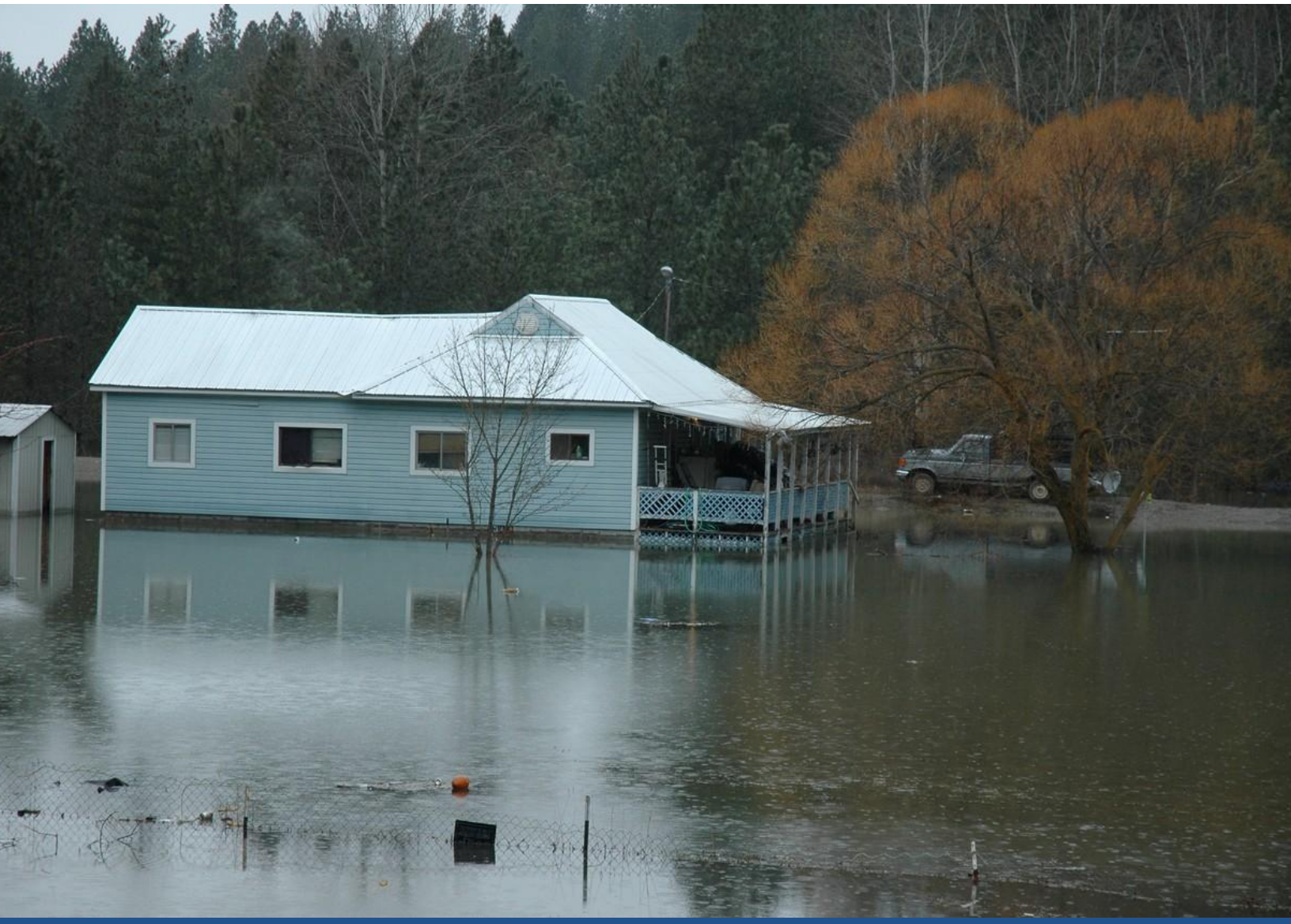


Risk Report

This Risk Report covers the Upper Spokane Watershed study area and is specific to Kootenai County and its participating communities: The Cities of Post Falls, Coeur d'Alene, Hayden Lake, Hayden, Rathdrum, and Dalton Gardens; and Kootenai County.

DRAFT October 2012

FEMA

RiskMAP
Increasing Resilience Together

Preface

The Department of Homeland Security (DHS), Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides States, Tribes and local communities with flood risk information and tools that they can use to increase their resilience to hazards and better protect their citizens. By combining accurate maps with risk assessment tools and planning and outreach support, Risk MAP has transformed traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating risks.

This Risk Report provides non-regulatory information to help local or Tribal officials, floodplain managers, planners, emergency managers, and others better understand their risk, communicate those risks to their citizens and local businesses, and take steps to mitigate those risks.

Because the extent of a risk often extends beyond community limits, the Risk Report provides risk data for the entire study area as well as for each individual community when available. This also emphasizes that risk reduction activities may impact areas beyond jurisdictional boundaries.

The risk associated with hazards is always changing, and there may be other studies, reports, or other sources of information available that provide more comprehensive information. The Risk Report is not intended to be regulatory or the final authoritative source of all risk data in the project area. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood, seismic, wildfire, landslides, and severe weather risks and their effects within the project area.

Table of Contents

1. Introduction

1.1 About Flood Risk

Floods are naturally occurring events that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry areas. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses.

Which picture below shows greater flood risk?

Even if you assume that the flood in both pictures was the same probability (e.g. a 10% annual-chance flood) the consequences in terms of property damage and potential injury as a result of the flood in the bottom picture are much more severe. Therefore, the flood risk in the area shown on the bottom picture is greater.

Whether an area might flood is one consideration. The extent to which it might flood adds a necessary dimension to that understanding.

Calculating Flood Risk

The most common method for determining flood risk, also referred to as vulnerability, is to identify the probability of flooding and the consequences of flooding:

Flood Risk (or Vulnerability) **= Probability x Consequences**; where

Probability = the likelihood of occurrence

Consequences = the estimated impacts associated with the occurrence

- The probability of a flood is the likelihood that a flood will occur. The probability of flooding can change based on physical, environmental, and/or engineering factors. Factors affecting the probability that a flood will impact an area vary due to changing weather patterns, land use decisions, to the existence of mitigation projects. The ability to assess the probability of a flood, and the level of accuracy for that assessment, is also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

- The consequences of a flood are the estimated impacts associated with the flood occurrence. Consequences relate to humans activities within an area and how a flood impacts the natural and built environment.

Risk MAP Flood Risk Products

FEMA understands that flood risk is dynamic and that flooding does not stop at a line on a map, and provides the following flood risk products:

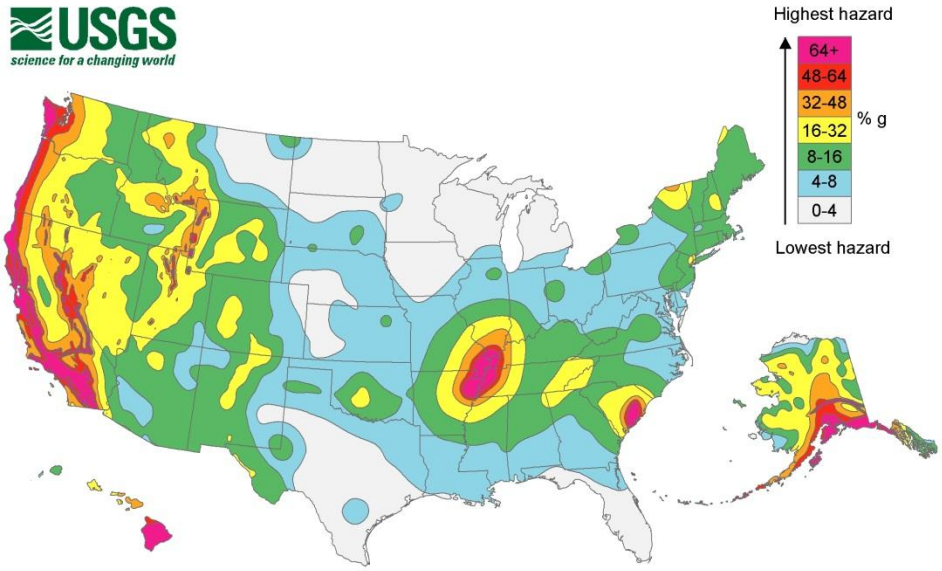
- A section in the Risk Report that describes key findings.
- A Flood Risk Map, found in Section 3.1 of this document, shows risk areas at risk and is provided as an exhibit within the Risk Report. Details about the data shown on the map can be found in Section 2.

- A Flood Risk Database houses the flood risk data developed during the course of the flood risk analysis to the raw flood risk data that can be used and updated by the community. After the Risk MAP study is complete, this data can be used in many ways to visualize and communicate flood risk within the study area.

1.2 About Earthquake Risk in Eastern Washington and Northwestern Idaho

Idaho and Washington have active faults that have produced a number of historic earthquakes.

The U.S. Geological Survey (USGS) National Seismic Hazard Maps display earthquake ground motions for various probability levels across the United States and are applied in seismic provisions of building codes, insurance rate structures, risk assessments, and other public policy. This is updated periodically to incorporate new findings on earthquake ground shaking, faults, seismicity, and geodesy. The resulting maps are derived from seismic hazard curves calculated on a grid of sites across the United States that describe the frequency of exceeding a set of ground motions. Below is a figure of the 2008 USGS Hazard Map with a 2% in 50 year probability.



Calculating Earthquake Risk

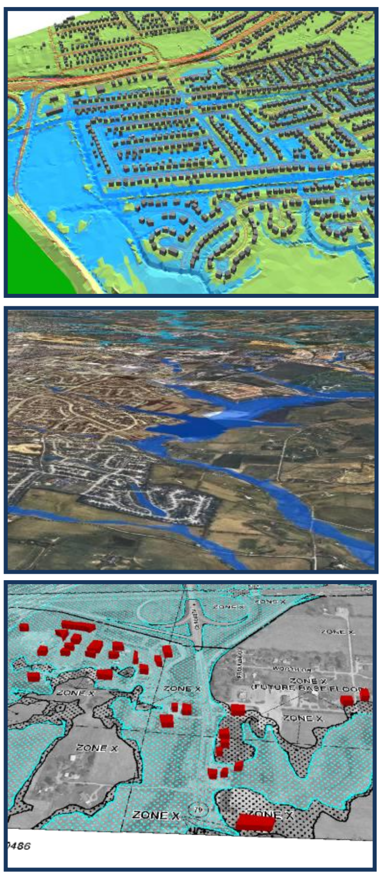
Earthquake risk is calculated based on location, extent, and magnitude. Location is determined by locations of faults and/or past locations of earthquakes. Extent and magnitude are measured in two ways:

- Magnitude (as measured by the Richter Scale) measures the energy that is released. Magnitude is calculated by seismologists from seismograph readings and is most useful to scientists comparing the power of earthquakes.
- Intensity (as measured by the Modified Mercalli Intensity Scale, MMI). The Modified Mercalli Intensity Scale is a subjective description of the physical effects of the shaking based on observations at the event site. Using this scale, a value of I is the least intense motion, and XII is the greatest ground shaking. Unlike magnitude, intensity can vary from place to place.

Modified Mercalli Intensity Scale (MMI)
I. Not felt except by a very few under especially favorable conditions
II. Felt only by a few persons at rest, especially on upper floors of buildings
III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX. Damage considerable in specially designed structures; well-designed frames structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI. Few, if any (masonry) structures remain standing. Bridges destroyed, Rails bent greatly.
XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Risk MAP Earthquake Risk Products

- A section in the Risk Report that describes key findings.
- A profile of available USGS ShakeMaps that may impact the study area.
- An Earthquake Risk Database that houses the earthquake risk data during the course of the risk assessment that can be used and updated by the community.



Examples of how FEMA data can be leveraged to identify and measure vulnerability.

1.3 About Severe Weather Risk

Kootenai's weather is typified by a very warm, arid climate during the summer months and a cold, snowy, and moist climate during winter months. Kootenai's location between the Cascade Mountains to the west and Rocky Mountains to the east and north, protects the area from typical weather patterns found in other regions of the Pacific Northwest. The area does experience ice storms and high wind storms that can impact the region for days to weeks. Typical storm damages include power outages, infrastructure collapse, and snowdrifts that block typical travel patterns.

Kootenai County maintains a hazard warning system that supplements warning services provided by the National Weather Service, NOAA Weather Radio, and other local, state, and federal agencies. The warning system can utilize both public and private resources, to the extent practicable, and activate at the neighborhood, community, or county level. Winter storm safety and preparedness checklists are located on the Kootenai County Office of Emergency Management website. In addition to this information, an outreach handout has been prepared by FEMA and is available in Appendix D of this report that discusses the local history of severe storms and steps residents can take before, during, and after a severe storm event.

1.4 Uses of this Report

The goal of this report is to help inform and enable communities to take action to reduce risk. State, local, and tribal officials can use the summary information provided in this report, in conjunction with the data in the Risk Database, to:

- **Update local hazard mitigation plans and community comprehensive plans** – Planners can use risk information in the development and/or update of hazard mitigation plans, comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes may be changed to better provide for appropriate land uses in high hazard areas.
- **Update emergency operations and response plans** – Emergency managers can identify low risk areas for potential evacuation and sheltering, and can assist first responders in avoidance of areas of high risk areas. Risk assessment results may show vulnerable areas, facilities and infrastructure for which planning for continuity of operations plans (COOP), continuity of government (COG) plans, and emergency operations plans (EOP) would be essential.
- **Communicate risk** – Local officials can use the information in this report to communicate with property owners, business owners, and other citizens about risks and what can be done about it.
- **Inform the modification of development standards** – Floodplain and emergency managers, planners and public works officials can use information in this report to support the adjustment of development standards for certain locations. For example, heavily

developed areas tend to increase floodwater runoff because paved surfaces cannot absorb water, indicating a need to adopt or revise standards that provide for appropriate stormwater retention.

The risk products provided under Risk MAP are available and intended for community use. They are not tied to the regulatory development and insurance requirements of the National Flood Insurance Program nor are they required to be used.

Possible users of this report include—

- Local Elected Officials
- Floodplain Managers
- Community Planners
- Emergency Managers
- Public Works Officials
- Other Special Interests (e.g., watershed conservation groups, environmental awareness organizations, etc.)

Flooding impacts non-populated areas too, such as agricultural lands and wildlife habitats.

State and Local Hazard Mitigation Plans are required to have a comprehensive all-hazard risk assessment. The flood risk analyses in the FRR, FRM, and FRD can inform the flood hazard portion of a community's or state's risk assessment. Further, data in the flood risk database can be used to develop information which meets the requirements for risk assessments as it relates to the hazard of flood in hazard mitigation plans.

2. Risk Analysis

2.1 Flood Overview

Risk assessment is the systematic approach to identifying how a hazard impacts the environment. By defining the hazard, flood risk assessments enable informed decision making and form the basis for mitigation strategies and actions. To fully assess flood risk requires the following:

- Development of a complete profile of the flood hazard including location, historical occurrence and previous impacts
- Inventory of assets located in the identified flood hazard area
- Estimation of potential future flood losses caused by exposure to the area of flood hazard

Flood risk analysis can be done on a large scale (state, watershed) level and on a very small scale (parcel, census block). Large scale flood risk analysis can identify how actions and development in one community can affect areas up- and downstream. On the parcel or census block level, analysis can provide communities with actionable data to inform appropriate mitigation actions.

