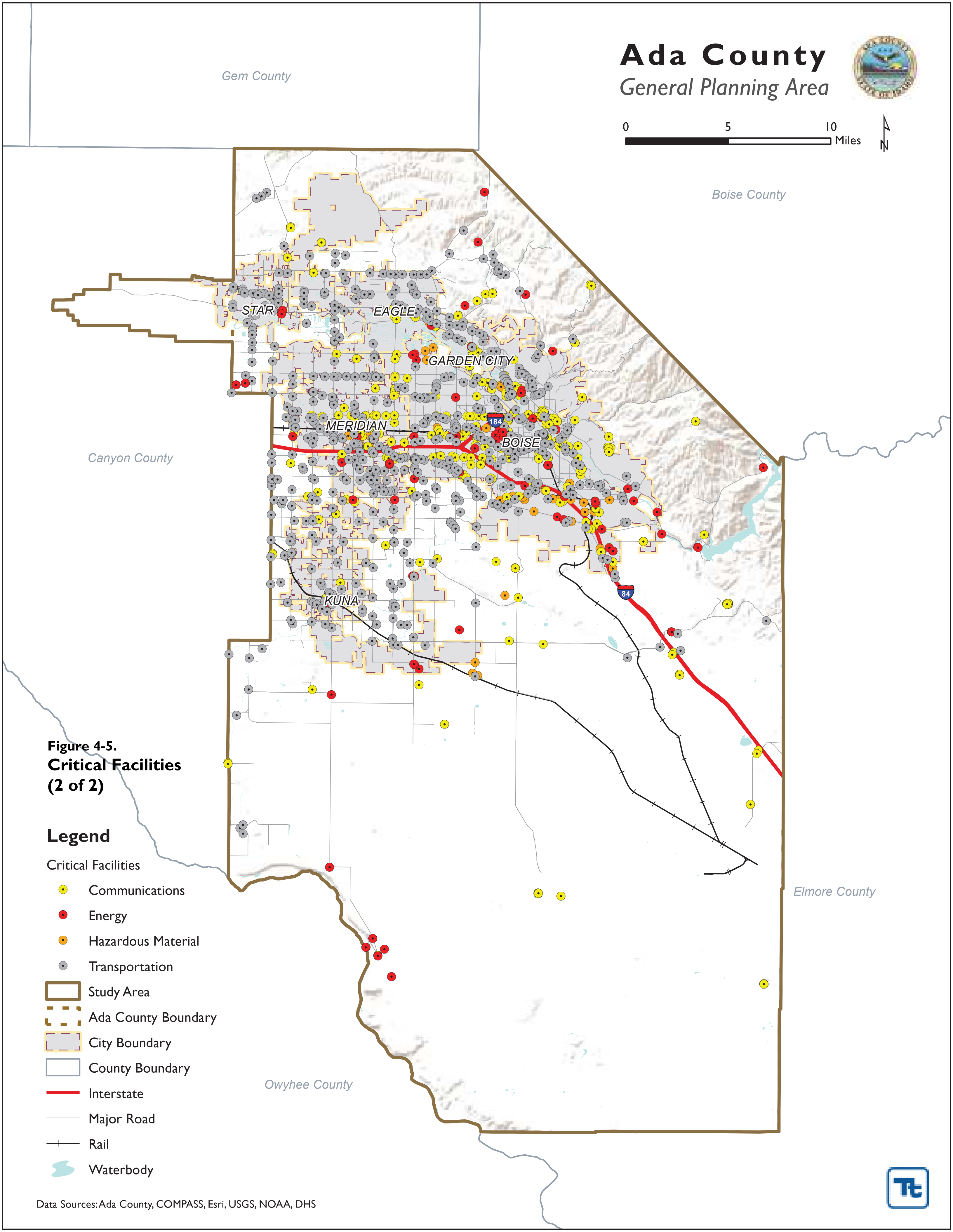


Figure 4-4.
Critical Facilities
(1 of 2)

Data Sources: Ada County, COMPASS, Esri, USGS, NOAA, DHS



Ada County
General Planning Area
0
5
10
Miles
N
Gem County
Boise County
Canyon County
Elmore County
Owyhee County
STAR
EAGLE
GARDEN CITY
MERIDIAN
BOISE
KUNA
184
84
Figure 4-5.
Critical Facilities
(2 of 2)
Legend
Critical Facilities
Communications
Energy
Hazardous Material
Transportation
Study Area
Ada County Boundary
City Boundary
County Boundary
Interstate
Major Road
Rail
Waterbody
Data Sources: Ada County, COMPASS, Esri, USGS, NOAA, DHS

4.5 DEMOGRAPHICS

4.5.1 Population Characteristics

Total Current Population

Ada County is the largest of Idaho's 44 counties. COMPASS (Community Planning Association of Southwest Idaho) estimated Ada County's population at 532,710 as of 2022.

Historical Population Trends

Population changes are useful socio-economic indicators. A growing population generally indicates a growing economy, while a decreasing population signifies economic decline. Table 4-4 shows the population of incorporated municipalities and the combined unincorporated areas in Ada County from 1940 to 2022. In 2022, about 12.4 percent of Ada County's residents lived outside incorporated areas. Overall growth in incorporated areas was 86.9 percent from 2000 to 2022, while the unincorporated areas of the county grew about 29.1 percent during the same timeframe.

Table 4-4. City and County Population Data

	Boise	Eagle	Garden City	Kuna	Meridian	Star	Unincorporated County	Ada County Total
1940	26,130	--	--	443	1,465	--	22,363	**50,401**
1950	34,393	--	764	534	1,810	--	33,148	**70,649**
1960	34,481	--	1,681	516	2,081	--	54,701	**93,460**
1970	74,990	--	2,368	593	2,616	--	31,663	**112,230**
1980	120,249	2,620	4,571	1,767	6,658	--	37,260	**173,125**
1990	125,738	3,327	6,369	1,952	9,596	648	58,145	**205,775**
2000	185,787	11,085	10,624	5,382	34,919	1,795	51,312	**300,904**
2010	205,671	19,908	10,972	15,210	75,092	5,781	59,731	**392,365**
2011	209,280	20,432	11,112	15,852	77,855	5,995	60,574	**401,100**
2012	212,244	21,009	11,234	16,191	80,369	6,196	61,648	**408,891**
2013	214,234	21,651	11,304	16,532	83,515	6,614	62,706	**416,556**
2014	216,282	22,502	11,420	16,999	87,743	7,280	64,010	**426,236**
2015	223,670	24,600	12,060	17,320	91,310	7,930	61,780	**438,660**
2016	226,900	25,510	11,420	18,430	91,420	8,150	61,020	**442,850**
2017	228,930	26,930	11,500	19,700	98,300	9,290	59,760	**454,400**
2018	232,300	29,910	11,880	20,740	106,410	10,310	59,390	**470,930**
2019	236,310	31,270	12,240	23,140	114,680	10,990	59,040	**487,660**
2020	235,684	30,346	12,316	24,011	117,635	11,117	63,868	**494,967**
2021	241,590	34,470	12,570	27,570	127,890	13,400	60,820	**518,300**
2022	243,570	33,960	13,040	27,480	133,470	14,950	66,240	**532,710**

Data Sources:
1940 – 2000, from Ada County, 2011
2010 – 2014, from Idaho Department of Labor, 2015
2011 – 2019, 2021, 2022 from COMPASS
2020 U.S. Census

Figure 4-6 shows the growth rate of Ada County from 2000 to 2022 compared to that of the State of Idaho. Over the period, Idaho's population grew by 46.6 percent (about 2.1 percent per year) while Ada County's population increased by 43.5 percent (2 percent per year). From 2010 to 2022, the County's population increased 26.1 percent, an average of 2.2 percent per year.

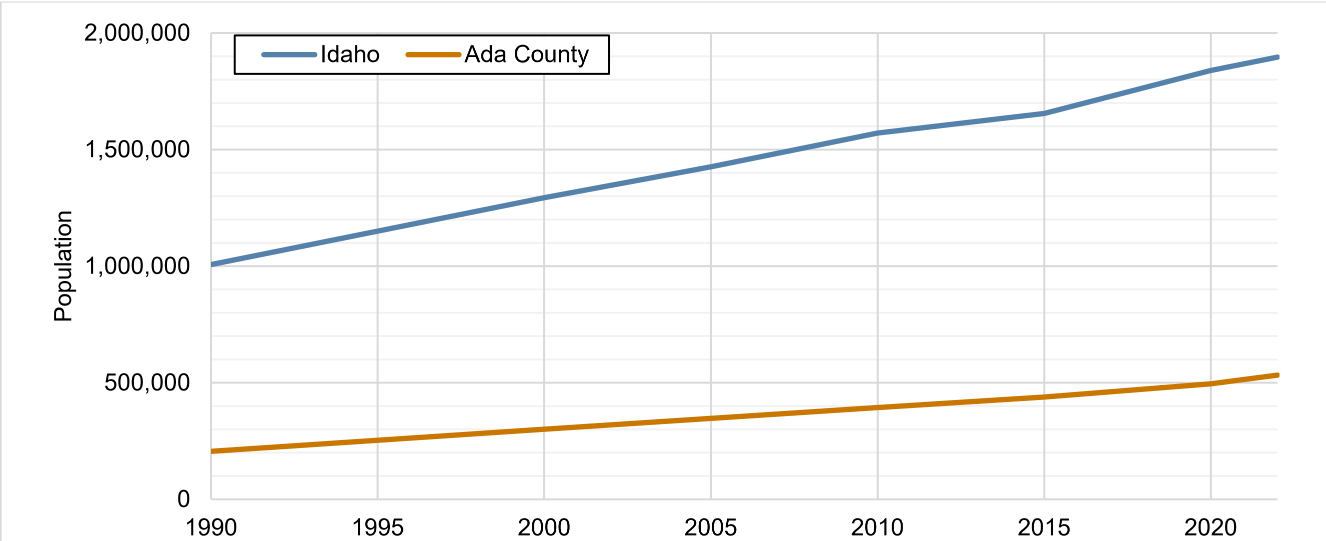


Figure 4-6. Idaho and Ada County Population Growth

4.5.2 Demographic Indicators for Social Vulnerability

Some populations are at greater risk from hazard events because of decreased resources or physical abilities. People living near or below the poverty line, the elderly, individuals with disabilities, women, children, ethnic minorities, and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members can help to extend focused public outreach and education to the most vulnerable community members.

Indicators from Census data are commonly used to assess social vulnerability. For the social vulnerability demographic profile component for this plan, the following indicators were selected:

- **Population Under 15 Years of Age—**Children, especially in the youngest age groups, often cannot protect themselves during a disaster because they lack the necessary resources, knowledge, or life experiences to effectively cope with the situation. Hazard mitigation planning needs to be tailored such that the community is prepared to ensure that children are safe during disaster events and that families with children have access to necessary information and tools.
- **Population Over 65 years of Age—**People 65 years old and older are likely to require financial support, transportation, medical care, or assistance with ordinary daily activities, especially during disasters. They are more likely to be vision, hearing, and/or mobility impaired, more likely to experience mental impairment or dementia, and more likely to live in assisted-living facilities where emergency preparedness is at the discretion of facility operators. Hazard mitigation needs to account for such needs.

- **People of Color—**Social and economic marginalization of certain racial and ethnic groups, including real estate discrimination, has resulted in greater vulnerability of these groups to all types of hazards. Based on data from a number of studies, African Americans, Native Americans, and populations of Asian, Pacific Islander, or Hispanic origin are likely to be more vulnerable than the broader community. Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during disaster events. Post-disaster recovery often exhibits cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability. Hazard mitigation plans need to identify the spatial distribution of these population groups and direct resources to reduce their vulnerability to hazards.
- **Limited English-Speaking Households—**For populations with limited English proficiency, disaster communication may be difficult, especially in communities for whom translators and accurate translations of advisories may be scarce. Such households are likely to rely on relatives and local social networks (i.e., friends and neighbors) for information for preparing for a disaster event.
- **Persons with Disabilities—**Persons with disabilities or other access and functional needs are more likely to have difficulty responding to a hazard event than the general population. Family, neighbors, and local government are the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. Emergency managers need to distinguish between functional and medical needs to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with access and functional needs allows emergency management personnel and first responders to anticipate the services needed by that population.
- **Families Below the Poverty Level—**Economically disadvantaged families have limited ability to absorb losses due to hazard impacts. Wealth enables families to absorb and recover from losses more quickly, due to insurance, savings, and often the availability of low-cost credit. People with lower incomes tend not to have access to these resources. At the same time, poorer families are likely to inhabit poor quality housing and reside in locations that are most vulnerable to hazard events. Economically disadvantaged neighborhoods are also likely to have relatively poor infrastructure and facilities, which exacerbate the disaster consequences for community members there.

These indicators were selected based on the availability of datasets at a small enough resolution to determine probable characteristics of populations within identified hazard areas. The following sections estimate the age, race, language, and disability indicators for Ada County; poverty levels are presented in Section 4.6.1.

Age Distribution

The overall age distribution for Ada County is illustrated in Figure 4-7. Based on U.S. Census data estimates, 14 percent of Ada County's population is 65 or older, compared to the state average of 16.2 percent. According to U.S. Census data, 29 percent of the County's over-65 population has disabilities of some kind and 9.2 percent have incomes below the poverty line. Of children under 18 in the county, 11.7 percent are below the poverty line. It is also estimated that 18.9 percent of the County's population is 14 or younger, compared to the state average of 18.7 percent.

Race, Ethnicity and Language

According to the U.S. Census, the racial composition of Ada County is predominantly white, at about 90.2 percent. The largest non-white racial groups are two-or-more-races, at 3.6 percent, and Asian, at 2.3 percent. Figure 4-8 shows the racial distribution in Ada County.

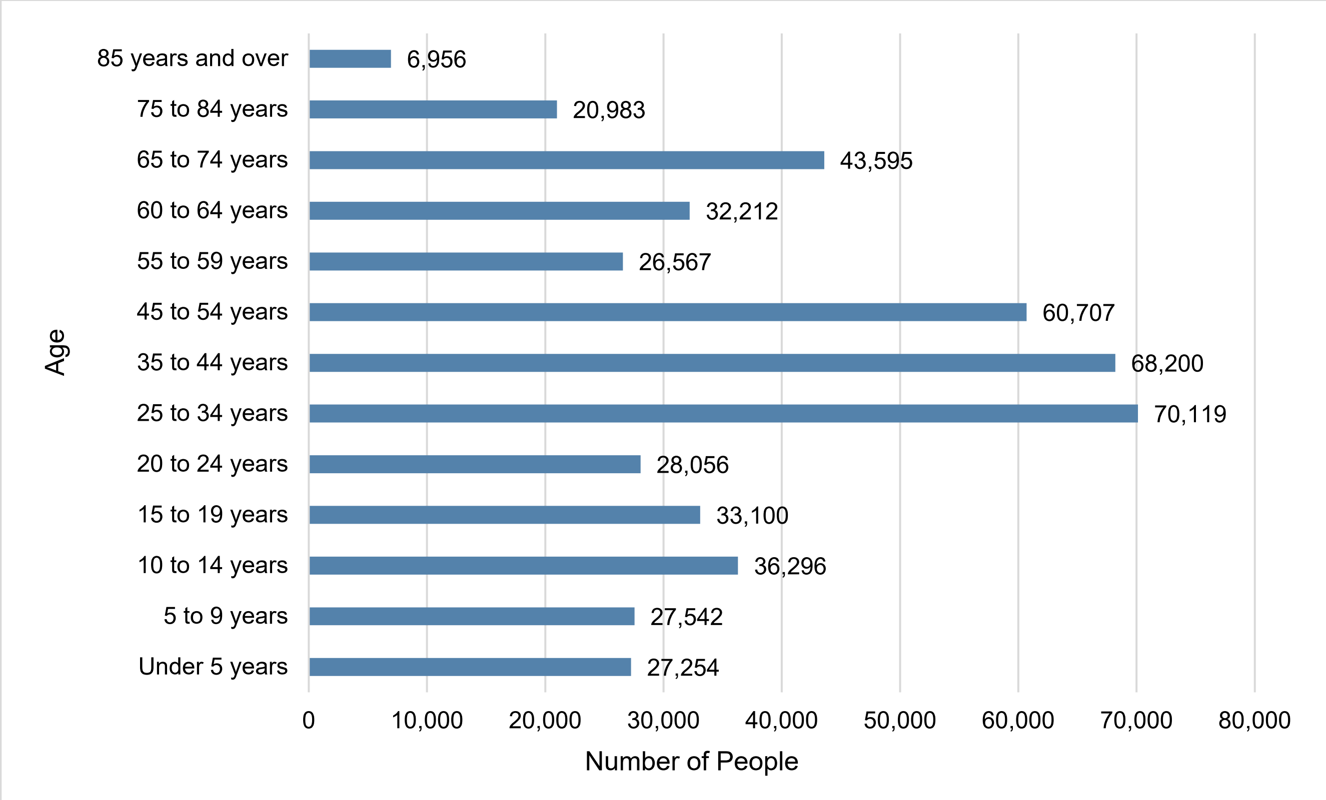


Figure 4-7. Ada County Age Distribution

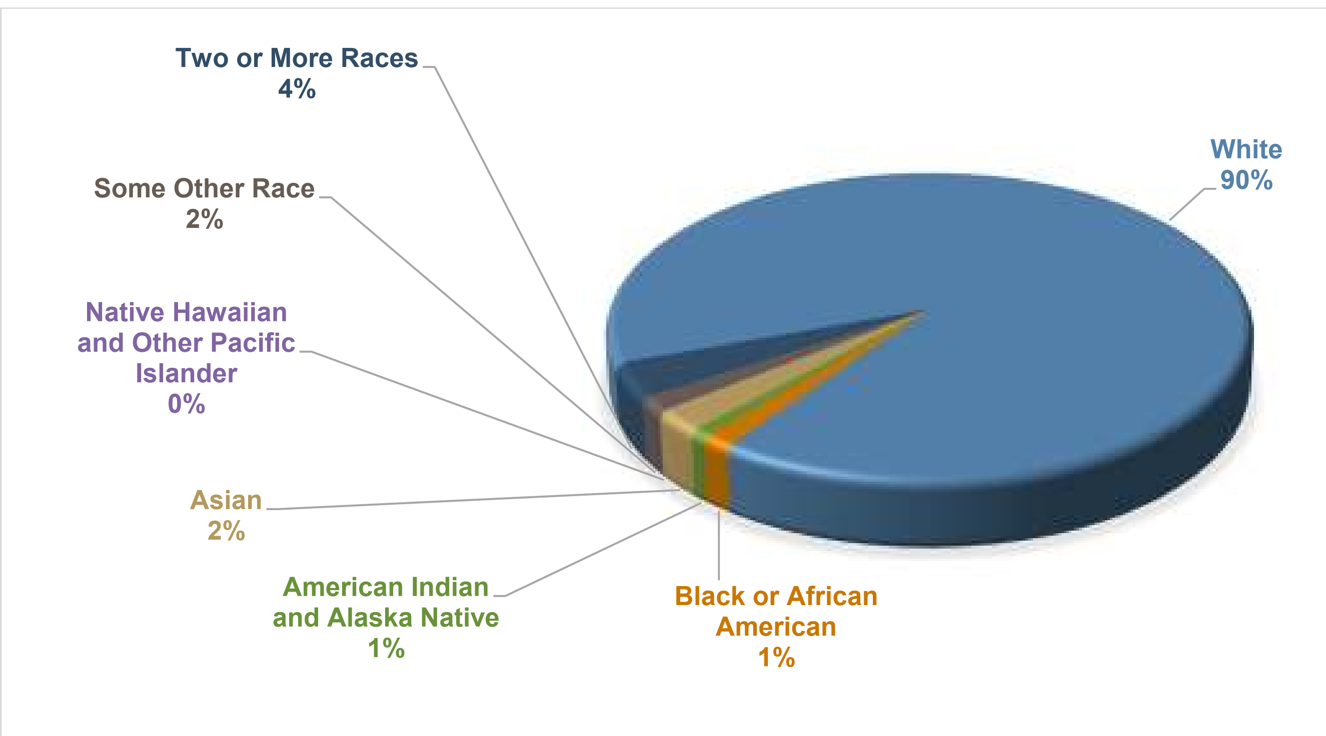


Figure 4-8. Ada County Race Distribution

The Hispanic population makes up 8.5 percent of the total population of Ada County. The County has a 6.2-percent foreign-born population. Other than English, the most commonly spoken language in Ada County is Spanish. The census estimates 3.0 percent of the county's residents speak English "less than very well."

Disabled Populations

According to U.S. Census data, 10.7 percent of the County's total population has a disability. Table 4-5 summarizes estimates of disabled people in Ada County by age group.

Table 4-5. Disability Status of Non-Institutionalized Population

Age	Persons with a Disability	Percent of Age Group
Under Age 18 years	3,520	3.1%
Age 18 to 64 years	26,722	9.2%
Age 65 years and over	20,388	29%

4.6 ECONOMY

4.6.1 Income

Based on U.S. Census Bureau estimates, per capita income in Ada County in 2019 was $37,297, and the median household income was $72,021. About 12 percent of the households in Ada County make less than $25,000 per year. Households with incomes of $150,000 or more account for 16.8 percent of total households.

The Census Bureau uses a set of income thresholds that vary by family size and composition to determine who is in poverty. If the family's total income is below the threshold, they are considered in poverty. The Census estimates that 7.7 percent of all persons in the planning area are below the poverty line.

4.6.2 Employment

Employment Levels

According to U.S. Census American Community Survey 5-year estimates for 2020, 68.0 percent of Ada County's population over the age of 16 is in the labor force—62.3 percent of women and 73.7 percent of men. Figure 4-9 compares Idaho's and Ada County's unemployment trends from 2010 through 2021. Ada County's unemployment rate was lowest in 2018, at 2.5 percent. The COVID-19 pandemic resulted in high unemployment, rising to 12.1 percent in April 2020. The rate fell back to 3.3 percent in 2021 (U.S. Bureau of Labor Statistics 2022).

Employment by Company, Industry Sector, and Occupation

Figure 4-10 and Figure 4-11 show the breakdown of employment in Ada County by industry sector and occupation type, respectively.

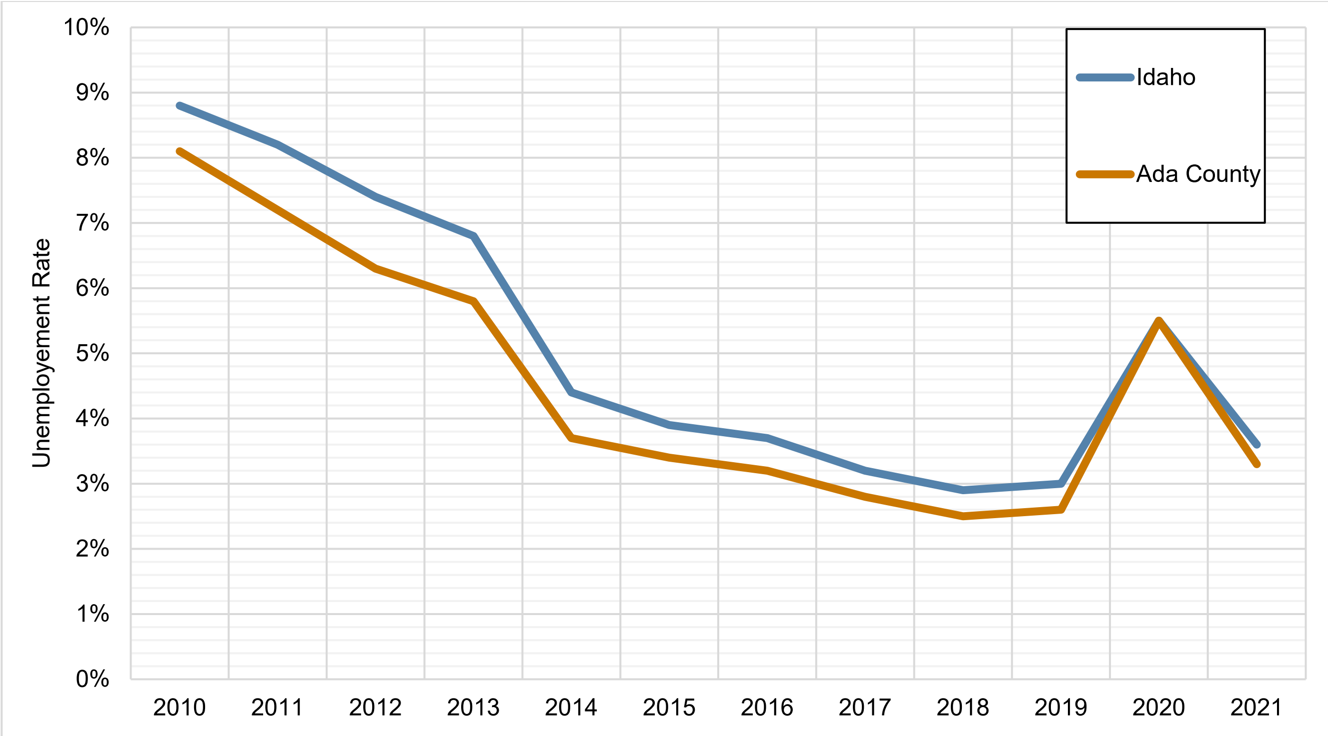


Figure 4-9. Idaho and Ada County Unemployment Rate

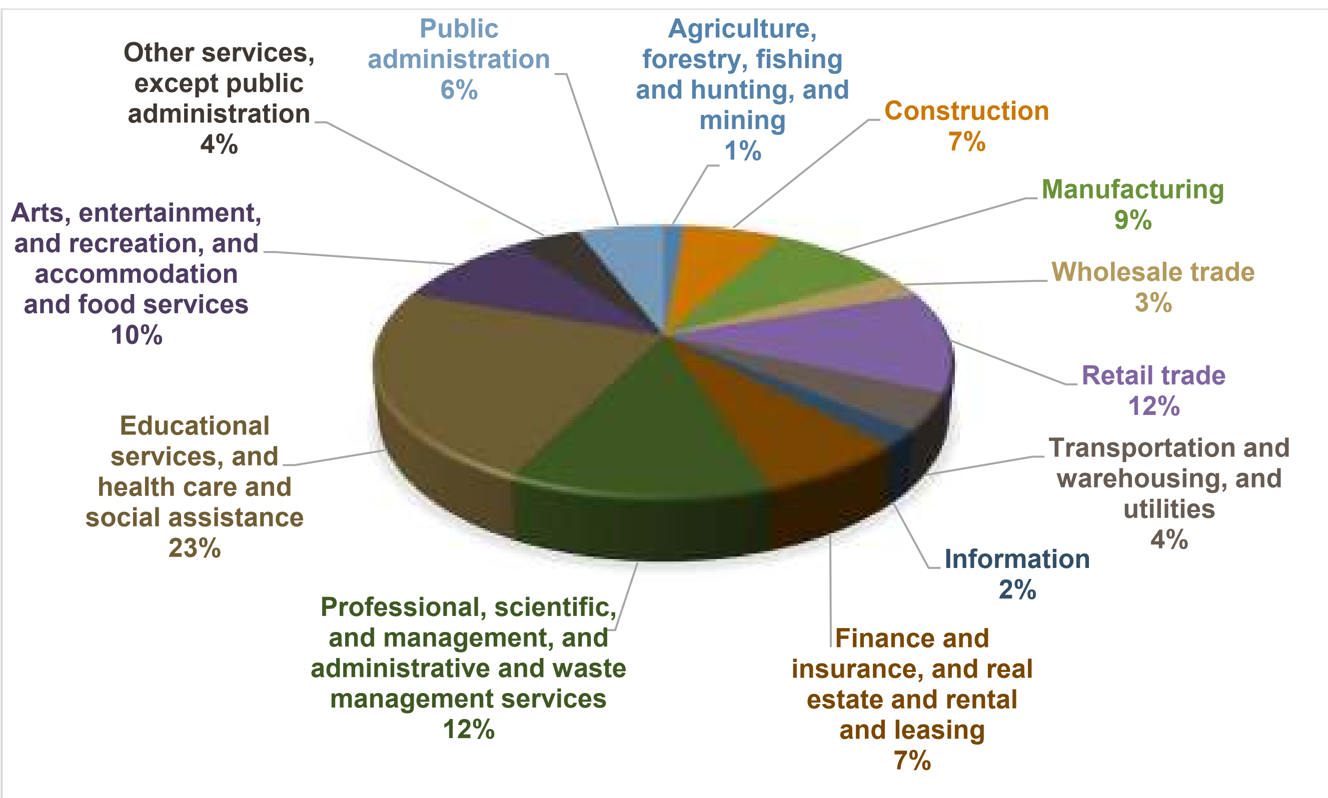


Figure 4-10. Employment by Industry in Ada County

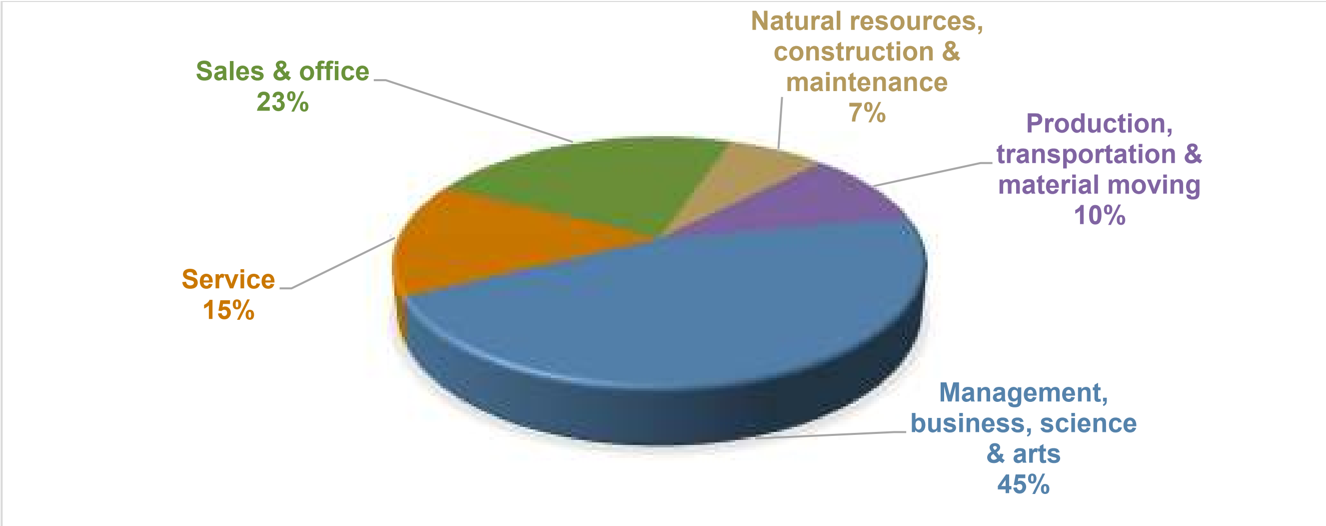


Figure 4-11. Employment by Occupation Type in Ada County

The Idaho Department of Labor identifies the following as major private employers in Ada County (listed in alphabetical order):

- Albertsons
- Blue Cross of Idaho
- Fred Meyer
- Hewlett-Packard
- Idaho Power Co.
- Micron Technology, Inc.
- Saint Alphonsus Health System
- St. Luke's Regional Medical Center
- Wal-Mart
- Wells Fargo

The State of Idaho is also a major employer in Ada County, as Boise, the state capitol, is in the county.

4.6.3 Commuting

According to the Idaho Department Labor, almost all workers living in Ada County also work in the County, with most of those who work elsewhere commuting to employment in Canyon County. The U.S. Census estimates that 80.6 percent of Ada County workers commute alone (by car, truck or van) to work, and mean travel time to work is 21.4 minutes (the state average is 21.5 minutes).

5. HAZARDS OF CONCERN

5.1 MAJOR PAST HAZARD EVENTS

Presidential disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without federal assistance. A presidential disaster declaration puts federal recovery programs into motion to help disaster victims, businesses and public entities. The State of Idaho has experienced 32 declared events since 1956, as listed in Table 5-1. Four of these events were specifically identified as impacting Ada County (impacted counties were not identified for disasters declared prior to 1964).

Table 5-1. Presidential Disaster Declarations in Idaho for Ada County Hazards of Concern

Type of Event	Date	Disaster Declaration	Counties Impacted[a]
Flood	4/21/1956	DR-55	n/a
Flood	5/27/1957	DR-76	n/a
Wildfires	7/22/1960	DR-105	n/a
Flood	6/26/1961	DR-116	n/a
Flood	2/14/1962	DR-120	n/a
Flood	2/14/1963	DR-143	n/a
Heavy rains & flooding	12/31/1964	DR-186	**Ada**, Bannock, Benewah, Blaine, Boise, Bonneville, Butte, Camas, Caribou, Cassia, Clearwater, Elmore, Gem, Gooding, Idaho, Jerome, Kootenai, Latah, Lewis, Lincoln, Minidoka, Nez Perce, Owyhee, Payette, Power, Shoshone, and Washington.
Forest Fires	8/30/1967	DR-231	Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce, and Shoshone
Severe storms, extensive flooding	3/2/1972	DR-324	Latah
Severe storms, snowmelt, flooding	1/25/1974	DR-415	Adams, Benewah, Bonner, Boundary, Clearwater, Kootenai, Latah, Shoshone, and Washington
Dam collapse	6/6/1976	DR-505	Bingham, Bonneville, Fremont, Jefferson, and Madison
Volcanic eruption, Mt. St. Helens	5/22/1980	DR-624	Benewah, Bonner, Boundary, Clearwater, Kootenai, Latah, Nez Perce, and Shoshone
Earthquake	11/18/1983	DR-694	Butte, Custer, and Gooding
Ice jams, flooding	2/16/1984	DR-697	Lemhi
Storms/flooding	2/11/1996	DR-1102	Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce, and Shoshone
Severe storms/flooding	1/4/1997	DR-1154	Adams, Benewah, Boise, Bonner, Boundary, Camas, Clearwater, Elmore, Gem, Idaho, Kootenai, Latah, Nez Perce, Owyhee, Payette, Shoshone, Valley, and Washington
Flood	6/13/1997	DR-1177	Benewah, Bingham, Bonner, Bonneville, Boundary, Butte, Custer, Fremont, Jefferson, Kootenai, Madison, and Shoshone

Type of Event	Date	Disaster Declaration	Counties Impacted[a]
Wildfires	9/1/2000	DR-1341	**Ada**, Bannock, Bingham, Blaine, Boise, Clearwater, Custer, Elmore, Fort Hall Indian Reservation, Idaho, Jerome, Lemhi, Lewis, Lincoln, Power, and Valley
Heavy rains and flooding	7/6/2005	DR-1592	Nez Perce County and Nez Perce Indian Reservation.
Severe storms and flooding	2/27/2006	DR-1630	Owyhee
Flooding	7/31/2008	DR-1781	Kootenai, and Shoshone
Severe storms and flooding	7/27/2010	DR-1927	Adams, Gem, Idaho, Lewis, Payette, Valley, and Washington
Flooding, landslides, and mudslides	5/20/2011	DR-1987	Nez Perce Indian Reservation
Severe Storm and Straight Line Winds	12/23/2015	DR-4246	Benewah County, Bonner County, Boundary County, Coeur d'Alene Indian Reservation and Kootenai County.
Severe Winter Storms	2/01/2016	DR-4252	Benewah County, Bonner County and Kootenai County.
Severe Winter Storms and Flooding	4/21/2017	DR-4310	Bingham, Cassia, Elmore, Franklin, Gooding, Jefferson, Jerome, Lincoln, Minidoka, Twin Falls, Washington
Severe Storms, Flooding, Landslides, and Mudslides	5/18/2017	DR-4313	Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Shoshone, Valley
Flooding, Landslides, and Mudslides	8/27/2017	DR-4333	Blaine, Camas, Custer, Elmore, Gooding
Flooding	10/7/2017	DR-4342	**Ada**, Canyon
Severe Storms, Flooding, Landslides, and Mudslides	6/12/2019	DR-4443	Adams, Idaho, Latah, Lewis, Nez Perce Indian Reservation, Valley
COVID-19 Pandemic	4/9/2020	DR-4534	**Ada**, Adams, Bannock, Bear Lake, Benewah, Bingham, Blaine, Boise, Bonner, Bonneville, Boundary, Butte, Camas, Canyon, Caribou, Cassia, Clark, Clearwater, Custer, Elmore, Franklin, Fremont, Gem, Gooding, Idaho, Jefferson, Jerome, Kootenai, Latah, Lemhi, Lewis, Lincoln, Madison, Minidoka, Nez Perce, Oneida, Owyhee, Payette, Power, Shoshone, Teton, Twin Falls, Valley, Washington
Straight-Line Winds	3/4/2021	DR-4589	Benewah, Bonner, Kootenai, Shoshone

a. Federal disaster declarations were not issued by county until 1964. Declarations prior to that date are statewide
b. In Idaho, as in many other states, the Hurricane Katrina disaster declaration was related to the need to assist evacuees.

Review of these events helps identify targets for risk reduction and ways to increase a community's capability to avoid large-scale events in the future. Still, many natural hazard events do not trigger federal disaster declaration protocol but have significant impacts on their communities. These events are also important to consider in establishing recurrence intervals for hazards of concern.

5.2 IDENTIFIED HAZARDS OF CONCERN

For this update, the Steering Committee considered the full range of natural hazards that could impact the planning area and then ranked the hazards that present the greatest concern. The process incorporated review of state and local hazard planning documents, as well as local, state and federal information on the frequency, magnitude and costs associated with hazards that have impacted or could impact the planning area. Anecdotal information regarding natural hazards and the perceived vulnerability of the planning area's assets to them was also used. Based on the review, this plan update addresses the following natural hazards of concern:

- Dam/canal failure
- Drought

- Earthquake
- Extreme weather
- Flood
- Landslide
- Volcano (ash fall)
- Wildfire.

Climate is not assessed as an individual hazard, but a profile is provided describing how future climate conditions could affect the hazards of concern assessed in this plan.

In addition to the natural hazards of concern, this plan update addresses non-natural (human-caused) hazards that are of most concern for the planning area. These hazards of concern are either addressed in the Ada County Threat Hazard Inventory and Risk Assessment prepared and maintained by EMCR or included to meet the emergency management standard criteria for the Emergency Management Accreditation Program (EMAP). EMAP fosters excellence and accountability in emergency management and homeland security programs by establishing credible standards applied in a peer review accreditation process. EMAP also provides emergency management programs the opportunity to be recognized for compliance with industry standards and to demonstrate accountability in emergency management. The discussion of the following non-natural hazards highlights the extensive capability within the planning area to address non-natural hazards:

- Civil disturbance and terrorism
- Cyber disruption
- Hazardous materials release
- Public health emergency/pandemic
- Radiological event
- Utility failure.

6. REGULATIONS AND PROGRAMS

Existing laws, ordinances and plans at the federal, state and local level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). Pertinent federal and state laws are described below. Each planning partner has individually reviewed existing local plans, studies, reports, and technical information in its jurisdictional annex, presented in Volume 2.

6.1 RELEVANT FEDERAL AND STATE AGENCIES, PROGRAMS AND REGULATIONS

State and federal regulations and programs that need to be considered in hazard mitigation are constantly evolving. For this plan, a review was performed to determined which regulations and programs are currently most relevant to hazard mitigation planning. The findings are summarized in Table 6-1 and Table 6-2. Short descriptions of each program are provided in Appendix B.

Table 6-1. Summary of Relevant Federal Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Americans with Disabilities Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Bureau of Land Management	Wildfire Hazard	The Bureau funds and coordinates wildfire management programs and structural fire management and prevention on BLM lands.
Civil Rights Act of 1964	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Clean Water Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
Community Development Block Grant Disaster Resilience Program	Action Plan Funding	This is a potential alternative source of funding for actions identified in this plan.
Community Rating System	Flood Hazard	This voluntary program encourages floodplain management activities that exceed the minimum National Flood Insurance Program requirements.
Disaster Mitigation Act	Hazard Mitigation Planning	This is the current federal legislation addressing hazard mitigation planning.
Emergency Relief for Federally Owned Roads Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Emergency Watershed Program	Action Plan Funding	This is a possible funding source for actions identified in this plan.
Endangered Species Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
Federal Energy Regulatory Commission Dam Safety Program	Dam Failure Hazard	This program cooperates with a large number of federal and state agencies to ensure and promote dam safety.
Federal Wildfire Management Policy and Healthy Forests Restoration Act	Wildfire Hazard	These documents mandate community-based collaboration to reduce risks from wildfire.
National Dam Safety Act	Dam Failure Hazard	This act requires a periodic engineering analysis of most dams in the country
National Environmental Policy Act	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable federal acts.
National Fire Plan (2001)	Wildfire Hazard	This plan calls for joint risk reduction planning and implementation by federal, state and local agencies.
National Flood Insurance Program	Flood Hazard	This program makes federally backed flood insurance available to homeowners, renters, and business owners in exchange for communities enacting floodplain regulations
National Incident Management System	Action Plan Development	Adoption of this system for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards is a prerequisite for federal preparedness grants and awards
National Landslide Preparedness Act	Risk Assessment of Landslide Hazard	This act authorized a national landslide hazards reduction program and a 3D elevation program, providing tools and data to assess the landside hazard.
Presidential Executive Order 11988 (Floodplain Management)	Flood Hazard	This order requires federal agencies to avoid long and short-term adverse impacts associated with modification of floodplains
Presidential Executive Order 11990 (Protection of Wetlands)	Action Plan Implementation	FEMA hazard mitigation project grant applications require full compliance with applicable presidential executive orders.
U.S. Army Corps of Engineers Dam Safety Program	Dam Failure Hazard	This program is responsible for safety inspections of dams that meet size and storage limitations specified in the National Dam Safety Act.
U.S. Army Corps of Engineers Flood Hazard Management	Flood Hazard, Action Plan Implementation, Action Plan Funding	The Corps of Engineers offers multiple funding and technical assistance programs available for flood hazard mitigation actions
U.S. Bureau of Reclamation Safety Evaluation of Existing Dams Program	Dam Failure Hazard	The basic objective of the program is to identify dams that pose an increased threat to the public, and to quickly complete analyses to expedite corrective action decisions.
U.S. Fire Administration	Wildfire Hazard	This agency provides leadership, advocacy, coordination, and support for fire agencies and organizations.
U.S. Fish and Wildlife Service	Wildfire Hazard	This service’s fire management strategy employs prescribed fire throughout the National Wildlife Refuge System to maintain ecological communities.

Table 6-2. Summary of Relevant State Agencies, Programs and Regulations

Agency, Program or Regulation	Hazard Mitigation Area Affected	Relevance
State and Local Building Codes	Mitigation actions involving new or rehabilitated structures	All actions will be required to comply with applicable building codes
Subdivision Regulations	Mitigation actions involving development	Subdivision regulations can specify requirements for layout and location of infrastructure, lots and other facilities in hazard prone areas as land is developed.
Comprehensive Plans and Zoning	Hazard mitigation planning	In Idaho, a comprehensive plan is required to include a section on hazards
Floodplain Zoning	Flood hazard	State law authorizes Idaho communities to adopt floodplain zoning to regulate any mapped or unmapped flood hazard area.
Idaho Department of Water Resources Dam Safety Program	Dam failure hazard	The Dam Safety Program monitors dams at the state level, currently regulating nearly 600 water storage dams and more than 20 mine tailings impoundment structures.
Idaho Disaster Preparedness Act of 1975	Mitigation actions involving disaster preparedness	This act makes it a state policy to plan and prepare for disasters and emergencies.
Idaho Silver Jackets Program	Flood hazard	Silver Jackets Program is the state-level implementation of the Army Corps of Engineers National Flood Risk Management Program

6.2 EMERGENCY MANAGEMENT ACCREDITATION PROGRAM

EMAP establishes voluntary standards, assessment, and an accreditation process for disaster preparedness programs throughout the country. The accreditation process evaluates emergency management programs on compliance with requirements in the following areas:

- Administration, coordination, administration and finance, and laws and authorities
- Hazard identification, risk assessment and consequence analysis
- Hazard mitigation
- Prevention
- Operational planning and procedures
- Incident management
- Resource management, mutual aid and logistics
- Communications and warning
- Facilities
- Training
- Exercises, evaluations, and corrective actions, and
- Emergency public information and education.

EMAP defines "emergency management" to include organizations involved in prevention of, mitigation against, preparedness for, response to, and recovery from disasters or emergencies (Emergency Management Accreditation Program 2019).

6.3 LOCAL PROGRAMS

All participating jurisdictions compiled an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of a jurisdiction's mission, programs, and policies and evaluates its capacity to carry them out. This assessment identifies potential gaps in the jurisdiction's capabilities.

The planning partnership views all core jurisdictional capabilities as fully adaptable to meet a jurisdiction's needs. Every code can be amended, and every plan can be updated. Such adaptability is itself considered to be an overarching capability. If the capability assessment identified an opportunity to add a missing core capability or expand an existing one, then doing so has been selected as an action in the jurisdiction's action plan, which is included in the individual annexes presented in Volume 2 of this plan.

Capability assessments for each planning partner are presented in the jurisdictional annexes in Volume 2. The sections below describe the capabilities evaluated in the assessment.

6.3.1 Planning and Regulatory Capabilities

Jurisdictions have the ability to develop policies and programs and to implement rules and regulations to protect and serve residents. Local policies are typically identified in a variety of community plans, implemented via a local ordinance, and enforced through a governmental body.

Jurisdictions regulate land use through the adoption and enforcement of zoning, subdivision, and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation.

6.3.2 Fiscal Capabilities

Assessing a jurisdiction's fiscal capability provides an understanding of the ability to fulfill the financial needs associated with hazard mitigation projects. This assessment identifies both outside resources, such as grant-funding eligibility, and local jurisdictional authority to generate internal financial capability, such as through impact fees.

6.3.3 Administrative and Technical Capabilities

Planning, regulatory, and fiscal capabilities provide the backbone for successfully developing a mitigation strategy; however, without appropriate personnel, the strategy may not be implemented. Administrative and technical capabilities focus on the availability of personnel resources responsible for implementing all the facets of hazard mitigation. These resources include technical experts, such as engineers and scientists, as well as personnel with capabilities that may be found in multiple departments, such as grant writers.

6.3.4 Compliance with National Flood Insurance Program

Flooding is the costliest natural hazard in the United States and, with the promulgation of recent federal regulation, homeowners throughout the country are experiencing increasingly high flood insurance premiums. Community participation in the National Flood Insurance Program (NFIP) opens up opportunity for additional grant funding associated specifically with flooding issues. Assessment of the jurisdiction's current NFIP status and compliance provides planners with a greater understanding of the local flood management program, opportunities for improvement, and available grant funding opportunities.

6.3.5 Public Outreach Capability

Regular engagement with the public on issues regarding hazard mitigation provides an opportunity to directly interface with community members. Assessing this outreach and education capability illustrates the connection between the government and community members, which opens a two-way dialogue that can result in a more resilient community based on education and public engagement.

6.3.6 Community Classifications

Other programs, such as the Community Rating System, StormReady, and Firewise USA, can enhance a jurisdiction's ability to mitigate, prepare for, and respond to natural hazards. These programs indicate a jurisdiction's desire to go beyond minimum requirements set forth by local, state, and federal regulations in order to create a more resilient community. These programs complement each other by focusing on communication, mitigation, and community preparedness to save lives and minimize the impact of natural hazards on a community.

6.3.7 Development and Permitting Capability

Identifying previous and future development trends is achieved through a comprehensive review of permitting since completion of the previous plan and in anticipation of future development. Tracking previous and future growth in potential hazard areas provides an overview of increased exposure to a hazard within a community.

6.3.8 Integration Opportunity

The assessment looked for opportunities to integrate this mitigation plan with the planning and regulatory capabilities identified. Capabilities were identified as integration opportunities if they can support or enhance the actions identified in this plan or be supported or enhanced by components of this plan. Planning partners considered actions to implement this integration as described in their jurisdictional annexes.

6.3.9 Expansion of Existing Capabilities

Local hazard mitigation plans are required to document each jurisdiction's ability to expand on and improve existing policies and programs. For this plan update, all planning partners reviewed their existing capabilities through the jurisdictional annex process (see Volume 2) and developed mitigation actions to address identified gaps in their capabilities or to expand on or improve existing capabilities. In the analysis to assign each mitigation action to a defined category (see Section 26.3), these actions are classified as "community capacity building" actions, which are defined as follows:

> *Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.*

Part 2. Risk Assessment

7. RISK ASSESSMENT METHODOLOGY

The risk assessments in this plan describe the risks associated with each identified hazard of concern. The following steps were used to define the risk of each hazard:

- **Identify and profile each hazard**—The following information is given for each hazard:
  - A summary of past events that have impacted the planning area
  - Geographic areas most affected by the hazard
  - Event frequency estimates
  - Severity descriptions
  - Warning time likely to be available for response.
- **Determine exposure to each hazard**—Exposure was assessed by overlaying hazard maps with an inventory of structures, facilities, and systems to decide which of them would be exposed to each hazard.
- **Assess the vulnerability of exposed facilities**—Vulnerability of exposed structures and infrastructure was evaluated by interpreting the probability of occurrence of each event and assessing structures, facilities, and systems that are exposed to each hazard. Tools such as geographic information systems (GIS) and Hazus were used for this assessment for the dam failure, earthquake, and flood hazards. Outputs similar to those from Hazus were generated for other hazards, using data generated through GIS.

7.1 RISK ASSESSMENT TOOLS

7.1.1 Mapping

National, state, and local databases were reviewed to locate spatially based data relevant to this planning effort. Maps were produced using GIS software to show the spatial extent and location of hazards when such datasets were available. These maps are included in the hazard profile chapters of this document and the jurisdiction-specific annexes in Volume 2. Appendix C provides details on the mapping data sources and methodologies.

7.1.2 Modeling

Overview

FEMA developed the GIS-based software program Hazus (Hazards U.S.) to estimate losses caused by earthquakes, hurricanes, floods, and tsunamis. Hazus is used to support risk assessments, mitigation planning, and emergency planning and response. It provides a range of inventory data, (such as demographics, building stock, critical facilities, transportation and utility infrastructure) and multiple models to estimate losses from natural disasters. The program maps and calculates hazard data and damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates the review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a hazard mitigation plan throughout its implementation.

Levels of Detail for Evaluation

Hazus provides default data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis, depending on the format and level of detail of information about the planning area:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. This data is derived from national databases and describes in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

7.2 RISK ASSESSMENT APPROACH

7.2.1 Hazard Profile Development

Hazard profiles were developed through web-based research and review of previous reports and plans, including community general plans and state and local hazard mitigation plans. Frequency and severity indicators include past events and the expert opinions of geologists, emergency management specialists, and others.

7.2.2 Exposure and Vulnerability

Dam Failure, Earthquake, and Flood

Community exposure and vulnerability to the following hazards were evaluated using Hazus:

- **Dam Failure and Flood**—A Level 2 user-defined analysis was performed for general building stock and for community lifelines using the flood module. Current mapping for the planning area was used to delineate hazard areas for flood and dam failure and estimate potential losses. To estimate damage that would result from these inundation-based hazards, Hazus uses pre-defined relationships between water depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting inundation depth data and known property replacement cost values, dollar-value estimates of damage were generated.

- **Earthquake**—A Level 2 analysis was performed to assess earthquake risk and exposure for two scenario events and two probabilistic events:
  - A Magnitude-7.03 event on the Squaw Creek fault with an epicenter 36 miles north of Boise.
  - A Magnitude-6.81 event on the Big Flat Jakes Creek fault with an epicenter 45 miles north-northwest of Boise.
  - The standard Hazus 100- and 500-year probabilistic events.

Extreme Weather, Landslide, Volcano and Wildfire

Historical datasets were not adequate to model future losses for landslide, extreme weather, volcano and wildfire. However, areas and inventory susceptible to some of the hazards of concern were mapped by other means to evaluate exposure. A qualitative analysis was conducted for other hazards using the best available data and professional judgment.

Drought

The risk assessment methodologies used for this update focus on damage to structures. Because drought does not impact structures, the risk assessment for drought was more limited and qualitative than the assessment for the other hazards of concern.

7.3 SOURCES OF DATA USED IN MODELING AND EXPOSURE ANALYSIS

7.3.1 Building and Cost Data

Replacement cost is the cost to replace the entire structure with one of equal quality and utility. Replacement cost is based on industry-standard cost-estimation models published in the 2021 *RS Means Square Foot Costs*. It is calculated using the RS Means square foot cost for a structure, which is based on the Hazus occupancy class (i.e., multi-family residential or commercial retail trade), multiplied by the square footage of the structure from the tax assessor data. The construction class and number of stories for single-family residential structures also factor into determining the square foot costs.

Replacement cost values and detailed structure information derived from parcel and tax assessor data provided by Ada County were loaded into Hazus. When available, an updated inventory was used in place of the Hazus defaults for community lifelines.

7.3.2 Hazus Data Inputs

The following hazard datasets were used for the Hazus Level 2 analysis conducted for the risk assessment:

- **Flood**—The effective Digital Flood Insurance Rate Map (DFIRM) for the planning area was used to delineate flood hazard areas and estimate potential losses from the FEMA 1-percent-annual chance and 0.2-percent-annual-chance (100- and 500-year) flood events. Using the DFIRM floodplain boundaries and base flood elevation information and the best available digital elevation model data, flood depth grids were generated and integrated into the Hazus model.

- **Dam Failure**—Dam failure inundation area boundaries and depth grids data for Blacks Creek and Lucky Peak were provided by the Idaho Department of Water Resources and the U.S. Army Corps of Engineers, respectively. The individual dam depth grids were integrated into the Hazus model.
- **Earthquake**—Earthquake ShakeMaps and probabilistic data prepared by USGS were used for the analysis of this hazard. National Earthquake Hazard Reduction Program (NEHRP) soils and liquefaction maps for the Boise metro area, from the Idaho Geological Survey, were also integrated into the Hazus model.

7.3.3 Other Local Hazard Data

Locally relevant information on hazards was gathered from a variety of sources. Data sources for specific hazards were as follows:

- **Drought**—No GIS format drought hazard area datasets were identified for Ada County.
- **Extreme weather**—No GIS format extreme weather area datasets were identified for Ada County.
- **Landslide**—A dataset of steep slopes was generated using data from a combination of the Boise Foothills 1-foot digital elevation model and the U.S. Geological Survey (USGS) 10-meter digital elevation model. Two slope classifications were created: 15 to 30 percent; and greater than 30 percent. These two categories were used in the risk assessment.
- **Volcano**—No GIS format volcano hazard area datasets were identified for Ada County.
- **Wildfire**—Base hazard data from the 2016 Enhanced Wildfire Risk Map Project was provided by Ada County. High and moderate base hazard rating areas were used in the exposure analysis.

7.3.4 Data Source Summary

Table 7-1 summarizes the data sources used for the risk assessment for this plan.

7.4 LIMITATIONS

Loss estimates, exposure assessments and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic or economic parameter data
- The unique nature, geographic extent and severity of each hazard
- Mitigation measures already employed
- The amount of advance notice residents have to prepare for a specific hazard event.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate and should be used only to understand relative risk. Over the long term, Ada County and its planning partners will collect additional data to assist in estimating potential losses associated with other hazards.

Table 7-1. Hazus Model Data Documentation

Data	Source	Date	Format
Residential and commercial parcel characteristics	Ada County	2021	Digital
Condos	Ada County	2021	Digital (GIS)
Property parcels	Ada County	2021	Digital (GIS)
U.S. Building Footprints—Boise metro area	Microsoft	2019-20	Digital (GIS)
U.S. Building Footprints—Other areas	Microsoft	2012	Digital (GIS)
Building replacement (square foot) costs	RS Means	2021	Digital (pdf)
Lucky Peak Dam failure inundation area and depth grid	U.S. Army Corps of Engineers	2020	Digital (GIS)
Blacks Creek Dam failure inundation area and depth grid	Idaho Department of Water Resources	2020	Digital (GIS)
ShakeMap – Big Flat-Jakes Creek M6.81	USGS	2017	Digital (GIS)
ShakeMap – Squaw Creek M7.03	USGS	2017	Digital (GIS)
Probabilistic peak ground acceleration data	Hazus v5.1	2018	Digital (GIS)
Boise Metro Area NEHRP Site Class	Idaho Geological Survey	2011	Digital (GIS)
Boise Metro Area Liquefaction	Idaho Geological Survey	2011	Digital (GIS)
Digital Flood Insurance Rate Map (DFIRM) – Ada County effective 6/19/2020 with latest LOMR effective date 10/14/2021	FEMA	2021	Digital (GIS)
Percent slope (generated from Boise Foothills 1-foot DEM and USGS 10-meter DEM)	2017 Ada County Hazard Mitigation Plan	2017	Digital (GIS)
Wildfire base hazard data (2016 Enhanced Wildfire Risk Map Project)	Ada County	2017	Digital (GIS)
USGS 10-meter DEM	U.S. Geological Survey	unknown	Digital (GIS)
USGS 2-meter DEM	U.S. Geological Survey	unknown	Digital (GIS)
2015 Boise Foothills DEM (1-foot)	Ada County	2015	Digital (GIS)
2020 Boise River DEM FCD10	Flood Control District #10	2020	Digital (GIS)
2015 Boise River DEM	Boise State University	2015	Digital (GIS)

8. CIVIL DISTURBANCE AND TERRORISM

8.1 GENERAL BACKGROUND

8.1.1 Description

Civil Disturbance

Civil disturbance can include acts of civil disobedience, such as demonstrations, riots, labor unrest, and rebellion often spontaneous, that involve large numbers of persons and are generally caused by political grievances, urban economic conflicts, or a decrease in the supply of essential goods and services. Civil disturbance is often a form of protest, arising from highly emotional social and economic issues.

Civil disturbance severity depends on the nature of the disturbance. The homicide of George Floyd on May 25, 2020, led to months of protests to address racism at all levels of society (Center for Disaster Philanthropy 2021). Between May 25 and Nov. 18, 2020, protests occurred in more than 4,446 cities worldwide, including in all states, territories and Washington, D.C., and internationally in more than 60 countries (Center for Disaster Philanthropy 2021). Throughout summer and fall 2020, there were also protests and rallies connected to the COVID-19 pandemic and the 2020 Presidential Election (Center for Disaster Philanthropy 2021). It is not possible to predict the potential severity of civil disturbance; however, it is necessary to think about the potential of such a disturbance. Incidents like these are less likely to occur in smaller cities.

Mob violence, such as riots, lynching, and vigilantism, is typically associated with disorder and lack of respect for the law on the part of masses of people who are uncontrolled, unorganized, angry, and emotional.

Terrorism

The Federal Bureau of Investigation (FBI) defines two types of terrorism (Federal Bureau of Investigation n.d.):

- International terrorism—Violent, criminal acts committed by individuals and/or groups who are inspired by, or associated with, designated foreign terrorist organizations or nations (state-sponsored). For example, an Uzbek national living in Boise was sentenced to 25 years in a federal prison for attempting to provide material support to a designated terrorist organization and possessing an unregistered destructive device (U.S. Immigration and Customs Enforcement 2016).
- Domestic terrorism—Violent, criminal acts committed by individuals and/or groups to further ideological goals stemming from domestic influences, such as those of a political, religious, social, racial, or environmental nature. For example, the January 6, 2021, storming of the U.S. Capitol building was described as an act of terrorism by the director of the FBI (Federal Bureau of Investigation 2021).

For a discussion of cyberterrorism, see Section 9.1.1.

8.1.2 Assessing Severity of the Hazard

Civil Disturbance

The following levels of severity can be associated with the civil disturbance hazard:

- A high hazard severity rating is assigned to an event where an emotionally charged and highly contentious business or police action engenders the outrage of a segment of the population. While the hazard severity is high, there is a moderate vulnerability in such an event and low probability. Therefore, a low risk rating is assigned to a high severity civil disturbance.
- A moderate hazard severity rating would be assigned to a localized event that resulted in damage to property, police action, or some physical harm to the people involved, either protesters or police. In that the vulnerability to such an event is moderate, the severity is moderate, and the probability is moderate, a moderate risk rating is assigned to a moderate civil disturbance event.
- A low hazard rating would be assigned to a localized event that resulted in minimal to no property damage, no police action (though potential police presence), and no physical harm to participants, bystanders, or police. While there may a high probability rating for such forms of civil disturbance, and while the vulnerability rating may be moderate, a low severity hazard would be given a low risk rating.

Such disturbances may originate from a political rally, a sport event celebration getting out of control, or demonstrations by environmental protestors. Dispatching police to control traffic corridors or intrusion on private property is considered a low severity civil disturbance. Disruption of businesses and potential property damage are assessed as a moderate civil disturbance. In these cases, police intervention would be required to restore order without employing chemical agents or physical force. A high civil disturbance would involve rioting, arson, looting, and assault, where aggressive police action (tear gas, curfews, and mass arrests) may be required.

Terrorism

The National Terrorism Advisory System issues alerts to communicate timely, detailed information about the risk of terrorism to the American public at any given time (U.S. Department of Homeland Security 2022).

8.1.3 Secondary Hazards

Civil Disturbance

The overall extent of secondary hazards will vary significantly based on the extent and nature of the civil unrest. Civil disturbances may lead to widespread urban fire, utility failure, transportation interruption, and environmental hazards. There is potential for a mass casualty incident to occur during the course of a civil disturbance event should rioters or protestors become violent and clash with law enforcement or opposing groups. The most significant secondary hazard associated with civil unrest is the interruption of continuity of government, which can also lead to several of the aforementioned secondary hazards.

Civil disturbances generally do not influence the initiation of natural hazards. However, humans could be the cause of a wildfire. During any natural hazard event, some homeowners worried about any ongoing civil disturbance may choose not to evacuate, causing first responders more danger when responding to the disaster.

Terrorism

Secondary hazards of terrorism can include falling debris, utility failure, or transportation interruption. Terrorist attacks on a dam or canal can cause it to fail and inundate the area it was designed to protect.

8.2 HAZARD PROFILE

8.2.1 Past Events

Civil Disturbance

The following episodes of civil disturbance occurred in Ada County over the past decade:

- **2011**—Occupy Boise, an episode of civil disturbance, launched from the Occupy movement that started with the Occupy Wall Street protest in New York City. Local officials expended time and resources planning for contingencies and dealing with permit issues. The protest against corporate entities for political reasons remained peaceful (Idaho Office of Emergency Management 2018).
- **February 3, 2014**—Gay-rights activists were arrested in Boise for a silent protest to draw attention to anti-discrimination legislation. The protestors blocked all entrances to the Senate chambers for more than two hours. Police took 43 people into custody after the demonstrators prevented lawmakers from getting past (Idaho Office of Emergency Management 2018).
- **March 4, 2014**—Twenty-three gay rights activists were arrested after they blocked the entrance to the governor's office inside the Idaho Statehouse. Four were charged with trespassing, 18 with unlawful assembly and one with resisting arrest (Idaho Office of Emergency Management 2018).
- **May and June 2020**—Protests and a vigil were attended by 5,000 to 6,000 people in response to the killing of George Floyd and other instances of police violence and racism toward African Americans nationwide. The protests did not lead to rioting, but U.S. Postal Service boxes were removed from areas near the State Capitol building as a precaution.
- **June 30, 2020**—During a protest at Boise City Hall, fights broke out between a small group of protesters from the organization Black Lives Matter Boise, who were scheduled to hold a "defund the police" rally, and a much larger group of counter protesters.
- **July 21, 2020**—A Black Lives Matter Boise group demonstrated in front of Boise City Hall. The event was met with counter protesters, but the police set up barriers before the event to manage the crowds (Idaho Press 2020).
- **March 6, 2021**—About 100 demonstrators burned masks outside the State Capitol in Boise as a statement against pandemic restrictions. No one was arrested, and the organizers had permits, but the rally was under review because an open fire is not allowed on State Capitol grounds (NBC News 2021).
- **March 15, 2022**—St. Luke's Boise Medical Center went on lockdown for about an hour after an activist urged supporters to go to the hospital to protest a child protection case.

Terrorism

In 2016, an Uzbek national living in Boise was sentenced for conspiring and attempting to provide material support to the Islamic Movement of Uzbekistan and procuring bomb-making materials in the interest of executing a terrorist attack. He was fined $250,000 and sentenced to 25 years in federal prison and three years of supervised release. He faces possible deportation after his sentence (U.S. Immigration and Customs Enforcement 2016).

8.2.2 Location

Civil Disturbance

Information is key for civil disturbances. There must be knowledge of who the demonstrators are, when, where, and why they are demonstrating, what their capabilities are, and what their possible course of action is. Because of their often spontaneous nature, it is difficult to identify specifics.

Government facilities, landmarks, prisons, and universities are common sites where crowds and mobs may gather. Correctional facilities, treatment units, and youth development centers, as well as local and private facilities throughout Idaho that may be targets for civil unrest. Civil disorder can erupt anywhere, but the most likely locations are those areas with large population groupings or gatherings. Civil disorder can also occur near where a "trigger event" occurred, as was the case in 2014 Ferguson, Missouri unrest.

The severity of a civil disturbance coincides with the level of public outrage. It can take the form of small gatherings or large groups blocking access to buildings or disrupting normal activities. Civil disturbances can be peaceful sit-ins or full scale riots (Idaho Office of Emergency Management 2018).

Terrorism

Terrorism can occur anywhere; however, targets are typically in urbanized areas where the attack will cause the most damage and fear.

8.2.3 Frequency

Civil Disturbance

It can be assumed that civil disturbances will occur in the future, but these events are difficult to predict. Some forms of civil disturbance are potentially anticipated. In the case of the race riots that erupted after legal verdicts, the ensuing civil disturbances could have been predicted.

Terrorism

While not historically as frequent as civil disturbances, it can be assumed that terrorism events will occur in the future. The frequency is difficult to predict.

8.2.4 Severity

Civil Disturbance

Civil disturbance severity depends on the nature of the disturbance. The protests after George Floyd's death took place in 140 U.S. cities; the arson, vandalism and looting that occurred will result in at least $1 billion to $2 billion of paid insurance claims—eclipsing the record set in Los Angeles in 1992 after the acquittal of the police officers who brutalized Rodney King (Kingston 2020).

Terrorism

The severity of an act of terrorism depends on whether the event is fully carried out or the instigators are apprehended before they can follow through with their plans.

8.2.5 Warning Time

Civil Disturbance

Because of their often spontaneous nature, it is difficult to identify specifics; however, information gathered in advance may warn officials and provide locations of future civil disturbances. Civil disturbances often occur with little to no warning; however, certain events may trigger riots. Planned demonstrations can turn into riots as a result of controversial court rulings, unfair working conditions, or general unrest. Riots can also be triggered as a result of favorable or unfavorable sports outcomes. Generally, there is a degree of warning time that a riot may occur; however, achieving certainty that an incident is imminent is not possible. Intelligence sharing with regards to crowd size and behavior, as well as known group presence, can assist authorities in determining the possibility of an organized nonviolent demonstration turning violent.

Terrorism

The National Terrorism Advisory System communicates information about terrorist threats. Bulletins are issued on the system's website regarding heightened threat environments across the United States, often in relation to public events such as the presidential inauguration, the anniversary of notable terrorist attacks, religious holidays and associated mass gatherings.

8.3 EXPOSURE AND VULNERABILITY

The entire county is vulnerable to the civil disturbance and terrorism hazard. However, government facilities, landmarks, and universities are common sites where crowds and mobs may gather. Facilities, such as homes, businesses, and other essential infrastructure, such as dams, utilities sites, and other public common areas are vulnerable to civil disturbance and terrorism. Civil violence and terrorism are most often directed at objects that reflect civil values—property, industry, and services.

The systems most likely impacted by civil disturbance include community systems, such as police, fire departments, and emergency medical teams. Straining such limited services, particularly in rural counties, could be disastrous. Transportation systems could be impacted if transit routes are blocked, such as major corridors through Ada County including Interstate 84 or Highway 55, or if the civil disturbance renders part of the city unsafe, like the Capitol building in Boise. Given its role as the state's capital and the high concentration of state buildings, the City of Boise is considered more vulnerable to this hazard than other areas of the county (State of Idaho Hazard Mitigation Plan 2018).

8.4 DEVELOPMENT TRENDS

Future population growth will impact the County's vulnerability to civil disturbance and terrorism. The population of Ada County is projected to increase by 37 percent between 2020 and 2040 (COMPASS 2021).

8.5 SCENARIO

A worst-case scenario for the civil disturbance and terrorism hazard would be a large protest event in the Capitol with a crowd numbering in the thousands, similar to the events in May/June 2020, with the added element of a terrorist attack targeting the mass gathering.

8.6 ISSUES

Much of Ada County is rural and not as impacted by issues concerning civil disturbance and terrorism. The issue in the population centers includes the lack of a civil disturbance policy.

9. CYBER DISRUPTION

9.1 GENERAL BACKGROUND

9.1.1 Description

Cyberattacks

A cyberattack is an intentional and malicious crime that compromises the digital infrastructure of a person or organization, often for financial or terror-related reasons. Such attacks vary in nature and are perpetrated using digital mediums or sometimes social engineering to target human operators. Generally, attacks last minutes to days, but large-scale events and their impacts can last much longer. As information technology continues to grow in capability and interconnectivity, cyberattacks become increasingly frequent and destructive. The FBI's *2020 Internet Crime Report* includes information from 791,790 complaints of suspected internet crime—an increase of more than 300,000 complaints from 2019—and reported losses exceeding $4.2 billion (FBI National Press Office 2021).

Cyberattacks can lead to loss of money, theft of personal information, and damage to personal reputation and safety. Cyber-threats differ by motive, attack type and perpetrator profile. Motives range from the pursuit of financial gain to political or social aims. Attack types include using viruses to erase entire systems, breaking into systems and altering files, using someone's personal computer to attack others, or stealing confidential information. Such threats having a wide range of effects on individuals, communities, and organizations.

Computer systems can experience a variety of cyberattacks, from blanket malware infection to targeted attacks on system capabilities. Cyberattacks seek to breach information technology security measures designed to protect an individual or organization. The initial attack is followed by more severe attacks for the purpose of causing harm, stealing data, or financial gain. Organizations are prone to different types of attacks that can be either automated or targeted in nature. Table 9-1 describes the most common cyberattack mechanisms faced by organizations today.

Cyberterrorism

Cyberterrorism is the use of computers and information, particularly over the Internet, to recruit others to an organization's cause, cause physical or financial harm, or cause a severe disruption of infrastructure service. Such disruptions can be driven by religious, political, or other motives. Like traditional terrorism tactics, cyberterrorism seeks to evoke very strong emotional reactions, but it does so through information technology rather than a physically violent or disruptive action.

Table 9-1. Common Mechanisms for Cyberattacks

Type	Description
Cross-Site Scripting	An attack that sends malicious scripts into content from reliable websites.
Denial of Service Attack	An attack that focuses on disrupting service to a network in which attackers send high volumes of data until the network becomes overloaded and can no longer function.
Internet of Things Attacks	Internet connectivity across commonly used devices presents a growing number of access points for attackers to exploit. The interconnectedness of things makes it possible for attackers to breach an entry point and use it as a gate to exploit other devices in the network.
Malware	"Malware" refers to various types of attacks, including spyware, viruses, and worms. Malware uses a vulnerability to breach a network when a user clicks a planted dangerous link or email attachment, which is used to install malicious software inside the system.
Man in the Middle	Man-in-the-middle attacks mirror victims and endpoints for online information exchange. In this type of attack, the attacker communicates with the victims, who believe they are interacting with a legitimate endpoint website. The attacker is also communicating with the actual endpoint website by impersonating the victim. As the process goes through, the attacker obtains entered and received information from both the victim and endpoint.
Password Attacks	Passwords are the most widespread method of authenticating access to a secure information system, making them an attractive target for cyber attackers. By accessing a person's password, an attacker can gain entry to confidential or critical data and systems, including the ability to manipulate and control them.
Phishing	Malicious email messages that ask users to click a link or download a program. Phishing attacks may appear as legitimate emails from trusted third parties.
Rootkits	Rootkits are installed inside legitimate software, where they can gain remote control and administration-level access over a system. The attacker then uses the rootkit to steal passwords, keys, and credentials and retrieve critical data.
SQL Injection	This occurs when an attacker inserts malicious code into a server using server query language (SQL), forcing the server to deliver protected information. This type of attack usually involves submitting malicious code into an unprotected website comment or search box.
Zero-day Exploit	A zero-day exploit refers to exploiting a network vulnerability when it is new and recently announced—before a patch is released and/or implemented.

Source: (Datto 2022)

Cyberterrorism has three main types of objectives:

- **Organizational**—Cyberterrorism with an organizational objective includes specific functions outside of or in addition to a typical cyberattack. Terrorist groups today use the internet on a daily basis. This daily use may include recruitment, training, fundraising, communication, or planning. Organizational cyberterrorism can use platforms such as social media as a tool to spread a message beyond country borders and instigate physical forms of terrorism. Additionally, organizational goals may use systematic attacks as a tool for training new members of a faction in cyber-warfare.
- **Undermining**—Cyberterrorism with undermining as an objective seeks to hinder the normal functioning of computer systems, services, or websites. Such methods include defacing, denying, and exposing information. While undermining tactics are typically used due to high dependence on online structures to support vital operational functions, they typically do not result in grave consequences unless undertaken as part of a larger attack. Undermining attacks on computers include the following (Waldron 2011):
  - Directing conventional kinetic weapons against computer equipment, a computer facility, or transmission lines to create a physical attack that disrupts the reliability of equipment.
  - Using electromagnetic energy, most commonly in the form of an electromagnetic pulse, to create an electronic attack against computer equipment or data transmissions. By overheating circuitry or jamming communications, an electronic attack disrupts the reliability of equipment and the integrity of data.

- ➢ Using malicious code directed against computer processing code, instruction logic, or data. Malicious code is unwanted files or programs that can cause harm to a computer or compromise data stored on a computer (Cybersecurity & Infrastructure Security Agency 2019). This type of cyberattack can disrupt the reliability of equipment, the integrity of data, and the confidentiality of communications.

- **Destructive**—The destructive objective for cyberterrorism is what organizations fear most. Through the use of computer technology and the Internet, the terrorists seek to inflict destruction or damage on tangible property or assets, and even death or injury to individuals. There are no cases of pure cyberterrorism as of the date of this plan.

9.1.2 Secondary Hazards

Cyber disruptions can impact all human-caused hazards in numerous and unforeseen ways. Malicious software could harm critical infrastructure operations, including power systems. Cyber disruptions cannot directly influence natural hazards, but it is possible for related systems to be affected. For instance, any computerized systems that manage flood control systems could be impacted by a cyber-event, causing a flood event. Cyber disruptions could impact the environment in a number of ways, as affected systems could to stop functioning as intended.

Cyber disruption could also be caused by several other hazards. Earthquakes, flooding, and extreme weather such as severe storms can cause any number of cyber disruption issues through availability of the cyber network. If hardware, computer systems, networks, servers, and backups are damaged due to other hazards, it will cause a cyber disruption for that specific area damaged (State of Idaho Hazard Mitigation Plan 2018).

9.2 HAZARD PROFILE

9.2.1 Past Events

Ada County has been subject to cyberattacks in the past. In May 2019, both the FBI and the Department of Homeland Security were brought in to investigate a ransomware attack that shut down the computer systems of the Ada County Highway District for about 30 hours (Harding 2019). In August 2021, Idaho's governor announced the formation of a new task force to advance cybersecurity initiatives in Idaho (Lewis 2021).

9.2.2 Location

This hazard is not geography-based. Attacks can originate from any computer to affect any other computer in the world. If a system is connected to the Internet or operating on a wireless frequency, it is susceptible to exploitation. Targets of cyberattacks can be individual computers, networks, organizations, business sectors, or governments. Financial institutions and retailers are often targeted to extract personal and financial data that can be used to steal money from individuals and banks. The most affected sectors are finance, energy and utilities, and defense and aerospace, as well as communication, retail, and health care. Both public and private operations are threatened on a near-daily basis by the engineered cyberattacks developed to automatically seek technological vulnerabilities.

9.2.3 Frequency

Cyberattacks are experienced on a daily basis, often without being noticed. Up-to-date virus protection software used in public and private sectors prevents most cyberattacks from becoming successful. Programs that promote public education on virus protection are an effective way to mitigate cyber-threats. The COVID-19 pandemic resulted in a 600 percent increase in cybercrime, with much of the increase coming from phishing email schemes (Purplesec 2021).

9.2.4 Severity

There is no index for measuring the severity of a cyberattack. If it were measured as a country, then cybercrime—which is predicted to inflict damages totaling $6 trillion globally in 2021—would be the world's third-largest economy after the U.S. and China. Experts predict that global cybercrime costs will grow by 15 percent per year over the next five years, reaching $10.5 trillion annually by 2025—more profitable than the global trade of all major illegal drugs combined. This represents the greatest transfer of economic wealth in history, risks the incentives for innovation and investment, is exponentially larger than the damage inflicted from natural disasters in a year (Morgan 2020).

9.2.5 Warning Time

There is no warning time for cyberattacks. The top vector for spreading cyber-ransom threats is email.

9.3 EXPOSURE AND VULNERABILITY

The entire population of Ada County and all critical assets operated by a computer system are exposed to cyberattacks. Any areas where technological systems exist or are utilized are vulnerable to cyber disruption. This includes county and municipal buildings and infrastructure. All critical facilities operated by electricity and/or a computer system are vulnerable to cyberattacks. Cyberattacks may affect structures if any critical electronic systems suffer service disruption. For instance, a cyberattack may cripple the electronic system that controls a cooling system or pressure system within critical infrastructure. This may result in physical damage to the structure from components overheating, or an explosion if pressure relief systems are rendered inoperable. Such failures may not be immediately recognizable as cyberattacks, appearing at first to be attributable to mechanical malfunctions.

If an attack targets critical infrastructure (such as the power grid) impacting life support systems in a healthcare facility, the effects on life, health, and safety could be dire. Likewise, if a cyberattack affects the emergency response system, such as by rendering a 911 call center or the radio network inoperable, emergency services at the county and local level could be hindered, which may result in increased injury or loss of life during emergency situations. If a cyber-disruption impacts the power or utility grid, individuals with medical needs would be impacted the most. These populations are most vulnerable because many of the life-saving systems they rely on require power. Power redundancy is recommended for the essential and critical facilities that serve vulnerable populations.

Economic impacts can be far-reaching if a cyberattack is prolonged for a week or longer. Cyberattacks can have extensive fiscal impacts. Companies and government services can lose large sums of unrecoverable revenue from site downtime and possible compromise of sensitive confidential data. The average amount of money it takes to recover one record of data is $120, and the average medium size business recovery costs about $50,000. Cyber-incidents could result in the theft or modification of important data—including personal, agency, or corporate information—and the sabotage of critical processes, including the provision of basic services by government or private-sector entities.

Ada County will continue to be impacted by cyberattacks in the future. The nature of these attacks is projected to evolve in sophistication over time. The reality remains that many computers and networks in organizations of all sizes and industries around the U.S. will continue to suffer intrusion attempts on a daily basis from viruses and malware that are passed through websites and emails (State of Idaho Hazard Mitigation Plan 2018).

9.4 DEVELOPMENT TRENDS

Development trends across the county can greatly influence and impact future cyber events. As the population increases, the number of connected devices will increase, thus increasing the number of people potentially impacted.

9.5 SCENARIO

A worst-case scenario of cyber disruption would involve an interruption of all critical assets in the County. This would cripple functions in the County, including utilities, emergency services, communication, and vital records. Such an event could last for days or weeks and cost millions of dollars to remedy.

9.6 ISSUES

Issues relating to cyber disruption include the efforts of emergency management to keep up with the rapid advancements made by cyber criminals to hack and disable systems.

10. DAM/CANAL FAILURE

10.1 GENERAL BACKGROUND

10.1.1 Causes of Dam Failure

Partial or full failure of dams has the potential to cause massive destruction to the ecosystems and communities located downstream. Partial or full failure can occur as a result of one or a combination of the following reasons (Federal Emergency Management Agency 2016):

- Overtopping caused by floods that exceed the dam capacity (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides).

Many dam failures in the United States have been secondary results of other disasters. The most common causes are earthquakes, landslides, extreme storms, equipment malfunction, structural damage, foundation failures, and sabotage. Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable by a program of regular inspections. Terrorism and vandalism are serious concerns that all operators of public facilities must plan for; these threats are under continuous review by public safety agencies.

The potential for catastrophic flooding due to dam failures led to passage of the National Dam Safety Act (Public Law 92-367), which requires a periodic engineering analysis of every major dam in the country. The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect the lives and property of the public.

10.1.2 Irrigation Canals

Much of the arid land of Southwest Idaho was developed through reclamation projects of the early 1900s. These projects included dams to collect water and provide flood control and canals to deliver water to agricultural areas.

Many canals crisscross the state, but they are not generally perceived as flood hazards. New development has encroached on the canals and the areas around them. Numerous housing developments in Ada County lie below large-capacity canals. This proximity creates risk to life, safety and property. Because of widespread ownership issues (private canals, irrigation districts, etc.) data for canal failure events is not readily obtainable. The Silver Jackets technical advisory group has expressed strong interest in monitoring this issue and the Idaho Office of Emergency Management anticipates further discussions regarding this hazard.

10.1.3 Secondary Hazards

Dam failure can cause severe downstream flooding, depending on the magnitude of the failure. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat.

10.2 HAZARD PROFILE

10.2.1 Past Events

According to the 2018 State of Idaho Hazard Mitigation Plan, the following dam failures have historically occurred within the State Idaho, some of which impacted the planning area:

- **Ridenbaugh Canal Failure, 1973—**On May 26, 1973, a 30-foot wide break in the Ridenbaugh Canal flooded southeast Boise. Waist deep water flooded 15 homes and the Triangle dairy as water flowed from the breach toward the Boise River.
- **Teton Dam Failure, 1976—**On June 5, 1976, Teton Dam in Fremont County failed (see Figure 10-1). An estimated 80 billion gallons of water were released into the Upper Snake River Valley from the reservoir. Devastating flooding occurred in Wilford, Sugar City, Rexburg, and Roberts; additional significant flooding occurred in Idaho Falls and Blackfoot. At the time of its failure, Teton Dam was brand new, stood 305 feet high, with a crest length of 3,100 feet and a base width of 1,700 feet. The dam was a zoned earth-fill structure with a volume of 10 million cubic yards. The floodwaters threatened American Falls Dam downstream on the Snake River. Dam managers opened the outlet works on American Falls to empty the reservoir and to save American Falls Dam and the string of dams farther down the Snake River.
- **Oakley Dam, 1984—**Oakley Dam nearly overtopped; a canal was constructed to mitigate flooding.
- **Twin Falls County Dam, 1984—**Salmon Falls Creek release caused flooding.
- **Kirby Dam Failure, 1991—**In the summer of 1990, the old log crib structure of the Kirby Dam near Atlanta became unsound and was in jeopardy of failing. The possibility of failure was of special concern due to the large quantity of mine runoff and tailings that had collected behind the dam over the years. A strategy to stabilize the dam developed by the IDWR and the U.S. Forest Service was unsuccessful. On May 26, 1991, Kirby Dam collapsed, cutting off electrical power and blocking the primary access bridge to Atlanta. Sediments containing arsenic, mercury and cadmium were released into the Middle Fork of the Boise River.
- **Brown's Pond Dam, 2010—**Browns Pond Dam overtop and breach during rain on snow event; federal declaration DR-1927.

Figure 10-1. Teton Dam Failure, 1976

10.2.2 Location

Dams

According to Idaho's Dam Safety Program, there are 26 dams in Ada County that impound approximately 1.3 million acre-feet of water. These dams are listed in Table 10-1. Five are operated by federal agencies, and the rest are under the jurisdiction of the state.

Dam failure inundation mapping is not available for every dam in the County. The planning team secured inundation mapping from the Corps of Engineers for the Lucky Peak Reservoir and Blacks Creek Reservoir, which are the dams whose failure is most likely to have the largest impact on the planning area. This inundation area is the focus of the risk assessment for the dam failure hazard. It reflects the normal high pool and maximum inundation area associated with dam operations. Figure 10-2 and Figure 10-3 show the Lucky Peak Dam and Blacks Creek Dam inundation areas, respectively, as used for the risk assessment. The mapped inundation area within each municipality is listed in Table 10-2.

Table 10-1. Dams That Impact Ada County

Name	National ID #	County	Year Built	Dam Type	Purpose	Crest Length (feet)	Height (feet)	Storage Capacity (acre-feet)	Downstream Hazard Potential
Anderson Ranch	ID00279	Elmore	1950	Earth	Multi-use	1350	456	503,500	High
Arrowrock	ID00280	Elmore	1915	Arch	Multi-use	1150	350	283,700	High
Barber	ID00207	Ada	1906	Timber	Multi-use	1225	26	200	High
Blacks Creek	ID00208	Ada	1915	Earth	Multi-use	1700	51.5	3,640	High
Boise Diversion	ID00281	Ada	1908	Gravity	Multi-use	500	57	1,200	High
C J Strike	ID00054	Elmore	1952	Earth	Hydro	3220	115	250,000	High
City of Kuna	ID00688	Ada	2001	Earth	Multi-use	940	18	15	Low
Cottonwood Creek Lower	ID00477	Ada	1961	Earth	Flood Control	1710	15	88	High
Cottonwood Creek Middle	ID00567	Ada	1961	Earth	Flood Control	1210	20	40	High
Cottonwood Creek Upper	ID00565	Ada	1961	Earth	Flood Control	840	18	17	High
Crane Creek Main Dam	ID00478	Ada	1998	Earth	Flood Control	204	64	56,800	Significant
Crane Gulch East Dam	ID00479	Ada	1998	Earth	Flood Control	316	60.4	28	Significant
Hidden Hollow Detention	ID00564	Ada	1997	Earth	Other	375	23	20	Low
Hidden Springs Cell 1A	ID00699	Ada	2007	Earth	Multi-use	--	26	9	Low
Hidden Springs Cell 3A	ID00695	Ada	2007	Earth	Multi-use	--	42.5	81.3	High
High Plains Estates	ID00691	Ada	2005	Erath	Multi-use	340	16	19	Significant
Hubbard	ID00376	Ada	1902	Earth	Irrigation	6000	23	4060	High
IDC-Effluent Storage	ID00490	Ada	1998	Earth	Irrigation	3125	23	105	Significant
Lucky Peak	ID00288	Ada	1954	Earth	Multi-use	2340	340	307,043	High
Micron Dam No 1	ID00415	Ada	1984	Earth	Multi-use	550	14	48	Low
Micron WWT Lagoon No 2	ID00561	Ada	1991	Earth	Other	1720	12	30	Significant
Micron WWT Lagoon No 3	ID00560	Ada	1997	Earth	Other	1540	13	30	Low
Orchard	ID00206	Ada	1902	Earth	Multi-use	2800	43	2,035	Significant
Stewart Gulch Main Fork	ID00480	Ada	1998	Earth	Flood Control	570	76.3	61	High
Swan Falls	ID00049	Ada	1901	Gravity	Hydro	1187	38	7,500	Significant
Terteling	ID00562	Ada	1973	Earth	Multi-use	1770	16	20	Low

Sources: (U.S. Army Corps of Engineers 2020), (Idaho Department of Water Resources 2022)

Table 10-2. Area Within the Mapped Inundation Area

	Area in Lucky Peak Dam Inundation Area (acres)	Area in Blacks Creek Dam Inundation Area (acres)
Boise	11,499	0
Eagle	6,290	0
Garden City	2,702	0
Kuna	0	0
Meridian	1	860
Star	3,222	0
Unincorporated	9,480	1,611
Total	**33,195**	**2,470**

Figure 10-2.

Lucky Peak Dam Failure Inundation Area

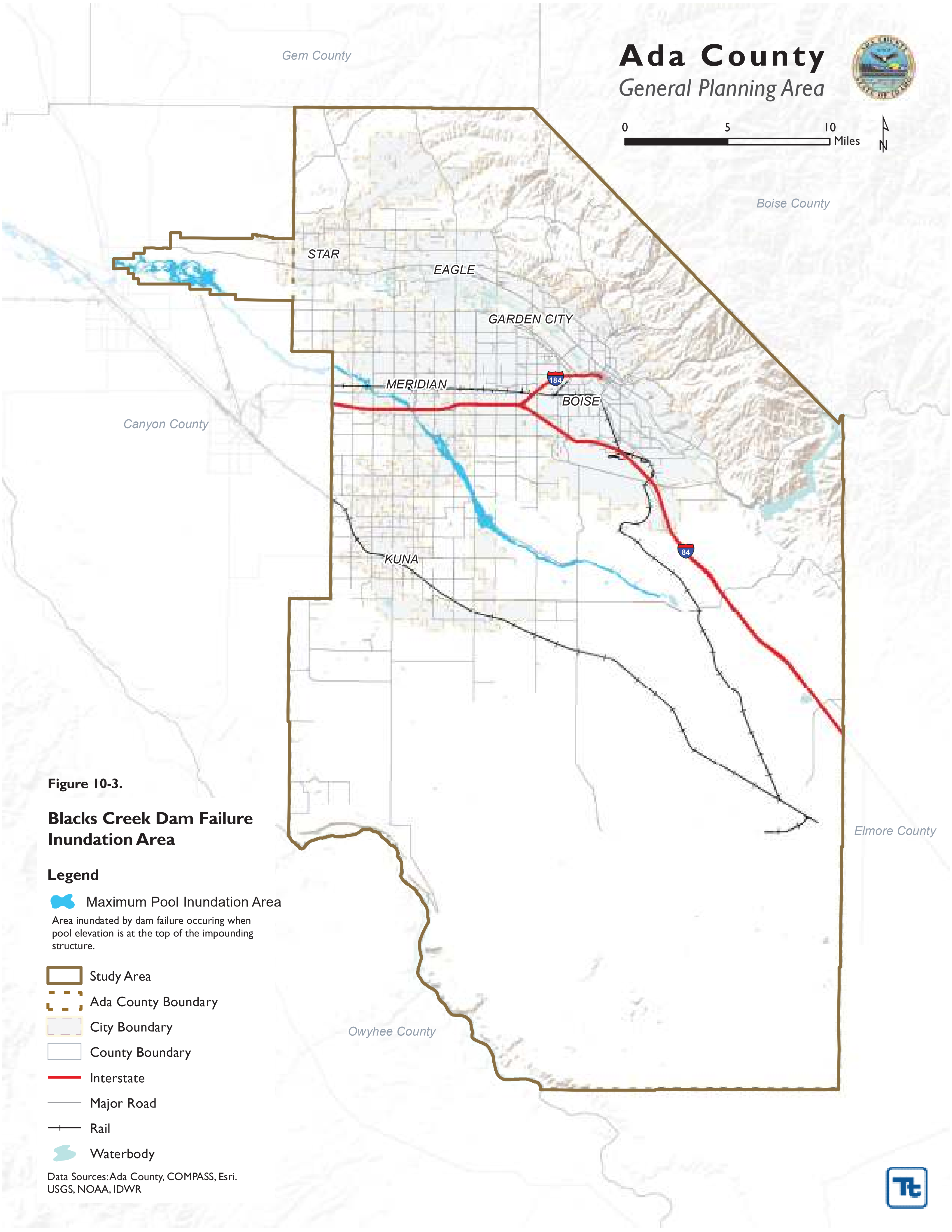


Figure 10-3.

Blacks Creek Dam Failure Inundation Area

Canals

With a water delivery system that includes over 400 miles of canals (see Figure 10-4), Ada County and the Boise area have the highest urban canal density in the United States. These canals are generally well-maintained by their owners/operators because it is their livelihood. However, these facilities can convey flows as high as 2,800 cubic feet per second (cfs), and they have not been evaluated according to engineering standards. The assessment of risk associated with canals is limited in this plan. Canal owners/operators were invited to participate in this plan update process but chose not to at this time. Future updates should continue to seek participation from these entities to better understand the risk posed by these facilities.

10.2.3 Frequency

Dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides and excessive rainfall and snowmelt. There is a "residual risk" associated with dams. Residual risk is the risk that remains after safeguards have been implemented. For dams, the residual risk is associated with events beyond those that the facility was designed to withstand. However, the probability of any type of dam failure is low in today's regulatory and dam safety oversight environment.

10.2.4 Severity

The Idaho Dam Safety Program classifies dams and reservoirs in a three-tier hazard rating system based on the potential consequences to downstream life and property that would result from a failure of the dam and sudden release of water (Idaho Department of Water Resources 2021):

- **High Hazard**—A high-hazard rating does not indicate that a dam suffers from an increased risk of failure. This rating means that if failure were to occur, the resulting consequences likely would be a direct loss of human life and extensive property damage. All high-hazard dams must be properly designed, and at all times responsibly maintained and safely operated because the consequences of failure are so great. IDWR considers the inundation of residential structures with flood water from a dam break to a depth greater than or equal to 2 feet to be a sufficient reason for assigning to a dam a high-hazard rating. An up-to-date emergency action plan is a requirement for all owners of high hazard dams.
- **Significant Hazard**—Significant hazard dams are those whose failure would result in significant damage to developed downstream property and infrastructure or that may result in an indirect loss of human life. An example of the latter would be a scenario where a roadway is washed out and people are killed or injured in an automobile crash caused by the damaged pavement.
- **Low Hazard**—Low hazard dams typically are located in sparsely populated areas that would be largely unaffected by a dam breach. Although the dam and works may be totally destroyed, damage to downstream property would be restricted to undeveloped land, with minimal impact on infrastructure.

Table 10-3 shows the Corps of Engineers classification system for the hazard potential of dam failures. The Idaho and Corps of Engineers hazard rating systems are both based only on the potential consequences of a dam failure; neither system takes into account the probability of such failures.

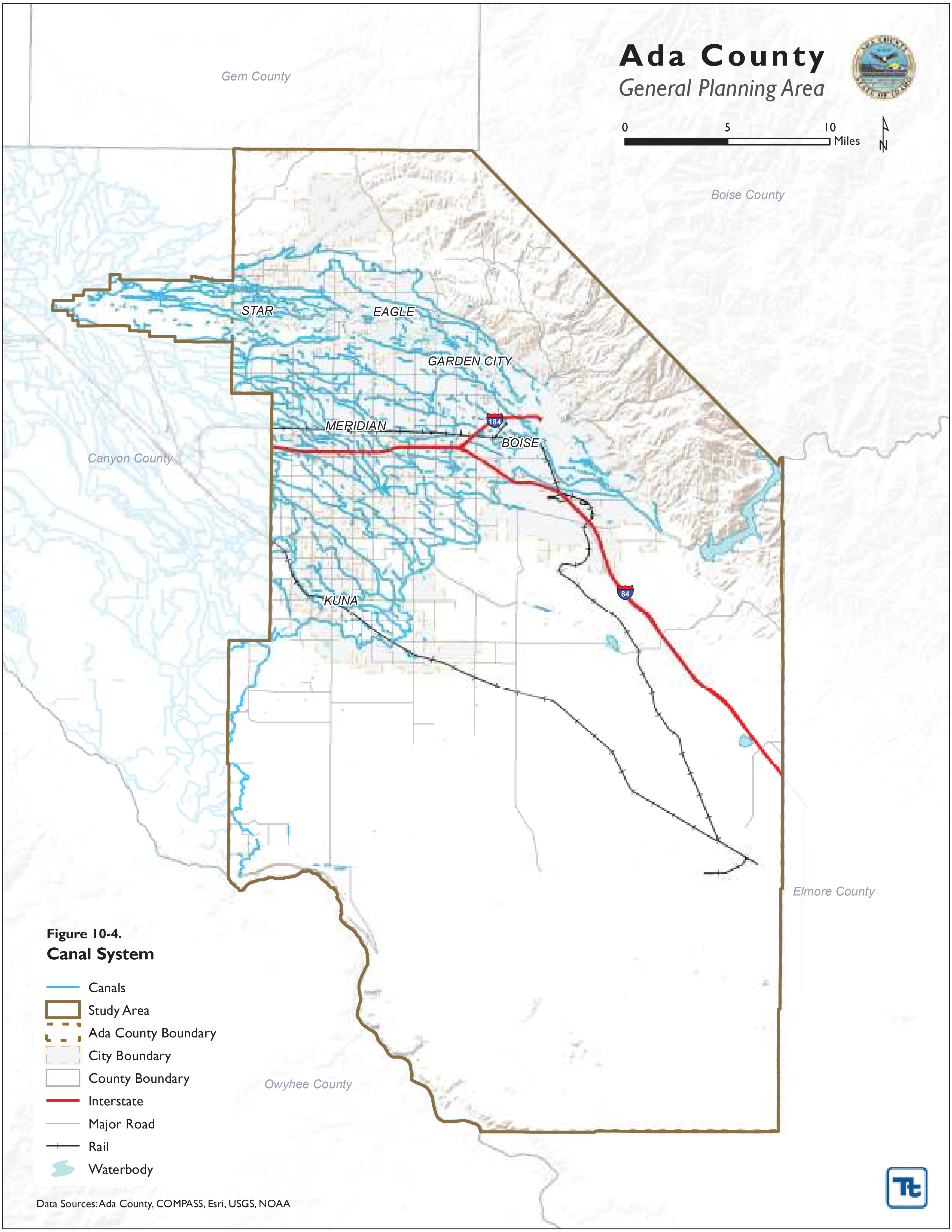


Figure 10-4.

Canal System

- Canals
- Study Area
- Ada County Boundary
- City Boundary
- County Boundary
- Interstate
- Major Road
- Rail
- Waterbody

Data Sources: Ada County, COMPASS, Esri, USGS, NOAA

Table 10-3. Hazard Potential Classification

Hazard Category[a]	Direct Loss of Life[b]	Lifeline Losses[c]	Property Losses[d]	Environmental Losses[e]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

a. Categories are assigned to overall projects, not individual structures at a project.
b. Loss of life potential based on inundation mapping of area downstream of the project. Analyses of loss of life potential should take into account the population at risk, time of flood wave travel, and warning time.
c. Indirect threats to life caused by the interruption of lifeline services due to project failure or operational disruption; for example, loss of critical medical facilities or access to them.
d. Damage to project facilities and downstream property and indirect impact due to loss of project services, such as impact due to loss of a dam and navigation pool, or impact due to loss of water or power supply.
e. Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: U.S. Army Corps of Engineers, 1995

10.2.5 Warning Time

Warning time for dam failure depends on the cause of the failure. In events of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. In the event of a structural failure due to earthquake, there may be no warning time. A dam's structural type also affects warning time. Earthen dams do not tend to fail instantaneously. Once a breach is initiated, discharging water erodes the dam until either the reservoir water is depleted or the breach resists further erosion. Concrete dams also tend to begin with a partial breach, formed over a few minutes or a few hours (U. S. Army Corps of Engineers 2019). The approximate travel time for water released from Lucky Peak Dam to Capitol Boulevard Bridge in Boise is 2 hours (Ada County Emergency Management 2018). EMCR protocols for flood warning and response to imminent dam failure are included in the the Ada County Flood Response Plan. These protocols are tied to emergency action plans for each dam.

10.3 EXPOSURE

The flood module of Hazus was used for a Level 2 assessment of dam failure. Where possible, the Hazus data was enhanced using GIS data from county, state and federal sources.

10.3.1 Population

All populations living in the mapped dam failure inundation zone would be exposed to the risk of a dam failure. Figure 10-5 and Figure 10-6 summarize the population living in the mapped dam-failure inundation areas for the Lucky Peak Dam and Blacks Creek Dam, respectively.

10.3.2 Property

The value of exposed buildings and contents in each jurisdiction is summarized in Figure 10-7 and Figure 10-8 for the Lucky Peak Dam and Blacks Creek Dam, respectively. Figure 10-9 summarizes the number of structures in the mapped Lucky Peak Dam inundation area by jurisdiction and occupancy class.

