Canyon County, Idaho
All Hazards
Mitigation Plan

Including the municipalities of Nampa, Caldwell, Middleton, Notus, Parma, Wilder, Greenleaf, & Melba

Volume I

Flood Mitigation Plan

Landslide Mitigation Plan

Earthquake Mitigation Plan

Severe Weather Mitigation Plan

FEMA Pre-Adoption Review

June 26, 2006

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

This plan was developed by the Canyon County All Hazards Mitigation Plan Committee in cooperation with Northwest Management, Inc., 233 E. Palouse River Dr., P.O. Box 9748, Moscow, ID, 83843, Tel: 208-883-4488, 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 preparedness for hazard events while reducing factors of risk.

Canyon County Commissioners and the employees of Canyon County

USDI Bureau of Land Management

Southwest Idaho Resource Conservation and Development Council, Inc.

USDI Bureau of Reclamation

Idaho Bureau of Homeland Security

Federal Emergency Management Agency

Idaho Transportation Department

Idaho Fish and Game

USDI Fish and Wildlife Service

USDA Forest Service

Idaho Department of Lands

City of Nampa

City of Caldwell

City of Middleton

City of Melba

City of Notus
City of Greenleaf
City of Wilder
City of Parma &
Local Businesses and
Citizens of Canyon County

Mercy Medical Center

Caldwell Fire Protection District

Nampa Fire Department

Nampa Police Department

Melba Fire Department
Middleton Fire, Rescue, & Emergency Services
Parma Fire Department
Upper Deer Flats Fire Department
Star Joint Fire Protection District
Wilder Rural Fire Protection District
Caldwell Police Department

To obtain copies of this plan contact:

Canyon County Commissioners Office
Canyon County Courthouse
1115 Albany
Caldwell, ID 83605
Phone: (208) 454-7300

Table of Contents

CHAPTER I: OVERVIEW OF THIS PLAN AND ITS DEVELOPMENT 1

1 INTRODUCTION 1

1.1 PHASE I HAZARD ASSESSMENT FOR CANYON COUNTY 2
1.1.1 Other Hazards Not Addressed in this Plan 3
1.2 GOALS AND GUIDING PRINCIPLES 3
1.2.1 Federal Emergency Management Agency Philosophy 3
1.2.2 Additional State and Federal Guidelines Adopted 4
1.2.3 Canyon County Planning Effort and Philosophy 4
1.2.3.1 Vision Statement 4
1.2.3.2 Mission Statement 5
1.2.3.3 Goals 5

CHAPTER 2: DOCUMENTING THE PLANNING PROCESS 6

2 INITIATION 6

2.1 DESCRIPTION OF THE PLANNING PROCESS 6
2.2 THE PLANNING TEAM 6
2.3 PUBLIC INVOLVEMENT 8
2.3.1 News Releases 8
2.3.1.1 Newspaper Articles 9
2.3.2 Public Mail Survey 9
2.3.2.1 Survey Results 10
2.4 COMMITTEE MEETINGS 12
2.4.1 Committee Meeting Minutes 14
2.4.1.1 June 30th, 2005 - Caldwell County Courthouse 14
2.4.1.2 July 21st, 2005 - Caldwell County Courthouse 15
2.4.1.3 September 20th, 2005 18
2.4.1.4 October 20th, 2005 18
2.4.2 Public Meetings 19
2.4.3 Documented Review Process 24
2.4.4 Continued Public Involvement 24

CHAPTER 3: CANYON COUNTY CHARACTERISTICS 25

3 BACKGROUND AND AREA DESCRIPTION 25

3.1 DEMOGRAPHICS 25
3.2 SOCIOECONOMICS 27
3.2.1 European Settlement of Canyon County 29
3.3 DESCRIPTION OF CANYON COUNTY 30
3.3.1 Highways 30
3.3.2 Rivers 30
3.3.3 Climate 30
3.3.4 Growing Season 31
3.3.5 Hours of Sunshine 31
3.3.6 Recreation 31
3.3.6.1 Old Fort Boise 31
3.3.6.2 Deer Flat National Wildlife Refuge 31
3.3.6.3 Celebration Archaeology Park 32
3.3.6.4 Bureau of Land Management Public Lands 32
3.3.6.5 Golfing 32
3.3.6.6 Boating 32
3.3.6.7 Fishing and Hunting 33
3.3.7 Resource Dependency 33
3.4 EMERGENCY SERVICES & PLANNING AND ZONING 34
3.5 GROWTH AND DEVELOPMENT 34
3.6 CULTURAL RESOURCES 34

3.6.1 National Register of Historic Places *35*
3.7 TRANSPORTATION 36
3.8 ALL HAZARDS PROFILE 37
3.9 PLANNING AND ZONING 46
3.9.1 Building Permit Requirements *46*
3.9.2 Information on Plans and Specifications *46*
3.9.2.1 Drawings 46

CHAPTER 4: FLOODS 48

4 FLOOD CHARACTERISTICS 48

4.1 HISTORY 48
4.1.1 February 1982 ..... *48*
4.1.2 January 17, 1971 ..... *49*
4.1.3 February 1963 ..... *49*
4.1.4 August 1, 1955 ..... *49*
4.1.5 April-June 1943 ..... *49*
4.1.6 May 2, 1938 ..... *50*
4.1.7 April 25, 1936 ..... *50*
4.1.8 Indian Creek Flood - March 4, 1910 ..... *50*
4.1.9 May 14-June 17, 1896 ..... *50*
4.1.10 March 16, 1894 ..... *51*
4.1.11 December 1871 ..... *51*
4.1.12 July 4, 1862 ..... *51*
4.2 WEATHER 51
4.3 TOPOGRAPHY 52
4.4 DEVELOPMENT 52
4.5 CANYON COUNTY FLOOD PROFILE 53
4.5.1 Assets at Risk to Flooding *56*
4.5.2 Countywide Potential Mitigation Activities *59*
4.5.2.1 Mitigation 59
4.5.2.2 Readiness/Education 59
4.5.2.3 Building Codes 60
4.6 INDIVIDUAL COMMUNITY ASSESSMENTS 63
4.6.1 Nampa *63*
4.6.1.1 Flood Potential 63
4.6.1.2 Ingress-Egress 64
4.6.1.3 Infrastructure 64
4.6.1.4 Assets at Risk 65
4.6.1.5 Flood Protection 66
4.6.1.6 Mitigation Activities 66
4.6.2 Caldwell *66*
4.6.2.1 Flood Potential 66
4.6.2.2 Ingress-Egress 67
4.6.2.3 Infrastructure 67
4.6.2.4 Assets at Risk 68
4.6.2.5 Flood Protection 69
4.6.2.6 Mitigation Activities 69
4.6.3 Middleton *69*
4.6.3.1 Flood Potential 70
4.6.3.2 Ingress-Egress 71
4.6.3.3 Infrastructure 71
4.6.3.4 Assets at Risk 72
4.6.3.5 Flood Protection 73
4.6.3.6 Mitigation Activities 73
4.6.4 Notus *73*
4.6.4.1 Flood Potential 73
4.6.4.2 Ingress-Egress 74
4.6.4.3 Infrastructure 75
4.6.4.4 Assets at Risk 75

4.6.4.5 Flood Protection 76
4.6.4.6 Mitigation Activities 76
4.6.5 Parma *76*
4.6.5.1 Flood Potential 76
4.6.5.2 Ingress-Egress 78
4.6.5.3 Infrastructure 78
4.6.5.4 Assets at Risk 78
4.6.5.5 Flood Protection 79
4.6.5.6 Mitigation Activities 79

CHAPTER 5: LANDSLIDES 80

5 LANDSLIDE CHARACTERISTICS 80

5.1 CANYON COUNTY PROFILE 80
5.1.1 Assets at Risk to Landslides *85*
5.2 LANDSLIDE PRONE LANDSCAPES 88
5.3 INDIVIDUAL COMMUNITY ASSESSMENTS 88
5.4 GENERAL LANDSLIDE HAZARDS MITIGATION STRATEGIES 88
5.4.1 Establish a countywide landslide hazard identification program *88*
5.4.2 Restricting development in Landslide Prone Landscapes *88*
5.4.3 Standardizing codes for excavation, construction, and grading *89*
5.4.4 Protecting existing development *89*
5.4.5 Post warnings of potentially hazardous areas and educate the public about areas to avoid *89*
5.4.6 Utilizing monitoring and warning systems *89*
5.4.7 Public Education *89*
5.5 FIRE RELATED DEBRIS FLOWS 90
5.5.1 Conditions for fire-related debris-flow occurrence *90*
5.5.2 General Mitigation Activities *91*

CHAPTER 6: EARTHQUAKE 92

6 EARTHQUAKE 92

6.1 MEASURING AN EARTHQUAKE 92
6.2 EARTHQUAKE PROFILE IN IDAHO 93
6.2.1 Canyon County Earthquake Profile *94*
6.2.1.1 Assets at Risk to Earthquake Damage 95
6.2.1.1.1 Nampa 96
6.2.1.1.2 Caldwell 96
6.2.1.1.3 Middleton 96
6.2.1.1.4 Notus 96
6.2.1.1.5 Parma 96
6.2.1.1.6 Wilder 96
6.2.1.1.7 Greenleaf 97
6.2.1.1.8 Melba 97
6.3 HISTORY 97
6.3.1 May 12, 1916 ..... *97*
6.3.2 October 2, 1915 ..... *97*
6.3.3 September 24, 1947 ..... *97*
6.4 SEISMIC SHAKING HAZARDS 98
6.5 FAULT LINE GEOLOGY 99
6.6 COUNTYWIDE POTENTIAL MITIGATION ACTIVITIES 101

CHAPTER 7: SEVERE WEATHER 103

7 SEVERE WEATHER CHARACTERISTICS 103

7.1 WINTER STORMS 103
7.2 THUNDERSTORMS 104
7.3 HISTORY 104
7.3.1 1987-1992 - Drought *104*
7.3.2 February 15, 1949 – Winter Storm *104*

7.3.3 January-February 1916 – Winter Storm *105*
7.3.4 The Big Shiver of '88 - January 13, 1888 – Winter Storm *105*
7.4 DROUGHT 106
7.5 REGIONAL CLIMATE PROFILE 106
7.5.1 Topographic Features *107*
7.5.2 Temperature *107*
7.5.3 Precipitation *108*
7.5.4 Snowfall *108*
7.5.5 Windstorms and Tornadoes *108*
7.6 CANYON COUNTY CONDITIONS 109
7.6.1 Monthly Climate Summaries In or Near Canyon County *110*
7.6.1.1 Caldwell, Idaho (101380) 110
7.6.1.2 Parma Experiment Station, Idaho (106844) 110
7.6.1.3 Deer Flat Dam, Idaho (102444) 111
7.6.1.4 Nampa Sugar Factory, Idaho (106305) 111
7.6.2 Individual Community Assessments *111*
7.6.3 Countywide Potential Mitigation Activities *112*
7.6.3.1 Mitigation 112
7.6.3.2 Readiness/Education 113
7.6.3.3 Building Codes 113

CHAPTER 8: POTENTIAL MITIGATION ACTIVITIES 115

8 ADMINISTRATION & IMPLEMENTATION STRATEGY 115

8.1 PRIORITIZATION OF MITIGATION ACTIVITIES 115
8.1.1 Prioritization Scheme *116*
8.1.1.1 Benefit / Cost 117
8.1.1.2 Population Benefit 117
8.1.1.3 Property Benefit 117
8.1.1.4 Economic Benefit 118
8.1.1.5 Vulnerability of the Community 118
8.1.1.6 Project Feasibility (Environmentally, Politically & Socially) 118
8.1.1.7 Hazard Magnitude/Frequency 118
8.1.1.8 Potential for repetitive loss reduction 118
8.1.1.9 Potential to mitigate hazards to future development 118
8.1.1.10 Potential project effectiveness and sustainability 119
8.1.1.11 Final ranking 119
8.2 RECOMMENDED HAZARD MITIGATION ACTIVITIES 119
8.2.1 Policy Actions *119*
8.2.1.1 Proposed Activities 120
8.2.2 Home and Business Protection Measures *122*
8.2.2.1 Proposed Activities 122
8.2.3 Infrastructure Hardening *123*
8.2.3.1 Proposed Activities 123
8.2.4 Resource and Capability Enhancements *127*
8.2.4.1 Proposed Activities 127

CHAPTER 9: SUPPORTING INFORMATION 129

9 SUPPORTING TABLES 129

9.1 LIST OF TABLES 129
9.2 LIST OF FIGURES 130
9.3 LIST OF PREPARERS 131
9.4 SIGNATURE PAGES 132
9.4.1 Representatives of Canyon County Government *132*
9.4.2 Representatives of City Government in Canyon County *133*
9.4.2.1 Representatives from the City of Nampa 133
9.4.2.2 Representatives from the City of Caldwell 134
9.4.2.3 Representatives from the City of Middleton 135
9.4.2.4 Representatives from the City of Notus 136
9.4.2.5 Representatives from the City of Parma 137

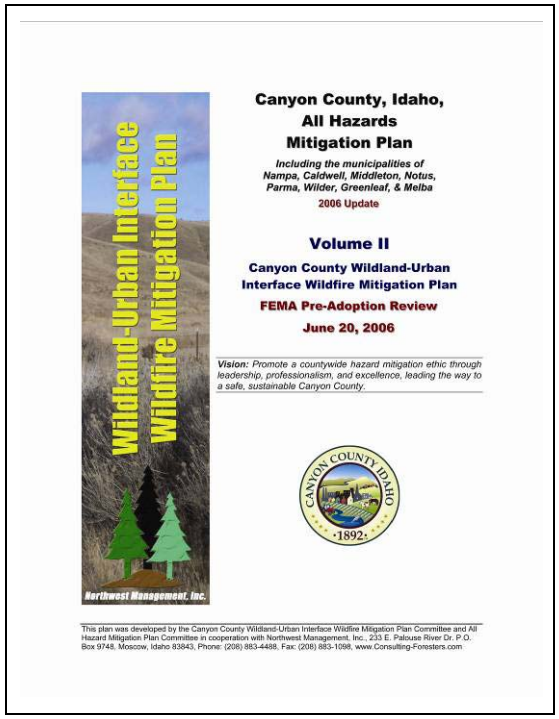
9.4.2.6 Representatives from the City of Wilder 138
9.4.2.7 Representatives from the City of Greenleaf 139
9.4.2.8 Representatives from the City of Melba 140
9.4.3 Representatives of City and Rural Fire Districts in Canyon County 141
9.4.4 Representatives of Organizations and Federal and State Agencies 142
9.5 LITERATURE CITED 143

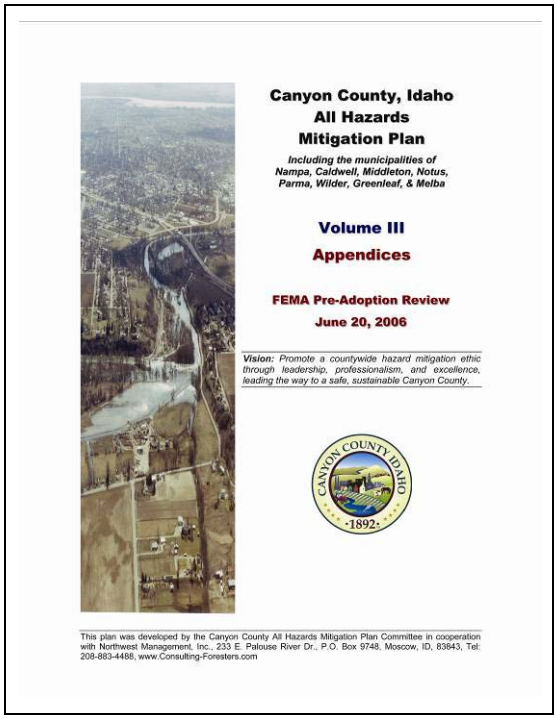
Foreword

The **Canyon County All Hazards Mitigation Plan** was developed during 2005-06 by the Canyon County Hazard Mitigation Planning Committee in cooperation with Northwest Management, Inc., of Moscow, Idaho. Three bound documents have been produced as part of this planning effort. They include:

- Volume I: All Hazards Mitigation Plan including chapters of;
    - Flood Mitigation Plan
    - Landslide Mitigation Plan
    - Earthquake Mitigation Plan
    - Severe Weather Mitigation Plan
- Volume II: Wildland-Urban Interface Wildfire Mitigation Plan
- Volume III: All Hazard Mitigation Plan Appendices

The Canyon County Wildland-Urban Interface Wildfire Mitigation Plan, in addition to being compatible with FEMA requirements is also compatible with the National Fire Plan, the Healthy Forests Restoration Act, and the Idaho Implementation Strategy for the National Fire Plan.





Chapter I: Overview of this Plan and its Development

1 Introduction

This All Hazard Mitigation Plan for Canyon County, Idaho, is the result of analyses, professional cooperation and collaboration, assessments of Flood, Landslide, Earthquake, and Severe Weather risks and other factors considered with the intent to reduce the potential for these hazards to threaten people, structures, infrastructure, and unique ecosystems in Canyon County, Idaho. The planning team responsible for implementing this project was led by the Canyon County Commissioners. Agencies and organizations that participated in the planning process included:

- Caldwell City Planning Department
- Caldwell City Public Works
- Caldwell Police Department
- Canyon County Assessor
- Canyon County Emergency Management
- Canyon County Board of County Commissioners
- Canyon County Highway District #4
- Canyon County Local Emergency Planning Committee
- Canyon County Planning Department
- Canyon County Sheriff's Department
- Canyon County Highway District
- City of Caldwell
- City of Melba
- City of Middleton
- City of Greenleaf
- City of Wilder
- City of Nampa
- City of Notus
- City of Parma
- Golden Gate Highway District
- Idaho Department of Lands
- Idaho Fire Chief's Association
- Idaho Transportation Department
- Kuna Fire District
- Melba Fire Department
- Mercy Medical Center
- Middleton Fire, Rescue, and Emergency Services
- Nampa City Planning Department
- Nampa City Public Works
- Nampa Dispatch Center
- Nampa Fire Department
- Nampa Highway District
- Nampa Police Department
- Northwest Management, Inc.
- Northwest Nazarene University
- Notus Fire Department

- Notus/Parma Highway District
- Notus Public Works
- Parma Fire Department
- Regional Communications - Canyon County Dispatch Center
- Southwest District Health
- Southwest Idaho Resource Conservation and Development Council
- Star Joint Fire Protection District
- Upper Deer Flats Fire Department
- USDA Forest Service
- USDI Bureau of Land Management
- USDI Fish and Wildlife Service
- West Valley Medical Center
- Wilder Rural Fire Protection District

The Canyon County Commissioners, working cooperatively with the Southwestern Idaho RC&D, solicited competitive bids from companies to provide the service of leading the assessment and the writing of the **Canyon County All Hazard Mitigation Plan** of which the County's Wildfire Mitigation Plan is being incorporated as a chapter. The Southwest RC&D selected Northwest Management, Inc. to provide this service. Northwest Management, Inc., is professional natural resources consulting firm located in Moscow, Idaho. Established in 1984 NMI provides natural resource management services across the USA. The Project Manager from Northwest Management, Inc. was Dr. William E. Schlosser, a professional forester and regional planner..

1.1 Phase I Hazard Assessment for Canyon 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 Canyon 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 Canyon County by Planning Committee.

Probability of Occurrence	Low	Medium	High
High		Flood	Severe Weather Wind Storms Hazardous Materials
Medium		Wildfire Landslide	
Low		Earthquake	
	Potential to Impact People, Structures, Infrastructure, and the Economy		

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

- Wildland-Urban Interface Wildfire Mitigation Plan
- Flood Mitigation Plan
- Landslide Mitigation Plan

- Earthquake Mitigation Plan
- Severe Weather (Wind Storm, Winter Storm, Drought) Mitigation Plan

1.1.1 Other Hazards Not Addressed in this Plan

Civil Unrest/ Terrorism were not addressed in this plan due its historically low impact in the county. With the presence of the jail next to the County Courthouse as well as major rail routes and with the heightened awareness countrywide this may need to be addressed in the future.

Another hazard issue within the county and specifically for the cities of Caldwell and Nampa is Hazardous Material transport on Interstate 84 and the railroads. The rail lines bisect the cities of Caldwell and Nampa. Interstate 84 runs through the northern sections of Caldwell and Nampa. Funding for detailed assessments of this hazard and potential mitigation activities should be sought. Future planning for hazardous materials mitigation could be added to this All Hazard Mitigation Plan at an annual update.

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 covers 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

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
- Implementation Through Existing Programs
- Continued Public Involvement

1.2.2 Additional State and Federal Guidelines Adopted

The Wildland-Urban Interface Wildfire Mitigation Plan component of this All Hazards Mitigation Plan will include compatibility with FEMA requirements while also adhering to the guidelines proposed in the National Fire Plan, the Idaho Statewide Implementation Plan, and the Healthy Forests Restoration Act (2004). The Wildland-Urban Interface Wildland Fire Mitigation Plan has been prepared in compliance with:

- The National Fire Plan; A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan–May 2002.
- The Idaho Statewide Implementation Strategy for the National Fire Plan–July 2002.
- Healthy Forests Restoration Act (2004)
- The Federal Emergency Management Agency's Region 10 guidelines for a Local Hazard Mitigation Plan as defined in 44 CFR parts 201 and 206, and as related to a fire mitigation plan chapter of a Natural Hazards Mitigation Plan.

The objective of combining these four complimentary guidelines is to facilitate an integrated wildland fire risk assessment, with the All Hazard risk assessment and to identify pre-hazard mitigation activities, and prioritize activities and efforts to achieve the protection of people, structures, the environment, and significant infrastructure in Canyon County while facilitating new opportunities for pre-disaster mitigation funding and cooperation.

1.2.3 Canyon County Planning Effort and Philosophy

The goals of this planning process include the integration of the National Fire Plan, the Idaho Statewide Implementation Strategy, the Healthy Forests Restoration Act, the Idaho State Hazard Mitigation Plan 2004, the Canyon County Comprehensive Plan and the requirements of FEMA for a county-wide All Hazards Mitigation Plan. This effort will utilize the best and most appropriate science from all partners, the integration of local and regional knowledge about man made and natural hazards, 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 Vision Statement

Promote a countywide hazard mitigation ethic through leadership, professionalism, and excellence, leading the way to a safe, sustainable Canyon County.

1.2.3.2 Mission Statement

To make Canyon County residents, communities, state agencies, local governments, and businesses less vulnerable to the negative effects of natural and human-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.

1.2.3.3 Goals

- Prioritize the protection of people, structures, infrastructure, and unique ecosystems that contribute to our way of life and the sustainability of the local and regional economy
- To provide a plan that will not diminish the private property rights of landowners in Canyon County
- Educate communities about the unique challenges of natural hazard preparedness in the county.
- Establish mitigation priorities and develop mitigation strategies in Canyon County
- Strategically locate and plan infrastructure projects that take into consideration the impacts of natural hazards.
- Meet or exceed the requirements of a FEMA All Hazard Mitigation Plan.

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 Canyon County All Hazard 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 throughout the process):

1. **Collection of Data** about the extent and periodicity of hazards in and around Canyon County. This included an area encompassing Ada, Canyon, Owyhee, Payette, Gem and Elmore counties to insure a robust dataset for making inferences about hazards in Canyon 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. Leading efforts from Canyon County, was Todd Herrera, Canyon County Disaster Services Coordinator, who organized meetings, facilitated information management, and coordinated many activities associated with the development of the plans.

They led a team of resource professionals that included city and rural fire protection, law enforcement, municipal public works, federal agencies, health districts, resource management professionals, hazard mitigation experts, and local city employees.

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.

The planning philosophy employed in this project included the open and free sharing of information with interested parties. Information from federal and state agencies and county departments 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:

- Canyon County, Idaho
- City of Nampa
- City of Caldwell
- City of Middleton
- City of Notus
- City of Wilder
- City of Parma
- City of Melba
- City of Greenleaf

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 (mayors and County Commissioners, Assessor, and Sheriff), appointed officials, 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: Todd Herrera, Canyon County Disaster Services Coordinator; Dr. William E. Schlosser, Toby Brown, and Tera King all of Northwest Management, Inc.; and Bill Moore Southwest Idaho Resource Conservation and Development Council, Inc. Coordinator.

Like other rural areas of Idaho and the USA, Canyon County's human resources have many demands put on them in terms of time and availability. Although many of the elected officials (County Commissioners and Nampa and Caldwell Mayors) serve in a full-time capacity. Many of the smaller towns and cities elected officials serve in a part time capacity. Many of them have other employment and serve the community through a convention of community service. Recognizing 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 the organization on the process and serve as a conduit between the planning committee and the jurisdiction. This was the case with the Canyon County Commissioners where Todd Herrera attended each planning committee meeting as a regular attendee and reported back to the Commissioners.

At the city level, all of the City Mayor offices were represented in a variety of ways. Most commonly, the Mayor of a municipality appointed a representative from the municipality to provide this representation on the committee meetings. In cases where the mayor was unable to attend, 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 educating themselves about hazards that might affect their own homes and businesses, while in other cases it led to the public becoming more aware of the overall planning process without becoming directly involved.

2.3.1 News Releases

Under the auspices of the Canyon County All Hazards Mitigation Planning Committee, news releases were submitted to local Canyon County newspapers. Informative flyers were also distributed around town and to local offices through the committee. Flyers were also distributed by individual committee members using email distribution lists. The following is the press release distributed to media outlets on August 29th 2005.

Hot Topic: Canyon County All Hazards Mitigation Plan

The Canyon County All Hazards Mitigation Plan has been launched to complete an All Hazards Mitigation Plan for Canyon County as part of the FEMA Pre Disaster Mitigation program. The Canyon County All Hazards Mitigation Plan will include risk analysis at the community level with predictive models for where disasters are likely to occur. The local contact for this effort is Canyon County Emergency Management Coordinator Todd Herrera. Northwest Management, Inc. has been retained by the Southwest ID RC&D on behalf of 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, land managers, elected officials, county departments, community members and others. Northwest Management specialists will conduct an analysis and make recommendations for potential treatments to mitigate the loss potential from various natural hazards.

Hazard mitigation planning is a collaborative process whereby hazards affecting the community are identified, vulnerability to the hazards are assessed, and consensus reached on how to minimize or eliminate the effects of these hazards. In recognition of the importance of planning, States and Counties with an approved Mitigation Plan in effect at the time of disaster declaration may receive additional Hazard Mitigation Grant Program (HMGP) funding. In addition the Pre-Disaster Mitigation (PDM) program provides technical and financial assistance to States and

local governments for cost-effective pre-disaster hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property. This planning process is one of the ways the county assesses and upgrades its ability to respond to a Varity of natural disasters.

The planning team will be conducting four public meetings to discuss preliminary findings and to seek public involvement in the planning process from September 6 to 8th, 2005. For more information on the All Hazards Mitigation Plan project in Canyon County contact Canyon County Emergency Management Coordinator Todd Herrera (208) 454-7271 or Northwest Management project coordinator Toby R. Brown at 208-883-4488. Everyone interested in these meetings is encouraged to attend and join in the discussions!

Public Information Meeting Schedule:

Middleton: September 6th @ 7 pm Middleton Civic Center 314 East Main

Nampa: September 7th @ 7 pm Hispanic Cultural Center Room 200, 315 Stampeded Drive

Melba: September 8th @ 12 PM Melba Senior Center 115 Baseline Road

Notus: September 8th @ 7 pm Notus Community Center 1st Street

2.3.1.1 Newspaper Articles

Public meeting announcements were published in the local newspapers ahead of each meeting. The above news article referenced the start of the planning process, the public survey, and the public meetings that were held in the county.

2.3.2 Public Mail Survey

In order to collect a broad base of perceptions about individual risk factors of homeowners in Canyon County, a mail survey was conducted. Approximately 235 residents of Canyon County were randomly selected to receive a mail survey.

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 Volume III Appendices.

The first in the series of mailings was sent August 5, 2005, and included a cover letter, a survey, and an offer of receiving a custom GIS map of the area of their selection in Canyon 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 and upcoming public meetings. A return self-addressed enveloped was included in each packet. A postcard reminder was sent to the non-respondents on August 17, 2005, encouraging their response. A final mailing, with a revised cover letter pleading with them to participate, was sent to non-respondents on August 29, 2005.

Surveys were returned during the months of August, September, October, and November. A total of 67 residents responded to the survey as of May 2nd, 2006. The effective response rate for this survey was 29%. 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 respondents in the survey 96% indicated that Canyon County was their primary residence. Respondents were asked to identify which "community they lived closest too" in many cases this may have been a town or city outside of the county in an adjacent county. Approximately 13% were from the Parma area, 19% from Nampa, 15% from Caldwell, 9% were from Wilder, 6% from Greenleaf, 13% from Middleton, 10% from Melba, and 3% each from Kuna, Marsing, and Star.

The vast majority of the respondents (96%) correctly identified that they have emergency telephone 911 services in their area. Structure fire protection in Canyon County is limited to those living within the rural fire districts. Approximately 96% of the respondents to the survey indicated they have rural structural fire protection. Analysis of this data indicates that none of those living outside of a fire protection district believe they have structural fire protection. However, 100% of those respondents who live outside of a structure fire protection area reported they do not have rural fire protection services.

The average driveway length of respondents to the survey was 428 feet long. The longest reported driveway was 1 mile. The average driveway running surface width was 21 feet with a range from 10 to 80 feet. Of those respondents (12%) with a driveway over ¼ mile long, approximately 50% do not have turnouts allowing two vehicles to pass. Approximately 58% of the respondents indicated an alternate escape route was available in an emergency which cuts off their primary driveway access. Approximately 40% of respondents indicated that they plow snow off their entire drive way width in the winter. About 42% of the respondents indicated an overhead obstruction in their drive ways. The average overhead obstruction was 17 ft high with 6% indicating 8 feet, 7% under 10 feet, and 15% under 12 feet. Roughly 37% indicated that their driveway was of moderate steepness. When asked if their home address was clearly visible at the junction of their driveway and the public road 94% responded that their addresses were clearly marked. Around 6% of respondents indicated that their driveway crossed water and 15% had a water body on their property.

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 Firefighting	5%
City or Rural Firefighting	3%
EMT (Emergency Medical Technician)	2%
Basic First aid/ CPR	31%
Search and Rescue	5%

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

Table 2.2. Disasters affecting homes in Canyon County.

↓Hazard↓	Percent of respondents reporting hazard occurrence during the period 1995-2005, near their home.	If YES, Complete these questions…	Percent of respondents experiencing damage to their home or property.	Approximate average damage caused by each hazard (during the period 1995-2005)
Wildfire	2%	→	--	$0
Flood	5%	→	5%	$1,200
Earthquake	0%	→	--	$--
Landslide	0%	→	--	$--
Wind Storm	35%	→	17%	$25,080
Winter Storm	17%	→	3%	$4,600

Other hazards that responders listed as a concern included:

- Power Outage
- Gov't regs
- Dogs
- Falling trees
- Railroad spills
- St. Highway
- Flash flood

Many Canyon County residents have been affected by at least one of the hazards covered by the All Hazards Mitigation Plan (wildfire, flood, landslide, and severe storm). The survey included a series of questions asking respondents to rank (scale of 1-6, 1 being of the highest threat) the importance or risk to the county as a whole from the hazards specified in Table 2.3.

Table 2.3. Ranking of Potential Risk

Type of Hazard	Ranking "1"	Ranking "2"	Ranking "3"	Ranking "4"	Ranking "5"	Ranking "6"	Ranking "7"
Wildfire	26%	12%	11%	18%	15%	17%	2%
Flood	5%	6%	12%	18%	33%	26%	0%
Earthquake	8%	0%	9%	14%	32%	36%	2%
Landslide	2%	3%	3%	12%	12%	65%	3%
Wind Storm	29%	23%	15%	14%	6%	11%	2%
Winter Storm	12%	23%	30%	20%	5%	11%	0%

Based on this assessment, the respondents to the survey rated these hazards as follows:

1. Wind Storm (score 5.14)
2. Winter Storm (score 4.89)
3. Wildfire (score 4.62)
4. Flood (score 3.54)
5. Earthquake (score 3.27)
6. Landslide (score 2.64)

Approximately 76% of respondents have a communication alternative to their landline phone service. Of these 77% have a cell phone, 0% a satellite phone, 6% a CB, and 18% have two way radios. 18% of respondents indicate having an alternative energy source.

When asked how long they expected various emergency services to respond to their homes Emergency Medical Services averaged 13 minutes, structural fire (where available) averaged 12 minutes, and law enforcement averaged 17 minutes.

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?" Just over 50% of respondents indicated a desire to participate in this type of training.

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 2.4.

Table 2.4. Public Opinion of Hazard Mitigation Funding Preferences.

	100% Public Funding	Cost-Share (Public & Private)	Privately Funded (Owner or Company)
Home Defensibility Projects →	20%	40%	40%
Community Defensibility Projects →	41%	51%	8%
Infrastructure Projects Roads, Bridges, Power Lines, Etc. →	74%	20%	6%

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

2.4 Committee Meetings

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

NAME **ORGANIZATION**

- Alan Brock.....Notus/Parma Highway District
- Alan Laird.....Canyon County LEPC
- Albert Erickson.....Wilder Police Department
- Al Bidwell.....Canyon County LEPC
- Arnold Waldemer .....Wilder Rural Fire Protection District
- Bob Flowers .....City of Parma
- Bob Schmillen .....City of Middleton
- Brad Trosky.....Middleton Fire, Rescue, and Emergency Service
- Bryce Millar .....Nampa Highway District
- Carrie Bilbao .....Bureau of Land Management
- Carmen Boeger.....Nampa Dispatch Center
- Casey Bequeath.....Canyon County Highway District #4
- Chris Smith.....County Sheriff
- Craig Wolford .....County Planning Department
- Curtis Homer.....Nampa Police Department
- David Carcich.....Canyon County CERT
- Dick Powell.....State Transportation Dept District # 3
- Doug Amick.....Wilder Rural Fire Protection District
- Doug Brown .....Idaho Fire Chief's Association
- Doug Rosin .....Kuna Fire District

- Elaine Johnson.....Deer Flat National Wildlife Refuge
- Eric Shannon.....State Transportation Dept District # 3
- Evan Rasmussen.....Bureau of Reclamation
- Frank McKeever.....City of Middleton
- Fred Montel.....Canyon County LEPC
- Garrett Nancolas.....City of Caldwell
- Gianpaulo Mammone.....Caldwell City Planning
- Gordon Law.....Caldwell City Public Works
- Greg Owen.....Canyon County Paramedics
- James Cook.....Parma Fire Department
- Jerome Scroggins.....Canyon Highway District
- Jim Smith.....Idaho Transportation Department
- John Stone.....West Valley Medical Center
- Ken Council.....Idaho Transportation Department
- Kester, Paul.....County Planning Department
- Kevin Courtney.....Star Joint Fire Protection District
- Kuehn, Gene.....County Assessor
- Laurel Bennett.....Southwest District Health
- Laurie Boston.....Southwest District Health
- Lennie Elfering.....Parma Police Department
- Leroy Forsman.....Nampa Police Department
- Linda Waller.....Northwest Nazarene University
- Lorainne Elfering.....Canyon County Dispatch Center
- Lynette Berriochoa.....Idaho Power
- Lynn Thompson.....Canyon County LEPC & Nampa Public Works
- Marje Ellmaker.....City of Notus
- Mark Wendelsdorf.....Caldwell Rural Fire Protection District
- Martin Luttrell.....City of Melba
- Melanie Nixon.....Local Red Cross
- Norm Holm.....Nampa City Planning
- Paul Raymond.....Nampa City Public Works
- Ralph Little.....Canyon Highway District
- Richard Davies.....Nampa Fire Department
- Richard Farner.....Melba Fire Department
- Richard Jesler.....Red Cross
- Robert Sobba.....Caldwell Police Department
- Rod Traux.....Amateur Radio Service
- Ron Javaux.....City of Notus
- Russ Dunn.....Amateur Radio Service
- Russ Schrall.....Upper Deer Flat Fire Department
- Stewart Constantine.....Golden Gate Highway District
- Tera R. King.....Northwest Management, Inc.
- Teresa Prow.....Mercy Medical Center
- Terry Wilson.....Southwest District Health
- Thomas Krasowski.....Notus Public Works
- Toby R. Brown.....Northwest Management, Inc.
- Todd Herrera.....Canyon County Emergency Management
- Tom Dale.....City of Nampa

- Tom Krasowski.....City of Notus
- Travis Best .....Southwest District Health
- Tyler Nimke .....Northwest Management, Inc.
- Wayne Davis .....Melba Fire Department
- Wayne Tuckness.....West Valley Medical Center
- William E. Schlosser .....Northwest Management, Inc.
- William Moore .....Southwest Idaho RC&D

2.4.1 Committee Meeting Minutes

Regular committee meetings were held from June thru October, 2005.

