Boise County, Idaho
All Hazards
Mitigation Plan

Flood Mitigation Plan

Earthquake Mitigation Plan

Landslide Mitigation Plan

Severe Weather Mitigation Plan

November 11th, 2005

Vision: *Institutionalize and promote a countywide hazard mitigation ethic through leadership, professionalism, and excellence, leading the way to a safe, sustainable Boise County.*

This plan was developed by the Boise County Hazards Mitigation Planning Committee in cooperation with Northwest Management, Inc., 233 E. Palouse River Drive P.O. Box 9748, Moscow, Idaho 83843, Phone: (208) 883-4488, Fax: (208) 883-1098, www.Consulting-Foresters.com

Acknowledgments

This All Hazards Mitigation Plan represents the efforts and cooperation of a number of organizations and agencies, through the commitment of people working together to improve the preparedness for hazard events while reducing factors of risk.

Boise County Commissioners
and the employees of Boise County

West Central Highlands Resource
Conservation and Development Council

USDI Bureau of Land Management

USDA Forest Service

Idaho Bureau of Homeland Security

Federal Emergency Management Agency

Idaho Department of Lands

Boise County Disaster Services
Centerville Volunteer Fire Department
Clear Creek Volunteer Fire Department
Garden Valley Rural Fire Department
Gem County II Fire District
Grand Jean Fire District
Horseshoe Bend Fire Department
Idaho City Volunteer Fire Department
Lowman Volunteer Fire Department
Placerville Fire Protection District
Robie Creek Volunteer Fire Department
Wilderness Ranch Volunteer Fire Department
Valley of the Pines Fire Department
Cities of Idaho City, Placerville, Horseshoe Bend, and Crouch
Local Businesses and Citizens of Boise County

To obtain copies of this plan contact:

Boise County Disaster Services
c/oBoise County Sheriffs Office
3851 Highway 21
Idaho City ID, 83631
Phone:208-392-4411
Fax: 208.-392-4104

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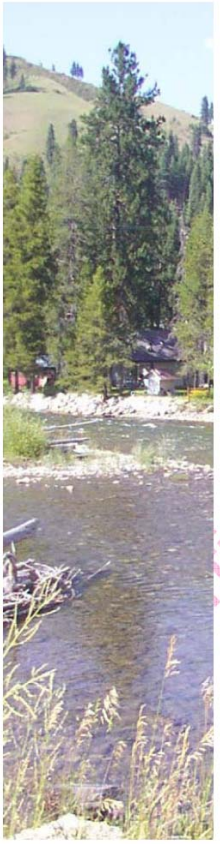
Foreword

The **Boise County All Hazards Mitigation Plan** was developed during 2004-05 by the Boise County Hazard Mitigation Planning Committee in cooperation with Northwest Management, Inc., of Moscow, Idaho. Two bound documents have been produced as part of this planning effort. They include:

- All Hazards Mitigation Plan including chapters of;
  - Flood Mitigation Plan
  - Earthquake Mitigation Plan
  - Landslide Mitigation Plan
  - Severe Weather Mitigation Plan
- Terrorism and Civil Unrest Mitigation Plan

The Terrorism and Civil Unrest Mitigation Plan may be limited in its distribution.



Boise County, Idaho
All Hazards
Mitigation Plan
Volume II

Terrorism & Civil Unrest

November 11, 2005

Vision: *Institutionalize and promote a countywide hazard mitigation ethic through leadership, professionalism, and excellence, leading the way to a safe, sustainable Boise County.*

Official Use Only

This plan was developed by the Boise County Hazards Mitigation Planning Committee in cooperation with Northwest Management, Inc., 233 E. Palouse River Dr. P.O. Box 9748, Moscow, Idaho 83843, Phone: (208) 883-4488, Fax: (208) 883-1098, www.Consulting-Foresters.com

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Chapter I: Overview of this Plan and its Development

1 Introduction

This All Hazards Mitigation Plan for Boise County, Idaho, is the result of analyses, professional cooperation and collaboration, assessments of natural and man caused risks and other factors considered with the intent to reduce the potential for disasters to threaten people, structures, infrastructure, and unique ecosystems in Boise County, Idaho. The planning team responsible for implementing this project was led by the Boise County Commissioners. Agencies and organizations that participated in the planning process included:

- USDI Bureau of Land Management (also providing funding through the National Fire Plan)
- USDA Forest Service
- Idaho Department of Lands
- West Central Highlands Resource Conservation and Development Council
- Boise County Disaster Services
- Centerville Volunteer Fire Department
- Clear Creek Volunteer Fire Department
- Garden Valley Rural Fire District
- Gem County II Fire District
- Grand Jean Fire District
- Horseshoe Bend Fire Department
- Idaho City Volunteer Fire Department
- Lowman Volunteer Fire Department
- Placerville Fire Protection District
- Robie Creek Volunteer Fire Department
- Wilderness Ranch Volunteer Fire Department
- Valley of the Pines Fire Department
- City of Idaho City
- City of Placerville
- City of Horseshoe Bend
- City of Crouch
- Northwest Management, Inc.

The Boise County Commissioners working with the West Central Highlands Resource Conservation and Development Council solicited competitive bids from companies to provide the service of leading the assessment and the writing of the **Boise County All Hazards Mitigation Plan**. The Commissioners selected Northwest Management, Inc., to provide this

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service. Northwest Management, Inc. is a professional natural resources consulting firm located in Moscow, Idaho. The Project Co-Managers from Northwest Management, Inc. were Dr. William E. Schlosser, a professional forester and regional planner, and Mr. Toby R. Brown, a resource management professional.

1.1 Phase I Hazard Assessment for Boise County

The All Hazards Mitigation Plan is developed in accordance with the Federal Emergency Management Agency's (FEMA) guidelines for a County level pre-disaster mitigation plan and the State of Idaho Bureau of Homeland Security.

The Phase I Assessment for Boise County was conducted to determine the relative likelihood of a hazard's occurrence and the potential damage to people, property, infrastructure, and the economy. This assessment is summarized in Table 1.1.

Table 1.1. Phase I Hazard Assessment of Boise County.

Probability of Occurrence				
	High		Landslide	Wildland Fire Winter Storm
	Medium		Flood	Wind Storms
	Low	Civil Unrest / Terrorism		Earthquake
		Low	Medium	High
		Potential to Impact People, Structures, Infrastructure, and the Economy		

This All Hazards Mitigation Plan will include assessment of a variety of hazards including:

- Flood Mitigation Plan
- Landslide Mitigation Plan
- Severe Weather (Wind Storm & Winter Storm) Mitigation Plan
- Earthquake Mitigation Plan
- Civil Unrest / Terrorism Mitigation Plan

Information gathered during the analysis and hazard profiles for Boise County indicates that 35% of homeowners in Boise County have experienced threats from wind storms. These wind storms have caused impacts on approximately 7% of those homes and 8% to property. Further, the average damage to homes caused by wind storms was estimated at over $1,750 for each event and landowner during the past 10 years. Wildfire has impacted about ¼ of the county's residents causing damage to 3% of their homes, 7% of their property and 3% their business. The average damage to home and property was estimated at just over $10,900 per wildfire occurrence, per landowner. Winter storms and tornadoes have impacted approximately 8% of the county's residents causing an average of almost $5,000 worth of damage for each event and landowner affected. Floods have impacted 18% of respondents, impacting property in and near the flood zone. Just 2% of impacted residents reported damage to Homes, 5% to property, and 2% to businesses, however, the average damage per occurrence was reported at over $14,300 per occurrence, per landowner. Earthquakes were reported to have impacted none of the surveyed residents. Landslides impacted 22% of respondents with 1% reporting damage to

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home, 3 % with damage to property and 4% with impacts on business. The average reported financial loss was $1,950 per owner per occurrence. Many people impacted by landslides indicated the major impact of landslides was restricted access on various roads throughout the county. The average loss to home and property because of civil unrest and terrorism were not reported to have impacted any residents in Boise County. These results are summarized from the public mail survey conducted during the implementation of this plan with specific responses detailed in Chapter 2 of this document.

1.2 Goals and Guiding Principles

1.2.1 Federal Emergency Management Agency Philosophy

Effective November 1, 2004, a local Hazard Mitigation Plan approved by the Federal Emergency Management Agency (FEMA) is required for Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation Program (PDM) eligibility. The HMGP and PDM program provide funding, through state emergency management agencies, to support local mitigation planning and projects to reduce potential disaster damages.

The new local hazard mitigation plan requirements for HMGP and PDM eligibility is based on the Disaster Mitigation Act of 2000, which amended the Stafford Disaster Relief Act to promote and integrated, cost effective approach to mitigation. Local hazard mitigation plans must meet the minimum requirements of the Stafford Act-Section 322, as outlined in the criteria contained in 44 CFR Part 201. The plan criteria cover the planning process, risk assessment, mitigation strategy, plan maintenance, and adoption requirements.

FEMA will only review a local hazard mitigation plan submitted through the appropriate State Hazard Mitigation Officer (SHMO). Draft versions of local hazard mitigation plans will not be reviewed by FEMA. FEMA will review the final version of a plan prior to local adoption to determine if the plan meets the criteria, but FEMA will be unable to approve it prior to adoption. In Idaho the SHMO is:

Idaho Bureau of Homeland Security
4040 Guard Street, Bldg 600
Boise, ID 83705
208-334-2336

A FEMA designed plan will be evaluated on its adherence to a variety of criteria.

- Adoption by the Local Governing Body
- Multi-jurisdictional Plan Adoption
- Multi-jurisdictional Planning Participation
- Documentation of Planning Process
- Identifying Hazards
- Profiling Hazard Events
- Assessing Vulnerability: Identifying Assets
- Assessing Vulnerability: Estimating Potential Losses
- Assessing Vulnerability: Analyzing Development Trends
- Multi-Jurisdictional Risk Assessment
- Local Hazard Mitigation Goals
- Identification and Analysis of Mitigation Measures
- Implementation of Mitigation Measures
- Multi-Jurisdictional Mitigation Strategy
- Monitoring, Evaluating, and Updating the Plan

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- Implementation Through Existing Programs
- Continued Public Involvement

1.2.2 Additional State and Federal Guidelines Adopted

This All Hazards Mitigation Plan will include compatibility with FEMA requirements while also adhering to the guidelines proposed in the, the Idaho State Hazard Mitigation Plan 2004. The All Hazards Mitigation Plan has been prepared in compliance with:

- The National Fire Protection Association's Standard on Disaster/Emergency Management and Business Continuity Programs, NFPA 1600 (2000 Edition).
- The Idaho Statewide Implementation Strategy for the National Fire Plan–July 2002.
- The Federal Emergency Management Agency's Region 10 guidelines for a Local Hazard Mitigation Plan as defined in 44 CFR parts 201 and 206.
- The Idaho State Hazard Mitigation Plan 2004, State of Idaho Military Division Bureau of Homeland Security.

The objective of combining these five complimentary guidelines is to facilitate an integrated All Hazards risk assessment, identify pre-hazard mitigation activities, and prioritize activities and efforts to achieve the protection of people, structures, the environment, and significant infrastructure in Boise County while facilitating new opportunities for pre-disaster mitigation funding and cooperation. Boise County has a completed Wildfire Mitigation Plan. Additional information on the Wildfire Mitigation Plan can be obtained from the Boise County Sheriff's Office.

1.2.3 Boise County Planning Effort and Philosophy

The goals of this planning process include the integration of guidelines for a County (local) level pre-disaster mitigation plan from the Federal Emergency Management Agency's, the Idaho Bureau of Homeland Security, and where appropriate, the National Fire Plan, the Idaho Statewide Implementation Strategy, and the Healthy Forest Restoration Act. This effort will utilize the best and most appropriate science from all partners, the integration of local and regional knowledge about hazard risks, while meeting the needs of local citizens, the regional economy, the significance of this region to the rest of Idaho and the Inland West.

1.2.3.1 Mission Statement

To make Boise County residents, communities, state agencies, local governments, and businesses less vulnerable to the negative effects of natural and man-caused hazards through the effective administration of pre-disaster mitigation grant programs, hazard risk assessments, wise and efficient mitigation efforts, and a coordinated approach to mitigation policy through federal, state, regional, and local planning efforts. Our combined prioritization will be the protection of people, structures, infrastructure, the economy, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy.

1.2.3.2 Vision Statement

Institutionalize and promote a countywide hazard mitigation ethic through leadership, professionalism, and excellence, leading the way to a safe, sustainable Boise County.

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1.2.3.3 Goals

- To reduce the area of land damaged and losses experienced because of hazards where these risks threaten communities in the county
- Prioritize the protection of people, structures, infrastructure, economic base, and unique ecosystems that contribute to the way of life and the sustainability of the local and regional economy
- Educate communities about the unique challenges of pre-disaster hazard mitigation and post-disaster response
- Establish mitigation priorities and develop mitigation strategies
- Strategically locate, plan, and implement hazard reduction projects
- Provide recommendations for alternative treatment methods that can impact the exposure to multiple hazards at one time
- Meet or exceed the requirements of FEMA for a County level All Hazards Mitigation Plan

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Chapter 2: Documenting the Planning Process

2 Initiation

Documentation of the planning process, including public involvement, is required to meet FEMA's DMA 2000 (44CFR§201.4(c)(1) and §201.6(c)(1)). This section includes a description of the planning process used to develop this plan, including how it was prepared, who was involved in the process, and how all of the involved agencies participated.

2.1 Description of the Planning Process

The Boise County All Hazards Mitigation Plan was developed through a collaborative process involving all of the organizations and agencies detailed in Section 1.0 of this document. The County Commissioner's office contacted these organizations directly to invite their participation and schedule meetings of the planning committee. The planning process included 5 distinct phases which were in some cases sequential (step 1 then step 2) and in some cases intermixed (step 4 completed though out the process):

1. **Collection of Data** about the extent and periodicity of hazards in and around Boise County. This included an area encompassing Gem, Adams, Payette, Valley, and Washington Counties to insure a robust dataset for making inferences about hazards in Boise County specifically.
2. **Field Observations and Estimations** about risks, juxtaposition of structures and infrastructure to risk areas, access, and potential treatments.
3. **Mapping** of data relevant to pre-disaster mitigation control and treatments, structures, resource values, infrastructure, risk assessments, and related data.
4. **Facilitation of Public Involvement** from the formation of the planning committee, to a public mail survey, news releases, public meetings, public review of draft documents, and acknowledgement of the final plan by the signatory representatives.
5. **Analysis and Drafting of the Report** to integrate the results of the planning process, providing ample review and integration of committee and public input, followed by signature of the final document.

2.2 The Planning Team

Planning efforts were led by the Project Co-Directors, Dr. William E. Schlosser, of Northwest Management, Inc. and Mr. Toby R., Brown, B.S. Dr. Schlosser's education includes 4 degrees in natural resource management (A.S. geology; B.S. forest and range management; M.S. natural resource economic & finance; Ph.D. environmental science and regional planning). Mr. Brown holds a bachelor's degree in Forest Resource Management.

They led a team of resource professionals that included city and rural fire protection, local elected officials, law enforcement, State of Idaho Bureau of Homeland Security, Idaho Department of Lands, the US Forest Service, the Bureau of Land Management, fire mitigation specialists, resource management professionals, and hazard mitigation experts.

The planning team met with many residents of the county during the inspections of communities, infrastructure, and hazard abatement assessments. This methodology, when coupled with the other approaches in this process, worked adequately to integrate a wide spectrum of observations and interpretations about the project.

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The planning philosophy employed in this project included the open and free sharing of information with interested parties. Information from federal and state agencies was integrated into the database of knowledge used in this project. Meetings with the committee were held throughout the planning process to facilitate a sharing of information between cooperators.

When the public meetings were held, many of the committee members were in attendance and shared their support and experiences with the planning process and their interpretations of the results.

2.2.1 Multi-Jurisdictional Participation

CFR requirement §201.6(a)(3) calls for multi-jurisdictional planning in the development of hazard mitigation plans which impact multiple jurisdictions. This All Hazards Mitigation Plan is applicable to the following jurisdictions:

- Boise County, Idaho
- City of Idaho City
- City of Placerville
- City of Horseshoe Bend
- City of Crouch

All of these jurisdictions were represented on the planning committee, in public meetings, and participated in the development of hazard profiles, risk assessments, and mitigation measures. The monthly planning committee meetings were the primary venue for authenticating the planning record. However, additional input was gathered from each jurisdiction in a combination of the following ways:

- Planning committee leadership visits to scheduled municipality public meeting (e.g., County Commission meetings, City Hall meetings) where planning updates were provided and information was exchanged.
- One-on-one visits between the planning committee leadership and the representatives of the municipality (e.g., meetings with County Commissioners, or City Councils in chambers).
- Special meetings at each jurisdiction by the planning committee leadership requested by the municipality involving elected officials (mayor and County Commissioners, County Assessor, Sheriff), appointed officials (e.g. City Police, Emergency Services Coordinator), municipality employees, local volunteers (e.g., fire district volunteers), business community representatives, and local citizenry.
- Written correspondence was provided monthly between the planning committee leadership and each municipality updating the cooperators in the planning process, making requests for information, and facilitating feedback.

Planning committee leadership (referenced above) included: Gordon Ravenscroft, Boise County Emergency Services Coordinator, Dr. William E. Schlosser, Toby R. Brown, and Tera King, all of Northwest Management, Inc., and Russ Manwaring, West Central Highlands Resource Conservation and Development Council, Inc., Coordinator.

Like other rural areas of Idaho and the USA, Boise County's human resources have many demands put on them in terms of time and availability. None of the elected officials (County Commissioners and City Mayors) serve in a full-time capacity: all of them have other employment and serve the community through a convention of community service. Recognizing

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this, many of the jurisdictions decided to identify a representative from the jurisdiction to cooperate on the planning committee and then report back to the remainder of their organization on the process and serve as a conduit between the planning committee and the jurisdiction. The County Emergency Services Coordinator typically kept the Boise County Commissioners up to date on the all hazards mitigation planning process.

At the city level, the city mayors were represented in a variety of ways. The individual mayors commonly appointed a representative from the municipality to provide this representation on the committee meetings. For example, the Horseshoe Bend Chief of Police represented the Mayor of the City of Horseshoe Bend. The planning committee leadership provided communications and feedback with the municipality directly to insure the multi-jurisdictional planning necessitated by this process.

2.3 Public Involvement

Public involvement in this plan was made a priority from the inception of the project. There were a number of ways that public involvement was sought and facilitated. In some cases this led to members of the public providing information and seeking an active role in protecting their own homes and businesses, while in other cases it led to the public becoming more aware of the process without becoming directly involved in the planning process.

2.3.1 News Releases

Under the auspices of the Boise County All Hazards Mitigation Planning Committee, news releases were submitted to area newspapers.

2.3.1.1 Newspaper Articles

Committee and public meeting announcements were published in the local newspapers ahead of each meeting. The following is an example of one of the newspaper announcements that ran in the local newspaper.

All Hazards Mitigation Plan Project

The Boise County All Hazards Mitigation Plan has been launched to complete an All Hazards Mitigation Plan for Boise County as part of the FEMA program. The Boise County All Hazards Mitigation Plan will include risk analysis at the community level with predictive models for where disasters are likely to occur. Northwest Management, Inc. has been retained by the county to provide risk assessments, mapping, field inspections, interviews, and to collaborate with the committee to prepare the plan. The coordinating team includes fire districts, elected county and city officials, community members and others. Northwest Management specialists will conduct an analysis and make recommendations for potential treatments to mitigate the loss potential from these natural and man-caused hazards. The local point of contact for information is Deputy Disaster Services Coordinator Gordon Ravenscroft.

One of the first steps in gathering information about risk in the county is to conduct a homeowner's survey. Northwest Management, Inc., in cooperation with the planning committee will be mailing a brief survey to randomly selected homeowners in the county seeking details about home construction materials, proximity to water sources, and other risk factors surrounding homes. This survey is very important to the success of the plan. Those homes that receive a survey are asked to please take the time to complete

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it thereby benefiting the community overall.

The planning team will be conducting Public Meetings to discuss preliminary findings and to seek public involvement in the planning process. A notice on the date and location of these meetings will be posted in local newspapers.

For more information on the All Hazard Mitigation Plan project in Boise County contact your County Commissioner, Northwest Management, Inc., Project Leader Toby R. Brown at 208-883-4488 or Deputy Disaster Services Coordinator Gordon Ravenscroft at 208-392-4411.

2.3.2 Public Mail Survey

In order to collect a broad base of perceptions about individual risk factors of homeowners in Boise County, a mail survey were conducted. Using the cadastral database of landowners in Boise County (provided by the county), homeowners from the county was identified. Approximately 235 residents of Boise County were randomly selected to receive mail surveys.

The public mail survey developed for this project has been used in the past by Northwest Management, Inc., during the execution of other Hazard Mitigation Plans. The survey used The Total Design Method (Dillman 1978) as a model to schedule the timing and content of letters sent to the selected recipients. Copies of each cover letter, mail survey, and communication are included in Appendix III.

The first in the series of mailings was sent September 23, 2004, and included a cover letter, a survey, and an offer of receiving a custom GIS map of the area of their selection in Boise County if they would complete and return the survey. The free map incentive was tied into assisting their community and helping their interests by participating in this process. Each letter also informed residents about the planning process. A return self-addressed enveloped was included in each packet. A postcard reminder was sent to the non-respondents on October 1, 2004, encouraging their response. A final mailing, with a revised cover letter pleading with them to participate, was sent to non-respondents on October 8, 2004.

Surveys were returned during the months of September, October, and November. A total of 96 residents responded to the survey. The effective response rate for this survey was 41%. Statistically, this response rate allows the interpretation of all of the response variables significantly at the 95% confidence level.

2.3.2.1 Survey Results

A summary of the survey's results will be presented here and then referred back to during the ensuing discussions on the need for various treatments, education, and other information.

Of the 96 respondents in the survey, approximately 27% were from the Crouch area, 18% from the Horseshoe Bend area, 14% from both the Garden Valley and Idaho City regions, 6% from Centerville, 5% from Placerville, 4% from Lowman, 3% each from Banks and Star Ranch, 1% from Gardena and 4% from other areas in the county.

96% of respondents indicated that their primary home is in Boise County. The vast majority of the respondents (94%) correctly identified that they have emergency telephone 911 services in their area. Approximately 98% of the respondents to the survey indicated they have rural fire protection. This exceeds the amount of rural fire protection coverage in the county and indicates that many respondents believe they have structural fire protection when in fact they do not.

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The average driveway length of respondents to the survey was 1726 feet long (0.33 miles). The longest reported was 15,840 feet (3 miles). On almost all landowners (97%) indicated that their driveway had at least one turnout wide enough for emergency vehicles to pass. Respondents were asked to determine if their address was clearly visible from the nearest public/main access road, 56% of the respondents answered affirmative to this question. Approximately 63% of the respondents indicated an alternate escape route was available in an emergency which cuts off their primary driveway access. Roughly 19% of the respondents indicated their driveway crosses a stream, river, or irrigation canal, while 41% reported there is a stream, river, or irrigation canal crossing their property.

Respondents were asked if they lost power do they have alternative power, 58% answered that they did have alternative power. If the main phone lines were not working 47% reported they had an alternative. Of those who had alternative to their landline phone, 71% had a cell phone, 7% a satellite phone, 24% CB/Ham radio, and 4% other. Several respondents had more than one alternative so the percentages add up to over 100.

County residents were asked what they felt the average response time would be for various emergency services to reach their homes, the average time for emergency medical response was 18 minutes, Fire was 19 minutes, and Law enforcement 34 minutes.

Survey recipients were asked to report emergency services training received by members of the household. Their responses are summarized in Table 2.1.

Table 2.1. Emergency Services Training received by household.

Type of Training	Percent of Households
Wildland Fire Fighting	29%
City or Rural Fire Fighting	22%
EMT (Emergency Medical Technician)	28%
Basic First Aid/ CPR	76%
Search and Rescue	23%

Residents were asked to indicate which, if any, of the disasters listed in Table 2.2 have affected their home, property or business within Boise County during the past 10 years.

Table 2.2. Disasters affecting homes in Boise County.

	Percent of respondents indicating that each hazard occurred during the period 1993-2003, near their home, property or business:		Percent of all respondents indicating that each hazard caused damage to:			Average damage caused to home, property or business by each hazard (during the period 1993-2003)
↓Hazard↓	Yes		Home	Property	Business	
Wildfire	28%	→	3%	7%	3%	$10,941
Flood	18%	→	2%	5%	2%	$14,333
Earthquake	0%	→	0%	0%	0%	$---
Landslide	22%	→	1%	3%	4%	$1950
Wind Storm	35%	→	7%	8%	2%	$1,758
Winter Storm / Tornado	28%	→	8%	3%	1%	$4,994
Civil Unrest /	0%	→	0%	0%	0%	$---

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Many Boise County residents have been affected by at least one of the hazards covered by the All Hazards Mitigation Plan (wildfire, flood, earthquake, landslide, windstorm, tornado, and terrorism/civil unrest). The survey included a series of questions asking if respondent's home, property, or business is located in an area that places it at risk to any of the hazards specified in Table 2.3.

Table 2.3. Respondent's home, property, or business potentially located in a place putting it at-risk to the listed hazards.

Disaster	Percent At-Risk
Wildfire	78%
Flood	15%
Earthquake	58%
Landslide	20%
Windstorm	78%
Winter Storm	66%
Terrorism	11%

Respondents were asked to provide their opinion, or perception, of the greatest risk or importance of each hazard for Boise County has a whole. They were asked to rank the seven hazards in order from 1 to 7. The results of this question have been summarized in Table 2.4.

Table 2.4. Respondent perception of the relative risk of each hazard for Boise County as a whole.

Disaster	Percent At-Risk
Wildfire	1
Windstorm	3
Landslide	2
Flood	5
Winter Storm/Tornado	4
Earthquake	6
Terrorism	7

When asked to identify additional hazards potentially affecting Boise County, respondents indicated a variety of hazards, and events:

- ✓ Sink hole
- ✓ vehicle traffic, water pollution
- ✓ junk yard (illegal) next door: junk vehicles, barrels of solvents, oil, gas, diesel, battery acid)
- ✓ lack of power or telephone service
- ✓ our property at XXXXXXXX is located on a road that is not maintained, a road with 25 ft easement, road for access & egress, and a man-made obstacle course (congestion) at the gate that identifies the road as "private." The GVFD has been called to the gate twice in the last 3 years and has had trouble getting past the gate.
- ✓ manmade: breach or failure of dam… bug kill that is not addressed by timber management due to court injunctions

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- ✓ ice storms, microburst, trees down on house, power lines down, public water system could be affected by power loss, earthquake or vandalism.
- ✓ Wards Lumber yard only has had one fire. Huge amounts of slab lumber there
- ✓ electrical fire/lightning, arson, vandalizing
- ✓ lack of fire hydrant
- ✓ snowfall & avalanche
- ✓ geothermal, possibly, because of temperature, if someone fell in the creek
- ✓ fuel dispensary
- ✓ chemical on Highway 55, specifically chorine ____ to Cascade/McCall
- ✓ unattended smoldering fires by residents
- ✓ ground water depletion due to increased use of resource
- ✓ prolonged power outage
- ✓ national, state and local government restrictions and less than desirable management at federal and state land
- ✓ lack of plowed main access road

47% of respondents indicated they had alternative communication if their main phone service was cut off. Of these 71% responded that their alternative was a cell phone, 7% a satellite phone, 24% CB or Ham radio, 31% two way radio, not everyone who answered that they had alternative communication indicated what kind, other respondents had multiple means of alternative communication so the percentages don't add up to 100. 58% also had alternative electrical power to use in case of power failure.

Finally, respondents were asked "If offered in your area, would members of your household attend a free or low cost, one-day training seminar designed to share with homeowners how to reduce the potential for casualty loss surrounding your home?" 57% of respondents indicated a desire to participate in this type of training. Of those responding that they wished to attend training, 45% preferred training seminars to occur during the week and 55% on weekends.

Homeowners were also asked, "How Hazard Mitigation projects should be funded in the areas surrounding homes, communities, and infrastructure such as power lines and major roads?" Responses are summarized in Table 2.5.

Table 2.5. Public Opinion of Hazard Mitigation Funding Preferences.

	100% Public Funding	Cost-Share (Public & Private)	Privately Funded (Owner or Company)
Home Defensibility Projects →	17%	28%	55%
Community Defensibility Projects →	51%	41%	8%
Infrastructure Projects Roads, Bridges, Power Lines, Etc. →	65%	24%	12%

Finally, a couple of respondents wrote comments on their survey asking that it be included in the summary of information:

"We all pay Idaho Power to take care of their electrical distribution system, etc. They should continue to do 100% of the work. We all pay either county taxes for county to maintain their roads and bridges and/or state taxes for the state to maintain their roads and bridges. They should continue to do 100% of that work. The US Forest Service takes care of Boise National Forest for most part- with help from General Public on certain projects."

"If people would just use a little common sense, none of this is needed. I've lived in the mountains all my life and know how to survive everything you talk about. If the city people

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moving here don't, they better learn. I'm against anything that is going to raise my taxes anymore."

"The only risk to our home or our adjacent ranch and other business would be the road or highway side grasses that could catch fire from motorists dragging flat tired trailers, smoking, or some way of causing sparks. This is probably sate highway right of way's responsibility."

"The one hazard that you have not addressed is the dirt road connecting Idaho City and Centerville. More and more traffic each year make that road a hazard and it should be pave. Instead of doing surveys we should be spending dollars to pave the Idaho City-Centerville Road."

We wish to thank all Boise County residents completing and returning these surveys.

2.3.3 Committee Meetings

The following list of people who participated in the planning committee meetings, volunteered time, or responded to elements of the Boise County All Hazard Mitigation Plan's preparation.

NAME	ORGANIZATION
• Chuck McConnell	Horseshoe Bend Chief of Police
• Dan Gasiorowski	Placerville City Maintenance
• Deb Miller	Horseshoe Bend Ambulance
• Doug Gochnour	District Ranger, Idaho City District Boise National Forest
• Doyle D. Woods	Horseshoe Bend Mayor
• Elaine Baker	Crouch Mayor
• Evans Kno	Boise National Forest Fire Management Affairs
• Fred Lawson	Boise County Commissioner
• Gordon Ravenscroft	Boise County Disaster Services Coordinator
• Jessica Gasiorowki	Placerville Mayor
• Larry Sprague	Fire Chief Placerville
• Paul Stutzman	Boise County Commissioner
• Phillip Canody	Idaho City Mayor
• Roger Jackson	Boise County Commissioner
• Roy Miller	Horseshoe Bend Ambulance
• Sandra Sprague	Placerville Fire Department

2.3.3.1 Committee Meeting Notes

Committee Meetings were scheduled and held on the dates indicated with each entry. This information is useful to observe what topics were discussed, who participated, and the source of recommendations made in this planning process.

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2.3.3.1.1 August 25, 2004

The meeting was held at the Bear Creek Senior Center in Idaho City and was conducted by Toby Brown. Meeting started at 6pm

The power went out just before the meeting started so the meeting was held by candlelight with no formal slide show. The senior center does not have back up power. Power outages in the County are a frequent occurrence due to its very rural condition. The problem is exacerbated by the narrow timbered canyons in which the power lines run.

The group made introductions and Toby gave a synopsis and overview of what would take place under the AHMP planning process. Toby stressed the importance of the plan as a funding mechanism for future $'s from FEMA. Some discussion took place about the counties Wildfire Mitigation Plan done in 2002 for the county by Dynamac. Toby noted that this plan would not be redoing any of the Fire plan work.

Toby discussed the details of the public survey that is intended to be sent to Boise County residents both inside communities and in the rural areas. He emphasized that the survey is a draft and encouraged comments and suggestions from the group. It was noted that the survey is not going to be possible if the county does not make the rural address available to NMI to conduct the survey. The survey is an important part of the public input section to meet FEMA requirements. Several additional questions were added to the survey including time for various emergency services to respond, how many homes have alternative communication if the landline phones are not operating, and how many have alternative power.

Toby handed out a timeline for completion. Toby stressed that the AHMP will be FEMA compatible. The contract is with the West Central Highlands and several neighboring counties will also be completed.

Toby handed out flood assessments and reiterated that comments and suggestions were encouraged. Flood insurance sections of the document were discussed. Community Rating System gives discounts on flood insurance. This document can be used as a tool to get discounted rates. The group reviewed the draft map that showed flood zones in Boise County. Flooding includes storm drainage and irrigation canals (just an issue in Horseshoe Bend power canal). Community assessments were written for Horseshoe Bend, Placerville, Lowman, and Idaho City.

Toby asked if other communities were affected by floods. Floods of 1997 affected many areas in the county. It was stressed that the flooding assessments are important because of the potential problems with power and drinking water. Toby encouraged the group to hand out surveys.

The Landslide Map was reviewed next. Toby asked where current landslide issues. All of the Highways and county roads in the county have issues with being closed/partially blocked by landslides and avalanches in the winter. It is a reoccurring problem that often exacerbates responding to flooding or wildfires. Identify areas to GPS occurrences of landslides. (specific areas highlighted on the map by Toby). Earthquakes were also discussed. Several faults lie along Highway 55 and into the major valleys.

Toby passed out the landslide assessment document. Discussed the various sections of the land slide assessments. Toby discussed the fire debris flow as well and the importance. Group wanted to see comments about all the county roads in the county.

Toby discussed the earthquake section that was handed out. Discussed “shaking hazard” and what makes up the potential problems. These hazards are reflected in building codes. Many

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older buildings can be highly impacted by earthquakes and have not been examined. Most schools have been examined.

Also discussed and reviewed were”

- Sample Press Release.
- Request Resource & Capability Info/ County disaster plan.
- Review County Map. Re examine access/ escapes routes.
- Set date for next meeting.

2.3.3.1.2 September 21, 2004

Meeting was held at the Horseshoe Bend City Hall. Meeting started at 6pm and was conducted by Toby Brown. William Schlosser took notes.

The meeting began with Toby looking for responses to the draft plans handed out at the last meeting. No copies were collected. Several members had comments which Toby noted... Toby emphasized the need to get these responses back so they could be incorporated into the plan.

Toby continued the meeting with a review of the Flood plain mapping done to date. Copies of the maps were displayed and committee members mad comments on the maps. The document format and some content of the Flood community assessments were made. A discussion took place with the mayor of Horseshoe Bend about the new sewer plan being built in the flood plain. The plan had to be elevated above the high water mark and alternative power supplied.

The city of Horseshoe Bend draws its drinking water directly form the Payette River. The system is very old and is located right next to the river in the flood plain. Water storage capacity is limited, and offers no more than 1 to 3 days of water to the city if the water plant is shut down for any reason.

Discussion took place on the primary and secondary road access. This is a difficult subject in this county due to the small dispersed population centers and difficult terrain that roads have to traverse to reach these communities. State Highway 55 is often closed off due to accidents or hazards (flooding/landslides). Often there is a traffic back up in the greater Horseshoe Bend area that significantly slows the response of emergency crews. Alternative access routes around town and to the north and south of town would help this problem. Signage on the roads showing where these alternative routes are and the type of vehicle traffic the routes can take would help.

Severe weather is a concern to the county. Due to its high elevation and close proximity to the City of Boise winter recreationalists often inundate the area. When these recreationalists get stuck or lost in the snow or trapped, there are insufficient services to provide for them. The small local population is often left with the burden of providing search and rescue services, for which they are not reimbursed. Additional public education and financial input into these services would help serve not only the local population, but the recreating population as well.

Some facilities in the county have alterative power to facilitate use during power outages. Most of the smaller communities are not able to function when the power grid is down.

2.3.3.1.3 October 27, 2004

Committee meeting Horseshoe Bend City Hall, Horseshoe Bend, Idaho 6pm

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The meeting began with Toby looking for responses to the draft plans handed out at the last meeting. No copies were collected. Several members had comments which Toby noted. Toby emphasized the need to get these responses back so they could be incorporated into the plan.

Toby continued the meeting with a review of the Flood plain mapping done to date. Copies of the maps were displayed and committee members mad comments on the maps. The document format and some content of the Flood community assessments were made. The mayor of Horseshoe Bend discussed the new Sewage facility being built in the flood plain, but elevated above flood level. The drinking water system draws water directly from the river and is an old system located in the flood plain. The water storage tank is sufficient to provide water to the community for only 1 to 3 days if the water system fails.

The other issue is Highway 95 being closed either in Boise County or to the north for a variety of reasons, accidents, floods, landslides etc. This creates problems in Horseshoe Bend with traffic back up and no way to by pass town. An alternative singed route would be helpful.

General discussions also took place about winter time recreationalists form the Boise area draining the local resources when they need search and rescue assistance or get caught in severe weather within the county.

2.3.3.1.4 November 16, 2004

Draft Plan Review meeting Placerville Community Center, Placerville Idaho 6pm

The committee reviewed the entire draft of the plan. Toby made comments to his copy of the committee draft and will incorporate them into the plan. Key comments made were to chapter 8. Highlights of the comments include the need to update the FIRM flood maps in certain areas; the need for an all purpose emergency response vehicle/truck; continued updates to the Rural addressing system, “72 hour kits” for the general population of the county, but especially seniors; surfacing of secondary access routes for all weather use, esp. during wet flood times; additional repeater towers to cover some “blind spots”; alternative power in each community.

2.3.4 Public Meetings

Public meetings were scheduled in a variety of communities in Boise County during the hazard assessment phase of the planning process. Public meetings were scheduled to share information on the planning process, inform details of the hazard assessments, and discuss potential mitigation treatments. Attendees at the public meetings were asked to give their impressions of the accuracy of the information generated, and provide their opinions of potential treatments.

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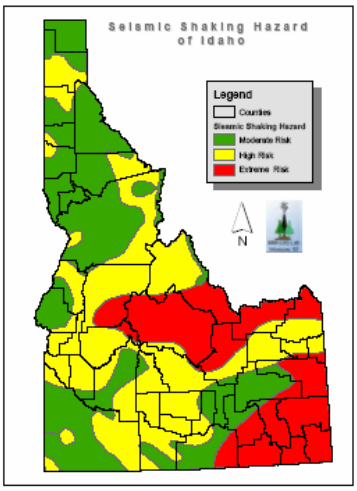
Figure 2.1 Boise County Public Meeting Notice

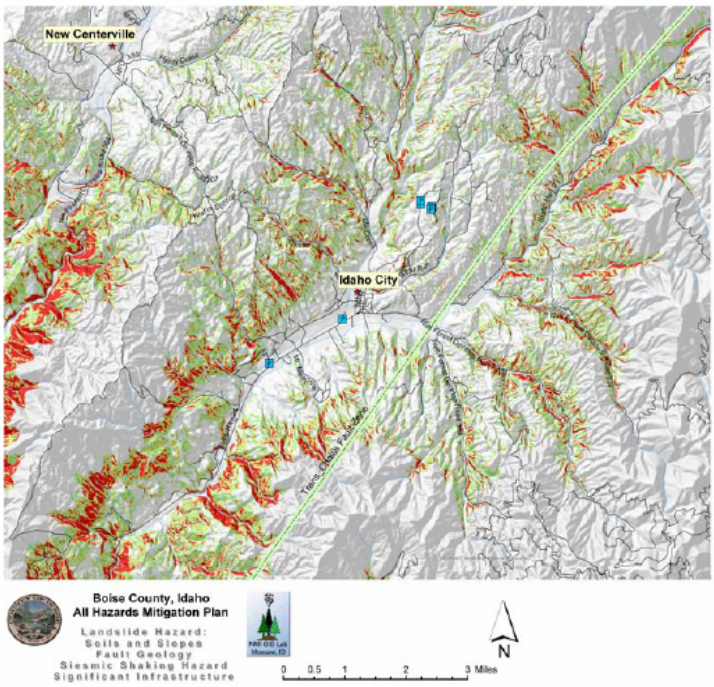
Boise County, Idaho All Hazards Mitigation Plan

Idaho City Public Meeting!

Idaho City: Tuesday, November 16th, at 7:00 P.M. at the Ray Robison Community Hall, 206 West Commercial St.

This public meeting is scheduled in **Idaho City, Tuesday, November 16th**, to address **Natural and Man Caused Hazards** around our communities. These meetings are open to the public and will include presentations from hazard mitigation specialists working on the Boise County All Hazards Mitigation Plan. Public input is being sought in order to better frame the County's efforts of hazard mitigation treatments, fire district resource enhancements, and public land management.





Topics of discussion include:

- Landslides
- Severe Weather
- Earthquakes
- Floods
- Wildfire

Learn about the assessments of risk (Landslide risks - map on left) and the Wildland-Urban Interface of Boise County. Discuss ***YOUR*** priorities for how Boise County can best mitigate risks around your community.

This meeting will last for approximately 1.5 hours and include refreshments, a slideshow, information on the planning process, and schedules for completion. We want your input. ***JOIN US!***

For more information on Hazard Mitigation Plan projects in Boise County, contact your County Commissioners, Russ Manwaring with the West Central Highlands RC&D office at 208-365-4475 ext. 4, or Toby Brown at the Northwest Management, Inc. office in Moscow, Idaho at 208-883-4488. ***We'll see you there!***

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Maps detailing risk assessments, hazard profiles, and a slide show were presented at each meeting. Public meetings were conducted by Project Co-Manager Toby R. Brown on the following dates and locations:

- November 16, 2004, Ray Robinson Community Hall, Idaho City Idaho 7:00 pm

The Public meeting was conducted by Toby R. Brown of Northwest Management. The meeting was well attended with over 14 members of the public plus several committee members. Toby present a slide show detailing the work the committee had done to date. At the end of the meeting Toby collected comments from the public about the plan. Highlights of the comments include the need for generators for public facilities, additional repeaters for areas of the county with no communication, reimbursement for volunteers in various emergency services organizations, snow avalanche issues on Highway 21, the need for rural addressing and the overall geographic isolation of the county.

Figures 2.2. Public meeting slideshow overview.

The public meeting slide show (title slide above) is outlined below.

Table 2.6. Public meeting slide show.

Slide 1	Slide 2
All Hazards Mitigation Plan: ***Boise County, Idaho*** ***Northwest Management, Inc.*** Toby Brown, B.S. William E. Schlosser, Ph.D. 233 East Palouse River Dr P.O. Box 9748 Moscow, Idaho 83843 Tel: (208) 883-4488	***Northwest Management, Inc.*** ▪ Serving the Western U.S. since 1984 ▪ Main Office in Moscow, Idaho ○ Hayden, Idaho ○ Caldwell, Idaho ○ Deer Park, Washington ○ Helena, Montana ▪ Full Service Natural Resource Consultants ○ Wildland-Urban Interface Wildfire Mitigation Planning ○ All Hazards Mitigation Planning *Providing a balanced approach to natural resource management*

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Table 2.6. Public meeting slide show.

Slide 3

Cooperative Effort:
Boise County Planning Team

To Assess Natural & Man Caused Hazards and develop a Pre-Disaster Mitigation Strategy to reduce the losses experienced within the County.

Slide 4

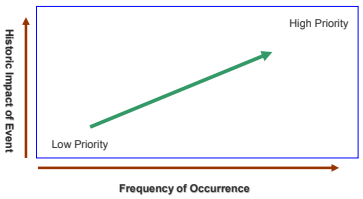
FEMA All Hazards Mitigation Plan

- Wildland Fire ***(completed)***
- Flooding
- Earthquakes
- Landslides
- Winter Storm
- Tornadoes/Wind Storms
- Terrorism and Civil Unrest
- *Plus others depending on a Hazard Profile*

Each Hazard is one Chapter of the AHMP
Required by November 1, 2004 for all counties

Slide 5

Phase I Hazard Profile



Slide 6

FEMA Requirements
(Outstanding Rating)

- Adoption by Local Government Body
- Multi-Jurisdictional Planning
- Identification of Hazards & Risk Assessment
  - Profiling Hazard Events
  - Mapping Juxtaposition of Hazards, Structures, Infrastructure
  - Potential Dollar Losses to Vulnerable Structures (B/C Analysis)
- Documented Planning Process
- Assessing Vulnerability
- Mitigation Goals
- Analysis of Mitigation Measures
- Monitoring, Evaluating & Updating the Plan (5 year cycles)
- Implementation Through Existing Programs
- Public Involvement

Slide 7

Wildfire Mitigation: National Policy

- **National Fire Plan (2000)**
  - Preparedness
  - Rehabilitation & Restoration
  - Hazardous Fuel Reduction
  - Community Protection
  - Accountability
- **Statewide Implementation Strategy**
  - Idaho Bureau of Homeland Security
  - Idaho Implementation Strategy of the National Fire Plan

Slide 8

Healthy Forests Restoration Act

- Strengthens public participation in developing high priority projects;
- Reduces the complexity of environmental analysis allowing federal land agencies to use the best science available to actively manage land under their protection;
- Creates a pre-decisional objections process encouraging early public participation in project planning; and
- Issues clear guidance for court action challenging HFRA projects.