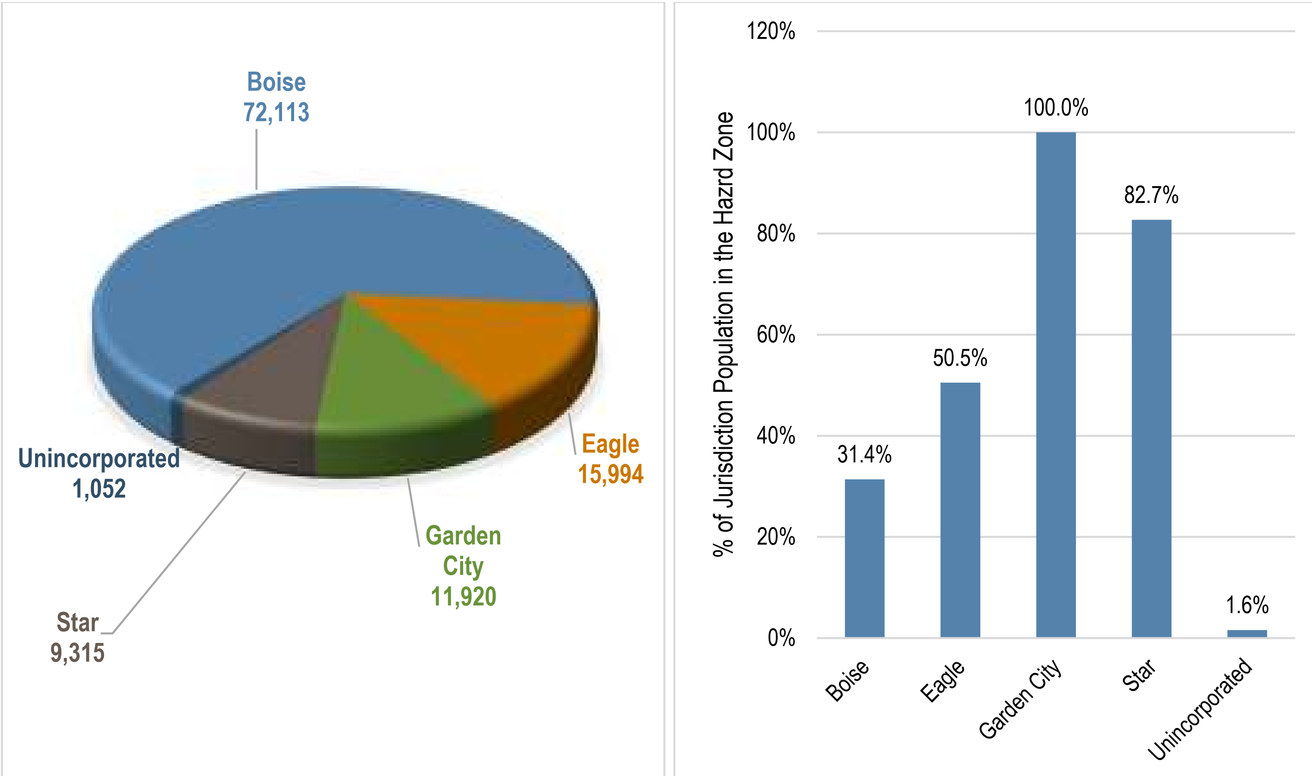


Figure 10-5. Population in the Lucky Peak Dam Failure Inundation Area

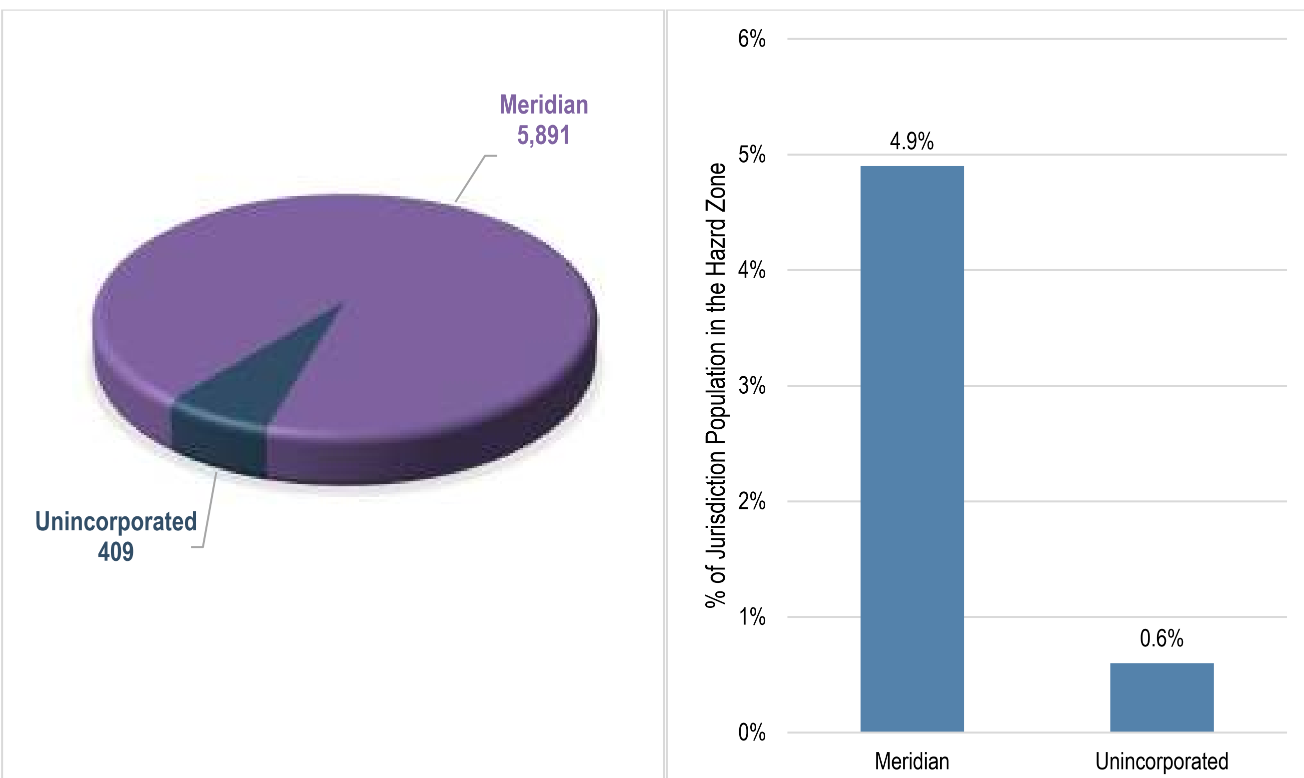


Figure 10-6. Population in the Blacks Creek Dam Failure Inundation Area

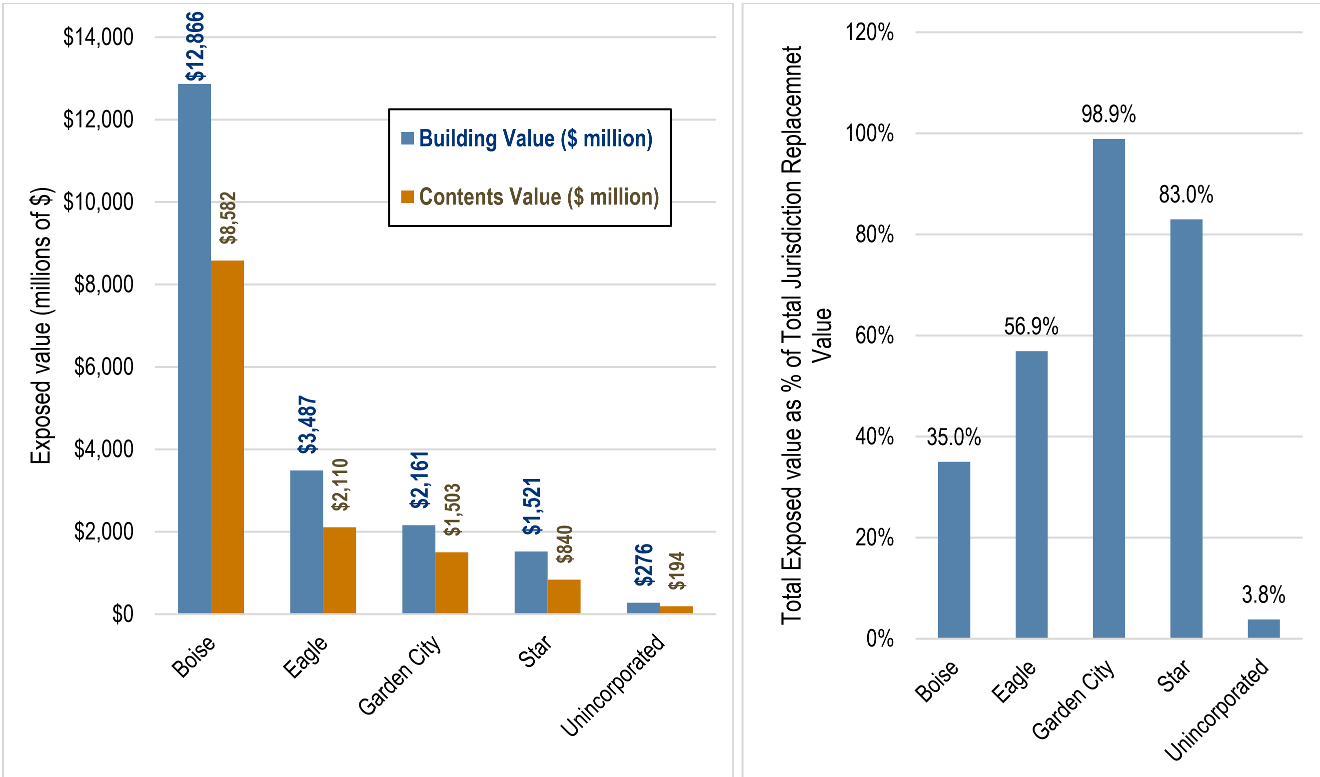


Figure 10-7. Value of Property in the Lucky Peak Dam Failure Inundation Area

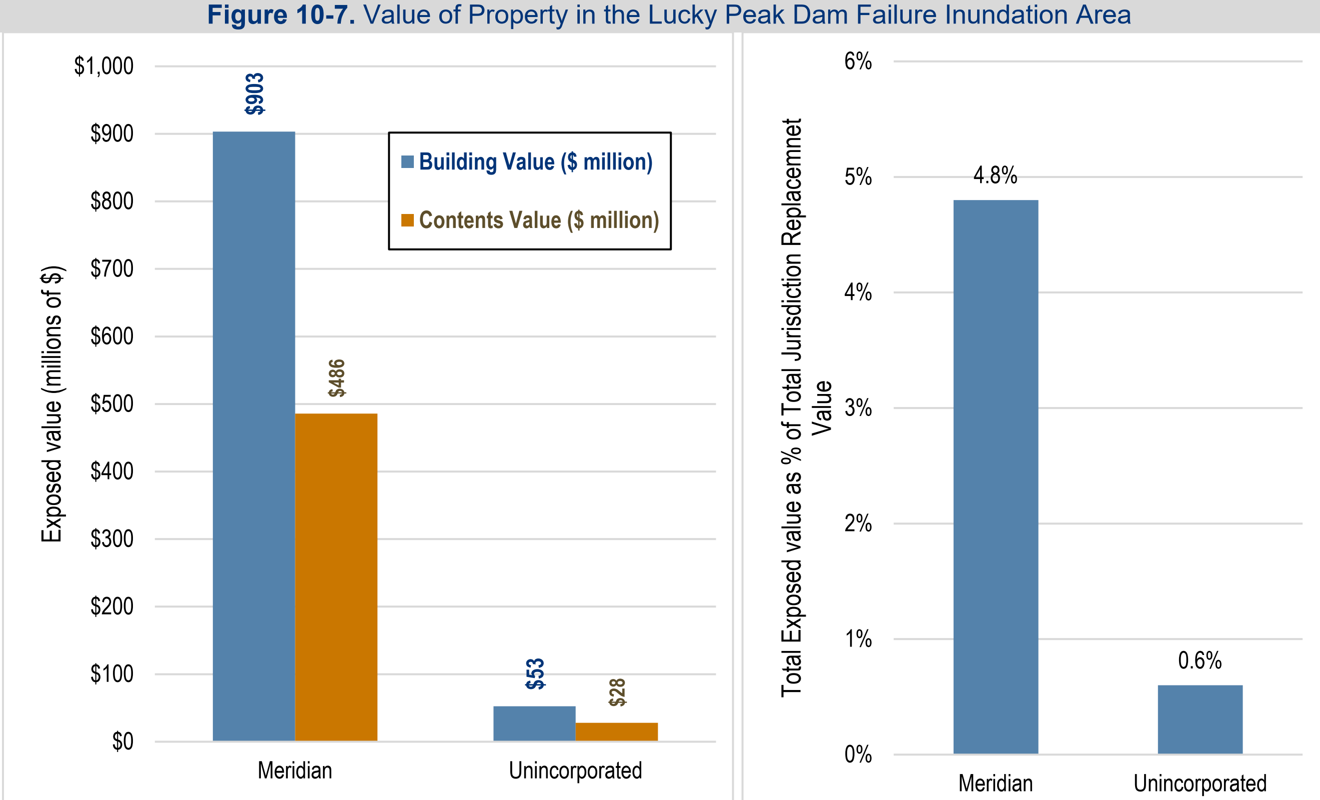


Figure 10-8. Value of Property in the Blacks Creek Dam Failure Inundation Area

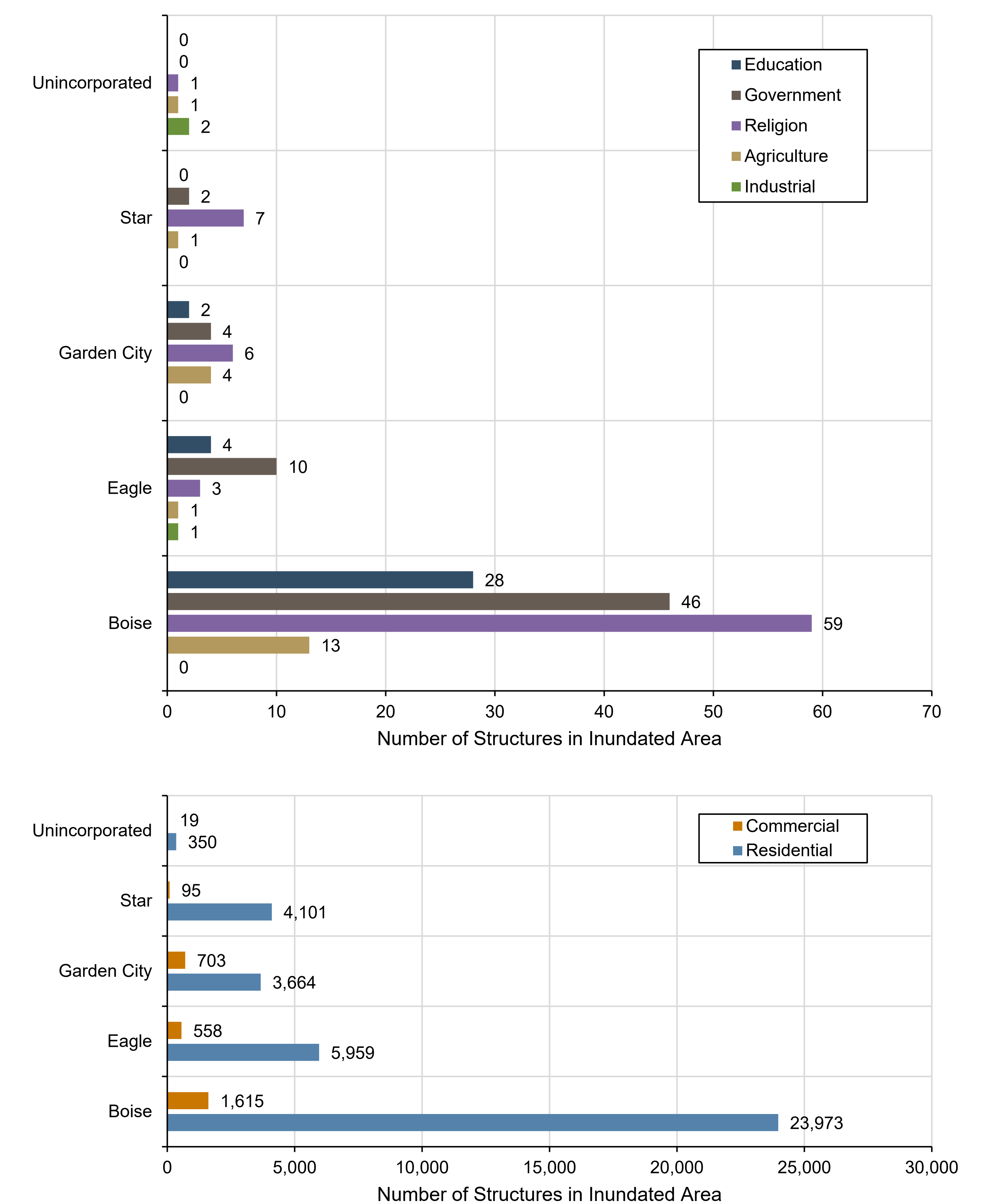


Figure 10-9. Number of Structures Within the Lucky Peak Dam Failure Inundation Area

For the Blacks Creek Dam, the mapped failure inundation area encompasses only the following numbers of structures:

- In unincorporated Ada County—2 agricultural, 2 commercial, 136 residential
- In Meridian—1 education, 1 religion, 8 commercial, 1,907 residential

10.3.3 Critical Facilities

GIS analysis determined that 702 of the planning area's critical facilities (33 percent of the planning area total) are in the mapped Lucky Peak Dam inundation area and 22 (1 percent) are in the mapped Blacks Creek Dam inundation area. Figure 10-10 summarizes critical facilities in the inundation area for the countywide planning area. Detailed results by jurisdiction are provided in Appendix D.

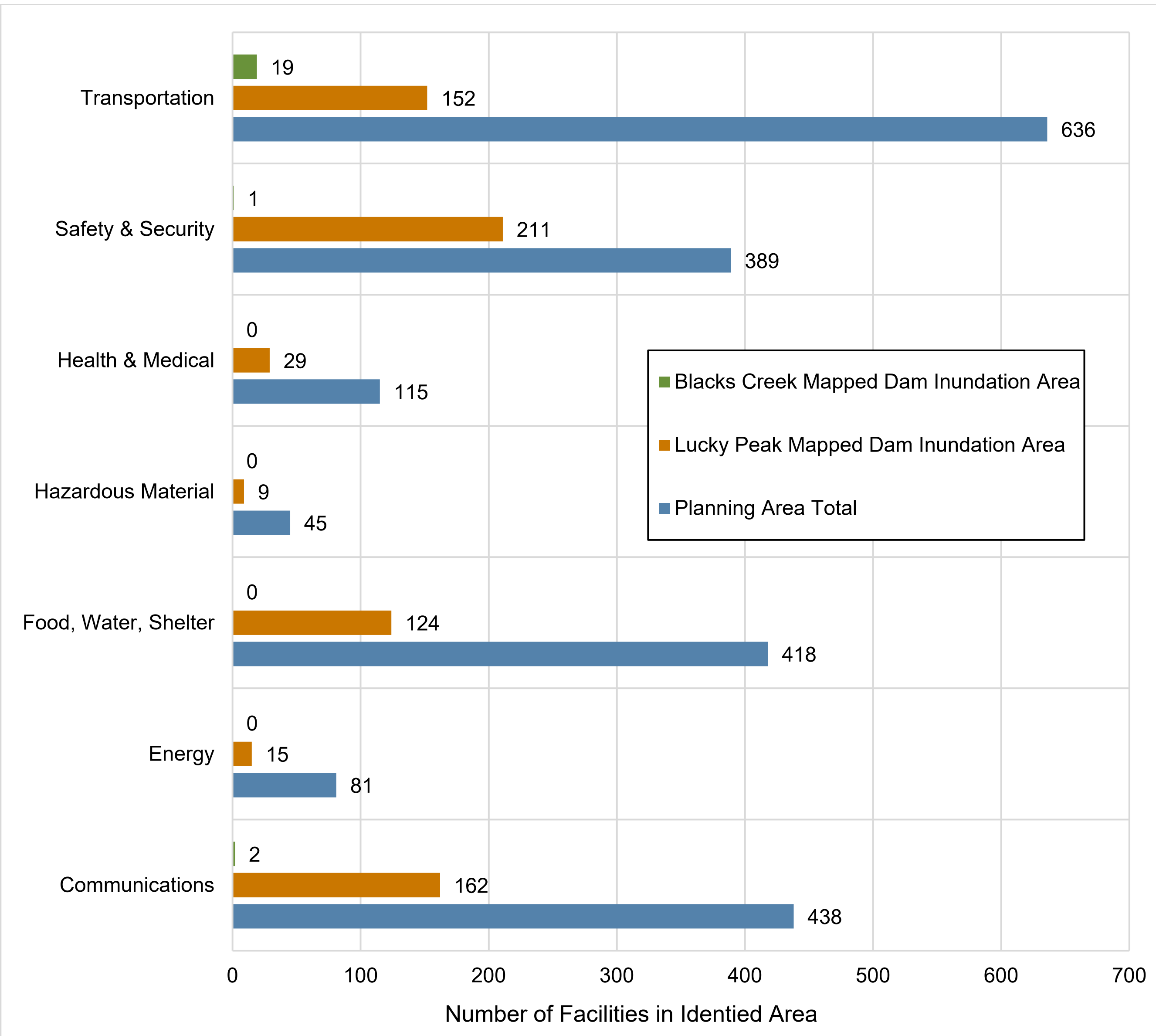


Figure 10-10. Critical Facilities in Dam Failure Inundation Zones and Countywide

10.3.4 Environment

Reservoirs held behind dams affect many ecological aspects of a river. River topography and dynamics depend on a wide range of flows, but rivers below dams often experience long periods of very stable flow conditions or saw-tooth flow patterns caused by releases followed by no releases. Water releases from dams usually contain very little suspended sediment; this can lead to scouring of riverbeds and banks.

The environment would be exposed to a number of risks in the event of dam failure. The inundation could introduce many foreign elements into local waterways. This could result in destruction of downstream habitat and could have detrimental effects on many species of animals, especially endangered species such as salmon.

10.4 VULNERABILITY

The vulnerability of people, property, and critical facilities was evaluated for the combined dam inundation area. Detailed results by jurisdiction are included in Appendix D.

10.4.1 Population

Impacts on persons and households for the combined dam inundation area are estimated through the Level 2 Hazus analysis. Table 10-4 summarizes the results. Vulnerable populations include the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television, radio emergency warning system, siren, or cell phone alert.

Table 10-4. Estimated Dam Failure Impacts on Population

	Number of Displaced Residents	Number of Residents Requiring Short-Term Shelter
Lucky Peak Dam Failure Inundation Area		
Boise	66,414	2,577
Eagle	12,642	547
Garden City	11,701	487
Kuna	0	0
Meridian	0	0
Star	9,065	285
Unincorporated	580	38
Total	**100,402**	**3,933**
Blacks Creek Dam Failure Inundation Area		
Boise	0	0
Eagle	0	0
Garden City	0	0
Kuna	0	0
Meridian	2,302	161
Star	0	0
Unincorporated	68	7
Total	**2,370**	**168**

10.4.2 Property

Figure 10-11 and Figure 10-12 summarize the Level 2 Hazus for property damage from the dam failure hazard for the Lucky Peak Dam and Blacks Creek Dam, respectively.

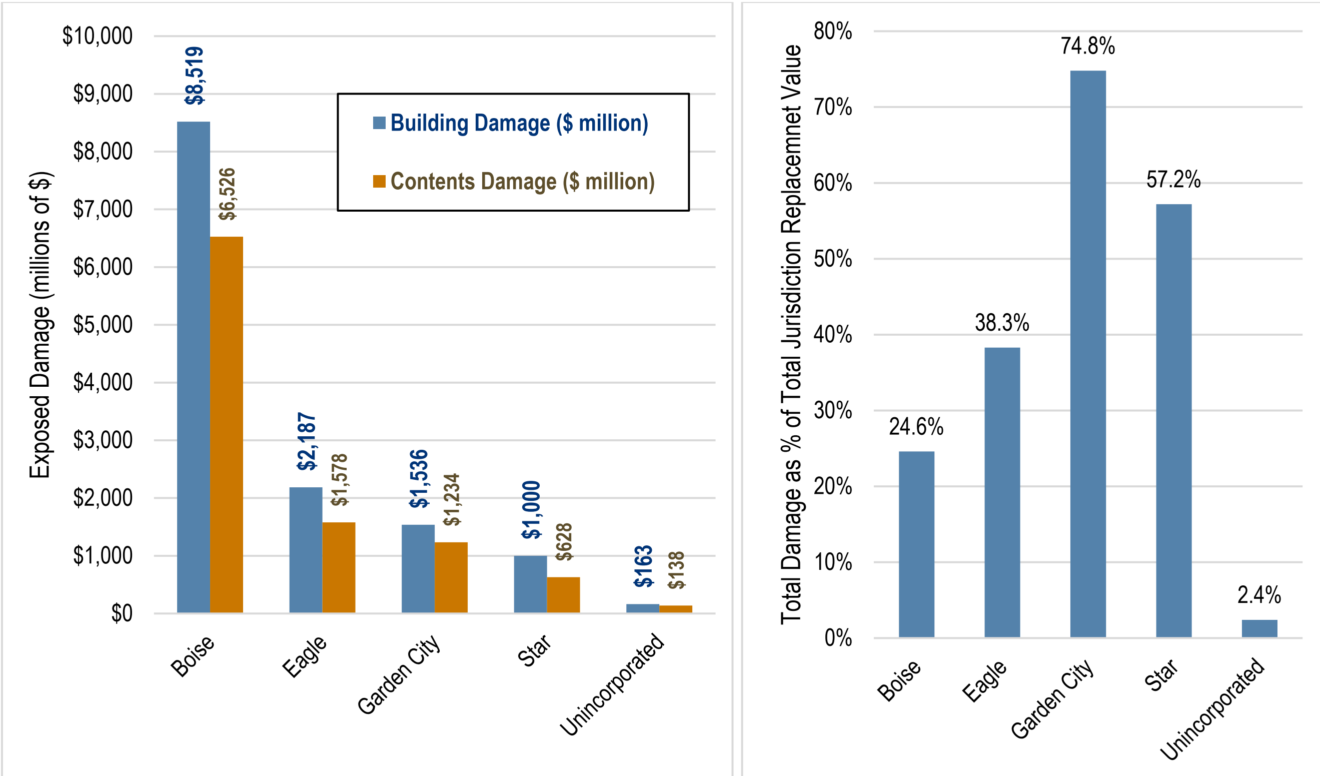


Figure 10-11. Estimated Damage to Property in the Lucky Peak Dam Failure Inundation Area

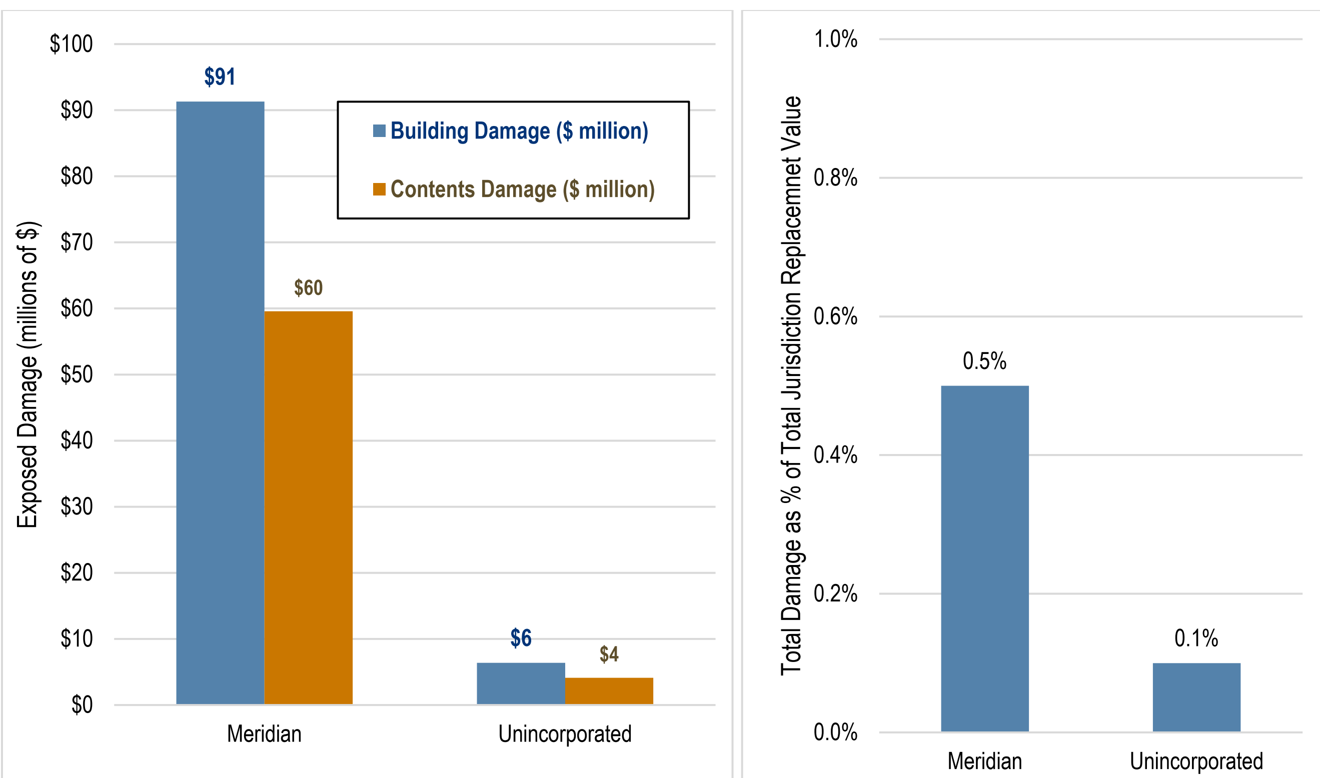


Figure 10-12. Estimated Damage to Property in the Blacks Creek Dam Failure Inundation Area

10.4.3 Critical Facilities

Hazus estimated damage to critical facilities in the dam failure inundation zones is summarized in Figure 10-13 and Figure 10-14.

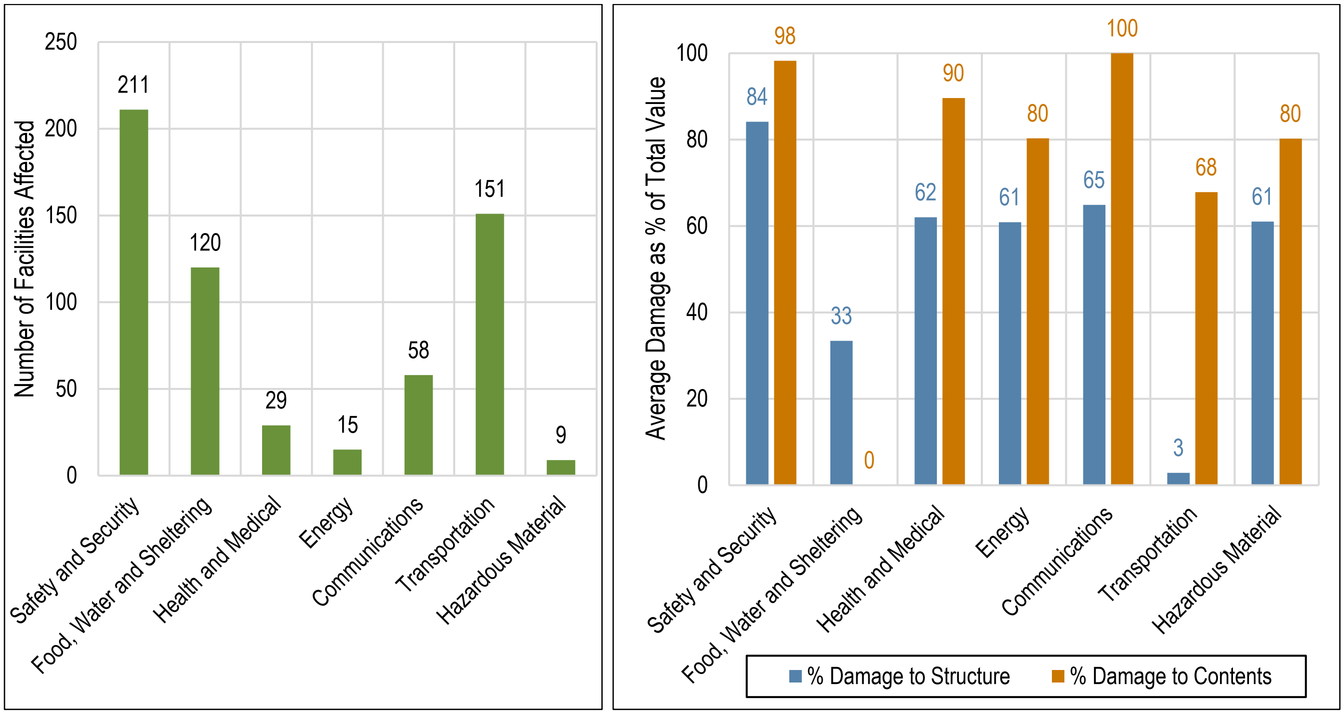


Figure 10-13. Estimated Damage to Critical Facilities from Lucky Peak Dam Failure

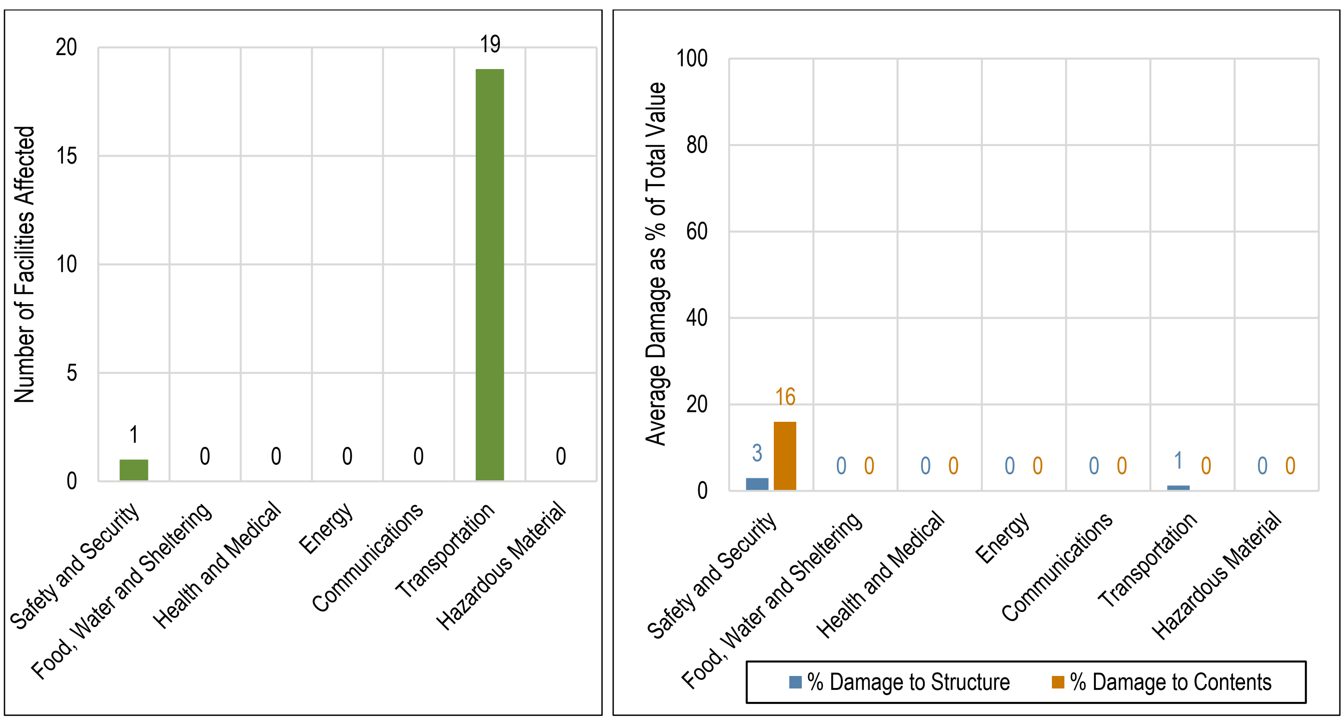


Figure 10-14. Estimated Damage to Critical Facilities from Blacks Creek Dam Failure

10.4.4 Environment

The environment would be vulnerable to a number of risks in the event of dam failure. The inundation could introduce foreign elements into local waterways, resulting in destruction of downstream habitat and detrimental effects on many species of animals, especially endangered species such as coho salmon. The extent of the vulnerability of the environment is the same as the exposure of the environment.

10.5 DEVELOPMENT TRENDS

The value of planning area properties exposed to the dam failure hazard has increased by 0.56 percent ($132.3 million) since the last hazard mitigation plan update in 2017. This increase in risk exposure can be attributed to the wide extent of the dam failure hazard and a countywide population growth of 13.6 percent in the same period (see Section 4.5.1).

While dam and canal failures are not generally hazards addressed in comprehensive plans, the risk assessment in this plan creates an opportunity for Ada County and its planning partners to consider the inclusion of dam/canal hazards in their comprehensive plans. The municipal planning partners have established comprehensive policies regarding sound land use in identified flood hazard areas. Most of the areas vulnerable to the greatest impacts from dam failure intersect the mapped flood hazard areas. Flood-related policies in the comprehensive plans will help to reduce the risk associated with the dam failure hazard for all future development in the planning area. Future updates to comprehensive plans in the planning area may provide enhancements to floodplain management policies considering the potential impacts from dam or canal failures.

10.6 SCENARIO

An earthquake in the region could lead to liquefaction of soils around a dam. This could occur without warning during any time of the day. A human-caused failure such as a terrorist attack also could trigger a catastrophic failure of a dam.

While the probability of dam failure is very low, the probability of flooding associated with changes to dam operational parameters in response to future climate conditions is higher. Dam designs and operations are developed based on hydrographs from historical records. If these hydrographs experience significant changes over time due to the impacts of future climate conditions, dam design and operations may no longer be valid for the changed condition. This could have significant impacts on dams that provide flood control. Specified release rates and impound thresholds may have to be changed. This would result in increased discharges downstream of these facilities, increasing the probability and severity of flooding.

10.7 ISSUES

Flooding as a result of a dam or canal failure would significantly impact properties and populations in the inundation zones. There is often limited warning time for such failures. These events are frequently associated with other natural hazard events such as earthquakes, landslides or extreme weather, which limits their predictability and compounds the hazard. Important issues associated with dam and canal failure hazards include the following:

- The true level of risk associated with canals in the planning area is not known. The lack of regulatory oversight of these facilities results in a void in the level of available information that can be used to assess risk and vulnerability.
- Owners of canals need to be educated on the benefits of participation in hazard mitigation planning. Their lack of participation in these planning efforts creates a gap in the coverage of these plans.
- Federally regulated dams have an adequate level of oversight and sophistication in the development of emergency action plans for public notification in the unlikely event of failure. However, the protocol for notification of downstream citizens of imminent failure needs to be tied to local emergency response planning.
- Mapping for federally regulated dams is already required and available; however, mapping for non-federally regulated dams that estimates inundation depths is needed to better assess the risk associated with dam failure from these facilities.
- Most dam failure mapping required at federal levels requires determination of the probable maximum flood. While the probable maximum flood represents a worst-case scenario, it is generally the event with the lowest probability of occurrence. For non-federally regulated dams, mapping of dam failure scenarios that are less extreme than the probable maximum flood but have a higher probability of occurrence can be valuable to emergency managers and community officials downstream of these facilities. This type of mapping can illustrate areas potentially impacted by more frequent events to support emergency response and preparedness.
- The concept of residual risk associated with structural flood control projects should be considered in the design of capital projects and the application of land use regulations.
- Addressing security concerns and the need to inform the public of the risk associated with dam failure is a challenge for public officials.
- A buildable-lands analysis that looks at vacant lands and their designated land use would be a valuable tool in helping decision-makers make wise decisions about future development.
- The risk analysis for Blacks Creek Dam is likely overstated due to the approximate methods that were used to generate the inundation mapping. To better understand the true risk from this facility, more detailed mapping and analysis is needed.

11. DROUGHT

11.1 GENERAL BACKGROUND

Drought is a significant decrease in water supply relative to what is needed to sufficiently meet typical demand in each location. It is a normal phase in the climactic cycle of most geographical regions, originating from a deficiency of precipitation over an extended period, usually a season or more. This leads to a water shortage for some activity, group, or environmental sector.

Droughts originate from a deficiency of precipitation resulting from an unusual weather pattern. If the weather pattern lasts a short time (a few weeks or a couple months), the drought is considered short-term. If the weather pattern becomes entrenched and the precipitation deficits last for several months or years, the drought is considered to be long-term. It is possible for a region to experience a long-term circulation pattern that produces drought, and to have short-term changes in this long-term pattern that result in short-term wet spells. Likewise, it is possible for a long-term wet circulation pattern to be interrupted by short-term weather spells that result in short-term drought.

Drought in Idaho is generally associated with a sustained period of low winter snowfall. Such periods result from a temporary change in the large-scale weather patterns in the western United States. Limited snowpacks result in reduced stream flows and groundwater recharge.

Water supply is controlled not only by precipitation, but also by other factors, including evaporation (which is increased by higher than normal heat and winds), transpiration (the use of water by plants), and human use. Idaho's system of reservoirs and natural storage can buffer the effects of minor events over a few years, but a series of dry winters (or an especially pronounced single low snowfall year) will result in a water shortage. Extended periods of above-average temperatures during spring and summer can increase the impacts of low snowpacks.

11.1.1 Types of Drought

Drought is generally defined based on four ways of measuring it (National Integrated Drought Information Center n.d.):

- **Meteorological drought**—When dry weather patterns dominate an area
- **Agricultural drought**—When crops become affected by drought
- **Hydrological drought**—When low water supply becomes evident in the water system
- **Socioeconomic drought**—When the supply and demand of various commodities is affected by drought
- **Ecological drought**—When natural ecosystems are affected by drought

11.1.2 Monitoring and Rating Drought

National Oceanic and Atmospheric Administration Drought Indices

The National Oceanic and Atmospheric Administration (NOAA) has developed several indices to measure the impacts and severity of meteorological, agricultural, and hydrological drought and to map their extent and locations:

- The ***Crop Moisture Index*** measures short-term drought weekly to assess impacts on agriculture.
- The ***Palmer Z Index*** measures short-term drought on a monthly scale.
- The ***Palmer Drought Severity Index*** is based on long-term weather patterns. The intensity of drought in a given month is dependent on current weather plus the cumulative patterns of previous months. Weather patterns can change quickly, and the Palmer Drought Severity Index can respond fairly rapidly.
- The ***Palmer Hydrological Drought Index*** quantifies hydrological effects (reservoir levels, groundwater levels, etc.), which take longer to develop and last longer. This index responds more slowly to changing conditions than the Palmer Drought Index.
- The ***Standardized Precipitation Index*** considers only precipitation. A value of zero indicates the median precipitation amount; the index is negative for drought and positive for wet conditions. The Standardized Precipitation Index is computed for time scales ranging from one month to 24 months.

Each of these indices is meaningful for different sectors of society and the economy. For example an urbanized areas that uses water from reservoirs would be sensitive to hydrological drought characterized by the Palmer Hydrological Drought Index, while unirrigated grazing land would be sensitive to meteorological drought characterized by the Crop Moisture Index. Maps of these indices show drought conditions nationwide at a given point in time. They are not necessarily indicators of any given area's long-term susceptibility to drought. Recent examples of these maps are shown on Figure 11-1.

U.S. Drought Monitor

The U.S. Drought Monitor (USDM) is a map that is updated weekly to show the location and intensity of drought across the country. The USDM uses a five-category system (U.S. Drought Monitor 2022):

- D0—Abnormally Dry
  - ➢ Short-term dryness slowing planting, growth of crops
  - ➢ Some lingering water deficits
  - ➢ Pastures or crops not fully recovered
- D1—Moderate Drought
  - ➢ Some damage to crops, pastures
  - ➢ Some water shortages developing
  - ➢ Voluntary water-use restrictions requested
- D2—Severe Drought
  - ➢ Crop or pasture loss likely
  - ➢ Water shortages common
  - ➢ Water restrictions imposed

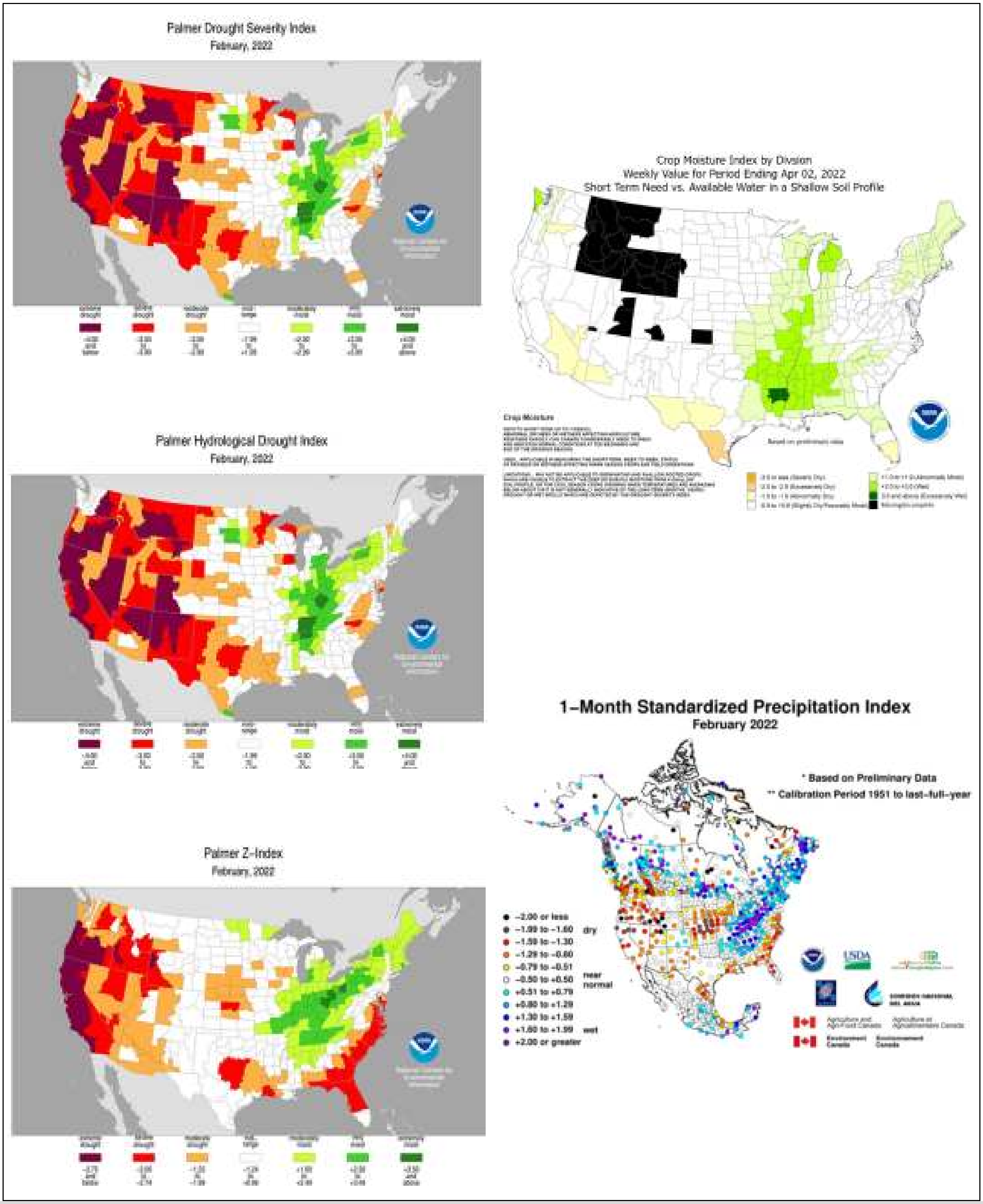


Figure 11-1. Example Drought Index Maps (for February and April 2022)

- D3—Extreme Drought
  - Major crop/pasture losses
  - Widespread water shortages or restrictions
- D4—Exceptional Drought
  - Exceptional and widespread crop/pasture losses
  - Shortages of water creating water emergencies

The USDM categories show experts' assessments of conditions related to drought. These experts check variables including temperature, soil moisture, stream flow, water levels in reservoirs and lakes, snow cover, and meltwater runoff. They also check whether areas are showing drought impacts such as water shortages and business interruptions. Associated statistics show what proportion of various geographic areas are in each category of dryness or drought, and how many people are affected. U.S. Drought Monitor data go back to 2000.

11.1.3 Drought Impacts

Drought can have a widespread impact on the environment and the economy, although it typically does not result in loss of life or damage to structures, as do other natural disasters. The National Drought Mitigation Center uses three categories to describe likely drought impacts:

- **Economic Impacts**—These impacts of drought cost people (or businesses) money. Farmers' crops are destroyed; low water supply necessitates spending on irrigation or drilling of new wells; water-related businesses (such as sales of boats and fishing equipment) may experience reduced revenue; power shutoffs may occur.
- **Environmental Impacts**—Plants and animals depend on water. When a drought occurs, their food supply can shrink, and their habitat can be damaged. Drought also has the potential to increase the risk of wildfire.
- **Social Impacts**—Social impacts include public safety, health, power failures, conflicts between people when there is not enough water to go around, and changes in lifestyle.

The demand that society places on water systems and supplies—such as expanding populations, irrigation, and environmental needs—contributes to drought impacts. Drought can lead to difficult decisions regarding the allocation of water, as well as stringent water use restrictions, water quality problems, and inadequate water supplies for fire suppression. There are also issues such as growing conflicts between agricultural uses of surface water and in-stream uses, surface water and groundwater interrelationships, and the effects of growing water demand on uses of water.

Vulnerability of an activity to drought depends on its water demand and the water supplies available to meet the demand. The impacts of drought vary between sectors of the community in both timing and severity:

- **Water supply—**The water supply sector encompasses urban and rural drinking water systems that are affected when a drought depletes ground water supplies due to reduced recharge from rainfall.
- **Power supply—**Production of all types of energy requires water. Because the energy sector is dependent on water availability, drought can severely impact energy systems.
- **Agriculture and commerce—**The agriculture and commerce sector includes the reduction of crop yield and livestock sizes due to insufficient water supply for crop irrigation and maintenance of ground cover for grazing.

- **Environment, public health, and safety**—The environmental, public health, and safety sector is affected by wildfires, which are detrimental to the forest ecosystem and hazardous to the public. It also experiences the impacts of desiccating streams, such as the reduction of in-stream habitats for native species.

11.1.4 Secondary Hazards

The secondary hazard most commonly associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the drought continues.

11.2 HAZARD PROFILE

11.2.1 Past Events

According to the Idaho State Hazard Mitigation Plan, Ada County has been impacted by drought conditions five times since 1977. The U.S. Department of Agriculture (USDA) issued drought declarations for Ada County in eight of the past 10 years (see Table 11-1). The most prolonged drought in Idaho was during the 1930s. For most of the state, this drought lasted for 11 years (1929-41) despite greater than average stream flows in 1932 and 1938.

Table 11-1. Historical Droughts in Ada County

Year	USDA Drought Declaration(s)	State Drought Emergency Declaration	Part of Federal Disaster Declaration?
2001	Unknown	Yes	No
2005	Unknown	Yes	No
2013	Yes	No	No
2014	Yes	No	No
2015	Yes	No	No
2016	Yes	No	No
2018	Yes	No	No
2019	Yes	No	No
2021	Yes	No	No
2022	Yes	No	No

Sources: (Idaho Department of Water Resources 2021), (FEMA 2022), (State of Idaho Hazard Mitigation Plan 2018)

Of all the statewide drought emergency declarations, only one was also a federal disaster: 1977, the worst single year on record. This event was part of a more widespread water shortage faced by the United States. In Idaho, a lack of winter snowfall resulted in the lowest runoff on record at most gages in the state. Ski resorts were closed for much of the ski season. Irrigation ditches were closed well before the end of the growing season, and crop yields were below normal. Domestic wells in the Big and Little Wood River basins became dry early in April 1977, and many shallow wells in six western Idaho counties became dry in June. Ada County was not included in this drought declaration.

11.2.2 Location

Drought can have the broadest effect of all of Idaho's hazards, sometimes affecting all regions of the state simultaneously. Although deaths and injuries are rarely direct results, drought can have significant impacts on the economic, environmental, and social well-being of the state. Idaho's arid climate predisposes it to periodic drought. Some areas of the state, however, have a greater potential for drought than others. The Idaho Department of Water Resources reports that, based on analyses of historical stream flow records, southeastern Idaho and the upper portions of the Snake River Plain appear to have the highest probability for persistent, severe stream flow deficits.

11.2.3 Frequency

Drought has a high probability of occurrence in the planning area. From January 2000 to April 12, 2022, some part of Ada County experienced a USDM rating of D1 or higher in 655 out of 1,163 weeks (see Figure 11-2). Ada County has also been included in USDA drought disaster declarations eight times since 2012. Historical drought data for the planning area indicate there have been four significant multi-year droughts in the last 40 years (1981 to 2021), amounting to a severe drought every 10 to 11 years on average.

Source: (U.S. Drought Monitor 2022)

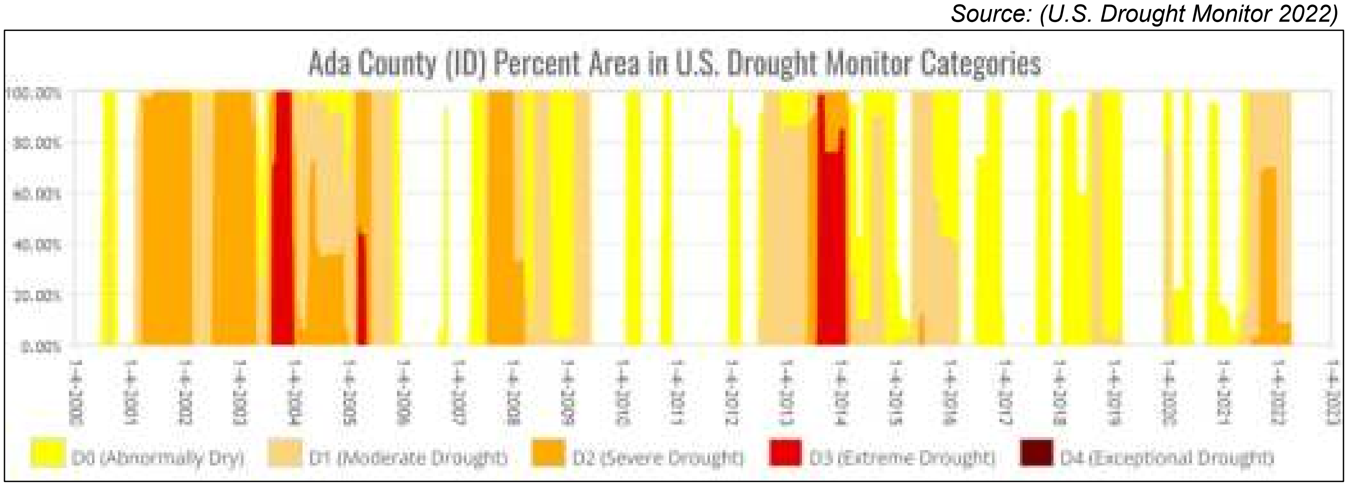


Figure 11-2. Percent of Ada County Affected by Each USDM Rating, 2000 – 2022

11.2.4 Severity

The severity of a drought depends on many factors. Driving factors are the amount and timing of precipitation, duration of below average rainfall, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts.

U.S. Drought Monitor Ratings

Ada County has a history of severe droughts. As shown in Figure 11-2, at least part of the county has experienced severe (D2) or extreme (D3) droughts more than once since 2000.

Drought Impact Reporter

The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. Information comes from a variety of sources: on-line, drought-related news stories and scientific publications, members of the public who visit the website and submit a drought-related impact for their region, members of the media, and staff of government agencies. The database is being populated beginning with the most recent impacts and working backward in time.

The Drought Impact Reporter indicates 111 impacts from drought that specifically affected Ada County from January 2011 through March 2022 (National Drought Mitigation Center 2022). The following are the reported numbers of Ada County impacts by category (some incidents are assigned to more than one impact category):

- Agriculture—64
- Business & Industry—4
- Fire—17
- Plants and Wildlife—32
- Relief, Response & Restrictions—62
- Society & Public Health—9
- Tourism & Recreation—9
- Water Supply and Quality—56

11.2.5 Warning Time

Predicting drought depends on the ability to forecast precipitation and temperature. Only generalized warning can take place due to the numerous variables that scientists have not pieced together well enough to make accurate and precise predictions. Determination of when drought begins is based on impacts on water users and assessments of available water supply, including water stored in reservoirs or groundwater basins. Different water agencies have different criteria for defining drought. Some issue drought watch or drought warning announcements.

It is difficult to predict how long a drought will last. Anomalies of precipitation and temperature may last from several months to several decades. How long they last depends on interactions between the atmosphere and the oceans, soil moisture and land surface processes, topography, internal dynamics, and the accumulated influence of weather systems on the global scale.

11.3 EXPOSURE

All people, property and environments in the Ada County planning area would be exposed to some degree to the impacts of moderate to extreme drought conditions.

11.4 VULNERABILITY

11.4.1 Population

The entire population of the county is vulnerable to drought events. Drought can affect people’s health and safety, including health problems related to low water flows, poor water quality, or dust. Other possible impacts include recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and hygiene; compromised food and nutrition; and increased incidence of illness and disease (Centers for Disease Control and Prevention 2020).

The planning partnership has the ability to minimize any impacts on residents and water consumers in the county should several consecutive dry years occur. This would be accomplished through proactive water conservation and identification and utilization of alternative water supplies. No significant life or health impacts are anticipated as a result of drought within the planning area.

11.4.2 Property

No structures will be directly affected by drought conditions, though some structures may become vulnerable to wildfires, which are more likely following years of drought. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners. However, these impacts are not considered critical in planning for impacts from the drought hazard.

11.4.3 Critical Facilities

Critical facilities as defined for this plan will continue to be operational during a drought. The risk to the critical facilities inventory will be largely aesthetic. For example, when water conservation measures are in place, landscaped areas will not be watered and may die. These aesthetic impacts are not considered significant.

11.4.4 Environment

Groundwater and Streams

Drought generally does not affect groundwater sources as quickly as surface water supplies, but groundwater supplies generally take longer to recover. Reduced precipitation during a drought means that groundwater supplies are not replenished at a normal rate. This can lead to a reduction in groundwater levels and problems such as reduced pumping capacity or wells going dry. Shallow wells are more susceptible than deep wells. Reduced replenishment of groundwater affects streams, especially during the summer when there is little or no precipitation. Reduced groundwater levels mean that even less water will enter streams when stream flows are lowest. Where stream flows are reduced, development that relies on surface water may seek to establish new groundwater wells, which could further increase groundwater depletion.

Other Potential Losses

Environmental losses from drought are associated with damage to plants, animals, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. The following are potential impacts of drought:

- Wildlife habitat may be degraded through the loss of wetlands, lakes and vegetation. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.
- Drought conditions greatly increase the likelihood of wildfires, a major threat to timber resources, structures, and other property.
- Water shortages and severe drought conditions would have a significant impact on Native American tribes' way of life in fishing and farming subsistence.

- Scenic resources in the county are vulnerable to the increased likelihood of wildfires associated with droughts.
- Drying up or dying off of forests could reduce ecological and eco-tourist values.
- Shortage of water supply can have significant economic impacts.
- Drought conditions often are associated with harmful algal blooms—specifically cyanobacteria that can cause severe illness and death in mammals.

11.4.5 Economic Impact

Drought causes the most significant economic impacts on industries that use water or depend on water for their business, most notably agriculture and related sectors (forestry, fisheries, and waterborne activities), power plants (including geothermal power production), and oil refineries. In addition to losses in yields in crop and livestock production, drought is associated with increased insect infestations, plant diseases, and wind erosion. Drought can lead to other losses because so many sectors are affected—losses that include reduced income for farmers and reduced business for retailers and others who provide goods and services to farmers. This leads to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Prices for food, energy, and other products may also increase as supplies decrease.

11.5 DEVELOPMENT TRENDS

Because all of the planning area is exposed to the drought hazard, the increase in exposed population and property since the last hazard mitigation plan update is equal to the countywide trends since then: a 13.6 percent increase in population, a 19.4 percent increase in number of general building stock structures, and a 46.7 percent increase in assessed property value. However, since droughts typically do not cause physical harm to people or structures, there would be no increase in vulnerability to drought from this increased exposure.

The principal resource impacted by drought conditions is water. The Ada County 2025 Comprehensive Plan has established goals and policies to preserve and protect groundwater and surface waters. These goals and policies equip the county to deal with the impacts of future droughts on future development.

11.6 SCENARIO

An extreme multiyear drought could impact the region. Combinations of low precipitation and unusually high temperatures could occur over several consecutive years. Intensified by such conditions, extreme wildfires could break out throughout Ada County, increasing the need for water. Surrounding communities, also in drought conditions, could increase their demand for water supplies relied upon by the planning partnership, causing social and political conflicts. If such conditions persisted for several years, the economy of Ada County could experience setbacks, especially in water dependent industries.

11.7 ISSUES

The planning team has identified the following drought-related issues:

- Identification and development of alternative water supplies
- Utilization of groundwater recharge techniques to stabilize the groundwater supply

- The probability of increased drought frequencies and durations due to future climate conditions
- The promotion of active water conservation even during non-drought periods.
- Public education on water conservation.

12. EARTHQUAKE

12.1 GENERAL BACKGROUND

An earthquake is the vibration of the earth's surface that follows a release of energy in the earth's crust. This energy can be generated by a sudden dislocation of segments of the crust or by a volcanic eruption. Most destructive quakes are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and snap to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake along the surface and through the earth at varying speeds, depending on the material through which they move.

12.1.1 Earthquake Location

The location of an earthquake is commonly described by its focal depth and the geographic position of its epicenter. The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus or hypocenter). The epicenter of an earthquake is the point on the Earth's surface directly above the hypocenter.

12.1.2 Earthquake Geology

Faults

Earthquakes tend to occur along faults, which are zones of weakness in the earth's crust. Even if a fault zone has recently experienced an earthquake, there is no guarantee that all the stress has been relieved. Another earthquake could still occur. In fact, relieving stress along one part of a fault may increase stress in another part.

Small, local faults produce lower magnitude quakes, but ground shaking can be strong and damage can be significant in areas close to the fault. In contrast, large regional faults can generate earthquakes of great magnitudes but, because of their distance and depth, they may result in only moderate shaking in an area.

Faults are more likely to have future earthquakes on them if they have more rapid rates of movement, have had recent earthquakes along them, experience greater total displacements, and are aligned so that movement can relieve the accumulating tectonic stresses. Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those that have ruptured to the ground surface during the Holocene period (about the last 11,000 years). "Potentially active" faults are those that displaced layers of rock from the Quaternary period (the last 1,800,000 years).

Determining if a fault is "active" or "potentially active" depends on geologic evidence, which may not be available for every fault. Most of the seismic hazards are associated with well-known active faults. However, inactive faults or concealed faults (referred to as "blind-thrust" faults), where no displacements have been recorded, also have the potential to reactivate or experience displacement along a branch sometime in the future.

Horizontal Extension

Most earthquakes occur at the boundaries of Earth's tectonic plates. Idaho is not on a plate boundary, but many faults in the state have produced large earthquakes. Tectonic forces in the western part of the North American plate combine with high heat from the underlying mantel to stretch the crust in a northeast-southwest direction. In response, the rigid crust breaks and shifts along faults, and the fault movement produces earthquakes. Stretching, or horizontal extension, of the crust produces a type of dipping fault called a "normal" fault (Figure 12-1).

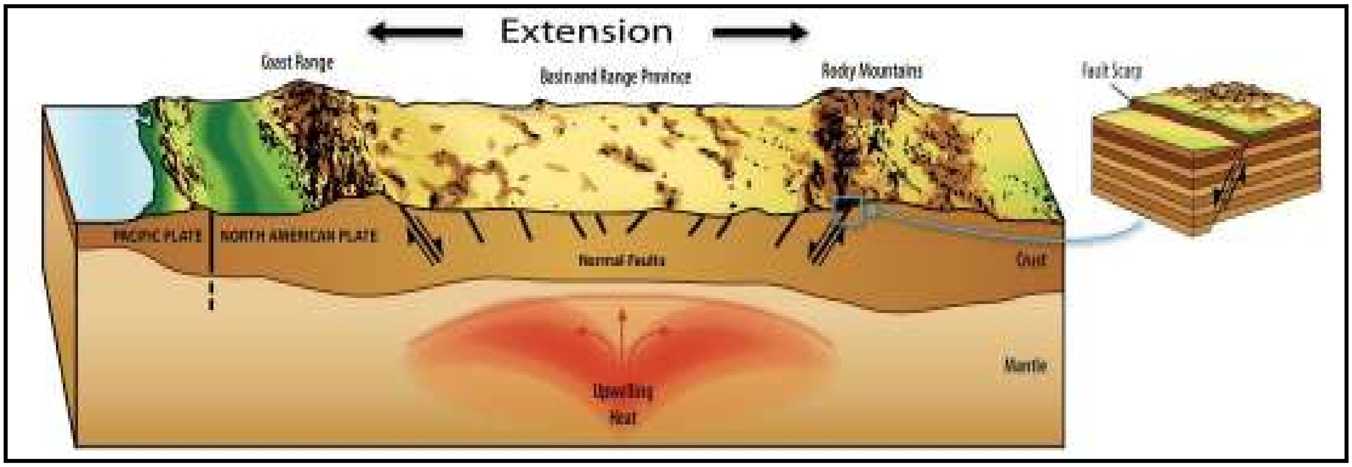


Figure 12-1. Horizontal Extension Creates Normal Faults

The movement of normal faults is characterized by the crust above the fault plane moving down relative to the crust below the fault plane. This up/down movement differs from movement on strike-slip faults like the San Andreas Fault in California, where the crust on one side of the fault slides horizontally past the crust on the other side. Earthquakes in Idaho can be generated by movement on a variety of types of faults, but the faults that are considered capable of generating large surface-faulting earthquakes are mainly normal faults.

Seismic Conditions in Idaho

Most earthquakes in Idaho occur along a belt of seismicity called the Intermountain Seismic Belt that extends from the northwest corner of Montana, along the Idaho-Wyoming border, through Utah, and into southern Nevada. Along most of its length, the Intermountain Seismic Belt straddles the boundary between the Basin and Range Province to the west and more stable parts of North America to the east.

The eastern Snake River Plain formed as the North American continent passed over a "hotspot" of hot rock rising from the earth's mantle. This plume is called the "Yellowstone hotspot" because it is presently located in the Yellowstone National Park area. Beginning along the Oregon-Nevada-Idaho border about 14.5 million years ago and continuing as recently as 600,000 years ago in Yellowstone, the hotspot melted crustal rocks passing over it, creating huge volumes of magma that erupted to form explosive calderas. These calderas are progressively younger to the northeast because of the continuous movement of the North American continent over the hotspot.

In an area around the eastern Snake River Plain, the Yellowstone hotspot has interacted with the Basin and Range Province to create a pattern of earthquakes and mountain building called the Yellowstone Tectonic Parabola Figure 12-2). A major branch of the Intermountain Seismic Belt extends from the Yellowstone area westward across central Idaho. This zone includes at least eight major active faults and has been the site of numerous earthquake swarms and seismic events, including the two largest historic earthquakes in the Intermountain West.

The pattern of earthquake activity in eastern and central Idaho seems to be related to interactions between the Yellowstone hotspot and the Basin and Range Province to the west. Geologists divide the region into five tectonic belts based on historical earthquake activity and the age and amount of movement on prehistoric faults. Within the Snake River Plain, earthquake activity is very low. Earthquake activity increases and faults become younger away from the Plain, culminating in a band of active faults that forms the tectonic parabola on the east.

12.1.3 Earthquake Classifications

Earthquakes are typically classified in one of two ways: By the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. It is commonly expressed by ratings on the moment magnitude scale (M_W). Most people have heard about the Richter scale, but the moment magnitude scale is a more accurate measure of magnitude (U.S. Geological Survey 2021). It is based on the product of the distance a fault moved and the force required to move it.

An earthquake's magnitude is a measure of the energy released at the source of the earthquake. Magnitude is commonly expressed by ratings on the moment magnitude scale (M_W), the most common scale used today (U.S. Geological Survey 2021). This scale is based on the total moment release of the earthquake (the product of the distance a fault moved and the force required to move it). The scale is as follows:

- Great—$M_W > 8$
- Major—$M_W = 7.0 – 7.9$
- Strong—$M_W = 6.0 – 6.9$
- Moderate—$M_W = 5.0 – 5.9$
- Light—$M_W = 4.0 – 4.9$
- Minor—$M_W = 3.0 – 3.9$
- Micro—$M_W < 3$

Intensity

The most used intensity scale is the modified Mercalli intensity scale. Ratings of the scale as well as the perceived shaking and damage potential for structures are shown in Table 12-1.

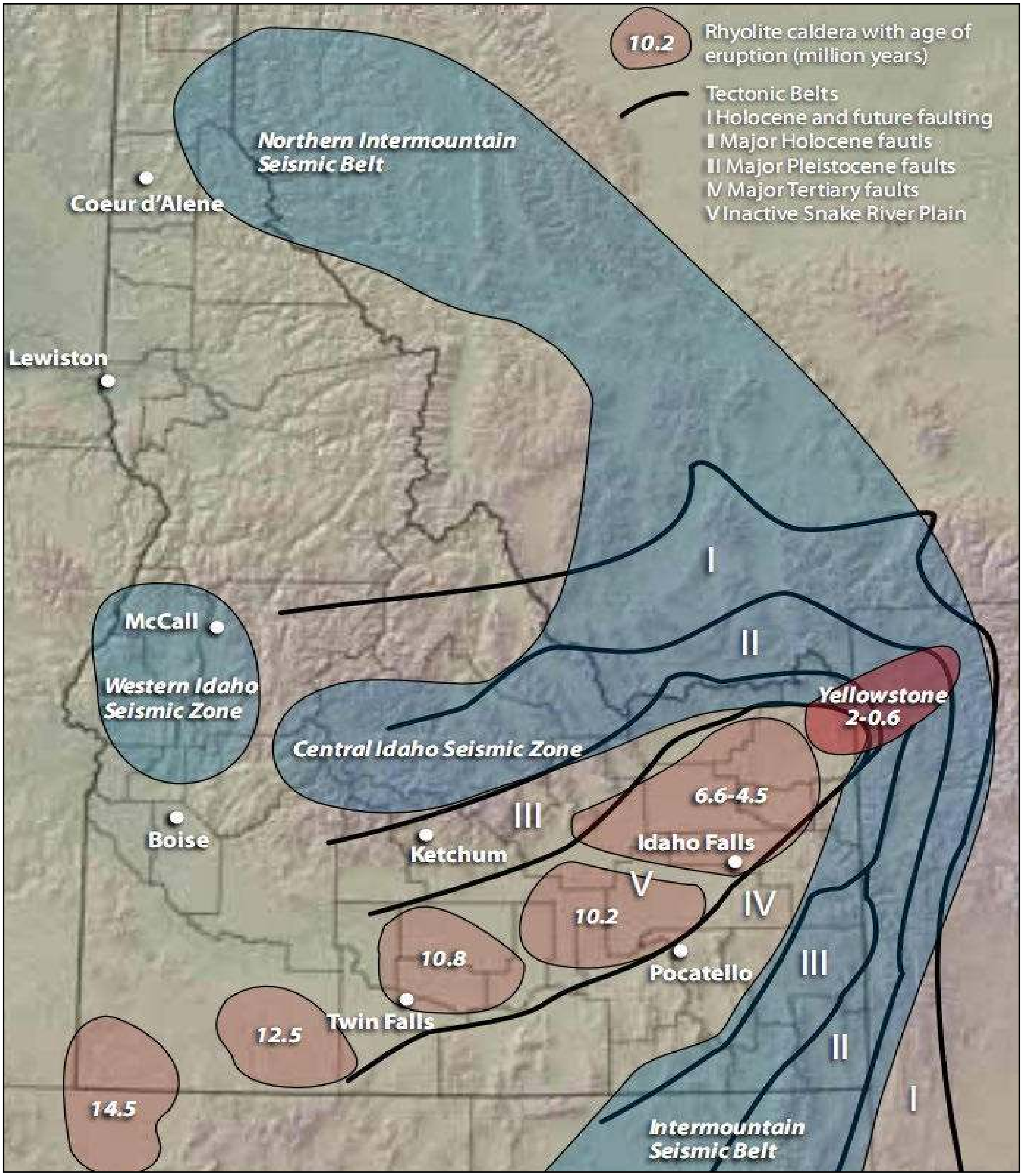


Figure 12-2. Volcanic and Tectonic Features of the Yellowstone-Snake River Plain System

Table 12-1. Mercalli Scale and Peak Ground Acceleration Comparison

Modified Mercalli Scale	Perceived Shaking	Potential Structure Damage		Estimated PGA[a] (%g)
		Resistant Buildings	Vulnerable Buildings	
I	Not Felt	None	None	<0.17%
II-III	Weak	None	None	0.17% - 1.4%
IV	Light	None	None	1.4% - 3.9%
V	Moderate	Very Light	Light	3.9% - 9.2%
VI	Strong	Light	Moderate	9.2% - 18%
VII	Very Strong	Moderate	Moderate/Heavy	18% - 34%
VIII	Severe	Moderate/Heavy	Heavy	34% - 65%
IX	Violent	Heavy	Very Heavy	65% - 124%
X – XII	Extreme	Very Heavy	Very Heavy	>124%

a. PGA = peak ground acceleration. Measured in percent of g, where g is the acceleration of gravity
Sources: (U.S. Geological Survey 2021); (U.S. Geological Survey 2011)

The modified Mercalli intensity scale is generally represented visually using shake maps, which show the expected ground shaking at any given location produced by an earthquake with a specified magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth's crust. A shake map shows the variation of ground shaking in a region immediately following significant earthquakes (for technical information about shake maps see (U.S. Geological Survey 2021)).

12.1.4 Ground Motion

Earthquake hazard assessment is based on expected ground motion. During an earthquake when the ground is shaking, it also experiences acceleration. The peak acceleration is the largest increase in velocity recorded by a particular station during an earthquake. Estimates are developed of the annual probability that certain ground motion accelerations will be exceeded; the annual probabilities can then be summed over a time period of interest.

The most commonly mapped ground motion parameters are horizontal and vertical peak ground accelerations (PGA) for a given soil type. PGA is a measure of how hard the earth shakes, or accelerates, in a given geographic area. Instruments called accelerographs record levels of ground motion due to earthquakes at stations throughout a region. PGA is measured in g (the acceleration due to gravity) or expressed as a percent acceleration force of gravity (%g). These readings are recorded by state and federal agencies that monitor and predict seismic activity.

Maps of PGA values form the basis of seismic zone maps that are included in building codes such as the International Building Code. Building codes that include seismic provisions specify the horizontal force due to lateral acceleration that a building should be able to withstand during an earthquake. PGA values are directly related to these lateral forces that could damage "short period structures" (e.g. single-family dwellings). Longer period response components determine the lateral forces that damage larger structures with longer natural periods (apartment buildings, factories, high-rises, bridges). Table 12-1 lists damage potential and perceived shaking by PGA factors, compared to the Mercalli scale.

12.1.5 USGS Earthquake Mapping Programs

National Seismic Hazard Map

National maps of earthquake shaking hazards provide information for creating and updating seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities and land use planning. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown et al., 2001). The USGS updated the National Seismic Hazard Maps in 2018. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2018 map, shown in Figure 12-3, represents the best available data as determined by the USGS.

Source: (U.S. Geological Survey 2021)

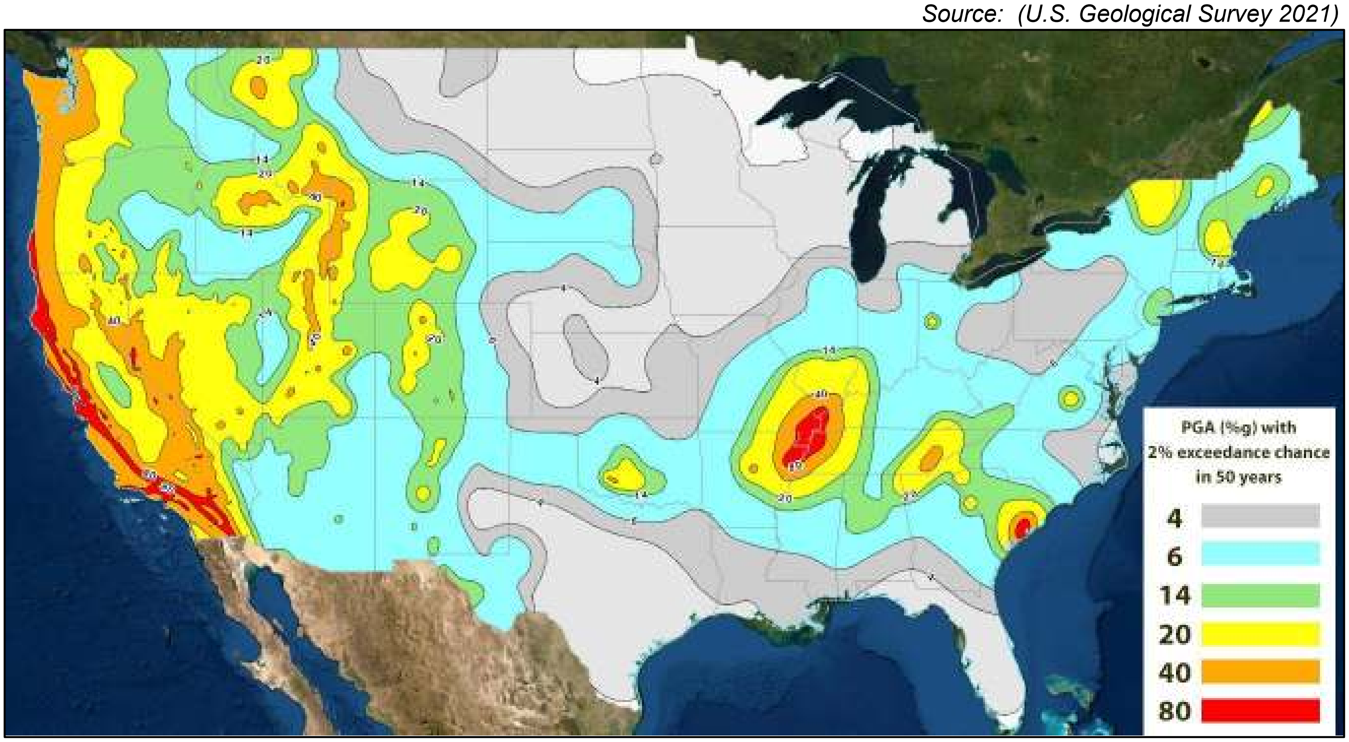


Figure 12-3. Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years

ShakeMaps

The USGS Earthquake Hazards Program produces maps called ShakeMaps that map ground motion and shaking intensity following significant earthquakes. ShakeMaps focus on the ground shaking caused by the earthquake, rather than on characteristics of the earthquake source, such as magnitude and epicenter. An earthquake has only one magnitude and one epicenter, but it produces a range of ground shaking at sites throughout the region, depending on the distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the earth’s crust.

A ShakeMap shows the extent and variation of ground shaking immediately across the surrounding region following significant earthquakes. Such mapping is derived from peak ground motion amplitudes recorded on seismic sensors, with interpolation where data are lacking based on estimated amplitudes. Color-coded instrumental intensity maps are derived from empirical relations between peak ground motions and Modified Mercalli intensity. In addition to the maps of recorded events, the USGS creates the following:

- Scenario ShakeMaps of hypothetical earthquakes of an assumed magnitude on known faults
- Probabilistic ShakeMaps, based on predicted shaking from all possible earthquakes over a 10,000-year period. In a probabilistic map, information from millions of scenario maps is combined to make a forecast for the future. The maps indicate the ground motion at any given point that has a given probability of being exceeded in a given timeframe, such as a 100-year (1-percent-annual chance) event.

12.1.6 Liquefaction and Soil Types

Soil liquefaction occurs when water-saturated sands, silts or gravelly soils are shaken so violently that the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Unless properly secured, hazardous materials can be released, causing significant damage to the environment and people.

The National Earthquake Hazard Reduction Program (NEHRP) creates maps based on soil characteristics to help identify locations subject to liquefaction. The maps classify soils as follows (Federal Emergency Management Agency 2022a):

- Type A—Hard rock (igneous rock).
- Type B—Rock (volcanic rock).
- Type C—Very dense soil and soft rock (sandstone).
- Type D—Stiff soil (mud).
- Type E—Soft soil (artificial fill).
- Type F—Soils requiring site-specific evaluations.

The areas that are commonly most affected by ground shaking have NEHRP Soils D, E and F. In general, these areas are also most susceptible to liquefaction.

12.1.7 Secondary Hazards

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties generally result from falling objects and debris as the shocks shake buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides or releases of hazardous material, compounding their disastrous effects.

12.2 HAZARD PROFILE

12.2.1 Past Events

The historical record demonstrates that earthquakes can occur throughout Idaho. Most earthquakes felt by Idaho residents have occurred within the Yellowstone Tectonic Parabola. Notable exceptions include large earthquakes in northern Nevada, eastern Washington and western Montana. The 2008 magnitude-6.0 Wells, Nevada earthquake was felt by thousands in Boise, Twin Falls and Pocatello. Because large earthquakes are felt over hundreds of miles, the locations of some early events not recorded by seismographs are uncertain. Table 12-2 lists past seismic events felt in Idaho.

Table 12-2. Historical Earthquakes 5.0+ Strongly Felt in Idaho

Year	Magnitude	Location	Description
1872	7.4	Lake Chelan, WA	Largest quake in Washington State; felt strongly in north Idaho.
1884	6.0	Bear Lake Valley	The earthquake damaged houses considerably in Paris, Idaho.
1905	6.0	SW Idaho or NE NV	Considerable damage at Shoshone, Idaho.
1913	5.0	Adams County	Broke windows and dishes.
1914	6.0	UT-ID State Line	Intensity VII; between Ogden, Utah and Montpelier, Idaho.
1915	7.75	Pleasant valley, NV	Considerable damage in southwest Idaho a hundred miles from epicenter.
1916	6.0	North of Boise	Boise residents rushed into the street; chimneys fell.
1918	5.0	North Idaho	Widely felt near Sandpoint.
1925	6.6	SW Montana	Felt throughout Idaho.
1927	5.0	Connor Creek	On Idaho-Oregon border west of Cascade.
1934	6.6	Hansel valley, UT	Largest Utah event on record; 20 miles south of Idaho border. 2 fatalities.
1935	6.25	Helena, MT	Extensive damage. Multiple large events throughout Idaho. 4 fatalities.
1936	6.4	Walla Walla, WA	Damaging earthquake; widely felt in Idaho.
1942	5.0	Sandpoint area	Cracked plaster; rock fall onto railroad tracks.
1944	6.0	Central Idaho	Knocked people to ground in Custer County.
1945	6.0	Central Idaho	Epicenter near Clayton. Slight damage in Idaho City and Weiser.
1947	6.25	Southwest Montana	Epicenter in Gravelly range, 10 miles north of Idaho border.
1947	5.0	Central Idaho	Several large cracks formed in a well-constructed brick building.
1959	7.3	Hebgen Lake, MT	Major event, extensive fault scarps. 20 miles from Idaho. 29 fatalities.
1960	5.0	Soda Springs	Foundations and plaster cracked.
1962	5.7	Cache Valley	Heavily damaged older buildings.
1963	5.0	Clayton	Plaster cracked and windows broken.
1969	5.0	Ketchum	Cement floors cracked.
1975	6.1	NW Yellowstone	Widely felt in Yellowstone region.
1975	6.1	Pocatello Valley	Some 520 homes damaged in Ridgedale and Malad City.
1983	6.9	Borah Peak	Major event, 21 mile surface scarp, 11 buildings destroyed, 2 fatalities.
1984	5.0	Challis	Largest of many Borah Peak aftershocks.
1994	5.9	Draney Peak	Remote area on Wyoming border. One injury from falling flower pot.
1999	5.3	Lima, MT	In Red Rock valley just north of Idaho border.
2005	5.6	Dillon, MT	Felt across Idaho.
2008	6.0	Wells, NV	Felt strongly throughout southern Idaho.
2014	7.4	Near Challis, ID	Sequence of earthquakes about 15 miles northwest of a portion of the Lost River Fault.
2015	5	Near Challis, ID	Tremors were felt across Idaho, from McCall to the Treasure Valley.
2017	5.8	Near Lincoln, MT	No damage or injuries.
2017	5.3	Near Soda Springs, ID	Moderate shaking in southeast Idaho. No reports of damage or death.
2017	5.0	Near Georgetown, ID	Aftershock of the magnitude 5.3 earthquake near Soda Springs.
2020	6.5	Stanley, ID	No injuries and only minor damage reported.

Sources: (State of Idaho Hazard Mitigation Plan 2018); (U.S. Geological Survey 2022)

12.2.2 Location

Faults

Ada County is situated near two fault zones: the western Idaho fault system and Owyhee Mountains fault system. The Squaw Creek, Big Flat and Jake Creek faults are active structures near Emmett, about 25 miles north of Boise. The most important of these, the Squaw Creek fault, has geologic evidence for movement as recently as 7,600 years ago. About 57 miles southeast of Boise and 13 miles from Grand View is the Water Tank fault. Recently discovered in 1997, this fault was active as recently as 3,000 years ago. Other faults present in and around Ada County do not appear to be active.

NEHRP Soils

NEHRP soil types define locations that will be significantly impacted by an earthquake. NEHRP soils data is available for a portion of the Ada County planning area, as shown in Figure 12-4. In general, areas with NEHRP Soils D, E and F are also susceptible to liquefaction.

Liquefaction Zones

Liquefaction mapping is available for the same portion of the Ada County planning area as the NEHRP soil mapping, as shown in Figure 12-5.

12.2.3 Frequency

Thousands of earthquakes have been recorded in Idaho. Table 12-3 summarizes statistics for the past three years. The 3,501 events in that period represent an average of 1,167 per year. This average includes the many aftershocks that occur after large earthquakes. The number of small earthquakes (magnitude less than 3) is greatly under-reported in Idaho because of limited seismic monitoring.

Table 12-3. Idaho Earthquake Statistics 2019-2021

	Number of Events		Number of Events
Magnitude 2-3	3,053	**Magnitude 5-6**	0
Magnitude 3-4	418	**Magnitude 6-7**	1
Magnitude 4-5	29	**Total**	**3,501**

Source: (Volcano Discovery 2022)

Seismologists use a historical distribution of extreme values to estimate the probability of shaking at or above a given intensity over a 50-year year exposure time. Using this methodology, Idaho Geological Survey has estimated the maximum shaking on unstable sites within 300 miles of Boise as follows:

- A >50-percent chance of a midrange intensity event (VI or greater) in any 50-year period.
- A 33-percent chance of intensity VII in any 50-year period.
- An 18-percent chance of intensity VIII in any 50-year period
- A 10-percent chance of intensity IX in any 50-year period

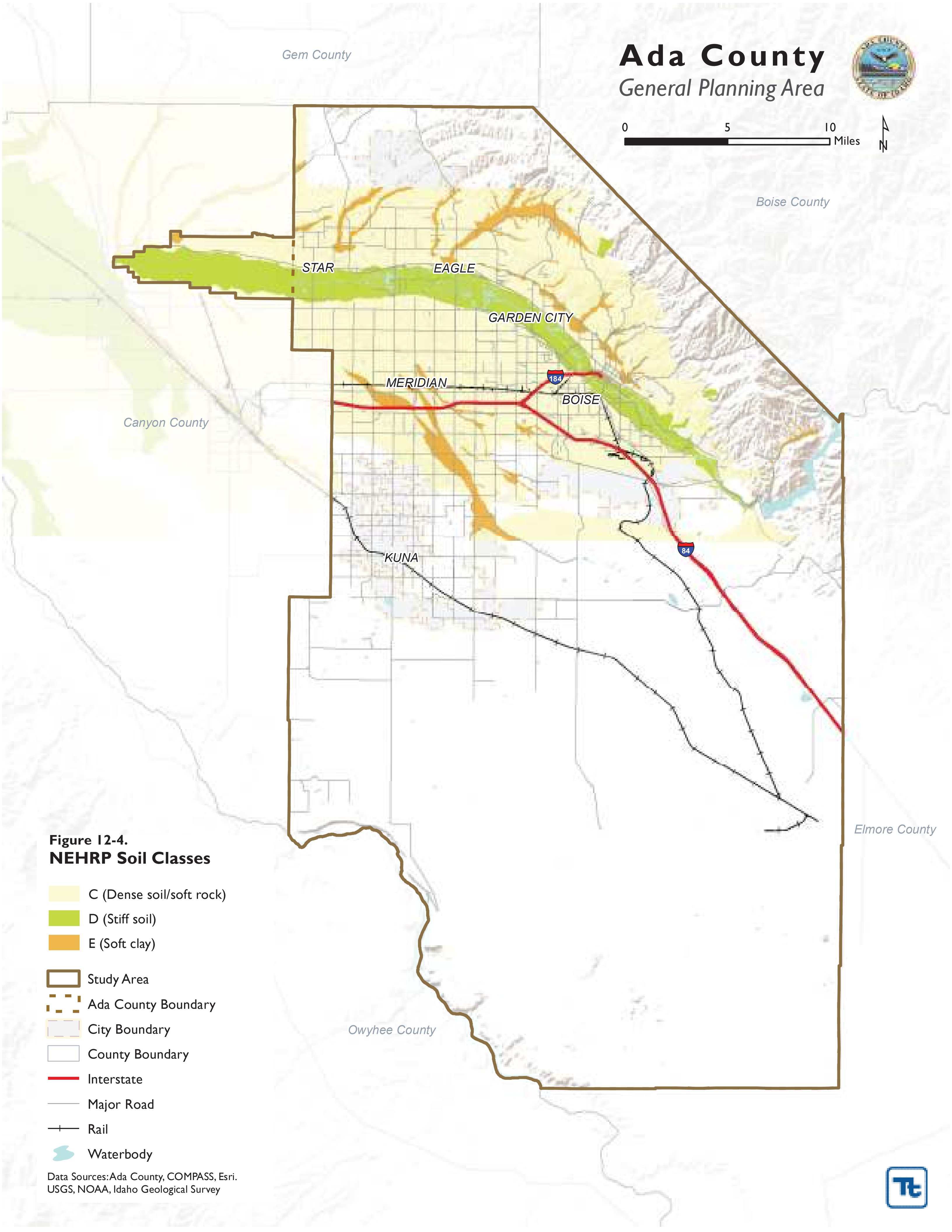


Figure 12-4.
NEHRP Soil Classes

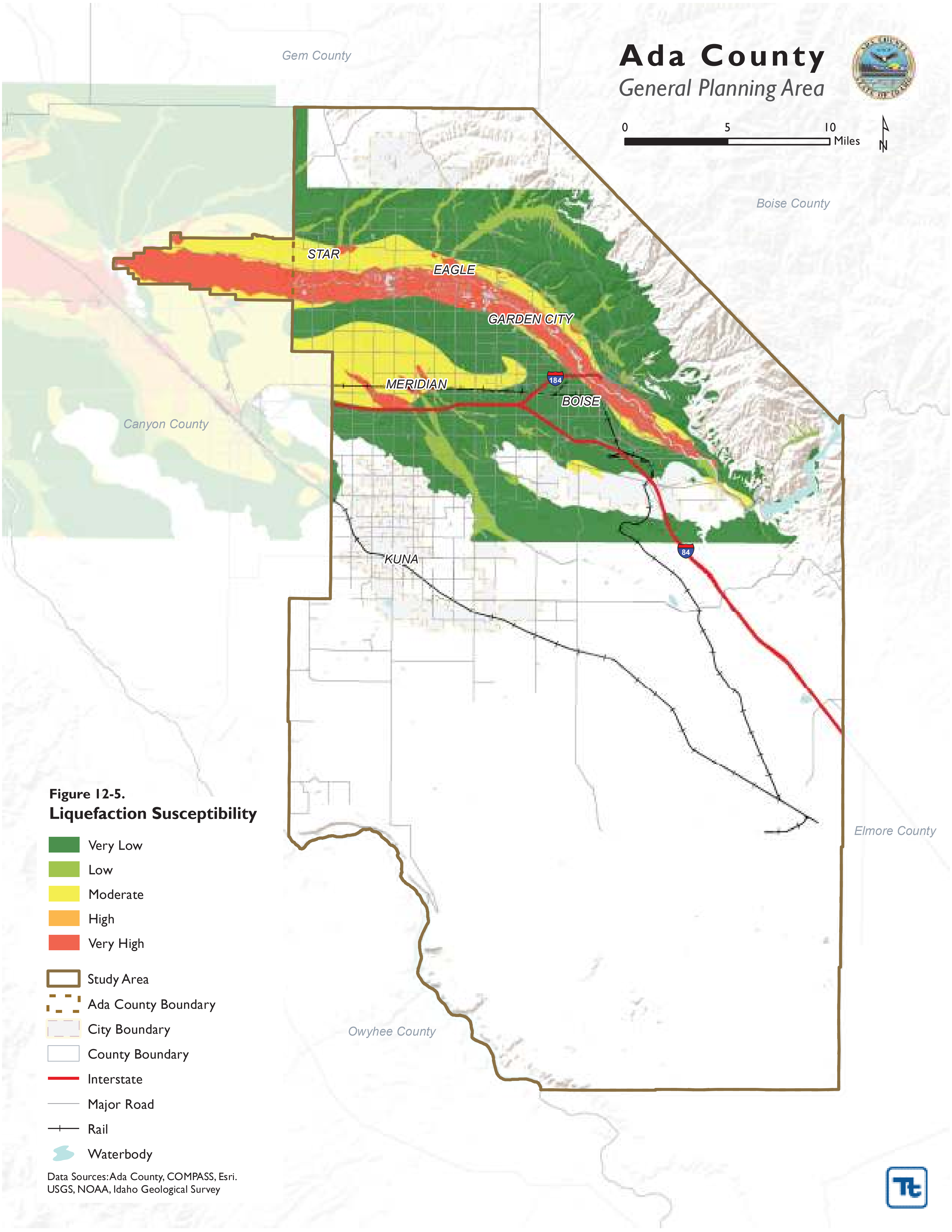


Figure 12-5.
Liquefaction Susceptibility

12.2.4 Severity

The severity of an earthquake can be expressed in terms of intensity or magnitude (see Section 12.1.3). It is directly correlated to the stability of the ground close to the event's epicenter. The difference in severity between intensity ranges can be immense. A poorly built structure on a stable site is far more likely to survive a large earthquake than a well-built structure on an unstable site. Thorough geotechnical site evaluations should be the rule of thumb for new construction in the planning area until creditable soils mapping becomes available.

The USGS creates ground motion maps based on current information about fault zones, showing the PGA that has a certain probability (2 percent or 10 percent) of being exceeded in a 50-year period. The PGA is measured in numbers of g's (the acceleration associated with gravity). Figure 12-6 shows the PGAs with a 2-percent exceedance chance in 50 years in southern Idaho. Ada County is in a medium-risk area.

Source: (U.S. Geological Survey 2014)

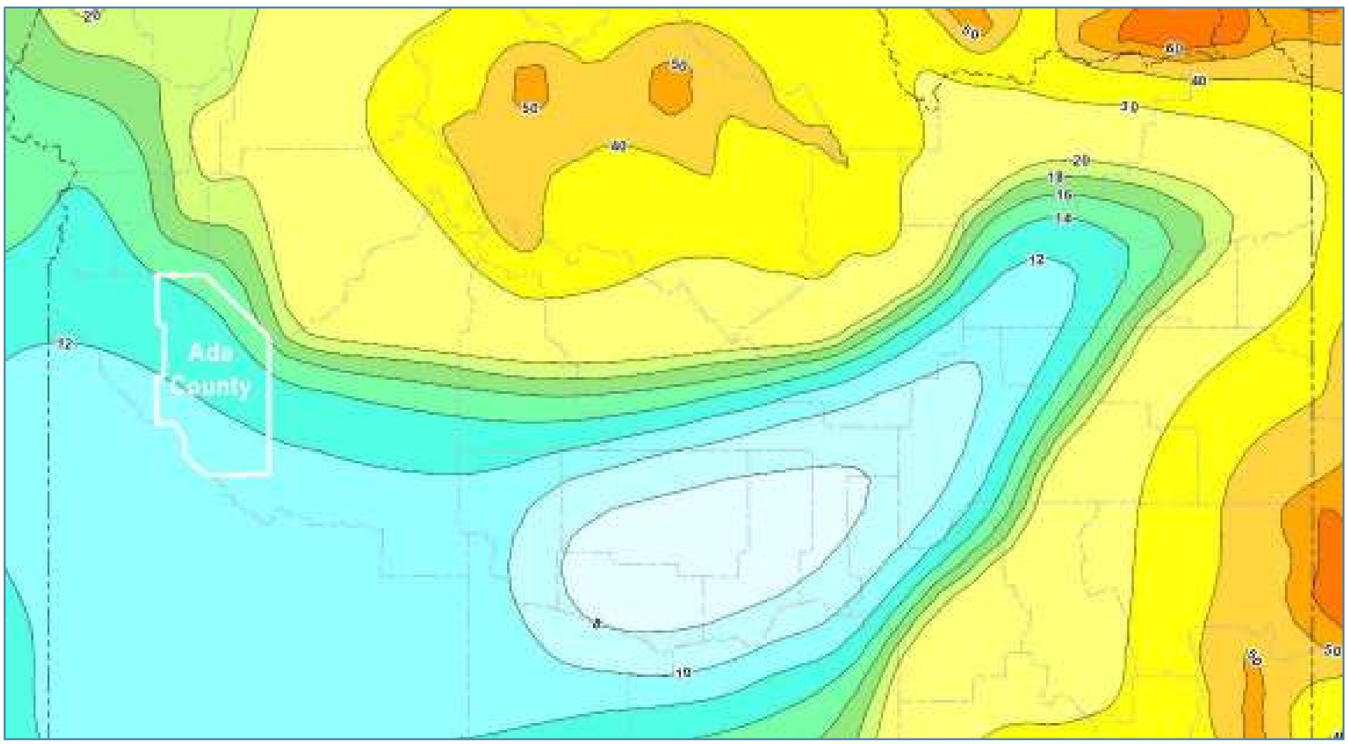


Figure 12-6. PGA (in %g) with 2-Percent Probability of Exceedance in 50 Years

12.2.5 Warning Time

Earthquakes can last from a few seconds to over five minutes. They may be one-time events or occur as a series of tremors over several days. There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. Research is being done with warning systems that use the low energy waves that precede major earthquakes. These potential warning systems give approximately 40 seconds notice that a major earthquake is about to occur. The warning time is very short, but it could allow for someone to get under a desk, pause hazardous or high-risk work, or initiate protective automated systems in structures or critical infrastructure.

12.3 EXPOSURE

12.3.1 Population

The entire population of the planning area is potentially exposed to direct damage from earthquakes or indirect impacts such as business interruption, road closures, and loss of function of utilities.

12.3.2 Property

The Ada County Assessor reports 174,802 buildings in Ada County, with a total assessed value of $123 billion. Most of the buildings (94.8 percent) are residential. All buildings are considered to be exposed to the earthquake hazard.

12.3.3 Critical Facilities

Since the entire planning area has exposure to the earthquake hazard, all critical facilities components are considered to be exposed. The breakdown of the numbers and types of facilities is presented in Table 4-3. Critical facilities constructed on NEHRP Type D and E soils are particularly at risk from seismic events.

12.3.4 Environment

The entire planning area is exposed to the earthquake hazard, including all natural resources, habitat, and wildlife.

12.4 VULNERABILITY

Earthquake vulnerability data for the risk assessment was generated using a Hazus Level 2 (user-defined) analysis for the for the events listed in Table 12-4. The countywide analysis results are summarized in the sections below. Detailed results by jurisdiction can be found in Appendix D.

Table 12-4. Earthquakes Modeled for Risk Assessment

Event	Magnitude	Focal Depth	Epicenter Location	PGA
100-Year Probabilistic Earthquake	N/A	N/A	N/A	Figure 12-7
500-Year Probabilistic Earthquake	N/A	N/A	N/A	Figure 12-8
Squaw Creek Fault Scenario	7.03	9.0 km	44.146°N 116.238°W	Figure 12-9
Big Flat Jake Creek Scenario	6.81	9.0 km	44.259°N 116.347°W	Figure 12-10

12.4.1 Population

Estimated Impacts on Persons and Households

Hazus estimated impacts on persons and households in the planning area for the four selected earthquake scenarios as summarized in Table 12-5.