2.4.1.1 June 30th, 2005 - Caldwell County Courthouse

6:30 PM - Toby Brown presenting, Bill Schlosser note taking. 21 people in attendance, sign in sheet completed.

Toby presented slideshow of the Hazard Mitigation Planning process. Questions and comments included:

- Example of Notus was discussed as a community with some preparedness in terms of electrical generator backup.

Introductions: Very diverse group, many municipalities. Contact list has names of participants. Need to invite the irrigation district personnel; may be quite a few folks. Commissioner Beebe provided map of irrigation districts ***(Source Idaho Department of Water Resources)***. NMI needs a copy of this data. There are dozens. Idaho Power and the Gas company need to be invited as well. Committee members have a responsibility on the committee to be responsive and informative.

Mission, Vision, Goals: Toby discussed the MVG. Public announcements about what is going on are needed. The MVG were passed around for discussion, folks felt they represented the county accurately. Thoughts were shared. Question about cooperation with cities. Dr. Schlosser described the adoption process and multiple reasons the cities need to be in the room. While many cities are in the room right now, every city needs represented. Committee members agreed to review the MVG and keep refining them as we move ahead.

Timelines were discussed, passed out timeline document. Comments collected.

Review of Natural Hazards Maps: Bill and Toby discussed hazard assessments and what they reveal. Discussions on the results. Comments: looks good, want to look at them in higher relief. Verified shaking hazards in the county earthquakes in far away counties shake this county; even though we do not have fault zones.

We need qualitative stories on hazards in Canyon County. Committee members please provide them to us so we can document them in this AHMP! ☺

Press Releases: to be distributed to local media. Looked over press release as a group. Comments also invited from participants after the mail. Committee providing review.

Survey instrument: discussed how names are selected, and Dillman Total Design Method of conducting surveys. Toby went over survey instrument, question by question. Discussions on a few items, everyone will review and provide additional feedback as ideas are developed. Some comments on the usefulness of the public mail survey, “it seems like a small sample with

marginal usefulness". Dr. Schlosser discussed the purpose of the mail survey and how it is used as one component of the overall public involvement. "It is a good bang for the buck".

Public Meeting Dates: Schedule distributed, discussed. Committee should have a booth at the county fair showing the plan elements. Notus City Council meets on August 1 at 7:00 PM and should host a public meeting. Nampa Civil center will be available this week as well. Schedule meetings with the civic groups in addition to the public meetings. Target about 4 public meetings in addition to the civic groups. Rosalie Moore is the Canyon County Fair & Festival Administrator. 208-455-8500 (business card provided). Contact her to get booth at the fair. Commissioner Beebe will assist with logistics (County Commissioner's project?).

Phase I Hazard Assessment of Canyon County by Planning Committee.

Probability of Occurrence				
	High		Flood	Severe Weather Wind Storms Hazardous Materials
	Medium		Wildfire	
	Low	Landslide	Earthquake	
		Low	Medium	High
		Potential to Impact People, Structures, Infrastructure, and the Economy		

Draft community assessments will incorporate the above data and be provided to the committee for comment. These provide the basis for comparing the risks in each community by hazard exposure.

Hazards by Community: To be further developed before next committee meeting based on hazard profiles and assessments.

Resources and Capabilities: samples were distributed, need to get updated information from all Services. Please provide updates. Emergency services needs (ambulance, fire, police, search and rescue). Primary responsibilities fall to each EMS department.

Critical infrastructure: discussions for next meeting. Toby provided many example of critical infrastructure and its importance. Led a discussion on the needs.

Next meeting: Working session? Expand it to about 4 hours. NMI will buy lunch. Meeting set for July 21 from 10:00 to 2:00 at County Courthouse. Commissioner Beebe will confirm the availability of the room. This will be a work-group style meeting with each community set up on separate tables to assess risk mitigation for all hazards.

2.4.1.2 July 21st, 2005 - Caldwell County Courthouse

Toby Brown of Northwest Management, Inc. began the meeting at 10 am by giving the attendants a brief update of the status of the All Hazard Mitigation Plan as well as a forecast of dates for upcoming events and meetings.

In order to leave enough time to acquire venues and send out media releases, the public meeting dates were pushed back to the week of August 23rd. The Caldwell Rural Fire Chief suggested that they hand out free smoke alarms at the meetings to help draw a crowd. Travis Best, a representative from the Health District, added that he might be able to come up with a few free radon detectors as well.

Additional entities the committee would like added to the current Resources and Capabilities list were: the Public Works Department, the irrigation districts, and hospitals. Todd Herrera has an up-to-date list.

10:00 A.M. – Canyon County Courthouse

Toby Brown led meeting discussions, sign in sheet passed around (15)

- Press outlets in count-
- Kuna Melba News
- Parma Western Chronicle
- Middleton Gazette
- Press Tribune
- Nampa/Caldwell Chamber of Commerce Newsletter (Diana Brown)
- Canyon County website (Rodney Hastleford)
- City water/fire cut sheets (Caldwell Fire is contact)

Public mail survey is approved by the committee.

Public meetings:

- County fair; cut sheets from FEMA, offer for agencies adding information
- Dates:
- Notus (Aug. 1)
- Caldwell (1st and 3rd Monday)
- Parma

*Aug. 1 may be too late! Look at week of 8th or 22nd. Shoot for week of 22nd.

Fire chief of Caldwell said he will provide free smoke detectors for attendees. (Big!) Thanks

Health Dist. – free radon detectors

(Toby- need to get BLM and USFS back into the meetings, especially fire)

-Community assessments- comments received

-Resource and Capabilities

- Sheriff's Department
- Fire protection (all returned)
- Public works
- Irrigation Districts (flood gate issues)
- Hospitals
- All agencies

Working Groups

The official business portion of the meeting was adjourned at approximately 10:15 am at which time the committee broke into three working groups to focus on specific projects or problem areas in the county. Northwest Management, Inc. provided each group with maps to draw on and a facilitator to take notes as the committee members discussed various ideas. The following is a compilation of each facilitator's notes.

- The IDWR is currently rewriting the FEMA flood maps, so NMI needs to make sure we have the most up-to-date flood information.

- Levies throughout the county are currently being inventoried. Contacts for this information are Jerry Glen, the District II Chairman, and Chuck Ferguson.
- NMI needs to send Casey Bequeath from the highway district a Resources and Capabilities survey. He can outline the equipment the district could make available during a county emergency. The highway district also has a ten year working plan of upcoming roads projects, which includes information about inadequate bridges, culverts, etc. that they plan to update.
- Microburst are relatively frequent in the northern regions of the county. These storms rarely cause severe damages; however, they have been known to cause some flash flooding resulting in plugged culverts, washed out roads, and damaged irrigation canals. High winds associated with microburst can also cause damage to trees and power lines.
- The need for generators at the more rural community centers was discussed at length. The committee felt it was important that these buildings had generators available; however, they weren't sure how many the sheriff's department had and if they would be available for this purpose. Idaho Power also has a mobile generator.
- Most of Canyon County is covered by a fire district; however, there is a large chunk south of the Deer Flat preserve that has not yet been annexed. The committee mapped out how they would like to see these lands included into the surrounding fire districts.
- NMI needs to send the Sheriff's Department a Resources and Capabilities survey to fill out for the AHMP.
- Highway 44 (State Street) bridges are choke points- north of Middleton.
- Willows along streams choking and damming river during floods
- Harmon subdivision is south of a choke point
- Need to replace bridge on Highway 44- Middleton Road
- Mill Creek Slough
- Middleton City- the willows in creek are problem, especially ice dams- flooding schools
- Caldwell floods- powerlines substation
- Issues
- levees to keep substation online
- alternative power (check with Idaho Power)
- Old Highway 30 and I-84- there is a diversion pond that pushes flood water into irrigation canals
- Extracting gravel from river bottom
- Gravel pits are holding a lot of surface water in the area
- Dikes- mainly terrain and interstate
- Caldwell- sewer treatment plant is in a flood zone
- Need dikes in Caldwell! Marked map with orange for levees and diversions to move water to Dixie Slough north of Greenleaf
- Debris flow management- lots of turns, bridges

- Grates on all check dams, all diversions need grates but need equipment
- Wilder and Parma; Highway 95- will lose highway due to flooding
- Look at structures layer- not showing all structures- get back with assessor
- Boise River floods
- Wind- is a significant issue for chemical spread and blowing trees over on powerlines and homes
- FPD- close gaps north of Highway 55- arrows show who to associate with
- All marked
- Make changes to city layer- look at key for changes
- Mutual aid agreements exist with most departments
- Repeaters marked on map of FPD
- Issue with irrigation canals taking March floods
- In March '99, irrigation districts said they could not open the gates- "not even the governor has authority."
- Need to research what could be done with authority for Dixie Canal diversion

2.4.1.3 September 20th, 2005

Toby Brown of Northwest Management, Inc. began the meeting by walking the committee through the FEMA crosswalk, which will be used to critique the plan. After the committee had a full understanding of what has to be included for FEMA to approve the document, the committee went through each section of the DRAFT document of the Canyon County All Hazards Mitigation Plan.

The committee was asked to read carefully through the DRAFT document and send comments or questions back to Toby by October 14th, 2005. The committee requested that changes in the document were highlighted in the next DRAFT version.

The DRAFT Plan will be posted on the County website during the public review period.

The next committee meeting was scheduled for October 19th, 2005.

2.4.1.4 October 20th, 2005

The purpose of this meeting was to present the committee with a revised draft of the All Hazard Mitigation Plan. Toby Brown of Northwest Management, Inc. began the meeting by passing out copies of the revised draft. He then proceeded to walk members through the changes made in the document since the last meeting. Committee members were again asked to review the documents and provide any additional edits to Toby by November 6th. At that time the document will be put out for public review. The following are edits discussed at the meeting.

- Make sure we have date of FEMA flood zone maps.
- Move earthquake to medium or high in Section 3.
- Displaced populations- how to deal with them, where to put them

- Make sure to include the city of Greenleaf everywhere incorporated cities are mentioned. It is listed under unincorporated, but it is incorporated.
- Public needs to be educated on what a clearly marked address is.
- There is no active Union Pacific RR in Middleton.
- Also, Highway 44 is Star Blvd. in Canyon County; it is State Street in Ada County.
- Capitalize "Ranch" in Anderson Ranch.
- When talking about dam failure, mention the dams on Lake Lowell.
- Get layer of private wells and sewers.
- 8.1.1.2- Percentages instead of hard numbers
- 8.1.1.3- Property benefit- also use percentage of total property value
- 8.1.1.4- 10- half the economy; 5- ¼ of the economy; 1- very little- subjective
- 8.1.a- Add cities and county to responsible agencies
- 8.1b,c,d- Take out year on action items and planning horizon
- Counties need to make sure policies match this plan for landslides and floods
- 8.1.g- Establish Hazard Advisory Commission- LEDC
- There should be an 8.1.h, but there isn't.
- Centennial Job Corps has a breakfast on the morning of Nov. 8, make the next meeting immediately after at 8:30 or 9:00.
- North- South connector roads; the north half of the county is isolated from the south half.

2.4.2 Public Meetings

Public meetings were scheduled for the week of September 6th to the 8th. Meetings were held in Middleton, Nampa, Melba and Notus.

In addition an informational booth was displayed at the Canyon County Fair in Caldwell from the 28th to the 31st of July. The fair booth was manned for the four days of the fair. Information was presented in map form of the various hazards that affect the county. Maps displayed included the flood zones, earthquake fault lines, and landslide prone landscapes in the county. In addition, there were maps portraying the general topography of the county as well as an orthophoto of Canyon County.

Along with the maps were publications of what individual homeowners could do to prepare for these hazards. Most of these publications were provided by FEMA. They relate to the basic responsibilities of homeowners to have at least three days of supplies available in a Preparedness Kit. The pamphlets also gave ideas on how to prepare a home to withstand several types of natural and man caused disasters.

The Northwest Management, Inc., staff manning the booth engaged in one-on-one conversations with over 180 individuals or families regarding the natural hazards that are present in the county. Information was also distributed regarding the AHMP planning process that is underway.

Many individuals had comments about the natural hazards in the county. The general category of comments and concerns is summarized below.

1. **Flooding and flood zones**: Many people felt that flooding in the county is a minimal problem countywide. They had many questions regarding recent growth (home building) along several of the waterways and flood zones in the county. Some people felt that the current FEMA flood zone maps were inaccurate. Some people felt they were classified as being in a flood zone when they were not, others had the opposite reaction and felt that the flood zone maps did not accurately reflect where flood waters would go. A few of the older citizens who had grown up in the county were aware of the constant flooding

back in the 20's, 30's and 40's. They had seen a reduction in lower level annual floods since the installation of the three dams (Lucky Peak, Anderson Ranch, and Arrowrock). These older residents generally felt that there was a possibility of floods causing a higher amount of damage than they used to due to the increase in structures within historic flood zones.

2. **Earthquakes**. Many people were surprised to see the number of fault lines that were in the county. A few had felt or read about the recent quake in Dillon, Montana, that had been felt by some people in the county. Many people were not aware that Idaho as a whole ranked 5th in the nation for earthquake damage. In general most of the people the booth staff talked to were unaware of the earthquake risk in the county and the state as a whole. This appeared to reflect the fact that many people had moved into the area within the last 15 years.
3. **Landslides**. The overall landslide risk in Canyon County is pretty low. Historically, the impact has been limited to a few areas and road cuts. There were few comments and discussion about landslide issues in the county
4. **Severe Weather**. This topic garnered the most discussion and comments from individuals. During the fair there were several afternoons where thunderstorms moved into the area bringing high winds, but only some scattered rain showers. These high winds kicked up dust around the fair grounds making visibility difficult. It also caused some damage to the fair booth (maps blown off their hangars, displays knocked over) and caused the booth to "close down" until the winds passed. Issues that many people voiced concerns over was the loss of electrical power during high wind events (powerline down due to falling trees) and during winter storms. Most people recognized their personal dependence upon the electrical grid and its continued uninterrupted power flow.
5. **Wildfire**. Most residents considered this more of a problem in the Boise Foothills in adjoining Ada County. Although the western extent of the Foothills enters the north end of Canyon County, the number of fires here is not large and the impacts have been low. Some people recognized that this is changing as more subdivision development moves into the Foothills area.

The public meetings are scheduled to share information on the planning process, inform details of the hazard assessments, and discuss potential mitigation treatments. Attendees at the public meetings are asked to give their impressions of the accuracy of the information generated and provide their opinions of potential treatments and issues when hazards strike.

Wall maps detailing risk assessments, hazard profiles, and a slide show were presented at each meeting. The following slideshow presentation was made by Toby Brown of Northwest Management, Inc. at the public meetings.

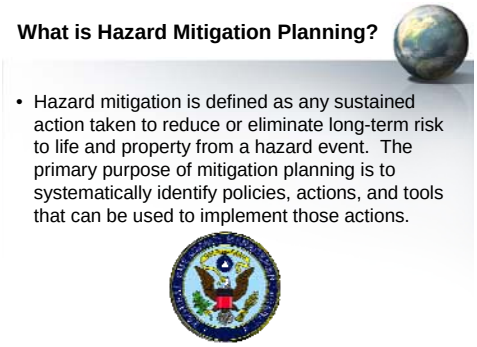
Figure 2.1 Public meeting slideshow overview.

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

Table 2.5. Public meeting slide show

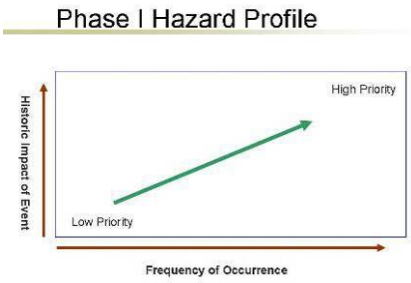
Slide 1

Slide 2



Slide 3

Slide 4



Slide 5

Floods

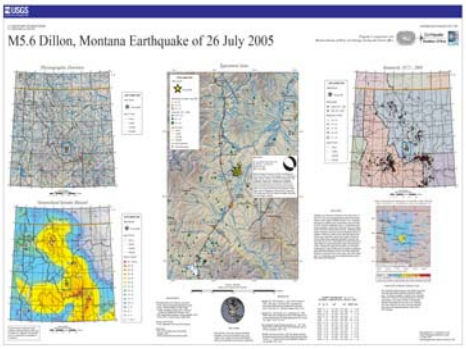
Wet weather defies Idaho's dire drought

BOISE (AP) — More than $5 million in flood damages prompted officials in north central Idaho to declare a state of emergency, while wild storms drenched parts of southern Idaho, turning farm fields into mud bogs, intersections into ponds and trampolines into UFOs.

Janet Dunn looks over floodwaters at Linden Addition Trailer Park in Caldwell, Idaho.

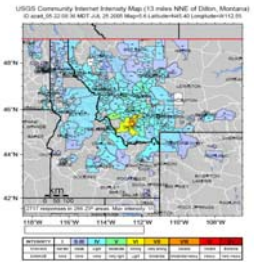
Dianne Humble, AP via Idaho Press Tribune
May 11th 2005

Slide 6



Slide 7

Earthquakes



On May 12, 1916, Boise was hit by a shock which wrecked chimneys and caused people to rush into the streets. Reclamation ditches were damaged and the flow of natural gas altered. It was felt at Loon Creek, 120 miles northeast, and in eastern Oregon - an area of 50,000 square miles.

Slide 8

FEMA Requirements

(for plan acceptance)

- Adoption by Local Governments, County and City
- 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 9

Canyon County AHMP Committee

Formed on behalf of and report to Commissioner's Office, membership identified by County Commissioners:

- County Departments
- City Mayor Offices
- City Fire Departments
- Rural Fire Departments
- Public Works Departments
- Canyon County Hwy
- Emergency Medical Services
- Law Enforcement
- Development Services
- USFS
- BLM (Funding Source)
- SW Idaho RC&D (Contract Oversight)
- Other Associations/groups in the County?

Meetings chaired by Northwest Management, Inc., representing County Commissioner's Office

Slide 10

Public Involvement

- Public Mail Survey will be sent to about 235 households in Canyon County
  - Average response rate of 50%±
- Public Meetings around the county (x4)
- Public Review of the DRAFT Plans will be facilitated once all sections have been completed and reviewed by the committee

Slide 11

AHMP Planning Committee

As a team we will develop this Plan. We need to work together at committee meetings, and individually to accomplish the following:

- Identify Significant Infrastructure
- Assess Resources and Capabilities
- Document Risk Factors
- Identify Potential Mitigation Strategies
- Implement the Plan!

Slide 12

AHMP Treatment Categories

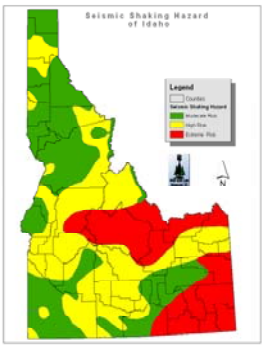
- **People and Structures**
  - Policy at the County Level
  - Reducing Risk to People and Structures
  - Planning and Zoning Changes
- **Infrastructure Protection**
  - Power Lines
  - Roads & Bridges
  - Gas and Water Lines
  - Watersheds
- **Resources and Capabilities**
  - Emergency Services Ability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

Slide 13

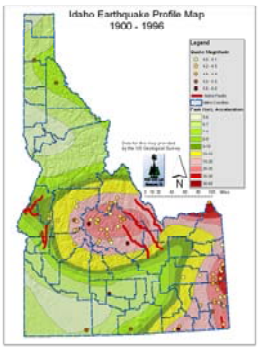
Data We Have

- GIS Data
  - Digital Elevation Models
  - Vegetation Cover Types
  - County Roads
  - Structures
  - Hydrology
  - Powerlines / Utility Lines
  - Municipal Water Supplies
  - Cadastral (property ownership)
  - Radio Repeater Towers
  - Ortho Photos

Slide 14



Slide 15



Slide 16

Data We Have Developed

- GIS Data
  - Flood Zones
  - Landslide and Earthquake Prone Areas
  - Fire Risk Ratings
  - Structure Density (Wildland-Urban Interface)
  - Seismic Shaking hazard

Slide 17

Data We Need

Historical impacts of:
- Flooding
- Earthquakes
- Landslides
- Severe Weather

- Potential Project Areas
  - Flooding
  - Earthquakes
  - Landslides
  - Severe Weather

Slide 18

Preparedness “Building The Ark”

- City Fire Protection
- Rural Fire Protection
- Infrastructure Resilience
- EMS Readiness

Slide 19

2.4.3 Documented Review Process

The review process started with the planning committee. The committee members were given draft copies of all community assessments, mapping analyses, and contributed to the many summaries of historical impacts of the various hazards. These sections of analysis were edited by the committee during and between the committee meetings. Once the public meetings were held and their comments were incorporated into the various chapters of the document a full draft plan was prepared.

This draft plan was distributed to the planning committee for editing, review, and discussions. The committee review period was extended beyond the anticipated 1 month committee review process because of some unanticipated personnel changes (the death of the one of the lead planners for the project).

The revised draft of the plan was then announced for public review during May and June of 2006. While this plan was undergoing public review (available on the Canyon County Internet web site) the Idaho Bureau of Homeland Security Mitigation Officer conducted a pre-FEMA-submission review. Edits from these reviews was incorporated into the final All Hazard Mitigation Plan (Volumes I-III) for FEMA review.

This set of documents will serve as the Canyon County All Hazards Mitigation Plan for all County, State, and Federal Purposes. This plan will be submitted by the County Commissioners to the Idaho Bureau of Homeland Security for FEMA final review and approval. The Wildland-Urban Interface Wildfire Mitigation Plan component of this plan will be submitted to the Idaho Statewide Implementation Committee for the National Fire Plan in an effort to facilitate the County's ability to garner financial assistance in wildfire mitigation planning and implementation.

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

2.4.4 Continued Public Involvement

Canyon County is dedicated to involving the public directly in review and updates of the All Hazard Mitigation Plan. The Canyon County Commissioners, through the Hazard Mitigation Committee are responsible for the annual review and update of the plan as recommended in the "Recommendations" section of this document.

The public will have the opportunity to provide feedback about the Plan annually on the anniversary of the adoption of this plan, at the meeting of the County Commissioners. Copies of the Plan will be catalogued and kept at all of the appropriate agencies in the county. The existence and location of these copies will be publicized. Instructions on how to obtain copies of the plan will be made available on the County's Internet web site. The Plan also includes the address and phone number of the County Planning Division, responsible for keeping track of public comments on the Plan.

In addition, copies of the plan and any proposed changes may also be posted on the county website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

A public meeting will also be held as part of each annual evaluation or when deemed necessary by the Hazard Mitigation Committee. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. The County Public Information Officer will be responsible for using county resources to publicize the annual public meetings and maintain public involvement through the public access channel, webpage, and newspapers.

Chapter 3: Canyon County Characteristics

3 Background and Area Description

This section relies heavily on data from the 2000 census. Due to the growth of the county and its municipalities the committee felt that much of this data may not reflect the current 2006 conditions in the county.

3.1 Demographics

Canyon County reported an increase in total population from 90,076 in 1990 to 131,441 in 2000 and a 2004 estimated population of 158,038 with approximately 45,065 households. Canyon County has eight incorporated communities, Parma (pop. 1,771), Wilder (pop. 1,462), Caldwell (25,967), Nampa (51,867), Middleton (2,978), Notus (458), Greenleaf (862), and Melba (pop. 439). The population in Canyon County has been growing very rapidly, especially the communities of Nampa, Melba, and Middleton, all of which experienced over a 50% increase in population between 1990 and 2000. Nearly 56% of the total county population resides in Nampa. Unincorporated communities include Huston, Apple Valley, Roswell, Sunnyslope, Riverside, Bowmont, Westma, and Walters Ferry. The total land area of the county is roughly 630.51 square miles (403,526 acres).

Table 3.1 summarizes some relevant demographic statistics for Canyon County.

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

Subject	Number	Percent
Total population	**131,441**	**100.0**
SEX AND AGE		
Male	65,148	49.6
Female	66,293	50.4
Under 5 years	11,922	9.1
5 to 9 years	11,798	9.0
10 to 14 years	10,336	7.9
15 to 19 years	10,617	8.1
20 to 24 years	10,149	7.7
25 to 34 years	18,905	14.4
35 to 44 years	18,282	13.9
45 to 54 years	15,188	11.6
55 to 59 years	5,651	4.3
60 to 64 years	4,212	3.2
65 to 74 years	7,097	5.4
75 to 84 years	5,295	4.0
85 years and over	1,989	1.5
Median age (years)	30.5	(X)
18 years and over	90,742	69.0

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

Subject	Number	Percent
Male	44,346	33.7
Female	46,396	35.3
21 years and over	84,698	64.4
62 years and over	16,933	12.9
65 years and over	14,381	10.9
Male	6,030	4.6
Female	8,351	6.4
RELATIONSHIP		
Population	**131,441**	**100.0**
In households	128,492	97.8
Householder	45,065	34.3
Spouse	28,203	21.5
Child	44,026	33.5
Own child under 18 years	37,393	28.4
Other relatives	5,949	4.5
Under 18 years	2,324	1.8
Nonrelatives	5,249	4.0
Unmarried partner	2,027	1.5
In group quarters	2,949	2.2
Institutionalized population	1,289	1.0
Noninstitutionalized population	1,660	1.3
HOUSEHOLDS BY TYPE		
Households	**45,065**	**100.0**
Family households (families)	34,239	76.0
With own children under 18 years	18,373	40.8
Married-couple family	27,961	62.0
With own children under 18 years	14,221	31.6
Female householder, no husband present	4,369	9.7
With own children under 18 years	2,914	6.5
Nonfamily households	10,826	24.0
Householder living alone	8,848	19.6
Householder 65 years and over	3,849	8.5
Households with individuals under 18 years	19,630	43.6
Households with individuals 65 years and over	13,532	30.0
Average household size	2.85	(X)
Average family size	3.28	(X)
HOUSING TENURE		
Occupied housing units	**45,018**	**100.0**
Owner-occupied housing units	33,010	73.3
Renter-occupied housing units	12,008	26.7

Table 3.1. Selected demographic statistics for Canyon County, Idaho, from the Census 2000.		
Subject	**Number**	**Percent**
Average household size of owner-occupied unit	2.83	(X)
Average household size of renter-occupied unit	2.91	(X)

3.2 Socioeconomics

Canyon County had a total of 45,065 housing units (45,018 occupied) and a population density of 222.9 persons per square mile reported in the 2000 Census. Ethnicity in Canyon County is distributed: white 83.1%, black or African American 0.3%, American Indian or Alaskan Native 0.9%, Asian 0.8%, Hispanic or Latino 18.6%, two or more races 2.6%, and some other race 12.2%.

Specific economic data for individual communities is collected by the US Census; in Canyon County this includes Parma, Wilder, Huston, Caldwell, Nampa, Middleton, Notus, and Melba. Parma households earn a median income of $32,278 annually, Wilder averages $32,946, Huston averages $40,313, Caldwell averages $32,641, Nampa averages $37,148, Middleton averages $38,568, Notus averages $27,955, and Melba reported a median income of $33,971, all of which compares to the Canyon County median income during the same period of $35,884.

Table 3.2 shows the dispersal of households in various income categories in Canyon County.

Table 3.2. Income in 1999	Canyon County	
	Number	**Percent**
Households	**45,065**	**100.0**
Less than $10,000	3,863	8.6
$10,000 to $14,999	3,104	6.9
$15,000 to $24,999	7,489	16.6
$25,000 to $34,999	7,441	16.5
$35,000 to $49,999	9,347	20.7
$50,000 to $74,999	8,426	18.7
$75,000 to $99,999	3,135	7.0
$100,000 to $149,999	1,599	3.5
$150,000 to $199,999	311	0.7
$200,000 or more	350	0.8
Median household income (dollars)	35,884	(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 Canyon County, a significant number, 8.7%, of families are at or below the poverty level (Table 3.3).

Table 3.3. Poverty Status in 1999 (below poverty level)	Canyon County	
	Number	Percent
Families	**2,976**	**(X)**
Percent below poverty level	(X)	8.7
With related children under 18 years	2,493	(X)
Percent below poverty level	(X)	12.9
With related children under 5 years	1,548	(X)
Percent below poverty level	(X)	17.1
Families with female householder, no husband present	**1,100**	**(X)**
Percent below poverty level	(X)	25.2
With related children under 18 years	1,062	(X)
Percent below poverty level	(X)	33.7
With related children under 5 years	596	(X)
Percent below poverty level	(X)	44.6
Individuals	**15,438**	**(X)**
Percent below poverty level	(X)	12.0
18 years and over	9,299	(X)
Percent below poverty level	(X)	10.5
65 years and over	1,470	(X)
Percent below poverty level	(X)	10.7
Related children under 18 years	5,767	(X)
Percent below poverty level	(X)	14.5
Related children 5 to 17 years	3,636	(X)
Percent below poverty level	(X)	13.0
Unrelated individuals 15 years and over	4,354	(X)
Percent below poverty level	(X)	26.8

(Census 2000)

The unemployment rate was 3.9% in Canyon County in 1999, compared to 4.4% nationally during the same period. Approximately 4.7% of the Canyon 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	Canyon County	
	Number	Percent
Employed civilian population 16 years and over	**59,634**	**100.0**
OCCUPATION		
Management, professional, and related occupations	15,565	26.1
Service occupations	9,087	15.2
Sales and office occupations	14,096	23.6
Farming, fishing, and forestry occupations	1,692	2.8
Construction, extraction, and maintenance occupations	7,824	13.1

Table 3.4. Employment & Industry	Canyon County	
	Number	Percent
Production, transportation, and material moving occupations	11,370	19.1
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	2,793	4.7
Construction	5,859	9.8
Manufacturing	11,432	19.2
Wholesale trade	2,333	3.9
Retail trade	6,909	11.6
Transportation and warehousing, and utilities	3,182	5.3
Information	1,222	2.0
Finance, insurance, real estate, and rental and leasing	2,633	4.4
Professional, scientific, management, administrative, and waste management services	3,816	6.4
Educational, health and social services	10,824	18.2
Arts, entertainment, recreation, accommodation and food services	3,396	5.7
Other services (except public administration)	2,579	4.3
Public administration	2,656	4.5

Approximately 78% of Canyon County's employed persons are private wage and salary workers, while around 13% are government workers (Table 3.5).

Table 3.5. Class of Worker	Canyon County	
	Number	Percent
Private wage and salary workers	46,754	78.4
Government workers	8,018	13.4
Self-employed workers in own not incorporated business	4,603	7.7
Unpaid family workers	259	0.4

(Census 2000)

3.2.1 European Settlement of Canyon County

Information summarized from the Canyon County Comprehensive Plan.

During the Boise Basin and Owyhee gold rushes of 1862 and 1863, Canyon County provided highways to and from the mines. Its earliest permanent communities founded along the Snake and Boise Rivers in the 1860's were farming centers developed to feed the mining population. Arrival of the Oregon Short Line Railroad in 1883 stimulated the growth of the cities of Nampa, Caldwell, Parma, and Melba and soon became the territory's most densely populated area. The urban areas of Canyon County have continued to grow with expansion of agriculture, business, and industry. The county was created from a portion of Ada County by act of the legislature on March 7, 1891.

3.3 Description of Canyon County

Canyon County was named after the Snake River canyon, which forms the county's western and southern border. Canyon County lies in the southwestern portion of the state with Ada County to the east, Payette and Gem Counties to the north, and the state of Oregon to the west. Caldwell is the county seat. There are 53 local taxing jurisdictions including four separate highway districts.

Canyon is a large county covering approximately 578.3 square miles. Of this, 6.0% is federally owned, 0.9% is state land, 0.2% belongs to the local government, and the remaining 92.9% is in private ownership. The Canyon Soil and Water Conservation District has identified 278,517 acres of important farm land in Canyon County. This acreage accounts for approximately 72% of Canyon County.

The topography is generally level with some rolling and bench terrain. The elevation ranges from 2,200 feet near where the Boise River flows into the Snake River to 3,083 feet at Pickles Butte. Most cultivated soils are at an elevation of 2,200 to 2,700 feet. The indigenous vegetation in most of the county is mainly big sagebrush, bluebunch wheatgrass, Sandberg bluegrass, giant wildrye, and cheatgrass. This favorable situation supports a diversified agricultural economy with 74 different commercial agriculture crops.

3.3.1 Highways

The main highways weaving through the county are U.S. 95, 30, 20, and 26; State Route 44, 45, 55, and 19; and Interstate 84. Interstate 84 traverses the northeastern corner of the county entering near Nampa, passing through Caldwell, and exiting near Sand Hollow. I-84 provides adequate on/off ramps for easy access to all communities. I-84 provides the main transportation route for the trucking industry in the northwestern section of the United States. I-84 also provides good connections eastward to Salt Lake City and points beyond.

U.S. Routes 20 and 26 provide access to the communities of Notus and Parma west of the main urban center. U.S. 95 and State Routes 55 and 19 connect Greenleaf, Wilder, Huston, and Roswell to the main arterial roadways as well as other communities. State Highway 45 travels south from Nampa to the communities of Bowmont, Melba, and Walters Ferry. Many access points along the Snake River are also reached via this route. These are all two lane highways that not only provide a transportation network, but also provide quick access in emergency response situations.

3.3.2 Rivers

The two major rivers in the county are the Boise River and the Snake River. Both waterways are significant components of the local economy as well as large financial entities providing many recreational and economic resources. Other important bodies of water in Canyon County are Lake Lowell, Jensen Lake, and the multitude of canals that provide irrigational resources to the otherwise arid landscape.

3.3.3 Climate

Canyon County lies almost entirely within the valleys of the Boise and Snake Rivers. This area is on the boundary between steppe and desert, and the climate is correspondingly semiarid to arid. Summers are warm and dry, annual precipitation is relatively low, and natural vegetation is sparse. Annual precipitation ranges from a little more than 5 inches to more than 15 inches. Generally rainfall is not adequate for crops from early in June to late in September. Winds tend to follow the orientation of the valleys. They blow mainly from the northwest during warmer

months, and from the southeast during the rest of the year. Occasionally destructive winds occur with a passing cold front or squall line, or late in spring and in summer during thunderstorms, but tornadoes are extremely rare. The highest wind speed recorded at Boise was 61 miles per hour in July 1944. Hailstorms are relatively infrequent. Small, soft hailstones fall early in spring. Late in spring and in summer the hailstones are occasionally larger, but generally they are not more than half an inch to three-fourths inch in diameter. Statistics about hail damage are not available, but widespread damage to crops is rare.