Slide 9

Funding Opportunities

- **Federal Monies**
  - National Fire Plan
  - Healthy Forests Restoration Act
  - Federal Emergency Management Agency
- **State Monies**
  - Statewide Implementation Efforts
  - Idaho Bureau of Homeland Security
- **The Goal is Hazard Reduction (eg., *FireWise*)**
  - Protection of People and Structures
  - Protection of Infrastructure
  - Protection of Economy
  - Protection of Ecosystems

Slide 10

Recommendations

- WUI Safety & Policy
- People & Structures
- Infrastructure
- Resources & Capabilities
- Regional Land Management Recommendations

We will revisit this list at the end of the presentation…

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Table 2.6. Public meeting slide show.

Slide 11

Slide 12

Hazard Mitigation:
Treatment Categories

- **People and Structures**
  - Policy at the County Level
  - Reducing Risk to People and Structures
  - Planning and Zoning Changes
- **Infrastructure Protection**
  - Power Lines
  - Roads & Bridges
  - Gas and Water Lines
  - Watersheds
- **Resources and Capabilities**
  - Emergency Services Ability to Respond
- **Federal, State, and Local Land Management Recommendations**

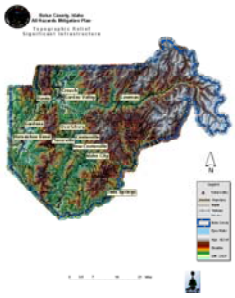
Slide 13

All Hazard Assessments

- Determine risk factors
- Identify resources at risk
- Create mitigation strategies
- Assess benefit/cost ratio
- Seek funding opportunities and partners
- Implement the plan!

Slide 14

Slide 15



Slide 16

Slide 17

Slide 18

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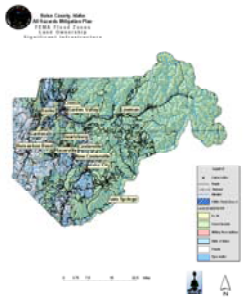
Table 2.6. Public meeting slide show.

Slide 19



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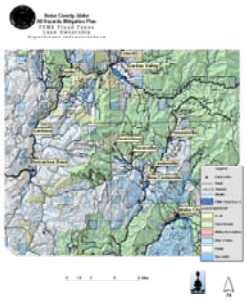

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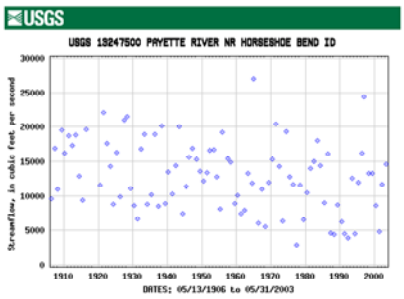
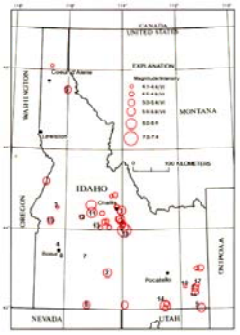
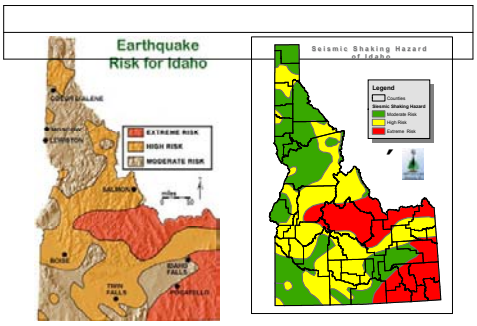


Slide 22



Slide 23



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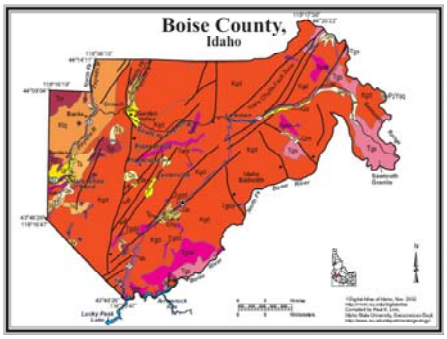

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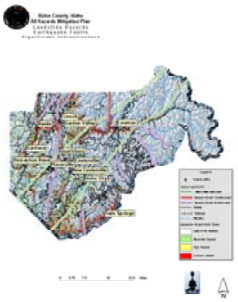
Table 2.6. Public meeting slide show.

Slide 25



Slide 26

Garden Valley School District

Non Structural Seismic Retrofits

- The Garden Valley school district has recently implemented several non-structural seismic retrofits to many of the school's structures. This project reduced the risk of injury to students and teachers, as well as others who may use the schools as shelter facilities. Also, objects such as shelves, lighting, computer equipment, etc, were secured from falling in the event of an earthquake. Propane tanks were secured to cement pads and a protective film was placed on windows to prevent shattering. This area experiences significant seismic activity.

- August 22, 1984 IV
- October 29, 1978 V
- August 17, 1959 V
- July 12, 1944 V - VII
- October 28, 1983 VI
- November 27, 1977 V
- February 13, 1945 VI

Slide 27

Preparedness

- City Fire and Medical Protection
- Rural Fire and Medical Protection
- Wildland Fire Protection

Slide 28

Public Involvement

- Public Mail Survey was sent to 235 households in Gem County
  - A total of 96 surveys were returned completed (40% response rate)
- Public Meetings will be held in November
- Public Review of the DRAFT Plans will be facilitated once all sections have been completed and reviewed by the committee

Slide 29

Written Plan Completion

- Committee will review the draft document first
- Public Review of the Draft document is next
- The final document will be presented for acceptance by the County Commissioners and others

Slide 30

Recommendations

- WUI Safety & Policy
- People & Structures
- Infrastructure
- Resources & Capabilities
- Regional Land Management Recommendations

Are we accomplishing these goals?

Slide 31

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2.3.5 Documented Review Process

The review process began with the committee. As previously discussed, the Wildland-Urban Interface Wildfire Mitigation Plan was completed in February 2002 and adopted by the Boise County Commissioners. This document will detail, in subsequent chapters, additional hazards listed below. The Terrorism and Civil Unrest chapter will be included in a separate document to receive limited distribution at the determination of the County Commissioners or their designees.

- Flood Mitigation Plan
- Severe Weather (Winter Storm, Wind Storm, Tornado) Mitigation Plan
- Landslide & Earthquake Mitigation Plan
- Civil Unrest & Terrorism Mitigation Plan

Chapters 1, 2, and 3 of this document are provided as "Overview" chapters, to set the stage for the planning process, the public involvement, and an assessment of the county's characteristics which influence all of the individual hazard assessments and mitigation efforts.

This set of documents will serve as the Boise County All Hazards Mitigation Plan for County, State, and Federal Purposes. This plan will be submitted by the County Commissioners to the Idaho Bureau of Homeland Security for FEMA review and approval.

Review of all sections of this document occurred by the Planning Committee as the plan's preparation progressed. Once the draft plans were completed (following public information meetings) the document was reviewed by the members of the planning committee. These modifications to the documents were integrated into a revised draft which was sent out for public review at the county courthouse, libraries, selected federal and state offices, and advertised in the local media. Comments and suggestions from the public review of the documents were integrated into final versions of the documents and approved by the county commissioners and others identified by their signatures in the last section of each document (Signature Pages).

Amendments to the plans can be made through a modification of the completed documents with a resolution and acceptance by the County Commissioners, annually at the renewal of the plan.

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Chapter 3: County Characteristics

3 Background and Area Description

3.1 Location and Land Forms

Boise County is located in the West Central Highlands of Idaho with the Payette River cutting through its heartland. Ownership is mixed between Federal (US Forest Service), state and private owners.

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Figure 3.1. Topographic relief of Boise County, Idaho.

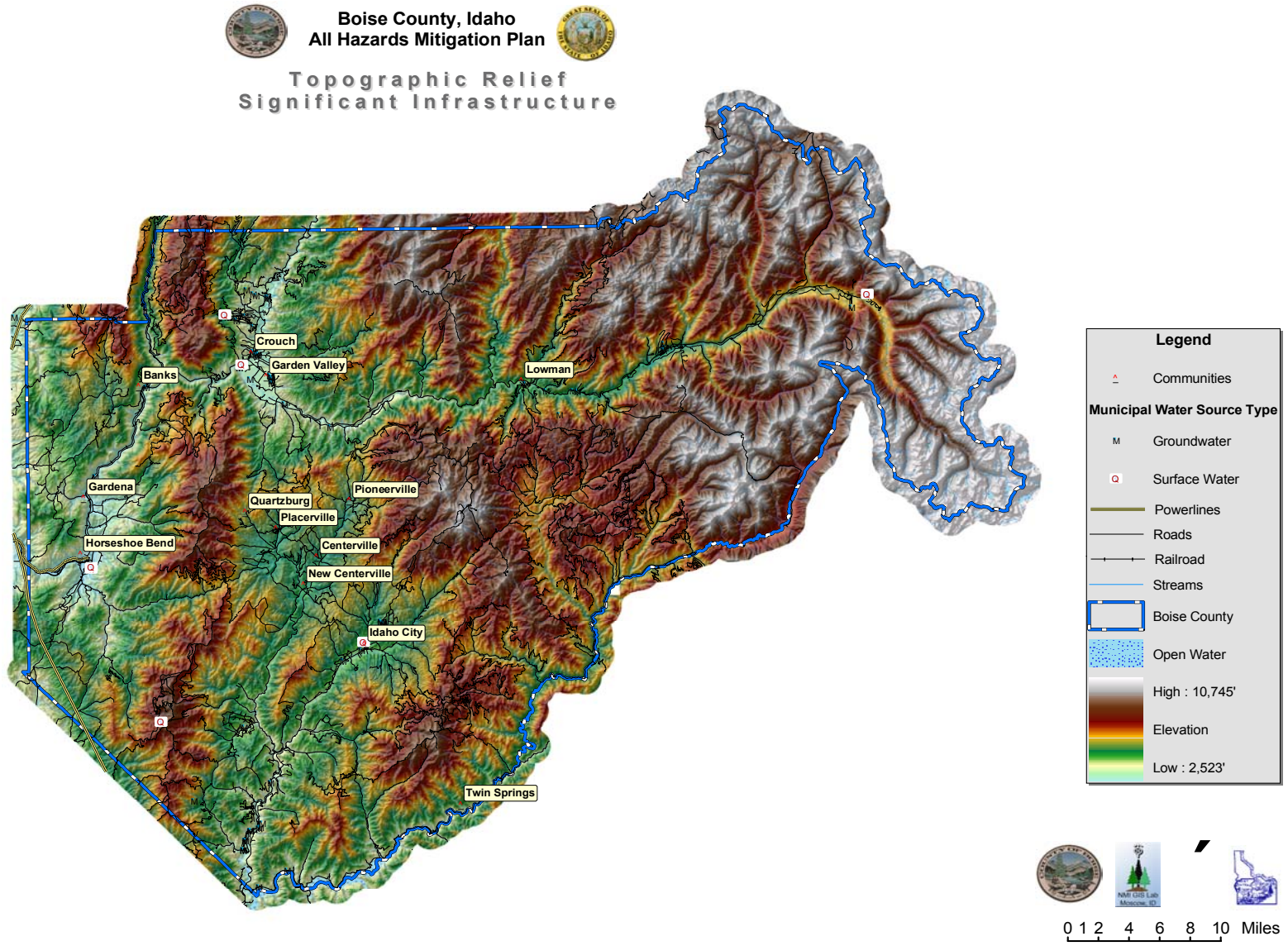


Figure 3.2. Topographic relief of the central portion Boise County (Idaho City/Centerville/Placerville).

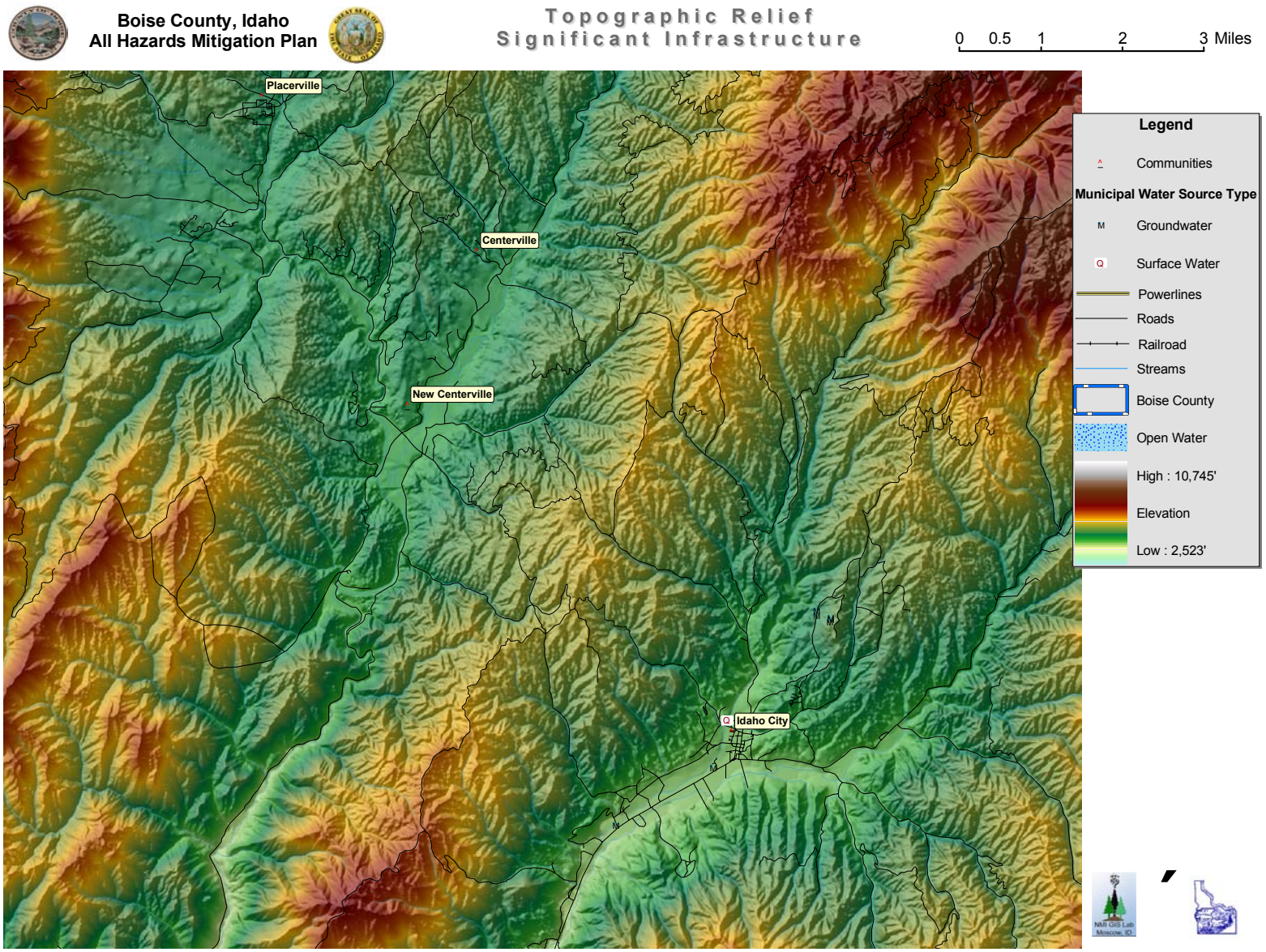


Figure 3.3 Topographic relief of the western portion Boise County (Horseshoe Bend).

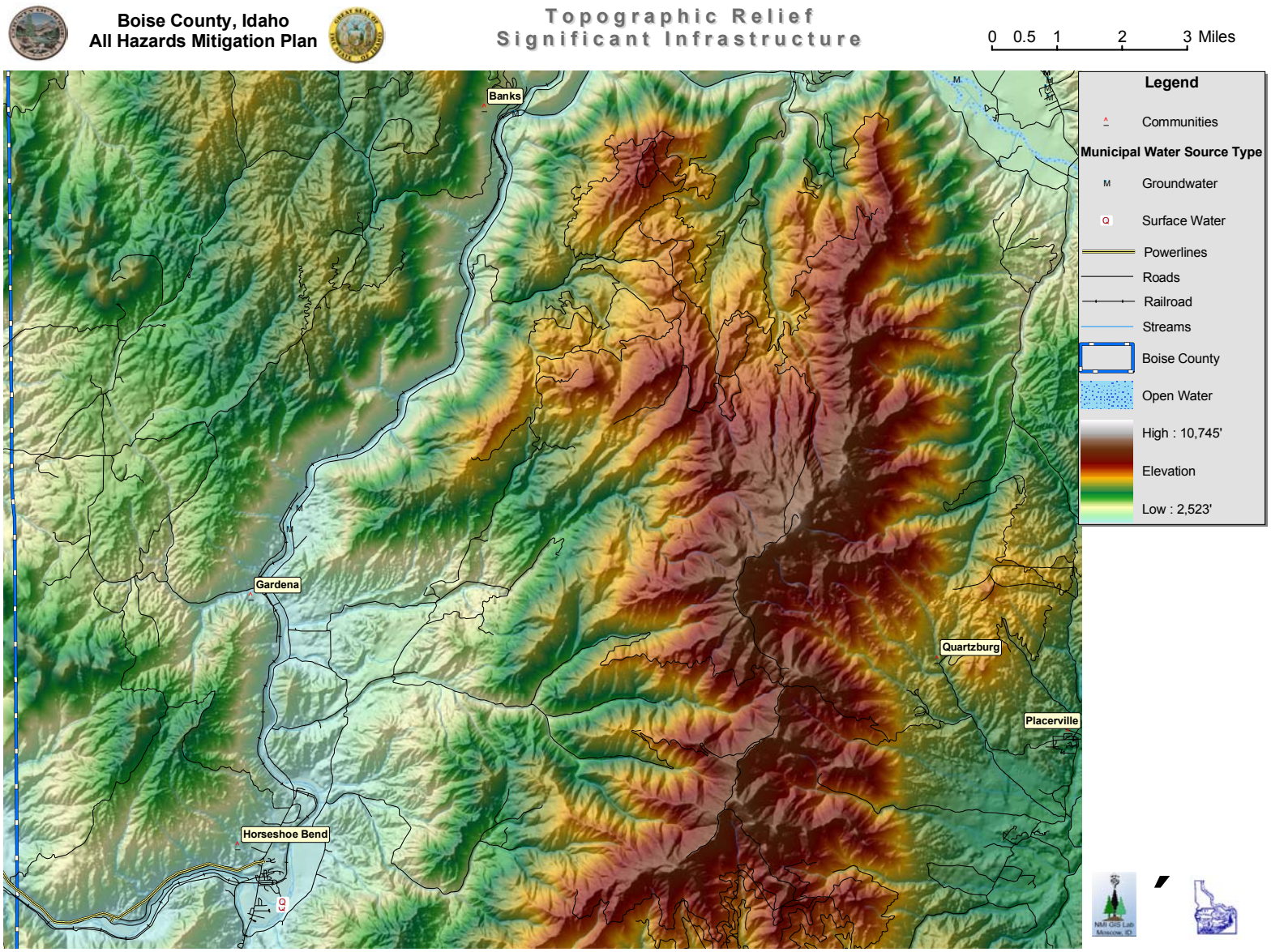


Figure 3.4 Topographic relief of the northern portion Boise County (Garden Valley/Crouch)

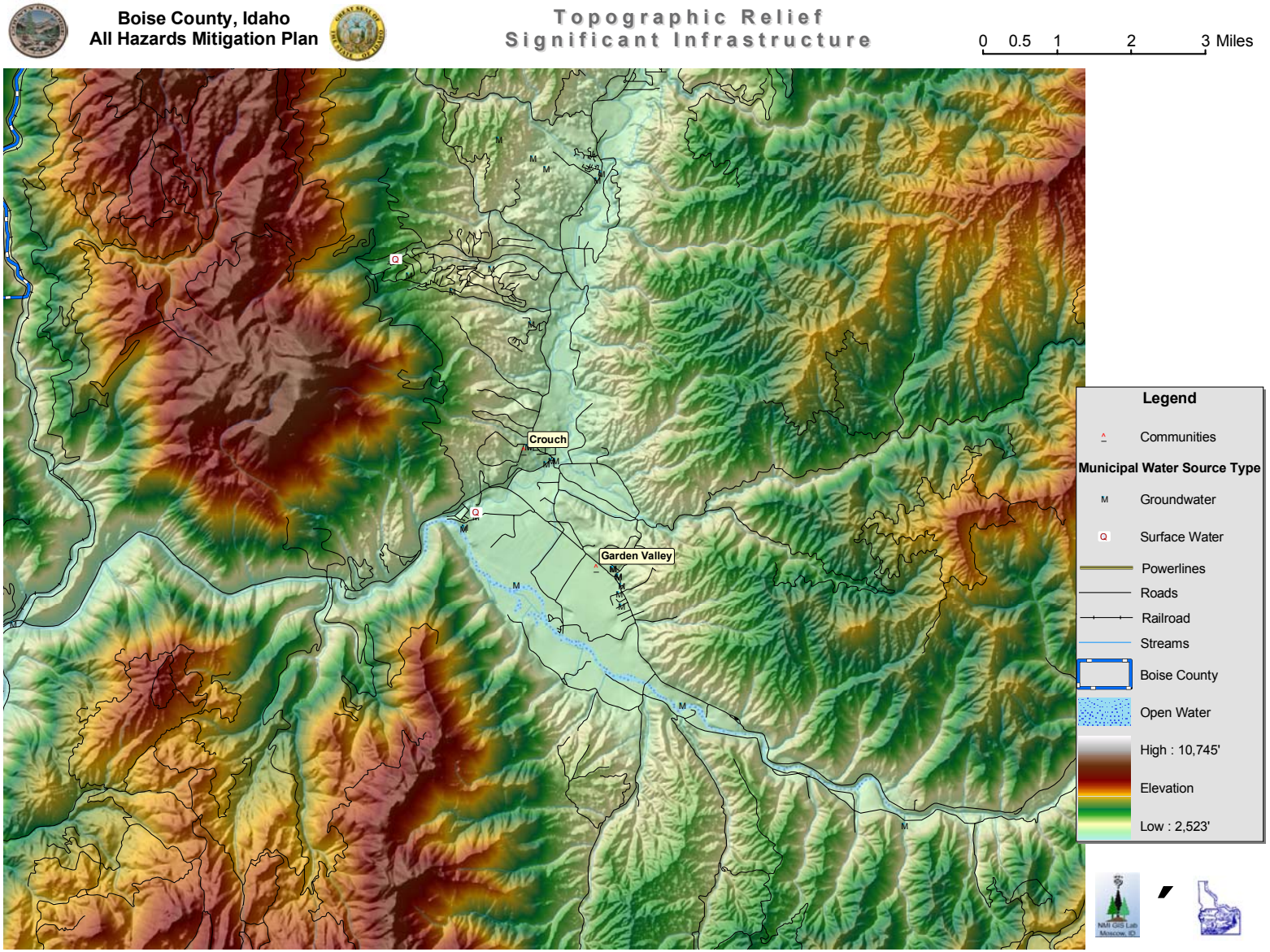
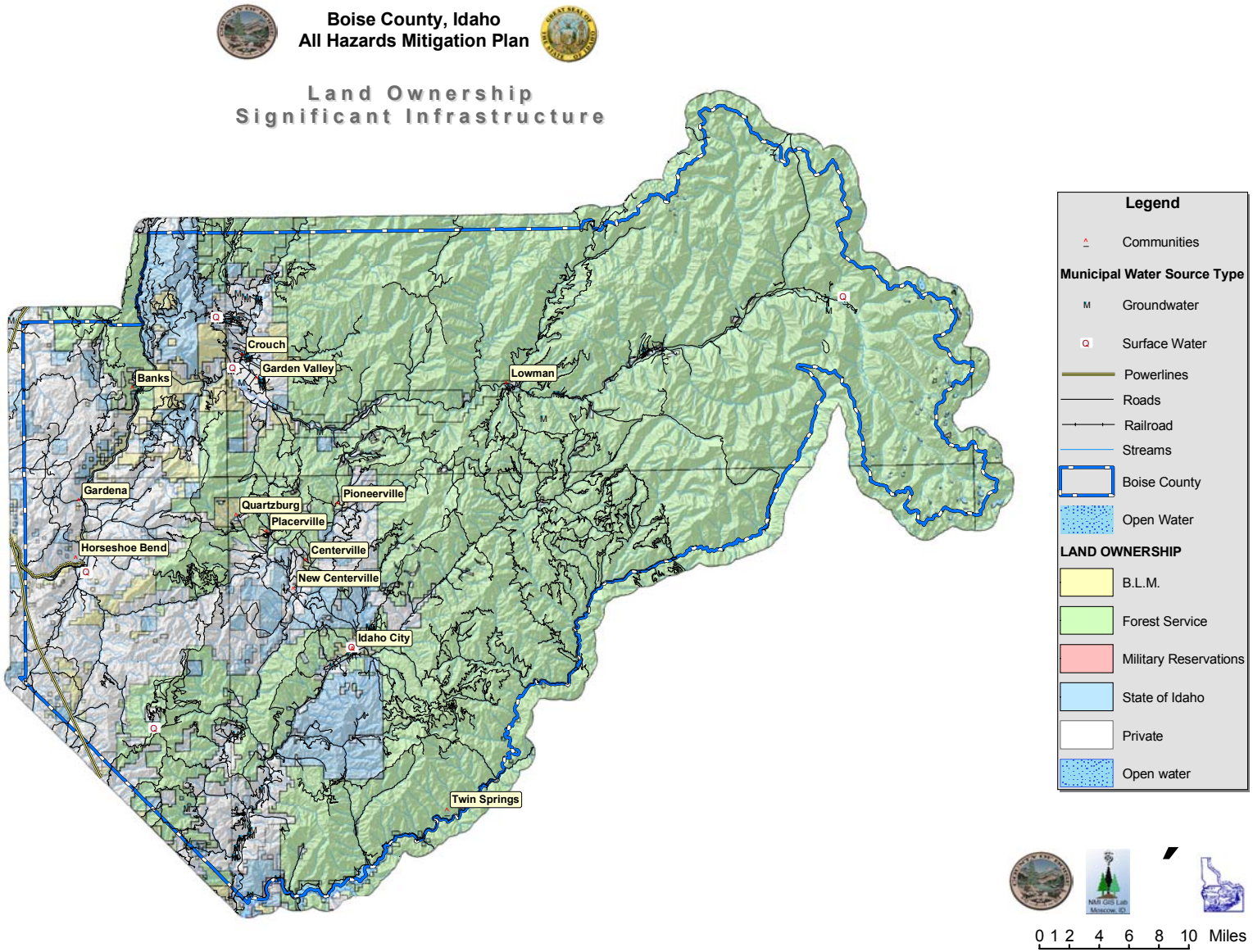


Figure 3.5. Land Ownership in Boise County.



3.2 Demographics

Boise County reported a total population of 6,670 in 2000 with approximately 4,349 housing units. Boise County has four incorporated communities, Idaho City (pop. 461), Placerville (pop. 60), Crouch (pop. 176), and Horseshoe Bend (pop. 769). The total population for the county increased nearly 53% from 1990 to 2000. The total land area of the county is roughly 1,906.76 square miles (1,220,326.4 acres).

Table 3.1 summarizes some relevant demographic statistics for Boise County.

Table 3.1 Selected demographic statistics for Boise County, Idaho, from the Census 2000.

Total population	**6,670**	**100.0**
SEX AND AGE		
Male	3,409	51.1
Female	3,261	48.9
Under 5 years	434	6.5
5 to 9 years	450	6.7
10 to 14 years	557	8.4
15 to 19 years	465	7.0
20 to 24 years	217	3.3
25 to 34 years	624	9.4
35 to 44 years	1,181	17.7
45 to 54 years	1,216	18.2
55 to 59 years	446	6.7
60 to 64 years	339	5.1
65 to 74 years	468	7.0
75 to 84 years	232	3.5
85 years and over	41	0.6
Median age (years)	40.5	(X)
18 years and over	4,871	73.0
Male	2,496	37.4
Female	2,375	35.6
21 years and over	4,725	70.8
62 years and over	934	14.0
65 years and over	741	11.1
Male	404	6.1
Female	337	5.1
RELATIONSHIP		
Population	**6,670**	**100.0**
In households	6,592	98.8
Householder	2,608	39.1

Table 3.1 Selected demographic statistics for Boise County, Idaho, from the Census 2000.

Total population	**6,670**	**100.0**
Spouse	1,652	24.8
Child	1,825	27.4
Own child under 18 years	1,613	24.2
Other relatives	199	3.0
Under 18 years	105	1.6
Nonrelatives	308	4.6
Unmarried partner	146	2.2
In group quarters	78	1.2
Institutionalized population	35	0.5
Noninstitutionalized population	43	0.6
HOUSEHOLDS BY TYPE		
Households	**2,608**	**100.0**
Family households (families)	1,900	72.9
With own children under 18 years	799	30.6
Married-couple family	1,630	62.5
With own children under 18 years	613	23.5
Female householder, no husband present	163	6.3
With own children under 18 years	106	4.1
Nonfamily households	708	27.1
Householder living alone	568	21.8
Householder 65 years and over	162	6.2
Households with individuals under 18 years	868	33.3
Households with individuals 65 years and over	741	28.4
Average household size	2.53	(X)
Average family size	2.93	(X)
HOUSING TENURE		
Occupied housing units	**2,616**	**100.0**
Owner-occupied housing units	2,178	83.3
Renter-occupied housing units	438	16.7
Average household size of owner-occupied unit	2.50	(X)
Average household size of renter-occupied unit	2.60	(X)

3.3 Socioeconomics

Boise County had a total of 4,349 housing units and a population density of 3.5 persons per square mile reported in the 2000 Census (Table 3.1). Ethnicity in Boise County is distributed: white 95.2%, black or African American 0.1%, American Indian or Alaskan Native 0.9%, two or more races 2.0%, and Hispanic or Latino 3.4%.

Specific economic data for individual communities is collected by the US Census; in Boise County this includes Idaho City, Placerville, and Horseshoe Bend. Boise County households earn a median income of $38,651 annually; Idaho City had a median household income of $28,068 in 2000, while Horseshoe Bend had a median household income of $32,125, Crouch averaged $29,375, and Placerville averaged $30,625 in 2000. Although there are no specific figures, a significant portion of the county commutes to jobs located outside the county. Table 3.2 shows the dispersal of households in various income categories in both communities.

Table 3.2 Income in 1999.

	Number	Percent
Households	2,608	100.0
Less than $10,000	266	10.2
$10,000 to $14,999	142	5.4
$15,000 to $24,999	406	15.6
$25,000 to $34,999	365	14.0
$35,000 to $49,999	488	18.7
$50,000 to $74,999	517	19.8
$75,000 to $99,999	210	8.1
$100,000 to $149,999	160	6.1
$150,000 to $199,999	27	1.0
$200,000 or more	27	1.0
Median household income (dollars)	38,651	(X)

(Census 2000)

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs federal agencies to identify and address any disproportionately high adverse human health or environmental effects of its projects on minority or low-income populations. In Boise County, a significant number of families are at or below the poverty level. Approximately 9.0% of Boise County families are below poverty level (Table 3.3).

Table 3.3 Poverty Status in 1999 (below poverty level)	**Boise County**	
	Number	**Percent**
Families	171	(X)
Percent below poverty level	(X)	9.0
With related children under 18 years	123	(X)
Percent below poverty level	(X)	14.5
With related children under 5 years	56	(X)
Percent below poverty level	(X)	17.2
Families with female householder, no husband present	48	(X)
Percent below poverty level	(X)	29.4
With related children under 18 years	46	(X)
Percent below poverty level	(X)	38.0
With related children under 5 years	26	(X)
Percent below poverty level	(X)	49.1
Individuals	852	(X)
Percent below poverty level	(X)	12.9

Table 3.3 Poverty Status in 1999 (below poverty level)	Boise County	
	Number	Percent
18 years and over	557	(X)
Percent below poverty level	(X)	11.4
65 years and over	57	(X)
Percent below poverty level	(X)	7.7
Related children under 18 years	282	(X)
Percent below poverty level	(X)	16.4
Related children 5 to 17 years	206	(X)
Percent below poverty level	(X)	16.0
Unrelated individuals 15 years and over	277	(X)
Percent below poverty level	(X)	27.1

(Census 2000)

The unemployment rate was 4.7% in Boise County in 1999, compared to 4.4% nationally during the same period. Approximately 6.6% of the Boise County employed population worked in natural resources, with much of the indirect employment relying on the employment created through these natural resource occupations; Table 3.4 (Census 2000).

Table 3.4 Employment & Industry	Boise County	
	Number	Percent
Employed civilian population 16 years and over	3,088	100.0
OCCUPATION		
Management, professional, and related occupations	1,021	33.1
Service occupations	439	14.2
Sales and office occupations	703	22.8
Farming, fishing, and forestry occupations	98	3.2
Construction, extraction, and maintenance occupations	450	14.6
Production, transportation, and material moving occupations	377	12.2
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	203	6.6
Construction	446	14.4
Manufacturing	367	11.9
Wholesale trade	84	2.7
Retail trade	311	10.1
Transportation and warehousing, and utilities	165	5.3
Information	79	2.6
Finance, insurance, real estate, and rental and leasing	113	3.7
Professional, scientific, management, administrative, and waste management services	206	6.7
Educational, health and social services	480	15.5
Arts, entertainment, recreation, accommodation and food services	235	7.6

Table 3.4 Employment & Industry	Boise County	
	Number	Percent
Other services (except public administration)	91	2.9
Public administration	308	10.0

Approximately 62.5% of Boise County's employed persons are private wage and salary workers, while 23.9% are government workers (Table 3.5).

Table 3.5 Class of Worker	Boise County	
	Number	Percent
Private wage and salary workers	1,929	62.5
Government workers	738	23.9
Self-employed workers in own not incorporated business	395	12.8
Unpaid family workers	26	0.8

(Census 2000)

3.3.1 Boise County History

Information summarized from the official Boise County website http://www.co.boise.id.us .

The rush was on. Originally, people traveled by steamer up the Columbia River to Umatilla, departing from Umatilla by stage lines, and finally journeying by pack-train to the Boise Basin. Difficult winters and shortages of food made life treacherous. One year a food riot occurred because the spring supplies from Walla Walla had not arrived. The Basin's population swelled to 25,000. The mining proved extensive and the gold was evenly distributed through out the Basin. Many claimed it was the "best mining district we ever saw". The mining laws were considered fair and liberal. On February 4, 1864 Boise County was established. This same year wagon roads brought the wagon trains, hauled by four, six , eight, or even twelve horses or mules. The saw mill ran continuously with rough lumber building up cities like magic.

In 1863 Idaho City had grown to 6000 people and had 250 places of business. Idaho City assumed the notoriety as being the best mining camp in the Basin and the general rendezvous of miners, speculators, and gamblers. There was plenty of amusement. Streets were thronged with wagons, horses, mule, and cattle. Idaho City also was favored by its never failing water supply.

The basin attracted families as it offered special appeal to those seeking homes. More children and women were in evidence here than in most other mining camps. Two early schools were in operations as well as a lending library. The Basin also believed in and appreciated good government.

The height of the boom lasted from 1863 to 1866. By 1867 many sold out to Chinese miners who were able, through industrious work, to make the mines pay; the 1870 Census lists 1700 Chinese. The rich gold fields were considered "panned out" as most readily worked streams had been worked. Another major factor in the decline was the high loss caused by destructive fires. Fires hit Idaho City in 1865, 1867, 1868 and 1871.

Mining techniques changed from sluicing to hydraulics, carving out vast hillsides. Quartz mining prospered in the 1870s with a number of stamp mills in operation. Dredge mining began in 1898 and continued till the 1950's. Unfortunately, much of the lower lying land in the Basin has been disfigured by dredging. Also, camps like Buena Vista located across Elk Creek from Idaho City disappeared through dredging. Fires have also continued their rampage, wiping out Quartzberg in 1931.

Any holiday was a time of special festivity in the Basin. Fourth of July was celebrated with picnics and parades characterized by flags, mottos, banners, and bands. Saint Patrick's Day brought supper and speeches, especially in Pioneer City which was chiefly Irish and referred to as New Dublin. Christmas programs were also festive events.

3.3.2 Forestry and Logging

Over the past century, employment through timber harvesting has been significant in the region. Forestry, logging, trucking, and related support industries have relied on timber harvests from this region.

3.3.3 Recreation

Boise County has many outstanding tourism and recreational facilities. The county offers a full panorama of recreational opportunities ranging from kayaking on the Payette River to skiing at Bogus Basin. The full spectrum of year around recreation activities that take place in Boise County do so on multi-jurisdictional Federal and State lands, as well as on private property.

The economic impacts of these activities to the local economy and the economy of Idaho have not been enumerated. However, they are substantial given the many months of the year that activities take place and the large numbers of visitors that travel to this location.

The Boise National Forest encompasses the County.

3.3.3.1 Boise National Forest

Extensive outdoor recreational activities occur (hunting, four-wheeling, etc.) in the Boise National Forest. There are also numerous developed and undeveloped campsites throughout the Forest. Lowman, Garden Valley and Idaho City are popular vacation and recreational destinations.

3.3.3.2 Sawtooth Wilderness Area

A small portion of the Sawtooth Wilderness Area is located on the easternmost side of the county. The only access to this area through Boise County is via Grand Jean Road off State Route 21. The Idaho State Centennial Trail passes through this area; otherwise there are no identified roads or trails.

3.3.3.3 Idaho State Centennial Trail

The Idaho State Centennial Trail passes through the Sawtooth Wilderness in eastern Boise County. The Trail extends about 1,200 miles from Nevada to the Canadian border passing through 11 national forests, 1,200 miles of rugged sagebrush desert, and the largest contiguous wilderness in the lower 48 states. The trail provides for a variety of uses: horseback riding, hiking, cross-country skiing, snowmobiling, mountain biking, motorized trail biking, and even conventional vehicle use where the "trail" is actually a road.

3.3.3.4 Camping

Camping is another popular activity enjoyed by the residents and visitors of Boise County. The Boise National Forests provide campsites varying from wheelchair accessible to isolated sites. The amenities vary from full RV hookup to only a cleared tent site.

3.3.3.5 Fishing and Hunting

Fishing and hunting is very important to Boise County both from a recreational standpoint and as an economic resource. A wide variety of fish can be caught in Boise County, including trout and bass. The rivers and streams provide excellent fisheries.

For those people who prefer a gun or bow to a fly rod, Boise County offers a bounty of hunting experiences. Wild birds and game, like deer, elk, bear, pheasant, quail, partridge, chukar, grouse, wild duck, geese, and doves are found in abundance.

3.3.3.6 Winter Sports

For those people who enjoy winter sports, Boise County has a variety of activities to interest them. Skiers will be exhilarated by the challenging slopes of Bogus Basin. Snowmobilers and cross country skiers are not left out; miles of designated snowmobile areas and groomed trails attract many local and out of town thrill seekers.

3.3.3.7 Summer Sports

There are a large variety of summer recreational opportunities as well. Many have already been listed; additional activities include 4 wheeling, cross county biking, horseback riding, motor biking, berry picking and hiking. All of these activities are done away from the major transportation routes in the county. During hazardous events finding and helping these recreationalists will be a difficult task with the local resources responding first to the local population in the communities.

3.3.4 Resource Dependency

The communities of Boise County have been evaluated by the University of Idaho College of Natural Resources Policy Analysis Group (PAG) for the degree of natural resource dependency each community experiences.

Idaho communities with more than 10% employment in resource-based sectors (wood products, travel & tourism, agriculture, and mining) were evaluated by Harris *et al.* (2003). Their findings indicate that Garden Valley, Banks and Idaho City fall into this category as a “Travel & Tourism Only” dependent community. Horse Shoe Bend is considered under the heading of “Wood products and Only” dependent community (Harris *et al.* 2000).

Idaho communities with more than 10% employment in resource-based sectors (wood products, travel & tourism, agriculture, and mining) were evaluated by Harris *et al.* (2003). Their findings indicate the following (Harris *et al.* 2000):

- Garden Valley .....Travel and Tourism Only
- Banks .....Travel and Tourism Only
- Idaho City .....Travel and Tourism Only
- Horseshoe Bend .....Wood Products Only

From 1993 to 1998 sawmill capacity dropped rapidly in response to dwindling public log supplies. Only two of five dominant companies operating in 1995 were still operating in 1998, and one of these, Boise Cascade, closed two of its large sawmills during this period. In the mid-1980s Boise Cascade operated three sawmills, one plywood mill and a finishing-planer mill. Idaho closures included its Council and Horseshoe Bend sawmills. Only two facilities remained

open in 1999, the sawmill in Cascade and a plywood mill in Emmett. In the last few years, both of these mills closed, along with Croman's mill (Harris *et al.* 2000). As of January 2005 all of the large mills in the county have now closed and the communities are feeling the economic loss of these closures.

Harris *et al.* (2003) further evaluated Idaho communities based on their level of direct employment in several industrial sectors. Their findings for communities in Boise County are summarized in Table 3.6.

Table 3.6. Levels of direct employment by industrial sector

Community	Economic Diversity Index	Agriculture	Timber	Travel and Tourism	State/Local Government	Federal Government	Mining and Minerals
Garden Valley	Med. Low	Low	Low	High	Low	Low	Low
Banks	Low	Low	Low	High	Low	Low	Low
Idaho City	Med. Low	Low	Low	High	High	Low	Low
Horseshoe Bend	Med. High	Med. Low	High	Low	Med. Low	High	Low

A "low" level of direct employment represents 5% or less of total employment in a given sector; "med. low," 6 to 10%; "med. high" 11 to 19%; and "high" 20% or more of total employment in a given sector.

Source: Harris *et al.* 2000

3.3.5 Development Trends

Boise County, once a dominantly forestry-based economy, is now less so. Recent trends of development and growth in this area have seen many high-value homes in sub-divisions that are purchased by out-of-county buyers that use these homes for weekend and vacation use, or in conjunction with recreational objectives. In addition, some new home buyers work in nearby Boise (Ada County). A significant number of new home buyers in the county do not reside full-time in Boise County. Harris *et al.* (2003) (Census 2000)

3.3.6 Population Density Indicators (WUI)

A key component in meeting the underlying need is the protection and treatment against hazards in what has been called the wildland-urban interface. The wildland-urban interface (WUI) was developed to give land managers a reference for where people and structures are located in reference to wildland fire control. The WUI has a broader application for use in hazard mitigation applications as it refers to areas where concentrations of people and structures are located. It encompass not only the interface (areas immediately adjacent to urban development), but also the continuous slopes and wildlands that lead directly to a risk to urban developments. Reducing the hazards in the wildland-urban interface requires the efforts of federal, state, local agencies, and private individuals (Norton 2002). "The role of [most] federal agencies in the wildland urban interface includes wildland fire fighting, hazard fuels reduction, cooperative prevention and education and technical experience. Structural fire protection [during a wildfire] in the wildland urban interface is [largely] the responsibility of Tribal, state, and local governments" (USFS 2001). Although Secretary Norton was speaking on wildfire risks, her comments apply equally to other hazards.

Property owners share a responsibility to protect their residences and businesses and minimize danger by creating defensible areas around them and taking other measures to minimize the risks to their structures (USFS 2001). With treatment, a wildland-urban interface can provide

firefighters a defensible area from which to suppress hazard risks or defend communities (Norton 2002).