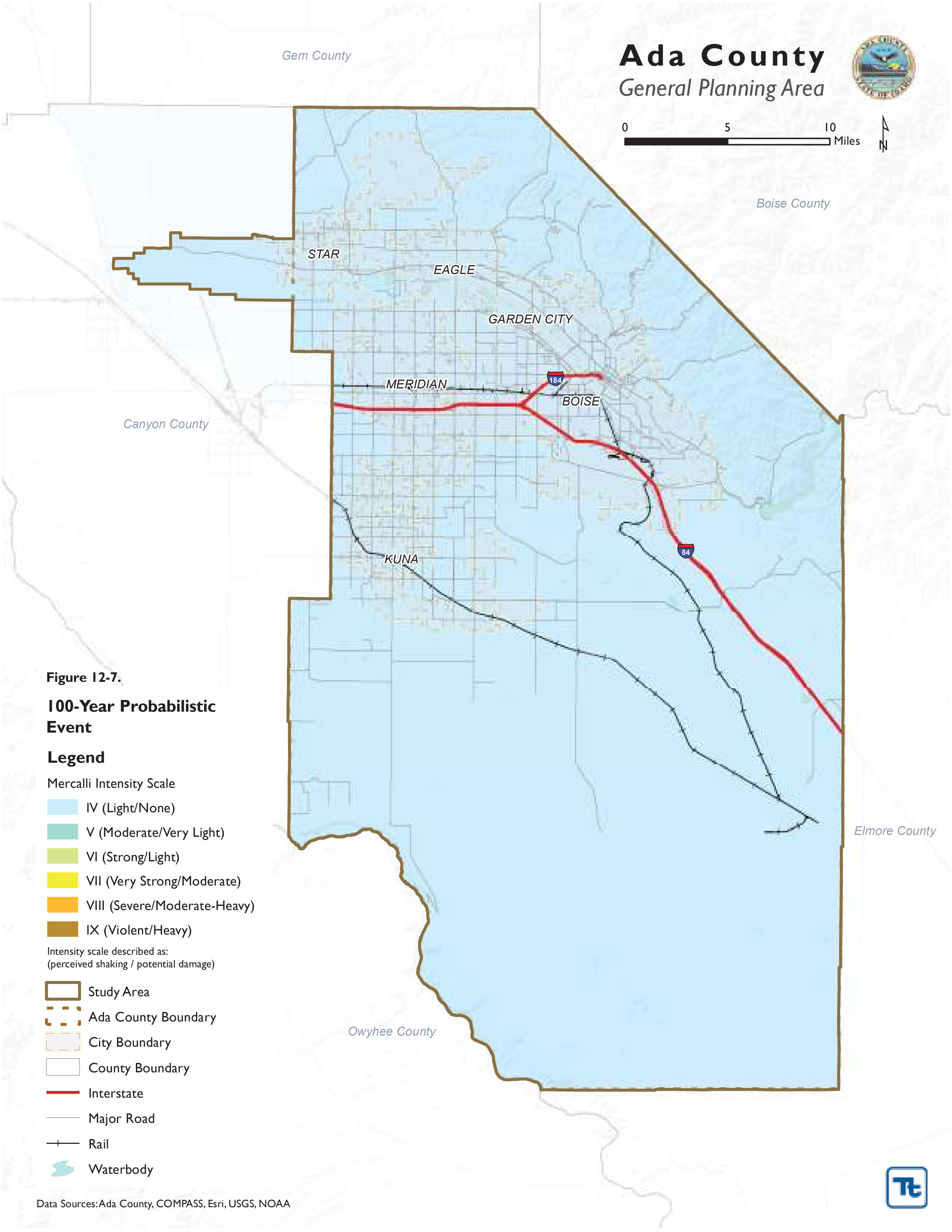


Figure 12-7.

100-Year Probabilistic Event

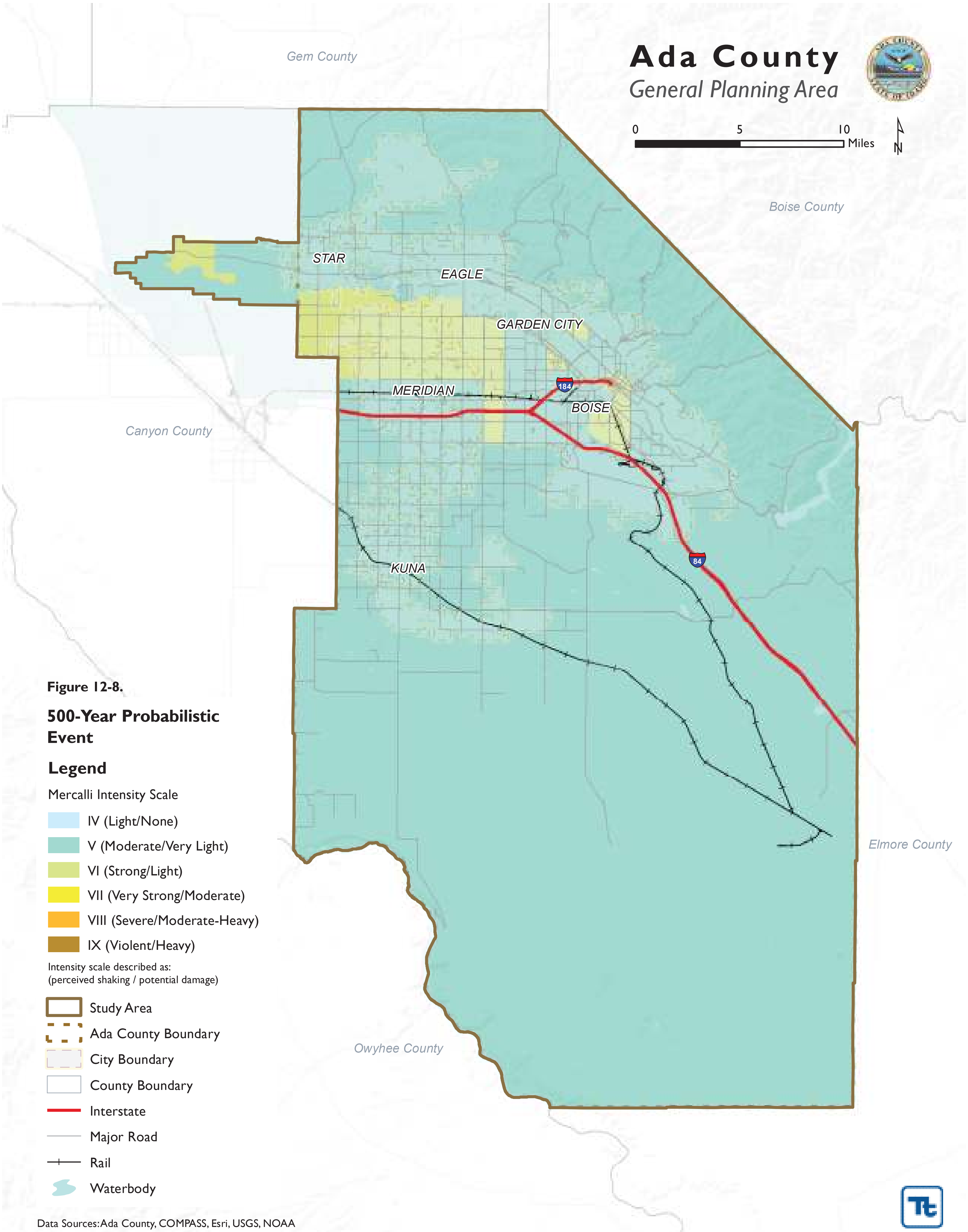
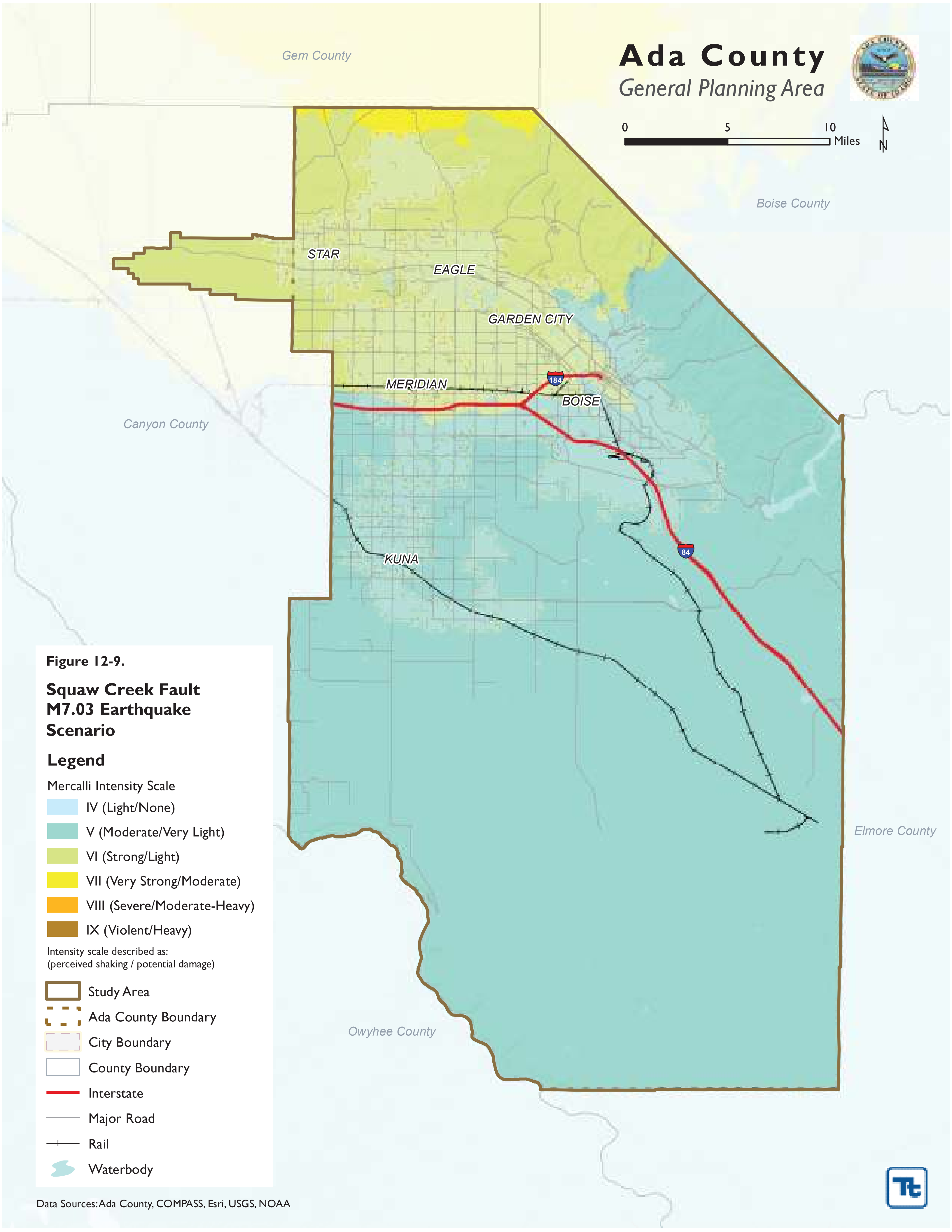


Figure 12-8.

500-Year Probabilistic Event

Data Sources: Ada County, COMPASS, Esri, USGS, NOAA



Ada County
General Planning Area
0
5
10
Miles
N
Gem County
Boise County
Canyon County
Elmore County
Owyhee County
STAR
EAGLE
GARDEN CITY
MERIDIAN
BOISE
KUNA
184
84
Figure 12-9.
Squaw Creek Fault
M7.03 Earthquake
Scenario
Legend
Mercalli Intensity Scale
IV (Light/None)
V (Moderate/Very Light)
VI (Strong/Light)
VII (Very Strong/Moderate)
VIII (Severe/Moderate-Heavy)
IX (Violent/Heavy)
Intensity scale described as:
(perceived shaking / potential damage)
Study Area
Ada County Boundary
City Boundary
County Boundary
Interstate
Major Road
Rail
Waterbody
Data Sources: Ada County, COMPASS, Esri, USGS, NOAA

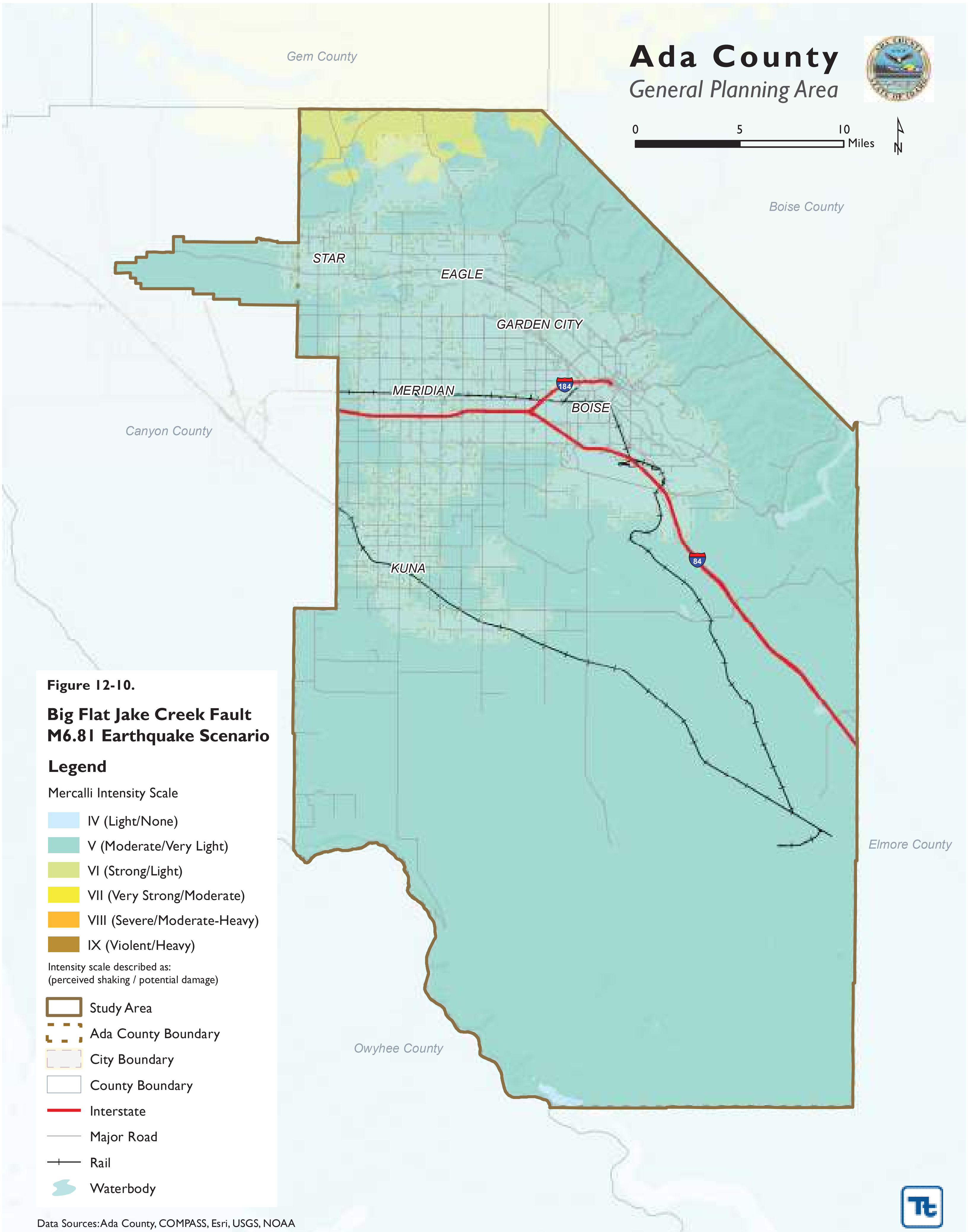


Figure 12-10.
Big Flat Jake Creek Fault M6.81 Earthquake Scenario

Table 12-5. Estimated Earthquake Impact on Persons

Scenario	Number of Displaced Households	Number of Persons Requiring Short-Term Shelter
100-Year Earthquake	0	0
500-Year Earthquake	5	3
Squaw Creek Scenario	2	1
Big Flat Jake Creek Scenario	0	0

12.4.2 Property

Building Age

Building codes were not state-mandated in Idaho until 2008. However, the Ada County planning area has had a strong influence of building code enforcement as modern building codes have evolved nationally. Seismic code requirements have principally come from California, due to that state's immense seismic risk. The California State Building Code Council has identified significant milestones in building and seismic code requirements that can be used as a gauge of structural integrity of existing building stock. Using these time periods, the planning team used Hazus to identify the number of structures in the County by date of construction. Table 12-6 shows the results of this analysis.

Table 12-6. Age of Structures in Ada County

Time Period	Number of Current County Structures Built in Period	Significance of Time Frame
Pre-1933	5,717	Before 1933, there were no explicit earthquake requirements in building codes. State law did not require local governments to have building officials or issue building permits.
1933-1940	2,346	In 1940, the first strong motion recording was made.
1941-1960	13,336	In 1960, the Structural Engineers Association of California published guidelines on recommended earthquake provisions.
1961-1975	16,642	In 1975, significant improvements were made to lateral force requirements.
1976-1994	37,816	In 1994, the Uniform Building Code was amended to include provisions for seismic safety.
1995—present	98,945	Seismic code is currently enforced.
Total	**174,802**	

The number of structures does not reflect the number of total housing units, as many multi-family units and attached housing units are reported as one structure. Structures constructed after the Uniform Building Code was amended in 1994 to include seismic safety provisions account for 57 percent of the planning area's structures. Approximately 3 percent were built before 1933 when there were no building permits, inspections or seismic standards.

Loss Potential

Table 12-7 summarizes Hazus estimates of earthquake damage in the planning area for the modeled earthquake scenarios. Detailed results by jurisdiction are included in Appendix D. The debris estimates include only structural debris; they do not include additional debris that may accumulate, such as from trees. In addition, these estimates do not include losses that would occur from any fires stemming from an earthquake.

Table 12-7. Estimated Impact of Earthquake Scenario Events in the Planning Area

	Estimated Loss				
	Structural	Contents	Total	% of Total Planning Area Replacement Value	Structural Debris (tons)
100-Year Probabilistic Earthquake	$623,125	$543,636	$1,166,761	0%	1.81
500-Year Probabilistic Earthquake	$76,774,603	$52,067,050	$128,841,653	0.1%	27.28
Squaw Creek Fault Scenario	$555,907,389	$258,961,047	$814,868,435	0.7%	29.68
Big Flat Jake Creek Scenario	$76,293,829	$49,040,497	$125,334,326	0.1%	6.99

12.4.3 Critical Facilities

Level of Damage

Hazus classifies the vulnerability of critical facilities to earthquake as no damage, slight damage, moderate damage, extensive damage, or complete damage. Hazus was used to assign a category to each critical facility in the planning area for the assessed earthquake scenarios. shows the average probability of being damaged at a given level for all facilities in each critical facilities category is shown in Figure 12-11 through Figure 12-14

Time to Restore Critical Facilities to Functionality

Hazus estimates the time to restore critical facilities to fully functional use. Results are presented as probability of being functional at specified time increments: 1, 3, 7, 14, 30 and 90 days after the event. For example, Hazus may estimate that a facility has 5 percent chance of being fully functional at Day 3, and a 95 percent chance of being fully functional at Day 90. The analysis of critical facilities in the planning area was performed for the assessed earthquake scenarios. The results are summarized in Figure 12-15 through Figure 12-18. These figures show the average functionality for all critical facilities in each category.

12.4.4 Environment

Environmental problems as a result of an earthquake can be numerous. Secondary hazards will likely have some of the most damaging effects on the environment. Earthquake-induced landslides can significantly damage surrounding habitat. It is also possible for streams to be rerouted after an earthquake. Rerouting can change the water quality, possibly damaging habitat and feeding areas. Streams fed by groundwater wells can dry up because of changes in underlying geology.

12.5 DEVELOPMENT TRENDS

Because all of the planning area is exposed to the earthquake hazard, the increase in exposed population and property since the last hazard mitigation plan update is equal to the countywide trend over that time period: a 13.6-percent increase in population, a 19.4-percent increase in number of general building stock structures, and a 46.7-percent increase in assessed property value.

The entire planning area is under the influence of the International Building Code as mandated by the State of Idaho since 2008. This is a significant capability for the planning area in the management of seismic risk in future development. Strict adherence and enforcement of the seismic provisions of the International Building Code (IBC) will play a significant role in the management of seismic risk for new development in the future.

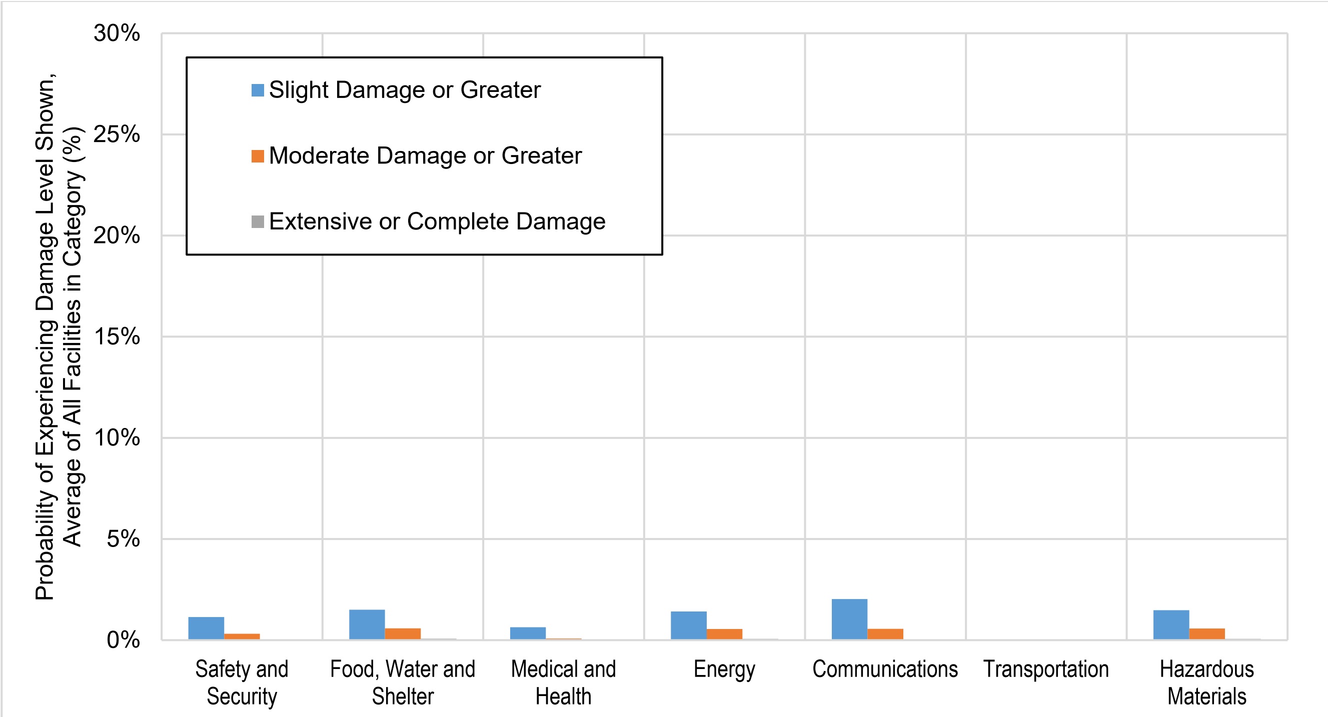


Figure 12-11. Critical Facility Damage Potential, 100-Year Probabilistic Earthquake

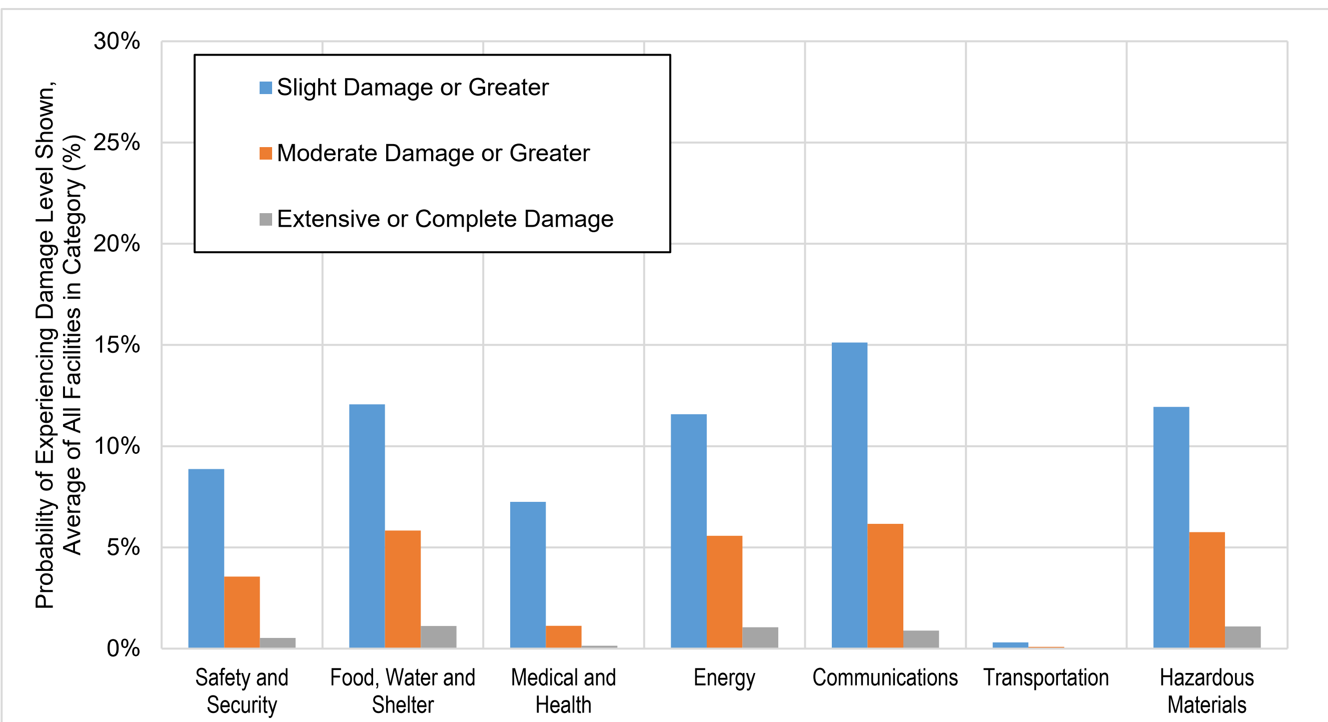


Figure 12-12. Critical Facility Damage Potential, 500-Year Probabilistic Earthquake

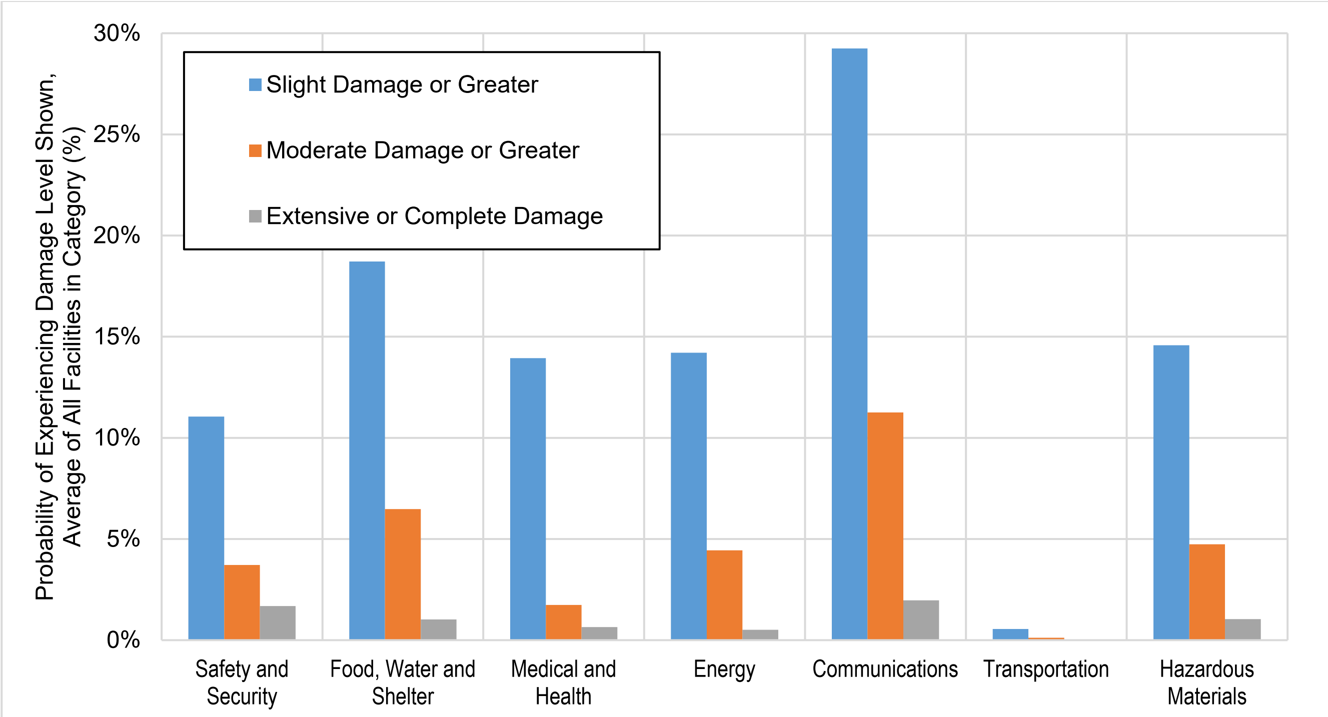


Figure 12-13. Critical Facility Damage Potential, Squaw Creek Fault Scenario

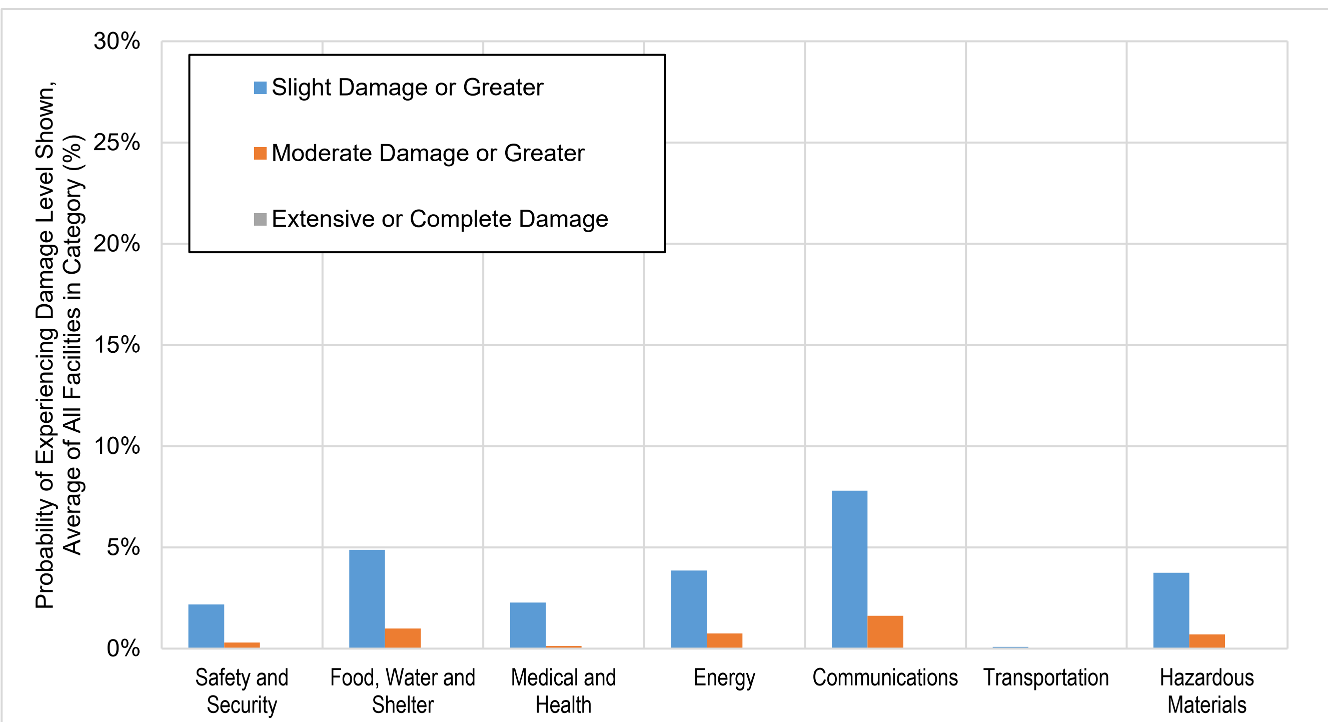


Figure 12-14. Critical Facility Damage Potential, Big Flat Jake Creek Fault Scenario

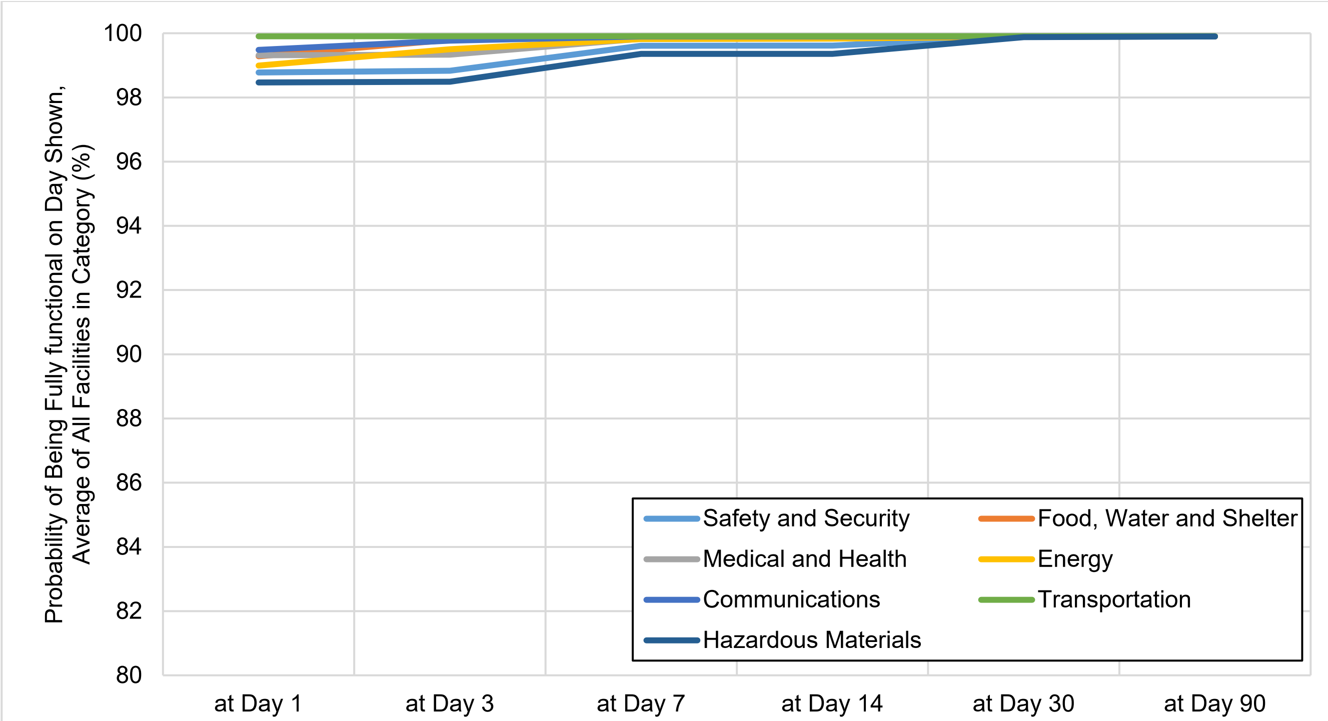


Figure 12-15. Critical Facility Functionality, 100-Year Probabilistic Earthquake

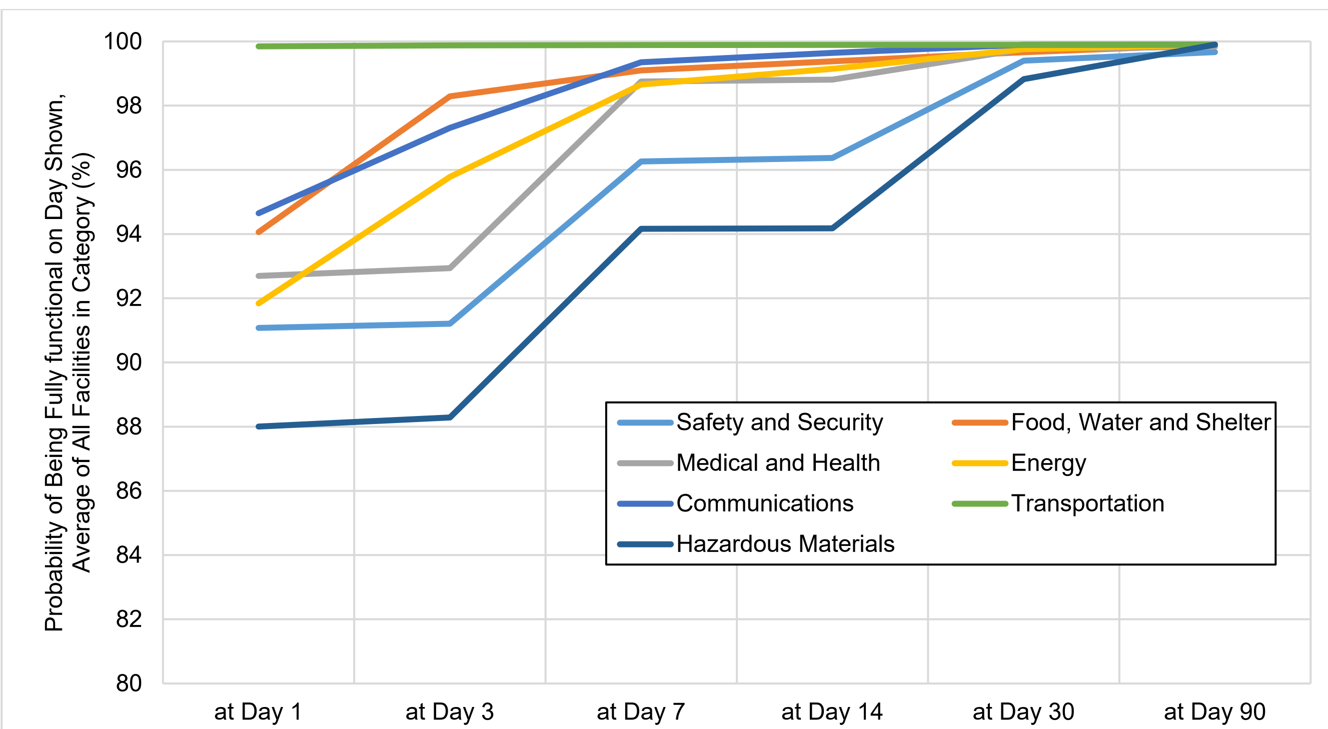


Figure 12-16. Critical Facility Functionality, 500-Year Probabilistic Earthquake

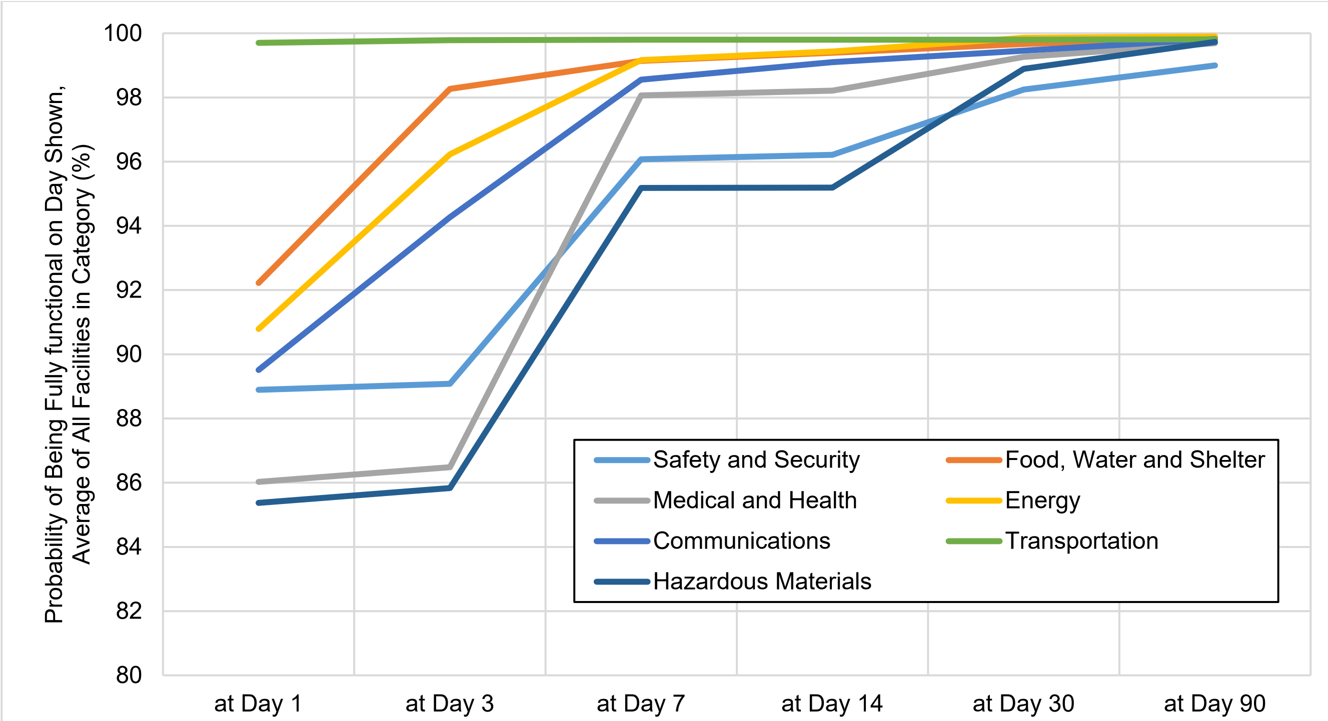


Figure 12-17. Critical Facility Functionality, Squaw Creek Fault Scenario

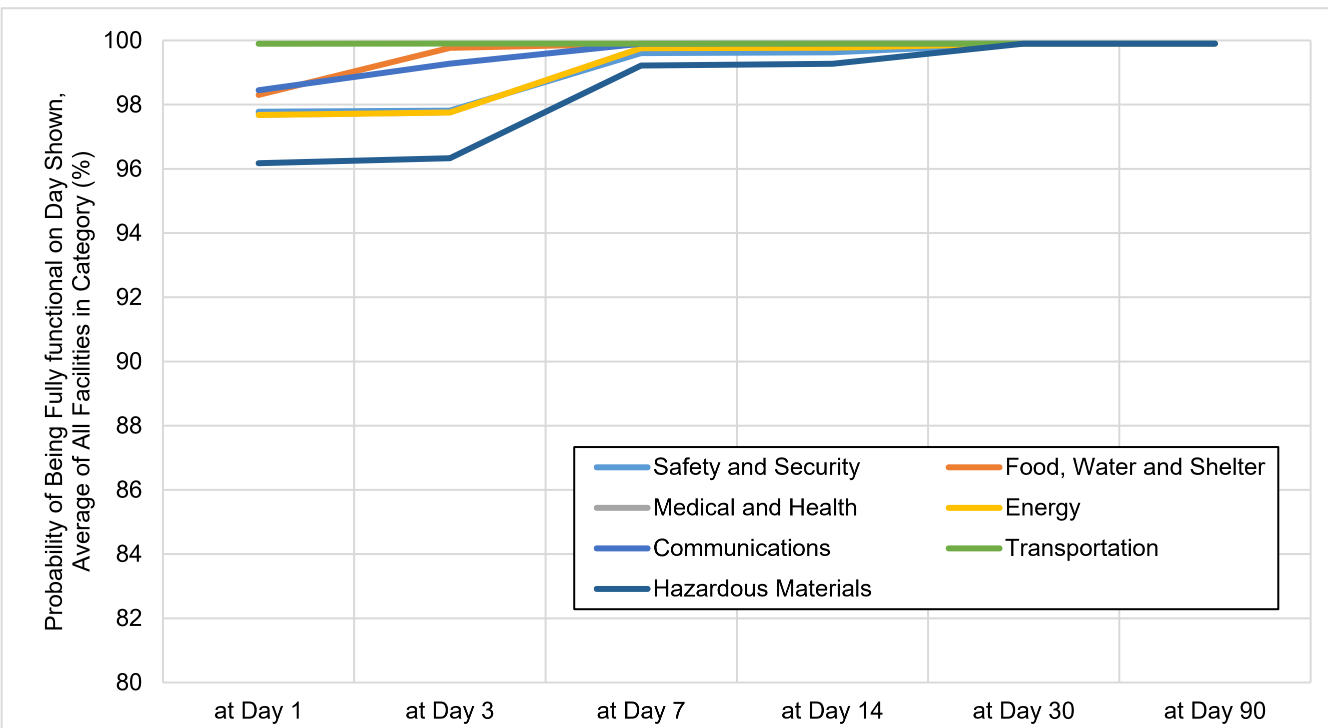


Figure 12-18. Critical Facility Functionality, Big Flat Jake Creek Fault Scenario

12.6 SCENARIO

Any seismic activity of 6.0 or greater on faults within the planning area would have significant impacts throughout Ada County. The seismic event likely to have the largest impact is a 7.1 magnitude or greater event on the Squaw Creek fault. Potential warning systems could give 40 seconds' notice that a major earthquake is about to occur; this would not provide adequate time for preparation. Earthquakes of this magnitude or higher would lead to massive structural failure of property on unstable soils. With the abundance of imported fill used to elevate building pads for homes in the Boise River floodplain, liquefaction impacts in these areas could be widespread. Un-engineered canal embankments would likely fail, representing a loss of critical infrastructure. The structural integrity of Lucky Peak Dam could be jeopardized as well. These events could cause secondary hazards, including landslides and mudslides. River valley hydraulic-fill sediment areas are also vulnerable to slope failure, often as a result of loss of cohesion in clay-rich soils. Soil liquefaction would occur in water-saturated sands, silts or gravelly soils.

12.7 ISSUES

Important issues associated with an earthquake include but are not limited to the following:

- NEHRP soils mapping is not available for the entire planning area. Acquiring this data in areas it does not currently exist would enhance the accuracy of future risk assessments for the planning area.
- Shake maps should be developed for the Squaw Creek and Water Tank fault scenarios.
- Approximately 22 percent of the planning area's building stock was built prior to 1975, when seismic provisions became uniformly applied through building codes.
- Critical facility owners should be encouraged to create or enhance Continuity of Operations Plans using the information on risk and vulnerability contained in this plan.
- Geotechnical standards should be established that take into account the probable impacts from earthquakes in the design and construction of new or enhanced facilities.
- The County has over 400 miles of canals that were not constructed to engineering standards. The structural integrity of these facilities as it pertains to seismic impacts is not known.
- Earthquakes could trigger other natural hazard events such as dam failures and landslides, which could severely impact the county.
- Dam failure warning and evacuation plans and procedures should be updated to reflect the earthquake risk associated with a large number of earthen dams in the planning area.
- Hazard mitigation plan survey results indicate that the public does not perceive a significant seismic risk in the planning area.
- Unreinforced masonry structures in the planning area are particularly vulnerable to the earthquake hazard.
- It is difficult to develop seismic retrofit projects that are cost-effective for FEMA hazard mitigation grant programs, due to the lack of state and federal risk data to support FEMA benefit-cost methodologies.

13. EXTREME WEATHER

13.1 GENERAL BACKGROUND

Extreme weather refers to unusual weather events at the extremes of the historical distribution for a given area. It involves any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. It includes thunderstorms, damaging winds, tornadoes, extreme temperatures, and severe winter weather.

13.1.1 Thunderstorms, Lightning and Hail

A thunderstorm is a rain event that includes thunder and lightning. A thunderstorm is classified as “severe” when it contains one or more of the following: hail with a diameter of three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), or tornado. Approximately 10 percent of the 100,000 thunderstorms that occur nationally every year are classified as severe (NOAA n.d.).

Storm Development

Three factors cause thunderstorms to form: moisture, rising unstable air (air that keeps rising when disturbed), and a lifting mechanism to provide the disturbance. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise (hills or mountains can cause rising motion, as can the interaction of warm air and cold air or wet air and dry air) it will continue to rise as long as it weighs less and stays warmer than the air around it. As the air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool and it condenses into a cloud.

The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice and some of it turns into water droplets. Both have electrical charges. Ice particles usually have positive charges, and rain droplets usually have negative charges. When the charges build up enough, they are discharged in a bolt of lightning, which causes the sound waves heard as thunder.

Storm Types

There are four types of thunderstorms:

- **Single-Cell Thunderstorms—**Single-cell thunderstorms usually last 20 to 30 minutes. A true single-cell storm is rare, because the gust front of one cell often triggers the growth of another. Most single-cell storms are not usually severe, but a single-cell storm can produce a brief extreme weather event. When this happens, it is called a pulse severe storm.

- **Multi-Cell Cluster Storm—**A multi-cell cluster is the most common type of thunderstorm. The multi-cell cluster consists of a group of cells, moving as one unit, with each cell in a different phase of the thunderstorm life cycle. Mature cells are usually found at the center of the cluster and dissipating cells at the downwind edge. Multi-cell cluster storms can produce moderate-size hail, flash floods and weak tornadoes. Each cell in a multi-cell cluster lasts only about 20 minutes; the multi-cell cluster itself may persist for several hours. This type of storm is usually more intense than a single cell storm.
- **Multi-Cell Squall Line—**A multi-cell line storm, or squall line, consists of a long line of storms with a continuous well-developed gust front at the leading edge. The line of storms can be solid, or there can be gaps and breaks in the line. Squall lines can produce hail up to golf-ball size, heavy rainfall, and weak tornadoes, in addition to strong downdrafts. Occasionally, a strong downburst will accelerate a portion of the squall line ahead of the rest of the line to produce a bow echo. Bow echoes can develop with isolated cells as well as squall lines. Bow echoes are easily detected on radar but are difficult to observe visually.
- **Super-Cell Storm—**A super-cell is similar to a single-cell storm in that it has one main updraft, but the updraft is extremely strong, reaching speeds of 150 to 175 miles per hour. Super-cells are rare. The main characteristic that sets them apart from other thunderstorms is the presence of rotation. The rotating updraft of a super-cell (called a mesocyclone when visible on radar) helps the super-cell to produce extreme weather events, such as giant hail (more than 2 inches in diameter), strong downbursts of 80 miles an hour or more, and strong to violent tornadoes.

Lightning

Lightning is an electrical discharge between positive and negative regions of a thunderstorm. A lightning flash is composed of a series of strokes, with an average of about four. The average duration of each stroke is about 30 microseconds. Lightning occurs in all thunderstorms. There are two main types of lightning: intra-cloud lightning and cloud-to-ground lightning (National Oceanic and Atmospheric Administration n.d.).

Lightning is one of the more dangerous weather hazards in the United States. Each year, lightning is responsible for deaths, injuries, and millions of dollars in property damage, including damage to buildings, communications systems, power lines, and electrical systems. Lightning also causes forest and brush fires and deaths and injuries to livestock and other animals. According to the National Lightning Safety Institute, property damage, increased operating costs, production delays, and lost revenue from lightning and secondary effects exceed $8-10 billion per year (National Lightning Safety Institute 2014). Impacts can be direct or indirect. People or objects can be directly struck, or damage can occur indirectly when the current passes through or near it.

Intra-cloud lightning is the most common type of discharge, but cloud-to-ground lightning is the most damaging and dangerous. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, many flashes carry positive charge to earth, often during the dissipating stage of a thunderstorm's life. Positive flashes are more common as a percentage of total ground strikes during the winter. Positive lightning frequently strikes away from the rain core. It can strike as far as 5 or 10 miles from the storm in areas that people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited.

Using a network of lightning detection systems, the United States monitors an average of 25 million strokes of lightning from the cloud-to-ground every year. Statistics compiled by the National Oceanic and Atmospheric Administration between 1959 and 1994 indicate that most lightning incidents occur in June, July and August and during the afternoon between 2 and 6 p.m.

Hail

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Super-cooled water may accumulate on frozen particles near the back-side of a storm as they are pushed forward across and above the updraft by the prevailing winds near the top of the storm. Eventually, the hailstones encounter downdraft air and fall to the ground.

Hailstones grow two ways: by wet growth or dry growth. In wet growth, a tiny piece of ice is in an area where the air temperature is below freezing, but not super cold. When the tiny piece of ice collides with a super-cooled drop, the water does not freeze on the ice immediately. Instead, liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape, resulting in a layer of clear ice. Dry growth hailstones grow when the air temperature is well below freezing and the water droplet freezes immediately as it collides with the ice particle. The air bubbles are “frozen” in place, leaving cloudy ice.

Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are “balanced” in an updraft. Hailstones can begin to melt and then re-freeze together, forming large and very irregularly shaped hail.

13.1.2 Damaging Winds

Damaging winds are classified as those exceeding 58 mph. Damage from such winds accounts for half of all extreme weather reports in the lower 48 states. Straight-line wind speeds can reach up to 100 mph and can produce a damage path extending for hundreds of miles. Isolated wind events in mountainous regions have more localized effects (State of Idaho Hazard Mitigation Plan 2018). There are seven types of damaging winds:

- **Straight-line winds—**Any thunderstorm wind that is not associated with rotation; this term is used mainly to differentiate from tornado winds. Most thunderstorms produce some straight-line winds as a result of outflow generated by the thunderstorm downdraft.
- **Downdrafts—**A small-scale column of air that rapidly sinks toward the ground.
- **Downbursts—**A strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst or damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder.
- **Microbursts—**A small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally less than 2.5 miles across and short-lived, lasting only 5 to 10 minutes, with maximum wind speeds up to 168 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- **Gust front—**A gust front is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.
- **Derecho—**A derecho is a widespread thunderstorm wind caused when new thunderstorms form along the leading edge of an outflow boundary (the boundary formed by horizontal spreading of thunderstorm-cooled air). The word “derecho” is of Spanish origin and means “straight ahead.” Thunderstorms feed on the boundary and continue to reproduce. Derechos typically occur in summer when complexes of thunderstorms form over plains, producing heavy rain and severe wind. The damaging winds can last a long time and cover a large area.

- **Bow Echo—**A bow echo is a linear wind front bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo. Bow echoes can be 200 miles long, last for several hours, and produce extensive wind damage at the ground.

Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, streetlights and parks, and other damage. They can also cause direct losses to buildings, people, and vital equipment. There are direct consequences to the local economy resulting from windstorms related to both physical damage and interrupted services.

Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. As positive and negative forces impact a building's doors, windows and walls, the result can be roof or building component failures and considerable structural damage. The effects of winds are magnified in the upper levels of multi-story structures.

Debris carried along by extreme winds can contribute directly to loss of life and indirectly to the failure of protective building envelopes. Falling trees and branches can damage buildings, power lines, and other property and infrastructure. Tree limbs breaking in winds of only 45 mph can be thrown over 75 feet, so overhead power lines can be damaged even in relatively minor windstorm events. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds. Utility lines brought down by summer thunderstorms have also been known to cause fires, which start in dry roadside vegetation. Electric power lines falling down to the pavement create the possibility of lethal electric shock.

Downed trees and power lines, and damaged property also can be major hindrances to emergency response and disaster recovery. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric service and from extended road closures.

13.1.3 Extreme Temperatures

Excessive Heat Events

Extreme heat is defined as summertime temperatures that are much hotter and/or humid than average. Because some places are hotter than others, this depends on what is considered average for a particular location. Humid conditions can make it seem hotter than it really is (Centers for Disease Control and Prevention 2017). Excessive heat claims over 100 lives each year in the United State. In a 30-year record of weather fatalities across the nation (1990-2019), excessive heat claimed more lives each year than floods, lightning, tornadoes, and hurricanes (Erdman 2021).

Heat Index

Extreme heat events are often a result of more than ambient air temperature. Heat index tables (see Figure 13-1) are commonly used to provide information about how hot it feels based on several meteorological conditions. Heat index values are for shady, light wind conditions; exposure to full sunshine can increase heat index values by up to 15°F. Strong winds with very hot, dry air also can be extremely hazardous (National Weather Service n.d.).

Source: (National Weather Service n.d.)

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution Extreme Caution Danger Extreme Danger

Figure 13-1. Heat Index Chart

Heat Islands

Extreme heat events may be exacerbated in urban areas, where reduced air flow, reduced vegetation and increased generation of waste heat can contribute to temperatures that are several degrees higher than in surrounding rural or less urbanized areas. When urban buildings, roads and other infrastructure replace open land and vegetation, surfaces that were once permeable and moist become impermeable and dry. These changes cause urban areas to become warmer than the surrounding areas, serving as contiguous regions of higher temperatures. This phenomenon is known as urban heat island effect. Heat islands can affect communities by increasing peak summer energy demand, air pollution, greenhouse gas emissions, and heat-related illness and death (Environmental Protection Agency 2022).

Extreme Cold and Wind Chill

Weather that constitutes extreme cold varies across different parts of the U.S. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered extreme cold (Centers for Disease Control and Prevention n.d.). Extreme cold can often accompany severe winter storms. Wind can exacerbate the effects of cold temperatures by carrying heat away from the body more quickly, thus making it feel colder than is indicated by the temperature. This phenomenon is known as wind chill. Wind chill is the temperature that your body feels when the air temperature is combined with wind speed. Figure 13-2 shows the value of wind chill based on ambient temperature and wind speed.

Source: (National Weather Service n.d.)

Wind (mph)	Temperature (°F)																	
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

Figure 13-2. Wind Chill Chart

13.1.4 Severe Winter Weather

Blizzards and Snowstorms

The National Weather Service defines a winter storm as having significant snowfall, ice and/or freezing rain; the quantity of precipitation varies by elevation. Heavy snowfall is 4 inches or more in a 12-hour period, or 6 inches or more in a 24-hour period in non-mountainous areas; and 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period in mountainous areas. There are three key ingredients to a severe winter storm:

- Cold Air—Below-freezing temperatures in the clouds and near the ground are necessary to make snow and/or ice.
- Moisture—Moisture is required in order to form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean, is a typical source of moisture.
- Lift—Lift is required in order to raise the moist air to form the clouds and cause precipitation. An example of lift is warm air colliding with cold air and being forced to rise over the cold dome. The boundary between the warm and cold air masses is called a front. Another example of lift is air flowing up a mountain side.

Areas most vulnerable to winter storms are those affected by convergence of dry, cold air from the interior of the North American continent and warm, moist air off the Pacific Ocean. When strong storms crossing the Pacific arrive at the coast, if the air is cold enough, snow falls. As the moisture rises into the mountains, heavy snow closes mountain passes and can cause avalanches. Cold air from the north has to filter through mountain canyons into basins and valleys to the south. If the cold air is deep enough, it can spill over a mountain ridge. As the air funnels through canyons and over ridges, wind speeds can reach 100 mph. High winds with snow results in a blizzard.

Ice Storms

The National Weather Service defines an ice storm as a storm that results in the accumulation of at least 0.25 inches of ice on exposed surfaces. Ice storms occur when rain falls from a warm, moist, layer of atmosphere into a below freezing, drier layer near the ground. The rain freezes on contact with the cold ground and exposed surfaces, causing damage to trees, utility wires, and structures (see Figure 13-3).

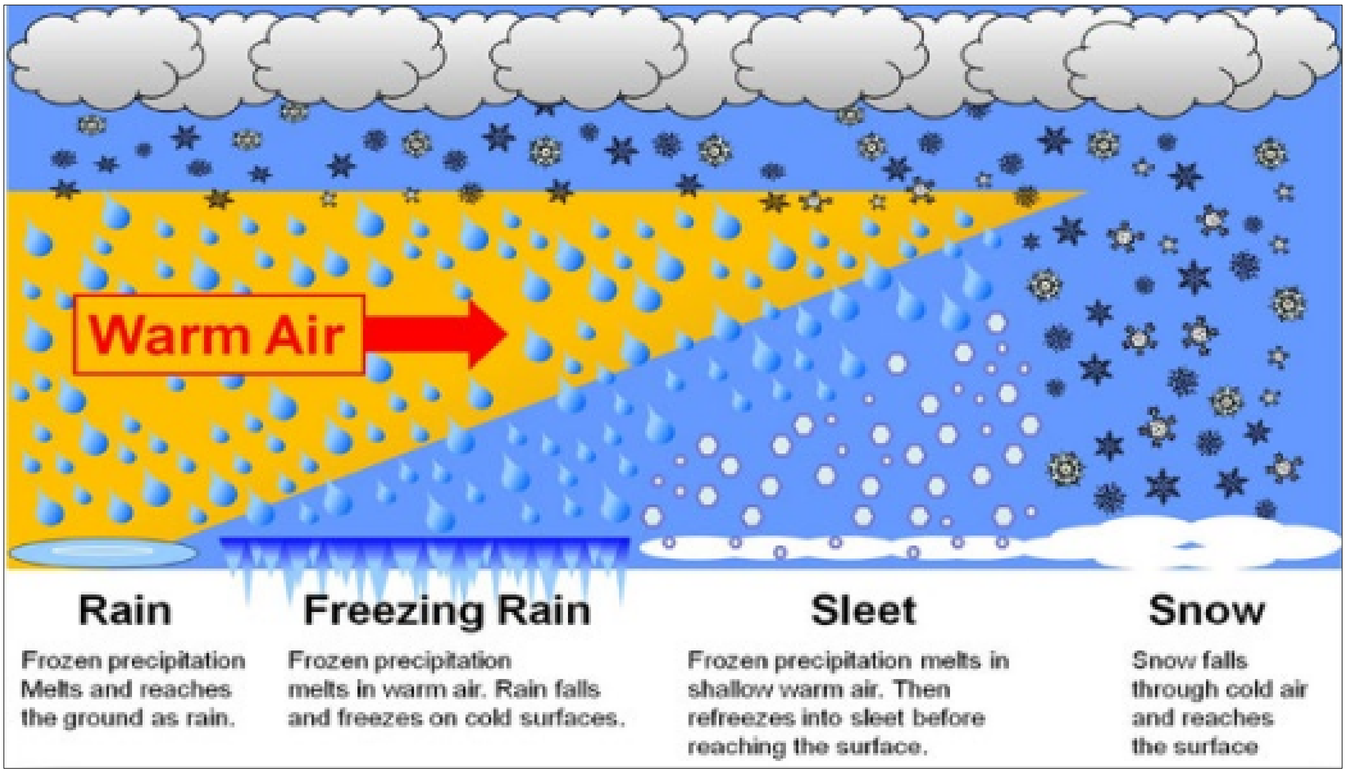


Figure 13-3. The Formation of Different Kinds of Precipitation

Ice accretion generally ranges from a trace to 1 inch. Accumulations between 1/4-inch and 1/2-inch can cause small branch and faulty limb breakage. Accumulations of 1/2-inch to 1 inch can cause significant breakage. Strong winds increase the potential for damage from ice accumulation.

13.1.5 Tornado

A tornado is a violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. Tornadoes are often (but not always) visible as a funnel cloud. On a local-scale, tornadoes are the most intense of all atmospheric circulations, with wind that can reach speeds of more than 300 mph. A tornado's vortex is typically a few hundred meters in diameter, and damage paths can be up to 1 mile wide and 50 miles long. Tornadoes can occur throughout the year at any time of day but are most frequent in the spring during the late afternoon. As shown in Figure 13-4, Idaho has a relatively low risk of tornadoes compared to states in the Midwestern and Southern U.S. Washington has experienced tornadoes on occasion. Some have produced significant damage, injury or death. Washington's tornadoes can be formed in association with large Pacific storms arriving from the west. Most of them, however, are caused by intense local thunderstorms. These storms also produce lightning, hail and heavy rain, and are more common during the warm season from April to October.

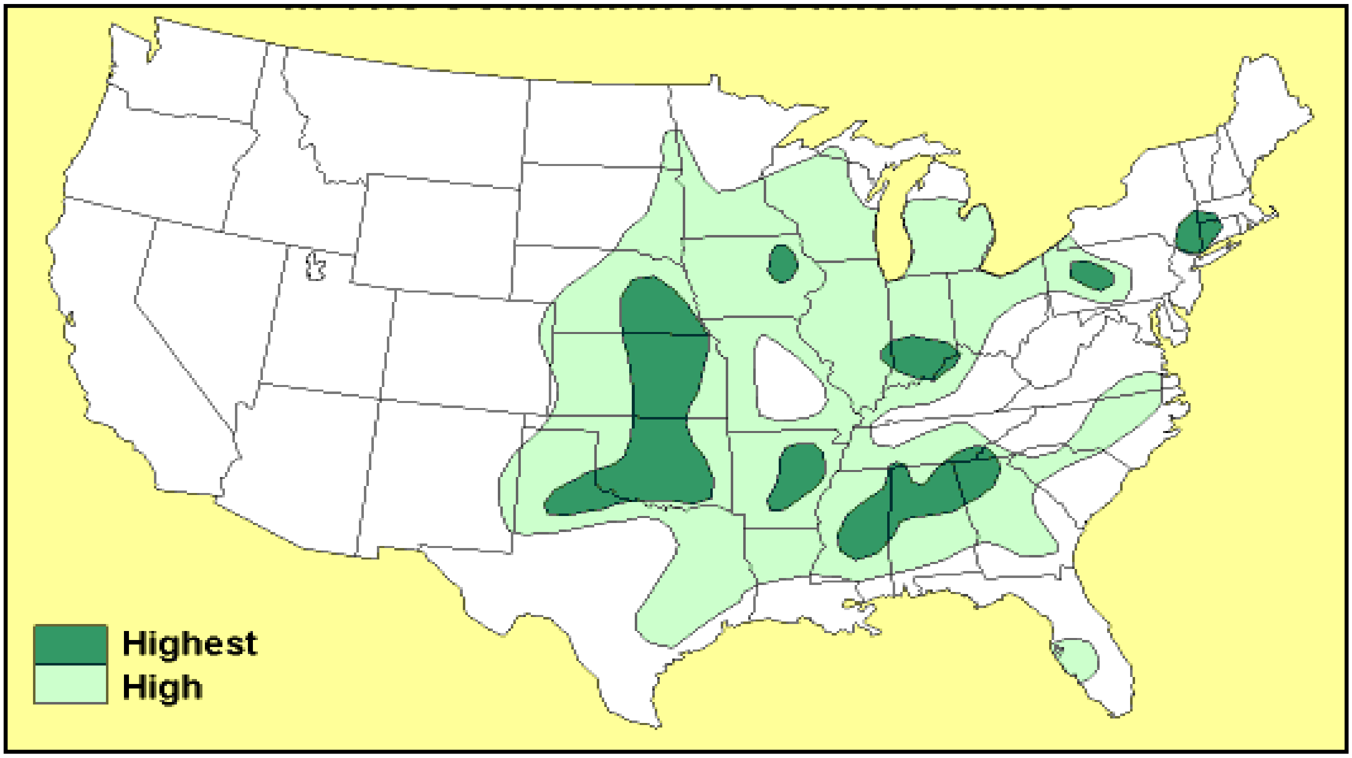


Figure 13-4. Tornado Risk Areas in the United States

13.1.6 Secondary Hazards

The most significant secondary hazards associated with severe local storms are floods, falling and downed trees, landslides and downed power lines. Rapidly melting snow combined with heavy rain can overwhelm both natural and man-made drainage systems, causing overflow and property destruction. Landslides occur when the soil on slopes becomes oversaturated and fails.

13.2 HAZARD PROFILE

13.2.1 Past Events

Table 13-1 summarizes extreme weather events in Ada County since 1970 that caused property damage or injury, as recorded by the National Oceanic and Atmospheric Administration (NOAA).

13.2.2 Location

Extreme weather events have the potential to happen anywhere in the planning area. Communities in low-lying areas next to streams or lakes are more susceptible to flooding. Wind events are most damaging to areas that are heavily wooded.

Table 13-1. Extreme Weather Events Impacting Planning Area Since 1970

<table>
<tr><th>Date</th><th>Type</th><th>Deaths or Injuries</th><th>Property Damage</th></tr>
<tr><td>6/22/2021</td><td>Thunderstorm Wind</td><td>0</td><td>Reports of damage, but not quantified.</td></tr>
<tr><td colspan="4">Hot and dry conditions were ideal for thunderstorm microburst outflow propagation across Southeast Oregon and Southwest Idaho. Severe gusts were reported with reports of damage throughout the area.</td></tr>
<tr><td>5/01/2021</td><td>Thunderstorm Wind</td><td>0</td><td>Numerous reports of damage, but not quantified.</td></tr>
<tr><td colspan="4">A low pressure system moved through the Intermountain West, producing thunderstorms with severe winds, dust storms and small hail. The automated surface observing system at Boise measured a 62 mph wind gust and numerous incidents of damage were reported.</td></tr>
<tr><td>5/30/2020</td><td>Thunderstorm Wind</td><td>0</td><td>Downed trees and fences</td></tr>
<tr><td colspan="4">Severe thunderstorms developed across parts of South Central Idaho and the West Central Mountains ahead of a strong cold front.</td></tr>
<tr><td>4/30/2020</td><td>Thunderstorm Wind</td><td>0</td><td>Wind damage across the Treasure Valley</td></tr>
<tr><td colspan="4">A strong low pressure system swept across the Pacific Northwest initiating severe convection across parts of Southwest Idaho.</td></tr>
<tr><td>10/19/2019</td><td>Thunderstorm Wind</td><td>2</td><td>House fire, downed power lines and fences, car damage</td></tr>
<tr><td colspan="4">A strong low pressure system and a fast moving cold front caused severe thunderstorms across the Treasure and Magic valleys. The Boise Fire Department reported a lightning strike on a house 2 miles east of Boise. Two injuries were reported.</td></tr>
<tr><td>9/05/2019</td><td>Thunderstorm Wind</td><td>0</td><td>Trees downed, school campus and home damage</td></tr>
<tr><td colspan="4">Numerous trees were knocked down during a microburst from Broadway Avenue to Apple Street, especially near Timberline High School, in Southeast Boise. Extensive damage to the high school campus was surveyed by National Weather Service (NWS) employees, including trees knocked down onto houses in the vicinity. The peak thunderstorm wind was estimated at 80 mph.</td></tr>
<tr><td>8/30/2017</td><td>Thunderstorm Wind</td><td>0</td><td>Downed branches and power outages</td></tr>
<tr><td colspan="4">Monsoon moisture combined with unstable conditions associated with an approaching trough and afternoon heating produced strong to severe thunderstorms across parts of Southwest Idaho. Multiple damage reports were received in Southeast Boise, with large trees and branches down including power outages.</td></tr>
<tr><td>6/04/2017</td><td>Thunderstorm Wind</td><td>0</td><td>Downed trees</td></tr>
<tr><td colspan="4">An upper level trough and a strong cold front moved through the Intermountain west producing severe thunderstorms including damaging winds. Trees down from Eagle to Boise and throughout the Treasure Valley.</td></tr>
<tr><td>8/10/2015</td><td>Thunderstorm Wind</td><td>0</td><td>Unknown damage</td></tr>
<tr><td colspan="4">Monsoon moisture moved northward out of Arizona creating conditions for severe convection over Southwest Idaho. A 61 mph wind gust was recorded at the Boise Automated Surface Observing System and numerous reports of damage were received by the NWS.</td></tr>
<tr><td>3/17/2014</td><td>Thunderstorm Wind</td><td>0</td><td>Unknown damage and power outages</td></tr>
<tr><td colspan="4">A powerful cold front raced through Southwest and South Central Idaho on the 17th with numerous reports of damage and power outages. Numerous reports of power outages reported by Idaho Power.</td></tr>
<tr><td>9/5/2013</td><td>Hail</td><td>0</td><td>None reported</td></tr>
<tr><td colspan="4">A strong upper level jet moving through the area brought severe thunderstorms to parts of Southeast Oregon and Southwest Idaho. Spotters in Meridian and Eagle reported large hail up to an inch and a half across the area.</td></tr>
<tr><td>3/6/2013</td><td>Thunderstorm Wind</td><td>0</td><td>Bleacher and fence damage</td></tr>
<tr><td colspan="4">A trough rotating around a large, cold, upper level low swept across Southwest Idaho. Strong to severe thunderstorms developed along the associated front bringing damaging winds and hail up to three quarters of an inch to the area. A NWS storm survey estimated a 60 to 65 mph wind gust destroyed an announcer's booth at the Meridian Lions Club rodeo grounds. Four sets of unsecured grandstand bleachers were flipped upside down and rolled over a fence into the middle of the rodeo grounds.</td></tr>
<tr><td>2/06/2013</td><td>Fog/Freezing Rain</td><td>1 injury</td><td>None reported</td></tr>
<tr><td colspan="4">Dense fog and a brief period of freezing rain in the Treasure Valley of Southwest Idaho caused numerous accidents throughout the area. Numerous reports of slide offs, roll overs and crashes due to dense fog and freezing rain in the area.</td></tr>
<tr><td>8/06/2012</td><td>Thunderstorm Wind</td><td>0</td><td>Tree and fence damage</td></tr>
<tr><td colspan="4">Thunderstorms developed across the Intermountain West on the 6th leading to wind damage in parts of Ada County in Southwest Idaho. Thunderstorms that moved across Ada County caused damage around the Boise area, including tree tops torn off, a large tree snapped at its base, and residential fences blown down.</td></tr>
</table>

Date	Type	Deaths or Injuries	Property Damage
4/24/2012	Hail	0	Wind damage
A line of severe thunderstorms moved through parts of Southwest Idaho on the 24th producing large hail and damaging winds. A trained spotter reported half dollar size hail and wind gusts to 75 mph.			
1/18/2012	Heavy Snow	0	None reported
A major winter storm slammed into the Pacific Northwest and spread heavy snow across parts of Eastern Oregon and Southwest Idaho Impacts were felt in the Boise metro area and along the Interstate 84 corridor. In the mountains, 2 to 3 feet of snow fell over a four day period. 4 to 8 inches of new snow were reported by various sources in the Treasure Valley and 9 inches at Mountain Home.			
4/25/2011	Thunderstorm Wind	0	Wind damage
A strong cold front produced high winds and isolated severe convection leading to significant wind damage to locations in the Treasure Valley of Southwest Idaho on the 25th. KTVB reported wind damage near Rocky Mountain High School in Meridian and around the Kuna area. Hail was covering the ground in the affected areas.			
8/21/2010	Thunderstorm Wind	70 injuries	$10,000
A dry cold front moving across Eastern Oregon and Idaho set off a series of mainly dry thunderstorms generating severe outflow winds in the Treasure Valley, including Boise, and the Snake River plain throughout the evening of the 21st. Minor injuries were reported from the Western Idaho Fair as a result of temporary structures collapsing.			
6/4/2010	Thunderstorm Wind	0	$10,000
The Boise Automated Surface Observing Systems measured a wind gust of 59 mph and NWS employees reported downed trees and fences in Southeast Boise along Surprise Valley Way. Ada County Emergency Manager reported power lines down in Southwest Boise and trees and traffic lights down in Garden City.			
3/29/2009	High Wind	0	$100,000
The automated surface observing system at Boise recorded a peak gust of 53 mph and over $100,000 in damage was sustained in the north end of Boise. Mountain Home had winds of 40 to 50 mph for most of the day.			
6/29/2006	Thunderstorm Wind	0	$5,000
Very moist air mass combined with a well-defined vortices center and maximum day time heating to produce widespread pulse thunderstorms yielding numerous reports of nickel size hail and wind damage including downed trees and power lines			
1/30/2004	Thunderstorm Wind	0	$15,000
During the morning of January 30, a fast moving cold front produced several severe thunderstorms, very strong (in excess of 60 mph) winds and snow showers as it moved eastward across Eastern Oregon and Southwestern Idaho. Fairly large trees were blown down in Payette in Payette County and in Nampa in Canyon County. There were also reports of trees down in Baker and Malheur counties in Oregon. Power was briefly knocked out in northern Owyhee County as the line of thunderstorms moved across the county..			
5/8-9/2002	Extreme Cold/Wind Chill	0	Crop damage
Most observation sites recorded low temperatures in the mid to upper 20s. The hard freeze damaged fruit and field crops.			
8/3/2000	Tornado	0	Uprooted trees, minor home damage
A series of thunderstorms moved though the Treasure Valley with four confirmed tornadoes in Ada county. One tornado touched down near Hidden Springs, with damage limited to two large trees being uprooted. The path of the tornado was 10 yards wide and less than one-tenth of a mile in length. Another touched down near the intersection of Lake Hazel Road and 5 Mile Road. Damage was confined to one home where a flag pole was bent in half and a 2x4 was imbedded in the outer wall of the home.			
2/2/1999	Winter Storm	0	100+ auto accidents, major traffic disruptions
During the day on February 2, a winter storm snarled traffic in the Treasure Valley and brought local heavy snow to the Lower Treasure Valley and the Boise Mountains. In the Upper Treasure Valley, 3 to 4 inches of snow fell and caused major traffic disruptions. Over 100 auto accidents were reported around Boise.			
1/16/1999	Thunderstorm Wind	0	$5,000
During the morning of January 16 a line of strong rain showers and ice pellet showers produced severe wind gusts near Boise. A spotter reported the roof of a small barn was blown off and a tree was uprooted. A second spotter reported a small outbuilding was blown 50 yards and power lines were downed.			
9/7/1998	Thunderstorm Wind	0	$20,000
Scattered thunderstorms produced heavy rains and isolated wet microbursts in the Boise area. Numerous reports of street flooding were received from around the city. Lightning caused a structure fire in Boise while about 3000 people were without power due to trees falling on power lines. At Shadow Valley on the outskirts of Boise, winds ripped two sections of roof off of an elementary school.			

Date	Type	Deaths or Injuries	Property Damage
9/7/1998	Lightning	0	$10,000
Scattered thunderstorms produced heavy rains and isolated wet microbursts in the Boise area. Numerous reports of street flooding were received from around the city. Lightning caused a structure fire in Boise while about 3000 people were without power due to trees falling on power lines. At Shadow Valley on the outskirts of Boise, winds ripped two sections of roof off of an elementary school.			
9/6/1998	Thunderstorm Wind	0	$8,000
During the evening of September 6th scattered thunderstorms moved through the Treasure Valley and Boise Mountains with heavy rain and isolated wet microbursts. In and around Boise numerous reports of street flooding were received while in Boise County a number of small mud slides covered the road between Garden Valley and Lowman. Winds gusted to an estimated 60 to 70 mph at the NWS office in Boise, while numerous reports of trees down were received from around the city. Winds toppled a tree onto a car and caused scattered power outages			
4/23/1998	Thunderstorm/ Wind/Hail	0	$20,000
A severe thunderstorm caused damage from Owyhee Count through the Boise area and into the Boise Mountains. As the storm crossed into Ada County numerous reports of large hail up to golf ball size were received along with damaging winds up to 59 mph. Many trees were blown down and a greenhouse sustained heavy damage from large hail. Windblown debris smashed a car window. A wind gust of 74 mph was reported south of Idaho City.			
3/4/1998	Winter Storm	0	20 to 30 minor traffic accidents
A local snow shower produced 3 inches of accumulation over southeast Boise. Twenty to thirty minor traffic accidents disrupted traffic on area roadways.			
9/17/1997	High Wind	0	$2,000
A strong wind gust toppled a 30-foot tall masonry wall at a Boise construction site.			
7/31/1997	Lightning	0	One house burned down, fire damage to a restaurant
During the afternoon of July 31, a thunderstorm formed over the Owyhee Mountains of southwest Idaho and moved into the Boise area. Lightning from this storm triggered a 530-acre range fire in Owyhee County and sparked a fire that burned a house down east of Boise. Winds from this storm peeled off shingles and damaged siding on a house in southeast Boise and short circuited an electric sign, causing a fire that damaged a restaurant in Boise.			
4/20/1997	Tornado	0	Six homes and surroundings suffered damage
A strong cold front across Southern Idaho spawned a short lived weak tornado. The tornado moved through a subdivision on the outskirts of Boise. Six houses suffered roof damage, fences were torn up and a trampoline was hurled 5 city blocks.			
9/3/1995	Lightning	0	$50,000
In Gooding, high winds uprooted trees, downed power lines, and damaged several structures in the area. A thunderstorm that moved through the Boise area produced lightning igniting a house on fire. This storm also produced high winds downing power lines causing several power outages throughout the Treasure Valley.			
7/28/1995	Lightning	2	$50,000
Thunderstorm in the Kuna area of Ada County caused 2 fatalities and approximately $5,000 in property damage			
8/15/1993	Lightning	0	$50,000
A lightning bolt did extensive damage to a home in Eagle, 10 miles northwest of Boise. The bolt punctured a hole in the roof, then traveled around the inside of the house damaging walls and knocking electrical outlets and telephones out of the walls. The bolt finally grounded on a telephone utility box and completely destroyed it.			
5/20/1993	Lightning	0	$5,000
Lightning from a morning thunderstorm struck two trees sending bark into two windows of a house. The two windows were shattered, and one tree was split.			
3/21/1984	Tornado	0	$25,000
A small tornado, associated with a fast moving cold front, passed through a farm east of Kuna. A grain bin, as well as a two-story wood framed shed, and the roof of an adjacent storage area were damaged.			
10/26/1984	Tornado	0	$25,000
An F1 tornado was reported in Ada County causing approximately $25,000 in Property damage.			

13.2.3 Frequency

Table 13-2 summarizes search results from the National Center for Environmental Information Storm Events Database for Ada County over the 20-year period from 2001 through 2021. Based on these results, damaging wind, severe winter weather, and thunderstorm, lightning and hail events are likely to happen every year, tornado events once every 10 years, and extreme temperature events once every 20 years.

Table 13-2. Ada County Extreme Weather Events, January 2001 - December 2021

Event Types Included[a]	Total Number of Events	Number of Days with: Event	Event and Death or Injury	Event and Property Damage	Average Years Between Days with Event
Thunderstorms, Lightning and Hail					
Hail, Heavy Rain, Lightning, Thunderstorm Wind	51	51	3	1	<1
Damaging Winds					
High Wind, Strong Wind, Thunderstorm Wind	57	57	3	2	<1
Extreme Temperatures					
Extreme Cold/Wind Chill	1	2	0	0	20
Severe Winter Weather					
Dense Fog, Heavy Snow	24	38	0	0	<1
Tornado					
Funnel Cloud	2	2	0	0	10

a. Event types are the categories available for search in the National Center for Environmental Information Storm Events Database
Source: National Center for Environmental Information Storm Events Database

13.2.4 Severity

The most common problems associated with severe storms are immobility and loss of utilities. Fatalities are uncommon, but can occur. Roads may become impassable due to flooding, downed trees or a landslide. Power lines may be downed due to high winds or ice accumulation, and services such as water or phone may not be able to operate without power. Physical damage to homes and facilities can be caused by wind or accumulation of snow or ice. Even a small accumulation of snow can cause havoc on transportation systems due to a lack of snow clearing equipment and experienced drivers and the hilly terrain.

Lightning severity is typically assessed based on property damage and life safety (injuries and fatalities). Lightning can cause severe damage and injury. The number of reported injuries from lightning is likely to be low. County infrastructure losses can be up to thousands of dollars each year.

Windstorms can be a frequent problem in the planning area and have been known to cause damage to utilities. The predicted wind speed given in wind warnings issued by the National Weather Service is for a one-minute average; gusts may be 25 to 30 percent higher. Lower wind speeds typical in the lower valleys are still high enough to knock down trees and power lines and cause other property damage. Mountainous sections of the county experience much higher winds under more varied conditions.

Ice storms accompanied by high winds can have especially destructive impacts, especially on trees, power lines, and utility services. While sleet and hail can create hazards for motorists when they accumulate, freezing rain can cause the most dangerous conditions in the planning area. Ice buildup can bring down trees, communication towers and wires, creating hazards for property owners, motorists and pedestrians. Rain can fall on frozen streets, cars, and other sub-freezing surfaces, creating dangerous conditions.

The severity of an extreme heat event depends on the number of consecutive days it lasts. Urban heat island effect can exacerbate the severity of an extreme heat event. Impacts of an extreme heat event may include increased energy consumption, elevated emissions of air pollutants and greenhouse gases, compromised human health and comfort, and impaired water quality. Extreme heat can also impact infrastructure by warping bridges, causing roads to buckle, and melting runways (National Weather Service n.d.).

Tornadoes are potentially the most dangerous of local storms, but they are not common in the planning area. If a major tornado were to strike within the populated areas of the county, damage could be widespread. Businesses could be forced to close for an extended period or permanently, fatalities could be high, many people could be homeless for an extended period, and routine services such as telephone or power could be disrupted. Buildings could be damaged or destroyed.

13.2.5 Warning Time

Meteorologists can often predict the likelihood of a severe storm. This can give several days of warning time. However, meteorologists cannot predict the exact time of onset or severity of the storm. Some storms may come on more quickly and have only a few hours of warning time.

13.3 EXPOSURE

All people and property and the entire environment of the planning area is exposed to some degree to the extreme weather hazard.

13.4 VULNERABILITY

13.4.1 Population

Vulnerability by Type of Weather

Population vulnerabilities to specific types of extreme weather event are as follows:

- **Damaging Winds**—Debris carried by extreme winds and trees felled by gusty conditions can contribute directly to loss of life. Electric power lines falling down to the pavement create the possibility of lethal electric shock.
- **Extreme Temperatures—**Certain medical conditions, such as heat stroke, can be directly attributable to excessive heat, while others may be exacerbated by excessive heat, resulting in medical emergencies. Individuals who lack shelter and heating are particularly vulnerable to extreme cold and wind chill.
- **Severe Winter Weather—**Many of the deaths that result from severe winter weather are indirectly related to the actual weather event, including deaths resulting from traffic accidents on icy roads and heart attacks while shoveling snow. Icy road conditions that lead to major traffic accidents can make it difficult for emergency personnel to travel. This may pose a secondary threat to life if police, fire, and medical personnel cannot respond to calls. Homeless populations that lack adequate shelter are also vulnerable to severe winter weather events.

- **Thunderstorms**—Most injuries and deaths associated with lighting strikes occur when people are outdoors; however, almost one-third of lightning-related injuries occur indoors. Males are five times more likely than females to be struck by lighting and people between the ages of 15 and 34 account for 41 percent of all lightning strike victims (Centers for Disease Control and Prevention 2013).
- **Tornado**—All residents in the path of a tornado are vulnerable, especially if there is not adequate warning that tornado-causing conditions are likely.

13.4.2 Property

Loss estimations for the extreme weather hazard are not based on damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of potential economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 13-3 lists the loss estimates to the general building stock.

Table 13-3. Potential Damage to Buildings from Extreme Weather Hazard

City	Assessed Value	10% Damage	30% Damage	50% Damage
Boise	$61,280,836,767	$6,128,083,677	$18,384,251,030	$30,640,418,383
Eagle	$9,838,649,929	$983,864,993	$2,951,594,979	$4,919,324,964
Garden City	$3,705,101,875	$370,510,187	$1,111,530,562	$1,852,550,937
Kuna	$3,886,826,099	$388,682,610	$1,166,047,830	$1,943,413,050
Meridian	$28,959,315,273	$2,895,931,527	$8,687,794,582	$14,479,657,637
Star	$2,845,160,473	$284,516,047	$853,548,142	$1,422,580,237
Unincorporated	$12,472,792,807	$1,247,279,281	$3,741,837,842	$6,236,396,403
Total	**$122,988,683,223**	$12,298,868,322	$36,896,604,967	$61,494,341,611

It is estimated that 20 percent of residential structures in the planning area were built without the influence of a structure building code with provisions for wind loads. All of these buildings are considered to be exposed to the extreme weather hazard, but structures in poor condition or in particularly vulnerable locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse. The frequency and degree of damage will depend on specific locations.

13.4.3 Critical Facilities

Critical facilities exposed to floods are at risk from extreme weather with heavy rain or snowmelt. Critical facilities on higher ground may be exposed to wind damage, damage from falling trees, heavy snow and ice accumulation, tornadoes, lightning strikes and extreme temperatures. The sections below describe systems most commonly at risk.

Transportation Systems

High winds can cause significant damage to trees and power lines, disrupting ingress and egress on roads with obstructing debris. Landslides caused by heavy prolonged rains can block roads. Snowstorms significantly impact the transportation system and the availability of public safety services. Of particular concern are roads providing access to isolated areas and bridges, which tend to become icy before and after other areas are clear. Prolonged obstruction of major routes due to weather can disrupt the shipment of goods and other commerce. Large, prolonged storms can have negative economic impacts for an entire region.

Power and Communication Lines

Ice and severe windstorms can create serious impacts on power and above-ground communication lines. Freezing of power and communication lines can cause them to break, disrupting both electricity and communication for households. They can also break as a result of falling trees. This can result in isolation.

Water and Sewer Lines

Severe local storms can cause water and sewer lines to freeze, which may crack pipes. This could result in a loss of potable water to households or exposed sewage causing public health hazards. However, extreme and prolonged freezing weather is required to cause underground pipes to crack, which is not likely to occur in Ada County. Above-ground pipes leading to and from individual homes are more likely vulnerabilities than large mainlines.

13.4.4 Environment

The environment is highly vulnerable to extreme weather. Natural habitats such as streams and trees exposed to the elements during a severe storm risk major damage and destruction. Prolonged rains can saturate soils and lead to slope failure. Flooding caused by extreme weather or snowmelt can produce river channel migration or damage riparian habitat. Storm surges can erode beachfront bluffs and redistribute sediment loads.

13.5 DEVELOPMENT TRENDS

Because all of the planning area is exposed to the extreme weather hazard, the increase in exposed population and property since the last hazard mitigation plan update is equal to the countywide trend over that time period: a 13.6-percent increase in population, a 19.4-percent increase in number of general building stock structures, and a 46.7-percent increase in assessed property value. However, since the majority of this growth was new development, the increase in vulnerability to extreme weather is considered to be minimal due to the influence of strong codes and code enforcement within the planning area.

All future development will be affected by severe storms. The ability to withstand impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. All planning partners that have permit authority have adopted the International Building Code. This code is equipped to deal with the impacts of extreme weather events. Land use policies identified in comprehensive plans within the planning area also address many of the secondary impacts (flood and landslide) of the extreme weather hazard. With these tools, the planning partnership is well equipped to deal with future growth and the associated impacts of extreme weather.

13.6 SCENARIO

Severe local storms can occur frequently and impacts can be significant, particularly when secondary hazards of flood and landslide occur. A worst-case event would involve prolonged high winds during a winter storm accompanied by thunderstorms. Such an event would have both short-term and longer-term effects. Initially, schools and roads would be closed due to power outages caused by high winds and downed tree obstructions. In more rural areas, some subdivisions could experience limited ingress and egress. Prolonged rain could produce flooding, overtopped culverts with ponded water on roads, and landslides on steep slopes. Flooding and landslides could further obstruct roads and bridges, further isolating residents.

13.7 ISSUES

Important issues associated with extreme weather in the Ada County planning area include the following:

- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to extreme weather events such as windstorms.
- Redundancy of power supply throughout the planning area must be evaluated to better understand what areas may be vulnerable.
- The capacity for backup power generation is limited.
- The County has numerous isolated population centers.
- Public education on dealing with the impacts of extreme weather needs to continue so that residents can be better informed and prepared for extreme weather events.
- Debris management (downed trees, etc.) must be addressed, because debris can impact the severity of extreme weather events, requires coordination efforts, and may require additional funding.
- Older building stock in the planning area is built to low code standards or none at all. These structures could be highly vulnerable to severe winter weather effects such as snow loads or high winds.
- Street tree management programs should be evaluated to help reduce impacts from tree-related damages.
- Priority snow removal routes should continue to be cleared first to ensure navigable routes through and between jurisdictions.

14. FLOOD

14.1 GENERAL BACKGROUND

14.1.1 Types of Flooding in the Planning Area

Three types of flooding primarily affect Ada County: riverine, stormwater runoff, and flash floods. The following subsections describe each type.

Riverine Floods

Riverine flooding is overbank flooding of rivers and streams. Natural processes of riverine flooding add sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers. Two types of flood hazards are generally associated with riverine flooding:

- **Inundation**—Inundation occurs when floodwater is present and debris flows through an area not normally covered by water. These events cause minor to severe damage, depending on velocity and depth of flows, duration of the flood event, quantity of logs and other debris carried by the flows, and amount and type of development and personal property along the floodwater's path.
- **Channel Migration**—Erosion of banks and soils worn away by flowing water, combined with sediment deposition, causes migration or lateral movement of a river channel across a floodplain. A channel can also abruptly change location (termed "avulsion"); a shift in channel location over a large distance can occur within as short a time as one flood event.

The frequency and severity of flooding for river systems are based on discharge probability. The discharge probability is the probability that a certain river discharge (flow) level will be equaled or exceeded in a given year. Flood studies use historical records to determine the probability of occurrence for different discharge levels and storm surge levels. These measurements reflect statistical averages only; it is possible for multiple floods with a low probability of occurrence (such as a 1-percent-annual-chance flood) to occur in a short time period. For riverine flooding, the same flood event can have flows at different points on a river that correspond to different probabilities of occurrence.

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas inundated by the 1-percent-annual-chance flood with flood depths of only 1 to 3 feet. These areas are generally flooded by low-velocity sheet flows of water.

Stormwater Runoff Floods

Stormwater flooding is a result of local drainage issues and high groundwater levels. Locally, heavy rain, especially during high lunar tide events, may induce flooding within areas other than delineated floodplains or along recognizable channels due to presence of storm system outfalls inadequate to provide gravity drainage into the adjacent body of water. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. Flooding issues of this nature generally occur within areas with flat gradients, and generally increase with urbanization, which speeds accumulation of floodwaters because of impervious areas. Shallow street flooding can occur unless channels have been improved to account for increased flows.

Urban drainage flooding is caused by increased water runoff due to urban development and drainage systems. Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and within other urban areas. These systems utilize a closed conveyance system that channels water away from an urban area to surrounding streams, and bypasses natural processes of water filtration through the ground, containment, and evaporation of excess water. Because drainage systems reduce the amount of time surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development within that area.

Flash Floods

The National Weather Service defined a flash flood as follows (National Weather Service 2009):

> “a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within 6 hours of the causative event (e.g., intense rainfall, dam failure). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters”

Flash floods can tear out trees, undermine buildings and bridges, and scour new channels. In urban areas, flash flooding is an increasingly serious problem due to removal of vegetation and replacement of ground cover with impermeable surfaces such as roads, driveways, and parking lots. The greatest risk from flash floods is occurrence with little to no warning. Major factors in predicting potential damage are intensity and duration of rainfall, and steepness of watershed and streams.

14.1.2 FEMA Regulatory Flood Zones

FEMA defines flood hazard areas through statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on Digital Flood Insurance Rate Maps (DFIRMs), which are official maps of a community on which the Federal Insurance and Mitigation Administration has delineated both special flood hazard areas (SFHAs) and risk premium zones. DFIRMS identify the following:

- Locations of specific properties in relation to SFHAs
- Base flood (1-percent annual chance flood) elevations at specific sites
- Flood magnitudes in specific areas
- Regulatory floodways and floodplain boundaries (1-percent and 0.2-percent annual chance floodplain boundaries).

The SFHA is the land area covered by floodwaters of the base flood. In SFHAs, National Flood Insurance Program (NFIP) floodplain management regulations must be enforced and flood insurance is mandatory.

The NFIP defines the base flood elevation as the floodwater elevation during a base flood event (a flood that has a 1-percent chance of occurring in any given year). A structure within a 1-percent annual chance floodplain has a 26-percent chance of undergoing flood damage during the term of a 30-year mortgage. The 1-percent annual chance flood is a regulatory standard adopted by federal agencies and most states to administer floodplain management programs. The 1-percent annual chance flood is used by the NFIP as the basis for insurance requirements nationwide. DFIRMs also depict 0.2-percent annual chance flood designations (500-year events).

DFIRM, FIRMs, and other flood hazard information identify the expected spatial extent of flooding from a 1-percent or 0.2-percent annual chance event, defining specific areas as follows:

- **Zones A1-30 and AE**—SFHAs that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base flood elevations are shown within these zones.
- **Zone A (Also known as Unnumbered A-zones**)—SFHAs where no base flood elevations or depths are shown because detailed hydraulic analyses have not been performed.
- **Zone AO**—SFHAs subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to shallow sheet flow flooding on sloping terrain.
- **Zone B and X (shaded)**—Zones where the land elevation as been determined to be above the base flood elevation, but below the 500-year flood elevation. These zones are not SFHAs.
- **Zones C and X (unshaded)**—Zones where the land elevation has been determined to be above both the base flood elevation and the 500-year flood elevation. These zones are not SFHAs.

14.1.3 Floodplains

A floodplain is the area adjacent to a river, creek, lake or the ocean that becomes inundated during a flood. Riverine floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon.

When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain unconsolidated sediments (accumulations of sand, gravel, loam, silt, and/or clay), often extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. These are often important aquifers, the water drawn from them being filtered compared to the water in the stream. Fertile, flat reclaimed floodplain lands are commonly used for agriculture, commerce and residential development.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

Floodplain Ecosystems and Beneficial Functions

Floodplains can support ecosystems that are rich in plant and animal species. A floodplain can contain 100 or even 1,000 times as many species as a river. Wetting of the floodplain soil releases an immediate surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive, and larger species enter a rapid breeding cycle. Opportunistic feeders (particularly birds) move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains valuable for agriculture. Species growing in floodplains are markedly different from those that grow outside floodplains. For instance, riparian trees (trees that grow in floodplains) tend to be very tolerant of root disturbance and very quick-growing compared to non-riparian trees.

Floodplains have many natural beneficial functions, and disruption of them can have long-term consequences for entire regions. Some well-known, water-related functions of floodplains (noted by FEMA) include:

- Natural flood and erosion control
- Provide flood storage and conveyance
- Reduce flood velocities
- Reduce flood peaks
- Reduce sedimentation
- Surface water quality maintenance
- Filter nutrients and impurities from runoff
- Process organic wastes
- Moderate temperatures of water
- Provide groundwater recharge
- Promote infiltration and aquifer recharge
- Reduce frequency and duration of low surface flows

Areas in the floodplain that typically provide these natural functions are wetlands, riparian areas, sensitive areas, and habitats for rare and endangered species.

Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; riverine floodplain land is fertile and suitable for farming; transportation by water is easily accessible; land is flatter and easier to develop; and there is value placed in ocean views. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels or causing erosion of natural flood protection systems such as dunes. Flood potential can be increased in several ways: reducing a stream’s capacity to contain flows; increasing flow rates or velocities downstream; and allowing waves to extend further inland. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities’ adverse impacts on floodplain functions.

14.1.4 Secondary Hazards

The most problematic secondary hazard for riverine flooding is bank erosion, in some cases more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour banks, edging properties closer to the floodplain or causing them to fall in. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers, or storm sewers.

14.2 HAZARD PROFILE

Flooding in Ada County is typically caused by high-intensity, short-duration (1 to 3 hours) storms concentrated on a stream reach with already saturated soil. Flooding is predominantly confined within traditional riverine valleys. Locally, some natural or manmade levees separate channels from floodplains and cause independent overland flow paths. Occasionally, railroad, highway or canal embankments form barriers, resulting in ponding or diversion of flows. Some localized flooding not associated with stream overflow can occur where there are no drainage facilities to control flows or when runoff volumes exceed the design capacity of drainage facilities.

14.2.1 Principal Flooding Sources

The Boise River

The Boise River is about 200 miles long and flows generally east to west. The headwaters are in the Sawtooth Mountains and the mouth is near Parma, Idaho, where it empties into the Snake River. Principal tributaries of the Boise River are the North, Middle, and South Forks, and Mores Creek. Total drainage area of the Boise River is 4,134 square miles. Deep V-shaped valleys, steep slopes and narrow ridges characterize the watershed above Lucky Peak Dam. In the upper basin, elevation ranges from 3,000 to 10,600 feet. The watershed below Lucky Peak Dam is roughly 1,485 square miles and is composed of river bottoms, terraces, and low rolling to steep hills. The bottomland adjoining the main stream constitutes the floodplain and varies from 1 to 3 miles in width.

Water gradients on the Boise River vary from 150 feet per mile in the upper reaches of the watershed to 6 feet per mile in the lower Reaches from Barber Dam to the Ada-Canyon County border, the river has an average slope of 11.5 feet per mile. The natural runoff of the Boise River usually consists of low flows from late July through February, increasing flows during March, and high flows in April, May and June. Occasionally this pattern is interrupted by high flows of short duration in winter caused by rainstorms. The vast majority of the runoff is generated above Lucky Peak Dam. Average discharge near Boise is about 2,750 cubic feet per second (cfs) or 2 million acre-feet per year. The maximum recorded mean daily discharge was 35,500 cfs, on June 14, 1896.

The principal dams on the Boise River are Anderson Ranch, Arrowrock and Lucky Peak. These dams provide flood-control storage for 64 percent of the drainage area of the river. The dams have greatly reduced the magnitude and frequency of Boise River floods. In spite of the flood protection provided by the existing system, major floods still cannot be fully controlled. Boise River water levels reach bank-full stage (6,500 cfs at the Glenwood Bridge gage) virtually every year. However, the reservoirs provide enough regulation to generally allow for 24 to 72 hours' warning before cities along the Boise River in Ada County experience major flooding.