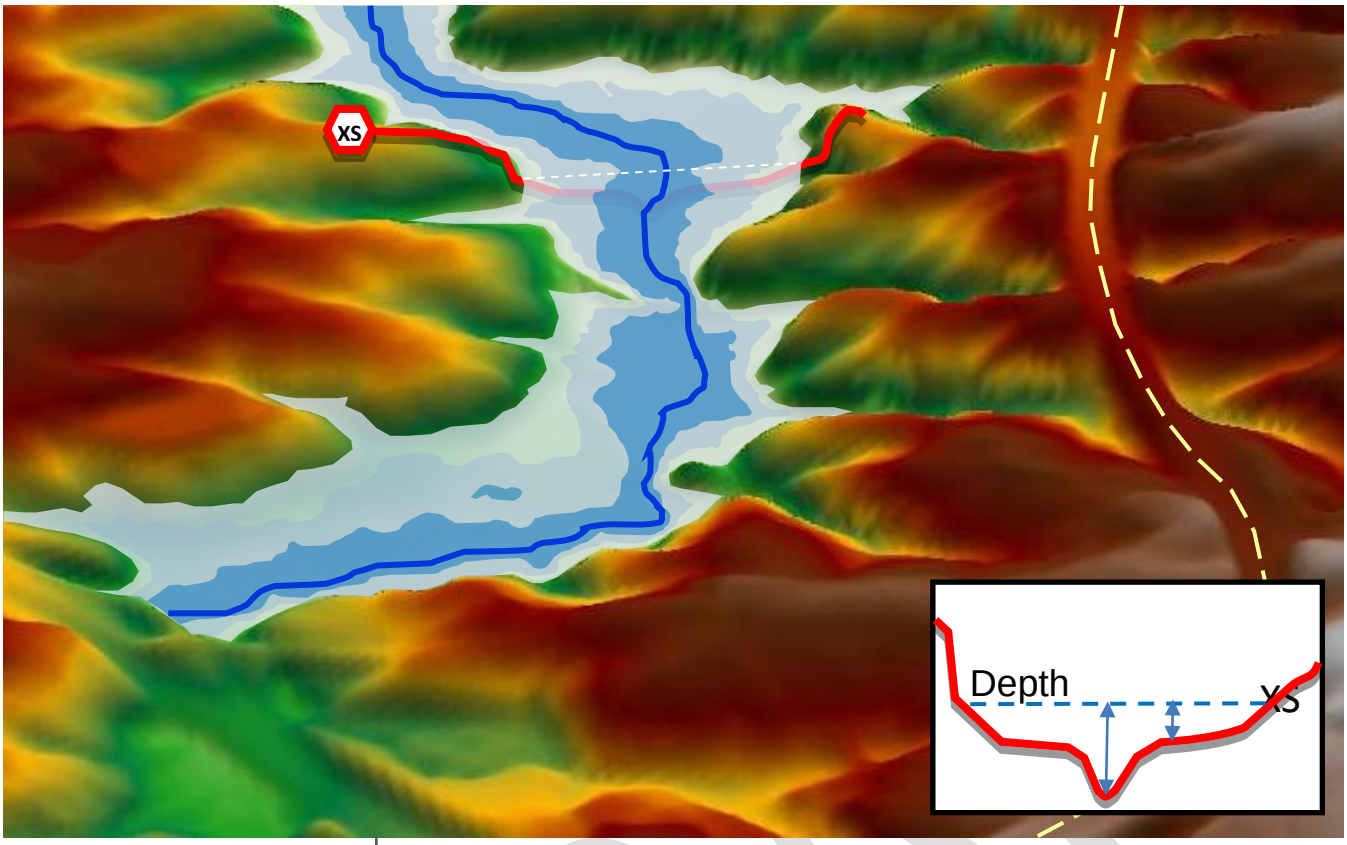
2.2 Analysis of Flood Risk

To assess potential community losses or the consequences portion of the "risk," equation, the following data was collected:

- Information about local assets or resources at risk of flooding
- Information about the physical features and human activities that contribute to that risk
- Information about location and severity of the hazard

The report, maps and database contain three general types of risk analysis to help describe and visualize the flood risk at the jurisdictional levels:

1. Water Surface, Flood Depth and Analysis Grids
2. Hazus Estimated Loss Information
3. Areas of Mitigation Interest



2.3 Flood Depth Grids

Depth grids are FEMA datasets provided in the Risk Report. Depth grids help to understand not only where the water will go but how deep it can get. These grids are intended to be used by communities for additional analysis, enhanced visualization, and communication of flood risks for hazard mitigation planning and emergency management. Grids provided in the Risk Report for this project area include 10%, 2%, 1%, and .2% Flood Depth Grids. The multi-frequency flood depth and analysis grids show depth, which is calculated as the difference (in feet) between the water surface elevation and the ground. These depth grids are used to calculate potential flood losses.

2.4 Seismic Overview

Risk assessment is the systematic approach to identifying how a hazard impacts the environment. By defining the hazard, earthquake risk assessments enable informed decision making and form the basis for mitigation strategies and actions. To fully assess earthquake risk requires the following:

- Development of a complete profile of the seismic hazard including epicenter, depth, magnitude, shaking intensity, liquefaction and soil data.
- Inventory of assets located in the identified hazard area

- Estimation of potential future losses caused by exposure to the area of the hazard.

Earthquake analysis is done on a large scale (state, county, watershed) level. Large scale risk analysis can identify how infrastructure capabilities, capacity, and failures can affect neighboring and distant community's economy and response efforts.

2.5 Analysis of Seismic Risk

To assess potential community losses or the consequences portion of the "risk," equation, the following data was collected:

- Information about local assets or resources that may be damaged by lateral ground movement and/or liquefaction,
- Information about the physical features (i.e. bridges, overpasses, etc.),
- Human activities that contribute to that risk (i.e. shelter needs, etc.) and information about location and severity of the hazard. The report, maps, and database contain two general types of risk analysis to help describe and visualize earthquake risk at the watershed level:
  1. Shaking Intensity and liquefaction overlays
  2. Hazus Estimated Loss Information

2.6 ShakeMaps

A ShakeMap is created by regional seismic network operators in cooperation with the United Geologic Survey (USGS). ShakeMaps can provide near real-time maps of shaking intensity and ground motion following an earthquake. ShakeMaps can also be generated as "Earthquake Scenarios" where intensities and ground motions have been estimated. These are events on faults that have ruptured in the past or have a likelihood of rupturing in the future. The primary purpose of a ShakeMap is for emergency response exercises and planning as well as for understanding the potential consequences of future large earthquakes. This data can be used as hazard scenario input for a FEMA loss-estimation tool, HAZUS, providing the software with seismic intensity and ground motions data for use in more accurately depicting losses.

HAZUS-MH is a loss estimation methodology developed by FEMA for the flood, wind, and earthquake hazards. The methodology and data established by HAZUS can also be used to study other hazards.

2.7 Hazus Estimated Loss Information

Loss estimates provided in the Risk Report were developed using a FEMA risk assessment tool, Hazus-MH. Hazus is a tool that can help to estimate losses to lives and property by combining information about the built environment with information about the location and magnitude of

hazard. Hazus can provide risk assessment information for floods, earthquakes, and hurricane winds.

The Risk Report primarily uses specific flood and seismic risk analysis methods which are summarized below:

Scenario Loss Estimates:

- **Flood:** Scenario losses have been generated by Hazus for the 10%, 2%, 1% and 0.2% floods.
- **Seismic:** A 5.5M earthquake in Spokane was input into Hazus.

A typical Risk Report would report contains Hazus estimated losses for the following: (Refer to the Earthquake Risk Analysis Results Section for more detailed information on Hazus outputs for Kootenai County)

- **Residential Asset Loss** – These include direct building losses (estimated costs to repair or replace the damage caused to the building) for all classes of residential structures including single family, multi-family, manufactured housing, group housing, and nursing homes. This value also includes content losses.
- **Commercial Asset Loss** –These include direct building losses for all classes of commercial buildings including retail, wholesale, repair, professional services, banks, hospitals, entertainment, and parking facilities. This value also includes content and inventory losses.
- **Other Asset Loss** –This includes losses for facilities categorized as industrial, agricultural, religious, government, and educational. This value also includes content and inventory losses.
- **Potential Impact to Essential Facilities**- including hospitals, fire stations, police stations, Emergency Operation Centers and schools
- **Shelter needs**-Projected number of people displaced from residence and/or in need of shelter
- **Debris**-Projected amount of debris generated in tons
- **Loss Ratio:** The loss ratio expresses the scenario losses divided by the total building value for a local jurisdiction. This can be a gage to determine overall community resilience as a result of a scenario event. For example, a loss ratio of 5% for a given scenario would indicate that a local jurisdiction would be more resilient and recover easier from a given event versus a loss ratio of 75% which would indicate widespread losses.

- **Hazus Flood Risk Value:** On the Flood Risk Map, relative flood risk is calculated at the community level and is expressed by the following three categories: low, medium, and high. It is based on the 10%, 2%, 1%, and .2% return periods and is calculated at the census block.

Loss estimates are based on best available data, and the methodologies applied result in an approximation of risk. These estimates should be used to understand relative risk and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, demographics, or economic parameters).

Unreinforced masonry buildings are susceptible to shaking and create debris.

2.8 Areas of Mitigation Interest (AOMI)

Many factors contribute to flooding and flood losses. Some are natural, some are not. In response to these risks there has been a focus by the Federal Government, State agencies, and local jurisdictions to avoid losses and mitigate properties against the impacts of flood hazards. AOMIs are important to identifying target areas and potential projects for flood hazard mitigation, encouraging local collaboration, and communicating how various mitigation activities can successfully reduce flood risk.

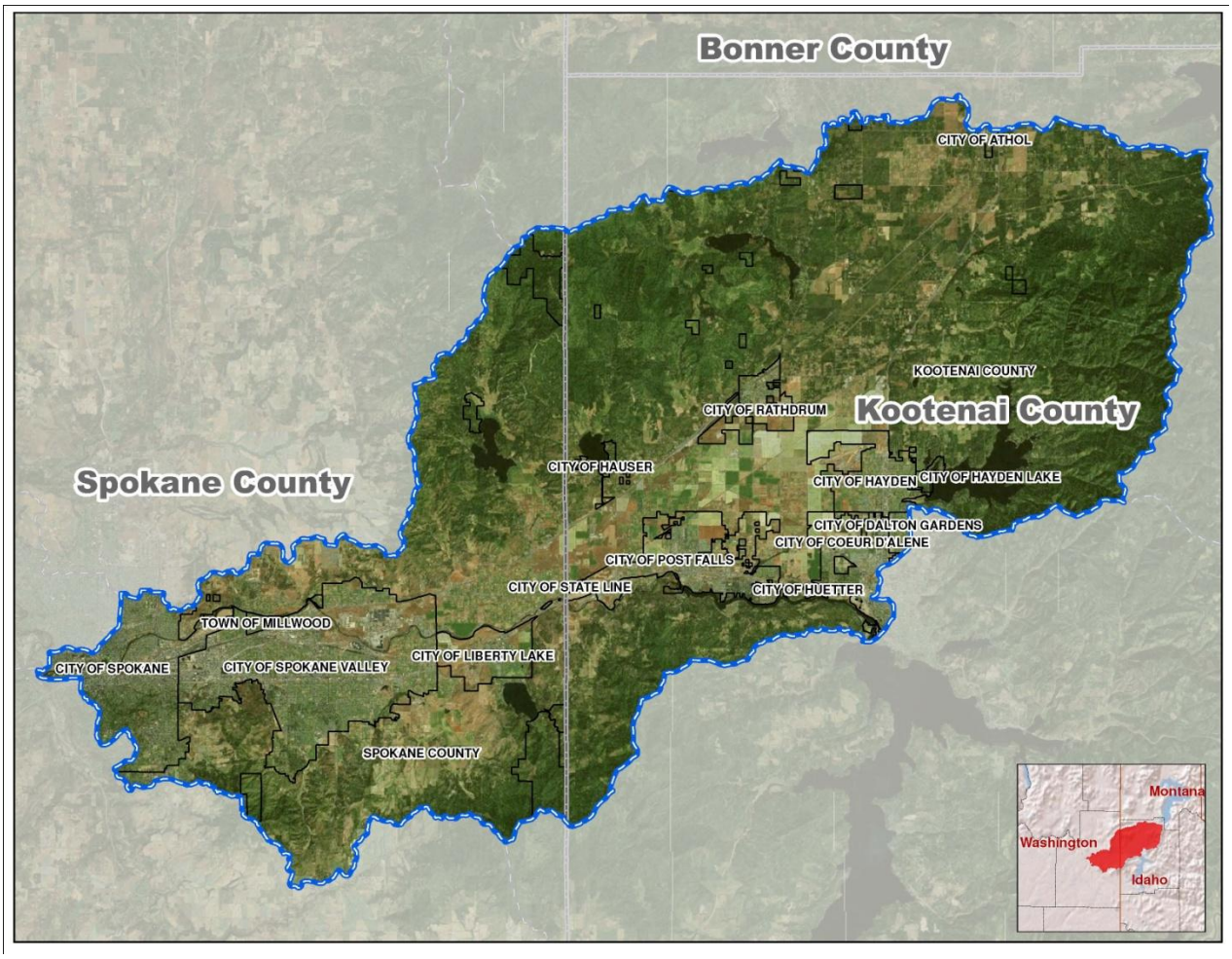
A list of hazard specific mitigation actions for each AOMI can be found in section 5.

3. Flood Risk Analysis Results

The following pages provide general risk assessment results of the analyses and identified areas of mitigation interest at the watershed level within Kootenai County as well as detailed results at the community level.

3.1 Upper Spokane Watershed Summary

Watershed Overview Map



Source: Kootenai and Spokane Counties

Kootenai County, within the Upper Spokane Watershed, includes the following communities:

Community Name	CID	Total Community Population	Environmental Sensitive Issues	CRS Community	Flood Claims	Repetitive Loss Properties	Total Policies	Total Insurance Coverage
Coeur d'Alene	160078	44,137	Aquifer	No	0	0	41	$8,488,900
Dalton Gardens	160164	2,335	Aquifer	n/a	n/a	n/a	1	$350,000
Hayden	160170	13,294	Aquifer	No	0	0	4	$1,008,000
Post Falls	160083	27,574	Q'emiln Park & Aquifer	No	0	0	12	$2,846,000
Rathdrum	160187	6,826	Aquifer	No	0	0	21	$3,102,300
Kootenai County	160076	138,494	Corbin Park & Aquifer	Yes		8	284	$63,005,900

The estimated HAZUS Building Value exposed is an estimate of the structure and content value within the entire community and does not differentiate between structures located within hazard areas and those located outside hazard areas.

Flood claims are indicative of past damage to structures. In general, unless a community has pursued mitigation measures, a greater number of flood claims suggest that there is a greater potential for future losses. Communities can use this information to identify mitigation opportunities.

Hazus Estimated Loss Information

Estimated Potential Losses for Flood Event Scenarios For Upper Spokane Watershed										
	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$23,617,500,000	62%	$181,290,000	1%	$239,170,000	1%	$266,680,000	1%	$320,660,000	1%
Commercial Buildings/Contents	$10,680,820,000	28%	$123,670,000	1%	$175,260,000	2%	$194,950,000	2%	$228,810,000	2%
Other Building/Contents	$3,935,620,000	10%	$43,110,000	1%	$58,520,000	1%	$64,220,000	2%	$80,140,000	2%
Total Building/Contents[3]	$38,233,950,000	100%	$348,080,000	1%	$472,940,000	1%	$525,840,000	1%	$629,600,000	2%
Business Disruption[4]	N/A	N/A	$22,680,000	N/A	$29,850,000	N/A	$32,350,000	N/A	$38,260,000	N/A
TOTAL[5]	$38,233,950,000	N/A	$370,760,000	N/A	$502,790,000	N/A	$558,190,000	N/A	$667,860,000	N/A

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

Note: Loss Ratios are a useful gage to determine overall community resiliency. The lower the loss ratio, the easier it will be for a community to recover from a given event.