3.4 Cultural Resources

Cultural resource impacts were qualitatively assessed through a presence/absence determination of significant cultural resources and mitigation measures to be employed during potential hazard mitigation activities.

The United States has a unique legal relationship with Indian tribal governments defined in history, the U.S. Constitution, treaties, statutes, Executive Orders, and court decisions. Since the formation of the union, the United States has recognized Indian tribes as domestic dependant nations under its protection. The Federal Government has enacted numerous regulations that establish and define a trust relationship with Indian tribes.

The relationship between Federal agencies and sovereign tribes is defined by several laws and regulations addressing the requirement of Federal agencies to notify or consult with Native American groups or otherwise consider their interests when planning and implementing Federal undertakings, among these are:

- **EO 13175, November 6, 2000**, Consultation and Coordination with Indian Tribal Governments.
- **Presidential Memorandum, April, 1994**. Government-Government Relations with Tribal Governments (Supplements EO 13175). Agencies must consult with federally recognized tribes in the development of Federal Policies that have tribal implications.
- **EO 13007, Sacred sites, May 24, 1996**. Requires that in managing Federal lands, agencies must accommodate access and ceremonial use of sacred sites and must avoid adversely affecting the physical integrity of these sites.
- **EO 12875, Enhancing Intergovernmental Partnerships, October 26, 1993**. Mainly concerned with unfunded mandates caused by agency regulations. Also states the intention of establishing “regular and meaningful consultation and collaboration with state, local and tribal governments on matters that significantly or uniquely affect their communities.”
- **Native American Graves Protection and Repatriation Act (NAGPRA) of 1989**. Specifies that an agency must take reasonable steps to determine whether a planned activity may result in the excavation of human remains, funerary objects, sacred objects and items of cultural patrimony from Federal lands. NAGPRA also has specified requirements for notifying and consulting tribes.
- **Archaeological Resources Protection Act (ARPA), 1979**. Requires that Federal permits be obtained before cultural resource investigations begin on Federal land. It also requires that investigators consult with the appropriate Native American tribe prior to initiating archaeological studies on sites of Native American origin.
- **American Indian Religious Freedom Act (AIRFA), 1978**. Sets the policy of the US to protect and preserve for Native Americans their inherent rights of freedom to believe, express, and exercise the traditional religions of the American Indian . . . including, but not limited to access to sacred sites, use and possession of sacred objects, and the freedom to worship through ceremonies and traditional rites.

- **National Environmental Policy Act (NEPA), 1969**. Lead agency shall invite participation of affected Federal, State, and local agencies and any affected Indian Tribe(s).
- **National Historic Preservation Act (NHPA), 1966**. Requires agencies to consult with Native American tribes if a proposed Federal action may affect properties to which they attach religious and cultural significance. (Bulletin 38 of the act, identification of TCPs, this can only be done by tribes.)
- Treaties (supreme law of the land) in which tribes were reserved certain rights for hunting, fishing and gathering and other stipulations of the treaty.
- Unsettled aboriginal title to the land, un-extinguished rights of tribes.

3.4.1 National Register of Historic Places

The National Park Service maintains the National Register of Historical Places as a repository of information on significant cultural locale. These may be buildings, roads or trails, places where historical events took place, or other noteworthy sites. The NPS has recorded sites in its database. These sites are summarized in Table 3.7.

Table 3.7 National Register of Historic Places in Boise County, Idaho.

Item Number	Resource Name	Address	City	Listed	Architect, Builder, or Engineer
1	**Idaho City**	Bounded by city limits	Idaho City	1975	
2	**Placerville Historic District**	Roughly bounded by town site limits	Placerville	1984	Multiple

*(National Register of Historic Places 2004)*Hazard mitigation activities in and around these sites has the potential to affect historic places. In all cases, the mitigation work will be intended to reduce the potential of damaging the site.

3.5 Transportation

Primary access to and from Boise County is provided by US Highway 55, a two-lane paved road with turnouts which traverses the county along its western side. This access is a primary north-south route for Idaho transportation networks, as the only road providing direct access between Boise and McCall. State Route 21 from Boise to Idaho City is paved; however, the continuation of this route through Lowman and on to Stanley is now also paved, but is subject to periodic closures due to landslides or avalanches. Smaller access roads (many gravel or dirt) provide access to the adjoining areas within the county. A variety of trails and closed roads are also to be found throughout the region.

Because of the constant interruption on the primary and secondary roads in the county often smaller Federal, State and private logging roads are used as alternative routes to various parts of the county. As these road systems are not maintained or are closed off the ability of county residents to move around during hazard events is being reduced.

Almost all of the roads in the county were originally built to facilitate logging and mining activities. As such, all of these roads can support timber harvesting equipment, logging trucks, and fire fighting equipment referenced in this document. However, many of the new roads have

been built for home site access, especially for new sub-divisions of homes. In many cases, these roads are not adequate to facilitate firefighting equipment. County building codes for new developments should be adhered to closely to insure this tendency is not continued.

3.6 Climate

3.6.1 Monthly Climate Summaries in Boise County

3.6.1.1 Lowman, Idaho

Period of Record Monthly Climate Summary

Period of Record: 8/ 1/1948 to 6/30/2004

Table 3.8 Climate summaries for Lowman, Boise County, Idaho.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	33.6	40.3	49.1	60.0	68.9	77.2	87.2	86.2	76.4	62.4	42.3	33.4	59.7
Average Min. Temperature (F)	13.8	16.9	22.7	28.8	34.4	39.4	42.5	40.8	34.8	28.3	22.3	14.5	28.3
Average Total Precipitation (in.)	3.58	3.11	2.56	2.08	2.03	1.34	0.60	0.59	1.18	1.64	3.29	3.89	25.90
Average Total Snow Fall (in.)	28.8	16.9	7.2	1.5	0.1	0.0	0.0	0.0	0.1	0.5	11.1	25.5	91.6
Average Snow Depth (in.)	18	20	12	1	0	0	0	0	0	0	2	9	5

Percent of possible observations for period of record. Max. Temp.: 67.2% Min. Temp.: 67.1% Precipitation: 69% Snowfall: 67.7% Snow Depth: 65%

3.6.1.2 Garden Valley Ranger Station, Idaho

Period of Record Monthly Climate Summary

Period of Record: 8/ 1/1948 to 6/30/2004

Table 3.9 Climate summaries for Garden Valley Ranger Station, Idaho.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	34.0	41.8	51.0	61.6	71.8	80.3	91.1	90.2	80.1	65.5	45.0	34.6	62.3
Average Min. Temperature (F)	17.3	20.7	25.3	30.8	37.6	43.6	47.4	45.7	38.6	30.8	25.6	19.3	31.9
Average Total Precipitation (in.)	3.96	2.68	2.28	1.73	1.63	1.46	0.49	0.50	0.99	1.50	3.10	4.13	24.46
Average Total Snow Fall (in.)	20.4	9.8	4.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	5.6	19.7	59.9
Average Snow Depth (in.)	12	11	3	0	0	0	0	0	0	0	1	6	3

Percent of possible observations for period of record. Max. Temp.: 92.9% Min. Temp.: 92.8% Precipitation: 95.5% Snowfall: 91.1% Snow Depth: 86%

3.6.1.3 Idaho City, Idaho

Period of Record Monthly Climate Summary

Period of Record: 1/ 1/1931 to 6/30/2004

Table 3.10 Climate summaries for Idaho City, Idaho.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	35.4	41.3	48.5	59.0	68.8	77.1	88.1	87.2	77.4	64.5	46.0	36.6	60.8
Average Min. Temperature (F)	12.7	15.4	21.2	27.7	34.4	40.1	44.7	42.9	35.6	28.5	22.0	15.2	28.4
Average Total Precipitation (in.)	3.63	2.79	2.38	1.76	1.77	1.39	0.44	0.48	0.88	1.46	2.93	3.62	23.55
Average Total Snow Fall (in.)	24.3	16.7	7.1	0.9	0.1	0.0	0.0	0.0	0.0	0.8	9.4	22.5	81.6
Average Snow Depth (in.)	17	19	11	1	0	0	0	0	0	0	1	9	5

Percent of possible observations for period of record. Max. Temp.: 99.6% Min. Temp.: 99.4% Precipitation: 99.6% Snowfall: 96.1% Snow Depth: 71.6%

3.7 Infrastructure

Boise County has both significant infrastructure and unique ecosystems within its boundaries. Of note for this All Hazards Mitigation Plan is the existence of state highway routes (55 and 21), and the presence of power lines supplying not only Boise County communities, but also neighboring counties. These resources will be considered in the protection of infrastructural resources for Boise County and to the larger extent of this region, and the rest of Idaho.

The unique geology of Boise County impacts the ability to plan for and respond to a variety of natural and manmade hazards. The county is large with a small population scattered in small hamlets with very roads crossing through difficult terrain connecting them. This makes the need to have local support and training in all parts of the county paramount when dealing with a variety of hazards. To its benefit this isolation has caused the populace of Boise County to be highly self-sufficient and better able to deal with most disasters than other parts of Idaho.

3.8 Soils

Most of central and north-central Idaho, including Boise County, is in a geographic region known as the Idaho Batholiths. This area is typically characterized as a granites soil composition with high erosion potential and often times, poor slope stability. Recovery potential of disturbed sites is poor due to thin organic horizons.

The following soil types are found in Boise County:

The Bryan series consists of deep and very deep, excessively drained soils that formed in deeply weathered quartz diorite and related rocks. Bryan soils are on mountains and have slopes of 5 to 70 percent. Permeability is very rapid. Average annual precipitation is about 30 inches and the average annual air temperature is about 42 degrees F.

Bryan soils are on steep mountains. Dominant slopes are 30 to 50 percent, but slopes ranges from 5 to 70 percent. The elevation is 4,200 to 7,000 feet. Parent materials are derived from deeply weathered quartz diorite and related rocks. The average annual precipitation is 25 to 35 inches, including about 7 to 15 feet of snowfall. The average annual temperature is 36 to 41 degrees F. Frost-free period ranges from about 30 to 80 days.

The soils of the Pyle series consists of moderately deep, well or somewhat excessively drained soils on uplands and formed in material from granodiorite, quartz monzonite, quartz diorite and related rocks. The mean annual precipitation is about 30 inches.

These soils occupy a wide range of geomorphic positions and aspects in uplands. Slopes range from about 5 to 70 percent. The elevations range from 4,700 feet, with northerly aspects, to 7,000 feet or higher. The soils formed in residuum and possibly some colluvium derived from granodiorite, quartz monzonite, quartz diorite and related bedrocks. The mean annual precipitation is 25 to 35 inches including 8 to 13 feet of snowfall.

The Quartzburg series consists of moderately deep to soft bedrock excessively drained soils with rapid permeability that formed in material weathered from granitic rocks. Slopes range from 20 to 90 percent in mountains. The average annual precipitation is about 28 inches and the average annual temperature is about 43 degrees F.

Quartzburg soils are on mountain slopes and canyon walls at 3,300 to 6,800 feet. These soils formed in residuum and colluvium weathered from granite, quartz monzonite, granodiorite and related rock. Slopes range from 20 to 90 percent. The average annual precipitation is 22 to 32 inches. The average annual temperature is 39 to 45 degrees F. The frost-free period is 30 to 90 days.

The Coski series consists of deep and very deep, well drained soils on forested mountain slopes. They formed in material weathered from intermediate intrusive rocks. Permeability is moderately rapid. Slopes are 10 to 70 percent. The average annual precipitation is about 28 inches, and the average annual air temperature is about 42 degrees F.

Coski soils are in rolling to very steep mountain side slopes. Slopes range from 10 to 70 percent. Elevation is 4,500 to 8,000 feet. The areas at the lower elevations have northerly slopes. The soils formed in residuum, alluvium and colluvium derived from intermediate intrusive bedrock. Average annual precipitation is 25 to 35 inches and includes 8 to 15 feet of snowfall. The average annual air temperature is 36 to 43 degrees F. The average freeze-free period is about 30 to 80 days.

The Danskin soils typically have gravelly loamy coarse sand A1 horizons, lighter colored gravelly loamy coarse sand C horizons, and granitic bedrock below 40 inches.

The soils occupy long side slopes and other uplands. Slopes range from 1 to 70 percent. Aspects are dominantly southerly. Elevations range from 2,500 to 4,500 feet. The soils are formed in materials weathered from granitic or related bedrock and some colluvium. The mean annual precipitation is 18 to 30 inches

The Gem series consists of moderately deep, well drained soils that formed in material weathered from basalt or other basic igneous rocks. Gem soils are on uplands and have slopes of 0 to 60 percent. Permeability is slow. The average annual precipitation is about 14 inches and the average annual temperature is about 47 degrees.

Gem soils are in uplands at elevations of 2,500 to 5,000 feet. Slopes range from 0 to 65 percent. The soils formed in residuum weathered from basalt or related basic igneous rock. The climate has dry summers, a frost-free season of 110 to 140 days, and an average annual

precipitation of 12 to 17 inches, including 3 to 6 feet of snow. The average annual temperature is 45 to 50 degrees F.

The Reywat series consists of shallow, well drained soils that formed in residuum derived dominantly from basalt. Reywat soils are on hills, mountains, and plateaus. Slopes are 0 to 90 percent. The mean annual precipitation is about 12 inches and the mean annual temperature is about 48 degrees F.

Reywat soils are hills, mountains, and plateaus. They formed dominantly in residuum derived from basalt or similar volcanic rocks. On steep slopes colluvium is a major portion of the parent material. Other areas have minor amounts of loess or volcanic ash in the A horizons. Slopes are 0 to 90 percent. Most slopes have south aspects, but some face north, especially at the lower elevations. Elevations range from 1,000 to 6,600 feet. The climate is semiarid with cool, moist winters and warm, dry summers. The mean annual precipitation is 9 to 14 inches, including 1.5 to 5 feet of snowfall. The mean annual temperature is 45 to 52 degrees F. The frost-free period is 80 to 160 days.

The Bakeoven series consists of very shallow, well drained soils that formed in mixed alluvium, loess and residuum weathered from basalt. Bakeoven soils are on uplands and have slopes of 0 to 90 percent. The mean annual precipitation is about 13 inches and the mean annual temperature is about 48 degrees F.

The Bakeoven soils are on mountains, ridge tops, hill slopes, mesas, and benches at elevations of 540 to 4,800 feet. Slopes of 2 to 20 percent are most common and the full range is from about 0 to 90 percent. The soils formed in loess and residuum weathered from basalt. The climate is semiarid. The mean annual precipitation is 9 to 16 inches. The mean annual temperature is 45 to 53 degrees F. The mean winter temperature is 31 to 35 degrees F. and the mean summer temperature is 62 to 66 degrees F. The frost-free period is 100 to 180 days.

The Haw series consists of very deep, well drained soils with moderately slow permeability that formed in old sediments derived mainly from intermediate intrusive rocks. Haw soils are in foothills and valleys with slopes of 0 to 65 percent. The average annual precipitation is about 11 inches and the average annual temperature is about 49 degrees F.

Haw soils are level to steep on dissected terraces, foothills, alluvial fans, fan remnants and draw bottoms at elevations of 2,000 to 5,300 feet. Slopes range from 0 to 65 percent. These soils formed in coarse or moderately coarse textured, old unconsolidated or weakly consolidated lacustrine sediments derived mainly from intrusive igneous rocks and are commonly high in quartz, and in micaceous and feldspathic materials. A thin mantle of loessial material covers most of the sediments. The climate is cool and moist in the winter and hot and dry in the summer. Average annual precipitation ranges from 9 to 15 inches. Average annual temperature ranges from 45 to 51 degrees F. Frost-free period is 90 to 160 days.

The Payette series consists of very deep, well drained soils that formed in material derived mainly from intrusive acid igneous rocks. Payette soils are on strongly dissected uplands and have slopes of 0 to 75 percent. The average annual precipitation is about 11 inches and average annual air temperature is about 48 degrees F. Permeability is moderately rapid in the upper part and very rapid in the lower part.

Payette soils are in strongly dissected, uplands and terraces in the Idaho and related formations at elevations of 2,300 to 4,000 feet. Slopes range from 0 to 75 percent. The soils formed in coarse or moderately coarse textured, old, unconsolidated or poorly consolidated sediments. The sediments are high in quartz, micaceous, and feldspathic material, and are derived mostly from intrusive acid igneous rocks. The climate has relatively dry summers. Frost-free period of

140 to 160 days, and average annual precipitation of 10 to 13 inches, including 1.5 to 4 feet of snowfall. Average annual air temperature is 46 to 51 degrees F.

The Van Dusen series consists of very deep, well drained soils with moderate permeability that formed in alluvium and colluvium from mixed lacustrine sediments. They are in valleys and foothills with slopes of 2 to 75 percent. The average annual precipitation is about 15 inches and the average annual temperature is about 47 degrees F

Van Dusen soils are mainly on north-facing hill backslopes and gulch slopes at elevations of 2,400 to 5,000 feet. These soils formed in alluvium and colluvium from mixed lacustrine sediments. Slopes dominantly range from 30 to 75 percent, but range down to 2 percent in one mapping unit on terraces in Elmore County, Idaho. Stony phases are below ledges of rock outcrop. The average annual precipitation is 12 to 20 inches. The average annual temperature is 45 to 50 degrees F. The frost-free period is 90 to 145 days.

The Josie series consists of very deep, somewhat excessively drained soils with moderately rapid permeability that formed in colluvium and residuum from granitic rocks and volcanic ash. Slopes range from 8 to 60 percent in mountains. The average annual precipitation is about 32 inches and the average annual temperature is about 37 degrees F.

Josie soils are strongly sloping to very steep on exposed mountain slopes and ridges at elevations of 6,000 to 8,500 feet. Slopes range from 8 to 60 percent. These soils formed in colluvium and residuum from granitic rocks and volcanic ash. Average annual precipitation is 28 to 45 inches. Average annual temperature is 35 to 39 degrees F. Frost-free period is 15 to 60 days.

The Hanks series consists of deep, somewhat excessively drained soils that formed in residuum from granitic and related rocks. Hanks soils are on side slopes, saddles, benches, and ridge crests and have slopes of 5 to 65 percent. Permeability is moderately rapid. The average annual precipitation is about 40 inches and the average annual air temperature is about 34 degrees F.

The soils are in mountains at elevations between 6,000 and 8,000 feet. The areas consist mostly of upper side slopes, saddles, benches, and ridge crests. Slopes range from about 5 to 65 percent. Most aspects are northerly. The soils are forming in residuum and possibly colluvium derived from granitic and related rocks. The average annual precipitation is 35 to 45 inches and includes 140 to 180 inches of snowfall. The average frost-free period is 20 to 60 days.

The Toiyabe series consists of shallow, excessively drained soils that formed in colluvium and residuum derived from granitic rock. Toiyabe soils are on mountains. Slopes are 2 to 75 percent. The mean annual precipitation is about 25 inches and mean annual temperature is about 42 degrees F.

Toiyabe soils are on mountains. These soils formed in colluvium and residuum derived from granitic rocks such as granite and granodiorite. Rock outcrops and boulders are common features of the landscape. Slopes are 2 to 75 percent. Elevations range from 5,000 to 7,500 feet in Nevada and California and are as low as 3,500 feet in Idaho. The climate is subhumid-continental with cool, moist winters and warm, dry summers. The mean annual precipitation is 16 to 35 inches. The mean annual temperature is 40 to 45 degrees F., mean January temperature is about 28 degrees F., and mean July temperature is about 65 degrees F. The frost-free period is 30 to 100 days.

The Scriver series consists of deep, well drained or somewhat excessively drained soils dominantly on broad ridges, side slopes, toe slopes, benches, and saddles in strongly dissected uplands. Slopes range from 5 to 50 percent. The elevations range from 4,700 feet where the

aspect is northerly to 6,500 feet or higher. They formed in residuum and colluvium from quartz monzonite, granodiorite, and related granitic bedrock. The mean annual precipitation is 25 to 35 inches, including 8 to 15 feet of snowfall. The average freeze-free period ranges from about 30 to 80 days.

The soils are on dominantly broad ridges, side slopes, toe slopes, benches, and saddles in strongly dissected uplands. Slopes range from 5 to 50 percent. The soils are most common in northerly slopes. The elevations range from 4,700 feet where the aspect is northerly to 6,500 feet or higher. The soils formed in residuum and colluvium derived from quartz monzonite, granodiorite, and related granitic bedrock. The mean annual precipitation is 25 to 35 inches, including 8 to 15 feet of snowfall. The average freeze-free period ranges from about 30 to 80 days.

The Rainey series consists of moderately deep over bedrock, well drained soils on south-facing hillsides and ridge tops. They formed in material weathered from coarse-grained intrusive igneous rocks. Permeability is moderately rapid. Slopes are 15 to 40 percent. The average annual precipitation is about 16 inches, and the average annual air temperature is about 47 degrees F.

Rainey soils are on hilly southerly slopes and ridge tops. Slopes range from 5 to 80 percent, but are typically 15 to 40 percent. The soils formed in residuum, alluvium, and colluvium weathered from coarse-grained intrusive igneous bedrock, which is high in quartz and mica. Elevations range from 2,000 to 5,500 feet. Average annual precipitation is 13 to 20 inches, including 3 to 6 feet of snow. Average annual air temperature is 45 to 50 degrees F. Frost-free period is 90 to 160 days.

The Brownlee series consists of deep and very deep, well drained soils with moderately slow permeability that formed in colluvium, residuum and old alluvium from coarse-grained intrusive rocks. Slopes range from 0 to 50 percent in foothills and valleys. The average annual precipitation is about 18 inches and the average annual temperature is about 47 degrees F.

Brownlee soils are nearly level to steep on hill summits, back slopes and foot slopes, and fan remnants at elevations of 2,500 to 5,600 feet. Slopes range from 0 to 50 percent. These soils formed in colluvium and residuum from granitic rocks on hills and in old alluvium from coarse-grained acid and intermediate intrusive rocks on fan remnants. Average annual precipitation ranges from 14 to 23 inches. Average annual temperature ranges from 45 to 50 degrees F. Frost-free period is 90 to 150 days.

The Ola series consists of moderately deep, well drained soils that formed in colluvium and residuum derived from intrusive igneous and metamorphic rocks. Ola soils are on pediments, hills, and mountains. Slopes are 6 to 80 percent. The mean annual precipitation is about 18 inches and the mean annual temperature is about 43 degrees F.

Ola soils are on pediments, hills, and mountains. They formed in residuum and colluvium derived from intrusive igneous rocks and metamorphic rocks. Slopes are 6 to 80 percent. Elevations range from 3,000 to 6,700 feet in Idaho. Elevations are as high as 7,500 feet on south-facing slopes in northern Nevada. The mean annual precipitation is 14 to 23 inches, the mean annual temperature is 40 to 45 degrees F., and the frost-free period is 65 to 100 days.

The Schoolhouse series consists of shallow over bedrock, excessively drained soils on mountain side slopes and ridges. They formed in material weathered from intermediate intrusive rocks. Permeability is very rapid. Slopes are 10 to 90 percent. The average annual precipitation is about 19 inches and the average annual air temperature is about 46 degrees F.

Schoolhouse soils are on mountain side slopes and ridges at elevations of 3,300 to 6,400 feet. Slopes are 10 to 90 percent. These soils formed in material weathered from intermediate intrusive and metamorphic rocks. The average annual precipitation is 15 to 22 inches. The average annual air temperature is 45 to 48 degrees F, with an average January temperature of about 20 degrees F. The average January soil temperature is 34 to 37 degrees F. The (32 degrees F) frost-free period is 85 to 120 days.

The Searles series consists of moderately deep, well drained soils that formed in colluvium and residuum weathered from rhyolite and basalt. Searles soils are on uplands and lava plains. Slopes are 0 to 80 percent. The mean annual precipitation is about 11 inches and the mean annual temperature is about 47 degrees F.

Searles soils are on south-facing slopes of uplands and lava plains at elevations ranging from 2,000 to 6,200 feet. Slopes are 0 to 80 percent. These soils formed in very gravelly or very cobbly medium and moderately fine textured residuum and colluvium overlying fractured rhyolite or basalt. The climate is semiarid with cool winters and warm dry summers. The mean annual precipitation is 9 to 15 inches. The mean annual temperature is 45 to 52 degrees F., mean winter temperature is 30 to 34 degrees F., and mean summer temperature is 61 to 64 degrees F. The frost-free period is 50 to 155 days.

The Ladd series consists of deep, well drained soils that formed in alluvium weathered from basic igneous rocks and quartz diorite mixed with loess and volcanic ash. Ladd soils are on alluvial fans, terraces and foot slopes and have slopes of 0 to 65 percent. The mean annual precipitation is about 15 inches, and the mean annual temperature is about 47 degrees F.

Ladd soils are on alluvial fans, terraces, and colluvial foot slopes. Elevations range from 2,700 to 5,050 feet. Slopes range from 0 to 65 percent. The soils formed in alluvium and colluvium weathered from basic igneous rocks high in quartz diorite mixed with loess and volcanic ash. The frost-free period is 80 to 130 days. The mean annual precipitation is 12 to 18 inches. The mean annual temperature is 45 to 50 degrees F; the average January temperature is 27 to 29 degrees F; and the average July temperature is about 65 to 68 degrees F.

The Sweet series consists of moderately deep to a duripan, well drained soils that formed in alluvium weathered mainly from acid igneous and basaltic sources. Sweet soils are on stream terraces and have slopes of 0 to 30 percent. The mean annual precipitation is about 12 inches and the mean temperature is about 53 degrees F.

Sweet soils are on dissected stream terraces. Slopes range from 0 to 30 percent, with those 3 to 7 percent dominant. The soils formed from medium and moderately coarse textured alluvium weathered from mixed acid igneous and basaltic rocks. In some areas, the upper part of the profile contains an admixture of loess. Elevations are about 2,500 to 5,500 feet. The climate is semiarid with hot dry summers and cool moist winters. The mean annual precipitation is 10 to 13 inches. The mean annual temperature is 47 to 53 degrees F. Frost-free season is about 100 to 150 days.

The Kepler series consists of moderately deep, well drained soil that formed in old alluvium mainly from mixed material influenced by loess. Kepler soils are on dissected high terraces and have slopes of 0 to 12 percent. The mean annual precipitation is about 12 inches and the mean annual air temperature is about 50 degrees F.

Kepler soils are on swales or intermound areas of dissected high terraces and have slopes of 0 to 12 percent. They formed in old mixed alluvium from granitic, quartz monzonitic, or quartz dioritic and basaltic sources. The upper part of the profile is influenced by loess. Elevations are 2,500 to 3,000 feet. The climate has dry warm summers and cold moist winters. Mean annual

precipitation is 11 to 13 inches. Mean summer temperature is 70 to 73 degrees F.; mean annual temperature is 51 to 55 degrees F. Frost-free season is about 140 to 160 days.

The Newell series is very deep, well drained soils that formed in alluvium on fans and terraces. Slopes are 0 to 30 percent. Permeability is moderately slow. The average annual precipitation is about 14 inches, and the average annual air temperature is about 49 degrees F.

Newell soils are in level to moderately steep alluvial and colluvial fans and terraces at elevations of 2,000 to 4,000 feet. The slopes are mostly less than 10 percent and ranges from 0 to 30 percent. The soils formed in alluvium and colluvium derived chiefly from basaltic and other basic rock sources but containing some mixture of granite, rhyolite, and related material. The climate is semiarid and has relatively dry summers, a freeze-free period of 110 to 130 days, and a mean annual precipitation is 12 to 16 inches, including 3 to 6 feet of snowfall. The average annual air temperature is 45 to 51 degrees.

The Truesdale series consists of moderately deep to a duripan, well drained soils on level to sloping terraces and basalt plains. They formed in alluvium or lacustrine sediments. Permeability is moderately rapid. Slopes are 0 to 12 percent. The average annual precipitation is about 9 inches, and the average annual air temperature is about 51 degrees F.

Truesdale soils are in level to sloping medium and high terraces and basalt plains at elevations of 2,200 to 4,700 feet. Slopes range from 0 to 12 percent. The soils formed in alluvium or lacustrine sediments of mixed mineralogy and may have some eolian admixture. Average annual precipitation is 7 to 12 inches, including 0.5 to 2 feet of snow, and the average annual air temperature is 47 to 52 degrees F. Frost-free period is 100 to 160 days.

The Scoon series consists of shallow to a duripan, well drained soils formed in loess and silty alluvium over a duripan. Scoon soils are on terraces and alluvial fans. Slopes are 0 to 30 percent. The mean annual precipitation is about 9 inches, and the mean annual temperature is about 50 degrees F.

Scoon soils are on uplands and terraces at elevations from 800 to 2,300 feet in Washington and 2,600 to 4,900 feet in Idaho. Slopes are 0 to 30 percent. The soils formed in loess and silty alluvium mantling a duripan. They are in an arid climate with hot, dry summers and cool, moist winters. The mean annual precipitation is 6 to 12 inches. The mean annual temperature is 49 to 53 degrees F. The frost-free season is 135 to 210 days in Washington and 100 to 140 days in Idaho.

3.9 Hydrology

The Idaho Water Resource Board is charged with the development of the Idaho Comprehensive State Water Plan. Included in the State Water Plan are the statewide water policy plan, and component basin and water body plans which cover specific geographic areas of the state (IDEQ 2003). The Idaho Department of Water Resources has prepared General Lithologies of the Major Ground Water Flow Systems in Idaho.

The state may assign or designate beneficial uses for particular Idaho water bodies to support. These beneficial uses are identified in sections 3.35 and 100.01 - .05 of the Idaho water quality standards (WQS). These uses include:

- **Aquatic Life Support:** cold water biota, seasonal cold water biota, warm water biota, and salmonid spawning;
- **Contact Recreation:** primary (swimming) and secondary (boating);

- **Water Supply:** domestic, agricultural, and industrial; and
- **Wildlife Habitat and Aesthetics**

While there may be competing beneficial uses in streams, federal law requires DEQ to protect the most sensitive of these beneficial uses (IDEQ 2003).

The geology and soils of this region lead to rapid to moderate moisture infiltration. Slopes are moderate to steep, however, headwater characteristics of this watershed lead to a high degree of infiltration as opposed to a propensity for overland flow. Thus sediment delivery efficiency of first and third order streams is fairly low. The bedrock is typically well fractured and moderately soft. This fracturing allows excessive soil moisture to rapidly infiltrate into the rock and thus surface runoff is rare. Natural mass stability hazards associated with slides are low. Natural sediment yields are low for these watersheds. However, disrupted vegetation patterns from logging (soil compaction) and wildland fire (especially hot fires that increase soil hydrophobic characteristics), can lead to increased surface runoff and debris flow to stream channels.

A significant component of Boise County's infrastructure is the water sources that are maintained for use by communities. While the Idaho Water Resources Board does not monitor all drinking water supplies in the State, they are charged with maintaining standards on municipal drinking water supplies. These include community water sources, water used in a business, and similar drinking water supplies in the County. There are approximately 68 collection points in Boise County that are monitored for these purposes (IDEQ 2003). Three categories of municipal water are recognized: Groundwater, spring-groundwater, and surface water. The former two are generally considered resistant to surface disturbances such as fire, flood, landslide, and severe weather events. The latter is considered much more influenced by many hazards. Earthquakes can impact all collection types, while landslides that directly contact any of them will have an impact. The major surface water collection point in the county are for the city of Horseshoe Bend, drawing from the Payette River, Idaho City drawing from Elk creek , and Castle Mountain water association drawing form Warm Spring.(Table 3.11).

Table 3.11 IDWR Water Source Table.

NAME	TYPE	SOURCE	SUPPLY	POPULATION
BANKS STORE AND CAFE	Non-community Transient	WELL #1	Groundwater	25
BASIN COMMUNITY HEALTH CENTER	Non-community Transient	WELL #1	Groundwater	25
BOGUS BASIN RECREATIONAL ASSN	Non-community Non-transient	BOGUS CREEK	Surface Water	750
CAMP GLENWOOD CHURCH CAMP	Non-community Transient	WELL #1	Groundwater	25
CASCADE RECREATION CENTER	Non-community Transient	WELL #1	Groundwater	35
CASTLE MOUNTAIN CREEKS OWNERS ASSN	Community	WELL #2	Groundwater	100
CASTLE MOUNTAIN CREEKS OWNERS ASSN	Community	WARM SPRINGS CK	Surface Water	100
CLEAR CREEK LODGE	Non-community Transient	WELL #1	Groundwater	25
CORPS MACKS CREEK PARK	Non-community Transient	WELL #1	Groundwater	75
CORPS ROBIE CREEK PARK	Non-community Transient	WELL #1	Groundwater	385
COUNTRY INN	Non-community Transient	WELL #1	Groundwater	25
CROUCH CITY HALL AND COMMUNITY	Non-community Transient	WELL #1	Groundwater	25
CROUCH MERC	Non-community Transient	WELL #1	Groundwater	25
DUQUETTE PINES INC	Community	WELL #3	Groundwater	90
DUQUETTE PINES INC	Community	WELL #2	Groundwater	90
DUQUETTE PINES INC	Community	WELL #5	Groundwater	90
DUQUETTE PINES INC	Community	WELL #4	Groundwater	90
DUQUETTE PINES INC	Community	WELL #1	Groundwater	90
GARDEN VALLEY HIGH SCHOOL	Non-community Non-transient	WELL #1-LOWER	Groundwater	290
GARDEN VALLEY HIGH SCHOOL	Non-community Non-transient	WELL #2-UPPER	Groundwater	290
GARDEN VALLEY MOTEL	Non-community Transient	WELL #1	Groundwater	25
GARDEN VALLEY RANCHETTES HOMEOWNERS	Community	WELL #2	Groundwater	40
GARDEN VALLEY RANCHETTES HOMEOWNERS	Community	WELL #1	Groundwater	40
GARDEN VALLEY STORE	Non-community Transient	WELL #1	Groundwater	25
HAVEN LODGE	Non-community Transient	WELL #1	Groundwater	25
HI DE HO TRAILER CLUB	Non-community Transient	WELL #1	Groundwater	30
HORSESHOE BEND WATER SUPPLY	Community	PAYETTE LOWER	Surface Water	643
HORSESHOE BEND WATER SUPPLY	Community	PAYETTE UPPER	Surface Water	643
IDAHO CITY WATER DEPT	Community	ELK CREEK	Surface Water	397
IDPR SPRING SHORES STATE PARK	Non-community Transient	WELL #1	Groundwater	780
KARNEY LAKES CLUB	Non-community Transient	SPRING #1	Groundwater	70

Table 3.11 IDWR Water Source Table.

NAME	TYPE	SOURCE	SUPPLY	POPULATION
LOWMAN INN	Non-community Transient	WELL #1	Groundwater	25
MARKS ROBIE CREEK INN	Non-community Transient	WELL #1	Groundwater	25
MORES CREEK RIM RANCH WATER DIST	Community	WELL #1-LOT 52	Groundwater	80
MORES CREEK RIM RANCH WATER DIST	Community	WELL #2-LOT 4	Groundwater	80
MORES CREEK RIM RANCH WATER DIST	Community	WELL #3-LOT 10	Groundwater	80
MOUNTAIN VIEW WATER AND ROAD ASSN	Community	WELL #2	Groundwater	30
MOUNTAIN VIEW WATER AND ROAD ASSN	Community	WELL #1	Groundwater	30
OLA SCHOOL	Non-community Non-transient	WELL 1	Groundwater	26
PROJECT PATCH	Non-community Transient	WELL #1	Groundwater	30
QUICK N TASTY	Non-community Transient	WELL #1	Groundwater	25
RANCH SUBD	Community	W WELL #1	Groundwater	65
RANCH SUBD	Community	E WELL #2	Groundwater	65
RIVERS POINT PROPERTY OWNERS ASSN	Community	SPRING INTAKE	Groundwater	140
RIVERS POINT PROPERTY OWNERS ASSN	Community	WELL #2	Groundwater	140
RIVERS POINT PROPERTY OWNERS ASSN	Community	WELL #3	Groundwater	140
RIVERS POINT PROPERTY OWNERS ASSN	Community	WTP-MF PAYETTE	Surface Water	140
ROCKS LODGE	Non-community Transient	SPRING #1	Groundwater	25
SAWTOOTH LODGE	Non-community Transient	GRANDJEAN CREEK	Surface Water	65
SCENIC PROPERTIES WATER ASSN INC	Non-community Transient	WELL #1	Groundwater	300
SCENIC PROPERTIES WATER ASSN INC	Non-community Transient	SPRING #1	Groundwater	300
SCRIVER WOODS HOMEOWNERS ASSN	Community	WELL #3	Groundwater	75
SCRIVER WOODS HOMEOWNERS ASSN	Community	WELL #4	Groundwater	75
SCRIVER WOODS HOMEOWNERS ASSN	Community	WELL #1	Groundwater	75
SCRIVER WOODS HOMEOWNERS ASSN	Community	WELL #2	Groundwater	75
SOURDOUGH LODGE	Non-community Transient	WELL #1	Groundwater	50
SOUTH FORK LODGE	Non-community Transient	WELL #1	Groundwater	75
TERRACE LAKES RESORT	Community	WELL #2 LODGE	Groundwater	330
TERRACE LAKES RESORT	Community	WELL #1-MAIN	Groundwater	330
THE COFFEE BEAR	Non-community Transient	WELL #1	Groundwater	25
USFS LOWMAN RANGER STATION PC	Non-community Non-transient	WELL #1	Groundwater	35
USFS LOWMAN RANGER STATION PC	Non-community Non-transient	WELL #2	Groundwater	35
VALLEY HI ESTATES	Community	WELL #1	Groundwater	90

Table 3.11 IDWR Water Source Table.

NAME	TYPE	SOURCE	SUPPLY	POPULATION
VALLEY HI ESTATES	Community	WELL #2	Groundwater	90
WAPITI CREEK	Non-community Transient	WELL #1	Groundwater	34
WARM SPRINGS RESORT	Non-community Transient	WELL #1	Groundwater	25
WILDERNESS RANCH 1 THROUGH 5	Community	GALLERY #1	Groundwater	385
WILDERNESS RANCH 1 THROUGH 5	Community	GALLERY #2	Groundwater	385
WILDERNESS RANCH 1 THROUGH 5	Community	GALLERY #3	Groundwater	385

3.10 Air Quality

The primary means by which the protection and enhancement of air quality is accomplished is through implementation of National Ambient Air Quality Standards (NAAQS). These standards address six pollutants known to harm human health including ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen oxides (USDA Forest Service 2000).

Smoke emissions from fires potentially affect an area and the airsheds that surround it. Climatic conditions affecting air quality in the West Central Highlands of Idaho are governed by a combination of factors. Large-scale influences include latitude, altitude, prevailing hemispheric wind patterns, and mountain barriers. At a smaller scale, topography and vegetation cover also affect air movement patterns. In Boise County, winds are generally from a southwesterly direction throughout the year. Air quality in the area and surrounding airshed is generally good to excellent. However, locally adverse conditions can result from occasional wildland fires in the summer and fall, and prescribed fire and agricultural burning in the spring and fall. All major river drainages are subject to temperature inversions which trap smoke and affect dispersion, causing local air quality problems. This occurs most often during the summer and fall months.

Boise County is in primarily Airshed Units 15 & 21 and partially in Airshed Units 14 & 22: Montana/Idaho Airshed Group Operating Guide (Levinson 2002). An airshed is a geographical area which is characterized by similar topography and weather patterns (or in which atmospheric characteristics are similar, e.g., mixing height and transport winds). The USDA Forest Service, Bureau of Land Management, and the Idaho Department of Lands are all members of the Montana/Idaho State Airshed Group, which is responsible for coordinating burning activities to minimize or prevent impacts from smoke emissions. Prescribed burning must be coordinated through the Missoula Monitoring Unit, which coordinates burn information, provides smoke forecasting, and establishes air quality restrictions for the Montana/Idaho Airshed Group. The Monitoring Unit issues daily decisions which may restrict burning when atmospheric conditions are not conducive to good smoke dispersion. Burning restrictions are issued for airsheds, impact zones, and specific projects. The monitoring unit is active March through November. Each Airshed Group member is also responsible for smoke management all year.

The Clean Air Act, passed in 1963 and amended in 1977, is the primary legal authority governing air resource management. The act established a process for designation of Class I and Class II areas for air quality management. Class I areas receive the highest level of protection and numerical thresholds for pollutants are most restrictive for this Class.

Some of the Class I airsheds in the immediate area include:

- **Hell's Canyon Wilderness Area:** A sensitive Class I airshed is the Hell's Canyon Wilderness Area (86,116 acres), which is managed for high scenic and recreation values.
- **Sawtooth Wilderness:** Another Class I Airshed is the Sawtooth Wilderness. The Sawtooth Wilderness is directly in the path of the prevailing winds crossing over Boise County.

All of the communities within Boise County could be affected by smoke or regional haze from burning activities in the region. Idaho Department of Environmental Quality maintains Air Pollution Monitoring Sites throughout Idaho. The Air Pollution Monitoring program monitors all of the six criteria pollutants. Measurements are taken to assess areas where there may be a problem, and to monitor areas that already have problems. The goal of this program is to control

areas where problems exist and to try to keep other areas from becoming problem air pollution areas (Louks 2001).

The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality. Under the Clean Air Act, OAQPS (Organization for Air Quality Protection Standards) is responsible for setting standards, also known as national ambient air quality standards (NAAQS), for pollutants which are considered harmful to people and the environment. OAQPS is also responsible for ensuring these air quality standards are met, or attained (in cooperation with state, Tribal, and local governments) through national standards and strategies to control pollutant emissions from automobiles, factories, and other sources (Louks 2001).

Air quality measurement stations juxtaposed near Boise County include McCall, Sawtooth Wilderness Station, Garden Valley, and Idaho City.

3.11 Hazard Profile of Boise County

Table 3.11 below lists many of the hazards experienced in Boise County between 1960 and 2000. This table is a useful reference when looking at the individual hazard sections.

Table 3.11. Mulit-Hazard Profile in Boise County, 1960-2000 (SHELDUS 2004).

HAZARD BEGIN DATE	HAZARD END DATE	HAZARD TYPE	COUNTY	STATE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE	LOCATION	REMARKS
8/1/1988	8/31/1988	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 11,364	ENTIRE STATE	DROUGHT
10/1/1988	10/31/1988	DROUGHT	BOISE	IDAHO	0	0	$ 11,364	$ 11,364	STATEWIDE	DROUGHT
7/1/1991	7/31/1991	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 18,519		DROUGHT
8/1/1991	8/31/1991	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 18,519		EXTREME DROUGHT
3/1/1992	3/31/1992	DROUGHT	BOISE	IDAHO	0	0	$ 18,519	$ 185,185	SOUTHERN	DROUGHT
4/1/1992	4/30/1992	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 1,851,852	SOUTHERN	DROUGHT
5/1/1992	5/31/1992	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 1,851,852	SOUTHERN ID	DROUGHT
6/1/1992	6/30/1992	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 1,136,364		DROUGHT
7/1/1992	7/31/1992	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 1,136,364		DROUGHT
8/1/1992	8/31/1992	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 1,136,364		DROUGHT
9/1/1992	9/30/1992	DROUGHT	BOISE	IDAHO	0	0	$ -	$ 1,136,364		DROUGHT
10/1/1992	10/31/1992	DROUGHT	BOISE	IDAHO	0	0	$ 113,636			DROUGHT
2/23/1986	2/23/1986	FLOODING	BOISE	IDAHO	0	0	$ 50,000	$ -		FLOOD
8/20/1990	8/20/1990	FLOODING	BOISE	IDAHO	0	0	$ 50,000	$ 5,000,000		FLOOD
11/24/1990	11/24/1990	FLOODING	BOISE	IDAHO	0	0	$ 1,136	$ -		FLOOD
1/12/1991	1/12/1991	FLOODING	BOISE	IDAHO	0	0	$ 7,143	$ -		URBAN FLOODING
2/12/1992	2/12/1992	FOG	BOISE	IDAHO	0	0	$ 6,250	$ -	SOUTHWEST	FOG
7/16/1970	7/16/1970	HAIL, LIGHTNING, WIND	BOISE	IDAHO	0	0	$ 278	$ 27,778	ADA, CANYON COUNTIES NORTHWARD	HAIL, LIGHTNING, WIND
7/8/1965	7/8/1965	HAIL, SEVERE STORM/THUNDER STORM	BOISE	IDAHO	0	0	$ -	$ 1,136	MOST OF STATE	HAIL, RAIM
4/22/1986	4/22/1986	HAIL, SEVERE STORM/THUNDER STORM, WIND	BOISE	IDAHO	0	0	$ 500,000	$ -		THUNDERSTORM WIND, HAIL
6/26/1970	6/27/1970	HAIL, WIND	BOISE	IDAHO	0.34	0.21	$ 17,241	$ 1,724	SOUTHERN IDAHO, SNAKE RIVER	SEVERE WIND AND HAIL

Table 3.11. Mulit-Hazard Profile in Boise County, 1960-2000 (SHELDUS 2004).