The river's ability to carry a flood has been significantly reduced over time by siltation. Before the upstream dams regulated flows, spring runoff flushed and scoured the river channel. Since 1954, when Lucky Peak, the last of the three big dams, went into operation, the capacity of the river channel has gradually been reduced. A 1972 USGS study noted a considerable decrease in stream capacity at the gauging stations at Notus and Boise. At the same river stage, flows at Notus were 11,800 cfs in 1938 and 8,000 cfs in 1972. Flows at the same stage at Boise were 9,600 cfs in 1943 and 7,700 cfs in 1972. This is a reduction in carrying capacity of 32 percent at Notus and 20 percent in Boise. In the decades since that study, silt has continued to be deposited. With present channel capacity, there is not enough reservoir space in the system to fully regulate the standard flood. There is a 1 percent chance in any year of flows at Boise exceeding 16,600 cfs, and a 2 percent chance of flows exceeding 11,000 cfs.

Other factors that affect flooding on the Boise River are the construction and condition of levees, the proliferation of plant growth along the river, and the construction of structures in the floodway. With these changes, water levels that in the past were merely an inconvenience now can cause significant damage. When flood elevations for the 10 percent or 2 percent annual chance flood are only slightly less than for a 1 percent annual chance flood, debris blockages can cause 1 percent annual chance elevations during a 10 percent annual chance flood.

The Snake River

The Snake River forms part of the southern boundary of Ada County, running from Castle Butte in the east to Gaffey Butte in the west. The river flows through a deep canyon bordered by high, steep walls. The main threat of flooding on the Snake River is from ice jams. The potential for other types of flooding is limited since large dams control the river. There is very little development along this part of the Snake River. The main residential area is near Swan Falls Dam. Depending on the time of year, varying numbers of recreationists may be on the river.

Tributaries

The most hazardous streams in Ada County are the Boise River tributaries that have their headwaters in the Boise Foothills: Seaman Gulch, Pierce Gulch, Polecat Gulch, Stewart Gulch, Crane Creek, Hull’s Gulch, and Cottonwood Creek. These streams flow southwest and are dry most of the year. Only after periods of heavy rainfall or snowmelt do they have significant flows. The soil of these streams is almost entirely deep sandy loam, loam with areas of clay, or clay loam, and all are highly erodible. Vegetation in these gulches is sparse and consists mainly of sagebrush, bitterbrush and perennial grasses. Elevations range from about 2,800 feet at the Boise city limits to about 5,800 feet at the summit of Boise Ridge.

The danger on these streams is flash flooding. Cottonwood Creek is the largest of these drainages and carries the greatest threat for extensive flash flooding. The largest flood in recent history from these Foothills streams occurred August 20, 1959, when Cottonwood Creek flooded, inundating about 50 blocks in Boise and several hundred acres of farmland with water, rocks and mud.

Precipitation normally varies from 12 inches in Boise to about 22 inches at higher elevations. Both frontal storms and thunderstorms can be sufficiently heavy to cause flooding. The maximum recorded 24-hour rainfall in Boise is 2.7 inches. The maximum observed short-duration rainfall at the Boise weather station is 4.1 inches/hour. However, intensities as high as 7.5 inches/hour have been logged in southwestern Idaho and eastern Oregon. Peaks for both of these types of floods occur in a rather short time: from 15 minutes to several hours.

Two conditions may cause floods in the drainages on the Boise Front: the combination of a rainstorm with snowmelt on frozen ground in winter or early spring; high-intensity thunderstorms, in summer. Winter storm floods generally occur during January through March. Thunderstorms may occur at any time of the year, although they usually happen from March through September. Sandy soil and sparse vegetation combine to foster flash floods during intense thunderstorms. Floods from thunderstorms do not occur as frequently as those from general rain and snowmelt conditions, but are far more severe. The possibility for injury and death from flash floods is heightened because they are so uncommon that people do not recognize or accept the potential danger.

The onset of flooding in these gulches can range from extremely slow to very fast. This variability depends on the cause of flooding and other factors such as rainfall intensity, the areas receiving the rain, temperature, and the condition of the soil. Floods that occur quickly are usually caused by thunderstorms, while floods that occur more slowly are often the result of moderate but prolonged rainfall, snowmelt or a combination of both. In the case of intense rainfall immediately above developed areas, the onset of flooding may occur in a matter of minutes.

The lower portions of most of the gulches contain residential developments, including single-family homes, mobile home parks and apartment complexes. A large portion of the older residential district in the City of Boise is located within the floodplains of these gulches. Residential streets form the flood channel in several locations. A number of gulches and areas immediately below the gulches contain commercial and public facilities.

Between August 26 and September 2, 1996, 15,300 acres of the Boise City foothills were burned by the Eight Street wildfire. About 50 percent of the area in the Stewart Gulch and Cottonwood Creek watersheds was burned. Crane Gulch and Hulls Gulch watersheds were burned almost totally. The fire removed vegetation and hardened the soil. As a result, for several years the threat of flash flooding was significantly increased. Treatments applied in an effort to reduce the flood risk included contour felling of trees, tillage and aerial seeding, placing straw wattles, hand trenching, contour trenching, and straw bale check dams. Flood control structures were as follows:

- Enlarging the Cottonwood Creek Mountain Cove ponds to 150 acre-feet combined and re-channeling the flow through the Mountain Cove Road turn at the head of the flume, and constructing a wall along Reserve Street to direct the flow of water
- Constructing a 35-acre-foot upper catch basin and a 15-acre-foot lower catch basin on Hulls Gulch
- Constructing a 19-acre-foot dam on the Main Fork of Crane Gulch, and a 28-acre-foot dam on the East Fork of Crane Gulch
- Elevating sections of the Bogus Basin Road to act as a 61-acre-foot dam across Stewart Gulch.

Recent studies addressing flash floods have focused on these Boise gulches. However, long-term consideration of all drainages is necessary to avoid similar problems. Other streams in Ada County that may be subject to flooding are Big Gulch Creek, Black's Creek, Bryans Run Creek, Corder Creek, Council Spring Creek, Current Creek, Dry Creek, Eightmile Creek, Fivemile Creek, Highland Valley Gulch, Indian Creek, Little Gulch Creek, Maynard Gulch, Ninemile Creek, Rabbit Creek, Sand Creek, Sheep Creek, Spring Valley Creek, Tenmile Creek, Threemile Creek, Warm Spring Creek, and Willow Creek. The majority of these streams are dry most of the year.

Canals

There are more than two dozen canals in Ada County, extending over 400 miles. The canals draw water from the Boise River, generally from April through October. This is the time of year when canals present the greatest flood danger. There are several types of flood threats posed by canals. The first type is from a break or breach in the canal. This has the potential for significant flooding, especially if the canal is elevated or located on a hillside. Another possibility is be from an obstruction in a canal that causes water to overtop the canal bank. Other potential risks are vandalism, piping of water, gopher holes, etc. A break would pose the most serious problem.

Urban Flooding

Like many areas in the western U.S., Ada County has experienced rapid change due to urban development in once rural areas. Drainage facilities in these recently urbanized areas are a series of pipes, roadside ditches and channels. Urban flooding occurs when these conveyance systems lack the capacity to convey rainfall runoff to nearby creeks, streams and rivers. As drainage facilities are overwhelmed, roads and transportation corridors become conveyance facilities. The two key factors that contribute to urban flooding are rainfall intensity and duration. Topography, soil conditions, urbanization and groundcover also play an important role.

Urban floods can be a great disturbance of daily life in urban areas. Roads can be blocked and people may be unable to go to work or school. Economic damage can be high but the number of casualties is usually limited, because of the nature of the flood. On flat terrain, the flow speed is low and people can still drive through it. The water rises relatively slowly and usually does not reach life endangering depths.

14.2.2 Participation in Federal Flood Programs

National Flood Insurance Program

Ada County entered the NFIP on December 18, 1984. Structures permitted or built in the County after then are called "post-FIRM" structures and are eligible for reduced flood insurance rates, since they were constructed after regulations and codes were adopted to decrease vulnerability. Structures built before then are called "pre-FIRM" and are subject to higher rates because they may not meet code or may be located in hazardous areas. The effective date for the current countywide FIRM is June 2020. This map is a DFIRM (digital flood insurance rate map).

All incorporated cities in Ada County also participate in the NFIP. The county and cities are currently in good standing with the provisions of the NFIP. Compliance is monitored by FEMA regional staff and by the Idaho Department of Water Resources under a contract with FEMA. Maintaining compliance under the NFIP is an important component of flood risk reduction. All planning partners that participate in the NFIP have identified actions to maintain their good standing.

Table 14-1 lists flood insurance statistics that help identify vulnerability in Ada County. Seven communities in the planning area participate in the NFIP, with 2,152 flood insurance policies providing $656.8 million in insurance coverage. According to FEMA statistics, 121 flood insurance claims were paid between January 1, 1978, and March 31, 2022, for a total of $480,275 and an average of $3,969 per claim.

Table 14-1. Flood Insurance Statistics for Ada County

Jurisdiction	Date of Entry Initial FIRM Effective Date	# of Flood Insurance Policies as of 3/31/2022	Insurance In Force	Total Annual Premium	Claims, 11/1978 to 3/31/2022	Value of Claims paid, 11/1978 to 3/31/2022
Boise	4/17/1984	952	$276,871,100	$625,595	55	$102,909
Eagle	3/04/1980	316	$114,310,600	$212,357	15	$198,703
Garden City	5/15/1980	486	$149,003,700	$352,585	18	$44,557
Kuna	10/02/2003	2	$537,300	$1,633	0	$0
Meridian	9/27/1991	122	$33,269,900	$88,623	1	$0
Star	12/18/1984	89	$28,015,100	$57,541	0	$0
Unincorporated	12/18/1984	185	$54,770,300	$133,551	32	$134,106
Total		**2,152**	**$656,778,000**	**$1,471,885**	**121**	**$480,275**

The Community Rating System

Ada County and the cities of Boise, Eagle, Garden City and Meridian are currently participating in the CRS, as summarized in Table 14-2. Many of the mitigation actions identified this plan are creditable activities under the CRS program. Therefore successful implementation of this plan offers the potential for these communities to enhance their CRS classifications and for currently non-participating communities to join the program.

Table 14-2. CRS Community Status in Ada County

Community	NFIP Community #	CRS Entry Date	Current CRS Classification	Premium Discount, SFHA	Premium Discount, non-SFHA
Ada County	160001	10/1/1994	7	15%	5%
Boise	160002	10/1/1991	6	20%	10%
Eagle	160003	4/1/2000	6	20%	10%
Garden City	160004	10/1/1998	8	10%	5%
Meridian	**160180**	**5/1/2016**	8	**10%**	**5%**

14.2.3 Past Events

Ada County has a long and extensive history of flooding. The most common problem areas for flooding are the Boise River and the Boise Foothills streams. The greatest flood of known magnitude on the Boise River occurred on June 14, 1896. Peak flow was estimated at 35,500 cfs. The largest recent flood occurred in April 1943. Peak flow for this event was estimated at 21,000 cfs. Both of these events occurred prior to the river being regulated by Lucky Peak Dam. Table 14-3 shows flood events that have impacted the planning area since 1955.

Table 14-3. Ada County Flood Events

Date	Declaration #	Type of event
8/01/2021	N/A	Flash Flood
Multiple small rock slides and flooding in Southeast Boise.		
4/30/2020	N/A	Flash Flood
Streets were flooded due to heavy rain from thunderstorms and stranded cars, which led to road closures in Southeast Boise.		
4/01/2017 - 5/01/2017	DR 4342	Flood
Planned releases from Lucky Peak Reservoir for flood control in April ranged from 7,800 cfs to 8,900 cfs. The Boise River remained in flood all of May due to planned release from Lucky Peak dam. Regulated flows were above flood stage for 101 days, resulting in extensive damage to the Greenbelt and Nature Trail paths. Extensive flood fight efforts were undertaken in the Eagle Island area. On Eagle Island in the Riviera Estates area, several homes were surrounded by water and low lying roads were inundated. Flood fight efforts to mitigate a pit capture were undertaken along the Eagle Island south channel of the river. Large portions of Ann Morrison Park, Barber Park, and Marianne Williams Park were flooded. Residential streets were flooded in the Garden City Warehouse District and on Eagle Island. A major shift in the river channel occurred downstream of Eagle Island. Streets in the Stonebriar development downstream of the Highway 16 bridge were inundated. Severe bank erosion and large trees washed into the river caused problems at some bridges.		
3/06/2017	N/A	Planned Dam Release
The Army Corps of Engineers and Bureau of Reclamation increased regulated flows from Lucky Peak Reservoir, putting the Boise River in flood for the remainder of March. Flooding was expected to continue through late spring. Flood flows caused significant damage to the Greenbelt and Nature Trail paths along the river. Flood fight efforts focused on the Eagle Island area where severe bank erosion occurred and a pit capture threat existed. A HESCO barrier wall and extensive sandbagging occurred in the area to mitigate a pit capture.		
2/08/2017	N/A	Flood
Strong Southwesterly flow behind a warm front spread heavy rain across most of the intermountain west. Flooding occurred in most of South Central Idaho.		
7/08/2015	N/A	Flash Flood
Strong thunderstorms and heavy rain crossed parts of southwest Idaho. Heavy rain from slow moving thunderstorms caused flash flooding in downtown Boise and in the north and northwest parts of the city. Over an inch of rain fell in less than an hour in parts of Boise.		
5/01/2012	N/A	Planned Dam Release
Unusually high rainfall triggered a rapid snow melt. Peak inflow into the three-dam reservoir system was over 26,000 cfs. Flows peaked at 8100 cfs through town. The high flows also caused an overtopping of a canal head-gate and two riverbank breeches along the Little Pioneer Ditch. Uncontrolled flows into the irrigation canal caused flooding on agricultural lands and threatened numerous public rights of way in Star. Ada County Highway District took the lead and completed the bank repairs that resolved this issue.		

Date	Declaration #	Type of event
5/30/2011	N/A	Planned Dam Release
Due to capacity issues at Lucky Peak Dam, officials were forced to increase flow on the Boise River, causing the channel to go above flood stage during the day. The river crested at 10.03 feet around 3:00 p.m..		
5/20/2008	N/A	Flooding-Boise River
High flows on the Boise River forced Boise Parks & Recreation to close three sections of the Greenbelt. The walking-only pedestrian area was underwater from the Cottonwoods Apartments past River Run in southeast Boise. Two other areas were also closed: Broadway Avenue tunnel on the north side of the river and Loggers Creek footbridge from Leadville Avenue east to the Park Center Bridge.		
5/6/2006	N/A	Flooding-Kuna-Mora canal
A breach in the Kuna-Mora Canal flooded parts of a south Kuna subdivision and came close to compromising a sewage pump about 2.5 miles away. Thirty to forty homeowners reported flooding. The canal broke about one quarter south of King Road. It started as a six foot breach and quickly became a 40 foot breach.		
5/25/2006	N/A	Flooding-Boise River
High water levels along the Boise River created a breach in the riverbank near Eagle Island. About 8- 10 homes along Artesian and Trout Roads were affected. The State of Idaho repaired the breach. For the affected residents Ada County provided sandbags, portable toilets, sump pumps and diesel for tractors.		
5/11/2006	N/A	Flooding –Boise River
High flows on the Boise River eroded a bridge near Garden City and nearly caused it to collapse into the river.		
4/5/2006	N/A	Flooding-Tributaries
Flooding along Five mile Creek and Lake Patricia flooded two homes and threatened several others as well as a small, private dam, southeast of Boise. Ada County inmate crews assisted in sandbagging.		
7/7/2004	N/A	Urban Flooding
The Idaho State Capital building was inundated by a flash flood. The flood occurred in the basement, displacing about 20 workers. Repairs are estimated to be between $70,000 and $100,000.		
3/7/1999	N/A	Flooding-Boise River
High water levels released from Lucky Peak Reservoir caused flooding in low lying areas. Segments of the Greenbelt were closed and areas in southeast Boise near Logger's Creek and Cottonwood Apartments were flooded. Also a 200' section of riverbank near Eagle's Starwood subdivision collapsed.		
May/June 1998	N/A	Flooding-Boise/Snake
Two weeks of rain fell on a melting snowpack caused flooding along the Snake, Weiser, Payette and Boise Rivers for the second year in a row. A levee break near Eagle Island caused flooding of nearby homes.		
9/11/1997	N/A	Flash Flooding
Flash flooding from thunderstorms caused damage in the Boise Foothills. Cloudburst dropped 0.40" of rain in 9 minutes on the Foothills area burned by the 1996 Eighth Street Fire, flooding homes, Highlands Elementary School, and streets in the Crane Creek and Hulls Gulch areas. Floodwaters were contained in several holding ponds. 15 people were evacuated and sheltered at Les Bois Junior High.		
March/July 1997	DR 1177	Riverine Flooding
Rapid melt of a record snowmelt led to flooded rivers throughout southern Idaho. The Snake River Basin received significant snowfall during the winter of 1996-97, and in higher elevations the snow pack exceeded 250 percent of normal, causing above normal runoff during the spring melt.		
1/1/1997	DR 1154	Riverine Flooding
Warm temperatures combined with a rainfall 4-6 times normal caused snowmelt triggering floods, mudslides and avalanches in the Weiser, Payette and Salmon River drainages, damaging communities and infrastructure throughout Idaho. Increased flows in the Boise River to make room in reservoirs flooded homes and businesses along Eagle Island. A dike near South Eagle Road broke, flooding a road and surrounding fields. Parts of the Greenbelt along the Boise River were closed.		
May 1993	N/A	Flooding-Boise River
Boise River floodwaters soaked 10 Eagle homes, 1 woman drowned.		
February 1986	N/A	Flooding-Tributaries
Melting snow flooded North Boise from creeks in the Foothills. Streets in downtown Boise were closed to form a temporary diversion cancel to channel water from Cottonwood Creek to the Boise River. The canal carried an est. 800,000 gallons of water an hour		

<table>
<tr><th>Date</th><th>Declaration #</th><th>Type of event</th></tr>
<tr><td>June 1983</td><td>N/A</td><td>Flooding-Boise River</td></tr>
<tr><td colspan="3">Snowmelt caused by high temperatures led to the raising of the Boise River to a peak runoff of 24,294 cfs. Flooding damaged the Greenbelt and river banks along Barber Park, Parkcenter, Garden City and Eagle Island. Homes along the river were flooded, and residents of Eagle Island used boats to travel. Cottonwood trees fell into the river, causing damming and further flooding. Municipal Park lost a chunk of land 300’ long and 55’ deep.</td></tr>
<tr><td>February 1982</td><td>N/A</td><td>Flooding-Tributaries</td></tr>
<tr><td colspan="3">Mudslides closed Hwy 55 three times in one month; erosion from floodwaters caused damage to numerous streets in the Foothills.</td></tr>
<tr><td>1/5/1979</td><td>N/A</td><td>Flooding-Tributaries</td></tr>
<tr><td colspan="3">In Boise, rain and melting snow caused flooding in North and West Boise from Foothills creeks. Over a dozen homes in the Highlands near Crane Creek were hardest hit, flooding basements, yards and streets despite sandbagging efforts. Flooding was also seen along Polecat Gulch, Stewart Gulch and Cottonwood Creek north of Boise, and Three mile, Five mile, Eight mile and Ten mile Creeks south of the airport, flooding homes, businesses and farmlands. Eckert Road bridge was closed.</td></tr>
<tr><td>5/26/1973</td><td>N/A</td><td>Flooding-Canal</td></tr>
<tr><td colspan="3">A 30’ wide break in the Ridenbaugh Canal flooded the Triangle Dairy and 15 houses in southeast Boise with muddy, waist-deep water. The affected area was between Broadway/Linden/Leadville</td></tr>
<tr><td>1/17/1971</td><td>N/A</td><td>Urban Flooding</td></tr>
<tr><td colspan="3">Heavy rain and snow over four days caused flooding in southwest Idaho. Basements, yards and low-lying roads were flooded. In Orchard, 3 of 30 homes were evacuated by rowboat. Floodwaters covered approximately 160 acres in the town.</td></tr>
<tr><td>1/22/1969</td><td>N/A</td><td>Flooding-tributaries</td></tr>
<tr><td colspan="3">Crane Creek, Cottonwood Creek, and other drainages in the Foothills flooded, with the Cottonwood Creek flow being measured at 30 percent above normal. The Boise River reached 3,643 cfs, three times normal. Flooding was mostly confined to roads and yards in North Boise.</td></tr>
<tr><td>5/22/1965</td><td>N/A</td><td>Flooding-Boise River</td></tr>
<tr><td colspan="3">300 acres of farmland and several houses near Eagle Island were flooded by the Boise River when a levee broke.</td></tr>
<tr><td>1/29/1965</td><td>N/A</td><td>Flooding-Tributaries</td></tr>
<tr><td colspan="3">Flooding from Cottonwood and Dry Creeks, Crane, Stewart and Hulls Gulch. Damage mostly was for repair to bridges and cleanup.</td></tr>
<tr><td>12/21/1964</td><td>N/A</td><td>Riverine Flooding</td></tr>
<tr><td colspan="3">Warm weather combined with heavy rains and melting snow caused flooding along the Payette, Big Wood, Little Wood, Portneuf, Clearwater and Boise River drainages. Hwy 21 and 15, U.S. 95N and 30E were closed. Over 100 homes were damaged, numerous bridges were washed out, and thousands of acres of farmlands were flooded. Two deaths were attributed to the flood. A state of emergency was declared. Boise was isolated as surrounding roads and highways were closed, train and bus service cut off.</td></tr>
<tr><td>2/1/1963</td><td>N/A</td><td>Flooding</td></tr>
<tr><td colspan="3">In Ada County, Meridian streets and homes were flooded, farmland along Hwy 20-26 flooded. Canals in the area were running 3’ above normal. Several highways were closed, bridges were washed away, and homes had basements and yards.</td></tr>
<tr><td>9/22/1959</td><td>N/A</td><td>Flash Flooding</td></tr>
<tr><td colspan="3">Heavy storms caused flooding along Cottonwood Creek and other Foothill drainages. The force of the water broke dikes across from the Armory on Reserve Street. Hwy 21 was closed because of debris flows. The area affected was mainly in the North End, from Fourth to Eighth Streets and Thatcher to Resseguie; also from Reserve Street to MK Plaza to Eighth Street. After these floods, several local and federal agencies cooperated in the “Boise Front Watershed Restoration Project” involving contour trenching, furrowing, seeding with trees and grasses and building protective fences, at a cost of approx. $165,000.</td></tr>
<tr><td>8/20/1959</td><td>N/A</td><td>Cloudburst Floods</td></tr>
<tr><td colspan="3">Severe thunderstorms in the northeast Boise Foothills were estimated to be a 50- to 100-year rainfall event; 0.30” of rain fell in 5 minutes at Deer Point. Earlier Lucky Peak fires had denuded the foothills of vegetation. Debris flows filled basements and yards in north and east Boise. Floodwaters were diverted along Broadway Avenue to the Boise River. Some 500 houses were damaged by mud; over 160 acres were covered by silt and debris. The agriculture area between Lucky Peak Dam and East Boise suffered extensive property, crop and livestock losses. The Boise police clubhouse on Mountain Cove Road was destroyed. The Idaho National Guard headquarters on Reserve Street was inundated.</td></tr>
</table>

Date	Declaration #	Type of event
1/12/1958	N/A	Flash Flooding
A rainstorm that dumped over 2" of rain in Boise in a 12 hour period caused extensive flooding and heavy crop damage. Homes, roads and storm basins were flooded, several families were evacuated. The Boise Bench was hit hardest, with one family on Atlantic Street evacuated when their house was flooded with over a foot of water.		
2/25/1957	N/A	Flooding-tributaries
Parts of Eagle flooded by Dry Creek.		
8/1/1955	n/a	Flooding-Canals
200' section of the New York Canal broke 7 miles southeast of Boise and flooded 200-300 acres of farmland with water, mud and rock. A dozen homes near the break were flooded with 3' of water and families were evacuated.		

14.2.4 Location

Figure 14-1 shows the flood hazard areas from FEMA's 2020 DFIRM for Ada County, which was used to assess flood risk for this plan update. The mapped 1 percent annual chance and 0.2 percent annual chance flood hazard area within each municipality is listed in Table 14-4.

Table 14-4. Area Within the Mapped Flood Hazard Areas

	Area in Flood Zone (acres)	
	1% Annual Chance	**0.2% Annual Chance**
Boise	2,386	6,398
Eagle	2,640	4,046
Garden City	845	2,092
Kuna	420	420
Meridian	590	976
Star	728	1,205
Unincorporated	14,673	16,542
Total	**22,282**	**31,679**

14.2.5 Frequency

Ada County experiences episodes of river flooding almost every winter. Large floods that can cause property damage typically occur every three to seven years. Urban portions of the county annually experience nuisance flooding related to drainage issues.

14.2.6 Severity

Peak Flows

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high velocity flows and transporting debris and sediment. Flood severity is often evaluated by examining peak discharges; Table 14-5 lists peak flows used by FEMA to map the floodplains of Ada County.

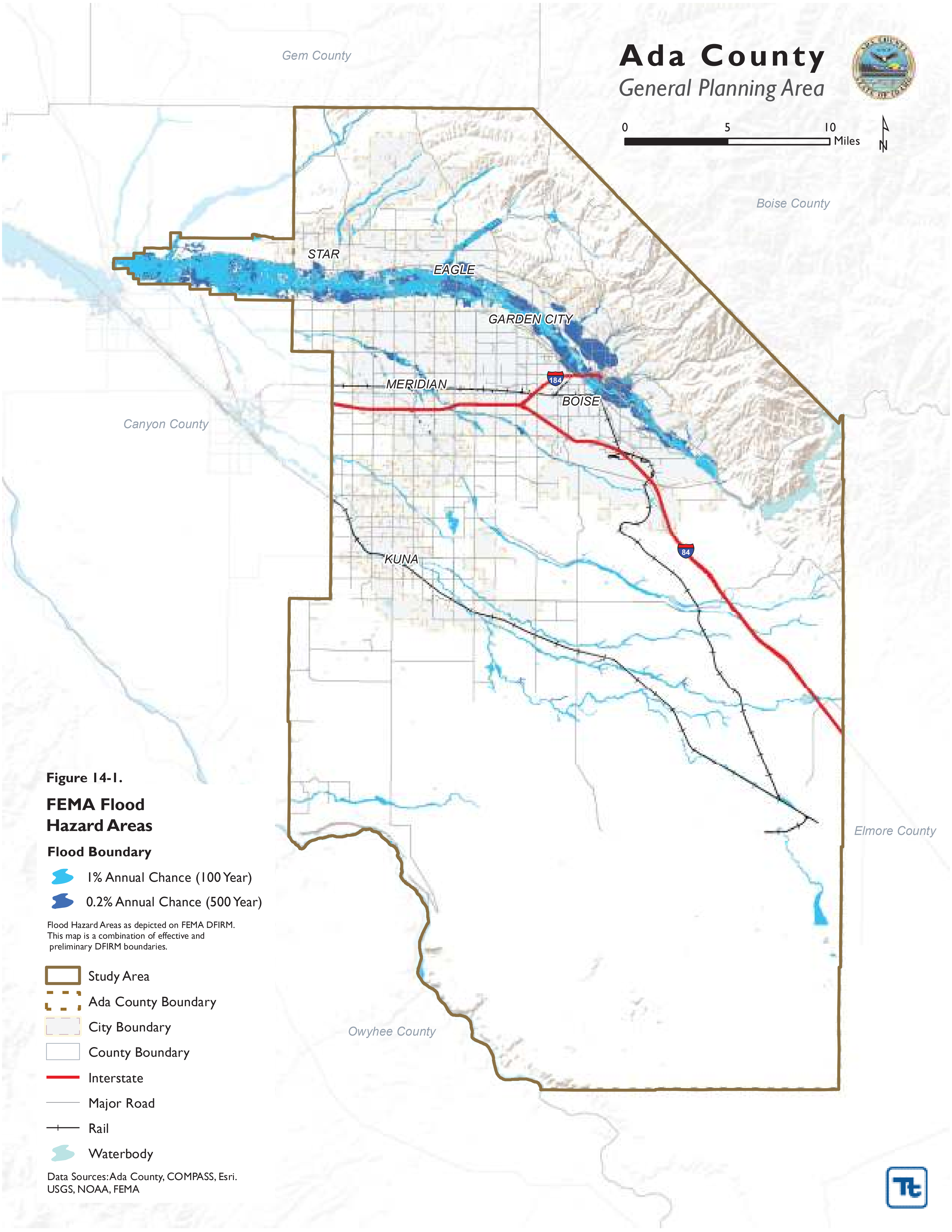


Figure 14-1.
FEMA Flood Hazard Areas

Table 14-5. Summary of Peak Discharges Within Ada County

Source/Location	Drainage Area (Square Miles)	Discharge (cubic feet/second)			
		10-Year	50-Year	100-Year	500-Year
Boise River					
At Lucky Peak Dam	2,650[a]	7,500[b]	11,000[b]	16,600[b]	34,800[b]
Boise River Side Channel					
At Park Center	N/A	N/A	N/A	675[c]	N/A
Cottonwood Gulch					
A mouth	16.5	242	1,450	3,650	25,500
Above Freestone Creek	11.7	192	1,016	2,688	19,282
Crane Gulch					
At mouth	7.8	154	376	1,030	8,428
Dry Creek					
At City of Eagle	67	610	2,700	4,000	13,200
Below Confluence with Spring Valley Creek	57.1	1,090	1,700	2,030	2,750
Above Confluence with Spring Valley Creek	37.8	791	1,200	1,410	1,950
Above Wooden Farm Bridge	34.5	695	1,090	1,280	1,770
Dry Creek below Current Creek Lane	33.5	674	1,060	1,240	1,710
Above split flow to Dry Creek Side Channel	--[d]	--[d]	--[d]	1,641	--[d]
5700 feet downstream of Cartwright Rd	--[d]	--[d]	--[d]	2,230	--[d]
Eightmile Creek					
At confluence with Fivemile Creek	16.7	330	525	590	850
At Cloverdale Road	--[d]	325	510	575	820
At Victory Road	13.4	275	390	425	580
Above New York Canal	9.9	300	700	950	1,800
Fivemile Creek					
Below Ninemile Creek	63	650	1,000	1,200	1,875
At Linder Road	--[c]	565	850	1,000	1,570
Below Eightmile Creek	52.5	530	780	900	1,375
Below Ridenbaugh Canal	--[c]	200	250	525	815
Above Ridenbaugh Canal	--[c]	345	440	525	815
Below Five Mile Road	--[c]	325	400	470	725
Below Threemile Creek	33	300	390	440	650
At Victory Road	--[c]	265	320	350	580
Below New York Canal	30.2	250	280	300	500
Above New York Canal	30.2	725	1,450	1,850	3,000
Highland Valley Gulch					
	2.5	150	940	1,250	2,100
Hulls Gulch					
At mouth	4.3	108	263	360	2,200
Maynard Gulch					
	2.3	150	830	1,100	1,850
Ninemile Creek					
At Tenmile Road	5.6	70	135	175	290
Above Linder Road	--[d]	50	95	120	200
At Meridian Road	--[d]	55	120	145	235

Source/Location	Drainage Area (Square Miles)	Discharge (cubic feet/second)			
		10-Year	50-Year	100-Year	500-Year
At Locust Grove Rd.	2.9	40	80	95	150
Pierce Gulch					
	2.0	140	760	1,100	1,700
Polecat Gulch					
	1.2	110	580	780	1,300
Seaman Gulch					
	1.8	140	760	1,100	1,700
South Channel Boise River Eagle Island					
	--c	--d	--d	4,900	14,000
South Channel Boise River Right Overbank					
	--c	--d	--d	3,250	4,000
Spring Valley Creek					
Below Brookside Lane	19.2	425	679	798	1,120
Stewart Gulch					
At mouth	9.1	169	538	1,494	11,794
Tenmile Creek					
At Roosevelt Road	10.0	215	415	510	820
At Tenmile Community Church	1.8	83	160	200	320
At Interstate 84	6.5	185	350	440	680
At Locust Grove Road	--d	170	320	400	620
At Amity Road	5.0	--c	--c	350	--c
At Eagle Road	3.4	--c	--c	275	--c
Warms Springs Creek					
	5.0	230	1,860	2,500	4,300

a. Drainage area above Lucky Peak Dam
b. Regulated Discharges
c. Data not available
d. Data not applicable

Repetitive Loss Areas

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses more than $1,000
- Two paid losses more than $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. Studies have found that many of these properties are outside any mapped 1 percent annual chance floodplain. The key identifiers for repetitive loss properties are the existence of NFIP insurance policies and claims paid by the policies.

Based on data provided by FEMA, there are two identified repetitive loss properties within the planning area as of March 14, 2022: one in the City of Garden City and one in the City of Eagle.

FEMA further designates as severe repetitive loss any NFIP-insured single-family or multi-family residential building for which either of the following is true:

- The building has incurred flood-related damage for which four or more separate claims payments have been made, with the amount of each claim (including building and contents payments) exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000
- At least two separate claims payments (building payments only) have been made under NFIP coverage, with the cumulative amount of claims exceeding the market value of the building.

To qualify as a severe repetitive loss property, at least two of the claims must be within 10 years of each other, and claims made within 10 days of each other are counted as one claim. In determining severe repetitive loss status, FEMA considers the loss history since 1978, or from the building's construction if it was built after 1978, regardless of any changes in the ownership of the building.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

14.2.7 Warning Time

Due to the extended pattern of weather conditions needed to cause serious flooding, warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advanced of potential flash flooding danger.

EMCR has developed a Flood Response Plan outlining the response to flooding in the planning area. Since flows on the Boise River system are regulated by the Corps of Engineers, warning on this system is tied to water release rates set by the Corps. Each significant increase in release rates from Lucky Peak Dam requires notification to emergency managers by the Corps. These announcements usually occur well in advance (24 to 48 hours) of increased release rates.

The National Weather Service (NWS) uses a two-tiered warning system for flash flooding:

- A Flash Flood Watch covers a large area (a thousand square miles or greater, usually several counties) for up to 12 hours. A Flash Flood Watch is issued when conditions are favorable to produce flash flooding on the Boise Foothills within the next 12 hours.
- A Flash Flood Warning generally covers a very small area (a few square miles to several hundred square miles) for up to 6 hours. A flash flood warning for the Boise Foothills is issued under the following conditions:
  - Rainfall in the Boise Foothills is occurring or is imminent and is falling at a rate that could cause flash flooding.
  - Heavy rainfall is falling on snowpack and flash flooding is occurring or imminent.
  - Flash flooding is occurring and has been confirmed by stream flow gauges, NWS spotters, emergency responders or citizens.

There is no warning system for flooding from canal breaches or failures. Warning for failures of these systems will occur likely well after the event has begun.

14.2.8 Natural and Beneficial Floodplain Functions

What Are Beneficial Floodplain Functions?

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Riparian areas—the zones along the edge of a river or stream that are influenced by or are an influence upon the water body—generally have a greater diversity and structure of vegetation than upland areas. Shelter, space, food and water available in these areas determine the health of wildlife populations. Riparian communities are of special importance for many animals since water supply is a major limiting factor to the animals' population. Animals depend upon a supply of water for their existence.

The Boise River Enhancement Plan

The Boise River Enhancement Plan is a community-generated plan to improve Boise River water quality, aquatic and riparian habitat, and stream channel function from Lucky Peak Dam to the Snake River. It provides an overview of the current health of the river and identifies how, what and where enhancement can be achieved to bring the most effective benefits to the river (Boise River Enhancement Network 2015).

14.3 EXPOSURE

A Level 2 Hazus analysis was used to assess exposure to flooding in the planning area. Where possible, the Hazus default data was enhanced using local GIS data from county, state and federal sources.

14.3.1 Population

All populations living in mapped flood zones would be exposed to the risk of a flood. Figure 14-2 and Figure 14-3 summarizes the population living in the 1 percent and 0.2 percent annual chance flood zones, respectively, by municipality.

14.3.2 Property

The value of exposed buildings and contents in each jurisdiction is summarized in Figure 14-4 and Figure 14-5 for the 1 percent annual chance and 0.2 percent annual chance flood zones, respectively. Figure 14-6 and Figure 14-7 summarize the number of structures in the 1 percent annual chance and 0.2 percent annual chance flood zones, respectively by municipality and occupancy class.

14.3.3 Critical Facilities

GIS analysis determined that 197 of the planning area's critical facilities (9 percent of the planning area total) are in the 1 percent annual chance floodplain and 542 (26 percent) are in the 0.2 percent annual chance floodplain. Figure 14-8 summarizes critical facilities in the mapped floodplains for the countywide planning area. Detailed results by jurisdiction are provided in Appendix D.

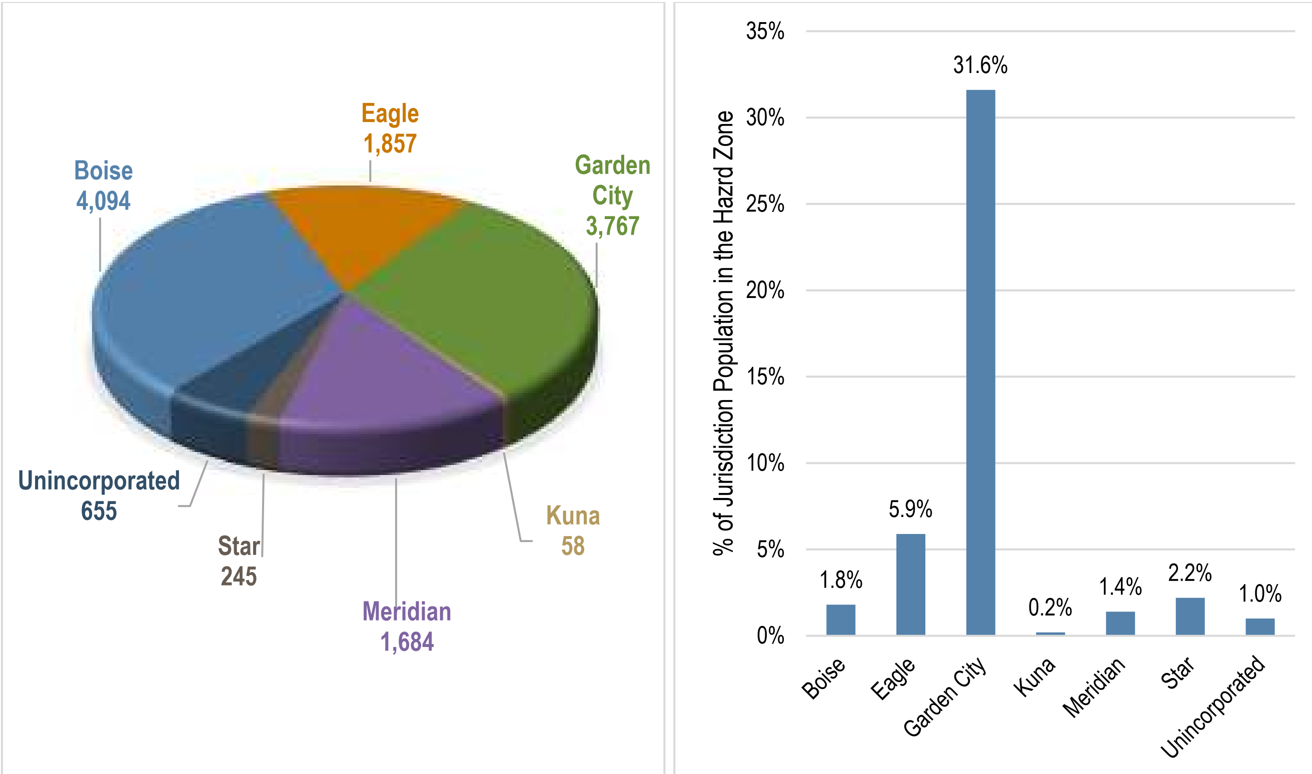


Figure 14-2. Population in the 1 Percent Annual Chance Flood Zone

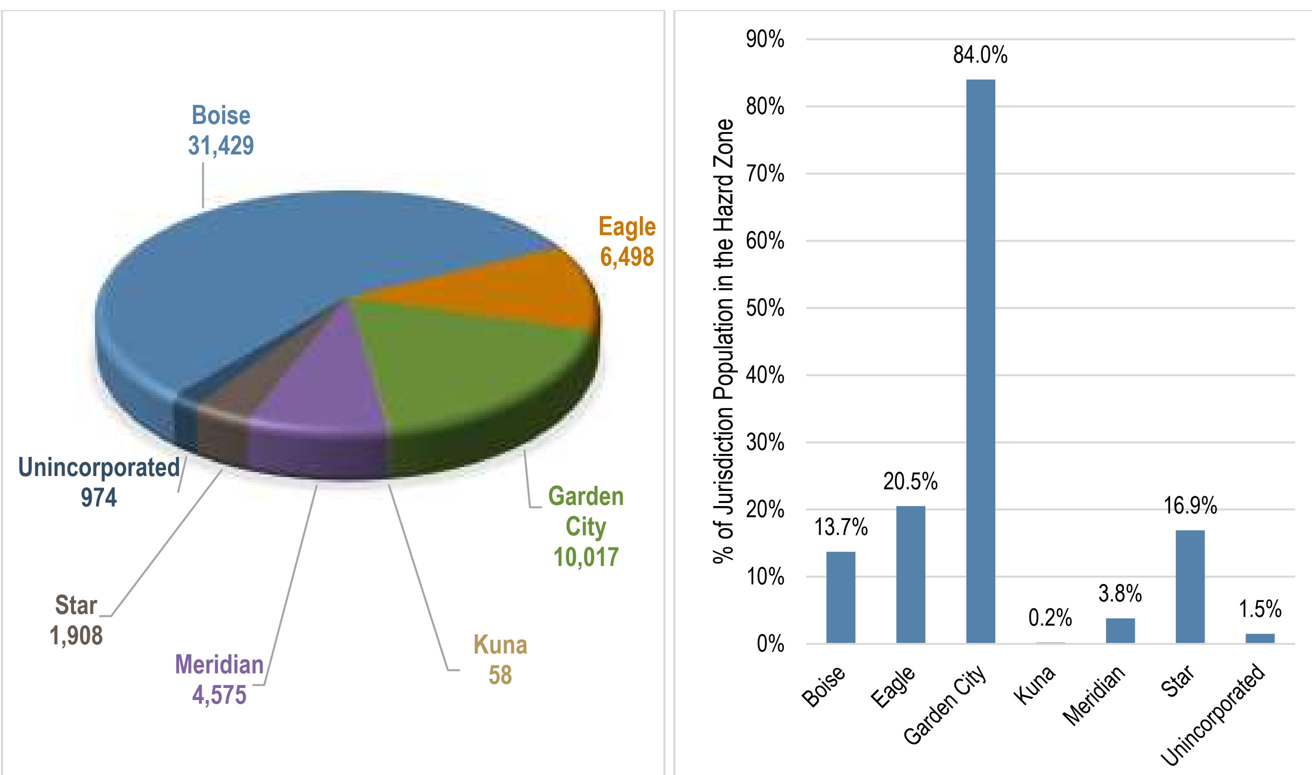


Figure 14-3. Population in the 0.2 Percent Annual Chance Flood Zone

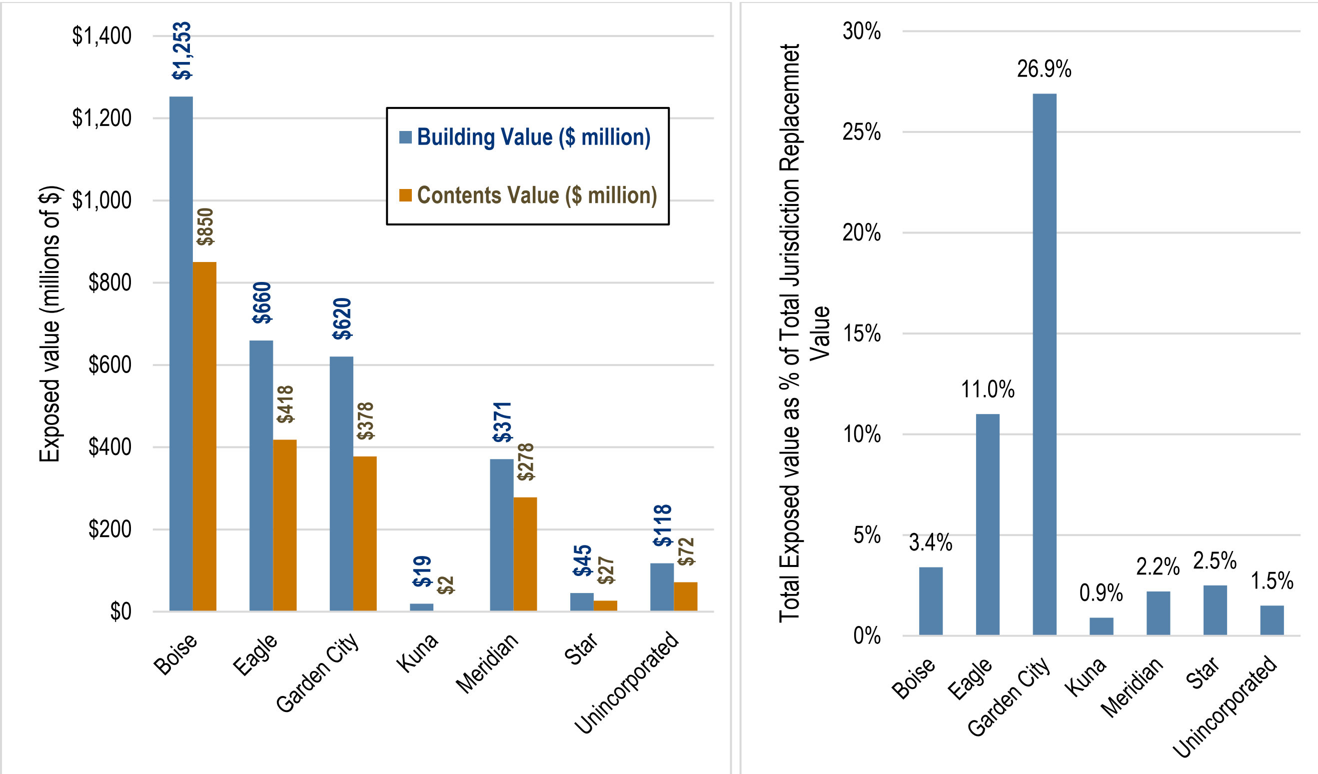


Figure 14-4. Value of Property in the 1% Annual Chance Flood Hazard Area

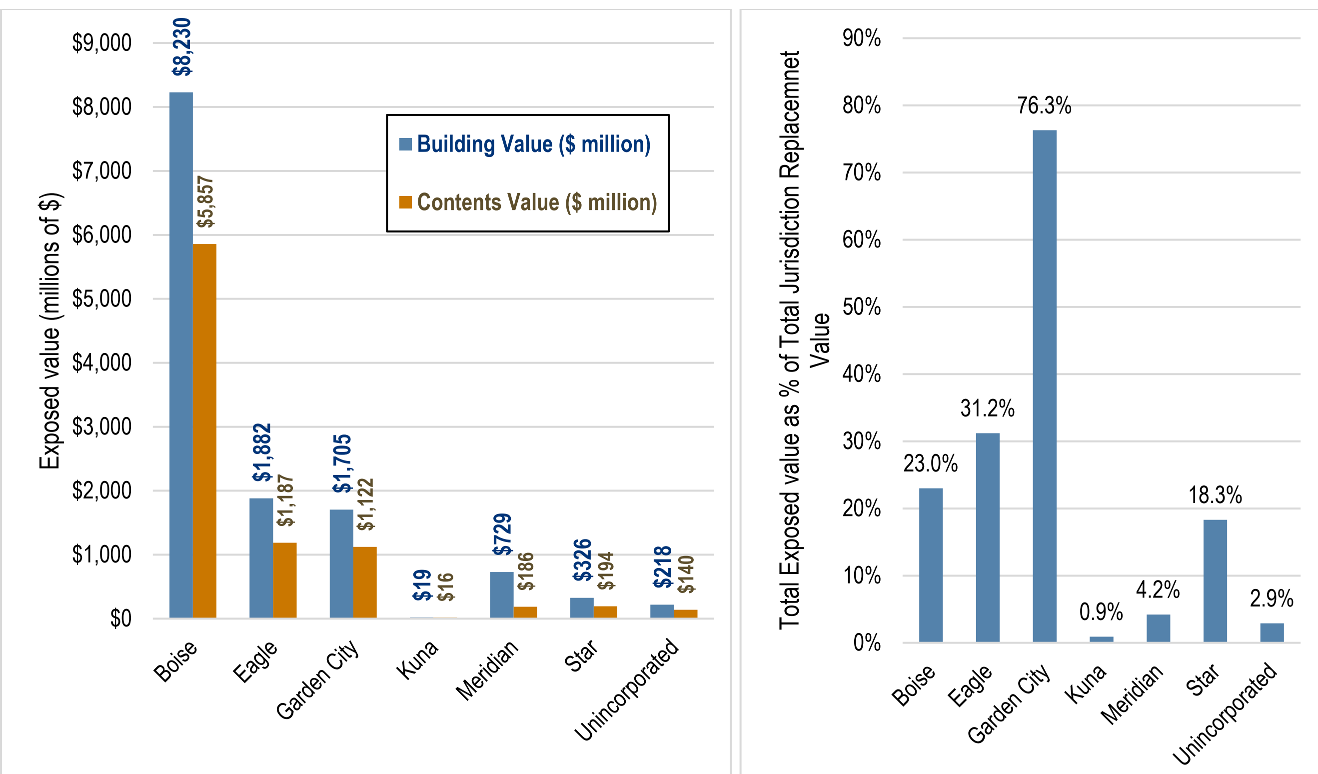


Figure 14-5. Value of Property in the 0.2% Annual Chance Flood Hazard Area

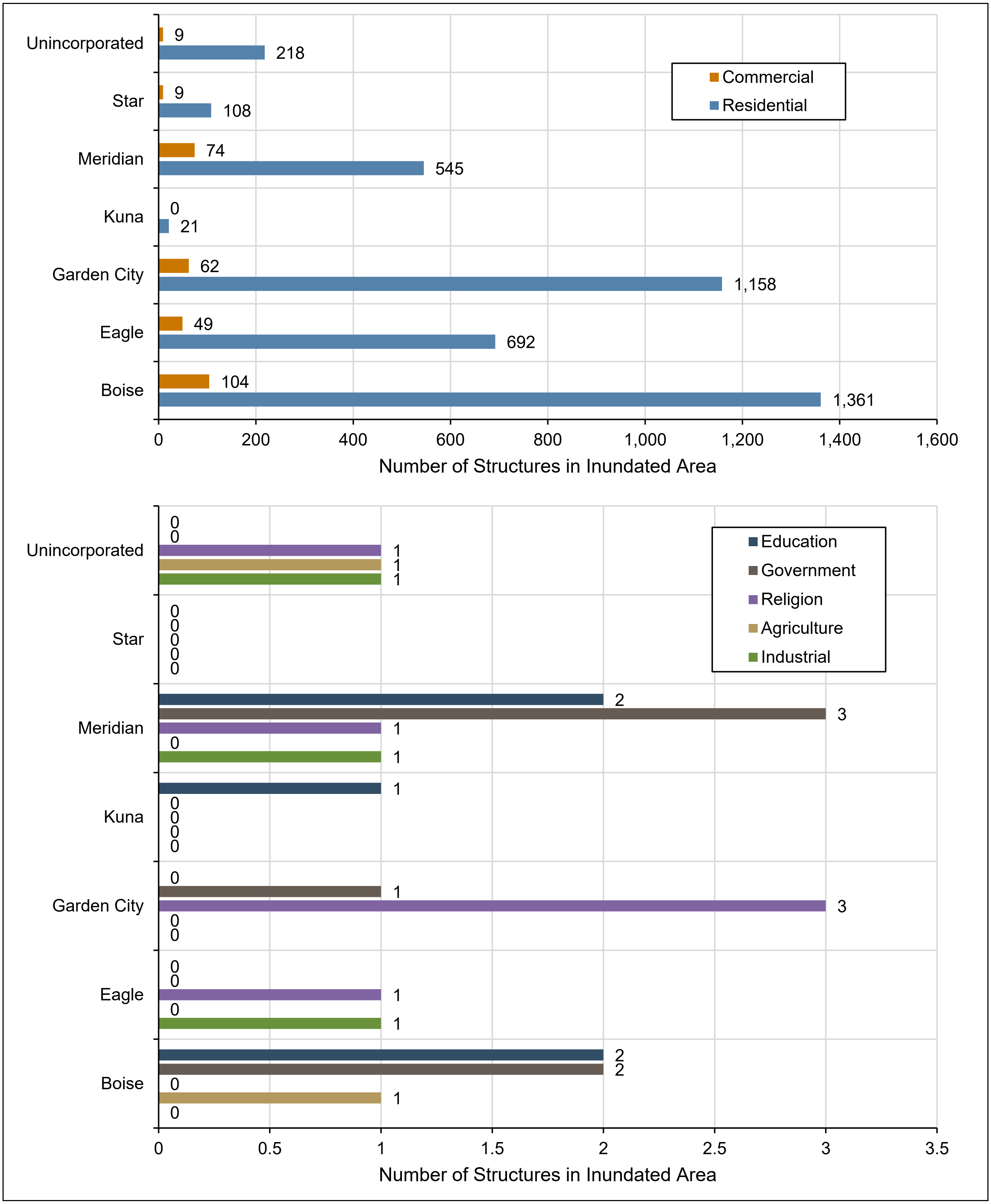


Figure 14-6. Number of Structures Within the 1% Annual Chance Flood Hazard Area

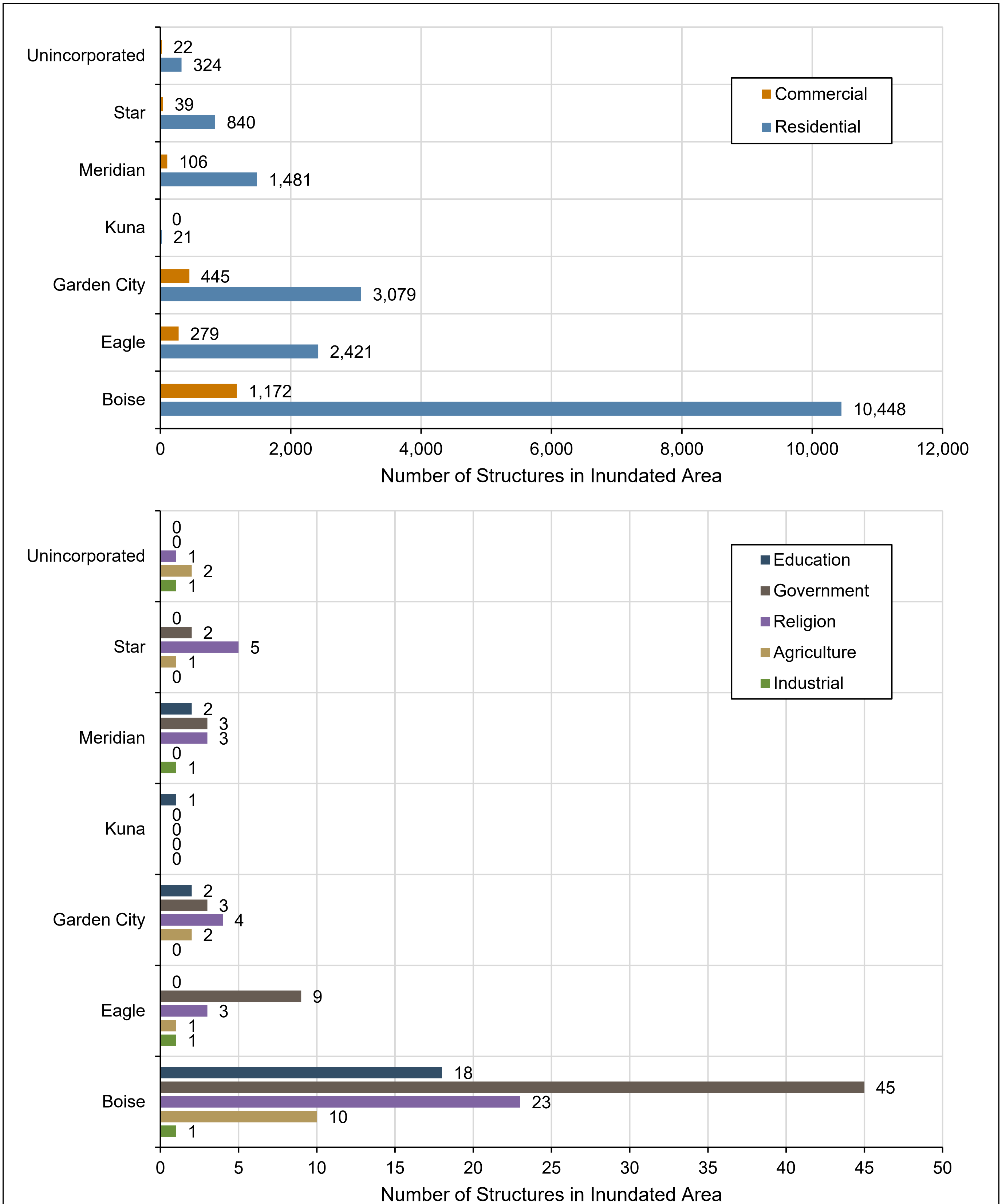


Figure 14-7. Number of Structures Within the 0.2% Annual Chance Flood Hazard Area

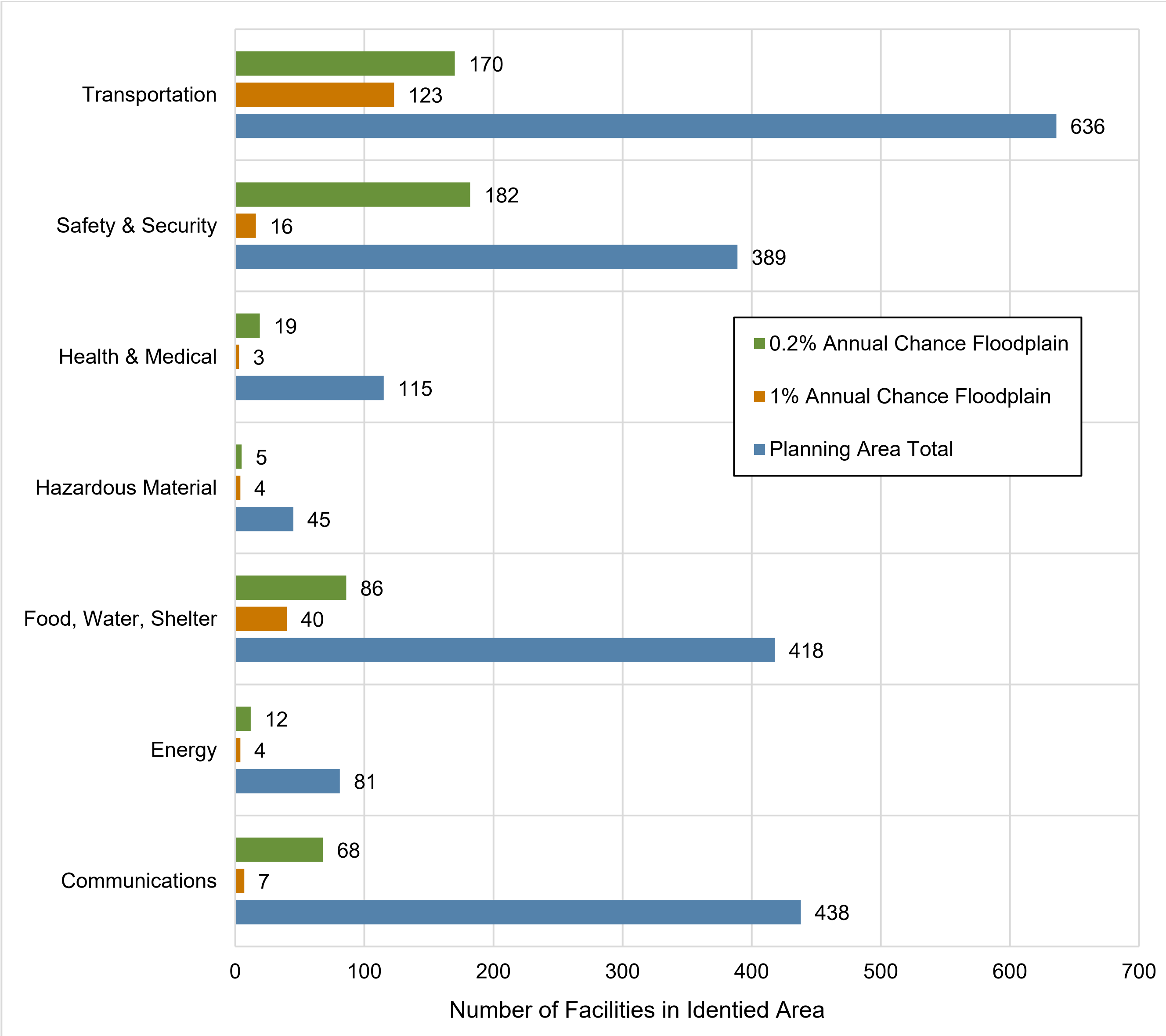


Figure 14-8. Critical Facilities in the Mapped Floodplains and Countywide

14.3.4 Environment

Flooding is a natural event, and floodplains provide many natural and beneficial functions. Nonetheless, with human development factored in, flooding can impact the environment in negative ways. Migrating fish can wash into roads or over dikes into flooded fields, with no possibility of escape. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments and levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

Many species of mammals, birds, reptiles, amphibians and fish live in Ada County in plant communities that are dependent upon streams, wetlands and floodplains. Changes in hydrologic conditions can result in a change in the plant community. Wildlife and fish are impacted when plant communities are eliminated or fundamentally altered to reduce habitat. Wildlife populations are limited by shelter, space, food and water. Since water supply is a major limiting factor for many animals, riparian communities are of special importance. Riparian areas are the zones along the edge of a river or stream that are influenced by or are an influence upon the water body. Human disturbance to riparian areas can limit wildlife's access to water, remove breeding or nesting sites, and eliminate suitable areas for rearing young. Wildlife relies on riparian areas in the following ways:

- Mammals depend upon a supply of water for their existence. Riparian communities have a greater diversity and structure of vegetation than other upland areas. Beavers and muskrats are now recolonizing streams, wetlands and fallow farm fields, which are converted wetlands. As residences are built in rural areas, there is an increasing concern with beaver dams causing flooding of low-lying areas and abandoned farm ditches being filled in, which can lead to localized flooding.
- A great number of birds are associated with riparian areas. They swim, dive, feed along the shoreline, or snatch food from above. Rivers, lakes and wetlands are important feeding and resting areas for migratory and resident waterfowl. Threatened or endangered species such as the bald eagle or the peregrine falcon eat prey from these riparian areas.
- Amphibians and reptiles are some of the least common forms of wildlife in riparian areas, but species such as the western pond turtle and the spotted frog are known to inhabit the waterways and wetlands.
- Fish habitat throughout the county varies widely based on natural conditions and human influence.

14.4 VULNERABILITY

14.4.1 Population

Vulnerable populations are all populations living within the mapped floodplain who are incapable of escaping the area before floodwaters arrive. Impacts on persons and households for the mapped floodplains were estimated through the Level 2 Hazus analysis. Detailed results by jurisdiction are included in Appendix D; summaries are provided in Table 14-6.

14.4.2 Property

Figure 14-9 and Figure 14-10 summarize the Level 2 Hazus analysis of the flood hazard for the 1 percent annual chance and 0.2 percent annual chance floodplains, respectively.

14.4.3 Critical Facilities

Estimated Damage by Category

Hazus was used to estimate the percent of damage to the building and contents of critical facilities, using depth/damage function curves. The results are summarized in Figure 14-11 and Figure 14-12.

Table 14-6. Estimated Flood Impacts on Persons and Households

	Number of Displaced Residents	Number of Residents Requiring Short-Term Shelter
1% Annual Chance Flood Zone		
Boise	1,042	133
Eagle	466	61
Garden City	2,225	153
Kuna	4	1
Meridian	231	45
Star	92	7
Unincorporated	84	16
Total	**4,144**	**416**
0.2% Annual Chance Flood Zone		
Boise	20,532	1,070
Eagle	3,562	226
Garden City	8,679	405
Kuna	4	1
Meridian	1,246	125
Star	1,074	54
Unincorporated	151	23
Total	**35,247**	**1,904**

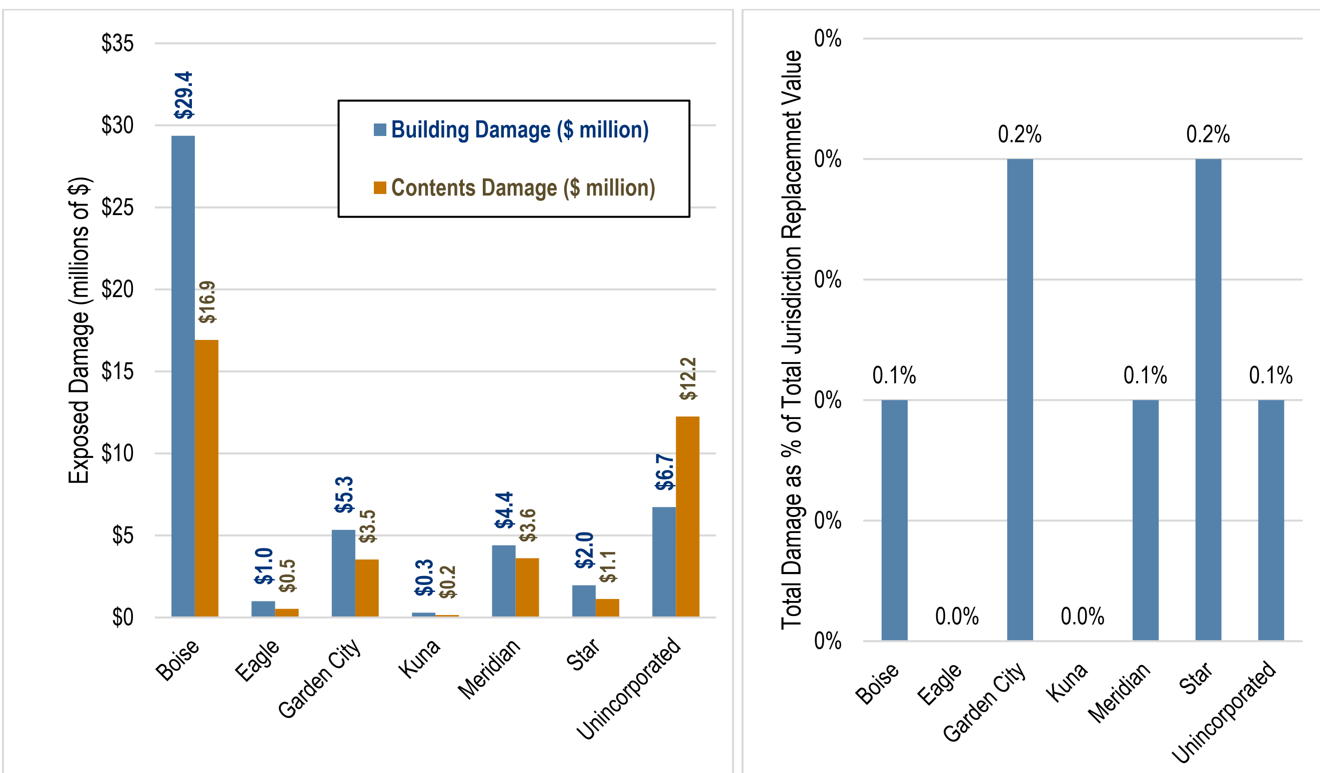
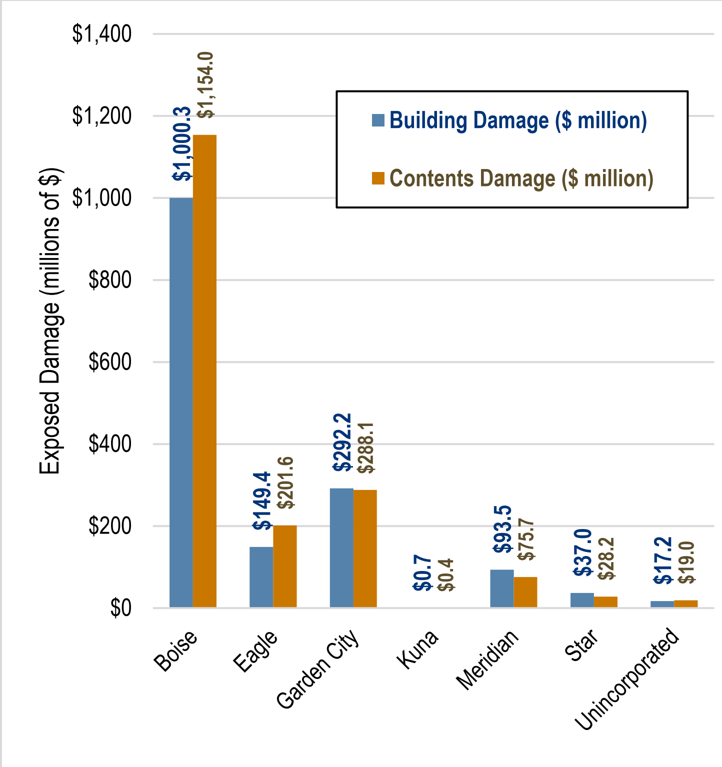


Figure 14-9. Estimated Property Damage in 1% Annual Chance Floodplain



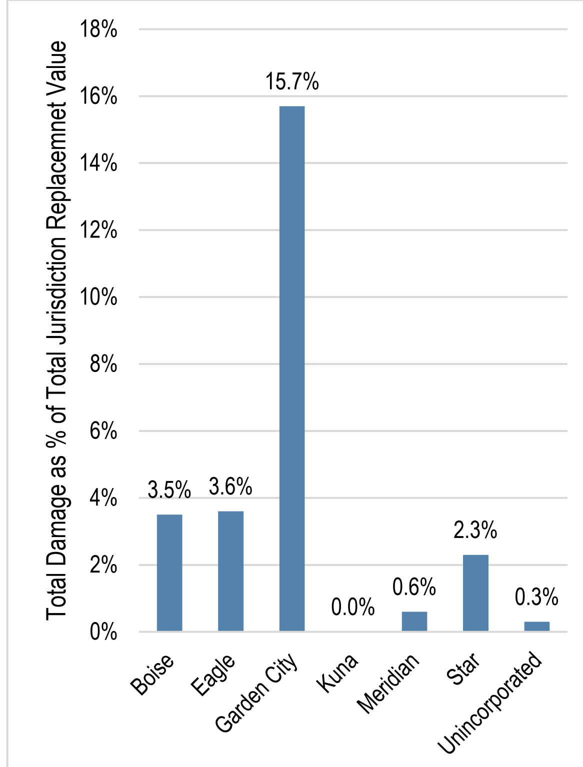
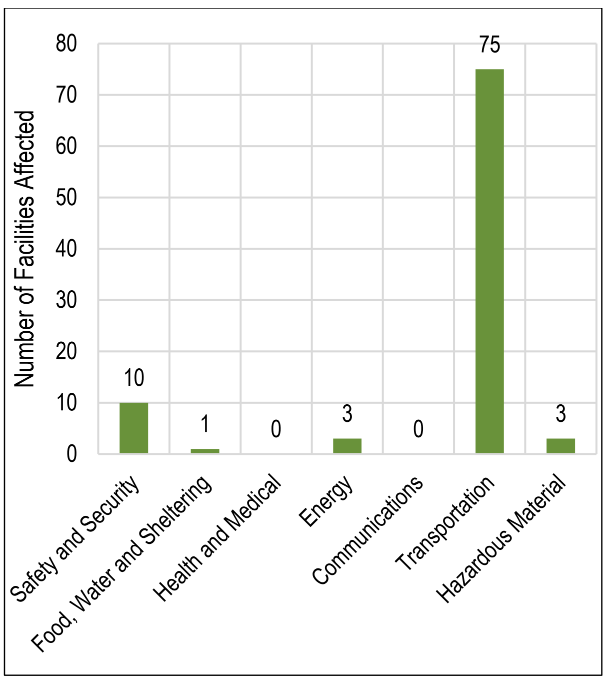


Figure 14-10. Estimated Property Damage in 0.2% Annual Chance Floodplain



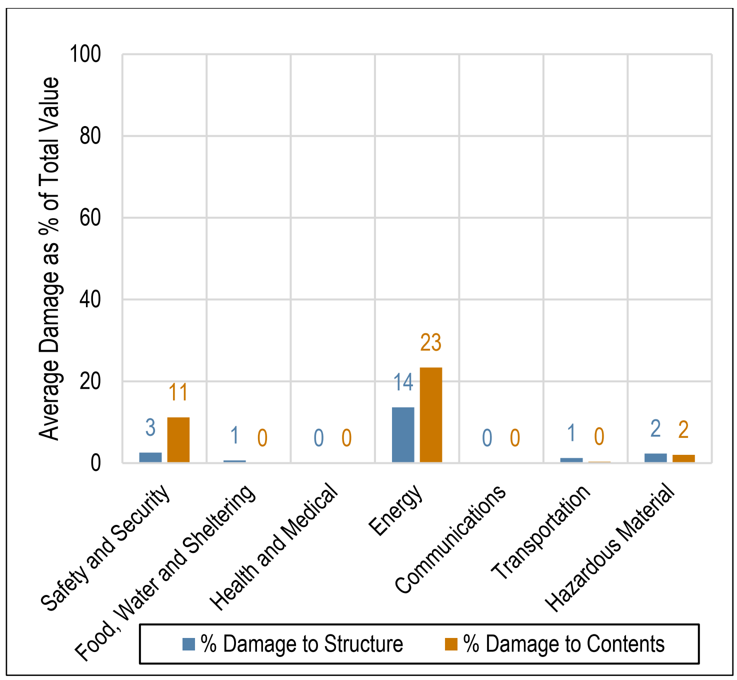


Figure 14-11. Estimated Damage to Critical Facilities from 1% Annual Chance Flood

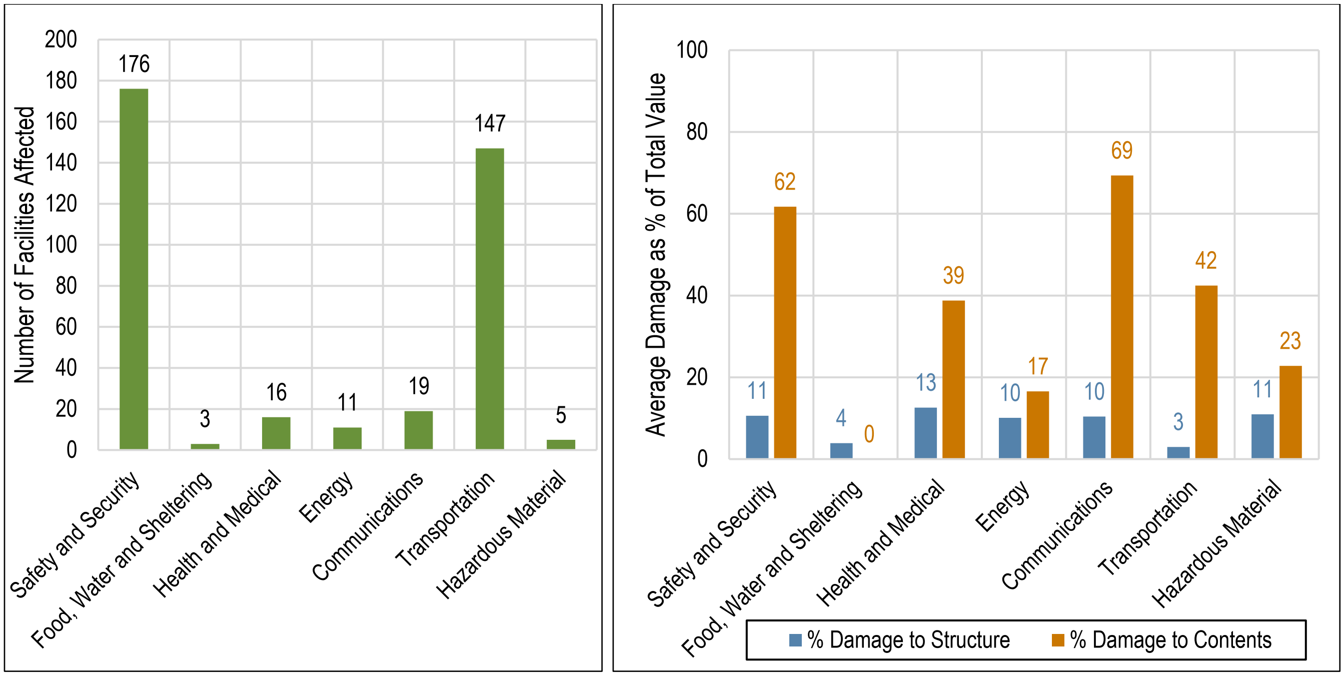


Figure 14-12. Estimated Damage to Critical Facilities from 0.2% Annual Chance Flood

Tier II Facilities

Tier II facilities are those that use or store materials that can harm the environment if damaged by a flood. During a flood event, containers holding hazardous materials can rupture and leak into the surrounding area. These facilities could release chemicals that cause cancer or other human health effects, significant adverse acute human health effects, or significant adverse environmental effects. The risk assessment identified three such facilities that would be affected by the 1 percent annual chance flood and five that would be affected by the 0.2 percent annual chance flood.

Utilities and Infrastructure

Roads that are blocked or damaged can isolate community members and can prevent access throughout the planning area, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Underground utilities can be damaged. Levees can fail or be overtopped, inundating the land that they protect. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers, and streams. The following sections describe the risk assessment for specific types of critical infrastructure.

Roads

The following major roads in Ada County pass through the 1 percent annual chance floodplain and thus are exposed to flooding:

- 8th Street
- Highway 21

- Broadway Avenue
- Capitol Blvd.
- Eagle Road
- Eckert Road
- Glenwood Street
- Highway 44
- Highway 55
- Interstate 84 (Connector)
- Linder Road
- Veterans Memorial Parkway

Some of these roads are built above the flood level, and others function as levees to prevent flooding. Still, in severe flood events these roads can be blocked or damaged, preventing access to some areas.

Bridges

Flooding events can significantly impact road bridges. These are important because often they provide the only ingress and egress to some neighborhoods. An analysis showed that there are 74 bridges that would be affected by the 1 percent annual chance floodplain and 144 bridges that would be affected by the 0.2 percent annual chance floodplain.

Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Floodwaters can back up drainage systems, causing localized flooding. Culverts can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers and streams. The risk assessment identified one water/wastewater facility that would be affected by the 1 percent annual chance floodplain and three that would be affected by the 0.2 percent annual chance floodplain.

14.5 DEVELOPMENT TRENDS

The value of planning area properties exposed to the 1 percent annual chance flood hazard has increased by 59 percent ($1.9 billion) since the last hazard mitigation plan update in 2017. The value exposed to the 500-year flood hazard has increased by 4.51 percent. This increase in risk exposure can be attributed to the population growth of 13.6 percent in the same period.

Current comprehensive planning in the planning area appears to be adequately equipped to dictate sound land use practices within the designated floodplain. The key to this will be to identify flood hazard areas that accurately reflect the true flood risk within the planning area. Ada County finalized new flood maps through FEMA’s Risk MAP program during the maintenance period of the previous plan. The new maps are based on the abundance of available information on flood risk from creditable agencies such as IDWR and the Corps of Engineers.

All municipal planning partners for this plan are participants in the NFIP and have adopted flood damage prevention ordinances in response to its requirements. With 71 percent of communities in the county participating in the CRS program, there is incentive to adopt consistent, appropriate, higher regulatory standards in communities with the highest degree of flood risk. All municipal planning partners have committed to maintaining their good standing under the NFIP through actions identified in this plan. Communities participating or considering participation in the CRS program will be able to refine this commitment using CRS programs and templates as a guide.

14.6 SCENARIO

The primary water courses in Ada County have the potential to flood at irregular intervals, generally in response to a succession of intense thunderstorms in summer or rain-on-snowpack events in winter. Storm patterns of warm, moist air usually occur between early November and late March. A series of such weather events can cause severe flooding in the planning area. The worst-case scenario is a series of storms that flood numerous drainage basins in a short time. This could overwhelm the response and floodplain management capability within the planning area. Major roads could be blocked, preventing critical access for many residents and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems.

Additionally, the potential impacts of future climate conditions on the operations of Lucky Peak Dam are real. The Boise River could see increased flows in response to a changing hydrograph that dictates dam operations.

14.7 ISSUES

The planning team has identified the following flood-related issues relevant to the planning area:

- The extent of the flood-protection currently provided by flood control facilities (dams, dikes and levees) is not known due to the lack of an established national policy on flood protection standards.
- The risk associated with the flood hazard overlaps the risk associated with other hazards such as earthquake, landslide and fishing losses. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- Additional efforts to coordinate land-use practices across all affected jurisdictions within the planning area are needed to expand floodplain management practices beyond the minimum requirements of the NFIP.
- Potential future climate conditions could alter flood conditions in Ada County.
- More information is needed on flood risk to support the concept of risk-based analysis of capital projects.
- There needs to be a sustained effort to gather historical damage data, such as high water marks on structures and damage reports, to measure the cost-effectiveness of future mitigation projects.
- Ongoing flood hazard mitigation will require funding from multiple sources.
- There needs to be a coordinated hazard mitigation effort between jurisdictions affected by flood hazards in the county.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods.
- The concept of residual risk should be considered in the design of future capital flood control projects and should be communicated with residents living in the floodplain.
- The promotion of flood insurance as a means of protecting private property owners from the economic impacts of frequent flood events should continue.
- Existing floodplain-compatible uses such as agricultural and open space need to be maintained. There is constant pressure to convert these existing uses to more intense uses within the planning area during times of moderate to high growth.

- The economy affects a jurisdiction's ability to manage its floodplains. Budget cuts and personnel losses can strain resources needed to support floodplain management.
- A buildable-lands analysis that looks at vacant lands and their designated land use would be a valuable tool in helping decision-makers make wise decisions about future development.
- The risk associated with flooding due to canal failure is unknown at this time. Data on this risk need to be gathered to better support communities' preparedness and response efforts.

15. HAZARDOUS MATERIALS RELEASE

15.1 GENERAL BACKGROUND

Hazardous materials are substances that are considered severely harmful to human health and the environment, as defined by the U.S. Environmental Protection Agency's (EPA's) Comprehensive Environmental Response, Compensation, and Liability Act (commonly known as Superfund). Many hazardous materials are commonly used substances that are harmless in their normal uses but dangerous if released. The EPA designates about 800 substances as hazardous and identifies many more as potentially hazardous due to their characteristics and the circumstances of their release (EPA 2022). If released or misused, hazardous substances can cause death, serious injury, long-lasting health effects, and damage to structures, other properties, and the environment. Hazardous materials are present in nearly every city and county in the United States in facilities that produce, store, or use them:

- Fuel storage vessels (both in and above ground)
- Water treatment plants use chlorine to eliminate bacterial contaminants.
- Hazardous materials are transported along interstate highways and railways daily.
- The natural gas used in homes and businesses is a dangerous substance when a leak occurs.
- Many businesses, through intentional action, lack of awareness or accidental occurrences, have contamination in and around their property.

Hazardous material releases can pose a risk to life, public health, air quality, water quality and the environment. They may result in the evacuation of a facility or an entire neighborhood. In addition to the immediate risk, long-term public health and environmental impacts may result from sustained exposure to certain substances.

15.1.1 Types of Incidents

The following are the most common types of hazardous material incidents:

- **Fixed-Facility Hazardous Materials Incident**—This is the uncontrolled release of materials from a fixed site capable of posing a risk to health, safety, and property as determined by the Resource and Conservation and Recovery Act. It is possible to identify and prepare for a fixed-facility incident because federal and state laws require those facilities to notify state and local authorities about what is being used or produced at the site.
- **Hazardous Materials Transportation Incident**—A hazardous materials transportation incident is any event resulting in uncontrolled release of materials during transport that can pose a risk to health, safety, and property as defined by Department of Transportation Materials Transport regulations. Transportation incidents are difficult to prepare for because there is little if any notice about what materials could be

involved should an accident happen. Hazardous materials transportation incidents can occur at any place within the country, although most occur on the interstate highways or major federal or state highways, or on major rail lines.

15.1.2 Hazardous Materials Resulting from Hazard Events

Debris generated from natural disasters often includes hazardous materials. Large quantities of debris from natural disasters can hinder emergency personnel, damage or block access to necessary infrastructure, and pose threats to human health and the environment (State of Idaho Hazard Mitigation Plan 2018). Natural disaster debris that may contain hazardous materials includes:

- Aluminum composite material—asbestos pipe wrap, siding, ceiling and floor tiles
- Ammunition and explosives
- Asphalt
- Building contents—furniture, personal property
- Cylinders and tanks
- Electronics waste—televisions, computers, cell phones
- Household waste—household cleaners, freezer and refrigerator coolant
- Medical waste
- Municipal solid waste—trash, garbage
- PCB-containing waste—transformers, capacitors, other electrical equipment
- Pharmaceuticals
- Radiological-contaminated waste—hospital equipment
- Tires
- Toxic materials—batteries, pesticides, solvents, paint thinners, mercury-containing devices
- Treated wood—utility poles, fencing, decks
- Used oil and oil-contaminated waste
- Vehicles and vessels
- White goods—household appliances, such as stoves, refrigerators, washers/dryers, air conditioner units

15.1.3 Secondary Hazards

Secondary hazards associated with fixed-facility hazardous substance releases include those impacting the health of the community and environment. The secondary impacts have the potential to occur regardless of the mode or the source of release. In addition to the secondary impacts noted for the fixed-facility hazard, other impacts may include damage to infrastructure such as road beds or bridges in a hazardous materials transportation incident.

15.2 HAZARD PROFILE

15.2.1 Past Events

The Pipeline and Hazardous Materials Safety Administration tracks hazardous material releases through its nationwide database. Incidents are listed by state. Regulations in 49 CFR govern situations where hazardous materials are released and establish notification and reporting requirements. Unless they are properly reported, it is difficult to identify and track past hazardous materials releases. Between January 1, 2000, and December 31, 2021, 495 hazardous material incidents in Ada County were reported (Pipeline and Hazardous Materials Safety Administration 2022). None of these resulted in injury or fatality. One caused a serious evacuation and three incidents resulted in closure of a main transportation artery. Total damages were estimated at more than $514,000. See Table 15-1 for events by city.

Table 15-1. Hazardous Materials Incidents by City, 2000-2021

City	Mode of Transportation	Number of Events	Damage
Boise	Air	31	$0
	Highway	342	$190,780
Eagle	Highway	1	$0
Garden City	Highway	4	$0
Kuna	Highway	2	$0
Meridian	Highway	115	$323,784

15.2.2 Location

Because hazardous materials are so widely used, stored and transported, a hazardous material event could take place almost anywhere. 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. According to the 2018 Idaho State Hazard Mitigation Plan, there are 213 Tier II facilities and 10 Toxic Release Inventory sites in Ada County (State of Idaho Hazard Mitigation Plan 2018). Ada County does not contain any hazardous waste Superfund sites (EPA 2021).

15.2.3 Frequency

Hazardous materials releases are difficult to predict; however, based on past events (Table 15-1), the County can expect to experience an event nearly 24 times a year.

15.2.4 Severity

Hazardous material releases can contaminate the air, water and soil. Releases may result in injury or loss of life. Hazardous materials can be carried quickly by water and wind, affecting the population and environment in surrounding areas.

For both accidental and intentional hazardous material releases, the severity of impact varies with mitigating or exacerbating conditions. Measures taken in advance of an event can reduce its severity. For example, shielding by sheltering in place and primary and secondary containment measures can protect people and the environment. However, adverse weather conditions, building code violations, and maintenance failures can substantially increase the hazard severity.

Severity is also dependent on the type of substance released and the response time of hazardous materials teams. The area with closest to the release is generally at greatest risk, but hazardous materials can be dispersed over large areas and affect the environment for a long period of time.

15.2.5 Warning Time

Warning times vary for incidents fixed facilities. Incidents may be sudden without any warning, such as an explosion, or may develop slowly, such as a leaking container. Facilities that store extremely hazardous substances are required to notify local officials when an incident occurs. Local emergency responders and emergency management officials determine the need to evacuate the public or to advise to shelter in place.

The amount of warning time for incidents associated with hazardous substances in transit varies based on the nature and scope of the incident. If an explosion does not occur immediately following an accident, there may be time for warning adjacent neighborhoods and facilitating appropriate protective actions.

15.3 EXPOSURE AND VULNERABILITY

Due to the nature of a hazardous materials release, all people, property and the environment of the planning area are exposed to some degree to the hazard. Populations who live or work near major transportation routes or sites that use and store large quantities of hazardous materials are likely to be more vulnerable.

15.4 DEVELOPMENT TRENDS

Not all land-use regulations restrict building around industrial facilities or along transportation routes. As the population increases, development will continue to increase in these areas, thereby exposing a greater number of individuals to the risk of a hazardous material release. Increased development will lead to increased vulnerability and potential losses.

15.5 SCENARIO

A worst-case event would involve a release on a major transportation route, in a developed area along a waterway. High winds could quickly spread the release. Such an event would have both short-term and longer-term effects. Initially, the affected transportation route would be closed, the surrounding area evacuated, and emergency response teams deployed. Longer-term effects would include environmental damage.

15.6 ISSUES

Important issues associated with hazardous materials release events in Ada County include the following:

- Facilities using or transporting hazardous materials need to continue to be monitored and regulated.
- Education needs to be provided to workers and emergency response personnel in appropriate techniques and safety measure for dealing with spills and incidents. This includes Hazardous Waste Operations & Emergency Response training and certification.
- The general public should be made aware of the hazards of household chemical products and methods for properly disposing of these products.

16. LANDSLIDE

16.1 GENERAL BACKGROUND

16.1.1 Landslide Causes

A landslide is a mass of rock, earth or debris moving down a slope. Slides are caused by a combination of geological and climate conditions and the influence of urbanization. They can be initiated by storms, earthquakes, fires, volcanic eruptions or human modification of the land. Vulnerable natural conditions are affected by human development and the infrastructure that supports it. In some cases, irrigation increases the landslide potential. The following factors can contribute to slide formation:

- Change in slope of the terrain
- Increased load on the land
- Shocks and vibrations
- Change in water content
- Groundwater movement
- Frost action
- Weathering of rocks
- Removing or changing the vegetation covering slopes

Ground saturation by water, steepening of slopes by erosion or construction, alternate freezing and thawing, and earthquake shaking are all factors that contribute to landslides. Landslides are typically associated with periods of heavy rainfall or rapid snow melt. Rain-saturated hill slopes and increased groundwater pressure on porous hillsides are triggering agents of slope failure. In areas burned by forest and brushfires, a lower threshold of precipitation may initiate landslides.

16.1.2 Landslide Risk Areas

Landslides are typically a function of soil type and steepness of slope. Soil type is a key indicator for landslide potential and is used by geologist and geotechnical engineers to determine soil stability for construction standards. In general, landslide hazard areas are where the land has characteristics that contribute to the risk of the downhill movement of material, such as the following:

- A slope greater than 33 percent
- A history of landslide activity or movement during the last 10,000 years
- Stream activity that has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable
- The presence or potential for snow avalanches
- The presence of an alluvial fan, indicating vulnerability to the flow of debris or sediments
- The presence of impermeable soils such as silt or clay, mixed with granular soils such as sand and gravel.

Certain combinations of earth materials and steep topography increase the likelihood of slope failure. In Idaho, examples include basalt with sedimentary interbeds, altered volcanic rocks, fractured metamorphic rocks, glacial and lake deposits, and weathered granite. Basalt lava flows exposed in canyons hundreds of feet deep occur throughout the Snake River Plain and Columbia Plateau. Large landslides tend to form where the basalts are underlain by unconsolidated sediments. In some cases, irrigation increases the landslide potential. At Salmon Falls Creek south of Buel, translational and rotational slides and multiple lateral spreads have occurred where basalt overlies lake and fluvial sediments. On steep slopes in Idaho's river canyons, metamorphic rocks fractured by faulting and folding are prone to fail as falls, topples, and translational slides. Such landslides are common along the Salmon River and in Hells Canyon.

16.1.3 Landslide Types

The following are common types of mass landslides (see Figure 16-1):

- **Rotational Slides**—Blocks of fine-grained sediment that rotate and move down slope
- **Translational Slides**—Sediments that move along a flat surface without a rotational component
- **Block Slides**—Blocks of rock that slide along a slip plane as a unit down a slope.
- **Rock Falls**—Blocks of rock that fall away from a bedrock unit without a rotational component
- **Rock Topples**—Blocks of rock that fall away from a bedrock unit with a rotational component
- **Debris Flows (Mudslides)**—Rivers of rock, earth, organic matter, and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt.
- **Debris avalanche**—A debris flow that travels faster than about 10 miles per hour (mph). Speeds in excess of 20 mph are not uncommon, and speeds in excess of 100 mph, although rare, can occur. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars, and anything else in its path.
- **Earth Flows**—Fine-grained sediments that flow downhill and typically form a fan structure
- **Creep**—A slow-moving landslide often only noticed through crooked trees and disturbed structures
- **Lateral spread**—Landslides that commonly form on gentle slopes and that have rapid fluid-like flow movement, like water

16.1.4 Secondary Hazards

Landslides can cause secondary effects such as blocking access to roads, which can isolate residents and businesses and delay transportation. This could result in economic losses for businesses. Other potential problems are power and communication failures. Vegetation or poles on slopes can be knocked over, resulting in possible losses to power and communication lines. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary loss for residents. They also can damage rivers or streams, potentially harming water quality, fisheries and spawning habitat.

Source: (U.S. Geological Survey 2006)

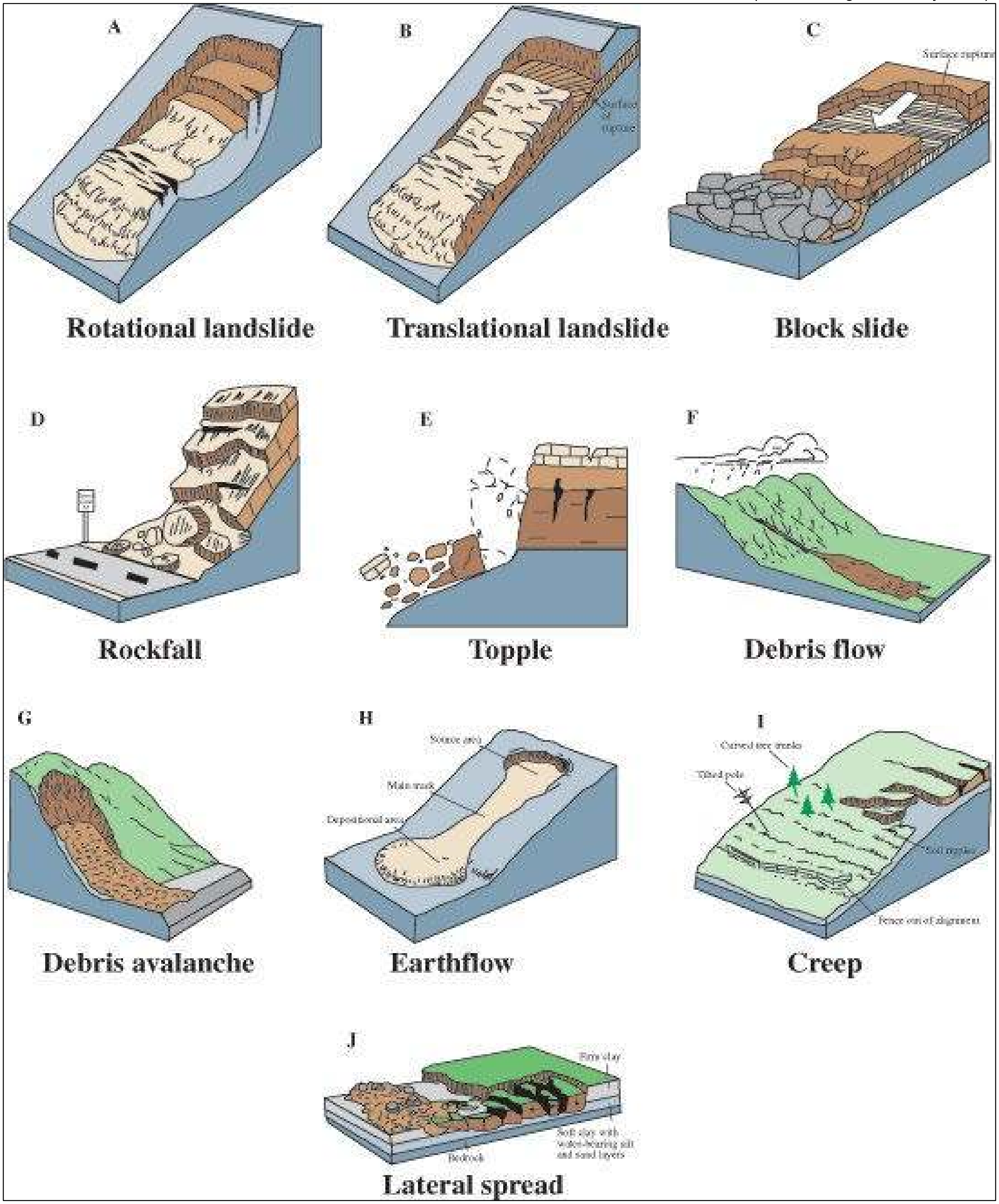


Figure 16-1. Common Landslide Types

16.2 HAZARD PROFILE

16.2.1 Past Events

Ada County has seen landslides primarily in the Boise Foothills. This area is most prone to landslides following large wildfires or heavy rain events. There are no records in the County of fatalities attributed to landslides. However, deaths have occurred across the western U.S. as a result of slides and slope collapses. Events that have caused property damage within the planning area are summarized below.

Early- to Mid-2016

The ground under the Terra Nativa subdivision in the Boise foothills experienced slow sliding for months. Roads and sidewalks buckled. The landslide caused homes to slide off their foundations (see Figure 16-2). Alto Via Court was closed; five of the six homes on the street were deemed unsafe to occupy and were demolished by the city. The sixth home is considered safe to live in, but is vacant. Another property on Strata Via Place was impacted by the landslide and is vacant.

Source: KTBV7

Figure 16-2. Residential and Infrastructure Damage, Alto Via Court

April 2003

Mud slid down a 400-yard embankment, crushed a 4-foot wooden fence and ripped a back door from its hinges on the 3800 block of McGonigull Street in Boise (see Figure 16-3).

December 1996

During the last days of 1996, warm unsettled air from the Pacific Ocean crossed into North Central Idaho dropping rain, snow, frozen rain, sleet and hail. Warming temperatures melted snow and saturated the soil of the area. The result was unstable soil conditions that led to mudslides along miles of the state’s primary roadways between Boise and Lewiston. Although the catastrophic mudslides north of Ada County received much of the press, smaller scale mudslides impacted the homes, driveways, and surface streets where cut banks had been created to site area roads.

Figure 16-3. McGonigull Street Slide

March – May 1973

Landslides along Warm Springs Mesa, some over 100 yards long, closed Starcrest Drive several times over a three-month period. The area was stabilized by installing 17 horizontal drains to release water.

August 20, 1959

During severe thunderstorms in the northeast Boise Foothills, estimated to be a 50- to 100-year rainfall event, 0.30 inches of rain fell in 5 minutes at Deer Point. The peak flow on Cottonwood Creek was 3,000 cfs. Floodwaters were carried by other Foothills creeks draining Shaw Mountain and Aldape Summit. Earlier Lucky Peak fires had denuded the Foothills of vegetation.

Debris flows over 10 inches deep filled basements and yards in north and east Boise. Floodwaters were diverted along Broadway Avenue to the Boise River. Approximately 500 houses were damaged by mud up to 10 inches deep; over 160 acres were covered by silt and debris flows. Hardest hit areas were Reserve Street, East Jefferson, East State, Krall and East Bannock, and Avenues D and E and Warm Springs Avenue.

The agriculture area between Lucky Peak Dam and East Boise suffered extensive property, crop and livestock losses. The Boise police clubhouse on Mountain Cove Road was destroyed, and the Idaho National Guard headquarters on Reserve Street was inundated, breaking out the windows, filling the basement with several feet of water, and destroying equipment and records.

16.2.2 Location

Landslides are typically a function of soil type and steepness of slope. Soil type is a key indicator for landslide potential and is used by geologist and geotechnical engineers to determine soil stability for construction standards. Soils mapping is lacking for the Ada County planning area.

The best available predictor of where movement of slides and earth flows might occur is the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years. Most landslides recognizable in this fashion range from a few acres to several square miles. Most show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges.