If loss ratios for 10 yr and 500 yr return periods are similar, you can expect to see comparable damages and flooding for floods of greater and lesser frequencies.

3.2 City of Coeur d'Alene Summary (CID 160078)

Overview

The City of Coeur d'Alene is the largest community located within Kootenai County in the Upper Spokane Watershed that participated in the Discovery Process. The information below provides an overview of the community's floodplain management program information as of the date of this publication.

- Participating in National Flood Insurance Program (NFIP)
- Not Participating in NFIP Community Rating System (CRS)
- Included in the Hazard Mitigation Plan for Kootenai County
- NFIP Policy Coverage (policies/value) = 41 policies totaling approximately $8,488,900
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized Severe Repetitive Loss properties = 0

Hazus Estimated Loss Information

The City of Coeur d'Alene's flood risk analysis uses results from a FEMA performed Hazus analysis which accounts for modeled areas in the study area. The analysis is based on multi-frequency Flood Depth grids (10%, 2%, 1%, and 0.2%)

Estimated Potential Losses for Flood Event Scenarios For City of Coeur d'Alene

	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$1,403,880,000	41%	$9,520,000	1%	$12,040,000	1%	$14,210,000	1%	$16,830,000	1%
Commercial Buildings/Contents	$1,820,720,000	53%	$33,330,000	2%	$44,960,000	2%	$48,720,000	3%	$56,060,000	3%
Other Building/Contents	$205,870,000	6%	$1,730,000	1%	$3,490,000	2%	$3,730,000	2%	$4,260,000	2%
Total Building/Contents[3]	**$3,430,480,000**	**100%**	**$44,580,000**	**1%**	**$60,480,000**	**2%**	**$66,660,000**	**2%**	**$77,150,000**	**2%**
Business Disruption[4]	N/A	N/A	$7,130,000	N/A	$9,340,000	N/A	$10,140,000	N/A	$11,680,000	N/A
TOTAL[5]	**$3,430,480,000**	**N/A**	**$51,710,000**	**N/A**	**$69,820,000**	**N/A**	**$76,800,000**	**N/A**	**$88,830,000**	**N/A**

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

Population, Debris, and Essential Facility Impacts

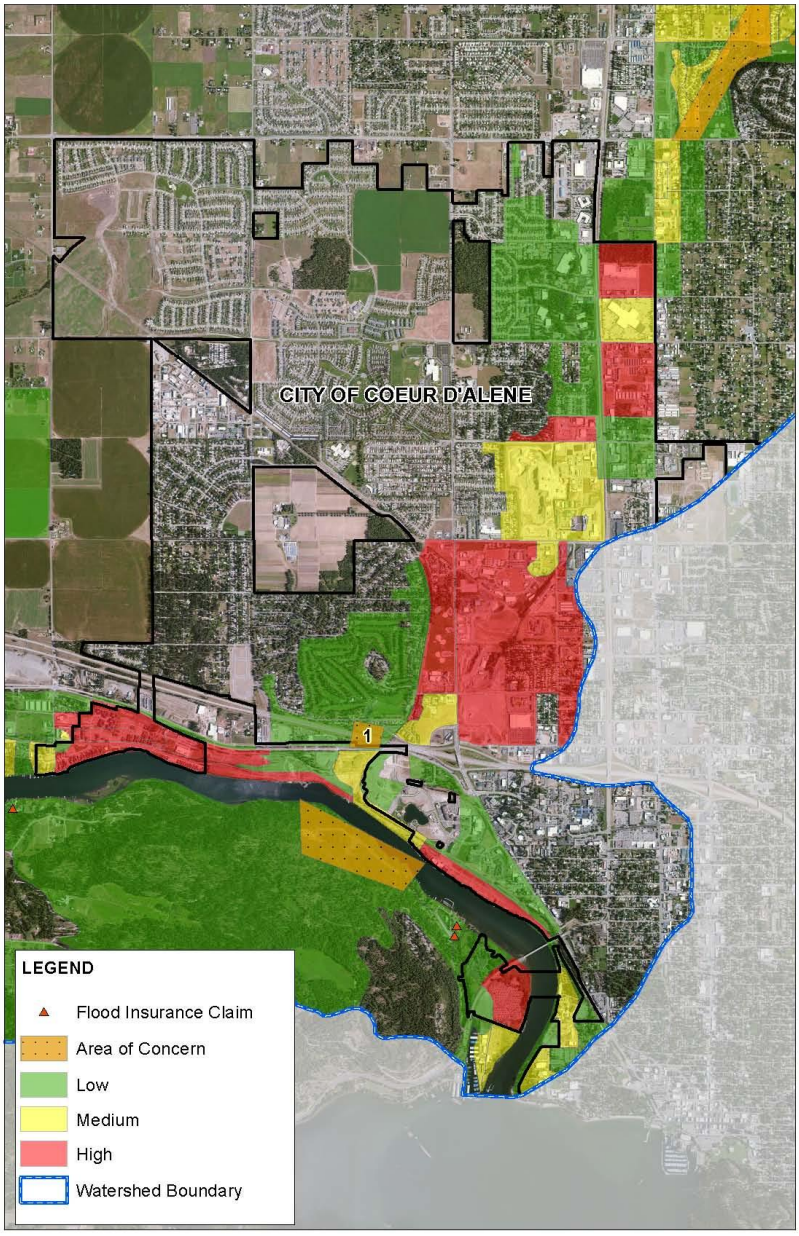
	10% (10-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
Shelter Needs	714	818	902	1,012
Displaced Population	813	918	993	1,110
Debris (in tons)	9,131	11,584	11,994	16,199
Fire Stations	0	0	0	0
Police Stations	1	1	1	1
Schools	0	0	0	0

Areas of Concern (AOC)

Section 6 of the Risk Report provides more information regarding areas of concern, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

Mitigation Interest	Problem Statement	Map ID#
Wildfire	Maintaining fire mitigation measures is of concern.	N/A
Flood	There is an area of ponding caused by a drainage issue.	1
Severe Storm	Long term power outages are experienced during severe storms.	N/A

This map summarizes the AOC identified through the discovery process



Source: Kootenai County

3.3 City of Dalton Gardens (CID 160164)

Overview

The City of Dalton Gardens is the smallest community in the Upper Spokane Watershed located within Kootenai County, which participated in the Discovery Process. The information below provides an overview of the community's floodplain management program information as of the date of this publication.

- Participating in National Flood Insurance Program (NFIP)
- Not Participating in NFIP Community Rating System (CRS)
- Included in the Hazards Mitigation Plan for Kootenai County
- NFIP Policy Coverage (policies/value) = 1 policies totaling approximately $350,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized Severe Repetitive Loss properties = 0

Hazus Estimated Loss Information

Dalton Garden's flood risk analysis uses results from a FEMA performed Hazus analysis which accounts for modeled areas in the study area. The analysis is based on multi-frequency Flood Depth grids (10%, 2%, 1%, and 0.2%)

Estimated Potential Losses for Flood Event Scenarios For City of Dalton Gardens

	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$98,400,000	42%	$450,000	0%	$730,000	1%	$960,000	1%	$1,350,000	1%
Commercial Buildings/Contents	$108,810,000	46%	$910,000	1%	$1,140,000	1%	$1,420,000	1%	$1,670,000	2%
Other Building/Contents	$29,550,000	12%	$420,000	1%	$530,000	2%	$650,000	2%	$760,000	3%
Total Building/Contents[3]	**$236,760,000**	**100%**	**$1,770,000**	**1%**	**$2,390,000**	**1%**	**$3,030,000**	**1%**	**$3,780,000**	**2%**
Business Disruption[4]	N/A	N/A	$330,000	N/A	$400,000	N/A	$480,000	N/A	$560,000	N/A
TOTAL[5]	**$236,760,000**	**N/A**	**$2,100,000**	**N/A**	**$2,790,000**	**N/A**	**$3,510,000**	**N/A**	**$4,340,000**	**N/A**

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

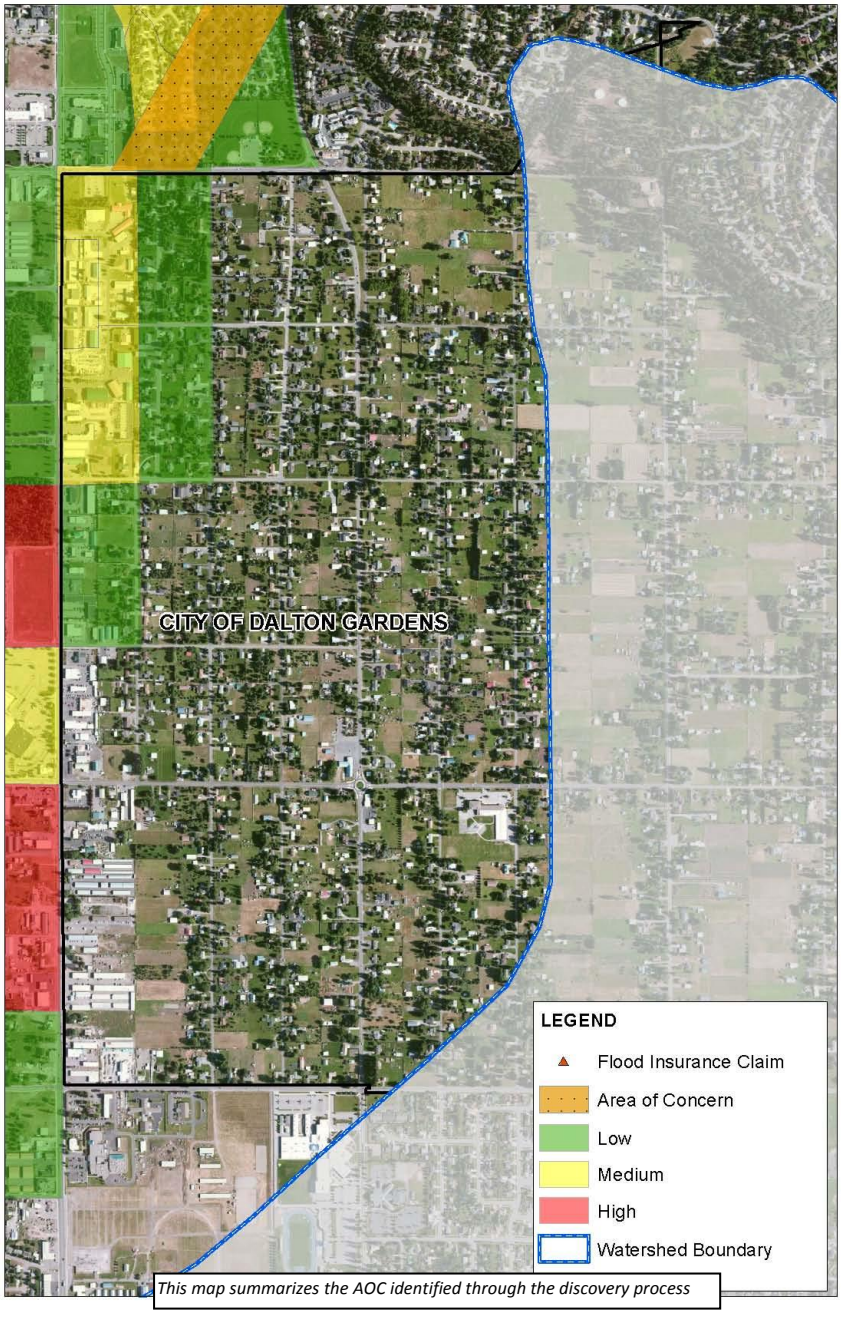
Population, Debris, and Essential Facility Impacts

	10% (10-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
Shelter Needs	9	11	12	16
Displaced Population	48	55	56	68
Debris (in tons)	895	1,131	1,209	1,796
Fire Stations	0	0	0	0
Police Stations	0	0	0	0
Schools	0	0	0	0

Areas of Concern (AOC)

Section 6 of the Risk Report provides more information regarding areas of concern, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

Mitigation Interest	Problem Statement	Map ID#
Wildfire	Canfield Mountain is a wildfire risk. One resident lives on the mountain. (Spatial extents verification needed for mapping.)	N/A



Source: Kootenai County

3.4 City of Hayden Summary (CID 160170)

Overview

City of Hayden is one of five communities, located within Kootenai County that participated in the Upper Spokane Watershed Discovery Process for Risk MAP. The information below provides an overview of the community's floodplain management program information as of the date of this publication.

- Participating in National Flood Insurance Program (NFIP)
- Not Participating in NFIP Community Rating System (CRS)
- Included in the Hazards Mitigation Plan for Kootenai County
- NFIP Policy Coverage (policies/value) = 4 policies totaling approximately $1,008,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized Severe Repetitive Loss properties = 0

Hazus Estimated Loss Information

Hayden's flood risk analysis uses results from a FEMA performed Hazus analysis which accounts for modeled areas in the study area. The analysis is based on multi-frequency Flood Depth grids (10%, 2%, 1%, and 0.2%)

Estimated Potential Losses for Flood Event Scenarios For City of Hayden

	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$843,510,000	52%	$5,290,000	1%	$6,900,000	1%	$7,570,000	1%	$9,990,000	1%
Commercial Buildings/Contents	$645,470,000	40%	$3,320,000	1%	$4,590,000	1%	$4,890,000	1%	$5,870,000	1%
Other Building/Contents	$125,770,000	8%	$460,000	0%	$810,000	1%	$880,000	1%	$1,110,000	1%
Total Building/Contents[3]	**$1,614,760,000**	**100%**	**$9,070,000**	**1%**	**$12,290,000**	**1%**	**$13,330,000**	**1%**	**$16,970,000**	**1%**
Business Disruption[4]	N/A	N/A	$440,000	N/A	$640,000	N/A	$690,000	N/A	$820,000	N/A
TOTAL[5]	**$1,614,760,000**	**N/A**	**$9,510,000**	**N/A**	**$12,930,000**	**N/A**	**$14,020,000**	**N/A**	**$17,790,000**	**N/A**