HAZARD BEGIN DATE	HAZARD END DATE	HAZARD TYPE	COUNTY	STATE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE	LOCATION	REMARKS
									VALLEY ABOVE WEISER	
10/15/1991	10/15/1991	HEAT	BOISE	IDAHO	0	0	$ -	$ 1,852		HEAT
7/17/1992	7/17/1992	HEAT	BOISE	IDAHO	0	0	$ 5,000	$ 50,000	GARDENA	HEAT
8/1/1992	8/1/1992	HEAT, WIND	BOISE	IDAHO	0	0	$ 62,500	$ 62,500	WEST CENTRAL MOUNTAINS	HEAT, WINDS
8/3/1992	8/3/1992	HEAT, WIND	BOISE	IDAHO	0	0	$ 62,500	$ 62,500	WEST CENTRAL MOUNTAINS	HEAT, WINDS
8/20/1992	8/20/1992	HEAT, WIND	BOISE	IDAHO	0	0	$ 26,316	$ 26,316	CENTRAL MOUNTAINS, SOUTHWEST HIGHLANDS	WIND, DRY HEAT
8/1/1970	8/1/1970	LIGHTNING	BOISE	IDAHO	0	0	$ 10,000	$ -	CLEARWATER AND NEZ PERCE NATIONAL FORESTS NORTH IDAHO; BOISE AND PAYETTE NATIONAL FORESTS, SW IDAHO BLM LANDS	LIGHTNING
6/14/1987	6/14/1987	LIGHTNING	BOISE	IDAHO	0	0	$ 3,846	$ 385		LIGHTNING
8/12/1988	8/12/1988	LIGHTNING	BOISE	IDAHO	0	0	$ 29,412	$ -	CENTRAL ID	LIGHTNING
7/15/1989	7/15/1989	LIGHTNING	BOISE	IDAHO	0	0	$ -	$ 35,714	BOISE CO	LIGHTNING
7/20/1989	7/20/1989	LIGHTNING	BOISE	IDAHO	0	0	$ -	$ 12,500	BOISE CO	LIGHTNING
7/26/1989	7/26/1989	LIGHTNING	BOISE	IDAHO	0	0	$ -	$ 625,000	BOISE CO	LIGHTNING
7/23/1990	7/23/1990	LIGHTNING	BOISE	IDAHO	0	0	$ 114	$ 1,136		LIGHTNING
8/8/1990	8/8/1990	LIGHTNING	BOISE	IDAHO	0	0	$ 1,136	$ 114		LIGHTNING
9/7/1990	9/7/1990	LIGHTNING	BOISE	IDAHO	0	0	$ -	$ 25,000		LIGHTNING
8/22/1991	8/23/1991	LIGHTNING	BOISE	IDAHO	0	0	$ 143	$ 1,429		LIGHTNING
6/11/1992	6/11/1992	LIGHTNING	BOISE	IDAHO	0	0	$ 4,545	$ -		LIGHTNING
8/11/1992	8/15/1992	LIGHTNING	BOISE	IDAHO	0	0	$ 1,136	$ 114		DRY LIGHTNING
7/29/1975	7/29/1975	LIGHTNING, SEVERE STORM/THUNDER STORM, WIND	BOISE	IDAHO	0	0	$ 1,852	$ 1,852	SOUTHERN IDAHO	WIND, LIGHTNING, RAIN
9/3/1960	9/4/1960	LIGHTNING, WIND	BOISE	IDAHO	0.05	0	$ 1,136	$ -	MOST OF STATE	WINDSTORM AND LIGHTNING

Table 3.11. Mulit-Hazard Profile in Boise County, 1960-2000 (SHELDUS 2004).

HAZARD BEGIN DATE	HAZARD END DATE	HAZARD TYPE	COUNTY	STATE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE	LOCATION	REMARKS
8/10/1968	8/23/1968	SEVERE STORM/THUNDER STORM	BOISE	IDAHO	0	0	$ -	$ 11,364	ENTIRE STATE	RAIN
1/7/1975	1/7/1975	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0.05	$ 1,136	$ -	ENTIRE STATE	HEAVY RAIN, SNOW
12/19/1988	12/19/1988	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 6,250	$ -	SOUTHWESTERN ID	SEVERE STORM-SNOW
12/30/1988	12/30/1988	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 2,381	$ -	N & WEST CENT. ID	SEVERE STORM-SNOW
11/20/1990	11/20/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0.07	$ 1,136	$ -		SEVERE STORM-SNOW
11/20/1990	11/20/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0.05	0.02	$ 1,136	$ -		SEVERE STORM-ICE/SLEET
12/13/1990	12/13/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -		SEVERE STORM-SNOW
12/13/1990	12/13/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0.02	0	$ 1,136	$ -		SEVERE STORM-SNOW
12/18/1990	12/18/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -		SEVERE STORM-SNOW
12/18/1990	12/18/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -		SEVERE STORM-SNOW
12/19/1990	12/19/1990	SEVERE STORM/THUNDER	BOISE	IDAHO	0.02	0	$ 1,136	$ -		SEVERE STORM-SNOW

Table 3.11. Mulit-Hazard Profile in Boise County, 1960-2000 (SHELDUS 2004).

HAZARD BEGIN DATE	HAZARD END DATE	HAZARD TYPE	COUNTY	STATE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE	LOCATION	REMARKS
		STORM, WINTER WEATHER								
12/27/1990	12/27/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0.02	0	$ 1,136	$ -		SEVERE STORM-SNOW
12/30/1990	12/30/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -		SEVERE STORM-SNOW
12/1/1994	12/1/1994	SEVERE STORM/THUNDER STORM, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -	ALL OF ID	HEAVY RAIN/SNOW
8/21/1992	8/21/1992	WILDFIRE	BOISE	IDAHO	0	0	$ 5,000,000	$ 50,000,000	BOISE	FIRE
4/19/1962	4/20/1962	WIND	BOISE	IDAHO	0.39	0	$ 114	$ 114	ENTIRE STATE	WIND AND DUST
7/19/1968	7/20/1968	WIND	BOISE	IDAHO	0	0	$ 1,136	$ 114	ENTIRE STATE	WIND
3/22/1976	3/22/1976	WIND	BOISE	IDAHO	0.4	0	$ 10,000	$ -		WINDSTORM
3/27/1977	3/27/1977	WIND	BOISE	IDAHO	0	0	$ 1,852	$ -		WIND
1/8/1990	1/8/1990	WIND	BOISE	IDAHO	0.02	0.02	$ 11,364	$ -		WIND
11/20/1990	11/20/1990	WIND	BOISE	IDAHO	0	0	$ 11,364	$ -		WIND
12/1/1990	12/1/1990	WIND	BOISE	IDAHO	0	0	$ 1,136	$ -		WIND
12/4/1990	12/4/1990	WIND	BOISE	IDAHO	0.02	0	$ 1,136	$ -		WIND
12/19/1990	12/19/1990	WIND	BOISE	IDAHO	0	0	$ 1,136	$ 1,136		WIND
3/3/1991	3/3/1991	WIND	BOISE	IDAHO	0	0	$ 1,136	$ -		HIGH WIND
3/4/1991	3/4/1991	WIND	BOISE	IDAHO	0	0	$ 1,852	$ -		HIGH WIND
4/17/1992	4/17/1992	WIND	BOISE	IDAHO	0	0	$ 11,364	$ 11,364		WIND
9/24/1992	9/24/1992	WIND	BOISE	IDAHO	0	0	$ 2,000	$ 20,000	WEST CENTRAL MOUNTAINS AND SNAKE RIVER VALLEY	WIND
10/2/1992	10/2/1992	WIND	BOISE	IDAHO	0	0	$ 6,250	$ -	TREASURE VALLEY	WIND
1/9/1972	1/12/1972	WIND, WINTER WEATHER	BOISE	IDAHO	0.07	0	$ 113,636	$ -	STATEWIDE	WIND AND SNOW
11/10/1975	11/10/1975	WIND, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -	STATEWIDE	WIND, SNOW

Table 3.11. Mulit-Hazard Profile in Boise County, 1960-2000 (SHELDUS 2004).

HAZARD BEGIN DATE	HAZARD END DATE	HAZARD TYPE	COUNTY	STATE	INJURIES	FATALITIES	PROPERTY DAMAGE	CROP DAMAGE	LOCATION	REMARKS
2/16/1976	2/17/1976	WIND, WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -		SNOW AND WIND
1/6/1969	1/7/1969	WINTER WEATHER	BOISE	IDAHO	0	0	$ 11,628	$ -	STATE WIDE	SNOW STORM
1/26/1969	1/26/1969	WINTER WEATHER	BOISE	IDAHO	0	0	$ 11,628	$ -	STATE WIDE	SNOW STORM
4/17/1972	4/17/1972	WINTER WEATHER	BOISE	IDAHO	0	0	$ -	$ 3,125	SOUTH CENTRAL AND SOUTHWEST IDAHO	FREEZE
6/26/1976	6/26/1976	WINTER WEATHER	BOISE	IDAHO	0	0	$ -	$ 18,519		EXTREME COLD
1/1/1979	1/31/1979	WINTER WEATHER	BOISE	IDAHO	0	0.11	$ 11,364	$ -		EXTREME COLD
2/1/1979	2/13/1979	WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,136	$ -		EXTREME COLD
10/3/1987	10/4/1987	WINTER WEATHER	BOISE	IDAHO	0	0	$ 12,500	$ -		COLD FRONT
12/22/1987	12/22/1987	WINTER WEATHER	BOISE	IDAHO	0.61	0	$ 1,136	$ -		HEAVY SNOW
12/18/1990	12/18/1990	WINTER WEATHER	BOISE	IDAHO	0.68	0.02	$ 11,364	$ 113,636		EXTREME COLD
1/1/1991	1/7/1991	WINTER WEATHER	BOISE	IDAHO	0	0	$ 16,129	$ -		EXTREME COLD
1/10/1991	1/10/1991	WINTER WEATHER	BOISE	IDAHO	0.14	1	$ 7,143	$ -		LIGHT SNOW
1/14/1991	1/14/1991	WINTER WEATHER	BOISE	IDAHO	0	0	$ 1,852	$ -		LIGHT SNOW
3/6/1991	3/6/1991	WINTER WEATHER	BOISE	IDAHO	0	0	$ 7,143	$ -		SNOW
10/26/1991	10/26/1991	WINTER WEATHER	BOISE	IDAHO	0	0	$ 5,000	$ 50,000		HEAVY SNOW
3/19/1992	3/23/1992	WINTER WEATHER	BOISE	IDAHO	0	0	$ -	$ 6,250	TREASURE VALLEY	FREEZE
4/7/1992	4/7/1992	WINTER WEATHER	BOISE	IDAHO	0	0	$ -	$ 22,727	SNAKE RIVER VALLEY	FREEZE
11/22/1992	11/22/1992	WINTER WEATHER	BOISE	IDAHO	0.13	0	$ 6,250	$ -	TREASURE VALLEY	GLAZE
11/27/1992	11/27/1992	WINTER WEATHER	BOISE	IDAHO	0	0	$ 6,250	$ -	TREASURE VALLEY	SNOW
9/1/1993	9/30/1993	WINTER WEATHER	BOISE	IDAHO	0	0	$ -	$ 11,364	ENTIRE STATE	COOL AND WET GROWING SEASON

3.12 Emergency Services Resources and Capabilities

Key points of the resources and capabilities guide are identified here.

3.12.1 Boise County Ambulance Units

Crouch: **President:** Curt Shirer 25 Fitchs Point, Garden Valley, 83627
Cshirer@iglide.net H 462-4513 / Wk 462-3074

Horseshoe Bend **President:** Roy Miller H 793-2671 / Wk 426-1518 / C 859-6731
484-9808 RLMiller@boisestate.edu

Idaho City **President:** Erik Cotten H 466-0683 / C371-4282 / Wk 422-5757
Erik.Cotten@idbois.ang.af.mil

Lowman **President:** Betty Meyers H 259-3424
elkseer@ctcweb.net

Mores Creek **President:** Terry Acker 6 Sharon St. Boise, ID 83716
Terry39@mcaems.org H 387-0888 / Wk 363-5320 /
Cell 283-7937

Placerville **President:** Joe Weiss 29 Doaka Ct. Star Ranch, ID 83631
weissmanemts@juno.com H 392-6694 / C 412-1801

3.12.2 Boise County Fire Departments

Centerville VFD **Fire Chief:** Rick Marston (H) 392-6079 (C) 484-3072
12 N. Meadow Cr.
RMMAR97@peoplepc.com
392-4191
Dispatch:Joan Marston 392-4976

Clear Creek VFD **Fire Chief**: Rob Smolczynski (H) 392-4944
212 Clear Creek Rd
Asst. Pam Smolczynski (WK) 373-0461
President: William Foote (WK)363-1682
wfoote@micron.com

Garden Valley RFD **Fire Chief:** Jon Delvalle (H) 462-3033 or 462-3175
jjdelvall@msn.com

Gem County II Fire Dist	**Fire Chief:**	Jim Buffington	(C) 989-3388
	President:	Karl Kellar	(H) 548-3488
	Asst. Chief:	Dennis Robbins	(H) 584-3392
	Dennisrobbins3@aol.com		
Grand Jean Fire Dist:	**Fire Chief:**	Rod Lockett (H) 344-2437	
	richardsupply@aol.com	(F) 331-3475	
	Sawtooth Lodge: (WK) 259-3331		
Horseshoe Bend FD:	**Fire Chief:**	Jason Hicks	(H) 793-2855
	roperrace@cs.com		
Idaho City VFD:	**Fire Chief:**	Terry Teeter (H) 392-4389 (W) 392-6681	
	teeterct@juno.com / tlteeter@fs.fed.us		
Lowman VFD:	**Fire Chief:**	Paul Rekow (H) 259-3865	
	8000 Highway 21		
	lowmanvfd@ctcweb.net		
Placerville FPD:	**Fire Chief:**	Larry Sprague	(H) 392-4174 / C 859-7345
	Sprague_ld@man.com		
Robie Creek VFD	**Fire Chief:**	David Haney	(H) 433-9329 / C 484-1481
	dhjhhaney@aol.com		
Wilderness Ranch VFD	**Fire Chief:**	John McCarthy	(H) 342-3805 / (F) 342-2922
	j.e.mccarthy@usa.net		
Valley of the Pines:	**Fire Chief:**	Rusty Westin	(H) 392-6693
	mr_chi@msn.com		
	President:	Elizabeth Macinata	(H) 392-4305
	Macinataem@quest.net		

Chapter 4: Floods

4 Flood Characteristics

Floods have been a serious and costly natural hazard affecting Idaho. Floods damage roads, farmlands, and structures, often disrupting lives and businesses. Simply put, flooding occurs when water leaves the river channels, lakes, ponds, and other confinements where we expect it to stay. Flood-related disasters occur when human property and lives are impacted by that flooding water. An understanding of the role of weather, runoff, landscape, and human development in the floodplain is therefore the key to understanding and controlling flood-related disasters.

Natural flood events are grouped into three general categories:

> **Riverine Flooding:** a rise in the volume of a stream until that stream exceeds its normal channel and spills onto adjacent lands.
>
> **Flash Flooding:** results from high water velocity in a small area but may recede relatively quickly.
>
> **Ice/Debris Jam Flooding:** floating debris or ice accumulates at a natural or man-made obstruction and restricts the flow of water.

The most commonly reported flood magnitude measure is the "base flood." This is the magnitude of a flood having a one-percent chance of being equaled or exceeded in any given year. Although unlikely, "base floods" can occur in any year, even successive ones. This magnitude is also referred to as the "100-year Flood" or "Regulatory Flood" by state government.

The areas adjacent to the channel that normally carries water is referred to as the floodplain. In practical terms, the floodplain is the area that is inundated by flood waters.

In regulatory terms, the floodplain is the area that is under the control of floodplain regulations and programs (such as the National Flood Insurance Program which publishes the Flood Insurance Rate Maps (FIRM) maps). Idaho State Code defines the floodplain as:

> *"That land that has been or may be covered by floodwaters, or is surrounded by floodwater and inaccessible, during the occurrence of the regulatory flood."*

4.1 History

Portions of Boise County have experienced a long history of high magnitude floods since first recorded in the late 1800s. The diverse landscape and weather patterns within Boise County are more the water source of high magnitude flooding that occurs along the Main Fork, N. Fork, S. Fork, and Middle Forks of the Payette Rivers. Rain on snow events and above normal high spring temperatures are not very typical throughout the county in the spring and late winter. With the regulation of the water depths in Payette Lake and Cascade Lake, spring runoff is channeled downstream into the northern portions of Boise County. Furthermore, localized flooding occurs in small streams, creeks, or sloughs within Boise County.

In January 1997, the heavy winter snow-pack and ice build-ups in streams and rivers north of Boise County were suddenly thawed, accompanied by heavy rains, created stream flows in the Main Fork, North Fork, South Fork, and Middle Fork Payette River greater than normal years. This water had such a force with it when it hit Northern Boise County, that it carried millions of

pounds of rock, sediment, and debris exceeding the normal capabilities of the river and stream banks and retention systems. Localized flooding also occurred within the higher elevation areas within the county. The higher areas around Boise County are the source of flooding problems that occur further south and west of the County. These flooding problems can be seen in other counties like Gem, Payette, and Washington Counties.

4.2 Weather

Winter weather conditions are the main driving force in determining where and when base floods will occur. The type of precipitation that a winter storm produces is dependent on the vertical temperature profile of the atmosphere over a given area. Idaho experiences riverine flooding from two distinct types of meteorological events: spring runoff and winter rain/snowmelt events.

The major source of flood waters in Idaho is normal spring snow melt. As spring melt is a "natural" condition, the stream channel is defined by the features established during the average spring high flow. Small flow peaks exceeding this level and the stream's occupation of the floodplain are common events.

Unusually heavy snow packs or unusual spring temperature regimes (e.g., prolonged warmth) may result in the generation of runoff volumes significantly greater than can be conveyed by the stream and river channels. Such floods are the ones that lead to widespread damage and disasters. Floods caused by spring snow melt tend to last for a period of several days to several weeks, longer than the floods caused by other meteorological sources.

Floods that result from rainfall on frozen ground in the winter, or rainfall associated with a warm, regional frontal system that rapidly melts snow at low and intermediate altitudes (rain-on-snow), can be the most severe. Both of these situations quickly introduce large quantities of water into the stream channel system, easily overloading its capacity.

On small drainages, the most severe floods are usually a result of rainfall on frozen ground but moderate quantities of warm rainfall on a snow pack, especially for one or more days, can also result in rapid runoff and flooding in streams and small rivers. Although meteorological conditions favorable for short-duration warm rainfall are common, conditions for long-duration warm rainfall are relatively rare. Occasionally, however, the polar front becomes situated along a line from Hawaii through Oregon, and warm, moist, unstable air moves into the region. Most winter floods develop under these conditions (as was the case with the northern Idaho floods of 1996).

In general, the meteorological factors leading to flooding are well understood. They are also out of human control, so flood mitigation must address the other contributing factors.

4.3 Topography

The nature and extent of a flood event is the result of the hydrologic response of the landscape. Factors that affect this hydrologic response include soil texture and permeability, land cover and vegetation, land use and land management practices. Precipitation and snow melt, known collectively as runoff, follow one of three paths, or a combination of these paths, from the point of origin to a stream or depression: overland flow, shallow subsurface flow, or deep subsurface ("ground water") flow. Each of these paths delivers water in differing quantities and rates. The character of the landscape will influence the relative allocation of the runoff and will, accordingly, affect the hydrologic response.

Unlike precipitation and ice formation, steps can be taken to mitigate flooding through manipulation or maintenance of the floodplain. Insufficient natural water storage capacity and changes to the landscape can be offset through water storage and conveyance systems that run the gamut from highly engineered structures to constructed wetlands.

Careful planning of land use can build on the natural strengths of the hydrologic response. Revegetation of burned slopes diverts overland flow (fast and flood producing) to subsurface flow (slower and flood moderating). Details on rehabilitating burned areas to reduce flash floods, debris flows and landslides can be found in the Landslide chapter.

4.4 Development

Floods generally come with warnings and flood waters rarely go where they are totally unexpected by experts. Those warnings are not always heeded, though, and despite the predictability, flood damage continues.

The failure to recognize or acknowledge the extent of the natural hydrologic forces in an area has led to development and occupation of areas that can clearly be expected to be flooded on a regular basis. Despite this, communities are often surprised when the stream leaves its channel to occupy its floodplain. A past reliance on structural means to control floodwaters and “reclaim” portions of the floodplain has also contributed to inappropriate development and continued flood-related damages.

Unlike the weather and the landscape, this flood-contributing factor can be controlled. Development and occupation of the floodplain places individuals and property at risk. Such use can also increase the probability and severity of flood events (and consequent damage) downstream by reducing the water storage capacity of the floodplain, or by pushing the water further from the channel or in larger quantities downstream.

4.5 Boise County Flood Profile

All three types of flood events can occur in Boise County. Riverine flooding occurs mostly in the Northern regions of Boise County along the Main Fork, N. Fork, South Fork, and Middle Fork Payette River. Valley County regulates the water flow rates by two dam located on Payette Lake and Cascade Lake. These dams reduce the drainage area within their county, but significantly increase the risks in Boise County by adding to the water velocity flowing southward into the northern lowlands of Boise County. The flat river valley and mountainous terrain of the county creates a flood-prone environment for areas in Northern Boise County. Rain-on-snow events can occur at almost all elevations across the county. These events often contain enough moisture to cause flooding on the Main Fork, N. Fork, South Fork, and Middle Fork Payette River and most of its major tributaries in the county. The high elevation areas within Boise County act as the water source for flooding other areas of the county as well as other counties adjacent to Boise County.

In general these flood events can be predicted 24 to 72 hours in advance of the rising waters. Emergency plans that are in place can be executed, before flood waters overtop the river channel, minimizing loss of life, and business disruption. Plans for reducing structural damage need to be put into place and executed long before the rain begins to fall and the snow begins to melt.

Boise County is a diverse combination of moderate to steep sloped forestland and flat to rolling river valleys and steep river gorges. When rain-on-snow events occur in this area, the run off tends to come off the slowly, channeling the water into the streams and rivers of Boise County.

The water is channeled downstream which poses a flooding problem downstream in the northern, southern, and western portions of the county and other counties of Idaho.

Within the region, summer thunderstorms can result in flash flooding of specific smaller drainages. Often there is little time to react to the quickly rising waters. Due to the nature of the terrain within Boise County, localized flooding from thunderstorms tends to be more of a storm drainage problem for many communities. Short term blockage of roads is usually the biggest impact as drainage structures are overwhelmed by the amount of water. Many of the roads within the county are gravel roads which tend to wash into storm drains and potentially sewer drains plugging these structures.

Past wildfires within the county could create a flash flooding event due to the reduced amount of vegetation of the landscape. This would create a localized flooding area of drainages within the burned area and downstream until the water and debris reaches the counties river system.

Ice/debris flows occur as part of riverine and flash flooding, usually exacerbating the effects of those types of flood events. In a case of a fire or heavy logging activity, flash flooding can result do to the loss of vegetation that usually intercepts some of the waters velocity flowing downhill. Details on reducing the effects of these types of debris flows can be found in the landslide chapter.

Boise County has a long history of past gold mining. With this gold mining activity came the dredging of the area streams. This dredging has re-directed the flow of water and has increased the flood plain area within Boise County. Furthermore, new channels and pools have been created in past spring runoff events and increased the flooding potential of the county.

New construction of homes still exists throughout Boise County near the flood plains of the county. With the recreation development of the area, further expansion within and near the flood plain exists. Further adoption of a Flood Plain Ordinance would help reduce the impacts of flooding events.

4.5.1 Past Flood Events in Boise County

Information summarized from the Idaho Bureau of Homeland Security website: http://www.bhs.idaho.gov/local/counties.htm.

4.5.1.1 New Year's Day Storm - January 1-5, 1997

Event Summary: $65,000,000.00 - New Year's Day floods in the Weiser, Payette and Salmon River drainages of southwestern Idaho caused record flooding and numerous mudslides. Warm temperatures combined with a rainfall 4-6 times the normal amount; the resulting snowmelt triggered devastating floods, mudslides and avalanches, extensively damaging communities and infrastructure throughout Idaho . The community of South Banks was condemned because of extensive slide damage. Over 400 miles of roads and several railroad lines were blocked or destroyed, stranding over 10,000 holiday travelers in western Idaho . Residents of McCall, Cascade, Banks, Lowman and Garden Valley were isolated. Rivers were "running like chocolate," carrying huge trees, mud and boulders; the Snake River at Hells Canyon Dam crested at 101,728 cfs January 1, nearly 30,000 cfs over its previous record level on 2/23/82 . The crash of a plane carrying 5 people from Boise to McCall, killing all, was a result of the weather. Governor Batt declared 13 counties a disaster: Gem, Adams, Washington, Idaho, Clearwater, Valley, Payette, Elmore, Latah, Boundary, Bonner, Shoshone and Boise . A Federal disaster was declared on January 4, 1997.

County Summary: The Banks-Lowman road was closed because of numerous slides, the

largest slide leaving over 100,000 cubic yards of mud, rocks and trees on the road. Hwy 21 from Lowman to Stanley was closed due to avalanches, and a 300' section 4 miles south of Lowman collapsed, leaving a gap 100' deep. Hwy 55 was closed in numerous areas because of flood and slide damage. Power and telephone service was cut to 2,000-2,500 customers in the Banks-Garden Valley-Lowman area and to 30 people in Placerville . The community of Banks was condemned by the federal government after mudslides carrying large boulders and trees destroyed homes and businesses. In the Lowman area, approx. 11" of rain fell on 14" of existing snow between 12/20/96 and 1/4/97 (188% of average). This area had burned extensively in a 1989 wildfire. The wet, heavy snow on these areas triggered numerous landslides that blocked major roadways, destroyed homes and businesses, and deposited mud and debris into the Payette River . Residents were evacuated by National Guard helicopter. In Garden Valley , generators were flown in by the National Guard after Hwy 17 was washed out by the Payette River ; schools were closed.

4.5.1.2 August 22, 1995

Event Summary: A flash flood destroyed a logging camp and altered the flow of the North Fork of the Boise River .

County Summary: A thunderstorm dumped 3" of rain onto the land burned in 1994 by the Rabbit Gulch Fire, sending mud and rock flows into creeks feeding into the North Fork of the Boise River and shifting it 100 yards to the west. It also washed away a logging camp, whose occupants escaped injury due to advance notice, and created a new dam that flooded FR 327. Officials estimated 150,000 cubic yards of rock, water and mud came down the mountain in less than an hour. At least six travel trailers in the camp were damaged or destroyed and a water truck was swept away. The rainbow trout fishery in the area was

4.5.1.3 February 1986

Event Summary: A warming trend melted low-elevation snow packs, triggering flooding and mudslides throughout western Idaho. Over $20,000 was spent on flood control efforts.

County Summary: All county roads closed temporarily b/c of mud slides; over 20 homes evacuated, over 100 stranded b/c of washed out roads. Mudslides closed the Crouch-Garden Valley road, Grimes Creek Road, Harris Creek Road, Robie Creek Road, Lowman to Garden Valley and Hwy 21 between Lowman and Idaho City , and Hwy 55 between Banks and Round Valley . State of emergency declared in Boise County; state disaster declaration 2/24/86 .

4.5.1.4 February 1982

Event Summary: Flooding in western Idaho from ice jams and swollen rivers and creeks.

County Summary: Mud, rock and snow slides closed roads in Boise County , including Hwy 21 from Lowman to Idaho City and to Garden Valley. Harris Creek Road near Horseshoe Bend was closed when ice jams on Harris Creek backed up water and flooded the road.

4.5.1.5 January 17, 1971

Event Summary: Heavy rain and snow over four days caused flooding in southwest Idaho

County Summary: Power outages were caused in Centerville, Pioneerville and Lowman when snow-covered tree limbs broke and hit power

4.5.1.6 December 21-23, 1964

Event Summary: $21,000,000.00 - During the end of December 1964, warm weather combined with heavy rains and melting snow, causing flooding along the Payette, Big Wood, Little Wood, Portneuf, Clearwater and Boise River drainages. Hwy 21 and 15, US 95N and 30E were closed. Over 100 homes were damaged, numerous bridges were washed out, and thousands of acres of farmlands were flooded. 2 deaths were attributed to the flood. A state of emergency was declared.

County Summary: Bridges on Mores Creek and Thorn Creek washed out, telephone service cut.

4.5.1.7 January 22, 1969

Event Summary: Heavy rain and snow over five days caused creeks and rivers to rise rapidly, leading to flooding in the Boise watershed and throughout the state.

County Summary: The rain caused snow slides along Hwy 21, closing the highway between Idaho City and Lowman.

4.5.1.8 April-June 1943

Event Summary: $1,000,000.00 - Snowmelt combined with rain led to flooding along the Boise and Payette River basins ranging from Boise, Eagle, Emmett, down to Notus. Throughout the area, over 200 families were evacuated, 11 highway bridges across the Boise River were closed for five days or more. Hwy 21 was closed for over a week because of washouts from flooding creeks, isolating Idaho City and Boise Basin communities. Of the damage, over $649,000 was agricultural: over 10,000 acres were flooded. This flood provided the final impetus to build Lucky Peak Dam.

County Summary: Hwy 21 was washed out in several places from flooding creeks, isolating Idaho City and other Boise Basin towns for over a week. Food supplies ran low, electricity and telephone service was out for several days.

Figure 4.1. FEMA Flood Zones and land ownership in Boise County.

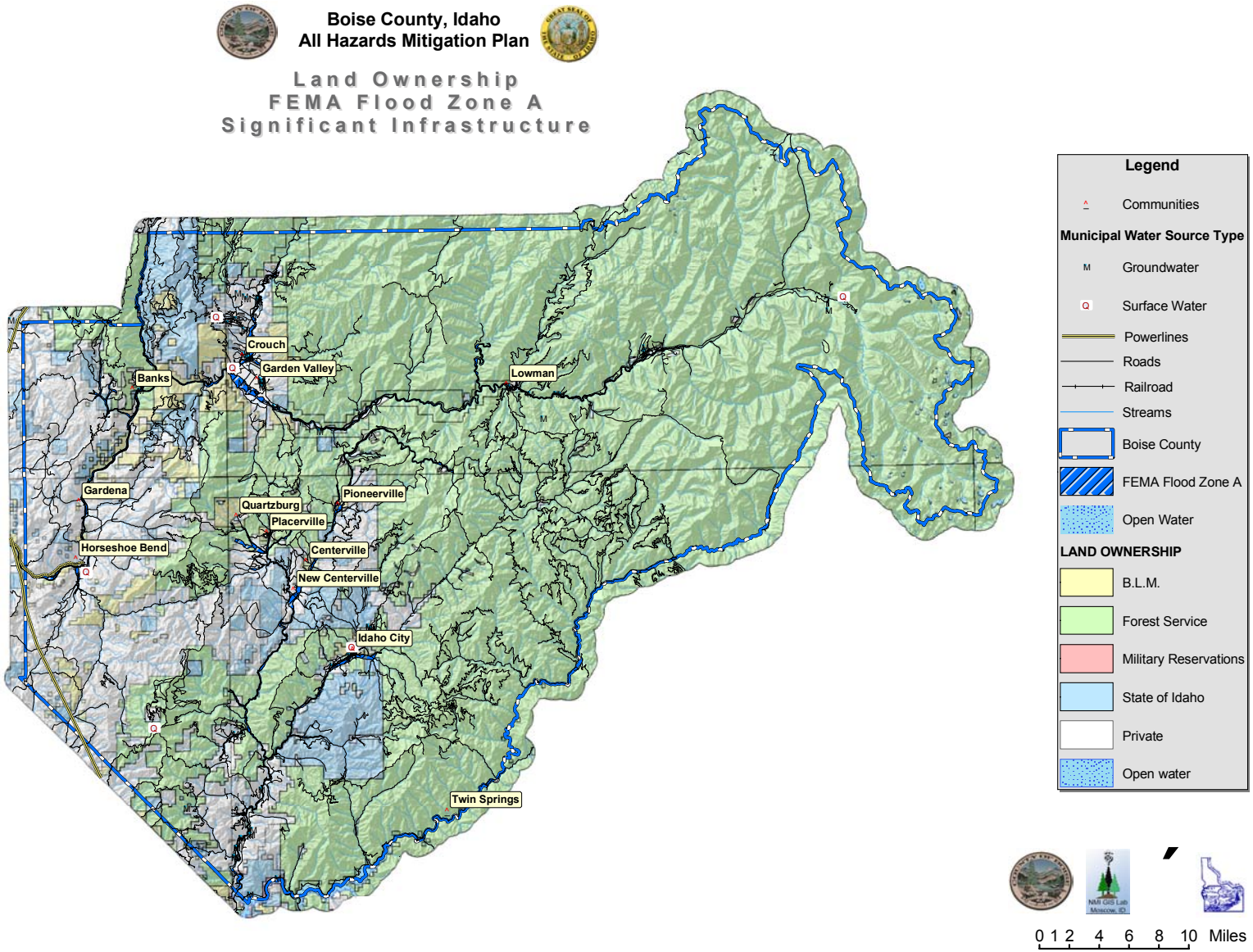


Figure 4.2. FEMA Flood Zones and land ownership in the west central portions of Boise County

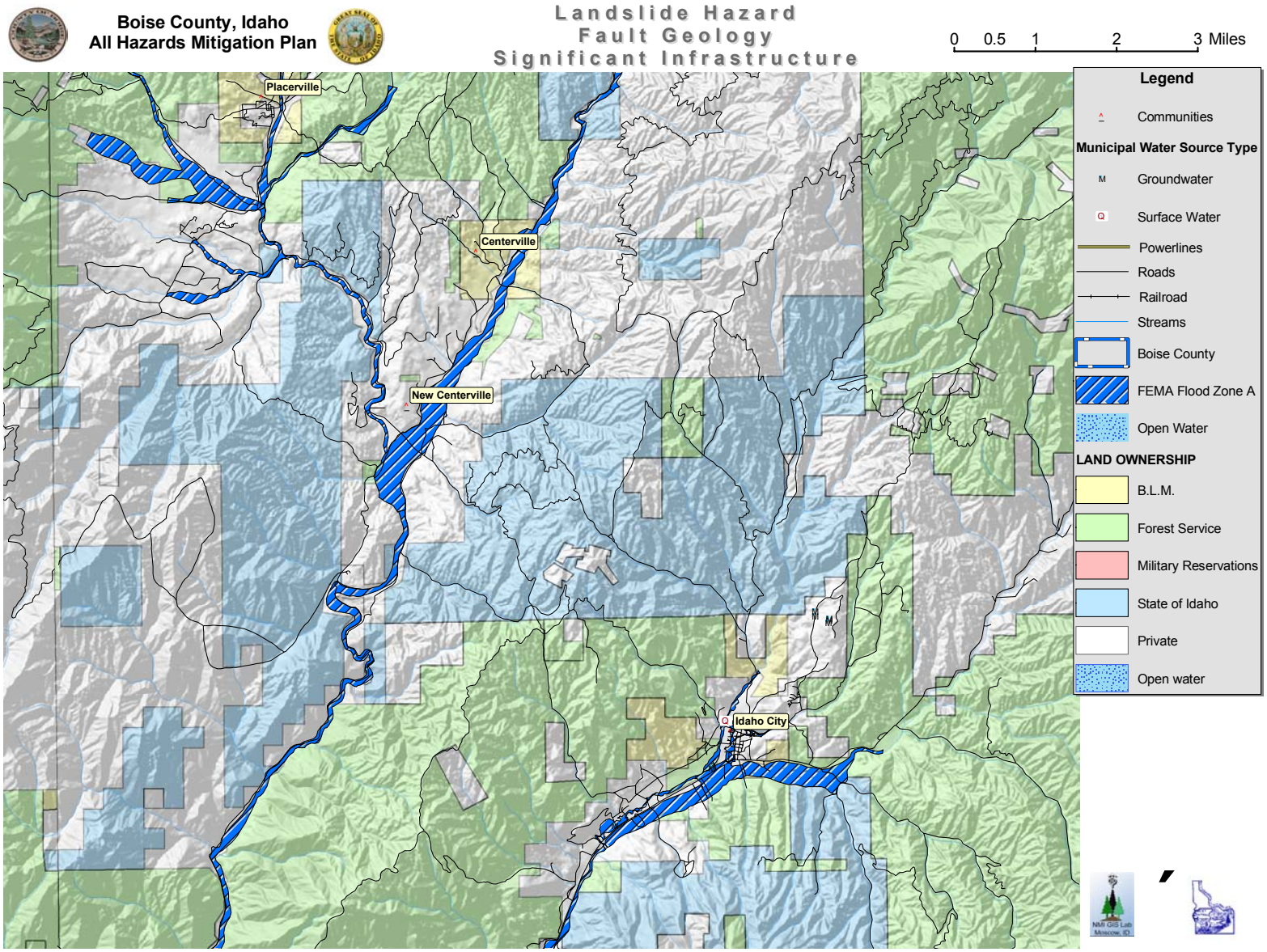


Figure 4.3. FEMA Flood Zones and land ownership in the western portions of Boise County

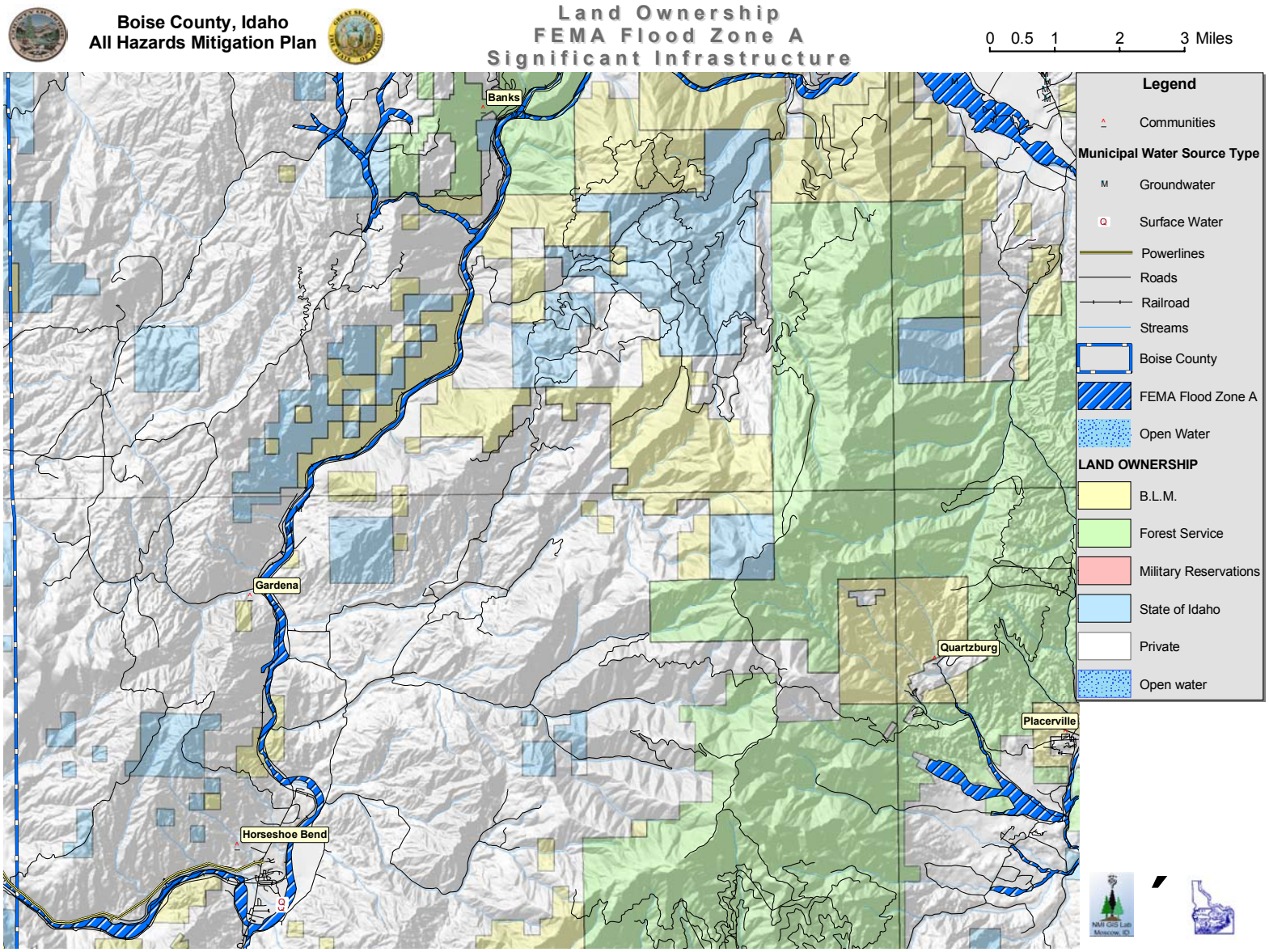
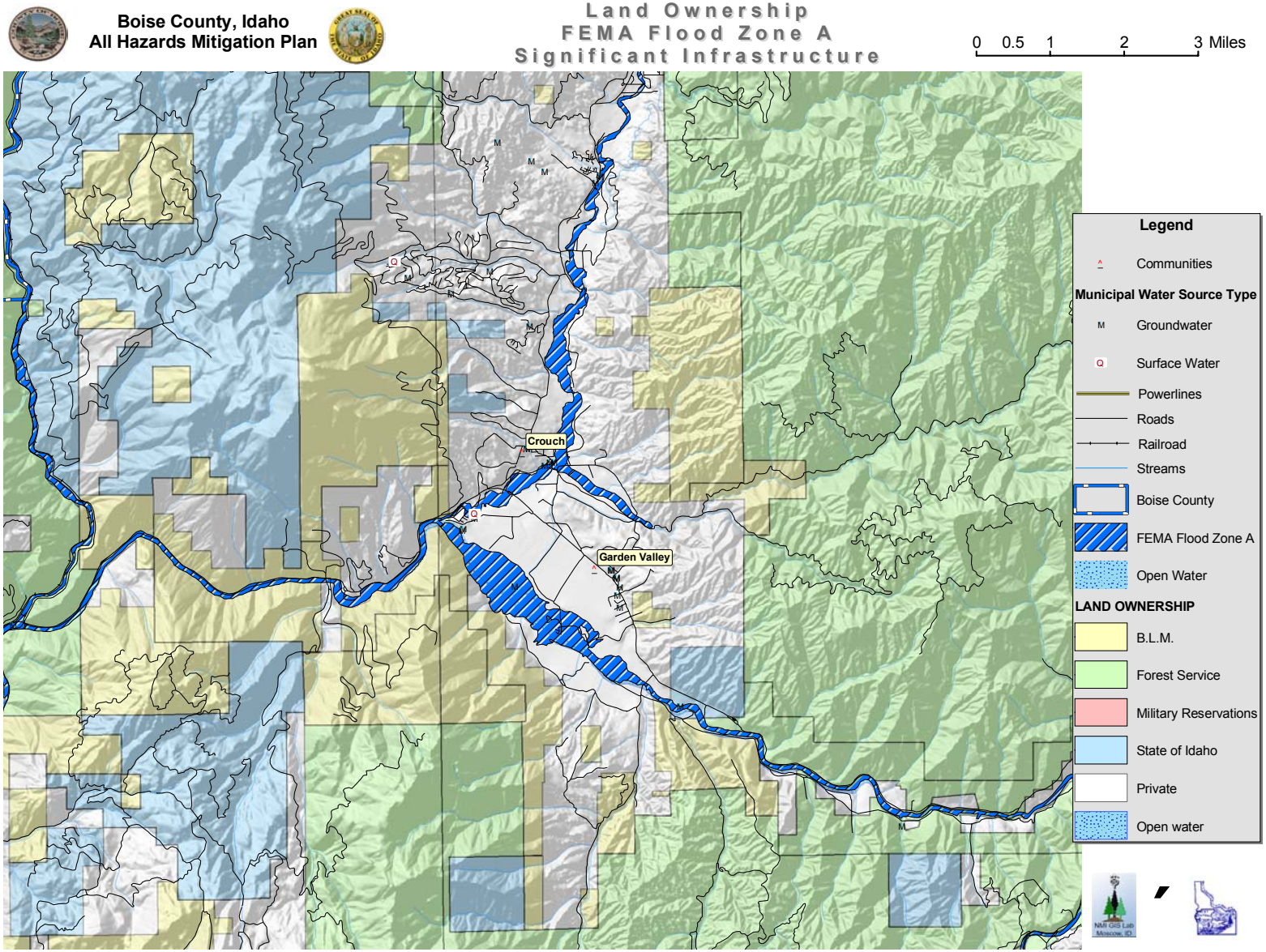


Figure 4.4. FEMA Flood Zones and land ownership in the northern portions of Boise County



The FEMA developed FIRM maps for Boise County were digitized for assessing how many acres in the County are within FEMA Flood Zones. FEMA has developed the Flood Zone A category of flood zones in Boise County. The FEMA Flood Zone A (also called the 100-year flood zone) encompasses approximately 9,449.3 acres (3,824 ha) in Boise County.