3.3.4 Growing Season

The frost-free season, or the interval between the last freeze in spring and the first in fall, generally ranges from 140 to 165 days. However, the dates can vary considerably from year to year and from place to place. For example, at Caldwell a temperature of 32° F. was recorded as late as June 11 in 1917 and as early as August 31 in 1932. At Parma the latest freeze on record was June 4 in 1962 and the earliest was September 7 in 1927. At Lake Lowell Dam the latest was May 23 in 1944 and the earliest was September 13 in 1960. The shortest frost-free season at Caldwell was 98 days (June 7 to September 13) in 1914; at Lake Lowell Dam it was 114 days (May 23 to September 14) in 1960; and at Parma it was 115 days (May 24 to September 16) in 1944.

3.3.5 Hours of Sunshine

Sunshine is ample during much of the growing season. The daily average number of hours of sunshine, based on 27 years of record, is 9.1 in April, 10.2 in May, 11.7 in June, 14.3 in July, 12.0 in August, 10.3 in September, and 7.5 in October.

3.3.6 Recreation

Canyon County has many outstanding tourism and recreational facilities. The county offers a full panorama of recreational opportunities ranging from boating on the Snake River to golfing at the Purple Sage Golf Coarse in Caldwell.

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.

3.3.6.1 Old Fort Boise

The original Fort Boise was built in 1834 by the Hudson's Bay Fur Trading Company and was located northwest of present day Parma. With the decline in fur trading, this outpost became known for its hospitality to travelers on the Oregon Trail. The original buildings washed away in the 1853 flood; however, replicas have been built to commemorate the site.

3.3.6.2 Deer Flat National Wildlife Refuge

Nestled in the rolling sagebrush hills of southwest Idaho, the watery oasis at Deer Flat National Wildlife Refuge provides an important breeding area for birds and mammals, as well as other wildlife. The refuge is also a significant resting and wintering area for birds migrating along the Pacific Flyway, including spectacular concentrations of mallards and Canada geese. Because of its value to birds, Deer Flat National Wildlife Refuge has been declared a Globally Important Bird Area by the American Bird Conservancy.

Deer Flat National Wildlife Refuge has two sectors–Lake Lowell and the Snake River Islands. The Lake Lowell sector encompasses 10,588 acres, including the almost 9,000-acre Lake

Lowell and surrounding lands. The Snake River Islands sector contains about 800 acres on 101 islands. These islands are distributed along 113 river miles from the Canyon-Ada County Line in Idaho, to Farewell Bend in Oregon.

The refuge protects a wide range of wildlife habitats from the open waters and wetland edges of Lake Lowell to the sagebrush uplands around the lake to the grasslands and riparian forests on the Snake River islands. Refuge staff uses a variety of wildlife management techniques to create and maintain wildlife habitat. With assistance from local growers, the refuge also cooperatively farms 240 acres to provide food for wildlife.

3.3.6.3 Celebration Archaeology Park

Celebration Park is located on the Snake River at the western boundary of the Snake River Birds of Prey National Conservation Area and serves as a beginning point for Halverson Bar and Lake Trail. Travelers worldwide have come to enjoy the high desert flora, scenic land features, and unique Indian art. Celebration Park was established as Idaho's only archaeological park in 1989. Hiking, fishing, boating, picnicking, camping, horseback riding trails, bird watching, ongoing interpretive park programs, and student fieldtrips are just some of the many activities available.

There are thousands of petroglyphs on the Bonneville melon gravel that make up the landscape of Celebration Park. Each element is considered Indian Art with many dating as far back as 12,000 years. The park offers a fascinating exploration tour into the scene of the wintering area used by Paleolithic, Archaic, historic Native Americans, and other visitors. There is also a tour of the historic Guffy Bridge, which offers interesting Idaho historic facts as you walk along the Snake River. Initially built in 1897, the bridge was intended to carry ore from Silver City to Nampa where it would be smelted. Guffy Bridge is a true Idaho artifact and has been renovated to allow walking access to the south side of the river and primitive trails beyond.

3.3.6.4 Bureau of Land Management Public Lands

A few portions of the County, particularly in the northwest corner, are administered by the Bureau of Land Management. These areas are open to the public year round. Although there are no developed sites, residents of Canyon County use these lands to hunt, four-wheel, mountain bike, and drive off-road vehicles among many other things.

3.3.6.5 Golfing

The flat to gently rolling landscape and availability of irrigation makes much of the Treasure Valley a hotspot for golfers. Canyon County boasts five golf courses in the Nampa-Caldwell area and an additional course in Wilder.

3.3.6.6 Boating

Boating, both motorized and non-motorized, is a very popular activity in Canyon County. There are many launching access points along the Snake and Boise Rivers, which usually also offer restroom and picnicking facilities. Swarms of recreators flock to these areas during the warmer months for swimming and various other watersports.

3.3.6.7 Fishing and Hunting

Fishing and hunting is very important to Canyon County both from a recreational standpoint and as an economic resource. A wide variety of fish can be caught in Canyon County's rivers and lakes. Many farms have sites that are suitable for fish ponds. For those people who prefer a gun or bow to a fly rod, Canyon County offers a bounty of bird hunting experiences. Wild birds, like bobwhite, chukar, mourning dove, ducks, geese, gray partridge, ring-necked pheasant, and California quail. Many non-game birds also live in the area. Wild ducks, geese, and muskrat live on bottom lands near the Boise and Snake River and in drainageways. Wild geese nest on river islands and in the Deer Flat National Wildlife Refuge. There are numerous developed sportman's access points and boat launching sites around the Wildlife Refuge and along both the Snake and Boise River.

3.3.7 Resource Dependency

Over the past century, employment through agricultural farming, livestock ranching, and mining has been significant in the region. Livestock ranching has been and continues to be an important component of the economy of Canyon County. Livestock grazing in Canyon and surrounding counties has provided stable employment while serving to keep rangelands maintained at a lower wildfire risk than if they had not been present and managed.

Agriculture in the county is now characterized by a wide range of farming enterprises. The principal crops are alfalfa and clover for hay and seed, winter and spring wheat, barley, field corn, sweet corn, hybrid sweet corn seed, sugar beets, potatoes, hops, onions, and beans. Specialty crops include lettuce, spinach, onions, carrots, peas, and vegetables for seed. Cherry, plum, peach, and apple orchards are on the south-facing slopes near the Snake River. Approximately one-half of farm income is derived from livestock and livestock products. Dairying and feedlots for sheep and cattle are the major enterprises. The trend is toward more specialization in crops and more intensive management of the land.

The communities of Canyon 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 the following (Harris *et al.* 2000):

- Nampa.....Travel & Tourism Only
- Caldwell.....Mining Only
- Middleton.....Agriculture Only
- Parma.....Agriculture Only
- Greenleaf .....Travel & Tourism Only
- Wilder .....Agriculture Only
- Notus.....Travel & Tourism and Agriculture
- Melba .....Agriculture Only

Harris *et al.* (2003) further evaluated Idaho communities based on their level of direct employment in several industrial sectors. Their findings for communities in Canyon 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 Gov.	Federal Gov.	Mining and Minerals
Nampa	High	Low	Low	Med. High	Low	Low	Med. Low
Caldwell	High	Low	Low	Med. Low	Med. High	Low	Med. High
Greenleaf	Low	Low	Low	High	High	Low	Low
Middleton	Med. High	High	Low	Med. Low	Med. Low	Low	Low
Parma	High	High	Low	Low	Med. Low	Low	Low
Notus	Med. High	High	Low	Med. High	High	Low	Low
Melba	Med. Low	Med. High	Low	Med. High	High	Low	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

3.4 Emergency Services & Planning and Zoning

The County has adopted a full rural addressing system. Road signs were ordered and installed throughout the County. The County and the U S Postal Service implemented the physical addresses.

Currently, the County does have Enhanced 911. The Canyon County Sheriff's Department is the Central Dispatch for the County. Dispatch will contact appropriate emergency response agencies and notify Canyon County Dispatch of transmissions and responses.

The Canyon County Planning & Zoning Commission recognizes the need for improved Road Standards. The Commission is actively researching design standards and plans to recommend that the County adopt standards for new construction that comply with the International Fire Code.

3.5 Growth and Development

Canyon County is currently supporting a lively industry of land subdividing into residential building lots. The physical location of subdivisions in the unincorporated parts of the county portrays a widely scattered pattern that often encroaches into rural locations impacting the surrounding agricultural areas. If this condition is permitted to continue, these impacts will undoubtedly be compounded.

In 1990, the unincorporated parts of Canyon County had approximately 37,350 residents with 13,000 dwelling units. Of these, 3,472 or 27% were made up of standard single-wide mobile homes. There have been approximately 6,500 lots created in about 275 subdivisions. About 3,500 lots have been built upon, leaving nearly 3,000 available for development into residences. It is estimated that of these remaining lots, there are up to 250 lots in very early recorded subdivisions where active farming is occurring and there is little indication that active lot sales will slow in the near future.

3.6 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 fire mitigation activities such as prescribed burning.

3.6.1 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 Canyon County, Idaho.

Item Number	Resource Name	Address	City	Listed	Architect or Building Designer
1	College of Idaho Academy Building	1015 Albany St	Caldwell	1986	
2	F. F. Beale House	1802 Cleveland Blvd.	Caldwell	1993	
3	Blatchley Hall	College of Idaho	Caldwell	1978	
4	Caldwell Carnegie Library	1101 Cleveland Blvd.	Caldwell	1979	
5	Caldwell Historic District	Downtown Caldwell	Caldwell	1982	Tourtellotte & Hummel
6	Caldwell Odd Fellow Home for the Aged	N 14th Ave	Caldwell	1982	Silbaugh, C. E., and Tourtellotte & Hummel
7	Caldwell Oregon Short Line Railroad Depot	701 S 7th	Caldwell	1995	Union Pacific
8	Caldwell Residential Historic District	Steunenberg's Acres	Caldwell	2002	Caldwell
9	Deer Flat Embankment	Lake Lowell	Nampa	1972	
10	E. H. Dewey Stores	1013-15 1st St	Nampa	1982	Tourtelotte & Hummel
11	Diversion Dam and Deer Flat Embankments	SE of Boise River	Boise	1976	US Reclamation Service
12	Henry W. Dorman and Ida Frost House	114 Logan St	Caldwell	2000	Harding, Lem
13	Farmers and Merchants Bank	101 11th Ave	Nampa	1976	Tourtellotte & Hummel
14	Fort Boise and Riverside Ferry Sites	NW of Parma on Snake River	Parma	1974	
15	Guffey Butte-Black Butte Archeological District	Swan Falls Dam and Power Plant		1978	
16	Horse Barn	NE of Nampa	Nampa	1978	Idaho State School and Hospital
17	Ellen Houlder Farm	Arena Valley Rd	Wilder	1994	
18	Idaho State Sanitarium Administration Building	11th Ave	Nampa	1982	Tourtellotte & Hummel
19	Thomas K. Little House	703 E Belmont St	Caldwell	1980	Miller, Robert E.
20	Map Rock Petroglyphs Historic District		Givens Springs	1982	
21	Middleton Substation	SR 44	Middleton	1973	
22	Samuel J. and Ora B. Miller House	1204 Cleveland Blvd	Caldwell	1982	Miller, Ora B.
23	Nampa American Legion Chateau	1508 2nd St	Nampa	1982	Tourtellotte & Hummel

Table 3.7. National Register of Historic Places in Canyon County, Idaho.					
Item Number	**Resource Name**	**Address**	**City**	**Listed**	**Architect or Building Designer**
24	Nampa City Hall	203 12th Ave	Nampa	1985	Reinhardt, Newton & Murphy, Wayland & Fennel
25	Nampa Department Store	1st St and 13th Ave	Nampa	1982	Rush, G. H., Tourtellotte, John E. & Company
26	Nampa Depot	12th Ave and Front St	Nampa	1972	Et al., Clarke, F. W.
27	Nampa First Methodist Episcopal Church	12th Ave and 4th St	Nampa	1982	Tourtellotte & Hummel
28	Nampa Historic District	1200 and 1300 blocks S 1st St	Nampa	1983	Tourtellotte & Hummel
29	Nampa Presbyterian Church	2nd St and 15th Ave	Nampa	1982	Tourtellotte & Hummel
30	Nampa and Meridian Irrigation District Office	1503 1st St	Nampa	1982	Tourtellotte & Hummel
31	North Caldwell Historic District	Albany and Belmont Sts	Caldwell	1979	
32	George Obendorf Gothic Arch Truss Barn	24047 Batt Corner Rd	Wilder	1999	Sears, Roebuck & Co.
33	Peckham Barn	US 95	Wilder	1982	
34	John C. Rice House	1520 Cleveland Blvd	Caldwell	1980	
35	Roswell Grade School	ID 18 and Stephan Lane	Roswell	1982	Tourtellotte & Hummel
36	Sacred Hearts of Jesus and Mary Church	608 7th St	Parma	1982	Tourtellotte & Hummel
37	St. Mary's Catholic Church	616 Dearborn	Caldwell	1982	McNeel, H. J., Tourtellotte & Hummel
38	St. Paul's Rectory and Sisters' House	810 15th Ave	Nampa	1982	Tourtellotte & Hummel
39	Sterry Hall	College of Idaho	Caldwell	1978	Nesbit & Paradice
40	A. K. Steunenberg House	409 N Kimball	Caldwell	1982	Tourtelotte, John E. & Company
41	A. H. Stewart House	3rd St and Bates Ave	Parma		
42	Carrie Adell Strahorn Memorial Library	College of Idaho	Caldwell	1982	McNeel, J. H. and Wayland & Fennell
43	US Post Office-Caldwell Main	823 Arthur St	Caldwell	1989	Wetmore, James A.
44	US Post Office-Nampa Main	123 11th Ave	Nampa	1989	Wetmore, James A.
45	Orton H. Wiley House	524 E Dewey	Nampa	1986	

(NRHP 2003)

3.7 Transportation

Primary access to and from Canyon County is provided by Interstate 84, a four-lane highway which passes through the county from the Payette-Canyon border at Sand Hollow to the Canyon- Ada County border east of Nampa. State Route 20/26 provides access from Parma to Caldwell and through to Boise, eventually merging with Interstate 84 east of Boise. U.S. Highways 20, 26 and 95 provide access to Canyon County from Payette County on the north

side to the Owyhee-Canyon border at Homedale. County Route 45 provides access to the southern portion of the county, coming into Canyon County at Walters Ferry. All major roadways in the county are relatively level and well-maintained with good width and ingress/egress points. Many of these routes also serve as ignition corridors where the roads pass through dry grass and brush fuels. Each year, dozens of fire starts are associated with travel routes, primarily along Interstate 84.

Smaller roads maintained by the County provide access to the adjoining areas within the county, including recreational areas and rural agricultural hubs. Many roads in the county were originally built to facilitate farming and ranching activities. As such, these roads can support trucks and emergency response equipment referenced in this document. Many of the new roads have been built for homesite access, especially for new subdivisions. In most cases, these roads are adequate to facilitate emergency response equipment as they adhere to county building codes. County building codes for new developments should be adhered to closely to insure this tendency continues.

The Idaho Land Use Planning Act, requires Idaho Counties to address transportation in their individual Comprehensive Plans. It requires an analysis, prepared in coordination with the local jurisdiction(s) having authority over the public highways and streets, showing the general locations of traffic ways and streets and the recommended treatment thereof. This component may also make recommendations on building line setbacks, control or access, street naming and numbering, and proposes a system of public and other transit lines and related facilities including rights-of-ways, terminals, future corridors, viaducts and grade separations.

3.8 All Hazards Profile

Data was collected from a variety of sources for developing Canyon County's hazards profile. Many of these sources are discussed in the chapters which follow and summarize risk exposures and hazards profiles by hazard type. SHELDUS is a county-level hazard data set for the U.S. for 18 different natural hazard event types such thunderstorms, hurricanes, floods, wildfires, and tornados. For each event the database includes the beginning date, location (county and state), property losses, crop losses, injuries, and fatalities that affected each county.

The data were derived from several existing national data sources such as National Climatic Data Center's monthly Storm Data publications and NGDC's Tsunami Event Database. Only those events that generated more than $50,000 in damages were included in SHELDUS. Since 1995, SHELDUS additionally includes all events that are reported in NCDC's Storm Data with a specific dollar amount.

Data and maps for SHELDUS were compiled and geo-referenced by the Hazards Research Lab at the University of South Carolina. This database was supported by grants from the National Science Foundation (Grant No. 99053252 and 0220712) and the University of South Carolina's Office of the Vice President for Research.

Event and Loss Data Sources: The data were derived from several existing national data sources, of which National Climatic Data Center's monthly Storm Data publications are the major data source. From 1960 to 1995, only those events that generated more than $50,000 in damages were included in SHELDUS. Since 1995, SHELDUS additionally includes all events that are reported in NCDC's Storm Data with a specific dollar amount. Prior to 2001, property and crop losses occurring on the same day within the same geography (i.e. county) are aggregated by hazard type. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the counties (e.g. if 4 counties were affected, then each was given 1/4 of the dollar loss, injuries and deaths). Where dollar loss estimates were

provided in ranges (e.g. $50,000 - 100,000) - such as in NCDC Storm data until 1995 - the lowest value in the range of the category was used. This results in the most conservative estimate of losses during the time period of 1960-1995. Since 1995 all events that were reported by the National Climatic Data Center (NCDC) with a specific dollar amount were included in the database.

Table 3.8 summarizes the SHELDUS data summary for Canyon County.

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
5/19/1960	5/22/1960	WINTER WEATHER	0	0	$0	$100,000	SOUTHWESTERN VALLEYS	KILLING FREEZE
9/3/1960	9/4/1960	LIGHTNING, WIND	0.05	0	$1,136	$0	MOST OF STATE	WINDSTORM AND LIGHTNING
11/16/1961	11/16/1961	WINTER WEATHER	0	0	$0	$277,778	SNAKE RIVER VALLEY	DEEP SOIL FREEZE
4/19/1962	4/20/1962	WIND	0.39	0	$114	$114	ENTIRE STATE	WIND AND DUST
5/19/1962	5/19/1962	HAIL, LIGHTNING, WIND	0	0	$556	$556	CANYON COUNTY AND SOUTH-CENTRAL COUNTIES	HAIL, WIND, LIGHTNING
7/8/1965	7/8/1965	HAIL, SEVERE STORM/THUNDER STORM	0	0	$0	$1,136	MOST OF STATE	HAIL, RAIM
5/30/1966	5/30/1966	HAIL	0	0	$2,500	$250,000	CANYON CO	HAIL
10/14/1966	10/16/1966	WINTER WEATHER	0	0	$0	$83,333	UPPER SNAKE RIVER VALLEY	HARD FREEZE
6/21/1967	6/21/1967	HAIL, SEVERE STORM/THUNDER STORM, WIND	0	0	$250,000	$0	CANYON CO.	HAIL, WIND, RAIN
7/19/1968	7/20/1968	WIND	0	0	$1,136	$114	ENTIRE STATE	WIND
8/10/1968	8/23/1968	SEVERE STORM/THUNDER STORM	0	0	$0	$11,364	ENTIRE STATE	RAIN
1/6/1969	1/7/1969	WINTER WEATHER	0	0	$11,628	$0	STATE WIDE	SNOW STORM
1/26/1969	1/26/1969	WINTER WEATHER	0	0	$11,628	$0	STATE WIDE	SNOW STORM
6/8/1969	6/8/1969	SEVERE STORM/THUNDER STORM	0	0	$0	$250,000	GEM AND CAYON COUNTIES	RAIN
6/26/1970	6/27/1970	HAIL, WIND	0.34	0.21	$17,241	$1,724	SOUTHERN IDAHO, SNAKE RIVER VALLEY ABOVE WEISER	SEVERE WIND AND HAIL
7/16/1970	7/16/1970	HAIL, LIGHTNING, WIND	0	0	$278	$27,778	ADA, CANYON COUNTIES NORTHWARD	HAIL, LIGHTNING, WIND

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
6/25/1971	6/27/1971	SEVERE STORM/THUNDER STORM	0	0	$0	$250,000	GEM AND CANYON COUNTIES	RAIN
1/9/1972	1/12/1972	WIND, WINTER WEATHER	0.07	0	$113,636	$0	STATEWIDE	WIND AND SNOW
4/17/1972	4/17/1972	WINTER WEATHER	0	0	$0	$3,125	SOUTH CENTRAL AND SOUTHWEST IDAHO	FREEZE
12/8/1972	12/15/1972	WINTER WEATHER	0	0	$125,000	$12,500	SOUTHWEST IDAHO VALLEYS	FREEZE
2/26/1974	2/26/1974	WIND	4	1	$12,500	$0	SOUTHWEST ID - ADA, GEN, CANYON, FAYETTE CO	WIND
1/7/1975	1/7/1975	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0.05	$1,136	$0	ENTIRE STATE	HEAVY RAIN, SNOW
6/2/1975	6/2/1975	HAIL, LIGHTNING, SEVERE STORM/THUNDER STORM, WIND	0	0	$3,571	$4	SOUTHWEST AND SOUTHCENTRAL	ELECTRICAL STORM, WIND, RAIN, HAIL
7/29/1975	7/29/1975	LIGHTNING, SEVERE STORM/THUNDER STORM, WIND	0	0	$1,852	$1,852	SOUTHERN IDAHO	WIND, LIGHTNING, RAIN
11/10/1975	11/10/1975	WIND, WINTER WEATHER	0	0	$1,136	$0	STATEWIDE	WIND, SNOW
2/16/1976	2/17/1976	WIND, WINTER WEATHER	0	0	$1,136	$0		SNOW AND WIND
3/22/1976	3/22/1976	WIND	0.4	0	$10,000	$0		WINDSTORM
6/26/1976	6/26/1976	WINTER WEATHER	0	0	$0	$18,519		EXTREME COLD
3/27/1977	3/27/1977	WIND	0	0	$1,852	$0		WIND
6/13/1977	6/13/1977	HAIL	0	0	$0	$25,000		HAIL
12/15/1977	12/15/1977	WIND	0	0	$25,000	$0		WIND
1/1/1979	1/31/1979	WINTER WEATHER	0	0.11	$11,364	$0		EXTREME COLD

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
2/1/1979	2/13/1979	WINTER WEATHER	0	0	$1,136	$0		EXTREME COLD
2/13/1979	2/13/1979	FLOODING	0	0	$500,000	$0		FLOOD
3/29/1981	3/29/1981	WIND	0.14	0	$35,714	$0		HIGH WINDS
3/18/1982	3/18/1982	WIND	0	0	$8,333	$0		WIND
8/11/1982	8/11/1982	HAIL, WIND	0	0	$250,000	$25,000		HAIL/WIND
4/15/1985	4/15/1985	WIND	0	0	$12,500	$0		WIND
6/14/1987	6/14/1987	LIGHTNING	0	0	$3,846	$385		LIGHTNING
6/15/1987	6/15/1987	HAIL	5	0	$5,000,000	$50,000	NAMPA	HAIL
6/15/1987	6/15/1987	SEVERE STORM/THUNDER STORM, WIND	0	0	$10,000	$0		THUNDERSTORM WINDS
12/22/1987	12/22/1987	WINTER WEATHER	0.61	0	$1,136	$0		HEAVY SNOW
3/23/1988	3/23/1988	WIND	0	0	$50,000	$0	CALDWELL	WIND
8/1/1988	8/31/1988	DROUGHT	0	0	$0	$11,364	ENTIRE STATE	DROUGHT
10/1/1988	10/31/1988	DROUGHT	0	0	$11,364	$11,364	STATEWIDE	DROUGHT
12/19/1988	12/19/1988	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$6,250	$0	SOUTHWESTERN ID	SEVERE STORM-SNOW
12/30/1988	12/30/1988	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$2,381	$0	N & WEST CENT. ID	SEVERE STORM-SNOW
2/4/1989	2/4/1989	WINTER WEATHER	0	0	$125,000	$125,000	SOUTHWEST IDAHO	UNUSUAL COLD SPELL
1/8/1990	1/8/1990	WIND	0.02	0.02	$11,364	$0		WIND
7/23/1990	7/23/1990	LIGHTNING	0	0	$114	$1,136		LIGHTNING
8/8/1990	8/8/1990	LIGHTNING	0	0	$1,136	$114		LIGHTNING
11/20/1990	11/20/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0.07	$1,136	$0		SEVERE STORM-SNOW

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
11/20/1990	11/20/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0.05	0.02	$1,136	$0		SEVERE STORM-ICE/SLEET
11/20/1990	11/20/1990	WIND	0	0	$11,364	$0		WIND
11/24/1990	11/24/1990	FLOODING	0	0	$1,136	$0		FLOOD
12/1/1990	12/1/1990	WIND	0	0	$1,136	$0		WIND
12/4/1990	12/4/1990	WIND	0.02	0	$1,136	$0		WIND
12/13/1990	12/13/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$1,136	$0		SEVERE STORM-SNOW
12/13/1990	12/13/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0.02	0	$1,136	$0		SEVERE STORM-SNOW
12/18/1990	12/18/1990	WINTER WEATHER	0.68	0.02	$11,364	$113,636		EXTREME COLD
12/18/1990	12/18/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$1,136	$0		SEVERE STORM-SNOW
12/18/1990	12/18/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$1,136	$0		SEVERE STORM-SNOW
12/19/1990	12/19/1990	WIND	0	0	$1,136	$1,136		WIND
12/19/1990	12/19/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0.02	0	$1,136	$0		SEVERE STORM-SNOW
12/27/1990	12/27/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0.02	0	$1,136	$0		SEVERE STORM-SNOW

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
12/30/1990	12/30/1990	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$1,136	$0		SEVERE STORM-SNOW
1/1/1991	1/7/1991	WINTER WEATHER	0	0	$16,129	$0		EXTREME COLD
1/7/1991	1/7/1991	WINTER WEATHER	0	0	$12,500	$0		SNOW
1/10/1991	1/10/1991	WINTER WEATHER	0.14	0	$7,143	$0		LIGHT SNOW
1/12/1991	1/12/1991	FLOODING	0	0	$7,143	$0		URBAN FLOODING
1/14/1991	1/14/1991	WINTER WEATHER	0	0	$1,852	$0		LIGHT SNOW
3/3/1991	3/3/1991	WIND	0	0	$1,136	$0		HIGH WIND
3/4/1991	3/4/1991	WIND	0	0	$1,852	$0		HIGH WIND
3/6/1991	3/6/1991	WINTER WEATHER	0	0	$7,143	$0		SNOW
7/1/1991	7/31/1991	DROUGHT	0	0	$0	$18,519		DROUGHT
8/1/1991	8/31/1991	DROUGHT	0	0	$0	$18,519		EXTREME DROUGHT
8/22/1991	8/23/1991	LIGHTNING	0	0	$143	$1,429		LIGHTNING
2/1/1992	2/29/1992	DROUGHT	0	0	$35,714	$35,714	SNAKE RIVER VALLEY	DROUGHT
3/1/1992	3/31/1992	DROUGHT	0	0	$18,519	$185,185	SOUTHERN	DROUGHT
3/19/1992	3/23/1992	WINTER WEATHER	0	0	$0	$6,250	TREASURE VALLEY	FREEZE
4/1/1992	4/30/1992	DROUGHT	0	0	$0	$1,851,852	SOUTHERN	DROUGHT
4/7/1992	4/7/1992	WINTER WEATHER	0	0	$0	$22,727	SNAKE RIVER VALLEY	FREEZE
4/17/1992	4/17/1992	WIND	0	0	$61,364	$61,364		WIND
5/1/1992	5/31/1992	DROUGHT	0	0	$0	$1,851,852	SOUTHERN ID	DROUGHT
6/1/1992	6/30/1992	DROUGHT	0	0	$0	$1,136,364		DROUGHT
6/11/1992	6/11/1992	LIGHTNING	0	0	$4,545	$0		LIGHTNING
7/1/1992	7/31/1992	DROUGHT	0	0	$0	$1,136,364		DROUGHT
8/1/1992	8/31/1992	DROUGHT	0	0	$0	$1,136,364		DROUGHT
8/11/1992	8/15/1992	LIGHTNING	0	0	$1,136	$114		DRY LIGHTNING

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
8/20/1992	8/20/1992	HEAT, WIND	0	0	$26,316	$26,316	CENTRAL MOUNTAINS, SOUTHWEST HIGHLANDS	WIND, DRY HEAT
9/1/1992	9/30/1992	DROUGHT	0	0	$0	$1,136,364		DROUGHT
9/24/1992	9/24/1992	WIND	0	0	$2,000	$20,000	WEST CENTRAL MOUNTAINS AND SNAKE RIVER VALLEY	WIND
10/1/1992	10/31/1992	DROUGHT	0	0	$113,636	$1,136,364		DROUGHT
10/2/1992	10/2/1992	WIND	0	0	$6,250	$0	TREASURE VALLEY	WIND
11/7/1992	11/8/1992	WINTER WEATHER	0	0	$3,571	$0	UPPER SNAKE RIVER HIGHLANDS	HEAVY SNOW
11/9/1992	11/9/1992	WINTER WEATHER	0	0	$3,571	$0	UPPER SNAKE RIVER	BLIZZARD
11/22/1992	11/22/1992	WINTER WEATHER	0.13	0	$6,250	$0	TREASURE VALLEY	GLAZE
11/27/1992	11/27/1992	WINTER WEATHER	0	0	$6,250	$0	TREASURE VALLEY	SNOW
9/1/1993	9/30/1993	WINTER WEATHER	0	0	$0	$11,364	ENTIRE STATE	COOL AND WET GROWING SEASON
11/1/1994	11/1/1994	WIND	0.1	0	$5,000	$0		HIGH WINDS
12/1/1994	12/1/1994	SEVERE STORM/THUNDER STORM, WINTER WEATHER	0	0	$1,136	$0	ALL OF ID	HEAVY RAIN/SNOW
5/14/1996	5/14/1996	LIGHTNING	0	0	$15,000	$0		LIGHTNING
5/17/1996	5/17/1996	TORNADO	0	0	$50,000	$0		
5/17/1996	5/17/1996	SEVERE STORM/THUNDER STORM, WIND	0	0	$5,000	$0		TSTM WIND
5/17/1996	5/20/1996	FLOODING	0	0	$5,000	$0		FLOOD
6/7/1996	6/7/1996	SEVERE STORM/THUNDER STORM, WIND	0	0	$80,000	$0		TSTM WIND

Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005.

Begin Date	End Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Location	Remarks
8/26/1996	8/26/1996	SEVERE STORM/THUNDER STORM, WIND	0	0	$250,000	$0		TSTM WIND
6/30/1997	6/30/1997	LIGHTNING	0	1	$0	$0	MELBA	LIGHTNING
7/29/1998	7/29/1998	HAIL, WIND, SEVERE STORM/THUNDER STORM	0	0	$3,000	$0		TSTM WIND/HAIL
6/15/1999	6/15/1999	SEVERE STORM/THUNDER STORM, WIND	0	0	$40,000	$0	MELBA	TSTM WIND
6/24/2001	6/24/2001	WILDFIRE	1	0	$0	$0	CALDWELL	
7/7/2002	7/7/2002	LIGHTNING	2	1	$0	$0	CALDWELL	
7/13/2002	7/13/2002	SEVERE STORM/THUNDER STORM, WIND	4	0	$0	$0	NAMPA	
4/24/2003	4/24/2003	SEVERE STORM/THUNDER STORM, WIND	0	0	$100,000	$0	MIDDLETON	
5/6/2005	5/6/2005	FLOODING	0	0	$50,000	$0	CALDWELL	FLASH FLOOD

3.9 Planning and Zoning

3.9.1 Building Permit Requirements

The following is summarized from information provided by the Canyon County Building Department.

- A building permit shall be obtained before construction begins.
- Constructing, altering, or adding to a structure or moving a structure from one location to another requires a building permit.
- Manufactured (modular, mobile) structures require a permit for the tie-downs.
- Plans for the construction of foundations and/or basements on which the manufactured structure sets are required.
- Structures shall be located within setback requirements and shall not be located on utility, road, or irrigation easements or rights-of-way.
- Fences six feet (6') and under are not required to have a building permit, however, the owner is advised that, if it becomes necessary to remove the fence, it will be done at the owner's expense.
- Fences shall not interfere with visibility at intersections.

3.9.2 Information on Plans and Specifications

- Plans and specifications are required PRIOR to issuance of a building permit.
- Plans (drawings) shall be drawn to a professional standard, to scale, upon substantial paper, and be of sufficient clarity to indicate the nature and extent of the work proposed.
- Plans shall include a plot plan showing the location of all existing and proposed structures on the parcel and their distance from the property lines and road rights-of-way.
- Plans shall contain floor plans that include foundations and/or basements, all floor levels, lofts, patios, porches, balconies, carports, garages, and outbuildings.
- Plans shall include exterior structure dimensions and square footage with separate figures for living space, basement, carport/deck, garage, etc. (UBC 106).

3.9.2.1 Drawings

Cross-section drawings of building(s) shall include:

- Footings and foundations;
- Spans for floor joists and materials (clearance between bottom of floor joist, or bottom floors without joists, and the ground shall be no less than 18 inches; minimum under girders shall be 12 inches);
- Spans for roof trusses or stacked roof--include type of materials to be used;
  Spacing of wall studs and materials used;
  Type of finishing materials (interior/exterior).

- Computation, stress diagrams, and other data sufficient to show the correctness of the plan shall be submitted when required by the building official.
    - Footings - 24 inches deep (below frost line or back filled)
    - Snow load in recreation area -- 120 lbs. p/s/f/ live load.
    - Snow load for remaining area -- 30 lbs. p/s/f/ live load.

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. 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 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

Canyon County has experienced a long history of high magnitude floods since first recorded in 1862, typically by "50 and 100-year" levels. The diverse landscape and weather patterns around Canyon County are triggers for those high magnitude floods. Rain-on-snow events and above normal high spring temperatures are very typical throughout the county in the spring and late winter. The combination of the above two events are devastating and can cause extraordinary flooding events.

4.1.1 February 1982

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

County Summary: Flooding from Willow Creek closed roads in Middleton and threatened the Middleton High School.

The Idaho Statesman, 2/17/82

4.1.2 January 17, 1971

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

County Summary: Homes throughout Caldwell, Pleasant Valley, and Kuna-Mora were evacuated because of rising floodwaters.

The Idaho Statesman 1/18/71

4.1.3 February 1963

Event Summary: $4,685,000.00 - Heavy snowfall followed by heavy rain caused snowmelt, and combined with large ice jams in several rivers, led to severe flooding in the Clearwater, Boise, Payette, Weiser, Portneuf and Snake River drainages. Ice jams and high water in the Clearwater River raised the Highway 95 bridge a foot off of its pilings. An federal disaster declaration was issued February 15, 1963, for eight Idaho counties due to flooding: Fremont, Madison, Blaine, Owyhee, Bannock, Caribou, Gooding, and Lincoln. Statewide highway damage was est. at $800,000; damage to county roads est. at $700,000.

County Summary: Floodwaters from local creeks, including Mason Creek, destroyed the bridge near Sunny Slope and flooded streets in North Nampa. Homedale schools were closed because of bridge washouts and Melba students were stranded at school because of road closures.

The Idaho Statesman Feb. 2, 3, 8, 1963

4.1.4 August 1, 1955

Event Summary: New York Canal break flooded homes and farms, reduced irrigation water flow to Canyon County farms.

County Summary:A break in the New York Canal caused the water flow to be shut off while repairs were done, severely affecting Canyon County farmers because the canal supplies 85% of their irrigation water. Farmlands without water during the repair were the Melba, South Nampa, Lakeview and South Deer Flat areas.