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

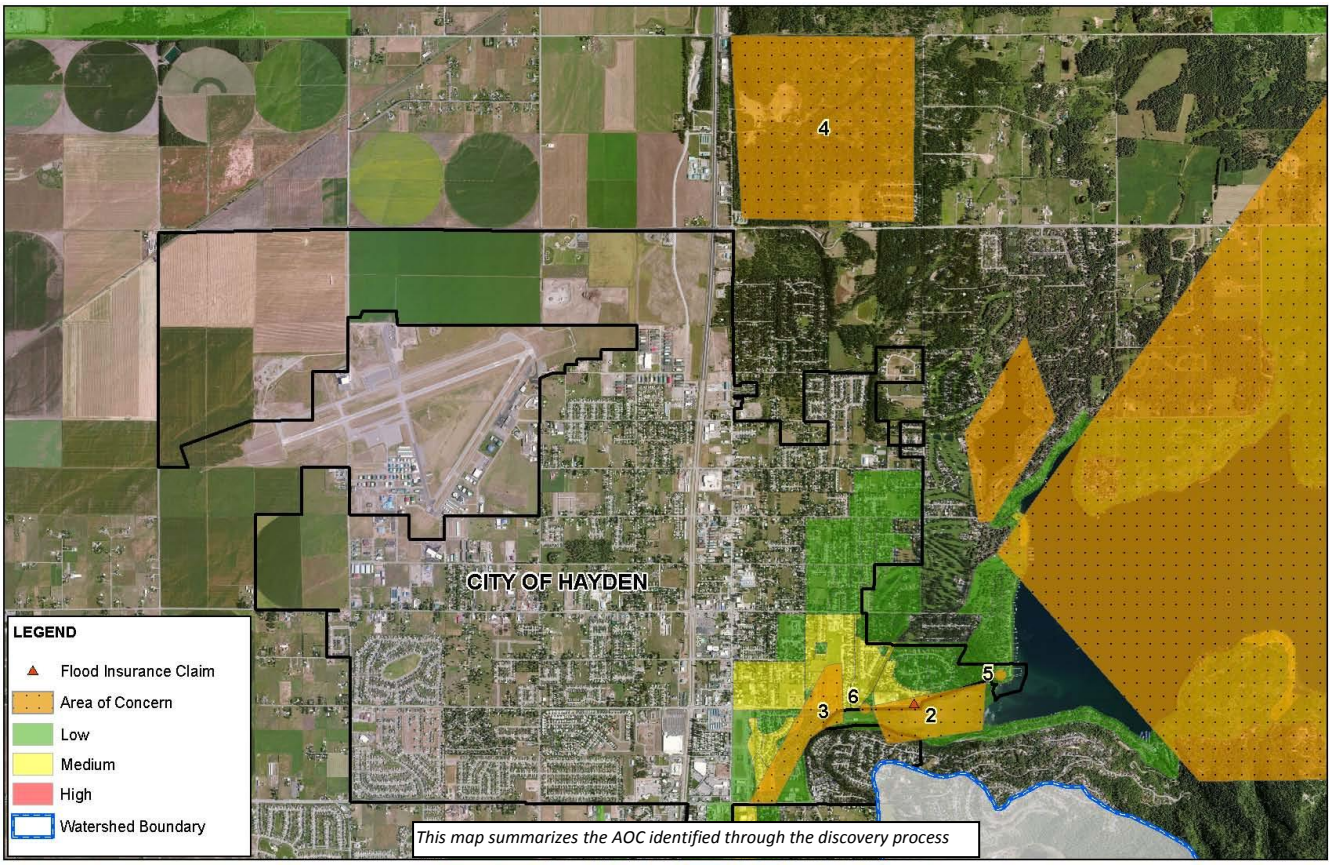
Population, Debris, and Essential Facility Impacts

	10% (10-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
Shelter Needs	488	610	666	772
Displaced Population	699	841	903	1,013
Debris (in tons)	6,065	7,329	8,276	12,543
Fire Stations	0	0	0	0
Police Stations	0	0	0	0
Schools	0	0	1	1

Areas of Concern (AOC)

Section 6 of this report provides more information regarding areas of concern, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

Mitigation Interest	Problem Statement	Map ID #
Flood	Earthen dams are located along the lake at the city boundary. (Spatial extents verification needed for mapping.)	
Flood	There is a flood potential from ponding caused by drainage issues in this area.	2, 3
Landslide	Hayden Canyon area in the northeast section of Hayden has significant slopes and is a concern for landslides.	4
Flood	All sanitary sewers are pumped out of the City of Hayden. Sand bagging efforts around lift stations have been required for protection of these facilities from flooding.	5, 6



Source: Kootenai County

3.5 City of Post Falls (CID 160083)

Overview

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

- Participating in National Flood Insurance Program (NFIP)
- Not participating in NFIP Community Rating System (CRS)
- Included in the All-Hazards Mitigation Plan for Kootenai County
- NFIP Policy Coverage (policies/value) = 12 policies totaling approximately $2,846,000
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized Severe Repetitive Loss properties = 0

Hazus Estimated Loss Information

Post Falls' flood risk analysis uses results from a FEMA performed Hazus analysis which accounts for modeled areas in the study area. The analysis is based on multi-frequency Flood Depth grids (10%, 2%, 1% and 0.2 %.)

Estimated Potential Losses for Flood Event Scenarios For City of Post Falls

	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$1,401,390,000	55%	$7,580,000	1%	$9,470,000	1%	$9,750,000	1%	$10,550,000	1%
Commercial Buildings/Contents	$876,110,000	35%	$7,720,000	1%	$10,530,000	1%	$12,050,000	1%	$15,930,000	2%
Other Building/Contents	$260,080,000	10%	$930,000	0%	$1,730,000	1%	$1,950,000	1%	$2,650,000	1%
Total Building/Contents[3]	**$2,537,580,000**	**100%**	**$16,230,000**	**1%**	**$21,730,000**	**1%**	**$23,760,000**	**1%**	**$29,130,000**	**1%**
Business Disruption[4]	N/A	N/A	$970,000	N/A	$1,350,000	N/A	$1,500,000	N/A	$1,920,000	N/A
TOTAL[5]	**$2,537,580,000**	**N/A**	**$17,200,000**	**N/A**	**$23,080,000**	**N/A**	**$25,260,000**	**N/A**	**$31,050,000**	**N/A**

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

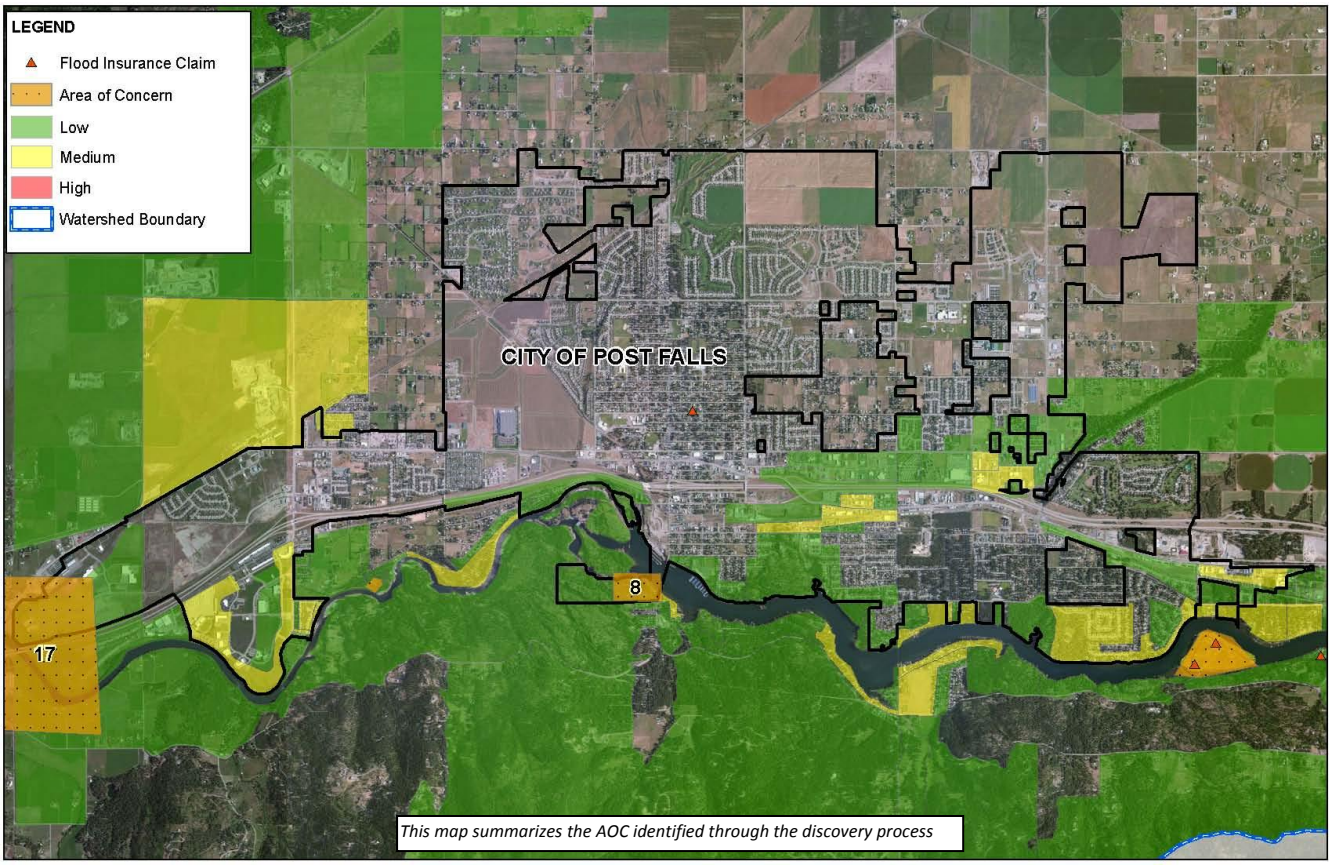
Population, Debris, and Essential Facility Impacts

	10% (10-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
Shelter Needs	557	672	725	840
Displaced Population	801	915	969	1,077
Debris (in tons)	13,434	16,750	18,707	22,780
Fire Stations	0	0	0	0
Police Stations	0	0	0	0
Schools	0	0	0	0

Areas of Concern (AOC)

Section 6 of the Risk Report provides more information regarding areas of concern and possible mitigation interests, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

Mitigation Interest	Problem Statement	Map ID #
Environmentally Sensitive Area	Q'emiln Park	8
Fire	Moderate to high fire risks exist in open field areas and north of HWY 53 and south of Spokane River. Local officials are interested in outreach and education for home owners on fire prevention and defensible space. (Spatial extents verification needed for mapping.)	



Source: Kootenai County

3.6 City of Rathdrum (CID 160083)

Overview

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

- Participating in National Flood Insurance Program (NFIP)
- Not participating in NFIP Community Rating System (CRS)
- Included in the All-Hazards Mitigation Plan for Kootenai County
- NFIP Policy Coverage (policies/value) = 21 policies totaling approximately $3,102,300
- NFIP-recognized repetitive loss properties = 0
- NFIP-recognized Severe Repetitive Loss properties = 0

Hazus Estimated Loss Information

Rathdrum's flood risk analysis uses results from a FEMA performed Hazus analysis which accounts for modeled areas in the study area. The analysis is based on multi-frequency Flood Depth grids (10%, 2%, 1%, and 0.2 %.)

Estimated Potential Losses for Flood Event Scenarios For City of Rathdrum										
	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$327,380,000	78%	$10,070,000	3%	$16,420,000	5%	$17,940,000	5%	$24,050,000	7%
Commercial Buildings/Contents	$36,530,000	9%	$1,380,000	4%	$1,730,000	5%	$1,970,000	5%	$2,890,000	8%
Other Building/Contents	$57,110,000	14%	$6,980,000	12%	$7,240,000	13%	$7,310,000	13%	$11,030,000	19%
Total Building/Contents[3]	**$421,020,000**	**100%**	**$18,430,000**	**4%**	**$25,390,000**	**6%**	**$27,220,000**	**6%**	**$37,970,000**	**9%**
Business Disruption[4]	N/A	N/A	$1,070,000	N/A	$1,140,000	N/A	$1,160,000	N/A	$1,660,000	N/A
TOTAL[5]	**$421,020,000**	**N/A**	**$19,500,000**	**N/A**	**$26,530,000**	**N/A**	**$28,380,000**	**N/A**	**$39,630,000**	**N/A**

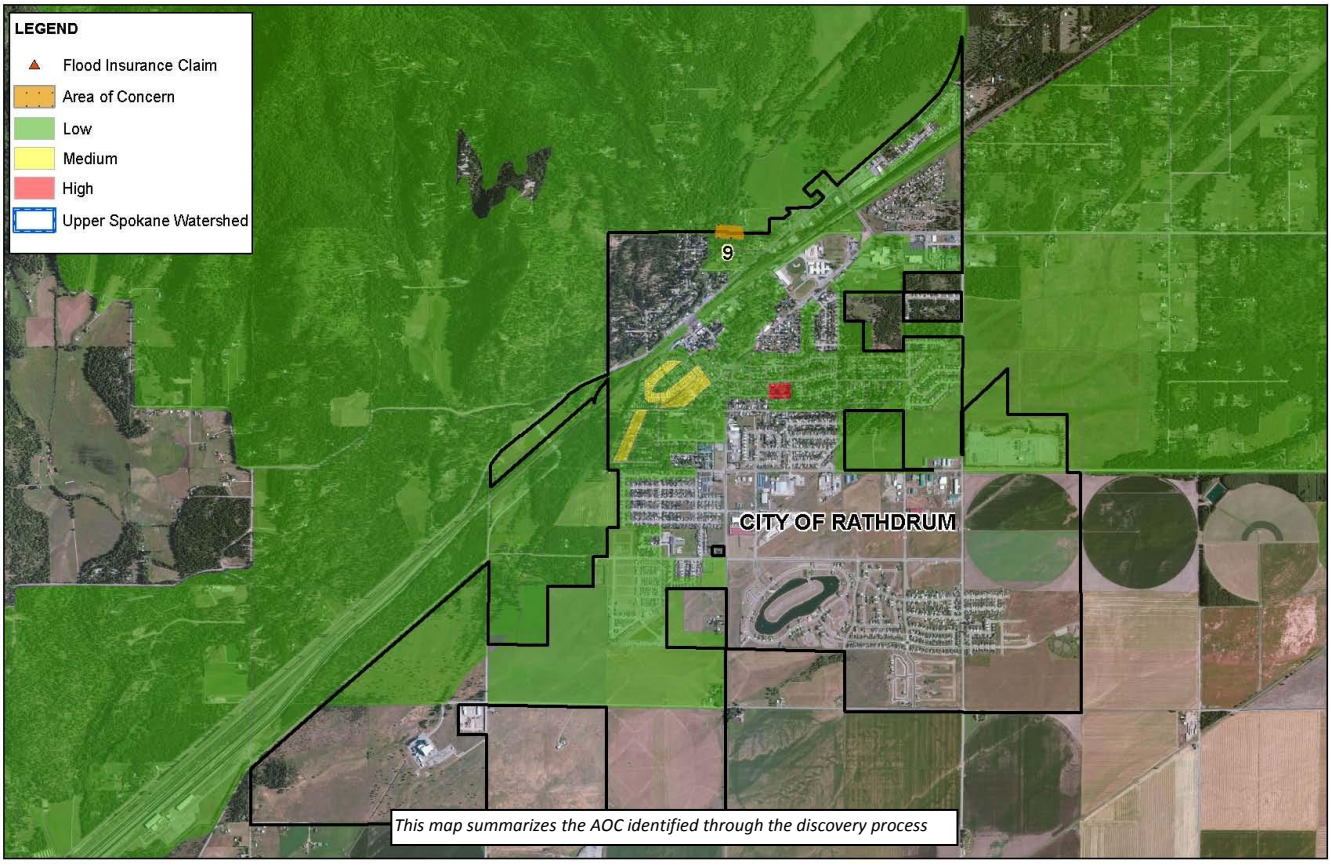
Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

Population, Debris, and Essential Facility Impacts				
	10% (10-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
Shelter Needs	916	1,125	1,182	1,338
Displaced Population	1,192	1,411	1,508	1,674
Debris (in tons)	1,628	2,497	3,008	3,791
Fire Stations	0	0	0	0
Police Stations	1	1	1	1
Schools	0	0	0	0

Areas of Concern (AOC)

Section 6 of the Risk Report provides more information regarding areas of concern and possible mitigation interests, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

Mitigation Interest	Problem Statement	Map ID #
Flood	The Willow Creek dike is critical for groundwater recharge. (Spatial extents verification needed for mapping.)	
Flood	The Bingham Street culvert size is inadequate according to local officials.	9
Flood	There is major development occurring in the southern portion of the city. This may be an area that should be mapped in more detail for flooding. (Spatial extents verification needed for mapping.)	
Severe Storms	High winds causing drifting snow are a concern to community leaders. Additional snow volume management planning may be of interest.	N/A



Source: Kootenai County

3.7 Kootenai County Incorporated and Unincorporated Areas (CID 160076)

Overview

The information below provides an overview of the community's floodplain management program information as of the date of this publication.