The recognition of ancient dormant landslide sites is important in the identification of areas susceptible to flows and slides because they can be reactivated by earthquakes or by exceptionally wet weather. Also, because they consist of broken materials and frequently involve disruption of groundwater flow, these dormant sites are vulnerable to construction-triggered sliding.

To assess the location of potential landslide hazard areas, a dataset of steep slopes was generated using available digital elevation models. Two slope classifications were created: 15 to 30 percent; and greater than 30 percent. Figure 16-4 shows the estimated landslide hazard areas in the Ada County planning area, based on slopes.

16.2.3 Frequency

In Ada County, landslides typically occur during and after major storms, so the landslide potential largely coincides with the potential for sequential severe storms that saturate steep, vulnerable soils. Until better data is generated specifically for landslide hazards, this severe storm frequency is appropriate for the purpose of ranking risk associated with the landslide hazard. The ground must be saturated prior to the onset of a major storm for significant landslides to occur. Most local landslides occur in January after the water table has risen during November and December. Water is involved in nearly all cases; and human influence has been identified in more than 80 percent of reported slides.

16.2.4 Severity

Landslides destroy property and infrastructure and can take the lives of people. Slope failures in the United States result in an average of 25 lives lost per year and an annual cost to society of about $1.5 billion. There are no records in Ada County of fatalities attributed to landslides. The biggest assets at risk to landslides are roads and infrastructure in landslide-prone area. Landslides can isolate populations due to road closures.

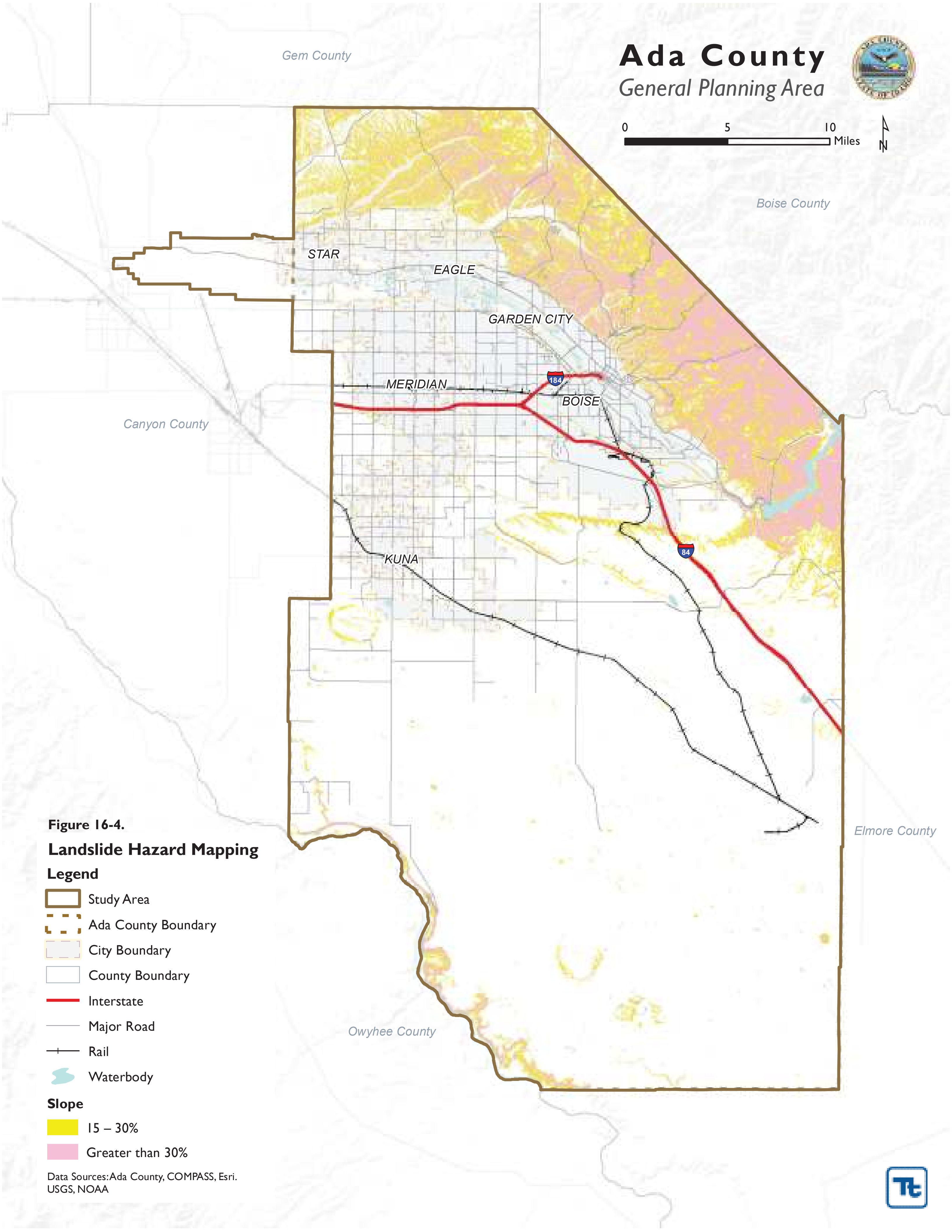


Figure 16-4.
Landslide Hazard Mapping

16.2.5 Warning Time

Landslide velocity can range from inches per year to many feet per second, depending on slope angle, material and water content. Generally accepted warning signs for landslide activity include the following:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavements or sidewalks
- Soil moving away from foundations
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls or fences
- Offset fence lines
- Sunken or down-dropped roadbeds
- Rapid increase in creek water levels, possibly accompanied by increased soil content
- Sudden decrease in creek water levels though rain is still falling or recently stopped
- Sticking doors and windows or visible open spaces indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together.

It is possible to determine areas at risk during general time periods based on geology, vegetation, and amount of predicted precipitation for an area. However, there is no practical warning system for individual landslides. The current procedure is to monitor situations on a case-by-case basis and respond after the event has occurred.

16.3 EXPOSURE

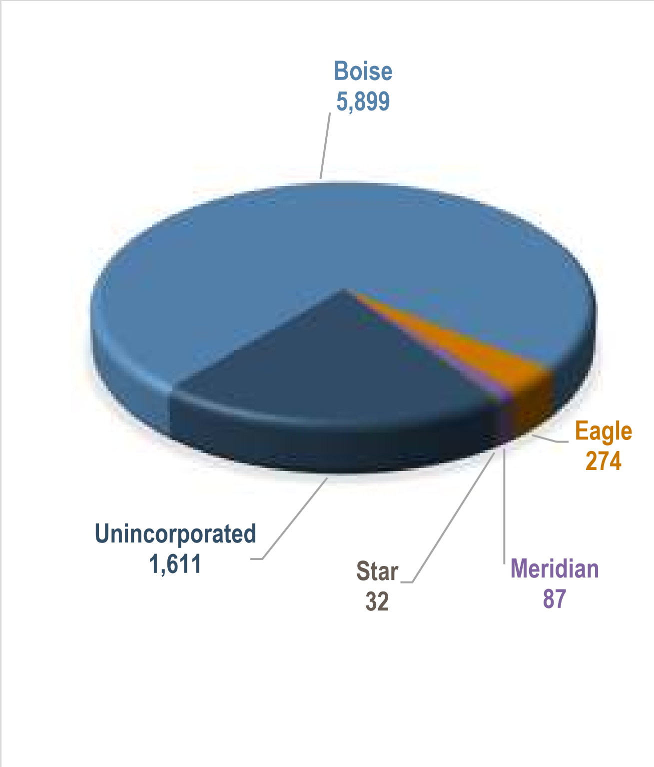
A Level 2 Hazus analysis was used to assess exposure to landslides in the planning area. Where possible, the Hazus default data was enhanced using local GIS data from county, state and federal sources.

16.3.1 Population

Population could not be examined by landslide hazard area because census block group areas do not coincide with the hazard areas. A population estimate was made using the structure count of buildings within the landslide hazard areas. Figure 16-5 and Figure 16-6 summarize the population by municipality living in the two landslide hazard zones (15 to 30 percent slopes, and slopes greater than 30 percent, respectively).

16.3.2 Property

The value of exposed buildings and contents in each jurisdiction is summarized in Figure 16-7 and Figure 16-8 for the 15 to 30 percent slope and greater than 30 percent slope landslide hazard zones, respectively.



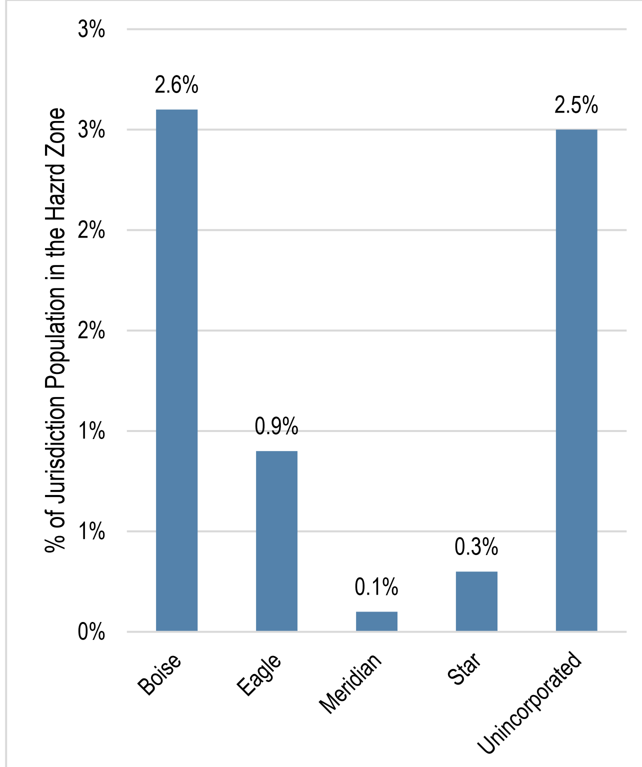
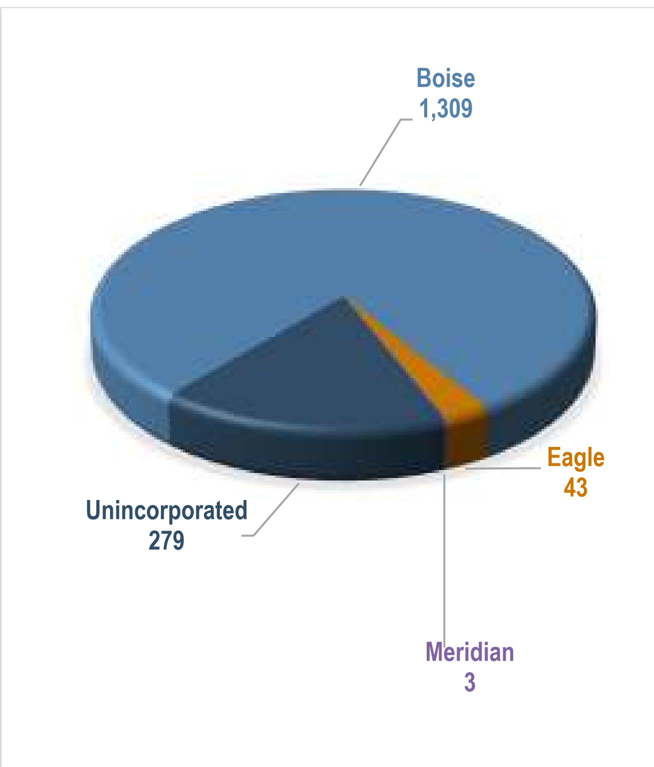


Figure 16-5. Population in the 15% to 30% Slope Landslide Hazard Area



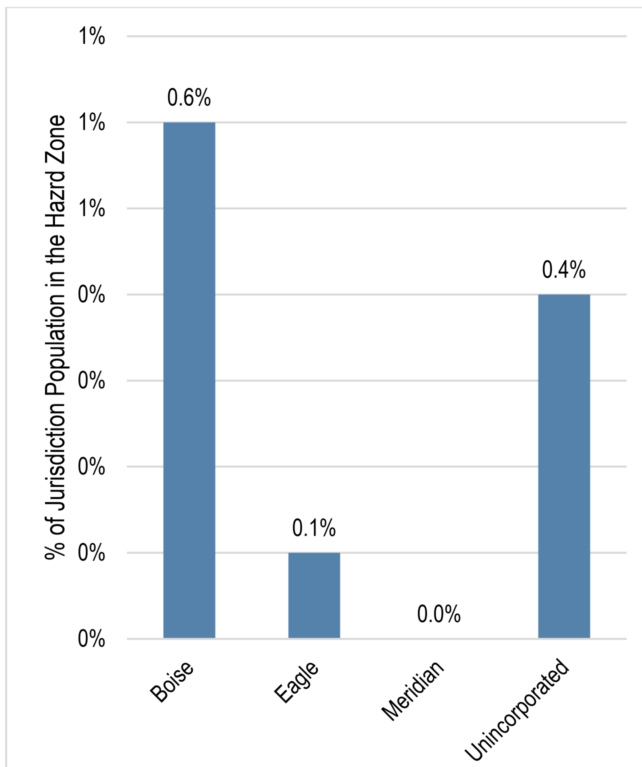


Figure 16-6. Population in the > 30% Slope Landslide Hazard Area

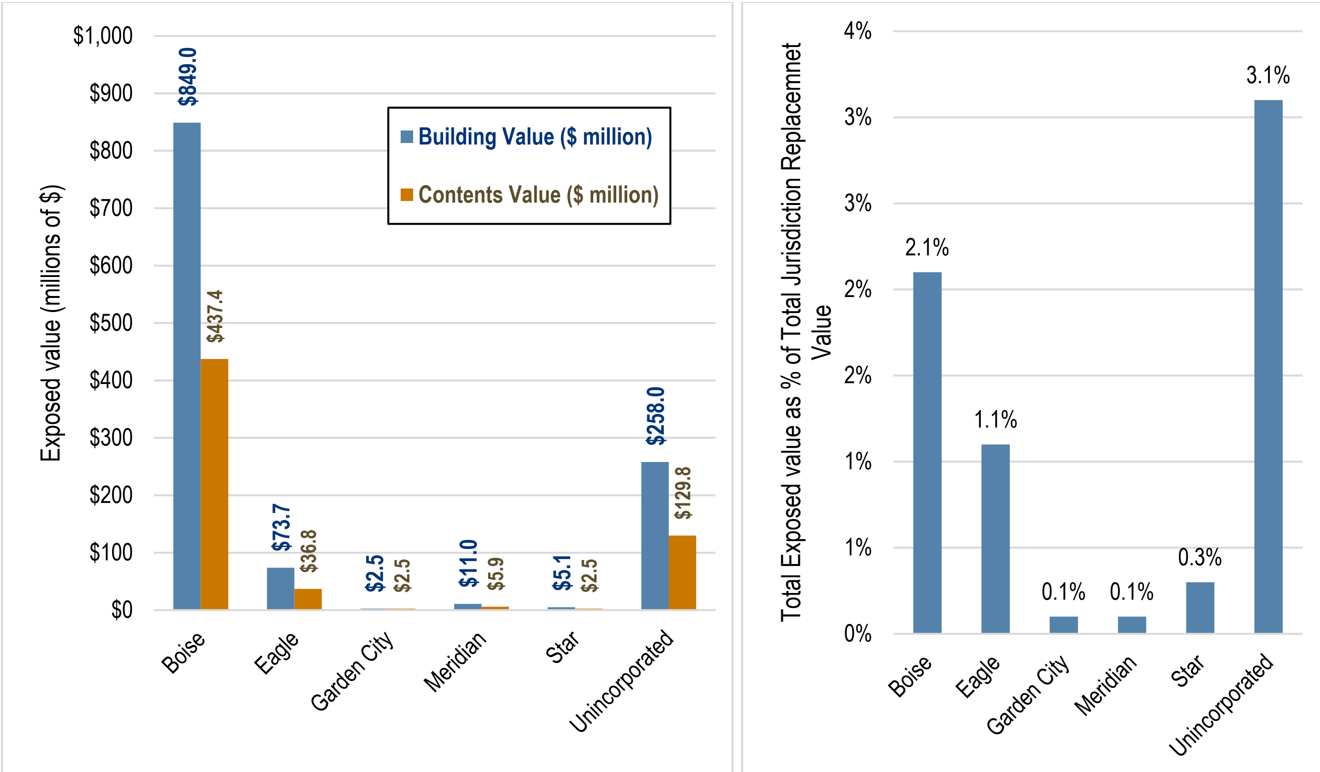


Figure 16-7. Value of Property in the 15% to 30% Slope Landslide Hazard Area

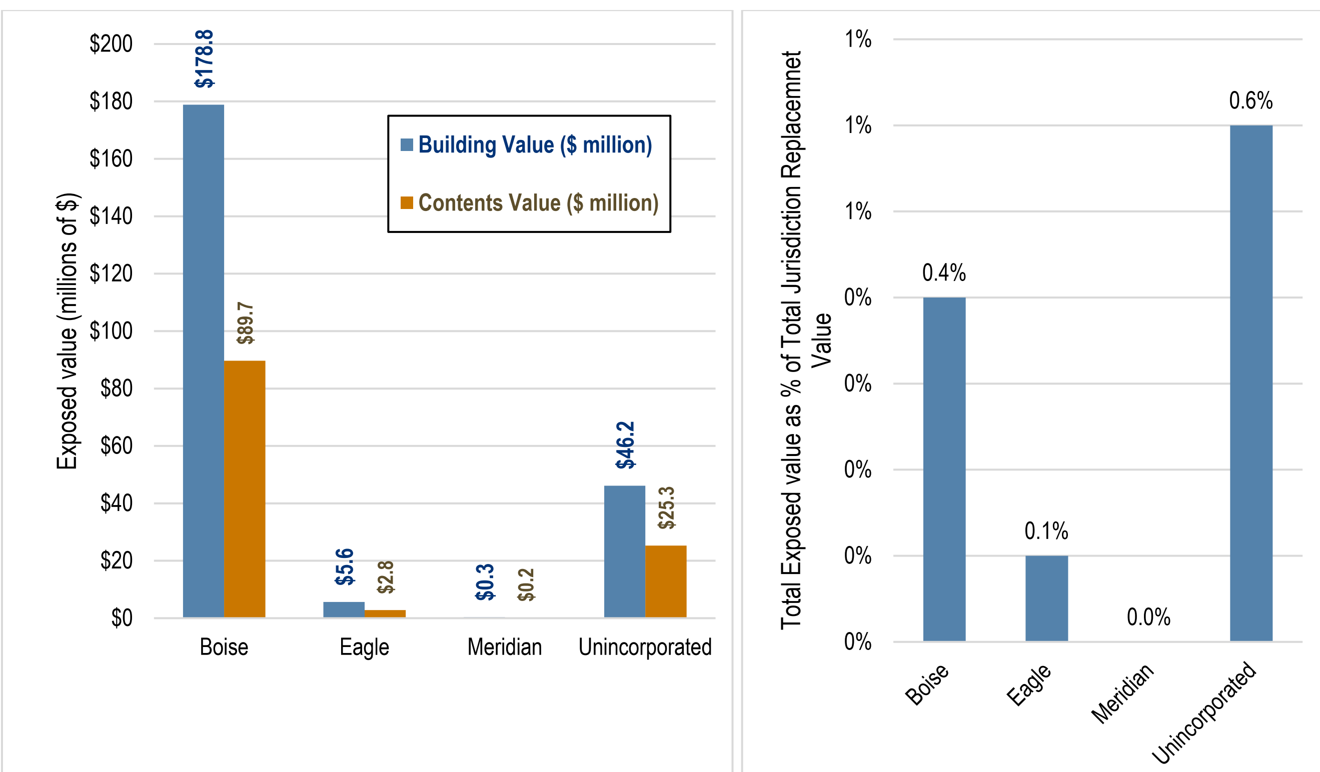


Figure 16-8. Value of Property in the > 30% Slope Landslide Hazard Area

Figure 16-9 summarizes the number of structures in the 15 to 30 percent slope landslide hazard zones by jurisdiction and occupancy class. In the greater than 30 percent slope landslide hazard zones, almost all of the exposed structures are residential, as shown in Figure 16-10. The only other exposed structures in this zone are one commercial structure in Boise and four in unincorporated Ada County.

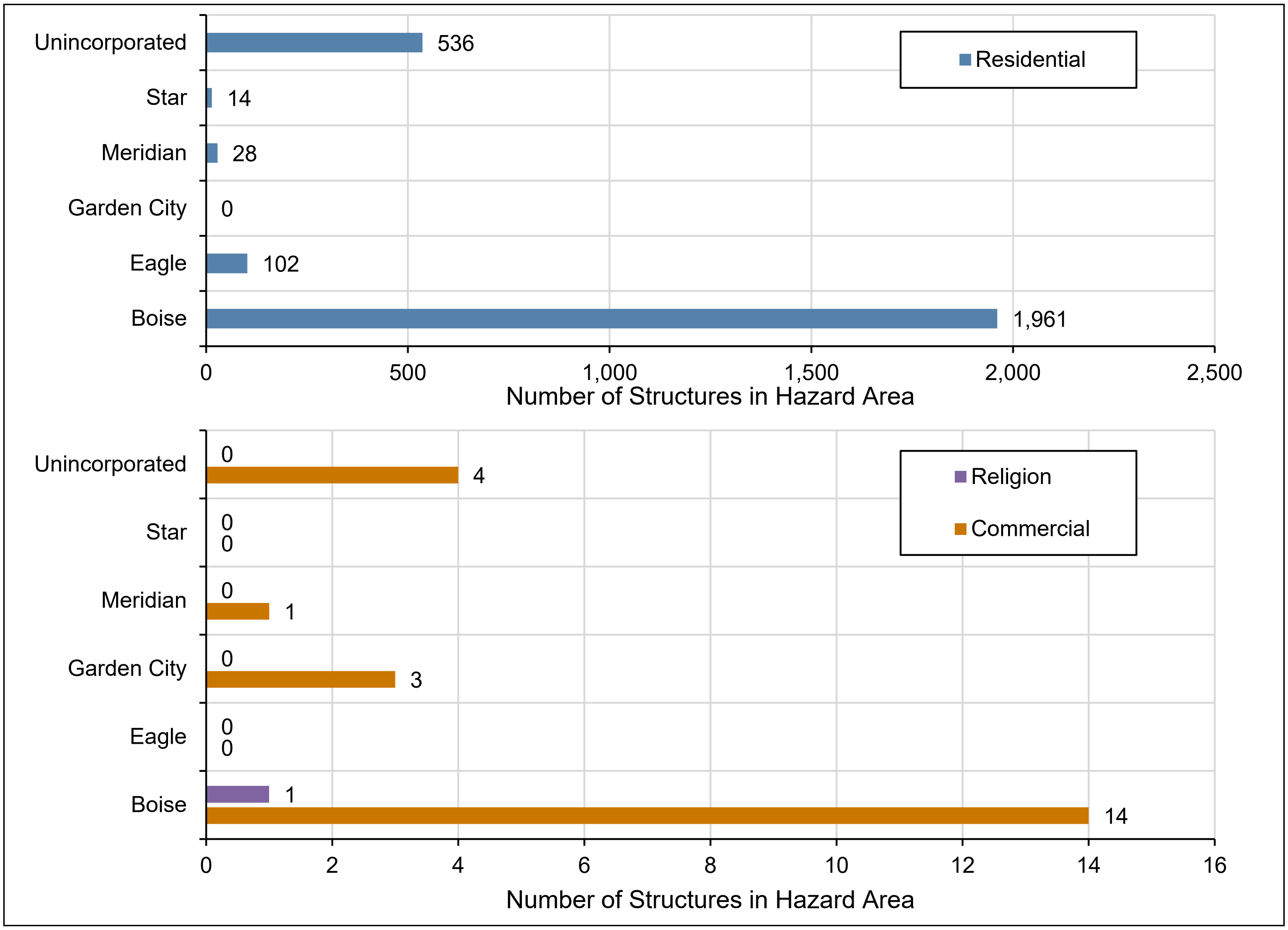


Figure 16-9. Number of Structures Within the 15% to 30% Slope Landslide Hazard Area

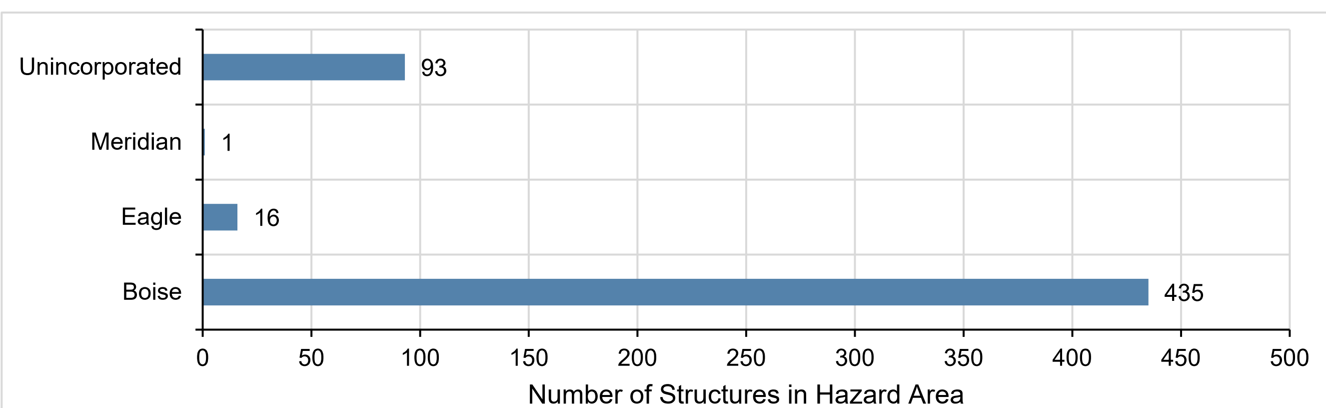


Figure 16-10. Number of Residential Structures Within the > 30% Slope Landslide Hazard Area

16.3.3 Critical Facilities

Figure 16-11 summarizes the critical facilities exposed to the landslide hazard for the countywide planning area. Detailed results by jurisdiction are included in Appendix D.

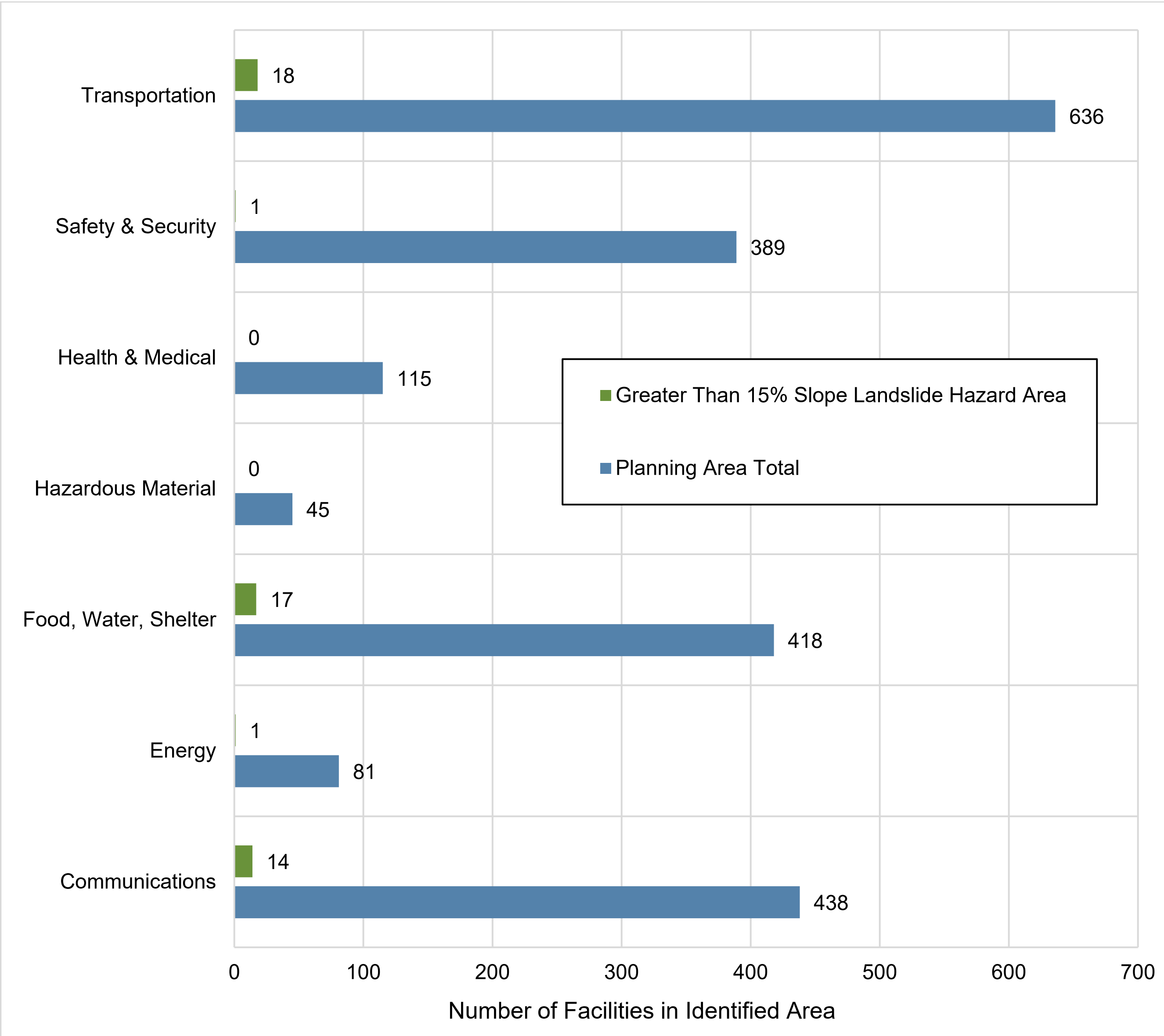


Figure 16-11. Critical Facilities in the Mapped Landslide Hazard Areas and Countywide

A significant amount of infrastructure can be exposed to landslides:

- **Roads**—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems and delays for public and private transportation. This can result in economic losses for businesses.

- **Bridges**—Landslides can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- **Power Lines**—Power line towers can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.

16.3.4 Environment

All natural areas within the mapped landslide hazard zones are considered to be exposed to the hazard.

16.4 VULNERABILITY

16.4.1 Population

All people exposed to the landslide hazard are potentially vulnerable to landslide impacts. Populations with access and functional needs as well as elderly populations and the very young are more vulnerable to the landslide hazards as they may not be able to evacuate quickly enough to avoid the impacts of a landslide.

16.4.2 Property

Loss estimations for the landslide hazard are not based on modeling using damage functions, because no such damage functions have been generated. Instead, loss estimates were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Table 16-1 shows the general building stock loss estimates in landslide risk areas.

Table 16-1. Estimated Building Losses in the Steep Slope Areas

	Building Count	Assessed Value	10% Damage	30% Damage	50% Damage
Boise	81,552	$61,280,836,767	$6,128,083,677	$18,384,251,030	$30,640,418,383
Eagle	12,437	$9,838,649,929	$983,864,993	$2,951,594,979	$4,919,324,964
Garden City	4,385	$3,705,101,875	$370,510,187	$1,111,530,562	$1,852,550,937
Kuna	8,831	$3,886,826,099	$388,682,610	$1,166,047,830	$1,943,413,050
Meridian	40,812	$28,959,315,273	$2,895,931,527	$8,687,794,582	$14,479,657,637
Star	5,065	$2,845,160,473	$284,516,047	$853,548,142	$1,422,580,237
Unincorporated	21,720	$12,472,792,807	$1,247,279,281	$3,741,837,842	$6,236,396,403
Total	**174,802**	**$122,988,683,223**	**$12,298,868,322**	**$36,896,604,967**	**$61,494,341,611**

16.4.3 Critical Facilities

There are 51 critical facilities with potential exposure to landslides due to their location on steep slopes. A more in-depth analysis of the mitigation measures taken by these facilities to prevent damage from landslides should be done to determine if they could withstand impacts of a landslide.

Several types of infrastructure are exposed to landslides, including transportation, water and sewer and power infrastructure. Highly susceptible areas of the county include mountain roads and transportation infrastructure. At this time, all infrastructure and transportation corridors identified as exposed to the landslide hazard are considered vulnerable until more information becomes available.

16.4.4 Environment

Natural Resources

Landslides can destroy natural assets that are highly valued by the community:

- Landslides that fall into streams may significantly impact fish and wildlife habitat, as well as affecting water quality.
- Hillsides that provide wildlife habitat can be lost due to landslides.
- Endangered species and their critical habitat in the planning area may be located in landslide hazard areas.

Agricultural and Timber Resources

Agricultural resources include rangelands, timberlands, cultivated farmlands and dairy lands. Landslides can have major consequences to such resources, primarily timberland, due to the large percentage of such land in remote locations on steep slopes. Roads accessing timberlands are often susceptible to slides and frequently are contributing factors to landslides. Landslide activity on these roads can remove them from production.

Cultural Resources

Landslides can destroy cultural resources such as artifacts and structures.

16.5 DEVELOPMENT TRENDS

The value of planning area properties exposed to the landslide hazard has increased by 48 percent ($701.5 million) since the last hazard mitigation plan update in 2017. This increase in risk exposure can be attributed to a population growth of 13.6 percent in the same period.

While landslides are not generally hazards addressed in comprehensive plans, the risk assessment in this plan creates an opportunity for Ada County and its planning partners to consider the inclusion of landslide hazards in their comprehensive plans. A key component to support this action would be the availability of good sub-surface soil mapping using the best available data, science and technology. It is anticipated that this data will be available in the near future. In the meantime, Ada County and its planning partners are equipped to deal with new development on a case-by-case basis through enforcement of the International Building Code. The IBC includes provisions for geotechnical analyses in steep slope areas that have soil types susceptible to landslides. These provisions ensure that new construction is built to standards that reduce the vulnerability to landslides.

16.6 SCENARIO

Major landslides in Ada County occur as a result of soil conditions that have been affected by severe storms, groundwater or human development. The worst-case scenario for landslide hazards in the planning area would generally correspond to a severe storm that had heavy rain and caused flooding. Landslides are most likely during late winter when the water table is high. After heavy rains from November to December, soils become saturated with water. As water seeps downward through upper soils that may consist of permeable sands and gravels and accumulates on impermeable silt, it will cause weakness and destabilization in the slope. A short intense storm could cause saturated soil to move, resulting in landslides. As rains continue, the groundwater table rises, adding to the weakening of the slope. Gravity, poor drainage, a rising groundwater table and poor soil exacerbate hazardous conditions.

Landslides are becoming more of a concern as development moves outside of city centers and into areas less developed in terms of infrastructure. Most landslides would be isolated events affecting specific areas. It is probable that private and public property, including infrastructure, will be affected. Landslides could affect bridges that pass over landslide prone ravines and knock out rail service through the county. Road obstructions caused by landslides would create isolation problems for residents and businesses in sparsely developed areas. Property owners exposed to steep slopes may suffer damage to property or structures. Landslides carrying vegetation such as shrubs and trees may cause a break in utility lines, cutting off power and communication access to residents.

Continued heavy rains and flooding will complicate the problem further. As emergency response resources are applied to problems with flooding, it is possible they will be unavailable to assist with landslides occurring all over Ada County.

16.7 ISSUES

Important issues associated with landslides in Ada County include the following:

- Sub-surface soils mapping is needed to better understand the landslide risk potential within the planning area.
- There are existing homes in landslide risk areas throughout the county. The degree of vulnerability of these structures depends on the codes and standards the structures were constructed to. Information to this level of detail is not currently available.
- Future development could lead to more homes in landslide risk areas, especially as development moves into the Boise Foothills.
- Mapping and assessment of landslide hazards are constantly evolving. As new data and science become available, assessments of landslide risk should be reevaluated.
- The impact of future climate conditions on landslides is uncertain. If future climate conditions impact atmospheric conditions, then exposure to landslide risks is likely to increase.
- Landslides may cause negative environmental consequences, including water quality degradation.
- The risk associated with the landslide hazard overlaps the risk associated with other hazards such as earthquake, flood and wildfire. This provides an opportunity to seek mitigation alternatives with multiple objectives that can reduce risk for multiple hazards.
- A buildable-lands analysis that looks at vacant lands and their designated land use would be a valuable tool in helping decision-makers make wise decisions about future development.

17. PUBLIC HEALTH EMERGENCY/PANDEMIC

17.1 GENERAL BACKGROUND

17.1.1 Description

An outbreak is defined by the U.S. Centers for Disease Control and Prevention (CDC) as the occurrence of more cases of disease than normally expected within a specific place or group of people over a given period of time. State and local regulations require immediate reporting of any known or suspected outbreaks by health care providers, health care facilities, laboratories, veterinarians, schools, child day care facilities, and food service establishments. An epidemic is a localized outbreak that spreads rapidly and affects a large number of people or animals in a community. A pandemic is an epidemic that occurs worldwide or over a very large area and affects a large number of people or animals.

A new virus strain or subtype that easily transmits between humans can cause a pandemic. Bacteria that become resistant to antibiotic treatment may also be behind a rapid spread. Sometimes, pandemics occur when new diseases develop the ability to spread rapidly, such as COVID-19. Humans may have little or no immunity against a new virus. Often, a new virus cannot spread between animals and people. However, if the disease changes or mutates, it may start to spread easily, and a pandemic may result. Seasonal flu epidemics generally occur because of a viral subtype that is already circulating among people. Novel subtypes, such as COVID-19, generally cause pandemics. These subtypes will not previously have circulated among humans. A pandemic can lead to social disruption, economic loss, and general hardship on a wide scale (Felman 2020).

According to the 2018 Idaho State's Hazard Mitigation Plan, factors in Idaho that heighten the probability of occurrences of such events include large numbers of travelers arriving via the region's airports, the transportation of infected animals into the area, or disease transmission through individuals transporting or coming into contact with infectious patients. (State of Idaho Hazard Mitigation Plan 2018).

17.1.2 Diseases with Pandemic Potential

The Idaho Office of Emergency Management has identified the following diseases that have become, or have the potential to become widespread in the area:

- **COVID-19** is a respiratory virus. People at high risk (those with certain underlying conditions, the elderly, the very young, and pregnant women) can develop severe illness that results in hospitalization or death.
- **Ebola virus disease** is a rare and deadly disease caused by infection with one of the Ebola virus species. Ebola viruses are transmitted through direct contact with contaminated blood or body fluids of a person who is sick or has died from Ebola. There have been no reported cases of Ebola virus disease contracted

in the United States, but two U.S. residents were infected with Ebola virus in 2014 while traveling to areas where it is found, and were diagnosed in the United States. Two healthcare workers who provided care for the first of these patients also became infected with Ebola virus.

- **HIV** (human immunodeficiency virus) is a viral infection transmitted by sexual intercourse, sharing needles or syringes, contaminated blood transfusions, or from infected mother to child during pregnancy or breastfeeding. This disease, first recognized by the CDC in 1981, compromises the immune system. There is no effective cure for HIV, but HIV can be controlled with proper medical care and antiretroviral therapy.
- **Influenza** is an infectious viral disease of birds and mammals commonly transmitted through aerosols produced by coughing or sneezing. People who have influenza can have some or all of these symptoms: fever, cough, sore throat, runny nose, muscle aches, headaches, fatigue, and sometimes vomiting an diarrhea. Complications from influenza can be moderate (e.g., sinus or ear infections) to severe (e.g., pneumonia, inflammation of the heart, inflammation of the brain, failure of multiple organs, or death). Influenza virus strains that were new or had not circulated in a while caused pandemics in the late 20th and 21st centuries (CDC 2018).
- **Measles** is a serious respiratory disease caused by the measles virus. It can lead to pneumonia, encephalitis (swelling of the brain), and death. The measles-mumps-rubella vaccine protects against measles.
- **Mosquito-borne diseases** are those spread by the bite of an infected mosquito. Diseases that are spread to people by mosquitoes include Chikungunya, dengue, malaria, Saint Louis encephalitis, West Nile virus disease, and Zika virus disease.
- **Mumps** is a contagious disease caused by the mumps virus. It is spread through saliva or mucus from the mouth, nose, or throat through coughing, sneezing or talking, sharing items such as cups or eating utensils, and touching contaminated objects. Mumps typically starts with a few days of fever, headache, muscle aches, tiredness, and loss of appetite, followed by swollen and tender salivary glands under the ears on one or both sides. Some people who get mumps have very mild or no symptoms; most people with mumps recover completely in a few weeks. The best way to protect against mumps is to be vaccinated with the measles-mumps-rubella vaccine.
- **Pertussis (whooping cough)** is a highly contagious respiratory disease caused by the pertussis bacterium. It causes violent persistent coughing. Whooping cough is most harmful for young babies and can be deadly. Vaccines that protect against pertussis include DtaP, for babies and children, and Tdap for preteens, teens, and adults.
- **Plague** is a disease that affects mammals, caused by the bacterium *Yersinia pestis*. Humans usually get plague after rodent fleabite carrying the bacterium or by handling an infected animal. Historically, plague pandemics have killed millions of people in Asia and Europe (CDC 2021). Today, modern antibiotics are effective in treating plague. Without prompt treatment, the disease can cause serious illness or death. Human plague infections continue to occur in the western United States, but significantly more cases occur in parts of Africa and Asia. An outbreak of plague among ground squirrels occurred in southwestern Idaho during 2016 and 2017. In 2018, a boy in Elmore County, Idaho contracted the first case of bubonic plague in the state in 26 years.
- **Rabies** is a viral disease of mammals most often transmitted through the bite of a rabid animal. It infects the central nervous system, ultimately causing disease in the brain and death. Over the last 100 years, rabies in the United States has changed dramatically. More than 90 percent of all animal cases reported annually to CDC now occur in wildlife; before 1960 the majority were in domestic animals. Two bats with rabies were found in Ada County in 2020, but none were reported in 2021.

- **Severe acute respiratory syndrome (SARS)** is a viral respiratory illness caused by a coronavirus, called SARS-CoV. SARS was first reported in Asia in 2003. The illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the global outbreak was contained.
- **Tuberculosis** is a disease caused by a bacterium called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs, but can attack any part of the body such as the kidney, spine, and brain. If not treated properly, tuberculosis can be fatal. It is spread through the air from one person to another. The bacteria are put into the air when a person with tuberculosis coughs, sneezes, speaks, or sings.

17.1.3 Secondary Hazards

While pandemic events do not influence natural hazards, secondary impacts are far-reaching as has been seen during the COVID-19 pandemic. In addition to health impacts, disease outbreaks reaching pandemic proportions can cause social and economic impacts on a global scale (Shang, Li and Zhang 2021). Civil disorder, protests, depression, and anxiety are a few of the social impacts of the COVID-19 pandemic. Economic impacts include unemployment, price increases, and supply chain interruptions (Center on Budget and Policy Priorities 2022).

17.2 HAZARD PROFILE

17.2.1 Past Events

Between 1953 and 2022, FEMA issued only one disaster declaration for the State of Idaho for a pandemic-related event. Ada County was included in this declaration for COVID-19. Known disease outbreaks that have impacted Ada County between 1918 and 2022 are identified in Table 17-1.

Table 17-1. Public Health Emergencies and Pandemics in Ada County

Type of Event	Dates	Description
Influenza	1918	Caused an estimated 50 million deaths worldwide and about 675,000 in the United States. Communities throughout Idaho reported 1918 influenza outbreaks and deaths and prohibited public events. The state Board of Health cancelled public and private schools statewide in hopes of preventing the spread to children and families. The pandemic of 1918 first affected Idaho in Canyon County. In less than two weeks, the number of cases grew to the extent the state was unable to track the disease accurately. Case records are not available on a county level.
Influenza	1957-1958	Killed an estimated 1.1 million people worldwide and 116,000 in the United States. In Idaho, 49 deaths were attributed to the pandemic. Case records are not available on a county level.
Influenza	1968-1969	Caused an estimated 1 million deaths worldwide and about 100,000 in the United States. In Idaho, 61 deaths were attributed to the pandemic. Case records are not available on a county level.
West Nile Virus	2004-present	Between 2003 and 2021, 327 human cases of West Nile Virus were reported in Ada County. 2006 had the majority of the cases at 252 reported.
Influenza	2009-2010	Killed nearly 12,000 Americans from 2009 through 2010; widespread in Idaho and led to several deaths. Case records are not available on a county level.
COVID-19 Pandemic	January 2020-present	As of March 31, 2022, 112,335 confirmed COVID-19 cases and 1,009 deaths have been reported in Ada County.

Sources: (State of Idaho Hazard Mitigation Plan 2018), (CDC 2022), (Idaho Division of Public Health 2022)

17.2.2 Location

Public health emergencies and pandemics can occur without regard for location. However, factors such as density, visitation, and the length of time in which the public spends in a location all contribute to the spread of infectious diseases. For example, influenza and COVID-19 are more likely spread by persons in close contact. Indoor areas in which people are in close contact with each other appear to be significant vectors for diseases that are spread through respiratory droplets. Infectious diseases spread by insects may be subject to other types of location hazards. For example, the prevalence of standing water can provide breeding grounds for mosquito-borne diseases such as West Nile Virus. Diseases that can infect humans are variable in nature and methods of transmission. Ultimately, residents need to be vigilant about diseases altogether in order to better understand and respond to public health emergencies and pandemic hazards.

17.2.3 Frequency

Public health emergencies and pandemics have occurred at a rate of 1 every 15 to 20 years in Ada County. The COVID-19 pandemic is by far the longest in duration. It has been ongoing for more than two years at the writing of this plan.

17.2.4 Severity

Widespread sickness and loss of life can result from public health emergencies and pandemics. The COVID-19 pandemic infected nearly 500 million people and caused more than 6 million deaths worldwide in just 27 months and is still ongoing (Worldometer 2022).

17.2.5 Warning Time

Pandemics can occur with very little warning. Air travel can hasten the spread of a new organism and decrease the time available for early implementation of interventions. Influenza outbreaks are expected to occur simultaneously throughout much of the United States, preventing shifts in human and material resources that usually occur in response to other disasters. Warning time for influenza will depend on the origin of the virus and the amount of time needed to identify the virus.

17.3 EXPOSURE AND VULNERABILITY

Health hazards that affect the residents of Ada County may arise in a variety of situations, such as during a communicable disease outbreak, after a natural disaster, or as the result of a bioterrorism incident. All populations in Ada County are susceptible to pandemic events. Populations who are young or elderly or have compromised immune systems are likely to be more vulnerable. The relative ease of world-wide travel in addition to the world’s expanding global food industry ensures that all countries are vulnerable to pandemic events at any time.

17.4 DEVELOPMENT TRENDS

Future population growth will directly impact the County’s vulnerability to public health emergencies and pandemics. The population of Ada County is projected to increase by 186,756, or 37 percent between 2020 and 2040 (COMPASS 2021). As the population grows, so will population density, which will increase the chance of transmission of communicable diseases from person to person. New structures close to water bodies or areas with high population density are at an increased risk.

17.5 SCENARIO

A worst-case scenario would be a global pandemic similar to COVID-19. This could lead to sickness and deaths; strain on healthcare systems; income stress and financial loss; and negative mental health impacts.

17.6 ISSUES

Many lessons have been learned and issues have been overcome during the COVID-19 pandemic. However, adequate health care staffing and response capabilities should continue to be considered in emergency management.

18. RADIOLOGICAL EVENT

18.1 GENERAL BACKGROUND

18.1.1 Description

Radiological incidents produce radiation without detonation of a nuclear device. They may occur for a wide variety of reasons and can range significantly in scope and severity. Even very small amounts of certain radiological sources can cause significant contamination of the environment. Radiological incidents can occur anywhere within the United States and throughout the world.

Radiation can come in two forms (State of Idaho Hazard Mitigation Plan 2018):

- Ionizing radiation is energetic waves or particles that have sufficient energy to ionize other atoms. This results in the biological breakdown of DNA and cellular molecules in all living organisms exposed to it. This can lead to skin rash, radiation sickness (nausea, vomiting, diarrhea), or death, depending on the radiation dose absorbed by the body.
- Non-ionizing radiation is electromagnetic radiation that lacks sufficient energy to ionize atoms or molecules. The danger posed by non-ionizing radiation sources (lasers, microwave- or ultraviolet-producing machines and linear accelerators) is injury to the eyes or skin.

The most common radiological incidents occur because of loss, theft, or mismanagement of relatively minor or low-level radioactive sources material. Natural hazards, such as fires and extreme weather, may impact radiological facilities, resulting in an incident. The 2011 Fukushima Daiichi nuclear disaster is an example of how a natural hazard (in that case, a tsunami) could result in a major international nuclear or radiological incident. Radiological incidents can also result from terrorist attempts to acquire or use nuclear threat devices.

18.1.2 Types of Radiological Events

Naturally Occurring Radioactive Material

Natural sources of radioactive elements are found in air, water, soil, and human bodies. Ionizing particulate and electromagnetic radiation are generated in the environment by naturally occurring radioactive material in the earth’s crust (terrestrial radioactivity, radon) or through the effects of cosmic radiation originating outside the earth’s atmosphere. Thorium and uranium are naturally occurring radioactive elements that are used as nuclear fuels. The Treasure Valley, where Ada County is located, contains elevated levels of uranium in the groundwater (Neace 2020).

Technologically Enhanced Naturally Occurring Radioactive Material

Technologically enhanced naturally occurring radioactive material (TENORM) is defined as naturally occurring radioactive materials that have been concentrated or exposed to the accessible environment through human activities such as manufacturing, mineral extraction, or water processing (EPA 2021). Industrial sectors that generate TENORM are mining, energy production, community drinking water treatment, and some consumer products (fertilizer, cigarettes, building materials). TENORM is generated by nuclear reactors or high energy particle accelerators. Relatively high levels of ionizing electromagnetic radiation are produced using X-ray machines.

Radioactive materials are often encapsulated so that the ionizing electromagnetic radiation they produce may be used without the hazard posed by uncontained radioactive contamination. Technologically produced radioactivity and radiation are used extensively in medical and industrial applications. Everyone receives varying amounts of radiation exposure from natural and technological sources (Ada County Multi-Hazard Mitigation Plan 2017).

Radiological Dispersal

Radioactive material can be dispersed by conventional explosive or other mechanical means, such as a spray. Dirty bombs are one type of radiological dispersal device. A dirty bomb spreads radioactive material by detonation of conventional explosive (see Figure 18-1). It kills or injures people through the initial blast and spreads radioactive contamination over possibly a large area. Such bombs could be miniature devices or large truck bombs (U.S. Department of Health & Human Services 2022). Passive or active dispersion can be achieved with unsealed radioactive material through means such as depositing the material in soil or water or a dropping it from an airborne device. Radioactive sources can be solid, aerosol, gas, or liquid, and contamination of people may occur via air, water, soil, or food (U.S. Department of Health & Human Services 2022).

Source: U.S. Department of Health and Human Services

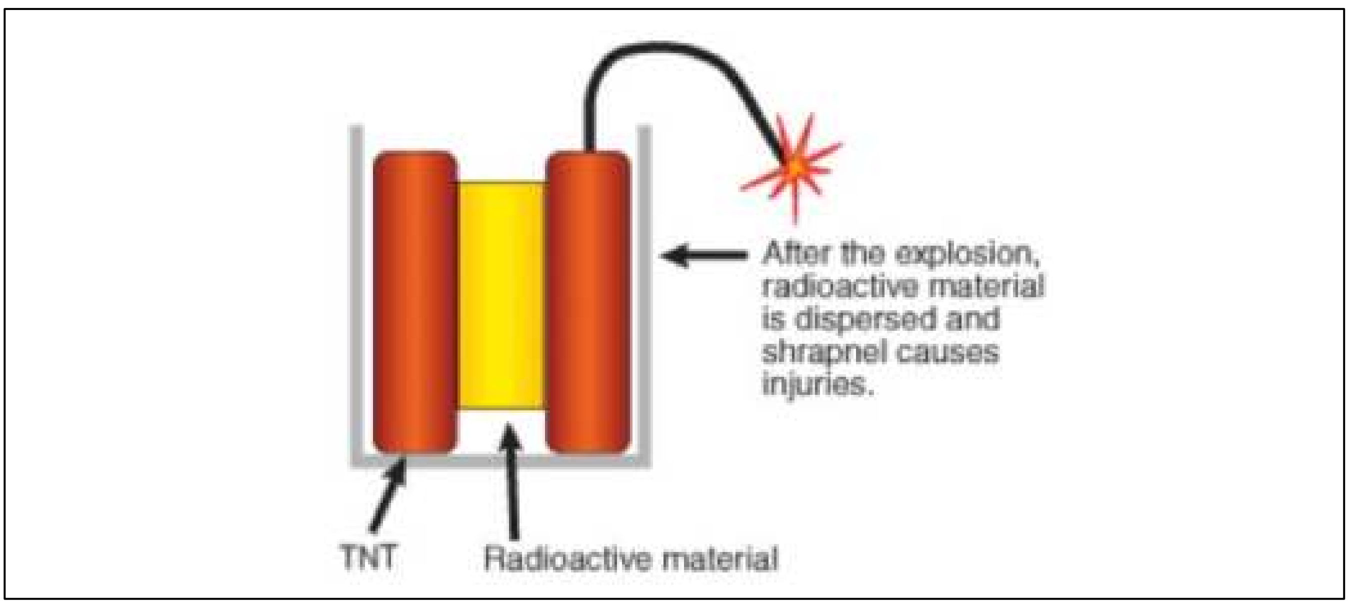


Figure 18-1. Dirty Bomb: Radiological Dispersal Device Using an Explosive

Radiological Exposure Device

A radiological exposure device, sometimes called a “hidden sealed source,” is a terrorist device intended to expose people to significant doses of ionizing radiation without their knowledge. Constructed from partially or fully unshielded radioactive material, a radiological exposure device could be hidden from sight in a public place (e.g., under a subway seat, in a food court, or in a busy hallway), exposing those who sit or pass close by. If the seal around the source were broken and the radioactive contents released from the container, the device could become a radiological dispersal device, capable of causing radiological contamination.

18.1.3 Secondary Hazards

The secondary impacts associated with radiological incidents include those impacting the health of the community and environment. Depending on the severity of exposure, impacts may include temporary illness or injury, permanent medical conditions, or death. Secondary impacts have the potential to occur regardless of whether the incident is naturally occurring or man-made. From a human-caused perspective, it is possible that small or large-scale radiological incidents could initiate civil disturbances.

18.2 HAZARD PROFILE

18.2.1 Past Events

An example of radiological contamination using TENORM occurred in Ada County in 2014. An individual was collecting uranium and thorium ore, grinding it up, and trying to chemically activate and produce uranium yellow cake to sell online. This resulted in a multi-million dollar EPA cleanup of the individual’s apartment and storage units. Given that these materials were naturally occurring, or below Nuclear Regulatory Commission (NRC) license limits, these activities went unnoticed for a long period of time until the NRC was notified about the individual attempting to ship a box into another country. This is an example of how small quantities of material can lead to large cleanup operations and a potential public hazard. While no members of the general public where exposed to these materials, an apartment fire could have drastically changed this scenario and its impact on surrounding neighborhoods (State of Idaho Hazard Mitigation Plan 2018).

Between 1954 and 2022, FEMA has not included Ada County or the State of Idaho in any radiological-related disasters or emergency declarations.

18.2.2 Location

Radiological materials are found in many locations. The NRC does not identify any licenses in Ada County, but it requires licenses only for sources with activities greater than 10 microcuries (a unit of radioactivity). Anyone can purchase industrial button sources of multiple isotopes online, and have them shipped to their home. While the quantity and activity of radioactive material in these sources is small, they could still be used for nefarious activities. Individuals also may be able to acquire naturally occurring materials like ore directly or from online sources.

Technologically produced sources are used extensively in medical and industrial applications. These sources have the highest probability of being involved in a radiological incident, due to the large quantities in medical facilities and the high frequency with which they are shipped or transported on local roads. They pose a high risk of overall impact on an area, depending on the isotope and its half-life.

Radiological incidents that happen in surrounding counties can also be carried into Ada County through multiple environmental and economic pathways. For these reasons, the risk for radiological emergencies exists throughout the entire county.

18.2.3 Frequency

Radiological events are difficult to predict. Currently, there are no identified TENORM issues in Ada County, although there is a relatively high potential for TENORM generation given the extractive industries operating in the county and the occurrence of uranium ore deposits in the county. Radioactive sources are used in a wide variety of industrial and consumer applications, including soil density/moisture gauges, smoke detection, well logging, weld inspection, and radioluminescent devices. Incidents involving manmade radioactivity in these applications have occurred sporadically, so the future rate of occurrence of incidents involving industrial radioactive sources cannot be projected on the basis of past experience. However, future incidents should be anticipated.

The most prevalent use of radioactive material in Idaho is for nuclear medicine. Hospitals and clinics in every region use radioactive isotopes for diagnostics and treatment. Medical isotopes are typically transported by common carrier either by air or road. Typically, nuclear medical applications involve use of relatively large amounts of short-lived radioactivity. Incidents involving radiopharmaceuticals could result in unintended exposures, but are not likely to pose a long-lasting hazard.

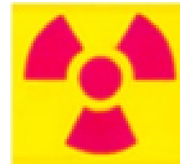
Safe transport will remain a small concern as nuclear spent fuel shipments continue in Idaho. Fuel shipments are transported in massive containment vessels via rail that undergo strict accident-proof testing criteria; therefore, these shipments pose little to no actual risk to the general public. Radioactive waste from the Idaho National Laboratory Cleanup Project facilities in eastern Idaho is transported by railway to the Waste Isolation Pilot Plant in New Mexico. These shipments pose a low risk for emergency due to the strict requirements for the vessels they are shipped in. No accidents have been reported in transporting spent fuel in Idaho.

18.2.4 Severity

All sources of energy pose some risk to human health or environmental quality. Radiation protection standards for humans, embodied in regulations that U.S. nuclear facilities must adhere to, exceed ample protection for other species and for ecosystems. Each year, U.S. residents receive an average dose from natural background radiation of about 3.1 millisievert (mSv). Medical procedures add another 3.1 mSv on average, for a total of 6.2 mSv per year. The NRC is the primary agency for regulating radioactive materials and ensuring public safety. The NRC set a radiation dose limit from regulated radiation sources of 1 mSv in a year and 0.02 mSv in an hour for a member of the public; this excludes natural and medical uses of ionizing radiation (U.S. Nuclear Regulatory Commission 2021).

Exposure to high levels of radiation is known to cause cancer and, at very high levels, radiation poisoning and even death. But the effects on human health from very low doses of radiation—such as exposure to varying levels of background radiation—does not significantly affect cancer incidence (UNSCEAR 2000).

18.2.5 Warning Time



The warning time for an incident occurring will vary and depends on the nature and scope of the incident. At facilities that handle radioactive material or any place where radiation-producing equipment is used, the radiation tri-foil sign (shown at right) must be displayed. This sign is used as a warning to protect people from being exposed to radioactivity (U.S. Departement of Health & Human Services 2021).

18.3 EXPOSURE AND VULNERABILITY

Radiological events that affect the residents of Ada County may arise in a variety of situations, such as a transportation accident involving radioactive materials, an accidental or intentional release at a fixed facility, or if used during a terrorist attack. All populations in Ada County are susceptible to radiological events. Populations who live or work near major transportation routes and fixed-facility locations are likely to be more vulnerable.

18.4 DEVELOPMENT TRENDS

Future population growth will directly impact the County’s vulnerability to radiological events. The population of Ada County is projected to increase by 186,756, or 37 percent between 2020 and 2040 (COMPASS 2021). New structures close to fixed facilities and major transportation routes are at an increased risk.

18.5 SCENARIO

A worst-case scenario would be a terrorist attack using a radiological dispersal device. This could lead to immediate injury or death of those nearby from the explosion and sickness and death over a much larger area from radiation. The affected area could be considered contaminated and uninhabitable for decades.

18.6 ISSUES

Important issues associated with radiological events in Ada County include the following:

- Facilities using or transporting radiological materials need to continue to be monitored and regulated closely.
- Education needs to be available about naturally occurring radiological materials.

19. UTILITY FAILURE

19.1 GENERAL BACKGROUND

19.1.1 Description

A power failure (also referred to as a power outage) is any interruption or loss of electrical service caused by disruption of power transmission due to accident, sabotage, natural hazards, or equipment failure. A significant power failure is defined as any incident of a long duration, which would require the involvement of the local and/or state emergency management organizations to coordinate provision of food, water, heating, cooling, and shelter.

Widespread power outages can occur without warning or as a result of a natural disaster. Generally, warning times are short in the case of technological failure, such as a fire at a sub-station, traffic accident, human error or terrorist attack. When a power failure is caused by natural hazards, greater warning time is possible. For example, high wind events such as tornados and hurricanes often cause widespread power failure, and are often forecasted before they affect a community. Additionally, severe winter weather conditions such as ice storms, blizzards, and snowstorms often cause power failure. Incidents such as these often have plenty of warning time, so power response crews can stage resources to prepare for power failure.

19.1.2 Secondary Hazards

Power failures can lead to secondary hazards, with negative impacts on the health and safety of residents:

- During periods of extreme heat or extreme cold, vulnerable populations such as the elderly and medically frail can be susceptible to hypothermia or heat stroke.
- Power failure can lead to food spoilage, which has negative impacts on public health.
- Residents who rely on electric medical devices such as home oxygen machines, medication nebulizers, home dialysis, infusion pumps, and electric wheelchairs may face life-threatening situations if power failure extends beyond the battery backup timeframe of their device (Huff 2021).
- Power failure can result in a loss of communications capability by first responders, with negative impacts on public safety.
- Power outages can also lead to instances of civil disturbance, including looting.
- Power interruptions at chemical handling plants can allow for a chemical spill during restart (EPA 2001). Chemical spills can have significant health and environmental impacts.
- Wastewater and potable water utility interruption may occur as a result of a power failure. Interruption of these critical utilities may have cascading economic and environmental impacts.

- Lack of power can prevent fuel pumps from operating and lead to fuel shortages.
- Traffic accidents may increase because of the lack of traffic control devices such as stoplights and railroad crossing advisory signals. Power outages lasting a long time will force law enforcement officials to man traffic control points to prevent accidents.
- Downed power lines can spark an urban or wildland fire.

19.2 HAZARD PROFILE

19.2.1 Past Events

Power outages and downed utility line events in Ada County between 2000-2021 are listed in Table 19-1. Between 1954 and 2022, FEMA has not included Ada County or the State of Idaho in any utility failure disasters or emergency declarations.

Table 19-1. Ada County Utility Failure Events

Date	Event Type	Utility Failure Event Description
October 19, 2019	Thunderstorm Wind	Several large trees, power lines and fences down in Kuna.
August 30, 2017	Thunderstorm Wind	Power outages in Southeast Boise
August 11, 2015	Thunderstorm Wind	Idaho Power reported outages from thunderstorm winds throughout the Treasure Valley. A downed power pole started a brush fire.
March 17, 2014	High Wind	Numerous reports of power outages reported by Idaho Power.
August 22, 2013	Thunderstorm Wind	Downed trees and power poles were reported across Ada County.
November 16, 2012	High Wind	Trees and power lines down in Start and North Boise.
August 21, 2010	Thunderstorm Wind	68 mph wind gusts, downed trees and power lines. A wildfire started due to the downed power lines and burned a home and six out buildings.
June 4, 2010	Thunderstorm Wind	Power lines downed in Southwest Boise and trees and traffic lights down in Garden City.
October 26, 2009	High Wind	Numerous incidents of power outages and wind damage in the Boise metro area.
November 20, 2008	High Wind	Downed trees and power outages in Boise, Mountain Home, Garden City and Kuna.
July 22, 2008	Thunderstorm Wind	Thunderstorm winds caused power outages to 6,000 customers in Meridian, Boise and Eagle.
June 21, 2008	Thunderstorm Wind	Downed trees and power outages in the Boise metro area.
September 4, 2007	Thunderstorm Wind	Gusty winds and rain ripped through the Treasure Valley, causing power outages and knocking down huge trees.
June 29, 2006	Thunderstorm Wind	Widespread thunderstorms yielding numerous reports of nickel-size hail and wind damage, including downed trees and power lines.
August 21, 2004	Thunderstorm Wind	Trees and power lines were blown down.
July 25, 2002	Thunderstorm Wind	Thunderstorm winds brought down trees and power lines which left over 5,000 homes and businesses without power.
July 22, 2002	Thunderstorm Wind	Trees and power lines were blown down across west Boise and Horseshoe Bend.
July 13, 2002	Thunderstorm Wind	Numerous trees and power lines were blown down across Ada, Canyon, Payette and Gem Counties.
February 7, 2002	Thunderstorm Wind	Numerous trees and power lines were brought down by the storm.
August 4, 2000	Thunderstorm Wind	Trees and power lines were downed in Ada County and Idaho Power reported that about 10,000 residents were without power for several hours.
July 18, 2000	Tornado	An old growth tree was snapped and several power lines were felled.
May 16, 2000	Hail Storm	Idaho power company reported power outages in Nampa, Caldwell and Meridian due to numerous trees and limbs down on power lines.

Source: (National Climatic Data Center 2022)

19.2.2 Location

Power failures in Ada County are usually localized and are usually the result of a natural hazard event involving high winds or heavy snowfall.

19.2.3 Frequency

The utility failure events for Ada County shown in Table 19-1 are often related to high winds associated with thunderstorms. Based on the frequency of these high wind events, the planning area can expect to experience a utility failure event at least annually.

Power failures also often result from damage to or electrical hazards within an electric power system. System components include power generation plants, substations, circuits, switches, transformers, power lines, and power poles. Due to the varied nature of power outage causes ranging from vehicle accidents to severe weather, utility interruptions can happen at any time.

19.2.4 Severity

The extent and severity of a power outage depends on the cause, location, duration, and time of year. It can range from a small, localized event to a countywide power outage. Impacts from an outage can be significant to the county and its residents.

Power failures lead to the inability to use diverse electric-powered equipment: lighting; heating, ventilation, and air conditioning; communication equipment (telephones, computers, etc.); fire and security systems; small appliances such as refrigerators, sterilizers, etc.; and medical equipment. This all can lead to food spoilage, loss of heating and cooling, basement flooding due to sump pump failure, and loss of water due to well pump failure.

Power failure is particularly problematic for homes that are cooled or heated with electricity. Widespread power outages during the summer and winter can directly impact vulnerable populations such as the elderly and medically frail. According to the 2020 American Community Survey 5-Year Estimates, 24.9 percent of homes across Ada County are heated with electricity.

19.2.5 Warning Time

Utility failures can occur without warning. Since they are often the result of severe weather events, the potential for a utility failure can be anticipated with the same warning time as the impending severe weather event. This includes extreme heat events that overload power systems due to heavy use of cooling systems. However, not every weather event triggers a utility failure. Many other events, such as transportation and construction accidents that may impact utility infrastructure, occur without warning.

19.3 EXPOSURE AND VULNERABILITY

The entire Ada County is exposed to the utility failure hazard. The most vulnerable residents are those over 65 or under 5 years of age, below the poverty threshold, or who rely on power for home medical devices.

19.4 DEVELOPMENT TRENDS

Future population growth will directly impact the County's vulnerability to utility failure events. The population of Ada County is projected to increase by 186,756, or 37 percent, between 2020 and 2040 (COMPASS 2021).

19.5 SCENARIO

A worst-case scenario would be a strong wind event that damages power lines and downs trees. Streets blocked by fallen trees would impact the ability of emergency utility crews to access and repair damaged lines.

19.6 ISSUES

Emergency management will need to continue to consider emergency backup power needs for critical facilities throughout the planning area.

20. VOLCANO (ASH FALL)

20.1 GENERAL BACKGROUND

A volcano is a vent in the earth's crust through which magma, rock fragments, gases and ash are ejected from the earth's interior. Over time, accumulation of these erupted products on the earth's surface creates a volcanic mountain. Figure 20-1 illustrates how Cascade volcanoes were formed.

Source: (U.S. Geological Survey 2016)

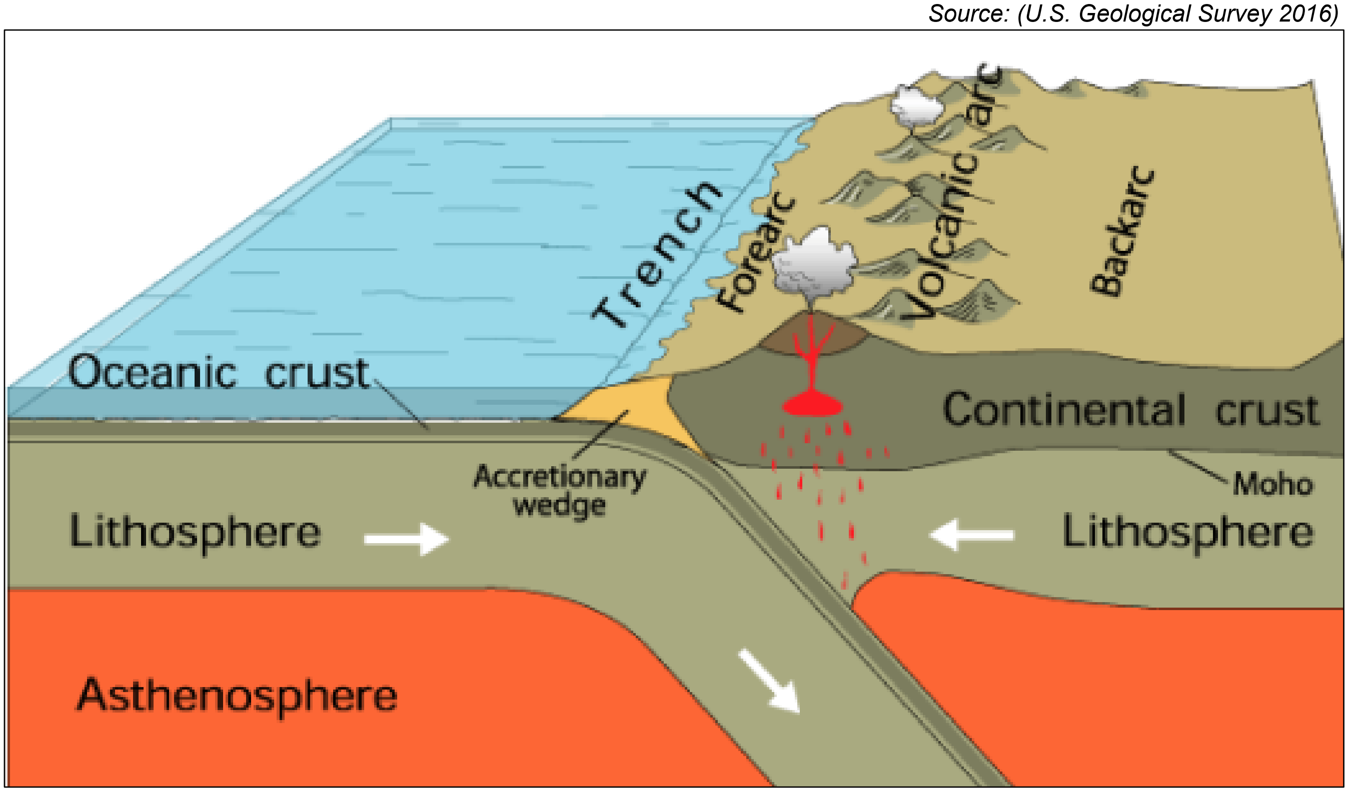


Figure 20-1. How Cascade Volcanoes Are Formed

There are a wide variety of hazards related to volcanoes and volcanic eruptions. The hazards are distinguished by the different ways in which volcanic materials and other debris flow from the volcano. The molten rock that erupts from the volcano (lava) forms a hill or mountain around the vent. The lava may flow out as a viscous liquid, or it may explode from the vent as solid or liquid particles. Ash and fragmented rock material can become airborne and travel far from the erupting volcano to affect distant areas.

Volcanoes can lie dormant for centuries between eruptions. When they erupt, high-speed avalanches of hot ash and rock called pyroclastic flows, lava flows, and landslides can devastate areas 10 or more miles away, while huge mudflows of volcanic ash and debris called ***lahars*** can inundate valleys more than 50 miles downstream. Falling ash from explosive eruptions, called ***tephra*,** can disrupt human activities hundreds of miles downwind, and drifting clouds of fine ash can cause severe damage to the engines of jet aircraft hundreds or thousands of miles away.

20.1.1 Idaho Volcanic Activity

Currently there are no active volcanoes in Idaho, but there is evidence of several types of volcanoes.

Craters of the Moon

Craters of the Moon is a volcanic field of basalt composition, 17,000 to 19,000 feet in elevation, that experienced eight eruptive episodes from 15,000 to 2,000 years ago. Its lava field lies along the northern border of the Snake River Plain, midway between Arco and Carey, Idaho. The Snake River Plain is a volcanic province that was created by a series of cataclysmic caldera-forming super-eruptions that started about 15 million years ago. The Yellowstone hotspot (see Section 12.1.1) was under the Craters of the Moon area some 10 to 11 million years ago but moved as the North American Plate migrated southwestward. Pressure from the hotspot heaves the land surface up, creating fault-block mountains. After the hotspot passes, the pressure is released and the land subsides. Leftover heat from this hotspot was later liberated by Basin and Range-associated rifting and created the overlapping lava flows that make up the Lava Beds of Idaho. The largest rift zone is the Great Rift; it is from the Great Rift fissure system that Craters of the Moon, Kings Bowl, and Wapi lava fields were created.

A typical eruption along the Great Rift and similar basaltic rift systems starts with a curtain of very fluid lava shooting up to 1,000 feet high along a segment of the rift up to 1 mile long. As the eruption continues, pressure and heat decrease and the lava becomes slightly more silica rich. The curtain of lava responds by breaking apart into separate vents. Various types of volcanoes may form at these vents: gas-rich pulverized lava creates cinder cones, and pasty lava blobs form spatter cones. Later stages of an eruption push lava streams out through the side or base of cinder cones, which usually ends the life of the cinder cone. This will sometimes breach part of the cone and carry it away as large and craggy blocks of cinder. Solid crust forms over lava streams, and lava tubes (a type of cave) are created when lava vacates its course.

Geologists feared that a large earthquake that shook Borah Peak, Idaho’s tallest mountain, in 1983 would restart volcanic activity at Craters of the Moon, though this proved not to be the case. Geologists predict that the area will experience its next eruption sometime in the next 900 years, with the most likely period in the next 100 years.

Bruneau-Jarbidge Caldera

The Bruneau-Jarbidge caldera (sometimes called a super volcano) is located in present-day southwest Idaho. The volcano erupted during the Miocene, between 10 and 12 million years ago, spreading a thick blanket of ash and forming a caldera. At the time, the caldera was above the Yellowstone hotspot. Prevailing westerly winds deposited distal ash fall over a vast area of the Great Plains. The evolving composition of the erupted material indicates that while it is derived in large part from melted material from the middle or upper crust, it also incorporated a young basaltic component.

Henry's Fork Caldera

The Henry's Fork Caldera in Idaho is located in an area known as Island Park west of Yellowstone National Park. The caldera was formed by a super-volcano in an eruption of more than 67 cubic miles 1.3 million years ago, and is the source of the Mesa Falls Tuff (tuff is a consolidated volcanic ash). The Henry's Fork Caldera is nested inside the Island Park Caldera; the two calderas share a rim on the western side. The older Island Park Caldera is much larger and more oval and extends well into Yellowstone Park. Although much smaller than the Island Park Caldera, the Henry's Fork Caldera is still sizeable at 18 miles long and 23 miles wide and its curved rim is plainly visible from many locations in the Island Park area. Of the many calderas formed by the Yellowstone hotspot, the Henry's Fork Caldera is the only one that is currently clearly visible.

Henry's Fork of the Snake River flows through the Caldera and drops out at Upper and Lower Mesa Falls. The caldera is bounded by Ashton Hill on the south, Big Bend Ridge and Bishop Mountain on the west, Thurburn Ridge on the north and Black Mountain and the Madison Plateau on the east.

Mahogany Mountain

Mahogany Mountain is an ancient caldera volcano on the border of Malheur County Oregon and Owyhee County Idaho. Its last eruption was probably 15.5 million years ago. This eruption ejected layers of volcanic rock tuff, creating formations of rock in the Leslie Gulch. A part of the Basin and Range Province, the volcano's most recent eruptive activity dates to 15 million years ago (the Miocene), forming during a period of active volcanism. It formed around the same time as Three Fingers, Castle Peak, and three other volcanoes. Today the volcano appears gnarled due to erosion and is topped by pine forests. The caldera is narrow and shaped like a ridge, with precipitous slopes and an escarpment on the northwest flank.

Leslie Gulch lies within the depression of the volcano. Layers of ash and tuff are evident in the formation, and leftover volcanic rocks sit in it as well. The gulch features an array of rock formations and ash erupted from the volcano 15.5 million years ago.

Menan Buttes

The North and South Menan Buttes in southeastern Idaho are two of the world's largest volcanic tuff cones. They are located in Madison County, with lower slopes extending westward into Jefferson County. The two cones, with four smaller associated cones, align along a north-northwest line and make up the Menan Complex. The buttes rise about 800 feet above the surrounding Snake River plain and are late Pleistocene in age, dating to 10,000 years ago. The buttes are the remains of the only volcanic eruptions that have occurred in freshwater within the boundaries of the modern United States. The South Menan Butte is currently in private hands, but North Menan Butte is publicly owned and has been designated as a National Natural Landmark and a Research Natural Area by the U.S. Congress. The BLM designated the North Butte as an Area of Critical Environmental Concern.

The volcanoes forming the two major Menan Buttes were created when basaltic magma came into contact with a shallow aquifer or with the precursor of the modern Snake River. Particles of volcanic glass were created as the water turned to steam and explosively fragmented the hot magma. The cone-shaped deposits are fairly uniform and consist primarily of tuff in small stone-sized particles. Some deposit layers preserve indentations made as larger pyroclastic particles landed on soft layers of tuff.

The Menan Buttes stand at an elevation of 5,619 feet and are very similar in size and shape. North Menan Butte is slightly larger and elliptical, with axes 2 and 2.5 miles in length. South Menan Butte measures 2 miles by 1 mile.

The crater of the North Menan Butte is about 3,000 feet in diameter and the cone is about 6,000 feet in diameter. The North Butte's volume is 0.16 cubic miles and the South Butte measures at 0.07 cubic miles. In comparison, the better-known tuff cone Diamond Head on Oahu has a volume of 0.15 cubic miles. The larger buttes in the Menan Complex are asymmetrical. Each has a greater accumulation of material on the northeast, presumably due to strong southwest winds during the initial eruption.

Yellowstone Caldera

The Yellowstone Caldera, sometimes referred to as the Yellowstone super-volcano, is located in Yellowstone National Park in the northwest corner of Wyoming. The major features of the caldera measure about 34 miles by 45 miles. The last full-scale eruption of the Yellowstone super-volcano, the Lava Creek eruption nearly 640,000 years ago, ejected 240 cubic miles of rock and dust into the sky.

The upward movement of the Yellowstone caldera floor between 2004 and 2008—almost 3 inches each year, and as much as 8 inches at the White Lake GPS station—was more than three times greater than ever observed since measurements began in 1923. By the end of 2009, the uplift had slowed significantly and appeared to have stopped. In January 2010, the USGS stated "that uplift of the Yellowstone Caldera has slowed significantly" and uplift continues but at a slower pace. Scientists with the Yellowstone Volcano Observatory say there is no evidence that a cataclysmic eruption will occur at Yellowstone in the foreseeable future.

20.1.2 Secondary Hazards

The secondary hazards associated with volcanic eruptions are mudflows and landslides and possibly seismic activity in the region of the eruption.

20.2 HAZARD PROFILE

The greatest volcano risk to the planning area is tephra accumulation from Cascade Range eruptions. The Cascade Range extends more than 1,000 miles from southern British Columbia into northern California and includes 13 potentially active volcanic peaks in the U.S. The heart of the Cascade Range lies 320 miles west of the Ada County planning area. Many of these volcanoes are far from the county or not directly upwind of the county.

20.2.1 Past Events

Figure 20-2 summarizes past eruptions in the Cascades. The last major volcanic eruption in the continental United states was the explosion of Mount St. Helens on May 18, 1980. Due to its great distance, and location across the continental divide of the Cascades, the lava and lahar flow from this eruption did not affect the Ada County planning area. West-central and southwestern Idaho did see small amounts (less than 1 inch) of tephra (ash) fall.

20.2.2 Location

The most hazardous volcanoes are those directly west and southwest of the county (along the direction of prevailing winds). The closest volcanoes due west of the planning area are Sisters, (330 miles) and Newberry Crater (285 miles). Mount Shasta in California is within 500 miles and is southwest of the Ada County planning area. With prevailing wind directions, volcanic eruption of Mount Shasta would put the Ada County planning area in the direct path for significant tephra accumulation. Figure 20-3 shows active volcanoes within the western United States.

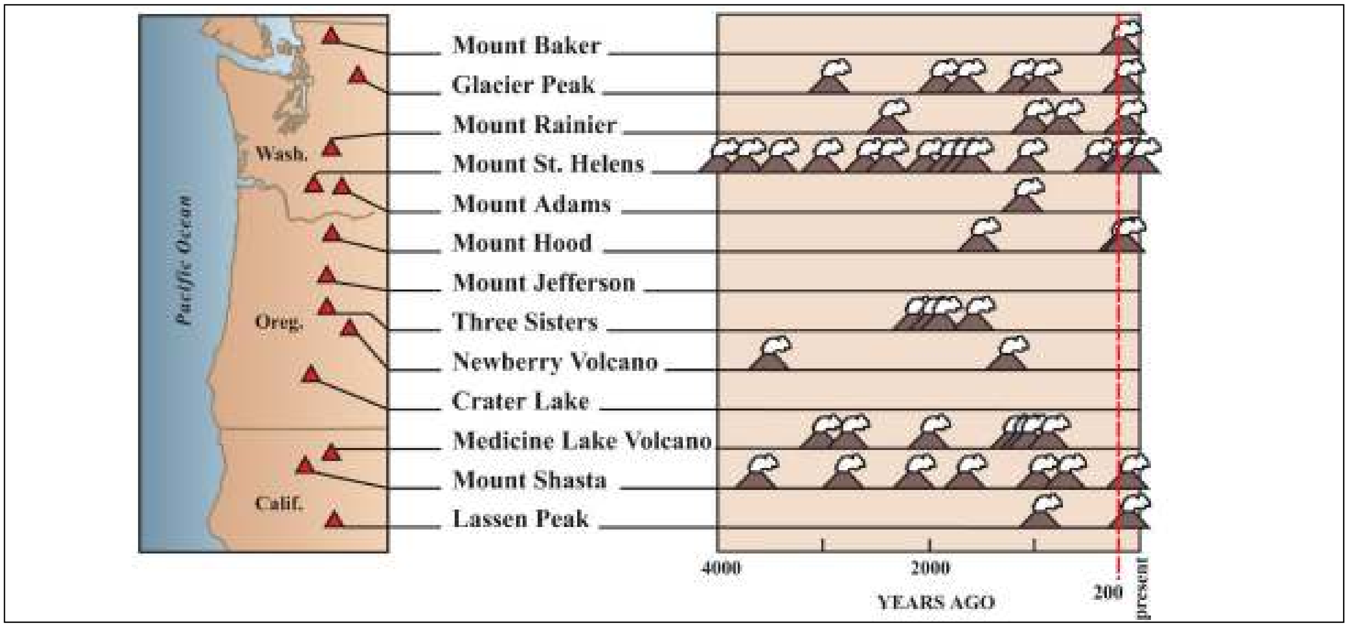


Figure 20-2. Past Eruptions in the Cascade Range

Figure 20-3. Potentially Active Volcanoes in the Western U.S.

20.2.3 Frequency

Eruptions in the Cascades have occurred at an average rate of 1 or 2 per century during the last 4,000 years. Mount St. Helens is by far the most active volcano in the Cascades, with four major explosive eruptions in the last 515 years. Still, the probability of an eruption in any given year is extremely low.

20.2.4 Severity

A 1-inch deep layer of ash weighs an average of 10 pounds per square foot, causing danger of structural collapse. Ash is harsh, acidic and gritty, and it has a sulfuric odor. Ash may also carry a high static charge for up to two days after being ejected from a volcano. When an ash cloud combines with rain, sulfur dioxide in the cloud combines with the rainwater to form diluted sulfuric acid that may cause minor, but painful burns to the skin, eyes, nose and throat.

20.2.5 Warning Time

The best warning of a volcanic eruption is one that specifies when and where an eruption is likely and what type and size eruption should be expected. Such accurate predictions are sometimes possible but still rare. The most accurate warnings are those in which scientists indicate an eruption is probably only hours to days away, based on significant changes in a volcano’s earthquake activity, ground deformation, and gas emissions. Experience from around the world has shown that most eruptions are preceded by such changes over a period of days to weeks. A volcano may begin to show signs of activity several months to a few years before an eruption. However, a warning that specifies months or years in advance when it might erupt are extremely rare.

20.3 EXPOSURE

The Ada County planning area has no direct volcanic exposure. The planning area is generally downwind of three Cascade Range volcanoes, and could experience the impacts of a tephra fall from any of these. Additionally, there are several dormant volcanic sources in Idaho that could create significant exposure to the planning area should they become active. Using the latest eruption of Mount St. Helens as an indicator, a tephra fall in Ada County could be anywhere from a half-inch to an inch. Nonetheless, some people, property and the environment are vulnerable to the effects of a tephra fall, as discussed below

20.3.1 Population

The whole population of the planning area would be exposed to some degree to the effects of a tephra fall from volcanic eruptions in the Cascade Range or volcanic sites in Idaho. The degree of exposure is highly dependent upon the magnitude of the eruption and the prevailing wind speed and direction.

20.3.2 Property

All property within the planning area could be exposed to the effects of a tephra fall to some degree. The degree of exposure would be highly dependent upon proximity to the event, magnitude of the event and the prevailing wind speed and direction at the time of the event.

20.3.3 Critical Facilities

All critical facilities could have some degree of exposure to tephra accumulation. All transportation routes are exposed to ash fall and tephra accumulation, which could create hazardous driving conditions on roads and highways and hinder evacuations and response

20.3.4 Environment

The environment is highly exposed to the effects of a volcanic eruption.

20.4 VULNERABILITY

20.4.1 Population

While accumulations of tephra would not be considered to be significant, the populations most vulnerable to the effects of a tephra fall are the elderly, the very young and those already experiencing ear, nose and throat problems. Homeless people, who may lack adequate shelter, are also vulnerable to the effects of a tephra fall, although Ada County has few homeless people who would not be able to find adequate shelter or assistance during an event.

20.4.2 Property

The planning team was not able to generate damage estimates for this hazard because there are no generally accepted damage functions for volcanic hazards in risk assessment platforms such as Hazus. Vulnerable property includes equipment and machinery left out in the open, such as farm equipment, whose parts can become clogged by the fine dust. Since Ada County receives snow every year, and roofs are built to withstand snow loads, most roofs are not vulnerable and would be able to withstand the potential load of ash. Infrastructure, such as drainage systems, is also potentially vulnerable to the effects of a tephra fall, since the fine ash can clog pipes and culverts. This may be more of a problem if an eruption occurs during winter or early spring when precipitation is highest and floods are most likely.

20.4.3 Critical Facilities

Critical facilities in the direction of wind would be vulnerable to tephra accumulations. Water treatment plants, power generation stations and wastewater treatment plants are vulnerable to contamination from ash fall.

20.4.4 Environment

The environment is very vulnerable to the effects of a volcanic eruption, even if the eruption does not directly impact the planning area. This is highly dependent upon the amount of tephra accumulation. Rivers and streams in the Boise River watershed are vulnerable to damage due to ash fall, especially since ash fall can be carried throughout the county by these water courses. The sulfuric acid contained in volcanic ash could be damaging to area vegetation, waters, wildlife and air quality.

Even if ash from a volcanic eruption were to fall elsewhere, it could be spread throughout the county by the rivers and streams. A volcanic blast would expose the local environment to many effects such as lower air quality, and many other elements that could harm local vegetation and water quality.

20.5 DEVELOPMENT TRENDS

Because all of the planning area is exposed to the volcanic ash fall hazard, the increase in exposed population and property since the last hazard mitigation plan update is equal to the countywide trend over that time period: a 17.8 percent increase in population, a 19.4 percent increase in number of general building stock structures, and an 46.7 percent increase in total assessed property value (see Section 4.4.4). However, since the majority of this growth was new development, the increase in vulnerability to volcanic ash fall is considered to be minimal due to the influence of strong codes and code enforcement within the planning area.

All future development has the potential of being impacted by ash fall generated from a volcanic event. While this potential impact on the built environment is not considered to be significant, the economic impact on industries that rely on machinery and equipment such as agriculture or civil engineering projects could be significant. The extent of this hazard is difficult to gauge because it is dependent upon many variables, so the ability to institute land use recommendations based on potential impacts of this hazard is limited. While the impacts of volcanic hazards are sufficient to warrant risk assessment for emergency management purposes, the impacts are not considered to be sufficient to dictate land use decisions.

20.6 SCENARIO

The worst-case scenario for the Ada County planning area would be any volcanic activity associated with the Yellowstone hotspot. Geologic history has shown that volcanic activity associated with the hotspot could be catastrophic if it were to occur in today's environment. The probability of such an event occurring in the near term is up for geologic debate. A more likely scenario is volcanic activity in the Cascade Range producing a significant amount of ash fall within the planning area. No one would be injured or killed, but businesses and non-essential government would be closed until the cloud passes. People and animals without shelter would be affected. Structures would be safe, but private property left out in the open, such as farm equipment, might be damaged by the fine ash dust.

20.7 ISSUES

Since volcanic episodes have been fairly predictable in the recent past, there is not much concern about loss of life, or impact on property. However, economic and environmental impacts are something to consider in emergency management.

21. WILDFIRE

21.1 GENERAL BACKGROUND

A wildfire is an uncontrolled fire on undeveloped or developed land, in most cases requiring fire suppression. They can be ignited by lightning or by human activity such as smoking, campfires, equipment use and arson. Wildfires occur when all of the necessary elements of a fire come together in a wooded or grassy area: an ignition source is brought into contact with a combustible material such as vegetation that is subjected to sufficient heat and has an adequate supply of oxygen from the ambient air.

A wildfire front is the portion of a wildfire sustaining continuous flaming combustion, where unburned material meets active flames. As the front approaches, the fire heats the surrounding air and vegetative material. At a temperature of 212ºF, vegetative material is dried as water in it is vaporized. At 450ºF, the wood releases flammable gases. Wood smolders at 720ºF and ignites at 1,000ºF. Before the flames of a wildfire arrive, heat from the wildfire front can warm the air to 1,470ºF, which pre-heats and dries flammable materials, causing them to ignite faster and allowing the fire to spread faster. High temperature and long-duration surface wildfires may encourage flashover or *torching*: the drying of tree canopies and their subsequent ignition from below.

Large wildfires may affect air currents by the stack effect: air rises as it is heated, so large wildfires create powerful updrafts that draw in new, cooler air from surrounding areas in thermal columns. Great vertical differences in temperature and humidity encourage fire-created clouds, strong winds, and fire whirls with the force of tornadoes at speeds of more than 50 mph. Rapid rates of spread, prolific crowning or spotting, the presence of fire whirls, and strong convection columns signify extreme conditions.

21.1.1 Wildfire Types

Fire types can be generally characterized by their fuels as follows:

- Ground fires are fed by subterranean roots, duff and other buried organic matter. This fuel type is especially susceptible to ignition due to spotting. Ground fires typically burn by smoldering, and can burn slowly for days to months.
- Crawling or surface fires are fueled by low-lying vegetation such as leaf and timber litter, debris, grass, and low-lying shrubbery.
- Ladder fires consume material between low-level vegetation and tree canopies, such as small trees, downed logs and vines. Invasive plants that scale trees may encourage ladder fires.
- Crown, canopy or aerial fires burn suspended material at the canopy level, such as tall trees, vines and mosses. The ignition of a crown fire, called *crowning*, depends on the density of the suspended material, canopy height, canopy continuity, and the presence of surface and ladder fires to reach the tree crowns.

21.1.2 Factors Affecting Wildfire Risk

Three principal factors have a direct impact on the behavior of wildfires: topography, fuel, and weather.

Topography

Topography can have a powerful influence on wildfire behavior. The movement of air over the terrain tends to direct a fire's course. Gulches and canyons can funnel air and act as a chimney, intensifying fire behavior and inducing faster rates of spread. Saddles on ridge tops offer lower resistance to the passage of air and will draw fires. Solar heating of drier, south-facing slopes produces upslope thermal winds that can complicate behavior.

Slope is an important factor. If the percentage of uphill slope doubles, the rate of spread of wildfire will likely double. On steep slopes, fuels on the uphill side of the fire are closer physically to the source of heat. Radiation preheats and dries the fuel, thus intensifying fire behavior. Fire travels downslope much more slowly than it does upslope, and ridge tops often mark the end of wildfire's rapid spread.

Fuels

Fuels are classified by weight or volume (fuel loading) and by type. Fuel loading, often expressed in tons per acre, can be used to describe the amount of vegetative material available. If fuel loading doubles, the energy released also can be expected to double. Each fuel type is given a burn index, which is an estimate of the amount of potential energy that may be released, the effort required to contain a fire in a given fuel, and the expected flame length. Different fuels have different burn qualities. Some fuels burn more easily or release more energy than others. Grass, for instance, releases relatively little energy, but can sustain very high rates of spread.

Continuity of fuels is expressed in terms of horizontal and vertical dimensions. Horizontal continuity is what can be seen from an aerial photograph and represents the distribution of fuels over the landscape. Vertical continuity links fuels at the ground surface with tree crowns via ladder fuels.

Another essential factor is fuel moisture. Fuel moisture is expressed as a percentage of total saturation and varies with antecedent weather. Low fuel moistures indicate the probability of severe fires. Given the same weather conditions, moisture in fuels of different diameters changes at different rates. A 1,000-hour fuel, which has a 3- to 8-inch diameter, changes more slowly than a 1- or 10-hour fuel.

Weather

Of all the factors influencing wildfire behavior, weather is the most variable. Extreme weather leads to extreme events, and it is often a moderation of the weather that marks the end of a wildfire's growth and the beginning of successful containment. High temperatures and low humidity can produce vigorous fire activity. The cooling and higher humidity brought by sunset can dramatically quiet fire behavior.

Fronts and thunderstorms can produce winds that are capable of radical and sudden changes in speed and direction, causing similar changes in fire activity. The rate of spread of a fire varies directly with wind velocity. Winds may play a dominant role in directing the course of a fire. The radical and devastating effect that wind can have on fire behavior is a primary safety concern for firefighters. In July 1994, a sudden change in wind speed and direction on Storm King Mountain led to a blowup that claimed the lives of 14 firefighters. The most damaging firestorms are usually marked by high winds.

21.1.3 Historical Fire Regime and Current Condition Classification

Land managers need to understand historical fire regimes (that is, fire frequency and fire severity prior to significant human settlement) to be able to define ecologically appropriate goals and objectives for an area. This understanding must include knowledge of how historical fire regimes vary across the landscape. Five historical fire regimes are classified based on average number of years between fires (fire frequency) and the severity of the fire (amount of replacement) on the dominant overstory vegetation:

I. 0- to 35-year frequency and low (surface fires most common) to mixed severity (less than 75 percent of the dominant overstory vegetation replaced)

II. 0- to 35-year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced)

III. 35- to 100-year frequency and mixed severity (less than 75 percent of the dominant overstory vegetation replaced)

IV. 35- to 100-year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced)

V. >200-year frequency and high (stand replacement) severity.

Understanding ecosystem departures—how ecosystem processes and functions have changed—provides a context for managing sustainable ecosystems. The fire regime condition class (FRCC) is a classification of the amount of departure from the historical fire regime. There are three condition classes for each historical fire regime. All wildland vegetation and fuel conditions fit within one of the three classes. The classification is based on a relative measure describing the degree of departure from the historical fire regime. This departure results in changes to one or more of the following ecological components:

- Vegetation characteristics (species composition, structural stages, stand age, canopy closure and mosaic pattern)
- Fuel composition
- Fire frequency, severity, and pattern
- Associated disturbances (e.g., insect and disease mortality, grazing, and drought).

The three classes indicate low (FRCC 1), moderate (FRCC 2) and high (FRCC 3) departure from the historical fire regime. Low departure is considered to be within the historical range of variability, while moderate and high departures are outside.

Characteristic vegetation and fuel conditions are those that occurred within the historical fire regime. Uncharacteristic conditions are those that did not occur within the historical fire regime, such as invasive species (e.g. weeds, insects, and diseases), "high graded" forest composition and structure (e.g. large trees removed in a frequent surface fire regime), or repeated annual grazing that reduces grassy fuels across relatively large areas to levels that will not carry a surface fire.

Determination of the amount of departure is based on comparison of a composite measure of fire regime attributes to the central tendency of the historical fire regime. The amount of departure is then classified to determine the fire regime condition class. Table 21-1 presents a simplified description of the fire regime condition classes and associated potential risks.

Table 21-1. Fire Regime Condition Class Definitions

Description	Potential Risks
Fire Regime Condition Class 1	
Within the historical range of variability.	• Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. • Composition and structure of vegetation and fuels are similar to the natural (historical) regime. • Risk of loss of key ecosystem components (e.g. native species, large trees and soil) is low.
Fire Regime Condition Class 2	
Moderate departure from the historical regime of variability.	• Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). • Composition and structure of vegetation and fuel are moderately altered. • Uncharacteristic conditions range from low to moderate. • Risk of loss of key ecosystem components is moderate.
Fire Regime Condition Class 3	
High departure from the historical regime of variability.	• Fire behavior, effects, and other associated disturbances are highly departed (more or less severe). • Composition and structure of vegetation and fuel are highly altered. • Uncharacteristic conditions range from moderate to high. • Risk of loss of key ecosystem components is high.

21.1.4 Secondary Hazards

Wildfires can generate a range of secondary effects, which in some cases may cause more widespread and prolonged damage than the fire itself. Fires can cause direct economic losses in the reduction of harvestable timber and indirect economic losses in reduced tourism. Wildfires cause the contamination of reservoirs, destroy transmission lines and contribute to flooding. They strip slopes of vegetation, exposing them to greater amounts of runoff. This in turn can weaken soils and cause failures on slopes. Major landslides can occur several years after a wildfire. Most wildfires burn hot and for long durations that can bake soils, especially those high in clay content, thus increasing the imperviousness of the ground. This increases the runoff generated by storm events, thus increasing the chance of flooding.

21.2 HAZARD PROFILE

Wildfire presents a risk to vegetation and wildlife habitats. Short-term loss caused by a wildfire can include the destruction of timber, wildlife habitat, scenic vistas, and watersheds. Long-term effects include smaller timber harvests, reduced access to affected recreational areas, destruction of cultural and economic resources, and potential impacts on water supply and community infrastructure. Vulnerability to flooding increases due to the destruction of watersheds. The potential for significant damage to life and property exists in areas designated as wildland urban interface (WUI) areas, where development is adjacent to densely vegetated areas. For the Ada County Planning area, a WUI has been identified and mapped based on the following definition:

> *The geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.*

This definition comes from the 2012 *International Wildland Urban Interface Code* and it is defined geographically in the planning layers. Ada County and its planning partners use this definition to implement land use regulations in the identified WUI. All references to the WUI in this hazard mitigation plan are for areas identified and mapped under this definition.

21.2.1 Past Events

In the fire-adapted ecosystems of Idaho, fire is the dominant process constraining terrestrial vegetation patterns, habitat, and species composition. Fire was once an integral function of the majority of ecosystems in Idaho, including the Ada County planning area. The seasonal cycling of fire across the landscape was as regular as the July, August and September lightning storms plying across the canyons and mountains. Depending on the plant community composition, structural configuration, and buildup of plant biomass, fire resulted from ignitions with varying intensities and extent across the landscape. Shorter return intervals between fire events often resulted in less dramatic changes in plant composition. The fires burned with a varied return interval, but much of the county burned through a stand-replacing fire that occurred on a moderate return interval of 20 to 80 years.

Native plant communities in this region developed under the influence of fire, and adaptations to fire are evident at the species, community and ecosystem levels. Fire history data (from fire scars and charcoal deposits) suggest fire has played a role in shaping the vegetation in the region for thousands of years.

Detailed records of fire perimeter and ignition and extent have been obtained from the BLM for the Ada County planning area. Since 2000, there were 239 fire events on or near BLM lands within the Ada County planning area, burning over 95,350 acres. These ignitions and perimeter points are shown in Figure 21-1. Table 21-2 is a summary of the number of fires per year from 2000 to 2021 on or near BLM lands in the Ada County planning area. There are over 589,000 acres of BLM-managed land in the Ada County planning area, representing 86 percent of the planning area. Much of this land is in or adjacent to privately held lands within the WUI as well as the overall planning area.