The Idaho Statesman 8/2/55

4.1.5 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. Highway 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: Flooding from the Boise River reached Parma and Notus. Damage to this area was primarily agricultural, including loss of crops, livestock, and farm buildings and equipment. Bridges across the Boise River were also damaged and/or closed. Farmers had to move livestock, then reseed and relevel fields. Flood damage also included extra travel by dairies and other rural farmers to reach an open bridge, as all but three bridges in the valley were closed.

Stacy, Susan M.; The Idaho Statesman 4/20/43, 6/10/83; USACE "Flood Plain Information Boise, Idaho and Vicinity" and "Flood Damage Report: the Boise River Flood"

4.1.6 May 2, 1938

Event Summary: Boise and Payette River floods.

County Summary:Increased runoff in Boise River led to flooding of hundreds of acres of agricultural land in Parma.

The Idaho Statesman, 5/2/38

4.1.7 April 25, 1936

Event Summary: Boise River flood. Rain and melting snow combined to cause the Boise River to flood with a peak discharge est. at 19,700 cfs, the sixth largest recorded flood. 2 deaths were reported caused by the flood. Hundreds of acres of agricultural land in the valley was flooded along the river, through Eagle, Star, Linder and Parma. Spring runoff also led to flooding along the Payette River and Soldier Creek. After the flood, the legislature appropriated $10,000 to improve the river channel, modify the bridges, and clean out timber and debris from the river and its banks.

County Summary:Hundreds of acres of agricultural land along the Boise River was flooded. WPA workers strengthened the Roswell and Island bridges; near Caldwell, farmers had to move livestock to higher ground.

Stacy, Susan M.; The Idaho Statesman, 4/21/36, 4/22/36, 4/26/36, 4/27/36, 5/2/38; USACE "Flood Plain Information Boise, Idaho and Vicinity" and "Flood Plain Information Payette, Idaho and Vicinity"

4.1.8 Indian Creek Flood - March 4, 1910

Event Summary:

County Summary: Heavy rains and thawing ice dams along Indian Creek caused a break in the New York Canal from heavy flows, flooding the creek. Floodwaters over 3' deep spread over the business district of Caldwell, with the heaviest damage on Main, Arthur and Kimball Streets (and Seventh Avenue. Every basement in the business district was flooded, and considerable damage was done to homes, sidewalks, streets and yards. Damages to roads and bridges totaled over $20,000; Pioneer Irrigation District canals received $3,500 damage.

$125,000.00

Idaho Press Tribune 6/25/01; Idaho Press Tribune 9/16/83

4.1.9 May 14-June 17, 1896

Event Summary: Boise and Payette River floods

County Summary: Floodwaters from the Boise River broke through the head gates and cut off access to and from Caldwell.

Stacy, Susan M.; USACE "Flood Plain Information Boise, Idaho and Vicinity"; The Idaho Statesman, April 21,

4.1.10 March 16, 1894

Event Summary: Dam break at Indian Creek

County Summary:Following heavy rainfall, the dam near the head of Indian Creek (near Orchard) broke; floodwaters reached Caldwell. Cellars were flooded, businesses damaged, and foot bridges washed away. Trains were stopped for several days while debris was cleared away. $8,000.00

Idaho Press Tribune 6/25/01

4.1.11 December 1871

Event Summary: Boise River flood

County Summary: Boise River broke through Canyon County Water Company headgate, flooded bottom lands from Star to Middleton to Parma

Stacy, Susan M.

4.1.12 July 4, 1862

Event Summary: Boise River flood from extremely high runoff; believed to be one of the highest water years, possibly four times the amount of the 1943 flood (100,000 second feet or greater)

County Summary: Boise River flood of river bottoms near present-day Caldwell

Stacy, Susan M.; The Idaho Statesman, 6/10/83

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 (bank-full width). 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 confines of the stream and river channels. Such floods are often 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 (IBHS 2004).

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. Re-vegetation 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 section of this document.

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 Canyon County Flood Profile

All three types of flood events occur in Canyon County. Riverine flooding occurs along all tributaries to the Snake and Boise Rivers. The mountainous terrain around the headwaters of the Boise River creates a flood-prone environment. Rain-on-snow events can and do occur at almost all elevations across the county. These events often contain enough moisture to cause flooding on the Boise Rivers and most of its tributaries in the county. To a lesser extent the Snake River is also affected by rain on snow events. Due to its larger drainage areas the impact of these events on the main stem of the Snake are muted. Tributaries to the Snake River can be greatly influenced by rain on snow events.. 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.

There are several dams on the Boise River, but the principle ones are Anderson Ranch, Arrowrock, and Lucky Peak. These three dams provide flood control storage for 64% of the drainage area of the Boise River, which greatly reduces the magnitude and frequency of Boise River floods. In spite of the impressive amount of flood protection provided by the existing system, major floods still cannot be fully controlled. In fact, the Boise River poses a frequent flood threat because water levels reach bank full stage (6,500 cfs at the USGS Glenwood Bridge gage) virtually every year. However, the upstream reservoirs provide enough regulation that there should be several days warning before cities along the Boise River in Canyon County would experience major flooding.

Lake Lowell is managed by both the Bureau of Reclamation and the US Fish and Wildlife Service. Lake Lowell, originally called Deer Flat Reservoir, was the first storage reservoir completed for the Boise Project, one of the earliest Reclamation projects. Historic features include the two earthen embankment dams that comprise the headgates for four canals. Most of the land surrounding the reservoir is used for agricultural purposes with homes and other structures scattered throughout.

Canyon County is a diverse combination of moderate to steep sloped foothills and open rangelands. The natural runoff of the Boise River usually consists of low flows from late July through February, increasing flows during March, and high flows in April, May, and June. Occasionally this pattern is interrupted by high flows of short duration during the winter months caused by rainstorms. The vast majority of the runoff is generated above Lucky Peak Dam. Average discharge near Boise in neighboring Ada County is about 2,750 cubic feet per second (cfs). The maximum recorded mean daily discharge was 35,500 cfs on June 14, 1896.

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 the 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.

Ice/debris flows occur as part of riverine and flash flooding, usually exacerbating the effects of those types of flood events. In the case of a fire or heavy farming activity, flash flooding can result from 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. This type of flood damage is currently occurring along the Middle Fork of the Boise River where the Hot Creek Fire burned in Elmore County in 2003.

The Boise River's ability to carry a flood has been significantly reduced in recent years due to siltation. The buildup of silt is the result of controlled water flows on the river. Before the upstream dams regulated flows, spring runoff flushed and scoured the river channel. Since 1954, when Lucky Peak, the last of the three big dams went into operation, the capacity of the river channel has gradually been reduced. In a study made in 1972 by the US Geological Survey, a considerable decrease in stream capacity was noted at the stream gaging stations at Notus and Boise (Ada County). Records show that at the same stage in Boise the river was able to carry 9,600 cfs in 1943, but only 7,700 cfs in 1972. This is a 20% reduction in carrying capacity in 30 years. Since this time, silt has continued to accumulate in the floodway. With present downstream channel capacity, there is not enough reservoir space in the system to fully regulate the standard project flood or maximum historic floods.

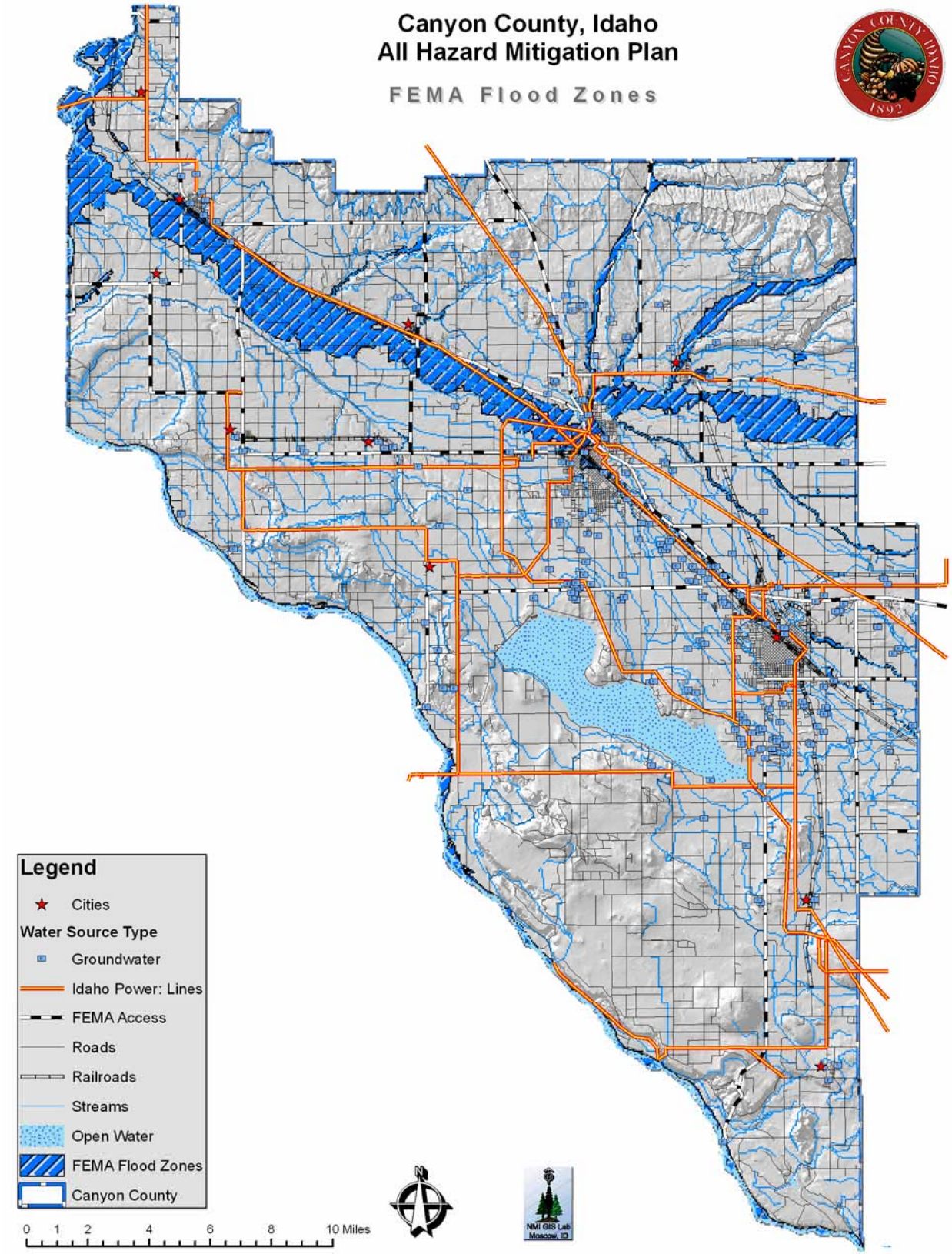
Other factors that affect flooding on the Boise River include the erection and state of repair of levees, the proliferation of plant growth, and the construction of homes and other structures in the floodway. The end result of these changes is that water levels, which in the past were merely an inconvenience, will now result in significant and costly damage. Installing grates on all check dams and diversion gates will help catch debris flows that can cause blockages downriver.

The amount and extent of damage caused by any flood depends on several variables. These include: how much area is flooded, the height of flooding, the velocity of flow, the rate of rise, sediment and debris carried, the duration of flooding, and the effectiveness of mitigation emergency response measures. The potential for destruction from large floods is magnified because most people do not recognize and/or accept the potential hazard. Large floods are more frequent than most suspect. Ten and 50-year floods may sustain elevations that are only slightly less than the 100-year flood. Unforeseen debris blockages (trees, mobile homes, etc.) may cause 500-year elevations from a 10-year flood. The 10, 50, 100, and 500-year floods have a 10%, 2%, 1%, and 0.2% chance, respectively, of being equaled or exceeded during any year.

The greatest flood of known magnitude on the Boise River occurred on June 14, 1896. The 1896 flood peak flow was 69 percent larger than the largest recent flood, which occurred in April of 1943. It was also approximately 3.0 feet higher in stage. Peak flow was estimated at 35,500 cubic feet per second. A recent large flood occurred April 1943. This was the third largest flood on Boise River. Peak flow was estimated at 21,000 cubic feet per second. The highest flow with existing flood control storage in the Boise River was 9,500 cubic feet per second in June 1983. The reservoirs were over 98% full when the inflow subsided in 1983 and normal regulation was resumed. Irrigation canals at maximum flow took 3,700 cubic feet per second from the total discharge or flooding would have been worse.

The Snake River forms the southern boundary of Canyon County. The river flows from east to west through a deep canyon bordered by high, steep walls. The main threat of flooding on the Snake River is from ice jams. The potential for other types of flooding is limited because large dams control the river. Additionally, most of the development along this part of the river is limited to agricultural fields and scattered homes, farms, and ranches. Depending on the time of year, varying numbers of recreationists may also be on the river.

Figure 4.1. Canyon County FEMA Flood Zone



The FIRM maps developed for Canyon 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 Canyon County.

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

Table 4.1 Significant assets and infrastructure in Canyon County Flood Zones.

Item	Flood Zone	
Structures		1,252 addressed structures
Municipal Water Intakes		4
High Tension Power Lines		12.9 miles
Railroads		18.6 miles
FEMA Primary & Secondary Access Roads		9.8 miles
Roads (general)		115.4 miles
Incorporated Cities	Parma	219.1 acres
	Notus	27.5 acres
	Middleton	288.2 acres
	Caldwell	804.1 acres
	Nampa	75.3 acres

The Canyon County Courthouse maintains a generator to power the Emergency Operations Center and the Dispatch Center during power outages. Idaho Power also has several generators to power critical infrastructure during prolonged outages.

Table 4.2 Municipal Water Intakes in Flood Zone

Name	System Type	Source Name	Source Type	Population
TOWNS VILLAGE	Community	WELL #1	Groundwater	25
DANS FERRY SERVICE	Non-community Transient	WELL #1	Groundwater	25
CAMP CALDWELL	Non-community Transient	WELL #1	Groundwater	25
CONAGRA BEEF COMPANY	Non-community Non-transient	WELL 1	Groundwater	300

4.5.1 Assets at Risk to Flooding

Canyon County, in addition to being a population center in the region and the state, has also been experiencing rapid growth. Much of this growth has been in the form of high valued residential homes and light commercial enterprises. Land values for properties adjacent to the river have skyrocketed and developers in the area have located high value homes near and within the flood zone.

These developments are often accompanied by levies and river channelization techniques which impact the nature of function of the existing flood plain. In turn, these developments may place other structures not already in the flood zone in the path of threatening floods through water displacement.

Using the parcel information and asset values maintained by the Canyon County Assessor's Office, overlaid with the FIRM maps of the A and X500 flood zones, we have completed an assessment of the assets at risk to damage from flooding in Canyon County. These summaries are detailed in Table 4.3. Canyon County has approximately $4.3 million worth of assets (land and improvements) within the flood zones (Table 4.3 and Figure 4.2).

The largest portion of assets in Canyon County located in the flood zone is in the unincorporated areas of the county, namely along the Boise River, with 55% of the total value located in the flood zones (A and X500). Caldwell is home to 27% of these at risk to flood assets, Nampa has 12%, and Middleton is home to 6.4%. The remaining 1.6% is located in Parma. Notus flood zones have less than 1% of the total assets in the flood zone. Summaries of the nature of the value within each municipality will be discussed in each community assessment section in the following sub-sections of this chapter.

The difficulty facing the county and the cities is to curb the exposure to risk from flooding. Those areas identified within the flood zones of Canyon County place all developments at risk to catastrophic damage during flooding events. This exposure is exacerbated when considering potential flood inundation zones downstream of the aforementioned dams. Prior to Hurricane Katrina little warrant was placed on flood inundation zones and the risks it presented. However, hazard mitigation experts are now questioning these assessments and considering further protection measures to mitigate future risks.

Without a doubt, the large amount of value ($4.3 million) and the number of human lives at risk to loss during flooding events is substantial in Canyon County.

Figure 4.2. Property values within all flood zones of Canyon County, by municipality.

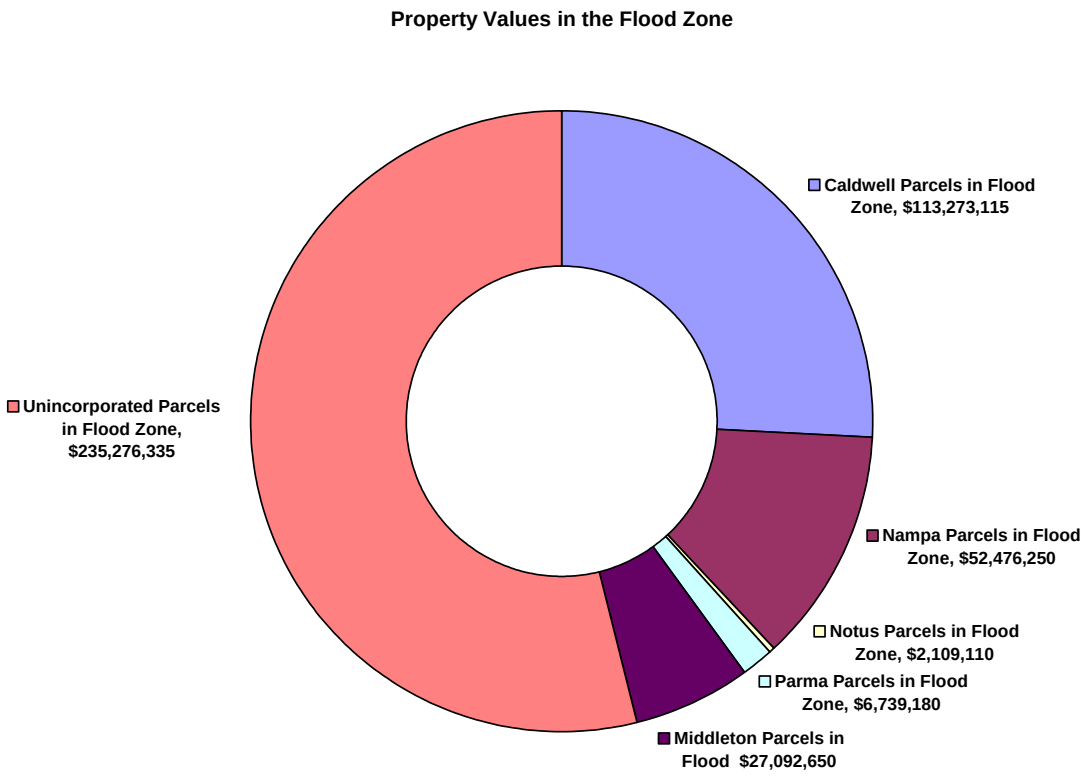


Table 4.3. Value of property within the flood zones of Canyon County, by municipality.

		← Land Classification →											
		Agricultural Land		Bare Land		Commercial		Industrial		Residential		Other	
	Total Value	Land	Improvements	Land	Improvements	Land	Improvements	Land	Improvements	Land	Improvements	Land	Improvements
Assessed value in flood zone, entire county	$426,510,810	$22,243,460	$44,075,110	$7,365,010	$12,526,820	$23,872,550	$43,026,270	$8,241,270	$49,954,455	$55,441,860	$109,399,060	$25,250,630	$25,114,315
	27,187 Ac	10,957 Ac		5,450 Ac		150 Ac		72 Ac		2,142 Ac		8,416 Ac	
Nampa Parcels in Flood Zone	$113,273,115	$416,650	$2,437,400	$144,600	$404,900	$21,462,320	$35,145,690	$1,932,470	$5,384,705	$12,692,510	$26,058,580	$1,524,860	$5,668,430
	804 Ac	12 Ac		11 Ac		84 Ac		31 Ac		209 Ac		457 Ac	
Caldwell Parcels in Flood Zone	$52,476,250	$629,030	$13,617,100	$169,200	$289,700	$508,570	$1,360,355	$2,985,010	$15,052,065	$4,455,520	$13,277,500	$59,400	$72,800
	75 Ac	4 Ac		8 Ac		0 Ac		5 Ac		40 Ac		19 Ac	
Middleton Parcels in Flood Zone	$2,109,110	$107,610	$42,770	$0	$0	$21,450	$34,700	$0	$0	$572,700	$1,321,800	$8,080	$0
	28 Ac	3 Ac		0 Ac		0 Ac		0 Ac		5 Ac		19 Ac	
Notus Parcels in Flood Zone	$6,739,180	$186,800	$216,100	$53,700	$21,300	$477,820	$1,356,850	$17,360	$0	$1,872,020	$2,452,200	$15,830	$69,200
	571 Ac	331 Ac		10 Ac		20 Ac		1 Ac		61 Ac		148 Ac	
Parma Parcels in Flood Zone	$27,092,650	$457,900	$444,950	$490,050	$25,550	$909,500	$3,364,600	$0	$0	$6,797,550	$14,536,500	$65,210	$840
	434 Ac	94 Ac		59 Ac		9 Ac		0 Ac		167 Ac		105 Ac	
Parcels in Flood Zone not in incorporated Cities	$235,276,335	$26,678,950	$39,820,200	$2,217,790	$1,643,260	$713,970	$2,267,820	$3,725,010	$29,694,000	$30,468,610	$51,361,390	$24,680,030	$22,005,305
	26,299 Ac	15,241 Ac		1,137 Ac		41 Ac		36 Ac		1,689 Ac		8,155 Ac	

4.5.2 Countywide Potential Mitigation Activities

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

4.5.2.1 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 Canyon County seems to be meeting most of the socio-economical goals within the county. Some types of mitigation measures have been addressed in all communities within the county since the floods of 1996.

4.5.2.2 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 hospitals.
- 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 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 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.

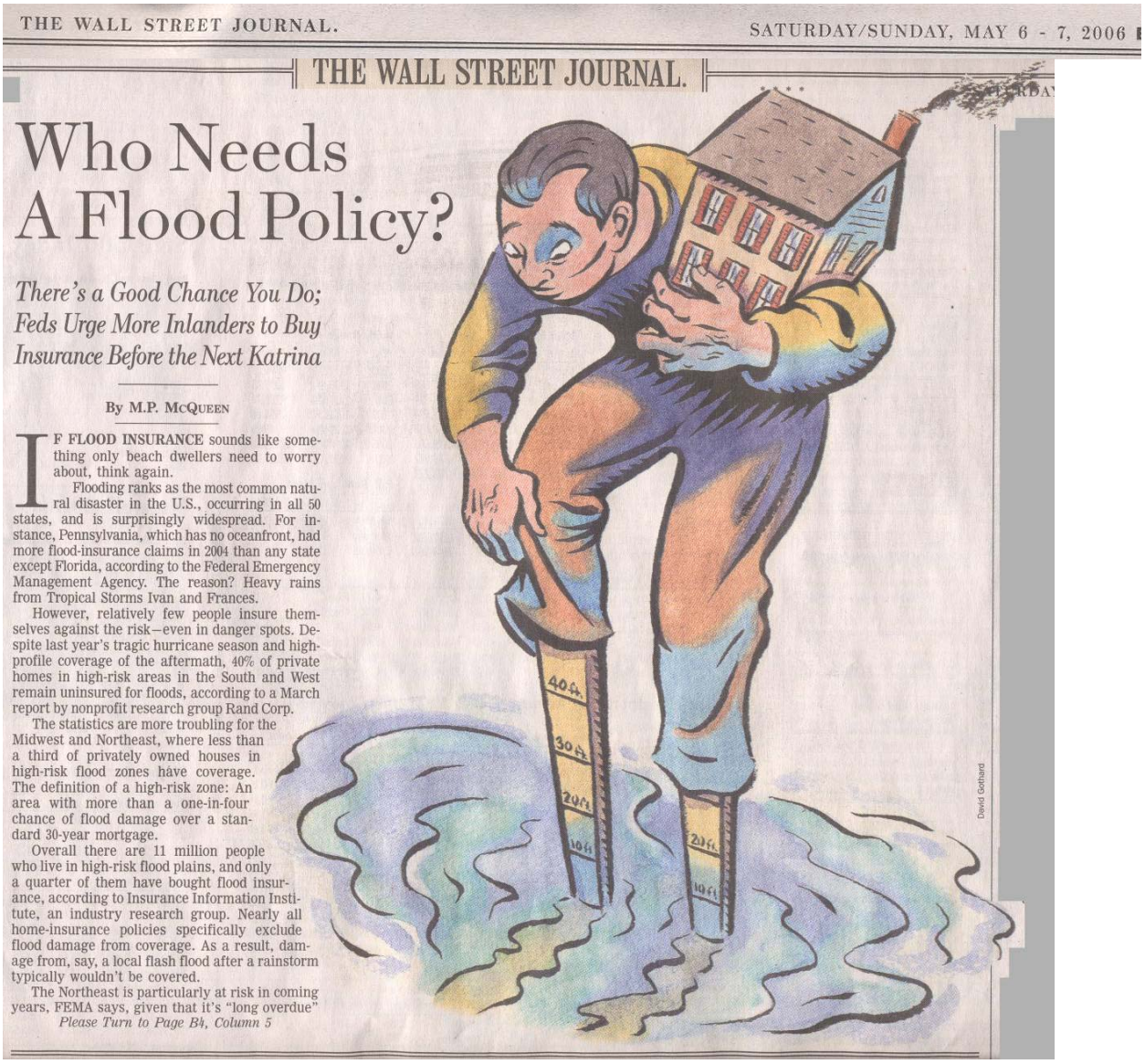
The Canyon County Radio Amateur Civil Emergency Service (RACES) alerts and mobilizes volunteer emergency communication personnel to establish and maintain fixed, mobile, and portable station emergency communications facilities for local radio coverage and point-to-point contact of public safety officials and locations.

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.

4.5.2.3 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.

Figure 4.3. Wall Street Journal Article on flood insurance participation (May 6, 2006).



THE WALL STREET JOURNAL. SATURDAY/SUNDAY, MAY 6 - 7, 2006

THE WALL STREET JOURNAL.

Who Needs A Flood Policy?

There's a Good Chance You Do; Feds Urge More Inlanders to Buy Insurance Before the Next Katrina

By M.P. McQueen

IF FLOOD INSURANCE sounds like something only beach dwellers need to worry about, think again.

Flooding ranks as the most common natural disaster in the U.S., occurring in all 50 states, and is surprisingly widespread. For instance, Pennsylvania, which has no oceanfront, had more flood-insurance claims in 2004 than any state except Florida, according to the Federal Emergency Management Agency. The reason? Heavy rains from Tropical Storms Ivan and Frances.

However, relatively few people insure themselves against the risk—even in danger spots. Despite last year's tragic hurricane season and high-profile coverage of the aftermath, 40% of private homes in high-risk areas in the South and West remain uninsured for floods, according to a March report by nonprofit research group Rand Corp.

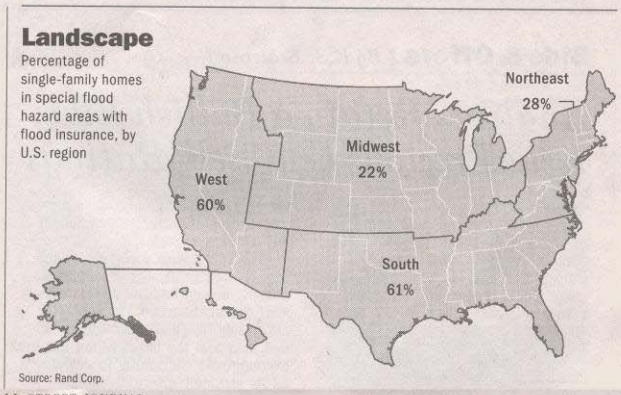
The statistics are more troubling for the Midwest and Northeast, where less than a third of privately owned houses in high-risk flood zones have coverage. The definition of a high-risk zone: An area with more than a one-in-four chance of flood damage over a standard 30-year mortgage.

Overall there are 11 million people who live in high-risk flood plains, and only a quarter of them have bought flood insurance, according to Insurance Information Institute, an industry research group. Nearly all home-insurance policies specifically exclude flood damage from coverage. As a result, damage from, say, a local flash flood after a rainstorm typically wouldn't be covered.

The Northeast is particularly at risk in coming years, FEMA says, given that it's "long overdue"

Please Turn to Page B4, Column 5

Figure 4.4. Wall Street Journal Article on flood insurance, *continued*.



Who Needs Flood Insurance?

Continued From Page B1

for a major storm on the scale of the 1938 hurricane that clobbered New York and Massachusetts. All of this triggered FEMA this past week to launch an ambitious $19 million campaign to encourage more people to shell out for flood insurance.

Basic coverage for homeowners, renters and small businesses is provided through the National Flood Insurance Program, or NFIP, which is part of the Department of Homeland Security. These policies, which are subsidized by taxpayer money, are relatively inexpensive and are sold by regular insurance agents.

However, the government-backed policies have their shortcomings. They cover a maximum $250,000 for a home's structure, and $100,000 for contents, making them inadequate for higher-priced properties and they have other restrictions. For instance, they don't cover most of the contents of a basement if a house is in a high-risk zone. Nor do they pay living expenses if a family is displaced.

Another major drawback: They don't provide replacement-cost coverage, but instead pay a depreciated value for damaged property or belongings. In buying it, coverage doesn't take effect for 30 days. Once a hurricane is forecast for your area, it's too late to make the purchase.

In high-risk flood zones, premiums on the NFIP coverage can run as high as about $2,000 for maximum coverage of a home's structure.

Recently, several private insurance companies have pushed into the market, including **Fireman's Fund Insurance** Co., a subsidiary of **Allianz** AG; **American Insurance Group** Inc.; and **Chubb Group of Insurance Companies**, with flood policies for high-end properties.

Supplemental flood policies that provide coverage beyond federal program limits are available in the private market in all states. One provider is AIG's Lexington Insurance Co., which provides flood coverage beyond NFIP caps up to $5 million.

A government-run Web site, floodsmart.gov, lets users search by address to determine flood risk. However, the site's data are based on federal flood-hazard maps, which may be as much as 20 years old. More recent flood-risk data may be available from local flood-control boards or a municipal buildings department.

Experts say flood zones change shape over time, especially in built-up areas, so even if you're only near a flood zone, it's better to err on the side of caution. "You will get a cheap rate because, according to the map, you are outside the flood zone, but actually you may be inside it," says J. Robert Hunter, insurance director of the Consumer Federation of America.

Few people heed that advice. Roughly half of all private homes in the country's highest-risk flood zones have flood insurance, according to the Rand study. Federal law requires homeowners in flood zones to have flood insurance if their mortgage is government-sponsored or guaranteed. But an estimated 25% of these homeowners don't comply, for reasons that aren't clear, according to the Rand study.

Lisa Magee and her husband, Chris, an Air Force captain, were glad that they complied. The couple bought a house in Ocean Springs, Miss., a year before Katrina hit in August, and were required by the mortgage lender to buy flood coverage because they lived near a bayou. "Flood insurance saved us," says Ms. Magee, whose neighborhood was hard hit by the hurricane. "Some neighbors didn't have adequate insurance, and some didn't have it at all. And they lost everything."

Outside of high-risk areas, a mere 1% of homes are covered for flooding, according to the Rand study, which was funded by FEMA. But this doesn't mean they are immune. About a quarter of flood claims are filed in low-risk areas, according to government figures. "Everyone is at risk," says Mary Jo Vrem, project manager of the NFIP marketing campaign.

Thomas Newgarden, chief underwriting officer for the AIG Private Client Group, which offers flood-insurance, says even wealthy clients refuse it. "Sometimes a client is paying upward of $20,000 in [homeowners' insurance] premiums, and you would be surprised how price-sensitive they may be to adding another $1,000 for [flood] coverage," he says.

So far, federal efforts to get more people to buy flood insurance have met with modest success. After years of negligible annual growth, the number of NFIP policies in force expanded 11% in the 22 months ended in April, with about 4.8 million policies currently in effect. But most of the new policies being sold are in areas that are already better covered than the rest of the country.

In the aftermath of Katrina, the insurance industry has defended itself in court against lawsuits over claims denials for hurricane-related water damage. In one suit, a federal judge in Mississippi last month upheld clauses in **Allstate** Corp. policies that excluded flood damage, ruling they were "valid and enforceable." One complication: Most homeowner policies cover damage from wind-driven rain, which can be hard for homeowners to distinguish from flood damage.

Of the new private-sector policies on the market, Fireman's Fund offers a special endorsement for flood coverage in its homeowner policies in 29 states, but only in low- to moderate-flood-risk areas. The policies offer broader coverage limits than the government insurance, living expenses, and full replacement cost of structure and contents. Flood insurance adds about $220 to $600 to the company's overall homeowner premium, which at Fireman's averages about $3,500.

Chubb Insurance Group of Companies recently rolled out personal flood-insurance policies for customers who also buy their primary homeowner coverage from Chubb. The policies are available in three states—Arizona, Colorado and Illinois—with a limit of $15 million for property damage to home and contents.

Figure 4.5. Article about participation in the Flood Insurance Program, January 8, 1997.

Insure homes against floods

1/8/97

Water, water everywhere. Have you got your flood insurance?

Chances are you don't. Local experts estimate that just a fraction of Boise residents who need flood insurance have it.

Gambling with Mother Nature is a dangerous and expensive game. It is far smarter to pay the cost of insurance now and know you're protected in case the worst happens. Even if it doesn't, the peace of mind flood insurance provides can be invaluable.

Two groups of Ada County residents need to take immediate action if they haven't yet insured their homes and property: those who live near the Foothills in Boise's North End and those who live in the 500-year flood plain along the Boise River.

James E. Hall, agency field executive for State Farm Insurance in Meridian, said many North End residents bought flood insurance after last summer's wildfire scorched the Foothills above Boise.

But he estimates that less than one-half of 1 percent of all homes in Idaho are covered for floods.

Rains and rapid runoff have swollen the Boise River system to flood stage. Thanks to upstream dams, Boiseans have escaped the devastation that hit other areas in western Idaho hard in recent days.

But the Treasure Valley won't escape unscathed.

Federal dam managers are steadily dumping water from reservoirs to make room for spring runoff. By Thursday the Boise River will be flowing at a high enough rate to flood low-lying areas near Eagle.

And it's only January. There's no telling what unhappy surprises may yet be in store this water-logged year.

The 30-day waiting period before flood insurance takes effect means people who need it have no time to waste. Protect your investment before it's too late.

Canyon County has no communities with identified special flood hazard areas that are not participating in the NFIP. Canyon County has no communities under suspension or revocation of participation in the NFIP (IDWR 2004).

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.

Table 4.4. NFIP Policy Statistics As of 12/30/04 in Canyon County.

Community Name	Policies In-Force in 2004	Insurance In-Force whole $	Written Premium In-Force $
Canyon County*	120	18,829,900	49,925
Caldwell	5	1,028,700	1,949
Middleton	75	7,001,200	34,938
Nampa	49	4,669,100	22,356
Notus	5	842,300	2,082
Parma	9	928,600	5,532
Totals	**263**	**33,299,800**	**116,782**

Overall participation by individuals and business in the NFIP appears to be low. Potential reasons for continuing low participation in the program are:

- Current cost of insurance is prohibitive.
- 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.

The last two reasons can be addressed through public education. The first 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 the community's CRS ratings, they can qualify for up to a 45% discount of annual flood insurance premiums. Neither the county nor any of the municipalities currently participate in 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 .

4.6 Individual Community Assessments

The cities of Caldwell, Nampa, Middleton, Notus, and Parma have completed Flood Insurance Rate Maps (FIRM). The Boise River and its tributaries have the highest potential of causing flood damage in Canyon County.

4.6.1 Nampa

Nampa is the largest city in Canyon County and is located along Interstate 84 to the southeast of Caldwell. The Mason Creek, Indian Creek, and Tenmile Creek drainages make up the only FEMA identified flood zones; however, these are very narrow and end near the Nampa city limits. There are also a multitude of irrigation canals in the area; most of which have a southeast to northwest orientation. Additionally, Lake Lowell, which makes up most of the Deer Flat National Wildlife Refuge lies about three miles to the west.