- Participating in National Flood Insurance Program (NFIP)
- Participating in NFIP Community Rating System (CRS)
- Included in the All-Hazards Mitigation Plan for Kootenai County
- NFIP Policy Coverage (policies/value) = 284 policies totaling approximately $63,005,900
- NFIP-recognized repetitive loss properties = 8

Hazus Estimated Loss Information

Kootenai's flood risk analysis uses results from a FEMA performed Hazus analysis which accounts for modeled areas in the study area. The analysis is based on multi-frequency Flood Depth grids (10%, 2%, 1%, and 0.2 %.)

Estimated Potential Losses for Flood Event Scenarios For Kootenai County

	Total Inventory		10% (10-yr)		2% (50-yr)		1% (100-yr)		0.2% (500-yr)	
	Estimated Value	% of Total	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]	Dollar Losses[1]	Loss Ratio[2]
Residential Buildings/Contents	$2,329,850,000	74%	$101,870,000	4%	$129,900,000	6%	$143,230,000	6%	$161,550,000	7%
Commercial Buildings/Contents	$563,560,000	18%	$36,580,000	6%	$47,730,000	8%	$51,170,000	9%	$59,290,000	11%
Other Building/Contents	$249,770,000	8%	$9,870,000	4%	$13,140,000	5%	$14,180,000	6%	$17,080,000	7%
Total Building/Contents[3]	**$3,143,180,000**	**100%**	**$148,320,000**	**5%**	**$190,770,000**	**6%**	**$208,590,000**	**7%**	**$237,930,000**	**8%**
Business Disruption[4]	N/A	N/A	$7,160,000	N/A	$9,040,000	N/A	$9,710,000	N/A	$11,150,000	N/A
TOTAL[5]	**$3,143,180,000**	**N/A**	**$155,480,000**	**N/A**	**$199,810,000**	**N/A**	**$218,300,000**	**N/A**	**$249,080,000**	**N/A**

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.
[1]Losses shown are rounded to the nearest $10,000
[2]Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
[3]Total Building/Contents Loss = Residential Building/Contents Loss + Commercial Building/Contents Loss + Other Building/Contents Loss.
[4]Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
[5]Total Loss = Total Building/Contents + Business Disruption

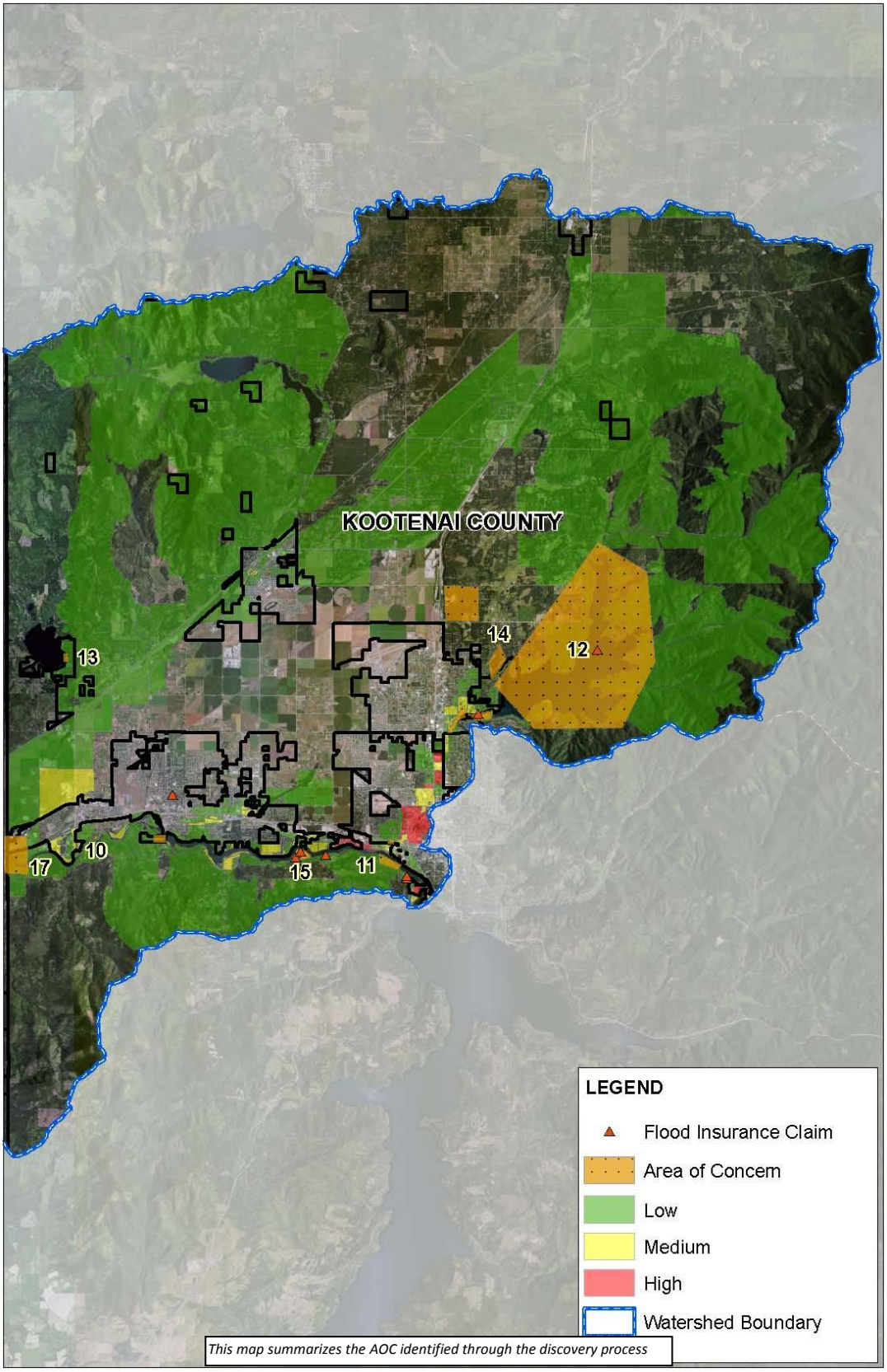
Population, Debris, and Essential Facility Impacts

	10% (10-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
Shelter Needs	1,618	1,964	2,098	2,469
Displaced Population	2,572	2,949	3,086	3,540
Debris (in tons)	33,903	43,126	47,515	60,134
Fire Stations	0	0	0	0
Police Stations	0	0	0	0
Schools	0	1	1	1

Areas of Concern (AOC)

Section 6 of the Risk Report provides more information regarding areas of concern and possible mitigation interests, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

Mitigation Interest	Problem Statement	Map ID #
Wildfire	Wildfire evacuation routes are of concern within the county.	N/A
Environmentally Sensitive Area	Corbin Park	10
Landslide	There is a potential for landslide risk in this area.	11
Flood	Several LOMAs exist around Hayden Lake. A redelineation of the lake is needed if more detailed topography exists.	12
Flood	There is a nuisance flooding area in the City of Hauser in a farming region. This is an area of repeated flooding but no claims have been submitted since they are not part of the NFIP.	13
Flood	A Flood Insurance Study update to incorporate BFEs is requested here.	14
Flood	Harbor Island Seawall may protect the island more than the effective floodplain shows.	15
Flood	Base Flood Elevations (BFE) for the Spokane River do not match up across the state line.	17
Flood	Hazel's Creek 500-year floodplain revision is requested in this area. (Spatial extents verification needed for mapping.)	
Severe Storms	Formal plan for shelter operations is of interest to community leaders.	N/A
Severe Storms	Resources are exhausted (man power, financial, materials) during widespread disasters. There are no backups or relief plan currently in place.	N/A
Severe Storms	Snow volume management planning is requested by community leaders.	N/A
Severe Storms	Transportation needs and communications enhancement assistance during hazard events are of interest to community leaders.	N/A



Source: Kootenai County

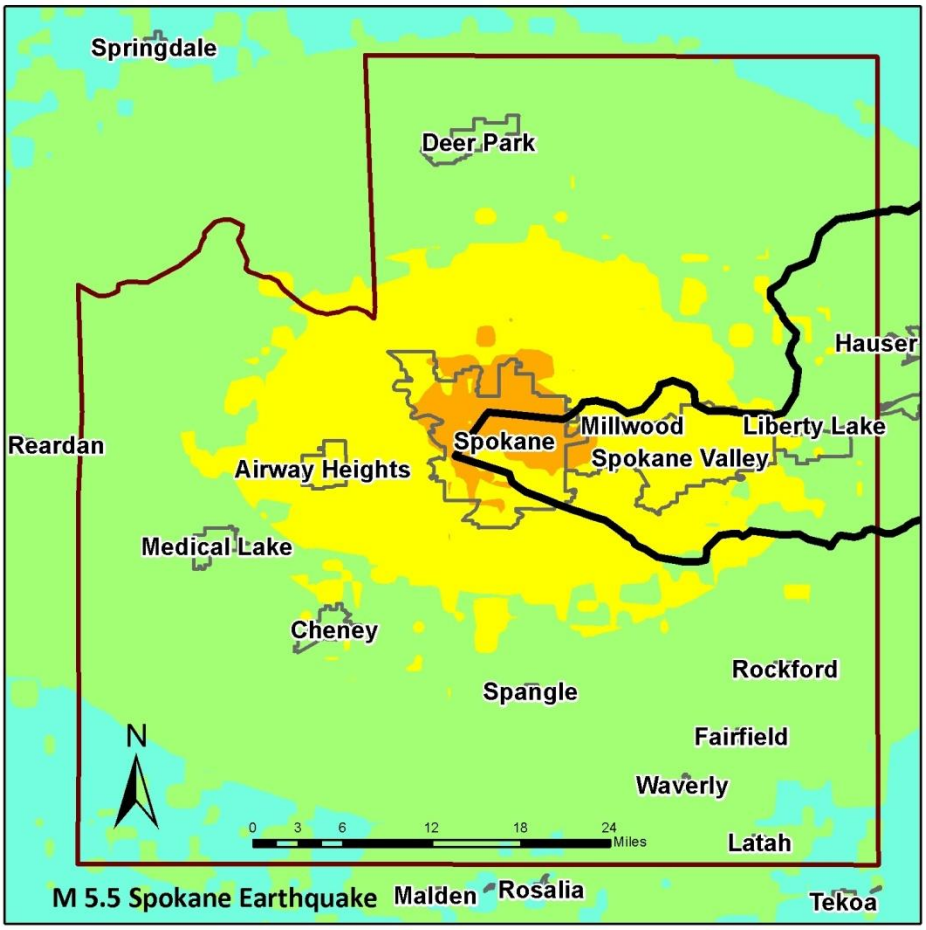
4. Earthquake Risk Analysis Results

The following pages provide general risk assessment results of the analyses at the county level.

Upper Spokane Watershed Earthquake Summary

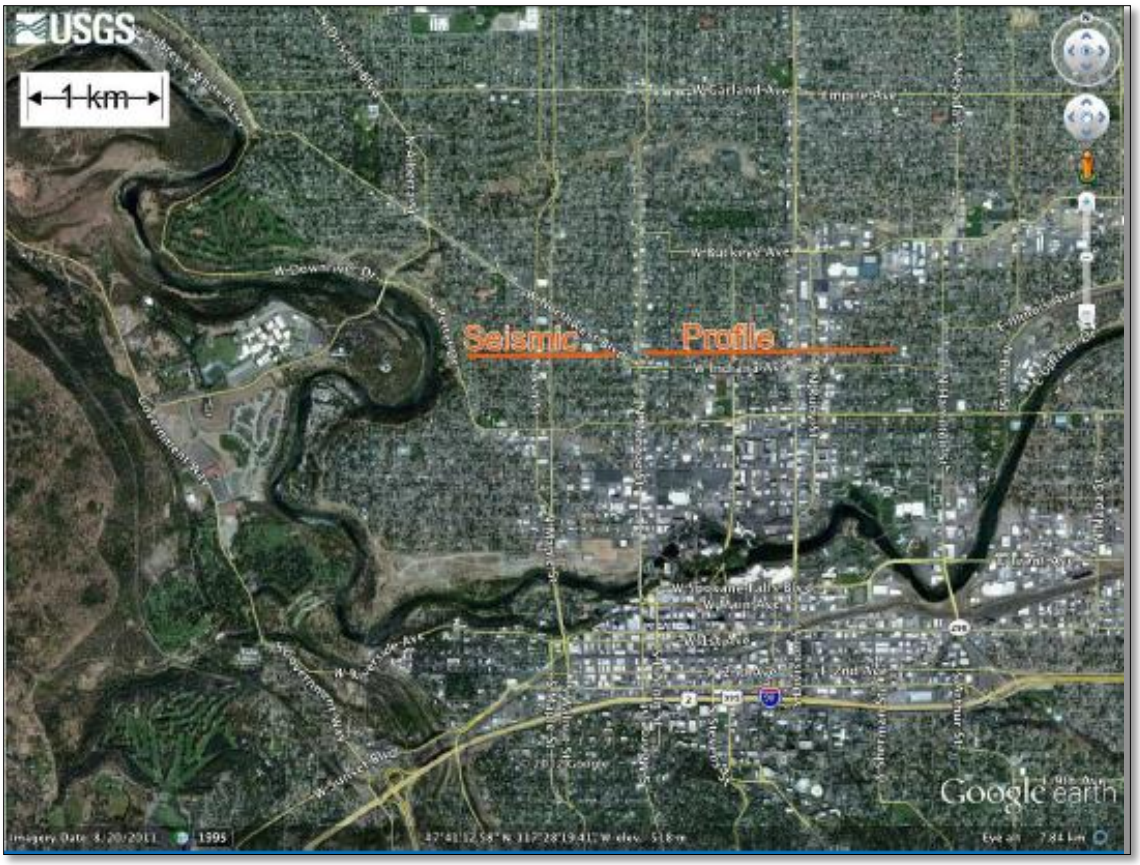
4.1 United States Geologic Survey (USGS) Scenario ShakeMap

Currently, there is no USGS ShakeMap for Kootenai County. Below is the closest USGS ShakeMap to the county and is a scenario event for a 5.5M earthquake centered on the City of Spokane. Areas of orange are the highest intensity shaking. This ShakeMap was created by the USGS in 2009.



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

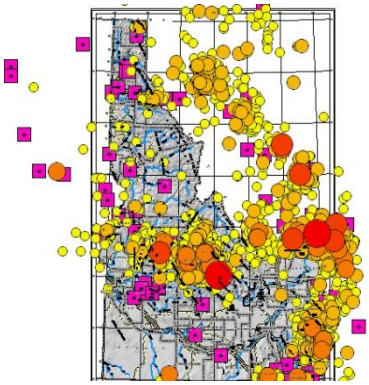
Effects to Kootenai County based on Hazus runs with this scenario displayed minimal to no damages. A more detailed Hazus run with updated data from the county may yield more damages and thus provide a more accurate planning tool. Updates can be conducted for soil data, liquefaction, general building stock, building type (wood frame, unreinforced masonry, etc.), and parcel information.



Seismic Profile of fault in Spokane being studied by USGS

Additional updates in Hazus can include new Shakemaps provided by the USGS. Currently, the USGS is conducting a study on a newly found fault north of Downtown Spokane. Once this fault is studied and understood, a new Shakemap may be generated. The USGS is currently installing new seismometers in the area and will soon begin trenching for fault analysis.

It is important to note that the limited seismic data available for Kootenai County does not mean the area is free of risk. The image below shows measured seismicity in Idaho greater than a M3.0 from 1872-2000. The presence of earthquakes demonstrates that seismicity is a risk throughout the State and appropriate planning and preparedness actions should be taken.