Many of these flood zones have received mitigation measures in the past such as dikes, water diversion projects, and levies to mitigation potential flooding damages. However, the natural areas remain in the flood zones. Within Boise County a number of structures and significant infrastructure components are found in the FEMA Flood Zone:

Table 4.1 Significant assets and infrastructure in Boise County Flood Zone.

Item	Flood Zone
Municipal Water Intakes	18 (14 groundwater) (4 Surface water- Payette Lower, Payette Upper, Elk Creek, WTP-MF Payette)
High Tension Power Lines	2 crossing 192.2 feet
Railroads (not active)	28 segments 4.1 miles
Primary Access Roads	172 segments 17.6 miles
Secondary Access Roads	57 segments 4.3 miles
Roads (general)	772 segments 68.4 miles
Incorporated Cities	Crouch – 77.76 acres Horseshoe Bend – 53.07 acres Idaho City – 89.84 acres Placerville – 0.29 acres

4.5.2 Countywide Potential Mitigation Activities

There is no way to prevent floods. The weather forces and topography of Boise County will always dictate when and where floods occur.

There are three areas where action can be taken to reduce the loss of life, property, infrastructure, and business disruption to floods.

- Mitigation
- Readiness/Education
- Building codes

4.5.3 Mitigation

In the past, mitigation efforts have concentrated on the construction of dams and dikes to control and corral flood waters. Over the decades these efforts have resulted in unexpected and undesirable consequences. Building dikes only moved the problem downstream. Often subdivisions were constructed in areas behind the dikes, resulting in high losses when dikes

were breached. Fish habitat, the natural functions of wetlands, and its associated wildlife habitat have all been found to be negatively effected by these mitigation measures.

Today mitigation of the topographical and hydrological aspects of a floodplain or watershed within Boise County seems to be meeting most of the socio-economical goals within the county. Some type of mitigation measures have been addressed in all communities within the county since the floods of 1997.

4.5.4 Readiness/Education

Continued periodic public education measures should be undertaken. When extended period of times pass between major flood events, both emergency response units and the public tend to forget to review plans and take necessary precautions. Some media and public communication ideas are:

- Publish a special section in your local newspaper with emergency information on floods and flash floods. Localize the information by printing the phone numbers of local emergency services offices, the American Red Cross chapter, and the nearest clinic.
- Ask the local paper to interview local officials about land use management and building codes in floodplains.
- Periodically inform your community of local public warning systems. Explain the difference between flood watches and warnings. Let them know where to turn for emergency broadcast information should they hear a warning on their radio or television.
- Assist clinics and other operations that are critically affected by power failure by arranging for auxiliary power supplies, this would include city water and sewer systems, emergency services (including electric dependent phone systems), police and fire.
- Publish emergency evacuation routes for areas prone to flooding.
- Have a ready source of sand, bags and shovels available, stored outside the floodplain.

Requiring building permits and compliance with building codes is a good educational tool. Builders and future homeowners are made aware of the potential risk of building in the flood plain. Periodic publication of the highlights of these building codes can help to keep up public awareness.

4.5.5 Building Codes

Participation in the National Flood Insurance Program (NFIP) and subsequent adoption of the International Building Codes, or more stringent local building codes, provide basic guidelines to communities on how to regulate development. When a county participates in the NFIP it enables property owners in the county to insure against flood losses. By employing wise floodplain management, a participating county can protect its citizens against much of the devastating financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

Table 4.2 provides a list of the communities within Boise County that currently participate in the NFIP.

Table 4.2. Communities Participating in NFIP as of 03/05/03

CID#	Community	Date of Entry	Current Effective Map Date
160205	Boise County*	04/05/88	04/05/88
160222	Idaho City	04/05/88	04/05/88
160172	Horseshoe Bend	12/04/84	04/05/88

*(NSFHA – no special flood hazard area) * Unincorporated areas only (IDWR 2004)*

Boise County has two communities (Placerville and Crouch see table below) with identified special flood hazard areas that are not participating in the NFIP. Boise County has no communities under suspension or revocation of participation in the NFIP.

Table 4.3 Communities identified as having special flood hazard areas. Not Participating in NFIP

CID#	Community	Hazard Area Identified	Date on which sanctions apply
160249	Placerville	04/05/88(F)	04/05/89
160247	Crouch	04/05/88(F)	04/05/89

(F) Effective map is a FIRM

An important part of being an NFIP community is the availability of low cost flood insurance for those homes and business within designated flood plains, or in areas that are subject to flooding, but that are not designated as Special Flood Hazard Areas.

Participation by individuals and business within each community for 2003 is shown in the Table 4.4.

Table 4.4. NFIP Policy Statistics As of 12/31/03 in Boise County.

Community Name	Policies In-Force	Insurance In-Force whole $	Written Premium In-Force
Boise County*	38	5,575,000	14,332
Idaho City	10	816,300	4,428
Horseshoe Bend	2	187,000	392
Placerville	0	0	0
Crouch	0	0	0

*does not include policies in incorporated areas (FEMA 2004).

Overall participation by individuals and business in the NFIP appears to be sufficient in some communities, while other communities appear to be low. Potential reasons are:

- A lack of knowledge about the existence of the availability of low cost flood insurance.
- Home and business owners unaware of their vulnerability to flood events.
- Current cost of insurance is prohibitive.

The first two reasons can be addressed thru public education. The third could be addressed by all communities in the county taking advantage of the Community Rating System (CRS).

To encourage communities to go beyond the minimum requirements and further prevent and protect against flood damage, the NFIP established the Community Rating System (CRS). To qualify for CRS, communities can do things like make building codes more rigorous, maintain drainage systems, and inform residents of flood risk.

In exchange for becoming more flood-ready, the CRS community's residents are offered discounted premium rates. Based on your community's CRS ratings, you can qualify for up to a 45% discount of your annual flood insurance premium.

Of the Boise County communities that participate in the NFIP, no community within the county has earned a discount on their flood insurance rates through the Community Rating System (CRS).

Participation is relatively simple, and with the planning work all ready in place within the county little to no additional work would have to be done to start receiving discounted insurance rates. For additional information go to http://www.floodsmart.gov/floodsmart/pages/crs_ratings.jsp .

Boise County does not currently operate under any building codes. Review of this policy is politically challenging in the county and has been addressed several times in the past decades.

4.6 Communities Assessments

The towns of Idaho City, Horseshoe Bend, Placerville, and Crouch are communities within Boise County that have completed Flood Insurance Rate Maps (FIRM).

4.6.1 Idaho City

Idaho City is located in the center of the Boise Basin along Highway 21. Idaho City is an old gold mining community which was founded in 1864. Extensive gold mining activity took place for several decades within the water ways surrounding the city. Mores Creek and Elk Creek are the main source of flooding in Idaho City, along with several other streams within the surrounding area. Mores Creek enters Idaho City from the Northeast and Elk Creek enters from the north. These bodies of water drain the forested ecosystem surrounding Idaho City. There are several homes and cabins, campgrounds, motels and other businesses located along the banks of these creeks. State Highway 21 is the main method of transportation to Idaho City. Other secondary roads do exist, but are forested roads that may not be passable during several months of the year.

4.6.1.1 Flood Potential

Floods in the area can be the result of rain-on-snow events and thunderstorms. Rain-on-snow events that could affect Idaho City occur when significant snow pack exists within the hydrologic watershed surrounding Idaho City. The boundaries of the watersheds are fairly small, draining the nearby forested watersheds. Warm rains falling on the snow pack result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days.

Thunderstorms are localized summer events that can also have an impact on the flooding potential of Idaho City. Thunderstorms have had a significant impact to the community of Idaho City, and help to know that the community is aware of the risks and impacts of these intense localized events. Flooding occurs rapidly, overwhelming the water carry capacity of channels and storm drains in a short time. The duration of subsequent flooding tends to be a matter of hours. This type of flooding seems to be the most influencing flooding event within Idaho City.

Flash flooding from past wildfires within the Idaho City area could present another type of flooding potential to the area. With the reduced amounts of vegetation, the water tends to runoff the landscape at an accelerated rate carrying rocks and other debris down slope.

Potential impacts from flooding in Idaho City can be the restricted use of Highway 21. Several bridges along Highway 21 cross major streams and draws within the surrounding community of Idaho City. If any one of these bridges is compromised, travel into and out of Idaho City could be very difficult and could potentially add several hours of travel time to your destination.

The United States Department of Geological Services (USGS) established several surfacing monitoring stations in streams near Idaho City from 1939 to 2003. The data for the peak flows were incomplete or no peak flows were recorded for these streams.

Several streets and road shoulders may erode under flood conditions within Idaho City. Many streets are not paved, which results in gravel washing down-slope potentially clogging sewer drains.

Several structures and businesses still operate within or close to the floodplain. Furthermore, several homes and cabins lie on the banks of Mores and Elk Creek, along with other smaller streams surrounding the town. A secondary problem within Idaho City is that the ground water is located within a few feet of the surface, so permeability is very low.

Idaho City is mainly the water source for flooding problems that could happen further downstream. The snow pack seems to come off the watershed fairly slow due to the elevation. Furthermore, there is not a very extensive watershed area around Idaho City. Most of the flooding waters in the surrounding counties are from Boise County. Some type of communication efforts should be in place to warn the surrounding areas about high flow rates coming out of Idaho City and surrounding areas. This would help the surrounding counties prepare for the oncoming affects of potential flooding water.

The majority of the streams within the area have been dredged during the past gold mining activity. This activity has redirected water in several areas within the community, which has potentially increased the amount of pooling and flood risk to the community. Re-channeling the streams back to their natural location would reduce the amount of pooling and side channels that have been created.

The city flood plain map is slightly different than the FEMA map. The newer sub-division located east of town has been excluded on the city flood map. This area is included in the FEMA map and still has the potential of flooding due to the re-channeling of the dredged stream. Several pools exist within this area, which increase the flooding potential to this area. If this area has been excluded from the FEMA FIRM map then this update needs to be included on the flood risk map.

4.6.1.2 Ingress-Egress

The primary access into the Idaho City community center is Highway 21. Highway 21 is the main highway connecting Idaho City to Boise. This roadway is well-traveled not only by area commuters, but also recreation use year around. This area has been used for recreation activity for the Boise area as well as tourists for many decades because of its long history in Idaho.

There are other access routes that extend from the community in all directions, but may be inadequate to handle heavy amounts of traffic or are closed during the winter months. Some are two-lane paved roads, while others are typically on lane gravel roads; however, they are wide and stable enough to support some large truck travel. All of these potential access routes dip in and out of small drainages and cross small streams that may prove impassible in major flood events. There is some elevation relief around Idaho City to provide a place for people to go until flood waters recede. There would be no need to evacuate the entire community during a flood event.

4.6.1.3 Infrastructure

Roads, bridges, and numerous structures are potentially the most affected infrastructure in Idaho City during flood events. Alternative routes to all parts of town are available during most floods. This can add additional time to reach a desired destination or emergency location. Usually it is only a matter of a few minutes to circumvent flooded areas, but many hours could also be the case. Historically there has not been long term damage to road systems in the Idaho City area. The floods of 97 did not damage any roads or bridges within the city limits of Idaho City, but some damage was done further south and fringes of Boise County. Paved road surfaces require some cleaning of flood carried debris, while local gravel roads need grading and some spot replacement of surface rock.

Most residents in Idaho City are connected to the municipal water system or have drilled personal wells. Idaho City's wells and water treatment facility are located within the flood plain. The cities ability to provide clean drinking water during flood events may be compromised during flooding events. The water storage tank is located outside the flood plain and consists of 200,000 gallons and would last the town approximately 10 hours if power was lost. No back up power supply is available on the water treatment facility. Idaho City's city sewer treatment plant is located near the floodplain and seems to be elevated enough to withstand a flood event.

Table 4.5 Water Use Table for Idaho City, Idaho.

Idaho City	Population = 483 (2002)
Max plant daily production	700,000 gallons/day
Max daily usage	325,000 gallons/day
Avg. daily usage	200,000 gallons/day
Storage capacity	200,000 gallons
Per capita avg. daily usage	414.1 gallons/day
# days use w/o power (avg. daily use)	1 day

The average domestic use, per capita, nationwide is 184 gallons. The smallest state, population-wise, among the nation's top 10 water users is Idaho, due to irrigation.

Some infrastructures of Idaho City are located within the floodplain, but seem to function properly, during past flooding events. Having these services not compromised during a major flood event could significantly increase Idaho City's ability to respond to the emergency.

4.6.1.4 Flood Protection

No dikes or levees have been built along Mores Creek, Elk Creek, or other creeks in the area to reduce the risk of flooding events.

Idaho City operates under the Uniform Building Code. Inspections within Idaho City are done primarily by the Boise Inspector. Adoption of a flood plain ordinance would further reduce the risk of potential flood damage to structures and people within the community.

4.6.1.5 Community Risk Assessment

Residents in the Idaho City area have a low risk of experiencing major flood damage or long term disruption of business. Flood impacts are mainly limited to disruption of road travel, and limited localized flooding of structures, equipment, and businesses. Restricted travel of Highway 21 could potentially be a main concern not only to the Idaho City community, but also to

travelers and tourists using the highway. If this road is compromised in any stretch, several hours of extra travel could arise.

Maintenance and improvement of the streams, water facility, sewer system and Highway 21 will provide the best mitigation measure for the city of Idaho City. Furthermore, re-channeling the area streams back to their natural location would reduce the amounts of pooling and side channels that have been created during the gold mining activity.

4.6.1.6 Mitigation Activities

At the local level Idaho City should develop a plan for the maintenance of:

- Culvert inlets and outlets through out town, including storm drain inlet and outlets
- Replacement of any under-sized culverts.
- Replacement of any bridges to handle 500 year floods along Highway 21.
- Establish a communication link to other surrounding communities and counties to warn about potential flooding waters.
- Re-channeling the area streams to reduce the flood plain area and reduce the amount of pooling and side-channels created by the dredging.

Continued participation in NFIP and enforcement of building codes in the flood plain will help keep Idaho City at a lower risk of experiencing costly flood damage.

A top priority for the community of Idaho City is getting better radio communication. Establishing a repeater in the area for emergency and local radio contact would help greatly in several aspects. This repeater and radio communication system could be used to warn the community of potential high flows coming from the area to adjoining communities and counties.

Major weather events that cause floods can interrupt electrical service. Back up power is not needed for the sewer treatment facility due to its basic functions. Back up power is available to the water treatment plant if the power is lost, so the city should not experience any lack of water. Back up power systems for emergency services and communication systems would help in emergency response situations.

4.6.2 Horseshoe Bend

Horseshoe Bend is located approximately 20 north of Boise along Highway 55. The major flood plain affecting Horseshoe Bend is the Payette River. This river drains an extensive land-base. This drainage area starts north of McCall, in the Payette Lake watershed, extending south into the Horseshoe Bend area. State Highway 55 is the main method of transportation route from Boise to McCall. State Highway 52 is another route to Horseshoe Bend from Emmett and Payette area. Both of these highways are two-lane paved roads, but cross main rivers and streams in all directions and could potentially be compromised during any flooding event. Other secondary routes do exist within the Horseshoe Bend area, but may not be suitable for heavy traffic or may not be passable during several months of the year.

4.6.2.1 Flood Potential

The Payette River flows around the City of Horseshoe Bend. Geographically, the town was built around the flood plain of the Payette River, but with extensive development of the area, the corporate city limits now extends into and near the flood plain. This river drains over 2,000 square miles of various watersheds at Horseshoe Bend. The vegetation in the area is a mix of nearly flat agricultural land, moderate to steep arid rangeland, steep forestland, and pasture land.

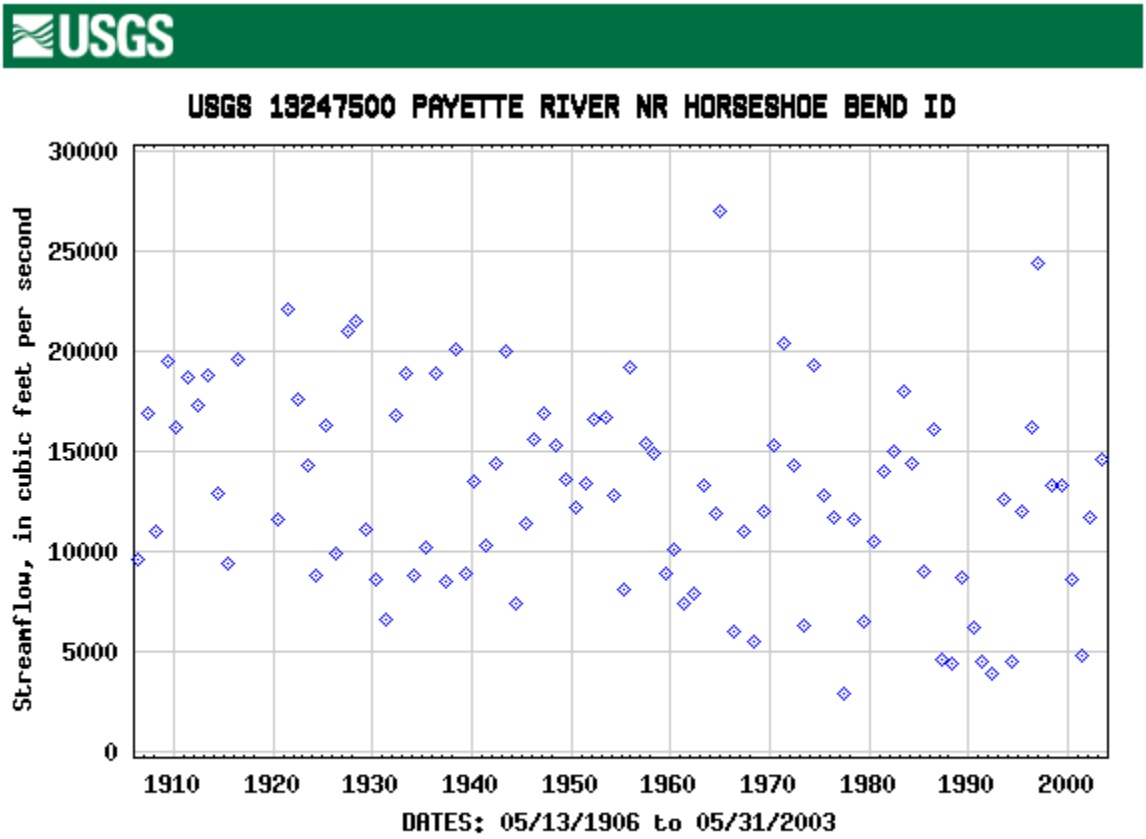
Floods in the area are the result of rain-on-snow events. Rain-on-snow events that affect Horseshoe Bend occur when significant snow pack exists within the hydrologic watersheds north of Horseshoe Bend in the Payette River Drainage. The boundaries of the watershed are extremely large, draining nearby Payette and Cascade Lakes to the north, agricultural fields and other surrounding watersheds. Warm rains falling on the snow pack result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days.

Thunderstorms are localized summer events that could also have an impact on the flooding potential of Horseshoe Bend. Flooding can occur rapidly, overwhelming the water carry capacity of channels in a short time. The duration of subsequent flooding tends to be a manner of hours.

An extensive power supply station exists within the Horseshoe Bend area providing power supply to Idaho Power. This canal starts just west of Horseshoe Bend extending further west towards Black Canyon Dam to a group of generators before it flows back into the Payette River. The canal is located above the Payette River along Highway 52. The water supply into this canal is regulated by head-gates along at the mouth of the canal. The flooding potential for this canal is if the head-gates are damaged or over-topped with flooding waters.

The United States Department of Geological Services (USGS) established a surfacing monitoring station in the Payette River near Horseshoe Bend from 1906 to 2003. The monitoring station was located just north of Horseshoe Bend in the Payette River. This river drains approximately 2,230 square miles of watersheds at this site. Peak flows from 1906 to 2003 exceeded 27,000 ft3 sec and had a maximum gage height of 16.35 feet. Gage height is the height of the water surface above the gage datum (zero point). Gage height is often used interchangeably with the more general term, stage, although gage height is more appropriate when used with a gage reading.

Figure 4.5 Streamflow data for the Payette River near Horseshoe Bend, Idaho.



The USGS also has had monitoring stations in Cottonwood Creek just south of Horseshoe Bend from 1961 to 1980.

The major impacts from all types of flooding in Horseshoe Bend are the restricted use of roads, bridges, and infrastructure. The floodplain shows a fairly wide but shallow flood plain, resulting in a flood plain that could several areas of the entire community. The main bridge that crosses the Payette River could restrict water flow, consequently backing the flow of water into the adjacent areas affected many homes and roads.

Several streets and road shoulders erode under flood conditions within Horseshoe Bend. Some streets are not paved, which results in gravel washing down-slope potentially clogging sewer and storm drains. Sewer and storm drains are quickly filled, which consequently back-up these lines which restrict the flow of water.

The construction of new homes and other structures has not ceased within or near the flood plain. Several new homes and sub-divisions have been or are being constructed near the Payette River, close to the flood plain.

Because of flood mitigation work conducted by the Army Corps of Engineers in the 1950s, a levee was built along the banks of the Payette River. This levee was built to help the area's businesses and residential area escape the flooding potentials of the river. Many efforts from the Corp have taken place and still an ongoing maintenance today.

4.6.2.2 Ingress-Egress

The primary access routes into Horseshoe Bend are State Highway 55 and 52. There are several other access routes that extend from the community in all directions, but are forested routes that lack the ability to withstand heavy amounts of traffic. These are typically one lane gravel roads; however, they are wide and stable enough to support some large truck travel. However, these roads may be impassable during several parts of the year. All of these potentially access routes dip in and out of small drainages and cross small streams that may prove impassable in major flood events. There is an elevation relief around Horseshoe Bend, so there is a good chance the entire community would not have to evacuate during a flooding event.

4.6.2.3 Infrastructure

Roads, bridges, home and some businesses are the most affected infrastructure in Horseshoe Bend during flood events. Access through town along Highway 55 and 52 could be compromised. This restricted access may cause temporary delays or further commuting miles to get to and from your destination. Historically there has been some long term damage to road systems in the Horseshoe Bend area. Paved road surfaces require some cleaning of flood carried debris, while local gravel roads need grading and some spot replacement of surface rock.

Most residents in Horseshoe Bend are connected to the municipal water system or have drilled personal wells. City wells and the water system are located outside of the floodplain. Horseshoe Bend's water storage capacity consists of 400,000 galloons, which will last the town 2 to 3 days in the summer and 3 to 4 days in the winter with the conservation of water if power was lost due to a flood event. No alternative power supply is available to this system due to its configuration and is highly recommended to add another 400,000 gallon water storage tank. The cities ability to provide clean drinking water during flood events should not be compromised during flooding events.

4.6.2.3.1 Water Use Table for Horseshoe Bend

Table 4.6 Water Use Table for Horseshoe Bend, Idaho.

Horseshoe Bend	Population = 812 (2002)
Max plant daily production	1.3 million gallons/day
Max daily usage	.55 million gallons/day
Avg. daily usage	.25 million gallons/day
Storage capacity	.4 million gallons
Per capita avg. daily usage	307.9 gallons/day
# days use w/o power (avg. daily use)	1.6 days

The average domestic use, per capita, nationwide is 184 gallons. The smallest state, population-wise, among the nation's top 10 water users is Idaho, due to irrigation.

Horseshoe Bend is building a new sewer treatment facility outside of the flood plain. This new system has an alternative power supply and is elevated well above the flood plain and should not pose a problem during extreme flooding events.

Power lines, city water/sewer, emergency services (fire/ambulance), City Hall, churches and other public facilities are located outside the floodplain. These services may not feel a direct impact of flooding, and should be able to fully function during flood emergencies.

4.6.2.4 Flood Protection

The entire reach of the Payette River in Horseshoe Bend has been levied by the Army Corp of Engineers in the 1950s. This levee was built to help the area's businesses and residential area escape the flooding potential of the Payette River. Many efforts from the Corp have taken place and still an ongoing project today. This levee has been damaged during past flooding events and requires cleaning following high runoffs. Furthermore, several small dikes and levees have been built along the Payette River for irrigation water to the local farmers. Some of the dikes act as catch basins for storm drainage.

The sewage treatment plant is located outside the flood plain, and is elevated enough to withstand flooding events. This system is being constructed and will be able to withstand a 500 year flood.

Horseshoe Bend operates under the Uniform Building Code and inspected by the Boise Inspector. A flood plain ordinance has been adopted by Horseshoe Bend to further reduce the amount of potential damage to structures and residents to the community.

4.6.2.5 Community Assessment

Residents in the Horseshoe Bend have a moderate risk or experiencing smaller periodic floods and a high risk of catastrophic flooding or potential disruption of business if the levees along the Payette River are breached. Due to the location of the town, flood risks will always be an issue in Horseshoe Bend due to the extensive drainage area of the Payette River.

Maintenance and improvement of the levee along the Payette River, replacing under-sized culverts, and maintaining the head-gates on canals within the communities' drainage system will provide the best, most socio-economically acceptable protection for Horseshoe Bend.

4.6.2.6 Mitigation Activities

Overall the city of Horseshoe Bend is very vulnerable to a catastrophic flood. The city should keep concentrating its efforts on annual maintenance the Payette River, as well as cleaning sewer drains, and culvert inlets and outlets to help the flow of water within the community. Additional supplies of sand and bags should be kept on hand for reinforcement during flood events.

A top priority for the community of Horseshoe Bend is getting better radio communication. Establishing a repeater in the area for emergency and local radio contact would help greatly in several aspects. This repeater and radio communication system could be used to warn the community of potential high flows coming into the area from adjoining communities and counties.

Continued participation in NFIP and enforcement of building codes in the flood plain will help keep Horseshoe Bend eligible for low cost flood insurance.

Major weather events that cause floods can interrupt electrical service. Back up power systems for emergency services, City water systems and communication systems would help in emergency response situations.

4.6.3 Placerville

Placerville is located approximately 18 miles northwest of Idaho City along Placerville Road. The major flood plain that could affect Placerville is Alder Creek and Woof Creek. These bodies of water drain the localized watersheds surrounding the community. These watersheds aren't very big due to the high elevation location of Placerville. Placerville is an old gold mining community which only houses around 20 to 30 people year around with a peak summer population of 100+.. No significant infrastructure exists within the community itself. A general store/gas station, community center, and museums are the only significant business structures within the city limits. Several residents, roads, and bridges associated with the community could be affected during flooding events. Placerville and many of its buildings are listed on the National Register of Historical Places.

4.6.3.1 Flood Potential

Flooding potential in the area could be the result of rain-on-snow events and localized thunderstorms. Rain-on-snow events that could affect Placerville occur when significant snow pack exists within the hydrologic watershed surrounding Placerville. The boundaries of the watershed are fairly small, draining the nearby forestland watersheds. Warm rains falling on the snow pack result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days.

Thunderstorms are localized summer events that can have an impact on the flooding potential of Placerville. Flooding can occur rapidly, overwhelming the water carry capacity of channels in a short time. The duration of subsequent flooding tends to be a matter of hours.

The major impacts that could take place from all types of flooding in Placerville are the restricted use of roads and bridges. There are numerous culverts that exist along Placerville Road. All of the culverts and bridges within the area could restrict water flow, consequently backing the flow of water onto the adjacent area or potentially damaging the bridge or road surface.

The construction of new homes and other structures has ceased within the flood plain of the City of Placerville, but some new construction has existed within and outside the flood plain outside of the corporate city limits. The homes within the flood plain are mainly summer recreation cabins or single level homes without basements. Several older businesses still exist near the flood plain, but seem to be at a lower risk from floods.

Placerville is mainly the water source for flooding problems that could potentially occur further downstream. The snow pack seems to come off the watershed fairly slow due to the elevation. Furthermore, there is not a very extensive watershed area around Placerville. Most of the flooding waters in the surrounding counties are from Boise County and the Placerville area. Some type of communication efforts should be in place to warn the surrounding areas about high flow rates coming out of the community and surrounding areas. This would help the surrounding counties prepare for the oncoming affects of potential flooding water.

The streams of the area have been dredged from past gold mining activity which has redirected the stream channel in several locations. This re-channelizing of the stream has increased the flood plain area has established pools outside of the normal stream channel.

4.6.3.2 Ingress-Egress

The primary access into Placerville is by Placerville Road. This road enters the town from the southeast from Idaho City and then north from Garden Valley. Harris Creek Road is another access route into Placerville from Horseshoe Bend. Both of these roads are gravel roads and could be impassable during several months of the year.

There are several access routes in and out of Placerville that could provide access around the community during flooding events, but many a mountainous roads and could be impassable during several months of the year. Most of these roads can handle heavy truck traffic, due to the extensive logging in the area.

In the winter time 80+ inches of snow falls in a 4 month period, this snow can lead to the community being isolated, and during rain on snow events leave roads difficult to impossible to pass due to their saturated condition.

All of the potential access routes to and from Placerville dip in and out of small drainages and cross small streams that may also prove impassable in major flood events. There is enough elevation relief around the community to provide a place for people to go until flood waters recede. There would be no need to evacuate the entire community during a flood event.

4.6.3.3 Infrastructure

The infrastructure of Placerville is not as significant today as it was decades ago. This old gold mining community's population has taken a significant drop since the gold mining days. Several old structures still exist, but are not in use or have been condemned. Bridges and roads, and some residential areas may be affected during flooding events. If the bridges that cross Alder Creek, Woof Creek or other creeks and draws are compromised, restricted travel corridors will be affected for the area residents and commuters. Historically there has been some long term damage to road systems in the Placerville area. Road surfaces require some cleaning of flood debris; culverts need to be cleaned out, while local gravel roads need grading and some spot replacement of surface rock.

Most residences in Placerville are connected to the municipal water system or have drilled personal wells and have their own septic systems. The municipal water system consists of two smaller reservoirs west of town which store surface water from Granite Creek. This surface water supplies water to the residents for irrigation, and fire hydrants. Individual wells provide drinking water to homes. These wells are dependent upon the electrical pumps that operate the wells. During large flood events it is not uncommon for Placerville to lose power, restricting the ability of homeowners to pump water. The communities' ability to provide clean drinking water may be compromised during flooding events.

4.6.3.4 Flood Protection

No flood protection exists along the creeks within the community of Placerville. Placerville operates under the Uniform Building Code and is inspected by the Boise inspector.

4.6.3.5 Community Risk Assessment

The community of Placerville has a low risk of experiencing a catastrophic flood event due to the elevation and small drainage areas of the local creeks.

Maintenance of the area culverts, roads and bridges will provide the best, most socio-economically accepted protection for Placerville. Furthermore, the area streams have been

dredged in the mining days, and need to be re-channeled to reduce the amount of pooling and reduce the flood plain area.

4.6.3.6 Mitigation Activities

Overall the City of Placerville has a low risk to catastrophic floods. The city should keep concentrating its efforts on annual maintenance of their culverts, roadways, and bridges.

Equipment (graders/Dozers/plow trucks) is needed to insure year round access to this community. A breakdown in the limited and antiquated equipment currently located in the Placerville area could easily result in the community being isolated during an emergency response.

At the local level Placerville should develop an annual plan for the maintenance of culvert inlets and outlets throughout town and access routes into and out of the community.

A top priority for the community of Placerville is getting better radio communication. Establishing a repeater in the area for emergency and local radio contact would help greatly in several aspects. This repeater and radio communication system could be used to warn the community of potential high flows coming from the area to adjoining communities and counties.

Future participation in NFIP and enforcement of building codes in the flood plain will help keep Placerville eligible for low cost flood insurance.

Major weather events that cause floods can interrupt electrical service. Back up power systems for emergency services and communication systems would help in emergency response situations.

4.6.4 Crouch

Crouch is located approximately 10 east of Banks along Banks/Lowman Road. The major flood plain affecting Crouch is the Middle Fork Payette River and the South Fork Payette River from Garden Valley. This river drains an extensive land-base, draining nearby agricultural land, forestland and rangeland. State Banks/Lowman Road is the main method of transportation route to the City of Crouch. This highway is a two-lane paved road, but has many river and stream crossings in all directions and could potentially be compromised during any flooding event. Other secondary routes do exist within the Crouch area, but may not be suitable for heavy traffic or may not be passable during several months of the year.

4.6.4.1 Flood Potential

The Middle Fork Payette River flows around the City of Crouch. The South Fork joins the Middle Fork just south of Crouch traveling west toward Banks. Geographically, the town was built around the flood plain of the Middle Fork Payette River, but with the new development of RV Parks, campgrounds, and recreation businesses to the area, the corporate city limits now extends into the flood plain. This river drains several hundred square miles of various watersheds at Crouch.

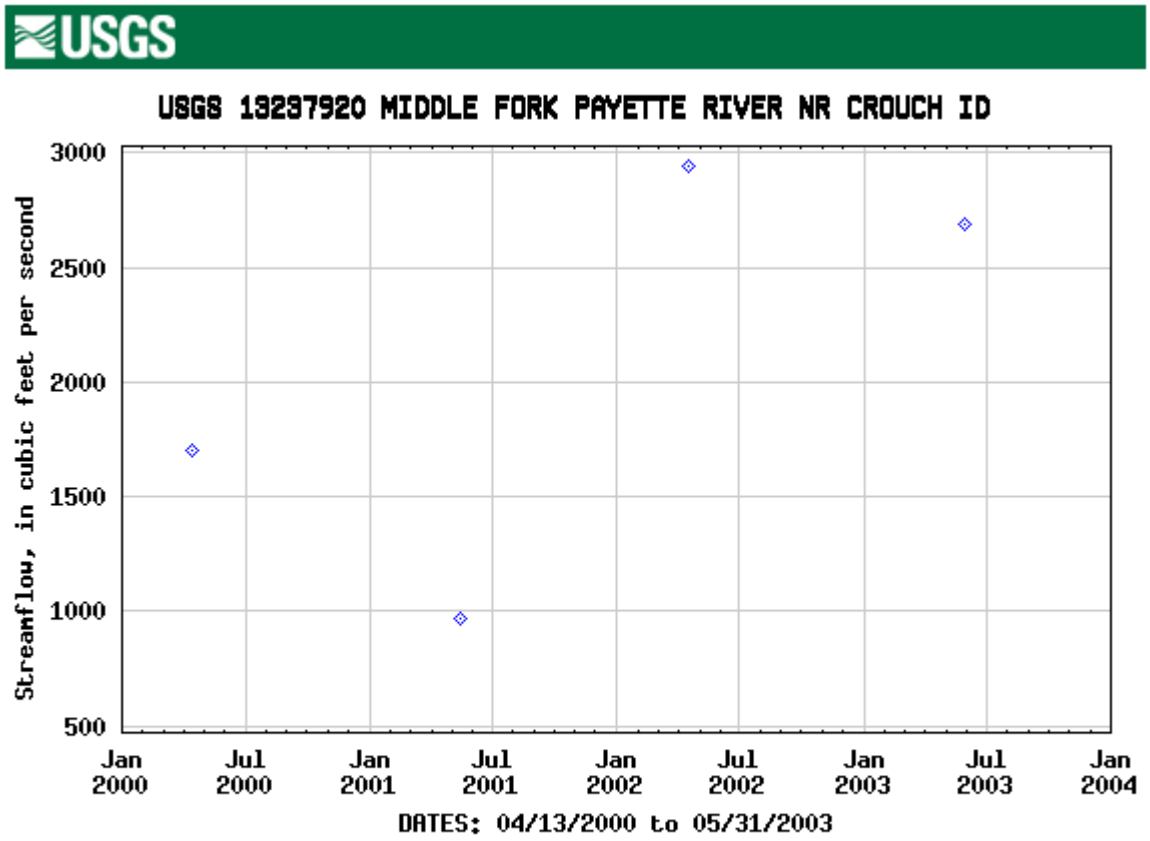
Floods in the area are the result of rain-on-snow events. Rain-on-snow events that affect Crouch occur when significant snow pack exists within the hydrologic watersheds north of Crouch in the Middle Fork Payette River drainage. Warm rains falling on the snow pack result in a significantly increased rate of snowmelt. Often this melting occurs while the ground is frozen and the water cannot be absorbed into the soil, resulting in increased overland flows. Flood waters recede slowly as rain-on-snow weather events tend to last for several days.

Thunderstorms are localized summer events that could also have an impact on the flooding potential of Crouch. Flooding can occur rapidly, overwhelming the water carry capacity of channels in a short time. The duration of subsequent flooding tends to be a manner of hours.

The major impacts from all types of flooding in Crouch are the restricted use of roads, bridges, and infrastructure. The floodplain shows a fairly wide but shallow flood plain, resulting in a flood plain that could affect several areas of the community. The main bridges that crosses the Middle Fork Payette River could restrict water flow, consequently backing the flow of water into the adjacent areas affected many homes and roads. The bridge located on the eastern side of town is an older structure that may not be able to withstand a 500 year flood. This bridge could potentially over-top or restrict water flow and traffic during peak runoffs. The bridge located on the Banks/Lowman road is a newer structure and seems to be in good shape and has the ability to withstand a 500 year flood.

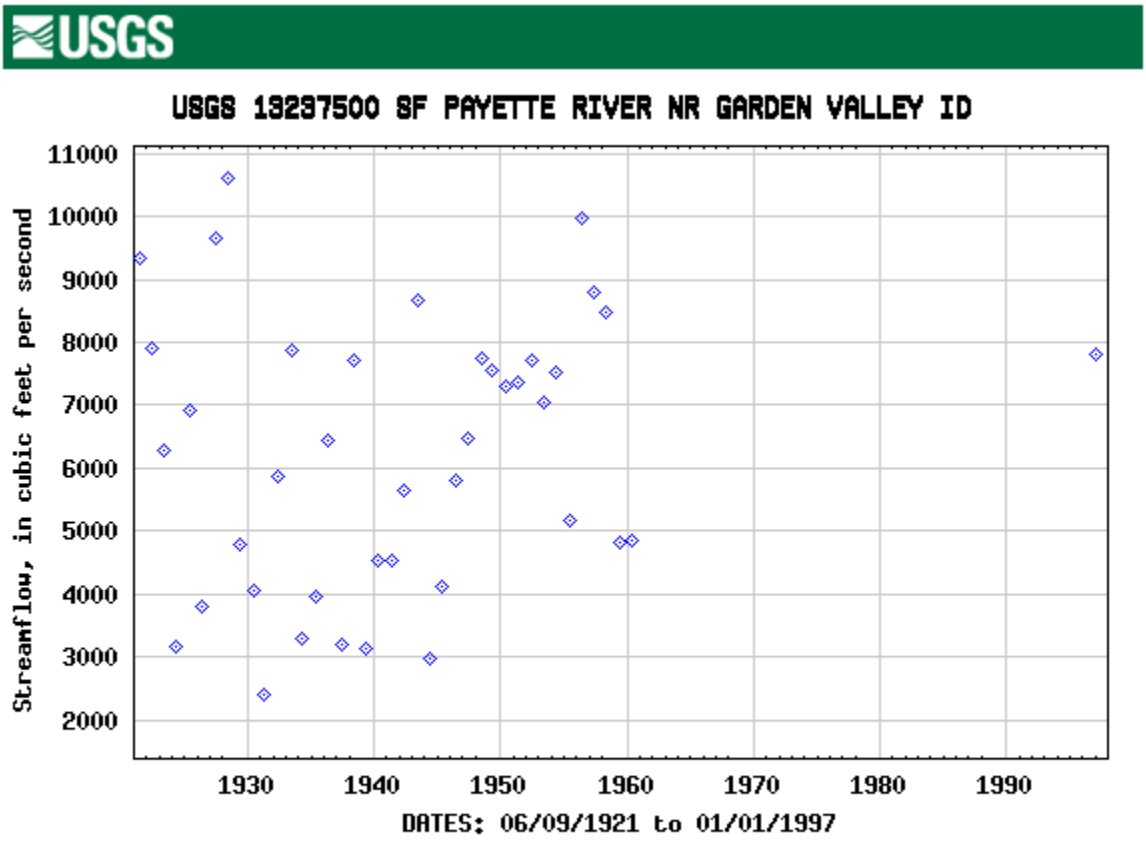
The United State Department of Geological Services (USGS) established a surfacing monitoring station in the Middle Fork Payette River near Crouch from 2000 to 2003. The monitoring station was located near the City of Crouch. Peak stream flows during this time period 3000 ft3/sec and had a maximum gage height of 6.45 feet. Gage height is the height of the water surface above the gage datum (zero point). Gage height is often used interchangeably with the more general term, stage, although gage height is more appropriate when used with a gage reading.

Figure 4.6 Streamflow data for Middle Fork of the Payette River near Crouch, Idaho.



The USGS has also had a monitoring station in the South Fork Payette River near Garden Valley between 1921 and 1997. The South Fork Payette River drains approximately 779 square miles of watersheds at this location. During 1921 and 1997, peak stream flows exceeded 10,600 ft3/sec and had a maximum gage height of 8.00 feet.

Figure 4.7 Streamflow data for South Fork of the Payette River near Garden Valley, Idaho.



Several streets and road shoulders erode under flood conditions within Crouch. Some streets are not paved, which results in gravel washing down-slope potentially clogging sewer and storm drains. Sewer and storm drains are quickly filled, which consequently back-up these lines which restrict the flow of water.

The construction of new homes and other structures has not ceased within or near the flood plain. Several new homes and sub-divisions have been or are being constructed near the Payette River, close to the flood plain.

4.6.4.2 Ingress-Egress

The primary access routes into Crouch are State Banks/Lowman Road and Middle Fork Road. There are several other access routes that extend from the community in all directions, but are forested routes that lack the ability to withstand heavy amounts of traffic. These are typically one lane gravel roads; however, they are wide and stable enough to support some large truck travel. However, these roads may be impassable during several parts of the year. All of these

potentially access routes dip in and out of small drainages and cross small streams that may prove impassable in major flood events. There is an elevation relief around Crouch, so there is a good chance the entire community would not have to evacuate during a flood event.

4.6.4.3 Infrastructure

Roads, bridges, home and some businesses are the most affected infrastructure in Crouch during flood events. Access through town along Banks/Lowman Road and Middle Fork Road could be compromised. This restricted access may cause temporary delays or further commuting miles to get to and from your destination. Historically there has been some long term damage to road systems in the Crouch area. Paved road surfaces require some cleaning of flood carried debris, while local gravel roads need grading and some spot replacement of surface rock.

Most residents in Crouch are connected to the municipal water system or have drilled personal wells. City wells and the water system are located outside of the floodplain. Crouch's water storage capacity consists of approximately 100,000 gallons, which will last the town 2 days if power was lost due to a flood event. The cities ability to provide clean drinking water during flood events may be compromised.