4.6.1.1 Flood Potential

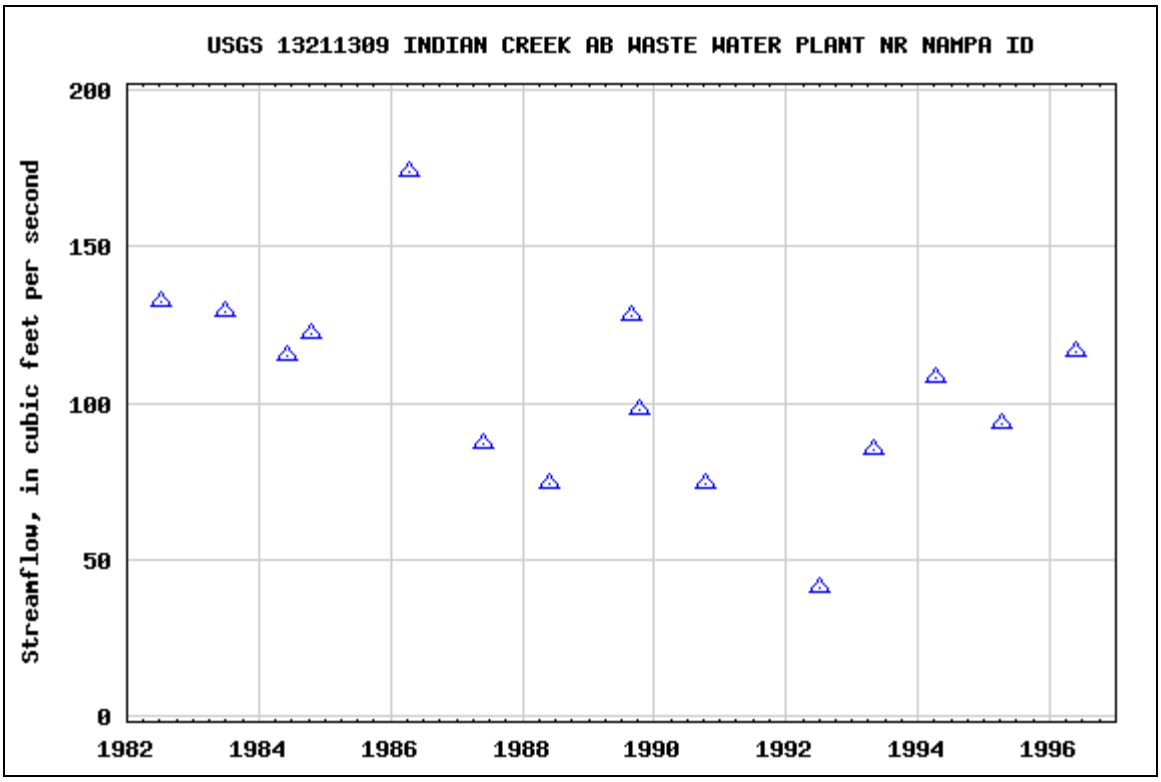
The expansive agricultural lands surrounding Nampa are, for the most part, relatively flat; therefore, any indention or low spot, whether it be natural or manmade can cause water to pool during a flood. Floods in the area are generally the result of a rain-on-snow event or heavy spring runoff.

Thunderstorms are also likely events to affect the community. These events are usually localized, but still can have a significant impact. They are typified by intense rain with flooding occurring rapidly, overwhelming the carrying capacity of the nearby streams. The duration is usually only a matter of hours, but the affects can be widespread throughout the impact areas of the city.

A small portion of Nampa along its eastern edge and northern edges and extending to the southeast and north, respectively, is within the Mason Creek floodplain. The Tenmile Creek floodplain lies along the northeastern edge of the city limits and the Indian Creek floodplain is narrow strip between the railroad tracks and Interstate 84 extending from the northwest corner of the city. Together the floodplains of these three small drainages encompass several subdivisions, businesses, and agricultural, industrial, or commercial facilities. Levees along Tenmile Creek, Indian Creek, and Mason Creek as well as several of the irrigation canals provide reasonable protection against flood waters; however, bank failures, siltation, blockages, or other circumstances could result in a flood waters overtopping the levees. In some parts of Nampa stream and irrigation water is piped underground. This piping system has been designed to handle larger flood events, but a blockage or other damage could lead to extensive flooding around the inlets of the pipes.

The United States Department of Geological Services (USGS) established a surfacing monitoring station in Indian Creek near Nampa from 1982 through 1996. Peak stream flow occurred at this station in April of 1986 and was approximately 174 ft3 /sec.

Figure 4.6. Peak Streamflow Data for Indian Creek near Nampa, Idaho.



4.6.1.2 Ingress-Egress

The primary access routes for Nampa are Interstate 84 or State Route 55 from the east or west and State Routes 45 from the south. Nampa-Caldwell Boulevard is also a main thoroughfare through the downtown area. Due to the high volume of traffic on these routes, most bridge and culvert crossings are engineered to withstand a 100-year flood event. There is a multitude of alternative routes throughout the area; however, closing one of these main roadways due to a flood event would cause considerable traffic problems.

4.6.1.3 Infrastructure

Some of Nampa's critical infrastructure may be affected during flooding events. Access into and out of the city could pose the most serious problem. Many roads, bridges, and culverts would restrict traffic in the area. Several homes, businesses, and industrial, agricultural, or commercial facilities are located within the floodplain.

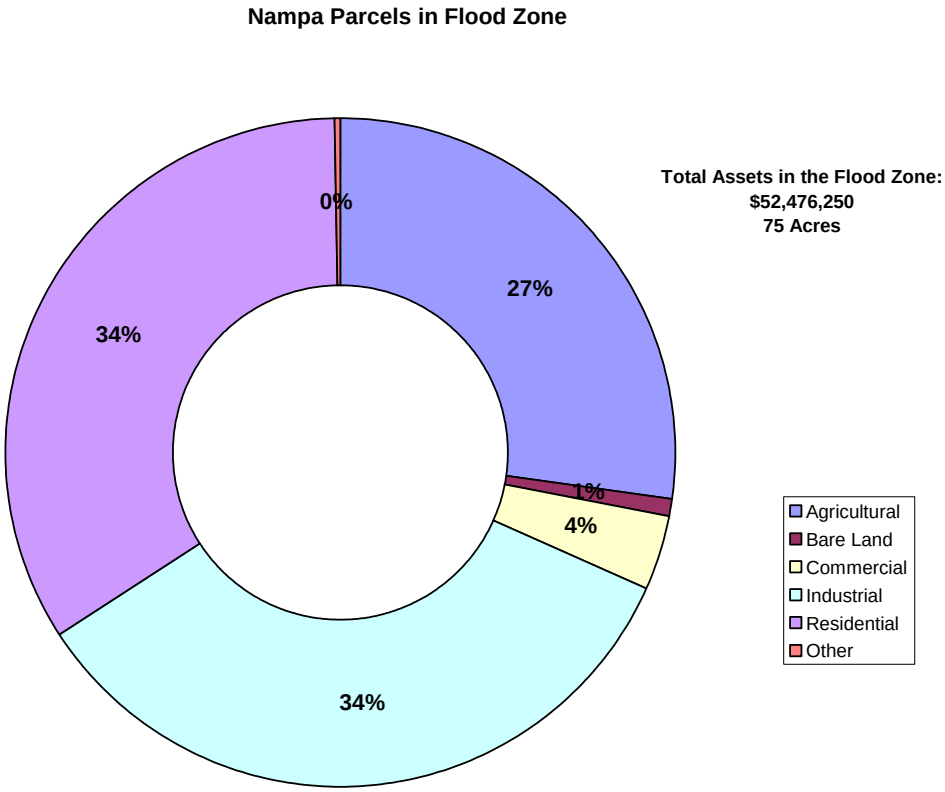
Most residents of Nampa are connected to the municipal water system or have drilled personal wells. Well heads and the water storage tanks are located well outside of the floodplain and have backup generators to provide power during electrical blackouts. Several of the lift stations on the Nampa sewer system have an alternative power source to keep the lines from backing up; however, the Nampa Police Department, Nampa Fire Stations, and the City Hall do not have generators for emergency power backup.

Table 4.5. Water and Sewer Use Data for Nampa, Idaho.			
Nampa Population		51,867	
Water System		**Sewer System**	
Max plant daily production	13 mgd	Treatment Plant Design Capacity	18 mgd
Max daily usage	4.8 mgd	Average Daily Usage (% of capacity)	50%
Avg. daily usage	3.7 mgd	Largest Main Line	30 inches
Storage capacity	.5 mg		

4.6.1.4 Assets at Risk

The City of Nampa is home to approximately $6.2 million of assets at risk located in the flood zone. This represents approximately 12% of all assets at risk to flood damage and loss in Canyon County (Table 4.3). Of these assets at risk, the largest proportion of assets are classified as residential homes ($18 million) and industrial properties ($18 million). The value of commercial property within the Nampa floodplain is $1.9 million while the value of agricultural property and bare land is $14 million and $458,900, respectively. Agriculture comprises approximately 27% of the total value of assets in the flood zone.

Figure 4.7. Classification of assets at risk in the City of Nampa.



4.6.1.5 Flood Protection

Currently, there is no countywide agency responsible for managing drainage issues. Prevention of future problems and enforcement of established standards, as well as mitigation and correction of existing deficiencies are joint responsibilities of the public works, engineering, and planning and zoning agencies of each jurisdiction in Canyon County.

4.6.1.6 Mitigation Activities

The majority of residents in the Nampa area have a low risk of damage caused by smaller periodic floods. Higher magnitude base flood events would likely affect a greater number of the population and could potentially cause extensive damage to critical components of the community's infrastructure. Flash flooding of the nearby stream channels may cause damage to numerous homes and businesses.

Effective mitigation strategies begin with public and municipal awareness of the risks associated with living and working in a floodplain. Residents of Nampa and Canyon County should be aware of the availability of flood insurance thru the NFIP. Continued participation in NFIP and enforcement of building codes in the floodplain will help keep Nampa eligible for low cost flood insurance.

At the local level Nampa should develop a plan for the maintenance of culvert inlets and outlets throughout the city, including storm drain inlets and outlets.

4.6.2 Caldwell

Caldwell is the second largest city in Canyon County is virtually connected to Nampa by urban development. The primary flooding potential comes from the Boise River; however, several of the river's tributaries drain into the river channel at or near Caldwell. These smaller waterways are particularly prone to flash flooding. West Hatley Gulch, East Hatley Gulch, Willow Creek, and Mill Creek Slough all flow into the Boise River along the north side of Caldwell while Mason Creek and Indian Creek drain from south. There are numerous industrial, agricultural, and commercial sites as well as residential areas within the floodplain in the Caldwell area.

4.6.2.1 Flood Potential

Floods in the area are the result of two different types of weather events, rain-on-snow and thunderstorms. Rain-on-snow- events that affect Caldwell occur when significant snow pack exists in the Boise National Forest to the east. 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. Low velocity flooding occurs in Caldwell almost annually during the spring runoff period. Ice jams in the smaller tributaries have historically caused flooding problems. The impacts of successive ice dams being built up and then breaking are felt all the way to the mouth of the creeks in Caldwell as the rush of water quickly overwhelms culverts, bridges, and storm drainage systems.

Sandy soil and sparse vegetation combine to foster flash flooding when intense thunderstorms hit the Caldwell area. Floods from thunderstorms do not occur as frequently as those from general rain and snowmelt conditions, but are far more severe. The possibility for injury and death from flash floods is heightened because they are so uncommon that people do not recognize the potential danger.

The major impacts from both types of flooding in Caldwell are the restricted use of several streets, highways, railroad lines, commercial, industrial, and residential areas. There are numerous bridge and culvert crossings over both the Boise River and several of the tributaries and irrigation canals throughout their extents within the city and the surrounding area.

Warm weather or rain after a heavy snowfall is responsible for high flows in these waterways. A high level of sediment is prevalent during periods of high runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the stream banks in the floodplain area. Considerable debris is allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the city.

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

4.6.2.2 Ingress-Egress

The primary access routes into Caldwell are Interstate 84, U.S. Highways 20 and 26, and State Routes 19 and 44. All of these routes are well traveled not only by commuters, but also by intra and interstate travelers. Due to the extensive use of these roadways, most water crossings have been adequately built to accommodate 100 year flood events. These routes are bordered by moderately sloping or flat rangelands throughout the Treasure Valley. There are numerous alternative routes to these primary routes; however, due to the volume of traffic in and around Caldwell, bypassing these main thoroughfares as a result of a flood event would be problematic.

4.6.2.3 Infrastructure

A large portion of downtown Caldwell as well as numerous roads and bridges would be greatly affected by a flood event. Blockages at bridge and culvert crossings could cause flood waters to overtop the roadway or trigger road failures. Alternative routes would be available during most floods; however, this can add additional time to reach a desired destination or emergency location.

Power line substations within the Caldwell flood zones can be protected by constructing levees around the facility. A plan for supplying an alternative power source to run substations during prolonged outages will also help mitigate the potential effects to the community.

Most residents of Caldwell are connected to the municipal water system or have drilled personal wells. Well heads and the water storage tanks are located well outside of the floodplain and have backup generators to provide power during electrical blackouts. The Caldwell Police Department and Caldwell Fire Stations also have generators for emergency power backup; however, the City Hall and most of the emergency community shelters and senior centers do not.

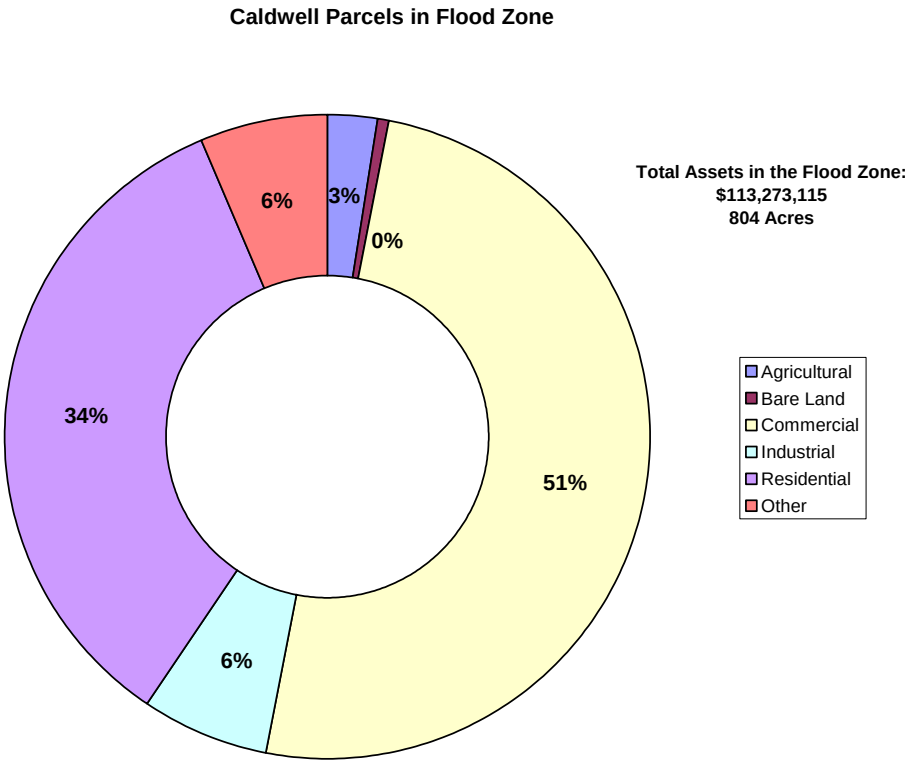
Table 4.6. Water and Sewer Use Data for Caldwell, Idaho.			
Caldwell Population		25,967	
Water System		**Sewer System**	
Max plant daily production	12 mgd	Treatment Plant Design Capacity	7.78 mgd
Max daily usage	6.7 mgd	Average Daily Usage (% of capacity)	58%
Avg. daily usage	3 mgd	Largest Main Line	30 inches
Storage capacity	.5 mg		

The Caldwell Sewer Facility is currently within the floodplain. A flooding incident may result in the release of untreated sewage with severe impacts upon the environment and potential contamination of water supplies. Inundation of the sewer system with floodwaters could also cause sewage to be backed up into homes and businesses.

4.6.2.4 Assets at Risk

Caldwell has approximately $113 million of assets at risk located in the flood zone. Of these assets at risk, the largest proportion of assets is classified as commercial properties ($2.8 million). The value of residential property in the flood zone is approximately $38.8 million while there is $7.3 worth of industrial assets and $7.2 worth of other land classifications.

Figure 4.8. Classification of assets at risk in the City of Caldwell.



The Nampa and Caldwell areas are currently experiencing aggressive residential and light commercial development, a trend throughout much of the Treasure Valley. The negative impact of locating residential and light commercial resources in the areas most prone to flooding has been seen during the spring flooding events. While city and county planning efforts have mitigated many of the risks associated with developing the floodplain, these developments are not without risk to the owners of new homes, and also the owners of existing homes and businesses as the flood waters will spillover as the waters rise. Flood mitigation within the Boise River regions of Caldwell and areas upstream and downstream will continue.

4.6.2.5 Flood Protection

Currently, there is no countywide agency responsible for managing drainage issues. Prevention of future problems and enforcement of established standards, as well as mitigation and correction of existing deficiencies are joint responsibilities of the public works, engineering, and planning and zoning agencies of each jurisdiction in Canyon County.

Many of the housing developments in Caldwell are removed from the 100-year floodplain as they are developed by using fill dirt to elevate them slightly above the flood level. Berms along the Boise River, streams, and canals have been constructed in many areas to help shield homes and other structures from damaging flood waters; however, they are not reinforced and were never meant to serve as engineered levees.

4.6.2.6 Mitigation Activities

Diversion gates to help redirect flood waters from the Boise River to the Dixie Slough or other nearby irrigation ditches would help alleviate some of the flooding problems along the main river channel during high water events. Engineered dikes along the river channel through Caldwell and some of the main irrigation canals would also help protect people and property during high water events.

During the 1999 floods, the local irrigation districts were not allowed to open the headgates on irrigation ditches to divert some of the flood waters to area farm fields. Canyon County and the city of Caldwell feel that a policy change on this issue is important for reducing the risk of floods to residents and property.

Continued participation in NFIP and enforcement of building codes in the floodplain will also help reduce the risk of Caldwell experiencing costly flood damage. Other mitigation strategies include elevating structures so that the lowest floor level is above the flood protection level, relocating structures to less flood prone areas, and constructing floodwalls (berms, levees, etc.) to keep floodwaters from reaching structures. Dry flood-proofing, making structures watertight, and wet flood-proofing, modifying structures so that floodwaters will cause only minimal damage, are also effective methods.

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

4.6.3 Middleton

Middleton is located along State Route 44 near the eastern boundary of Canyon County. The Boise River flows just to the south of the community with the FEMA floodplain extending within about ½ miles of State Route 44 in some places. Middleton does not experience a significant flood risks from the river; however, the smaller drainages of Willow Creek and the Mill Creek

Slough flowing directly through the city do pose serious flood risks. There are also numerous agricultural operations surrounding the community center that would also be affected by flood events.

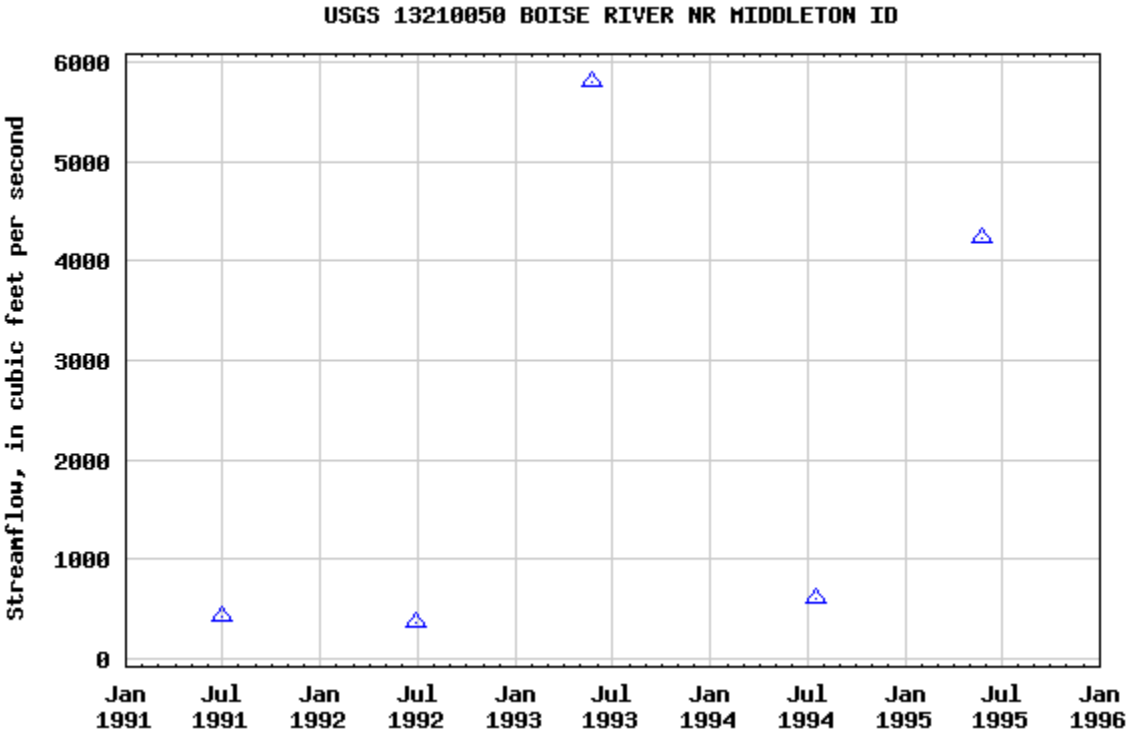
4.6.3.1 Flood Potential

In addition to the potential flood hazard of the Boise River, the Middleton Canal, which drains several small tributaries out of the foothills, flows through the center of Middleton. Although the Middleton Canal does not have FEMA identified floodplain, a blockage or malfunction could cause the canal to breach its banks resulting in severe damage to many homes and businesses. Willow Creek, which flows through Middleton out of the foothills to the north, is dry throughout most of the year; however, thunderstorms and spring runoff events have been known to cause flooding events. The Mill Creek Slough is a small drainage that flows into the city from its eastern side. Throughout most of the year, there is very little water flowing through this drainage; however, like Willow Creek, during thunderstorms and spring runoff, this water flow in this drainage is significantly increased.

Flooding in Middleton is usually the result of rain-on-snow events or heavy spring runoff. Warm weather or rain after a heavy snowfall is a called rain-on-snow event. Warm rains falling on the snow pack result in a significantly increased rate of snowmelt. Often the melting occurs when the ground is frozen and the water cannot be absorbed fast enough, resulting in increased overland flows. Flood waters recede slowly as the weather events tend to last for several days. The three dams on the Boise River provide good flood protection along the main channel; however, several of the tributaries downriver from the dams can contribute to unusually high flow rates and potential flooding downstream.

The United States Department of Geological Services (USGS) established a surfacing monitoring station in the Boise River near Middleton from 1991 through 1995. Peak stream flow occurred at this station in May of 1993 and was approximately 5,800 ft3 /sec.

Figure 4.9. Peak Streamflow for Boise River near Middleton, Idaho.



Thunderstorms are also likely events to affect the community. These events usually are localized, but still can have a significant impact. They are usually typified by intense rainfall in a localized area with flooding occurring rapidly and overwhelming the carrying capacity of the nearby streams and rivers. This duration usually only lasts a matter of hours, but the affects can be spread throughout the impact areas of the town.

4.6.3.2 Ingress-Egress

The primary access routes into Middleton are State Route 44 from the east and west and Middleton Road from the north and south. Both of these routes and several others may be affected by flooding. There are numerous alternative routes throughout the area, but due to relative flatness of the landscape, many of these routes may be affected by flooding as well.

4.6.3.3 Infrastructure

Much of Middleton's critical infrastructure is located within the floodplains including City Hall, the Fire Station, and the Civic Center. Flood water inundation of these buildings would significantly impact the community's ability to respond to emergencies. Bridges and culvert crossings along the Boise River, the Middleton Canal, Willow Creek, and the Mill Creek Slough may experience blockage problems due to downed trees, shrubs, or other debris. Siltation is also an issue in the Boise River channel due to long term control of the water flow.

The State Route 44 bridges across the Mill Creek Slough and Willow Creek is not adequate to withstand a 100-year flood and has been known to cause flood damage due to blockages at this bottleneck. This is a particularly a problem due to the location of City Hall, the Fire Station, the Civic Center, and other parts of downtown Middleton within the floodplain on the adjacent blocks. Larger culverts and better engineered bridges are needed to alleviate this problem.

Table 4.7. Water and Sewer Use Data for Middleton, Idaho.

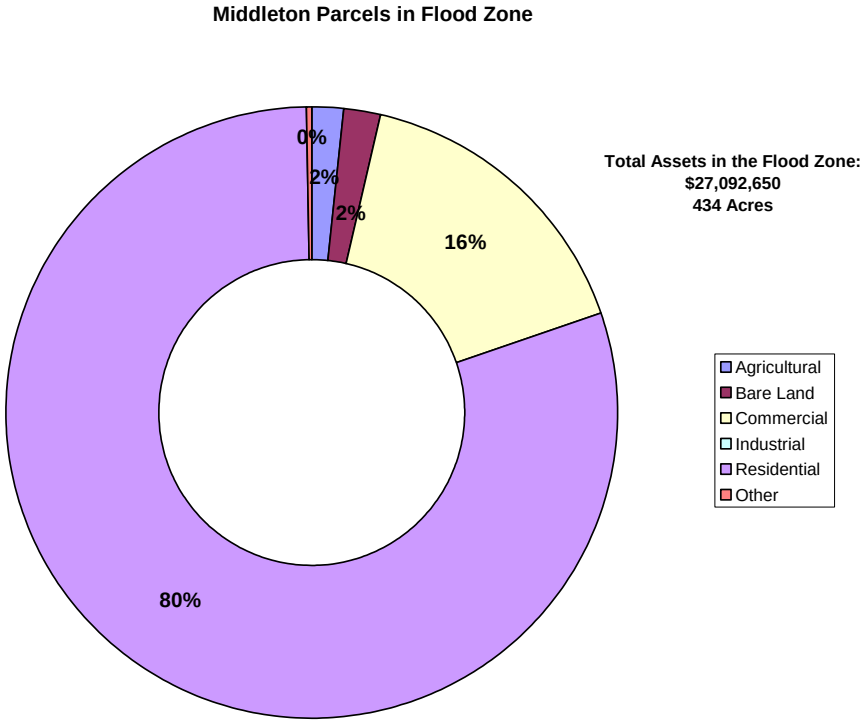
Middleton Population	2,978		
Water System		**Sewer System**	
Max plant daily production	7 mgd	Treatment Plant Design Capacity	1 mgd
Max daily usage	.26 mgd	Average Daily Usage (% of capacity)	45%
Avg. daily usage	.19 mgd	Largest Main Line	15 inches
Storage capacity	2 mg		

Most residents of Middleton are connected to the municipal water system or have drilled personal wells. Although the Middleton Sewer Facility is located outside of the floodplain, if the electrical power were cut off for any reason, the city does not currently have generators to run the lift station, which would likely cause sewer water backup into area homes and business within one or two days.

4.6.3.4 Assets at Risk

Middleton has approximately $27.1 million of assets at risk located in the flood zone. The vast majority of these assets at risk are classified as residential homes ($21.3 million). The value of commercial property within the Middleton city limits amounts to $4.3 million. This accounts for approximately 16% of the value in the flood zone (Figure 4.10). Bare land comprises $515,600 and agricultural property is worth $902,850, 2% each of the total value of assets within the floodplain in Middleton. If the trend over the past 10 years is any indication, then these lands are under high pressure to be developed, primarily as residential lands. The addition of high dollar homes to these undeveloped sites would further increase the proportion and total value at flood risk in the residential category.

Figure 4.10. Classification of assets at risk in the City of Middleton.



The aggressive development of lands within the Treasure Valley includes pressures on Middleton as well. The negative impacts of locating residential and light commercial resources in the areas most prone to flooding has been seen during the spring flooding events. While city and county planning efforts have mitigated many of the risks associated with developing the floodplain, these developments are not without risk to the owners of new homes, and also the owners of existing homes and businesses as the flood waters rise.

4.6.3.5 Flood Protection

Currently, there is no countywide agency responsible for managing drainage issues. Prevention of future problems and enforcement of established standards, as well as mitigation and correction of existing deficiencies are joint responsibilities of the public works, engineering, and planning and zoning agencies of each jurisdiction in Canyon County.

4.6.3.6 Mitigation Activities

Residents in the Middleton area have a moderate risk of experiencing periodic floods. Effective mitigation strategies begin with public and municipal awareness of the risks associated with living and working in a floodplain. Residents of Middleton should be aware of the availability of flood insurance thru the NFIP. At the local level, Middleton should develop a plan for the maintenance of culvert inlets and outlets through town, including storm drain inlets and outlets. Periodic cleaning of the willows and other overgrowth from the stream banks will reduce the occurrence of blockages and ice dams causing flooding problems

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

4.6.4 Notus

Notus is located along U.S. Highway 20/26 about six miles northwest of Caldwell. The Boise River flows along the south side of the community. The Conway Gulch is a very small drainage that flows through Notus from the northeast corner of the community. There are numerous homes, businesses, agricultural operations in and around Notus that would be affected by flood events.

4.6.4.1 Flood Potential

The Boise River runs along the south side of the Notus community. There are many residences as well as businesses, industrial operations, and critical infrastructure including the sewer facility in this area. The Union Pacific railroad bed, which parallels U.S. Highway 20/26, has been elevated several feet creating a berm that provides much of the community on the north side of the tracks flood protection from the river. Neverthless, this berm was not designed or engineered to serve this purpose and may fail. Some of the homes and other structures within the floodplain have been slightly elevated as well, but it is not known whether or not this elevation will protect them through 100 year flood events. Due to the contour of the landscape, most of the floodplain associated with the Boise River at Notus extends from the southern river bank.

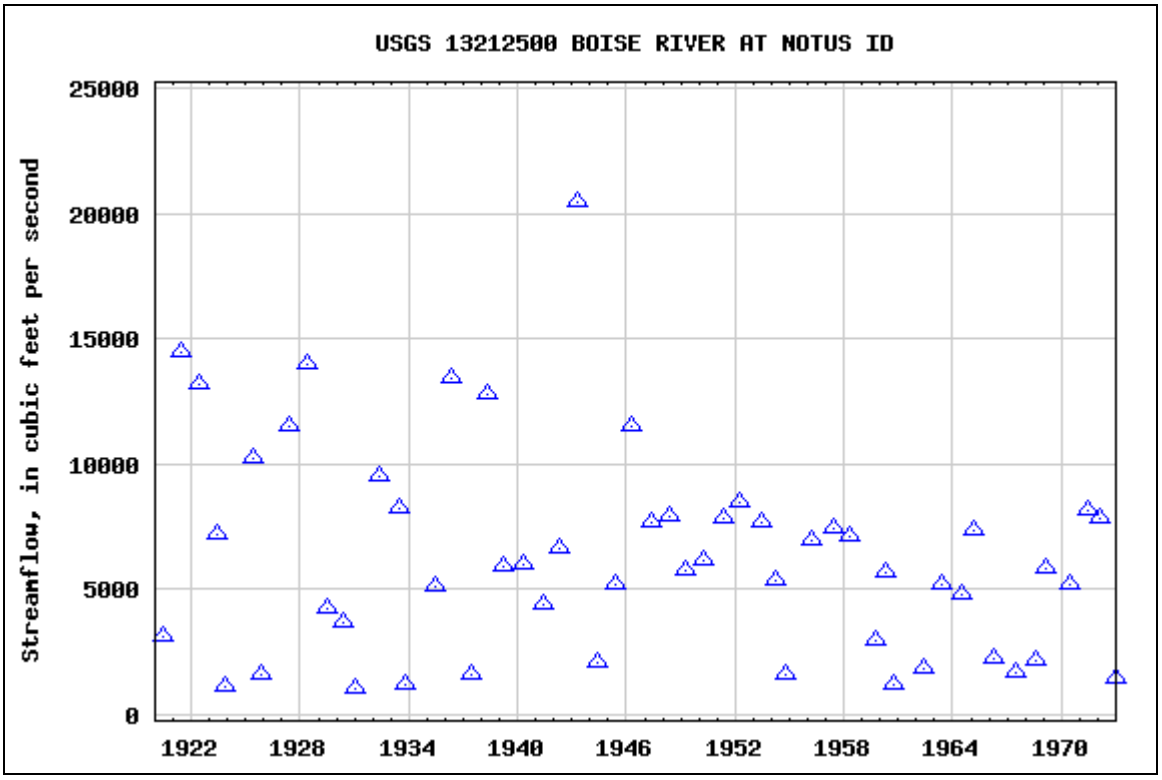
In addition to the potential flood hazard of the Boise River, the Conway Gulch drainage flows through the center of Notus. Historically, this small waterway has not caused a significant amount of flood damage due its regulation by irrigation headgates. However, the potential for

blockages or malfunctions of the irrigation system could cause water in the narrow stream to overtop its banks and cause significant damage to adjacent homes and businesses.

Flooding in Notus is usually the result of rain-on-snow events or heavy spring runoff. Warm weather or rain after a heavy snowfall is a called rain-on-snow event. Warm rains falling on the snow pack result in a significantly increased rate of snowmelt. Often the melting occurs when the ground is frozen and the water cannot be absorbed fast enough, resulting in increased overland flows. Flood waters recede slowly as the weather events tend to last for several days. The three dams on the Boise River provide good flood protection along the main channel; however, several of the tributaries downriver from the dams can contribute to unusually high flow rates and potential flooding.

The United States Department of Geological Services (USGS) established a surfacing monitoring station in the Boise River at Notus from 1920 through 1973. Peak stream flow occurred at this station in April of 1943 and was approximately 20,500 ft3 /sec.

Figure 4.11. Peak Streamflow for Boise River at Notus, Idaho.



Thunderstorms are also likely events to affect the community. These events usually are localized, but still can have a significant impact. They are usually typified by intense rainfall in a localized area with flooding occurring rapidly and overwhelming the carrying capacity of the nearby streams and rivers. This duration usually only lasts a matter of hours, but the affects can be spread throughout the impact areas of the town.

4.6.4.2 Ingress-Egress

The primary access route into Notus is U.S. Highway 20/26 from the east and west. This route and several others may be affected by flooding. There are numerous alternative routes throughout the area, but due to relative flatness of the landscape, many of these routes may be affected by flooding as well.

4.6.4.3 Infrastructure

Most of Notus's critical infrastructure is on the north side of U.S. Highway 20/26 and is; therefore, outside of the floodplain. However, the Notus Sewer Facility and several industrial operations are on the south side and have a high risk of flood damage. The sewer ponds have been elevated and are additionally protected from floodwaters by earthen berms. However, flood water inundation of the sewer system could cause back up into structures and contamination of the water supply as well as have significant environmental impacts. Siltation is also an issue in the Boise River channel due to long term control of the water flow.