1872-2000 Instrumental Seismicity M> 3.0

5. Wildfire Risk Overview

5.1 Wildfire Overview

A Wildland-Urban Interface (WUI) fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. Kootenai County communities have an abundance of WUI areas identified where fuel reduction projects are identified.

The three factors that greatly affect how a wildfire will burn include fuel, topography, and weather. The type and amount of **fuel**, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components is also a factor. **Topography** affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the rate of speed at which the fire travels. **Weather** affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity, and wind (both short and long term) affect the severity and duration of wildfires.

5.2 Fire Regime Condition Class (FRCC)

Describing the fire regime and condition class of the fuels in the planning area will provide historical reference and a basic understanding of the wildfire risk to the community.

A fire regime can be described in cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval. You can access fire effects/fire ecology data to learn more about fire regime characterizations and summaries on plant, animal, and vegetation communities for your specific area by exploring the Fire Effects Information System (FEIS; www.fs.fed.us/database/feis/).

Table 5.1. The Five Historic Natural Fire Regime Groups

Fire Regime Group	Frequency (Fire Return Interval)	Severity
I	0-35 years	Low severity
II	0-35 years	Stand Replacement Severity
III	35-100+ years	Mixed Severity
IV	35-100+ years	Stand Replacement Severity
V	>200 years	Stand Replacement Severity

Fire regime condition class (FRCC) is a standardized tool for determining the degree to which current vegetation and fire regime conditions have departed from historical reference conditions.

Three “condition classes” have been developed to categorize the current condition with respect to each of the five historic Fire Regime Groups.

Table 5.2. Fire Regime Condition Class Classifications

Fire Regime	Condition Class Description	Potential Risks
Condition Class I	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	• 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) are low
Condition Class II	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	• 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 are moderate.
Condition Class III	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	• 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 are high

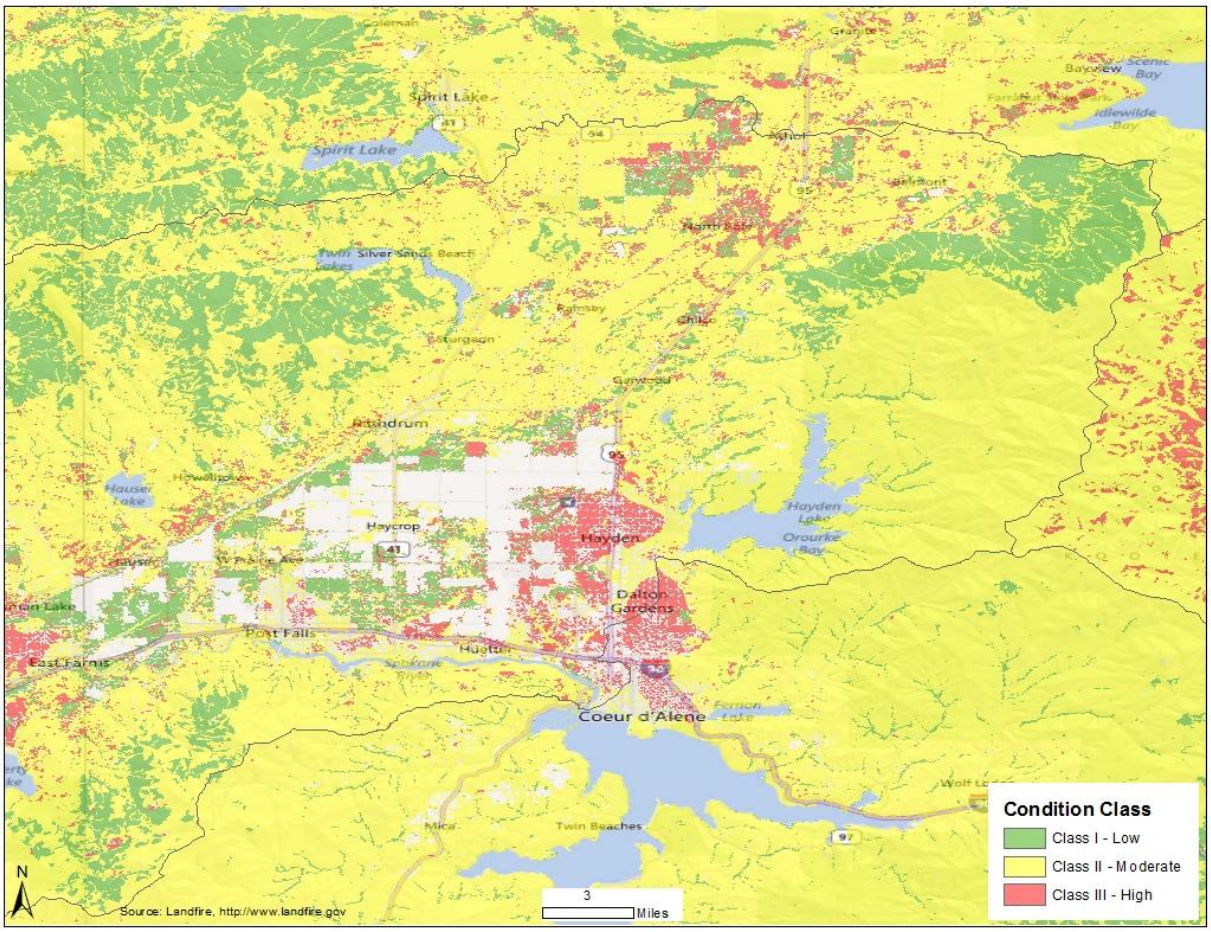
Source: http://www.nwcg.gov/teams/wfewt/archive/message/FrccDefinitions.pdf

A complete definition, background information, and the nationally consistent methodology for calculating and mapping fire regime condition class are available at www.frcc.gov. (NWCG)

Currently, the communities in Kootenai County can access and use the Fire Regime Condition Class datasets on Landfire (http://www.landfire.gov) to understand their wildfire risk. As Figure 5.1 demonstrates, generally the FRCC in the watershed is Class II. The areas of concern are those Class III located in the Wildland-Urban Interface areas. These may be areas with a great wildfire risk.

Keep in mind that FRCC data is limited because it is solely focused on the current natural conditions and doesn't consider local response capabilities, mitigation efforts, and other inputs that can affect the wildfire risk to a community. Enhancing this data set with local data will improve its effectiveness to understand wildfire risk.

Figure 5.1. Fire Regime Condition Class (FRCC) for Upper Spokane Watershed (Kootenai County)



Source: Landfire. http://www.landfire.gov

5.3 Data Gap

To asses and designate areas with wildfire risk, the *Kootenai County Community Wildfire Protection Plan* (CWPP) was developed. The document is the result of analyses, professional cooperation and collaboration, assessments of wildfire risks and other factors by the Kootenai County Wildland Urban Interface Fire Mitigation Planning Committee, a subcommittee of the Local Emergency Planning Committee. The intent of this document is to reduce the potential for wildfires that threaten people, structures, infrastructure, and the natural ecosystems in Kootenai County. The projects are re-evaluated each year and updated in the plan.

The *Kootenai County Multi-Jurisdictional All Hazard Mitigation Plan* (2009) identifies a variety of natural hazards and offers strategies to mitigate the risk to the hazards. The wildfire profile of the plan incorporates information from the Community Wildfire Protection Plan.

An important action item identified in the All Hazard Mitigation Plan, and validated through interviews with community officials in May and September 2012, is the lack of wildfire risk data to help better prioritize fuel treatment areas. There is no identified wildfire risk database that the County and Cities use.

A project that will provide an up-to-date wildfire risk assessment and accompanying database to address any data limitations that the community may have is the West Wide Wildfire Risk Assessment.

5.4 West Wide Wildfire Risk Assessment (WWA)

The West Wide Wildfire Risk Assessment is a 17 state and selected Pacific Islands effort led by the Council of Western State Foresters and the Western Forestry Leadership Coalition (WFLC). The project website (http://www.westwideriskassessment.com) states,

> "The WWA will produce a wildfire risk assessment to quantify the magnitude of the current wildland fire problem in the west and provide a baseline for quantifying mitigation activities and monitoring change over time. It will be used to facilitate national, regional and state level strategic planning and policy discussions. The methodology implemented will provide results comparable across the entire West providing a consistent basis for interpretation and use."

The deliverables for the project include

- **Comprehensive Wildfire Database:** A comprehensive GIS data repository reflecting current conditions will be developed. This GIS database will leverage existing federal mapping programs combined with state, tribal and local data. The database will not only be used to derive the assessment outputs but will also be delivered to support on-going fire protection planning efforts

- **Conducting the Wildfire Risk Assessment:** The assessment will utilize the GIS database and leverage existing proven risk models to derive measures of wildfire threat, fire effects, wildfire risk and communities-at-risk. Since a significant part of the fire problem in the west is associated with federal and tribal lands, and many of these fires affect state jurisdiction, the assessment will include all lands.

- **Final Report – Methods, Findings and Using the Assessment Products:** A summary of the risk assessment methods and findings will be developed including state and regional statistics. The assessment summary reports will facilitate comprehensive comparisons between regional geographic areas and states.

- **Technology Transfer** is a key element of the WWA project and outputs will be delivered with detailed information in a form ready to use by project partners. Nonetheless, it will be the responsibility of the user to be familiar with the value, assumptions, and accuracy of WWA products. More specific information will be developed as the assessment progresses.

Of importance to this Risk Report are the following model outputs which can be utilized to develop and prioritize projects based on wildfire risk in Kootenai County.

- **Wildland Fire Susceptibility Index** (Wildfire Threat)

- **Level of Concern Index** (Wildfire Risk)

Each state involved in the project has a designated point of contact. The Point of Contact for the State of Idaho is Andrew Mock, Department of Lands, Coeur d'Alene office. He can be contacted at (208) 666-8630 or amock@idl.idaho.gov.

All the communities within Kootenai County will benefit from the new data. It's expected that the data will be released by the end of 2012. The communities will be able to incorporate their own local data to help improve/refine the risk assessment so that it is more community specific.

5.5 References

Federal Emergency Management Agency (FEMA). August 2001. “Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2). Retrieved at: http://www.fema.gov/library/viewRecord.do?id=1880

National Wildfire Coordinating Group (NWCG). “Communicator's Guide for Wildland Fire Management: Fire Education, Prevention, and Mitigation Practices”. Retrieved at: http://www.nifc.gov/prevEdu/prevEdu_communicatorGuide.html

West Wide Wildfire Risk Assessment. http://www.westwideriskassessment.com

Before Mitigation and After Mitigation

Communities will need to prioritize projects as part of the planning process. FEMA can then help route federal mitigation dollars to fund these projects.

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: To reduce flood losses, to facilitate accurate insurance rating; and to promote the awareness of flood insurance.

For CRS participating communities, flood insurance premium rates are discounted in increments of 5%; i.e., a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount (a Class 10 is not participating in the CRS and receives no discount).

6 Actions to Reduce Risk

6.1 Types of Mitigation Actions

Mitigation provides a critical foundation on which to reduce loss of life and property by avoiding or lessening the impact of hazard events. This creates safer communities, and facilitates resiliency by enabling communities to return to normal function as quickly as possible after a hazard event. Once a community understands its risk, it is in a better position to identify potential mitigation actions that can reduce the risk to its people and property.

The mitigation plan requirements in 44 CFR Part 201 encourage communities to understand their vulnerability to hazards and take actions to minimize vulnerability and promote resilience. Mitigation actions generally fall into the following categories:

Preventative Measures
Preventative measures are intended to keep hazards from getting worse. They can reduce future vulnerability to flooding and/or the earthquake hazard, especially in areas where development has not yet occurred or where capital improvements have not been substantial.

- Comprehensive land use planning
- Zoning regulations
- Subdivision regulations
- Open space preservation
- Building codes
- Floodplain development regulations
- Stormwater management
- Purchase development rights or conservation easements
- Participation in the NFIP Community Rating System (CRS)

Property Protection Measures
Property protection measures protect existing buildings by modifying the building to withstand floods and/or earthquakes, or by removing buildings from hazardous locations.

- Building relocation
- Acquisition and clearance
- Building elevation
- Barrier installation
- Building retrofit

Natural Resource Protection Activities

Natural resource protection activities reduce the impact of floods by preserving or restoring natural areas such as floodplains, wetlands, and dunes and their natural functions. Examples include the following:

- Wetland protection
- Habitat protection
- Erosion and sedimentation control
- Best management practices (BMPs)
- Prevention of stream dumping activities (anti-litter campaigns)
- Improved forestry practices such as reforesting or selective timbering (extraction)

Structural Mitigation Projects

Structural mitigation refers to any physical construction to reduce or avoid possible impacts of hazards, which includes engineering measures and construction of hazard-resistant and protective structures and infrastructure. Structural protection such as upgrading dams/levees for already existing development and critical facilities may be a realistic alternative. However, citizens should be made aware of their residual risk.

- Reservoirs, retention, and detention basins
- Levees and floodwalls
- Channel modifications
- Channel maintenance
- Securing a structure's foundation
- Strengthening building frames, cripple walls, and facades

Public Education and Awareness Activities

Public education and awareness activities advise residents, business owners, potential property buyers, and visitors about floods, hazardous areas, and mitigation techniques that they can use to reduce risk to themselves and their property.

- Readily available and readable updated maps
- Outreach projects
- Library
- Technical assistance
- Real estate disclosure
- Environmental education
- Providing risk information via the nightly news

For more information regarding hazard mitigation techniques, best practices, and potential grant funding sources, visit www.fema.gov or contact your local floodplain manager, emergency manager, or State Hazard Mitigation Officer.

Emergency Services (ES) Measures

Although not typically considered a mitigation technique, emergency service measures minimize the impact of an event on people and property. These are actions commonly taken immediately prior to, during, or in response to a hazard event.

- Hazard warning system
- Emergency response plan
- COOP and COG planning
- Critical facilities protection
- Health and safety maintenance
- Post-event recovery planning

Table 6.1 below identifies possible mitigation actions for flooding risks

AOMI	***Possible Actions to Reduce Flood Risk***
Dams	*Engineering assessment* *Dam upgrades and strengthening* *Emergency Action Plan (EAPs)* *Dam removal* *Easement creation in impoundment and downstream inundation areas*
Levees (accredited and non-accredited) and significant levee-like structures	*Generally same as dams above* *Purchase of flood insurance for at-risk structures*
Coastal Structures *Jetties* *Groins* *Seawalls* *Other structures*	*Increase coastal setbacks for construction* *Habitat restoration programs* *Wetland restoration and mitigation banking programs*
Stream Flow Pinch Point *Undersized culverts or bridge openings*	*Engineering Analysis* *Replacement of structure pre- and post-disaster*
Past Claims and IA/PA Hot Spots	*Acquisition* *Elevation* *Relocation* *Floodproofing*
Major Land Use Changes (past 5 years or next 5 years)	*Higher regulatory standards, Stormwater BMPs, Transfer of Development rights, compensatory storage and equal conveyance standards, etc.*
Key emergency routes overtopped during frequent flooding events	*Elevation* *Creation of alternate routes* *Design as low water crossing*
Areas of Significant Riverine or Coastal Erosion	*Relocation of buildings and infrastructure, regulations and planning, natural vegetation, hardening*
Drainage or Stormwater Based Flood Hazard Areas, or Areas not Identified as Floodprone on the FIRM but known to be Inundated	*Identification of all flood hazard areas*
Areas of Mitigation Success	*N/A*

Table 6.2 below identifies possible mitigation actions for earthquake risks

AoMI	Possible Actions to Reduce Earthquake Risk
Building Assessments	*Identify vulnerable structures within your community* *Engineering assessment* *Prioritizing building retrofits or seismic upgrades* *Retrofitting of structural and non-structural components of critical facilities*
Building Codes	*Adopting current building codes that include the most current seismic code.* *Implementing seismic code design for all new buildings*
Liquefaction Mapping	*Increase area liquefaction mapping* *Protect natural resources that might be impacted by the built environment (i.e. pipelines, roadways, etc.)*
Soil Mapping	*Increase knowledge of local soils for better design of buildings, roads, and bridges.* *Increase knowledge of how soils can impact areas by addressing setbacks of unstable soils and steep slopes, this will minimize the risk of the community.*
Public Education & Safety	*Education of K-12, citizens, elected officials, developers and businesses on earthquake safety and building codes.* *Maintain an earthquake response plan to account for secondary hazards, such as fire and hazardous material spills.*

6.2 Identifying Specific Actions for your Community

As many mitigation actions are possible to lessen the impact of floods, how can a community decide which ones are appropriate to implement? There are many ways to identify specific actions most appropriate for a community. Some factors to consider may include the following:

- Political – Is there political support to implement the action? Have political leaders participated in the planning process?
- Site characteristics – Does the site present unique challenges (e.g., significant slopes, erosion potential)?
- Flood characteristics – Are the flood waters affecting the site fast or slow moving? Is there debris associated with the flow? How deep is the flooding?
- Social acceptance – Will the mitigation action be acceptable to the public? Does it cause social or cultural problems?
- Technical feasibility – Is the mitigation action technically feasible (e.g., making a building watertight to a reasonable depth)?
- Administrative feasibility – Is there administrative capability to implement the mitigation action?
- Legal – Does the mitigation action meet all applicable codes, regulations, and laws? Public officials may have a legal responsibility to act and inform citizens if a known hazard has been identified.