Power lines, city water/sewer, emergency services (fire/ambulance), City Hall, churches and other public facilities are located outside the floodplain. These services may not feel a direct impact of flooding, and should be able to fully function during flood emergencies.

4.6.4.4 Flood Protection

No dikes or levees have been built along the Middle Fork Payette River within Crouch to reduce the risk of potential flooding events.

The sewage treatment plant is located within the flood plain, and seems to be elevated enough to withstand flooding events.

Crouch operates under the Uniform Building Code and inspected by the Boise Inspector.

4.6.4.5 Community Assessment

Some of the residents in the Crouch have a high risk of experiencing major flood damage or potential disruption of business due to the close proximity of the Middle Fork Payette River. Due to the location of the town, flood risks will always be an issue in Crouch due to the extensive drainage area of the Middle Fork Payette River.

Maintenance of the Middle Fork Payette River drainage, roads, bridges and replacing under-sized culverts within the communities' drainage system will provide the best, most socio-economically acceptable protection for Crouch. Adoption of a flood plain ordinance will further reduce the amount of risk and damage to structures and people within the Crouch Community.

4.6.4.6 Mitigation Activities

Overall the city of Crouch is very vulnerable to a catastrophic flood. The city should keep concentrating its efforts on annual maintenance the Middle Fork Payette River, as well as cleaning storm drains, sewer drains, and culvert inlets and outlets to help the flow of water within the community. Additional supplies of sand and bags should be kept on hand for reinforcement during flood events.

A top priority for the community of Crouch is getting better radio communication. Establishing a repeater in the area for emergency and local radio contact would help greatly in several aspects. This repeater and radio communication system could be used to warn the community of potential high flows coming from the adjoining communities and counties.

Future participation in NFIP and enforcement of building codes in the flood plain will help keep Crouch eligible for low cost flood insurance.

Major weather events that cause floods can interrupt electrical service. Back up power systems for emergency services, City water systems and communication systems would help in emergency response situations.

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Chapter 5: Earthquakes

5 Earthquake characteristics

Geological and seismological studies show that earthquakes are likely to happen in any of several active zones in Idaho and adjacent states. Idaho is ranked fifth highest in the nation for earthquake hazard. Only California, Nevada, Utah, and Alaska have a greater overall hazard. Idaho has experienced the two largest earthquakes in the contiguous United States in the last thirty years—the 1959 Hebgen Lake earthquake (M7.5) and the 1983 Borah Peak earthquake (M7.3). Both tremors caused fatalities and millions of dollars in damage.

The crust or surface of our planet is broken into large, irregularly shaped pieces called plates. The plates tend to pull apart or push together slowly, but with great force. Stresses build along edges of the plates until part of the crust suddenly gives way in a violent movement. This shaking of the crust is called an earthquake.

The crust breaks along uneven lines called faults. Geologists locate these faults and determine which are active and inactive. This helps identify where the greatest earthquake potential exists. Many faults mapped by geologists, are inactive and have little earthquake potential, others are active and have a higher earthquake potential.

When the crust moves abruptly, the sudden release of stored force in the crust sends waves of energy radiating outward from the fault. Internal waves quickly form surface waves, and these surface waves cause the ground to shake. Buildings may sway, tilt, or collapse as the surface waves pass.

The constant interaction of crustal plates in western North America still creates severe earthquakes. Idaho is situated where the Basin and Range and Rocky Mountain geomorphic provinces meet. Most of Idaho has undergone the effects of tremendous crustal stretching. Central Idaho's high mountain ranges are striking evidence of these powerful earth movements over millions of years. The Borah Peak earthquake of 1983 was another event in the stretching that formed long deep valleys and tall, linear mountain ranges. Earthquakes from the crustal movements in the adjoining states of Montana, Utah, and Nevada also cause severe ground shaking in Idaho.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage.

Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings. After-shocks can occur in the first hours, days, weeks, or even months after the quake. Be aware that some earthquakes are actually foreshocks, and a larger earthquake might occur.

Ground movement during an earthquake is seldom the direct cause of death or injury. Most earthquake-related injuries result from collapsing walls, flying glass, and falling objects as a result of the ground shaking, or people trying to move more than a few feet during the shaking.

5.1 Measuring an earthquake

Earthquakes are measured in two ways. One determines the power; the other describes the physical effects. Magnitude is calculated by seismologists from the relative size of seismograph tracings. This measurement has been named the Richter scale, a numerical gauge of earthquake energy ranging from 1.0 (very weak) to 9.0 (very strong). The Richter scale is most useful to scientists who compare the power in earthquakes. Magnitude is less useful to disaster planners and citizens, because power does not describe and classify the damage an earthquake can cause. The damage we see from earthquake shaking is due to several factors like distance from the epicenter and local rock types. Intensity defines a more useful measure of earthquake shaking for any one location. It is represented by the modified Mercalli scale. On the Mercalli 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. In addition, intensity is not measured by machines. It is evaluated and categorized from people's reactions to events and the visible damage to man-made structures. Intensity is more useful to planners and communities because it can reasonably predict the effects of violent shaking for a local area.

Table 5.1. Modified Mercalli Earthquake Intensity Scale.

Intensity	Description
I.	Only instruments detect the earthquake
II.	A few people notice the shaking
III.	Many people indoors feel the shaking. Hanging objects swing.
IV.	People outdoors may feel ground shaking. Dishes, windows, and doors rattle.
V.	Sleeping people are awakened. Doors swing, objects fall from shelves.
VI.	People have trouble walking. Damage is slight in poorly-built buildings.
VII.	People have difficulty standing. Damage is considerable in poorly-built buildings.
VIII.	Drivers have trouble steering. Poorly-built structures suffer severe damage, chimneys may fall.
IX.	Well-built buildings suffer considerable damage. Some underground pipes are broken.
X.	Mast buildings are destroyed. Dams are seriously damaged. Large landslides occur.
XI.	Structures collapse. Underground utilities are destroyed.
XII.	Almost everything is destroyed. Objects are thrown into the air.

(IGS 2004)

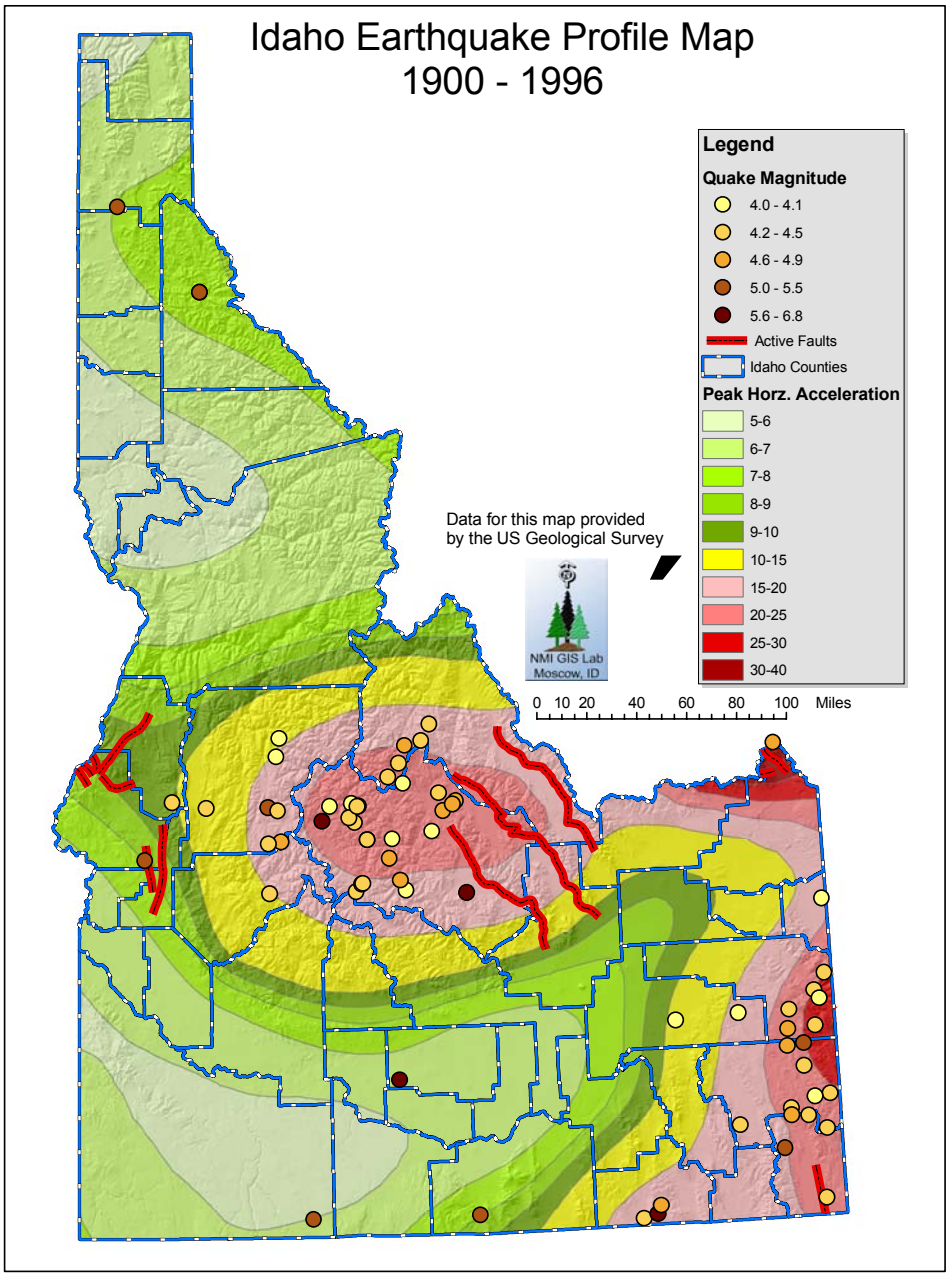
5.2 Earthquake Profile in Idaho

Many of Idaho's cities are at risk to earthquakes, even small ones, because many were built on unconsolidated sediments that move easily in response to seismic waves. Seismic waves are the form of energy that ripples through Earth when an earthquake occurs. When seismic waves propagate through unconsolidated sediments the sediments re-organize and move chaotically (sort of shaking like a bowl of gelatin). The danger is really two fold because those cities which were built near rivers below the foothills and mountains eventually expanded upward into the foothills. Mountain foothills contain erosional remnants called alluvial fans. The alluvial fans may

either slide down into the valley or simply shake about creating new topography due to internal settling. For this reason, Idaho ranks fifth in the lower 48 states as to its earthquake hazard.

Ground motion is the shaking of the ground that causes buildings to vibrate. Large structures such as office buildings, dams and bridges may collapse. Fire may cause much damage after an earthquake. Broken gas lines and fallen electrical wires cause fires, while broken water lines hinder the capability of controlling fires. Landslides are commonly caused by earthquakes.

Figure 5.1. Earthquakes in Idaho with a magnitude of 4.0 or greater.



5.2.1 Boise County Earthquake Profile

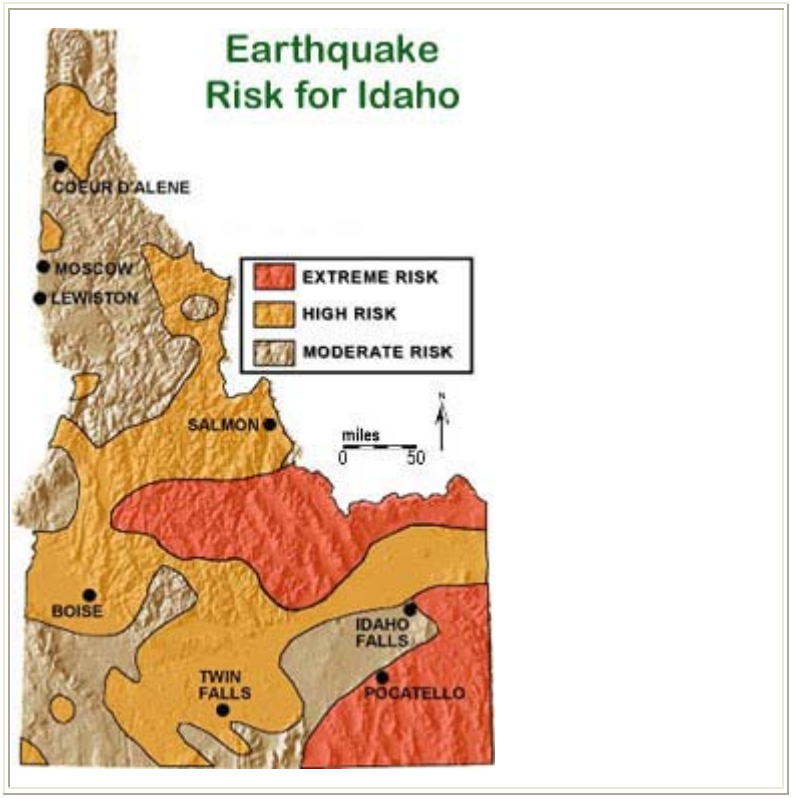
Geological and seismological studies show that earthquakes are likely to happen in any of several active zones in Idaho and adjacent states.

The 1991 Uniform Building Code (UBC), a nationwide industry standard, sets construction standards for different seismic zones in the nation. UBC seismic zone rankings for Idaho are among the highest in the nation. When buildings are built to these standards they have a better chance to withstand earthquakes. In 2002 the International Building Code (IBC) adopted the 1991 UBC earthquake standards. Boise County and all of the cities within the county do not operate under the UBC and IBC. For the counties and communities risk level this is inadequate protection for all new construction.

Studies of ground shaking in Idaho during previous earthquakes have led to better interpretations of the seismic threat to buildings. In areas of severe seismic shaking hazard, older buildings are especially vulnerable to damage. Older buildings are at risk even if their foundations are on solid bedrock. Areas shown on the map with high seismic shaking hazard can experience earthquakes with intensity VII where weaker soils exist. Most populated areas in Idaho are located on or near alluvial deposits which provide poorer building site conditions during earthquakes. Older buildings may suffer damage even in areas of moderate ground shaking hazards.

As seen in the following map Boise County is located in the area classified as “high risk to extreme risk” for Earthquake hazard.

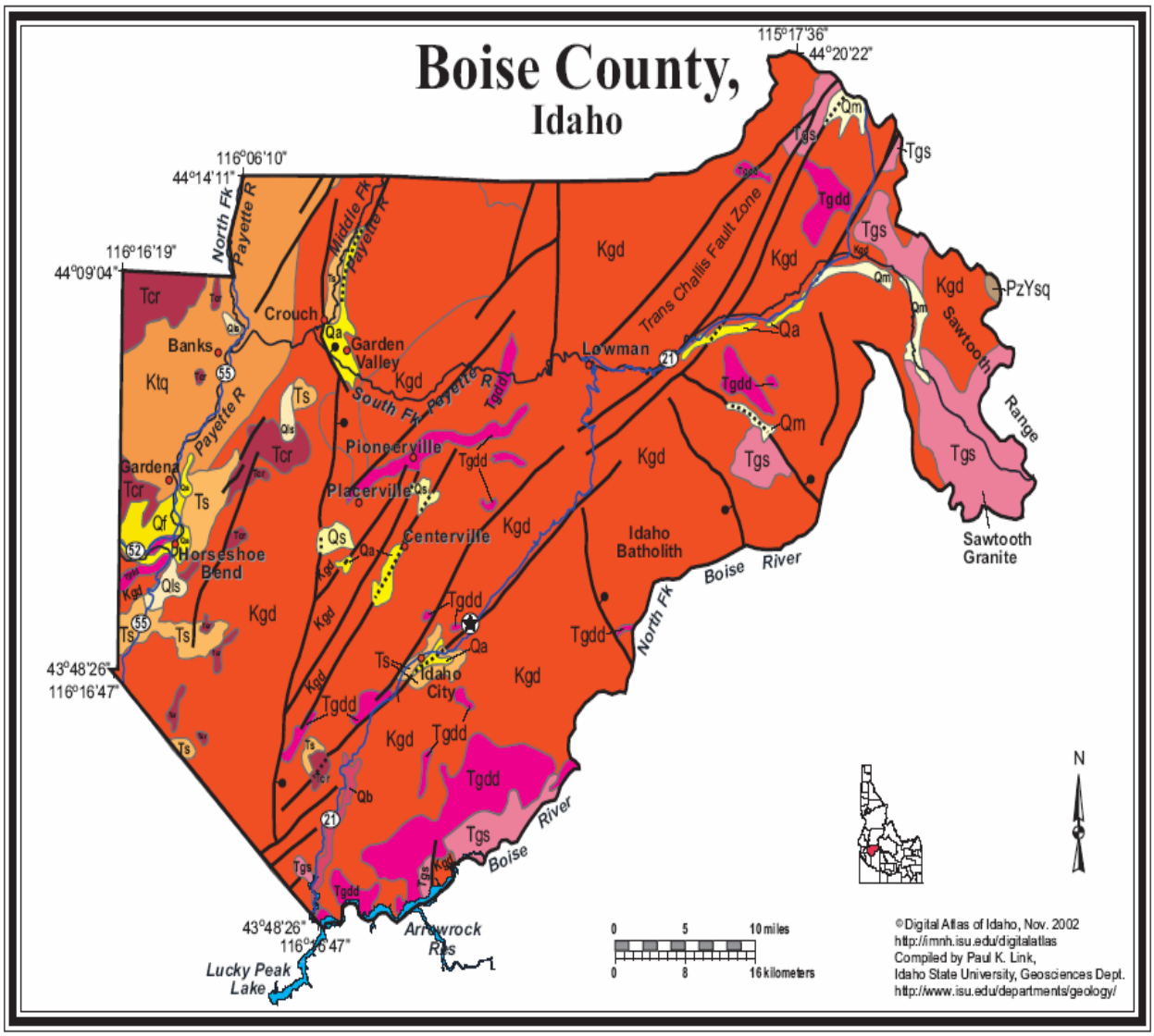
Figure 5.2 Relative earthquake risks for Idaho.



5.2.2 Boise County Geology

The following map shows the various geological features associated with Boise County as well as a brief description of each feature. Additionally, the fault lines located within Boise County are displayed as well.

Figure 5.3 Geologic features and fault lines in Boise County.



Boise County

Boise County contains a huge area of the central Idaho mountains between Ada County and the city of Boise and the Sawtooth Mountains on the east. This country is drained by the Payette and Boise Rivers, Grimes Creek and Bear Valley Creek. Most of the area is underlain by Cretaceous granodiorite of the Idaho batholith. Eocene intrusions are present in the Sawtooth Mountains on the east and in the Idaho City area. Near Idaho City are extensive placer gold workings from the 19th century. Mineralization was along a northeast trending fault zone associated with the Trans Challis fault zone (Great Falls lineament). A north-tending Basin and Range fault, down on the east bounds the system of northeast-striking trans-Challis faults.

In the western part of the county, west of Horseshoe Bend on the Payette River is tonalitic intrusive rock of the Idaho batholith, and Miocene Columbia River basalt in the valleys. This basalt flowed north east, or up the valleys from sources to the west in Oregon and westernmost Idaho.

Horseshoe Bend is the site of recurrent landslides in Miocene sedimentary rocks of the Payette Formation. These landslides caused rerouting of highway 55 to avoid the active scarps.

P.K. Link, 10/02

Description of Units for Boise County, Idaho

Qa	Quaternary alluvial deposits
Qs	Quaternary surficial cover, including colluvium, fluvial, alluvial fan, lake, and windblown deposits. Included fluveolian cover on Snake River Plain, (Snake River Group).
Qf	Pleistocene silicic volcanic rocks; rhyolite lava and ash-flow tuff (includes Yellowstone Group).
Qls	Quaternary landslide deposits (only Weiser Area).
Ts	Tertiary sedimentary rocks, undifferentiated. Includes Oligocene and Eocene sedimentary rocks in east-central Idaho (Paleogene basins of Janecke). In northern and western Idaho this unit contains Miocene lake and stream deposits formed adjacent to and above the Columbia River and Weiser basalts, which formed dams in stream canyons.
Tcr	Miocene basalt (Columbia River Basalt Group); flood basalt, extensively exposed in western Idaho; fed by fissures, many of which are near the Idaho-Oregon border. Flowed eastward up valleys cut into the Idaho mountains.
Tgs	Eocene granite, pink granite, syenite, rhyolite dikes, and rhyolitic shallow intrusive; last phase of the Challis magmatic event (46 to 44 Ma). Forms craggy scenic mountain landscape in central and northern Idaho.
Tgdd	Eocene granodiorite and dacite porphyry intrusive, also includes diorite and, in northern Idaho, minor granitic rock; intermediate phase of Challis magmatic event (50 to 46 Ma). Summit Creek stock.
Kgd	Cretaceous granitic rocks of the 2 mica suite. Idaho batholith and related plutons; granite and granodiorite that contains both muscovite and biotite. Sodium (Na) rich. Intruded between 80 and 65 Ma.
Ktg	Cretaceous tonalite and quartz diorite; hornblende and biotite bearing early phases of the Idaho batholith. Intruded about 90 to 95 Ma.
PzYsq	Paleozoic/Mesoproterozoic schist and quartzite; age uncertain.

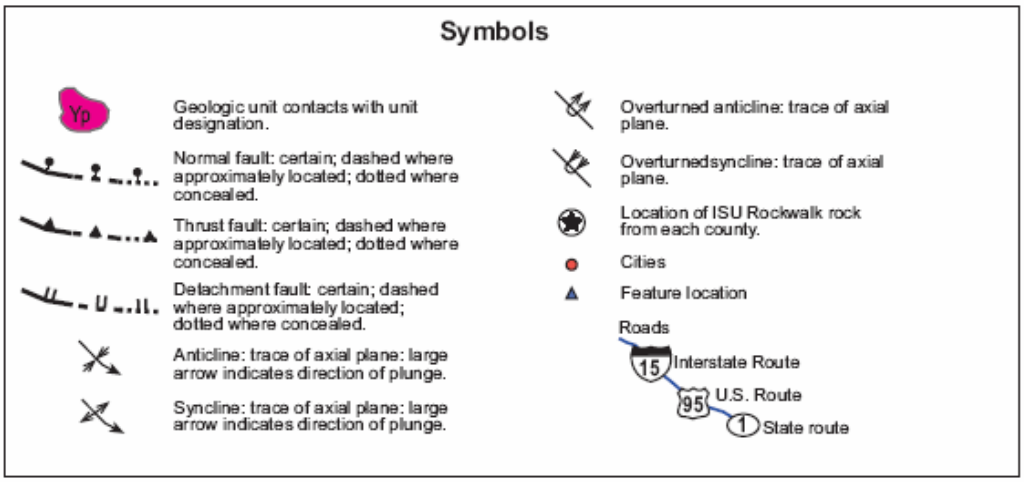
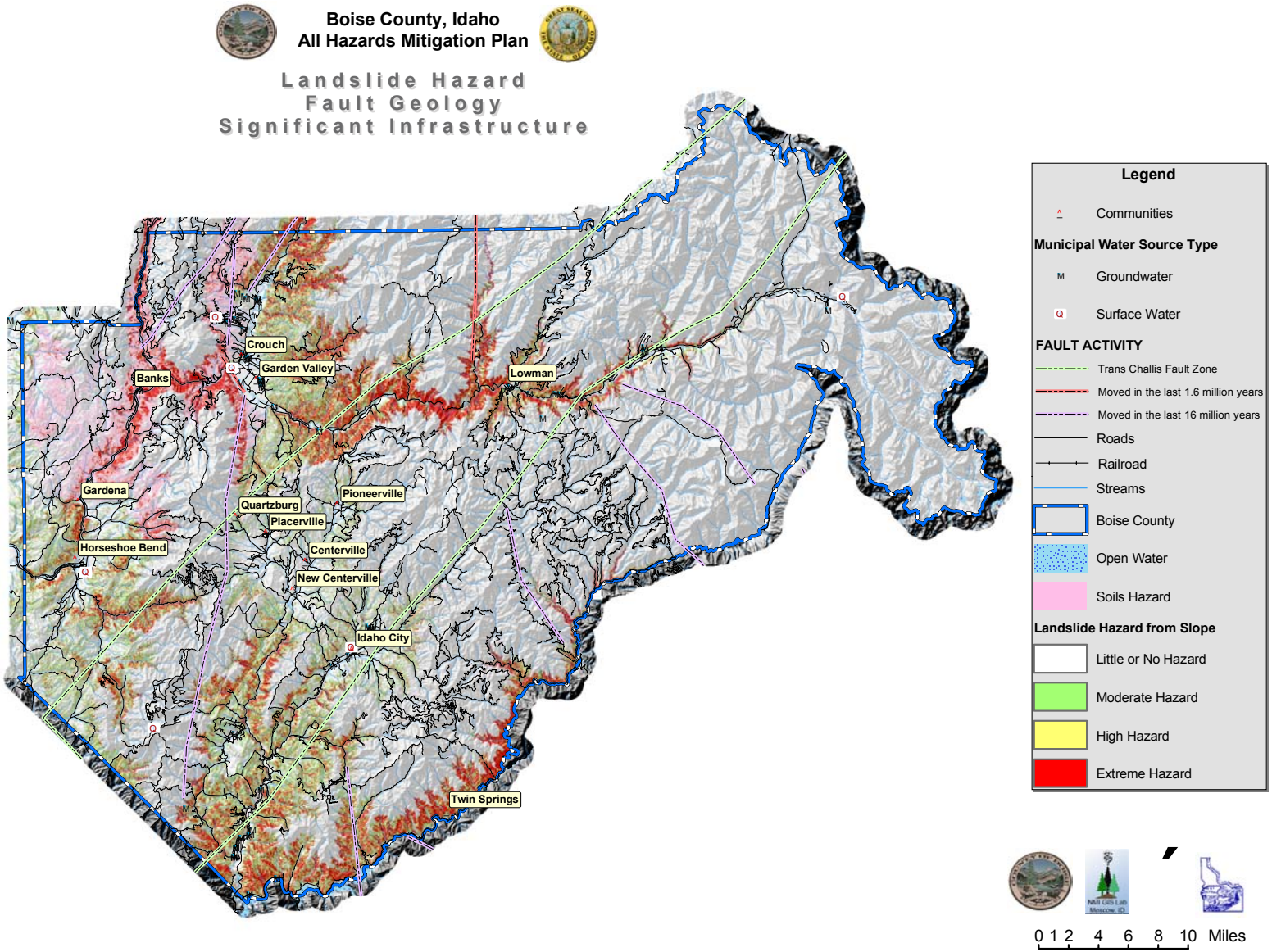

Symbols
Yp
Geologic unit contacts with unit designation.
Normal fault: certain; dashed where approximately located; dotted where concealed.
Thrust fault: certain; dashed where approximately located; dotted where concealed.
Detachment fault: certain; dashed where approximately located; dotted where concealed.
Anticline: trace of axial plane: large arrow indicates direction of plunge.
Syncline: trace of axial plane: large arrow indicates direction of plunge.
Overturned anticline: trace of axial plane.
Overturnedsyncline: trace of axial plane.
Location of ISU Rockwalk rock from each county.
Cities
Feature location
Roads
15
Interstate Route
95
U.S. Route
1
State route

Figure 5.4. Fault Geology in Boise County.



5.3 Seismic Shaking Hazards

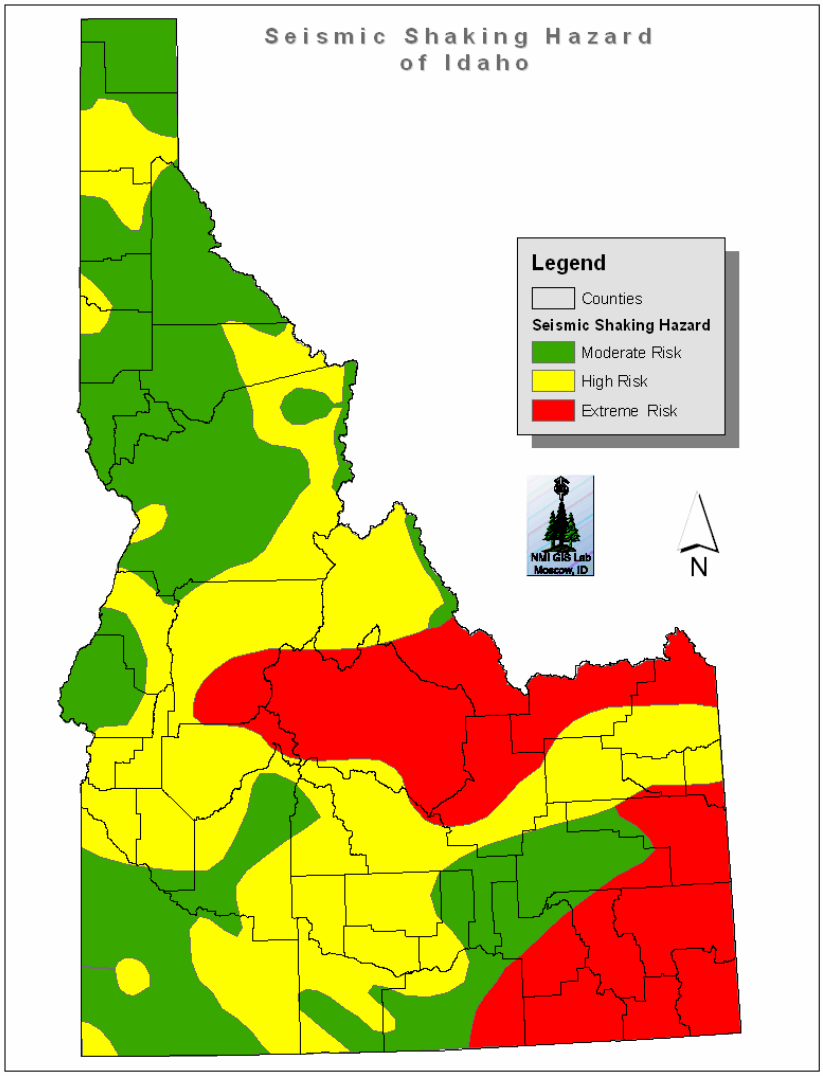
Geological and seismological studies show that earthquakes are likely to happen in any of several active zones in Idaho and adjacent states. Idaho is ranked fifth highest in the nation for earthquake risk.

The 1991 Uniform Building Code (UBC), a nationwide industry standard, sets construction standards for different seismic zones in the nation. UBC seismic zone rankings for Idaho are among the highest in the nation. When buildings are built to these standards they have a better chance to withstand earthquakes. Boise County has not adopted any building codes so newer buildings may be at a high risk for earthquake damage and potential fatalities.

The U.S. Geological Survey has gathered data and produced maps of the nation, depicting earthquake shaking hazards. This information is essential for creating and updating seismic design provisions of building codes in the United States. The USGS Shaking Hazard maps for the United States are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from quake sources. Colors on the maps show the levels of horizontal shaking that have a 1 in 10 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of “g” (g is the acceleration of a falling object due to gravity). This map is based on seismic activity and fault-slip rates and takes into account the frequency of occurrence of earthquakes of various magnitudes. Locally, this hazard may be greater than that shown, because site geology may amplify ground motions.

Studies of ground shaking in Idaho during previous earthquakes has led to better interpretations of the seismic threat to buildings. In areas of severe seismic shaking hazard, older buildings are especially vulnerable to damage. Older buildings are at risk even if their foundations are on solid bedrock. Areas shown on the map with high seismic shaking hazard can experience earthquakes with high intensity where weaker soils exist. Most populated areas in Idaho are located on or near alluvial deposits that provide poorer building site conditions during earthquakes. Older buildings may suffer damage even in areas of moderate ground shaking hazards (IGS 2004).

Figure 5.5. Seismic Shaking Hazards in Idaho.



5.4 Fault Line Geology

We live on the thin crust of a layered Earth. The crust or surface of our planet is broken into large, irregularly shaped pieces called plates. The plates tend to pull apart or push together slowly, but with great force. Stresses build along edges of the plates until part of the crust suddenly gives way in a violent movement. This shaking of the crust is called an earthquake.

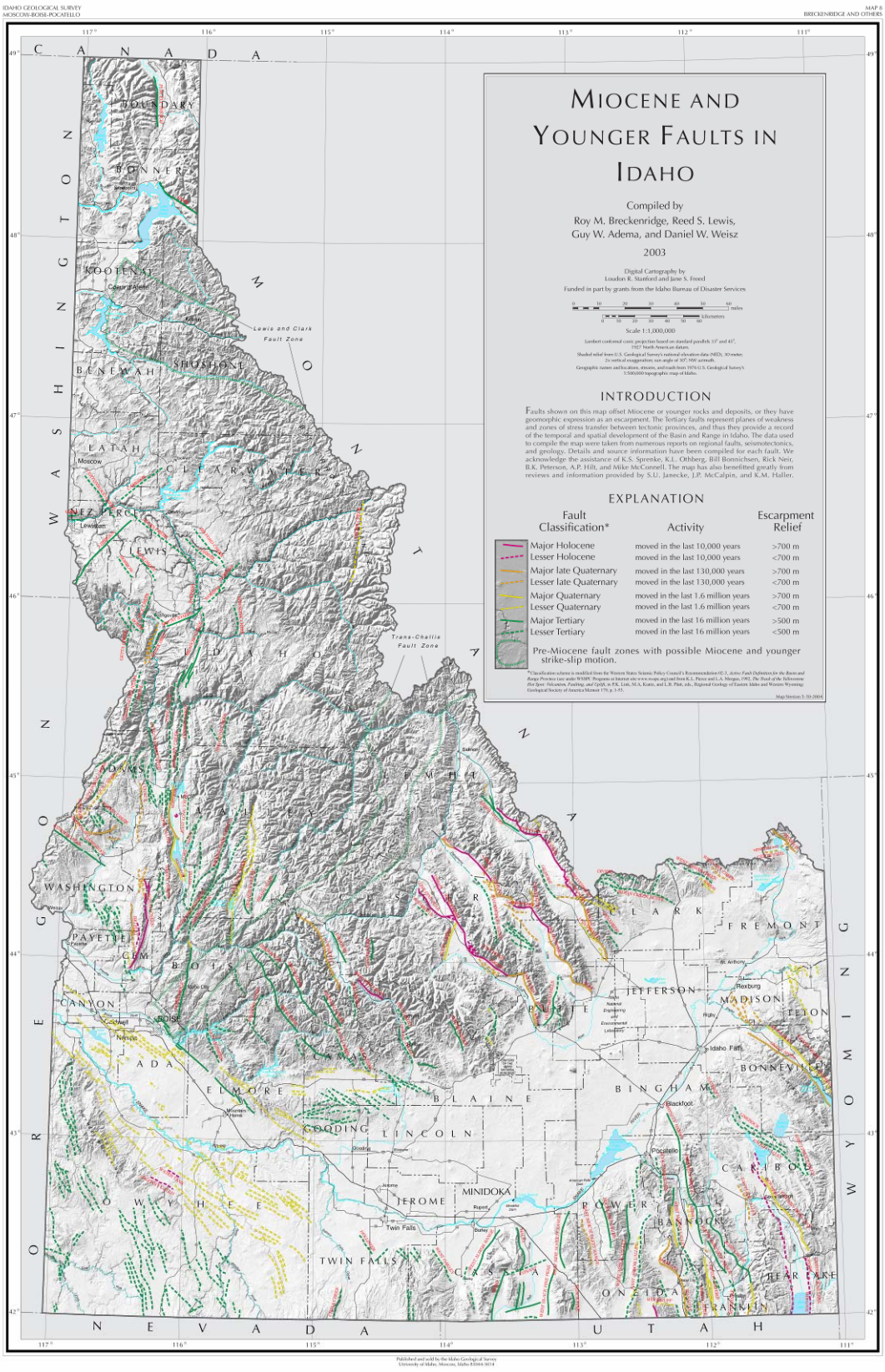
The crust breaks along uneven lines called faults. Geologists locate these faults and determine which are active and inactive. This helps identify where the greatest earthquake potential exists. Most faults mapped by geologists, however, are inactive and have no earthquake potential.

When the crust moves abruptly, the sudden release of stored force in the crust sends waves of energy radiating outward from the fault. Internal waves quickly form surface waves, and these surface waves cause the ground to shake. Buildings may sway, tilt, or collapse as the surface waves pass.

The constant interaction of crustal plates in western North America still creates severe earthquakes. Idaho is situated where the Basin and Range and Rocky Mountain geomorphic provinces meet. Most of Idaho has undergone the effects of tremendous crustal stretching. Central Idaho's high mountain ranges are striking evidence of these powerful earth movements over millions of years. The Borah Peak earthquake of 1983 was another event in the stretching that forms long deep valleys and tall, linear mountain ranges. Earthquakes from the crustal movements in the adjoining states of Montana, Utah, and Nevada also cause severe ground shaking in Idaho.

Fault line information used in this report was adopted from maps developed by the Idaho Geological Survey, a research agency of the University of Idaho. The data includes fault line locations derived from a map titled the “Miocene and Younger Faults in Idaho” (Breckenridge *et al.* 2003). The map identifies each fault by classification, activity and escarpment relief. Also depicted on the map and used in this report is Pre-Miocene fault zones with possible Miocene and younger strike-slip motion. Location of the various fault lines and zones on the maps indicate areas of geological activity in the recent past, and aid in determining earthquake hazard in a specific location.

Figure 5.6. Miocene and Younger Faults in Idaho.



5.5 Past Earthquake Events in Boise County

Information summarized from the Idaho Bureau of Homeland Security website: http://www.bhs.idaho.gov/local/counties/gem.htm.

5.5.1 February 13, 1945

Event Summary: Earthquake near Clayton, felt over a 60,000 square mile area. Magnitude 6, Intensity VI.

County Summary: A magnitude 6 earthquake, centered near Clayton, broke dishes at Idaho City

5.5.2 May 25, 1916

Event Summary: Earthquake centered at Idaho City , felt over 10,000 square miles, including at Boise and Payette. Intensity V.

County Summary: Intensity V earthquake, minor damage to buildings.

5.6 Countywide Potential Mitigation Activities

Boise County comprehensive plan and strategy for preparing for earthquakes should include:

- Assessment of seismic hazards to quantify and understand the threat;
- Adoption and enforcement of seismic building code provisions;
- Implementation of land-use and development policy to reduce exposure to hazards;
- Implementation of retrofit, redevelopment, and abatement programs to strengthen existing structures;
- Support of ongoing public-education efforts to raise awareness and build constituent support; and
- Development and continuation of collaborative public/private partnerships to build a prepared and resilient community.

There are several earthquake-related mitigation activities outlined in the Idaho State Hazard Mitigation Plan that pertain to Boise County including:

- Change purchasing specifications for non-structural items to include seismic safety (SHMP-HM13)
- Improve school safety by establishing a special fund for grants to schools to reduce non-structural seismic hazards (SHMP-HM14)

The media can raise awareness about earthquakes by providing important information to the community. Here are some suggestions:

- Publish a special section in your local newspaper with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices, the American Red Cross, and hospitals.

- Conduct a week-long series on locating hazards in the home.
- Work with local emergency services and American Red Cross officials to prepare special reports for people with mobility impairments on what to do during an earthquake.
- Provide tips on conducting earthquake drills in the home, schools and public buildings.
- Interview representatives of the gas, electric, and water companies about shutting off utilities.
- Circulate "Earthquake Safety for People Who Work in Old Masonry Buildings" published by the Idaho Bureau of Disaster Services to promote safety for communities with old unreinforced masonry buildings still in public or private use. (FEMA 2004)

5.7 Current Earthquake Mitigation Projects

5.7.1 Garden Valley School District's - Non Structural Seismic Retrofits

The Garden Valley school district has recently implemented several non-structural seismic retrofits to many of the school's structures. This project reduced the risk of injury to students and teachers, as well as others who may use the schools as shelter facilities. Also, objects such as shelves, lighting, computer equipment, etc, were secured from falling in the event of an earthquake. Propane tanks were secured to cement pads and a protective film was placed on windows to prevent shattering. This area experiences significant seismic activity. According to the 1991 UBC Zone Map, Garden Valley School District is located in Seismic Zone 3. Recent significant events affecting the area include are listed in Table 5.2.

Table 5.2 Recent seismic activities near the Garden Valley School District.

DATE	INTENSITY
August 22, 1984	IV
October 28, 1983	VI
October 29, 1978	V
November 27, 1977	V
August 17, 1959	V
February 13, 1945	VI
July 12, 1944	V - VII

5.8 Lessons Learned From Around the World

- Bam, Iran (2003). Many of the 26,200 who perished were crushed by poorly constructed buildings doomed to collapse in a seismic hot spot like Iran. Lesson learned: Develop and enforce building codes in areas where earthquakes are common.
- Molise, Italy (2002). Of the 29 victims, 26 were children at school. Lesson learned: Take special precautions to safeguard schools and other public buildings.
- Gujarat, India (2001). After 20,000 died in one of the most devastating earthquakes in India's history, the nation overhauled its disaster-management strategy, reorganizing

responsibility so that some was given to officials at the local level. Lesson learned: When local authorities are better prepared, public safety improves.

- Kobe, Japan (1995). The disaster claimed more than 5,500 lives and caused a stunning $100 billion in economic losses. Lesson learned: Even wealthy nations suffer dramatically when a deadly quake hits.
- Northridge, California (1994). Of the property lost, valued at $44 billion, a third was insured – a high percentage. Lesson learned: Quake insurance can reduce vulnerability and speed disaster recovery.
- Mexico City, Mexico (1985). After this earthquake, which killed at least 9,500 the government created an agency for disaster-preparedness that brought together scientists, engineers, and government officials? Lesson learned: Nations need to plan for quakes ahead of time, instead of waiting until disaster strikes to respond.
- Tangshan, China (1976). Recovery from the earthquake and its staggering death toll (255,000) was delayed by political power struggles and the death of Mao. Lesson learned: Competing priorities can divert attention from disasters. (National Geographic – September 2004)

Chapter 6: Landslides

6 Boise County Conditions

Boise County is within the Idaho Batholith, which is a Granitic intrusion of the late Cretaceous Period. Only small portions of the county are level, with the predominant mountainous landscape brought about by historic uplifts, faults, fault blocks, alluvial deposits and stream cutting action that has created steep narrow canyons. About 70% of Boise County has slopes steeper than 40%. The deep canyons associated with all forks of the Payette River cut through the granite that underlie the regions of Boise County. These flows are interbedded with loose, unstable sedimentary layers that are exposed in the deeply incised canyons. The expose of this unconsolidated sedimentary layer increases landslide potential wherever these deposits are present on steep slopes. Weathering and climatic events lead to landslide activity, with the scale of the event largely dependent on the environmental conditions leading up to the event. Highway 55, 17, and 21 and structures along Payette River system are most likely to be affected by landslide activity.

Avalanches also occur in the high elevation areas within Boise County. Due to the high amounts of snow fall in the winter (80% of the snow fall for the county occurs in a 3 month period) and the number of past fires within the county, the amount of vegetation that intercepts the movement of snow has been lost in several areas within the county.

6.1 Landslide Hazard Profile

Landslide is a general term for a wide variety of down slope movements of earth materials that result in the perceptible downward and outward movement of soil, rock, and vegetation under the influence of gravity. The materials may move by falling, toppling, sliding, spreading, or flowing. Some landslides are rapid, occurring in seconds, whereas others may take hours, weeks, or even longer to develop. Although landslides usually occur on steep slopes, they also can occur in areas of low relief. Landslides can occur as ground failure of river bluffs, cut and-fill failures that may accompany highway and building excavations, collapse of mine-waste piles, and slope failures associated with quarries and open-pit mines.

Landslides can be triggered by natural changes in the environment or by human activities. Inherent weaknesses in the rock or soil often combine with one or more triggering events, such as heavy rain, snowmelt, or changes in ground water level. Late spring-early summer is slide season, particularly after days and weeks of greater than normal precipitation. Long-term climate change may result in an increase in precipitation and ground saturation and a rise in ground-water level, reducing the shear strength and increasing the weight of the soil.

Stream and riverbank erosion, road building or other excavation can remove the toe or lateral slope can exacerbate landslides. Seismic or volcanic activity often triggers landslides as well. Urban and rural living with excavations, roads, drainage ways, landscape watering, logging, and agricultural irrigation may also disturb the solidity of landforms, triggering landslides. In general, any land use changes that affect drainage patterns or that increase erosion or change ground-water levels can augment the potential for landslide activity.