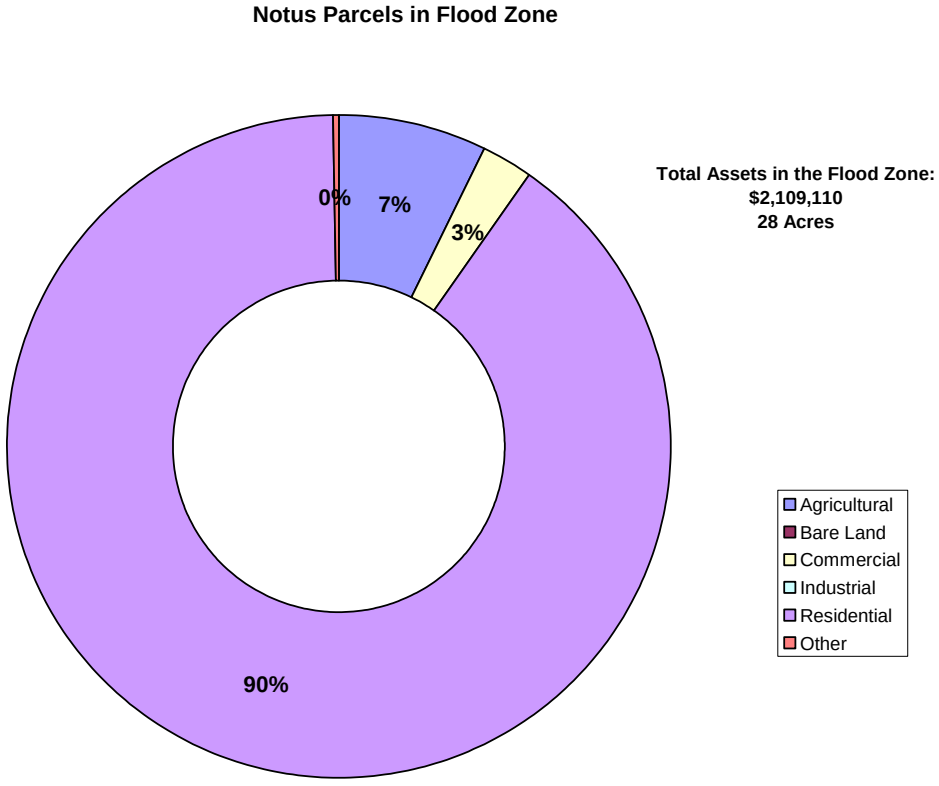
Blockages at bridge and culvert crossings on Conway Gulch or other waterways in the area could cause flood waters to overtop roadways. Alternative routes would be available during most floods; however, this can add additional time to reach a desired destination or emergency location.

Most residents of Notus are connected to the municipal water system or have drilled personal wells. The city maintains a mobile generator to provide backup power to the sewer and water systems, but the Notus City Hall as well as the Fire Station are not hardwired to accept a generator.

4.6.4.4 Assets at Risk

Notus has approximately $2.1 million of assets at risk located in the flood zone. Of these assets at risk, the largest portion (90%) of assets are classified as residential homes ($1.9 million). The value of agricultural property within the Notus city limits amounts to $150,380. This accounts for approximately 7% of the value in the Notus flood zone (Figure 4.12). Commercial properties located within the Notus city limits accounts for a total value of $56,150.

Figure 4.12. Classification of assets at risk in the City of Notus.



4.6.4.5 Flood Protection

Currently, there is no countywide agency responsible for managing drainage issues. Prevention of future problems and enforcement of established standards, as well as mitigation and correction of existing deficiencies are joint responsibilities of the public works, engineering, and planning and zoning agencies of each jurisdiction in Canyon County.

4.6.4.6 Mitigation Activities

Residents in the Notus area have a moderate risk of experiencing periodic floods. Effective mitigation strategies begin with public and municipal awareness of the risks associated with living and working in a floodplain. Residents of Notus should be aware of the availability of flood insurance thru the NFIP. At the local level Notus should develop a plan for the maintenance of culvert inlets and outlets through town, including storm drain inlets and outlets.

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

4.6.5 Parma

The city of Parma is also located along the Boise River to the northwest of Notus and; therefore, has many of the same flood issues. The primary flooding potential comes from the Boise River, which flows along the south side of the community. There are numerous industrial, agricultural, and commercial sites as well as residential areas within the floodplain in the Parma area. The confluence of the Boise River and the Snake River is located about four miles to the west at the Oregon-Idaho border.

4.6.5.1 Flood Potential

The Boise River runs along the south side of the Parma community. There are many residences as well as businesses, industrial operations, and critical infrastructure including the sewer facility in this area. The Union Pacific railroad bed, which parallels U.S. Highway 20/26, has been elevated several feet creating a berm that provides much of the community on the north side of the tracks flood protection from the river. Nevertheless, this berm was not designed or engineered to serve this purpose and may fail. The area between the river channel and the community and extending west towards the mouth of the river is very marshy with several braided streams throughout. The higher water table in this area may lead to extensive flooding of structures in this area.

Floods in the Parma area are usually the result of two different types of weather events, rain-on-snow and thunderstorms. Rain-on-snow- events that affect Parma occur when significant snow pack exists in the upper reaches of the Boise National Forest to the east. Warm rains falling on the snow pack results 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. Low velocity flooding occurs in Parma almost annually during the spring runoff period.

Sandy soil and sparse vegetation combine to foster flash flooding when intense thunderstorms hit the Parma area. Floods from thunderstorms do not occur as frequently as those from general rain and snowmelt conditions, but are far more severe. The possibility for injury and death from

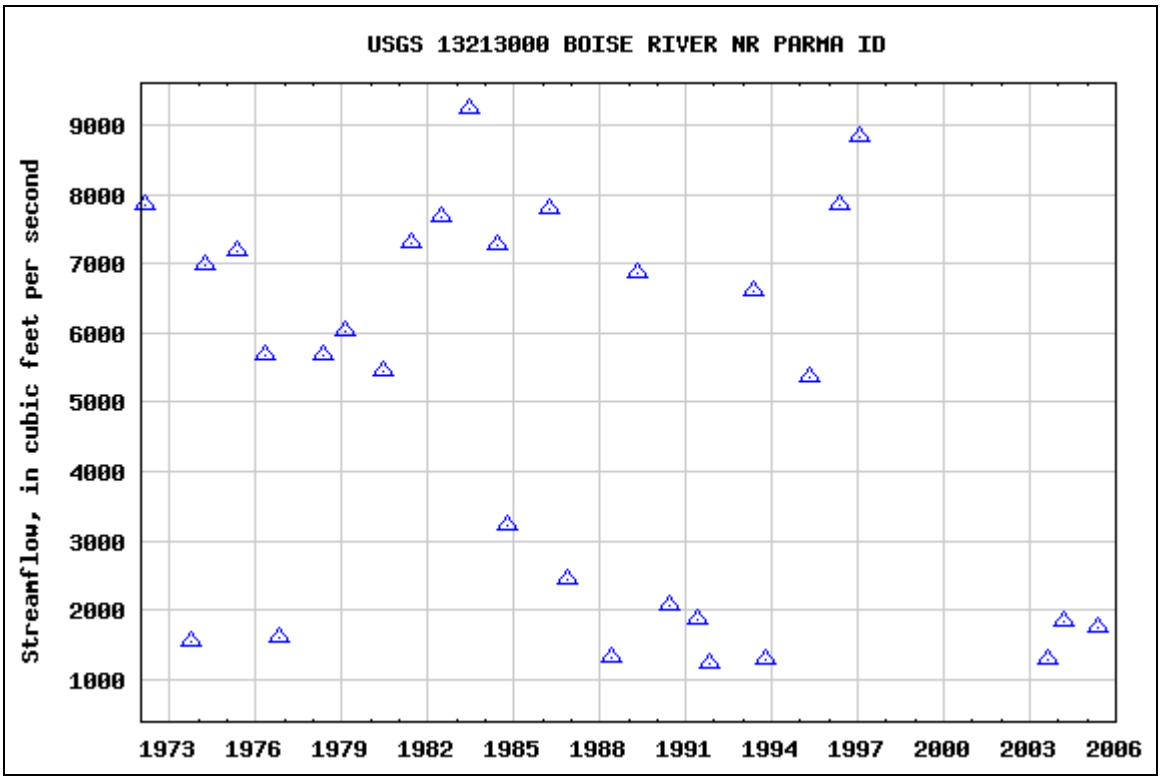
flash floods is heightened because they are so uncommon that people do not recognize the potential danger.

The major impacts from both types of flooding in Parma are the restricted use of several streets, highways, railroad lines, commercial, industrial, and residential areas. There are numerous bridge and culvert crossings over both the Boise River and several of the tributaries and irrigation canals throughout their extents within the cities and the surrounding area.

Warm weather or rain after a heavy snowfall is responsible for high flows in these waterways. A high level of sediment is prevalent during periods of high runoff. This sediment tends to cause a deteriorating condition in streambeds and channels through deposition. Natural obstructions to flood waters include trees, brush, and other vegetation along the river and stream banks in the floodplain area. Considerable debris is allowed to accumulate in these channels, plugging culverts and bridges at several locations throughout the city.

The United States Department of Geological Services (USGS) established a surfacing monitoring station in the Boise River near Parma from 1972 through 2005. Peak stream flow occurred at this station in June of 1983 and was approximately 9,240 ft3 /sec.

Figure 4.13. Peak Streamflow Data for Boise River at Parma, Idaho.



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

4.6.5.2 Ingress-Egress

The primary access routes into Parma are U.S. Highway 20/26 and 95. Both of these routes are well traveled not only by commuters, but also by intra and interstate travelers. Due to the extensive use of these roadways, most water crossings have been adequately built to accommodate 100 year flood events. These routes are bordered by moderately sloping or flat rangelands. There are numerous alternative routes to these primary routes; however, due to the volume of traffic through Parma, bypassing these main thoroughfares as a result of a flood event would be problematic.

4.6.5.3 Infrastructure

A large portion of Parma as well as numerous roads and bridges would be greatly affected by a flood event, particularly in the areas south of U.S. Highway 20/26. U.S. Route 95 crosses the Boise River as well as Sand Creek and several other small channels near Parma. Many of the culverts and bridges along this route could become at risk to flooding due to debris blockages or ice dams. Water over the roadway or bank failures could result in significant travel delays along this main north-south route. There are only two (Highway 95 and Highway to Roswell) that cross the Boise River near Parma; therefore if one or both of these crossings are comprised by floodwaters, there could be major access problems for emergency responders.

Table 4.8. Water and Sewer Use Data for Parma, Idaho.

Parma Population	1,771		
Water System		**Sewer System**	
Max plant daily production	8.2 mgd	Treatment Plant Design Capacity	.65 mgd
Max daily usage	1.7 mgd	Average Daily Usage (% of capacity)	70%
Avg. daily usage	1.1 mgd	Largest Main Line	18 inches
Storage capacity	.75 mg		

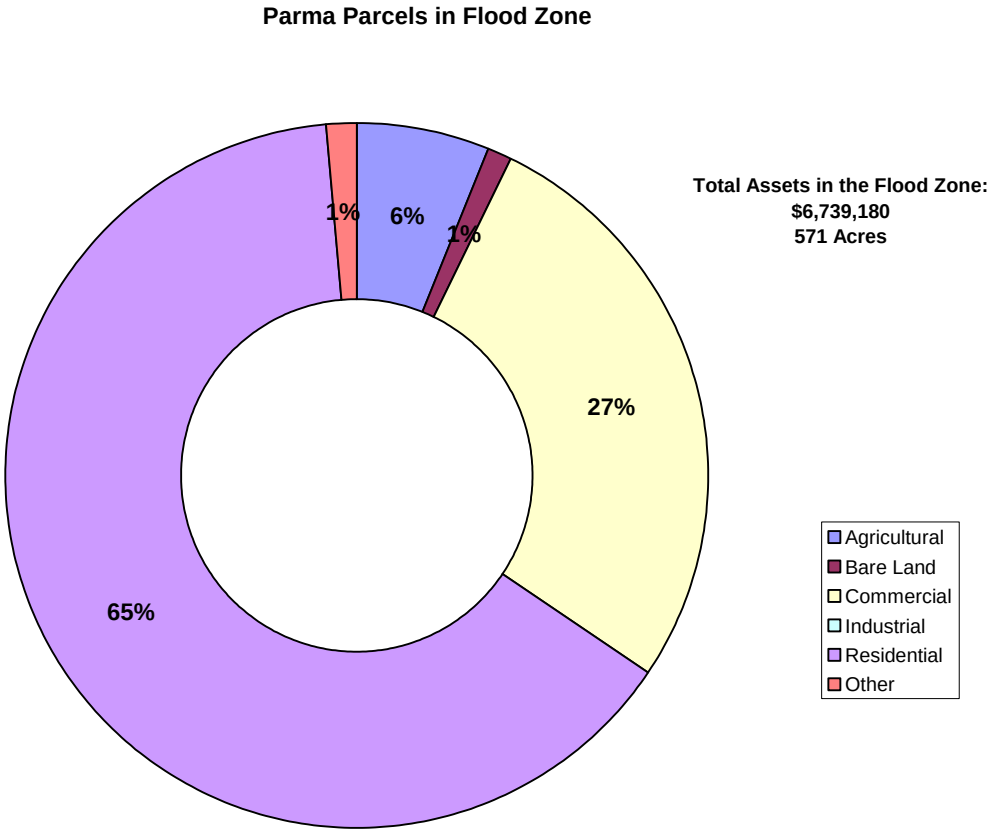
Most residents of Parma are connected to the municipal water system or have drilled personal wells.

The Parma Sewer Facility and several industrial operations are within the floodplain and have a high risk of flood damage. Flood water inundation of the sewer system could cause back up into structures as well as have significant environmental impacts. Currently, the sewer system does not have an alternative source of power. Siltation is also an issue in the Boise River channel due to long term control of the water flow.

4.6.5.4 Assets at Risk

Parma has approximately $6.7 million of assets at risk located in the flood zone. Of these assets at risk, the largest proportion of assets (65%) is classified as residential homes ($4.3 million). The value of commercial property within Parma's city limits amounts to $1.8 million. Agricultural land located within the Parma city limits accounts for a total value of $402,900.

Figure 4.14. Classification of assets at risk in the City of Parma.



4.6.5.5 Flood Protection

Currently, there is no countywide agency responsible for managing drainage issues. Prevention of future problems and enforcement of established standards, as well as mitigation and correction of existing deficiencies are joint responsibilities of the public works, engineering, and planning and zoning agencies of each jurisdiction in Canyon County.

4.6.5.6 Mitigation Activities

Continued participation in NFIP and enforcement of building codes in the floodplain will help reduce the risk of Parma experiencing costly flood damage. Other mitigation strategies include elevating structures so that the lowest floor level is above the flood protection level, relocating structures to less flood prone areas, and constructing floodwalls (berms, levees, etc.) to keep floodwaters from reaching structures. Dry flood-proofing, making structures watertight, and wet flood-proofing, modifying structures so that floodwaters will cause only minimal damage, are also effective methods.

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

Chapter 5: Landslides

5 Landslide Characteristics

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.

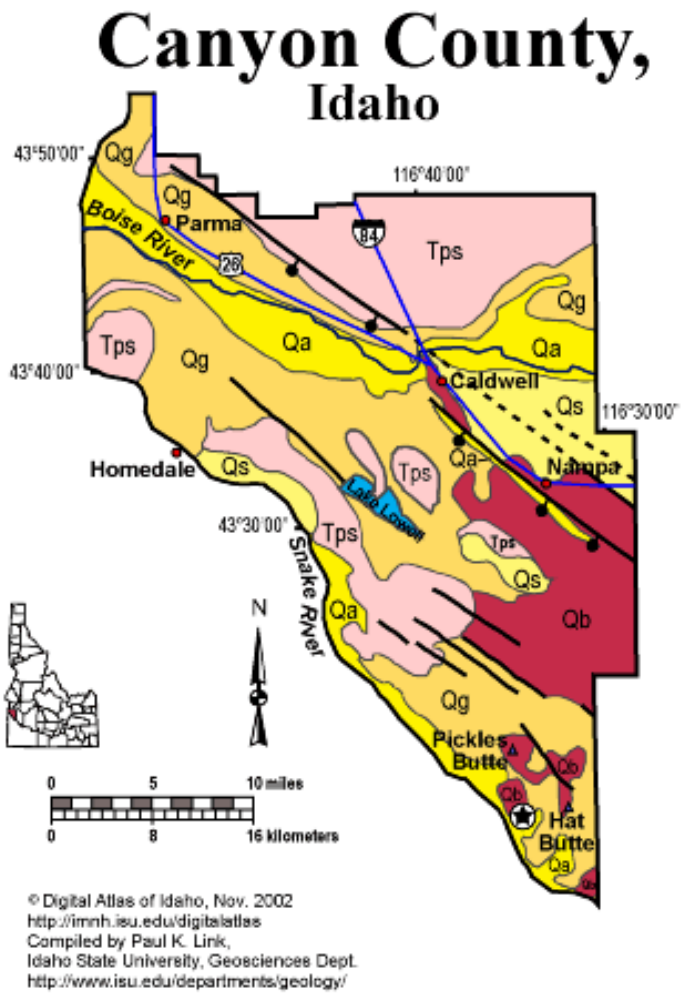
5.1 Canyon County Profile

Canyon County is generally level with some rolling and bench terrain. Canyon County is entirely on the Snake River Plain, between the Snake River to the south and the foothills of the central Idaho Mountains to the north. Much of the county is underlain by Quaternary alluvium of the Boise River and Pleistocene gravel from glacial outwash. This gravel forms high benches above the Boise River.

Several normal faults run northwest through the county, parallel with the northern boundary of the western Snake River Plain. Miocene lake beds make up the foothills on the northern boundary of the county.

Quaternary basalt covers the southeastern section of the county. Miocene and Pliocene lake beds of the Glenns Ferry and Chalk Hills formation are found on the bluffs north of the Snake River. 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.

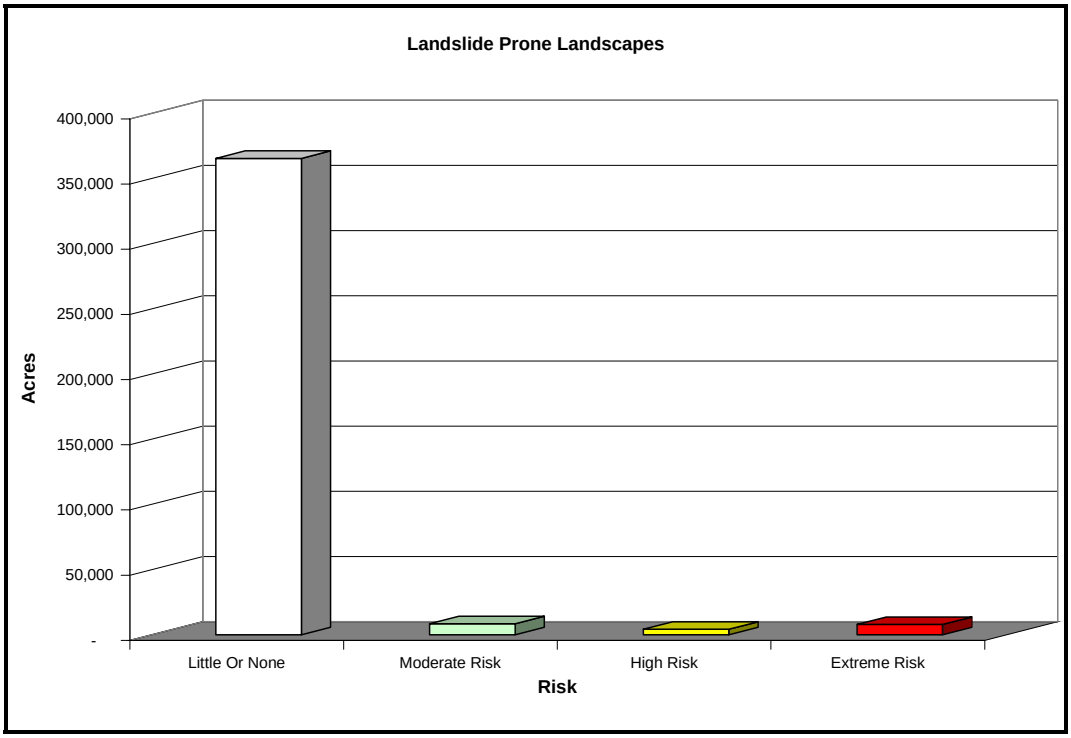
Figure 5.1. Geologic Map of Canyon County.



The primary factors that increase landslide risk are slope and certain soil characteristics. In general, the potential for landslide occurrence intensifies as slope increases on all soil types and across a wide range of geological formations.

Soil factors that increase the potential for landslide are soils developed from parent materials high in schist and granite, and soils that are less permeable containing a resistive or hardpan layer. These soils tend to exhibit higher landslide potential under saturated conditions than do well drained soils. To identify the high-risk soils in Canyon County, the NRCS State Soils Geographic Database (STATSGO) layer was used to identify the location and characteristics of all soils in the County. The specific characteristics of each major soil type within the County was reviewed. Soils with very low permeability that characteristically have developed a hardpan layer or have developed from schist and granite parent material were selected as soils with potentially high landslide risk potential. High-risk soils magnify the effect slope has on landslide potential. Soils identified as having high potential landslide risk are further identified only in areas with slopes between 14° and 30° (25-60%). It is these areas that traditionally exhibit the highest landslide risk due to soil characteristics within a given landscape.

Figure 5.2 Landslide Prone Landscapes in Canyon County Based on Geology.



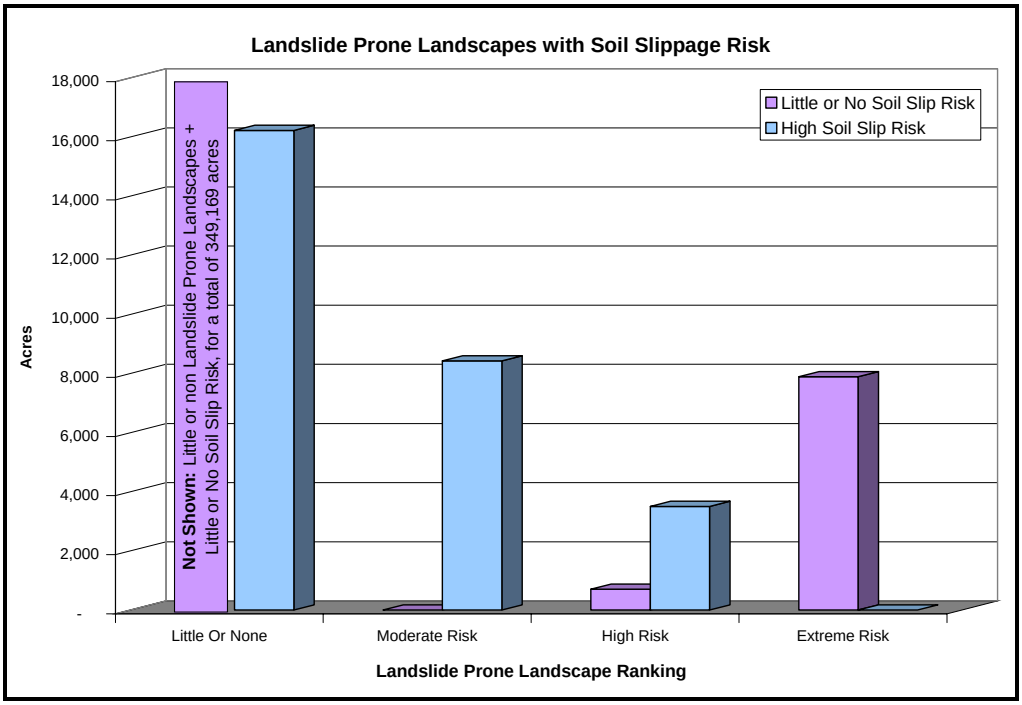
To portray areas of probable landslide risk due to slope related factors, slope models were used to identify areas of low, moderate and high risk. This analysis identified the low risk areas as slopes in the range of 20°-25° (36-46%), moderate as 26°-30° (48-60%) and high risk as slopes in the range of 31°-60° (60-173%). Slopes that exceeded 60° (173%) were considered low risk due to the fact that sliding most likely had already occurred relieving the area of the potential energy needed for a landslide. From the coverage created by these two methods it is possible to depict areas of risk and their proximity to development and human activity. With additional field reconnaissance the areas of high risk were further defined by overlaying additional data points identifying actual slide locations, thus improving the resolution by specifically identifying the highest risk areas. This method of analysis is similar to a method developed by the Clearwater National Forest in north central Idaho (McClelland *et al.* 1997).

Table 5.1. Landslide Risk Due to Slopes and Geology in Canyon County.

Risk Due to Slopes and Geology	Acres	Percent
Little or No Landslide Risk	365,389	95%
Moderate Landslide Risk	8,423	2%
High Landslide Risk	4,200	1%
Extreme Landslide Risk	7,891	2%

Landslide may occur on slopes steepened by man during construction, or on natural ground never disturbed. However, most slides occur in areas that have had sliding in the past. All landslides are initiated by factors such as weaknesses in the rock and soil, earthquake activity, the occurrence of heavy snow or rainfall, or construction activity that changes a critical factor involved with maintaining stability of the soil or geology of the area. A prime example of this includes previously stable slopes where home construction utilizing independent septic systems are added. The increased moisture in the ground, when coupled with an impermeable layer below the septic systems has led to surface soil movements and mass wasting.

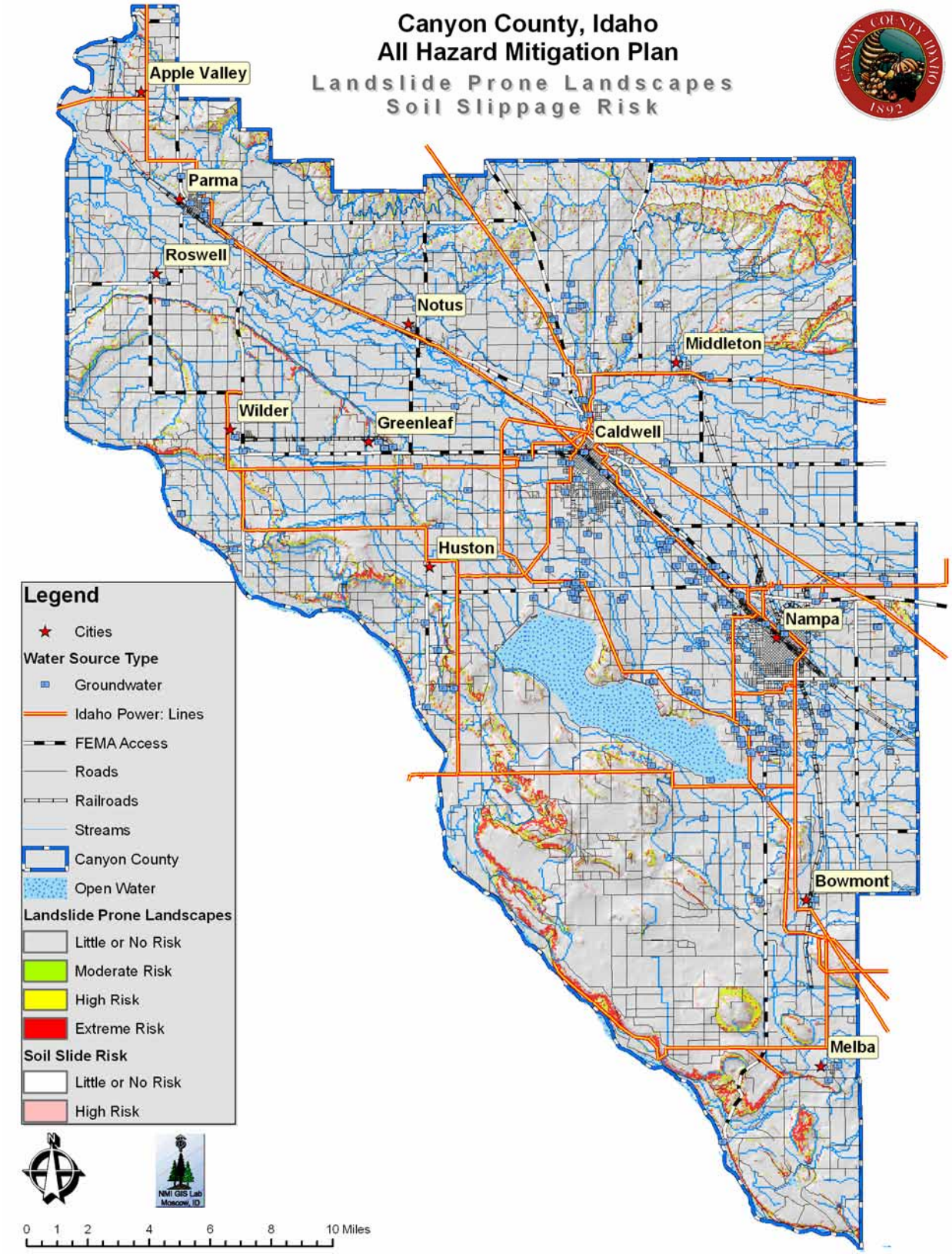
Figure 5.3. Landslide Prone Landscapes Based on Geology and Soils.



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 and 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 affects drainage patterns or that increase erosion or change ground-water levels can augment the potential for landslide activity.

Figure 5.4. Landslide Prone Landscapes of Canyon County; Slope and Geologic Factors.



5.1.1 Assets at Risk to Landslides

There are only two relatively small areas in Canyon County that have are within the impact zones of areas at high risk to experiencing a landslide. One of these areas is located in the foothills in the northeastern corner of the county and the other lies along the Snake River canyon in the southern tip of the county.

Using the parcel information and asset values maintained by the Canyon County Assessor's Office, overlaid with the Landslide Prone Landscapes map developed by Northwest Management, Inc., and Canyon County, we have completed an assessment of the assets at risk to damage from landslides in Canyon County. These summaries are detailed in Table 4.2. Canyon County has approximately $8.7 million of land and improvements within the landslide impact zones (Table 5.2, Figure 5.5).

The largest portion of assets in Canyon County located in the landslide impact zones is in the North County Area, with 51% of the total value ($44,595,920) located in the impact zones. The South County Area has $43,038,720 worth of assets within the landslide impact zones. Summaries of the nature of the value in each area are detailed in Table 5.2 and Figure 5.5.

The landslide impact areas within the Canyon County are relatively limited to rural areas with most of the total value coming from agriculture, bare land, or scattered residences. Neither of the landslide impact zones affect incorporated cities; however, the unincorporated communities of Walters Ferry, Riverside, and Sunnyslope may be affected by the South County Area impact zone.

Figure 5.5. Property values within North County Landslide Impact Area of Canyon County.

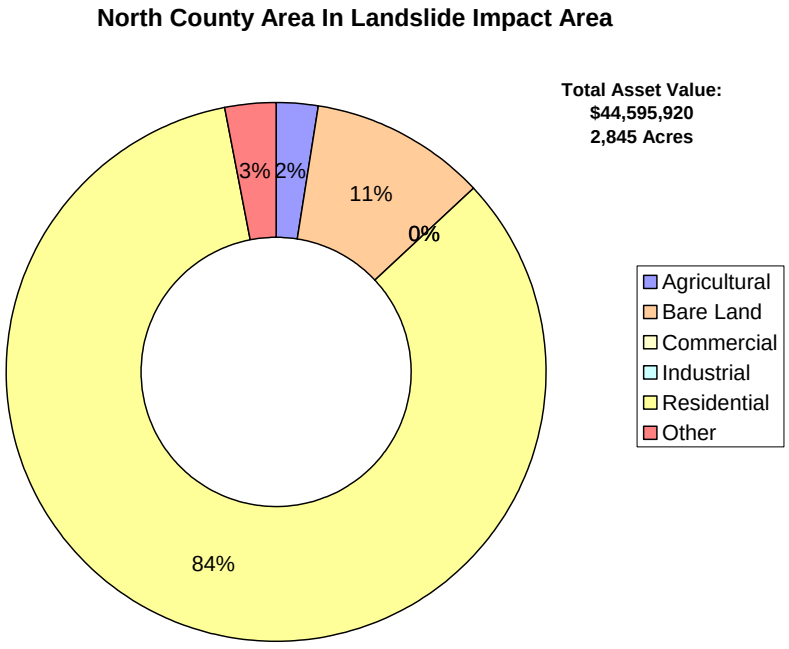


Figure 5.6. Property values within South County Landslide Impact Area of Canyon County.

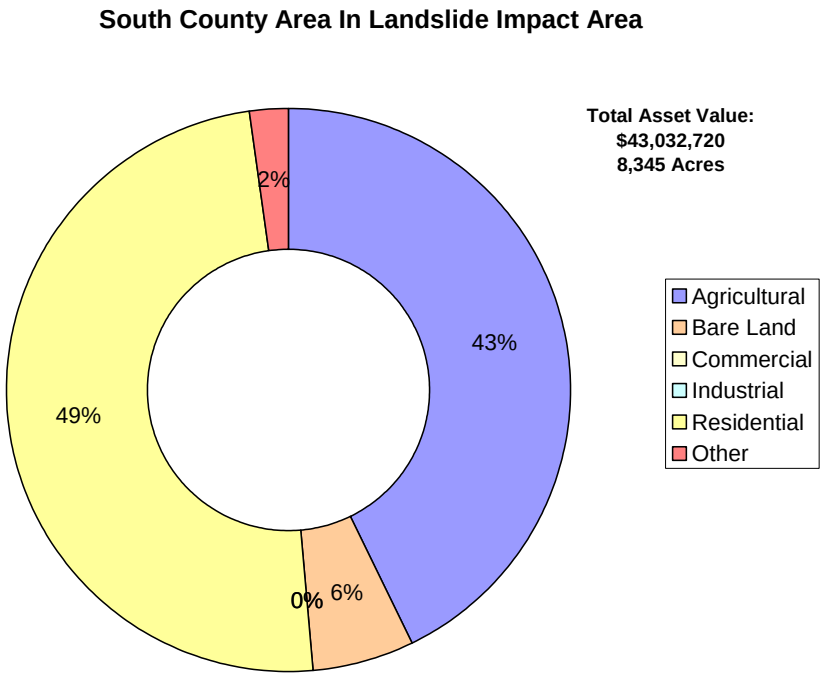


Table 5.2. Value of property within landslide impact zones of Canyon County.

		← Land Classification →											
		Agricultural Land		Bare Land		Commercial		Industrial		Residential		Other	
	Total Value	Land	Improvements	Land	Improvements	Land	Improvements	Land	Improvements	Land	Improvements	Land	Improvements
Assessed value in Impact Zones, entire county	$87,634,640	$9,838,980	$11,793,655	$5,544,390	$3,785,320	$0	$0	$0	$0	$15,999,360	$30,434,265	$9,029,860	$1,208,810
	11,190 Ac	3,236 Ac		3,316 Ac		0 Ac		0 Ac		4,282 Ac		356 Ac	
North county area in Impact Zone	$44,595,920	$387,490	$500,620	$4,396,740	$2,239,920	$0	$0	$0	$0	$10,588,620	$17,414,240	$8,432,830	$639,100
	2,845 Ac	66 Ac		1,060 Ac		0 Ac		0 Ac		1,344 Ac		376 Ac	
South county area in Impact Zone	$43,038,720	$9,451,490	$11,296,675	$1,147,650	$1,545,400	$0	$0	$0	$0	$5,410,740	$13,020,025	$597,030	$569,710
	8,345 Ac	3,170 Ac		2,249 Ac		0 Ac		0 Ac		2,797 Ac		129 Ac	

5.2 Landslide Prone Landscapes

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 Canyon County because of their juxtaposition to one or more of these characteristics.

5.3 Individual Community Assessments

Due to the relative flatness of the landscape surrounding the incorporated cities in Canyon County, they all have a fairly low risk of being affected by landslides. Nevertheless, on a smaller scale, slumps along roads or streambank failures could negatively impact some residents and businesses in nearby areas. Road failures or slumps along cutbanks can impede travel corridors and streambank failures can cause blockages that result in flooding.