Refer to FEMA Mitigation Planning How To Guide #3 (FEMA 386-3) "Developing the Mitigation Plan - identifying mitigation actions and implementation strategies" for more information on how to identify specific mitigation actions to address hazard risk in your community.

FEMA, in collaboration with the American Planning Association, has released the publication, "Integrating Hazard Mitigation into Local Planning." This guide explains how hazard mitigation can be incorporated into several different types of local planning programs. For more information go to www.planning.org. or http://www.fema.gov/library.

- Economic — Is the mitigation action affordable? Is it eligible under grant or other funding programs? Can it be completed within existing budgets?

- Environmental – Does the mitigation action cause adverse impacts on the environment or can they be mitigated? Is it the most appropriate action among the possible alternatives?

Your local Hazard Mitigation Plan is a valuable place to identify and prioritize possible mitigation actions. The plan includes a mitigation strategy with mitigation actions that were developed through a public and open process. You can then add to or modify those actions based on what is learned during the course of the Risk MAP project and the information provided within this Risk Report.

6.3 Mitigation Programs and Assistance

Not all mitigation activities require funding (e.g., local policy actions such as strengthening a flood damage prevention ordinance), and those that do are not limited to outside funding sources (e.g. include in local capital improvements plan, etc.). For those mitigation actions that require assistance through funding or technical expertise, several State and Federal agencies have flood hazard mitigation grant programs and offer technical assistance. These programs may be funded at different levels over time or may be activated under special circumstances such as after a presidential disaster declaration.

FEMA Mitigation Programs and Assistance

FEMA awards many mitigation grants each year to States and communities to undertake mitigation projects to prevent future loss of life and property resulting from hazard impacts. The FEMA Hazard Mitigation Assistance (HMA) programs provide grants for mitigation through the programs listed in Table 6.3 below.

Communities can link hazard mitigation plans and actions to the right FEMA grant programs to fund flood risk reduction. More information about FEMA HMA programs can be found at http://www.fema.gov/government/grant/hma/index.shtm.

Table 6.3 FEMA Hazard Mitigation Assistance Programs

Mitigation Grant Program	Authorization	Purpose
Hazard Mitigation Grant Program (HMGP)	Robert T. Stafford Disaster Relief and Emergency Assistance Act	Activated after a presidential disaster declaration; provides funds on a sliding scale formula based on a percentage of the total federal assistance for a disaster for long-term mitigation measures to reduce vulnerability to natural hazards
Flood Mitigation Assistance (FMA)	National Flood Insurance Reform Act	Reduce or eliminate claims against the NFIP
Pre-Disaster Mitigation (PDM)	Disaster Mitigation Act	National competitive program focuses on mitigation project and planning activities that address multiple natural hazards

Repetitive Flood Claims (RFC)	Bunning-Bereuter-Blumenauer Flood Insurance Reform Act	Reduce flood claims against the NFIP through flood mitigation; properties must be currently NFIP insured and have had at least one NFIP claim
Severe Repetitive Loss (SRL)	Bunning-Bereuter-Blumenauer Flood Insurance Reform Act	Reduce or eliminate the long-term risk of flood damage to SRL residential structures currently insured under the NFIP

The HMGP and PDM programs offer funding for mitigation planning and project activities that address multiple natural hazard events. The FMA, RFC, and SRL programs focus funding efforts on reducing claims against the NFIP. Funding under the HMA programs is subject to availability of annual appropriations and under HMGP to the amount of FEMA disaster recovery assistance under a presidential major disaster declaration.

The Silver Jackets program, active in several states, is a partnership of the USACE, FEMA and state agencies. The Silver Jackets program provides a state-based strategy for an interagency approach to planning and implementing measures for risk reduction.

FEMA's HMA grants are awarded to eligible States, Tribes, and Territories (Applicant) that, in turn, provide subgrants to local governments and communities (subapplicant). The Applicant selects and prioritizes sub-applications developed and submitted to them by subapplicants and submits them to FEMA for consideration of funding. Prospective subapplicants should consult the office designated as their Applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers is available on the FEMA website.

Additional Mitigation Programs and Assistance

Several additional agencies including the US Army Corps of Engineers (USACE), Natural Resource Conservation Service (NRCS), US Geological Survey (USGS), and others have specialists and a lot of information hazard mitigation.

The State NFIP Coordinator and State Hazard Mitigation Officer are state level sources of information and assistance, which vary among different states.

Appendix A: Acronyms and Definitions

ACRONYMS

A

AAL	Average Annualized Loss
ALR	Annualized Loss Ratio

B

BCA	Benefit-Cost Analysis
BFE	Base Flood Elevation

C

CFR	Code of Federal Regulations
COG	Continuity of Government Plan
COOP	Continuity of Operations Plan
CRS	Community Rating System

D

DHS	Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000

E

EOP	Emergency Operations Plan

F

FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FRD	Flood Risk Database
FRM	Flood Risk Map
FRR	Flood Risk Report
FY	Fiscal Year

G

GIS	Geographic Information System

H

HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program

N

NFIA	National Flood Insurance Act
NFIP	National Flood Insurance Program
NRCS	Natural Resource Conservation Service

P

PDM	Pre-Disaster Mitigation

R

RFC	Repetitive Flood Claims
Risk MAP	Mapping, Assessment, and Planning

S

SFHA	Special Flood Hazard Area
SHMO	State Hazard Mitigation Officer
SRL	Severe Repetitive Loss

U

USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

DEFINITIONS

1-percent-annual-chance flood – The flood elevation that has a 1-percent chance of being equaled or exceeded each year. Sometimes referred to as the 100-year flood.

0.2-percent-annual-chance flood – The flood elevation that has a 0.2-percent chance of being equaled or exceeded each year. Sometimes referred to as the 500-year flood.

Average Annualized Loss (AAL) – The estimated long-term weighted average value of losses to property in any single year in a specified geographic area

Annualized Loss Ratio (ALR) – expresses the annualized loss as a fraction of the value of the local inventory (total value/annualized loss).

Base Flood Elevation (BFE) – Elevation of the 1-percent-annual-chance flood. This elevation is the basis of the insurance and floodplain management requirements of the NFIP.

Berm – A small levee, typically built from fill dirt.

CFS – Cubic feet per second, the unit by which discharges are measured (a cubic foot of water is about 7.5 gallons).

Consequence (of flood) – The estimated damages associated with a given flood occurrence.

Crest – The peak stage or elevation reached or expected to be reached by the floodwaters of a specific flood at a given location.

Dam – Any artificial barrier that impounds or diverts water and that: (1) is 25 feet or more in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier or from the lowest elevation of the outside limit of the barrier if it is not across a stream channel or watercourse, to the maximum water storage elevation or (2) has an impounding capacity at maximum water storage elevation of 50 acre-feet or more.

Design flood event – The greater of the following two flood events: (1) the base flood, affecting those areas identified as SFHAs on a community's FIRM; or (2) the flood corresponding to the area designated as a flood hazard area on a community's flood hazard map or otherwise legally designated.

Earthquake – The result of a sudden release of energy in the Earth's crust that creates seismic waves.

Epicenter – is the point on the Earth's surface that is directly above the point where the fault begins to rupture.

Erosion – Process by which floodwaters lower the ground surface in an area by removing upper layers of soil.

Essential facilities – Facilities that, if damaged, would present an immediate threat to life, public health, and safety. As categorized in HAZUS-MH, essential facilities include hospitals, emergency operations centers, police stations, fire stations and schools.

Fault – A fracture or discontinuity in a volume of rock, across which there has been significant displacement along the fractures as a result of earth movement. Energy release associated with rapid movement on active faults is the cause of most earthquakes.

Flood – A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is your property) from: overflow of inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; mudflow; or collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Flood Insurance Rate Map (FIRM) – An official map of a community, on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. See also Digital Flood Insurance Rate Map.

Flood Insurance Study (FIS) – Contains an examination, evaluation, and determination of the flood hazards of a community, and if appropriate, the corresponding water-surface elevations.

Flood risk – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of flooding. Sometimes referred to as vulnerability.

Floodborne debris impact – Floodwater moving at a moderate or high velocity can carry floodborne debris that can impact buildings and damage walls and foundations.

Floodwall – A long, narrow concrete or masonry wall built to protect land from flooding.

Floodway (regulatory)– The channel of a river or other watercourse and that portion of the adjacent floodplain that must remain unobstructed to permit passage of the base flood without cumulatively increasing the water surface elevation more than a designated height (usually 1 foot).

Floodway fringe – This is the portion of the SFHA that is outside of the floodway.

Flow pinch point – A point where a human-made structure constricts the flow of a river or stream.

Freeboard – The height above the base flood added to a structure to reduce the potential for flooding. The increased elevation of a building above the minimum design flood level to provide additional protection for flood levels higher than the 1-percent chance flood level and to compensate for inherent inaccuracies in flood hazard mapping.

Geodesy – The branch of science concerned with determining the exact position of geographical points and the shape and size of the earth.

HAZUS-MH – A GIS-based risk assessment methodology and software application created by FEMA and the National Institute of Building Sciences for analyzing potential losses from floods, hurricane winds, and earthquakes.

High velocity flow – Typically comprised of floodwaters moving faster than 5 feet per second.

Hot Spot – A volcanic area that forms as a tectonic plate moves over a point heated deep within the Earth's mantle.

Intensity (of earthquake shaking) – based on the Modified Mercalli Intensity Scale, is a subjective description of the physical effects of the shaking based on observations at the event site. Using this scale, a value of I is the least intense motion, and XII is the greatest. Unlike magnitude, intensity can vary from place to place.

Liquefaction – Soil liquefaction describes a phenomenon whereby a saturated soil substantially loses strength and stiffness in response to an applied stress, usually an earthquake, causing it to behave like a liquid.

Loss Ratio – expresses loss as a fraction of the value of the local inventory (total value/ loss).

Levee – A manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

Magnitude – A scale used by seismologists to measure the size of earthquakes in terms of the energy released.

Mudflow – A river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water.

Normal Fault – A fault where two blocks of rock are pulled apart, as in tension (as opposed to rock being pushed together or slid horizontally)

Probability (of flood) – The likelihood that a flood will occur in a given area.

Risk MAP – The vision of this FEMA strategy is to work collaboratively with State, local, and tribal entities to deliver quality flood data that increases public awareness and leads to action that reduces risk to life and property.

Riverine – Of or produced by a river. Riverine floodplains have readily identifiable channels.

Special Flood Hazard Area (SFHA) – Portion of the floodplain subject to inundation by the base flood.

Stafford Act – Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-707, signed into law November 23, 1988; amended the Disaster Relief Act of 1974, PL 93-288. This Act constitutes the statutory authority for most federal disaster response activities especially as they pertain to FEMA and FEMA programs.

Stillwater – A rise in the normal level of a water body.

Vulnerability – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of flooding. Sometimes referred to as flood risk.

Appendix B: Additional Resources

For a more comprehensive picture of a community's flood risk, FEMA recommends that State and local officials use the information provided in this report in conjunction with other sources of flood risk data, such as those listed below.

- Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FISs). This information indicates areas with specific flood hazards by identifying the limit and extent of the 1-percent-annual-chance floodplain and the 0.2-percent-annual-chance floodplain. FIRMs and FISs do not identify all floodplains in a study area. The FIS includes summary information regarding other frequencies of flooding, as well as flood profiles for riverine sources of flooding. In rural areas, and areas for which flood hazard data are not available, the 1-percent-annual-chance floodplain may not be identified. In addition, the 1-percent-annual-chance floodplain may not be identified for flooding sources with very small drainage areas (less than 1 square mile).

- Flood or multi-hazard mitigation plans. Local hazard mitigation plans include risk assessments that contain flood risk information and mitigation strategies that identify community priorities and actions to reduce flood risk. This report was informed by any existing mitigation plans in the study area.

- Other risk assessment reports. HAZUS-MH, a free risk assessment software application from FEMA, is the most widely used flood risk assessment tool available. HAZUS-MH can run different scenario floods (riverine and coastal) to determine how much damage might occur as a result. HAZUS-MH can also be used by community officials to evaluate flood damage that can occur based on new/proposed mitigation projects or future development patterns and practices. HAZUS-MH can also run specialized risk assessments such as what happens when a dam or levee fails. Flood risk assessment tools are available through other agencies as well, including the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Army Corps of Engineers (USACE). Other watershed reports may exist that have a different focus, such as water quality, but that may also contain flood risk and risk assessment information. See Appendix B for additional resources.

ASCE 7 – National design standard issued by the American Society of Civil Engineers, *Minimum Design Loads for Buildings and Other Structures*, which gives current requirements for dead, live, soil, flood, wind, snow, rain, ice, and earthquake loads, and their combinations, suitable for inclusion in building codes and other documents.

ASCE 24-05 – National design standard issued by the American Society of Civil Engineers, *Flood Resistant Design and Construction*, which outlines the requirements for flood resistant design and construction of structures in flood hazard areas.