Table 21-2. BLM Fire Statistics—Fires per Year in Ada County Planning Area, 2000-2021

Fire Year	# Fires	Total Acres	Causes	Fire Year	# Fires	Total Acres	Causes
2021	8	556.05	2 Natural, 6 Human	**2009**	6	629.17	N/A
2020	6	240.65	1 Natural, 5 Human	**2008**	3	584.73	N/A
2019	6	102.95	2 Natural, 4 Human	**2007**	32	6,685.70	N/A
2018	9	69.2	2 Natural, 7 Human	**2006**	8	2,531.13	N/A
2017	9	215.45	4 natural, 5 human	**2005**	13	10,286.88	N/A
2016	19	7,144.1	3 natural, 16 Human	**2004**	2	126.12	N/A
2015	6	178.10	6 Human	**2003**	3	1,295.72	N/A
2014	6	1,540.88	2 natural, 6 human	**2002**	7	5,189.88	N/A
2013	16	5,208.07	4 natural, 12 human	**2001**	26	1,1740.08	N/A
2012	24	10,804.70	2 natural, 22 human	**2000**	9	5,789.50	N/A
2011	14	18,050.43	7 natural, 7 Human	**Total**	**109**	**44,858.91**	
2010	7	6,381.03	N/A	***Average***	***10.86***	***4,334.11***	

21.2.2 Location

The wildfire risk assessment for this hazard mitigation plan update used different data from what was used for previous plans. After the completion of the 2017 Ada County Multi-Hazard Mitigation Plan, EMCR completed the Ada County Enhanced Wildfire Risk Map project. This project produced wildfire maps and GIS data at the block level within the wildland urban interface (WUI) and at a study region level outside the WUI (study regions were delineated by defined characteristics such as interior urban environment or irrigated agriculture). This data and modeling were identified by the Steering Committee as the best data available to assess the wildfire risk for the current update. Figure 21-2 shows the extent and location of the wildfire hazard based on the new data.

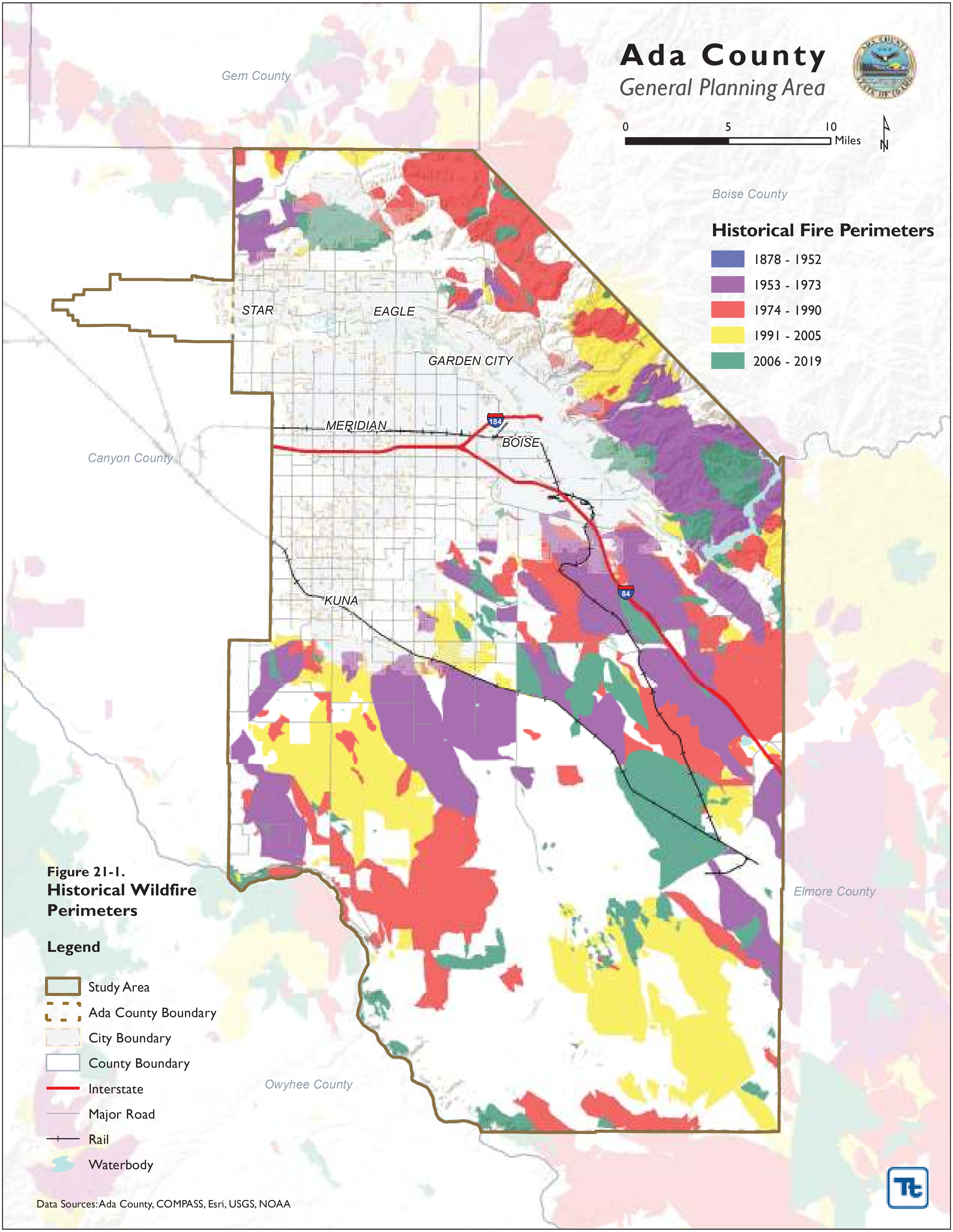


Figure 21-1.
Historical Wildfire Perimeters

Legend

Study Area
Ada County Boundary
City Boundary
County Boundary
Interstate
Major Road
Rail
Waterbody

Data Sources: Ada County, COMPASS, Esri, USGS, NOAA

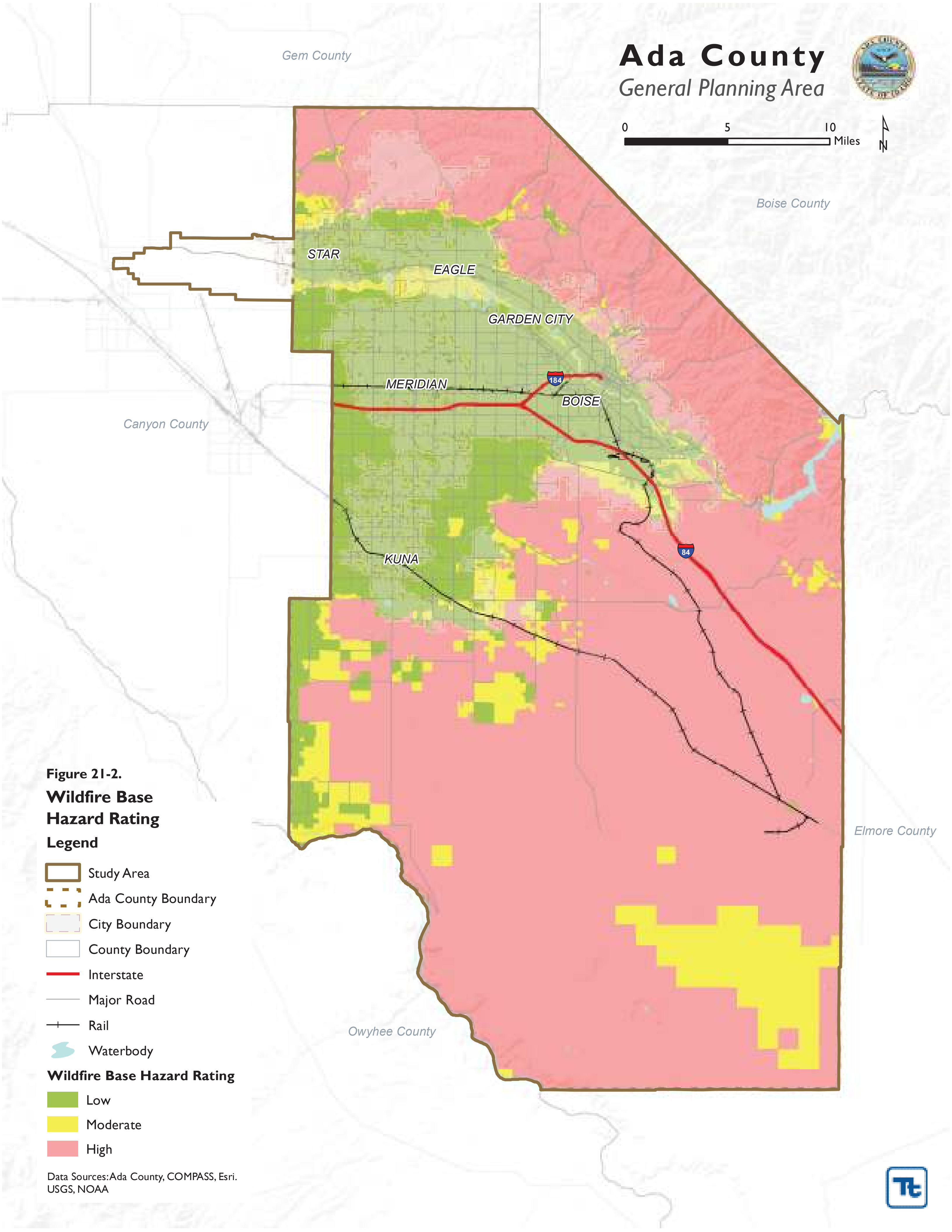


Figure 21-2.
Wildfire Base Hazard Rating

21.2.3 Frequency

Fire ecologists use natural fire rotation to establish recurrence intervals for a planning area. Fire rotation is a measure of relative expected intervals between fires at regional scales, where site-specific fire frequency estimates are not available. Natural fire rotation is defined as the number of years necessary for fires to burn over an area equal to that of the study area (Heinselman, 1981). It is calculated for large areas using past fire size records by dividing the length of the record period in years by the percentage of total area burned during that period. Modern-era fire rotation analysis summarizes areas into the following classes of expected fire frequency:

- High (fire rotation less than 100 years)
- Medium (fire rotation more than 100 years and less than 300 years)
- Low (fire rotation more than 300 years).

As shown in Table 21-2, Ada County experienced an average of 10.86 fires per year on or near BLM-managed lands from 2000 to 2021, burning 4,334 acres per fire. This yields a natural fire rotation of 109.2 years, a medium rating, almost a high rating.

21.2.4 Severity

Fire severity has been defined as "the magnitude of significant negative fire impacts on wildland systems" (Simard, 1991). This definition has nothing to do directly with the fire itself—not the fire's behavior, flame length, rate of spread, or any of the other measures of the fire. Rather, it is defined by the effects of a fire on wildland systems. This definition was born out of the need to provide a description of how fire intensity affects ecosystems, particularly wildfires for which direct information on fire intensity was absent and effects vary among different ecosystems (Keely, 2009).

Within the WUI, risks are associated with the probability that an area will burn, its severity, and the likely behavior of fire in the area. It was assumed that burn probability and fire behavior contribute equally to the risks to communities. Agriculture areas, rock, urban areas, and water are not assigned a burn probability or relative fire behavior. Communities with these cover classes are assumed to not be at risk from wildfire.

Wildfire impacts beyond those on ecosystems include impacts on human life, built improvements, and natural resources such as watersheds, grazing lands and recreational areas. Although fire suppression capabilities in the WUI areas are substantial, the volatile nature of wildfires makes fighting them a challenge. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke.

Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly and those with respiratory and cardiovascular diseases. In addition, wildfire can lead to ancillary impacts such as landslides in steep ravine areas and flooding due to the impacts of silt in local watersheds. There are two reported incidents of loss of life from wildfires in the planning area. One involved first responders and the other involved a resident who lived within a WUI.

21.2.5 Warning Time

Wildfires are often caused by humans, intentionally or accidentally. There is no way to predict when one might break out. The weather can provide an element of warning for local governments in that nicer weather heightens public activity in interface areas. Within Ada County the planning area, there is always a heightened state of readiness by fire response personnel during the spring, summer and fall as weather and the increased recreational uses within the WUI can trigger events.

Dry seasons and droughts are factors that greatly increase fire likelihood. Dry lightning may trigger wildfires. Extreme weather can be predicted, so special attention can be paid during weather events that may include lightning. Reliable National Weather Service lightning warnings are available on average 24 to 48 hours prior to a significant electrical storm.

If a fire does break out and spread rapidly, residents may need to evacuate within days or hours. A fire's peak burning period generally is between 1 p.m. and 6 p.m. Once a fire has started, fire alerting is reasonably rapid in most cases. The spread of cellular and two-way radio communications in recent years has contributed to a significant improvement in warning time.

21.2.6 Performance Period Wildfire Mitigation Activities

Several organizations in Ada County have implemented wildfire mitigation projects since completion of the 2017 plan. These projects have been well-supported by the community and are helping to lessen the impact of wildfires on Ada County residents, structures, ecosystems, and economy. A summary of all project activities by implementing agencies is provided in Appendix E of this volume.

21.2.7 Firefighting Resources and Capabilities

Fire district personnel are often the first responders during emergencies. In addition to structure fire protection, they are called on during wildfires, floods, landslides, and other events. There are many in Ada County serving fire protection departments in various capacities. A complete inventory of resources and capabilities of fire-fighting agencies in the Ada County planning area is provided in Appendix F of this volume.

21.3 EXPOSURE

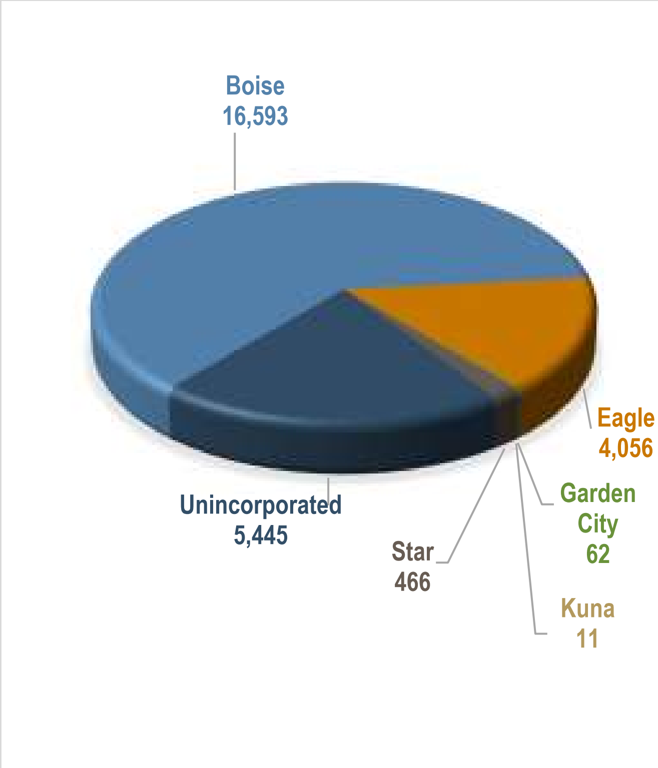
A Level 2 Hazus analysis was used to assess exposure to wildfire in the planning area. Where possible, the Hazus default data was enhanced using local GIS data from county, state and federal sources. Population could not be examined by wildfire hazard area because census block group areas do not coincide with the hazard areas. A population estimate was made using the structure count of buildings within the wildfire hazard areas.

21.3.1 Population

Figure 21-3 and Figure 21-4 summarize the population living in the moderate and high wildfire hazard zones.

21.3.2 Property

The value of exposed buildings and contents in each jurisdiction is summarized in Figure 21-5 through Figure 21-6 for the moderate, moderate/high, and high wildfire hazard zones, respectively. Figure 21-7 through Figure 21-8 summarize the number of structures in the moderate, moderate/high, and high wildfire hazard zones, respectively, by municipality and occupancy class.



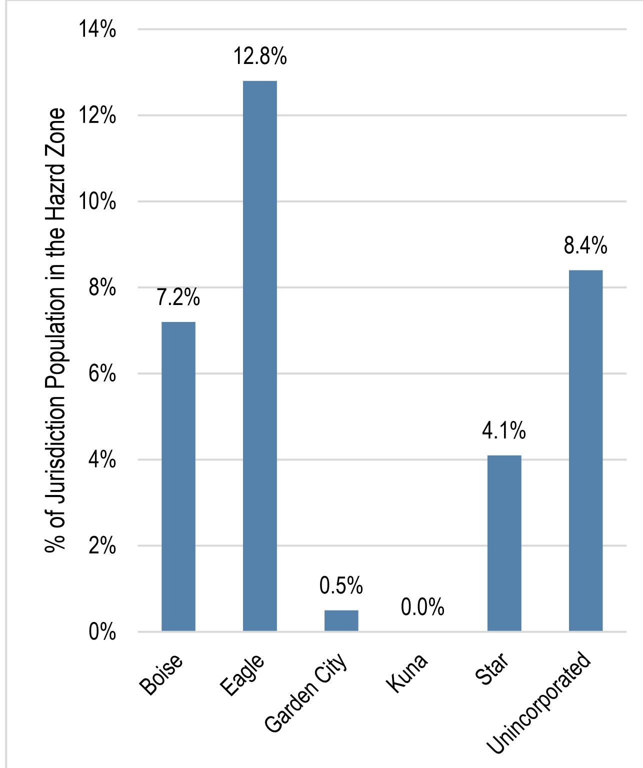
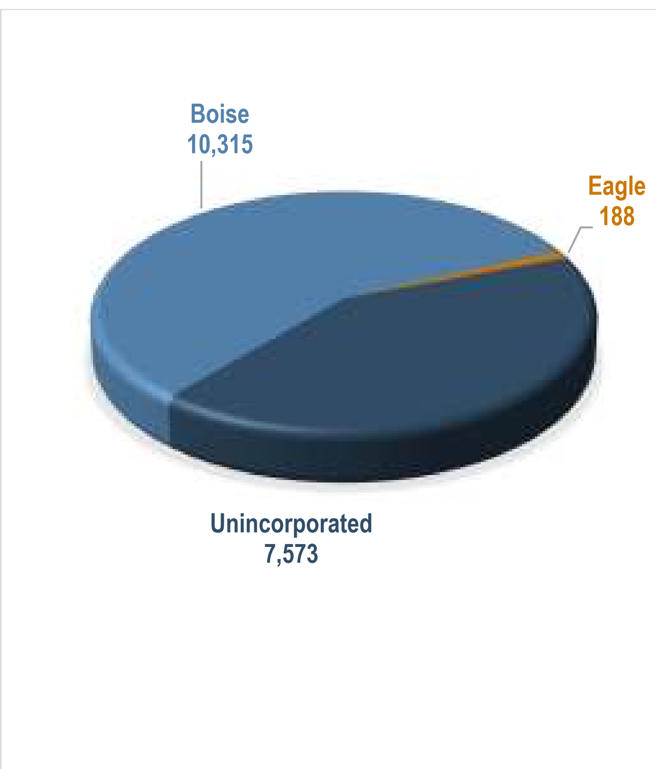


Figure 21-3. Population in the Moderate Wildfire Hazard Area



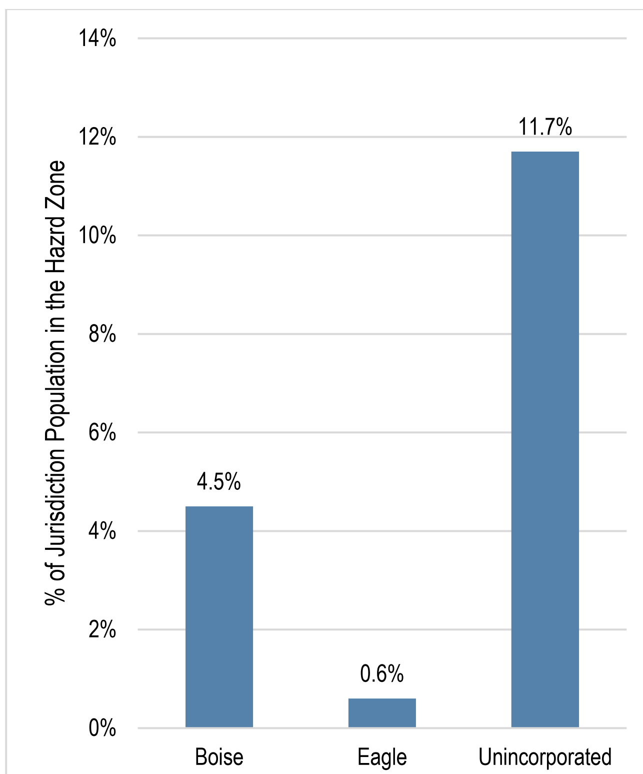


Figure 21-4. Population in the High Wildfire Hazard Area

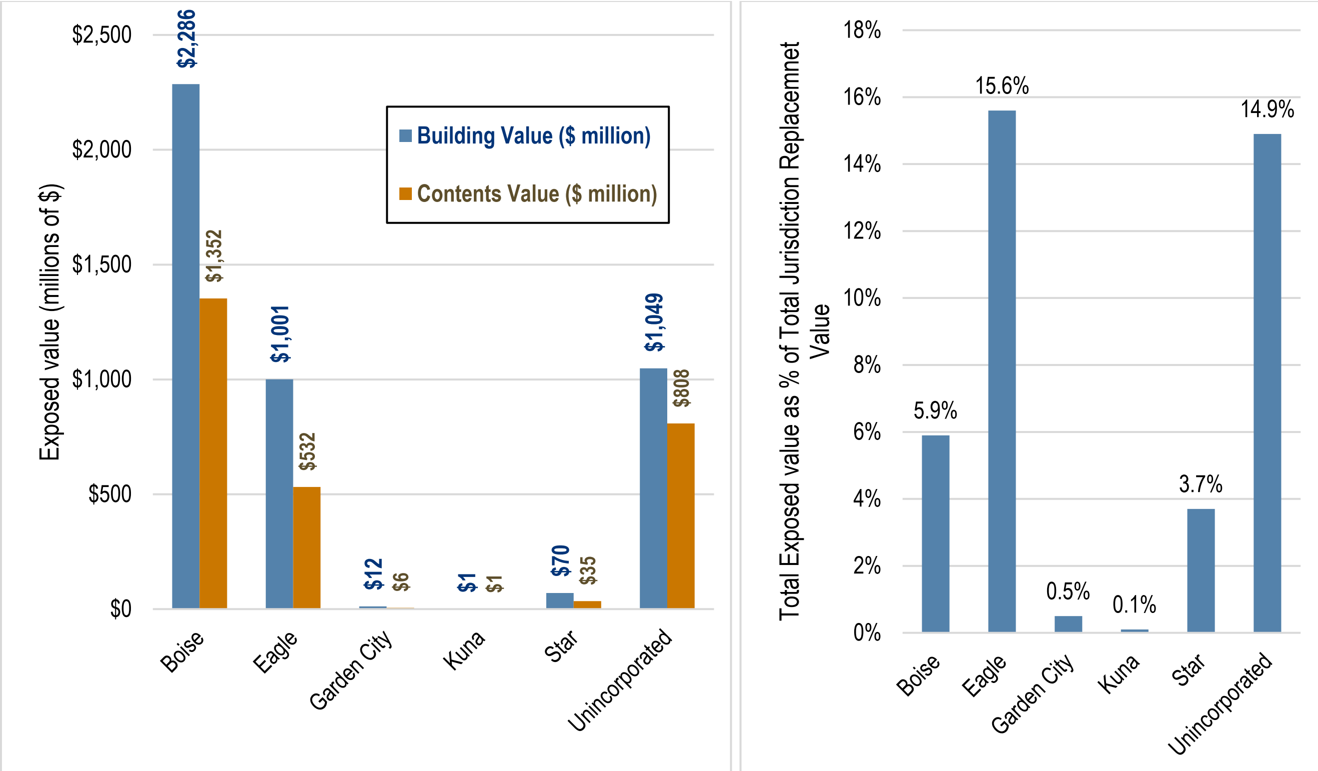


Figure 21-5. Value of Property in the Moderate Wildfire Hazard Area

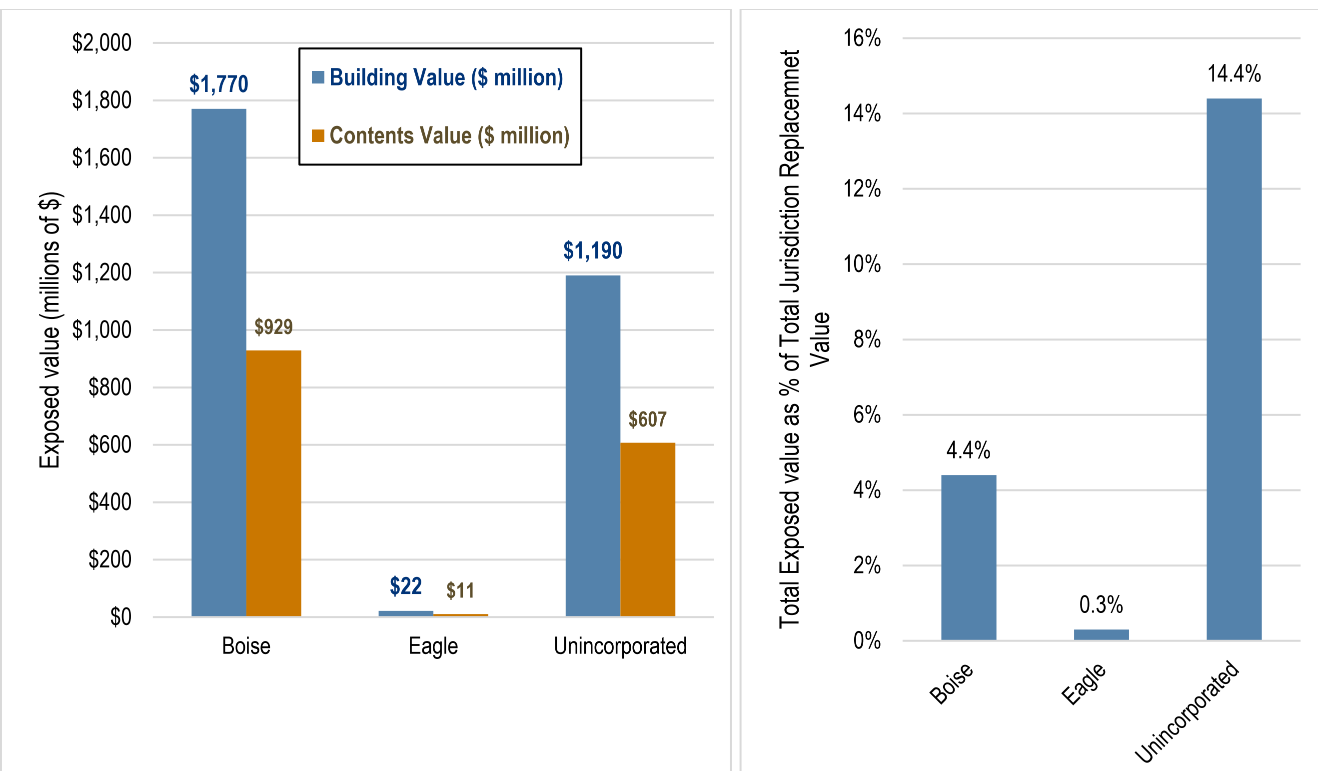


Figure 21-6. Value of Property in the High Wildfire Hazard Area

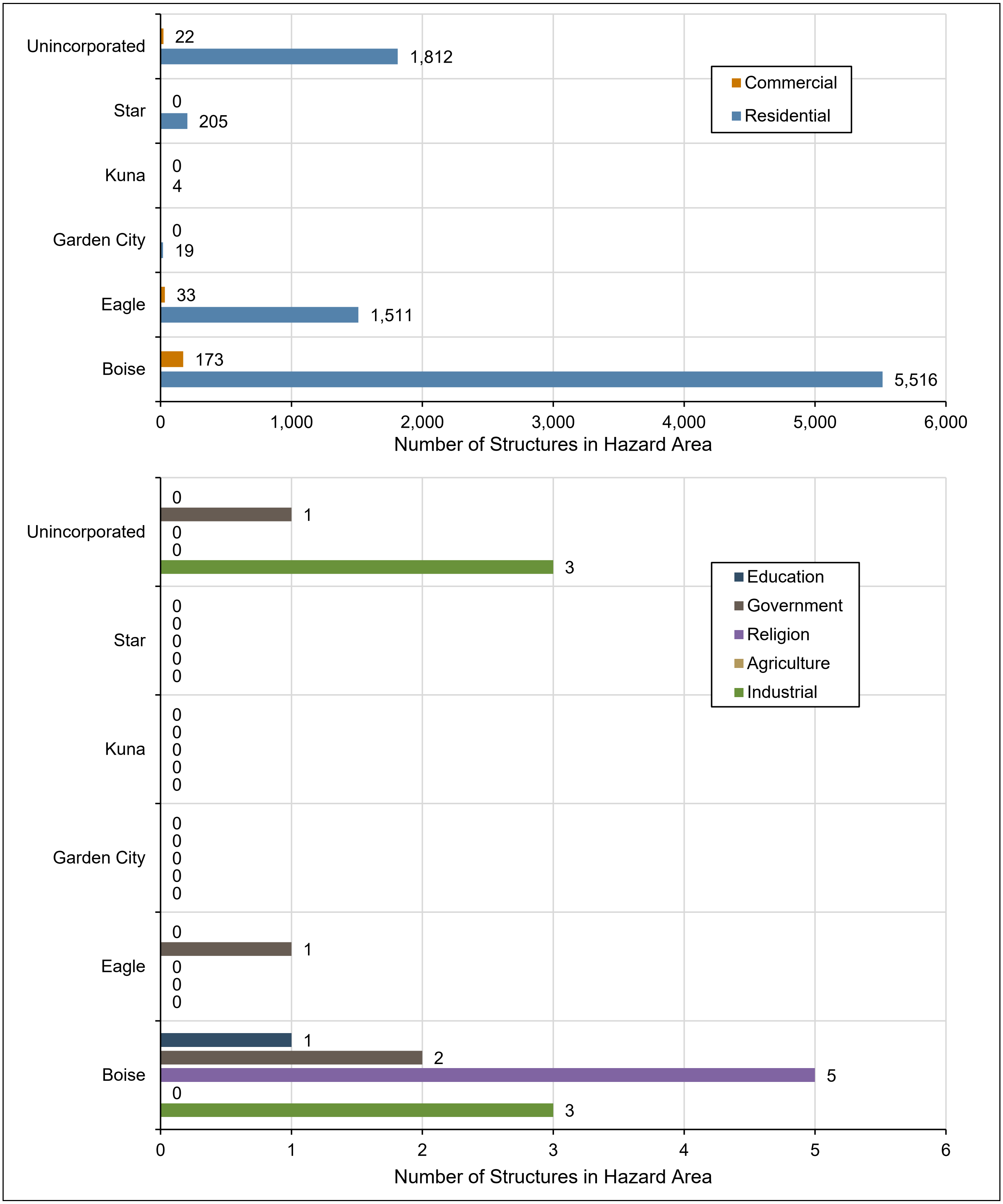


Figure 21-7. Number of Structures Within the Moderate Wildfire Hazard Area

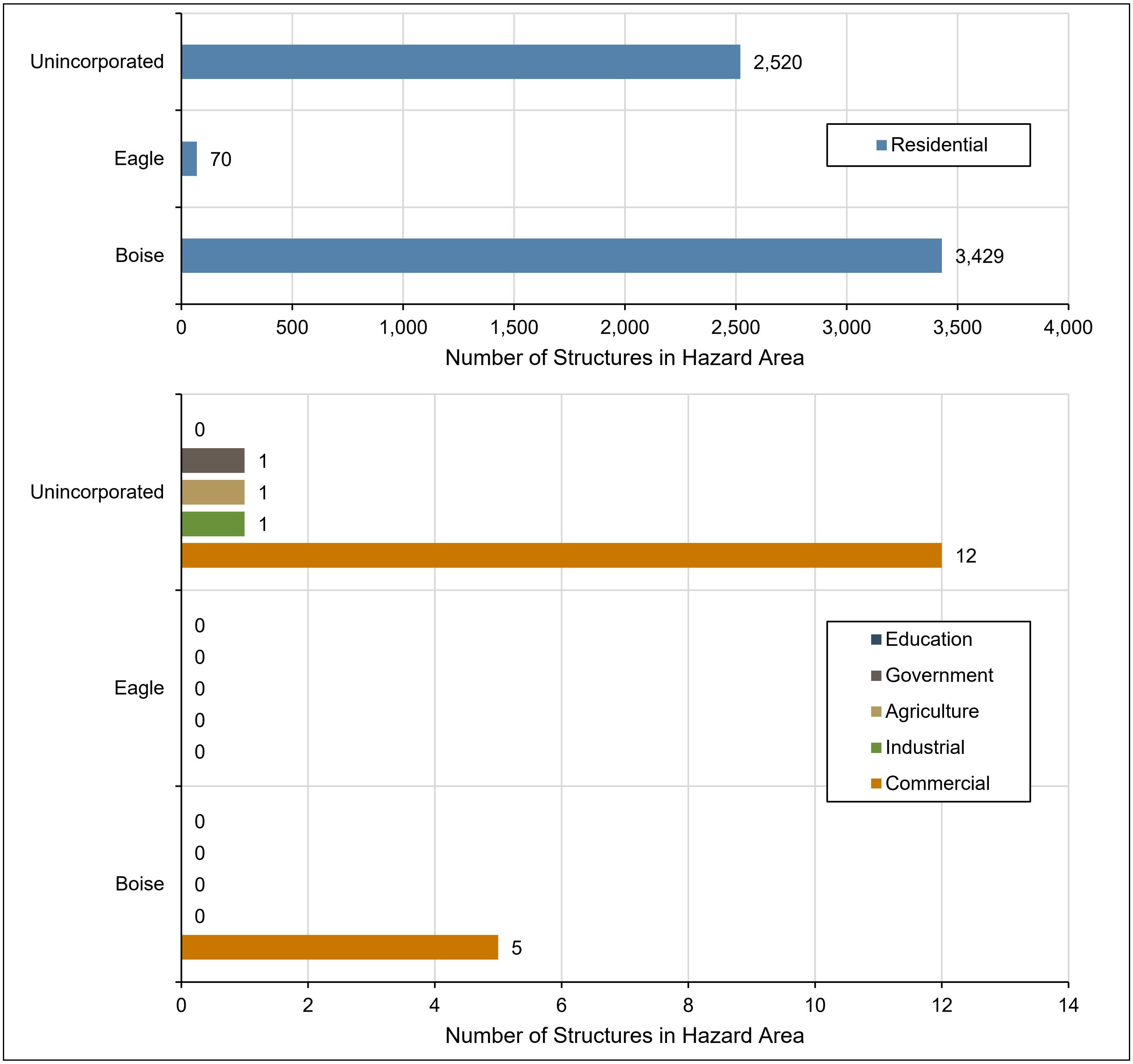


Figure 21-8. Number of Structures Within the High Wildfire Hazard Area

21.3.3 Critical Facilities

Figure 21-9 summarizes the critical facilities exposed to the wildfire hazard for the countywide planning area. Results for individual jurisdictions are provided in Appendix D.

In the event of wildfire, there would likely be little damage to the majority of infrastructure. Most road and railroads would be without damage except in the worst scenarios. Power lines are the most at risk to wildfire because most are supported on poles made of wood and susceptible to burning. In the event of a wildfire, pipelines could provide a source of fuel and lead to a catastrophic explosion.

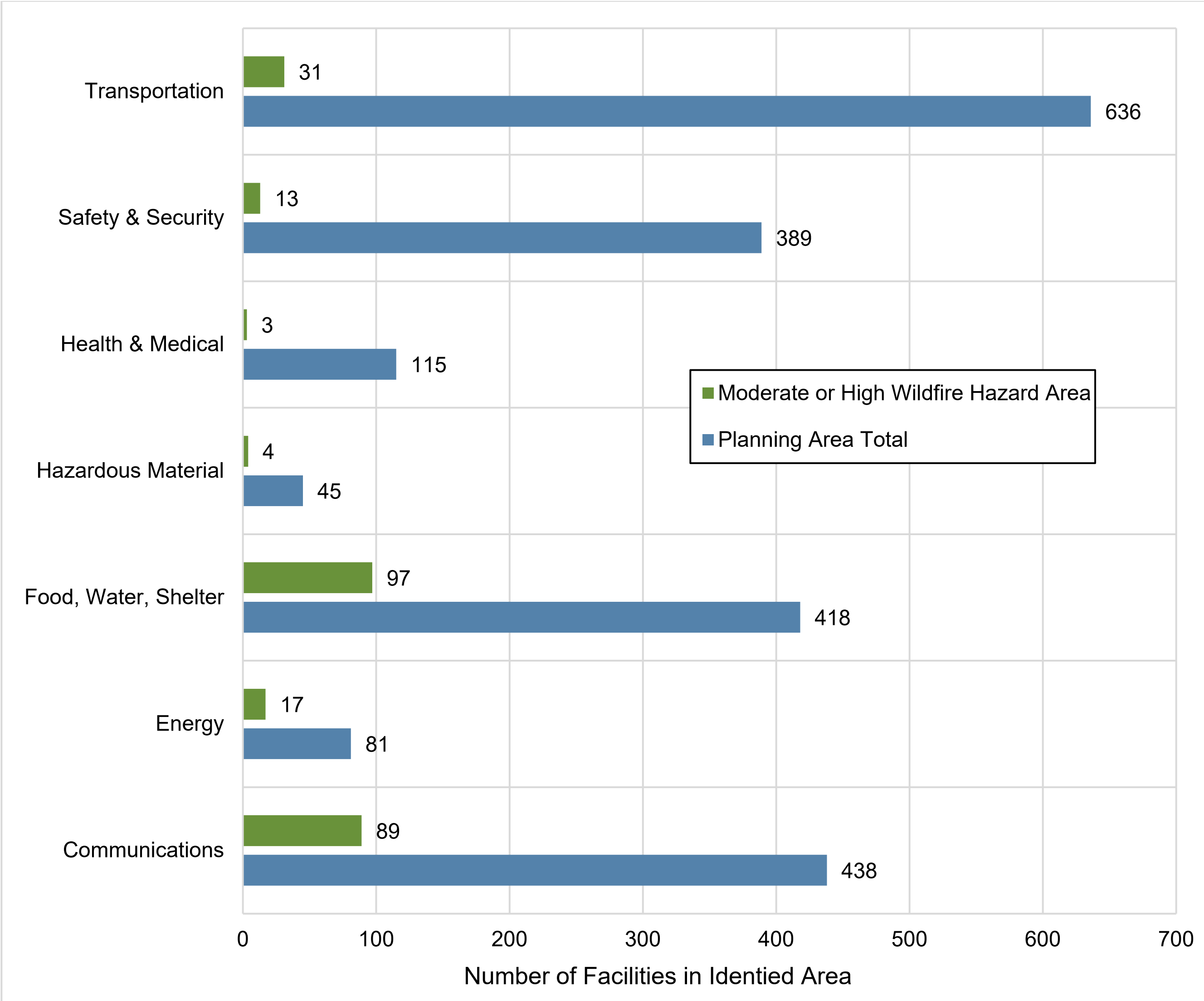


Figure 21-9. Critical Facilities in the Mapped Wildfire Hazard Areas and Countywide

During a wildfire event, hazardous material containers at Tier II material containment sites could rupture due to excessive heat and act as fuel for the fire, causing rapid spreading and escalating the fire to unmanageable levels. In addition, they could leak into surrounding areas, saturating soils and seeping into surface waters, and have a disastrous effect on the environment.

21.3.4 Environment

All natural areas within the mapped wildfire hazard zones are considered to be exposed to the hazard.

21.4 VULNERABILITY

There are currently no recognized models that estimate the vulnerability of people, property or infrastructure in for wildfire. There are too many variables with wildfire behavior to establish damage curves for the various wildfire severity zones. The vulnerabilities to wildfires are many. This section quantifies vulnerabilities in a fashion consistent with FEMA-suggested best management practices for risk assessment for hazard mitigation planning. For vulnerabilities that are not quantifiable, a qualitative assessment is provided. Except as discussed in this section, vulnerable populations, property, infrastructure and environment are assumed to be the same as described in the section on exposure.

21.4.1 Population

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly and those with respiratory and cardiovascular diseases. Smoke generated by wildfire consists of emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility. Wildfire may also threaten the health and safety of those fighting the fires.

21.4.2 Property

Loss estimations for this assessment were developed representing 10 percent, 30 percent and 50 percent of the assessed value of exposed structures. This allows emergency managers to select a range of economic impact based on an estimate of the percent of damage to the general building stock. Damage in excess of 50 percent is considered to be substantial by most building codes and typically requires total reconstruction of the structure. Loss estimates for the general building stock for jurisdictions that have an exposure to the top three hazard risk areas are listed in Table 21-3 and Table 21-4.

Table 21-3. Potential Damage to Buildings in High Wildfire Risk Areas

	Assessed Value	10% Damage	30% Damage	50% Damage
Boise	$2,699,393,432	$269,939,343	$809,818,029	$1,349,696,716
Eagle	$32,296,279	$3,229,627	$9,688,883	$16,148,139
Garden City	$0	$0	$0	$0
Kuna	$0	$0	$0	$0
Meridian	$0	$0	$0	$0
Star	$0	$0	$0	$0
Unincorporated	$1,797,462,158	$179,746,215	$539,238,647.40	$898,731,079
Total	**$4,529,151,869**	**$452,915,187**	**$1,358,745,561**	**$2,264,575,935**

Table 21-4. Potential Damage to Buildings in Moderate Wildfire Risk Areas

	Assessed Value	10% Damage	30% Damage	50% Damage
Boise	$3,638,292,936	$363,829,293	$1,091,487,880	$1,819,146,468
Eagle	$1,532,844,195	$153,284,419	$459,853,258	$766,422,097
Garden City	$17,512,716	$1,751,271	$5,253,814	$8,756,358
Kuna	$2,067,968	$206,796	$620,390	$1,033,984
Meridian	$0	$0	$0	$0
Star	$104,906,482	$10,490,648	$31,471,944	$52,453,241
Unincorporated	$1,856,895,561	$185,689,556	$557,068,668	$928,447,780
Total	**$7,152,519,858**	**$715,251,985**	**$2,145,755,957**	**$3,576,259,929**

21.4.3 Critical Facilities

Critical facilities of wood frame construction are especially vulnerable during wildfire events. In the event of wildfire, there would likely be little damage to most infrastructure. Most roads and railroads would be without damage except in the worst scenarios. Power lines are the most at risk from wildfire because most poles are made of wood and susceptible to burning. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Wildfire typically does not have a major direct impact on bridges, but it can create conditions in which bridges are obstructed. Many bridges in areas of high to moderate fire risk are important because they provide the only ingress and egress to large areas and in some cases to isolated neighborhoods.

Transportation infrastructure increases the wildfire vulnerability of adjacent lands because it provides access to the WUI. For example, a car towing a trailer through the WUI with a safety chain dragging on the ground that cause sparks can start a wildfire. Any access to a wildfire hazard area increases the vulnerability of that area.

21.4.4 Ecosystem Impacts

Wildfire is a part of nature. It plays a key role in shaping ecosystems by serving as an agent of renewal and change. But fire can be deadly, destroying homes, wildlife habitat and timber, and polluting the air with emissions harmful to human health. Fire also releases carbon dioxide—a key greenhouse gas—into the atmosphere. Fire's effect on the landscape may be long-lasting. Fire effects are influenced by forest conditions before the fire and management action taken or not taken after the fire. Fire can shape ecosystem composition, structure and functions in multiple ways:

- By selecting fire-adapted species and removing other, susceptible species
- By releasing nutrients from the biomass and improving nutrient cycling
- By affecting soil properties through changing soil microbial activities and water relations
- By creating heterogeneous mosaics, which in turn, can further influence fire behavior and ecological processes
- By damaging watersheds that serve as water supplies for urban areas
- By eliminating natural grazing areas.

Fire as a destructive force can rapidly consume large amount of biomass and cause negative impacts such as post-fire soil erosion and water runoff, and air pollution; however, as a constructive force, fire is also responsible for maintaining the health and perpetuity of fire-dependent ecosystems. Considering the unique ecological roles of fire in mediating and regulating ecosystems, fire should be incorporated as an integral component of ecosystems and management.

Ecosystem stability is threatened when any of the attributes for a given fire regime diverge from its range of natural variability. In such cases, wildfires can cause severe environmental impacts:

- Damaged Fisheries—Critical fisheries can suffer from increased water temperatures, sedimentation, and changes in water quality.
- Soil Erosion—The protective covering provided by foliage and dead organic matter is removed, leaving the soil fully exposed to wind and water erosion. Accelerated soil erosion occurs, causing landslides and threatening aquatic habitats.

- Spread of Invasive Plant Species—Non-native woody plant species frequently invade burned areas. When weeds become established, they can dominate the plant cover over broad landscapes, and become difficult and costly to control.
- Disease and Insect Infestations—Unless diseased or insect-infested trees are swiftly removed, infestations and disease can spread to healthy forests and private lands. Timely active management actions are needed to remove diseased or infested trees.
- Destroyed Endangered Species Habitat—Catastrophic fires can devastate endangered species.
- Soil Sterilization—Topsoil exposed to extreme heat can become water repellant, and soil nutrients may be lost. It can take decades or even centuries for ecosystems to recover from a fire. Some fires burn so hot that they can sterilize the soil.

21.5 DEVELOPMENT TRENDS

The planning area appears to be well equipped to deal with the wildfire hazard to future development. The key will be the availability of good hazard identification mapping that accurately reflects risks. As new science, data and technology become available, wildfire mapping should be updated.

Another key element to dealing with future development trends will be the ability of fire districts to maintain their levels of service. In a weak economy with decreasing tax revenues, fire districts struggle to maintain their resources at existing levels. Maintaining and or improving service will be a key element to dealing with future growth in the WUI.

County-wide adoption of stricter building codes for structures in the WUI is the first step to reducing risk in new construction. Increased public outreach will be the tool used to educate and assist property owners already in the WUI on how to comply with new codes and reduce the risk to their property. This combination of public education and code enforcement will be critical to reducing the risk of wildfire countywide.

21.5.1 Boise City Foothills Policy Plan

The purpose of the *Boise City Foothills Plan* of 1997 is to preserve multiple qualities and values of the Foothills while allowing for controlled development. The plan recognizes the constraints to Foothills development, including the wildfire hazard and the need for appropriate subdivision design, street layout, building materials and design, and landscaping. As an amendment of the Boise City Comprehensive Plan, the Foothills Plan has adopted zoning and building codes with specific wildfire prevention provisions.

21.5.2 Wildland Urban Fire Interface Overlay District

Ada County has delineated its high hazard area as a Wildland Urban Fire Interface overlay district, with specific requirements for building construction and defensible space. The building requirements are listed in Section 419.3 – 419.12.3 of the County's Uniform Building Code of 1997. The zoning code regulations apply to the area within the overlay district. Any new construction, alteration, moving, or change of use of a habitable structure is required to establish and maintain a minimum 50-foot defensible space around its perimeter. Within this defensible space buffer zone, there can be only single specimens of trees or ornamental vegetation, and cultivated ground cover or grasses up to a maximum height of 4 inches. All dead wood must be removed from trees, and clusters of trees must be thinned so that the crowns do not overlap. Trees must be pruned up to 6 feet. Areas adjacent to private roads and driveways must be cleared of vegetation. Areas within 5 feet on either side of driveways must be cleared, and the entire width of the easement of private roads must be cleared. Other regulations in the code address the location of liquefied petroleum gas, firewood, and other combustible materials near structures, road access to subdivisions, length of cul-de-sacs and water supply needs for fire flow.

21.6 SCENARIO

A major conflagration in Ada County might begin with a wet spring, adding to fuels already present on the forest floor. Flashy fuels would build throughout the spring. The summer could see the onset of insect infestation. A dry summer could follow the wet spring, exacerbated by dry hot winds. Carelessness with combustible materials or a tossed lit cigarette, or a sudden lighting storm could trigger a multitude of small isolated fires.

The embers from these smaller fires could be carried miles by hot, dry winds. The deposition zone for these embers would be deep in the forests and interface zones. Fires that start in flat areas move slower, but wind still pushes them. It is not unusual for a wildfire pushed by wind to burn the ground fuel and later climb into the crown and reverse its track. This is one of many ways that fires can escape containment, typically during periods when response capabilities are overwhelmed. These new small fires would most likely merge. Suppression resources would be redirected from protecting the natural resources to saving more remote subdivisions.

The worst-case scenario would include an active fire season throughout the American west, spreading resources thin. Firefighting teams would be exhausted or unavailable. Many federal assets would be responding to other fires that started earlier in the season. While local fire districts would be useful in the WUI areas, they have limited wildfire response capabilities and would have a difficult time responding to the ignition zones due to topography and other access limitations. Even though the existence and spread of the fire is known, it may not be possible to respond to it adequately. An initially manageable fire can become out of control before resources can reach the area.

Heavy rains could follow, causing flooding and landslides and releasing sediment into rivers, permanently changing floodplains and damaging sensitive habitat. With the forests removed from the watershed, stream flows could easily double. High-magnitude floods could increase in frequency.

21.7 ISSUES

The major issues for wildfire are the following:

- Public education and outreach to people living in or near the fire hazard zones should include information about and assistance with mitigation activities such as defensible space and advance identification of evacuation routes and safe zones.
- Wildfires could cause landslides as a secondary natural hazard.
- Future climate conditions could affect the wildfire hazard.
- Future growth into interface areas should continue to be managed.
- Area fire districts need to continue to train on wildland urban interface events.
- Vegetation management activities would include enhancement through expansion of the target areas as well as additional resources.
- Regional consistency is needed for higher building code standards such as residential sprinkler requirements and prohibitive combustible roof standards.

- Additional fire department water supply is needed in high risk wildfire areas.
- A buildable-lands analysis that looks at vacant lands and their designated land use would be a valuable tool in helping decision-makers make wise decisions about future development.

22. PLANNING AREA RISK RANKING

A risk ranking for the entire planning was performed for the hazards of concern described in this plan. This risk ranking assesses the probability of each hazard's occurrence as well as its likely impact on the people, property, and economy of the planning area. The risk ranking was conducted via facilitated brainstorming sessions with the Steering Committee. Estimates of risk were generated with data from Hazus using methodologies promoted by FEMA. Separate risk rankings for each planning partner city and the unincorporated county are provided in Volume 2. The ranking assessed only the natural hazards of concern and the dam/canal failure hazard. Other human-caused hazards of concern were not included.

22.1 PROBABILITY OF OCCURRENCE

The probability of occurrence of a hazard is indicated by a factor determined by the likelihood of annual occurrence, based on past hazard events in the area:

- High—Hazard event is likely to occur within 25 years (Probability Factor = 3)
- Medium—Hazard event is likely to occur within 100 years (Probability Factor =2)
- Low—Hazard event is not likely to occur within 100 years (Probability Factor =1)
- No exposure—There is no probability of occurrence (Probability Factor = 0)

Figure 22-1 summarizes the probability assessment for each hazard of concern for this plan. The probability factor is the same for the baseline ranking and the equity lens ranking.

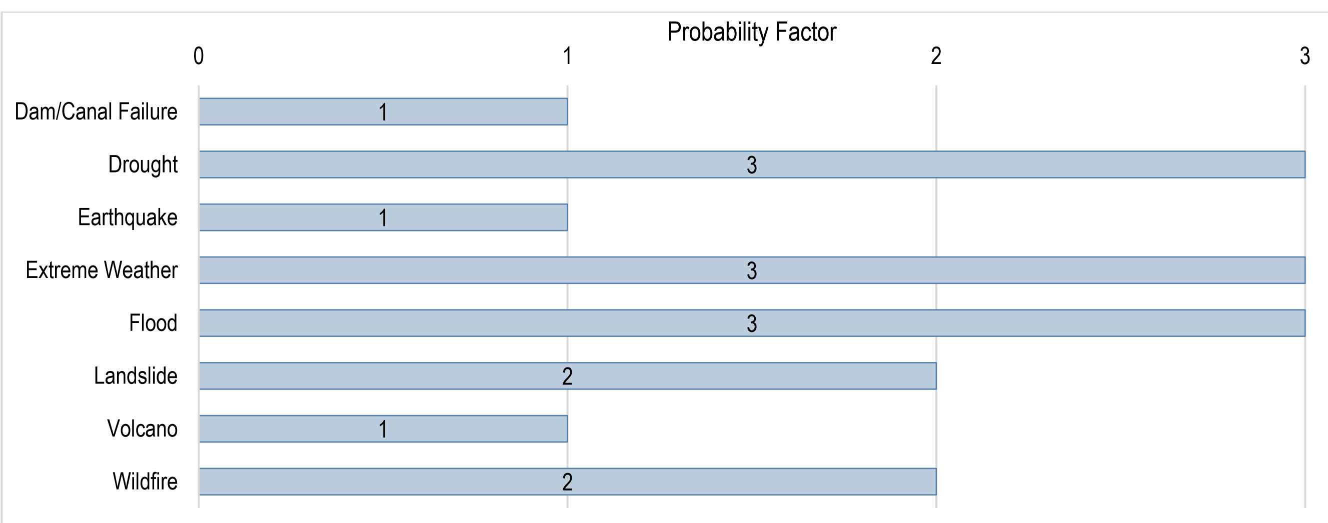


Figure 22-1. Probability Factors for Hazards of Concern

22.2 IMPACT

Hazard impacts were assessed in three categories: impacts on people, impacts on property and impacts on the local economy. Numerical impact factors were assigned as follows:

- **People**—Values were assigned based on the percentage of the total ***population exposed*** to the hazard event. The rating of this impact assumes, for simplicity and consistency, that all people exposed to a hazard because they live in a hazard zone will be equally impacted when a hazard event occurs. Planners can use an element of subjectivity when assigning values for impacts on people. Impact factors for people were assigned as follows:
  - High—50 percent or more of the population is exposed to a hazard (Impact Factor = 3)
  - Medium—25 percent to 49 percent of the population is exposed to a hazard (Impact Factor = 2)
  - Low—25 percent or less of the population is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the population is exposed to a hazard (Impact Factor = 0)
- **Property**—Values were assigned based on the percentage of the total ***property value exposed*** to the hazard event:
  - High—30 percent or more of the total assessed property value is exposed to a hazard (Impact Factor = 3)
  - Medium—15 percent to 29 percent of the total assessed property value is exposed to a hazard (Impact Factor = 2)
  - Low—14 percent or less of the total assessed property value is exposed to the hazard (Impact Factor = 1)
  - No impact—None of the total assessed property value is exposed to a hazard (Impact Factor = 0)
- **Economy**—Values were assigned based on the percentage of the total ***property value vulnerable*** to the hazard event. Values represent estimates of the loss from a major event of each hazard in comparison to the total assessed value of the property exposed to the hazard. For some hazards, such as wildfire, landslide and extreme weather, vulnerability was considered to be the same as exposure due to the lack of loss estimation tools specific to those hazards. Loss estimates separate from the exposure estimates were generated for the earthquake and flood hazards using Hazus.
  - High—Estimated loss from the hazard is 20 percent or more of the total assessed property value (Impact Factor = 3)
  - Medium—Estimated loss from the hazard is 10 percent to 19 percent of the total assessed property value (Impact Factor = 2)
  - Low—Estimated loss from the hazard is 9 percent or less of the total assessed property value (Impact Factor = 1)
  - No impact—No loss is estimated from the hazard (Impact Factor = 0)

The impacts of each hazard category were assigned a weighting factor to reflect the significance of the impact. These weighting factors are consistent with those typically used for measuring the benefits of hazard mitigation actions: impact on people was given a weighting factor of 3; impact on property was given a weighting factor of 2; and impact on the operations was given a weighting factor of 1. Figure 22-2 and Figure 22-3 summarize the unweighted and weighted impact factors, respectively, for each hazard.

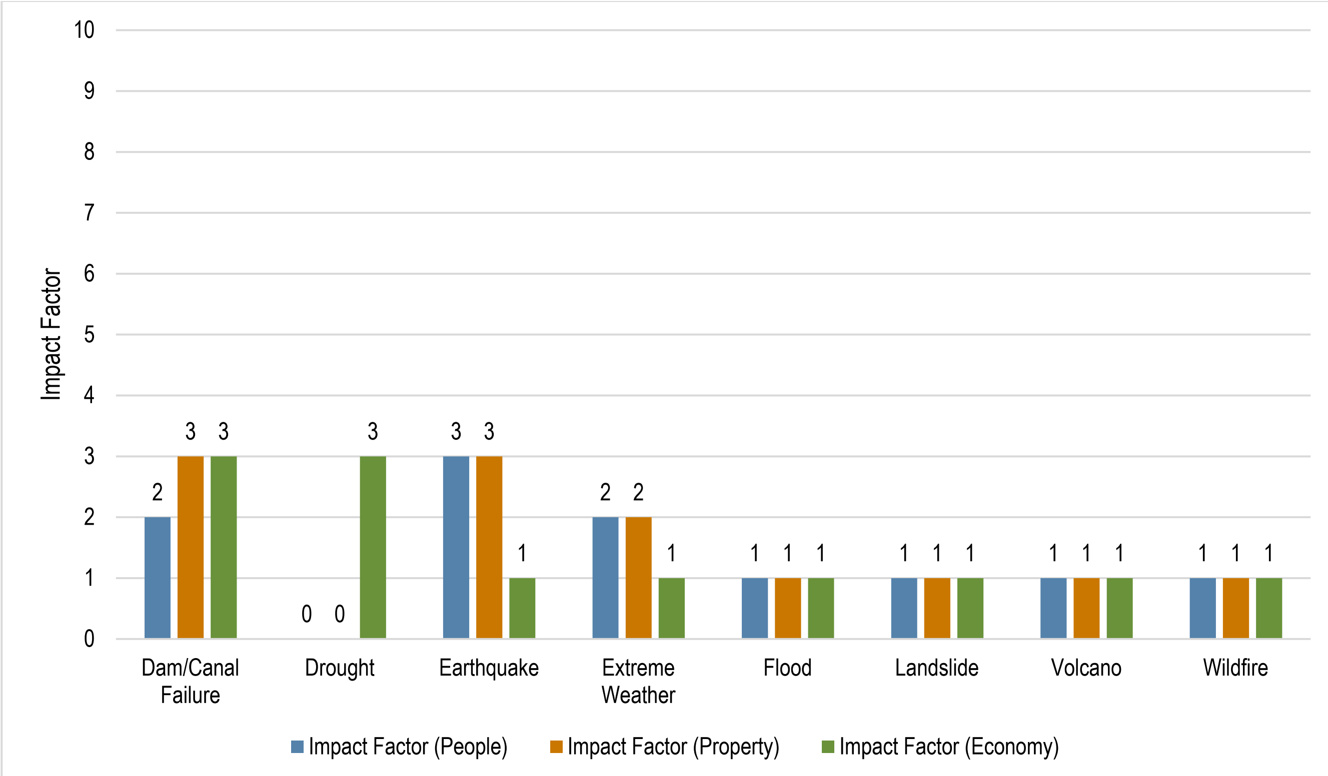


Figure 22-2. Impact Factors for Hazards of Concern

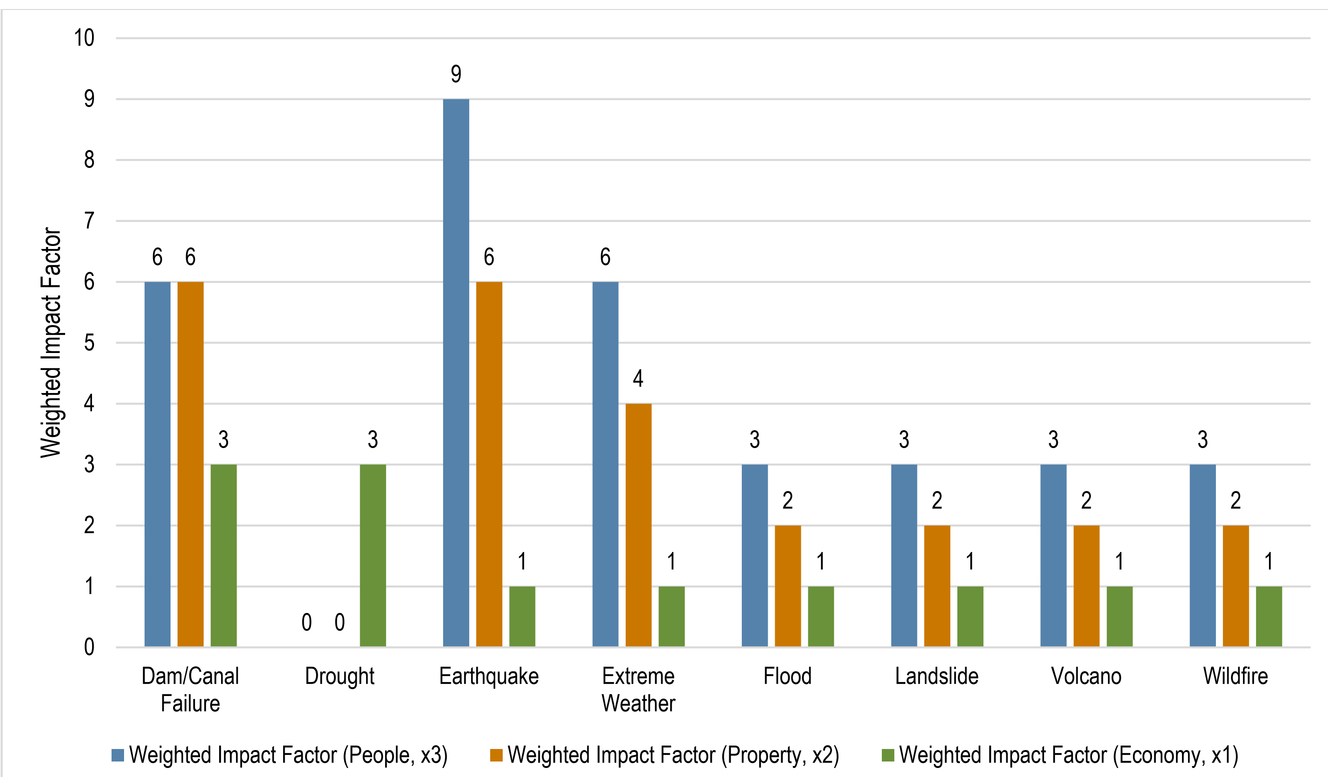


Figure 22-3. Weighted Impact Factors for Hazards of Concern

22.3 RISK RATING AND RANKING

The risk rating for each hazard was determined by multiplying the probability factor by the sum of the weighted impact factors for people, property, and operations, as summarized in Figure 22-4. Based on these ratings, a priority of high, medium, or low was assigned to each hazard. Figure 22-5 shows the hazard risk ranking.

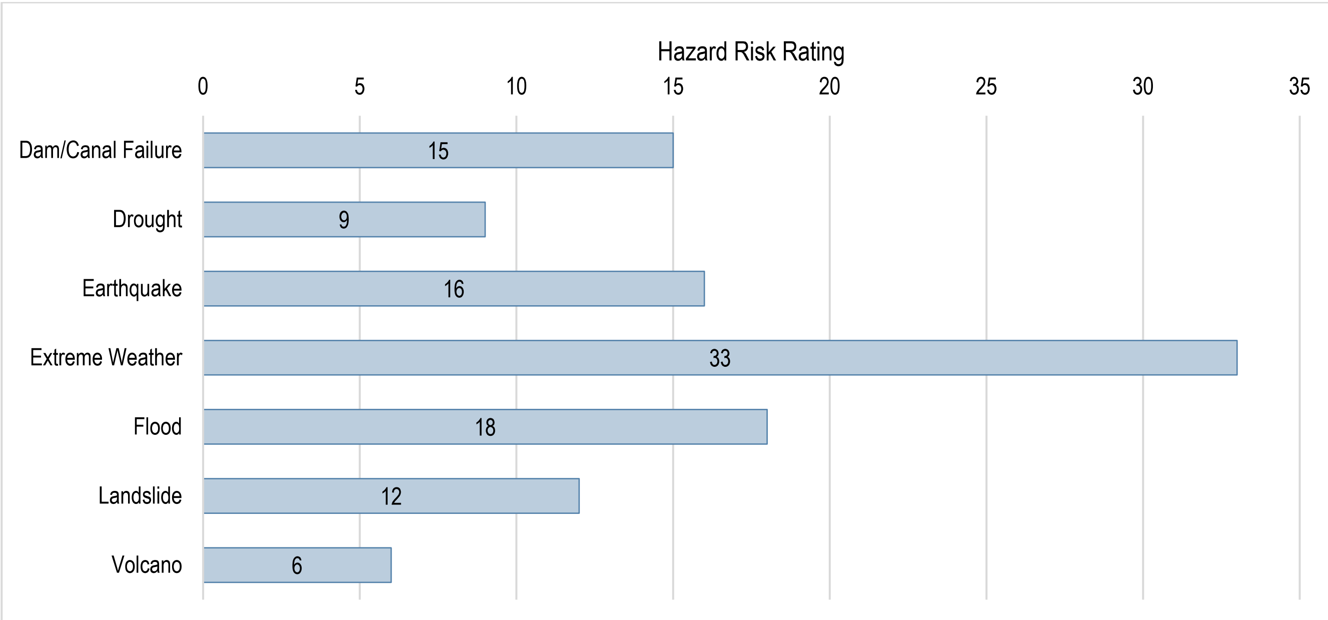


Figure 22-4. Total Risk Rating for Hazards of Concern

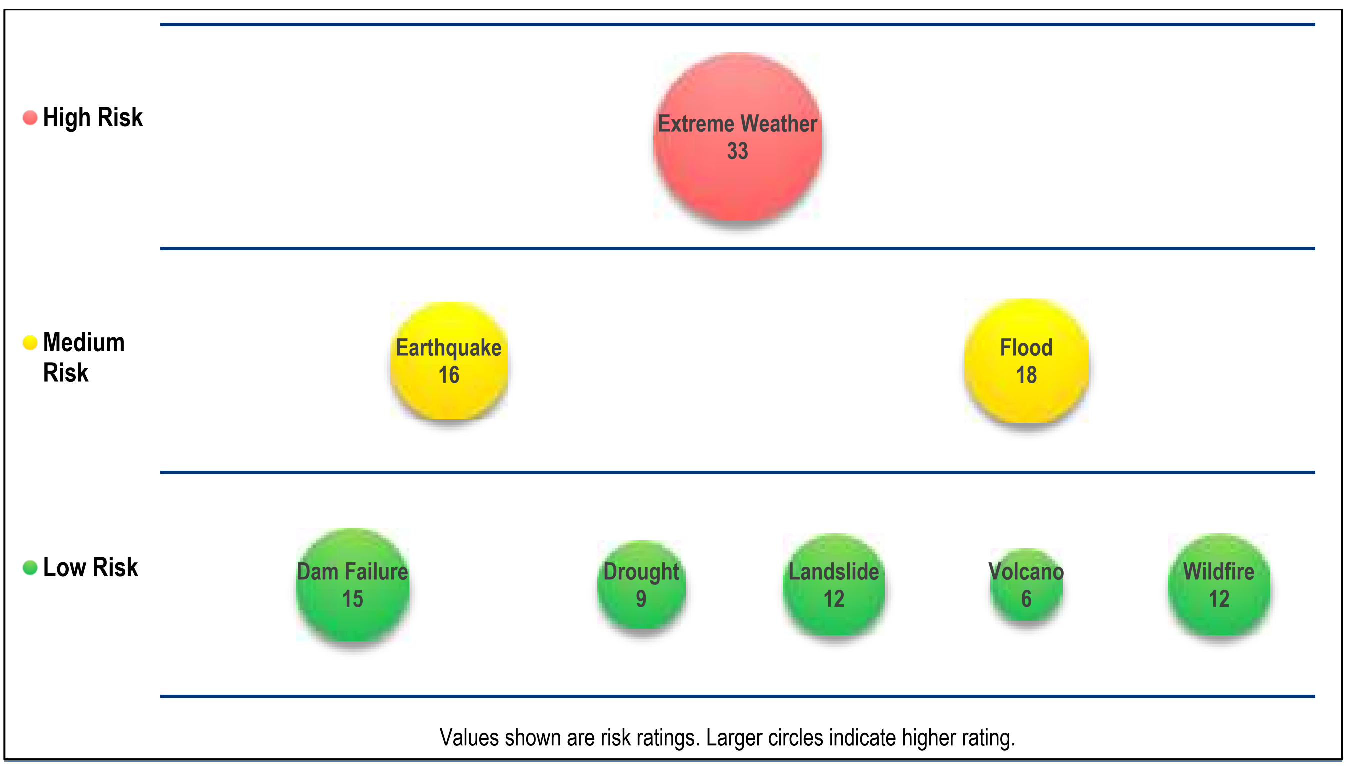


Figure 22-5. Hazard Risk Ranking

23. CONSIDERATION OF FUTURE CLIMATE CONDITIONS

23.1 WHAT ARE FUTURE CLIMATE CONDITIONS?

Climate, consisting of patterns of temperature, precipitation, humidity, wind and seasons, plays a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. "Future climate conditions" refers to variations in climate conditions over a long period of time.

The well-established worldwide warming trend of recent decades and its related impacts are caused by increasing concentrations of carbon dioxide and other greenhouse gases in the earth's atmosphere. Greenhouse gases are gases that trap heat in the atmosphere, resulting in a warming effect. Carbon dioxide is the most commonly known greenhouse gas; however, methane, nitrous oxide and fluorinated gases also contribute to warming. Emissions of these gases come from a variety of sources, such as the combustion of fossil fuels, agricultural production, and changes in land use. According to the National Aeronautics and Space Administration (NASA), carbon dioxide concentrations measured about 280 parts per million (ppm) before the industrial era began in the late 1700s and have risen dramatically since then, surpassing 400 ppm in 2013 for the first time in recorded history (see Figure 23-1).

Source: (National Aeronautics and Space Administration 2022)

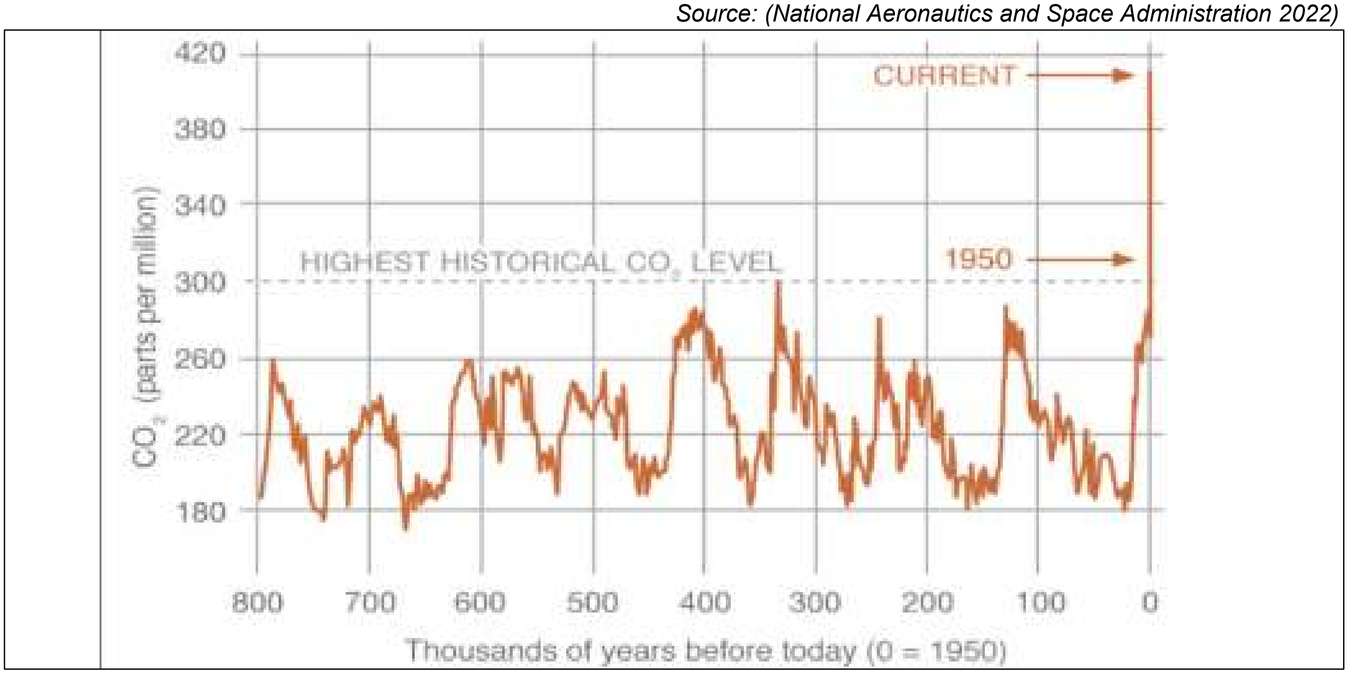


Figure 23-1. Global Carbon Dioxide Concentrations Over Time

23.2 HOW CLIMATE CONDITIONS AFFECT HAZARD MITIGATION

Future climate conditions will have a measurable impact on the occurrence and severity of natural hazards, affecting the people, property, economy and ecosystems of Ada County in a variety of ways. Impacts are likely to be associated with changes such as increased flooding, heat-related illnesses, or public health concerns.

An essential aspect of hazard mitigation is predicting the likelihood of hazard events. Typically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of hazard events remains essentially unchanged over time. Thus, averages based on the past frequencies of, for example, floods are used to estimate future frequencies: if a river has flooded an average of once every 5 years for the past 100 years, then it can be expected to continue to flood an average of once every 5 years.

For hazards that are affected by climate conditions, the assumption that future behavior will be equivalent to past behavior is not valid if climate conditions are changing. As flooding is generally associated with precipitation frequency and quantity, for example, the frequency of flooding will not remain constant if broad precipitation patterns change over time. Specifically, as hydrology changes, storms currently considered to be a 1 percent-annual-chance event might strike more often, leaving many communities at greater risk. The risks of landslide, severe storms, extreme heat and wildfire are all affected by climate patterns as well. For this reason, an understanding of climate conditions is pertinent to efforts to mitigate natural hazards. Information about how climate patterns are changing provides insight on the reliability of future hazard projections used in mitigation analysis. This chapter summarizes current understandings about future climate conditions in order to provide a context for the recommendation and implementation of hazard mitigation measures.

23.3 CURRENT INDICATORS OF FUTURE CLIMATE CONDITIONS

23.3.1 Global Indicators

The major scientific agencies of the United States—including NASA and the National Oceanic and Atmospheric Administration (NOAA)—have presented evidence of trends for future climate conditions. NASA summarizes key evidence as follows (National Aeronautics and Space Administration 2022):

- **Global Temperature Rise**—The planet's average surface temperature has risen about 2 ºF since the late 19th century, a change driven largely by increased carbon dioxide emissions into the atmosphere and other human activities. Most of the warming occurred in the past 40 years, with the seven most recent years being the warmest. The years 2016 and 2020 are tied for the warmest year on record.
- **Warming Ocean**—The ocean has absorbed much of this increased heat, with the top 300 feet of ocean showing warming of more than 0.6 ºF since 1969. Earth stores 90 percent of its extra energy in the ocean.
- **Shrinking Ice Sheets**—The Greenland and Antarctic ice sheets have decreased in mass. Data from NASA's Gravity Recovery and Climate Experiment show Greenland lost an average of 279 billion tons of ice per year between 1993 and 2019, and Antarctica lost about 148 billion tons of ice per year.
- **Glacial Retreat**—Glaciers are retreating almost everywhere around the world—including in the Alps, Himalayas, Andes, Rockies, Alaska and Africa.
- **Decreased Snow Cover**—Satellite observations reveal that the amount of spring snow cover in the Northern Hemisphere has decreased over the past five decades and the snow is melting earlier

- **Sea Level Rise**—Global sea level rose about 8 inches in the last century. The rate in the last two decades is nearly double that of the last century and is accelerating slightly every year.
- **Declining Arctic Sea Ice**—Both the extent and thickness of Arctic sea ice has declined rapidly over the last several decades
- **Extreme Events**—The number of record high temperature events in the United States has been increasing, while the number of record low temperature events has been decreasing, since 1950. The U.S. has also witnessed increasing numbers of intense rainfall events.
- **Ocean Acidification**—Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30 percent. This increase is the result of humans emitting more carbon dioxide into the atmosphere and hence more being absorbed into the ocean. The amount of carbon dioxide absorbed by the upper layer of the oceans has increased to about 7 to 10 billion metric tons per year.

23.3.2 Idaho Indicators

Monitoring and research efforts across Idaho have generated data that describe observed changes already underway in the state. Notable examples across the state include the following (Abatzoglou, Marshall and Harley 2021) (University of Idaho n.d.).

- **Statewide Warming Trends**—While the warmest year in Idaho was 1934 during the Dust Bowl, seven of the ten warmest years from 1895 through 2020 have occurred since 1990; only one of the 10 coldest years has occurred since 1990. Warming trends are evident in all seasons over the past five decades. From 1918 through 2010, observations show approximately a two-week lengthening in the freeze-free season for lower elevation weather stations across Idaho.
- **Snowpack Decline**—The elevation of the freezing level in Idaho has increased over 500 feet from November through April since 1950. Widespread reductions in snowfall are evident across the state, with reduction of up to 15 percent in the Bitterroot Mountains from 1950 through 2020.
- **Streamflow Changes**—In unregulated basins in Idaho, there has been a reduction in total annual stream flow since 1950. In snowmelt-dominated regions, peak stream flow has occurred 1 to 2 weeks earlier in the year, tracking the reduction in spring snowpack. Stream gage measurements show decreases in minimum annual streamflow. Summer stream temperatures warmed by an average of 1.5ºF from 1975 to 2015.
- **Heavier Spring Rainfall**—The intensity of the biggest rainfall event of the season has increased, with most of the large events having occurred since 1990.
- **Drought**—There has been a notable trend toward warmer and drier summers over the past five decades that have increased atmospheric water demand and dryness. Such changes have contributed to a substantial decrease in fuel moisture, contributing to escalating fire potential.
- **Increasing Forest Wildfire Activity**—Since 1986, longer, warmer summers in the western United States have resulted in four times as many major wildfires and six times as much area of forest burned, compared to 1970 through 1986. The length of the wildfire season (when fires are actively burning) has increased by 78 days. The average time-span of large fires has increased from 7.5 to 37.1 days. Earlier snowmelt, higher summer temperatures, and a longer fire season have contributed to these changes in fire activity.
- **Plants and Forests**—Through observations of plant life cycle events and temperature data, scientists have determined that indicator plant species are blooming earlier on average.

- **Salmon Migration**—Sockeye salmon migration has been occurring earlier in the spring. Thirty years' worth of data suggests that salmon are returning to freshwater streams about one day earlier per decade.
- **Wildlife**—Changes in temperature impact plant and animal life cycle events. Tracking by citizen scientists has provided data that indicates that mountain bluebirds in Idaho lay eggs earlier when spring temperatures are warmer.

23.4 PROJECTED FUTURE IMPACTS

Projections about future climate conditions contain inherent uncertainty, largely because they depend on future greenhouse gas emission scenarios. Generally, the uncertainty in greenhouse gas emissions is addressed by the presentation of differing scenarios: low-emissions or high-emissions scenarios. In low-emissions scenarios, greenhouse gas emissions are reduced substantially from current levels. In high-emissions scenarios, greenhouse gas emissions generally increase or continue at current levels. Uncertainty in outcomes is generally addressed by averaging a variety of model outcomes. Despite this uncertainty, future climate condition projections present valuable information to help guide decision-making for possible future conditions.

23.4.1 Global and National Projections

The Intergovernmental Panel on Climate Change, which includes more than 1,300 scientists from the United States and other countries, project that Earth's average temperatures will raise 2.5 to 10 ºF over the next century (National Aeronautics and Space Administration 2022). The Third and Fourth *National Climate Assessment Reports* indicate the following:

- **Change Will Continue Through This Century and Beyond**—Global climate is projected to continue to change over this century and beyond. The magnitude of change beyond the next few decades depends primarily on the amount of heat-trapping gases emitted globally, and how sensitive the Earth's climate is to those emissions.
- **Temperatures Will Continue to Rise**—Because human-induced warming is superimposed on a naturally varying climate, the temperature rise has not been, and will not be, uniform or smooth across the country or over time.
- **Frost-Free Season and Growing Season will Lengthen**—The length of the frost-free season and the corresponding growing season has been increasing nationally since the 1980s, with the largest increases occurring in the western United States, affecting ecosystems and agriculture. Across the United States, the growing season is projected to continue to lengthen. In a future in which heat-trapping gas emissions continue to grow, increases of a month or more in the lengths of the frost-free and growing seasons are projected across most of the United States by the end of the century, with slightly smaller increases in the northern Great Plains. The largest increases in the frost-free season (more than eight weeks) are projected for the western United States, particularly in high elevation and coastal areas. The increases will be smaller if heat-trapping gas emissions are reduced.

23.4.2 Projections for Idaho

A research project at the University of Idaho sought to identify future climate projections from climate models in the State of Idaho. The following information is summarized from their findings (Abatzoglou, Marshall and Harley 2021):

Temperature and Precipitation

Projected changes in temperature in Idaho largely mirror projected changes for the northwestern United States. The annual mean temperature averaged for Idaho is projected to warm 11 ºF on average above 1950 through 1999 values by 2100 under a high-warming scenario, compared with a warming of 6 ºF on average under a moderate-warming scenario. All models show faster rates of warming over the 21st century than in the 20th century.

The length of the freeze-free season is projected to increase substantially across Idaho. For example, in Nampa, the length of the freeze-free season extends from around 160 days for the late 20th century to 210 days by the mid-21st century under a high-warming scenario.

Summer precipitation and cloud cover are projected to decrease slightly. Despite small decreases in relative humidity, increased temperatures and increased overall atmospheric moisture are projected to dramatically increase the occurrence of days with elevated heat index values across Idaho. The heat index—which incorporates a combination of air temperature and relative humidity—is used by the National Weather Service and health information services across the country to assess heat-related impacts. While Boise saw an average of less than one day per year with heat indices over 100 ºF from 1971 through 2000, model projections suggest the region could see upwards of two weeks of such conditions by the mid-21st century under a high-warming scenario.

Projected changes include a slight increase (5 to 10 percent) in total annual precipitation by 2100. In addition to changes in cumulative precipitation, models suggest changes in the character of precipitation. The frequency of extremely heavy hourly precipitation from December through February is projected to increase 3- to 5-fold across Idaho by the end of the 21st century using a high-warming scenario. Compensatory changes in the frequency of precipitation are also projected for the region, with a few additional days per year without notable precipitation.

Snowpack

Despite uncertain projected changes in the total amount of precipitation, warming results in decreased snowpack as precipitation falls more as rain and less as snow. April 1 volumetric snowpack storage across Idaho is projected to decrease by one-third by the mid-21st century under a high-warming scenario. In addition, multiple consecutive years of snow drought—years with very low snow or snow that melts very early—are projected to become much more common. A larger fraction of the annual snowpack is projected to come from large storm events.

Drought

The likelihood, duration, magnitude, and character of drought are also likely to change across the state in the coming decades. Warming, associated increased evaporative demand, and reduced mountain snowpack all favor a future of increased summer drought.

23.5 RESPONSES TO FUTURE CLIMATE CONDITIONS

Communities and governments worldwide are working to address, evaluate and prepare for future climate conditions that are likely to impact communities in coming decades. Generally, future climate condition discussions encompass two separate but inter-related considerations: mitigation and adaptation.

The term "mitigation" has multiple meanings across disciplines. Mitigation in emergency management, as generally addressed in this hazard mitigation plan, is typically defined as the effort to reduce loss of life and property by lessening the impact of disasters. Mitigation in climate condition discussions is defined as a human intervention to reduce impacts on the climate system. It includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks. In this chapter, mitigation is used as defined by the climate condition community. In the other chapters of this plan, mitigation is primarily used in an emergency management context.

Adaptation refers to adjustments in natural or human systems in response to the actual or anticipated effects of future climate conditions and associated impacts. These adjustments may moderate harm or exploit beneficial opportunities. Mitigation and adaptation are related, as the world's ability to reduce greenhouse gas emissions will affect the degree of adaptation that will be necessary. Some initiatives and actions can both reduce greenhouse gas emissions and support adaptation to likely future conditions.

Societies across the world are facing the need to adapt to changing conditions associated with natural disasters and climate conditions. Farmers are altering crops and agricultural methods to deal with changing rainfall and rising temperature; architects and engineers are redesigning buildings; planners are looking at managing water supplies to deal with droughts or flooding.

Adaptive capacity goes beyond human systems, as some ecosystems are able to adapt to change and to buffer surrounding areas from the impacts of change. Forests can bind soils and hold large volumes of water during times of plenty, releasing it through the year; floodplains can absorb vast volumes of water during peak flows; coastal ecosystems can hold out against storms, attenuating waves and reducing erosion. Other ecosystem services—such as food provision, timber, materials, medicines, and recreation—can provide a buffer to societies in the face of changing conditions. Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall strategy to help people adapt to the adverse effects of future climate conditions. This includes the sustainable management, conservation and restoration of specific ecosystems that provide key services.

23.6 FUTURE CLIMATE CONDITION IMPACTS ON HAZARDS

The following sections provide information on how each identified hazard of concern for this planning process may be impacted by future climate conditions and how these impacts may alter current exposure and vulnerability for the people, property, critical facilities and the environment in Ada County to these hazards.

23.6.1 Civil Disturbance and Terrorism

Impacts on the Hazard

Because civil disturbance and terrorism are short-term, human-caused hazards, no future climate condition impacts are associated with the hazard.

Population, Property, Critical Facilities and the Environment

Increases in exposure and vulnerability of the local resources are not able to be determined. However, adverse effects on the population due to future climate conditions could create a possibility for civil disturbance instances. An example would be critical resource shortages (such as water) during a drought, or prolonged power and service issues resulting from floods or severe storms causing people to become angry with government.

23.6.2 Cyber Disruption

Impacts on the Hazard

Although cyber disruption is categorized as a human-caused hazard, future climate condition impacts could have cascading effects potentially causing a cyber disruption. Such instances would be severe storms, as well as flooding associated with potential rain on snow events. If the damage were caused to computer systems or servers, this could cause a cyber disruption for that agency or building.

Population, Property, Critical Facilities and the Environment

Increases in exposure and vulnerability of the local resources are not able to be determined.

23.6.3 Dam Failure

Impacts on the Hazard

Small changes in rainfall, runoff, and snowpack conditions may have significant impacts for water resource systems, including dams. Dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream.

Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events, often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although future climate conditions will not increase the probability of catastrophic dam failure, they may increase the probability of design failures.

Population

Population exposure and vulnerability to the dam failure hazard are unlikely to change as a result of future climate conditions.

Property

Property exposure and vulnerability to the dam failure hazard are unlikely to change as a result of future climate conditions.

Critical Facilities

The exposure and vulnerability of critical facilities are unlikely to change as result of future climate conditions. Dam owners and operators may need to alter maintenance and operations to account for changes in the hydrograph and increased sedimentation.

Environment

The exposure and vulnerability of the environment to dam failure are unlikely to change as a result of future climate conditions. Ecosystem services may be used to mitigate some of the factors that may increase the risk of design failures, such as increasing the natural water storage capacity in watersheds above dams.

23.6.4 Drought

Impacts on the Hazard

The long-term effects of future climate conditions on regional water resources are unknown, but global water resources are already experiencing the following stresses:

- Growing populations
- Increased competition for available water
- Poor water quality
- Environmental claims
- Uncertain reserved water rights
- Groundwater overdraft
- Aging urban water infrastructure.

With a warmer climate, droughts could become more frequent, more severe, and longer-lasting. According to the National Climate Assessment, "higher surface temperatures brought about by global warming increase the potential for drought. Evaporation and the higher rate at which plants lose moisture through their leaves both increase with temperature. Unless higher evapotranspiration rates are matched by increases in precipitation, environments will tend to dry, promoting drought conditions" (U.S. Climate Resilience Toolkit 2021).

Much of the water needed for agriculture, public supplies, and other uses comes from mountain snowpack, which melts in spring and summer and runs off into rivers and fills reservoirs. As the climate warms, less precipitation falls as snow, and more snow melts during the winter, which decreases the snowpack. Since the 1950s, Idaho's snowpack has been decreasing in most locations. A warming climate makes water less available during summer. As snowpack melts earlier, flows of fresh water in rivers and streams increase during late winter and early spring, but decrease during summer (Environmental Protection Agency 2016).

By addressing current stresses on water supplies and by building a flexible, robust program, Ada County will be able to more adeptly respond to changing conditions and to survive dry years.

Population

Population exposure and vulnerability to drought are unlikely to increase as a result of future climate conditions. While greater numbers of people may need to engage in behavior change, such as water saving efforts, significant life or health impacts are unlikely.

Property

Property exposure and vulnerability may increase as a result of increased drought resulting from future climate conditions, although this would most likely occur in non-structural property such as crops and landscaping. It is unlikely that structure exposure and vulnerability would increase as a direct result of drought, although secondary impacts of drought, such as wildfire, may increase and threaten structures.

Critical Facilities

Critical facility exposure and vulnerability are unlikely to increase as a result of increased drought resulting from future climate conditions; however, critical facility operators may need to alter standard management practices and actively manage resources, particularly in water-related service sectors.

Environment

The vulnerability of the environment may increase as a result of increased drought resulting from future climate conditions. The ecosystems and biodiversity in Ada County are already under stress from development and water diversion activities. Prolonged or more frequent drought resulting from future climate conditions may further stress the ecosystems in the region.

23.6.5 Earthquake

Impacts on the Hazard

The impacts of global future climate conditions on earthquake probability are unknown, although scientists have identified tiny earthquakes triggered by the change of fault stress loads from rain and snow. Similarly, long-term drought can result in a significant change in the stress load on earth’s crust.

Secondary impacts of earthquakes could be magnified by future climate conditions. Soils saturated by repetitive storms or heavy precipitation could experience liquefaction or an increased propensity for slides during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events.

Population, Property, Critical Facilities and the Environment

Because impacts on the earthquake hazard are not well understood, increases in exposure and vulnerability of the local resources are not able to be determined.

23.6.6 Extreme Weather

Impacts on the Hazard

Future climate conditions present a challenge for risk management associated with extreme weather. The frequency of extreme weather events has increased steadily over the last century. The number of weather-related disasters during the 1990s was four times that of the 1950s, and cost 14 times as much in economic losses. Historical data shows that the probability for extreme weather events increases in a warmer climate.

This increase in average surface temperatures can also lead to more intense heat waves that can be exacerbated in urbanized areas by what is known as urban heat island effect. The evidence suggests that heat waves are already increasing, especially in western states.

Population and Property

Population and property exposure and vulnerability would be unlikely to increase as a direct result of future climate condition impacts on the extreme weather hazard. Extreme weather events may occur more frequently, but exposure and vulnerability will remain the same. Secondary impacts, such as the extent of localized flooding, may increase, thus impacting greater numbers of people and structures.

Critical Facilities

Critical facility exposure and vulnerability would be unlikely to increase as a result of future climate condition impacts on the extreme weather hazard; however, critical facility owners and operators may experience more frequent disruptions. For example, more frequent and intense storms may cause more frequent disruptions in power service.

Environment

Exposure and vulnerability of the environment would be unlikely to increase; however, more frequent storms and heat events and more intense rainfall may place additional stressors on already stressed systems.

23.6.7 Flood

Impacts on the Hazard

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers future climate conditions must be adopted. Future climate conditions are already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection, drought preparedness and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by future climate conditions will allow more mountain areas to contribute to peak storm runoff. High frequency flood events (e.g. 10-year floods) in particular will likely increase with future climate conditions. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to future climate conditions, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

As hydrology changes, what is currently considered a 1-percent-annual-chance flood may strike more often, leaving many communities at greater risk. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, bypass channels and levees, as well as the design of local sewers and storm drains.

Population and Property

Population and property exposure and vulnerability may increase as a result of future climate condition impacts on the flood hazard. Runoff patterns may change resulting in flooding in areas where it has not previously occurred.

Critical Facilities

Critical facility exposure and vulnerability may increase as a result of future climate condition impacts on the flood hazard. Runoff patterns may change resulting in risk to facilities that have not historically been at risk from flooding. Additionally, changes in the management and design of flood protection critical facilities may be needed as additional stress is placed on these systems.

Environment

The exposure and vulnerability of the environment may increase as a result of future climate condition impacts on the flood hazard. Changes in the timing and frequency of flood events may have broader ecosystem impacts that alter the ability of already stressed species to survive.

23.6.8 Hazardous Materials Release

Impacts on the Hazard

Hazardous materials are an important factor and often a cascading effect in every natural and many man-made disasters. Therefore, there are serious implications for impacts from future climate conditions.

Population, Property, Critical Facilities and the Environment

Increases in exposure and vulnerability of local resources are not able to be determined with certainty, but hazardous materials are subject to the same future climate considerations as every other hazard.

23.6.9 Landslide

Impacts on the Hazard

Future climate conditions may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature is likely to affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability for landslide occurrences.

Population and Property

Population and property exposure and vulnerability would be unlikely to increase as a result of future climate condition impacts on the landslide hazard. Landslide events may occur more frequently, but the extent and location should be contained within mapped hazard areas and recently burned areas.

Critical Facilities

Critical facility exposure and vulnerability would be unlikely to increase as a result of future climate condition impacts on the landslide hazard; however, critical facility owners and operators may experience more frequent disruption to service provision as a result of landslide hazards. For example, transportation systems may experience more frequent delays if slides blocking these systems occur more frequently.

Environment

Exposure and vulnerability of the environment would be unlikely to increase as a result of future climate conditions, but more frequent slides in riverine systems may impact water quality and have negative impacts on already stressed species.

23.6.10 Public Health Emergency/Pandemic

Impacts on the Hazard

Worldwide, there has been an apparent increase in reports of infectious diseases, many of which reflect the combined effects of rapid demographic, environmental, social, technological, and other changes in how we live. Future climate conditions will likely affect changes in transmission patterns of infectious diseases (Centers for Disease Control and Prevention 2020). Emergence of new pathogens and improved detection and reporting can also contribute to increases in numbers of reported cases.

Population, Property, Critical Facilities and the Environment

The relationship between climate conditions and infectious diseases is complex and not well understood. The ranges and impacts of important pathogens might change as a result of changing temperatures and precipitation. Future climate conditions might increase or change the range of disease vectors such as mosquitoes or rodents. Heavy rainfall and flooding can be associated with waterborne disease outbreaks. Increases in exposure to property, critical facilities, and the environment are unknown.

23.6.11 Radiological Event

Impacts on the Hazard

In addition to increase in temperature, the stratospheric ozone is depleting. Stratospheric ozone absorbs much of the incoming solar ultraviolet radiation. A depleting ozone increases the amount of ultraviolet-B in the atmosphere, raising concern about the levels of biologically damaging radiation reaching the ground.

Population, Property, Critical Facilities and the Environment

Loss of stratospheric ozone may lead to human health impacts, affecting the skin, eyes, immune system and general well-being. Many studies have indicated that solar radiation is a cause of skin cancer and there may be an increase in skin cancer incidence and sunburn severity due to ozone depletion (World Health Organization 2017). Increases in exposure to property, critical facilities, and the environment are unknown.

23.6.12 Utility Failure

Impacts on the Hazard

Declining snowpack and resulting lower streamflow would mean less hydroelectric power. (Environmental Protection Agency 2016).

Population, Property, Critical Facilities and the Environment

Increases in exposure and vulnerability of local resources are not able to be determined.

23.6.13 Volcano (Ash Fall)

Impacts on the Hazard

Future climate conditions are not likely to affect the risk associated with volcanoes; however, volcanic activity can affect future climate conditions. Volcanic clouds absorb terrestrial radiation and scatter a significant amount of incoming solar radiation. By reducing the amount of solar radiation reaching the Earth's surface, large-scale volcanic eruptions can lower temperatures in the lower atmosphere and change atmospheric circulation patterns. The massive outpouring of gases and ash can influence climate patterns for years following a volcanic eruption. Additionally, while future climate conditions are not likely to increase the frequency of eruptions, changes in precipitation amounts could increase the potential for lahars or debris avalanches in volcanic areas.

Population, Property, Critical Facilities and the Environment

Exposure and vulnerability to the volcano hazard are unlikely to change as a direct result of future climate conditions.

23.6.14 Wildfire

Impacts on the Hazard

Wildfire is determined by climate variability, local topography, and human intervention. Future climate conditions have the potential to affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot dry spells create the highest fire risk. Increased temperatures may intensify wildfire danger by warming and drying out vegetation. Additionally, changes in climate patterns may impact the distribution and perseverance of insect outbreaks that create dead trees (increase fuel). When climate alters fuel loads and fuel and soil moisture, forest susceptibility to wildfires changes (Environmental Protection Agency 2016). Future climate conditions also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

Population, Property and Critical Facilities

Larger, more severe, and more frequent fires may impact the people, property and critical facilities by increasing the risk of ignition from nearby fire sources. Additionally, secondary impacts such as air quality issues may increase.

Environment

It is possible that the exposure and vulnerability of the environment will be impacted by impacts on wildfire risk from future climate conditions, as natural fire regimes may change, resulting in more frequent or higher intensity burns. These impacts may alter the composition of the ecosystems in the areas in and surrounding Ada County.

Part 3. Mitigation Plan

24. MISSION STATEMENT, GOALS AND OBJECTIVES

Hazard mitigation plans must identify goals for reducing long-term vulnerabilities to identified hazards (44 CFR Section 201.6.c(3i)). The Steering Committee established a mission statement, a set of goals and measurable objectives for this update, based on data from the preliminary risk assessment and the results of the public involvement strategy. The mission statement, goals, objectives and actions in this plan all support each other. Goals were selected to support the mission statement. Objectives were selected that met multiple goals. Actions were prioritized based on the action meeting multiple objectives.

24.1 MISSION STATEMENT

A mission statement provides a vision for a process. It is not a goal because it does not describe a hazard mitigation outcome, and it is broader than a hazard-specific objective. The mission statement for the 2022 Ada County Multi-Hazard Mitigation Plan is as follows:

> To reduce the vulnerability to natural hazards in order to protect the health, safety, welfare and economy of the Ada County community.

24.2 GOALS

The following are the mitigation goals for this plan update:

1. Protect lives and reduce hazard related injuries
2. Minimize or reduce current and future damage from natural hazards to property, including critical facilities and environment
3. Encourage the development and implementation of long-term, cost-effective mitigation projects that foster resilience for the whole community
4. Maintain, enhance, and restore the natural environment's capacity to deal with the impacts of natural hazard events.
5. Improve emergency management preparedness, collaboration, and outreach within the planning area.

Achievement of these goals defines the effectiveness of a mitigation strategy.

24.3 OBJECTIVES

Each selected objective meets multiple goals, serving as a stand-alone measurement of the effectiveness of a mitigation action, rather than as a subset of a goal. The objectives also are used to help establish priorities. The objectives are as follows:

1. Minimize disruption of local government and commerce operations caused by the identified hazards.
2. Using best available data, science, and knowledge, continually improve understanding of the location and potential impacts of the identified hazards.
3. Based on willing participation, encourage retrofit, purchase, or relocation of real property, based on one or more of the following criteria: level of exposure, repetitive loss history, and previous damage from natural hazards.
4. Based on understanding of risk, prevent or discourage new development in hazardous areas; if building occurs in high-risk areas, ensure that it is done in such a way as to minimize risk.
5. Strengthen codes and code enforcement to ensure that new construction and redevelopment of property and infrastructure can withstand the impacts of hazards.
6. Integrate hazard mitigation policies into local government land use plans that not only protect the built environment, but also maintain or enhance the natural environment's ability to withstand and recover from disasters, with an emphasis on the promotion of regional consistency in policy.
7. Develop new, and improve existing, early warning emergency notification protocols, systems, and evacuation procedures.
8. Perform whole community engagement to educate the public on the area's potential hazards and ways to personally prepare, respond, recover and mitigate the impacts of these events.
9. Establish partnerships among all levels of government, the business community, and other stakeholders to improve and implement methods to protect life, property and the natural environment.
10. Increase the resilience and continuity of operations of identified critical facilities and infrastructure within the planning area to maintain delivery of essential services to the whole community.

25. MITIGATION BEST PRACTICES

Catalogs of hazard mitigation best practices were developed that present a broad range of alternatives to be considered for use in the planning area, in compliance with 44 CFR (Section 201.6.c.3.ii). These catalogs were developed through a facilitated session with the Steering Committee looking at strengths, weaknesses, obstacles and opportunities within the planning area for each identified hazard of concern. The planning team augmented the catalogs with best practices from state and federal publications as well as experience from past planning efforts. One catalog was developed for each natural hazard of concern evaluated in this plan. The catalogs for each hazard are listed in Table 25-1 through Table 25-8. The catalogs present best practices categorized in two ways:

- By what it would do:
  - Manipulate a hazard
  - Reduce exposure to a hazard
  - Reduce vulnerability to a hazard
  - Increase the ability to respond to or be prepared for a hazard
- By who would have responsibility for implementation:
  - Individuals
  - Businesses
  - Government.