The unincorporated communities of Walters Ferry, Sunnyslope, and Riverside are located near the northern rim of the Snake River drainage and lie within the South County Landslide Impact Area. These areas are characterized by large farming and ranching operations with residences and other structures scattered throughout the area. There is very little commercial development in these communities. Most of the residents in these rural populations have a low risk of being affected by a landslide; however, those structures situated within or along the rim of the Snake River canyon have a much higher potential risk. Even a small slump under a home could result in the structure sliding into the river. Heavy rains or high water events could weaken the stability of slopes along the canyon. Additionally, the river may undercut its banks periodically causing the upper slopes to become unstable and slide.

5.4 General Landslide 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. Following a number of approaches used individually or in combination to reduce or eliminate losses can reduce landslide risk.

5.4.1 Establish a countywide landslide 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. This could become a County directive to the road and bridge crews.

5.4.2 Restricting development in Landslide Prone Landscapes

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 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.

5.4.3 Standardizing codes for excavation, construction, and grading

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.

5.4.4 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.

5.4.5 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. In addition to identifying these at-risk landscapes, it will also serve to begin an educational dialog with landowners in Canyon County, enlightening residents and visitors to the risks associated with landslides.

5.4.6 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 sent via telemetry for real-time warning. Development of regional real-time landslide warning systems is one of the more significant areas of landslide research (Fragaszy 2002, USGS 2004).

5.4.7 Public Education

Residents can increase their personal awareness by becoming familiar with the land around the home and community. People can learn whether landslides or debris flows have occurred in the 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 telltale 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 deck-sand 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 roadbeds.
- 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.

(USGS 2004)

5.5 Fire Related Debris Flows

Wildland fires are inevitable in the western United States where burnable vegetation exists. 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 potentially 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.

5.5.1 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 (MacDonald *et al.* 2004). Thunderstorm events producing 0.25 inches of precipitation an hour have been used as a threshold for flash flooding in severely burned areas of Western Montana.

5.5.2 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, rilling, gullying, 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 rilling 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 needed, 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.

Chapter 6: Earthquake

6 Earthquake

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.

Figure 6.1. Damage from the Borah Peak Earthquake, 1983.

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.

6.1 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 6.1. 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.

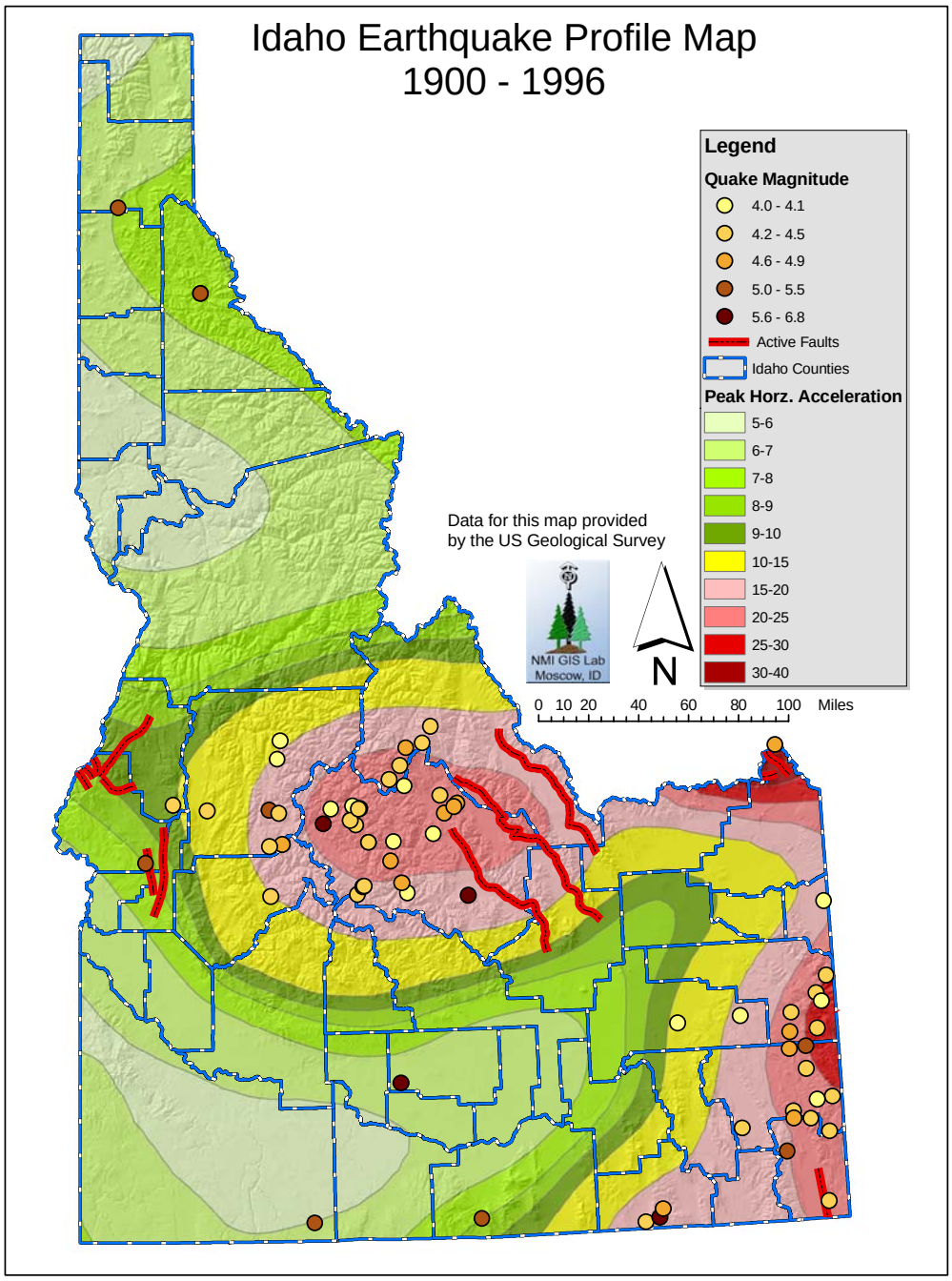
(IGS 2004)

6.2 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 6.2. Earthquakes in Idaho with a magnitude of 4.1 or greater.



6.2.1 Canyon 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.

Based on a historical record extending from about 1872 to the present, Canyon County has not experienced any seriously damaging earthquakes. Three distant earthquakes produced

intensities of VI in Caldwell that were strong enough to cause light nonstructural damage. These were the 1983 Borah Peak (east-central Idaho, magnitude 7.0), the 1959 Hebgen Lake (western Wyoming; magnitude 7.5), and an earthquake in 1947 with an epicenter in Idaho's Salmon River mountains northeast of Boise. Regional seismic networks indicate that low magnitude earthquakes do not generally occur directly beneath Canyon County, and that microseismicity does not outline active faults (Phillips 2005).

A group of northwest-trending faults assigned to the Western Snake River Plain Fault System occur in and near Canyon County. These faults offset Pliocene-Pleistocene deposits and form topographic linears consisting of asymmetric ridges up to 30 meters high. Quaternary deposits are locally deformed by these faults. Along the southwestern margin of the WSRP Fault System between the Owyhee Mountains and the Snake River Plain, active structures have been identified in the Owyhee Mountains Fault System trenched the Water Tank fault and found evidence for five events since 26±8 ka, and an age of the youngest event of about 3 ka (Phillips 2005).

The earth structure along the foothills is a sand or gravel type loam over sandstone or other relatively solid rock formation. This is a questionable soil structure if subjected to serve movement. Slides, liquefaction, and subsidence are all possibilities. Slope failures would interrupt utilities and road access to some areas and consequently delay or reduce emergency response.

Communities can expect some structural failure of older multistory buildings. Cornices, frieze, and other heavy decorative portions of these structures may fail. Brick veneer exteriors may collapse and utility interruption should be expected. In some cases whole structures may collapse. Vehicular travel may be very difficult and congestion could prevent timely emergency response.

6.2.1.1 Assets at Risk to Earthquake Damage

There are many structures throughout the county that may be at risk to damage due to shaking caused by earthquakes. Generally, these structures are older un-reinforced masonry buildings located within the city limits of many of the communities. Estimating the number and value of these structures is very difficult; however, city officials from each municipality have offered the estimates in the following subsections.

Without exception, older un-reinforced masonry buildings should be well maintained and an evacuation plan developed. Expectation that an earthquake will occur sometime in the future should prepare the owner to have emergency information and supplies on hand. The following bullets are examples of actions that can be taken to evaluate the condition of un-reinforced masonry structures as well as prevent further deterioration.

- Check roofs, gutters, and foundations for moisture problems, and for corrosion of metal ties for parapets and chimneys. Make repairs and keep metal painted and in good condition.
- Inspect and keep termite and wood boring insects away from wooden structural members. Check exit steps and porches to ensure that they are tightly connected and will not collapse during an emergency exit.
- Check masonry for deteriorating mortar, and never defer repairs.
- Contact utility companies for information on flexible connectors for gas and water lines, and earthquake activated gas shut-off valves. Strap oil tanks down and anchor water heaters to wall framing.

- Collect local emergency material for reference and implement simple household or office mitigation measures, such as installing latches to keep cabinets from flying open or braces to attach tall bookcases to walls. Keep drinking water, tarpaulins, and other emergency supplies on hand.

6.2.1.1.1 Nampa

There are approximately 100 – 120 un-reinforced masonry buildings within the city limits of Nampa. Several schools and other intensely used un-reinforced masonry buildings have undergone seismic retrofitting to help decrease their risk of experiencing costly structural damage as well as their potential to cause injury or death to occupants or nearby pedestrians. Seismic retrofit of historic buildings is achieved through the reinforcement of structural elements. Such reinforcement may have included anchored ties, reinforced mortar joints, braced frames, bond beams, moment-resisting frames, shear walls, and horizontal diaphragms. Although retrofitting at risk buildings decreases the potential hazard they pose during an earthquake, it is not an easy fix, and damage or injury could still occur.

6.2.1.1.2 Caldwell

There are approximately 90 - 100 un-reinforced masonry buildings within the city limits of Caldwell. Several schools and other intensely used un-reinforced masonry buildings have undergone seismic retrofitting to help decrease their risk of experiencing costly structural damage as well as their potential to cause injury or death to occupants or nearby pedestrians. Seismic retrofit of historic buildings is achieved through the reinforcement of structural elements. Such reinforcement may have included anchored ties, reinforced mortar joints, braced frames, bond beams, moment-resisting frames, shear walls, and horizontal diaphragms. Although retrofitting at risk buildings decreases the potential hazard they pose during an earthquake, it is not an easy fix, and damage or injury could still occur.

6.2.1.1.3 Middleton

The city of Middleton has approximately 5 - 10 un-reinforced masonry buildings within the city limits. This estimate is based on masonry buildings known to be twenty or more years old.

6.2.1.1.4 Notus

The city of Notus has relatively few un-reinforced masonry buildings. There are approximately five buildings throughout the town that were constructed using cinder blocks, which would be at risk to damage and potential collapse during an earthquake. There may also be a few older homes in the area that were constructed using cinder blocks for basement walls.

6.2.1.1.5 Parma

The city of Parma has approximately 10 – 20 un-reinforced masonry buildings within the city limits. This estimate is based on masonry buildings known to be twenty or more years old.

6.2.1.1.6 Wilder

The city of Wilder has approximately 10 – 20 un-reinforced masonry buildings within the city limits. This estimate is based on masonry buildings known to be twenty or more years old.

6.2.1.1.7 Greenleaf

The city of Greenleaf has approximately 10 – 20 un-reinforced masonry buildings within the city limits. One structure that is of particular importance due to the intensity of its use is the Friends Academy, a private school (k-12) located in Greenleaf. This estimate is based on masonry buildings known to be twenty or more years old.

6.2.1.1.8 Melba

The city of Melba has approximately 12 un-reinforced masonry buildings within the city limits. In addition, there are approximately 24 homes in Melba that are likely to be un-reinforced masonry. These estimates are based on masonry buildings known to be twenty or more years old.

6.3 History

Earthquakes have affected Canyon County on a random periodic basis since the first records were kept of the area. Although less frequent then other natural hazards, the earthquake history of the area is pronounced.

6.3.1 May 12, 1916

Event Summary: Earthquake in SW Idaho, centered near Cascade. This quake was felt from Anaconda, Montana, to Reno, Nevada, an area over 50,000 miles, and measured 6.1 on the Richter scale.

County Summary: An earthquake centered near Cascade shook Nampa nearly as violently as Boise, but was less noticeable at Caldwell.

Harpham, Lynda Koll; The Idaho Statesman 5/13/16; 1/31/84; Earthquake History of the United States

6.3.2 October 2, 1915

Event Summary: Earthquake in SW Idaho; felt in Boise, Nampa, Payette, Caldwell and Weiser; also felt as far as WA, OR, NV, AZ, CA and UT. Despite being felt throughout such a large area, no major damage was reported.

County Summary: Earthquake with epicenter approx. 80 miles southeast of Spokane, knocked chickens off their perches, broke dishes, caused minor damage to buildings. The quake shook Arrowrock Dam while three workers were working on it, but caused no damage.

The Idaho Statesman 1/31/84

6.3.3 September 24, 1947

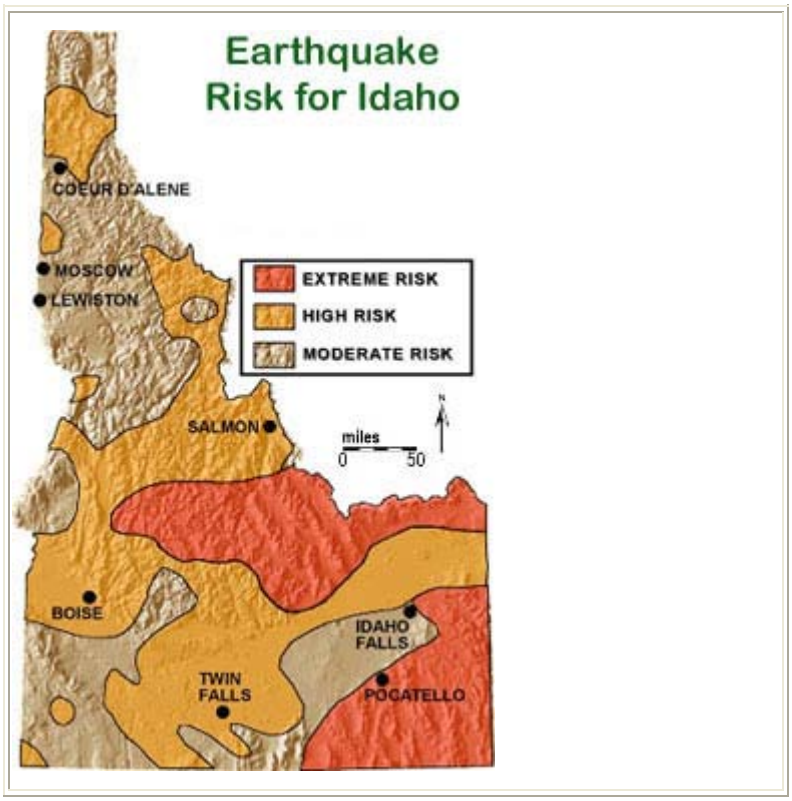
Event Summary: Earthquake in central Idaho caused slight damage. Magnitude 4.7, Intensity VI.

County Summary: Earthquake in central Idaho caused cracks in a brick building in Boise

Seismicity of the United States

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

Figure 6.3. Relative earthquake risks for Idaho.



6.4 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.

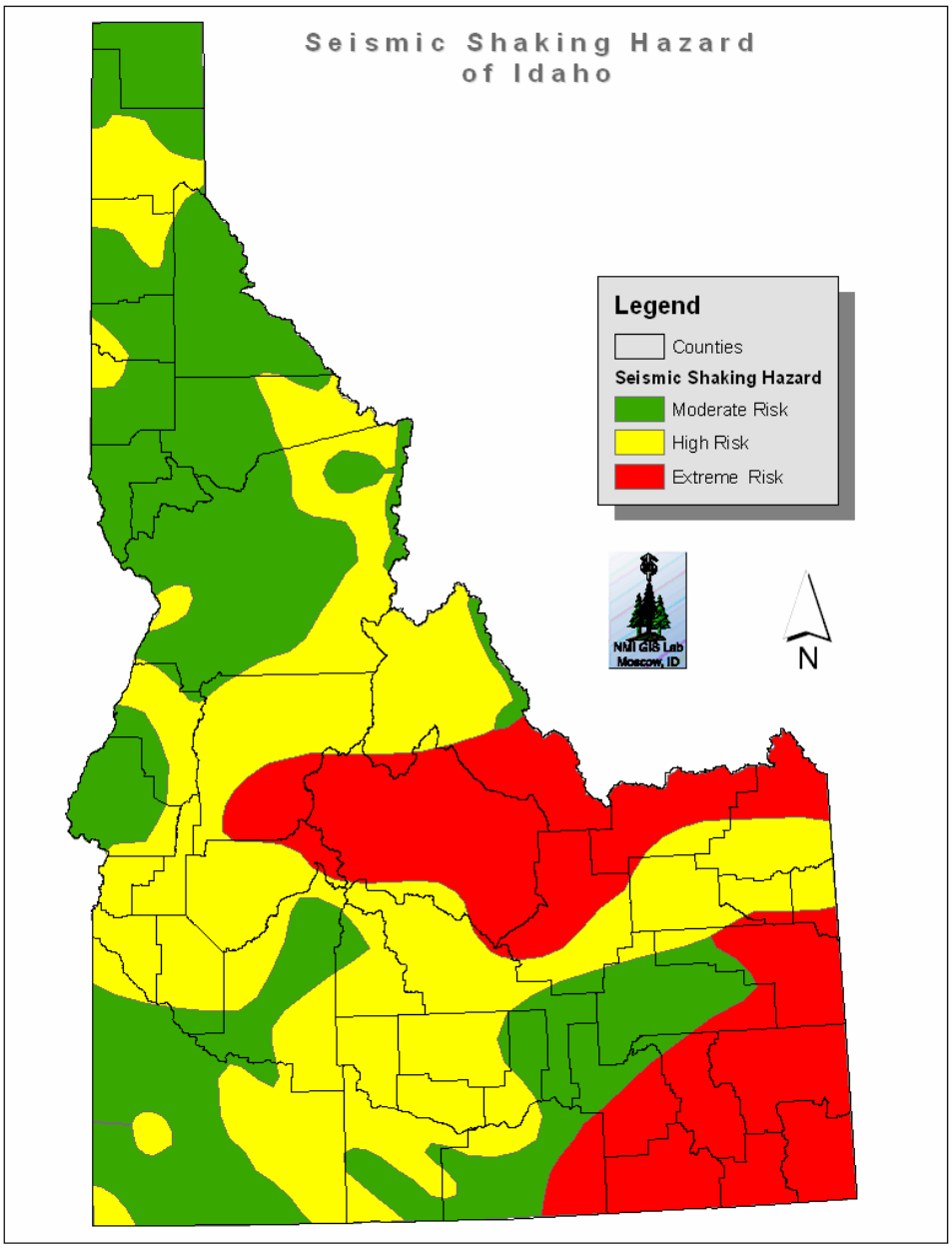
The 1991 Uniform Building Code (UBC), a nationwide industry standard, sets construction standards for different seismic zones in the nation. UBC seismic zone rankings for Idaho are among the highest in the nation. When buildings are built to these standards they have a better chance to withstand earthquakes. Canyon County has adopted the latest editions of the UBC as well as the International Building Codes; therefore, newer buildings may not 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 6.4. Seismic Shaking Hazards in Idaho.



6.5 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.

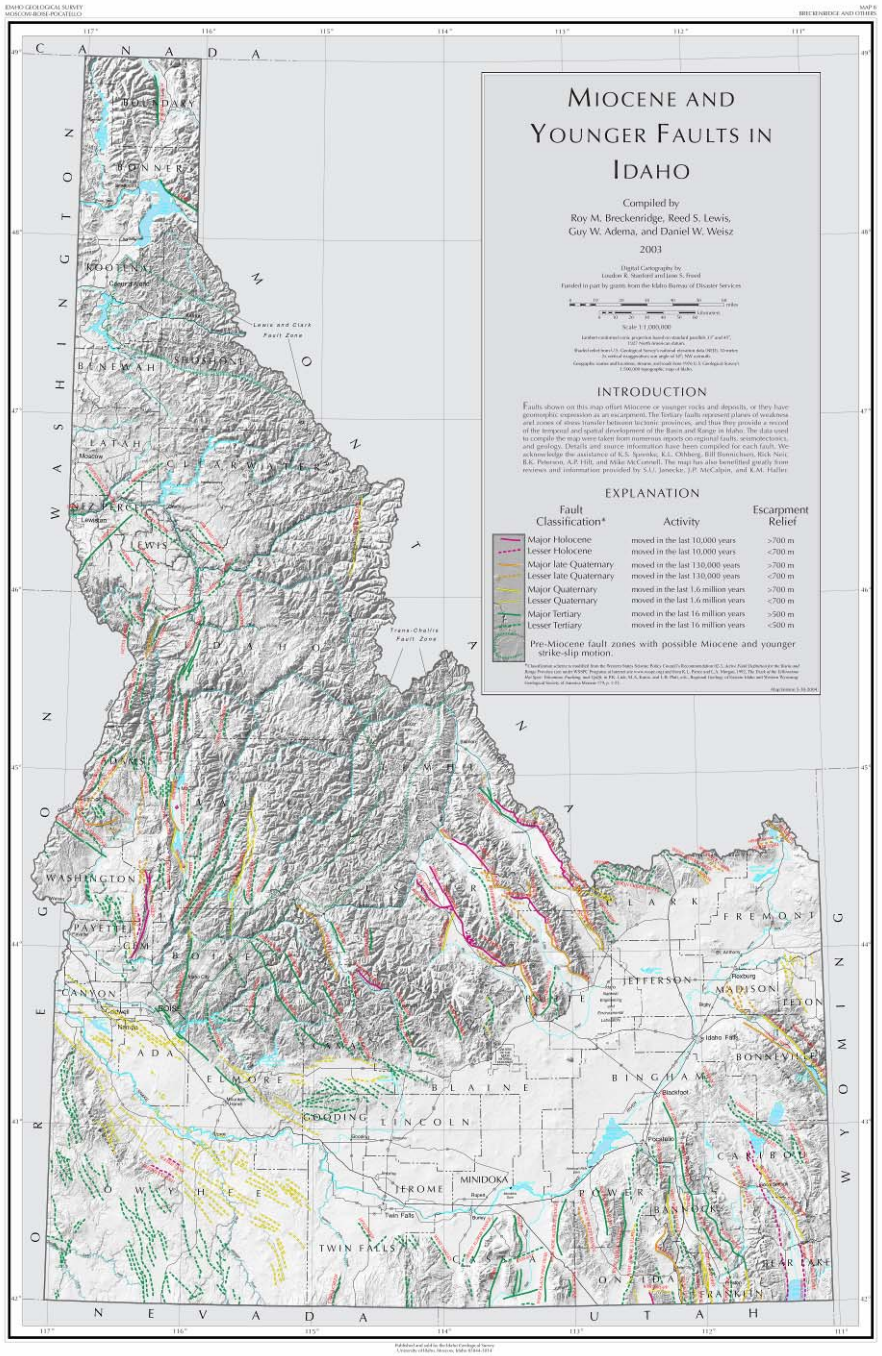
The crust breaks along uneven lines called faults. Geologists locate these faults and determine which are active and inactive. This helps identify where the greatest earthquake potential exists. Most faults mapped by geologists, however, are inactive and have no earthquake potential.

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 6.5. Miocene and Younger Faults in Idaho.



6.6 Countywide Potential Mitigation Activities

The Canyon County Comprehensive Plan 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; Particular attention and priority should be given to schools, public buildings, community evacuation and assessable sites.
- 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.

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 clinics.
- 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.

Chapter 7: Severe Weather

7 Severe Weather Characteristics

Each year across America there is on average 10,000 thunderstorms, 2,500 floods, 1,000 tornadoes, and 6 named hurricanes. Additionally, about 90 percent of all presidentially declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage. In Idaho alone, there have been 3,301 severe weather related disasters since 1950 (StormReady 2006).

Severe storms are a serious hazard that can and do 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 four storm-related Presidential Disaster declarations were made in Idaho between 1976 and 2006. These disasters occurred in 2006, 2005, 1997, and 1996.

Damaging storms do occur 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 part of life in Idaho. They vary in degree and intensity and can occur at anytime but are especially probable between September and May. These storms could be localized or could affect the entire state. They can last a matter of minutes or over many 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.

Blizzard – A winter storm with winds over 35 mph and temperatures of 20 degrees F., Accompanied by blowing snow that reduces visibility to near zero.

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.

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 this All Hazard Mitigation Plan.

7.3 History

Idaho has not had a significant number of severe storm-related Presidential Disaster Declarations during 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.

7.3.1 1987-1992 - Drought

Event Summary: 7 year drought, from 1987-1992. This period saw the worst water shortage since the 1977 drought. In 1987, Idaho requested $5.8 million in Emergency Conservation Funds to aid drought-stricken farmers. In 1988, in Oneida County the Deep Creek Reservoir was shut off half-way through irrigation season because the water level was so low it was filling the sprinkler system with mud and silt. Throughout the drought, reservoirs were consistently below capacity, resulting in irrigation water ending earlier than normal, crops being plowed under or not planted at all, and recreational activities being curtailed. The drought caused high water temperatures in rivers, and the lack of perennial grass growth caused livestock to be removed from public lands early, while wildlife starved in many wintering areas. Conservation measures were instituted for residential and commercial use. Wells used for residential and agricultural sectors ran dry, and a moratorium on new wells was instituted. In 1992 alone, $500 million was lost in agricultural production.

County Summary: 7 year drought (1987-1992) saw the worst water shortage in the state since the 1977 drought.

The Idaho Statesman; Idaho State Journal; Idaho Press Tribune; Times-News; Spokesman

7.3.2 February 15, 1949 – Winter Storm

Event Summary: Severe winter storm November 1948-February 1949

County Summary: November 1948 - February 1949 saw weekly snow storms in the valley; 14.5" of snow was dumped in one night. There was so much snow that roofs collapsed; Morrison-Knudsen used front-end loaders to haul snow to the Boise River.

The Idaho Statesman 12/31/81

7.3.3 January-February 1916 – Winter Storm

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

County Summary: Severe winter storm: 20" of snow fell in 3 weeks

The Idaho Statesman

7.3.4 The Big Shiver of '88 - January 13, 1888 – Winter Storm

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: Boise recorded -28F

Idaho World, January 13, 1982

Figure 7.1. Article Published in the *Idaho Statesman* in 1997.

Weather pat collide, sink

More wet winters, floods ahead? Experts disagree

By Marianne Flagg
The Idaho Statesman

In the past two weeks, events locally and globally collided with remarkably bad timing to produce a gush of snow, rain and flooding in the West.

"It was a pretty wet snow and in low elevation. That was the start of it all," said John Jannuzzi, a meteorologist at the National Weather Service in Boise. "Then it warmed up after that and went to very mild conditions. You put that on top of the melting snow, and that's a prescription for disaster."

An Oregon climatologist predicts that the West could see wet winters — and the risk of flooding — for perhaps the next 20 years. Another weather expert downplays that possibility, saying it is too soon to tell.

But they agree that Idaho and its neighbors fell victim to events that, by themselves, would have been notable but not destructive.

"We've had everything but the kitchen sink thrown at us," said Cliff Mass, professor of atmospheric sciences at the University of Washington in Seattle. "Any of these things independently would not have been so shocking. But we've had everything run into each other."

Here's how the weather unfolded:

■ A snowstorm Dec. 20 in Boise dumped 9.8 inches of wet snow. (Snow is not created equal. Snowfalls contain varying amounts of water content.)

■ Temperatures crept up gradually over the next few days.

■ Meanwhile, a warm, moist current of air was on its way from the subtropics near Indonesia. It arrived in southern Idaho to dump warm rain on melting snow.

■ On Christmas Day and Dec. 26, 1.35 inches of water from snow and rain fell in southern Idaho — as much moisture as the area usually receives in the entire month of December.

In Seattle on Dec. 26, the northern band of the jet stream dropped cold air and walls of snow over a city with only 11 snowplows.

■ Between Dec. 25 and Dec. 27 in Boise, temperatures climbed eight degrees, to a high of 47.

■ Nighttime temperatures stayed above freezing. Had the nights been colder, they would have slowed the rapid melt of snow.

■ Melting snow and heavy rains overwhelmed the Payette and Weiser rivers.

Southern Idaho has been hit with an unusually high volume of water.

The normal amount of precipitation for December is 1.36 inches, the National Weather Service reports. The area was drenched in nearly twice that amount in a 12-day period last month. From Dec. 20 to Dec. 31, 2.54 inches of water fell. A similar series of storms occurred in February 1996 in the Pacific Northwest and in North Idaho, resulting in severe flooding.

George Taylor, Oregon state climatologist, said the wet winters are likely part of what is known as the "La Niña" effect, in which warm, moist air moves up from the tropics.

Its more well-known climatic cousin, "El Niño," brings dry, cool air to the Northwest from the tropics. Winters are dry during El Niño, which means "the child" in Spanish, so called because it often occurs around Christmas.

With La Niña, "The ocean temperatures in the western Pacific are higher than normal," Taylor said.

The jet stream played a big role in the recent storms. The jet stream is a band, or several bands, of air that moves west to east around the Earth.

"The reason Seattle had all that snow is because it had a cold system (from the northern band)," said Jannuzzi of the National Weather Service in Boise. "We were under a warmer air mass coming from southwest. With time, the warm air gradually moved north."

Taylor said it is possible that the West's weather pattern is affected by a global climatic theory called "the conveyor belt."

Basing his theory on the work of oceanographer Wally Broeker, meteorologist Bill Gray suggests that a conveyor belt of air transports warm ocean water from the Pacific through the Indian Ocean and into the Atlantic. In the Atlantic, the belt could be responsible for a number of hurricanes.

Taylor, who subscribes to the theory, said Gray suggests that the conveyor belt could operate on a time scale of decades.

"My theory is that the next 20 years will see more wet years than dry years. We won't see protracted multiyear droughts," Taylor said.

He also said it is possible that man-made threats to the Earth's protective ozone layer could contribute to the warmer winter weather.

But Mass of the University of Washington said it is too soon to know whether larger forces are at work in changing the weather in the Northwest.

He has seen no evidence to support the idea of a 20-year bout of excessively wet winters. "Most people in the field think global warming will eventually be a reality, but most people agree the signal has not become obvious yet," Mass said.

A search to pinpoint a global cause for every weather calamity often is futile, he said. "The atmosphere has a tremendous amount of internal variability. It's sort of like a giant pinball machine. It's a very complex system. Even without any kind of grand forces, you can get all kinds of variability."

Mass and Taylor agree that if wet winters persist, they will be good for farmers, skiers, forests and fish.

They would not be welcome for people living in canyons, flood plains and near bodies of water.

"The only downside is the human impact from floods," Taylor said.

Added Mass: "A lot of these problems are man-based. Most of these things are unnecessary. People shouldn't be allowed to build next to lakes and rivers. That's looking for trouble."

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 are currently declared Drought Emergency Declarations are summarized in Table 7.1.

Table 7.1. Drought hazard profile of Idaho.

County/Area	Date Declared
Lincoln County	June 16, 2005
Ada County	June 9, 2005
Jerome County	June 3, 2005
Gooding County	May 19, 2005
Lemhi County	May 19, 2005
Jefferson County	May 19, 2005
Blaine County	May 19, 2005
Caribou County	May 19, 2005
Twin Falls County	May 12, 2005
Elmore County	May 12, 2005
Clark County	May 12, 2005
Bannock County	May 12, 2005
Power County	April 27, 2005
Fremont County	April 15, 2005
Madison County	April 15, 2005
Canyon County	**April 15, 2005**
Bingham County	April 15, 2005
Bonneville County	April 15, 2005
Custer County	March 28, 2005
Butte County	March 28, 2005

(IDWR 2006)

Federal officials declared Canyon County a primary disaster area because of drought conditions experienced in the region over the past several years. The declaration, made April 15, 2005 allows area farmers to receive eligibility for low-interest emergency loans.

Most croplands in Canyon County are irrigated. Prolonged drought, two or more winters of below normal precipitation combined with extreme summer heat, may cause reduced irrigation quotas resulting in some crop loss. The rangelands and some trees on public lands suffer severe distress during long hot spells. Reduced forage growth may result in premature withdrawal of livestock from the range with an eventual sharp increase in forage expense.

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 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, 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. At 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 summer there are some exceptions to this 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. Annual snowfall totals in Shoshone County have reached nearly 500 inches. The greatest long-term (1942-56) seasonal average was 182 inches at Mullan Pass, while the greatest snow depth (also 182 inches) was recorded at that station on February 20, 1954. 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 Windstorms 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 Canyon County Conditions

Severe weather in Canyon County ranges from the commonly occurring thunderstorms to hail, tornadoes, high winds, dense fog, lightning, and snow storms. There has been 94 severe weather events in Canyon County since 1950 including a thunderstorm/windstorm in Nampa that caused $250,000 in damages in 1996. A lightning storm near Melba and Kuna in 1997 and 2002, respectively, each claimed a life. Additionally, a magnitude F1 tornado occurred near Parma in 1996 causing $50,000 in property damages. The lowest recorded temperature was -25°F in December of 1990. This extreme cold snap caused severe ice jams and subsequent flooding on the Portneuf River near Pocatello, power failures all across southern Idaho, froze water pipes, and damaged furnaces due to congealed oil leaving many residents without heat and/or water. This type of weather also delays air travel and causes many traffic accidents as roads ice over.

Due to the abundance of agricultural development in Canyon County, crop damage due to hail or high winds can have disastrous effects on the local economy. Altogether severe weather events in Canyon County have claimed two lives, caused thirteen injuries, and cost $781,000 in property damages since 1950 (StormReady 2006).

Canyon County has gone through the steps to become a StormReady Community. StormReady is a nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather—from tornadoes to floods. The program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations.

To be officially StormReady, Canyon County must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.