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Appendix C: First Pass Analysis

Upper Spokane Watershed Background Information	Spokane County											
Name of flooding source	Spokane River	Saltese Creek	Saltese Flats	Chester Creek	Unnamed Tributary to Chester Creek	Liberty Lake Drainage	Cable Creek	Argonne Drainage	Forker Draw	Newman Lake	Newman Creek	Thompson Creek
CNMS Mileage	Total AE Mi=43 AE = 30 mi in Spokane Co., 13mi Kootenai Co., Total A Mi=1 A =0.6 mi in Spokane Co., 0.4 mi Kootenai Co.	AE = 2.6 mi; A = 1.4 mi	AE	AE = 6.4mi;	AE = 2.3mi	AE=3.8mi	A = 2.4 mi	AE = 1.4 mi	AE = 1.02mi; A = 0.33mi	AE=2.7	AE=1.1 mi A= 0.8mi	A = 1.7mi
CNMS Validatation status	Unkown	AE = Valid, A = Unknown	Valid	Valid	Valid	Valid	Unknown	Valid	Valid	Valid	AE = Valid A = Unknown	Unknown
Date of effective analysis	1976 (Spokane Co. FIS, July 6, 2010) & 1986 (Kootenai Co. FIS, May 3, 2010)	1983 (Spokane Co. FIS, July 6, 2010)	1983 (Spokane Co. FIS, July 6, 2010)	2006 (Spokane Co. FIS, July 6, 2010)	2006 (Spokane Co. FIS, July 6, 2010)	1990 (Spokane Co. FIS, July 6, 2010)	1976 (Spokane Co. FIS, July 6, 2010)	2008 (Spokane Co. FIS, July 6, 2010)	2007 (Spokane Co. FIS, July 6, 2010)	1983 (Spokane Co. FIS, July 6, 2010)	Tributary to Newman Lake; no discussion in the FIS	Tributary to Newman Lake; no discussion in the FIS
Hydrologic Model Used	Different LPIII analyses across the stateline, resulting in different effective discharges. Analysis for Spokane County (originally done for City of Spokane, 1976) were based on Spokane gage and separated winter/rainfall floods from spring/snowmelt floods. Analysis for Kootenai County (1986) was based on Post Falls, ID, gage, did not separate flood events.	TR 20	TR 20	HSPF	HSPF	HEC-1	-	Regression equations (USGS, 2002)	Regression equations (USGS, 2002)	TR -20		
Hydraulic Model Used	WSP2 in Spokane Co.; HEC-2 in Kootenai Co.	WSP2	WSP2	HEC-RAS	HEC-RAS	-	Flooding based on stereophotography and geomorphological characteristics of floodplain	HEC-RAS	HEC-RAS	-		
Availability of H&H models	Available as PDF documents	Not available	Not available	Available in digital format	Available in digital format	Not available	Not aplicable	Available in digital format	Available in digital format	Not available	Not available	Not available
Critical Issues for Needs Assessment	RiskMap Watershed approach: Hydrologic analyses need to be consistent within HUC-8, methods and models need to agree at transitions (not the case for Spokane River); WSP2 no longer accepted by FEMA	WSP2 no longer accepted by FEMA	WSP2 no longer accepted by FEMA						Presence of alluvial fan			
Secondary Issues for Needs Assessment		Saltese Creek has been rerouted around the lower part of Saltese Flats.										
Availability of better topography / bathymetry	LiDAR - Spokane County, 2007; Kootenai County, 2011	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007); no LiDAR available in the reach in Kootenai Co.	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007)	LiDAR (Spokane County, 2007) - available for area currently classified as Zone A	No	No

Upper Spokane Watershed Background Information	Kootenai County											
Name of flooding source	Rathdrum Creek	Twin Lakes	Fish Creek	East Green Acres Main Ditch	Hauser Lake	Hauser Creek	Lost Creek	Sage Creek	Green Creek	Lewellen Creek	Hayden Lake	Nettleton Gulch
CNMS Mileage	AE =0.22 mi; A = 8.4 mi	A	A = 5 mi	AE = 1 mi A = 0.3mi	A	A=0.7 mi	A= 2.8mi	A = 4.5 mi	A= 0.4 mi	A = 3.8 mi	A	AE = 1.52 mi
CNMS Validatation status	Unkown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Date of effective analysis	1980 (Kootenai Co. FIS, May 3, 2010)	1980 (Kootenai Co. FIS, May 3, 2010)	Tributary to Twin Lakes/Rathdrum; no discussion in the FIS	Tributary to Rathdrum; no discussion in the FIS	1980 (Kootenai Co. FIS, May 3, 2010)	Tributary to Hauser Lake; no discussion in the FIS	Drains into Spokane; no discussion in the FIS	Upper NE corner of watershed; no discussion in the FIS	Upper NE corner of watershed, tributary to Sage; no discussion in the FIS	Upper NE corner of watershed; no discussion in the FIS	1980 (Kootenai Co. FIS, May 3, 2010)	1984 (Kootenai Co. FIS, May 3, 2010)
Hydrologic Model Used	Unit runoff vs drainage area curves, developed from regionalized frequency analysis of 11 streamflow gages located throughout Northern Idaho (only for reach downstream of Twin Lakes)	Statistical analysis of lake levels	-	Unit runoff vs drainage area curves, developed from regionalized frequency analysis of 11 streamflow gages located throughout Northern Idaho	Inflow/Outflow routing	-	-	-	-	-	Statistical analysis of lake levels	Unit runoff vs drainage area curves, developed from regionalized frequency analysis of 11 streamflow gages located throughout Northern Idaho
Hydraulic Model Used	HEC-2	-	Based on historical flooding data, USGS Flood-Prone Maps, correlation with other streams studied in detail; no modeling.	-	-	Based on historical flooding data, USGS Flood-Prone Maps, correlation with other streams studied in detail; no modeling.	Based on historical flooding data, USGS Flood-Prone Maps, correlation with other streams studied in detail; no modeling.	Based on historical flooding data, USGS Flood-Prone Maps, correlation with other streams studied in detail; no modeling.	Based on historical flooding data, USGS Flood-Prone Maps, correlation with other streams studied in detail; no modeling.	Based on historical flooding data, USGS Flood-Prone Maps, correlation with other streams studied in detail; no modeling.	-	HEC-2
Availability of H&H models	Available as PDF documents	Not available	Not aplicable	Not available	Not available	Not aplicable	Not aplicable	Not aplicable	Not aplicable	Not aplicable	Not available	Not available
Critical Issues for Needs Assessment	New regression equations for Idaho (USGS, 2002)			New regression equations for Idaho (USGS, 2002)								New regression equations for Idaho (USGS, 2002)
Secondary Issues for Needs Assessment	Channel configuration changed since effective study, either because of channel migration or developments within the City of Rathdrum.		New regression equations for Idaho (USGS, 2002)			New regression equations for Idaho (USGS, 2002)	New regression equations for Idaho (USGS, 2002)	New regression equations for Idaho (USGS, 2002)	New regression equations for Idaho (USGS, 2002)	New regression equations for Idaho (USGS, 2002)		
Availability of better topography / bathymetry	Aerial photography, 2006 (Kootenai Co. FIS, May 3, 2010)	No	No	No	No	No	No	No	No	No	No	LiDAR - Kootenai County, 2011

Appendix D: Upper Spokane Watershed Outreach Handouts

FEMA

Developing a Home for Wildfires

Developers play an important role in determining a home's resistance to wildfires. All phases of the construction process, from planning to implementation, can have a significant impact during any wildfire event. Aspects to be considered include location, building materials, and complying with Firewise standards. For more information, contact your local fire department or firewise.org.

Pre-Construction Design

- ☐ Choose a site away from heavily vegetated areas.
- ☐ Build on the most level portion of the property.
- ☐ Avoid ridgetops, canyons and areas between high points on a ridge. These are extremely hazardous locationsfor houses and fire-fighters because they become natural chimneys, increasing the intensity of the fire.

- ☐ Design decks so that they are not located at the top of a hill directly in the line of a fire moving up slope.

Building Materials & Considerations

- ☐ Use fire-resistive or non-combustible building materials. Whenever possible, use *brick*, *rock*, or *stucco*—they resist fire much better than wood.
- ☐ Your roof has the largest surface area of your structure and is also the most vulnerable, exposed exterior of your house. Use class A or B roofing materials, such as *asphalt shingles*, *slate* or *clay tile*, or *metal*.
- ☐ Use a minimum of Class III flame-spread rated siding material, from the ground to the roof overhang.
- ☐ A building's foundation often comes in contact with wildfire first, enclose them with concrete block, cement walls, or other fire-resistive building materials.
- ☐ Minimize the size and number of windows on the downhill side of the house or the side that would most likely be exposed to wildfire. Consider both size and material for not only windows but sliding glass doors. Multi-paned glass provides more protection from radiant heat than single-paned.
- ☐ To prevent spark and embers from entering your home, cover attic and vent spaces with 1/8-inch wire mesh.
- ☐ Install eave and soffit vents closer to the roof line than the walls.

FEMA

Preparing your Home for Wildfire

In order to make your home as defensible as possible against wildfire risk, there are a host of measures that can be taken. This list is not exhaustive, but does provide a number of safety measures to better protect your property during fire season. It is recommended that you create a 30 to 100 foot safety zone around your home. Within this area, you can take steps to reduce potential exposure to flames and radiant heat. Homes built within pine forests should have a *minimum* safety zone of 100 feet. If your home sits on a steep slope, additional safety precautions should be taken. Contact your local fire department or forestry service for additional information.

- ✓ Rake leaves, dead limbs and twigs. Clear all flammable vegetation.
- ✓ Remove leaves and rubbish from under structures.
- ✓ Thin a 15-foot space between tree crowns, and remove limbs within 15 feet of the ground.
- ✓ Remove dead branches that extend over the roof.
- ✓ Prune tree branches and shrubs within 15 feet of a stovepipe or chimney outlet.
- ✓ Ask the power company to clear branches from powerlines.
- ✓ Remove vines from the walls of the home.
- ✓ Mow and water grass regularly, it should be no more than 6 icnhes tall at any given time.
- ✓ Clear a 10-foot area around propane tanks and the barbecue. Place a screen over the grill - use nonflammable material with mesh no coarser than one-quarter inch.
- ✓ Regularly dispose of newspapers and rubbish at an approved site. Follow local burning regulations.
- ✓ Place stove, fireplace and grill ashes in a metal bucket, soak in water for 2 days; then bury the cold ashes in mineral soil.
- ✓ Store gasoline, oily rags and other flammable materials in approved safety cans. Place cans in a safe location away from the base of buildings.
- ✓ Stack firewood at least 100 feet away and uphill from your home. Clear combustible material within 20 feet. Use only wood-burning devices evaluated by a nationally recognized laboratory, such as Underwriters Laboratories (UL).

FEMA

Severe Storms

SPOKANE COUNTY

LOCAL HISTORY

All areas of Spokane County are vulnerable to severe storms and extreme winter weather annually. Affects can range from minor disruptions in transportation and utility functions to major structural damage and business closures. The best way to prevent these losses is to prepare *before*, *during*, and *after* severe stroms occur. As a resident of Spokane County, it is important to recognize the risks associated with your area and to start thinking about what you can do in and around your own home and local community. This handout will help you identify a variety of simple steps you can take today as well as offer multiple long-term approaches to reducing the overall risk from severe winter weather and storms.

UNDERSTANDING YOUR RISK

In recent years, Spokane County has experienced severe weather in multiple forms. Windstorms occur frequently with sustained gusts of up to 50 mph. Funnel clouds may produce damaging hail, heavy rain and wind. Drifting often results from blizzards and snowstorms, leaving large amounts of snow in compact areas. Ice and hail storms can damage trees, crops, utility wires, as well as both private and public infrastructure throughout the area.

DATE	**April 1972**	**Nov. 1981**	**Dec. 1995**	**April 1996**	**Nov. 1996**	**Dec. 1996**	**Dec .1996**	**May 1997**
TYPE OF STORM	Tornado	Wind	Rain, Flood, & Wind	Rain, Flood, & Wind	Ice Storm	Winter storm, Ice, Wind, & Gale Warning	Winter storm, Ice, Wind, Gale, Landslide & Avalanche	Tornado and Thunder-storm

FEMA

REDUCING YOUR RISK

BEFORE

- Have a 72-hour kit prepared and ready within the home.
- Winterize your home by insulating walls and attics, caulking and weather-stripping doors and windows, and installing storm windows or covering windows with heavy plastic.

- Clear rain gutters, repair roof leaks, and cut away tree branches that may fall on a your house or other structures during a storm.
- Inspect the structural ability of your roof to sustain heavy accumulations of snow, water, or ice--you may need to consult a contractor.
- Know how to operate and shut off water valves (in case pipes burst); maintain heating equipment and chimneys by having them cleaned and inspected annually.

DURING

- Stay indoors during the storm; drive only if absolutely necessary and keep someone informed of your destination and time of travel.
- Keep dry. Change wet clothing frequqently to prevent loss of body heat.
- Know and watch for signs of frostbite, hypothermia, and overexertion.
- If the pipes freeze, remove any insulation or layers of newspapers and wrap pipes in rags. Completely open all faucets and and pour hot water over the pipes, starting where they were most exposed to the cold.
- If you will be going away during cold weather, leave the heat on in your home, set to a temperature of at least 55°F.

AFTER

- Go to a designated public shelter if your home loses power during periods of extreme cold.
  Text: **SHELTER** + your ZIP code to **43362** (FEMA) to find the nearest shelter in your area. Example: *shelter 99202*
- Continue to protect yourself from frostbite and hypothermia by wearing warm, loose-fitting, light-weight clothing in several layers.
- Stay indoors as much as possible, until the weather has subsided enough to be out.

For a more thorough list of Risk Reduction Recommendations, please visit: [www.ready.gov]

Wildfires

LOCAL HISTORY

All areas of Spokane County have a high probability of experiencing wildland fire. The fire season ranges from mid-May through October and is often extended with exceptionally dry weather patters. Affects can range from minor disruptions in transportation and utility functions to major structural damage to both homes and businesses. The best way to prevent these losses is to prepare *before*, *during*, and *after* fire season. As a resident of Spokane County, it is important to recognize the risks associated with your area and to start thinking about what you can do in and around your own home and local community. The following information will help you identify a variety of simple steps you can take today as well as offer multiple long-term approaches to reducing the overall risk from wildfires.

UNDERSTANDING YOUR RISK

DATE	NAME	AREA	ACRES	DEATHS
August 20, 1910	Great Idaho Fire	Over 150,000 acres burned in Spokane, Pend Orielle Counties.	3,000,000	85
1987	Hangman Hills	24 residences lost	1,500	2
October 1991	Firestorm 1991	93 fires destroyed 114 homes and 40 buildings in Ferry, Lincoln, Stevens, Pend Orielle, Spokane, and Whitman Counties.	35,000	1
August 12, 1996	Bowie Road	Spokane County	3,000	
August 14, 1997	Newkirk/Redlake	Spokane & Stevens County	1,750	
Summer 2000	2000 Wildfires	Spokane, Stevens, Ferry, Whitman, Lincoln Counties	300,000	

FEMA

REDUCING YOUR RISK

BEFORE

- Design and landscape your home with wildfire safety in mind. Select materials and plants that help contain fire rather than fuel it.
- Plant fire resistant shrubs and trees; Hardwood trees are *less* flammable than evergreen, pine, eucalyptus or fir trees.
- Regularly clean gutters and roof.
- Have your chimney cleaned and inspected at least twice a year, contact your local fire department for exact specifications regarding spark arrester installations.

- Use 1/8-inch mesh screens beneath porches, decks, floor areas and the home itself. Screen opening to floors, roof, and attic so that burning embers cannot accumulate.

DURING

- If advised to evacuate your home, do so immediately. Be sure to take your disaster supply kit, lock your home, and choose a route that travels away from the fire hazard.
- If you haven't received evacuation orders, FEMA recommends you take the following precautions:
  - Gather fire tools such as rake, axe, handsaw/chainsaw, and shovel.
  - Close outside attic, eaves and basement vents, windows, doors and pet doors. Remove flammable drapes and curtains.
  - Shut off any natural gas or fuel supplies at the source.
  - Close all doors inside the house to prevent draft. Open the damper on your fireplace, but close the fireplace screen.

AFTER

- If you have evacuated, do not enter your home until fire officials say it is safe.
- If you remained at home, check the roof immediately after the fire danger has passed. Put out any roof fires, sparks, or embers, check the attic for any hidden burning sparks.
- Follow public health guidelines regarding safe fire ash clean up and use of masks.

For a more thorough list of Risk Reduction Recommendations, please visit: www.ready.gov