Hazard mitigation actions recommended in this plan were selected from among the best practices presented in the catalogs or inspired by a review of the catalogs. The catalogs provide a baseline of mitigation best practices that are backed by a planning process, are consistent with the planning partners' goals and objectives, and are within the capabilities of the partners to implement. Some of these best practices may not be feasible based on the selection criteria identified for this plan. The purpose of the catalog was to equip the planning partners with a list of what could be considered to reduce risk from natural hazards within the planning area. Best practices in the catalog that are not included for the final action plan were not selected for one or more of the following reasons:

- The action is not feasible.
- The action is already being implemented.
- There is an apparently more cost-effective alternative.
- The action does not have public or political support.

Table 25-1. Catalog of Mitigation Alternatives—Dam/Canal Failure

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Relocate out of dam failure inundation areas • **Reduce vulnerability:** ❖ Elevate home to appropriate levels • **Build local capacity:** ❖ Learn about risk reduction for the dam failure hazard ❖ Learn the evacuation routes for a dam failure event ❖ Educate yourself on early warning systems and the dissemination of warnings	• **Manipulate the hazard:** ❖ Remove dams ❖ Harden dams • **Reduce exposure:** ❖ Replace earthen dams with hardened structures • **Reduce vulnerability:** ❖ Flood-proof facilities within dam failure inundation areas • **Build local capacity:** ❖ Educate employees on the probable impacts of a dam failure ❖ Develop a continuity of operations plan	• **Manipulate the hazard:** ❖ Remove dams ❖ Harden dams • **Reduce exposure:** ❖ Replace earthen dams with hardened structures ❖ Relocate critical facilities out of dam failure inundation areas ❖ Consider open space land use in designated dam failure inundation areas • **Reduce vulnerability:** ❖ Adopt higher floodplain standards in mapped dam failure inundation areas ❖ Retrofit critical facilities within dam failure inundation areas • **Build local capacity:** ❖ Map dam failure inundation areas ❖ Enhance emergency operations plan to include a dam failure component ❖ Institute monthly communications checks with dam operators ❖ Inform the public on risk reduction techniques ❖ Adopt real-estate disclosure requirements for the re-sale of property located within dam failure inundation areas ❖ Consider the probable impacts of future climate conditions in assessing the risk associated with the dam failure hazard ❖ Establish early warning capability downstream of listed high hazard dams ❖ Consider the residual risk associated with protection provided by dams in future land use decisions

Table 25-2. Catalog of Mitigation Alternatives—Drought

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Drought-resistant landscapes ❖ Reduce water system losses ❖ Modify plumbing systems (through water saving kits) ❖ For homes with on-site water systems: increase storage, utilize rainwater catchment • **Build local capacity:** ❖ Practice active water conservation	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Drought-resistant landscapes ❖ Reduce private water system losses ❖ Support alternative irrigation techniques to reduce water use and encourage use of climate-sensitive water supplies ❖ For businesses with on-site water systems: increase storage, utilize rainwater catchment • **Build local capacity:** ❖ Practice active water conservation	• **Manipulate the hazard:** ❖ Groundwater recharge through stormwater management ❖ Develop a water recycling program ❖ Increase "above-the-dam" regional natural water storage systems • **Reduce exposure:** ❖ Identify and create groundwater backup sources • **Reduce vulnerability:** ❖ Water use conflict regulations ❖ Reduce water system losses ❖ Distribute water saving kits ❖ increase conventional storage that is filled during high-flow periods • **Build local capacity:** ❖ Public education on drought resistance ❖ Identify alternative water supplies for times of drought; mutual aid agreements with alternative suppliers ❖ Develop drought contingency plan ❖ Develop criteria "triggers" for drought-related actions ❖ Improve accuracy of water supply forecasts ❖ Modify rate structure to influence active water conservation techniques ❖ Consider the probable impacts of future climate conditions on the risk associated with the drought hazard

Table 25-3. Catalog of Mitigation Alternatives—Earthquake

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate outside of hazard area (off soft soils) • **Reduce vulnerability:** ❖ Retrofit structure (anchor house structure to foundation) ❖ Secure household items that can cause injury or damage (such as water heaters, bookcases, and other appliances) ❖ Build to higher design • **Build local capacity:** ❖ Practice "drop, cover, and hold" ❖ Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 72-hour self-sufficiency during an event ❖ Keep cash reserves for reconstruction ❖ Become informed on the hazard and risk reduction alternatives available. ❖ Develop a post-disaster action plan for your household	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate or relocate mission-critical functions outside hazard area where possible • **Reduce vulnerability:** ❖ Build redundancy for critical functions and facilities ❖ Retrofit critical buildings and areas housing mission-critical functions • **Build local capacity:** ❖ Adopt higher standard for new construction; consider "performance-based design" when building new structures ❖ Keep cash reserves for reconstruction ❖ Inform your employees on the possible impacts of earthquake and how to deal with them at your work facility. ❖ Develop a continuity of operations plan	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate critical facilities or functions outside hazard area where possible • **Reduce vulnerability:** ❖ Harden infrastructure ❖ Provide redundancy for critical functions ❖ Adopt higher regulatory standards • **Build local capacity:** ❖ Provide better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (e.g., tax incentives, information) ❖ Include retrofitting and replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components such as pipe, power line, and road repair materials ❖ Develop and adopt a continuity of operations plan ❖ Initiate triggers guiding improvements (such as <50% substantial damage or improvements) ❖ Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities. ❖ Develop a post-disaster action plan that includes grant funding and debris removal components.

Table 25-4. Catalog of Mitigation Alternatives—Extreme Weather

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Insulate house ❖ Provide redundant heat and power ❖ Insulate structure ❖ Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program) • **Build local capacity:** ❖ Trim or remove trees that could affect power lines ❖ Promote 72-hour self-sufficiency ❖ Obtain a NOAA weather radio. ❖ Obtain an emergency generator.	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ None • **Reduce vulnerability:** ❖ Relocate critical facilities (such as power lines) underground ❖ Reinforce critical facilities (such as power lines) to meet performance expectations ❖ Install tree wire • **Build local capacity:** ❖ Trim or remove trees that could affect power lines ❖ Create redundancy ❖ Equip facilities with a NOAA weather radio ❖ Equip vital facilities with emergency power sources.	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Develop an urban heat island reduction program that includes an urban forest program or plan • **Reduce vulnerability:** ❖ Harden infrastructure such as locating utilities underground ❖ Trim trees back from power lines ❖ Designate snow routes and strengthen critical road sections and bridges • **Build local capacity:** ❖ Support programs such as "Tree Watch" that proactively manage problem areas through use of selective removal of hazardous trees, tree replacement, etc. ❖ Establish and enforce building codes that require all roofs to withstand snow loads ❖ Increase communication alternatives ❖ Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors. ❖ Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines ❖ Provide NOAA weather radios to the public ❖ Consider the probable impacts of future climate conditions on the risk associated with the extreme weather hazard ❖ Review and update heat response plan in light of future climate condition (heat events) projections

Table 25-5. Catalog of Mitigation Alternatives—Flood

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques • **Reduce exposure:** ❖ Locate outside of hazard area ❖ Elevate utilities above base flood elevation ❖ Use low-impact development techniques • **Reduce vulnerability:** ❖ Raise structures above base flood elevation ❖ Elevate items within house above base flood elevation ❖ Build new homes above base flood elevation ❖ Flood-proof structures • **Build local capacity:** ❖ Buy flood insurance ❖ Develop household plan, such as retrofit savings, communication with outside, 72-hour self-sufficiency during and after an event	• **Manipulate the hazard:** ❖ Clear storm drains and culverts ❖ Use low-impact development techniques • **Reduce exposure:** ❖ Locate critical facilities or functions outside hazard area ❖ Use low-impact development techniques • **Reduce vulnerability:** ❖ Build redundancy for critical functions or retrofit critical buildings ❖ Provide flood-proofing when new critical facilities must be located in floodplains • **Build local capacity:** ❖ Keep cash reserves for reconstruction ❖ Support and implement hazard disclosure for sale of property in risk zones. ❖ Solicit cost-sharing through partnerships with others on projects with multiple benefits.	• **Manipulate the hazard:** ❖ Maintain drainage system ❖ Institute low-impact development techniques on property ❖ Dredging, levee construction, and providing regional retention areas ❖ Structural flood control, levees, channelization, or revetments. ❖ Stormwater management regulations and master planning ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff • **Reduce exposure:** ❖ Locate or relocate critical facilities outside of hazard area ❖ Acquire or relocate identified repetitive loss properties ❖ Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. ❖ Adopt land development criteria such as planned unit developments, density transfers, clustering ❖ Institute low impact development techniques on property ❖ Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff ❖ Preserve undeveloped and vulnerable shoreline ❖ Restore existing flood control and riparian corridors • **Reduce vulnerability:** ❖ Harden infrastructure, bridge replacement program ❖ Provide redundancy for critical functions and infrastructure ❖ Adopt regulatory standards such as freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. ❖ Stormwater management regulations and master planning. ❖ Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on downstream communities ❖ Facilitate managed retreat from, or upgrade of, the most at-risk areas ❖ Require accounting of sea level rise in all applications for new development in shoreline areas ❖ Implement Assembly Bill 162 (2007) requiring flood hazard information in local general plans • **Build local capacity:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) ❖ Incorporate retrofitting or replacement of critical system elements in capital improvement plan ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Consider participation in the Community Rating System ❖ Maintain and collect data to define risks and vulnerability ❖ Train emergency responders ❖ Create an elevation inventory of structures in the floodplain ❖ Develop and implement a public information strategy ❖ Charge a hazard mitigation fee ❖ Integrate floodplain management policies into other planning mechanisms within the planning area. ❖ Consider the probable impacts of future climate conditions on the risk associated with the flood hazard ❖ Consider the residual risk associated with structural flood control in future land use decisions ❖ Enforce National Flood Insurance Program requirements ❖ Adopt a Stormwater Management Master Plan ❖ Develop an adaptive management plan to address the long-term impacts of sea level rise

Table 25-6. Catalog of Mitigation Alternatives—Landslide

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope ❖ Minimize vegetation removal and the addition of impervious surfaces. • **Reduce exposure:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) • **Reduce vulnerability:** ❖ Retrofit home • **Build local capacity:** ❖ Institute warning system, and develop evacuation plan ❖ Keep cash reserves for reconstruction ❖ Educate yourself on risk reduction techniques for landslide hazards	• **Manipulate the hazard:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope • **Reduce exposure:** ❖ Locate structures outside of hazard area (off unstable land and away from slide-run out area) • **Reduce vulnerability:** ❖ Retrofit at-risk facilities • **Build local capacity:** ❖ Institute warning system, and develop evacuation plan ❖ Keep cash reserves for reconstruction ❖ Develop a continuity of operations plan ❖ Educate employees on the potential exposure to landslide hazards and emergency response protocol.	• **Manipulate the hazard:** ❖ Stabilize slope (dewater, armor toe) ❖ Reduce weight on top of slope • **Reduce exposure:** ❖ Acquire properties in high-risk landslide areas. ❖ Adopt land use policies that prohibit the placement of habitable structures in high-risk landslide areas. • **Reduce vulnerability:** ❖ Adopt higher regulatory standards for new development within unstable slope areas. ❖ Armor/retrofit critical facilities against the impact of landslides. • **Build local capacity:** ❖ Produce better hazard maps ❖ Provide technical information and guidance ❖ Enact tools to help manage development in hazard areas: better land controls, tax incentives, information ❖ Develop strategy to take advantage of post-disaster opportunities ❖ Warehouse critical infrastructure components ❖ Develop and adopt a continuity of operations plan ❖ Educate the public on the landslide hazard and appropriate risk reduction alternatives. ❖ Consider the probable impacts of future climate conditions on the risk associated with the landslide hazard

Table 25-7. Catalog of Risk Reduction Measures—Volcano

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate outside of hazard area • **Reduce vulnerability:** ❖ None • **Build local capacity:** ❖ Develop and practice a household evacuation plan.	• **Manipulate the hazard:** ❖ None • **Reduce exposure:** ❖ Locate outside of hazard area • **Reduce vulnerability:** ❖ Protect corporate critical facilities from potential impacts of severe ash fall (air filtration capability). • **Build local capacity:** ❖ Develop and practice a corporate evacuation plan ❖ Inform employees through corporate sponsored outreach ❖ Develop a cooperative.	• **Manipulate the hazard:** ❖ Limited success has been experienced with lava flow diversion structures • **Reduce exposure:** ❖ Locate outside of hazard area • **Reduce vulnerability:** ❖ Protect critical facilities from potential problems associated with ash fall. ❖ Build redundancy for critical facilities and functions. • **Build local capacity:** ❖ Public outreach, awareness. ❖ Tap into state volcano warning system to provide early warning to residents of potential ash fall problems

Table 25-8. Catalog of Mitigation Alternatives—Wildfire

Personal-Scale	Corporate-Scale	Government-Scale
• **Manipulate the hazard:** ❖ Clear potential fuels on property such as dry overgrown underbrush and diseased trees • **Reduce exposure:** ❖ Create and maintain defensible space around structures ❖ Locate outside of hazard area ❖ Mow regularly • **Reduce vulnerability:** ❖ Create and maintain defensible space around structures and provide water on site ❖ Use fire-resistant building materials ❖ Create defensible spaces around home • **Build local capacity:** ❖ Employ techniques from the National Fire Protection Association's Firewise USA program to safeguard home ❖ Identify alternative water supplies for fire fighting ❖ Install/replace roofing material with non-combustible roofing materials and implement other strategies to harden homes from embers and flame impingement	• **Manipulate the hazard:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees • **Reduce exposure:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area • **Reduce vulnerability:** ❖ Create and maintain defensible space around structures and infrastructure and provide water on site ❖ Use fire-resistant building materials ❖ Use fire-resistant plantings in buffer areas of high wildfire threat. • **Build local capacity:** ❖ Support Firewise USA community initiatives. ❖ Create /establish stored water supplies to be utilized for firefighting.	• **Manipulate the hazard:** ❖ Clear potential fuels on property such as dry underbrush and diseased trees ❖ Implement best management practices on public lands • **Reduce exposure:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Locate outside of hazard area ❖ Enhance building code to include use of fire resistant materials in high hazard area. • **Reduce vulnerability:** ❖ Create and maintain defensible space around structures and infrastructure ❖ Use fire-resistant building materials ❖ Use fire-resistant plantings in buffer areas of high wildfire threat. ❖ Consider higher regulatory standards (such as Class A roofing) ❖ Establish biomass reclamation initiatives ❖ Reintroduce fire (controlled or prescribed burns) to fire-prone ecosystems ❖ Manage fuel load through thinning and brush removal ❖ Establish integrated performance standards for new development to harden homes. • **Build local capacity:** ❖ More public outreach and education efforts, including an active Firewise USA program ❖ Possible weapons of mass destruction funds available to enhance fire capability in high-risk areas ❖ Identify fire response and alternative evacuation routes and establish where needed ❖ Seek alternative water supplies ❖ Become a Firewise USA community ❖ Use academia to study impacts/solutions to wildfire risk ❖ Establish/maintain mutual aid agreements between fire service agencies ❖ Develop, adopt, and implement integrated plans for mitigating wildfire impacts in wildland areas bordering on development ❖ Consider the probable impacts of future climate conditions on the risk associated with the wildfire hazard in future land use decisions ❖ Establish a management program to track forest and rangeland health ❖ Provide incentives to for existing structures to be hardened against wildfire.

26. MITIGATION ACTIONS

26.1 SELECTED COUNTYWIDE MITIGATION ACTIONS

The planning partners and the Steering Committee determined that some actions from the mitigation catalogs could be implemented to provide hazard mitigation benefits countywide. Table 26-1 lists the recommended countywide actions, the lead agency for each, and the proposed timeline. The parameters for the timeline are as follows:

- Short Term = to be completed in 1 to 5 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded and implemented under existing programs.

Table 26-1. Action Plan—Countywide Mitigation Actions

Benefits new or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
CW-1—Sponsor and maintain a natural-hazard informational website to include the following types of information: • Hazard-specific information such as warning, private property mitigation alternatives, important facts on risk and vulnerability • Pre- and post-disaster information such as notices of grant funding availability • CRS creditable information • Links to planning partners' pages, FEMA and Idaho Office of Emergency Management • Natural hazard mitigation plan information such as progress reports, mitigation success stories, update strategies, Steering Committee meetings.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 8, 9	EMCR	N/A	Low	EMCR Operational Budget	Ongoing
CW-2—Maintain the Steering Committee as a functioning body, under the ground rules established at its inception, to monitor progress of the plan, provide technical assistance to planning partners, and oversee the update of the plan according to schedule.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	6, 8, 9	EMCR	N/A	Low	Can be funded under existing programs	Ongoing
CW-3—All planning partners that committed to the update effort will formally adopt this plan when pre-adoption approval has been granted by the Idaho Office of Emergency Management and FEMA Region X. Each planning partner will adhere to the plan maintenance protocol identified in this plan. All actions under this action will be coordinated by EMCR.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	All	EMCR	All Planning Partners	Low	Can be funded under existing programs	Short-term
CW-4—Continue to implement ongoing public outreach programs administered by EMCR. Seek opportunities to promote the mitigation of natural hazards within the planning area, using information contained in this plan.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 8, 9	EMCR	N/A	Low	Can be funded under existing programs	Ongoing

Benefits new or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
CW-5—Seek out and use the best available data, science and technology to update the risk assessment to this plan as that data, science, technology and funding resources become available.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 9	EMCR	N/A	Medium	FEMA HMGP, RiskMAP, federal hazard analysis funding	Long-term
CW-6—Continue to support and coordinate with the Idaho Silver Jackets program.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 6, 8, 9	EMCR	N/A	Low	Can be funded under existing programs	Ongoing
CW-7—Provide technical support and coordination for available grant funding opportunities to the planning partnership.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 9	EMCR	N/A	Low	Can be funded under existing programs, FEMA HMGP	Short-term
CW-8—Participate as a cooperating partner with FEMA and other stakeholders in FEMA's RiskMAP initiative.						
Hazards Mitigated: Flood						
New and Existing	2, 9	EMCR	N/A	Low	Can be funded under existing programs, RiskMAP initiative	Short-term
CW-9—Leverage public outreach partnering capabilities within the planning area to promote a uniform and consistent message on the importance of proactive hazard mitigation.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	All	EMCR	N/A	Low	EMCR Operational Budget	Ongoing
CW-10—Coordinate mitigation planning and project efforts within the planning area to leverage all resources available to the planning partnership.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	1, 9, 10	EMCR	N/A	Low	EMCR Operational Budget	Ongoing
CW-11—Where appropriate, support retrofitting, purchase, or relocation of structures located in hazard-prone areas to protect them from future damage, with repetitive and severe repetitive loss properties as a priority. Seek opportunities to leverage partnerships within the planning area in these pursuits.						
Hazards Mitigated: Dam/Canal Failure, Earthquake, Flood, Landslide, Extreme Weather, Wildfire						
Existing	3, 9	Planning Partners	N/A	High	FEMA HMGP, BRIC, FMA	Long-term
CW-12—Use information contained in the Ada County Multi-Hazard Mitigation Plan to support updates to other emergency management plans in effect within the planning area.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	1, 2, 6, 10	EMCR	N/A	Low	Can be funded under existing programs	Short-term
CW-13—Using the most current Hazus model and other data available, examine exposure and level of risk to the known hazards of concern for first responder facilities and identified potential sheltering sites.						
Hazards Mitigated: Dam/Canal Failure, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 9	EMCR	N/A	Low	Can be funded under existing programs	Long-term
CW-14—Based on identified risks, relocate or structurally harden first responder facilities as needed. Relocation may not be an option based on response requirements of the organization.						
Hazards Mitigated: Dam/Canal Failure, Drought, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	3, 9	EMCR	All Planning Partners	High	FEMA HMGP	Long-term

Benefits new or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
CW-15—Using the most current Hazus model and other data available, categorize potential sheltering sites from lowest to highest exposure to the known hazards of concern. Identify partners that own the sheltering sites and encourage building enhancements at those sites that would allow for operations during a major disaster event.						
Hazards Mitigated: Dam/Canal Failure, Earthquake, Flood, Landslide, Extreme Weather, Volcano, Wildfire						
New and Existing	2, 9	EMCR	All Planning Partners	Low	Can be funded under existing programs, FEMA HMGP	Long-term

26.2 AREA-WIDE ACTION PLAN PRIORITIZATION

The actions recommended in the action plan were prioritized based on the following factors:

- Cost and availability of funding
- Benefit, based on likely risk reduction to be achieved
- Number of plan objectives achieved
- Timeframe for project implementation
- Eligibility for grand funding programs

Two priorities were assigned for each action:

- A high, medium, or low priority for implementing the action
- A high, medium, or low priority for pursuing grant funding for the action.

The sections below describe the analysis of benefits and costs and the assignment of the two priority ratings.

26.2.1 Benefit and Cost

The action plan must be prioritized according to a benefit/cost analysis of the proposed actions (44 CFR, Section 201.6(c)(3)(iii)). For this hazard mitigation plan, a qualitative benefit-cost review was performed for each action by assigning ratings for benefit and cost as follows:

- Cost:
  - ➢ **High**—Existing funding will not cover the cost of the action; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
  - ➢ **Medium**—The action could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the action would have to be spread over multiple years.
  - ➢ **Low**—The action could be funded under the existing budget. The action is part of or can be part of an ongoing existing program.
- Benefit:
  - ➢ **High—**Action will provide an immediate reduction of risk exposure for life and property.
  - ➢ **Medium—**Action will have a long-term impact on the reduction of risk exposure for life and property, or action will provide an immediate reduction in the risk exposure for property.
  - ➢ **Low—**Long-term benefits of the action are difficult to quantify in the short term.

To assign priorities, each action with a benefit rating equal to or higher than its cost rating (such as high benefit/medium cost, medium benefit/medium cost, medium benefit/low cost, etc.) was considered to be cost-beneficial. This is not the detailed level of benefit/cost analysis required for some FEMA hazard-related grant programs. Such analysis would be performed at the time a given action is being submitted for grant funding.

26.2.2 Implementation Priority

Implementation priority ratings were assigned as follows:

- **High Priority**—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- **Medium Priority**—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short term (1 to 5 years), once funding is secured. Medium-priority actions become high-priority actions once funding is secured.
- **Low Priority**—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, and is not eligible for any known grant funding. Action can be completed in the long term (1 to 10 years). Low-priority actions may be eligible for grant funding from programs that have not yet been identified.

26.2.3 Grant Pursuit Priority

Outside funding pursuit priority ratings were assigned as follows:

- **High Priority**—An action that meets identified funding eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for funding from an outside local government source.
- **Medium Priority**—An action that meets identified outside funding source eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
- **Low Priority**—An action that has not been identified as meeting any outside funding source eligibility requirements.

26.2.4 Prioritization Summary for Countywide Actions

Table 26-2 lists the priority of each action.

26.3 CLASSIFICATION OF AREA-WIDE MITIGATION ACTIONS

Each recommended action was classified based on the hazard it addresses and the type of mitigation it involves. Table 26-3 shows these classifications.

Table 26-2. Mitigation Action Priority

Action #	# of Objectives Met	Benefit	Cost	Do Benefits Equal or Exceed Costs?	Is Action Eligible for Grant Funding?	Can Action be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Pursuit Priority
CW-1	3	Low	Low	Yes	No	Yes	High	Low
CW-2	3	Low	Low	Yes	No	Yes	High	Low
CW-3	10	Low	Low	Yes	No	Yes	High	Low
CW-4	3	Low	Low	Yes	No	Yes	High	Low
CW-5	2	Medium	Medium	Yes	Yes	No	Medium	Medium
CW-6	4	Low	Low	Yes	No	Yes	High	Low
CW-7	2	Low	Low	Yes	Yes	Yes	High	Medium
CW-8	2	Low	Low	Yes	Yes	Yes	High	Medium
CW-9	10	Low	Low	Yes	No	Yes	High	Low
CW-10	3	Low	Low	Yes	No	Yes	High	Low
CW-11	2	High	High	Yes	Yes	No	Medium	High
CW-12	4	High	Low	Yes	Yes	Yes	High	High
CW-13	2	Low	Low	Yes	Yes	Yes	High	Medium
CW-14	2	High	High	Yes	Yes	No	Medium	High
CW-15	2	Low	Low	Yes	Yes	Yes	High	Medium

Table 26-3. Analysis of Mitigation Actions

Hazard	Actions That Address the Hazard, by Mitigation Type							
	Prevention	Property Protection	Public Education & Awareness	Natural Resource Protection	Emergency Services	Structural Projects	Climate Resiliency	Community Capacity Building
Medium Risk Hazards								
Earthquake		CW-11, 14	CW-1, 4, 9		CW-13, 15			CW-2, 3, 5, 6, 7, 10, 12
Extreme Weather		CW-11, 14	CW-1, 4, 9		CW-13, 15			CW-2, 3, 5, 6, 7, 10, 12
Flood		CW-11, 14	CW-1, 4, 9		CW-13, 15			CW-2, 3, 5, 6, 7, 8, 10, 12
Low Risk Hazards								
Dam/Canal Failure		CW-11, 14	CW-1, 4, 9		CW-13, 15			CW-2, 3, 5, 6, 7, 10, 12
Drought			CW-1, 4, 9					CW-2, 3, 5, 6, 7, 10, 12
Landslide		CW-11, 14	CW-1, 4, 9		CW-13, 15			CW-2, 3, 5, 6, 7, 10, 12
Wildfire		CW-11, 14	CW-1, 4, 9		CW-13, 15			CW-2, 3, 5, 6, 7, 10, 12

Mitigation types used for this categorization are as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection**—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness**—Actions to inform community members and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, wetland restoration and preservation, and green infrastructure.
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- **Climate Resiliency**—Actions that incorporate methods to mitigate and/or adapt to the impacts of future climate conditions. Includes aquifer storage and recovery activities, incorporating future conditions projections in project design or planning, or actions that specifically address jurisdiction-specific climate risks, such as sea level rise or urban heat island effect.
- **Community Capacity Building**—Actions that increase or enhance local capabilities to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. Includes staff training, memorandums of understanding, development of plans and studies, and monitoring programs.

27. PLAN ADOPTION AND IMPLEMENTATION

27.1 PLAN ADOPTION

A hazard mitigation plan must document formal adoption by the governing body of the jurisdiction requesting federal approval of the plan (44 CFR, Section 201.6.c.5). For multi-jurisdictional plans, each jurisdiction requesting approval must document that is has been formally adopted. This plan will be submitted for a pre-adoption review to the Idaho Office of Emergency Management and the Insurance Services Office (FEMA's CRS contractor) prior to adoption. Once pre-adoption approval has been provided, all planning partners will formally adopt the plan update. All partners understand that DMA compliance and its benefits cannot be achieved until the plan is adopted. Copies of the resolutions adopting this plan for all planning partners and the final approval letter from FEMA can be found in Appendix G of this volume.

27.2 PLAN MAINTENANCE STRATEGY

A hazard mitigation plan must present a plan maintenance process that includes the following (44 CFR Section 201.6.c.4):

- A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan over a 5-year cycle
- A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate
- A discussion on how the community will continue public participation in the plan maintenance process.

This section details the formal process that will ensure that the 2017 Ada County Multi-Hazard Mitigation Plan remains an active and relevant document and that the planning partners maintain their eligibility for applicable funding sources. The plan maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. This chapter also describes how public participation will be integrated throughout the plan maintenance and implementation process. It explains how the mitigation strategies outlined in this Plan will be incorporated into existing planning mechanisms and programs, such as comprehensive land-use planning processes, capital improvement planning, and building code enforcement and implementation. The Plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current.

27.3 PLAN IMPLEMENTATION

The effectiveness of the hazard mitigation plan depends on its implementation and incorporation of its action items into partner jurisdictions' existing plans, policies and programs. Together, the action items in the Plan provide a framework for activities that the partners can implement over the next 5 years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies and programs.

Ada County Emergency Management & Community Resilience (EMCR) will have lead responsibility for overseeing the Plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all planning partnership members and agencies identified as lead agencies in the mitigation action plans (see planning partner annexes in Volume 2 of this plan).

27.4 STEERING COMMITTEE

The Steering Committee is a volunteer body that oversaw the development of the Plan and made recommendations on key elements of the plan, including the maintenance strategy. It was the Steering Committee's position that an oversight committee with representation similar to the initial Steering Committee should have an active role in the Plan maintenance strategy. Therefore, it is recommended that a steering committee remain a viable body involved in key elements of the Plan maintenance strategy. The new steering committee should strive to include representation from the planning partners, as well as other stakeholders in the planning area.

The principal role of the new steering committee in this plan maintenance strategy will be to review the annual progress report and provide input to EMCR on possible enhancements to be considered at the next update. Future plan updates will be overseen by a steering committee similar to the one that participated in this update process, so keeping an interim steering committee intact will provide a head start on future updates. Completion of the progress report is the responsibility of each planning partner, not the responsibility of the steering committee. The steering committee's role will be to review the progress report in an effort to identify issues needing to be addressed by future plan updates.

27.5 ANNUAL PROGRESS REPORT

The minimum task of each planning partner will be the evaluation of the progress of its individual action plan during a 12-month performance period. This review will include the following:

- Summary of any hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new projects
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or initiatives that involve hazard mitigation.

The planning team has created a template to guide the planning partners in preparing a progress report (see Appendix H). The plan maintenance steering committee will provide feedback to the planning team on items included in the template. It is the intent of the planning team to prepare an annual report on the progress of the plan. This report should be used as follows:

- Posted on the EMCR website page dedicated to the hazard mitigation plan
- Presented to planning partner governing bodies to inform them of the progress of actions implemented during the reporting period
- For planning partners that participate in the Community Rating System, the report can be provided as part of the CRS annual re-certification package. The CRS requires an annual recertification to be submitted by October 1 of every calendar year for which the community has not received a formal audit. To meet this recertification timeline, the planning team will strive to complete progress reports between June and September each year.

Uses of the progress report will be at the discretion of each planning partner. Annual progress reporting is not a requirement specified under 44 CFR. However, it may enhance the planning partnership's opportunities for funding. While failure to implement this component of the plan maintenance strategy will not jeopardize a planning partner's compliance under the DMA, it may jeopardize its opportunity to partner and leverage funding opportunities with the other partners. Each planning partner was informed of these protocols at the beginning of this planning process, and each partner acknowledged these expectations with submittal of a letter of intent to participate in this process.

27.6 PLAN UPDATE

Local hazard mitigation plans must be reviewed, revised if appropriate, and resubmitted for approval in order to remain eligible for benefits under the DMA (44 CFR, Section 201.6.d.3). The Ada County partnership intends to update the hazard mitigation plan on a 5-year cycle from the date of initial plan adoption. This cycle may be accelerated to less than 5 years based on the following triggers:

- A Presidential Disaster Declaration that impacts the planning area
- A hazard event that causes loss of life
- An update of the County or participating city's comprehensive plan

It will not be the intent of future updates to develop a complete new hazard mitigation plan for the planning area. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plans will be reviewed and revised to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new partnership policies identified under other planning mechanisms (such as the comprehensive plan).
- The draft update will be sent to appropriate agencies and organizations for comment.
- The public will be given an opportunity to comment on the update prior to adoption.
- The partnership governing bodies will adopt their respective portions of the updated plan.

27.7 CONTINUING PUBLIC INVOLVEMENT

The public will continue to be apprised of the plan's progress through the EMCR website, including providing copies of annual progress reports on the website. Each planning partner has agreed to provide links to the County hazard mitigation plan website on their individual jurisdictional websites to increase avenues of public access to the plan. EMCR has agreed to maintain the hazard mitigation plan website. This site will not only house the final plan, it will become the one-stop shop for information regarding the plan, the partnership and plan implementation. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of the planning partnership at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

27.8 INCORPORATION INTO OTHER PLANNING MECHANISMS

The information on hazard, risk, vulnerability and mitigation contained in this plan is based on the best science and technology available at the time this update was prepared. The Ada County Comprehensive Plan and the comprehensive plans of the partner cities are considered to be integral parts of this plan. The County and partner cities, through adoption of comprehensive plans and zoning ordinances, have planned for the impact of natural hazards. The Plan update process provided the County and the cities with the opportunity to review and expand on policies contained within these planning mechanisms. The planning partners used their comprehensive plans and the hazard mitigation plan as complementary documents that work together to achieve the goal of reducing risk exposure to the citizens of the Ada County. An update to a comprehensive plan may trigger an update to the hazard mitigation plan.

All municipal planning partners support the creation of a linkage between the hazard mitigation plan and their individual comprehensive plans by identifying a mitigation action as such and giving that action a high priority. Other planning processes and programs to be coordinated with the recommendations of the hazard mitigation plan may include the following:

- Partners' emergency response plans
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments
- Master fire protection plans.

Some action items do not need to be implemented through regulation. Instead, they can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation. As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

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2022 Ada County Multi-Hazard Mitigation Plan

Appendix A. Community Survey Results

2021 - 2022 Ada County Survey: Hazard Mitigation Planning

Respondents:	3537 displayed, 3537 total	**Status:**	Open
Launched Date:	10/28/2021	**Closed Date:**	04/30/2022

1. Where do you live?

	Response Total	Response Percent	Points	Avg
Boise	582	48%	n/a	n/a
Meridian	280	23%	n/a	n/a
Garden City	23	2%	n/a	n/a
Eagle	105	9%	n/a	n/a
Star	65	5%	n/a	n/a
Kuna	64	5%	n/a	n/a
Hidden Springs Dry	8	1%	n/a	n/a
Creek Ranch	0	0%	n/a	n/a
Avimor	10	1%	n/a	n/a
Cartwright Ranch	3	0%	n/a	n/a
Unincorporated Ada	36	3%	n/a	n/a
County Outside Ada County	20	2%	n/a	n/a
Other, please specify view	14	1%	n/a	n/a
Total Respondents	**1210**	**100%**		
(skipped this question)	2327			

2. Do you work in Ada County?

	Response Total	Response Percent	Points	Avg
Yes	724	60%	n/a	n/a
No	412	34%	n/a	n/a
Telecommute	63	5%	n/a	n/a
Total Respondents	**1199**	**100%**		
(skipped this question)	2338			

3. Which of the following hazard events have you or anyone in your household experienced in the past withinAda County? (Check all that apply)

	Response Total	Response Percent	Points	Avg
Drought	465	40%	n/a	n/a
Earthquake	602	52%	n/a	n/a
Flood	126	11%	n/a	n/a
Hazardous Materials	65	6%	n/a	n/a
Household Fire	34	3%	n/a	n/a
Landslide	11	1%	n/a	n/a
Severe Weather (wind, lightning, winter storm, etc.)	694	60%	n/a	n/a
Wildfire	191	17%	n/a	n/a
Cyber Disruption	108	9%	n/a	n/a
Radiological Event	7	1%	n/a	n/a
Utility Failure	499	43%	n/a	n/a
Civil Disturbance	93	8%	n/a	n/a
Pandemic	840	73%	n/a	n/a
None	100	9%	n/a	n/a
Other, please specify view	49	4%	n/a	n/a
Total Respondents	**1157**			

(skipped this question)	2380

4. How concerned are you about the following hazards in Ada County? (Check one response for each hazard)

	Not Concerned	Somewhat Concerned	Concerned	Very Concerned	Extremely Concerned	Response Total	Points	Avg
Air Quality	10.2% (106)	20.98% (218)	25.99% (270)	23.39% (243)	19.44% (202)	**1039**	**n/a**	**n/a**
Climate Change	31.32% (327)	14.56% (152)	15.52% (162)	15.33% (160)	23.28% (243)	**1044**	**n/a**	**n/a**
Civil Disturbance	24.83% (256)	29.29% (302)	27.16% (280)	13.58% (140)	5.14% (53)	**1031**	**n/a**	**n/a**
Dam/Levee Failure	45.9% (476)	27.58% (286)	18.32% (190)	5.69% (59)	2.51% (26)	**1037**	**n/a**	**n/a**
Disease/Epidemic	20.59% (215)	25.1% (262)	23.08% (241)	18.1% (189)	13.12% (137)	**1044**	**n/a**	**n/a**
Drought	8.14% (86)	19.51% (206)	26.14% (276)	27.18% (287)	19.03% (201)	**1056**	**n/a**	**n/a**
Earthquake	34.25% (360)	38.44% (404)	20.17% (212)	5.14% (54)	2% (21)	**1051**	**n/a**	**n/a**
Flood	46.2% (480)	30.8% (320)	16.55% (172)	4.81% (50)	1.64% (17)	**1039**	**n/a**	**n/a**
Hazardous Materials	42.44% (441)	31.67% (329)	17.32% (180)	5.77% (60)	2.79% (29)	**1039**	**n/a**	**n/a**
Household Fire	31.16% (325)	37.97% (396)	20.23% (211)	6.62% (69)	4.03% (42)	**1043**	**n/a**	**n/a**
Landslide	72.65% (757)	17.75% (185)	6.72% (70)	2.11% (22)	0.77% (8)	**1042**	**n/a**	**n/a**
Severe Weather	21.13% (221)	35.37% (370)	26.96% (282)	12.43% (130)	4.11% (43)	**1046**	**n/a**	**n/a**
Wildfire	20.83% (217)	26.3% (274)	22.84% (238)	16.89% (176)	13.15% (137)	**1042**	**n/a**	**n/a**
Volcano (Ash fall)	67.98% (705)	18.9% (196)	9.45% (98)	2.51% (26)	1.16% (12)	**1037**	**n/a**	**n/a**
Radiological Event	58.28% (602)	24.01% (248)	10.75% (111)	4.07% (42)	2.9% (30)	**1033**	**n/a**	**n/a**
Utility Failure	16.18% (168)	35.65% (370)	27.65% (287)	14.16% (147)	6.36% (66)	**1038**	**n/a**	**n/a**
Cyber Disruption	19.02% (198)	28.53% (297)	27.28% (284)	16.81% (175)	8.36% (87)	**1041**	**n/a**	**n/a**
Other	69.88% (297)	9.88% (42)	12.47% (53)	4.24% (18)	3.53% (15)	**425**	**n/a**	**n/a**
					Total Respondents	**1078**		
					(skipped this question)	2459		

5. Which of the following steps has your household taken to prepare for a hazard event?(Check all that apply)

	Response Total	Response Percent	Points	Avg
Received first aid/CPR training	**663**	**63%**	**n/a**	**n/a**
Made a fire escape plan	**476**	**45%**	**n/a**	**n/a**
Created a household preparedness plan (designated a meeting place, etc.)	**333**	**32%**	**n/a**	**n/a**
Identified utility shutoffs	**678**	**64%**	**n/a**	**n/a**
Stored sand bags	**39**	**4%**	**n/a**	**n/a**
Prepared a disaster supply kit	**338**	**32%**	**n/a**	**n/a**
Installed smoke detectors on each level of the house	**954**	**90%**	**n/a**	**n/a**
Stored food and water	**587**	**56%**	**n/a**	**n/a**
Stored flashlights and batteries	**811**	**77%**	**n/a**	**n/a**
Purchased and learned how to program a NOAA Weather Radio	**141**	**13%**	**n/a**	**n/a**
Stored a battery-powered radio	**358**	**34%**	**n/a**	**n/a**
Stored a fire extinguisher	**789**	**75%**	**n/a**	**n/a**

Stored medical supplies (first aid kit, medications)		787	74%	n/a	n/a
Purchased natural hazard insurance (Flood, Earthquake, Wildfire)		138	13%	n/a	n/a
Established a "defensible space" around your home		280	26%	n/a	n/a
Use of fire resistive landscapes		174	16%	n/a	n/a
Have anchored service utilities to my home (water heater, furnace, wood stove, etc.)		277	26%	n/a	n/a
Signed up for Code Red		322	30%	n/a	n/a
Planned for loss of cell service		174	16%	n/a	n/a
None		25	2%	n/a	n/a
Other, please specify view		35	3%	n/a	n/a
	Total Respondents	**1057**			
	(skipped this question)		2480		

6. Which of the following methods do you think are most effective for providing hazard and disasterinformation? (Check all that apply)

		Response Total	Response Percent	Points	Avg
Newspaper		225	22%	n/a	n/a
Informational Brochures		235	23%	n/a	n/a
City Newsletters		231	22%	n/a	n/a
Public Meetings		211	21%	n/a	n/a
Workshops		160	16%	n/a	n/a
Schools		259	25%	n/a	n/a
TV News		624	61%	n/a	n/a
TV Ads		294	29%	n/a	n/a
Radio News		577	56%	n/a	n/a
Radio Ads		304	30%	n/a	n/a
Internet		778	76%	n/a	n/a
Outdoor Advertisements		188	18%	n/a	n/a
Fire Department/Rescue		369	36%	n/a	n/a
Law Enforcement		366	36%	n/a	n/a
Church (faith-based institutions)		223	22%	n/a	n/a
CERT Classes		122	12%	n/a	n/a
Public Awareness Campaign (e.g., Flood Awareness Week, Winter Storm Preparedness Month)		481	47%	n/a	n/a
Books		59	6%	n/a	n/a
Chamber of Commerce		68	7%	n/a	n/a
Academic Institutions		119	12%	n/a	n/a
Public Library		241	23%	n/a	n/a

Red Cross Information		254	25%	n/a	n/a
Community Safety Events		307	30%	n/a	n/a
Fair Booths		183	18%	n/a	n/a
Word of Mouth		266	26%	n/a	n/a
Social Media (Twitter, Facebook, LinkedIn, NextDoor)		632	61%	n/a	n/a
Auto-dial information from "9-1-1" center		252	24%	n/a	n/a
YouTube/Streaming Service		186	18%	n/a	n/a
Employer		251	24%	n/a	n/a
Smart Phone		597	58%	n/a	n/a
Other, please specify view		35	3%	n/a	n/a
	Total Respondents	1029			
	(skipped this question)		2508		

7. Is your property located in or near an identified floodplain?

		Response Total	Response Percent	Points	Avg
Yes		140	14%	n/a	n/a
No		734	73%	n/a	n/a
Not Sure		138	14%	n/a	n/a
	Total Respondents	1012	100%		
	(skipped this question)		2525		

8. Do you have flood insurance?

		Response Total	Response Percent	Points	Avg
Yes		78	8%	n/a	n/a
No		846	84%	n/a	n/a
Not Sure		79	8%	n/a	n/a
	Total Respondents	1003	100%		
	(skipped this question)		2534		

9. Is your property located near an earthquake fault?

		Response Total	Response Percent	Points	Avg
Yes		65	6%	n/a	n/a
No		502	50%	n/a	n/a
Not Sure		440	44%	n/a	n/a
	Total Respondents	1007	100%		
	(skipped this question)		2530		

10. Do you have earthquake insurance?

		Response Total	Response Percent	Points	Avg
Yes		49	5%	n/a	n/a
No		829	82%	n/a	n/a
Not Sure		130	13%	n/a	n/a
	Total Respondents	1008	100%		
	(skipped this question)		2529		

11. Is your property located in an area at risk for wildfires?

		Response Total	Response Percent	Points	Avg
Yes		189	19%	n/a	n/a
No		667	67%	n/a	n/a

Not Sure	144	14%	n/a	n/a
Total Respondents	**1000**	**100%**		
(skipped this question)	2537			

12. Have you ever had problems getting homeowner's or renter's insurance due to risks from naturalhazards?

	Response Total	Response Percent	Points	Avg
Yes	5	0%	n/a	n/a
No	943	94%	n/a	n/a
Not Sure	43	4%	n/a	n/a
If "Yes," which natural hazard was involved? view	14	1%	n/a	n/a
Total Respondents	**1004**	**100%**		
(skipped this question)	2533			

13. Do you have any special access or functional needs within your household that would require earlywarning or specialized response during disasters?

	Response Total	Response Percent	Points	Avg
Yes	100	10%	n/a	n/a
No	893	90%	n/a	n/a
Total Respondents		**993**		
(skipped this question)		2544		

14. If residence is in a hazard risk zone (e.g., dam failure zone, flood zone, landslide hazard area, high fire riskarea) was this disclosed to you by a real estate agent, seller, or landlord before you purchased or moved intoyour home?

	Response Total	Response Percent	Points	Avg
Yes	90	9%	n/a	n/a
No	196	20%	n/a	n/a
Not Sure	132	14%	n/a	n/a
Not Applicable	551	57%	n/a	n/a
Total Respondents	**969**	**100%**		
(skipped this question)	2568			

15. If you own your home, which of the following incentives would encourage you to spend money to retrofityour home to protect against disasters? (Check all that apply)

	Response Total	Response Percent	Points	Avg
Insurance premium discount	556	57%	n/a	n/a
Mortgage discount	282	29%	n/a	n/a
Low interest rate loan	212	22%	n/a	n/a
Grant funding	378	39%	n/a	n/a
"Rebate" program	516	53%	n/a	n/a
None	73	7%	n/a	n/a
Not Applicable	141	14%	n/a	n/a
Other, please specify view	25	3%	n/a	n/a
Total Respondents	**975**			
(skipped this question)	2562			

16. If you own a home, how much money would you be willing to spend to retrofit your home to reduce risksassociated with disasters? (for example, by elevating a home above the flood level, performing seismicupgrades, or replacing a combustible roof with non-combustible roofing)

	Response Total	Response Percent	Points	Avg
$10,000 or above	81	8%	n/a	n/a
$5,000 to $9,999	148	15%	n/a	n/a
$1,000 to $4,999	183	19%	n/a	n/a
Less than $1,000	67	7%	n/a	n/a

Nothing	46	5%	n/a	n/a
Not Sure	229	24%	n/a	n/a
Not Applicable	211	22%	n/a	n/a
Total Respondents	965	100%		
(skipped this question)	2572			

17. How supportive are you of the restriction on land use within known high-hazard areas?

	Response Total	Response Percent	Points	Avg
Very supportive	533	55%	n/a	n/a
Not very supportive	70	7%	n/a	n/a
Somewhat supportive	218	22%	n/a	n/a
Adamantly oppose	40	4%	n/a	n/a
noncommittal	109	11%	n/a	n/a
Total Respondents	970	100%		
(skipped this question)	2567			

18. What types of projects do you believe the Local, State or Federal agencies should be doing in order toreduce damage and disruption from hazard events within Ada County? Please rank each option as a high,medium or low priority.

	High	Medium	Low	Response Total	Points	Avg
Retrofit and strengthen essential facilities such as police, fire, schools and hospitals.	58.73% (545)	34.16% (317)	7.11% (66)	928	n/a	n/a
Retrofit infrastructure such as roads, bridges, drainage facilities, levees, water supply, waste water and power supply facilities.	81.31% (757)	16% (149)	2.69% (25)	931	n/a	n/a
Fund capital projects such as dams, levees, flood walls, drainage improvements and bank stabilization projects.	50.49% (468)	38.4% (356)	11.11% (103)	927	n/a	n/a
Strengthen codes and regulations to include higher regulatory standards in hazard areas.	43.07% (398)	39.61% (366)	17.32% (160)	924	n/a	n/a
Acquire at-risk properties and maintain as open space.	33.87% (313)	35.93% (332)	30.19% (279)	924	n/a	n/a
Assist at-risk property owners with securing funding for mitigation.	23.68% (216)	44.85% (409)	31.47% (287)	912	n/a	n/a
Provide better public information about risk, and the exposure to hazards within the operational area.	52% (481)	38.92% (360)	9.08% (84)	925	n/a	n/a
Implement projects that restore the natural environments capacity to absorb the impacts from natural hazards.	57.24% (530)	32.72% (303)	10.04% (93)	926	n/a	n/a
Implement projects that mitigate the potential impacts from climate change.	45.37% (421)	24.57% (228)	30.06% (279)	928	n/a	n/a
Total Respondents				939		
(skipped this question)				2598		

19. Please indicate how you feel about the following statement:It is the responsibility of government (local, state and federal) to provide education and programs that promotecitizen actions that will reduce exposure to the risks associated with hazards.

	Response Total	Response Percent	Points	Avg
Strongly Disagree	64	7%	n/a	n/a
Somewhat Disagree	81	9%	n/a	n/a

Neither Agree nor Disagree	112	12%	n/a	n/a
Somewhat Agree	402	43%	n/a	n/a
Strongly Agree	280	30%	n/a	n/a
Total Respondents	939	100%		
(skipped this question)	2598			

20. Please indicate how you feel about the following statement:It is my responsibility to educate myself and take actions that will reduce my exposure to the risks associatedwith natural hazards.

	Response Total	Response Percent	Points	Avg
Strongly Disagree	37	4%	n/a	n/a
Somewhat Disagree	18	2%	n/a	n/a
Neither Agree nor Disagree	27	3%	n/a	n/a
Somewhat Agree	312	33%	n/a	n/a
Strongly Agree	547	58%	n/a	n/a
Total Respondents	941	100%		
(skipped this question)	2596			

21. Please indicate how you feel about the following statement:Information about the risks associated with hazards is readily available and easy to locate.

	Response Total	Response Percent	Points	Avg
Strongly Disagree	81	9%	n/a	n/a
Somewhat Disagree	228	24%	n/a	n/a
Neither Agree nor Disagree	278	30%	n/a	n/a
Somewhat Agree	266	28%	n/a	n/a
Strongly Agree	87	9%	n/a	n/a
Total Respondents	940	100%		
(skipped this question)	2597			

22. Please indicate your age range:

	Response Total	Response Percent	Points	Avg
Under 18	0	0%	n/a	n/a
18 to 30	56	6%	n/a	n/a
31 to 40	103	11%	n/a	n/a
41 to 50	148	16%	n/a	n/a
51 to 60	200	21%	n/a	n/a
61 or older	429	46%	n/a	n/a
Total Respondents	936	100%		
(skipped this question)	2601			

23. How many people currently live in your household?

	Response Total	Response Percent	Points	Avg
1	149	16%	n/a	n/a
2	452	48%	n/a	n/a
3	150	16%	n/a	n/a
4	117	12%	n/a	n/a
5	43	5%	n/a	n/a
6	21	2%	n/a	n/a
7 or more	5	1%	n/a	n/a
Total Respondents	937	100%		
(skipped this question)	2600			

24. Please indicate the primary language spoken in your household.

	Response Total	Response Percent	Points	Avg
English	925	99%	n/a	n/a

Spanish		0	0%	n/a	n/a
Other Indo-European Languages		2	0%	n/a	n/a
Asian and Pacific Island Languages		1	0%	n/a	n/a
Other, please specify view		6	1%	n/a	n/a
	Total Respondents	**934**	**100%**		
	(skipped this question)		2603		

25. Please indicate your gender:

	Response Total	Response Percent	Points	Avg
Male	360	39%	n/a	n/a
Female	555	60%	n/a	n/a
Non-binary	8	1%	n/a	n/a
Total Respondents	**923**	**100%**		
(skipped this question)		2614		

26. Please indicate your highest level of education.

	Response Total	Response Percent	Points	Avg
Grade school/No schooling	2	0%	n/a	n/a
Some high school	3	0%	n/a	n/a
High school graduate/GED	42	5%	n/a	n/a
Some college/Trade school	223	24%	n/a	n/a
College degree	426	46%	n/a	n/a
Graduate degree	229	25%	n/a	n/a
Other, please specify view	6	1%	n/a	n/a
Total Respondents	**931**	**100%**		
(skipped this question)		2606		

27. How long have you lived in Ada County?

	Response Total	Response Percent	Points	Avg
Less than 1 year	20	2%	n/a	n/a
1 to 5 years	167	18%	n/a	n/a
6 to 10 years	122	13%	n/a	n/a
11 to 20 years	154	16%	n/a	n/a
More than 20 years	460	49%	n/a	n/a
I do not live in Ada County	14	1%	n/a	n/a
Total Respondents	**937**	**100%**		
(skipped this question)		2600		

28. How much is your gross household income?

	Response Total	Response Percent	Points	Avg
$20,000 or less	22	2%	n/a	n/a
$20,001 to $49,999	100	11%	n/a	n/a
$50,000 to $74,999	183	20%	n/a	n/a
$75,000 to $99,999	171	19%	n/a	n/a
$100,000 or more	352	38%	n/a	n/a

Not Sure		**87**	**10%**	**n/a**	**n/a**
	Total Respondents	**915**	**100%**		
	(skipped this question)	2622			

29. Comments

	Total Respondents	**173**
	(skipped this question)	3364

Appendix B. Summary of Federal and State Agencies, Programs and Regulations

B. SUMMARY OF FEDERAL AND STATE AGENCIES, PROGRAMS AND REGULATIONS

Existing laws, ordinances, plans and programs at the federal and state level can support or impact hazard mitigation actions identified in this plan. Hazard mitigation plans are required to include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information as part of the planning process (44 CFR, Section 201.6(b)(3)). The following federal and state programs have been identified as programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement mitigation actions or has a nexus with a mitigation action in this plan. Information presented in this section can be used to review local capabilities to implement the actions found in the jurisdictional annexes of Volume 2. Each planning partner has individually reviewed existing local plans, studies, reports, and technical information in its jurisdictional annex, presented in Volume 2.

FEDERAL

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. Title II of the ADA deals with compliance with the Act in emergency management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all community members have all necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or other visual alerts. Two technical documents for shelter operators address physical accessibility needs of people with disabilities, as well as medical needs and service animals.

The ADA intersects with disaster preparedness programs in regards to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of community members. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for community members who may require more assistance.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Bureau of Land Management

The U.S. Bureau of Land Management (BLM) funds and coordinates wildfire management programs and structural fire management and prevention on BLM lands. BLM works closely with the Forest Service and state and local governments to coordinate fire safety activities. The Interagency Fire Coordination Center in Boise, Idaho serves as the center for this effort.

Civil Rights Act

The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex or nation origin and requires equal access to public places and employment. The Act is relevant to emergency management and hazard mitigation in that it prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all community members equally, to the extent possible. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, and pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. Numerous issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

The CWA is important to hazard mitigation in several ways. There are often permitting requirements for any construction within 200 feet of water of the United States, which may have implications for mitigation projects identified by a local jurisdiction. Additionally, CWA requirements apply to wetlands, which serve important functions related to preserving and protecting the natural and beneficial functions of floodplains and are linked with a community's floodplain management program. Finally, the National Pollutant Discharge Elimination System is part of the CWA and addresses local stormwater management programs. Stormwater management plays a critical role in hazard mitigation by addressing urban drainage or localized flooding issues within jurisdictions.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Community Development Block Grant Disaster Resilience Program

In response to disasters, Congress may appropriate additional funding for the U.S. Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities and neighborhoods that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of FEMA, the Small Business Administration, and the U.S. Army Corps of Engineers. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by a formula that considers disaster recovery needs unmet by other federal disaster assistance programs. To be eligible for CDBG-DR funds, projects must meet the following criteria:

- Address a disaster-related impact (direct or indirect) in a presidentially declared county for the covered disaster
- Be a CDBG-eligible activity (according to regulations and waivers)
- Meet a national objective.

Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger. CDBG-DR funding is a potential alternative source of funding for actions identified in this plan.

Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses.
- Facilitate accurate insurance rating.
- Promote awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 1 community would receive a 45 percent premium discount, and a Class 9 community would receive a 5 percent discount. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The discount partially depends on location of the property. Properties outside the special flood hazard area receive smaller discounts: a 10-percent discount if the community is at Class 1 to 6 and a 5-percent discount if the community is at Class 7 to 9. The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

Disaster Mitigation Act

The DMA is the current federal legislation addressing hazard mitigation planning. It emphasizes planning for disasters before they occur. It specifically addresses planning at the local level, requiring plans to be in place before Hazard Mitigation Assistance grant funds are available to communities. This plan is designed to meet the requirements of DMA, improving eligibility for future hazard mitigation funds.

Emergency Relief for Federally Owned Roads Program

The U.S. Forest Service's Emergency Relief for Federally Owned Roads Program was established to assist federal agencies with repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel and have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure. The program funds both emergency and permanent repairs. Eligible activities under this program meet some of the goals and objectives for this plan and the program is a possible funding source for actions identified in this plan.

Emergency Watershed Program

The USDA Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection (EWP) Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. EWP is an emergency recovery program. Financial and technical assistance are available for the following activities (Natural Resources Conservation Service, 2018):

- Remove debris from stream channels, road culverts, and bridges
- Reshape and protect eroded banks
- Correct damaged drainage facilities
- Establish cover on critically eroding lands
- Repair levees and structures
- Repair conservation practices.

This federal program could be a possible funding source for actions identified in this plan.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

Federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the ESA's purposes. The ESA defines three fundamental terms:

- Endangered means that a species of fish, animal or plant is "in danger of extinction throughout all or a significant portion of its range." (For salmon and other vertebrate species, this may include subspecies and distinct population segments.)
- Threatened means that a species "is likely to become endangered within the foreseeable future." Regulations may be less restrictive for threatened species than for endangered species.
- Critical habitat means "specific geographical areas that are…essential for the conservation and management of a listed species, whether occupied by the species or not."

Five sections of the ESA are of critical importance to understanding it:

- Section 4: Listing of a Species—The National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) is responsible for listing marine species; the U.S. Fish and Wildlife Service is responsible for listing terrestrial and freshwater aquatic species. The agencies may initiate reviews for listings, or community members may petition for them. A listing must be made "solely on the basis of the best scientific and commercial data available." After a listing has been proposed, agencies receive comment and conduct further scientific reviews for 12 to 18 months, after which they must decide if the listing is warranted. Economic impacts cannot be considered in this decision, but it may include an evaluation of the adequacy of local and state protections. Critical habitat for the species may be designated at the time of listing.
- Section 7: Consultation—Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed or proposed species or adversely modify its critical habitat. This includes private and public actions that require a federal permit. Once a final listing is made, non-federal actions are subject to the same review, termed a "consultation." If the listing agency finds that an action will "take" a species, it must propose mitigations or "reasonable and prudent" alternatives to the action; if the proponent rejects these, the action cannot proceed.
- Section 9: Prohibition of Take—It is unlawful to "take" an endangered species, including killing or injuring it or modifying its habitat in a way that interferes with essential behavioral patterns, including breeding, feeding or sheltering.
- Section 10: Permitted Take—Through voluntary agreements with the federal government that provide protections to an endangered species, a non-federal applicant may commit a take that would otherwise be prohibited as long as it is incidental to an otherwise lawful activity (such as developing land or building a road). These agreements often take the form of a "Habitat Conservation Plan."
- Section 11: Citizen Lawsuits—Civil actions initiated by any citizen can require the listing agency to enforce the ESA's prohibition of taking or to meet the requirements of the consultation process.

FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) cooperates with a large number of federal and state agencies to ensure and promote dam safety. More than 3,000 dams are part of regulated hydroelectric projects in the FERC program. Two-thirds of these are more than 50 years old. As dams age, concern about their safety and integrity grows, so oversight and regular inspection are important. FERC inspects hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with the terms and conditions of a license.

Every five years, an independent engineer approved by the FERC must inspect and evaluate projects with dams higher than 32.8 feet (10 meters), or with a total storage capacity of more than 2,000 acre-feet.

FERC monitors seismic research and applies it in performing structural analyses of hydroelectric projects. FERC also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, FERC visits dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake. The FERC publication Engineering Guidelines for the Evaluation of Hydropower Projects guides the FERC engineering staff and licensees in evaluating dam safety. The publication is frequently revised to reflect current information and methodologies.

FERC requires licensees to prepare emergency action plans and conducts training sessions on how to develop and test these plans. The plans outline an early warning system if there is an actual or potential sudden release of water from a dam due to failure. The plans include operational procedures that may be used, such as reducing reservoir levels and reducing downstream flows, as well as procedures for notifying affected community members and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that everyone knows what to do in emergency situations.

Federal Wildfire Management Policy and Healthy Forests Restoration Act

Federal Wildfire Management Policy and Healthy Forests Restoration Act (2003). These documents call for a single comprehensive federal fire policy for the Interior and Agriculture Departments (the agencies using federal fire management resources). They mandate community-based collaboration to reduce risks from wildfire.

National Dam Safety Act

Potential for catastrophic flooding due to dam failures led to passage of the National Dam Inspection Act in 1972, creation of the National Dam Safety Program in 1996, and reauthorization of the program through the Dam Safety Act in 2006. National Dam Safety Program, administered by FEMA requires a periodic engineering analysis of the majority of dams in the country; exceptions include the following:

- Dams under jurisdiction of the Bureau of Reclamation, Tennessee Valley Authority, or International Boundary and Water Commission
- Dams constructed pursuant to licenses issued under the Federal Power Act

- Dams that the Secretary of the Army determines do not pose any threat to human life or property.

The goal of this FEMA-monitored effort is to identify and mitigate the risk of dam failure so as to protect lives and property of the public. The National Dam Safety Program is a partnership among the states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and purchases of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most of the dams in the United States.

National Environmental Policy Act

The National Environmental Policy Act requires federal agencies to consider the environmental impacts of proposed actions and reasonable alternatives to those actions, alongside technical and economic considerations. The National Environmental Policy Act established the Council on Environmental Quality, whose regulations (40 CFR Parts 1500-1508) set standards for compliance. Consideration and decision-making regarding environmental impacts must be documented in an environmental impact statement or environmental assessment. Environmental impact assessment requires the evaluation of reasonable alternatives to a proposed action, solicitation of input from organizations and individuals that could be affected, and an unbiased presentation of direct, indirect, and cumulative environmental impacts. FEMA hazard mitigation project grant applications require full compliance with applicable federal acts. Any action identified in this plan that falls within the scope of this act will need to meet its requirements.

National Fire Plan

The 2001 National Fire Plan was developed based on the National Fire Policy. A major aspect of the National Fire Plan is joint risk reduction planning and implementation carried out by federal, state and local agencies and communities. The National Fire Plan presented a comprehensive strategy in five key initiatives:

- Firefighting—Be adequately prepared to fight fires each fire season.
- Rehabilitation and Restoration—Restore landscapes and rebuild communities damaged by wildfires.
- Hazardous Fuel Reduction—Invest in projects to reduce fire risk.
- Community Assistance—Work directly with communities to ensure adequate protection.
- Accountability—Be accountable and establish adequate oversight, coordination, program development, and monitoring for performance.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities that enact floodplain regulations. Participation and good standing under NFIP are prerequisites to grant funding eligibility under the Robert T. Stafford Act.

Flood Study and Mapping

For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1-percent-annual-chance flood and the 0.2-percent-annual-chance flood.

Base flood elevations and the boundaries of the flood hazard areas are shown on Flood Insurance Rate Maps, which are the principle tool for identifying the extent and location of the flood hazard. Flood Insurance Rate Maps are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under the local floodplain management program. Structures permitted or built in a jurisdiction before its first flood map was approved are called “pre-FIRM” structures, and structures built afterwards are called “post-FIRM.” The insurance rate is different for the two types of structures. In recent years, Flood Insurance Rate Maps have been digitized as Digital Flood Insurance Rate Maps, which are more accessible to community members, local governments and stakeholders.

Requirements for Development Regulations

NFIP participants must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a floodplain, participating jurisdictions must ensure that three criteria are met:

- New buildings and those undergoing substantial improvements must, at a minimum, be elevated to protect against damage by the 1-percent-annual-chance flood.
- New floodplain development must not aggravate existing flood problems or increase damage to other properties.
- New floodplain development must exercise a reasonable and prudent effort to reduce its adverse impacts on threatened salmonid species.

NFIP participation is limited to local governments that possess permit authority and have the ability to adopt and enforce regulations that govern land use. This does not typically apply to special purpose districts.

Repetitive Loss Properties and Areas

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

Repetitive loss properties make up 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation’s flood insurance claim payments. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A recent report on repetitive losses by the National Wildlife Federation found that 20 percent of these properties are outside any mapped 1 percent annual chance floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

FEMA-sponsored programs, such as the CRS, require participating communities to identify repetitive loss areas. A repetitive loss area is the portion of a floodplain holding structures that FEMA has identified as meeting the definition of repetitive loss. Identifying repetitive loss areas helps to identify structures that are at risk but are not on FEMA's list of repetitive loss structures because no flood insurance policy was in force at the time of loss.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In some cases, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency responder disciplines. These cases necessitate coordination across a spectrum of organizations. Communities using NIMS follow a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, technological hazards, and human-caused hazards) regardless of size or complexity.

Although participation is voluntary, federal departments and agencies are required to make adoption of NIMS by local and state jurisdictions a condition to receive federal preparedness grants and awards. The content of this plan is considered to be a viable support tool for any phase of emergency management. The NIMS program is considered as a response function, and information in this hazard mitigation plan can support the implementation and update of all NIMS-compliant plans within the planning area.

National Landslide Preparedness Act

The 2021 National Landslide Preparedness Act authorized a national landslide hazards reduction program and a 3D elevation program within the USGS. This broadened the existing Landslide Hazards Program (under the Natural Hazards Mission Area) and the 3D Elevation Program (under the National Geospatial Program). The act required coordination among federal agencies through an Interagency Coordinating Committee on Landslide Hazards representing USGS and other agencies. The act calls for development of a national strategy for landslide loss reduction and a publicly accessible national landslide database of landslide hazard and risk.

Presidential Executive Order 11988, Floodplain Management

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities (FEMA, 2015a):

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

Presidential Executive Order 11990, Protection of Wetlands

Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.

All actions identified in this plan will seek full compliance with all applicable presidential executive orders.

Rural Development Program

The mission of the U.S. Department of Agriculture (USDA) Rural Development Program is to help improve the economy and quality of life in rural America. The program provides project financing and technical assistance to help rural communities provide the infrastructure needed by rural businesses, community facilities, and households. The program addresses rural America's need for basic services, such as clean running water, sewage and waste disposal, electricity, and modern telecommunications and broadband. Loans and competitive grants are offered for various community and economic development projects and programs, such as the development of essential community facilities including fire stations. This program is a potential source of funding for actions identified in this plan.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers operates and maintains approximately 700 dams nationwide. It is also responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried dams; surveyed each state and federal agency's capabilities, practices and regulations regarding design, construction, operation and maintenance of the dams; and developed guidelines for inspection and evaluation of dam safety. The Corps maintains the National Inventory of Dams, which contains information about a dam's location, size, purpose, type, last inspection and regulatory status.

U.S. Army Corps of Engineers Flood Hazard Management

The following U.S. Army Corps of Engineers authorities and programs related to flood hazard management:

- The Floodplain Management Services program offers 100-percent federally funded technical services such as development and interpretation of site-specific data related to the extent, duration and frequency of flooding. Special studies may be conducted to help a community understand and respond to flood risk. These may include flood hazard evaluation, flood warning and preparedness, or flood modeling.
- For more extensive studies, the Corps of Engineers offers a cost-shared program called Planning Assistance to States and Tribes. Studies under this program generally range from $25,000 to $100,000 with the local jurisdiction providing 50 percent of the cost.

- The Corps of Engineers has several cost-shared programs (typically 65 percent federal and 35 percent non-federal) aimed at developing, evaluating and implementing structural and non-structural capital projects to address flood risks at specific locations or within a specific watershed:
  - The Continuing Authorities Program for smaller-scale projects includes Section 205 for Flood Control, with a $7 million federal limit and Section 14 for Emergency Streambank Protection with a $1.5 million federal limit. These can be implemented without specific authorization from Congress.
  - Larger scale studies, referred to as General Investigations, and projects for flood risk management, for ecosystem restoration or to address other water resource issues, can be pursued through a specific authorization from Congress and are cost-shared, typically at 65 percent federal and 35 percent non-federal.
  - Watershed management planning studies can be specifically authorized and are cost-shared at 50 percent federal and 50 percent non-federal.
- The Corps of Engineers provides emergency response assistance during and following natural disasters. Public Law 84-99 enables the Corps to assist state and local authorities in flood fight activities and cost share in the repair of flood protective structures. Assistance is provided in the flowing categories:
  - Preparedness—The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Funding for Corps of Engineers emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.
  - Response Activities—Public Law 84-99 allows the Corps of Engineers to supplement state and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details). All flood fight efforts require a project cooperation agreement signed by the public sponsor and the sponsor must remove all flood fight material after the flood has receded. Public Law 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for "advance measures" assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.
  - Rehabilitation—Under Public Law 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the federal system owner, and at 20-percent cost to the eligible non-federal system owner. All systems considered eligible for Public Law 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis. The Corps has the responsibility to coordinate levee repair issues with interested federal, state, and local agencies following natural disaster events where flood control works are damaged.

These authorities and programs are all available to the planning partners to support any related mitigation actions.

U.S. Bureau of Reclamation Safety Evaluation of Existing Dams Program

The U.S. Bureau of Reclamation's Safety Evaluation of Existing Dams Program was officially implemented in 1978 with passage of the Reclamation Safety of Dams Act (Public Law 95-578). This act was amended in 1984 under Public Law 98-404, in 2000 under Public Law 106-377, in 2002 under Public Law 107-117, and in 2004 under Public Law 108-439. Program development and administration of dam safety activities is the responsibility of the Bureau of Reclamation's Dam Safety Office located in Denver, Colorado.

Dams must be operated and maintained in a safe manner, ensured through inspections for safety deficiencies, analyses utilizing current technologies and designs, and corrective actions if needed based on current engineering practices. In addition, future evaluations should include assessments of benefits foregone with the loss of a dam. For example, a failed dam can no longer provide needed fish and wildlife benefits.

The primary emphasis of the Safety Evaluation of Existing Dams program is to perform site evaluations and to identify potential safety deficiencies on Bureau of Reclamation and other Interior Department dams. The basic objective is to quickly identify dams which pose an increased threat to the public, and to quickly complete the related analyses in order to expedite corrective action decisions and safeguard the public and associated resources.

The program focuses on evaluating and implementing actions to resolve safety concerns at Bureau of Reclamation dams. Under this program, the Bureau of Reclamation completes studies and identifies and implements needed corrective action on Bureau of Reclamation dams. The selected course of action relies on assessments of risks and liabilities with environmental and public involvement input to the decision-making process.

U.S. Fire Administration

There are federal agencies that provide technical support to fire agencies/organizations. For example, the U.S. Fire Administration, which is a part of FEMA, provides leadership, advocacy, coordination, and support for fire agencies and organizations.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service fire management strategy uses prescribed fire to maintain early successional fire-adapted grasslands and other ecological communities throughout the National Wildlife Refuge system.

STATE

State and Local Building Codes

Idaho's building code largely reflects international codes, with provisions for wind, seismic and snow loading. As of October 1, 2008, the Idaho building code became mandatory for all municipalities in the state. As of January 1, 2015, the building codes include the following:

- 2012 International Building Code
- 2012 International Residential Code Parts I, II, II, IV and IX
- 2012 International Energy Conservation Code
- 2012 International Existing Building Code
- Idaho administrative rules 07.03.01 (Rules of Building Safety), amending the above codes. There are significant changes to the energy conservation provisions for one- and two-family dwellings.

Subdivision Regulations

Subdivision regulations form part of the process utilized by local governments to carry out the requirements of their comprehensive plans and zoning ordinances. In Idaho, local governments have the authority to define the term "subdivision" as they prefer. State enabling authority does not contain standards or requirements that would be considered to exceed those commonly found elsewhere, nor are subdivision regulations mandated. Subdivision regulations are important in hazard prone areas as they can specify requirements for layout and location of infrastructure, lots and other facilities as land is developed.

Comprehensive Plans and Zoning

Title 67, Chapter 65, which is Idaho's local land use enabling authority, includes a stated, specific purpose of local land use regulation "to protect life and property in areas subject to natural hazards and disasters." Tools to do this include comprehensive planning and zoning. Consistent with Idaho law, a comprehensive plan provides the policy basis for a community's zoning ordinance, which contains the specific standards and requirements and processes for making land use and development decisions. In Idaho, a comprehensive plan is required to include a section on hazards (67-6508(g)):

> *The plan with maps, charts, and reports shall be based on the following components as they may apply to land use regulations and actions unless the plan specifies reasons why a particular component is unneeded ... Hazardous Areas -- An analysis of known hazards as may result from susceptibility to surface ruptures from faulting, ground shaking, ground failure, landslides or mudslides; avalanche hazards resulting from development in the known or probable path of snow slides and avalanches, and floodplain hazards.*

As part of comprehensive planning, a future land use map is prepared indicating suitable projected land uses for the jurisdiction. The implementation tool to realize the vision in the comprehensive plan is the zoning ordinance. Zoning protects the rights of property owners while promoting the general welfare of the community. By dividing land into categories according to use, and setting regulations for these categories, a zoning ordinance can govern private land use and segregate incompatible uses. The purpose of zoning is to locate particular land uses where they are most appropriate, considering public utilities, road access and the established development pattern.

Floodplain Zoning

Idaho communities are authorized to adopt floodplain zoning to regulate any mapped or unmapped flood hazard area. Additionally, Idaho communities may adopt standards that exceed the minimum standards of the NFIP. In March 2010, the Idaho Legislature passed House Bill 556, which changes Idaho's floodplain zoning enabling authority to exempt operation, maintenance, cleaning or repair of any of any canal ditch, irrigation, drainage or diversion structure from floodplain zoning. Floodplain zoning is important in flood hazard areas to provide for appropriate development standards and enable communities to participate in the NFIP and therefore be eligible for flood insurance and flood mitigation programs. The recent law change would appear to be in conflict with federal minimum regulatory standards for communities participating in the NFIP and could therefore endanger community participation in the program.

Idaho Department of Water Resources Dam Safety Program

The Dam Safety Program of Idaho's Department of Water Resources monitors dams at the state level. The Department currently regulates nearly 600 water storage dams and more than 20 mine tailings impoundment structures throughout the state. The program regulates dams greater than or equal to 10 feet in height or reservoirs greater than or equal to 50 acre-feet in storage capacity. Each dam inspected by IDWR has a classification for size and risk:

- Large—40 feet high or more or with a storage capacity of more than 4,000 acre feet of water. *104 dams are currently listed as large*.
- Intermediate—More than 20 but less than 40 feet high or with a storage capacity of 100 to 4,000 acre feet of water. *198 dams are currently listed as intermediate*.
- Small—20 feet high or less and a storage capacity of less than 100 acre feet of water. *244 dams are currently listed as small*.

All statutory sized dams must be inspected by the IDWR no less than every five years. The frequency between individual dam inspections depends on such items as the project's physical condition, method of construction, maintenance record, age, hazard rating, and size and storage capacity. Inspection reports prepared by the IDWR for non-federal dams are available through the state office in Boise (Idaho Dam Safety Web Site, 2011).

Idaho Disaster Preparedness Act of 1975

The Idaho Disaster Preparedness Act of 1975 (Chapter 10, Title 46 of the Idaho Code) created the Bureau of Disaster Services and subsequently the Office of Emergency Management, and provided for the creation of local organizations for disaster preparedness. According to the Act, it is the policy of the State of Idaho to plan and prepare for disasters and emergencies resulting from natural or manmade causes, enemy attack, sabotage or other hostile action. State law was put into place to do the following:

- Create an Office of Emergency Management.
- Prevent and reduce damage, injury, and loss of life and property resulting from natural or man-made catastrophes.
- Prepare assistance for prompt and efficient search, rescue and care.
- Provide for rapid restoration and rehabilitation.
- Prescribe the roles of government in prevention, preparation and response to disaster.
- Authorize and encourage cooperation in disaster prevention, preparation and response.
- Provide for coordination of activities.
- Provide a disaster management system.
- Provide for payment of obligations and expenses incurred by the state of Idaho through the Office of Emergency Management.

Idaho Silver Jackets Program

The Silver Jackets Program is the state-level implementation of the Army Corps of Engineers National Flood Risk Management Program. The core member agencies will establish a continuous intergovernmental collaborative team working with other state and federal agencies to do the following:

- Provide assistance in identifying and prioritizing actions to reduce the threat, vulnerability and consequences of flooding in the State of Idaho.
- Facilitate strategic planning and implementation of life-cycle mitigation, response and recovery actions to reduce the threat, vulnerability and consequences of flooding in the State of Idaho.
- Create or supplement a process to collaboratively identify issues and implement or recommend solutions.

- Identify and implement ways to leverage available resources and information between agencies.
- Increase and improve flood risk communication and outreach.
- Promote wise stewardship of the taxpayers' investments.
- Develop more comprehensive state flood risk management policies and strategies.
- Develop advanced hydrologic predictive services to reduce loss of life and property damage from flooding.

2022 Ada County Multi-Hazard Mitigation Plan

Appendix C. Concepts and Methods Used for Hazard Mapping

C. CONCEPTS AND METHODS USED FOR HAZARD MAPPING

TO BE COMPLETED

2022 Ada County Multi-Hazard Mitigation Plan

Appendix D. Detailed Risk Assessment Results

Exposure and Estimated Loss

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Estimated Building Exposure						
					Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed
Boise	229,776	81,552	76,386	$61,280,836,767	0	0	0.0%	$0	$0	$0	0.0%
Eagle	31,699	12,437	11,810	$9,838,649,929	0	0	0.0%	$0	$0	$0	0.0%
Garden City	11,920	4,385	3,664	$3,705,101,875	0	0	0.0%	$0	$0	$0	0.0%
Kuna	23,937	8,831	8,663	$3,886,826,099	0	0	0.0%	$0	$0	$0	0.0%
Meridian	121,182	40,812	39,226	$28,959,315,273	1,917	5,891	4.9%	$903,251,412	$485,875,710	$1,389,127,122	4.8%
Star	11,259	5,065	4,957	$2,845,160,473	0	0	0.0%	$0	$0	$0	0.0%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	140	409	0.6%	$52,531,955	$27,946,028	$80,477,983	0.6%
Total	**494,399**	**174,802**	**166,212**	**$122,988,683,223**	**2,057**	**6,300**	**1.3%**	**$955,783,367**	**$513,821,738**	**$1,469,605,105**	**1.2%**

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor website.
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Percent of residential buildings exposed multiplied by the Estimated Populatio
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.1, and adjusted to reflect the estimated populatio
(6) Calculated using a user-defined (UDF) analysis in Hazus 5.1

Jurisdiction	Economic Impact							
	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Boise	0	0	0	0	$0	$0	$0	0.0%
Eagle	0	0	0	0	$0	$0	$0	0.0%
Garden City	0	0	0	0	$0	$0	$0	0.0%
Kuna	0	0	0	0	$0	$0	$0	0.0%
Meridian	9,113	2,302	161	1,887	$91,184,948	$59,622,255	$150,807,203	0.5%
Star	0	0	0	0	$0	$0	$0	0.0%
Unincorporated	1,648	68	7	138	$6,389,396	$4,132,240	$10,521,636	0.1%
Total	**10,761**	**2,370**	**168**	**2,025**	**$97,574,344**	**$63,754,495**	**$161,328,839**	**0.1%**

Notes:

Jurisdiction	Acres of Inundation Area	Number of Structures in Inundation Area (2)							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	0	0	0	0	0	0	0	0	0
Eagle	0	0	0	0	0	0	0	0	0
Garden City	0	0	0	0	0	0	0	0	0
Kuna	0	0	0	0	0	0	0	0	0
Meridian	860	1,907	8	0	0	1	0	1	1917
Star	0	0	0	0	0	0	0	0	0
Unincorporated	1,611	136	2	0	2	0	0	0	140
Total	**2,470**	**2,043**	**10**	**0**	**2**	**1**	**0**	**1**	**2057**

Notes:

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Estimated Building Exposure						
					Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed
Boise	229,776	81,552	76,386	$61,280,836,767	25,734	72,113	31.4%	$12,866,040,555	$8,581,720,881	$21,447,761,436	35.0%
Eagle	31,699	12,437	11,810	$9,838,649,929	6,536	15,994	50.5%	$3,487,091,072	$2,109,863,128	$5,596,954,199	56.9%
Garden City	11,920	4,385	3,664	$3,705,101,875	4,383	11,920	100.0%	$2,161,203,941	$1,503,098,230	$3,664,302,171	98.9%
Kuna	23,937	8,831	8,663	$3,886,826,099	0	0	0.0%	$0	$0	$0	0.0%
Meridian	121,182	40,812	39,226	$28,959,315,273	0	0	0.0%	$0	$0	$0	0.0%
Star	11,259	5,065	4,957	$2,845,160,473	4,206	9,315	82.7%	$1,521,064,449	$839,698,865	$2,360,763,313	83.0%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	373	1,052	1.6%	$276,335,622	$193,538,207	$469,873,829	3.8%
Total	**494,399**	**174,802**	**166,212**	**$122,988,683,223**	**41,232**	**110,394**	**22.3%**	**$20,311,735,638**	**$13,227,919,311**	**$33,539,654,949**	**27.3%**

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor website.
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Percent of residential buildings exposed multiplied by the Estimated Populatio
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.1, and adjusted to reflect the estimated populatio
(6) Calculated using a user-defined (UDF) analysis in Hazus 5.1

Jurisdiction	Economic Impact							
	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Boise	4,617,669	66,414	2,577	25,632	$8,520,691,228	$6,532,377,833	$15,053,069,061	24.6%
Eagle	974,977	12,642	547	6,532	$2,189,011,480	$1,580,665,864	$3,769,677,344	38.3%
Garden City	863,391	11,701	487	4,383	$1,538,041,053	$1,235,897,533	$2,773,938,586	74.9%
Kuna	0	0	0	0	$0	$0	$0	0.0%
Meridian	0	0	0	0	$0	$0	$0	0.0%
Star	416,524	9,065	285	4,203	$1,001,199,124	$629,776,445	$1,630,975,569	57.3%
Unincorporated	74,302	580	38	373	$162,961,705	$137,612,687	$300,574,392	2.4%
Total	**6,946,864**	**100,402**	**3,933**	**41,123**	**$13,411,904,589**	**$10,116,330,362**	**$23,528,234,951**	**19.1%**

Notes:

Jurisdiction	Acres of Inundation Area	Number of Structures in Inundation Area (2)							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	11,499	23,973	1,615	0	13	59	46	28	25734
Eagle	6,290	5,959	558	1	1	3	10	4	6536
Garden City	2,702	3,664	703	0	4	6	4	2	4383
Kuna	0	0	0	0	0	0	0	0	0
Meridian	1	0	0	0	0	0	0	0	0
Star	3,222	4,101	95	0	1	7	2	0	4206
Unincorporated	9,480	350	19	2	1	1	0	0	373
Total	**33,195**	**38,047**	**2990**	**3**	**20**	**76**	**62**	**34**	**41232**

Notes:

Jurisdiction	Estimated Exposure					Economic Impact						
	Estimated Population (1)	% Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	% of Total Value Damaged
Boise	229,776	100%	81,552	$61,280,836,767	100%	1.17	0	0	$418,057	$343,588	$761,645	0.0%
Eagle	31,699	100%	12,437	$9,838,649,929	100%	0.08	0	0	$22,267	$21,464	$43,731	0.0%
Garden City	11,920	100%	4,385	$3,705,101,875	100%	0.13	0	0	$20,703	$20,032	$40,735	0.0%
Kuna	23,937	100%	8,831	$3,886,826,099	100%	0.02	0	0	$5,452	$5,458	$10,910	0.0%
Meridian	121,182	100%	40,812	$28,959,315,273	100%	0.30	0	0	$104,495	$97,832	$202,327	0.0%
Star	11,259	100%	5,065	$2,845,160,473	100%	0.02	0	0	$13,784	$12,221	$26,005	0.0%
Unincorporated	64,626	100%	21,720	$12,472,792,807	100%	0.08	0	0	$38,368	$43,041	$81,408	0.0%
TOTAL	**494,399**	100%	**174,802**	**$122,988,683,223**	100%	**1.81**	**0**	**0**	**$623,125**	**$543,636**	**1,166,761**	0.0%

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor websi
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 5.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 5.

Jurisdiction	Estimated Exposure					Economic Impact						
	Estimated Population (1)	**% Population Exposed**	**Total Number of Buildings (2)**	**Total Building Value (Structure and contents in $) (2)**	**% of Total Value Exposed**	**Structure Debris (x 1,000 Tons) (3)**	**Number of Displaced Households (3)**	**People Requiring Short-Term Shelter (3)**	**Value Structure in $ Damaged (4)**	**Value Contents in $ Damaged (4)**	**Total Value (Structure and Contents in $) Damaged (4)**	**% of Total Value Damaged**
Boise	229,776	100%	81,552	$61,280,836,767	100%	16.95	5	3	$43,934,732	$29,987,476	$73,922,209	0.1%
Eagle	31,699	100%	12,437	$9,838,649,929	100%	1.45	0	0	$5,633,649	$3,269,503	$8,903,152	0.1%
Garden City	11,920	100%	4,385	$3,705,101,875	100%	1.73	0	0	$2,189,122	$1,744,551	$3,933,673	0.1%
Kuna	23,937	100%	8,831	$3,886,826,099	100%	0.36	0	0	$1,037,176	$784,797	$1,821,973	0.0%
Meridian	121,182	100%	40,812	$28,959,315,273	100%	4.85	0	0	$13,615,042	$10,233,618	$23,848,661	0.1%
Star	11,259	100%	5,065	$2,845,160,473	100%	0.42	0	0	$5,649,585	$2,301,750	$7,951,335	0.3%
Unincorporated	64,626	100%	21,720	$12,472,792,807	100%	1.52	0	0	$4,715,298	$3,745,354	$8,460,652	0.1%
TOTAL	**494,399**	100%	**174,802**	**$122,988,683,223**	100%	**27.28**	**5**	**3**	**$76,774,603**	**$52,067,050**	**128,841,653**	0.1%

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor websi
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 5.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 5.

Jurisdiction	Estimated Exposure					Economic Impact						
	Estimated Population (1)	% Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	% of Total Value Damaged
Boise	229,776	100%	81,552	$61,280,836,767	100%	15.52	1	0	$246,262,265	$121,964,676	$368,226,941	0.6%
Eagle	31,699	100%	12,437	$9,838,649,929	100%	3.28	0	0	$93,283,212	$36,220,159	$129,503,371	1.3%
Garden City	11,920	100%	4,385	$3,705,101,875	100%	1.94	1	0	$75,061,519	$30,863,816	$105,925,335	2.9%
Kuna	23,937	100%	8,831	$3,886,826,099	100%	0.28	0	0	$3,281,006	$1,797,653	$5,078,659	0.1%
Meridian	121,182	100%	40,812	$28,959,315,273	100%	6.27	0	0	$87,369,033	$45,862,545	$133,231,578	0.5%
Star	11,259	100%	5,065	$2,845,160,473	100%	1.04	0	0	$23,830,178	$8,596,781	$32,426,959	1.1%
Unincorporated	64,626	100%	21,720	$12,472,792,807	100%	1.35	0	0	$26,820,176	$13,655,417	$40,475,593	0.3%
TOTAL	**494,399**	100%	**174,802**	**$122,988,683,223**	100%	**29.68**	**2**	**1**	**$555,907,389**	**$258,961,047**	**814,868,435**	0.7%

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor websi
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 5.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 5.

Jurisdiction	Estimated Exposure					Economic Impact						
	Estimated Population (1)	% Population Exposed	Total Number of Buildings (2)	Total Building Value (Structure and contents in $) (2)	% of Total Value Exposed	Structure Debris (x 1,000 Tons) (3)	Number of Displaced Households (3)	People Requiring Short-Term Shelter (3)	Value Structure in $ Damaged (4)	Value Contents in $ Damaged (4)	Total Value (Structure and Contents in $) Damaged (4)	% of Total Value Damaged
Boise	229,776	100%	81,552	$61,280,836,767	100%	3.49	0	0	$35,929,180	$24,887,455	$60,816,634	0.1%
Eagle	31,699	100%	12,437	$9,838,649,929	100%	0.74	0	0	$8,674,006	$4,689,704	$13,363,709	0.1%
Garden City	11,920	100%	4,385	$3,705,101,875	100%	0.40	0	0	$3,293,981	$2,176,965	$5,470,946	0.1%
Kuna	23,937	100%	8,831	$3,886,826,099	100%	0.08	0	0	$702,346	$383,245	$1,085,591	0.0%
Meridian	121,182	100%	40,812	$28,959,315,273	100%	1.79	0	0	$19,945,635	$12,372,053	$32,317,688	0.1%
Star	11,259	100%	5,065	$2,845,160,473	100%	0.20	0	0	$2,694,628	$1,404,258	$4,098,886	0.1%
Unincorporated	64,626	100%	21,720	$12,472,792,807	100%	0.29	0	0	$5,054,054	$3,126,817	$8,180,871	0.1%
TOTAL	**494,399**	100%	**174,802**	**$122,988,683,223**	100%	**6.99**	**0**	**0**	**$76,293,829**	**$49,040,497**	**125,334,326**	0.1%

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor websi
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Calculated using a Census tract level, general building stock (GBS) analysis in Hazus 5.
(4) Calculated using an Advanced Engineering Building Model (AEBM) analysis in Hazus 5.