7.6.1 Monthly Climate Summaries In or Near Canyon County

7.6.1.1 Caldwell, Idaho (101380)

Period of Record Monthly Climate Summary

Period of Record : 10/8/1904 to 12/31/2003

Table 7.2. Climate records for Caldwell, Idaho (Canyon County)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	37.1	45.4	56.3	65.9	74.4	82.6	92.4	90.3	79.7	66.6	50.1	39.2	65.0
Average Min. Temperature (F)	20.5	25.7	30.7	36.6	43.7	50.4	55.9	53.0	44.2	35.7	28.0	22.5	37.2
Average Total Precipitation (in.)	1.36	1.06	1.09	0.97	1.00	0.79	0.27	0.28	0.52	0.77	1.21	1.27	10.60
Average Total SnowFall (in.)	6.8	2.9	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.1	1.5	4.3	16.5
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record. Max. Temp.: 99.6% Min. Temp.: 99.5% Precipitation: 99.4% Snowfall: 97.8% Snow Depth: 94.5%

7.6.1.2 Parma Experiment Station, Idaho (106844)

Period of Record Monthly Climate Summary

Period of Record : 11/7/1922 to 12/31/2003

Table 7.3. Climate records for Parma, Idaho (Canyon County)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	36.6	44.8	56.2	65.6	74.2	82.1	92.1	90.5	80.3	67.0	49.8	38.9	64.8
Average Min. Temperature (F)	19.1	24.3	29.4	35.7	43.3	49.5	54.5	52.1	43.2	34.3	26.7	21.6	36.1
Average Total Precipitation (in.)	1.33	0.93	0.96	0.88	1.01	0.83	0.22	0.36	0.53	0.75	1.13	1.20	10.14
Average Total SnowFall (in.)	6.3	2.2	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.4	4.0	14.6
Average Snow Depth (in.)	1	1	0	0	0	0	0	0	0	0	0	1	0

Percent of possible observations for period of record. Max. Temp.: 98.5% Min. Temp.: 98.5% Precipitation: 98.7% Snowfall: 97.9% Snow Depth: 95.3%

7.6.1.3 Deer Flat Dam, Idaho (102444)

Period of Record Monthly Climate Summary

Period of Record : 3/14/1916 to 12/31/2003

Table 7.4. Climate records for Deer Flat Dam, Idaho (Canyon County)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	37.8	45.5	55.5	64.0	72.5	80.1	88.4	87.2	78.4	65.7	49.8	39.3	63.7
Average Min. Temperature (F)	21.8	26.7	32.0	37.9	45.6	52.0	57.6	55.6	47.6	37.7	29.8	23.6	39.0
Average Total Precipitation (in.)	1.18	0.87	1.04	0.96	1.03	0.78	0.24	0.34	0.48	0.67	1.02	1.17	9.77
Average Total SnowFall (in.)	4.5	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	3.0	9.8
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record. Max. Temp.: 66.5% Min. Temp.: 66.6% Precipitation: 67% Snowfall: 62.5% Snow Depth: 61.7%

7.6.1.4 Nampa Sugar Factory, Idaho (106305)

Period of Record Monthly Climate Summary

Period of Record : 10/1/1976 to 12/31/2003

Table 7.5. Climate records for Nampa Sugar Factory, Idaho (Canyon County)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	37.5	45.0	56.0	64.6	72.5	82.7	90.9	89.9	79.7	67.0	49.8	39.3	64.6
Average Min. Temperature (F)	21.0	25.2	31.1	36.4	43.3	50.8	56.0	54.1	45.2	35.6	27.6	21.3	37.3
Average Total Precipitation (in.)	1.36	1.08	1.33	1.19	1.26	0.59	0.31	0.26	0.56	0.67	1.18	1.32	11.12
Average Total SnowFall (in.)	3.7	1.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	3.3	9.2
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record. Max. Temp.: 95.1% Min. Temp.: 95.1% Precipitation: 95.1% Snowfall: 84.3% Snow Depth: 81.8%

7.6.2 Individual Community Assessments

All of the communities in Canyon County have similar risks to severe weather. Extremely cold temperatures and severe snow accumulations are not commonplace, but they do occur occasionally. Due to the large traffic flows that occur along Interstate 84 and through the main population centers, snow removal equipment should be maintained and available throughout the county.

Power failure sometimes accompanies severe storms. More rural communities such as Notus and Melba are sometimes more prepared to deal with power outages for a few days due to the

frequent occurrence of such events; however, prolonged failure, especially during cold winter temperatures can have disastrous effects. All communities should be prepared to deal with power failures. Community shelters equipped with alternative power sources will help local residents stay warm and prepare food. A community-based system for monitoring and assisting elderly or disabled residents should also be developed. All households should maintain survival kits that include warm blankets, flashlights, extra batteries, nonperishable food items, and clean drinking water.

Thunder and lightning storms affect all communities in the west. Because we cannot lessen our potential of experiencing this type of storm, it is important to mitigate the potential affects. Lightning typically ignites several wildfires in Canyon County on an annual basis. Following the guidelines to increase the wildfire defensibility of communities and individual homes discussed in the Wildfire Mitigation Plan will help lessen the potential damage from lightning caused wildfires. Flooding can also result from severe and/or prolonged rain storms. Potential mitigation activities for this type of flooding are discussed in Chapter 4 of this document.

Hail can be particularly damaging to crops as well as vehicles, roofs, and other personal property. The most long-term damage from hailstorms is likely the loss of the year's crop. Since Canyon County primarily has an agriculturally based economy, all communities may have a high potential risk.

All Canyon County communities are affected by drought, especially long-term drought conditions. Unless irrigation infrastructure is already in place, there is little communities can do to alleviate the affects on agricultural operations, watersheds, and even personal well systems. Most residents of Canyon County and southern Idaho in general are accustomed to dealing with dry conditions and; therefore, are aware of water saving practices. However, countywide public education on drought mitigation is always helpful.

7.6.3 Countywide Potential Mitigation Activities

There is no way to prevent severe storms. The weather forces and topography of Canyon 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

7.6.3.1 Mitigation

Further mitigation efforts should include 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.

7.6.3.2 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 hospitals.
- 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.

7.6.3.3 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.

Chapter 8: Potential Mitigation Activities

8 Administration & Implementation Strategy

Critical to the implementation of this All 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 Canyon County and the region. Since there are many management agencies and thousands of private landowners in Canyon 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.

Canyon 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 Canyon County, specifically 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 Canyon County.

All risk assessments were made based on the conditions existing during 2005-06, 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 Canyon County in relation to this planning document, this entire **All Hazard Mitigation Plan** should be reviewed annually at a special meeting of the Canyon 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

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 local jurisdictions with overall coordination provided by the Canyon County Disaster Services Coordinator.

County Commissioners and the elected officials of all jurisdictions 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 Disaster Services Coordinator to include the County Commissioner's Office, City Mayors and Councils, Fire District Chiefs and Commissioners, agency representatives (BLM, Idaho Department of 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 50% of the population. A ranking of 5 has the potential to impact 25% of the population, 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 ranked high, medium, or low based on the non-planning project thresholds of:

Project Ranking Priority Score

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

8.2 Recommended Hazard Mitigation Activities

As part of the implementation of hazard mitigation activities in Canyon County, a variety of management tools may be used. Recommendations are presented in five broad categories based on their characteristics.

8.2.1 Policy Actions

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.	All Hazards	Cooperative effort including Canyon County, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, City of Wilder, SW ID RC&D, Idaho Bureau of Homeland Security, federal and state agencies.	• 2006 Identify teaching partners in public education program • 2007 Locate and adopt training materials appropriate for local conditions • 2007 Develop budgets and acquire funding for desired programs • 2008 Begin implementation in schools and through adult education programs.
8.1.b: Implement land-use and development policy to reduce exposure to hazards.	All Hazards	Canyon County Commissioners, Canyon County Building Department, Canyon , Canyon County Emergency Management, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, and City of Wilder.	• 2006 Review of hazard mapping in updating County Comprehensive Plan. • 2006-10: Municipality identification of specific resources at risk as identified by this plan's hazard profile mapping and identification of land use policy to limit or restrict new developments in the at-risk areas.
8.1.c: Develop a landslide hazard identification program.	Landslide, Flood, Wildfire, and Earthquake	Canyon County Commissioners, County Highway Districts, Planning and Zoning, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, and City of Wilder.	• 2006 Review of landslide hazard mapping in updating County comprehensive and Transportation plans. • 2007 Draft recommendations for housing site plans in landslide prone areas.
8.1.d. Standardize practices for excavation, construction, and grading of home sites and roads.	Wildfire, Flood, Earthquake, and Landslides	Canyon County Commissioners, Canyon County Highway Districts, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, and City of Wilder.	• 2006 Draft recommendations for road location and standards in landslide prone areas.

Table 8.1. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.1.e: Increase participation in National Flood Insurance Program.	Flood	Canyon County Commissioners, Canyon County Building Department, Emergency Management, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, and City of Wilder.	• On going: Continued participation in NFIP, increase participation. • 2007 Participation in the Community Rating System to lower the costs of NFIP premiums.
8.1.f: Rural signage (road signs & rural fire district boundary signs) improvements across the county.	All Hazards	Highway Districts and Idaho Transportation Department in cooperation with County Commissioners, Nampa Fire Department, Caldwell Fire Protection District, Melba Fire Department, Parma Fire Department, Upper Deer Flat Fire Department, Star Joint Fire Protection District, and Wilder Rural Fire Protection District.	• Can be completed during year 1 (2006) pending funding to implement the project. Estimate $15,000 for signs and posting.
8.1.g: Complete All Hazards Mitigation Plan for additional hazards.	All Hazards	Canyon County Commissioners, Canyon County Emergency Management, Bureau of Homeland Security, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, and City of Wilder.	• Seek out funding during 2006-07 for additional funding to assess hazards not completed here.
8.1.h: Conduct a review of local ordinances, policies, and comprehensive plans to characterize current policies related to the Boise River and inconsistencies among jurisdictions.	Flood and Landslide	Canyon County Commissioners, Canyon County Emergency Management, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, and City of Wilder.	• 2006 Conduct review of ordinances and policies over all jurisdictions. • 2006 Determine adequacy of standards regarding minimization of impacts to adjacent and downstream areas. • 2007 Develop implementation plan to alleviate inadequacies and/or ratify more effective standards
8.1.i: Change the policy to give local officials the authority to open irrigation canal headgates during flood events.	Flood	Canyon County Commissioners, City of Caldwell, City of Middleton, City of Notus, City of Parma, local irrigation districts, and affected landowners.	• 2006 Form a multi-jurisdictional committee to evaluate the problem and draft recommendations. • 2007 Present the County's position to the appropriate authorities.

Table 8.1. Action Items in Safety and Policy.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.1.j: Enforce a policy to engineer bridge and culvert crossings on canals with the same standards as river and stream bridges and culverts**.**	Flood	Canyon County Commissioners, County Highway Districts, and the Idaho Transportation Department.	• 2006 Draft recommendations for bridge and culvert standards on canals.

8.2.2 Home and Business Protection Measures

The protection of people and structures will be tied together closely as the loss of life in the event of a natural hazard 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 Home and Business Protection.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.2.a: Assess and hardwire emergency facilities and shelters for use with a portable generator (e.g. Notus City Hall, Notus Community Center, Middleton City Hall, Middleton City Shop, Nampa City Hall, Nampa Police Department, Caldwell City Hall, Melba City Hall, Greenleaf City Hall, Wilder City Hall, Parma City Hall, and local fire stations, community shelters, and senior centers throughout the county).	All Hazards	Canyon County Commissioners, Sheriff's Department, Canyon County Emergency Management, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, City of Wilder, Nampa Fire Department, Caldwell Fire Protection District, Melba Fire Department, Parma Fire Department, Upper Deer Flat Fire Department, Star Joint Fire Protection District, and Wilder Rural Fire Protection District..	• 2006 Assess which buildings in the county require alternative power during emergencies. • 2006 Cost benefit assessment of providing portable power. • 2006 Secure grant funding through PDM grants or others for the wiring of buildings and purchase of portable generators with capacity to power needed buildings. • 2007 Implement wiring changes to allow quick connection for off-grid power.
8.2.b: Inspect buildings, particularly un-reinforced masonry, for hazard stability.	All Hazards	Canyon County Building Department	• 2006 Bi-annual review of older masonry buildings. • 2006 Education campaign, information dissemination

Table 8.2. Action Items for Home and Business Protection.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.2.c: Obtain needed resources for health care facilities, community centers, and other shelters to protect themselves from potential hazards (e.g. sandbags, cots, nonperishable foods, etc.)	All Hazards	Canyon County Commissioners, Red Cross, Mercy Medical Center, West Valley Medical Center, City of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, City of Greenleaf, City of Melba, City of Wilder, Canyon County Senior Centers, Canyon County Community Halls, and other potential shelters.	• 2006 Identify and obtain funding for needed supplies. • 2006 Address storage issue for each facility. • 2006-07 Acquire recommended resources. • Ongoing: Train personnel on use and maintenance of supplies

8.2.3 Infrastructure Hardening

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 southern Idaho and to Canyon County specifically. These networks are by definition a part of the Wildland-Urban Interface in the protection of people, structures, **infrastructure**, and unique ecosystems. Without supporting infrastructure a community's structures may be protected, but the economy and way of life 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: Review bridge and culverts along all <u>Primary Access Routes</u> identified in this plan which cross through flood zones.	Flood and Landslides	Canyon County Commissioners, County Highway Districts, and Idaho Transportation Department.	• 2006 review the bridge crossings and culverts along primary access routes in the county to determine restrictions in cases of flooding. • 2006 Development replacement needs list to make crossings suitable to allow flood water passage or road relocations where needed. • 2007 Create implementation plan for making changes.

Table 8.3. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon
8.3.b: Review bridge and culverts along all public roads identified in this plan which cross through flood zones.	Flood and Landslides	Canyon County Commissioners, County Highway Districts, and Idaho Transportation Department.	• 2006 review the bridge crossings and culverts along public roads in the county to determine restrictions in cases of flooding. • 2006 Development replacement needs list to make crossings suitable to allow flood water passage or road relocations where needed. • 2007 Create implementation plan for making changes.
8.3.c: Review all road profiles which are within flood zones to determine degree of road profile rise needed to elevate it above the flood zone.	Flood	Canyon County Commissioners, County Highway Districts, and Idaho Transportation Department	• 2006 Review road surfaces and complete engineering study. • 2006 Create a priority list of modifications to road surfaces. • 2007-11 Work with County and State Highway Departments to schedule changes.
8.3.d: Reinforce the 4 well intakes in the county which are within the flood zone.	Flood	Canyon County Emergency Management and the Cities of Nampa, Caldwell, Middleton, Notus, Parma, Wilder, Greenleaf, and Melba.	• 2006 Evaluate all well intakes in the flood zone for operations during and after a flood • 2006-07 develop implementation plan and potential funding sources for hardening these infrastructure resources. • Ongoing: maintain these structures for sustainable operations.
8.3.e: Post FEMA "Emergency Evacuation Route" signs along the identified primary, secondary and escape access routes in the county.	All Hazards	County Commissioners in cooperation with County Highway Districts and Cities of Nampa, Caldwell, Middleton, Notus, Parma, Wilder, Greenleaf, and Melba.	• 2006 Purchase of signs. • Post signs on roads and make information available to residents of the importance of Emergency Routes.

Table 8.3. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon
8.3.f: Access improvements of bridges, cattle guards, culverts, and limiting road surfaces (e.g. alt routes to Interstate 84, State Highway 44 bridges in Middleton, etc.)	All Hazards	Idaho Transportation Department, County Highway Districts, BLM, and private landowners.	• 2006 Update existing assessment of travel surfaces, bridges, and cattle guards in Canyon County as to location. Secure funding for implementation of this project (grants). • 2007 Conduct engineering assessment of limiting weight restrictions for all surfaces (e.g., bridge weight load maximums). Costs may be shared between County, USFS, State, and private based on landownership associated with road locations. • 2007 Post weight restriction signs on all limiting crossings, copy information to rural fire districts and wildland fire protection agencies in affected areas. Estimate cost at roughly $15-$25,000 for signs and posting. • 2008 Identify limiting road surfaces in need of improvements to support traffic or emergency vehicles and other emergency equipment. Develop plan for improving limiting surfaces including budgets, timing, and resources to be protected for prioritization of projects (benefit/cost ratio analysis). Create budget based on full assessment.
8.3.e: Reinforcement of the FEMA "Emergency Evacuation Routes" in the county to insure these routes can be maintained in the case of an emergency.	All Hazards	County Commissioners in cooperation with County Highway Districts, Nampa Fire Department, Caldwell Fire Protection District, Melba Fire Department, Parma Fire Department, Upper Deer Flat Fire Department, Star Joint Fire Protection District, and Wilder Rural Fire Protection District.	• 2006 Full assessment of road defensibility and ownership participation. • Implementation of projects

Table 8.3. Action Items for Infrastructure Enhancements.

Action Item	Goals and Objectives	Responsible Organization	Action Items & Planning Horizon
8.3.f: Conduct feasibility study to install debris catchment structures in the Boise River system upstream of critical access crossings, and develop program for maintaining these structures during flooding events with high debris flow.	Flood	Canyon County Emergency Management Office, County Highway Districts, Idaho Transportation Department, and Idaho Water Resources Division	• 2006: Determine where debris management in the Boise River system is the largest (upstream and below confluences) and impacts bridge crossings the most • 2006-07: engineer debris catchment in-stream and mechanical process to clean the debris from the channel • 2008: Implement best findings
8.3.g: Reinforce or replace head gates on canals to stabilize them during flood events and mud slides.	Flood, Debris flows	Irrigation Districts in cooperation with the Canyon County Emergency Management	• 2006-07: Identify status of all head gates on canals and make priority list of replacements or upgrades. • 2007: Secure funding for needed modifications. • 2007-09: replace substandard head gates.
8.3.h: Obtain generators for community of Middleton, specifically to power water and sewer systems.	All Hazards	Middleton City Council, Middleton Fire, Rescue, and Emergency Service, and Middleton Police Department.	• 2006 Coordinate with Item 8.2.a. • 2006 Determine where generators will be stored and who will maintain. • 2007 Secure funding for generator purchase.
8.3.i: Construct engineered levees around powerline substations within the floodplain.	Flood	County Commissioners, Cities of Nampa, City of Caldwell, City of Middleton, City of Notus, City of Parma, and affected power companies.	• 2006 Inventory and assess condition of substations in the flood zone. • 2007 Develop action plan for construction of levees with the affected power companies.
8.3.j: Install diversion gate to redirect water from the Boise River to the Dixie Slough near Caldwell during flood events.	Flood	County Commissioners, City of Caldwell, City of Greenleaf, and local irrigation districts.	• 2006 Conduct a study to determine feasibility, cost of constructing the diversion gate, and potential locations. • 2007-08 Obtain funding and begin work on the project.
8.3.k: Conduct risk assessment of gravel mining in the Boise River channel and adjacent floodplain for both commercial operations and annual channel maintenance.	Flood and Severe Weather	County Commissioners, Canyon County Public Works, City of Caldwell, City of Middleton, City of Notus, and City of Parma.	• 2006 Summarize research and case studies from other regions illustrating responses and risks of gravel mining in rivers and floodplains. • 2006 Reconstruct the events leading up to the two prior pit captures that have occurred on the Boise River. • 2007 Synthesize this information to develop recommendations for policy implementation on the Boise River regarding the permitting and the long term liabilities.

8.2.4 Resource and Capability Enhancements

There are a number of resource and capability enhancements identified by the Emergency services in Canyon County. Additionally many communities have identified additional resources and infrastructure need to protect and people during natural and man made hazards.

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: Acquisition of mapping system for Canyon County (compatible with CAD).	All Hazards	Nampa Fire Department, Caldwell Fire Protection District, Melba Fire Department, Parma Fire Department, Upper Deer Flat Fire Department, Star Joint Fire Protection District, and Wilder Rural Fire Protection District working with E-911 Board, Canyon County Emergency Medical Services, Southwest Idaho RC&D, and other first response organizations.	• 2006 Determine necessary equipment. • 2006-07 Acquire and install equipment and hire or train personnel.
8.4.b: Install Automatic Vehicle Locator systems on all emergency response units.	All Hazards	Nampa Fire Department, Caldwell Fire Protection District, Melba Fire Department, Parma Fire Department, Upper Deer Flat Fire Department, Star Joint Fire Protection District, and Wilder Rural Fire Protection District working with E-911 Board, Canyon County Emergency Medical Services, Southwest Idaho RC&D, and other first response organizations.	• 2006 Determine necessary equipment. • 2006-07 Acquire and install equipment and train personnel.
8.4.c: Construct an Emergency Operations Center within the county.	All Hazards	Canyon County Commissioners, Canyon County LEPC, E-911 Board, all emergency response organizations (including fire departments), and Southwest Idaho RC&D.	• 2006 Develop expansion plans and find a location. • 2006 Develop cost estimates and find funding. • 2007-08 Construct and equip the new facility.

Table 8.4. Action Items for Resource and Capability Enhancements.

Action Item	Mitigated Hazard	Responsible Organization	Action Items & Planning Horizon
8.4.d: Establish and train a Type 2 Overhead Team.	All Hazards	Bureau of Land Management, Nampa Fire Department, Caldwell Fire Protection District, Melba Fire Department, Parma Fire Department, Upper Deer Flat Fire Department, Star Joint Fire Protection District, and Wilder Rural Fire Protection District.	• 2006 Identify needed training. • 2006-07 Provide needed training and experience. • 2007 Implement a Type II overhead team for All Hazards.
8.4.e: Obtain portable generators for use in Canyon County during power outages and other emergency situations.	All Hazards	County Commissioners, Sheriff's Department, and County Emergency Management.	• 2006 Coordinate with Item 8.2.a. • 2007 Secure funding for generator purchase. • 2006 Determine where generators will be stored and who will provide maintenance.
8.4.f: Evaluate location of emergency services headquarters, field offices, and storage facilities for proximity to potentially hazards, particularly the flood zone.	All Hazards	County Commissioners, County Emergency Management, County emergency service organizations, city emergency service organizations, private emergency service organizations, and area medical facilities.	• 2006 Conduct review of structure and equipment locations. • 2007 Move structures and equipment currently at risk to hazards to safer locations.
8.4.g: Maintain snow removal equipment and schedule for communities and primary transportation routes.	Winter Storm	County Highway Districts	• Annual review of equipment and community snow removal needs to determine if operable equipment is adequate.

Chapter 9: Supporting Information

9 Supporting Tables

9.1 List of Tables

Table 1.1 Phase I Hazard Assessment of Canyon County by Planning Committee. 2
Table 2.1. Emergency Services Training received by household. 10
Table 2.2. Disasters affecting homes in Canyon County. 11
Table 2.3. Ranking of Potential Risk 11
Table 2.4. Public Opinion of Hazard Mitigation Funding Preferences. 12
Table 2.5. Public meeting slide show 21
Table 3.1. Selected demographic statistics for Canyon County, Idaho, from the Census 2000. 25
Table 3.2. Income in 1999 27
Table 3.3. Poverty Status in 1999 (below poverty level) 28
Table 3.4. Employment & Industry 28
Table 3.5. Class of Worker 29
Table 3.6. Levels of direct employment by industrial sector 34
Table 3.7. National Register of Historic Places in Canyon County, Idaho. 35
Table 3.8. SHELDUS hazard profile for Canyon County, Idaho, 1960-2005. 39
Table 4.1 Significant assets and infrastructure in Canyon County Flood Zones. 56
Table 4.2 Municipal Water Intakes in Flood Zone 56
Table 4.3. Value of property within the flood zones of Canyon County, by municipality. 58
Table 4.4. NFIP Policy Statistics As of 12/30/04 in Canyon County. 62
Table 4.5. Water and Sewer Use Data for Nampa, Idaho. 65
Table 4.6. Water and Sewer Use Data for Caldwell, Idaho. 68
Table 4.7. Water and Sewer Use Data for Middleton, Idaho. 72
Table 4.8. Water and Sewer Use Data for Parma, Idaho. 78
Table 5.1. Landslide Risk Due to Slopes and Geology in Canyon County. 82
Table 5.2. Value of property within landslide impact zones of Canyon County. 87
Table 6.1. Modified Mercalli Earthquake Intensity Scale. 93
Table 7.1. Drought hazard profile of Idaho. 106
Table 7.2. Climate records for Caldwell, Idaho (Canyon County) 110
Table 7.3. Climate records for Parma, Idaho (Canyon County) 110
Table 7.4. Climate records for Deer Flat Dam, Idaho (Canyon County) 111

Table 7.5. Climate records for Nampa Sugar Factory, Idaho (Canyon County) 111
Table 8.1. Action Items in Safety and Policy.....120
Table 8.2. Action Items for Home and Business Protection.....122
Table 8.3. Action Items for Infrastructure Enhancements.....123
Table 8.4. Action Items for Resource and Capability Enhancements.....127
Table 9.1. List of Preparers.....131

9.2 List of Figures

Figure 2.1 Public meeting slideshow overview. 21
Figure 4.1. Canyon County FEMA Flood Zone.....55
Figure 4.2. Property values within all flood zones of Canyon County, by municipality. 57
Figure 4.3. Wall Street Journal Article on flood insurance participation (May 6, 2006).....60
Figure 4.4. Wall Street Journal Article on flood insurance, *continued*. 61
Figure 4.5. Article about participation in the Flood Insurance Program, January 8, 1997. 62
Figure 4.6. Peak Streamflow Data for Indian Creek near Nampa, Idaho.....64
Figure 4.7. Classification of assets at risk in the City of Nampa. 65
Figure 4.8. Classification of assets at risk in the City of Caldwell. 68
Figure 4.9. Peak Streamflow for Boise River near Middleton, Idaho. 71
Figure 4.10. Classification of assets at risk in the City of Middleton. 72
Figure 4.11. Peak Streamflow for Boise River at Notus, Idaho.....74
Figure 4.12. Classification of assets at risk in the City of Notus. 75
Figure 4.13. Peak Streamflow Data for Boise River at Parma, Idaho.....77
Figure 4.14. Classification of assets at risk in the City of Parma. 79
Figure 5.1. Geologic Map of Canyon County.....81
Figure 5.2 Landslide Prone Landscapes in Canyon County Based on Geology. 82
Figure 5.3. Landslide Prone Landscapes Based on Geology and Soils. 83
Figure 5.4. Landslide Prone Landscapes of Canyon County; Slope and Geologic Factors. 84
Figure 5.5. Property values within North County Landslide Impact Area of Canyon County. 85
Figure 5.6. Property values within South County Landslide Impact Area of Canyon County. 86
Figure 6.1. Damage from the Borah Peak Earthquake, 1983.....92
Figure 6.2. Earthquakes in Idaho with a magnitude of 4.1 or greater. 94
Figure 6.3. Relative earthquake risks for Idaho. 98
Figure 6.4. Seismic Shaking Hazards in Idaho.....99
Figure 6.5. Miocene and Younger Faults in Idaho.....101
Figure 7.1. Article Published in the *Idaho Statesman* in 1997. 105

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

Name	Affiliation	Role
William E. Schlosser, Ph.D.	Northwest Management, Inc.	**Lead Author,** Project Co-Manager, GIS Analyst, Natural Resource Economist, Hazard Mitigation Specialist, Regional Planner
Tera King, B.S.	Northwest Management, Inc.	Natural Resource Manager, Fire Control Technician
Toby R. Brown, B.S. (*posthumously*)	Northwest Management, Inc.	Natural Resource Manager, Project Co-Manager, Hazard Mitigation Specialist
Vincent P. Corrao, B.S.	Northwest Management, Inc.	Resource Management Specialist, Deputy Project Manager
John A. Erixson, M.S.	Northwest Management, Inc.	Range Management, Fire Specialist
Dennis S. Thomas	Northwest Management, Inc.	Fire & Fuels Specialist, Prescribed Burning Manager
Vaiden E. Bloch, M.S.	Northwest Management, Inc.	GIS Analyst
Greg Bassler, M.S.	Northwest Management, Inc.	Roads Engineer, Timber Sale Layout & Harvest Manager
Tyler Nimke, B.S.	Northwest Management, Inc.	Resource Manager

9.4 Signature Pages

This **Canyon County All Hazards Mitigation Plan** has been developed in cooperation and collaboration with the representatives of the following organizations, agencies, and individuals.

9.4.1 Representatives of Canyon County Government

9.4.2 Representatives of City Government in Canyon County

9.4.2.1 Representatives from the City of Nampa

9.4.2.2 Representatives from the City of Caldwell

9.4.2.3 Representatives from the City of Middleton

9.4.2.4 Representatives from the City of Notus

9.4.2.5 Representatives from the City of Parma

9.4.2.6 Representatives from the City of Wilder

9.4.2.7 Representatives from the City of Greenleaf

9.4.2.8 Representatives from the City of Melba

9.4.3 Representatives of City and Rural Fire Districts in Canyon County

This All Hazards Mitigation Plan and all of its components were developed in close cooperation with the participating fire districts listed herein.

By: James Woydziak, Chief Nampa Fire Department	Date
By: Mark Wendelsdorf, Chief Caldwell Fire Protection District	Date
By: Brad Trosky, Chief Middleton Fire, Rescue, and Emergency Service	Date
By: Mike Skogsberg, Chief Notus Fire Department	Date
By: Kevin Courtney, Chief Star Joint Fire Protection District	Date
By: Arnold Waldenmer, Chief Wilder Rural Fire Protection Districtt	Date
By: Russ Shroll, Chief Upper Deer Flat Fire Department	Date
By: James Cook, Chief Parma Fire Department	Date
By: Richard Farner, Chief Melba Fire Department	Date

9.4.4 Representatives of Organizations and Federal and State Agencies

This All Hazards Mitigation Plan was developed in cooperation and collaboration with the additionally listed agencies and organizations. These entities listed below are not eligible to "formally adopt" this plan, but will strive to implement its recommendations.

By: Idaho Department of Lands	Date
By: USDI Bureau of Reclamation	Date
By: USDI Bureau of Land Management	Date
By: Bill Moore, Coordinator Southwest Idaho Resource Conservation & Development Council	Date
By: Idaho Transportation Department	Date
By: Idaho Fish and Game	Date
By: William E. Schlosser, Ph.D. Project Manager-All Hazard Mitigation Plan Northwest Management, Inc.	Date

9.5 Literature Cited

Breckenridge, R.M., R.S. Lewis, G.W. Adema, and D.W. Weisz. 2003. *Miocene and Younger Faults in Idaho.* Map series of the Idaho Geological Survey, University of Idaho, Moscow.

Dillman, D.A. 1978. Mail and Telephone Surveys: The Total Design Method. Hoboken: John Wiley & Sons, Incorporated. 344 p.

FEMA 2004. Federal Emergency Management Agency Internet web site at http://www.fema.gov/nfip/10110309.shtm last accessed on October 5, 2004.

Fragaszy, J. 2002. USGS 2004. National Landslide Hazards - Mitigation Strategy - A Framework for Loss Reduction. Circular 1244. U.S. Department of the Interior U.S. Geological Survey. Accessed on the internet at http://pubs.usgs.gov/circ/c1244/c1244.txt on October 1, 2004.

Harris, C., P.S. Cook, and J. O'Laughlin. 2003. Forest Resource-Based Economic Development in Idaho: Analysis of Concepts, Resource Management Policies, and Community Effects. Policy Analysis Group, University of Idaho, College of Natural Resources, Report № 22. Pp 82.

IDEQ (Idaho Department of Environmental Quality). 2003. Rules of the Department of Environmental Quality, IDAPA 58.01.02, "Water Quality Standards and Wastewater Treatment Requirements". Idaho Administrative Code (3-20-97), IDAPA 58.01.02, Boise, ID.

IBHS 2004. Idaho Bureau of Homeland Security Internet web site at http://www.bhs.idaho.gov/disaster/flood.htm last accessed on October 1, 2004.

IDOCL 2004. Idaho Department of Commerce and Labor. Data last accessed on the Internet at www.idoc.state.id.us/idcomm/profiles/cppdfs/Kamiah.pdf on October 6, 2004.

IDWR 2004. Idaho Department of Water Resources, Internet web site at http://www.idwr.state.id.us/water/flood/flood1.pdf, last accessed on October 1, 2004.

IGS 2004. Idaho Geological Society, Internet web site at http://www.idahogeology.com/Services/GeologicHazards/Earthquakes/ last accessed on October 5, 2004.

Levinson, D.H. 2002. Montana/Idaho Airshed Group; Operating Guide. Montana / Idaho Airshed Group, Missoula, MT 59808

Louks, B. 2001. Air Quality PM 10 Air Quality Monitoring Point Source Emissions; Point site locations of DEQ/EPA Air monitoring locations with Monitoring type and Pollutant. Idaho Department of Environmental Quality. Feb. 2001. As GIS Data set. Boise, Id.

MacDonald, L.H., J. Benavides-Solorio, J. Stednick , J. Pietraszek, D. Hughes. 2004. Controls on post-fire erosion rates from wild and prescribed fires in the Colorado front range. Geophysical Research Abstracts, Vol. 6, 06003, 2004 SRef-ID: 1607-7962/gra/EGU04-A-06003. European Geosciences Union 2004. Last accessed on the Internet at http://www.cosis.net/abstracts/EGU04/06003/EGU04-J-06003-2.pdf on October 6, 2004.

McClelland D.E., R.B. Foltz, W.D. Wilson, T.W. Cundy, R. Heinemann, J.A. Saurbier, R.L. Schuster. 1977. Assessment of the 1995 & 1996 floods and landslides on the Clearwater National Forest Part 1: Landslide Assessment, A Report to the regional Forester Northern Region U.S. Forest Service, December 1997.

National Register of Historic Places. 2003. Internet web site listings for Canyon County, Idaho. On the Internet at www.nationalregisterofhistoricalplaces.com last accessed on October 1, 2004.

Norton, P. 2002. Bear Valley National Wildlife Refuge Fire Hazard Reduction Project: Final Environmental Assessment, June 20, 2002. Fish and Wildlife Service, Bear Valley National Wildlife Refuge.

Rasmussen, L.M. 2000. Soil Survey of Adams-Washington Area, Idaho, Parts of Lewis and Nez Perce Counties. USDA Natural Resources Conservation Service. Available on the Internet at http://www.or.nrcs.usda.gov/pnw_soil/idaho/id656.html

Redmond, R.L. 1997. Mapping existing vegetation and land cover across western Montana and Northern Idaho. Wildlife Spatial Analysis Lab. Montana Cooperative Fish and Wildlife Research Unit. University of Montana, Missoula, MT 59812.

Schiappa, T. and P.K. Link. 2002. Cenozoic Geologic History of Gem and Payette Counties. As presented on the Idaho State University Internet web site at http://imnh.isu.edu/digitalatlas/counties/gem/geomap.htm last accessed on October 1, 2004.

SHELDUS. 2004. Hazards Research Lab and the Board of Trustees of the University of South Carolina. SHELDUS Ver 2.1 Last accessed December 10, 2004, on the Internet at http://www.cla.sc.edu/GEOG/hrl/index.htm

SIU 2003. Southern Illinois University – Perspectives: Drop by Drop: Some Fast Water Facts. On the Internet at http://www.siu.edu/~perspect/03_fall/water3.html last accessed on October 6, 2004.

USDA-Forest Service (United States Department of Agriculture, Forest Service). 2000. Incorporating Air Quality Effects of Wildland Fire Management into Forest Plan Revisions – A Desk Guide. April 2000. – Draft

Weisz, D.W., K.L. Othberg, and R. M. Breckenridge. 2003. Surficial Geological Map of the Payette Quadrangle, Idaho and Lewis Counties, Idaho. Idaho Geological Survey Map, scale 1:24,000.

WRCC 2004. Western Regional Climate Center data last accessed on the Internet at http://www.wrcc.dri.edu/narratives/IDAHO.htm on October 6, 2004.

This plan was developed by Northwest Management, Inc., under contract with the Canyon County Commissioners and the Southwest Idaho Resource Conservation and Development Council, Inc., with funding provided by the USDI Bureau of Land Management, the Idaho Bureau of Homeland Security, FEMA, and Canyon County.

Citation of this work:

Schlosser, W. E., T. R. King and T. R. Brown *(posthumously)*. *Lead Authors.* 2006. Canyon County, Idaho, All Hazard Mitigation Plan, Volume I. Northwest Management, Inc., Moscow, Idaho. June 26, 2006. Pp. 145.

Schlosser, W. E., T. R. King and T. R. Brown *(posthumously)*. *Lead Authors.* 2006. Canyon County, Idaho Wildland Urban Interface Wildfire Mitigation Plan, Volume II. Northwest Management, Inc. Moscow, Idaho. June 26, 2006. Pp. 146.

Schlosser, W. E., T. R. King and T. R. Brown *(posthumously)*. *Lead Authors.* 2006. Canyon County, Idaho All Hazard Mitigation Plan Appendices, Volume III. Northwest Management, Inc. Moscow, Idaho. June 26, 2006. Pp. 73.

Last Page of Document

Northwest Management, Inc.
233 East Palouse River Drive
PO Box 9748
Moscow ID 83843

208-883-4488 Telephone
208-883-1098 Fax
NWManage@consulting-foresters.com e-Mail
http://www.Consulting-Foresters.com/ Internet

(Remainder Intentionally Blank)