Landslides are a recurrent menace to waterways and highways and a threat to homes, schools, businesses, and other facilities. The unimpeded movement over roads—whether for commerce, public utilities, school, emergencies, police, recreation, or tourism—is essential to a normally functioning of Boise County. The shallow walls of the Payette River drainage pose special problems to Highway 55, 17, and 21, which are all major interstate and intercommunity travel

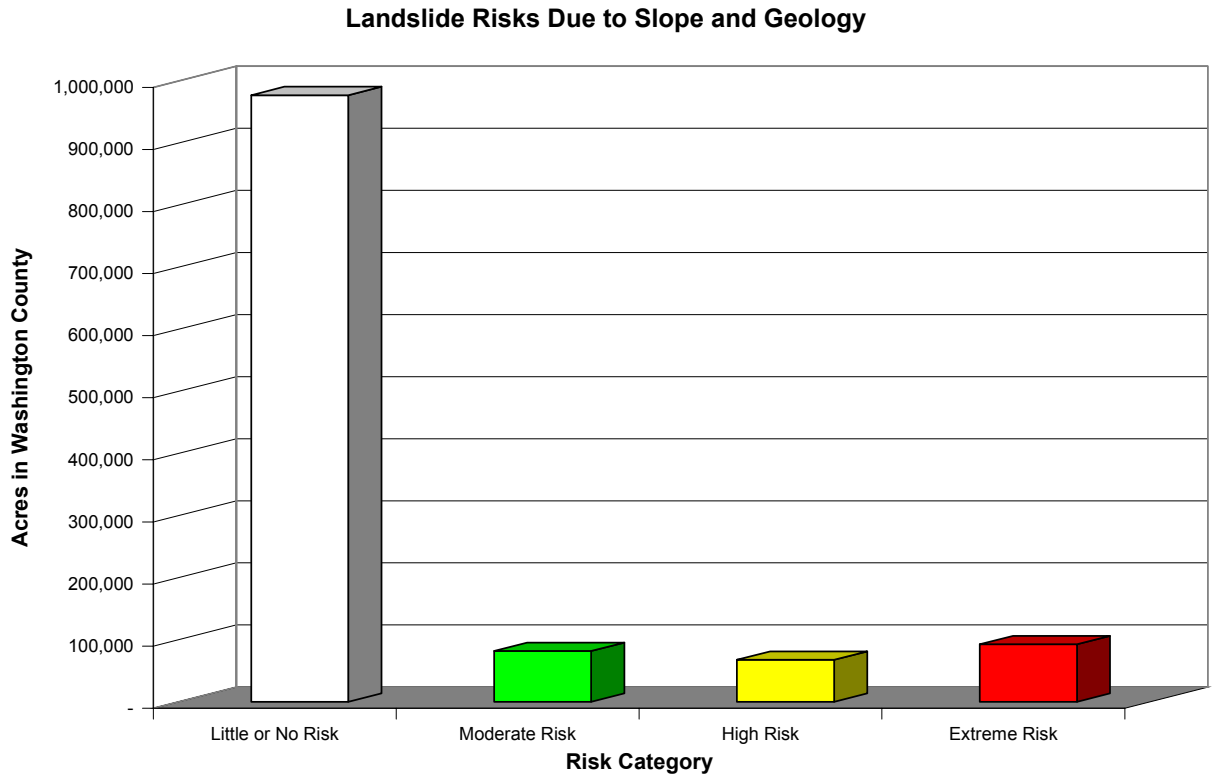
routes. The disruption and dislocation of this or any other routes in the break lands caused by landslides can quickly jeopardize travel and vital services.

Landslide risks in and around Boise County were evaluated and are presented in a number of Figures in this chapter. An analysis of this data reveals that approximately 8% of the area in and around Boise County is in the Extreme risk category, 6% is in the High risk category, 7% is in the Moderate risk category, with the remaining 80% at little to no risk to landslides from slope and geology factors (Table 6.1).

Table 6.1. Landslide Risk Due to Slopes and Geology in Boise County.

Risk Due to Slopes and Geology	Acres	Percent
Little or No Landslide Risk	976,986	80%
Moderate Landslide Risk	81,966	7%
High Landslide Risk	67,831	6%
Extreme Landslide Risk	92,880	8%

Figure 6.1. Landslide Risks in Boise County: Geology and Slope Factors.



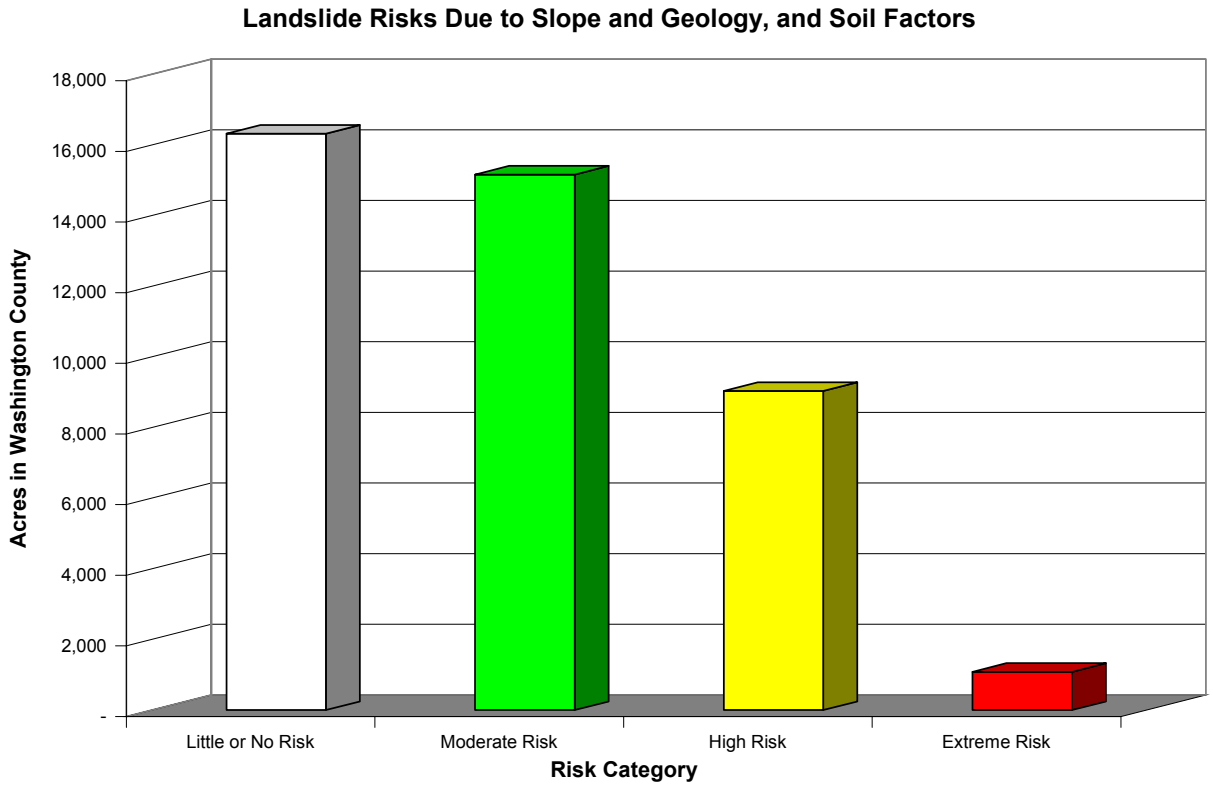
Soil factors, as described above account for additional risks, literally on-top-of the slope and geological factors detailed in Table 6.1 and Figure 6.1. There are approximately 41,491.0 acres (16,790.8 ha) of soils in this high risk soils category. In order to evaluate the juxtaposition of these soils to the areas at risk from slopes and geology, those areas underlying the areas determined to be at risk due to soil conditions were evaluated, separate from the rest of the County. This analysis reveals that in those areas with high soil risk factors, approximately 39%

of that area is at little to no risk due to slope and geological factors, 36% is at Moderate landslide risk, 22% is at High landslide risk, and less than 3% is at Extreme landslide risk (Table 6.2). While all areas specified at risk from either assessment should be given consideration for planning, zoning, and determining risks to human development and use, it is the lands that show risk through both assessment strategies that should receive additional attention and mitigation measures, especially where developments already exist. The vast majority of this high risk soil, juxtaposed over the top of high risk slopes and geology, is in the northwest corner of Boise County from Gardena, up the Payette River, west to the county line, and east to Garden Valley.

Table 6.2. Landslide Risk Due to Slopes and Geology that are also at risk due to soil factors in Boise County.

Risk Due to Slopes and Geology	Acres	Percent
Little or No Landslide Risk	16,317	39%
Moderate Landslide Risk	15,159	36%
High Landslide Risk	9,034	22%
Extreme Landslide Risk	1,081	3%

Figure 6.2. Landslide Risks in Boise County: Geology, Slope, and Soil Factors.



6.2 Past Landslide Events in Boise County

Information summarized from the Idaho Bureau of Homeland Security website: http://www.bhs.idaho.gov/local/counties/gem.htm.

6.2.1 December 31, 1997

Event Summary: Mudslides and flooding along the Payette and Weiser River drainages.

County Summary: Mudslides and flooding cut power and closed the Banks-Lowman road. Avalanches caused the closure of Hwy 21.

6.2.2 March 4, 1986

Event Summary: Following snowmelt and flooding in February, further landslides hit Idaho

County Summary: Robie Creek Road was closed for 4 days because of mud and debris slides, isolating 90 families. The Banks-Garden Valley Road was closed off and on. A state disaster was declared.

6.2.3 January-March 1865

Event Summary: Series of avalanches in Idaho City and Boise Basin mining areas.

County Summary: Series of avalanches in Idaho City and Boise Basin mining areas, destroyed several cabins and blocked travel

6.3 Landslide-prone Areas:

Many areas have specific landslide concerns. Areas that are generally prone to landslides are:

- On **existing** landslides, old or recent
- On or at the **base or top of slopes**
- In or at the **base of minor drainage hollows**
- At the base or top of an **old fill slope**
- At the base or top of a **steep cut slope**

There are many homes, roads and other resources at risk in Boise County because of one there juxtaposition to one or more of these characteristics. Individual assessments of landslide-prone areas that would cause disruption in Boise County will follow.

6.4 General Landslide and Avalanche Hazards Mitigation Strategies

A number of techniques and practices are available to reduce and cope with losses from landslide hazards. Careful land development can reduce losses by avoiding the hazards or by reducing the damage potential. Landslide risk can be reduced by the following a number of approaches used individually or in combination to reduce or eliminate losses.

6.4.1 Establish a Countywide landslide and avalanche hazard identification program.

Document all landslides, bank failures, “washouts”, and manmade embankment failures. Each failure should be located on a map with notations about time of failure, repair (if made), and

descriptions of the damaged area. Identify and sign all area where avalanches are a common occurrence. This could become a County directive to the road and bridge crews.

6.4.2 Restricting development in landslide-prone areas:

Land-use planning is one of the most effective and economical ways to reduce landslide losses by avoiding the hazard and minimizing the risk. This minimization is accomplished by removing or converting existing development or discouraging or regulating new development in unstable areas. Buildings should be located away from known landslides, debris flows, steep slopes, streams and rivers, intermittent-stream channels, and the mouths of mountain channels. In the State of Idaho, restrictions on land use generally are imposed and enforced by local governments by land-use zoning districts and regulations.

6.4.3 Standardizing codes for excavation, construction, and grading of county roads and private driveways:

Excavation, construction, and grading codes have been developed for construction in landslide-prone areas; however, there is no nationwide standardization. Instead, State and local government agencies apply design and construction criteria that fit their specific needs. The Federal Government has developed codes for use on Federal projects. Federal standards for excavation and grading often are used by other organizations in both the public and private sectors.

6.4.4 Protecting existing development:

Control of surface-water and ground water drainage is the most widely used and generally the most successful slope-stabilization method. Stability of a slope can be increased by removing all or part of a landslide mass or by adding earth buttresses placed at the toes of potential slope failures. Restraining walls, piles, caissons, or rock anchors are commonly used to prevent or control slope movement. In most cases, combinations of these measures are used.

6.4.5 Post warnings of potentially hazardous areas and educate the public about areas to avoid:

Such areas may include (a) existing old landslides, (b) on or at the base of a slope, (c) in or at the base of a minor drainage hollow, (d) at the base or top of an old fill or steep cut slope, and (e) on developed hillsides where leach field septic systems are used.

6.4.6 Utilizing monitoring and warning systems:

Monitoring and warning systems are utilized to protect lives and property, not to prevent landslides. However, these systems often provide warning of slope movement in time to allow the construction of physical measures that will reduce the immediate or long-term hazard. Site-specific monitoring techniques include field observation and the use of various ground motion instruments, trip wires, radar, laser beams, and vibration meters. Data from these devices can be telemetered for real-time warning. Development of regional real-time landslide warning systems is one of the more significant areas of landslide research.

6.4.7 Public Education

Become familiar with the land around the home and community. Learn whether landslides or debris flows have occurred in your area by contacting local officials, state geological surveys or departments of natural resources, USGS maps, and university departments of geology. Slopes where landslides or debris flows have occurred in the past are likely to experience them in the future.

Educate the public about tell-tale signs that a landslide is imminent so that personal safety measures may be taken. Some of these signs include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before.
- New cracks or unusual bulges in the ground, street pavements or sidewalks.
- Soil moving away from foundations, and ancillary structures such as decksand patios tilting and/or moving relative to the house.
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls or fences.
- Sunken or dropped-down road beds.
- Rapid increase in a stream or creek water levels, possibly accompanied by increased turbidity (soil content).
- Sudden decrease in creek water levels even though rain is still falling or just recently stopped.

Residents or county representatives who live and work in landslide prone areas should follow these recommendations prior to a storm event:

- Watch the patterns of storm-water drainage on slopes and note places were runoff water converges, increasing flow over soil-covered slopes. Watch the hillsides around your home and community for any signs of land movement, such as small landslides or debris flows or progressively tilting trees.
- Develop emergency response and evacuation plans for individual communities and for travel routes. Individual homeowners and business owners should be encouraged to develop their own evacuation plan.

6.5 Individual Community Assessments

6.5.1 Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman

Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman are located within the Payette River Valley along Highway 55 and 17. The Payette River has cut a deep canyon throughout Boise County along Highway 55 and 17. Large areas of landslide deposits dominate the geology around Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman, the result of the movement of sedimentary materials interbedded with granite. Landslide deposits occur where major sedimentary interbeds are exposed along the steep valley sides.

6.5.1.1 Landslide Potential

The Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman area has been an area of active landslide activity in the geologic past as well as in the present. The factors that lead to slope instability have been present in the area since ancient times. Although recent years have not seen the same level of activity that was typical in ancient times, these characteristics remain. Many of the slopes and hillsides along the Payette River system and in the vicinity of Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman are comprised by material deposited by past landslides. Location of landslide deposits in canyons is controlled by the presence of sedimentary interbeds, the hydrologic regime, and the occurrence of basalt overlying clay-rich weathered basement rocks. The largest landslides occur where canyon cutting has exposed landslide-prone sediments to steep topography. Today, initiation and reactivation of landslides is closely tied to unusual climatic events and land-use changes. Even small landslide activity on the upper parts of canyon slopes can transform into high-energy debris glows that endanger roads, buildings, and people below. Landslide debris is highly unstable when modified through natural variations in precipitation, artificial cuts, fills, and changes to surface drainage and ground water (Weisz et al 2003).

The Idaho Geological Survey has aggressively been mapping surficial geologic features along the Payette River. These maps provide valuable information for planning of private and public land planning by identifying areas of unstable geologic formations. This work indicates that there are numerous visible landslides blocks on many of the steep slopes above the communities of Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman. The presence of these landslide blocks is a strong indicator of possible landslide activity in the future.

Poorly sorted material deposited during debris flow events is also present in the Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman area. These deposits are at the mouths of steep chutes and small canyons along the forks of the Payette River drainage. The presence of this material indicates the historic occurrence of high-energy, short duration floods and debris flows in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. During these events, material present in the sedimentary layers was washed down the steep drainages and deposited at the mouth of the chutes, forming alluvial fans of varying sizes. These events are historically infrequent, with recurrence cycles on the order of years to decades. However, these events can result in significant damage to buildings and infrastructure, disrupt travel, reduce water quality and jeopardize safety.

6.5.1.2 Community Risk Assessment

The communities of Horseshoe Bend, Banks, Crouch, Garden Valley, and Lowman are at a high risk to landslide activity. Homes and travel routes that have been constructed at the mouths of steep chutes and through alluvial deposits that is at an increased risk of being affected by landslide activity. These historic deposits are a strong indicator of debris flows in the future. Furthermore, these deposits tend to be unstable and somewhat prone to movement. The following is a list of areas that are built in alluvial fans:

Debris flow activity and the resulting alluvial sediment deposition is associated with soil saturation and precipitation events. As mentioned, landslide events are generally associated with large precipitation events. The areas noted above are in areas with landslide characteristics. The probability of these events occurring during normal weather conditions is quite low. However during large precipitation events residents and county representatives should monitor these areas for landslide activity.

The potential for debris flows and landslides would dramatically escalate in the event of a large wildland fire event that denudes the steep canyon slopes of vegetative cover. The loss of the vegetative cover reduces slope stability by removing much of the organic matter that helps absorb and intercept precipitation and anchor the fragile soil to the canyon walls.

6.5.1.3 Mitigation Activities

Land-use planning is one of the most effective and economical ways to reduce landslide losses by avoiding the hazard and minimizing the risk. This minimization is accomplished by removing or converting existing development or discouraging or regulating new development in unstable areas. Buildings should be located away from known landslides, debris flows, steep slopes, streams and rivers, intermittent-stream channels, and the mouths of mountain channels.

Excavation, construction, and grading codes have been developed for construction in landslide-prone areas; however, there is no nationwide standardization. Instead, State and local government agencies apply design and construction criteria that fit their specific needs. The Federal Government has developed codes for use on Federal projects. Federal standards for excavation and grading often are used by other organizations in both the public and private sectors.

6.5.2 Idaho City

6.5.2.1 Landslide Potential

The Communities of Idaho City area is located in the central highland region of Boise County along Highway 21. Boise County is known for its deep, fertile loess soils and crop production capacity. Soils throughout this are many feet deep. Due to the gentle topography of the area, landslide potential is quite low. However, landslide activity is possible wherever roads or other excavations have been constructed across the toe of steep hill slopes. Landslide events under these soils and topographic conditions would be associated with soil saturation and the loss of cohesion between soil particles. Soils with an underlying hardpan are elevated risk due to the presence of a consistent bed surface for slope failure. Once soils become saturated, soil water accumulates at the hardpan, lubricating and reducing friction between particles. This surface can then act as a sliding surface, potentially leading to slope failures.

6.5.2.2 Community Risk Assessment

The Idaho City area has a moderate risk to landslide activity. The moderate topography of the community reduces the probability of landslide occurrence. Although slope failures are possible, these would likely be isolated areas where excavation or road building has weakened slope stability. The majority of the landslide potential would come in the form of an avalanche in the winter time. This would affect the travel routes into the Idaho City area, not the community itself. The steep slopes associated with the travel routes and the loss of vegetation due to past fire activities have greatly increased the risk of avalanches to the area.

6.6 Fire Related Debris Flows

Wildland fires are inevitable in the western United States. Expansion of human development into forested areas has created a situation where wildfires can adversely affect lives and

property, as can the flooding and landslides that occur in the aftermath of the fires. Post-fire landslide hazards include fast-moving, highly destructive debris flows that can occur in the years immediately after wildfires in response to high intensity rainfall events, and those flows that are generated over longer time periods accompanied by root decay and loss of soil strength. Post-fire debris flows are particularly hazardous because they can occur with little warning, can exert great impulsive loads on objects in their paths, can strip vegetation, block drainage ways, damage structures, and endanger human life. Wildfires could potentially result in the destabilization of pre-existing deep-seated landslides over long time periods.

6.6.1 Conditions for fire-related debris-flow occurrence:

In a recent study of the erosion response of recently burned basins in the intermountain west, the USGS found that not all basins produce debris flows; most burned watersheds respond to even heavy rainfall events by flooding. However, those watersheds that do produce destructive debris flows can be readily identified by a combination of geologic, topographic, and rainfall characteristics. The factors that best determine the probability of debris-flow occurrence are:

- The percent of area burned in each basin at both high and moderate severities,
- The average storm rainfall intensity,
- The measure of sorting of the grain-size distribution of the burned soil,
- The percent of soil organic matter (by weight),
- The soil permeability,
- The soil drainage, and
- The percent of the basin with slopes great than or equal to 30%

The results from post-fire erosion rates show that the majority of post-fire erosion results from summer thunderstorms rather than frontal storms or snowmelt. Thunderstorm events producing .25 inches of precipitation an hour have been used as a threshold for flash flooding in severely burned areas of Western Montana.

6.7 General Mitigation Activities

There are a number of mitigation activities that can be implemented following large wildland fires in order to help rehabilitate the site. Rehabilitation efforts help speed the ecological recovery of the burned area while reducing the potential for rapid runoff, riling, gulling, and development of destructive debris flows. These efforts also help reduce the loss of soil productivity and water quality, while reducing the threat to human life and property. In the event of large-scale fire events, a complete Burned Area Emergency Recovery (BAER) plan should be completed in order to address the unique features of the burn. The following is a partial list of components that would likely be included in a BAER plan.

- Directional tree felling, and contour log terracing along drainages and slopes with high burn severity in order to reduce overland and in stream channel flow. This can help reduce the amount of runoff and potential to initiate riling and downstream mud and debris flows.
- Aerially seed moderate to high burn areas to provide short-and long-term vegetative cover to reduce water yield and sedimentation.
- Apply straw mulch to high severity burn areas where soils are well drained, occurring on gentle slopes and are protected from the wind. Mulch will slow runoff and help to prevent erosion. Topsoil will be protected and soil moisture will be maintained to promote biological activity in the soil.

- Install straw bale check dams in steep drainages in order to trap sediment.
- Place flood hazard warning signs in areas prone to flash-flooding.
- Install straw wattles in a checkerboard fashion along the contour of hillsides. The wattles serve as soil erosion and runoff control measure on steep slopes with a high degree of water repellency. Waddles can help stabilize the slope, minimize soil erosion and capture sediment.
- Clear, reinforce, and if need be replace undersized culverts and stream crossings within the burn area to prevent washout along roads. Since water yield will be dramatically higher in the post-burn condition, drainage systems need to be restructured in order to accommodate the increase in flow.

The Idaho State Mitigation Plan suggests that they should provide funding, through appropriation or other means, for a grant program to assist counties in installing cost-effective debris retention or collection systems (SHMP-HM15).

Figure 6.3. Landslide Risks in Boise County

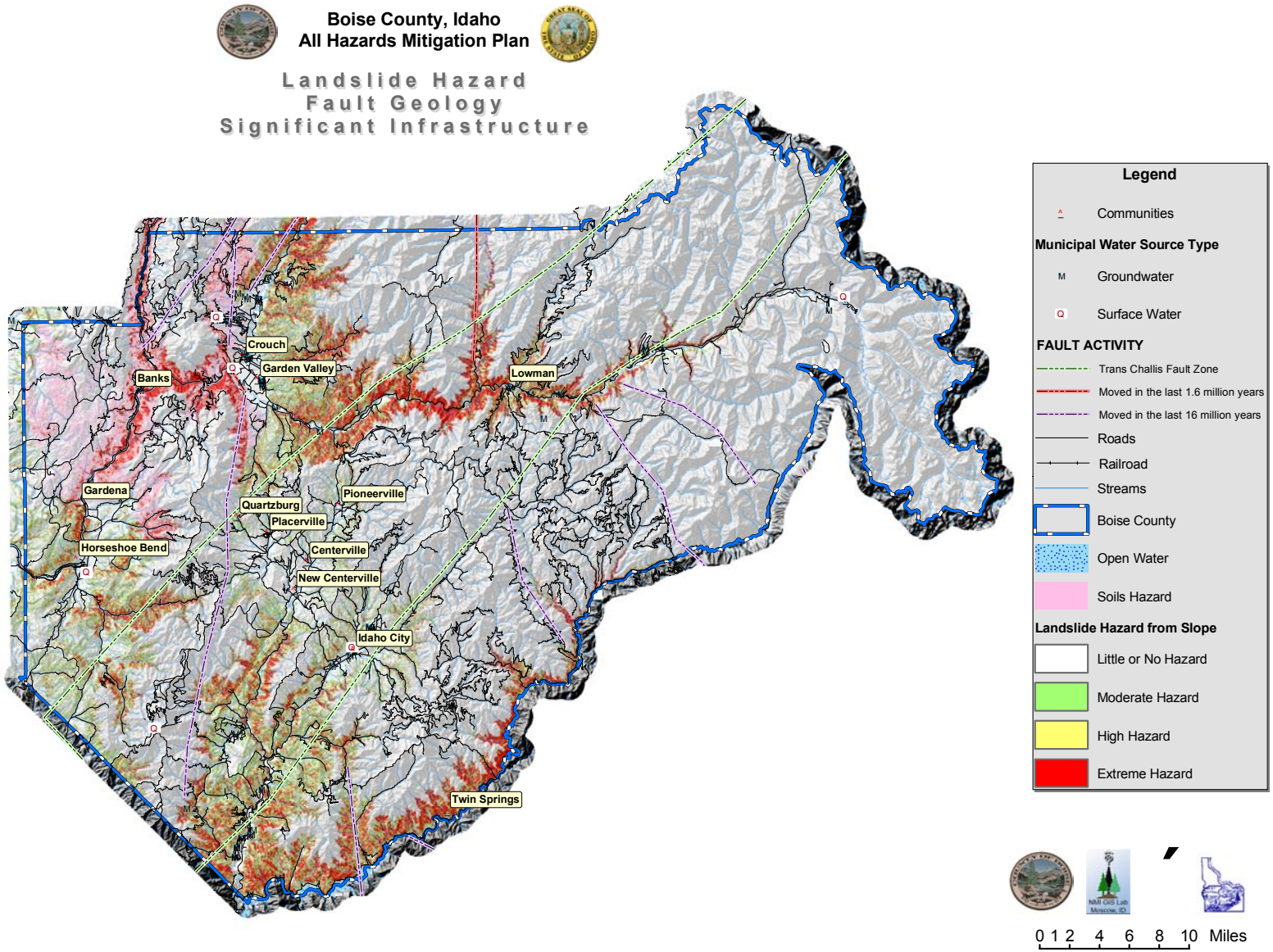


Figure 6.4 Landslide Risk near Horseshoe Bend

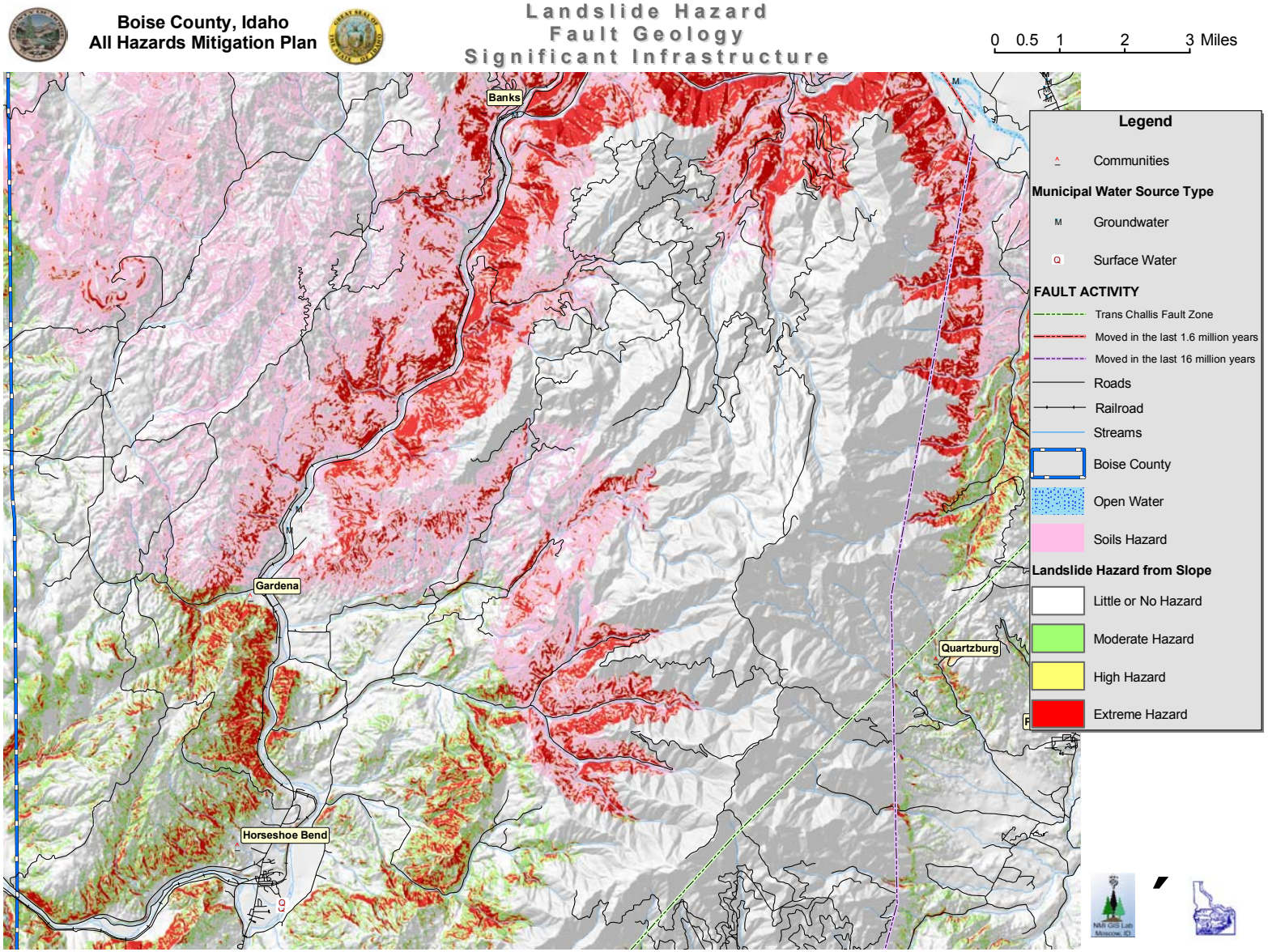


Figure 6.5. Landslide Risk near Idaho City

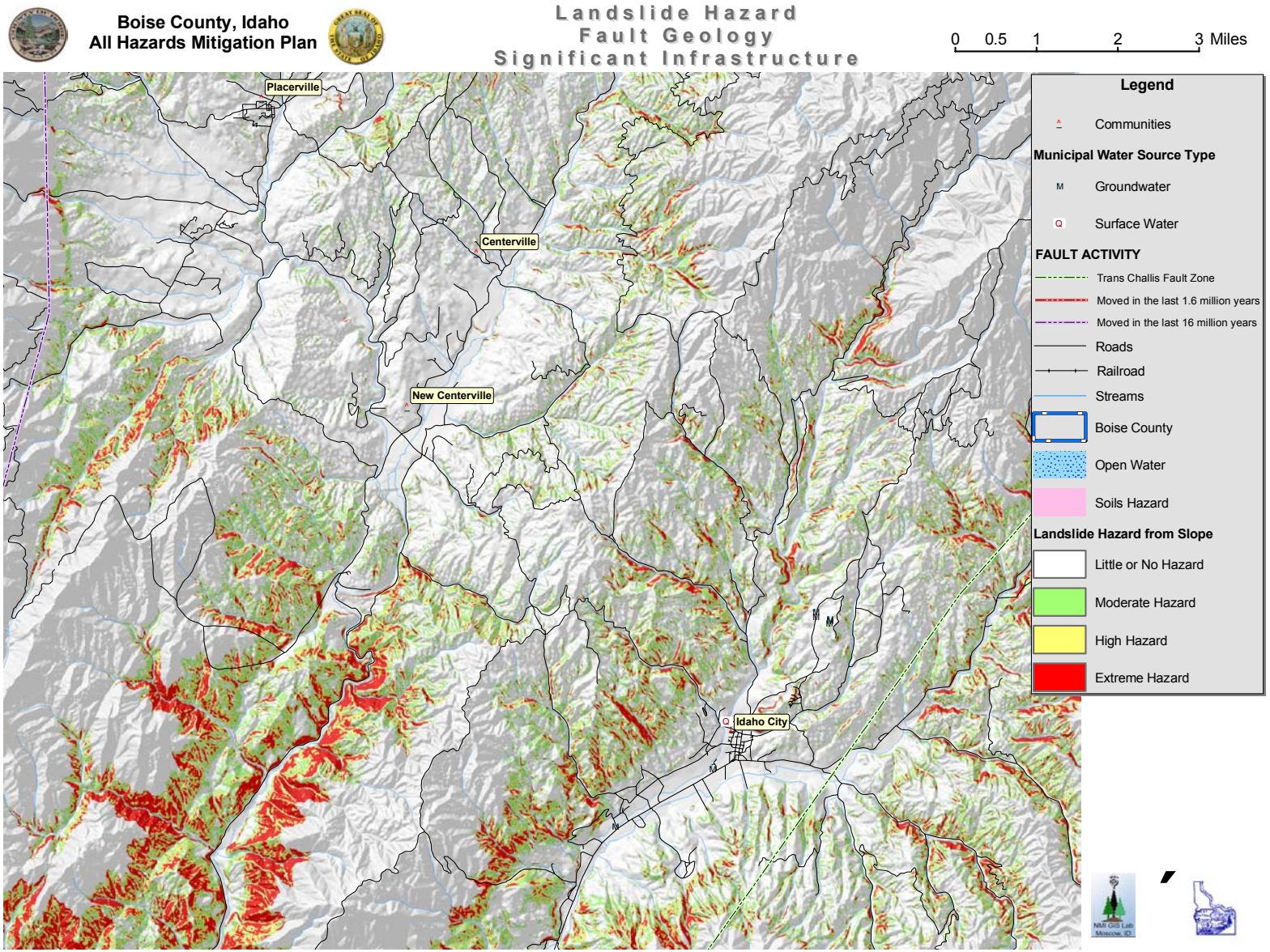
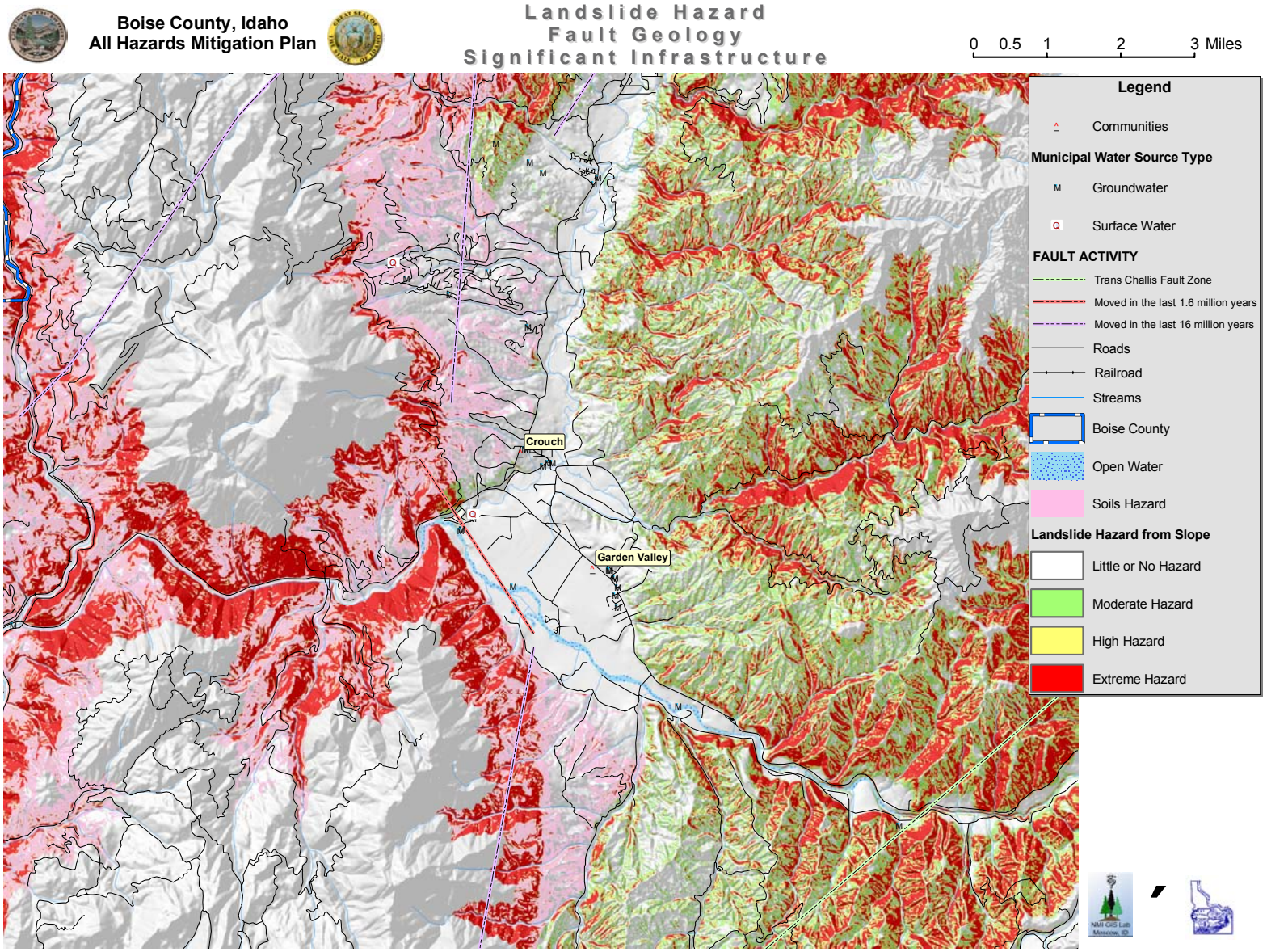


Figure 6.6. Landslide Risk near Garden Valley



Chapter 7: Severe Weather

7 Severe Storm Characteristics

Severe storms are a serious hazard that could affect Idaho. Severe storms can affect the entire state with varying degrees, due to the complex landscape and the influence from the Pacific Ocean. Although, Idaho's climate sees relatively few severe storms in comparison with the rest of the nation, it still poses a significant hazard to the state and local communities. Only two storm-related Presidential Disaster declarations were made in Idaho during 1976 to 2000.

Damaging storms do occur, however, and casualties and extensive property damage result throughout the entire state. Two types of severe storms are of concern in Idaho:

- Winter storms with accumulations of snow and ice, extreme cold and reduced visibility.
- Thunderstorms with hail, lightning, and high winds.

7.1 Winter Storms

Winter storms are a way of life in Idaho. They vary in degree and intensity and can occur during anytime between September and May. These storms could be localized or could affect the entire state. They could last a matter of minutes or matter of days. Typically, winter storms are measured by the amounts of snow which accumulated during any given storm. Additionally, these storms could be measured by the accompanied wind or temperatures associated with each storm.

In any discussion about winter storms, terminology and the general characteristics of the causes and impacts of winter storms need to be defined.

Natural winter storm events are grouped into the following categories:

Flurries – Light snow falling for short durations. No accumulation or light dusting is all that is expected.

Showers – Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Squalls – Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes Region.

Blowing Snow – Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Sleet – Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists.

Freezing Rain – Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coat or glaze of ice. Even small accumulations of ice can cause a significant hazard.

Severe Winter Storm - defined as one that drops four or more inches of snow during a twelve hour period, or six or more inches during a twenty-four hour period.

Blizzard - a winter storm with winds exceeding 35 miles per hour and temperatures of 20 degrees F.

Ice storm - occurs when cold rain freezes immediately on contact with the ground, structures, and vegetation.

7.2 Thunderstorms

Thunderstorms do occur within Idaho affecting almost all counties, but usually are localized events. Their impacts are fairly limited and do not significantly affect the communities enough to declare a disaster. Thunderstorms are emphasized within the flood chapter of the All Hazard Mitigation Plan.

7.3 Severe Weather Event Profile in Idaho

Idaho has not had a significant number of severe storm-related Presidential Disaster Declarations in the past 30 years. The majority of the storms that affect Idaho are on a lower scale that is not recognized as a "Disaster", due to the number of less intense storms that occur every year. Idaho, due to its complex landscape, will always have to deal with winter conditions that occur every year. People and communities have learned to adapt to the winter storms and deal with them as they come.

The Table 7.1 lists the State Disaster declarations from 1976-2000:

Table 7.1. Severe weather profile of Idaho.

DATE	COUNTIES AFFECTED
January 1989	Bonner, Clark
January 1993	Jerome
January 1994	Elmore
February 1996	Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce, Shoshone
November 1996 to January 1997	Adams, Benewah, **Boise**, Bonner, Boundary, Clearwater, Elmore, Gem, Idaho, Kootenai, Latah, Nez Perce, Owyhee, Payette, Shoshone, Valley, Washington

(State Hazard Mitigation Plan 2004)

7.4 Drought

Drought conditions are currently affecting several counties within the state of Idaho. Current warming trends and below normal precipitation levels in the past ten years is causing severe drought conditions. These droughts are causing severe water losses to the area aquifers as well as municipal water supplies. Furthermore, reduced growth to the areas vegetation due to the lack of moisture is increasing the risk of wildfires. The counties within Idaho that have currently declared Drought Emergency Declarations are summarized in Table 7.2.

Table 7.2. Drought hazard profile of Idaho.

County/Area	Date Declared
Bear Lake	August 24, 2004
Cassia County	July 27, 2004
Jerome County	July 27, 2004
Franklin County	July 20, 2004

Table 7.2. Drought hazard profile of Idaho.

County/Area	Date Declared
Elmore County	July 9, 2004
Twin Falls County	July 2, 2004
Teton County	June 17, 2004
Bingham County	May 26, 2004
Jefferson County	May 25, 2004
Oneida County	May 25, 2004
Bannock County	May 20, 2004
Bonneville County	May 20, 2004
Madison County	May 20, 2004
Blaine County	May 13, 2004
Gooding County	May 13, 2004
Custer County	May 5, 2004
Lemhi County	May 5, 2004
Fremont County	May 4, 2004
Caribou County	April 27, 2004
Lincoln County	April 19, 2004
Butte County	April 14, 2004
Clark County	April 14, 2004
Power County	May 20, 2004

7.5 Regional Climate Profile

The nature and extent of severe weather conditions is a result of the topography of the state or local community and the location of the state within the Pacific Northwest. Information for this section (7.5) has been summarized from the Western Regional Climate Center (WRCC 2004).

7.5.1 Topographic Features

Idaho lies entirely west of the Continental Divide, which forms its boundary for some distance westward from Yellowstone National Park. With a maximum north-south extent of 7° of latitude, its east-west extent of 6° of longitude at latitude 42° N., but only 1° of longitude at 49° N. The northern part of the State averages lower in elevation than the much larger central and southern portions, where numerous mountain ranges form barriers to the free flow of air from all points of the compass.

In the north the main barrier is the rugged chain of Bitterroot Mountains forming much of the boundary between Idaho and Montana. The extreme range of elevation in the State is from 738 feet of the confluence of the Clearwater and Snake Rivers to 12,655 feet at Mt. Borah in Custer County. Comprising rugged mountain ranges, canyons, high grassy valleys, arid plains, and fertile lowlands, the State reflects in its topography and vegetation a wide range of climates. Located some 300 miles from the Pacific Ocean, Idaho is, nevertheless, influenced by maritime air borne eastward on the prevailing westerly winds. Particularly in winter, the maritime influences are noticeable in the greater average cloudiness, greater frequency of precipitation, and mean temperatures, which are above those at the same latitude and altitude in mid-continent. This maritime influence is most marked in the northern part of the state, where the air arrives via the Columbia River Gorge with a greater burden of moisture than at lower latitudes.

Eastern Idaho's climate has a more continental character than the west and north, a fact quite evident not only in the somewhat greater range between winter and summer temperatures, but also in the reversal of the wet winter-dry summer pattern.