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Estimated Building Exposure						
					Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed
Boise	229,776	81,552	76,386	$61,280,836,767	1,470	4,094	1.8%	$1,252,551,619	$850,224,927	$2,102,776,545	3.4%
Eagle	31,699	12,437	11,810	$9,838,649,929	743	1,857	5.9%	$659,514,095	$418,242,230	$1,077,756,325	11.0%
Garden City	11,920	4,385	3,664	$3,705,101,875	1,224	3,767	31.6%	$620,366,748	$377,689,327	$998,056,075	26.9%
Kuna	23,937	8,831	8,663	$3,886,826,099	22	58	0.2%	$19,381,677	$16,277,555	$35,659,232	0.9%
Meridian	121,182	40,812	39,226	$28,959,315,273	626	1,684	1.4%	$370,927,805	$278,101,082	$649,028,888	2.2%
Star	11,259	5,065	4,957	$2,845,160,473	117	245	2.2%	$45,284,433	$26,534,107	$71,818,540	2.5%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	230	655	1.0%	$117,691,227	$71,735,057	$189,426,285	1.5%
Total	**494,399**	**174,802**	**166,212**	**$122,988,683,223**	**4,432**	**12,361**	**2.5%**	**$3,085,717,605**	**$2,038,804,285**	**$5,124,521,890**	**4.2%**

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor website.
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Percent of residential buildings exposed multiplied by the Estimated Populatio
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.1, and adjusted to reflect the estimated populatio
(6) Calculated using a user-defined (UDF) analysis in Hazus 5.1

Jurisdiction	Economic Impact							
	Structure Debris (Tons) (4)	Displaced Population (5)	People Requiring Short-Term Shelter (5)	Buildings Impacted (6)	Value Structure in $ Damaged (6)	Value Contents in $ Damaged (6)	Total Value (Structure and Contents in $) Damaged (6)	% of Total Value Damaged
Boise	7,437	1,042	133	568	$29,358,874	$16,924,899	$46,283,773	0.1%
Eagle	108	466	61	16	$993,721	$524,059	$1,517,780	0.0%
Garden City	776	2,225	153	130	$5,344,786	$3,540,063	$8,884,849	0.2%
Kuna	46	4	1	9	$290,426	$150,771	$441,197	0.0%
Meridian	515	231	45	185	$4,398,207	$3,610,346	$8,008,553	0.0%
Star	103	92	7	52	$1,959,574	$1,126,172	$3,085,746	0.1%
Unincorporated	609	84	16	77	$6,725,995	$12,248,103	$18,974,098	0.2%
Total	**9,595**	**4,144**	**416**	**1,037**	**$49,071,584**	**$38,124,412**	**$87,195,996**	**0.1%**

Notes:

Jurisdiction	Acres of Floodplain	Number of Structures in Floodplain (2)							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	2,386	1,361	104	0	1	0	2	2	1470
Eagle	2,640	692	49	1	0	1	0	0	743
Garden City	845	1,158	62	0	0	3	1	0	1224
Kuna	420	21	0	0	0	0	0	1	22
Meridian	590	545	74	1	0	1	3	2	626
Star	728	108	9	0	0	0	0	0	117
Unincorporated	14,673	218	9	1	1	1	0	0	230
Total	**22,282**	**4,103**	**307**	**3**	**2**	**6**	**6**	**5**	**4432**

Notes:

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Estimated Building Exposure						
					Buildings Exposed (2)	Population Exposed (3)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value Exposed
Boise	229,776	81,552	76,386	$61,280,836,767	11,717	31,429	13.7%	$8,229,803,359	$5,856,652,153	$14,086,455,512	23.0%
Eagle	31,699	12,437	11,810	$9,838,649,929	2,714	6,498	20.5%	$1,881,964,156	$1,186,674,067	$3,068,638,223	31.2%
Garden City	11,920	4,385	3,664	$3,705,101,875	3,535	10,017	84.0%	$1,705,051,525	$1,121,705,710	$2,826,757,235	76.3%
Kuna	23,937	8,831	8,663	$3,886,826,099	22	58	0.2%	$19,381,677	$16,277,555	$35,659,232	0.9%
Meridian	121,182	40,812	39,226	$28,959,315,273	1,596	4,575	3.8%	$729,082,292	$485,624,132	$1,214,706,424	4.2%
Star	11,259	5,065	4,957	$2,845,160,473	887	1,908	16.9%	$325,964,252	$194,228,809	$520,193,061	18.3%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	350	974	1.5%	$218,495,513	$139,530,081	$358,025,594	2.9%
Total	**494,399**	**174,802**	**166,212**	**$122,988,683,223**	**20,821**	**55,458**	**11.2%**	**$13,109,742,774**	**$9,000,692,506**	**$22,110,435,281**	**18.0%**

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor website.
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Percent of residential buildings exposed multiplied by the Estimated Populatio
(4) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.
(5) Calculated using a Census block level, general building stock (GBS) analysis in Hazus 5.1, and adjusted to reflect the estimated populatic
(6) Calculated using a user-defined (UDF) analysis in Hazus 5.1

Jurisdiction	Economic Impact							
	Structure Debris (Tons) (4)	**Displaced Population (5)**	**People Requiring Short-Term Shelter (5)**	**Buildings Impacted (6)**	**Value Structure in $ Damaged (6)**	**Value Contents in $ Damaged (6)**	**Total Value (Structure and Contents in $) Damaged (6)**	**% of Total Value Damaged**
Boise	515,520	20,532	1,070	10,626	$1,000,297,727	$1,153,983,725	$2,154,281,452	3.5%
Eagle	21,743	3,562	226	1,086	$149,359,357	$201,632,462	$350,991,819	3.6%
Garden City	79,607	8,679	405	3,235	$292,165,606	$288,077,249	$580,242,855	15.7%
Kuna	138	4	1	13	$703,406	$377,929	$1,081,336	0.0%
Meridian	14,043	1,246	125	1,049	$93,542,910	$75,706,549	$169,249,459	0.6%
Star	3,592	1,074	54	544	$36,998,042	$28,169,821	$65,167,862	2.3%
Unincorporated	3,721	151	23	181	$17,174,017	$19,018,506	$36,192,523	0.3%
Total	**638,364**	**35,247**	**1,904**	**16,734**	**$1,590,241,066**	**$1,766,966,241**	**$3,357,207,306**	**2.7%**

Notes:

Jurisdiction	Acres of Floodplain	Number of Structures in Floodplain (2)							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	6,398	10,448	1,172	1	10	23	45	18	11717
Eagle	4,046	2,421	279	1	1	3	9	0	2714
Garden City	2,092	3,079	445	0	2	4	3	2	3535
Kuna	420	21	0	0	0	0	0	1	22
Meridian	976	1,481	106	1	0	3	3	2	1596
Star	1,205	840	39	0	1	5	2	0	887
Unincorporated	16,542	324	22	1	2	1	0	0	350
Total	**31,679**	**18,614**	**2063**	**4**	**16**	**39**	**62**	**23**	**20821**

Notes:

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Landslide Category Greater than 30% Slope (3)						
					Estimated Exposure						
					Estimated Buildings Exposed (2)	Population Exposed (4)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value
Boise	229,776	81,552	76,386	$61,280,836,767	436	1,309	0.6%	$178,842,812	$89,671,917	$268,514,729	0.4%
Eagle	31,699	12,437	11,810	$9,838,649,929	16	43	0.1%	$5,633,927	$2,816,963	$8,450,890	0.1%
Garden City	11,920	4,385	3,664	$3,705,101,875	0	0	0.0%	$0	$0	$0	0.0%
Kuna	23,937	8,831	8,663	$3,886,826,099	0	0	0.0%	$0	$0	$0	0.0%
Meridian	121,182	40,812	39,226	$28,959,315,273	1	3	0.0%	$332,839	$166,419	$499,258	0.00%
Star	11,259	5,065	4,957	$2,845,160,473	0	0	0.0%	$0	$0	$0	0.0%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	97	279	0.4%	$46,154,003	$25,268,272	$71,422,275	0.6%
Total	**494,399**	**174,802**	**166,212**	**122,988,683,223**	**550**	**1,634**	**0.3%**	**$230,963,580**	**$117,923,572**	**$348,887,153**	**0.3%**

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Landslide Category 15-30% Slope (3)						
					Estimated Exposure						
					Estimated Buildings Exposed (2)	Population Exposed (4)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value
Boise	229,776	81,552	76,386	$61,280,836,767	1,976	5,899	2.6%	$848,951,056	$437,350,990	$1,286,302,046	2.1%
Eagle	31,699	12,437	11,810	$9,838,649,929	102	274	0.9%	$73,690,306	$36,845,153	$110,535,459	1.1%
Garden City	11,920	4,385	3,664	$3,705,101,875	3	0	0.0%	$2,517,835	$2,517,835	$5,035,671	0.1%
Kuna	23,937	8,831	8,663	$3,886,826,099	0	0	0.0%	$0	$0	$0	0.0%
Meridian	121,182	40,812	39,226	$28,959,315,273	29	87	0.1%	$10,968,363	$5,888,610	$16,856,973	0.1%
Star	11,259	5,065	4,957	$2,845,160,473	14	32	0.3%	$5,086,178	$2,543,089	$7,629,267	0.3%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	540	1,611	2.5%	$258,009,979	$129,824,504	$387,834,483	3.1%
Total	**494,399**	**174,802**	**166,212**	**122,988,683,223**	**2,664**	**7,902**	**1.6%**	**$1,199,223,718**	**$614,970,181**	**$1,814,193,899**	**1.5%**

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor websi
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Slope data created from Boise Foothills DEM (from 2015 LiDAR) and USGS 10m-resolution DEM
(4) Percent of residential buildings exposed multiplied by the Estimated Populatio

Jurisdiction	Number of Structures in Category Greater than 30% Slope (2)							
	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	435	1	0	0	0	0	0	436
Eagle	16	0	0	0	0	0	0	16
Garden City	0	0	0	0	0	0	0	0
Kuna	0	0	0	0	0	0	0	0
Meridian	1	0	0	0	0	0	0	1
Star	0	0	0	0	0	0	0	0
Unincorporated	93	4	0	0	0	0	0	97
Total	**545**	**5**	**0**	**0**	**0**	**0**	**0**	**550**

Jurisdiction	Number of Structures in Category 15-30% Slope (2)							
	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	1,961	14	0	0	1	0	0	1,976
Eagle	102	0	0	0	0	0	0	102
Garden City	0	3	0	0	0	0	0	3
Kuna	0	0	0	0	0	0	0	0
Meridian	28	1	0	0	0	0	0	29
Star	14	0	0	0	0	0	0	14
Unincorporated	536	4	0	0	0	0	0	540
Total	**2,641**	**22**	**0**	**0**	**1**	**0**	**0**	**2,664**

Notes:

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Wildfire Hazard Category High (3)						
					Estimated Exposure						
					Estimated Buildings Exposed (2)	Population Exposed (4)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value
Boise	229,776	81,552	76,386	$61,280,836,767	3,434	10,315	4.5%	$1,770,215,793	$929,177,639	$2,699,393,432	4.4%
Eagle	31,699	12,437	11,810	$9,838,649,929	70	188	0.6%	$21,530,853	$10,765,426	$32,296,279	0.3%
Garden City	11,920	4,385	3,664	$3,705,101,875	0	0	0.0%	$0	$0	$0	0.0%
Kuna	23,937	8,831	8,663	$3,886,826,099	0	0	0.0%	$0	$0	$0	0.0%
Meridian	121,182	40,812	39,226	$28,959,315,273	0	0	0.0%	$0	$0	$0	0.0%
Star	11,259	5,065	4,957	$2,845,160,473	0	0	0.0%	$0	$0	$0	0.0%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	2,535	7,573	11.7%	$1,190,302,910	$607,159,249	$1,797,462,158	14.4%
Total	**494,399**	**174,802**	**166,212**	**122,988,683,223**	**6,039**	**18,075**	**3.7%**	**$2,982,049,555**	**$1,547,102,314**	**$4,529,151,869**	**3.7%**

Jurisdiction	Estimated Population (1)	Total Number of Buildings (2)	Total Number of Residential Buildings (2)	Total Building Value (Structure and contents in $) (2)	Wildfire Hazard Category Moderate (3)						
					Estimated Exposure						
					Estimated Buildings Exposed (2)	Population Exposed (4)	% of Population Exposed	Value Structure in $ Exposed (2)	Value Contents in $ Exposed (2)	Value (Structure and contents in $) Exposed (2)	% of Total Value
Boise	229,776	81,552	76,386	$61,280,836,767	5,700	16,593	7.2%	$2,285,803,448	$1,352,489,488	$3,638,292,936	5.9%
Eagle	31,699	12,437	11,810	$9,838,649,929	1,545	4,056	12.8%	$1,000,699,140	$532,145,055	$1,532,844,195	15.6%
Garden City	11,920	4,385	3,664	$3,705,101,875	19	62	0.5%	$11,675,144	$5,837,572	$17,512,716	0.5%
Kuna	23,937	8,831	8,663	$3,886,826,099	4	11	0.0%	$1,378,646	$689,323	$2,067,968	0.1%
Meridian	121,182	40,812	39,226	$28,959,315,273	0	0	0.0%	$0	$0	$0	0.0%
Star	11,259	5,065	4,957	$2,845,160,473	205	466	4.1%	$69,937,654	$34,968,827	$104,906,482	3.7%
Unincorporated	64,626	21,720	21,506	$12,472,792,807	1,838	5,445	8.4%	$1,048,703,413	$808,192,147	$1,856,895,561	14.9%
Total	**494,399**	**174,802**	**166,212**	**122,988,683,223**	**9,311**	**26,632**	**5.4%**	**$4,418,197,446**	**$2,734,322,412**	**$7,152,519,858**	**5.8%**

Notes: (1) 2020 estimates from "Population Decennial Census & Annual Estimates" downloaded from Idaho Department of Labor websi
(2) Values based off of 2021 tax assessor data provided by Ada County
(3) Hazard XXX data provided by XXX.
(4) Percent of residential buildings exposed multiplied by the Estimated Populatio

Jurisdiction	Number of Structures in Category High(2)							
	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	3,429	5	0	0	0	0	0	3,434
Eagle	70	0	0	0	0	0	0	70
Garden City	0	0	0	0	0	0	0	0
Kuna	0	0	0	0	0	0	0	0
Meridian	0	0	0	0	0	0	0	0
Star	0	0	0	0	0	0	0	0
Unincorporated	2,520	12	1	1	0	1	0	2,535
Total	**6,019**	**17**	**1**	**1**	**0**	**1**	**0**	**6,039**

Jurisdiction	Number of Structures in Category Moderate (2)							
	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Boise	5,516	173	3	0	5	2	1	5,700
Eagle	1,511	33	0	0	0	1	0	1,545
Garden City	19	0	0	0	0	0	0	19
Kuna	4	0	0	0	0	0	0	4
Meridian	0	0	0	0	0	0	0	0
Star	205	0	0	0	0	0	0	205
Unincorporated	1,812	22	3	0	0	1	0	1,838
Total	**9,067**	**228**	**6**	**0**	**5**	**4**	**1**	**9,311**

Notes:

Risk Ranking

	RISK RANKING-Dam Failure - Blacks Creek									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	None	0	0.00%	None	0	0	0.00%	None	0	0
Eagle	None	0	0.00%	None	0	0	0.00%	None	0	0
Garden City	None	0	0.00%	None	0	0	0.00%	None	0	0
Kuna	None	0	0.00%	None	0	0	0.00%	None	0	0
Meridian	Low	1	4.86%	Low	1	3	4.80%	Low	1	2
Star	None	0	0.00%	None	0	0	0.00%	None	0	0
Unincorporated	Low	1	0.63%	Low	1	3	0.65%	Low	1	2
Total	None	0	1.27%	Low	1	3	1.19%	Low	1	2

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.00%	None	0	0	**0**	**Low**
Eagle	0.00%	None	0	0	**0**	**Low**
Garden City	0.00%	None	0	0	**0**	**Low**
Kuna	0.00%	None	0	0	**0**	**Low**
Meridian	0.52%	Low	1	1	**6**	**Low**
Star	0.00%	None	0	0	**0**	**Low**
Unincorporated	0.08%	Low	1	1	**6**	**Low**
Total	0.13%	Low	1	1	**0**	**Low**

RISK RANKING-Dam Failure - Lucky Peak

	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Low	1	31.38%	High	3	9	35.00%	High	3	6
Eagle	Low	1	50.46%	High	3	9	56.89%	High	3	6
Garden City	Low	1	100.00%	High	3	9	98.90%	High	3	6
Kuna	None	0	0.00%	None	0	0	0.00%	None	0	0
Meridian	None	0	0.00%	None	0	0	0.00%	None	0	0
Star	Low	1	82.73%	High	3	9	82.97%	High	3	6
Unincorporated	Low	1	1.63%	Low	1	3	3.77%	Low	1	2
Total	Low	1	22.33%	Medium	2	6	27.27%	High	3	6

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	24.56%	High	3	3	**18**	**Medium**
Eagle	38.31%	High	3	3	**18**	**Medium**
Garden City	74.87%	High	3	3	**18**	**Medium**
Kuna	0.00%	None	0	0	**0**	**Low**
Meridian	0.00%	None	0	0	**0**	**Low**
Star	57.32%	High	3	3	**18**	**Medium**
Unincorporated	2.41%	Low	1	1	**6**	**Low**
Total	19.13%	High	3	3	**15**	**Low**

	RISK RANKING									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Medium	2	100.00%	High	3	9	100.00%	High	3	6
Eagle	Medium	2	100.00%	High	3	9	100.00%	High	3	6
Garden City	Medium	2	100.00%	High	3	9	100.00%	High	3	6
Kuna	Medium	2	100.00%	High	3	9	100.00%	High	3	6
Meridian	Medium	2	100.00%	High	3	9	100.00%	High	3	6
Star	Medium	2	100.00%	High	3	9	100.00%	High	3	6
Unincorporated	Medium	2	100.00%	High	3	9	100.00%	High	3	6
TOTAL	Medium	2	100.00%	High	3	9	100.00%	High	3	6

G-Earthquake - 100-year Probabilistic

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.00%	None	0	0	30	Medium
Eagle	0.00%	None	0	0	30	Medium
Garden City	0.00%	None	0	0	30	Medium
Kuna	0.00%	None	0	0	30	Medium
Meridian	0.00%	None	0	0	30	Medium
Star	0.00%	None	0	0	30	Medium
Unincorporated	0.00%	None	0	0	30	Medium
TOTAL	0.00%	None	0	0	30	Medium

	RISK RANKING									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Low	1	100.00%	High	3	9	100.00%	High	3	6
Eagle	Low	1	100.00%	High	3	9	100.00%	High	3	6
Garden City	Low	1	100.00%	High	3	9	100.00%	High	3	6
Kuna	Low	1	100.00%	High	3	9	100.00%	High	3	6
Meridian	Low	1	100.00%	High	3	9	100.00%	High	3	6
Star	Low	1	100.00%	High	3	9	100.00%	High	3	6
Unincorporated	Low	1	100.00%	High	3	9	100.00%	High	3	6
TOTAL	Low	1	100.00%	High	3	9	100.00%	High	3	6

-Earthquake - 500-year Probabilistic

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.12%	Low	1	1	16	Medium
Eagle	0.09%	Low	1	1	16	Medium
Garden City	0.11%	Low	1	1	16	Medium
Kuna	0.05%	Low	1	1	16	Medium
Meridian	0.08%	Low	1	1	16	Medium
Star	0.28%	Low	1	1	16	Medium
Unincorporated	0.07%	Low	1	1	16	Medium
TOTAL	0.10%	Low	1	1	16	Medium

	RISK RANKING									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Low	1	100.00%	High	3	9	100.00%	High	3	6
Eagle	Low	1	100.00%	High	3	9	100.00%	High	3	6
Garden City	Low	1	100.00%	High	3	9	100.00%	High	3	6
Kuna	Low	1	100.00%	High	3	9	100.00%	High	3	6
Meridian	Low	1	100.00%	High	3	9	100.00%	High	3	6
Star	Low	1	100.00%	High	3	9	100.00%	High	3	6
Unincorporated	Low	1	100.00%	High	3	9	100.00%	High	3	6
TOTAL	Low	1	100.00%	High	3	9	100.00%	High	3	6

i-Earthquake - Squaw Creek M7.03

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.60%	Low	1	1	16	Medium
Eagle	1.32%	Low	1	1	16	Medium
Garden City	2.86%	Low	1	1	16	Medium
Kuna	0.13%	Low	1	1	16	Medium
Meridian	0.46%	Low	1	1	16	Medium
Star	1.14%	Low	1	1	16	Medium
Unincorporated	0.32%	Low	1	1	16	Medium
TOTAL	0.66%	Low	1	1	16	Medium

	RISK RANKING-Ea									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Low	1	100.00%	High	3	9	100.00%	High	3	6
Eagle	Low	1	100.00%	High	3	9	100.00%	High	3	6
Garden City	Low	1	100.00%	High	3	9	100.00%	High	3	6
Kuna	Low	1	100.00%	High	3	9	100.00%	High	3	6
Meridian	Low	1	100.00%	High	3	9	100.00%	High	3	6
Star	Low	1	100.00%	High	3	9	100.00%	High	3	6
Unincorporated	Low	1	100.00%	High	3	9	100.00%	High	3	6
TOTAL	Low	1	100.00%	High	3	9	100.00%	High	3	6

rthquake - Big Flat - Jake Creek M6.81

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.10%	Low	1	1	**16**	**Medium**
Eagle	0.14%	Low	1	1	**16**	**Medium**
Garden City	0.15%	Low	1	1	**16**	**Medium**
Kuna	0.03%	Low	1	1	**16**	**Medium**
Meridian	0.11%	Low	1	1	**16**	**Medium**
Star	0.14%	Low	1	1	**16**	**Medium**
Unincorporated	0.07%	Low	1	1	**16**	**Medium**
TOTAL	0.10%	Low	1	1	**16**	**Medium**

RISK RANKING-Flood - 100-year

	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	High	3	1.78%	Low	1	3	3.43%	Low	1	2
Eagle	High	3	5.86%	Low	1	3	10.95%	Medium	2	4
Garden City	High	3	31.60%	High	3	9	26.94%	High	3	6
Kuna	High	3	0.24%	Low	1	3	0.92%	Low	1	2
Meridian	High	3	1.39%	Low	1	3	2.24%	Low	1	2
Star	High	3	2.18%	Low	1	3	2.52%	Low	1	2
Unincorporated	High	3	1.01%	Low	1	3	1.52%	Low	1	2
Total	High	3	2.50%	Low	1	3	4.17%	Low	1	2

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.08%	Low	1	1	**18**	**Medium**
Eagle	0.02%	Low	1	1	**24**	**Medium**
Garden City	0.24%	Low	1	1	**48**	**High**
Kuna	0.01%	Low	1	1	**18**	**Medium**
Meridian	0.03%	Low	1	1	**18**	**Medium**
Star	0.11%	Low	1	1	**18**	**Medium**
Unincorporated	0.15%	Low	1	1	**18**	**Medium**
Total	0.07%	Low	1	1	**18**	**Medium**

	RISK RANKING-Flood - 500-year									
	Probability		**Impact on People**				**Impact on Property**			
	Probability (High, Medium, Low, None)	**Probability Factor (3,2,1,0)**	**% Population Exposed**	**Impact (High, Medium, Low, None)**	**Impact Factor**	**Weighted Impact Factor**	**% of Total Value Exposed**	**Impact (High, Medium, Low, None)**	**Impact Factor**	**Weighted Impact Factor**
Boise	Medium	2	13.68%	Medium	2	6	22.99%	Medium	2	4
Eagle	Medium	2	20.50%	Medium	2	6	31.19%	High	3	6
Garden City	Medium	2	84.03%	High	3	9	76.29%	High	3	6
Kuna	Medium	2	0.24%	Low	1	3	0.92%	Low	1	2
Meridian	Medium	2	3.78%	Low	1	3	4.19%	Low	1	2
Star	Medium	2	16.95%	Medium	2	6	18.28%	Medium	2	4
Unincorporated	Medium	2	1.51%	Low	1	3	2.87%	Low	1	2
Total	Medium	2	11.22%	Medium	2	6	17.98%	Medium	2	4

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	3.52%	Low	1	1	22	Medium
Eagle	3.57%	Low	1	1	26	Medium
Garden City	15.66%	High	3	3	36	High
Kuna	0.03%	Low	1	1	12	Low
Meridian	0.58%	Low	1	1	12	Low
Star	2.29%	Low	1	1	22	Medium
Unincorporated	0.29%	Low	1	1	12	Low
Total	2.73%	Low	1	1	22	Medium

	RISK RANKING- Landslide Hazard (Categories Greater than 30% Slope & 1									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Medium	2	3.14%	Low	1	3	2.54%	Low	1	2
Eagle	Medium	2	1.00%	Low	1	3	1.21%	Low	1	2
Garden City	Low	1	0.00%	None	0	0	0.14%	Low	1	2
Kuna	Medium	2	0.00%	None	0	0	0.00%	None	0	0
Meridian	Low	1	0.07%	Low	1	3	0.06%	Low	1	2
Star	Medium	2	0.28%	Low	1	3	0.27%	Low	1	2
Unincorporated	Medium	2	2.92%	Low	1	3	3.68%	Low	1	2
Total	Medium	2	1.93%	Low	1	3	1.76%	Low	1	2

5-30% Slope)						
	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	0.63%	Low	1	1	**12**	**Low**
Eagle	0.30%	Low	1	1	**12**	**Low**
Garden City	0.03%	Low	1	1	**3**	**Low**
Kuna	0.00%	None	0	0	**0**	**Low**
Meridian	0.01%	Low	1	1	**6**	**Low**
Star	0.07%	Low	1	1	**12**	**Low**
Unincorporated	0.92%	Low	1	1	**12**	**Low**
Total	0.44%	Low	1	1	**12**	**Low**

	RISK RANKING- Wildfire Hazard (Categories High & Moderate									
	Probability		Impact on People				Impact on Property			
	Probability (High, Medium, Low, None)	Probability Factor (3,2,1,0)	% Population Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	% of Total Value Exposed	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor
Boise	Medium	2	11.71%	Medium	2	6	10.34%	Medium	2	4
Eagle	Medium	2	13.39%	Medium	2	6	15.91%	Medium	2	4
Garden City	Medium	2	0.52%	Low	1	3	0.47%	Low	1	2
Kuna	Medium	2	0.05%	Low	1	3	0.05%	Low	1	2
Meridian	Medium	2	0.00%	None	0	0	0.00%	None	0	0
Star	Medium	2	4.14%	Low	1	3	3.69%	Low	1	2
Unincorporated	Medium	2	20.14%	Medium	2	6	29.30%	High	3	6
Total	Medium	2	9.04%	Low	1	3	9.50%	Low	1	2

e)

	Impact on Economy					
	% of Total Value Damaged	Impact (High, Medium, Low, None)	Impact Factor	Weighted Impact Factor	Risk Ranking Score	Hazard Risk Rating
Boise	2.59%	Low	1	1	**22**	**Medium**
Eagle	3.98%	Low	1	1	**22**	**Medium**
Garden City	0.12%	Low	1	1	**12**	**Low**
Kuna	0.01%	Low	1	1	**12**	**Low**
Meridian	0.00%	None	0	0	**0**	**Low**
Star	0.92%	Low	1	1	**12**	**Low**
Unincorporated	7.32%	Medium	2	2	**28**	**Medium**
Total	2.37%	Low	1	1	**12**	**Low**

Exposed Critical Facilities

Dam Failure - Blacks Creek

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Boise	0	0	0	0	0	0	0	**0**
Eagle	0	0	0	0	0	0	0	**0**
Garden City	0	0	0	0	0	0	0	**0**
Kuna	0	0	0	0	0	0	0	**0**
Meridian	0	0	0	0	0	1	14	**15**
Star	0	0	0	0	0	0	0	**0**
Unincorporated	2	0	0	0	0	0	5	**7**
Total	**2**	**0**	**0**	**0**	**0**	**1**	**19**	**22**

Dam Failure - Lucky Peak

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Boise	78	7	61	4	16	184	78	**428**
Eagle	11	2	25	1	5	12	23	**79**
Garden City	71	0	19	4	4	6	8	**112**
Kuna	0	0	0	0	0	0	0	**0**
Meridian	0	0	0	0	0	0	0	**0**
Star	2	0	6	0	1	6	22	**37**
Unincorporated	0	6	13	0	3	3	21	**46**
Total	**162**	**15**	**124**	**9**	**29**	**211**	**152**	**702**

Flood - 100-year

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Boise	1	0	24	0	1	13	39	**78**
Eagle	1	0	3	0	0	0	4	**8**
Garden City	1	0	2	3	0	1	2	**9**
Kuna	0	0	0	0	0	0	3	**3**
Meridian	4	1	2	1	1	1	18	**28**
Star	0	0	0	0	0	0	2	**2**
Unincorporated	0	3	9	0	1	1	55	**69**
Total	**7**	**4**	**40**	**4**	**3**	**16**	**123**	**197**

Flood - 500-year

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Boise	49	6	40	0	11	159	73	**338**
Eagle	6	1	13	0	2	8	6	**36**
Garden City	8	0	14	4	3	6	7	**42**
Kuna	0	0	0	0	0	0	3	**3**
Meridian	5	2	3	1	2	1	19	**33**
Star	0	0	3	0	0	5	4	**12**
Unincorporated	0	3	13	0	1	3	58	**78**
Total	**68**	**12**	**86**	**5**	**19**	**182**	**170**	**542**

Landslide - Categories Greater than 30% Slope & 15-30% Slope

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Boise	4	0	3	0	0	0	7	**14**
Eagle	0	0	1	0	0	0	2	**3**
Garden City	0	0	0	0	0	0	2	**2**
Kuna	0	0	0	0	0	0	0	**0**
Meridian	0	0	0	0	0	0	0	**0**
Star	0	0	1	0	0	0	0	**1**
Unincorporated	10	1	12	0	0	1	7	**31**
Total	**14**	**1**	**17**	**0**	**0**	**1**	**18**	**51**

Wildfire - Categories High & Moderate

Jurisdiction	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Boise	13	1	29	1	1	6	15	**66**
Eagle	1	0	4	0	0	2	0	**7**
Garden City	0	0	0	0	0	0	0	**0**
Kuna	0	0	0	0	0	0	0	**0**
Meridian	0	0	0	0	0	0	0	**0**
Star	0	0	0	0	0	0	0	**0**
Unincorporated	75	16	64	3	2	5	16	**181**
Total	**89**	**17**	**97**	**4**	**3**	**13**	**31**	**254**

Appendix E. Wildfire Mitigation Activities Over Previous Performance Period

IDAHO FIREWISE-ADA COUNTY SPECIFIC

2017

Educational Events: (32)
Cooperators:

- Boise Fire Department
- Bureau of Land Management
- College of Western Idaho

Organized Garden Tours: (8)
Home Assessments: (7)
Communities Assisted: (7)

- Quail Ridge
- Columbia Village
- El Paseo
- Warm Springs Mesa
- Briar Hills
- Highland Cove
- Hidden Springs

Fuels Reduction – Existing Project Maintenance:
Firewise Demonstration Gardens
Mechanical removal = 30 cubic yards

2018

Educational Events: (36)

Cooperators:

- Boise Fire Department
- Bureau of Land Management
- US Forest Service
- College of Western Idaho
- D & B Supply
- Zamzows
- Treasure Valley Land Trust
- Idaho Botanical Garden
- Idaho Nursery & Landscape Association
- Centennial Rotary Club
- Capital High School
- NRCS

Organized Garden Tours: (11)

Home Assessments: (6)

Communities Assisted (6)

- Central Foothills
- Warm Springs Mesa
- Avimor
- Columbia Village
- Tandem Ridge
- Briar Hill

Project: March 2018 - ongoing

Firewise Demonstration Garden, Jim Hall Foothills Learning Center

Contact:

Martha Brabec, Foothills Restoration Spec

Boise City Parks & Recreation

mbrabec@cityofboise.org

Office: (208)493-2535

Description/scope:

- Approximately 1,500 sq ft area
- Removal of existing landscape
- Weed control
- Landscape design assistance and installation

Fuels Reduction – Existing Project Maintenance:
Firewise Demonstration Gardens
Mechanical removal = 30 cubic yards

2019

Education Events: (19)

Cooperators:

- Boise Fire Department
- Bureau of Land Management
- US Forest Service
- College of Western Idaho
- D & B Supply
- Zamzows
- Idaho Botanical Garden
- Idaho Nursery & Landscape Association
- Capital High School
- Boise State University
- NRCS
- Idaho Smart Growth

Organized Garden Tours: (10)

Home Assessments: (11)

Communities Assisted: (8)

- Morningside Heights
- Barber Valley
- Avimor
- Columbia Village
- Central Foothills
- Warm Springs Mesa
- Tandem Ridge
- Briar Hills
- Hidden Springs
- Quail Ridge

Fuels Reduction – Existing Project Maintenance:
Firewise Demonstration Gardens

- Mechanical removal = 30 cubic yards

2020

Education Events: (5)

Cooperators:

- Boise Fire Department
- College of Western Idaho
- Franz Witte
- Idaho Botanical Garden
- Idaho Smart Growth
- Boise State University

Organized Garden Tours: (6)

Home Assessments: (3)

Communities Assisted: (2)

- Harris Ranch North
- Quail Ridge

Project: September 2020-ongoing

Children's Firewise Garden, Bernardine Quinn Riverside Park

Contacts:

Wendy Larimore, Associate Landscape Architect

Boise Parks & Recreation

wlarimore@cityofboise.org

Office: (208)409-4142

Kristin Gnojewski

Boise Parks & Recreation

kgnojewski@cityofboise.org

Olivia Harman, Olivia Landscape Design

olivia.harman123@gmail.com

208-577-1387

Description/scope

- Approximately ½ acre
- Landscape design assistance and installation

Fuels Reduction – Existing Project Maintenance:
Firewise Demonstration Gardens
Mechanical removal = 30 cubic yards

2021

Education Events: (6)

Cooperators:

- Boise Fire Department
- College of Western Idaho
- Idaho Botanical Garden
- Idaho Nursery & Landscape Association

Organized Garden Tours: (6)

Home Assessments: (2)

Communities Assisted: (2)

- Harris Ranch North
- Hidden Springs

Project: April 2021

Private residence

Contact:

Brittany Brand

3217 N Wagon Wheel Ct Boise, ID 83702

brittanybrand@boisestate.edu

(513) 532-7362

Description/scope

- Mechanically removed 10 cubic yards of Juniper

Fuels Reduction – Existing Project Maintenance:
Firewise Demonstration Gardens
Mechanical removal = 30 cubic yards

Project:

City of Eagle Chipping Event

Cubic yards: 20

Website Maintenance: 20 hours annually

Grants Provided: $3,000 Annually to Project Learning Tree (Fire Education)

Planned classes for 2022:

EYC training events (2)

IBG Treasure Valley Garden Certificate Program (1)

BOISE BLM PROJECT SUMMARY

- Surprise Valley Fuel Break
- Multiple entries 9/1/2017 – 11/1/19
- Bill Moore Project Coordinator SW Idaho RC&D swidrcd@idahorcd.org (208) 573-4875
- Hazardous vegetation removal, chemical spraying, reseeding fuel break along north rim of Surprise Valley neighborhood.
- SW Idaho RC&D, Bureau of Land Management

- Surprise Valley North Rim Condo Hazardous Fuel Reduction
- Multiple entries 9/1/2020 – 11/1/21
- Bill Moore Project Coordinator SW Idaho RC&D swidrcd@idahorcd.org (208) 573-4875
- Hazardous fuel removal around Surprise Valley North Rim Condos
- SW Idaho RC&D, Bureau of Land Management

- Canyon Point Fuel Break
- Multiple entries 9/1/2017 – 11/1/19
- Jared Jablonski Fire Mitigation Education BLM jjablonski@blm.gov (208) 384-3210
- Seeding and planting forged kochia green strip on BLM land around Canyon Point neighborhood
- Bureau of Land Management

- Idaho Department of Transportation Roadside Vegetation Treatment
- Multiple entries 1/1/2017 – 12/31/21
- Michael Garz District 3 Operations Manager ITD michael.garz@itd.idaho.gov (208) 334-8347
- SW Idaho Interstate 84 mowing, seeding, spraying
- Idaho Department of Transportation, Bureau of Land Management

- Eagle Roadside Vegetation Treatment
- 9/1/19 – 11/30/19
- Bill Moore Project Coordinator SW Idaho RC&D swidrcd@idahorcd.org (208) 573-4875
- Highway 55 roadside mowing and seeding
- SW Idaho RC&D, Bureau of Land Management, Eagle Fire Department

- Highland Nines
- 9/1/21 – 10/31/21
- Bill Moore Project Coordinator SW Idaho RC&D swidrcd@idahorcd.org (208) 573-4875
- Hazardous fuel removal common areas Highland Nines neighborhood
- SW Idaho RC&D, Bureau of Land Management

Current Projects & Initiatives (separate projects):

- Idaho Department of Transportation Roadside Vegetation Treatment
- Multiple entries 1/1/2017 – 12/31/21
- Michael Garz District 3 Operations Manager ITD michael.garz@itd.idaho.gov (208) 334-8347
- Interstate 84 mowing, seeding, spraying
- Idaho Department of Transportation, Bureau of Land Management

Planned Projects & Initiatives:

- Highland Nines
- 9/1/22 -11/1/22

- Bill Moore Project Coordinator SW Idaho RC&D swidrcd@idahorcd.org (208) 573-4875
- Further hazardous fuel removal in common areas Highland Nines neighborhood
- SW Idaho RC&D, Bureau of Land Management

- Idaho Department of Transportation Roadside Vegetation Treatment
- Multiple entries 1/1/2017 – 12/31/21
- Michael Garz District 3 Operations Manager ITD michael.garz@itd.idaho.gov (208) 334-8347
- Interstate 84 mowing, seeding, spraying
- Idaho Department of Transportation, Bureau of Land Management

BOISE STATE HAZARD & CLIMATE RESILIENCY INSTITUTE

Prior Projects & Initiatives (separate projects):

- **Name of Project:**

Using active-learning and goal-setting strategies to promote wildfire hazard awareness and preparedness

- **Approximate Start Date and Completion Date:**

July 2019 - October 2020

- **Project Contacts (name, title, agency, email & phone):**

Brittany Brand, Director for the Boise State Hazard and Climate Resilience Institute, brittanybrand@boisestate.edu, 513-532-7362

Carson MacPherson-Krutsky, Research Scientists for the Boise State Hazard and Climate Resilience Institute, carsonmk@gmail.com

- **Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.)**

Promoting the adoption of household preparedness to natural hazards represents a critical step toward building resilient communities. However, despite the efforts of stakeholders who provide hazard preparedness recommendations to the public, the level of disaster preparedness across the world remains low. We hypothesize that the passive way in which natural hazard and risk information is most often delivered (i.e., lecture style; pamphlets; websites) inhibits participants' ability to connect with the materials, limiting both their attention and knowledge retention.

Our study examines how knowledge, perceptions, and attitudes toward preparedness actions influence preparedness behavior of residents of Boise's Wildland Urban Interface (WUI). As part of our study, we implemented a questionnaire before and after a 90-minute education workshop designed to help participants better understand WUI hazards, personalize their household risk, and develop positive attitudes toward taking mitigation and preparedness actions. The workshop, developed in collaboration with the Boise Fire Department and Idaho Firewise, uses active-learning and goal setting strategies to help participants engage with the material and set reasonable, measureable, and achievable goals.

Analysis of pre- and post-questionnaires show an overwhelmingly positive shift in knowledge, perceptions, attitudes, and preparedness intentions after experiencing the workshop. For example, our attendees reported feeling more able to protect their family and property from the threat of wildfire after our workshop. They also reported an intention to take action to reduce household risk after the workshop.

Our research demonstrates the efficacy of active-learning and goal-setting strategies to engage homeowners who live in the wildland urban interface (WUI) in a way that helps them personalize their wildfire risk and develop positive attitudes toward preparing. This work also demonstrates how giving the audience a voice through active-learning allows stakeholders to both recognize and resolve inaccurate risk perceptions, lack of trust in message sources, and negative attitudes toward preparing for future hazard events.

- **Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.)**

Content Collaborators include Jerry McAdams (Wildfire Mitigation Specialist with the Boise Fire Department), Brett Van Paepeghem (Idaho Firewise), and the Fire Adapted Communities Learning Network

CWPP PROJECTS

Project Name	Dates	Categories	Activities	Partners	Impacts
2021					
Hidden Springs Town Association Annual Fire Fuel Reduction Project 2021	June 17-21, 2021	Fuels Reduction, Education	The importance of fuel reduction and creating defensible space along with details of the event were promoted on the community website, social media and email newsletter. Residents were given access to a checklist and asked to register for complimentary curbside pick-up of debris. Hopkins Evergreens crews picked up the debris and branches chipped were chipped for use at the community farm and bagged leaves and other organic debris were taken to the landfill. Great Outdoors Event.	Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens, NFPA for Firewise Educational Materials.	Hidden Springs Community - population:
Hidden Springs Wild-Fire Mitigation Efforts 2021	June 1 – July 1, 2021	Fuels Reduction	Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres / see blue on map).	Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens, NFPA for Firewise Educational Materials.	total of nine (9) acres
2020					
Hidden Springs Town Association Annual Fire Fuel Reduction Project 2020	May 1 & 2, 2020	Fuels Reduction, Education	The importance of fuel reduction and creating defensible space along with details of the event were promoted on the community website, social media and email newsletter. Residents were given	Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens;	Hidden Springs Community - population:

Project Name	Dates	Categories	Activities	Partners	Impacts
			access to a checklist and asked to register for complimentary curbside pick-up of debris. Hopkins Evergreens crews picked up the debris and branches chipped were chipped for use at the community farm and bagged leaves and other organic debris were taken to the landfill.	NFPA for Firewise Educational Materials.	

EAGLE FIRE LETTER TO BE INSERTED

ADA COUNTY PARKS

Prior Projects & Initiatives (separate projects):

- Firewise Landscaping Homeowner Incentive Program
- Summer 2020
- Martha Brabec, Ecologist, City of Boise Parks and Rec, mbrabec@cityofboise.org, 208-493-2535
- Homeowners who have fire-prone vegetation in their landscaping can receive a free firewise plant upon proof of removal.
- Idaho Firewise and Draggin Wing High Desert Nursery
- City of Boise Fire Mitigation Brochure Distribution
- 2020
- Martha Brabec/Jerry McAdams
- The City of Boise offers three free programs to WUI residents: 1) Citizen Fuel Reduction Policy, 2) Wildfire Safety Home Assessments, and 3) Neighborhood Chipping Program. Flyers were developed and distributed during 2020 to over 2000 homes in the WUI.
- Idaho Department of Lands Western States Fire Manager's Grant, HOAs and Neighborhood Associations

Current Projects & Initiatives (separate projects):

Projects are on-going and therefore qualify as past and current.

- City of Boise Hazardous Fuels Reduction – Slope Mowing
- 2016 - current
- Martha Brabec
- Slope mowing in City owned reserves to reduce hazardous fuels in high-threat areas. Measurable metrics are acres treated.
- Land Trust of the Treasure Valley, Boise Fire
- Neighborhood Chipping Program
- Spring 2020 – current
- Martha Brabec/Jerry McAdams
- WUI residents who receive a free wildfire safety home assessment from Boise Fire are eligible to receive free chipping services through this program. Hazardous debris is piled curbside and picked up on pre-scheduled Fridays. Measurable metrics are cubic yards of debris removed.
- City of Boise Neighborhood Associations, Boise Fire, BPR Community Forestry, Idaho Department of Lands
- Hulls Gulch Restoration/Hazardous Fuels Reduction
- 2018 - current
- Martha Brabec

- Hazardous fuels reduction and invasive species management adjacent to wetlands in Hulls Gulch. Debris is chipped and left on site or removed in dump trucks.
- BLM Wildfire Community Assistance Grant funded portions of Phase 1 and 3 of this project. IDL Western States Fire Manager's grant will likely fund an additional and final phase in Fall 2022.

Planned Projects & Initiatives:

- Stack Rock Hazardous Fuels Reduction
- Spring 2022 – on-going
- Martha Brabec and Boise Fire
- The City of Boise will reduce hazardous fuels at Stack Rock, the City's only forested property, starting in spring 2022. Mechanical or hand treatment methods will be used to encourage aspen regeneration by removing standing, down dead timber, and ladder fuels; thin; and remove underbrush—for the improvement of stand condition and increase resilience of stands to disturbance. Slash will either be utilized for firewood, pile burned or chipped.
- USFS and IDL Western State's Fire Manager's Grant.
- East Boise Riparian Corridor Project
- Spring 2022
- Golden Eagle Audubon Society (GEAS)/City of Boise
- The project goal is to restore 50+ acres of important wildlife habitat along the Boise River by 2023. Invasive tree and dead down debris removal is large component of the habitat restoration, and accumulated slash will be removed by Boise Fire and other project partners.
- Ada County Parks and Waterways, Boise River Enhancement Network, Boise Fire, Boise Parks and Recreation, Idaho Foundation for Parks and Lands, and others.

HIGHLANDS NINES FUEL REDUCTION PROJECT

Started June of 2020

Projected completion date Fall 2023

The major thinning element of the project was completed the last week of September 2021, what remains is focused spraying of invasive weed concentrations (one complete, two to go) and overseeding.

Contacts:

Mike Hill

Highlands Nines HOA VP

mjhill33@gmail.com

208-863-1050

Dave Churchill

Highlands Nines HOA President

dave.churchill4681@gmail.com

208-606-5903

SCOPE:

Create fire breaks and thin and remove brush within the common areas of the Highlands Nines development located at the top of Braemere Rd. in Boise. Additionally focused spraying of concentrations of invasive weeds and overseeding of treated areas.

Phase One was fuel load reduction which was completed in September of 2021.

Work performed by contractor Forest Management

Approximately 8 acres were treated

A total of 13 dump truck loads of chipped vegetation were removed.

Phase Two is spraying of invasive weed concentrations

Work to be performed by Ada County Noxious Weed Control

Estimated to require 3-4 sprayings, First spraying complete in Fall of 2021

Phase Three is overseeding of sprayed areas once the invasive weeds are removed.

Project participants included the Highlands Nines HOA, Highlands Neighborhood Association, BLM, City of Boise Fire Department, Ada County Noxious Weed Control, Forest Management (Contractor), Southwest Idaho RC&D and input from multiple potential contractors.

1) The number of housing units protected by the project is 84.

2) The project covered 8 acres.

HIDDEN SPRINGS TOWN ASSOCIATION (HSTA) FIREWISE INITIATVES 2015-2022

HSTA Prior Projects & Initiatives:

Hidden Springs Town Association Annual Fire Fuel Reduction Project 2021

June 17 -21, 2021

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens, NFPA for Firewise Educational Materials.

The Association hosted a fire fuel's reduction project. The importance of fuel reduction and creating defensible space along with details of the event were promoted on the community website, social media and email newsletter. Residents were given access to a checklist and asked to register for complimentary curbside pick-up of debris. Hopkins Evergreens crews picked up the debris and branch es chipped were chipped for use at the community farm and bagged leaves and other organic debris were taken to the landfill.

Hidden Springs Great Outdoors Event 2021

June 16, 2021

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise.

The Association hosted the Great Outdoors event to educate residents on the importance of caring for community open spaces including Firewise best practices. In addition to educational booths, there was live music, food trucks and educational passport activity to encourage pa rticipation.

Hidden Springs Wild-Fire Mitigation Efforts 2021

June 1 – July 1, 2021

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise; City of Boise Foothills Restoration.

Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres / see blue on map). Hopkins followed guidelines and safe practices for trimming and seeding per the City of Boise Foothills Restoration Specialists, Idaho Firewise and the Boise Fire Department.

The following activities were performed:

- Weed trimming of grass understory, with plastic blades or plastic string, on HSTA property within 20 feet of property line if property is directly adjacent to HSTA property.
- Care taken to leave perennial native grasses, as they typically stay green thru August, are more resistant to fire and natural re-seeding helps combat cheat-grass and medusa head.
- Fall broadcast seeding of native grasses (Approved native grasses will be determined by the Foothills Restoration Specialist with guidance from NRCS).

The following guidelines were followed:

- Grass was not cut shorter than 6 inches in length.
- Cut or trimmed organic materials were bagged and removed from the site to reduce the spread of non-native invasive grasses, and to reduce wildfire risk.

The following best practices were observed:

- A fire extinguisher was on hand with all crews.
- Residents in homes adjacent to the marked areas were asked to have a garden hose easily accessible.
- Crews all had working cellphone in case a fire started.
- Hot equipment was not laid on dry grass where it may ignite flammable grasses.
- Refueling took place on paved surfaces.

Hidden Springs Town Association Annual Fire Fuel Reduction Project 2020

May 1 & 2, 2020

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; NFPA for Firewise Educational Materials.

The Association hosted a fire fuel's reduction project. The importance of fuel reduction and creating defensible space along with details of the event were promoted on the community website, social media and email newsletter. Residents were given access to a checklist and asked to register for complimentary curbside pick-up of debris. Hopkins Evergreens crews picked up the debris and branches chipped were chipped for use at the community farm and bagged leaves and other organic debris were taken to the landfill.

Hidden Springs Wild-Fire Mitigation Efforts 2020

June 1 – July 1, 2017

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise; City of Boise Foothills Restoration.

Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres see map above). Hopkins followed guidelines and safe practices for trimming and seeding per the City of Boise Foothills Restoration Specialists, Idaho Firewise and the Boise Fire Department.

The following activities were performed:

- Weed trimming of grass understory, with plastic blades or plastic string, on HSTA property within 20 feet of property line if property is directly adjacent to HSTA property.
- Care taken to leave perennial native grasses, as they typically stay green thru August, are more resistant to fire and natural re-seeding helps combat cheat-grass and medusa head.
- Fall broadcast seeding of native grasses (Approved native grasses will be determined by the Foothills Restoration Specialist with guidance from NRCS).

The following guidelines were followed:

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The following best practices were observed:

- A fire extinguisher was on hand with all crews.
- Residents in homes adjacent to the marked areas were asked to have a garden hose easily accessible.
- Crews all had working cellphone in case a fire started.
- Hot equipment was not laid on dry grass where it may ignite flammable grasses.
- Refueling took place on paved surfaces.

Hidden Springs Town Association Annual Fire Fuel Reduction Project 2019

May 3 & 4, 2019

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; NFPA for Firewise Educational Materials.

The Association hosted a fire fuel's reduction project. The importance of fuel reduction and creating defensible space along with details of the event were promoted on the community website, social media and email newsletter. Residents were given access to a checklist and asked to register for complimentary curbside pick-up of debris. Hopkins Evergreens crews picked up the debris and branches chipped were chipped for use at the community farm and bagged leaves and other organic debris were taken to the landfill.

Hidden Springs Wild-Fire Mitigation Efforts 2019

June 1 – July 1, 2019

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise; City of Boise Foothills Restoration.

Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres see map above). Hopkins followed guidelines and safe practices for trimming and seeding per the City of Boise Foothills Restoration Specialists, Idaho Firewise and the Boise Fire Department.

The following activities were performed:

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- Fall broadcast seeding of native grasses (Approved native grasses will be determined by the Foothills Restoration Specialist with guidance from NRCS).

The following guidelines were followed:

- Grass was not cut shorter than 6 inches in length.
- Cut or trimmed organic materials were bagged and removed from the site to reduce the spread of non-native invasive grasses, and to reduce wildfire risk.

The following best practices were observed:

- A fire extinguisher was on hand with all crews.
- Residents in homes adjacent to the marked areas were asked to have a garden hose easily accessible.
- Crews all had working cellphone in case a fire started.
- Hot equipment was not laid on dry grass where it may ignite flammable grasses.
- Refueling took place on paved surfaces.

Hidden Springs Town Association Annual Fire Fuel Reduction Project 2018

May 4 & 5, 2018

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; NFPA for Firewise Educational Materials. The Association hosted a fire fuel's reduction project. The importance of fuel reduction and creating defensible space along with details of the event were promoted on the co mmunity website, social media and email newsletter. Residents were given access to a checklist and asked to register for complimentary curbside pick-up of debris. Hopkins Evergreens crews picked up the debris and branches chipped were chipped for use at the community farm and bagged leaves and other organic debris were taken to the landfill.

Hidden Springs Wild-Fire Mitigation Efforts 2018

June 1 – July 1, 2018

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise; City of Boise Foothills Restoration. Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres see map above). Hopkins followed guidelines and safe practices for trimming and seeding per the City of Boise Foothills Restoration Specialists, Idaho Firewise and the Boise Fire Department.

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- Fall broadcast seeding of native grasses (Approved native grasses will be determined by the Foothills Restoration Specialist with guidance from NRCS).

The following guidelines were followed:

- Grass was not cut shorter than 6 inches in length.
- Cut or trimmed organic materials were bagged and removed from the site to reduce the spread of non-native invasive grasses, and to reduce wildfire risk.

The following best practices were observed:

- A fire extinguisher was on hand with all crews.
- Residents in homes adjacent to the marked areas were asked to have a garden hose easily accessible.
- Crews all had working cellphone in case a fire started.
- Hot equipment was not laid on dry grass where it may ignite flammable grasses.
- Refueling took place on paved surfaces.

Hidden Springs Town Association Wildfire Preparedness Day 2017 – Plan – Prepare - Protect

May 20, 2017

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; NFPA; Boise Fire; Idaho F irewise. The focus of the event was on community safety as well as a home and garden component with an emphasis on Firewise and sustainable products and companies. Educational workshops (Creating Defensible Space, Firewise Landscaping, Community Wood Chipping Project) and presentations were hosted in the Community Clubhouse from 11:00 – 3:00pm with a Home and Garden show later on the Village Green. The event featured live music, a climbing wall, Pinewood Derby competition, food and drink available for purchase at the Dry Creek Mercantile.

Hidden Springs Wild-Fire Mitigation Efforts 2017

June 1 – July 1, 2017

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise; City of Boise Foothills Restoration.

Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres - see blue on map). Hopkins followed guidelines and safe practices for trimming and seeding per the City of Boise Foothills Restoration Specialists, Idaho Firewise and the Boise Fire Department.

The following activities were performed:

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- Care taken to leave perennial native grasses, as they typically stay green thru August, are more resistant to fire and natural re-seeding helps combat cheat-grass and medusa head.
- • Fall broadcast seeding of native grasses (Approved native grasses will be determined by the Foothills Restoration Specialist with guidance from NRCS).
- The following guidelines were followed:
- Grass was not cut shorter than 6 inches in length.
- Cut or trimmed organic materials were bagged and removed from the site to reduce the spread of non-native invasive grasses, and to reduce wildfire risk.

The following best practices were observed:

- A fire extinguisher was on hand with all crews.
- Residents in homes adjacent to the marked areas were asked to have a garden hose easily accessible.
- Crews all had working cellphone in case a fire started.
- Hot equipment was not laid on dry grass where it may ignite flammable grasses.
- Refueling took place on paved surfaces.

Hidden Springs Great Outdoors Event 2016

May 21, 2016

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise.

Hidden Springs Wild-Fire Mitigation Efforts 2016

June 1 – July 1, 2016

Lisa Ahrens, Town Manager; Chuck Vertrees, Open Space Committee Chair, Hidden Springs Open Space Committee; Brett Hopkins, Hopkins Evergreens; Boise Fire; Idaho Firewise; City of Boise Foothills Restoration. Hopkins Evergreen crews trimmed Association open space property adjacent to resident lots to help with the wildfire mitigation efforts (total of nine (9) acres - see blue on map). Hopkins followed guidelines and safe practices for trimming and seeding per the City of Boise Foothills Restoration Specialists, Idaho Firewise and the Boise Fire Department.

The following activities were performed:

- Weed trimming of grass understory, with plastic blades or plastic string, on HSTA property within 20 feet of property line if property is directly adjacent to HSTA property.
- Care taken to leave perennial native grasses, as they typically stay green thru August, are more resistant to fire and natural re-seeding helps combat cheat-grass and medusa head.

- Fall broadcast seeding of native grasses (Approved native grasses will be determined by the Foothills Restoration Specialist with guidance from NRCS).

The following guidelines were followed:

- Grass was not cut shorter than 6 inches in length.
- Cut or trimmed organic materials were bagged and removed from the site to reduce the spread of non-native invasive grasses, and to reduce wildfire risk.

IDAHO POWER

Prior Projects & Initiatives (separate projects):

- Name of Project: Pole vegetation removal and sterilant treatment.
- Approximate Start Date and Completion Date 2019-2021
- Project Contacts (name, title, agency, email & phone) Brent Van Patten, Engineering Leader, bvanpatten@idahopower.com, 208-388-2514
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.) cleared vegetation and applied ground sterilant around the bases of poles/structures near our Boise Bench Substation and poles along HWY 21 between Warm Springs Ave and Wilderness Ranch
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.) n/a

Current Projects & Initiatives (separate projects):

- Name of Project: Vegetation Management-Wildfire Mitigation
- Approximate Start Date and Projected Completion Date: Ongoing
- Project Contacts (name, title, agency, email & phone): Brent Van Patten, Engineering Leader, bvanpatten@idahopower.com, 208-388-2514
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.): Perform annual line patrols in elevated wildfire risk zones to verify adequate clearance between trees and overhead powerlines and mitigate any hazard trees and clearance issues we find
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.) n/a

Current Projects & Initiatives (separate projects):

- Name of Project: Vegetation Management
- Approximate Start Date and Projected Completion Date: Ongoing
- Project Contacts (name, title, agency, email & phone): Brent Van Patten, Engineering Leader, bvanpatten@idahopower.com, 208-388-2514
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.): Prunes trees away from overhead transmission and distribution power lines on regular intervals (multi-year cycles)
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.) n/a

Prior Projects & Initiatives (separate projects):

- Name of Project: Idaho Power Company Oregon Trail Fire Area Vegetation Management

- Approximate Start Date and Completion Date: 2017-2022 once annually prior to 4th of July, generally June 20th-30th (a second mow may occur depending on plant growth and weather conditions)
- Project Contacts (name, title, agency, email & phone): Sarah Funk, Vegetation Ecologist, Idaho Power Company, sfunk@idahopower.com, 208-870-8890 (mobile)
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.): Annually mow approximately 61.4 acres of green strip area (planted with forage kochia) to maintain short stature vegetation, annually sterilization of approximately 3 miles of roadway/firebreak around Idaho Power property near E. Amity and S. Holcomb Roads, in 2021 vegetation sterilization treatments of up to 10 feet around each distribution and transmission structures on Idaho Power property, annual spot treatments of noxious weed on entire site and within firebreak (total 215 acres).
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.): Boise City Fire, BLM, neighborhood associations

Prior Projects & Initiatives (separate projects):

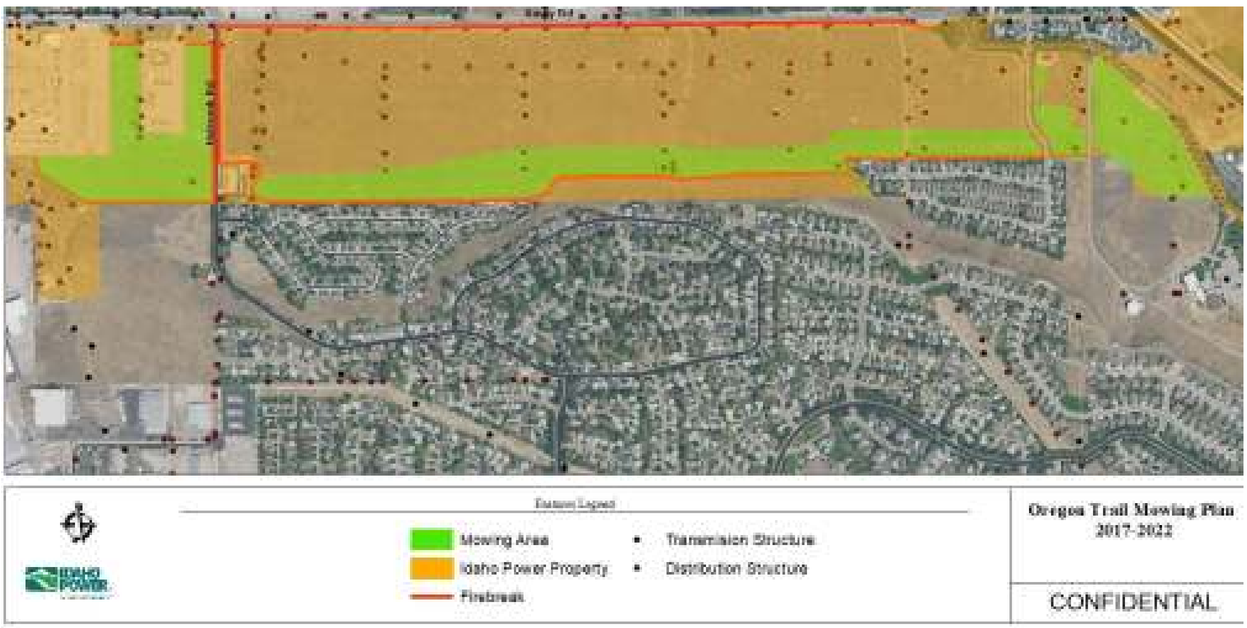
- Name of Project: Idaho Power Company Oregon Trail Fire Area Vegetation Management-forage kochia planting in green strip
- Approximate Start Date and Completion Date: December 2017
- Project Contacts (name, title, agency, email & phone): Sarah Funk, Vegetation Ecologist, Idaho Power Company, sfunk@idahopower.com, 208-870-8890 (mobile)
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.): Planted forage kochia on top of light snow in winter 2017 on approximately 26 acres within the green strip on Idaho Power property at S. Holcomb and E. Amity Road
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.): n/a

Current Projects & Initiatives (separate projects): Mowing and vegetation sterilization treatments (listed above with same parameters)

- Name of Project: Idaho Power Company Oregon Trail Fire Area Vegetation Management
- Approximate Start Date and Projected Completion Date: 2022 mow once annually prior to 4th of July, generally June 20th-30th (a second mow may occur depending on plant growth and weather conditions)
- Project Contacts (name, title, agency, email & phone): Sarah Funk, Vegetation Ecologist, Idaho Power Company, sfunk@idahopower.com, 208-870-8890 (mobile)
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.): Annually mow approximately 61.4 acres of green strip area (planted with forage kochia) to maintain short stature vegetation, annually sterilization of approximately 3 miles of roadway/firebreak around Idaho Power property near E. Amity and S. Holcomb Roads, annual spot treatments of noxious weed on entire site and within firebreak (total 215 acres).
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.): Boise City Fire, BLM, neighborhood associations

Planned Projects & Initiatives: Mowing and vegetation treatments

- Name of Project: Idaho Power Company Oregon Trail Fire Area Vegetation Management
- Projected Start Date and Projected Completion Date: 2023-2028-mow once annually prior to 4th of July, generally June 20th-30th (a second mow may occur depending on plant growth and weather conditions)
- Project Contacts (name, title, agency, email & phone): Sarah Funk, Vegetation Ecologist, Idaho Power Company, sfunk@idahopower.com, 208-870-8890 (mobile)
- Description/Scope of individual project with mitigation methods and quantitative measures (e.g. acres, cubic yards, structures, people, etc.): Annually mow approximately 61.4 acres of green strip area (planted with forage kochia) to maintain short stature vegetation, annually sterilization of approximately 3 miles of roadway/firebreak around Idaho Power property near E. Amity and S. Holcomb Roads, annual spot treatments of noxious weed on entire site and within firebreak (total 215 acres).
- Cooperators, to show multiple levels of involvement (e.g. Federal agencies, State agencies, other local agencies, not-for-profits and other NGO's, etc.): Boise City Fire, BLM, neighborhood associations



IDAHO DEPARTMENT OF FISH AND GAME

Prior Projects & Initiatives

Name of Project: Hammer Flat Herbicide Treatment

Approximate Start Date and Completion Date: Winter 2018

Project Contact:

Ann Moser, Wildlife Habitat Biologist

Boise River Wildlife Management Area

Idaho Department of Fish and Game

ann.moser@idfg.idaho.gov

208-334-2115

Project Description:

Idaho Department of Fish and Game (IDFG) owns and manages Hammer Flat, a key property at the wildland/urban interface above the intersection of Highway 21 and Warm Springs Ave. In winter 2018, IDFG worked with Ada County to treat 66 acres of Hammer Flat with the herbicide Imazapic. Imazapic was used at 6 oz/acre to target invasive annual grasses, particularly highly flammable cheatgrass.

Cooperators: Ada County Weed, Pest and Mosquito Abatement

Ongoing Annual Projects

Name of Project: Boise River Wildlife Management Area Road Maintenance

Approximate Start Date and Completion Date: Annually

Project Contact:

Ann Moser, Wildlife Habitat Biologist

Boise River Wildlife Management Area

Idaho Department of Fish and Game

ann.moser@idfg.idaho.gov

208-334-2115

Project Description:

Boise River Wildlife Management Area (BRWMA) staff maintain 11 miles of motorized trails on IDFG property in the Boise foothills. Road maintenance includes grading, mowing, and herbicide spraying in the roadway, as well as herbicide spraying within 10 feet on either side of the roadway. We also maintain an additional 3.5 miles of access roads for administrative use, but they are not open to public vehicles. Road maintenance ensures safe travel on our dirt roads, as well as limits the potential for a fire start from the road.

Cooperators: None. Annual road maintenance is done with IDFG staff and funding.

Name of Project: Boise River Wildlife Management Area Field Mowing

Approximate Start Date and Completion Date: Annually as needed

Project Contact:

Ann Moser, Wildlife Habitat Biologist

Boise River Wildlife Management Area

Idaho Department of Fish and Game

ann.moser@idfg.idaho.gov

208-334-2115

Project Description: There are approximately 35 acres of grass fields adjacent to the BRWMA office and shop on State Highway 21; about 27.5 acres are accessible with a mower. The fields are primarily composed of intermediate wheatgrass and smooth brome, but cheatgrass is also present. These fields are mowed annually, as needed, to minimize the fire risk to our facilities and adjacent wildlife habitat. One of these fields borders Highway 21 for about 1 mile, thus mowing the field minimizes risk of a fire start from the highway.

Cooperators: None. Field mowing is completed with IDFG staff and funding.

Name of Project: Boise River Wildlife Management Area Boundary

Approximate Start Date and Completion Date: Annually as needed

Project Contact:

Ann Moser, Wildlife Habitat Biologist

Boise River Wildlife Management Area

Idaho Department of Fish and Game

ann.moser@idfg.idaho.gov

208-334-2115

Project Description: BRWMA staff annually mow and/or apply herbicide to 3.9 miles of our boundary where we interface with urban lands. We mow or spray 1.6 miles of fence that separates IDFG property and housing developments on the Boise Front above Warm Springs Ave. We also mow 2.3 miles of IDFG property above the Black Cliffs on Highway 21. The goal is to minimize fire risk to our property as well as adjacent private property.

Cooperators: Fence mowing and herbicide spraying is completed with IDFG staff and funding. We have occasionally contracted with Ada County to conduct the herbicide spraying.

SOUTHWEST IDAHO RC&D WILDFIRE FUELS REDUCTION PROJECTS

Surprise Valley Wildfire Fuels Reduction Project

Start Date: January 2017 End Date: December 2021

Project Sponsor: Surprise Valley HOA

Contact Person: Steve King

Mailing Address: 5240 S Surprise Way, Boise, Idaho 83716

Phone: (208) 284 7673 E-mail: spking83@gmail.com

The project reduced the wildfire risk to 416 homes and 70 condos located in Southeast Boise. In total approximately 6600 by 40 feet of fire break was established. This area had fuels removed and reseeded to reduced wildfire vegetation.

The SWID RC&D received a grant of approximately $90,000 from the BLM Community assistance program to fund this project. Joshua Renz was the RC&D contact with BLM.

Avimor Firebreak Project

Person Submitting Proposal: Rusty Coffelt

Start Date: 07/30/2018 End Date: December 2018.

Organization Name: Eagle Fire Protection District

Mailing Address: 1119 E. State St. Suite #240

Contact Person Name:Scott Buck

Contact Person Phone: 208 914 8294

Contact Person Email:sbuck@eaglefire.org

Agreement or Announcement Title: Avimor Village Fuel Mitigation Project

Estimated Period of Performance: 2 years (Fall 2018/Fall 2019)

Proposed Project Location: Avimor Village Community

Avimor Village, a Fire Wise community, is a village of 350+ homes, surrounded by foothills heavily covered in grass, sage and other wild vegetation. It is our mission to improve life safety, reduce damage to infrastructure and control the spread of wildfire in the Wildland Urban Interface through fuels reduction by creating defensible wildfire fuels mitigation space 30 feet wide and five miles in length. The SWID RC&D received a grant of approximately $43,000 from the BLM Community Assistance Program to fund this project.

Key Personnel:

Dan Richter- Managing Partner of the Avimor Development

Brad Pfannmuller- General Manager Avimor Village

Charlie Baun- Conservation Consultant

Rusty Coffelt- Fire Chief Eagle Fire Department

Jamie Vincent- Deputy Chief of Operations Eagle Fire Department

Scott Buck- Deputy Fire Marshal Eagle Fire Department

Joshua Renz - was the RC&D contact with BLM

Highland Nines Fuels Reduction Project

Person Submitting Proposal: Mike Hill

Start Date: 2/15/2021 End Date: November 2021

Organization Name: Highlands Nines HOA

Mailing Address: 1322 E. Braemere Rd. Boise, ID 83702

Contact Person Name:Mike Hill

Contact Person Phone: 208-863-1050

Contact Person Email:mjhill33@gmail.com

The Highlands Nines development is surrounding on three sides by open Foothill's land making it particularly susceptible to Wildland fire risk. Fuels reduction within the Nines development decreases the chances of a fire spreading to other surrounding neighborhoods in the Boise foothills.

The expected benefit is to significantly reduce the ability of a wild land fire to spread from a common area into housing and also to make it less likely flying embers landing in the common area would ignite a fire which could spread into housing.

In addition, the Nines HOA is working with the City of Boise Fire Department to complete the work required to become a Firewise USA site, this work involves the individual homeowner's lots but is also expected to reduce the risk of wildland fire in the overall Nines development.

Financial/Technical Project needs:

Highlands Nines HOA has consulted with other HOA's (Surprise Valley, Hidden Springs), wild land fire experts from the BLM (Jerad Johnson), Pat Durland (Stone Creek Fire LLC), Jerry McAdams (City of Boise Fire Department), Martha Brabec (Foothills Restoration Specialist - City of Boise) and experienced contractors to develop a plan to reduce the fuel load in the common areas and create a defensible barrier on the property lines. Jared Jablonski was the RC&D's contact at BLM for technical assistance.

Highlands Nines HOA will rely on the experience of the contractor selected to a significant degree regarding the specifics of the vegetation removal.

Estimated cost for completion of the first phase of the Highland Nines HOA Fuel Reduction project ended up being about $24,000 which the SWID RC&D received a grant from the BLM Community Assistance Program to fund.

1) Removal of vegetation on the perimeter of the common areas that abut the homeowner's property lines to create a fuel break. At this time, I do not have an acreage or number of homes effected but there were thirteen dump trucks of chipped vegetation were removed.
2) Spraying of noxious/invasive weeds and reseeding within the common areas are to be done when funding becomes available.

US ARMY CORPS OF ENGINEERS

USACE will be creating some fuel breaks along the back of many boat-in campsites at Placer Point and Charcoal Flat this spring, assisted by IDFG. This was one element of our Lakeview Hike/Bike trail plan that moved forward, while the project in general was tabled. The fuel break is in effort to preserve high value areas of the Boise River Wildlife Management Area from fire starts originating at our boat in sites, and to also give time for recreators to flee fires descending upon them from the WMA.

- We'll begin in June 2022 when high water allows access to these areas. There's no other access.
- The break will be about 10 feet wide.
- The segments are 2400 feet and 4200 feet in length.
- Once cleared of vegetation, we'll maintain this break with herbicide. It will receive light use from visitors using it to visit the vault restrooms. We had originally planned that a recreational trail connecting this area to the dam would have provided sufficient use to eliminate the need for herbicides (same as Ridge to Rivers trail use).

We continue to provide baseline fire prevention measures generally entailing the use of herbicides to maintain bare ground road shoulders along Lucky Peak owned parking lots and roadways, maintain a bare ground 10' radius around recreation site fire amenities (ground grill, cooking grills), and maintain as bare ground many of our service roads. The attached files may help visualize the fuel breaks and service roads.

Does this help you out? Let me know if there is anything else we can provide.

Keith Hyde

Natural Resources Manager

CISM Peer Supporter

Lucky Peak Lake, Boise ID

Walla Walla District

U.S. Army Corps of Engineers

O 208.343.0671

C 208.954.7120

VOIP 208.555.4302

keith.b.hyde@usace.army.mil

Glenns Ferry Wildfire Fuels Reduction Projects

Person Submitting Proposal: Christy Acord for the City of Glenns Ferry

Start Date: June 2021 End Date December 2021

Start and end dates only reflect purchase of the equipment.

Organization Name: City of Glenns Ferry

Mailing Address: P.O. Box 910 Glenns Ferry, Idaho 83633

Contact Person Name: Mayor Monty White

Contact Person Phone: 208-366-7418

Contact Person Email: Mayorgf@rtci.net

Estimated Period of Performance: June 2021

Brush Hog $6,600:

The SWID RC&D received a community assistance grant from the BLM for this equipment.

Mini Excavator $55,000:

This was funded by the SWID RC&D through community assistance grant from the BLM for $10,000, the City of Glenns Ferry for approximately $15,000 and a $30,000 grant to the City of Glenns Ferry through a USDA RD equipment grant for the remainder.

Proposed Project Location:

The Glenns Ferry Municipal Airport, (The Curly Shambers Airport), has repaved and repaired the runway, and has seen a dramatic increase in usage of the area. It has been identified by the Glenns Ferry Fire Department that the area surrounding the runway, parking area, and hangars is a fire risk. In order to reduce this fire risk, our mission is to remove the vegetation along the runways and parking area, and to keep this vegetation and any new vegetation cut in the future.

The Glenns Ferry Highway District has also shown interest and will be using the brush hog to trim back vegetation along the roadways surrounding Glenns Ferry. A verbal agreement with the City of Glenns Ferry Public Works Manager, and Glenns Ferry Highway District is in place. The King Hill Rural Fire Department will also be using this equipment to reduce the fuel along the roadways that are the most prone to summer fires, and stated this equipment will be especially useful around the Flint Mesa area, and other areas that are utilized for outdoor recreation during the summer months.

Personnel involved:

Johnny Hernandez/Scott Nichols-Glenns Ferry Public Works Manager. Responsible for arranging Glenns Ferry Municipal Airport fuels reduction.
Derek Janousek-Glenns Ferry Fire Chief, King Hill Rural Fire Department coordinator. Jim Gluch-Glenns Ferry Highway District is responsible for coordination to reduce fuels along roadways in the Elmore County area.

Jared Jablonski was the RC&D’s contact at BLM for technical assistance.

MEADOW CREEK HOA FUELS REDUCTION PROJECT

Start Date: 7/28/20 End Date: December 2021

Project Advocate:

Centerville Fire VFD Mailing Address: 115 Grimes Pass Rd., Centerville, ID 83631-4138

Phone: (208) 392-4191 Fax:

E-mail: baumhoff.bruce@gmail.com

Project Contact Person: Trinia Richardson

Mailing Address: PO Box 189

Idaho City, ID 83631

Phone: (208) 807-0073 Fax:

E-mail: trichardson@co.boise.id.us

The meadow Creek subdivision is located in Centerville Idaho. It has approximately 30 residential structures. The roads through Meadow Creek subdivision are overgrown with grass, sage, and ponderosa pines and are very prone to fire due to the dry weather conditions in this area. Centerville Volunteer Fire Department would like to work with Boise County to reduce the overgrown fuels and provide for a safer ingress/egress for the residents in the area, as well as emergency response personnel.

Description of Project to be Accomplished and Expected Benefits:

The fuels reduction project objective is to reduce the fuel load along the roads that are owned by the Meadow Creek HOA.

This project will significantly reduce the ability of wild land fire to spread throughout the subdivision, as well as adjoining subdivisions. This work will also provide for a safe ingress/egress routes for residents as well as emergency response personnel.

Financial/Technical Project needs:

Boise County Fire Mitigation Forester (Trinia Richardson), Centerville Fire Chief (Bruce Baumhoff), BLM wild land fire expert (Jared Jablonski), and Meadow Creek HOA President (Chris Cash) worked together to develop a plan to reduce the fuel load. We relied on an experienced contractor to complete the fuels reduction.

The cost was $17,386.00 which was funded through a grant the RC&D received from the BLM Community Assistance Program. Jared Jablonski was the RC&D’s contact at BLM for technical assistance.

2022 Ada County Multi-Hazard Mitigation Plan

Appendix F. Ada County Firefighting Resources and Capabilities

Boise National Forest
2021 Designators

Designators have been established for key positions within Fire Management on the Boise National Forest consistent with the Intermountain Region's policy for designators and fire emergency vehicle marking standards. The intent of the designator and emergency vehicle standard is to enhance emergency and daily operations through standard nomenclature, represent the Boise NF as a cohesive professional federal fire organization while retaining unit identity, and avoid miss-communications that can be associated with using a person's last name.

The use of designators is primarily for radio communication and emergency vehicle striping and is intended to clearly identify a person's working title within the Boise National Forest organization, associated NWCG qualification standards or Line Officer status.

Supervisors Office

Position	**Designator**	**Name**	**Location**
Forest Supervisor	Supervisor 1	Tawnya Brummett	Supervisors Office
Deputy Forest Supervisor	Supervisor 2	David Francomb	Supervisors Office
Forest FMO	Chief 1	Rich Zimmerlee	Supervisors Office
Forest AFMO	Chief 2	Steve Baran	Supervisors Office
Forest Fire Planner	Chief 3	Vacant	Supervisors Office
Forest Fuels Planner	Fuels 1	Ryan Jones	Supervisors Office
Forest Aviation Officer	Marolf	Doug Marolf	Supervisors Office
Forest Fire Training Officer	Figgins	Julia Figgins	Supervisors Office
Interagency Center Manager	Leguineche	Jill Leguineche	Supervisors Office/BDC

D-1 Mountain Home Ranger District

Position	**Designator**	**Name**	**Location**
District Ranger	Ranger 1	Stephaney Kerley	Mtn. Home Office
FMO	Division 1	Mike Brady	Mtn. Home Office
AFMO-Suppression	Battalion 1	Ryan Erne	Mtn. Home Office
AFMO-Fuels	Battalion 14	Wes Duncan	Mtn. Home Office
Fuels Tech	Fuels 141	Mike Elles	Mtn. Home Office
Crew 11	Crew 11		
Mtn. Home Crew Supervisor	Captain 11	Preston Glaisyer	Lucky Peak Station
Mtn. Home Asst. Crew Sup.	11 Alpha	Ian Turner	Lucky Peak Station
Mtn. Home Squad Leader	11 Bravo	Clint Buchan-Barrnett	Lucky Peak Station
Engine 411	Engine 411		
Mtn. Home Engine SFEO	Captain 411	Beau Burley	Mtn. Home Office
Mtn. Home Engine FEO	Engineer 411	Andrew Geringer	Mtn. Home Office
Mtn. Home Engine AFEO	Engine Operator 411	Nick Becharas	Mtn. Home Office
Engine 412	Engine 412		
Lucky Peak Engine SFEO	Captain 412	Colby Bertalotto	Lucky Peak Station
Lucky Peak Engine FEO	Engineer 412	Paul Mitchell	Lucky Peak Station
Lucky Peak Engine AFEO	Engine Operator 412	Craig Fluer	Lucky Peak Station
Engine 413	Engine 413		
Lester Creek Engine SFEO	Captain 413	Joel Welch	Lester Creek Station
Lester Creek Engine FEO	Engineer 413	Johnathan Blodgett	Lester Creek Station

Lester Creek Engine AFEO	Engine Operator 413	Aaron Badillo	Lester Creek Station
Prevention			
Prevention	Prevention 11	Chad Cline	Mtn. Home Office
Prevention	Patrol 12	Vacant	Lester Creek Station
Prevention	Patrol 21	Taryn Robinson	Lucky Peak Station
Prevention	Patrol 22	Alex Abols	Lucky Peak Station
Lucky Peak Helitack	Helicopter Superintendent 421	Jeremy Schwandt	Lucky Peak Station
Lucky Peak Helitack	Captain 421A	Jose Munguia	Lucky Peak Station
Lucky Peak Helitack	Captain 421B		Lucky Peak Station
Lucky Peak Helitack	Squad 421C	Morgan Meserth	Lucky Peak Station
Lucky Peak Helitack	Squad 421D	Colin Vickers	Lucky Peak Station
Lucky Peak Helitack Vehicle	Heli-tender 421		Lucky Peak Station
Lucky Peak Fuel Truck	LP Fuel Truck 421		Lucky Peak Station

D-3 Idaho City Ranger District

District Ranger	Ranger 3	Brant Petersen	Idaho City Office
FMO	Division 3	Chris Boldman	Idaho City Office
AFMO-Suppression	Battalion 3	Randy Lamb	Idaho City Office
AFMO-Fuels	Battalion 34	Allyn Spanfellner	Idaho City Office
Fuels Tech	Fuels 341	Ed Hunt	Idaho City Office
Engine 431	Engine 431		
Idaho City Engine SFEO	Captain 431	Ryan Green	Idaho City Station
Idaho City Engine FEO	Engineer 431	CJ Carter	Idaho City Station
Idaho City Engine AFEO	Engine Operator 431	Daniel Kurth	Idaho City Station
Engine 432	Engine 432		
Idaho City Engine SFEO	Captain 432	Anthony Rojo	Idaho City Station
Idaho City Engine FEO	Engineer 431	Nick Adamson	Idaho City Station
Idaho City Engine AFEO	Engine Operator 432	Cooper Wartonick	Idaho City Station
Crew 3	Crew 3		
Crew 3 Supervisor	Captain 3	Gordon Wells	Idaho City Station
Crew 3 Asst. Supervisor	3A	Andrew Nielsen	Idaho City Station
Crew 3 Squad Ldr	3B	Blake Bishop	Idaho City Station
Crew 3 Squad Ldr	3C	Denver Price	Idaho City Station
Prevention			
Prevention	Patrol 31	Chris Hightower	Idaho City Station
Prevention	Patrol 32	Kallie Leggett	Idaho City Station
Idaho City Hotshots	Crew 2		
Hotshot Superintendent	Superintendent 2	Brian Cardoza	Idaho City Station
ICIHC Captain	Captain 2A	Vacant	Idaho City Station
ICIHC Captain	Captain 2B	Steve Traverso	Idaho City Station
ICIHC Squad Ldr	Squad 2C	Todd Wanner	Idaho City Station
ICIHC Squad Ldr	Squad 2D	Holt Jaeger	Idaho City Station

D-4 Cascade Ranger District

District Ranger	Ranger 4	Jake Strohmyer	Cascade Office
FMO	Division 4	Josh Warden	Cascade Office

AFMO-Suppression	Battalion 4	Patrick Morgan	Cascade Office
AFMO-Fuels	Battalion 44	Jim Bishop	Cascade Office
Fuels Tech	Fuels 441	Tim Dulhanty	Cascade Office
Crew 41	Crew 41		
Crew 41 Supervisor	Captain 41	Rory Anderton	Cascade Office
Crew 41 Assistant Supervisor	41A	Shane Kelley	Cascade Office
Crew 41 Squad Ldr	41B	Stanton Schaeffer	Cascade Office
Engine 441	Engine 441		
Cascade Engine SFEO	Captain 441	James Brown	Cascade Office
Cascade Engine FEO	Engineer 441	Matt Haupt	Cascade Office
Cascade Engine AFEO	Engine Operator 441	Jeff Henderson	Cascade Office
Prevention			
Prevention	Patrol 41	Kim Drake	Cascade Office
Prevention	Patrol 42	Darcey Doyle	Cascade Office

D-5 Lowman Ranger District

District Ranger	Ranger 5	Vacant	Lowman Office
FMO	Division 5	Colin Good	Lowman Office
AFMO –Suppression	Battalion 5	Richard "Aaron" Schneider	Lowman Office
AFMO-Fuels	Battalion 54	Ryan Shannahan	Lowman Office
Fuels Tech	Fuels 541	Guy Blom	Lowman Office
Engine 451	Engine 451		
Lowman Engine SFEO	Captain 451	Colter Stewart	Lowman Station
Lowman Engine FEO	Engineer 451	Andy Wagner	Lowman Station
Lowman Engine AFEO	Engine Operator 451	Vacant	Lowman Station
Crew 5	Crew 5		
Crew 5 Supervisor	Captain 5	Chris Knight	Lowman Station
C 5 Assistant Supervisor	5A	Nick Terrell	Lowman Station
C 5 Squad Ldr	5B	John Wagner	Lowman Station
C 5 Squad Ldr	5C	Jason Overfelt	Lowman Station
Prevention			
Prevention	Patrol 51	Vacant	Lowman Station
Prevention	Patrol 52	Mary Wagner	Lowman Station

D-6 Emmett Ranger District

District Ranger	Ranger 6	Katie Wood	Emmett Office
FMO	Division 6	Quincy Chung	Emmett Office
AFMO-Suppression	Battalion 6	Tim Garity	Garden Valley Office
AFMO-Fuels	Battalion 64	Justin Yankey	Emmett Office
Fuels Tech	Fuels 641	Zachary Van Abbema	Emmett Office
Engine 461	Engine 461		
Garden Valley Engine SFEO	Captain 461	Vacant	Garden Valley Station
Garden Valley Engine FEO	Engineer 461	Andrew Patota	Garden Valley Station
Garden Valley Engine AFEO	Engine Operator 461	Sam Lewis	Garden Valley Station
Prevention			
Prevention	Patrol 61	Willie Rockhill	Garden Valley Station
Prevention	Patrol 62	Vacant	Emmett Office
Prevention	Patrol 63	Sarah Jorgenson	Emmett Office

Garden Valley Helitack	Helicopter Superintendent 422	Dan Crowell	Garden Valley Station
Garden Valley Helitack	Captain 422A	DW Cook	Garden Valley Station
Garden Valley Helitack	Squad Ldr 422B	Karl Briggs	Garden Valley Station
Garden Valley Helitack	Squad Ldr 422C	Jacob Lancaster	Garden Valley Station
GV Helitack Vehicle	Heli-tender 422		Garden Valley Station
GV Fuel Truck	GV Fuel Truck 422		Garden Valley Station
Boise Hotshots	Crew 7		Garden Valley Station
BIHC Superintendent	Superintendent 7	Deon Berner	Garden Valley Station
BIHC Captain	Captain 7A	Dave Rogan	Garden Valley Station
BIHC Captain	Captain 7B	Allison Lund	Garden Valley Station
BHIC Squad Ldr	Squad 7C	Chris Lowers	Garden Valley Station
BHIC Squad Ldr	Squad 7D	Michael Wynkoop	Garden Valley Station

Chief – Equivalent to Fire Staff Officer, Forest FMO or Forest AFMO.

Division Chief – Equivalent to FMO. The designator will be used to identify the FMO or, provided that the incumbent meets the minimum DIVS and ICT3 qualification. Currency is required (see PMS 310-1 pg 11 definition of 'currency'). In the event that the incumbent does not meet the qualification criteria or loses currency, they will revert to a designator that recognizes their GS-11 status, but will not be designated as a Division Chief.

Battalion Chief – Equivalent to district AFMO, fire or fuels. The incumbent must meet the minimum DIVS and/or ICT3 qualification. Currency is required (see PMS 310-1 pg 11 definition of 'currency'). In the event that the incumbent does not meet these criteria, or loses currency, they will revert to a designator that recognizes their AFMO status, but will not be designated as a Battalion Chief. For example: Fuels-X4 (X signifying the District number).

Engines – All Boise NF engines will follow Intermountain Region Fire Emergency Vehicle Markings standards. Example: ID-BOF-ENG-431, where '4' designates the type, where '3' designates Idaho City RD, and '1' indicates the station identifier for that engine on that district.

Captain – Is a designator for Module Leaders, such as Engine Captain, Type 2 I.A. Crew Captain, or Hotshot Captain. Captains will only use their designator when they are away from their assigned module. At all other times they will use their module designator.

> **Example:** Captain-431 would use this designator when he is on the hill and is requesting something from Engine-431; or Captain-431 remained in station while Engine-431 is out doing project work… ie "Engine-431", this is "Captain-431".

Engineer – Is the R-4 Engine Committee standard designator for the Assistant Captain on a wildland fire engine, ie Engineer-431.

Prevention - A prevention unit consists of one Prevention Officer without pumping capability.

Patrol - A patrol unit consists of a Type 6 or 7 engine with one firefighter. The minimum qualification for a Patrol Officer is FFT2. Note: To be utilized as a Type 6 or 7 engine on a wildfire, the staffing level must meet Redbook standards for personnel and qualification, and Fireline Handbook standards for equipment.

Type 2 I.A. Crews - When on-forest, the Type 2 I.A. Crews will use their Crew-3, Crew-5, designators. When off-forest on assignment, the Type 2 I.A. Crews will go by Boise NF Crew-3, 5.

When Crews breaks down into their 6 person squads for Initial Attack, they will use their designators indicating Crew and Squad identifiers as:

Designator	**Assistants**	**Squad**
Crew – 2 IHC	Alpha	Bravo
Crew – 3		Charlie
Crew – 5		
Crew – 7 IHC		

US Bureau of Land Management

Last Update: February 2021

OVERHEAD			
POSITION	**NAME**	**IDENTIFIER**	**OFFICE PHONE**
FIRE MANAGEMENT OFFICER	RUSS BABIAK	CHIEF 1-1	208.384.3401
ASST FIRE MANAGEMENT OFFICER	VACANT	CHIEF 1-2	208.384.3453
FUELS PROGRAM MANAGER	LANCE OKESON	CHIEF 1-3	208.384.3486
FIRE PLANNER	VACANT		208.384.3461
FIRE PREVENTION & MITIGATION	JOSH RENZ	CHIEF 1-4	208.384.3444
FIRE OPERATIONS SUPERVISOR - SOUTHERN AREA	DAN BETTS	BAT 30	208.384.3471
FIRE OPERATIONS SUPERVISOR - BOISE AREA	JUSTIN SCHELLENBERG	BAT 20	208.384.3481
FIRE OPERATIONS SUPERVISOR - NORTHERN AREA	LINDSEY NEIWERT	BAT 10	208.384.3284
FIRE OPERATIONS SUPERVISOR – BOISE AREA	DENNIS KONRAD	BAT 21	208.384.3264
FIRE OPERATIONS SUPERVISOR - AVIATION	RAY RADDATZ	BAT 40	208.334.1028
FIRE OPERATIONS SUPERVISOR - FUELS	CHRIS CROMWELL	CHIEF 1-5	208.384.3469
FIRE INVESTIGATOR	BOISE	INV 1	208.384.3409
FIRE INVESTIGATOR	BOISE	INV 2	208.384.3482
DAILY SUPERVISOR	WILD WEST	SUPT 11	208.384.3281
DAILY SUPERVISOR	UNIT A BOISE	SUPT 21	208.384.3286
DAILY SUPERVISOR	UNIT B BOISE	SUPT 22	208.384.3472
DAILY SUPERVISOR	UNIT C BOISE	SUPT 23	208.384.3283
DAILY SUPERVISOR	HAMMETT	SUPT 31	208.366.7722
DAILY SUPERVISOR	BRUNEAU	SUPT 32	208.845.2011
PREVENTION / INFORMATION	Jared Jablonski	FIRE INFO	208.384.3378

ENGINES			
RESOURCE	**LOCATION**	**IDENTIFIER**	**TYPE**
ENGINE	STAR	E1301	TYPE 3
ENGINE	STAR	E1411	TYPE 4
ENGINE	STAR	E1412	TYPE 4
ENGINE	UNIT A - BOISE	E1415	TYPE 4

ENGINE	UNIT A - BOISE	E1421	TYPE 4
ENGINE	UNIT A - BOISE	E1422	TYPE 4
ENGINE	UNIT B - BOISE	E1416	TYPE 4
ENGINE	UNIT B - BOISE	E1424	TYPE 4
ENGINE	UNIT B - BOISE	E1425	TYPE 4
ENGINE	UNIT C - BOISE	E1427	TYPE 4
ENGINE	UNIT C - BOISE	E1428	TYPE 4
ENGINE	HAMMETT	E1302	TYPE 4
ENGINE	HAMMETT	E1432	TYPE 4
ENGINE	HAMMETT	E1433	TYPE 4
ENGINE	BRUNEAU	E1434	TYPE 4
ENGINE	BRUNEAU	E1435	TYPE 4
ENGINE	BRUNEAU	E1436	TYPE 4

HEAVY EQUIPMENT

RESOURCE	**LOCATION**	**IDENTIFIER**	**TYPE**
DOZER	BOISE	DZ1833	2
DOZER	BOISE	DZ1834	2
DOZER	BRUNEAU	DZ1831	2
DOZER	BRUNEAU	DZ1832	2
WATER TENDER	BOISE	WT1931	2
WATER TENDER	BOISE	WT1932	2
WATER TENDER	BRUNEAU	WT1933	1
FUEL TENDER	BOISE	FT1199	

AVIATION

RESOURCE	**LOCATION**	**IDENTIFIER**	**TYPE**
AIR ATTACK	BOISE	AA5DT	FW
HELICOPTER	BOISE	803PJ	1

Boise District BLM Call Numbers 2021

Call #	Name	Title
Chief 1-1	Russ Babiak	FMO
Chief 1-2	Vacant	AFMO
	Vacant	Fire Operations Manager
Chief 1-3	Lance Okeson	Fuels Program Coordinator
Chief 1-4	Josh Renz	Prevention/Information
Investigation/Prevention		
Investigation 1	Chelsea Rounds	Daily-Investigator
Investigation 2	Vacant	Daily-Investigator
Information 1	Jared Jablonski	Information Officer
Information 2	Vacant	Information Officer
Battalion/FOS Group		
Bat 10	Lindsey Neiwert	871-1843
Bat 20	Justin Schellenburg	871-1835
Bat 21	Dennis Konrad	871-7544
Bat 30	Dan Betts	871-1830
Unit Superintendents		
Supt 11- Wild West	Nick Loveless	871-7538
Supt 21 - Boise Yard	Chad Niblett	401-4295
Supt 22 - Boise Yard	TJ Gholson	484-8878
Supt 23 - Boise Yard	Ben Rojas	871-7520
Supt 31- Hammett	Ray Bilbao	789-4259
Supt 32 - Bruneau	James Brummond	908-1629
*Supts will be qualified as a TFLD and ICT4 or will use Chase as Designator		
Helitack		
HT40	Chase Truck	White Chase
HT43	Chase Truck	White Chase
HT44	Chase Truck	Yellow Chase
Fuels		
Fuels 51	Chris Cromwell	Monitoring
Fuels 52	Shared	Archeology
Fuels 53	Courtney Wyatt	Fuels Ops
Fuels 54	Chris Cromwell	Monitoring
Fuels 55	Shared	Fuels Ops
Fuels 56	Fuels 1 Ton	TerraTorch/Warehouse

The district is divided into 3 areas. North, Middle, and South

1 - all resources stationed in the North will have a 1 designator
2 - all resources stationed in the Boise Yard will have a 2 designator
3 - all resources stationed in the South will have a 3 designator
4 - all resources assigned to Helitack will have a 4 designator
5 - all resources assigned to Fuels group will have a 5 designator
8 - all resources assigned to the Heavy equipment group will have a 8 designator

Call #	Resource	Location
E1411	Engine Type IV	Wild West
E1412	Engine Type IV	Wild West
E1301	Engine Type III	Wild West
E1415	Engine Type IV	Unit A Boise
E1421	Engine Type IV	Unit A Boise
E1422	Engine Type IV	Unit A Boise
E1416	Engine Type IV	Unit B Boise
E1424	Engine Type IV	Unit B Boise
E1425	Engine Type IV	Unit B Boise
E1427	Engine Type IV	Unit C Boise
E1428	Engine Type IV	Unit C Boise
E1432	Engine Type IV	Hammett
E1433	Engine Type IV	Hammett
E1302	Engine Type III	Hammett
E1434	Engine Type IV	Bruneau
E1435	Engine Type IV	Bruneau
E1436	Engine Type IV	Bruneau
Heavy Equipment		
DZ1831	Dozer D6R	Bruneau
DZ1832	Dozer D6T	Bruneau
DZ1833	Dozer D6T	Boise
DZ1834	Dozer D6T	Boise
WT1931	Water Tender Type II/3500 gal	Boise
WT1932	Water Tender Type II/3500 gal	Boise
WT1933	Water Tender Type I/6500 gal	Bruneau
FT1199	Fuel Tender	Boise
Air Attack	425DT	Air Attack Base, Boise
Helicopter	803PJ (Type 1 Helo)	Air Attack Base, Boise

Boise Fire Department

Personnel

Administration		
Title	**Name**	**Identifier**
Fire Chief	Mark Niemeyer	101
Planning & Administration Asst. Chief	Kim Brown	
Emergency Services Asst. Chief	Brad Bolen	102
Support Services Asst. Chief	Romeo Gervais	103
Operations/EMS Division Chief	aron Hummel	104
Special Operations Division Chief	Paul Roberts	105
Training & Safety Division Chief	Steve Rasulo	107
Logistics Division Chief	Lance Carbone	108
Fire Marshal Division Chief	Mike Bisagno	109
Wildfire Division Chief	Tony Piscopo	110
Emergency Management Manager	Rachel Holford	115
Operations		
Title	**Name**	**Identifier**
Battalion Chief BC1/A	Jonas Dethman	134
Battalion Chief BC2/A	Greg Ramey	136
Battalion Chief BC3/A	John Peugh	138
Battalion Chief BC1/B	Tom Moore	139
Battalion Chief BC2/B	Mike Walker	133
Battalion Chief BC3/B	Roy Mitchell	135
Battalion Chief BC1/C	Terry Theriot	137
Battalion Chief BC2/C	Brian Ashton	131
Battalion Chief BC3/C	Shawn Res	132
Logistics		
Title	**Name**	**Identifier**
Captain Logistics	Kevin Wilson	121
Captain Logistics	VACANT	122
Captain Logistics	Brian Skinner	123
Captain Logistics	Dan Hopkins	124
Supply/Inventory Specialist	Jen Sword	
Training		
Title	**Name**	**Identifier**
Captain Training	Jeremy Kircher	151
Captain Training	Shawn Cope	152
Captain Training	Marcus Rainey	153
Captain Training	Kurt Freeman	154
Captain Training	Stephen Madigan	155
Captain Training	Chad Cain	156
Captain Training	Vacant	

Prevention		
Title	**Name**	**Identifier**
Captain Inspector/ Investigator	Joel Damron	141
Captain Inspector	Dray Thompson	142
WUI Mitigation Captain	Jerry McAdams	143
Captain Investigator/Pub Ed	Roy Boehm	144
Captain Inspector	Jesse Tappert	145
Captain Inspector	DeWaine Kuehl	146
Captain Inspector/Investigator	Forrest France	147
Captain Inspector	Justin Wright	148

Apparatus

Category	#	Type	Availability	Staffing	Designator
Structural Engine	16	II	In-Service	3 Personnel	E1,E2,E3,E4,E5,E6,E7,E8,E9,E10,E11, E12,E14,E15,E16,E17
Structural Engine	5	II	Reserve	Not Staffed	R2,R10,R8,R10,R16
Structural Engine	1	II	Training	Not Staffed	TRN!, TRN2, TRN3
Aerial Platform	2	I	In-Service	4 Personnel	T4,T7
Aerial Ladder	1	I	In-Service	4 Personnel	T5 (Tiller)
Heavy Rescue	1	II	In-Service	Per Incident	RSQ7- ITR2
Command	3		In-Service	1 Person	BC1, BC2, BC3
Wildland Engine	5	IV	In-Service	3 Personnel	BR2,BR9,BR13,BR14,BR15
Wildland Engine	1	V	In-Service	Per Incident	BR16
Wildland Engine	2	VI	In-Service	Per Incident	BR01,BR12
Water Tender	3	I	In-Service	1 Person	WT12,WT14,WT16
HazMat	1	I	In-Service	Per Incident	HazMat 17 (Hackney)- RRT4
HazCom	1		In-Service	Per Incident	HazCom 17 (30’ Command)- RRT4
Rescue Squad	1		In-Service	Per Incident	Squad 7
Rescue Trailer	1		In-Service	Per Incident	
Boat	1	III	In-Service	Per Incident	Dive 1
Jet Ski	2		In-Service	Per Incident	Jet Ski 1
ARFF Command	1		In- Service	1 Person	Smokey 7
ARFF	1		In- Service	2 Personnel	Smokey 9 (1500 gal)
ARFF	1		In- Service	2 Personnel	Smokey 10 (3000 gal)
ARFF	1		Reserve	Not Staffed	Smokey 8
Foam Engine	1		In-Service	Per Incident	Foam 6 (1160 gal)
Air Trailer	1		In-Service	Per Incident	Air (SCBA)

Rehab	1		In-Service	Per Incident	Rehab
AHIMT3	1		In-Service	Per Incident	Boise City AHIMT3

Eagle Fire District

Administration and Personnel

Title	Name	Identifier
Fire Chief	Tyler Lewis	401
Deputy Chief – Fire Marshal	Scott Buck	402
Deputy Chief-Support Services	Jamie Vincent	403
Division Chief-Deputy Fire Marshal	John Francesconi	404
Deputy Chief-Operations	Theron Hudson	406
Division Chief-Training	Kelsey Backen	405
		407
Safety Officer	Kelly Chadd	451
Safety Officer	Tyler Assmus	452
51 Career Firefighters		

Apparatus
Station: #1 – 966 E. Iron Eagle Dr. Eagle, Idaho

Category	Type	Staffing	Identifiers	Availability
Quint	1	3-4 Personnel	T41	In Service
Heavy Rescue		3-4 Personnel	R41	In Service
Squad 41-Swift Water Rescue		1-4 Personnel	SQ41	In Service
Brush Engine	6	3-4 Personnel	B41	In Service
Brush Engine	6	3-4 Personnel	Reserve Brush	Reserve
Reserve Engine	1	3-4 Personnel	Reserve Engine	Reserve
ATV/Tactical Rescue Vehicle		3-4 Personnel	TRV41	In Service
Command – Battalion 41		1	465	In Service
Command – Fire Chief		1	473	In Service
Command- Response Chief		1	474	In Service
Command – Investigation		1	462	In Service
Command – Safety		1	471	In Service
Command – Investigation		1	466	In Service
Command – Response Chief Command – Response Chief		1 1	472 461	In Service
Rehab Trailer		Per Incident	Rehab	In Service
Incident Communications Trailer		Per Incident	ICT	In Service

Station #2 – 3180 E. Floating Feather Rd. Eagle, Idaho

Structural Engine	1	3-4 Personnel	E42	In Service
Brush Engine	6	3-4 Personnel	B42	In Service
ATV / Tactical Rescue Vehicle		3-4 Personnel	TRV42	In Service
Dozer 42		1 Person	DOZ42	In Service

Station #3 – 825 N. Cactus Creek Ave. Eagle, Idaho

Structural Engine	1	3-4 Personnel	E43	In Service
Brush Engine	6	3-4 Personnel	B43	In Service
Water Tender		1-2 Personnel	WT43	In Service

Station #5– 5871 W. Hidden Springs Dr. Boise, Idaho

Structural Engine	1	3-4 Personnel	E45	In Service
Brush Engine	5	3 Personnel	B45	In Service
ATV/Tactical Rescue		3-4 Personnel	TRV45	In Service

Idaho Department of Lands-

Southwest Idaho Forest Protective District

Casper Urbanek	Fire Warden
Tyke Lofing	Assistant Fire Warden
Bryan Durkin	Assistant Fire Warden
Bob Pietras	Area Manager

Aircraft: Available statewide from mid-June through mid-October (extended when needed)

Helicopters – Two Type 2 helicopters with seven-person helitack staffed in Coeur d'Alene and Lewiston area.

Single Engine Air Tanker (SEAT):	McCall (2), Grangeville (2),
Fire Boss Scooper:	Coeur d'Alene (2)

Equipment:

Call #	Resource	Location
E-06	Engine Type 5	Boise
E-25	Engine Type 5	Boise Basin
E-12	Engine Type 5	High Valley

Crews:

Call #	Resource	Location
Crew 39	Type 2 IDOC crew	Idaho City / Boise

Additional Type 2 IDOC crews may be available from Orofino and St. Anthony, ID

Other staff includes:

Fire Information, Investigation, Prevention, and Mitigation programs are administered by district fire staff.

The Fire Management Bureau staff in Coeur d'Alene and Boise provides state-wide support in fire business, resource and incident management, and interagency fire cache operations.

Kuna Rural Fire District

Personnel

Title	Name	Identifier
Fire Chief	Perry Palmer	601
Assistant Fire Chief	Terry Gammel	602
Battalion Chief		603
Captain	TJ Lawrence	6842
Captain	Joe Link	6830
Captain	John Charlton	6847

Apparatus

Category	Identifier
Structure Engine	E-61 (Type 2)
Structure Engine	E-62 (Type 2)
Water Tender	WT-61
Brush Squad	BR-61 (Type 4)
Brush Squad	BR-62 (Type 3)
Ambulance	KM-61 (Type 2)
Ambulance	KM-63 (Type 2)
Command F-150	602
Command Explorer	601

Kuna Rural Fire District

Personnel

Title	Name	Identifier
Fire Chief	T.J. Lawrence	601
Assistant Fire Chief	None	602
Battalion Chief	None	603
Captain	Matt Coffelt	6857
Captain	Joe Link	6830
Captain	John Charlton	6847

Apparatus

Category	Identifier
Structure Engine	E-61 (Type 1)
Structure Engine	E-62 (Type 1)
Water Tender	WT-61
Brush	BR-61 (Type 4)
Brush	BR-62 (Type 4)
Squad F-150	SQ-61
Command GMC 1500	601

Meridian Fire Department

Personnel

Title	Name	Identifier
Chief	Kristopher Blume	301
Deputy Chief Operations	Charlie Butterfield	302
Division Chief Logistics	Justin Winkler	307
Deputy Chief Prevention	Joe Bongiorno	304
Division Chief of Training	Jordan Reese	305
Division Chief of EMS	JD Hendrick	306

Battalion Chief A Shift	Kristian Forbey	BC31
Battalion Chief B Shift	Tyler Rountree	BC31
Battalion Chief C Shift	Ken Welborn	BC31

Apparatus

Category	#	Type	Availability	Staffing	Identifier
Structural Engine	5	II	In-service	3 Personnel	E32, E33, E34, E35, E36
Structural Engine	3	II	Reserve	Not staffed	E31, E37, E38
Aerial Platform	1	II	In-service	4 Personnel	T31
Command	1		In-service	1 Person	BC31
Wildland Engine	2	VI	In-service	3 Personnel	BR34, BR35 - Cross Staffed with E34, E35
Water Tender	1	II	In-service	2 Personnel	WT32 Cross Staffed with E32 - 3000 Gallons
Command Trailer	1		In-service	Per incident	COMM Trailer

Star Fire Protection District/Middleton Rural Fire District

We are operating with a joint power's agreement as (Mid/Star Fire)

Stations #51, 52, 53

Personnel

Title	Name	Identifier
Fire Chief Operations Chief Fire Marshal	Greg Timinsky David Sparks Victor Islas	501 502 503
Career Firefighters (Star) Career Firefighter (Middleton)	21 13	Stations 51 and 52 Station 53

Apparatus

Category	Identifier	Staffing / Availability
Structural Engine (Star)	E-51	Staffed with min of 3 per shift
Structural Engine (Star) Structure Engine (Middleton) Structural Engine (Mid/Star)	E-52 E-53 E-54	Staffed with min of 3 per shift Staffed with min of 3 per shift Reserve Engine
Tender (Star) Tender (Middleton)	WT-51 WT-53	Available Per Incident Available Per Incident
Brush Engine Type 3 (Star) Brush Engine Type 5 (Star) Brush Engine Type 3 (Middleton) Brush Engine Type 4 (Middleton)	B-51 B-52 B-53 B-54	Available per Incident Available per Incident Available per Incident
Air Trailer	A-51	Available Per Incident
Command Vehicle (Star) Command Vehicle (Star) Command Vehicle (Middleton)	501 502 503	Staffed or available per incident Staffed or available per incident Staffed or available per incident

2022 Ada County Multi-Hazard Mitigation Plan

Appendix G. Plan Adoption Resolutions from Planning Partners

G. PLAN ADOPTION RESOLUTIONS FROM PLANNING PARTNERS

TO BE PROVIDED WITH FINAL DRAFT

Appendix H. Progress Report Template

H. PROGRESS REPORT TEMPLATE

2022 Ada County Multi-Hazard Mitigation Plan
Annual Progress Report

Reporting Period: *(Insert reporting period)*

Background: Ada County and participating cities and special purpose districts in the county developed a hazard mitigation plan to reduce risk from all hazards by identifying resources, information, and strategies for risk reduction. The federal Disaster Mitigation Act of 2000 requires state and local governments to develop hazard mitigation plans as a condition for federal disaster grant assistance. To prepare the plan, the participating partners organized resources, assessed risks from natural hazards within the county, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from natural hazards. By completing this process, these jurisdictions maintained compliance with the Disaster Mitigation Act, achieving eligibility for mitigation grant funding opportunities afforded under the Robert T. Stafford Act. The plan can be viewed on-line at:

https://adacounty.id.gov/accem

Summary Overview of the Plan's Progress: The performance period for the 2022 Ada County Multi-Hazard Mitigation Plan became effective in Month Year with the final approval of the plan by FEMA. The initial performance period for this plan will be 5 years, with an anticipated update to the plan to occur before August 2027. As of this reporting period, the performance period for this plan is considered to be __% complete. The hazard mitigation plan has targeted __ hazard mitigation actions to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- __ out of __ actions (__%) reported ongoing action toward completion.
- __ out of __ actions (__%) were reported as being complete.
- __ out of __ actions (___%) reported no action taken.

Purpose: The purpose of this report is to provide an annual update on the implementation of the action plan identified in the 2017 Ada County Multi-Hazard Mitigation Plan. The objective is to ensure that there is a continuing and responsive planning process that will keep the hazard mitigation plan dynamic and responsive to the needs and capabilities of the partner jurisdictions. This report discusses the following:

- Natural hazard events that have occurred within the last year
- Changes in risk exposure within the planning area
- Mitigation success stories

- Review of the action plan
- Changes in capabilities that could impact plan implementation
- Recommendations for changes/enhancement.

The Multi-Hazard Mitigation Plan Steering Committee: The Multi-Hazard Mitigation Plan Steering Committee, made up of planning partners and stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on _____, 201_. It was determined through the plan's development process that a steering committee would remain in service to oversee maintenance of the plan. At a minimum, the Steering Committee will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the Steering Committee membership is as indicated in Table 1.

Table 1. Steering Committee Members

Name	Title	Jurisdiction/Agency

Natural Hazard Events within the Planning Area: During the reporting period, there were __ natural hazard events in the planning area that had a measurable impact on people or property. A summary of these events is as follows:

- ____________________________
- ____________________________

Changes in Risk Exposure in the Planning Area: *(Insert brief overview of any natural hazard event in the planning area that changed the probability of occurrence or ranking of risk for the hazards addressed in the hazard mitigation plan)*

Mitigation Success Stories: *(Insert brief overview of mitigation accomplishments during the reporting period)*

Review of the Action Plan: Table 2 reviews the action plan, reporting the status of each action. Reviewers of this report should refer to the hazard mitigation plan for more detailed descriptions of each action and the prioritization process.

Address the following in the "status" column of the following table:

- *Was any element of the action carried out during the reporting period?*
- If no action was completed, why?
- Is the timeline for implementation for the action still appropriate?
- If the action was completed, does it need to be changed or removed from the action plan?

Table 2. Action Plan Matrix

Action Taken? (Yes or No)	Time Line	Priority	Status	Status (X, O,✓)
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				
Action #__—____________________[description]				

Completion status legend:
✓= Project Completed
O = Action ongoing toward completion
X = No progress at this time

Changes That May Impact Implementation of the Plan: *(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development)*

Recommendations for Changes or Enhancements: Based on the review of this report by the Multi-Hazard Mitigation Plan Steering Committee, the following recommendations will be noted for future updates or revisions to the plan:

- ____________________________
- ____________________________
- ____________________________
- ____________________________

Public review notice: *The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the governing boards of all planning partners and to local media outlets and the report is posted on the Ada County Multi-Hazard Mitigation Plan website. Any questions or comments regarding the contents of this report should be directed to:*

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