7.5.2 Temperature

The pattern of average annual temperatures for the state indicates the effect both of latitude and altitude. The highest annual averages are found in the lower elevations of the Clearwater and Little Salmon River Basins, and in the stretch of the Snake River Valley from the vicinity of Bliss downstream to Lewiston, including the open valleys of the Boise, Payette, and Weiser Rivers. At Swan Falls, the annual mean is 55° F, the highest in the State. Obsidian, at an elevation of 6,780 feet in Custer County, has the lowest annual average, 35.4° F, of any reporting station, with such places as Sun Valley, Chilly Barton Flat, Grouse, Island Park Dam, and Big Creek not far behind.

The range between the mean temperature of the coldest and warmest months of the year varies from less than 40° F at a number of northern stations, to well over 50° F at stations in the higher elevation of the central and eastern parts of the State. In the basin of the Snake River and its tributaries, between Twin Falls and Idaho Falls, monthly mean temperatures of 32° F or lower persist from December through February, while downstream from Twin Falls, at the lower elevations, monthly mean temperatures are freezing or below only in December and January. Low-level stations like Riggins and Lewiston show no month in the year with mean temperature 32° F or lower. In general, it can be said that monthly means are 32° F or lower at stations above 5,000 feet from November through March; between 4,000 and 5,000 feet, November through February; 3,000 to 4,000 feet, December through February; and 2,000 to 3,000 feet, only one or two months.

The diurnal range of temperature is, of course, most extreme in high valleys and in the semiarid plains of the Snake River valley. The magnitude of diurnal range varies with the season, being lowest in winter when cloudiness is much more prevalent and greatest in the warmer part of the year. In Boise, for example, the average diurnal range is only 14° F in January, but exceeds 30° F in July through September. Temperatures can range from -60° to 118° F. The coldest monthly mean minimum temperature has been -20° F, and the warmest monthly mean maximum 104° F. The highest long-term annual average has been 55°F at Swan Falls Power House, and the lowest long-term average 35° F at Obsidian. In summer, periods of extreme heat extending beyond a week are quite rare, and the same can be said of periods of extremely low temperatures in winter. In both cases the normal progress of weather systems across the state usually results in a change at rather frequent intervals. In the realm of extremely low temperatures, two winters stand out in the records for the State: 1937-38 and 1948-49. The lowest monthly mean temperatures on record occurred throughout the State in January 1949, and many stations registered the absolute lowest temperature on record during that month.

7.5.3 Precipitation

To a large extent, the source of moisture for precipitation in Idaho is the Pacific Ocean. In the summer, there are some exceptions when moisture-laden air is brought in from the south at high levels to produce thunderstorm activity, particularly in the eastern part of Idaho. The source of this moisture from the south is apparently the Gulf of Mexico and Caribbean region. The average precipitation map for Idaho is as complex as the physiographic of the state. Partly because of the greater moisture supply in the west winds over the northern part of the state, (less formidable barriers to the west) and partly because of the greater frequency of cyclonic

activity in the north, the average valley precipitation is considerably greater than in southern sections.

Peaks on the average annual precipitation map are found, however, in nearly all parts of the state at higher elevations. Sizeable areas in the Clearwater, Payette, and Boise River Basins receive an average of 40 to 50 inches per year, with a few points or small areas receiving in excess of 60 inches. Large areas including the northeastern valleys, much of the Upper Snake River Plains, Central Plains, and the lower elevations of the southwestern valleys receive less than 10 inches annually. Seasonal distribution of precipitation shows a very marked pattern of winter maximum and midsummer minimum in the northern and western portions of the State. In the eastern part of the state, however, many reporting stations show maximum monthly amounts in summer and minimum amounts in winter. In the northeastern valleys and eastern highlands, more than 50 percent of the annual rainfall occurs during the period April through September. Over nearly all of the northern part of the state, however, less than 40 percent of the annual rainfall occurs in this same period, and in portions of the Boise, Payette, and Weiser River drainages less than 30 percent of the annual amount comes in that six-month period.

7.5.4 Snowfall

Snowfall distribution is affected both by availability of moisture and by elevation. 80+ inches of snow fall is common in Boise County. The major mountain ranges of the State accumulate a deep snow cover during the winter months, and the release of water from the melting snow-pack in late spring furnishes irrigation water for more than two million acres, mainly within the Snake River Basin above Weiser. Irrigation water supplies are nearly always plentiful, except on some of the smaller projects where storage facilities are inadequate. Electric power in increasing amounts is generated by the waters of the many rivers of the state.

7.5.5 Wind Storms and Tornadoes

Windstorms are not uncommon in Idaho, but the state has no destructive storms such as hurricanes, and an extremely small incidence of tornadoes. Windstorms associated with cyclonic systems, and their cold fronts, do some damage to trees each year, often causing temporary disruption of power and communication facilities, but only minor damage to structures in most instances. Storms of this type may occur at any time from October into July, while during the summer months strong winds almost invariably come with thunderstorms. Hail damage in Idaho is very small in comparison with damage in areas of the central part of the United States. Often the hail that occurs does not grow to a size larger than one-half inch in diameter, and the areas affected are usually small. Quite often, hail comes during early spring storms, when it is mostly of the small, soft variety with a limited damaging effect. Later when crops are more mature and more susceptible to serious damage, hail occurs in widely scattered spots in connection with summer thunderstorms. The incidence of summer thunderstorms is greatest in mountainous areas, where lightning often causes serious forest and range fires.

7.6 Boise County Conditions

Past weather patterns show that severe weather conditions are likely to happen in any part of the county in any given year. The topographical features of the county contribute greatly to the various weather conditions that occur. Due to the overall high elevation of the county it is not uncommon for several of the communities (Placerville, Centerville, and Lowman, Idaho City) to be “snowed in” for a period of hours up to a week depending on snowfall amounts. The following table lists the average weather/climate within Boise County.

Table 7.3. Weather and Climate for Boise County, Idaho.

Temperature		Degrees	Month
Lowest Average Daily Minimum Temperature		10.1	January
Highest Average Daily Maximum Temperature		89.9	July
Hottest Month	July	Driest Month	July
Coldest Month	January	Wettest Month	December
Precipitation	Average Annual Total Precipitation	23.2 inches	
	Average Annual Snowfall	122.4 inches	
Elevation	3,906 Feet (Idaho City)		
	2,630 Feet (Horseshoe Bend)		(IDOCL 2004)

7.7 Past Severe Weather Events in Boise County

Information summarized from the Idaho Bureau of Homeland Security website: http://www.bhs.idaho.gov/local/counties/gem.htm.

7.7.1 Severe Storm - January 15, 1998

Event Summary: Severe winter storm in Boise Basin toppled trees and cut power.

County Summary: A severe winter storm with heavy snow broke tree branches and toppled trees onto power lines in the Boise Basin area. Power was cut to about 1,500 residents of Idaho City, Placerville, Centerville and New Centerville residents for over 11 hours. Bogus Basin Ski Area was closed, as was Idaho 21 from Idaho City to Lowman, and local TV and radio stations were knocked out.

7.7.2 Wind - August 7, 1993

Event Summary: Windstorms in Western Idaho, with sustained gusts up to 50 mph, caused property damage.

County Summary: A windstorm with gusts up to 50 mph knocked down trees in the county.

7.7.3 Severe Weather - January-February 1916

Event Summary: Severe winter storm in western Idaho resulting in 1 reported death, travel cut off.

County Summary: Severe winter storm: Idaho City isolated for a week by 6' of snow; several buildings collapsed after February 3 storm left 10" of snow.

7.7.4 Severe Weather - The Big Shiver of '88 - January 13, 1888

Event Summary: Severe winter storm, December 1887-January 1888. Hundreds of head of livestock froze; people froze to death; blocks of ice floated in rivers. Subsequent flooding along river bottoms followed the thaw.

County Summary: Idaho City, Placerville, Centerville believed to have been -50F.

7.8 Climate Records by Community

7.8.1 Idaho City, Idaho

Table 7.4 Climate summaries for Idaho City, Idaho.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average temp. (°F)	23.6	28.0	35.0	42.5	50.7	58.2	65.1	64.3	55.1	44.8	32.1	23.7
High temperature (°F)	34.9	41.0	48.0	57.3	66.8	76.1	85.8	85.6	75.4	62.8	43.8	34.8
Low temperature (°F)	12.3	15.1	21.9	27.6	34.6	40.2	44.5	43.1	34.9	26.9	20.4	12.7
Precipitation (in)	3.4	2.8	2.4	1.9	1.9	1.3	0.7	0.5	1.2	1.5	3.1	3.5

7.8.2 Greater Idaho City, Idaho Area

Table 7.5 Climate summaries for the greater Idaho City, Idaho area.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Days with precip.	12	10	10	8	8	6	2	2	4	6	10	11
Wind speed (mph)	7.9	8.9	9.9	9.9	9.4	9.0	8.4	8.2	8.2	8.3	8.4	8.1
Morning humidity (%)	80	79	73	70	69	66	54	52	58	66	77	81
Afternoon humidity (%)	70	60	44	36	34	29	21	22	29	38	60	71
Sunshine (%)	40	50	62	68	70	75	87	85	82	69	43	38
Days clear of clouds	4	5	6	6	8	12	20	19	17	12	6	5
Partly cloudy days	5	6	7	9	10	10	7	8	7	8	6	6
Cloudy days	22	17	18	15	13	8	3	4	6	11	18	20
Snowfall (in)	6.5	3.7	1.7	0.6	0.1	0.0	0.0	0.0	0.0	0.1	2.3	5.7

7.8.3 Horseshoe Bend, Idaho

Table 7.6 Climate summaries for Horseshoe Bend, Idaho.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average temp. (°F)	28.5	34.1	41.2	47.8	55.6	63.9	71.7	71.1	61.7	50.6	37.5	29.1
High temperature (°F)	35.6	42.6	51.7	60.2	69.4	79.0	88.4	87.6	76.8	63.4	45.8	36.1
Low temperature (°F)	21.4	25.5	30.6	35.3	41.7	48.8	54.9	54.5	46.6	37.8	29.2	22.0
Precipitation (in)	2.4	2.0	2.1	1.7	1.8	1.1	0.5	0.4	1.0	1.2	2.3	2.4

7.8.4 Countywide Potential Mitigation Activities

There is no way to prevent severe storms. The weather forces and topography of Boise County will always dictate when and where severe storms will occur.

There are three areas where action can be taken to reduce the loss of life, property, and infrastructure and business disruption to severe weather.

- Mitigation
- Readiness/Education
- Building Codes

7.8.4.1 Mitigation

Some type of mitigation measures have been addressed in all communities within the county since the major state disasters in 1996 and 1997.

Some of the mitigation efforts should require the following:

- Readiness of snow removal equipment and schedule within the community.
- The availability of traction sand.
- School bus schedule or delays.
- Communication centers.
- Back-up power supplies.
- Water availability.
- Abundance of emergency equipment or shelters to the public.

At the individual home level:

- Insulate walls and attic.
- Caulk and weather-strip doors and windows.
- Install storm windows or cover windows with plastic from the inside.
- Have emergency heating equipment available.
- Fireplace with ample supply of wood.
- Small, well-vented, wood, coal, or camp stove with fuel.
- Portable space heaters or kerosene heaters.
- Install smoke detectors.
- Keep pipes from freezing.
- Have disaster supplies on hand in case power goes out.
- Develop an emergency communication plan.
- Make sure that all family members know how to respond after or during a severe winter storm.
- Stay indoors and dress warmly.
- Conserve fuel.

Weather-related mitigation activities suggested in the Idaho State Hazard Mitigation Plan that pertain to Boise County include:

- Inspect schools and other public buildings for snow-load resistance and retrofit as necessary (SHMP-HM18).
- Implement electrical protective measures and backup systems for public agencies (SHMP-HM16).

7.8.4.2 Readiness/Education

Continued periodic public education measures should be undertaken. When extended periods of time pass between major weather events, both emergency response units and the public tend to forget to review plans and take necessary precautions. Some media and public communication ideas are:

- Publish a special section in your local newspaper with emergency information on severe weather patterns. Localize the information by printing the phone numbers of local emergency services offices, the American Red Cross chapter, and the nearest clinics.
- Ask the local paper to interview local officials about land use management and building codes in the area.
- Periodically inform your community of local public warning systems. Explain differences between winter weather warnings and watches. Let them know where to turn for emergency broadcast information should they hear a warning on their radio or television.
- Assist hospitals and other operations that are critically affected by power failure by arranging for auxiliary power supplies, this would include city water and sewer systems, emergency services (including electric dependant phone systems), police and fire departments.
- Publish emergency evacuation routes for areas prone to severe weather.
- Have a ready source of shovels, candles, or other emergency equipment.
- Provide information at the local level on the weather patterns within the area to people new to the area.
- Provide information on traction devices for winter time travel.

Requiring building permits and compliance with building codes is a good educational tool. Builders and future homeowners are made aware of the potential risk of building in a severe weather area. Periodic publication of the highlights of these building codes can help to keep up public awareness.

7.8.4.3 Building Codes

The subsequent adoption of the International Building Codes, or more stringent local building codes, provides basic guidelines to communities on how to regulate development. Careful localized management of development in severe weather areas or rural areas results in construction practices that can reduce losses and the high costs associated with disasters to all levels of government.

Building codes should address the following:

- Snow load requirements for roofing materials.
- Localized wind storms or prevailing winds.
- Parking lot construction to handle snow removal or piling of snow.
- Width of driveways for snow removal equipment or piling of snow.
- Manufactured home tie downs and placement of blocking.
- Sign Codes for billboards in high wing prone areas.

Boise County has not adopted any building codes.

Chapter 8: Potential Mitigation Activities

8 Administration & Implementation Strategy

Critical to the implementation of this Hazard Mitigation Plan will be the identification of, and implementation of, an integrated schedule of treatments targeted at achieving an elimination of the lives lost, and reduction in structures destroyed, infrastructure compromised, and unique ecosystems damaged that serve to sustain the way-of-life and economy of Boise County and the region. Since there are many land management agencies and thousands of private landowners in Boise County, it is reasonable to expect that differing schedules of adoption will be made and varying degrees of compliance will be observed across all ownerships.

Boise County encourages the philosophy of instilling disaster resistance in normal day-to-day operations. By implementing plan activities through existing programs and resources, the cost of mitigation is often a small portion of the overall cost of a project's design or program.

The federal land management agencies in Boise County, specifically the USDA Forest Service and the Bureau of Land Management, are participants in this planning process and have contributed to its development. Where available, their schedule of land treatments have been considered in this planning process to better facilitate a correlation between their identified planning efforts and the efforts of Boise County.

All risk assessments were made based on the conditions existing during 2004-05, thus, the recommendations in this section have been made in light of those conditions. However, the components of risk and the preparedness of the county's resources are not static. It will be necessary to fine-tune this plan's recommendations annually to adjust for changes in the components of risk, population density changes, infrastructure modifications, and other factors.

As part of the Policy of Boise County in relation to this planning document, this entire **All Hazards Mitigation Plan** should be reviewed annually at a special meeting of the Boise County Commissioners, open to the public and involving all municipalities/jurisdictions, where action items, priorities, budgets, and modifications can be made or confirmed. A written review of the plan should be prepared (or arranged) by the Chairman of the County Commissioners, detailing plans for the year's activities, and made available to the general public ahead of the meeting (in accord with the Idaho Open Public Meeting Laws). Amendments to the plan should be detailed at this meeting, documented, and attached to the formal plan as an amendment to the All Hazards Mitigation Plan. Re-evaluation of this plan should be made on the 5th anniversary of its acceptance, and every 5-year period following.

8.1 Prioritization of Mitigation Activities

Prioritization of projects will occur at the county, city, agency, and private levels. Differing prioritization processes will occur, however, the county and cities will adopt the following prioritization process, as indicated through the adoption of this plan by each municipality.

The prioritization process will include a special emphasis on cost-benefit analysis review. The process will reflect that a key component in funding decision is a determination that the project will provide an equivalent or more in benefits over the life of the project when compared with the costs. Projects will be administered by county and local jurisdictions with overall coordination provided by the County Emergency Services Coordinator.

County Commissioners and the elected officials of the Cities of Idaho City, Placerville, and Horseshoe Bend will evaluate opportunities and establish their own unique priorities to accomplish mitigation activities where existing funds and resources are available and there is community interest in implementing mitigation measures. If no federal funding is used in these situations, the prioritization process may be less formal. Often the types of projects that the County can afford to do on their own are in relation to improved codes and standards, department planning and preparedness, and education. These types of projects may not meet the traditional project model, selection criteria, and benefit-cost model. The County will consider all pre-disaster mitigation proposals brought before the County Commissioners by department heads, city officials, fire districts and local civic groups.

When federal or state funding is available for hazard mitigation, there are usually requirements that establish a rigorous benefit-cost analysis as a guiding criterion in establishing project priorities. The county will understand the basic federal grant program criteria which will drive the identification, selection, and funding of the most competitive and worthy mitigation projects. FEMA's three grant programs (the post-disaster Hazard Mitigation Grant Program, the pre-disaster Flood Mitigation Assistance and Pre-Disaster Mitigation grant programs) that offer federal mitigation funding to state and local governments all include the benefit-cost and repetitive loss selection criteria.

The prioritization of projects will occur annually and be facilitated by the County Emergency Services Coordinator to include the County Commissioner's Office, City of Idaho City Mayor, City of Placerville Mayor, City of Horseshoe Bend Mayor, Fire District Chiefs and Commissioners, agency representatives (USFS, BLM, State Lands, etc.). The prioritization of projects will be based on the selection of projects which create a balanced approach to pre-disaster mitigation which recognizes the hierarchy of treating in order (highest first):

- People and Structures
- Infrastructure
- Local and Regional Economy
- Traditional Way of Life
- Ecosystems

8.1.1 Prioritization Scheme

A numerical scoring system is used to prioritize projects. This prioritization serves as a guide for the county when developing mitigation activities. This project prioritization scheme has been designed to rank projects on a case by case basis. In many cases, a very good project in a lower priority category could outrank a mediocre project in a higher priority. The county mitigation program does not want to restrict funding to only those projects that meet the high priorities because what may be a high priority for a specific community may not be a high priority at the county level. Regardless, the project may be just what the community needs to mitigate disaster. The flexibility to fund a variety of diverse projects based on varying reasons and criteria is a necessity for a functional mitigation program at the County and community level.

To implement this case by case concept, a more detailed process for evaluating and prioritizing projects has been developed. Any type of project, whether county or site specific, will be prioritized in this more formal manner.

To prioritize projects, a general scoring system has been developed. This prioritization scheme has been used in statewide all hazard mitigations plans. These factors range from cost-benefit ratios, to details on the hazard being mitigated, to environmental impacts.

Since planning projects are somewhat different than non-planning projects when it comes to reviewing them, different criteria will be considered, depending on the type of project.

The factors for the non-planning projects include:

- Cost/Benefit
- Population Benefit
- Property Benefit
- Economic Benefit
- Project Feasibility (environmentally, politically, socially)
- Hazard Magnitude/Frequency
- Potential for repetitive loss reduction
- Potential to mitigate hazards to future development
- Potential project effectiveness and sustainability

The factors for the planning projects include:

- Cost/Benefit
- Vulnerability of the community or communities
- Potential for repetitive loss reduction
- Potential to mitigate hazards to future development

Since some factors are considered more critical than others, two ranking scales have been developed. A scale of 1-10, 10 being the best, has been used for cost, population benefit, property benefit, economic benefit, and vulnerability of the community. Project feasibility, hazard magnitude/frequency, potential for repetitive loss reduction, potential to mitigate hazards to future development, and potential project effectiveness and sustainability are all rated on a 1-5 scale, with 5 being the best. The highest possible score for a non-planning project is 65 and for a planning project is 30.

The guidelines for each category are as follows:

8.1.1.1 Benefit / Cost

The analysis process will include summaries as appropriate for each project, but will include benefit / cost analysis results, Projects with a negative benefit / cost analysis result will be ranked as a 0. Projects with a positive Benefit / Cost analysis will receive a score equal to the projects Benefit / Cost Analysis results divided by 10. Therefore a project with a BC ratio of 50:1 would receive 5 points, a project with a BC ratio of 100:1 (or higher) would receive the maximum points of 10.

8.1.1.2 Population Benefit

Population Benefit relates to the ability of the project to prevent the loss of life or injuries. A ranking of 10 has the potential to impact over 3,000 people. A ranking of 5 has the potential to impact 100 people, and a ranking of 1 will not impact the population. In some cases, a project may not directly provide population benefits, but may lead to actions that do, such as in the case of a study. Those projects will not receive as high of a rating as one that directly effects the population, but should not be considered to have no population benefit.

8.1.1.3 Property Benefit

Property Benefit relates to the prevention of physical losses to structures, infrastructure, and personal property. These losses can be attributed to potential dollar losses. Similar to cost, a ranking of 10 has the potential to save over $1,000,000 in losses, a ranking of 5 has the potential to save roughly $100,000 in losses, and a ranking of 1 only has the potential to save less than $100 in losses. In some cases, a project may not directly provide property benefits, but may lead to actions that do, such as in the case of a study. Those projects will not receive as high of a rating as one that directly effects property, but should not be considered to have no property benefit.

8.1.1.4 Economic Benefit

Economic Benefit is related to the savings from mitigation to the economy. This benefit includes reduction of losses in revenues, jobs, and facility shut downs. Since this benefit can be difficult to evaluate, a ranking of 10 would prevent a total economic collapse, a ranking of 5 could prevent losses to about half the economy, and a ranking of 1 would not prevent any economic losses. In some cases, a project may not directly provide economic benefits, but may lead to actions that do, such as in the case of a study. Those projects will not receive as high of a rating as one that directly affects the economy, but should not be considered to have no economic benefit.

8.1.1.5 Vulnerability of the Community

For planning projects, the vulnerability of the community is considered. A community that has a high vulnerability with respect to other jurisdictions to the hazard or hazards being studied or planned for will receive a higher score. To promote planning participation by the smaller or less vulnerable communities in the state, the score will be based on the other communities being considered for planning grants. A community that is the most vulnerable will receive a score of 10, and one that is the least, a score of 1.

8.1.1.6 Project Feasibility (Environmentally, Politically & Socially)

Project Feasibility relates to the likelihood that such a project could be completed. Projects with low feasibility would include projects with significant environmental concerns or public opposition. A project with high feasibility has public and political support without environmental concerns. Those projects with very high feasibility would receive a ranking of 5 and those with very low would receive a ranking of 1.

8.1.1.7 Hazard Magnitude/Frequency

The Hazard Magnitude/Frequency rating is a combination of the recurrence period and magnitude of a hazard. The severity of the hazard being mitigated and the frequency of that event must both be considered. For example, a project mitigating a 10-year event that causes significant damage would receive a higher rating than one that mitigates a 500-year event that causes minimal damage. For a ranking of 5, the project mitigates a high frequency, high magnitude event. A 1 ranking is for a low frequency, low magnitude event. Note that only the damages being mitigated should be considered here, not the entire losses from that event.

8.1.1.8 Potential for repetitive loss reduction

Those projects that mitigate repetitive losses receive priority consideration here. Common sense dictates that losses that occur frequently will continue to do so until the hazard is mitigated. Projects that will reduce losses that have occurred more than three times receive a rating of 5. Those that do not address repetitive losses receive a rating of 1.

8.1.1.9 Potential to mitigate hazards to future development

Proposed actions that can have a direct impact on the vulnerability of future development are given additional consideration. If hazards can be mitigated on the onset of the development, the county will be less vulnerable in the future. Projects that will have a significant effect on all future development receive a rating of 5. Those that do not affect development should receive a rating of 1.

8.1.1.10 Potential project effectiveness and sustainability

Two important aspects of all projects are effectiveness and sustainability. For a project to be worthwhile, it needs to be effective and actually mitigate the hazard. A project that is questionable in its effectiveness will score lower in this category. Sustainability is the ability for the project to be maintained. Can the project sustain itself after grant funding is spent? Is maintenance required? If so, are or will the resources be in place to maintain the project. An action that is highly effective and sustainable will receive a ranking of 5. A project with effectiveness that is highly questionable and not easily sustained should receive a ranking of 1.

8.1.1.11 Final ranking

Upon ranking a project in each of these categories, a total score can be derived by adding together each of the scores. The project can then be ranking high, medium, or low based on the non-planning project thresholds of:

Project Ranking Priority Score

- High 40-65
- Medium 25-39
- Low 9-24

8.2 Recommended Hazard Mitigation Activities

As part of the implementation of hazard mitigation activities in Boise County, a variety of management tools may be used.

8.2.1 Safety & Policy

Hazard mitigation efforts must be supported by a set of policies and regulations at the county level that maintain a solid foundation for safety and consistency. The recommendations enumerated here serve that purpose. Because these items are regulatory in nature, they will not necessarily be accompanied by cost estimates. These recommendations are policy-related in nature and therefore are recommendations to the appropriate elected officials; debate and formulation of alternatives will serve to make these recommendations suitable and appropriate.

8.2.1.1 Proposed Activities

Table 8.1. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.1.a. Public education programs.	Flood, Earthquake, Landslide, Winter Storm, and Windstorm/Tornado	Cooperative effort including Boise County, University of Idaho Cooperative Extension, West Central Highlands RC&D, Idaho Bureau of Homeland Security, federal and state agencies, Centerville Volunteer Fire Department, Clear Creek Volunteer Fire Department, Garden Valley Rural Fire Department, Gem County II Fire District, Grand Jean Fire District, Horseshoe Bend Fire Department, Idaho City Volunteer Fire Department, Lowman Volunteer Fire Department, Placerville Fire Protection District, Robie Creek Volunteer Fire Department, Wilderness Ranch Volunteer Fire Department, Valley of the Pines Fire Department, Sheriff's Office, Health District, City of Idaho City, City of Placerville, and City of Horseshoe Bend.	• 2005 Identify teaching partners in public education program • 2005 Locate and adopt training materials appropriate for local conditions • 2005 Develop budgets and acquire funding for desired programs • 2006 Begin implementation in schools and through adult education programs.
8.1.b. Assess seismic hazard to public buildings.	Earthquake and Landslide	Boise County Planning and Zoning Department, and Cities of Crouch, Placerville, Idaho City, and Horseshoe Bend.	• 2005 Secure funding for engineered surveys of older brick buildings in county.
8.1.c. Adoption and enforcement of International Building Codes and/or more stringent hazard--related building code provisions.	Flood, Earthquake, Landslide, Winter Storm, and Windstorm/Tornado	Boise County Commissioners, Boise County Planning and Zoning, and County Emergency Services Coordinator.	• 2005 Review of IBC and relevance to hazards in county. Review applicability to Public and/or private structures.
8.1.d. Implement land-use and development policy to reduce exposure to hazards.	Flood, Earthquake, Landslide, Winter Storm, and Windstorm/Tornado	Boise County Commissioners, Boise County Planning and Zoning, and County Emergency Services Coordinator.	• 2005 Review of hazard mapping in updating County comprehensive plan.
8.1.e. Develop collaborative partnerships to build prepared and resilient communities.	Flood, Earthquake, Landslide, Winter Storm, Thunderstorm, Drought, and Windstorm/Tornado	County Emergency Services Coordinator, Boise County Commissioners, Centerville Volunteer Fire Department, Clear Creek Volunteer Fire Department, Garden Valley	• 2005 Form formal MOU's with the cities in the county to coordinate hazard mitigation.

Table 8.1. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
		Rural Fire Department, Gem County II Fire District, Grand Jean Fire District, Horseshoe Bend Fire Department, Idaho City Volunteer Fire Department, Lowman Volunteer Fire Department, Placerville Fire Protection District, Robie Creek Volunteer Fire Department, Wilderness Ranch Volunteer Fire Department, Valley of the Pines Fire Department, and Cities of Crouch, Placerville, Idaho City, and Horseshoe Bend.	
8.1.f. Develop a landslide and avalanche hazard identification program.	Landslide, Flood, and Earthquake	County Road Department, Idaho Department of Transportation, and County Planning and Zoning.	• 2005 Review of landslide hazard mapping in updating County Comprehensive and Transportation Plans.
8.1.g. Restrict development in landslide prone areas.	Landslide, Flood, and Earthquake	County Planning and Zoning.	• 2005 Draft recommendations for housing site plans in Landslide prone areas.
8.1.h. Standardize codes for excavation, construction, and grading of roads.	Flood, Earthquake, and Landslides	Boise County Road Department and County Planning and Zoning.	• 2005 Draft recommendations for road location and standards in landslide prone areas.
8.1.i. Continued Participation in National Flood Insurance Program.	Flood	Boise County Commissioners, Boise County Planning and Zoning, Cities of Crouch, Placerville, Idaho City, and Horseshoe Bend, and County Emergency Services Coordinator.	• On going: Continued participation in NFIP. • 2005 Participation in the Community Rating System to lower the costs of NFIP premiums.
8.1.j. Establish a special commission to help schools reduce structural and non-structural seismic hazards.	Earthquake	Boise County Commissioners, Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend.	• 2005 Form and appoint members to the commission.
8.1.k. Coordinate FIRM Map updates with FEMA and IDWR.	Flood	County Emergency Services Coordinator.	• 2005 Contact IDWR and FEMA Region 10 office to establish coordination of FRIM maps updates

Table 8.1. Action Items in Safety and Policy.			
Action Item	**Mitigated Hazard**	**Responsible Organization**	**Action Items & Planning Horizon**
			which begin in 2007.

8.2.2 People and Structures

The protection of people and structures will be tied together closely as the loss of life in the event of a natural disaster is generally linked to a person who could not, or did not, flee a structure threatened by a hazard. Many of the recommendations in this section will define a set of criteria for implementation while others will be rather specific in extent and application.

8.2.2.1 Proposed Activities

Table 8.2. Action Items for People and Structures.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.2.a. Assess and hardwire county, city, non-profit, and emergency facilities for use with a portable generator.	Flood, Earthquake, Landslide, Winter Storm, Thunderstorm, and Wind Storm/Tornado.	Boise County Commissioners, Sheriff's Office, Cities of Placerville, Crouch, Idaho City, Horseshoe Bend, and County Emergency Services Coordinator.	2005 Assess which buildings in the county require alternative power during emergencies. 2005 Cost benefit assessment of providing alternative power. 2005 Secure grant funding through PDM grants or others for the wiring of buildings 2006 Secure funding for the purchase of generators, or other alternative power sources.
8.2.b. Inspect buildings, particularly unreinforced masonry, for earthquake stability.	Earthquake	Boise County Commissioners, Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend, and County Emergency Services Coordinator.	2005 Bi annual review of older Masonry buildings. 2005 Education campaign using "Earthquake Safety for People Who work in Old Masonry Buildings".
8.2.c. Control surface and ground water drainage.	Flood, Landslide, Sever Weather (thunderstorms)	County Planning and Zoning, County and City Road Departments, Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend, and County Emergency Services Coordinator.	2005 Locate and Map current drainage problem areas. 2006 secure funding for need upgrades.
8.2.d. Inspect schools and other public buildings for snow-load resistance and retrofit as necessary.	Winter Storm	Boise County Planning and Zoning, Cities of Crouch, Placerville, Idaho City, and Horseshoe Bend, and County Emergency Services Coordinator.	2005 Inspect all public facilities to insure compliance with updated building codes.
8.2.e. Provide earthquake evacuation and response training to	Earthquake	Boise County Commissioners, Cities of Crouch, Placerville, Idaho City, and Horseshoe Bend, and County Emergency	2005 Education campaign using "Earthquake Safety for People Who work in Old Masonry Buildings".

Table 8.2. Action Items for People and Structures.			
Action Item	**Mitigated Hazard**	**Responsible Organization**	**Action Items & Planning Horizon**
all public workers in all older buildings		Services Coordinator.	

8.2.3 Infrastructure

Significant infrastructure refers to the communications, transportation (road and rail networks), energy transport supply systems (gas and power lines), and water supply that service a region or a surrounding area. All of these components are important to the West Central Highlands and to Boise County specifically. Without supporting infrastructure, a community's structures may be protected, but the economy and way of life are lost. As such, a variety of components will be considered here in terms of management philosophy, potential policy recommendations, and on-the-ground activities.

8.2.3.1 Proposed Activities

Table 8.3. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon
8.3.a. Identify roads subject to periodic closure due to landslides. Prioritize upgrades to these roads to reduce vulnerability.	Earthquake, Landslide, Flood	Boise County Commissioners, County and City Road Departments, Idaho Department of Transportation, Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend, and County Emergency Services Coordinator.	• 2005 Identify problem primary and secondary access roads. • 2006 engineer planed up grades to roads to meet all hazard access needs. • 2007 secure funding. • 2008 begin upgrade construction work.
8.3.b. Assess primary and secondary roads in need of surface upgrades to provide year around access during hazard events.	Flood, Earthquake, and Thunderstorm	Boise County Commissioners, County and City Road Departments, Idaho Department of Transportation, Cities of Placerville, Crouch, Idaho City, Horseshoe Bend, and County Emergency Services Coordinator.	• 2005 Identify and prioritize road and road segments in need of surfacing. • 2006 Conduct cost appraisal of surfacing secondary access roads. • 2006 Secure funding. • 2007 Begin surfacing projects.
8.3.c. Request local power companies to take a more active role in maintaining power lines and power line corridors.	Flood and Thunderstorm	Boise County Commissioners.	• 2005 Formal letter from the county to local power companies.
8.3.d. Assess community water systems of Horseshoe Bend, Centerville, Placerville and Idaho City, for	Flood and Earthquake	Boise County Commissioners, Town of Centerville, Cities of Placerville, Crouch, Idaho City, Horseshoe Bend, and	• 2005 Hire certified water consultants and engineers to review the needs of the various water systems.

Table 8.3. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon
vulnerability to floods and earthquakes		County Emergency Services Coordinator.	• 2006 implement recommendations from the studies.
8.3.e. Provide alternative access routes around Highway 55 in the Horseshoe Bend area.	Flood, Earthquake, Landslide	Boise County Commissioners, County and City Road Departments, Idaho Department of Transportation, City of Horseshoe Bend, and County Emergency Services Coordinator.	• 2005 Study alternative routes around the greater Horseshoe Bend Area. Coordinate with IDT.
8.3.f. Provide signage for alternative routes around Horseshoe Bend.	Flood, Earthquake, Landslide	County and City Road Departments, Idaho Department of Transportation, and City of Horseshoe Bend.	• 2005 Sign current bypass routes around Highway 55 with road weight and length restrictions.
8.3.g. Assess water storage/ alternative power needs for community water systems.	Flood, Earthquake, Landslide, Winter Storm, Thunderstorm, and Wind Storm/Tornado.	Boise County Commissioners, Cities of Placerville, Crouch, Idaho City, Horseshoe Bend, and County Emergency Services Coordinator.	• 2005 Conduct needs analysis and cost appraisal of providing water. • 2006 Secure funding for projects. • 2007 implement projects.

8.2.4 Resource and Capability Enhancements

There are a number of resource and capability enhancements identified by the committee for Boise County.

8.2.4.1 Proposed Activities

Table 8.4. Action Items for Resource and Capability Enhancements.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.4.a. Obtain portable generators for use during power outages and other emergency situations.	Flood, Earthquake, Landslide, Winter Storm, Thunderstorm, and Wind Storm/Tornado.	County Commissioners, Sheriff's Office, Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend, Town of Centerville, and County Emergency Services Coordinator.	• 2005 Coordinate with 8.2.a. • 2006 Secure funding for generator purchase. • 2005 Determine where generators will be stored and who will maintain.
8.4.b. Obtain and maintain snow removal equipment and schedule for communities and primary transportation routes.	Winter Storm	Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend, Town of Centerville, County Emergency Services Coordinator, and County Road Department.	• Annual review of equipment and community snow removal needs to determine if operable equipment is adequate.
8.4.c. Emergency	Flood, Earthquake,	County Emergency	• 2005 Define equipment

Table 8.4. Action Items for Resource and Capability Enhancements.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
equipment cache.	Landslide, Winter Storm, Thunderstorm, and Wind Storm/Tornado.	Services Coordinator, County Building Department, Centerville Volunteer Fire Department, Clear Creek Volunteer Fire Department, Garden Valley Rural Fire Department, Gem County II Fire District, Grand Jean Fire District, Horseshoe Bend Fire Department, Idaho City Volunteer Fire Department, Lowman Volunteer Fire Department, Placerville Fire Protection District, Robie Creek Volunteer Fire Department, Wilderness Ranch Volunteer Fire Department, Valley of the Pines Fire Department, Cities of Placerville, Crouch, Idaho City, and Horseshoe Bend, and Town of Centerville.	and goods needed to sustain various communities for 72 hours after a hazard event. • 2006 secure funding for items needed.
8.4.d. Emergency response vehicles.	Flood, Earthquake, Landslide, Terrorism Winter Storm, Thunderstorm, and Wind Storm/Tornado.	County Emergency Services Coordinator, Centerville Volunteer Fire Department, Clear Creek Volunteer Fire Department, Garden Valley Rural Fire Department, Gem County II Fire District, Grand Jean Fire District, Horseshoe Bend Fire Department, Idaho City Volunteer Fire Department, Lowman Volunteer Fire Department, Placerville Fire Protection District, Robie Creek Volunteer Fire Department, Wilderness Ranch Volunteer Fire Department, Valley of the Pines Fire Department, and County Road Department.	• 2005 Conduct gap analysis of vehicles and equipment need for emergency response. • 2006 Securing funding for vehicles and equipment identified from Gap analysis.
8.4.e. Develop a centralized countywide GIS system and data base.	Flood, Earthquake, Landslide, Terrorism Winter Storm, Thunderstorm, and Wind Storm/Tornado.	County Commissioners and County Emergency Services Coordinator.	• 2005 Assess GIS system parameters needed to serve Boise County. • 2006 Secure funding for system and data. • 2007 Implement GIS plan.
8.4.f. Additional repeater towers to cover the "blind spots" throughout	Flood, Earthquake, Landslide, Terrorism Winter Storm,	County Commissioners, Sheriff's Office, Centerville Volunteer Fire Department,	• 2005 Assess where and how many additional repeaters are needed to

Table 8.4. Action Items for Resource and Capability Enhancements.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
the county.	Thunderstorm, and Wind Storm/Tornado.	Clear Creek Volunteer Fire Department, Garden Valley Rural Fire Department, Gem County II Fire District, Grand Jean Fire District, Horseshoe Bend Fire Department, Idaho City Volunteer Fire Department, Lowman Volunteer Fire Department, Placerville Fire Protection District, Robie Creek Volunteer Fire Department, Wilderness Ranch Volunteer Fire Department, Valley of the Pines Fire Department, and County Emergency Services Coordinator.	serve the county. • 2006 Secure funding. • 2007 Install repeaters.
8.4.g. Mobile full spectrum radios for emergency services personnel.	Flood, Earthquake, Landslide, Terrorism Winter Storm, Thunderstorm, and Wind Storm/Tornado.	County Commissioners, Sheriff's Office, Centerville Volunteer Fire Department, Clear Creek Volunteer Fire Department, Garden Valley Rural Fire Department, Gem County II Fire District, Grand Jean Fire District, Horseshoe Bend Fire Department, Idaho City Volunteer Fire Department, Lowman Volunteer Fire Department, Placerville Fire Protection District, Robie Creek Volunteer Fire Department, Wilderness Ranch Volunteer Fire Department, Valley of the Pines Fire Department, and County Emergency Services Coordinator.	• 2005 Determine number of units needed so all EMS personnel can be in contact. • 2006 Secure Funding and purchase radios.

8.2.5 Regional Land Management Recommendations

Boise County is both a county with several small towns scattered throughout the county. It is dominated by wide expanses of forest with some rangelands intermixed with communities and rural houses. Regional land management policy will impact all of the natural hazards that potentially impact Boise County.

8.2.5.1 Proposed Activities

Table 8.5. Action Items for Regional Land Management Agencies.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon

Table 8.5. Action Items for Regional Land Management Agencies.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon
8.5.a Maintain federal and state lands along primary and secondary access routes concurrent with the purpose of these roads.	Flood, Earthquake, Landslide, Winter Storm	County Commissioners, Sheriff's Office, County Road Department, and County Emergency Services Coordinator.	• 2005 Formal request from the county to land management agencies indenting access needs and coordination for keep routes open. • 2005 Formation of a local Road Committee to discuss emergency routes around the county across multiple ownerships.

Chapter 9: Supporting Information

9 Supporting Information

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9.3 List of Preparers

The following personnel participated in the formulation, compilation, editing, and analysis of alternatives for this assessment.

Table 9.1. List of Preparers

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9.4 Signature Pages

This Boise County All Hazards Mitigation Plan including the Elmore County Terrorism & Civil Unrest Mitigation Plan was developed in cooperation with and approved by the following jurisdictions in Boise County.

9.4.1 Representatives of Boise County Government

BOISE COUNTY

ORIGINAL BOISE COUNTY COURTHOUSE

RESOLUTION #2006-37

A BOISE COUNTY RESOLUTION DECLARING BOISE COUNTY SUPPORT and ADOPTION of the BOISE COUNTY ALL HAZARDS MITIGATION PLAN, which includes CIVIL UNREST/TERRORISM MITIGATION PLAN.

Whereas, The Board of Boise County Commissioners supports the Boise County All Hazards Mitigation Plan and the Civil Unrest/Terrorism Mitigation Plan; and

Whereas, The Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan will be utilized as a guide for planning as related to FEMA Pre-Disaster Mitigation, the National Fire Plan, the Healthy Forest Restoration Act and other purposes as deemed appropriate by the Boise County Board of Commissioners.

Now Therefore be it Resolved, that the Boise County Board of Commissioners do hereby adopt, support and will facilitate the Boise County All Hazards Mitigation Plan and the Civil Unrest/Terrorism Plan's implementation.

APPROVED and ADOPTED in open session this 12th day of June 2006.

BOISE COUNTY BOARD OF COMMISSIONERS

Roger B. Jackson

Roger B. Jackson, Chairman of the Board

F H Lawson

Fred H. Lawson, Commissioner

Paul A. Stutzman, Commissioner

Attest:

Rora A Canody

Rora A. Canody, Clerk to the Board

Phone (208) 392-4431
FAX (208) 392-4473

P.O. Box 1300
Idaho City, Idaho 83631

9.4.2 City of Idaho City

City of Idaho City

Resolution of the City Council of Idaho City located in Boise County, Idaho

NO. 2006-05

A resolution of the City Council of Idaho City declaring City support and adoption of the Boise County All Hazards Mitigation Plan, which includes the Civil Unrest / Terrorism Mitigation Plan.

Whereas, The City Council of Idaho City supports the Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan, and

Whereas, The City Council of Idaho City has participated in the development of the Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan, and

Whereas, The Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan will be utilized as a guide for planning as related to FEMA Pre-Disaster Mitigation, The National Fire Plan, The Healthy Forest Restoration Act, and other purposes as deemed appropriate by the City Council of Idaho City,

Therefore be it resolved, that the City Council of Idaho City does hereby adopt, support, and will facilitate the Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan's implementation.

Passed and approved this 22nd Day of August 2006

City Council of Idaho City located in Boise County, Idaho

Phillip J Canody

Phillip J. Canody, Mayor

Attest:

Tammy L. Ellsworth

Tammy L. Ellsworth, City Clerk

9.4.3 City of Horseshoe Bend

Resolution of the City Council of Horseshoe Bend located in Boise County, Idaho

A resolution of the City Council of Horseshoe Bend declaring City support and adoption of the Boise County All Hazards Mitigation Plan, which includes the Civil Unrest / Terrorism Mitigation Plan.

Whereas, The City Council of Horseshoe Bend supports the Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan, and

Whereas, The City Council of Horseshoe Bend has participated in the development of the Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan, and

Whereas, The Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan will be utilized as a guide for planning as related to FEMA Pre-Disaster Mitigation, The National Fire Plan, The Healthy Forest Restoration Act, and other purposes as deemed appropriate by the City Council of Horseshoe Bend,

Therefore be it resolved, that the City Council of Horseshoe Bend does hereby adopt, support, and will facilitate the Boise County All Hazards Mitigation Plan and the Civil Unrest / Terrorism Mitigation Plan's implementation.

Passed and approved this 3 Day of October 2006

City Council of Horseshoe Bend located in Boise County, Idaho

Doyle D Woods

By:
Mayor, City of Horseshoe Bend

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